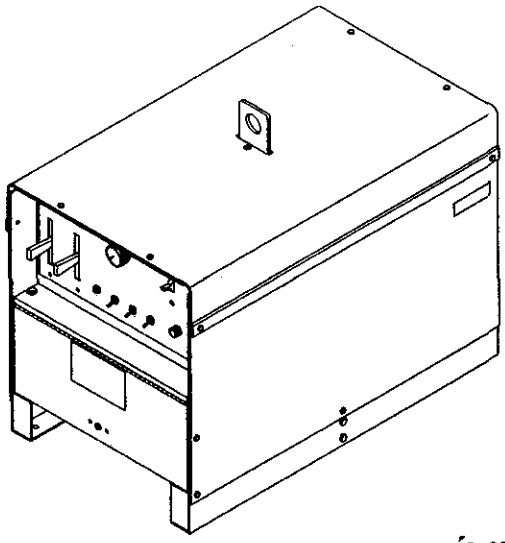
Miller®

August 1993 Form: OM-315U

Effective With Serial No. KB048222

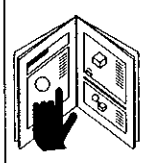
OWNER'S MANUAL



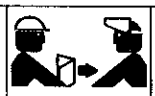
FILE COPY
RETURN TO FOLDER

Dialarc® HF And HF-P

- CC, AC/DC Welding Power Source
- For SMAW And GTAW Welding
- 250 Amperes, 30 Volts DC At 40% Duty Cycle (See Specifications)
- Single-Phase Input Power
- Overload And Thermal Protection
- High Frequency Switch



- Read and follow these instructions and all safety blocks carefully.
- Have only trained and qualified persons install, operate, or service this unit.
- Call your distributor if you do not understand the directions.



- Give this manual to the operator.

- For help, call your distributor
- or: MILLER Electric Mfg. Co., P.O. Box 1079, Appleton, WI 54912 414-734-9821

cover 7/93 – Ref. ST-070 399-D

PRINTED IN USA

MILLER'S TRUE BLUE™ LIMITED WARRANTY

Effective January 1, 1992
(Equipment with a serial number preface of "KC" or newer)

This limited 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 below, MILLER Electric Mfg. Co., Appleton, Wisconsin, warrants to its original retail purchaser that new MILLER equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped by MILLER. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

Within the warranty periods listed below, MILLER will repair or replace any warranted parts or components that fail due to such defects in material or workmanship. MILLER must be notified in writing within thirty (30) days of such defect or failure, at which time MILLER will provide instructions on the warranty claim procedures to be followed.

MILLER shall honor warranty claims on warranted equipment listed below in the event of such a failure within the warranty time periods. All warranty time periods start on the date that the equipment was delivered to the original retail purchaser, or one year after the equipment is sent to the distributor.

1. 5 Years Parts – 3 Years Labor
   * Original main power rectifiers
2. 3 Years — Parts and Labor
   * Transformer/Rectifier Power Sources
   * Plasma Arc Cutting Power Sources
   * Semi-Automatic and Automatic Wire Feeders
   * Robots
3. 2 Years — Parts and Labor
   * Engine Driven Welding Generators
     (NOTE: Engines are warranted separately by the engine manufacturer.)
   * Air Compressors
4. 1 Year — Parts and Labor
   * Motor Driven Guns
   * Process Controllers
   * *Water Coolant Systems*
   * HF Units
   * Grids
   * Spot Welders
   * Load Banks
   * SDX Transformers
   * Running Gear/Trailers
   * Field Options

   (NOTE: Field options are covered under True Blue™ for the remaining warranty period of the product they are installed in, or for a minimum of *one year — whichever is greater.)*
5. 6 Months — Batteries
6. 90 Days — Parts and Labor
   * MIG Guns/TIG Torches
   * *Plasma Cutting Torches*
   * Remote Controls
   * Accessory Kits
   * Replacement Parts

MILLER'S True Blue™ Limited Warranty shall not apply to:

1. Items furnished by MILLER, but manufactured by others, such as engines or trade accessories. These items are covered by the manufacturer's warranty, if any.
2. Consumable components; such as contact tips, cutting nozzles, contactors and relays or parts that fail due to normal wear.
3. Equipment that has been modified by any party other than MILLER, or equipment that has been improperly installed, improperly operated or misused based upon industry standards, or equipment which has not had reasonable and necessary maintenance, or equipment which has been used for operation outside of the specifications for the equipment.

MILLER PRODUCTS ARE INTENDED FOR PURCHASE AND USE BY COMMERCIAL/INDUSTRIAL USERS AND PERSONS TRAINED AND EXPERIENCED IN THE USE AND MAINTENANCE OF WELDING EQUIPMENT.

In the event of a warranty claim covered by this warranty, the exclusive remedies 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 as determined by MILLER. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

TO THE EXTENT PERMITTED BY LAW, THE REMEDIES PROVIDED HEREIN ARE THE SOLE AND EXCLUSIVE REMEDIES. IN NO EVENT SHALL MILLER BE LIABLE FOR DIRECT, INDIRECT, SPECIAL, INCIDENTAL OR CONSEQUENTIAL DAMAGES (INCLUDING LOSS OF PROFIT), WHETHER BASED ON CONTRACT, TORT OR ANY OTHER LEGAL THEORY.

ANY EXPRESS WARRANTY NOT PROVIDED HEREIN AND ANY IMPLIED WARRANTY, GUARANTY OR REPRESENTATION AS TO PERFORMANCE, AND ANY REMEDY FOR BREACH OF CONTRACT TORT OR ANY OTHER LEGAL THEORY 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 FITNESS FOR PARTICULAR PURPOSE, WITH RESPECT TO ANY AND ALL EQUIPMENT FURNISHED BY MILLER IS EXCLUDED AND DISCLAIMED BY MILLER.

Some states in the U.S.A. do not allow limitations of how long an implied warranty lasts, or the exclusion of incidental, indirect, special or consequential damages, so the above limitation or exclusion may not apply to you. This warranty provides specific legal rights, and other rights may be available, but may vary from state to state.

In Canada, legislation in some provinces provides for certain additional warranties or remedies other than as stated herein, and to the extent that they may not be waived, the limitations and exclusions set out above may not apply. This Limited Warranty provides specific legal rights, and other rights may be available, but may *vary from province to province.*

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 distributor and/or equipment manufacturer's Transportation Department.

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

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

Model _____

Serial or Style No. _____

Date of Purchase _____

ARC WELDING SAFETY PRECAUTIONS

⚠ WARNING

ARC WELDING can be hazardous.

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS KEEP AWAY UNTIL CONSULTING YOUR DOCTOR.

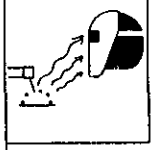
In welding, as in most jobs, exposure to certain hazards occurs. Welding is safe when precautions are taken. The safety information given below is only a summary of the more complete safety information that will be found in the Safety Standards listed on the next page. Read and follow all Safety Standards.

HAVE ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR WORK PERFORMED ONLY BY QUALIFIED PEOPLE.

ELECTRIC SHOCK can kill.

Touching live electrical parts can cause fatal shocks or severe burns. The electrode and work circuit is electrically live whenever the output is on. The input power circuit and machine internal circuits are also live when power is on. In semiautomatic or automatic wire welding, the wire, wire reel, drive roll housing, and all metal parts touching the welding wire are electrically live. Incorrectly installed or improperly grounded equipment is a hazard.

1. Do not touch live electrical parts.
2. Wear dry, hole-free insulating gloves and body protection.
3. Insulate yourself from work and ground using dry insulating mats or covers.
4. Disconnect input power or stop engine before installing or servicing this equipment.
5. Properly install and ground this equipment according to its Owner's Manual and national, state, and local codes.
6. When making input connections, attach proper grounding conductor first.
7. Turn off all equipment when not in use.
8. Do not use worn, damaged, undersized, or poorly spliced cables.
9. Do not wrap cables around your body.
10. Ground the workpiece to a good electrical (earth) ground.
11. Do not touch electrode if in contact with the work or ground.
12. Use only well-maintained equipment. Repair or replace damaged parts at once.
13. Wear a safety harness if working above floor level.
14. Keep all panels and covers securely in place.



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

Arc rays from the welding process produce intense heat and strong ultraviolet rays that can burn eyes and skin. Noise from some processes can damage hearing.

NOISE

1. Use approved ear plugs or ear muffs if noise level is high.

ARC RAYS

2. Wear a welding helmet fitted with a proper shade of filter (see ANSI Z49.1 listed in Safety Standards) to protect your face and eyes when welding or watching.
3. Wear approved safety glasses. Side shields recommended.
4. Use protective screens or barriers to protect others from flash and glare; warn others not to watch the arc.
5. Wear protective clothing made from durable, flame-resistant material (wool and leather) and foot protection.

FUMES AND GASES can be hazardous to your health.

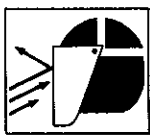
Welding produces fumes and gases. Breathing these fumes and gases can be hazardous to your health.

1. Keep your head out of the fumes. Do not breathe the fumes.
2. If inside, ventilate the area and/or use exhaust at the arc to remove welding fumes and gases.
3. If ventilation is poor, use an approved air-supplied respirator.
4. Read the Material Safety Data Sheets (MSDSs) and the manufacturer's instruction for metals, consumables, coatings, and cleaners.
5. Work in a confined space only if it is well ventilated, or while wearing an air-supplied respirator. Shielding gases used for welding can displace air causing injury or death. Be sure the breathing air is safe.
6. Do not weld in locations near degreasing, cleaning, or spraying operations. The heat and rays of the arc can react with vapors to form highly toxic and irritating gases.
7. Do not weld on coated metals, such as galvanized, lead, or cadmium plated steel, unless the coating is removed from the weld area, the area is well ventilated, and if necessary, while wearing an air-supplied respirator. The coatings and any metals containing these elements can give off toxic fumes if welded.

WELDING can cause fire or explosion.

Sparks and spatter fly off from the welding arc. The flying sparks and hot metal, weld spatter, hot workpiece, and hot equipment can cause fires and burns. Accidental contact of electrode or welding wire to metal objects can cause sparks, overheating, or fire.

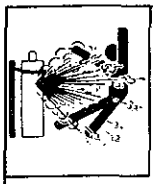
1. Protect yourself and others from flying sparks and hot metal.
2. Do not weld where flying sparks can strike flammable material.
3. Remove all flammables within 35 ft (10.7 m) of the welding arc. If this is not possible, tightly cover them with approved covers.
4. Be alert that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas.
5. Watch for fire, and keep a fire extinguisher nearby.
6. Be aware that welding on a ceiling, floor, bulkhead, or partition can cause fire on the hidden side.
7. Do not weld on closed containers such as tanks or drums.
8. Connect work cable to the work as close to the welding area as practical to prevent welding current from traveling long, possibly unknown paths and causing electric shock and fire hazards.
9. Do not use welder to thaw frozen pipes.
10. Remove stick electrode from holder or cut off welding wire at contact tip when not in use.
11. Wear oil-free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes, and a cap.



FLYING SPARKS AND HOT METAL can cause injury.

Chipping and grinding cause flying metal. As welds cool, they can throw off slag.

1. Wear approved face shield or safety goggles. Side shields recommended.
2. Wear proper body protection to protect skin.



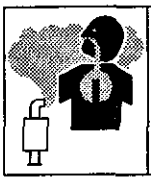
CYLINDERS can explode if damaged.

Shielding gas cylinders contain gas under high pressure. If damaged, a cylinder can explode. Since gas cylinders are normally part of the welding process, be sure to treat them carefully.

1. Protect compressed gas cylinders from excessive heat, mechanical shocks, and arcs.
2. Install and secure cylinders in an upright position by chaining them to a stationary support or equipment cylinder rack to prevent falling or tipping.
3. *Keep cylinders away from any welding or other electrical* circuits.
4. Never allow a welding electrode to touch any cylinder.
5. Use only correct shielding gas cylinders, regulators, hoses, and fittings designed for the specific application; maintain them and associated parts in good condition.
6. Turn face away from valve outlet when opening cylinder valve.
7. Keep protective cap in place over valve except when cylinder is in use or connected for use.
8. Read and follow instructions on compressed gas cylinders, associated equipment, and CGA publication P-1 listed in Safety Standards.

⚠ WARNING

ENGINES can be hazardous.



ENGINE EXHAUST GASES can kill.

Engines produce harmful exhaust gases.

1. Use equipment outside in open, well-ventilated areas.
2. If used in a closed area, vent engine exhaust outside and away from any building air intakes.

ENGINE FUEL can cause fire or explosion.

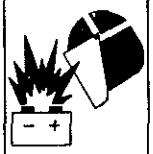
Engine fuel is highly flammable.

1. Stop engine before checking or adding fuel.
2. Do not add fuel while smoking or if unit is near any sparks or open flames.
3. Allow engine to cool before fueling. If possible, check and add fuel to cold engine before beginning job.
4. Do not overfill tank – allow room for fuel to expand.
5. Do not spill fuel. If fuel is spilled, clean up before starting engine.

MOVING PARTS can cause injury.

Moving parts, such as fans, rotors, and belts can cut fingers and hands and catch loose clothing.

1. Keep all doors, panels, covers, and guards closed and securely in place.
2. Stop engine before installing or connecting unit.
3. Have only qualified people remove guards or covers for maintenance and troubleshooting as necessary.
4. To prevent accidental starting during servicing, disconnect *negative (–) battery cable from battery.*
5. Keep hands, hair, loose clothing, and tools away from moving parts.
6. Reinstall panels or guards and close doors when servicing is finished and before starting engine.



SPARKS can cause BATTERY GASES TO EXPLODE; BATTERY ACID can burn eyes and skin.

Batteries contain acid and generate explosive gases.

1. Always wear a face shield when working on a battery.
2. Stop engine before disconnecting or connecting battery cables.
3. Do not allow tools to cause sparks when working on a battery.
4. *Do not use welder to charge batteries or jump start vehicles.*
5. Observe correct polarity (+ and –) on batteries.

STEAM AND PRESSURIZED HOT COOLANT can burn face, eyes, and skin.

The coolant in the radiator can be very hot and under pressure.

1. Do not remove radiator cap when engine is hot. Allow engine to cool.
2. *Wear gloves and put a rag over cap area when removing cap.*
3. Allow pressure to escape before completely removing cap.

PRINCIPAL SAFETY STANDARDS

Safety in Welding and Cutting, ANSI Standard Z49.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami FL 33126

Safety and Health Standards, OSHA 29 CFR 1910, from Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

Recommended Safe Practices for the Preparation for Welding and Cutting of Containers That Have Held Hazardous Substances, American Welding Society Standard AWS F4.1, from American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126

National Electrical Code, NFPA Standard 70, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

Safe Handling of Compressed Gases in Cylinders, CGA Pamphlet P-1, from Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

Code for Safety in Welding and Cutting, CSA Standard W117.2, from Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

Safe Practices For Occupation And Educational Eye And Face Protection, ANSI Standard Z87.1, from American National Standards Institute, 1430 Broadway, New York, NY 10018.

Cutting And Welding Processes, NFPA Standard 51B, from National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

EMF INFORMATION

NOTE ☞ *Considerations About Welding And The Effects Of Low Frequency Electric And Magnetic Fields*

The following is a quotation from the General Conclusions Section of the U.S. Congress, Office of Technology Assessment, *Biological Effects of Power Frequency Electric & Magnetic Fields – Background Paper*, OTA-BP-E-53 (Washington, DC: U.S. Government Printing Office, May 1989): ". . . there is now a very large volume of scientific findings based on experiments at the cellular level and from studies with animals and people which clearly establish that low frequency magnetic fields can interact with, and produce changes in, biological systems. While most of this work is of very high quality, the results are complex. Current scientific understanding does not yet allow us to interpret the evidence in a single coherent framework. Even more frustrating, it does not yet allow us to draw definite conclusions about questions of possible risk or to offer clear science-based advice on strategies to minimize or avoid potential risks."

To reduce magnetic fields in the workplace, use the following procedures:

1. Keep cables close together by twisting or taping them.
2. Arrange cables to one side and away from the operator.
3. Do not coil or drape cables around the body.
4. Keep welding power source and cables as far away as practical.
5. Connect work clamp to workpiece as close to the weld as possible.

About Pacemakers:

The above procedures are among those also normally recommended for pacemaker wearers. Consult your doctor for complete information.

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TABLE OF CONTENTS

SECTION 1 – SAFETY INFORMATION

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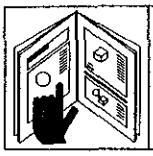
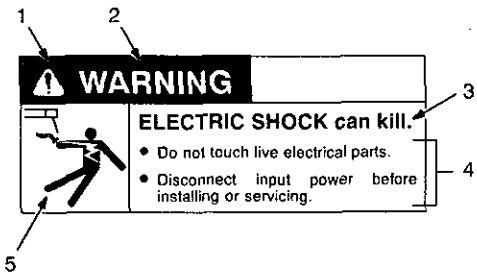


- Read all safety messages throughout this manual.
- Obey all safety messages to avoid injury.
- Learn the meaning of WARNING and CAUTION.



1 Safety Alert Symbol

2 Signal Word

WARNING means possible death or serious injury can happen.

CAUTION means possible minor injury or equipment damage can happen.

3 Statement Of Hazard And Result

4 Safety Instructions To Avoid Hazard

5 Hazard Symbol (If Available)

6 Safety Banner

Read safety blocks for each symbol shown.

7 NOTE

Special instructions for best operation – not related to safety.

Figure 1-1. Safety Information

SECTION 2 – SPECIFICATIONS

Table 2-1. Welding Power Source

Specification	Description	
Type Of Output	Constant Current (CC), Alternating Current/Direct Current (AC/DC)	
Type Of Input Power	Single-Phase; 200, 230, 460, Or 575 Volts AC; 60 Hz	
Input Amperes At Rated Output	HF Model: 103 A At 200 V, 90 A At 230 V, 45 A At 460 V, 36 A At 575 V HF-P Model: 87 A At 200 V, 76 A At 230 V, 38 A At 460 V, 30 A At 575 V	
KVA/KW Used At Rated Output	HF Model: 20.7/12.4 HF-P Model: 17.5/12.4	
Max. Open-Circuit Voltage	AC Mode: 75 Volts DC Mode: 76 Volts	
Welding Processes	Shielded Metal Arc (SMAW), Gas Tungsten Arc Welding (GTAW)	
Overall Dimensions	See Figure 3-3	
Weight	HF Model, Net: 476 lb (215 kg); Ship: 486 lb (220 kg) HF-P Model, Net: 486 lb (220 kg); Ship: 496 lb (224 kg)	
Options	See Rear Cover	
	Shielded Metal Arc Welding (SMAW)	**Gas Tungsten Arc Welding (GTAW)**
Rated Weld Output	250 Amperes, 30 Volts At 40% Duty Cycle; 200 Amperes, 28 Volts At 60% Duty Cycle (See Section 2-2)	200 Amperes AC At 40% Duty Cycle; 125 Amperes AC At 100% Duty Cycle; 250 Amperes DC At 40% Duty Cycle (See Section 2-2)

2-1. Volt-Ampere Curves

The volt-ampere curves show the minimum and maximum voltage and amperage output capabilities of the welding power source. Curves of other settings fall between the curves shown.

