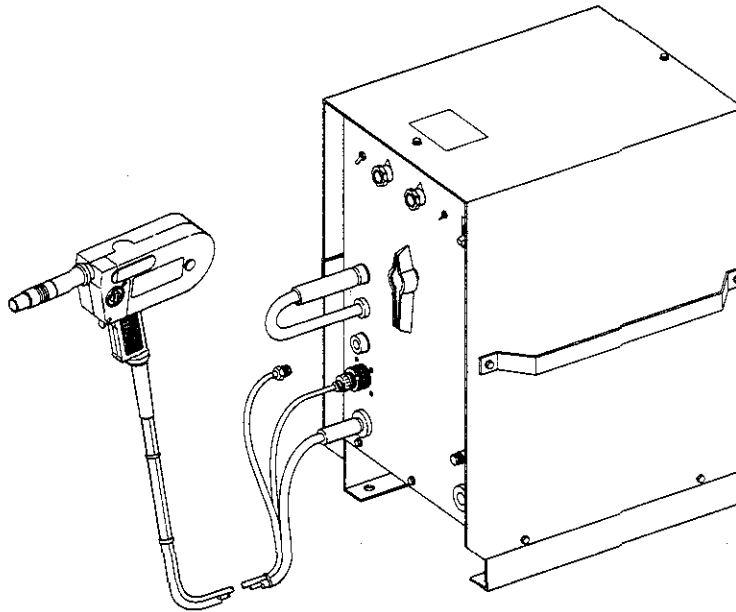




MODEL
SPOOLMATE™ 200
SK-200 Spot Panel



OWNER'S MANUAL

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

Miller Electric Mfg. Co.

A Miller Group Ltd. Company

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

LIMITED WARRANTY

EFFECTIVE: OCTOBER 1, 1986

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

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

Amend Figure 6 - 2. Circuit Diagram For Units With Optional SK-200 Spot Panel

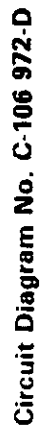


Figure 6 -- 2. Circuit Diagram For Units With Optional SK-200 Spot Panel

**	Dia. Mkgs.	Part No.	Replaced With	Description	Quantity
3-21		082 067	600 320	CABLE, weld-stranded No. 1 (order by ft)(Eff w/JJ337881)	3ft
7-16		085 698	114 786	LINK, connecting-contactor terminal (Eff w/JH312125).....	2

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

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

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

1-1. INTRODUCTION – We learn by experience. Learning safety through personal experience, like a child touching a hot stove is harmful, wasteful, and unwise. Let the experience of others teach you.

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

Read and understand these safe practices before attempting to install, operate, or service the equipment. Comply with these procedures as applicable to the particular equipment used and their instruction manuals, for personal safety and for the safety of others.

Failure to observe these safe practices may cause serious injury or death. When safety becomes a habit, the equipment can be used with confidence.

These safe practices are divided into two Sections: 1 – General Precautions, common to arc welding and cutting; and 2 – Arc Welding (and Cutting) (only).

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

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

1-2. GENERAL PRECAUTIONS

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

A. Burn Prevention

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

Wear helmet with safety goggles or glasses with side shields underneath, appropriate filter lenses or plates (protected by clear cover glass). This is a **MUST** for

welding or cutting, (and chipping) to protect the eyes from radiant energy and flying metal. Replace cover glass when broken, pitted, or spattered. See 1-3A.2.

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

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

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

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

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

B. Toxic Fume Prevention

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

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

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

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

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

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

Vapors from chlorinated solvents can be decomposed by the heat of the arc (or flame) to form PHOSGENE, a

highly toxic gas, and other lung and eye irritating products. The ultraviolet (radiant) energy of the arc can also decompose trichloroethylene and perchloroethylene vapors to form phosgene. DO NOT WELD or cut where solvent vapors can be drawn into the welding or cutting atmosphere or where the radiant energy can penetrate to atmospheres containing even minute amounts of trichloroethylene or perchloroethylene.

C. Fire and Explosion Prevention

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

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

To prevent fires and explosion:

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

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

Walls touching combustibles on opposite sides should not be welded on (or cut). Walls, ceilings, and floor near work should be protected by heat-resistant covers or shields.

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

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

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

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

An empty container that held combustibles, or that can produce flammable or toxic vapors when heated, must

never be welded on or cut, unless container has first been cleaned as described in AWS Standard A6.0, listed 7 in Standards index.

This includes: a thorough steam or caustic cleaning (or a solvent or water washing, depending on the combustible's solubility) followed by purging and inerting with nitrogen or carbon dioxide, and using protective equipment as recommended in A6.0. Waterfilling just below working level may substitute for inerting.

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

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

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

D. Compressed Gas Equipment

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

1. Pressure Regulators

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

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

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

Leaks - if gas leaks externally.

Excessive Creep - if delivery pressure continues to rise with downstream valve closed.

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

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

2. Cylinders

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

Avoid electrical circuit contact with cylinders including third rails, electrical wires, or welding circuits. They can produce short circuit arcs that may lead to a serious accident. (See 1-3C.)

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

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

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

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

Locate or secure cylinders so they cannot be knocked over.

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

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

Do NOT expose cylinders to excessive heat, sparks, slag, and flame, etc. that may cause rupture. Do not allow contents to exceed 130°F. Cool with water spray where such exposure exists.

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

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

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

Never refill any cylinder.

Cylinder fittings should never be modified or exchanged.

3. Hose

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

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

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

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

Coil excess hose to prevent kinks and tangles.

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

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

Repair leaky or worn hose by cutting area out and splicing (1-2D3). Do NOT use 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 agree, and that the regulator inlet and cylinder outlet match. NEVER CONNECT a regulator designed for a particular gas or gases to a cylinder containing any other gas.

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 there-after. Brush with soap solution (capful of Ivory

Liquid* or equivalent per gallon of water). Bubbles indicate leak. Clean off soapy water after test; dried soap is combustible.

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.

1-3. ARC WELDING - Comply with precautions in 1-1, 1-2, and this section. Arc Welding, properly done, is a safe process, but a careless operator invites trouble. The equipment carries high currents at significant voltages. The arc is very bright and hot. Sparks fly, fumes rise, ultraviolet and infrared energy radiates, weldments are hot, and compressed gases may be used. The wise operator avoids unnecessary risks and protects himself and others from accidents. Precautions are described here and in standards referenced in index.

A. Burn Protection

Comply with precautions in 1-2.

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

1. Protective Clothing

Wear long-sleeve clothing (particularly for gas-shielded arc) in addition to gloves, hat, and shoes (1-2A). As necessary, use additional protective clothing such as leather jacket or sleeves, flame-proof apron, and fire-resistant leggings. Avoid outer garments of untreated cotton.

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

2. Eye and Head Protection

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

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

*Trademark of Proctor & Gamble.

Protect filter plate with a clear cover plate.

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

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

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

3. Protection of Nearby Personnel

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

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

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

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

B. Toxic Fume Prevention

Comply with precautions in 1-2B.

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

C. Fire and Explosion Prevention

Comply with precautions in 1-2C.

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

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

Never strike an arc on a cylinder or other pressure vessel. It creates a brittle area that can cause a violent rupture or lead to such a rupture later under rough handling.

D. Compressed Gas Equipment

Comply with precautions in 1-2D.

E. Shock Prevention

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

To protect against shock:

Keep body and clothing dry. Never work in damp area without adequate insulation against electrical shock. Stay on a dry duckboard, or rubber mat when dampness or sweat can not be avoided. Sweat, sea water, or moisture between body and an electrically HOT part - or grounded metal - reduces the body surface electrical resistance, enabling dangerous and possibly lethal currents to flow through the body.

1. Grounding the Equipment

When arc welding equipment is grounded according to the National Electrical Code, and the work is grounded according to ANSI Z49.1 "Safety In Welding And Cutting," a voltage may exist between the electrode and any conducting object. Examples of conducting objects include, but are not limited to, buildings, electrical tools, work benches, welding power source cases, workpieces, etc. **Never touch the electrode and any metal object unless the welding power source is off.**

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

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

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

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

2. Electrode Holders

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

3. Connectors

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

4. Cables

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

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

5. Terminals And Other Exposed Parts

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

6. Electrode

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

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

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

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

7. Safety Devices

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

Before installation, inspection, or service, of equipment, shut OFF all power and remove line fuses (or lock

or red-tag switches) to prevent accidental turning ON of power. Disconnect all cables from welding power source, and pull all 115 volts line-cord plugs.

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

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

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

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

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

1-4. STANDARDS BOOKLET INDEX

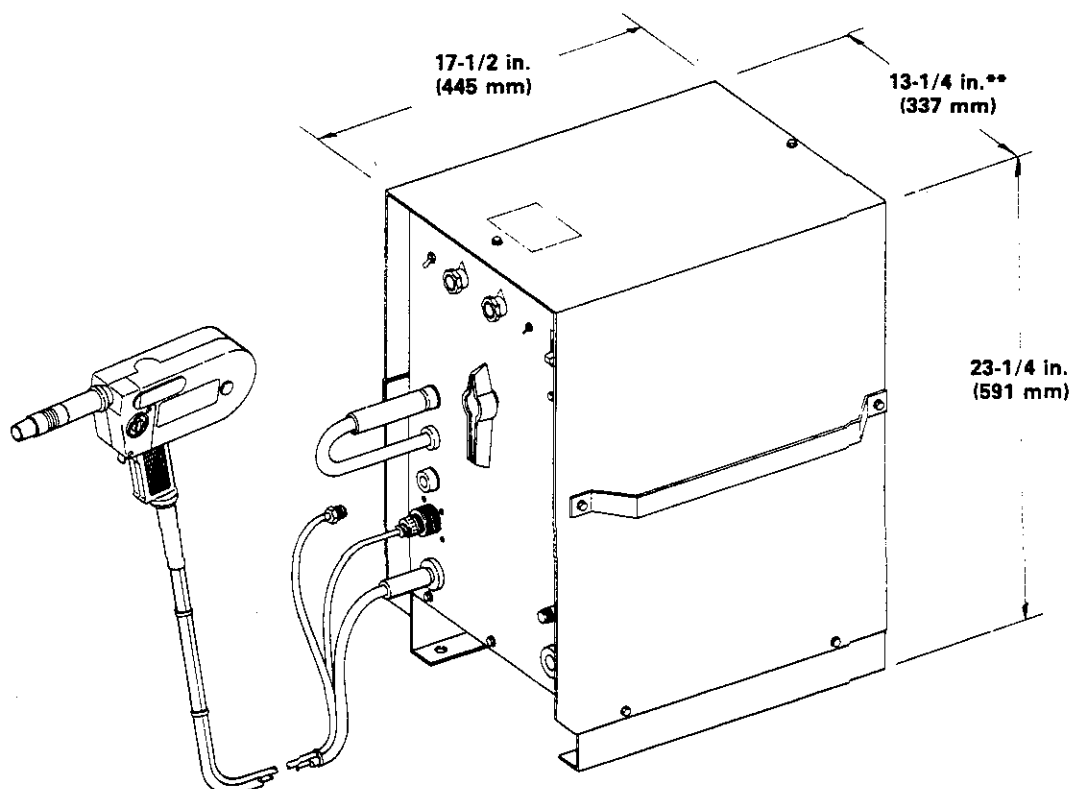
For more information, refer to the following standards or their latest revisions and comply as applicable:

