

## Operator's Manual

# MAXsa<sup>™</sup> 10 CONTROLLER



For use with machines having Code Numbers:  
**11590, 11777, 12327**



**Register your machine:**

[www.lincolnelectric.com/register](http://www.lincolnelectric.com/register)

**Authorized Service and Distributor Locator:**

[www.lincolnelectric.com/locator](http://www.lincolnelectric.com/locator)

### Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

# THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

## PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

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.

## 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.

### **WARNING**

This statement appears where the information must be followed exactly to avoid serious personal injury or loss of life.

### **CAUTION**

This statement appears where the information must be followed to avoid minor personal injury or damage to this equipment.



## KEEP YOUR HEAD OUT OF THE FUMES.

**DON'T** get too close to the arc. Use corrective lenses if necessary to stay a reasonable distance away from the arc.

**READ** and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

**USE ENOUGH VENTILATION** or exhaust at the arc, or both, to keep the fumes and gases from your breathing zone and the general area.

**IN A LARGE ROOM OR OUTDOORS**, natural ventilation may be adequate if you keep your head out of the fumes (See below).

**USE NATURAL DRAFTS** or fans to keep the fumes away from your face.

If you develop unusual symptoms, see your supervisor. Perhaps the welding atmosphere and ventilation system should be checked.



## WEAR CORRECT EYE, EAR & BODY PROTECTION

**PROTECT** your eyes and face with welding helmet properly fitted and with proper grade of filter plate (See ANSI Z49.1).

**PROTECT** your body from welding spatter and arc flash with protective clothing including woolen clothing, flame-proof apron and gloves, leather leggings, and high boots.

**PROTECT** others from splatter, flash, and glare with protective screens or barriers.

**IN SOME AREAS**, protection from noise may be appropriate.

**BE SURE** protective equipment is in good condition.

Also, wear safety glasses in work area **AT ALL TIMES.**



## SPECIAL SITUATIONS

**DO NOT WELD OR CUT** containers or materials which previously had been in contact with hazardous substances unless they are properly cleaned. This is extremely dangerous.

**DO NOT WELD OR CUT** painted or plated parts unless special precautions with ventilation have been taken. They can release highly toxic fumes or gases.

## Additional precautionary measures

**PROTECT** compressed gas cylinders from excessive heat, mechanical shocks, and arcs; fasten cylinders so they cannot fall.

**BE SURE** cylinders are never grounded or part of an electrical circuit.

**REMOVE** all potential fire hazards from welding area.

**ALWAYS HAVE FIRE FIGHTING EQUIPMENT READY FOR IMMEDIATE USE AND KNOW HOW TO USE IT.**



## SECTION A: WARNINGS



### CALIFORNIA PROPOSITION 65 WARNINGS



**WARNING:** Breathing diesel engine exhaust exposes you to chemicals known to the State of California to cause cancer and birth defects, or other reproductive harm.

- Always start and operate the engine in a well-ventilated area.
- If in an exposed area, vent the exhaust to the outside.
- Do not modify or tamper with the exhaust system.
- Do not idle the engine except as necessary.

For more information go to [www.P65warnings.ca.gov/diesel](http://www.P65warnings.ca.gov/diesel)

**WARNING:** This product, when used for welding or cutting, produces fumes or gases which contain chemicals known to the State of California to cause birth defects and, in some cases, cancer. (California Health & Safety Code § 25249.5 *et seq.*)



**WARNING:** Cancer and Reproductive Harm  
[www.P65warnings.ca.gov](http://www.P65warnings.ca.gov)

**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.**



### FOR ENGINE POWERED EQUIPMENT.

- 1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
- 1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
- 1.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.

- 1.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.
- 1.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.
- 1.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.
- 1.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.
- 1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



### ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS



- 2.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
- 2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.
- 2.c. Exposure to EMF fields in welding may have other health effects which are now not known.
- 2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:
  - 2.d.1. Route the electrode and work cables together - Secure them with tape when possible.
  - 2.d.2. Never coil the electrode lead around your body.
  - 2.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.
  - 2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.
  - 2.d.5. Do not work next to welding power source.



## ELECTRIC SHOCK CAN KILL.



- 3.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.
- 3.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.
- 3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.
  - 3.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.
  - 3.e. Ground the work or metal to be welded to a good electrical (earth) ground.
  - 3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
  - 3.g. Never dip the electrode in water for cooling.
  - 3.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.
  - 3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.
  - 3.j. Also see Items 6.c. and 8.



## ARC RAYS CAN BURN.



- 4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- 4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 4.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.



- 5.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 hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required. Additional precautions are also required when welding on galvanized steel.**
- 5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.
- 5.c. 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.
- 5.d. 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.
- 5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS forms are available from your welding distributor or from the manufacturer.
- 5.f. Also see item 1.b.



## WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



- 6.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.
- 6.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.
- 6.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.
- 6.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).
- 6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- 6.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.
- 6.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.
- 6.h. Also see item 1.c.
- 6.i. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 022690-9101.
- 6.j. Do not use a welding power source for pipe thawing.



## CYLINDER MAY EXPLODE IF DAMAGED.



- 7.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.
- 7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 7.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.
- 7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.
- 7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
- 7.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, 14501 George Carter Way Chantilly, VA 20151.



## FOR ELECTRICALLY POWERED EQUIPMENT.



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

**Refer to**  
<http://www.lincolnelectric.com/safety>  
**for additional safety information.**

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# PRODUCT DESCRIPTION

## GENERAL PHYSICAL DESCRIPTION

- The MAXsa™ 10 CONTROLLER is a user interface and a feeder controller. The control is used to set all welding parameters and control any travel mechanisms. High-speed digital cables connect the control, wire drive, and the Power Wave power source together.
- The MAXsa™ 10 CONTROLLER is a self-contained control box designed to control the entire weld arc at one location.
- The user interface utilizes alphanumeric displays for advanced text messaging providing the end user with an intuitive interface allowing for easy set up and real-time control of all welding parameters.
- An eight button memory section has been included which provides easy storage and recall of stored welding parameters.
- The user interface can be removed from the control box and connected as a Pendant for remote control near the arc.

## GENERAL FUNCTIONAL DESCRIPTION

- The MAXsa™ 10 CONTROLLER is one of the most versatile user interfaces ever created. Easy to use features make it a snap to adjust the arc for specific preferences.
- The user interface brightly displays essential welding information. Use it to quickly adjust weld settings, arc starting parameters, arc end parameters and set-up information.
- The memories allow for up to eight weld schedules to be stored and quickly recalled. The user interface allows for multiple levels of limits and lockouts.
- Digital communications to the power source provide the most accurate and reliable operation possible.
- When the MAXsa™ 10 CONTROLLER is coupled to the Power Wave® AC/DC 1000 SD welding power source, the result is a welding system with the best arc performance on the market.

## DEFINITIONS OF WELDING MODES

### NON-SYNERGIC WELDING MODES

- A Non-synergic welding mode requires all welding process variables to be set by the operator.

### SYNERGIC WELDING MODES

- A Synergic welding mode offers the simplicity of single knob control. The machine will select the correct voltage and amperage based on the wire feed speed (WFS) set by the operator.
- See the Power Wave® AC/DC 1000 SD Operator's Manual for available weld modes.

### COMMON WELDING ABBREVIATIONS

#### SAW

- Submerged Arc Welding

### GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL



**PENDENT  
ARCLINK  
CONNECTOR**



**WIRE FEEDER**



**CONTROLLER  
ARCLINK INPUT  
CONNECTOR**



**FLUX HOPPER  
CONNECTOR**



**TRAVEL  
CARRIAGE  
CONNECTOR**

## DESIGN FEATURES

- Easy control of all weld parameters.
- 8 Memories for easy storage and recall of weld schedules.
- Weld parameter limit setting and lockout capabilities.
- Digital communications for accurate and reliable performance.
- PC boards are potted in epoxy for the ultimate in outdoor protection.
- Connectors are filled with environmental protective grease.
- Designed for the Power Wave® AC/DC 1000 SD series of products for the best arc in the industry.
- Wire feed speed accuracy calibrated to within 2%.
- Digital display of voltage and wire feed speed.
- Tachometer controlled wire drive motor.
- Flux Fill Switch.
- Bright, high intensity digital read-outs.
- Option to convert to hand-held pendant included.

## RECOMMENDED PROCESSES AND EQUIPMENT

- The MAXsa™ 10 CONTROLLER is best suited for submerged arc welding only with the Power Wave® AC/DC 1000 SD, the MAXsa™ 22 or the MAXsa™ 29 Feed Heads.
- SAW

## COMMON BASIC EQUIPMENT PACKAGES

### Basic Package

- K2803-1 Power Wave® AC/DC 1000 SD
- K2370-2 MAXsa™ 22 Wire Drive
- K2814-1 or
- K2814-2 MAXsa™ 10 CONTROLLER / User Interface
- K2683-xx Control Cable (5 pin – 5 pin) - power source to MAXsa™ 10.
- K1785-xx Control Cable (14 pin – 14 pin) - MAXsa™ 10 to Wire Drive.

### Optional kits

- K2312-2 MAXsa™ 29 Wire Drive (for fixture builders).
- K2311-1 Motor Conversion Kit (to convert existing NA-3/NA-4/NA-5 wire feeder gear boxes).



## TECHNICAL SPECIFICATIONS: MAXsa™ 10 CONTROLLER

INPUT VOLTAGE & CURRENT			PHYSICAL SIZE				TEMPERATURE RATING	
Model	Voltage*	-- Input Amps*	Dimensions			Weight	Operating	Storage
			Height	Width	Depth			
K2814-1 K2814-2	40VDC	1.0	15.0in. (381 mm)	13.0 in (259 mm)	4.0 in. (102 mm)	25 Lbs (11.3 Kg.)	14°F to 104°F (-10°C to 40°C)	-40°F to 185°F (-40°C to 85°C)

\* When not driving a motor.

### IP 23

**SAFETY PRECAUTION**



**WARNING**



**ELECTRIC SHOCK can kill.**

- Only a qualified electrician should connect the MAXsa™ 10 CONTROLLER. Installation should be made in accordance with the appropriate National Electrical Code, the local codes and the information in this manual.
- Turn off the input power to the power source at the disconnect switch or fuse box before working on this equipment. Turn off the input power to any other equipment connected to the welding system at the disconnect switch or fuse box before working on this equipment.

- Do not touch electrically hot parts.

**WELDING VOLTAGE**

Wire feed parts are electrically live while welding and while inching wire (with Touch Sense feature selection). The electrically live parts are listed below:

Electrode	Electrode Reel
Wire Drive Motor	Drive Rolls
Gear Box	Cross-seam Adjuster
Wire Straightener	Welding Nozzle
Welding Cables	Welding Cable Terminal



**CAUTION**



- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

**MECHANICAL HAZARDS**



- Welding fixture or wire feeder will move during welding or inching. Keep away from pinch points.
- Electrode reel and drive rolls turn during welding or inching. Keep gloved hands away from areas that may catch the glove.

**LOCATION AND MOUNTING**

The MAXsa™ 10 CONTROLLER will operate in harsh environments and can be used outdoors with an IP 23 rating. Even so, it is important that simple preventative measures are followed in order to assure long life and reliable operation. The MAXsa™ 10 CONTROLLER must be mounted in the vertical(upright) position and located where there is little risk of impacts to the Controller.

**HIGH FREQUENCY PROTECTION**

Locate the MAXsa™ 10 CONTROLLER away from radio controlled machinery. The normal operation of the MAXsa™ 10 CONTROLLER may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

**AUXILIARY EQUIPMENT INPUT POWER CONNECTION**

The MAXsa™ 10 CONTROLLER has the ability to control auxiliary equipment such as feeders, flux hoppers and travel motors using solid state relays. There are three relays (CR1,CR2 &CR3) in the MAXsa™ 10 CONTROLLER, controlled by two independent coil drivers. The coils of CR1 and CR2 are in parallel, therefore, they must turn ON and OFF at the same time. The CR1 and CR2 relays are designated for driving travel motors to control motion. CR3 is driven separately, and is designated to control flux hopper operation.

MAXsa™ 10 CONTROLLER Relay Ratings:

Coil: 12Vdc, resistance = 86 ohms at 25° C

Normally Closed (N.C.) Contacts: 3A @ 277VAC

Normally Open (N.O.) Contacts: 30A @ 277VAC

The MAXsa™ 10 CONTROLLER does not provide the input power to feed any equipment, other than the MAXsa 22 or the MAXsa 29 feeders. Therefore a separate power feed must be provided by the end user. The MAXsa™ 10 CONTROLLER has been shipped standard with all of the wiring and connectivity to operate the Lincoln K325 TC-3 Travel Carriage (4-pin cable connector) and the Lincoln K219 Automatic Flux Hopper (3-pin cable connector). The CR2 Relay is wired to the 4-pin travel connector, and the CR3 Relay is wired to the 3-pin flux connector, both located on the bottom of the MAXsa™ 10 CONTROLLER.

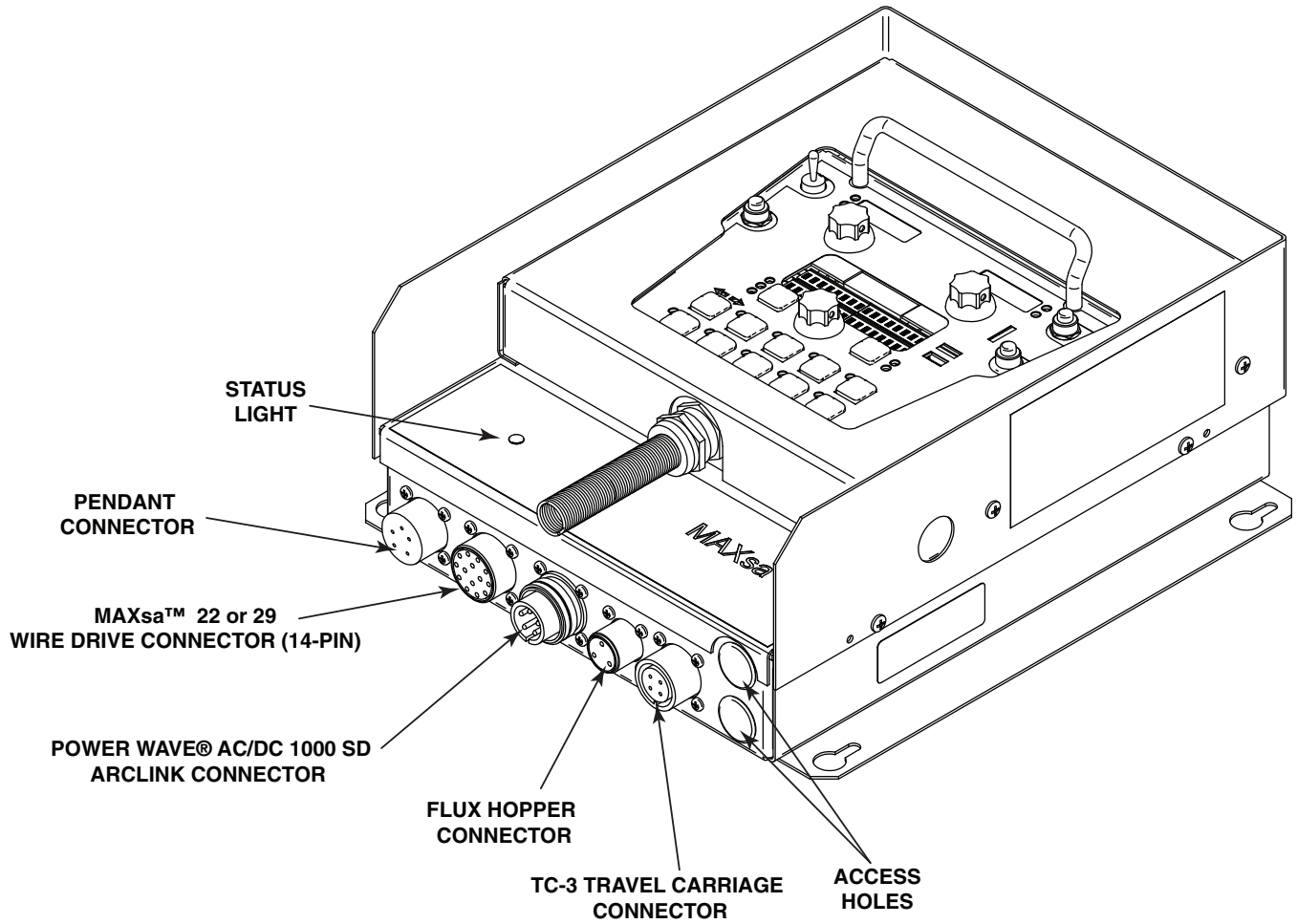
If either of these is to be used with the MAXsa™ 10 CONTROLLER, the end-user must provide the 115VAC input power to the terminal strip located inside the MAXsa™ 10 CONTROLLER. Access to the terminal strip may be obtained via one of the two .875" dia. (22.2mm) access holes in the bottom of the MAXsa™ 10 CONTROLLER. These access holes are shipped with plug buttons installed. Remove the plug button and install a suitable strain relief to protect the wires. See Figure A.1



**WARNING**

**Although input power to MAXsa™ 10 CONTROLLER is turned off, the customer installed auxiliary input may be energized! Ensure that all input power to the MAXsa™ 10 CONTROLLER is turned off before opening the cover**

