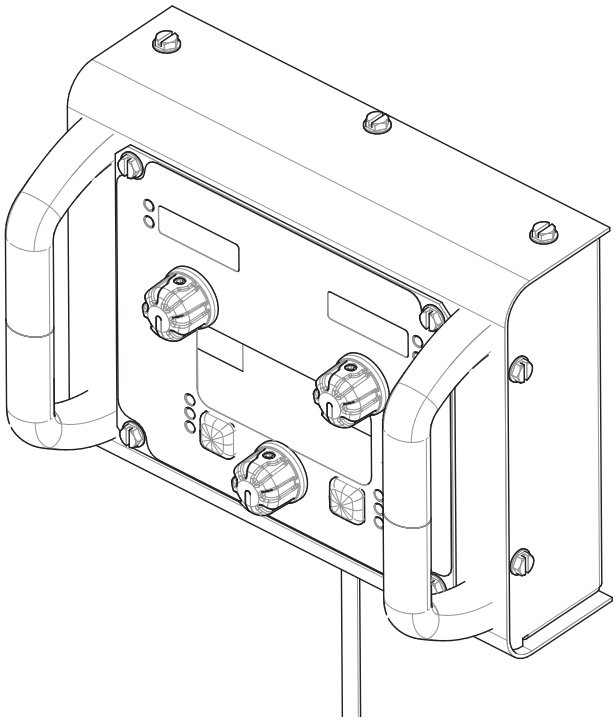
Operator's Manual

Power Feed® Pendant



For use with machines having Code Numbers:
12396

GENUINE LINCOLN PARTS™

Register your machine:
www.lincolnelectric.com/register

Authorized Service and Distributor Locator:
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Save for future reference

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Code: (ex: 10859)

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IM10371 | Issue Date Oct-16

THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue • Cleveland, OH • 44117-1199 • U.S.A.
Phone: +1.216.481.8100 • www.lincolnelectric.com

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.P65 warnings.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

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. I 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.

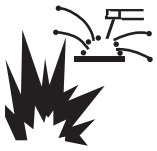
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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-I, "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.

GENERAL DESCRIPTION

General Physical Description

The POWER FEED PENDANT is a user interface and a feeder controller for use with the Power Feed and Power Wave products. The pendant is used to set all welding parameters. High-speed digital cables connect the pendant to the ArcLink System. The user interface provides ready access to all welding modes in the Power Wave.

TECHNICAL SPECIFICATIONS – POWER FEED PENDANT (K4177-1)

INPUT VOLTAGE
40 V DC (1 Input Amperes)

TEMPERATURE RANGE	
OPERATING TEMPERATURE:	STORAGE TEMPERATURE:
14°F to 104°F (-10°C to 40°C)	14°F to 122°F (-10°C to 50°C)

PHYSICAL DIMENSIONS			
Height	Width	Depth	Weight
4.516 Inches (114.7 mm)	8.7 Inches (220.9 mm)	6.860 Inches (174.24 mm)	3.545 lbs (1.60kg)

Read this entire installation section before you start installation.

INSTALLATION

⚠ WARNING

ELECTRIC SHOCK CAN KILL.

- **Turn the input power OFF at the welding power source before installation or changing drive rolls and/or guides.**
- **Do not touch electrically live parts.**
- **When inching with the gun trigger, electrode and drive mechanism are "hot" to work and ground and could remain energized several seconds after the gun trigger is released.**
- **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.**

SELECT SUITABLE LOCATION

The POWER FEED PENDANT will operate in harsh environments and can be used outdoors. Even so, it is important that simple reventative measures are followed in order to assure long life and reliable operation. The POWR FEED PENDANT is provided with magnetic feet to provide flexibility of relocation, however the pendant should be secured in a location where there is minimal risk of impact.

Do not submerge the POWER FEED PENDANT.

HIGH FREQUENCY PROTECTION

⚠ CAUTION

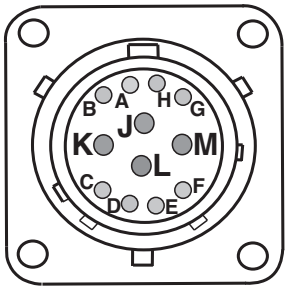
Locate the POWER FEED® PENDANT away from radio controlled machinery. The normal operation of the POWER FEED® PENDANT may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

CABLE CONNECTIONS

There is one circular connector on the front of the POWER FEED® PENDANT.

(See 12-pin Figure A.1)

FIGURE A.1



Function	PIN	Wiring
12-pin connector for remote control, foot/hand amptrol, push-pull guns and ArcLink peripherals	A	CANL
	B	CANH
	C	75 Remote potentiometer, common
	D	75 Remote potentiometer, common
	E	77 Remote potentiometer, 5K
	F	ArcLink Peripheral Sense
	G	Trigger
	H	Trigger
	J	40VDC Common
	K	40VDC +
	L	Pull Motor –
	M	Pull Motor +

The control cable for the PENDANT should not be extended.

OPERATION

SAFETY PRECAUTIONS

Read entire operation section before operating machine.

⚠ WARNING

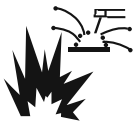
ELECTRIC SHOCK can kill.

- Unless using COLD FEED feature, when feeding with gun trigger, the electrode and drive mechanism are always electrically energized and could remain energized several seconds after the welding ceases.
- Turn the input power OFF at the welding power source before installation or changing drive rolls and/or guides.
- Do not touch electrically live parts.
- When inching with the gun trigger, electrode and drive mechanism are "hot" to work and ground and could remain energized several seconds after the gun trigger is released.
- Do not operate with covers, panels or guards removed or open.
- Only qualified personnel should perform maintenance work

FUMES AND GASES can be dangerous.

- Keep your head out of fumes.
- Use ventilation or exhaust to remove fumes from breathing zone.

WELDING SPARKS can cause fire or explosion.



- Keep flammable material away.
- Do not weld on closed containers.

ARC RAYS can burn eyes and skin.

- Wear eye, ear and body protection.

Observe all safety information throughout this manual.

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL

INPUT POWER

ON

OFF

WIRE FEEDER

POSITIVE OUTPUT

NEGATIVE OUTPUT

INPUT POWER

DIRECT CURRENT

U_0 OPEN CIRCUIT VOLTAGE

U_1 INPUT VOLTAGE

U_2 OUTPUT VOLTAGE

I_1 INPUT CURRENT

I_2 OUTPUT CURRENT

PROTECTIVE GROUND

WARNING OR CAUTION

DEFINITION OF WELDING TERMS

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.

WFS

- Wire Feed Speed

CC

- Constant Current

CV

- Constant Voltage

GMAW

- Gas Metal Arc Welding

GMAW-P

- Gas Metal Arc Welding-(Pulse Arc)

SMAW

- Shielded Metal Arc Welding

FCAW

- Flux Core Arc Welding

CAG

- Carbon Arc Gouging

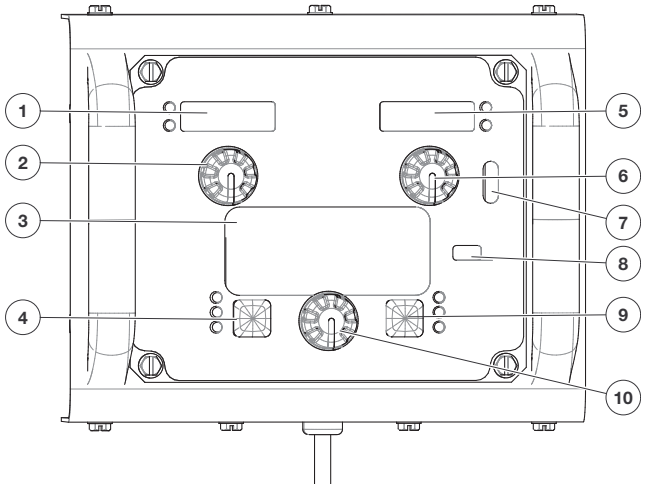
DUTY CYCLE

The POWER FEED® PENDANT is rated for 330 amps, 60% duty cycle. The duty cycle is based on a 10 minute cycle.

For example, when welding at 330 amps, the The POWER FEED® PENDANT may run continuously for 6 minutes and then must sit idle for 4 minutes.

CASE FRONT CONTROLS

FIGURE B.1



All operator controls and adjustments are located on the case front of the Power Feed Pendant. (See Figure B.1)

1. **LEFT DISPLAY- Shows wire feed speed or amperage,**
2. **Left Knob - Adjusts value in left display.**
3. **Main display - Shows detailed welding and diagnostic information.**
4. **Left Button - Changes the Main display to show the Weld Mode or UltimArc™ Control or Memories.**
5. **Right Display - Shows voltage or trim.**
6. **RIGHT Knob - Adjusts value in right display.**
7. **Thermal Light - Indicates when machine has thermal fault.**
8. **Set-up- Lights when machine is in set-up mode,**
9. **RIGHT BUTTON- Changes the Main display to arc start, arc end and trigger options.**
10. **Main Knob- Changes the values on the Main display.**

POWER WAVE SYSTEM OPERATION

⚠ WARNING

The serviceability of a product or structure utilizing the welding programs is and must be the sole responsibility of the builder/user. Many variables beyond the control of The Lincoln Electric Company affect the results obtained in applying these programs. These variables include, but are not limited to, welding procedure, plate chemistry and temperature, weldment design, fabrication methods and service requirements. The available range of a welding program may not be suitable for all applications, and the build/user is and must be solely responsible for welding program selection.

The steps for operating the Power Wave will vary depending upon the user interface of the welding system. The flexibility of the Power Wave lets the user customize operation for the best performance.

First, consider the desired welding process and the part to be welded. Choose an electrode material, diameter, shielding gas and process (GMAW, GMAW-P, etc.)

Second, find the program in the welding software that best matches the desired welding process. The standard software shipped with the Power Waves encompasses a wide range of common processes and will meet most needs. If a special welding program is desired, contact the local Lincoln Electric sales representative.

All adjustments are made on the user interface. Because of the different configuration options your system may not have all of the following adjustments. Regardless of availability, all controls are described below.

SMAW (STICK) WELDING PHYSICAL SETUP

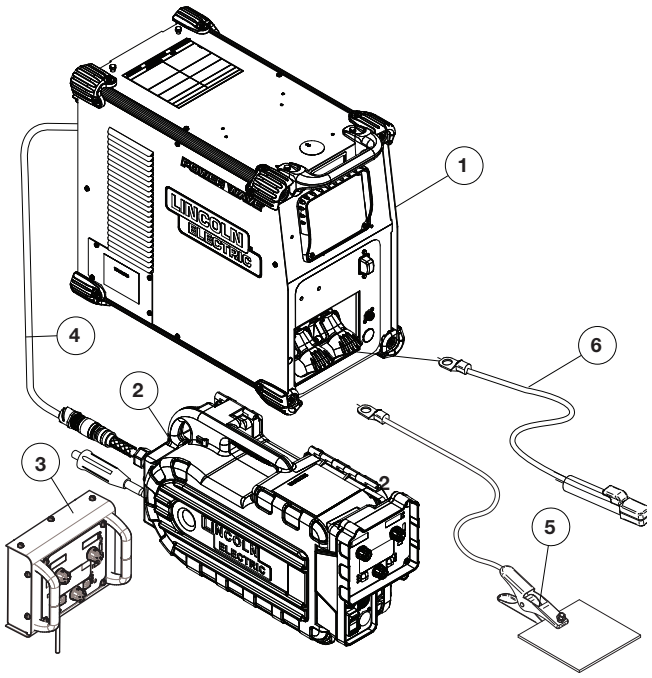
SMAW is most often used for outdoor construction, pipe welding and general repairs. The wire feeder controls Amperage, Output Control and Arc Force during SMAW welding.

During SMAW welding, the user interface sets the weld parameters and the wire drive remains idle.

The “Volts”-”Trim” control is used to turn the power Source Output ON or OFF. (See Figure B.3)

SMAW Welding (See Figure B.2)

FIGURE B.2



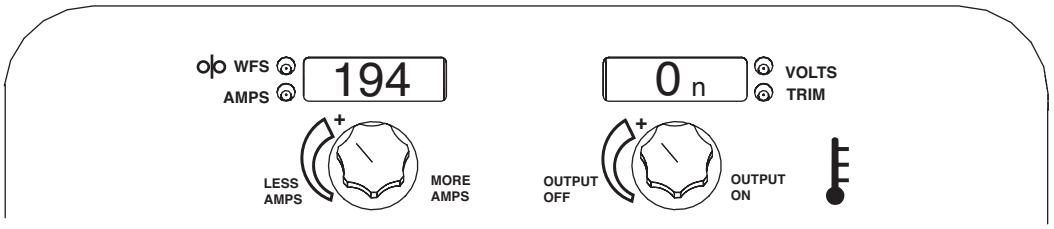
1	K2904-5	Power Wave® S500
2	K4119-1	Power Feed 8 NNS
3	K4177-1	POWER FEED® PENDANT
4	K4264-xx	Heavy Duty ArcLink Cable
5	K1842-x K910-xx	Weld Power Cable, Lug to Lug Ground Clamp
6	K909-xx	Electrode Holder

SMAW (STICK) WELDING (CONT.)

SMAW is most often used for outdoor construction, pipe welding and general repairs. The POWER FEED PENDANT controls Amperage, Output Control and Arc Force during SMAW welding.

During SMAW welding the wire drive remains idle.

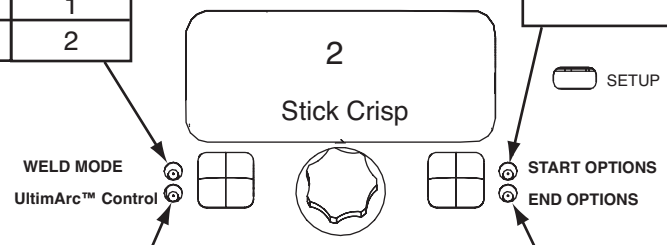
FIGURE B.3 BASIC OPERATION



CC STICK MODES	
PROCESS	MODE
Stick Soft(7018)	1
Stick Crisp(6010)	2

START OPTIONS

No arc starting options are active for SMAW (Stick) welding modes.



UltimArc™ Control	
EFFECT / RANGE	DESCRIPTION
ARC FORCE (Soft)-10.0 to (Crisp)+10.0	Arc Force adjusts the short circuit current for a soft arc, or for a forceful, driving arc. It helps to prevent sticking and shorting of organic coated electrodes, particularity globular transfer types such as stainless and low hydrogen. Arc Force is especially effective for root pass on pipe with stainless electrode and helps to minimize spatter for certain electrodes and procedure as with low hydrogen, etc.

END OPTIONS

No arc ending options are active for SMAW (Stick) welding modes.

