

July 1981

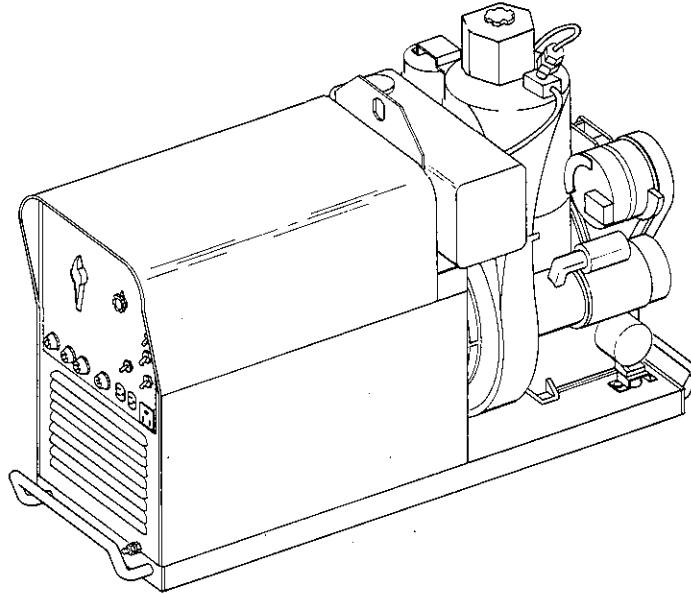
FORM: OM-412G

Effective With Serial No. JB490060

MODEL

DEL-200 (60 Hz)

DEL-200 (50 Hz)



OWNER'S MANUAL



MILLER ELECTRIC MFG. CO.

718 S. BOUNDS ST. P.O. Box 1079
APPLETON, WI 54912 USA

ADDITIONAL COPY PRICE 90 CENTS

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LIMITED WARRANTY

EFFECTIVE: JUNE 1, 1979

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2. Original main power rectifiers 3 years
(labor - 1 year only)
3. All welding guns and feeder/guns 90 days
4. All other Millermatic Feeders 1 year
5. Replacement or repair parts, exclusive of labor . 60 days
6. Batteries 6 months

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

















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The nameplate of this unit uses international symbols for labeling the front panel controls. The following definitions should help the operator become familiar with the symbols and their meanings. The symbols also appear at the appropriate section in the text.

Symbol	Definition	Symbol	Definition	Symbol	Definition	Symbol	Definition
	POSITIVE		WORK		AMPERAGE		RUN IN
	NEGATIVE		ELECTRODE		DO NOT SWITCH UNDER LOAD		START
	AC		OUTPUT		WELD		AUTO IDLE ON
	DC		POWER		STOP OUT		AUTO IDLE OFF

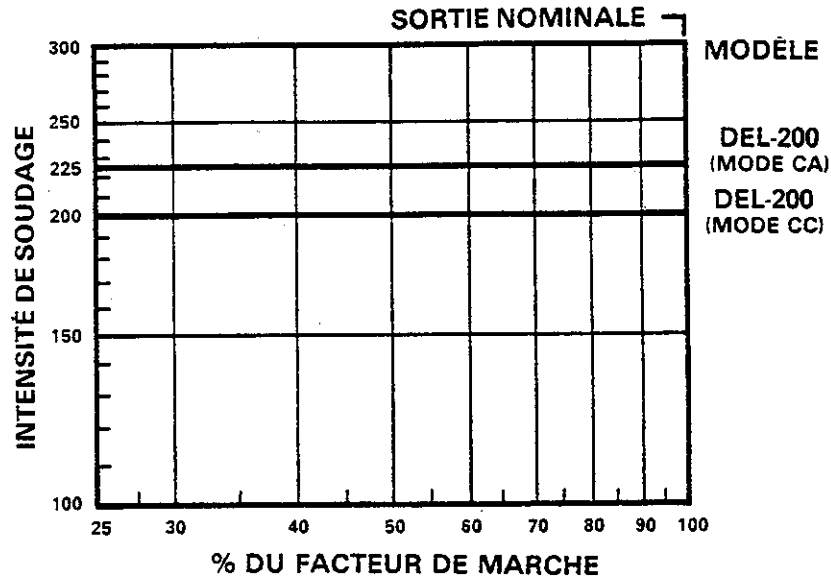
ERRATA

Après l'impression de ce manuel, des modifications ont été apportées afin d'améliorer l'appareil. Cette page énumère toutes les modifications apparues depuis.

IMPORTANT : Supprimer toute référence à 1 KVA, 115 Volts, 8.7 ampères pendant soudage CC. Ce poste est désigné à fournir 1 KVA 115 Volts 8.7 ampères 100 HZ pendant soudage CA.

MODIFICATION DU CHAPITRE 4 - FONCTIONS DES COMMANDES DU GENERATEUR

Changer Figure 4-3. Diagramme du facteur de marche



B-052 960-B

Figure 4-3. Diagramme du Facteur de Marche

MODIFICATION DU CHAPITRE 7 - DÉFAUTS DE FONCTIONNEMENT

Changer Figure 7-1. Schéma de Circuit pour génératrices de soudage

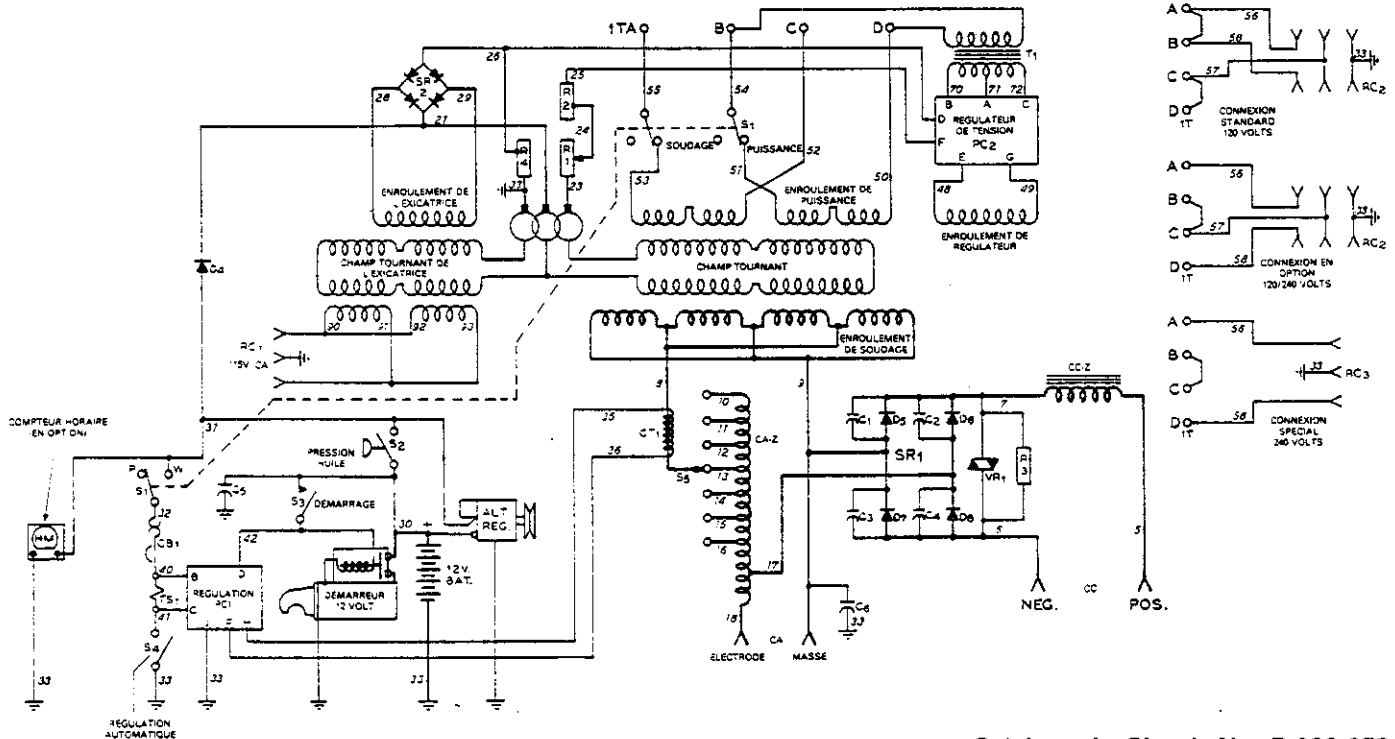


Schéma de Circuit No. B-086 953

Figure 7-1. Schéma de Circuit de la génératrice de soudage à partir du No. de série JC637008 et les suivants

Ajouter Figure 7-3. Schéma de Circuit de la Carte de Circuit pour le Regulateur de Tension

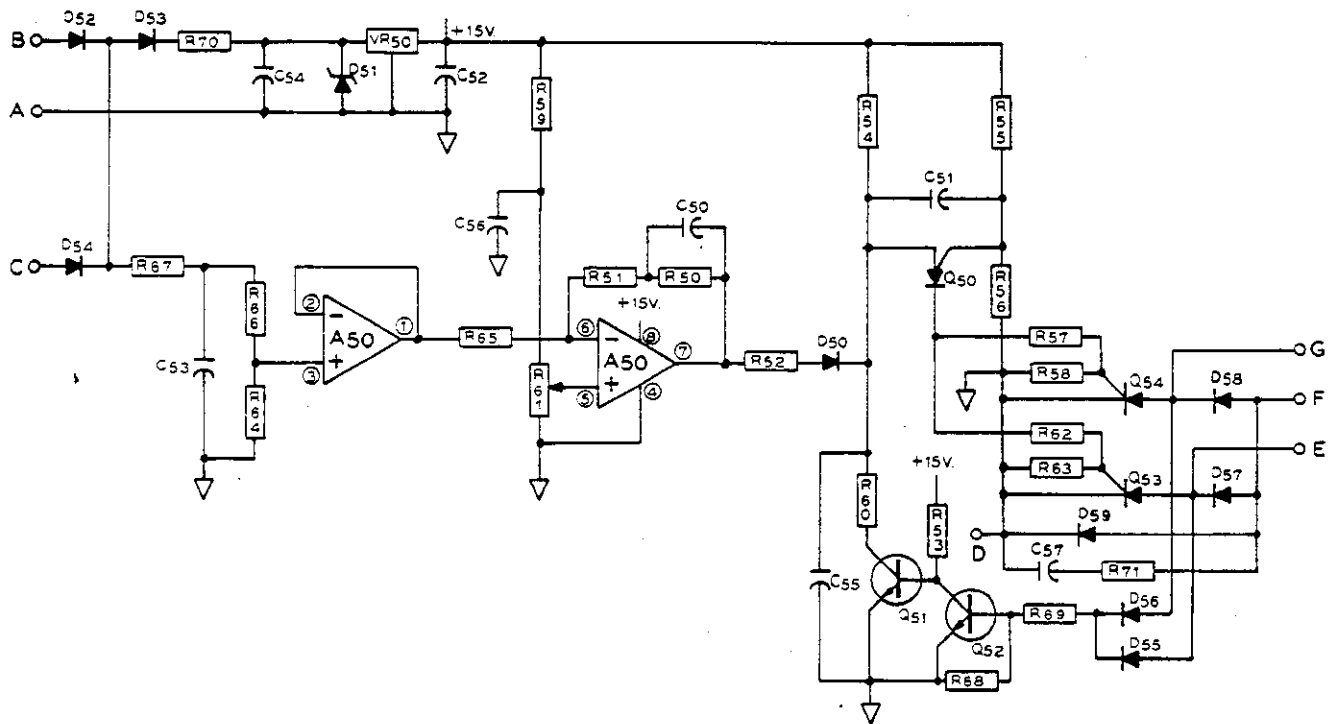


Schéma de Circuit No. A-049 506-A

Figure 7-3. Schéma de Circuit de la Carte de Circuit pour le Regulateur de Tension

Page N°	Repère N°	Schéma	Réf. N°	Remplacé par	Designation	Quantité
2	18		010 865	010 865	Fixation (Changement de quantité) (Applicable à partir du numéro de série JB556758).....	4
2	19		604 308	604 308	Coude (Changement de quantité) (Applicable à partir du numéro de série JB556758).....	1
2	19		604 308	039 599	Coude Male-Barbele 5/16 TBG x 1/4 NPT (Applicable à partir du numéro de série JB556758).....	1
2	20		070 919	084 210	Tuyau, néoprène No. 15/16 ID x 19 (Applicable à partir du numéro de série JB556758).....	1
4	28		603 097	Supprimée		
4	12		070 209	+086 961	Stator 60 HZ (Applicable à partir du numéro de série JC637088) OU.....	1
4	12		070 208	+086 960	Stator 50 HZ (Applicable à partir du numéro de série JC637088).....	1
4	21	SR2	039 123	035 704	Redresseur intègre 30 Amp 600 Volts (Applicable à partir du numéro de série JC637088).....	1
4	22		035 704	Supprimée	(Applicable à partir du numero de série JC637088)	
4	23	D1-3	037 572	Supprimée	(Applicable à partir du numéro de série JC637088)	
4	23		020 847	Supprimée	(Applicable à partir du numéro de série JC637088)	
				084 173	Fixation, tuyau (Applicable à partir du numéro de série JB556758).....	2

+ Lorsqu'une composante portant une étiquette de précaution est commandée, cette étiquette doit être aussi commandée.

VEILLER À INDIQUER LE MODÈLE ET LE NO. DE SÉRIE POUR COMMANDER DES PIÈCES DE RECHANGE.

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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

A. Burn Prevention

Wear protective clothing - leather (or asbestos) gauntlet gloves, hat, and high safety-toe shoes. Button shirt collar and pocket flaps, and wear cuffless trousers to avoid entry of sparks and slag.

