IDEALARC® SP-250

IM397B

January 1994

For use with machines above Code Number 10,000.

This manual covers equipment which is obsolete and no longer in production by The Lincoln Electric Co. Specifications and availability of optional features may have changed.

IM397
January, 1994
Idealarc SP-250
9402; 9546; 9723; 10001; 10002

Safety Depends on You

Lincoln arc welding and cutting 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 MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

Damage Claims

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

OPERATOR'S MANUAL

World's Leader in Welding and Cutting Products

LINCOLN® ELECTRIC

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⚠ WARNING

ARC WELDING can be hazardous.

PROTECT YOURSELF AND OTHERS FROM POSSIBLE SERIOUS INJURY OR DEATH. KEEP CHILDREN AWAY. PACEMAKER WEARERS SHOULD CONSULT WITH THEIR DOCTOR BEFORE OPERATING.

Read and understand the following safety highlights. For additional safety 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. A **Free** copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

BE SURE THAT ALL INSTALLATION, OPERATION, MAINTENANCE, AND REPAIR PROCEDURES ARE PERFORMED ONLY BY QUALIFIED INDIVIDUALS.

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.

1.b. Insulate yourself from work 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 (Wire) Welder.**
- **DC Manual (Stick) Welder.**
- **AC Welder with Reduced Voltage Control.**

1.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

1.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.

1.e. Ground the work or metal to be welded to a good electrical (earth) ground.

1.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

1.g. Never dip the electrode in water for cooling.

1.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.

1.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

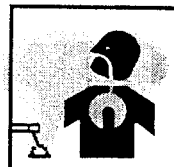
1.j. Also see Items 4.c. and 6.

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. I standards.

2.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

2.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.

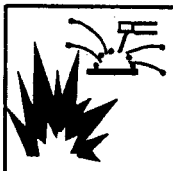
3.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases.When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and below Threshold Limit Values (TLV) using local exhaust or mechanical ventilation. In confined spaces or in some circumstances, outdoors, a respirator may be required. Additional precautions are also required when welding on galvanized steel.**

3.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.

3.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.

3.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. MSDS forms are available from your welding distributor or from the manufacturer.

3.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. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

4.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.

4.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.

4.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 from the American Welding Society (see address above).

4.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

4.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.

4.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.

4.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.

5.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

5.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.

5.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

5.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

5.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

5.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.

6.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

6.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.

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

7.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.

7.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.

7.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.

7.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.

7.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.

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

ELECTRIC AND MAGNETIC FIELDS may be dangerous

8.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines.

8.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

8.c. Exposure to EMF fields in welding may have other health effects which are now not known.

8d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

8.d.1. Route the electrode and work cables together - Secure them with tape when possible.

8.d.2. Never coil the electrode lead around your body.

8.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.

8.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.

8.d.5. Do not work next to welding power source.

PRÉCAUTIONS DE SÛRETÉ

Pour votre propre protection lire et observer toutes les instructions et les précautions de sûreté specifiques qui parraissent dans ce manuel aussi bien que les précautions de sûreté générales suivantes:

Sûreté Pour Soudage A L'Arc

1. Protegez-vous contre la secousse électrique:

   a. Les circuits à l'électrode et à la piéce sont sous tension quand la machine à souder est en marche. Eviter toujours tout contact entre les parties sous tension et la peau nue ou les vétements mouillés. Porter des gants secs et sans trous pour isoler les mains.

   b. Faire trés attention de bien s'isoler de la masse quand on soude dans des endroits humides, ou sur un plancher metallique ou des grilles metalliques, principalement dans les positions assis ou couché pour lesquelles une grande partie du corps peut être en contact avec la masse.

   c. Maintenir le porte-électrode, la pince de masse, le câble de soudage et la machine à souder en bon et sûr état defonctionnement.

   d. Ne jamais plonger le porte-électrode dans l'eau pour le refroidir.

   e. Ne jamais toucher simultanément les parties sous tension des porte-électrodes connectés à deux machines à souder parce que la tension entre les deux pinces peut être le total de la tension à vide des deux machines.

   f. Si on utilise la machine à souder comme une source de courant pour soudage semi-automatique, ces precautions pour le porte-électrode s'applicuent aussi au pistolet de soudage.

2. Dans le cas de travail au dessus du niveau du sol, se protéger contre les chutes dans le cas ou on recoit un choc. Ne jamais enrouler le câble-électrode autour de n'importe quelle partie du corps.

3. Un coup d'arc peut être plus sévère qu'un coup de soliel, donc:

   a. Utiliser un bon masque avec un verre filtrant approprié ainsi qu'un verre blanc afin de se protéger les yeux du rayonnement de l'arc et des projections quand on soude ou quand on regarde l'arc.

   b. Porter des vêtements convenables afin de protéger la peau de soudeur et des aides contre le rayonnement de l'arc.

   c. Protéger l'autre personnel travaillant à proximité au soudage à l'aide d'écrans appropriés et non-inflammables.

4. Des gouttes de laitier en fusion sont émises de l'arc de soudage. Se protéger avec des vêtements de protection libres de l'huile, tels que les gants en cuir, chemise épaisse, pantalons sans revers, et chaussures montantes.

5. Toujours porter des lunettes de sécurité dans la zone de soudage. Utiliser des lunettes avec écrans lateraux dans les zones où l'on pique le laitier.

6. Eloigner les matériaux inflammables ou les recouvrir afin de prévenir tout risque d'incendie dû aux étincelles.

7. Quand on ne soude pas, poser la pince à une endroit isolé de la masse. Un court-circuit accidental peut provoquer un échauffement et un risque d'incendie.

8. S'assurer que la masse est connectée le plus prés possible de la zone de travail qu'il est pratique de le faire. Si on place la masse sur la charpente de la construction ou d'autres endroits éloignés de la zone de travail, on augmente le risque de voir passer le courant de soudage par les chaines de levage, câbles de grue, ou autres circuits. Cela peut provoquer des risques d'incendie ou d'echauffement des chaines et des câbles jusqu'à ce qu'ils se rompent.

9. Assurer une ventilation suffisante dans la zone de soudage. Ceci est particuliérement important pour le soudage de tôles galvanisées plombées, ou cadmiées ou tout autre métal qui produit des fumeés toxiques.

10. Ne pas souder en présence de vapeurs de chlore provenant d'opérations de dégraissage, nettoyage ou pistolage. La chaleur ou les rayons de l'arc peuvent réagir avec les vapeurs du solvant pour produire du phosgéne (gas fortement toxique) ou autres produits irritants.

11. Pour obtenir de plus amples renseignements sur la sûreté, voir le code "Code for safety in welding and cutting" CSA Standard W 117.2-1974.

PRÉCAUTIONS DE SÛRETÉ POUR LES MACHINES À SOUDER À TRANSFORMATEUR ET À REDRESSEUR

1. Relier à la terre le chassis du poste conformement au code de l'électricité et aux recommendations du fabricant. Le dispositif de montage ou la piece à souder doit être branché à une bonne mise à la terre.

2. Autant que possible, l'installation et l'entretien du poste seront effectués par un électricien qualifié.

3. Avant de faires des travaux à l'interieur de poste, la debrancher à l'interrupteur à la boite de fusibles.

4. Garder tous les couvercles et dispositifs de sûreté à leur place.

Idealarc® SP-250

effective code 10,001 and above

The new units now offer a choice of "SLOW" or "FAST" run-in for the first 2 seconds of starting wire feeding. Previous units (below code 10,000) always start with "SLOW" run-in.

To set "FAST" run-in:

1. Turn front panel power switch ON.
2. *Hold* down the TIMERS OFF key.
3. Press the PROCESS key. If the display reads "FAST INCH ENABLED", you are done.
4. If display reads "FAST INCH DISABLED", release all keys.
5. Press and hold TIMERS OFF again.
6. Press the PROCESS key again, and it will read "FAST INCH ENABLED".
7. Release all keys, unit is set for "FAST".

To set "SLOW" run-in:

1. Turn front panel power switch ON.
2. *Hold* down the TIMERS OFF key.
3. Press the PROCESS key. If the display reads "FAST INCH DISABLED", you are done.
4. If display reads "FAST INCH ENABLED", release all keys.
5. Press and hold TIMERS OFF again.
6. Press the PROCESS key again, and it will read "FAST INCH DISABLED".
7. Release all keys, unit is set for "SLOW".

Once set, the run-in will stay in that mode until the unit is reprogrammed. No need to reprogram each time unit is powered up.

NOTE: When saving to memory locations 1-5, the run-in is also saved to that memory. When recalled, the run-in stored in memory will rule. This could yield a quick and easy way to instantly change from "FAST" to "SLOW" run-in.

This improvement is made with the new S20448-2 ROM for the existing G2252-2 Control Board.

All other operation remains the same as described in IM397B.

January 1994

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PRODUCT DESCRIPTION

The SP-250 is a complete semiautomatic constant voltage DC arc welding machine built to meet NEMA specifications. It combines a constant voltage power source and a constant speed wire feeder with a microcomputer-based controller. This forms an intelligent welding system that really puts the automatic in semiautomatic. A touch key entry system with audible feedback, along with a two-line, 32 character alphanumeric display, provide user friendly control of the system.

Multilingual display capability allows the SP-250 to communicate with the user in any of the following languages: English, German, French, Spanish, or Japanese (Katakana).

RECOMMENDED PROCESSES AND EQUIPMENT

The SP-250 is recommended for GMA welding processes using 10 to 30 lb. (4.5 to 13.6kg) 2" (51mm) I.D. spools or Readi-Reel® coils of the following:

- .025 through .045 (0.6-1.2mm) solid steel using CO_2, Ar/Co_2, or Ar/O_2 shielding gas
- .035 (0.9mm) stainless steel using Ar/O_2 or $He/Ar/CO_2$ shielding gas
- 3/64" (1.2mm) aluminum using Ar shielding gas
- .045 (1.2mm) Outershield® electrodes using CO_2 or Ar/CO_2 shielding gas
- .035 (0.9mm) and .045 (1.2mm) Innershield® self-shielded electrodes

SPECIFICATIONS

Type	K482 or K482-1		
Open Circuit Voltage	10V - 40V		
Output Range	30A/5V - 250A/26V		
Rated Output	145A/26V	200A/28V[1]	250A/26V
Duty Cycle	100%	60%	35%
Input Power (1 Phase, 60 Hz) @ Rated Output (K482)	208/230V 36/33A	208/230V 44/40A	208/230V 53/49A
Input Power (1 Phase, 60 Hz) @ Rated Output (K482-1)	230/460/575V 34/17/14A	230/460/575V 42/21/17A	230/460/575V 50/25/20A
Wire Speed Range	50 - 500 IPM (1.27 - 12.7m/minute)		
Weight (with gun)	222 lbs. (101kg)		
H x W x D in. (mm)	28.2 x 18.8 x 40.1 (excluding 2.4" (61mm) handle) (719 x 480 x 1091) 28.24 x 18.80 x 27.04 (w/o cylinder mtg.) (717 x 477 x 687)		
Operating Temperature	-20° C to 40° C		
Storage Temperature	±40° C		

[1]NEMA Class 1 (60) Rating

INSTALLATION

Safety Precautions

- Read "ARC WELDING SAFETY PRECAUTIONS" on pages 2, 3 and 4 of Operating Manual before proceeding.
- Only qualified personnel should perform this installation.
- Machine must be connected to system ground per the U.S. National Electrical Code and any applicable local codes.
- Turn the power switch on the SP-250 "off" before connecting or disconnecting gun and cable, output cables or other equipment.

Uncrating the SP-250

Remove the staples from the bottom edge of the carton and lift off. Cut the tape securing the two rear wheels to the wooden shipping pallet. Using a 1/2 inch (12.8mm) wrench or socket, remove the two screws which attach the pallet to the bottom of the SP-250.

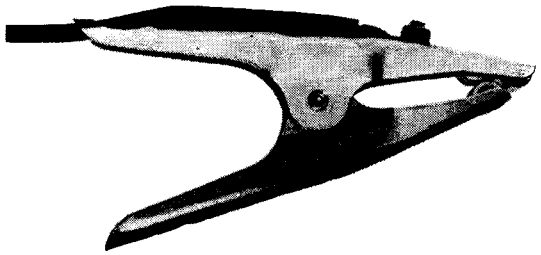
Location

Locate the welder in a dry location where there is free circulation of clean air into the louvers in the back and out the front. A location that minimizes the amount of smoke and dirt drawn into the rear louvers reduces the chance of dirt accumulation that can block air passages and cause overheating.

Work Clamp Installation

Attach the work clamp, provided, to the cable which extends from the front of the machine per the following:

1. Insert the lug on the end of the cable through the strain relief hole in the work clamp as shown below.
2. Fasten securely with the bolt and nut provided.



Input Power and Grounding Connections

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Do not touch electrically live parts such as output terminals or internal wiring.**

WARNING: ALL INPUT POWER MUST BE ELECTRICALLY DISCONNECTED BEFORE PROCEEDING.

1. Before starting the installation, check with the local power company if there is any question about whether your power supply is adequate for the voltage, amperes, phase, and frequency specified on the welder nameplate. Also, be sure the planned installation will meet the U.S. National Electrical Code and local code requirements. This welder may be operated from a single phase line or from one phase of a two or three phase line.
2. Models that have multiple input voltages specified on the nameplate (e.g., 208/230) are shipped connected for the higher voltage. If the welder is to be operated on lower voltage, it must be reconnected according to the instructions on the inside of the removable panel near the top left side of the rear panel. These instructions are repeated below:

INPUT SUPPLY RECONNECT DIAGRAM FOR DUAL VOLTAGE MACHINES

⚠ WARNING

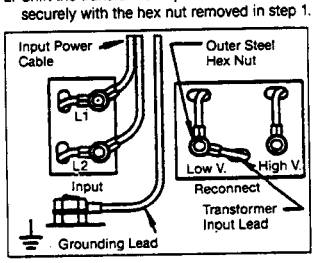
HIGH VOLTAGE can KILL

- **Remove input power to the welder by unplugging the power cable before installing or servicing this machine.**
- **Do not touch electrically "HOT" parts such as output terminals or internal windings.**
- **Grounding screw (⏚) must be connected to a good earth ground through the cable plug per National Electrical Code.**
- **Do not operate with covers removed.**
- **Only qualified personnel should install or service this equipment.**

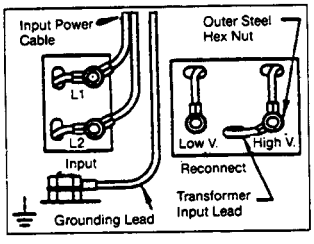
All machines are shipped from the factory connected for the higher of the two input voltages listed on the nameplate.

To change voltage connection proceed as follows:

1. Remove the outer steel hex nut from the terminal where the transformer input lead is connected.
2. Shift the transformer input lead to the terminal that the unit is to operate on and fasten securely with the hex nut removed in step 1. Make certain that brass nuts are tight.



Lower Voltage Connection



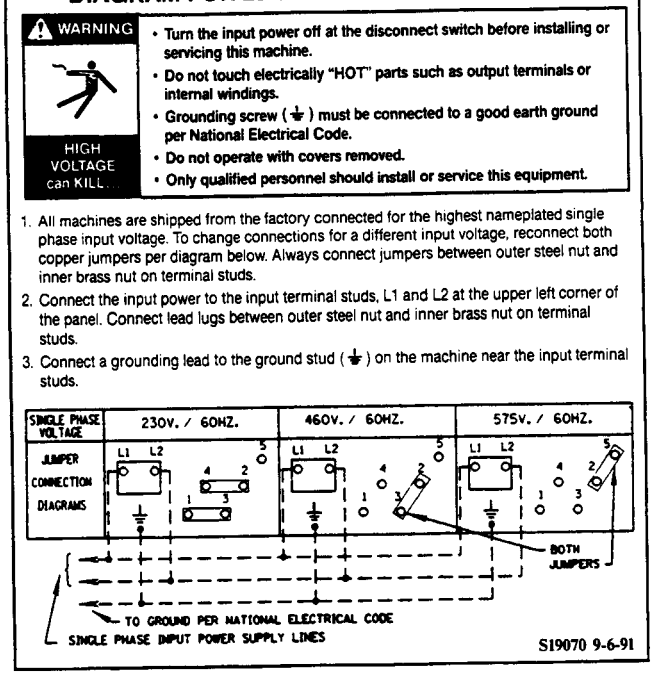
Higher Voltage Connection

S19070 12-90

WARNING: MAKE CERTAIN THAT THE INPUT POWER IS ELECTRICALLY DISCONNECTED BEFORE REMOVING THE SCREW THAT HOLDS THE REMOVABLE REAR PANEL IN PLACE.

3. The 208/230 volt 60 Hz model SP-250 is shipped with a 10 ft. (3.0m) input cable and plug connected to the welder. A matching receptacle is supplied with the machine. Mount the receptacle in a suitable location using the screws provided. Be sure it can be reached by the plug on the input cable attached to the welder. Mount with the grounding terminal at the top to allow the power cable to hang down without bending.

SINGLE PHASE INPUT SUPPLY RECONNECT DIAGRAM FOR 230/460/575 60 HZ MACHINES

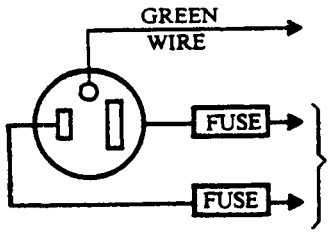


The 230/460/575 volt 60 Hz model is not equipped with a plug, input cable or receptacle.

