

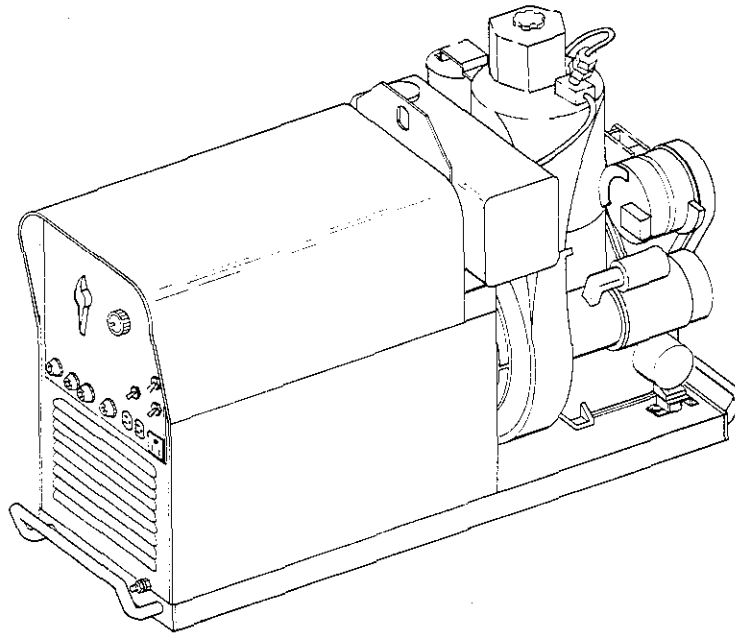


June 1990

FORM: OM-412N

Effective With Serial No. KA780148

MODEL: DEL-200 (60 Hz)
DEL-200 (50 Hz)



OWNER'S MANUAL

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

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

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

LIMITED WARRANTY

EFFECTIVE: FEBRUARY 1, 1990

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

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

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

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

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

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

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

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

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

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

ERRATA SHEET

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

AMENDMENT TO SECTION 10 – TROUBLESHOOTING

Amend Section 10-3. IDLE CONTROL CIRCUIT 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.*

The idle control printed circuit board PC1 and throttle solenoid TS1 are protected by a manual reset circuit breaker CB1 located behind the right side panel. Normally, this circuit breaker should not trip. However, if an arc is struck or the Automatic Idle Control switch is placed in the AUTO IDLE OFF position after throttle solenoid has deenergized and engine is slowing down, CB1 may trip.

If CB1 trips, proceed as follows:

1. Remove right side panel.
2. Wait approximately one minute.
3. Manually reset breaker.
4. Reinstall right side panel.
5. Resume operation.

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 equip-

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

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

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

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

D. Compressed Gas Equipment

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

1. Pressure Regulators

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

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

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

Leaks-if gas leaks externally.

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

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

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

2. Cylinders

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

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

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

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

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

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

Locate or secure cylinders so they cannot be knocked over.

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

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

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

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

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

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

Never refill any cylinder.

Cylinder fittings should never be modified or exchanged.

3. Hose

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

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

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

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

Coil excess hose to prevent kinks and tangles.

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

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

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

4. Proper Connections

Clean cylinder valve outlet of impurities that may clog orifices and damage seats before connecting regulator. Except for hydrogen, crack valve momentarily, pointing

outlet away from people and sources of ignition. Wipe with a clean lintless cloth.

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

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

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

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

5. Pressurizing Steps:

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

Stand to side of regulator while opening cylinder valve.

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

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

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

E. User Responsibilities

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

F. Leaving Equipment Unattended

Close gas supply at source and drain gas.

G. Rope Staging-Support

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

*Trademark of Proctor & Gamble.

1-3. ARC WELDING

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

A. Burn Protection

Comply with precautions in 1-2.

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

1. Protective Clothing

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

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

2. Eye and Head Protection

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

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

Protect filter plate with a clear cover plate.

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

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

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

3. Protection of Nearby Personnel

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

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

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

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

B. Toxic Fume Prevention

Comply with precautions in 1-2B.

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

C. Fire and Explosion Prevention

Comply with precautions in 1-2C.

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

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

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

D. Compressed Gas Equipment

Comply with precautions in 1-2D.

E. Shock Prevention

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

To protect against shock:

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

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

1. Grounding the Equipment

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

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

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

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

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

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

2. Electrode Holders

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

3. Connectors

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

4. Cables

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

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

5. Terminals And Other Exposed Parts

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

6. Electrode

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

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

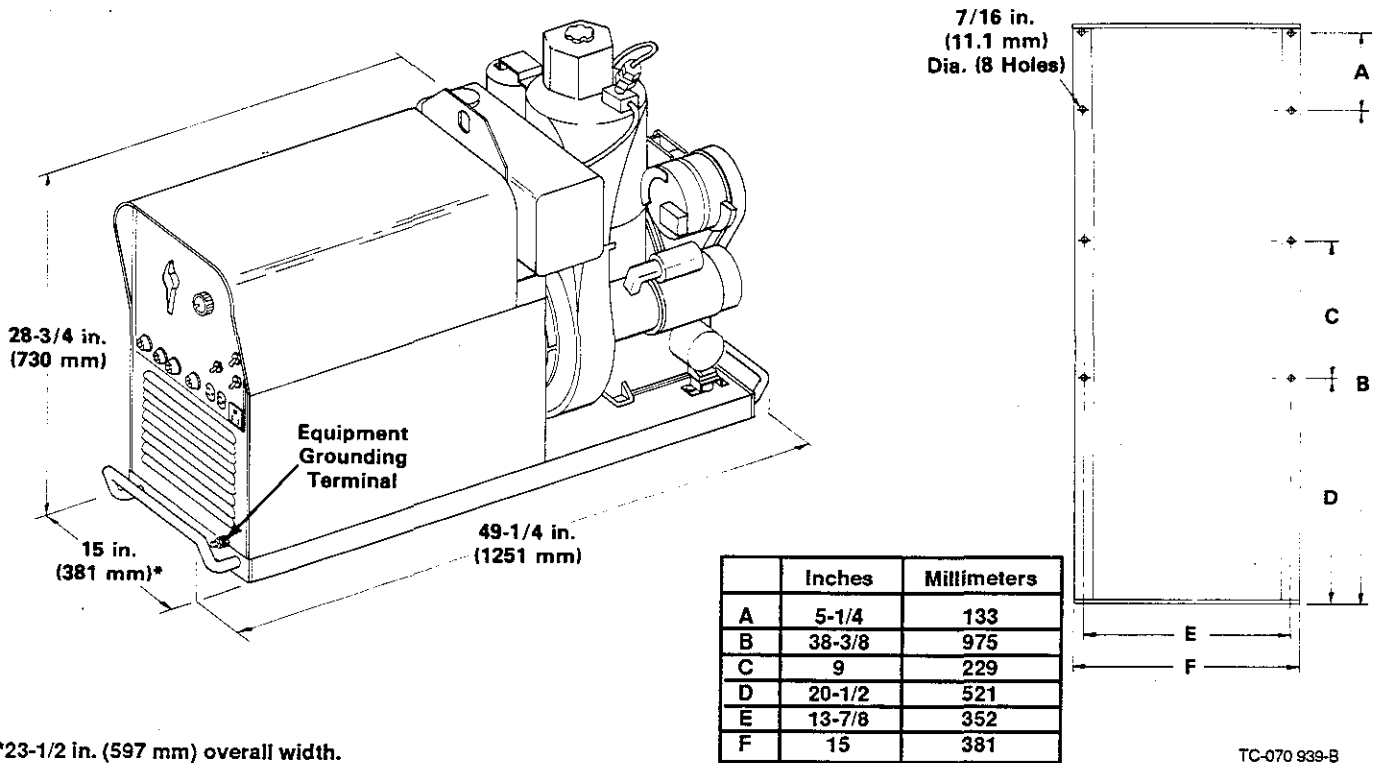
IMPORTANT statements identify special instructions necessary for the most efficient operation of this equipment.

SECTION 3 – SPECIFICATIONS

Table 3-1. Specifications

Rated Output At 100% Duty Cycle	Max. Open-Circuit Voltage (OCV)	Welding Range	Welding Current Ranges In Amperes		Single-Phase AC Auxiliary Power	Weight	
			Coarse Range	Fine Range		Net	Ship
225 Amperes At 25 Volts AC	80 Volts AC	45-225 Amperes AC	Min.-40 40-55 55-75 70-105	From Min. To Max In Each Coarse Range	1 kVA, 115 volts 8.7 amperes 100 Hz ac while welding	670 lbs. (304 kg)	708 lbs. (321 kg)
200 Amperes At 25 Volts DC	72 Volts DC (RMS)	35-200 Amperes DC	90-135 115-165 140-Max.		4.5 kVA, 120/240 volts 38/19 amperes 60 Hz ac as power plant*		

*3 kva, 120/240 volts, 25/12.5 amperes 50 Hz ac on 50 Hz models.

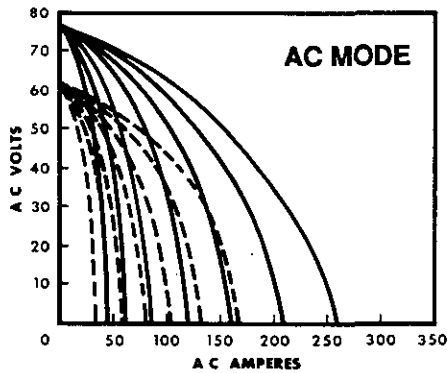


*23-1/2 in. (597 mm) overall width.

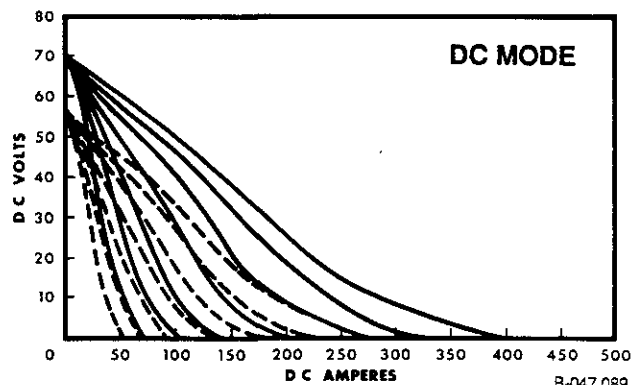
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Figure 3-1. Dimensional Drawing And Base Mounting Hole Layout

Chart 3-1. Volt-Ampere Curves



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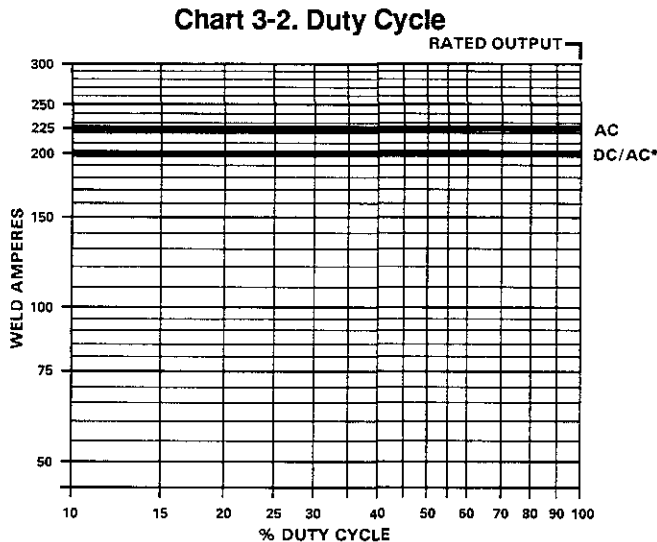


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3-1. VOLT-AMPERE CURVES (Chart 3-1)



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



*CSA CONSTRUCTION

B-052 960-C

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

The duty cycle is the percentage of a ten minute period that a welding generator can be operated at a given output without causing overheating and damaging the unit. If this unit is operated in the 225 amperes at 25 volts AC or 200 amperes at 25 volts DC output range, this unit is rated at 100 percent duty cycle; therefore, the unit can be

operated at rated load continuously. This unit, however, does not offer output in excess of its rating if the duty cycle is decreased.

Refer to the Duty Cycle Chart (Chart 3-2) to determine the output of the welding generator at various duty cycles.



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

- Do not exceed indicated duty cycles.

3-3. DESCRIPTION

This unit is a constant current ac/dc arc welding generator, driven by a one-cylinder, air-cooled, Deutz diesel engine (F1L-210D). It is designed to be used for the Shielded Metal Arc Welding (SMAW) process.

Rated weld output is 225 amperes at 25 volts ac or 200 amperes at 25 volts dc. 1 kVA of 115 volts (8.7 amperes) 100 Hertz ac auxiliary power is available while welding. 4.5 kVA of 120/240 volts (38/19 amperes) 60 Hertz (3 kVA of 120/240 volts (25/12.5 amperes) 50 Hertz) ac auxiliary power is available when the engine is running at power speed (1860 rpm).

This unit is specifically prepared for operation in harsh and corrosive environments.

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

- * Spark Arrestor
- * Hour Meter

IMPORTANT: For a complete listing of Options and Accessories, see back cover of this manual.

SECTION 4 – INSTALLATION OR RELOCATION

4-1. LOCATION (Figure 3-1)

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



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 high levels of dust, dirt, moisture, and corrosive vapors, and extreme heat.

A. Lifting Of Equipment



WARNING: 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



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.

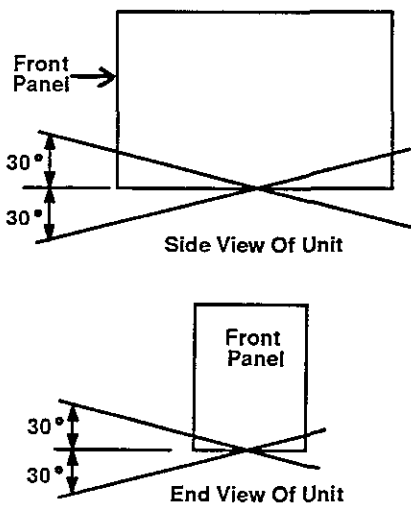


Figure 4-1. Allowable Tilt Angles For Welding Generator Engine

Holes are provided in the base for securing the unit in a permanent location, to a trailer running gear, or transport vehicle. 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.