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

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

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

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

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

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

B. Toxic Fume Prevention

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

Lead -, cadmium -, zinc -, mercury -, and beryllium - bearing and similar materials, when welded (or cut) may produce

harmful concentrations of toxic fumes. Adequate local exhaust ventilation must be used, or each person in the area as well as the operator must wear an air-supplied respirator. For beryllium, both must be used.

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

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

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

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

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

C. Fire and Explosion Prevention

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

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

To prevent fires and explosion:

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

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

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

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

- appreciable combustibles (including building construction) are within 35 feet
- appreciable combustibles are further than 35 feet but can be ignited by sparks
- openings (concealed or visible) in floors or walls within 35 feet may expose combustibles to sparks
- 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 3 in Standards index.

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

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

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

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

D. Compressed Gas Equipment

Standard precautions. Comply with precautions in this manual, and those detailed in CGA Standard P-1, PRECAUTIONS FOR SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, listed 6 in Standards index.

1. Pressure Regulators

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

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

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

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

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

2. Cylinders

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

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

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

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

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

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

Locate or secure cylinders so they cannot be knocked over.

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

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

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

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

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

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

Never refill any cylinder.

Cylinder fittings should never be modified or exchanged.

3. Hose

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

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

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

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

Coil excess hose to prevent kinks and tangles.

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

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

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

4. Proper Connections

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

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

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

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

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

5. Pressurizing Steps:

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

Stand to side of regulator while opening cylinder valve.

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

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

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

E. User Responsibilities

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

F. Leaving Equipment Unattended

Close gas supply at source and drain gas.

G. Rope Staging-Support

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

1-3. ARC WELDING

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

A. Burn Protection

Comply with precautions in 1-2.

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

1. Protective Clothing

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

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

2. Eye and Head Protection

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

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

Protect filter plate with a clear cover plate.

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

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

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

3. Protection of Nearby Personnel

Enclosed welding area. For production welding, a separate room or enclosed bay is best. In open areas, surround the

operation with low-reflective, non-combustible screens or panels. Allow for free air circulation, particularly at floor level.

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

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

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

B. Toxic Fume Prevention

Comply with precautions in 1-2B.

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

C. Fire and Explosion Prevention

Comply with precautions in 1-2C.

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

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

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

D. Compressed Gas Equipment

Comply with precautions in 1-2D.

E. Shock Prevention

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

To protect against shock:

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

1. Grounding the Equipment

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

Three-phase connection. Check phase requirement 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.

*Trademark of Proctor & Gamble.

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 Wire

Electrode wire becomes electrically HOT when the power switch of gas metal-arc welding equipment is ON and welding gun trigger is pressed. Keep hands and body clear of wire and other HOT parts.

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.

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, 2501 NW 7th St., Miami, Fla. 33125.
2. ANSI Standard Z87.1, SAFE PRACTICE FOR OCCUPATION AND EDUCATIONAL EYE AND FACE PROTECTION, obtainable from American National Standards Institute, 1430 Broadway, New York, N.Y. 10018.
3. American Welding Society Standard A6.0, WELDING AND CUTTING CONTAINERS WHICH HAVE HELD COMBUSTIBLES, obtainable same as item 1.
4. NFPA Standard 51, OXYGEN-FUEL GAS SYSTEMS FOR WELDING AND CUTTING, obtainable from the National Fire Protection Association, 470 Atlantic Avenue, Boston, Mass. 02210.
5. NFPA Standard 51B, CUTTING AND WELDING PROCESSES, obtainable same as item 4.
6. CGA Pamphlet P-1. SAFE HANDLING OF COMPRESSED GASES IN CYLINDERS, obtainable from the Compressed Gas Association, 500 Fifth Avenue, New York, N. Y. 10036.
7. OSHA Standard 29 CFR, Part 1910, Subpart Q, WELDING, CUTTING AND BRAZING.
8. Code for Safety in Welding and Cutting, CSA Standard W117.2.

SECTION 2 - INTRODUCTION

Output Rating At 100% Duty Cycle	Welding Range	Welding Current Ranges In Amperes		Open- Circuit Voltage	Power	Dimensions	(Approx.) Weight	
		Coarse Ranges	Fine Range				Net	Ship
225 Amperes At 25 Volts AC	45-225 Amperes AC	Min.-40 40-55 55-75 70-105	From Min. To Max. Of Each Coarse Range	80 Volts AC 72 Volts DC	1 kva, 115 volts, 8.7 amperes dc while welding 4.5 kva, 120/240 volts 38/19 amperes 60 Hz. ac (single phase) as power plant.	Height - 28-3/4 in. (730 mm) Width - 23-1/2 in. (597 mm) Length - 49-1/4 in. (1251 mm)	670 lbs. (304 kg)	708 lbs. (321 kg)
200 Amperes At 25 Volts DC	35-200 Amperes DC	90-135 115-165 140-Max.						

Figure 2-1. Specifications

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 safe and effective use of this equipment.

B. Safety

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

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

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

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

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

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

When requesting information concerning this equipment, it is essential that Model Description and Serial (or Style) Numbers of the equipment be supplied.

2-3. DESCRIPTION - This unit is a constant current ac/dc arc welding generator, driven by a one-cylinder Deutz diesel engine. It is designed to be used for the Shielded Metal-Arc Welding (SMAW) process.

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

SECTION 3 - INSTALLATION

3-1. LOCATION

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.

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 has not been equipped with a spark arrestor unless it was ordered as an optional accessory. 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.

IMPROPER LIFTING OF EQUIPMENT can result in personal injury and equipment damage.

- Use equipment of adequate capacity to lift the unit.
- If using lift forks to handle this unit, be sure the lift forks are long enough to extend out of the opposite side of the base.

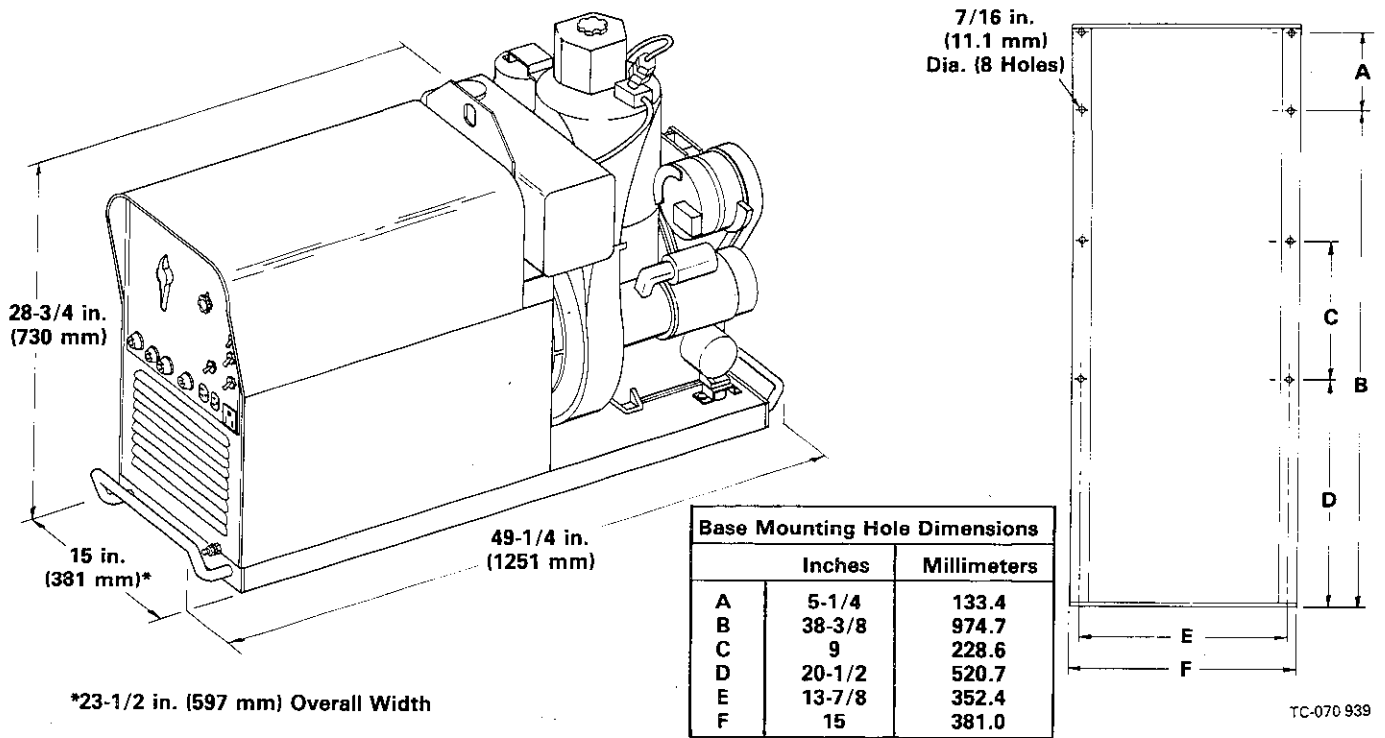


Figure 3-1. Dimensional Drawing And Base Mounting Hole Layout

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

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

- Operate unit in an approximately level position.
- See Figure 3-2 for maximum allowable tilt for proper operation.
- Check crankcase oil level with unit on a level surface.

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

- Maintain at least 18 inches (457 mm) of unrestricted space on all sides of the 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. **UNCONTROLLED TILTING OF TRAILER** can result in personal injury or equipment damage.

- Distribute weight so that trailer tongue weight is approximately 10% of the gross trailer weight.
- Follow trailer manufacturer's instructions when mounting welding generator onto trailer.

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

This welding generator is provided with a lifting eye for moving the unit and mounting holes in the base for securing the unit in a permanent location, or to a running gear, 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 cover and side panels for maintenance and repair functions.

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

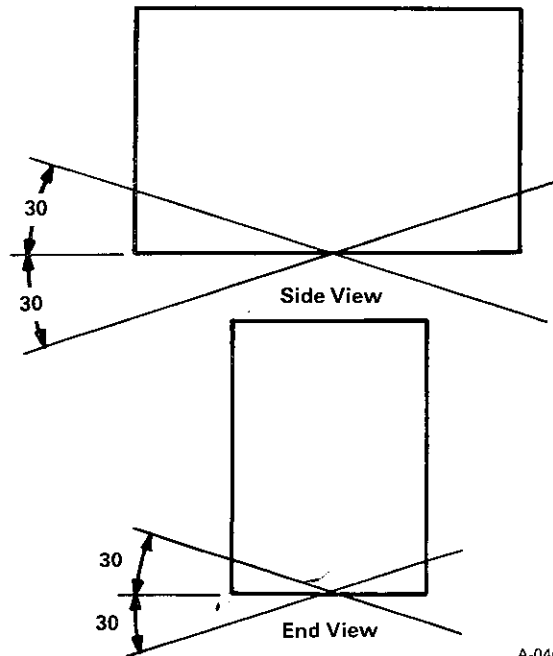


Figure 3-2. Allowable Tilt Angles

3-2. PREPARING NEW BATTERY FOR SERVICE - This unit may be equipped with a maintenance-free battery, a conventional wet charged battery, or a dry charged battery. Maintenance-free batteries do not have conventional vent caps since they do not require the addition of water during normal service. Once the battery type is determined, read the following **WARNING** and proceed to the appropriate section: A. Maintenance-Free Battery; B. Wet Charged Battery; C. Dry Charged Battery.

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

- *Wear correct eye and body protection 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.*

A. Maintenance-Free Battery

To place this battery in service connect the negative (-) battery cable to the negative battery terminal. No other preparation should be required.

B. Wet Charged Battery

Connect the negative (-) battery cable to the negative terminal on the battery. If the battery has enough power to start the engine, it will charge up while the engine is running. However, if the battery fails to supply enough power to crank the engine, the battery will require recharging.

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

- *Check the state of the electrolyte solution and allow battery to warm to 60°F (16°C) before charging if electrolyte is frozen or slushy.*

Remove the vent caps and refer to Section 3-2C, Steps 7-9 for charging instructions.

C. Dry Charged Battery

1. Obtain battery grade (1.265 specific gravity) electrolyte solution.
2. Remove battery from unit and place on a level work table or other suitable surface.
3. Remove vent caps.

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

- *Wear correct eye and body protection.*
- *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.*
- *Do not lean over battery when testing.*
- *Keep sparks, flames, cigarettes, and other ignition sources away from batteries.*
- *Use enough ventilation to keep battery gases from building up during activation.*

4. Fill battery cells to top of separators with electrolyte.
5. Allow battery to stand for 20 minutes.

6. Recheck electrolyte level and add if necessary to fill to top of separators.
7. 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 8. For each 10°F (6°C) increment below 80°F (27°C), 0.004 must be subtracted from the reading taken in Step 8.
8. 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).

WARNING: Follow the precautionary steps below in addition to those given in the previous WARNING statements.

- *Use enough ventilation to keep battery gases from building up during and for several hours after battery charging.*
 - *Turn battery charger off before making connection to battery.*
 - *Do not touch or move connections on battery while battery charger is on.*
 - *Do not lean over battery when charging.*
 - *Be sure battery charger connections to battery are clean and tight.*
 - *Keep vent caps in place and cover top of battery with damp cloth.*
 - *Be sure battery charger output matches battery voltage.*
9. If a corrected specific gravity reading of 1.260 at 80°F (27°C) is not obtained, replace the vent caps and recharge the battery following the battery charger manufacturer's instructions.

WARNING: BATTERY GASES can explode and shatter the battery.

- *Turn the battery charger off before disconnecting the charger from the battery.*

10. Recheck electrolyte level and add if necessary.

CAUTION: BATTERY ACID is corrosive to metals.