1. ANSI Standard Z49.1, SAFETY IN WELDING AND CUTTING obtainable from the American Welding Society, 550 Le Jeune Rd, P.O. Box 351040, Miami, FL 33135.
2. NIOSH, SAFETY AND HEALTH IN ARC WELDING AND GAS WELDING AND CUTTING obtainable from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.
3. OSHA, SAFETY AND HEALTH STANDARDS, 29CFR 1910, obtainable from the U.S. Government Printing Office, Washington, D.C. 20402.
4. ANSI Standard Z87.1, SAFE PRACTICES FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
5. ANSI Standard Z41.1, STANDARD FOR MEN'S SAFETY-TOE FOOTWEAR obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.
7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES obtainable from the American Welding Society, 550 Le Jeune Rd. P.O. Box 351040, Miami FL 33135.
8. NFPA Standard 51, OXYGEN - FUEL GAS SYSTEMS FOR WELDING AND CUTTING obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
9. NFPA Standard 70-1978, NATIONAL ELECTRICAL CODE obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, MA 02210.
11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS obtainable from the Compressed Gas Association, 500 Fifth Avenue, New York, NY 10036.
12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.
13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103.
14. American Welding Society Standard AWSF4.1 "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", obtainable from the American Welding Society, 550 Le Jeune Rd. P.O. Box 351040, Miami, FL 33135.
15. ANSI Standard Z88.2 "Practice for Respiratory Protection" obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

SECTION 2 - INTRODUCTION

Rated Welding Output At 60% Duty Cycle	Maximum Open- Circuit Voltage	Input At Rated Load Output 60 Hz Single-Phase					kw	Weight*	
		Amperes At				kva			
		200V	230V	460V	575V			Net	Ship
200 Amperes At 28 Volts DC	42	46	40	20	16	9.15	8.3	168 lbs. (76 kg)	172 lbs. (78 kg)

Figure 2 - 1. Specifications



*Add 20 lbs. (9 kg) when shipped with SPOOLMATIC 1 gun.
 **Add 3 in. (76 mm) for handles.

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Figure 2 - 2. Overall Dimensions

2 - 1. VOLT-AMPERE CURVES (Figure 2-3)



The volt-ampere curves show the voltage and amperage output capabilities of the welding power source at the minimum and maximum values of the VOLTAGE ADJUSTMENT control setting. Curves of other settings will fall between the curves shown.

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

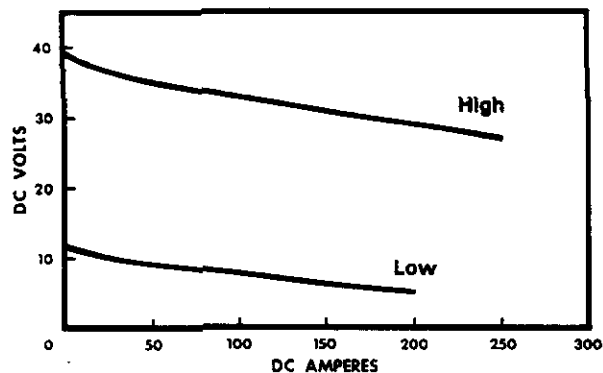


Figure 2 - 3. Volt-Ampere Curves

B-049 424

2 - 2. DUTY CYCLE (Figure 2-4) - The duty cycle of a welding power source is the percentage of a ten minute period that a welding power source can be operated at a given output without causing overheating and damage to the unit. This welding power source is rated at 60 percent duty cycle. This means that the welding power source can be operated at rated load for six minutes out of every ten. During the remaining four minutes, the unit should idle to permit proper cooling. If the welding amperes are decreased, the duty cycle will increase. Figure 2-4 enables the operator to determine the output of the welding power source at various duty cycles.

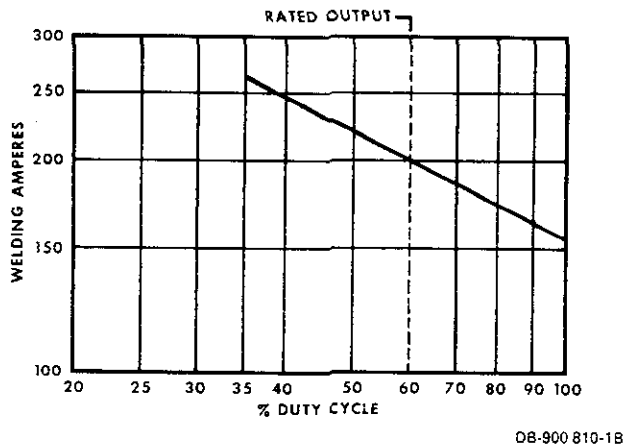


Figure 2 - 4. Duty Cycle Chart

2 - 3. GENERAL INFORMATION AND SAFETY

A. General

Information presented in this manual and on various labels, tags, and plates on this 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.

Safety instructions specifically pertaining to this unit appear throughout this manual highlighted by the signal words **WARNING** and **CAUTION** which identify different levels of hazard.

WARNING statements include installation, operation, and maintenance procedures or practices which if not carefully followed could result in serious personal injury or loss of life.

CAUTION statements include installation, operation, and maintenance procedures or practices which if not carefully followed could result in minor personal injury or damage to this equipment.

A third signal word, **IMPORTANT**, highlights instructions which need special emphasis to obtain the most efficient operation of this equipment.

2 - 4. RECEIVING-HANDLING - Before installing this equipment, clean all packing material from around the unit, and carefully inspect for any damage that may have occurred during shipment. Any claims for loss or damage that may have occurred in transit must be filed **by the purchaser with the carrier**. A copy of the bill of lading will be furnished by the manufacturer on request if occasion to file claim arises.

When requesting information concerning this equipment, it is essential that Model Description and Serial Number of the equipment be supplied.

2 - 5. DESCRIPTION

This unit is a single-phase, constant voltage dc arc welding power source designed for Electrode Positive/Reverse Polarity Gas Metal Arc Welding (GMAW).

The unit is available with or without a self-contained gun/feeder system. The front panel is equipped with receptacles for installing the SPOOLMATIC 1 gun, and the rear panel is equipped with a receptacle for installing a separate 50-series wire feeder. If a 50-series wire feeder is used, an adapter cord is required. Obtain the necessary adapter cord from your welding equipment distributor.

Models with the optional SK-200 Spot Panel provide the controls for regulating spot/weld time and burnback time when using the SPOOLMATIC 1 gun.

The number 200 in the model designation refers to the rated output of the unit. Information concerning the gun/feeder is found in the SPOOLMATIC 1 gun Owner's Manual (OM-1210).

SECTION 3 - INSTALLATION

3 - 1. LOCATION (Figure 2-2)

WARNING: ELECTRIC SHOCK can kill.

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

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Lift unit using handles on sides of case.
- Have two persons of adequate physical strength lift unit.
- Move unit with hand cart or similar device of adequate capacity.
- If using a fork lift vehicle, place unit on a proper skid before transporting.

This unit has a lift handle on each side of case for lifting. Be sure unit is lifted and transported safely and securely.

RESTRICTED AIR FLOW causes overheating and possible damage to internal parts.

- 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 welding power source.

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

This welding power source has two lifting handles for moving the unit and holes in the base for mounting purposes. Figure 2-2 gives overall dimensions of the unit.

The location should allow room to remove the top cover and side panels for installation, maintenance, and repair procedures.

The service life and efficiency of this unit are reduced when the unit is subjected to high levels of dust, dirt, moisture, corrosive vapors, and extreme heat.

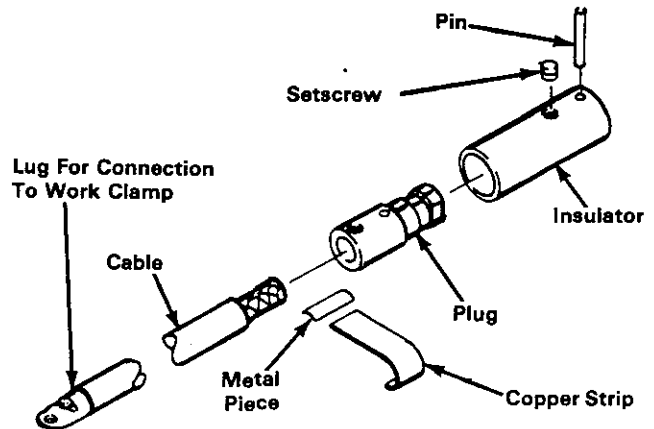
3 - 2. WORK CABLE ASSEMBLY AND INSTALLATION (Figure 3-1)

A 10 ft. (3 m) cable and twistlock plug are provided with this unit to assemble for use as a work cable. A work clamp must be obtained and installed onto cable to complete the assembly, proceed as follows:

A. Assembly (Figure 3-1)

1. Slide terminal lug on cable onto work clamp.
2. Secure terminal lug to work clamp.
3. Remove one inch (25.4 mm) of insulation from remaining end of cable.
4. Wrap copper strip tightly around cable.
5. Place metal piece on copper strip, and insert cable into setscrew end of male plug so that cable is snug against bottom of plug body, and setscrew hole is over the metal piece.

6. Install and tighten setscrew to secure plug onto cable.
7. Slide insulator over plug so that setscrew and locking pin holes line up.
8. Secure insulator by driving pin through insulator and plug.



Ref: TD-083 264-E

Figure 3 - 1. Twistlock Plug Installation

B. Installation

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before making weld output connections.

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. Insert plug from work cable into NEGATIVE (-) weld output receptacle with flat side towards receptacle key.
2. Rotate plug fully clockwise.
3. Connect work clamp to workpiece.

3 - 3. SPOOLMATIC 1 INSTALLATION (If Applicable)

IMPORTANT: Prepare SPOOLMATIC 1 gun/feeder as required before installing to welding power source. See SPOOLMATIC 1 Owner's Manual OM-1210.