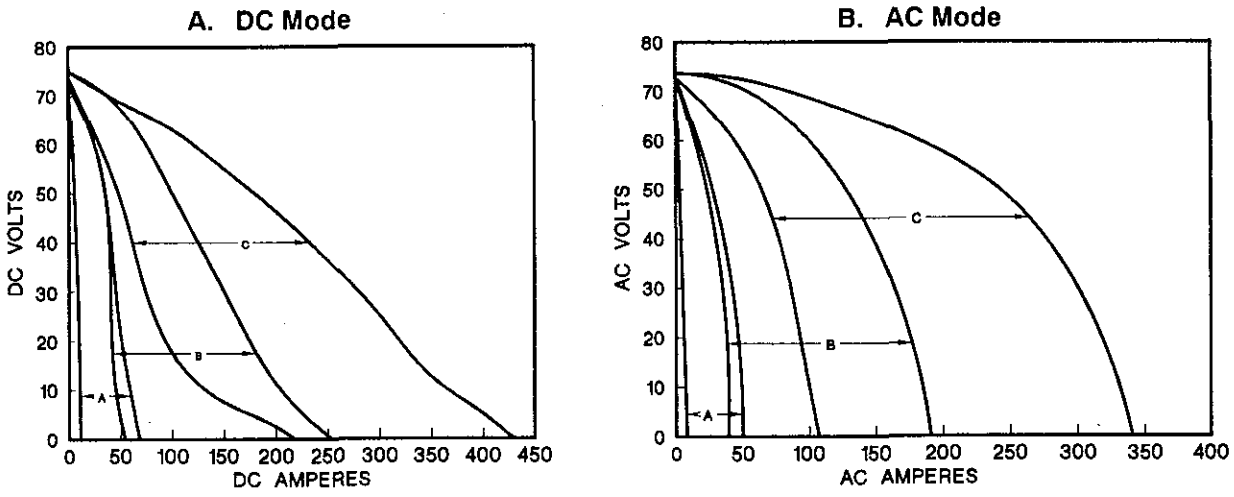


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Figure 2-1. Volt-Ampere Curves

2-2. Duty Cycle

⚠ CAUTION

EXCEEDING DUTY CYCLE RATINGS will damage unit.

- Do not exceed indicated duty cycles.

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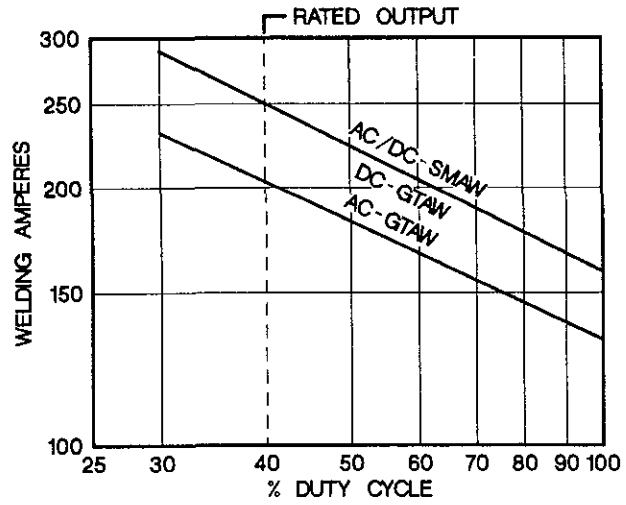

Duty cycle is how long the unit can operate within a ten minute period without causing overheating or damage.

This unit has several duty cycle ratings, each for a specific amperage output range (see Table 2-1). If operated at 40% duty cycle for one application, the unit can be used for welding 4 minutes out of every 10 minutes. If the welding amperes decrease, the duty cycle increases.

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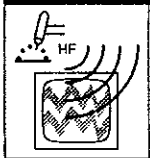
Figure 2-2. Duty Cycle Chart

SECTION 3 – INSTALLATION

⚠ WARNING



HIGH-FREQUENCY RADIATION can interfere with radio navigation, safety services, computers, and communications equipment.

- Have only qualified person familiar with electronic equipment perform this installation.
- Read and follow entire Section 8 for proper location and installation requirements for high-frequency equipment before installing unit.

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3-1. Typical Process Connections

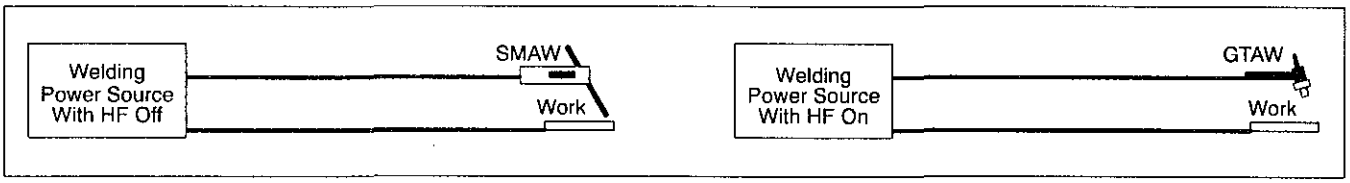

Figure 3-1. Typical Process Connections

3-2. Selecting A Location And Moving Welding Power Source

⚠ WARNING

ELECTRIC SHOCK can kill.

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

FIRE OR EXPLOSION can result from placing unit on, over, or near combustible surfaces.

- Do not locate unit on, over, or near combustible surfaces.
- Do not install unit near flammables.

BLOCKED AIRFLOW causes overheating and possible damage to unit.

- Do not block or filter airflow.

Warranty is void if any type of filter is used.

FUMES can be hazardous; LACK OF FRESH AIR AND PROPER VENTILATION can be harmful.

- Do not breathe welding fumes.
- Place unit only where there is a good fresh air supply and proper ventilation.

FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- Use lifting eye to lift unit only, NOT running gear, gas cylinders, or any other accessories.
- Use equipment of adequate capacity to lift the unit.

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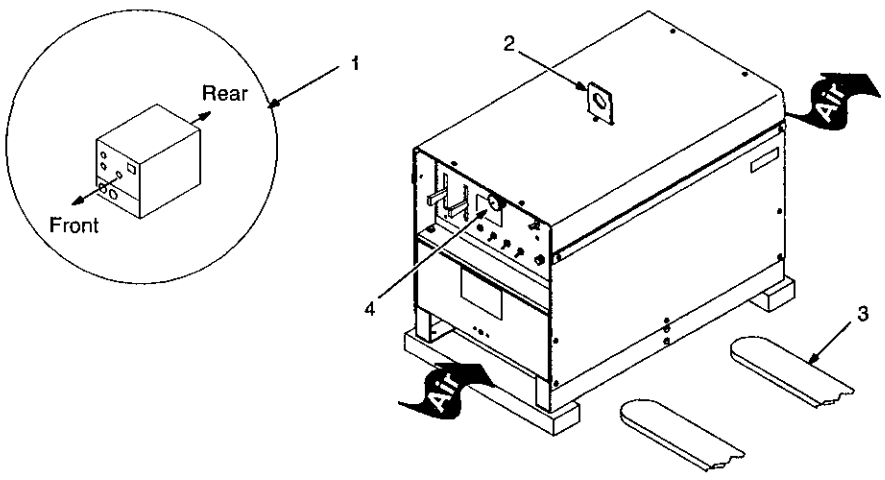


1 18 in (460 mm) Open Space At Front And Rear For Good Airflow

2 Lifting Eye

Use lifting eye to move unit.

3 Lifting Forks

If using lifting forks, extend forks out opposite end of unit.

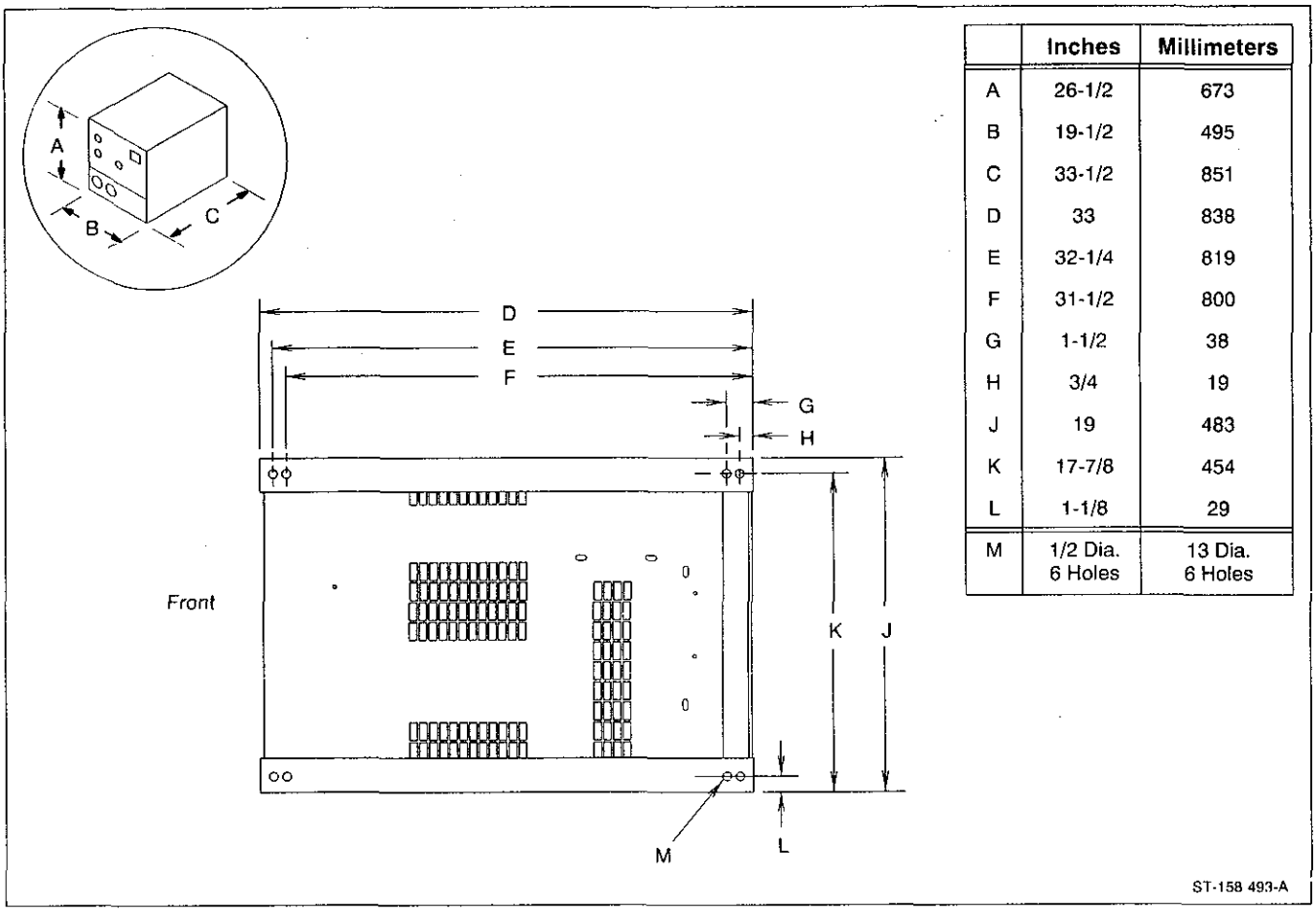
4 Rating Label

Locate unit near correct input power supply.

ST-158 495-A

Figure 3-2. Location and Movement Of Welding Power Source

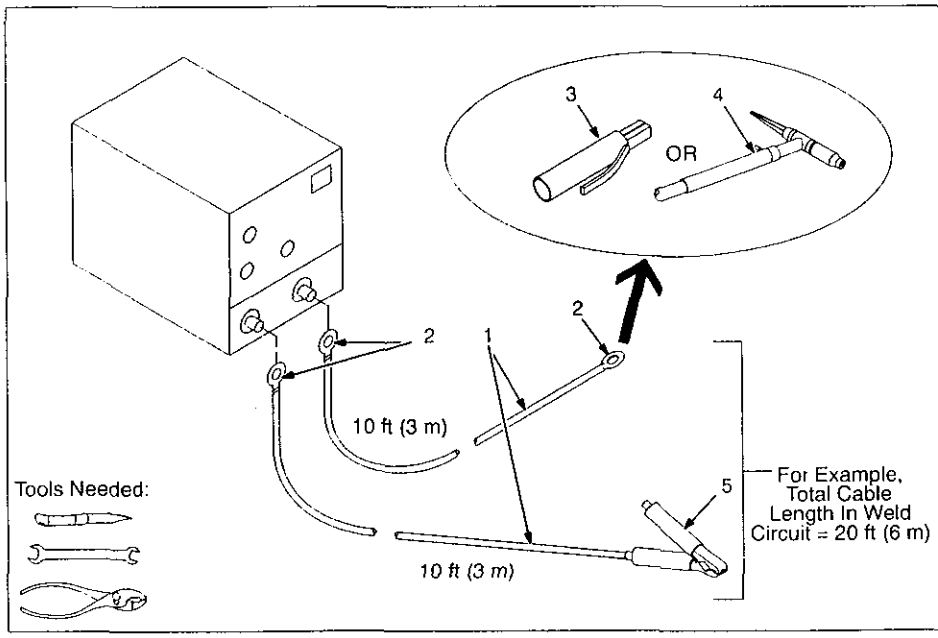
NOTE ☞ *Overall dimensions (A, B, and C) include lifting eye, handles, hardware, etc.*



	Inches	Millimeters
A	26-1/2	673
B	19-1/2	495
C	33-1/2	851
D	33	838
E	32-1/4	819
F	31-1/2	800
G	1-1/2	38
H	3/4	19
J	19	483
K	17-7/8	454
L	1-1/8	29
M	1/2 Dia. 6 Holes	13 Dia. 6 Holes

Figure 3-3. Overall Dimensions And Base Mounting Hole Layout

3-3. Selecting And Preparing Weld Output Cables



1 Weld Output Cable

Determine total cable length in weld circuit and maximum welding amperes. Use Table 3-1 to select proper cable size.

Use shortest cables possible.

Do not use damaged cables.

2 Terminal Lug

Use lugs of proper amperage capacity and hole size for connecting to work clamp, wire feeder or electrode holder, and weld output terminals.

3 Insulated Electrode Holder

4 GTAW Torch

Install according to manufacturer's instructions.

5 Work Clamp

Install onto work cable.

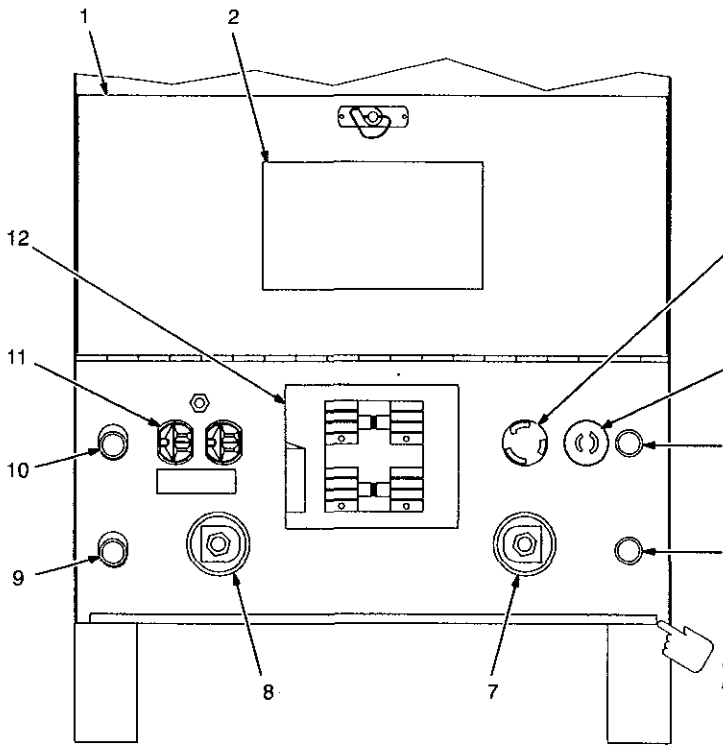
Figure 3-4. Selecting And Preparing Weld Output Cables

Table 3-1. Weld Cable Size*

Welding Amperes	Total Cable (Copper) Length In Weld Circuit Not Exceeding							
	100 ft (30 m) Or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	10 To 60% Duty Cycle	60 Thru 100% Duty Cycle	10 Thru 100% Duty Cycle					
100	4	4	4	3	2	1	1/0	1/0
150	3	3	2	1	1/0	2/0	3/0	3/0
200	3	2	1	1/0	2/0	3/0	4/0	4/0
250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0
300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0
350	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0
400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0
500	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-3/0

*Weld cable size (AWG) is based on either a 4 volts or less drop or a current density of not more than 300 circular mils per ampere. S-0007-C

3-4. Lower Front Panel



1 Access Door

Loosen screw and open access door.

2 Connections Label

3 Remote Amperage Control Receptacle

4 Remote Contactor Control Receptacle

5 Water In Connection (Optional)

6 Water Out Connection (Optional)

7 Electrode Weld Output Terminal

8 Work Weld Output Terminal

9 Gas Out Connection

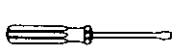
10 Gas In Connection

11 115 Volts AC Duplex Receptacle

12 High Frequency Spark Gaps (Section 5-3)

Close access door after making connections.

Tools Needed:



ST-158 494

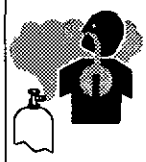
Figure 3-5. Lower Front Panel

3-5. Shielding Gas Connections

⚠ WARNING

CYLINDERS can explode if damaged.

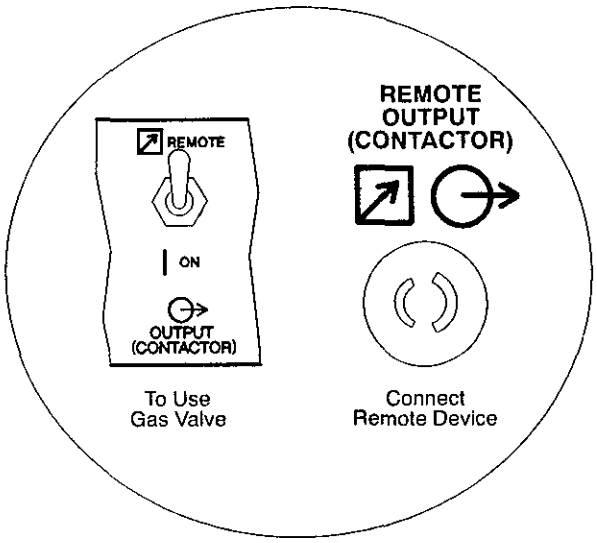
- Keep cylinders away from welding and other electrical circuits.
- Never touch cylinder with welding electrode.
- Always secure cylinder to running gear, wall, or other stationary support.

