

OPERATING MANUAL

Shield-Arc SA-200-F163
IM208
October, 1969
3417; 3418; 3554; 3555; 4113; 4149;
4150; 4744; 4745; 4815; 4816; 4843;
4998; 4999; 5065; 5107; 5108; 5141;
5336; 5337; 5376; 5495; 5496; 5500;
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5840; 5841; 5957; 6072; 6073; 6132;
6339; 6346; 6349; 6392; 6662; 6666;
6634; 6779; 6791; 6792; 6934; 7044;
7074; 7078; 7167; 7168; 7213; 7214;
7242, K-6090

Shield-Arc[®] SA-200-F163 DC Arc Welder With CONTINENTAL F163 ENGINE



Type: K-6090

Models:

SA-200-F162

SA-200-F163 Codes 3400 to 7275

For machines above Code 7275, request IM-276.

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

SAFETY DEPENDS ON YOU

Lincoln arc welding equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation . . . and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS OPERATING MANUAL AND THE ARC WELDING SAFETY PRECAUTIONS ON PAGES ii, iii, AND iv.** And, most importantly, think before you act and be careful.

ARC WELDING SAFETY PRECAUTIONS



WARNING: PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH.



ELECTRIC SHOCK can kill.

1. a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.
- b. Insulate yourself from workpiece and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

In addition to the normal safety precautions, if welding must be performed under electrically hazardous conditions (in damp locations or while wearing wet clothing; on metal structures such as floors, gratings or scaffolds; when in cramped positions such as sitting, kneeling or lying, if there is a high risk of unavoidable or accidental contact with the workpiece or ground) use the following equipment:

- Semiautomatic DC Constant Voltage Welder
 - DC Manual (Stick) Welder.
 - AC Welder with Reduced Voltage Control.
- c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".
 - d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
 - e. Ground the work or metal to be welded to a good electrical (earth) ground.
 - f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
 - g. Never dip the electrode in water for cooling.
 - h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
 - i. When working above floor level, protect yourself from a fall should you get a shock.
 - j. Also see Items 4c and 6.



ARC RAYS can burn.

2. a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.

- b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- c. Protect other nearby personnel with suitable non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES can be dangerous.

3. a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. When welding on galvanized, lead or cadmium plated steel and other metals which produce toxic fumes, even greater care must be taken.
- b. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- c. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- d. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the material safety data sheet (MSDS) and follow your employer's safety practices.
- e. Also see item 7b.



WELDING SPARKS can cause fire or explosion.

4. a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Have a fire extinguisher readily available.
- b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure

that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned." For information purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1-80 from the American Welding Society (see address below).

- e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- h. Also see item 7c.



CYLINDER may explode if damaged.

- 5. a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- c. Cylinders should be located:
 - Away from areas where they may be struck or subjected to physical damage.
 - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- d. Never allow the electrode, electrode holder, or any other electrically "hot" parts to touch a cylinder.
- e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- f. Valve protection caps should always be in place and handtight except when the cylinder is in use or connected for use.
- g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 1235 Jefferson Davis Highway, Arlington, VA 22202.



FOR ELECTRICALLY powered equipment.

- 6. a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.
- b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.
- c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.



FOR ENGINE powered equipment.

- 7. a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.



- b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.



- c. Do not add the fuel near an open flame, welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.



- d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.
- e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.
- f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.



- h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

HAVE ALL INSTALLATION, OPERATION, MAINTENANCE AND REPAIR WORK performed by qualified people.

For more detailed information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting — ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974.

PROPER GROUNDING DURING INSTALLATION

The 1985 National Electrical Code does not require this machine to be grounded under normal operating circumstances.

Some State, local or other codes or unusual operating circumstances may require the machine frame to be grounded. It is recommended that you determine the extent to which such requirements may apply to your particular situation and follow them explicitly.

