



OM-166 941C

July 1999

Processes



Stick (SMAW) Welding



Flux Cored (FCAW) Welding



Air Carbon Arc (CAC-A)
Cutting and Gouging

Description



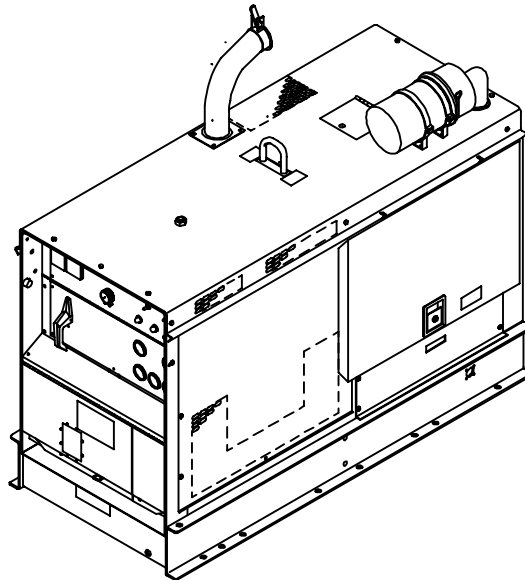
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DC

Engine Driven Welding Generator

CBI 801D

(Per NSPR 10202)



OWNER'S MANUAL

Warranty

Effective January 1, 1999
(Equipment with a serial number preface of "KK" or newer)

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

LIMITED WARRANTY – Subject to the terms and conditions below, warrants to its original retail purchaser that new equipment sold after the effective date of this limited warranty is free of defects in material and workmanship at the time it is shipped from factory. THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTIES OF MERCHANTABILITY AND FITNESS.

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

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

1. 5 Years Parts – 3 Years Labor
 - * Original main power rectifiers
2. 3 Years — Parts and Labor
 - * Transformer/Rectifier Power Sources
 - * Plasma Arc Cutting Power Sources
 - * Semi-Automatic and Automatic Wire Feeders
 - * Engine Driven Welding Generators
 - (NOTE: Engines are warranted separately by the engine manufacturer.)**
3. 1 Year — Parts and Labor
 - * Motor Driven Guns (w/exception of Spoolmate 185)
 - * Process Controllers
 - * Positioners and Controllers
 - * Automatic Motion Devices
 - * Robots
 - * RFCS Foot Controls
 - * Water Coolant Systems
 - * HF Units
 - * Grids
 - * Spot Welders
 - * Load Banks
 - * SDX Transformers
 - * Running Gear/Trailers
 - * Field Options
 - (NOTE: Field options are covered under the limited warranty for the remaining warranty period of the product they are installed in, or for a minimum of one year — whichever is greater.)
4. 6 Months — Batteries
5. 90 Days — Parts and Labor
 - * MIG Guns/TIG Torches
 - * Plasma Cutting Torches
 - * Remote Controls
 - * Accessory Kits
 - * Replacement Parts
 - * Spoolmate 185

Limited Warranty shall not apply to:

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

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

In the event of a warranty claim covered by this warranty, the exclusive remedies shall be, at manufacturer's option: (1) repair; or (2) replacement; or, where authorized in writing by manufacturer in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized 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. manufacturer's option of repair or replacement will be F.O.B., Factory at Appleton, Wisconsin, or F.O.B. at an authorized service facility as determined by manufacturer. Therefore no compensation or reimbursement for transportation costs of any kind will be allowed.

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

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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 ade-

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

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

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

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

2. Electrode Holders

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

3. Connectors

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

4. Cables

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

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

5. Terminals And Other Exposed Parts

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

6. Electrode

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

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

ject 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.

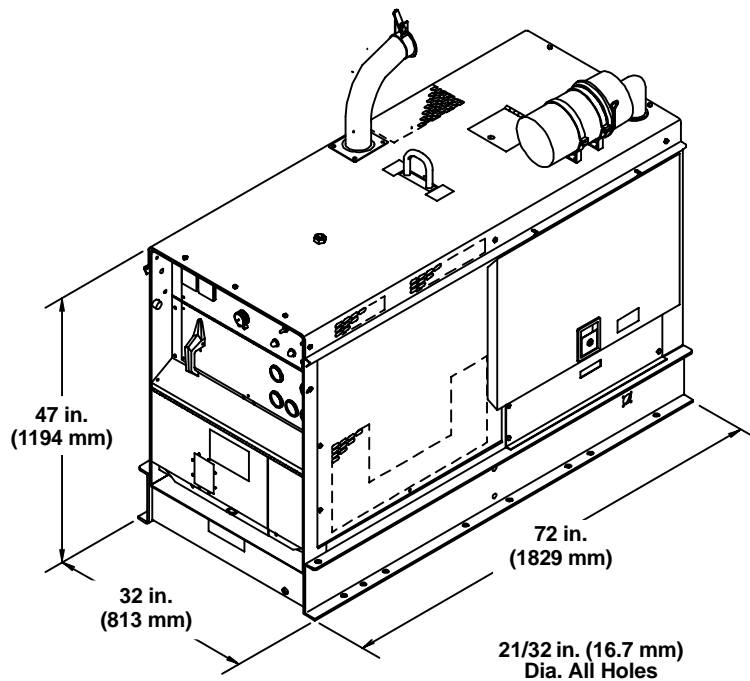
IMPORTANT statements identify special instructions necessary for the most efficient operation of this equipment.

SECTION 3 – SPECIFICATIONS

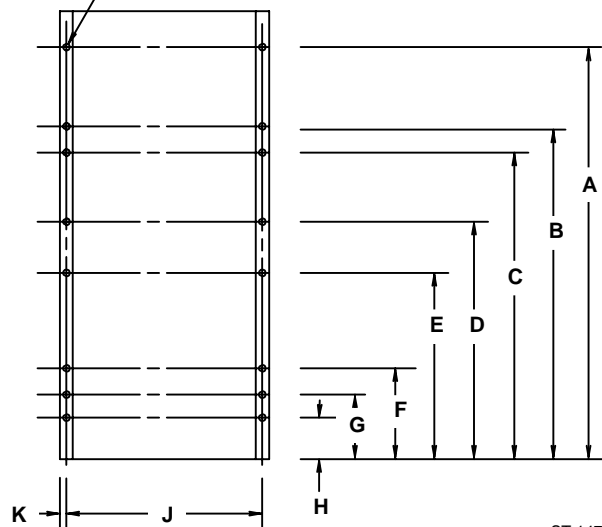
Table 3-1. Welding Generator Specifications

Rated Output At 100% Duty Cycle	Welding Range	Maximum Open-Circuit Voltage (OCV)	Maximum Engine Speed (No Load)	Single-Phase Auxiliary Power While Welding	Weight	
					Net	Ship
800 Amperes At 36 Volts DC	100 to 800 Amps DC	95 Volts DC 80 Volts DC Nominal	1860 RPM	3 kVA/kW 60 Hz 26 Amperes At 120 Volts	2150 lbs. (975 kg)	2280 lbs. (1034 kg)

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



	Inches	Millimeters
A	62-3/8	1584
B	50-1/2	1283
C	46-1/2	1181
D	36	914
E	28-3/16	716
F	13-3/4	349
G	9-3/4	248
H	6-1/8	156
J	29-7/8	759
K	1-1/16	27



ST-147 323-B

Figure 3-1. Overall Dimensions And Mounting Hole Locations

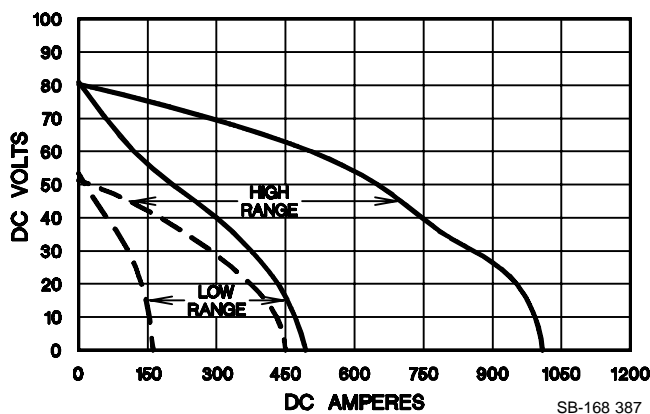
3-1. DUTY CYCLE

The duty cycle of a welding generator is the percentage of a ten minute period that a welding generator can be operated at a given output without causing overheating and damage to the unit. This welding generator is rated at 100 percent duty cycle when operated at 800 amperes. This means that the welding generator can be operated at 800 amperes continuously without causing damage to the unit.

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

The volt-ampere curves show the voltage and amperage output capabilities of the welding generator at minimum and maximum of each coarse range. Curves of other settings fall between the curves shown.

Chart 3-1. Volt-Ampere Curves



3-3. DESCRIPTION

This unit is a constant current (CC) dc arc welding generator designed for use with the Shielded Metal Arc Welding (SMAW), Flux Cored Arc Welding (FCAW),

and Air Carbon Arc Cutting And Gouging (CAC-A) processes.

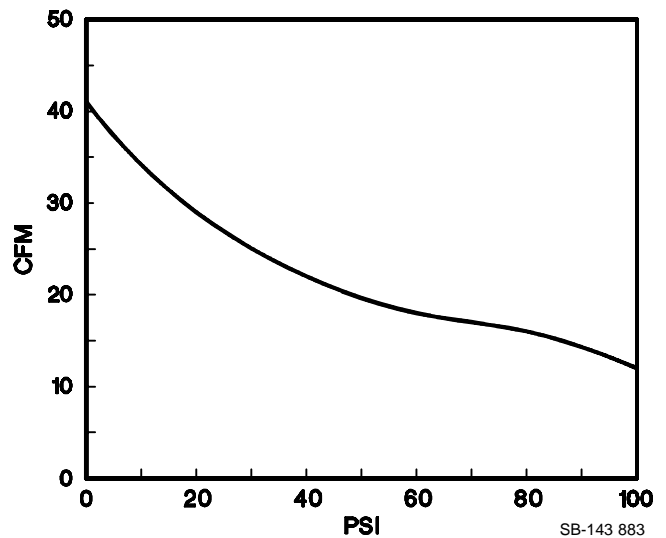
The unit is equipped with a four-cylinder, air-cooled, Deutz diesel engine (F4L-912). The air compressor in this unit is mounted on the front of the engine, and it operates whenever the engine is running. The compressor delivers 12 cfm of air at a pressure of 100 psi (see Chart 3-2).

In addition to welding and air compressor operation, this unit can provide up to 3 kVA/kW of 120 volts (26 amperes) ac electrical power for operating 50/60 Hz or 60 Hz auxiliary equipment while welding.

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

An optional Ether Starting Aid can be provided on the welding generator and is covered within this Owner's Manual.

Chart 3-2. Air Output Curve



SECTION 4 – INSTALLATION OR RELOCATION

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

4-1. LOCATION (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.



WARNING: ENGINE EXHAUST GASES can kill.

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



CAUTION: RESTRICTED AIRFLOW causes overheating and possible damage to internal parts.

- Maintain at least 18 inches (457 mm) of unrestricted space on all sides of unit, and keep underside free of obstructions.
- Do not place any filtering device over the intake air passages of this welding generator.

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

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

A. Lifting Of Equipment



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

- Use lifting eye to lift unit only, NOT gas cylinders, trailer, or any other heavy options, accessories, or devices.
- Use equipment of adequate capacity to lift the unit.
- Use lift forks at least 42 in. (1067 mm) long.
- Lift only from engine-end (end opposite front panel).

B. Trailer Mounting



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

- Distribute weight so that trailer tongue weight is approximately 10% of 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 and improper operation.

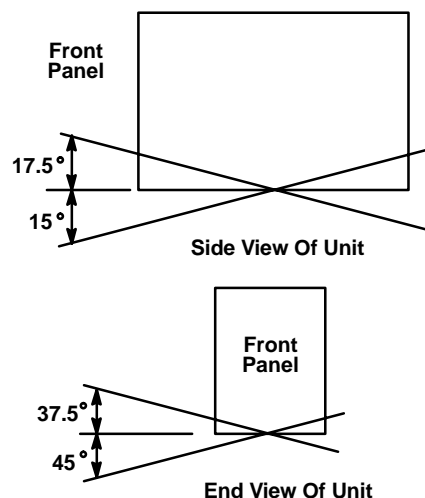


Figure 4-1. Allowable Tilt Angles For Welding Generator Engine

Holes are provided in the base for securing the unit in a permanent location or to a trailer 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 functions.

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

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. EXHAUST EXTENSION INSTALLATION



WARNING: HOT ENGINE PARTS can cause severe burns.

- If applicable, shut down engine and allow exhaust system to cool before installing exhaust extension.

1. Install exhaust extension through top cover opening, over muffler extension elbow. (Be sure to face end of extension away from air cleaner; see Figure 3-1).
2. Secure exhaust extension to top cover of unit using supplied hardware.

4-3. CONNECTING THE BATTERY



WARNING: BATTERY ACID can burn eyes and skin and destroy clothing and 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 the battery connected.
- Do not disconnect the battery while the engine is running.

IMPORTANT: Be sure the Engine Control switch is in the OFF position before connecting battery.

This unit is equipped with a maintenance-free battery. To place the unit in service, remove the left, rear side panel, connect the negative (-) battery cable to the negative battery terminal, and reinstall the side panel. No other preparation should be required. If the battery does not supply enough power to crank the engine, charge the battery according to Section 8-6.

4-4. FUEL



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

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

ENGINE FUEL can cause fire or explosion.

- Stop engine before checking or adding fuel.
- Do not spill fuel; if spilled, wipe up.
- Do not refuel if engine is hot or running.
- Do not refuel near sparks or open flame.
- Do not smoke while refueling.
- Do not fill fuel tank to top; allow 1/2 in. (13 mm) from fuel to tank top for expansion.
- Do not weld on fuel tank.

IMPORTANT: Fill fuel tank up to 1/2 in. (13 mm) from top with fresh fuel before starting engine the first time. 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.

The capacity of the fuel tank is 30 gallons U.S. Measure (114 liters). See the Engine Manufacturer's Manual for fuel recommendations. Chart 4-1 illustrates typical fuel consumption under specific load conditions. Fuel consumption varies from one engine to another. Different brands of fuel, operating conditions, condition of the engine, etc., also affect the fuel consumption level.

Keep the fuel tank filled to ensure that the injector system receives an adequate supply of fuel. The fuel cap is located on the lower front panel, behind the right access door (see Figure 4-2). If the fuel tank is allowed to empty, air will enter the system, causing starting problems. The Engine Manufacturer's Manual outlines procedures for air bleeding the fuel system.

4-5. LUBRICATION (Figure 4-2)

A. Oil And Oil Level Indicator

The engine is shipped with its crankcase filled with SAE 20 break-in oil. An oil level indicator is provided on the

lower front panel of this unit (see Figure 4-2). If oil level is below the lower pointer when engine is running, add oil according to the recommendations in the Engine Manufacturer's Manual (F4L-912 engine). The oil cap is located under the access door on the top cover.

IMPORTANT: This engine is equipped with an Oil Pressure Shutdown gauge/switch and an Oil Temperature Shutdown gauge/switch. If oil pressure becomes too low or oil temperature rises to a level that may cause engine damage, the respective gauge/switch shuts down the engine. The shutdown oil pressure has been factory set at 30 psi (207 kPa), and the shutdown oil temperature has been set at 265° F (130° C).

B. Wetstacking Considerations

Wetstacking is an accumulation of unburned fuel and oil in the exhaust pipe. The engine may use oil and wetstacking may occur during the run-in period if the piston rings are not seated properly. If oil consumption and wetstacking occur during run-in period, see Section 8-12.

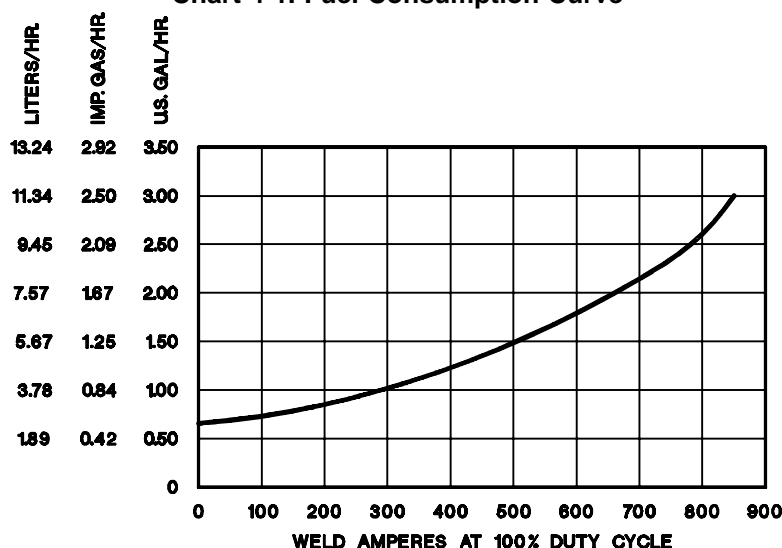
4-6. EQUIPMENT GROUNDING TERMINAL



This unit is equipped with a grounding terminal for grounding the generator case. The grounding terminal is located on the lower front panel (see Figure 4-2). Since the generator neutral is connected to the frame, the equipment grounding terminal must be connected to a proper earth ground. Additionally, comply with all national, regional, and local codes concerning portable generators for the specific application.

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.

Chart 4-1. Fuel Consumption Curve



4-7. WELD OUTPUT CONNECTIONS (Table 4-1 And Figure 4-2)

RATED WELD 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

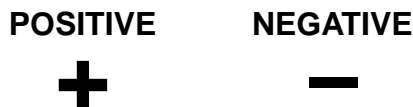
Use the following guidelines to select weld cables:

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 generator (see Table 3-1 for unit maximum ocv rating).
3. Select weld cable size according to maximum weld output and total length of connecting cables in weld circuit. For example, if a 25 foot (7.5 m) wire feeder or 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 damaged or frayed cables.

B. Weld Cable Preparation

1. Install electrode holder to cable following manufacturer's instructions. Always use an insulated electrode holder to ensure operator safety.
2. Install correct size lugs onto ends of both cables for connecting to work clamp, electrode holder or wire feeder, and weld output terminals.
3. Install work clamp onto cable.

C. Weld Output Connections



WARNING: ELECTRIC SHOCK can kill.