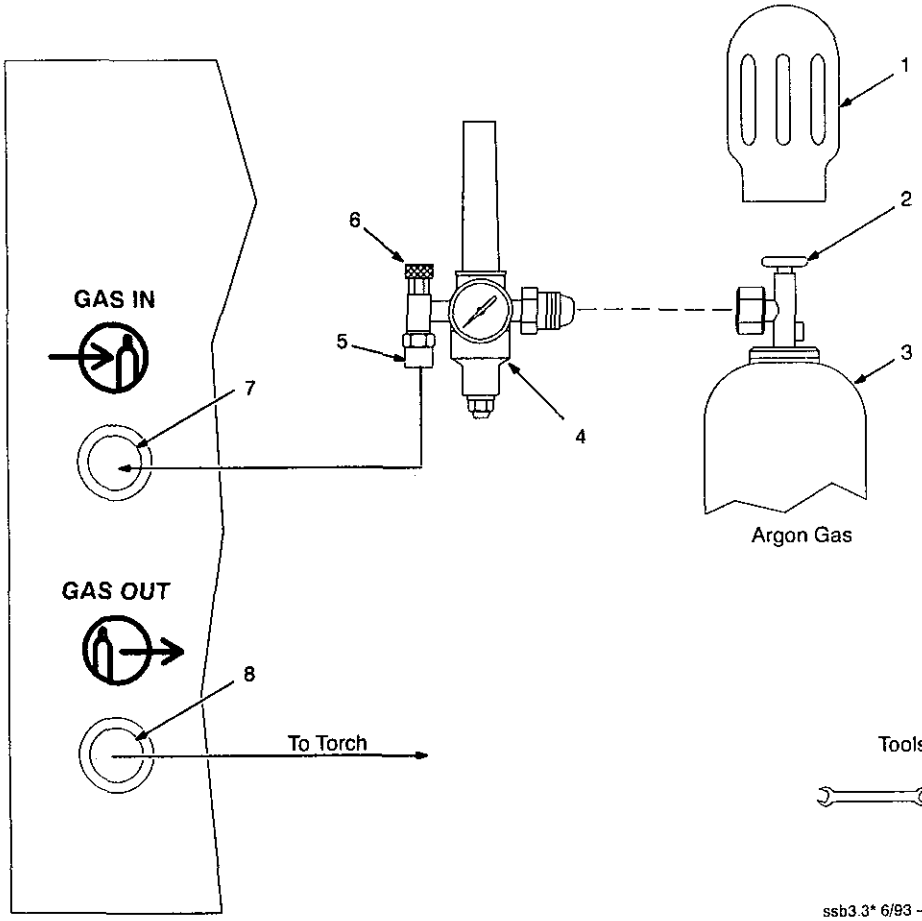


BUILDUP OF SHIELDING GAS can harm health or kill.

- Shut off shielding gas supply when not in use.

warn4.1 9/91





Obtain gas cylinder and chain to running gear, wall, or other stationary support so cylinder cannot fall and break off valve.

1 Cap

2 Cylinder Valve

Remove cap, stand to side of valve, and open valve slightly. Gas flow blows dust and dirt from valve. Close valve.

3 Cylinder

4 Regulator/Flowmeter

Install so face is vertical.

5 Gas Hose Connection

Fitting has 5/8-18 right-hand threads.

6 Flow Adjust

Typical flow rate is 15 cfh (cubic feet per hour).

7 Gas In Fitting

8 Gas Out Fitting

The Gas In and Gas Out fittings have 5/8-18 right-hand threads. Obtain proper size, type, and length hose and make connections as follows:

Connect hose from shielding gas supply regulator/flowmeter to Gas In fitting.

Connect shielding gas hose from torch to Gas Out fitting.

Close access door.

Tools Needed:

5/8, 1-1/8 in

ssb3.3* 6/93 – ST-158 697-A / Ref. ST-071 975-F / Ref. S-071 983-D

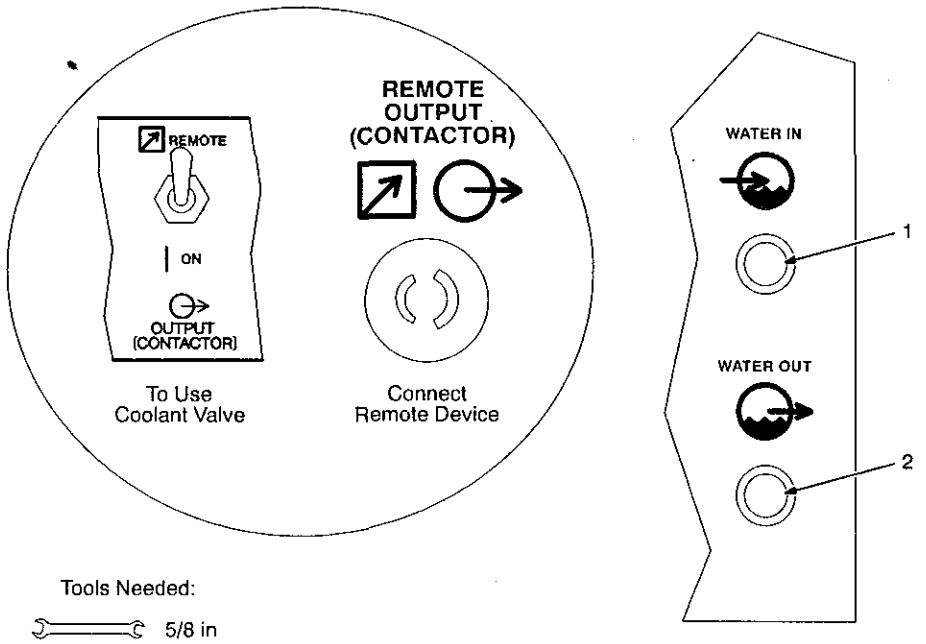
Figure 3-6. Shielding Gas Connections

3-6. Water Connections (Optional)

⚠ CAUTION

OVERHEATING can damage torch parts.

- If using recirculating coolant system, do not make connections from coolant system to water connections on welding power source; instead, make connections directly from coolant system to torch hoses.



Tools Needed:

5/8 in

Turn Off welding power source.

1 Water In Fitting

2 Water Out Fitting

The Water In and Water Out fittings have 5/8-18 left-hand threads. Obtain proper size, type, and length hose and make connections.

Attach hose from water supply to Water In fitting. Attach water hose from torch to Water Out fitting.

Connect and route torch output hose to proper drain.

Close access door.

Ref. ST-071 975-F

Figure 3-7. Water Connections

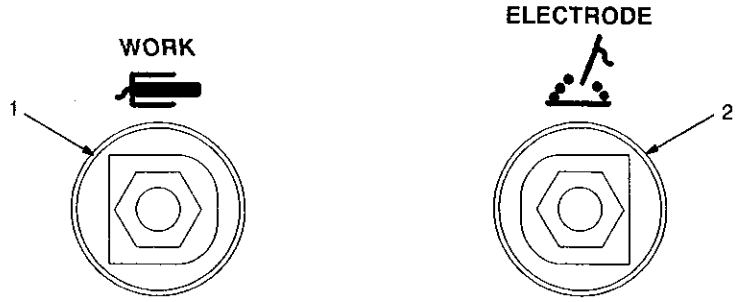
3-7. Connecting To Weld Output Terminals

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before making any weld output connections.

swarm12.1 2/93



Tools Needed:

3/4 in

1 Work Weld Output Terminal

For both GTAW and SMAW welding, connect one end of work cable to Work weld output terminal and remaining end to workpiece.

2 Electrode Weld Output Terminal

For GTAW welding, connect torch connector or cable to Electrode weld output terminal. Be sure torch connector does not touch access door when closed.

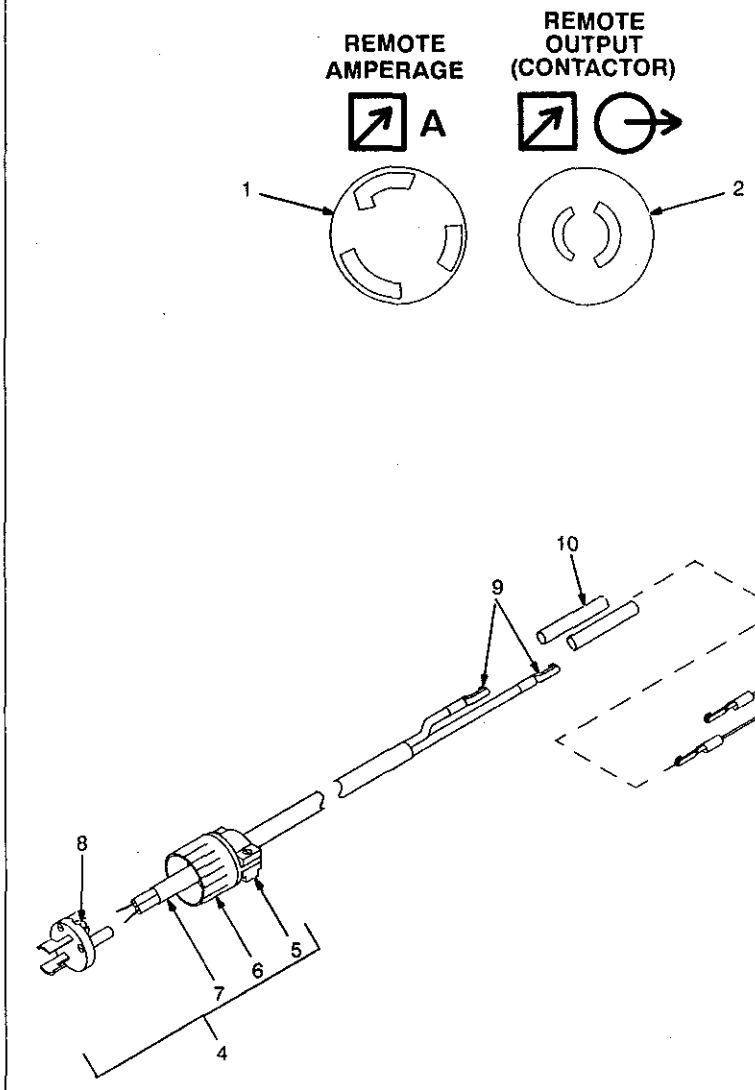
For SMAW welding, connect electrode holder cable to Electrode weld output terminal.

Weld output polarity is determined by position of the AC/DC Selector switch (see Figure 4-4).

Close access door.

Figure 3-8. Weld Output Connections

3-8. Remote Control Connections



1 Remote Amperage Control Receptacle

2 Remote Contactor Control Receptacle

To connect to receptacle, insert plug and turn clockwise.

To assemble supplied remote contactor control slide switch and plug, proceed as follows:

3 Switch Clamp

Mount switch in desired location on torch body. Secure switch with clamp.

4 Twistlock Plug

5 Cord Grip

6 Outer Shell

Remove outer shell and loosen cord grip.

7 2-Conductor Cord (Not *Supplied*)

8 Plug Terminal

Strip cord jacket back enough to separate conductors. Strip conductors enough to make good contact with plug terminals. Connect one wire to each terminal – choice *does not matter. Reinstall outer* shell and cord grip. Tighten assembly screws.

9 Knife Terminals (Not Supplied)

Cut cord to desired length. Strip jacket and conductors to correct length and install knife terminals.

10 Sleeving

Slide sleeving past terminals. Connect cord leads to slide switch leads using knife terminals. Slide and secure sleeving over terminals.

11 *Slide Switch*

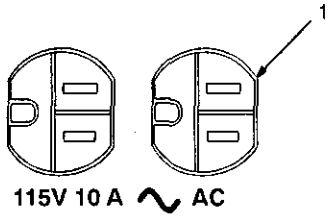
To close contactor, push switch forward and hold. Release switch to open contactor.

Close access door.

ST-162 181

Figure 3-9. Remote Control Connections

3-9. 115 Volts AC Duplex Receptacle



1 115 Volts AC Duplex Receptacle

This welding power source supplies up to 10 amperes of 115 volts *ac power.*

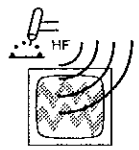
The duplex receptacle is protected from overload by circuit breaker CB2 (see Section 5-2).

Close access door.

Figure 3-10. Connecting To 115 Volts AC Duplex Receptacle

3-10. Connecting Input Power

⚠ WARNING



HIGH-FREQUENCY RADIATION can interfere with radio navigation, safety services, computers, and communications equipment.

- Have only qualified person familiar with electronic equipment perform this installation.
- Read and follow entire Section 8 for proper location and installation requirements for high-frequency equipment before installing unit.

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting or installing.
- Have only qualified persons install unit.
- Installation must meet National Electrical Code and all other codes.

swarn13.2 4/93

A. Positioning Jumper Links

Jumper links allow operation on different input voltages and are factory set for the highest input voltage.

Check input voltage available at site.

Remove side panel to check jumper links.

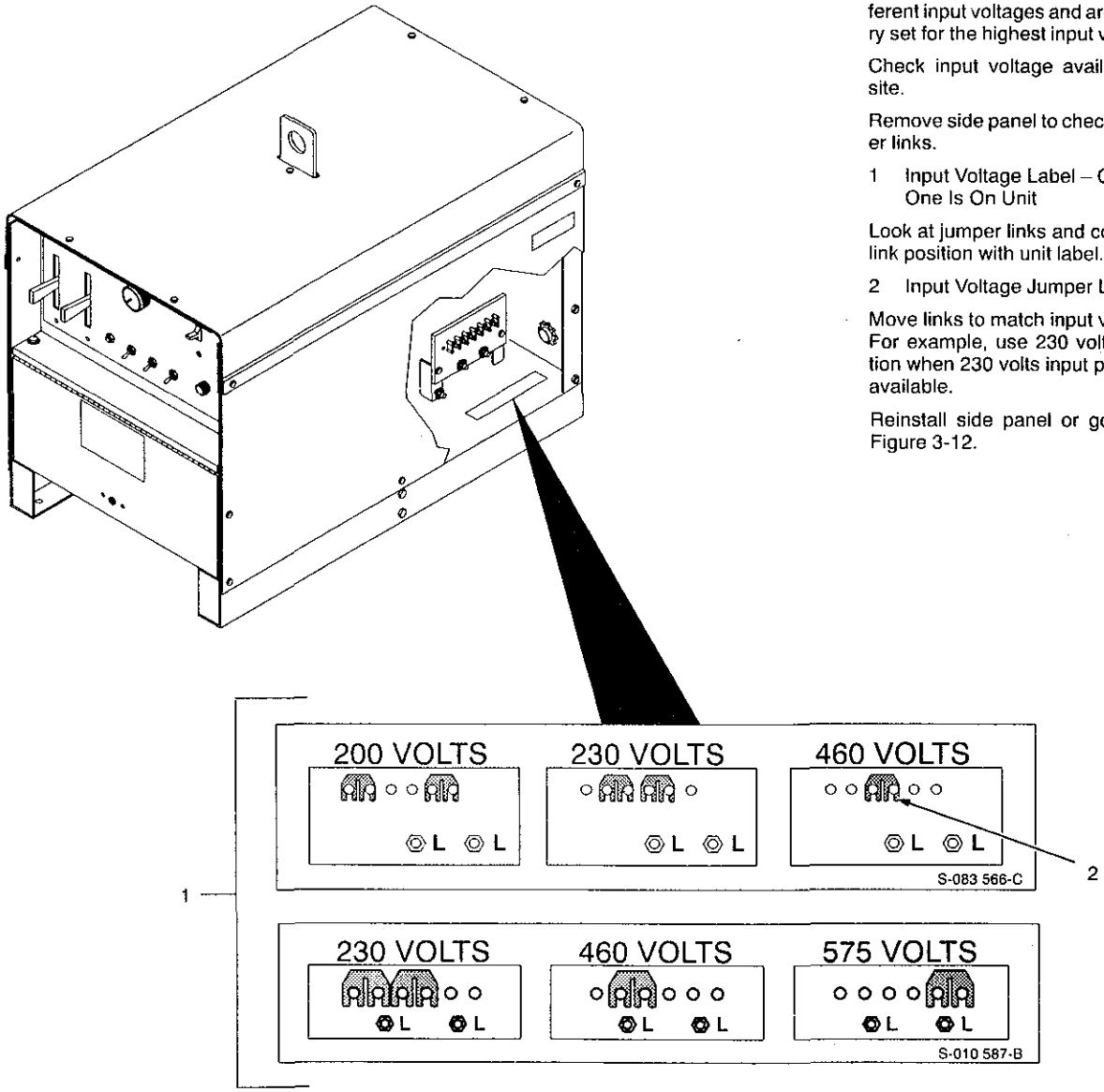
1 Input Voltage Label – Only One Is On Unit

Look at jumper links and compare link position with unit label.

2 Input Voltage Jumper Links

Move links to match input voltage. For example, use 230 volts position when 230 volts input power is available.

Reinstall side panel or go on to Figure 3-12.



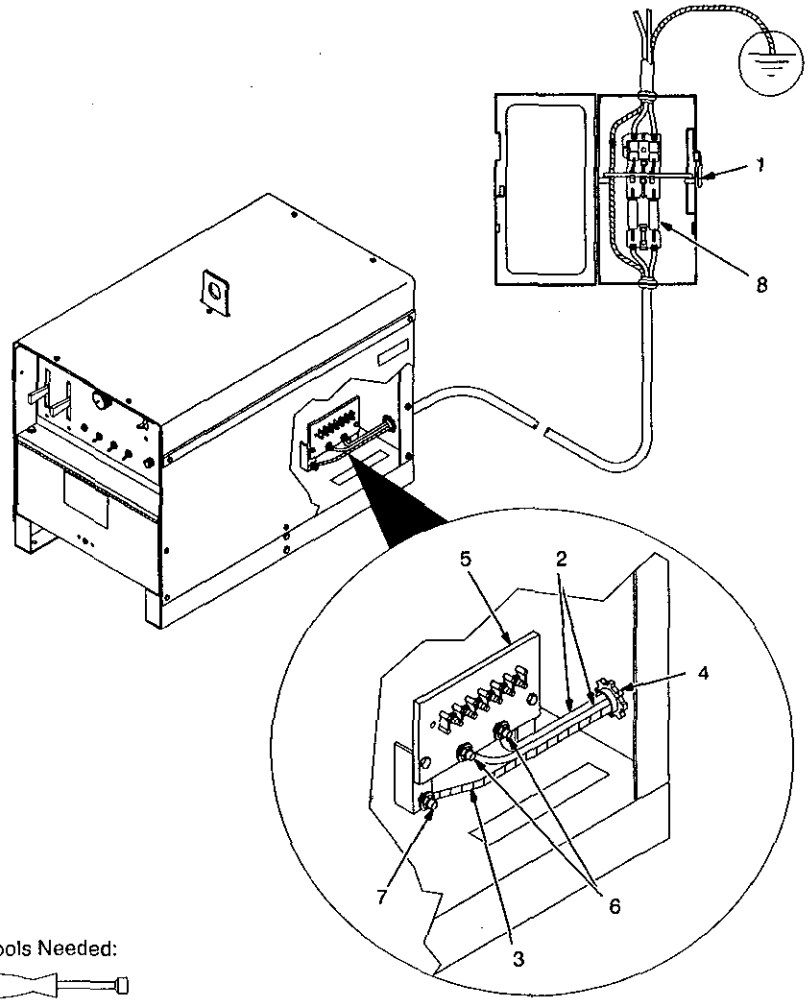
Tools Needed:

3/8 in

ssb5.1 2/92 – ST-070 399-D

Figure 3-11. Input Voltage Jumper Links Location

B. Connecting Input Power



Tools Needed:

3/8, 7/16, 1/2 in

Have only qualified persons make this installation.

