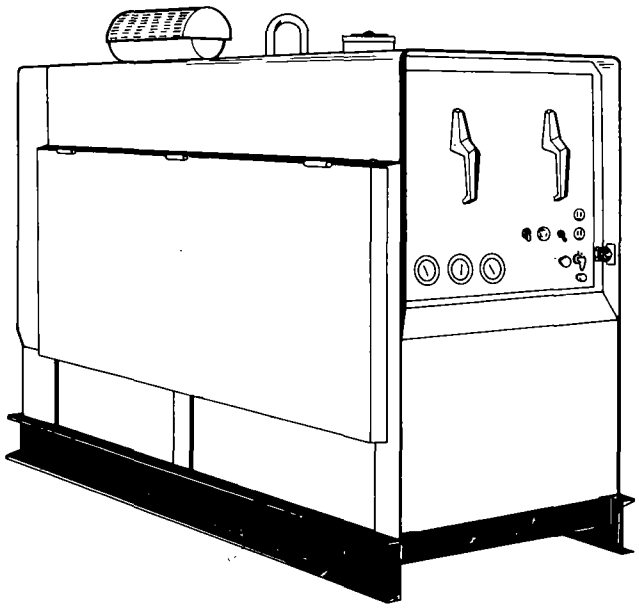
April 1978 FORM: OM-457C

Effective With Serial No. HJ134589

MODEL

Trailblazer 22G



OWNER'S MANUAL

MILLER ELECTRIC MFG. CO.

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

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LIMITED WARRANTY

EFFECTIVE: FEBRUARY 20, 1978

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

LIMITED WARRANTY—Miller Electric Mfg. Co., Appleton, Wisconsin warrants to Customer that all new and unused Equipment furnished by Miller is free from defect in workmanship and material as of the time and place of delivery by Miller. No warranty is made by Miller with respect to engines, trade accessories or other items manufactured by others. Such engines, trade accessories and other items are sold subject to the warranties of their respective manufacturers, if any. The manufacturer's warranty on engines is for a period of one year.

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

In the case of Miller's breach of warranty or any other duty with respect to the quality of any goods, the exclusive remedies therefor shall be, at Miller's option, (1) repair or (2) replacement or, where authorized in writing by Miller in appropriate cases, (3) the reasonable cost of repair or replacement at an authorized Miller service station or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at Customer's risk and expense. All transactions are F.O.B. Appleton, Wisconsin. Upon receipt of notice of apparent defect or failure, Miller shall instruct the claimant on the warranty claim procedures to be followed.

As a matter of general policy only, Miller may honor an original user's warranty claims on warranted Equipment in the event of failure resulting from a defect within the following periods from the date of delivery of Equipment to the original user:

1. Arc welders, power sources, and components. . 1 year
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

provided that the user so notifies Miller in writing within thirty (30) days of the date of such failure.

5. Replacement or repair parts exclusive of labor 60 days

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

ERRATA SHEET

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

AMENDMENT TO SECTION 3 - INSTALLATION

Amend Section 3-3. EQUIPMENT GROUNDING TERMINAL

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 and 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.

Amend Figure 3-3. Power Plant Connections

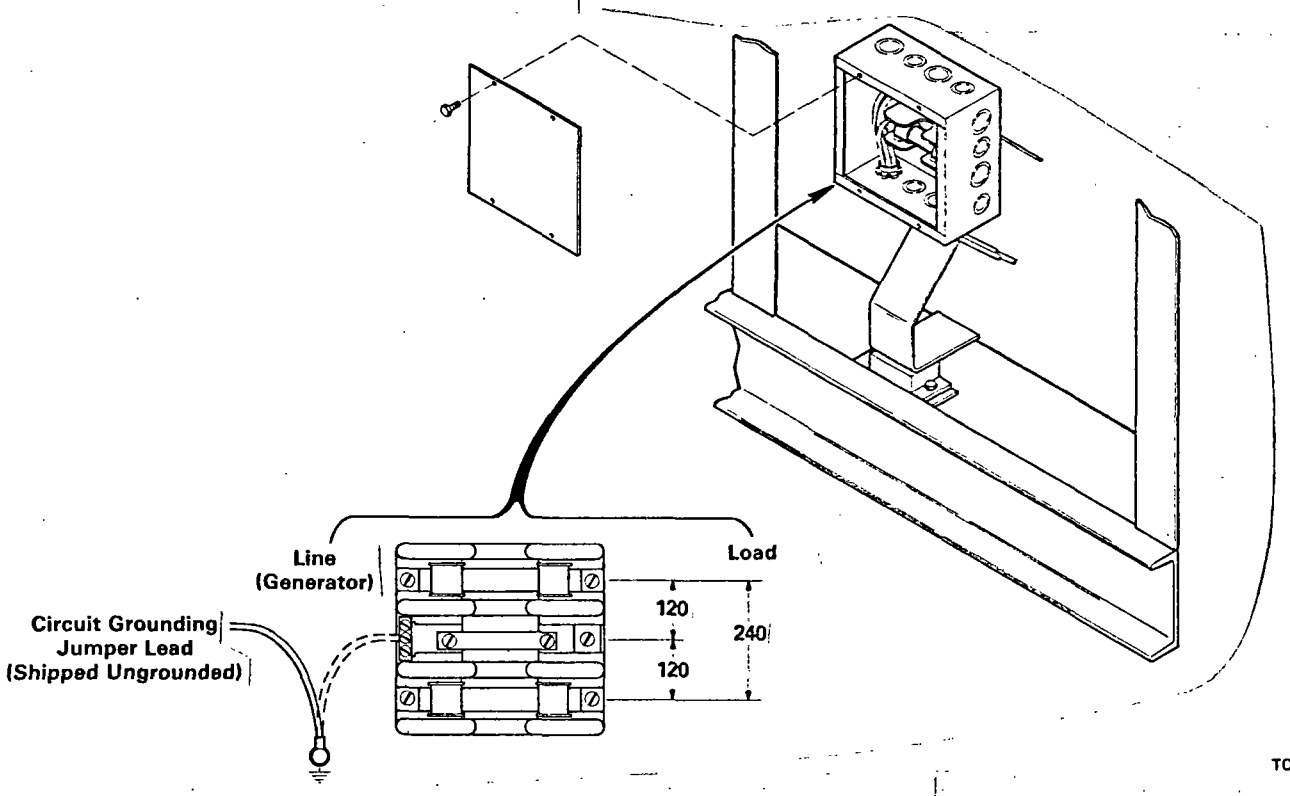

Figure 3-3. Power Plant Connections

AMENDMENT TO SECTION 5 - FUNCTION OF GENERATOR CONTROLS

Amend Sections 5-1 and 5-9

Add the following CAUTION block at the beginning of the section

CAUTION: *The auxiliary power capability of this welding generator is primarily intended for use with portable cord-connected accessory equipment (lights, drills, grinders, etc.). Do not connect this unit to any service box, switchboard, panelboard, or other equipment normally supplied by other electrical power unless a proper transfer switch and grounding procedure is employed (see Section 3-3 for unit grounding information). ALWAYS consult the local electric utility, local and state codes, and the latest issue of the National Electrical Code for proper installation procedures. Since hazardous voltages are present, it is recommended that the installation be made by a licensed electrician to avoid injury or damage caused by improper or faulty installation.*

AMENDMENT TO SECTION 6 - FUNCTION OF ENGINE CONTROLS

Delete Section 6-7. ELECTRICAL TACHOMETER (OPTIONAL)

AMENDMENT TO SECTION 7 - SEQUENCE OF OPERATION

Amend Section 7-2. POWER PLANT OPERATION

Add CAUTION block at beginning of Section

CAUTION: *The weld output terminals are electrically energized when the engine is running. Disconnect the welding cables when not welding and do not touch the output terminals when the engine is running.*

AMENDMENT TO SECTION 9 - ENGINE MAINTENANCE

Amend Section 9-3. GOVERNOR SERVICE

Weld speed of this engine is 1850 rpm.

Amend Section 9-4. CARBURETOR FLOAT SETTING

Carburetor Change Effective With Serial No. HJ185451

NOTE: *Do not bend, twist, or apply pressure on the float body. The float body, when viewed from the free end, must be centered between and at right angles to the machined surface, and must move freely on the float axle.*

This engine is equipped with a Teledyne Walbro carburetor.

To ensure correct fuel level in the float chamber, check distance (dimension A, Figure 9-1) from top of float to machined surface of throttle body (no gasket) with throttle body inverted. This dimension should be 1-1/16 inches plus or minus .020 inch. To increase or decrease distance from the top of the float body to the machined surface, use a long nose pliers and bend the float lever at a point close to the float body.

Delete Figure 9-2. Carburetor Float Setting

Amend Section 9-9. IDLE CONTROL/GOVERNOR LINKAGE ADJUSTMENT (Figure 9-7)

Amend Figure 9-7. IDLE CONTROL/GOVERNOR LINKAGE ADJUSTMENT

To obtain proper engine idle and/or weld speed, perform the following procedures:

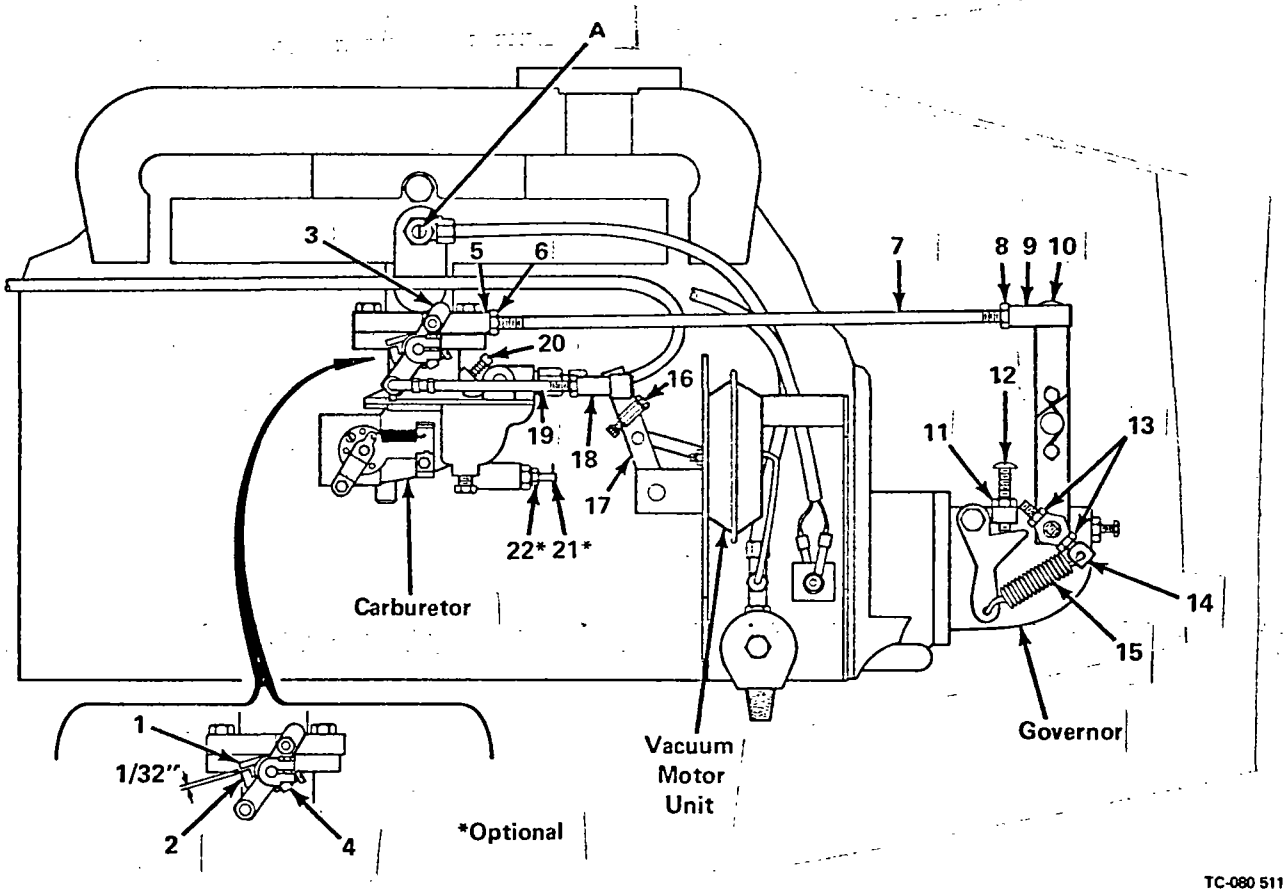

Figure 9-7. Idle Control/Governor Linkage Adjustment

1. Loosen the linkage nuts (6 & 8) and remove the hardware (10) securing the linkage socket (9) to the governor. Rotate the linkage socket (9) until the throttle stop plate (2) is about 1/32 inch from the stop (1). A clockwise rotation of the linkage socket (9) will shorten the governor linkage (7) and reduce the gap; a counterclockwise rotation of the linkage socket (9) will lengthen the governor linkage (7) and widen the gap. (In some cases it may be necessary to adjust the linkage itself to obtain the 1/32 inch gap required.) Tighten the linkage socket nuts (6 & 8) to lock the position of the linkage sockets (5 & 9).

IMPORTANT: *Check the linkage (7) for freedom of movement throughout its entire travel. If the linkage is binding due to the linkage socket nuts (5 & 9) being out of proper alignment, loosen the linkage socket nuts (6 & 8) and rotate the sockets (5 & 9) slightly until unrestricted movement of the linkage (7) is restored. Tighten the linkage socket nuts (6 & 8).*

CAUTION: *Ensure that body limbs are clear of the fan and the vacuum motor unit before starting or working on the engine.*

2. Recheck all adjustments made thus far. Place the IDLE CONTROL switch in the LOCK OUT position. Start the engine and allow it to reach normal operating temperature (about five minutes). Ensure that the CHOKE control is pushed fully in at this time.

3. Pull the arm (3) toward the front of the welding generator to the idle position. Maintain pressure on the arm (3) to butt against the idle screw (4) throughout the following adjustments:

   A. Rotate the idle screw (4) to obtain 550 rpm. Clockwise rotation of the screw (4) will increase engine rpm, whereas counterclockwise rotation of the screw (4) will decrease engine rpm.

   B. Rotate the idle mixture adjustment screw (20) counterclockwise until the engine begins to falter or roll; then rotate the screw (20) clockwise until the engine operates smoothly. Rotating the screw (20) clockwise restricts the fuel flow, making the air-fuel mixture leaner. Rotating the screw (20) counterclockwise admits more fuel, making the air-fuel mixture richer.

IMPORTANT: *Ensure that the vacuum motor idle screw (16) butts against the vacuum motor unit mounting plate BEFORE the throttle stop plate (2) butts against the idle screw (4) prior to placing the IDLE CONTROL switch in the AUTOMATIC IDLE position. To obtain this condition it may be necessary to adjust screw (16). Check by manually pivoting the vacuum motor arm (17) until screw (16) butts against the mounting plate.*

4. Place the IDLE CONTROL switch in the AUTOMATIC IDLE position. Operation of the idling device is automatic when the IDLE CONTROL switch is in the AUTOMATIC IDLE position. When the engine is running, engine rpm will remain at idle until an arc is established, at which time the engine immediately comes up to weld rpm. When the arc is broken, a time delay will exist before the engine begins to return to idle rpm. The length of this time delay is controlled by the setting of the time-delay screw "A" in Figure 9-7. If the engine does not go to idle rpm after about ten seconds, adjust the time-delay screw (A) for the desired time delay. This screw is located on the vacuum line fitting going into the intake manifold of the engine.

5. When the engine has gone to idle rpm, adjust screw (16) until 1200 rpm is obtained.

NOTE: *Do not readjust the idle rpm screw (4) when adjusting the vacuum motor idle rpm.*

IMPORTANT: *Check the linkage (19) for freedom of movement throughout its entire travel. If the linkage is binding due to the linkage socket (18) being out of proper alignment with the fixed end, adjust the length of the linkage. It will then be necessary to readjust the vacuum motor idle screw (16) and repeat Steps 4 and 5.*

CAUTION: *Ensure that body limbs are clear of the fan and the vacuum motor unit before working on the engine.*

6. Place the IDLE CONTROL switch in the LOCK OUT position. Loosen the governor speed adjusting screw securing nut (11). Adjust the governor speed adjustment screw (12) until a high idle rpm of 1850 is obtained. Tighten the securing nut (11) to maintain the governor speed setting.

7. Check the governor engine regulation by applying and removing the engine load. If a governor sensitivity adjustment is deemed necessary, loosen one of the two locking nuts (13) and proceed with the following instructions:

   A. IF REGULATION RANGE IS TOO BROAD - Decrease the governor spring (15) tension by sliding the sensitivity adjustment screw (14) inward.

   B. IF REGULATION RANGE IS TOO NARROW - Increase the governor spring (15) tension by sliding the sensitivity adjustment screw (14) outward.

   C. IF ENGINE SURGES (HUNTS) UNDER LOAD - Increase the governor spring (15) tension by sliding the sensitivity adjustment screw (14) outward.

8. Tighten the two locking nuts (13) to maintain the desired governor sensitivity. Readjust the governor sensitivity by repeating Step 7.