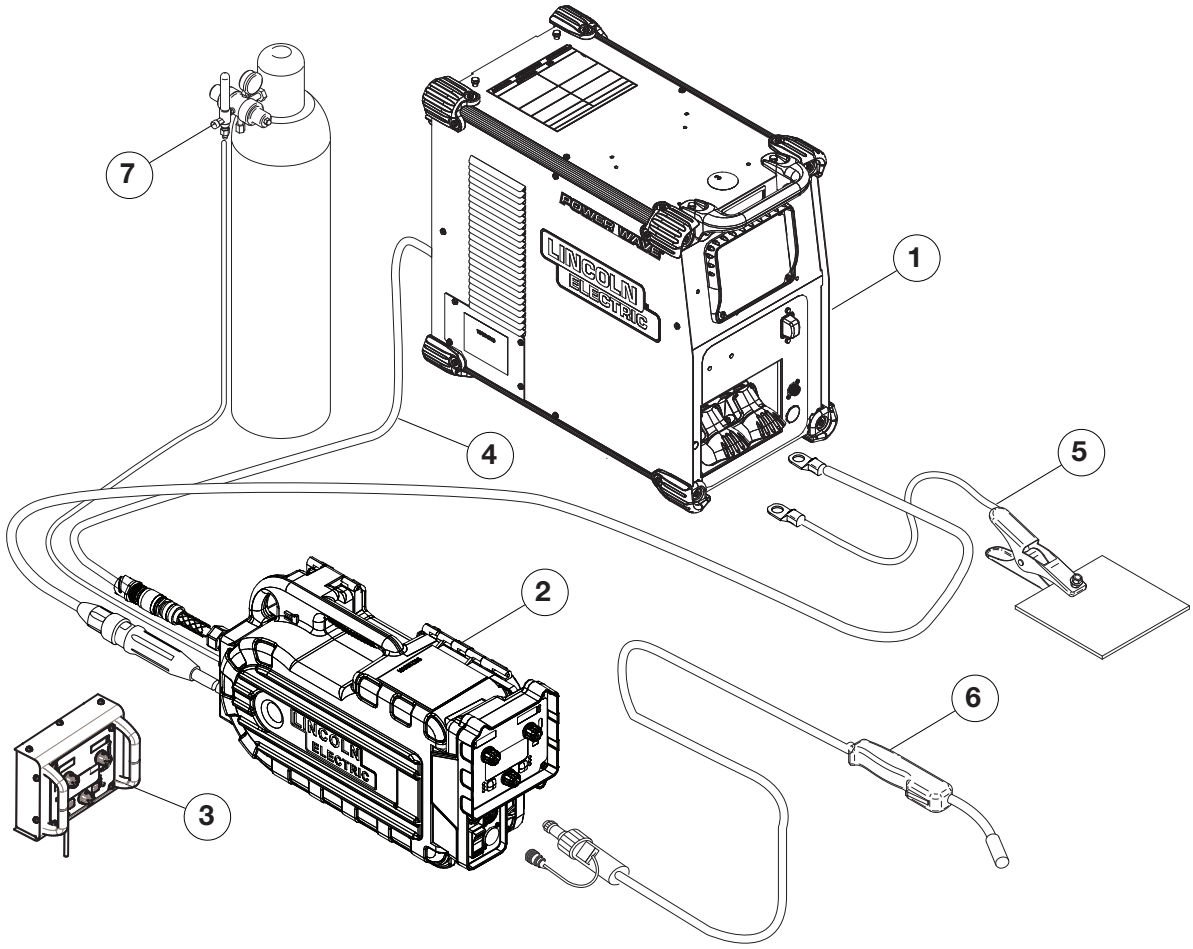
NON-SYNERGIC GMAW AND FCAW WELDING PHYSICAL SETUP

(See Figure B.4)

Non-synergic GMAW and FCAW welding mimics the welding controls of traditional welding power sources. Voltage and WFS are set as independent variables.

THREE NON-SYNERGIC WELDING MODES ARE AVAILABLE.		
Description	**Mode**	**Used for:**
GMAW, Standard CV	5	Best for traditional MIG welding.
GMAW, Power	40	Specialized GMAW mode.
FCAW	6	Best for self shielded electrodes like Innershield®.

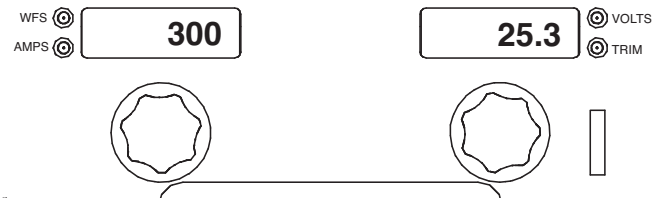
FIGURE B.4



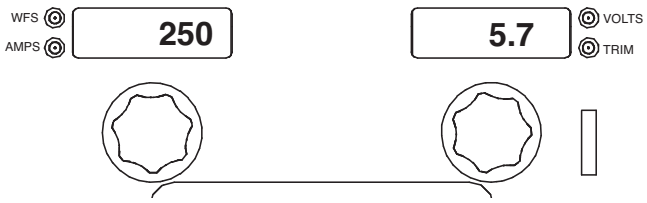
1	K2904-5	Power Wave® S500
2	K4119-1	Power Feed 8 NNS
	KP1696-xx, KP1697-xx	
3	K4177-1	POWER FEED® PENDANT
4	K4405-xx	Digital Control Cable
5	K1842-x K910-xx	Weld Power Cable, Lug to Lug Ground Clamp
6	See Magnum Literature	MIG Gun
7	K586-1	Deluxe Regulator for Mixed Shielding Gases and Gas Hose

Display Operation

Modes 5 and 6:



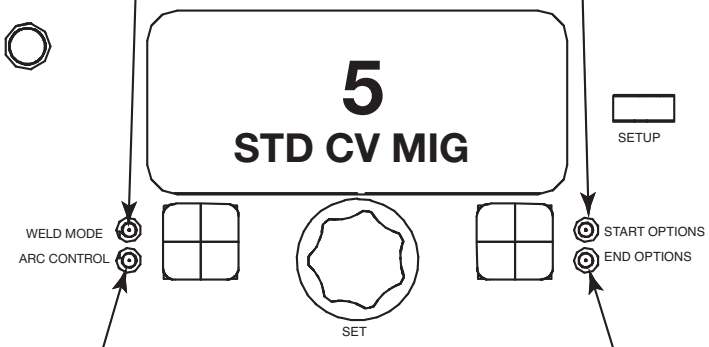
Mode 40:



USER INTERFACE OPERATION, NON-SYNERGIC GMAW (MIG) AND FCAW (FLUX CORED) WELDING.

START OPTIONS	
EFFECT / RANGE	DESCRIPTION
Preflow Time	Adjusts the time that shielding gas flows after the trigger is pulled and prior to feeding wire.
Run-In WFS:	Run-In sets the wire feed speed from the time the trigger is pulled until an arc is established or 2.5 seconds.
Start Procedure	The Start Procedure controls the WFS and Volts for a specified time at the beginning of the weld. During the start time, the machine will ramp up or down from the Start Procedure to the preset Welding Procedure.

WELD MODE	
PROCESS	WELD MODE
GMAW, STANDARD CV	5
GMAW, POWER MODE	40
FCAW, STANDARD CV	6



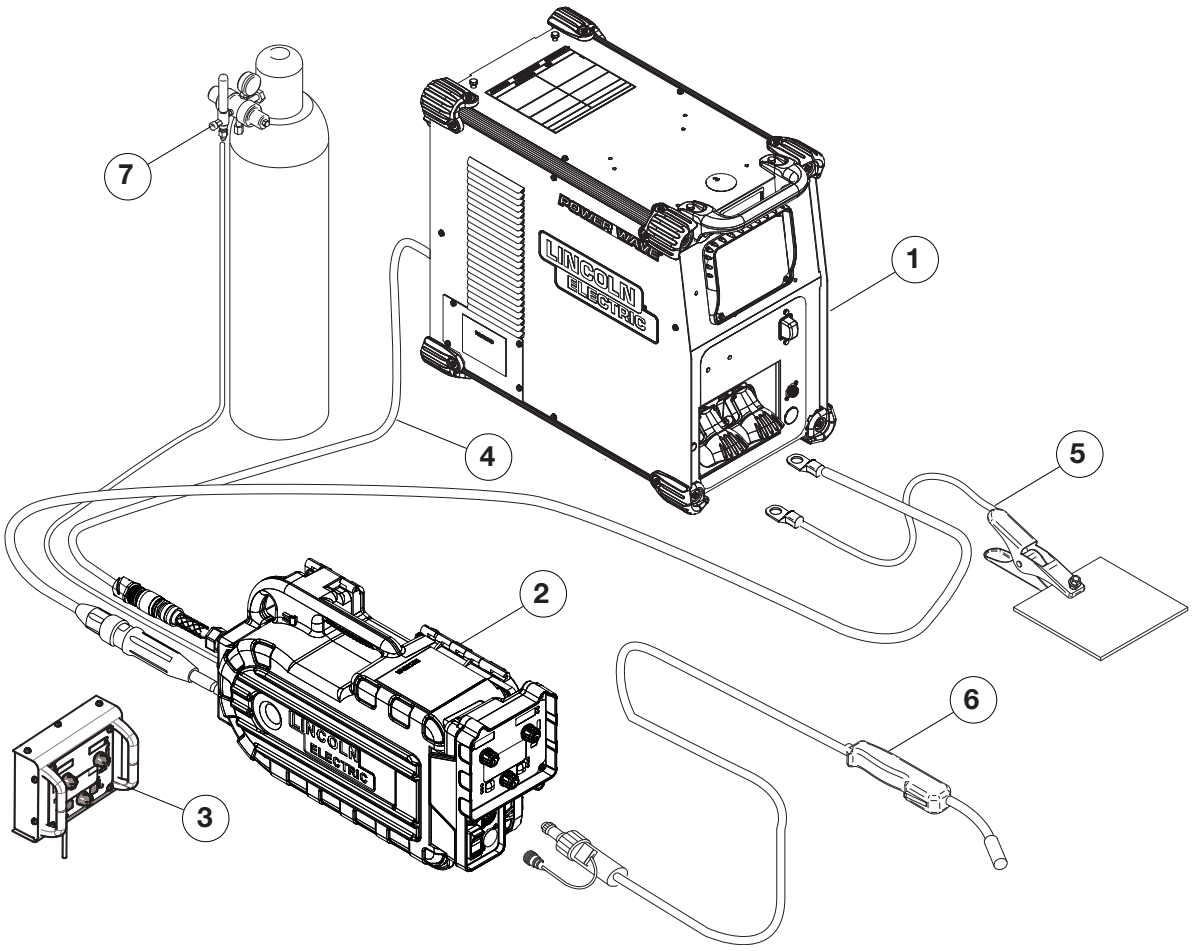
ULTIMARC*	
EFFECT / RANGE	DESCRIPTION
PINCH (Soft)-10.0 to (Crisp)+10.0	Pinch controls the arc characte--ristics when short-arc welding.

***Wave Control in Power Wave® 350 and 500 machines.**

END OPTIONS	
EFFECT / RANGE	DESCRIPTION
Spot Timer	Adjust the time welding will continue even if the trigger is still pulled. This option has no effect in 4-Step Trigger Mode.
Crater Procedure	Crater Procedure controls the WFS and Volts for a specified time at the end of the weld after the trigger is released. During the Crater time, the machine will ramp up or down from the Weld Procedure to the Crater Procedure.
Burnback:	The burnback time is the amount of time that the weld output continues after the wire stops feeding. It prevents the wire from sticking in the puddle and prepares the end of the wire for the next arc start.
Postflow Time	Adjusts the time that shielding gas flows after the welding output turns off.

GMAW (MIG) SYNERGIC WELDING PHYSICAL SETUP

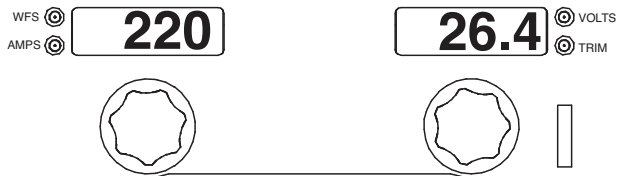
Synergic welding allows for easy procedure setting. The WFS and Voltage change together to maintain an optimal arc length. During synergic welding , when the WFS (left) knob is rotated, the voltage is adjusted accordingly to maintain a similar arc length.



1	K2904-5	Power Wave® S500
2	K4119-1	Power Feed 8 NNS
	KP1696-xx, KP1697-xx	Drive Roll Kit, 2 Roll Feeder
3	K4177-1	POWER FEED® PENDANT
4	K4405-xx	Digital Control Cable
5	K1842-x K910-xx	Weld Power Cable, Lug to Lug Ground Clamp
6	See Magnum Literature	MIG Gun
7	K586-1	Deluxe Regulator for Mixed Shielding Gases and Gas Hose

Display Operation

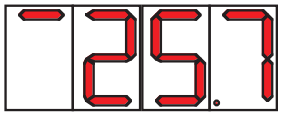
Synergic CV programs feature an ideal voltage best suited for most procedures. Use this voltage as a starting point and adjust if needed for personal preferences.



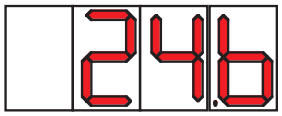
Synergic CV Voltage Display

When the voltage knob is rotated, the display will show an upper or lower bar indicating if the voltage is above or below the ideal voltage.

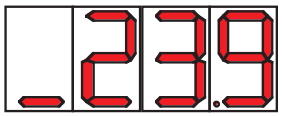
- Preset voltage above ideal voltage. (upper bar displayed)



- Preset voltage at ideal voltage. (no bar displayed)



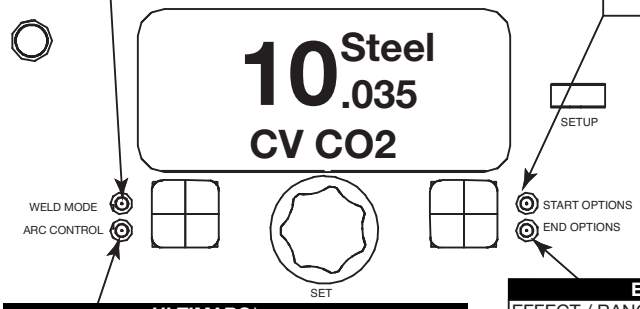
- Preset voltage below ideal voltage. (lower bar displayed)



USER INTERFACE OPERATION, SYNERGIC GMAW(MIG) WELDING

WELD MODE					
ELECTRODE AND GAS		WIRE SIZE			
		0.030	0.035	0.045	0.052
Steel	CO_2	---	10	20	24
Steel	Ar(Mix)	94	11	21	25
Stainless	Ar(Mix)	61	31	41	---
Stainless	Ar/He/CO_2	63	33	43	---
Aluminum 4043	Ar	---	148	71	---
Aluminum 5356	Ar	---	151	75	---
Metal Core		---	---	81	83

START OPTIONS	
EFFECT / RANGE	DESCRIPTION
Preflow Time	Adjusts the time that shielding gas flows after the trigger is pulled and prior to feeding.
Run-in WFS:	Run-In sets the wire feed speed from the time the trigger is pulled until an arc is established or 2.5 seconds.
Start Procedure	The Start Procedure controls the WFS, Volts at a specified time at the beginning of the weld. During the start time, the machine will ramp up or down from the Start Procedure to the preset Welding Procedure.



