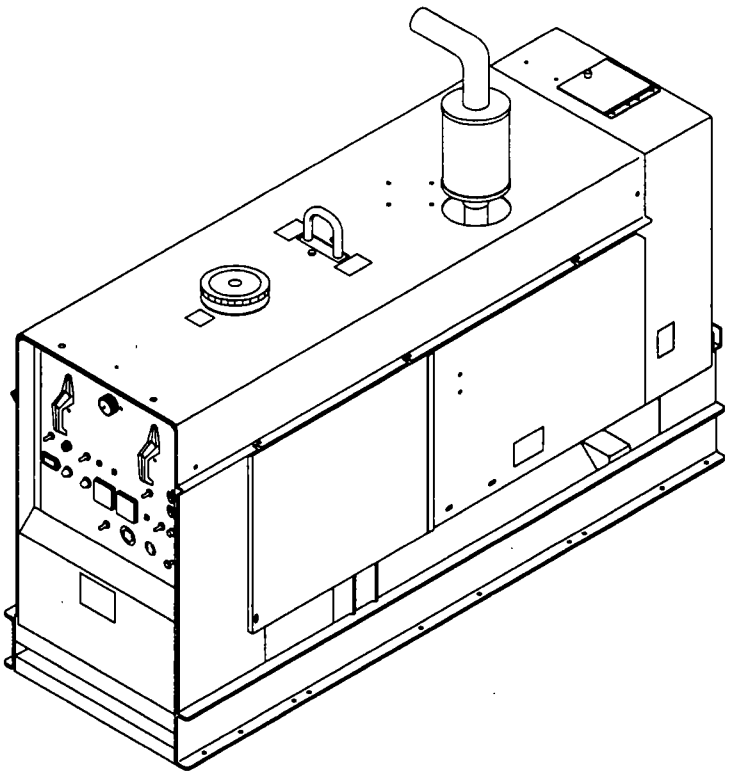
Miller®

April 1991 FORM: OM-458M

Effective With Serial No. KA895189

MODEL: TRAILBLAZER® 44G



OWNER'S MANUAL

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

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

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

SB-086 640-C

PRINTED IN U.S.A.

LIMITED WARRANTY

EFFECTIVE: AUGUST 6, 1990

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

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

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

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

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

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

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

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

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

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

November 6, 1991 FORM: OM-458M

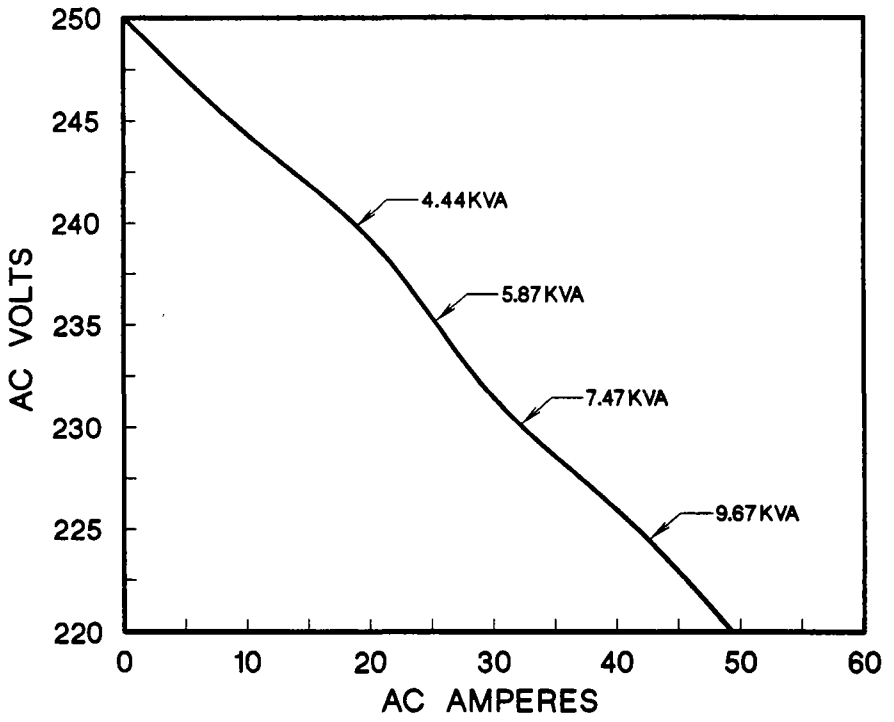
ERRATA SHEET

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

AMENDMENT TO SECTION 5 – AUXILIARY POWER

Amend Chart 5-2. AC Power Curve For 120/240 Volts AC Terminals (No Weld Load Condition)

Chart 5-2. AC Power Curve For 120/240 Volts AC Terminals (No Weld Load Condition)



SB-085 329-A

AMENDMENT TO SECTION 11 – ELECTRICAL DIAGRAMS

Amend Diagram 11-1. Circuit Diagram For Welding Generator (see Pages 2 and 3 on this Errata Sheet)

AMENDMENT TO SECTION 12 – PARTS LIST

Amend Parts List as Follows:

**	Part No.	Replaced With	Description	Quantity
60-110	039 169	149 541	HOLDER, fuse crtg 60A 250V 2 fuse	1

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

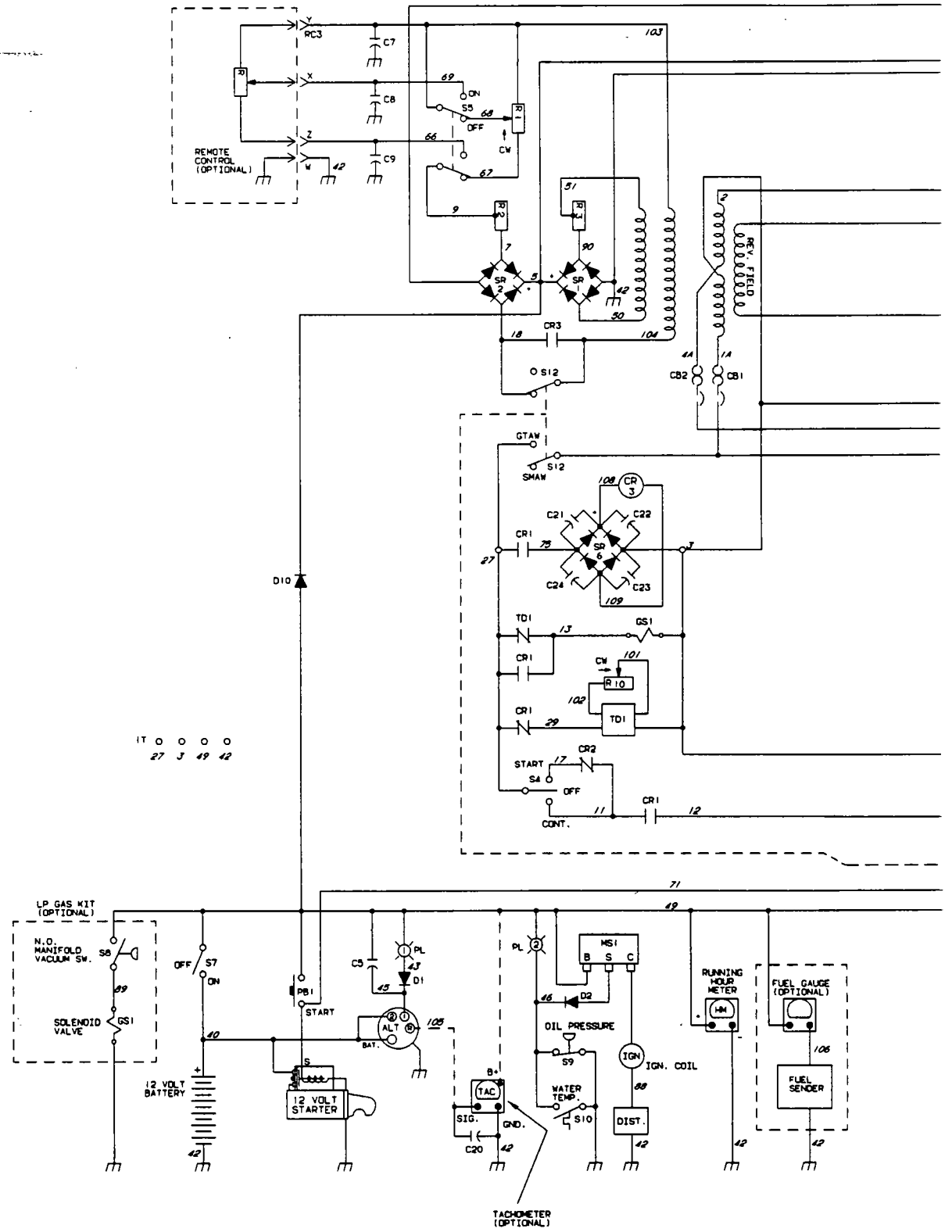
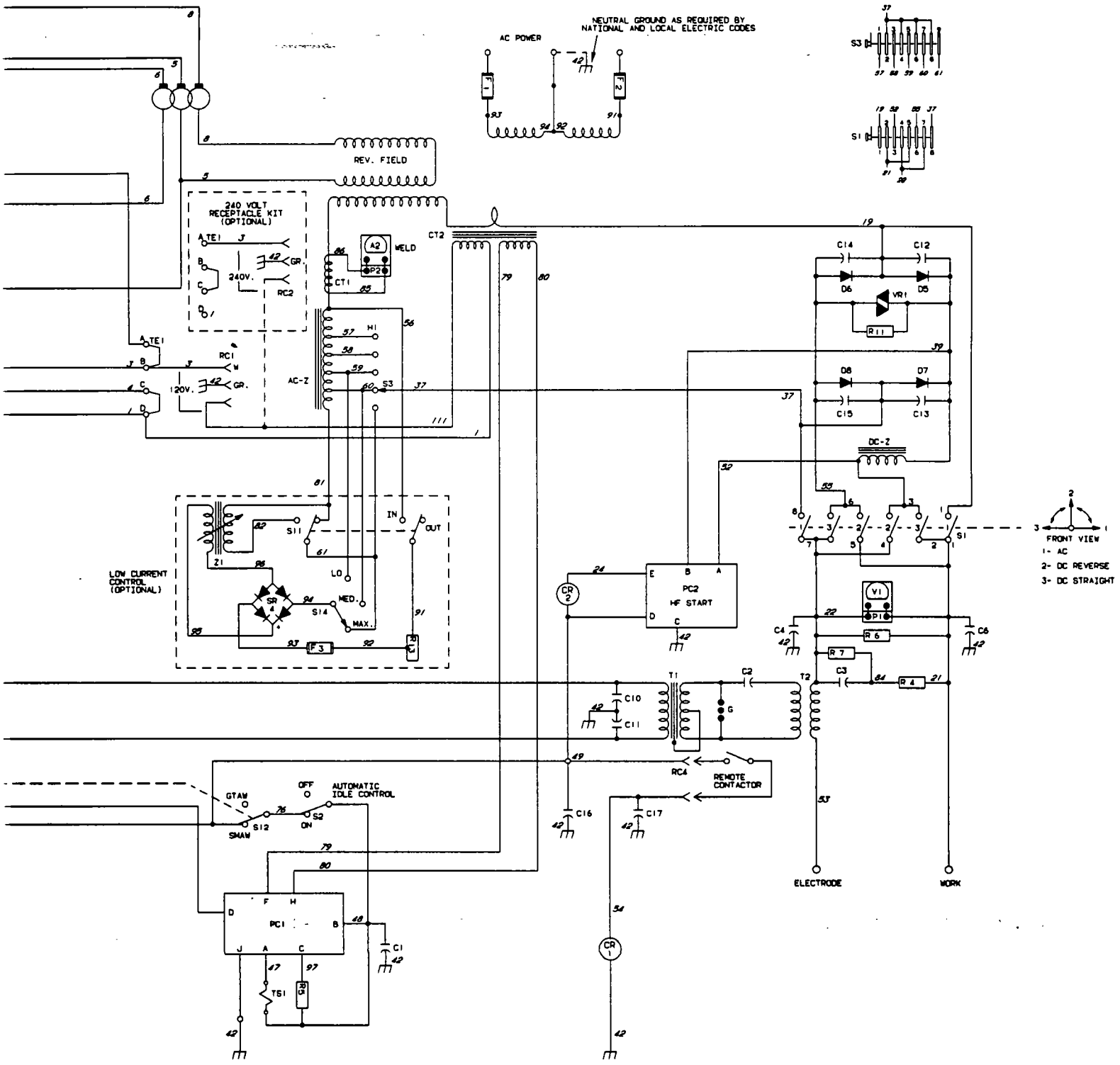


Diagram 11-1. Circuit Diagram For Welding Generator



Circuit Diagram No. SD-136 407-B

CERTIFICATE

NAME OF EQUIPMENT:_____ MODEL NO._____

SERIAL NO._____ DATE: _____

This equipment has been type-tested under standardized field test conditions as recommended by the Joint Industry Committee on High Frequency Stabilized Arc Welding Machines found to radiate less than 10 microvolts per meter at a distance of one mile, the maximum allowable limit established by the Federal Communications Commission for equipment of this type.

Installations using this equipment on the basis of these tests, may reasonably be expected to meet the radiation limitations established by the Federal Communications Commission, only when installed, operated and maintained as specified in the instruction book provided.

USER'S CERTIFICATION

The welding equipment identified above has been installed in accordance with the specific instructions applicable to this model as outlined in the instruction book furnished. It is being used only for the purpose for which it was intended and is being maintained and operated in accordance with the manufacturer's instructions.

Date Installed _____ Signed _____

RECEIVING-HANDLING

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

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

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

Model _____

Serial or Style No. _____

Date of Purchase _____

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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 Material Safety Data Sheets (MSDSs) for specific technical data and precautionary measures concerning their material.

A. Burn Prevention

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

Wear helmet with safety goggles and glasses with side shields underneath, appropriate filter lenses or plates (protected by clear cover glass). This is a MUST for welding or cutting, (and chipping) to protect the eyes from radiant energy and flying metal. Replace cover glass when broken, pitted, or spattered. See 1-3A.2.

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

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

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

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

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

B. Toxic Fume Prevention

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

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

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

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

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

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

Vapors from chlorinated solvents can be decomposed by the heat of the arc (or flame) to form PHOSGENE, a highly toxic gas, and other lung and eye irritating products. The ultraviolet (radiant) energy of the arc can also decompose trichloroethylene and perchloroethylene vapors to form phosgene. DO NOT WELD or cut where solvent vapors can be drawn into the welding or cutting atmosphere or where the radiant energy can penetrate to

atmospheres containing even minute amounts of trichloroethylene or perchloroethylene.

C. Fire and Explosion Prevention

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

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

To prevent fires and explosion:

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

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

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

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

a. appreciable combustibles (including building construction) are within 35 feet

b. appreciable combustibles are further than 35 feet but can be ignited by sparks

c. openings (concealed or visible) in floors or walls within 35 feet may expose combustibles to sparks

d. combustibles adjacent to walls, ceilings, roofs, or metal partitions can be ignited by radiant or conducted heat.

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

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

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

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

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

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

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

D. Compressed Gas Equipment

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

1. Pressure Regulators

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

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

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

Leaks-if gas leaks externally.
Excessive Creep-if delivery pressure continues to rise with downstream valve closed.
Faulty Gauge-if gauge pointer does not move off stop pin when pressurized, nor returns to stop pin after pressure release.

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

2. Cylinders

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

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

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

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

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

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

Locate or secure cylinders so they cannot be knocked over.

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

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

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

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

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

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

Never refill any cylinder.

Cylinder fittings should never be modified or exchanged.

3. Hose

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

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

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

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

Coil excess hose to prevent kinks and tangles.

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

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

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

4. Proper Connections

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

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

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

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

Regulator outlet (or hose) connections may be identified by right hand threads for oxygen and left hand threads (with grooved hex on nut or shank) for fuel gas.

5. Pressurizing Steps:

Drain regulator of residual gas through suitable vent before opening cylinder (or manifold valve) by turning adjusting screw in (clockwise). Draining prevents excessive compression heat at high pressure seat by allowing seat to open on pressurization. Leave adjusting screw engaged slightly on single-stage regulators.

Stand to side of regulator while opening cylinder valve.

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

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

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

E. User Responsibilities

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

F. Leaving Equipment Unattended

Close gas supply at source and drain gas.

G. Rope Staging-Support

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

*Trademark of Proctor & Gamble.

1-3. ARC WELDING

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

A. Burn Protection

Comply with precautions in 1-2.

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

1. Protective Clothing

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

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

2. Eye and Head Protection

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

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

Protect filter plate with a clear cover plate.

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

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

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

3. Protection of Nearby Personnel

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

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

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

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

B. Toxic Fume Prevention

Comply with precautions in 1-2B.

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

C. Fire and Explosion Prevention

Comply with precautions in 1-2C.

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

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

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

D. Compressed Gas Equipment

Comply with precautions in 1-2D.

E. Shock Prevention

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

To protect against shock:

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

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

1. Grounding the Equipment

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

When installing, connect the frames of each unit such as welding power source, control, work table, and water circulator to the building ground. Conductors must be adequate to carry ground currents safely. Equipment made

electrically HOT by stray current may shock, possibly fatally. Do NOT GROUND to electrical conduit, or to a pipe carrying ANY gas or flammable liquid such as oil or fuel.

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

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

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

2. Electrode Holders

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

3. Connectors

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

4. Cables

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

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

5. Terminals And Other Exposed Parts

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

6. Electrode

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

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

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

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

7. Safety Devices

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

Before installation, inspection, or service, of equipment, shut OFF all power and remove line fuses (or lock or red-tag switches) to prevent accidental turning ON of power. Disconnect all cables from welding power source, and pull all 115 volts line-cord plugs.

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

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

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

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

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

1-4. STANDARDS BOOKLET INDEX

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

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

6. ANSI Standard Z49.2, FIRE PREVENTION IN THE USE OF CUTTING AND WELDING PROCESSES obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

7. AWS Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126.

8. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING, CUTTING, AND ALLIED PROCESSES obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

9. NFPA Standard 70, NATIONAL ELECTRICAL CODE obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

10. NFPA Standard 51B, CUTTING AND WELDING PROCESSES obtainable from the National Fire Protection Association, Batterymarch Park, Quincy, MA 02269.

11. CGA Pamphlet P-1, SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS obtainable from the Compressed Gas Association, 1235 Jefferson Davis Highway, Suite 501, Arlington, VA 22202.

12. CSA Standard W117.2, CODE FOR SAFETY IN WELDING AND CUTTING obtainable from the Canadian Standards Association, Standards Sales, 178 Rexdale Boulevard, Rexdale, Ontario, Canada M9W 1R3.

13. NWSA booklet, WELDING SAFETY BIBLIOGRAPHY obtainable from the National Welding Supply Association, 1900 Arch Street, Philadelphia, PA 19103.

14. American Welding Society Standard AWSF4.1, RECOMMENDED SAFE PRACTICES FOR THE PREPARATION FOR WELDING AND CUTTING OF CONTAINERS AND PIPING THAT HAVE HELD HAZARDOUS SUBSTANCES, obtainable from the American Welding Society, 550 N.W. LeJeune Rd, Miami, FL 33126.

15. ANSI Standard Z88.2, PRACTICE FOR RESPIRATORY PROTECTION, obtainable from the American National Standards Institute, 1430 Broadway, New York, NY 10018.

SECTION 2 – SAFETY PRECAUTIONS AND SIGNAL WORDS

2-1. GENERAL INFORMATION AND SAFETY

A. General

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

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

B. Safety

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

2-2. SAFETY ALERT SYMBOL AND SIGNAL WORDS

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

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

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

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

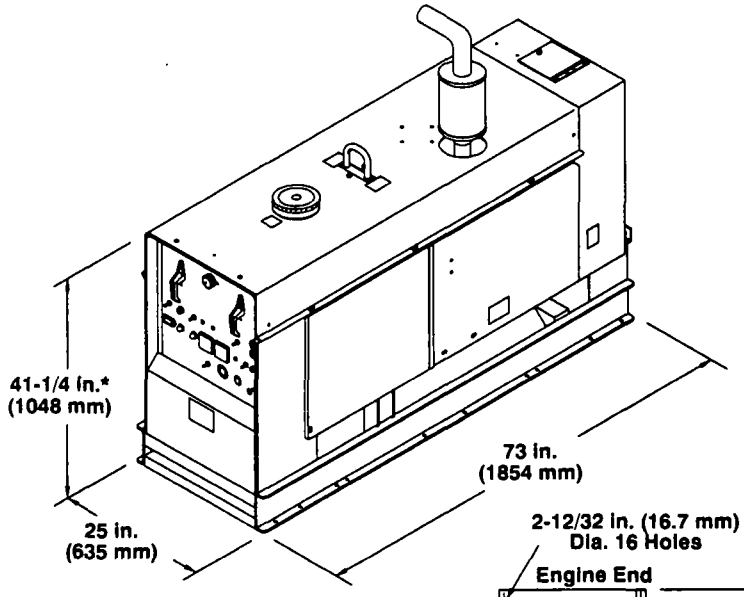
IMPORTANT *statements identify special instructions necessary for the most efficient operation of this equipment.*

SECTION 3 – SPECIFICATIONS

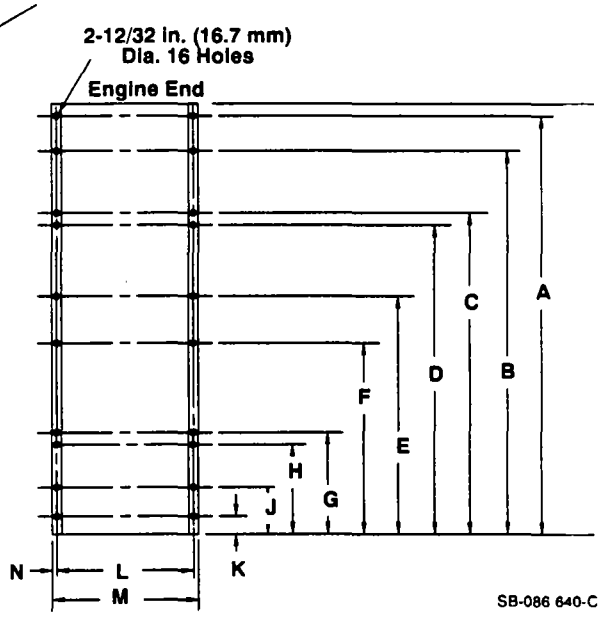
Table 3-1. Specifications

Rated Output At 100% Duty Cycle	AC Amperage Ranges	DC Amperage Ranges	Max. Open-Circuit Voltage (OCV)	Single-Phase AC Auxiliary Power	Weight	
	Fine Adjustment In Each Range					
	35 to 400	30 to 300			Net	Ship
300 Amps At 34 Volts AC 300 Amps At 32 Volts DC	Min.-50 45-75 75-140 130-240 210-Max.	Min.-40 35-60 55-100 90-180 150-Max.	80 AC 72 DC	3 kVA/kW 60 Hz 26 Amps At 120V Or 13 Amps At 240V While Welding 7.5 KVA/KW 60 Hz 31 Amps At 120/240V As A Power Plant	1620 lbs. (735 kg)	1660 lbs. (752 kg)

Conforms with NEMA EW1 (ANSI C87.1), "ELECTRIC ARC WELDING POWER SOURCES", Class (1/100)



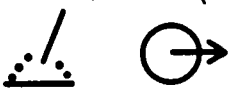
Add 14 in. (356 mm) for spark arrrestor/muffler.



	Inches	Millimeters		Inches	Millimeters
A	70	1778	H	15	381
B	64	1626	J	8	203
C	54	1372	K	3	76
D	52	1321	L	23	584
E	40	1016	M	25	635
F	32	813	N	11/16	17
G	17	432			

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

3-1. VOLT-AMPERE CURVES (Charts 3-1 And 3-2)

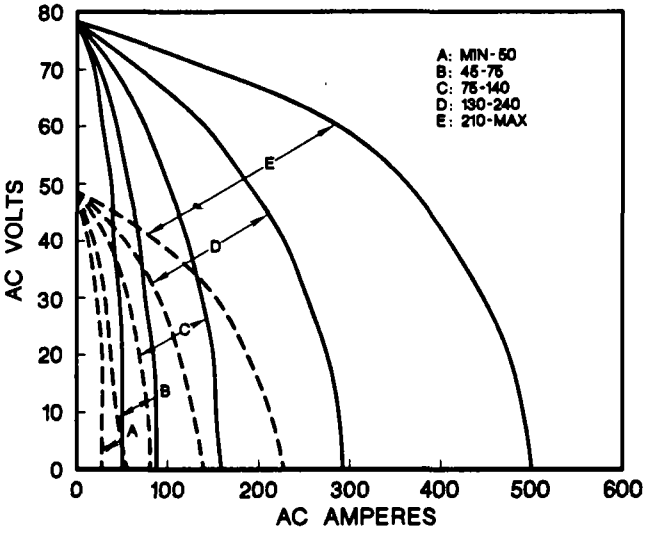


RATED WELD OUTPUT

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

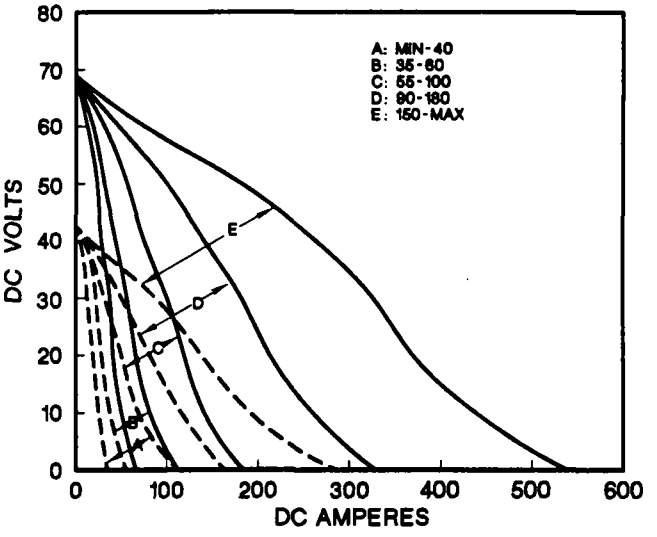
Chart 3-1. Volt-Ampere Curves

A. AC Mode



SB-085 283-B

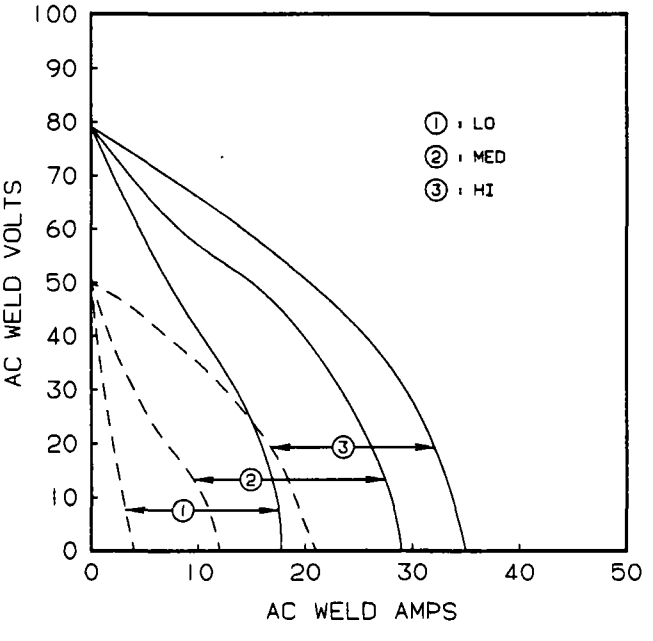
B. DC Mode



SB-085 284-B

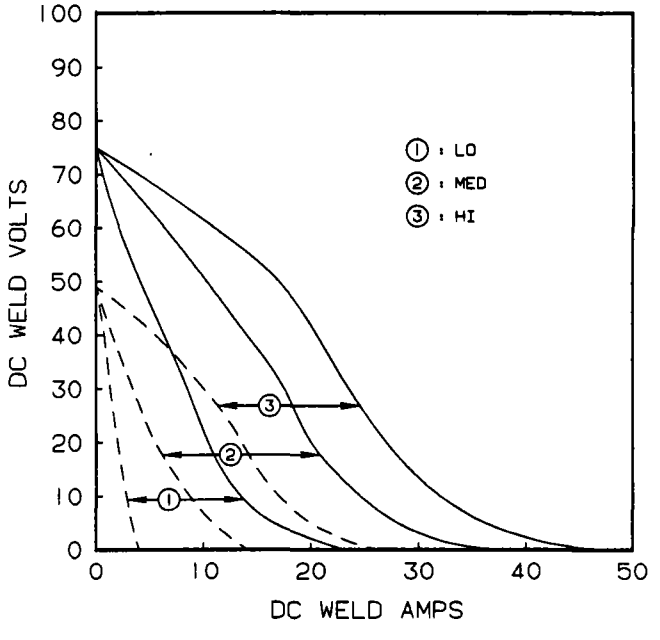
Chart 3-2. Volt-Ampere Curves With Low Current Control Option

A. AC Mode



SA-111 860-A

B. DC Mode



SA-111 861-A

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

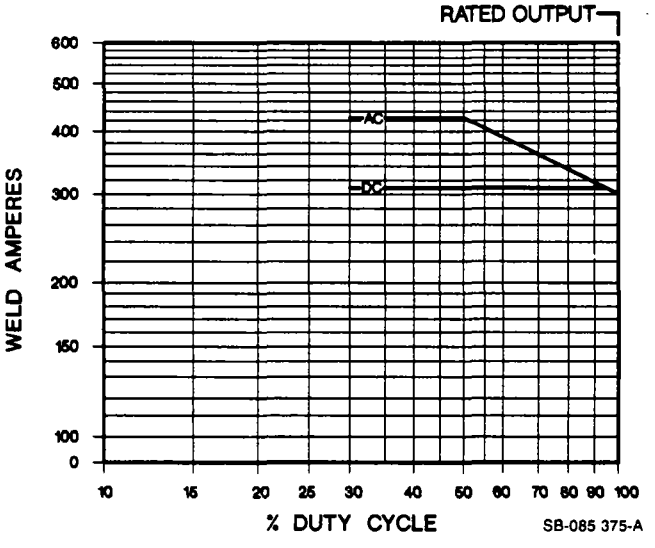
The duty cycle is the percentage of a ten minute period that a welding generator can be operated at a given output without overheating and damaging the unit. This welding generator is rated at 100% duty cycle when operated at 300 amperes. The unit can be operated continuously at rated load without causing damage to the unit.

Refer to the Duty Cycle Chart (Chart 3-3) to determine the output of the welding generator at various duty cycles.