11. Thoroughly rinse with water and mutilate empty electrolyte containers before discarding.
12. Reinstall battery in welding generator.
13. Replace battery holddown and tighten securely. Do not overtighten.
14. Connect positive (+) battery cable to positive (+) battery terminal.
15. Connect negative (-) battery cable to negative (-) battery terminal.

3-3. FUEL (Figure 3-3)

WARNING: ENGINE FUEL can cause fire or explosion.

- Do not spill fuel; if spilled, wipe up.
- Do not fill fuel tank if engine is hot or running.
- Do not refuel near sparks or open flame.
- Do not smoke while refueling.
- Do not fill fuel tank completely; cold fuel will expand when subjected to heat causing overflowing and spillage.

USE OF GASOLINE will damage engine.

- Do not use gasoline to fuel a diesel engine.

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

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

IMPORTANT: Fill fuel tank with fresh fuel before starting engine the first time. Rust and corrosion preventative was added to inside of fuel tank and engine at the factory and could cause rough engine running if not properly diluted with a full tank of fresh fuel. If rough engine running is encountered, contact the nearest Deutz service representative.

Keep the fuel tank filled to ensure that the injector system receives an adequate supply of fuel. If the fuel tank is allowed to empty, air will enter the system causing starting problems (see Section 6-3 for procedures on air venting the fuel system).

Figure 3-3 illustrates typical fuel consumption under specific load conditions. Fuel consumption will vary from one engine to another. Different brands of fuel, operating conditions, condition of the engine, etc., will affect the fuel consumption of this engine.

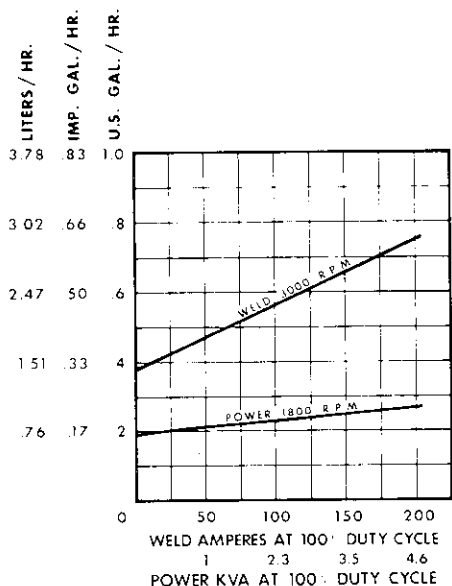


Figure 3-3. Fuel Consumption Chart

3-4. LUBRICATION (Figure 3-4) - The engine is shipped with its crankcase filled with SAE-20 break-in oil. If the oil level is not up to the full mark on the dipstick, add oil according to the recommendations in the Engine Manufacturer's Manual before starting the engine.

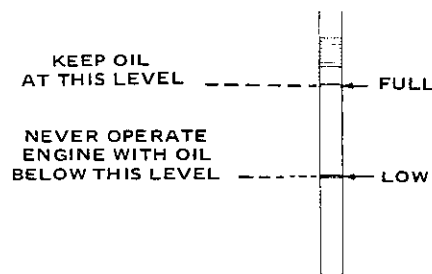


Figure 3-4. Oil Level Indicator

3-5. EQUIPMENT GROUNDING TERMINAL (Figure 4-1) - Normally engine-driven welding generators do not require grounding. However, this machine has auxiliary power plant capability; therefore, grounding of the frame and case is recommended. Also, unusual circumstances may require machine grounding. For these reasons a convenient grounding terminal is provided on all weld/power units.

For detailed grounding instructions consult your local or state codes or the latest issue of the National Electrical Code. If additional information regarding your particular 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.

3-6. WELD OUTPUT CONNECTIONS (Figure 4-1) - To obtain the full rated output from this unit, it is necessary to select, install, and maintain proper welding cables. Failure to comply in any of these areas may result in less than satisfactory welding performance.

A. Welding Cables

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

1. Keep cables as short as possible and place cables close together. Excessive cable length adds resistance which may reduce output or cause overloading of the unit.
2. Select adequate size welding cable for the anticipated maximum weld current. Use total length of welding cable in the circuit to determine cable size. For example: If the electrode holder cable is 75 feet (23 m) long and the work cable is 25 feet (8 m) long, select the size cable recommended in Table 3-1 for 100 ft (31 m).
3. Do not use damaged or frayed cables.

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- Install electrode holder to cable following manufacturer's instructions. An insulated electrode holder must be used to ensure operator safety.
- Install work clamp to cable.

Table 3-1. Welding Cable Size

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

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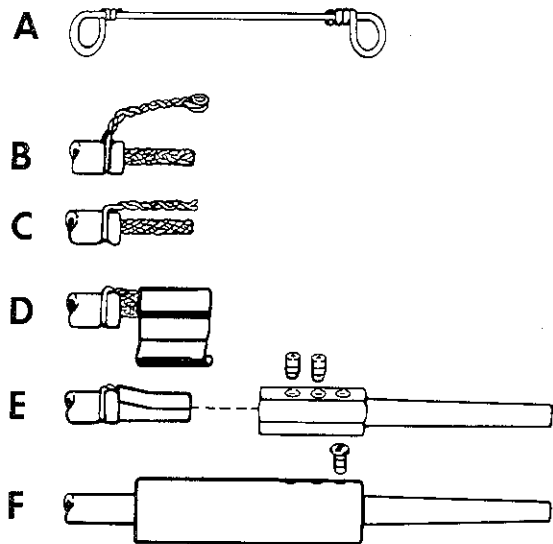
- NOTE:
- *A. 50 FEET OR LESS.
 - *B. CABLE SIZE IS BASED ON DIRECT CURRENT (DC), 100% DUTY CYCLE AND EITHER A 4 VOLTS OR LESS DROP OR A CURRENT DENSITY OF NOT OVER 300 CIRCULAR MILS PER AMP.
 - *C. WELD CABLE INSULATION WITH A VOLTAGE RATING TO WITHSTAND THE OPEN-CIRCUIT VOLTAGE (OCV) OF THE WELDING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

B. Jack Plug Installation

The supplied red jack plugs are to be connected to the weld cables in order to facilitate connection to the weld output receptacles. Connect the red jack plugs to the weld cable as follows:

- Remove 3/4 inch (19 mm) of insulation from one end of each welding cable.
- Clamp the welding cable in a vice with the uninsulated end protruding upward out of the vise approximately 1-3/4 inches (44 mm).
- Place the steel tie wire (see item A, Figure 3-5) approximately 1/4 inch (6 mm) from the end of the insulation.
- Make a half turn around the cable bringing the looped ends of the tie wire together.
- Insert a rod of approximately 3/8 inch (10 mm) diameter through the two looped ends of the wire.
- Twist the tie wire (B) until the entire tie wire is twisted and is tight around the insulation of the welding cable.
- Clip off the looped ends of the tie wire.
- Bend the twisted tie wire over and along the side (C) of the uninsulated portion of the welding cable.
- Wrap the strip of copper foil tightly around the uninsulated end of the welding cable and twisted tie wire (D).
- Place the jack plug on the end of the welding cable and push it onto the welding cable over the copper foil (D).

- Insert the 1/4-20 set screws into the center and bottom holes in the jack plug and tighten (E).
- Remove the welding cable from the vise and insert the jack plug into the insulating sleeve. Slide the insulating sleeve over the jack plug and welding cable until the hole in the insulating sleeve lines up with the remaining hole in the jack plug.
- Insert the 8-32 self tapping screw (F) through the hole in the insulating sleeve into the jack plug. Tighten the screw with a screw driver.



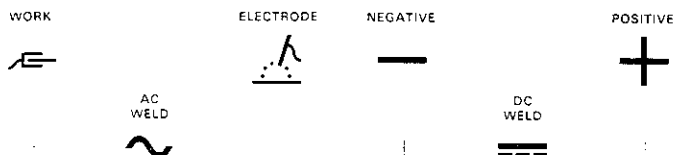
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Figure 3-5. Jack Plug Installation

C. Weld Output Receptacles (Figure 4-1)

WARNING: ELECTRIC SHOCK can kill; ARCING can burn skin or damage electrical connections.

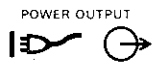
- Do not touch live electrical parts.
- Ensure that the unit is completely shut down before making any weld output connections.
- Do not change position of the welding cable jack plugs while welding.
- Be sure that jack plugs are secure in correct receptacles before welding.



The ELECTRODE and WORK AC WELD and the POSITIVE and NEGATIVE DC WELD output receptacles are located on the center portion of the front panel.

- Connect the weld cables to the appropriate weld output receptacles.
- Ensure that all connections are clean and tight.

3-7. AUXILIARY POWER



WARNING: ELECTRIC SHOCK can kill.

- Do not touch live electrical parts.
- Shut down the engine and disconnect negative (-) battery cable from battery before making internal connections.
- Do not connect to any electrical distribution system normally supplied by utility power unless a proper transfer switch and grounding procedure are employed.

ELECTRIC SPARKS can cause fire.

- Isolate the electrode and work cables from each other and from any conductive surface when not welding.

The weld output terminals are electrically energized whenever the engine is running.

LOW VOLTAGE AND FREQUENCY can damage electrical equipment.

- Turn off or unplug all electrical equipment connected to the 120V 30A AC receptacle, before starting or stopping the engine.

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

A. 115 Volts DC Receptacle (Figure 4-1)



The two-pole, three-wire receptacle provides 8.7 amperes of 115 volts dc power while welding. The engine must be operating at weld rpm to obtain the full rated output from this receptacle. Ensure that the Automatic Idle Control switch is in the CONT. RPM position when using 115 volts dc power.

B. 120 Volts AC Receptacle (Figure 4-1 & 3-6)



Up to 4.5 kva of 120 volts ac, 38 amperes, 60 Hz. (3 kva if the unit is a 50 Hz. model) power is available at this duplex receptacle; however, the power supplied is dependent on the amount of power being used from the 120/240 Volts AC terminal strip. In all cases, total ac auxiliary power output cannot exceed unit rating 4.5 kva. Whenever this receptacle is used, the engine must be operating at power rpm and the Weld Power switch must be in the POWER position.

Figure 3-6. AC Power Curves

C. 120/240 Volts AC Terminal Strip (Figures 3-7 & 3-8)

This welding generator is equipped with a four-pole terminal strip 1T located behind the right side panel. The terminal strip serves as a connection point when auxiliary power is needed. Because this unit has power plant capability, grounding of the generator frame and case may be required. See Section 3-5 for specific information on grounding this unit.

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

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

1. Remove the right side panel.
2. Insert leads through the strain relief provided on the generator rear panel. Route the leads over to terminal strip 1T. See Figure 3-7.

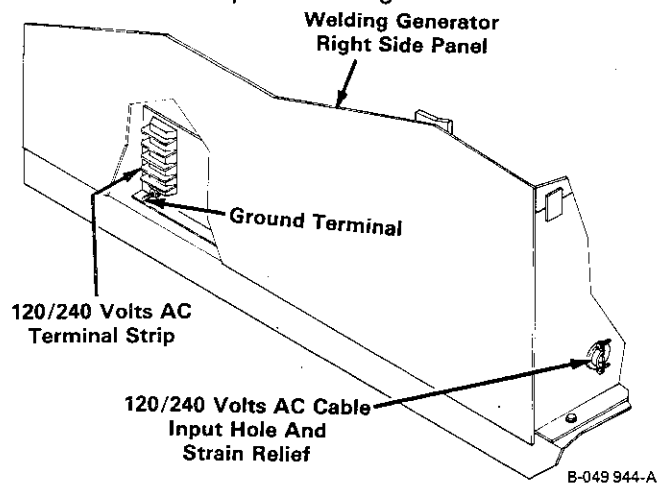


Figure 3-7. Location of 120/240 Volts Terminal Strip

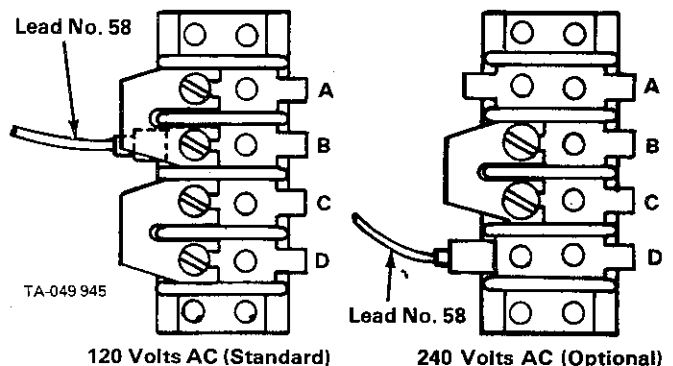


Figure 3-8. Jumper Link Arrangement 120/240 Volts AC Terminal Strip

NOTE: This unit is shipped with the jumper links on terminal strip 1T positioned for 120 volts (see Figure 3-8). (If the unit is equipped with an optional 240 volts ac receptacle, the jumper links will be positioned for 240 volts).

A total of 4.5 kva of 120 volts, 38 amperes, 60 Hz. ac auxiliary power (3.0 kva if the unit is a 50 Hz. model) is

available from this unit. When the unit is linked for 120 volts, full kva is available at either half of the 120V 30A AC receptacle or from terminal strip 1T.

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

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

3. For 120 volts ac auxiliary power:

- a. Connect one lead to terminal A or B on terminal strip 1T.
- b. Connect remaining lead to terminal C or D on terminal strip 1T.
- c. Ensure that the jumper links on terminal strip 1T are positioned for 120 volts ac (see Figure 3-8).
- d. If the circuit must be grounded, connect a ground lead to the ground terminal below terminal strip 1T.
- e. Tighten strain relief on generator rear panel.
- f. Install right side panel and resume operation.