Remove side panel.

1 Line Disconnect Device Of Proper Rating

2 Input Conductors

3 Grounding Conductor

Select size and length using Table 3-2. Conductor rating must comply with national, state, and local electrical codes. Use lugs of proper amperage capacity and correct hole size.

4 Strain Relief Connector

Insert conductors through strain relief.

5 Input Terminal Board

6 Line Terminals

7 Ground Terminal

Connect grounding conductor and *input conductors to line terminals* and to ground terminal.

Install and connect grounding conductor and input conductors in conduit or equivalent to deenergized line disconnect device.

Be sure grounding conductor goes to an earth ground.

Reinstall side panel.

8 Overcurrent Protection

Select type and size using Table 3-2. Install into deenergized line disconnect device (fused disconnect switch shown).

ssb2.4 3/93 – ST-070 399-E

Figure 3-12. Input Power Connections

Table 3-2. Electrical Service Requirements*

NOTE ☞	*All values calculated at 60% duty cycle.*

Electrical Service Requirements	With Power Factor Correction				Without Power Factor Correction			
Input Voltage	200	230	460	575	200	230	460	575
Input Amperes At Rated Output	87	76	38	30	103	90	45	36
Recommended Standard Fuse Or Circuit Breaker Rating In Amperes[1]	125	125	60	45	150	125	70	50
Input Conductor Size In AWG/Kcmil[2]	*4*	*6*	*10*	*10*	*4*	*4*	*8*	*10*
Max Input Conductor Length In Feet (Meters)[3]	131 (40)	116 (35)	203 (62)	317 (97)	124 (38)	164 (50)	295 (90)	311 (95)
Grounding Conductor Size In AWG/Kcmil[4]	6	6	10	10	6	6	8	10

* These values are calculated from the 1993 edition of the National Electrical Code (NEC).

1 Recommended fuse or circuit breaker size is that closest to 150% of rated input amperage of the welding power source. Article 630-12(a) of NEC allows fuse or circuit breaker sizing up to 200% of rated input amperage.

2 Input conductor size is for insulated copper wire with 75°C rating with not more than three single current-carrying conductors in a cable or raceway (Table 310-16 of NEC).

3 Maximum length is to prevent more than a 3% voltage drop between service entrance and input terminals of the welding power source (Articles 210-19(a) and 215-2(b) of NEC).

4 The grounding conductor shall be colored or identified as specified in the NEC. Grounding conductor size for copper wire is not required to be larger than input conductor (Article 250-95 of NEC).

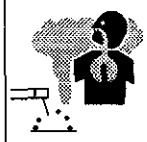
S-0092-G

SECTION 4 – OPERATION

⚠ WARNING

ELECTRIC SHOCK can kill.

- Always wear dry insulating gloves.
- Insulate yourself from work and ground.
- Do not touch live electrical parts.
- Keep all panels and covers securely in place.

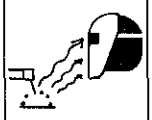


FUMES AND GASES can be hazardous to your health.

- Keep your head out of the fumes.
- Ventilate area, or use breathing device.
- Read Material Safety Data Sheets (MSDSs) and manufacturer's instructions for material used.

WELDING can cause fire or explosion.

- Do not weld near flammable material.
- Watch for fire; keep extinguisher nearby.
- Do not locate unit over combustible surfaces.
- Do not weld on closed containers.
- Allow work and equipment to cool before handling.



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

- Wear welding helmet with correct shade of filter.
- Wear correct eye, ear, and body protection.

MOVING PARTS can cause injury.

- Keep away from moving parts.
- Keep all doors, panels, covers, and guards closed and securely in place.

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

- Pacemaker wearers keep away.
- Wearers should consult their doctor before going near arc welding, gouging, or spot welding operations.

See Safety Precautions at beginning of manual for basic welding safety information.

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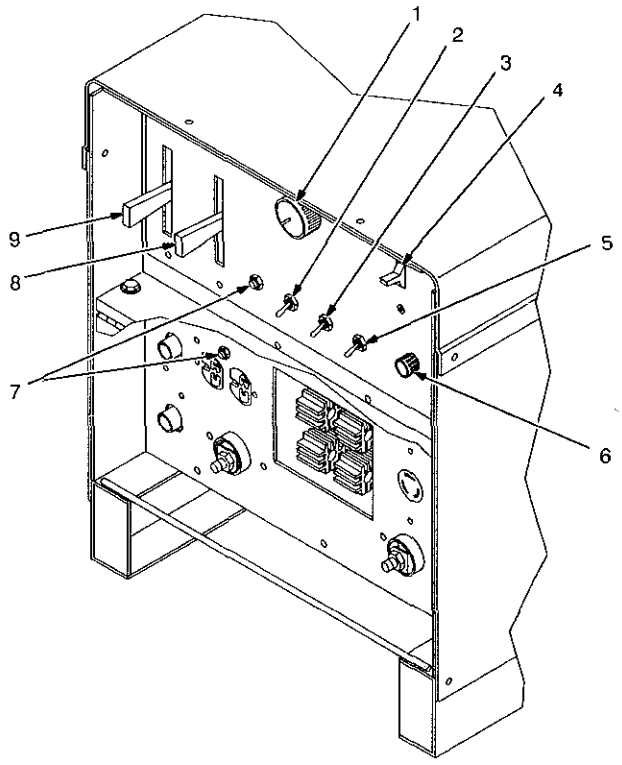
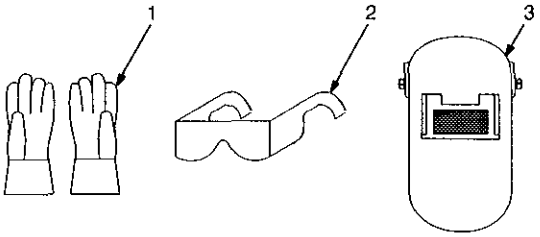


1 Amperage Adjustment Control
2 Amperage Control Switch
3 Output (Contactor) Control Switch
4 Power Switch
5 High Frequency Switch
6 Postflow Time Control
7 Circuit Breakers CB1 And CB2 (Section 5-2B)
8 Range Selector Switch
9 AC/DC Selector Switch

ST-070 400-C

Figure 4-1. Controls

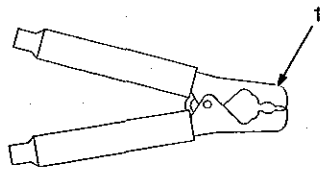


1 Insulating Gloves
2 Safety Glasses With Side Shields
3 Welding Helmet

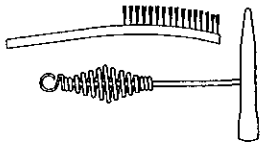
Wear dry insulating gloves, safety glasses with side shields, and a welding helmet with a correct shade of filter (see ANSI Z49.1).

sb3.1 10/91

Figure 4-2. Safety Equipment



Tools Needed:



1 Work Clamp

Connect work clamp to a clean, paint-free location on workpiece, as close to weld area as possible.

Use wire brush or sandpaper to clean metal at weld joint area. Use chipping hammer to remove slag after welding.

sb4.1 2/93

Figure 4-3. Work Clamp

⚠ WARNING

ELECTRIC SHOCK can kill.

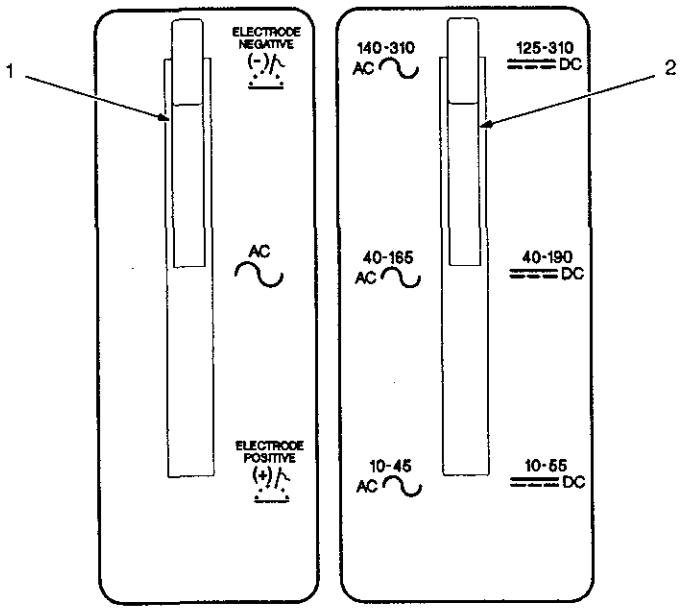
- Do not use AC output in damp areas, if movement is confined, or if there is a danger of falling.
- Use AC output ONLY if required for the welding process.
- If AC output is required, use remote output control.
- Read Safety Precautions at beginning of this manual.

ARCING can damage switch.

- Do not change AC/DC Selector switch or Range Selector switch position while welding.

Arcing inside switch can damage contacts, causing switch to fail.

warn6.3 4/92 / warn5.1* 2/93



1 AC/DC Selector Switch

Use switch to select polarity and type of weld output.

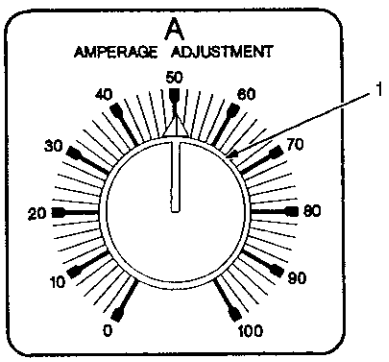
2 Range Selector Switch

Use switch to select ac or dc weld amperage range.

If desired amperage is in the overlapping area of two ranges, set switch in the lower range for better fine amperage control (see Figure 4-7).

Ref. ST-071 975-F

Figure 4-4. AC/DC Selector Switch And Range Selector Switch



1 Amperage Adjustment Control

Use control to adjust amperage within range selected by Range Selector switch.

The numbers are a percentage of the range selected and not an actual value.

Control may be adjusted while welding.

Figure 4-5. Amperage Adjustment Control

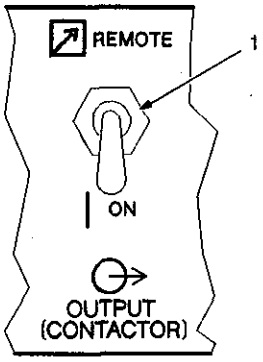
⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Do not touch weld output terminals when contactor is energized.
- Do not touch electrode and work clamp at the same time.

swarn7.1 10/91

⚠ **Weld output terminals are energized when switch is On and Power is On.**



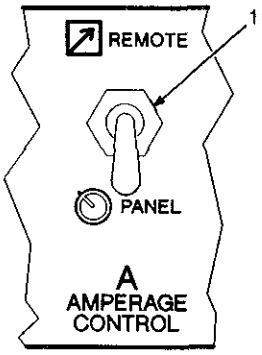
1 Output (Contactor) Control Switch

Use switch to select way of controlling unit output.

For front panel control, place switch in On position.

For remote control, place switch in Remote position (see Section 3-8).

Figure 4-6. Output (Contactor) Control Switch



1 Amperage Control Switch

Use switch to select way of controlling amperage adjustment.

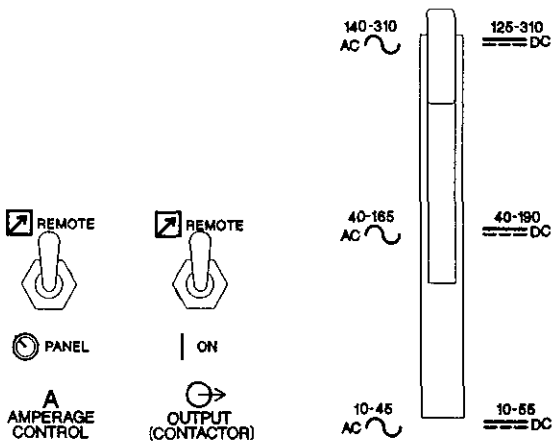
For front panel control, place switch in Panel position.

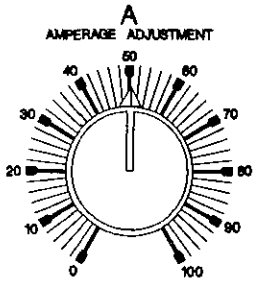
For remote control, place switch in Remote position. See Example below.

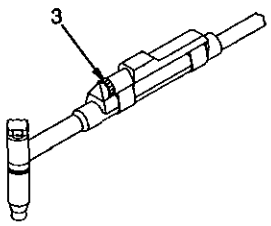
2 Remote Foot Control

3 Fingertip Control

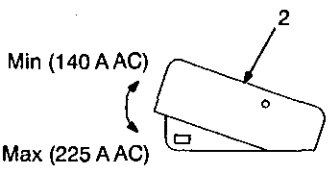
EXAMPLE Of Combination Remote Amperage Control







In Example:
Min = 140 A AC
Percentage Of Range = 50%
Max = 225 A AC (50% of 140 to 310)



Set Switches → Set Range → Set Percentage → Adjust Remote Control

ST-159 059

Figure 4-7. Amperage Control Switch

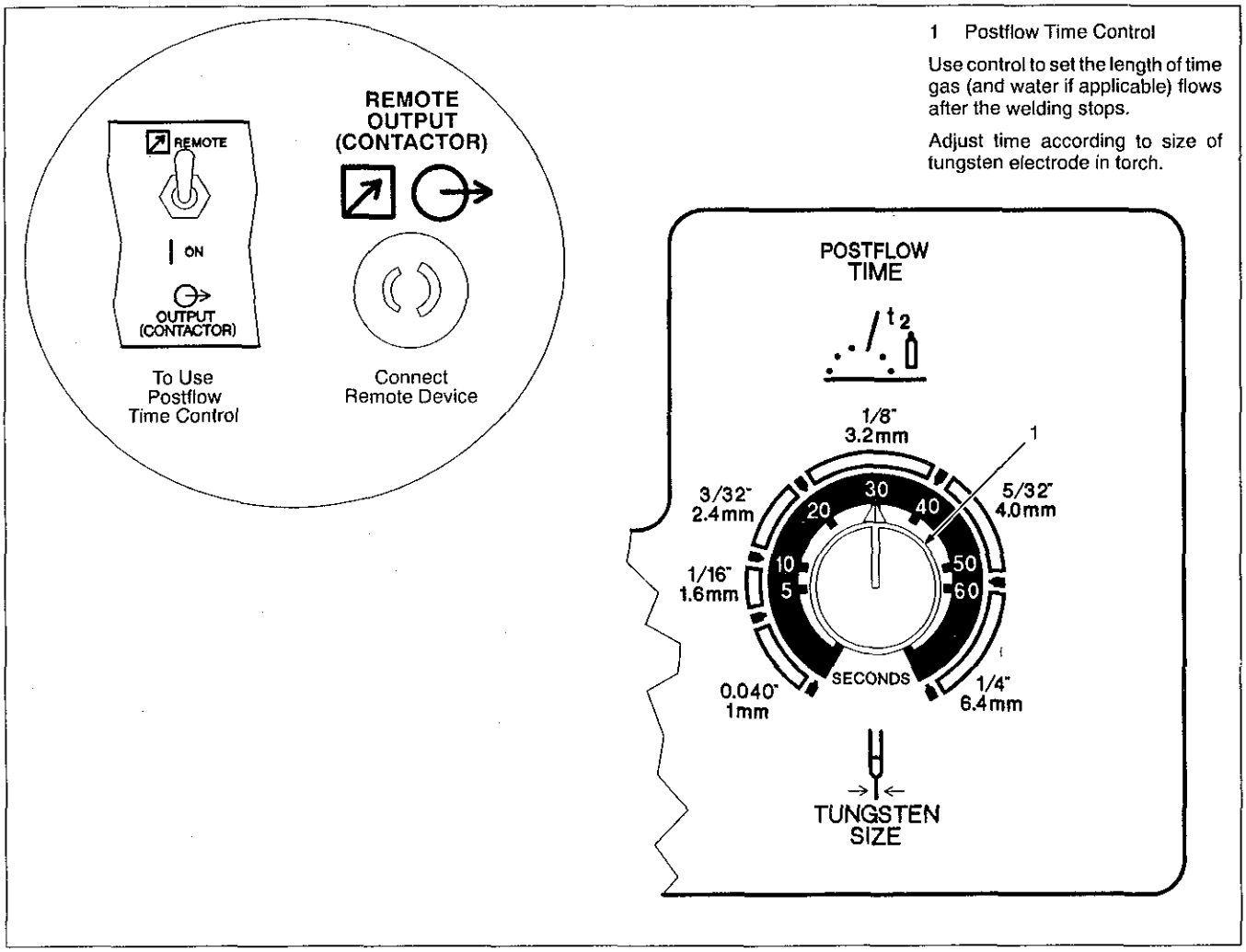


Figure 4-8. Postflow Time Control

⚠ WARNING

USING HIGH FREQUENCY WITH THE SHIELDED METAL ARC WELDING PROCESS can result in serious personal injury.