ULTIMARC*	
EFFECT / RANGE	DESCRIPTION
PINCH EFFECT (-10.0 to +10.0)	Pinch controls the arc characte--ristics when short-arc welding.

***Wave Control in Power Wave® 350 and 500 machines.**

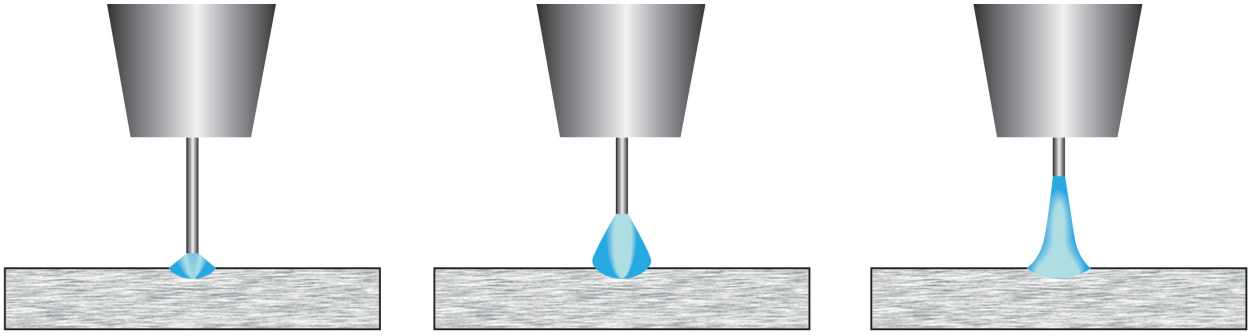
END OPTIONS	
EFFECT / RANGE	DESCRIPTION
Spot Timer	Adjust the time welding will continue even if the trigger is still pulled. This option has no effect in 4-Step Trigger Mode.
Burnback:	The burnback time is the amount of time that the weld output continues after the wire stops feeding. It prevents the wire from sticking in the puddle and prepares the end of the wire for the next arc start.
Crater Procedure	Crater Procedure controls the WFS and volts for a specified time at the end of the weld after the trigger is released. During the Crater time, the machine will ramp up or down from the Weld Procedure to the Crater Procedure.
Postflow Time	Adjusts the time that shielding gas flows after the welding output turns off.

STEEL AND STAINLESS SYNERGIC GMAW-P (PULSED MIG) WELDING

Synergic GMAW-P (Pulsed MIG) welding is ideal for low spatter, out of position and reduced heat input applications. During pulse welding, the welding current continuously switches from a low level to a high level and then back again. Each pulse sends a small droplet of molten metal from the wire to the weld puddle.

Pulse welding controls the arc length with 'Trim' instead of voltage. When trim (arc length) is adjusted, the Power Wave automatically recalculates the voltage, current and time of each part of the pulse waveform for the best result. Trim adjusts the arc length and ranges from 0.50 to 1.50. Increasing the trim value increases the arc length, while decreasing the trim value decreases the arc length.

FIGURE B.6



Trim .50
Arc Length Short

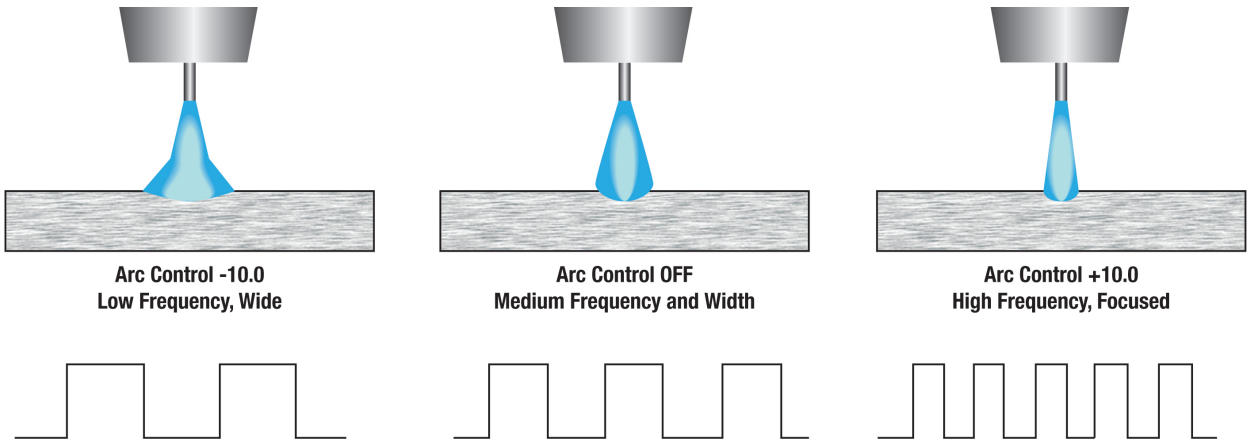
Trim 1.00
Arc Length Medium

Trim 1.50
Arc Length Long

UltimArc*

For steel and stainless pulse modes, UltimArc regulates the focus or shape of the arc. UltimArc values greater than 0.0 increase the pulse frequency while decreasing the background current, resulting in a tight, stiff arc best for high speed sheet metal welding. UltimArc values less than 0.0 decrease the pulse frequency while increasing the background current, for a soft arc good for out-of-position welding.

FIGURE B.7

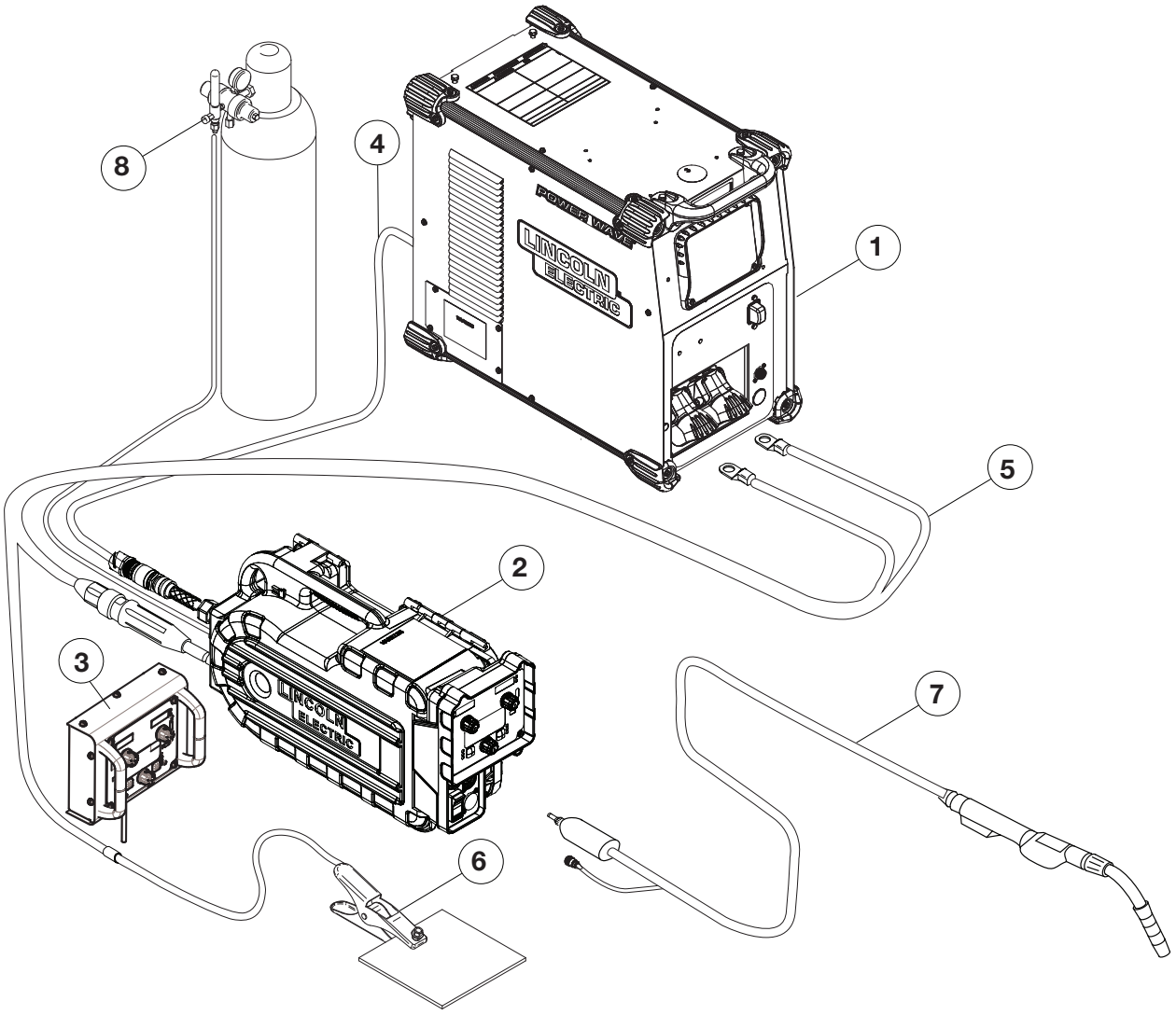


Arc Control -10.0
Low Frequency, Wide

Arc Control OFF
Medium Frequency and Width

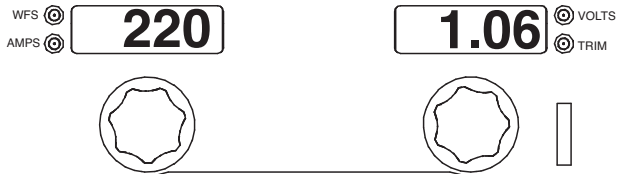
Arc Control +10.0
High Frequency, Focused

SYNERGIC GMAW-P (PULSED MIG) WELDING PHYSICAL SETUP



1	K2904-5	Power Wave® S500
	K4119-1	Power Feed 8 NNS
	KP1696-xx, KP1697-xx	Drive Roll Kit, 2 Roll Feeder
3	K4177-1	POWER FEED® PENDANT
4	K4405-xx	Digital Control Cable
5	K1796-xx	Coaxial Weld Power Cable, Lug to Lug
6	K910-xx	Ground Clamp
7	K3355-x	Magnum® PRO AL Push Pull Gun Air Cooled, 12-Pin
8	K586-1	Deluxe Regulator for Mixed Shielding Gases and Gas Hose

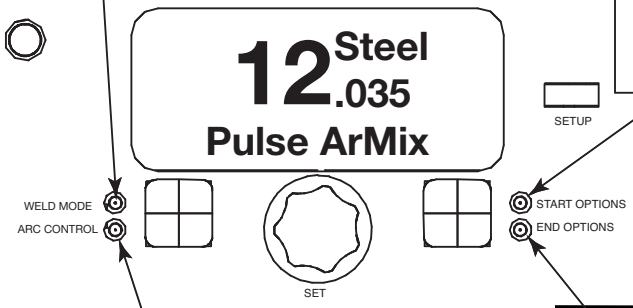
Display Operation



OPERATION, STEEL AND STAINLESS GMAW-P (PULSED MIG) WELDING

WELD MODE					
ELECTRODE AND GAS		WIRE SIZE			
		0.030	0.035	0.045	0.052
Steel(Crisp)	Ar(Mix)	95	12	22	26
Steel(Soft)	Ar(Mix)	---	14	19	28
Stainless	Ar/ CO_2	66	36	46	---
Stainless	Ar/ CO_2	62	32	42	---
Stainless	Ar/He/CO_2	---	34	44	---

START OPTIONS	
EFFECT / RANGE	DESCRIPTION
Preflow Time	Adjusts the time that shielding gas flows after the trigger is pulled and prior to feeding wire.
Run-In WFS:	Run-in sets the wire feed speed from the time the trigger is pulled until an arc is established or 2.5 seconds.
Start Procedure	The Start Procedure controls the WFS, Trim at a specified time at the beginning of the weld. During the start time, the machine will ramp up or down from the Start Procedure to the preset Welding Procedure.



ULTIMARC*	
ARC FOCUS	DESCRIPTION
-10.0 (SOFT to 10.0 (STIFF)	Arc Focus adjusts the arc from a wide, soft arc good for out of position work to a narrow, stiff arc preferred for faster travel speeds. The pulse frequency is lower with a soft arc and higher with a stiff arc.

***Wave Control in Power Wave® machines**.

END OPTIONS	
EFFECT / RANGE	FUNCTION
Spot Timer	Adjust the time welding will continue even if the trigger is still pulled. This option has no effect in 4-Step Trigger Mode.
Burnback:	The burnback time is the amount of time that the weld output continues after the wire stops feeding. It prevents the wire from sticking in the puddle and prepares the end of the wire for the next arc start.
Crater Procedure	Crater Procedure controls the WFS and Trim for a specified time at the end of the weld after the trigger is released. During the Crater time, the machine will ramp up or down from the Weld Procedure to the Crater Procedure.
Postflow Time:	Adjusts the time that shielding gas flows after the welding output turns off.

GTAW (TIG) WELDING

The POWER FEED® / Power Wave system is excellent for Touch Start TIG welding.

The system supports TIG torches with or without gas control valves. TIG torches with gas control valves connect directly to the gas flow regulator. For TIG torches without gas control valves, connect the output gas hose on the wire feeder to the TIG torch gas hose.

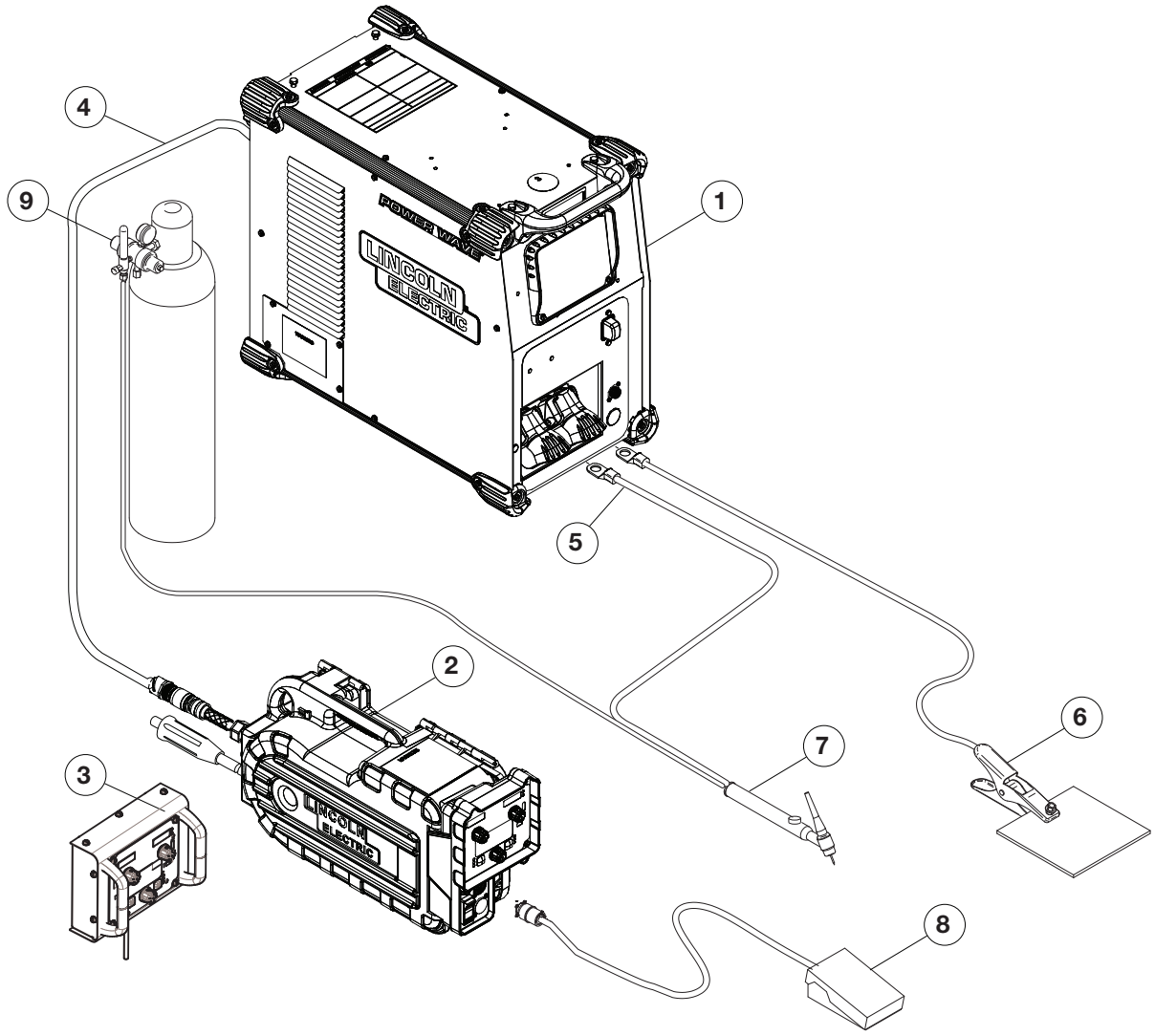
The wire feeder gas solenoid may be enabled or disabled by parameter P.8 in the set-up menu found in this operations section.