For 240 volts ac auxiliary power:

- a. Remove and retain the jumper links from terminal strip 1T.
- b. Move lead No. 58 from terminal B to terminal D on the same side of terminal strip 1T.
- c. Position the jumper links on 1T for 240 volts ac (see Figure 3-8).
- d. Connect line leads to terminals A and D on terminal strip 1T.
- e. If the circuit must be grounded, connect a ground lead to the ground terminal below terminal strip 1T.
- f. Tighten strain relief on generator rear panel.
- g. Install right side panel and resume operation.

For 120/240 volts ac auxiliary power:

- a. Remove and retain the jumper links from terminal strip 1T.
- b. Move lead No. 58 from terminal B to terminal D on the same side of terminal strip 1T.

- c. Position the jumper links on 1T for 240 volts ac (see Figure 3-8).
- d. Connect line leads to terminals A and D on terminal strip 1T.
- e. Connect neutral lead to terminal B on terminal strip 1T.
- f. If the power supply neutral must be grounded, connect a ground lead from terminal C on terminal strip 1T to the ground terminal below terminal strip 1T.
- g. If the circuit must be grounded, connect a ground lead to the ground terminal below terminal strip 1T.
- h. Tighten strain relief on generator rear panel.
- i. Install right side panel and resume operation.

D. 240 Volts AC Receptacle (Optional) (Figure 3-6)

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

E. Field Installation Instructions For 240 Volts AC Reconnection

The 120/240 Volts AC terminal strip (see Figure 3-7) provides reconnection capability for 240 volts ac. Although the capability for 240 volts ac is present, an optional kit must be purchased if 240 volts is desired at the front panel. For the 240 volts ac auxiliary power output of the unit, see Section 3-7D.

WARNING: ELECTRIC SHOCK can kill.

- *Shut down the engine and disconnect negative (-) battery cable from battery before making internal inspection or reconnection.*

1. Remove right side panel.
2. Remove 120 VOLTS AC duplex receptacle RC2 located on the front panel. Remove leads and allow them to hang free.
3. Connect leads No. 56 and 58 removed from RC2 to the 240 volts ac duplex receptacle (one on each side of receptacle). Connect lead No. 33 to the ground terminal on the receptacle.
4. Install the 240 volts ac duplex receptacle in the front panel.

5. Affix supplied 240 VOLTS AC label over existing 120 VOLTS AC designation for duplex receptacle on nameplate.
6. Locate terminal strip 1T on the right side of the welding generator (see Figure 3-7). Disconnect two leads No. 57 from terminal strip 1T. Tape up terminals on both leads No. 57 and tie leads into wiring harness.
7. Remove and retain the jumper links from terminal strip 1T.
8. Move lead No. 58 from terminal B to terminal D on the same side of terminal strip 1T.
9. Position the jumper links on 1T for 240 volts ac (see Figure 3-8).
10. Install right side panel and resume operation.

SECTION 4 - FUNCTION OF GENERATOR CONTROLS

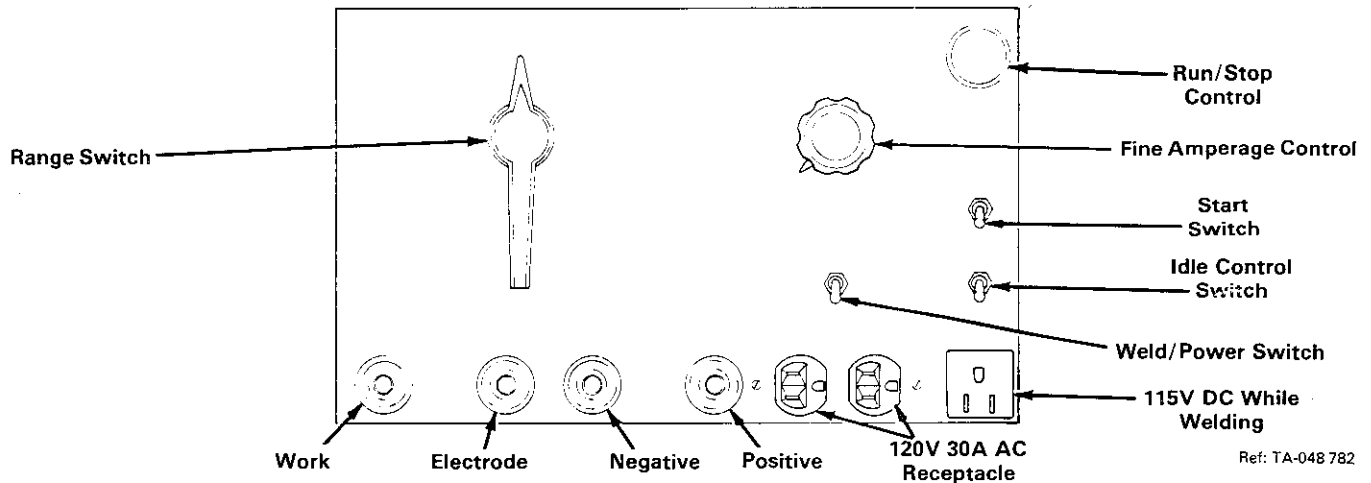


Figure 4-1. Front Panel Controls

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



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

CAUTION: ARCING can damage switch contacts.



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

Arcing causes the contacts to become pitted and eventually inoperative.

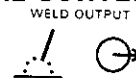
4-2. FINE AMPERAGE CONTROL (Figure 4-1)



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

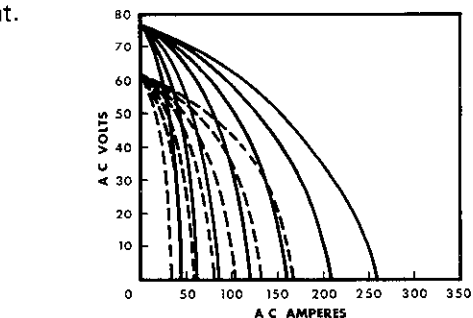
IMPORTANT: The FINE AMPERAGE control can be adjusted while welding. However the FINE AMPERAGE control must be set at 100 to obtain the full rated output from the 120V 30A AC receptacle when the welding generator is used to supply ac auxiliary power.

4-3. VOLT-AMPERE CURVES (Figure 4-2)

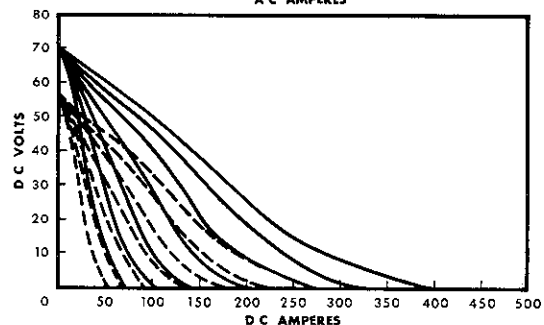


The volt-ampere curves show the voltage and amperage output capabilities of the welding generator at min. and max. of each coarse range. Voltage and amperage adjustment within each range is provided by the FINE ADJUSTMENT control.

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



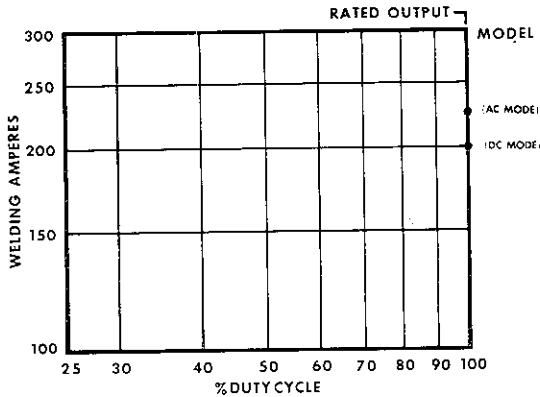
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B-047 089

Figure 4-2. Volt-Ampere Curves

4-4. DUTY CYCLE (Figure 4-3) – The duty cycle of the welding generator is the percentage of a ten minute period that a welding generator can safely be operated at a given output current setting. This welding generator is rated at 100 percent duty cycle. This means that this unit can be safely operated at rated load continuously. This unit, however, does not offer output in excess of its rating if the duty cycle is decreased.



B-052 960-A

Figure 4-3. Duty Cycle Chart

CAUTION: EXCEEDING DUTY CYCLE RATINGS will damage the welding generator.

- Do not exceed duty cycles indicated on duty cycle chart.

4-5. WELD/POWER SWITCH (Figure 4-1)



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

4-6. RUN/STOP CONTROL (Figure 4-1)



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

4-7. START SWITCH (Figure 4-1)



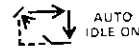
The Starter switch is a spring-loaded toggle switch. Placing the switch in the START position will engage the starter. The switch must be released as soon as the engine has started to prevent damage to the starter.

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

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

4-8. AUTOMATIC IDLE CONTROL SWITCH (Figure 4-1) – The automatic idling device reduces fuel consumption during welding operation by allowing the engine to idle when the generator is not loaded. The Automatic Idle Control switch controls the operation of the device.

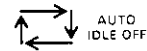
A. Auto Idle On Position



When the Automatic Idle control switch is in the AUTO IDLE ON position the engine will remain at idle rpm 1860 ± 100 for 60 Hz. Models; (1650 ± 100 for 50 Hz. Models) until an arc is struck. When an arc is struck, the engine speed will increase to weld rpm (3000). Approximately 15 seconds after the arc is broken, the engine will return to idle rpm. This time delay is nonadjustable.

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

B. Auto Idle Off



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

4 - 9. OIL PRESSURE SWITCH – This unit is equipped with an oil pressure switch which automatically disconnects the battery from the excitation and idle control circuitry when the engine shuts down.

4-10. HOUR METER (Optional) – This unit can be equipped with an hour meter. The meter, labeled TOTAL HOURS, registers the total hours of engine operation. This information is useful for routine maintenance on the engine.

SECTION 5 - SEQUENCE OF OPERATION

WARNING: MOVING PARTS can cause serious injury; IMPROPER AIR FLOW can result in damage to internal parts; EXPOSURE TO WEATHER can shorten the life of internal components.

- Keep all covers and panels in place while operating.
- Keep clear of moving parts.

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

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

- Wear correct eye, ear, and body protection.

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

5-1. SHIELDED METAL-ARC WELDING (SMAW)

1. Ensure that the unit has been installed and prepared as instructed in Section 3.
2. Rotate the Range switch to the desired position (see Section 4-1).
3. Rotate the FINE AMPERAGE control to the desired setting (see Section 4-3).
4. Place the Weld/Power switch in the WELD position.
5. Connect the work clamp to the object to be welded. Place the desired electrode into the electrode holder.
6. Start the engine as instructed in Section 5-3.
7. Connect desired accessory equipment to the 115V DC receptacle (see Section 3-7A). Ensure that all ac auxiliary equipment is turned off or disconnected.
8. Place the Automatic Idle Control switch in the desired position.
9. Commence welding.

5-2. POWER PLANT OPERATION

1. Ensure that the unit has been installed and prepared as instructed in Section 3.

WARNING: Follow the precautionary steps given in the WARNING at the beginning of Section 3-7.

2. Make connections to the 120V 30A AC receptacle (see Section 3-7B) and/or the 120/240 Volts AC terminal strip (see Section 3-7C).
3. Place the Weld/Power switch in the POWER position.
4. Rotate the FINE AMPERAGE control to 100.
5. Start the engine as instructed in Section 5-3.
6. Turn on auxiliary equipment when the engine has come up to proper speed.

5-3. STARTING THE ENGINE

1. Push the RUN/STOP fully in to the RUN position.
2. Place the Automatic Idle Control switch in the AUTO IDLE position.
3. Place the Starter switch in the START position (see Section 4-7).
4. As soon as the engine starts, release the Starter switch and allow the engine to run for a few minutes before applying a load. This is necessary to enable the engine to properly warm up and ensure proper lubrication.

5-4. STOPPING THE ENGINE

1. Remove all weld and power loads from the unit.
2. Place the Automatic Idle Control switch in the AUTO IDLE position.
3. Operate the engine at idle speed for 2 minutes to allow internal engine temperature to equalize.
4. Pull the RUN/STOP control fully out to the STOP position. After the engine has stopped, return the RUN/STOP control to the RUN position.

SECTION 6 - MAINTENANCE

WARNING: HOT ENGINE PARTS can cause severe burns.

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

MOVING PARTS can cause serious injury.

- Keep clear of moving parts.
- Shut down the engine and disconnect negative (-) battery cable from battery before internally inspecting or servicing.

6-1. GENERAL - The service life of this welding generator can be prolonged and operating efficiency maintained under normal conditions by following the routine service and workshop maintenance procedures outlined in this section and in the Engine Manufacturer's Manual (F1L 210D Engine). Where operating conditions are severe, more frequent attention must be given to all routine service categories;

however a special effort must be made to maintain clean internal and external engine surfaces.

6-2. PERIODIC CLEANING AND INSPECTION – A schedule for cleaning and inspection should be set up, based on the type and conditions of service, to include the following:

Keep the inside of the unit clean by blowing out the unit with clean, dry compressed air.

Wipe oil and fuel spills from engine immediately to avoid accumulation of dust.

Check for fluid leaks indicating loose oil or fuel connections. Tighten loose connections and clean oil or fuel spills or leaks off of engine surfaces.

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

6-3. AIR VENTING THE FUEL SYSTEM

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

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

6-4. AIR CLEANER SERVICE (Figure 6-1) – The air cleaner is one of the most important parts of the engine from the standpoint of engine life. An engine consumes several thousand cubic feet of air per hour when operating. If dirty air gets into the engine, it can wear out a set of piston rings within a few operating hours. See the Engine Manufacturer's Manual for air cleaner maintenance intervals and service procedures.