4. Using the following instructions have a qualified electrician connect the receptacle or cable to the input power lines and the system ground per the U.S. National Electrical Code and any applicable local codes. See the table for proper wire sizes. For long runs over 100 feet (30m), larger copper wires should be used. Fuse the two hot lines with super lag type fuses as shown in the following diagram. The center contact in the receptacle is for the grounding connection. A green wire in the input cable connects this contact to the frame of the welder.

This ensures proper grounding of the welder frame when the welder plug is inserted into the receptacle.

Input Voltage	Hertz	Type 75°C Wire in Conduit, Copper Cond. AWG Size		Grounding Wire Copper Cond. AWG Size	Fuse Size (Super Lag)
		Runs to 100 ft. (to 30m)	Runs over 100 ft. (over 30m)		
208	60	8	6	10	60
230	60	10	8	10	60
460	60	14	12	10	30
575	60	14	12	10	25



CONNECT TO A SYSTEM GROUNDING WIRE. SEE THE UNITED STATES NATIONAL ELECTRICAL CODE AND/OR LOCAL CODES FOR OTHER DETAILS AND MEANS FOR PROPER GROUNDING.

CONNECT TO HOT WIRES OF A THREE-WIRE, SINGLE PHASE SYSTEM OR TO ONE PHASE OF A TWO OR THREE PHASE SYSTEM.

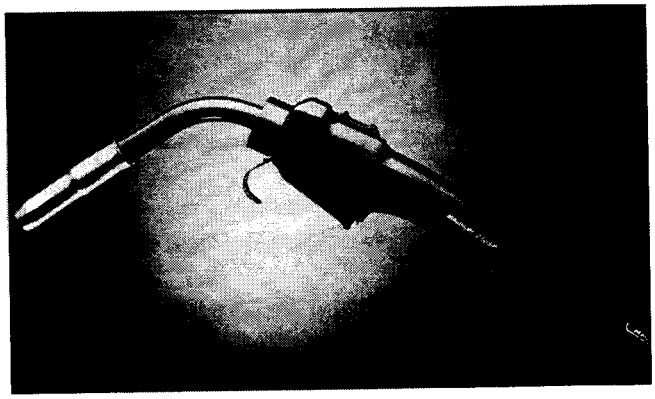
Output Polarity Connection

WARNING: TURN THE WELDER POWER SWITCH OFF BEFORE CHANGING OUTPUT CONNECTION.

The welder, as shipped from the factory, is connected for electrode positive (+) polarity. This is the normal polarity for GMA welding.

If negative (–) polarity is required, interchange the connections of the two cables located in the wire drive compartment near the front panel. The negative lead is the lead closest to the front panel (where the leads come out of the floor of the compartment) and should be reconnected to the brass conductor tube of the gun connector. The positive lead is stamped (+) on its terminal and should be reconnected to the work lead stud.

Gun and Cable



The Magnum™ 250SP gun and cable provided with the SP-250 is factory installed with a liner for .035-.045 (0.9-1.2mm) electrode and an .035 (0.9mm) contact tip. Install

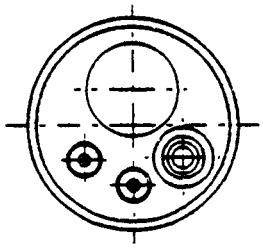
the .045 tip (also provided) if this wire size is being used. For other wire sizes, see Gun and Cable Maintenance on page 25.

WARNING: TURN THE WELDER POWER SWITCH OFF BEFORE INSTALLING GUN AND CABLE.

1. Lay the cable out straight.

2. Make sure all pins on the gun cable connector are aligned with the proper mating sockets on the front panel gun connector and then join the connectors and tighten the hand nut on the gun cable connector.

   NOTE: If a gun and cable other than the Magnum 250SP is to be used, it must conform to standard European-style connector (Magnum Fast-Mate™) specifications. See diagram below.



   However, the thumbswitch functions available on the Magnum 250SP gun will only be operable from the front panel keypad. The gun trigger switch must be capable of switching 5 milliamps at 15 volts DC — resistive.

CAUTION: The gun trigger switch connected to the gun trigger control cable must be a normally open, momentary switch. The terminals of the switch must be insulated from the welding circuit. Improper operation of or damage to the SP-250 might result if this switch is common to an electrical circuit other than the SP-250 trigger circuit.

Shielding Gas (For Gas Metal Arc Welding Processes)

Customer must provide cylinder of appropriate type shielding gas for the process being used.

CYLINDER may explode if damaged.

WARNING: GAS UNDER PRESSURE IS EXPLOSIVE. ALWAYS KEEP GAS CYLINDERS IN AN UPRIGHT POSITION AND ALWAYS KEEP CHAINED TO UNDERCARRIAGE OR STATIONARY SUPPORT. SEE AMERICAN NATIONAL STANDARD Z49.1, "SAFETY IN WELDING AND CUTTING" PUBLISHED BY THE AMERICAN WELDING SOCIETY.

1. Set gas cylinder in rear platform of SP-250. Hook chain in place to secure cylinder to rear of welder.

2. Remove the cylinder cap. Inspect the cylinder valves for damaged threads, dirt, dust, oil or grease. Remove dust and dirt with a clean cloth.

   DO NOT ATTACH THE REGULATOR IF OIL, GREASE OR DAMAGE IS PRESENT! Inform your gas supplier of this condition. Oil or grease in the presence of high pressure oxygen is explosive.

3. Stand to one side away from the outlet and open the cylinder valve for an instant. This blows away any dust or dirt which may have accumulated in the valve outlet.

WARNING: BE SURE TO KEEP YOUR FACE AWAY FROM THE VALVE OUTLET WHEN "CRACKING" THE VALVE.

4. Inspect the regulator for damaged threads, dirt, dust, oil or grease. Remove dust and dirt with a clean cloth.

   DO NOT USE THE REGULATOR IF OIL, GREASE OR DAMAGE IS PRESENT! Have an authorized repair station clean the regulator or repair any damage.

5. Attach the flow regulator to the cylinder valve and tighten the union nut(s) securely with a wrench.

   NOTE: If connecting to 100% CO_2 cylinder, insert regulator adapter provided between regulator and cylinder valve. If adapter is equipped with a plastic washer, be sure it is seated for connection to the CO_2 cylinder.

6. Attach one end of the inlet gas hose to the outlet fitting of the flow regulator, the other end to the SP-250 rear fitting, and tighten the union nuts securely with a wrench.

7. Before opening the cylinder valve, turn the regulator adjusting knob counter-clockwise until the adjusting spring pressure is released.

8. Open the cylinder valve slowly a fraction of a turn. When the cylinder pressure gauge pointer stops moving, open the valve fully.

WARNING: NEVER STAND DIRECTLY IN FRONT OF OR BEHIND THE FLOW REGULATOR WHEN OPENING THE CYLINDER VALVE. ALWAYS STAND TO ONE SIDE.

9. The flow regulator is adjustable. Set it for the flow rate recommended for the procedure and process being used before making the weld.

Spool Gun Module Installation
(Optional K531-1 or -2 Kit)

The optional K531-1 or K531-2 Kit will enable the SP-250 to accept either the K487 Spool Gun with remote control or the K469 Spool Gun when used with the K518 adapter.

To determine which kit is required for your SP-250, turn on the input power switch and watch the display. If it reads "S19636-2" (or higher), the K531-2 kit can be used; **if not,** the K531-1 kit (with updated ROM) must be used.

NOTE: If SP-250 is an early unit below Serial Number 732062, check the part number printed on the Control P.C. Board. If it is "G-1992-1" it will need to be replaced with the latest Control P.C. Board before the Spool Gun Module is installed, then use the K531-2 kit.

WARNING: Remove all input power to the SP-250 before proceeding.

1. Remove the SP-250 gun and cable.

   NOTE: If the cable is not removed, the tip of the gun will be electrically hot while using the spool gun; also, the SP-250 gun trigger, if pulled, will activate the spool gun.

2. Remove the six screws that hold the case side on (1 in front, 2 at rear, 3 under the door in the hinge). Lift the top up and over the lip of the center divider panel, then while pulling the case side away from the unit, slide it out of the slots in the base.

3. If this is a K531-2 kit, skip to step 4; otherwise, if it is a K531-1 kit, replace the old SP-250 ROM with the new ROM assembly provided in the kit. Be sure to follow the included installation instructions.

4. Find the four snap connectors mounted to the side panel of the P.C. board compartment. See Figure B.

5. Position the spool gun module board over the snap mount connectors making sure the lead plug connectors are placed at the top.

6. Gently press the board onto the connectors, making sure all the connectors snap into place.

7. On the wire drive of the SP-250, remove the hex-head screw from beneath the gas connector, releasing the small metal cover. See Figure A.

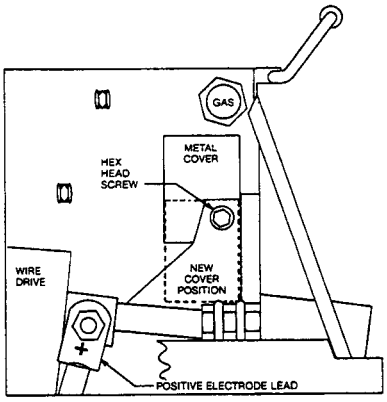


FIGURE A

8. Slide the metal cover out from behind the motor bracket. Flip the cover over so the screw hole is in the top right corner, then re-install as a spacer plate with the hex-head screw.

9. Find the receptacle lead harness included in the kit. Insert the panel receptacle into the hole from the control board side of the panel, making sure the panel receptacle key is in the twelve o'clock position.

10. Fasten the panel receptacle to the case with the three #6-32 x ⅜" self-tapping screws provided. Insert the screws from the wire drive side, thru the sheet metal, into the receptacle mounting holes.

11. Plug the 10 pin connector plug from the other end of the connector harness into the 10 pin connector (J12) at the top of the spool gun module board.

12. Find the control board lead harness with the two 8 pin plugs included in the kit. Connect either end into the unused 8 pin connector (J4) on the SP-250 control board and the other end into the 8 pin connector (J11) at the top of the spool gun module board.

13. Using the cable tie included in the installation kit, tie the two harnesses together approximately 3.5 inches (89mm) from the end of the molex's.

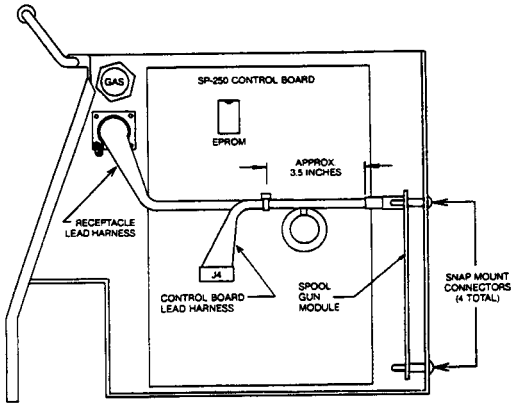


FIGURE B

14. Slip case side into the slots in the base, make sure the lip of the case side is lifted over the top edge of the center panel during installation. Fasten down with the six screws removed in step 2.

Spool Gun Installation

1. Slide the spool gun cable assembly through the opening in the louvers provided for the work lead.
2. Remove the SP-250 gas line from the connector. Screw the spool gun 6 pin plug into the new connector just below the gas line connector. Attach the spool gun gas hose to the gas connector. Tighten snugly, being careful not to strip the brass threads.

   NOTE: IF USING A K469 SPOOL GUN WITH 4 PIN PLUG, USE THE K518 ADAPTER.
3. Thread the removed SP-250 gas line between the new gas hose and spool gun cable (see Figure C). Push the SP-250 gas hose up until it wedges between the cable connector and gas connector. Make sure the SP-250 gas hose brass connector does not touch the wire drive unit.

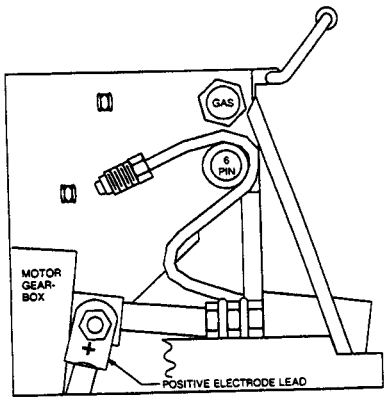


FIGURE C

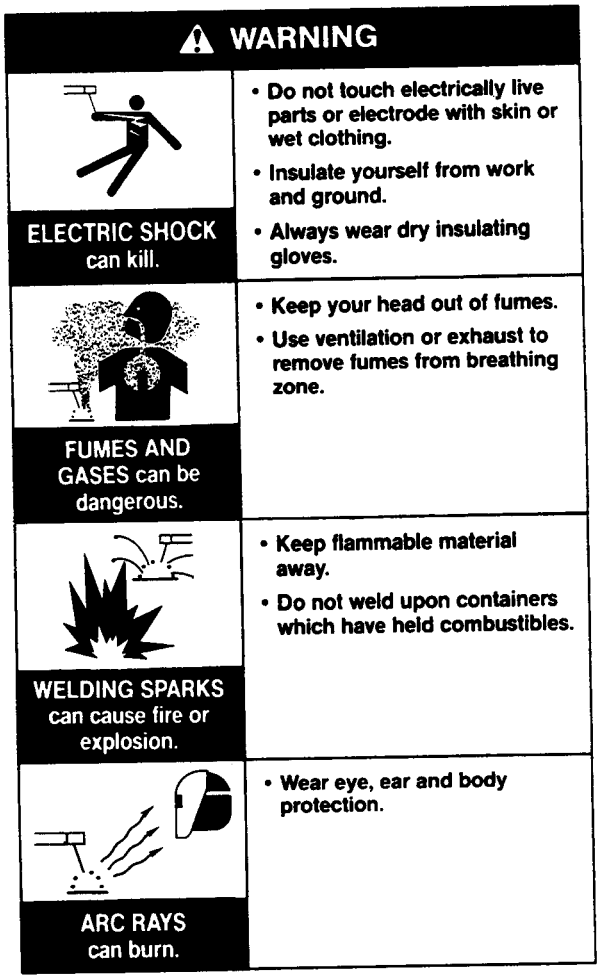
4. With SP-250 connected for electrode positive (refer to Output Polarity Connection on page 8), remove the positive electrode lead from the stud on the wire drive. Put the spool gun electrode lead on the stud, then the SP-250 positive electrode lead on top, followed by the nut. Tighten snugly being careful not to strip the threads.
5. Turn the SP-250 input power on. The display will flash the messages "SPOOL GUN HAS BEEN CONNECTED" and "PRESS MANUAL TO ENTER SETTINGS." Pressing the MANUAL key will put you in spool gun welding mode (see Operating Instructions).
6. Refer to the Instruction Manual included with the K487 or K469 Spool Gun for more detail in Spool Gun set-up and operation.

Removal of Spool Gun

WARNING: Remove all input power to the SP-250 before proceeding.

1. To return to normal SP-250 welding, turn input power off, and remove the spool gun electrode lead, gas hose and plug. Reattach the SP-250 gas line and the Magnum 250SP gun and cable.
2. When the input power is first turned back on, the display will flash the messages "SPOOL GUN HAS BEEN REMOVED" and "PRESS PROCESS TO ENTER SETTINGS." Pressing the PROCESS key will return you to normal SP-250 welding.

OPERATING INSTRUCTIONS



IMPORTANT SAFETY NOTE: This DC Constant Voltage wire welder provides "COLD" electrode when gun trigger is released. This feature and DC Constant Voltage output provide an added margin of safety when welding must be performed under electrically hazardous conditions such as:

- damp locations
- while wearing wet clothing
- on metal structures, or,
- in cramped positions (sitting, kneeling or lying) if there is a high risk of unavoidable or accidental contact with the workpiece or ground.

Duty Cycle

The SP-250 is rated at the following duty cycles:

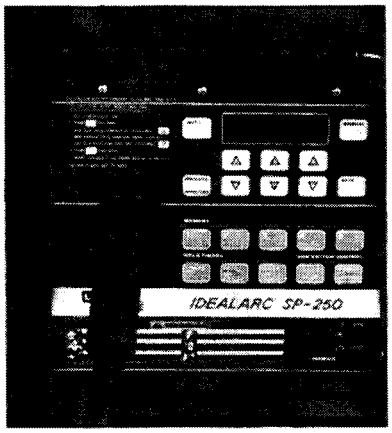
DUTY CYCLE[1]	AMPS	VOLTS
100%	145	26
60%	200	28
35%	250	26

[1] Based upon 10 minute time period (i.e., for 60% duty cycle, it is 6 minutes on and 4 minutes off).

Control Function/Operation

Power Switch

Place the lever in the "ON" position to turn the SP-250 on. When the power is on, the red LED backlighting of the LCD display will be lit, and the screen will contain a readable display. The welding setup present when the power was shut off or disconnected will be restored when the power is restored.