Touch Start TIG Weld Sequence	No Foot / Hand Amptrol	With Foot / Hand Amptrol
TIG torches without built-in Gas Valves.	1. Adjust the arc amperage with the left knob on the display panel. 2. Turn the right knob on the display panel until the Output Control is ON. Gas will start to flow. 3. Touch the tungsten to the work piece. 4. Lift the tungsten to create an arc and weld. 5. Stop welding by turning the Output Control to OFF, or by pulling away the tungsten from the work. 6. Gas flow will continue for a short time and then shut-off.	1. Adjust the maximum arc amperage with the left knob on the display panel. 2. Touch the tungsten to the work piece. 3. Press the foot pedal or slide the hand amptrol a slight amount. Gas will start to flow. 4. Lift the tungsten to create an arc. 5. Regulate the arc current with the foot pedal or hand amptrol. 6. Stop welding by releasing the foot pedal or hand amptrol, or by pulling the tungsten away from the work. 7. Gas will continue for a short time and then shut-off.
TIG torches with built-in Gas Valves.	1. Adjust the arc amperage with the left knob on the display panel. 2. Turn the right knob on the display panel until the Output Control is ON. 3. Open the gas valve on the TIG torch. 4. Touch the tungsten to the work piece. 5. Lift the tungsten to create an arc and weld. 6. Stop welding by turning the Output Control to OFF, or by pulling away the tungsten from the work. 7. Close the gas valve on the TIG torch.	1. Adjust the maximum arc amperage with the left knob on the display panel. 2. Touch the tungsten to the work piece. 3. Press the foot pedal or slide the hand amptrol a slight amount. 4. Open the gas valve on the TIG torch. 5. Lift the tungsten to create an arc. 6. Regulate the arc current with the foot pedal or hand amptrol. 7. Stop welding by releasing the foot pedal or hand amptrol, or by pulling the tungsten away from the work. 8. Close the gas valve on the TIG torch.

GTAW (TIG) WELDING PHYSICAL SETUP

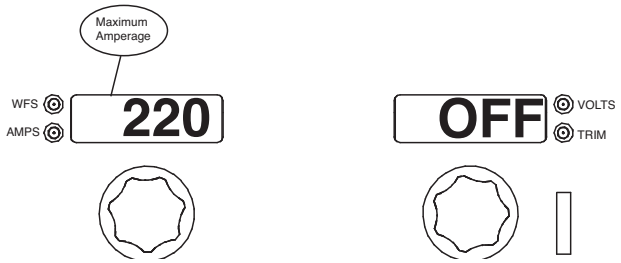
⚠ WARNING

Do not connect a high frequency arc starting kit to the Power Feed / Power Wave system.

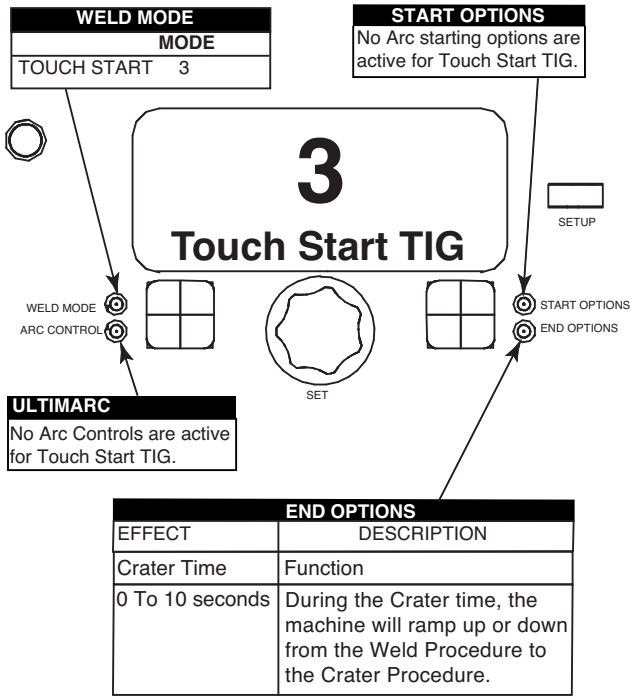


1	K2904-5	Power Wave® S500
2	K4119-1	Power Feed 8 NNS
3	K4177-1	POWER FEED® PENDANT
4	K4405-xx	ArcLink Control Cable
5	K1842-xx	Weld Power Cable, Lug to Lug
6	K910-xx	Ground Clamp
7	K1782-xx, K1783-xx	PTA-17, PTA-25 TIG torch (shown with valve)
8	K870-2	Foot Amptrol
9	3100211	Harris Argo Flow Regulator

Display Operation



USER INTERFACE OPERATION, GTAW (TOUCH START TIG) WELDING.



END OPTIONS	
EFFECT	DESCRIPTION
Crater Time	Function
0 To 10 seconds	During the Crater time, the machine will ramp up or down from the Weld Procedure to the Crater Procedure.

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 turn the set knob until “Weld Mode Search” is displayed. This will appear in between the highest and the lowest weld mode numbers.

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.

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

When the final selection is made, the Feeder 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

SETUP MENU FEATURES

The Setup Menu gives access to the Setup Configuration. Stored in the setup configuration are user parameters that generally only need to be set at installation. The parameters are grouped as shown in the following table.

Parameter	Definition
P.1 through P.99	Unsecured Parameters (always adjustable)
P.101 through P.199	Diagnostic Parameters (always read only)
P.501 through P.599	Secured Parameters (only accessible through a p.c. or palm application)

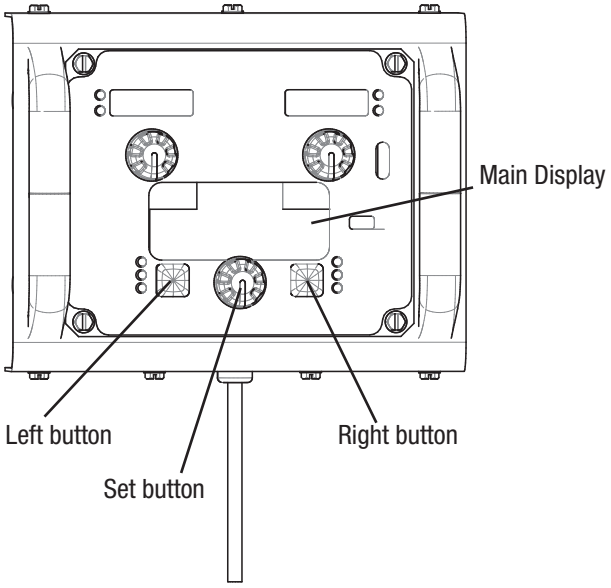
SET-UP FEATURES MENU

(See Figure B.13b)

1. To access the set-up menu, press the right and left buttons of the user interface panel simultaneously. Note that the set-up menu cannot be accessed if the system is welding, or if there is a fault (The status LED is not solid green).

   Change the value of the blinking parameter by pressing and turning the SET knob.
2. After changing a parameter it is necessary to press the Right hand button to save the new setting. Pressing the Left button will cancel the change.
3. To exit the set-up menu at any time, press the Right and Left buttons of the MSP4 panel simultaneously. Alternately, 1 minute of inactivity will also exit the set-up menu.

FIGURE B.13B - SETUP MENU



Set-Up MENU

USER DEFINED PARAMETERS

Parameter	Name and Description	Range
P.0	**Exit Setup Menu** This option is used to exit the setup menu. When P.0 is displayed, press the Left Button to exit the setup menu.	
P.1	**Wire Feed Speed Units** 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.	English, Metric
P.2	**Arc Display Mode** 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.	Amps, WFS
P.3	**Display Options** This setup parameter was previously named "Display Energy." If the previous software revision had this parameter set to display energy, that selection will remain. 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. 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. Show Gas Flow = Gas Flow Rate is displayed during a weld (PF84 only).	Standard Display, Show Energy, Show Weld Score Show Gas Flow
P.4	**Recall Memory with Trigger** This option allows a memory to be recalled by quickly pulling and releasing the gun trigger. To recall a memory, quickly pull and release the trigger the number of times that correspond to the memory number. For example, to recall memory 3, quickly pull and release the trigger 3 times. To recall memory 1, quickly pull and release the trigger the number of user memories plus 1. Memories cannot be recalled while the system is welding. Disabled = The gun trigger cannot be used to recall user memories (default). Enabled = The gun trigger can be used to recall user memories.	Disabled, Enabled

USER DEFINED PARAMETERS

Parameter	Name and Description	Range
P.5	**Procedure Change Method** This option selects how remote procedure selection (A/B) will be made. For some products the selected procedure can be changed locally at the user interface by pressing the 'A-Gun-B' button. Other products do not have this button and must use a Cross-switch gun or wire into the procedure select input. The following methods can be used to remotely change the selected procedure: External Switch = Dual Procedure selection may only be performed at the memory panel or an external switch (e.g. K683). Quick Trigger = The selected procedure can be changed remotely by releasing and re-pulling the trigger quickly while welding. This feature is disabled in 4-Step trigger mode. The external procedure switch is disabled. To operate: • Select "GUN" on the memory panel (for products that have an 'A-Gun-B' button). • Start the weld by pulling the gun trigger. The system will weld with procedure A settings. • While welding, quickly release then pull the gun trigger once. The system will switch to procedure B settings. Repeat to switch back to procedure A settings. The procedure can be changed as many times as needed during the weld. • Release the trigger to stop welding. The system will automatically return to procedure A settings. IntegralTrigProc = When using a Magnum DS dual-schedule gun (or similar) that incorporates a procedure switch in the gun trigger mechanism. While welding in 2-step, machine operation is identical to the "External Switch" selection. When welding in 4-step, additional logic prevents procedure A from being re-selected when the trigger is released at step 2 of the 4-step weld sequence. The machine will always operate in 2-step if a weld is made exclusively in procedure A, regardless of the 2/4 step switch position (this is intended to simplify tack welding when using a dual-schedule gun in 4-step).	External Switch, Quick Trigger, IntegralTrigProc
P.7	**Gun Offset Adjustment** This option adjusts the wire feed speed calibration of the pull motor of a push-pull gun. This should only be performed when other possible corrections do not solve any push-pull feeding problems. An rpm meter is required to perform the pull gun motor offset calibration. To perform the calibration procedure do the following: 1. Release the pressure arm on both the pull and push wire drives. 2. Set the wire feed speed to 200 ipm. 3. Remove wire from the pull wire drive. 4. Hold an rpm meter to the drive roll in the pull gun. 5. Pull the trigger on the push-pull gun. 6. Measure the rpm of the pull motor. The rpm should be between 115 and 125 rpm. If necessary, decrease the calibration setting to slow the pull motor, or increase the calibration setting to speed up the motor. The calibration range is -30 to +30, with 0 as the default value. Note: The range was changed to -90 to +90 for the PF25M in WD software S28539-3. Default value remains at 0.	-90 to 90

USER DEFINED PARAMETERS

Parameter	Name and Description	Range
P.8	**TIG Gas Control** This option allows control over which gas solenoid actuates while TIG welding. "Valve (manual)" = No MIG solenoid will actuate while TIG welding, gas flow is manually controlled by an external valve. "Solenoid (auto) = The MIG solenoid will turn on and off automatically while TIG welding. "Feeder Solenoid" = The internal (feeder) MIG solenoid will turn on and off automatically while TIG welding. "Pwr Src Solenoid" = Not applicable to PWC300. Any gas solenoid connected to the power source will turn on and off automatically while TIG welding. This selection will not appear in the list if the power source does not support a gas solenoid. Notes: Preflow is not available while TIG welding. Postflow is available - the same postflow time will be used in MIG and TIG. When machine output on/off is controlled via the upper right knob, gas flow will not start until the tungsten touches the work. Gas flow will continue when the arc is broken until the Postflow time expires. When machine output on/off is controlled via an arc start switch or foot Amptrol, gas will begin flowing when the output is turned on and will continue flowing until the output is turned off and the Postflow time expires. If a dedicated TIG gas solenoid is installed, as in the Advanced AC Module, all TIG gas control will use that solenoid and this menu option will be irrelevant.	Valve (manual), Feeder Solenoid, Pwr Src Solenoid
P.9	**Crater Delay** This option is used to skip the Crater sequence when making short tack welds. If the trigger is released before the timer expires, Crater will be bypassed and the weld will end. If the trigger is released after the timer expires, the Crater sequence will function normally (if enabled).	
P.14	**Reset Consumable Weight** 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.	