NOTE: *Whenever the governor sensitivity (Step 7) is adjusted, the governor speed (Step 6) MUST be readjusted. Whenever the governor speed (Step 6) is adjusted, the governor sensitivity (Step 7) MAY need readjustment.*

Amend Section 9-10. HIGH ALTITUDE CARBURETOR MODIFICATION (Optional) (Figure 9-7)

The Teledyne Walbro carburetor can be equipped with an adjustable main jet for high-altitude operation (above 4000 ft.). Minor adjustment will be necessary for proper operation at a particular altitude. Whenever a carburetor adjustment is deemed necessary, see Figure 9-7 and proceed as follows:

Loosen the main adjustment screw locking nut (22). Apply a near-full engine load to the welding generator. Rotate the main adjustment screw (21) clockwise until the engine begins to falter and lose RPM. Rotate the main adjustment screw (21) counterclockwise until the engine operates smoothly; then continue counterclockwise rotation of 1/4 turn. Rotating the screw (21) clockwise restricts the fuel flow, making the air-fuel mixture leaner. Rotating the screw (21) counterclockwise admits more fuel, making the air-fuel mixture richer. Remove the engine load. Tighten the locking nut (22).

IMPORTANT: *Restricting the fuel flow to the point where the mixture is too lean will cause valve burning.*

Delete Figure 9-8. High-Altitude Carburetor Adjustment

AMENDMENT TO SECTION 10 - TROUBLESHOOTING

Amend Figure 10-1. Circuit Diagram

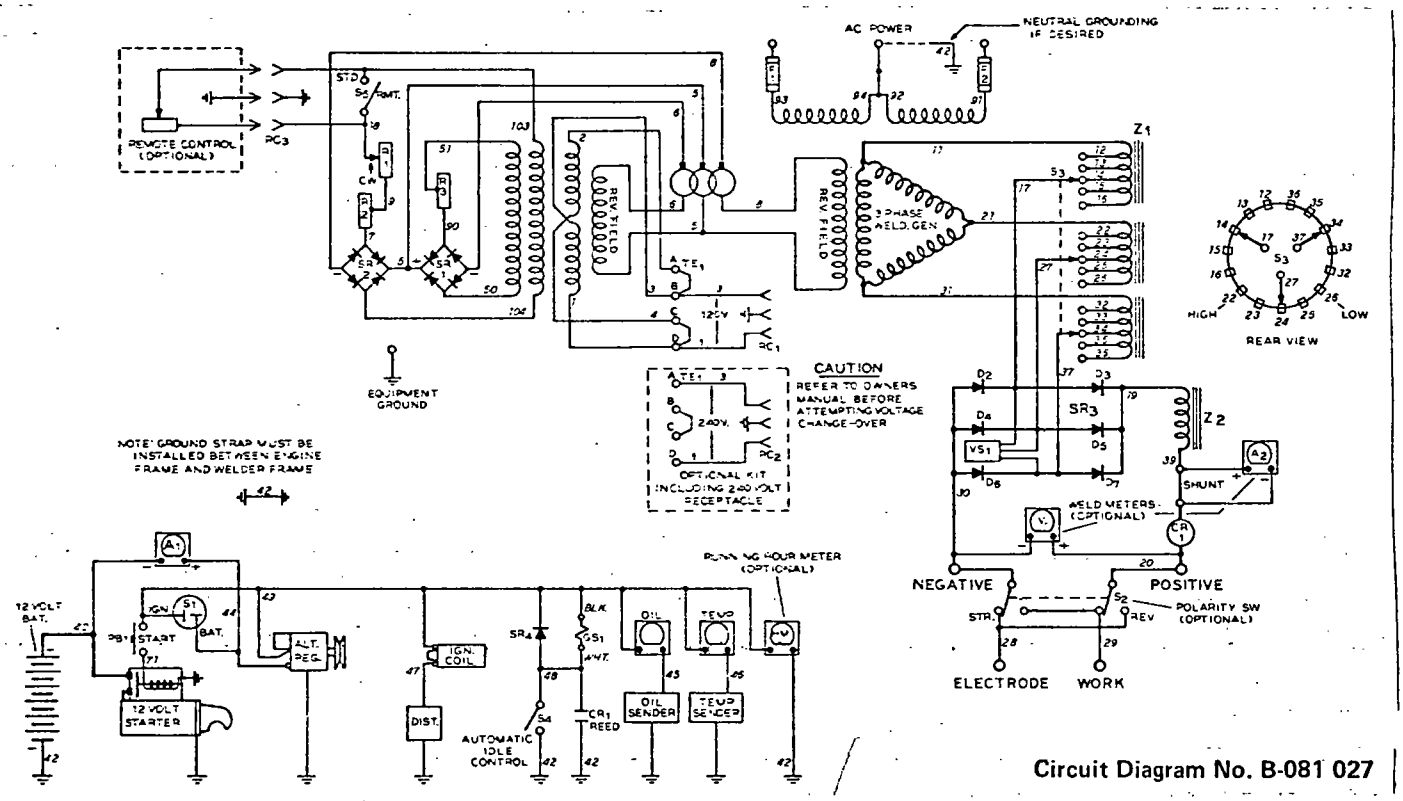

Figure 10-1. Circuit Diagram For Models Effective With Serial No. HJ211479

Item No.	Dia. Mkgs.	Part No. Listed In Parts List	Replaced With Part No.	Description	Quantity
6		010 318	015 602	VALVE, shut - off w/strainer - fuel	1
33		053 724	053 966	GUARD, fan	2
53		017 421	049 685	CATCH, door	2
77	Z1	036 259	036 377	REACTOR	1
80	VS1	025 932	024 017	SUPPRESSOR, 0.75 uf 65 volts ac (Eff with S/N HK311202)	1
Page 4	TAC	032 936	Deleted		
Page 5	HM	032 936	032 936	METER (dia. mkg. changed)	1
97		039 269	080 497	FUSE BOX (Eff with S/N HJ211479)	1
			601 158	BLANK, snap - in 7/8 (Eff with S/N HJ211479)	2
			079 496	COVER, junction box (Eff with S/N HJ211479)	1
			010 014	CLAMP, steel - cushion 3/4 dia x 13/64 hole (Eff with S/N HJ211479)	1
			010 891	BLANK, snap - in 1 inch dia (Eff with S/N HJ211479)	1
100		010 493	030 170	BUSHING, snap in 3/4 ID x 1	1
146	S2,5	053 359	011 609	SWITCH, toggle SPDT 15 amp 125 volts	2

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

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SECTION 10 – TROUBLESHOOTING

PARTS LIST

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 accidently opened or left open. Check to be sure that the space is safe before re-entering it.

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

C. Fire and Explosion Prevention

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

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

To prevent fires and explosion:

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

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

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

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

a. appreciable combustibles (including building construction) are within 35 feet
b. appreciable combustibles are further than 35 feet but can be ignited by sparks
c. openings (concealed or visible) in floors or walls within 35 feet may expose combustibles to sparks
d. combustibles adjacent to walls, ceilings, roofs, or metal partitions can be ignited by radiant or conducted heat.

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

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

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

Rated Amperes Output	Welding Current Range	Welding Current Ranges In Amperes		Open-Circuit Voltage Range	Power	Dimensions (Inches)	Weight (Pounds)	
		Coarse Ranges	Fine Range				Net	Ship
350 @ 40V 100% Duty Cycle	45 To 475 Amps	45 - 85 65 - 140 100 - 220 130 - 300 220 - 475	From Min. To Max. Of Each Coarse Range	55 To 90 DC Volts	3 kva 120 Volts AC 50/60 Hz. While Welding 7.5 kva 120/240 Volts AC 50/60 Hz. As Power Plant	Height - 43-1/2 Width - 25 Depth - 63	1520	1560

Figure 2-1. Specifications

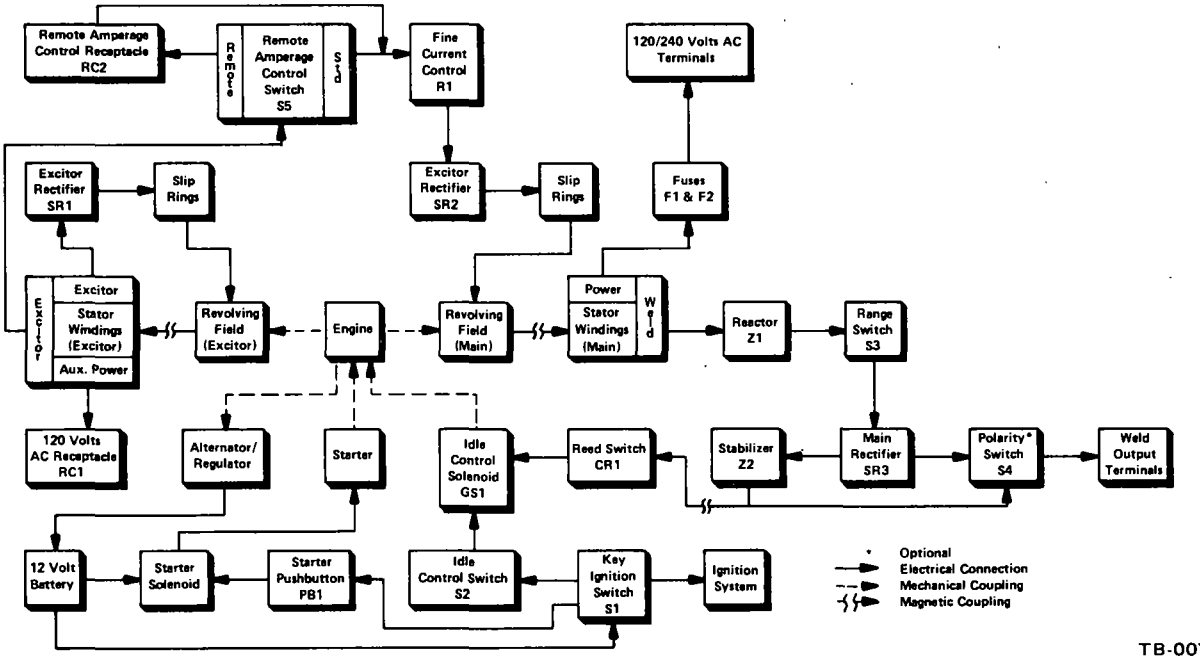

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Figure 2-2. Functional Diagram

2-1. GENERAL

This manual has been prepared especially for use in familiarizing personnel with the design, installation, operation, maintenance, and troubleshooting of this equipment. All information presented herein should be given careful consideration to assure optimum performance 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/or Stock Number and Serial (or Style) Numbers of the equipment be supplied.

2-3. DESCRIPTION

This welding generator is driven by a gasoline engine. The unit will produce a dc output for Shielded Metal Arc (SMAW) Welding when used as a welding generator, or an ac output of 7.5 kva at 120/240 volts when used as a power generator. A duplex receptacle on the front panel provides an ac output of up to 3 kva at 120 volts to power tools, lights, etc., while welding.

NOTE

This welding generator has reconnectable capability to provide 240 volts ac auxiliary power at the front panel if the optional receptacle kit is ordered. Should preparation and installation (or information if factory installed) be desired, see Section 5-9 for complete instructions, and delete all reference to 120 volts ac duplex receptacle and replace with 240 volts dc duplex receptacle.

2-4. SAFETY

Before the equipment is put into operation, the safety section at the front of this manual should be read completely. This will help avoid possible injury due to misuse or improper welding applications.

The following definitions apply to CAUTION, IMPORTANT, and NOTE blocks found throughout this manual:

CAUTION

Under this heading, installation, operating, and maintenance procedures or practices will be found that if not carefully followed may create a hazard to personnel.

IMPORTANT

Under this heading, installation, operating, and maintenance procedures or practices will be found that if not carefully followed may result in damage to equipment.

NOTE

Under this heading, explanatory statements will be found that need special emphasis to obtain the most efficient operation of the equipment.

SECTION 3 - INSTALLATION

3 - 1. LOCATION (Figure 3-1)

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

IMPORTANT

If this welding generator is to be mounted on a trailer (optional), ensure that the engine end is mounted toward the front (hitch end) of the trailer to maintain proper weight distribution. Also ensure that the torque weight of the trailer is 5 to 10% of the gross vehicle weight. 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.

CAUTION

If this unit is to be operated indoors, it should be located in a place where the exhaust fumes from the engine can be vented out of the building. Failure to comply with proper venting may result in serious bodily injury or loss of life.

IMPORTANT

The engine exhaust system on this welding generator has not been equipped with a spark arrestor unless it was specifically 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.

A proper installation site permits freedom of air movement into and out of the welding generator, and also least subjects the unit to dust, dirt, moisture, and corrosive vapors. A minimum of 18 inches of unrestricted space must be maintained between the welding generator front and rear panels and the nearest obstruction. Also, the underside of the welding generator must be kept completely free of obstructions. The installation site should also permit easy removal of the outer enclosure for maintenance functions.

IMPORTANT

Do not place any filtering device over the intake air passages of the welding generator as this would restrict the volume of intake air and thereby subject the internal components to an overheating condition and subsequent failure. Warranty is void if any type of filtering device is used.

Holes are provided in the base for mounting purposes. Figure 3-1 gives overall dimensions and the base mounting hole layout.

On most welding generators a lifting device is provided for moving the unit. However, if a fork lift vehicle is used for lifting the unit, be sure that the lift forks are long enough to extend completely under base.

IMPORTANT

The use of lift forks too short to extend out of the opposite side of the base will expose internal components to damage should the tips of the lift forks penetrate the bottom of the unit.

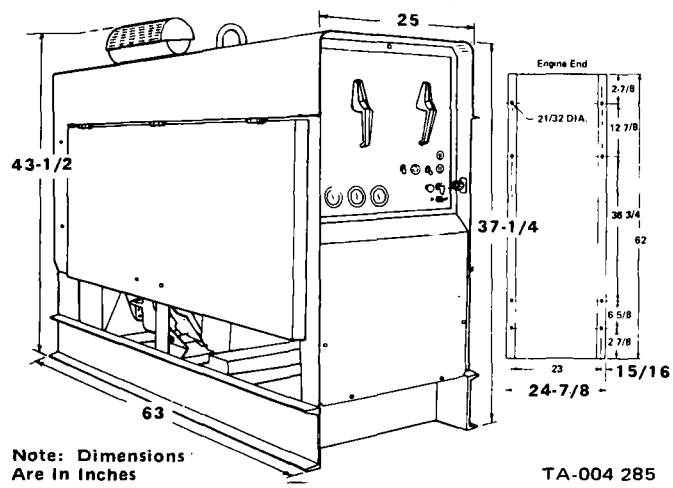


Figure 3-1. Dimensional Drawing

3 - 2. WELD OUTPUT CONNECTIONS (Figure 3-2)

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.

CAUTION

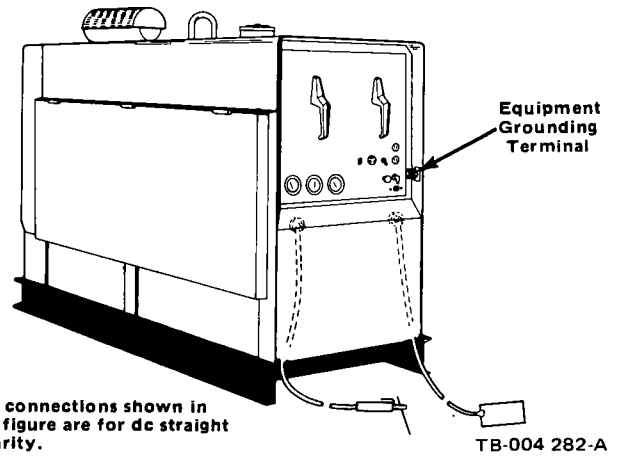
Ensure that the unit is completely shut down before making any weld output connections.

A. Location

The POSITIVE and NEGATIVE weld output terminals are located on the lower portion of the front panel. Open the lower front access door. Route the weld cables between the two horizontal pieces of angle iron on the front of the base (see Figure 3-2) and connect the cables to the weld output terminals. Secure the lower access door.

NOTE

If the welding generator is equipped with a POLARITY SWITCH (Optional), the weld output terminals are labeled ELECTRODE and WORK.



The connections shown in this figure are for dc straight polarity.

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Figure 3-2. Weld Output Connections

B. Welding Cables

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

1. It is recommended that the welding cables be kept as short as possible, be placed close together, and be of adequate current carrying capacity. The resistance of the welding cables and connections causes a voltage drop which is added to the voltage of the arc. Excessive cable resistance may result in overloading as well as reducing the maximum current output capability of this unit. Proper operation is to a great extent dependent on the use of welding cables and connections that are in good condition and of adequate size. An insulated electrode holder must be used to ensure the operator's safety.

2. Use Table 3-1 as a guide for selecting correct cable size for the anticipated maximum weld current which will be used. Table 3-1 shows total cable length, which includes the electrode and work cable. Example: If the electrode holder cable is 75 feet long and the work cable is 25 feet long, select the size cable that is recommended for 100 feet at the maximum weld current that is to be used.

3. Do not use damaged or frayed cables.

4. Follow the electrode holder manufacturer's instructions for installing the electrode holder onto the electrode cable.

5. Use correct lugs on the weld cable to connect the work clamp and to connect the cables to the weld output terminals. Install the cables to the output terminals according to Section 3-2A.