A. Shielding Gas Connection

Connect shielding gas hose from SPOOLMATIC 1 to the gas regulator/flowmeter on the shielding gas supply.

B. Weld Cable Connections (Figure 4-1)

SPOOLMATIC



POSITIVE



To make connection, align flat side of SPOOLMATIC 1 weld cable plug with key in SPOOLMATIC POSITIVE weld output receptacle, insert plug into receptacle, and rotate plug fully clockwise.

C. Trigger Control Connections (Figure 4-1)



To make connection, align keyway in plug on SPOOLMATIC 1 trigger control cord with key in trigger control receptacle RC1, insert plug into receptacle, and rotate threaded collar fully clockwise.

3 - 4. WELD OUTPUT CONNECTIONS FOR UNITS WITHOUT SPOOLMATIC 1 GUN/FEEDER (Figure 3-1)



WARNING: ELECTRIC SHOCK can kill, ARC SPARKS can cause fire.

- Do not touch live electrical parts.
- Do not connect two guns to this welding power source at the same time.
- Shut down welding power source and disconnect input power employing "lockout/tagging procedures" before inspecting or installing.
- Watch for fire.
- Keep a fire extinguisher nearby, and know how to use it.

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

If two guns are connected to this welding power source both electrode wires will be energized when either gun is operated.

To obtain the full rated output from this unit, it is necessary to select, install, and maintain proper welding cables. Failure to comply in any of these areas may result in less than satisfactory welding performance.

A. Weld Cable Selection

If welding cables were not ordered with this unit, the steps listed should be followed to ensure the best welding performance:

1. Keep cables as short as possible and place cables close together. Excessive cable length adds resistance which may reduce output or cause overloading of the unit.
2. Select adequate size welding cable for the anticipated maximum weld current. Use total length of welding cables in the circuit to determine cable size. For example: If the wire feeder cable is 5 feet (1.5 m) long and the work cable is 10 feet (3 m) long, select the size cable recommended in Table 3-1 for 15 feet (4.6 m). The maximum recommended cable length when using high frequency is 50 feet (15 m).

WELDING AMPERES	*TOTAL LENGTH OF CABLE (COPPER) IN WELD CIRCUIT							
	*50	100	150	200	250	300	350	400
100	4	4	4	3	2	1	1/0	1/0
150	3	3	2	1	1/0	2/0	3/0	3/0
200	2	2	1	1/0	2/0	3/0	4/0	4/0
250	1	1	1/0	2/0	3/0	4/0	4/0	2-2/0
300	1/0	1/0	2/0	3/0	4/0	4/0	2-2/0	2-3/0

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- NOTE: *A. 50 FEET OR LESS.
- *B. CABLE SIZE IS BASED ON DIRECT CURRENT (DC), 60% DUTY CYCLE AND EITHER A 4 VOLTS OR LESS DROP OR A CURRENT DENSITY OF NOT OVER 300 CIRCULAR MILS PER AMP.
- *C. WELD CABLE INSULATION WITH A VOLTAGE RATING TO WITHSTAND THE OPEN-CIRCUIT VOLTAGE (OCV) OF THE WELDING POWER SOURCE MUST BE USED. WHILE MOST WELDING POWER SOURCES HAVE AN OPEN-CIRCUIT VOLTAGE OF LESS THAN 100 VOLTS, SOME WELDING POWER SOURCES OF SPECIAL DESIGN MAY HAVE HIGHER OPEN-CIRCUIT VOLTAGE.

3. Do not use damaged or frayed cable.
4. Install correct size lug of adequate amperage capacity onto end of cable for connecting to wire feeder.

B. Weld Cable Preparation

A male plug is supplied with this unit for making weld output connections from welding power source to the wire feeder. Obtain one weld cable (No. 2 size cable is recommended) of the desired length, and install the plug onto one end of this cable.

1. Remove 1 in. (25.4 mm) of insulation from one end of cable.
2. Wrap copper strip tightly around stripped end of cable.
3. Place metal piece on copper strip, and slide plug onto cable so that setscrew hole is over metal piece. Be sure end of cable is snug against bottom of plug body.
4. Install and tighten setscrew, securing plug to cable.
5. Slide insulator over plug so that setscrew and locking pin holes line up.
6. Secure insulator to plug by driving insulator pin through insulator and plug.

- Obtain and install lug of adequate size and capacity onto remaining end of cable.

C. Weld Cable Connections

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down unit and disconnect input power employing "lockout/tagging procedures" before making weld output connections.

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

- Install lug on cable to weld cable terminal on drive housing of wire feeder (see wire feeder Owner's Manual for location).
- Insert plug on remaining end of cable into POSITIVE (+) weld output receptacle with flat side towards receptacle key, and rotate plug fully clockwise.

3 - 5. WIRE FEEDER INSTALLATION FOR UNITS WITHOUT SPOOLMATIC 1 GUN/FEEDER

The welding power source is equipped with a receptacle RC2 on the rear panel for making connections to a separate wire feeder. The rear panel receptacle provides 115 volts ac and contactor control. To make connections, proceed as follows:

- Obtain proper adapter cord from welding equipment distributor.
- Install four-pin plug on end of adapter cord into four-socket receptacle on rear of welding power source, and rotate plug fully clockwise.
- Install remaining end of adapter cord into receptacle on wire feeder (see wire feeder Owner's Manual for location of receptacle).

3 - 6. ELECTRICAL INPUT CONNECTIONS



A. Electrical Input Requirements

This welding power source is designed to be operated from single-phase, 60 Hertz, ac input power which has a voltage rating that matches one of the electrical input voltages shown on the nameplate or input data label. Consult the local electric utility if there is any question about the type of electrical system available at the installation site or how proper connections to the welding power source are to be made.

B. Matching The Welding Power Source To The Available Input Voltage

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.

- Shut down welding power source and disconnect input power employing "lockout/tagging procedures" before inspecting or installing.

Lockout/tagging procedures consist of removing input power plug from receptacle, 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: INCORRECT INPUT VOLTAGE JUMPER LINK PLACEMENT can damage unit.

- Position jumper links as shown on the input voltage label located on input terminal board.
- Store unused jumper links across linked terminals.

This welding power source is equipped with input voltage jumper links either installed or in a bag on the input terminal board to allow operation from different line voltages. If installed, the jumper links are positioned for the highest voltage stated on the nameplate or input data label. If in a bag, proper installation is necessary before operation.

Remove the wrapper. Reposition or install if applicable the jumper links onto the input terminal board to match the available line voltage positions shown on the input voltage label (see Figure 3-2). Reinstall wrapper.

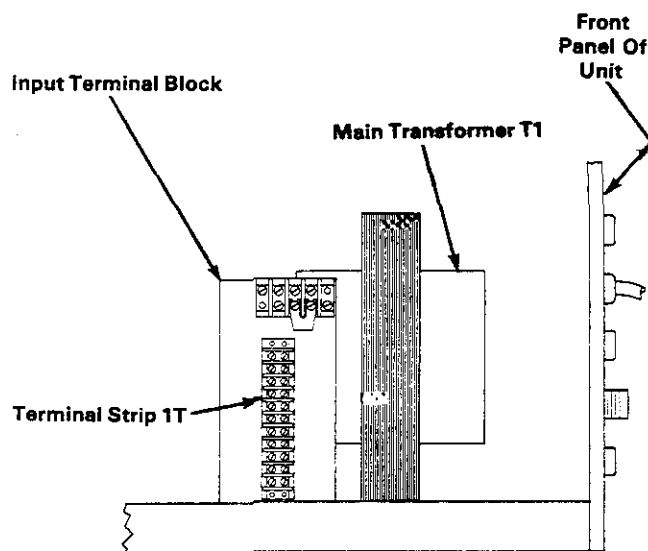


Figure 3 - 2. Input Voltage Jumper Links Location

C. Wall Receptacle And Power Cable Connections (Figure 3-)

WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Install a fusible line disconnect switch in the input circuit to the welding power source.

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

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

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

- *When making input power connections, work from welding power source power cable, to wall receptacle if applicable, to deenergized line disconnect switch. Always work on deenergized circuits when making input power connections.*

All models are equipped with a three-conductor power cable. Models requiring 200 or 230 volts input are equipped with a three-prong polarized plug and wall receptacle. The wall receptacle should be installed in a convenient location by a competent electrician. Install the wall receptacle with the grounding terminal at the top, allowing the power cable to hang downward without undue bending or twisting.

Models having an electrical input voltage above 230 volts have prewired power cables with three conductors. The black and white conductors must be connected to the line disconnect switch and the green conductor must be connected to a proper ground (see Figure 3-3). Use a grounding method that is acceptable to the local electrical inspection authority.

WARNING: ELECTRICAL SHOCK can kill.

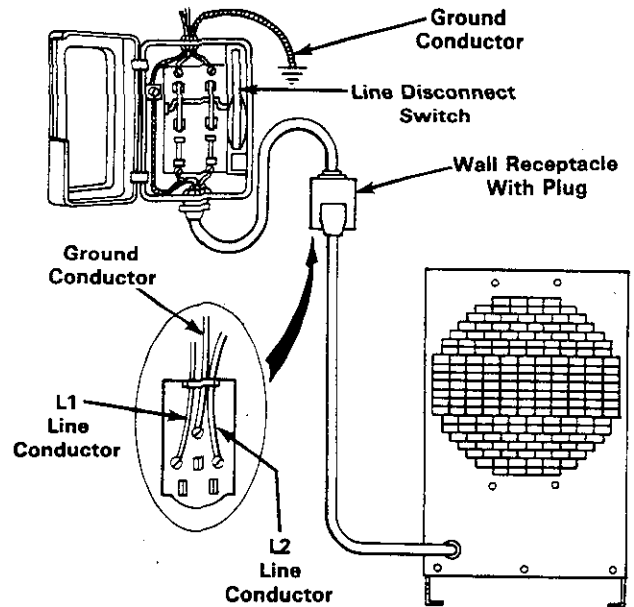
- *Do not connect an input (white or black) conductor to the ground terminal.*
- *Do not connect the ground (green) conductor to an input line terminal.*

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

Table 3 - 1. Input Conductor And Fuse Size

Input Conductor Size - AWG*				Fuse Size In Amperes			
200V	230V	460V	575V	200V	230V	460V	575V
8 (10)	8 (10)	12 (14)	12 (14)	60	50	25	20