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.

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.

The engine exhaust system on this welding generator is not equipped with a spark arrestor. 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. If a spark arrestor (optional) is desired, contact your dealer/distributor.

4-2. CONNECTING THE BATTERY



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 that the Run/Stop control is pulled fully out to the STOP position before connecting battery.

This unit is equipped with a conventional wet charged battery. To place the unit in service, make sure that the engine control switch is in the OFF position, and then connect the negative (-) battery cable to the negative battery terminal. No other preparation should be required. If the battery does not supply enough power to crank the engine, the battery will require charging. See Section 9-2 for battery charging procedures.

4-3. FUEL (Chart 4-1)



WARNING: ENGINE FUEL can cause fire or explosion.

- 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.

USE OF GASOLINE will damage engine.

- Do not use gasoline to fuel a diesel engine.

Lack of lubrication in the fuel will damage the injector pump and the injectors.

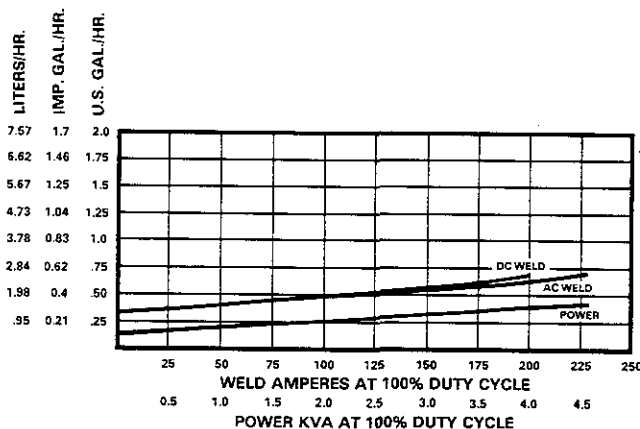
This welding generator is shipped with a small amount of fuel in the fuel tank, and the fuel shut-off valve, located under the fuel tank, in the open position. See the Engine Owner's Manual for fuel recommendations. The capacity of the fuel tank is 3.5 gallons (13.2 liters).

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. If rough engine running is encountered, contact the nearest Deutz service representative.

Keep the fuel tank filled to ensure that the injector system receives an adequate supply of fuel. If the fuel tank is allowed to empty, air will enter the system causing starting problems (see Section 9-4 for procedures on air venting the fuel system).

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

Chart 4-1. Fuel Consumption



B-088 605

4-4. 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 (F1L- 210D engine) before starting the engine.

4-5. EQUIPMENT GROUNDING TERMINAL (Figure 6-1)



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 circum-

stances 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.

4-6. WELD OUTPUT CONNECTIONS (Table 4-1, And Figures 4-2 And 7-1)

→ RATED OUTPUT

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

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.
2. Use weld cable with an insulation voltage rating equal to or greater than the maximum open-circuit voltage (ocv) of the welding power source (see Table 3-1 for unit maximum ocv rating).
3. Select welding 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 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).
4. Do not use damage or frayed cables.

B. Weld Cable Preparation

1. Install terminal lugs of adequate amperage capacity and correct stud size onto cables that connect to the work clamp, electrode holder, and weld output terminals.
2. When installing an electrode holder, follow manufacturer's installation instructions. Always use an insulated electrode holder to ensure operator safety.
3. Install work clamp onto cable.

C. Jack Plug Installation Onto Weld Cables (Figure 4-2)

The supplied jack plugs are used to connect the weld cables to the weld output receptacles. Install jack plugs onto weld cables as follows:

1. Remove 3/4 in. (19 mm) of insulation from one end of each weld cable.

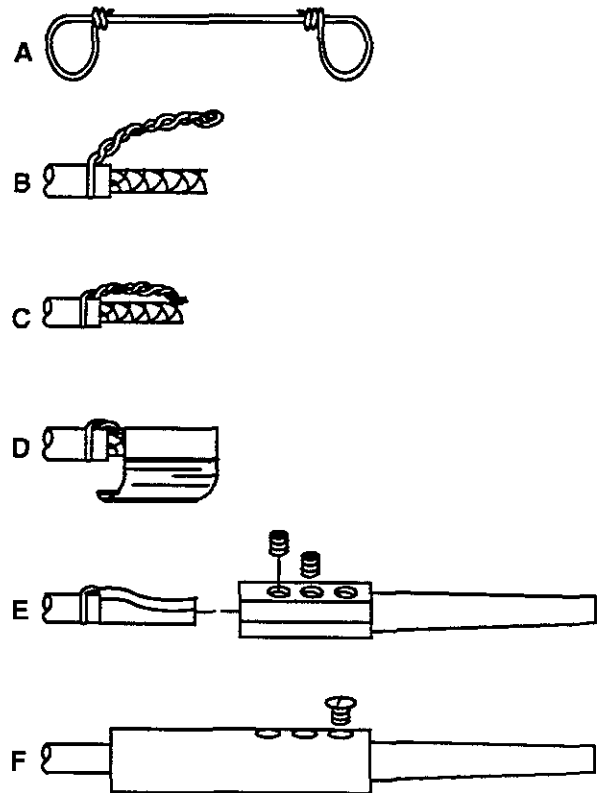
Table 4-1. Weld Cable Size

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

*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.

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2. Clamp cable in a vise with the uninsulated end extending upward out of vise approximately 1-3/4 in. (44 mm).
3. Place steel tie wire (item A, Figure 4-2) approximately 1/4 in. (6 mm) from end of insulation.
4. Make a half turn around cable bringing looped ends of tie wire together.
5. Insert a 3/8 in. (9.5 mm) diameter rod through looped ends of tie wire.
6. Twist tie wire (B) until entire tie wire is twisted and is tight around insulation of cable.
7. Cut off looped ends of tie wire.
8. Bend the twisted tie wire over and along the side (C) of uninsulated portion of cable.
9. Wrap the strip of copper foil tightly around uninsulated portion of cable and twisted tie wire (D).
10. Push the jack plug onto cable over copper foil. (E).
11. Insert the 1/4-20 setscrews into center and bottom holes in jack plug, and tighten (E).
12. Remove cable from vise, and insert jack plug into insulating sleeve. Slide insulating sleeve over jack plug and cable until hole in insulating sleeve lines up with remaining hole in jack plug (F).
13. Insert the 8-32 self-tapping screw (F) through hole in insulating sleeve into jack plug, and tighten.



S-0023

Figure 4-2. Jack Plug Installation

D. Weld Output Receptacle Connections (Figure 7-1)

WORK



ELECTRODE



NEGATIVE



POSITIVE



AC
WELD



DC
WELD



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.
- Disconnect weld cables for process not in use.
- Do not change position of weld cable jack plugs while welding.
- Be sure that jack plugs are secure in correct receptacles before welding.

Both weld output receptacles are electrically hot (energized) whenever the engine is running.

MOVING PARTS can cause serious injury.

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

IMPORTANT: Type of weld current (AC, Electrode Positive, Electrode Negative) is determined by the AC/DC WELD output receptacle connections.



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.
- Read and follow Safety Rules at beginning of this manual.

- For AC welding:
 - Connect electrode jack plug to ELECTRODE receptacle.
 - Connect work cable jack plug to WORK receptacle.
- For DC electrode positive/reverse polarity welding:
 - Connect electrode cable jack plug to POSITIVE receptacle.
 - Connect work cable jack plug to NEGATIVE receptacle.
- For DC electrode negative/straight polarity welding:
 - Connect electrode cable jack plug to NEGATIVE receptacle.
 - Connect work cable jack plug to POSITIVE receptacle.

SECTION 5 – AUXILIARY POWER

IMPORTANT: For units with 50 Hz auxiliary power capabilities, auxiliary power when not welding has the following specifications: 120 volts ac at 25 amperes and 240 volts ac at 12.5 amperes of single-phase 50 Hz power. The receptacle and terminal strip configurations are the same as the 60 Hz model. Auxiliary power while welding is always 115 volts at 8.7 amperes 100 Hz ac for both 50 and 60 Hz models.

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 whenever the engine is running.

- *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. For best performance (voltage and frequency regulation), limit load to approximately 90% of available auxiliary power.

A brief period (less than 5 seconds) of the large current draw is required for starting motor-driven equipment. This generator can supply up to 200% of rated current output at the receptacles and terminal strip for brief periods for motor starting. For best performance, use 240 volt motors connected to the terminal strip. Remove motor load before starting engine. Use adequate size cords so that voltage drop at the motor is not excessive. Voltage at the receptacles and terminal strip drops significantly when the motor-driven equipment is started.

Ground fault circuit interrupters (GFCI) may be required for use with these receptacles. Check local and state codes and the latest issue of the National Electrical Code, and follow all regulations.

5-2. AUXILIARY POWER WHILE WELDING (Chart 5-1)

115V  AC
WHILE WELDING

The 115V AC receptacle RC1 is provided to supply power for accessory equipment used with the welding process.

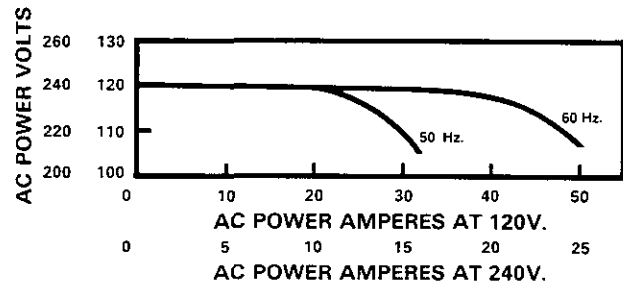
Power available at the 115V AC receptacle RC1 is rated at 1000 watts at 8.7 amperes of 115 volts ac, 100 Hz while welding. The engine must be operating at weld speed to obtain the power output. Be sure that the Automatic Idle Control switch is in the AUTO IDLE OFF position when using power from this receptacle.



CAUTION: IMPROPER FREQUENCY can damage equipment.

- *Do not operate equipment rated only for 50 or 60 Hertz from this receptacle.*
- *Use receptacle power only for operating resistance heaters without fans, incandescent lights, and universal power tools.*

Chart 5-1. AC Power Curve



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5-3. AUXILIARY POWER WHEN NOT WELDING

A. 120 Volts AC Power Plant (Chart 5-1 And Figure 7-1)

120V 30A  AC

Up to 4.5 kVA of 120 volts ac, 38 amperes, 60 Hz power is available at the 120V 30A AC duplex receptacle RC2, however, the power supplied is dependent on the amount of power being used from the 120/240 Volts AC terminal strip. In all cases, total ac auxiliary power output cannot exceed unit rating 4.5 kVA. Whenever this receptacle is used, the engine must be operating at power rpm and the Weld Power switch must be in the POWER position.

B. 120/240 Volts AC Terminal Strip (Chart 5-1 And Figure 5-2)

This welding generator is equipped with a four-pole terminal strip 1T located behind the right side panel. The terminal strip serves as a connection point when auxiliary power is needed. Because this unit has power plant capability, grounding of the generator frame and case may be required. See Section 4-5 for specific information on grounding this unit.

If there are any questions regarding proper connection to terminal strip 1T and/or correct circuit grounding procedures, consult a qualified electrician.

To make connection from an external load to terminal strip 1T, proceed as follows:

1. Remove the right side panel.
2. Insert leads through the strain relief provided on the generator rear panel. Route the leads over to terminal strip 1T. See Figure 5-1.

IMPORTANT: *This unit is shipped with the jumper links on terminal strip 1T positioned for 120 volts (see Figure 5-2). (If the unit is equipped with an optional 240 volts ac receptacle, the jumper links will be positioned for 240 volts).*

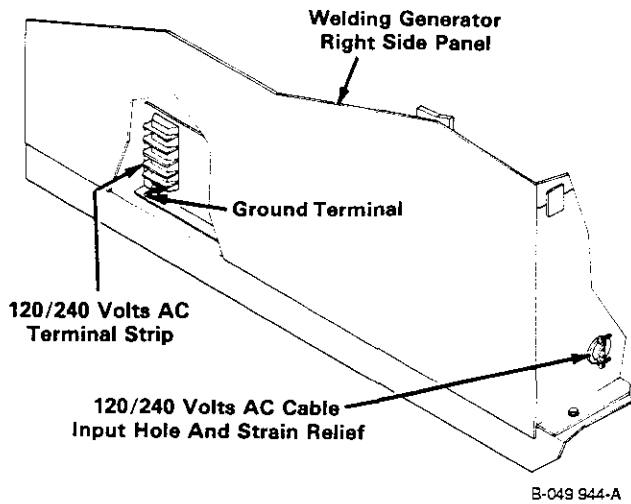


Figure 5-1. Location of 120/240 Volts Terminal Strip

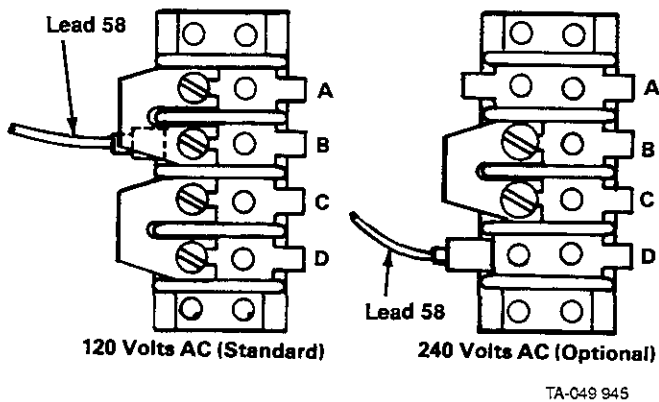


Figure 5-2. Jumper Link Arrangement 120/240 Volts AC Terminal Strip

A total of 4.5 kVA of 120 volts, 38 amperes, 60 Hz ac auxiliary power is available from this unit. When the unit is linked for 120 volts, full kva is available at either half of the 120V 30A AC receptacle or from terminal strip 1T.