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

MOVING PARTS can cause serious injury.

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

1. Open and secure the lower front panel access door, and route weld cables through bracket on front upright to the weld output terminals (see Figure 4-2).

Table 4-1. Weld Cable Size*

Welding Amperes	Total Cable (Copper) Length In Weld Circuit Not Exceeding							
	100 ft (30 m) Or Less		150 ft (45 m)	200 ft (60 m)	250 ft (70 m)	300 ft (90 m)	350 ft (105 m)	400 ft (120 m)
	10 To 60% Duty Cycle	60 Thru 100% Duty Cycle	10 Thru 100% Duty Cycle					
100	4	4	4	3	2	1	1/0	1/0
150	3	3	2	1	1/0	2/0	3/0	3/0
200	3	2	1	1/0	2/0	3/0	4/0	4/0
250	2	1	1/0	2/0	3/0	4/0	2-2/0	2-2/0
300	1	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0
350	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0
400	1/0	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	2-4/0
500	2/0	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-3/0
600	3/0	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-4/0	3-4/0
700	4/0	2-2/0	2-3/0	2-4/0	3-3/0	3-4/0	3-4/0	4-4/0
800	4/0	2-2/0	2-3/0	2-4/0	3-4/0	3-4/0	4-4/0	4-4/0
900	2-2/0	2-3/0	2-4/0	3-3/0	3-4/0	4-4/0	4-4/0	

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

2. For Shielded Metal Arc Welding (SMAW) and Air Carbon Arc Cutting and Gouging (CAC-A) (Electrode Positive/Reverse Polarity), connect weld cables as follows:

- a. Connect one end of work cable to NEGATIVE (-) weld output terminal.
- b. Connect end of electrode holder cable to POSITIVE (+) weld output terminal.

IMPORTANT: For Electrode Negative/Straight Polarity connections, reverse cable connections to weld output terminals; electrode becomes negative.

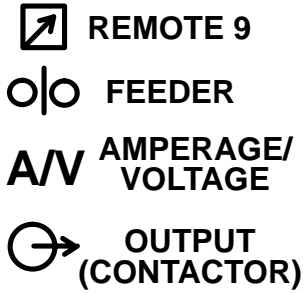
3. For Wire Feeding Processes (GMAW, FCAW, SAW) (Electrode Positive/Reverse Polarity), connect weld cables as follows:

- a. Connect one end of work cable to NEGATIVE (-) weld output terminal.
- b. Connect end of electrode holder cable to POSITIVE (+) weld output terminal and remaining end to terminal on the wire feeder drive housing (see wire feeder Owner's Manual for location).

4. Close and secure front panel access door.

4-8. REMOTE CONTROL CONNECTIONS

A. Remote 9 Receptacle Information And Connections (Figures 4-2 And 4-3)



REMOTE 9 receptacle RC3, located under the lower front panel access door (see Figure 4-2), is provided to connect any of the following equipment to the welding generator circuitry:

- a. Remote Contactor
- b. Remote Amperage or Voltage control
- c. Wire feeder which provides contactor control to the welding generator.
- d. Combination of the above.

To Make connections, align keyway, insert plug, and rotate threaded collar fully clockwise.

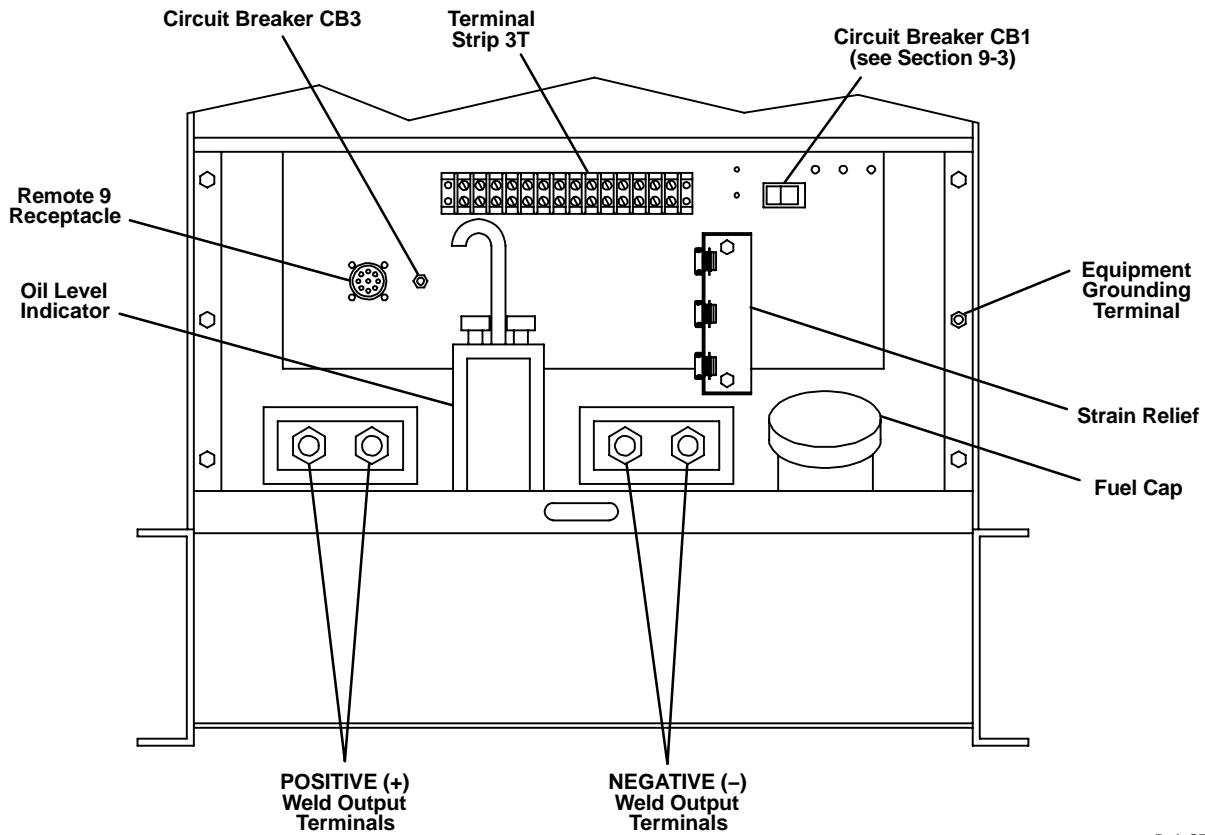


Figure 4-2. Lower Front Panel Components And Connections

Ref. ST-147 322-E

If supplied remote control cord is not suitable for connecting to the REMOTE 9 receptacle RC3, proceed with one of the following alternatives;

1. Wire a plug or cord to interface with REMOTE 9 receptacle RC3 using socket information in Section C.
2. Wire remote control cord directly to terminal strip within unit according to Section B.

B. REMOTE Terminal Strip 3T Information And Connections (Figures 4-2 And 4-4)



WARNING: ELECTRIC SHOCK can kill; UNEXPECTED OUTPUT can cause serious injury.

- Do not touch live electrical parts.
- Stop engine, and disconnect negative (-) battery cable from battery before making any internal inspection or connections.
- Do not connect to REMOTE 9 receptacle and terminal strip at the same time.

Since the OUTPUT (CONTACTOR) can be energized from either the receptacle or terminal strip, it is vital to use only one remote control method.

MOVING PARTS can cause serious injury.

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

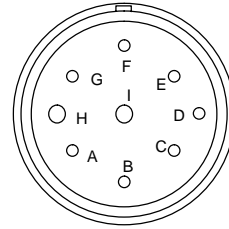
Terminal strip 3T, mounted on the lower front panel (see Figure 4-2), is included in case the plug supplied on the remote control cord is not suitable for connections to the REMOTE 9 receptacle RC3.

To make connections, proceed as follows:

1. Remove existing plug from remote control cord.
2. Open and secure lower front door.
3. Locate strain reliefs provided on lower front panel (see Figure 4-2).
4. Insert leads from cord through strain relief.
5. For Remote Electrical Cutoff Switch, remove jumper link between terminals N and P.
6. Connect leads to terminal strip 3T using terminal information provided in Section C.
7. Secure the cord in the strain relief.
8. Close and secure door.

C. Socket/Terminal Information (Figure 4-4)

The following lists the functions of the sockets of REMOTE 9 receptacle RC3 (see Figure 4-3), and the terminals of strip 3T (see Figure 4-4). The following socket/terminal information is provided in case it is necessary to wire the auxiliary equipment cord.



Ref. S-0706

Figure 4-3. Front View Of Remote 9 Receptacle With Socket Locations

Socket A/Terminal A:

Contact closure to Socket B/Terminal B completes the 115 volts ac contactor control circuit; protected by circuit breaker CB3.

Socket B/Terminal B:

Contact closure to Socket A/Terminal A completes the 115 volts ac contactor control circuit.

Socket H/Terminal J:

Command reference; +10 volts dc.

Socket F/Terminal G:

Control circuit common.

Socket G/Terminal H:

Input command signal from wiper of remote control potentiometer; 0 volts equals machine minimum; +10 volts equals machine maximum.

Socket C/Terminal C:

115 volts ac circuit common; also connected to welding power source chassis.

Socket D/Terminal D:

Up to 10 amperes of 115 volts ac, 60 Hz, with respect to terminal C (circuit common).

Terminals L and M of 3T:

Terminals supply 30 amperes of 115 volts ac, 60 Hz, auxiliary power. Terminal L is circuit common.

Terminals E/Terminal E or F:

Weld Voltage Feedback. Polarity determined by connection at terminal E (+) or F (-).

Terminal N and P of 3T:

Closed circuit between terminals N and P is normal condition. Open circuit between terminals N and P is Remote Emergency Electrical Cutoff condition.

Terminal I/Terminal K:

Machine chassis (Equipment Ground).

4-9. AIR COMPRESSOR CONNECTIONS

This unit delivers 12 cfm of air at a pressure of 100 psi whenever the engine is running. A 1/2 in. NPT fitting for air compressor connections is provided on the top cover of the unit.

To make connections to the air compressor, obtain and install a quick-connect connector onto the air compressor fitting.

4-10. ETHER STARTING AID (Optional)

This unit is shipped without the ether cylinder. Before this device is operational, an ether cylinder must be obtained and installed. To install the ether cylinder, proceed as follows:



WARNING: IMPROPER HANDLING OR EXPOSURE TO ETHER can seriously harm your health.

- Follow the manufacturer's safety instructions on the cylinder when handling ether components.

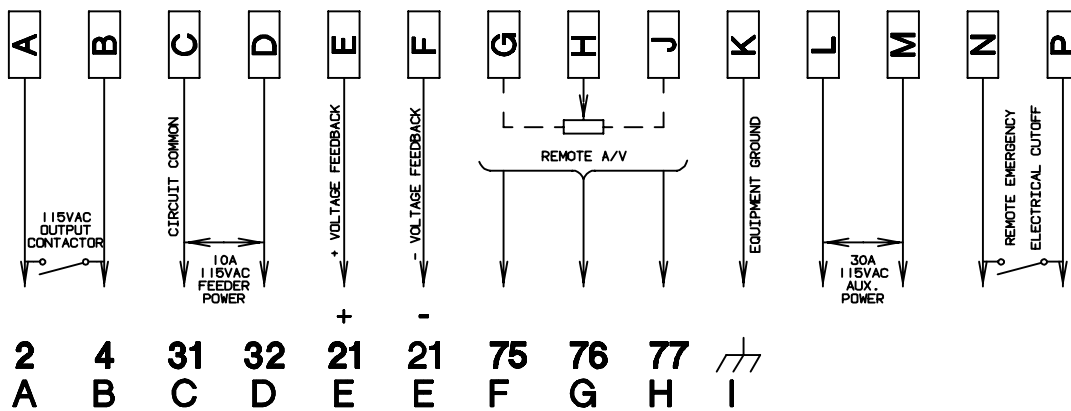
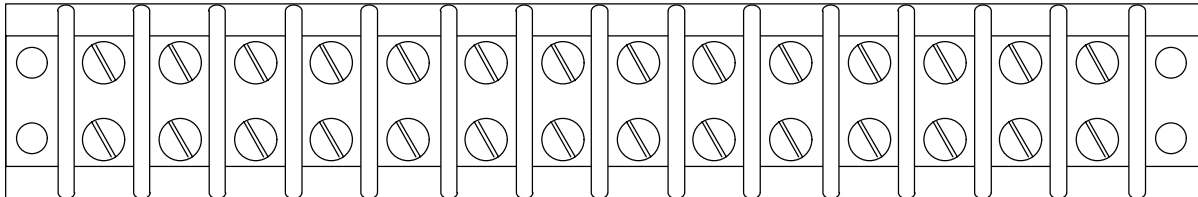
IMPORTANT: Before installing the ether cylinder, clean nozzle on ether cylinder and fitting into which the ether cylinder is inserted. If dirt is present in either of these areas, the system may not work.

- Open and secure right rear side door.
- If applicable, remove protective cap from ether valve, or remove old ether cylinder from unit.
- Loosen cylinder clamp, install ether cylinder, and tighten clamp.

IMPORTANT: After installing or replacing ether cylinder, do not use or test ether start system for at least 10 to 15 minutes to allow particles in fuel to settle to prevent atomizer plugging.

- Using a liquid soap and water solution, check all ether start system connections for leaks. If a leak exists, escaping gas will produce bubbles in the solution.
- Close and secure side door.

132 55 3 132 19 30 18 44 43 42 2 133 51 74 MILLER
CONNECTION
NUMBER



LINCOLN
CONNECTION
NUMBERS

Ref. ST-164 613-A

Figure 4-4. Terminal Strip 3T Information

SECTION 5 – AUXILIARY POWER



POWER OUTPUT



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

- Do not touch live electrical parts.
- Stop the engine and disconnect negative (-) battery cable from battery before making internal inspection or reconnection.
- Ground generator as required by any applicable national, state, and local electrical codes.

The generator neutral is connected to the frame; therefore, the equipment grounding terminal must be connected to a proper earth ground.

- Do not connect to any electrical distribution system normally supplied by utility power unless a proper transfer switch and grounding procedure are employed.
- Keep away from moving parts such as fans, belts, and rotors.
- Keep all covers and panels in place while operating.

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

ELECTRIC SPARKS can cause fire.

- Disconnect weld cables when using auxiliary power.

The weld output terminals are electrically energized when the engine is running and the contactor (if applicable) is energized.

- Watch for fire.
- Have 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 terminals on terminal strip 3T. For best performance (voltage and frequency regulation), limit connected load to approximately 90% of generator capability.

A brief period (less than 5 seconds) of large current draw is required for starting motor-driven equipment. This generator can supply 25% of rated current output at the terminal strip for motor starting. Disconnect motor from generator before starting engine. Use adequate size cords so that voltage drop at the motor is not excessive. Voltage drops significantly when starting motor-driven equipment.

Ground fault circuit interrupters (GFCI) may be required. Check local and state codes, and the latest issue of the National Electrical Code.

5-2. 120 VOLT TERMINALS (Chart 5-1, And Figure 4-2)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Stop engine, and disconnect negative (-) battery cable from battery before beginning this installation.

MOVING PARTS can cause serious injury.

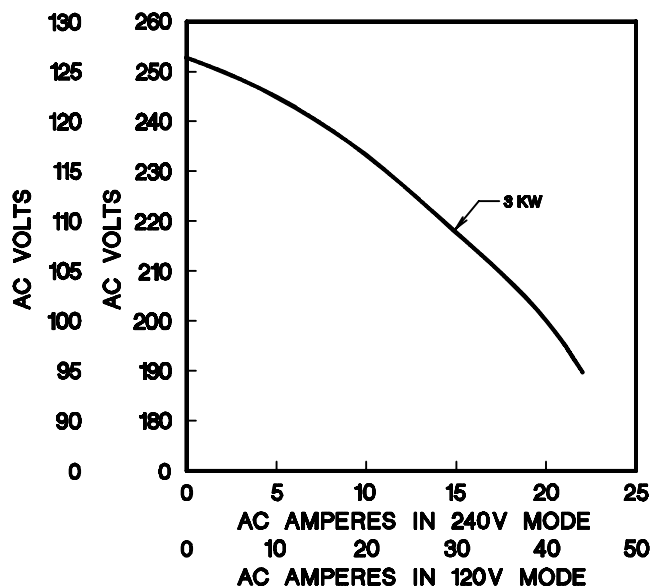
- Keep away from moving parts such as fans, belts, and rotors.

HOT SURFACES can cause severe burns.

- Wear protective gloves and clothing when working near a hot engine.
- Allow components to cool completely before touching.

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

Chart 5-1. AC Power Curve For 120 Volt Terminals



SB-109 365-B

A. Auxiliary Equipment Connections To Terminal Strip 3T (Figure 4-2)



WARNING: Read and follow safety information at beginning of entire Section 5-2 before proceeding.

Terminal strip 3T is provided to directly wire the auxiliary power cord(s) into the unit. To make connections, proceed as follows:

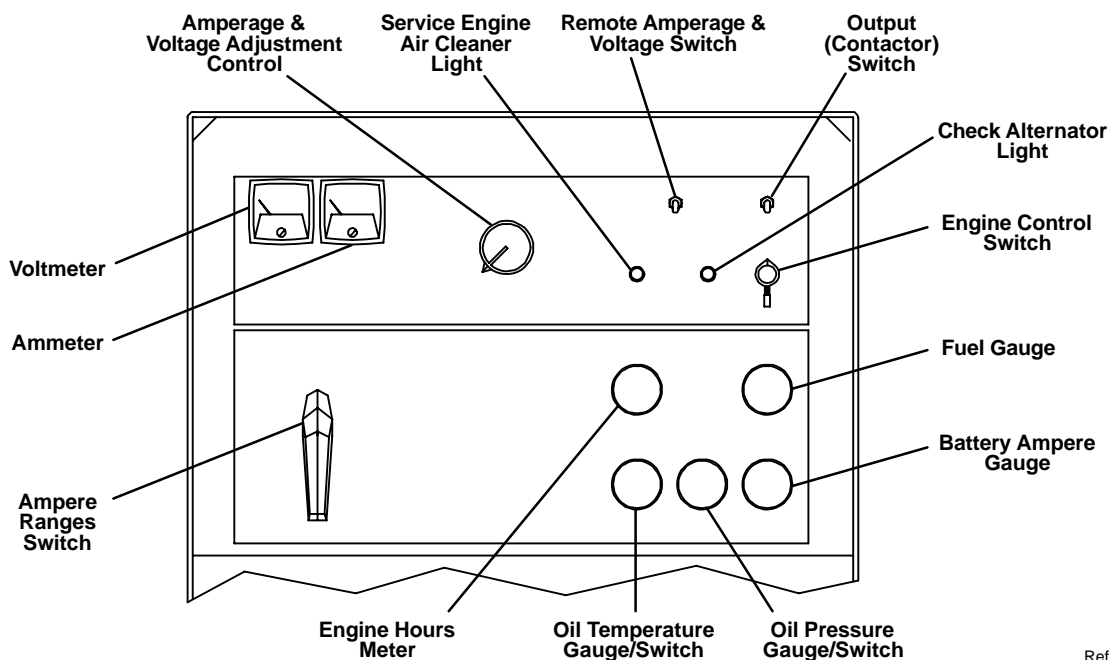
1. Remove plug from auxiliary equipment cord(s), if applicable.
2. Open and secure lower front door.