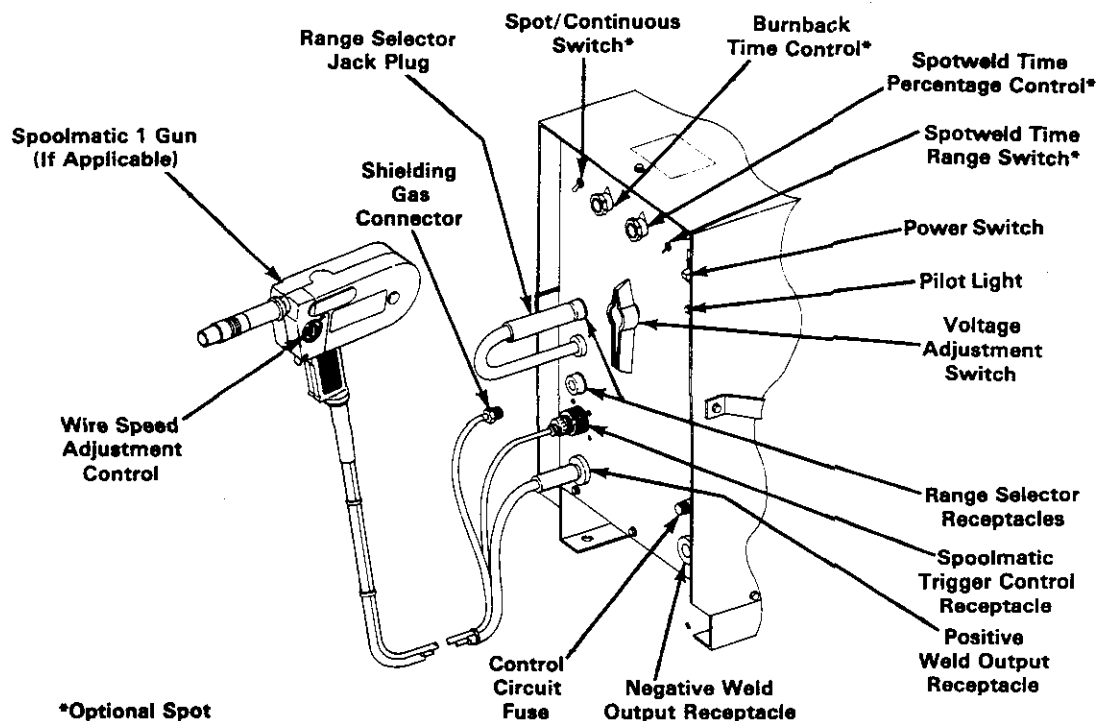
*Input conductor sizes are based on National Electrical Code specifications for allowable ampacities of insulated copper conductors, having a temperature rating of 75°C, with not more than three conductors in a raceway or cable. Numbers in () are equipment ground conductor sizes.



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Figure 3 - 3. Wall Receptacle And Power Cable Connections

SECTION 4 - OPERATOR CONTROLS



TC-083 269-A

Figure 4 - 1. Operator Controls

4-1. POWER SWITCH (Figure 4-1)

POWER



Placing the POWER switch in the ON position energizes the welding power source, making the unit operational. Placing the POWER switch in the OFF position shuts down the unit.

4-2. VOLTAGE ADJUSTMENT SWITCH AND VOLTAGE RANGE SELECTOR PLUG (Figure 4-1)

DO NOT SWITCH WHILE WELDING



VOLTAGE ADJUSTMENT

CAUTION: ARCING can damage contact surfaces.

- Do not change VOLTAGE ADJUSTMENT switch or VOLTAGE RANGE selector plug position while welding or under load.

Arcing causes the contacts to become pitted and eventually inoperative.

The HIGH/LOW VOLTAGE RANGE selector jack plug and VOLTAGE ADJUSTMENT switch provide selection of the open-circuit voltage range. The six-position VOLTAGE ADJUSTMENT switch provides selection of open-circuit voltage from Low 1 through High 6 within each coarse range.

IMPORTANT: Rotate the selector plug a quarter turn when inserting into the receptacle. To remove the plug, give a quarter turn in the opposite direction while withdrawing.

4-3. PILOT LIGHT (Figure 4-1)

The Pilot Light indicates when the welding power source is energized and in a ready-to-weld status. The Pilot Light will light whenever the POWER switch is in the ON position, and it will remain lit if the welding power source shuts down because of overtemperature.

4-4. DEMAND FAN CONTROL

FAN CONTROLLED BY THERMOSTAT

Fan motor FM is thermostatically controlled to provide fan cooling of the transformer T1 and rectifier SR2 if these components require cooling. Under normal

loading, the fan may not run. Two normally-open thermostats, TP1 in main transformer and TP2 in main rectifier, regulate the operation of fan motor FM.

When transformer T1 and/or rectifier SR2 warm up enough to close either of the thermostats, the fan motor starts to run. The fan motor continues to operate until T1 or SR2 have cooled enough to permit TP1 and TP2 to open or until the welding power source is shut down.

4 - 5. FUSE PROTECTION (Figure 4-1)

Fuse F1 provides protection from damage due to an internal short or excessive overload. If F1 opens, the welding power source will completely shut down. See Section 6-4 for fuse replacement procedure.

4 - 6. OPTIONAL SK-200 SPOT PANEL CONTROLS (Figure 4-1)

A. Spot/Continuous Switch



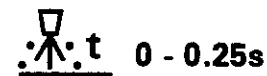
SPOT



CONTINUOUS

This toggle switch allows the operator to choose between a normal wire feed operation or a timed spot weld operation. When the switch is in the SPOT position, weld time is determined by the setting on the SPOTWELD TIME PERCENTAGE control. When the switch is in the CONTINUOUS position, the operator controls the weld time.

B. Burnback Time Control

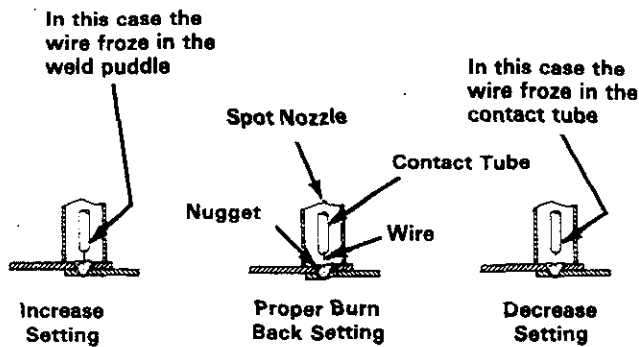


BURNBACK TIME
0.25 SEC. MAX.

The BURNBACK TIME control provides a means of adjusting the time period (up to a maximum of 0.25 seconds) that the welding wire remains electrically energized after the wire feeding has stopped.

By adjusting this control properly, the welding wire will neither freeze in the weld puddle nor in the contact tube of the gun. If the welding wire freezes to the work, increase the burnback time. If the welding wire burns back into the contact tube, decrease the burnback time. Rotate the control clockwise to increase the burnback time, and rotate the control counterclockwise to decrease the burnback time.

The scale surrounding the control is calibrated in percent and does not indicate actual burnback times.



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Figure 4 - 2. Burnback Settings

C. Spotweld Time Range Switch

...t SPOTWELD TIME RANGE

The SPOTWELD TIME RANGE switch allows the operator to select between two spot weld time ranges. In the upper position, this switch provides a spot weld time range of 0.2 to 2.5 seconds. In the lower position, the switch provides a time range of 2.5 to 5.0 seconds.

D. Spotweld Time Percentage Control

...t % SPOTWELD TIME PERCENTAGE

The SPOTWELD TIME PERCENTAGE control is used in conjunction with the SPOTWELD TIME RANGE switch. This control provides a means of selecting a percentage of the weld time selected on the SPOTWELD TIME RANGE switch. Rotating the control clockwise increases the percentage of weld time for the spot weld.

SECTION 5 - SEQUENCE OF OPERATION

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

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

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

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

● Wear correct eye, ear, and body protection.
FUMES AND GASES can seriously harm your health.

- Ventilate to keep from breathing fumes and gases.
- If ventilation is inadequate use approved breathing apparatus.

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

- Watch for fire.
- Have a fire extinguisher nearby, and know how to use it.
- Allow work and equipment to cool before handling.

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

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

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

IMPORTANT: Sections 5-4 and 5-5 are provided as a general introduction to the Gas Metal Arc Welding (GMAW) process. Read and thoroughly understand these instructions before attempting to operate this equipment.

5 - 1. GAS METAL ARC WELDING (GMAW)-CONTINUOUS

1. Install and connect unit according to Section 3.
2. Place VOLTAGE RANGE selector jack plug in the desired voltage range receptacle, and rotate the VOLTAGE ADJUSTMENT switch to the desired setting (see Section 4-2).
3. If applicable, place SPOT/CONTINUOUS switch in CONTINUOUS position.
4. Connect work clamp to workpiece.
5. Place Line Disconnect Switch in the ON position.
6. Turn on shielding gas supply.

IMPORTANT: Open the gas cylinder valve slowly to avoid excessive shock to the regulator indicator.

7. Place the welding power source POWER switch in the ON position.

8. Hold gun nozzle approximately 1/2 in. (12.7 mm) from workpiece.
9. Depress gun trigger. Gas will flow, and wire will feed if drive roll pressure is properly adjusted. (If drive roll pressure adjustment is necessary, see the gun/feeder or wire feeder Owner's Manual.)

5 - 2. GAS METAL ARC WELDING (GMAW) - SPOT (Models With Optional SK-200 Spot Panel Only)

1. Install and connect unit according to Section 3.
2. Place VOLTAGE RANGE selector jack plug in the desired voltage range receptacle, and rotate the VOLTAGE ADJUSTMENT switch to the desired setting (see Section 4-2).
3. Place SPOT/CONTINUOUS switch in SPOT position.
4. Place the SPOTWELD TIME RANGE switch in the desired position (see Section 4-6).
5. Rotate the SPOTWELD TIME PERCENTAGE control to the desired position (see Section 4-6).
6. Rotate the BURNBACK TIME control to the desired position (see Section 4-6).
7. Connect work clamp to workpiece.
8. Place Line Disconnect Switch in the ON position.
9. Turn on shielding gas supply.

IMPORTANT: Open the gas cylinder valve slowly to avoid excessive shock to the regulator indicator.

10. Place the welding power source POWER switch in the ON position.
11. Hold gun nozzle approximately 1/2 in. (12.7 mm) from workpiece.
12. Depress gun trigger. Gas will flow, and wire will feed if drive roll pressure is properly adjusted. (If drive roll pressure adjustment is necessary, see the gun/feeder or wire feeder Owner's Manual.)
13. Readjust SPOTWELD TIME PERCENTAGE control and BURNBACK TIME control as necessary.

5 - 3. SHUTTING DOWN

1. Stop welding.
2. Shut down welding power source.
3. Place Line Disconnect Switch in Off position.
4. Turn off shielding gas at the source.

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

- Shut off gas supply when not in use.