CAUTION: EXCEEDING DUTY CYCLE RATINGS will damage unit.

- *Do not exceed indicated duty cycle(s).*

Chart 3-3. Duty Cycle



3-3. DESCRIPTION

Rated weld output is 300 amperes at 34 volts ac, or 300 amperes at 32 volts dc.

This unit is a constant current ac/dc arc welding generator driven by a four-cylinder, water-cooled Teledyne Continental gasoline engine (F-163). It is designed for Shielded Metal Arc Welding (SMAW) and Gas Tungsten Arc (GTAW) Welding. This unit is specially prepared for operation in harsh and corrosive environments.

The duplex receptacle provides a total of 3 kVA/kW, 26 amperes of 120 volts ac auxiliary power while welding. The unit can be equipped with a 240 volt ac duplex receptacle that provides 13 amperes of auxiliary power while welding.

The 7.5 kVA/kW ac power plant can provide up to 31 amperes at 120/240 volts ac auxiliary power when not welding.

The following optional equipment can be provided on the welding generator and is covered within this Owner's Manual:

* Remote Amperage Control
* Low Current Control
* Tachometer
* Oil Pressure Gauge
* Air Cleaner Service Indicator
* Temperature Gauge
* Fuel Gauge

IMPORTANT: *For a complete listing of Accessories and Optional Equipment, see back cover of this welding generator Owner's Manual.*

SECTION 4 – INSTALLATION OR RELOCATION

IMPORTANT: *Read entire Section 12 on equipment that produces output in the radio frequency range, such as high-frequency starters, for site selection information and installation requirements before beginning the installation procedures.*

IMPORTANT: *Unless otherwise specified, all directions, such as left or right, are with respect to the operator facing the welding generator front panel.*

4-1. LOCATION (Figures 3-1 And 4-1)

A proper installation site should be selected for the welding generator if the unit is to provide dependable service and remain relatively maintenance free.

WARNING: engine EXHAUST GASES can kill.

- *Operate in open, well-ventilated areas, or if operated indoors, vent engine exhaust outside the building.*
- *Keep engine exhaust outlet away from building air intakes.*

CAUTION: RESTRICTED AIRFLOW 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 generator.*

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

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

A. Lifting Equipment

WARNING: INCORRECT LIFTING will damage internal parts; FALLING EQUIPMENT can cause serious personal injury and equipment damage.

- *Use lifting eye to lift unit only, NOT running gear, gas cylinders, trailer, or any other heavy options, accessories, or devices.*
- *Use equipment of adequate capacity to lift the unit.*
- *If using lift forks to handle this unit, be sure the lift forks are long enough to extend out of the opposite side of the base.*

Using lift forks too short will expose internal components to damage should the tips of the lift forks penetrate the bottom of the unit.

B. Mounting Unit Onto Trailer

CAUTION: UNCONTROLLED TILTING OF TRAILER can result in personal injury or equipment damage.

- *Install welding generator onto trailer with engine end toward hitch end of trailer.*
- *Distribute weight so that trailer tongue weight is approximately 10% of the gross trailer weight.*
- *Follow trailer manufacturer's instructions when mounting welding generator onto trailer.*

OPERATION ON UNLEVEL SURFACE can cause improper lubrication and result in severe engine damage.

- *Operate unit in an approximately level position.*
- *See Figure 4-1 for maximum allowable tilt for proper operation.*
- *Check crankcase oil level with unit on a level surface.*

Exceeding these limits can cause severe engine damage.

Base mounting holes provide the capability to install and secure the unit on a running gear, trailer, transport vehicle, or in a permanent location. Figure 3-1 gives overall dimensions and base mounting hole layout.

The mounting location should allow sufficient room to remove the top cover and side panels for maintenance and repair functions.

Use a properly fitting cover (optional) over the welding generator when not in operation to protect the unit from the environment. Be sure unit is cool before installing any cover.

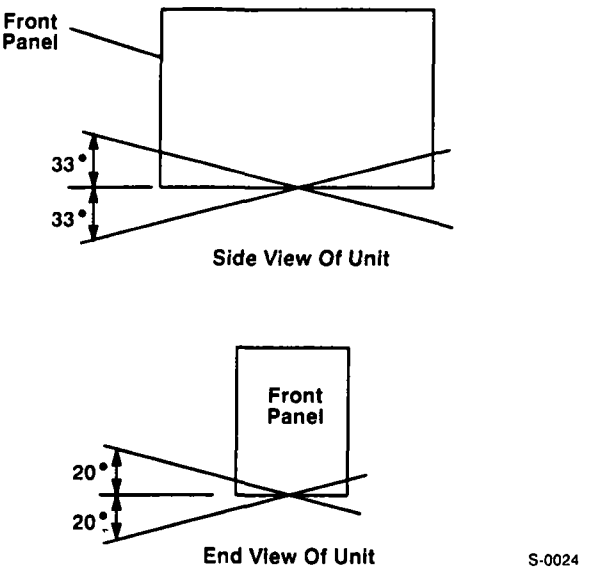


Figure 4-1. Allowable Tilt Angles For Welding Generator Engine

C. Spark Arrestor Considerations

WARNING: ENGINE EXHAUST SPARKS can cause fire.

- *Exhaust spark arrestor must be installed in accordance with local, state, and federal regulations.*

A spark arrestor/muffler is provided for installation onto the engine exhaust pipe on this welding generator as standard equipment (see Section 4-2). A spark arrestor, maintained in effective working order, is mandatory if this welding generator is to be operated in a National Forest or on California Grasslands, brush, or forest covered land (see Section 4442 of California Public Resources Code). For other areas, check your state and local laws.

4-2. SPARK ARRESTOR/MUFFLER INSTALLATION

WARNING: HOT ENGINE PARTS can cause severe burns.

- *If applicable, stop engine, and allow exhaust system to cool before installing exhaust extension.*

1. Open right side panel, and secure in open position.
2. Install spark arrestor/muffler through top cover opening onto exhaust pipe. (Be sure to face spark arrestor/muffler away from air cleaner; see Figure 3-1).
3. Secure spark arrestor/muffler in place with supplied clamp.
4. Close and secure right side panel.

4-3. CONNECTING THE BATTERY (Figure 4-2)

WARNING: BATTERY ACID can burn eyes, skin, destroy clothing, and damage other material.

- *Wear a face shield and proper protective clothing when working with batteries.*

ABNORMAL VOLTAGE can cause damage to engine electrical components.

- *Do not operate engine without battery connected.*
- *Do not disconnect battery while engine is running.*

IMPORTANT: *Be sure IGNITION switch is in the OFF position before connecting battery.*

This unit is equipped with a maintenance-free battery. To place unit into service, proceed as follows:

1. Be sure IGNITION switch is in the OFF position.
2. Remove bolt from battery access door, and open door (see Figure 4-2).
3. Connect negative (–) battery cable to the negative battery terminal.
4. Close and secure access door with bolt.

No other preparation should be required. If battery does not supply enough power to crank engine, charge battery according to Section 9-4.

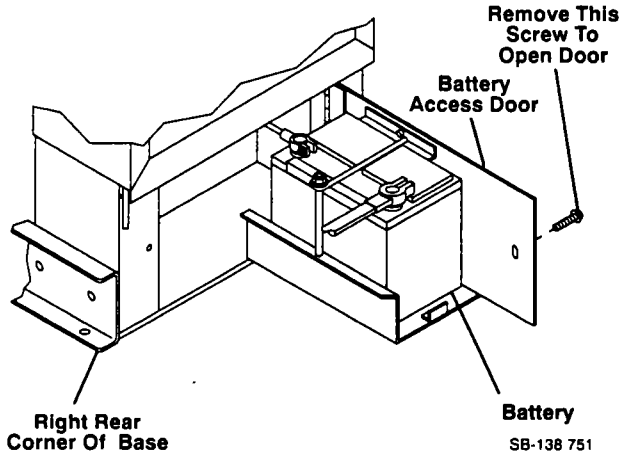


Figure 4-2. Battery Location

4-4. FUEL (Chart 4-1)

WARNING: REMOVE FUEL CAP SLOWLY; FUEL SPRAY may cause injury; FUEL may be under pressure.

- *Rotate fuel cap slowly and wait until hissing stops before removing cap.*

ENGINE FUEL can cause fire or explosion.

- *Stop engine before checking or adding fuel.*
- *Do not spill fuel; if spilled, wipe up.*
- *Do not refuel if engine is hot or running.*
- *Do not refuel near sparks or open flame.*
- *Do not smoke while refueling.*
- *Do not fill fuel tank to top; allow room for expansion.*

IMPORTANT: *Fill fuel tank with fresh fuel before starting engine the first time. Do not fill tank to top; allow room for expansion. Rust and corrosion preventative was added to inside of fuel tank and engine at the factory and could cause rough engine running if not properly diluted with a full tank of fresh fuel.*

This welding generator is shipped with a small amount of fuel in the fuel tank and with the fuel shut-off valve, located under the fuel tank, in the open position. See the unit maintenance label and engine Owner's Manual (F-163 engine) for fuel recommendations. The capacity of the fuel tank is 16 gallons (60 liters).

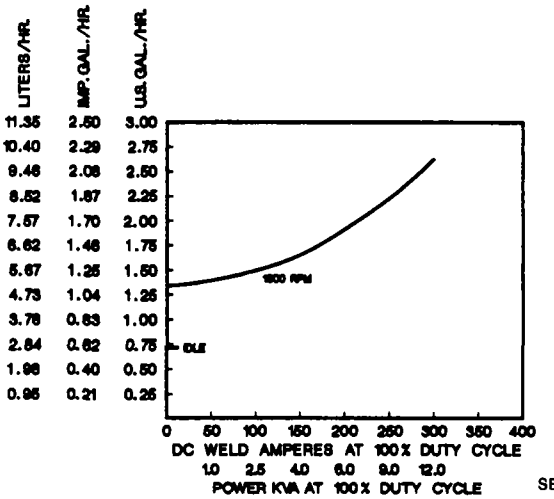
Chart 4-1 illustrates typical fuel consumption under specific load conditions. Fuel consumption varies from one engine to another. Different brands of fuel, operating conditions, condition of the engine, etc., affect the fuel consumption of this engine.

CAUTION: POOR QUALITY, LOW OCTANE FUEL can damage engine.

- *Use clean, fresh, unleaded gasoline meeting engine manufacturer's specifications (see engine maintenance label for minimum octane rating).*
- *Do not mix oil with gasoline.*
- *Do not use gasohol or gasoline alcohol fuel blends.*

Gasoline with a lower octane rating than specified may cause detonation (knocking) which could damage the engine. Regular gasoline may be used; however unleaded gasoline is preferred because it reduces pollution and combustion chamber deposits. See engine Owner's Manual for complete fuel information.

Chart 4-1. Fuel Consumption Curve



4-5. LUBRICATION

The engine is shipped with its crankcase filled with SAE 20 break-in oil. If the oil level is not up to the full mark on the dipstick, add oil according to the recommendations in the engine Owner's Manual (F-163 engine) before starting the engine.

4-6. COOLANT SYSTEM

IMPORTANT: *See maintenance label, located on unit, and engine Owner's Manual (F-163 gasoline engine) for complete engine care information.*

A. Coolant

The liquid capacity of the coolant system in this welding generator is 9 quarts (8.5 liters). This unit is shipped from the factory with the proper amount of water and ethylene glycol base antifreeze to permit operation at temperatures down to 0° F (-18° C).

IMPORTANT: *If unit will be operated in temperatures below 0° F (-18° C), ethylene glycol base antifreeze must be added to the coolant system to prevent freezing.*

B. Thermostat

CAUTION: INCORRECT ENGINE TEMPERATURE will damage engine.

- *Do not operate engine without a correct thermostat.*
- *Replace thermostat immediately if it becomes inoperable.*

If thermostat remains closed, the engine will overheat. If thermostat remains open or the engine is run without a thermostat, the engine will run cold. As a result, sludge and excess carbon will accumulate in the engine.

The coolant system is equipped with a 180° F (80° C) thermostat. If the thermostat is replaced, be sure that the replacement has an equal temperature rating.

C. Radiator

WARNING: PRESSURIZED HOT COOLANT AND STEAM can burn face, eyes, and skin; REMOVING RADIATOR PRESSURE CAP can cause serious injury.

- *Allow engine to cool down completely before removing radiator cap.*
- *Wear proper gloves, and use a rag over cap area when removing radiator cap.*
- *Allow all pressure to escape before completely removing cap from radiator.*

The radiator is equipped with a pressurized cap which is rated at 7 psi (48 kPa). If cap is replaced, be sure replacement cap has a rating of 7 psi (48 kPa).

To remove radiator cap, place rag over cap, and turn cap to an almost full open position to allow venting of pressure from within the radiator. Allow all pressure to escape before completely removing the cap.

When operating in temperatures below 0° F (-18° C), the engine may not warm up to operating temperature. If the engine is run cold, sludge and excess carbon will accumulate in the engine. To prevent the engine from running cold in temperatures below 0° F (-18° C), restrict airflow through the radiator. Airflow may be restricted by using a radiator shutter kit (optional), or covering 1/2 to 2/3 of the radiator with cardboard, plywood, or other material. Do not cover entire radiator because this will cause overheating.

4-7. EQUIPMENT GROUNDING TERMINAL (Figure 4-3)

EQUIPMENT GROUND

Normally, engine-driven welding generators do not require grounding. However, this machine has auxiliary power plant capability; therefore, grounding of the frame and case is recommended. Also, unusual circumstances may require machine grounding. For these reasons a convenient grounding terminal is provided on all weld/power units.

For detailed grounding instructions consult your national, regional, and local codes. If additional information regarding your operating circumstances and/or grounding requirements is needed, consult a qualified electrician or your dealer. After determining the extent to which any grounding requirements apply to your particular situation, follow them explicitly.

4-8. WELD OUTPUT CONNECTIONS (Figure 4-3)

RATED WELD OUTPUT

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

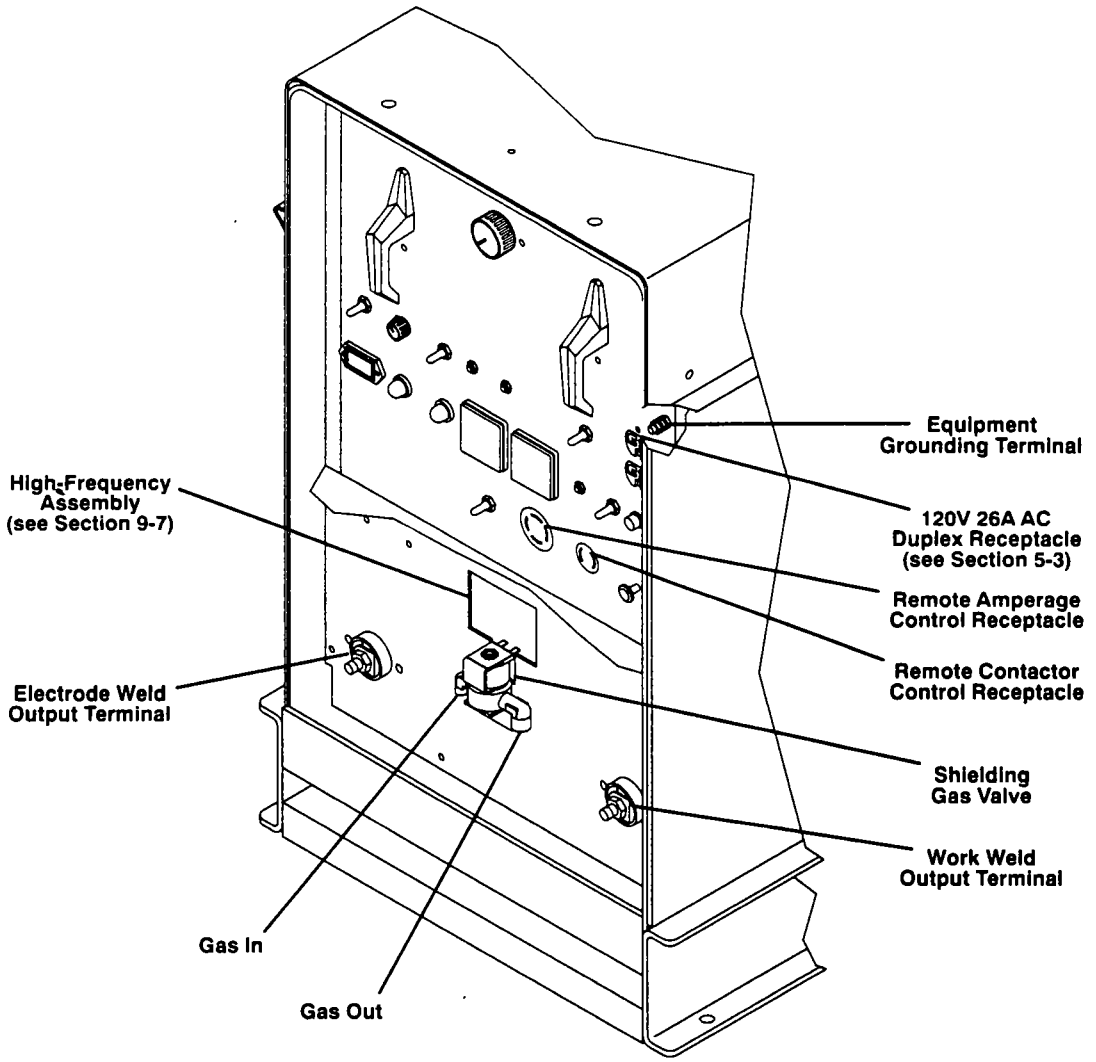


Figure 4-3. Front Panel Connections

A. Weld Cable Selection

Use the following guidelines to select weld cables:

1. Use the shortest possible cables, and place cables close together. Excessive cable lengths may reduce output or cause unit overload due to added resistance. Excessive cable length also increases high frequency radiation (see Section 12).
2. Use weld cable with an insulation voltage rating equal to or greater than the maximum open-circuit voltage (ocv) of the welding generator (see Table 4-1 for unit maximum ocv rating).
3. Select weld cable size according to maximum weld output and total length of connecting cables in weld circuit. For example, if a 25 foot (7.5 m) electrode holder (torch) cable is used with a 25 foot (7.5 m) work cable, select the cable size recommended in Table 4-1 for 50 feet (15 m). The maximum recommended cable length when using high frequency is 50 ft. (15 m).
4. Do not use damaged or frayed cables.

B. Weld Cable Preparation

1. Install correct size lugs of adequate amperage capacity onto ends of both cables for connecting work clamp, electrode holder if applicable, and weld output terminals.
2. If applicable, install electrode holder onto weld cable following manufacturer's instructions. An insulated electrode holder must be used to ensure operator safety.
3. Install work clamp onto cable.

Table 4-1. Weld Cable Size

Welding Amperes	Total Cable (Copper) Length In Weld Circuit Not Exceeding*							
	100 ft. Or Less (30 m)		150 ft. (45 m)	200 ft. (60 m)	250 ft. (70 m)	300 ft. (90 m)	350 ft. (105 m)	400 ft. (120 m)
	10 To 60% Duty Cycle	60 Thru 100% Duty Cycle	10 Thru 100% Duty Cycle					
100	4	4	4	3	2	1	1/0	1/0
150	3	3	2	1	1/0	2/0	3/0	3/0
200	3	2	1	1/0	2/0	3/0	4/0	4/0
250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0
300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0
350	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0
400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0
500	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-3/0
600	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-4/0	3-4/0

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

S-0007/8-88

C. Weld Cable Connections

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (–) battery cable from battery before making any weld output connections.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

1. Open the lower front access door, and route cables between the two horizontal pieces of angle iron on the front of the base.
2. For Gas Tungsten Arc Welding (GTAW);
   a. Connect torch cable or connector to ELECTRODE weld output terminal. Be sure that the torch connector does not touch the access door when closed.
   b. Connect one end of work cable to WORK weld output terminal.

IMPORTANT: *Weld polarity is determined by the position of the AC/DC Selector switch (see Section 7-6).*

3. For Shielded Metal Arc Welding (SMAW);
   a. Connect end of electrode holder cable to ELECTRODE weld output terminal.
   b. Connect one end of work cable to WORK weld output terminal and remaining end to workpiece.

IMPORTANT: *Weld polarity is determined by the position of the AC/DC Selector switch (see Section 7-6).*

4. Close and secure access door.

4-9. REMOTE AMPERAGE CONTROL RECEPTACLE (Figure 4-3)

The 4-socket Remote Amperage Control receptacle, located on the welding generator front panel, is used to connect a Remote Amperage Control rheostat to the internal circuitry of the welding generator.

To connect the Remote Amperage Control to the Remote receptacle, align keyway, insert the four-prong plug from the Remote Amperage Control into the receptacle, and rotate the plug clockwise.

4-10. REMOTE CONTACTOR RECEPTACLE (Figure 4-3)

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.*

The 2-socket REMOTE CONTACTOR receptacle, located on the welding generator front panel, is used to connect the supplied Remote Contactor Control switch to the internal circuitry of the welding generator.

To connect the Remote Contactor Control switch to the Remote receptacle, insert the 2-prong plug from the Remote Contactor Control switch into the receptacle, and rotate the plug clockwise.

4-11. SHIELDING GAS CONNECTIONS (Figure 4-3)

GAS IN **GAS OUT**

The GAS IN and GAS OUT fittings have 5/8-18 right-hand threads

1. Open lower front access door, and route hoses between the two horizontal pieces of angle iron on front of base.
2. Connect hose from shielding gas supply regulator/flowmeter to GAS IN fitting.
3. Connect shielding gas hose from torch to GAS OUT fitting.
4. Close and secure access door.

SECTION 5 – AUXILIARY POWER

POWER OUTPUT

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

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (–) battery cable from battery before making internal inspection or reconnection.*
- *Ground generator according to all applicable national, state, and local electrical codes.*
- *Do not connect to any electrical distribution system normally supplied by utility power unless a proper transfer switch and grounding procedure are employed.*
- *Keep away from moving parts such as fans, belts, and rotors.*
- *Keep all covers and panels in place while operating.*

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

ELECTRIC SPARKS can cause fire.

- *Disconnect weld cables when using auxiliary power.*

The weld output terminals are electrically energized when the engine is running unless the Process switch is in the GTAW position and the Remote Contactor Control switch is open.

- *Watch for fire.*
- *Keep a fire extinguisher nearby, and know how to use it.*

LOW VOLTAGE AND FREQUENCY can damage electrical equipment.

- *Turn off or unplug all electrical equipment connected to auxiliary power before starting or stopping the engine.*

When starting or stopping, the engine has low speed which causes low voltage and frequency.

5-1. GENERAL

Calculate load requirements before connecting equipment to the auxiliary power receptacles or junction box (see Section 6).

5-2. AUXILIARY POWER GENERATOR

The 7.5 kVA/kW ac power plant can provide up to 31 amperes at 120/240 volts ac auxiliary power when not welding.

IMPORTANT: *This unit is designed to supply ac auxiliary power only when operating at weld/power rpm.*

5-3. AUXILIARY POWER RECEPTACLES (Chart 5-1 And Figure 7-1)

A. 120 Volts 26 Amperes AC Duplex Receptacle

120V 26A ~ AC

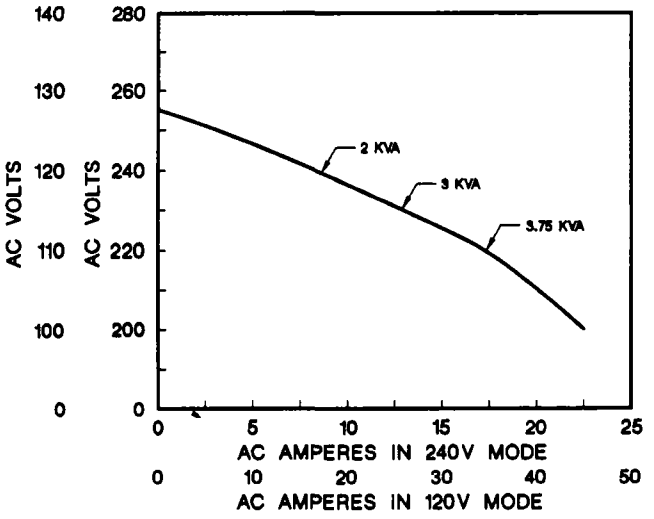
Rated auxiliary power output is 3 kVA/kW of 120 volts ac 60 Hz at the 120V 26A AC duplex receptacle RC1. Up to 15 amperes can be drawn from either half of the 120V 26A AC duplex receptacle; however, total load on the duplex receptacle cannot exceed 26 amperes.

The voltage at various loads can be determined from Chart 5-1. The combined continuous load of all receptacles cannot exceed the kVA/kW rating of the generator.

B. Optional 240 Volts 13 Amperes AC Duplex Receptacle

Rated auxiliary power output is 3 kVA/kW of 240 volts ac 60 Hz at the 240V 13A AC duplex receptacle RC2. Up to 13 amperes can be drawn from either half of the 240V 13A AC duplex receptacle.

Chart 5-1. AC Power Curve For 120 (And Optional 240) Volts Duplex Receptacle (No Weld Load Condition)



SB-005 192-B

C. Connections

The 120 and optional 240 volts ac duplex receptacles are for use with cord-connecting accessory equipment. Plug in or turn on equipment when engine is running at weld/power speed.

D. Overload Protection

Overload breakers CB1 and CB2 are provided to protect the welding generator from overload and fault conditions. If either half of the 120V duplex receptacle is overloaded, both overload breakers trip and the entire receptacle becomes inoperative. If either half of the optional 240V duplex receptacle is overloaded, only the overloaded receptacle half becomes inoperative; the remaining receptacle portion is fully operational. If it becomes necessary to reset the overload breakers. see Section 10-3.

5-4. FIELD INSTALLATION INSTRUCTIONS FOR 240 VOLTS DUPLEX RECEPTACLE (Figures 5-1 And 5-2)

A voltage changeover terminal strip, located behind the right side panel, provides reconnection capability for 240 volts ac. Although the capability for 240 volts ac is present, an optional kit must be purchased if 240 volts is desired at the front panel. For the 240 volts auxiliary power output of the unit, see Section 5-3B.

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (–) battery cable from battery before inspecting, maintaining, or servicing.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

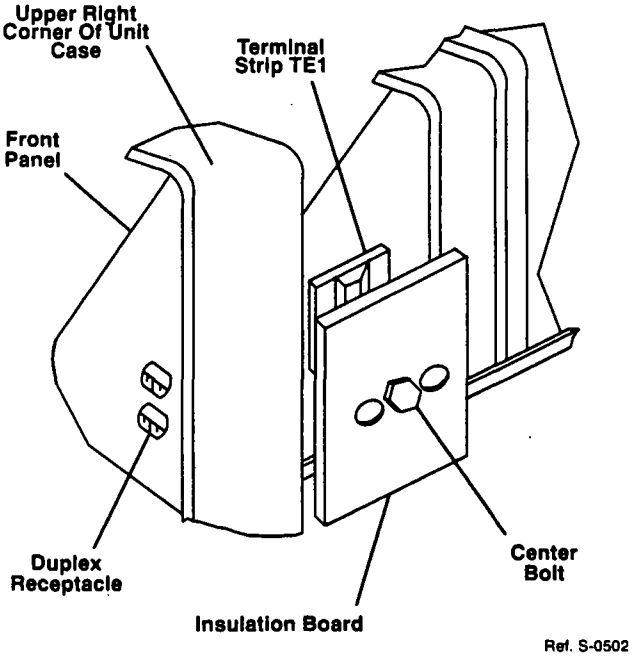
HOT engine PARTS can cause severe burns.

- *Wear protective gloves and clothing when working on a hot engine.*

Maintenance to be performed only by qualified persons.

IMPORTANT: *All directions, such as left or right, are with respect to the operator facing the welding generator front panel. Retain all hardware removed during this procedure for reinstallation.*

1. Open right side doors, and secure in open position.
2. Remove right side panel.
3. Remove center bolt from insulation board (see Figure 5-1); remove and retain insulation board.
4. Remove the 120V 26A AC duplex receptacle from the front panel, and disconnect leads 1, 3, and 42 from the receptacle.
5. Reconnect leads 1 and 3 to the 240 volts ac duplex receptacle (one on each side of receptacle). Reconnect lead 42 to the ground (green) terminal on the receptacle.



Ref. S-0502

Figure 5-1. Location Of Reconnectable Components

6. Install the 240 volts ac receptacle in the front panel.
7. Affix the 240V 13A AC label over existing 120V 26A AC designation on the nameplate.
8. Move lead 3 (see Figure 5-2) from terminal B on the changeover terminal strip to terminal A.
9. Position the jumper links on the changeover terminal strip for 240 volts (see Figure 5-2).
10. Reinstall insulation board.
11. Reinstall right side panel.
12. Reconnect negative (–) battery cable.
13. Close and secure right side doors.

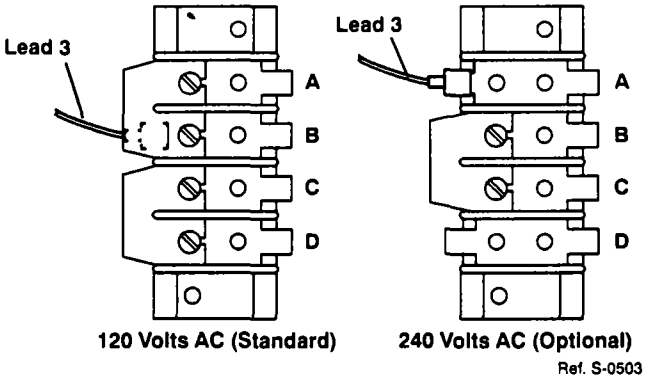


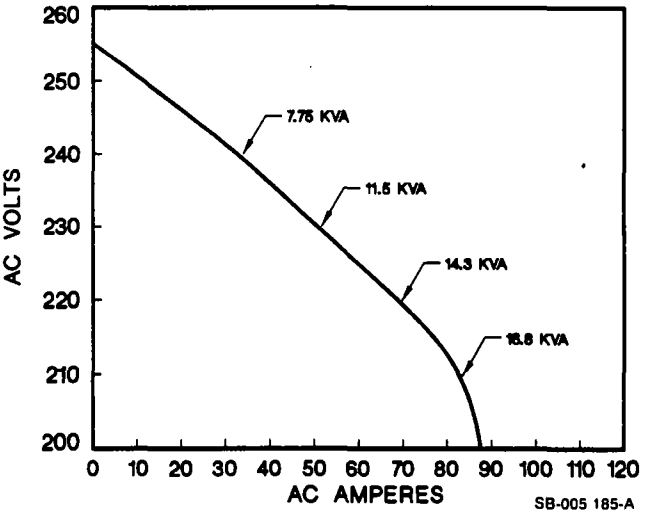
Figure 5-2. Jumper Link Arrangement On Terminal Strip TE1 For 120 And 240 Volts AC

5-5. 7.5 KVA/KW POWER PLANT (Chart 5-2 And Figure 5-3)

A. General

The terminals, located behind the left side door, provide 7.5 kVA/kW of 120/240 volts ac, 31 amperes, 60 Hz single-phase ac power for operating 50/60 or 60 Hz power tools or providing standby service to rural, residential, or other buildings requiring 120/240 volts ac, 3 wire connection. The voltage at the 120/240 volts ac terminals will vary according to the applied load. The voltage at various loads can be determined from Chart 5-2.

