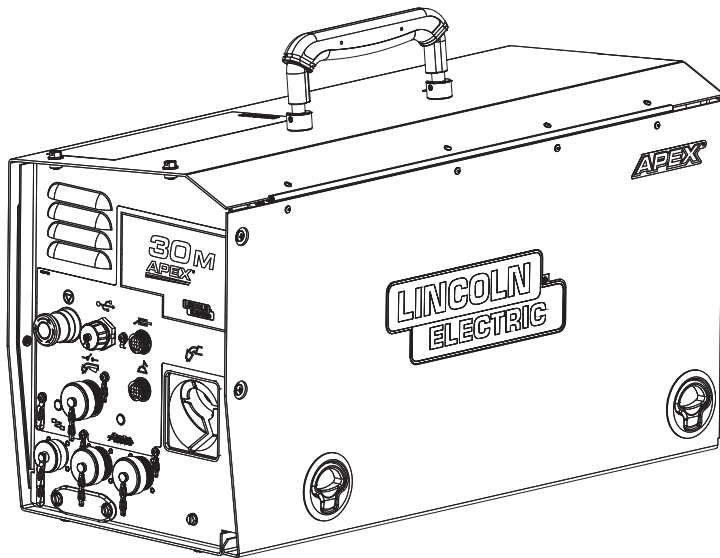


Operator's Manual

APEX[®] 30M



For use with machines having Code Numbers:
12675



Register your machine:
www.lincolnelectric.com/register
Authorized Service and Distributor Locator:
www.lincolnelectric.com/locator

Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

Need Help? Call 1.888.935.3877
to talk to a Service Representative

Hours of Operation:
8:00 AM to 6:00 PM (ET) Mon. thru Fri.

After hours?
Use "Ask the Experts" at lincolnelectric.com
A Lincoln Service Representative will contact you
no later than the following business day.

For Service outside the USA:
Email: globalservice@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.

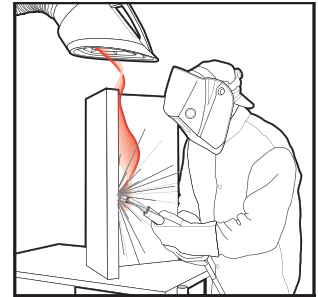
READ and obey the Safety Data Sheet (SDS) and the warning label that appears on all containers of welding materials.

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

Diesel Engines

Diesel engine exhaust and some of its constituents are known to the State of California to cause cancer, birth defects, and other reproductive harm.

Gasoline Engines

The engine exhaust from this product contains chemicals known to the State of California to cause cancer, birth defects, or other reproductive harm.

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

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2-1974. A Free copy of "Arc Welding Safety" booklet E205 is available from the Lincoln Electric Company, 22801 St. Clair Avenue, Cleveland, Ohio 44117-1199.

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



FOR ENGINE POWERED EQUIPMENT.

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



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

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



- 1.d. Keep all equipment safety guards, covers and devices in position and in good repair. Keep hands, hair, clothing and tools away from V-belts, gears, fans and all other moving parts when starting, operating or repairing equipment.



- 1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.
- 1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.
- 1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.
- 1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.



ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS



- 2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines
- 2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.
- 2.c. Exposure to EMF fields in welding may have other health effects which are now not known.
- 2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:
 - 2.d.1. Route the electrode and work cables together - Secure them with tape when possible.
 - 2.d.2. Never coil the electrode lead around your body.
 - 2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
 - 2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.
 - 2.d.5. Do not work next to welding power source.



ELECTRIC SHOCK CAN KILL.



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

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

- Semiautomatic DC Constant Voltage (Wire) Welder.
 - DC Manual (Stick) Welder.
 - AC Welder with Reduced Voltage Control.
- 3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically “hot”.
 - 3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.
 - 3.e. Ground the work or metal to be welded to a good electrical (earth) ground.
 - 3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.
 - 3.g. Never dip the electrode in water for cooling.
 - 3.h. Never simultaneously touch electrically “hot” parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.
 - 3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.
 - 3.j. Also see Items 6.c. and 8.



ARC RAYS CAN BURN.



- 4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87.1 standards.
- 4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.
- 4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.



FUMES AND GASES CAN BE DANGEROUS.



- 5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required. Additional precautions are also required when welding on galvanized steel.**
- 5.b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.
- 5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.
- 5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.
- 5.e. Read and understand the manufacturer's instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer's safety practices. SDS forms are available from your welding distributor or from the manufacturer.
- 5.f. Also see item 1.b.



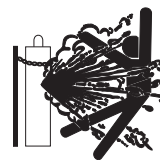
WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



- 6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- 6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- 6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).
- 6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- 6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- 6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- 6.h. Also see item 1.c.
- 6.i. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 02269-9101.
- 6.j. Do not use a welding power source for pipe thawing.



CYLINDER MAY EXPLODE IF DAMAGED.



- 7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.
- 7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.
- 7.c. Cylinders should be located:
 - Away from areas where they may be struck or subjected to physical damage.
 - A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.
- 7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.
- 7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.
- 7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.
- 7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-1, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.



FOR ELECTRICALLY POWERED EQUIPMENT.



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

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

ELECTROMAGNETIC COMPATIBILITY (EMC)

CONFORMANCE

Products displaying the CE mark are in conformity with European Community Council Directive of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (89/336/EEC). It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10

Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

INTRODUCTION

All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc. Be aware that interference may result and extra precautions may be required when a welding power source is used in a domestic establishment.

INSTALLATION AND USE

The user is responsible for installing and using the welding equipment according to the manufacturer's instructions. If electromagnetic disturbances are detected then it shall be the responsibility of the user of the welding equipment to resolve the situation with the technical assistance of the manufacturer. In some cases this remedial action may be as simple as earthing (grounding) the welding circuit, see Note. In other cases it could involve construction of an electro-magnetic screen enclosing the power source and the work complete with associated input filters. In all cases electromagnetic disturbances must be reduced to the point where they are no longer troublesome.

Note: The welding circuit may or may not be earthed for safety reasons according to national codes. Changing the earthing arrangements should only be authorized by a person who is competent to assess whether the changes will increase the risk of injury, e.g., by allowing parallel welding current return paths which may damage the earth circuits of other equipment.

ASSESSMENT OF AREA

Before installing welding equipment the user shall make an assessment of potential electromagnetic problems in the surrounding area. The following shall be taken into account:

- a. other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;
- b. radio and television transmitters and receivers;
- c. computer and other control equipment;
- d. safety critical equipment, e.g., guarding of industrial equipment;
- e. the health of the people around, e.g., the use of pacemakers and hearing aids;
- f. equipment used for calibration or measurement
- g. the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;
- h. the time of day that welding or other activities are to be carried out.

The size of the surrounding area to be considered will depend on the structure of the building and other activities that are taking place. The surrounding area may extend beyond the boundaries of the premises.

METHODS OF REDUCING EMISSIONS

Mains Supply

Welding equipment should be connected to the mains supply according to the manufacturer's recommendations. If interference occurs, it may be necessary to take additional precautions such as filtering of the mains supply. Consideration should be given to shielding the supply cable of permanently installed welding equipment, in metallic conduit or equivalent. Shielding should be electrically continuous throughout its length. The shielding should be connected to the welding power source so that good electrical contact is maintained between the conduit and the welding power source enclosure.

Maintenance of the Welding Equipment

The welding equipment should be routinely maintained according to the manufacturer's recommendations. All access and service doors and covers should be closed and properly fastened when the welding equipment is in operation. The welding equipment should not be modified in any way except for those changes and adjustments covered in the manufacturer's instructions. In particular, the spark gaps of arc striking and stabilizing devices should be adjusted and maintained according to the manufacturer's recommendations.

Welding Cables

The welding cables should be kept as short as possible and should be positioned close together, running at or close to floor level.

Equipotential Bonding

Bonding of all metallic components in the welding installation and adjacent to it should be considered. However, metallic components bonded to the work piece will increase the risk that the operator could receive a shock by touching these metallic components and the electrode at the same time. The operator should be insulated from all such bonded metallic components.

Earthing of the Workpiece

Where the workpiece is not bonded to earth for electrical safety, not connected to earth because of its size and position, e.g., ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the work piece increasing the risk of injury

to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the work piece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding

Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.

1 Portions of the preceding text are contained in EN 60974-10: "Electromagnetic Compatibility (EMC) product standard for arc welding equipment."

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Technical Specifications APEX® 30M

APEX® 30M Control Unit Product Number K52160-1			
Input Power		40 VDC	
Rated Output		24V 9A	
Input Current		10A Max	
Dimensions L x W x H (in.)		25.33 x 11 x 14.33	
Dimensions L x W x H (mm)		644.4 x 279.4 x 363.2	
Net Weight lbs. (kg)		48.5 (22.0)	
Duty Cycle			
@ 500 Amps		60%	
@ 450 Amps		100%	
GEARING			
GMAW		FCAW	
WFS Range	Wire Sizes	WFS Range	Wire Sizes
50 - 1200 ipm (0.8 - 30.5 m/m)	0.023 - 1/16” (0.6 - 1.6 mm)	50 - 1200 ipm (1.3 -30.5 m/min)	0.035 - 5/64” (0.9 - 2.0 mm)
Temperature Ranges			
Operating Temperature Range 32°F to 122°F (0°C - 50°C)		Storage Temperature Range -22°F to 140°F (-30°C - 60°C)	
APEX® 30M Pendant Product Number K52113-1			
Input Power		40 VDC	
Input Current		250 mA	
Dimensions (in.)		11.33 x 7.8 x 2.71	
Dimensions (mm)		287.8 x 198.1 x 68.8	
Net Weight lbs. (kg)		2.65 (1.2)	

Symbols & Icons

This list is a quick reference for all icons from the pendant and on the control unit.

	Users		Settings		Wire		Reboot		Insert
	Weld		Weld Time		Upslope / Start Settings		Process		Track Ring
	Test Mode		Reset Settings		Downslope / End Settings		Version		Track Ring Diameter
	Segment		Enter		Time		Motion		Pipe
	Trash		Voltage		Program		Return Home		Pipe Diameter
	Gas Purge Pre/Post Flow		Amperage		Trim Volts		Trim		Log Out
	Save		Travel / Travel Setup		Osc Speed		Left Dwell		Settings / Service Page
	Swap		Shift Case		Osc Width		Right Dwell		Increment Unit Settings
	Gas		Advanced Settings		Next / Index		Travel Direction		Positioner
	ID Track		Kilowatts		Wire Feed		Travel Direction		Wire / Wire Feed Speed
	OD Track		Steering / Oscillator		Wire Retract		Travel Direction		Previous / Index
	Flat Track		Wire Diameter		Pass		Travel Direction		Add User
	Direction		Delay		Amps		Details		Weave Type
	Manual Height		Torch/Auto Height		Oscillation Speed		Copy To		Constant Travel
	Exit		Oscillation		Mode Select		Cancel		Step Travel
	Oscillation Width		Weld Mode		Load		Okay		No Weave Travel
	Snapshot								

Safety Precautions

Read entire manual before installation or operation.



WARNING

Electric shock can kill



- Only qualified personnel should perform this installation.
- Turn the input power OFF at the disconnect switch or fuse box before working on this equipment turn off the input power to any other equipment connected to the

welding system at the disconnect switch or fuse box before working on the equipment.

- Do not touch electrically hot parts.
- Always connect the power supply grounding lug to a proper safety (Earth) ground.

Proper Handling

Do not attempt to pick up, move or manipulate the control unit by the cables.

Always operate the control unit on stable, flat and level surfaces with the bottom or side rails facing the ground. Be sure to leave adequate room to open the door to the wire feed assembly. Unplug the control unit when not in use. Do not place on wet ground or in puddles.

The system cart is designed for flat even surfaces. Do no overload cart.

Operation

Read entire manual before operation.

Only operate while on firm level surface or attached to a system cart. Always verify that the system cart is secured in place before operation.

Keep hands away from weld head while in operation.



CAUTION

Never unplug or plug in control cables to the tractor while the system is powered on.

Verify that the system is properly grounded before beginning to weld.

Refer to the individual system manuals for additional instructions.

Explanation of Welding Terms

GMAW

- Gas Metal Arc Welding

FCAW

- Flux Cored Arc Welding

STT

- Surface Tension Transfer

WFS

- Wire Feed Speed

OSC

- Oscillation

ACC

- Automatic Current Control

ID

- Inside Diameter

OD

- Outside Diameter

WFS

- Wire Feed Speed

IPM

- Inches per minute

CM/MIN

- Centimeters per minute

Volts

- Voltage

Amps

- Amperage

APEX® 30M System

Basic Information

APEX systems are digital Lincoln Electric systems designed for mechanized automation. These systems consist of three main components, an APEX control unit, a HELIX weld head, and a welding power supply. In addition to the main components there are various cables, pendants and other items that make up the complete offering.

These digital control systems operate a variety of weld heads for multiple applications. Despite system differences there are several commonalities both software and operational.

Control Unit

The APEX® 30M Control Unit (**K52160-1**) is part of the APEX 3 Series family of controls. The control unit enables welding process from the power supply and optional advanced process modules which include: MIG, Pulsed MIG, Flux-Cored, & GMAW-STT®. All aspects of the weld are synchronized through the 30M.

The APEX 30M is a digital control and wire feeder designed for portability and ease of use. The wire feeder is capable of supporting up to a 44lb spool.

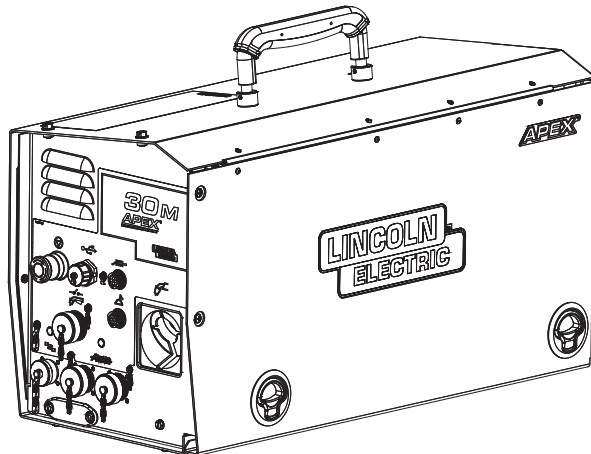


FIGURE 1 - Apex 30M

System Components

Power Supply

The system is designed to work with a **PowerWave S** series or an ArcLink enabled **Vantage Engine Drive**.

Weld Head

All HELIX M and MP weld heads work with the APEX 30M control unit.

System Cart

The 30M was designed for use with a system cart (**K52164-1**). This cart is based on a standard inverter cart with a reinforced top and handles to stand up to demanding shop environments. It includes hooks and trays for organizing consumable parts and cables as well as a hook to hold the weld head. The system cart can be configured to fit the power supply as well as an add on component such as the Advance Process Module, Water Cooler and others.

The system cart makes moving the complete system around a shop environment easy, see **FIGURE 2 - System With Cart**. The system shown is the APEX 30M/HELIX M85 system with a PowerWave and an Advance Process Module (**K52165-2**).

The system cart is not required for operation. The APEX 30M control unit can also be hooked up to a stationary power supply and carried to the welding station. The length this can be moved will depend on the type of weld. Many processes support remote welding as far as 100 feet from the power supply.

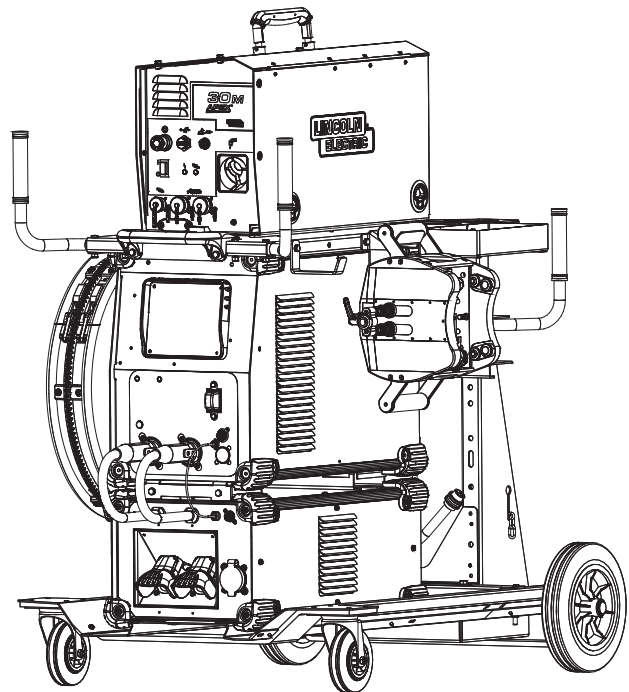


FIGURE 2 - System With Cart

Installation

The complete system cart is meant to be installed in a very specific order. Refer to **FIGURE 3 - System Assembly** for reference.

System Cart

The system cart (**K52166-1**) comes fully assembled when ordered as a part of a complete system. If ordered individually it may require additional assembly. Please refer to system cart assembly instructions for complete step by step instructions.

Optional Modules

The optional modules are installed in the cart before the power supply. Set the module into the mounting holes provided and push backwards to seat the module.

Install bracket to lock the unit in place.

Optional modules have brackets in the top to supporting PowerWaves.

Power Supply

The PowerWave will be installed either onto the base or on top of the optional modules (if installed). Set the module into the mounting holes provided and push backwards to seat the module.

Once this unit is in place remove the front and back handles. The top of the system cart will be screwed into the handles holes left by removing the front handle.

Cart Top

To affix the PowerWave in place attach the top of the cart. Adjust the sliding back brace of the cart so that it is in line with the cart top. Verify that the cart top lines up with both the screw holes on the sliding back brace and the holes from the power supply handle. Secure the top in place.

With the top secured in place, attach the handle from the front of the power supply to the front of the cart top into the holes provided. This will prevent the handle from being lost and is a convenient holder for the system pendant.

APEX 30M

Once all other components are secured in place the 30M can be installed onto the top of the system cart. There are channels provided to help guide the 30M into place.

Slide the system back until the rear of the 30M is secured under the catch, and the latch has locked into place. Refer to **FIGURE 3 - System Assembly**

1. **Catch** - Holds the rear of the control in place
2. **Latch** - Latches onto the front of the control to hold it in place. Pull on the latch to disengage.

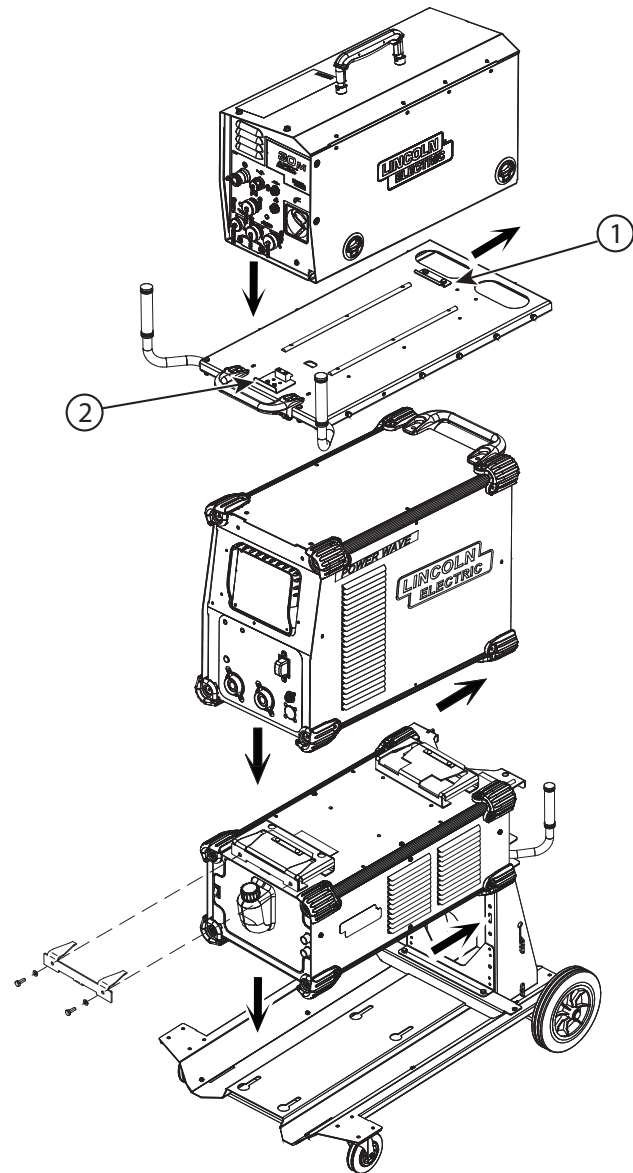


FIGURE 3 - System Assembly

Additional Items

There are other items that can be secured or included on the system cart. These items can include cables, weld head, track ring or gas canisters. Verify that any additional items are properly secured.

Cart Accessories

The system cart includes configurable accessories.

These accessories are screwed into the side of the cart as required by the customer.

See **FIGURE 4 - Cart Accessories**, for all the accessories. These items include:

1. **Tractor Hook** - Holds the tractor in place, includes pads and a backing to prevent the weld head from swinging during transportation. 1 ea.
2. **Hook** - Holds cables or track rings. 3 ea.
3. **Trays** - Holds lightweight system consumables like tips and gas cups. 2 ea.

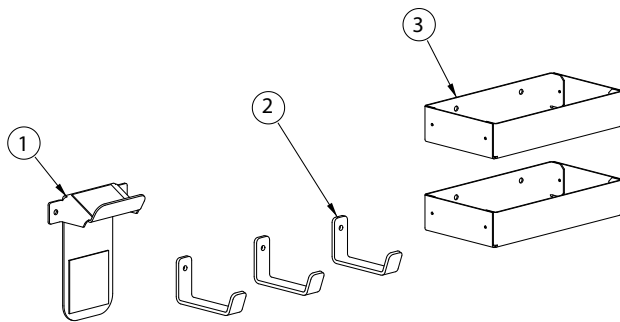


FIGURE 4 - Cart Accessories

FIGURE 5 - Accessories Installation, shows how the accessories screw into the provided holes. Utilization and location of accessories is up to the user.

Note: To prevent PowerWave from overheating do not block vents while in operation

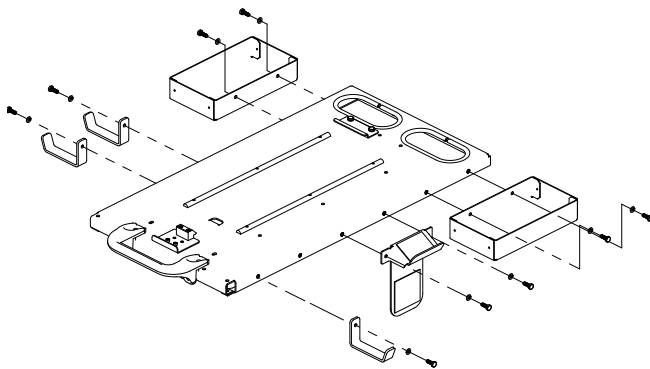


FIGURE 5 - Accessories Installation

Once the entire system is fully assembled it should look similar to **FIGURE 6 - System Complete**. System shown includes optional module.

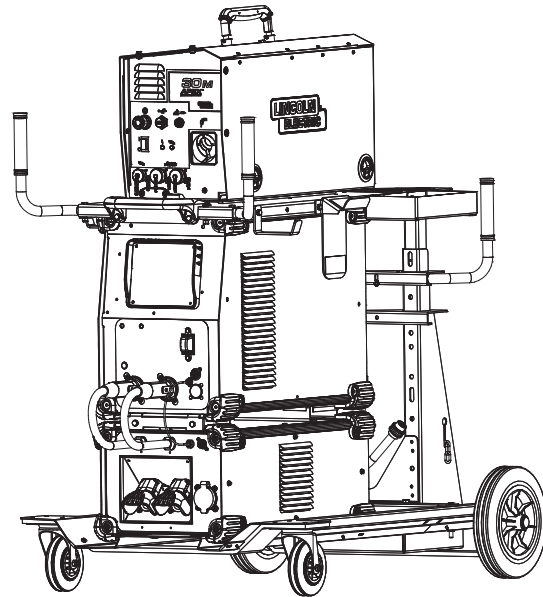


FIGURE 6 - System Complete

Cable Installation

The system is shipped out with cables connected, however the components can be ordered separately and installed by the operator, or the cables and components may be removed during routine maintenance. For the complete system cable map see **FIGURE 7 - System Assembly**.

Note:

- Always use the shortest cable lengths possible. DO NOT coil excess cable. It is recommended that the total length of control cable does not exceed 100' (30.5M). The use of non-standard cables in excess of 25' (7.5M) can lead to communication problems (system shut-downs), poor motor acceleration (poor arc starting), and low wire driving force (wire feeding problems).

- Best results will be obtained when the control cables are routed separate from the weld cables. This minimizes the possibility of interference between the high currents flowing through the weld cables and the low level signals in the control cables.

Arclink Cables can be used to extend the pendant cable length.