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.*

6-5. ELECTRICAL SYSTEM

A. Cables And Wiring

Check interconnecting wiring and connections for tightness and flaws. Ensure 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: **BATTERY ACID** can burn eyes and skin and destroy clothing and other materials.

- *Wear correct eye and body protection.*

Periodically inspect the battery for loose connections, defective cables, corrosion, cracked case or cover, loose holdowns, and loose or deformed terminal posts.

On units equipped with conventional wet or dry charged batteries with removable vent caps check the electrolyte level frequently. Add clean, mineral-free or distilled water to bring the electrolyte in each cell up to the level indicator.

6-6. IDLE CONTROL CIRCUIT PROTECTION – The idle control printed circuit board and the throttle solenoid are protected by an automatic reset circuit breaker located on the printed circuit board mounting panel on the right side of the engine. If the circuit breaker opens, engine speed drops to idle rpm.

6-7. SPARK ARRESTOR (Optional) – Internal combustion engines operating in a highly combustible environment are a common fire hazard. Glowing carbon particles blown out with the exhaust can retain sufficient heat to ignite materials. While no practical spark arresting device will stop all sparks, this device will minimize fire hazards by removing and trapping most solid particles provided that it is properly maintained.

The carbon trap should be serviced weekly or every 50 operating hours, whichever occurs first. The entire spark arrestor should be inspected every 1000 operating hours or three times per season.

A. Inspection

1. Visually examine the outside of the device for holes, cracks, or metal corrosion.
2. With the engine stopped, look inside the spark arrestor outlet tube with a flashlight or other light source. Visually examine the vanes and the outlet tube for metal or weld failure. The vanes must be firmly attached to the inlet tube and the outlet tube must be completely intact (this is an important factor in maintaining spark arresting efficiency).

3. Check the mounting clamp to ensure that the spark arrestor is securely mounted. Replace the spark arrestor if inspection reveals any signs of failure.

B. Servicing The Carbon Trap

CAUTION: Service the device in an area where there is no danger from flying sparks or hot carbon particles.

1. Stop the engine and allow the exhaust system to cool.
2. Remove the cleanout plug from the bottom of the spark arrestor with a wrench. 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. Replace and secure the cleanout plug.

6-8. COLLECTOR RING BRUSHES - The brushes should be inspected periodically to ensure their proper function. The brush life is very good under normal conditions. If the generator has been operating in an extremely dusty or dirty location, a close check of the brushes for freedom of movement and cleanliness should be made weekly. Under normal use the slip rings will discolor to a dark brown. If it should become necessary to clean the slip rings, use a 3/0 or finer sandpaper followed by a crocus cloth. Never use emery cloth as part of the emery will embed itself into the collector rings and in turn destroy the carbon brushes.

6-9. GOVERNOR - The governor has been set at the factory and should not require further adjustment. If the governor works loose or is disconnected, adjustments should be made by a authorized diesel service station.

If one of the springs attached to the governor arm works loose or is disconnected, reattach the spring exactly as illustrated in Figure 6-1.

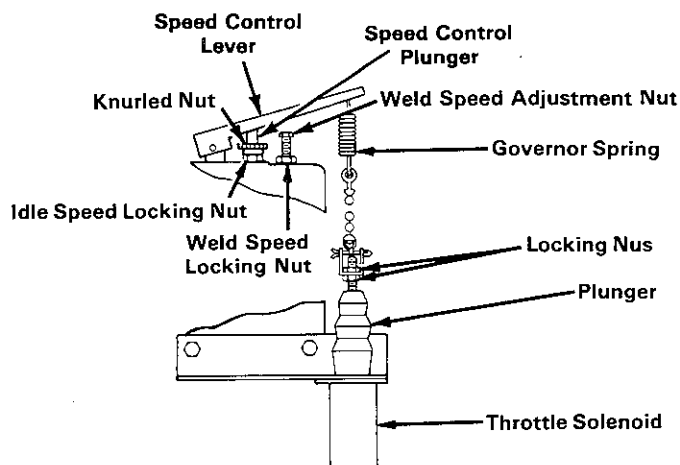


Figure 6-1. Engine Speed Adjustments

6-10. ENGINE SPEED ADJUSTMENTS (Figure 6-2)

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

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

A. Idle Speed Adjustment

1. Start the engine as outlined in Section 5-3.
2. Place the Weld Power switch in the POWER position.
3. Rotate the FINE AMPERAGE control to 100.
4. Ensure that the speed control lever does not contact the speed control plunger during the following adjustment:

Loosen the idle speed locking nut. With the plunger bottomed in the solenoid, rotate the knurled adjustment nut until 1860 rpm, is obtained. Tighten the locking nut.

B. Weld Speed Adjustment

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

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SECTION 7 - TROUBLESHOOTING

7-1. GENERAL - It is assumed that proper installation has been made, according to Section 3 of this manual, and that the welding generator has been functioning properly until this trouble developed.

7-2. TROUBLESHOOTING CHART

WARNING: ELECTRIC SHOCK can kill.

- *Do not touch live electrical parts.*
- *Shut down the engine and disconnect negative (-) battery cable from battery before internally inspecting or servicing.*

MOVING PARTS can cause severe injury.

- *Keep clear of moving parts.*

HOT ENGINE PARTS can cause severe burns.

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

Troubleshooting of internal parts to be performed only by qualified persons.

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

TROUBLE	PROBABLE CAUSE	REMEDY
Engine fails to start.	Battery.	Units With Conventional Batteries: Inspect the electrical system (see Section 6-5). If the battery requires recharging (see Section 3-2C, Steps 7-10) follow all applicable safety procedures and the battery charger manufacturer's instructions. Never use a battery charger without these instructions. If the battery does not recharge, replace the battery.
		Units With Maintenance-Free Batteries: Inspect the electrical system (see Section 6-5). If the trouble is isolated to the battery, replace the battery.
Battery discharges between uses.	Jump start the engine employing approved safety practices and booster jump starting instructions provided in Section 7-3.	
	Build-up of acid on top of battery (white-grayish substance).	Clean battery with soda solution; rinse with clear water.
	Infrequent use (units with conventional batteries only).	Periodically recharge battery (approximately every 3 months).
	Defective battery.	Replace battery.
	Defective oil pressure switch.	Replace oil pressure switch.

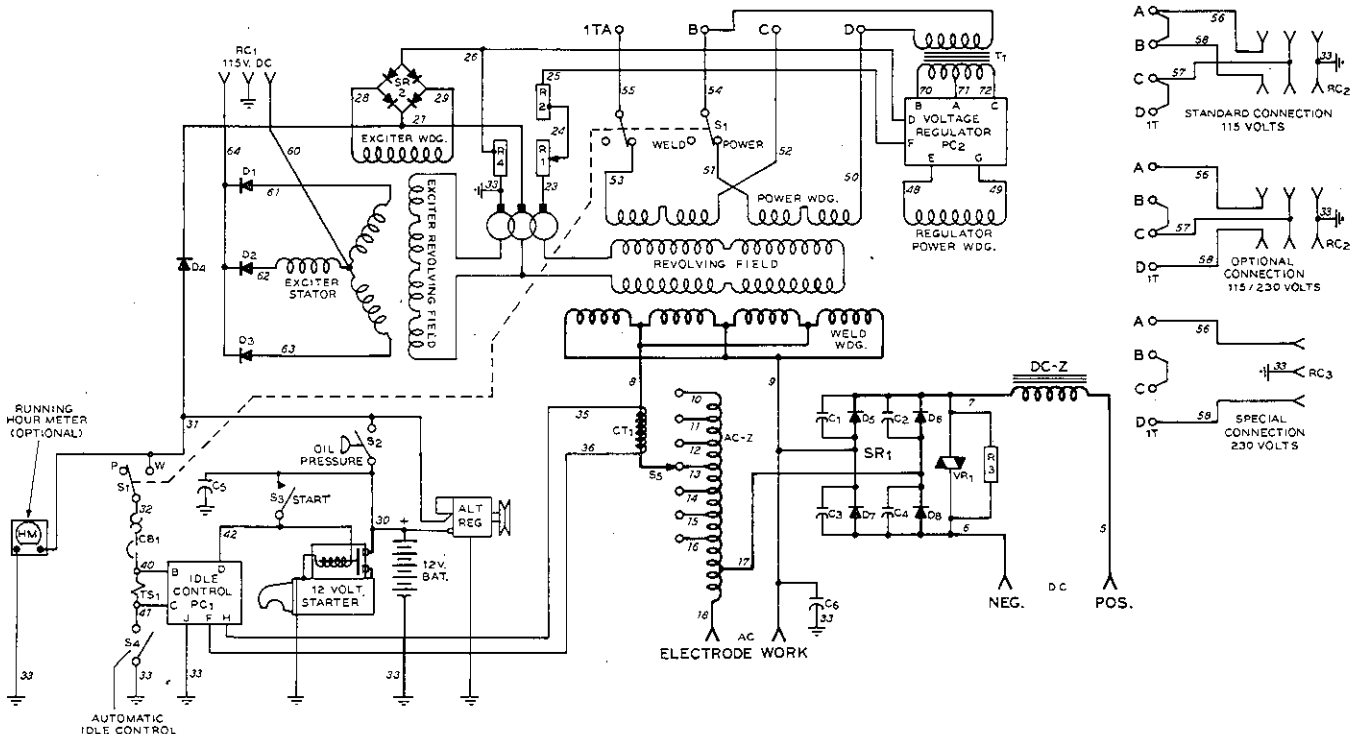
TROUBLE	PROBABLE CAUSE	REMEDY
No power output at power receptacles.	Weld/Power switch S1 in WELD position.	Place Weld/Power switch S1 in POWER position.
Low power output at power receptacles.	Low setting on FINE AMPERAGE control R1.	Rotate FINE AMPERAGE control R1 to 100.
	Engine running below required speed (1860 rpm).	Check air filter; clean if necessary.
		Adjust engine speed (see Section 6-6).
	Voltage Regulator board PC2 defective.	Replace PC2.
Transformer T1 defective.	Replace T1.	
Low weld output.	Engine running below required speed (3000 rpm).	Check air filter; clean if necessary.
		Fill fuel tank.
		Adjust engine speed (see Section 6-6).
Erratic weld output.	Damp, defective, or wrong type electrodes.	Try different electrodes.
	Improper connection to workpiece.	Check and tighten loose connections.
Erratic weld and power output.	Dirty slip rings and/or worn brushes.	Clean slip rings and/or replace worn brushes (see Section 6-7).
High power voltage.	Voltage Regulator board PC2 defective.	Replace PC2.
High weld voltage.	Voltage Regulator board PC2 defective.	Disconnect lead No. 48 from Voltage Regulator board PC2. If voltage drops to 80 volts ac, replace Voltage Regulator board PC2.

7-3. BOOSTER BATTERY JUMP STARTING - If jump starting is attempted, employ the safety precautions below and the following 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.

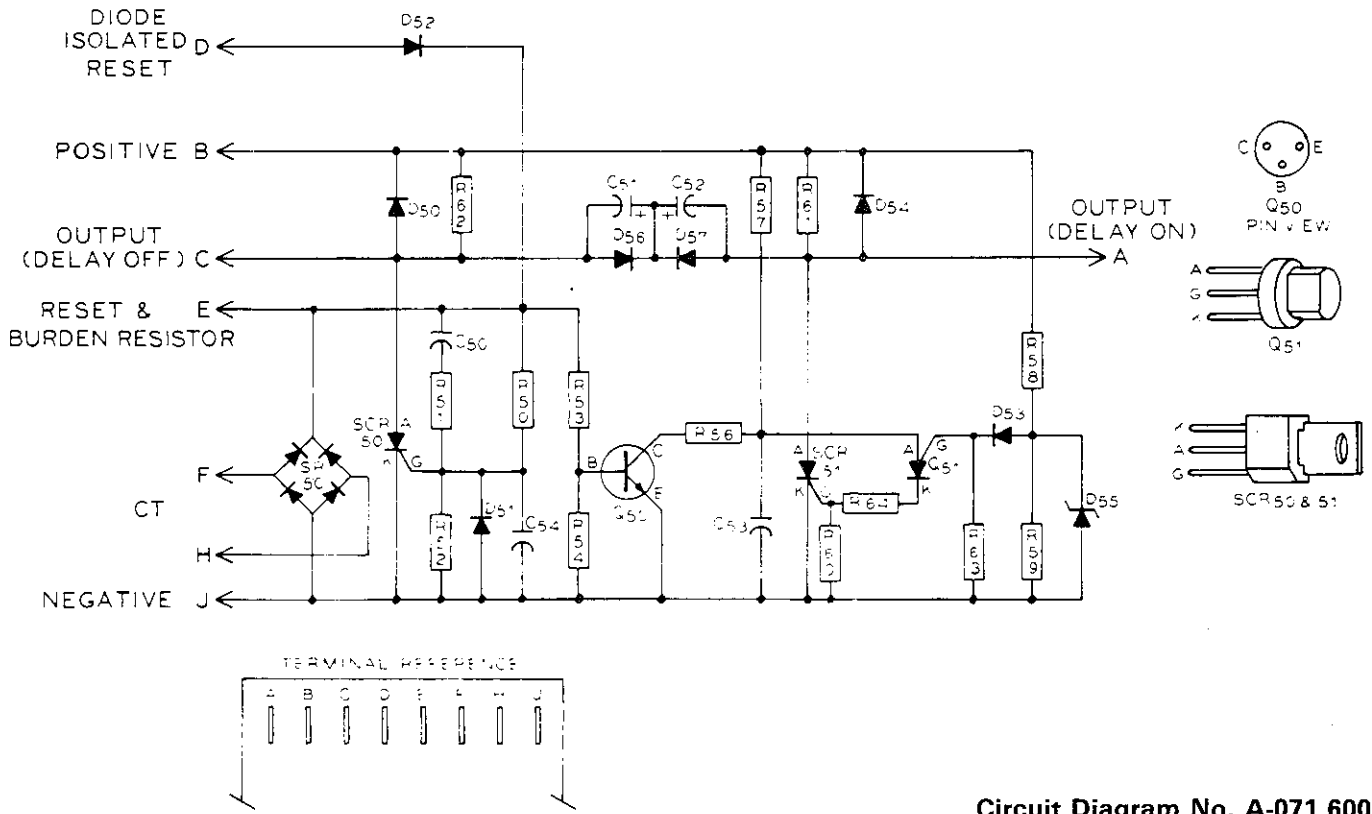
- *Keep sparks, flames, cigarettes, and other ignition sources away from batteries.*
- *Ensure that all personnel are a safe distance from batteries while starting.*
- *Do not jump start a frozen or completely discharged battery.*
- *Do not jump start a battery which has loose terminals or one having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

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 (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 5 (Sequence Of Operation) of this manual and allow engine to return to idle speed.
7. Remove jumper cable from engine block.
8. Remove other end of same cable from booster battery negative (-) terminal.
9. Remove other jumper cable from welding generator battery positive (+) terminal.
10. Remove remaining end of cable from booster battery positive (+) terminal.
11. Discard damp cloth.



