



Product Description	VPAC
MK Manual Part Number	091-0422
MK Form Number	VPAC/OM
NWSA Form Number	550
Effective with Serial Number	3125
Voltage Ratings	120VAC
Print/Revision Date	9/98
This manual applies to the following Model Numbers	VPAC

# ***VPAC*** ***Variable Polarity – AC***

## **OWNERS MANUAL**



VPAC shown with ACL®



# SAFETY CONSIDERATIONS

## ELECTRIC ARC WELDING EQUIPMENT

### CAUTION : READ BEFORE ATTEMPTING INSTALLATION, OPERATION OR MAINTENANCE OF THIS EQUIPMENT

#### 1-1 INTRODUCTION

This equipment is intended for ultimate application by commercial/industrial users and for operation by persons trained and experienced in the use and maintenance of welding equipment. Operation should not be undertaken without adequate training in the use of such equipment. Training is available from many public and private schools or similar facilities.

Safe practices in the installation, operation and maintenance of this equipment requires proper training in the art, a careful study of the information provided with the equipment, and the use of common sense. Rules for safe use are generally provided by suppliers of welding power sources, compressed gas suppliers, and electrode suppliers. Careful compliance with these rules will promote safe use of this equipment.

The following Safety Rules cover some of the more generally found situations. READ THEM CAREFULLY. In case of any doubt, obtain qualified help before proceeding.

#### 1-2 GENERAL PRECAUTIONS

##### A. Burn Prevention

ELECTRIC ARC WELDING PRODUCES HIGH INTENSITY HEAT AND ULTRAVIOLET RADIANT ENERGY WHICH MAY CAUSE SERIOUS AND PERMANENT EYE DAMAGE AND WHICH MAY DAMAGE ANY EXPOSED SKIN AREAS.

Wear helmet with safety goggles or glasses with side shields underneath, appropriate filter lenses or plates (protected by clear cover glass). This is a must for welding or cutting (and chipping) to protect the eyes from radiant energy and flying metal. Replace cover glass when broken, pitted, or spattered.

Medical first aid and eye treatment. First aid facilities and a qualified first aid person should be available for each shift unless medical facilities are close by for immediate treatment of flash burns of the eyes and skin burns.

Wear protective clothing - leather (or asbestos) gauntlet gloves, hat, and high safety-toe shoes. Button shirt collar and pocket flaps, and wear cuffless trousers to avoid entry of sparks and slag.

Avoid oily or greasy clothing. A spark may ignite them.

Flammable hair preparations should not be used by persons intending to weld or cut.

Hot metal such as electrode stubs and work pieces should never be handled without gloves.

Ear plugs should be worn when working on overhead or in a confined space. A hard hat should be worn when others work overhead.

##### B. Toxic Fume Prevention

Adequate ventilation. Severe discomfort, illness or death can result from fumes, vapors, heat, or oxygen enrichment or depletion that welding (or cutting) may

produce. Prevent them with adequate ventilation. NEVER ventilate with oxygen.

Lead-, cadmium-, zinc-, mercury-, beryllium-bearing and similar materials, when welded or cut, may produce harmful concentrations of toxic fumes. Adequate local exhaust ventilation must be used, or each person in the area, as well as the operator, must wear an air-supplied respirator. For beryllium, both must be used.

Metals coated with or containing materials that emit toxic fumes should not be heated unless coating is removed from the work surface, the area is well ventilated, or the operator wears an air-supplied respirator.

Work in a confined space only while it is being ventilated and, if necessary, while wearing an air-supplied respirator.

Gas leaks in a confined space should be avoided. Leaked gas in large quantities can change oxygen concentration dangerously. Do not bring gas cylinders into a confined space.

Leaving confined space, shut OFF gas supply at source to prevent possible accumulation of gases in the space if downstream valves have been accidentally opened or left open. Check to be sure that the space is safe before reentering it.