Standard Lincoln Cables		
Torch & Cables	Part Number	Location #
Pendant Cable 25'	K52130-25	1
Pendant Cable 15'	K52130-15	1
Control Cable 15 ft. (4.6 m)	K52107-15	2
Control Cable 25 ft. (7.6 m)	K52107-25	2
Mechanized Torch 25 ft. (7.6 m)	K52106-1	3
Mechanized Torch 15 ft. (4.6 m)	K52106-2	3
Weld Power Cable 10'	K1824-10	4/5
Weld Power Cable 35'	K1824-35	4/5
Weld Power Cable 60'	K1824-60	4/5
Weld Power Cable 110'	K1824-110	4/5
Sense Lead	M20023-1	6
Arclink Cable 8'	K1543-8	7
Arclink Cable 25'	K1543-25	7
Arclink Cable 50'	K1543-50	7
Arclink Cable 100'	K1543-100	7

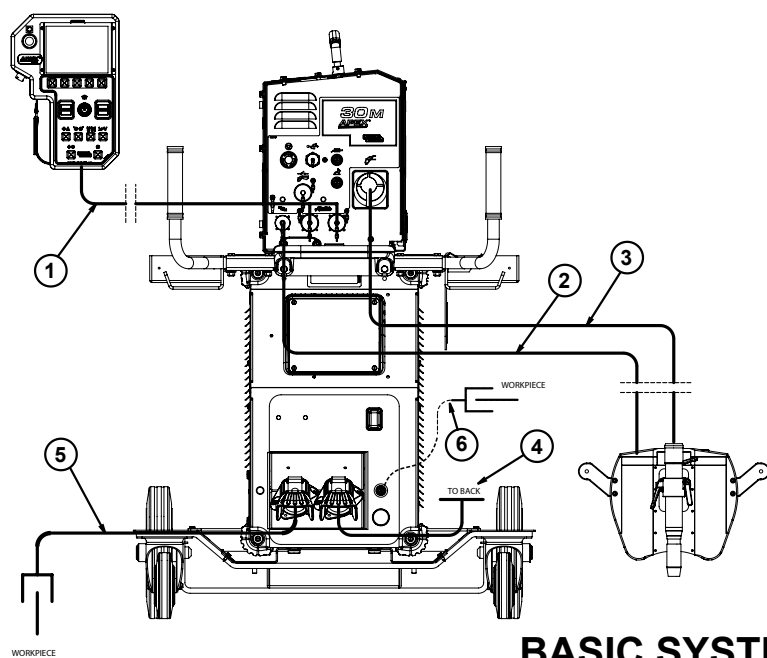
Basic System

1. **Pendant Cable** - Connects from the pendant to the control unit
2. **Control Cable** - Connects from the weld head to the control unit
3. **Mechanized Torch** - Runs from the Control unit out to the weld head
4. **Electrode Cable** - Connects from the positive stud on the PowerWave (or Advanced Process Module if installed) to the rear of the Control Unit
5. **Work Cable*** - Connects from the negative stud of the PowerWave (or Advanced Process Module if installed) to the work piece
6. **Sense Lead*** - Optional sense lead, can extend from the PowerWave to the work piece
7. **ArcLink Cable** - Connects from the power supply to the control unit
8. **3 Phase Power Cable*** - Connects power supply to facility power (refer to power supply manual for installation)
9. **Gas Hose*** - Supplies gas to the system from external source
10. **Ethernet Cable*** - Optional cable to connect the power supply to a local area network for added system functionality

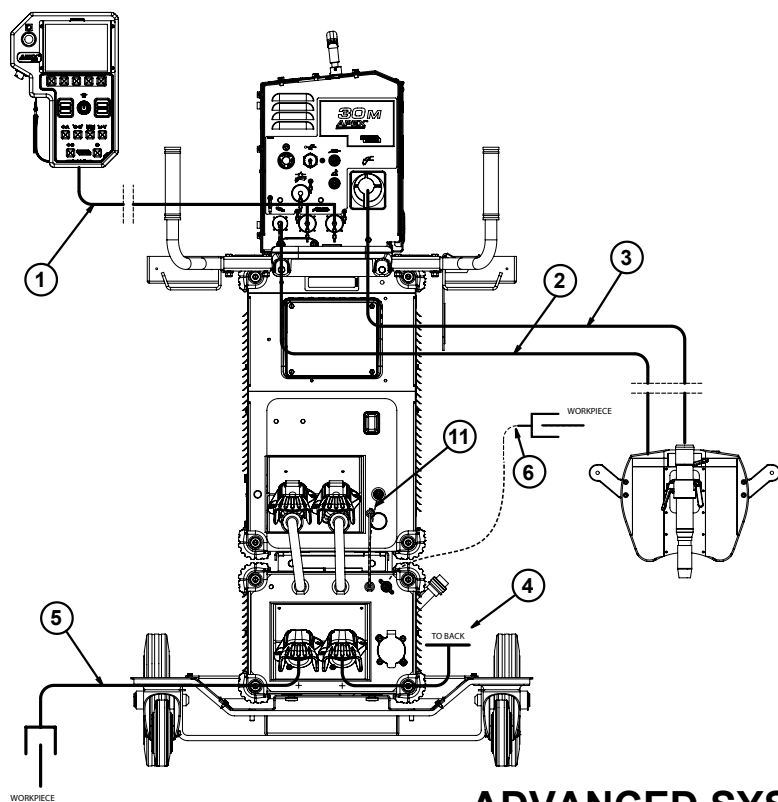
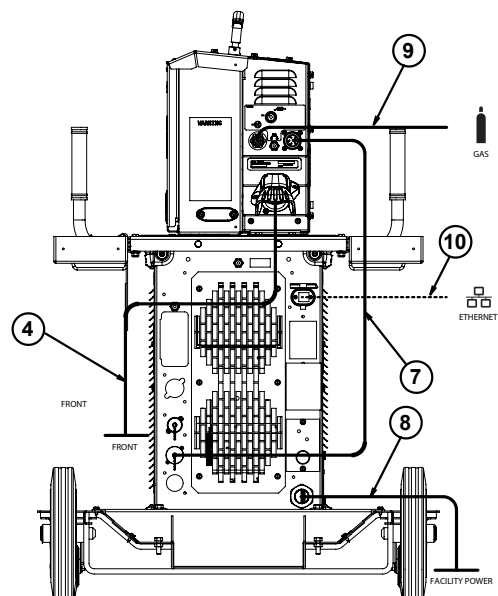
Advanced System

11. **Sense Lead Pigtail** - Comes as part of the Advanced Process Module, allows sensing from the new module
12. **Arclink Pigtail** - Comes as part of the Advanced Process Module, connects to the power supply

* Indicates items not included with the system



BASIC SYSTEM



ADVANCED SYSTEM

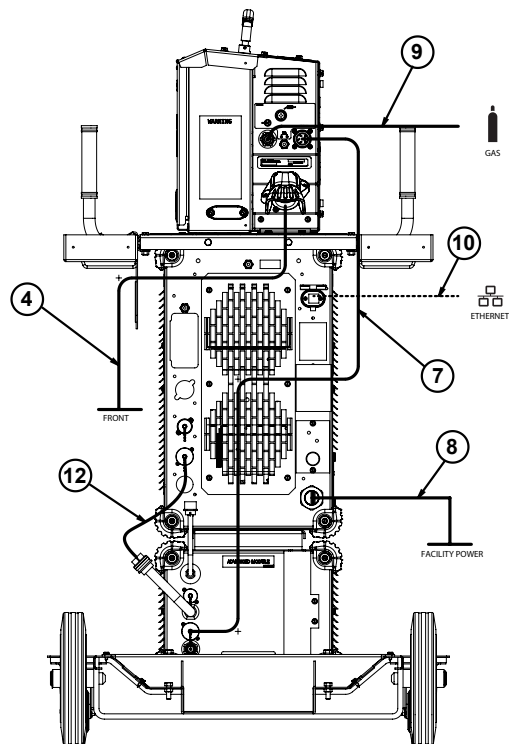


FIGURE 7 - System Assembly

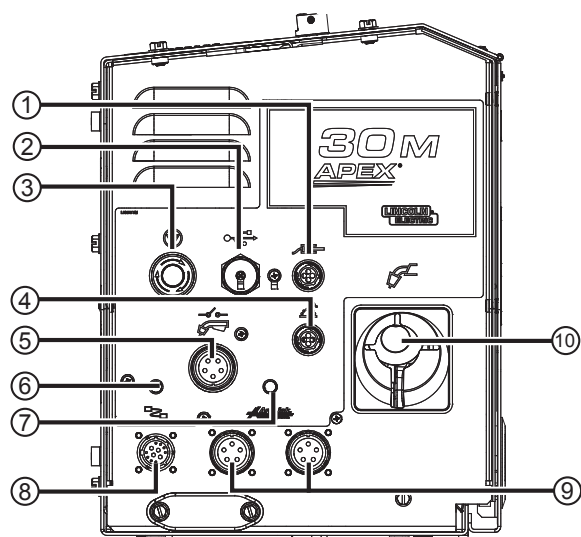


FIGURE 8 - Front Panel

Front Panel

For all front panel connections, see **FIGURE 8 - Front Panel**.

1. **Work Sense** - Optional connection for Work Sense. (Sense lead can be direct from Power Wave).
2. **USB** - Welding programs and data can be saved and loaded via USB.
3. **Power Off** - Allows operator to remove power from the weld head and halt welding operation. The system will remain off until switch is rotated clockwise.
4. **Electrode Sense** - Optional connection for Electrode sense to welding torch.
5. **Trigger Input** - Optional trigger input for manual welding.
6. **Motion Network Connection** - The network connection light will show green if all motion systems are operational.
7. **ArcLink Status** - The ArcLink Status light will be green if all ArcLink systems are operational.
8. **Weld Head Control Cable** - Connection from the Apex 30M to the weld head.
9. **ArcLink Cables** - Two ArcLink Cable connections for one pendant, and the optional operator pendant or other ArcLink device.
10. **Mechanized Torch** - Welding Torch passes through the front panel (connected and secured through side panel).

Wire Compartment

For all wire Compartment connections, see **FIGURE 9 - Wire Compartment**.

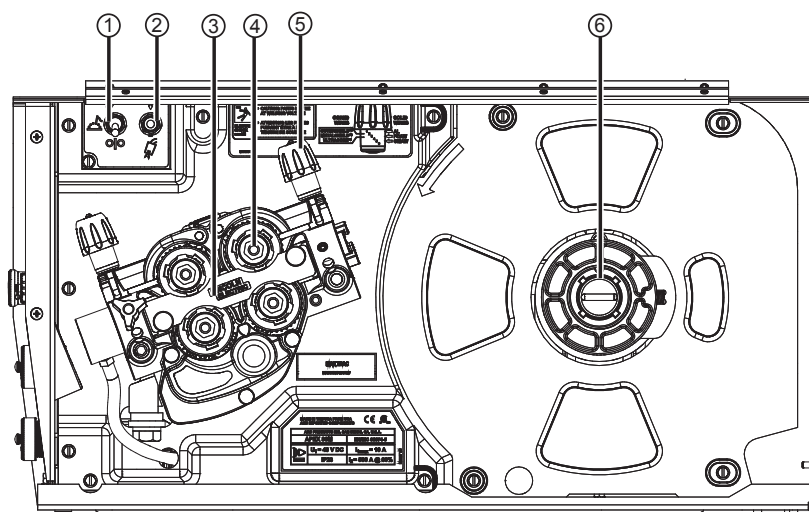


FIGURE 9 - Wire Compartment

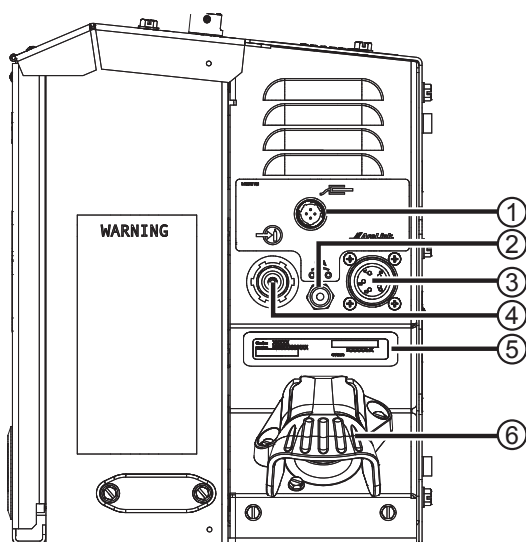


FIGURE 10 - Back Panel

Back Panel Connections

For all back panel connections, see **FIGURE 10 - Back Panel**.

1. **Work Sense Lead** - Used when the work sense lead signal is passing through the Apex 30M. (Optional)
2. **Breaker 10A** - Will trip in overpower situations, push to reengage.
3. **ArcLink In** - The ArcLink connection from the Power Wave or other ArcLink enabled device.
4. **Gas Input** - Gas supplied to the system ties into the back of the 30M.
5. **System Label** - Contains part number, serial number and code number of the machine
6. **Weld Cable Connection** - Connection supplies power to the mechanized torch for welding.

Shielding Gas Connection

WARNING



CYLINDER may explode if damaged.

- Keep cylinder upright and chained to support.

- Keep cylinder away from areas where it may be damaged.
- Never lift welder with cylinder attached.
- Never allow welding electrode to touch cylinder.
- Keep cylinder away from welding or other live electrical circuits.
- **BUILD UP OF SHIELDING GAS MAY HARM HEALTH OR KILL.**



- Shut off shielding gas supply when not in use.
- See American National Standard Z-49.1, "Safety in Welding and Cutting" Published by the American Welding Society.

Maximum inlet pressure is 100 psi. (6.9 bar.)

Install the shielding gas supply as follows:

1. Secure the cylinder to prevent it from falling.
2. Remove the cylinder cap. Inspect the cylinder valves and regulator for damaged threads, dirt, dust, oil or grease. Remove dust and dirt with a clean cloth. **DO NOT ATTACH THE REGULATOR IF OIL, GREASE OR DAMAGE IS PRESENT!** Inform your gas supplier of this condition. Oil or grease in the presence of high pressure oxygen is explosive.
3. Stand to one side away from the outlet and open the cylinder valve for an instant. This blows away any dust or dirt which may have accumulated in the valve outlet.
4. Attach the flow regulator to the cylinder valve and tighten the union nut(s) securely with a wrench. Note: if connecting to 100% CO₂ cylinder, insert regulator adapter between regulator and cylinder valve. If adapter is equipped with a plastic washer, be sure it is seated for connection to the CO₂ cylinder.
5. Attach one end of the inlet hose to the outlet fitting of the flow regulator. Attach the other end to the welding system shielding gas inlet. Tighten the union nuts with a wrench.
6. Before opening the cylinder valve, turn the regulator adjusting knob counterclockwise until the adjusting spring pressure is released.
7. Standing to one side, open the cylinder valve slowly a fraction of a turn. When the cylinder pressure gage stops moving, open the valve fully.
8. The flow regulator is adjustable. Adjust it to the flow rate recommended for the procedure and process being used before making a weld.

Procedure to Install Wire Guides and Drive Rolls

WARNING

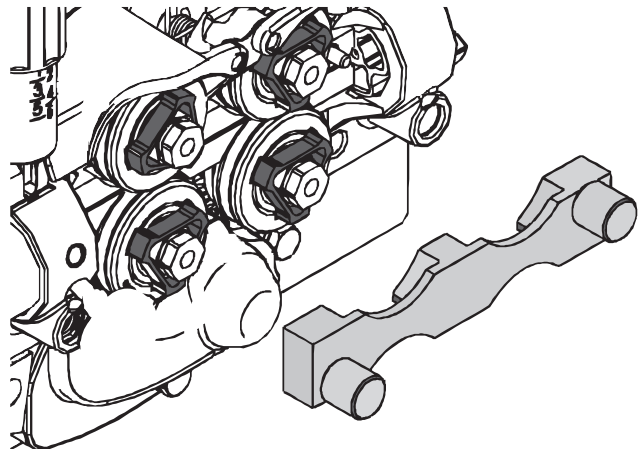
ELECTRIC SHOCK can kill.



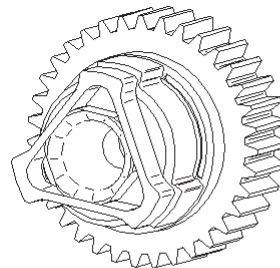
- Turn the input power OFF at the welding power source before installation or changing drive rolls and/or guides.
- Do not touch electrically live parts.
- When inching with the gun trigger, electrode and drive mechanism are "hot" to work and ground and could remain energized several seconds after the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

To remove drive rolls and wire guides:

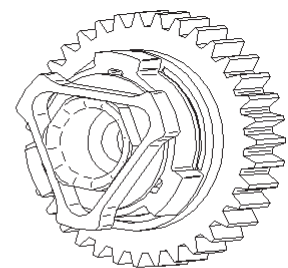
1. Turn power off at the welding power source.
2. Remove the outer wire guide.



3. Rotate all of the triangular rings to the unlocked position.



**UNLOCKED
POSITION**

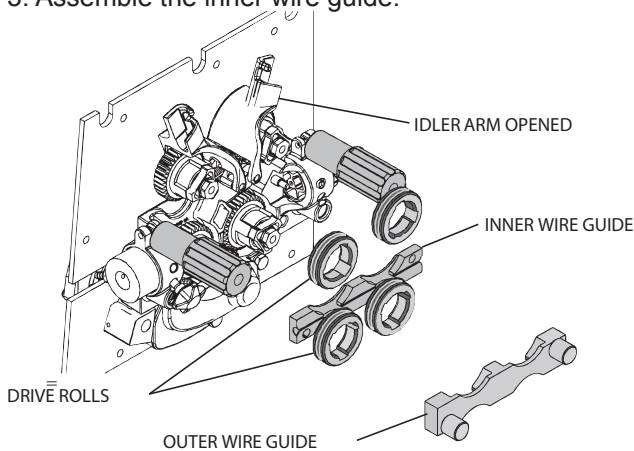


**LOCKED
POSITION**

4. Open the idle arms.
5. Remove the drive rolls and inner wire guide.

To install drive rolls and wire guides:

1. Turn off power at the welding power source.
2. Open the idle arms.
3. Assemble the inner wire guide.



4. Slide the drive rolls onto the drive hubs.
5. Close the idle arms.
6. Rotate all of the triangular rings to the locked position.
7. Assemble the outer wire guide.
8. Adjust the pressure arms to the recommended setting.

Pressure Arm Adjustment



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.

- Do not operate with covers, panels or guards removed or open.

- Only qualified personnel should perform maintenance work.

The pressure arm controls the amount of force the drive rolls exert on the wire. Proper adjustment of the pressure arm gives the best welding performance.

Set the Pressure arm as follows:

(See Figure A.3)

Aluminum wires	between 1 and 3
Cored Wires	between 2 and 4
Steel, Stainless wires	between 4 and 6

FIGURE A.3



Loading Wire



WARNING



- Keep hands, hair, clothing and tools away from rotating equipment

- Do not wear gloves when threading wire or changing wire spool.

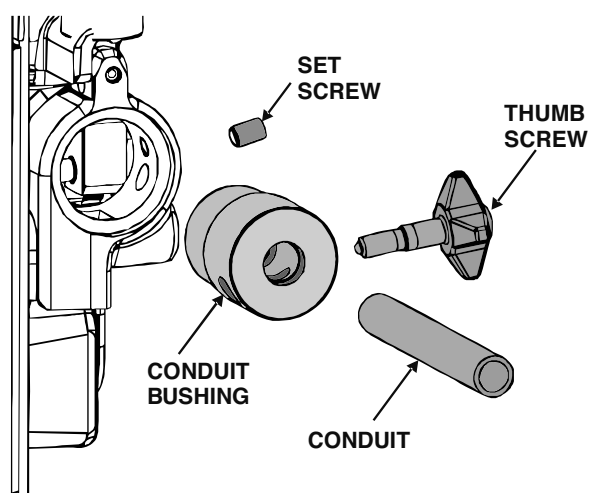
- Only qualified personnel should perform maintenance work.

Conduit Installation

The K1546-xx series of conduits are compatible with K515-xx, K565-xx, Wire Wizard and Electron Beam Technologies conduits.

To install conduit to the wire drive:

1. Slide the conduit bushing into the feed plate and secure with the set screw.
2. Slide the conduit into the bushing and lock in place with the thumb screw.



Operational Safety Precautions

Read and understand this entire section before operating the machine.



WARNING



ELECTRIC SHOCK CAN KILL.

- Only qualified personnel should perform the installation.
- Turn the input power **OFF** at the disconnect switch or fuse box.
- Do not touch electrically live parts or electrode with skin or wet clothing.
- Insulate yourself from work and ground.
- Always dry insulating gloves.
- Read and follow “Electric Shock Warnings” in the Safety section if welding must be performed under electrically hazardous conditions such as welding in wet areas or on or in the work pieces.



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 and explosion
- * Keep flammable material away.
 - * Do not weld on containers that have held combustibles.



ARC RAYS

- can burn.
- * Wear eye, ear and body protection.

Observe additional Safety Guidelines detailed in the beginning of this manual.

Operation Information

The APEX® 30M Control System is a precision digital control system designed for multi process welding and is designed to work with the HELIX® M and MP type weld heads. Refer to the specific weld head manual for installation and safety instructions.

External inputs

The external inputs for the APEX 30M are welding power supplied by the power source, gas, ArcLink.

Control

Control of the weld head and wire feeder is provided by the APEX 30M controller. Through the use of a hand-held pendant the operator is able to control and monitor all aspects of the weld and change parameters while welding.

Welding Power

Welding power is provided through a standard Lincoln Electric Power Wave or Vantage power supply. See the correct IM for the power supply chosen for complete installation and operation instructions.

Manual Adjustments

Manual adjustments for this system are limited to physical wire adjustments, such as torch placement, lead/lag, work angle etc...

Before operation check all cable connections for fraying or loose connections or damage. All consumables should be changed out per shift, or as needed during each shift. Operating welding equipment with incorrect or broken consumables can cause bodily harm or damage to the machine.

System Start Up

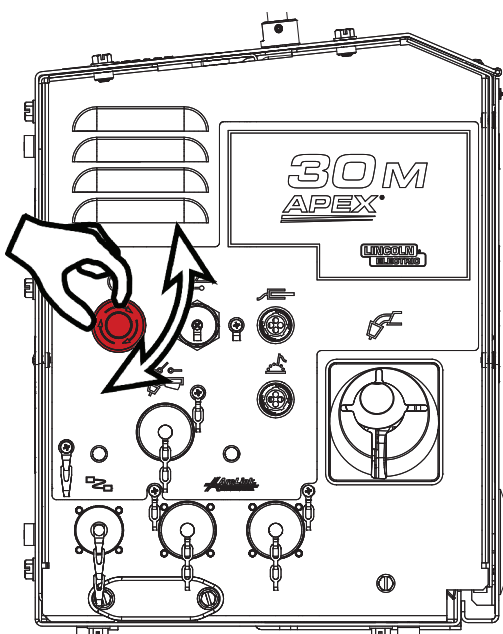
Ensure all components are connected, refer to individual component manuals for full connection instructions.

When the complete system is ready to weld turn on the power to the power supply. The system is designed to be turned on and off through the power supply.

NOTE

With power applied to the system ensure that the reset button is not engaged. If the reset button is engaged the system will not initialize. To disengage the reset button rotate the knob clockwise.

This reset button can be used to restart the system for troubleshooting purposes and to halt system movement.



Emergency Off

To remove all welding power use the emergency off button located on the specific power supply being used.

Reset

During welding the control unit has a reset button that will remove the 24volts to the weld head. This function stops all welding but does not function as an emergency stop button.

Startup Screen

For some software versions when the system is reset at the power wave the screen will display multicolored bars, see **FIGURE 11 - Startup Screen**. This is a normal part of the initialization process.



FIGURE 11 - Startup Screen

Once initialization has been completed the user is presented with a log in screen, see **FIGURE 12 - Log In Screen**.

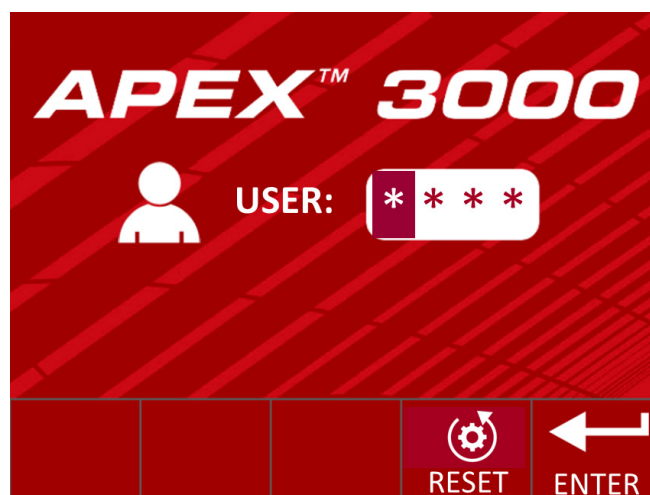


FIGURE 12 - Log In Screen

Note:

During the start up cycle the weld head goes through a self calibration cycle. The system will not allow the user to log in until the calibration cycle has been completed.

At this point the user can begin using the system. See the next sections for pendant operation and log in information.

Pendant Operation

The Apex 3000 Pendant, frequently called the teach pendant or standard pendant is designed around full functionality and an easy operator experience. As such the pendant's different buttons can serve multiple purposes depending on the screen, see **FIGURE 13 - Pendant Items** for all buttons, knobs and switches.

Button Actions

Each of the buttons and toggles can perform differently on the different screens depending on how the buttons are pressed. There are three types of button press:

Short Press - A short press is a standard press that engages the button and is not held in place, most operations are performed as a short press.

Example: Quickly pressing down on #7 the steering knob, will center the oscillator

Long Press - For some screens, by holding a button down for a length of time exceeding 2 seconds the system performs an alternate function

Example: A long press of more than 2 seconds of #7 will start the oscillation test mode

Hold - By pressing and holding down a button or toggle the effects exhibited will continue or will speed up

Example: When pressing the selection button #1 in the jog screen gas will purge for 3 seconds, by holding down the button gas will continuously purge

Hold & Rotate - The steering knob also acts as a button. It can be pressed, as well as rotated for different actions and in some screen can be held down and rotated for fast navigation.