If the unit is linked for 240 volts, 1/2 of the total kVA of the unit is available at either half of the 120 volts duplex receptacle or full kva can be obtained at the terminal strip. In all cases, when power is supplied to the duplex receptacle and/or the terminal strip, total ac auxiliary power cannot exceed unit rating.

When making lead connections to terminal strip 1T use ring terminals to ensure that proper connections are made.

3. For 120 volts ac auxiliary power:
 - a. Connect one lead to terminal A or B on terminal strip 1T.
 - b. Connect remaining lead to terminal C or D on terminal strip 1T.
 - c. Ensure that the jumper links on terminal strip 1T are positioned for 120 volts ac (see Figure 5-2).

- d. If the circuit must be grounded, connect a ground lead to the ground terminal below terminal strip 1T.
- e. Tighten strain relief on generator rear panel.
- f. Install right side panel and resume operation.

For 240 volts ac auxiliary power:

- a. Remove and retain the jumper links from terminal strip 1T.
- b. Move lead 58 from terminal B to terminal D on the same side of terminal strip 1T.
- c. Position the jumper links on 1T for 240 volts ac (see Figure 5-2).
- d. Connect line leads to terminals A and D on terminal strip 1T.
- e. If the circuit must be grounded, connect a ground lead to the ground terminal below terminal strip 1T.
- f. Tighten strain relief on generator rear panel.
- g. Install right side panel and resume operation.

For 120/240 volts ac auxiliary power:

- a. Remove and retain the jumper links from terminal strip 1T.
- b. Move lead 58 from terminal B to terminal D on the same side of terminal strip 1T.
- c. Position the jumper links on 1T for 240 volts ac (see Figure 5-2).
- d. Connect line leads to terminals A and D on terminal strip 1T.
- e. Connect neutral lead to terminal B on terminal strip 1T.
- f. If the power supply neutral must be grounded, connect a ground lead from terminal C on terminal strip 1T to the ground terminal below terminal strip 1T.
- g. If the circuit must be grounded, connect a ground lead to the ground terminal below terminal strip 1T.
- h. Tighten strain relief on generator rear panel.
- i. Install right side panel and resume operation.

C. 240 Volts AC Receptacle (Optional)

Up to 4.5 kVA of 240 volts, 19 amperes, 60 Hz ac power is available at this duplex receptacle; however, the power supplied is dependent on the amount of power being used at the 120/240 Volts AC terminal strip. In all cases, total ac auxiliary power output cannot exceed unit rating (4.5 kVA). Whenever this receptacle is used, the engine must be operating at power rpm and the Weld/Power switch must be in the POWER position.

5-4. FIELD INSTALLATION INSTRUCTIONS FOR 240 VOLTS AC DUPLEX RECEPTACLE AND RECONNECTION

The 120/240 Volts AC terminal strip (see Figure 5-1) 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 ac auxiliary power output of the unit, see Section 5-3C.



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Stop engine, and disconnect negative (-) battery cable from battery before making internal inspection or reconnection.

1. Remove right side panel.
2. Remove 120 VOLTS AC duplex receptacle RC2 located on the front panel. Remove leads and allow them to hang free.
3. Connect leads 56 and 58 removed from RC2 to the 240 volts ac duplex receptacle (one on each side of
4. Install the 240 volts ac duplex receptacle in the front panel.
5. Affix supplied 240 VOLTS AC label over existing 120V 30A AC designation for duplex receptacle on nameplate.
6. Locate terminal strip 1T on the right side of the welding generator (see Figure 5-1). Disconnect two leads 57 from terminal strip 1T. Tape up terminals on both leads 57 and tie leads into wiring harness.
7. Remove and retain the jumper links from terminal strip 1T.
8. Move lead 58 from terminal B to terminal D on the same side of terminal strip 1T.
9. Position the jumper links on 1T for 240 volts ac (see Figure 5-2).
10. Install right side panel and resume operation.

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.

$$\text{VOLTS} \times \text{AMPERES} = \text{WATTS} \quad (\text{EQUATION 1})$$

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

$$115V \times 4.5A = 520W$$

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:

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

$$\text{Volts} = 230$$

$$\text{HP} = 1/4$$

$$\text{Using Table 6-2, Code G results in kVA/HP} = 6.3$$

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

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	500	300	Stock Tank De-Icer		0	1000	
	1/6 HP	725	500	Grain Cleaner	1/4 HP	1000	650	
	1/4 HP	1000	600	Portable Conveyor	1/2 HP	2400	1000	
	1/3 HP	1400	700	Grain Elevator	3/4 HP	3000	1400	
	1/2 HP	2300	875	Milk Cooler		1800	1100	
Capacitor Start-Induction Run				Milker (Vacuum Pump)	2 HP	7700	2800	
	1/3 HP	1300	720	FARM DUTY MOTORS	1/3 HP	1000	720	
	1/2 HP	2100	975		Std. (e.g. Conveyors,	1/2 HP	1600	975
	3/4 HP	3100	1400		Feed Augers, Air	3/4 HP	3100	1400
	1 HP	4500	1600		Compressors)	1 HP	4500	1600
	1-1/2 HP	6000	2200			1-1/2 HP	6000	2200
	2 HP	7700	2850			2 HP	7700	2850
	3 HP	12000	3900			3 HP	12000	3900
5 HP	16500	6800			5 HP	16500	6800	
Capacitor Start-Capacitor Run	1-1/2 HP	6100	2000	High Torque (e.g. Barn	1-1/2 HP	6100	2000	
	5 HP	17300	6000	Cleaners, Silo Unloaders,	5 HP	17300	6000	
	7-1/2 HP	27000	8000	Silo Hoists, Bunk Feeders)	7-1/2 HP	27000	8000	
	10 HP	36000	10700		10 HP	36000	10700	
Fan Duty				3-1/2 Cu. Ft. Mixer	1/2 HP	2300	1000	
	1/8 HP	600	400	High Pressure 1.8 Gal/Min	500 PSI	2200	950	
	1/6 HP	850	550	Washer 2 Gal/Min	550 PSI	3100	1400	
	1/4 HP	1200	650	2 Gal/Min	700 PSI	4500	1600	
	1/3 HP	1600	800					
	1/2 HP	2400	1100					

CONTRACTOR	RATING	APPROXIMATE STARTING WATTS	APPROXIMATE RUNNING WATTS	RESIDENTIAL	RATING	APPROXIMATE STARTING WATTS	APPROXIMATE RUNNING WATTS
Hand Drill	1/4"	0	350	Coffee Maker		0	1750 Typ.
	3/8"	0	400	Elec. Range	6" Element	0	1500
	1/2"	0	600		8" Element	0	2100
Circular Saw	6-1/2"	0	500	Oven		0	6000
	7-1/4"	0	900	Microwave	625W	800	2000
	8-1/4"	0	1400	Television (Solid-State)	B & W	0	100
Table Saw	3"	3000	1500	Color		0	300
	10"	4500	1800	Radio		0	50-200
Band Saw	14"	1400	1100	Refrig. Or Freezer		2300	800
Bench Grinder	6"	1000	720	Shallow Well Pump	1/3 HP	1400	750
	8"	2500	1400		1/2 HP	2100	1000
	10"	3600	1600	Sump Pump	1/3 HP	1300	800
Air Compressor	1/2 HP	2000	1000		1/2 HP	2150	1050
	1 HP	4500	1500	Dishwasher	(Cool Dry)	1400	700
	1-1/2 HP	6000	2200	(Hot Dry)	1400	1450	
	2 HP	7700	2800	Clothes Dryer	Gas	1800	700
Electric Chain Saw	1-1/2 HP, 12"	0	1100	Electric	1800	5750	
	2 HP, 14"	0	1100	Automatic Washer		2300	1150
Electric Trimmer	Standard 9"	0	350	Gas Or Fuel Oil			
	Heavy Duty 12"	0	500	Furnace Blower	1/8 HP	500	300
Electric Cultivator	1/3 HP	1400	700		1/6 HP	750	500
Elec. Hedge Trimmer	18"	0	400		1/4 HP	1000	600
Flood Lights	HID	25	100		1/3 HP	1400	700
	Metal Halide	63	250		1/2 HP	2350	875
	Mercury & Sodium Vapor	100 400		Central Air Conditioner	10,000 BTU	2200	1500
Submersible Pump	400 GPH	250	1000		20,000 BTU	3300	2500
Centrifugal Pump	900 GPH	400	500		24,000 BTU	4950	3800
Floor Polisher	3/4 HP, 16"	3100	1400		32,000 BTU	6500	5000
	1 HP, 20"	4500	1600		40,000 BTU	7800	6000
High Pressure Washer	1/2 HP	2200	950	Garage Door Opener	1/4 HP	1100	550
	3/4 HP	3100	1400		1/3 HP	1400	725
	1 HP	4500	1600	Electric Blanket	Portable	0	400
55 Gal. Drum Mixer	1/4 HP	1200	700	Dehumidifier		800	650
	1.7 HP	0	900	Vacuum Cleaner	Standard	0	800
Wet & Dry Vac	2-1/2 HP	0	1300		Deluxe	0	1100
				Lights			As Indicated
				On Bulb			
				Toaster	2 Slice	0	1050
					4 Slice	0	1650
				Hair Dryer		0	300-1200
				Iron		0	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 en-

gine 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.

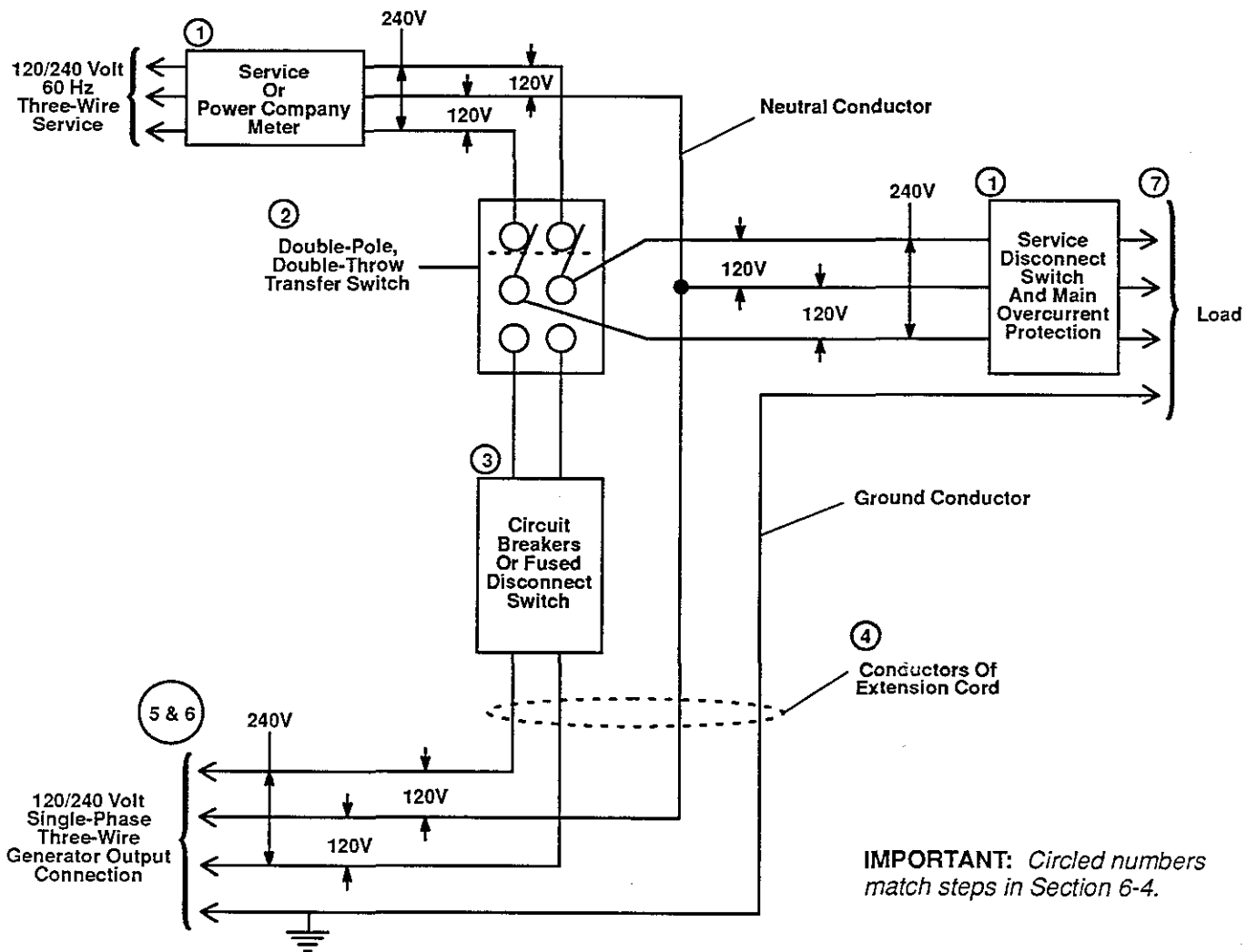


Diagram 6-1. Standby Power Equipment And Connections

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)				

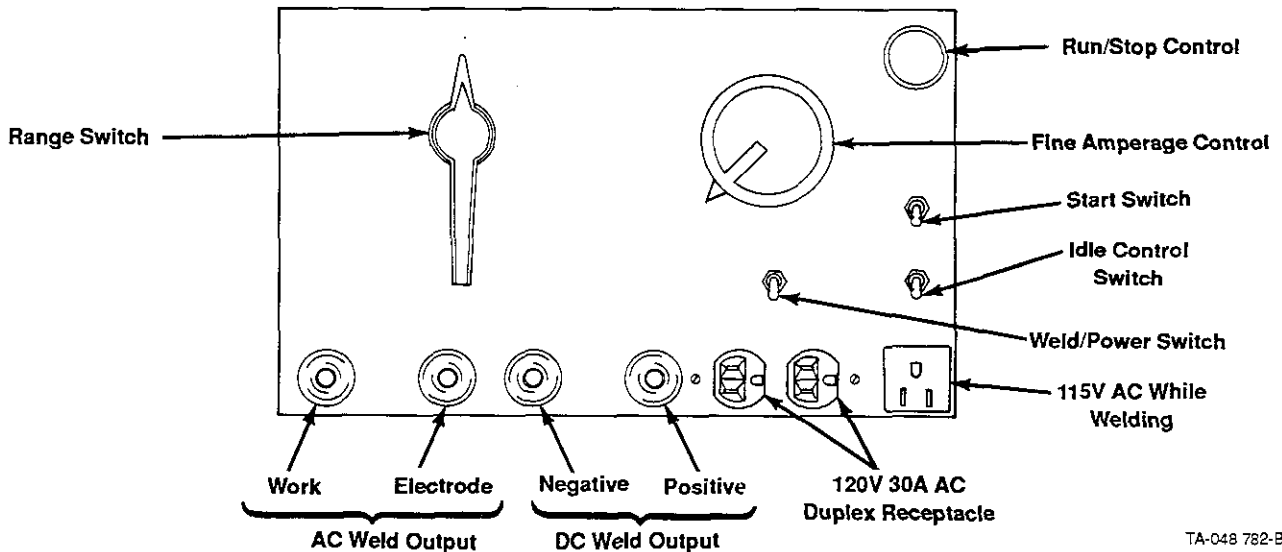
*Conductor size is based on maximum 2% voltage drop.