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

##### C. Fire and Explosion Prevention

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

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

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

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

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

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

1. Appreciable combustibles (including building construction) are within 35 feet.
2. Appreciable combustibles are further than 35 feet, but can be ignited by sparks.
3. Openings (concealed or visible) in floors or walls within 35 feet may expose combustibles to sparks.
4. Combustibles adjacent to walls, ceilings, roofs, or metal partitions can be ignited by radiant or conducted heat.

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

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

An empty container that held combustibles, or that can produce flammable or toxic vapors when heated, must never be welded on or cut, unless container has first been cleaned in accordance with industry standards.

This includes: a thorough steam or caustic cleaning (or a solvent of water washing, depending on the combustible's solubility), followed by purging and inerting with nitrogen or carbon dioxide, and using protective equipment.

Water-filling just below working level may substitute for inerting.

A container with unknown contents should be cleaned (see paragraph above). Do NOT depend on sense of smell or sight to determine if it is safe to weld or cut.

Hollow castings or containers must be vented before welding or cutting. They can explode.

Explosive atmospheres. NEVER weld or cut where the air may contain flammable dust, gas, or liquid vapors (such as gasoline).

##### D. Compressed Gas Equipment

The safe handling of compressed gas equipment is detailed in numerous industry publications. The following general rules cover many of the most common situations.

##### 1. Pressure Regulators

Regulator relief valve is designed to protect only the regulator from overpressure; it is not intended to protect any downstream equipment. Provide such protection with one or more relief devices.

Never connect a regulator to a cylinder containing gas other than that for which the regulator was designed.

Remove faulty regulator from service immediately for repair (first close cylinder valve). The following symptoms indicate a faulty regulator:  
Leaks - if gas leaks externally.

Excessive Creep - if delivery pressure continues to rise with downstream valve closed.  
Faulty Gauge - if gauge pointer does not move off stop pin when pressurized, nor returns to stop pin after pressure release.

Repair. Do NOT attempt repair. Send faulty regulators for repair to manufacturer's designated repair center, where special techniques and tools are used by trained personnel.

## 2. Cylinders

Cylinders must be handled carefully to prevent leaks and damage to their walls, valves, or safety devices:

Avoid electrical circuit contact with cylinders including third rails, electrical wires, or welding circuits. They can produce short circuit arcs that may lead to a serious accident. (See 1-3C)

ICC or DOT marking must be on each cylinder. It is an assurance of safety when the cylinder is properly handled.

Identifying gas content. Use only cylinders with name of gas marked on them; do not rely on color to identify gas content. Notify supplier if unmarked. NEVER DEFACE or alter name, number, or other markings on a cylinder. It is illegal and hazardous.

Empties: Keep valves closed, replace caps securely; mark MT; keep them separate from FULLS, and return promptly.

Prohibited use. Never use a cylinder or its contents for other than its intended use, NEVER as a support or roller.

Locate or secure cylinders so they cannot be knocked over.

Passageways and work areas. Keep cylinders clear of areas where they may be stuck.

Transporting cylinders. With a crane, use a secure support such as a platform or cradle. Do NOT lift cylinders off the ground by their valves or caps, or by chains, slings, or magnets.

Do NOT expose cylinders to excessive heat, sparks, slag, and flame, etc. that may cause rupture. Do not allow contents to exceed 55 degrees C (130 degrees F.) Cool with water spray where such exposure exists.

Protect cylinders, particularly valves from bumps, falls, falling objects, and weather. Replace caps securely when moving cylinders.

Stuck valve. Do NOT use a hammer or wrench to open a cylinder valve that cannot be opened by hand. Notify your supplier.

Mixing gases. NEVER try to mix any gases in a cylinder.

NEVER refill any cylinder.

Cylinder fittings should never be modified or exchanged.

## 3. Hose

Prohibited use. Never use hose other than that designed for the specified gas. A general hose identification rule is: red for fuel gas, green for oxygen, and black for inert gases.

Use ferrules or clamps designed for the hose (not ordinary wire or other substitute) as a binding to connect hoses to fittings.

No copper tubing splices. Use only standard brass fittings to splice hose.