Selection buttons

Buttons 1 through 5 are selection buttons, their functions change depending on the screen. In each screen there will be an icon to indicate their functions. If there is no icon above the variable button then pressing that button will have no effect.

1. **Selection Button 1** -
 - **Short Press** - Enables/Disables shown variable
2. **Selection Button 2** -
 - **Short Press** - Enables/Disables shown variable
3. **Selection Button 3** -
 - **Short Press** - Enables/Disables shown variable
4. **Selection Button 4** -
 - **Short Press** - Enables/Disables shown variable
5. **Selection Button 5** -
 - **Short Press** - Enables/Disables shown variable

Navigation Controls

Items 6 through 8 control navigation, their functions are primarily navigating through the menus and changing values while setting up the system.

Note: While welding the steering knob #7 functions only for oscillation steering.

6. **Left Toggle (White Border)** -
 - **Short Press** - Changes selected value (in this example it will change the value in the left dwell box)
 - **Hold** - Increases value / change speed
7. **Steering Knob** -
 - **Rotate** - Steers the oscillation in and out, or changes the selected variable
 - **Short Press** - Centers the oscillation, or moves to the next variable
 - **Long Press** - Starts/stops oscillation test (in idle mode only)
 - **Hold & Rotate** - Fast navigation between selected variables
8. **Right Toggle (Gray Border)** -
 - **Short Press** - Navigates or changes the selected value (in this example it will change the value in the right dwell box)
 - **Hold** - Increases value / change speed

Menu buttons

Buttons 9 through 12 are the menu buttons, pressing these buttons bring up the specified menu screen while in the idle, test or welding screens. (if the user is already in that menu, the button will have no effect)

9. **Wire Feed/Amps** -
 - **Short Press** - Wire Feed/Amps options
 - **Long Press** - Navigates to the Jog Screen from the Idle Weld screen
10. **Dwell** -
 - **Short Press** - Dwell options
 - **Long Press** - Navigates to the Oscillation Screen from the Idle Weld screen
11. **Oscillation** -
 - **Short Press** - Oscillation options
 - **Long Press** - Navigates to the Oscillation Screen from the Idle Weld screen
 -
12. **Travel/Volts** -
 - **Short Press** - Travel/Voltage options
 - **Long Press** - Navigates to the Jog Screen from the Idle Weld Screen

Control buttons

Buttons 13 through 15 are the control buttons. These buttons have a specific purpose that does not change.

Note: Buttons may be disabled in menu screens

13. **Start/Stop** -
 - **Short Press** - Start if idle, stop if welding, stop/start test weld when in test mode



FIGURE 13 - Pendant Items

14. Sector -

- **Short Press** - Switches between sectors (if available)

15. Reset -

- **Short Press** - Initiates a system reset
***Important* this is not an emergency stop button, power is still applied to the system**

Color Coding

The menu buttons and Toggles are color coded. For button #9 the icons above are Wire Feed (White Icon) and Amps (Gray Icon). This means when the operator presses that menu button (#9) the value for Wire Feed (White Icon) will be presented and can be changed by the Left Toggle (White Border) and the value for Amps (Gray Icon) will be presented and can be changed by the Right Toggle (Gray Border).

Fast Movement

Certain screens allow for fast movement using the steering knob. Movement and selection can still be accomplished with the left and right toggle. In addition the Steering Knob will allow the user to change the selections by turning the knob and moving to the next section by pressing the knob.

For fast movement between selections hold the steering knob down while turning to rapidly move from one selection to the other.

Fast Movement Screens

The screens where fast movement is enabled are:

- Log In Screen
- Users Screen
- Programs Screen

System Log In

Every time the system is powered on it will go through a self calibration routine. Ensure that the torch is free to move before starting the system.

After the system finishes powering up and calibrating the user will be presented with a Log In Screen see **FIGURE 14 - Log In Screen**.

Fast Movement

Fast movement using the steering knob is enabled on this screen. Use the steering knob or left and right toggles for navigation and selection.

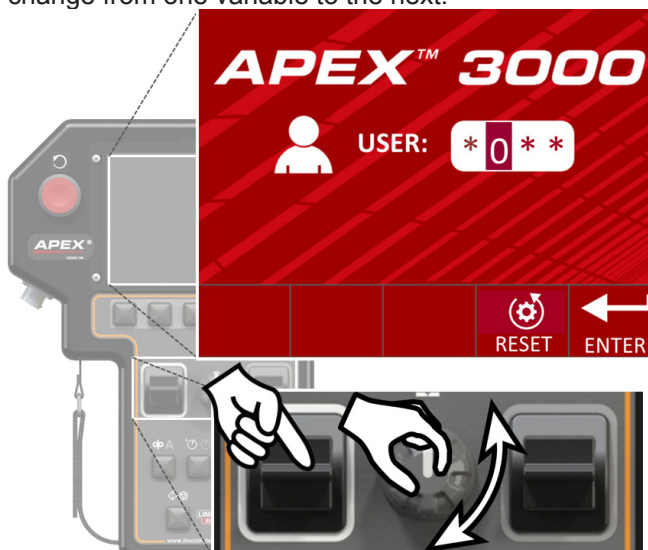
Login

The system requires a four digit log code in to log in.



FIGURE 14 - Log In Screen

Use the left toggle or the press the steering knob to change from one variable to the next.



Use the right toggle or the turn the steering knob to

change the selected variable.



Press the Enter selection button when user code has been entered. Once a four digit code is accepted the system automatically moves into the default Idle screen, see **FIGURE 15 - Idle Screen Default**. This screen is shown when a supervisor logs into the system.

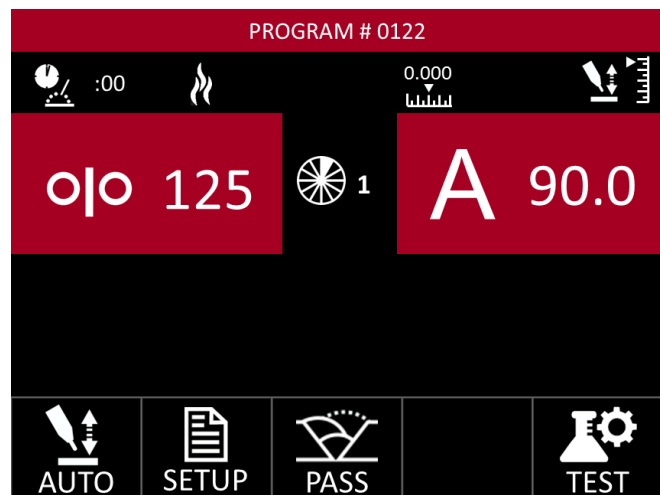


FIGURE 15 - Idle Screen Default

From the Idle screen is possible to move into the Setup screen, Jog and Oscillation screens as well as switch between test and weld modes.

Note: The values shown on each screen are representative only.

Log In Screen

The following buttons and options are available from the log in screen:

1. N/A
 - No Effect
2. N/A
 - No Effect
3. N/A
 - No Effect
4. Reset -
 - **Short Press** - Will change password entry back to "0000"
5. Enter -
 - **Short Press** - Attempts to log in to the system with the currently entered user code
6. Left Toggle (White Border) -
 - **Short Press** - Pressing up or down moves cursor between spaces
7. Steering Knob -
 - **Short Press** - Moves cursor to the next space
 - **Rotation** - Quickly cycles through available character options
 - **Hold & Rotate** - Quickly moves the cursor from one selection to the next
8. Right Toggle (Gray Border) -
 - **Short Press** - Pressing up or down changes value of the selection
9. Wire Feed/Amps -
 - No Effect
10. Dwell -
 - No Effect
11. Oscillation -
 - No Effect
12. Travel/Volts -
 - No Effect
13. Start/Stop -
 - No Effect
14. Sector -
 - No Effect
15. Reset -
 - **Short Press** - Initiates a system reset



FIGURE 16 - Log in Buttons

Idle Screen

The Idle Screen is the first screen presented to the supervisor when logging in, see **FIGURE 15 - Idle Screen Default**. This screen functions as a jumping off point to either weld, or set up all the parameters for welding as well as testing those parameters.

Menu Option Variables

The Idle Screen will show the user four separate variables depending on which Menu button has been pressed. Pressing the different Menu buttons will change the shown values.

The different variables shown correspond to the icons on the Menu buttons.

Press the Menu button to open the Wire Feed/Amps Menu options.



Press the Menu button to open the Dwell Menu Button options



Press the Menu button to open the Oscillation Menu options



Press the Menu button to open the Travel/Voltage Menu options



Similar variables are paired together. The variables shown on the screen can be changed using the left and right toggles. It is possible to change between these menu options while idle or welding.

Idle Screen Buttons

The Idle Screen will change depending on which menu button has been selected. Some items in the Selection button windows will change depending on system configurations.

1. Auto Height -

- **Short Press** - Turns Auto Height on and off

2. Setup -

- **Short Press** - Navigates to the Setup Screen

3. Pass -

- **Short Press** - Switches to the next pass in the weld program (if available)

4. N/A -

- **No Effect** -

5. Test/Weld -

- **Short Press** - Switches between weld and test modes (Image shows system in Weld Mode)

6. Left Toggle (White Border) -

- **Short Press** - Changes the value displayed in the top left box (in this example it will change the value in the left dwell box)
- **Hold** - Increases adjustment speed

7. Steering Knob -

- **Rotate** - Moves the oscillation in and out
- **Short Press** - Centers the oscillation
- **Long Press** - Starts/stops oscillation test

8. Right Toggle (Gray Border) -

- **Short Press** - Changes the value displayed in the top right box (in this example it will change the value in the right dwell box)
- **Hold** - Increases adjustment speed

9. Wire Feed/Amps -

- **Short Press** - Wire Feed/Amps options
- **Long Press** - Navigates to the Jog Screen

10. Dwell -

- **Short Press** - Dwell options
- **Long Press** - Navigates to the Jog Screen Dwell

11. Oscillation -

- **Short Press** - Oscillation options
- **Long Press** - Navigates to the Jog Screen Oscillation

12. Travel/Volts -

- **Short Press** - Travel/Voltage options
- **Long Press** - Navigates to the Jog Screen



FIGURE 17 - Idle Screen

13. Start/Stop -

- **Short Press** - Starts welding

14. Sector -

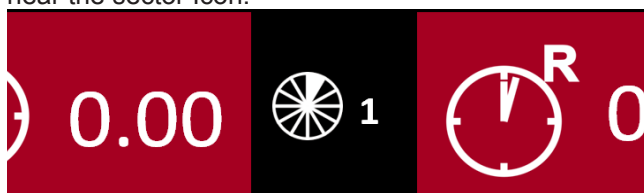
- **Short Press** - Switches to the next sector*

15. Reset -

- **Short Press** - Initiates a system reset

Important: this is not an emergency stop button, power is still applied to the system

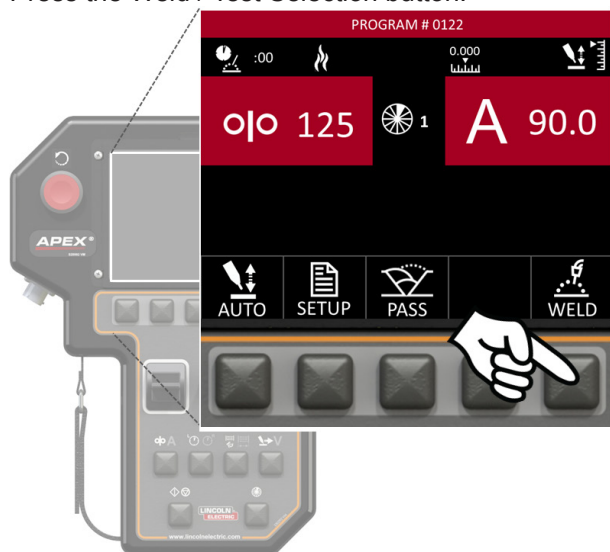
Current sector is displayed at the center of the screen near the sector icon.



Idle Screen Test/Weld Modes

After preparing a program it is recommended that the user test the parameters before striking an arc. The system allows for a test mode, which will allow for testing of all non weld functions such as travel, gas purge/flow, oscillation and others.

Press the Weld / Test Selection button.



Switches to Idle Screen
Test Mode



Switches to Idle Screen
Weld Mode



This changes the system from Test, to Weld mode. The icon showing in the Selection Button window denotes the mode that the system is in.

Auto Height is no longer an option while in Test mode.

From either of these modes, pressing the Start/Stop Control button will enter the Weld Screen or the Test Screen depending on which mode the user is in.

Static Screen Items

There are many items common through the Idle, Weld and Test screens. These items give helpful information to the user throughout the setup and welding process.

- 1. Arc Time -**
 - Tells the amount of time spent welding
- 2. Heat Input -**
 - Displays the amount of heat input for current weld
- 3. Sector -**
 - Displays the current sector in the weld set, if applicable
- 4. Program Name -**
 - Displays the currently loaded weld program and program pass
Note: Program Name changes to Italics when program parameters have changed
- 5. Oscillation Location -**
 - Displays where the torch is in relation to the oscillation width.
- 6. Torch Height -**
 - Torch location in relation to maximum travel distance.

FIGURE 18 - Static Items illustrates the different items that appear on the weld screen. These items are for information only and are not selectable variables.

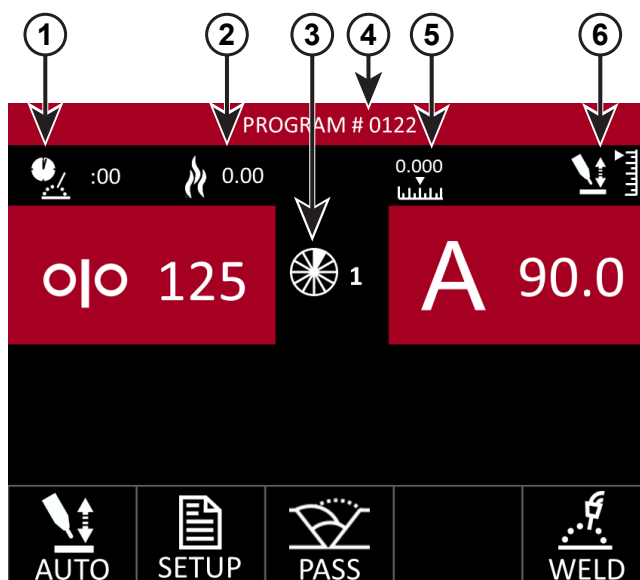


FIGURE 18 - Static Items

Weld Screen

While welding the screen will show voltage and amperage feedback on the Weld Screen, see **FIGURE 19 - Weld Screen Options 1**. Pressing the menu buttons will move the user through the Menu Option Variables similar to **FIGURE 21 - All Test Screens**.

The Setup Selection disappears and is replaced with the Adv Selection, Autoheight can also be disengaged, see **FIGURE 19 - Weld Screen Options 1**.

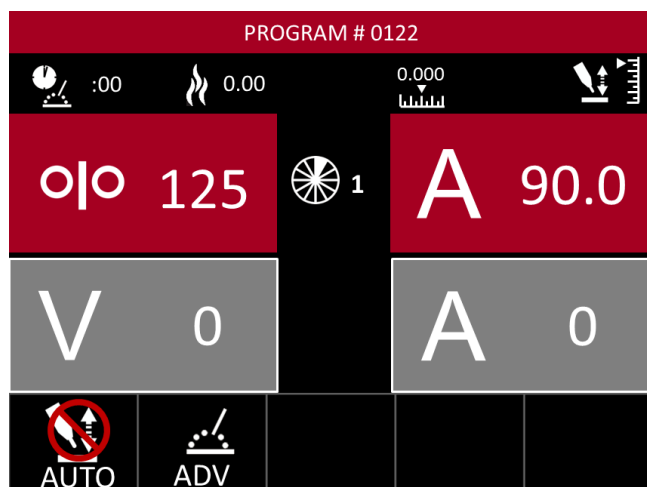
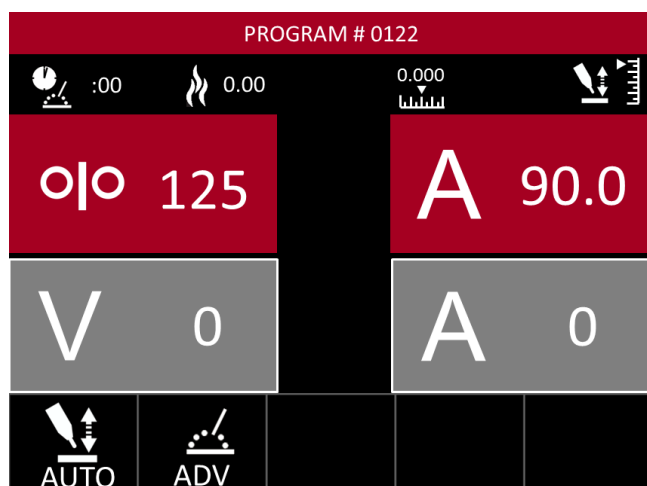


FIGURE 19 - Weld Screen Options 1



Weld Screen Buttons

The Weld Screen buttons work similar to the Idle screen buttons, see **FIGURE 17 - Idle Screen**.

Pressing the Start/Stop button during the weld halts the weld and moves into the Jog Menu.

Test Screen

As with the Weld screen the test screen will show voltage and amperage feedback on the Weld Screen, see **FIGURE 20 - Weld Screen Options 1**. Pressing the menu buttons will move the user through the Menu Option Variables as shown in the Idle Screen section.

Auto Height is disable while testing.

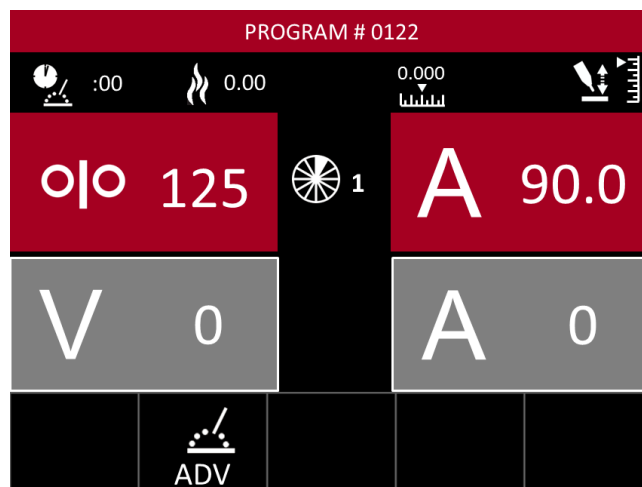


FIGURE 20 - Weld Screen Options 1

Test Screen Buttons

The Test Screen buttons work similar to the Idle screen buttons, see **FIGURE 17 - Idle Screen** with changes being made to the parameter settings.

Pressing the Start/Stop button during the weld halts the test and moves into the Jog Menu.

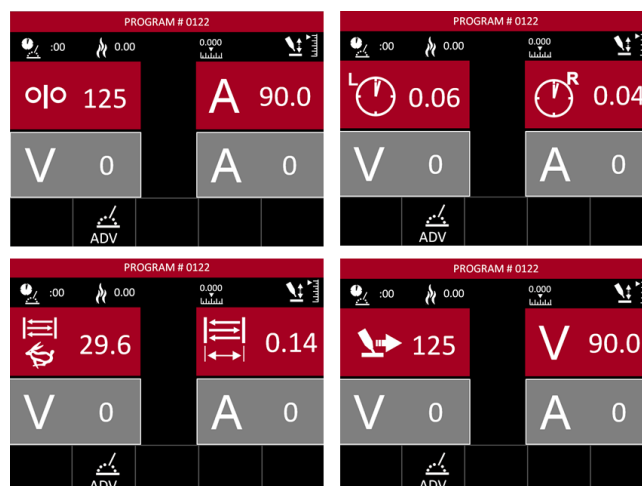


FIGURE 21 - All Test Screens

Jog Screen

The Jog Screen is used to test movement of the system before welding. The Jog Screen can be entered from the Idle or Oscillation screens.

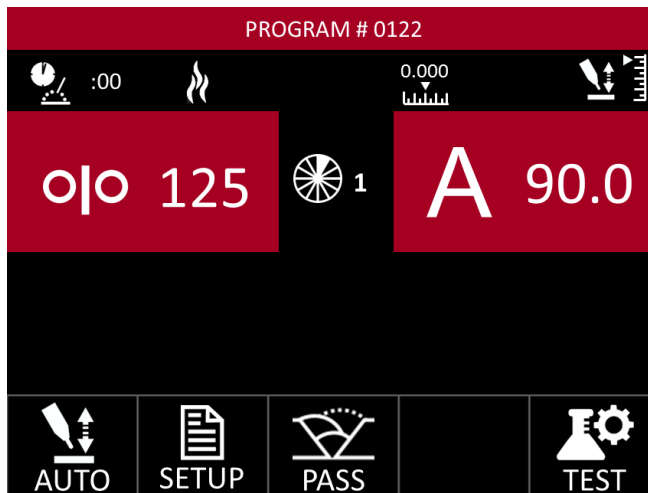
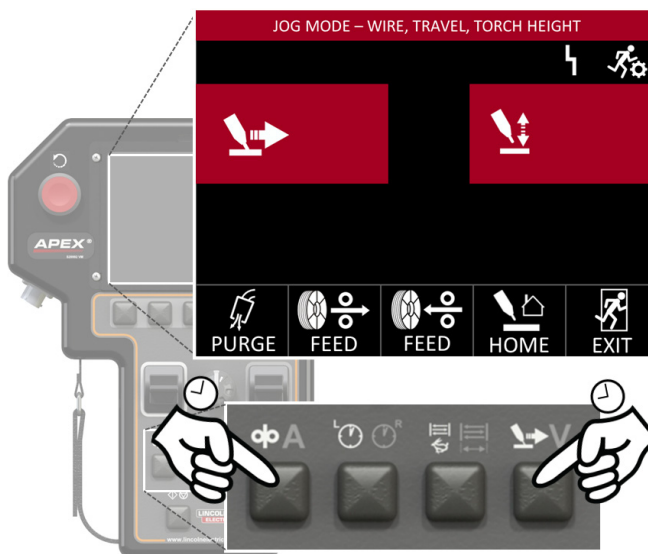


FIGURE 22 - Idle Screen

Press the “Exit” selection button to return Idle screen



From the Idle Screen see **FIGURE 22 - Idle Screen**, press and hold the Wire Feed/Amps or the Travel/Voltage menu buttons to enter the Jog Menu.



This screens allows for moving the tractor along the track, adjusting torch height, purging gas as well as wire feed and retract.

Jog Buttons

The following buttons and options are available from the from the Jog Menu:

1. **Gas Purge -**
 - **Short Press** - Purge welding gas for 3 seconds
 - **Hold** - Continually purges welding gas while held
2. **Cold Feed Forward -**
 - **Short Press** - Feeds wire slightly
 - **Hold** - Feeds wire continuously & accelerates the WFS
3. **Cold Feed Reverse -**
 - **Short Press** - Retracts wire slightly
 - **Hold** - Retracts wire continuously & accelerates the WFS

Note: Be sure to keep the spool tight as wire is retracted
4. **Home -**
 - **Short Press** - Returns the weld head to starting position on the track. Starting position is determined by power up or previous weld start.
5. **Exit -**
 - **Short Press** - Returns to Idle Screen
6. **Left Toggle (White Border) -**
 - **Short Press** - Travels forward or backward slightly
 - **Hold** - Ramps travel speed
7. **Steering Knob -**
 - **Rotate** - Moves the oscillation in and out
 - **Short Press** - Centers the oscillation
 - **Long Press** - Starts/stops oscillation test
8. **Right Toggle (Gray Border) -**
 - **Short Press** - Adjusts the torch up and down
 - **Hold** - Ramps adjustment speed
9. **Wire Feed/Amps -**
 - **No Effect**
10. **Dwell -**
 - **Short Press** - Navigates to Oscillation screen

Dwell option
11. **Oscillation -**
 - **Short Press** - Navigates to Oscillation screen
12. **Travel/Volts -**
 - **No Effect**



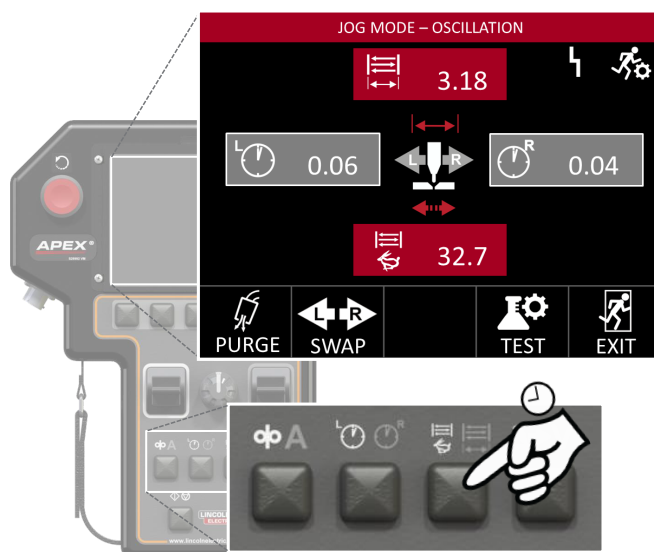
FIGURE 23 - Jog Screen

13. **Start/Stop -**
 - **No Effect**
14. **Sector -**
 - **No Effect**
15. **Reset -**
 - **Short Press** - Initiates a system reset ***Important*** this is not an emergency stop button, power is still applied to the system

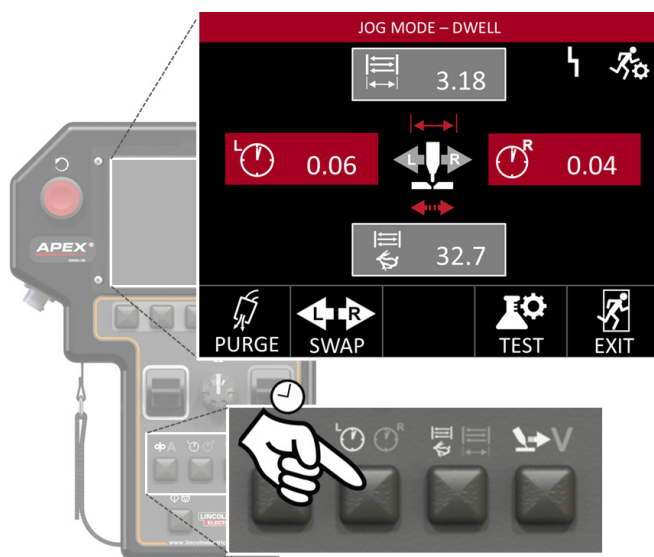
Oscillation Screen

The Oscillation Screen is used to test and adjust system oscillation before welding. To enter press and hold the Dwell or Oscillation menu buttons while in the Jog or Idle screens.