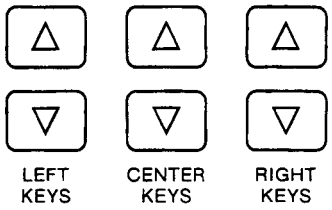
Setup Keys

DISPLAY LANGUAGE SELECTION

The SP-250 has multilingual display capability permitting the SP-250 prompts, messages, and other display information to be in any of five languages: English, German, French, Spanish, and Japanese (Katakana). The user may select the chosen language by simultaneously pressing the PROCESS Key and the appropriate Number Key per the instructions given in the appropriate language on the Keypad Instruction Decal inside the SP-250 door, also shown below:

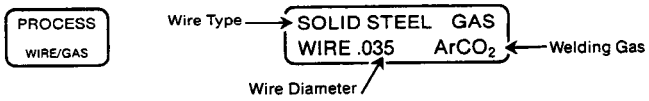
For ENGLISH display press both keys at the same time.	PROCESS WIRE/GAS	and	1
Für die optische Anzeige auf DEUTSCH sind beide Tasten gleichzeitig zu drücken.	PROCESS WIRE/GAS	und	2
Pour l'affichage en FRANCAIS appuyez les deux touches en même temps.	PROCESS WIRE/GAS	et	3
Para monstrar en ESPAÑOL pulsar las dos teclas a la vez.	PROCESS WIRE/GAS	y	4
ニホンゴノヒョージハ リョーホーノ キーヲ ドージニ オス	PROCESS WIRE/GAS	ト	5

ARROW KEYS



There are three pairs of arrow keys: left, center, and right. The up arrow keys increase the selection displayed directly above them. The down arrow keys decrease the selection displayed directly above them. All of the arrow keys have a repeat function when they are held closed. The left pair will automatically continue to increment or decrement the selection above it at a slow, steady rate as long as the key is pressed. The center and right pairs will continue to increment and decrement the selections above them at a slow rate, but then the rate will gradually increase until it becomes very rapid. This allows rapid setting from a small quantity to a large quantity or vice versa while maintaining an excellent resolution (i.e., 50 IPM to 500 IPM). However, when the trigger is closed, the changes will be at a steady, moderate rate to allow for proper "on the fly" control.

PROCESS (WIRE/GAS) KEY



This key is used to display the Wire Type, Wire Diameter, and Welding Gas. Each combination of wire and gas dictates a unique relationship between the wire feed speed and the arc voltage. The SP-250 uses this unique relationship, along with the metal thickness, to set the proper values of wire feed speed and arc voltage. **Therefore, it is very important that the wire type, wire diameter, and welding gas on the display match the actual wire type, wire diameter, and welding gas being used for the weld.**

Left arrow keys — set Wire Type

Center arrow keys — set Wire Diameter

Right arrow keys — set Welding Gas

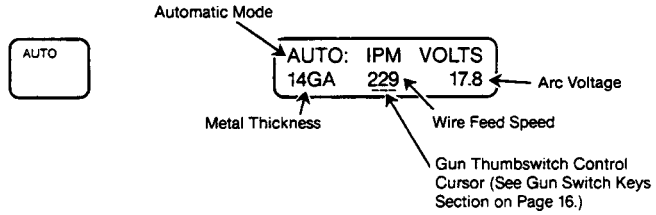
The following 16 processes are programmed into the SP-250:

Wire Type	Wire Diameter	Welding Gas
Solid Steel	.025 (0.6mm)	CO_2
Solid Steel	.025 (0.6mm)	Ar/CO_2
Solid Steel	.030 (0.8mm)	CO_2
Solid Steel	.030 (0.8mm)	Ar/CO_2
Solid Steel	.035 (0.9mm)	CO_2
Solid Steel	.035 (0.9mm)	Ar/CO_2
Solid Steel	.035 (0.9mm)	Ar/O_2
Solid Steel	.045 (1.2mm)	CO_2
Solid Steel	.045 (1.2mm)	Ar/CO_2
Stainless	.035 (0.9mm)	Ar/O_2
Stainless	.035 (0.9mm)	$He/Ar/CO_2$
Aluminum (5356)	3/64" (1.2mm)	Argon
Outershield®	.045 (1.2mm)	CO_2
Outershield	.045 (1.2mm)	Ar/CO_2
Innershield®	.035 (0.9mm)	None
Innershield	.045 (1.2mm)	None

Procedure Keys

Because design, fabrication, assembly and welding variables affect the results obtained in applying recommended procedure information, the serviceability of a product or assembly is the responsibility of the builder/user.

AUTO KEY



Pressing the Auto Key once places the SP-250 into the automatic mode of operation. Auto mode provides automatic setup of the recommended wire feed speed and arc voltage based on the metal thickness selected and the process being used. The Auto mode screen displays metal thickness, set wire feed speed, the set arc voltage, and a cursor that indicates which parameter, wire feed speed, or arc voltage is being controlled by the thumbswitch on the SP-250 gun (see Gun Switches Section on page 17).

Left arrow keys — Increases (up arrow) or decreases (down arrow) metal thickness setting. Increasing or decreasing metal thickness automatically increases or decreases both wire feed speed and arc voltage simultaneously. See gauge chart on instruction label on inside of SP-250 door for available sizes. (**NOTE:** If the spot or stitch timers are on, metal thickness is not displayed and, therefore, the left arrow keys will not function. Also, the left arrow keys do not function when the trigger is closed. (See Figures 1 and 2 following.)

Center arrow keys — Increases (up arrow) or decreases (down arrow) wire feed speed setting. Increasing or decreasing wire feed speed will simultaneously cause an increase or decrease in the arc voltage and can change the metal thickness setting.

Right arrow keys — Increases (up arrow) or decreases (down arrow) arc voltage setting. An up arrow indicator appears below the V in VOLTS if the arc voltage has been set higher than the recommended value, and a down arrow indicator appears below the V in VOLTS if the arc voltage is below the recommended value. No arrow indicates that you are set to the recommended value. (See Figures 1 and 2 following.)

Repressing the Auto key resets the wire feed speed and arc voltage settings to the recommended values for the metal thickness displayed. (**NOTE:** If the spot or stitch timers are on, metal thickness is not displayed and, therefore, the repress function does not work.)

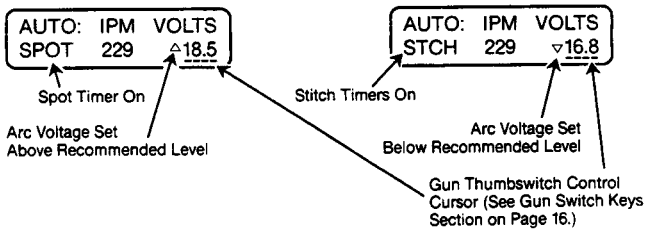
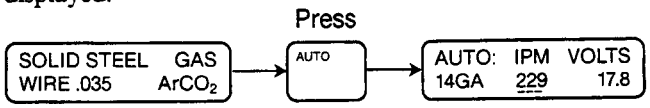


FIGURE 1

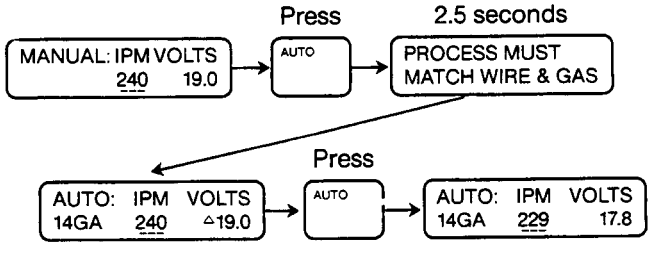
FIGURE 2

TYPICAL AUTO KEY PRESS SEQUENCES

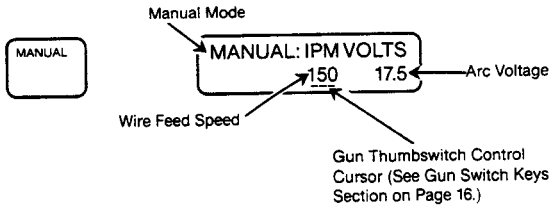
Process screen is being displayed prior to pressing Auto key. The Auto key is pressed, the Auto screen is now displayed.



If the unit was in a Manual configuration (see Manual Key) when the Auto key was pressed, the audio alarm will beep three times and a message (see below)· will be displayed for 2.5 seconds reminding you that the process entered into the SP-250 (see Process Key) must match the wire and gas being used. After the 2.5 second period is over, the Auto screen will be displayed with the same procedure that was in Manual. Repressing the Auto Key sets the recommended procedure for the metal thickness displayed.



MANUAL KEY



Permits individual setting of wire feed speed and arc voltage for manual procedure setup. The manual screen displays wire feed speed, arc voltage, and a cursor that indicates which parameter, wire feed speed, or arc voltage is being controlled by the thumbswitch on the SP-250 gun (see Gun Switches Section on page 17).

Left arrow keys — Do not function in Manual mode.

Center arrow keys — Increase (up arrow) or decrease (down arrow) wire feed speed.

Right arrow keys — Increase (up arrow) or decrease (down arrow) arc voltage.

If the spot or stitch timers are on it will be indicated in the bottom left corner of the display. (See Figures 3 and 4 below.)

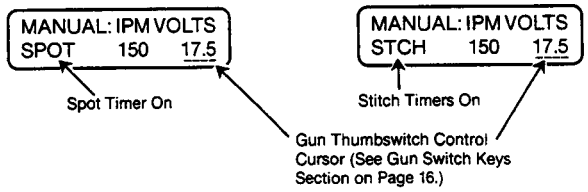
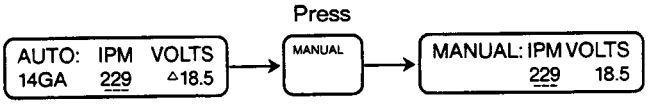


FIGURE 3

FIGURE 4

TYPICAL MANUAL KEY PRESS SEQUENCE

Auto screen is being displayed prior to pressing Manual key. The Manual key is pressed, the Manual screen is now displayed. The procedure is the same that was in Auto.



Memory Keys

SAVE KEY 

Saves present setup (including process, procedure, and timer functions, if used) to one of five memories chosen by pressing the desired memory number key.

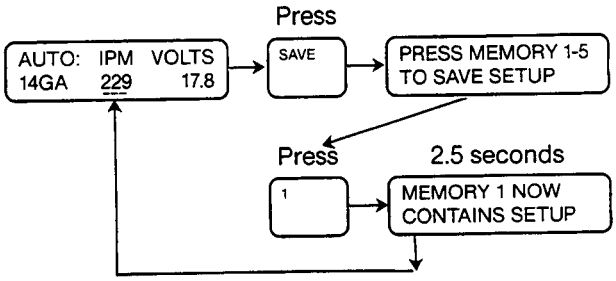
When the Save key is pressed, a prompting message instructing the operator to "PRESS MEMORY 1-5 TO SAVE SETUP" is displayed. This message will stay on the display until a memory number key is selected or one of the other keys, such as Auto, Manual, or Process, is pressed. If a memory number key is selected, a message will be displayed for 2.5 seconds that confirms that the setup was saved to that memory number (see Key Press Sequence following).

The six arrow keys perform no function when saving a setup.

NOTE: When a setup is saved to a memory, the previous content of that memory is lost because it is replaced by the present setup. Removing input power does not affect setups in memory.

TYPICAL SAVE KEY PRESS SEQUENCE

Auto screen displayed prior to pressing Save key. Save key is pressed, and display changes to prompting message. Memory 1 key is pressed, and the display changes to a message that confirms the setup was saved to memory 1. The message is displayed for 2.5 seconds, and then the original Auto screen is displayed.



MEMORY NUMBER KEY 

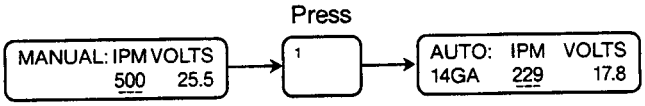
Pressing the desired Memory Number key recalls the setup saved in that memory (including process, procedure, and timer functions if used).

The six arrow keys perform no function during a recall.

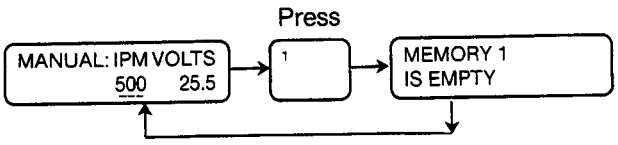
NOTE: The presently displayed setup is lost because it is replaced by the setup recalled from memory. If you wish to save the present setup, save it to an unused memory first (see Save key), and then recall the memory required.

TYPICAL MEMORY NUMBER KEY PRESS SEQUENCE

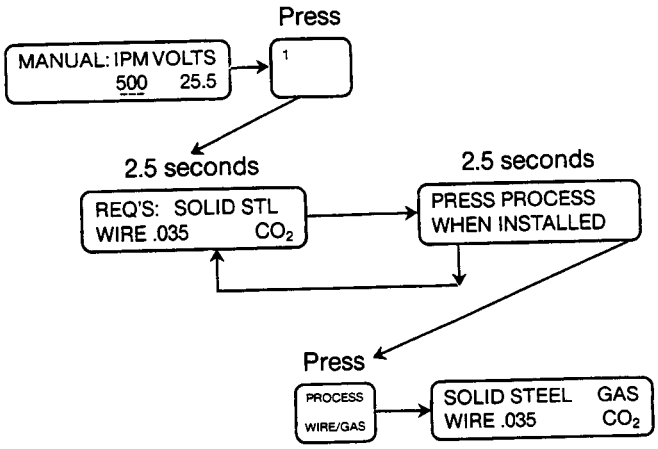
Manual screen displayed prior to pressing Memory Number key. Memory Number key is pressed, the display changes to the Auto setup that was in memory 1.



If the memory is empty (contains no setup yet), then a message indicating that (see below) will be displayed when the Memory Number key is pressed. The message will be displayed for 2.5 seconds, and then the display will change to the original display before the Memory Number key was pressed.

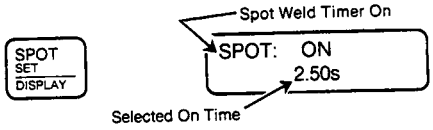


If the setup in memory is an Auto mode type and it requires a different wire type, wire size, or welding gas, the display will alternate messages (see below), once the Memory Number is pressed. The first message will tell you what process is required, and the second message will tell you to press the Process key once you have installed the process required into the SP-250. Once the required process has been installed, press the Process key and the setup will be recalled from memory 1 and the display will show the required process. Press Auto key or close the gun trigger to display the procedure stored in memory 1.



Timer Keys

SPOT KEY



Turns on the Spot weld timer and displays selection of the spot ON time. Pressing the Spot key a second time returns the screen to the previous display without turning off the spot timer. Any time the Spot weld timer is on and the display is in the Auto or Manual mode, the word SPOT will appear in the bottom left corner of the display.

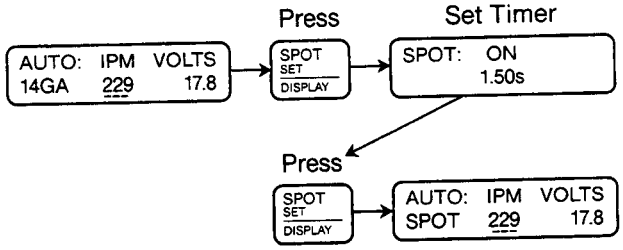
Left arrow keys — Do not function.

Center arrow keys — Increase (up arrow) or decrease (down arrow) Spot ON time in seconds (0.20 to 2.50s).

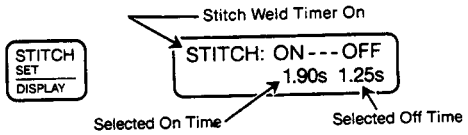
Right arrow keys — Do not function.

TYPICAL SPOT KEY PRESS SEQUENCE

Auto screen is displayed prior to pressing Spot key. Spot key is pressed, Spot On timer is activated and the display changes to Spot screen. Spot ON timer can now be adjusted using the center arrow keys. Once the timer has been set, pressing the Spot key again returns the display to the original Auto screen with the Spot timer status indicated in the bottom left corner.



STITCH KEY



Turns on the Stitch weld timers and displays selections of the stitch ON and OFF times. Pressing the Stitch key a second time returns the screen to the previous display without turning off the stitch timers. Any time the Stitch weld timers are on and the display is in the Auto or Manual mode, the abbreviation STCH will appear in the bottom left corner of the display.

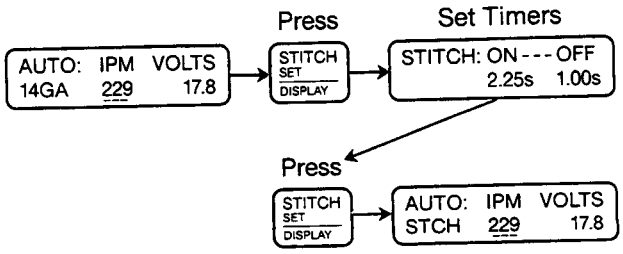
Left arrow keys — Do not function.

Center arrow keys — Increase (up arrow) or decrease (down arrow) Stitch ON time in seconds (0.20 to 2.50s).

Right arrow keys — Increase (up arrow) or decrease (down arrow) Stitch OFF time in seconds (0.20 to 2.50s).