Avoid long runs to prevent kinks and abuse. Suspend hose off ground to keep it from being run over, stepped on, or otherwise damaged.

Coil excess hose to prevent kinks and tangles.

Protect hose from damage by sharp edges, and by sparks, slag, and open flame.

Examine hose regularly for leaks, wear, and loose connections. Immerse pressured hose in water; bubbles indicate leaks

Repair leaky or worn hose by cutting area out and splicing. Do NOT use tape.

## 4. Proper Connections

Clean cylinder valve outlet of impurities that may clog orifices and damage seats before connecting regulator. Except for hydrogen, crack valve momentarily, pointing outlet away from people and sources of ignition. Wipe with a clean, lintless cloth. Match regulator to cylinder. Before connecting, check that the regulator label and cylinder marking agree, and that the regulator inlet and cylinder outlet match. NEVER Connect a regulator designed for a particular gas or gases to a cylinder containing any other gas.

Tighten connections. When assembling threaded connections, clean and smooth seats where necessary. Tighten. If connection leaks, disassemble, clean, and retighten, using properly fitting wrench.

Adapters. Use a CGA adapter (available from your supplier) between cylinder and regulator, if one is required. Use two wrenches to tighten adapter marked RIGHT and LEFT HAND threads.

Regulator outlet (or hose) connections may be identified by right hand threads for oxygen and left hand threads (with grooved hex on nut or shank) for fuel gas.

## 5. Pressurizing Steps:

Drain regulator of residual gas through suitable vent before opening cylinder (or manifold valve) by turning adjusting screw in (clockwise). Draining prevents excessive compression heat at high pressure seat by allowing seat to open on pressurization. Leave adjusting screw engaged slightly on single-stage regulators.

Stand to side of regulator while opening cylinder valve.

Open cylinder valve slowly so that regulator pressure increases slowly. When gauge is pressurized (gauge reaches regulator maximum) leave cylinder valve in following position: for oxygen and inert gases, open fully to seal stem against possible leak; for fuel gas, open to less than one turn to permit quick emergency shut-off.

Use pressure charts (available from your supplier) for safe and efficient recommended pressure settings on regulators.

Check for leaks on first pressurization and regularly thereafter. Brush with soap solution. Bubbles indicate leaks. Clean off soapy water after test; dried soap is combustible.

## E. User Responsibilities

Follow all Safety Rules.  
Remove leaky or defective equipment from service immediately for repair. Read and follow user manual instructions.

## F. Leaving Equipment Unattended

Close gas supply at source and drain gas.

## G. Rope Staging-Support

Rope staging-support should not be used for welding or cutting operation; rope may burn.

## 1-3 ARC WELDING

Comply with precautions in 1-1, 1-2, and this section. Arc Welding, properly done, is a safe process, but a careless operator invites trouble. The equipment

carries high currents at significant voltages. The arc is very bright and hot. Sparks fly, fumes rise, ultraviolet and infrared energy radiates, weldments are hot, and compressed gases may be used. The wise operator avoids unnecessary risks and protects himself and others from accidents.

## A. Burn Protection

Comply with precautions in 1-2.

The welding arc is intense and visibly bright. Its radiation can damage eyes, penetrate lightweight clothing, reflect from light-colored surfaces, and burn the skin and eyes. Skin burns resemble acute sunburn; those from gas-shielded arcs are more severe and painful. DON'T GET BURNED; COMPLY WITH PRECAUTIONS.

### 1. Protective Clothing

Wear long-sleeve clothing in addition to gloves, hat, and shoes. As necessary, use additional protective clothing such as leather jacket or sleeves, flameproof apron, and fire-resistant leggings. Avoid outer garments of untreated cotton.

Bare skin protection. Wear dark, substantial clothing. Button collar to protect chest and neck, and button pockets to prevent entry of sparks.

### 2. Eye and Head Protection

Protect eyes from exposure to arc. Eyes may be damaged by radiant energy when exposed to the electric arc, even when not looking in the direction of the arc. Never look at an electric arc without protection.