6. Ensure that all connections are clean and tight.

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
300	2/0	2/0	2/0	3/0	4/0	4/0	2-2/0	2-3/0
350	3/0	3/0	3/0	4/0	4/0	2-2/0	2-3/0	2-3/0
400	3/0	3/0	3/0	4/0	2-2/0	2-3/0	3-2/0	2-4/0
500	4/0	4/0	4/0	2-2/0	2-3/0	2-3/0	2-4/0	3-3/0

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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.

3 - 3. EQUIPMENT GROUNDING TERMINAL (Figure 3-2)

Normally, engine-driven welding generators do not require grounding. However, since this unit has auxiliary power plant capability, grounding of the frame and case may be required. A grounding terminal has been provided on the front panel for this purpose (see Figure 3-2). For detailed grounding instructions consult your local or state codes or the latest issue of the National Electrical Code.

3 - 4. REMOTE AMPERAGE CONTROL CONNECTIONS (Figure 5-1)

The REMOTE AMPERAGE CONTROL receptacle, located on the front panel of the welding generator provides a junction point for connecting a Remote Amperage Control to the amperage control circuitry in the unit.

To connect the Remote Amperage Control to the REMOTE AMPERAGE CONTROL receptacle, insert the three-prong plug from the remote control into the receptacle and rotate the plug as far as it will turn in clockwise direction. Once fully rotated, the plug will be locked in the receptacle and will not pull out under stress.

3 - 5. 120/240 VOLTS AC TERMINALS (Figure 3-3)

CAUTION

Due to the high potential that is present at the 120/240 volts ac terminals while the welding generator is operating, it is recommended that connections to the 120/240 volts ac terminals be made only by a licensed electrician to avert any chance of personal injury due to faulty installation. Never attempt to make connections to the 120/240 volts ac terminals while the engine is operating.

The 120/240 volts ac terminals act as a junction point for connecting accessory equipment to the 7.5 kva, 120/240 volts, 50/60 Hertz power plant. The power that can be obtained at these terminals may be used to provide standby service to rural, residential, or other buildings requiring 120/240 volts 3 wire connection.

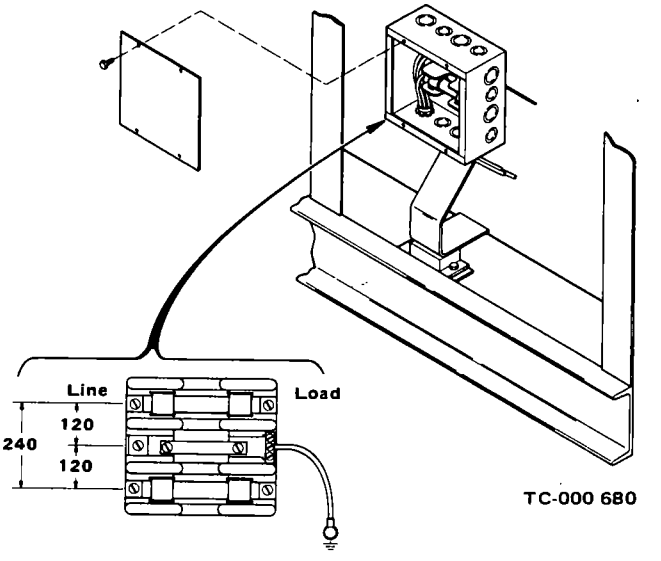

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Figure 3-3. Power Plant Connections

CAUTION

Do not change fuses or connect any lead wires while engine is running. Install circuit grounding jumper lead if NEC or local electrical code requires grounded neutral conductor. Insert load lead wires through proper cord grip box connector. Strip 1/2 inch insulation and connect to proper load terminals and tighten connectors securely.

NOTE

The FINE AMPERAGE control must be rotated to the 100 (full counterclockwise) position whenever the 120/240 volts power plant is being utilized.

The voltage will vary in accordance with the load applied to the 120/240 volts terminals. The voltage at various loads may be determined from Figure 3-4.

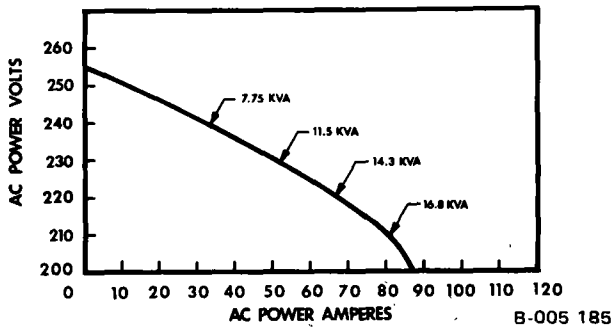

Figure 3-4. AC Power Curve For 120/240 Volts AC Terminals

SECTION 4 - ENGINE PREPARATION

NOTE

See the Engine Manufacturer's manual (F-163 Engine) for complete engine care.

4-1. LUBRICATION

This engine was shipped from the factory with its crankcase filled with the correct amount and type of break-in oil unless otherwise ordered. Check the oil level before attempting to operate the engine. It should be up to the FULL mark on the bayonet type indicator. Add a quality brand of oil if the oil level is low. See the oil selection chart, Table 9-1, in Section 9.

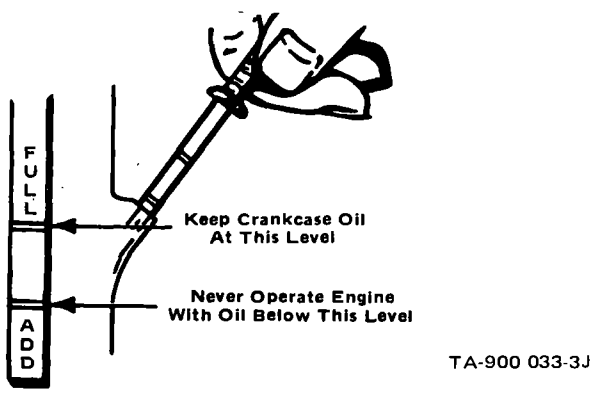

Figure 4-1. Oil Level Indicator

IMPORTANT

New engines have very close clearance between their moving parts. Thus, it is recommended that loading of the engine be kept to a minimum during the first 50 hours of operation. Be sure to check the oil level several times each day during the engine break-in period. This engine requires about 50 hours of running time before it will be fully broken in.

After about 50 hours of running time, drain the break-in oil and change the oil filter. See the oil selection chart, Table 9-1, in Section 9 for correct oil type and grade to use after the break-in oil is drained.

4-2. COOLANT SYSTEM

The liquid capacity of the coolant system in this welding generator is 9 quarts (U.S. Measure). This unit is shipped from the factory with the proper amount of water and anti-freeze to permit operation of the unit at temperatures down to 0^{o}F.

IMPORTANT

If this welding generator is to be operated in temperatures which are below 0^{o}F, additional anti-freeze will have to be added to the coolant system or the liquid in the system will freeze and thus cause the engine to overheat.

The coolant system is equipped with a 180^{o}F thermostat. If the thermostat should become defective, be sure the replacement is of equal temperature rating.

IMPORTANT

Do not run the engine with a defective thermostat or without one. If this is done, the engine will run cold and develop excess carbon accumulation and the oil will become contaminated with excessive sludge and dirt.

The radiator for this engine is equipped with a pressurized cap which is rated at 7 psi. If this cap is ever replaced, ensure that the replacement cap has a rating of 7 psi.

CAUTION

Caution should be exercised at all times when removing the radiator pressure cap. The cap will turn to an almost full open position, at which point a provision has been made to permit venting built up pressure within the radiator. Allow the pressure to escape before completely removing the cap from the radiator neck. When removing the cap, it is recommended that a glove or rag be used to protect the operator's hand from possible exposure to extremely hot coolant.

4-3. PREPARING NEW BATTERY FOR SERVICE

A. Wet Charged Battery

The wet charged battery is shipped with the electrolyte solution added and normally in an operational status. However, due to long periods of idleness, the battery may become weak and thus require charging. The battery should have a specific gravity reading of 1.260 (at 80^{o}F) before operation. If this level is not present when it is to be used, charge the battery as instructed in Section 4-3A, step 4.

IMPORTANT

Do not attempt to operate the engine without the battery connected. Also, do not attempt to remove the battery while the engine is running.

NOTE

If the battery does not require any additional charging, the only step required to place the battery into operation is to connect the negative (—) battery cable to the negative (—) terminal on the battery.

B. Dry Charged Battery

This battery is shipped in a dry state. To prepare the new battery for operation, it will be necessary to obtain electrolyte, proceed as follows:

CAUTION

Put on protective eye cover and clothing prior to pouring the electrolyte solution.

1. Remove the battery from the unit and place it on a level work table or other suitable area.
2. Fill the battery cells to the required level with electrolyte.
3. Place a battery thermometer in one of the center cells and check the specific gravity of each cell with a battery hydrometer.
4. The battery temperature must be 80°F and the specific gravity reading 1.260 prior to installation. If both conditions are not met, charge the battery following the instructions below:

CAUTION

Prior to charging the battery, the battery caps must be removed. Failure to remove the caps could result in the battery exploding should the battery be overcharged.

   a. Use an automotive type battery charger. This battery should be charged at about a 3.5 ampere rate until correct electrolyte conditions are met. Lower charging rates can be used; however, the time to obtain the correct electrolyte conditions will be longer.

   b. When the battery is charged, disconnect it from the charger and re-check the electrolyte level. Add if necessary. Install the battery caps.

   c. Rinse the empty electrolyte containers with water before discarding. Since battery acid is corrosive to metals, do not pour into a metal sink or drain. Rinse and mutilate the empty electrolyte container before discarding. If acid has accidentally spilled on the battery or work area during filling or charging, flush off with clear water and neutralize with soda or ammonia solution. Use the same procedure if acid is spilled on clothing.

5. Re-install the battery in the unit making sure that the negative (—) terminal of the battery is connected to the negative (—) battery cable.

4-4. AIR CLEANER

The air cleaner this engine is equipped with, is a dry element type with a replaceable filter element. The air cleaner requires no initial service.

4-5. FUEL

Figure 4-2 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, and many other conditions will affect the fuel consumption of this engine.

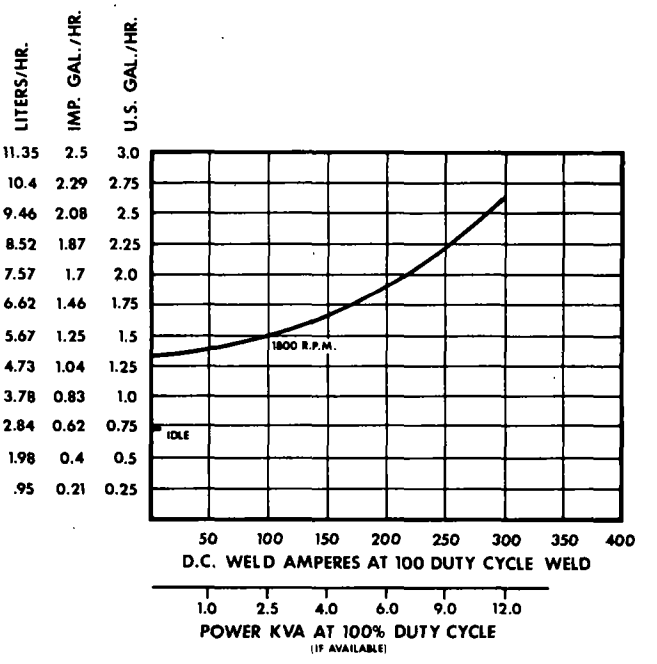

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Figure 4-2. Fuel Consumption Chart

CAUTION

Do not attempt to fill the fuel tank with the engine running. Do not fill the fuel tank completely as cold fuel will expand when exposed to outside temperature in a warm climate or to engine heat. If the tank is too full it will overflow causing a potential fire hazard. Never allow fuel to drain on the engine or other components.

The fuel tank is equipped with a trap area in the bottom of the tank, therefore; the tank will not go completely dry. This trap holds water and dirt back from the engine. A drain plug is located on the left, bottom of the tank to drain water and dirt from the tank if it should become necessary.

IMPORTANT

Use a good grade of "regular" gasoline, rated at least at 85 octane, for this engine. Fuels of lower octane ratings may cause detonations (knocking) which could result in damage to the engine. The fuel capacity of the fuel tank is 17.5 gallons (U.S. Measure).

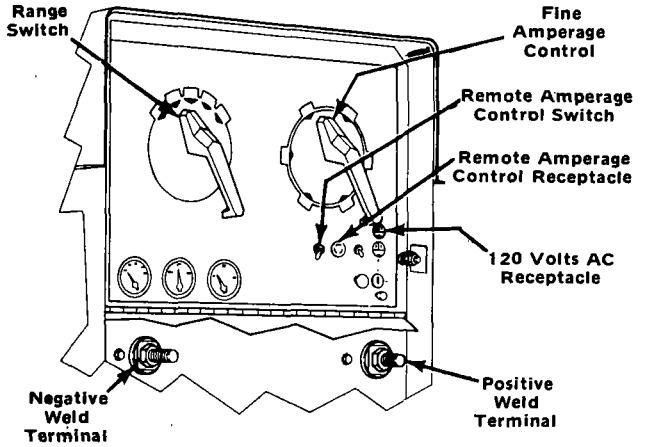

Figure 5-1. Generator Controls TB-004 284

5 - 1. 120 VOLTS AC RECEPTACLE (Figure 5-1) (For Optional 240 Volts AC Receptacle, See Section 5-9)

Up to 3 kva of 120 volts ac 50/60 Hertz power is available at this duplex receptacle for operating 120 volts ac or 120 volts universal power tools etc., when the welding generator is being operated at weld rpm.

The ac power output voltage will decrease in accordance with the load applied to power connections.

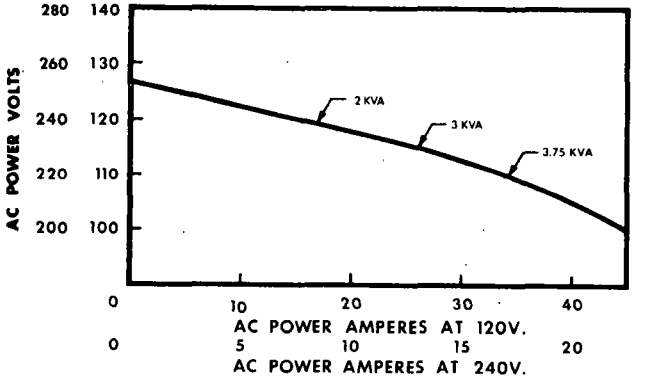

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Figure 5-2. AC Power Curve For 120 (And Optional 240) Volts AC Receptacle

5-2. RANGE SWITCH (Figure 5-1)

The Range switch permits selection of five different amperage ranges. Each of the five switch positions has its amperage range indicated on the scale above the Range switch handle.

IMPORTANT

Do not change the position of the Range switch while welding or under load, as this causes arcing across the contacts of the switch. This arcing causes the contacts to become pitted and eventually inoperative.

5 - 3. FINE AMPERAGE CONTROL (Figure 5-1)

The FINE AMPERAGE control permits the operator to select an exact welding amperage. This control allows adjustment of the welding amperage from minimum to maximum of the coarse amperage range selected by the Range switch.

NOTE

The contacts of the FINE AMPERAGE control are of the continuous contact type, thereby making it possible to fine adjust the amperage output while welding.

The scale surrounding the FINE AMPERAGE control is calibrated from 0 to 100 percent in increments of ten. Due to this percentage calibration, it should be noted that if the operator is using this scale to select a fine amperage setting, the operator is selecting a percentage of the coarse range in use and not an actual amperage value.

NOTE

The FINE AMPERAGE control must be rotated to the 100 (full counterclockwise) position whenever the 120/240 volts power plant is being utilized. The FINE AMPERAGE control may be in any position when using the 120 VOLTS AC duplex receptacle on the front panel.

5-4. REMOTE AMPERAGE CONTROL (Figure 5-1)

If a Remote Amperage Control is to be used, make connections from the control to the REMOTE AMPERAGE CONTROL receptacle as instructed in Section 3-4.

When remote control of the amperage is desired, it is essential that the REMOTE AMPERAGE CONTROL switch be placed in the REMOTE position. Likewise, if a Remote Amperage Control is not to be utilized, the switch must be in the STANDARD position. When in the STANDARD position only the FINE AMPERAGE control on the front panel will control the amperage.

When a Remote Amperage Control is being used, the remote control is functioning as a fine amperage adjustment of the FINE AMPERAGE control setting on the WELDING generator. For example: If the FINE AMPERAGE control on the welding generator is set at the 50% position, the Remote Amperage Control will provide (from min. to max. positions) fine amperage adjustment of one half of the welding generator output for the range selected by means of the Range switch. If full adjustment of the range selected is desired, the FINE AMPERAGE control on the welding generator must be set at 100% (max. position).

5-5. VOLT-AMPERE CURVES (Figure 5-3)

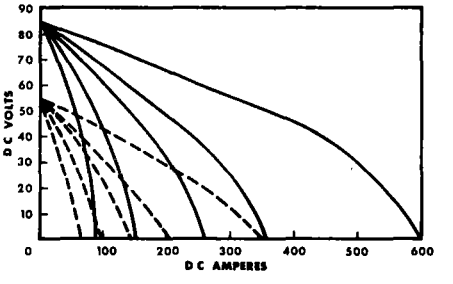

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Figure 5-3. Volt-Ampere Curves

The volt-ampere curves show the output voltage and current of the welding generator available at any point from the minimum to maximum of each coarse range. The FINE AMPERAGE control, controls the output between the minimum and maximum curves of each coarse range that is shown.