3. Locate three strain reliefs on lower front panel.
4. Insert leads from cord(s) through a strain relief.
5. Connect leads to terminal strip 3T using terminal information provided in Figure 4-4.
6. Secure the cord(s) in the strain relief(s).
7. Close and secure door.

B. Protection

Circuit breaker CB1 protects the 120 volts ac auxiliary power terminals from overload. See Section 9-3 for CB1 location and resetting procedure.

SECTION 6 – OPERATOR CONTROLS



Ref. ST-147 322-E

Figure 8-1. Operator Controls

6-1. AMPERE RANGES SWITCH (Figure 6-1)

The Ampere Ranges switch provides two coarse amperage ranges. When in LOW OUTPUT, amperage range is 100-350 amperes. When in HIGH OUTPUT, amperage range is 300-800 amperes.



CAUTION: ARCING can damage switch contacts.

- Do not change the position of the Ampere Ranges switch while welding or under load. Arcing causes the contacts to become pitted and eventually inoperative.

6-2. AMPERAGE & VOLTAGE ADJUSTMENT CONTROL (Figure 6-1)



AMPERAGE AND VOLTAGE ADJUSTMENT

The AMPERAGE & VOLTAGE ADJUSTMENT control adjusts welding amperage within range selected by Ampere Ranges switch. The scale surrounding the control is calibrated in percent and does not indicate an actual amperage or voltage value.

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

6-3. ENGINE CONTROL SWITCH (Figure 6-1)



The Engine Control switch has three positions: START, RUN, and OFF.

A. START Position



Rotating the switch to the START position starts the engine. Release the switch as soon as the engine starts, and the switch automatically returns to the RUN position.

B. RUN Position



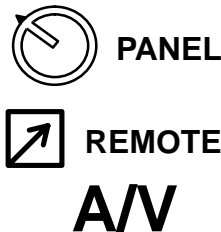
When the Engine Control switch is in the RUN position, engine speed remains at governed weld/power speed (1860 rpm).

C. OFF Position



Rotating the Engine Control switch to the OFF position disconnects battery voltage, thereby shutting down the engine.

6-4. REMOTE AMPERAGE & VOLTAGE CONTROL SWITCH (Figure 6-1)



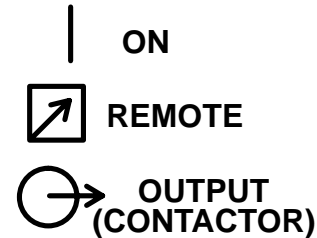
WARNING: ELECTRIC SHOCK can kill.

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

If remote amperage or voltage control is desired, make connections to the REMOTE 9 receptacle terminal strip according to Section 4-8, and place the AMPERAGE & VOLTAGE switch in the REMOTE position. When a Remote Amperage or Voltage Control is being used, the remote control functions as a fine amperage or voltage adjustment for the AMPERAGE & VOLTAGE ADJUSTMENT control on the welding generator. For example, if the AMPERAGE & VOLTAGE ADJUSTMENT control on the welding generator is set at midrange, the Remote Amperage or Voltage Control will provide (from minimum to maximum adjustment) fine amperage or voltage adjustment of one half of the welding generator output for the range selected. For complete remote control of the output, rotate the AMPERAGE & VOLTAGE ADJUSTMENT control to the maximum position.

If remote amperage or voltage is not desired, place the AMPERAGE & VOLTAGE switch in the PANEL position. Only the AMPERAGE & VOLTAGE ADJUSTMENT control will adjust output.

6-5. OUTPUT(CONTACTOR) SWITCH (Figure 6-1)



WARNING: ELECTRIC SHOCK can kill.

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

When the OUTPUT/CONTACTOR switch is in the ON position, open-circuit voltage is present at the weld output terminals for as long as the engine is running.

If the OUTPUT(CONTACTOR) switch is in the ON position, open-circuit voltage will be present at the output terminals whenever the engine is running.

If remote contactor control by means of a wire feeder or remote device is desired, make connections to the REMOTE 9 receptacle or terminal strip 3T according to Section 4-8, and place the OUTPUT(CONTACTOR) switch in the REMOTE position. Open-circuit voltage is present at the weld output terminals whenever the gun switch or remote device is closed.

6-6. SERVICE ENGINE AIR CLEANER LIGHT (Figure 6-1)

This unit is equipped with an engine air cleaner. When the SERVICE ENGINE AIR CLEANER light PL1 comes on, the air cleaner requires servicing (see Section 8-2).

6-7. CHECK ALTERNATOR (Figure 6-1)

The CHECK ALTERNATOR light PL3 comes on if the alternator requires servicing. If the light comes on, check for loose or broken engine belt.

6-8. HOUR METER (Figure 6-1)



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

6-9. FUEL GAUGE (Figure 6-1)



The FUEL Gauge indicates the level of fuel remaining in the fuel tank. The unit is equipped with a 30 gallon (114 L) fuel tank.

6-10. MAGNETIC SHUTDOWN SWITCH

An internal switch automatically shuts down the engine if oil pressure drops to an unsafe level or oil temperature becomes too high.

The switch assembly is located directly behind the upper front panel access door, in the upper left corner. The switch is protected by a fuse located on the bottom of the switch assembly. Should this fuse open, the engine would not start. See Section 9-3 for fuse replacement procedure.

6-11. OIL TEMPERATURE GAUGE/SWITCH (Figure 6-1)



The OIL TEMPERATURE gauge/switch registers the temperature of the oil in the lubricating system. If the oil temperature rises to a level that may cause engine damage (factory set at 265°F, 130°C), switch closes and magnetic shutdown switch stops the engine (see Section 6-10).

6-12. OIL PRESSURE GAUGE/SWITCH (Figure 6-1)



The OIL PRESSURE gauge/switch registers the lubricating system pressure in pounds per square inch (psi). The pressure registered by the gauge should remain constant for a given engine speed. Should the pressure fluctuate or drop, stop the engine, and do not operate until the trouble has been corrected. If the oil pressure drops to a level that may cause engine damage, switch closes and magnetic shutdown switch stops the engine (see Section 6-10). The shutdown oil pressure is factory set at 30 psi (207 kPa). Normal operating pressure is approximately 50 psi (345 kPa).

6-13. BATTERY GAUGE (Figure 6-1)



The BATTERY voltmeter registers the alternator-supplied output voltage to the battery. The meter should always register 12-15 volts dc while the engine is running. If the voltage is outside this range, stop the engine, and determine the cause. Do not operate the engine until the trouble has been corrected.

6-14. METERS (Figure 6-1)

The meters are provided to monitor the welding operation; however, they are not intended for exact amperage or voltage measurements. These meters are internally connected to the output circuit.

The voltmeter indicates the voltage at the weld terminals, but not necessarily the actual voltage at the welding arc (due to cable resistance, poor connections, etc.). The ammeter indicates the amperage output of the unit.

6-15. BROKEN COOLING BELT SHUTDOWN SWITCH

An internal switch automatically shuts down the engine if the cooling belt breaks. The cooling belt is located on the rear of the engine. If the engine shuts down, check for broken cooling belt.

6-16. ETHER STARTING AID (Optional)

The cold weather starting components provide a means of applying a premeasured portion of ether into the manifold. The amount of ether supplied should be sufficient to permit easy engine starting under cold weather conditions.

Depressing ETHER STARTING AID switch for one second while cranking the engine will provide the proper amount of ether to the manifold. This control will function only while cranking the engine.



CAUTION: ETHER INJECTION WHILE ENGINE IS RUNNING can cause engine damage.

- Do not actuate ETHER STARTING AID while engine is running.

IMPORTANT: Ether is sprayed into the engine when this switch is released. Depressing the switch does not spray the ether into the engine but rather fills the valve chamber.

SECTION 7 – SEQUENCE OF OPERATION



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

- Do not touch live electrical parts.
- Stop the 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.
- Have 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 with their doctor before going near arc welding, gouging, or spot welding operations.

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

7-1. SHIELDED METAL ARC WELDING (SMAW)



WARNING: Read and follow safety information at beginning of entire Sections 5 and 7 before proceeding.

1. Install and connect unit according to Section 4.
2. Wear dry insulating gloves and clothing.
3. Connect work clamp to clean, bare metal at workpiece.
4. Select proper electrode.
5. Set Ampere Ranges switch and rotate AMPERAGE & VOLTAGE ADJUSTMENT control to the desired position (see Sections 6-1 and 6-2).
6. If remote amperage control is not used, place AMPERAGE & VOLTAGE switch in the PANEL position. If remote amperage control is to be used, place AMPERAGE & VOLTAGE switch in the REMOTE position.
7. If remote contactor control is not used, place OUTPUT(CONTACTOR) switch in the ON position. If remote contactor control is to be used, place OUTPUT(CONTACTOR) switch in the REMOTE position.
8. Start engine as instructed in Section 7-6.
9. Connect desired auxiliary equipment to the 120 volts ac terminals according to Section 5.
10. Place Engine Control switch in the RUN position.
11. Energize auxiliary equipment, if applicable.
12. Wear welding helmet with proper filter lens according to ANSI Z49.1.
13. Insert electrode into electrode holder.
14. Begin welding.

7-2. GAS METAL ARC (GMAW) AND FLUX CORED ARC WELDING (FCAW)



WARNING: Read and follow safety information at beginning of entire Sections 5 and 7 before proceeding.

1. Install and connect unit according to Section 4.
2. Install and connect wire feeder to the terminal strip according to wire feeder Owner's Manual and Section 4-8.
3. Wear dry insulating gloves and clothing.
4. Connect work clamp to clean, bare metal at workpiece.
5. Set Ampere Ranges switch and rotate AMPERAGE & VOLTAGE ADJUSTMENT control to the desired position (see Section 6-1 and 6-2).

6. If remote amperage or voltage control is not used, place AMPERAGE & VOLTAGE switch in the PANEL position. If remote amperage or voltage control is to be used, place AMPERAGE & VOLTAGE switch in the REMOTE position.
7. If remote contactor control is not used, place OUTPUT(CONTACTOR) switch in the ON position. If remote contactor control is to be used, place OUTPUT(CONTACTOR) switch in the REMOTE position.
8. Turn on shielding gas supply, if applicable.
9. Start engine as instructed in Section 7-6.
10. Connect desired auxiliary equipment to the 120 volts ac terminals according to Section 5.
11. Place Engine Control switch in the RUN position.
12. Energize auxiliary equipment, if applicable.
13. Wear welding helmet with proper filter lens according to ANSI Z49.1.
14. Begin welding.

7-3. AIR CARBON ARC CUTTING AND GOUGING (CAC-A) (Table 7-1)



WARNING: Read and follow safety information at beginning of entire Sections 5 and 7 before proceeding.

1. Install and connect unit according to Section 4.
2. Wear dry insulating gloves and clothing.
3. Connect work clamp to clean, bare metal at workpiece.
4. Place AMPERAGE & VOLTAGE switch in the PANEL position.
5. Place OUTPUT(CONTACTOR) switch in the ON position.
6. Set Ampere Ranges switch and rotate AMPERAGE & VOLTAGE ADJUSTMENT control to the desired position (see Sections 6-1 and 6-2).
7. Start engine as instructed in Section 7-6.
8. Connect desired auxiliary equipment to the 120 volts ac terminals according to Section 5.
9. Place Engine Control switch in the RUN position.
10. Energize auxiliary equipment, if applicable.
11. Wear welding helmet with proper filter lens according to ANSI Z49.1.
12. Begin welding.

Table 7-1. Suggested Electrode Diameter For Amperage Range (CAC-A Only)

Electrode Diameter		Amperage Range	
Inches	Millimeters	Minimum	Maximum
1/8	3.2	30	60
5/32	4.0	90	150
3/16	4.8	200	250
1/4	6.4	300	400
5/16	7.9	350	450
3/8	9.5	450	600
1/2	12.7	800	1000
5/8	15.9	1000	1250
3/4	19.0	1250	1600
1	25.4	1600	2200

7-4. AUXILIARY POWER OPERATION



WARNING: Read and follow safety information at beginning of entire Sections 5 and 7 before proceeding.

1. Install and connect unit according to Section 4.
2. Install and connect auxiliary power equipment cord(s) to 120 volts auxiliary power terminals according to Section 5-2.
3. Start engine as instructed in Section 7-6.
4. Place Engine Control switch in the RUN position.
5. Energize auxiliary equipment, if applicable. Auxiliary power may be obtained whenever engine is running.

7-5. AIR COMPRESSOR OPERATION (Tables 7-2 And 7-3)

1. Install and connect unit according to Section 4.
2. Install a quick-connect connector onto the air compressor fitting in top cover of unit.
3. Start engine as instructed in Section 7-6.
4. Begin operation.

7-6. STARTING THE ENGINE

IMPORTANT: Read entire engine Owner's Manual (Deutz F4L-912 engine) before operating engine.

1. Engine Prestart Checks
 - a. Oil Level

Check engine oil level. If oil level is low, fill to top mark on dipstick (see engine Owner's Manual for oil selection specifications and Section 4-5).
If oil consumption and wetstacking occur during run-in period, see Section 8-12.

b. Fuel Level



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

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

Check fuel level. If necessary, fill tank with fresh, clean fuel (see engine Owner's Manual for fuel specifications).

c. Cooling System

Check the air cooling system by inspecting the air intake and exhaust openings for blockage and blower impeller for obstruction and free movement. Check the blower/alternator belt for proper tension (see the engine Owner's Manual), and ensure that all sheet metal cowlings, shrouds, and panels are properly in place and secure.

d. Air Cleaner

Check air cleaner service indicator daily (see Section 6-6).

2. Rotate Engine Control switch to the START position, and if applicable, depress ETHER STARTING AID switch, if applicable, at the same time —

release ETHER STARTING AID switch after one second.



CAUTION: REENGAGING 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 maximum cranking time of 20 seconds.

Allow two minutes cooling time before attempting to restart engine.

3. As soon as engine starts, release Engine Control switch, and allow the engine to warm up for approximately three minutes with no weld or power load applied.

7-7. STOPPING THE ENGINE

1. Stop all operations, and turn off or disconnect any auxiliary equipment.



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

- Shut off gas supply when not in use.

2. Rotate Engine Control switch to the OFF position.

Table 7-2. Flow Of Free Air (CFM) Through Orifices Of Various Diameters

Gauge Pressure In Receiver (lbs.)	Orifice Diameter And Free Air Flow (CFM)							
	1/64"	1/32"	3/64"	1/16"	3/32"	1/8"	3/16"	1/4"
1	0.027	0.107	0.242	0.430	0.97	1.72	3.86	6.85
2	0.038	0.153	0.342	0.607	1.36	2.43	5.42	9.74
3	0.046	0.188	0.471	0.750	1.68	2.98	6.71	11.9
5	0.059	0.242	0.545	0.965	2.18	3.86	8.71	15.4
10	0.084	0.342	0.77	1.36	3.08	5.45	12.3	21.8
15	0.103	0.418	0.94	1.67	3.75	6.65	15.0	26.7
20	0.119	0.485	1.07	1.93	4.25	7.7	17.1	30.8
25	0.133	0.54	1.21	2.16	4.75	8.6	19.4	34.5
30	0.156	0.632	1.40	2.52	5.6	10.0	22.5	40.0
35	0.173	0.71	1.56	2.80	6.2	11.2	25.0	44.7
40	0.19	0.77	1.71	3.07	6.8	12.3	27.3	49.1
45	0.208	0.843	1.9	3.36	7.6	13.4	30.3	53.8
50	0.225	9.14	2.05	3.64	8.2	14.5	32.8	58.2
60	0.26	1.05	2.35	4.2	9.4	16.8	37.5	67.0
70	0.295	1.19	2.68	4.76	10.7	19.0	43.0	76.0
80	0.33	1.33	2.97	5.32	11.9	21.2	47.5	85.0
90	0.364	1.47	3.28	5.87	13.1	23.5	52.5	94.0
100	0.40	1.61	3.66	6.45	14.5	25.8	58.3	103.0
110	0.43	1.76	3.95	7.00	15.7	28.0	63.0	112.0
120	0.47	1.90	4.27	7.58	17.0	30.2	68.0	121.0
130	0.50	2.04	4.57	8.13	18.2	32.4	73.0	130.0
140	0.54	2.17	4.87	8.68	19.5	34.5	78.0	138.0
150	0.57	2.33	5.2	9.20	20.7	36.7	83.0	147.0
175	0.66	2.65	5.94	10.6	23.8	42.1	95.0	169.0
200	0.76	3.07	6.90	12.2	27.5	48.7	110.0	195.0

Table 7-3. Approximate Air Consumption (Cubic Feet) Required To Operate Various Pneumatic Equipment At Pressure Range 70-90 P.S.I.G.