FIGURE A.1 - MAXsa™ 10 CONNECTIONS



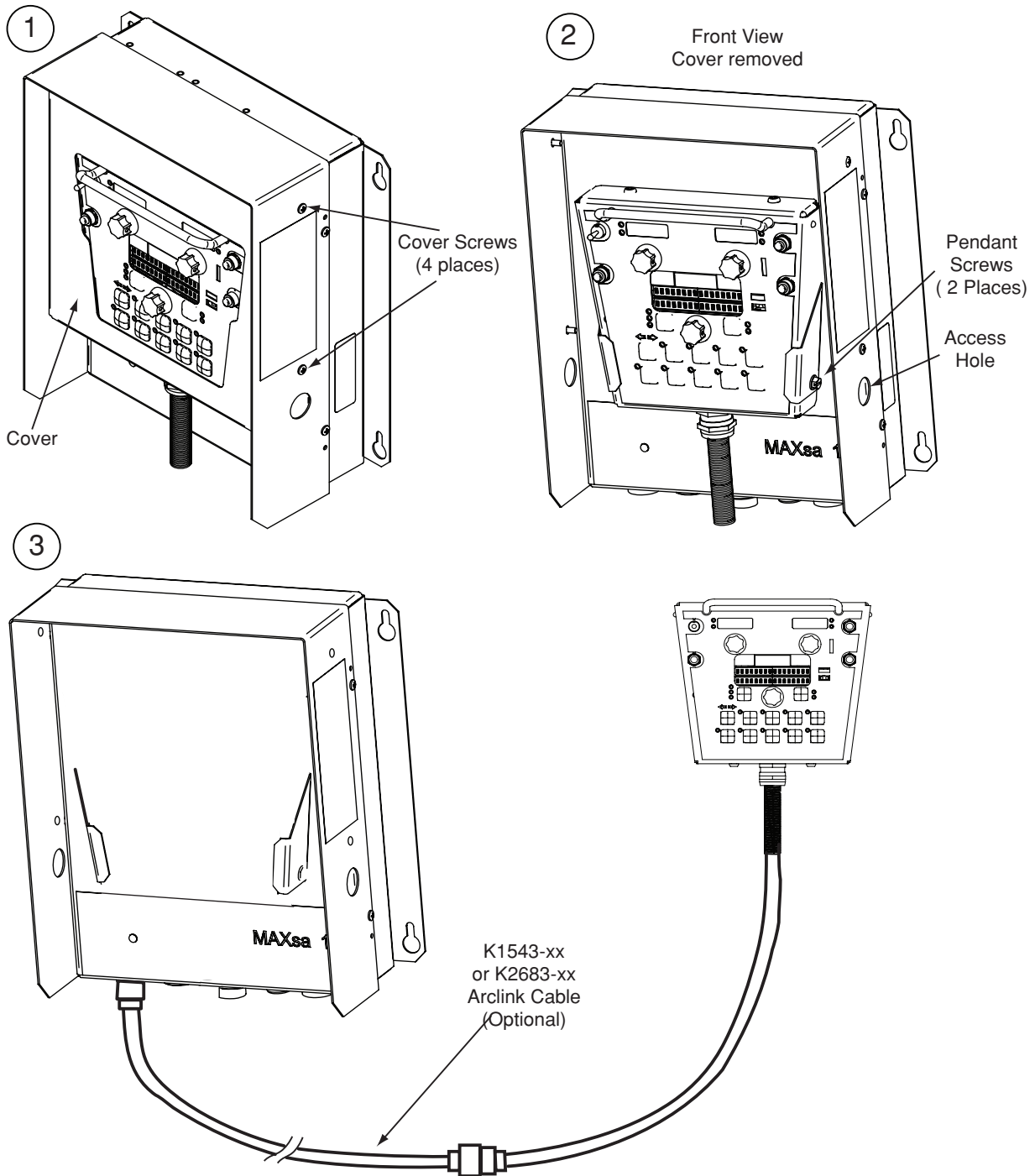
**INTERFACING TO THE MAXsa™ 10 CONTROLLER**

The MAXsa™ 10 CONTROLLER is a versatile controller. The User Interface can be removed and used as a hand-held pendant. Most circuits can be accessed through the screwless terminal strip. The auxiliary relays can control standard Lincoln equipment, or they can be used to control any other auxiliary equipment custom controls. PLC interfacing to control starting, stopping, motion, etc, can be accomplished with ease.

**Using the Controller as a Hand-held Pendant:**

1. Remove the 4 screws from the MAXsa™ 10 CONTROLLER that hold the cover. See Figure A.2.
2. Remove the 2 screws that hold the pendant in the brackets. Use the access holes shown.
3. Extend the control cable as needed with an Arc Link cable of appropriate length. See Figure A.2

**FIGURE A.2 - HAND HELD PENDANT**



### Auxiliary Input Power Connection Instructions

Use the appropriate size leads, at least 14 AWG – 2 wire with ground.

1. Remove two Phillips Head screws on right side of front panel of hinged door to access terminal strip.
2. Remove a plug button and install a box connector to provide strain relief for the input power leads.
3. Strip off 1/4" (6.4mm) of insulation from the leads and route them through the strain relief
4. Locate the 4-terminal blocks, numbered #48, #49, and #50. These are to be used to bring in auxiliary power. Terminal block #50 is used for the input ground connection. This terminal block is color-coded green and yellow for easy identification. Terminal blocks #48 and #49 are to be used to connect the input power circuit. (See Figure A.3).
5. Using a flat-head screwdriver with a blade dimension of 0.137" (3.5mm) x 0.020" (.51mm), insert the screwdriver into the square hole next to the mounting hole to be used on the terminal strip. The screwdriver should be inserted until it bottoms out. This opens the screwless cage clamping style wire insertion port. With the cage clamp opened insert the wire into the round port until it bottoms out. While holding the lead securely, remove the screwdriver from the terminal block. This closes the cage clamp onto the lead holding it securely. Any open port on blocks #48, #49, and #50 may be used.

Terminal blocks 48 and 49 are shipped connected to the contacts of CR2 and CR3 by leads 531 and 532. These relay contacts are also connected to the 4-pin Travel connector and the 3-pin Flux connector located on the bottom of the MAXsa™ 10 CONTROLLER. CR1 is available for a separate customer connection, but it will turn ON and OFF with CR2. Therefore, if Lincoln auxiliary equipment is to be used, connecting 115VAC to the terminal strip is all that is required to power the devices.

**NOTE:** The contacts of CR1 are not connected to terminals #48 and #49 when shipped. Applying power to the #48 and #49 terminals will not transfer voltage to the CR1 relay. Connect leads from the #48 terminal to the #4 terminal and from the #49 terminal to the #3 terminal to supply power to the common contacts of the relay.

Once input power is applied to the terminal strip, this voltage is always on terminal strip blocks #3, #4 (if connected), #11, #17, and #18. These are the inputs to the solid-state relay contacts. Input voltage is also present on terminal strip blocks #7, #8 (if connected), #15, #21, and #22 due to the N.C. contacts on the relays. When the CR1 relay is energized, input power is transferred to terminal strip blocks #5 and #6 (if connected). When the CR2 relay is energized, input power is transferred to terminal strip block #13. When the CR3 relay is energized, input power is transferred to terminal strip blocks #19 and #20. CR1 and CR2 will be turned ON and OFF at the same time.

FIGURE A.3

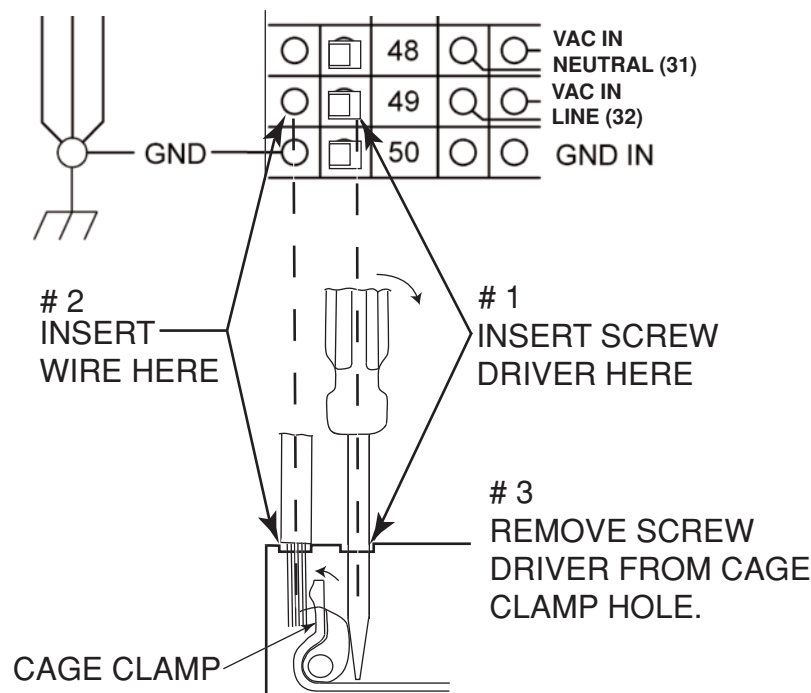
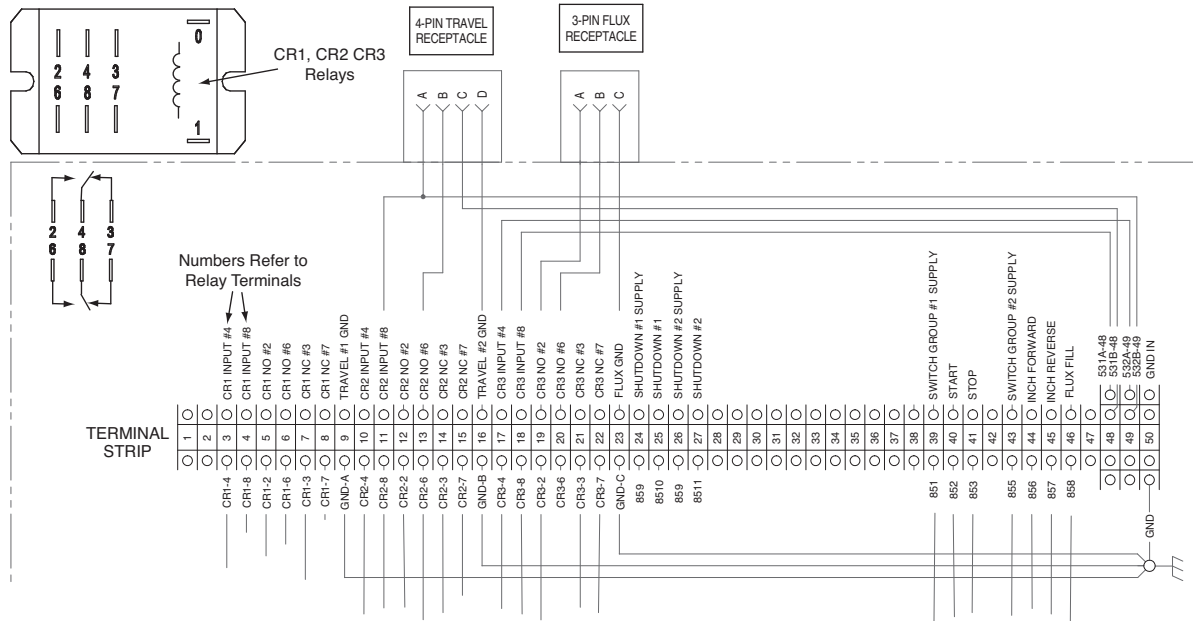


FIGURE A.4 - CONTROLLING NON-LINCOLN EQUIPMENT



### CONTROLLING NON-LINCOLN AUXILIARY EQUIPMENT

Custom motion control and/or other auxiliary equipment can be powered using the terminal strip and relays. To use non-Lincoln motion control and/or flux hoppers, follow instructions below. See Figure A.4.

1. Remove all input power to the MAXsa™ 10 CONTROLLER including any auxiliary power supplies.
2. Remove the wire duct cover to gain access to the leads on the right side of the terminal strip.
3. Remove a plug button from one of the .875" (22.2mm) access holes on the bottom of the MAXsa™ 10 CONTROLLER control box. Install a suitable strain relief to protect the leads. See **Figure A.1**.
4. Remove the leads going from the terminal strip to the corresponding connectors, i.e. terminal strip blocks #11, #13, and #16 for the 4-pin TC-3 Travel Carriage or terminal strip blocks #19, #20, and #23 for the 3-pin Automatic Flux Hopper. See the **Wiring Diagram**.
5. These loose leads can be taped and secured in the wire duct.
6. Any custom or non-Lincoln equipment can be powered by the normally open contacts from relays CR1, CR2, or CR3. The contacts for CR1 are connected to the terminal strip blocks #3 through #8. The contacts for CR2 are connected to terminal strip blocks #10 through #15. The contacts for CR3 are connected to terminal strip blocks #17 through #22. See Figure A.3.

CR1 and CR2 relay coils are in parallel and are BOTH turned ON and OFF as determined by the Travel Options setting (P12 in the Set-up Menu) as long as the TRAVEL MODE is set to AUTO. CR3 turns ON with the START command and OFF with the STOP Command.

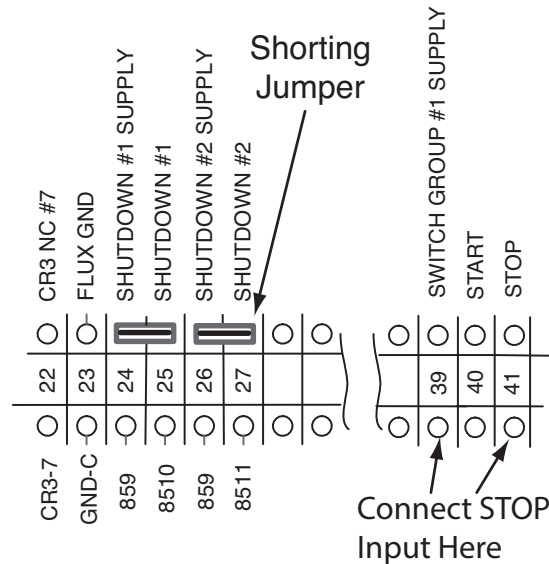
7. The supply voltage to power the devices is provided by the end user. As shipped, the MAXsa™ 10 has the auxiliary supply blocks (terminal strip blocks #48 and #49) connected to the CR2 relay and CR3 relay inputs, respectively. When the end user connects a supply to the AUX blocks #48 and #49, this voltage will be jumpered to the CR2 and CR3 relay inputs on terminal strip blocks #11, #17, and #18.

**NOTE:** The CR1 relay is not connected to the AUX terminal strip blocks; the customer must connect power to this relay if it is to be used. See relay ratings listed earlier.

8. Connect input supply voltage per the Auxiliary Input Power Connection Instructions listed earlier.
9. The relays can also be used to provide contact closure for any interfacing signals out using the normally open contacts. An external auxiliary supply voltage would not be necessary to use the relays as hard contact closure out signals.

**NOTE:** The CR1 relay as shipped does not have AUX leads connected to it. This relay operates as described above and has two normally open / normally closed contacts that could be used as a signal out when interfacing to PLC's or custom controls.

FIGURE A.5 - SHUTDOWN AND STOP INPUTS



## SHUTDOWN INPUTS

The MAXsa™ 10 CONTROLLER has two shutdown inputs available on the terminal strip. These are independent, normally closed inputs that can be used for limit switches, PLC inputs, etc, in order to shut down the welding operation for any reason. Shutdown #1 is located on terminal strip blocks #24 and #25. Shutdown #2 is located on terminal strip blocks #26 and #27.

1. Remove all input power to the MAXsa™ 10 CONTROLLER including any auxiliary power supplies.
2. Remove the wire duct cover to gain access to the leads on the right side of the terminal strip.
3. Remove one of the plug buttons located on the bottom of the MAXsa™ 10 CONTROLLER control box and install a box connector to provide strain relief for the auxiliary control leads.
4. Connect the external shutdown circuit to either of the shutdown terminal blocks, #24 & #25, and/or #26 & #27. A normally closed circuit must be connected – the MAXsa™ 10 CONTROLLER will recognize an open circuit as a shutdown command.
5. Remove the shorting jumpers imbedded in the center of the terminal strip with a small screwdriver for the shutdown circuits to be used.

When a shutdown input is received, all welding will stop and an error message will be displayed on the MAXsa™ 10 CONTROLLER. The shutdown circuit must be closed before resetting the Controller. To reset the system, the Mode Select Panel display will prompt the user to press the left Mode Select Panel Pushbutton.