Load voltage is predetermined to a large extent by the arc characteristics. With the use of the volt-ampere curves it is possible to determine what the weld current will be at a particular arc voltage. Remember, the volt-ampere curves

show the minimum and maximum curves of each coarse range. When the FINE AMPERAGE control is adjusted, the volt-ampere curve will fall between the minimum and maximum curves of the particular coarse range in use.

5 - 6. DUTY CYCLE (Figure 5-4)

The duty cycle of a welding generator is the percentage of a ten minute period that a welding generator can safely be operated at a given output. This welding generator is rated at 100 percent duty cycle. This means that the welding generator can be safely operated at rated load continuously. If the welding amperes are increased beyond rated output, the duty cycle will decrease. Figure 5-4 enables the operator to determine the safe output of the welding generator at various duty cycles.

IMPORTANT

Exceeding the indicated duty cycle will cause damage to the internal components of the welding generator.

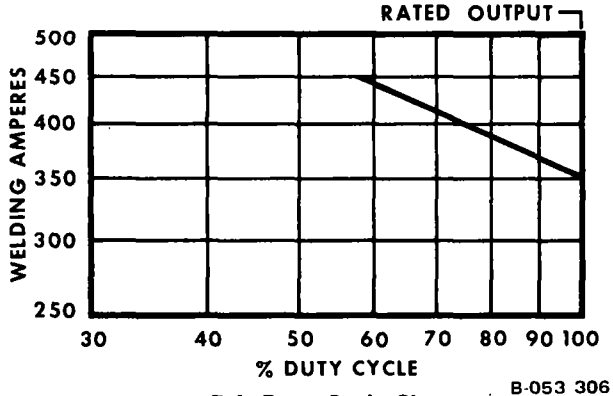


Figure 5-4. Duty Cycle Chart

5 - 7. POLARITY SWITCH (Optional)

The POLARITY SWITCH provides a means of selecting either DC STRAIGHT or DC REVERSE polarity without changing cable connections.

IMPORTANT

Do not change the position of the POLARITY SWITCH while welding or under load, as this causes arcing across the contacts of the switch. This arcing causes the contacts to become pitted and eventually inoperative.

NOTE

If the welding generator is equipped with a POLARITY SWITCH (Optional), the weld output terminals are labeled ELECTRODE and WORK.

To ensure that the weld current output will be in accordance with the labeling of the position on the POLARITY SWITCH, connect the electrode holder cable to the ELECTRODE terminal and the work cable to the WORK terminal.

5 - 8. METERS (Optional)

This welding generator can be equipped with meters. The meters are for monitoring the welding operation and serve as an indication of the welding process. These meters are internally connected to the welding generator output terminals. The voltmeter will indicate the voltage at the weld output terminals, not the actual voltage at the welding arc (due to cable resistance). The ammeter will indicate the current output of the welding generator.

5 - 9. 240 VOLTS AC DUPLEX RECEPTALCE (Optional) (Figure 5-1)

This welding generator is equipped with a voltage changeover terminal strip TE1 and proper stator to provide reconnection capbility for 240 volts ac. Although the capability for either 120 or 240 volts ac is present, an optional kit must be purchased if 240 volts is desired at the front panel.

A. Power Curve For Optional 240 VOLTS AC Duplex Receptacle (See Figure 5-2).

Up to 3 kva of 240 volts ac 50/60 Hertz power is available at the duplex receptacle for operating power tools, lights, etc., when the welding generator is being operated at weld rpm.

NOTE

The FINE AMPERAGE control may be in any position when using the 240 VOLTS AC duplex receptacle on the front panel.

The voltage will vary in accordance with the load applied to the 240 VOLTS AC receptacle. The voltage at various loads may be determined from Figure 5-2.

B. Installation Of 240 VOLTS AC Duplex Receptacle

CAUTION

Ensure that the engine is completely shut down before attempting any connections or examination of components on or near terminal strip TE1.

IMPORTANT

Before proceeding with this installation, familiarize yourself with the circuit diagram in the Troubleshooting Section of this manual.

NOTE

All directions, such as left or right, are with respect to the operator facing the welding generator front panel.

NOTE

Retain all hardware removed during this procedure for installation.

1. Shut down the welding generator and raise the right side panel.
2. Remove center bolt from insulation board (see Figure 5-5), remove and retain insulation board.

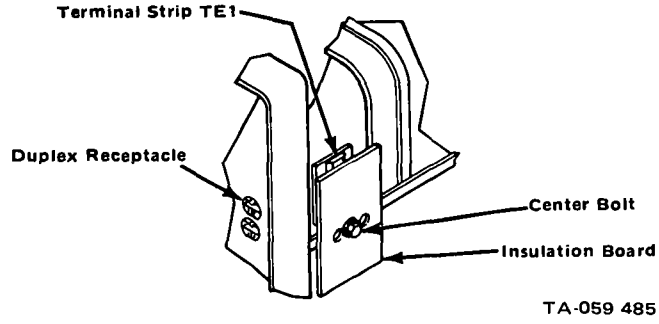


Figure 5-5. Location Of Reconnectable Components

3. Remove 120 VOLTS AC duplex receptacle RC1 located on front panel (see Figure 5-5). Remove leads and allow to hang free.

4. Connect leads removed from RC1 to the 240 volts ac duplex receptacle RC2 (one on each side of receptacle).

5. Install RC2 in front panel.

6. Affix supplied 240 VOLTS AC label over existing 120 VOLTS AC designation for duplex receptacle on nameplate.

7. Remove and retain jumper links from terminal strip TE1 (see Figure 5-6).

8. Move lead No. 3 (only lead on jumper link side) from terminal B to terminal A (same side of TE1). See Figure 5-6.

9. Position jumper links on TE1 for 240 volts (see Figure 5-6).

10. Install insulation board over TE1 and secure with bolt.

11. Lower right side panel of welding generator and resume operation.

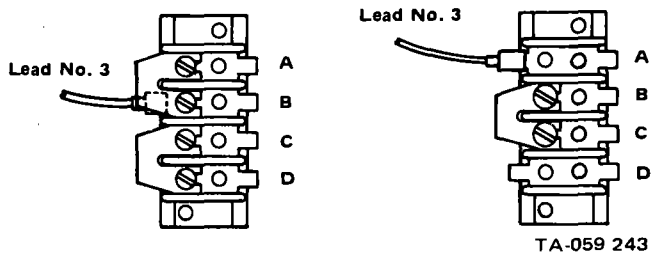


Figure 5-6. Jumper Link Arrangement For 120 And 240 Volts AC

SECTION 6 - FUNCTION OF ENGINE CONTROLS

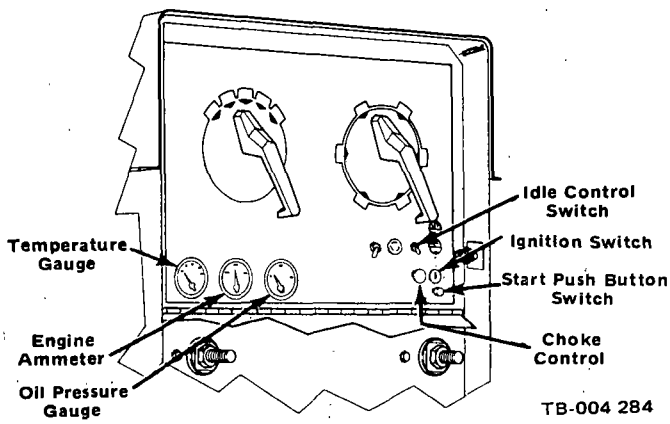


Figure 6-1. Engine Controls

6-1. CHOKE CONTROL (Figure 6-1)

A CHOKE control for varying the fuel-air mixture to the engine, is provided on the front control panel of the weld/power generator. When the CHOKE control is pulled fully out, very little air will be admitted to the engine thru the carburetor thereby supplying a richer mixture of fuel. This position is required if the engine is cold when started. As the engine warms up it will be necessary to push the CHOKE control inward slowly until it is pushed in as far as it will go. When the CHOKE control is fully in, the engine should be ready for operation.

6-2. START PUSH BUTTON AND SWITCH (Figure 6-1)

A START push button and key operated switch is provided on the front panel for starting and stopping the engine. Rotating the key operated Ignition switch fully clockwise to RUN, and pressing the START push button will engage the starter motor and start the engine. Once the engine has started, release the START push button. To stop the engine, rotate the key operated Ignition switch fully counter-clockwise to the OFF position.

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

This engine is equipped with an automatic idling device as standard equipment. When the idle control is being employed, the engine will remain at idle rpm when the generator is not loaded, thus saving fuel.

An IDLE CONTROL switch, located on the generator control panel, allows control over the operation of the automatic idling device. The IDLE CONTROL switch is labeled AUTOMATIC IDLE - LOCK OUT. The AUTOMATIC IDLE position allows the engine to idle until an arc is struck. The LOCK OUT position of the switch is used whenever it is necessary or desirable to operate the engine at constant weld rpm (1800). The LOCK OUT position must be used when 120 volts ac power is required from the 120 VOLTS AC receptacle or when the 7.5 kva power plant is being utilized.

The IDLE CONTROL switch AUTOMATIC IDLE position would usually be used when performing Shielded Metal Arc Welding (SMAW) as this process does not require a constant rpm. This only holds true if the 120 VOLTS AC receptacle is not being used. If accessory power tools are to be operated from the 120 VOLTS AC receptacle, or 120/240 volts ac terminals, place the IDLE CONTROL switch in the LOCK OUT position.

IMPORTANT

If 120 volts ac power equipment is going to be operated from the 120 VOLTS AC receptacle or 120/240 volts ac terminals, be sure the equipment is "off" until the engine is operating at full rpm. The same holds true when returning the engine to idle. If power tools are operated while the engine is idling, low voltage and frequency (resulting from the lower engine idling rpm) at the power receptacle may cause damage to the 120 volts equipment.

6-4. ENGINE AMMETER (Figure 6-1)

The ENGINE ammeter registers the charging current which is being supplied to the battery by the charging generator. It also registers a discharge equivalent to the amount of current being used by the engine electrical system when the generator is not charging.

6-5. TEMPERATURE GAUGE (Figure 6-1)

The Temperature gauge indicates the coolant temperature and will indicate when an overheated condition occurs.

6-6. OIL PRESSURE GAUGE (Figure 6-1)

The OIL PRESSURE gauge indicates the lubricating system pressure in pounds per square inch. Normally, the pressure indicated by the gauge should remain constant for a given engine rpm. Should the pressure fluctuate or drop, stop the engine and do not operate the engine again until trouble has been remedied.

6-7. ELECTRICAL TACHOMETER (OPTIONAL)

The ELECTRICAL tachometer is a 0-4000 rpm tachometer used to indicate engine rpm.

6-8. TOTAL HOUR METER (OPTIONAL)

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

SECTION 7 - SEQUENCE OF OPERATION

CAUTION

Never under any circumstances, operate the welding generator with any portion of the outer enclosure open or removed. In addition to being a hazard to personnel, weather protection to the internal components of the unit will be greatly reduced. Warranty is void if the welding generator is operated with any portion of the outer enclosure open or removed.

IMPORTANT

Make sure all electrical equipment connected to the 120 VOLTS AC receptacle and 120/240 volts ac terminal strip is turned off before starting the engine. The engine, when starting, has low rpm which causes low voltage at the output receptacle of the generator. This could result in damage to electrical equipment.

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

CAUTION

Prior to welding, it is imperative that proper protective clothing (welding coat and gloves) and eye protection (glasses and/or welding helmet) be put on. Failure to comply may result in serious or permanent bodily damage.

1. Ensure that the engine has been prepared as instructed in Section 4.
2. Make connections to the weld output terminals as required.
3. Place the Ignition switch in the OFF position.
4. Rotate the FINE AMPERAGE control to the desired setting.
5. If a Remote Amperage Control is not to be used, place the REMOTE AMPERAGE CONTROL switch in the STANDARD position. If a Remote Amperage Control is to be used, place the REMOTE AMPERAGE CONTROL switch in the REMOTE position.
6. Start the engine as instructed in Section 7-3.
7. Place the IDLE CONTROL switch in the desired position and commence welding.
8. The FINE AMPERAGE control (or remote amperage control if used) may be adjusted while welding.

7 - 2. POWER PLANT OPERATION

IMPORTANT

Make sure all electrical equipment connected to the 120 VOLTS AC receptacle and 120/240 volts ac terminal strip is turned off before starting the engine. The engine, when starting, has low rpm which causes low voltage at the output receptacle of the generator. This could result in damage to electrical equipment.

1. Ensure that the engine has been prepared for operation as instructed in Section 4.
2. Make connections to the 120/240 volts ac terminals as instructed in Section 3-5.
3. Rotate the FINE AMPERAGE control to the 100 (full counterclockwise) setting.
4. Start the engine as instructed in Section 7-3.
5. Place the IDLE CONTROL switch in the LOCK OUT position and commence operation.

7 - 3. STARTING THE ENGINE

IMPORTANT

Check the engine oil level and radiator coolant level. Make sure no loose parts etc. are laying in the unit. Make the necessary connections to the generator before attempting to start the unit. Fill the fuel tank with fresh gasoline.

1. Make all welding and electrical connections to the welding generator.
2. Place the IDLE CONTROL switch in the AUTOMATIC IDLE position. This should be done in order to permit the engine to warm up at idle rpm.
3. Choke the engine as necessary.
4. Rotate the Ignition switch to the RUN position.
5. Press the START push button.

IMPORTANT

Always ensure that the starter pinion and flywheel have stopped rotating before re-engaging the starter motor, otherwise the ring or pinion may be damaged.

6. When the engine starts, release the START push button. As the engine warms up, slowly push the CHOKE in.

7 - 4. ENGINE SHUT DOWN

1. Remove all weld and power loads from the generator.
2. Allow the engine to idle for a few minutes, allow a longer length of time if the engine has been operating at full load. This idling time is to ensure that the internal engine temperature has a chance to equalize.

IMPORTANT

Do not operate accessory power equipment from the 120 VOLTS AC receptacle or 120/240 volts terminals during the engine shutdown-idling period.

3. Place the Ignition switch in the OFF position.

SECTION 8 - GENERATOR MAINTENANCE

CAUTION

If any work is to be done on the rotor of the generator, remove the spark plugs from the engine. This will prevent engine compression from turning the rotor and catching the repairperson's hand between the rotor fan casting and the stationary adapter casting. Also disconnect the negative (-) battery cable from the battery.

8-1. GENERAL

Economical operation and trouble-free service of this weld/power generator are based upon regular inspections and reasonable attention.

Occasional blowing out of the unit with clean dry compressed air is recommended. This should be performed periodically, depending upon the location of the unit and the amount of dust and dirt in the atmosphere.

8-2. 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 rings and in turn destroy the carbon brushes.

8-3. WELDING CABLES

Check connections periodically for tightness. The cables should be inspected frequently and all breaks in the insulation should be repaired with electrical insulating tape or the cables replaced.

SECTION 9 - ENGINE MAINTENANCE

9-1. LUBRICATION

This engine will require at least 50 hours of running time to become fully broken in. During this period, the load on the engine should be kept as light as possible. The oil level should be checked a number of times during an operating day, as some engines will use oil during the break-in period. After about 50 hours of running time on the break-in oil, drain the oil and change the oil filter. Premium heavy duty oil, manufactured by any one of the major oil companies, should be used as a replacement oil. Table 9-1 gives a list of recommended grades and types of oil to use to keep oil level up during break-in and to use after the break-in oil is drained. The capacity of the engine with a filter change is 4-1/2 quarts, without a filter change, 4 quarts. Check the dip stick to make sure oil level is up to the required operating level.

IMPORTANT

Do not mix different brands of oils. Generally, motor oils fall into two categories: phosphate base, and sulphonate base. The phosphate base oils are acidic; the sulphonates are alkaline. Although both bases produce good oils, mixing the two bases produces a chemical reaction which greatly reduces the lubricating properties of either oil. The mixing of oils could cause extensive damage to the engine.

In normal operation, oil should be changed after about 50 hours of operation with a filter change every 150 hours. The oil should be drained after the engine has been warmed up to normal operating temperature, thus promoting foreign particle suspension in the oil and thereby removal when the oil is drained. Foreign particles tend to settle at the bottom of the crankcase when the oil is allowed to cool, thereby avoiding removal and thus contaminating the new oil added.

Table 9-1. Oil Selection Guide

Above 90 degrees Fahrenheit Not lower than 32 degrees	SAE 30 or 10W-30 SAE 20 or 20W 10W-30 or 10W-20
As low as 10 degrees above zero Fahrenheit	SAE 20W 10W-30 or 10W-20
As low as 10 degrees below zero Fahrenheit	SAE 10W 10W-30 or 10W-20
Lower than 10 degrees below zero Fahrenheit	SAE 5W or 5W-20

9-2. COOLANT SYSTEM

CAUTION

Caution should be exercised at all times when removing the radiator pressure cap. The cap will turn to an almost full open position, at which point a provision has been made to permit venting built up pressure within the radiator. Allow the pressure to escape before completely removing the cap from the radiator neck. When removing the cap, it is recommended that a glove or rag be used to protect the operator's hand from possible exposure to extremely hot coolant.

If the engine is to be operated in a temperature below $0^{o}F$, make sure a good grade of ethylene glycol anti-freeze is added to the coolant system. Change the coolant solution as often as necessary. The coolant system capacity is 9 quarts (U.S. Measure).