MISCELLANEOUS PORTABLE TOOLS	Percent Use Factor And Compressed Air Consumption (CF)				MISCELLANEOUS PORTABLE TOOLS	Percent Use Factor And Compressed Air Consumption (CF)			
	9 sec	15 sec	21 sec	1 min		9 sec	15 sec	21 sec	1 min
Drill, 1/18" to 3/8"	3.75	6.25	8.75	25	Burring Tool, Large	3.6	6.0	8.4	24
Drill, 3/8" to 5/16"	5.25	8.75	12.25	35	Rammers, Small	3.9	3.25	9.1	13
Screwdriver, #2 to #6 Screw	1.8	3.0	4.2	12	Rammers, Medium	5.1	8.5	11.9	34
Screwdriver, #6 to 5/16" Screw	3.6	6.0	8.4	24	Rammers, Large	6.0	10.0	14.0	40
Tapper, to 3/8"	3.0	5.0	7.0	20	Backfill Tamper	3.75	6.25	8.75	25
Nutsetters, to 3/8"	3.6	6.0	8.4	24	Compression Riveter	0.2 cu. ft. per cycle			
Nutsetters, to 3/4"	4.5	7.5	10.5	30	Air Motor, 1 Horsepower	3.75	6.3	8.75	25
Impact Wrench, 1/4"	2.25	3.75	5.3	15	Air Motor, 2 Horsepower	7.5	12.5	17.5	50
Impact Wrench, 3/8"	3.0	5.0	7.0	20	Air Motor, 3 Horsepower	11.25	18.75	26.3	75
Impact Wrench, 5/8"	4.5	7.5	10.5	30	Air Motor Hoist 1000#	1 cu. ft. per foot of lift			
Impact Wrench, 3/4"	5.25	8.75	12.25	35	Air Motor Hoist, 2000#	1 cu. ft. per foot of lift			
Impact Wrench, 1"	6.75	11.25	15.75	45	Paint Spray Gun (Production)	3.0	5.00	7.00	20
Impact Wrench, 1-1/4"	8.25	13.75	19.2	55	HAMMERS				
Die Grinder, Small	2.25	3.75	5.3	15	Scaling Hammer	1.3	3.0	4.2	12
Die Grinder, Medium	3.6	6.0	8.4	24	Chipping Hammer	4.5	7.5	10.5	30
Horizontal Grinder, 2"	3.0	5.0	7.0	20	Riveting Hammer, Light	2.25	3.75	5.25	15
Horizontal Grinder, 4"	9.0	15.0	21.0	60	Riveting Hammer, Heavy	4.5	7.5	10.5	30
Horizontal Grinder, 6"	9.0	15.0	21.0	60	SAWS				
Horizontal Grinder, 8"	12.0	20.0	28.0	80	Circular, 8"	6.75	11.25	15.75	45
Vertical Grinders and Sanders, 5" Pad	5.25	8.75	12.25	35	Circular, 12"	9.75	16.25	23.8	65
Vertical Grinders and Sanders, 7" Pad	9.0	15.0	21.0	60	Chain, Lightweight	4.20	7.0	9.8	28
Vertical Grinders and Sanders, 9" Pad	10.5	17.5	24.5	70	Chain, Heavy Duty	13.1	21.8	30.5	87
Burring Toll, Small	2.25	3.75	5.3	15					

Always check with tool manufacturers for actual air consumption of tools being used. The above is based on averages and should not be considered accurate for any particular make of tool.

Above tools are rated based upon typical "on-load" performance characteristics.

For other values, adjust the C.F. air consumption on a proportional basis. The cubic feet (C.F.) air consumption for 1 minute may also be expressed as air consumption in cubic feet per minute (C.F.M.)

SECTION 8 – MAINTENANCE

8-1. ROUTINE MAINTENANCE (Table 8-1)

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 8-1 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 8-1 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, Filter, And Drain



WARNING: Read and follow safety information at beginning of entire Section 8-1 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 (Deutz F4L-912 engine). Use correct type and grade of oil as listed in instructions for expected temperature range before next oil and filter change.

This unit is equipped with an oil drain hose secured in a clamp behind the rear panel. A valve is provided in the hose inside the right side base rail. To drain oil from engine, remove drain hose from clamp and open valve. Close valve and reinstall hose into clamp before adding new oil.

IMPORTANT: This engine is equipped with an Oil Pressure Shutdown gauge/switch and an Oil Temperature Shutdown gauge/switch. If oil pressure becomes too low or oil temperature rises to a level that may cause engine damage, the respective gauge/switch shuts down the unit. The shutdown oil pressure has been factory set at 30 psi (207 kPa), and the shutdown oil temperature has been set at 265° F (130° C).

D. Cleaning And Inspecting



WARNING: Read and follow safety information at beginning of entire Section 8-1 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 (Deutz F4L-912 engine) for complete engine care.

Table 8-1. Maintenance Schedule


Frequency*	Maintenance
Every day.	Check fuel and oil levels (see Sections 4-4, 4-5, and 8-1C, and engine Owner's Manual, Deutz F4L-912 engine).
Every 100 to 150 hours.	Change oil and filter (see engine Owner's Manual, Deutz F4L-912 engine).
	Check cables, wiring (see Section 8-1A), and battery (see Section 8-1B).
	Units in heavy service environments: Check labels; clean and inspect unit (see Section 8-1).
	Change fuel/water separator (see Section 8-3).
Every 250 hours.	Check and clean spark arrestor muffler (see Section 8-11).
Every 1000 hours.	Replace fuel filter (see Section 8-4). Check brushes and slip rings (see Section 8-9). Check all labels (see IMPORTANT block, Section 8-1). Clean and inspect unit (see Section 8-1D).

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

	<p>Air Filter Service 50 hours or less – see Owner's Manual Air Filter Element MILLER 020 319, AC 302C, Donaldson P10-1222, Fleetguard AF437K, Fram CAK 253, Purolator AF-2030K</p>
	<p>Engine Cooling <i>Avoid recirculation of air from hot air exit to blower intake.</i> Blower Belt Deutz 223-5531, MILLER 064 690 Alternator Belt Deutz 223-5179, MILLER 066 213 Compressor Belts (2) Deutz 116-1683</p>
	<p>Battery BCI Group 31 Cranking Performance at 0°F (-18°C) 815 Amps</p>
	<p>Engine RPM – No Load Weld/Power 1850</p> <p>Valve Clearance –Cold Intake 0.006 in (0.15 mm) Exhaust 0.006 in (0.15 mm)</p>
	<p>Injectors MILLER 064 684, Deutz 223-3085 Nozzle MILLER 064 685, Deutz 223-3086 <i>Have only trained technician maintain injection pump and injectors. AIR, WATER, or GASOLINE will harm the injection system. If tank is run out of fuel or fuel filter is changed, bleeding of air is required.</i></p>
	<p>Do NOT use ether.</p>
	<p>Spark Arrestor Inspection And Service 250 operating hours – see Owner's Manual</p>

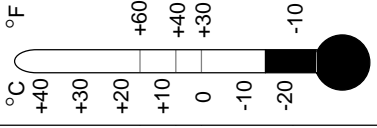
DEUTZ F4L912 DIESEL ENGINE

See Engine Manual for complete engine care.
 Give Engine Specification and Serial Number when ordering parts.



Check daily.

<p>Recommended Oil API Service Classification CD/CE Oil And Filter Change dirty conditions . . . 100 hours or less normal conditions . . . 125-150 hours Oil Filter MILLER 064 677, Deutz 117-4418, Fleetguard LF4056, Fram PH2842, Hastings P352 or FP352</p>	<p>Oil Capacity 11.5 qt (11 L) or 12 qt (11.4 L) with filter change</p>
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<p>Fuel Capacity 30 gal (113.6 L) Fuel Grade 1-D or 2-D Cetane No. 45 min. Primary Fuel Filter/ Water Separator MILLER 062 342, Fleetguard FF194, Fram P1107 Secondary Fuel Filter Deutz 117-4423, Fleetguard FF5018, Fram P4102 MILLER 064 686</p>	<p> Diesel</p> <p><i>Fill filter with clean fuel before installing – read instructions on filter.</i></p>
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Figure 8-1. Engine Maintenance Label

8-2. AIR CLEANER SERVICE (Table 8-2)



CAUTION: DIRTY AIR can damage engine.

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

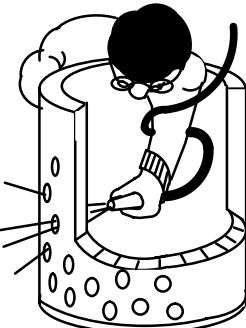

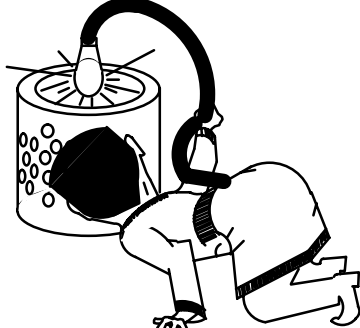
The air cleaner is one of the most important parts of the engine from the standpoint of engine life. If dirty air gets into the engine, it can cause major engine damage within a few operating hours. The air cleaner must be serviced when the SERVICE ENGINE AIR CLEANER Indicator light PL1 comes on. If PL1 comes on, empty dust cap, and inspect air cleaner and element.

The air cleaner on this unit is equipped with precleaners. Remove the precleaner cover and empty the dust receptacle when dirt accumulates up to the indicator marks on the side of the precleaner.

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

When it becomes necessary to service the air cleaner in the field, follow the steps in Table 8-2. Keep a spare element on hand for replacement. New elements are available from your welding equipment distributor.

Table 8-2. Air Cleaner Service

<p>Follow These Easy Steps:</p>	<ol style="list-style-type: none"> 1. Stop engine. 2. Wipe off cover before opening air cleaner. 3. Remove cover. 4. Remove element. 	<ol style="list-style-type: none"> 5. Wipe out element chamber with clean, damp cloth. 6. Inspect new element and all gaskets for shipping damage before use. 	<ol style="list-style-type: none"> 7. Reinstall element. 8. Replace cover.
<p>Important</p>	<ol style="list-style-type: none"> 1. Don't attempt to service air cleaner with engine running. 2. Don't blow out the inside of the air cleaner with compressed air. 	<ol style="list-style-type: none"> 3. Don't leave open air cleaner exposed to blowing dust while you clean element. Replace cover. 4. If air cleaner is horizontally mounted, be sure that dust cup is positioned so arrows point up. 	<ol style="list-style-type: none"> 5. For Donalclone air cleaners, don't blow out Donalclone tube section without element, cover and inner cover (if any) <i>correctly installed</i> or you will blow dust into the engine.
<p>How To Clean Elements For Re-Use</p>	<p>Clean element by one of the following methods:</p> <p>Compressed Air or Washing.</p> <p>Compressed air is recommended when element will be re-used immediately because a washed element must be dried before</p>  <p>Compressed Air</p> <p>Direct air through element in the direction <i>opposite to normal air flow through the element</i>. Move nozzle up and down while rotating element. Keep nozzle at least one inch from pleated paper. Maximum air pressure – 100 P.S.I.</p>	<p>re-use. However, washing does a better job and must be used when exhaust soot has lodged in fine pores of the filter media. Use Donaldson D-1400 detergent which contains a special additive for removing soot and carbon.</p> <p>Replace element after 6 cleanings or annually, whichever occurs first.</p>  <p>Washing</p> <ol style="list-style-type: none"> 1. Soak element 15 minutes or more in Donaldson D-1400 and water solution. See carton for full instructions. 2. Rinse until water is clear (Maximum water pressure 40 P.S.I.) 3. Air-dry or use warm flowing air, max. 160° F. Do not use compressed air or light bulbs. 	<p>(When cleaning Cyclopac elements, <i>do not</i> remove plastic fin assembly – back-flowing with compressed air or washing will remove dust from beneath the fin assembly).</p>  <p>Inspection</p> <p>Place bright light inside element and rotate element slowly. If any rupture, holes or damaged gaskets are discovered – replace.</p>

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8-3. FUEL/WATER SEPARATOR AND SLUDGE DRAIN PLUG



WARNING: ENGINE FUEL can cause fire or explosion.

- Do not drain fuel tank while engine is running.
- Do not smoke while handling fuel.
- Do not allow fuel to drain onto the engine or other components.
- Do not spill fuel; if spilled, wipe up.
- Have a fire extinguisher nearby, and know how to use it.

A. Fuel/Water Separator

The fuel/water separator, located on the right base rail near the engine, is provided to drain off water from the fuel system. Before starting the engine for the first time each day, open the fuel drain plug on the bottom of the separator, and drain the water into a metal container. Close the drain plug at the first signs of fuel. The fuel/water separator should be changed every 125 hours of operation or every four months, whichever occurs first.

B. Sludge Drain Plug

A sludge drain plug, located on the lower right front corner of the unit, is provided to drain off sediment from the fuel tank. Once a week, drain the sludge into a metal container. If the fuel is extremely dirty, drain the sludge daily.

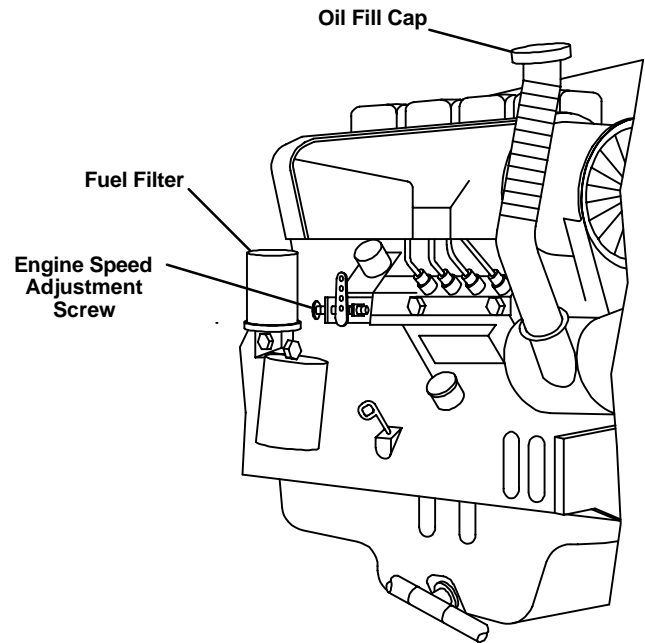
8-4. FUEL FILTER (Figure 8-2)



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.
- Have a fire extinguisher nearby, and know how to use it.

This welding generator is equipped with a cartridge-type fuel filter located above the oil filter on the right side of the unit. The fuel filter should be replaced after 1000 hours of operation, or more often depending on the quality of fuel used and how dusty and dirty the location is in which the engine is being used. To replace the fuel filter, refer to the Engine Manufacturer's Manual.



Ref. ST-147 321-A

Figure 8-2. Right Side And Rear View Of Engine

8-5. 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.

8-6. MAINTENANCE-FREE BATTERY CHARGING



WARNING: CHARGING A FROZEN BATTERY can cause the battery to explode and result in serious personal injury or damage to equipment.

- Allow battery to warm up to 60° F (16°C) before charging if battery is frozen.

BATTERY ACID can burn eyes and skin and destroy clothing and other materials; BATTERY GASES can explode and shatter battery.

- 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.
- Do not touch or move connections on battery while battery charger is on.
- Turn battery charger off before making connections to battery.
- 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 the battery charger off before disconnecting the charger from the battery.

1. Remove battery from unit, and place on a level worktable or other suitable surface.
2. If battery has removable vent caps, check the condition of the electrolyte as follows:
 - a. Check electrolyte temperature in one of the center cells with a battery thermometer. For each 10°F (6°C) increment above 80°F (27°C), a correction factor of 0.004 specific gravity must be added to the specific gravity reading taken in Step 2b. For each 10°F (6°C) increment below 80°F (27°C), 0.004 must be subtracted from the reading taken in Step 2b.
 - b. Check the specific gravity of each cell with a hydrometer. (Draw in and expel the electrolyte two or three times from the first cell to be tested to adjust the temperature of the hydrometer to that of the electrolyte.)
 - c. If a corrected specific gravity reading of 1.225 at 80°F (27°C) is not obtained, replace the vent caps and recharge the battery following the battery charger manufacturer's instructions.

3. If the battery does not have removable vent caps, check the condition of the battery as follows:
 - a. Check the stabilized open-circuit voltage of the battery. For a 12 volt battery, any reading below 12.4 volts indicates the battery needs charging. Disconnect both battery cables from the battery, and allow battery voltage to stabilize for several hours.
 - b. If the stabilized open-circuit voltage is below 12.4 volts, charge the battery following the battery charger manufacturer's instructions.
4. Remove damp cloth from battery.
5. Reinstall battery in unit.
6. Replace battery holddown, and tighten securely. Do not overtighten.
7. Connect positive (+) battery cable to positive (+) battery terminal.
8. Connect negative (-) battery cable to negative (-) battery terminal.

8-7. GOVERNOR

The governor has been set at the factory and should not require further adjustment.

8-8. ENGINE SPEED ADJUSTMENTS (Figure 8-2)



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, 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.

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 weld/power speed should be 1860 rpm. If necessary, adjust the speeds as follows:

1. Open and secure right rear side door.
2. Loosen nut on end of engine speed adjusting screw (see Figure 8-2).
3. Start the engine as instructed in Section 7-6.
4. Adjust the weld/power speed as follows:

IMPORTANT: All directions, such as clockwise and counterclockwise, are with respect to the operator facing the rear panel of the unit.

- a. To increase weld/power speed, rotate the engine speed adjustment screw clockwise.
- b. To decrease weld/power speed, rotate the engine adjustment screw counterclockwise.

5. When the weld/power speed reaches 1860 rpm, prevent the adjustment screw from turning, and tighten the securing nut.
6. Stop engine.
7. Close and secure side door.

8-9. BRUSHES AND SLIP RINGS (Figure 8-3)



WARNING: ELECTRIC SHOCK can kill

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

MOVING PARTS can cause serious injury.

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

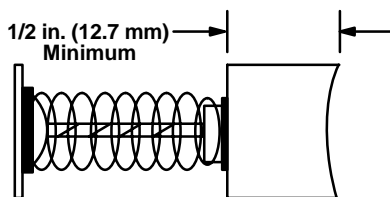
HOT ENGINE PARTS can cause severe burns.

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

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. Be sure that slip rings are clean and brushes are free to move. If the welding generator has been operating under extremely dusty or dirty conditions, increase the frequency of inspection.

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. Clean rings with a number 220 or finer sandpaper, and polish rings with crocus cloth. Never use emery cloth because part of the emery will embed itself into the rings and, in turn, destroy the carbon brushes.

Replace the brushes if they become chipped or broken or if less than 1/2 in. (12.7 mm) of brush material is left.



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Figure 8-3. Brush Replacement

8-10. ETHER STARTING AID (Optional)



CAUTION: ETHER INJECTION WHILE ENGINE IS RUNNING can cause engine damage.

- Do not actuate ETHER STARTING AID while engine is running.

The ether used in the cold weather starting aid system is contained in a replaceable cylinder located behind the right rear side door on the center portion of the frame.