In general, if the machine is to be grounded, it should be connected with a #8 or larger copper wire to a solid earth ground such as a metal pipe going into the ground for at least ten feet and having no insulated joints, or to the metal framework of a building which has been effectively grounded. The National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground to an unpainted frame screw or bolt.)

INSTALLATION, CONNECTION, AND MAINTENANCE OF BATTERY

To prevent EXPLOSION when:

- a) Installing a new battery — disconnect the negative cable from the old battery first and connect the negative cable to the new battery last.
- b) Connecting a battery charger — remove the battery from the welder by disconnecting the negative cable first, then the positive cable and battery clamp. When reinstalling, connect the negative cable last.
- c) Using a booster — connect the positive lead to the battery first then connect the negative lead to the copper strap on the engine foot.

To prevent ELECTRICAL DAMAGE when:

- a) Installing a new battery.
- b) Using a booster.

Use correct polarity — Negative Ground.

To prevent BATTERY DISCHARGE, if you have an ignition switch, turn it off when the engine is not running.

To prevent BATTERY BUCKLING, tighten nuts on battery clamp only until snug.

(S-17851)

OPERATION OF ENGINE WELDERS

WARNING: Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

OPERATION OF ALL WELDERS

DO NOT TURN THE “CURRENT RANGE SELECTOR” WHILE WELDING because the current may arc between the contacts and damage the switch.

MAINTENANCE AND TROUBLESHOOTING WARNINGS

WARNING: Have qualified personnel do the maintenance and troubleshooting work. Turn the engine (or electrical power at the switchbox) off before working inside the machine. In some cases, it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

ATTENTION OWNERS OF ENGINE WELDERS

WARNING: Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running. If a problem cannot be corrected by following the instructions, take the machine to the nearest Lincoln Field Service Shop.

CAUTION WHEN INSPECTING THE COMMUTATOR AND BRUSHES

WARNING: Uncovered rotating equipment can be dangerous. Use care so your hands, hair, clothing or tools do not catch in the rotating parts. Protect yourself from particles that may be thrown out by the rotating armature when stoning the commutator.

NAMEPLATES

Whenever routine maintenance is performed on this machine — or at least yearly — inspect all nameplates and labels for legibility. Replace those which are no longer clear. Refer to the parts list for the replacement item number.

Need Welding Training?

The Lincoln Electric Company operates the oldest and most respected Arc Welding School in the United States at its corporate headquarters in Cleveland, Ohio. Over 60,000 students have graduated. Tuition is low and the training is "hands on".

For details write: Lincoln Welding School
22801 St. Clair
Cleveland, Ohio 44117

and ask for bulletin ED-80 or call 216-481-8100 and ask for the Welding School Registrar.

DAMAGE CLAIMS

When Lincoln equipment is shipped, title passes to the purchaser upon receipt by carrier. Consequently, claims for material damaged in shipment must be made by the purchaser against the transportation company at time shipment is received.

The 1978 National Electrical Code does not require this machine to be grounded under normal operating circumstances.

Some State, local or other codes or unusual operating circumstances may require the machine frame to be grounded. It is recommended that you determine the extent to which such requirements may apply to your particular situation and follow them explicitly.

In general, if the machine is to be grounded it should be connected with a #8 or larger copper wire to a solid earth ground such as a metal water pipe going into the ground for at least ten feet and having no insulated joints, or to the metal framework of a building which has been effectively grounded. The National Electrical Code lists a number of alternate means of grounding electrical equipment. (If an older portable welder does not have a grounding stud, connect the ground wire to an unpainted frame screw or bolt.)

WARNING: Operate internal combustion engines in open, well ventilated areas or vent engine exhaust fumes outdoors.

PRELIMINARY CHECKS AND OPERATION

See the engine manufacturer's operating manual supplied with the welder for detailed engine operating instructions.