Welding helmet or shield containing a filter plate shade no. 12 or denser must be used when welding. Place over face before striking arc.

Protect filter plate with a clear cover plate.

Cracked or broken helmet or shield should NOT be worn; radiation can be passed through to cause burns.

Cracked, broken, or loose filter plates must be replaced IMMEDIATELY. Replace clear cover plate when broken, pitted, or spattered.

Flash goggles with side shields MUST be worn under the helmet to give some protection to the eyes should the helmet not be lowered over the face before an arc is struck. Looking at an arc momentarily with unprotected eyes (particularly a high intensity gas-shielded arc) can cause a retinal burn that may leave a permanent dark area in the field of vision.

### 3. Protection of Nearby Personnel

Enclose the welding area. For production welding, a separate room or enclosed bay is best. In open areas, surround the operation with low-reflective, noncombustible screens or panels. Allow for free air circulation, particularly at floor level.

Viewing the weld. Provide face shields for all persons who will be looking directly at the weld.

Others working in area. See that all persons are wearing flash goggles.

Before starting to weld, make sure that screen flaps or bay doors are closed.

## B. Toxic Fume Prevention

Comply with precautions in 1-2B.

Generator engine exhaust must be vented to the outside air. Carbon monoxide can kill.

## C. Fire and Explosion Prevention

Comply with precautions in 1-2C.

Equipment's rated capacity. Do not overload arc welding equipment. It may overheat cables and cause a fire.

Loose cable connections may overheat or flash and cause a fire.

Never strike an arc on a cylinder or other pressure vessel. It creates a brittle area that can cause a violent rupture or lead to such a rupture later under rough handling.

## D. Compressed Gas Equipment

Comply with precautions in 1-2D.

## E. Shock Prevention

**Exposed electrically hot conductors or other bare metal in the welding circuit, or in ungrounded, electrically-HOT**

equipment can fatally shock a person whose body becomes a conductor. DO NOT STAND, SIT, LIE, LEAN ON, OR TOUCH a wet surface when welding without suitable protection.

To protect against shock:

Keep body and clothing dry. Never work in damp area without adequate insulation against electrical shock. Stay on a dry duckboard, or rubber mat when dampness or sweat cannot be avoided. Sweat, sea water, or moisture between body and an electrically HOT part - or grounded metal - reduces the body surface electrical resistance, enabling dangerous and possibly lethal currents to flow through the body.

### 1. Grounding the Equipment

When installing, connect the frames of each unit such as welding power source, control, work table, and water circulator to the building ground. Conductors must be adequate to carry ground currents safely. Equipment made electrically HOT by stray currents may shock, possibly fatally. Do NOT GROUND to electrical conduit, or to a pipe carrying ANY gas or a flammable liquid such as oil or fuel.

Three-phase connection. Check phase requirement of equipment before installing. If only three-phase power is available, connect single-phase equipment to only two wires of the three-phase line. Do NOT connect the equipment ground lead to the third (live) wire, or the equipment will become electrically HOT - a dangerous condition that can shock, possibly fatally.

Before welding, check ground for continuity. Be sure conductors are touching bare metal of equipment frames at connections.

If a line cord with a ground lead is provided with the equipment for connection to a switch box, connect the ground lead to the grounded switch box. If a three-prong plug is added for connection to a grounded mating receptacle, the ground lead must be connected to the ground prong only. If the line cord comes with a three-prong plug, connect to a grounded mating receptacle. Never remove the ground prong from a plug, or use a plug with a broken ground prong.

### 2. Connectors

Fully insulated lock-type connectors should be used to join welding cable lengths.

### 3. Cables

Frequently inspect cables for wear, cracks, and damage. IMMEDIATELY REPLACE those with excessively worn or damaged insulation to avoid possibly lethal shock from bared cable. Cables with damaged areas may be taped to give resistance equivalent to original cable.

Keep cable dry, free of oil and grease, and protected from hot metal and sparks.

### 4. Terminals and Other Exposed Parts

Terminals and other exposed parts of electrical units should have insulating covers secured before operation.