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 (68)	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)	100 (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



TA-048 782-B

Figure 7-1. Front Panel Controls

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

A

AMPERE RANGES

The Range switch provides seven coarse amperage ranges. The range of each switch position is displayed on the scale surrounding the Range switch handle.



CAUTION: ARCING can damage switch contacts.

- Do not change the position of the Range switch while welding or under load.

Arcing causes the contacts to become pitted and eventually inoperative.

DO NOT SWITCH UNDER LOAD



7-2. FINE AMPERAGE CONTROL (Figure 7-1)

A

**FINE
AMPERAGE**

The FINE AMPERAGE control permits the operator to select a welding current between the minimum and maximum values of the coarse range selected by the Range switch. The scale surrounding the control is calibrated in percent and does not indicate an actual amperage value.

IMPORTANT: The FINE AMPERAGE control can be adjusted while welding. However the FINE AMPERAGE control must be set at 100 to obtain the full rated output from the 120V 30A AC receptacle when the welding generator is used to supply ac auxiliary power.

7-3. WELD/POWER SWITCH (Figure 7-1)

WELD



POWER



The Weld/Power switch provides selection of weld current or auxiliary power output. Placing the Weld/Power switch in the WELD position enables the engine to run at the proper speed for welding. Placing the Weld/Power switch in the POWER position enables the engine to run at the proper speed for auxiliary power.

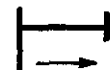
7-4. RUN/STOP CONTROL (Figure 7-1)



**RUN
IN**



**STOP
OUT**



The Run/Stop control controls the flow of fuel to the injector pump. The Run/Stop control must be pushed fully in to the RUN position when starting the engine. Pulling the Run/Stop control fully out shuts off fuel to the injector pump, thereby stopping the engine.

7-5. START SWITCH (Figure 7-1)



The START switch is a spring-loaded toggle switch. Placing the switch in the START position will engage the starter. The switch must be released as soon as the engine has started to prevent damage to the starter.



CAUTION: REENGAGING STARTER MOTOR while flywheel is rotating can damage starting components.

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

7-6. AUTOMATIC IDLE CONTROL SWITCH (Figure 7-1)

The automatic idling device reduces fuel consumption while welding by allowing the engine to idle when the generator is not loaded. The Automatic Idle Control switch controls the operation of the device.

A. Auto Idle On



When the Automatic Idle control switch is in the AUTO IDLE ON position, the engine will remain at idle speed ,

1860 ±100 rpm for 60 Hz Models (1650 ±100 rpm for 50 Hz Models), until an arc is struck. When an arc is struck, the engine speed will increase to weld speed (3000 rpm). Approximately 15 seconds after the arc is broken, the engine will return to idle rpm. This time delay is non-adjustable.

The Automatic Idle control AUTO IDLE ON position can be used for Shielded Metal Arc Welding (SMAW).

B. Auto Idle Off



When the Automatic Idle control switch is in the AUTO IDLE OFF position, engine speed remains at weld speed (3000 rpm) when the generator is not loaded.

7-7. OIL PRESSURE SWITCH

This unit is equipped with an oil pressure switch which automatically disconnects the battery from the excitation and idle control circuitry when the engine shuts down.

7-8. HOUR METER (Optional)

This unit can be equipped with an hour meter. The meter, labeled TOTAL HOURS, registers the total hours of engine operation. This information is useful for routine maintenance on the engine.

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.*

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.*

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. 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.



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.*
- *Read and follow Safety Rules at beginning of this manual.*

2. Place the Range switch in desired position (see Section 7-1).
3. Rotate the FINE AMPERAGE control to the desired position (see Section 7-2).
4. Wear dry insulating gloves and clothing, and welding helmet with proper filter lens according to ANSI Z49.1.
5. Prepare for welding as follows:
 - a. Connect work clamp to clean, bare metal at workpiece.
 - b. Select and obtain proper electrode, and insert into electrode holder.
6. Start the engine as instructed in Section 8-3.
7. Place the Weld/Power switch in the WELD position.
8. Connect desired auxiliary equipment to the 115 volt duplex receptacle (see Section 5-2).
9. Energize the auxiliary equipment, if applicable.
10. Place the Automatic Idle Control switch in the desired position (see Section 7-6).
11. Begin welding.

8-2. AUXILIARY POWER 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. Read entire Section 5 for auxiliary power operation information.
3. Place Weld/Power switch in the POWER position .
4. Connect auxiliary equipment to 120 volt duplex receptacle and/or 120/240 volts AC terminal strip (see Sections 5-2A and B).
5. Rotate the FINE AMPERAGE control to 100.
6. Start engine as instructed in Section 8-3.
7. Turn on auxiliary equipment, and begin operation.

8-3. STARTING THE ENGINE

IMPORTANT: Read entire engine Owner's Manual (F1L-210D Engine) before operating engine.

1. Engine Prestart Checks
 - a. Oil Level
Check engine oil level. Fill to top mark on dipstick if necessary (see engine manual for oil selection specifications and Section 4-4).
 - b. Fuel Level
Check fuel level. Fill tank with fresh, clean diesel fuel if necessary (see engine manual for fuel specifications).
2. Push the Run/Stop control fully in to the RUN position.
3. Place the Automatic Idle Control switch in the AUTO IDLE ON position.
4. Place the START switch in the START position. Once the engine has started, release the START switch.



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.

5. 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.

8-4. SHUTTING DOWN

1. Stop welding, and turn off or disconnect any auxiliary equipment.
2. Place the Automatic Idle Control switch in the AUTO IDLE ON position.
3. Operate the engine at idle speed for a few minutes to allow internal engine temperature to equalize.
4. Pull the Run/Stop control fully out to the STOP position. After the engine has stopped, return the Run/Stop control to the RUN position.

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 (F1L-210D) engine. Use correct type and grade of oil as listed in instructions for expected temperature range before next oil and filter change.

Table 9-1. Maintenance Schedule

Frequency*	Maintenance
Every day.	Check fuel and oil levels (see Sections 4-3 and 9-1C, and engine Owner's Manual, F1L-210D engine).
Every 100 to 150 hours.	Change oil and filter (see engine Owner's Manual, F1L-210D 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 9-1D).
Every 250 hours.	Inspect and service spark arrestor (see Section 9-8).
Every 1000 hours.	Check brushes and slip rings (see Section 9-7). Check all labels (see IMPORTANT block, Section 9-1). Clean and inspect unit (see Section 9-1C).

*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 (F1L-210D) engine for complete engine care.

9-2. AIR CLEANER



CAUTION: DIRTY AIR can damage engine.

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

The air cleaner is one of the most important parts of the engine from the standpoint of engine life. An engine consumes several thousand cubic feet of air per hour when operating. If dirty air gets into the engine, it can wear out a set of piston rings within a few operating hours. See and follow the engine Owner's Manual for oil bath air cleaner maintenance intervals and service procedures.

9-3. AIR VENTING THE FUEL SYSTEM



WARNING: ENGINE FUEL can cause fire or explosion.

- Stop engine before working on fuel system.
- Do not spill fuel; if spilled, wipe up.
- Do not service fuel filter if engine is hot or running.
- Do not service fuel filter near sparks or open flame.
- Do not smoke while servicing fuel filter.
- Keep a fire extinguisher nearby, and know how to use it.

Maintenance to be performed only by qualified persons.

1. Loosen thumb screw and slide retaining spring off hand primer on fuel pump mounted to base on left side of engine.
2. Loosen bleed screw in banjo connector at injection pump (see engine Owner's Manual for pump location).
3. Hand prime the injection pump until fuel free of bubbles emerges.
4. Lock primer pump and tighten bleed screw.
5. Start the engine as instructed in Section 8-3. If the engine does not run properly, loosen the bleed screw until air is completely vented from fuel line. Tighten bleed screw.

IMPORTANT: If the engine still does not run properly, loosen fuel line at injector (see engine Owner's Manual for injector location); crank engine until fuel free of bubbles emerges at injector; tighten fuel line.

9-4. BATTERY REPLACEMENT PROCEDURE



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

- Stop engine before disconnecting or connecting battery cables.
- 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 Engine Control switch is in the OFF position.
2. Locate battery in unit.
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 doors or panels.

9-5. BATTERY CHARGING



WARNING: CHARGING 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 or disconnect 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 or disconnect battery charger before disconnecting charger from battery.

1. Remove battery from unit, and place on a level worktable or other suitable surface.
2. Remove vent caps, and check 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 charger manufacturer's instructions.

9-6. ENGINE SPEED ADJUSTMENTS (Figure 9-1)

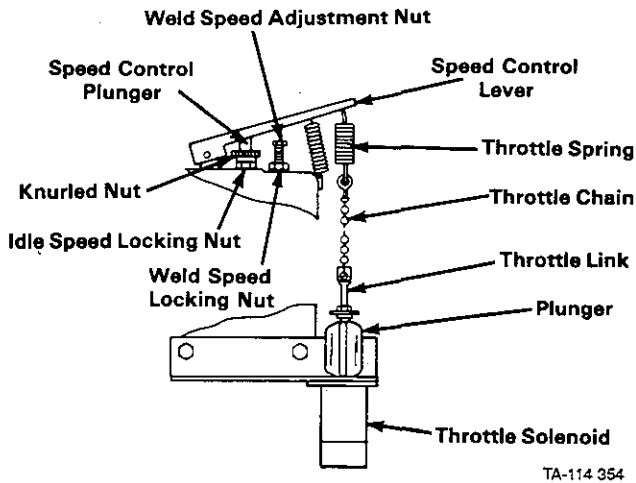
IMPORTANT: Engine speed adjustments should be made by an authorized diesel mechanic.

The engine speeds have been factory adjusted and should not require frequent readjustment. After tuning the engine, check the speeds with a tachometer. With no load applied, the power speed should be 1860 rpm for 60 Hz Models (1650 for 50 Hz Models) and the weld speed 3000 rpm. If necessary adjust the speeds as follows:

A. Idle Speed Adjustment

1. Start the engine as instructed in Section 8-3.
2. Place the Weld/Power switch in the POWER position.
3. Rotate the FINE AMPERAGE control to 100.
4. Ensure that the speed control lever does not contact the speed control plunger during the following adjustment:

Loosen the idle speed locking nut. Rotate the knurled adjustment nut until 1860 rpm is obtained. Tighten the locking nut.



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Figure 9-1. Engine Speed Adjustments

B. Weld Speed Adjustment

1. Shut down the engine.
2. Remove the lead seal from the weld speed adjustment nut.
3. Press the plunger to the bottom of the throttle solenoid and check for $1/8 \pm 1/16$ inch (3.2 ± 1.6 mm) stretch in throttle spring. If adjustment is necessary, loosen the locking nut on the throttle link and rotate the throttle link to obtain the proper distance. Tighten locking nut.
4. Start the engine as instructed in Section 8-3.
5. Place the Weld/Power switch in the WELD position.
6. Place the Automatic Idle Control switch in the AUTO IDLE OFF position.
7. Loosen the weld speed locking nut and rotate the weld speed adjustment nut until 3000 rpm is obtained. Check for proper throttle spring stretch. Re-adjust spring stretch if necessary and recheck weld speed. Tighten locking nut.

IMPORTANT: If the throttle spring works loose or is disconnected, reattach the spring as shown in Figure 9-1.

8. Shut down the engine.
9. Reseal the weld speed adjustment nut.

9-7. BRUSHES AND SLIP RINGS (Figure 9-1)



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.

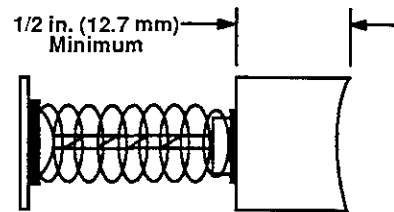
- Keep away from moving parts such as fans, belts, and rotors.

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. The brushes and slip rings should be inspected every six months or whenever excitation voltage is lost. Check for cleanliness of the slip rings and the freedom of motion of the brushes. If the welding generator has been operating under extremely dusty or dirty conditions, increase the frequency of inspection.



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Figure 9-2. Brush Replacement

Under normal use the slip rings will discolor to a dark brown. If a buildup of brush material is noted, it may be necessary to clean the slip rings. Use a number 220 or finer sandpaper followed by a crocus cloth. Never use emery cloth as part of the emery will embed itself into the rings and in turn destroy the carbon brushes.

