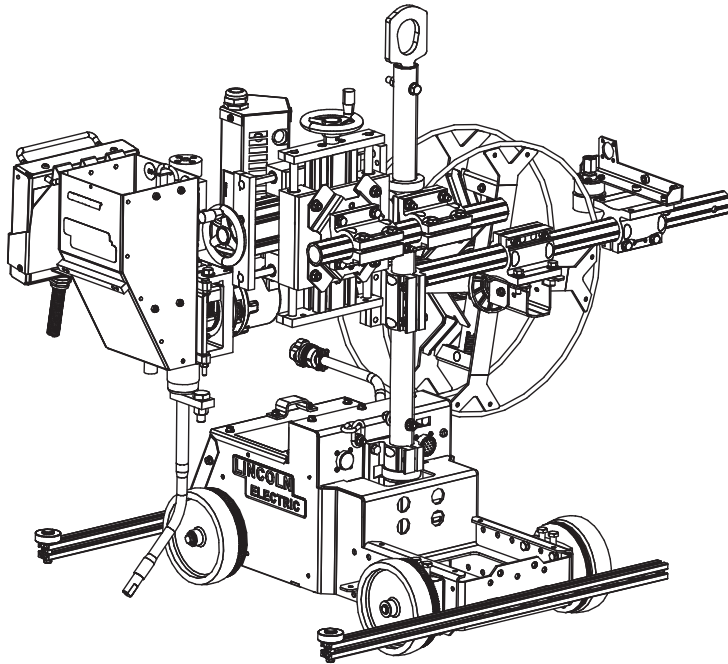


Operator's Manual

CRUISER[™]



For use with machines having Code Numbers:
11767, 11910, 11947



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)

THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

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

SAFETY DEPENDS ON YOU

Lincoln arc welding and cutting equipment is designed and built with safety in mind. However, your overall safety can be increased by proper installation ... and thoughtful operation on your part. **DO NOT INSTALL, OPERATE OR REPAIR THIS EQUIPMENT WITHOUT READING THIS MANUAL AND THE SAFETY PRECAUTIONS CONTAINED THROUGHOUT.** And, most importantly, think before you act and be careful.

WARNING

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

CAUTION

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



KEEP YOUR HEAD OUT OF THE FUMES.

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

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

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

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

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

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



WEAR CORRECT EYE, EAR & BODY PROTECTION

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

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

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

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

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



SPECIAL SITUATIONS

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

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

Additional precautionary measures

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

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

REMOVE all potential fire hazards from welding area.

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



SECTION A: WARNINGS



CALIFORNIA PROPOSITION 65 WARNINGS



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

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

For more information go to www.P65warnings.ca.gov/diesel

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



WARNING: Cancer and Reproductive Harm
www.P65warnings.ca.gov

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

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

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



FOR ENGINE POWERED EQUIPMENT.

- 1.a. Turn the engine off before troubleshooting and maintenance work unless the maintenance work requires it to be running.
- 1.b. Operate engines in open, well-ventilated areas or vent the engine exhaust fumes outdoors.
- 1.c. Do not add the fuel near an open flame welding arc or when the engine is running. Stop the engine and allow it to cool before refueling to prevent spilled fuel from vaporizing on contact



with hot engine parts and igniting. Do not spill fuel when filling tank. If fuel is spilled, wipe it up and do not start engine until fumes have been eliminated.

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



ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS



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



ELECTRIC SHOCK CAN KILL.



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

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

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



ARC RAYS CAN BURN.



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



FUMES AND GASES CAN BE DANGEROUS.



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



WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



- 6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.
- 6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.
- 6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.
- 6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).
- 6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.
- 6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.
- 6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.
- 6.h. Also see item 1.c.
- 6.i. Read and follow NFPA 51B "Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, MA 022690-9101.
- 6.j. Do not use a welding power source for pipe thawing.



CYLINDER MAY EXPLODE IF DAMAGED.



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



FOR ELECTRICALLY POWERED EQUIPMENT.