5 - 4. CONTINUOUS WELDING TECHNIQUES

A. General

Before attempting to weld on a finished piece of work, it is recommended that practice welds be made on sample metal the same as that of the finished workpiece.

It is recommended that of all the weld positions this equipment is capable of (flat, vertical, and overhead), the beginner experiment with the flat position in making practice welds since this is the easiest to learn.

As with any other electric arc welding process, the metal to be welded should be free of paint, rust, or other non-conductive material.

B. Holding The Gun (Figure 5-1)

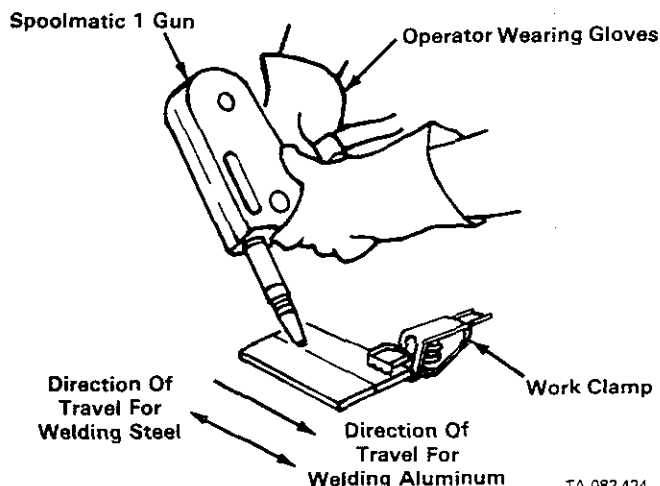


Figure 5-1. Gun Position

IMPORTANT: Sections 5-4, CONTINUOUS WELDING TECHNIQUES and 5-5. SPOT WELDING TECHNIQUES are provided as a general introduction to the Gas Metal Arc Welding process. Read and thoroughly understand these instructions before attempting to operate this equipment.

The gun, held in either hand, should be at a 45 to 60 degree lead angle. It can also be tilted 45 to 60 degrees away from the operator. This gives good vision of the arc which is necessary to follow the seam. However, never view the arc directly. Always use a welding helmet with proper filter lens.

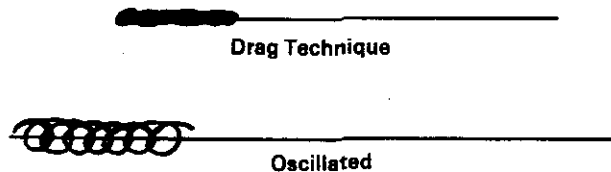
A 1/4 - 5/16 inch (6.3 - 7.9 mm) distance from the bottom side of the gun nozzle to the workpiece must be maintained during the arc starting and welding period.

IMPORTANT: Do not pull the gun back when the arc starts. This will create a long wire extension and a very poor weld.

Cradle the gun in one hand and rest side of hand on workpiece (avoid doing this on hot material); use other hand to hold gun and control gun trigger.

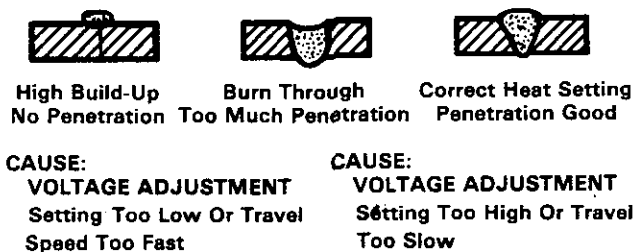
The wire is not energized until trigger is pressed. Therefore the wire can be placed on the seam before lowering helmet and pressing the gun trigger.

The gun can be moved along the seam in a steady movement known as the drag technique. (See Figure 5-2). It can also be oscillated in a full circle a few degrees beyond each side of the seam. Either one is good, and the technique desired will be easy to select. The speed of travel is regulated by the type of weld bead required. The average speed is 15 - 20 inches (0.4 - 0.5 m) per minute. Refer to Figure 5-3 for examples of acceptable or improper weld results.



TA-057 469-16

Figure 5-2. Welding Techniques



TA-057 469-8

Figure 5-3. Crosscut View Of Various Welds

C. Possible Problems

IMPORTANT: The gas nozzle will periodically fill up with weld spatter. Carefully clean it out with a hard-wood stick. Never use a metal tool.

D. Techniques For Vertical And Overhead Welding

For vertical welding, the arc is started at the top of the seam and pulled downward in a steady drag method. When bridging a gap, the arc can be oscillated from one piece of the work to the other.

Overhead welding is easily done with the same techniques: drag or oscillating along the seam. If the puddle is too fluid (hot) using a given VOLTAGE RANGE and VOLTAGE ADJUSTMENT switch setting, move to a lower numbered setting and set the Wire Speed Adjustment control on the Spoolmatic gun at a higher setting. This will aid in cooling the weld puddle.

If welding is being performed in HIGH Range and moving to a lower VOLTAGE ADJUSTMENT setting does not result in more satisfactory weld characteristics, drop to LOW Range and VOLTAGE ADJUSTMENT set at 6. Lower the VOLTAGE ADJUSTMENT setting as required.

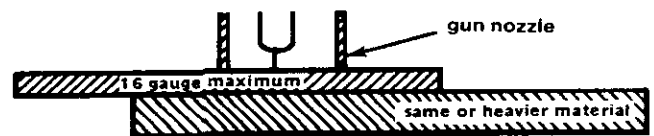
5-5. SPOT WELDING TECHNIQUES

A. Metal Preparation (Figures 5-4 & 5-5)



TA-057 469-8

Figure 5-4. Various Spot Welds



TA-057 469-10A

Figure 5-5. Metal Size

For the best spot welding results, the metal should be clean. Paint and rust should be removed before welding. The work cable clamp must be attached to parts being welded to insure proper grounding and to complete a current path.

Spot welds can be made in a variety of methods and in all positions, thru use of the various nozzles supplied with the spot weld panel.

If the materials are of different thicknesses, the lightest gauge material should always be spotted to the heavy material. Recommended maximum thickness for the top piece for lap spot is 16 gauge.

For tack, inside corner or outside corner, the maximum material thickness will be determined by your acceptance of sufficient weld.

The .035 in. (0.9 mm) wire is best for spotting with this unit. The .030 in. (0.8 mm) will work, but not as well.

The gas can be either CO₂ or 75A-25CO₂. The latter is recommended for use with the lighter gauge materials.

B. Voltage Control

Spot welding usually requires greater heat input to the weld for a given size material than is required for continuous welding. VOLTAGE ADJUSTMENT settings of 3, 4 and 5 in the HIGH range are most generally used.

To start with, use sample materials and set VOLTAGE ADJUSTMENT at 5.

C. Weld Speed Adjustment Control

To determine the proper Wire Speed Adjustment control setting, begin in the 50 - 70% range. This will prevent the wire burning back in the contact tube during initial attempts to set proper wire speed. Decrease the Wire Speed Adjustment setting as required.

D. Nozzle Selection (Figure 5-6)

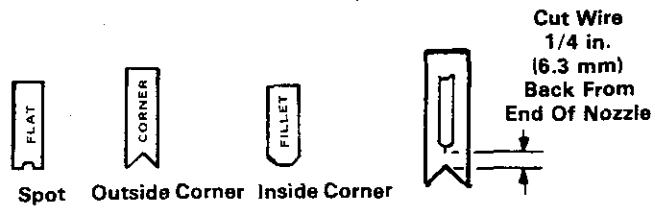
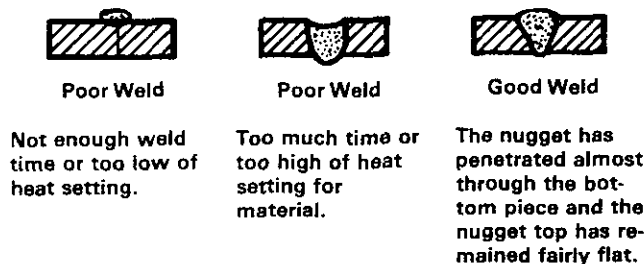


Figure 5 - 6. Spot Nozzles

Remove continuous weld nozzle from gun. Install spot nozzle. Check that wire is cut back 1/4 in. (6.3 mm) from the shortest end of weld nozzle.

E. Spot Weld Checklist (Figure 5-7)



A-057 469-8

Figure 5 - 7. Various Spot Welds

1. To check a spot weld, pull the two pieces apart. A good weld will tear a small hole out of the bottom piece.
2. If weld pulls apart easily, increase the weld time.
3. For a visual test, examine the reverse side of the spot; if a very dark blue circle or small metal protrusion appears, a good weld is indicated.

F. Checking Wire Length And Burnback

Wire should stick out of the contact tube 1/8 in. - 1/4 in. (3.2 - 6.3 mm). If a burnback has occurred (the wire has burned into the contact tube) the contact tube must be replaced as follows:

1. Shut down the welding power source.
2. Remove gun nozzle.
3. Remove contact tube and cut wire off behind tube.
4. Install new contact tube.
5. Replace nozzle.
6. Check wire length.

Decrease the BURNBACK TIME control setting at least ten percent.

SECTION 6 - MAINTENANCE & TROUBLESHOOTING

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 the Parts List for part number of precautionary labels.

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

6 - 2. INSPECTION AND UPKEEP - Usage and shop conditions will determine the frequency and type of maintenance. At minimum, inspect equipment every three months as follows:

WARNING: ELECTRIC SHOCK can kill.

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

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

HOT SURFACES can cause severe burns.

- Allow cooling period before servicing.

1. Inspect all cables and hoses for damage or breaks in the insulation jacket, particularly at the plugs or ends. Repair or replace cable(s) or hoses as necessary.
2. Remove grease and dirt from components, and remove moisture from electrical parts and cables.
3. Be sure that all connections are clean and tight.

6 - 3. INTERNAL CLEANING

WARNING: ELECTRIC SHOCK can kill.

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

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

HOT SURFACES can cause severe burns.

- Allow cooling period before servicing.

Annually blow out or vacuum dust and dirt from around welding power source internal components using a clean, dry airstream. If dirty or dusty conditions are present, clean unit monthly.

6 - 4. OVERLOAD PROTECTION

WARNING: ELECTRIC SHOCK can kill.

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

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

The welding power source is protected from damage due to an internal short or excessive overload by fuse F1. Fuse F1 is located on the front panel. If fuse F1 should open, the welding power source would completely shut down. To replace the fuse, proceed as follows:

CAUTION: IMPROPER FUSES can damage unit.

- Be sure replacement fuse is same size, type, and rating (see Parts List).

1. Depress and rotate fuse holder cover counterclockwise.
2. Pull out fuse with cover when fuse holder cover is free.
3. Insert new fuse into fuse holder cover.