- *Place the High Frequency switch in the Off position before using the Shielded Metal Arc Welding (SMAW) process.*

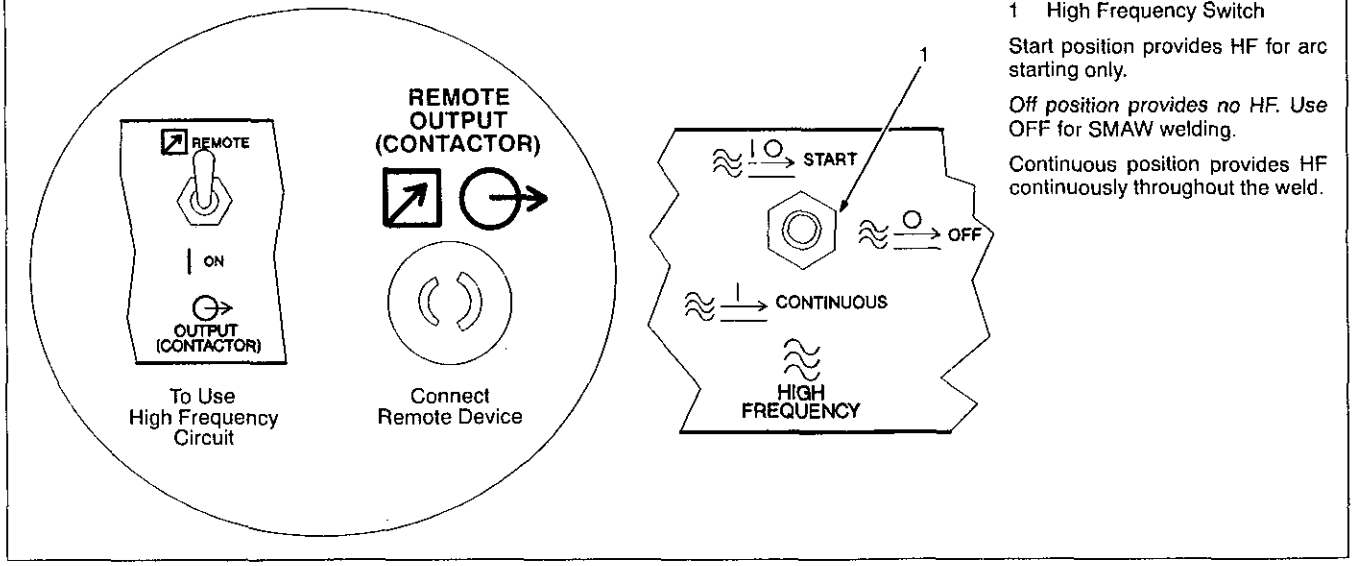


Figure 4-9. High Frequency Switch

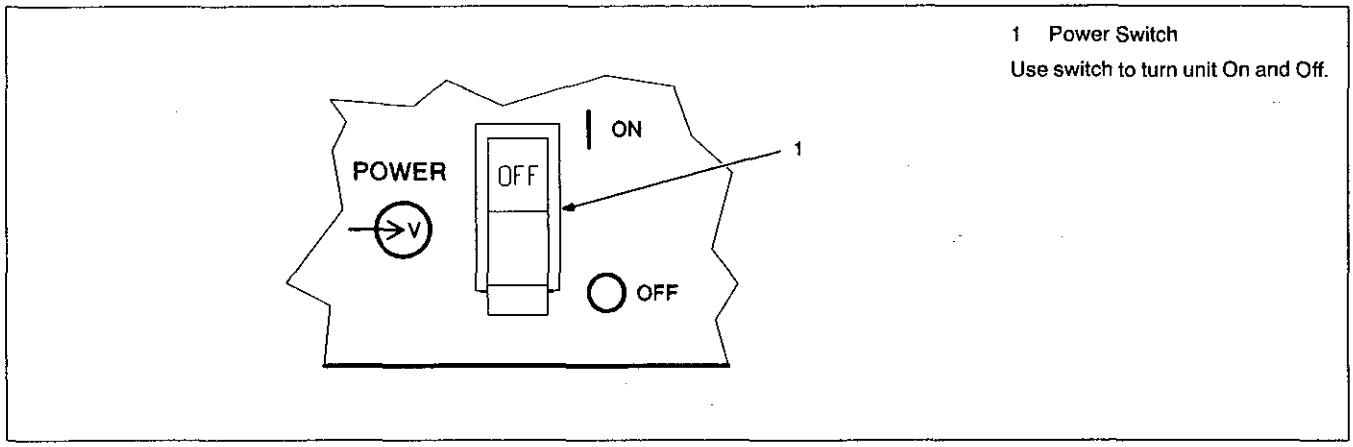


Figure 4-10. Power Switch

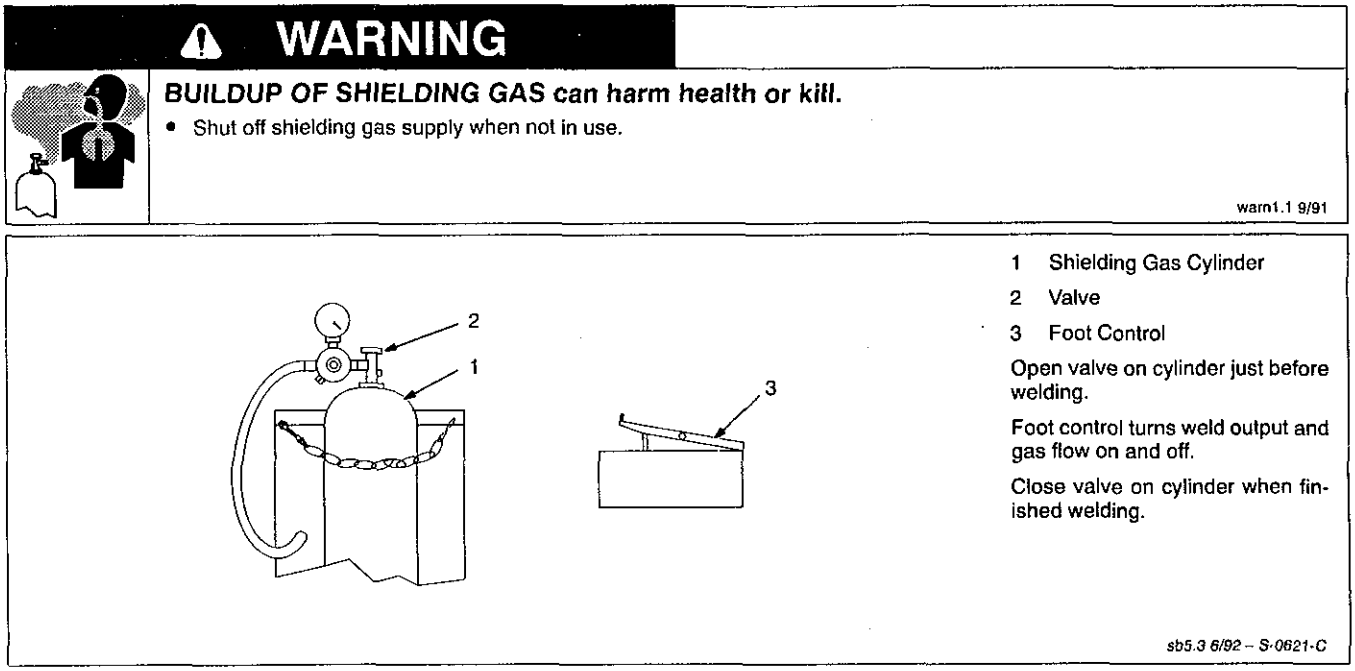


Figure 4-11. Shielding Gas

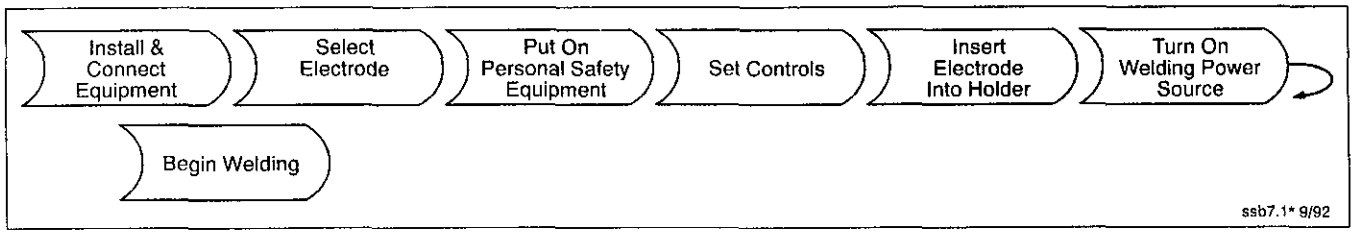


Figure 4-12. Sequence Of Shielded Metal Arc Welding (SMAW)

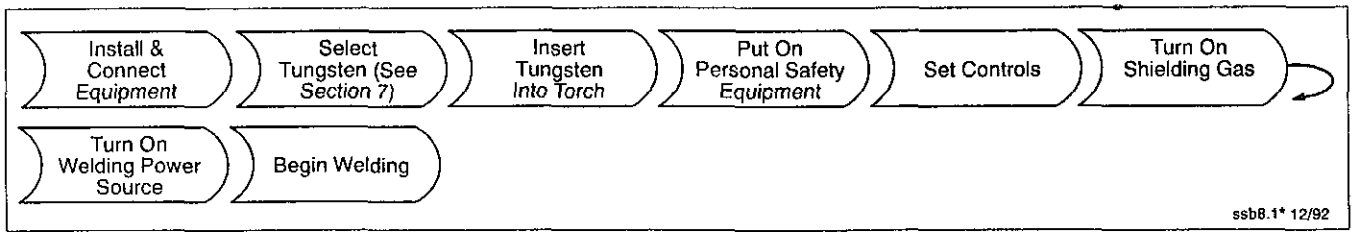


Figure 4-13. Sequence Of Gas Tungsten Arc Welding (GTAW)

SECTION 5 – MAINTENANCE & TROUBLESHOOTING

⚠ WARNING

ELECTRIC SHOCK can kill.
- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting, maintaining, or servicing.

HOT PARTS can cause severe burns.
- Allow cooling period before maintaining or servicing.

MOVING PARTS can cause injury.
- Keep away from moving parts.

Maintenance to be performed only by qualified persons.

swarn8.1 2/93

5-1. Routine Maintenance

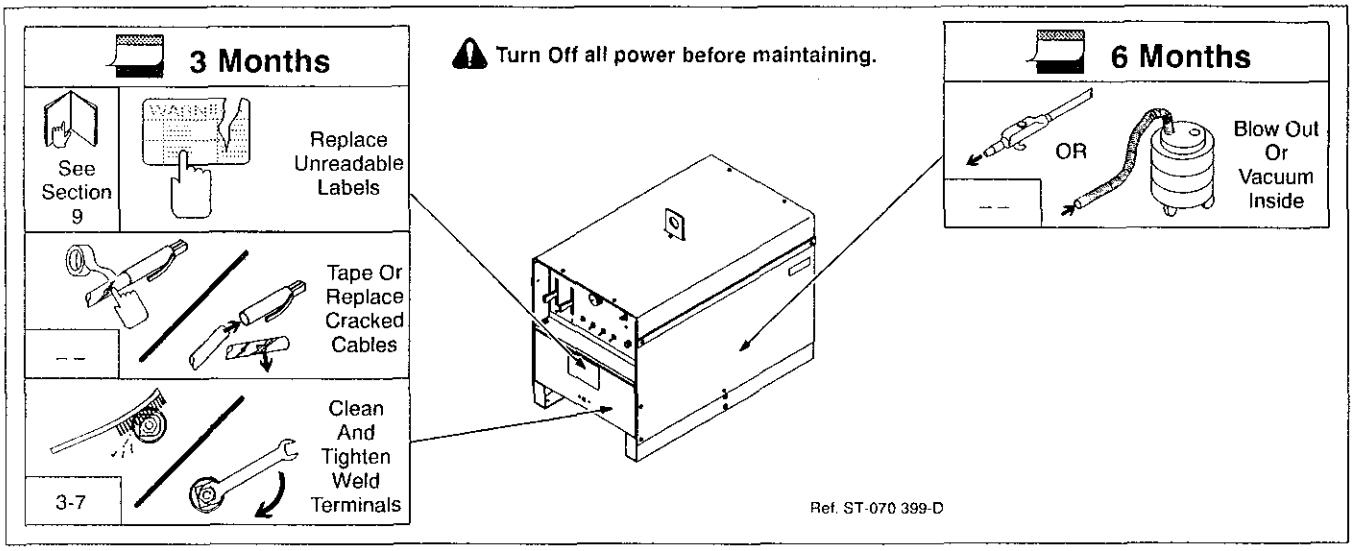


Figure 5-1. Maintenance Schedule

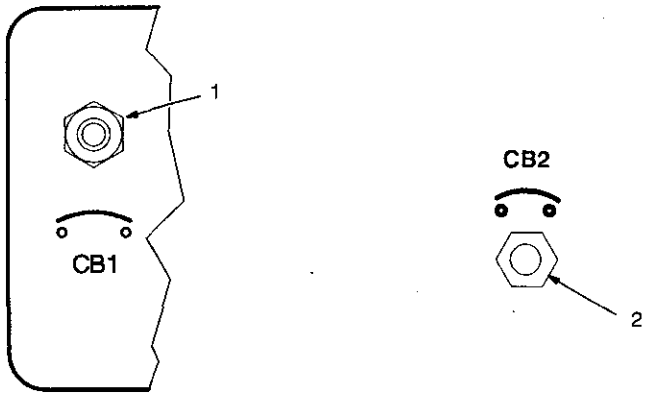
5-2. Overload Protection

⚠ WARNING **READ SAFETY BLOCKS at start of Section 5 before proceeding.**

A. Overheating

Thermostat TP1 protects the unit from damage due to overheating. If main transformer T1 gets too hot, TP1 opens and weld output stops. The fan keeps running to cool the transformer. Wait several minutes before trying to weld.

B. Circuit Breakers CB1 And CB2



See Figure 4-1 for circuit breaker location.

1 Circuit Breaker CB1

CB1 protects the amperage control circuit from overload. If CB1 opens, weld output drops to the minimum of the range selected.

2 Circuit Breaker CB2

CB2 protects the contactor control circuit and duplex receptacle from overload. If CB2 opens, weld output and output to duplex stops.

Press button to reset circuit breaker.

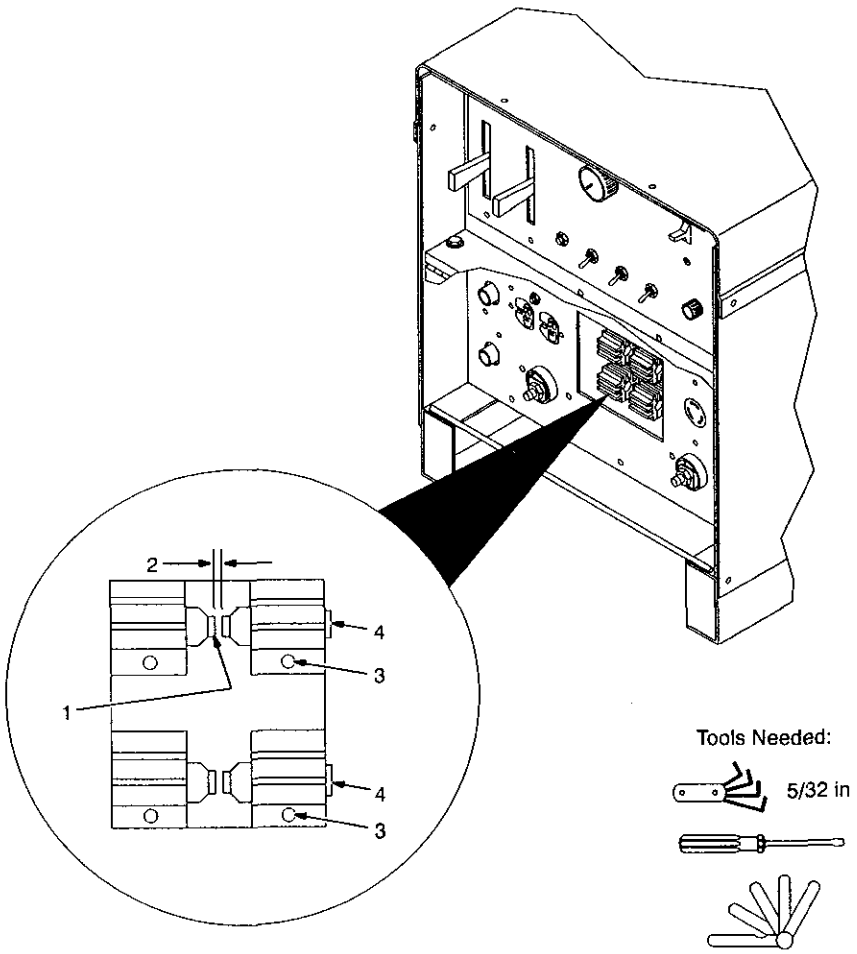
Close access door.

Ref. ST-071 975-F / Ref. S-071 983-E

Figure 5-2. Circuit Breakers CB1 And CB2

5-3. Adjusting Spark Gaps

⚠ WARNING  **READ SAFETY BLOCKS at start of Section 5 before proceeding.**



Turn Off welding power source and disconnect input power.

Loosen screw on lower front panel and open access door.

1 Tungsten End Of Point

Do not clean or dress tungsten. Replace point if tungsten end disappears.

2 Spark Gap

Normal spark gap is 0.008 in (0.203 mm).

If spark gaps are okay, reinstall door. If adjustment is needed, continue as follows:

3 Adjustment Screws

Loosen screws. Place gauge of proper thickness in spark gap.

4 Pressure Point

Apply slight pressure at point until gauge is held firmly in gap. Repeat gauge adjustment with other gap. Tighten adjustment screws.

Close access door.

ST-070 400-C / Ref. S-0043

Figure 5-3. Adjusting Spark Gaps

5-4. Troubleshooting

⚠ WARNING

ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Turn Off welding power source, and disconnect input power before inspecting, maintaining, or servicing.

HOT PARTS can cause severe burns.

- Allow cooling period before servicing.

MOVING PARTS can cause injury.

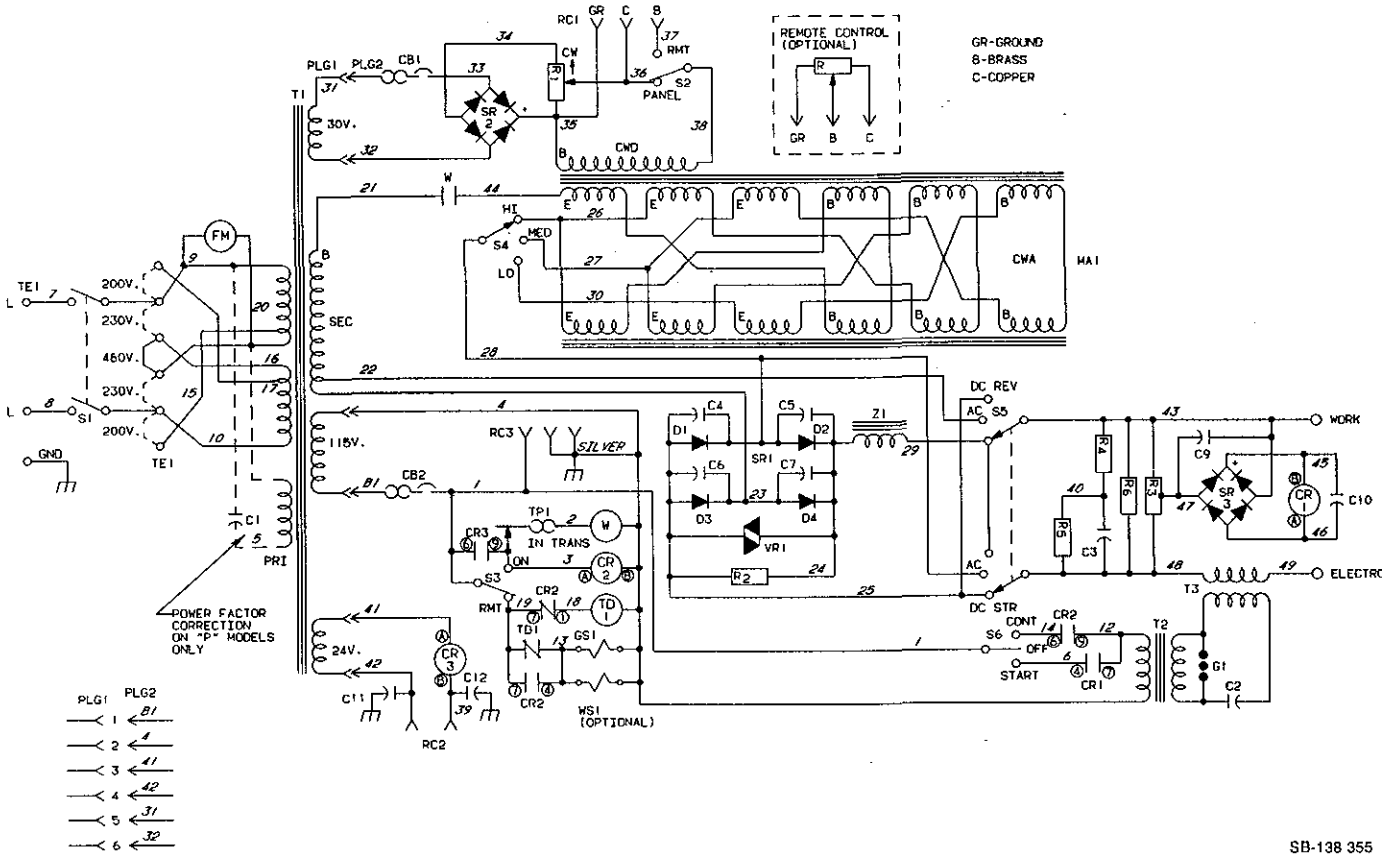
- Keep away from moving parts.