No indicator is provided to show the amount of ether left in the cylinder; therefore, it is recommended that a spare cylinder be kept on hand. Generally, the ether cylinder is empty if the engine fails to start in cold weather while utilizing the cold weather starting system.



WARNING: IMPROPER HANDLING OR EXPOSURE TO ETHER can seriously harm your health.

- Follow the manufacturer's safety instructions on the cylinder when handling ether components.

The cylinder can be weighed to determine the amount of ether inside. The cylinder weighs 33 ounces (936 gr) when full, and it weighs 15 ounces (425 gr) when empty. To replace the ether cylinder, see Section 4-10.

IMPORTANT: Before installing the ether cylinder, clean nozzle on ether cylinder and fitting into which the ether cylinder is inserted. If dirt is present in either of these areas, the system may not work.

IMPORTANT: After installing or replacing ether cylinder, do not use or test ether start system for at least 10 to 15 minutes to allow particles in fuel to settle to prevent atomizer plugging.

8-11. SPARK ARRESTOR



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Stop engine and disconnect negative (-) battery cable from battery before beginning this installation.

MOVING PARTS can cause severe injury.

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

ENGINE EXHAUST SPARKS can cause fire.

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

HOT PARTS can cause severe burns.

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

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 operation hours.

Removal of the device from the exhaust system is not necessary for servicing. Proceed as follows to service 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.

8-12. RUN-IN PROCEDURE



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Stop engine before inspecting, connecting, or servicing.
- Do not leave live unit unattended when engine is running.
- Keep all panels, covers, and guards securely in place while engine is running.

MOVING PARTS can cause severe 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 hot engine parts or components.



CAUTION: LOW OIL LEVEL can damage engine; ENGINE MAY USE OIL AND WETSTACKING may occur during run-in period.

- Check oil level several times a day during run-in period, and add oil if required.
- See engine Owner's Manual (Deutz F4L-912 diesel engine) for run-in information.
- Do not idle engine longer than necessary during run-in period.
- Piston rings seat faster if engine runs at weld/power rpm, and the welding generator is kept loaded during the run-in period.

The run-in procedure for diesel engines is different than those associated with gasoline engines. Diesel engines must be run at near-rated load during the run-in period to ensure proper seating of piston rings and to prevent wetstacking. Wetstacking is an accumulation of unburned fuel and oil in the exhaust pipe. Wetstacking can

occur during the run-in period if the engine is left at idle rpm too long, or the welding generator is not heavily loaded.

If wetstacking occurs, complete one of the following procedures to dry the engine (see engine Owner's Manual, F4L-912 diesel engine). A resistance load is required to fully load the generator during the run-in procedure. A load bank or resistance grid may provide a constant load for run-in, however, a load bank is preferred. If a load bank is available, proceed with the run-in procedure provided in Subsection A. If a resistance grid is being used, proceed to Subsection B.

A. Run-In Procedure Using Load Bank (Diagram 8-1)



WARNING: Read and follow safety information at beginning of entire Section 8-12 before proceeding.

1. Stop engine.

IMPORTANT: Weld cables supplied with load bank may be inadequate for run-in procedure. Use weld cables of proper size with appropriate connectors to connect load bank to generator (see load bank Owner's Manual).

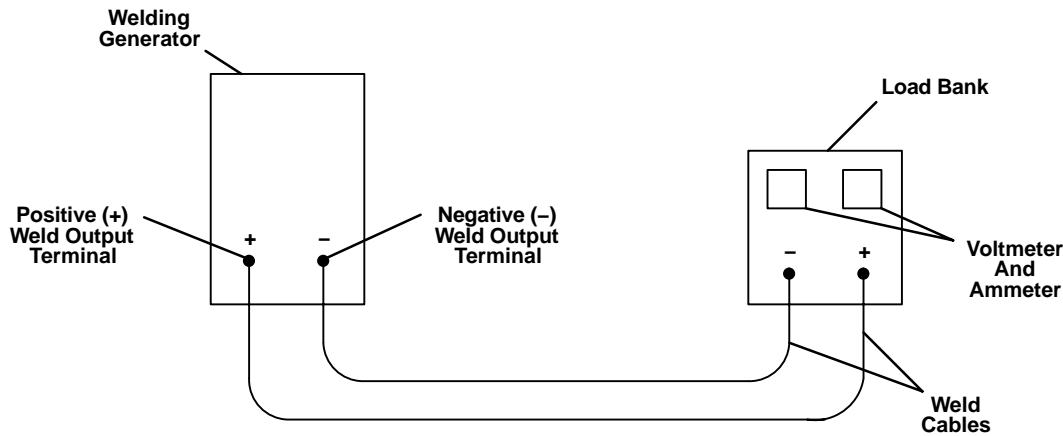
2. Connect cables from load bank to generator weld output terminals observing correct polarity (see Diagram 8-1).
3. Place all load switches in the OFF position.

IMPORTANT: If load bank requires 115 volts ac, it may be connected to the welding generator auxiliary power terminal strip, if applicable.

4. Place welding generator AMPERAGE & VOLTAGE ADJUSTMENT control in the minimum position.
5. Start engine as instructed in Section 7-6, and allow engine to warm up for approximately three minutes.
6. Adjust load bank switches and generator controls to provide a load equal to rated generator output.

For example, if rated generator output is 350 amperes, 40 volts at 100% duty cycle, adjust switches until values indicated by load meters equal rated generator output.

7. Allow engine to run under load for at least one hour. Check engine and load bank meters after the first five minutes and every 15 minutes thereafter to be sure equipment is operating properly.
8. After running engine under load for at least one hour, remove load by shutting down load bank.
9. Allow engine to idle for approximately three minutes to permit internal engine temperatures to equalize.



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Diagram 8-1. Load Bank Connections

10. Stop engine, and disconnect load bank cables.
11. Allow exhaust system to cool.
12. Inspect inside of exhaust pipe. If pipe is dry, the run-in procedure is complete. If pipe is coated with a wet, black, tar-like substance, repeat run-in procedure.

B. Run-In Procedure Using Resistance Grid (Diagram 8-2)



WARNING: Read and follow safety information at beginning of entire Section 8-12 before proceeding.

1. Stop engine.
2. Obtain resistance grid adequately sized for rated output of welding generator.
3. Obtain two weld cables of proper size to connect resistance grid to generator (see Section 4-7).
4. If a voltmeter and ammeter are not provided on the welding generator, obtain a voltmeter and clamp-on dc ammeter.
5. Place welding generator AMPERAGE & VOLTAGE ADJUSTMENT control in the minimum position.
6. Adjust grid switches and generator controls to provide a load approximately equal to rated generator output.

For example, if rated generator output is 350 amperes, 40 volts at 100% duty cycle, adjust switches until values indicated by meters equals rated generator output.
7. Connect one weld cable to grid input receptacle and remaining weld cable to grid output receptacle (see Diagram 8-2).
8. If a voltmeter and ammeter are provided on the welding generator, proceed to Step 9. If meters

are not provided, connect voltmeter and clamp-on dc ammeter as shown in Diagram 8-2.

9. Connect remaining ends of weld cables to generator weld output terminals (polarity is not important).
10. Start engine as instructed in Section 7-6, and allow engine to warm up for approximately three minutes.

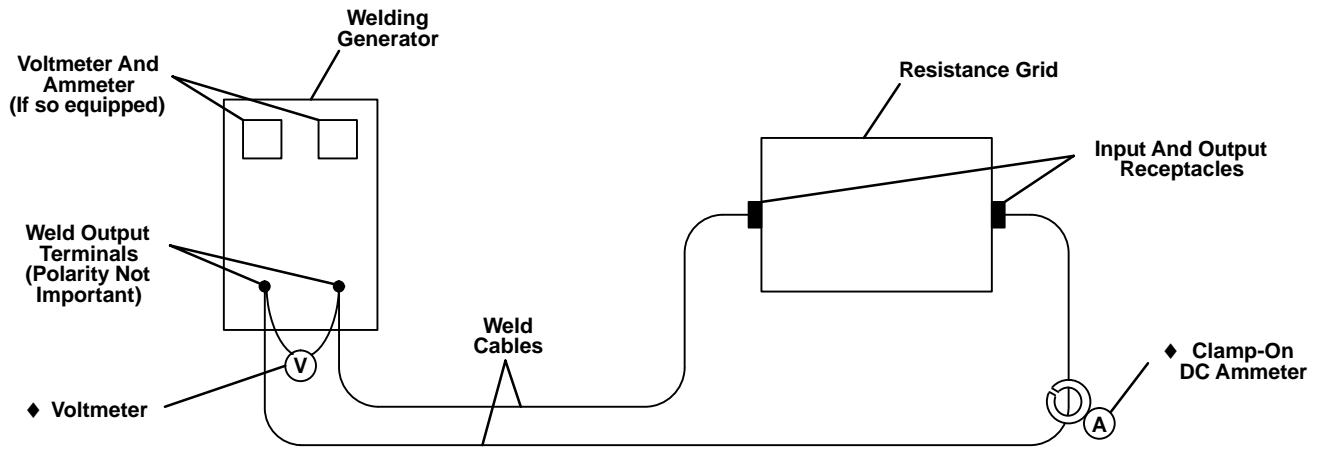


CAUTION: ARCING can damage switch contacts.

- Do not change the position of the grid switches while engine is running.

Arcing causes the contacts to become pitted and eventually inoperative.

11. Check meters. Adjust load with generator controls or, if necessary, by changing positions of grid switches until values indicated by meters equal rated generator output.
12. Allow engine to run under load for at least one hour. Check engine and meters after the first five minutes and every 15 minutes thereafter to be sure equipment is operating properly
13. After running engine under load for at least one hour, remove load by shutting down resistance grid.
14. Allow engine to idle for approximately three minutes to permit internal engine temperatures to equalize.
15. Stop engine, and disconnect weld cables.
16. Allow exhaust system to cool.
17. Inspect inside of exhaust pipe. If pipe is dry, the run-in procedure is complete. If pipe is coated with a wet, black, tar-like substance, repeat run-in procedure.



◆ Required if welding generator is not equipped with meters.

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Diagram 8-2. Resistance Grid Connections

SECTION 9 – TROUBLESHOOTING

9-1. 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.

9-2. BOOSTER BATTERY JUMP STARTING

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



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

- Keep sparks, flames, cigarettes, and other ignition sources away from battery.
- Ensure that all personnel are a safe distance from batteries and clear of moving parts while starting.
- Do not jump start a frozen or completely discharged battery.
- Do not jump start a battery which has loose terminals or one having evidence of damage such as a cracked case or cover.
- Be sure that vent caps are tight and level on both batteries and cover both batteries with a damp cloth.

- Wear correct eye and body protection, and remove all metal jewelry.
- Keep jumper cables clear of moving parts.
- Ensure that both batteries are of the same voltage.
- Do not jump start a trailer mounted welding generator with the towing vehicle battery unless the trailer is completely disconnected from the towing vehicle.
- Do not jump start a vehicle mounted welding generator from the vehicle battery.
- If booster battery is installed in vehicle, do not allow vehicle to make contact with welding generator case or frame.
- Do not jump start by applying power to weld output receptacles or terminals.
- Do not allow jumper cables to contact any other metal while attaching or removing cables.

1. Use properly insulated jumper cables of adequate size.
2. Connect ends of one cable to positive (+) terminals of each battery.
3. Connect one end of other cable to negative (-) terminal of booster battery.
4. Connect remaining end of cable to welding generator engine block at least 18 inches (457 mm) from battery (do not connect to welding generator case, frame, or equipment grounding terminal as damage to equipment can result).
5. Wait at least one minute after connecting cables before starting engine.

6. Start engine following procedures outlined in Section 7 (Sequence of Operation) of this manual. If the unit does not start after cranking for twenty seconds, stop the jump starting procedure. More than twenty seconds seldom starts the engine unless some mechanical adjustment is made.
7. Remove jumper cable from engine block.
8. Remove other end of same cable from booster battery negative (-) terminal.
9. Remove other jumper cable from booster battery positive (+) terminal.
10. Remove remaining end of cable from welding generator battery positive (+) terminal.
11. Discard damp cloths.

9-3. OVERLOAD PROTECTION (Figure 4-2)



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 personal injury.

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

HOT ENGINE PARTS can cause severe burns.

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

INCORRECT FUSE can damage unit.

- Be sure replacement fuse is same size, type, and rating.

A. Circuit Breaker CB1 (Figure 4-2)



WARNING: Read and follow safety information at beginning of Section 9-3 before proceeding.

Circuit breaker CB1 protects the 120 volts ac auxiliary power terminals on terminal strip 3T from overload. CB1 is located behind the lower front door. When CB1 opens, the ON/OFF switch goes to the OFF position, and 3T will not operate. If CB1 opens, locate and correct the problem, and place the circuit breaker switch in the ON position.

B. Circuit Breaker CB3 (Figure 4-2)



WARNING: Read and follow safety information at beginning of Section 9-3 before proceeding.

Circuit breaker CB3 protects the unit wiring from overload and damage. CB3 is located behind the lower front door.

If CB3 opens, 115 volts ac output to socket/terminal D of REMOTE 9 receptacle RC3 and terminal strip 3T stops, and the remote amperage/voltage control will not function.

C. Replacement Of Low Oil Pressure/High Oil Temperature Shutdown System Fuse F



WARNING: Read and follow safety information at beginning of Section 9-3 before proceeding.

1. Remove securing screws, and open upper front access door.
2. Locate shutdown switch MS1 on left, rear side of front access door.
3. Locate fuse F on bottom of shutdown switch MS1.
4. Remove and check fuse, and replace if necessary.
5. Close and secure front access door.

9-4. 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 plugs can damage circuit board.

- Be sure that plugs are properly installed and aligned before closing access door.

EXCESSIVE PRESSURE can break circuit board.

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

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

9-5. TROUBLESHOOTING (Tables 9-1 Thru 9-4)



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Stop engine, and disconnect the negative (-) battery cable 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 procedure. If the trouble is not remedied after performing these procedures, contact the nearest Factory Authorized Service Station/Service Distributor. In all cases of equipment malfunction, strictly follow the manufacturer's procedures and instructions.

Table 9-1. Weld/Power Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY	
No weld output.	Amperage Ranges switch S9 between positions.	Place S9 in LOW OUTPUT or HIGH OUTPUT position (see Section 6-1).	
	OUTPUT (CONTACTOR) switch S5 in REMOTE position and Remote Contactor device not connected.	Place S5 in ON position, or install Remote Contactor Control device.	
	Incorrect or poor connection to REMOTE 9 receptacle or terminal strip 3T.	Check and secure connections (see Section 4-8).	
	Circuit breaker CB3 open (GMAW only).	Reset CB3 (see Section 9-3).	
	Poor contact between slip rings and brushes.		Clean slip rings (see Section 8-9).
			Replace brushes according to Section 8-9.
Field Current Regulator board PC1.		See Section 9-4, and contact nearest Factory Authorized Service Station/Service Distributor.	
Erratic weld output.	Loose or dirty connections.	Check connections both inside and outside the unit.	
	Connection at work.	Check connection. Be sure connection is clean and tight.	
	Damp electrode.	Use dry, properly stored electrode.	
	Field Current Regulator board PC1.	See Section 9-4, and contact nearest Factory Authorized Service Station/Service Distributor.	
	Electrode polarity.	See Section 4-7C.	
High welding output voltage.	High engine speed.	Check and adjust engine speed according to Section 8-8.	
	Field Current Regulator board PC1.	See Section 9-4, and contact nearest Factory Authorized Service Station/Service Distributor.	
Wire feeder inoperative.	Circuit breaker CB3.	Reset CB3 according to Section 9-3.	

Table 9-2. Auxiliary Power Troubleshooting

AUXILIARY POWER TROUBLE	PROBABLE CAUSE	REMEDY
No 120 volt output at 3T terminals L and M.	Circuit breaker CB1 open.	Reset CB1 (see Section 9-3).
	Poor contact between slip rings and brushes.	Clean slip rings (see Section 8-9).
		Replace brushes according to Section 8-9.
High auxiliary power output voltage.	High engine speed.	Check and adjust engine speed according to Section 8-8. (Maximum voltages should not exceed 132 volts for single-phase power.)

Table 9-3. Engine Troubleshooting

TROUBLE	PROBABLE CAUSE	REMEDY
Engine does not start.	Out of fuel.	Fill fuel tank, and air vent fuel system (see Engine Manufacturer's Manual.)
	Battery problem.	Check engine battery charging system according to engine service manual (not supplied with engine).
		Inspect electrical system (see Section 8-1). If trouble is isolated to battery, replace it.
		Jump start the engine using approved safety practices and booster battery (see Section 9-2).
	Engine Control switch S1.	Check S1, and replace if necessary.
	Oil Pressure gauge/switch or Oil Temperature gauge/switch activated, or other engine trouble.	See Sections 6-10 thru 6-11; see Engine Manufacturer's Manual (F4L-912 engine).
	MS1 fuse F.	Check and replace F, if necessary (see Section 9-3).
Engine suddenly shuts down.	Broken cooling belt.	Check and replace belt (see Section 6-15).
	High oil temperature.	Check engine oil level and add oil if necessary; check for cooling air flow obstructions.
	Low oil pressure.	Check engine oil level, and add oil if necessary (see Section 4-5).
	MS1 fuse F.	Check and replace F if necessary (see Section 9-3).

Table 9-4. Air Compressor Troubleshooting

AIR COMPRESSOR TROUBLE	CAUSE	REMEDY
Air compressor fails to build pressure or builds pressure slowly.	Engine air compressor.	Service air compressor. Contact nearest Authorized Service Station/Service Distributor.
Pneumatic tools freeze up.	Moisture in compressed air.	Induce an antifreeze solution into the air supply. Contact nearest Authorized Service Station/Service Distributor.

NOTES

SECTION 10 - ELECTRICAL DIAGRAMS

A B C D E F G H J K A B C D E F G H J K L M
 I T O O O O O O O O 2T 1 O O O O O O O O
 . . . 49 48 6 5 5 . 3 1 1 2 3 4 50 51 81 82 103 104 130 .