Replace the brushes if they become chipped or broken or if less than $5/16$ in. (7.9 mm) of brush material will be left at the next projected inspection interval.

9-8. SERVICING THE SPARK ARRESTOR (Optional)



WARNING: ENGINE EXHAUST SPARKS can cause fire.

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

The engine exhaust system on this welding generator is not equipped with a spark arrestor. 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. If a spark arrestor (optional) is desired, contact your dealer/distributor.

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.

Inspect and service spark arrestor every 250 operating hours.

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.

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 jump starting is attempted, 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 injury and damage equipment.

- *Keep sparks, flames, cigarettes, and other ignition sources away from battery.*
- *Be sure that all personnel are a safe distance from batteries and away from 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 away from moving parts.*
- *Be sure 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 a vehicle, do not allow vehicle to touch welding generator case or frame.*
- *Do not jump start by applying power to weld output receptacles or terminals.*
- *Do not allow jumper cable clamps to touch 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 (+) terminal 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 after engine starts.
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. IDLE CONTROL CIRCUIT PROTECTION

The idle control printed circuit board PC1 and the throttle solenoid TS1 are protected by an automatic reset circuit breaker CB1 located behind the right side panel.

Normally, this circuit breaker should not trip. However, if an arc is struck or the Automatic Idle control switch is placed in the AUTO IDLE OFF position after the throttle solenoid has deenergized and the engine is slowing down, CB1 may trip. If this occurs, wait approximately one minute before resuming operation.

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.

HOT ENGINE PARTS can cause severe burns.

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



CAUTION: ELECTROSTATIC DISCHARGE (ESD) can damage circuit board components.

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

INCORRECT INSTALLATION or misaligned plug 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 of the circuit boards are not working, follow the preceding precautions, and contact nearest Factory Authorized Service Station.

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



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 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 tables are designed to diagnose and provide remedies for some of the troubles that may develop in this welding generator.

Use these tables 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

WELD/POWER TROUBLE	PROBABLE CAUSE	REMEDY
No power output at power receptacles.	Weld/Power switch S1 in WELD position.	Place S1 in POWER position.
Low power output at power receptacles.	Low setting on FINE AMPERAGE control R1.	Rotate R1 to 100.
	Engine running below required speed (1860 rpm)	Check air filter; clean if necessary (see Section 9-2). Adjust engine speed (see Section 9-6).
	Voltage Regulator board PC2.	Replace PC2 (see Section 10-4).
	Transformer T1.	Replace T1.
Low weld output.	Engine running below required speed (3000 rpm).	Check air filter; clean if necessary (see Section 9-2). Adjust engine speed (see Section 9-6).
	Damp or wrong type electrodes.	Try different electrodes.
Erratic weld output.	Improper connection to workpiece.	Check and tighten loose connections.

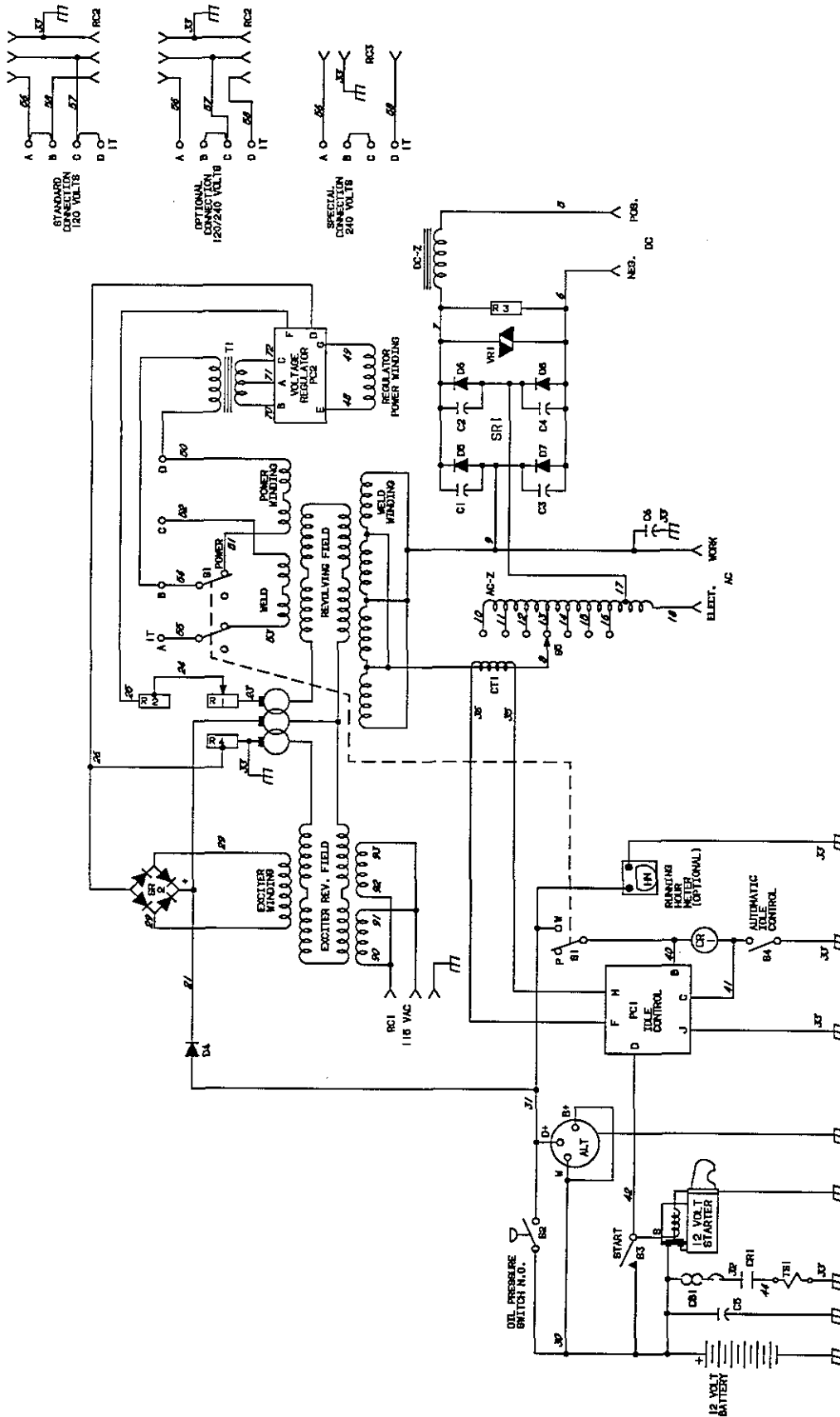
Table 10-1. Weld/Power Troubleshooting (Continued)

WELD/POWER TROUBLE	PROBABLE CAUSE	REMEDY
Erratic weld and power output.	Dirty slip rings and/or worn brushes.	Clean slip rings and/or replace worn brushes (see Section 9-7).
High power voltage.	Voltage Regulator board PC2.	Replace PC2 (see Section 10-4).
High weld voltage.	Voltage Regulator board PC2.	Disconnect lead 48 from Voltage Regulator board PC2. If voltage drops to 80 volts ac, replace Voltage Regulator board PC2 (see Section 10-4).

Table 10-2. Engine Troubleshooting

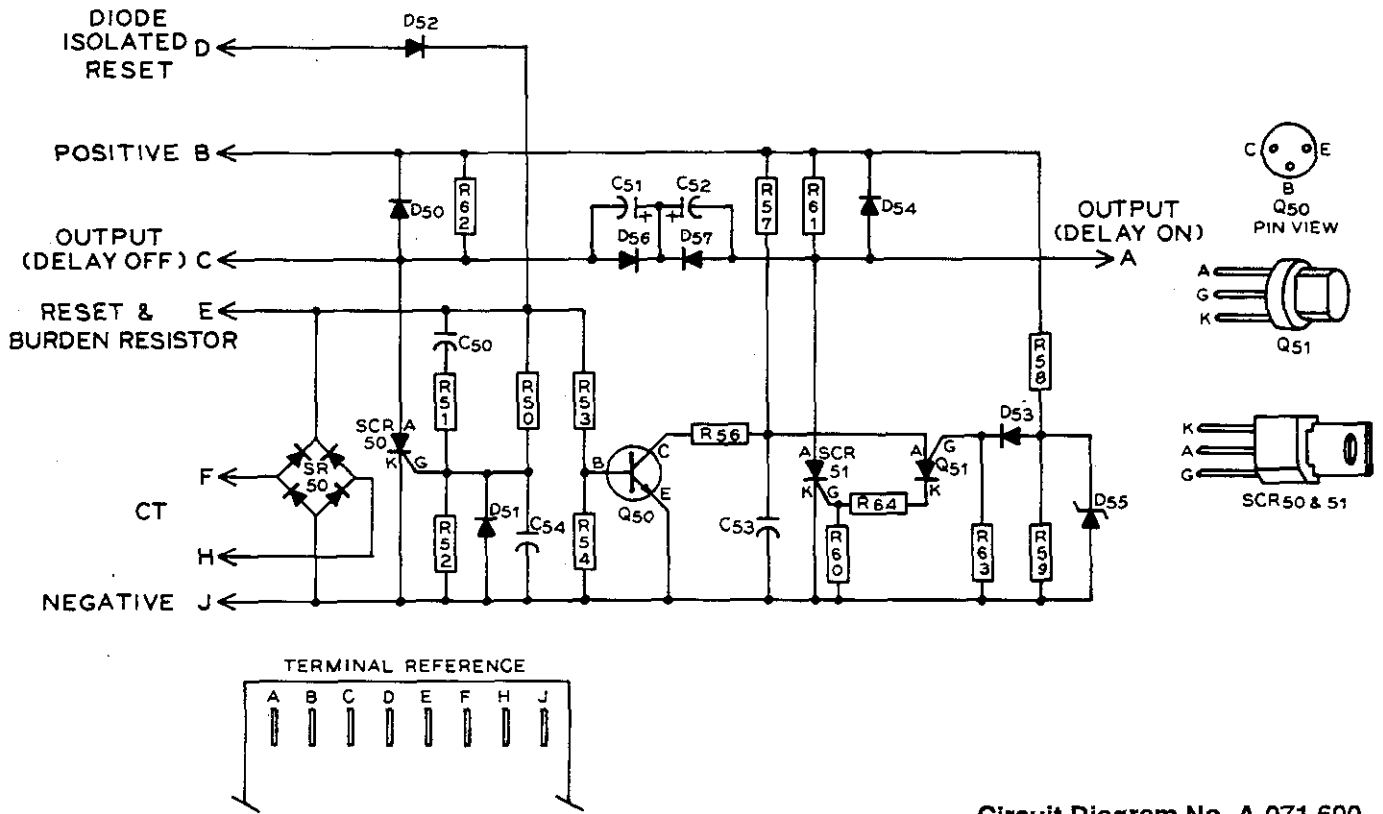
ENGINE TROUBLE	PROBABLE CAUSE	REMEDY
Engine fails to start and does not turnover.	Battery.	Inspect the electrical system (see Section 9-1). If the battery requires recharging (see Section 9-5) follow all applicable safety procedures and the battery charger manufacturer's instructions. Never use a battery charger without these instructions. 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.
Engine fails to start but does turnover.	Out of fuel.	Fill fuel tank (see Section 4-3).
Engine idles, but does not come up to weld speed.	Automatic Idle Control Board PC1.	See Section 10-4, and contact nearest Factory Authorized Service Station
Battery discharges between uses.	Buildup of acid on top of battery (white-grayish substance).	Clean battery with soda solution; rinse with clear water.
	Infrequent use.	Periodically recharge battery (approximately every 3 months, see Section 9-5).
	Battery.	Replace battery.
	Oil pressure switch S2.	Replace S2.