USER DEFINED PARAMETERS

Parameter	Name and Description	Range
P.16	**Push-Pull Gun Knob Behavior** This option determines how the potentiometer on the Push/Pull torch will behave. • Gun Pot Enabled = The welding wire feed speed is always controlled by the potentiometer on the push-pull gun (default). The left front panel knob is only used to adjust Start and Crater wire feed speed. • Gun Pot Disabled = The wire feed speed is always controlled by the left front panel knob. This setting is useful when the operator wishes to have wire feed speed settings recalled from memories and not have the potentiometer "overwrite" the setting. • Gun Pot Proc A = When in procedure A, the welding wire feed speed is controlled by the potentiometer on the push-pull gun. When in procedure B, the welding wire feed speed is controlled by the left front panel knob. This setting allows a fixed wire feed speed to be selected in procedure B and not have the potentiometer "overwrite" the setting when the procedure changes.	Gun Pot Enabled Gun Pot Disabled Gun Pot Proc A
P.17	**Remote Control Type** This setup parameter was previously named "Spool/Push-Pull." This option selects the type of analog remote control being used. Digital remote control devices (those with a digital display) are configured automatically. Not all P.17 selections will be available on all machines. When P.17 is used to configure the remote control to function in a specific process, the remote will be ignored in other processes. For example, if P.17 = TIG Amp Control, the remote control will only function when TIG welding - the remote will be ignored in other processes (MIG, stick and gouge). If P.17 is set to Spool Gun or Push-Pull Gun then set to All Mode Remote, the machine will remember prior value of P.17 and will operate a Spool Gun or Push-Pull Gun, depending on the prior value of P.17. **Spool Gun =** Use this setting while MIG welding with a spool gun that uses a potentiometer used for wire feed speed control (this setting is backward compatible with "P.17 Gun Selection" = Standard/Spool). **Push-Pull Gun** = Use this setting wile MIG welding with a push-pull gun that uses a potentiometer for wire feed speed control (this setting is backward compatible with "P.17 Gun Selection" = PushPull). **TIG Amp Control =** Use this setting while TIG welding with a foot or hand current control device (Amptrol). While TIG welding, the upper left knob on the User Interface sets the maximum current obtained when the TIG amp control is at its maximum setting. **Stick/Gouge Rem. =** Use this setting while stick welding or gouging with a remote output control device. While stick welding, the upper left knob on the User Interface sets the maximum current obtained when the stick remote is at it's maximum setting. While gouging, the upper left knob is disabled and the gouging current is set on the remote control. **All Mode Remote =** This setting allows the remote control to function in all weld modes which is how most machines with 6-pin and 7-pin remote control connections operate. This setting was provided so that customers with a mix of Lincoln Electric equipment can have consistent remote control behavior across all of their equipment. (N. American default) **Joystick MIG Gun =** Use this setting while MIG welding with a push MIG gun with a joystick control. Stick, TIG and gouge welding currents are set at the User Interface. (European default)	Spool Gun Push-Pull Gun Tig Amp Control Stick/Gouge Rem. All Mode Remote Joystick MIG Gun

USER DEFINED PARAMETERS

Parameter	Name and Description	Range
P.20	**Display Trim as Volts Option** This option determines how trim is displayed. False = The trim is displayed in the format defined in the weld set (default). True = All trim values are displayed as a voltage. Note: This option may not be available on all machines. The power source must support this functionality, or this option will not appear in the menu.	False, True
P.22	**Arc Start/Loss Error Time** This option can be used to optionally shut off output if an arc is not established, or is lost for a specified amount of time. Error 269 will be displayed if the machine times out. If the value is set to OFF, machine output will not be turned off if an arc is not established nor will output be turned off if an arc is lost. The trigger can be used to hot feed the wire (default). If a value is set, the machine output will shut off if an arc is not established within the specified amount of time after the trigger is pulled or if the trigger remains pulled after an arc is lost. This is disabled while welding in Stick, TIG or Gouge. To prevent nuisance errors, set Arc Start/Loss Error Time to an appropriate value after considering all welding parameters (run-in wire feed speed, weld wire feed speed, electrical stick out, etc). To prevent subsequent changes to Arc Start/Loss Error Time, the setup menu should be locked out by setting Preference Lock = Yes using the Power Wave Manager software.	
P.24	**Push Pull Type** Allows operator to choose the Prince option if welding with a Prince Push Pull gun. This gun requires unique settings to run at the correct WFS.	Default Prince
P.25	**Joystick Configuration** The new analog and digital gun controls have a joystick to allow the user to change various weld settings at the gun rather than having to go to the user interface. P.25 can be used to change the behavior of the joystick. When P.25 is set to “Disable Joystick”, the joystick does not function. In all configurations other than “Disable Joystick”, the up and down joystick positions will adjust the wire feed speed, while welding and while not welding. P.25 is used to reconfigure the behavior of the left and right joystick positions. When P.25 is set to “WFS/Trim”, the left and right joystick positions will adjust Arc Length Trim, Arc Voltage, Power or STT Background Current based on the selected weld mode. For example, when a non-synergic STT weld mode is selected, the left and right joystick positions will adjust Background Current. When a Power mode is selected, the left and right joystick positions will adjust the Power (kW). When P.25 is set to “WFS/Job (Memory)”, the left and right joystick positions will select a user memory while not welding and adjust Trim/Voltage/Power/STT Background Current while welding. When P.25 is set to “WFS/Proced. A-B”, the left and right joystick positions will be used to select procedure A and B, while welding and while not welding. The left joystick position selects procedure A, the right joystick position selects procedure B.	WFS/Trim (default) WFS/Job (Memory) WFS/Proced. A-B Disable Joystick
P.26	**Show Memory LED** On user interfaces that support user memories but do not have dedicated user memory buttons, this parameter is used to show or hide the LED that is used to select a user memory to save to or recall from. When P.26 is set to Yes, the user memory LED will be shown and the operator can save to and recall from user memories. When P.26 is set to No, the user memory LED will not be shown, preventing the operator from saving to and recalling from user memories.	No, Yes (default)

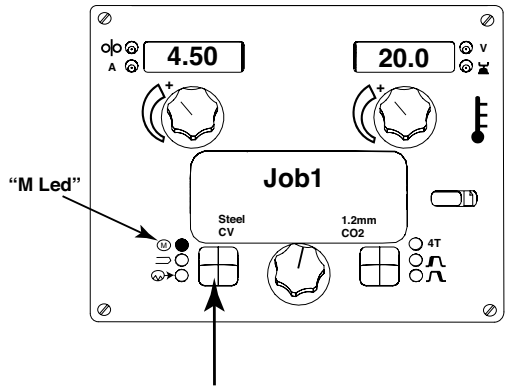
Parameter	Name and Description	Range
P.27	**Language Select** Selects which language will be displayed on the User Interface. English (Default) Italiano Deutsch Francais Polski Espanol	English, Italiano, Deutsch, Francais, Polski, Espanol
P.28	**Display Workpoint as Amps Option** This option determines how workpoint is displayed. False = The workpoint is displayed in the format defined in the weld set (default). True = All workpoint values are displayed as an amperage. Note: This option may not be available on all machines. The power source must support this functionality, or this option will not appear in the menu.	False, True
P.80	**Sense From Studs** Use this option for diagnostic purposes only. When power is cycled, this option is automatically reset to False. False = Voltage sensing is automatically determined by the selected weld mode and other machine settings (default). True = Voltage sensing is forced to "studs".	False, True
P.81	**Electrode Polarity** This option allows selection of the electrode voltage sense polarity. Most GMAW welding procedures use Electrode Positive welding. Most GTAW and some inner shield procedures use Electrode Negative welding. Positive Electrode Welding (default). Negative Electrode Welding.	Positive Electrode Welding, Negative Electrode Welding
P.82	**Voltage Sense Display** Allows viewing of Voltage Sense Lead Selection to aid in troubleshooting. The configuration is displayed as a text string on the lower display whenever the output is enabled. This parameter is not saved on a power cycle, but will be reset to False.	
P.99	**Show Test Modes** 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.100	**View Diagnostics** 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).	

Parameter	Name and Description	
P.101	**View Event Logs** 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.102	**View Fatal Logs** 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.103	**View Software Version Information** 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.104	**View Hardware Version Information** 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.105	**View Welding Software Information** 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.106	**View Ethernet IP Address** 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.107	**View Power Source Protocol** 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.	

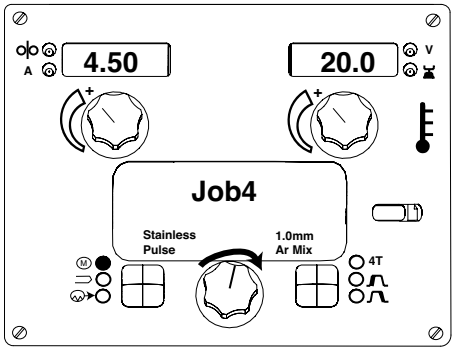
SAVING A MEMORY:

To save the current machine settings to the selected memory, **press and hold the right button for (2 seconds).** After two seconds, the alphanumeric displays will show **"Memory # Save Memory"** at which time the center knob should be released.

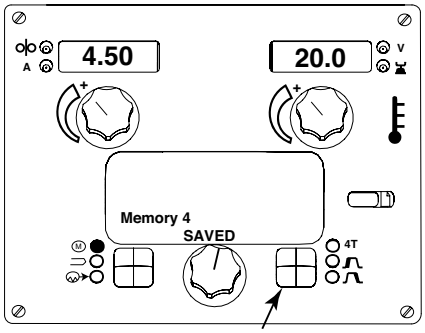
1. Press the Left Push Button until Memory 'M' LED is illuminated.



2. Press and turn center knob to desired memory location.



3. Press and hold right button for 2 seconds. The active procedure will be saved into the selected memory.

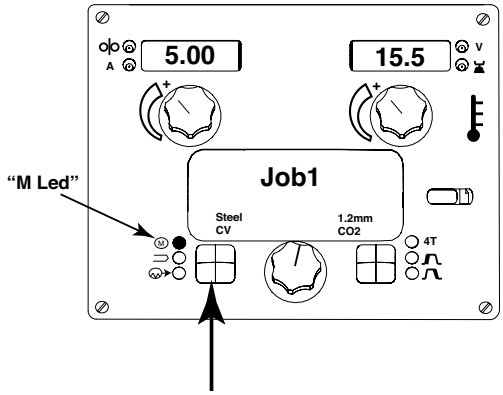


"Press and Hold right button for 2 Seconds to save Memory"

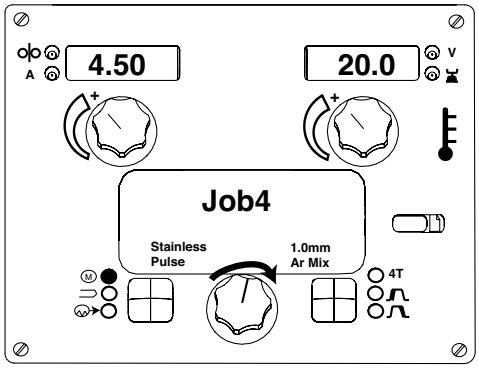
RECALLING A MEMORY

To recall the selected memory, **press and hold right button for (1 second).** After recalling a memory, a message will briefly appear indicating that the selected memory has been recalled. The **Memory LED** will remain lit so that the user can quickly recall a different memory if needed.

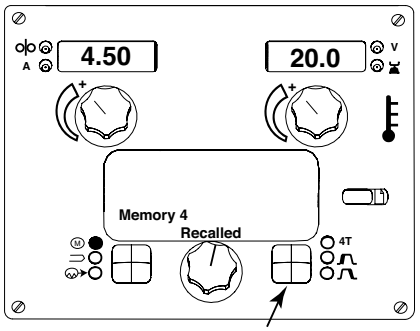
1. Press the Left Push Button until Memory 'M' LED is illuminated.



2. Press and turn center knob to desired memory location.



3. Press and hold right button for 1 second. The selected memory is now active.



Press and Hold Knob for 1 second. Memory is active.

LIMITS

Limits allow the welder to adjust the welding procedure only within a defined range.

Each user memory may have a different set of limits. For example, memory 1 can be set to limit the WFS to 200 through 300 in/min, and memory 2 can be set to limit the WFS to 275 through 310 in/min, while memory 3 may not have any WFS limits.

Parameters are always constrained by machine limits. When memory limits are enabled, the parameter will flash whenever an attempt is made to exceed the memory limit value. The parameter will not flash if an attempt is made to exceed the machine limit.

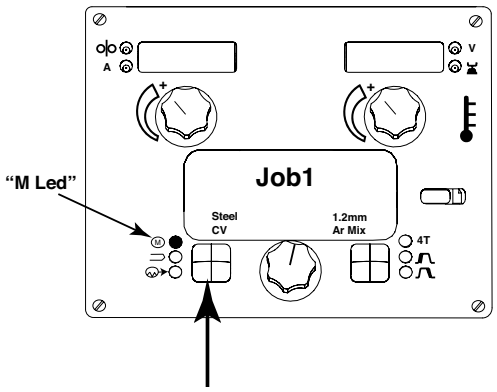
The system machine limits are:

Parameter	Range	Units
Wire Feed Speed	Weld mode and wire feeder dependent.	in/min
Voltage	Weld mode dependent	Volts
Trim	0.50 to 1.50	--
UltimArc™Control	-10.0 to 10.0	Weld mode dependent
Preflow	0.0 to 2.5	Seconds
Start Time	0.0 to 10.0	Seconds
Run-In WFS	Off, 50 to 150	in/min
Crater Time	0.0 to 10.0	Seconds
Burnback Time	0.00 to 0.25	Seconds
Postflow Time	0.0 to 10.0	Seconds

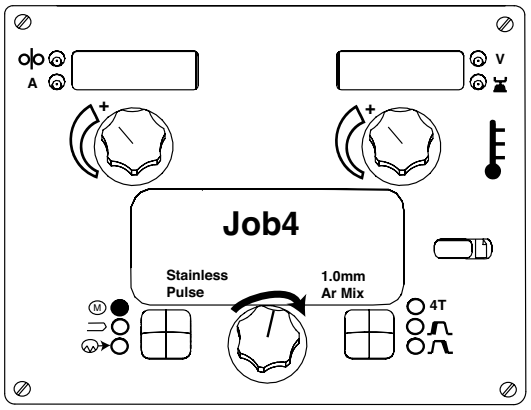
Limits may be set for:
- Wire Feed Speed/Amperage
- Voltage/Trim
- UltimArc™ Control

Weld modes cannot be selected through the Limits Setup menu, and must be chosen and saved to memory before entering the Limits Setup Menu.

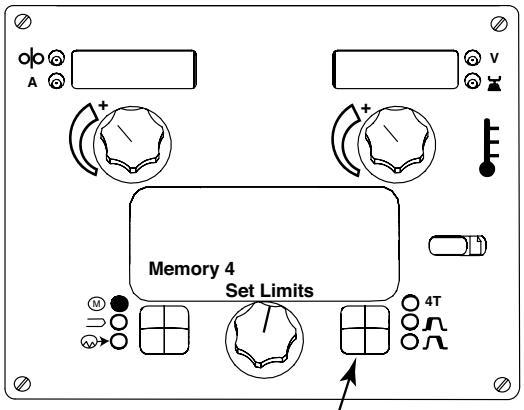
Press the Left Push Button until Memory 'M' LED is illuminated.



Press and turn center knob to cycle to desired memory.

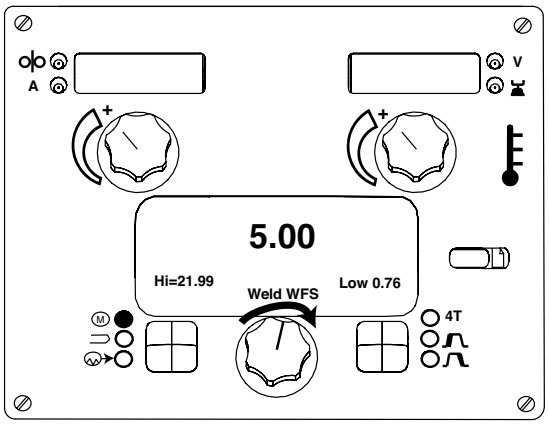


Press and hold right button for 5 seconds. The Set Limits Menu will be active.