TYPICAL STITCH KEY PRESS SEQUENCE

Auto screen is displayed prior to pressing Stitch key. Stitch key is pressed, Stitch timers are activated and the display changes to Stitch screen. Stitch ON and OFF timers can now be adjusted using the center and right arrow keys. Once the timers have been set, pressing the Stitch key again returns the display to the original Auto screen with the Stitch timer status indicated in the bottom left corner.



TIMERS OFF KEY

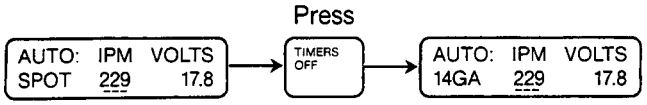
Turns off both Spot and Stitch timers and removes their

indicating letters from the bottom left corner of the Auto and Manual mode displays.

The six arrow keys do not function with this key.

TYPICAL TIMERS OFF KEY PRESS SEQUENCE

Auto screen is displayed prior to pressing Timers Off key. Timers Off key is pressed, all timers are turned off, and the display no longer indicates in the bottom left-hand corner that any timers are on. (Timer status is replaced by gauge in the Auto mode.)



Gun Switch Keys

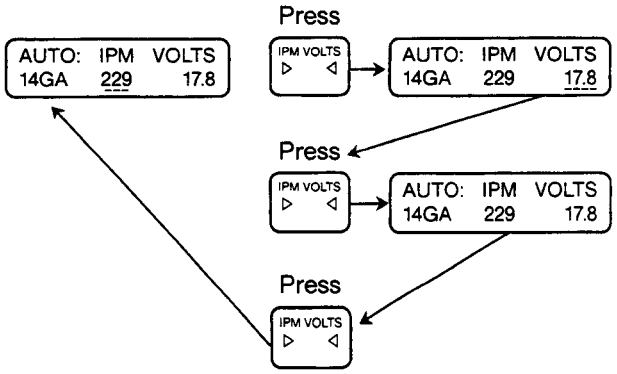
IPM VOLTS KEY

Sets the gun thumbswitch to control IPM or VOLTS. Pushing the gun thumbswitch forward (toward the tip) increases and pulling it back decreases IPM or VOLTS. The underlining cursor **always** indicates the selection being controlled by the gun thumbswitch. If the cursor is not present, the gun thumbswitch will not be functional which prevents any inadvertent actuations. Each time this key is pressed, it causes the cursor to go to the next step in the following sequence IPM to VOLTS to no cursor to IPM to VOLTS, etc.

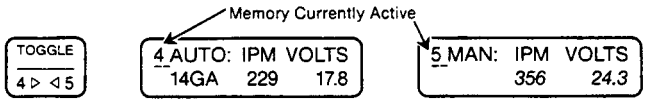
NOTE: In Auto mode, changing IPM will change arc voltage also and can cause a change in metal thickness as well.

TYPICAL IPM VOLTS KEY PRESS SEQUENCE

Auto screen is displayed prior to pressing IPM VOLTS key. IPM VOLTS key is pressed, cursor moves from under IPM to under VOLTS. Pressing the IPM VOLTS key again causes the cursor to disappear. Pressing the IPM VOLTS key again causes the cursor to appear under IPM. This sequence continues each time the IPM VOLTS key is pressed.



TOGGLE KEY



The first time this key is pressed it turns on toggle mode and recalls the setup in memory 4. This mode allows you to toggle between the setups in memory 4 and memory 5. Each time the key is pressed, it alternates between the two memories. The toggle screen displays the memory number the current setup was recalled from, indicates automatic (AUTO:) or manual (MAN:) mode, displays gauge if in Auto mode, set wire feed speed, and set arc voltage. The cursor underlines the memory number currently selected.

If in AUTO mode, an up or down arrow which shows whether the arc voltage has been adjusted above or below the recommended level can also be on the display (see Auto Key Section on page 13). Also Spot or Stitch timer status will be displayed in the lower left-hand corner if either timer is active.

The gun thumbswitch functions as a Toggle key in Toggle mode. Pushing the gun thumbswitch forward (toward the tip) selects the setup in memory 5, and pulling it back selects the setup in memory 4 (see Gun Thumbswitch Section on page 17). The gun thumbswitch also functions with the trigger closed for "on the fly" changes during a weld.

To turn toggle mode off, press Auto, Manual, or any Memory Number key.

CAUTION: Any changes made to settings in toggle mode are **not** automatically saved when power is removed, or if toggle mode is turned off. To save these changes, press the Save key and then the memory number key that was currently displayed on the toggle screen (4 or 5), "toggle," then press the Save key and then the other Memory Number key that was displayed after the toggle (5 or 4). When power is returned, the machine will not be in toggle mode, but will contain the settings present when power was removed so you may continue to weld right where you left off or press Toggle key to return to toggle mode.

Left arrow keys — If metal thickness is displayed, these keys will increase (up arrow) or decrease (down arrow) it; otherwise, they perform no function.

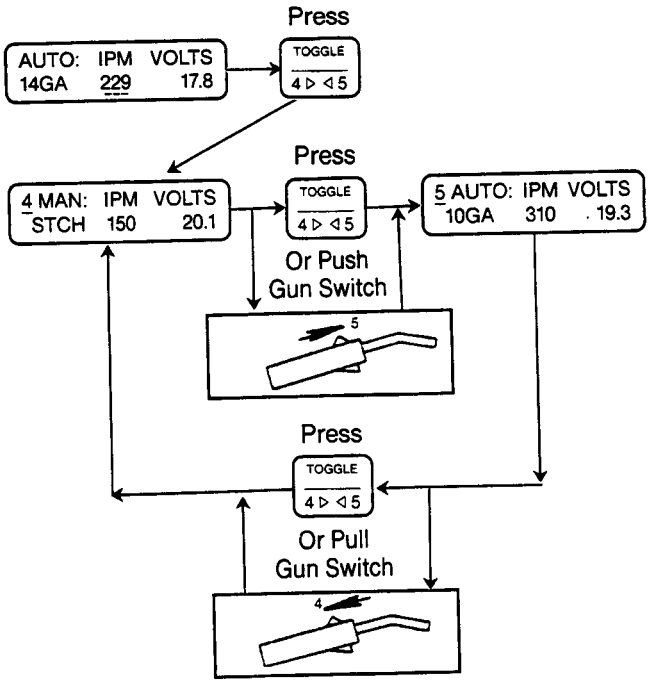
Center arrow keys — Increases (up arrow) or decreases (down arrow) wire feed speed setting. If in Auto mode, increasing or decreasing wire feed speed will simultaneously cause an increase or

decrease in the arc voltage and can change the metal thickness setting.

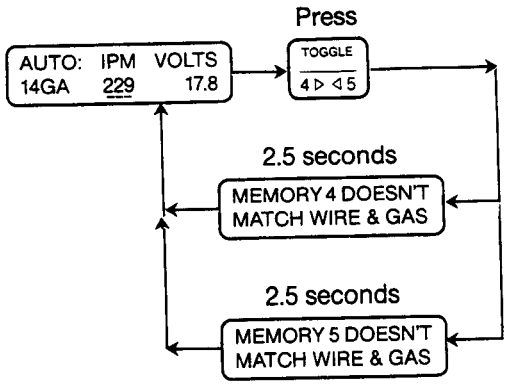
Right arrow keys — Increases (up arrow) or decreases (down arrow) arc voltage setting. If in Auto mode, an up arrow indicator appears below the V in VOLTS if the arc voltage has been set higher than the recommended value, and a down arrow indicator appears below the V in VOLTS if the arc voltage is below the recommended value. No arrow indicates that you are set to the recommended value.

TYPICAL TOGGLE KEY PRESS SEQUENCE

Auto screen is displayed prior to pressing Toggle key. Toggle key is pressed, memory 4 is recalled and appears on the display. The unit is now in toggle mode. Pressing the Toggle key again or pushing the gun thumbswitch forward (toward the gun tip) "toggles" the unit, and memory 5 is recalled and appears on the display. Pressing the Toggle key again or pulling the gun thumbswitch back (toward the gun cable) "toggles" the unit, and memory 4 is recalled and appears on the display. This whole cycle is repeatable as long as the unit remains in Toggle mode.



When the Toggle key is pressed and the setup in memory 4 or 5 is an Auto mode type and it requires a different wire type, wire diameter, or welding gas, a message (see below) will be displayed for 2.5 seconds telling you which memory does not match the process set in the machine, and then the screen will return to the previous display. In order to see what process is required, press the Memory Number key of the one that did not match (see Memory Number Key Section on page 14).



Gun Switches

Gun Trigger Switch — Turns on arc voltage, wire feeder, and gas solenoid (except with Innershield® electrodes) when closed. Also causes the screen to display the Auto or Manual screens, (depending on which mode it is in), when the trigger is pulled. Turns off arc voltage, wire feeder, and gas solenoid when opened.

Gun Thumbswitch (Magnum™ 250SP Only) — Used to control wire feed speed, arc voltage, or selection of toggle memories 4 and 5. See IPM VOLTS key and Toggle key for control details. The increase or decrease function of the thumbswitch is the same as the center and right arrow key pairs for IPM or VOLTS setting. (See Arrow keys on page 12 for details.)

Wire Drive Roll

The drive roll provided with the SP-250 has two grooves, one for .030-.035 (0.8-0.9mm) solid steel electrode, and the other for .045 (1.2mm) solid steel electrode. The welder is shipped with the drive roll installed in the .030-.035 (0.8-0.9mm) position as indicated by the stenciling on the exposed side of the drive roll. If .045 (1.2mm) electrode is to be used or one of the optional drive rolls (see below) is required, then the drive roll must be reversed or changed per the following instructions.

Drive Rolls available to feed different sizes and types of electrode:

DRIVE ROLLS	DRIVE ROLL PART NO.
Steel Wire Sizes: .025-.035 (0.6-0.9mm) .030-.045 (0.8-1.2mm) .045 Cored (1.2mm)	 M14932 M15809 S14541-052 (2 Req'd)
Aluminum Wire Sizes: 3/64" (1.2mm)	 S17092-3/64A

PROCEDURE FOR CHANGING DRIVE ROLL

Different wire sizes may require changing the drive roll. The applicable wire sizes are stamped on the drive roll. Dual groove rolls must be installed so the side with the proper wire size stamp faces out.

1. Turn off the power source.
2. Release the pressure on the idle roll by swinging the pressure arm off the idle roll arm.
3. Remove the wire from the drive system.
4. Remove the wing screw from the drive roll. Turn the drive roll over or change to another roll as required. Reinstall the wing screw.
5. Be sure the gun liner and contact tip are properly sized for wire being used. (See Gun and Cable Maintenance Section on page 25.)

To Start the Welder

Turn the "Power" switch to "ON." This lights the red LED back lighting of the LCD display and a readable screen should be visible on the display. With the desired weld mode selected, operate the gun trigger for welder output and to energize the wire feed motor.

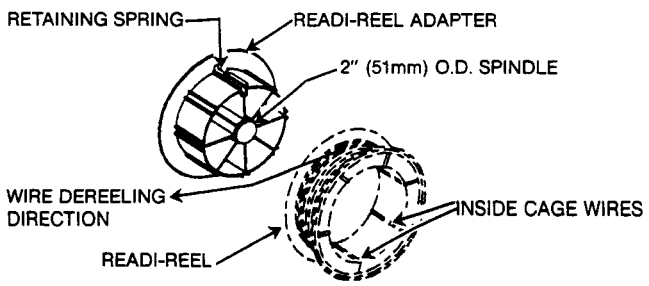
Fan Control

The fan motor is thermostatically controlled to provide cooling for the transformer and other components only when required. Even though the power switch is on, the fan motor will not run when the machine does not require fan cooling, such as when first turned on, or when welding at low current or duty cycle procedures.

Wire Reel Loading

To mount a 22-30 lb. (10-14kg) Readi-Reel® package using the Readi-Reel adapter provided:

1. Pull the Readi-Reel adapter and spindle up out of the SP-250 spindle mounting clips (V-brackets).
2. Rotate the spindle and adapter so the retaining spring is at the 12 o'clock position.
3. Position the Readi-Reel so that it will rotate in a **counterclockwise** direction when wire is dereeled from the **top** of the coil.



4. Set one of the Readi-Reel inside cage wires on the slot in the retaining spring tab.
5. Lower the Readi-Reel to depress the retaining spring and align the other inside cage wires with the grooves in the molded adapter.
6. Slide cage all the way onto the adapter until the retaining spring "pops up" fully.

WARNING: CHECK TO BE SURE THE RETAINING SPRING HAS FULLY RETURNED TO THE LOCKING POSITION AND HAS **SECURELY** LOCKED THE READI-REEL CAGE IN PLACE. RETAINING SPRING MUST REST ON THE CAGE NOT THE WELDING ELECTRODE.

7. Check that the mating surfaces of the spindle hubs and spindle mounting clips (V-brackets) are clear of dirt and debris and that the adapter is fully engaged onto the spindle.
8. Lower the loaded spindle into the spindle mounting clips (V-brackets) so wire dereels from top of coil toward wire drive.

   NOTE: The retaining spring side of the adapter should be facing the center (inner) panel of the SP-250.

To remove Readi-Reel from Adapter, depress retaining spring tab with thumb while pulling the Readi-Reel cage from the molded adapter with both hands. Do not remove adapter from spindle.

To mount 10 to 30 lb. (5-14kg) spools: 8" (203mm) and 12" (305mm) diameter:

1. Remove the Readi-Reel adapter shipped on the 2 inch (51mm) dia. spindle.
2. Be sure that the mating surfaces of the spindle hubs and spindle mounting clips (V-brackets) are clear of dirt and debris.
3. Place the spool on the spindle making certain the brake driving pin enters one of the holes in the back side of the spool.
4. Lower the loaded spindle into the spindle mounting clips (V-brackets) so the wire dereels from the top of the reel toward the wire drive.

NOTE: The SP-250 Spindle was designed to mount 12" (300mm) and 8" (200mm) diameter spools meeting international spool size specifications. If the spool being used is too narrow to keep the brake driving pin engaged with the spool pin hole, a 2" (51mm) I.D. shim washer could be used between the spool and the spindle retaining clip to take up the space.

Feeding Electrode

WARNING: When inching, the electrode and drive mechanism are always "hot" to work and ground and remain "hot" several seconds after the gun trigger is released.

NOTE: Check that drive rolls and gun parts are proper for the wire size and type being used. (Refer to Sections on pages 17 and 27.)

1. Turn the Readi-Reel or spool until the free end of the electrode is accessible.
2. While tightly holding the electrode, cut off the bent end and straighten the first six inches (152mm). Cut off the first inch (25mm). (If the electrode is not properly straightened, it may not feed or may not go into the outgoing guide tube causing a "birdnest.")
3. Push the wire through the guide tubes and close the idle roll assembly. For idle roll pressure settings, see Idle Roll Pressure Setting Section below.
4. Turn "OFF" weld timers by pressing TIMERS OFF key. Press the gun trigger and push the electrode into the drive roll. If the electrode fails to thread itself into the outgoing guide tube of the wire drive, open the quick release idle roll arm, thread the electrode manually, and reclose the arm.
5. Inch the electrode through the gun.

   NOTE: Due to the low speed starting feature of the SP-250, the wire will feed at low speed for 2 seconds while inching, then come up to the set speed.
6. Check that the welding process is set for the wire type, diameter, and gas per instructions on nameplate.

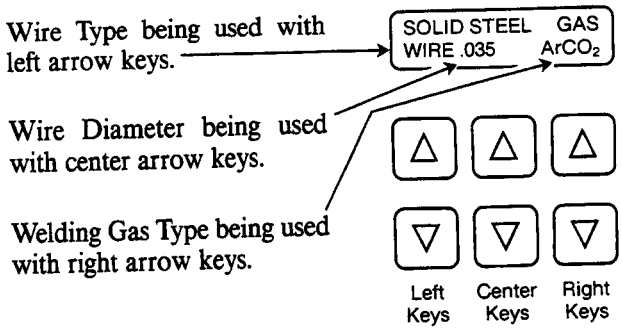
Idle Roll Pressure Setting

The idle roll pressure wing screw is set at the factory backed out 2½ turns from full pressure. This is an approximate setting. The optimum idle roll pressure varies with type of wire, wire diameter, surface condition, lubrication, and hardness. As a general rule, hard wires may require greater pressure, and soft, or aluminum wire, may require less pressure than the factory setting. The optimum idle roll setting can be determined as follows:

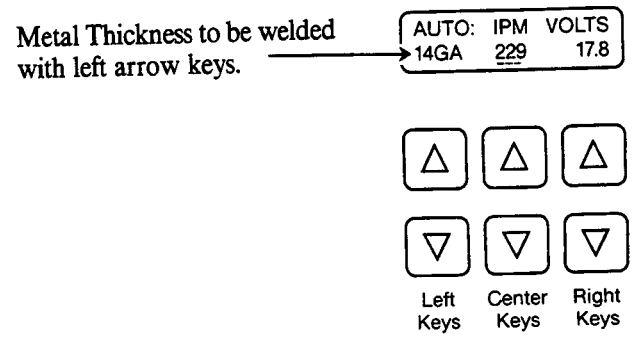
1. Press end of gun against a solid object that is electrically isolated from the welder output and press the gun trigger for several seconds.
2. If the wire "birdnests," jams or breaks at the drive roll, the idle roll pressure is too great. Back the wing screw out ½ turn, run new wire through gun, and repeat above steps.
3. If the only result was drive roll slippage, loosen the gun cable Fast-Mate™ connection nut from the front of the SP-250 and pull the gun cable forward about 6" (152mm). There should be a slight waviness in the exposed wire. If there is no waviness, the pressure is too low. Tighten the wing screw ¼ turn, lock the gun cable in place and repeat the above steps.