SECTION 11 - ELECTRICAL DIAGRAMS



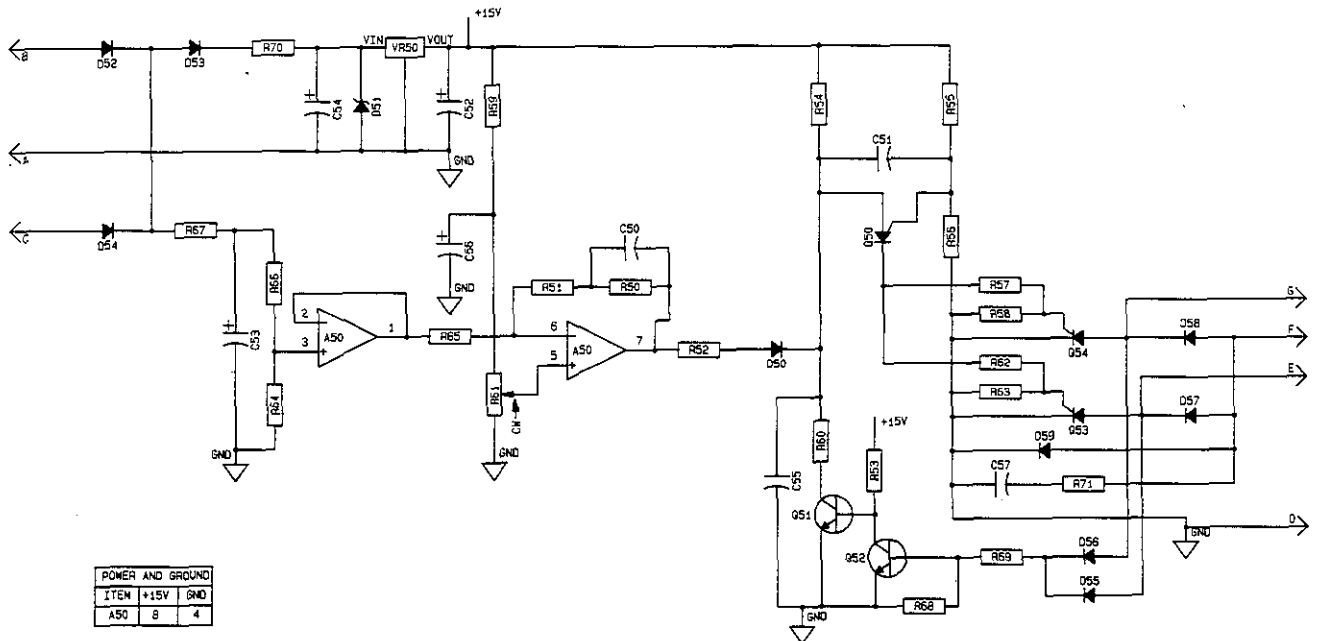
Circuit Diagram No. SC-136 786

Diagram 11-1. Circuit Diagram For Welding Generator



Circuit Diagram No. A-071 600

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



Circuit Diagram No. B-049 506-C

Diagram 11-3. Circuit Diagram For Voltage Regulator Circuit Board PC2

SECTION 12 – PARTS LIST

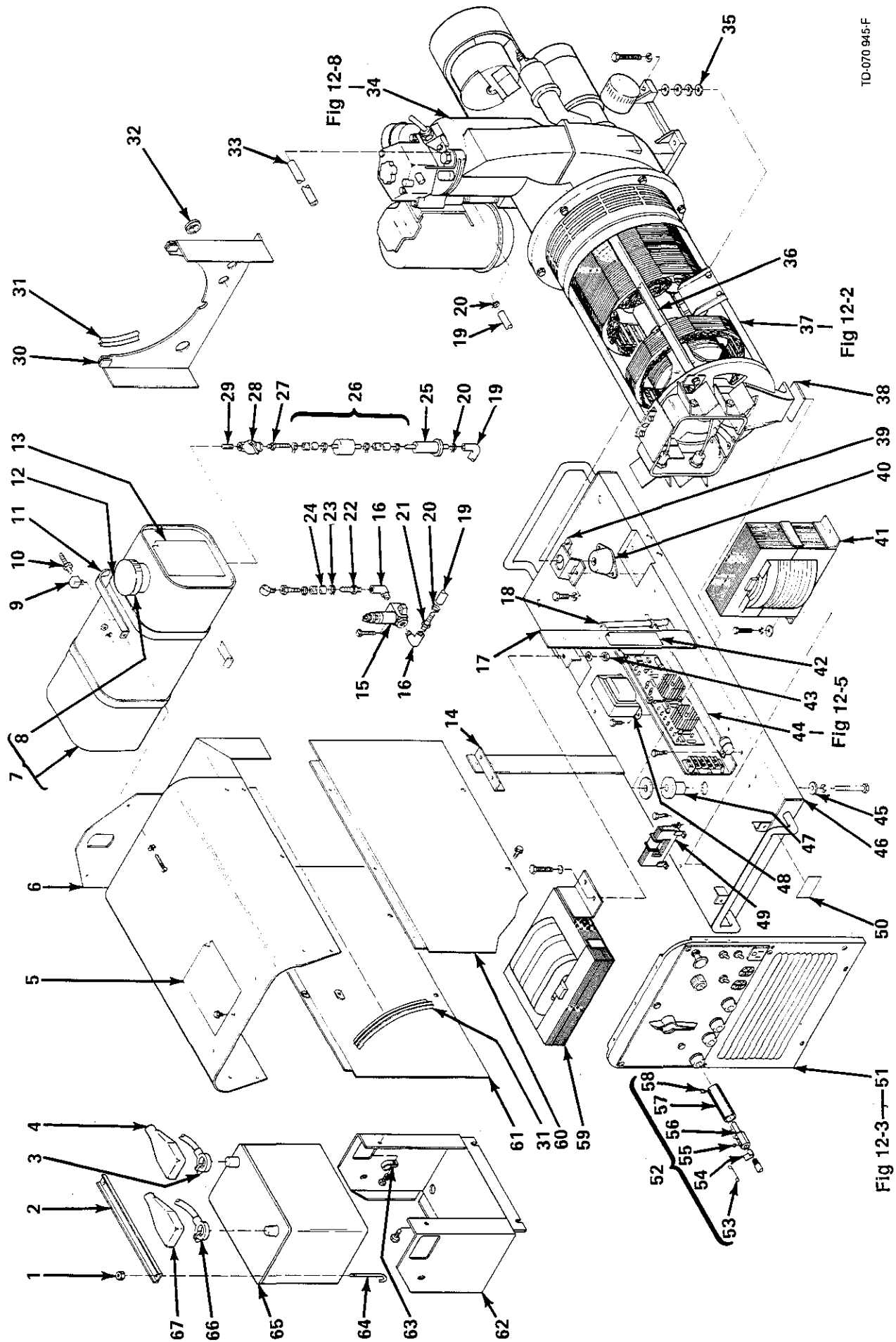


Figure 12-1. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 12-1. Main Assembly				
1		604 318	NUT, slflkg hex 1/4-20	3
2		070 213	HOLDDOWN, bat	1
3		082 317	CABLE, bat-neg	1
4		071 973	COVER, cable-bat post	1
5		046 392	LABEL, general precautionary	1
6		+035 141	COVER, top	1
		108 487	LABEL, warning use lifting eye	1
7		+071 944	TANK, fuel (consisting of)	1
8		015 603	- CAP	1
9		020 185	FITTING, pipe-elb st 1/8 NPT	1
10		073 432	FITTING, barbed male 3/16TBG x 1/8NPT	1
11		014 951	STRAP, mtg-fuel tank	2
12		603 120	STRIP, felt 1/8 x 3/4 x 28-1/4	2
13		136 722	LABEL, engine maintenance	1
14		099 267	UPRIGHT, base LH	1
15		082 968	PUMP, fuel-hand primer	1
16		010 678	FITTING, pipe-brs elb st 1/4NPT L	2
17		099 264	UPRIGHT, base RH	1
18	R2,4	052 782	RESISTOR ASSEMBLY, dual adj 180W 12 ohm	1
19		603 106	HOSE, nprn brd No. 1 x 1/4 ID (order by ft)	1ft
20		010 865	CLAMP, hose .406-7/16 dia	4
21		604 308	FITTING, brs-barbed M 1/4TBG x 1/4NPT	1
22		039 559	FITTING, barbed M 5/16TBG x 1/4NPT	1
23		084 173	CLAMP, hose .460-.545 dia	2
24		134 835	HOSE, No. 1 x 5/16 ID x .560 (order by ft)	2ft
25		070 819	FILTER, fuel-in line	1
26		047 420	FILTER, fuel-in line 1/4 w/hoses & clamps	1
27		604 313	FITTING, barbed-M 1/4TBG x 1/8NPT	1
28		010 868	FITTING, pipe-brs drain cock F 1/8NPT	1
29		602 898	FITTING, pipe-nipple close 1/8NPT	1
	CR1	090 104	RELAY, encl 12VDC SPDT	1
30		035 471	BAFFLE, air	1
31		095 970	STRIP, rbr 18 in	2
32		010 493	BUSHING, rbr 5/8ID x 7/8 mtg hole	1
33		134 834	HOSE, No. 1 .187 x .410 OD (order by ft)	2ft
34		136 784	ENGINE, diesel-electric (Fig 12-8)	1
35		010 954	WASHER, flat 13/32 ID x 1-1/4 OD x 1/8	9
36		013 367	LABEL, warning moving parts	1
37		Fig 12-2	GENERATOR ASSEMBLY	1
38		017 836	SPACER, 2 sq x 7/16 x 1/4	1
39		070 218	RETAINER, engine-mount	2
40		070 717	MOUNT, engine	2
41	AC-Z D4	049 466	REACTOR	1
		049 943	DIODE, 3A 1000V SP	1
42		047 491	LABEL, 120/240V	1
43		605 181	NUT, slflkg-hex 3/8-16	5
44		Fig 12-5	BRACKET, mtg-w/components	1
45		010 955	WASHER, flat 13/32 ID x 2 OD x 1/8	1
46		099 268	BASE	1
47		009 235	MOUNT	1
48	T1	049 712	TRANSFORMER, control	1
49	CT1	095 041	TRANSFORMER, control-idle	1
50		027 657	LABEL, caution equipment ground term	1
51		Fig 12-3	PANEL, front-w/components	1
		083 030	STUD, brs 1/4-20 x 1-3/4	1
		601 836	NUT, brs-hex jam 1/4-20	2
52		039 608	PLUG, jack-red (consisting of)	2
53		010 521	· WIRE, tie	1
54		019 833	· STRIP, copper .01 x 2-1/2 x 3/4	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 12-1. Main Assembly (Continued)				
55		602 178	· SCREW, skt hd 1/4-20 x 3/8	2
56		101 219	· PLUG, jack	1
57		602 814	· INSULATION, jack plug-red	1
58		602 160	· SCREW, sltptg fillister hd 8-32 x 1/4	1
59	DC-Z	035 429	STABILIZER	1
60		035 135	PANEL, side-RH	1
61		035 136	PANEL, side-LH	1
62		070 211	SHELF, bat	1
63		032 878	CLAMP, 9/16 dia x 13/32 hole	2
64		097 829	BOLT, J 1/4-20 x 2-3/4	2
65		071 678	BATTERY, 12V 74A	1
66		082 316	CABLE, bat-pos	1
67		071 972	COVER, cable - bat post	1
		108 081	TERMINAL PROTECTOR, bat post	2

Parts For Optional Equipment

		041 470	METER KIT, running hour (consisting of)	1
	HM	032 936	· METER, hour 4-40VDC	1
		041 941	240 VOLT RECEPTACLE KIT (consisting of)	1
	RC2	604 103	· RECEPTACLE, straight duplex grd 2P3W 15A 250V	1
		041 307	SPARK ARRESTOR, exhaust - engine (consisting of)	1
		048 901	· SPARK ARRESTOR, exhaust	1
		061 864	· GASKET, exhaust	1

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure 12-2. Generator Assembly (Fig 12-1 Item 37)

1		072 859	GUARD, fan	1
2		070 212	ROTOR, generator (consisting of)	1
3		024 617	· RING, retaining	1
4		053 390	· BEARING	1
5		006 307	· FAN	1
		026 206	· KEY, 1/4 x 1/4 x 1-3/4	1
6		006 298	ADAPTER, engine	1
7	SR2	035 704	RECTIFIER, integ 30A 600V	1
8		047 878	BAR, retaining - brushholder	1
9		047 885	CAP, brushholder	3
10		*049 125	BRUSH, w/spring	3
11		005 614	HOLDER, brush w/tabs	3
12		007 250	BRACKET, mtg-brushholder	1
13		+086 961	STATOR (60 Hz) or	1
13		+086 960	STATOR (50 Hz)	1
14		020 908	ENDBELL	1
15	SR1	099 190	RECTIFIER, si diode (consisting of)	1
16		009 970	· BRACKET, mtg	2
17		037 305	· DIODE, 150A 300V SP	2
18	C1-4	031 689	· CAPACITOR, cer.01 uf 500VDC	4
19		037 306	· DIODE, 150A 300V RP	2
20	R3,VR1	046 819	· SUPPRESSOR	1

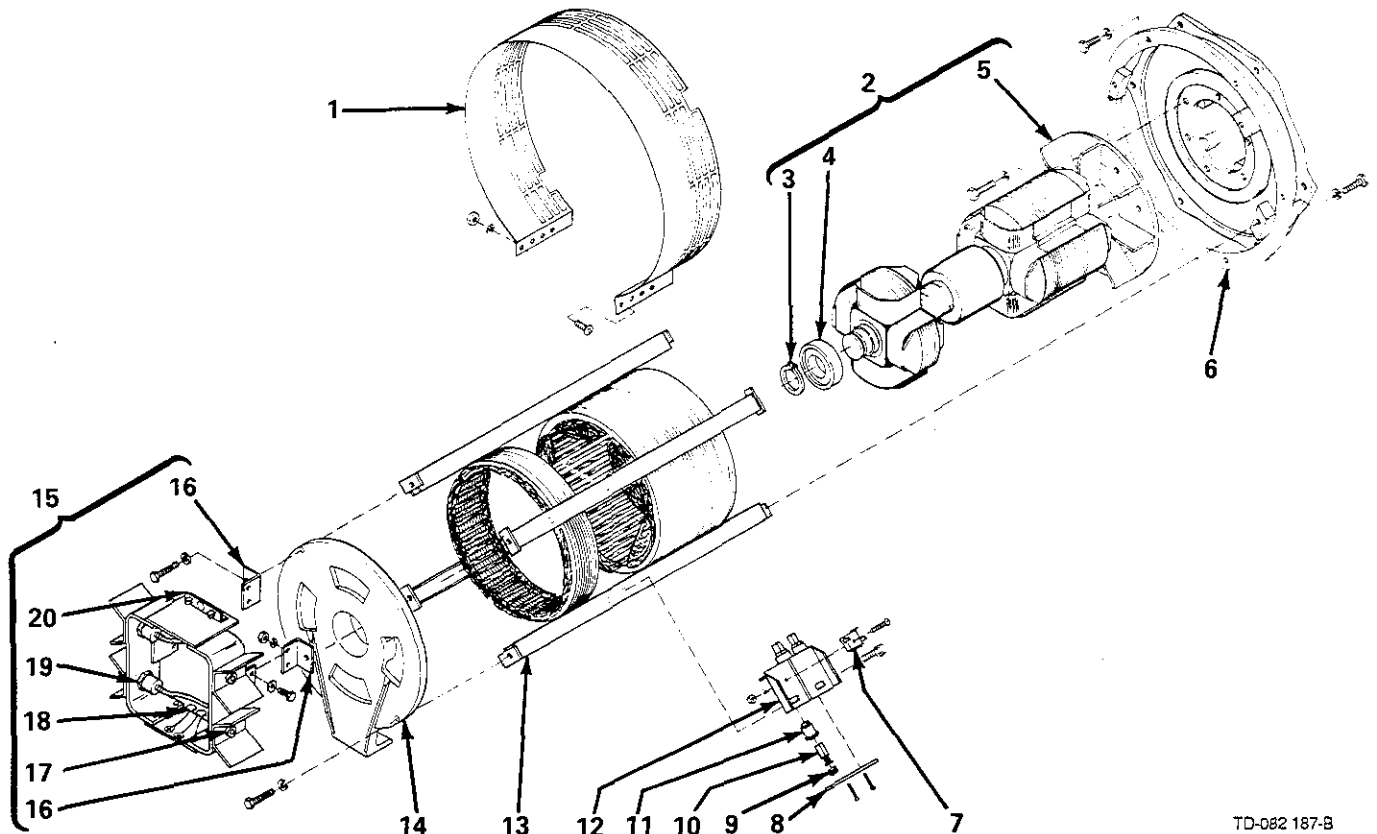


Figure 12-2. Generator Assembly

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*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.