Chart 5-2. AC Power Curve For 120/240 Volts AC Terminals (No Weld Load Condition)



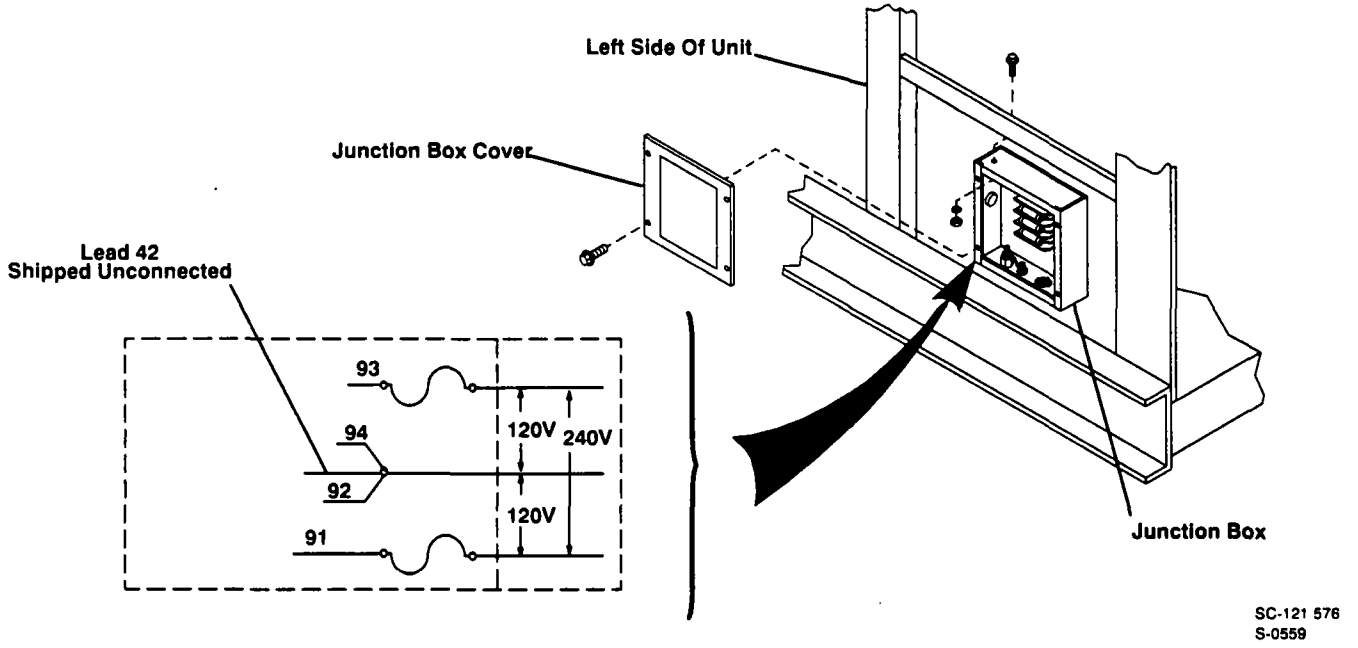


Figure 5-3. Power Plant Connections

B. Connection Procedure

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Keep junction box cover in place while engine is running.*
- *Stop engine, and disconnect negative (–) battery cable from battery before making connections or changing fuses.*
- *Ground in accordance with NEC, state, and local codes; install circuit grounding lead (inside junction box) to box mounting hardware, and be sure that a proper ground is connected to the Equipment Grounding Terminal provided on the equipment frame (see Figure 7-1).*

INCORRECT FUSES can cause equipment damage.

- *Use only fuses of correct size, type, and rating (see Parts List).*

IMPROPER VOLTAGE OR FREQUENCY can damage equipment.

- *Read all equipment instruction manuals before making connections.*
- *Use only equipment suitable for operation on 50/60 or 60 Hz power.*
- *Turn off or disconnect electrical equipment from 120/240 volts fuse block before starting or stopping the engine.*
- *Place the AUTO IDLE switch in the OFF position.*
- *Rotate AMPERAGE & VOLTAGE ADJUSTMENT control to 100.*

1. Open left side door, and secure in open position.
2. Remove cover from junction box.
3. Install circuit grounding lead if required.
4. Remove snap-in blank from junction box.
5. Install proper connector (not supplied) into opening, and route load leads through connector into junction box.
6. Strip approximately 3/4 inch (19 mm) of insulation from ends of leads, and connect to proper load terminals (see Figure 5-3); tighten connections securely.
7. Reinstall cover onto junction box.
8. Reconnect negative (–) battery cable.
9. Close and secure left side door.

SECTION 6 – EVALUATING AUXILIARY POWER REQUIREMENTS

6-1. AUXILIARY POWER GENERATORS

A. Introduction

The auxiliary power generated from this unit is most commonly used in industrial, small business, and residential applications. For industrial applications, this portable unit can be moved to the job site to power portable tools, lights, compressors, etc. For small business and residential applications, the generator supplies standby power during power outages.

It is the installer's responsibility to follow all applicable codes when installing an auxiliary power generator. It is also the installer's responsibility to determine if the generator is capable of supplying adequate power for a specific application. The following sections provide some guidelines for the installation and operation of an auxiliary power generator.

IMPORTANT: *Consult qualified local personnel and follow all applicable codes for safe and proper installation.*

B. Safety Considerations

Before this generator may be used to supply auxiliary power, the installer must first become familiar with and meet all codes applicable to the installation of an auxiliary power generator. It is the installer's responsibility to follow the applicable rules from the National Electrical Code (NEC), state, local, and OSHA codes for the installation and use of auxiliary power generators. The following list includes major safety requirements of NEC for auxiliary power generator installation.

1. **Isolation** is always required between a portable generator and other sources of electric power. Proper isolation procedures prevent possible injury due to feedback from the generator to the primary source of electric power. Consult qualified local personnel and follow all applicable codes for safe and proper installation.
2. **Overcurrent protection**, such as fuses or circuit breakers, is required if a generator is supplying a permanent installation. Overcurrent protection may not be required for generators supplying portable, cord-connected equipment through receptacles mounted on the generator.

   Overcurrent protection may be factory installed if the generator design and/or receptacle(s) require overcurrent protection. If the generator design and receptacle(s) protect themselves from overcurrent conditions, circuit protection is not required and, thus, not factory installed.
3. **Grounding requirements** depend upon the operating setup for the generator. If the generator supplies only equipment mounted on the generator, or cord-connected equipment through generator-mounted receptacles, the generator frame

does not require grounding. If the generator is mounted on a vehicle, the vehicle and generator frames must be connected. If the generator is supplying a permanent installation or some load that does not meet the mounting or receptacle connection exclusion, the generator frame and one of the supply conductors may have to be grounded (refer to local codes for specific requirements).

A grounding terminal is normally provided on the generator for grounding the generator case. To ground the generator case, locate grounding terminal, connect one end of ground cable to grounding terminal, and connect remaining end to a proper earth ground using adequate size cable (refer to NEC for specific requirements).

When a conductor within the generator requires grounding, a grounding terminal is normally provided within the generator.

4. Ground fault protection for personnel on construction sites must be provided with one of the following methods:

   a. **Ground fault circuit interrupters** (GFCI's) are required on all 15 and 20 ampere 120 volt receptacles not part of permanent wiring, and on all receptacles with a grounded neutral conductor.

      GFCI's are generally not required on portable and vehicle-mounted generators rated not more than 5 kW with circuit conductors isolated from the frame, and on generators not connected to 15 or 20 ampere, 120 volt receptacles.

   b. **An assured equipment grounding program** may be used instead of GFCI's to provide ground fault protection for personnel on construction sites. Refer to NEC for specific program procedures.

6-2. LOAD EVALUATION (Tables 6-1 And 6-2)

Before connecting or operating the auxiliary power generator, the installer must determine if the generator is capable of supplying adequate power for a specific application. Load and generator evaluation is essential for satisfactory generator and equipment operation (see Table 6-1).

A. Types Of Loads

Load requirements depend on the type of load connected to the generator. There are two types of loads, resistive and non-resistive. A resistive load, such as a light bulb, requires a constant amount of power from the generator. A non-resistive load, such as a portable grinder, requires variable amounts of power from the generator. Because a grinder requires more power for motor starting and is rarely used with a constant, even pressure, the load requirements can change greater than the operator anticipates.

The following sections provide information on how to determine running load and motor-starting requirements (see Sections 6-2B and C).

B. Running Load Requirements

The total running load applied to the generator is calculated by adding up all the individual loads. Some equipment is rated in amperes, others in watts. The requirements for most equipment are provided on its nameplate.

EXAMPLE 1: If a drill requires 4.5 amperes at 115 volts, calculate its running power requirement in watts.

VOLTS x AMPERES = WATTS (EQUATION 1)

(Equation 1 provides an actual power requirement for resistive loads, or an approximate running requirement for non-resistive loads.)

115V x 4.5A = 520W

Therefore, the individual load applied by the drill is 520 watts.

EXAMPLE 2: If a flood lamp is rated at 200 watts, the individual load applied by the lamp is 200 watts. If three 200 watt flood lamps are used with the drill from Example 1, add the individual loads to calculate total load.

(200W + 200W + 200W) + 520W = 1120W

Therefore, the total load applied by the three flood lamps and drill is 1120 watts.

C. Motor-Starting Requirements

Starting amperage requirements are many times the running amperage of the motor. Starting requirements must be determined to assure that the generator is capable of starting the motor without damaging it. This can be done by examining the motor nameplate and identifying the code letter specifying the starting kVA/HP required. Table 6-2 lists common motor start codes with their starting kVA/HP requirement.

If the kVA/HP requirement, motor horsepower, and voltage rating are known, the starting amperage can be calculated.

EXAMPLE 3: Calculate the starting amperage required for a 230V, 1/4 HP motor with a motor start code of G.

Calculate the starting amperage using the following equation:

$$\frac{\text{kVA/HP x HP x 1000}}{\text{VOLTS}} = \text{STARTING AMPERAGE} \quad \textbf{(EQUATION 2)}$$

Volts = 230

HP = 1/4

Using Table 6-2, Code G results in kVA/HP = 6.3

$$\frac{6.3 \times 1/4 \times 1000}{230} = 6.85\text{A}$$

Therefore, starting the motor requires 6.85 amperes.

Table 6-1. Power Requirements*

INDUSTRIAL MOTORS	RATING	APPROXIMATE STARTING WATTS	APPROXIMATE RUNNING WATTS	FARM EQUIPMENT	RATING	APPROXIMATE STARTING WATTS	APPROXIMATE RUNNING WATTS
Split Phase	1/8 HP	800	300	Stock Tank De-Icer		1000	1000
	1/6 HP	1225	500	Grain Cleaner	1/4 HP	1650	650
	1/4 HP	1600	600	Portable Conveyor	1/2 HP	3400	1000
	1/3 HP	2100	700	Grain Elevator	3/4 HP	4400	1400
	1/2 HP	3175	875	Milk Cooler		2900	1100
				Milker (Vacuum Pump)	2 HP	10500	2800
Capacitor Start-	1/3 HP	2020	720				
Induction Run	1/2 HP	3075	975	**FARM DUTY MOTORS**	1/3 HP	1720	720
	3/4 HP	4500	1400	Std. (e.g. Conveyors,	1/2 HP	2575	975
	1 HP	6100	1600	Feed Augers, Air	3/4 HP	4500	1400
	1-1/2 HP	8200	2200	Compressors)	1 HP	6100	1600
	2 HP	10550	2850		1-1/2 HP	8200	2200
	3 HP	15900	3900		2 HP	10550	2850
	5 HP	23300	6800		3 HP	15900	3900
					5 HP	23300	6800
Capacitor Start-	1-1/2 HP	8100	2000	High Torque (e g. Barn	1-1/2 HP	8100	2000
Capacitor Run	5 HP	23300	6000	Cleaners, Silo Unloaders,	5 HP	23300	6000
	7-1/2 HP	35000	8000	Silo Hoists, Bunk Feeders)	7-1/2 HP	35000	8000
	10 HP	46700	10700		10 HP	46700	10700
				3-1/2 Cu. Ft. Mixer	1/2 HP	3300	1000
Fan Duty	1/8 HP	1000	400	High Pressure 1.8 Gal/Min	500 PSI	3150	950
	1/6 HP	1400	550	Washer 2 Gal/Min	550 PSI	4500	1400
	1/4 HP	1850	650	2 Gal/Min	700 PSI	6100	1600
	1/3 HP	2400	800				
	1/2 HP	3500	1100				

CONTRACTOR	RATING	APPROXIMATE STARTING WATTS	APPROXIMATE RUNNING WATTS	RESIDENTIAL	RATING	APPROXIMATE STARTING WATTS	APPROXIMATE RUNNING WATTS
Hand Drill	1/4"	350	350	Coffee Maker		1750	1750 Typ.
	3/8"	400	400	Elec. Range	6" Element	1500	1500
	1/2"	600	600		8" Element	2100	2100
Circular Saw	6-1/2"	500	500		Oven	6000	6000
	7-1/4"	900	900	Microwave	625W	2800	2000
	8-1/4"	1400	1400	Television (Solid-State)	B & W	100	100
Table Saw	9"	4500	1500		Color	300	300
	10"	6300	1800	Radio		50-200	50-200
Band Saw	14"	2500	1100	Refrig. Or Freezer		3100	800
Bench Grinder	6"	1720	720	Shallow Well Pump	1/3 HP	2150	750
	8"	3900	1400		1/2 HP	3100	1000
	10"	5200	1600	Sump Pump	1/3 HP	2100	800
Air Compressor	1/2 HP	3000	1000		1/2 HP	3200	1050
	1 HP	6000	1500	Dishwasher	(Cool Dry)	2100	700
	1-1/2 HP	8200	2200		(Hot Dry)	2850	1450
	2 HP	10500	2800	Clothes Dryer	Gas	2500	700
Electric Chain Saw	1-1/2 HP, 12"	1100	1100		Electric	7550	5750
	2 HP, 14"	1100	1100	Automatic Washer		3450	1150
Electric Trimmer	Standard 9"	350	350	Gas Or Fuel Oil			
	Heavy Duty 12"	500	500	Furnace Blower	1/8 HP	800	300
Electric Cultivator	1/3 HP	2100	700		1/6 HP	1250	500
Elec. Hedge Trimmer	18"	400	400		1/4 HP	1600	600
Flood Lights	HID	125	100		1/3 HP	2100	700
	Metal Halide	313	250		1/2 HP	3225	875
	Mercury & Sodium	1000 1400		Central Air Conditioner	10,000 BTU	3700	1500
	Vapor	1250	1000		20,000 BTU	5800	2500
Submersible Pump	400 GPH	600	200		24,000 BTU	8750	3800
Centrifugal Pump	900 GPH	900	500		32,000 BTU	11500	5000
Floor Polisher	3/4 HP, 16"	4500	1400		40,000 BTU	13800	6000
	1 HP, 20"	6100	1600	Garage Door Opener	1/4 HP	1650	550
High Pressure Washer	1/2 HP	3150	950		1/3 HP	2125	725
	3/4 HP	4500	1400	Electric Blanket	Portable	400	400
	1 HP	6100	1600	Dehumidifier		1450	650
55 Gal. Drum Mixer	1/4 HP	1900	700	Vacuum Cleaner	Standard	800	800
Wet & Dry Vac	1.7 HP	900	900		Deluxe	1100	1100
	2-1/2 HP	1300	1300	Lights			As Indicated On Bulb
				Toaster	2 Slice	1050	1050
					4 Slice	1650	1650
				Hair Dryer		300-1200	300-1200
				Iron		1200	1200

*Motors require up to two or three times their starting wattage when starting under load.

Table 6-2. Single-Phase Induction Motor Starting KVA/HP Requirements

Motor Start Code Letter	KVA/HP
G	6.3
H	7.1
J	8.0
K	9.0
L	10.0
M	11.2
N	12.5
P	14.0

If a code letter is not present on the motor nameplate, approximate starting amperage is equal to six times running amperage. This is a reasonable approximation for all applications where the generator rated amperage is at least twice the motor requirement. If the generator-to-motor-size ratio is less than 2:1, acquire the needed information to properly determine the motor-starting requirement.

6-3. GENERATOR CAPABILITY

A. Auxiliary Power Output

Different types of loads require different types of output. When a nonmotor load is applied, generator output goes to the ampere requirement of the equipment. When a motor load is applied, the generator attempts to supply motor-starting amperage causing output to drop to a low voltage because the starting amperage is many times the running amperage.

The total load requirements must not exceed the generator capability. When combining motor (non-resistive) and resistive loads, compare the total load required by the equipment to the generator output. Limit load requirements to the capabilities of the generator. For best performance and load handling, only use approximately 90% of the available output. The 10% margin allows for more satisfactory engine governor response to changing load situations. When loading the generator, always apply the largest non-resistive (motor) load first, add non-resistive loads in succession from largest to smallest, and add resistive loads last.

B. Operation

It is the installer's responsibility to follow all applicable safety codes and guidelines for the installation and operation of an auxiliary power generator. Always start engine and bring up to speed before starting any auxiliary equipment connected to the auxiliary power receptacles or junction box. Before stopping the engine, be sure to turn off the auxiliary equipment.

The installer should check for proper generator/load operation. If a motor does not start within 5 seconds, turn off power to it or the motor will be damaged. This 5-second-maximum-time rule should be applied to all motor-starting situations to prevent damage to the start winding. **If 90% of rated voltage is present across the motor terminals when running under load, then it is safe to assume that it is properly running within the capabilities of the generator.**

6-4. STANDBY POWER CONNECTIONS (Diagram 6-1)

The block diagram shown in Diagram 6-1 includes the proper equipment and connections required for the generator to supply standby power during emergencies or power outages.

IMPORTANT: *Consult qualified local personnel and follow all applicable codes for safe and proper installation. The following step numbers match the circled numbers within Diagram 6-1.*

1. Locate the power company or service meter, disconnect switch, and main overcurrent protection.

2. If necessary, obtain and install a double-pole, double-throw transfer switch between the service meter and disconnect switch.

IMPORTANT: *Double-pole, double-throw transfer switch rating must be the same as or greater than the main overcurrent protection.*

3. If necessary, obtain and install circuit breakers or fused disconnect switch to protect generator from overload conditions.

4. Select conductors of adequate amperage capacity for the current rating of the generator and overcurrent protection (see Section 6-5).

5. Install terminals or plug of adequate amperage capacity onto end of cable.

6. Make connections according to all codes and safety practices.

7. Turn off or unplug all auxiliary equipment connected to generator before starting or stopping engine. When starting or stopping, the engine has low speed which causes low voltage and frequency. For best performance and load handling, limit load to approximately 90% of the available output.

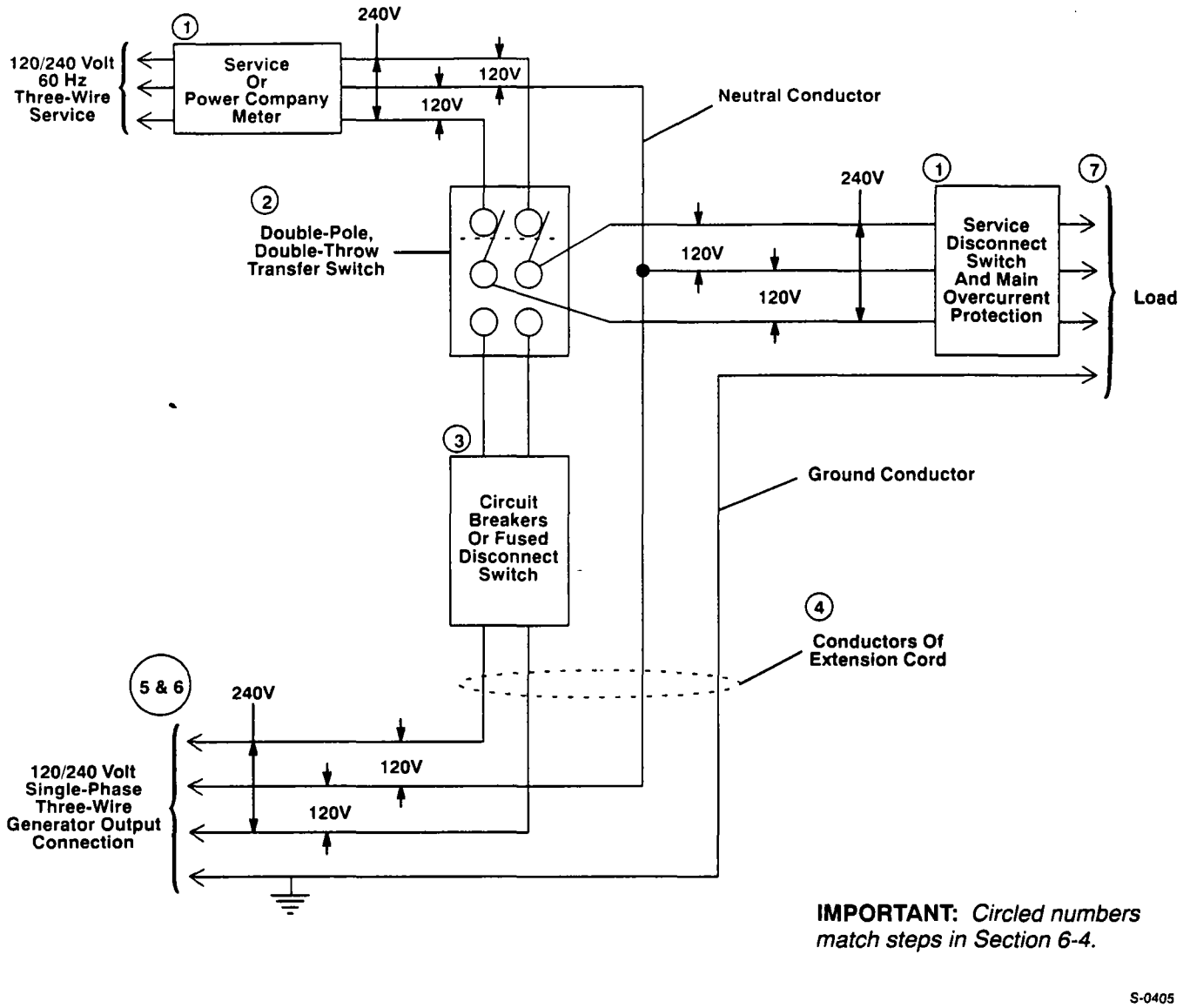


Diagram 6-1. Standby Power Equipment And Connections

6-5. AUXILIARY POWER EXTENSION CORD SELECTION (Tables 6-3 And 6-4)

Extension cords may be necessary if power is supplied to tools or load a distance from the generator. Select cords of adequate amperage capacity, and use the following Tables 6-3 and 6-4 to select conductor size according to cord length. Use the shortest cords possible because excessive cord lengths may reduce output or cause unit overload due to added resistance.

Table 6-3. Cord Lengths For 120 Volt Loads

Current In Amperes	Load In Watts	Maximum Allowable Cord Length In Feet (Meters) For Conductor Size (AWG)*					
		4	6	8	10	12	14
5	600			350 (106)	225 (68)	137 (42)	100 (30)
7	840		400 (122)	250 (76)	150 (46)	100 (30)	62 (19)
10	1200	400 (122)	275 (84)	175 (53)	112 (34)	62 (19)	50 (15)
15	1800	300 (91)	175 (53)	112 (34)	75 (23)	37 (11)	30 (9)
20	2400	225 (68)	137 (42)	87 (26)	50 (15)	30 (9)	
25	3000	175 (53)	112 (34)	62 (19)	37 (11)		
30	3600	150 (46)	87 (26)	50 (15)	37 (11)		
35	4200	125 (38)	75 (23)	50 (15)			
40	4800	112 (34)	62 (19)	37 (11)			
45	5400	100 (30)	62 (19)				
50	6000	87 (26)	50 (15)				

*Conductor size is based on maximum 2% voltage drop

Table 6-4. Cord Lengths For 240 Volt Loads

Current In Amperes	Load In Watts	Maximum Allowable Cord Length In Feet (Meters) For Conductor Size (AWG)*					
		4	6	8	10	12	14
5	1200			700 (213)	450 (137)	225 (84)	200 (61)
7	1680		800 (244)	500 (152)	300 (91)	200 (61)	125 (38)
10	2400	800 (244)	550 (168)	350 (107)	225 (69)	125 (38)	10 (31)
15	3600	600 (183)	350 (107)	225 (69)	150 (46)	75 (23)	60 (18)
20	4800	450 (137)	275 (84)	175 (53)	100 (31)	60 (18)	
25	6000	350 (107)	225 (69)	125 (38)	75 (23)		
30	7000	300 (91)	175 (53)	100 (31)	75 (23)		
35	8400	250 (76)	150 (46)	100 (31)			
40	9600	225 (69)	125 (38)	75 (23)			
45	10,800	200 (61)	125 (38)				
50	12,000	175 (53)	100 (31)				

*Conductor size is based on maximum 2% voltage drop

SECTION 7 – OPERATOR CONTROLS

IMPORTANT: *Once a week move all controls and switches through their entire sequences. This procedure cleans switch contacts and provides better general performance and less downtime, especially in corrosive or dirty environments.*

7-1. PROCESS SWITCH (Figure 7-1)

SMAW

GTAW

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.*

Open-circuit voltage is present at the weld output terminals whenever the engine is running and the Process switch is in the SMAW position or in the GTAW position and the contactor is energized.

Placing the Process switch in the GTAW position provides high frequency, shielding gas, and contactor control with use of a Remote Contactor Control Switch.

Placing the Process switch in the SMAW position allows use of the automatic idle circuitry and disconnects the high frequency, shielding gas control, and contactor control circuits.

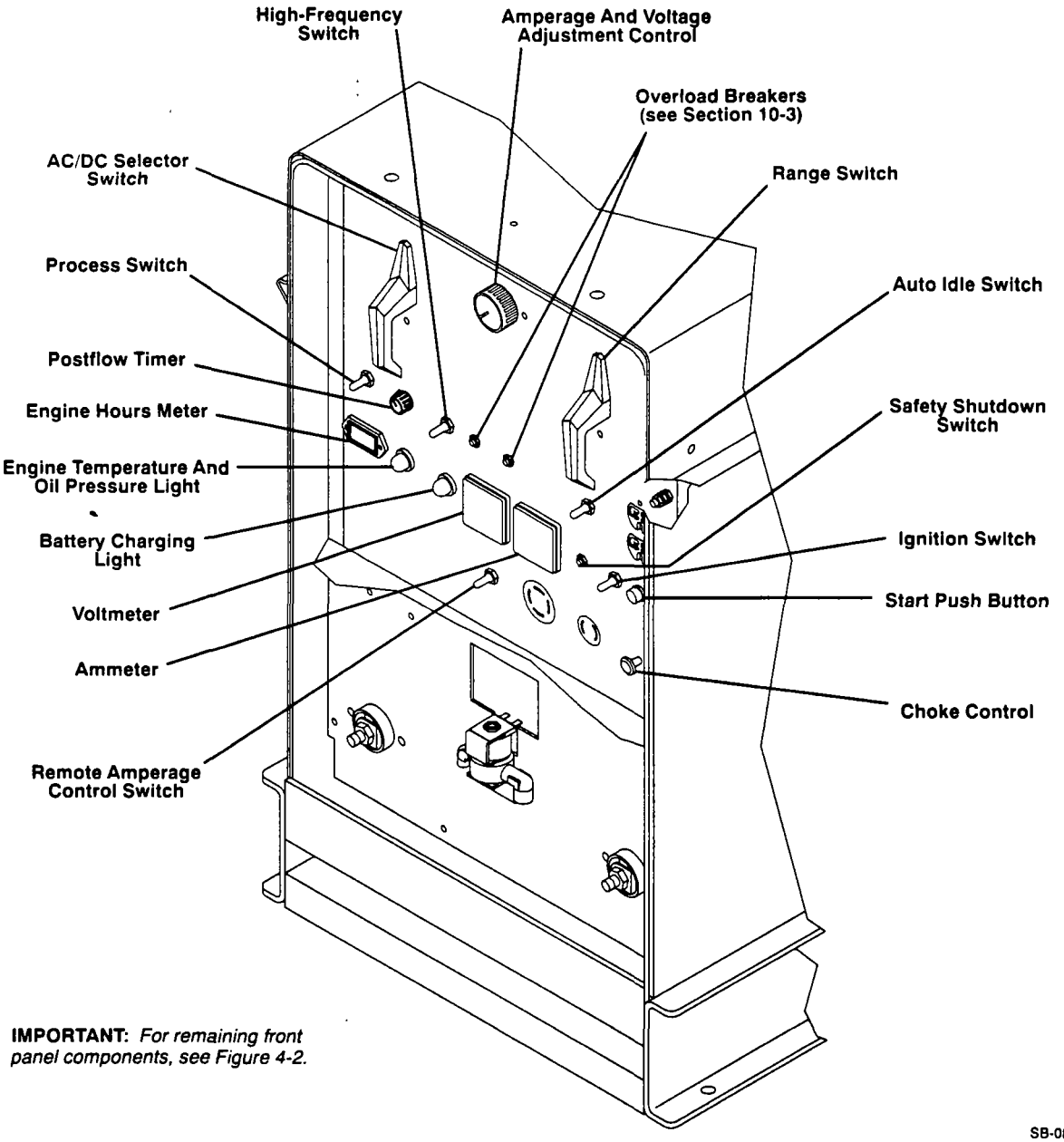


Figure 7-1. Front Panel Controls

7-2. AMPERE RANGES SWITCH (Figure 7-1)

DO NOT SWITCH UNDER LOAD

The AMPERE RANGES switch provides five coarse ac and dc amperage ranges. The range of each switch position is displayed on the nameplate.

CAUTION: ARCING can damage switch contacts.

- *Do not change the position of the AMPERE RANGES switch while welding or under load.*

Arcing causes the contacts to become pitted and eventually inoperative.