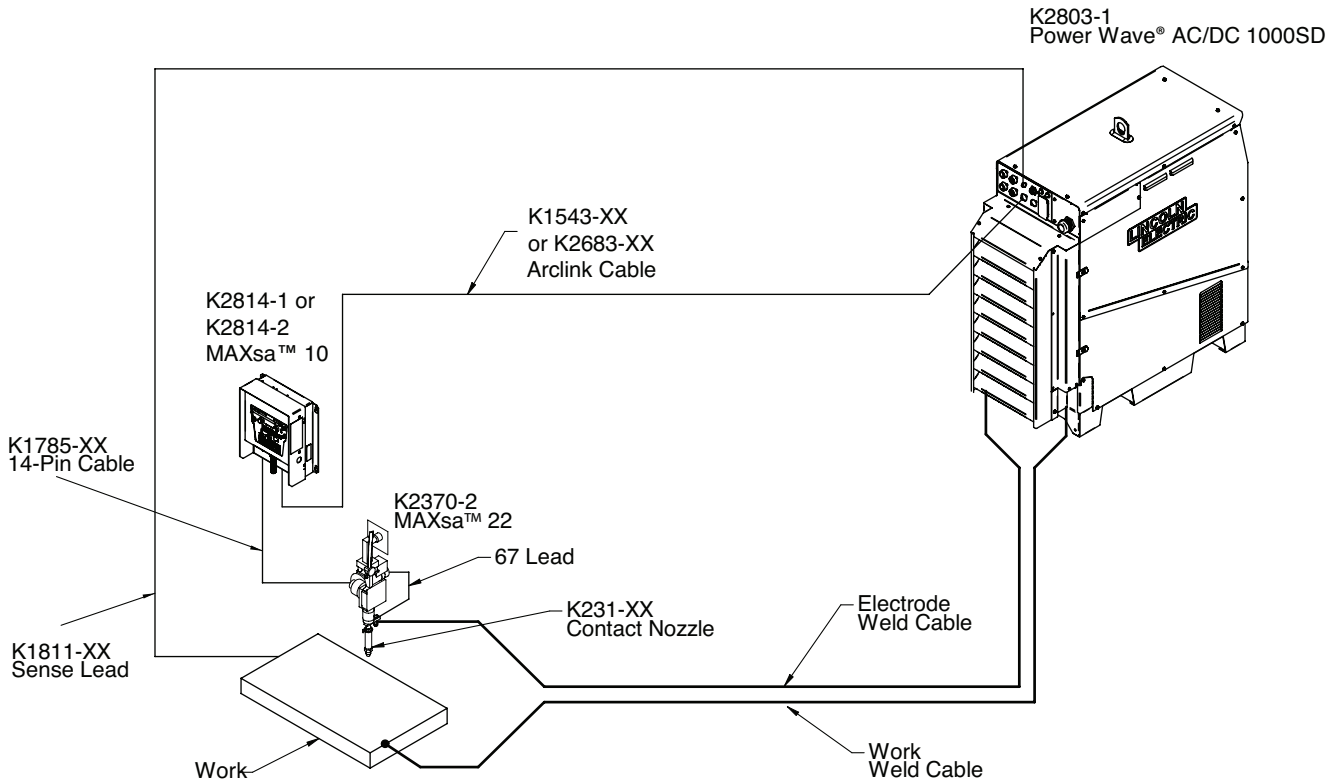
## STOP INPUT

The MAXsa™ 10 CONTROLLER has a Stop Input available on the terminal strip. The Stop Input will work just like pressing the STOP Pushbutton located on the Switch Panel. This circuit is in parallel with the STOP Pushbutton, which completely shutdown all welding and auxiliary equipment, the STOP Input will allow all welding and auxiliary motion to continue based on the END OPTIONS configurations in the MAXsa™ 10 CONTROLLER. See Figure A.5.

1. Remove all input power to the MAXsa™ 10 CONTROLLER including any auxiliary power supplies.
2. Remove the wire duct cover to gain access to the leads on the right side of the terminal strip.
3. Remove one of the plug buttons located on the bottom of the MAXsa™ 10 CONTROLLER control box and install a box connector to provide strain relief for the control leads.
4. Connect the external Stop Input circuit to terminal blocks #39 and #41.

**NOTE:** The STOP circuit only needs a momentary closure to be recognized by the MAXsa™ 10 CONTROLLER.


FIGURE A.6 - CONNECTION DIAGRAM - SINGLE ARC SYSTEM



Connection Diagrams for Additional Configurations (Multi- Arc and Parelleled Power Sources) are in the Power Wave® AC/DC 1000SD Operators Manual



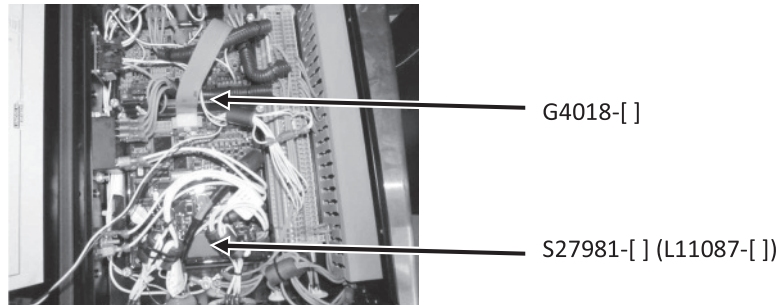
## INSTALLATION INSTRUCTIONS FOR MAXsa 10 BEING USED WITH K2803-1 USING 9SS30221-[ ]

	<b>WARNING</b>	<b>ELECTRIC SHOCK can kill.</b>
		<ul style="list-style-type: none"><li>• Turn the supply power OFF at the disconnect switch before working on this equipment.</li><li>• Do not touch electrically hot parts.</li><li>• Only qualified personnel should install, use or service this equipment.</li><li>• Follow all national and local safety procedures.</li><li>• Wear the appropriate Personal Protective Equipment.</li></ul>

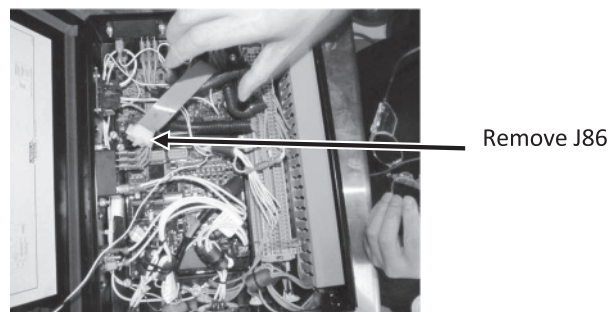
**Notes:**

**DO NOT DISTURB ANY OTHER HARNESS, LEAD, OR EXISTING GROUND CONNECTIONS DURING INSTALLATION.**

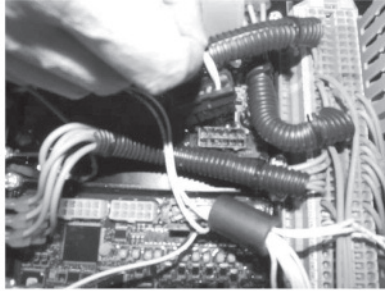
- 1- Open control box and locate S27981-[ ] (L11087-[ ]) and G4018-[ ] boards.



- 2- Remove J86 connector from the S27981-[ ] (L11087-[ ]) board.

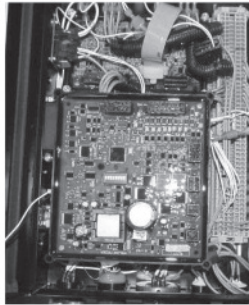


3- Remove J331 from the G4018-[ ] board.

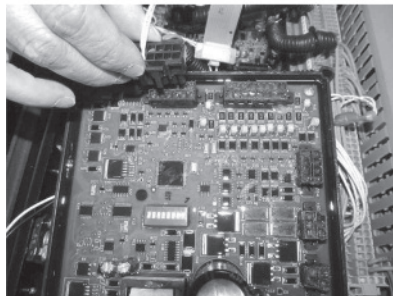


4- G4018-[ ] is no longer needed. It can stay or be removed.

5- Replace S27981-[ ] (L11087-[ ]) board with the S30221-[ ] (G6752-[ ]) board.



6- Reconnect the J331 connector to J88 on the S30221-[ ] (G6752-[ ]) board, then reconnect the rest of the connectors.



7- Reconnect the input power and assure proper output.

## SAFETY PRECAUTIONS

Read this entire section of operating instructions before operating the machine.



### WARNING



#### ELECTRIC SHOCK can kill.

- Do not touch electrically live parts or electrodes with your skin or wet clothing.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.
- Do not use AC welder if your clothing, gloves or work area is damp or if working on, under or inside work-piece.



Use the following equipment:

- DC manual (stick) welder.
- AC welder with reduced voltage control.
- Do not operate with panels removed.
- Disconnect input power before servicing.

ONLY QUALIFIED PERSONS SHOULD INSTALL, USE OR SERVICE THIS EQUIPMENT. READ AND FOLLOW THE MANUFACTURER'S INSTRUCTIONS, EMPLOYER'S SAFETY PRACTICES AND MATERIAL SAFETY DATA SHEETS (MSDS) FOR CONSUMABLES.

READ THIS WARNING, PROTECT YOURSELF & OTHERS.



#### FUMES AND GASES can be dangerous.

- Keep your head out of fumes.
- Use ventilation or exhaust at the arc, or both, to keep fumes and gases from your breathing zone and general area.



#### WELDING SPARKS can cause fire or explosion.

- Do not weld near flammable material.
- Do not weld on containers which have held flammable material.



#### ARC RAYS can burn.

- Wear eye, ear, and body protection.

FIGURE B.1 - INPUT AND OUTPUT CONNECTIONS

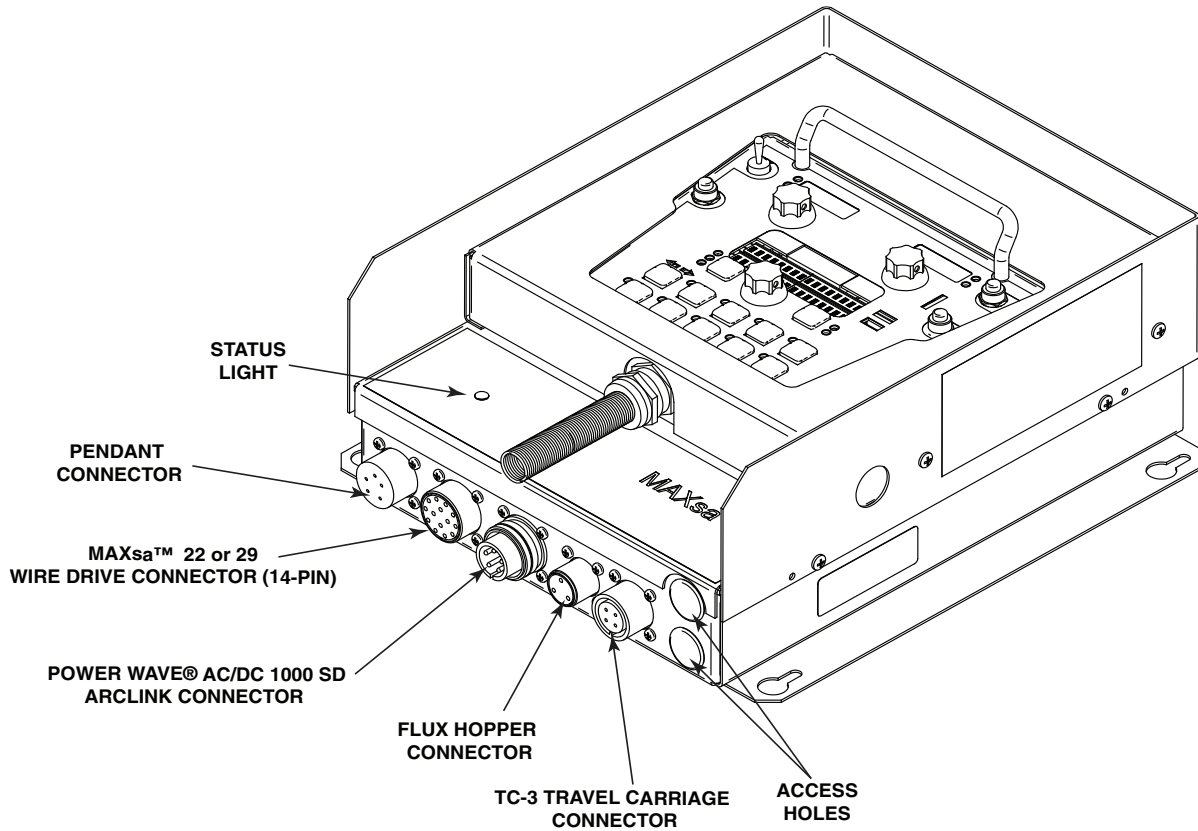


FIGURE B.2 - PENDANT CONTROLS

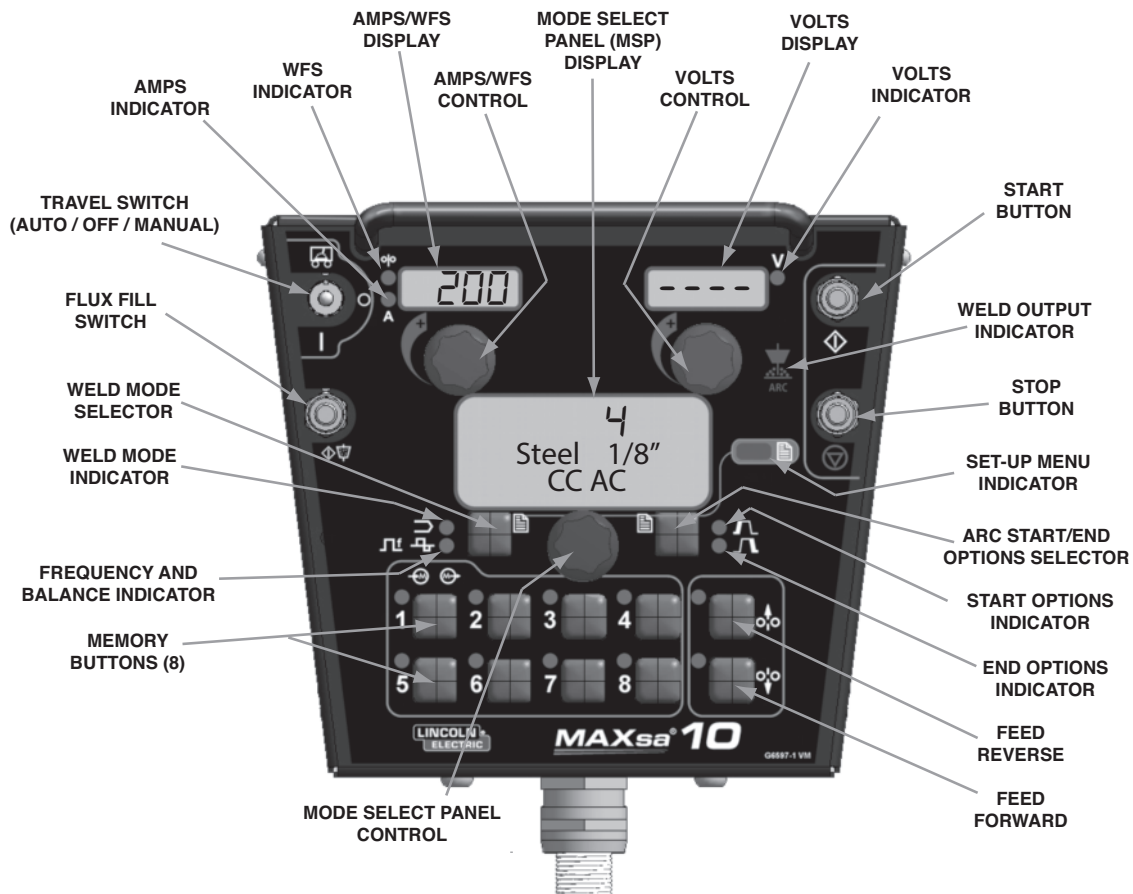


FIGURE B.3 - POWER UP



FIGURE B.4.- FEED CONTROLS



**POWER-UP SEQUENCE**

When power is first applied to the machine the MODE SELECT Display reads "MAXsa™ Initializing...". Once the PowerWave AC/DC has initialized (20 to 60 seconds) a "lamp test" is performed.

- All discrete LED's, seven segment displays and alpha numeric displays will be turned ON for 2 seconds
- After 2 seconds all displays are turned OFF again and the MSP Display will show:



After initialization is complete, the MSP Display will show the weld mode. The upper displays will show the parameters that were selected when the machine was last powered down and the WELD MODE Indicator will be ON.

**WIRE FEEDER SETUP**

Use the FEED FORWARD pushbutton to insert wire into the feed mechanism.





Prior to inserting the wire make sure that the "Touch Sense" option is disabled. (P.15 in the Setup Menu).

**SETTING FEED FORWARD/REVERSE**

While pressing either the FEED FORWARD or FEED REVERSE pushbutton the MSP Display will read as shown in Figure B.4 and the preset wire feed speed will be displayed on the left (AMPS/WFS) display.

The feed speed can be changed by adjusting the control knob below the display while pressing either button.

 FEED REVERSE Use to retract the wire from the feed mechanism.

 FEED FORWARD Feeds the wire downward towards the work piece.

**NOTE:** The MAXsa 10 has an option in the Setup Menu (P.15) to enable the "Touch Sense" circuitry. See the *Setup Menu*. When P.15 is enabled and the FEED FORWARD button is pressed, the MSP Display will read:



This "Hot Feed" feature enables the output of the power source and there is voltage on the wire while feeding down. Avoid touching any exposed parts as defined in the SAFETY PRECAUTIONS.

### CHANGING AND SETTING WELD MODES

To select a weld mode, press the WELD MODE SELECTOR button until the WELD MODE indicator comes ON (it may already be lit by default at power up). Turn the control knob to select the desired mode. After about 1 second, the parameters for the new mode will be displayed. These parameters can be adjusted with the control knobs below each display.

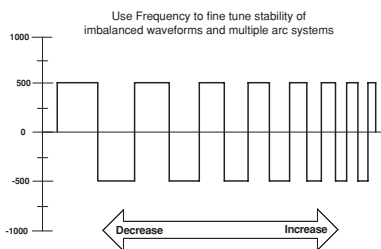


**NOTE:** CC Modes will show AMPS in the upper left display. CV Modes will show wire feed speed and the WFS indicator will be lit.

### FREQUENCY/BALANCE CONTROL

#### FREQUENCY ADJUST

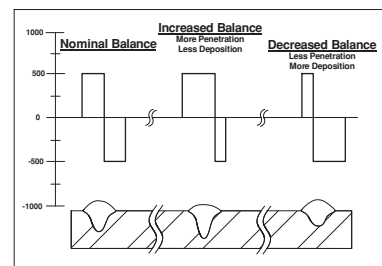
Press the WELD MODE selector until the FREQUENCY/BALANCE indicator comes ON and the MSP Display reads "Frequency". If the selected mode allows for frequency adjustment, the Control Knob can be used to select the desired frequency between 20 and 100hz.



Frequency adjustment can be used to fine tune stability of imbalanced waveforms and multiple arc system.