## 5. Electrode Wire

Electrode wire becomes electrically HOT when the power switch of gas metal-arc welding equipment is ON and welding gun trigger is pressed. Keep hands and body clear of wire and other HOT parts.

## 6. Safety Devices

Safety devices such as interlocks and circuit breakers should not be disconnected or shunted out.

Before installation, inspection, or service of equipment, shut OFF all power, and remove line fuses (or lock or red-tag switches) to prevent accidental turning ON of power. Disconnect all cables from welding power source, and pull all 115 volts line-cord plugs.

Do not open power circuit or change polarity while welding. If, in an emergency, it must be disconnected, guard against shock burns or flash from switch arcing. Leaving equipment unattended. Always shut OFF, and disconnect all power to equipment.

Power disconnect switch must be available near the welding power source.



# TABLE OF CONTENTS

INTRODUCTION .....	1
TECHNICAL SPECIFICATIONS.....	1
APPLICATIONS .....	1
INPUT CONNECTIONS .....	1
POWER CORD .....	2
INTERFACE CONTROL CABLE.....	2
WELDHEAD CONTROL .....	2
WELD POWER.....	2
PURGE GAS.....	2
OUTPUT CONNECTIONS .....	3
OPERATION .....	3
POWER UP.....	3
PROCEDURE CONFIGURATION.....	3
PROCEDURE MODIFICATION .....	4
STRAIGHT POLARITY .....	4
REVERSE POLARITY .....	4
SOFTWARE VERSION NOTICE .....	4

## INTRODUCTION

The VPAC (Variable Polarity-Alternating Current) unit, is an accessory to the ACL® Orbital Tube Welding System. Its primary purpose is to provide a means of generating a reverse polarity output to the weldhead electrode.

The ACL® software modification allows the user to program the duration of the interval in which the electrode polarity is reversed. The VPAC uses a MOFSET H-Bridge to accomplish this polarity reversal.

It also provides a means of maintaining the arc during this polarity reversal. This is due to the fact that the arc has a tendency to extinguish during reversal.

## TECHNICAL SPECIFICATIONS

POWER	120VAC +/- 10%, 50/60 Hz, 0.5A
CURRENT CAPABILITY	200 Amps (throughput)
FUSE	1 Amp, 250V (AGC Type)
DIMENSIONS	23"L X 5.8"H* X 13.25"W *Height includes rubber feet.
WEIGHT	25.0 lbs.

## APPLICATIONS

Portions of this manual can be found in the ACL® Operator's Manual. Please consult the ACL® Manual when referencing weld procedure parameters, weldhead size, and any other variables which may affect the welding automatic tube welding system.

### **WARNING**

**Do NOT weld through the VPAC, on any material other than aluminum, using a standard welding procedure. If welding other than aluminum using the VPAC, disconnect the VPAC from the ACL® and connect the weldhead directly to the ACL®.**

**Failure to heed these instructions could cause major damage to the internal components of the VPAC.**

## INPUT CONNECTIONS

All the input power connections can be found on the rear panel of the VPAC. All signals come directly from the ACL® and all the cable connections are made to rear panel of the ACL®.



Even though there are many connections that need to be made between the VPAC and the ACL®, there are only two cable assemblies included: the 120VAC power cord and the Interface Control cable (see Figure 1 for rear panel connection locations).

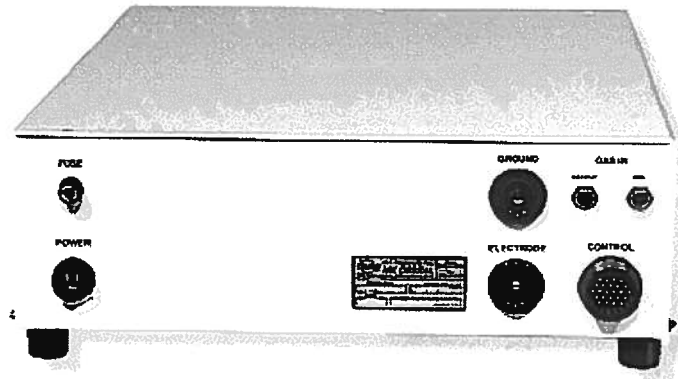


Figure 1

## **POWER CORD**

From the Auxiliary Power connection on the rear panel of the ACL®, attach the 120VAC power cable to the rear panel connector of the VPAC. Each end of the power cord is exclusive to each unit, and the pin orientation is designed to be fail-safe.