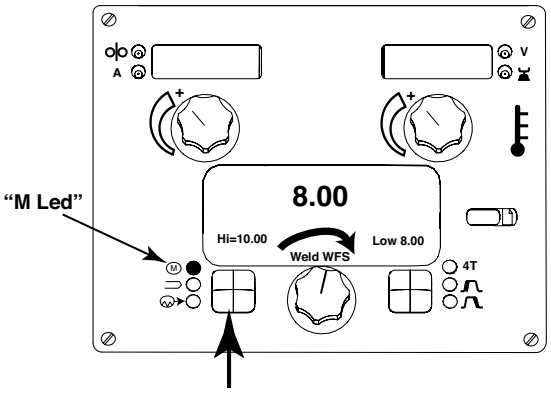


Press and Hold right button for 5 second. Limits is active.

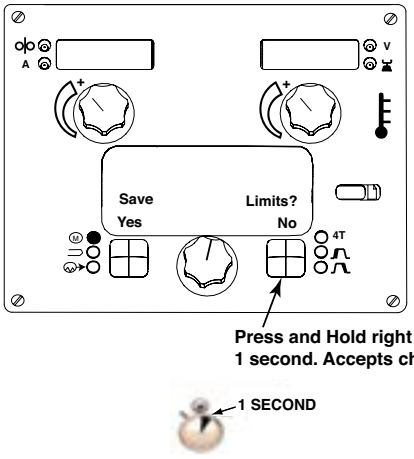
1. Press and turn center knob to select parameter to be set (WFS, Voltage, Trim)



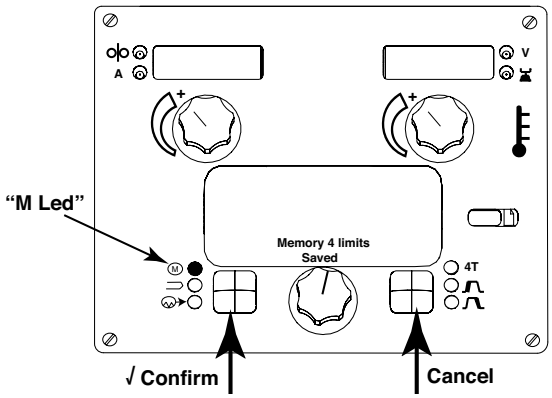
2. Press the Left pushbutton to select the limit to be set (High, Nominal, Low). The selected value will blink. Press and turn center knob to desired setting.



3. Once all limits have been set, press and hold the right push button for 1 second, release to accept changes.



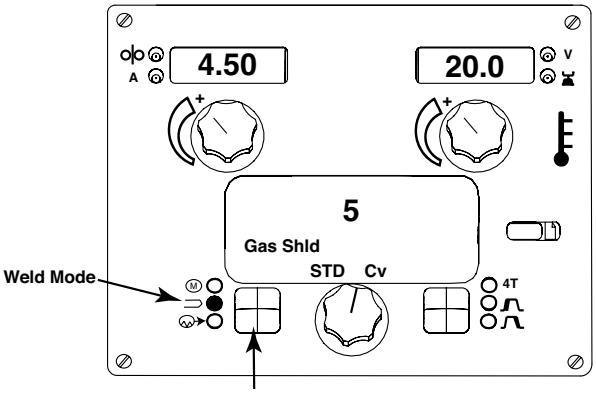
4. Press the left push button to confirm changes (or press the right push button to cancel).



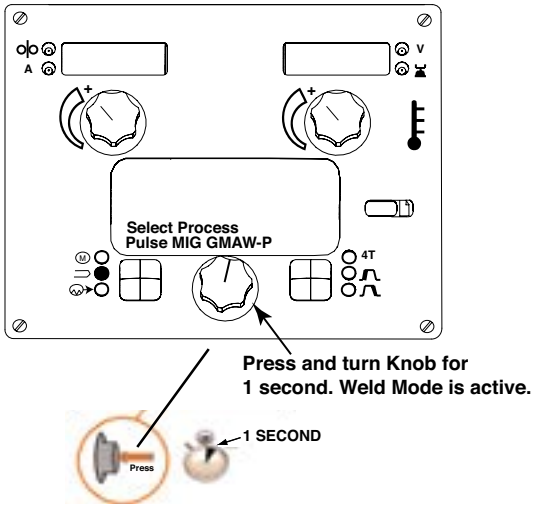
WELD MODE SEARCH

The Weld Mode search function allows for a particular mode to be selected based on the process, wire type and wire size.

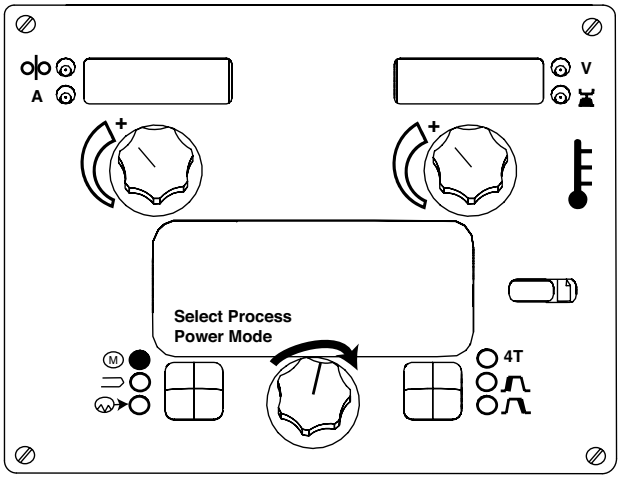
1. Press the Left Push Button until Weld Mode LED is illuminated.



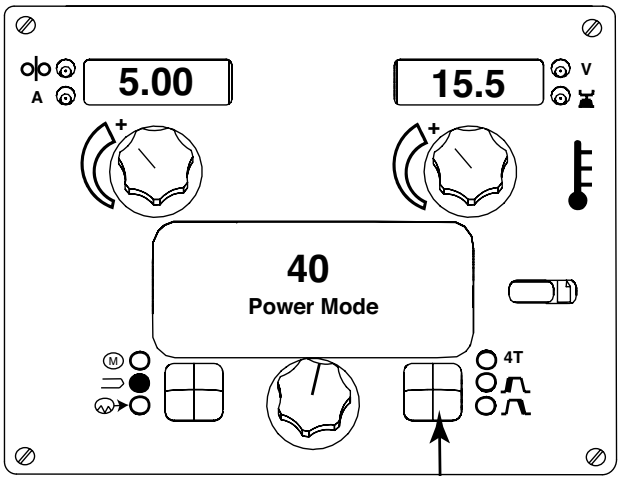
2. Press and turn the center knob until display reads weld mode search then release the center knob. The Weld Mode search menu will be active.



3. Press and turn center knob to cycle to desired process.



4. Press the right Push Button to select the process. If necessary, repeat steps 3 and 4 to select wire type, wire size, and final selection.

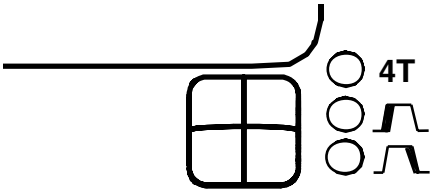


2-STEP 4-STEP- TRIGGER OPERATION

The **2-Step - 4-Step** switch changes the function of the gun trigger. **2-Step** trigger operation switches the welding output ON-OFF in direct response to the trigger. **4-Step** trigger operation provides 'trigger interlock' capability and gives the ability to control the amount of time spent in the arc start and arc crater steps.

Press the right push button on the case front to toggle between **2-Step** and **4-Step** operation.

The **2-Step, 4-Step** trigger has no effect when welding with SMAW or CAG procedures.



2-Step Trigger

2-Step trigger operation is the most common. When the gun trigger is pulled, the welding system (power source and wire feeder) cycles through the arc starting sequence and into the main welding parameters. The welding system will continue to weld as long as the gun trigger is activated. Once the trigger is released, the welding system cycles through the arc ending steps

4-Step Trigger

4-Step trigger operation gives the welder additional control in the welding sequence. **4-Step** trigger allows the welder to choose the arc start, weld and arc end time. It may also be set-up to work as a trigger interlock.

EXAMPLE 1 - 2 STEP TRIGGER: Simple operation
The simplest trigger operation occurs with a 2 Step trigger and the Start, Crater and Burnback functions all set to OFF. (See Figure B.11)

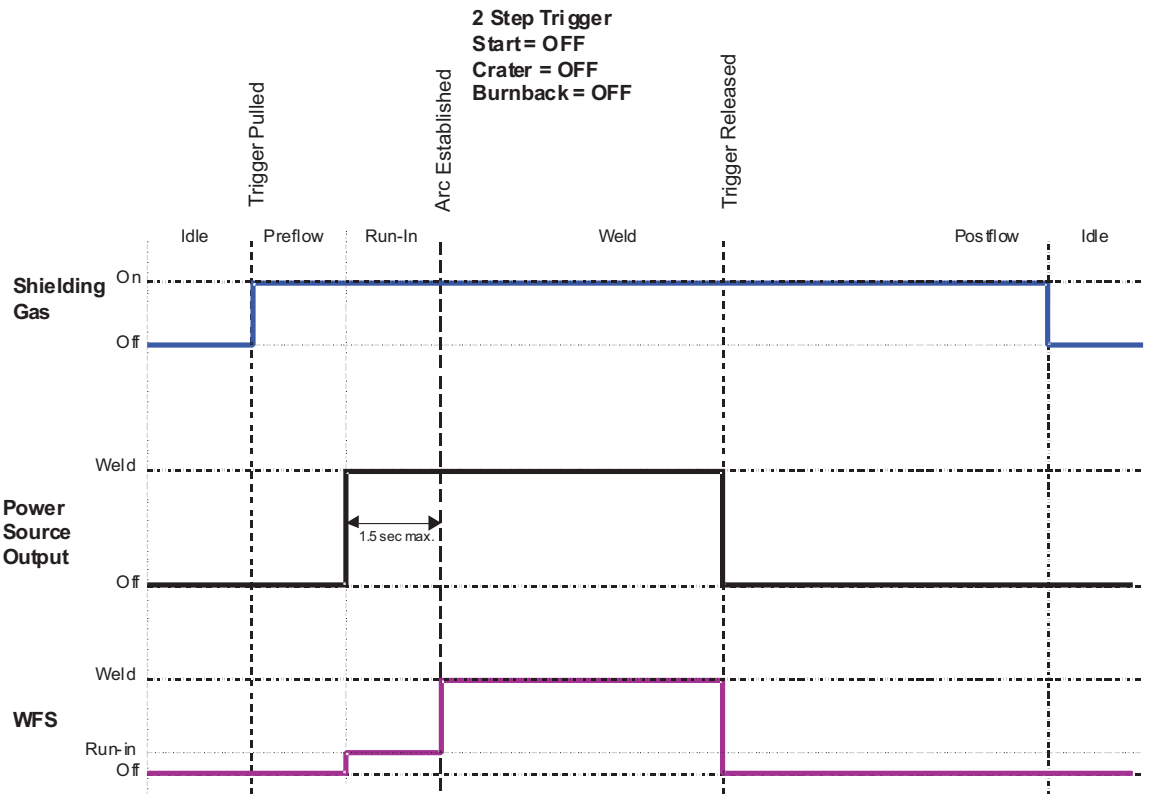
For this sequence,
PREFLOW:
Shielding gas begins to flow immediately when the gun trigger is pulled.

RUN-IN:
After preflow time expires, the power source regulates to the welding output and wire is advanced towards the work piece at the Run-In WFS. If an arc is not established within 1.5 seconds, the wire feed speed will jump to the welding wire feed speed

WELD:
The power source output and the wire feed speed continue at the weld settings for as long as the trigger is pulled.

POSTFLOW: As soon as the trigger is released, the power source output and the wire feed speed are turned OFF. Shielding gas continues until the post flow timer expires.

FIGURE B.11



EXAMPLE 2 - 2 STEP TRIGGER: Improved Arc Start and Arc End. Tailoring the arc start and arc end is a common method for reducing spatter and improving weld quality. This can be accomplished with the Start and Burnback functions set to a desired values and Crater set to OFF. (See Figure B.12)

For this sequence,

PREFLOW:
Shielding gas begins to flow immediately when the gun trigger is pulled.

RUN-IN:
After preflow time expires, the power source regulates to the start output and wire is advanced towards the work piece at the Run-In WFS. If an arc is not established within 1.5 seconds, the power source output and wire feed speed skips to the weld settings.

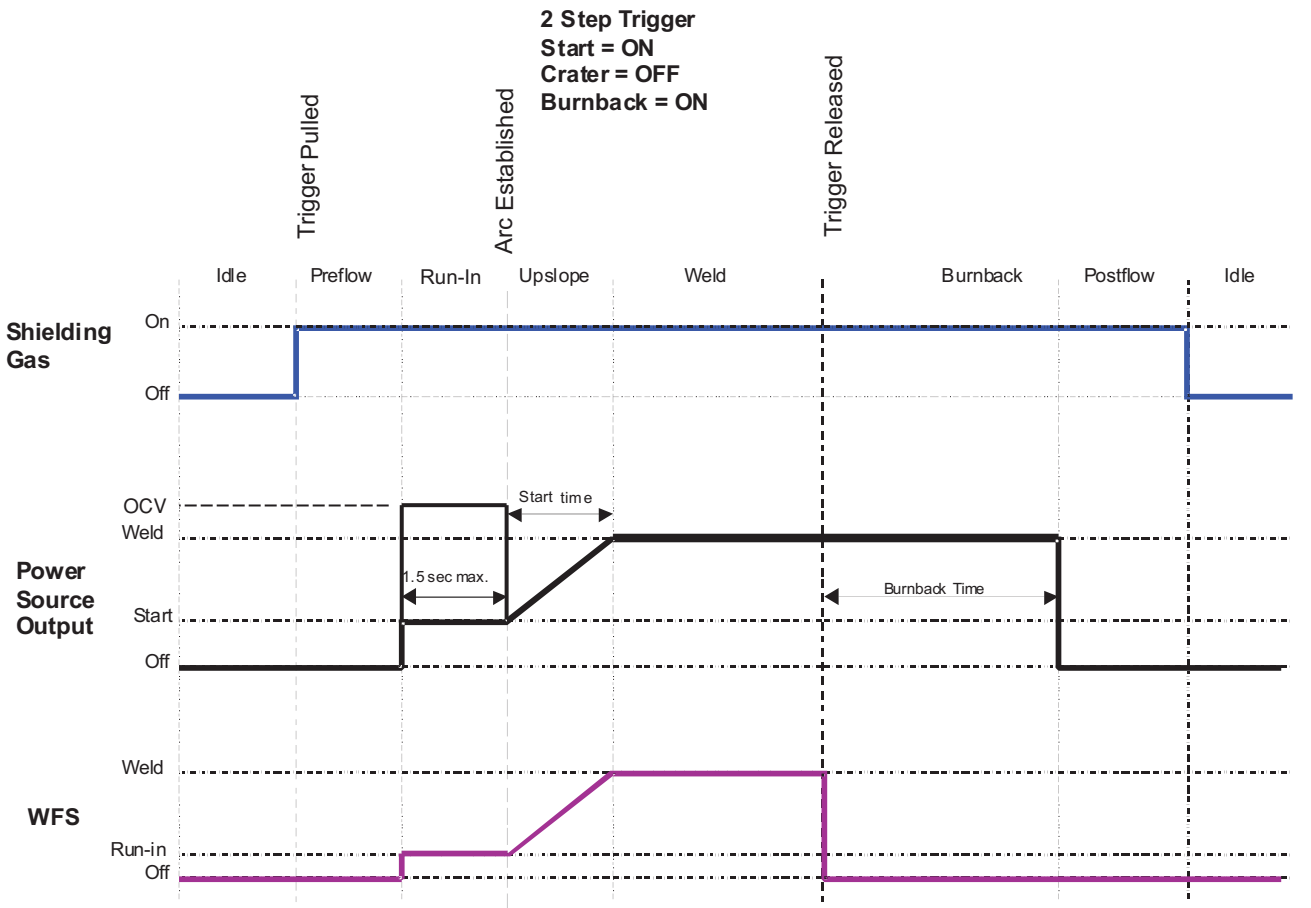
UPSLOPE:
Once the wire touches the work and an arc is established, both the machine output and the wire feed speed ramp to the weld settings throughout the start time. The time period of ramping from the start settings to the weld settings is called UPSLOPE.