Engines equipped with starters are furnished with dry charged batteries. Fill with the electrolyte supplied per the instructions furnished with the welder. **Use caution as the electrolyte is a strong acid.**

Upon receipt of the welder, fill the crankcase to the "full" mark on the bayonet gage with the recommended weight of oil (See ENGINE MANUAL). Fill the radiator, gasoline tank and air filter oil bath. Open the carburetor feed valve on the sediment bowl by turning the handle from right to left. Then put the ignition switch in the "on" position and start the engine. Run the engine for five minutes before welding in order to check for any damage to the engine when in transit. Stop and check the oil level before proceeding. If the oil level is down, fill to the "full" mark again.

When the engine is running satisfactorily, stop the engine and connect the electrode and work cables to the studs on the control panel. For positive (reverse) polarity, connect the electrode cable to the terminal marked "Positive", and for negative (straight) polarity connect it to the "Negative" terminal.

Always operate the welder with the doors closed. Leaving the doors open changes the designed air flow and can cause overheating.

Before starting the engine everyday, check the fuel supply (running out of fuel may draw dirt into the fuel system), crankcase oil, radiator and battery.

When hauling the welder between job sites, close the fuel feed valve on the sediment bowl by turning the handle from left to right. Failure to turn the fuel off when travelling can cause carburetor flooding and difficult starting at the new job site.

The fan belt tends to loosen after about 40 hours of operation. Check and tighten, if necessary. Check and tighten all internal and external connections as necessary.

The machine has a pressure radiator with a 10-1/2 quart capacity. Keep the radiator cap tight and the system clean. Add sufficient anti-freeze in cold weather.

NOTE: Machines built after Feb. 1971 (above code 6900) have an alternator rather than a DC generator in the **engine electrical system**. In these machines the negative battery cable is connected to ground rather than the positive cable as used in the generator equipped welders for many years. When using jumper cables, extra care must be taken to connect + to + and - to - when using an "alternator" equipped machine to start a "generator" machine and vice versa.

IDLING DEVICE

The engine idler reduces engine speed after the arc is broken to conserve fuel and reduce engine wear. For automatic idling, remove the latching pin from the idler control lever allowing the lever to swing freely.

For detailed description of the idler operation, see IM-179.

CARBURETOR DE-ICER

This welder is provided with an anti-frosting device. Frosting generally occurs when the humidity is high and the temperature is between 26 and 40°F. To connect the de-icer, remove the molded rubber hose that is hung underneath the gas tank and connect it between the air filter inlet tube and the heater tube mounted on the engine manifold. This provides positive preheated air to the carburetor.

Disconnect this hose for warm weather operation.

EXHAUST SPARK ARRESTER

Some federal, state or local laws may require that gasoline engines be equipped with exhaust spark arresters when they are operated in certain locations where unarrested sparks may present a fire hazard. This welder is not originally shipped with a spark arrester nor does the optional muffler qualify as a spark arrester. When required by local

regulations, suitable spark arresters must be installed and properly maintained. **NOTICE:** An incorrect arrester may lead to damage of the engine or its performance. Contact the engine manufacturer for specific recommendations.

CONTROL OF WELDING CURRENT

Duty Cycle

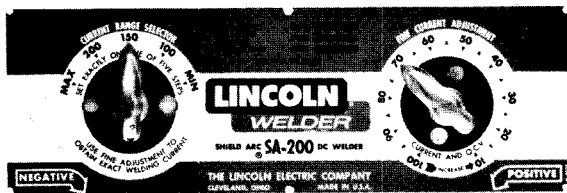
This welder is NEMA rated 200 amperes at 40 arc volts on a 60% duty cycle. Duty cycle is based on a 10 minute period; thus, the welder can be loaded at Rated Output for 6 minutes out of every 10 minute period.

DO NOT TURN THE CURRENT RANGE SELECTOR WHILE WELDING because the current may arc between the contacts and damage the switch.

The 'Current Range Selector' provides five overlapping current ranges. The 'Fine Current Adjustment' (Continuous Voltage Control) adjusts the current from minimum to maximum within each range. Open circuit voltage is also controlled by the 'Fine Current Adjustment' permitting control of the arc characteristics.