Circuit Diagram No. B-070 461

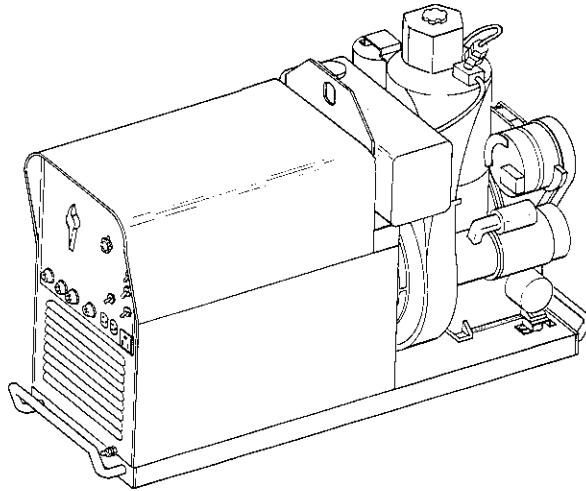
Figure 7-1. Circuit Diagram For Welding Generator



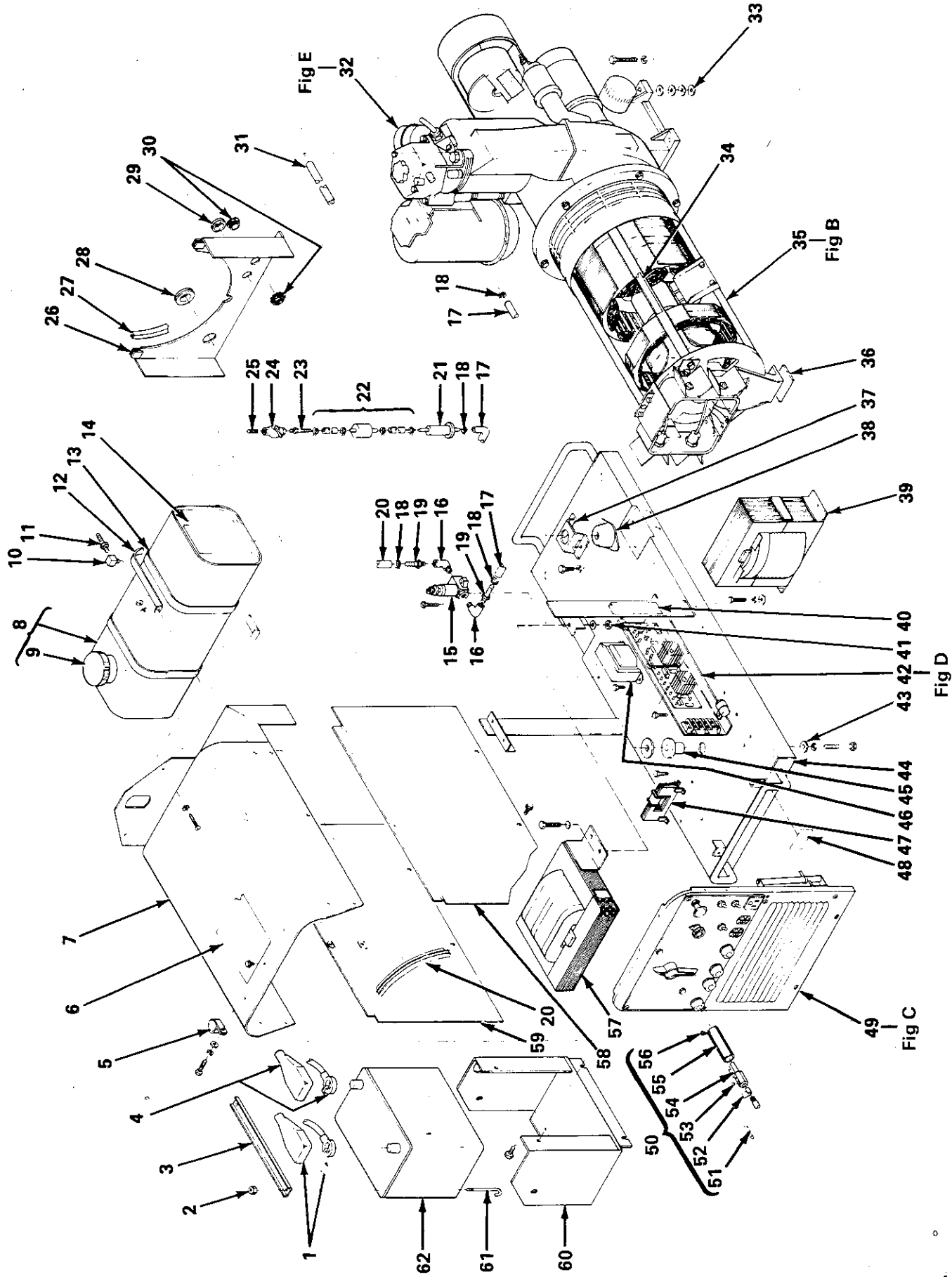
Circuit Diagram No. A-071 600

Figure 7-2. Circuit Diagram For Automatic Idle Control Circuit Board

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



PARTS LIST



TD-070 945-A

Figure A - Main Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
Figure A Main Assembly				
1		082 316	CABLE, battery - positive	1
2		604 318	NUT, self-locking hex 1/4-20	3
3		070 213	HOLD DOWN, battery	1
4		082 317	CABLE, battery - negative	1
5		032 878	CLAMP, 9/16 dia x 13/32 hole	1
6		046 392	LABEL, general precautionary	1
7		+035 141	COVER, top	1
8		+071 944	TANK, fuel (consisting of)	1
9		015 603	. CAP, tank - fuel	1
10		020 185	FITTING, pipe - elbow street 1/8 NPT	1
11		073 432	FITTING, barbed male 3/16 TBG x 1/8 NPT	1
12		014 951	STRAP, mounting - fuel tank	2
13		603 120	STRIP, felt	2
14		071 823	LABEL, engine maintenance	1
15		082 968	PUMP, fuel - hand primer	1
		062 234	CONNECTION, banjo	1
16		010 678	FITTING, pipe - brass elbow st 1/4 NPT L	2
17		070 917	HOSE, No. 1 x 1/4 ID x 12-1/2	1
18		010 865	CLAMP, hose .406 - 7/16 dia	1
19		604 308	FITTING, brass - barbed M 1/4 TBG x 1/4 NPT	2
20		070 919	HOSE, No. 1 x 1/4 ID x 19	1
21		070 819	FILTER, fuel - in line	1
22		047 420	FILTER, fuel - in line 1/4 w/hoses & clamps	1
23		604 313	FITTING, barbed - M 1/4 TBG x 1/8 NPT	1
24		010 868	FITTING, pipe - brass drain cock F 1/8 NPT	1
25		602 898	FITTING, pipe - nipple close 1/8 NPT	1
26		035 471	BAFFLE, air	1
27		603 124	STRIP, rubber (order by ft)	4 ft
28		603 097	GROMMET, rubber 27/32 x 1-1/4 mtg hole	1
29		015 712	GROMMET, rubber 5/8 ID x 7/8 mtg hole	1
30		010 610	CONNECTOR, clamp - cable 1/2 inch	1
31		604 550	HOSE, neoprene No. 1 (order by ft)	1 ft
32		070 961	ENGINE, diesel - electric (Fig E Pg 10)	1
33		010 954	WASHER, flat 13/32 ID x 1-1/4 OD x 1/8	9
34		013 367	LABEL, caution - compression release	1
35		Figure B	GENERATOR ASSEMBLY (Pg 4)	1
36		017 836	SPACER, steel	1
37		070 218	RETAINER, engine - mount	2
38		070 717	MOUNT, engine	2
39	AC-Z	049 466	REACTOR	1
40		047 491	LABEL, 120/240 volts	1
41		605 181	NUT, self-locking - hex 3/8-16	5
42		Figure D	BRACKET, mounting - w/components (Pg 7)	1
43		010 955	WASHER, flat 13/32 ID x 2 OD x 1/8	1
44		070 210	BASE	1
45		009 235	MOUNT	1
46	T1	049 712	TRANSFORMER, control	1
47	CT1	080 870	TRANSFORMER, control - idle	1
48		027 698	LABEL, equipment ground	1
49		Figure C	PANEL, front - w/components (Pg 6)	1
50		039 608	PLUG, jack - red (consisting of)	2
51		010 521	. WIRE, tie	1
52		019 833	. STRIP, copper 0.01 x 2-1/2 x 3/4	1
53		602 178	. SCREW, socket hd 1/4-20 x 3/8	2
54		101 219	. PLUG, jack	1
55		602 814	. INSULATION, jack plug - red	1
56		602 160	. SCREW, self-tapping fillister hd 8-32 x 1/4	1
57	DC-Z	035 429	STABILIZER	1
58		035 135	PANEL, side - right hand	1
59		035 136	PANEL, side - left hand	1

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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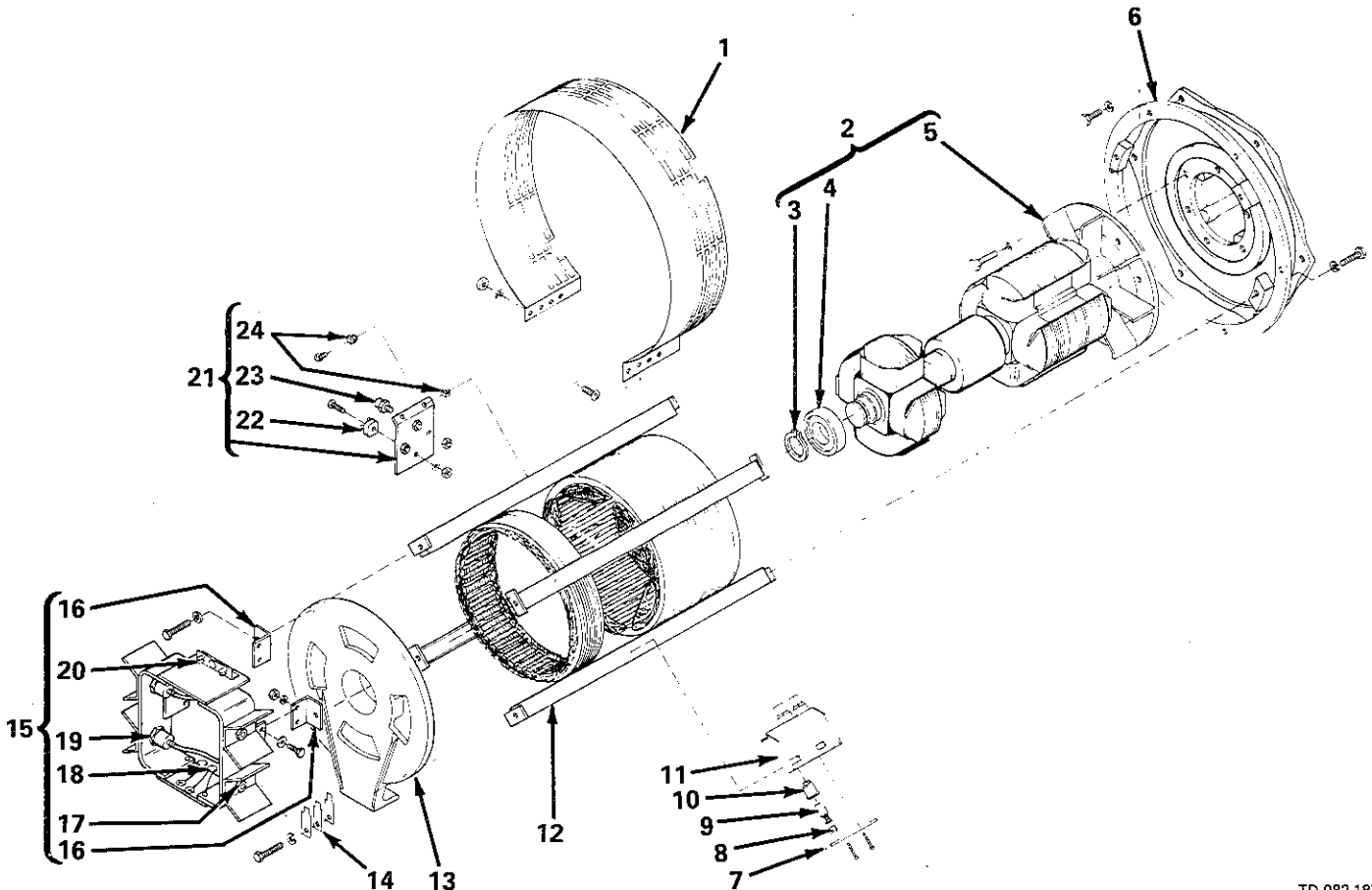
Figure A Main Assembly (Cont'd)