WELD:
After upslope, the power source output and the wire feed speed continue at the weld settings.

BURNBACK:
As soon as the trigger is released, the wire feed speed is turned OFF and the machine output continues for the burnback time.

POSTFLOW:
Next, the machine output is turned OFF and shielding gas continues until the post flow timer expires.

FIGURE B.12



EXAMPLE 3 - 2 STEP TRIGGER: Customized Arc Start, Crater and Arc End. Sometimes it is advantageous to set specific arc start, crater and arc ending parameters for the ideal weld. Many times when welding aluminum crater control is necessary to make a good weld. This is done by setting Start, Crater and Burnback functions to desired values. (See Figure B.13)

For this sequence,

PREFLOW:
Shielding gas begins to flow immediately when the gun trigger is pulled.

RUN-IN:
After preflow time expires, the power source regulates to the start output and wire is advanced towards the work piece at the Run-In WFS. If an arc is not established within 1.5 seconds, the power source output and wire feed speed skips to the weld settings.

START & UPSLOPE:
As soon as the trigger is pulled, this starts preflow. The Strike arc established, Start time, and Upslope parameters are used at the beginning of the weld sequence to establish a stable arc and provide a smooth transition to the weld settings.

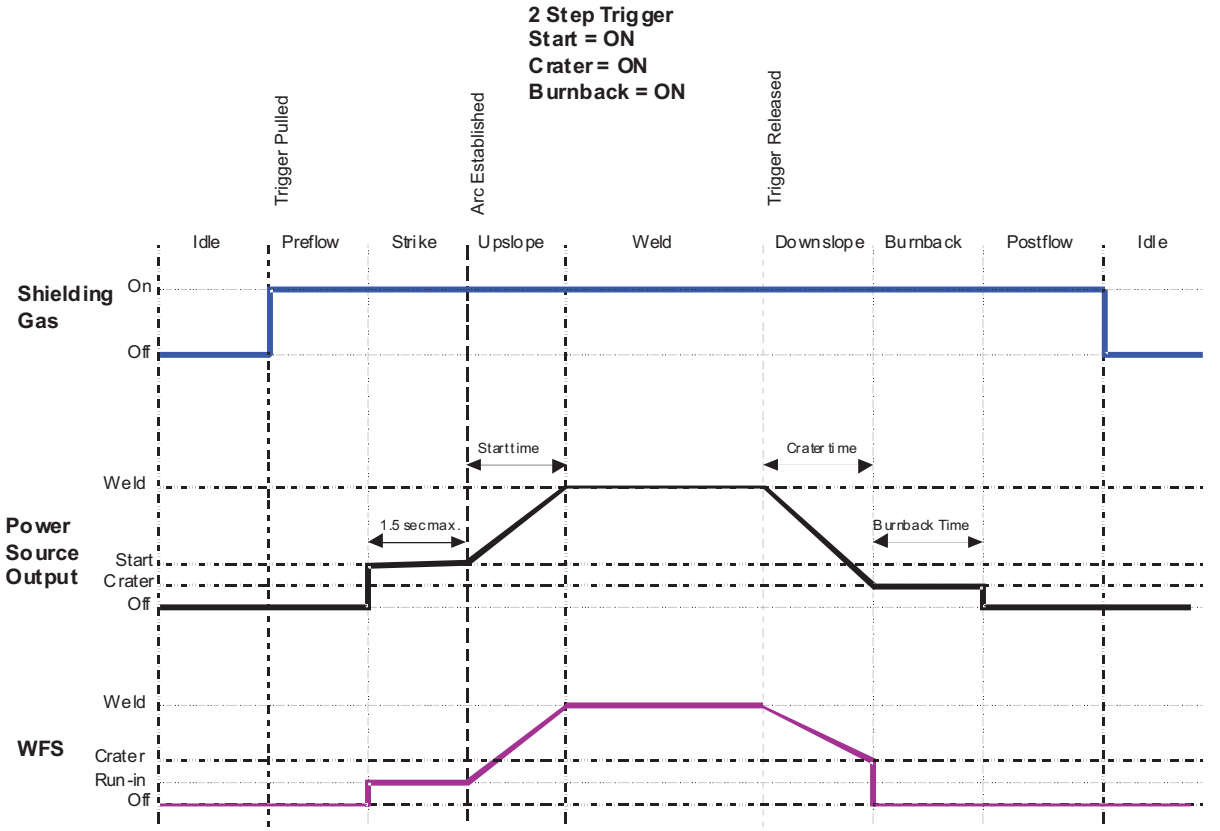
WELD:
After upslope, the power source output and the wire feed speed continue at the weld settings.

CRATER & DOWNSLOPE:
As soon as the trigger is released, the wire feed speed and power source output ramp to the crater settings throughout the crater time. The time period of ramping from the weld settings to the crater settings is called DOWNSLOPE.

BURNBACK:
After the crater time expires, the wire feed speed is turned OFF and the machine output continues for the burnback time.

POSTFLOW:
Next, the machine output is turned OFF and shielding gas continues until the post flow timer expires.

FIGURE B.13



EXAMPLE 4 – 4 STEP TRIGGER: Trigger Interlock
The 4 step trigger can be configured as a trigger interlock. Trigger interlock adds to the welder's comfort when making long welds by allowing the trigger to be released after an initial trigger pull. Welding stops when the trigger is pulled a second time and then released, or if the arc is interrupted. (See Figure B.14)

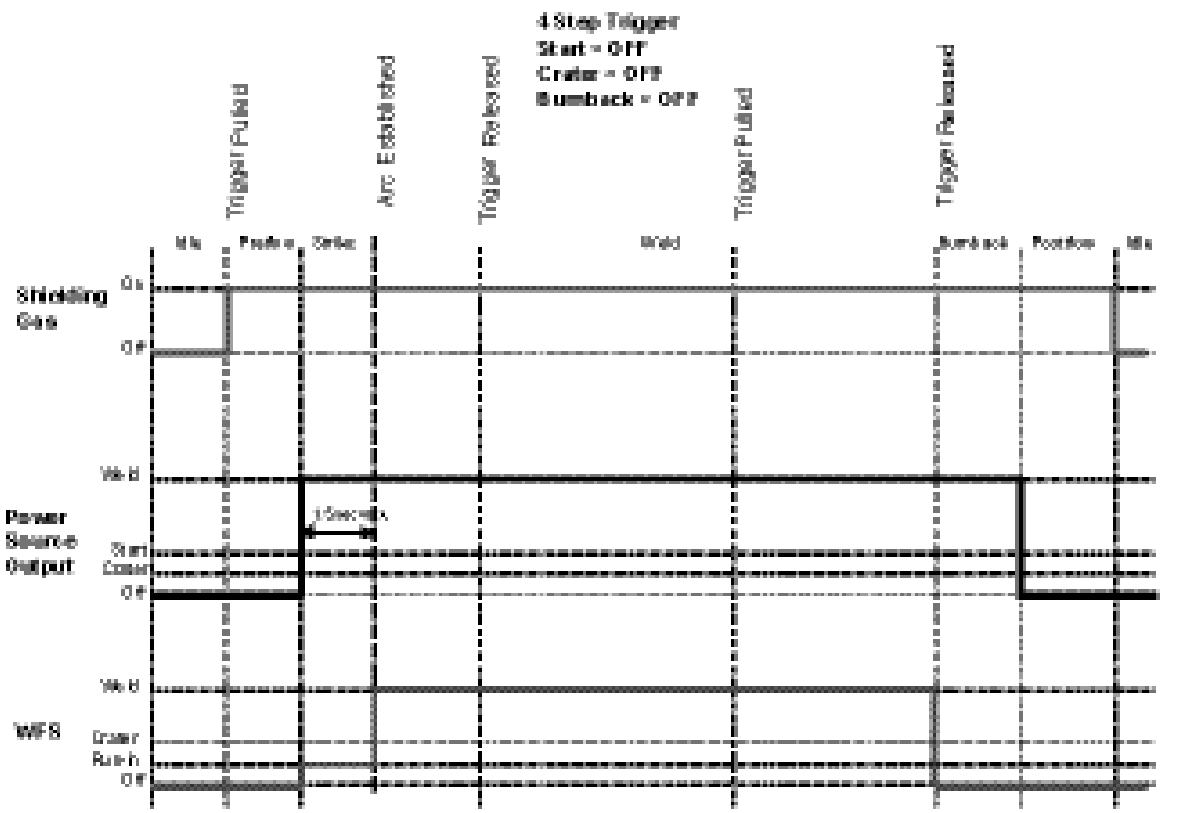
For this sequence,
PREFLOW:
Shielding gas begins to flow immediately when the gun trigger is pulled.

RUN-IN:
After preflow time expires, the power source regulates to the welding output and wire is advanced towards the work piece at the Run-In WFS. If an arc is not established within 1.5 seconds, the wire feed speed will jump to the welding wire feed speed.

WELD:
The power source output and the wire feed speed continue at the weld settings. Welding continues when the trigger is pulled a second time.

POSTFLOW:
As soon as the trigger is released for the second time, the power source output and the wire feed speed are turned OFF. Shielding gas flows until the post flow timer expires.

FIGURE B.14



EXAMPLE 5 - 4 STEP TRIGGER: Manual control of Start and Crater times with Burnback ON. The 4 step trigger sequence gives the most flexibility when the Start, Crater and Burnback functions are active. This is a popular choice when welding aluminum because extra heat may be needed during Start and less heat desired during crater. With 4 step trigger, the welder chooses the amount of time to weld at the Start, Weld and Crater settings by using the gun trigger. Burnback reduces the occurrence of wire to sticking into the weld pool at the end of a weld and conditions the end of the wire for the next arc start. (See Figure B.15)

In this sequence,

PREFLOW:
Shielding gas begins to flow immediately when the gun trigger is pulled.

RUN-IN:
After preflow time expires, the power source regulates to the start output and wire is advanced towards the work piece at the run-in WFS. If an arc is not established within 1.5 seconds, the power source output and wire feed speed skips to the weld settings.

START:
The power source welds at the start WFS and voltage until the trigger is released.

UPSLOPE:
During upslope, the power source output and the wire feed speed ramp to the weld settings throughout the start time. The time period of ramping from the start settings to the weld settings is called UPSLOPE.

WELD:
After upslope, the power source output and the wire feed speed continue at the weld settings.

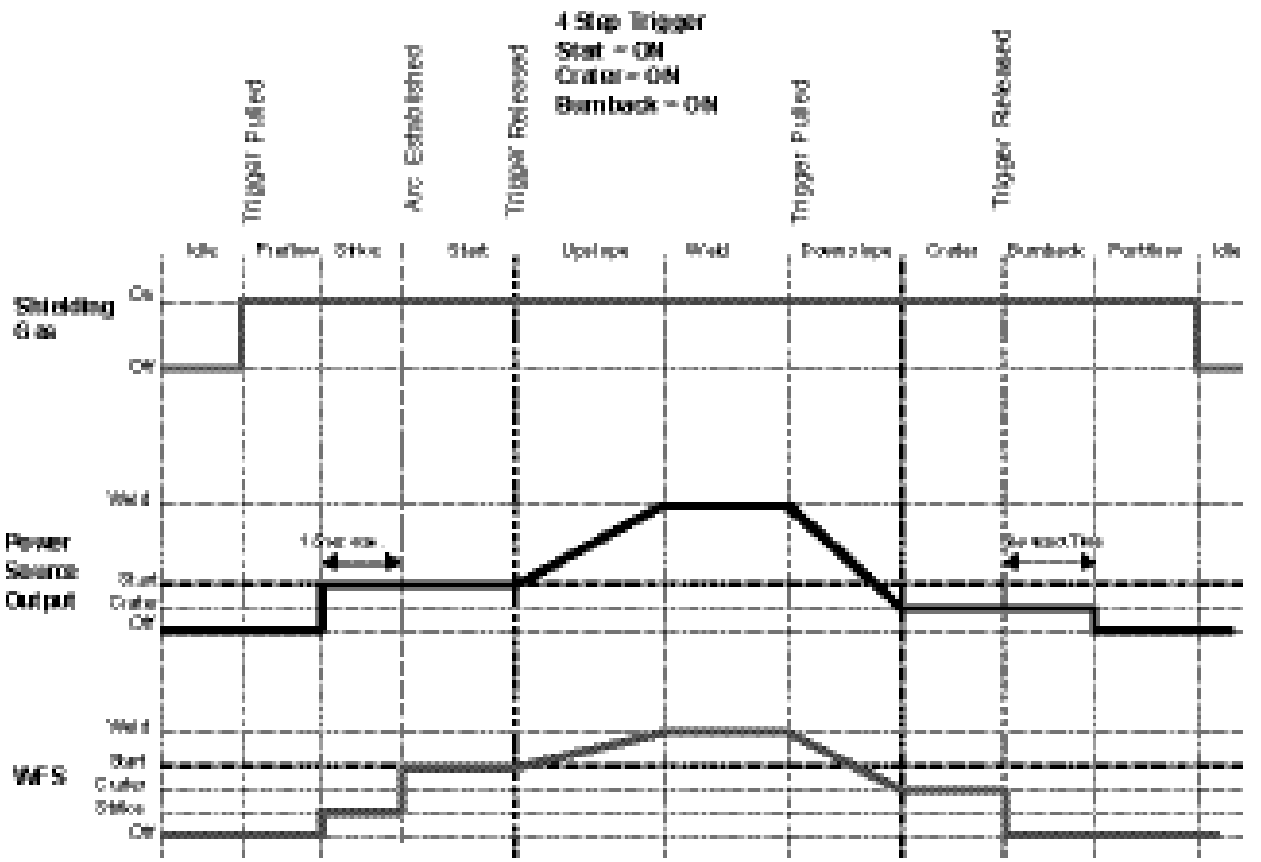
DOWNSLOPE:
As soon as the trigger is pulled, the wire feed speed and power source output ramp to the crater settings throughout the crater time. The time period of ramping from the weld settings to the crater settings is called DOWNSLOPE.