Pressing and holding the Oscillator menu button will present the user with the option to change the oscillation width and the oscillation speeds.



Holding down the Dwell menu button will present the user with the option to change the left and right dwells.

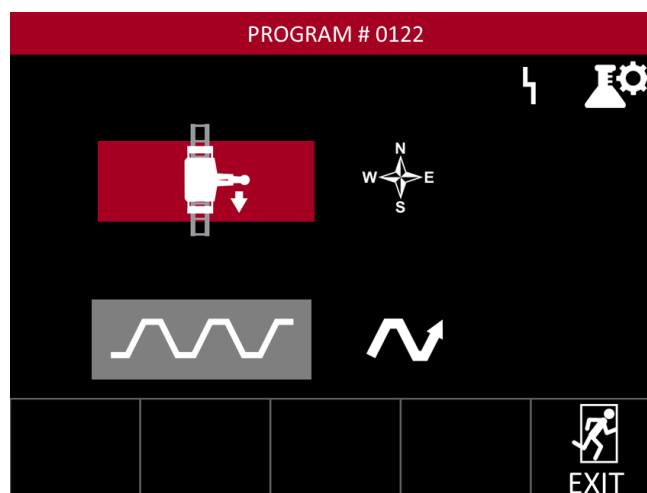


Once in the Oscillation screen, use a short press to switch between Oscillation and Dwell. The items highlighted in red are the variables that can be changed.

Press the Swap selection button to be taken to the travel setup screen.



The travel setup page is discussed in the in the travel screen section on page **B-18**. This screen allows the user to quickly change weld head orientation or change the weave pattern.



Press the "Exit" selection button to return to the Jog Screens. Once all parameters have been input and verified exit out of the Jog Screen to return to the idle screen.

Oscillation Buttons

The following buttons and options are available from the from the Oscillation Menu:

1. **Purge -**
 - **Short Press** - Purge welding gas for 3 seconds
 - **Hold** - Continually purges welding gas while held
2. **L/R Swap-**
 - **Short Press** - Navigates to the Travel Direction Setup Screen
3. **N/A**
 - **No Effect**
4. **Test/Weld -**
 - **Short Press** - Starts/Stops oscillation test
5. **Exit -**
 - **Short Press** - Returns to idle screen
6. **Left Toggle (White Border) -**
 - **Short Press** - Increases or decreases Left Dwell time or Oscillation Width
 - **Hold** - Increases increment speed
7. **Steering Knob -**
 - **Rotate** - Moves the oscillation in and out
 - **Short Press** - Centers the oscillation
 - **Long Press** - Starts/stops oscillation test
8. **Right Toggle (Gray Border) -**
 - **Short Press** - Increases or decreases Right Dwell time or Oscillation Speed
 - **Hold** - Increases or decreases value continuously
9. **Wire Feed/Amps -**
 - **Short Press** - Navigates to Jog Menu
10. **Dwell -**
 - **Short Press** - Switches to Dwell option (when in Oscillation option, otherwise no effect)
11. **Oscillation -**
 - **Short Press** - Switches to Oscillation option (when in Dwell option, otherwise no effect)
12. **Travel/Volts -**
 - **Short Press** - Navigates to Jog Menu



FIGURE 24 - Oscillation Screen

13. **Start/Stop -**
 - **No Effect**
14. **Sector -**
 - **No Effect**
15. **Reset -**
 - **Short Press** - Initiates a system reset ***Important*** this is not an emergency stop button, power is still applied to the system

Setup Screen

The setup screen allows the appropriate user to set all parameters for welding. Please note that this screen can only be accessed by authorized supervisors set up in the “Users” menu. This is explained further in the Users Setup Screen section.

The Setup Screen, see **FIGURE 25 - Setup Screen** can be accessed from the weld menu. This menu is accessible in either test or weld mode, but it is not accessible while welding. Press the Setup Selection button to enter into the setup screen.



Once in the setup screen the user has access to change multiple system parameters.

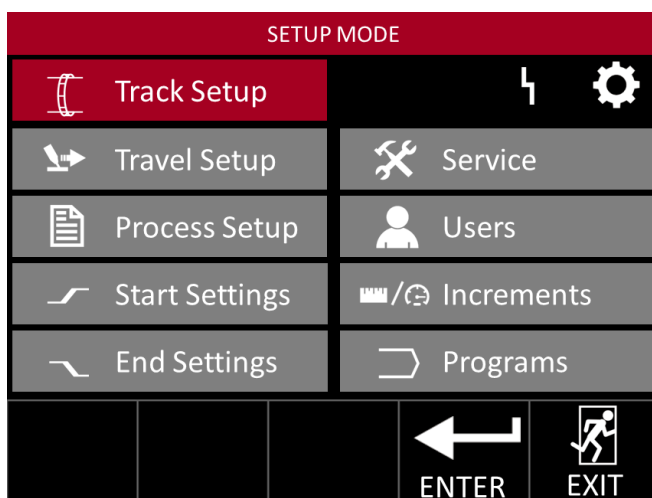
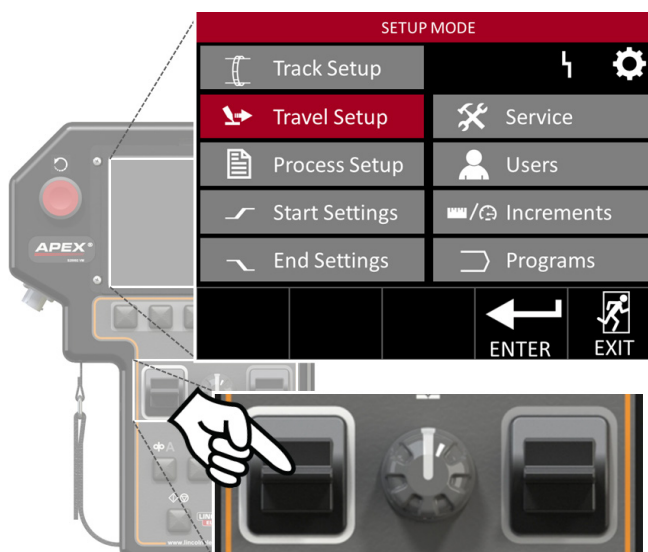


FIGURE 25 - Setup Screen

To select the individual screens the user moves the red cursor to the desired field using the Left Toggle (White Border), and presses the Enter Selection button. Pressing Exit will return the user back to the Idle Screen.



Setup Screen Options

Track Setup - The track setup screen allows the user to choose the type and size of the track as well as the size of the pipe (where applicable)

Travel Setup - The travel setup screen allows the operator to change the steering controls based on where the operator is standing in relation to the track, as well as setting up the travel pattern.

Process Setup - The process setup screen will allow the user to set up the weld processes.

Start Settings - The start settings screen allows the user to adjust the run in settings specific to the program, which affect how the system will react when the weld starts.

End Settings - The end setting screen allows the user to adjust the end settings specific to the program, which affect how the system will react when the weld ends.

Service - The service screen allows the user to access currently loaded software information and change certain motion settings.

Users - The users screen allows the Supervisors to assign operator and supervisor codes for the system.

Increments - In this menu the supervisor can set which variables the operator can adjust and to what degree for each program. This screen also allows the user to choose between imperial and metric units.

Programs - The programs screen is where all programs are saved, loaded or deleted.

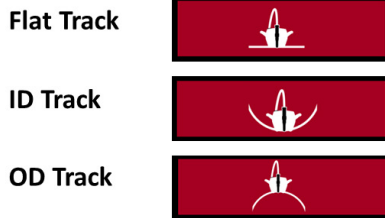
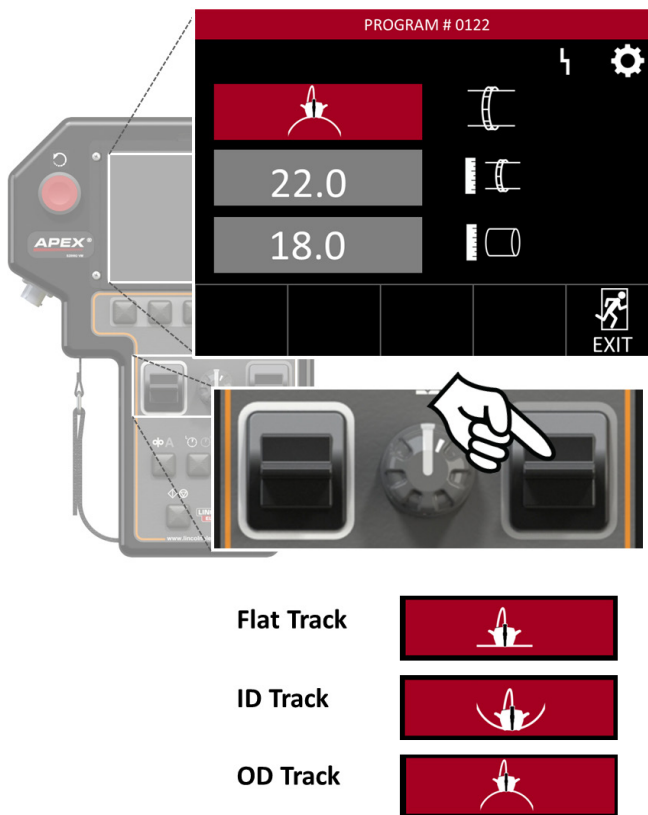
Track Setup

The Track setup screen presents the user with several options. From this screen the operator can change the type of track, the size of the track and the size of the pipe.

Track Type

The first selectable option is track type. With the track type field highlighted in red the user is able to switch between the different types of tracks. These tracks consist of:

- Outside Diameter Track
- Inside Diameter Track
- Flat Track



Track Ring Size

Track sizes can range from 4 in. to 300 in. the value can be changed in increments of 0.1 in. Holding the switch for longer than 2 seconds will increase the speed at which the increments increase. Use the nominal sizes for the track rings. These nominal sizes are stamped into the track.

With both the Outside and Inside Diameter options the user is required to enter in the track ring size, and the pipe size. These numbers need to be input correctly in order to calibrate to the correct travel speed. This ensures that the torch travel is consistent.

Pipe Size

The third field that can be changed is the pipe size. This can range from 4 in. to 300 in. The value can be changed in increments of 0.1 in. Holding the switch for longer than 2 seconds will increase the speed at which the increments increase.

Heavy Wall Pipes

Heavy wall pipes may require the user to change the pipe size in later passes.

Example: A 20" schd 120 pipe would have the first pass pipe size entered at: 17" (true pipe ID) As the joint is filled in the diameter being welded will increase until the last pass where a true 20" (true pipe OD) diameter is being welded.

Positioner Setup

This system can be used as a part of a 1G system with certain positioners. When the system detects positioners as part of the setup the Travel Setup screen will change, see **FIGURE 26 - Positioners Setup Screen**.

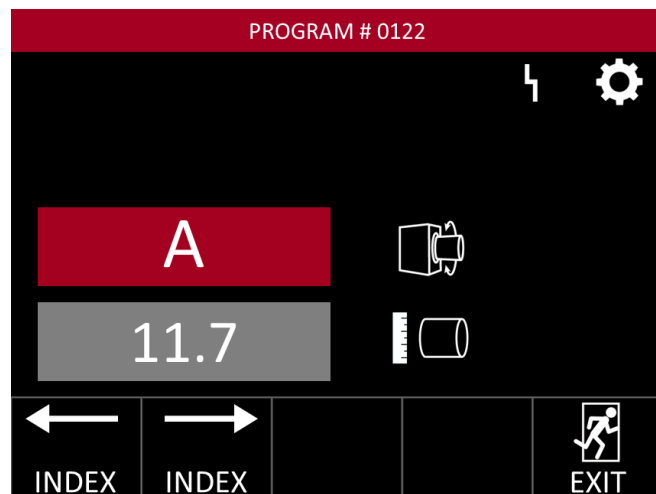


FIGURE 26 - Positioners Setup Screen

When the system is set to control multiple positioners the right toggle will switch between positioner A and B.

Use the Index Selection buttons to index the weld head on its mount.

When the system is used to control positioners the weld and idle screens will show the current positioner as a selection. Pressing the Positioner Selection button will switch from positioner A to positioner B.

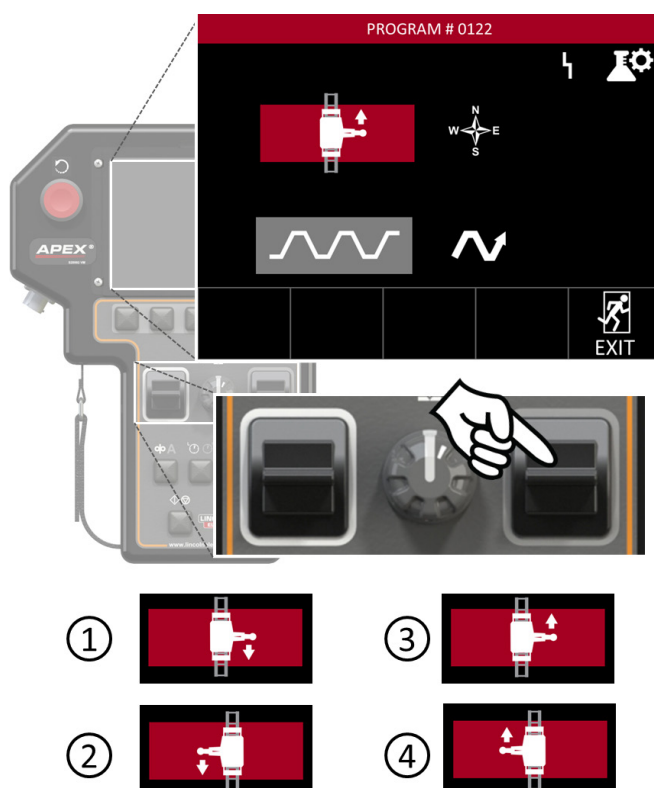


Travel Setup Screen

The travel setup allows the operator to set how the controls will work while welding and change the weave pattern.

Travel

The operator has the option of choosing how the tractor is oriented on the track. This is a benefit when welding because the operator is able to choose which direction is forward and which direction is reverse. The travel direction being oriented correctly with the user allows the steering to be intuitive. With some tractors that don't allow the user to set orientation, forward and reverse can be confused; pressing up will make the tractor move forward, but when the tractor is oriented 180 degrees pressing up will move the tractor backward. This can lead to confusion and weld errors.

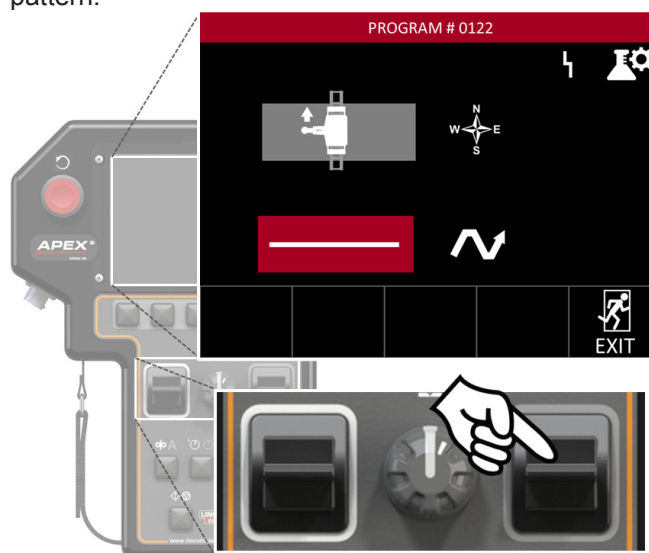


With the travel field highlighted the tractor orientation can be selected, as well as the travel direction. There are four different options available. All directions refer to the tractor and are in relation to the users view facing the tractor.

1. Facing Right, Traveling Down
2. Facing Left, Traveling Down
3. Facing Right, Traveling Up
4. Facing Left, Traveling Up

Travel Pattern

The second field the operator can choose is the weave pattern.



No Weave



Step Travel



Continuous Travel



There are three options to choose from.

No Weave

When no weave is selected the oscillator does not move during the welding process. The user can still manually steer the oscillator.

Step Travel

During step travel the travel speed stops during the dwells. This allows the heat to be directed to the side walls.

Continuous Travel

Continuous travel will continue travelling throughout the weld process, as well as during oscillation, excursion and dwells.

Process Setup Screen

The Process Setup Screen, see **FIGURE 27 - Process Setup**, allows the user to select from various options to determine the variables in the weld.

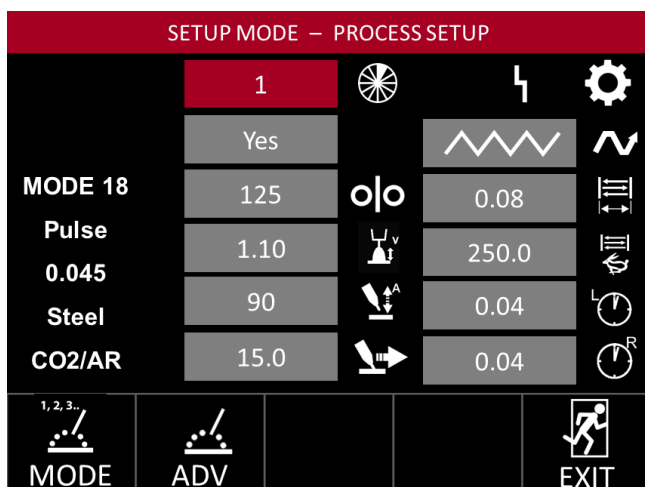


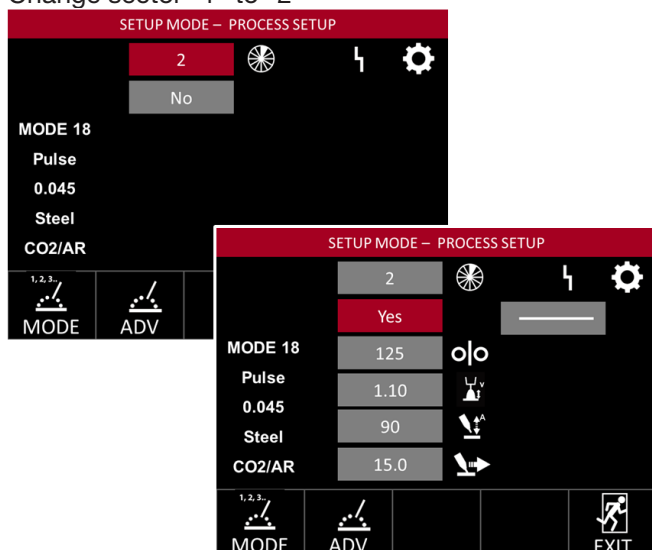
FIGURE 27 - Process Setup

Standard Process Options

Certain process options should be set up for every weld and every sector. These options are:

- **Sector** - Determines which sector options are being set for. There are 8 possible sectors.
- **Wire Speed** - Sets wire feed speed
- **Trim/Voltage** - The voltage option which controls the amount of voltage applied to the wire
- **Torch Height (Amperage)** - The Amperage value which determines how close the torch is to the work surface
- **Travel Speed** - Sets the electrode travel speed

Change sector “1” to “2”



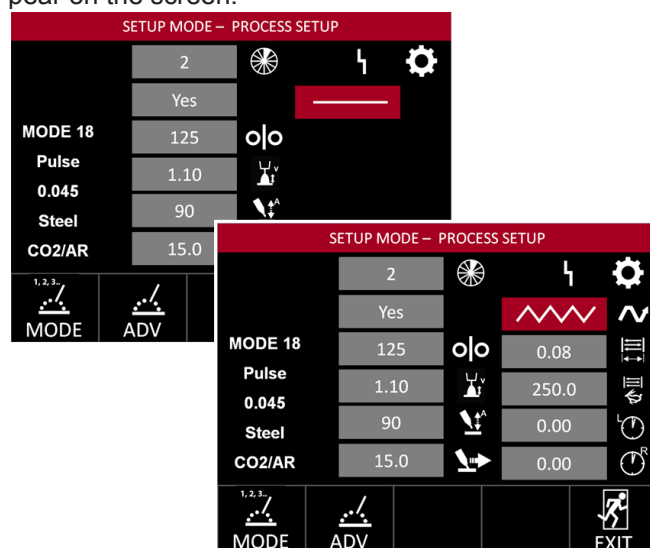
and travel options. Without multiple sectors enabled the system will only register 1 sector for the entire weld. With only one sector selected the Idle, Weld and Test screens will not show the sector icon.

Weave Process Options

Weave is an optional process option that is set up depending on the user's and application's requirements.

- **Weave** - Refer to the Travel Pattern section on page B-18 for the different weave options.
- **Oscillation Width** - Determines the width of the oscillation weave (up to 2 in.)
- **Oscillation Speed** - The speed at which the torch moves during oscillation
- **Left Dwell** - How long the torch remains on the left side of oscillation
- **Right Dwell** - How long the torch remains on the right side of oscillation

With no weave selected, oscillation settings do not appear on the screen.



Many settings on the Process Setup Screen can be adjusted during the weld. The purpose of this screen is to set base settings before the weld begins.

Weld Mode and Weave Pattern cannot be adjusted during the weld.

Enabling a sector presents the Wire, Trim, Torch height

Mode Select

The weld mode is determined by the wire size, type, process and type of gas being used. It is important to have the correct weld mode set because that allows the power supply to drive the different aspects of the weld. These aspects determine how the power supply will behave throughout the weld.

Mode select provides a range for weld controls such as WFS, Amps, Volts and others.

Guided Mode Select

The system allows for a guided mode select, see **FIGURE 28 - Guided Mode Select** for when the user is not sure which mode is appropriate for their application.

Press the Mode selection button



Much like other screens only pertinent information appears on the screen. The user is prompted to select the wire size, type, process, and then gas type.

Mode Select guides the user through the settings.

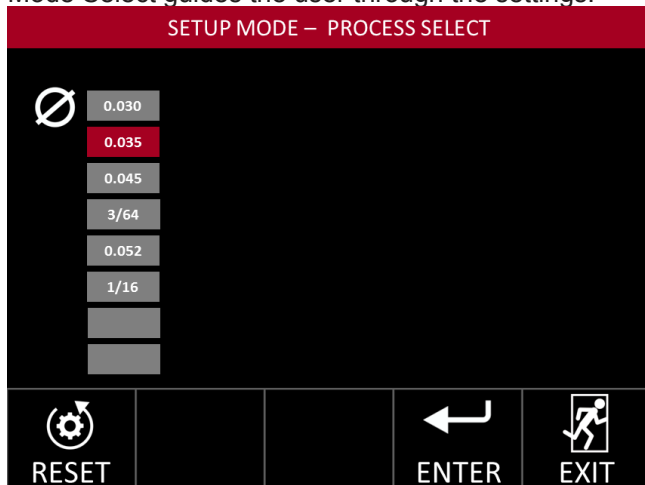
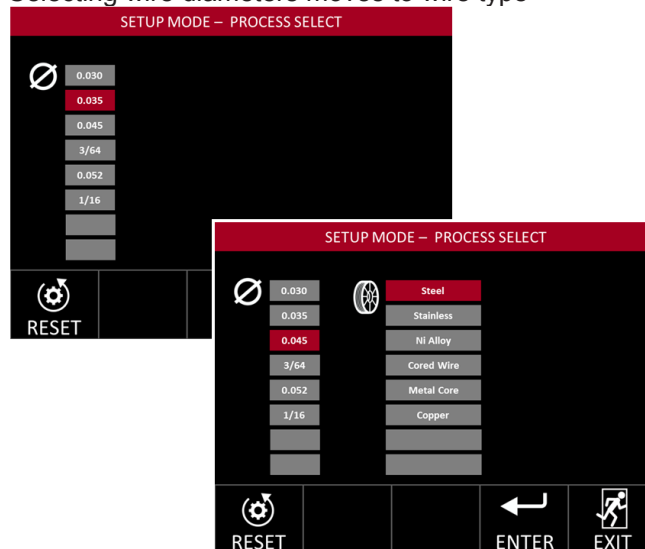
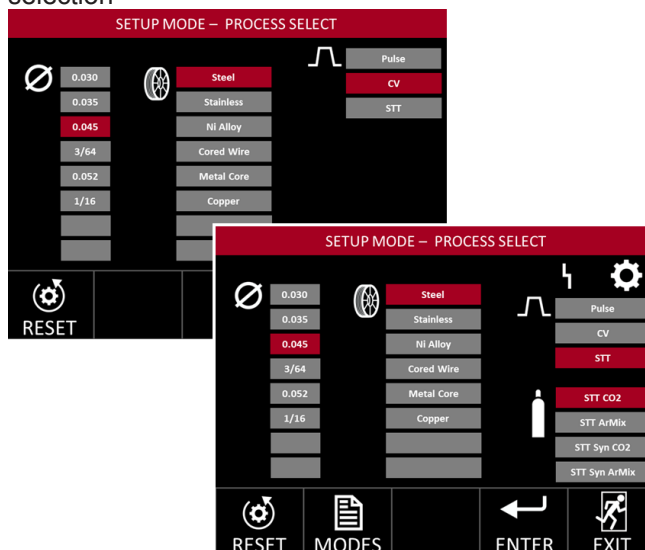


FIGURE 28 - Guided Mode Select

Selecting wire diameters moves to wire type



Wire type leads to specific process and then to gas selection



Each selection filters the list of available weld modes to match your application. A cored wire would not allow the user to select an STT process. This prevents errors before the weld even begins.