Making an Auto Mode Weld

1. Check that the polarity is correct for the process being used, then turn power switch ON.
2. Press PROCESS / WIRE/GAS then select:

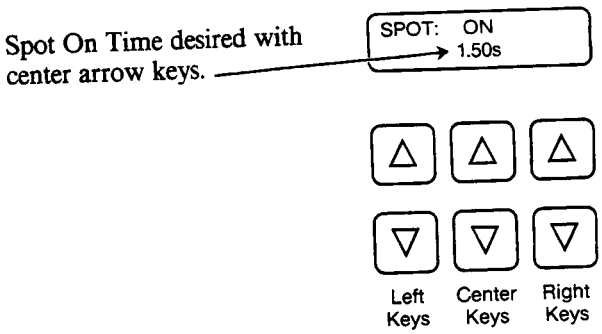


3. Press AUTO then select:



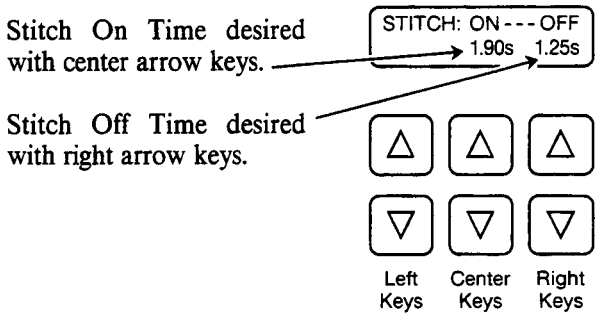
4. If Spot or Stitch timing modes are required, perform either step 4.a. for Spot or step 4.b. for Stitch; otherwise, go to step 5.

4.a. Press SPOT / DISPLAY then select:



Press SPOT / DISPLAY again to return to previous display.

4.b. Press STITCH/DISPLAY then select:



Press STITCH/DISPLAY again to return to previous display.

5. Inch the electrode through the gun and cable and then cut the electrode within approximately ⅜ inch (9.5mm) of the end of the contact tip [¾ inch (19mm) for Outershield® electrodes].

6. If welding gas is to be used, turn on the gas supply and set the required flow rate [typically 25-35 CFH (12-16.5 l/min)].

7. When using Innershield® electrode, the gas nozzle may be removed from the insulation on the end of the gun. This will give improved visibility and eliminate the possibility of the gas nozzle overheating.

8. Connect work clamp to metal to be welded. Work clamp must make good electrical contact to the work. The work must also be grounded as stated in "Arc Welding Safety Precautions."

> **WARNING:** WHEN USING AN OPEN ARC PROCESS, IT IS NECESSARY TO USE CORRECT EYE, HEAD, AND BODY PROTECTION.

9. Position electrode over joint. End of electrode may be lightly touching the work.

10. Lower welding helmet, close gun trigger, and begin welding. Hold the gun so the contact tip to work distance is about ⅜ inch (9.5mm), [¾ inch (19mm) for Outershield electrodes].

11. To stop welding, release the gun trigger and then pull the gun away from the work after the arc goes out.

12. When no more welding is to be done, close valve on gas cylinder (if used), momentarily operate gun trigger to release gas pressure, and turn off SP-250.

Spot Weld Mode

Arc spot plug welds are used when continuous welds are not needed or to hold thin sheet metal together prior to stitch welding or continuous welding. Plug welds are made by using a punch to make a 3/16 inch (4.8mm) diameter hole in the top sheet and arc welding through the hole into the back sheet.

Spot On Time sets welding time. Start with a dial setting of about 1.2 seconds.

To make an arc spot plug weld, punch 3/16 inch (4.8mm) holes in top sheet. Set the procedure for the metal thickness to be welded. Install spot weld nozzle (if available) on gun and press it against the top sheet so the top and bottom sheets are tight together. Close trigger and hold it closed until the arc goes out. If a spot weld nozzle is not used, smoother welds will result by moving the welding wire in a small circle during the weld.

Stitch Weld Mode

Used to weld thin material where warpage and burnthrough are a problem. Proper adjustment of ON and OFF times and arc travel speed permits welding thin sheet metal with small welds, minimum distortion, and no burnthrough.

Stitch On Time sets welding time. Start with a dial setting of 0.5 seconds. Raise setting to increase penetration and weld size; lower setting to reduce burnthrough and distortion.

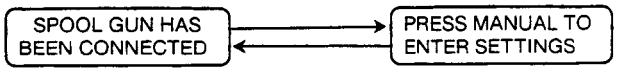
Stitch Off Time sets off time. Start with a dial setting of 0.5 seconds. Raise setting to reduce burnthrough; lower setting to make weld flatter and smoother.

To weld, set the procedure for the metal thickness to be welded. Close trigger and hold it closed for length of seam. Hold gun in one place during ON time and move gun just beyond edge of molten metal during OFF time.

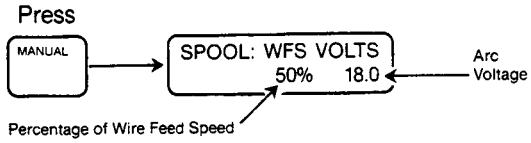
NOTE: For smoothest welds on thinner metal, point gun slightly toward direction of travel.

Making a Weld With The Spool Gun

With the Spool Gun properly installed when the Input power switch is turned on, the display should flash between the screens:



Pressing the Manual key will change the display to the spool screen.



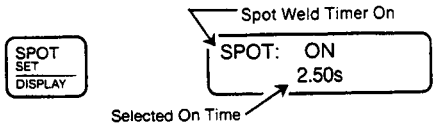
The 1-99% on the display represents a percentage of wire feed speed. This is the set speed for the K469 spool gun and the maximum set speed for the K487 spool gun (with the remote control in gun handle at maximum). The remote control turned to minimum will give you approximately 50% of the maximum set WFS.

Left arrow keys — Do not function.

Center arrow keys — Increase (up arrow) or decrease (down arrow) percent of wire feed speed.

Right arrow keys — Increase (up arrow) or decrease (down arrow) arc voltage.

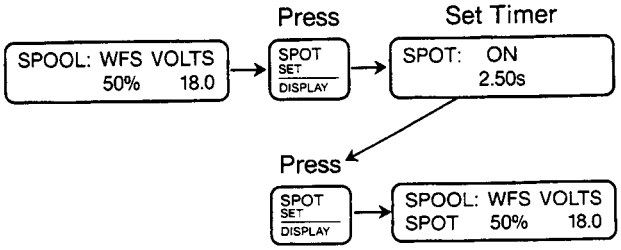
SPOT KEY



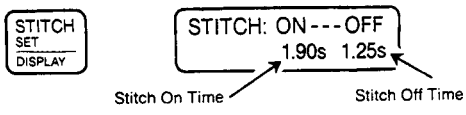
Anytime the Spot weld timer is on and the display is in Spool mode, the word SPOT will appear in the bottom left corner of the display.

TYPICAL SPOT KEY PRESS SEQUENCE

Spool screen is displayed prior to pressing Spot key. Spot key is pressed, Spot On timer is activated and the display changes to Spot screen. Spot On timer can now be adjusted using the center arrow keys. Once the timer has been set, pressing the Spot key again returns the display to the original Spool screen with the Spot timer status indicated in the bottom left corner.



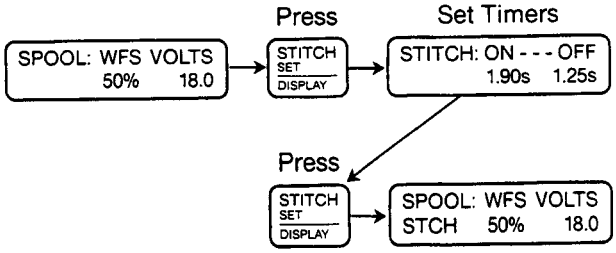
STITCH KEY



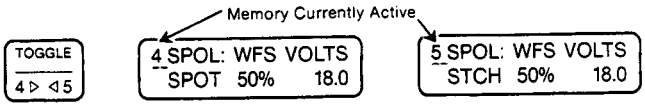
Anytime the Stitch weld timers are on and the display is in Spool mode, the abbreviation STCH will appear in the bottom left corner of the display.

TYPICAL STITCH KEY PRESS SEQUENCE

Spool screen is displayed prior to pressing Stitch key. Stitch key is pressed, Stitch timers are activated and the display changes to Stitch screen. Stitch ON and OFF timers can now be adjusted using the center and right arrow keys. Once the timers have been set, pressing the Stitch key again returns the display to the original Spool screen with the Stitch timer status indicated in the bottom left corner.



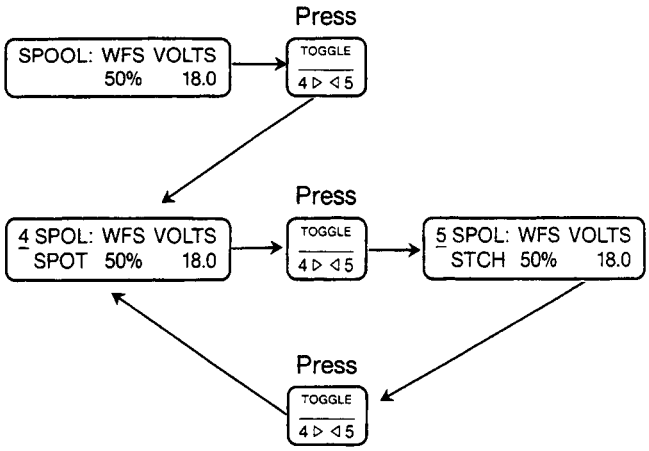
TOGGLE KEY



The first time this key is pressed it turns on toggle mode and recalls the setup in memory 4. This mode allows you to toggle between the setups in memory 4 and memory 5. Each time the key is pressed, it alternates between the two memories. The toggle screen displays the memory number the current setup was recalled from, indicates spool (SPOL:) mode, displays percentage of wire feed speed, and set arc voltage. The cursor underlines the memory number currently selected.

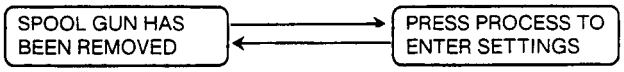
TYPICAL TOGGLE KEY PRESS SEQUENCE

Spool screen is displayed prior to pressing Toggle key. Toggle key is pressed, memory 4 is recalled and appears on the display. The unit is now in toggle mode. Pressing the Toggle key again "toggles" the unit, and memory 5 is recalled and appears on the display. Pressing the Toggle key again "toggles" the unit, and memory 4 is recalled and appears on the display. This whole cycle is repeatable as long as the unit remains in Toggle mode.

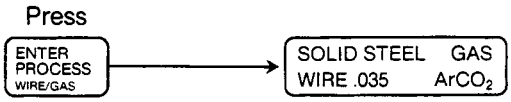


SPOOL GUN REMOVAL

With the Spool Gun removed and Input power switch turned on, display will flash between these two messages:



Pressing the Process key will return you to the last process entered before the Spool gun was attached.



Explanation of Prompting and Error Messages

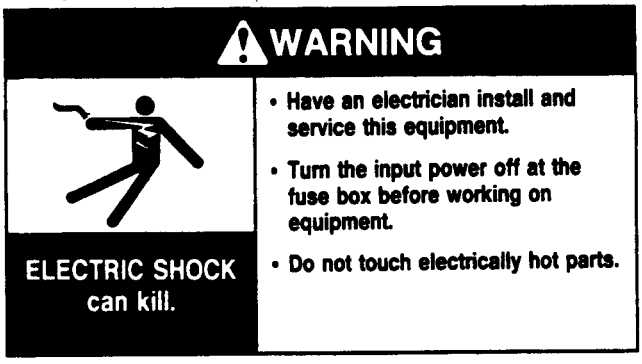
On Screen Error Message	Message Explanation
PROCESS MUST MATCH WIRE & GAS	Reminder that in Auto mode the process entered with the Process key must match the process installed in the machine.
ONLY SET UP FOR .035 STAINLESS	Unit is only programmed for .035 (0.9mm) diameter in stainless steel wire. Other wire diameters can be accommodated by using the Manual mode.
ONLY ARGON USED WITH ALUMINUM	Unit is programmed to use only argon gas with aluminum electrodes. Other gases can be accommodated by using the Manual mode.
ONLY SET UP FOR .045 OUTERSHIELD	Unit is only programmed for .045 (1.1mm) diameter in Outershield® electrode wire. Other wire diameters within the SP-250 rating can be accommodated by using the Manual mode.
NO GAS REQUIRED WITH INNERSHIELD	Innershield® electrode wire does not require a shielding gas. In the Auto mode the SP-250 automatically leaves the solenoid de-energized even when the trigger is closed.
MEMORY 1 NOW CONTAINS SETUP	Verifies that the setup was saved to memory number 1. The actual memory number is determined by the memory number key that was pressed following Save.
MEMORY 2 IS EMPTY	An attempt was made to recall a setup from a memory that does not contain one. The actual memory number is determined by the memory number key that was just pressed.
MEMORY 4 DOESN'T MATCH WIRE & GAS	An attempt was made to enter Toggle mode and the process of the Auto setup in memory 4 doesn't match the process in the machine. Press memory 4 to find out what process is required. The memory number indicates which memory, 4 or 5, doesn't match.
REQ'S: STAINLESS WIRE .035 Ar/O_2 ↓ PRESS PROCESS WHEN INSTALLED	An attempt was made to recall from memory an Auto setup whose process doesn't match the process in the machine. This message indicates the process required and alternates with the second message until the Process key is pressed.

On Screen Error Message	Message Explanation
DATA ***ERROR*** CHECK SETTINGS ↓ PRESS PROCESS TO CHECK SETTINGS	An attempt was made to recall a setup from memory that has improper settings due to excessive electrical interference. The SP-250 will recall the setup and reset the improper data to within machine limits. However, all settings should be checked, properly set if needed, and then resaved to that memory. This message alternates with the second message until the Process key is pressed.
MOTOR OVERLOADED CHECK GUN, DRIVE	Unit shut down even though trigger was closed. There is an excessive current draw on the motor. Check for proper size tip, liner, and drive rolls, for any obstructions or bends in the gun cable, and any other factors that would impede the wire feeding. To resume welding, simply pull the trigger.
XXXX ***ERROR*** CHECK SETTINGS ↓ PRESS PROCESS TO CHECK SETTINGS	Indicates that an error has occurred due to excessive electrical interference. All of these error types turn off the arc voltage, wire feed speed, and solenoid. Press the Process key, per second message, and check all settings before continuing to weld. XXXX IC3I RTI SWI IOT XIRQ PWOF DATA This table shows all of the actual lettering which appears in place of XXXX. There is no reason to note which of these occurred unless it occurs frequently.
GUN SWITCH BEING USED FOR TOGGLE	Reminds the operator that the gun switch is being used to toggle between memory 4 and memory 5 and, therefore, is not able to control IPM or arc VOLTS.
CONNECT FOR NEG. POLARITY	Reminds the operator to change the electrode polarity to negative when Innershield wire type is selected.
LOW LINE: CHECK RECONNECT PANEL PRESS ANY KEY TO STOP MESSAGE	Indicates to operator that the input line voltage is too low to obtain the output set on the machine. The operator can continue to weld, but the voltage will be less than what is set on the machine. This message occurs when the line voltage is less than 75% of nominal line or if the voltage level set on the machine is not obtainable at that line voltage and load current. The operator should check if the reconnect panel is wired properly. Lowering the set VOLTS and/or IPM can eliminate the message. Pressing any key or gun switch when the operator is not welding will stop the message from being displayed. Pressing any increment or decrement arrow keys or gun switch while welding will temporarily stop the message from being displayed (approximately 1.3 sec.) allowing the operator to view the increase or decrease in that setting.
HIGH LINE: CHECK RECONNECT PANEL PRESS ANY KEY TO STOP MESSAGE	Indicates to operator that the line voltage is too high, and the output voltage has been reduced to protect the capacitor bank voltage rating limits. The operator can continue to weld, but the voltage will be less than what is set on the machine. This message occurs when the line voltage is greater than 121% of nominal line. The operator should check if the reconnect panel is wired properly. Pressing any key or gun switch when the operator is not welding will stop the message from being displayed. Pressing any increment or decrement arrow keys or gun switch while welding will temporarily stop the message from being displayed (approximately 1.3 sec.) allowing the operator to view the increase or decrease in that setting.