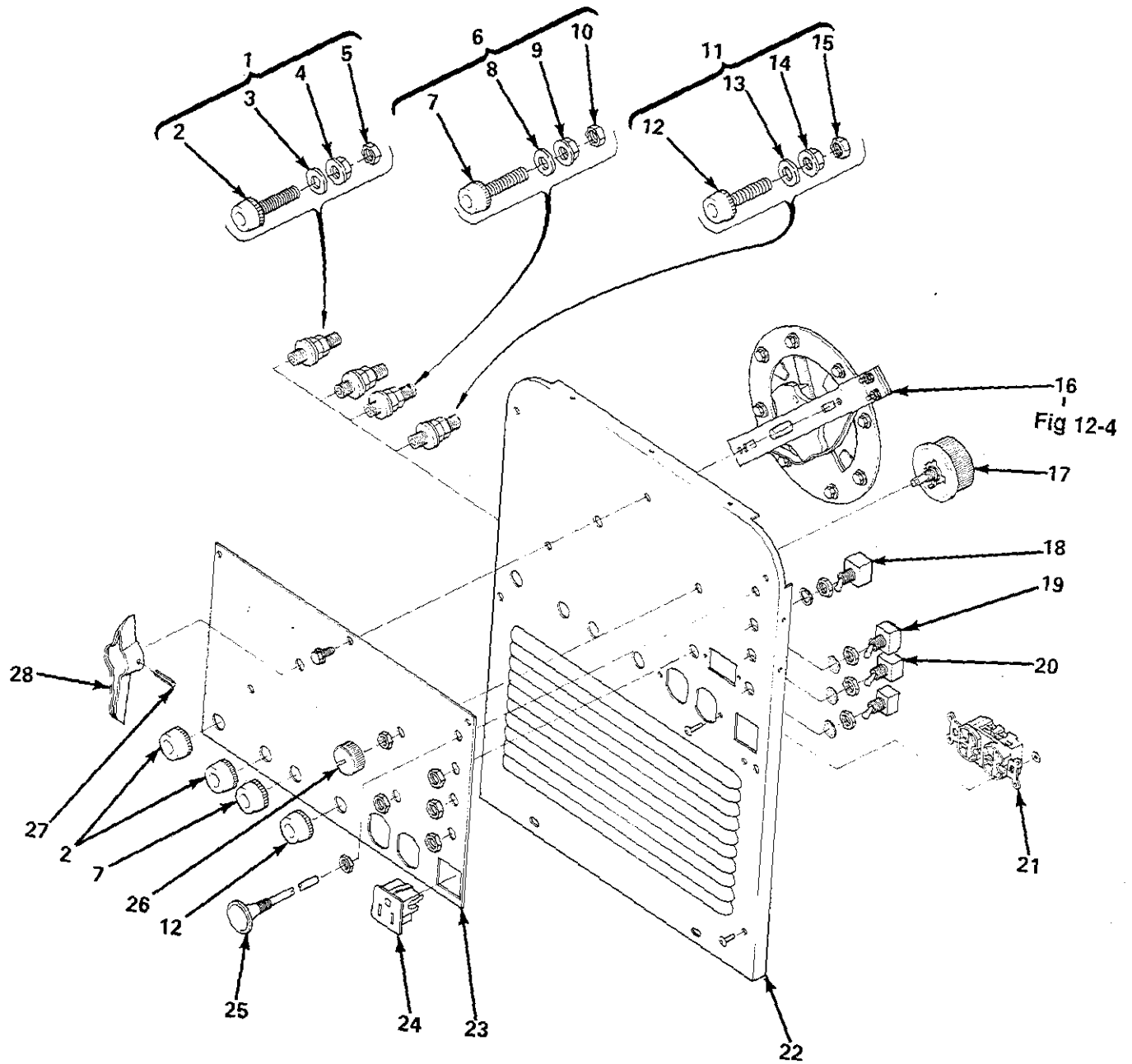


Figure 12-3. Panel, Front - w/Components

Ref. TD-048 814-A

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 12-3. Panel, Front - w/Components (Fig 12-1 Item 51)				
1		057 608	RECEPTACLE, jack plug-yellow (consisting of)	2
2		072 334	· RECEPTACLE & NUT, yellow	1
3		010 291	· WASHER, flat-nylafil 5/8 ID x 1-1/4 OD x 1/8	1
4		604 668	· NUT, sflkg hex 1/2-20	1
5		601 881	· NUT, hex - jam 1/2-20	1
		605 787	· WASHER, lock-internal tooth 1/2	1
	C6	106 494	CAPACITOR	1
6		039 801	RECEPTACLE, jack plug-black (consisting of)	1
7		091 542	· RECEPTACLE & NUT, black	1
8		010 291	· WASHER, flat-nylafil 5/8 ID x 1-1/4 OD x 1/8	1
9		604 668	· NUT, sflkg hex 1/2-20	1
10		601 881	· NUT, hex - jam 1/2-20	1
		605 787	· WASHER, lock-internal tooth 1/2	1
11		039 800	RECEPTACLE, jack plug-red	1
12		091 541	· RECEPTACLE & NUT, red	1
13		010 291	· WASHER, flat-nylafil 5/8 ID x 1-1/4 OD x 1/8	1
14		604 668	· NUT, sflkg hex 1/2-20	1
15		601 881	· NUT, hex jam 1/2-20	1
		605 787	· WASHER, lock-internal tooth 1/2	1
16	S5	005 563	SWITCH, selector (Fig 12-4)	1
17	R1	081 712	RHEOSTAT, WW 100W 30 ohm	1
18	S1	011 622	SWITCH, tgl 3PDT 15A 125V	1
19	S3	021 467	SWITCH, tgl SPST MC 3A 125VAC	1
20	S4	089 085	SWITCH, tgl SPST 20A 125V	1
21	RC2	039 864	RECEPTACLE, straight duplex grd 2P3W 15A 125V	1
22		049 213	PANEL, front	1
23			NAMEPLATE (order by model and serial number)	1
24	RC1	034 952	RECEPTACLE, straight 3P3W 15A 125V	1
		073 690	CAP, P & S 5266-DF (RC1 & R2)	
25		019 790	CONTROL, push/pull	1
26		097 924	KNOB, pointer	1
27		010 647	PIN, spring-compression 5/32 x 1-1/4	1
28		006 927	HANDLE, switch-range	1

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

Item No.	Part No.	Description	Quantity
005 563 Figure 12-4. Switch, Selector (Fig 12-3 Item 16)			
1	005 562	BRACKET, mtg-switch	1
2	005 561	SHAFT, rotor	1
3	005 564	INSULATOR, scr-switch	1
4	605 276	SCREW, cap-steel hex hd 1/4-20 x 1-1/4	1
5	005 559	CONTACT BOARD, movable-switch	1
6	005 560	CONTACT, switch-movable	1
7	008 485	SPACER, contact-switch	1
8	005 566	CONTACT BOARD, stationary-switch	1
9	011 644	CONTACT, stationary-switch	7
10	052 405	SPRING, pressure-contact switch	1
11	052 404	CONTACT, movable-switch	1
12	005 557	BUS BAR, switch-range	1
13	005 558	SPRING, selector-switch	1

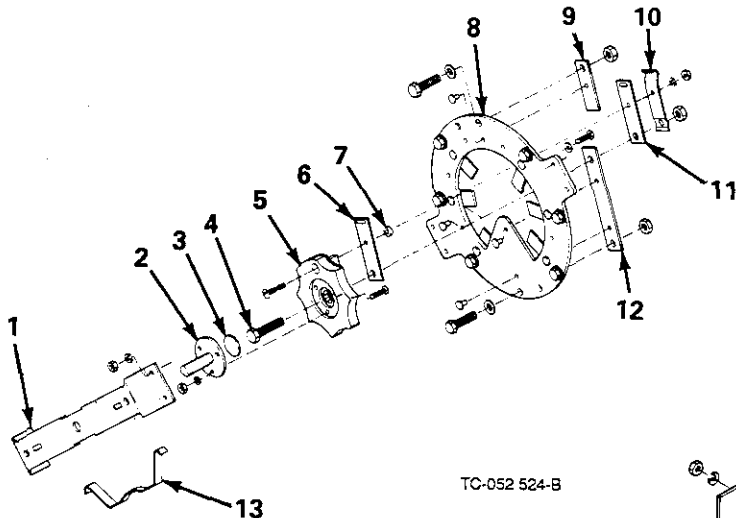


Figure 12-4. Switch, Selector

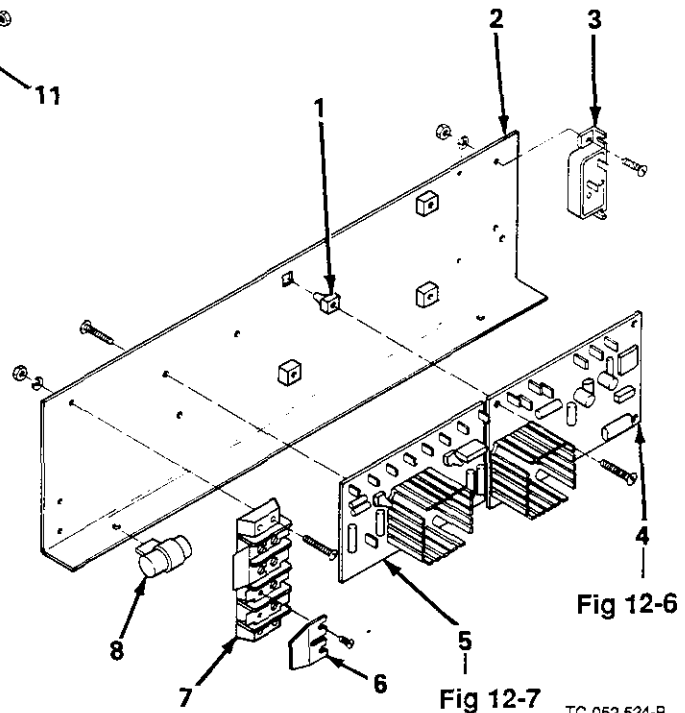
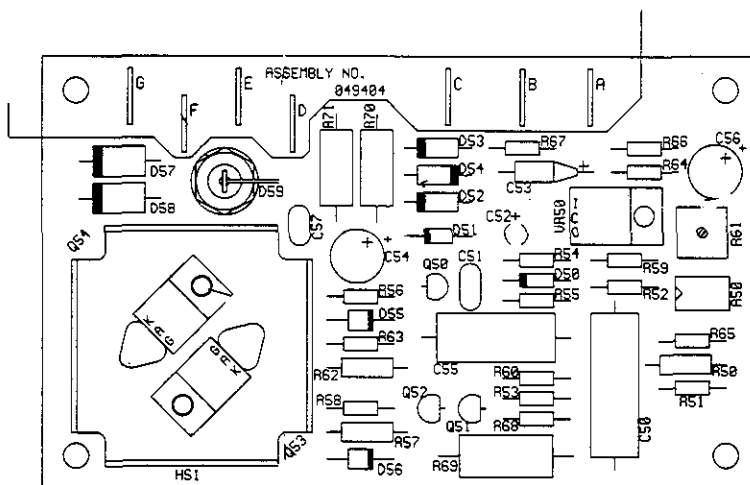


Figure 12-5. Bracket, Mounting - w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 12-5. Bracket, Mounting - w/Components (Fig 12-1 Item 44)				
1		080 509	GROMMET, scr No. 8/10 panel hole	4
2		049 377	BRACKET, mtg-components	1
3	CB1	083 432	CIRCUIT BREAKER, man reset 1P 10A 250V	1
4	PC2	049 404	CIRCUIT CARD, regulator 115V (Fig 12-6)	1
5	PC1	071 609	CIRCUIT CARD, weld/idle control (Fig 12-7)	1
6		038 620	LINK, jumper-term block 30A	2
7	1T	038 621	BLOCK, term 30A 4P	1
8	C5	070 949	CAPACITOR	1