60		070 211	SHELF, battery	1
61		070 010	BOLT, J 1/4-20 x 2-5/16	2
62		071 678	BATTERY, 12 volt 74 amp	1

Parts For Optional Equipment

HM		032 936	METER, hour 4-40 volts dc	1
RC2		604 103	RECEPTACLE, straight - duplex grounded 2P3W 15 amp 250 volts	1
		025 234	CAP, straight - grounded 2P3W 15 amp 250 volts	1
		048 901	SPARK ARRESTOR, exhaust	1
		061 864	GASKET, exhaust	1
		041 057	FA-2 Flame Arrestor Fuel Cap	1

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



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Figure B - Generator Assembly

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure B Generator Assembly (Fig A Pg 2 Item 35)

1		072 859	GUARD, fan	1
2		**070 212	ROTOR, generator (consisting of)	1
3		024 617	. RING, retaining	1
4		053 390	. BEARING	1
5		006 307	. FAN	1
		026 206	. KEY, 1/4 x 1/4 x 1-3/4	1
6		006 298	ADAPTER, engine	1
7		047 878	BAR, retaining - brush holder	1
8		047 885	CAP, holder - brush	3
9		*049 125	BRUSH, w/spring	3
10		005 614	HOLDER, brush w/tabs	3
11		007 250	BRACKET, mounting - brush holder	1
12		**+070 209	STATOR (60 Hz) or	1
12		**+070 208	STATOR (50 Hz)	1
13		020 908	ENDBELL	1
14		010 222	CONNECTOR, rectifier - cell	3
15	SR1	045 032	RECTIFIER, silicon diode (consisting of)	1
16		035 410	. ANGLE, mounting - rectifier	2
17		037 305	. DIODE, rectifier 150 amp 300 volts straight polarity	2
18		031 689	. CAPACITOR, ceramic 0.01 uf 500 volts dc	4
19		037 306	. DIODE, rectifier 150 amp 300 volts reverse polarity	2
20		046 819	. SUPPRESSOR, rectifier	1
21		039 123	RECTIFIER, silicon diode (consisting of)	1
22	SR2	035 704	. RECTIFIER, integrated 30 amp 600 volts	1
23	D1-3	037 572	. DIODE, rectifier 50 amp 400 volts straight polarity	3
24		020 847	. WASHER, nylon - shoulder 5/16 ID x 7/8 OD x 1/16	4

*Recommended Spare Parts.

**Rotor and Stator are available on an exchange basis. Contact Factory Service Department for details.

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

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

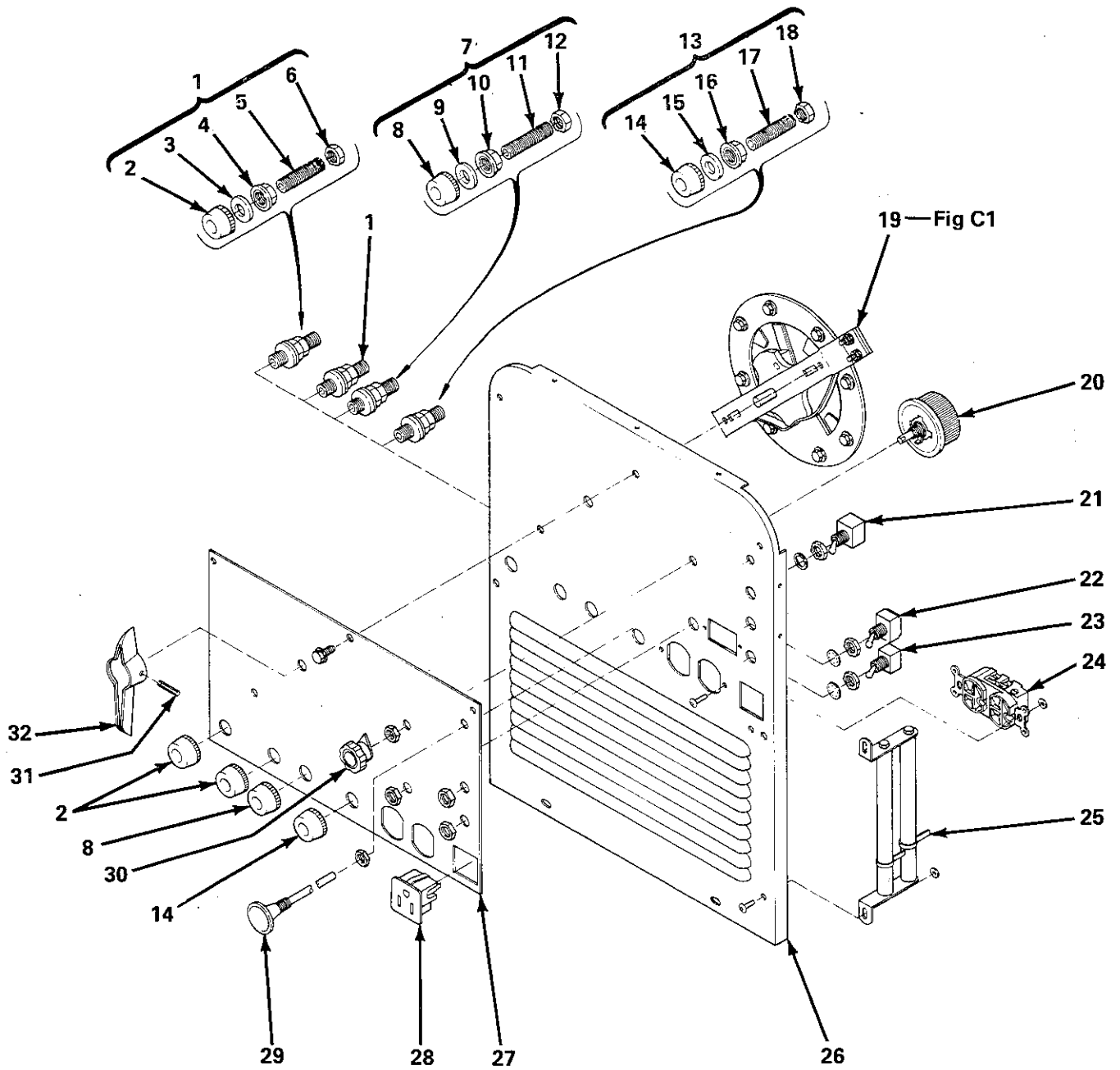


Figure C - Panel, Front - W/Components

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

Panel, Front W/Components (Fig A Pg 2 Item 49)

1		057 608	RECEPTACLE, jack plug - yellow (consisting of)	2
2		039 889	. NUT, terminal - yellow	1
3		010 291	. WASHER, flat - nylafil 5/8 ID x 1-1/4 OD x 1/8	1
4		604 668	. NUT, steel - self-locking hex 1/2-20	1
5		020 015	. RECEPTACLE, jack plug	1
6		601 881	. NUT, steel - hex jam 1/2-20	1
	C6	049 961	CAPACITOR, ceramic 0.1 uf 500 volts dc	1
7		039 826	RECEPTACLE, jack plug - black (consisting of)	1
8		039 796	. NUT, terminal - black	1
9		010 291	. WASHER, flat - nylafil 5/8 ID x 1-1/4 OD x 1/8	1
10		604 668	. NUT, steel - self-locking hex 1/2-20	1
11		020 015	. RECEPTACLE, jack plug	1
12		601 881	. NUT, steel - hex jam 1/2-20	1
13		039 800	RECEPTACLE, jack plug - red	1
14		039 768	. NUT, terminal - red	1
15		010 291	. WASHER, flat - nylafil 5/8 ID x 1-1/4 OD x 1/8	1
16		604 668	. NUT, steel - self-locking hex 1/2-20	1
17		020 015	. RECEPTACLE, jack plug	1
18		601 881	. NUT, steel - hex jam	1
19	S5	005 563	SWITCH, selector (Fig C1 Pg 7)	1
20	R1	081 712	RHEOSTAT, WW 100 watt 30 ohm	1
21	S1	011 622	SWITCH, toggle 3PDT 15 amp 125 volts	1
22	S3	021 467	SWITCH, toggle SPST MD 3 amp 125 volts ac	1
23	S4	053 359	SWITCH, toggle SPST 20 amp 125 volts	1
24	RC2	039 864	RECEPTACLE, straight - duplex grounded 2P3W	1
25	R2,4	052 782	RESISTOR ASSEMBLY, dual adjustable 180 watt 12 ohm	1
26		049 213	PANEL, front	1
27			NAMEPLATE (order by model and serial numbers)	1
28	RC1	034 952	RECEPTACLE, straight - 3P3W 15 amp 125 volts	1
29		019 790	CONTROL, push/pull	1
30		019 609	KNOB, pointer	1
31		010 647	PIN, spring - compression 5/32 x 1-1/4	1
32		006 927	HANDLE, switch - range	1

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

Item No.	Part No.	Description	Quantity
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Figure C1 005 563 Switch, Selector (Fig C Pg 6 Item 19)

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

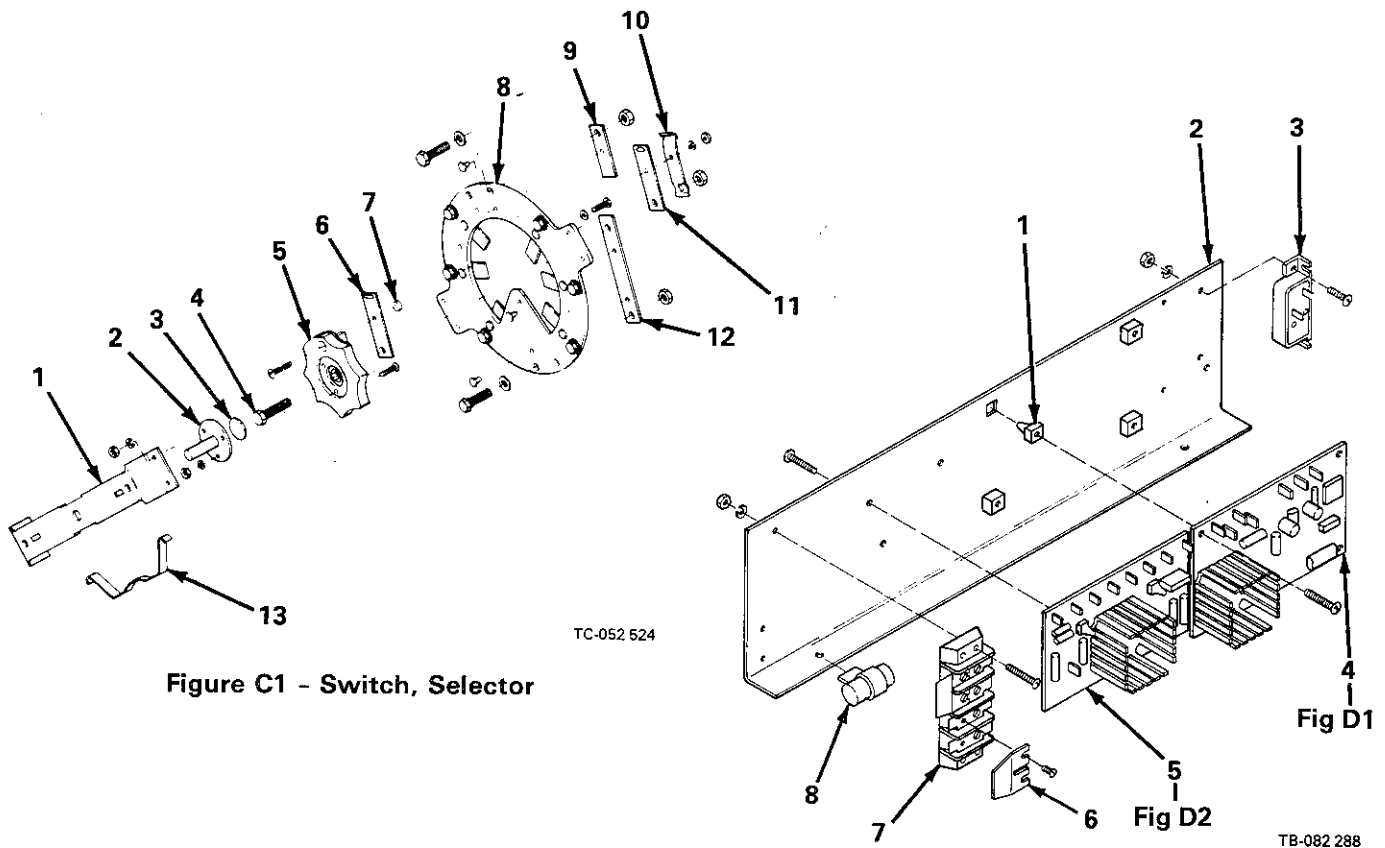


Figure C1 - Switch, Selector

Figure D - Bracket, Mounting - W/Components

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure D Bracket, Mounting - W/Components (Fig A Pg 2 Item 42)