#### BALANCE ADJUST

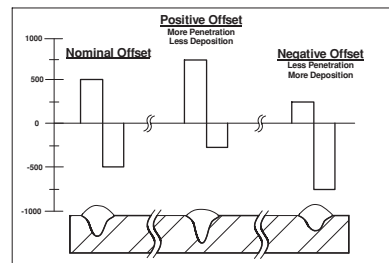
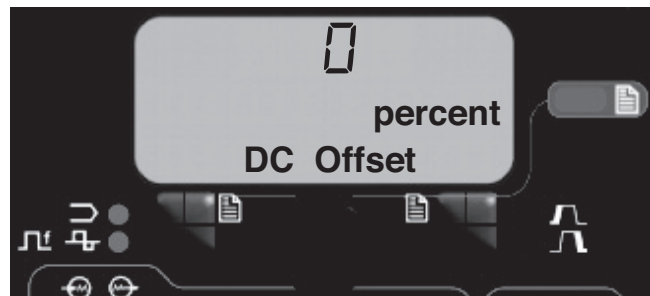
Press the WELD MODE selector until the MSP Display reads "Balance". If the selected mode allows for balance adjustment, the Control Knob can be used to select the desired wave balance through a range of 25% to 75%.



Adjusting the Balance (the ratio between Positive and Negative half cycle 'on time') changes the deposition for more efficient welding.

#### OFFSET ADJUST

Press the WELD MODE selector until the MSP Display reads "Offset". If the selected mode allows for offset adjustment, the Control Knob can be used to select the desired offset. The amount of offset allowed is determined by the selected weld mode.



Independent control of the Positive and Negative cycles allows for more precise control of penetration and deposition.

## WELD MODE SEARCHING

The Weld Mode Search feature allows the selection of a welding mode based on certain criteria (wire size, process type, etc.).

### SEARCHING FOR A WELD MODE

To search for a mode, press and release the control knob while the WELD MODE indicator is lit. Another way to search for a mode is to turn the control knob until “Weld Mode Search” is displayed. This will appear in between the highest and the lowest weld mode number.

Once “Weld Mode Search” is displayed, pressing the right pushbutton labeled “Begin” will start the search process.

During the search process, pressing the right pushbutton typically acts as a “next” button and the left pushbutton typically acts as a “back” button. Pressing the control knob also acts as a “next” button.

Rotate the control knob then press to select relevant welding details such as welding process, wire type, wire size, etc.

When the final selection is made, the MAXsa™ 10 will automatically change to the weld mode found by the Weld Mode Search process.

Earlier products may not have this feature. To activate this feature, a software update may be needed from [www.power-wavesoftware.com](http://www.power-wavesoftware.com)

## MULTIPLE ARC CONFIGURATION

Power Wave® AC/DC 1000 SD / MAXsa™ systems can be used in multiple arc set ups with up to six arcs. To minimize magnetic interaction between the arcs, it is imperative that they be phased correctly. Phasing is essentially a time offset between the waveforms of different arcs. The phase of each arc is set via the User Interface of the lead arc.

The ideal situation is to have adjacent arcs 90° offset as illustrated

**TABLE B.1 - PHASE RELATIONSHIP**

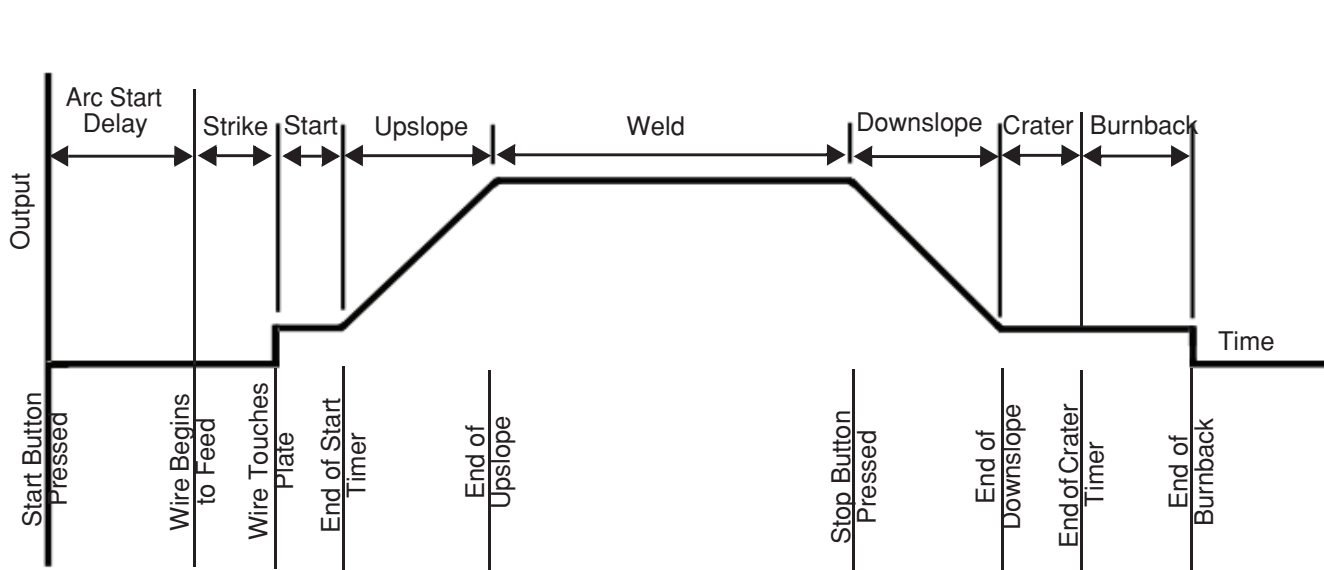
in table B.1 when using 50% balance on all arcs.

	ARC 1	ARC 2	ARC 3	ARC 4	ARC 5	ARC 6
<b>2 Arc System</b>	0°	90°	X	X	X	X
<b>3 Arc System</b>	0°	90°	180°	X	X	X
<b>4 Arc System</b>	0°	90°	180°	270°	X	X
<b>5 Arc System</b>	0°	90°	180°	270°	0°	X
<b>6 Arc System</b>	0°	90°	180°	270°	0°	90°

**(for balanced waveforms only)**

See the Power Wave® AC/DC Operator’s Manual for more information regarding the configuration of multiple arc systems.

FIGURE B.6 - WELD SEQUENCE



## WELD SEQUENCE

The weld sequence defines the weld procedure from beginning to end. All adjustments are made through the user interface.

## START OPTIONS

The delay, strike, start and upslope parameters are used at the beginning of the weld sequence to establish a stable arc and provide a smooth transition to the welding parameters. They are described in the following:

- **ARC DELAY** inhibits the wire feed for up to 5 seconds to provide an accurate weld start point. Typically used in multi-arc systems.
- **STRIKE** settings are valid from the beginning of the sequence (Start) until the arc is established. They control run-in (speed at which the wire approaches the workpiece) and provide the power to establish the arc. Typically output levels are increased, and WFS is reduced during the strike portion of the weld sequence.
- **START** values allow the arc to become stabilized once it is established. Extended start times or improperly set parameters can result in poor starting.
- **UPSLOPE TIME** determines the amount of time it takes to ramp from the start parameters to the weld parameters. The transition is linear and may be up or down depending on the relationship between the start and weld settings.

## START OPTIONS OPERATION

Pressing the **Arc Start/End Options** pushbutton will illuminate the START OPTIONS LED and the Arc Delay Time parameter will show on the MSP Display.



Use the **Mode Select Panel Control** to select the desired delay time. Press the **Weld Mode Selector** to exit the Start parameters.

Repeated pressing of the **Arc Start/End Options** pushbutton will scroll through the parameters. Turning the **Mode Select Panel Control**, while on a parameter will change its value.

When a Start Option is set to a value other than OFF, the START OPTIONS LED will blink synchronous with the WFS or Amps and/or the volts LED located on the Dual Display Panel prompting the user to enter these parameters. The parameters that can be set by the user in the START OPTIONS will be as follows:

ARC DELAY TIME  
 STRIKE WFS  
 STRIKE TIME  
 START WFS/AMPS  
 START VOLTS  
 START TIME  
 UPSLOPE TIME



## END OPTIONS

The downslope, crater, and burnback parameters are used to define the end of the weld sequence. They are defined in the following:

- DOWNSLOPE determines the amount of time it takes to ramp from the weld parameters to the crater parameters. The transition is linear and may be up or down depending on the relationship between the weld and crater settings.
- CRATER parameters are typically used to fill the crater at the end of the weld and include both time and output settings.
- BURNBACK defines the amount of time the output remains on after the wire has stopped. This feature is used to prevent the wire from sticking in the weld puddle and to condition the end of the wire for the next weld. A burnback time of 0.4 second is sufficient in most applications.
- RESTRIKE TIME determines how long the system will try to re-establish the arc in the event of a poor start or if the arc goes out for any reason (short circuit or open circuit). During restrike, the WFS and outputs are driven in an attempt to re-establish the arc.
  - A restrike time of 1 to 2 seconds is sufficient in most applications.
  - A restrike time of 0 seconds allows the restrike function to continue indefinitely.

Repeated pressing of the **Arc Start/End Options** pushbutton will toggle through the parameters. Turning the **Mode Select Panel Control** while on a parameter will change its value. When the Crater Time is set to a value other than OFF, the END OPTIONS LED will blink synchronous with the WFS or Amps LED (depending on CC or CV Weld Modes) and with the Volts LED located on the Dual Display Panel prompting the user to enter these parameters. The parameters that can be set by the user in the END OPTIONS will be as follows:

DOWNSLOPE TIME  
 CRATER WFS/AMPS  
 CRATER VOLTS  
 CRATER TIME  
 BURNBACK TIME  
 RESTRIKE TIME

## END OPTIONS OPERATION

Pressing the **Arc Start/End Options** pushbutton after scrolling through the Start Options will illuminate the END OPTIONS LED and the Downslope Time parameter will show on the MSP Display.



Use the **Mode Select Panel Control** to select the desired delay time. Press the **Weld Mode Selector** to exit the End parameters.

### SETUP MENU FEATURES

The Setup Menu provides access for configuring user preferences, which are generally only set at installation. The user preferences are grouped as shown in the following table.

PARAMETER	DEFINITION
P.1 through P.99 P.101 through P.199 P.501 through P.599	Unsecured Parameters (always adjustable) Diagnostic Parameters (always read only) Secured Parameters (only accessible with Weld Manager)

### ACCESSING THE SETUP MENU

#### 1. ACCESS

To access the Setup Menu, Press the Left Button and Right Button simultaneously. The Setup Menu Indicator will light and the lower display will read as shown below.

Note: The Setup Menu cannot be accessed during welding, or if a fault is displayed. To resume welding, exit the Setup Menu.

#### 2. PREFERENCE SELECTION

Scroll through the Preference list by rotating the Control Knob. Press the Right Button to edit the selected preference.

#### 3. PREFERENCE CHANGE

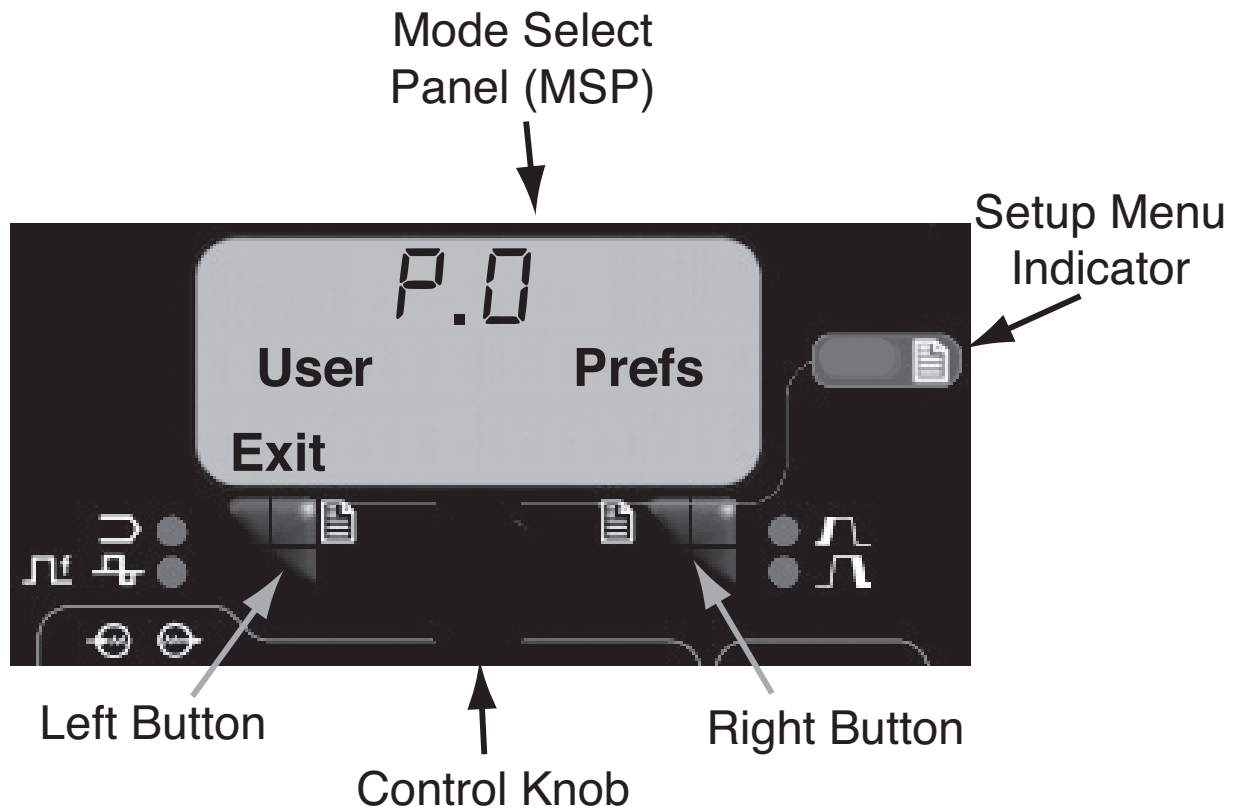
Scroll through the preference options by rotating the Control Knob. Change the preference setting by pressing the Right Button. To cancel, press the Left Button.

#### 4. EXIT

To exit the Setup Menu, press both buttons simultaneously or select P.0 and press the Left Button. Sixty seconds of inactivity will automatically exit the Setup Menu.

**Note:** If a product is missing any of the preference options listed below, a software update may be needed from [www.powerwavesoftware.com](http://www.powerwavesoftware.com).

FIGURE B.7 - SETUP MENU



## USER DEFINED PARAMETERS

Parameter	Definition
P.0	<p><b>Exit Setup Menu</b> This option is used to exit the setup menu. When P.0 is displayed, press the Left Button to exit the setup menu</p>
P.1	<p><b>Wire Feed Speed Units</b> This option selects which units to use for displaying wire feed speed. English = inches/minute wire feed speed units (default). Metric = meters/minute wire feed speed units.</p>
P.2	<p><b>Arc Display Mode</b> This option selects what value will be shown on the upper left display while welding. Amps = The left display shows Amperage while welding (default). WFS = The left display shows Wire Feed Speed while welding.</p>
P.3	<p><b>Display Options</b> This setup parameter was previously named "Display Energy"</p> <p>If the previous software revision had this parameter set to display energy, that selection will remain.</p> <p>This option selects the information displayed on the alphanumeric displays while welding. Not all P.3 selections will be available on all machines. In order for each selection to be included in the list, the power source must support that feature. A software update of the power source may be needed to include the features.</p> <p>Standard Display = The lower displays will continue to show preset information during and after a weld (default). Show Energy = Energy is displayed, along with time in HH:MM:SS format. Show Weld Score = The accumulative weld score result is shown.</p>
P.12	<p><b>Travel Carriage Start/Stop - Travel Starts</b> This option allows the adjustment of the start and end travel options for a travel carriage. Press the Right Button to enter the option and rotate the Control Knob to select either starting or ending options. Press the Right Button to enter the selected option. Rotate the Control Knob to select the desired function. After selecting the function, press the Left Button to save the function and back out to select another option. Rotate the Control Knob to make another selection, or press the Left Button to exit this option.</p>
P.12	<p><b>Travel Carriage Start/Stop - Travel Ends</b> This option allows the adjustment of the start and end travel options for a travel carriage. Press the Right Button to enter the option and rotate the Control Knob to select either starting or ending options. Press the Right Button to enter the selected option. Rotate the Control Knob to select the desired function. After selecting the function, press the Left Button to save the function and back out to select another option. Rotate the Control Knob to make another selection, or press the Left Button to exit this option.</p>
P.13	<p><b>Arc Force Adjustment Options</b> This option allows the adjustment of Arc Force values for Start, Weld and Crater. Press the Right Button to enter the option and rotate the Control Knob to select the desired weld state to adjust. Press the Right Button again to adjust the value on the upper Left Knob. Press the Left Button to save the value and back out to select another weld state. Rotate the Control Knob to make another selection, or press the Left Button to exit this option. This option will not appear if the presently selected weld mode does not support Arc Force.</p>
P.14	<p><b>Reset Consumable Weight</b> Use this option to reset the initial weight of the consumable package. Press the Right Button to reset the consumable weight. This option will only appear with systems using Production Monitoring.</p>