On Screen Error Message	Message Explanation
CURRENT OVERLOAD REDUCE OUTPUT PRESS ANY KEY TO STOP MESSAGE	Indicates to operator that too much current is being drawn from the machine, and the output has been reduced to prevent the current from exceeding safe levels. This will typically occur in Manual mode using .045 (1.2mm) wire and WFS greater than 275 IPM (7.0m/min.). Lowering the WFS will reduce the output requirement and allow operation within the machine ratings. Pressing any key or gun switch when the operator is not welding will stop the message from being displayed. Pressing any increment or decrement arrow keys or gun switch while welding will temporarily stop the message from being displayed (approximately 1.3 sec.) allowing the operator to view the increase or decrease in that setting.
SXXXXX-X ROM ASSEMBLY	Only displayed at power-up. Displays the part number of the ROM ASSEMBLY currently on the PC board.
C SXXXXX-X ROM ASSEMBLY	Indicates a checksum error in the software. Turn power off and back on again. If this message persists, then replace the ROM assembly on the PC board. Earlier units did not display the SXXXXX-X ROM ASSEMBLY number.
R	Indicates a fault in system RAM. Turn power off and back on again. If this message persists, then replace the control PC board assembly.
SPOOL GUN HAS BEEN CONNECTED PRESS MANUAL TO ENTER SETTINGS	Reminder that the Spool gun has been connected and the Manual key must be pressed to enter any Spool gun welding procedures.
SPOOL GUN HAS BEEN REMOVED PRESS PROCESS TO ENTER SETTINGS	Reminder that the Spool gun has been removed and the Process key must be pressed to enter SP-250 weld settings. This message may also be displayed if there is an open lead in the spool gun 6 pin plug assembly.

MAINTENANCE

Safety Precautions



Routine Maintenance

General Maintenance

In extremely dusty locations, dirt may clog the air passages causing the welder to run hot. Blow dirt out of the welder with low-pressure air at regular intervals to eliminate excessive dirt and dust build-up on internal parts.

The fan motors have sealed ball bearings which require no service.

Welding Thermal Overload Protection

The SP-250 has built-in protective thermostats that respond to excessive temperature. They open the wire feed and welder output circuits if the machine exceeds the maximum safe operating temperature because of a frequent overload, or high ambient temperature plus overload. The thermostats automatically reset when the temperature reaches a safe operating level.

Overcurrent Protection

The machine will automatically reduce the output if the load on the machine exceeds 260 to 280 amperes. This protects the welding power SCR's from excessive short circuit currents and from exceeding their temperature rating before the thermostats can react. A CURRENT OVERLOAD message is displayed when the overcurrent protection is active (see Section on Explanation of Prompting and Error Messages on page 22).

Input Line Voltage Protection

HIGH LINE VOLTAGE — If the line voltage exceeds 121% of rated input voltage, the output will be reduced to the lower level to protect voltage rating of the capacitor bank. A HIGH LINE message will be displayed if the output has been reduced (see Section on Explanation of Prompting and Error Messages on page 22).

LOW LINE VOLTAGE — You may not be able to get maximum output from the machine if the line voltage is less than rated input. If the output you want is not obtainable because of insufficient line voltage, a LOW LINE message will be displayed (see Section on Explanation of Prompting and Error Messages on page 22). The unit will continue to weld, but the output will be less than what is set.

Wire Feed Overload Protection

The SP-250 has solid state overload protection of the wire drive motor. If the motor becomes overloaded, the protection circuitry turns off the arc voltage, wire feed speed and gas solenoid and then causes the alarm to beep 3 times. The screen displays a message for 2.5 seconds stating that the motor is being overloaded and the gun and wire drive should be checked. Check for proper size tip, liner, and drive rolls, for any obstructions or bends in the gun cable, and any other factors that would impede the wire feeding. To resume welding, simply pull the trigger.

Drive Rolls and Guide Tubes

After every coil of wire, inspect the wire drive mechanism. Clean it as necessary by blowing with low pressure compressed air. Do not use solvents for cleaning the idle roll because it may wash the lubricant out of the bearing. All drive rolls are stamped with the wire sizes they will feed. If a wire size other than that stamped on the roll is used, the drive roll must be changed.

For instructions on replacing or changing drive roll, see Wire Drive Roll Section on page 17 or instruction decal inside the SP-250 door.

Drop-In Reel Spindle and Clips

Before each time a coil of wire is loaded onto the SP-250 drop-in spindle inspect the mating surfaces of the spindle hubs and the spindle mounting clips (V-brackets) and, if necessary, wipe or blow out any dirt and debris which may have deposited on these surfaces.

Gun and Cable Maintenance

Cable Cleaning

Clean cable liner after using approximately 300 pounds (136kg) of electrode. Remove the cable from the wire feeder and lay it out straight on the floor. Remove the contact tip from the gun. Using an air hose and only partial pressure, gently blow out the cable liner from the gas diffuser end.

> **CAUTION:** Excessive pressure at the start may cause dirt to form a plug.

Flex the cable over its entire length and again blow out the cable. Repeat this procedure until no further dirt comes out.

Gun Tubes and Nozzles

1. Replace worn contact tips as required.
2. Remove spatter from inside of gas nozzle and from tip after each 10 minutes of arc time or as required.

Contact Tip and Gas Nozzle Installation

1. Choose the correct size contact tip for the electrode being used (wire size is stencilled on the side of the contact tip) and screw it snugly into the gas diffuser.
2. Be sure the nozzle insulator is fully screwed onto the gun tube and does not block the gas holes in the diffuser.
3. Slip the appropriate gas nozzle onto the nozzle insulator. Either a standard .50 (12.7mm) or optional .62 (15.9mm) I.D. slip-on gas nozzle may be used and should be selected based on the welding application.

   Adjust the gas nozzle as appropriate for the GMAW process to be used. Typically, the contact tip end should be flush to .12 (3.2mm) extended for the short-circuiting transfer process and .12 (3.2mm) recessed for spray transfer.

Liner Removal and Replacement

NOTE: Changing the liner for a **different** wire size requires replacement of the gas diffuser per the table below to properly secure the different size liner.

Diameter of Electrodes Used	Replacement Liner Part Number	Size Stencilled on End of Liner Bushing	Gas Diffuser Part No. (and Stencil)
.025-.030 Steel (0.6-0.8mm)	M16087-2	030 (0.8mm)	S19418-2
.035-.045 Steel (0.9-1.2mm)	M16087-1	045 (1.2mm)	S19418-1
3/64" Aluminum (1.2mm)	M16107-1		S19418-1

Liner Removal, Installation, and Trimming Instructions for Magnum 250SP

NOTICE: The variation in cable lengths prevents the interchangeability of liners. Once a liner has been cut for a particular gun, it should not be installed in another gun unless it can meet the liner cutoff length requirement. Liners are shipped with the jacket of the liner extended the proper amount.

1. Remove the gas nozzle and nozzle insulator to locate the set screw in the gas diffuser which is used to hold the old liner in place. Loosen the set screw with a 5/64" (2.0mm) Allen wrench.

2. Remove the gas diffuser from the gun tube.

3. Lay the gun and cable out straight on a flat surface. Remove the liner nut from the Fast-Mate™ connector end of the cable and pull the liner out of the cable.

4. Insert a new untrimmed liner into the connector end of the cable. Be sure the liner bushing is stencilled appropriately for the wire size being used.

5. Fully seat the liner bushing into the connector. Finger tighten the liner nut onto the cable connector. The gas diffuser, at this time, should not be installed onto the end of the gun tube.

6. With the gas nozzle and nozzle insulator removed from the gun tube, be sure the cable is straight, and then trim the liner to the length shown in Figure 5. Remove any burrs from the end of the liner.

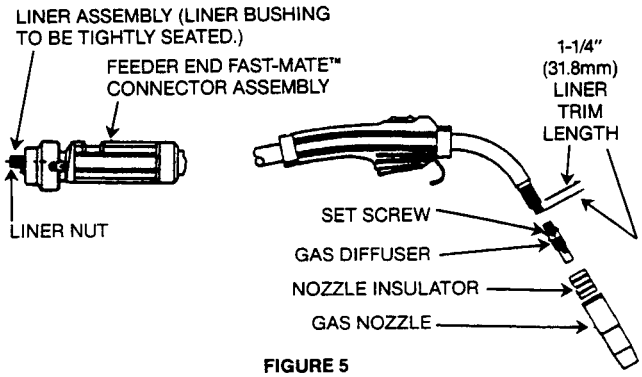


FIGURE 5

7. Screw the diffuser onto the end of the gun tube and securely tighten. Be sure the gas diffuser is correct for the liner being used. (See table left and diffuser stencil.)

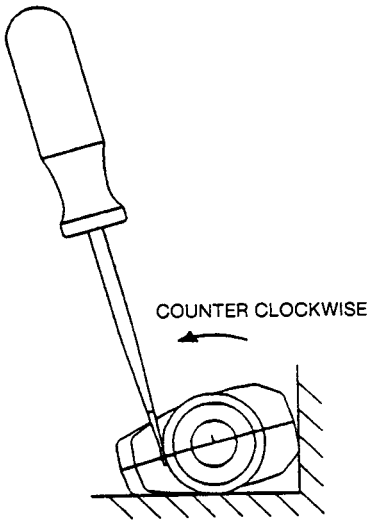
8. Tighten the set screw in the side of the gas diffuser against the cable liner using a 5/64" (2.0mm) Allen wrench.

> **CAUTION:** This screw should only be gently tightened. Overtightening will split or collapse the liner and cause poor wire feeding.

Gun Handle Disassembly

The internal parts of the gun handle may be inspected or serviced if necessary.

The gun handle consists of two halves that are held together with a collar on each end. To open up the handle, turn the collars approximately 60 degrees counterclockwise (the same direction as removing a right hand thread) until the collar reaches a stop. Then pull the collar off the gun handle. If the collars are difficult to turn, position the gun handle against a corner, place a screwdriver against the tab on the collar and give the screwdriver a sharp blow to turn the collar past an internal locking rib.



Expendable Replacement Parts for Magnum™ 250SP Gun and Cable Assemblies

DESCRIPTION	PART NUMBER	ENGLISH SIZE	METRIC SIZE
Cable Liner			
For 10 ft. (3.0m) to 15 ft. (4.5m) Cable	M16087-2	.025-.030	0.6-0.8mm
	-1(1)	.035-.045	0.9-1.2mm
	M16107-1	3/64" (Alum. Wire)(2)	1.2mm
Contact Tips and Gas Diffuser Assemblies			
Standard Duty	S19391-6	.025	0.6mm
	-7	.030	0.8mm
	-1(1)	.035	0.9mm
	-2(1)	.045	1.2mm
Heavy Duty	S19392-1	.035	0.9mm
	-2	.045	1.2mm
Tapered	S19393-5	.025	0.6mm
	-6	.030	0.8mm
	-1	.035	0.9mm
	-2	.045	1.2mm
Gas Diffuser Assembly	S19418-2	.025-.030	0.6-0.8mm
	-1(1)	.035-.045	0.9-1.2mm
Gas Nozzles and Nozzle Insulator Assembly			
Adjustable Slip-On (Requires Nozzle Insulator Assembly)	M16093-2(1)	.50	12.7mm
	-1	.62	15.9mm
Nozzle Insulator Assembly	S19417-1(1)		
Gun Tube Assemblies			
Standard (60°)	S18920(1)		
45°	S19890(2)		

(1) Factory provided with SP-250.

(2) 5356 alloy aluminum wire and 45° gun tube are recommended to alleviate potential soft wire feeding problems with push-type wire feeding.

Avoiding Wire Feeding Problems

Wire feeding problems can be avoided by observing the following gun handling procedures:

1. Do not kink or pull cable around sharp corners.
2. Keep the electrode cable as straight as possible when welding or loading electrode through cable.
3. Do not allow dolly wheels or trucks to run over cables.
4. Keep cable clean by following maintenance instructions.
5. Use only clean, rust-free electrode. The Lincoln electrodes have proper surface lubrication.
6. Replace contact tip when the arc starts to become unstable or the contact tip end is fused or deformed.
7. Keep drop-in spindle and spindle mounting clip contacting surfaces clear of dirt and debris.

TROUBLESHOOTING GUIDE

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have an electrician install and service this equipment.**
- **Turn the input power off at the fuse box before working on equipment.**
- **Do not touch electrically hot parts.**

Problems

Problem	Possible Cause	What To Do
Rough wire feeding or wire not feeding but drive rolls turning.	Gun cable kinked and/or twisted.	Inspect gun cable and replace if necessary.
	Wire jammed in gun and cable.	Remove wire from gun and cable — feed in new wire. Note any obstructions in gun and cable. Replace gun and cable if necessary.
	Incorrect position of drive roll with two grooves.	See Wire Drive Roll Section on page 17 for proper installation of drive roll.
	Drive roll loose.	Remove, clean, install and tighten.
	Gun cable dirty.	Clean cable or replace liner.
	Worn drive roll.	Replace.
	Electrode rusty and/or dirty.	Replace.
	Worn nozzle or cable liner.	Replace.
	Partially flashed or melted contact tip.	Replace contact tip.
	Incorrect idle roll pressure.	Set idle roll pressure per Section on page 18.
	Rough turning and/or bouncing reel spindle.	Clean drop-in reel spindle and spindle mounting clips per section on page 25.
Variable or "hunting" arc.	Wrong size, worn and/or melted contact tip.	Replace tip — remove any spatter on end of tip.
	Worn work cable or poor work connection.	Inspect — repair or replace as necessary.
	Loose electrode connections.	Be sure electrode lead is tight, gun cable tight in wire feeder contact block, gun nozzle and gun tip tight.
	Wrong polarity.	Check connection at output studs for polarity required by welding process.

(continued)

TROUBLESHOOTING GUIDE *(continued)*

Problem	Possible Cause	What To Do
Poor arc striking with sticking or "blast offs," weld porosity, narrow and ropy looking bead, or electrode stubbing into plate while welding.	Improper procedures or techniques.	See "Gas Metal Arc Welding Guide" (GS100).
	Improper gas shielding.	Clean gas nozzle. Make certain that gas diffuser is not restricted. Make certain that gas cylinder is not empty or turned off. Make certain gas solenoid valve is operating and gas flow rate is proper. Remove gun liner and check rubber seal for any sign of deterioration or damage. Be sure set screw in brass connector is in place and tightened against the liner bushing.
Tip seizes in diffuser.	Tip overheating due to prolonged or excessive high current and/or duty cycle welding.	Do not exceed current and duty cycle rating of gun. A light application of high temperature antiseize lubricant (such as Lincoln E2607 Graphite Grease) may be applied to tip threads.
Unit shuts off while welding and MOTOR OVERLOADED message appears.	See page 23.	Correct problems.
	Defective wire feed motor or gearbox.	Replace.
No wire feed, although arc voltage is present.	Defective wire feed motor or control PC board.	Disconnect wire drive plug P6 from PC board. Measure voltage across 541(+) pin 6 of J6 and 539(–) pin 3 of J6 on PC board with trigger closed. If voltage is ≥24 VDC, then replace motor/gearbox. If ≤24 VDC, replace control PC board (see Procedure for Replacing PC Boards on page 31).
No control of wire feed.	Defective wire feed motor tach or control PC board.	Measure voltage across 555(+) pin 2 of J6 and 206(–) pin 4 of J6 on PC board with motor running. If voltage is 1.5 to 3.5 then replace control PC board (see Procedure for Replacing PC Boards on page 31). If not, then replace wire feed motor/gearbox.
No wire feed and no arc voltage. LCD display indicates input power to SP-250.	Protection circuit actuated due to overload or short.	Allow machine to cool down and reduce on time and/or wire feed speed.
	Faulty gun trigger switch or damaged control cable connected to gun trigger.	Repair.
	Defective control PC board.	See Procedure for Replacing PC Boards on page A1 if no fault is detected in trigger-thermostat circuit.

(continued)

TROUBLESHOOTING GUIDE *(continued)*

Problem	Possible Cause	What To Do
Output voltage and wire feed present either continuously or pulsing with gun trigger off.	Gun trigger circuit not electrically isolated.	Gun trigger circuit is grounded or shorted to electrode.
Settings are being incremented or decremented even though gun thumbswitch or front panel arrow keys are not activated.	Gun thumbswitch circuit not electrically isolated.	Gun thumbswitch circuit is grounded or shorted to electrode.
Audio alarm does not sound when a key is pressed, but display changes.	Defective audio alarm or control PC board.	Measure voltage across pins 1(+) and 2 of J7 on control board with alarm removed. Should see brief indication of voltage when a key is pressed. If voltage pulse present, replace alarm. If not, see Procedure for Replacing PC Boards on page 31.
Audio alarm does not sound when a key is pressed, and the display does not change.	Defective keypad or control PC board.	Ring out keypad. Replace if defective. If not, see Procedure for Replacing PC Boards on page 31.
Gas does not flow.	Process gas type is set to NONE for Innershield® Solenoid or control PC board is defective.	Press PROCESS key and enter correct process including gas. Measure voltage across pins 3(+) and 4(–) of J8 on control PC board with trigger closed and solenoid removed. If ≥12 VDC, replace solenoid. If not, see Procedure for Replacing PC Boards on page 31.
No message or non-readable display, even though backlighting indicates power to unit.	System fault. LCD display or control PC board is defective.	Turn power off. Wait a few seconds. Turn power back on. Try a known good display first. If display functions, replace original display. If not, replace control PC board.
Display backlighting does not function.	Display or control PC board is defective.	Disconnect display and measure voltage across pins 1(+) and 2(–) of J1. If voltage is ≥12 VDC, replace the display. If not, see Procedure for Replacing PC Boards on page 31.
Error messages or alarm continuously beeps in bursts of three.	Error in system or keypad entry.	See Explanation of Prompting and Error Messages Section on page 22.