The currently selected mode is displayed on the left side of the screen, see **FIGURE 27 - Process Setup**. These processes are accessed from the Power Wave, and are updated with the standard Power Wave updates.

Manual Mode Select

Lincoln power supplies come with pre set welding modes for particular welding applications and wire types. Press the Mode selection button to see a list of weld modes loaded into the power supply.

Press the Modes selection button



The available weld modes are displayed in sequential order. These available modes depend on the available equipment. STT modes will not be selectable without an STT or Advance Process Module connected to the welding equipment.

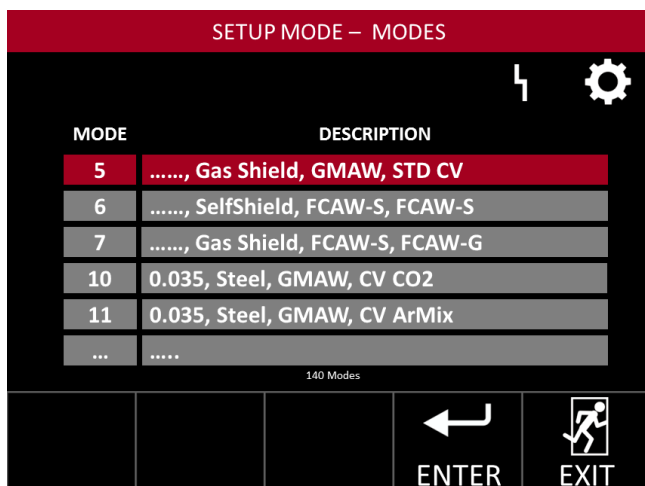


FIGURE 29 - Automatic Mode Screen

Advanced Process Setup

Certain weld modes have advanced settings specific to that mode or process. Pressing the ADV Selection button on the Process Setup screen will present the user with the advanced options associated with the selected weld mode, see **FIGURE 30 - Advanced Process Setup**.

Press the ADV Selection button.



Advanced Options

Options available depend on the selected weld mode. See the PowerWave settings for a full breakdown and explanation of advanced options.

Wave Controls

Some typical wave controls are:

- Pinch
- Hot Start
- UltimArc

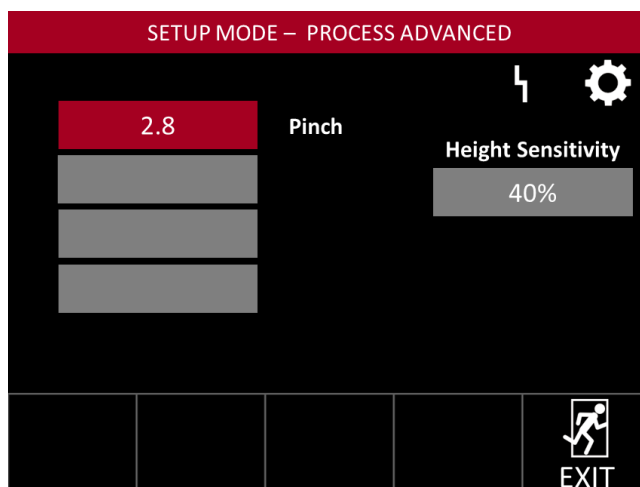


FIGURE 30 - Advanced Process Setup

Height Sensitivity

Height sensitivity is a global setting available regardless of the weld mode selected.

The operator is able to chose how quickly the auto height will react to changes. Higher sensitivity will result in faster adjustment which might cause hesitation in torch height motion and abrupt changes in the weld.

Sensitivity Recommendations

- 0 No movement
- 20 STT/FCAW or pipe out of roundness
- 50 CV (Also factor default setting
- 80 Pulse or Joint Profile tracking

Start Settings

Start setting should be set up after the process setup has been completed. The start settings screen, see **FIGURE 31 - Start Settings Screen**, allows the user to adjust the run in settings specific to the program which affect how the system acts when the weld starts. The start settings take effect as soon as the Start / Stop button is pressed to initiate the weld. Refer to page **G-7** to see a full timing diagram.

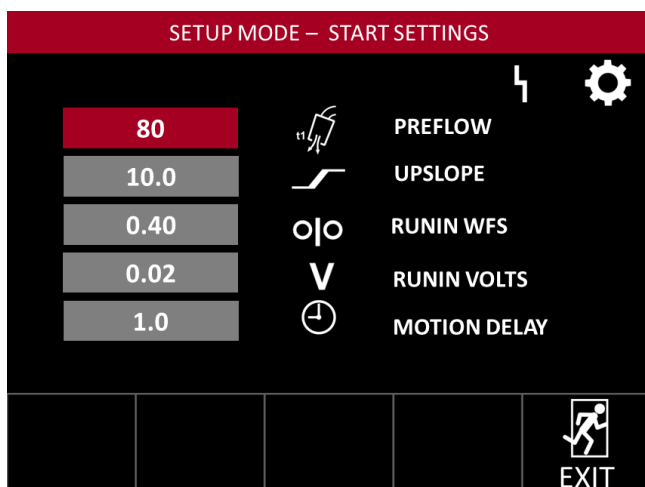


FIGURE 31 - Start Settings Screen

The setting that can be changed in this screen are:

Preflow

The amount of time (sec) that gas flows before welding begins to ensure adequate gas coverage for the weld. This prevents porosity.

Upslope

This is the amount of time (sec) it takes for the system to ramp from start settings to welding parameters.

RunIn WFS

Determines the speed at which the wire will travel at the beginning of upslope. Will ramp up to welding WFS.

RunIn Volts

The voltage setting at which the system begins to weld. Will then ramp to welding voltage.

Motion Delay

This determines how long the system will wait before beginning to travel and oscillate.

End Settings

The end setting screen, see **FIGURE 32 - End Settings Screen**, allows the user to adjust the end settings specific to the program, which affect how the system will behave at the end of the weld. End settings take effect as soon as the Start / Stop button is pressed to stop the weld. Refer to page **G-7** to see a full timing diagram.

The settings that can be changed in this screen are:

Crater WFS

The wire feed speed during crater

Crater Volts

The amount of voltage after downslope

Crater Time

The voltage setting that downslope will ramp to

Burnback

The time the arc is maintained after the wire stops.

Downslope

How quickly the system ramps from welding parameters to crater parameters

Postflow

How long the gas continues to flow after the weld to provide shielding

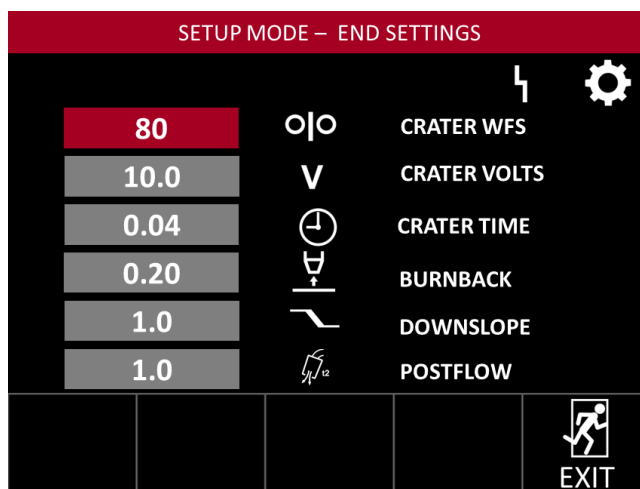


FIGURE 32 - End Settings Screen

Service

The Service Screen allows for advanced welding options. There are two menus available in the Service Screen: Version and Motion.

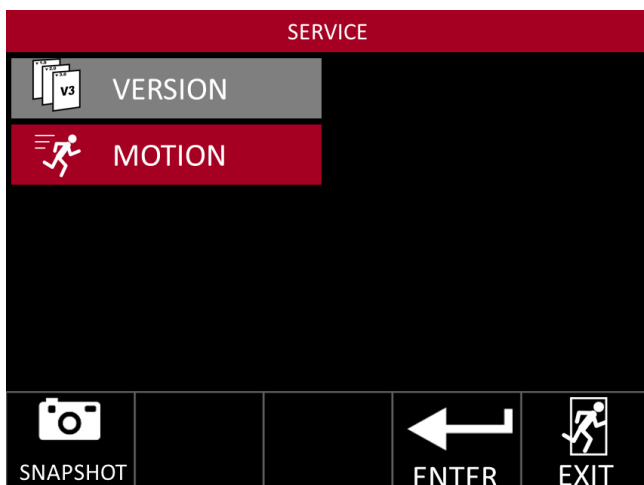


FIGURE 33 - Service Options Page

If a USB is installed the system allows for a system snapshot to be taken from this screen.

Version

The version option of the service menu shows the user information about the installed software and hardware. Page through the screen using the Next Selection button.

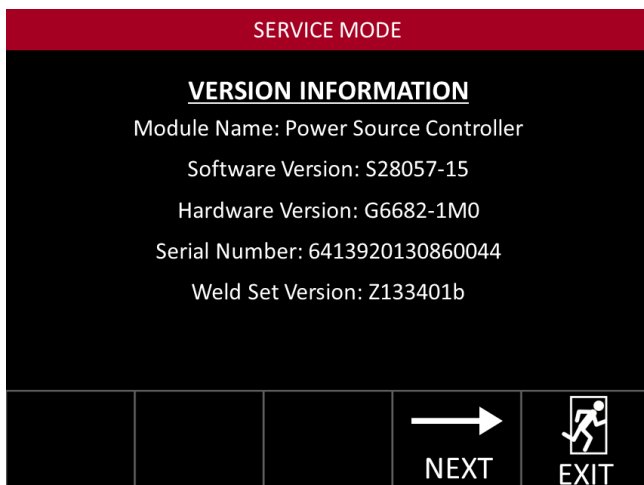


FIGURE 34 - Service Screen Versions

Motion

Allows the user to select certain motions and behaviors of the weld system, see **FIGURE 35 - Service Screen Motion** for available options.

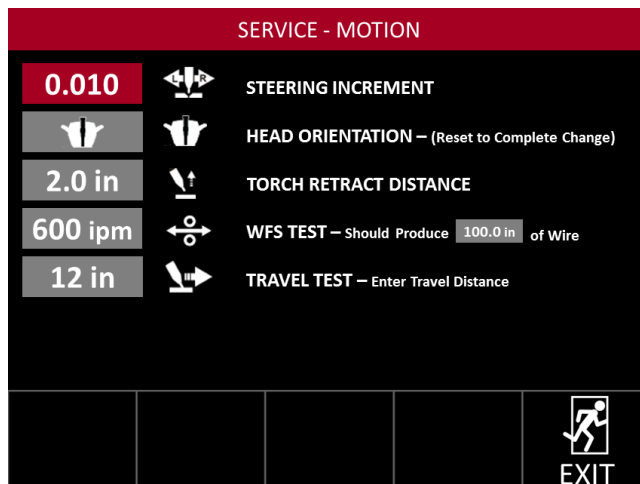


FIGURE 35 - Service Screen Motion

Service Motion items are:

- **Steering Increment** - Allows the supervisor to set the distance the oscillation will move for each click of the steering knob.
- **Head Orientation** - To change the torch orientation relative to the weld head the supervisor must also change the system settings in addition to physically inverting the weld head.
- **Torch Retract Distance** - Change how far the torch retracts at the end of the weld. This allows for greater retract distance when clearance is desired, and less distance when restarting the weld needs to be rapid.
- **WFS Test** - The APEX system does all calibrations internally, however in order to comply with welding standards our system allows for verification. WFS Test will produce a desired amount of wire for a desired length of time for verification.
- **Travel Test** - The APEX system does all calibrations internally, however in order to comply with welding standards our system allows for verification. Travel Test will travel for the specified distance for verification. The speed the weld head will travel is determined by the program parameters.

Users

The Users Screen, see **FIGURE 36 - Users Screen** allows the user to set up operator and administrator log in codes. Each user can be assigned an individual code which determines the level of access.

Fast Movement

Fast movement using the steering knob is enabled on this screen. Use the steering knob or left and right toggles for navigation and selection.

Adding Users

Only those with supervisor access are able to view the users screen.

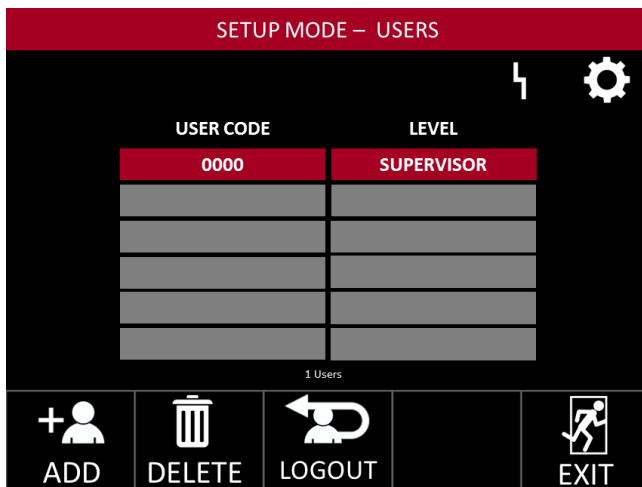


FIGURE 36 - Users Screen

Press the Add User Selection button.



Pressing the Add Selection button will bring up the Add User screen, see **FIGURE 37 - Add User**.

After the code has been selected the user can determine the level of access:

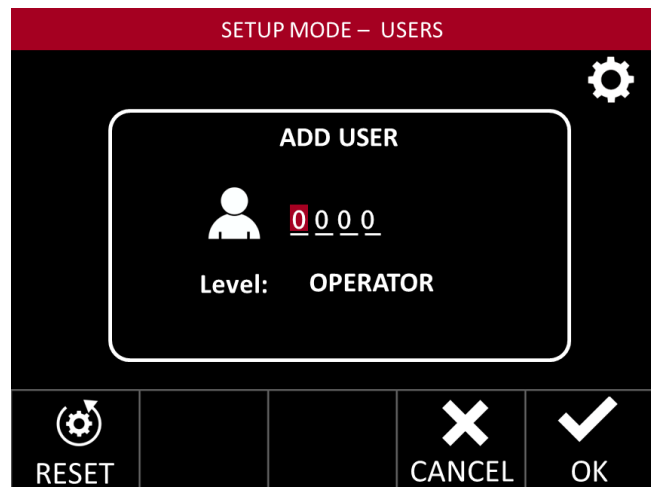


FIGURE 37 - Add User

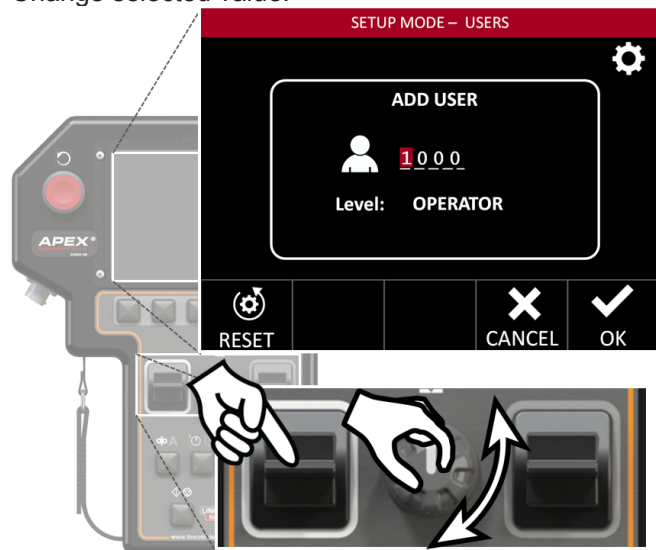
Operator

Limited access to settings, will only be able to operate within the increment settings placed by the supervisor per program.

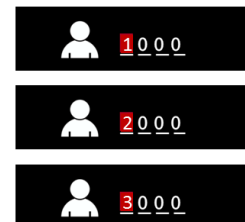
Supervisor

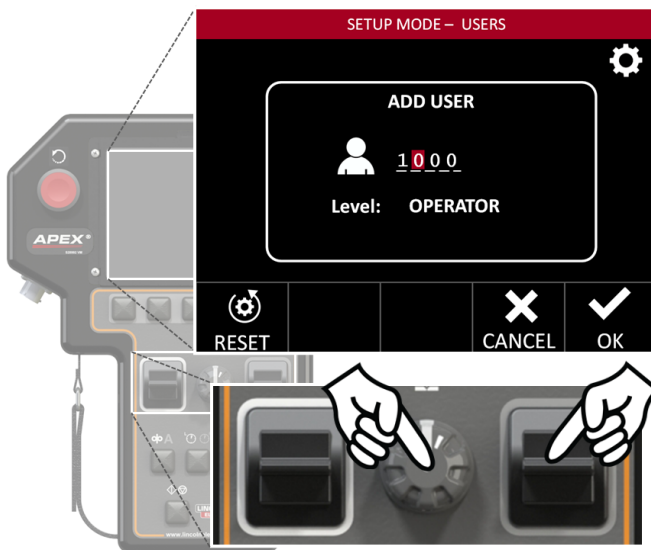
Full rights and access to all weld parameters and setup screens.

Change selected value.

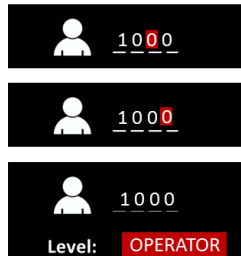


Changes the value of the selected item





Changes the location of the cursor



Once you have chosen the appropriate User code and level of access then select OK.

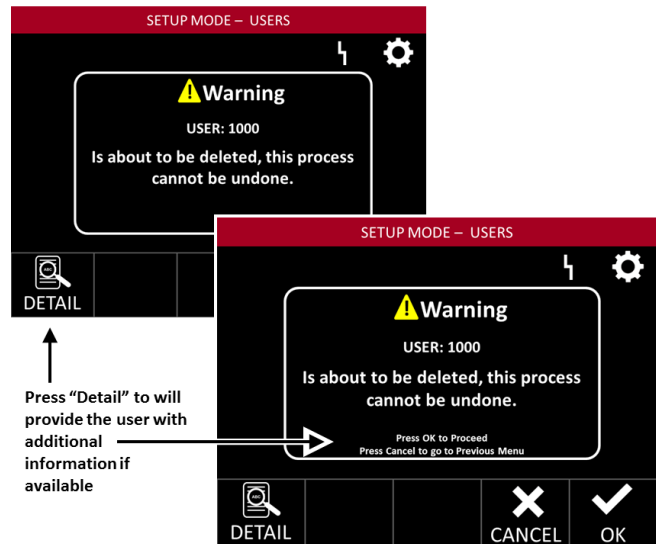
Reset will change characters back to "0000".

Deleting Users

Press the Delete Selection Button after selecting a user from the list.



Deleting a user account will bring up a warning screen. Press the Detail Selection button to see more information about the shown screen.



The warning screen allows the user the chance to re-view what is being deleted. The warning screen shows the level of access and the user code. In this instance it is USER: 1000. If this User Code had Supervisory access the screen would read, SUPERVISOR: 1000.

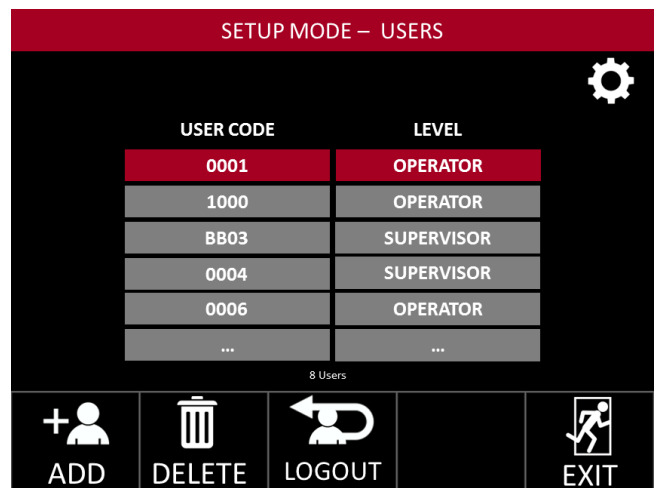


FIGURE 38 - Multiple Users

If there are too many users to fit on the screen the last box will contain ellipses, see **FIGURE 38 - Multiple Users**. This indicates that there are additional system users. At the bottom of the fields it will tell how many user codes are currently listed in the system.

Changing User Access

To change the level of access that a user has been granted press the ADD selection button. Instead of entering a unique user code add in the existing user code that needs to be changed.

With "Level" highlighted choose the new access level.

Log Out

To change users press the Logout Selection button. This logs out the current user so that a new user can log in.



Note: If the new user code is set as an operator they may not have full access to the system settings. Be sure to always have at least one operator code at all times for full system access.

Operator Log In

When an operator logs into the pendant they are presented with program screen, see **FIGURE 39 - Operator Log In**.

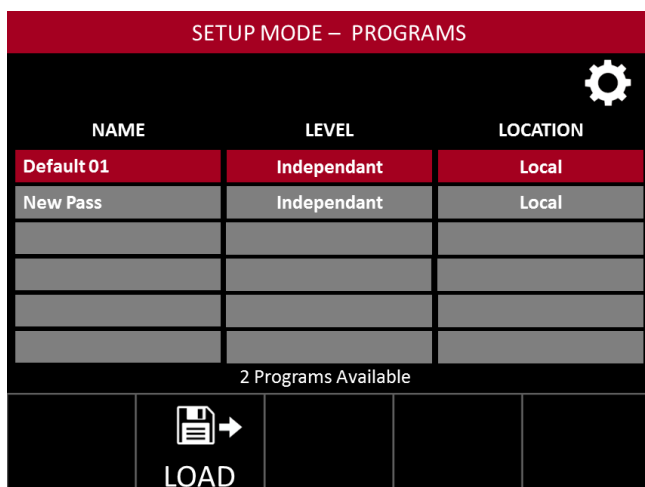


FIGURE 39 - Operator Log In

Since operators cannot save or create programs, they are presented with the program options available to them. They can select only these programs.

When entering setup mode operators are automatically brought to the Programs Screen.

Increments Settings

The increments screen, see **FIGURE 40 - Increments Screen** is used to set how much a single button press will change each value and limit the operator's access to certain parameters.

The minimum and maximum values provided to the user are based on welding power source, weld mode, wire diameter and other items.

The increments that can be set are:

Increment Options

- Wire Feed Speed
- Amperage
- Voltage
- Travel Speed
- Oscillation Width
- Oscillation Speed
- Dwell Time

Each of these values can have a minimum and maximum value set that the operator will not be able to exceed. These increments can be changed per program and per pass.

To reset all increments back to their widest tolerance press the Reset Selection button.

In addition to limits the operator has the ability to set the system units between Imperial to Metric.

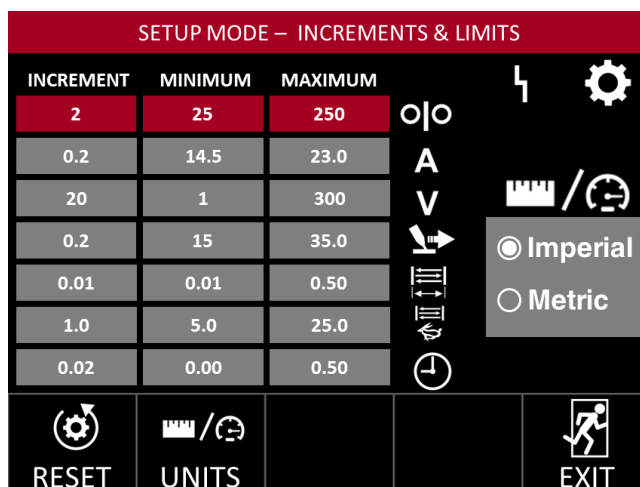


FIGURE 40 - Increments Screen

See **FIGURE 41 - Increments Reference** for a list of the different values for imperial and metric.

Increments quick reference document

Refer to **FIGURE 41 - Increments Reference** for a complete list of increment values for both imperial and metric measurements.