## USER DEFINED PARAMETERS (CONT.)

Parameter	Definition
<p><b>P.15</b></p>	<p><b>Hot-Inch Touch Sense Option</b>  This option allows enabling or disabling touch sense when feeding wire forward.  Disabled = Touch sensing is disabled when feeding the wire forward (default).  Enabled = Touch sensing is active when feeding the wire forward.</p> <p>When enabled and feeding wire forward, the wire is electrically "hot" and waiting to short to the plate. When a short occurs, the wire feed automatically stops and the flux hopper relay is activated until the feed forward button is released.</p>
<p><b>P.18</b></p>	<p><b>Wire Drive Gear Ratio</b>  This option selects the Wire Drive Gear Ratio that will be used. The possible selectable values are read from the Wire Drive on startup. For semi-automatic systems, if the feedhead board has dip switches, this option does not appear in the menu. Gear ratio can be selected using the dip switches.</p> <p>Note: Changing this value will cause the system to reset.</p>
<p><b>P.21</b></p>	<p><b>Shutdown 2 Function Select</b>  This option allows selection of the Shutdown 2 input function on the control box. Normal <b>Shutdown</b> = The Shutdown 2 input functions as a standard shutdown input that locks out all input buttons (default) <b>Output Disable</b> = The Shutdown 2 input functions as a machine output lockout to disable the welding circuit but still allow cold feeding of the wire.</p>
<p><b>P.23</b></p>	<p><b>Trigger Fan-Out</b>  For Sub-Arc Lead Arc machines only. Allows the Lead Arc MAXSAT™ 10 to control all machine triggers in a multi-arc system.  <b>No</b> = Only the machine connected to the MAXSAT™10 can be triggered on and off (default).  <b>Yes</b> = All machines in the system can be triggered on and off simultaneously.</p>
<p><b>P.30</b></p>	<p><b>Input Control</b>  This option allows the front panel controls of the MAXSAT™ 10 to be enabled/disabled. The remote inputs are always functional when connected, but there may be applications where it is necessary to disable the inputs on the pendent. <b>Panel &amp; Remote</b> = All pendent buttons are enabled (default). <b>Panel Locked</b> = The Start, Flux and feed buttons are disabled at the pendent. The pendent's Stop button is always active and cannot be disabled.</p>
<p><b>P.80</b></p>	<p><b>Sense From Studs</b>  Use this option for diagnostic purposes only. When power is cycled, this option is automatically reset to False.  <b>False</b> = Voltage sensing is automatically determined by the selected weld mode and other machine settings (default).  <b>True</b> = Voltage sensing is forced to "studs".</p>
<p><b>P.99</b></p>	<p><b>Show Test Modes?</b>  Most power sources contain weld modes used for calibration and test purposes. By default, the machine does not include test weld modes in the list of weld modes that are available to the operator. To manually select a test weld mode, set this option to "Yes". When the power source is turned off and back on again, the test modes will no longer appear in the mode list. Test weld modes typically require the machine output to be connected to a grid load and cannot be used for welding.</p>
<p><b>P.100</b></p>	<p><b>View Diagnostics?</b>  Diagnostics are only used for servicing or troubleshooting the Power Wave system. Select "Yes" to access the diagnostic options in the menu. Additional parameters will now appear in the setup menu (P.101, P.102, etc).</p>

### USER DEFINED PARAMETERS (CONT.)

Parameter	Definition
<b>P.101</b>	<p><b>View Event Logs</b></p> <p>Used for viewing all the system event logs. Press the Right Button to enter the option. Rotate Control Knob to select the desired event log to read. Press the Right Button again to enter the selected log. Rotating the Control Knob will scroll through the event log, displaying the log index number, event code and some other data. Press the Left Button to back out to select another log. Press the Left Button again to exit this option.</p>
<b>P.102</b>	<p><b>View Fatal Logs</b></p> <p>Used for viewing all the system fatal logs. Press the Right Button to enter the option. Rotate Control Knob to select the desired fatal log to read. Press the Right Button again to enter that log. Rotating the Control Knob will scroll through the log, displaying the log index number and fatal code. Press the Left Button to back out to select another log. Press the Left Button again to exit this option.</p>
<b>P.103</b>	<p><b>View Software Version Information</b></p> <p>Used for viewing the software versions for each board in the system. Press the Right Button to enter the option. Rotate Control Knob to select the desired board to read. Press the Right Button again to read the firmware version. Press the Left Button to back out to select another board. Rotate the Control Knob to select another board, or press the Left Button to exit this option.</p>
<b>P.104</b>	<p><b>View Hardware Version Information</b></p> <p>Used for viewing the hardware version for each board in the system. Press the Right Button to enter the option. Rotate Control Knob to select the desired board to read. Press the Right Button again to read the hardware version. Press the Left Button to back out to select another board. Press the Left Button again to exit this option.</p>
<b>P.105</b>	<p><b>View Welding Software Information</b></p> <p>Used for viewing the Weld Set in the Power Source. Press the Right Button to read the Weld Set version. Press the Left Button to back out and exit this option.</p>
<b>P.106</b>	<p><b>View Ethernet IP Address</b></p> <p>Used for viewing the IP address of Ethernet compatible equipment. Press the Right Button to read the IP Address. Press the Left Button to back out and exit this option. The IP address cannot be changed using this option.</p>
<b>P.107</b>	<p><b>View Power Source Protocol</b></p> <p>Used for viewing the type of power source the feeder is connected to. Press the Right Button to identify the power source as either LincNet or ArcLink. Press the Left Button to back out and exit this option.</p>
<b>P.501</b>	<p><b>Encoder Lockout</b></p> <p>Locks one or both of the upper knobs (encoders), preventing the operator from changing wire feed speed, amps, volts or trim. The function of each upper knob depends on the selected weld mode. When a constant current weld mode is selected (e.g. Stick, TIG, Gouge), the upper right knob will always function as an on/off switch. This parameter can only be accessed using Power Wave Manager software.</p>

## USER DEFINED PARAMETERS (CONT.)

Parameter	Definition
P.502	<p><b>Memory Change Lockout</b>  Determines if the memories can be overwritten with new contents.  <b>No</b> = Memories can be saved and limits can be configured (default).  <b>Yes</b> = Memories cannot be changed - saving is prohibited and limits cannot be re-configured.  This parameter can only be accessed using Power Wave Manager software.</p>
P.503	<p><b>Memory Button Disable</b>  Disables the specified memory button(s). When a memory is disabled, welding procedures cannot be restored from or saved to that memory. If an attempt is made to save or restore a disabled memory, a message will be displayed on the lower display indicating the memory number is disabled. In multi-head systems, this parameter disables the same memory buttons on both feed heads. This parameter can only be accessed using Power Wave Manager software.</p>
P.504	<p><b>Mode Select Panel Lock</b>  Selects between several Mode Select Panel lockout preferences. When a Mode Select Panel selection is locked and an attempt is made to change that parameter, a message will be displayed on the lower display indicating the parameter is locked.  <b>All MSP Options Unlocked</b> = All adjustable parameters on the Mode Select Panel are unlocked.  <b>All MSP Options Locked</b> = All knobs and buttons on the Mode Select Panel are locked.  <b>Start &amp; End Options Locked</b> = The Start and End parameters on the Mode Select Panel are locked, all others are unlocked.  <b>Weld Mode Option Locked</b> = The weld mode cannot be changed from the Mode Select Panel, all others Mode Select Panel settings are unlocked.  <b>Wave Control Options Locked</b> = The Wave Control parameters on the Mode Select Panel are locked, all others are unlocked.  <b>Start, End, Wave Options Locked</b> = The Start, End and Wave Control parameters on the Mode Select Panel are locked, all others are unlocked.  <b>Start, End, Mode Options Locked</b> = The Start, End and Weld Mode Select parameters on the Mode Select Panel are locked, all others are unlocked.  This parameter can only be accessed using Power Wave Manager software.</p>
P.505	<p><b>Setup Menu Lock</b>  Determines if the setup parameters can be modified by the operator without entering a passcode.  <b>No</b> = The operator can change any set menu parameter without first entering the passcode even if the passcode is non-zero (default).  <b>Yes</b> = The operator must enter the passcode (if the passcode is non-zero) in order to change any setup menu parameters.  This parameter can only be accessed using Power Wave Manager software.</p>

## USER DEFINED PARAMETERS (CONT.)

Parameter	Definition
<b>P.506</b>	<p><b>Set User Interface Passcode</b></p> <p>Prevents unauthorized changes to the equipment. The default passcode is zero which allows full access. A nonzero passcode will prevent unauthorized: changes to memory limits, saving to memory (if <b>P.502</b> = Yes), changes to setup parameters (if <b>P.505</b> = Yes). This parameter can only be accessed using Power Wave Manager software.</p>
<b>P.509</b>	<p><b>UI Master Lockout</b></p> <p>Locks all user interface controls, preventing the operator from making any changes. This parameter can only be accessed using Power Wave Manager software.</p>

### TOUCH SENSE

The Touch Sense option, when enabled, allows the operator to feed the wire forward until it touches the workpiece. When contact to the work is made, the wire will stop and the flux hopper (if used) will activate to put flux around the wire and fill the flux feed system. The flux hopper will stay active until the Feed Forward button is released.

#### **WARNING**

**If the Touch Sense is enabled the Power Source output is ON as long as the Feed Forward button is held. Avoid touching any portion of the weld circuit while feeding down.**

If the Touch Sense option is disabled, the wire is “cold” during the Feed Forward time. It will not stop when it touches the work and the flux hopper will not activate.

### LOCKOUT / SECURITY

The MAXsa™ 10 can be configured to prevent the operator from changing selected User Interface panel controls. By default, the welder will be able to change the weld mode, all relevant wave controls and all relevant start and end options.

Note that when an option is locked, its value can still be monitored. For example, if start and end options are locked, the welder can still press the right Mode Select Panel Pushbutton and see the value set for Start Time. If the welder attempts to change its value, a message will briefly appear on the Mode Select Panel indicating "MSP Option is LOCKED"

**The lockout features are only available through the use of Power Wave Manager.**

## MAKING A WELD

Once the necessary parameters have been set and the desired Weld Mode selected:

Press the **START BUTTON** to begin welding.

The **ARC ESTABLISHED INDICATOR** will 'flash' as the wire feeds towards the work piece to show that OCV is present and switch to **ON** when the arc is lit.

If "Start" parameters have been set they will be in effect for the specified time and then the Weld Mode parameters will take effect.

The two upper displays will indicate the "actual" parameters as the weld progresses.

If the TRAVEL function is selected it will begin moving as prescribed in the **P.12** Parameter setting.

Press the **STOP BUTTON** to end the weld.

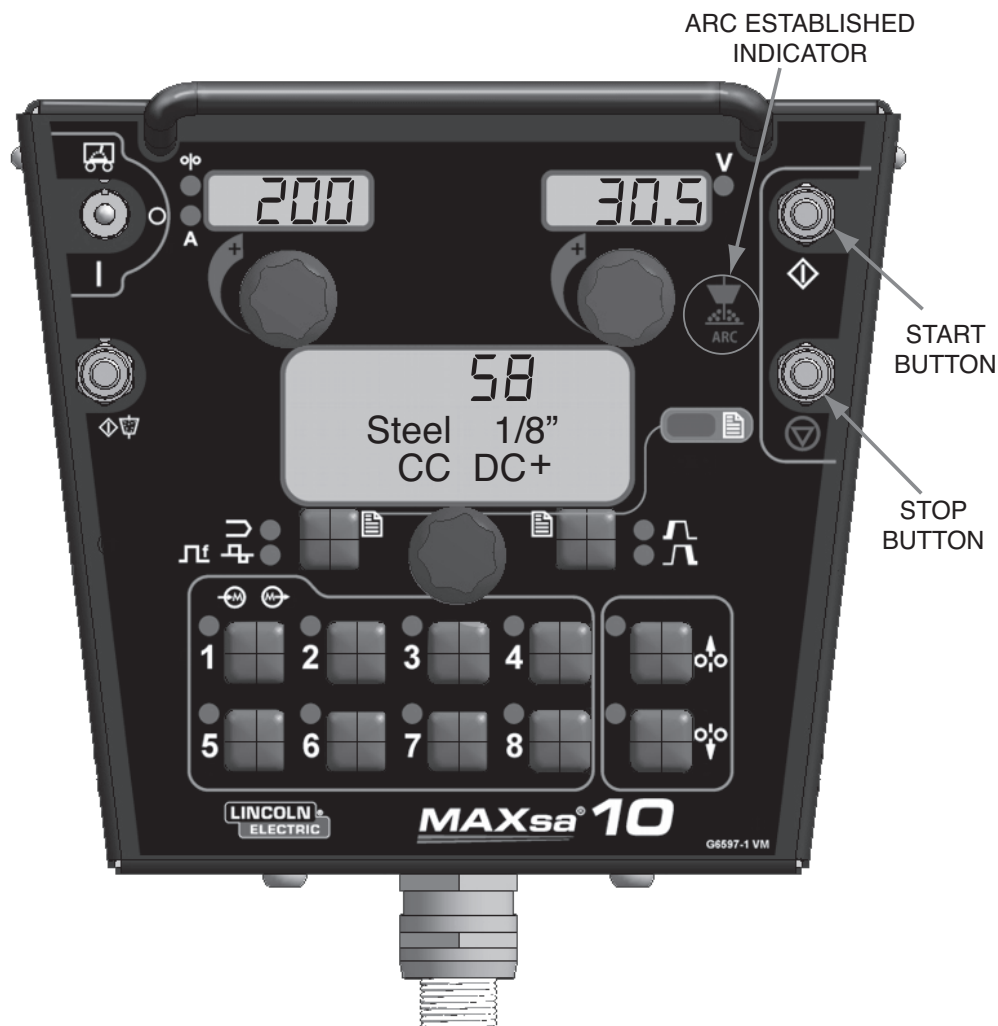
If "End" parameters have been set, they will take effect for the specified time.

If the TRAVEL function is selected it will stop moving as prescribed in the **P.12** Parameter setting.

The **ARC ESTABLISHED INDICATOR** will go OFF when the power source output is disabled (after Burnback).

The displays will return to the idle state in preparation for the next weld.

FIGURE B.7 - MAKING A WELD





## USING THE MEMORY OPTION

The MAXsa™ 10 has eight available memory locations for storing procedural information. Each location will store the following information:

- Weld Mode
- Amperage(or WFS)
- Voltage
- Frequency
- Balance
- DC Offset
- Arc Start options
- Arc End Options

### NAMING A SAVED PROCEDURE

Procedures stored in memory can be given a name that the user will easily recognize such as “Root Pass”, “Fill Pass” or “Cap Pass”. As with the Lockout Option, this option is only available through the use of Weld Manager.

### MULTI PROCEDURE WELDING

The MAXsa™ 10 CONTROLLER can do “On-The-Fly” welding changes with multiple weld procedures by using the Memory Panel. While welding, any Memory location can be accessed, and the parameters stored in that memory location will be switched in while actively welding.

**NOTE: This can only be done with Memory locations that have the same Weld Mode.**

While welding, any Memory location trying to be accessed with a different Weld Mode than the one currently being used will be ignored and an error message will be displayed. Up to eight different weld procedures can be used while actively welding by using all of the memory locations, as long as each location utilizes the same Weld Modes.

Memory saving can be optionally disabled using Lockout Levels. If the user attempts to save a procedure to memory location that is locked, the Mode Select Panel will briefly display "Memory Save is DISABLED!". Presently, Memory Panel Lockout Levels can only be accessed through Weld Manager.

## SAVING A PROCEDURE TO A MEMORY LOCATION

Once the parameters have been set:

- Press and Hold the **Memory Button** of the desired location for 2 seconds.
- The LED for that location will come ON.
- After 2 seconds the LED will go OFF
- The MSP display will show briefly that the information is saved, then return to the Weld Mode.

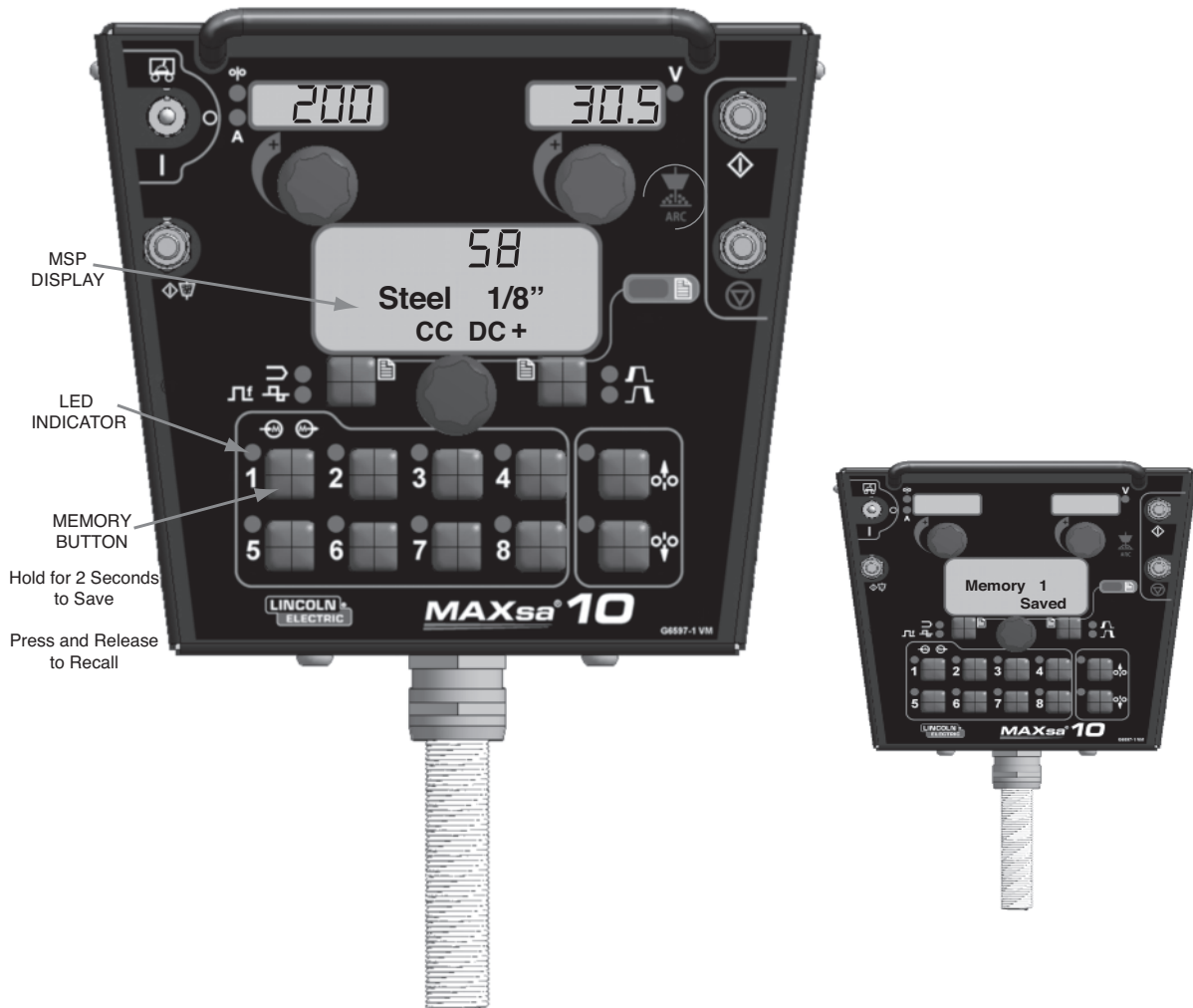
**NOTE: Holding the button for longer than 5 seconds will enter the Limits Mode.**

## RECALLING A PROCEDURE FROM A MEMORY LOCATION

- Press and release the desired **Memory Button**.
- The LED for that location will come ON and the stored procedure information will show in the displays.
- The LED will remain ON until another location is selected

**NOTE: Holding the button for longer than 1 second will re-enter the “Save” Mode.**

FIGURE B.8 - MEMORY



## OPTIONAL LIMIT SETUP

The Limits feature allows the operator to set minimum and maximum values for various parameters depending on the Weld Mode selected.