(continued)

TROUBLESHOOTING GUIDE *(continued)*

Problem	Possible Cause	What To Do
Poor welding characteristics and/or cannot obtain full rated output of 200 amps at 28 volts.	Improper settings for wire feed speed and volts.	Use AUTO mode settings.
	"HIGH LINE:", "LOW LINE:", or "CURRENT OVERLOAD" messages are on display.	See respective message explanation in Explanation of Prompting and Error Messages Section on page 22.
	Capacitor(s) in power source output circuit failed. A failure is indicated if the small vent plug on top of a capacitor is raised or blown out.	Replace entire bank of capacitors. Do **not** replace individual capacitors. **WARNING:** The liquid electrolyte in these capacitors is toxic. Avoid contact with any portion of your body. Clean up vented electrolyte using rubber gloves and a water dampened cloth. Any electrolyte which gets on skin, clean with soap and water.
	One SCR has failed.	Check and replace SCR bridge if defective.
	Defective control PC board.	See Procedure for Replacing PC Boards below.

Procedure for Replacing PC Boards

Before replacing a PC board which is suspected of being defective, visually inspect the PC board in question for any **electrical** or **mechanical** damage to any of its components and conductors on the back of the board.

1. If there is **no** visible damage to the PC board, install a new one and see if this remedies the problem. If the problem is remedied, reinstall the **old** PC board to see if the problem still exists. If the problem no longer exists with the old PC board:
   a. Check the PC board harness connector pins for corrosion, contamination, or looseness.
   b. Check leads in the plug harness for loose or intermittent connection.
2. If PC board is visibly damaged **electrically,** before possibly subjecting the new PC board to the same cause of failure, check for possible shorts, opens, or grounds caused by:
   a. Frayed or pinched lead insulation.
   b. Poor lead termination, such as a poor contact or a short to adjacent connection or surface.
   c. Shorted or open motor leads, or other external leads.
   d. Foreign matter or interference behind the PC boards.
3. If PC board is visibly damaged **mechanically,** inspect for cause, then remedy before installing a replacement PC board.

If there is damage to the PC board or if replacing PC board corrects problem, return it to the Lincoln Electric Field Service Shop.

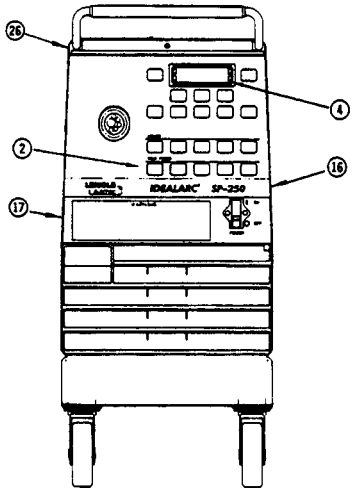
Procedure for Making Lead Connections When Replacing SCR Bridge Rectifier Assembly

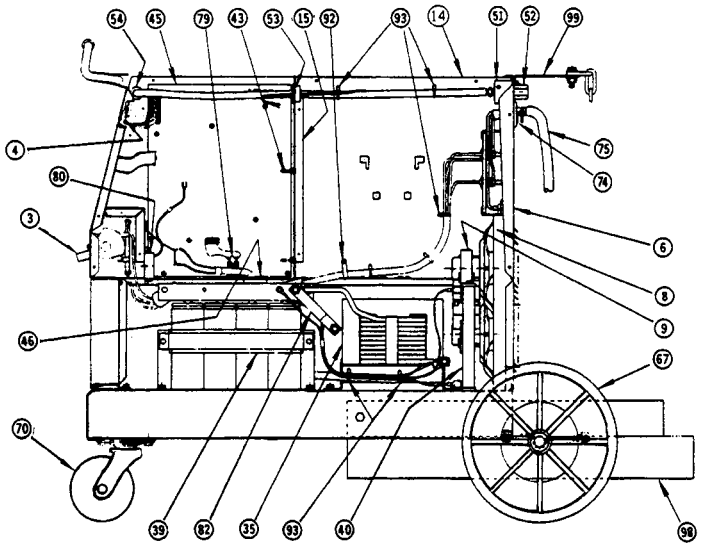
If any lead connection to the rectifier aluminum heat sinks is disconnected, take the following steps before reconnecting:

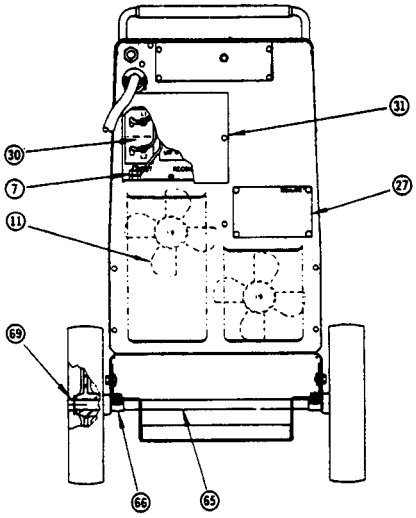
1. Clean mating surfaces of aluminum sink and connecting lead.
2. Apply thin uniform coating of **Dow Corning 340** compound or equivalent to entire sink area where the connecting lead will come in contact with it.
3. Reconnect, placing the pretinned surface of the lead against the coated area of the heat sink. Place a flatwasher under the connecting screw head and a flatwasher and a lockwasher under the nut with the lockwasher against the nut, tighten to a minimum of 70 in-lbs. (8 N•m) torque.

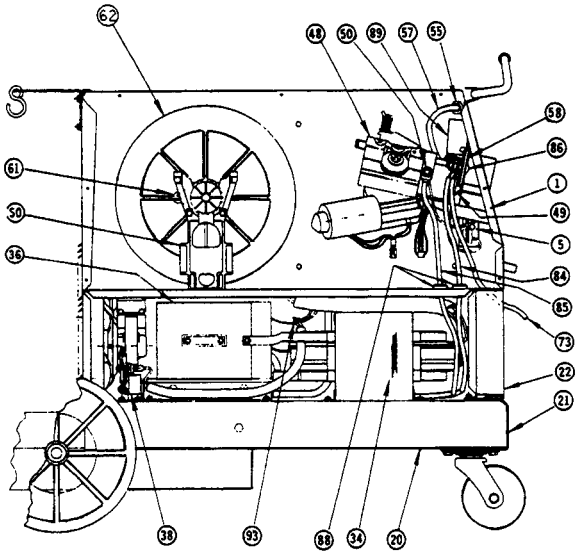
Failure to follow the above instructions can result in corrosion and overheating of the connection.

FINAL ASSEMBLY









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Parts List P-201-C

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Front Panel	1
	Self Tapping Screw	2
2	Keypad/Nameplate	1
2	Keypad/Nameplate	1
3	Power Switch	1
3	Power Switch	1
	Switch Bezel	1
	Self Tapping Screw	2
	Sems Screw	4
	Hex Nut	4
4	LCD Display	1
	Spacer	4
	Lock Washer	4
	Hex Nut	4
5	RF Bypass Filter	1
6	Rear Panel	1
	Self Tapping Screw	2
8	Fan Baffle	1
	Sems Screw	4
9	Self Tapping Screw	2
	Fan Motor	4
10	Pilot Light (Not Shown)	1
11	Fan	2
12	Selector Switch (Not Shown)	1
	Spacer (Not Shown)	2
13	Switch Handle Assembly (Not Shown)	1
	Set Screw	1
	Knob (Not Shown)	1
	Spring (Not Shown)	1
14	Divider Panel	1
14	Self Tapping Screw	1
	Divider Panel	4
	Self Tapping Screw	1
15	P.C. Board Partition	1
	Self Tapping Screw	3
	Thread Forming Screw	1
16	Right Side Panel	1
	Right Side Panel (Dual Voltage Mach. Only)	1
	Right Side Panel	1
	Right Side Panel (Triple Voltage, Single Ph.)	1
	Self Tapping Screw	3
17	Left Side Panel	1
17	Left Side Panel	1
	Self Tapping Screw	4
	Self Tapping Screw	1
20	Base	1
20	Base	1
21	Base Front	1
21	Base Front	1
22	Louver Panel	1
	Self Tapping Screw	1
23	Handle Assembly	1
	Thread Forming Screw	2
26	Door and Hinge Assembly	1
26	Door and Hinge Assembly	1
	Self Tapping Screw	3
27	Rear Nameplate	1
27	Rear Nameplate (Triple Voltage, Single Ph.)	1
	Rear Nameplate (220/440 Volt)	1
	Rear Nameplate (220-208/400-415)	1
27	Rear Nameplate (380 Volt)	1
	Fastener Button	4
	Reconnect Panel (208/230)	1
30	Reconnect Panel	1

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
30	Reconnect Panel (230-460-575 Volts)	1
	Reconnect Panel (220/440 Volts)	1
	Reconnect Panel (380 Volts)	1
	Self Tapping Screw	2
31	Reconnect Access Door	1
	Self Tapping Screw	1
34	Transformer Assembly	1
	Self Tapping Screw	4
	Thread Forming Screw	4
35	Choke Assembly	1
	Choke Mounting Plate	1
	Thread Forming Screw	2
36	SCR Bridge Assembly, Includes:	1
36	SCR Bridge Assembly, Includes:	1
	Diode	1
	Spring Washer	1
	Rectifier	2
	Rectifier	3
	Socket Head Cap Screw	2
	SCR Clamp	As Req'd
	SCR Spring	As Req'd
	Roll Pin	As Req'd
	Insulating Tube	2
	SCR Support	2
	SCR Support	2
	Insulator	2
	Insulator	2
	Socket Head Cap Screw	2
	Self Tapping Screw	4
37	Shunt (Not Shown)	1
38	Fan Sensor Assembly	1
	Self Tapping Screw	2
39	Capacitor Bank Assembly, Includes:	1
39	Capacitor Bank and Shunt Assembly, Includes	
	Capacitor	4
	Shunt	1
	Self Tapping Screw	2
	Capacitor Bank and Shunt Assembly	1
	(Triple Volt., Single Ph.)	
	Capacitor	1
	Self Tapping Screw	1
40	Resistor	2
	Round Head Screw	1
	Insulating Washer	2
43	Snap in P.C. Board Support	4
45	P.C. Board	1
45	P.C. Board	1
	P.C. Board (Dual & Triple Volt., Single Ph.)	1
	Expansion Nut	8
	Self Tapping Screw	8
48	Wire Drive Assembly	1
	Fibre Washer	1
	Self Tapping Screw	1
	Flange Bushing	1
50	Heavy Hex Jam Nut (Brass)	1
51	Solenoid Assembly, Includes:	1
	Solenoid Valve	1
	Valve Support	1
	Hose Nipple	1
	Plug Housing	1
	Self Tapping Screw	2
52	Female Connector	1
53	Grommet	1

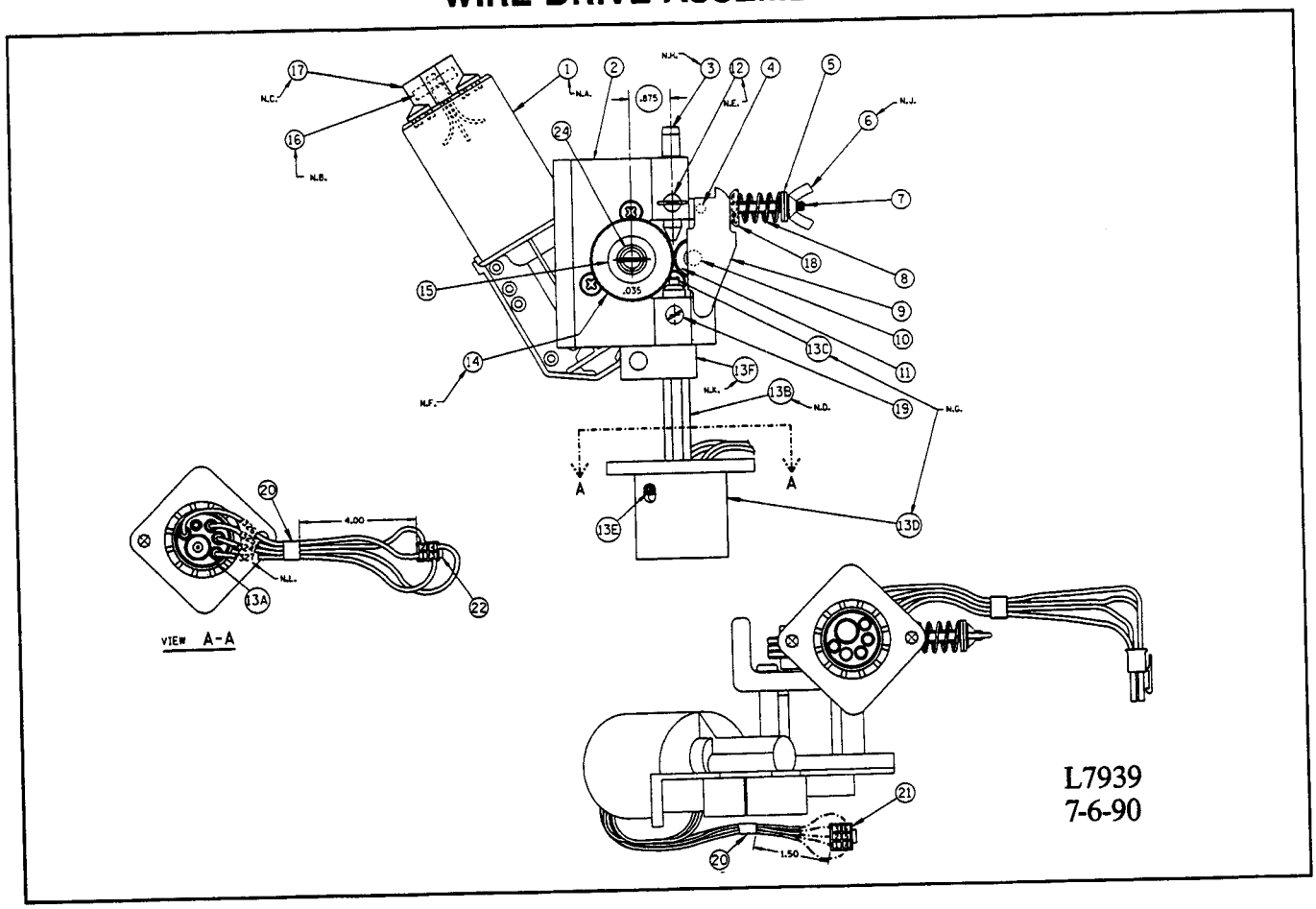
Parts List P-201-C.1

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
54	Connector (Brass)	1
55	Inert Arc Nut	1
	Hose Nipple	1
57	Gas Hose	1
60	Spindle Mounting Clip	2
61	Wire Reel Spindle	1
62	Readi-Reel Adapter	1
65	Axle	1
66	Axle Bracket Asembly	2
67	Wheel	2
67	Wheel	2
69	Push Nut	2
70	Caster	2
	Thread Forming Screw	8
73	Work Lead	1
74	Cable Clamp	1
75	Input Cord	1
79	RF Toroid Assembly	1
79	RF Toroid Assembly	1
80	Alarm System	1
	Self Tapping Screw	1
86	Heavy Hex Jam Nut (Brass)	1
89	Strain Relief Bushing	2
98	Receptacle Cover	1
98	Cylinder Platform	1
	Cylinder Platform	1
99	Cylinder Stabilizer Assembly	1
	Thread Forming Screw	4
	Items Not Illustrated:	
	Instruction Decal	1
	Instruction Decal	
	(Dual Voltage Machines Only)	1
	Instruction Decal (Triple Voltage, Single Ph.)	1
	Instruction Decal	1

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Warning Decal	1
	Warning Decal	1
	Ground Decal	1
	Decal — Earth Ground Connection	1
	Decal — 3 Year Warranty	1
	Decal — 3 Year Warranty	1
	Decal — 3 Year Warranty (Dual Voltage Machine Only)	1
	Decal — Lincoln/Norweld	2
	Reel Installation Decal	1
	Items Shipped Loose:	
	Receptacle (250V)	1
	Adjustable Gas Regulator	1
	Regulator Adapter	1
	Gas Line Assembly	1
	Gas Line Assembly	1
	Gun & Cable Assembly	
	Ground Clamp	1
	Field Installed Options:	
	Spool Gun Module Kit (S19636-1 Rom or Lower)	
	Spool Gun Module Kit (S19636-2 Rom or Higher)	
	Drive Roll (.025-.035)	
	Drive Roll (.035-.045)	
	Aluminum Drive Roll (.035A)	
	Aluminum Drive Roll ($^{3}/_{64}$A)	
	Cored Drive Roll (.045) (2 Req'd)	
	12.5 Ft. Magnum 250-SP Gun (.035-.045)	
	12.5 Ft. Magnum 250-SP Gun (.025-.030)	
	15 Ft. Magnum 250-SP Gun (.035-.045)	
	15 Ft. Magnum 250-SP Gun (.025-.030)	