During the break-in period of a new engine, one of the greatest dangers is over-heating. There are several possible causes of over-heating, but the basic items for consideration are engine lubrication and coolant circulation.

At the first sign of over-heating, shut the engine down and make a thorough check to determine the cause.

Temperature of the engine coolant is regulated by a thermostatic valve located in the outlet at the front of the cylinder head. This unit retards the flow of coolant until a predetermined temperature is reached, usually varying between $170^{o}F$ and $180^{o}F$. When the desired temperature is achieved, the valve opens and free circulation of the coolant through the system begins.

IMPORTANT

If the thermostat should fail, replace it immediately. Ensure that the replacement has an equal temperature rating. Do not run the engine without a thermostat. If the thermostat remains closed, the engine will overheat. If the thermostat remains open, or the engine is run without a thermostat, the engine will run cold. As a result, excess carbon will accumulate and the oil will become contaiminated with sludge.

IMPORTANT

The engine fan and alternator belts are subject to normal wear and should be checked for proper tension periodically. Check and readjust tension after the first 50 hours of operation, and whenever belts are replaced.

9-3. GOVERNOR SERVICE

The governor speed setting and sensitivity setting are factory set to obtain correct weld rpm and engine response to changing load conditions. The governor speed control setting is factory locked with a lead seal. Do not remove this seal unless absolutely necessary.

NOTE

The governor, as used in conjunction with this engine, does not have a "No Load Surge" adjustment as described in the Engine Manual.

The engine is factory set to operate at 1200 rpm idle speed and 1800 rpm when it comes up to weld speed. For information concerning governor adjustment, refer to the Engine Manual, Page 41, paragraph entitled "Pierce Governor".

9-4. CARBURETOR FLOAT SETTING

A. Zenith Carburetor

NOTE

Do not bend, twist, or apply pressure on the float bodies. The float bodies when viewed from the free end of the bodies must be centered between and at right angles to the machined surface and must move freely on the float axle.

To ensure correct fuel level in the float chamber, check distance (dimension A, Figure 9-1) from top of floats to machined surface of throttle body (no gasket) with throttle body inverted. This dimension should be 1-5/32 inches plus or minus 1/32 inch. To increase or decrease distance from the top of the float bodies to the machined surface, use a long nose pliers and bend the float lever at a point close to the float body.

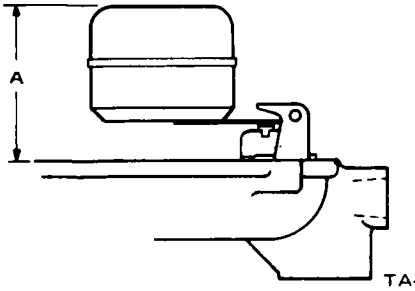


Figure 9-1. Carburetor Float Setting

B. Marvel-Schebler Carburetor

To ensure correct fuel level in the float chamber, check distance (dimension B, Figure 9-2) from top of floats to gasket face with throttle body inverted. This dimension should be 1/4". To increase or decrease distance from the top of the float bodies to the gasket face, use a long nose pliers and bend the float lever at a point close to the float body. The edge of the float should be kept parallel with the gasket.

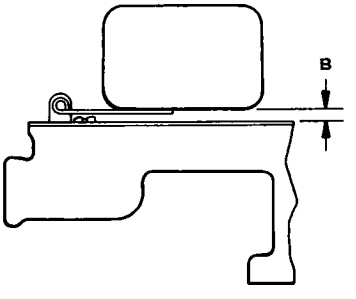


Figure 9-2. Carburetor Float Setting

9-5. VACUUM CIRCUIT AIR FILTER (Figure 9-3)

In order to provide clean air for the vacuum circuit, a brass fitting type air cleaner is provided on the underside of the idle control valve. See Figure 9-3 for location on the engine. This brass fitting will have to be removed and cleaned in gasoline or a suitable solvent periodically to ensure proper engine operation.

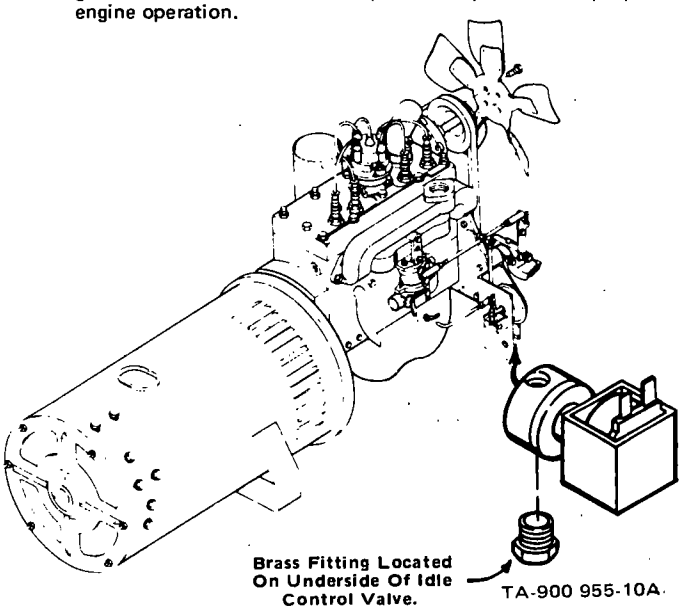


Figure 9-3. Vacuum Circuit Air Filter Location

9-6. IDLE CONTROL TIME DELAY ADJUSTMENT (Figure 9-4)

Operation of the idling device is automatic when the IDLE CONTROL switch is in the AUTOMATIC IDLE position. When the engine is started, engine rpm will remain at idle until an arc is established, at which time the engine immediately comes up to weld rpm. When the arc is broken, a time delay will exist before the engine begins to return to idle rpm. The length of this time delay is controlled by the setting of Screw "A" in Figure 9-4. This screw is located on the vacuum line fitting going into the intake manifold of the engine. Figure 9-4 shows the adjustment of this screw.

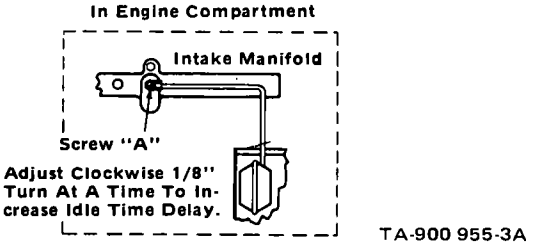


Figure 9-4. Idle Control Time Delay Adjustment

9-7. CARBURETOR AIR TEMPERATURE SELECTOR (Figure 9-5)

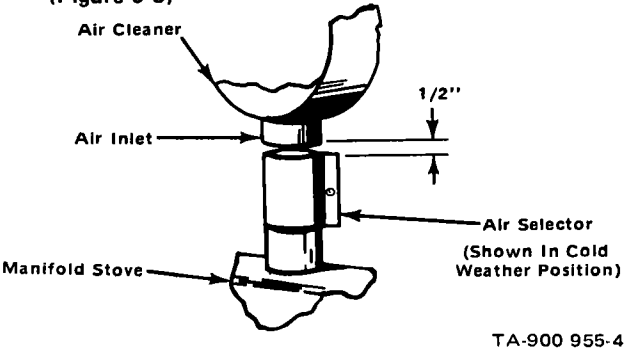


Figure 9-5. Carburetor Air Temperature Selector

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

Figure 9-5 shows the selector tube in the cold weather operating position. When the tube is in this position, it must remain about 1/2" away from the air cleaner inlet.

For warm weather operation, loosen the selector tube and slide it all the way down against the manifold and re-tighten.

9-8. AIR CLEANER SERVICE (Figure 9-6)

A. Daily Service

1. Open the engine compartment door nearest the air cleaner.
2. Make certain that the screen on the weather cap is free of dirt and foreign material.

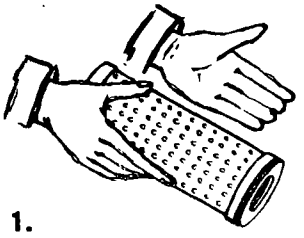
B. Weekly Service

Service paper element once every week under normal conditions or when loss of power is noted. Servicing element is accomplished in the following manner:

1. Remove filter element lock assembly and seal.
2. Inspect the gasket on the end of the element for damage. Wipe out inside of air cleaner housing before installing element. Do not use the element if the gasket is damaged or missing.
3. It is recommended that the element should be replaced after ten washings or at the end of the season, whichever comes first.

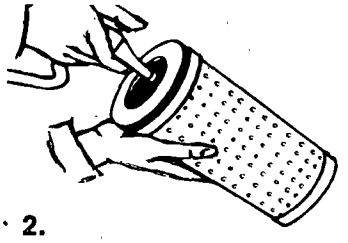
NOTE

When it becomes necessary to service the air cleaner in the field, follow the procedure outlined in Figure 9-6. It is recommended that a spare element always be kept on hand for replacement. New elements are available from your distributor.

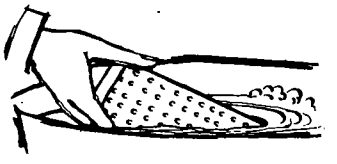


1. For a temporary expedient in the field, the element can be cleaned by tapping the side or the end carefully against the palm of the hand.

CAUTION: *Do not tap element against a hard surface. The element may be damaged by doing so.*



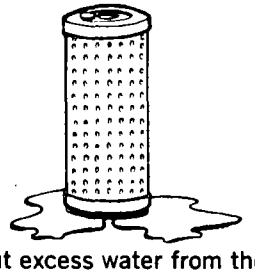
2. Compressed air, not to exceed 100 lbs. of pressure can clean the element. Insert nozzle inside the element and blow out dust. Clean dust from the outside of the element by holding the nozzle at least 6 inches from the element.



3. If compressed air is not available, or if soot, oily vapor, or any dirt is present which cannot be removed by compressed air, then the element is to be washed. Agitate element in warm water containing a non-sudsing detergent.

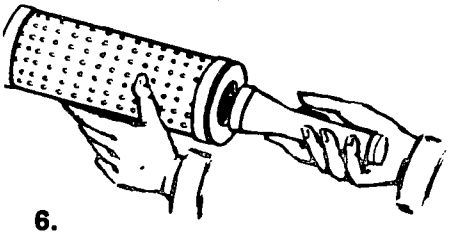
CAUTION: *Do not use water hotter than the hand can stand; solvents or oil; fuel oil, or gasoline.*

4. Reverse flush with clean water to thoroughly rinse all loosened foreign material from the filter.

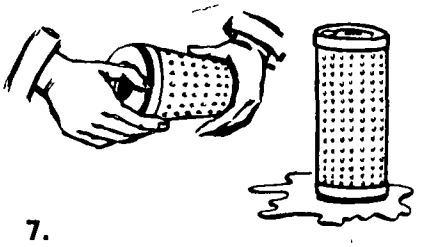


5. Shake out excess water from the element and allow to air dry.

CAUTION: *Do not attempt to remove excess water by using compressed air.*



6. An even fine pattern of light through the element, when a light is held inside the element, indicates that the element is clean. Any large spot of light indicates that the element is damaged and, therefore, is unfit for further use. Replace the element.



7. To minimize down time, created by waiting for the element to dry, it is suggested that the newly cleaned filter be replaced by a similar standby unit.

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Figure 9-6. Air Cleaner Service

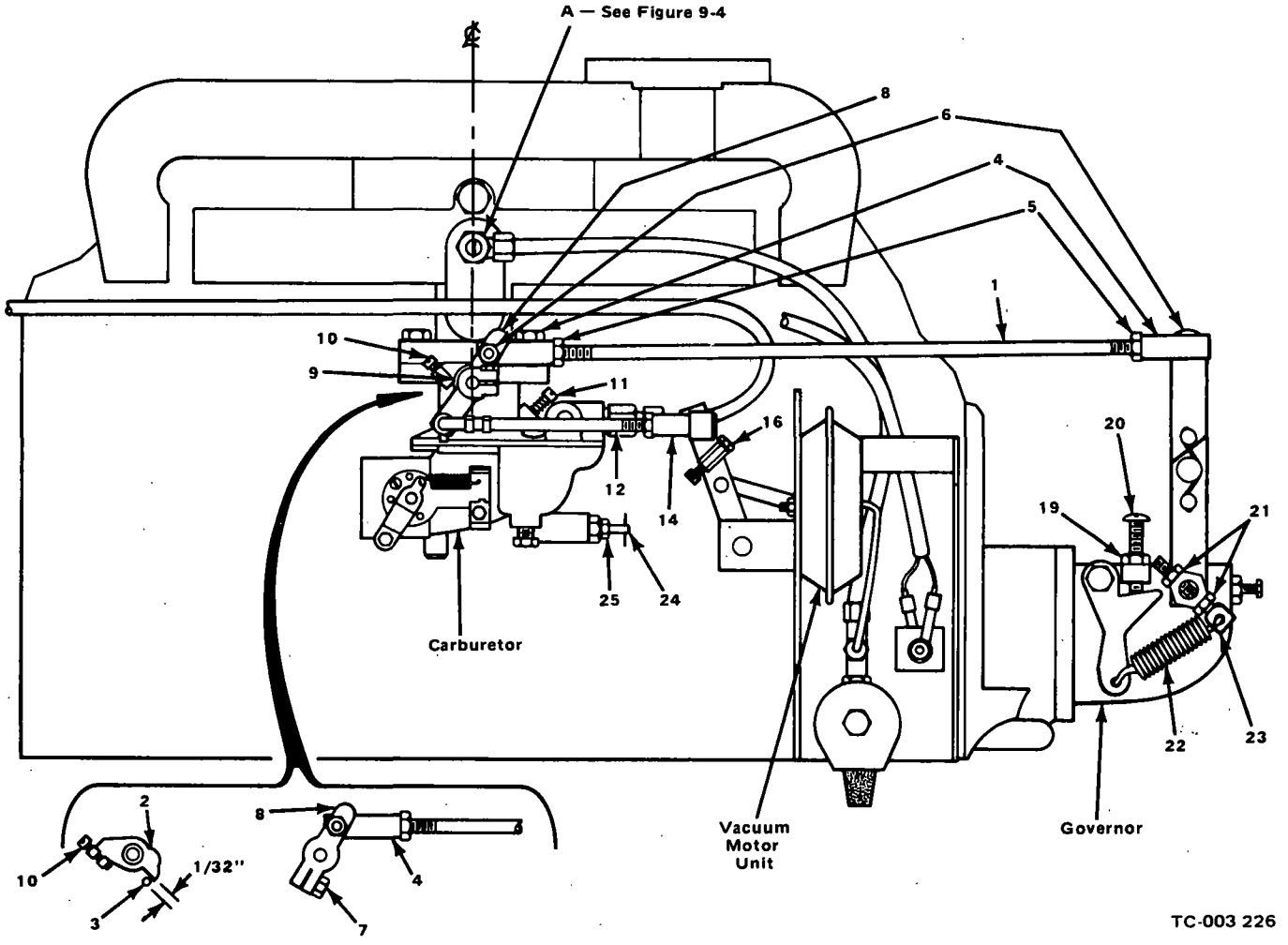


Figure 9-7. Idle Control/Governor Linkage Adjustment

9-9. IDLE CONTROL/GOVERNOR LINKAGE ADJUSTMENT (Figure 9-7)

In the event that proper engine idle and/or weld rpm is not being attained, perform the following procedures to calibrate the engine for proper idle and weld rpm:

1. Adjust the length of the governor linkage (item 1, Figure 9-7) so that the throttle stop plate (2) is about 1/32" from the stop (3). To adjust the linkage (1), loosen the linkage securing nuts (5) and remove the hardware (6) securing the linkage socket(s) (4) to the governor and carburetor. Rotate the linkage socket(s) (4) accordingly to obtain the 1/32" gap. Clockwise rotation of the linkage socket(s) (4) will shorten the governor linkage (1) and thus reduce the gap. Conversely, counterclockwise rotation of the linkage socket(s) (4) will lengthen the governor linkage (1) and thus increase the gap.

2. Rotate the linkage socket(s) (4) slightly until the sockets (4) are parallel but in opposite directions with respect to each other. Secure the linkage socket nuts (5) to lock the position of the linkage socket(s) (4).

IMPORTANT

Check the linkage (1) for freedom of movement throughout its entire travel. If the linkage (1) is binding due to the linkage socket(s) (4) being cocked relative to each other, repeat Step 2.

3. Loosen the alignment screw (7) and position the arm (8) radially and laterally until the following conditions are simultaneously met:

   A. Position the arm (8) laterally so that the carburetor linkage socket (4) does not touch the throttle stop plate (2) throughout its entire travel.

   B. Position the arm (8) radially so that the arm (8) travels an equal distance to either side of an imaginary center line drawn perpendicular to the center of the throttle shaft (9).

   Tighten the alignment screw (7) and recheck the adjustments made in Steps 1 and 2.

CAUTION

Before starting the engine and while working on the engine, ensure that body limbs are clear of the fan and of the vacuum motor unit.

4. Recheck all connections made thus far. Place the IDLE CONTROL switch in the LOCK OUT position. Start the welding generator engine and allow the engine to reach normal operating temperature (about five minutes). Ensure that the CHOKE control is pushed fully in at this time.