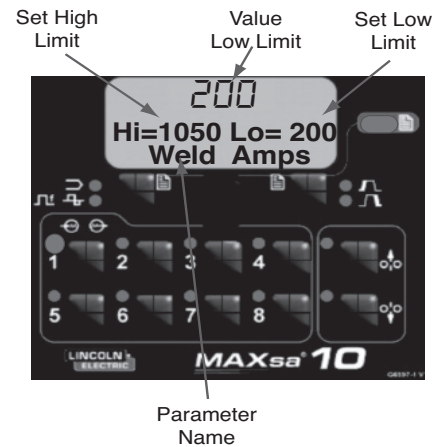
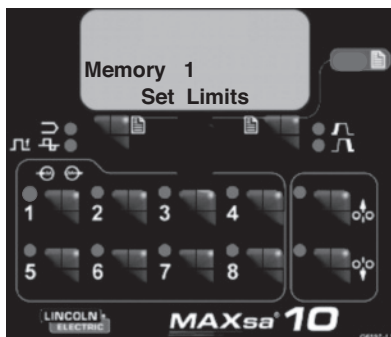
Each memory location may have a different set of limits, even if the Weld Mode is the same. For example: Memory Location 1 can be set for a maximum wire feed speed of 140"/min; Memory Location 2 may be set for a minimum of 100"/min and a maximum of 160"/min and Memory Location 3 may have no WFS limit set.

Parameters are constrained by the machine limitations or by memory limits. When the Memory Limits are enabled the parameter will flash if an attempt is made to set a value outside of the prescribed limit (if less than the machine capabilities). The parameter will not flash if an attempt is made to exceed the machine limits.

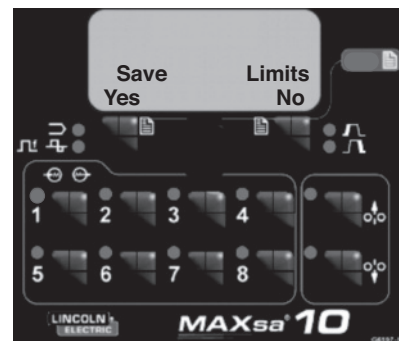
**NOTE:** Weld Modes cannot be selected through the Limits Setup Menu. They must be chosen and saved before entering the Limits Menu.

### SETTING LIMITS

1. Press and hold the desired **Memory Button** until the LED for that location begins to blink rapidly.
  - The MSP Display will read:
    - Memory Value
    - High Limit
    - Low Limit
    - Parameter Name



3. The Parameter Name on the MSP Display will flash to indicate it is ready to be changed. If no limits were previously set, the High and Low values are the limits of the Power Source
  - Press the **Arc Start/End Options** button to select that parameter.
  - Use the **Mode Select Panel Control** to adjust the High Limit (flashing).
  - Press the **Arc Start/End Options** button.
  - Use the **Mode Select Panel Control** to adjust the Value (flashing).
  - Press the **Arc Start/End Options** button.
  - Use the **Mode Select Panel Control** to adjust the Low Limit (flashing).
  - Press the **Arc Start/End Options** button.
  - Use the **Mode Select Panel Control** to select another Parameter Name (flashing) and repeat the above sequence until all Limits are set.
4. Press the selected Memory when all limits are set to desired values. The MSP Display will read:
  - Save Yes
  - Limits No



- Use the **Weld Mode Select** or the **Arc Start/End Options** button to either save (yes) or discard (no) the changes.



**OPTIONS AND ACCESSORIES** are available at  
[www.lincolnelectric.com](http://www.lincolnelectric.com)

**Follow these steps:**

1. Go to [www.lincolnelectric.com](http://www.lincolnelectric.com)
2. In the **Search** field type E9.181 and click on the **Search** icon (or hit 'Enter' on the keyboard).
3. On the Results page, scroll down to the **Equipment** list and click on E9.181.

All of the information for the Power Wave System accessories can be found in this document.

## SAFETY PRECAUTIONS

### WARNING

**ELECTRIC SHOCK can kill.**



- Do not touch electrically live parts such as output terminals or internal wiring.
- When inching, electrode and drive mechanism are “hot” to work and ground and could remain energized several seconds after the inch button is released.
- Turn OFF input power at welding power source before installation or changing drive roll and/or guide tubes.

- Welding power source must be connected to system ground per the National Electrical Code or any applicable local codes.
  - Only qualified personnel should perform maintenance work.
- 

See additional warning information throughout this operator’s manual and the Engine manual as well.

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## ROUTINE MAINTENANCE

- Check weld cables, control cables and gas hoses for cuts.

## PERIODIC MAINTENANCE

- N/A

## CALIBRATION SPECIFICATION

All calibration is factory set on the MAXsa™ 10 CONTROLLER.

## HOW TO USE TROUBLESHOOTING GUIDE

### WARNING

Service and Repair should only be performed by Lincoln Electric Factory Trained Personnel. Unauthorized repairs performed on this equipment may result in danger to the technician and machine operator and will invalidate your factory warranty. For your safety and to avoid Electrical Shock, please observe all safety notes and precautions detailed throughout this manual.

This Troubleshooting Guide is provided to help you locate and repair possible machine malfunctions. Simply follow the three-step procedure listed below.

#### **Step 1. LOCATE PROBLEM (SYMPTOM).**

Look under the column labeled "PROBLEM (SYMPTOMS)". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting.

#### **Step 2. POSSIBLE CAUSE.**

The second column labeled "POSSIBLE CAUSE" lists the obvious external possibilities that may contribute to the machine symptom.

#### **Step 3. RECOMMENDED COURSE OF ACTION**

This column provides a course of action for the Possible Cause, generally it states to contact your local Lincoln Authorized Field Service Facility.

If you do not understand or are unable to perform the Recommended Course of Action safely, contact your local Lincoln Authorized Field Service Facility.

### CAUTION

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

## USING THE STATUS LED TO TROUBLESHOOT SYSTEM PROBLEMS

The MAXsa 10 is equipped with a Status Light. If a problem occurs it is important to note the condition of the status lights. **Therefore, prior to cycling power to the system, check the power source status light for error sequences as noted below.**

Included in this section is information about the power source and Wire Drive Module Status LED's, and some basic troubleshooting charts for both machine and weld performance.

The STATUS LIGHTS are dual-color LED's that indicate system errors. Normal operation for each is steady green. Error conditions are indicated in the following Table E.1.

TABLE E.1

Light Condition	Meaning
Steady Green	System OK. Power source is operational, and is communicating normally with all healthy peripheral equipment connected to its ArcLink network.
Blinking Green	Occurs during power up or a system reset, and indicates the POWER WAVE® i400 is mapping (identifying) each component in the system. Normal for first 1-10 seconds after power is turned on, or if the system configuration is changed during operation.
Fast Blinking Green	Under normal conditions indicates Auto-mapping has failed. Also used by the Diagnostics Utility (included on the POWER WAVE® Utilities and Service Navigator CD's or available at <a href="http://www.powerwavesoftware.com">www.powerwavesoftware.com</a> ) to identify the selected machine when connecting to a specific IP address.
Alternating Green and Red	<p>Non-recoverable system fault. If the Status lights are flashing any combination of red and green, errors are present. <b>Read the error code(s) before the machine is turned off.</b></p> <p>Error Code interpretation through the Status light is detailed in the Service Manual. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. Only active error conditions will be accessible through the Status Light.</p> <p>Error codes can also be retrieved with the Diagnostics Utility (included on the POWER WAVE® Utilities and Service Navigator CD's or available at <a href="http://www.powerwavesoftware.com">www.powerwavesoftware.com</a>). This is the preferred method, since it can access historical information contained in the error log.</p> <p>To clear the active error(s), turn power source off, and back on to reset.</p>
Steady Red	Not applicable.
Blinking Red	Not applicable.

 **CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.



Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)		POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
<b>ARCLINK SYSTEM ERROR CODES</b>			
Err 31	Primary overcurrent	1. The power source has exceeded input current limits. Adjust the welding procedure to reduce the current draw. The welding procedure may exceed the capacity of the power source.  2. See the power source Instruction Manual.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
Err 32	Capacitor bank "A" under voltage.	1. The power source input power may be wired incorrectly. Verify the power source reconnect panel wiring matches the input power.  2. See the power source Instruction Manual.	
Err 33	Capacitor bank "B" under voltage.	1. The power source input power may be wired incorrectly. Verify the power source reconnect panel wiring matches the input power.  2. See the power source Instruction Manual.	
Err 34	Capacitor bank "A" overvoltage.	1. The power source input power may be wired incorrectly. Verify the power source reconnect panel wiring matches the input power.  2. See the power source Instruction Manual.	

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

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PROBLEMS (SYMPTOMS)		POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
<b>ARCLINK SYSTEM ERROR CODES</b>			
Err 35	Capacitor bank "B" overvoltage.	<ol style="list-style-type: none"> <li>1. The power source input power may be wired incorrectly. Verify the power source reconnect panel wiring matches the input power.</li> <li>2. See the power source Instruction Manual.</li> </ol>	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.</p>
Err 36	Thermal	<ol style="list-style-type: none"> <li>1. Power source overheating. Verify duty cycle is correct. Ensure adequate airflow around power source.</li> </ol>	
Err 41	Long term secondary over-current.	<ol style="list-style-type: none"> <li>1. The power source has exceeded the output current limits. Adjust the welding procedure to reduce the current draw. The welding procedure may exceed the capacity of the power source.</li> <li>2. See the power source Instruction Manual.</li> </ol>	
Err 43	Capacitors are out of balance	<ol style="list-style-type: none"> <li>1. Verify the power source reconnect panel wiring matches the input power.</li> <li>2. See the power source Instruction Manual.</li> </ol>	

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
<b>ARCLINK SYSTEM ERROR CODES</b>		
Err 44 Main CPU problem.	<ol style="list-style-type: none"> <li>1. Verify the earth ground connection to the power source is wired correctly.</li> <li>2. See the power source Instruction Manual.</li> </ol>	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.</p>
Err 53 Voltage sense loss.	<ol style="list-style-type: none"> <li>1. Verify correct sense lead connection.</li> </ol>	
Err 54 Short term secondary over-current.		
Err 81 Motor overload, long term.	<ol style="list-style-type: none"> <li>1. The wire drive motor has overheated. Check that the electrode slides easily through the gun and cable.</li> <li>2. Remove tight bends from the gun and cable.</li> <li>3. Check that the spindle brake is not too tight.</li> <li>4. Verify a high quality electrode is being used.</li> <li>5. Wait for the error to reset and the motor to cool (approximately 1 minute).</li> <li>6. Long term average motor current limit has been exceeded. Typically indicates mechanical overload of system. If problem continues consider higher torque gear ratio (lower speed range).</li> </ol>	
Err 82 Motor overload, short term.	<ol style="list-style-type: none"> <li>1. The wire drive motor current draw has exceeded limits, usually because the motor is in a locked rotor state. Check that motor can turn freely when idle arm is open.</li> <li>2. Verify that the gears are free of debris and dirt.</li> </ol>	

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
<b>ARCLINK SYSTEM ERROR CODES</b>		
Err 263 No usable weld modes.	1. The power source does not have any welding programs loaded.  2. See the power source Instruction Manual for load welding programs.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.

Below are errors implemented for the MAXsa™ 10.

Error Code	Source	UI Text	Reason
N/A	User Interface	" Limits Exceed " "Gear Box Type"	When a mode is selected with a work point low limit greater than the high WFS limit. (no event is logged)
28	Feeder	"OUTPUT DISABLED"	The shutdown 2 input on the Feeder Board is open and P.21 is selected for "Output Disable"
83	Feeder	" UI Shutdown 1 "	The shutdown 1 input on the Feeder Board is open.
84	Feeder	" UI Shutdown 2 "	The shutdown 2 input on the Feeder Board is open.

Typical User Interface 3 digit error codes (not blinked on the status LED).

Error Code	Source	UI Text	Reason
213	User Interface	Power Source is Off-Line	User Interface could not communicate with control board in power source.
215		Feeder Board is Off-Line	Either no feed head board is connected, being reprogrammed or experiencing a fatal event.
247		N/A	Arc control has a latched fault. The UI will indicate a Reset button needs to be pressed to clear the fault.
274		N/A	Weld set change required clearing of user memory.
275		N/A	UI memory could not be saved. Contact Lincoln Electric Service Department for further support.
276		N/A	UI memory could not be restored. Contact Lincoln Electric Service Department for further support.
277		N/A	UI memories were converted due to change in number of UI parameters. Info only.
278		N/A	UI limits were converted due to change in number of UI parameters with limits. Info only.
281		(Varies based on the error type and who caused the error)	Internal Error. Collect all displayed values and contact Lincoln Electric Service Department.
282		(Varies based on the error type and who caused the error)	Internal Error. Collect all displayed values and contact Lincoln Electric Service Department.

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

Typical User Interface 3 digit error codes (not blinked on the status LED).

Error Code	Source	UI Text	Reason
283	User Interface	(Varies based on the error type and who caused the error)	Internal Error. Collect all displayed values and contact Lincoln Electric Service Department.
285		N/A	UI memory could not be restored. Contact Lincoln Electric Service Department for further support.
612		{ " Phase Gen Init " }, { " Duplicate Arc # " }, { " Mult Lead Arcs " }, { " Missing an Arc " }, { " Too Many Arcs " }, { " Missing Lead Arc " }, { " Missing an Arc " }	1 = Initializing Phase Generator 2 = Duplicate Arc #'s found 3 = Mult Lead Arcs found 4 = Missing a Trail Arc 5 = Too Many Arcs 6 = Missing Lead Arc 7 = Trail Arc dropped communication with Lead Arc

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
The feeder does not power up - no display, no feed.	<ol style="list-style-type: none"> <li>1. The Power Wave power source is OFF. Turn ON the Power Wave source.</li> <li>2. The circuit breaker for the wire feeder on power source has tripped. Reset the circuit breakers.</li> <li>3. The control cable may be loose or damaged. Tighten, repair or replace the control cable.</li> <li>4. The power switch is damaged. Replace the power switch.</li> </ol>	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.