A high Open Circuit voltage setting provides the soft "buttering" arc with best resistance to pop-outs preferred for most welding. To get this characteristics, set the 'Current Range Selector' to the lowest setting that still provides the current you need and set the 'Fine Current Adjustment' near maximum. For example; to obtain 175 amps and a soft arc, set the 'Current Range Selector' to the 190-120 position* and the 'Fine Current Adjustment' for 175 amps.

When a forceful "digging" arc is required, usually for vertical and overhead welding, use a higher 'Current Range Selector' setting and a lower open circuit voltage. For



*Older machines have only a single number at each position on the nameplate as shown here. These values are the center of the ranges for each setting.

example; to obtain 175 amps and a forceful arc, set the 'Current Range Selector' to the 240-160 position* and the 'Fine Current Adjustment' setting for 175 amps.

DO NOT attempt to set the 'Current Range Selector' between the five points designated on the nameplate. All switches made after 1959 have a spring loaded cam which almost eliminates the possibility of setting this switch between the designated points.

RECOMMENDED CABLE SIZES

Machine Size in Amperes	Duty Cycle	Cable Sizes for Combined Lengths of Copper Electrode and Work Cables		
		0 to 150 ft.	150 to 200 ft.	200 to 250 ft.
200	60	2	1	1/0

POWER PLUG

A 115 volt D.C. power plug outlet is located on the control panel. The current available is 8.7 amperes. This will furnish 1 kilowatt of power to operate power tools and lights. Drawing more power may damage the welder exciter. To draw this power hold the idler in full power position with the latching pin.

Power tools should always be grounded to the welder frame unless they are protected by an approved system of double insulation. (On old machines equipped with a 2-prong receptacle, either replace the receptacle with a 3-prong grounding type or use an adapter in the receptacle and connect the pigtail to the control panel.)

PIPE THAWING – WARNING

"Pipe thawing, if not done properly, can result in fire, explosion, damage to wiring which may make it unsafe, damage to pipes, burning up the welder, or other hazards. Do not use a welder to thaw pipe before reviewing Lincoln bulletin E-695.1 (dated December '76 or later)".

For protection of the welder from overloads when thawing pipe, use of a device called the "Linc-Thaw" is recommended. A description of the "Linc-Thaw" is in bulletin E695.1.

COMMUTATOR AND BRUSHES

The generator brushes are properly adjusted when the welder is shipped. It requires no particular attention. **DO NOT SHIFT THE BRUSHES** or adjust the rocker setting.

Periodically inspect the commutators and brushes by removing the commutator covers. **DO NOT** remove or replace these covers while the machine is running.

Commutators require little attention. However, if they are black or appear uneven, clean while running with fine sandpaper or a commutator stone. Never use emery cloth or paper for this purpose.

Replace brushes when they wear within 1/4" of the pigtail. A complete set of replacement brushes should be kept on hand. Lincoln brushes have a curved face to fit the commutator. Seat these brushes by lightly stoning the commutator as the armature rotates at full speed until contact is made across the full face of the brushes. After stoning, blow out the dust with low pressure air.

WARNING: Uncovered rotating equipment can be dangerous. Use care so hands, hair, clothing or tools do not catch in the rotating parts. Protect yourself from particles that may be thrown out by the rotating armature when stoning the commutator.

Arcing or excessive exciter brush wear indicates a possible misaligned shaft. Have an authorized Field Service Shop check and realign the shaft.

BEARINGS

This welder is equipped with a double-shielded ball bearing having sufficient grease to last indefinitely under normal service. Where the welder is used constantly or in excessively dirty locations, it may be necessary to add one-half ounce of grease per year. A pad of grease one inch wide, one inch long and one inch high weighs approximately one-half ounce. Over-greasing is far worse than insufficient greasing.