5. Pull the arm (8) toward the front of the welding generator to the idle position. Maintain pressure on the arm (8) to butt the idle screw (10) against the stop (3) throughout the following adjustments:

   A. Rotate the idle screw (10) to obtain 400 rpm. Clockwise rotation of the screw (10) will increase engine rpm whereas counterclockwise

rotation of the screw (10) will decrease engine rpm.

B. Rotate the idle mixture adjustment screw (11) clockwise until the engine begins to falter or roll, then rotate the screw (11) counterclockwise until the engine operates smoothly. Rotating the screw (11) clockwise restricts the air flow, making the air-fuel mixture richer. Rotating the screw (11) counterclockwise admits more air, making the air-fuel mixture leaner.

6. Connect the vacuum motor linkage (12) from the vacuum motor unit to the carburetor.

7. Manually pivot the vacuum motor arm (14) until screw (16) butts against the vacuum motor unit mounting plate. If this is not possible due to the idle screw (10) butting against the stop (3) before the screw (16) butting against the mounting plate, adjust screw (16) so that screw (16) butts against the vacuum motor unit mounting plate before idle screw (10) butts against stop (3).

IMPORTANT

Ensure that the screw (16) butts against the mounting plate before the idle screw (10) butts against the stop (3) prior to placing the IDLE CONTROL switch in the AUTOMATIC IDLE position.

8. Place the IDLE CONTROL switch in the AUTOMATIC IDLE position. Operation of the idling device is automatic when the IDLE CONTROL switch is in the AUTOMATIC IDLE position. Once the engine is started, engine rpm will remain at idle until an arc is established, at which time the engine immediately comes up to weld rpm. When the arc is broken, a time delay will exist before the engine begins to return, to idle rpm. The length of this time delay is controlled by the setting of the time-delay screw "A" in Figure 9-4. If the engine does not go to idle rpm after about ten seconds, adjust the time-delay screw (A) for the desired time delay. This screw is located on the vacuum line fitting going into the intake manifold of the engine. Figure 9-4 shows the adjustment of this screw.

9. When the engine has gone to idle rpm, adjust screw (16) until 1050 rpm is obtained.

NOTE

Do not readjust the idle rpm screw (10) when adjusting the vacuum motor idle rpm.

IMPORTANT

Check the linkage (12) for freedom of movement throughout its entire travel. If the linkage (12) is binding due to the linkage socket (14) being cocked relative to the linkage (12) fixed end adjust the length of the linkage and repeat Steps 7, 8, & 9.

10. Place the IDLE CONTROL switch in the LOCK OUT position. Loosen the governor speed adjusting screw securing nut (19). Adjust the governor speed adjustment screw (20) until a high idle rpm of 1800 is obtained. Tighten the securing nut (19) to maintain the governor speed setting.

11. Check the governor engine regulation by applying and removing the engine load. If a governor sensitivity adjustment is deemed necessary, loosen one of the two locking nuts (21) and proceed with the following instructions:

A. IF REGULATION RANGE IS TOO BROAD – Decrease the governor spring (22) tension by sliding the sensitivity adjustment screw (23) inward.

B. IF REGULATION RANGE IS TOO NARROW – Increase the governor spring (22) tension by sliding the sensitivity adjustment screw (23) outward.

C. IF ENGINE SURGES (HUNTS) UNDER LOAD – Increase the governor spring (22) tension by sliding the sensitivity adjustment screw (23) outward.

12. Tighten the two locking nuts (21) to maintain the desired governor sensitivity. Readjust the governor sensitivity by repeating Step 11.

NOTE

Whenever the governor sensitivity (Step 11) is adjusted, the governor speed (Step 10) must be readjusted. Whenever the governor speed (Step 10) is adjusted, the governor sensitivity (Step 11) may need readjustment.

9-10. HIGH ALTITUDE CARBURETOR MODIFICATION (Optional) (Figure 9-8)

The Zenith carburetor may be equipped with an adjustable main jet for high altitude operation (above 4000 ft). Minor adjustment will be necessary for proper operation at a particular altitude. Whenever a carburetor adjustment is deemed necessary, refer to figure 9-8 and proceed as follows:

Loosen the main adjustment screw locking nut (1). Apply a near full engine load to the welding generator. Rotate the main adjustment screw (2) clockwise until the engine begins to falter and lose rpm. Rotate the main adjustment screw (2) counterclockwise until the engine operates smoothly, then continue counterclockwise rotation for 1/4 turn. Rotating the screw (2) clockwise restricts the fuel flow, making the air-fuel mixture leaner. Rotating the screw (2) counterclockwise admits more fuel, making the air-fuel mixture richer. Remove the engine load. Tighten the locking nut (1).

IMPORTANT

Restricting the fuel flow to the point where the mixture is too lean will cause valve burning.

9-11. KEY TYPE IGNITION SWITCH LUBRICATION (If Applicable)

Periodically, depending on the location of the unit and the amount of moisture in the air, or when binding is noticed, remove the key and lubricate the Ignition switch by spraying a generous amount of lubricant into the key slot. Wipe excess off of the nameplate. It is recommended that lubriplate "chain and cablefluid" which is non-gumming and is also an anti-oxidant and penetrating oil or a similar product be used.

9-12. 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.

IMPORTANT

The engine exhaust system on this welding generator has not been equipped with a spark arrestor unless it was specifically 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.

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.

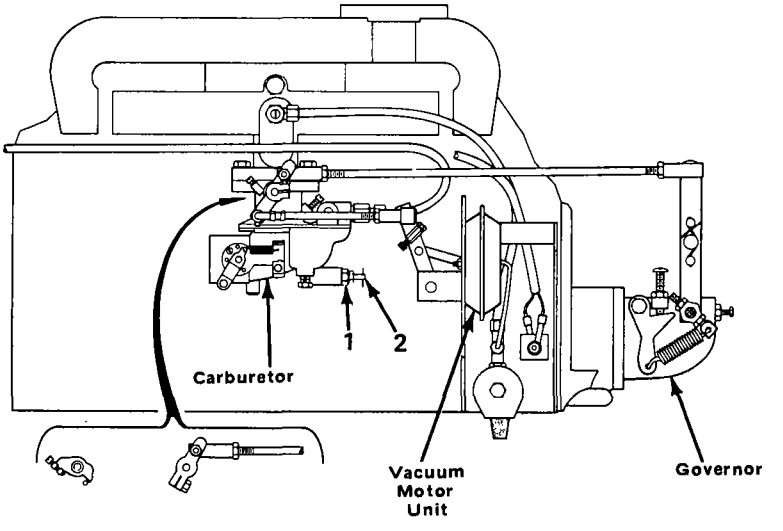


Figure 9-8. High-Altitude Carburetor Adjustment

SECTION 10- TROUBLESHOOTING

CAUTION

Hazardous voltages are present on the internal circuitry of the welding generator while the engine is running. Shut down the engine before attempting any inspection or work on the inside of the unit. Troubleshooting of internal circuitry should be performed by qualified personnel only.

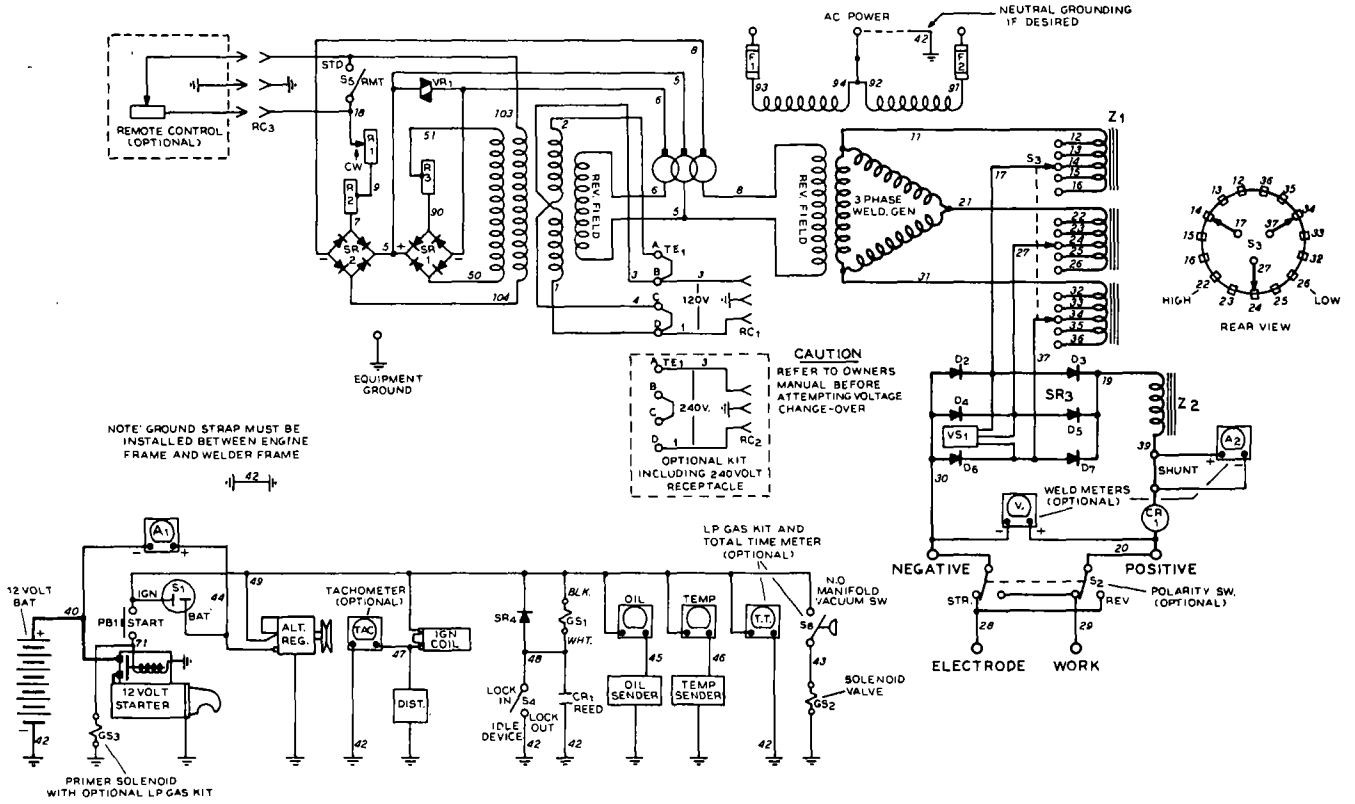
The following chart is designed to diagnose and provide remedies for some of the troubles that may develop in this welding generator.

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.

Use this chart 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
No weld output or 120/240 volts output from 120/240 volts ac terminals. 120 VOLTS AC receptacle RC1 output is normal.	REMOTE AMPERAGE CONTROL switch S5 is in REMOTE position with no remote amperage control connected to welding generator.	Place the REMOTE AMPERAGE CONTROL switch S5 in the STANDARD position or connect a remote amperage control to the REMOTE AMPERAGE CONTROL receptacle RC2.
	Remote amperage control plug is not secure in REMOTE AMPERAGE CONTROL receptacle RC2.	Insert remote amperage control plug fully into receptacle RC2 and rotate as far as possible in a clockwise direction.
No output from 120/240 volts ac terminals. Weld output is normal as well as output from 120 VOLTS AC receptacle RC1.	*Fuse F1 and/or F2 is open.	Check and replace fuses F1 or F2 as required.
	Loose connections at 120/240 volts ac terminals.	Secure connections.
	Defective power winding.	Have power winding replaced at authorized service station.
No output from 120 VOLTS AC receptacle RC1. Weld output as well as 120/240 volts power plant output is normal.	Loose connection at 120 VOLTS AC receptacle RC1.	Secure all connections to 120 VOLTS AC receptacle RC1.
	Defective 120 volts ac winding.	Have 120 volts ac winding replaced at authorized service station.
No weld or ac power output.	Defective brushes.	Replace brushes.
	Defective rotor.	Have rotor replaced at authorized service station.
Erratic weld current.	Damp or defective electrodes.	Use new, dry electrodes.
	Loose or dirty connections.	Check connections both inside and outside of welding generator.
	Check leads and contacts of the RANGE switch S3.	Discoloring of brass contacts could indicate heating caused by loose connection. Replace contact or switch plate of S3.
Engine speed remains at idle rpm when arc is struck and IDLE CONTROL switch S2 is in AUTOMATIC IDLE position.	Magnetic field not closing reed switch CR1.	Replace CR1.
	Coil of idle control solenoid valve GS1 burned out.	Apply 12 vdc to solenoid coil GS1 and check for proper operation.
	Filter on solenoid plugged.	Clean filter. See Section 9-8 for cleaning procedure.
Engine will not return to idle rpm when arc is broken and IDLE CONTROL switch S2 is in AUTOMATIC IDLE position.	Idle control valve GS1 closed.	Open valve GS1 by turning in a counterclockwise direction.
	Idle control valve GS1 plugged.	Remove and clean GS1.
	Leak in vacuum line.	Check line.
	Shorted IDLE CONTROL switch S2.	Check switch S2 with ohmmeter.

*If it becomes necessary to replace any fuse in the welding generator, ensure that a fuse of the proper size is used.



Circuit Diagram No. CB-901 775-1C1

Figure 10-1. Circuit Diagram

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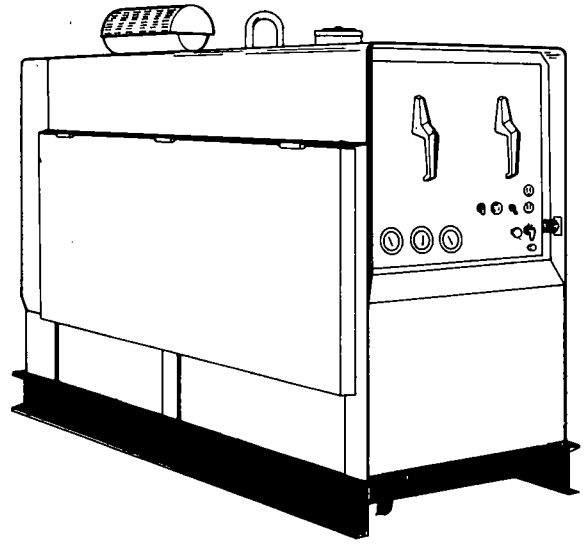