4. Install fuse with fuse holder cover back into unit.

5. Depress and rotate fuse holder cover clockwise until cover is secure.

6 - 5. RECTIFIER PROTECTION (Thermal Shut-down) - Rectifier SR2 is protected from overheating by a normally-closed thermostat TP3 wired in series with contactor W coil circuit. Should overheating occur, TP3 would open causing the contactor to drop out (deenergize) thereby stopping all weld output. If this condition occurs, allow a cooling period before resuming operation.

6 - 6. TROUBLESHOOTING CHART

WARNING: ELECTRIC SHOCK can kill.

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

Lockout/tagging procedures consist of removing input power plug from receptacle, 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 clear of moving parts.

HOT SURFACES can cause severe burns.

- Allow cooling period before servicing.

Troubleshooting to be performed only by qualified persons.

It is assumed that the unit was properly installed according to Section 3 of this manual, the operator is familiar with the function of controls, the welding power source was working properly, and that the trouble is not related to the welding process. The following chart is designed to diagnose and provide remedies for some of the troubles that may develop in this welding power source.

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

IMPORTANT: See gun or wire feeder Owner's Manuals for their complete troubleshooting information.

TROUBLE	PROBABLE CAUSE	REMEDY
No weld output; unit completely inoperative; pilot light PL1 not on.	Line Disconnect Switch in OFF position.	Place Line Disconnect Switch in ON position.
	Line fuse open.	Check and replace line fuses if necessary.
	Improper electrical input connections.	See Section 3-6 for proper input connections.

TROUBLE	PROBABLE CAUSE	REMEDY
No weld output; unit completely inoperative; pilot light PL1 on.	Input voltage jumper links not in proper position.	See Section 3-6 for proper jumper link position.
	Fuse F1 open.	Check and replace F1 according to Section 6-4.
	POWER switch S1.	Replace S1.
	Input voltage jumper links not in proper position.	See Section 3-6 for proper jumper link position.
	Low input voltage.	Connect welding power source to proper input voltage.
Erratic weld output.	Poor and/or improper input and/or output connections.	See Sections 3-2, 3-3, 3-4, and 3-6 for proper input and output connections.
	VOLTAGE RANGE Selector jack plug not secure in receptacle.	Secure plug into receptacle.
	VOLTAGE ADJUSTMENT switch S3.	Check leads and contacts of S3, and replace contacts or switch plate if necessary.
	Capacitor C7.	Replace C7.
No open-circuit voltage; pilot light PL1 on; wire does not feed.	Gun trigger inoperative, or gun trigger leads open.	Replace gun trigger (if applicable) or repair trigger leads (see gun Owner's Manual).
	Control relay CR1 (or CR2 if using separate wire feeder).	Replace CR1 or CR2 as applicable.
	Plug from gun trigger not secure in receptacle RC1 on welding power source (or separate wire feeder if applicable).	Secure plug in RC1.
	SK-200 Spot Panel (Spot Weld Models Only).	Replace spot panel.
No open-circuit voltage; pilot light PL1 on; wire feeds.	VOLTAGE RANGE Selector jack plug not secure in receptacle.	Secure plug into receptacle.
	Main rectifier SR2 overheating (thermal overload; thermostat TP3 open).	Allow unit to cool down (see Section 6-5).
	Contactor points.	Replace points.
	Contactor coil W.	Replace W.

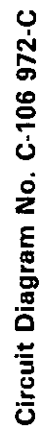
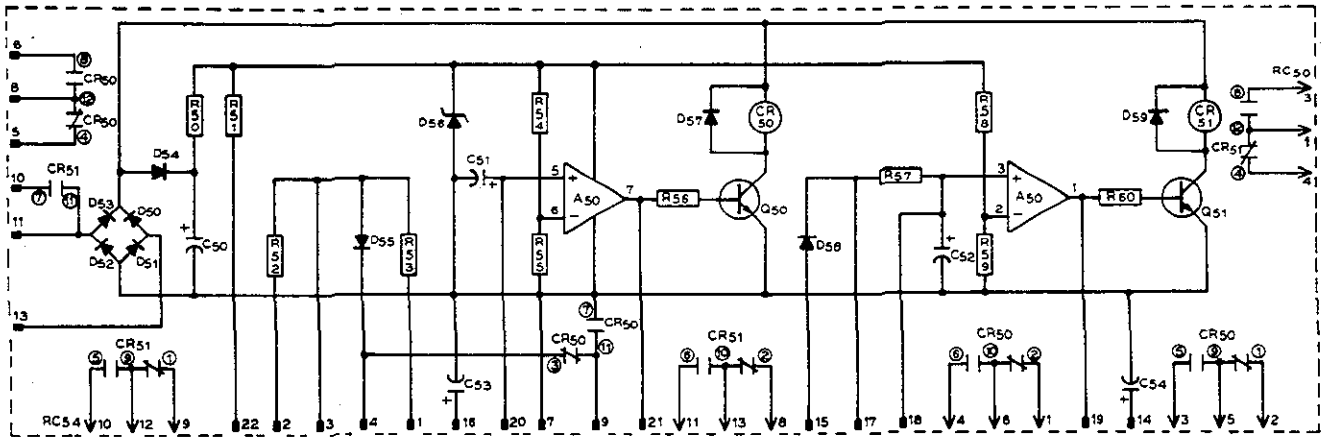
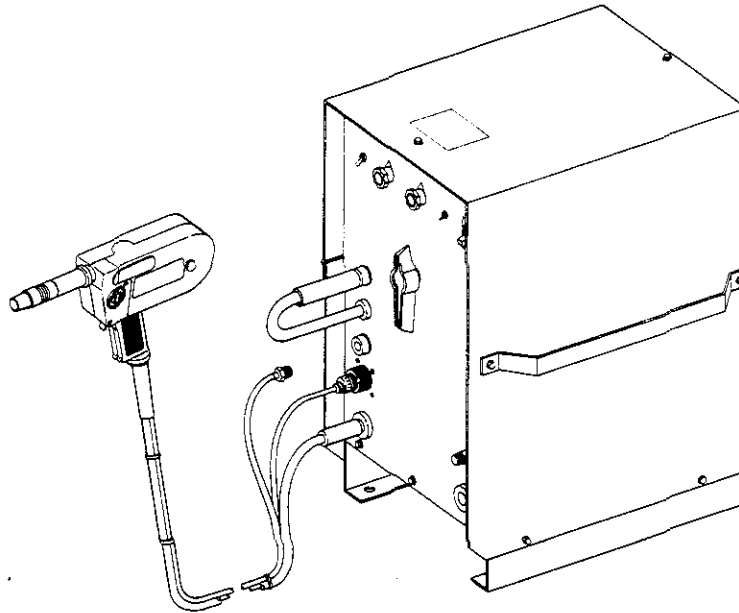