Setup Screen	Value Name	Increments	Metric Increments
SETUP MODE – INCREMENTS & LIMITS			
INCREMENT	MINIMUM	MAXIMUM	
2	25	250	
0.2	14.5	23.0	
20	1	300	
0.2	15	35.0	
0.01	0.01	0.50	
1.0	5.0	25.0	
0.02	0.00	0.50	
SETUP MODE – START SETTINGS			
80			
10.0			
0.40			
0.02			
1.0			
SETUP MODE – END SETTINGS			
80			
10.0			
0.04			
0.20			
1.0			
1.0			
SETUP MODE – PROCESS SETUP			
MODE 18	2		
Pulse	Yes		
0.045	125		
Steel	1.10		
CO2/AR	90		
	15.0		
SETUP MODE – PROCESS SETUP			
MODE 18	2		
Pulse	Yes		
0.045	125		
Steel	1.10		
CO2/AR	90		
	15.0		

Increments & Limits Menu		
Wire Speed	ipm	cm/min
Amperage	Amps	Amps
Voltage*	Volts	Volts
Travel Speed	ipm	cm/min
Oscillation Width	Inches	Centimeters
Oscillation Speed	ipm	cm/min
Oscillation Dwell	Seconds	Seconds
Start Settings Menu		
Preflow	Seconds	Seconds
Upslope	Seconds	Seconds
Runin Wire Feed Speed	ipm	cm/min
Runin Voltage	Volts	Volts
Motion Delay	Seconds	Seconds
End Settings Menu		
Crater Wire Feed Speed	ipm	cm/min
Crater Voltage	Volts	Volts
Crater Time	Seconds	Seconds
Burnback	Seconds	Seconds
Downslope	Seconds	Seconds
Postflow	Seconds	Seconds
Process Setup Menu		
Wire Feed Speed	ipm	cm/min
Voltage*	Volts	Volts
Amperage	Amps	Amps
Travel Speed	ipm	cm/min
Process Setup Menu (Continued)		
Oscillation Width	Inches	Centimeters
Oscillation Speed	ipm	cm/min
Left Dwell	Seconds	Seconds
Right Dwell	Seconds	Seconds

FIGURE 41 - Increments Reference

Programs

From the program screen, see **FIGURE 42 - Program Screen**, programs can be saved into the system or onto a usb memory stick.

Fast Movement

Fast movement using the steering knob is enabled on this screen. Use the steering knob or left and right toggles for navigation and selection.

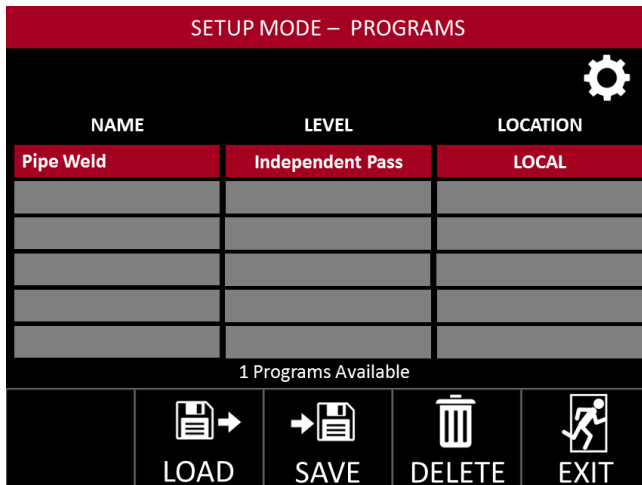


FIGURE 42 - Program Screen

Saving an Independent Pass

By going to the different system settings pages the supervisor can change the parameters of the loaded program. Once these parameters have changed they can be saved as a new program.

Pressing the save selection button will take the user to a sub menu. This menu will allow the user to set

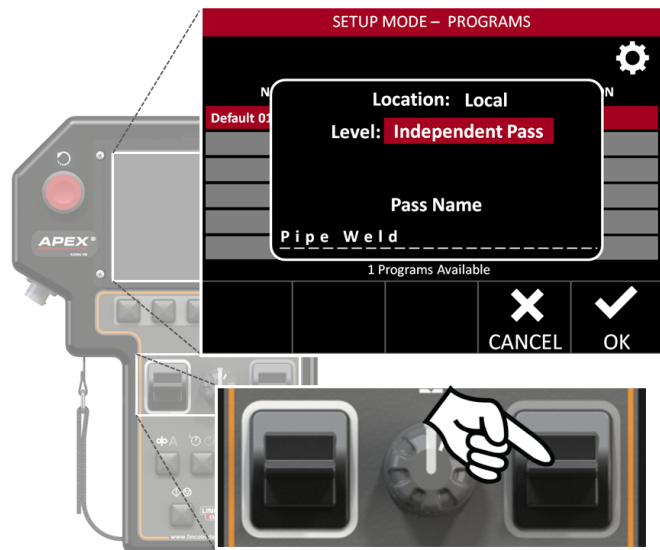
Location: Selects where the program is saved

- Local: This saves directly to the Pendant
- USB: This saves to the installed USB. This option only appears when a USB is plugged in.

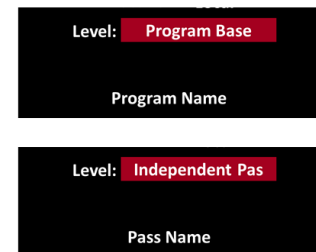
Level: Selects what type of Program is being saved

- Independent Pass: stand alone weld procedures, not tied to any other program
- Program Base: The first step in creating a multiple passes which tie together to form a full welding procedure; this is explained in the next section.
- Program Pass; These are tied to the Program Base and can be created as needed by the user. For example a pipe could require four passes, so each pass could be saved under a Program Base for easy retrieval

Pass Name: Allows the user to select a unique pass name to identify the pass or program.



Switches between Program Base & Independent Pass



Once the location and level are set choose a unique name for the program. This name should be distinct to prevent confusion.

Saving to a USB limits the program to 8 characters.

The “name” field always auto populates with the name for the currently loaded program. Change this independent pass to “New Program 01” and press the OK Selection button.

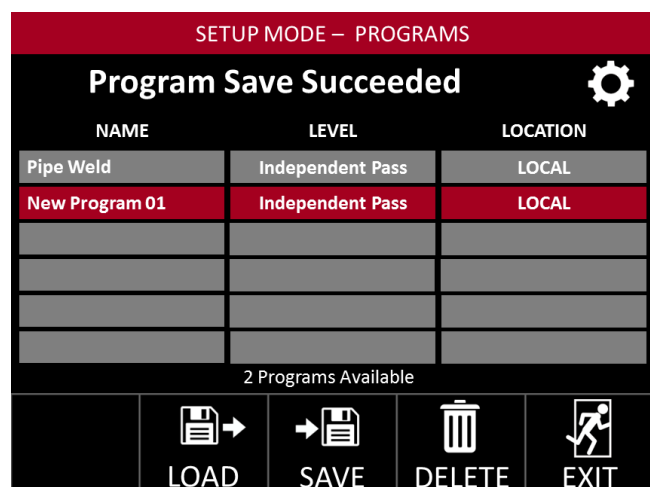


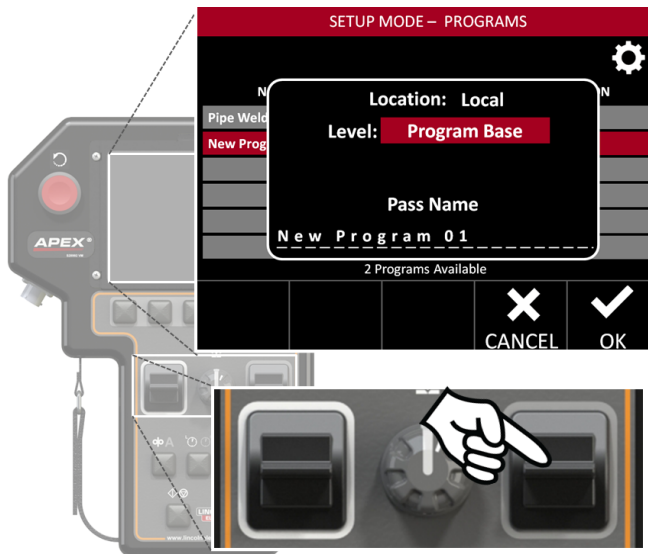
FIGURE 43 - New Independent Pass

A new independent pass is created with the selected name.

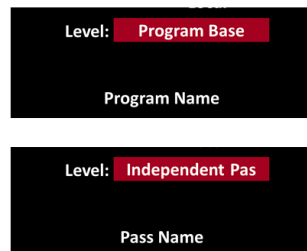
Saving a Program Base

Independent passes work for single pass welds. For instance if the system is only going to be performing the root pass then an independent pass is ideal. If there are multiple passes on the same material then it is better to set up a Program Base.

In the save program sub menu change the level from Independent Pass to Program Base



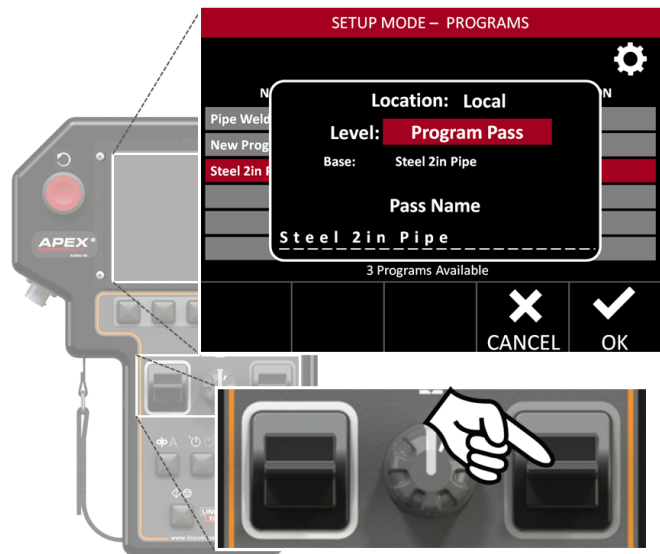
Switches between
Program Base &
Independent Pass



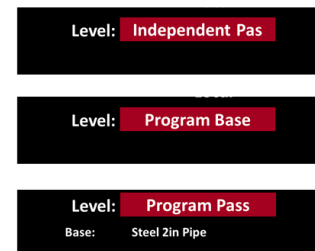
Saving a Program Pass

With a program base saved it is necessary to create individual passes within the Program Base for the settings to be saved. Press the Save Selection button again.

A new options is now available, "Program Pass". With Program Pass selected it will allow the user to choose which "Base" to save to. Choose the appropriate base.



Switches between
Independent Pass
Program Base &
Program Pass



Change the name of the base to something easily remembered for the operator. Descriptions of the material and size may be helpful.

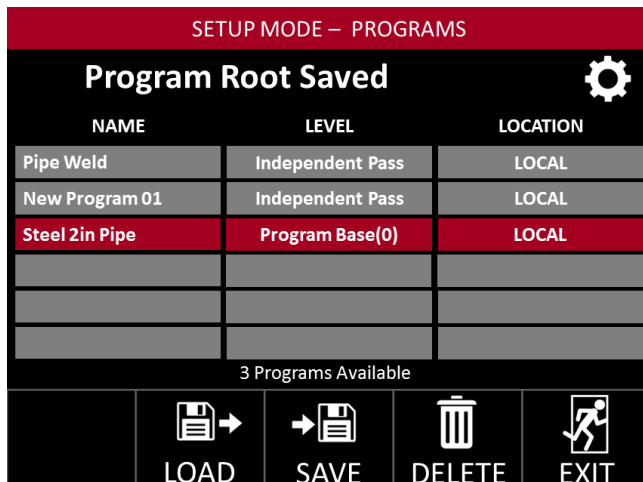


FIGURE 44 - New Program Base

For this example the pass has been named "Root"

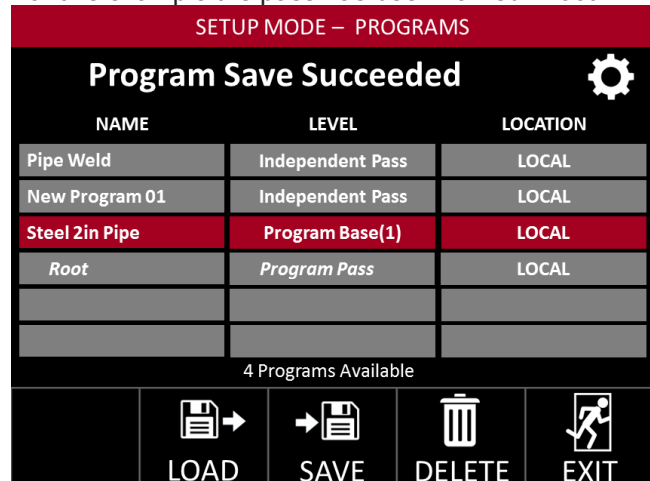


FIGURE 45 - New Base Pass: Root

Continue to save programs to this base until the required passes are all saved.

For this example we will save three passes, a Root, Fill and Cap Pass.

After saving the required passes they are all displayed under the base, see **FIGURE 46 - Full Program Base**.

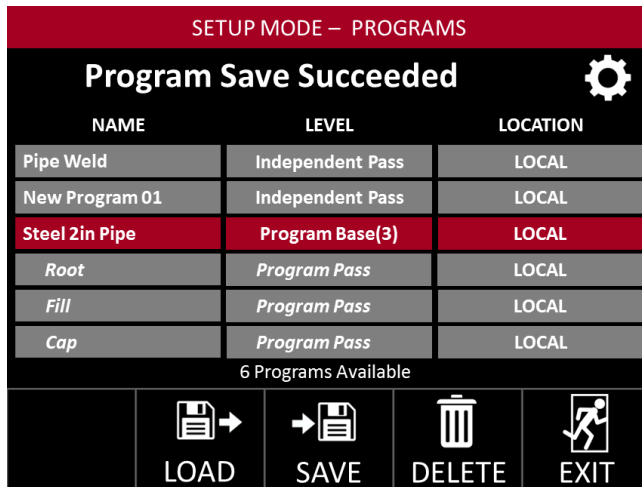
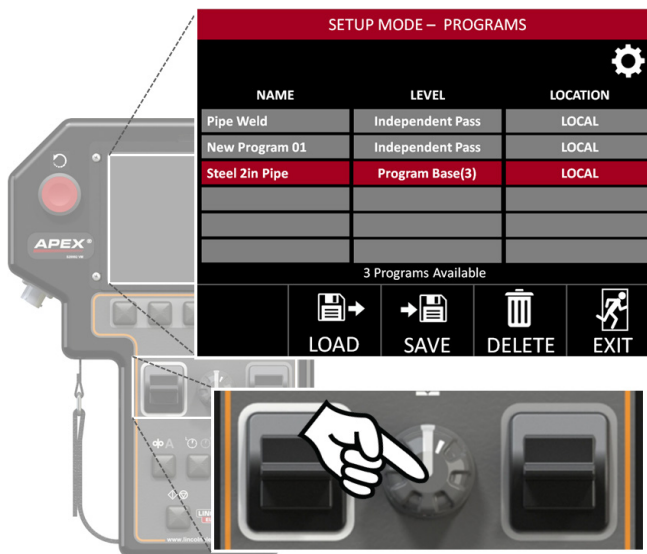


FIGURE 46 - Full Program Base

Hide Program Passes

The passes in a program base can be hidden by highlighting the program base and pressing the steering knob once, this collapses the group. Press again to expand.



Saving to a USB

All of the examples shown have been saved locally to the pendant, they can also be saved to a USB.

The USB is required to have a specific folder to save or read files. If this folder is missing then a prompt will appear on the screen, see **FIGURE 47 - USB Folder Notification**. If this is a new flash drive the system will create the required folder.

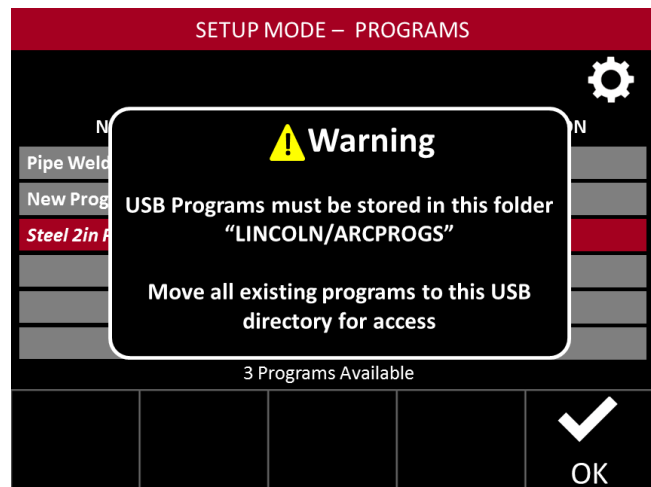
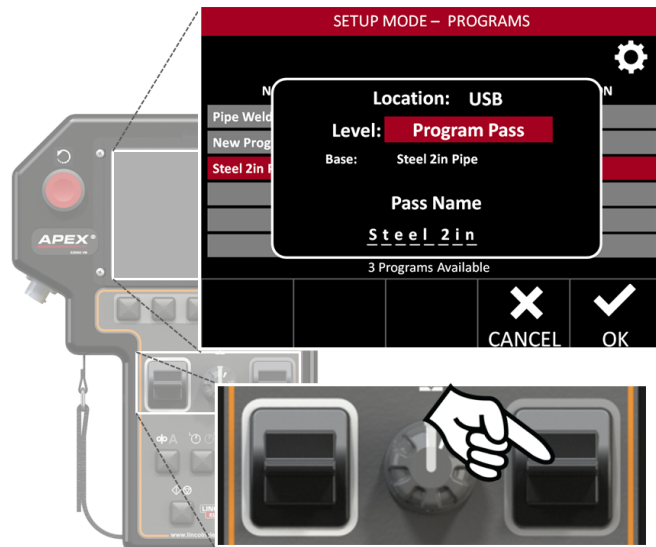


FIGURE 47 - USB Folder Notification

Pressing "Ok" will create the folder in the USB. To access files already saved on the USB move them to the specified directory.

Note: USB File save is restricted to 8 characters. Local files can be up to 16 characters.

Note: The only program named not allowed is "Lincoln"



Switches between USB & Local

Location: **USB**

Level: Program Pass

Location: **Local**

Level: Program Pass

Copy to/from USB

With the USB inserted a Copy Icon appears in bottom left of the screen see, **FIGURE 48 - Copy Icon**.

Press the Copy Selection Button

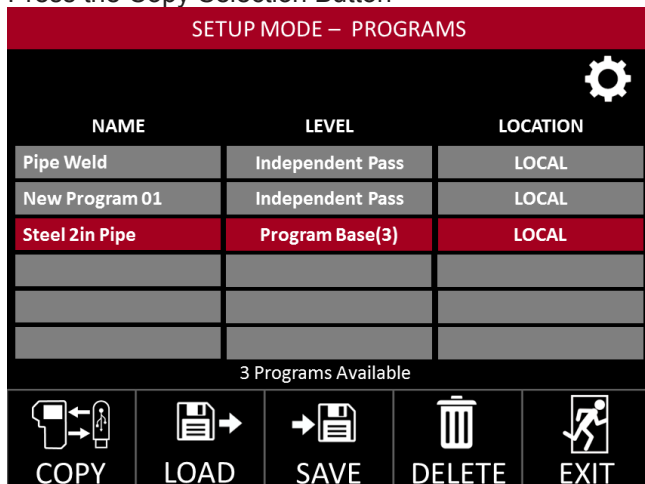


FIGURE 48 - Copy Icon

A copy of the selected program is made, see **FIGURE 49 - Copy to USB**.

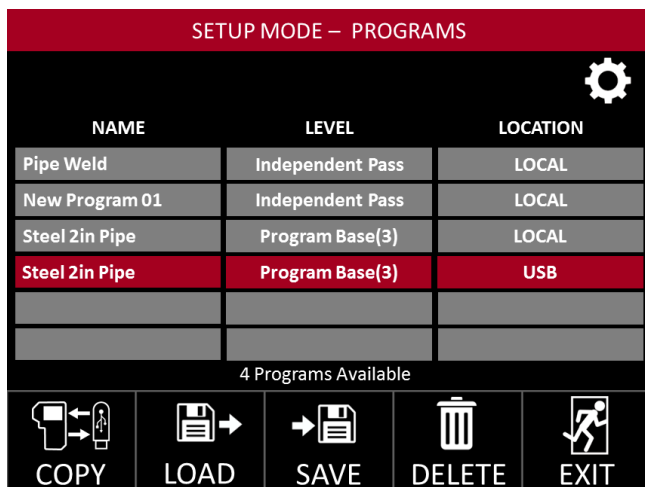


FIGURE 49 - Copy to USB

If the file is currently saved on the USB it will save to the Pendant, if it is a Local file (saved to the pendant) then it will save to USB as shown in **FIGURE 49 - Copy to USB**.

Note: If a locally saved program has more than 8 characters then copying to the USB will truncate the name to the first 8 characters. To save with a unique name load the program and then manually save to the USB with the desired 8 character name.

Deleting a Program

Saved programs can be deleted by highlighting the program and pressing the Delete Selection button. This will bring up a new window, see **FIGURE 50 - Program Delete**.

Press the Delete Selection Button.

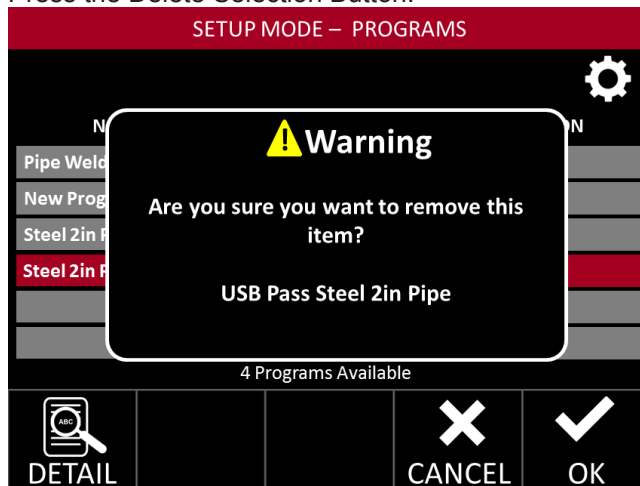


FIGURE 50 - Program Delete

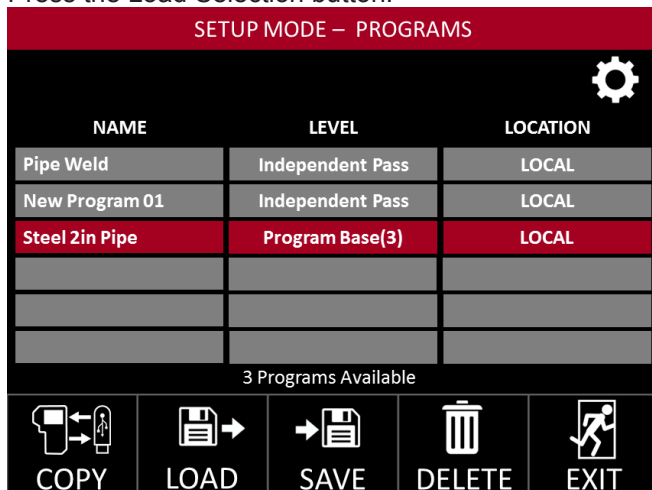
Deleting a Program Base

If a Program Base is deleted then all associated passes are also deleted.

Loading a Program

Once a program is saved, or when starting the system you can go into the Programs menu and load the desired program. Simply highlight the desired program or base and press the Load Selection button.

Press the Load Selection button.



This will load the desired program, see **FIGURE 51 - Loaded Program**.

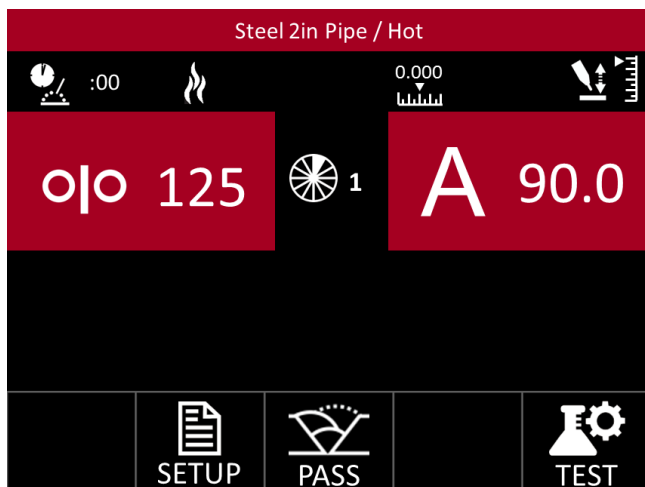


FIGURE 51 - Loaded Program

Overwriting a Program

If you attempt to save a file with the same name you will overwrite the existing program. The system will give you a warning asking if you are sure you want to overwrite the existing program. Overwriting will delete the original program.

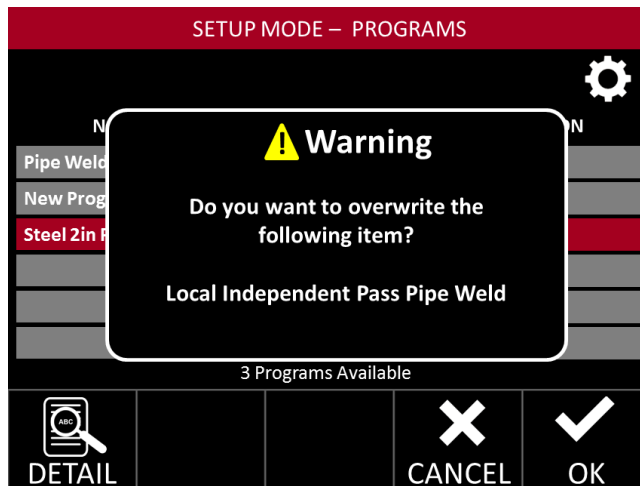


FIGURE 52 - Program Select

Operator Views

Supervisors will have access to all levels of the system, however the system is designed to lock out operators from higher level functions at the supervisors discretion.