S1	OFF	IDLE	RUN	AUX.	START
1		X	X	X	X
2		X	X	X	X
3		X			
4				X	X
5					X

X = CLOSED TO "B" TERMINAL

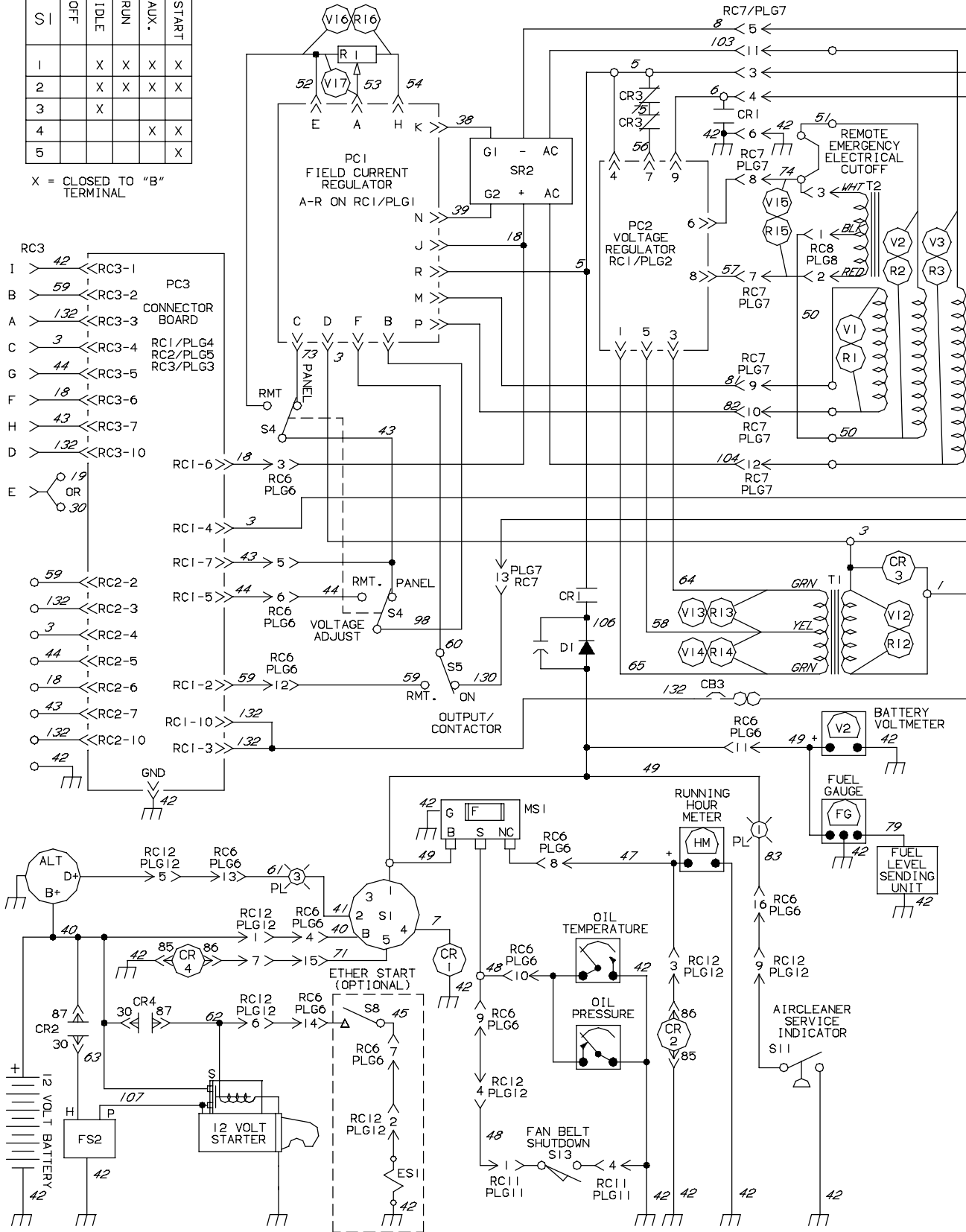


Diagram 10-1. Circuit Diagram For Welding Generator

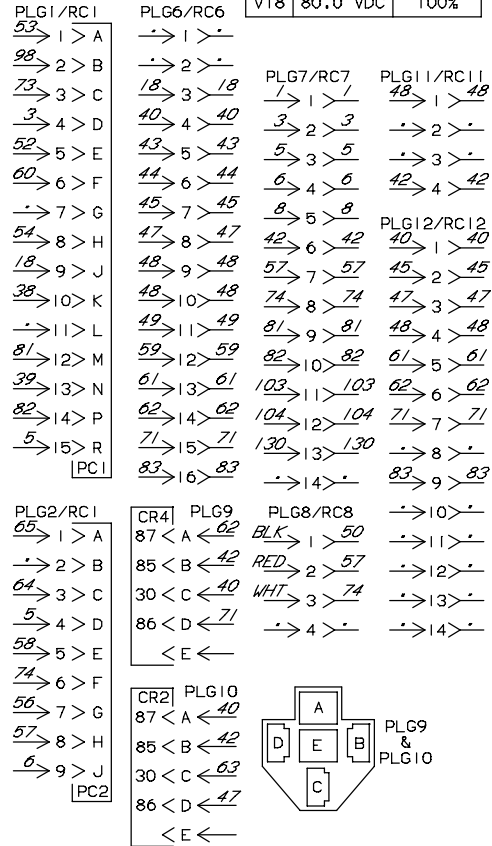
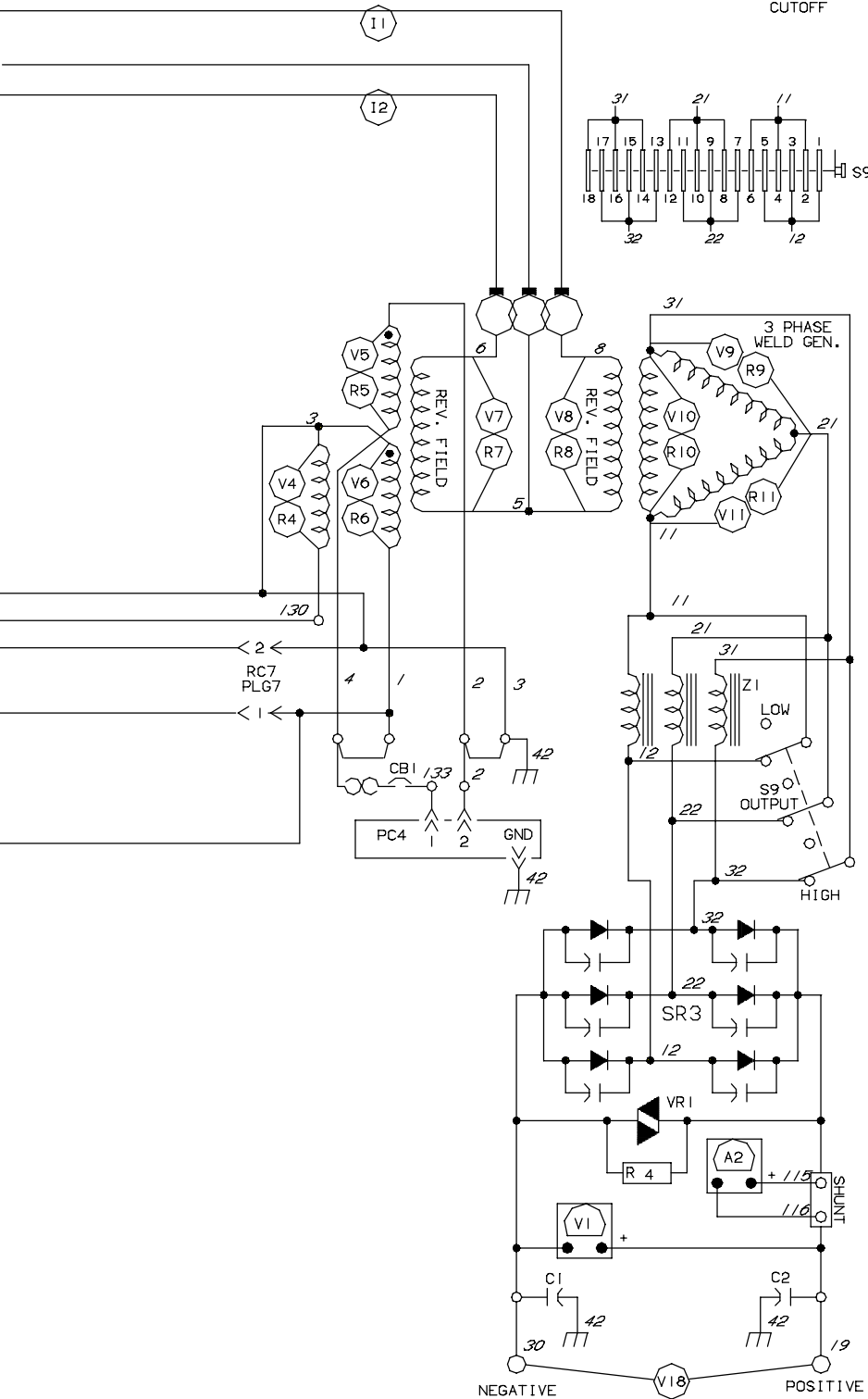
MILLER CONNECTIONS	A	B	C	D	E	F	G	H	J	K	L	M	N	P
	132	59	3	132	19	30	18	44	43	42	2	133	51	74
LINCOLN CONNECTIONS	A	B	C	D	E	F	G	H	I					
	2	4	31	32	+21	-21	75	76	77	111				

ALL READINGS TAKEN UNDER NO LOAD CONDITIONS

CURRENT READINGS		
LOCATION	CURRENT	FINE CURRENT CONTROL SETTING
I1	3.0A	0%
I1	6.5A	100%
I2	1.7A	NO EFFECT

VOLTAGE READINGS		
LOCATION	VOLTAGE	FINE CURRENT CONTROL SETTING
V1	14.4 VAC	NO EFFECT
V2	160 VAC	NO EFFECT
V3	191 VAC	NO EFFECT
V4	22.0 VAC	NO EFFECT
V5	116 VAC	NO EFFECT
V6	116 VAC	NO EFFECT
V7	81.0 VDC	NO EFFECT
V8	45.0 VDC	0%
V8	96.0 VDC	100%
V9	40.0 VAC	0%
V9	59.0 VAC	100%
V10	40.0 VAC	0%
V10	59.0 VAC	100%
V11	40.0 VAC	0%
V11	59.0 VAC	100%
V12	116 VAC	NO EFFECT
V13	20.0 VAC	NO EFFECT
V14	20.0 VAC	NO EFFECT
V15	245 VAC	NO EFFECT
V16	10.0 VDC	NO EFFECT
V17	10.0 VDC	0%
V17	0.00 VDC	100%
V18	52.0 VDC	0%
V18	80.0 VDC	100%

RESISTANCE READINGS (ENGINE OFF)	
LOCATION	RESISTANCE
R1	.240n
R2	2.50n
R3	1.23n
R4	.212n
R5	.280n
R6	.280n
R7	44.5n
R8	13.2n
R9	3.65mΩ
R10	3.65mΩ
R11	3.65mΩ
R12	34.0n
R13	2.00n
R14	2.00n
R15	2.15n
R16	1.0KΩ