Troubleshooting to be performed only by qualified persons.

swarn9.1 2/93

Table 5-1. Welding Trouble

Trouble	Remedy	Section
No weld output.	Place Power switch in the On position.	Figure 4-10
	Check line fuse(s); replace if open. Reset circuit breakers.	3-10B
	Reset circuit breaker CB2.	5-2B
	Unit overheated; allow unit to run with fan on so thermostat TP1 resets.	5-2A
	If Output (Contactor) switch is in Remote position, connect remote contactor control to remote contactor receptacle.	3-8, Figure 4-6
Erratic weld output.	Clean and tighten all weld connections.	3-7
	Be sure electrode is dry and proper type for SMAW	--
	Be sure tungsten is correct size for GTAW.	7
	Use proper size and type weld cable.	3-3
Fan motor FM does not run.	Have Factory Authorized Service Station/Service Distributor check Power switch and fan motor.	--
Low weld output; Amperage Adjustment Control does not control weld output.	Reset control circuit breaker CB1.	5-2B
	If Amperage Control switch is in Remote position, connect remote amperage control to remote amperage receptacle.	3-8, Figure 4-7
Lack of high frequency; difficult in establishing an arc.	Select proper size tungsten.	7-1
	Place High Frequency switch in correct position.	Figure 4-9
	Check cables and torch for cracked insulation or bad connections. Be sure torch cable is not close to any grounded metal. Repair or replace necessary parts.	--
	Check spark gaps and adjust if necessary.	5-3
Wandering arc – poor control of direction of arc.	Reduce gas flow rate.	3-5
	Properly prepare and select tungsten.	7-1, 7-2
Tungsten electrode oxidizing and not remaining bright after conclusion of weld.	Shield weld zone from drafts.	--
	Increase postflow time.	Figure 4-8
	Check and tighten all gas fittings.	3-5
	Properly prepare tungsten.	7-2
	Replace torch parts if water has leaked into torch.	--



SB-138 355

Figure 6-1. Circuit Diagram For Welding Power Source

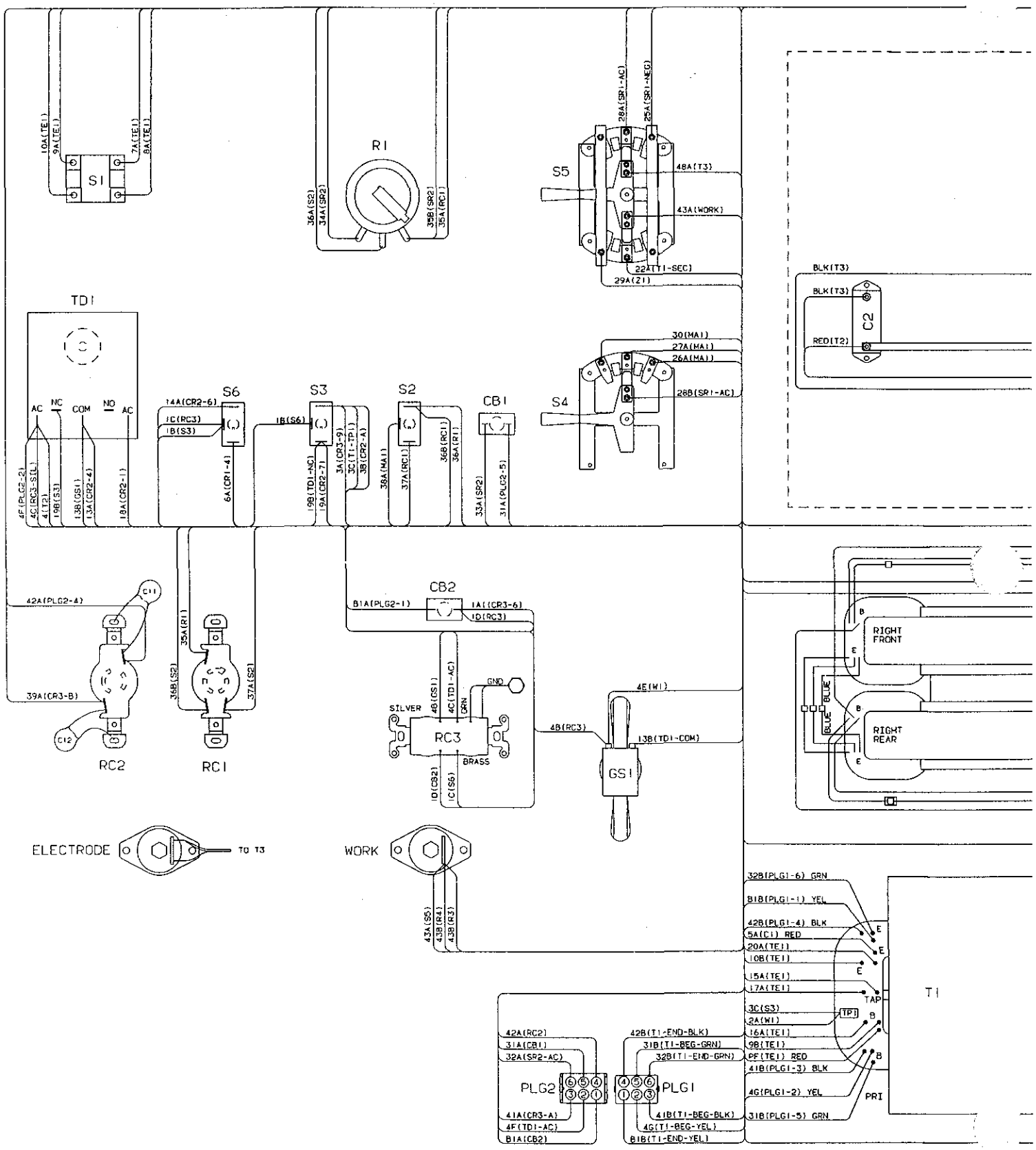
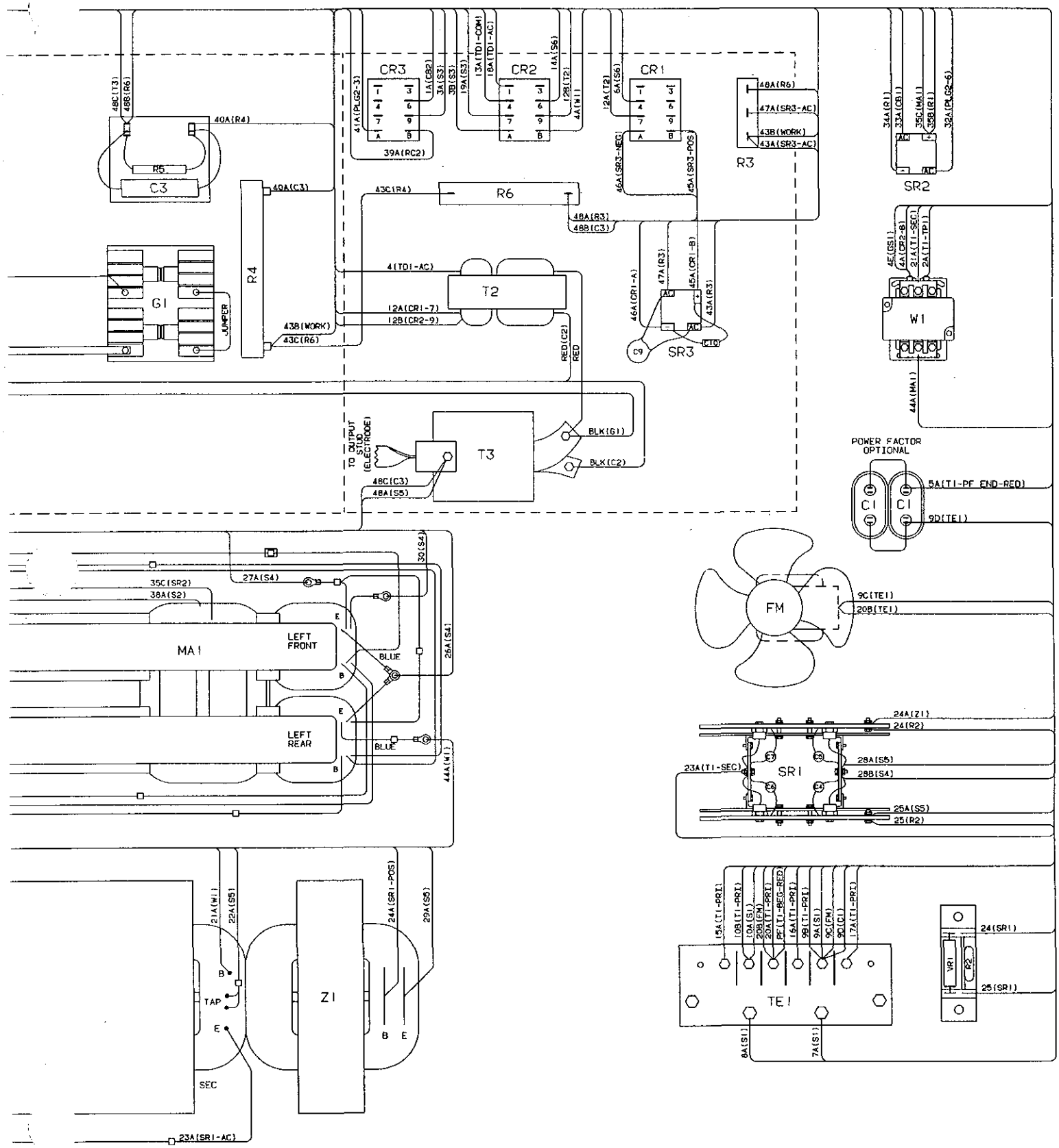


Figure 6-2. Wiring Diagram For Welding Power Source


CR3
CR2
CR1
R3
SR2
R6
R5
C3
R4
G1
JUMPER
T2
SR3
W1
T3
TO OUTPUT STUD (ELECTRODE)
POWER FACTOR OPTIONAL
C1
C1
FM
MA1
LEFT FRONT
LEFT REAR
BLUE
SR1
Z1
TAP
SEC
TE1
VR1
R2
48C(T3)
48B(R6)
40A(R4)
49A(C3)
41A(PLG2-3)
1A(CR2)
3A(S3)
3B(S3)
19A(S3)
13A(TDI-COM)
18A(TDI-AC)
14A(S6)
22B(T2)
4A(W1)
12A(T2)
6A(S6)
46A(SR3-NEG)
45A(SR3-POS)
48A(R6)
47A(SR3-AC)
43B(WORK)
43A(SR3-AC)
34A(R1)
33A(CB1)
35C(MA1)
35B(R1)
32A(PLG2-6)
43C(R4)
48A(R3)
48B(C3)
4(TDI-AC)
12A(CR1-7)
12B(CR2-9)
43B(WORK)
43C(R6)
46A(CR1-A)
47A(R3)
45A(CR1-B)
43A(R3)
C9
C10
RED(C2)
RED
4E(GS1)
4A(CR2-8)
21A(TI-SEC)
2A(TI-TP1)
44A(MA1)
BLK(G1)
BLK(C2)
48C(C3)
48A(S5)
5A(TI-PF END-RED)
9D(TE1)
9C(TE1)
20B(TE1)
30(S4)
27A(S4)
35C(SR2)
38A(S2)
26A(S4)
44A(W1)
24A(Z1)
24(R2)
23A(TI-SEC)
28A(S5)
28B(S4)
25A(S5)
25(R2)
21A(W1)
22A(S5)
24A(SR1-POS)
29A(S5)
23A(SR1-AC)
15A(TI-PRI)
10B(TI-PRI)
10A(S1)
20B(FM)
20A(TI-PRI)
PF(TI-BEG-RED)
16A(TI-PRI)
9B(TI-PRI)
9A(S1)
9C(FM)
9D(C1)
17A(TI-PRI)
8A(S1)
7A(S1)
24(SR1)
25(SR1)

SECTION 7 – TUNGSTEN ELECTRODE

mod2.1 3/93

NOTE ☞

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

Wear clean gloves to prevent contamination of tungsten electrode.

7-1. Selecting Tungsten Electrode

Table 7-1. Tungsten Size

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

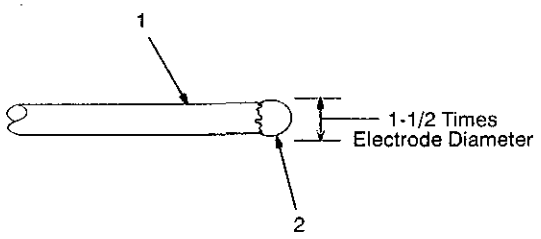
♦Typical argon shielding gas flow rates are 15 to 35 cfh (cubic feet per hour).

*Not Recommended.

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

S-0009

7-2. Preparing Tungsten



1 Tungsten Electrode

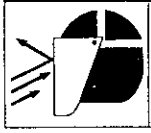
2 Balled End

Ball end of tungsten before welding by applying either an ac amperage slightly higher than what is recommended for a given electrode diameter (see Table 7-1), or a dc electrode positive amperage.

Ref. S-0161

Figure 7-1. Preparing Tungsten For AC Or DC Electrode Positive (DCEP) Welding

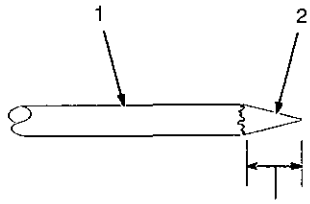
⚠ CAUTION



FLYING SPARKS AND HOT METAL can cause injury and start fires.

- Shape tungsten electrode only on grinder with proper guards in a safe location wearing proper face, hand, and body protection.
- Keep flammables away.

warn2.1 9/91

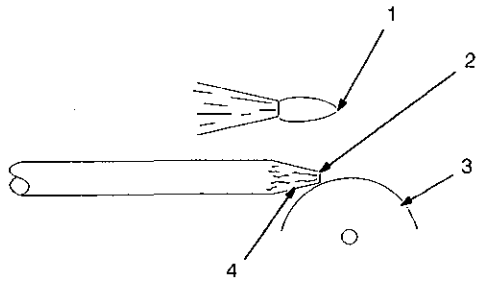


1 Tungsten Electrode

2 Tapered End

Grind end of tungsten on fine grit, hard abrasive wheel before welding. Do not use wheel for other jobs or tungsten can become contaminated causing lower weld quality.

Ref. S-0161



Ideal Tungsten Preparation – Stable Arc

1 Stable Arc

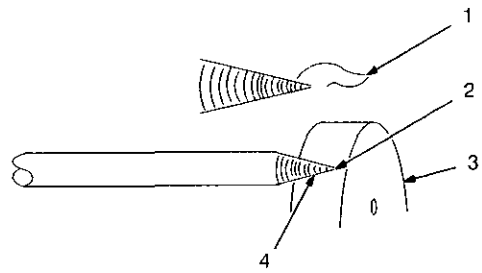
2 Flat

Diameter of this flat determines amperage capacity.

3 Grinding Wheel

4 Straight Ground

Ref. S-0162



Wrong Tungsten Preparation – Wandering Arc

1 Arc Wander

2 Point

3 Grinding Wheel

4 Radial Ground

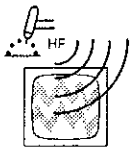
Ref. S-0162

Figure 7-2. Preparing Tungsten For DC Electrode Negative (DCEN) Welding

SECTION 8 – HIGH FREQUENCY

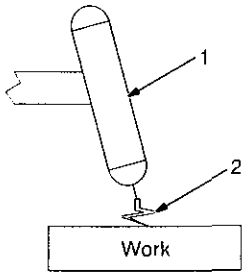
mod6.1 4/93

⚠ WARNING

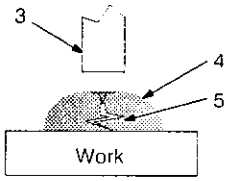


HIGH-FREQUENCY RADIATION can interfere with radio navigation, safety services, computers, and communications equipment.

- Have only qualified person familiar with electronic equipment perform this installation.
- The user is responsible for having a qualified electrician promptly correct any interference problem resulting from the installation.
- If notified by the FCC about interference, stop using the equipment at once.
- Have the installation regularly checked and maintained.
- Keep high-frequency source doors and panels tightly shut, keep spark gaps at correct setting, and use grounding and shielding as shown in Figure 8-3 to minimize the possibility of interference.



Gas Tungsten Arc Welding (GTAW)



Submerged Arc Welding (SAW)

1 Gas Tungsten Arc Torch

2 High-Frequency Voltage

Used to help arc jump air gap between torch and workpiece and/or stabilize the arc.

3 Submerged Arc Welding Gun

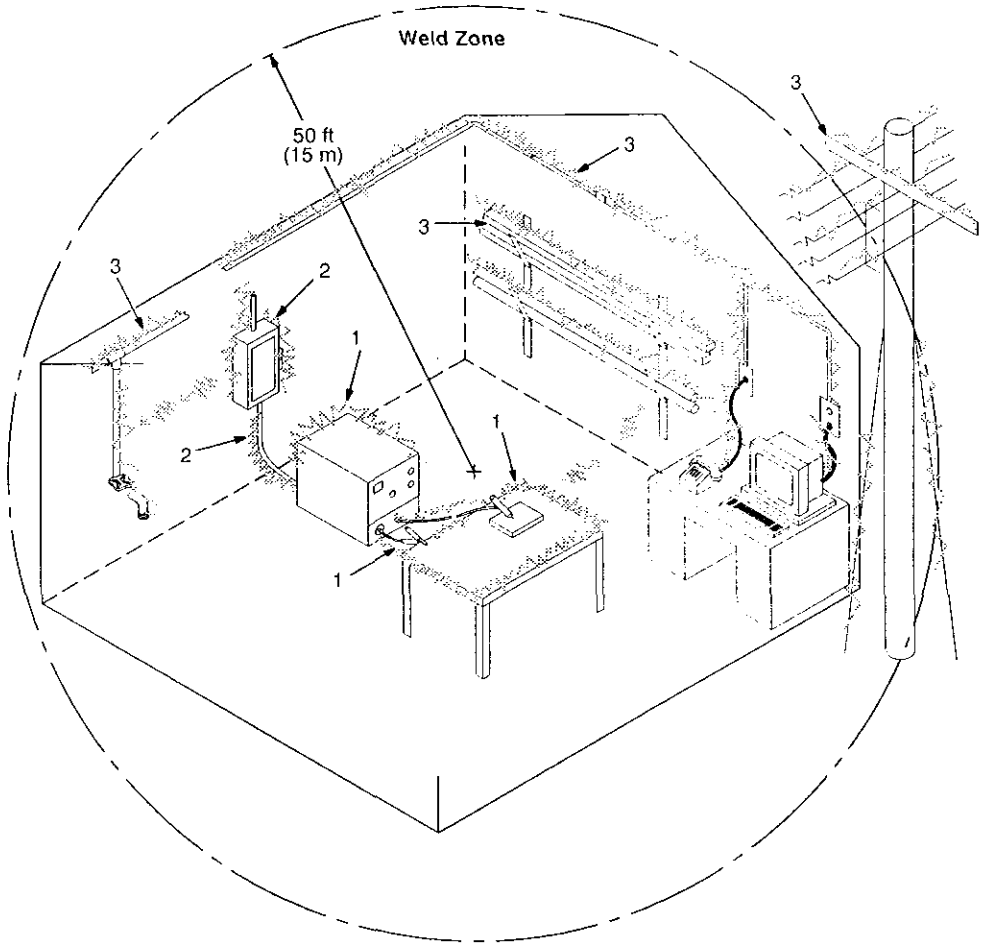
4 Flux

5 High-Frequency Voltage

Used to help arc reach workpiece through flux granules.