CRATER:
During CRATER, the power source continues to supply output at the crater WFS and voltage.

BURNBACK:
When the trigger is released, the wire feed speed is turned OFF and the machine output continues for the burnback time.

POSTFLOW:
Next, the machine output is turned OFF and shielding gas continues until the post flow timer expires.

FIGURE B.15



MAINTENANCE

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Do not operate with covers removed.**
- **Turn off power source before installing or servicing.**
- **Do not touch electrically hot parts.**
- **Turn the input power to the welding power source off at the fuse box before working in the terminal strip.**

- **Only qualified personnel should install, use or service this equipment.**

ROUTINE MAINTENANCE

- Check weld cables, control cables and gas hoses for cuts.
- Clean and tighten all weld terminals.

CALIBRATION SPECIFICATION

All calibrations are factory set on the POWER FEED® 8 NNS.

To verify the wire feed speed:

- Assemble a .045 (1.2mm) drive roll kit into the wire feeder.
- Load a spool of .045 (1.2mm) electrode and thread the electrode through the wire drive.
- Adjust the wire feed speed to 300 in/min (7.62m/min).
- Press the COLD FEED switch and measure the actual wire feed speed with a calibrated wire feed speed tachometer.
- The measured wire feed speed should be within 2% of the set value.

To verify the voltage display:

- Set the welding power source and POWER FEED® PENDANT to a CV procedure that gives steady “spray” transfer in the arc.
- While a weld is being made, measure the voltage from the feed plate to work with a calibrated volt meter.
- The displayed voltage on the POWER FEED® PENDANT should be within 2% of the measured value.

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.

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

Observe all Safety Guidelines detailed throughout this manual		
PROBLEMS (SYMPTOMS)	**POSSIBLE CAUSE**	**RECOMMENDED COURSE OF ACTION**
LINC-NET SYSTEM ERROR CODES		
Err 006	1. The wire feeder has not received a recognition command from the power source.	1. Verify the power source is operating properly. (Status light steady green.) 2. Check control cable for loose or broken leads. 3. See power source Instruction Manual.
Err 100	1. The power source has issued a shutdown command.	1. Verify the power source is operating properly (Status light steady green.) 2. Check control cable for loose or broken leads. 3. See power source Instruction Manual.
ARCLINK SYSTEM ERROR CODES		
Err 53 Voltage sense loss.		
Err 81 Motor overload, long term.	1. The wire drive motor has overheated.	1. Check that the electrode slides easily through the gun and cable. 2. Remove tight bends from the gun and cable. 3. Check that the spindle brake is not too tight. 4. Verify a high quality electrode is being used. 5. Wait for the error to reset and the motor to cool. (approximately 1 minute).
Err 82 Motor overload, short term.	1. The wire drive motor current draw has exceeded limits, usually because the motor is in a locked rotor state.	1. Check that motor can turn freely when idle arm is open. 2. Verify that the gears are free of debris and dirt.
Err 95 Spool gun or pull gun motor overload.	1. The drive motor in the spool gun or push-pull gun is drawing too much current.	1. Check that the wire moves freely through the gun when the gun is straight. 2. Verify the correct size contact tip is installed in the gun.
Err 263 No usable weld modes.	1. The power source does not have any welding programs loaded.	1. See the power source Instruction Manual for load welding programs.

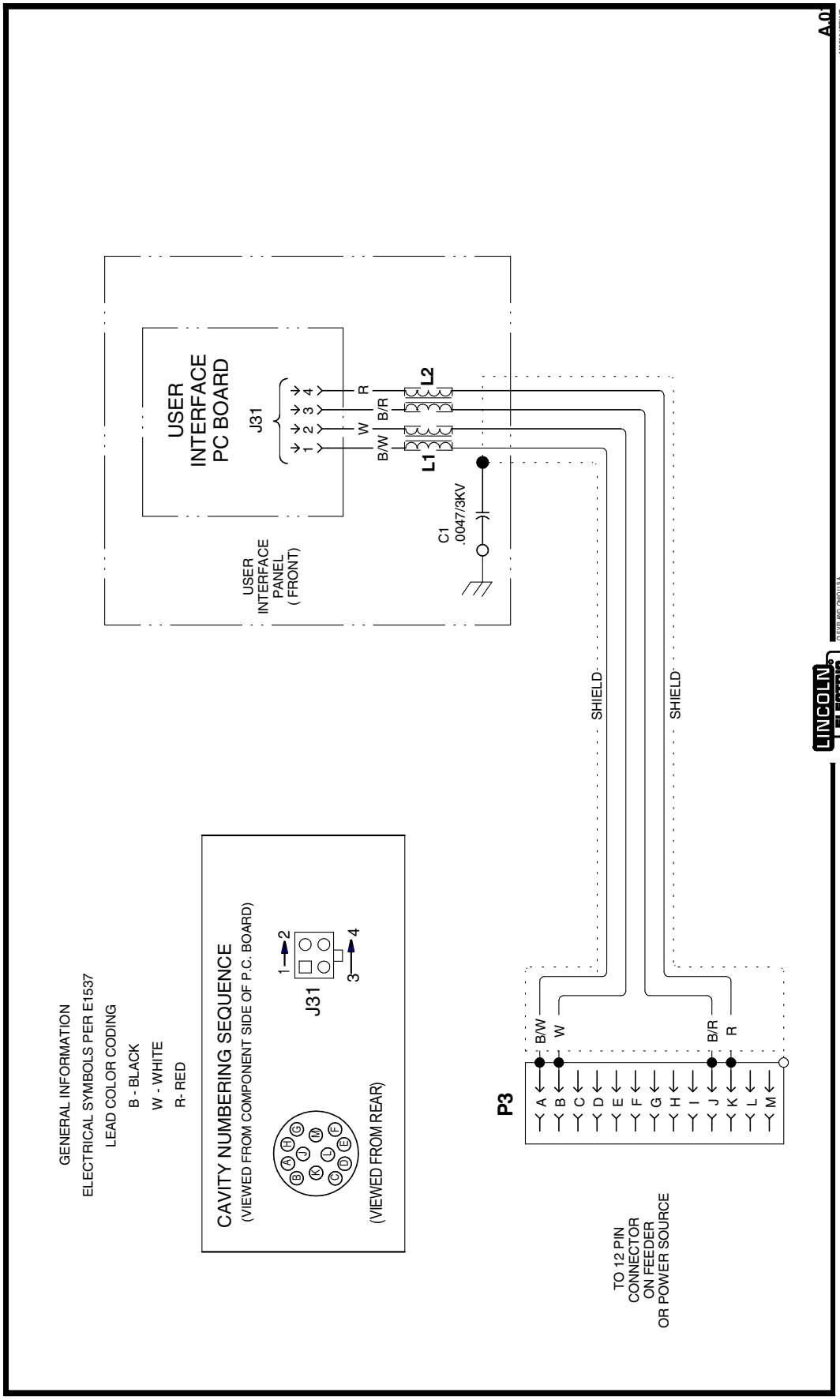
If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.
WWW.LINCOLNELECTRIC.COM/LOCATOR

Observe all Safety Guidelines detailed throughout this manual		
PROBLEMS (SYMPTOMS)	**POSSIBLE CAUSE**	**RECOMMENDED COURSE OF ACTION**
OUTPUT PROBLEMS		
The feeder does power up - no display, no cold feed.	1. The Power Wave power source is OFF. 2. The circuit breaker for the wire feeder on power source have tripped. 3. The control cable may be loose or damaged. 4. The power switch is damaged.	1. Turn ON the Power Wave power source. 2. Reset the circuit breakers. 3. Tighten, repair or replace the control cable. 4. Replace the power switch.
No shielding gas.	1. The gas supply is OFF or empty. 2. The gas hose is cut or crushed. 3. Dirt or debris is in the solenoid. 4. There is a loose solenoid connection or the solenoid has failed. 5. The solenoid has failed.	1. Verify the gas supply is ON and flowing. 2. Route the gas hose so it avoids sharp corners and make sure nothing is on top of it. Repair or replace damaged hoses. 3. Apply filtered shop at 80psi to the solenoid to remove dirt. 4. Remove the cover and check that all connections are in good condition. 5. Replace the solenoid.
Inconsistent wire feeding or wire not feeding but drive rolls turning.	1. The gun cable is kinked and/or twisted. 2. The wire is jammed in the gun and cable. 3. The gun liner is dirty or worn. 4. The electrode is rusty or dirty. 5. The contact tip is partially melted or has spatter. 6. Improper gun liner, tip, drive rolls and/or inner wire guide. 7. Incorrect tension arm pressure on the drive rolls. 8. Worn drive roll.	1. Keep the gun cable as straight as possible. Avoid sharp corners or bends in the cable. 2. Remove the gun from the wire feeder and pull the jammed wire out of the gun and cable. 3. Blow dirt out of the liner with low pressure (40psi or less). Replace the liner if worn. 4. Use only clean electrode. Use quality electrode, like L-50 or L-56 from Lincoln Electric. 5. Replace the contact tip. 6. Verify the proper parts are installed. 7. Adjust the tension arm per the Instruction Manual. Most electrodes feed well at a tension arm setting of “3”. 8. Replace the drive rolls if worn or filled with dirt.

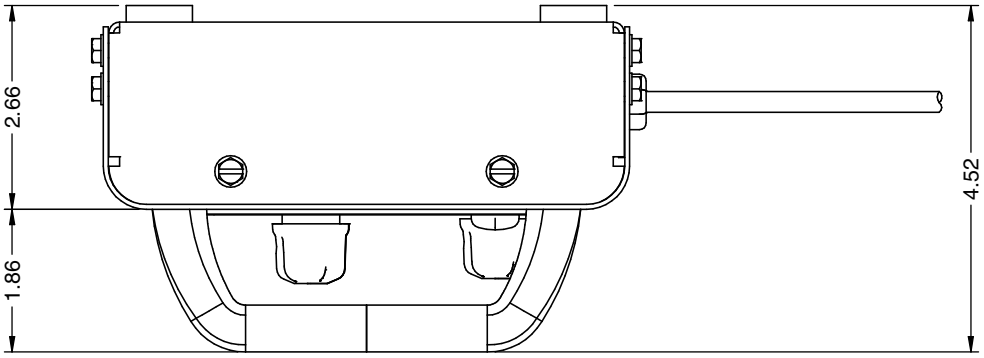
If for any reason you do not understand the test procedures or are unable to perform the tests/repairs safely, contact your Lincoln Authorized Service Facility for technical troubleshooting assistance before you proceed.

WWW.LINCOLNELECTRIC.COM/LOCATOR

Observe all Safety Guidelines detailed throughout this manual		
	POSSIBLE CAUSE	
OUTPUT PROBLEMS		
Wire feed speed consistently operates at the wrong value.	Poor arc starts with sticking or “blast-offs”, weld porosity, narrow and ropy looking bead.	1. Verify the feeder software setting matches the gear mounted. See the Instruction Manual for setting the gear speed.
Variable or “hunting” arc.	1. Wrong size, worn and/or melted contact tip. 2. Worn work cable or poor work connection. 3. Wrong polarity. 4. The gas nozzle is extended beyond the contact tip or the wire stickout is too long. 5. Poor gas shielding on processes requiring gas.	1. Replace the contact tip. 2. Verify all work and electrode connections are tight and that the cables are in good condition. Clean/replace as necessary. 3. Adjust polarity to the recommended procedure. 4. Adjust the gas nozzle and shorten the stickout to 3/8 to 1/2 inches. 5. Check gas flow and mixture. Remove or block sources of drafts.
Poor arc starts with sticking or “blast-offs”, weld porosity, narrow and ropy looking bead.	1. Improper procedures or techniques.	1. See “Gas Metal Arc Welding Guide”. (GS-100).
The wire feed speed/amperage and voltage/trim display work during preset but show nothing during welding.	1. The software in the POWER FEED® PENDANT must be upgraded.	1. Contact the local authorized Lincoln Field Service Shop.



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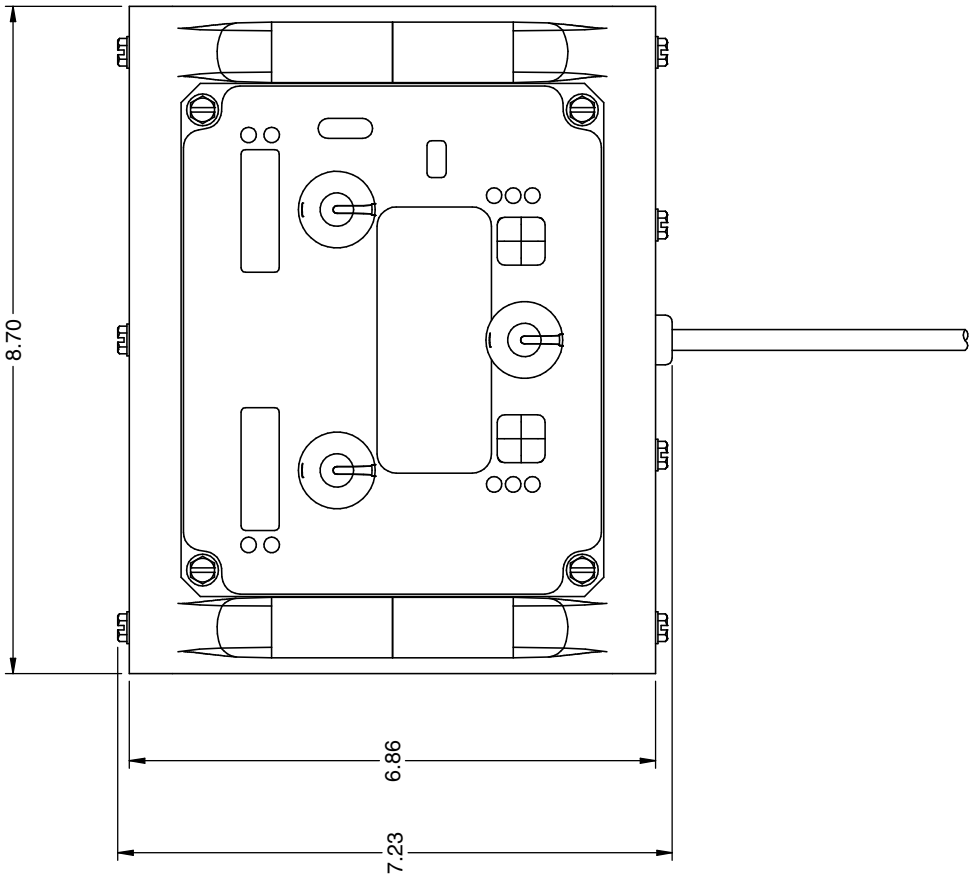
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WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes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

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

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

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

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

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

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

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

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

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

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

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 for any updated information.

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