7-3. AMPERAGE & VOLTAGE ADJUSTMENT CONTROL (Figure 7-1)

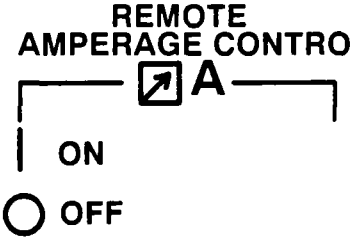
AMPERAGE & VOLTAGE ADJUSTMENT

The AMPERAGE & VOLTAGE ADJUSTMENT control permits the operator to select a welding amperage and open-circuit voltage between the minimum and maximum values of the course range selected by the Range switch. The scale surrounding the AMPERAGE & VOLTAGE ADJUSTMENT control is calibrated in percent and does not indicate an actual amperage value.

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

IMPORTANT: *The AMPERAGE & VOLTAGE ADJUSTMENT control must be rotated to the 100 (maximum) position whenever the 7.5 kVA/kW ac power plant is used. The AMPERAGE & VOLTAGE ADJUSTMENT control may be in any position when using the 120V 26A or optional 240V 13A AC duplex receptacle.*

7-4. REMOTE AMPERAGE CONTROL SWITCH (Figure 7-1)



If remote amperage control is desired, make connections to the Remote Amperage Control receptacle (see Section 4-9), and place the REMOTE AMPERAGE CONTROL switch in the ON position. The Remote Control adjusts output from minimum to maximum of the selected range of the Ampere Ranges switch.

If remote amperage control is not desired, place the REMOTE AMPERAGE CONTROL switch in the OFF position.

7-5. REMOTE CONTACTOR CONTROL SWITCH

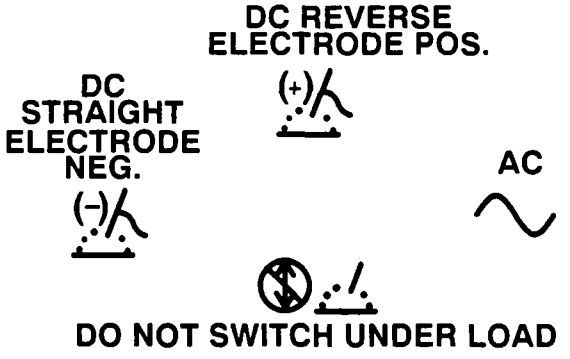
WARNING: ELECTRIC SHOCK can kill.

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

The Remote Contactor Control switch functions when the Process switch is in the GTAW position.

If remote contactor control is desired, make connections to Remote Contactor Receptacle (see Section 4-10), close the Remote Contactor Control Switch, and high frequency, shielding gas, and weld output are available. When the Remote Contactor Control switch is opened, high frequency and weld output stop, and the POST-FLOW begins to time.

7-6. AC/DC SELECTOR SWITCH (Figure 7-1)



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 and follow Safety Rules at beginning of this manual.*

CAUTION: ARCING can damage switch contacts.

- *Do not change the position of the AMPERE RANGES switch while welding or under load.*

Arcing causes the contacts to become pitted and eventually inoperative.

The AC/DC Selector switch provides a means of selecting AC, DC STRAIGHT/ELECTRODE NEG. polarity, or DC REVERSE/ELECTRODE POS. polarity output without changing weld output cable connections. To ensure that weld output corresponds to the dc polarity positions, connect the electrode holder/torch connector to the ELECTRODE terminal and the work cable to the WORK terminal..

7-7. HIGH-FREQUENCY SWITCH (Figure 7-1)

High frequency is used during Gas Tungsten Arc Welding (GTAW) to aid in starting and maintaining the arc.

WARNING: USING HIGH FREQUENCY WITH THE SHIELDED METAL ARC WELDING (SMAW) 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.*

The attempted use of high frequency to establish an arc with a stick electrode could cause an arc to form between the electrode holder and operator.

The HIGH FREQUENCY switch allows the operator to choose whether high frequency will be used or not and for how long. This switch has four positions: START, OFF, and CONTINUOUS.

A. START Position

High frequency is present from the time the contactor is closed until an arc is established. Once an arc is established, high frequency is no longer present. High frequency is present any time the arc is broken to aid in restarting the arc as long as the contactor is energized.

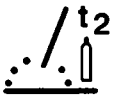
B. OFF Position

High frequency is not present. The HIGH FREQUENCY switch must be in the OFF position while doing Shielded Metal Arc Welding (SMAW) or when high frequency is not desired.

C. CONTINUOUS Position

High frequency is present whenever the contactor is closed throughout the welding operation until the contactor opens. When the contactor opens, high frequency is not present until the contactor closes again.

7-8. POSTFLOW TIMER (Figure 7-1)



The POSTFLOW TIMER control provides 0 to 60 seconds of gas flow after the arc is extinguished by opening the Remote Contactor Control. The scale surrounding the POSTFLOW TIMER control is calibrated in percent and does not indicate an actual time in seconds. Rotating the POSTFLOW TIMER clockwise increases postflow time.

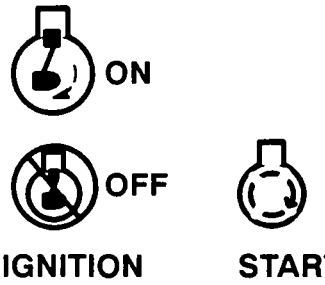
7-9. METERS

The meters are provided to monitor the welding operation. They are not intended for exact amperage or voltage measurements. These meters are internally connected to the output terminals. The voltmeter indicates the voltage at the output terminals, but not necessarily the actual voltage at the welding arc (due to cable resistance, poor connections, etc.). The ammeter indicates the amperage output of the unit.

7-10. CHOKE CONTROL (Figure 7-1)

The CHOKE control varies the fuel-air mixture to the engine. When the CHOKE control is pulled fully out, very little air will be admitted to the engine through the carburetor thereby supplying a richer mixture of fuel. This position is required if the engine is cold when started. As the engine warms up, push the CHOKE control inward slowly as far as it will go. When the CHOKE control is fully in and the engine is warmed up, the engine should be ready for loading.

7-11. START PUSH BUTTON AND IGNITION SWITCH (Figure 7-1)



CAUTION: REENGAGING THE STARTER MOTOR while flywheel is rotating or EXCEEDING RATED CRANKING TIME can damage starting components.

- *Do not reengage starter motor until starter pinion and flywheel have stopped rotating.*

Placing the IGNITION switch in the ON position energizes the fuel system circuit. When the IGNITION switch is in the ON position, holding the Low Oil Pressure And High Coolant Temperature Shutdown System Switch closed and depressing the START push button engages the starter motor and starts the engine. Once the engine has started, release the START push button.

Placing the IGNITION switch in the OFF position shuts down the engine. The IGNITION switch must be left in the OFF position when the engine is not running to prevent the battery from discharging.

7-12. LOW OIL PRESSURE AND HIGH COOLANT TEMPERATURE SHUTDOWN SYSTEM SWITCH (Figure 7-1)

The Low Oil Pressure And High Coolant Temperature Shutdown System Switch will automatically shut down the engine if oil pressure drops to an unsafe level or the coolant temperature becomes too high. When starting the engine, depress the Low Oil Pressure And High Coolant Temperature Shutdown System Switch and hold in until the engine starts and the OIL & TEMP. light goes off.

This switch is protected by fuse F located on the bottom of the switch assembly directly behind the front panel. Should this fuse open, the engine will not start. See Section 10-3 for fuse replacement procedure.

7-13. AUTO IDLE SWITCH (Figure 7-1)

The automatic idling device saves fuel by allowing the engine to idle when the welding generator is not loaded. The AUTO IDLE switch controls the operation of this device. This switch has two positions: ON and OFF.

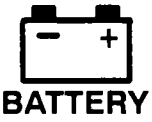
A. ON Position

When the AUTO IDLE switch is in the ON position, the engine will remain at idle speed (1200rpm) until an arc is struck or load applied to the duplex receptacle. When an arc is struck or load applied to the duplex receptacle, the engine speed will increase to weld/power rpm (1850). Approximately 10 seconds after the arc is broken or load is removed, the engine will return to idle rpm. This time delay is nonadjustable.

B. OFF Position

When the AUTO IDLE switch is in the OFF position, engine speed remains at governed weld/power rpm (1850) when the generator is not loaded. This position must be used when the 7.5 kVA/kW power plant is used.

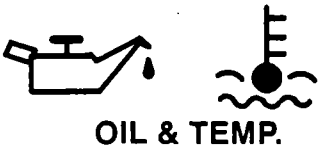
7-14. BATTERY CHARGING LIGHT (Figure 7-1)



The BATTERY charging light turns on when the engine battery charge current is not flowing. It is normal for the light to turn on when the IGNITION switch is in the ON position and the engine is NOT operating.

IMPORTANT: *If this light comes on while the engine is running, immediately shut down the engine and determine the cause. Do not attempt to operate the engine again until the trouble has been remedied.*

7-15. ENGINE TEMPERATURE AND OIL PRESSURE LIGHT (Figure 7-1)



The OIL & TEMP. light turns on if the oil pressure decreases below 8 psi (55 kPa) or if the coolant temperature increases above 240°F (116°C). It is normal for the light to turn on when the IGNITION switch is in the ON position and the engine is NOT operating.

7-16. ENGINE HOURS METER (Figure 7-1)

The engine HOURS meter registers the total hours of engine operation. This information is useful for routine maintenance on the engine.

7-17. LOW CURRENT CONTROL (Optional)

The Low Current Control option provides selection of weld output from 5 to 40 amperes ac/dc in one of three current ranges. See Volt-Ampere curves for Low Current Control option (Chart 3-2).

The LOW CURRENT CONTROL is protected by a cartridge-type fuse F3 located behind the right side panel on the rear of the high frequency control panel. If the fuse opens, weld output in the low current range stops. See Section 10-3 for fuse replacement procedure.

A. LOW CURRENT CONTROL Switch

Place the LOW CURRENT CONTROL switch in the IN position to obtain the low current ranges. Place the LOW CURRENT CONTROL switch in the OUT position to disconnect Low Current Control.

B. RANGE SELECTOR Switch

CAUTION: ARCING can damage switch contacts.

- *Do not change the position of the AMPERE RANGES switch while welding or under load.*

Arcing causes the contacts to become pitted and eventually inoperative.

IMPORTANT: *If welding current in excess of 40 amperes is required, use the standard ranges available on the front panel.*

When Range switch is in the Minimum position and LOW CURRENT CONTROL switch is in the IN position, the RANGE SELECTOR switch provides selection of weld output from 5 to 40 amperes ac/dc in one of three low current ranges. AMPERAGE & VOLTAGE ADJUSTMENT control provides adjustment of the amperage output from minimum to maximum of each coarse low current range.

7-18. TACHOMETER (Optional)

The tachometer, located on the radiator enclosure, registers engine speed from 0-3000 rpm.

7-19. OIL PRESSURE GAUGE (Optional)

The optional Oil Pressure gauge registers the lubricating system pressure in pounds per square inch (psi). The pressure registered by the gauge should remain constant for a given engine speed. If the oil pressure fluctuates or drops, stop the engine, and do not operate until the trouble has been corrected.

7-20. TEMPERATURE GAUGE (Optional)

The Temperature gauge registers the coolant temperature and indicates when an abnormal condition occurs.

7-21. AIR CLEANER SERVICE INDICATOR (Optional)

The air cleaner service indicator signals when the air cleaner requires servicing (see Section 9-2).

7-22. FUEL GAUGE (Optional)

The FUEL gauge registers the amount of fuel remaining in the fuel tank.

SECTION 8 – SEQUENCE OF OPERATION

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

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (-) battery cable from battery before inspecting or servicing.*
- *Keep away from moving parts such as fans, belts, and rotors.*
- *Keep all covers and panels in place while operating.*

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

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

- *Wear correct eye, ear, and body protection.*
- *If ventilation is inadequate, use approved breathing device.*
- *Use in open, well ventilated areas, or vent exhaust out of doors.*

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

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

FUMES AND GASES can seriously harm your health.

- *Ventilate to keep from breathing fumes and gases.*
- *If ventilation is inadequate, use approved breathing device.*
- *Use in open, well ventilated areas, or vent exhaust out of doors.*

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

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

FUMES AND GASES can seriously harm your health.

- *Ventilate to keep from breathing fumes and gases.*

ENGINE FUEL can cause fire or explosion.

- *Stop engine before checking or adding fuel.*
- *Do not spill fuel; if spilled, wipe up.*
- *Do not refuel if engine is hot or running.*
- *Do not refuel near sparks or open flame.*
- *Do not smoke while refueling.*
- *Do not fill tank to top; allow room for expansion.*

MAGNETIC FIELDS FROM HIGH CURRENTS can affect pacemaker operation.

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

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

8-1. GAS TUNGSTEN ARC WELDING (GTAW)

WARNING: Read and follow safety information at beginning of entire Sections 5 and 8 before proceeding.

1. Install and connect unit as instructed in Section 4.
2. Install and connect the High-Frequency unit according to its Owner's Manual, if applicable. Scratch start GTAW does not require the use of external high-frequency.

3. Select and obtain proper electrode (see Table 9-3).
4. Prepare tungsten electrode according to Section 9-6, and insert into torch.
5. Wear dry and insulating gloves.
6. Connect work clamp to clean, bare metal at workpiece.
7. Place Process in the GTAW position.
8. Place AC/DC Selector switch in desired position (see Section 7-6).

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 and follow Safety Rules at beginning of this manual.*

9. Place Range switch in desired position (see Section 7-2).
10. If remote amperage control is not used, place REMOTE AMPERAGE CONTROL switch in OFF position and rotate AMPERAGE & VOLTAGE ADJUSTMENT control to desired position (see Section 7-3).
11. If remote amperage control is to be used, make connections to REMOTE AMPERAGE CONTROL receptacle (see Section 4-9), set desired amperage, and place REMOTE AMPERAGE CONTROL switch in ON position.
12. Place HIGH FREQUENCY switch in desired position (see Section 7-7).
13. Rotate POSTFLOW TIMER to desired postflow position.
14. Start the engine as instructed in Section 8-5.
15. Connect desired auxiliary equipment to the 120V26A or optional 240V 13A AC duplex receptacle.
16. Energize the auxiliary equipment, if applicable.
17. Wear welding helmet with proper filter lens according to ANSI Z49.1.
18. Close Remote Contactor Control switch.
19. Turn on High-Frequency unit, if applicable.
20. Begin welding.

8-2. GAS TUNGSTEN ARC WELDING (GTAW) WITH LOW CURRENT CONTROL OPTION

WARNING: Read and follow safety information at beginning of entire Sections 5 and 8 before proceeding.

CAUTION: ARCING can damage switch contacts.

- *Do not change LOW CURRENT CONTROL switch position while welding or under load.*

1. Install and connect unit as instructed in Section 4.
2. Install and connect the High-Frequency unit according to its Owner's Manual, if applicable. Scratch start GTAW does not require the use of external high-frequency.
3. Select and obtain proper electrode (see Table 9-3).
4. Prepare tungsten electrode according to Section 9-6, and insert into torch.
5. Wear dry and insulating gloves.
6. Connect work clamp to clean, bare metal at workpiece.
7. Place Process in the GTAW position.
8. Place LOW CURRENT CONTROL switch in the IN position.
9. Place the RANGE SELECTOR switch in the desired position.
10. Place AC/DC Selector switch in desired position (see Section 7-6).

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 and follow Safety Rules at beginning of this manual.*

11. Place Range switch in minimum range position
12. If remote amperage control is not used, place REMOTE AMPERAGE CONTROL switch in OFF position and rotate AMPERAGE & VOLTAGE ADJUSTMENT control to desired position (see Section 7-3).
13. If remote amperage control is to be used, make connections to REMOTE AMPERAGE CONTROL receptacle (see Section 4-9), set desired amperage, and place REMOTE AMPERAGE CONTROL switch in ON position.
14. Place HIGH FREQUENCY switch in desired position (see Section 7-7).

15. Rotate POSTFLOW TIMER to desired postflow position.
16. Start the engine as instructed in Section 8-5.
17. Connect desired auxiliary equipment to the 120V26A or optional 240V 13A AC duplex receptacle.
18. Energize the auxiliary equipment, if applicable.
19. Wear welding helmet with proper filter lens according to ANSI Z49.1.
20. Close Remote Contactor Control switch.
21. Turn on High-Frequency unit, if applicable.
22. Begin welding.

8-3. SHIELDED METAL ARC WELDING (SMAW)

WARNING: Read and follow safety information at beginning of entire Sections 5 and 8 before proceeding.

1. Install and connect unit as instructed in Section 4.
2. Wear dry and insulating gloves.
3. Connect work clamp to clean, bare metal at workpiece.
4. Select proper electrode.
5. Place Process in the SMAW position.
6. Place AC/DC Selector switch in desired position (see Section 7-6).

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 and follow Safety Rules at beginning of this manual.*

7. Place Range switch in desired position (see Section 7-2).
8. If remote amperage control is not used, place REMOTE AMPERAGE CONTROL switch in OFF position and rotate AMPERAGE & VOLTAGE ADJUSTMENT control to desired position (see Section 7-3).
9. If remote amperage control is to be used, make connections to REMOTE AMPERAGE CONTROL receptacle (see Section 4-9), set desired amperage, and place REMOTE AMPERAGE CONTROL switch in ON position.
10. Place HIGH FREQUENCY switch in the OFF position (see Section 7-7).
11. Start the engine as instructed in Section 8-5.
12. Place AUTO IDLE switch in the desired position (see Section 7-13).
13. Connect desired auxiliary equipment to the 120V26A or optional 240V 13A AC duplex receptacle.
14. Energize the auxiliary equipment, if applicable.
15. Wear welding helmet with proper filter lens according to ANSI Z49.1.
16. Begin welding.

8-4. 7.5 KVA/KW POWER PLANT OPERATION

WARNING: Read and follow safety information at beginning of entire Sections 5 and 8 before proceeding.

1. Install and connect unit as instructed in Section 4.
2. Make connections to the 120/240 volts ac terminals as instructed in Section 5-5.
3. Rotate the AMPERAGE & VOLTAGE ADJUSTMENT control to 100 (maximum).
4. Start the engine as instructed in Section 8-5.
5. Place the AUTO IDLE switch in the OFF position.
6. Once the engine is operating at weld/power rpm, power may be obtained from the 7.5 kVA/kW power plant.

8-5. STARTING THE ENGINE

IMPORTANT: *Weld output is present whenever the engine is running unless the Process switch is in the GTAW position and the Remote Contactor Control switch is open. Auxiliary power output is present whenever the engine is running.*

IMPORTANT: *Read entire engine Owner's Manual (F-163) before operating engine.*

1. Engine Prestart Checks
   a. Oil Level

      Check engine oil level. If oil level is low, fill to mark on dipstick. (See engine manual for oil selection.)

   b. Fuel Level

WARNING: REMOVE FUEL CAP SLOWLY; FUEL SPRAY may cause injury; FUEL may be under pressure.

- *Rotate fuel cap slowly and wait until hissing stops before removing cap.*

      Check fuel level. If necessary, fill tank with fresh, clean fuel. (See engine manual for fuel specifications.)

   c. Coolant level

      Check coolant level. If necessary, fill radiator with fresh coolant. (See engine manual for coolant specifications.)

2. Place Process switch in SMAW position.

3. Place the AUTO IDLE switch in the ON position. This should be done to permit the engine to warm up at idle rpm.
4. Place IGNITION switch in ON position.
5. Choke engine as necessary (see Section 7-10).
6. While holding Low Oil Pressure And High Coolant Temperature Shutdown System switch closed, depress START push button.

CAUTION: REENGAGING THE STARTER MOTOR while flywheel is rotating or EXCEEDING RATED CRANKING TIME can damage starting components.

- *Do not reengage starter motor until starter pinion and flywheel have stopped rotating.*
- *Do not exceed engine manufacturer's maximum cranking time.*

Allow two minutes cooling time before attempting to restart engine.

7. When engine starts, release START push button. When OIL & TEMP light goes off, release Low Oil Pressure And High Coolant Temperature Shutdown System switch.
8. Allow the engine to run for a few minutes before applying a load. This is necessary to enable the engine to properly warm up and ensure proper lubrication.

8-6. STOPPING THE ENGINE

1. Stop welding and all other operations, and turn off all auxiliary equipment.
2. If applicable, place Process switch in SMAW position and place the AUTO IDLE switch in the ON position.
3. Place Ignition switch in OFF position.
4. Turn off shielding gas supply, if applicable.

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

- *Shut off gas supply when not in use.*

SECTION 9 – MAINTENANCE

9-1. ROUTINE MAINTENANCE (Table 9-1)

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

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (–) battery cable from battery before inspecting, maintaining, or servicing.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

HOT ENGINE PARTS can cause severe burns.

- *Wear protective gloves and clothing when working on a hot engine.*

BATTERY ACID can burn eyes, skin, destroy clothing, and damage other material.

- *Wear correct eye and body protection.*

Maintenance to be performed only by qualified persons.

A. Cables And Wiring

WARNING: Read and follow safety information at beginning of entire Section 9-1 before proceeding.

Check interconnecting wiring and connections for tightness and flaws. Be sure that the weld output cable connections are clean and tight. Check the insulation for breaks or other signs of damage. Repair or replace cables or wiring as necessary.

B. Battery

WARNING: Read and follow safety information at beginning of entire Section 9-1 before proceeding.

Inspect the battery for loose connections, damaged cables, corrosion, cracked case or cover, loose holddowns, and loose or deformed terminal posts.

Clean and tighten connections, replace cables, or replace battery if necessary.

C. Oil And Filter

WARNING: Read and follow safety information at beginning of entire Section 9-1 before proceeding.

The engine is equipped with a full-flow oil filter. Change the oil and filter according to instructions on unit maintenance label and in engine Owner's Manual (F-163 engine). Use correct type and grade of oil as listed in instructions for expected temperature range before next oil and filter change.

IMPORTANT: *This engine is equipped with a LOW OIL PRESSURE AND HIGH COOLANT TEMPERATURE SHUTDOWN SYSTEM. If engine shuts down, determine the cause, and make necessary corrections. Do not operate the welding generator until the trouble has been corrected.*

Table 9-1. Maintenance Schedule

Frequency*	Maintenance
Every day.	Check fuel, oil, and coolant levels (see Sections 4-4 and 4-5, and engine Owner's Manual, F-163 engine).
Every 100 to 150 hours.	Change oil and filter (see engine Owner's Manual, F-163 engine).
	Check cables, wiring (see Section 9-1A), and battery (see Section 9-1B).
	Units in heavy service environments: Check labels; clean and inspect unit (see Section 9-1).
Every 200 hours.	Replace fuel filter (see engine Owner's Manual, F-163 engine).
Every 250 hours.	Clean spark arrestor carbon trap, if applicable (see Section 9-6).
Every 1000 hours.	Check brushes and slip rings (see Section 9-10). Check all labels (see IMPORTANT block, Section 9-1). Clean and inspect unit (see Section 9-1).
Once a year.	Check coolant system (see engine Owner's Manual, F-163 engine).

*Frequency of service is based on unit operated 40 hours per week. Increase frequency of maintenance if usage exceeds 40 hours per week.

D. Cleaning And Inspecting

WARNING: Read and follow safety information at beginning of entire Section 9-1 before proceeding.

When performing routine oil changes at intervals specified on the unit maintenance label, clean and inspect the unit as follows:

1. Keep the inside of the welding generator clean by blowing out the unit with clean, dry compressed air.
2. Wipe oil and fuel spills from engine immediately to avoid accumulation of dust.
3. Check for fluid leaks indicating loose oil or fuel connections. Tighten loose connections, and clean oil or fuel spills off engine.

IMPORTANT: *See the engine Owner's Manual (F-163 engine) for complete engine care.*

9-2. AIR CLEANER SERVICE AND OPTIONAL INDICATOR (Table 9-2)

WARNING: Read and follow safety information at beginning of entire Section 9-1 before proceeding.

CAUTION: DIRTY AIR can damage engine.

- *Do not operate engine with dirty air cleaner element in place.*
- *Do not operate engine without air cleaner element in place.*

A. Air Cleaner Service (Table 9-2)

The air cleaner is one of the most important parts of the engine from the standpoint of engine life. If dirty air gets into the engine, it can cause major engine damage within a few operating hours. Every 50 hours or less depending on conditions, empty the dust cup, and inspect the element.

IMPORTANT: *A dirty air cleaner element is usually accompanied by a loss of power and smoke in the engine exhaust.*

When it becomes necessary to service the air cleaner in the field, follow the steps in Table 9-2. Keep a spare element on hand for replacement. New elements are available from your welding equipment distributor.

B. Air Cleaner Service Indicator (Optional)

The air cleaner service indicator, located on air cleaner hose adapter near intake manifold (behind right side access door), signals when the air cleaner requires servicing. During normal operation, a green band signals a properly functioning air cleaner. When a red band appears, the air cleaner element should be serviced.

Reset the indicator by pressing the end of the indicator marked PRESS TO RESET after servicing element.

IMPORTANT: *Check the air cleaner service indicator before starting or stopping the engine. See supplied instructions on indicator.*

Table 9-2. Air Cleaner Service

<table>
<tr><td>Follow These Easy Steps:</td><td>1. Stop engine.

2. Wipe off cover before opening air cleaner.

3. Remove cover.

4. Remove element.

5. Wipe out element chamber with clean, damp cloth.

6. Inspect new element and all gaskets for shipping damage before use.

7. Reinstall element.

8. Replace cover.</td></tr>
<tr><td>Important</td><td>1. Don't attempt to service air cleaner with engine running.

2. Don't blow out the inside of the air cleaner with compressed air.

3. Don't leave open air cleaner exposed to blowing dust while you clean element. Replace cover.

4. If air cleaner is horizontally mounted, be sure that dust cup is positioned so arrows point up.

5. For Donaclone air cleaners, don't blow out Donaclone tube section without element, cover and inner cover (if any) correctly installed or you will blow dust into the engine.</td></tr>
<tr><td>How To Clean Elements For Re-Use</td><td>Clean element by one of the following methods:

Compressed Air or Washing.

Compressed air is recommended when element will be re-used immediately because a washed element must be dried before re-use. However, washing does a better job and must be used when exhaust soot has lodged in fine pores of the filter media. Use Donaldson D-1400 detergent which contains a special additive for removing soot and carbon.

Replace element after 6 cleanings or annually, whichever occurs first.

(When cleaning Cyclopac elements, do not remove plastic fin assembly – back-flowing with compressed air or washing will remove dust from beneath the fin assembly).

Compressed Air

Direct air through element in the direction opposite to normal air flow through the element. Move nozzle up and down while rotating element. Keep nozzle at least one inch from pleated paper. Maximum air pressure – 100 P.S.I.

Washing

1. Soak element 15 minutes or more in Donaldson D-1400 and water solution. See carton for full instructions.

2. Rinse until water is clear (Maximum water pressure 40 P.S.I.)

3. Air-dry or use warm flowing air, max. 160° F. Do not use compressed air or light bulbs.

Inspection

Place bright light inside element and rotate element slowly. If any rupture, holes or damaged gaskets are discovered – replace.</td></tr>
</table>

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9-3. BATTERY REPLACEMENT PROCEDURE (Figure 9-1)

WARNING: SPARKS OR FLAMES can cause BATTERY GASES to EXPLODE; BATTERY ACID can burn eyes and skin.

- *Stop engine before disconnecting or connecting battery.*
- *Keep sparks, flames, cigarettes, and other ignition sources away from batteries.*
- *Do not allow tools to cause sparks when working on a battery.*
- *Always wear a face shield and proper protective gloves and clothing when working on a battery.*

Use the following procedure to prevent sparks when removing or installing a battery:

1. Be sure engine is fully stopped, and IGNITION switch is in the OFF position.
2. Locate battery in unit (see Figure 9-1).
3. Open door or remove panels as necessary.
4. Disconnect negative (–) battery cable first and positive (+) cable last.
5. Remove holddown device.
6. Remove battery.
7. Install new (or charged) battery.
8. Reinstall and secure holddown device.
9. Connect positive (+) cable first and negative (–) cable last.
10. Securely reinstall or close any doors or panels.

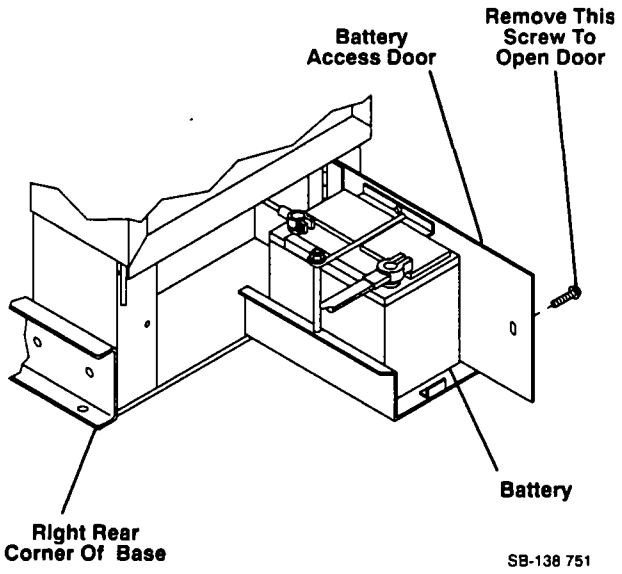

Figure 9-1. Battery Location

9-4. MAINTENANCE-FREE BATTERY CHARGING

WARNING: CHARGING A FROZEN BATTERY can cause the battery to explode and result in serious injury or damage to equipment; BATTERY ACID can burn eyes, skin, destroy clothing, and damage other material; BATTERY GASES can explode and shatter battery.

- *Allow battery to warm up to 60° F (16° C) before charging if battery is frozen.*
- *Wear a face shield, proper protective clothing, and remove all metal jewelry.*
- *Do not spill or splash battery fluid.*
- *Do not apply pressure to walls of filled battery – use battery carrier, or place hands on opposite corners when lifting battery.*
- *Keep sparks, flames, cigarettes, and other ignition sources away from batteries.*
- *Use enough ventilation to keep battery gases from building up during and for several hours after battery charging.*
- *Turn off battery charger before making connections to battery.*
- *Do not touch or move connections on battery while battery charger is on.*
- *Do not lean over battery when charging.*
- *Be sure battery charger connections to battery are clean and tight.*
- *Keep vent caps in place, and cover top of battery with damp cloth.*
- *Be sure battery charger output matches battery voltage.*
- *Turn off battery charger before disconnecting charger from battery.*

1. Remove battery from unit, and place on a level worktable or other suitable surface.
2. If battery has removable vent caps, check the condition of the electrolyte as follows:
   a. Check electrolyte temperature in one of the center cells with a battery thermometer. For each 10°F (6°C) increment above 80°F (27°C), a correction factor of 0.004 specific gravity must be added to the specific gravity reading taken in Step 2b. For each 10°F (6°C) increment below 80°F (27°C), 0.004 must be subtracted from the reading taken in Step 2b.
   b. Check the specific gravity of each cell with a hydrometer. (Draw in and expel the electrolyte two or three times from the first cell to be tested to adjust the temperature of the hydrometer to that of the electrolyte.)

c. If a corrected specific gravity reading of 1.225 at 80°F (27°C) is not obtained, replace the vent caps and recharge the battery following the battery charger manufacturer's instructions.