S-0693

Figure 8-1. Welding Processes Requiring High Frequency



1 Sources Of Direct High-Frequency Radiation

High-frequency source (welding power source with built-in HF or separate HF unit), weld cables, torch, work clamp, workpiece, and work table.

2 Sources Of Conduction Of High Frequency

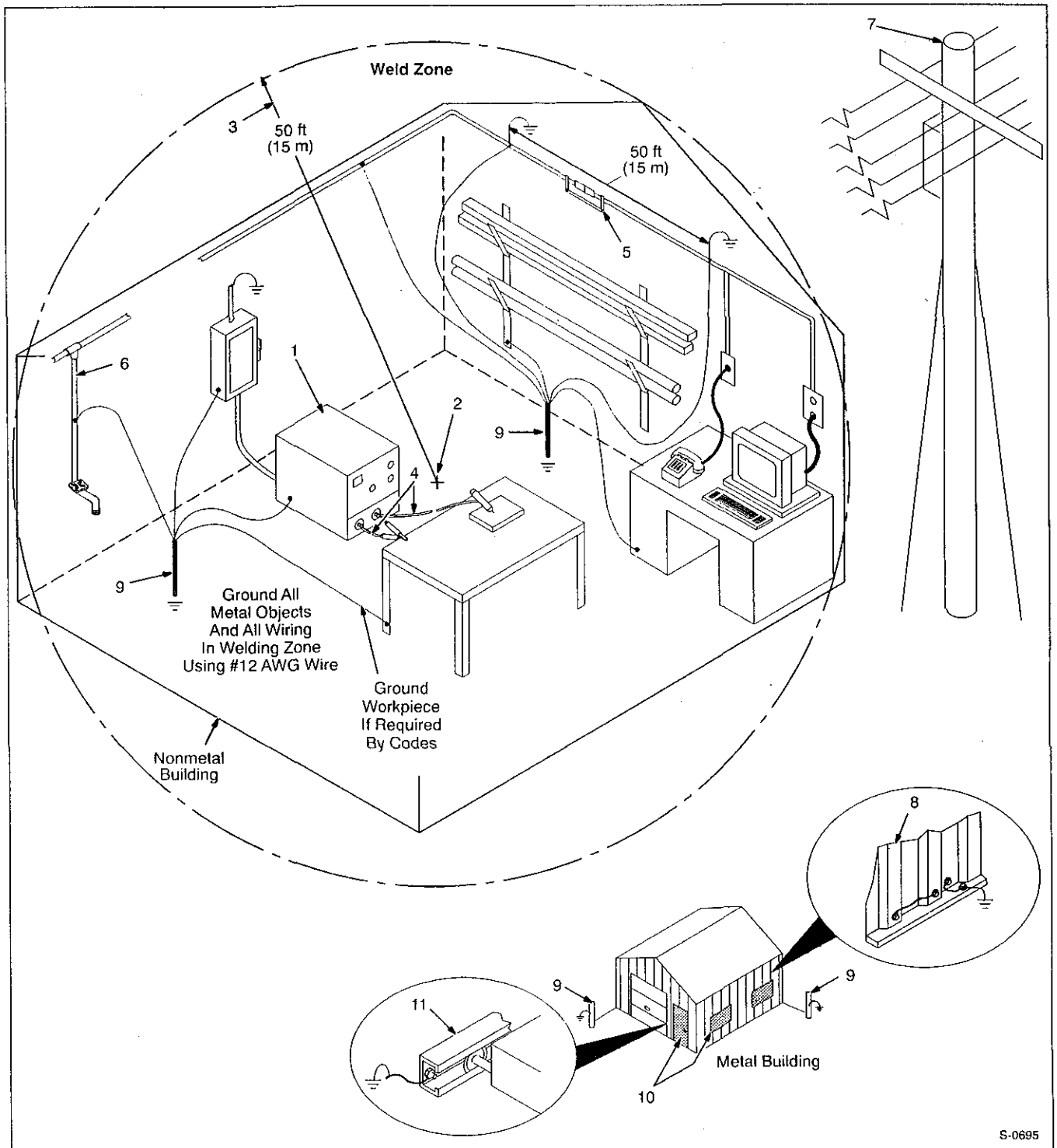
Input power cable, line disconnect switch, and input supply wiring.

3 Sources Of Reradiation Of High Frequency

Ungrounded metal objects, lighting, wiring, water pipe and fixtures, external phone and power lines.

S-0694

Figure 8-2. Sources Of High-Frequency Radiation From Incorrect Installation



1 High-Frequency Source (Welder With Built-In HF Or Separate HF Unit)

Ground metal machine case, work output terminal, line disconnect switch, input supply, and worktable.

2 Center Point Of Welding Zone

Midpoint between high-frequency source and welding torch.

3 Welding Zone

A circle 50 ft (15 m) from center point in all directions.

4 Weld Output Cables

Keep cables short and close together.

5 Conduit Joint Bonding

Electrically join (bond) all conduit sections using copper straps or braided wire. Ground conduit every 50 ft (15 m).

6 Water Pipe And Fixtures

Ground water pipe every 50 ft (15 m).

7 External Power Or Telephone Lines

Locate high-frequency source at least 50 ft (15 m) away from power and phone lines.

8 Metal Building Panel Bonding Methods

Bolt or weld building panels together, install copper straps or braided wire across seams, and ground frame.

9 Grounding Rod

Consult the National Electrical Code for specifications.

10 Windows And Doorways

Cover all windows and doorways with grounded copper screen of not more than 1/4 in (6.4 mm) mesh.

11 Overhead Door Track

Ground the track.

Figure 8-3. Correct Installation

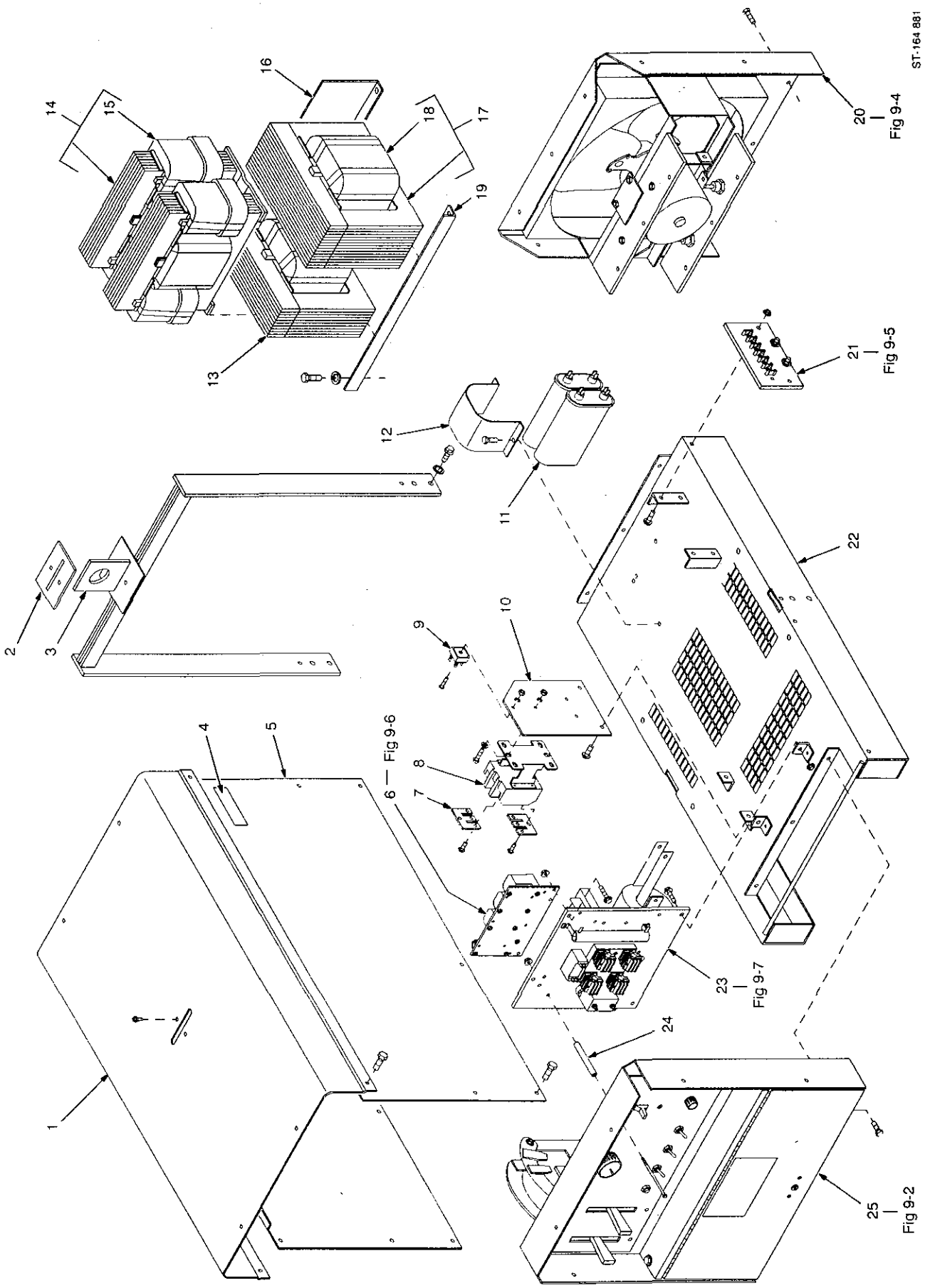


Figure 9-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity Model Without PFC	Quantity Model With PFC
			Figure 9-1. Main Assembly		
1		000 073	COVER, top	1	1
2		026 627	GASKET, lifting eye cover	1	1
3		144 697	FRAME, lifting	1	1
4		109 035	LABEL, warning electric shock can kill etc	1	1
5		+070 197	PANEL, side	2	2
6		Fig 9-6	MOUNTING BOARD, w/components	1	1
7		114 786	LINK, connecting contactor term	2	2
8	W	114 780	CONTACTOR, 60A 3P 115V (consisting of)	1	1
		114 787	. COIL	1	1
9	SR2	035 704	RECTIFIER, integ 40A 800V	1	1
10		114 785	PLATE, mtg contactor	1	1
11	C1	114 543	CAPACITOR, poly met film 40uf 480VAC	2	
12		025 141	BRACKET, mtg capacitor	1	
13	Z	027 218	STABILIZER	1	1
14	MA1	039 234	AMPLIFIER, magnetic (consisting of)	1	1
15		039 175	. COIL, control AC	4	4
		039 176	. COIL, control DC	1	1
16		092 613	BRACKET, mtg transformer & stabilizer	1	1
17	T1	140 551	TRANSFORMER, main (200/230/460) (consisting of)	1	
18		140 434	. COIL, pri/sec	1	
17	T1	140 552	TRANSFORMER, main (230/460/575) (consisting of)	1	
18		140 439	. COIL, pri/sec	1	
17	T1	140 557	TRANSFORMER, main (200/230/460) (consisting of)		1
18		140 432	. COIL, pri/sec		1
17	T1	140 558	TRANSFORMER, main (230/460/575) (consisting of)		1
18		140 433	. COIL, pri/sec		1
	TP1	020 520	. THERMOSTAT, NC	1	1
19		092 614	ANGLE, mtg transformer & stabilizer	1	1
20		Fig 9-4	PANEL, rear w/components	1	1
21	TE1	034 587	TERMINAL ASSEMBLY, pri (Fig 9-5)	1	1
22		138 295	BASE	1	1
23		108 324	HF PANEL, (Fig 9-7)	1	1
24		092 368	TUBING, stl .250 ID x 16 ga x 3	2	2
25		Fig 9-2	PANEL, front w/components	1	1
		011 751	SWITCH, slide NO w/leads & clamp	1	1
		039 618	PLUG, twlk 2P2W 20A 250V	1	1

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

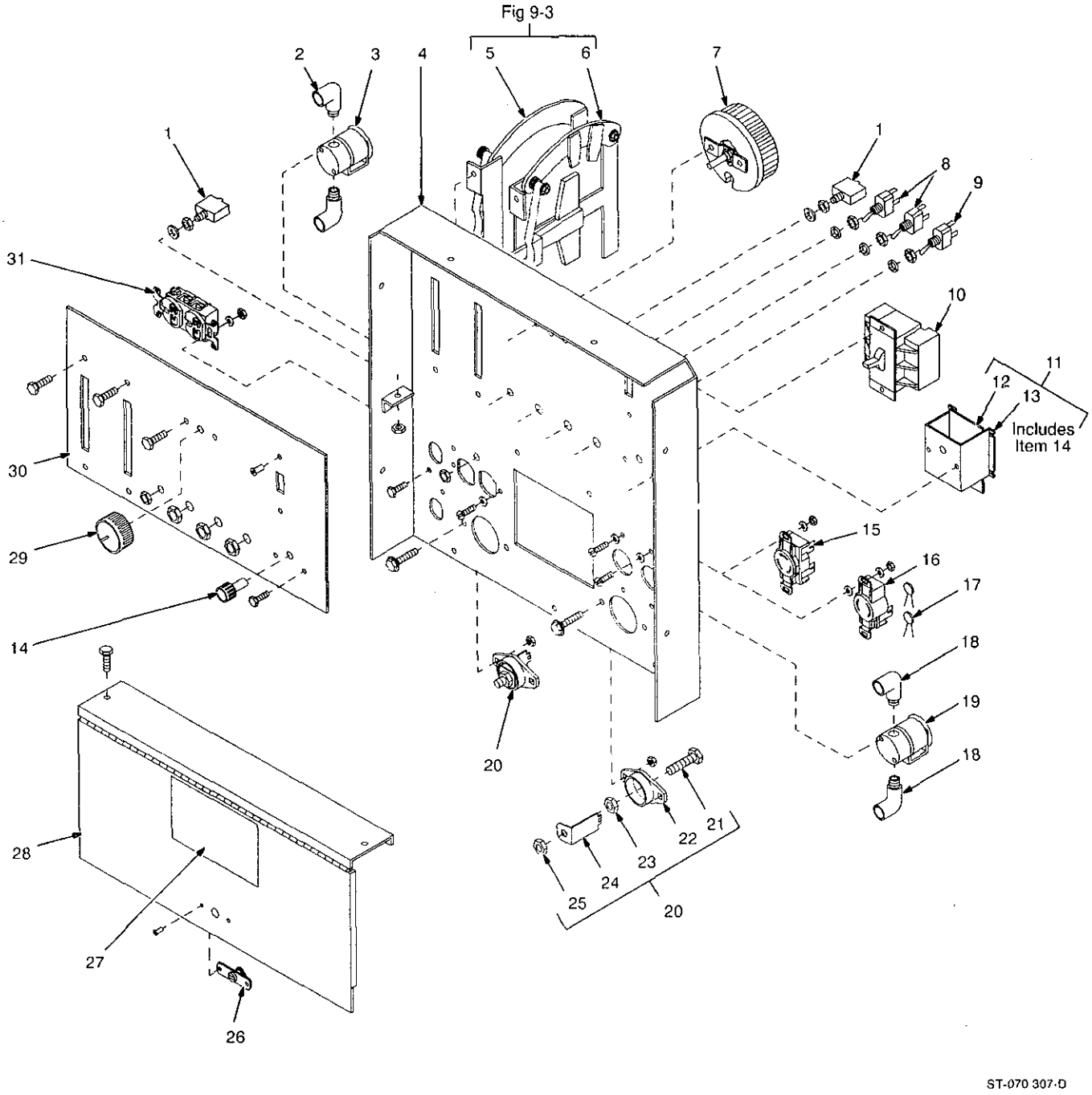


Figure 9-2. Panel, Front w/Components

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

Figure 9-2. Panel, Front w/Components (Fig 9-1 Item 25)

1	CB1,2	083 432	CIRCUIT BREAKER, man reset 10A 250V	2
2		010 296	FITTING, hose brs elbow M 1/4NPT x .625-18RH	2
3	GS1	003 538	VALVE, 115VAC 2 way 1/4 IPS port 1/8 orf	1
4		125 525	PANEL, front	1
5	S5	070 199	SWITCH, plrt (Fig 9-3)	1
6	S4	070 200	SWITCH, range (Fig 9-3)	1
7	R1	083 671	RHEOSTAT, WW 150W 15 ohm	1
8	S2,3	011 609	SWITCH, tgl SPDT 15A 125V	2
9	S6	011 610	SWITCH, tgl SPDT 10A 125V center off	1
10	S1	045 834	SWITCH, tgl DPST 60A 600VAC	1
11	TD1	052 192	TIMER, 0-60 sec (consisting of)	1
12		044 723	. CIRCUIT CARD, postflow	1
13		039 449	. BRACKET, mtg circuit card	1
14		052 370	. KNOB	1
15	RC1	039 607	RECEPTACLE, twlk 3P3W 20A 250V	1
		605 797	PLUG, twlk 3P3W 20A 125V Arrow Hart 6312	
16	RC2	039 602	RECEPTACLE, twlk 2P2W 20A 250V	1
		039 618	PLUG, twlk 2P2W 20A 250V Arrow Hart 9102N	
17	C11,12	080 894	CAPACITOR, cer disc .01uf 1000VDC	2
18		♦010 295	FITTING, pipe brs elbow M 1/4NPT x .625-18LH	2
19	WS1	♦003 538	VALVE, 115VAC 2 way 1/4 IPS port 1/8 orf	1
20		039 047	TERMINAL, pwr output red (consisting of)	2
21		601 976	. SCREW, hex hd .500-13 x 1.500	1
22		039 049	. TERMINAL BOARD	1
23		601 880	. NUT, hex jam .500-13	1
24		039 044	. BUS BAR	1
25		601 879	. NUT, hex full .500-13	1
26		605 583	CATCH, spring loaded door	1
27		134 327	LABEL, warning general precautionary	1
28		+138 250	DOOR, access lower front	1
29		097 926	KNOB, pointer	1
30			NAMEPLATE, (order by model and serial number)	1
31	RC3	604 176	RECEPTACLE, str dx grd 2P3W 15A 125V	1
		073 690	PLUG, str grd armd 2P3W 15A 125V Arrow Hart 5965V	