SECTION 11 - PARTS LIST

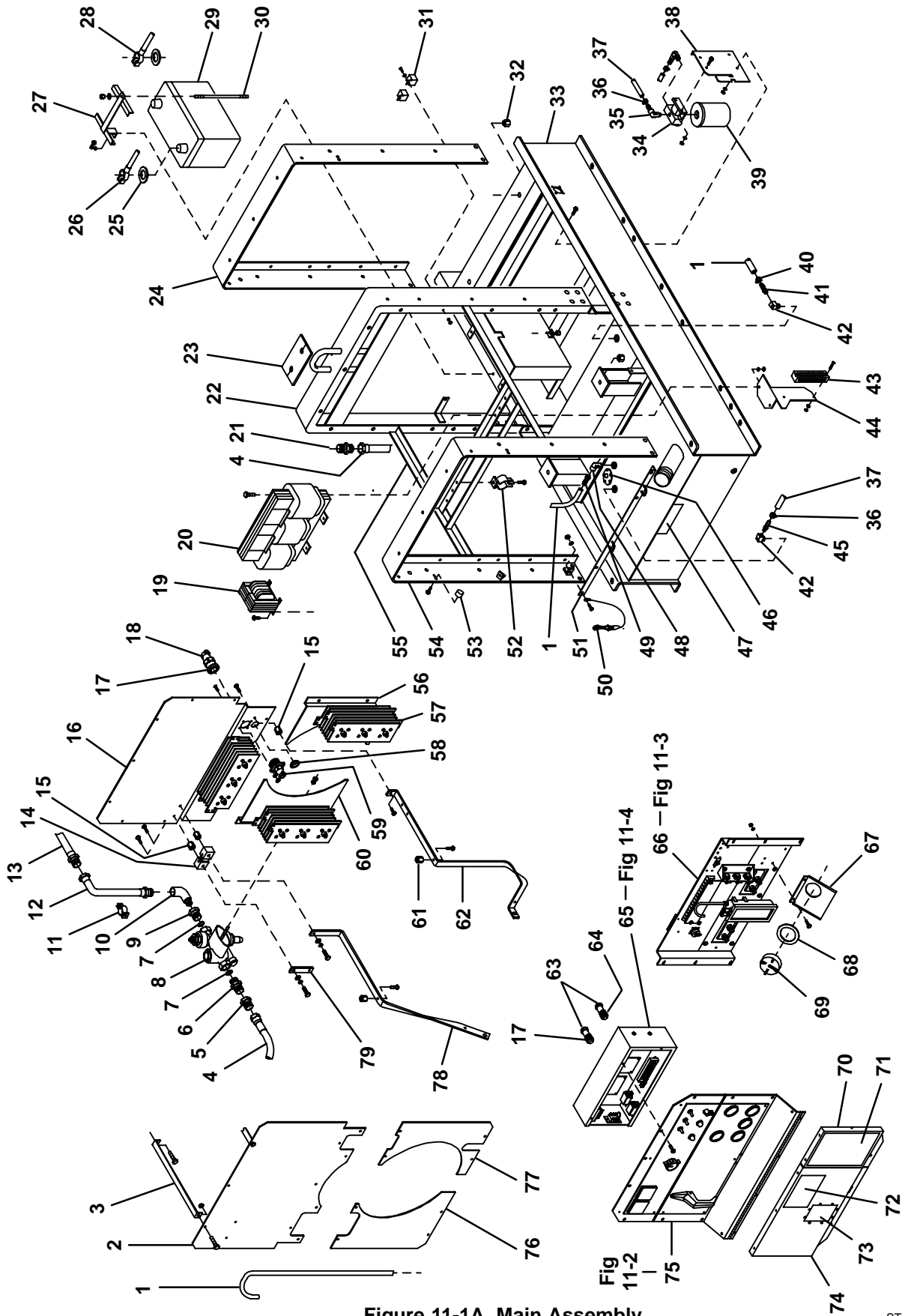


Figure 11-1A. Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-1A. Main Assembly				
1		134 834	HOSE, SAE .187 ID x .410 OD (order by ft)	4ft
2		131 123	SHIELD, heat upper	1
3		146 240	BRACKET, heat shield	2
4		1063920009309	HOSE, air 43.000 3/4 swivel both ends	1
5		0302390009309	FITTING, stl fird conn fem 1/2tbg x 1/2NPT	1
6		1261610009309	FITTING, pipe brs adapter 1/2NPT x M22 x 1.5	1
7		1448660009309	SEAL, ring copper	2
8		1448670009309	VALVE, control air	1
9		1448320009309	FITTING, pipe brs adapter 1/2fem NPT x M22 x 1.5	1
10		602 904	FITTING, pipe stl elb st .500NPT	1
11		010 917	HANGER, minerallic No. 0	3
12		1224390009309	AIR LINE, tank to exit	1
13		138 098	HOSE, sst brd 20.750 lg 3/4NPT M ftg x 3/4NPT M INV (same as Item 5 Fig 11-1B)	1
14	Shunt	072 426	SHUNT, meter 50MV 1000A	1
15		025 248	STAND-OFF, insul .250-20 x 1.250 lg	3
16		14172390009309	FIREWALL, top	1
17	PLG7,12	047 636	CONNECTOR & PINS, (consisting of)	2
		079 535	CONNECTOR, circ pin push-in 14-18ga Amp 66359-6	14
18		143 922	CONNECTOR, circ clamp str rlf sz 17-20 Amp 206070-3	2
19	T2	1479850009309	TRANSFORMER, control (consisting of)	1
	RC8	167 640	CONNECTOR & PINS, (consisting of)	1
		113 633	CONNECTOR, rect pin 20-14ga Amp 350218-1	4
	PLG8	136 810	CONNECTOR & SOCKETS, (consisting of)	1
		114 066	CONNECTOR, rect skt 20-14ga Amp 350536-1	4
20	Z1	1290740009880	REACTOR	1
21		1107430009309	FITTING, stl fird conn M 1/2tbg x .750-16	1
22		1551670009309	UPRIGHT, center	1
		601 965	SCREW, .375-16 x 1.000hexhd	2
23		017 479	SEAL, weather lift eye	2
24		1551680009309	UPRIGHT, rear	1
25		108 081	TERMINAL PROTECTOR, battery post mtg	2
26		134 456	CABLE, bat neg	1
27		1186440009309	HOLD DOWN, battery	1
28		032 452	CABLE, bat pos	1
29	BAT	012 724	BATTERY, stor 12V 550crk 165RSV	1
		1448270009309	INSULATOR ASSEMBLY, battery	1
30		010 460	STUD, stl .312-18	1
31	CR2,4	090 104	RELAY, encl 12VDC SPST	2
	PLG9,10	148 850	SOCKET, relay 5 pin	2
32		601 851	NUT, stl slf lkg hex reg .625-18	4
33		1169780009309	BASE	1
34		083 553	BASE, filter fuel w/adapter	1
35		145 281	FITTING, hose brs barb elb M 3/8tbg x 1/4NPT	2
36		099 542	CLAMP, hose .645-.828clp dia	3
37		134 836	HOSE, SAE .375 ID x .620 OD (order by ft)	7ft
		023 562	CLAMP, hose .312-.875clp dia	2
38		117 227	BRACKET, mtg fuel filter	1
39		*062 342	SEPARATOR, fuel filter & water	1
40		089 120	CLAMP, hose .375-.450clp dia	1
41		073 433	FITTING, brs barbed M 3/16tbg x 1/4NPT	2
42		1194860009309	TUBE, pick-up fuel	2
43	2T	163 656	BLOCK, term 65A 12P	1
44		0570560009309	BRACKET, mtg term strip	1
45		081 646	FITTING, brs barbed M 3/8tbg x 1/4NPT	1
46		146 357	SENDER, fuel gauge 11.000 deep	1
47		121 823	LABEL, warning do not lift from this end	1
48		010 678	FITTING, pipe brs elb st 1/4NPT LH	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
49		073 433	FITTING, brs barbed M 3/16tbg x 1/4NPT	1
50		0456660009309	LATCH, door snap	2
51		1187900009309	ANGLE, strain relief	1
52		010 914	HANGER, minerallic No. 5	1
53		087 341	BUMPER, door 1.000 OD x .750 high	6
54		1551660009309	UPRIGHT, front	1
		121 699	SPACER, cover	3
		601 965	SCREW, .375-16 x 1.000hexhd (used on fuel filter bracket also)	4
		602 213	WASHER, lock stl split .375 (used on fuel filter bracket also)	4
		601 871	NUT, stl hex jam .375-16 (used on fuel filter bracket also)	4
55		1311880009309	FRAME, mtg reactor	1
		007 025	SCREW, cap stl hexhd .625-11 x 1.250	4
		602 218	WASHER, lock stl split .625	4
		085 980	NUT, stl hex full fnsh .625-11	4
56		1311270009309	BRACKET, rect RH	1
57	SR3	142 507	RECTIFIER, si 3ph 450A	3
		1448180009309	BUS BAR, rectifier AC to AC	6
58		030 170	BUSHING, snap-in nyl .750 ID x 1.000mtg hole	1
59	RC12	047 637	CONNECTOR & SOCKETS, (consisting of)	1
		079 534	CONNECTOR, circ skt push-in 14-18ga Amp 66358-6	14
60		1215410009309	BRACKET, rect LH	1
61		026 947	STAND-OFF, insul .250-20 x 1.000 lg	2
62		1376100009309	BUS BAR, neg term to rectifier	1
63		079 739	CONNECTOR, circ clamp str rlf sz 17-20 Amp 206322-2	2
64	PLG6	048 598	CONNECTOR & SOCKETS, (consisting of)	1
		079 534	CONNECTOR, circ skt push-in 14-18ga Amp 66358-6	16
65		Fig 11-4	CONTROL BOX	1
66		Fig 11-3	PANEL, lower front w/components	1
67		122 354	GUARD, splash fuel	1
68		107 343	GROMMET, rbr neck filter fuel	1
69		0240350009309	CAP, tank fuel	1
70		1448230010202	DOOR, front lower RH	1
71		147 911	PLATE, ident diesel fuel only	1
72		134 792	LABEL, warning general precautionary	1
73		1448210009309	WINDOW, door lower	1
		1448220009309	FRAME, support window	1
74		+1292260010202	DOOR, front lower	1
75		Fig 11-2	PANEL, front w/components	1
76		131 125	SHIELD, heat lower LH	1
77		131 124	SHIELD, heat lower RH	1
78		1312430009309	BUS BAR, pos term to rectifier	1
79		1317500009309	BUS BAR, shunt	1
		120 188	LABEL, warning electric shock	1
		136 615	LABEL, caution refer to Owner's Manual	1
		164 617	CLIP, wiring straight	2
		164 616	CLIP, wiring offset	1
		135 784	CLIP, conduit convoluted 3/4 in 6.35mm mtg hole	3
		149 616	CLAMP, stl cush .187dia x .344mtg hole	1
		010 021	CLAMP, stl cush .562dia x .343mtg hole	1
		034 116	CLAMP, stl cush .625dia x .468mtg hole	2
		010 014	CLAMP, stl cush .750dia x .203mtg hole	4
		020 279	CLAMP, stl cush .750dia x .281mtg hole	2
		127 854	CLAMP, stl cush 1.312dia x .343mtg hole	2
		089 256	CLAMP, stl cush 1.750dia x .531mtg hole	1
		010 143	CLAMP, nyl .375 clamp dia	2

*Recommended Spare Parts.

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-1B. Main Assembly				
1		1448720009309	BAFFLE, air upper	1
2		006 086	BLANK, snap-in 1.500mtg hole	1
3			See engine manual for replacement parts	
4		1448200009309	BRACKET, mtg air line to alternator	1
5		138 098	HOSE, sst brd 20.750 lg 3/4NPT M ftg x 3/4NPT M INV (same as Item 13 Fig 11-1A)	1
6		192 197	BRACKET, mounting	1
7		1187060009309	AIR LINE, tank to exit	1
8		023 313	CLAMP, hose 3.250-3.000clp dia	1
9		162 625	HOSE, air cleaner	1
10		010 863	CLAMP, hose 2.062-3.000clp dia	5
11		1626660009309	TUBING, air cleaner intake	1
12		073 655	FITTING, pipe brs nipple hex 1/8NPT	1
13	S11	118 067	SWITCH, vacuum air flow	1
14		1371640009309	HOSE, air input	1
15		010 497	CLAMP, hose .750 – 1.750clp dia	3
16		1183490009309	AIR LINE, compressor to tank	1
17		1448300009309	FITTING, pipe brs adapter M 3/4NPSM x 26mm x 1.5	2
18		1448310009309	SEAL, ring copper	2
19		1371790009309	AIR COMPRESSOR, 300cc	1
20		1261620009309	SHIELD, heat compressor	1
21		151 734	ENGINE, Deutz dsl elec	1
		1065390009309	O-RING	1
		1065380009146	STARTER, engine 12V	1
		164 618	SHUTDOWN KIT, rsv type governor	1
22		1528460009309	HOSE, air cleaner elb	1
23		1532490009309	BAFFLE, upper air intake	1
24		1142710009309	COMPOUND, sealant material (order by ft)	5ft
25		+1528530010202	COVER, top	1
26		1174860010202	PIPE, exhaust	1
27		122 382	CAP, rain	1
28		108 487	LABEL, warning falling equipment can cause serious injury	2
29		163 226	AIR CLEANER, intake (consisting of)	1
30		021 116	CAP, dust	1
31		004 115	BAFFLE, dust cap	1
32		021 117	NUT, wing	1
33		*020 319	ELEMENT	1
34		021 114	CLAMP ASSEMBLY	1
35		021 115	BAND, mtg	1
36		1528450009309	HOSE, air cleaner elb	1
37		0280890010202	DOOR, access radiator	1
38		147 913	PLATE, ident engine lube oil only	1
		147 912	PLATE, ident oil specification	1
39		089 178	GROMMET, rbr 3.000 ID x 3.500mtg hole	1
40		049 170	GROMMET, rbr 2.500 ID x 2.750mtg hole	1
41		004 130	BRACKET, support door	1
42		1214130010202	PANEL, end baffle air	1
43		+1453150010202	DOOR, side	1
		1311870010202	PANEL, engine LH	1
		146 389	LABEL, diesel engine maintenance	1
44		147 923	LABEL, warning moving parts can cause serious injury	2
45		119 861	LATCH, paddle series 300 w/lock	1
46		1198510010202	PANEL, rocker	1
47		1172190010202	PANEL, side	2
48		149 971	FITTING, pipe brs adapter bhd 1/2NPT x 1.500 lg	1

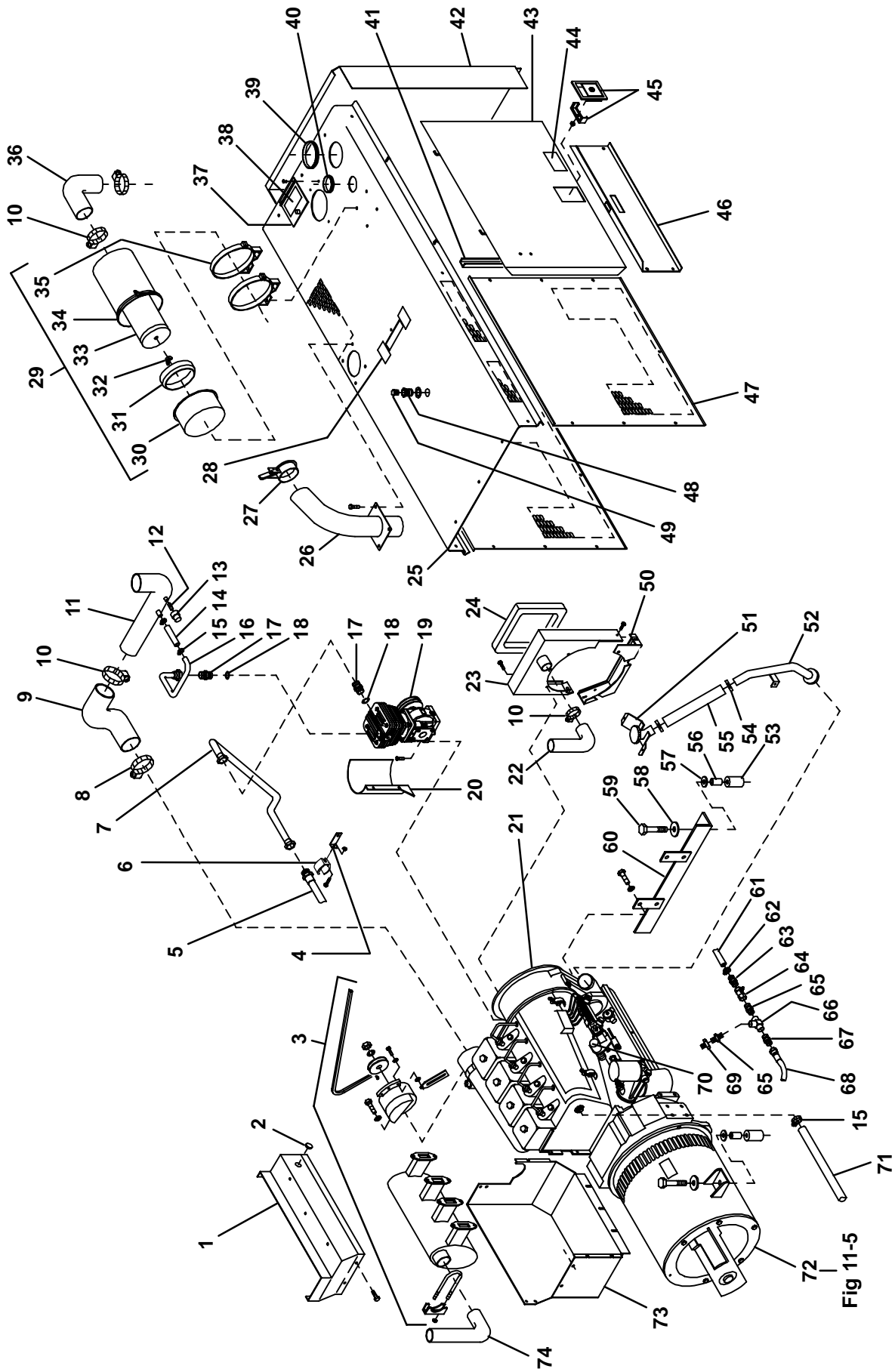


Fig 11-5

Figure 11-1B. Main Assembly

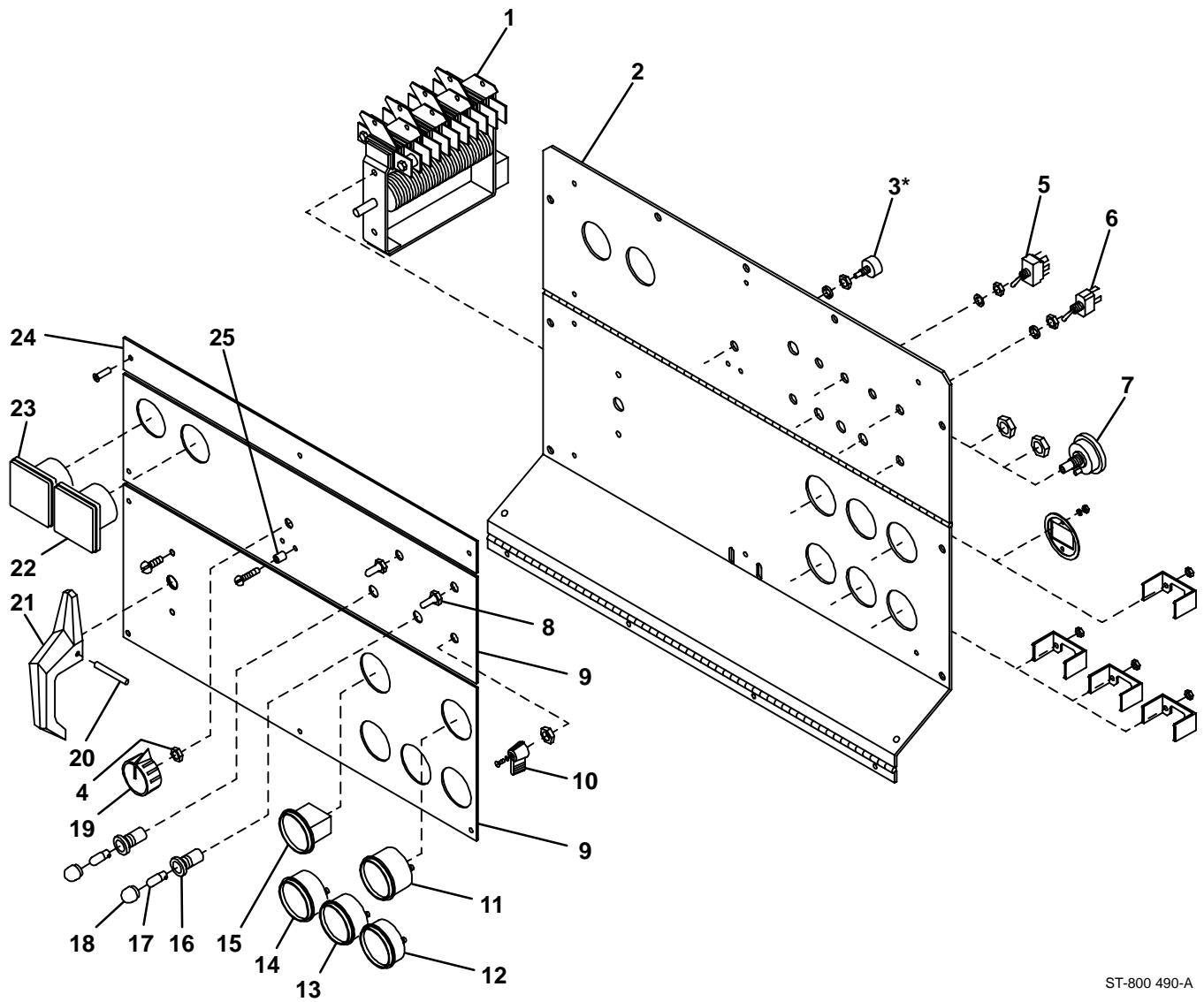
Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-1B. Main Assembly (Continued)				
49		089 351	FITTING, pipe brs plug hexhd 1/2NPT	1
50		1532480009309	BAFFLE, lower air intake	1
51		1528480009309	BRACKET, oil neck w/cap	1
52		1528520009309	PIPE, oil fill	1
53		071 890	RETAINER, mount eng/gen	4
54		1529040009309	CLAMP, hose 1.500	2
55		1528470009309	HOSE, oil filler	1
56		071 730	TUBING, stl .875 OD x 12ga wall x 2.500	4
57		602 246	WASHER, flat stl std .500	4
58		071 731	WASHER, flat stl .656 ID x 2.250 OD	4
59		601 945	SCREW, cap stl hexhd .625-18 x 4.000	4
60		116 707	SUPPORT, front engine	1
61		603 110	HOSE, nprn .500 ID x .687 OD (order by ft)	2ft
62		010 858	CLAMP, hose .500-.906clp dia	1
63		0395990009309	FITTING, brs barbed M 1/2tbg x 1/2NPT	1
64		088 684	VALVE, ball bronze 1/2thd female	1
65		1063940009309	FITTING, stl flrd conn M 1/2tbg x 1/2tbg	2
66		1178270009309	FITTING, pipe stl tee F 1/2NPT	1
67		1107430009309	FITTING, brs flrd conn M hd 1/4tbg x 1/8NPT	1
68		1355720009309	HOSE, oil 47.000 3/4 swivel both ends (same as Item 29 Fig 11-3)	1
69		118 452	FITTING, adapter oil drain	1
70		131 208	STOP, throttle	1
71		1448100009309	HOSE, cooling compressor	1
72		Fig 11-5	GENERATOR	1
73		1448640009309	BAFFLE, air lower	1
74		132 712	PIPE, muffler extension elb 1.875 OD	1
		119 836	TUBING, stl .875 OD x .563 ID x .875 lg	2
		◆041 481	STARTING AID, diesel (consisting of)	1
ES1		◆034 074	VALVE, ether (diesel starting aid)	1
		◆083 859	BRACKET, mtg fuel filter/quick start	1
		◆195 754	ADAPTER, atomizer	1
		◆046 410	ATOMIZER, .125 L elbow orf 12 o'clock from inlet	1
		◆035 325	LABEL, ether starting aid caution etc	1
S8		◆021 467	SWITCH, tgl SPST 3A 250V off-none-(on) spd term	1
		◆021 385	BOOT, toggle switch lever	1
		◆020 185	FITTING, pipe brs elbow st 1/8NPT	1

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

*Recommended Spare Parts.