Figure 6 - 2. Circuit Diagram For Units With Optional SK-200 Spot Panel



Circuit Diagram No. B-084 442

Figure 6 - 3. Circuit Diagram For Optional SK-200 Spot Panel Circuit Board



PARTS LIST

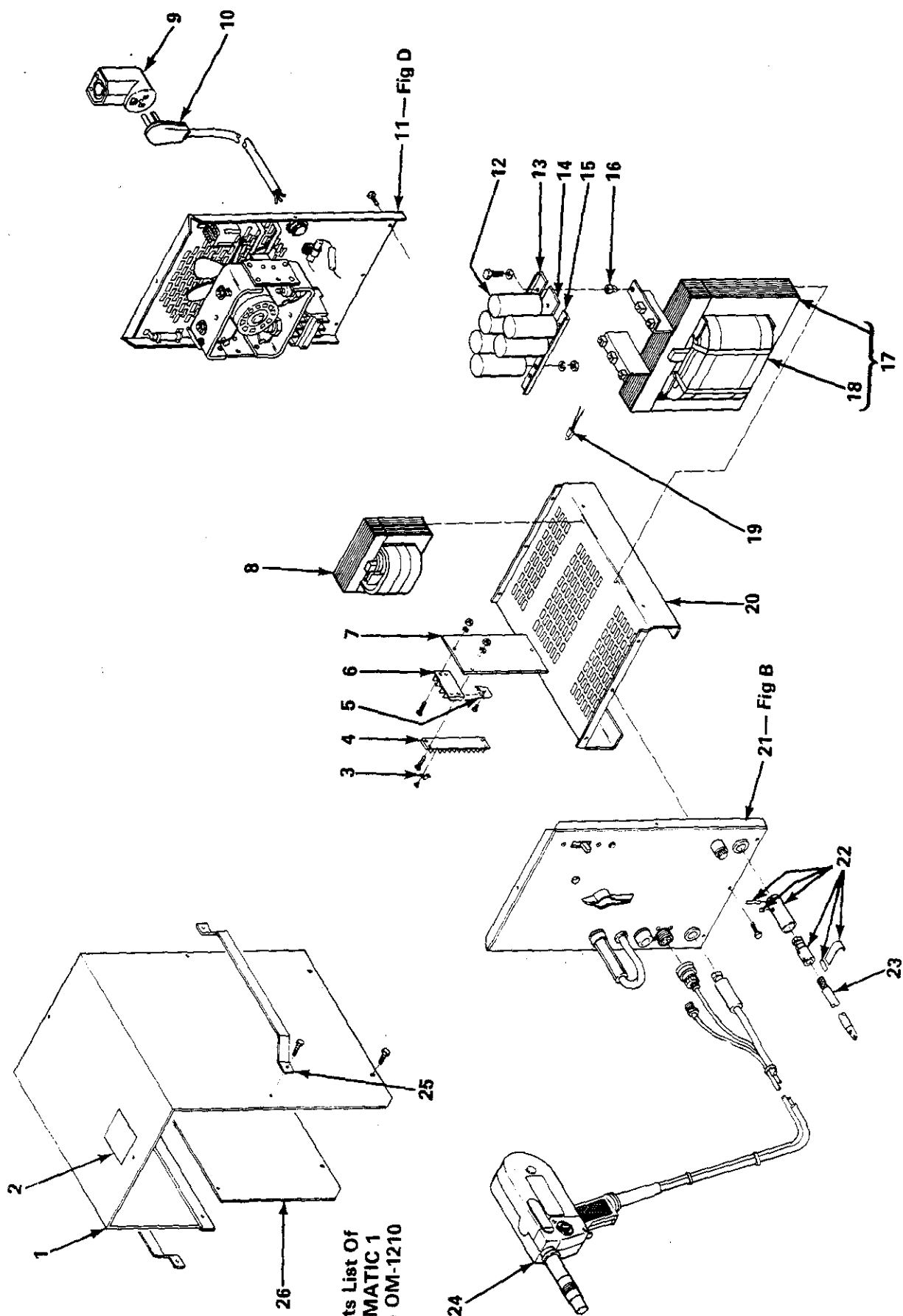


Figure A - Main Assembly

Replace Coils at Factory or Factory Authorized Service Station

Item No.	Dia. Mkgs.	Part No.	Description	Quantity	
				Model	
				W/Gun	W/O Gun
Figure A Main Assembly					
1		+047 167	WRAPPER	1	1
2		047 497	LABEL, general precautionary	1	1
3		601 219	LINK, jumper - terminal block 20 amp	3	3
4	1T	073 586	BLOCK, terminal - 20 amp 11 pole	1	1
5		038 620	LINK, jumper - terminal block 30 amp	1	1
6	TE1	026 189	BLOCK, terminal 30 amp 3 pole	1	1
7		070 765	STRIP, mounting - terminal block	1	1
8	Z	081 716	STABILIZER	1	1
9		039 778	RECEPTACLE, straight 2P3W 50 amp 250 volts	1	1
10		047 721	CORD SET, power 250 volts 3/c 8 ft	1	1
11		Figure D	PANEL, rear-w/components (Pg 7)	1	1
12	C7	084 087	CAPACITOR, electrolytic 9000 uf 40 volts dc	8	8
13		081 594	ANGLE, right hand - mtg capacitor	1	1
14		081 590	STRIP, center - mtg capacitor	1	1
15		081 592	ANGLE, left hand - mtg capacitor	1	1
16		080 509	GROMMET, screw No. 8/10 panel hole 3/16	6	6
17	T1	089 997	TRANSFORMER, power-main (200/230)(consisting of)	1	1
17	T1	092 214	TRANSFORMER, power-main (230/460)(consisting of)	1	1
17	T1	092 215	TRANSFORMER, power-main (230/460/575)(consisting of)	1	1
18		089 780	. COIL, pri/sec (200/230)	1	1
18		092 026	. COIL, pri/sec (230/460)	1	1
18		092 027	. COIL, pri/sec (230/460/575)	1	1
19	TP1	088 592	THERMOSTAT, NO	1	1
20		081 586	BASE	1	1
21		Figure B	PANEL, front - w/components (Pg 3)	1	1
22		039 630	PLUG, male - twistlock insulated	1	2
23		023 100	CABLE, interconnecting - ground clamp	1	1
24		+ +	SPOOLMATIC 1 gun	1	1
25		081 588	HANDLE, lifting	2	2
26		049 150	PANEL, side	1	1
		†070 941	SK-200 Spot Panel (Fig C Pg 6)	1	1

†Optional Equipment.

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

+ + For complete breakdown of SPOOLMATIC 1 gun see OM-1210.

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

Figure B **Panel, Front-W/Components (Fig A Pg 2 Item 21)**

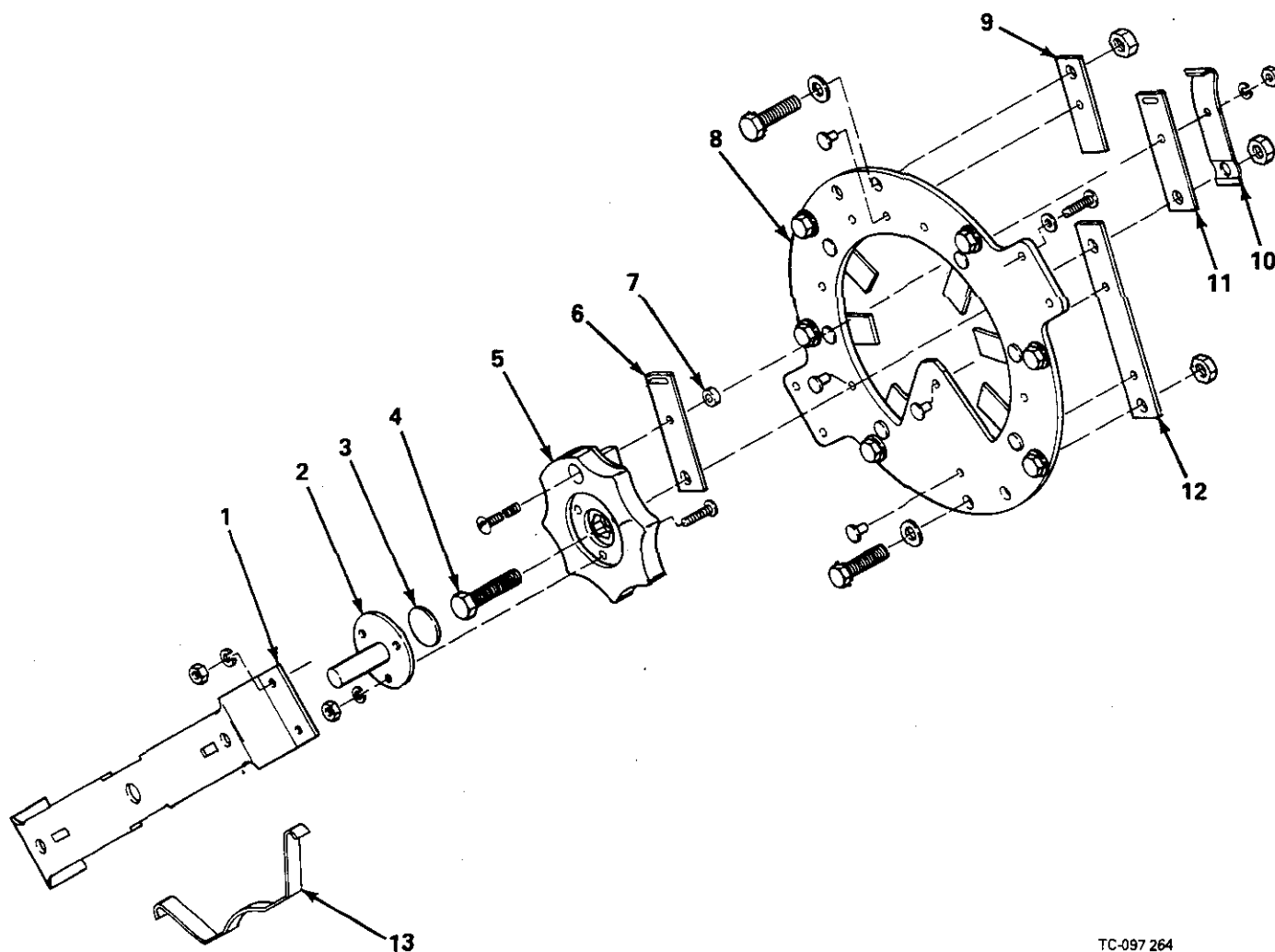
Exploded view diagram of a mechanical assembly. The diagram shows various components labeled with numbers 1 through 28. A bracket labeled 1 points to a sub-assembly including items 2, 3, 4, and 5. A callout 'Includes Item 2' points to a sub-assembly. A callout '6 - Fig B1' points to a detailed view of a dial component. The main assembly includes a bracket (1), a plate (2), a handle (3), a pin (4), a screw (5), a dial (6), a bracket (7), a pin (8), a screw (9), a pin (10), a plate (11), a pin (12), a screw (13), a pin (14), a screw (15), a pin (16), a screw (17), a pin (18), a screw (19), a pin (20), a screw (21), a pin (22), a screw (23), a pin (24), a screw (25), a pin (26), a screw (27), and a pin (28).

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Item No.	Part No.	Description	Quantity
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Figure B1 049 280 Switch, Selector (Fig B Pg 3 Item 6)

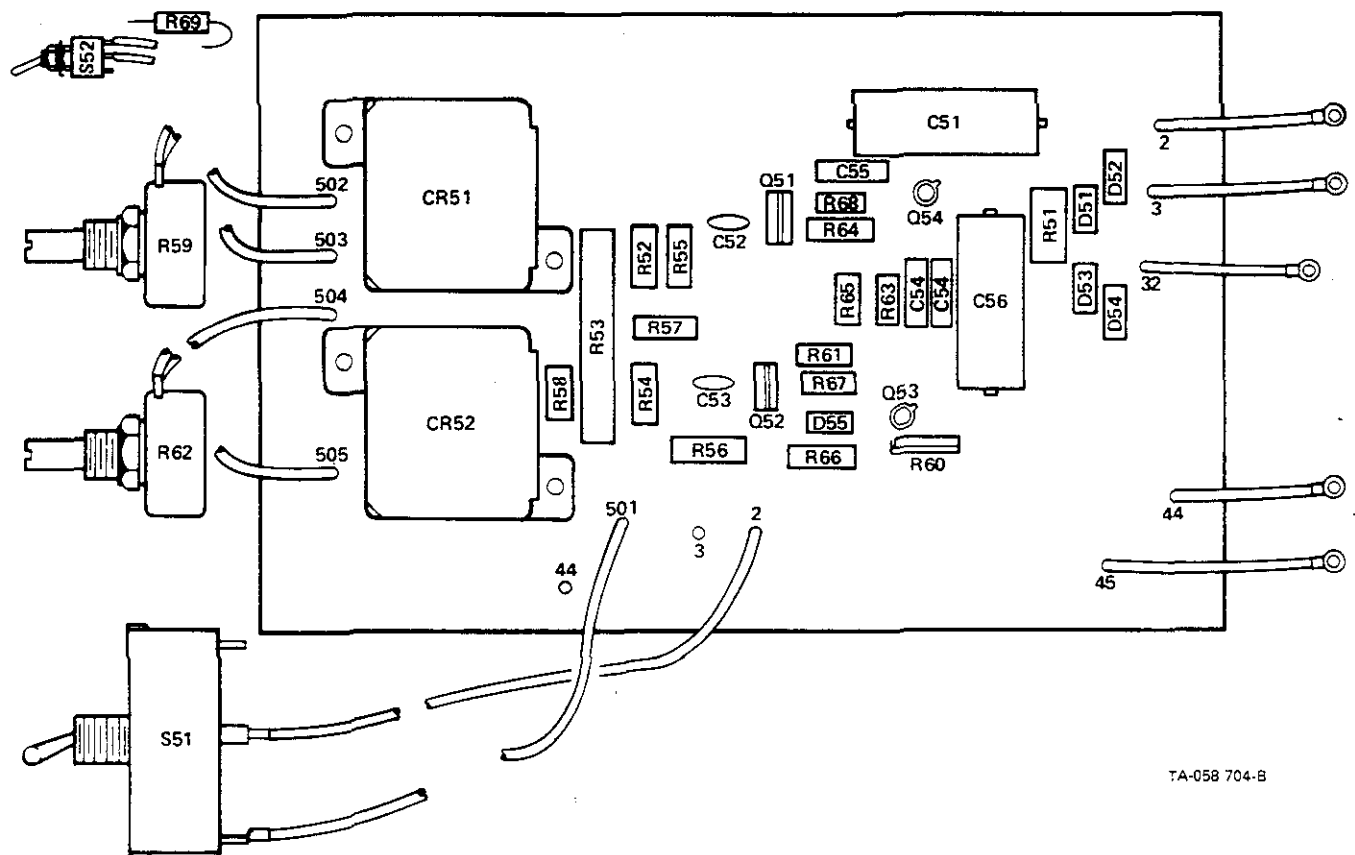
1	005 562	BRACKET, mounting - switch	1
2	005 561	SHAFT, rotor	1
3	005 564	INSULATOR, screw - switch	1
4	605 276	SCREW, cap - steel hex hd 1/4-20 x 1-1/4	1
5	005 559	CONTACT BOARD, movable - switch	1
6	005 560	CONTACT, switch - movable	1
7	008 485	SPACER, contact - switch	1
8	005 566	CONTACT BOARD, stationary - switch	1
9	011 644	CONTACT, stationary - switch	7
10	052 405	SPRING, pressure - contact switch	1
11	052 404	CONTACT, movable - switch	1
12	005 557	BUS BAR, switch - range	1
13	005 558	SPRING, selector - switch	1