## **INTERFACE CONTROL CABLE**

The Interface Control cable is made up of cables and hoses that interface the weldhead control, weld power and purge gas.

Each end of this cable assembly is exclusive to each unit, one end is the ACL® side and the other is the VPAC side.

## **WELDHEAD CONTROL**

The Weldhead Control is the cable with the two 24-pin connectors on each end. The ACL® side uses a male connector (with pins) and the VPAC side uses a female connector (with socket holes).

## **WELD POWER**

These are two welding cables with the push-type, green (ground) and black (electrode), connectors. Each end is mated to fit the appropriate unit.

## **PURGE GAS**

There are two gas hoses that connect between the ACL® and the VPAC: ARC and BACKUP.

The ARC gas hose is used for gas purging of the weldhead and the BACKUP gas hose is for the inside diameter of the component. Each of these hoses is labeled "ARC" and "BACKUP".

## OUTPUT CONNECTIONS

The front panel of the VPAC has a weldhead connection layout very similar to that of the weldhead connection layout on the rear panel of the ACL®. These connections include the weldhead control, weld power and purge gas.

## OPERATION

The *function* of the VPAC is wholly controlled and performed by the operation of the ACL®. There are no switches or buttons nor are there meters or readouts, **all** the VPAC control is performed within the weld procedure program of the ACL®.

### POWER UP

Because of the direct input power connection from the ACL® to the VPAC, when the ACL® is turned ON, the VPAC will automatically power up at the same time. The LED on the front panel will automatically come on indicating power into the VPAC.

As the VPAC powers up, the relays and contactors inside energize causing them to be pulled and "close" to one side. This closing causes a thumping sound from inside the VPAC. This sound is normal and should not be cause for concern.

### PROCEDURE CONFIGURATION

When designing a weld procedure to be used with the VPAC, the Weld Procedure Options in the ACL® program must be configured in such a manner as to enable the programming of the Straight and Reverse Polarities.

Once at the Weld Procedure Options Screen, it displays a list of enabled options which are unique to each and every procedure. The options that appear in GREEN are the currently selected options for the procedure being modified.

At the bottom of this screen under the list of options, is the question "Change Options?" The operator may press either [YES] or [NO]: pressing [NO] will advance the program to the next screen, pressing [YES] will move the cursor to the top of the screen, and begin the modification of this information. As each option is displayed it is highlighted with a question mark following. To enable that particular option press [YES], this will leave that option highlighted in green. If that option is not enabled, by pressing [NO], it will remain in RED.

In order to configure the procedure to accept values for the Straight and Reverse Polarities, the last option [A/C Welding] must be enabled.

Once all the applicable options have been enabled, the screen will show all enabled options highlighted, again with the question at the bottom of the screen "Change Options?". At this point press [NO].

## PROCEDURE MODIFICATION

Refer to the **Software Version Notice** at the end of this section for proper modification instructions.

If the A/C Welding option is enabled at the Procedure Options Screen, each and every level of the procedure must be modified to reflect switching polarities. First of all, each level must have the Low Pulse parameters erased. This is easily done by entering a value of 0.00 seconds in the High Pulse parameter field. When this value is 'entered', all the Low Pulse parameters will disappear. Refer to the example below:

<u>Before Modification</u>	<u>After Modification</u>
High ----- Low	High ----- Low
0.08 Pulse 0.08 Sec	0.00 Pulse ___ Sec
32.5 Curnt 10.8 AMP	32.5 Curnt ___ AMP
3.82 Motor 3.82 RPM	3.82 Motor ___ RPM
Rev ----- Str	Rev ----- Str
___ A/C ___ msec	___ A/C ___ msec

Continue to press the [ENTER] key to accept the High Current amperage value then the High Motor RPM value. When the [ENTER] key is pressed again, the cursor box will move down to the Reverse and Straight Polarity parameter fields.