When greasing the bearings, keep all dirt out of the area. Wipe the fittings completely clean and use clean equipment. More bearing failures are caused by dirt introduced during greasing than from insufficient grease.

MAINTENANCE INSTRUCTIONS

Have a qualified electrician do the maintenance and trouble-shooting work. Turn the engine off before working inside the machine.

1. Blow dirt out of the welder and controls with an air hose at least once every two months – once every week in

dirty locations. Use low air pressure to avoid driving dirt into the insulation.

2. Current control contacts should not be greased. To keep the contacts clean rotate the current control through its entire range frequently. Good practice is to turn the handle from maximum to minimum setting twice each morning before starting to weld.
3. Drain the crankcase oil every 50 hours of operation under average conditions.
4. Drain and change the oil filter per instructions on the filter. It will require 5 quarts of oil to refill the system when filter is changed.
5. Keep governor and carburetor toggles and butterfly valve shaft clean and lubricated.
6. Inspect air filter (oil bath type) daily – more often under dusty conditions. Clean and fill with oil to bead. The oil cup should never be removed while the engine is running.
7. Put a drop of oil on the current control shaft at least once every month.
8. See the engine manufacturer's manual supplied with the welder for more complete engine maintenance information.

TROUBLE SHOOTING

Have a qualified electrician do the maintenance and trouble shooting work. Turn the engine off before working inside the machine.

TROUBLE	CAUSES	WHAT TO DO
Machine fails to hold the "heat" constantly.	<p>Rough or dirty commutator.</p> <p>Brushes may be worn down to limit.</p> <p>Brush springs may be broken.</p> <p>Field circuit may have variable resistance connection or intermittent open-circuit, due to loose connection or broken wire.</p> <p>Electrode lead or work lead connection may be poor.</p> <p>Wrong grade of brushes may have been installed on generator.</p> <p>Field rheostat may be making poor contact and overheating.</p>	<p>Commutator should be trued or cleaned.</p> <p>Replace brushes.</p> <p>Replace brush springs.</p> <p>Check field current with ammeter to discover varying current. This applies to both the main generator and exciter.</p> <p>Tighten all connections.</p> <p>Use Lincoln brushes.</p> <p>Inspect rheostat and clean and adjust finger tension on contact.</p>
Welder starts but fails to generate current.	<p>Generator or exciter brushes may be loose or missing.</p> <p>Exciter may not be operating.</p> <p>Field circuit of generator or exciter may be open.</p> <p>Exciter may have lost excitation.</p> <p>Series field and armature circuit may be open-circuited.</p>	<p>Be sure that all brushes bear on the commutator and have proper spring tension.</p> <p>Check exciter output voltage with voltmeter or lamp.</p> <p>Check for open circuits in rheostat, field leads, and field coils.</p> <p>Flashing the exciter fields consists of passing current through the fields using an external source of 6 to 125 volts of DC power from a storage battery or DC generator. If using a DC generator, keep the generator turned off except when actually applying the flashing current.</p> <p>To flash the fields:</p> <ol style="list-style-type: none"> 1. Turn the welder off and raise one exciter brush off the commutator. 2. On Lincoln welders, attach the positive lead from the DC source to the right hand brushholder. 3. Carefully holding an insulated section of the negative lead from the DC source, touch its lug or clamp to the left hand brushholder for 5 seconds. Pull it away quickly to minimize arcing. <p>Remove the leads from the brushholder, replace the brush on the commutator, start the welding and generator voltage should build up.</p> <p>Check circuit with ringer or voltmeter.</p>
Welding arc is loud and spatters excessively.	<p>Current setting may be too high.</p> <p>Polarity may be wrong.</p>	<p>Check setting and current output with ammeter.</p> <p>Check polarity. Try reversing polarity or try an electrode of the opposite polarity.</p>
Welding current too great or too small compared to indication on the dial.	<p>Exciter output low causing low output compared to dial indication.</p> <p>Operating speed too low or high.</p>	<p>Check exciter field circuit.</p> <p>Adjust speed screw on governor for 1550 rpm operating speed for welding.*</p>
Arc continuously pops out.	<p>Selective Current control switch may be set at an intermediate position.</p>	<p>Set the switch at the center of the current range desired.</p>
Engine fails to start.	<p>Out of fuel.</p> <p>Clogged fuel system.</p> <p>Choke not closing tightly.</p> <p>Lead attached to stud on outside of magneto is grounded.</p> <p>Magneto points are pitted and fused.</p> <p>Ignition switch shorted.</p> <p>Moisture or carbon on spark plugs.</p>	<p>Fill with at least 75 octane gasoline.</p> <p>Check all lines to carburetor.</p> <p>Loosen choke cable screw and slack off choke wire.</p> <p>Check for ground and insulate lead.</p> <p>Dress points and adjust to 0.020".</p> <p>Replace.</p> <p>Remove plugs, clean and adjust gap to 0.025".</p>
Low oil pressure.	<p>Oil to light.</p> <p>Oil too low.</p> <p>Defective oil gage.</p>	<p>Drain, refill with heavier grade.</p> <p>Fill to "full" mark on bayonet gage. Do not overfill.</p> <p>Replace.</p>