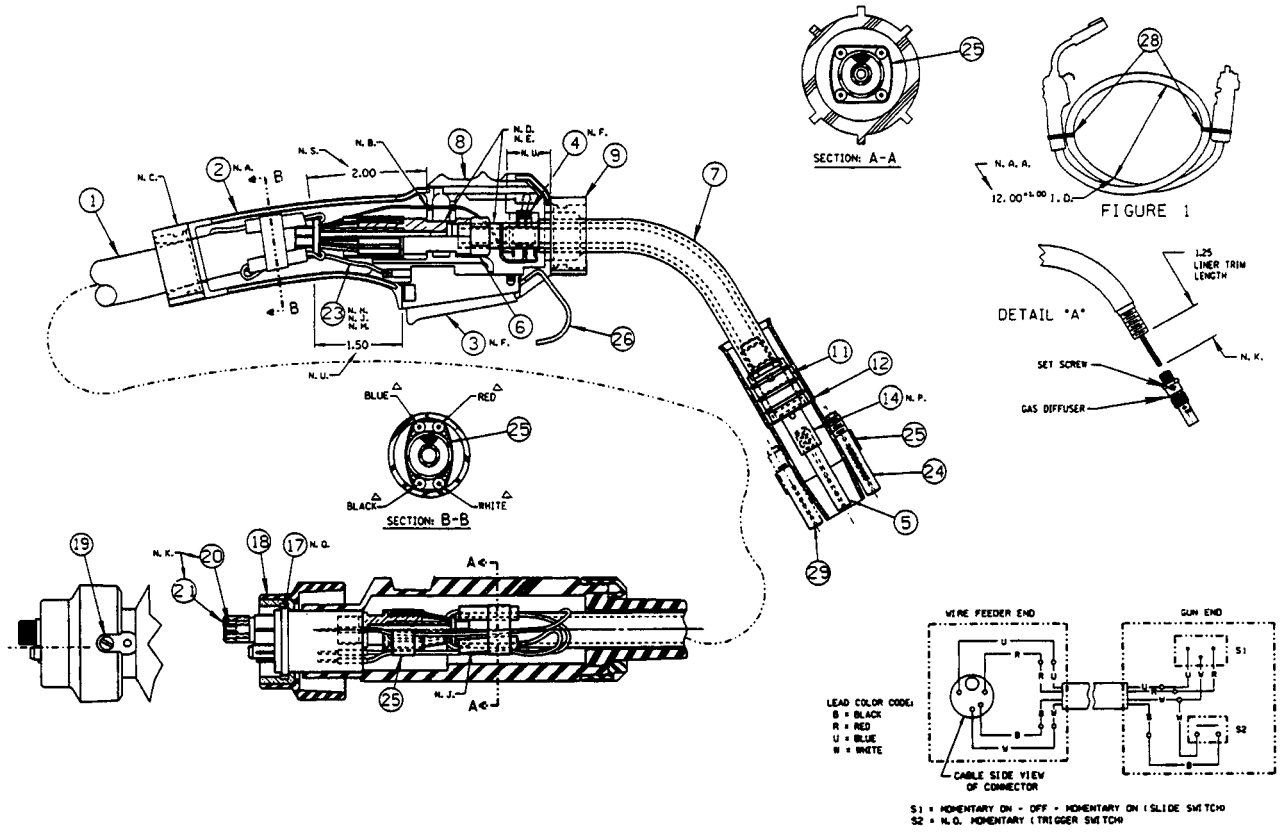
9-9-91

WIRE DRIVE ASSEMBLY



ITEM	PART NAME & DESCRIPTION	NO. REQ'D
1	Drive Motor	1
2	Face Plate	1
	Pan Head Screw	3
	Lock Washer	3
3	Guide Tube	1
4	Roll Pin	1
5	Plain Washer	2
6	Wing Nut	1
7	Clevis	1
8	Spring	1
9	Idle Roll Arm	1
10	Idle Roll Shaft	1
11	Bearing	1
12	Wing Screw	1
13	Fast Mate Connector Assembly	1
14	Drive Roll	1
15	Drive Hub	2
16	Ring Magnet	1
17	Tach Sensor	1
18	Pressure Washer	1
19	Slotted Head Set Screw	1
24	Wing Screw Assembly	1

MAGNUM 250 SP GUN ASSEMBLY

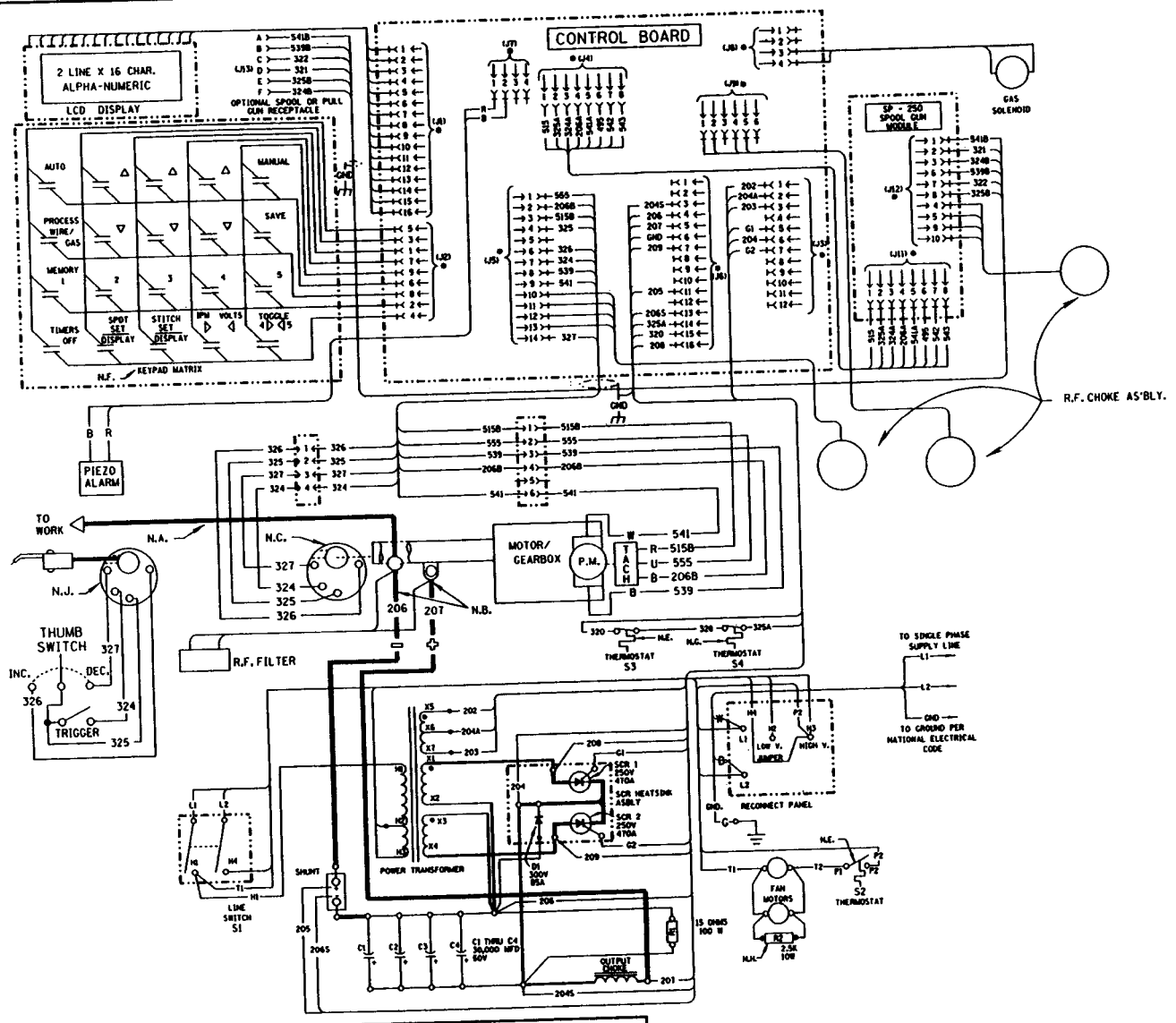


L8007
5-31-91

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
	Gun and Cable Assembly (.035-.045, 12.5 Ft) Gun and Cable Assembly (.025-.030, 12.5 Ft)	
	Gun and Cable Assembly (.035-.045, 15 Ft) Gun and Cable Assembly (.025-.030, 15 Ft)	
1	Cable Assembly (12.5 Ft)	1
1	Cable Assembly (15 Ft)	1
2	Gun Handle (Left)	1
2	Gun Handle (Right) (Not Shown)	1
3	Trigger Assembly	1
4	Switch Assembly	1
5	Contact Tip (.035-.045)	1
5	Contact Tip (.025-.030)	1
6	Locking Nut	1
7	Gun Tube Assembly	1
8	Slide	1
9	Collar	2

ITEM	PART NAME & DESCRIPTION	NO. REQ'D
11	Slip On Nozzle Insulator	1
12	Gas Nozzle	1
14	Gas Diffuser (.035-.045)	1
14	Gas Diffuser (.025-.030)	1
15	Decal (Magnum 250 SP)	1
17	Central Adapter Assembly	1
18	Collar Nut	1
19	Pan Head Screw (Metric) (M4 x 0.7)	1
20	Liner Assembly (.035-.045, 12.5 Ft)	1
20	Liner Assembly (.025-.030, 12.5 Ft)	1
20	Liner Assembly (.035-.045, 15 Ft)	1
20	Liner Assembly (.025-.030, 15 Ft)	1
21	Liner Nut	1
24	Contact Tip	1
26	Hook	1

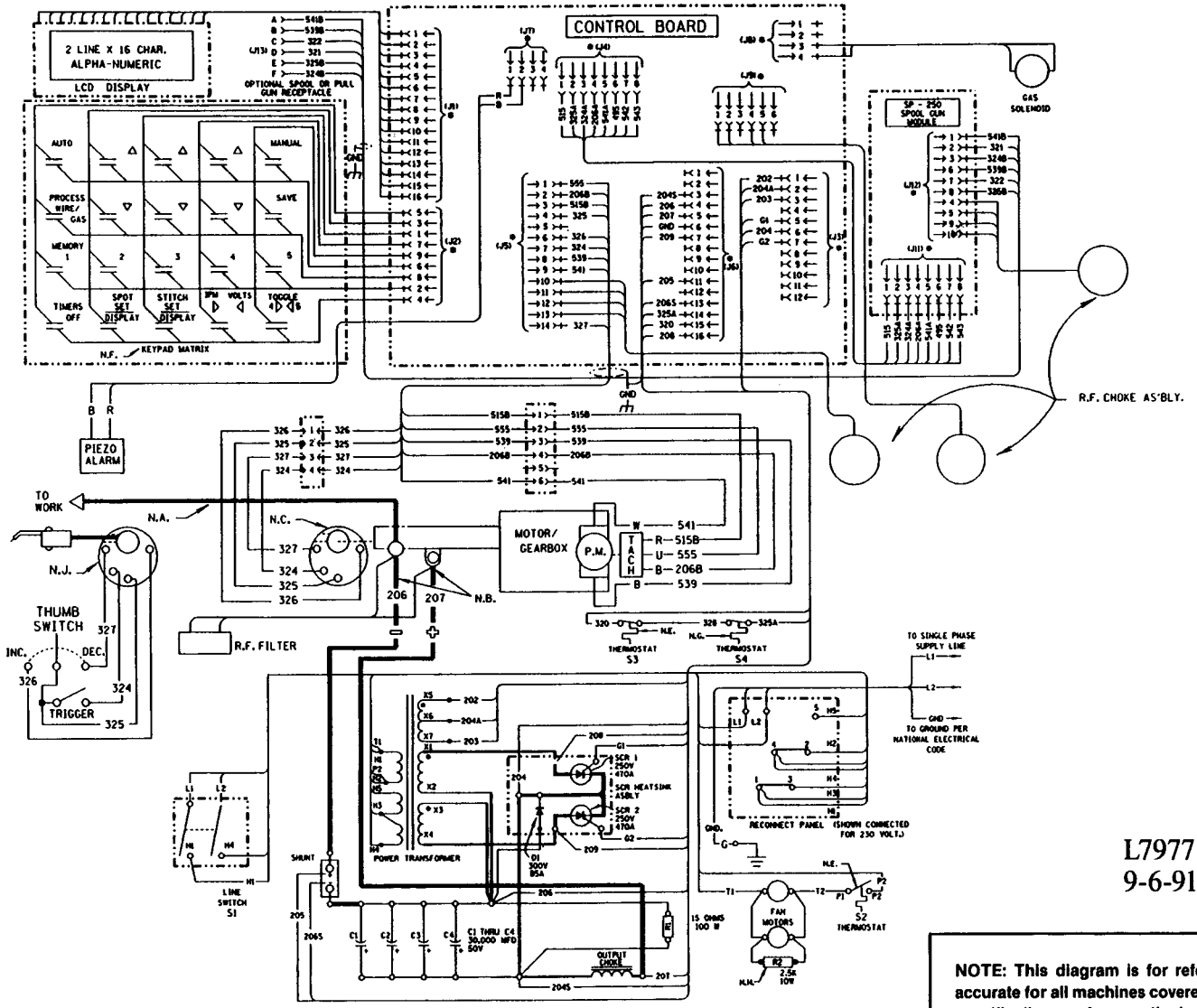
SP-250 (DUAL VOLTAGE) WIRING DIAGRAM



NOTE: This diagram is for reference only. It is not accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the welder code number.

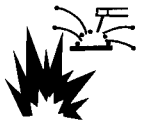
L8423
9-6-91

SP-250 (230/460/575V) WIRING DIAGRAM



L7977
9-6-91

NOTE: This diagram is for reference only. It is not accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the welder code number.

			
WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aislese del trabajo y de la tierra.	● Mantenga el material combustible fuera del área de trabajo.	● Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre.	● Gardez à l'écart de tout matériel inflammable.	● Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden!	● Entfernen Sie brennbarres Material!	● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra.	● Mantenha inflamáveis bem guardados.	● Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。	● 燃えやすいものの側での溶接作業は絶対にしてはなりません。	● 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	● 皮肤或濕衣物切勿接觸帶電部件及銲條。 ● 使你自己與地面和工件絕緣。	● 把一切易燃物品移離工作場所。	● 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	● 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. ● 모재와 접지를 접촉치 마십시요.	● 인화성 물질을 접근 시키지 마시요.	● 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل.	● ضع المواد القابلة للاشتعال في مكان بعيد.	● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

			
● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone.	● Turn power off before servicing.	● Do not operate with panel open or guards off.	**WARNING**
● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.	● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	● No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	● Débranchez le courant avant l'entretien.	● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
● Vermeiden Sie das Einatmen von Schweibrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
● Mantenha seu rosto da fumaça. ● Use ventilação e exhaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。	● 維修前切斷電源。	● 儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

LEIA E COMPREENDA AS INSTRUÇÕES DO FABRICANTE PARA ESTE EQUIPAMENTO E AS PARTES DE USO, E SIGA AS PRÁTICAS DE SEGURANÇA DO EMPREGADOR.

使う機械や溶材のメーカーの指示書をよく読み、まず理解して下さい。そして貴社の安全規定に従って下さい。

請詳細閱讀並理解製造廠提供的説明以及應該使用的銀焊材料，並請遵守貴方的有関勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

اقرأ بتمعن وافهم تعليمات المصنع المنتج لهذه المعدات والمواد قبل استعمالها واتبع تعليمات الوقاية لصاحب العمل.

PERFORMANCE PLUS PROTECTION

3 YEAR WARRANTY PARTS & LABOR

LINCOLN® ELECTRIC

LIMITED WARRANTY

WARRANTY SUPERSEDED SEE IMWS 1

STATEMENT OF WARRANTY:

The Lincoln Electric Company (Lincoln) warrants to the original purchaser (end-user) of new equipment that it will be free of defects in workmanship and material.

This warranty is void if Lincoln finds that the equipment has been subjected to improper care or abnormal operation.

WARRANTY PERIOD:

All warranty periods date from the date of shipment to the original purchaser and are as follows:

Three Years:

Transformer Welders
Motor-generator Welders
Inverter Welders
Automatic Wire Feeders
Semiautomatic Wire Feeders
Plasma-cutting Power Source
Engine-driven Welders (except engine and engine accessories) with operating speed under 2,000 RPM

Two Years:

Engine Driven Welders (except engine, engine accessories and Power-Arc generator/welders) with operating speed over 2,000 RPM

All engine and engine accessories are warranted by the engine or engine accessory manufacturer and are not covered by this warranty.

One Year:

Equipment not listed above such as guns and cable assemblies, water coolers, MIG-TRAK optics package, Power-Arc generator/welders, Wire Feed Module (Factory Installed) and field-installed optional equipment.

TO OBTAIN WARRANTY COVERAGE:

You are required to notify Lincoln Electric, your Lincoln Distributor, Lincoln Service Center or Field Service Shop of any defect within the warranty period. Written notification is required.

WARRANTY REPAIR:

If Lincoln's inspection of the equipment confirms the existence of a defect covered by this warranty, the defect will be corrected by repair or replacement at Lincoln's option.

WARRANTY COSTS:

You must bear the cost of shipping the equipment to a Lincoln Service Center or Field Service Shop as well as return shipment to you from that location.

IMPORTANT WARRANTY LIMITATIONS:

- Lincoln will not accept responsibility for repairs made without its authorization.
- Lincoln shall not be liable for consequential damages (such as loss of business, etc.) caused by the defect or reasonable delay in correcting the defect.
- Lincoln's liability under this warranty shall not exceed the cost of correcting the defect.
- This written warranty is the only express warranty provided by Lincoln with respect to its products. Warranties implied by law such as the Warranty of Merchantability are limited to the duration of this limited warranty for the equipment involved.

January, '94