Observe all Safety Guidelines detailed throughout this manual

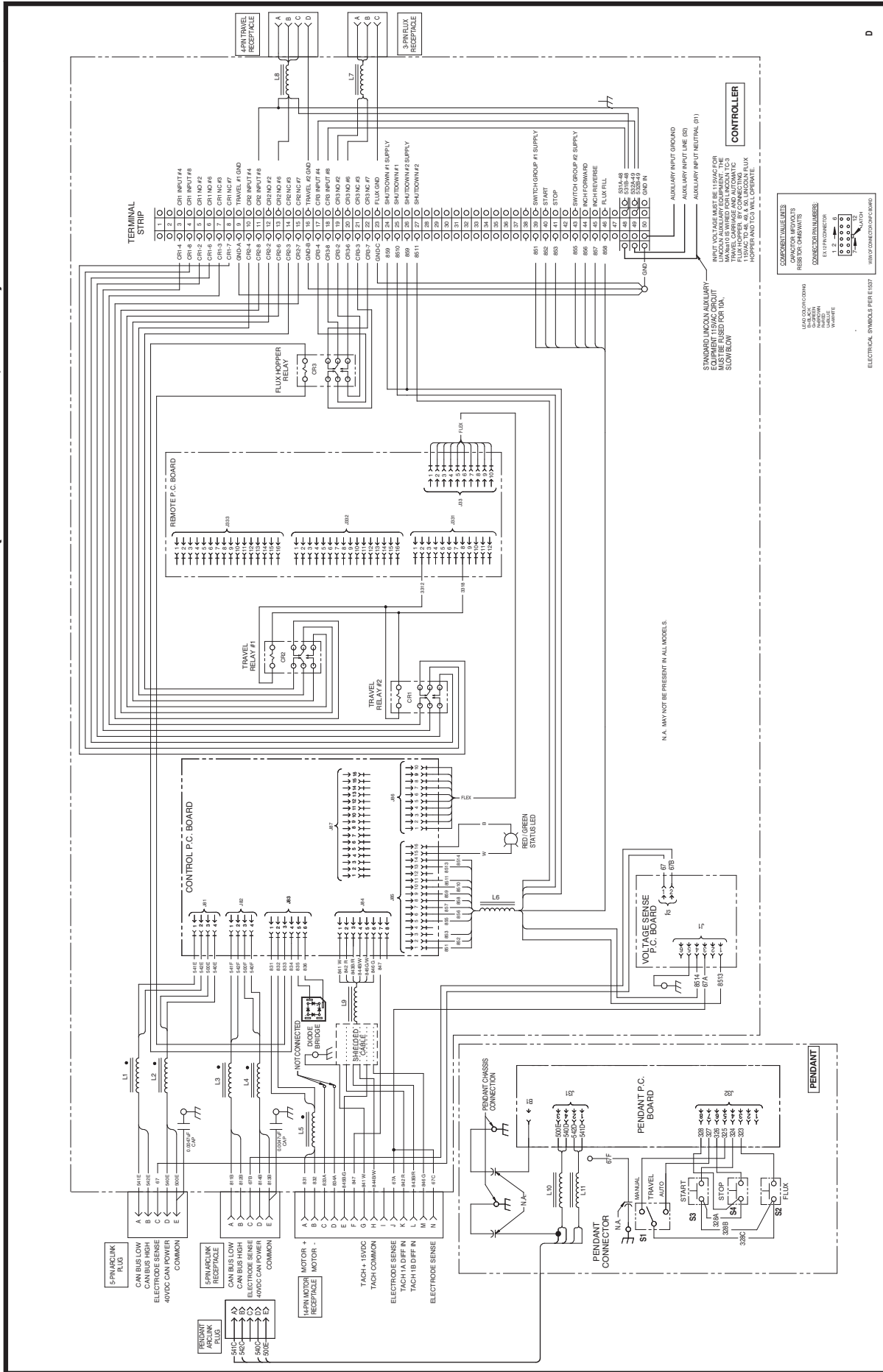
PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
<b>OUTPUT PROBLEMS</b>		
<p>Inconsistent wire feeding or wire not feeding but drive rolls turning.</p>	<ol style="list-style-type: none"> <li>1. The electrode is rusty or dirty. Use only clean electrode. Use quality electrode, like L-50 or L-56 from Lincoln Electric.</li> <li>2. The contact tip is partially melted or has spatter. Replace the contact tip.</li> <li>3. Improper tip, drive rolls and/or inner wire guide. Verify the proper parts are installed.</li> <li>4. Incorrect tension arm pressure on the drive rolls. Adjust the tension arm per the Instruction Manual. Most electrodes feed well at a tension arm setting of "3".</li> <li>5. Worn drive roll. Replace the drive rolls if worn or filled with dirt.</li> </ol>	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.</p>
<p>Wire feed speed consistently operates at the wrong value.</p> <p>Variable or "hunting" arc.</p>	<ol style="list-style-type: none"> <li>1. The wire feeder gear setting is not properly set. Verify that the software setting matches the gear mounted. See the Instruction Manual for setting the gear ratio.</li> <li>1. Wrong size, worn and/or melted contact tip. Replace the contact tip.</li> <li>2. Worn work cable or poor work connection. Verify all work and electrode connections are tight and that the cables are in good condition. Clean/replace as necessary.</li> <li>3. Wrong polarity. Adjust polarity to the recommended procedure. Verify DIP switch #7 setting matches the electrode polarity.</li> </ol>	

**⚠ CAUTION**

If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your **Local Lincoln Authorized Field Service Facility** for technical troubleshooting assistance before you proceed.



MAXsa 10 CONTROLLER WIRING DIAGRAM (CODES 11590, 11777)

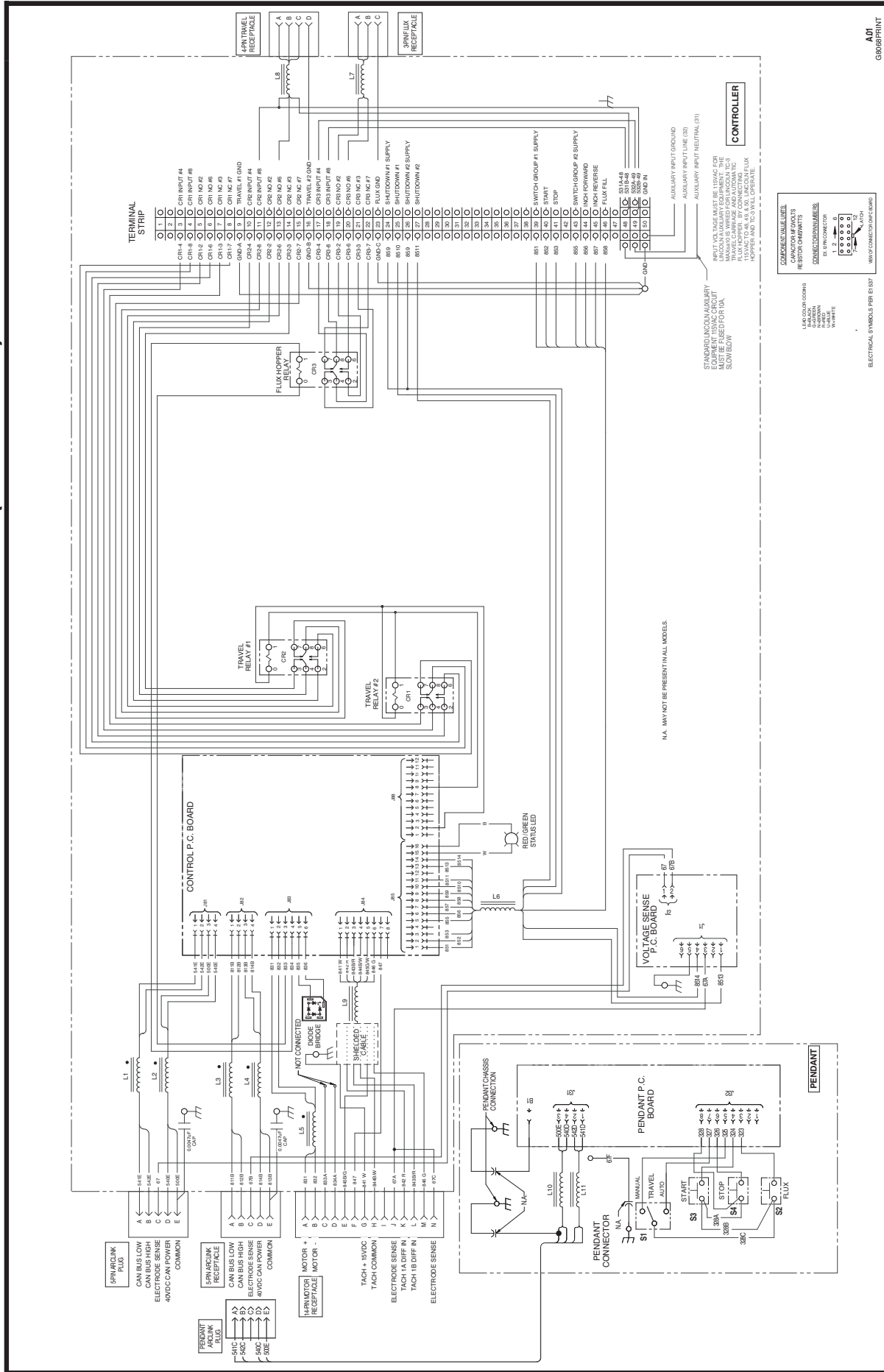


**G5118**

NOTE: This diagram is for reference only. It may not be 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 equipment code number.



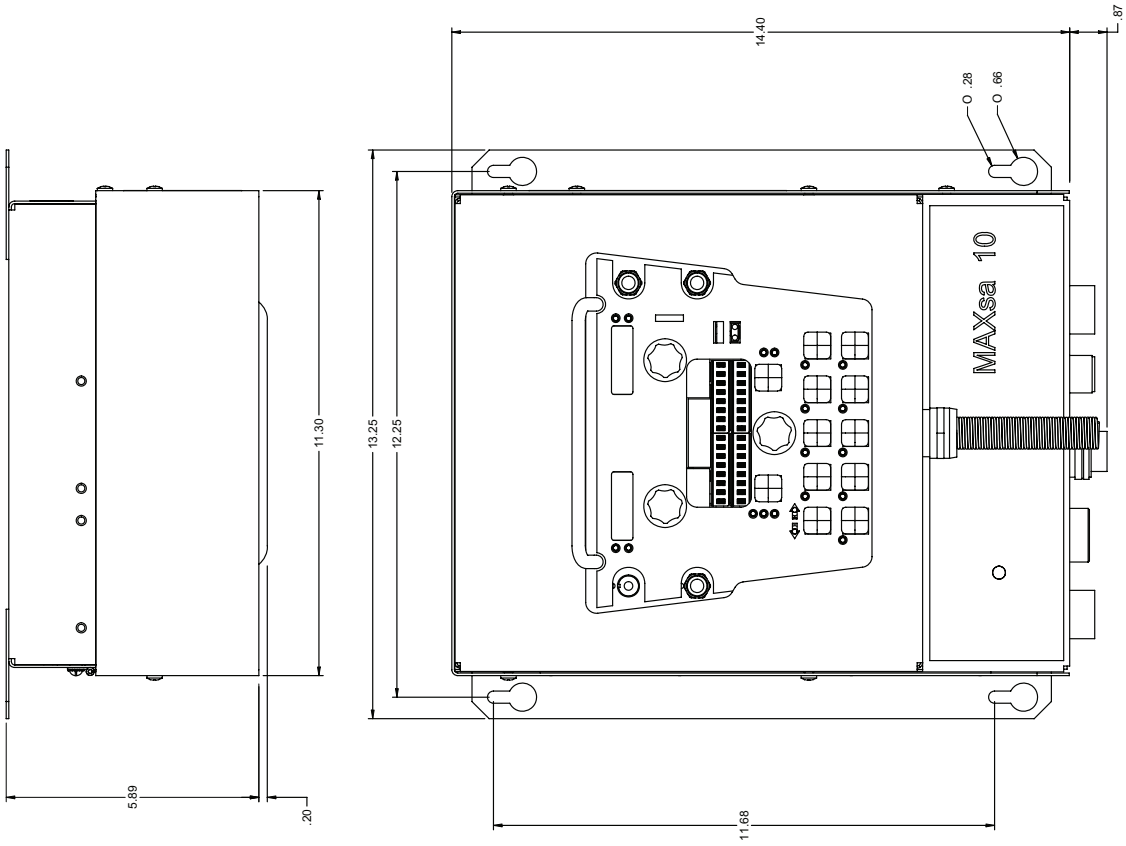
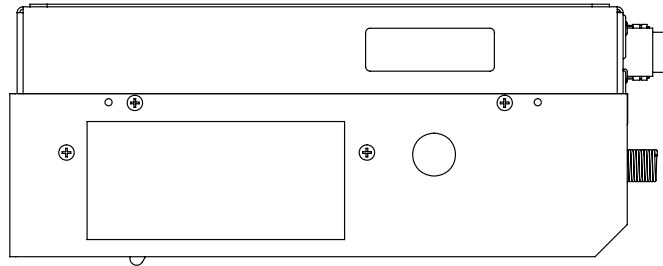
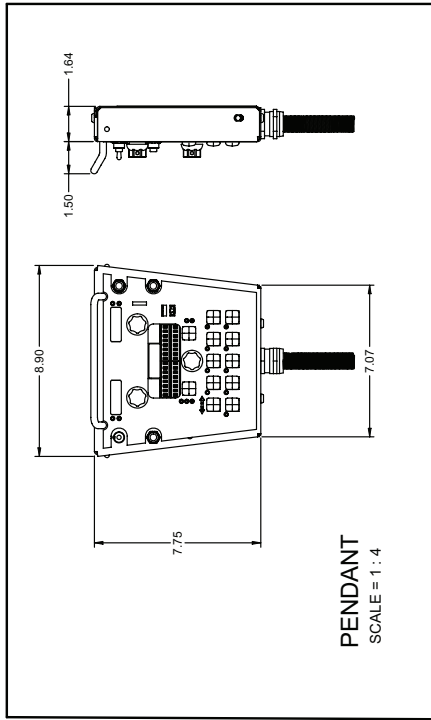
MAXsa 10 CONTROLLER WIRING DIAGRAM (CODE #12327)



**G8068**

**NOTE:** This diagram is for reference only. It may not be 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 equipment code number.

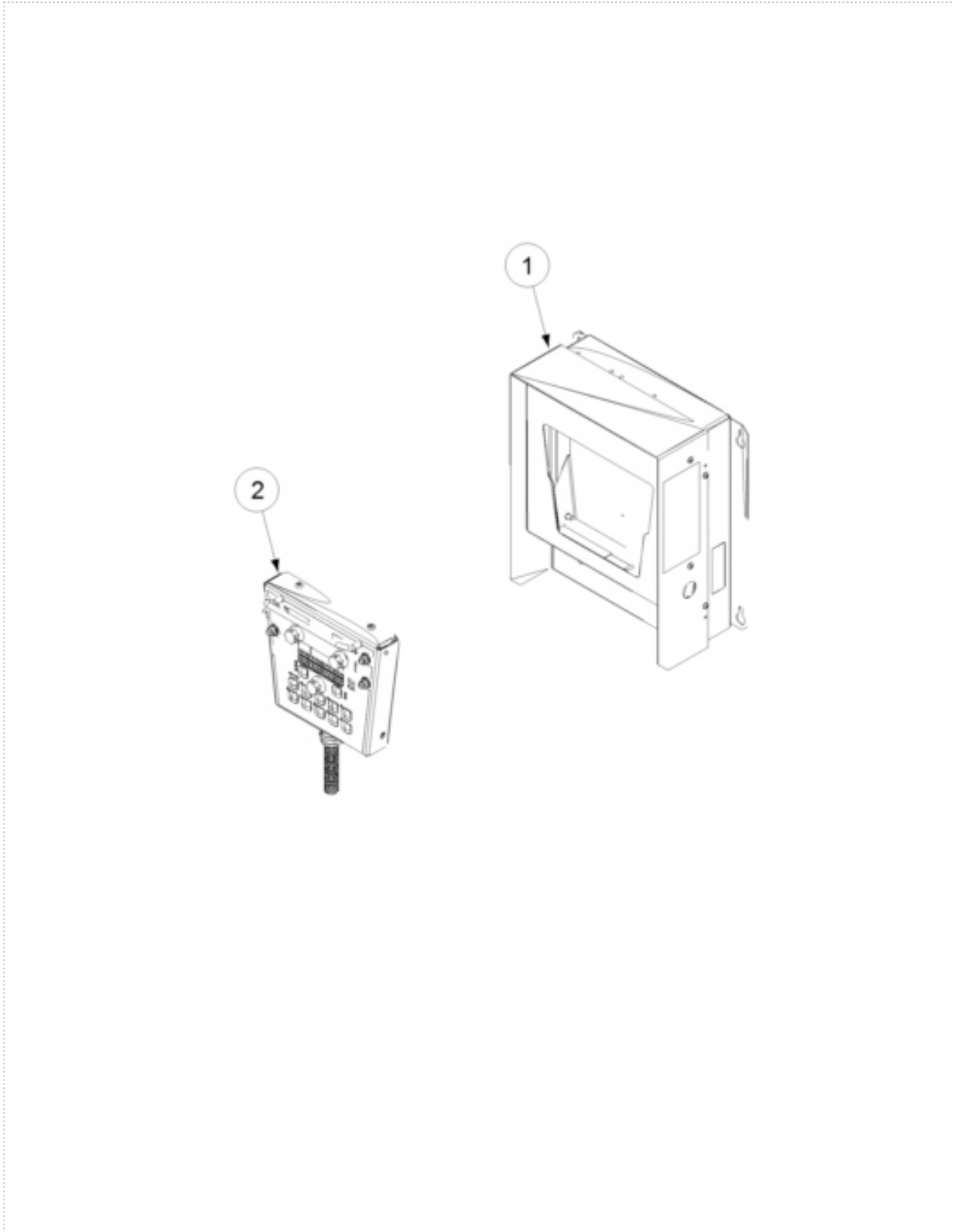
L13444



## Index of Sub Assemblies - 12327

KEY	PART NUMBER	DESCRIPTION	QTY
	P-616-A	Index of Sub Assemblies	AR
1	P-616-C	Control Box Assembly	AR
2	P-616-D	Pendant Assembly	AR