### STRAIGHT POLARITY

Normal welding of the ACL® is done using Straight Polarity: when the electrical current flow is from the tungsten electrode (positive) to the workpiece (ground). Valid values are from 0.1 milliseconds to 400.0 milliseconds.

Remember, that **each and every level** of the weld procedure must be programmed to show the switching polarities in order to perform a high quality weld, especially on aluminum.

### REVERSE POLARITY

When using Reverse Polarity, the electrical current flow is from the workpiece (ground switched to positive) to the tungsten electrode (positive switched to ground). Valid values are from 0.1 milliseconds to 200.0 milliseconds.

## SOFTWARE VERSION NOTICE

If the software version loaded in the ACL® is prior to 5.71, you must alter the modification process described herein.

When attempting to modify Level 1 of the weld procedure, instead of *erasing* the Low Pulse parameters, they must both be equal - in Pulse Time and in Current Value. This is easily performed by pressing the

[ENTER] key until the cursor box scrolls from the High Pulse parameters to the Low Pulse parameters, once the cursor reaches the Low Current parameter field, enter the value which equals that of the High Pulse parameter field. Refer to the example below for reference:

Prior to Ver. 5.71

High ----- Low  
0.08 Pulse 0.08 Sec  
**32.5** Curnt **32.5** AMP  
3.82 Motor 3.82 RPM  
Rev ----- Str  
\_\_\_ A/C \_\_\_ msec

Ver. 5.71

High ----- Low  
0.00 Pulse \_\_\_ Sec  
32.5 Curnt \_\_\_ AMP  
3.82 Motor \_\_\_ RPM  
Rev ----- Str  
\_\_\_ A/C \_\_\_ msec

**If this modification is not performed correctly, the polarity will fail to start switching and the weld will be performed using Straight Polarity ONLY.**

In an attempt to ease the modification process, you may also install version 5.71 into the ACL®. For a copy of this version software, have the ACL® serial number ready and call MK Customer Service.

# LIMITED WARRANTY

Effective April 1, 1998

**This warranty supersedes all previous MK Products warranties and is exclusive, with no other guarantees or warranties expressed or implied.**

**LIMITED WARRANTY** - MK Products, Inc., Irvine, California warrants that all new and unused equipment furnished by MK Products is free from defect in workmanship and material as of the time and place of delivery by MK Products. No warranty is made by MK Products with respect to trade accessories or other items manufactured by others. Such trade accessories and other items are sold subject to the warranties of their respective manufacturers, if any.

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In the case of MK Products' breach of warranty or any other duty with respect to the quality of any goods, the exclusive remedies therefore shall be at MK Products' option: (1) repair; (2) replacement; (3) where authorized in writing by MK Products, the reasonable cost of repair or replacement at our Irvine, California plant; or (4) payment of or credit for the purchase price (less reasonable depreciation based upon actual use) upon return of the goods at customer's risk and expense. Upon receipt of notice of apparent defect or failure, MK Products shall instruct the claimant on the warranty claim procedures to be followed.

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

1. **Torches and Weldheads** ..... 1 year
2. **All Other Equipment** ..... 3 years
3. **Repairs** ..... 90 days

Classification of any item into the foregoing categories shall be at the sole discretion of MK Products. Notification of any failure must be made in writing within 30 days of such failure.

A copy of the invoice showing the date of sale must accompany products returned for warranty repair or replacement.

All equipment returned to MK Products for service must be properly packaged to guard against damage from shipping. MK Products will not be responsible for any damages resulting from shipping.

Normal surface transportation charges (both ways) for products returned for warranty repair or replacement will be borne by MK Products, except for products sold to foreign markets.

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FORM: LW-8  
DATE: April 1, 1998



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