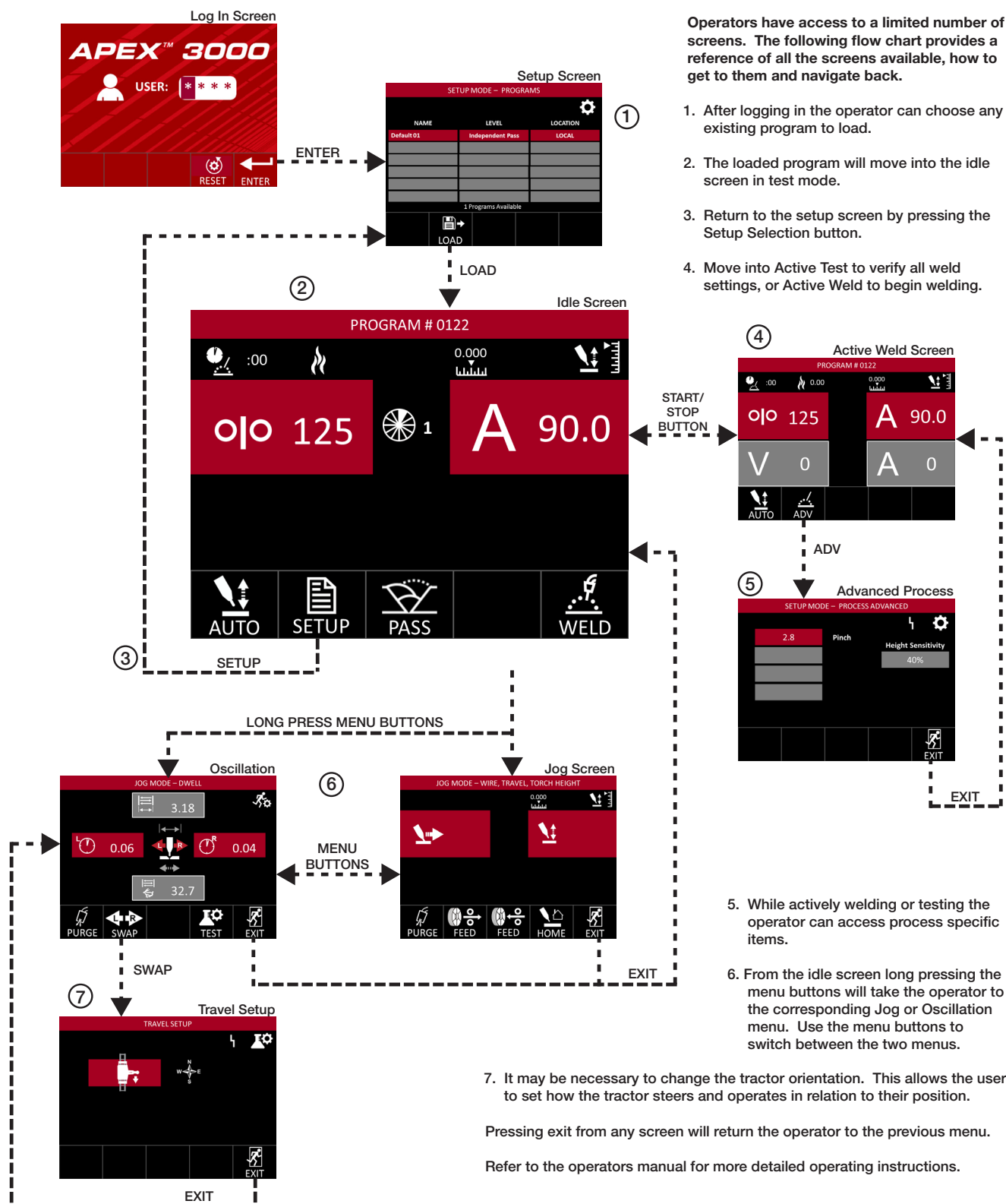


FIGURE 53 - Operator Navigation Chart

Operator Pendant

The Apex systems allow for the addition of an Operator Pendant. This pendant is a more rugged and simple version of the standard pendant. Not every user needs access to the wide range of welding and system parameters that can be accessed by a supervisor, to accommodate this an operator pendant was created with limited functionality.

Like the standard pendant the operator pendant uses colors for quick reference. White Icons are Weld/Test Icons, while Gray icons are Idle Icons.

The operator pendant operates in three modes.

- Weld Mode
- Jog Mode
- Test Mode

The various buttons and knobs on the pendant will change based on which mode the system is in. Weld and Jog modes are both accessible from the Operator Pendant. To get into and out of test mode will require the use of the standard pendant.

Weld Mode

These settings are available when the system is welding.

1. **Reset** - Pressing will reset the system
2. **Sector/Pass** - Will move to the next sector when a multi-sector program is loaded
3. **Display** - Displays current sector
4. **Steering Knob** - Manually steer torch
5. **Oscillation/Gas** - Adjusts the oscillation width
6. **Status** - Status LED should show solid green
7. **Travel** - Adjusts travel speed
8. **Amps/Torch Height** - Adjusts amperage, or if the auto height is turned off it will manually adjust the torch height
9. **Trim Volts/Wire Feed** - Adjusts trim or voltage depending on the selected process
10. **Start/Stop** - Stops the weld.

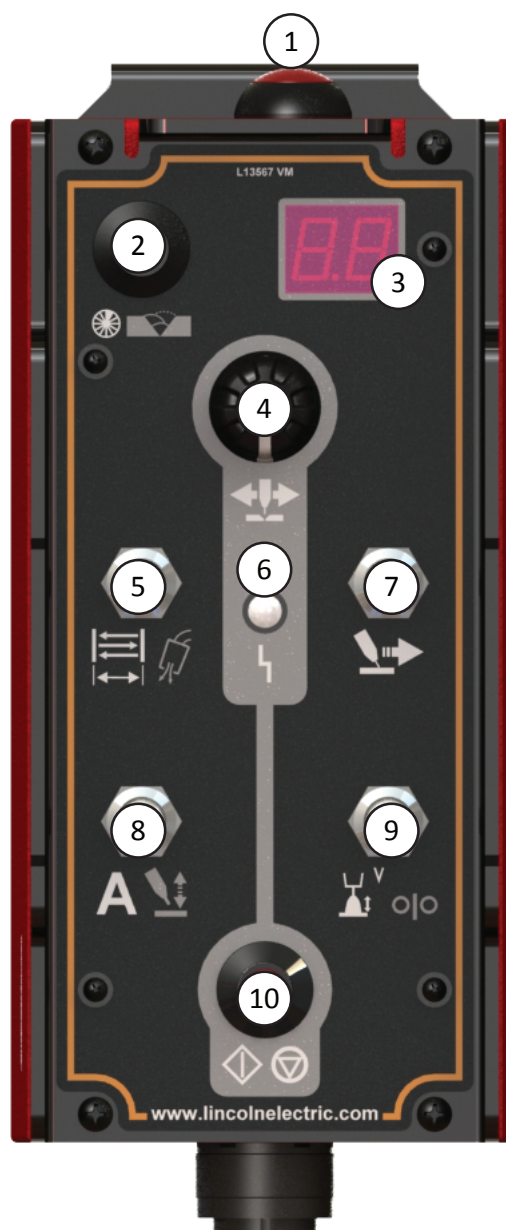


FIGURE 54 - Operator Pendant Buttons

Idle Mode

These settings are available when the system is idle.

1. **Reset** - Pressing will reset the system
2. **Sector/Pass** - Will move to the next pass when a multi-pass program is loaded
3. **Display** - Displays current pass
4. **Steering Knob** - Manually steer torch
 - **Short Press** - Centers torch
 - **Long Press** - Begins oscillation test
5. **Oscillation/Gas** - Purges gas
6. **Status** - System status LED
7. **Travel** - Adjusts travel speed
8. **Amps/Torch Height** - Adjusts height up or down and will ramp speed*
9. **Trim Volts/Wire Feed** - Feeds Wire and will ramps speed*
10. **Start/Stop** - Starts the weld.

Test Mode

These settings are available when the system is testing in Test mode.

1. **Reset** - Pressing will reset the system
2. **Sector/Pass** - Will move to the next sector
3. **Display** - Displays current sector
4. **Steering Knob** - Manually steer torch
5. **Oscillation/Gas** - Adjusts the oscillation width
6. **Status** - System status LED
7. **Travel** - Adjusts travel speed
8. **Amps/Torch Height** - Adjusts height up or down. Will ramp speeds*
9. **Trim Volts/Wire Feed** - No effect
10. **Start/Stop** - Starts or stops weld head movement

*Ramping speeds means that the system will start off adjusting speeds slowly, and gradually move to max speed

Operator Pendant Cable

Operator pendants can be used with various size arclink cables. These Arclink cables can be linked together to form longer or different sizes other than those shown.

- **K1543-8**
- **K1543-25**
- **K1543-50**
- **K1543-100**

Arclink T Connector

An Arclink T Connector (**K2429-1**) can be used to aid in cable management. It is useful when only one arclink cable needs to be extended from the control unit instead of two. In this instance a 50' Arclink cable could be used to extend away from control unit. An Arclink T connector and two 8' Arclink cables could then be connected to the end of the longer cable. This would eliminate the need for two 50' Arclink Cables. There are many different configurations to save weight or prevent inconvenience.

Pendant Light

The operator pendant comes with a built in LED light for inspecting welds.

1. **Light Switch** - Pressing and hold to turn on light
2. **LED Light** - Light used for inspecting welds

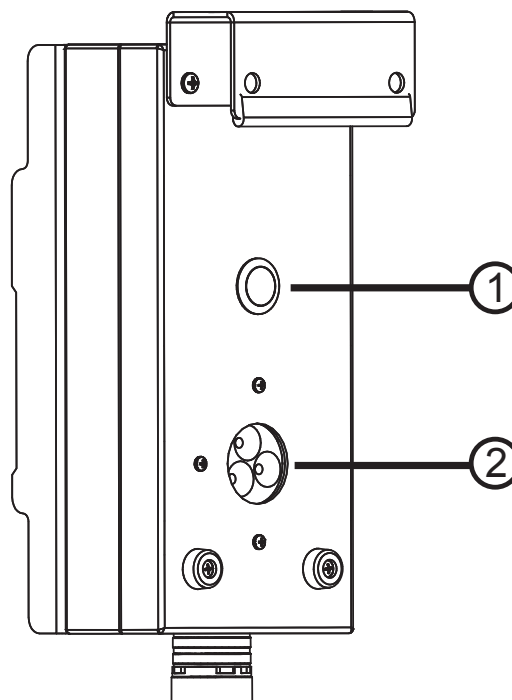


FIGURE 55 - Operator Pendant Back

Accessories

Drive Roll & Wire Guide Kits		
Description in (mm)		Part Number
Steel Wire Sizes (includes stainless steel):		
0.035 (0.9)		KP1696-035S
0.045 (1.2)		KP1696-045S
0.052 (1.4)		KP1696-052S
0.035, 0.045 (0.9, 1.2)		KP1696-1
0.040 (1.0)		KP1696-2
1/16 (1.6)		KP1696-1/16S
Cored Wire Sizes:		
0.035 (0.9)		KP1697-035C
0.040 - 0.045 (1.0 - 1.2)		KP1697-045C
0.052 (1.4)		KP1697-052C
1/16 (1.6)		KP1697-1/16C
Mechanized Torches & Liners		
Length ft. (m)	Description	Part Number
15 (4.6)	Mechanized Torch 15'	K52106-15
25 (7.6)	Mechanized Torch 25"	K52106-25
15 (4.6)	Wire Liner 0.035- 0.045 in (0.9 - 1.14 mm)	KP45-3545-15
25 (7.6)	Wire Liner 0.035- 0.045 in (0.9 - 1.14 mm)	KP45-3545-25
15 (4.6)	Wire Liner 0.052- 1/16 in (1.3 - 1.6 mm)	KP45-116-15
25 (7.6)	Wire Liner 0.052- 1/16 in (1.3 - 1.6 mm)	KP45-116-25
ArcLink Control Cables/Extensions		
Length ft. (m)	Description	Part Number
8 (2.5)	ArcLink Cable 8'	K1543-8
25 (7.6)	ArcLink Cable 25'	K1543-25
50 (15.2)	ArcLink Cable 50'	K1543-50
100 (30.4)	ArcLink Cable 100'	K1543-100
25 (7.6)	Heavy Duty ArcLink 25'	K2683-25
50 (15.2)	Heavy Duty ArcLink 50'	K2683-50
100 (30.4)	Heavy Duty ArcLink 100'	K2683-100
Torch Components		
Description in (mm)		Part Number
Gas Diffuser, Thread-on		KP2747-1
Teflon Spacer, Std Slip-on		KP52144-1
Teflon Spacer, Self Shielding		KP52162-1
Gas Nozzle, Thread-on 1/8 (3.2) Recessed		KP2743-1-62R
Gas Nozzle, Thread-on Flush		KP2743-1-62F
Gas Nozzle, Thread-on 1/8 (3.2) Stick Out		KP2743-1-62S
Bottleneck Gas Nozzle, Recessed		KP3161-1-62R
Bottleneck Gas Nozzle, Flush		KP3161-1-62F
Bottleneck Gas Nozzle, Stick Out		KP3161-1-62S

Common Contact Tips	
Description in (mm)	Part Number
Standard Magnum Pro 550 Tip	
0.035 (0.9) 550A Contact Tips	KP2745-035R
0.040 (1.0) 550A Contact Tips	KP2745-040R
0.045 (1.2) 550A Contact Tips	KP2745-045R
0.052 (1.3) 550A Contact Tips	KP2745-052R
1/16 (1.6) 550A Contact Tips	KP2745-116R
Tapered Tips*	
0.035 (0.9) Contact Tips	
0.040 (1.0) Contact Tips	
0.045 (1.2) Contact Tips	
0.052 (1.3) Contact Tips	
1/16 (1.6) Contact Tips	
Extended Length Tapered Tips	
0.035 (0.9) Contact Tips	KP52108-035R
0.040 (1.0) Contact Tips	KP52108-040R
0.045 (1.2) Contact Tips	KP52108-045R
0.052 (1.3) Contact Tips	KP52108-052R
1/16 (1.6) Contact Tips	KP52108-116R

* Contact customer service



Extended Length
Tapered
Contact Tip



Magnum Pro 550A
Contact Tip



Tapered
Contact Tip



Teflon Spacer
Standard Slip-on



Teflon Spacer
for Self Shielded
Threaded



Gas Nozzle
for 550A
Thread-on
1/8 in. (3.2 mm)



Bottleneck Gas
Nozzle for 550A
Thread-on
1/8 in. (3.2 mm)



Gas Diffuser
for 550A
Thread-on

Maintenance

The APEX® 30M Control System is designed for trouble free operation and normally requires minimal preventive care and cleaning. This section provides instructions for maintaining user serviceable items. The suggested repair procedure for all such items is to remove and replace defective assemblies or parts. When users and/or service personnel are not familiar with electrical and electronic equipment, the product should be returned to the factory or serviced by factory authorized representatives.

Semi Annually

- Based on a 40 hour work week it is recommended that the belts be replaced every six months.
- Verify that all motors are working correctly without strain. Listen to the motor to verify that there is no excess noise or grinding.

Maintenance Schedule

The maintenance schedule is suggested as a guideline for proper system maintenance. More stringent maintenance requirements may be required depending on the work being performed and the requirements of the customer for whom the work is performed. All maintenance schedules are based on a 40 hour work week. Any excess play in parts or equipment should be noted and reported to an authorized repair facility. Any anomalous activity, such as motor hesitation, clicking or other noises, or anything out of the ordinary should be noted and reported to an authorized repair facility.

Every Shift

- Check lines, cables, and drive belts for loose connections and worn areas.
- Change out consumables as needed.
- Check torch height, oscillation and travel for slop or wearing parts.
NOTE: Do not force the Oscillator in or out while checking for worn parts.
- Inspect torch cable for wear or damage.

Monthly

- With the clutch latch and clamp latch engaged grab the weld head by the handles and gently move back and forth to check for excess play in the weld head along the track.
- Release the clutch latch and verify that the weld head moves smoothly along the track without rubbing or binding.
- Examine all cable connections to verify that there are no gas leaks, and that all cables are seated correctly and that there is no visible wear and tear to any connector or associated cables.
- Check over the all weld head components for any signs of damage or wearing.
- Ensure track ring gears and weld head gears are clean and clear of debris.
- Check for wear of drive wheels on wire feeder.

Observe all Safety Guidelines detailed throughout this manual

USING THE STATUS LED TO TROUBLESHOOT SYSTEM PROBLEMS

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

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

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

TABLE E.1

Light Condition	Meaning
Steady Green	System OK. Power source is operational, and is communicating normally with all healthy peripheral equipment connected to its ArcLink network.
Blinking Green	Occurs during power up or a system reset, and indicates the POWER WAVE® is mapping (identifying) each component in the system. Normal for first 1-60 seconds after power is turned on, or if the system configuration is changed during operation.
Fast Blinking Green	Under normal conditions indicates Auto-mapping has failed. Also used by the Weld Manager Utility (included on the POWER WAVE® Submerged Arc Utilities and Service Navigator CDs or available at www.powerwavesoftware.com to identify the selected machine when connecting to a specific IP address.
Alternating Green and Red	Non-recoverable system fault. If the Status lights are flashing any combination of red and green, errors are present. Read the error code(s) before the machine is turned off. Error Code interpretation through the Status light is detailed in the Service Manual. Individual code digits are flashed in red with a long pause between digits. If more than one code is present, the codes will be separated by a green light. Only active error conditions are accessible through the Status Light. Error codes can also be retrieved with the Weld Manager Utility (included on the POWER WAVE® Submerged Arc Utilities and Service Navigator CDs or available at www.powerwavesoftware.com . This is the preferred method, since it can access historical information contained in the error log. To clear the active error(s), turn power source off, and back on to reset.
Steady Red	Not applicable.
Blinking Red	Not applicable.

CAUTION

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

Observe all Safety Guidelines detailed throughout this manual

List of Error Codes for Troubleshooting

Error ID	Description	Potential Solution
5-3-1	Weld Head network not recognized by controller. Weld Head has no power.	Check to make sure the Weld Head cable is plugged in and that the APEX 3000 controller has power via 110v aux connector (if applicable). Cycle power to Power Wave.
5-3-3	Communication with oscillation motor has halted.	Check Weld Head cable for potential bad connections. Cycle power.
5-3-4	Communication with height motor has halted.	Check Weld Head cable for potential bad connections. Cycle power.
5-3-5	Communication with travel motor has halted.	Check Weld Head cable for potential bad connections. Cycle power.
5-3-6	Calibrated fault with oscillation	Check weld head cable and cycle power.
5-3-7	Calibration fault with height	Check weld head cable and cycle power.
5-3-8	Wire drive timeout	Check weld head cable and cycle power.
5-3-9	"Other"	Cycle power.
5-4-1	Oscillation motor following error	Check for resistance on the torch arm. Oscillation speeds too high.
5-4-2	Oscillation motor overcurrent	Check power supplies, cycle power. Clear any resistance/debris from track and the weld head arm.
5-4-3	Oscillation motor overheat	Check welding conditions. Turn off power for 5 minutes.
5-4-4	Oscillation communications fault	Check Weld Head cable and make sure no extra power/noise is being discharged into the Weld Head.
5-4-5	Oscillation communications off	Check Weld Head cable and make sure no extra power/noise is being discharged into the Weld Head.
5-4-6	Oscillation was moved passed programmed limit	Recalibrate the system/cycle power. Make sure Weld Head arm moves all the way in and you have full range of movement.
5-4-7	Oscillation motor overvoltage	Check power supplies, cycle power. Clear any resistance/debris from track and the weld head arm.
5-4-8	Oscillation motor position sensor error	Cycle power. Make sure internal motor controller wire harnesses and connectors are secure.
5-4-9	Oscillation fault unknown	Check all of the above items. Cycle Power. Contact Arc Products.
5-5-1	Height motor following error	Check for resistance on the torch arm. Height movement speeds too high.
5-5-2	Height motor overcurrent	Check power supplies, cycle power. Clear any resistance/debris from track and the weld head arm.
5-5-3	Height motor overheat	Check welding conditions. Turn off power for 5 minutes.
5-5-4	Height communications fault	Check Weld Head cable and make sure no extra power/noise is being discharged into the Weld Head.
5-5-5	Height communications off	Check Weld Head cable and make sure no extra power/noise is being discharged into the Weld Head.
5-5-6	Height was moved passed programmed limit	Recalibrate the system/cycle power. Make sure Weld Head arm moves all the way in and you have full range of movement. Check Setup
5-5-7	Height motor overvoltage	Check power supplies, cycle power. Clear any resistance/debris from track and the weld head arm.
5-5-8	Height motor position sensor error	Cycle power. Make sure internal motor controller wire harnesses and connectors are secure.

Observe all Safety Guidelines detailed throughout this manual

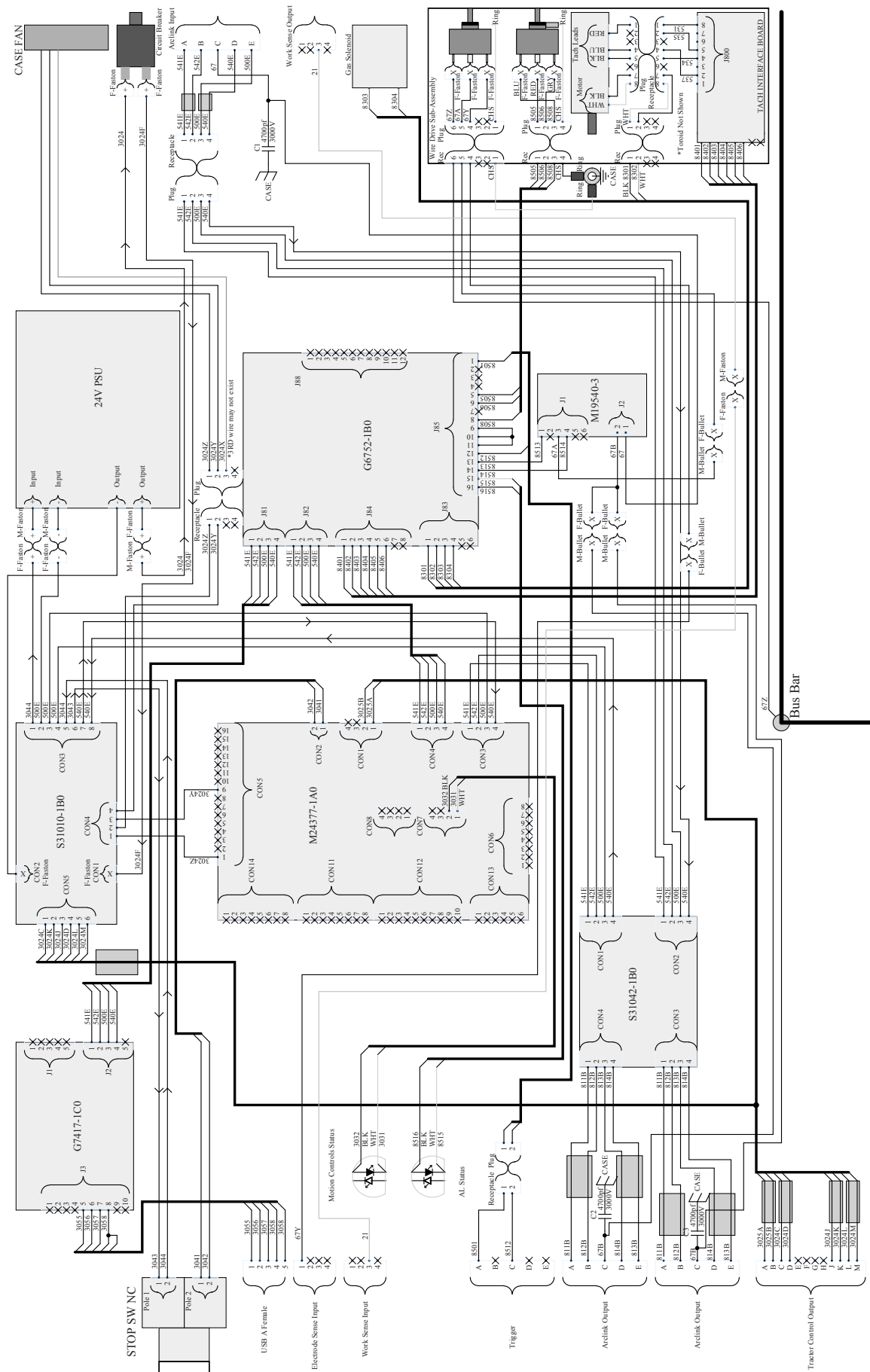
5-5-9	Height fault unknown	Check all of the above items. Cycle Power. Contact Arc Products.
5-6-1	Travel motor following error	Check for resistance on the torch arm. Travel speeds too high.
5-6-2	Travel motor overcurrent	Check power supplies, cycle power. Clear any resistance/debris from track and the weld head arm.
5-6-3	Travel motor overheat	Check welding conditions. Turn off power for 5 minutes.
5-6-4	Travel communications fault	Check Weld Head cable and make sure no extra power/noise is being discharged into the Weld Head.
5-6-5	Travel communications off	Check Weld Head cable and make sure no extra power/noise is being discharged into the Weld Head.
5-6-6	Travel was moved passed programmed limit	Recalibrate the system/cycle power. Make sure you can jog travel along your track.
5-6-7	Travel motor overvoltage	Check power supplies, cycle power. Clear any resistance/debris from track and the weld head arm.
5-6-8	Travel motor position sensor error	Cycle power. Make sure internal motor controller wire harnesses and connectors are secure.
5-6-9	Travel fault unknown	Check all of the above items. Cycle Power. Contact Arc Products.
6-3-3-1	Unstable or “noisy” WFS feedback signal	Check the cables and connections. Cycle power.
8-1	Motor Overload (Long Term)	Check the electrode feeds easily through feed system. Verify the wire reel bracket is not too tight. Verify quality of electrode.
8-2	Motor Overload (Short Term)	Check that motor can turn freely when idle arm is open. Check gears for dirt and debris. Check all items for error 8.1.
8-3	Shutdown #1 is open	Contact Arc Products.
8-4	Shutdown #2 is open	Contact Arc Products