TROUBLE SHOOTING (Continued)

TROUBLE	CAUSES	WHAT TO DO									
Lack of power.	Carbon deposits, causing pre-ignition. Incorrect timing.	Run engine under full load for a short time. Time ignition.*									
Overheating.	No water in radiator or clogged cooling system. Late timing. Improper valve clearance. Fan belt too loose.	Check throughout for dirty or broken hoses, clogged radiator or defective water pump. Time ignition.* Adjust valve tappets (cold settings). <table style="margin-left: auto; margin-right: auto; border: none;"> <tr> <td></td> <td style="text-align: center;">Intake</td> <td style="text-align: center;">Exhaust</td> </tr> <tr> <td style="text-align: center;">F162</td> <td style="text-align: center;">.014</td> <td style="text-align: center;">.014</td> </tr> <tr> <td style="text-align: center;">F163</td> <td style="text-align: center;">.012</td> <td style="text-align: center;">.021</td> </tr> </table> Adjust to from 3/4" to 1" deflection.		Intake	Exhaust	F162	.014	.014	F163	.012	.021
	Intake	Exhaust									
F162	.014	.014									
F163	.012	.021									
Knocking	Poor grade of gasoline. Spark advanced too far.	Use at least 75 octane gasoline. Retime ignition.									
Surging.	Governor and carburetor toggles and butterfly valve shaft lever are dirty and sticking. Dirty or choked air filter. Governor spring adjusting screw misadjusted. Governor control rod wrong length.	Clean and lubricate. Replace toggles if worn. Remove and clean according to instruction on unit. Adjust screw just enough to eliminate surge.* Adjust length of control rod so that there is from 1/32" to 1/16" clearance between the stop pin and the stop when the engine is shut off and the regulator expanded.									
Low output.	Operating speed is set too low.	Adjust speed screw on governor for 1550 rpm operating speed for welding.*									
Large decrease in speed.	Misadjusted governor spring adjusting screw.	Adjust screw until speed does not drop more than 150 rpm + 25 rpm when arc is struck. If surge occurs, eliminate it with the control rod. If high idle speed changes readjust the high idle speed screw.*									
Unable to strike an arc.	Idle speed screw is misadjusted.	Idle speed is set too low so idler fails to operate when arc is struck. Adjust low idle speed screw for 950-1050 rpm.*									
Engine runs irregularly.	Carburetor set too lean.	Adjust carburetor adjusting screw so engine will run smoothly at idle speed.*									
Engine fails to pick up speed when arc is struck.		Check the idler, etc.*									

*See "Gasoline Engine Adjustment: Timing, Carburetor, Governor & Idler," Instruction Manual IM-179.

**WARRANTY SUPERSEDED
SEE MWS 1**



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