PARTS LIST

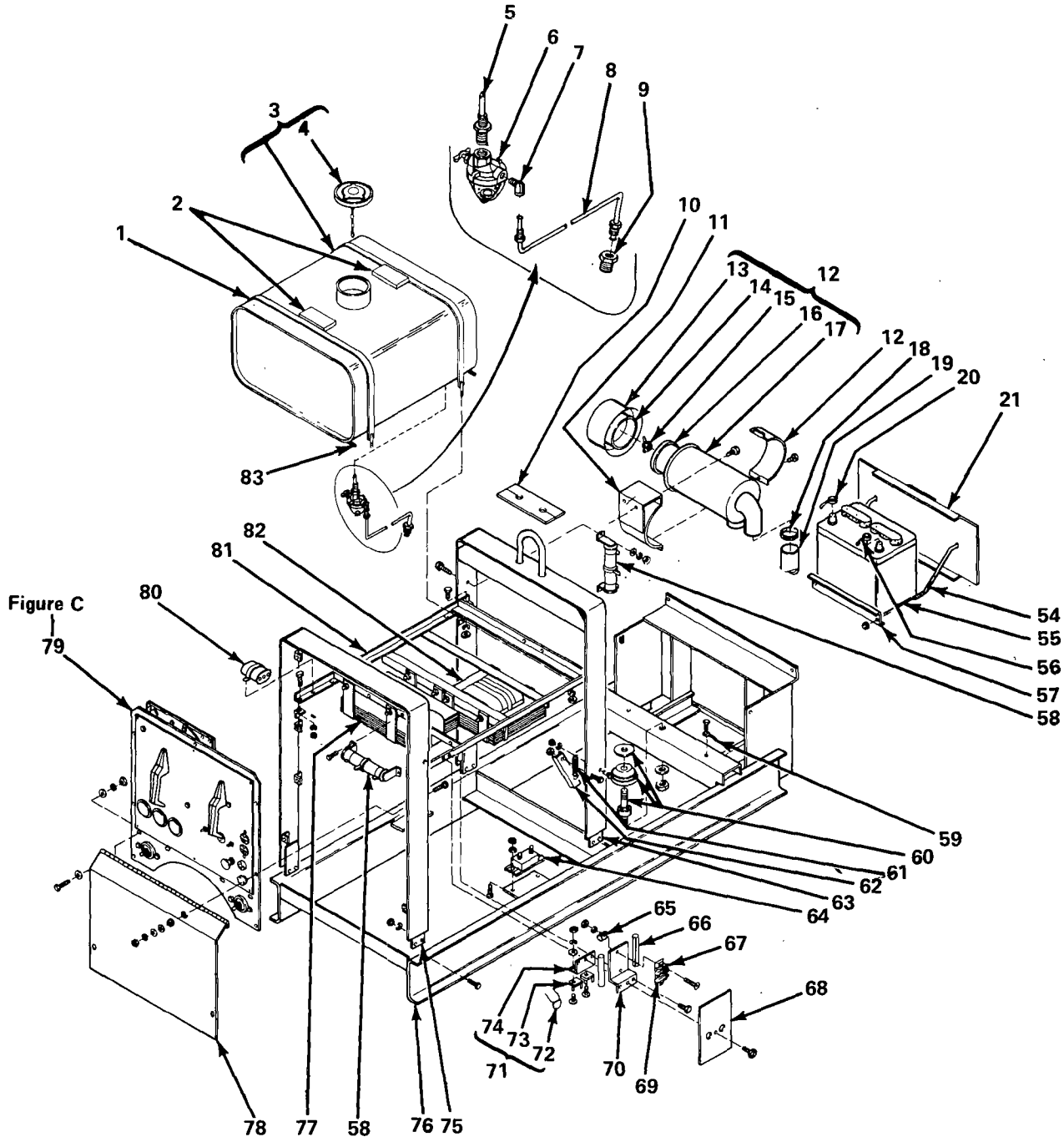

Figure A — Main Assembly

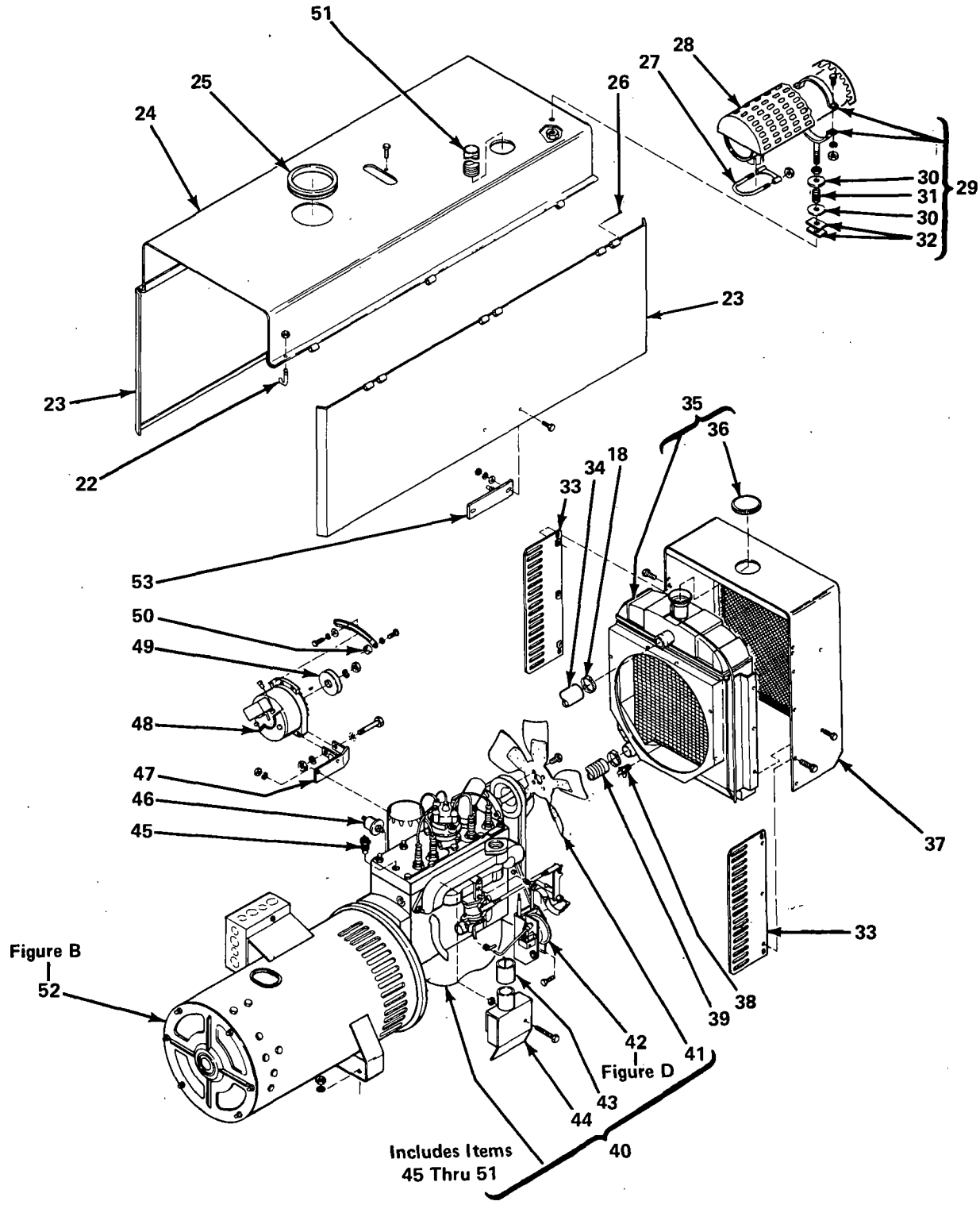
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Figure B
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Figure D
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Includes Items
45 Thru 51

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Item No.	Dia. Mkgs.	Factory Part No.	Description	Quantity
Figure A			**Main Assembly**	
1		017 430	STRAP, mounting - fuel tank	2
2		010 434	STRIP, rubber 1/2 x 2 x 2	2
3		006 698	TANK, fuel (consisting of)	1
4		018 858	. CAP, tank - fuel	1
		602 938	FITTING, pipe - galvanized plug	1
5		010 870	FITTING, pipe - brass nipple hex 1/8 NPT	1
6		010 318	VALVE, shut-off - w/strainer	1
7		006 014	FITTING, brass - flared inverted elbow male 1/4 x 1/8 NPT	2
8		007 829	LINE, fuel (used with Marvel - Schebler carburetor)	1
9		010 289	FITTING, brass - flared inverted connector male 1/4 TBG x 1/8 NPT	1
10		017 479	SEAL, weather - lift eye	1
11		031 868	BRACKET, mounting - air cleaner	1
12		018 765	AIR CLEANER, intake - carburetor dry type (consisting of)	1
13		018 859	. CAP, air cleaner - intake	1
14		008 698	. BAFFLE, dust - cap	1
15		010 433	. NUT, wing - steel 7/16-20	1
16		*017 309	. ELEMENT, air cleaner	1
17		018 861	. BODY, air cleaner	1
		000 272	. CLAMP, air cleaner	1
18		010 861	CLAMP, hose 1-1/16-2 clamp dia	5
19		018 365	HOSE, intake - air	1
20		023 626	CABLE, battery - insulated	1
21		022 899	DOOR, access - battery	1
22		010 515	BOLT, J 5/16-18	4
23		005 612	DOOR, side	2
24		008 766	COVER, top	1
25		035 968	WASHER, neoprene 5-7/8 x 3-5/8 x 1/16	1
26		027 529	PIN, cotter 1/4 x 3-1/2	6
27		010 875	CLAMP, muffler 2 inch dia	1
28		*028 262	MUFFLER, exhaust	1
29		015 700	BRACKET ASSEMBLY, mounting - muffler (consisting of)	1
30		010 955	. WASHER, flat - steel 13/32 ID x 2 OD x 1/8	2
31		073 355	. SPRING, compression	1
32		027 564	. SPACER, anti - noise	2
33		053 724	GUARD, fan	2
34		017 363	HOSE, radiator - upper	1
35		028 404	RADIATOR (consisting of)	1
36		605 982	. CAP, radiator 7 lb pressure	1
37		008 777	ENCLOSURE, radiator	1
38		006 015	FITTING, pipe - brass drain cock 1/4 NPT	1
39		006 037	HOSE, radiator - lower	1
40		005 112	ENGINE, gas - electric start (consisting of)	1
41			. BLADE, fan (included with engine - see engine parts list)	1
42		018 757	. CONTROL, weld/idle vacuum (See Fig. D Page 10)	1
43		017 594	. CLAMP, stove - manifold	1
44		020 365	. STOVE, manifold	1
45		025 453	. SENDER, temperature	1
46		025 884	. SENDER, pressure - oil	1
47		025 182	. BRACKET, mounting - alternator	1
48		605 429	. ALTERNATOR, 35 amp 12 volts negative ground	1
		026 837	. INSULATOR, terminal - nylon (engine alternator)	1
49		605 430	. PULLEY, single belt	1
50		025 181	. TUBING, steel 5/8 OD x 12 ga wall x 1/2	1
51		005 108	. PIPE, black 1-1/2 x 15	1
		010 089	. FITTING, pipe - brass coupling 1/8 NPT	1
52		Figure B	GENERATOR ASSEMBLY (See Page 6)	1
53		017 421	CATCH, door	2
54		017 477	ROD, holddown - battery	2
55	Batt	*015 709	BATTERY, 12 volts 53 amp	1
56		023 641	CABLE, battery - uninsulated	1
57		017 431	HOLDER, battery	1

Item No.	Dia. Mkgs.	Factory Part No.	Description	Quantity
Figure A			**Main Assembly (Cont'd.)**	
58	R2,3	030 060	RESISTOR, WW adj 375 watt 20 ohm	2
59		023 892	CABLE, ground	1
60		007 894	MOUNT, engine	1
61		010 266	SPRING, extension	2
62		017 420	LATCH, door	2
63		004 444	UPRIGHT, base - center	1
64		000 553	MOUNT, dual stud - generator	2
65		010 144	CLAMP, nylon 7/16 dia	1
66		603 107	HOSE, neoprene - slit 5/32 ID x 11/32 OD (order by foot)	1 ft.
67	TE1	038 621	BLOCK, terminal 30 amp 4 pole	1
68		053 967	INSULATION, rectifier	1
69		038 620	LINK, jumper - terminal block	2
70		052 372	BRACKET, mtg. - terminal strip	1
71		035 860	RECTIFIER ASSEMBLY (consisting of)	1
72	VR1	038 493	. VARISTOR, 3 joule 390 volts	1
73	SR1,2	035 704	. RECTIFIER, integrated 6 amp 600 volts	2
74		031 926	. HEAT SINK, rectifier	1
75		008 780	UPRIGHT, base - front	1
76		004 291	BASE	1
77	Z1	036 259	REACTOR (consisting of)	1
		025 138	. COIL, left hand	1
		025 139	. COIL, center	1
		025 140	. COIL, right hand	1
78		004 556	DOOR, access - front lower or	
78		031 318	PANEL, hinged - lower right (used when unit has TAC)	1
79		Figure C	PANEL, front - upper with components (See Page 8)	1
80	VS1	025 932	SUPPRESSOR, 0.75 uf 10 ohm w/leads	1
81		028 218	FRAME, mounting - reactor & stabilizer	1
82	Z2	031 220	STABILIZER	1
83		603 125	STRIP, cotton 1/8 x 4 (4 ft req'd - order by ft)	4 ft.
		004 426	KIT, label (includes all labels)	1
			Parts for Optional Equipment	
	A2	025 103	METER, amp dc 50MV 0-600 scale	1
	RC2	604 103	RECEPTACLE, straight - duplex grounded 2P3W 15 amp 250 volts	1
		025 234	CAP, straight - grounded 2P3W (used with RC2)	1
	S4	031 317	SWITCH & TERMINAL, polarity & power output (consisting of)	1
		027 847	. BRACKET, mounting - switch & terminal board	1
		038 311	. INSULATOR, switch - polarity	1
		011 281	. SWITCH, polarity (consisting of)	1
		010 082	.. TUBING, steel 5/8 OD x 5/32 wall x 1/2 lg	2
		010 805	.. HANDLE, switch	1
		011 948	.. GUIDE, contact - switch	2
		019 603	.. KNOB, ball	1
		024 694	.. BEARING	1
		038 769	.. CONTACT BOARD ASSEMBLY, movable	1
		103 633	.. BUS BAR	2
		103 634	.. MOUNTING BOARD	1
		604 318	.. NUT, steel - self-locking hex 1/4-20	1
		039 046	. TERMINAL BOARD, power output - black (consisting of)	2
		039 044	.. BUS BAR	1
		039 045	.. TERMINAL BOARD, black	1
		053 032	.. CLIP, spring - bus bar	1
		601 976	.. SCREW, cap - steel hex hd 1/2-13 x 1-1/2	1
		601 880	.. NUT, steel - hex jam 1/2-13	1
		601 879	.. NUT, steel - hex full 1/2-13	1
		027 851	COVER, switch & terminal board	1
	Shunt	030 084	SHUNT, meter 50MV 600 amp	1
	TAC	032 936	TACHOMETER, electric 12 volts 4000 rpm	1

Item No.	Dia. Mkgs.	Factory Part No.	Description	Quantity
Figure A			**Main Assembly (Cont'd.)**	
		017 390	BRACKET, mtg. - tachometer	1
		020 374	BRACKET, mtg. - tachometer to engine	1
	TT	032 936	METER, hour 4-40 volts	1
	V	025 638	METER, volts dc 0-100 scale	1
		027 561	MUFFLER, exhaust - low noise	1
		010 429	JET, carburetor - high altitude	1
		010 875	CLAMP, muffler 2 inch dia	2
		031 466	PIPE, black 1-1/2 x 4-3/4	1

*Recommended Spare Parts.

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

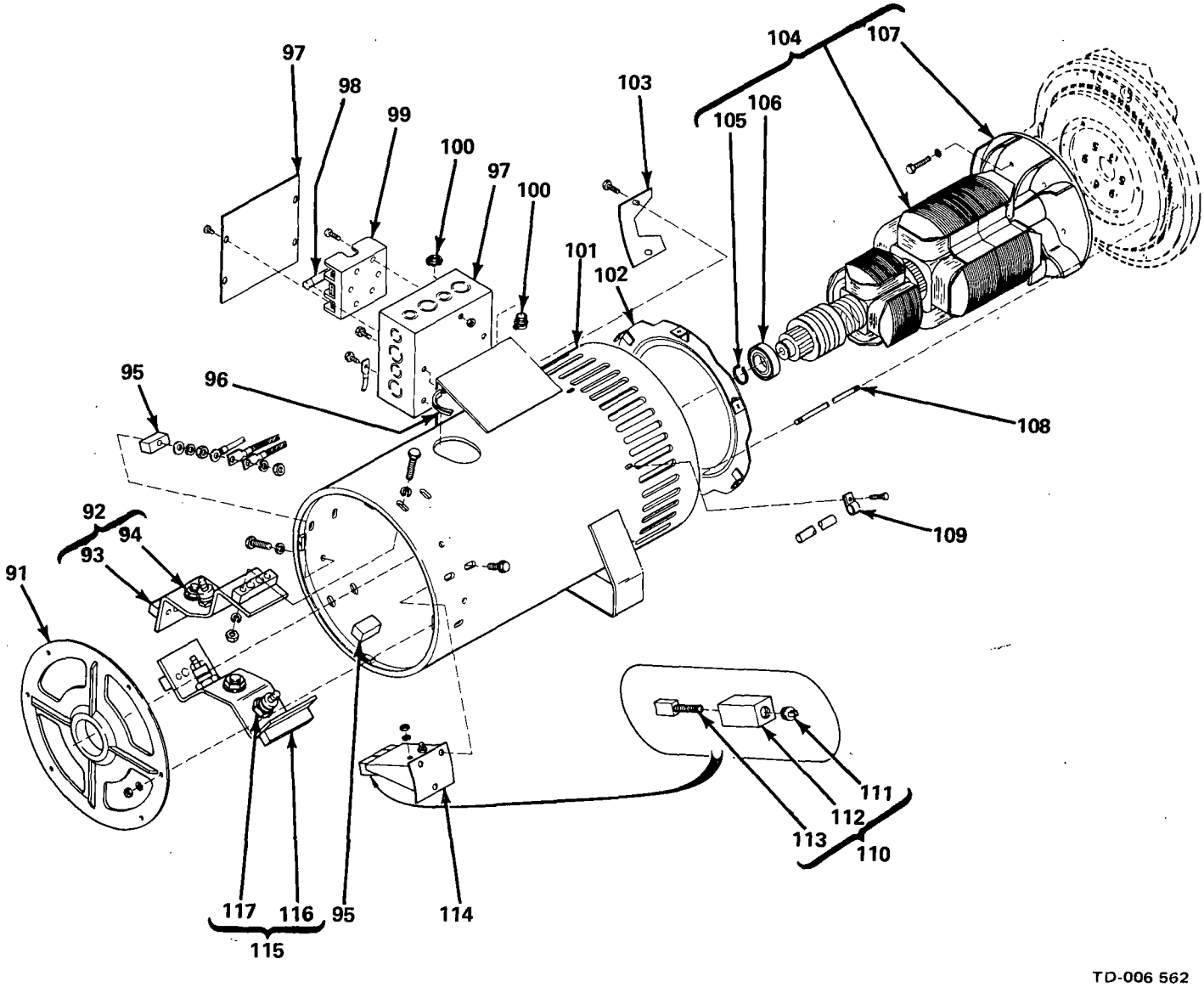

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Figure B — Generator Assembly

Item No.	Dia. Mkgs.	Factory Part No.	Description	Quantity
Figure B			**Generator Assembly (See Fig. A Page 3 Item 52)**	
91		025 271	ENDBELL	1
92	SR3	025 517	DIODE ASSEMBLY, reverse polarity (consisting of)	1
93		025 305	. INSULATOR	2
94		037 957	. DIODE, 275 amp 250 volts reverse polarity	3
95		025 306	INSULATOR	5
96		026 203	CHANNEL, neoprene 1/4 inch x 11-1/2 long	1
97		039 269	BOX, fuse - holder	1
98	F1,2	*012 625	FUSE, cartridge 45 amp 250 volts	2
99		039 169	HOLDER, fuse cartridge 60 amp 250 volts	1
100		010 493	BUSHING, snap 5/8 ID 7/8 mounting hole	1
101		059 017	STATOR	1
102		039 207	BAFFLE, air	1
103		032 311	GUARD, generator	1
104		**003 632	ROTOR, generator (consisting of)	1
105		024 617	. RING, retaining - external	1
106		053 390	. BEARING, ball	1
107		035 917	. FAN, rotor	1
		035 776	. KEY, steel 3/8 x 3/8 x 2	1
108		025 525	ROD, threaded end	6
109		010 021	CLAMP, steel cushion 9/16 dia x 11/32 hole	2
110		018 614	BRUSH SET (consisting of)	1
111		018 665	. CAP, brush holder	1
112		600 270	. BRUSH HOLDER	1
113		*020 034	. BRUSH, contact	1
114		025 321	BRACKET, mounting - brush holder	1
115	SR3	025 516	DIODE ASSEMBLY, straight polarity (consisting of)	1
116		025 305	. INSULATOR	2
117		037 956	. DIODE, 275 amp 250 volts straight polarity	3

*Recommended Spare Parts.