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

Dia. Mkgs.	Part No.	Description	Quantity
PC2	049 404	Figure 12-6. Circuit Card, Regulator (Fig 12-5 Item 4)	
A50	009 159	IC, linear 358	1
C50	028 294	CAPACITOR, polymet film 1uf 250VDC	1
C51	053 992	CAPACITOR, cer dis .001uf 1000VDC	1
C52	000 348	CAPACITOR, tantlm .47uf 35V	1
C53	005 023	CAPACITOR, tantlm 2.2uf 20V	1
C54,56	000 861	CAPACITOR, elctlt 33uf 35V	2
C55	038 585	CAPACITOR, myl .22uf 50V	1
C57	028 292	CAPACITOR, cer .005uf 1000VDC	1
D50	028 351	DIODE, sig .020A 75V SP	1
D51	049 641	DIODE, zener 27V 1W	1
D52-54	026 202	DIODE, rect 1A 400V SP	3
D55,56	073 555	DIODE, rect 1A 600V SP	2
D57,58	070 250	DIODE, rect 3A 600V	2
D59	030 529	DIODE, 22A 600V RP	1
Q50	039 355	TRANSISTOR, ujt 15MA 40V	1
Q51,52	037 200	TRANSISTOR, NPN 200MA 40V	2
Q53,54	049 642	THYRISTOR, SCR 8A 600V	2
R50	005 640	RESISTOR, C .05W 680K ohm	1
R51	035 884	RESISTOR, CF .25W 100K ohm	1
R52	039 328	RESISTOR, CF .25W 1.5K ohm	1
R53,54,65	035 886	RESISTOR, CF .25W 22K ohm	3
R55	039 329	RESISTOR, CF .25W 2.7K ohm	1
R56,64	035 827	RESISTOR, CF .25W 10K ohm	2
R57,62	028 285	RESISTOR, CF .5W 100 ohm	2
R58,63	035 823	RESISTOR, CF .25 100 ohm	2
R59	035 888	RESISTOR, CF .25W 2.2K ohm	1
R60	074 026	RESISTOR, C .25W 150 ohm	1
R61	006 424	POTENTIOMETER, cermet trmr 1/T .5W 2K ohm	1
R66	039 332	RESISTOR, CF .25W 15K ohm	1
R67	039 334	RESISTOR, CF .25W 27K ohm	1
R68	039 331	RESISTOR, CF .25W 4.7K ohm	1
R69	049 439	RESISTOR, C 2W 47K ohm	1
R70	074 099	RESISTOR, C 1W 150 ohm	1
R71	030 707	RESISTOR, C 1W 47 ohm	1
VR50	081 832	IC, linear 78M15	1

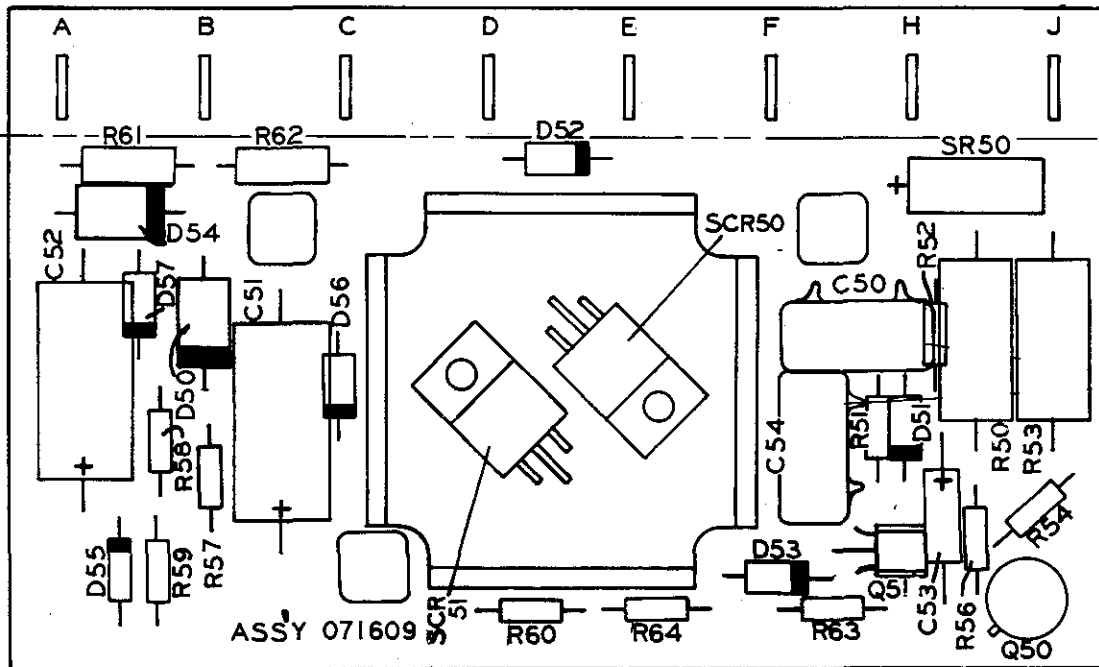


Ref. A-099 497-A

Figure 12-6. Circuit Card, Regulator PC2

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

Dia. Mkgs.	Part No.	Description	Quantity
PC1	071 609	Figure 12-7. Circuit Card, Weld/Idle Control (Fig 12-5 Item 5)	
C50,54	035 522	CAPACITOR, polyefilm .047uf 100V	2
C51,52	045 868	CAPACITOR, elclit 100uf 25VDC	2
C53	080 507	CAPACITOR, tantlm 22uf 15V	1
D50,54	070 250	DIODE, 3A 600V	2
D51-53, 56,57	026 202	DIODE, 1A 400V SP	5
D55	037 243	DIODE, zener 18V 1W	1
Q50	000 088	TRANSISTOR, NPN 800MA 400V	1
Q51	039 355	TRANSISTOR, ujt 15 MA 40V	1
R50,53	000 039	RESISTOR, 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, CF .25W 620K ohm	1
R58	053 572	RESISTOR, CF .25W 12K ohm	1
R59	052 138	RESISTOR, CF .25W 20K ohm	1
R60	035 822	RESISTOR, CF .25W 10 ohm	1
R61,62	030 026	RESISTOR, CF .5W 560 ohm	2
R63	003 272	RESISTOR, CF .25W1 meg ohm	1
R64	071 595	RESISTOR, CF .25W 22 ohm	1
SCR50,51	080 508	THYRISTOR, SCR 8.5A 200V	2
SR50	035 841	RECTIFIER, integ 1.5A 200V	1



B-090 506

Figure 12-7. Circuit Card, Weld/Idle Control PC1

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
136 784 Figure 12-8. Engine, Diesel-Electric (Fig 12-1 Item 34)				
1		136 785	ENGINE, deutz dsl elect	1
2		070 216	BRACKET, mtg-cable stop	1
3		070 456	RETAINER, spring	1
4		070 255	SPRING, compression	1
5		603 110	HOSE, 1/2 ID x 11/16 OD (order by ft)	2ft
6		064 646	SPRING, high speed	1
7		114 162	CHAIN, throttle	1
8		107 333	LINK, throttle	1
9		075 064	WASHER, flat 7/32 ID x 1-1/8 OD x .090	1
10		070 215	BRACKET, mtg-solenoid	1
11		034 116	CLAMP, 5/8 dia x 15/32 hole	1
12		114 154	BRACKET, stop-solenoid	1
13	TS1	106 977	SOLENOID, 12VDC 20A	1
14		070 900	GUARD, solenoid	1
15		010 516	SWIVEL, wire-inner	1
16	S2	011 917	SWITCH, pressure 2P normally open	1
17		011 198	LABEL, warning fan	1

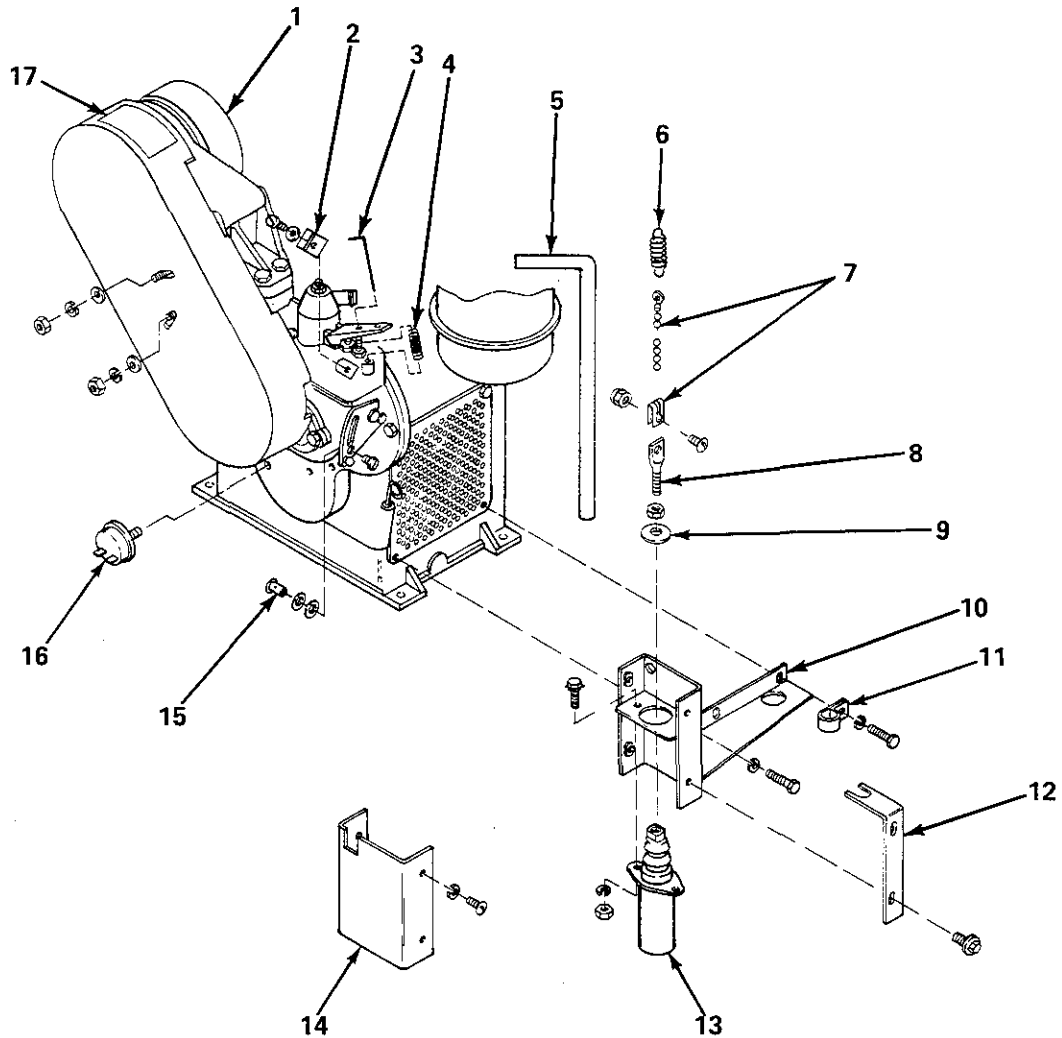
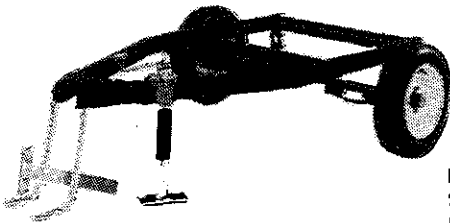


Figure 12-8. Engine, Diesel - Electric

TD-138 330

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

OPTIONS AND ACCESSORIES



EDT 1000-2 TWO WHEEL TRAILER Stock No. 041 777

A 1000 lbs. (453 kg) capacity trailer with welded structural steel frame, heavy duty axle with roller bearing hubs and leaf spring suspension. Mounting holes for all small Miller engine driven 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.

When equipped with fender and light kit and 2" (50 mm) ball hitch this trailer conforms to all applicable U.S. Federal motor vehicle safety standards in effect on date of manufacture.

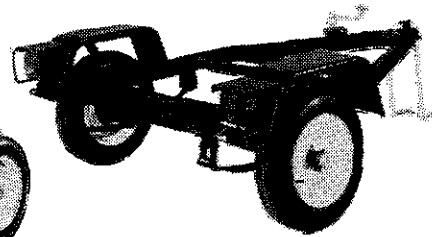
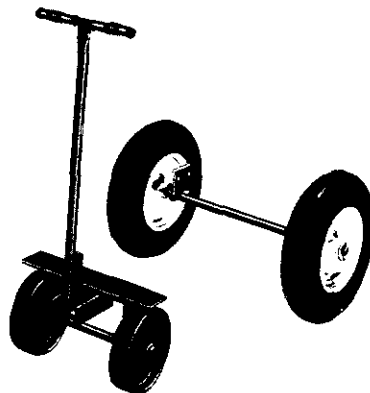
Specifications

GVWR: 1200 lbs (544 kg)
 Trailer weight: 186 lbs (84 kg)
 Trailer capacity: 1000 lbs (453 kg)
 Total width (without optional fender kit) 55" (1.4 m)
 Total length (without optional hitch) 72" (1.8 m)
 Width of bed 36" (914 mm)
 Track Width 49 1/2" (1257 mm)
 Height of bed 18" (457 mm)
 Tire size 4.80-12
 Shipping weight 186 lbs (84 kg)

No. 4A RUNNING GEAR

Stock No. 040 020

Two rear wheels with 480/400 x 8 pneumatic tires. Two 8" (203 mm) solid rubber tired front wheels with 30" (762 mm) towing handle.



FENDER AND LIGHT KIT

Stock No. 041 778

Includes fenders, lights, wiring harness and mounting hardware.
 Shipping weight 37 lbs. (17 kg)

HITCHES

2" (51 mm) BALL

Stock No. 041 724

Shipping weight 5 lbs. (2 kg)



CLEVIS

(Not for highway use)

Stock No. 041 726

Shipping weight 11 lbs. (5 kg)



2 1/4" (64 mm) LUNETTE EYE

Stock No. 041 725

Shipping weight 9 lbs. (4 kg)



When ordering trailers without the fender and light kit and ball hitch the purchase order must include the statement, "For off the road use only."



No. 2-BWA WELDING ACCESSORY PACKAGE

Stock No. 040 041 — Consists of 35' (10.6 m) No. 2 electrode cable with insulated electrode holder and jack plug, 30' (9.1 m) No. 2 work cable with work clamp and jack plug, welding helmet, wire scratch brush.

RUNNING HOUR METER

Stock No. 041 470 (Factory)

Stock No. 041 471 (Field)

240 VOLT AUXILIARY POWER RECEPTACLE KIT

Stock No. 041 623 (Factory)

Stock No. 041 624 (Field)

Required to reconnect auxiliary power from 120 to 240 volts.

SPARK ARRESTOR

Stock No. 041 307 (Field Only)

Mandatory when operating on California grasslands, brush or forest covered land and all National Forests. For other areas, check your state and local laws.

CC-1A CANVAS COVER

Stock No. 040 252

Heavy-duty, olive drab, waterproof and mildew resistant.