3. If the battery does not have removable vent caps, check the condition of the battery as follows:

   a. Check the stabilized open-circuit voltage of the battery. For a 12 volt battery, any reading below 12.4 volts indicates the battery needs charging. Disconnect both battery cables from the battery, and allow battery voltage to stabilize for several hours.

   b. If the stabilized open-circuit voltage is below 12.4 volts, charge the battery following the battery charger manufacturer's instructions.

4. Remove damp cloth from battery.

5. Reinstall battery into unit.

6. Replace battery holddown, and tighten securely. Do not overtighten.

7. Connect positive (+) battery cable to positive (+) battery terminal.

8. Connect negative (–) battery cable to negative (–) battery terminal.

9-5. TUNGSTEN ELECTRODE (Table 9-3, Figures 9-2 And 9-3)

Use Table 8-3 to select the correct size and type tungsten electrode. Prepare the tungsten electrode using the following guidelines. A properly prepared tungsten electrode is essential in obtaining a satisfactory weld.

A. For AC or DC Electrode Positive Welding (Figure 9-2)

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

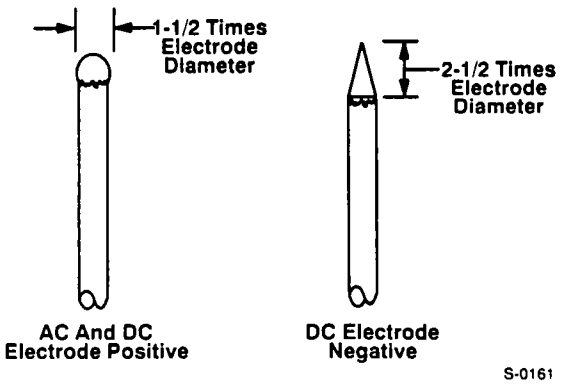

Figure 9-2. Properly Prepared Tungsten Electrodes

B. For DC Electrode Negative Welding (Figures 9-2 And 9-3)

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

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

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

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

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

Table 9-3. Tungsten Size

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

*NOT RECOMMENDED

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

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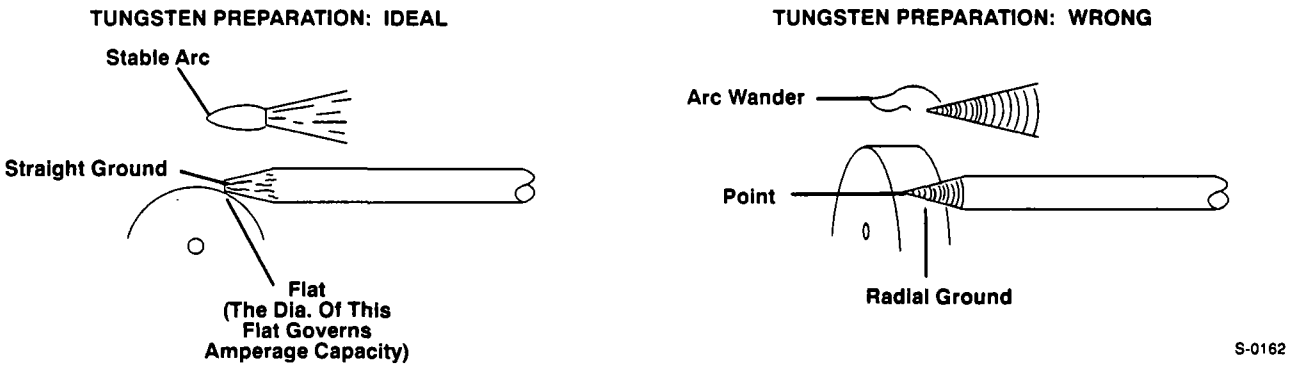


Figure 9-3. Tungsten Preparation

9-6. SERVICING THE SPARK ARRESTOR

WARNING: ENGINE EXHAUST SPARKS can cause fire.

- *Exhaust spark arrestor must be installed in accordance with local, state, and federal regulations.*
- *Stop engine before cleaning spark arrestor.*
- *Clean spark arrestor in a noncombustable environment.*

HOT ENGINE PARTS can cause severe burns.

- *The exhaust system must be cold when servicing the spark arrestor.*

A spark arrestor/muffler is provided for installation onto the engine exhaust pipe on this welding generator (see Section 4-2). A spark arrestor, maintained in effective working order, is mandatory if this welding generator is to be operated in a National Forest or on California Grasslands, brush, or forest covered land (see Section 4442 or California Public Resources Code). For other areas, check your state and local laws.

Internal combustion engines operating in a highly combustible environment are a common fire hazard. Glowing carbon particles blown out with the exhaust can retain sufficient heat to ignite materials. While no practical spark arresting device will stop all sparks, this device will minimize fire hazards by removing and trapping most solid particles provided that it is properly maintained.

The carbon trap should be serviced every 250 operating hours. The entire spark arrestor should be inspected every 1000 operating hours or three times per season.

Removal of the device from the exhaust system is not necessary for servicing.

Proceed as follows to service the spark arrestor:

1. Stop the engine and allow the exhaust system to cool.
2. Remove the cleanout plug from the bottom of the spark arrestor. If a crust has formed over the hole, break it loose with a screwdriver or similar tool.
3. Start the engine and run it at idle rpm to blow collected particles out the cleanout hole. If particles are slow to discharge, momentarily cover the end of the exhaust stack.
4. Stop the engine, and allow the exhaust system to cool.
5. Replace and secure the cleanout plug.

9-7. SPARK GAPS (Figures 4-3 And 9-4)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine before inspecting, maintaining, or servicing.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

HOT ENGINE PARTS can cause severe burns.

- *Wear protective gloves and clothing when working on a hot engine.*

Maintenance to be performed only by qualified persons.

It is necessary to readjust the spark gaps every three to four months or when intermittent operation occurs. Normal spark gap setting is 0.012 in. (0.304 mm).

High-frequency output varies with the spark gap setting. When a great amount of high frequency is necessary, the spark gaps can be adjusted to 0.013 in. (0.330 mm). This, however, increases high-frequency radiation which increases interference with communications equipment. It is suggested that a minimum spark gap setting of 0.008 to 0.012 in. (0.203 to 0.304 mm) be used.

IMPORTANT: *Spark gaps widen with normal operation. At regular inspections, check and maintain the spark gaps to ensure consistent welding results and compliance with FCC radiation regulations.*

IMPORTANT: *Do not clean or dress the points since the material at the tips is tungsten and is impossible to file. The entire point should be replaced when the tungsten section has completely disappeared.*

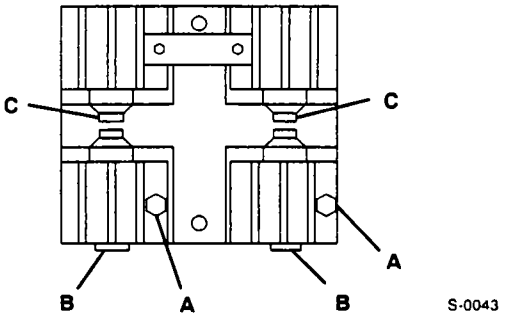


Figure 9-4. Spark Gap Adjustment

This unit is provided with a spark gap assembly located behind the lower front panel access door (see Figure 4-3). To adjust spark gaps, proceed as follows:

1. Open lower front panel access door.
2. Loosen screws A on both sides.
3. Place feeler gauge of proper thickness between points C.
4. Apply slight pressure against points so feeler gauge is held firmly in gap.
5. Tighten screws A.
6. Close and secure lower front panel access door.

9-8. CARBURETOR AIR TEMPERATURE SELECTOR (Figure 9-5)

CAUTION: IMPROPER AIR SELECTOR TUBE ADJUSTMENT can damage engine.

- *Use proper carburetor air temperature selector position for ambient temperature.*

The air intake to the air cleaner is equipped with a selector tube which allows cool air to be drawn from the surrounding engine compartment or heated air from around the exhaust manifold of the engine. Heated air prevents carburetor icing in cold weather.

Figure 9-5 shows the selector tube in the cold weather position. In cold weather, the tube must be approximately 1/2 in. (13 mm) away from the air cleaner inlet.

For warmer weather, loosen the selector tube and slide it down against the manifold and retighten.

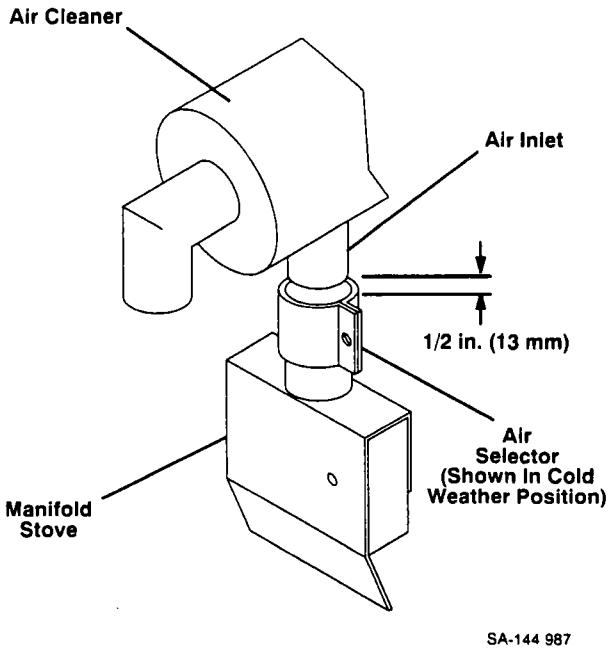


Figure 9-5. Carburetor Air Temperature Selector

9-9. AUTOMATIC IDLE CONTROL/GOVERNOR LINKAGE ADJUSTMENT (Figure 9-6)

This welding generator was shipped fully adjusted and ready for use. Should problems arise, select and perform the following procedure(s) to obtain proper engine idle and/or weld speed:

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine before inspecting, maintaining, or servicing.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

HOT ENGINE PARTS can cause severe burns.

- *Wear protective gloves and clothing when working on a hot engine.*

Maintenance to be performed only by qualified persons.

A. Weld Speed (1825 rpm) Adjustment

1. Shut down the engine.
2. Loosen the linkage socket nuts and remove the hardware securing the linkage socket to the governor. Rotate the linkage socket until the throttle stop plate is about 1/32 in. (0.79 mm) from the stop. A clockwise rotation of the linkage socket will shorten the governor linkage and reduce the gap; a counterclockwise rotation of the linkage socket will lengthen the governor linkage and widen the gap. (In some cases it may be necessary to adjust the linkage itself to obtain the 1/32 in. (0.79 mm) gap required.) Tighten the linkage socket nuts to lock the position of the linkage sockets.

IMPORTANT: *Check the linkage for freedom of movement throughout its entire travel. If the linkage is binding due to the linkage sockets being out of proper alignment, loosen the linkage socket nuts and rotate the socket slightly until unrestricted movement of the linkage is restored. Tighten the linkage socket nuts.*

3. Recheck all connections. Place the AUTO IDLE switch in the OFF position. Start the engine and allow it to reach normal operating temperature (about five minutes). Ensure that the CHOKE control is pushed fully in at this time.
4. Loosen the governor speed adjustment screw securing nut. Adjust the governor speed adjustment screw until a speed of 1825 rpm is obtained. Tighten the securing nut to maintain the governor speed setting.

IMPORTANT: *Whenever the governor speed is adjusted, the governor sensitivity MAY need readjustment (see Section 9-9C for procedure).*

B. Idle Speed (1200 rpm) Adjustment

1. Start the engine and allow it to reach normal operating temperature (about five minutes). Ensure that the CHOKE control is pushed fully in. Place the AUTO IDLE switch in the ON position.

Adjust the carburetor low speed mixture as follows:

2. Loosen solenoid screws, and allow solenoid to travel freely.

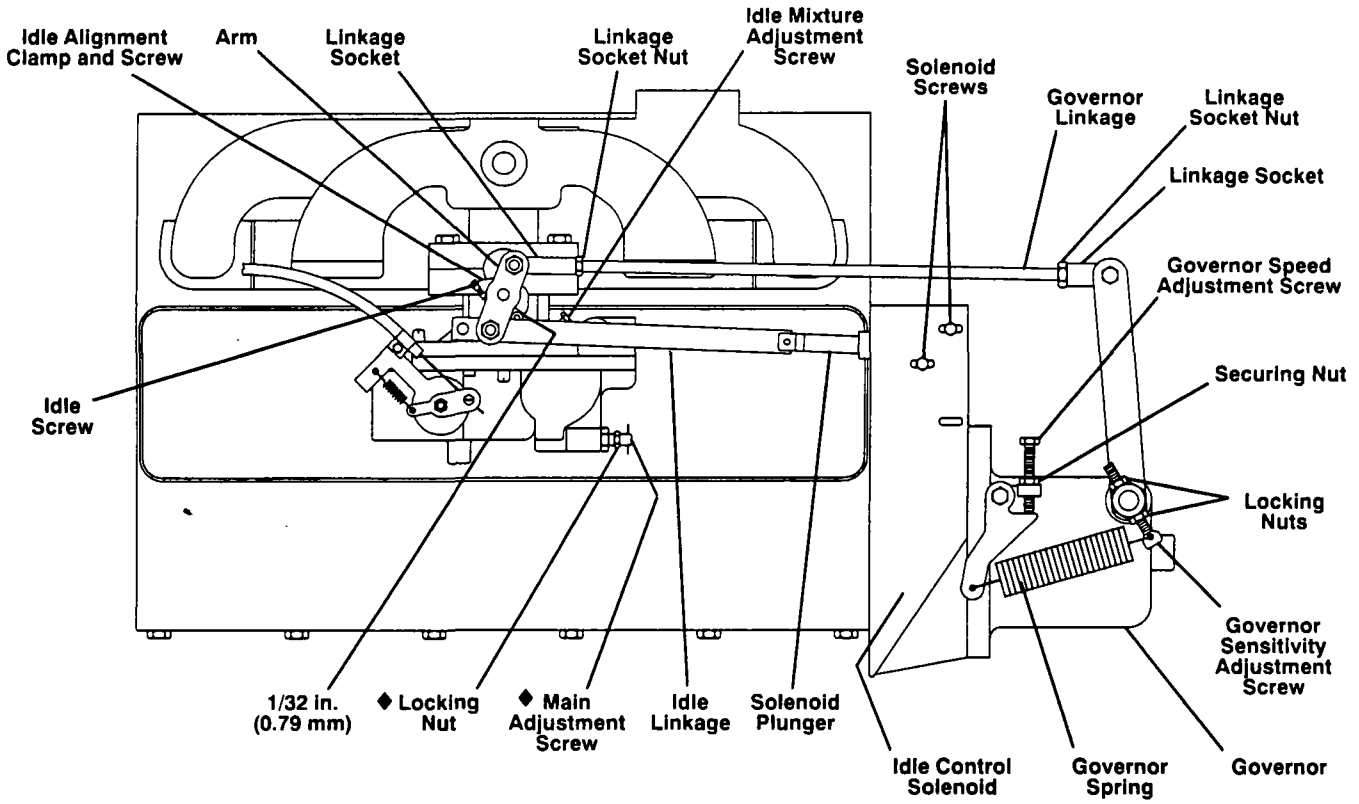


Figure 9-6. Idle Control/Governor Linkage Adjustment

3. Pull the arm toward the front of the welding generator to the idle position. Maintain pressure on the arm to butt against the idle screw throughout the following adjustments:

   a. Rotate the idle speed screw to obtain 550 rpm. Clockwise rotation of the screw will increase engine rpm, whereas counterclockwise rotation of the screw will decrease engine rpm.

   b. Rotate the idle mixture adjustment screw counterclockwise until the engine begins to falter or roll; then rotate the screw clockwise until the engine operates smoothly. Rotating the screw clockwise restricts the fuel flow, making the air-fuel mixture leaner. Rotating the screw counterclockwise admits more fuel, making the air-fuel mixture richer.

   c. When mixture is satisfactory, rotate idle speed screw to obtain 1200 rpm.

4. Loosen alignment screw and position the idle alignment clamp so that idle arm is positioned as shown in Figure 9-6. Tighten alignment screw.

5. Maintain pressure on the arm to butt the stop against the idle screw. Slide the solenoid plunger until fully bottomed in the solenoid body. Tighten the two solenoid screws. Recheck for 1200 rpm.

IMPORTANT: *Do not readjust the idle speed screw when adjusting the idle speed.*

IMPORTANT: *Check the idle linkage for freedom of movement throughout its entire travel. If the linkage is binding due to the linkage being out of proper alignment with the idle arm, adjust the idle alignment clamp until unrestricted movement of the linkage is restored. Repeat Steps 3, 4, and 5.*

C. Governor Sensitivity Adjustment

IMPORTANT: *Before making any governor sensitivity adjustment, be sure that the carburetor and associated linkages have been completely adjusted according to Sections 9-9A and 9-9B. If engine performance is still unsatisfactory, check and adjust the governor sensitivity as follows:*

Check the governor engine regulation by applying and removing a load.

If the engine is slow to increase rpm or rpm drops excessively under load, regulation range is too broad. Loosen one of two locking nuts, and decrease the governor spring tension by sliding the sensitivity adjustment screw inward.

If the engine hunts or surges with or without a load, regulation range is too narrow. Loosen one of the two locking nuts and increase governor spring tension by sliding the adjustment screw outwards.

IMPORTANT: *Whenever governor sensitivity is adjusted, governor speed (weld speed) must be readjusted (see Section 9-9A). Whenever the governor speed (weld speed) is adjusted, governor sensitivity may need adjustment.*

D. High Altitude Carburetor Main Mixture Adjustment (Optional) (Figure 9-6)

The carburetor can be equipped with an adjustable main jet for high-altitude operation (above 4000 ft. or 1219 m). Minor adjustment will be necessary for proper operation at a particular altitude.

Loosen the main adjustment screw locking nut. Apply a near-full engine load to the welding generator. Rotate the main adjustment screw clockwise until the engine begins to falter and loose rpm. Rotate the main adjustment screw counterclockwise until the engine operates smoothly; then continue counterclockwise rotation for 1/4 turn. Rotating the screw clockwise restricts fuel flow, making air-fuel mixture leaner. Rotating the screw counterclockwise admits more fuel, making the air-fuel mixture richer. Remove the engine load. Tighten the locking nut.

CAUTION: A TOO LEAN AIR-FUEL MIXTURE can damage valves.

- *Do not restrict fuel flow to the point where the air-fuel mixture is too lean.*

9-10. BRUSHES AND SLIP RINGS (Figure 9-7)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (–) battery cable from battery before inspecting, maintaining, or servicing.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

HOT ENGINE PARTS can cause severe burns.

- *Wear protective gloves and clothing when working on a hot engine.*

Maintenance to be performed only by qualified persons.

Brush life is very good under most operating conditions. Inspect brushes and slip rings every six months or whenever excitation voltage is lost. Be sure that slip rings are clean and brushes are free to move. If the welding generator has been operating under extremely dusty or dirty conditions, increase the frequency of inspection.

IMPORTANT: *If the welding generator has not been used for an extended period of time, oxidation may form on the slip rings causing excitation voltage to be lost.*

Under normal use, slip rings discolor to a dark brown. Clean slip rings if a buildup of brush material is present. Clean rings with a 220 or finer sandpaper, and polish rings with crocus cloth. Never use emery cloth because part of the emery will embed itself into the rings and, in turn, destroy the carbon brushes.

Replace brushes if they become chipped or broken or if less than 1/2 in. (12.7 mm) of brush material will be left at next projected inspection interval.

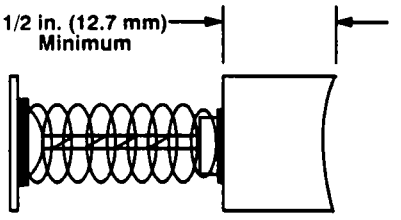


Figure 9-7. Brush Replacement

SECTION 10 – TROUBLESHOOTING

10-1. GENERAL

It is assumed that proper installation has been made, according to Section 4 of this manual, the operator is familiar with the function of controls, the welding generator was functioning properly, and the trouble is not related to the welding process.

10-2. BOOSTER BATTERY JUMP STARTING

If it is necessary to jump start this unit, use the following safety precautions and the step-by-step procedures in order of appearance.

WARNING: BATTERY GASES OR A DAMAGED BATTERY can explode thereby shattering the battery; BATTERY ACID can burn eyes, skin, destroy clothing, and damage other material; MOVING PARTS AND IMPROPER CONNECTIONS can cause serious personal injury and damage equipment.

- *Keep sparks, flames, cigarettes, and other ignition sources away from battery.*
- *Ensure that all personnel are a safe distance from batteries and clear of moving parts while starting.*
- *Do not jump start a frozen or completely discharged battery.*
- *Do not jump start a battery which has loose terminals or one having evidence of damage such as a cracked case or cover.*
- *Be sure that vent caps are tight and level on both batteries and cover both batteries with a damp cloth.*
- *Wear correct eye and body protection, and remove all metal jewelry.*
- *Keep jumper cables clear of moving parts.*
- *Ensure that both batteries are of the same voltage.*
- *Do not jump start a trailer mounted welding generator with the towing vehicle battery unless the trailer is completely disconnected from the towing vehicle.*
- *Do not jump start a vehicle mounted welding generator from the vehicle battery.*
- *If booster battery is installed in vehicle, do not allow vehicle to make contact with welding generator case or frame.*
- *Do not jump start by applying power to weld output receptacles or terminals.*
- *Do not allow jumper cables to contact any other metal while attaching or removing cables.*

1. Use properly insulated jumper cables of adequate size.
2. Connect ends of one cable to positive (+) terminals of each battery.
3. Connect one end of other cable to negative (–) terminal of booster battery.
4. Connect remaining end of cable to welding generator engine block at least 18 inches (457 mm) from battery (do not connect to welding generator case, frame, or equipment grounding terminal as damage to equipment can result).
5. Wait at least one minute after connecting cables before starting engine.
6. Start engine following procedures outlined in Section 8 (Sequence of Operation) of this manual and allow engine to return to idle speed. If the unit does not start after cranking for twenty seconds, stop the jump starting procedure. More than twenty seconds seldom starts the engine unless some mechanical adjustment is made.
7. Remove jumper cable from engine block.
8. Remove other end of same cable from booster battery negative (–) terminal.
9. Remove other jumper cable from welding generator battery positive (+) terminal.
10. Remove remaining end of cable from booster battery positive (+) terminal.
11. Discard damp cloths.

10-3. OVERLOAD PROTECTION

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (–) battery cable from battery before inspecting, maintaining, or servicing.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

HOT ENGINE PARTS can cause severe burns.

- *Wear protective gloves and clothing when working on a hot engine.*

INCORRECT FUSE can damage unit.

- *Use only replacement fuse of same size, type, and rating (see Parts List).*

A. Resetting Overload Breakers (Figure 7-1)

WARNING: Read and follow safety information at beginning of entire Section 10-3 before proceeding.

The overload breakers are automatic-trip type and are not manually operable. When the overload breaker button is in (ON position), the overload breaker is functional. When the button is out (OFF position), the breaker is open.

If an overload breaker trips when equipment use begins, a fault is probably present in the equipment. If a breaker trips after prolonged equipment use, an overload condition is probably present. Should a breaker trip, proceed as follows:

1. Locate and repair fault or reduce receptacle load.
2. Reconnect equipment to receptacle and start engine.
3. Reset overload breaker (depress button); it may be necessary to allow a cooling period before the breaker can be reset.
4. Resume operation.

B. Replacement Of 7.5 KVA/KW Fuses

WARNING: Read and follow safety information at beginning of entire Section 10-3 before proceeding.

Proceed as follows to replace fuses F1 and/or F2:

1. Open left side doors, and secure in open position.
2. Remove cover from junction box.
3. Check fuses F1 and F2, and replace if necessary.
4. Replace junction box cover.
5. Reconnect negative (–) battery cable.
6. Close and secure left side doors.

C. Replacement Of Low Oil Pressure And High Coolant Temperature System Shutdown Fuse

WARNING: Read and follow safety information at beginning of entire Section 10-3 before proceeding.

Proceed as follows to replace the fuse F on MS1:

1. Open right side doors, and secure in open position.
2. Remove right side panel.
3. Locate fuse F on bottom of MS1.
4. Remove and check fuse, replace if necessary.
5. Reinstall right side panel.
6. Reconnect negative (–) battery cable.
7. Close and secure right side doors.

D. Replacement Of Optional Low Current Control Fuse

WARNING: Read and follow safety information at beginning of entire Section 10-3 before proceeding.

Proceed as follows to replace the fuse F3:

1. Open right side doors, and secure in open position.
2. Remove right side panel.
3. Locate F3 on top of high frequency panel mounting bracket.
4. Remove and check F3, replace if necessary.
5. Reinstall right side panel.
6. Reconnect negative (–) battery cable.
7. Close and secure right side doors.

10-4. CIRCUIT BOARD HANDLING PRECAUTIONS

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (–) battery cable from battery before inspecting, maintaining, or servicing.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

HOT ENGINE PARTS can cause severe burns.

- *Wear protective gloves and clothing when working on a hot engine.*

Maintenance to be performed only by qualified persons.

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

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

INCORRECT INSTALLATION or misaligned plugs can damage circuit board.

- *Be sure that plugs are properly installed and aligned.*

EXCESSIVE PRESSURE can break circuit board.

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

If any circuit board is not working, follow the preceding precautions, and contact nearest Factory Authorized Service Station.

10-5. TROUBLESHOOTING (Tables 10-1, 10-2, And 10-3)

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Stop engine, and disconnect negative (–) battery cable from battery before inspecting, maintaining, or servicing.*

MOVING PARTS can cause serious injury.

- *Keep away from moving parts such as fans, belts, and rotors.*

HOT ENGINE PARTS can cause severe burns.

- *Wear protective gloves and clothing when working on a hot engine.*

Troubleshooting to be performed only by qualified persons.

The following table is designed to diagnose and provide remedies for some of the troubles that may develop in this welding generator.

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

Table 10-1. Weld/Power Troubleshooting

WELDING TROUBLE	PROBABLE CAUSE	REMEDY
No or low weld output; 3 kVA/ kW auxiliary power available.	Loose or poor electrical connections.	Check internal and external connections to weld output terminals.
	Process switch S12 in wrong position for welding process.	Place S12 in SMAW position for Shielded Metal Arc Welding; place in the GTAW position for Gas Tungsten Arc Welding.
	REMOTE AMPERAGE CONTROL switch S5 is in ON position with no remote control connected.	Place S5 in the OFF position, or connect a remote control to the REMOTE AMPERAGE CONTROL receptacle RC3.
	RANGE switch S3 is between positions.	Be sure S3 is properly positioned.
	Control relay CR1.	Check and replace CR1 if necessary.
	Control relay CR3.	Check and replace CR3 if necessary.
Low or high open-circuit voltage at weld output terminals.	Incorrect engine speed.	Check and adjust engine speed according to Section 9-8.
Erratic weld output.	Loose or dirty connections; improper connection to workpiece.	Check connections both inside and outside welding generator. Clean and tighten connections as necessary.
	Range switch S3.	Check and replace S3 if necessary.
Erratic weld and power output.	Poor contact between slip rings and brushes.	Clean slip rings and replace worn brushes if necessary (see Section 9-7).
No optional Low Current Control weld output; regular weld output available.	Range switch S3 is between ranges.	Place S3 in Minimum position (see Section 7-17).
	Fuse F3.	Check and replace F3 if necessary (see Section 10-3).
	LOW CURRENT CONTROL switch S11 in the OUT position, or S11 not operating properly.	Place S11 in the IN position, or check and replace S11 if necessary.
	RANGE SELECTOR switch S14.	Check and replace S14 if necessary.

Table 10-1. Weld/Power Troubleshooting (Continued)

WELDING TROUBLE	PROBABLE CAUSE	REMEDY
No weld or 3 kVA/kW auxiliary power output.	Poor contact between brushes and slip rings.	Clean slip rings and replace worn brushes if necessary (see Section 9-7).
Tungsten electrode oxidizing and not remaining bright after conclusions of weld.	Water in torch.	Refer to torch parts list for part or parts requiring replacement, and repair torch as necessary.
	Loose gas fittings on regulator or gas line. This will draw air into the weld zone.	Check and tighten all gas fittings.
	Insufficient postflow time.	Increase postflow time.
	Drafts blowing gas shield away from tungsten.	Shield weld zone from drafts.
Wandering arc; poor control of direction of arc.	Use of tungsten considerably larger than recommended.	Use proper size tungsten (see Table 9-3).
	Improperly prepared tungsten.	Prepare tungsten as instructed in Section 9-6.
	Gas flow rate too high.	Reduce flow rate.
Lack of high frequency; difficulty in establishing a GTAW arc.	Use of tungsten larger than recommended for welding amperage.	Use proper size tungsten for welding amperage (see Table 9-3).
	Dissipation of high frequency from torch or work cable.	Check that torch or work cables are not near any grounded metal.
	Weld cable leakage.	Check cables and torch for cracked or deteriorated insulation or bad connections. Repair or replace necessary parts.
	Improper spark gap G.	Check G, and adjust if necessary (see Section 9-5).
No high frequency.	HIGH FREQUENCY switch S4 in OFF position, or S4 not operating properly.	Place S4 in the desired position (see Section 7-7), or check and replace S4 if necessary.
	Improper spark gap G.	Check G, and adjust if necessary (see Section 9-5).
	Control relay CR2 if HIGH FREQUENCY switch S4 is in the START position.	Check and replace CR2 if necessary.
	Capacitor C2.	Check and replace C2 if necessary.
	Transformer T1 or coupling coil T2.	Check and replace T1 or T2 if necessary.
	High Frequency Start Control Board PC2 if HIGH FREQUENCY switch S4 is in the START position.	See Section 10-4, and contact Factory Authorized Service Station.