◆OPTIONAL

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



ST-800 490-A

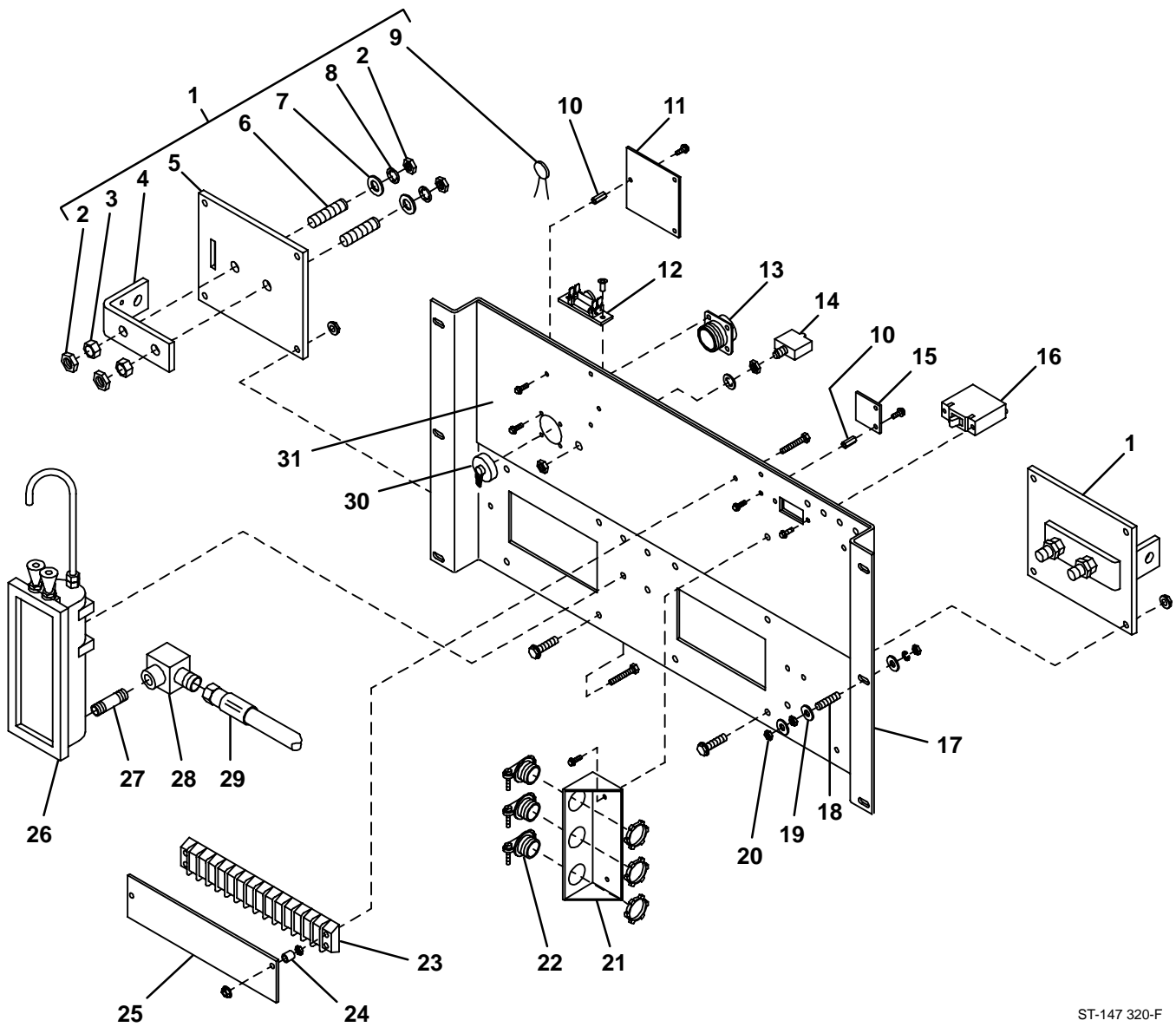
*Includes Item 4

Figure 11-2. Panel, Front w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-2. Panel, Front w/Components (Fig 11-1A Item 75)				
... 1	S9	1346300009880	.. SWITCH, range	1
... 2		1183400010202	.. PANEL, front upper	1
... 3	R1	072 462	.. POTENTIOMETER, w/shaft lock (consisting of)	1
... 4		072 590	.. LOCK, shaft pot .375-32 x .250	1
... 5	S4	011 611	.. SWITCH, tgl DPDT 15A 125V	1
... 6	S5	011 609	.. SWITCH, tgl SPDT 15A 125VAC	1
... 7	S1	172 070	.. SWITCH, ignition 5posn w/out handle	1
... 8		021 385	.. BOOT, tgl switch lever	2
... 9			.. PLATE, ident control rating (order by model and NSPR number)	1
... 10		125 707	.. LEVER, switch	1
... 11	FG	118 066	.. GAUGE, fuel elec 12V neg grd	1
... 12	V2	164 747	.. METER, volt batt chg 8-18 scale	1
... 13	OG	129 870	.. GAUGE, pressure oil 25-30PSI	1
		128 829	.. KIT, oil line 44.000 in 1/8NPT x 10mm	1
... 14		1298370009309	.. GAUGE/SWITCH, temp oil mech 300deg setting	1
... 15	HM	118 058	.. METER, hour 12-24VDC	1
... 16		082 788	.. HOLDER, light ind only	2
... 17	PL1,3	*048 155	.. BULB, incand flg base 12V	2
... 18		082 789	.. LENS, light ind red	2
... 19		097 926	.. KNOB, pointer	1
... 20		010 647	.. PIN, spring .156 x 1.250	1
... 21		090 231	.. HANDLE, switch range	1
... 22	A2	164 875	.. METER, amp DC 50MV 0-1K scale	1
... 23	V1	164 872	.. METER, volt DC 0-100 scale	1
... 24			.. NAMEPLATE, (order by model and NSPR number)	1
... 25		022 289	.. TUBING, stl .312 OD x .187 ID	2

*Recommended Spare Parts.

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



ST-147 320-F

Figure 11-3. Panel, Lower Front w/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure 11-3. Panel, Lower Front w/Components (Fig 11-1A Item 66)				
1		0386120009309	.. TERMINAL ASSEMBLY, pwr output (consisting of)	2
2		601 840	.. NUT, brs hex .500-13 jam	4
3		601 839	.. NUT, brs hex .500-13 full	2
4		038 847	.. BUS BAR, term pwr output	1
5	Neg/Pos	038 613	.. TERMINAL BOARD, pwr output	1
6		038 900	.. STUD, brs .500-13 x 2.250	2
7		602 247	.. WASHER, flat stl SAE .500	2
8		605 787	.. WASHER, lock stl intl tooth .500	2
9	C1,2	085 321	.. CAPACITOR	1
		601 976	.. SCREW, cap stl hexhd .500-13 x 1.500 (bus bar to terminal)	2
		044 942	.. NUT, locking .500-13 (bus bar to terminal)	2
10		097 132	.. STAND-OFF, 6-32 x .375 lg	5
11	PC3	150 415	.. CIRCUIT CARD, connector	1
	PLG3-5	165 668	.. CONNECTOR & SOCKETS, (consisting of)	3
		079 534	.. CONNECTOR, circ skt push-in 14-18ga Amp 66358-6	10
12	VR1/R4	046 819	.. SUPPRESSOR	1
13	RC3	085 302	.. CONNECTOR, circ 9skt rcpt Amphenol MS-3102A-20-16S	1
14	CB3	083 432	.. CIRCUIT BREAKER, man reset 1P 10A 250V	1
15	PC4	152 966	.. CIRCUIT CARD, filter HF	1
16	CB1	1532470009309	.. CIRCUIT BREAKER, mag SPDT 30A 250VAC	1
17		1502670009309	.. PANEL, front lower	1
18		083 030	.. STUD, brs grd .250-20 x 1.750	1
19		010 915	.. WASHER, flat brs .250 ID x .625 OD	5
20		601 836	.. NUT, brs hex .250-20	3
21		0918600009309	.. STRAIN RELIEF	1
22		010 916	.. CONNECTOR, clamp cable .750	3
23	3T	073 873	.. BLOCK, term 30A 14P	1
24		022 289	.. TUBING, stl .312 OD x .187 ID x .437 lg	2
25		1482370009309	.. COVER, terminal	1
26		1479080009309	.. GAUGE, oil level	1
27		1224460009309	.. FITTING, pipe galv nipple .500NPT x 1.500 lg	1
28		0886900009309	.. FITTING, stl flrd elbow fem 1/2tbg x 1/2NPT	1
29		1355720009309	.. HOSE, oil 47.000 3/4 swivel both ends (same as Item 70 Fig 11-1B)	1
30		039 885	.. CONNECTOR, circ protective cap Amphenol 9760-20	1
31			.. PLATE, ident control rating lower (order by model and NSPR number)	1
		1577780009309	.. STRAP, grounding (front panel to base)	1
		1577920009309	.. STRAP, grounding (front panel to control box)	1

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
1		1186380009309	ENCLOSURE, control box	1
2	T1	0700700009309	TRANSFORMER, control	1
3	RC6	090 246	CONNECTOR w/PINS, (consisting of)	1
		079 535	CONNECTOR, circ pin push-in 14-18ga Amp 66359-6	16
4	RC7	047 637	CONNECTOR & SOCKETS, (consisting of)	1
		079 534	CONNECTOR, circ skt push-in 14-18ga Amp 66358-6	14
5	D1	189 701	DIODE/CAPACITOR BOARD	1
6		1562370009309	BRACKET, holding	1
7	1T	098 828	BLOCK, term, 10A 10P	1
8		129 524	TERMINAL, frict .250 x .032 uninsul male	1
9		110 375	STAND-OFF SUPPORT, PC card No. 6 screw	8
10	PC2	160 888	CIRCUIT CARD, voltage regulator	1
	PLG2	168 071	CONNECTOR & SOCKETS, (consisting of)	1
		114 066	CONNECTOR, rect skt 20-14ga Amp 350536-1	9
11	PC1	1337570009309	CIRCUIT CARD, field current regulator	1
	PLG1	135 275	CONNECTOR & SOCKETS, (consisting of)	1
		114 066	CONNECTOR, rect skt 20-14ga Amp 350536-1	15
12	CR1	044 588	RELAY, encl 12VDC 3PDT	1
13	CR3	059 268	RELAY, encl 120VAC DPDT	1
14	SR2	097 353	DIODE/SCR, bridge intg 2SCR 3 diodes	1
15	MS1	118 072	SWITCH, magnetic shutdown 12VDC (consisting of)	1
16	F	*048 317	FUSE, mintr gl 14A 32V	1
		045 852	CLIP, component .687dia mtg adh back	1

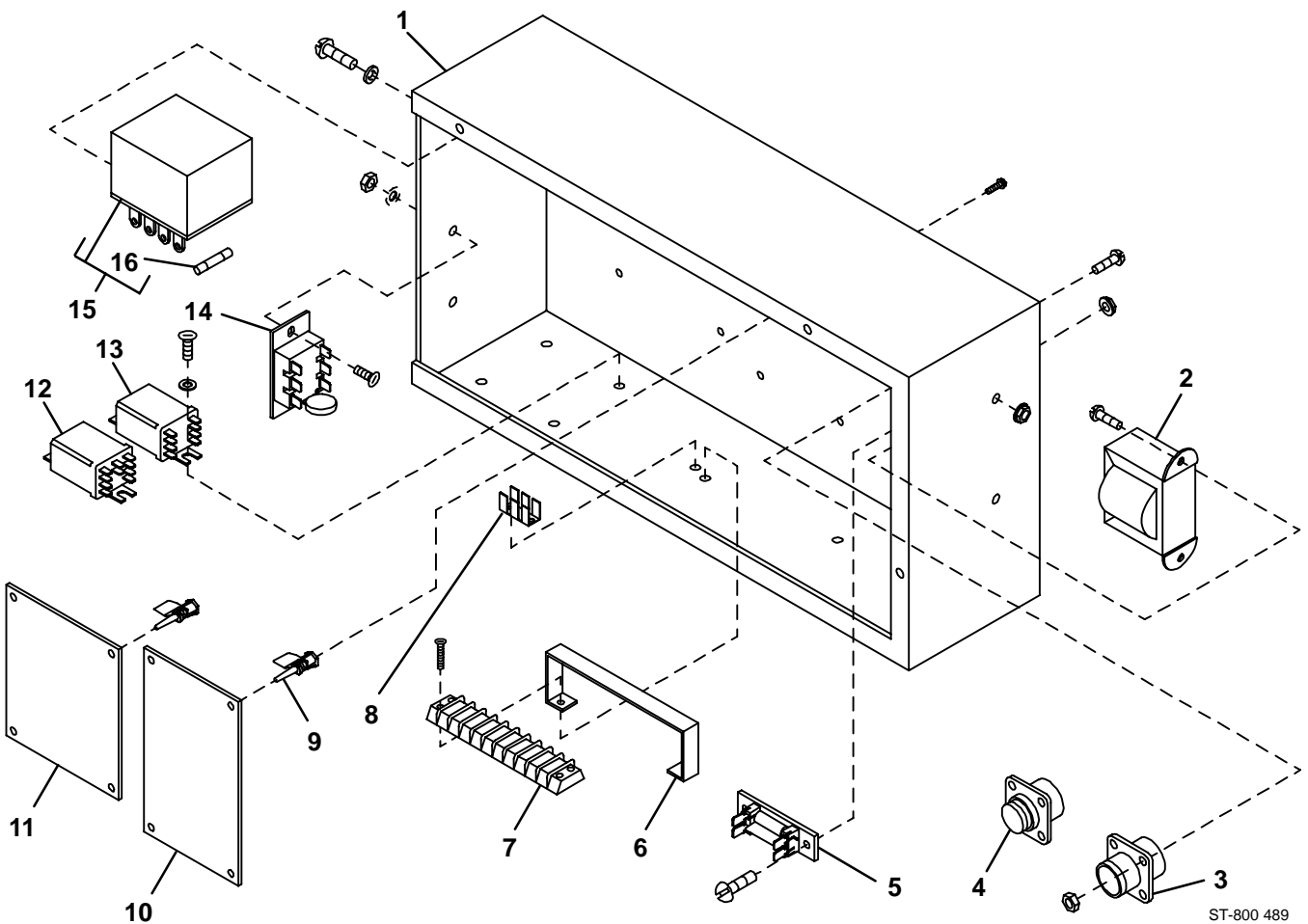


Figure 11-4. Control Box

ST-800 489

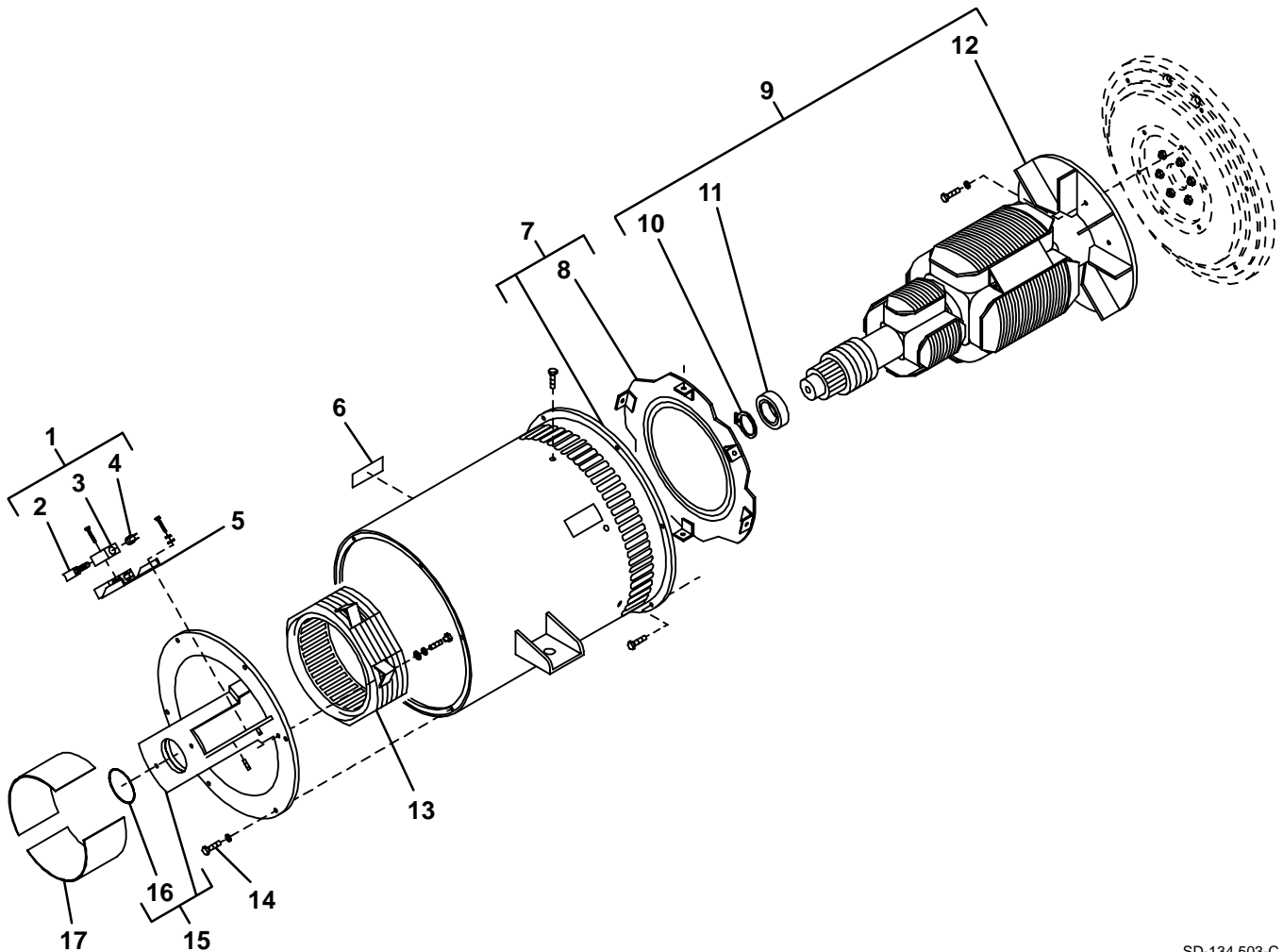
*Recommended Spare Parts.

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

Item No.	Part No.	Description	Quantity
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Figure 11-5. Generator (Fig 11-1B Item 72)

1	018 614	BRUSH SET, (consisting of)	3
2	*151 299	BRUSH, contact	1
3	600 270	HOLDER, brush	1
4	152 044	CAP, brush holder	1
5	049 650	BRACKET, mtg brushholder	1
6	013 367	LABEL, warning moving parts can cause serious injury	2
7	+140 096	STATOR, generator (consisting of)	1
8	039 207	BAFFLE, air generator	1
9	083 751	ROTOR, gen (consisting of)	1
10	024 617	RING, retaining external	1
11	053 390	BEARING, ball	1
12	083 748	FAN, rotor	1
13	1450210009309	STATOR, exciter/endbell	1
14	601 965	SCREW, .375-16 x 1.000hexhd	6
15	153 299	ENDBELL, generator (consisting of)	1
16	143 220	O-RING, 2.859 ID x .139CS	1
17	004 203	STRIP, nyl .050 x 4.000 x 9.000	2



SD-134 503-C

Figure 11-5. Generator

*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.

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