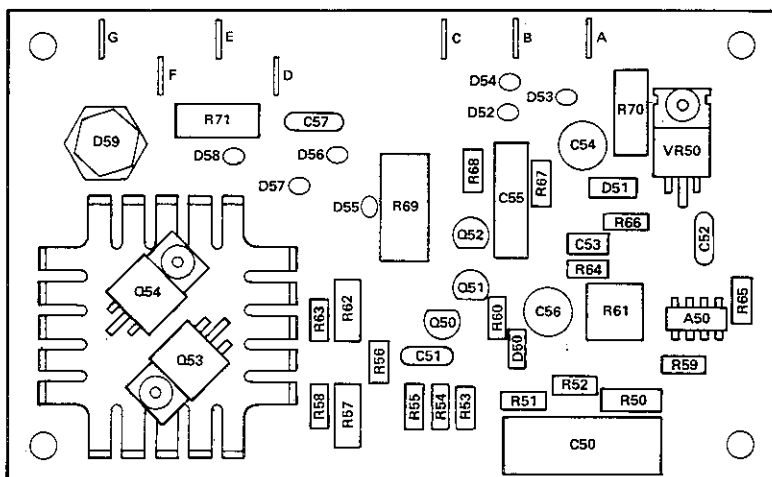
1		080 509	GROMMET, screw No. 8/10 panel hole	4
2		049 377	BRACKET, mounting - components	1
3	CB1	045 061	CIRCUIT BREAKER, auto reset 24 volts dc 7 amp	1
4	PC2	049 404	CIRCUIT CARD, regulator 115 volts (Fig D1 Pg 8)	1
5	PC1	071 609	CIRCUIT CARD, weld/idle control (Fig D2 Pg 9)	1
6		038 620	LINK, jumper - terminal block 30 amp	2
7	1T	038 621	BLOCK, terminal 30 amp 4 pole	1
8	C5	053 296	CAPACITOR, ignition .5 uf	1

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

Qty.	Part No.	Description	Quantity
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Figure D1 049 404 Circuit Card, Regulator (Fig. D Pg 7 Item 4)

A50	009 159	AMPLIFIER, OPNL 32 volts dc	1
C50	028 294	CAPACITOR, mylar 1 uf 200 volts dc	1
C51	053 992	CAPACITOR, ceramic 0.001 uf 1000 volts	1
C52	000 348	CAPACITOR, tantalum 0.47 uf 35 volts	1
C53	005 023	CAPACITOR, tantalum 2.2 uf 20 volts	1
C54,56	000 861	CAPACITOR, electrolytic 33 uf 35 volts	2
C55	038 585	CAPACITOR, mylar 0.22 uf 50 volts	1
C57	028 292	CAPACITOR, ceramic 0.005 uf 1000 volts dc	1
D50	028 351	DIODE, signal 0.020 amp 75 volts straight polarity	1
D51	049 641	DIODE, zener 27 volts 1 watt	1
D52,53,54	026 202	DIODE, rectifier 1 amp 400 volts straight polarity	3
D55,56	073 555	DIODE, rectifier 1 amp 600 volts straight polarity	2
D57,58	070 250	DIODE, rectifier 3 amp 600 volts	2
D59	030 529	DIODE, rectifier 12 amp 600 volts reverse polarity	1
Q50	039 355	TRANSISTOR, unijunction 15MA 40 volts	1
Q51,52	037 200	TRANSISTOR, 200MA 40 volts NPN	2
Q53,54	049 642	THYRISTOR, SCR 8 amp 600 volts	2
R50	005 640	RESISTOR, carbon 0.5 watt 680K ohm	1
R51	035 884	RESISTOR, carbon film 0.25 watt 100K ohm	1
R52	039 328	RESISTOR, carbon film 0.25 watt 1500 ohm	1
R53,54,65	035 886	RESISTOR, carbon film 0.25 watt 22K ohm	3
R55	039 329	RESISTOR, carbon film 0.25 watt 2700 ohm	1
R56,64	035 827	RESISTOR, carbon film 0.25 watt 10K ohm	2
R57,62	028 285	RESISTOR, carbon film 0.5 watt 100 ohm	2
R58,63	035 823	RESISTOR, carbon film 0.25 watt 100 ohm	1
R59	035 888	RESISTOR, carbon film 0.25 watt 2200 ohm	1
R60	074 026	RESISTOR, carbon 0.25 watt 150 ohm	1
R61	006 424	POTENTIOMETER, cermet trimmer 1 turn 0.5 watt 2K ohm	1
R66	039 332	RESISTOR, carbon film 0.25 watt 15K ohm	1
R67	039 334	RESISTOR, carbon film 0.25 watt 27K ohm	1
R68	039 331	RESISTOR, carbon film 0.25 watt 4700 ohm	1
R69	049 439	RESISTOR, carbon 2 watt 47K ohm	1
R71	030 707	RESISTOR, carbon 1 watt 47 ohm	1
R70	074 099	RESISTOR, carbon 1 watt 150 ohm	1
VR50	081 832	REGULATOR, voltage 3 terminal 0.5 amp 15 volts	1
	080 506	HEAT SINK, dual	1



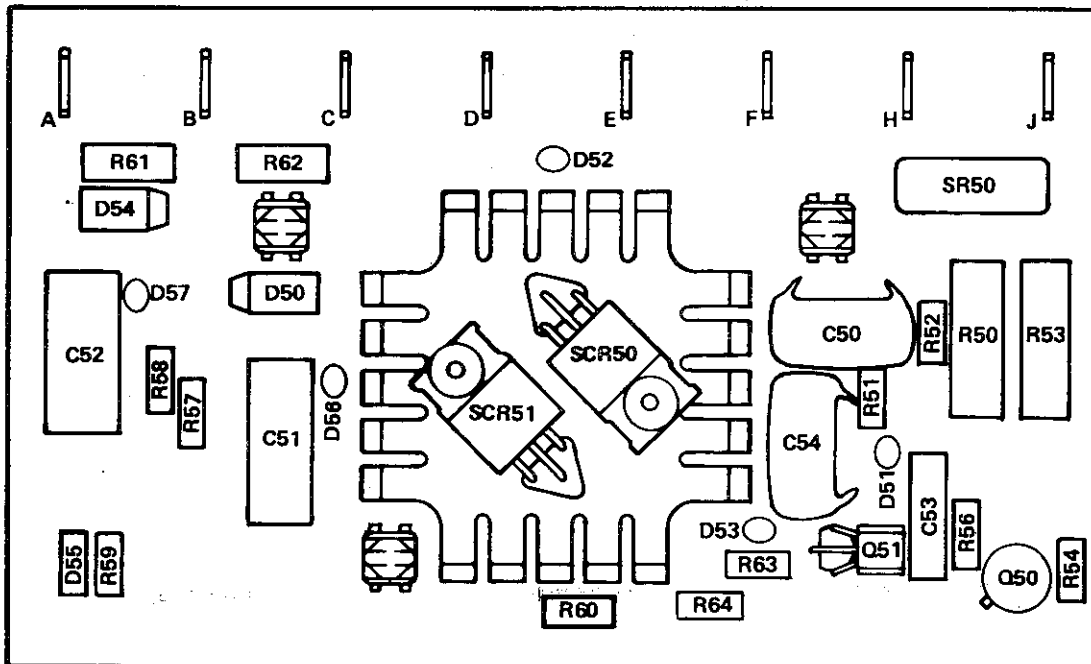
**COMPONENTS TO BE
REPLACED BY
QUALIFIED PERSONNEL ONLY**

TA-048 815

Figure D1 - Circuit Card, Regulator

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

Dia. Mkgs.	Part No.	Description	Quantity
Figure D2 071 609 Circuit Card, Weld/Idle Control (Fig D Pg 7 Item 5)			
C50,54	035 522	CAPACITOR, mylar 0.047 uf 100 volts	2
C51,52	045 868	CAPACITOR, electrolytic 100 uf 25 volts dc	2
C53	080 507	CAPACITOR, tantalum 22 uf 15 volts	1
D50,54	070 250	DIODE, rectifier 3 amp 600 volts	2
D51-53, 56,57	026 202	DIODE, rectifier 1 amp 400 volts straight polarity	5
D55	037 243	DIODE, zener 18 volts 1 watt	1
Q50	000 088	TRANSISTOR, 800 MA 400 volts NPN	1
Q51	039 355	TRANSISTOR, unijunction 15 MA 40 volts	1
R50,53	000 039	RESISTOR, carbon 2 watt 680 ohm	2
R51,56	605 919	RESISTOR, carbon 0.25 watt 47 ohm	2
R52	605 916	RESISTOR, carbon 0.25 watt 1K ohm	1
R54	035 824	RESISTOR, carbon film 0.25 watt 270 ohm	1
R57	052 146	RESISTOR, carbon film 0.25 watt 620K ohm	1
R58	053 572	RESISTOR, carbon film 0.25 watt 12K ohm	1
R59	052 138	RESISTOR, carbon film 0.25 watt 20K ohm	1
R60	035 822	RESISTOR, carbon film 0.25 watt 10 ohm	1
R61,62	030 026	RESISTOR, carbon 0.5 watt 560 ohm	2
R63	003 272	RESISTOR, carbon film 0.25 watt 1 meg ohm	1
R64	071 595	RESISTOR, carbon film 0.25 watt 22 ohm	1
SCR50,51	080 508	THYRISTOR, SCR 8.5 amp 200 volts	2
SR50	035 841	RECTIFIER, integrated 1.5 amp 200 volts	1
	080 506	HEAT SINK, dual	1



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

TA-048 816-A

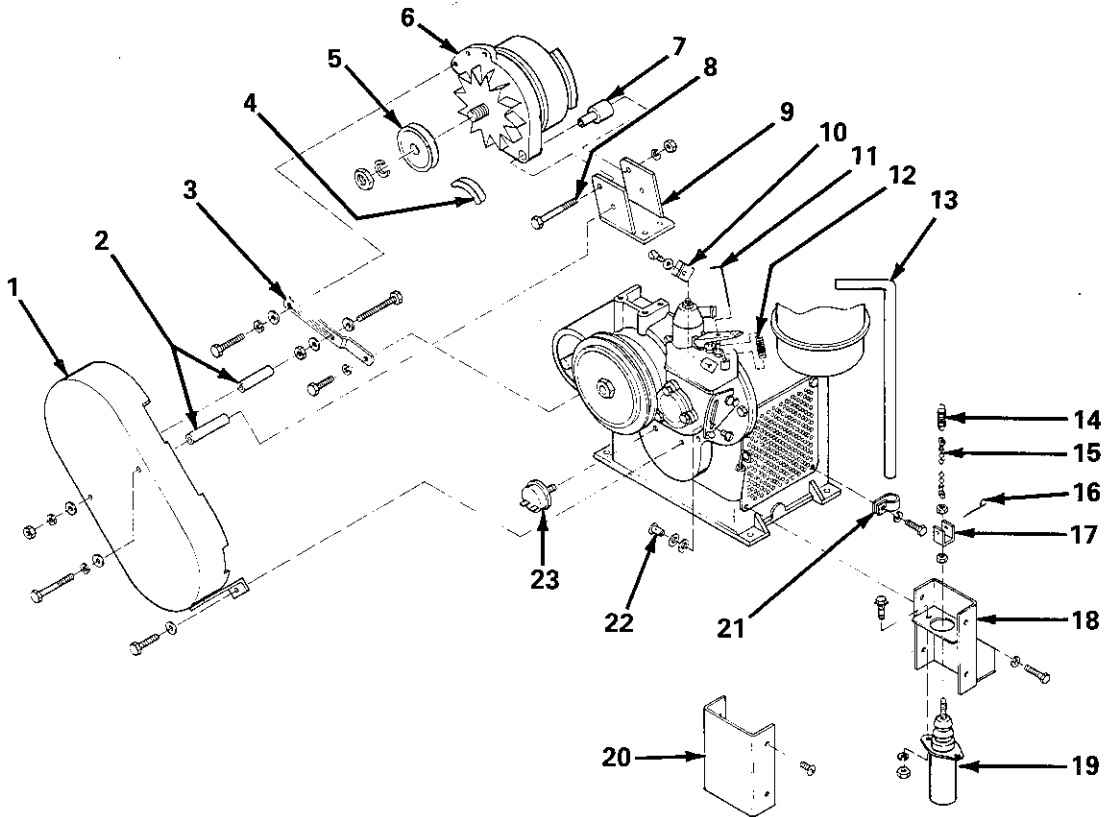
Figure D2 - Circuit Card, Weld/Idle Control

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

Item No.	Dia. Mkgs.	Part No.	Description	Quantity
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Figure E 070 961 Engine, Diesel - Electric (Fig A Pg 2 Item 32)

1		070 214	GUARD, alternator	1
2		070 220	TUBING, steel 1/2 OD x 17 ga wall x 2-1/8	2
3		070 217	STRIP, adjusting - alternator	1
4		070 407	BELT, V	1
5		605 430	PULLEY, single - belt	1
6		605 429	ALTERNATOR, 35 amp 12 volts	1
7		070 020	SPACER, alternator	1
8		009 043	SCREW, cap - hex hd 3/8-16 x 3	1
9		070 434	BRACKET, mounting - alternator	1
10		070 216	BRACKET, mounting - cable stop	1
		010 517	CLIP, conduit	1
11		070 456	RETAINER, spring	1
12		070 255	SPRING, compression	1
13		070 441	HOSE, 1/2 ID x 11/16 OD x 16	1
14		064 646	SPRING, high speed	1
15		070 442	CHAIN, throttle	1
16		605 277	PIN, cotter 3/32 x 3/4	1
17		049 839	BRACKET, adjustment - solenoid	1
18		070 215	BRACKET, mounting - solenoid	1
19	TS1	032 933	SOLENOID, 12 volts dc 20 amp	1
20		070 900	GUARD, solenoid	1
21		034 116	CLAMP, 5/8 dia x 15/32 hole	1
22		010 516	SWIVEL, wire - inner	1
23	S2	011 917	SWITCH, pressure 2P normally open	1



TD-070 946

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