Table 10-2. Auxiliary Power Troubleshooting

AUXILIARY POWER TROUBLE	PROBABLE CAUSE	REMEDY
No 3 kVA/kW power output; weld output available.	OVERLOAD BREAKER CB1 or CB2 open.	Reset CB1 or CB2 (see Section 10-3).
	Receptacle or receptacle wiring.	Check receptacle RC1 or optional RC2 for proper connections (see Section 5-5). Replace receptacle if necessary.
No 7.5 kVA/kW power plant output; weld output available.	Improper connections.	Check connections according to Section 5-4.
	Fuse F1 or F2.	Check and replace F1 or F2 if necessary (see Section 10-3).
Low or high 3 kVA/kW auxiliary power output.	Incorrect engine speed.	Check and adjust engine speed according to Section 9-8.
No weld or 3kVA/kW auxiliary power output.	Poor contact between brushes and slip rings.	Clean slip rings and replace worn brushes if necessary (see Section 9-7).

Table 10-3. Engine Troubleshooting

ENGINE TROUBLE	PROBABLE CAUSE	REMEDY
Engine does not crank.	IGNITION switch S7.	Check S7, and replace if necessary.
	Start switch PB1.	Check PB1, and replace if necessary.
	Battery.	Inspect the electrical system (see Section 9-1). Test the battery and recharge it if necessary (see Section 9-9). If the battery does not recharge, replace the battery.
		Jump start the engine employing approved safety practices and booster. Jump starting instructions provided in Section 10-2.
	Starter solenoid.	See Engine Owner's Manual (F-163 Engine).
Engine cranks but fails to start.	Fuse F on Low Oil Pressure And High Coolant Temperature Shutdown System Switch MS1 open.	Check and replace fuse F on MS1 if necessary according to Section 10-3.
	Engine problems.	See Engine Owner's Manual (F-163 Engine).
Engine ran fine but slowly stopped; unable to start engine.	Fuel tank cap vent in CLOSED position.	Examine inside of fuel tank cap, and rotate valve to the OPEN position.
	Out of fuel.	Fill fuel tank with fresh, clean fuel (see F-163 Engine).
Engine suddenly shuts down; OIL & TEMP warning light on.	Low oil or coolant level (other probable causes can be found in the engine manual).	Add oil or coolant.
	High coolant temperature or low oil pressure.	Correct coolant temperature or oil pressure problems (see Section 10-3).
BATTERY warning light on.	Loose or dirty electrical connection.	Inspect ignition system. Clean and tighten connection.
	Alternator/regulator.	Check and replace alternator/regulator (see Engine Owner's Manual, F-163 Engine).
Battery discharges between uses.	IGNITION switch S7 left in ON position.	Be sure S7 is left in the OFF position when the unit is shut down.
	Buildup of acid on top of battery (white-grayish substance).	Clean battery with soda solution; rinse with clear water.
	Battery.	Check battery, and replace if necessary.
Engine remains at weld/power rpm when AUTO IDLE switch S2 is in the ON position and no load is applied.	AUTO IDLE switch S2.	Check S2, and replace if necessary.
	Throttle solenoid TS1.	Check TS1, and replace if necessary.
	Auto Idle Board PC1.	See Section 10-4, and contact Factory Authorized Service Station.
Engine remains at idle rpm when AUTO IDLE switch S2 is in the ON position and an arc is struck.	Current transformer CT2	Check CT2, and replace if necessary.
	Auto Idle Board PC1.	See Section 10-4, and contact Factory Authorized Service Station.

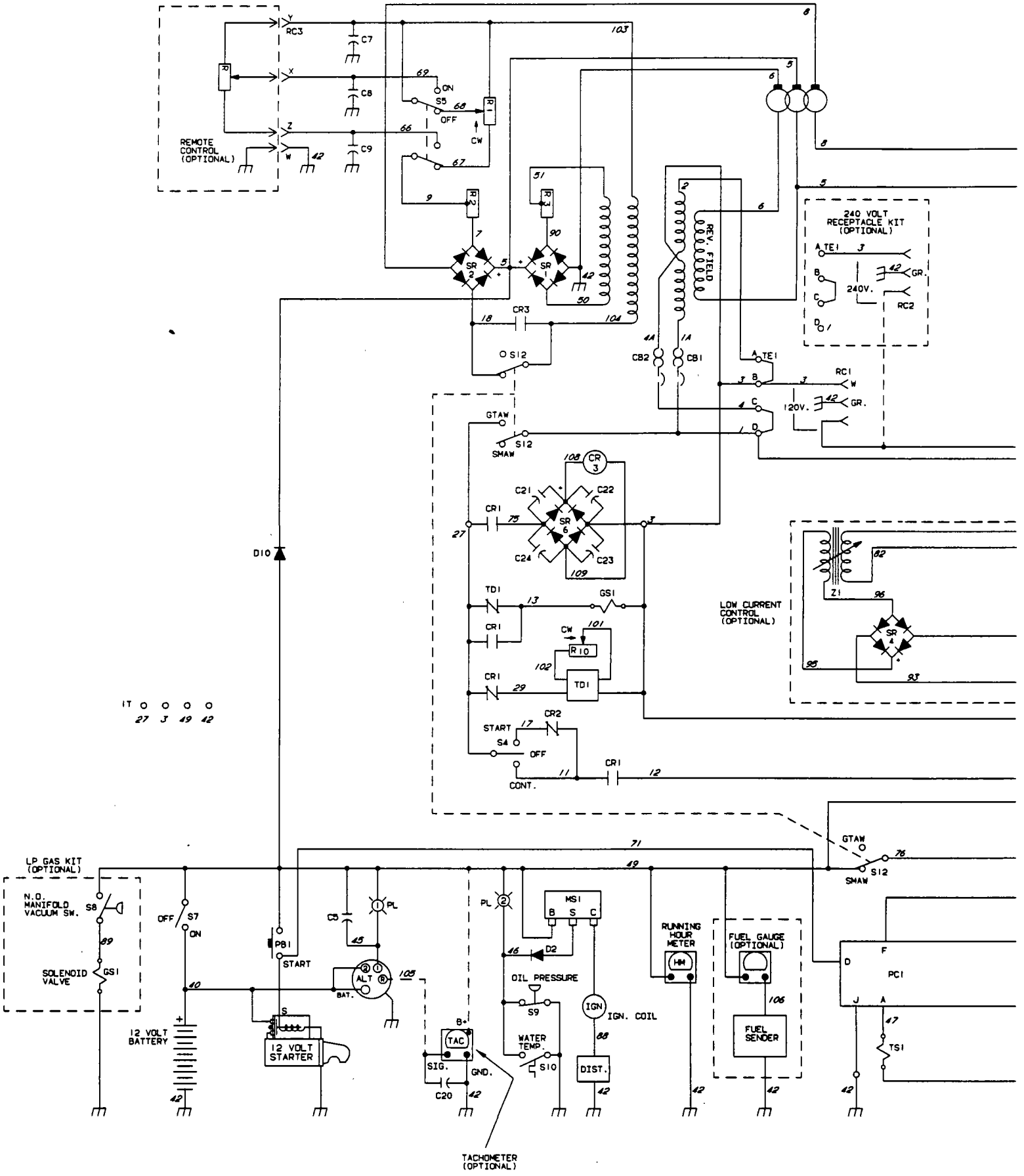
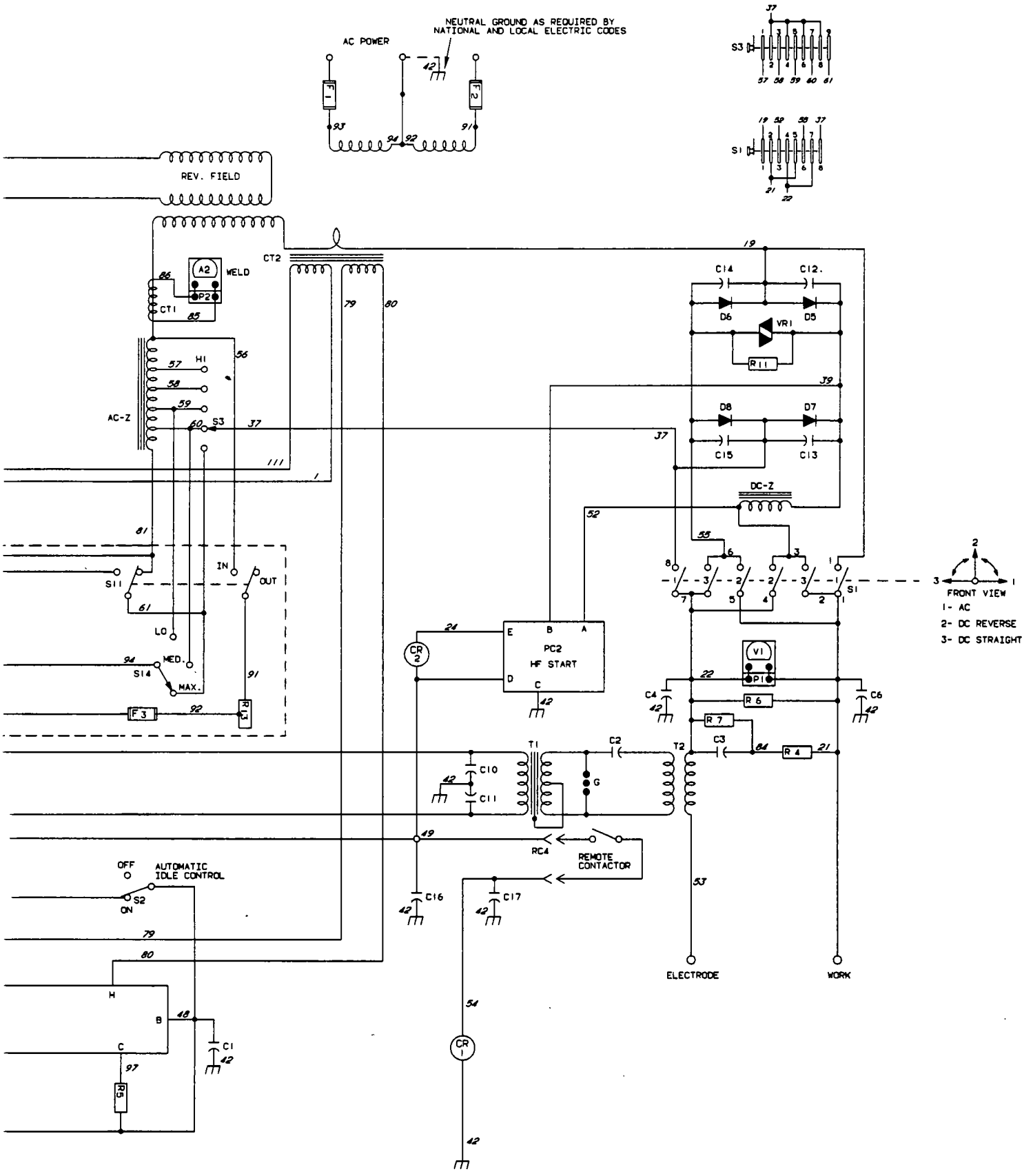
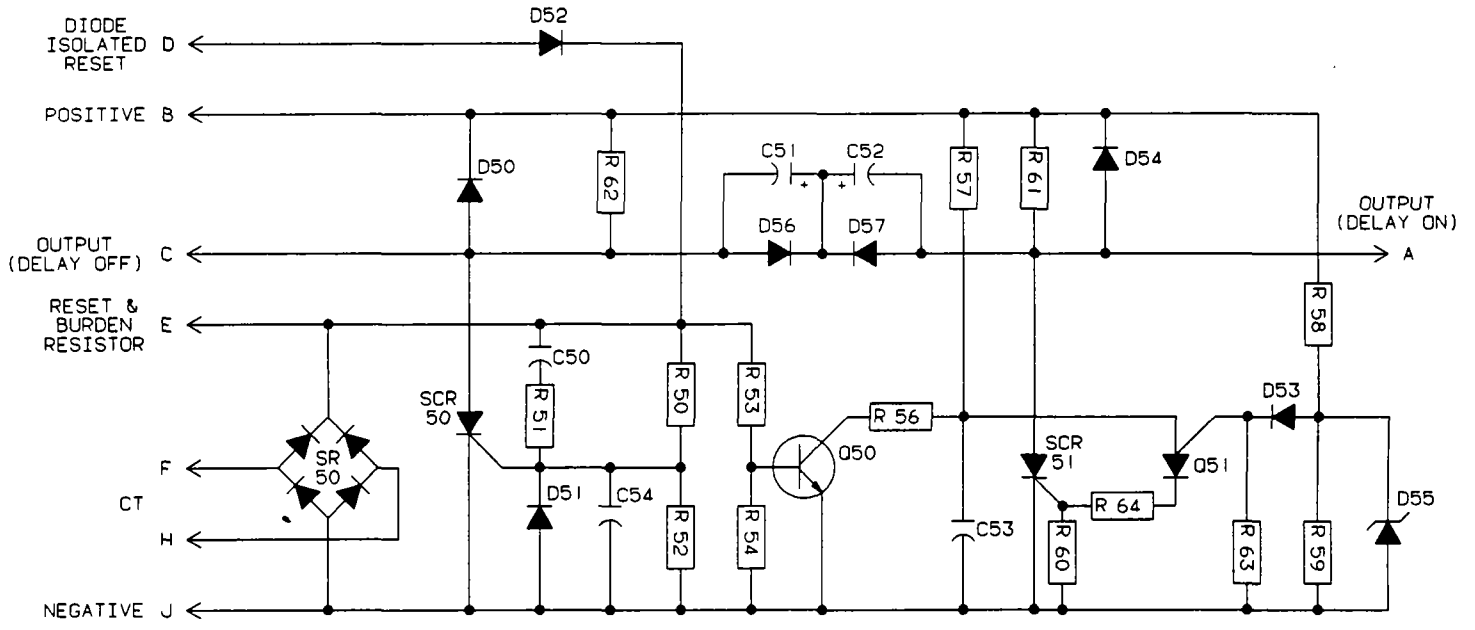


Diagram 11-1. Circuit Diagram For Welding Generator

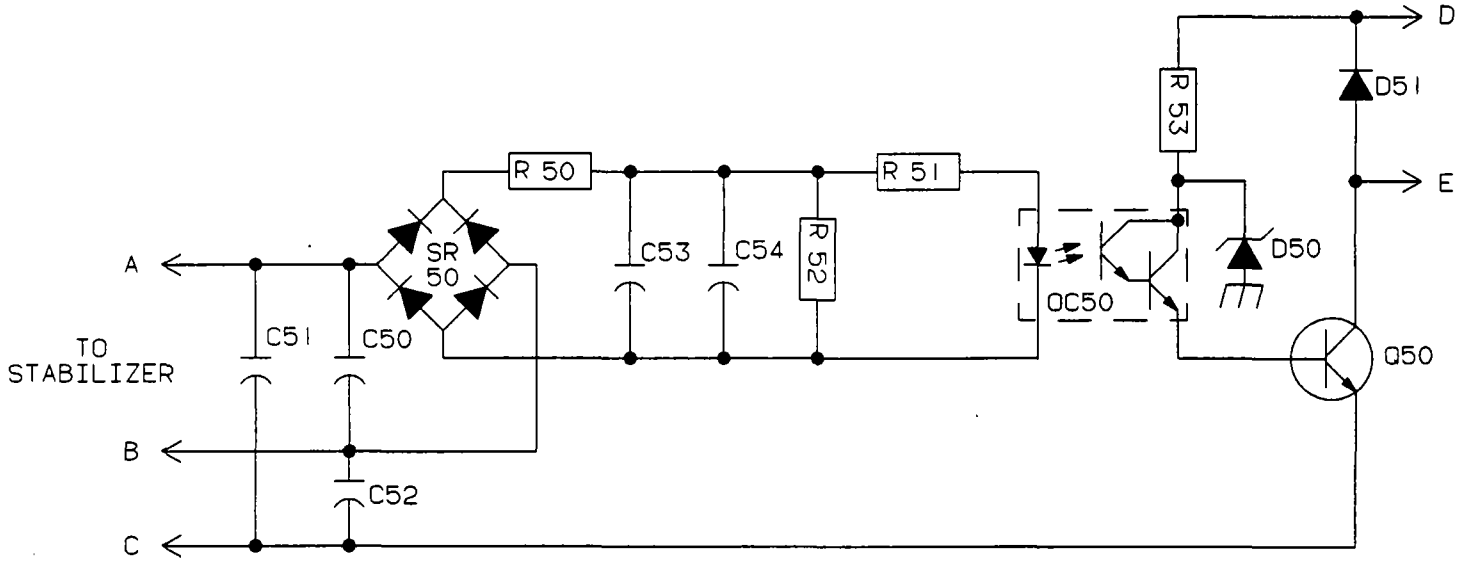


Circuit Diagram No. SD-136 407-A



Circuit Diagram No. SA-071 600-A

Diagram 11-2. Circuit Diagram For Automatic Idle Control Board PC1



Circuit Diagram No. SA-084 076-A

Diagram 11-3. Circuit Diagram For HF Start Control Board PC2

SECTION 12 – CERTIFICATION FOR HIGH FREQUENCY ARC WELDING EQUIPMENT

12-1. GENERAL

The following information is necessary to make a proper installation of the high-frequency arc welding equipment described in this instruction manual. In order to comply with Part 18 of the Rules and Regulations of the Federal Communications Commission (FCC), the certificate in the front of this manual must be filled in completely and signed after the unit has been correctly installed. The certificate must be kept WITH THE EQUIPMENT AT ALL TIMES to comply with the regulation. The manufacturer of the equipment covered herein has conducted approved field tests and certifies that the radiation can be expected to be within the legal limits if the correct installation procedures, as outlined, are followed. The importance of a correct installation cannot be overemphasized since case histories of interference due to high-frequency stabilized arc welding equipment have shown that in most cases, an inadequate installation was at fault. In the event that interference with authorized FCC services occurs, the user is required to take suitable steps to clear the situation. The Factory Service Department personnel will assist the user by supplying technical information.

Instead of complying with the installation requirements and the certification of each individual installation, the user may elect to certify the entire plant by having a qualified engineer make a plant radiation survey. In such cases, these instructions could serve as a guide in minimizing interference that might be caused by the high-frequency arc welding equipment.

Many processes and applications of processes require open-circuit voltages sufficient to jump from the electrode to the work without making direct contact. The maximum open-circuit voltage (OCV) of a welding power source is not sufficient for this. In the Submerged Arc Welding (SAW) process, granules of flux often get between the electrode and the workpiece making starting of the arc difficult at normal open-circuit voltages. A higher voltage is also required to start and maintain a stable arc in processes like the Gas Tungsten Arc Welding (GTAW) process. In these cases it will take several thousand volts to cause an electrical spark to jump this gap between the electrode and the work, creating an initial path of ionization that the arc current can follow without the hazards that would be present at power frequency.

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

12-2. DEFINITIONS

A. High-Frequency Assisted Arc Welding Power Sources

In the arc welding process, high frequency may be used for initiating an arc or stabilizing the arc once it is struck, or for both functions.

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

B. Welding Circuit

The welding circuit consists of all attachments connected to the welding terminals.

C. Welding Terminals

Welding terminals are the terminals which provide welding power and high-frequency energy to the arc.

D. Electrode Terminal

The electrode terminal is the terminal to which the electrode cable or welding torch is connected.

E. Welding Torch

A device used in the Gas Tungsten Arc Welding (GTAW) process to control the position of the electrode, to transfer current to the arc, and to direct the flow of shielding gas.

F. Work Terminal

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

G. Welding Zone

The welding zone is the space within 50 ft. (15 m) in all directions from the midpoint between the power source and the welding arc (see Figure 12-6).

H. Bonding

Bonding refers to connecting metallic objects together to cause the objects to be at the same potential regardless of any current flow between them (see Figures 12-3 and 12-4).

I. Grounding (Earthing)

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

J. Receiver

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

K. Conduction

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

L. High Frequency

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

M. High-Frequency Assisted Arc Welding

High-frequency assisted arc welding refers to any of the arc welding processes requiring high frequency.

N. Interference

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

O. Radiation

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

12-3. HIGH-FREQUENCY RADIATION

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

A. Direct Radiation From The Power Source Or High-Frequency Accessory Unit

Direct radiation is that radiation emanating directly from the power source or accessory unit. Radiation from the power line and welding power source accessories is not considered to be direct radiation from the power source or accessory unit.

B. Direct Radiation From The Welding Circuit

Any attachment to the output terminals of the high-frequency source is capable of acting as an antenna and radiating high-frequency energy. Attachments include weld cables, torches, worktables, etc. Since direct radiation from the welding circuit is the major source of radiation, it is important to keep attachments to a minimum.

C. Conduction And Radiation From The Power Line

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

D. Reradiation

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

12-4. LOCATION

Locate the high-frequency power source as close to the welding process as possible. Also consider the nearness of a suitable ground connection when selecting a site for the installation of the power source. Ideally, the high-frequency power source should be located in an area where there is a limited amount of miscellaneous wiring (lighting, power, telephone, communications, and other unshielded conductors) located within the welding zone. Ungrounded, metallic conductors in the welding zone can act as antennas which will pick up, conduct, or reradiate the high-frequency energy transmitted by the welding circuit. All miscellaneous wiring in the welding zone should be enclosed in grounded, rigid metallic conduit, copper braid, or some other material having an equivalent shielding efficiency, and grounded at 50 ft. (15 m) intervals (see Figure 12-1).

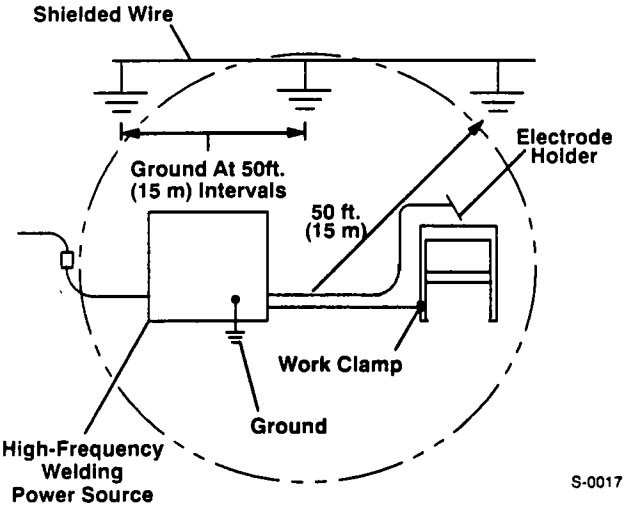


Figure 12-1. Requirements To Minimize Reradiation Pickup In The Vicinity Of The Welding Zone

12-5. GENERAL INSTALLATION PROCEDURES

A. Weld Cables

Keep the weld cables as short as possible and do not exceed 25 ft. (8 m) in length. Position the cables as close together and as close to the floor or ground plane as possible.

If the welding operation must be carried out at a point farther than 25 ft. (8 m) from the welding power source, use a portable high-frequency source and locate the portable unit within 25 ft. (8 m) of the welding electrode.

B. High-Frequency Assisted Arc Welding Power Sources

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

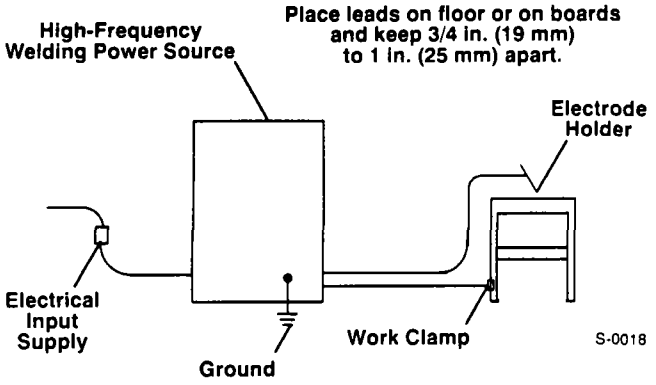


Figure 12-2. General Rules For Welding Leads

C. Grounding (Earthing) The Weld Cables

Be sure that the enclosure of the high-frequency power source is firmly grounded to the WORK terminal. If the high-frequency power source is not labeled as being internally high-frequency grounded, then this ground must be made by grounding the enclosure to the WORK terminal with No. 12 AWG gauge or smaller wire. Connect the ground wire to a driven ground rod or to a water pipe which enters the earth within 10 ft. (3 m) of the high-frequency power source.

D. Metal Buildings

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

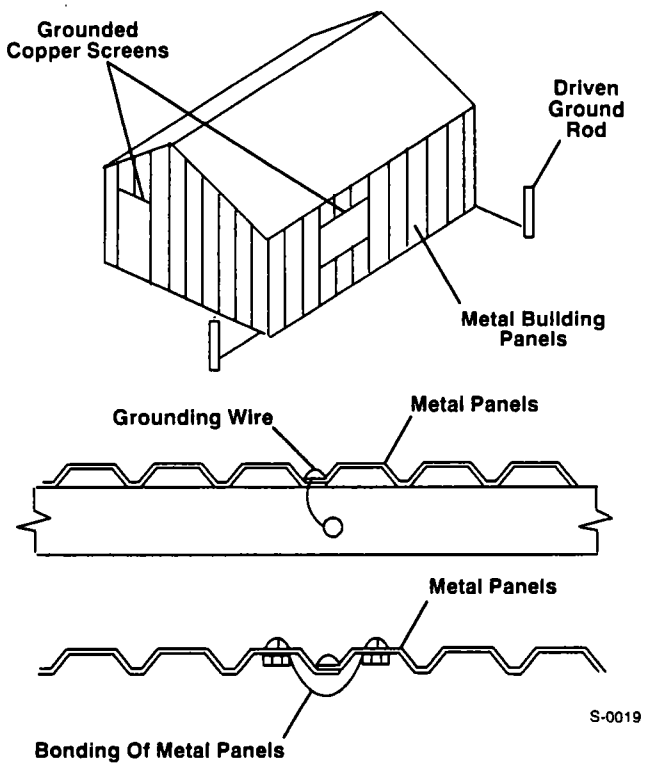


Figure 12-3. Grounding And Bonding Panels Of Metal Building

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

E. Shielding Of Miscellaneous Wiring In The Welding Zone

Ungrounded, metallic conductors in the welding zone can act as antennas which will pick up, conduct, and/or reradiate the high-frequency energy transmitted by the welding circuit located within or near the welding zone. This means that all ungrounded water pipes must be grounded, and that all lighting, power, telephone, communications, and other conductors within the welding zone must be enclosed in grounded, rigid metallic conduit, copper braid, or some other material having an equivalent shielding capability (spirally wound, flexible, metallic conduit is not suitable). Shielding of the miscellaneous wiring in the welding zone must be grounded at 50 ft. (15 m) intervals. Excellent low resistance electrical connections must be maintained between conduit sections (see Figure 12-4).

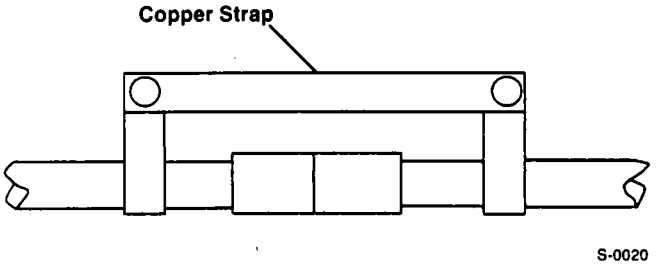


Figure 12-4. Bonding Method For Poor Conductors

F. Power Service

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

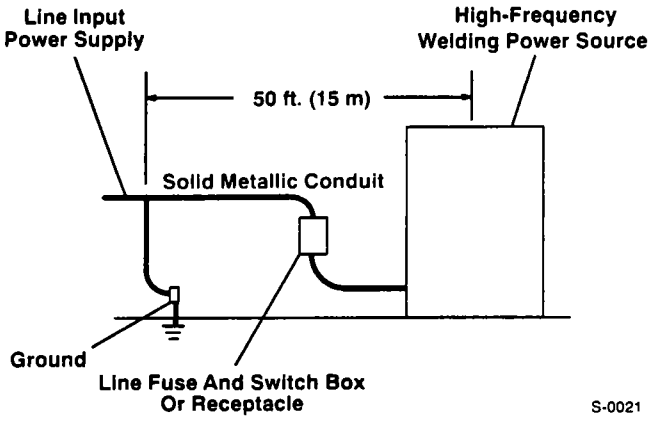


Figure 12-5. Installation Of High-Frequency Stabilized Arc Welding Power Source

12-6. GUIDELINES FOR INSTALLATION OF HIGH-FREQUENCY ASSISTED ARC WELDING POWER SOURCES

1. Locate the equipment so that the ground wire of the high-frequency power source can be kept as short as possible.
2. Shield the line input power leads up to the point of connection with the enclosure of the high-frequency power source as specified by the manufacture's requirements (see section 12-5F).
3. Be sure that there is good electrical contact made at the enclosure of the high-frequency welding power source, through the conduit, and back to the service box. Be sure that the conduit system is continuous to a point at least 50 ft. (15 m) from the equipment, and that the conduit system is one complete run within the high-frequency zone. If rigid, metallic conduit is not used, be sure that the shielding used has equivalent shielding efficiency. Copper sleeving, lead covered cable, or the equivalent, is satisfactory. Spirally wound, flexible, metallic conduit is not suitable.
4. Keep WORK and ELECTRODE cables as short and straight as possible.
5. Keep weld cables to a maximum length of 25 ft. (8 m).
6. Keep weld cables as close together and as close to the ground plane as possible.
7. Adjust spark gap setting to the minimum setting given in this manual.
8. Secure all service and access doors before operating.
9. Visualize the welding zone as a sphere with a 50 ft. (15 m) radius centered on a point between the power source and the electrode holder (see Figure 12-6), and proceed as follows:
   a. Have all unshielded power, lighting, and communication wires within the welding zone placed in grounded shields or relocated outside the welding zone.
   b. Ground all large metallic objects, long guy wires, or support wires within the welding zone.
   c. Be sure that there are no external power or telephone wires, which may be off the immediate premises, within the welding zone.

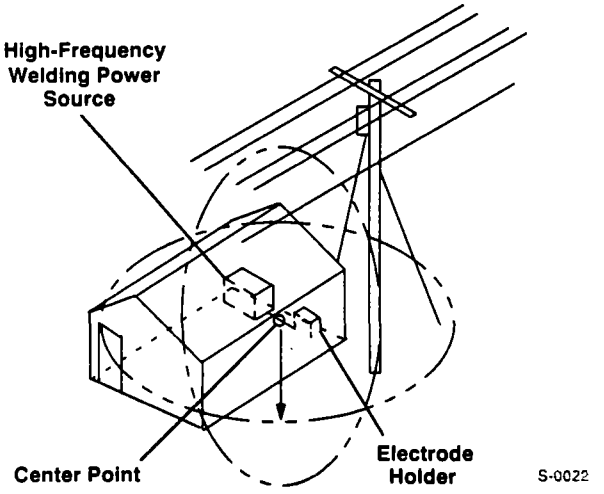


Figure 12-6. Welding Zone

10. Use driven ground rods which enter the ground 10 ft. (3 m) or less from the ground connection, or cold water pipes, as the ground for the high-frequency welding power source.
11. Be sure that all ground connections are clean and tight.
12. If the high-frequency welding power source is operated within a metal building, be sure that the building is properly grounded.