## Index of Sub Assemblies - 12327



P-616-A.jpg

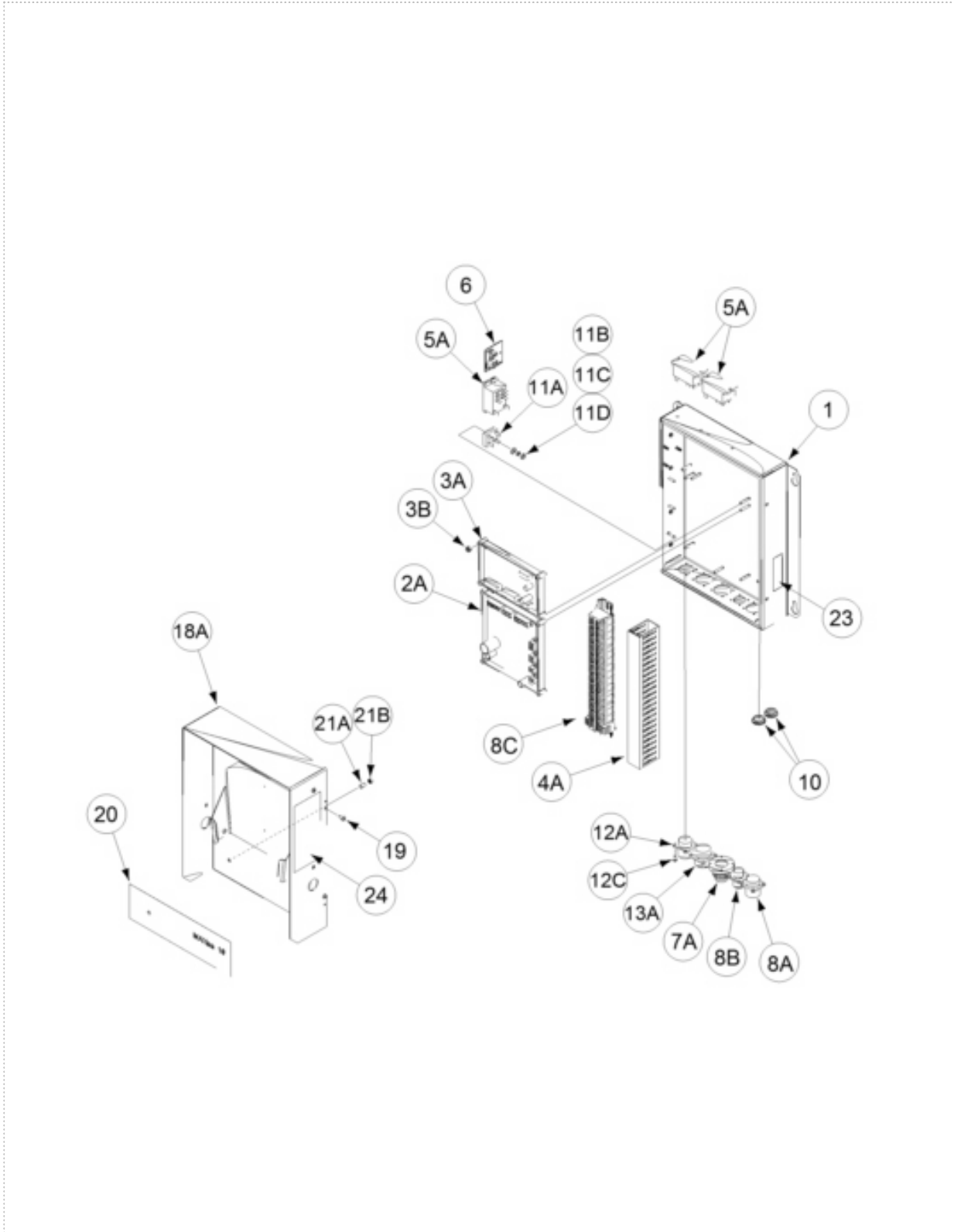
## Control Box Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SG8067	Control Box Assembly	1
1	9SL15041	CONTROL BOX WELDED ASBLY	1
2A	9SS30221-2	FEEDHEAD PC BD ASBLY	1
	9ST9187-13	#10-24HLN-1817/1-NYLON INSERT	4
4A	9SS25825	WIRE DUCT	1
	9ST9187-13	#10-24HLN-1817/1-NYLON INSERT	2
5A	9SS15122-14	RELAY	3
	9ST9187-13	#10-24HLN-1817/1-NYLON INSERT	6
6	9SM19540-3	VOLTAGE SENSE SELECT PC BD ASBLY	1
7A	9SS23766	CONNECTOR ASBLY	1
	9ST10082-27	SEMS SCREW	4
	9SG6509	HARNESS ASBLY	1
8A	9SS12021-11	CONNECTOR	1
8B	9SS12021-64	BOX RECEPTACLE SOLID SHELL	1
8C	9SM20350	TERMINAL STRIP	1
	9ST9187-13	#10-24HLN-1817/1-NYLON INSERT	2
	9SCF000010	#10-24HN	4
	9SS8025-96	SELF TAPPING SCREW	12
10	9ST10397-4	PLUG BUTTON	2
11A	9ST13637-6	DIODE-BRIDGE35A400VF-W1-PH	1
11B	9SS9262-27	PLAIN WASHER	1
11C	9SS9262-27	PLAIN WASHER	1
11D	9SCF000010	#10-24HN	1
12A	9SS12021-73	BOX RECEPTACLE SOLID SHELL	1
	9SS24019-6	CONNECTORLOCKING POSTFOR 6-CAVITY	1
12C	9SS8025-96	SELF TAPPING SCREW	4
13A	9SS12021-72	BOX RECEPTACLE SOLID SHELL	1
	9SS8025-96	SELF TAPPING SCREW	4
	9SS24019-6	CONNECTORLOCKING POSTFOR 6-CAVITY	1
18A	9SL12778	COVER WELDED ASBLY	1
	9ST10082-27	SEMS SCREW	4
19	9SS9225-87	THREAD FORMING SCREW	2
20	9SL13399-1	NAMEPLATE	1
21A	9SS23093-1	LED LENS CLEAR	1

## Control Box Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
21B	9SS23094-1	RETAINING O RING	1
23	9SS23760-5	I.D. DECAL	1
24	9SS25836	DECAL	1
25	9SG5118	Wiring Diagram	1

# Control Box Assembly



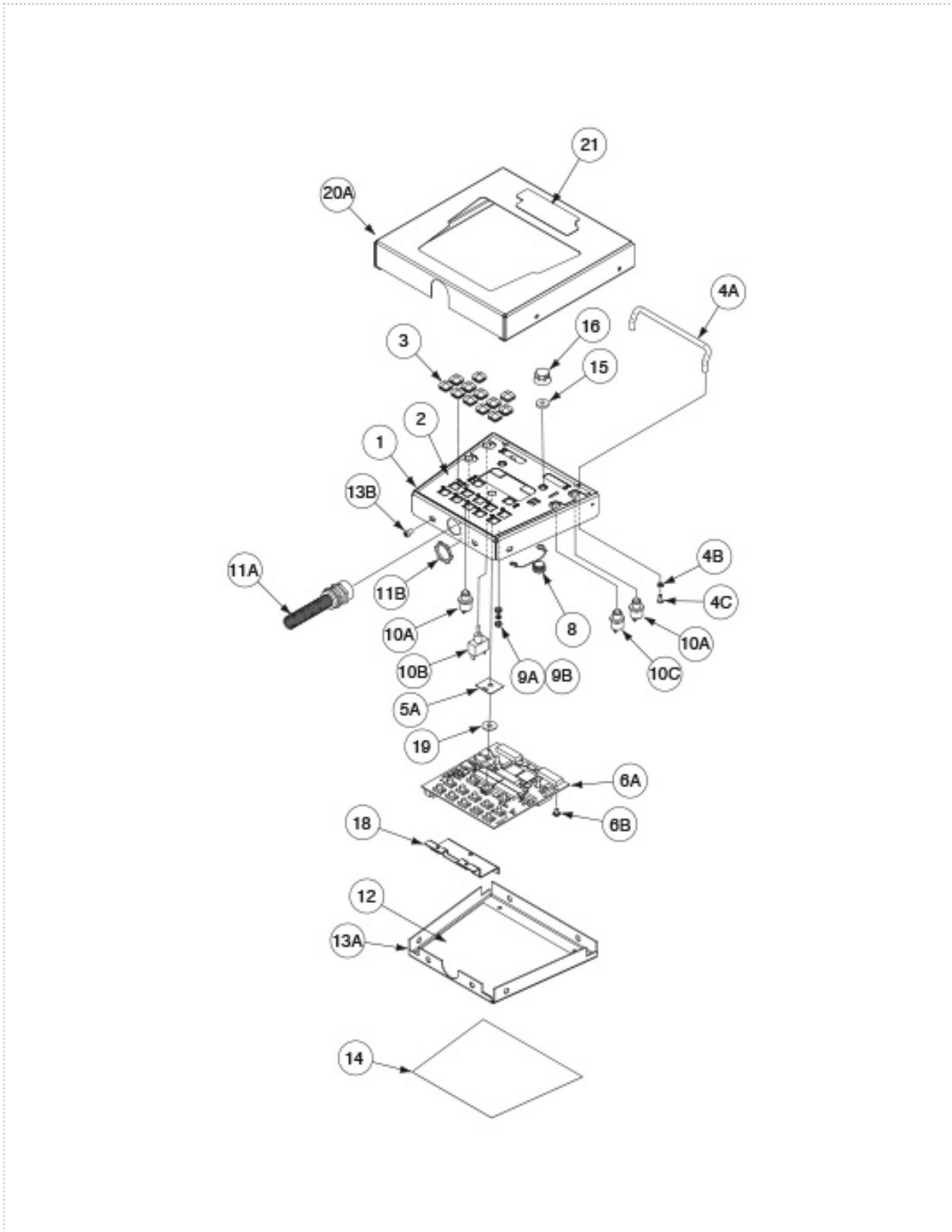
P-616-C.jpg

## Pendant Assembly

KEY	PART NUMBER	DESCRIPTION	QTY
	9SG6474-1	PENDANT ASBLY	1
1	9SG5756-3	CASE FRONT	1
2	9SG6597	PENDANT NAMEPLATE	1
3	9SS23055-1	BUTTON COVER	10
4A	9SS27045	HANDLE	1
4B	9SE106A-1	LOCKWASHER	2
4C	9SCF000113	#10-32X.375RHS	2
6A	9SS28734-7	USER INTERFACE PC BD	1
6B	9ST10082-12	SEMS SCREW	4
9A	9SCF000010	#10-24HN	2
9B	9SE106A-1	LOCKWASHER	1
	9SL13363	PENDANT HARNESS	1
10A	9SS26807	PUSH BUTTON SWITCH	2
10B	9ST10800-23	SWITCH-TOGGLE	1
10C	9ST14200	SWITCH	1
	9SS22061-6	SEALING BOOT	3
11A	9SM21459-2	CABLE CONNECTOR ASSEMBLY	1
11B	9ST14370-2	CONDUIT LOCKNUT	1
12	9SG6597	PENDANT NAMEPLATE	1
13A	9SL13016-2	PENDANT CASE BACK	1
13B	9SS25930-7	TORX BUTTON HEAD SCREW 1/4-20X.375	4
14	9SG6597	PENDANT NAMEPLATE	1
15	9ST14034-4	SHAFT SEAL	2
16	9ST13639-3	KNOB	3
18	9SS28744	SHIELD	1
19	9SS28745	CONDUCTIVE FOAM WASHER	1
20A	9SG5288-1	PENDANT COVER	1
20B	9SS9225-87	THREAD FORMING SCREW	4
21	9SS11893-13	LOGO DECAL	1



# Pendant Assembly



P-616-D.jpg

			
<b>WARNING</b>	<ul style="list-style-type: none"> <li>● Do not touch electrically live parts or electrode with skin or wet clothing.</li> <li>● Insulate yourself from work and ground.</li> </ul>	<ul style="list-style-type: none"> <li>● Keep flammable materials away.</li> </ul>	<ul style="list-style-type: none"> <li>● Wear eye, ear and body protection.</li> </ul>
Spanish <b>AVISO DE PRECAUCION</b>	<ul style="list-style-type: none"> <li>● No toque las partes o los electrodos bajo carga con la piel o ropa mojada.</li> <li>● Aíslese del trabajo y de la tierra.</li> </ul>	<ul style="list-style-type: none"> <li>● Mantenga el material combustible fuera del área de trabajo.</li> </ul>	<ul style="list-style-type: none"> <li>● Protéjase los ojos, los oídos y el cuerpo.</li> </ul>
French <b>ATTENTION</b>	<ul style="list-style-type: none"> <li>● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension.</li> <li>● Isolez-vous du travail et de la terre.</li> </ul>	<ul style="list-style-type: none"> <li>● Gardez à l'écart de tout matériel inflammable.</li> </ul>	<ul style="list-style-type: none"> <li>● Protégez vos yeux, vos oreilles et votre corps.</li> </ul>
German <b>WARNUNG</b>	<ul style="list-style-type: none"> <li>● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung!</li> <li>● Isolieren Sie sich von den Elektroden und dem Erdboden!</li> </ul>	<ul style="list-style-type: none"> <li>● Entfernen Sie brennbares Material!</li> </ul>	<ul style="list-style-type: none"> <li>● Tragen Sie Augen-, Ohren- und Körperschutz!</li> </ul>
Portuguese <b>ATENÇÃO</b>	<ul style="list-style-type: none"> <li>● Não toque partes elétricas e electrodos com a pele ou roupa molhada.</li> <li>● Isole-se da peça e terra.</li> </ul>	<ul style="list-style-type: none"> <li>● Mantenha inflamáveis bem guardados.</li> </ul>	<ul style="list-style-type: none"> <li>● Use proteção para a vista, ouvido e corpo.</li> </ul>
Japanese <b>注意事項</b>	<ul style="list-style-type: none"> <li>● 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。</li> <li>● 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。</li> </ul>	<ul style="list-style-type: none"> <li>● 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。</li> </ul>	<ul style="list-style-type: none"> <li>● 目、耳及び身体に保護具をして下さい。</li> </ul>
Chinese <b>警告</b>	<ul style="list-style-type: none"> <li>● 皮膚或濕衣物切勿接觸帶電部件及鎢條。</li> <li>● 使你自己與地面和工件絕緣。</li> </ul>	<ul style="list-style-type: none"> <li>● 把一切易燃物品移離工作場所。</li> </ul>	<ul style="list-style-type: none"> <li>● 佩戴眼、耳及身體勞動保護用具。</li> </ul>
Korean <b>위험</b>	<ul style="list-style-type: none"> <li>● 전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오.</li> <li>● 모재와 접지를 접촉치 마십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 인화성 물질을 접근시키지 마십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 눈, 귀와 몸에 보호장구를 착용하십시오.</li> </ul>
Arabic <b>تحذير</b>	<ul style="list-style-type: none"> <li>● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجسدك أو بالملابس المبللة بالماء.</li> <li>● ضع عازلا على جسمك خلال العمل.</li> </ul>	<ul style="list-style-type: none"> <li>● ضع المواد القابلة للاشتعال في مكان بعيد.</li> </ul>	<ul style="list-style-type: none"> <li>● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.</li> </ul>

**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.**

			
<ul style="list-style-type: none"> <li>● Keep your head out of fumes.</li> <li>● Use ventilation or exhaust to remove fumes from breathing zone.</li> </ul>	<ul style="list-style-type: none"> <li>● Turn power off before servicing.</li> </ul>	<ul style="list-style-type: none"> <li>● Do not operate with panel open or guards off.</li> </ul>	<b>WARNING</b>
<ul style="list-style-type: none"> <li>● Los humos fuera de la zona de respiración.</li> <li>● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.</li> </ul>	<ul style="list-style-type: none"> <li>● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.</li> </ul>	<ul style="list-style-type: none"> <li>● No operar con panel abierto o guardas quitadas.</li> </ul>	Spanish <b>AVISO DE PRECAUCION</b>
<ul style="list-style-type: none"> <li>● Gardez la tête à l'écart des fumées.</li> <li>● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.</li> </ul>	<ul style="list-style-type: none"> <li>● Débranchez le courant avant l'entretien.</li> </ul>	<ul style="list-style-type: none"> <li>● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.</li> </ul>	French <b>ATTENTION</b>
<ul style="list-style-type: none"> <li>● Vermeiden Sie das Einatmen von Schweißrauch!</li> <li>● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!</li> </ul>	<ul style="list-style-type: none"> <li>● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)</li> </ul>	<ul style="list-style-type: none"> <li>● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!</li> </ul>	German <b>WARNUNG</b>
<ul style="list-style-type: none"> <li>● Mantenha seu rosto da fumaça.</li> <li>● Use ventilação e exaustão para remover fumo da zona respiratória.</li> </ul>	<ul style="list-style-type: none"> <li>● Não opere com as tampas removidas.</li> <li>● Desligue a corrente antes de fazer serviço.</li> <li>● Não toque as partes elétricas nuas.</li> </ul>	<ul style="list-style-type: none"> <li>● Mantenha-se afastado das partes moventes.</li> <li>● Não opere com os painéis abertos ou guardas removidas.</li> </ul>	Portuguese <b>ATENÇÃO</b>
<ul style="list-style-type: none"> <li>● ヒュームから頭を離すようにして下さい。</li> <li>● 換気や排煙に十分留意して下さい。</li> </ul>	<ul style="list-style-type: none"> <li>● 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して下さい。</li> </ul>	<ul style="list-style-type: none"> <li>● 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。</li> </ul>	Japanese <b>注意事項</b>
<ul style="list-style-type: none"> <li>● 頭部遠離煙霧。</li> <li>● 在呼吸區使用通風或排風器除煙。</li> </ul>	<ul style="list-style-type: none"> <li>● 維修前切斷電源。</li> </ul>	<ul style="list-style-type: none"> <li>● 儀表板打開或沒有安全罩時不準作業。</li> </ul>	Chinese <b>警告</b>
<ul style="list-style-type: none"> <li>● 얼굴로부터 용접가스를 멀리하십시오.</li> <li>● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 보수전에 전원을 차단하십시오.</li> </ul>	<ul style="list-style-type: none"> <li>● 판넬이 열린 상태로 작동치 마십시오.</li> </ul>	Korean <b>위험</b>
<ul style="list-style-type: none"> <li>● ابعد رأسك بعيداً عن الدخان.</li> <li>● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.</li> </ul>	<ul style="list-style-type: none"> <li>● أقطع التيار الكهربائي قبل القيام بأية صيانة.</li> </ul>	<ul style="list-style-type: none"> <li>● لا تشغيل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.</li> </ul>	Arabic <b>تحذير</b>

**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說明以及應該使用的銀焊材料，並請遵守貴方的有關勞動保護規定。

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.

## **CUSTOMER ASSISTANCE POLICY**

The business of The Lincoln Electric Company is manufacturing and selling high quality welding equipment, consumables, and cutting equipment. Our challenge is to meet the needs of our customers and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for advice or information about their use of our products. We respond to our customers based on the best information in our possession at that time. Lincoln Electric is not in a position to warrant or guarantee such advice, and assumes no liability, with respect to such information or advice. We expressly disclaim any warranty of any kind, including any warranty of fitness for any customer's particular purpose, with respect to such information or advice. As a matter of practical consideration, we also cannot assume any responsibility for updating or correcting any such information or advice once it has been given, nor does the provision of information or advice create, expand or alter any warranty with respect to the sale of our products.

Lincoln Electric is a responsive manufacturer, but the selection and use of specific products sold by Lincoln Electric is solely within the control of, and remains the sole responsibility of the customer. Many variables beyond the control of Lincoln Electric affect the results obtained in applying these types of fabrication methods and service requirements.

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to [www.lincolnelectric.com](http://www.lincolnelectric.com) for any updated information.



**THE LINCOLN ELECTRIC COMPANY**

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