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Figure B1 - Switch, Selector

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



**COMPONENTS TO BE
REPLACED BY QUALIFIED
PERSONNEL ONLY**

Figure C - Circuit Card, W/Switch

CERTAIN NON CRITICAL PARTS LISTED BELOW MAY DIFFER FROM THOSE USED ON THE CIRCUIT CARD IN YOUR UNIT, BUT WILL SERVE AS SUITABLE REPLACEMENTS.

Dia. Mkgs.	Part No.	Description	Quantity
Figure C 070 941 SK-200 (Spot Panel)			
	†000 442	NOZZLE, spot	1
	†000 443	NOZZLE, spot - inside corner	1
	†009 925	NOZZLE, spot - outside corner	1
	070 766	BRACKET, mounting - circuit card	1
	073 756	STAND-OFF, 6-32 x 5/8 lg x 1/4 hex	4
	097 922	KNOB	2
	082 168	CIRCUIT CARD, w/switch (consisting of)	1
S2	011 611	SWITCH, toggle DPDT 15 amp 125 volts	1
C51	000 859	CAPACITOR, electrolytic 220 uf 35 volts dc	2
C52,53	000 340	CAPACITOR, ceramic 0.01 uf 50 volts	2
C54,55	072 113	CAPACITOR, tantalum 4.7 uf 35 volts dc	2
C54	072 130	CAPACITOR, tantalum 1 uf 35 volts dc	1
C56	045 868	CAPACITOR, electrolytic 100 uf 25 volts dc	11
CR51	032 944	RELAY, 12 volts dc DPDT	1
CR52	032 945	RELAY, 24 volts dc DPDT	1
	032 946	SOCKET, relay	2
	048 848	SPRING, holddown-relay	2
D51-54	026 202	DIODE, 1 amp 400 volts SP	4
D55	037 243	DIODE, zener 18 volts 1 watt	1
Q51,52	000 341	THYRISTOR, 2 amp 100 volts	2
Q53,54	037 289	TRANSISTOR, unijunction 50MA 35 volts	2
R51	030 055	RESISTOR, carbon 2 watt 10 ohm	1
R52,54,65	030 024	RESISTOR, carbon 0.5 watt 1K ohm	3
R53	030 630	RESISTOR, WW fixed 11 watt 100 ohm	1
R55,57	030 937	RESISTOR, carbon 0.5 watt 10 ohm	2
R56	074 099	RESISTOR, carbon 1 watt 150 ohm	1
R58	030 004	RESISTOR, carbon 0.5 watt 10K ohm	1
R59	030 738	POTENTIOMETER, carbon 1 turn 2 watt 500K ohm	1
R60	030 049	POTENTIOMETER, carbon 1 turn 0.25 watt 5K ohm	1
R61,64	074 052	RESISTOR, carbon 0.5 watt 120 ohm	2
R62	030 131	POTENTIOMETER, carbon 1 turn 2 watt 50K ohm	1
R63	028 276	RESISTOR, carbon 0.5 watt 2.2K ohm	1
R66	030 105	RESISTOR, carbon 0.5 watt 680 ohm	1
R67,68	028 285	RESISTOR, carbon 0.5 watt 100 ohm	2
R69	032 819	RESISTOR, carbon 0.5 watt 390K ohm	1
S52	011 770	SWITCH, toggle SPDT 5 amp 125 volts	1
	†084 739	CABLE, interconnecting (consisting of)	1
	604 571	CABLE, No. 18/4 (order by ft)	3 ft
	079 878	HOUSING PLUG & PINS (consisting of)	1
	079 535	TERMINAL, male	4
	079 531	CLAMP, cable 29/64	2
	048 284	HOUSING PLUG & SOCKETS (consisting of)	1
	079 534	TERMINAL, female	4

†Optional Parts.

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure D Panel, Rear-W/Components (Fig A Pg 2 Item 11)

1	FM	081 373	MOTOR, 1/15 HP 115 volts ac 60 Hz 3000 rpm	1
2		081 372	BLADE, fan 60 Hz 9 inch 5 wing 20 degree	1
3	RC2	048 282	RECEPTACLE W/SOCKET (consisting of)	1
		079 534	. TERMINAL, female	4
4	VR1	082 722	VARISTOR, 0.6 watt 175 volts dc	1
5	SR1	035 914	RECTIFIER, integrated 30 amp 400 volts	1
6	R2	079 781	RESISTOR, WW fixed 25 watt 50 ohm	1
7		070 803	PANEL, rear	1
8	D1	026 202	DIODE, 1 amp 400 volts SP	1
9	CR1	052 964	RELAY, enclosed 24 volts dc DPDT	1
10		044 426	CONNECTOR, clamp - cable 1 inch	1
11		010 143	CLAMP, 3/8 dia	1
12	C1	000 339	CAPACITOR, electrolytic 220 uf 50 volts dc	1
13	R1	604 288	RESISTOR, WW fixed 10 watt 2 ohm	1
14	CR2	059 266	RELAY, enclosed 120 volts ac DPDT	1
15	W	114 780	CONTACTOR, 60 amp 3 P 115 volts (consisting of)	1
		114 787	. COIL	1
16		085 698	LINK, jumper-contact	2
17	SR2	087 660	RECTIFIER/WINDTUNNEL (consisting of)	1
18		081 678	. BRACKET, mtg-fan motor	1
19		037 957	. DIODE, 275 amp 300 volts RP	2
20	C2-5	031 689	. CAPACITOR, ceramic 0.01 uf 500 volts dc	4
21		037 956	. DIODE, 275 amp 300 volts SP	2
22	TP2	086 323	. THERMOSTAT, NO	1
23	TP3	006 334	. THERMOSTAT, NC	1

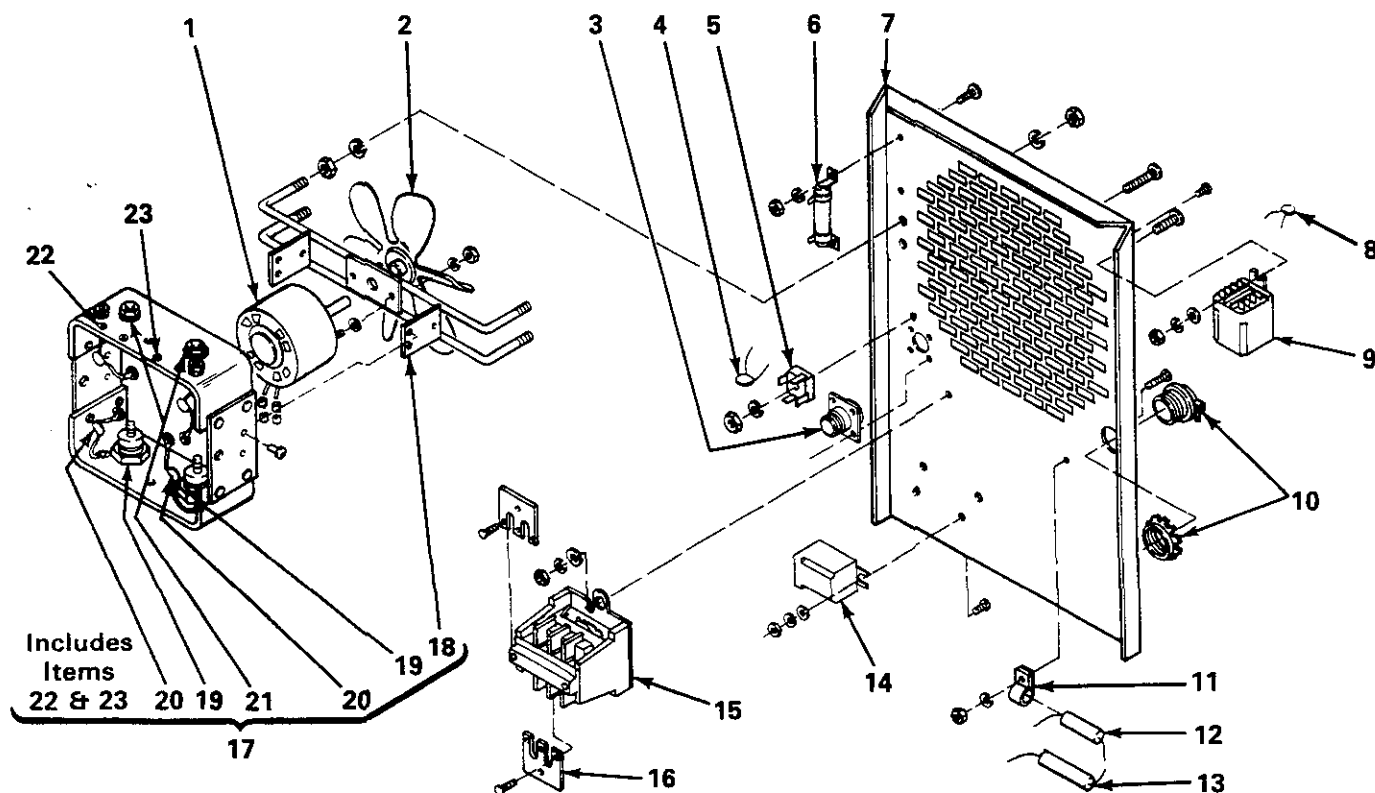


Figure D - Panel, Rear-W/Components

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