12-7. INSTALLATION GUIDELINES CHECKLIST

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

1. Is equipment properly located?
   (See Sections 12-4, 12-5D, 12-5E, 12-6.1, and 12-6.9.)
2. Are ac input power connections properly made?
   (See Sections 12-5B, 12-6.2, and 12-6.3.)
3. Are weld cables and equipment properly installed?
   (See Sections 12-5A, 12-6.4, 12-6.5, and 12-6.6.)
4. Are ground connections properly made?
   (See Sections 12-5C, 12-6.1, 12-6.6, 12-6.11, and 12-6.12.)
5. Is equipment properly set up and adjusted?
   (See Sections 12-6.7 and 12-6.8.)

SECTION 13 – PARTS LIST

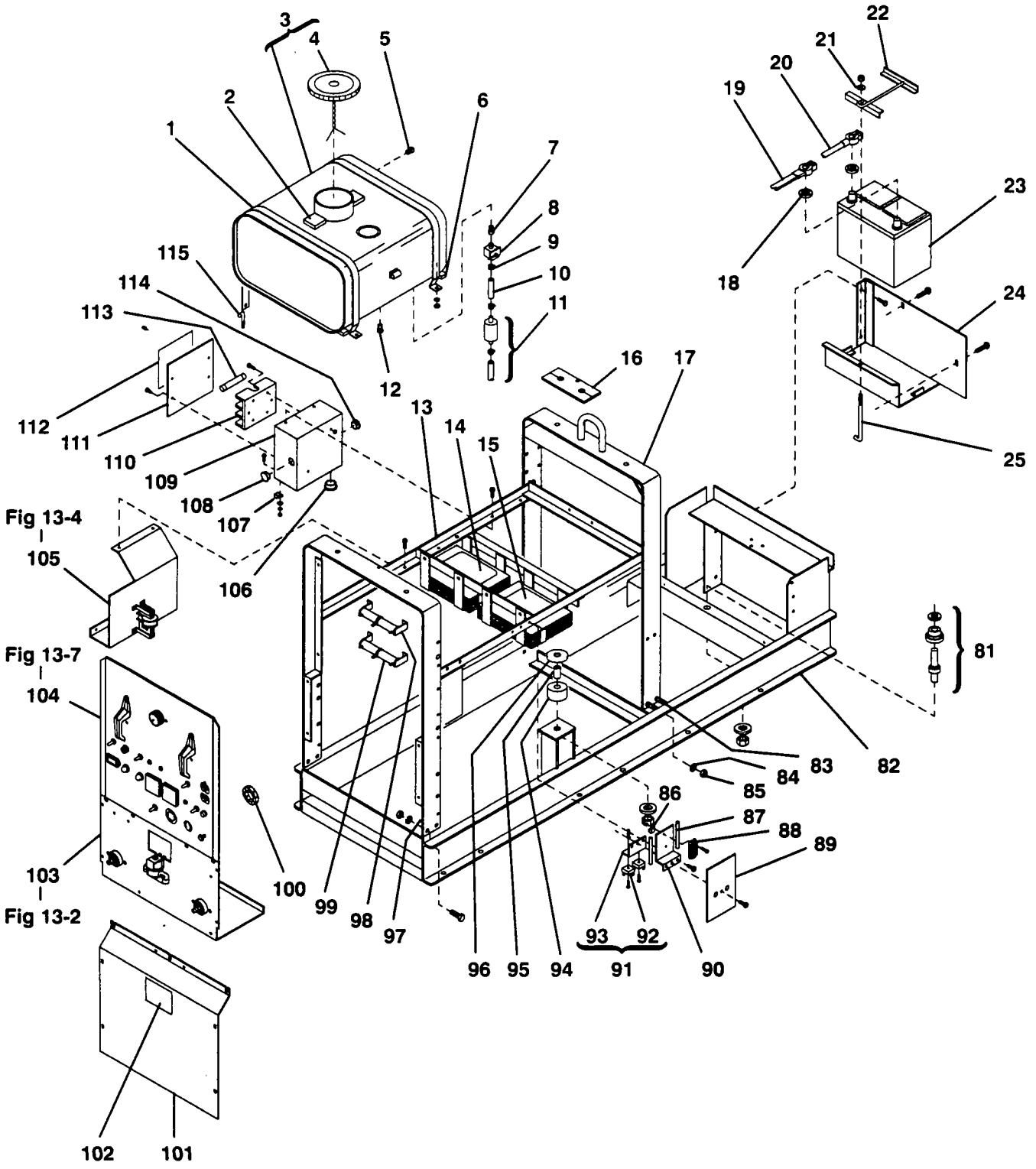


Figure 13-1. Main Assembly

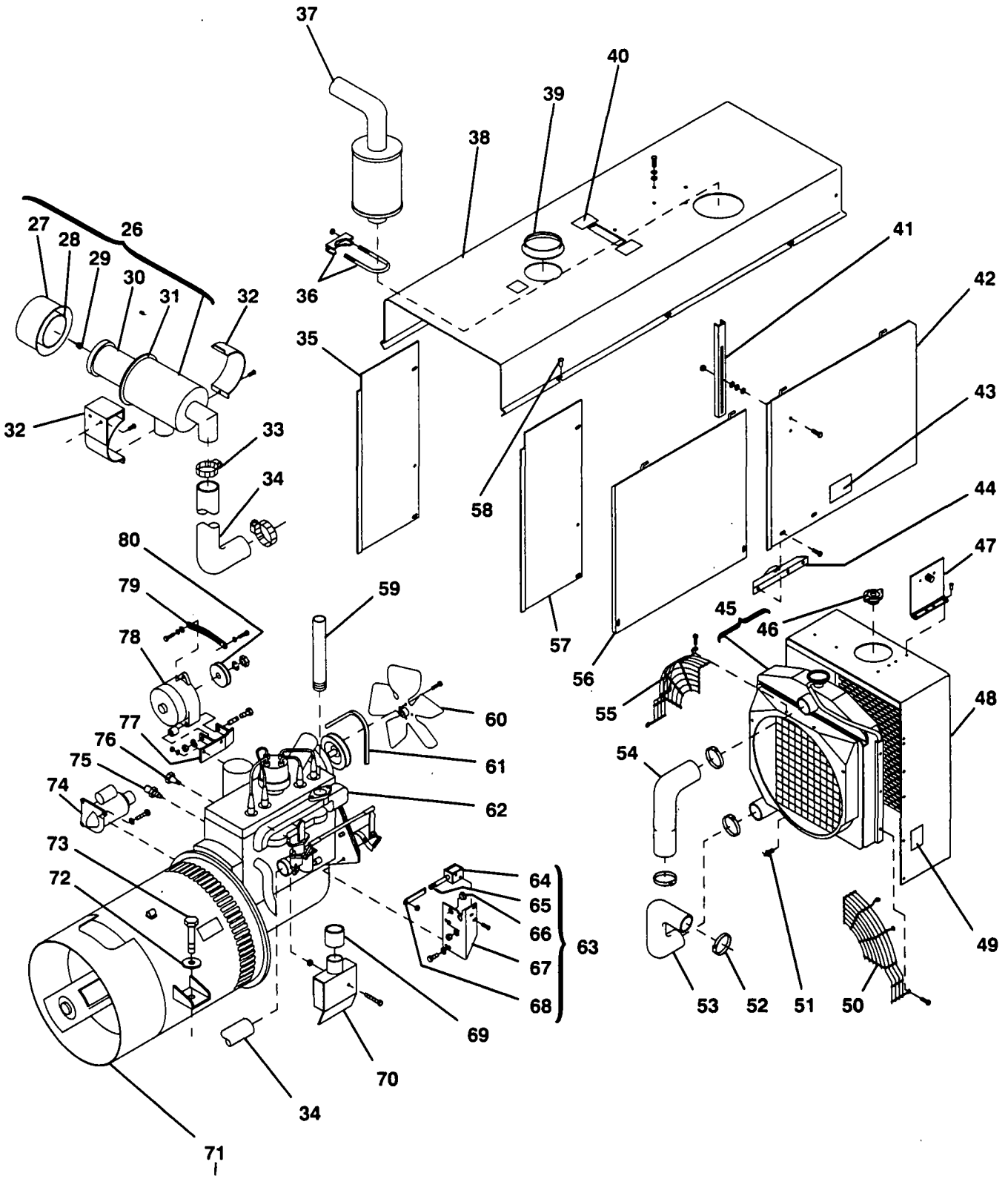


Fig 13-8

SD-086 637-E

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 13-1. Main Assembly	
1		089 517	STRAP, fuel tank	2
2		134 771	PLUG, protective .640sq (used as engine door bumpers also)	6
3		030 194	TANK, fuel (consisting of)	1
3		♦053 664	TANK, fuel (consisting of)	1
4		115 000	· CAP, fuel tank	1
		♦125 756	SENDER, fuel gauge	1
		♦020 108	FLANGE, fuel gauge	1
		♦118 066	GUAGE, fuel elec 12V neg grd	1
5		602 938	FITTING, pipe-plug sq hd .125NPT	1
6		097 507	STRIP, rbr adh back .125 x 1.000 x 20.500	2
7		010 869	FITTING, pipe brs bushing 1/4 x 1/8NPT	1
8		096 439	VALVE, ball .125-27NPTF inlet x .250tbg	1
9		084 173	CLAMP, hose .460-.545 clp dia	3
10		107 816	HOSE, SAE .250 ID x .500 OD (order by ft)	1ft
11		047 420	FILTER, fuel inline	1
12		605 288	FITTING, pipe galv plug sq hd .250NPT	1
13		084 479	FRAME, mtg-reactor/stabilizer	1
14	AC-Z	003 135	REACTOR	1
15	DC-Z	003 097	STABILIZER	1
16		017 479	SEAL, weather-lift eye	1
17		092 097	FRAME, center/lift eye base	1
18		108 081	TERMINAL PROTECTOR, battery post	2
19	NEG	047 812	CABLE, bat neg	1
20	POS	023 626	CABLE, bat pos	1
21		010 954	WASHER, flat stl .406 ID x 1.250 OD	1
22		134 779	HOLDDOWN, battery	1
23	BAT	071 678	BATTERY, stor 12V 550crk 165rsv	1
24		134 782	BATTERY BOX	1
25		082 672	BOLT, L stl .312-18 x 6.375	1
		604 433	NUT, stl slflkg hex hvy .312-18	1
26		018 765	AIR CLEANER, intake (consisting of)	1
27		018 859	· CAP, dust	1
28		008 698	· BAFFLE, dust cap	1
29		021 117	· NUT, wing	1
30		+017 309	· ELEMENT	1
31		000 272	· CLAMP ASSEMBLY	1
32		031 868	BRACKET, mtg air cleaner	1
33		010 861	CLAMP, hose 1.312-2.250 clp dia	2
34		018 365	HOSE, air cleaner intake	1
35		003 075	PANEL, side LH	1
36		010 875	CLAMP, muffler 2.000dia	1
37		107 632	MUFFLER, exhaust spark arrestor	1
38		090 656	COVER, top	1
39		035 968	WASHER, flat rbr 3.625 ID x 5.875 OD x .062thk	1
40		108 487	LABEL, warning falling equipment can cause serious etc	2
41		004 130	BRACKET, support door	2
42		+090 699	DOOR, engine cmpt RH	1
		+090 700	DOOR, engine cmpt LH	1
43		121 509	LABEL, warning do not run engine	2
		053 430	LABEL, diesel engine maintenance (LH engine door)	1
44		090 628	LATCH	2
45		089 947	RADIATOR w/SHROUD, (consisting of)	1
46		605 982	· CAP, rdtr pressure 7 lb	1
47		028 089	DOOR, access rdtr	1
48		+003 559	ENCLOSURE, rdtr	1
48		+003 648	ENCLOSURE, rdtr w/tachometer	1
49		011 198	LABEL, warning fan	2

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 13-1. Main Assembly (Continued)	
50		123 504	GUARD, fan RH	1
51		006 015	FITTING, pipe brs drain cock 1/4NPT	1
52		010 861	CLAMP, hose 1.312-2.250 clp dia	6
53		091 418	HOSE, rdtr lower	1
54		017 363	HOSE, rdtr	1
55		123 505	GUARD, fan LH	1
56		090 690	PANEL, side generator	2
57		000 302	PANEL, side RH	1
58		089 343	RIVET, truss hd 1 in	6
59		003 631	PIPE, exhaust	1
60		088 781	FAN, engine 15.500 CCW rotation	1
61		062 263	BELT, (included w/engine)	1
62		136 404	ENGINE, gas	1
		006 014	FITTING, brs flrd invt elb M 1/4 x 1/8NPT	1
		111 851	LINE, fuel	1
63		005 772	CONTROL, weld/idle (consisting of)	1
64		005 373	· SOLENOID, 14VDC .52A	1
65		010 837	· PIN, spring CS .093 x .625	1
66		010 493	· BUSHING, snap-in nyl .625 ID x .875mtg hole	1
67		047 474	· BRACKET, mtg idle device	1
68		071 194	· STRIP, mtg throttle	1
69		017 594	CLAMP, manifold stove	1
70		020 365	STOVE, manifold	1
71		Fig 13-8	GENERATOR	1
72		071 731	WASHER, flat stl .656 ID x 2.250 OD x .187thk	2
73		601 945	SCREW, cap stl hexhd .625-18 x 4.000	2
74		114 772	STARTER, engine 12V (included w/engine)	1
75	S10	025 474	SWITCH, thermo temp	1
76	S9	025 473	SWITCH, pressure oil	1
77			BRACKET, mtg alternator (included w/engine – see engine parts list)	1
78	ALT	136 268	ALTERNATOR, 42A 12V neg grd w/pulley (included w/engine)	1
79			STRIP, adj-alternator (included w/engine – see engine parts list)	1
80			PULLEY, (included w/engine – see engine parts list)	1
81		007 894	MOUNT, engine	1
82		134 948	BASE	1
83		007 025	SCREW, cap stl hexhd .625-11 x 1.250	2
84		602 218	WASHER, lock stl split .625	4
85		085 980	NUT, stl hex full fnsh .625-11	4
86		010 146	CLAMP, nyl .625	1
87		603 107	HOSE, nprn slit bk .156 ID x .343 OD (order by ft)	2ft
88	TE1	038 621	BLOCK, term 30A 4P	1
		038 620	LINK, jumper	1
		035 131	CONNECTOR, blk 30A 45 deg	1
89		053 967	INSULATION, rect	1
90		081 499	BRACKET, mtg-term strip	1
91		035 860	RECTIFIER, (consisting of)	1
92	SR1,2	035 704	· RECTIFIER, integ 40A 800V	2
93		031 926	· HEAT SINK	1
		601 851	NUT, stl slflkg hex reg .625-18	2
94		083 476	TUBING, nprn .875 ID 2.500 OD x 2.000	2
95		071 730	TUBING, stl .875 OD x 12ga wall x 2.375	2
96		071 890	RETAINER, mount	2
97		+085 439	FRAME, upright base front	1
		083 030	STUD, brs grd .250-20 x 1.750	1
		601 836	NUT, brs hex .250-20 jam hvy	3
98	R2	030 060	RESISTOR, WW adj 375W 20 ohm	1
99	R3	128 862	RESISTOR, WW adj 375W 50 ohm	1
100	CT1	036 611	TRANSFORMER, current 500/5	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 13-1. Main Assembly (Continued)	
101		+113 038	DOOR, access front lower	1
102		134 792	LABEL, warning general precautionary	1
103		Fig 13-2	PANEL, front lower w/components	1
104		Fig 13-7	PANEL, front upper w/components	1
105		084 771	PANEL, control HF (Fig 13-4)	1
106		057 358	BUSHING, snap 1.000 ID x 1.375mtg hole	1
107		048 489	CLAMP, nyl 1.000 clamp dia	1
108		601 158	BLANK, snap-in metal .875mtg hole	1
109		134 903	FUSE BOX	1
		026 947	STAND-OFF, insul .250-20 x 1.000 lg	1
110		039 169	HOLDER, fuse-cartridge 60A 250V	1
111		+132 116	COVER, junction box	1
112		044 383	LABEL, warning 120/240V volt junction box	1
113	F1,2	*012 625	FUSE, cartridge 45A 250V	2
114		601 165	BLANK, snap-in metal 1.000mtg hole	1
115		070 010	BOLT, J .250-20 x 2.312	2
	C5/D1	085 323	CAPACITOR/DIODE	1
	D10	059 389	DIODE, 3A 1000V SP	1

♦Part of Optional 041 713 Fuel Gauge.
*Recommended Spare Parts.
+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.

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 13-2. Panel, Front Lower w/Components (Fig 13-1 Item 103)	
1		020 279	CLAMP, stl cush .750dia x .281mtg hole	1
2	C10,11	085 319	CAPACITOR	1
3		010 006	TUBING, stl .625 OD x 12ga wall	4
4		108 321	HF PANEL, (Fig 13-3)	1
5		085 436	BRACKET, mtg HF panel	1
6	C6	085 321	CAPACITOR	1
7		039 047	TERMINAL, pwr output red (consisting of)	2
8		601 976	· SCREW, cap stl hex hd .500-13 x 1.500	1
9		039 049	· TERMINAL BOARD, red	1
10		601 880	· NUT, stl hex jam .500-13	1
11		039 044	· BUS BAR, term bd	1
12		601 879	· NUT, stl hex full fnsh .500-13	1
13		085 437	PANEL, front lower	1
13		♦111 784	PANEL, front lower w/LCC	1
14		010 222	CONNECTOR, rect cell	2
15		010 296	FITTING, hose brs elb M 1/4NPT x .625-18RH	2
16		003 207	BRACKET, mtg solenoid	1
17	GS1	003 538	VALVE, 115VAC 2 way 1/4IPS port 1/8 orf	1

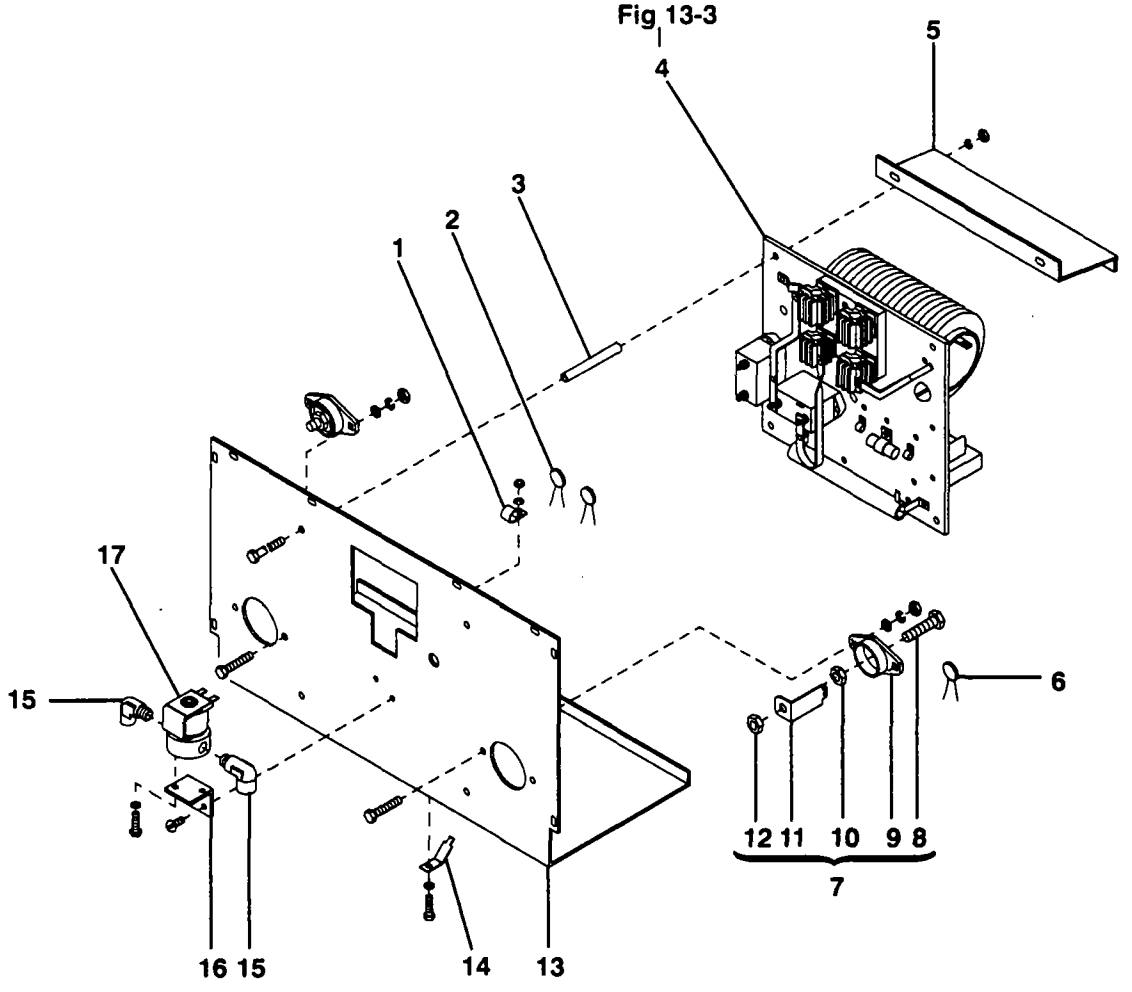


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Figure 13-2. Panel, Front Lower w/Components

♦OPTIONAL

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		108 321	**Figure 13-3. HF Panel (Fig 13-2 Item 4)**	
1		020 623	SPARK GAP ASSEMBLY, (consisting of)	1
2	G	*020 603	· POINT, spark gap	4
3		020 622	· HOLDER, point	4
4		095 621	· BASE	1
5		601 835	NUT, hex-regular 10-32	8
6		010 886	STRIP, conductor	1
7		016 601	MOUNTING BOARD	1
8		038 887	STUD, primary board brs 10-32 x 1.375	2
9		602 042	SCREW, brs-rd hd 10-32 x 1.000	1
10	T2	033 373	COIL, coupling-air	1
11		601 838	NUT, brs hex .375-16	6
12	T1	074 398	TRANSFORMER, HV 115V	1
13		603 737	SCREW, mach brs rdh .375-16 x 1.750	2
14		605 742	CLIP, mtg-resistor .500 ID	4
15	R4	083 784	RESISTOR, WW fxd 100W 10 ohm	1
16	R6	030 965	RESISTOR, WW fxd 100W 100 ohm	1
17		081 291	CAPACITOR, (consisting of)	1
18		081 282	· STRIP, mtg-capacitor	1
19		007 532	· CLAMP, 1.000dia	2
20	C3	059 887	· CAPACITOR, MF 10uf 220V	1
21	R7	030 603	RESISTOR, WW fxd 10W 10K ohm	1
22		010 885	STRIP, conductor 5-3/8 in lg	3
23	C2,4	096 761	CAPACITOR, mica .002uf 10,000V	2

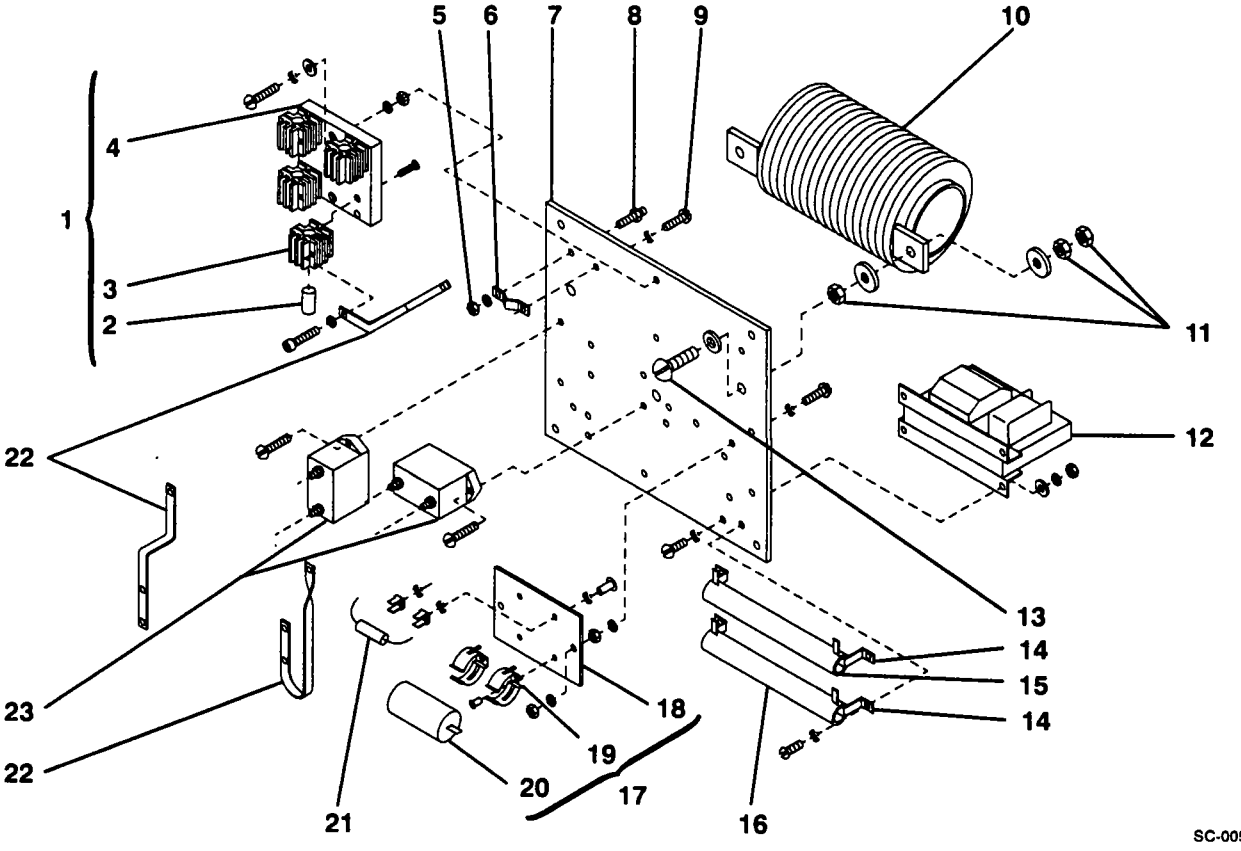

Figure 13-3. HF Panel

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
		084 771	**Figure 13-4. Panel, Control-HF (Fig 13-1 Item 105)**	
1	CR3	034 856	RELAY, 110VDC SPST	1
2		084 536	PANEL, mtg-HF components	1
		059 712	CLIP, component .437dia	1
3		123 794	EDGE TRIM, (order by ft)	2ft
4	CT2	095 042	TRANSFORMER, control-idle	1
5	1T	038 621	BLOCK, term 30A 4P	1
6		080 509	GROMMET, scr No. 8/10 .312sq	3
7	PC2	072 255	CIRCUIT CARD, output-current detector (Fig 13-6)	1
8	TD1	000 769	TIMER, delay 0-100 sec 120VAC	1
9	CR2	059 267	RELAY, encl 12VDC DPDT w/flange	1
10	CR1	044 588	RELAY, encl 12VDC 3PDT flanged	1
11	C1	053 296	CAPACITOR, ignition .5uf	1
12	PC1	071 609	CIRCUIT CARD, weld/idle control (Fig 13-5)	1
13		072 635	RESISTOR w/BRACKET, (consisting of)	1
	R5	007 080	· RESISTOR, WW fxd 25W 50 ohm	1
		072 633	· BRACKET, mtg-resistor	1
14	SR6	035 704	RECTIFIER, integ 40A 800V	1
15	C21-24	110 960	CAPACITOR ASSEMBLY	1

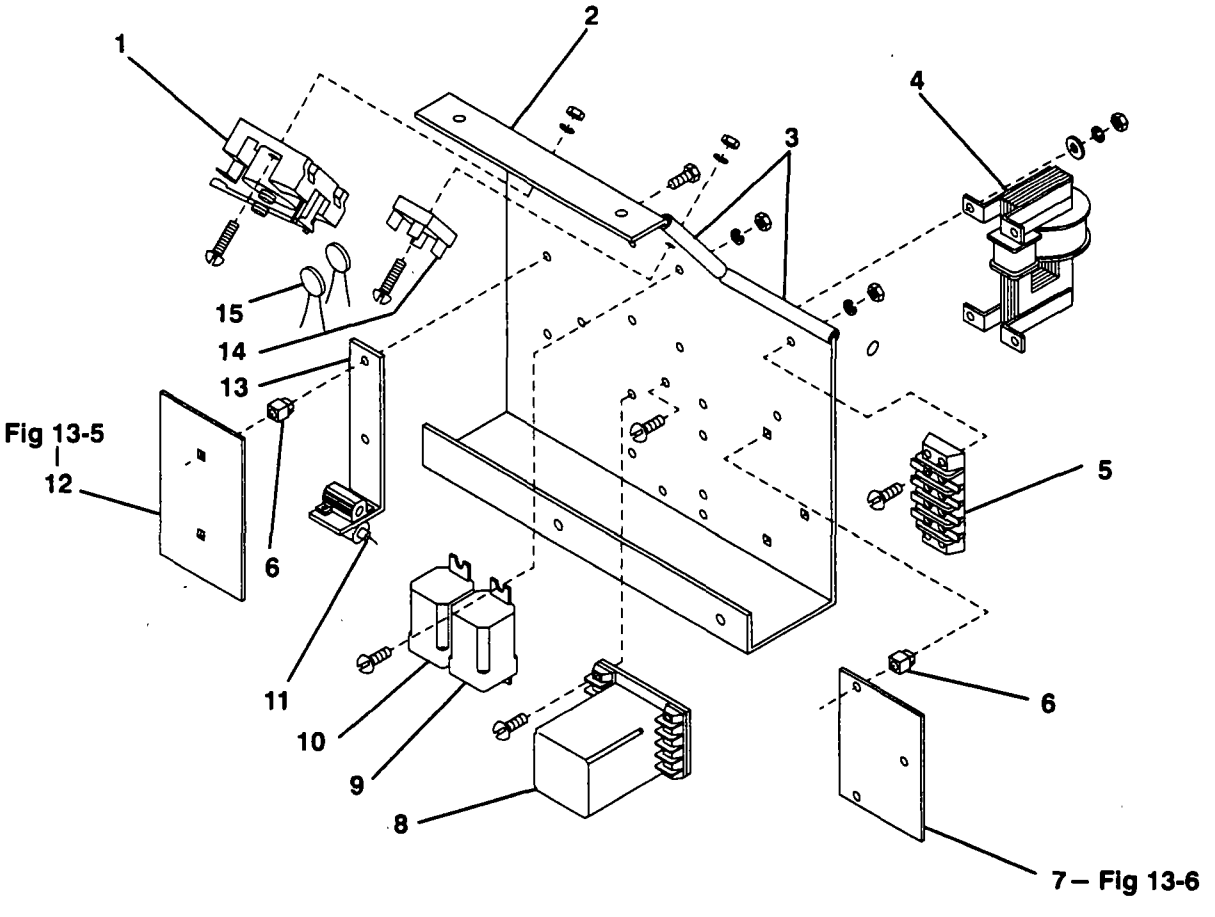

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Figure 13-4. Panel, Control-HF