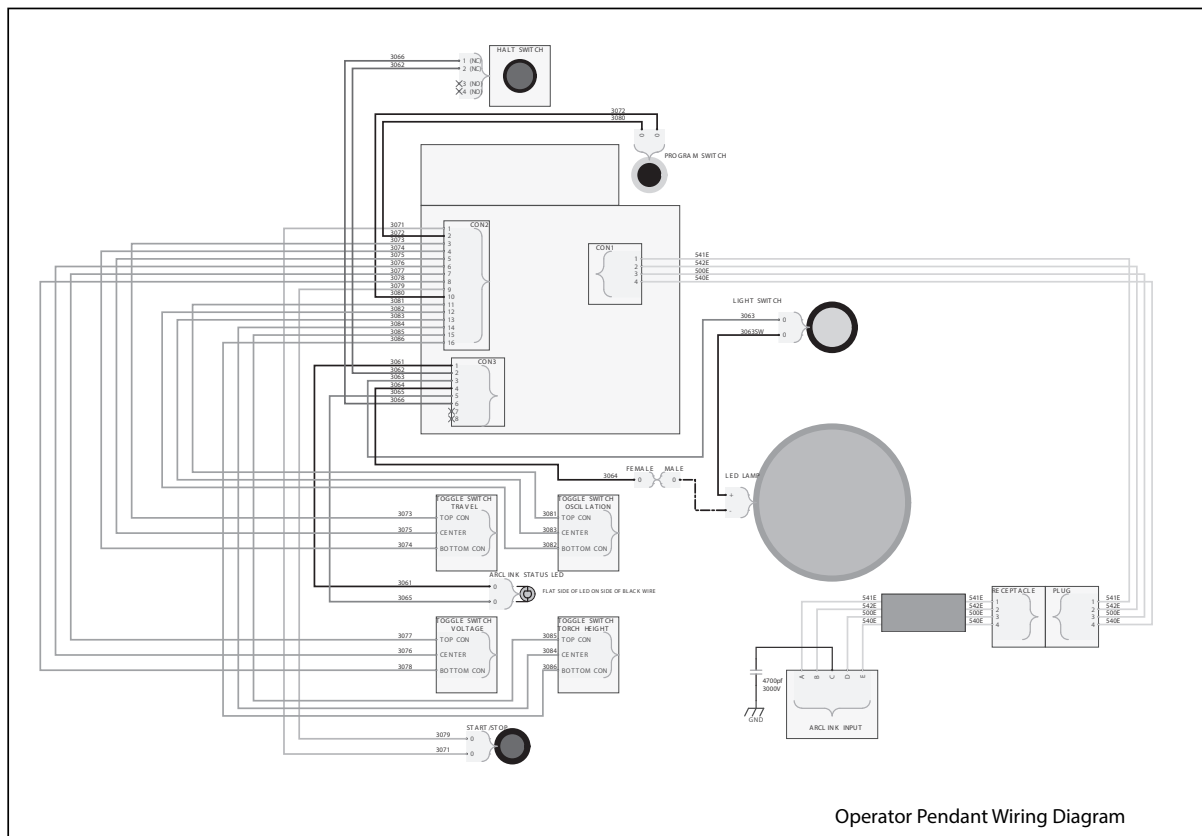
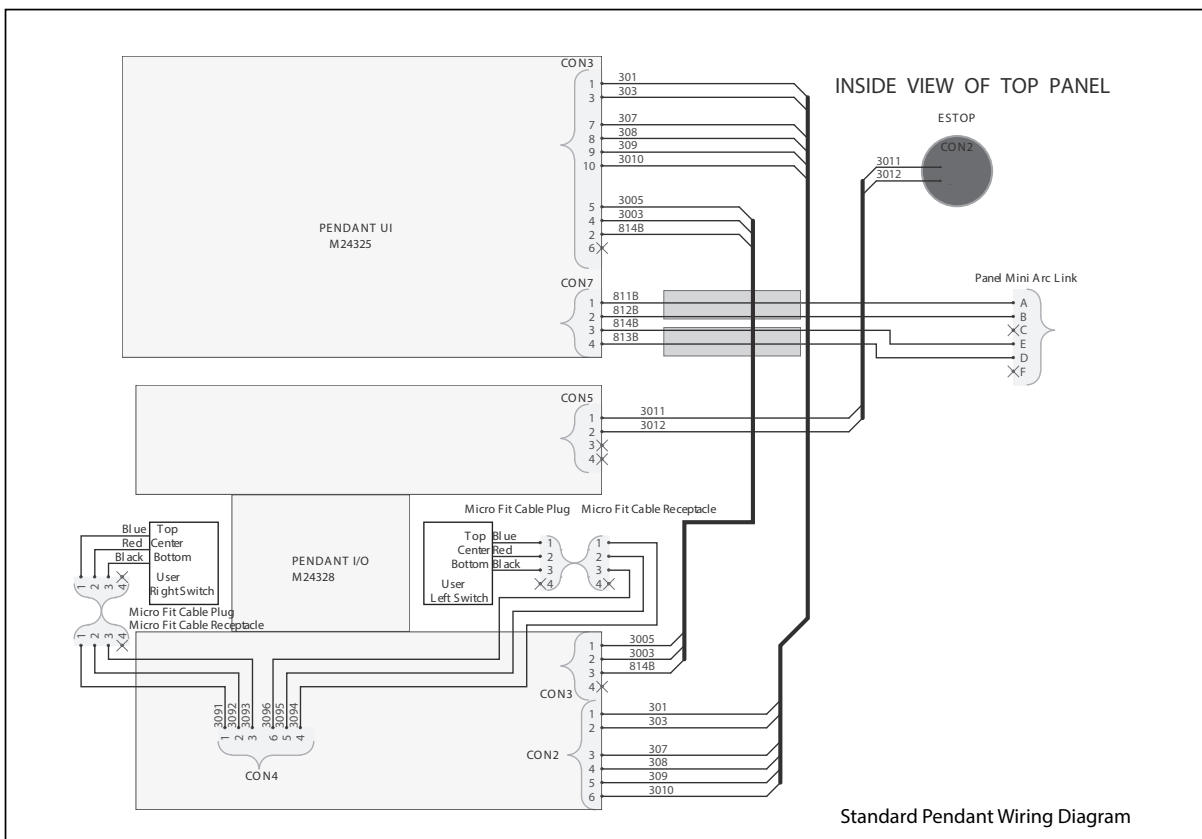
Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
Auto height does not operate / operates incorrectly.	1. Check WFS/Amps 2. Check ACC is on. 3. Check wire.	If all recommended possible areas of misjudgment have been checked and the problem persists, Contact your local Lincoln Authorized Field Services Facility
Travel hesitates or does not work.	1. Check clutch latch to ensure it is engaged (locked). 2. Check all cable connections.	
Travel is inconsistent.	1. Check gear contact and lever. 2. Check travel settings.	
No oscillation / inconsistent oscillation.	1. Check all cable connections. 2. Check oscillator settings on jog screen. 3. Check bellows for free movement. 3. Check oscillator belt.	
Wire does not feed properly.	1. Check drive rolls 2. Check wire feed for blockage. 3. Check contact tip. 4. Check for kinks or obstructions in the torch or wire liner.	
Gas issues	1. Verify gas is turned on. 2. Verify there is gas present in the tank. 3. Check the gas line for kinks or obstructions.	
Tractor drags on work surface	1. Check that the shoes are all equally spaced around the track.	

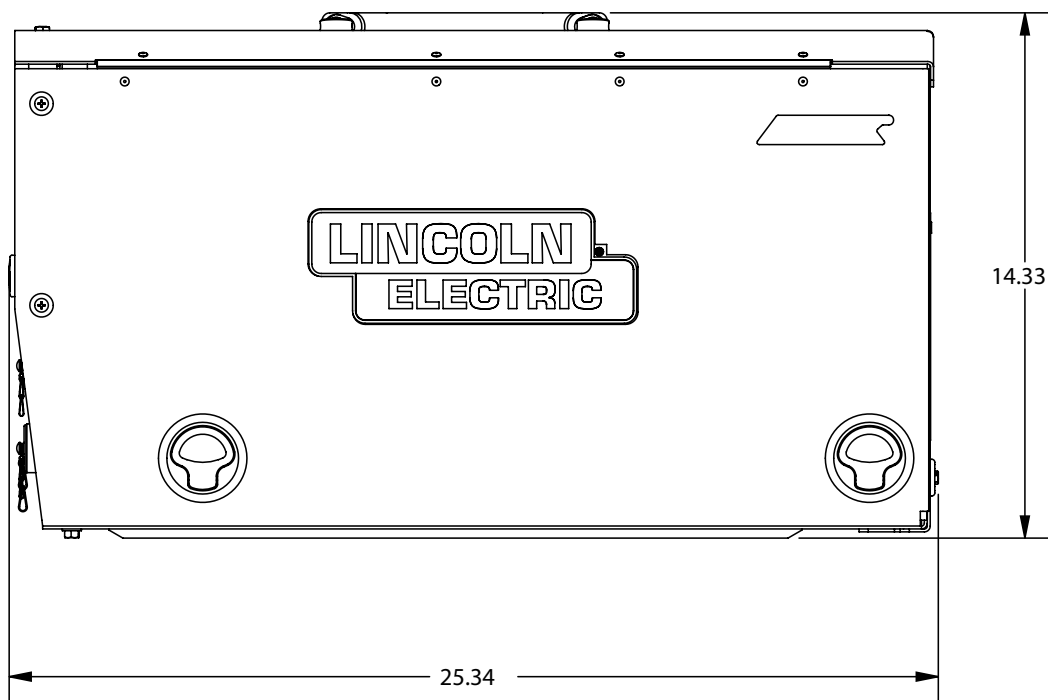
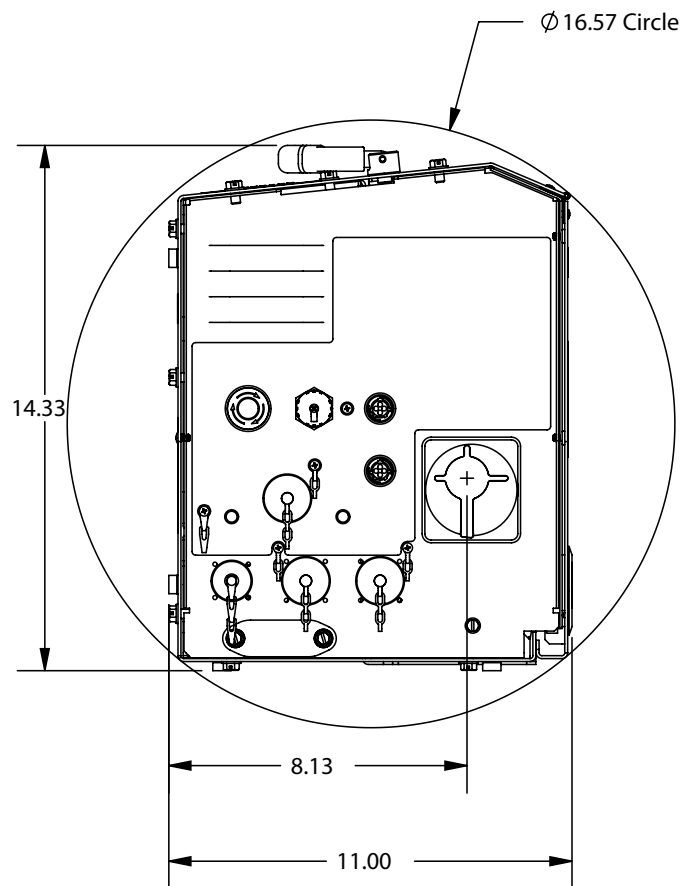
CAUTION

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

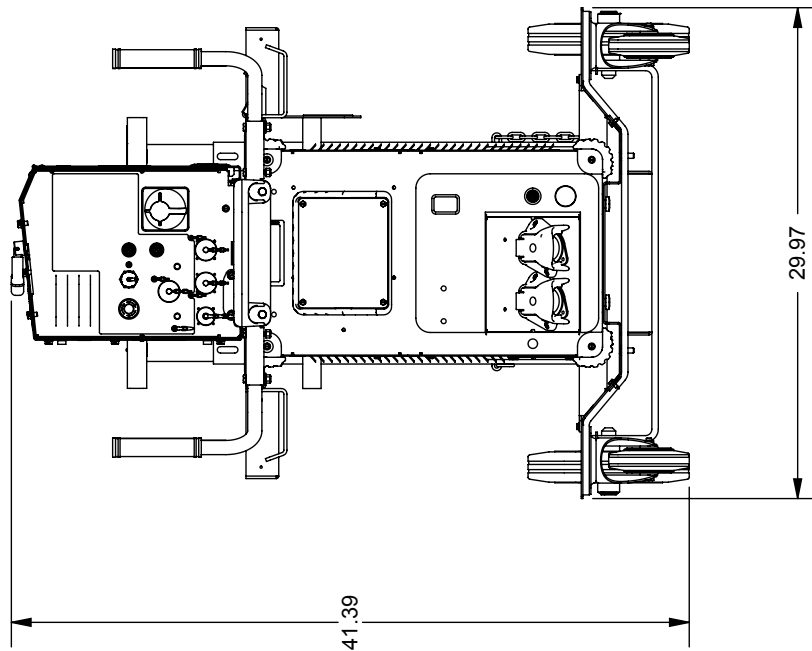
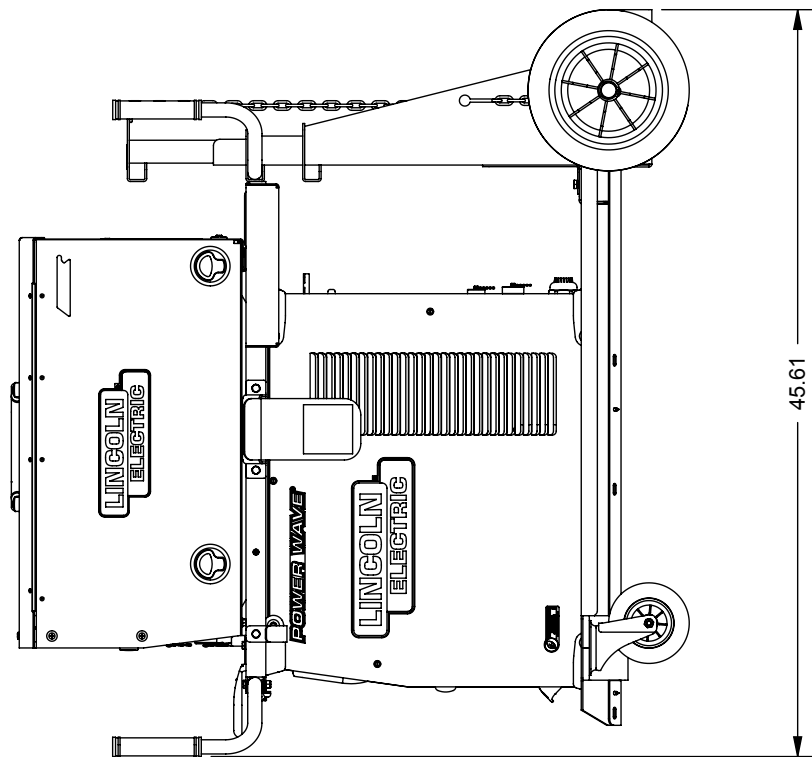




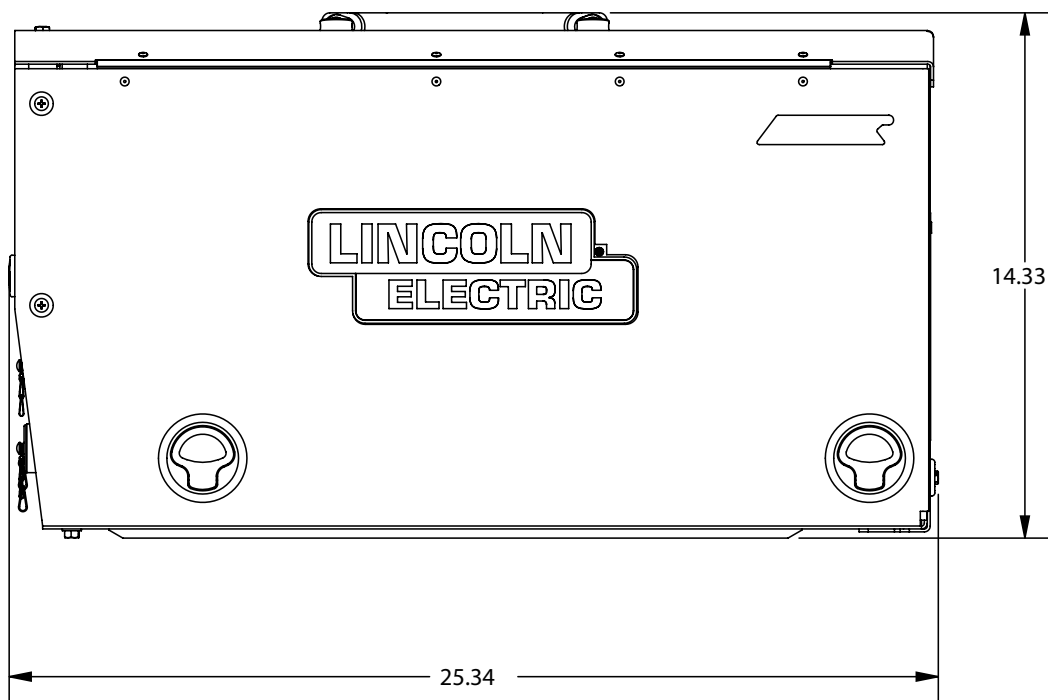
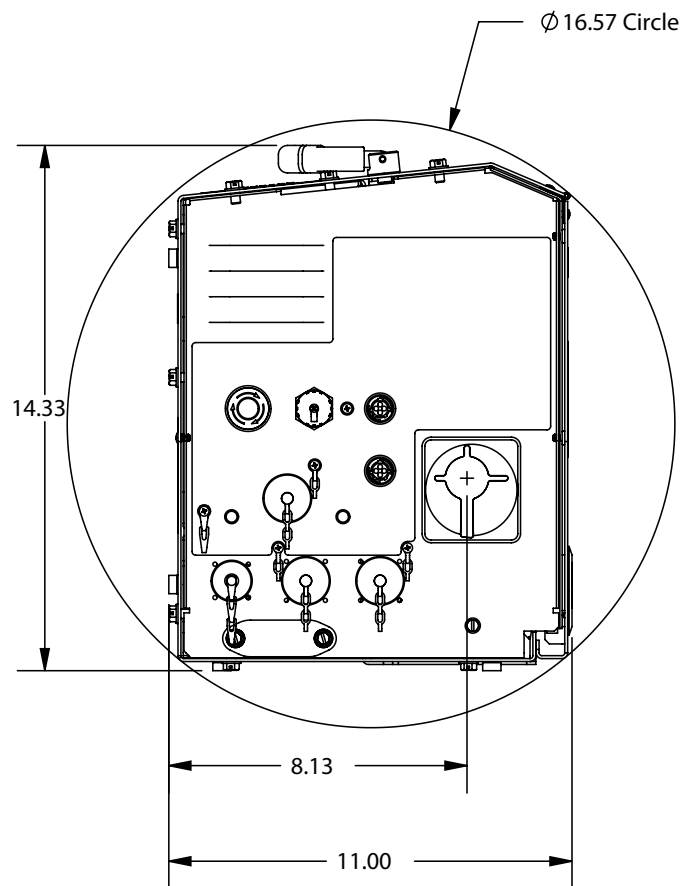
Pendant Wiring Diagrams



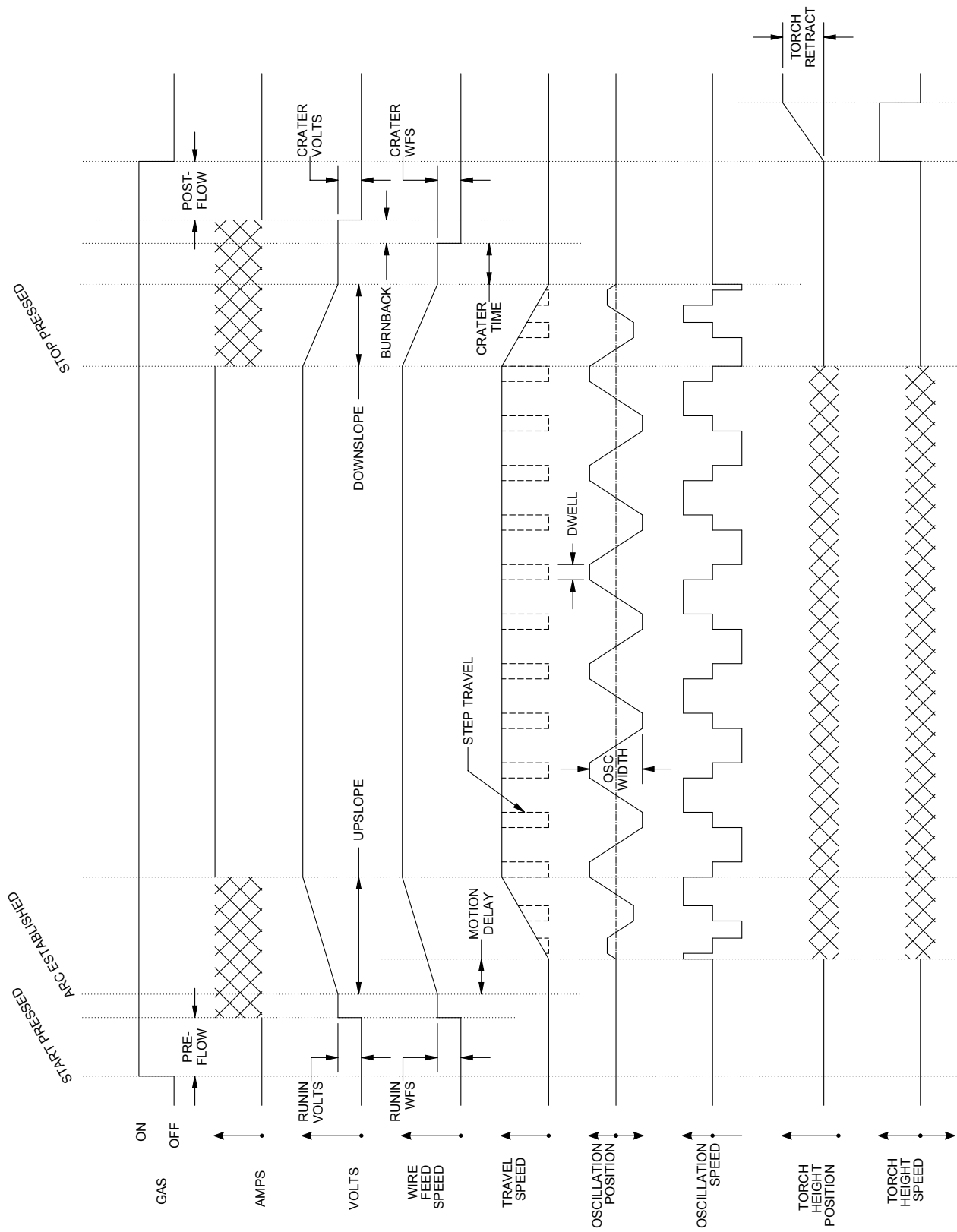
K52160-1 Dimensions



K52165-1 Dimensions



K52160-1 Dimensions



GMAW Timing Diagram

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. - Aíslese 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 brennbares 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	- 皮肤或湿衣物切勿接触带电部件及焊条。 - 使你自己与地面和工件绝缘。	把一切易燃物品移离工作场所。	佩戴眼、耳及身体劳动保护用具。
Korean 위험	- 전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오. - 모재와 접지를 접촉치 마십시오.	인화성 물질을 접근시키지 마십시오.	눈, 귀와 몸에 보호장구를 착용하십시오.
Arabic تحذير	- لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الألكترود بجسد 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 Schweißrauch! ● 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 exaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas.	Portuguese ATENÇÃO
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切して下さい。	● 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 멀리하십시오. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오.	● 보수전에 전원을 차단하십시오.	● 판넬이 열린 상태로 작동치 마십시오.	Korean 위험
● 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 تشغيل 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說明以及應該使用的銀焊材料，並請遵守貴方的有關勞動保護規定。

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

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

CUSTOMER ASSISTANCE POLICY

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

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

Subject to Change – This information is accurate to the best of our knowledge at the time of printing. Please refer to www.lincolnelectric.com for any updated information.



THE LINCOLN ELECTRIC COMPANY

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