**Rotor is available on an exchange basis. Contact Factory Service Department for details.

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

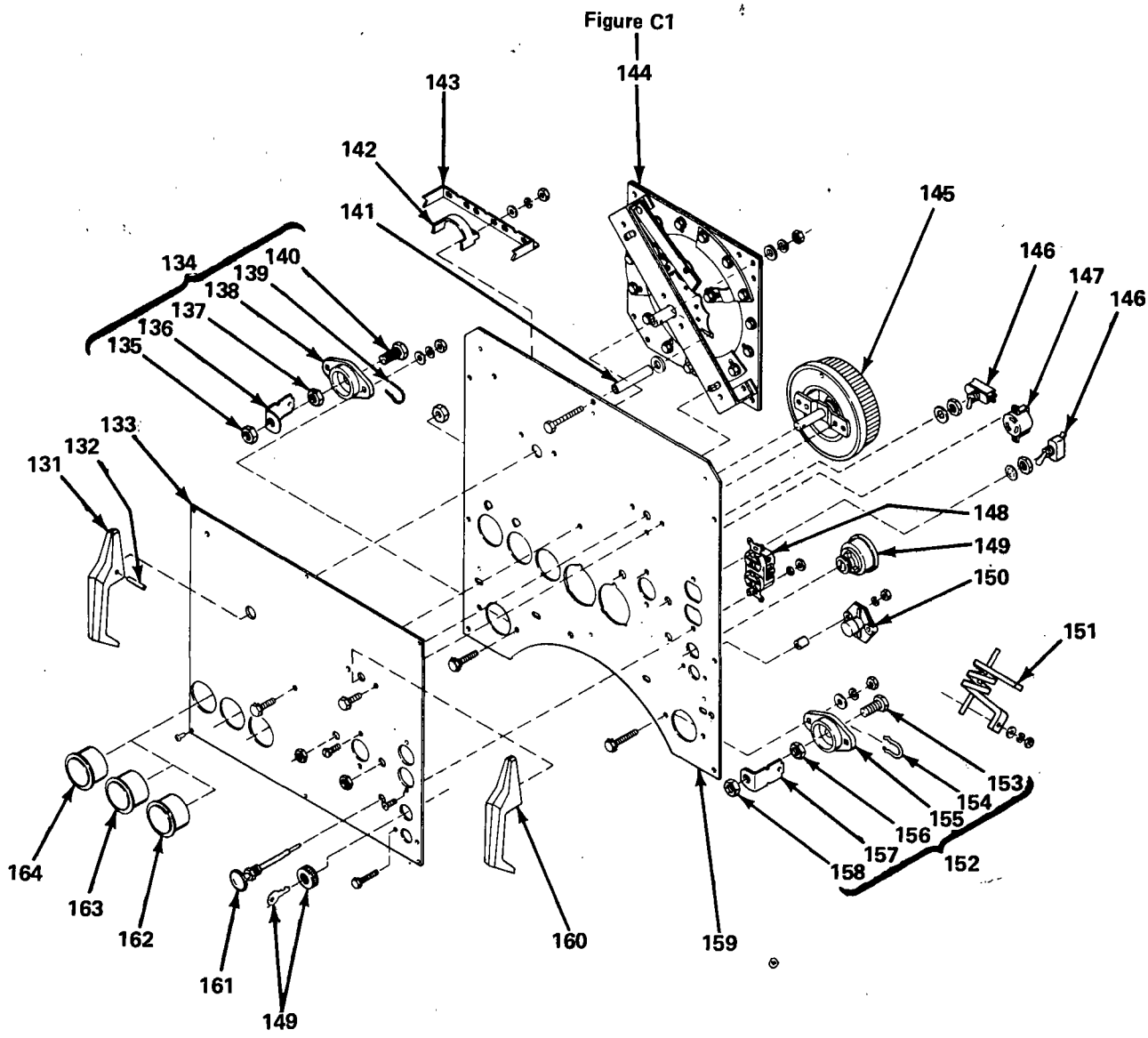

Figure C — Panel, Front - Upper With Components

Item No.	Dia. Mkgs.	Factory Part No.	Description	Quantity
Figure C			**Panel, Front - Upper With Components (See Fig. A Page 4 Item 79)**	
131		019 754	HANDLE, switch - range	1
132		010 836	PIN, spring - compression	1
133			NAMEPLATE (order by stock, model, and serial numbers)	1
134		039 046	TERMINAL, power output - black (consisting of)	1
135		601 879	. NUT, steel - hex full 1/2-13	1
136		039 044	. BUS BAR	1
137		601 880	. NUT, steel - hex jam 1/2-13	1
138		039 045	. TERMINAL BOARD, black	1
139		039 043	. CLIP, spring - bus bar	1
140		601 976	. SCREW, cap - steel hex hd 1/2-13 x 1-1/2	1
141		010 528	TUBING, steel 1/2 OD x 11 ga wall x 1-1/4	1
142		059 343	BRACKET, mounting - meter	1
143		059 262	BRACKET, mounting - meter	1
144	S3	011 413	SWITCH, range (See Fig. C1 Page 9)	1
145	R1	*605 960	RHEOSTAT, WW 300 watt 34 ohm	1
146	S2,5	053 359	SWITCH, toggle SPST 20 amp 125 volts	2
147	RC3	032 897	RECEPTACLE, twistlock - grounded 2P3W	1
148	RC1	604 176	RECEPTACLE, straight - duplex grounded 2P3W 15 amp 125 volts	1
149	S1	005 372	SWITCH, ignition - key type w/o start	1
150	PB1	011 767	SWITCH, push button - starter	1
151	CR1	034 876	RELAY, reed	1
152		039 047	TERMINAL, power output - red (consisting of)	1
153		601 976	. SCREW, cap - steel hex hd 1/2-13 x 1-1/2	1
154		039 043	. CLIP, spring - bus bar	1
155		039 049	. TERMINAL BOARD, red	1
156		601 880	. NUT, steel - hex jam 1/2-13	1
157		039 044	. BUS BAR	1
158		601 879	. NUT, steel - hex full 1/2-13	1
159		031 858	PANEL, front - upper	1
160		019 755	HANDLE, rheostat	1
		602 178	SCREW, set - steel 1/4-20 x 3/8 (used with handle)	1
161		019 790	CONTROL, push - pull	1
162	Oil	039 241	GAUGE, pressure - oil	1
163	A	039 237	METER, amp dc 60-0-60	1
164	Temp	039 239	GAUGE, temperature	1

*Recommended Spare Parts

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

Item No.	Factory Part No.	Description	Quantity
Figure C1	**011 413**	**Switch, Range (See Fig. C Page 8 Item 144)**	
171	011 322	BRACKET, mounting - switch (consisting of)	1
172	010 671	. SPRING	1
173	017 428	LOCATOR, quadrant	1
174	011 412	CONTACT BOARD ASSEMBLY (consisting of)	1
175	011 490	. CONTACT ASSEMBLY, movable (consisting of)	3
176	011 025	. . SPRING, pressure	1
177	011 010	. . CONTACT, switch - copper	2
178	011 009	. . CONTACT, switch - bronze	2
179	010 200	. . SPACER, contact .024 thick	1
180	010 202	. . SPACER, contact 1/8 thick	1
181	010 201	. . SPACER, contact 1/16 thick	1
182	011 007	. . SPRING, pressure	1
183	011 018	. CONTACT, stationary	9
184	011 489	. CONTACT ASSEMBLY, stationary (consisting of)	6
185	011 018	. . CONTACT, stationary	2
186	010 200	. . SPACER, contact .024 thick	1
187	010 202	. . SPACER, contact 1/8 thick	1
188	010 201	. . SPACER, contact 1/16 thick	1
189	011 095	. CONTACT BOARD, stationary	2
190	011 019	. CONTACT BOARD, movable	2
191	011 012	. SHIM, guide - contact board	3
192	011 013	. GUIDE, contact board - stationary	3

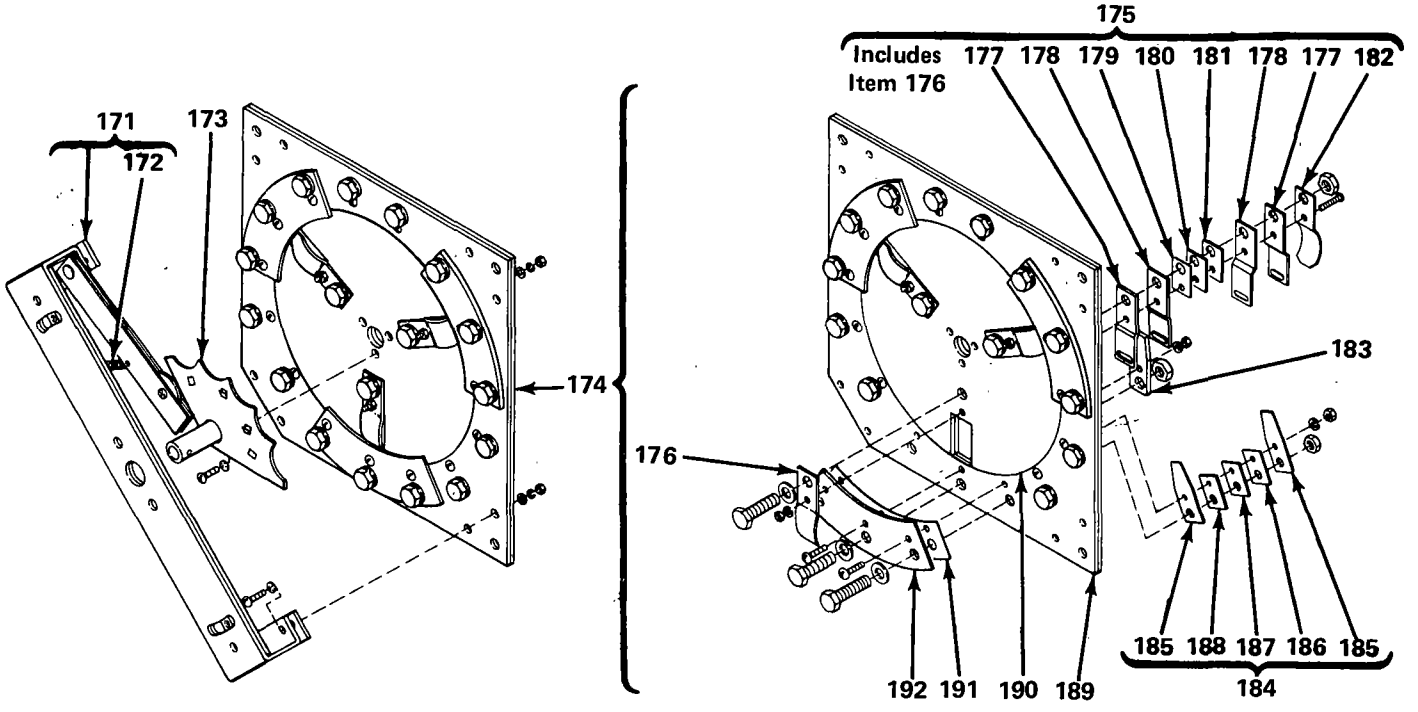

Figure C1 – Switch, Range

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

Item No.	Dia. Mkgs.	Factory Part No.	Description	Quantity
Figure D		**018 757**	**Control, Weld/Idle Vacuum (See Fig. A Page 3 Item 42)**	
201		017 417	LINKAGE ASSEMBLY, vacuum - actuator	1
202		604 393	NUT, speed 3/16 inch	1
203		604 392	RIVET, steel - round head 3/16 x 3/4	1
204		603 931	RECEPTACLE, screw 1/4 dia	1
205		603 470	VALVE, shut-off - needle	1
206		010 869	BUSHING, brass - pipe reducer 1/4 MPT 1/8 FPT	2
207		020 963	TUBING, copper 3/16 OD x .030 wall x 13-1/2	1
208		018 097	CHAMBER, vacuum	1
209		020 962	HOSE, neoprene 7/64 ID x 4	1
210		010 561	TEE, brass 1/8 x 1/8	1
211	SR4	031 252	RECTIFIER, selenium	1
212		020 964	TUBING, copper 1/4 OD x .030 wall x 1	1
213	GS1	003 304	VALVE, 12 volts dc 2 way 1/4 IPS port 1/8 orifice	1
214		023 030	BREATHER, brass - pipe vent	1
215		603 802	RIVET, steel - round head 1/4 x 2	1
216		017 544	BRACKET, mounting - chamber vacuum	1
217		015 713	GROMMET, rubber - 5/16 ID x 1/2 hole 3/16 groove	1
218		018 160	LINKAGE ASSEMBLY, vacuum to carburetor (consisting of)	1
219		024 799	. BALL JOINT, 1/4-28 thread	1
220		018 098	. BOLT, hook 1/4-28 x 1/2 x 3-3/4	1
221		010 334	. CLIP, clevis - rod end	1

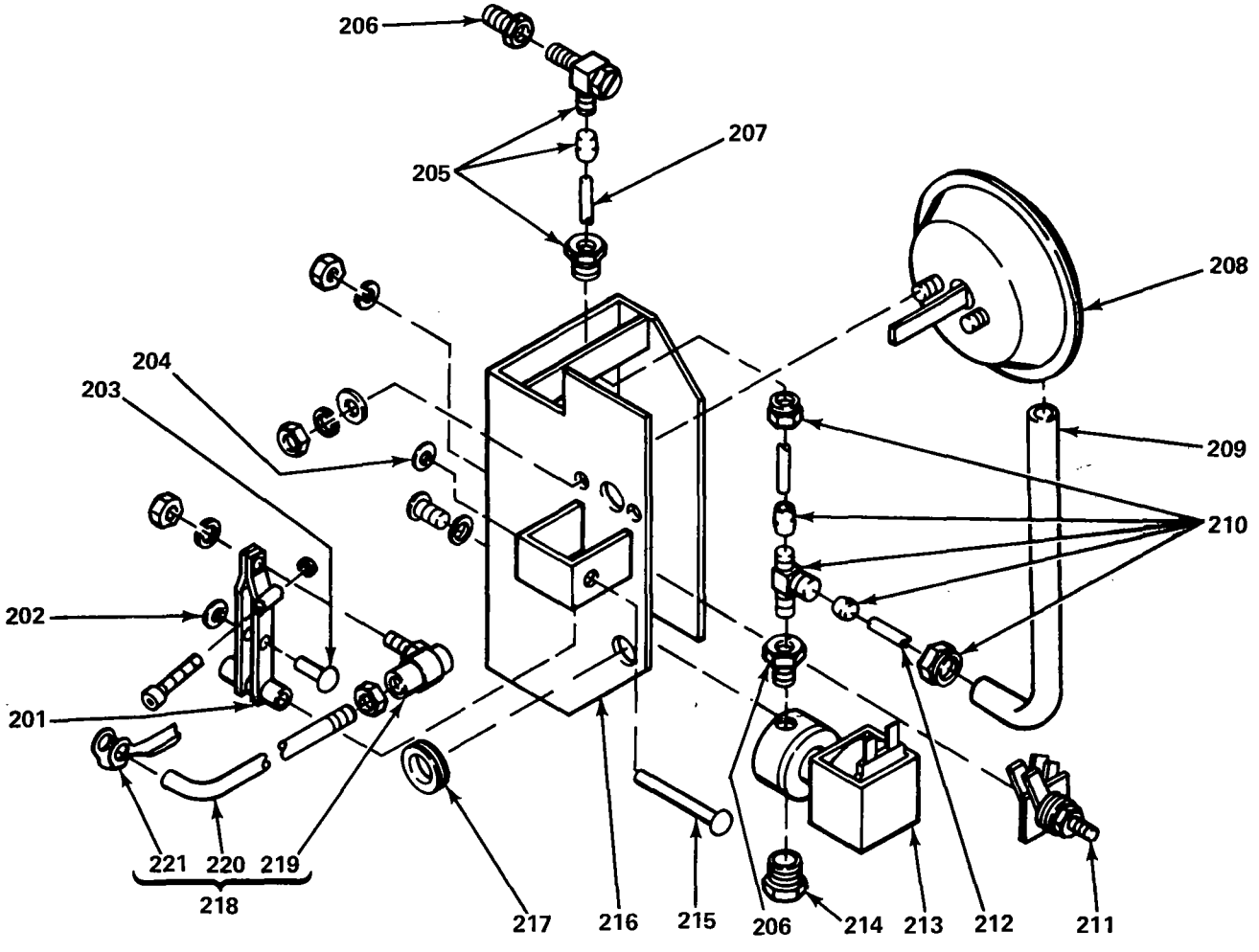

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Figure D — Control, Weld/Idle Vacuum

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