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

Dia. Mkgs.	Part No.	Description	Quantity
PC1	**071 609**	**Figure 13-5. Circuit Card, Weld/Idle Control (Fig 13-4 Item 12)**	
C50,54	035 522	CAPACITOR, polye film .047uf 100V	2
C51,52	045 868	CAPACITOR, elctlt 100uf 25VDC	2
C53	080 507	CAPACITOR, tantlm 22uf 15V	1
D50,54	070 250	DIODE, rect 3A 600V SP	2
D51-53,56,57	026 202	DIODE, rect 1A 400V SP	5
D55	037 243	DIODE, zener 18V 1W	1
Q50	000 088	TRANSISTOR, NPN 800 MA 40V	1
Q51	039 355	TRANSISTOR, ujt 15 MA 40V	1
R50,53	000 039	RESISTOR, C 2W 680 ohm	2
R51,56	605 919	RESISTOR, C .25W 47 ohm	2
R52	605 916	RESISTOR, C .25W 1K ohm	1
R54	035 824	RESISTOR, CF .25W 270 ohm	1
R57	052 146	RESISTOR, MF .25W 619K ohm	1
R58	053 572	RESISTOR, MF .25W 12.1K ohm	1
R59	052 138	RESISTOR, MF .25W 20K ohm	1
R60	035 822	RESISTOR, CF .25W 10 ohm	1
R61,62	030 026	RESISTOR, C .5W 560 ohm	2
R63	003 272	RESISTOR, CF .25W 1 meg ohm	1
R64	071 595	RESISTOR, CF .25W 22 ohm	1
SCR50,51	080 508	THYRISTOR, SCR 8.5A 200V	2
SR50	021 939	RECTIFIER, integ 1.5A 400V	1

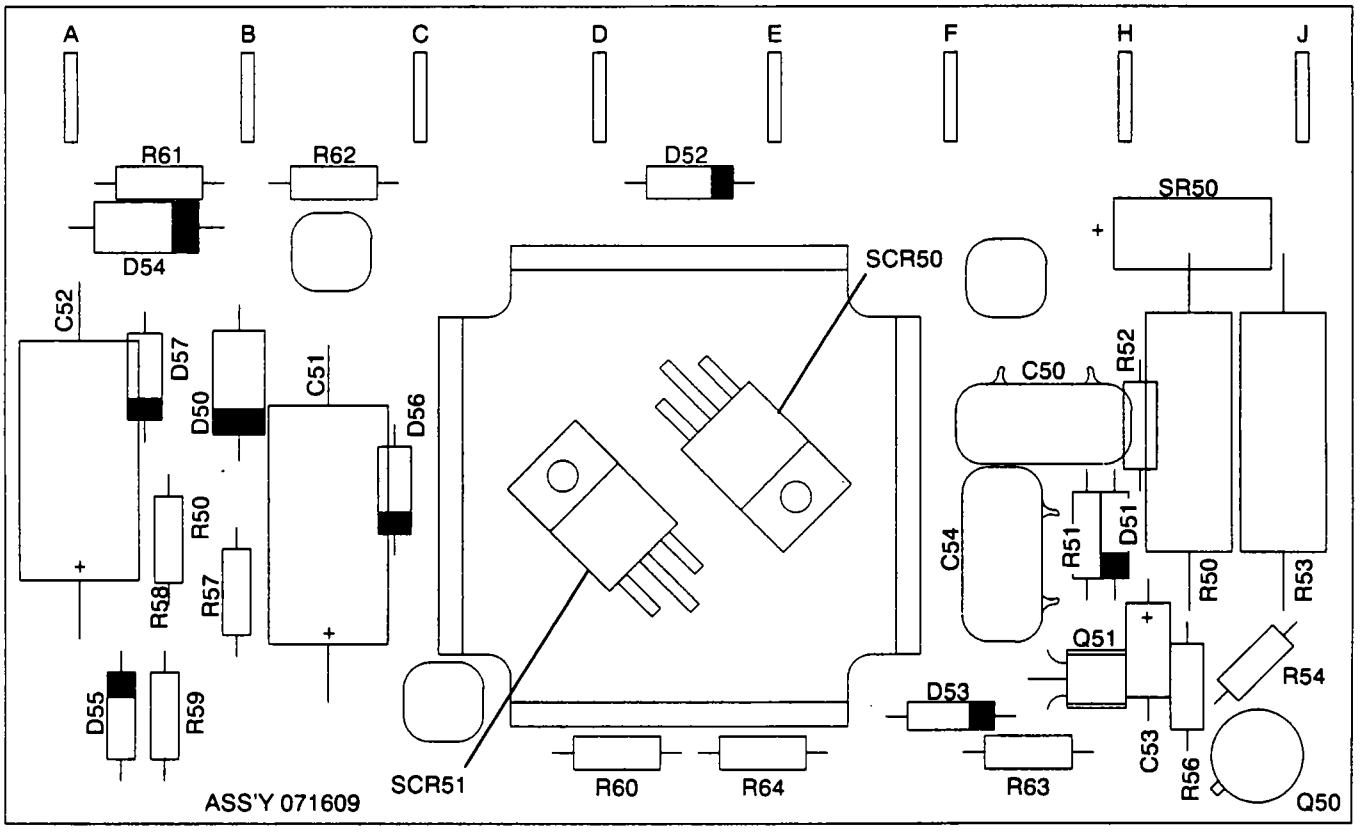

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Figure 13-5. Circuit Card, Weld/Idle Control PC1

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

Dia. Mkgs.	Part No.	Description	Quantity
PC2	**072 255**	**Figure 13-6. Circuit Card, Output-Current Detector (Fig 13-4 Item 7)**	
C50-52	031 670	CAPACITOR, cer disc .05uf 500VDC	3
C53,54	000 859	CAPACITOR, elctlt 220uf 35VDC	2
D50	037 449	DIODE, zener 15V 1W SP	1
D51	026 202	DIODE, rect 1A 400V SP	1
OC50	000 041	IC, interface 4N32	1
Q50	005 274	TRANSISTOR, NPN 10A 80V NPN	1
R50	030 630	RESISTOR, WW fxd 11W 100 ohm	1
R51	039 106	RESISTOR, CF .25W 470 ohm	1
R52	074 111	RESISTOR, C 2W 47 ohm	1
R53	605 912	RESISTOR, C .25W 4.7K ohm	1
SR50	021 939	RECTIFIER, integ 1.5A 400V	1

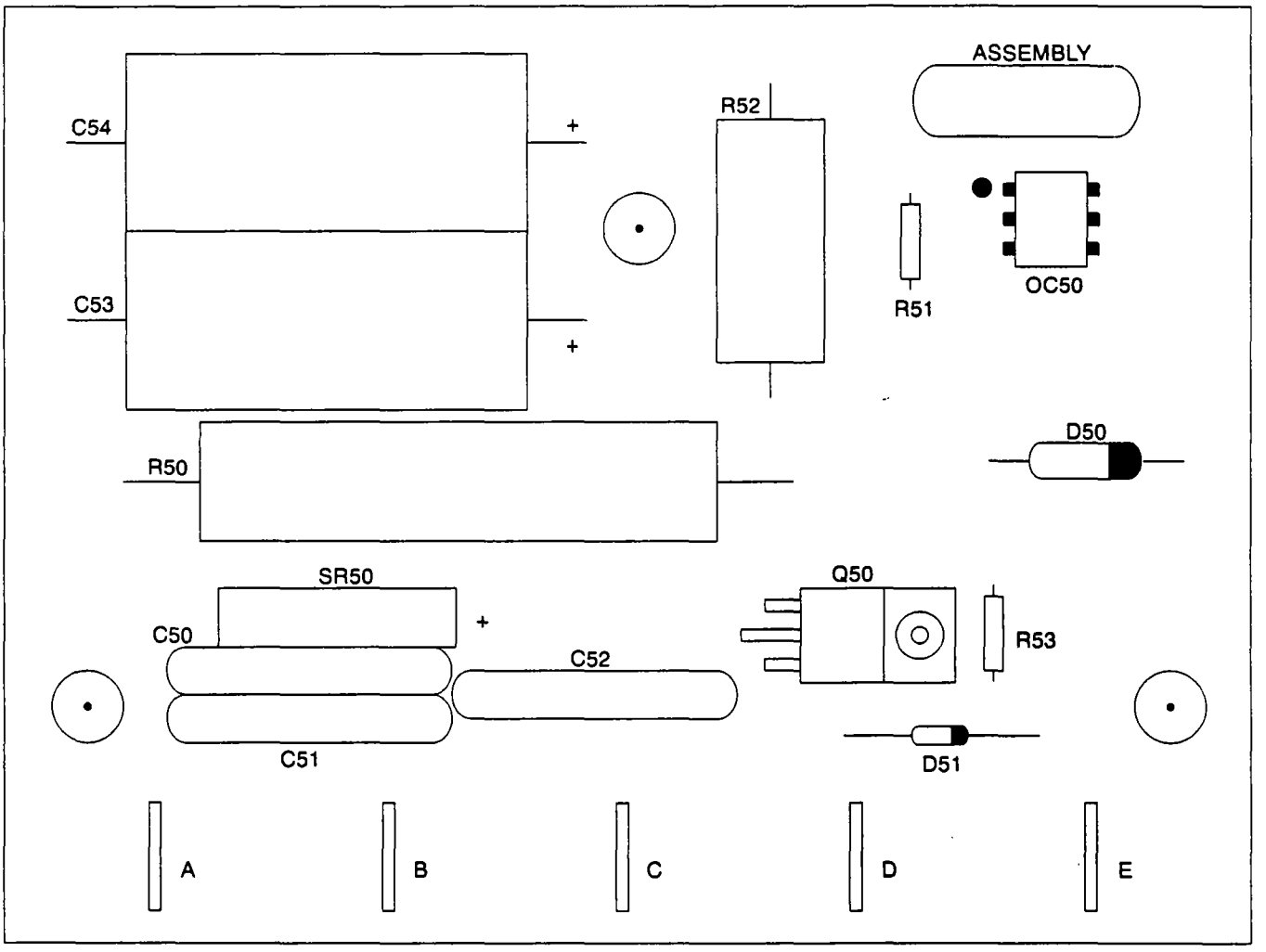

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Figure 13-6. Circuit Card, Output-Current Detector PC2

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

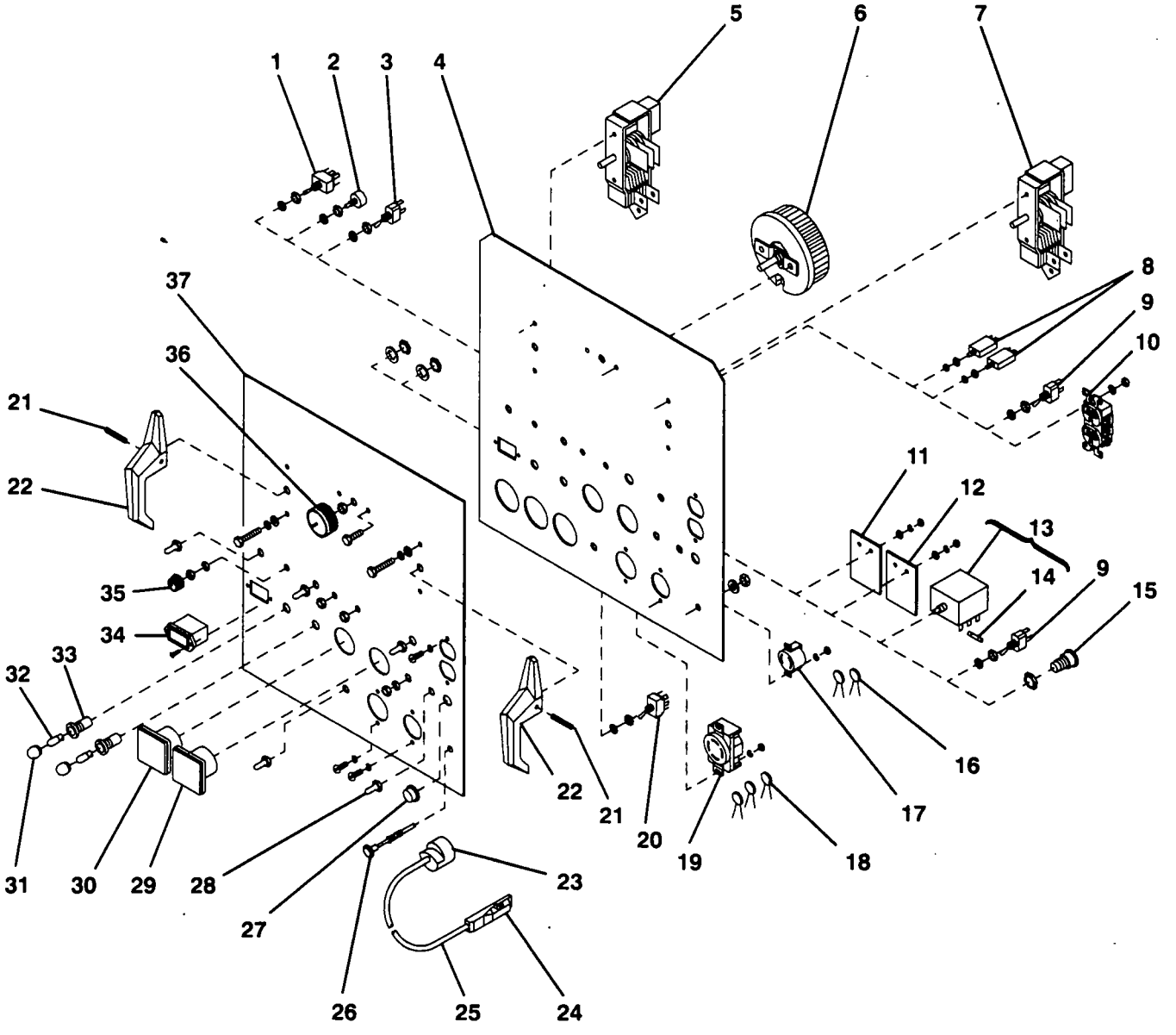
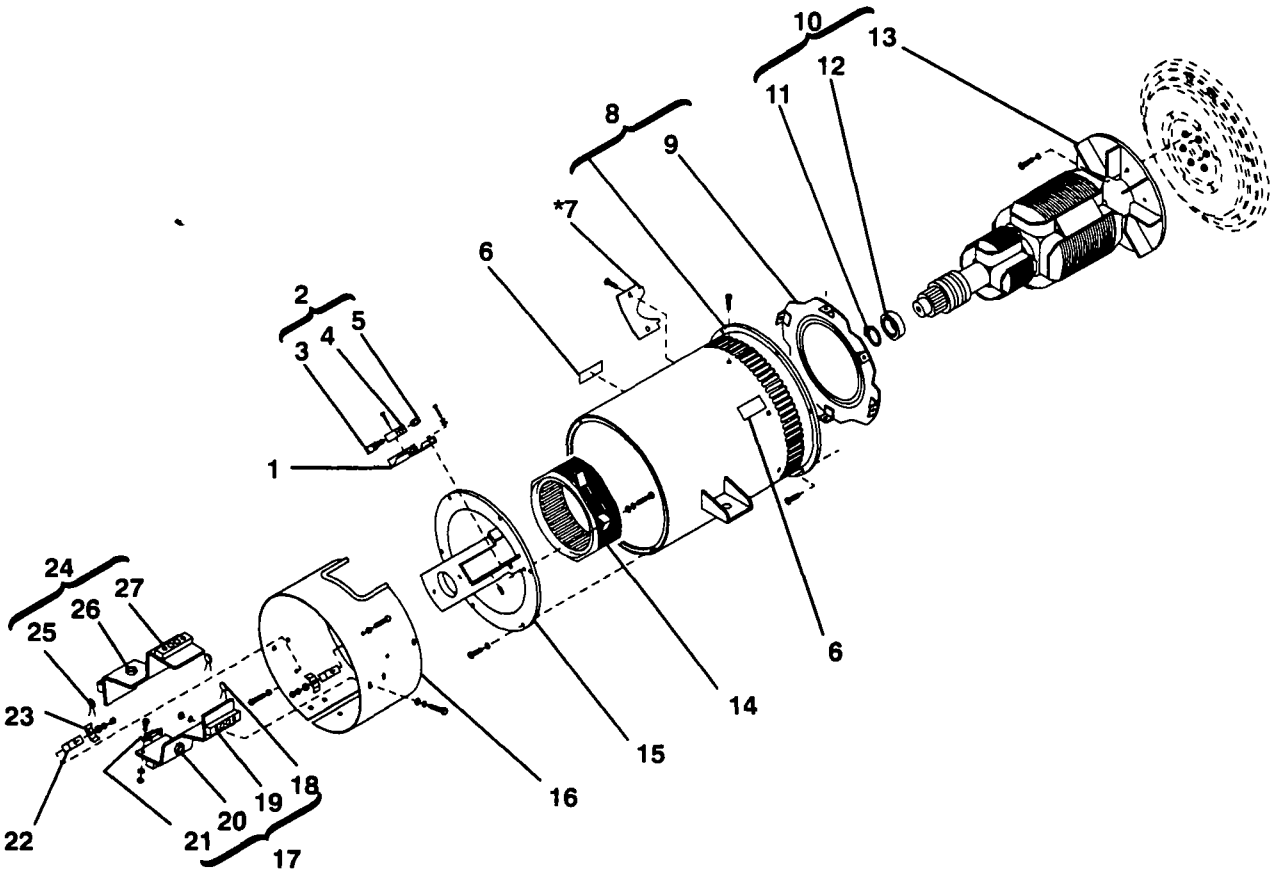


Figure 13-7. Panel, Front-Upper w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 13-7. Panel, Front-Upper w/Components (Fig 13-1 Item 104)	
1	S12	011 622	SWITCH, tgl 3PDT 15A 125V	1
2	R10	030 686	POTENTIOMETER, C 1T 2W 2 meg ohm	1
3	S4	011 610	SWITCH, tgl SPDT 15A 125VAC center off	1
4		085 363	PANEL, front-upper	1
5	S1	084 578	SWITCH, polarity	1
6	R1	605 960	RHEOSTAT, WW 300W 34 ohm	1
7	S3	044 353	SWITCH, range	1
8	CB1,2	139 266	CIRCUIT BREAKER, man reset 1P 15A 250VAC	2
9	S2,7	011 609	SWITCH, tgl SPDT 15A 125VAC	2
10	RC1	604 176	RECEPTACLE, str dx grd 2P3W 15A 125V	1
		073 690	CAP, P&S 5266 DF	
10		♦041 329	AUXILIARY POWER, 240V (consisting of)	1
	RC2	604 103	· RECEPTACLE, str dx grd 2P3W 15A 250V	1
		025 234	· PLUG, str grd 2P3W 15A 250V	1
11	P1	025 704	FILTER, HF AC/DC volt and DC amp meter	1
12	P2	025 703	FILTER, HF AC amp meter	1
	D2	070 250	DIODE, 3A 600V	1
13	MS1	011 072	SWITCH, magnetic w/adj plate and clamp (consisting of)	1
14	F	*048 317	· FUSE, mintr gl 14A 32V	1
15	PB1	046 433	SWITCH, PB MC NO 36VDC black	1
16	C16,17	085 320	CAPACITOR	1
17	RC4	039 602	RECEPTACLE, twlk 2P2W 20A 250V	1
		039 618	CAP, Arrow Hart 9102N	
18	C7-9	085 324	CAPACITOR	1
19	RC3	039 615	RECEPTACLE, twlk 4P4W 20A 250V	1
		039 621	CAP, Hubbel 7411C	
20	S5	011 611	SWITCH, tgl DPDT 15A 125V	1
21		010 647	PIN, spring 5/32 x 1-1/4	2
22		044 328	HANDLE, switch	2
23		039 618	CAP, twlk 2P2W 20A 250V	1
24		009 835	SWITCH w/LEADS	1
25		604 525	CABLE, No. 18 2/c (order by ft)	21ft
26		019 790	CONTROL, push/pull	1
27		084 246	CAP, switch-dust/weather proof black	1
28		021 385	BOOT, tgl switch lever	5
39	A2	025 623	METER, weld 0-500 scale	1
30	V1	044 335	METER, volt AC/DC 0-100 scale	1
		602 592	KIT, shield-meter	2
31		082 789	LENS, lignt-red	2
32	PL1,2	*048 155	BULB, incandescent-flanged base 12V	2
33		082 788	HOLDER, light-indicator	2
34	HM	145 247	METER, hour 4-40VDC	1
35		097 922	KNOB, pointer (R10)	1
36		019 602	KNOB, pointer (R1)	1
		602 178	SCREW, set skt .250-20 x .375	1
37			NAMEPLATE, (order by model and serial number)	1
		083 030	STUD, brs grd .250-20 x 1.750	1
		601 836	NUT, brs hex .250-20 jam hvy	3

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



*Does not reflect actual part.

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Figure 13-8. Generator

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
			Figure 13-8. Generator (Fig 13-1 Item 71)	
1		049 650	BRACKET, mtg-brushholder	1
2		018 614	BRUSH SET, (consisting of)	1
3		*044 755	· BRUSH	1
4		600 270	· HOLDER, brush	1
5		018 665	· CAP, brushholder	1
6		013 367	LABEL, warning moving parts can cause serious injury	2
7		085 274	GUARD, generator	1
8		+137 733	STATOR, generator (consisting of)	1
9		039 207	· BAFFLE, air-generator	1
10		089 736	ROTOR, generator (consisting of)	1
11		024 617	· RING, retaining-ext	1
12		053 390	· BEARING, ball	1
13		089 737	· FAN, rotor	1
		035 776	· KEY, 3/8 x 3/8 x 2	1
14		044 374	STATOR, excitor	1
15		049 235	ENDBELL, generator	1
16		106 424	BARREL, rect	1
17	SR3	106 429	DIODE ASSEMBLY, (consisting of)	1
18	C14,15	048 420	· CAPACITOR, cer .01uf 500VDC	2
19		106 425	· INSULATOR	2
20	D6,8	037 956	· DIODE, 275A 300V SP	2
21	R11,VR1	046 819	· SUPPRESSOR	1
22		106 426	INSULATOR	2
23		106 440	BUS BAR, rect	2
24	SR3	106 428	DIODE ASSEMBLY, (consisting of)	1
25	C12,13	048 420	· CAPACITOR, cer .01uf 500VDC	2
26	D5,7	037 957	· DIODE, 275A 300V RP	2
27		106 425	· INSULATOR	1

*Recommended Spare Parts.
+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
		Parts For Optional Equipment	
	042 564	ENGINE METER KIT, (consisting of)	1
	047 841	· GAUGE, temp	1
	047 842	· GAUGE, pressure 5-100	1
	137 825	· KIT, oil line 54.000 1/4NPT x 1/8NPT	1
	602 946	· FITTING, pipe-brs tee B 1/8NPT	1
	041 179	ELEVATION MODIFICATION, (consisting of)	1
	010 429	· JET, carburetor high altitude	1
	020 325	· LABEL, high-altitude operation	1
	041 329	AUXILIARY POWER, 24V (see Fig 13-7)	1
	042 566	TAC-8 TACHOMETER, (consisting of)	1
TAC	105 738	· TACHOMETER, 0-3000RPM	1
	003 648	· ENCLOSURE, rdtr	1
C20	106 632	· CAPACITOR	1
	027 735	· HANDLE	2
	010 021	· CLAMP, stl cush .562dia x .343mtg hole	2
	042 023	LOW CURRENT CONTROL, (consisting of)	1
F3	011 116	· FUSE, mintr gl slo-blo 7A	1
	111 782	· HOLDER, fuse mintr	1
R13	030 647	· RESISTOR, WW adj 240W 10 ohm	1
S11	111 779	· SWITCH, polarity	1
S14	112 018	· SWITCH, rotary	1
SR4	035 704	· RECTIFIER, integ 40A 800V	1
Z1	111 790	· REACTOR	1
	059 866	· HANDLE, switch	1
	097 922	· KNOB, pointer	1
	111 783	· CHANNEL, mtg	1
	010 647	· PIN, spring .156 x 1.250	1
	070 220	· TUBING, .500 OD x 17ga wall 2.125	2
	041 713	GAUGE, fuel (Fig 13-1)	1

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

OPTIONS AND ACCESSORIES

RHC-3GD25B
(#004 735)
Remote hand amperage control. Furnished with 20 ft. (6 m) cord and plug.

RFC-23GD25A
(#004 737)
Remote foot amperage and contactor control. Furnished with 20 ft. (6 m) cord and plug.

LOW CURRENT CONTROL
(#042 023 Factory)
(#042 024 Field)
Provides 0 to 40 amperes of ac or dc current.

240 VOLT AUXILIARY POWER RECEPTACLE KIT
(#041 329 Factory)
(#041 330 Field)
Required to reconnect auxiliary power from 120 to 240 volts.

LP GAS CONVERSION KIT
(#041 504 Factory)

ENGINE GAUGE KIT
(#041 526 Factory)
(#041 606 Field)
Mechanical gauges for oil pressure-water temperature in addition to standard indicator lights.

TACHOMETER TAC-7
(#041 591 Factory only)
Electronic type. Mounted inside on radiator shroud.

FA-1 LOCKABLE FLAME ARRESTOR FUEL CAP
(#041 056 Field only)

COOLANT SYSTEM HEATER
(#040 878 Field only)

ALTITUDE MODIFICATION KITS
When operating above 4000 ft. (1219 m).
(#041 395 Factory)
(#041 396 Field)

NO. 4WA WELDING ACCESSORIES
(#040 045)
35' (10.7 m) No. 2/0 electrode cable with electrode holder and lug, 30' (9 m) No. 2/0 ground cable with lugs attached, welding helmet and wire scratch brush.

RADIATOR 1 (115 volt)
(#041 398)
RADIATOR 2 (230 volt)
(#041 399)
Water coolant system for water-cooled TIG torch.

Mounting Kit For 4 Wheel Trailer.
(#041 544)

OPTIONS AND ACCESSORIES

NO. 3000-4 FOUR-WHEEL TANDEM TRAILER
(#041 015)

Tandem axle design enables this trailer to ride smoothly over rough terrain. The unit is equipped with fenders, lights, a leveling jack, 2" (50 mm) ball hitch and safety chains.

The two wheel self-actuating hydraulic brake system operates automatically as pressure is put against the tongue of the trailer. Another feature is a breakaway device which would automatically lock the brakes should the trailer become loose. A hand operated parking brake is standard.

Specifications
Total Width 72-1/4" (1.8 m)
Tread 63" (1.6 m)
Length 163-1/2" (4.2 m)
Height of Bed 19" (480 mm)
Road Clearance 10" (254 mm)
GVWR 3000 lbs. (1360 kg)
Shipping Wt. 757 lbs. (343 kg)

EDT 2400-2 TWO WHEEL TRAILER
(#041 722)

A 2100 lbs. (953 kg) capacity trailer with welded structural steel frame, heavy duty axle with roller bearing hubs and leaf spring suspension. Mounting holes for all large Miller engine driven welding generators are prepunched. Hardware for mounting is provided. Also included is a jack stand for raising and lowering the tongue, safety chains and universal tongue mounting for optional hitches. An optional fender and light kit is required when trailer is used on the highway. NOTE: Hitch must be ordered separately.

Specifications
GVWR: 2400 lbs. (1087 kg)
Trailer weight: 300 lbs. (136 kg)
Trailer capacity 2100 lbs. (953 kg)
Total Width (without optional fender kit) 62" (1.6 m)
Total length (witout optional hitch) 96" (2.4 kg)
Width of bed 40-1/2" (1029 mm)
Track Width 53-1/2" (1359 mm)
Height of Bed 21" (533 mm)
Tire size P205D-14
Shipping Wt. 300 lbs. (136 kg)

The EDT 2400-2 trailer when equipped with fender and light kit and 2" (50 mm) ball hitch and the No. 3000-4 trailer conform to all applicable U.S. Federal Motor Vehicle Safety Standards in effect on date of manufacture.

3" (80 MM) DIAMETER LUNETTE TOWING EYE
For use with No. 3000-4 Trailer.
(#041 628 Factory)
For use with 64X and 74X Trailer.
(#040 697)

FENDER AND LIGHT KIT
(#041 723)
Includes fenders, lights, wiring harness and mounting hardware. Shipping weight 50 lbs. (23 kg)

HITCHES

2" (51 mm) BALL
(#041 724)
Shipping weight 5 lbs. (2 kg)

CLEVIS
(Not for highway use)
(#041 726)
Shipping weight 11 lbs. (5 kg)

2-1/2" (64 mm) LUNNETTE EYE
(#041 725)
Shipping weight 9 lbs. (4 kg)

TOOL BOX
(#040 638)
For use with 4 wheel trailer only. Keeps tools handy. Sturdy steel construction with hinged cover. Five inch (130 mm) high divider in center of box. Attachment hardware included. Height 11" (280 mm), Depth 10" (254 mm), Length 44" (1120 mm).

NO. CC-4 CANVAS COVER
(#040 144)
Heavy-duty, olive drab, waterproof and mildew resistant.

CRT CYLINDER RACK
(#040 543)
Two racks included. (For use with 4 wheel trailer only)

NO. 74X FOUR-WHEEL TANDEM TRAILER
(#041 086)
For off the road use only.
The tandem axle design enables this trailer to ride smoothly over rough terrain. The unit is equipped with fenders, 12 volt stop, directional and tail-lights and leveling jack. A bolt on clevis hitch and 2" (50 mm) ball hitch are also included.

Tire Size F78-14
Tread 62" (1.6 m)
Total Width 72" (1.8 m)
Road Clearance 11" (280 mm)
Shipping Wt. 790 lbs. (358 kg)

NO. 64 X TRAILER
(#041 223)
Same as 74X but without fenders and lights. Weight 710 lbs. (321 kg)
Shipping Wt. 740 lbs. (336 kg)

When ordering off-road trailers the purchase order must include the statement, "For off the road use only."