♦OPTIONAL

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

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

Dia. Mkgs.	Part No.	Description	Quantity	
		Figure 9-3. Switch, Polarity & Range (Fig 9-2 Item 5 & 6)	070 199	070 200
1	011 645	CONTACT ASSEMBLY, movable (consisting of)	2	1
2	011 074	SPRING, pressure	1	1
3	011 953	CONTACT, switch	2	2
4	011 075	SPRING, pressure	1	1
5	011 644	CONTACT, stat switch	6	3
6	070 204	BUS BAR	2	
7	072 028	GUIDE, contact switch	2	1
8	072 026	BRACKET, mtg switch	1	1
9	005 558	SPRING, selector switch	1	1
10	072 027	LEVER, switch	1	1
11	072 082	BUSHING, stl .265 x .484 OD x .593	1	1

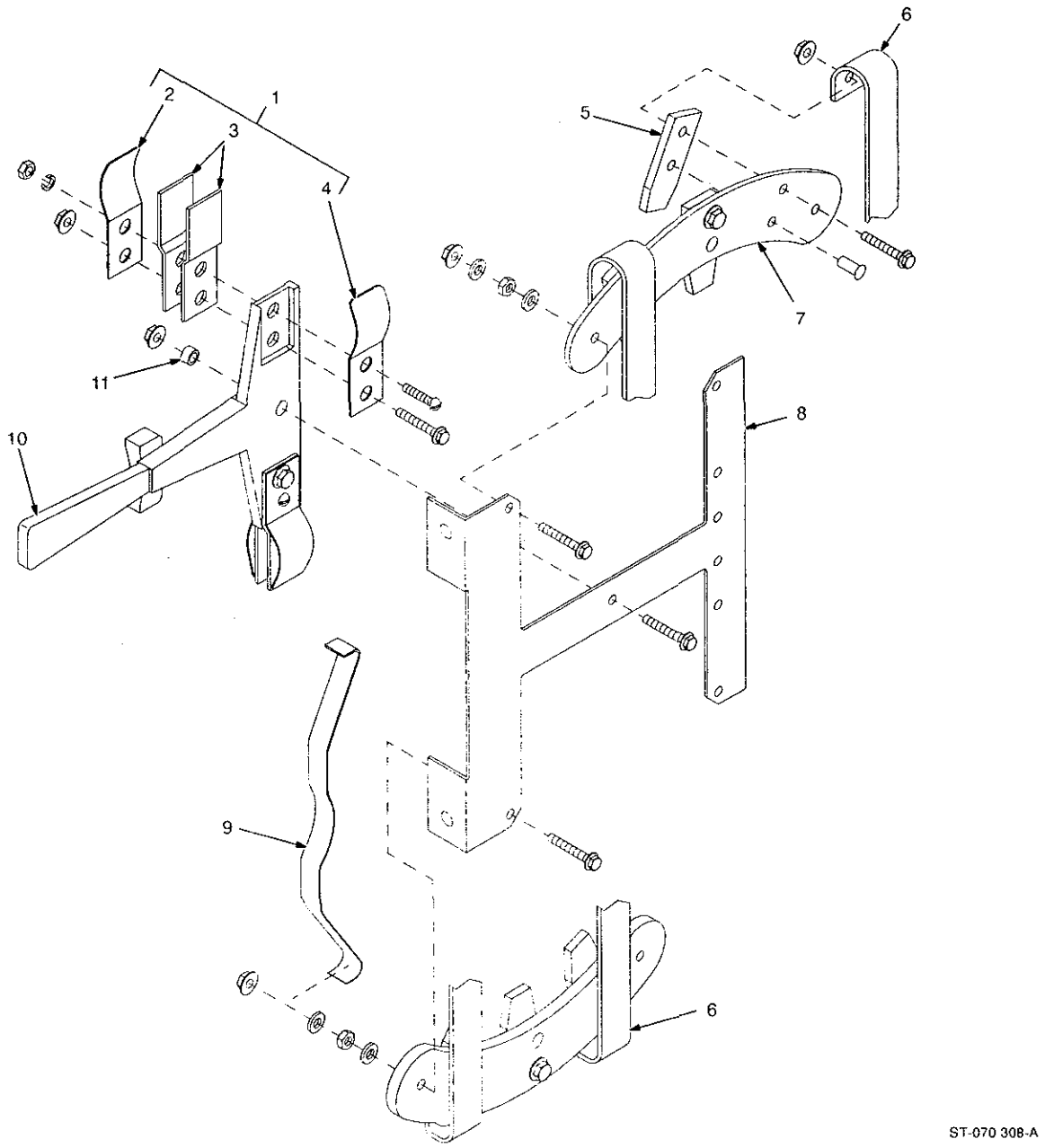


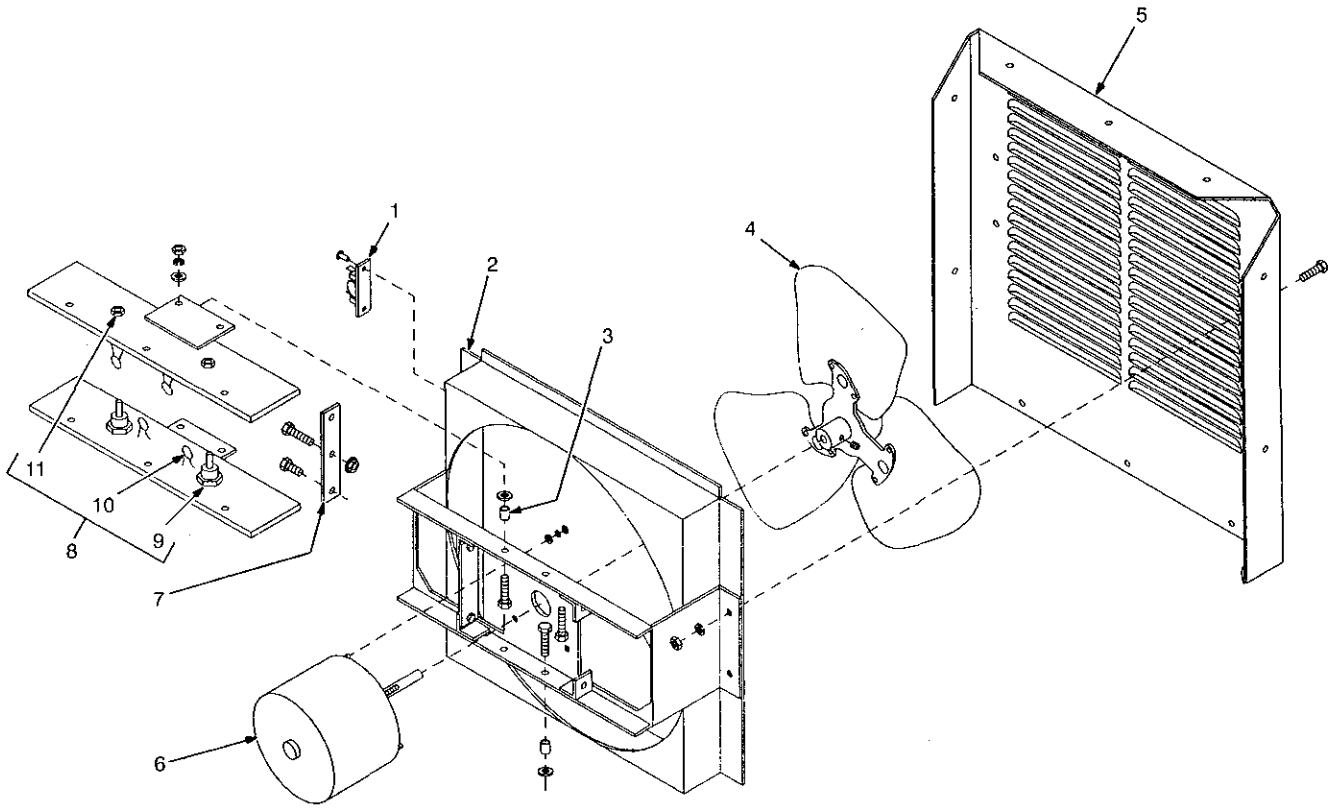
Figure 9-3. Switch, Polarity & Range

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

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

Figure 9-4. Panel, Rear w/Components (Fig 9-1 Item 20)

1	R2,VS1	046 819	SUPPRESSOR	1
2		111 936	CHAMBER, plenum 14 in	1
3		128 325	TUBING, stl .375 OD x .256 ID	4
4		032 604	BLADE, fan 14 in 3 wg 19 deg	1
5		111 987	PANEL, rear	1
6	FM	116 190	MOTOR, 1/12 hp 230V 1550RPM	1
7		111 932	JUNCTION BOARD, diode	2
8	SR1	111 935	RECTIFIER, si diode (consisting of)	1
9		037 306	. DIODE, rect 150A 300V RP	2
10	C4-7	031 689	. CAPACITOR, rect	4
11		037 305	. DIODE, rect 150A 300V SP	2



ST-002 760-D

Figure 9-4. Panel, Rear w/Components

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

Dia. Mkgs.	Part No.	Description	Quantity
	034 587	**Figure 9-5. Terminal Assembly, Pri (Fig 9-1 Item 21)**	
1	601 835	NUT, brs hex 10-32 reg	12
2	601 836	NUT, brs hex .250-20 jam	4
3	010 915	WASHER, flat brs .250 ID x .625 OD	4
4	083 426	TERMINAL BOARD, pri	1
5	038 888	STUD, brs .250-20 x 1.500	2
6	038 887	STUD, brs 10-32 x 1.375	6
7	010 913	WASHER, flat brs .218 ID x .460 OD	6
8	038 618	LINK, jumper	2

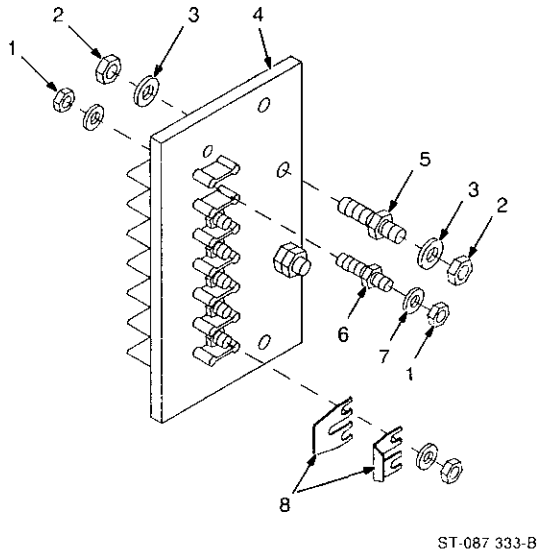


Figure 9-5. Terminal Assembly, Pri

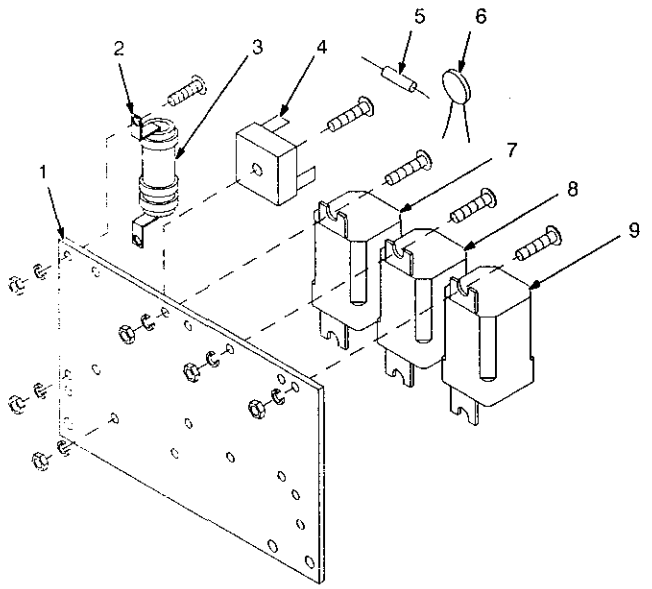


Figure 9-6. Mounting Board, w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 9-6. Mounting Board, w/Components (Fig 9-1 Item 6)	
1		006 208	MOUNTING BOARD, cmpnt elect	1
2		605 741	CLIP, mtg resistor .312 ID	2
3	R3	030 601	RESISTOR, WW adj 25W 1000 ohm	1
4	SR3	035 914	RECTIFIER, integ 30A 600V	1
5	C10	046 139	CAPACITOR	1
6	C9	046 140	CAPACITOR	1
7	CR1	059 267	RELAY, encl 12VDC DPDT 10A/120VAC	1
8	CR2	059 266	RELAY, encl 120VAC DPDT 10A/120VAC	1
9	CR3	006 393	RELAY, 24VAC DPDT 10A/120VAC	1

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		108 324	**Figure 9-7. HF Panel (Fig 9-1 Item 23)**	
1	C3	106 935	CAPACITOR, polyp film 10uf 250VAC	1
2		070 201	MOUNTING BOARD	1
3		605 742	CLIP, mtg resistor	4
4	R6	030 965	RESISTOR, WW fxd 100W 100 ohm	1
5	T2	074 398	TRANSFORMER, 115V	1
6		000 681	STRIP, mtg coil	2
7	T3	039 177	COIL, coupling air	1
8		000 682	TUBING, fbr vulc .250 ID x .312 OD x .812	2
9	R4	083 784	RESISTOR, WW fxd 100W 10 ohm	1
10		020 623	SPARK GAP ASSEMBLY, (consisting of)	1
11		095 621	. BASE, spark gap	1
12		020 622	. HOLDER, points	4
13	G	*020 603	. POINT, spark gap	4
14		025 065	STRIP, conductor	1
15	C2	096 761	CAPACITOR, mica .002uf 10000V	1
16	R5	080 929	RESISTOR	1

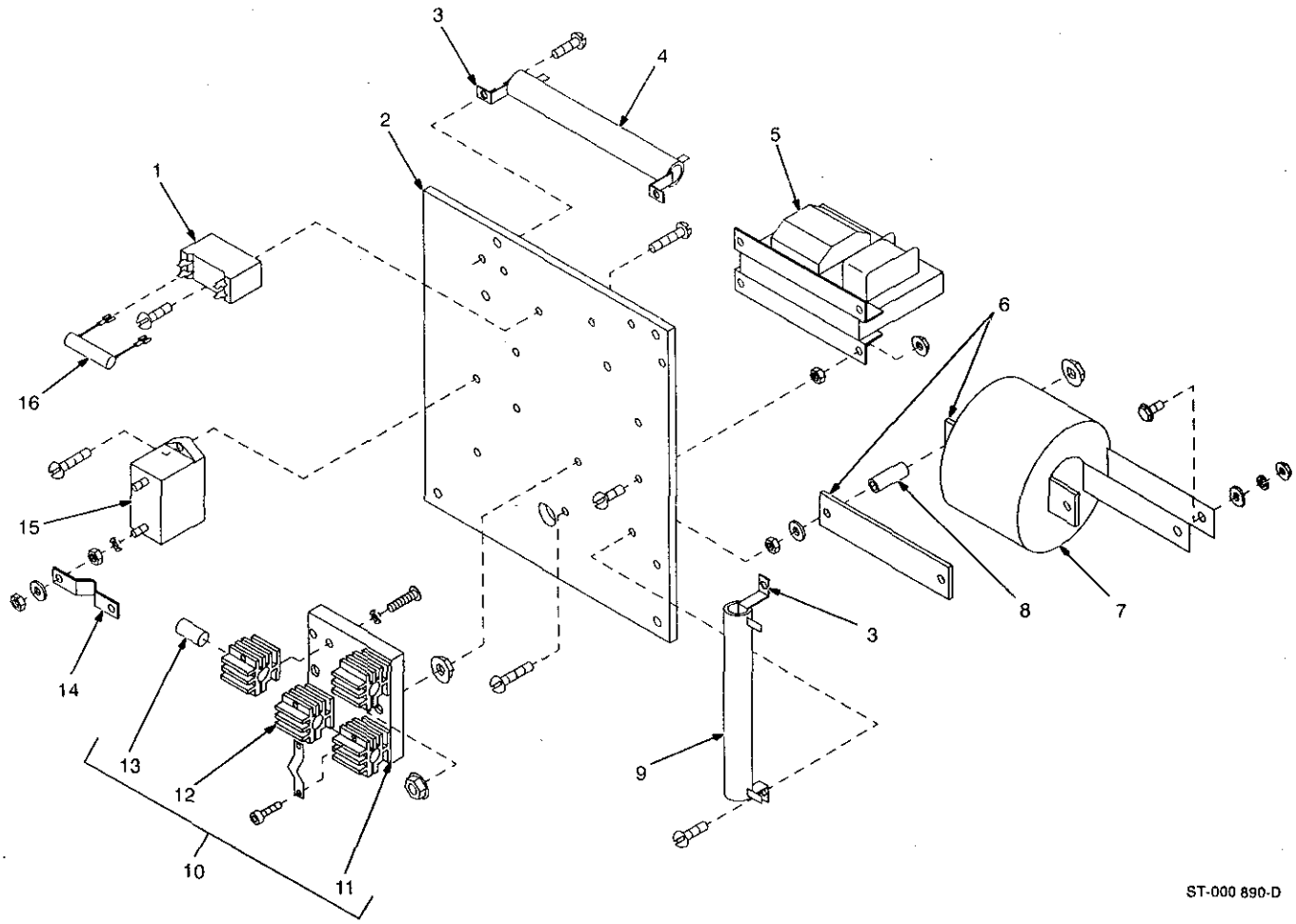


Figure 9-7. HF Panel

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

OPTIONS AND ACCESSORIES

COOLANT SYSTEMS
For use with liquid-cooled torches.
Radiator 1 115 Volts **041 398**
Radiator 230 Volts **041 399**
Horizontal design, 1.5 gal (5.6 l) capacity.
Watermate™ 1 115 Volts **041 852**
Watermate™ 2 230 Volts **041 853**
Vertical design, 2 gal & (7.6 l) capacity.

SPOT TIMER
Stock No. **041 754** (Field)
For units with Serial No. JB 510828 and higher. Adjusts spot time 0 to 5 secs.

RHS-2 REMOTE HAND SWITCH
Stock No. **040 048**
Momentary contact. For use with Spot Timer.

RHC-3 REMOTE HAND AMPERAGE CONTROL
Stock No. **040 056**
Includes 20 ft. (6 m) cord and plug.

MIC-4 INTERFACE CONTROL
Stock No. **041 675**
Provides solid state remote control facilities for the following controls:
FTC-23 Fingertip Control
Stock No. **006342**
RHCS-3 Hand Control
Stock No. **041 146**
RFCS-23 Foot Control
Stock No. **041 148**
Order controls separately.

RFC-23A REMOTE FOOT CONTROL
Stock No. **040 071**
Amperage and contactor control with 20 ft. (6 m) cords and plugs.

No. 19 RUNNING GEAR
Stock No. **041 580**
Four 8" (203 cm) Poly/rubber blend wheels with 30" (762 mm) towing handle.

No. 4CR
Stock No.**041 583** Cylinder rack.

NO. 2WA WELDING ACCESSORIES
Stock No. **040 039**
Consists of 35' (10.6 m) of No. 2 electrode cable with insulated electrode holder, 30' (9.1 m) of No. 2 work cable, work clamp, welding helmet, wire scratch brush.