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

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

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TECHNICAL SPECIFICATIONS - CRUISER™ K-3048-1

Wire Feeders - Input Voltage and Current				
VOLTAGE		INPUT AMPERES		
40 VDC		8 AMPS		
Rated Output				
DUTY CYCLE		AMPERES		
100%		1000 AMPS		
Physical Dimensions (as shipped from the factory)* (Overall Size and Weight Dependent Upon Configuration)				
MODEL	HEIGHT	WIDTH	DEPTH	WEIGHT
K3048-1	29 In (736 mm)	23 in (548 mm)	36 in (914 mm)	207 lb (94 kg)
Temperature Ranges				
Operating Temperature		-40°F to 122°F (-40°C to +50°C)		
Storage Temperature		-40°F to 185°F (-40°C to +85°C)		
SAW				
GEARING	WFS Range		Wire Sizes	
57:1	50 to 500 ipm (1.3 to 12.5 m/min)		1/16 to 3/32 inch (1.6 to 2.4 mm)	
95:1	15 to 300 ipm (0.4 to 7.5 m/min)		1/16 to 3/32 inch (1.6 to 2.4 mm)	
142:1*	15 to 200 ipm (0.4 to 5.0 m/min)		1/16 to 7/32 inch (1.6 to 5.6 mm)	

* = gearing installed in the wire drive as equipped from the factory.

IP23S

GENERAL PHYSICAL DESCRIPTION

The CRUISER™ is a self propelled, modular platform for performing submerged arc welds. A unique tube and clamp design provides flexibility to mount the feeding components in any position.

Wire is fed to the arc with the proven wire drive. All of the drive rolls, nozzles, contact tips and wire straighteners are common between the MaxSA wire drives and the CRUISER™ wire drive. The wire drive rotates about two axes for setting torch drag/pull angle and torch tilt angle.

The wire drive is mounted to two heavy duty X-Y slides. The cross slides allow easy adjustment of the electrode stick-out and position of the wire in the joint.

The entire mast and arm structure separates from the base for portability and mobility purposes.

Driving the tractor is a permanent magnet DC motor with a 5 stage gear box built with all metal gears. A high resolution encoder keeps the tractor speed consistent even at slow speeds. The wheels are made of a high temperature rubber specially bonded to an aluminum core. Also mounted on the axle are guide wheels and a gear for operating on K396 track sections.

The tractor may be configured for 3 or 4 wheel operation. The flexible wheel configuration allows the tractor to be assembled in a manner for optimum balance while aligning the wheels for the tracking of the joint.

All of the controls are housed in a light weight pendant that connects to the tractor via an ArcLink cable. The pendant housing is fabricated from aluminum to resist impacts and high temperatures.

GENERAL FUNCTIONAL DESCRIPTION

The CRUISER™ is a modular platform for submerged arc welding.

RECOMMENDED PROCESSES

- SAW (AC, DC+, DC-) up to 1000 amps.
- Tiny Twin

PROCESS LIMITATIONS

- The CRUISER™ does not support open arc procedures.

EQUIPMENT LIMITATIONS

- Curved extension nozzle limited to 3/16" wire.
- Inductance of the electrode and work cables may affect arc performance. Do not coil excess cable.
- For robust digital communications, do not use more than 200 feet of control cable.
- The CRUISER™ operates on 40 VDC only.
- There is no 115 VAC in the tractor.
- The minimum turning radius of the CRUISER™ is 10 feet when assembled with 3 wheels.
- The minimum turning radius of the CRUISER™ is 20 feet when assembled with 4 wheels.
- The rubber wheels are rated to 500°F (260°C)
- The laser pointer mounting bracket is not compatible with the tiny twin nozzle or K148 nozzle.

RECOMMENDED POWER SOURCES

- Power Wave AC/DC 1000

DESIGN FEATURES

Loaded with Standard Features

Arc Performance

- The CRUISER™ and Power Wave AC/DC 1000 combination provide for new levels of submerged arc productivity.

User Controls

- Light weight, hand-held pendant.
- Four memories for quick selection of common procedures.
- Full sequence control for tailoring the weld from start to end.
- All welding controls located at the pendant, including program selection.
- Laser pointer to aid in steering the CRUISER™.

Wire Drive

- Changeable gears for feeding small diameter wires at high speed and large diameter wires at low speed.
- High torque, permanent magnet DC motor with tachometer for accurate wire feed speed control.
- Three roll wire straightener included.
- Uses standard Lincoln submerged arc contact nozzles.

Tractor and Frame

- Configures to 3 or 4 wheels with patent pending design, for the best tracking and balancing.
- Permanent magnet DC motor with encoder for steady, accurate travel speeds.
- All steel gears for long life.
- Easily engaged travel clutch.
- Fully assembled for track use.
- High temperature rubber wheels for superior traction and heat resistance up to 500°F (260°C).
- Heavy duty slides for adjusting the electrode position in the joint.

LOCATION

⚠ WARNING**ELECTRIC SHOCK can kill.**

- Do not touch the wire drive, drive rolls, nozzle, wire coil, electrode or wire drive motor when welding output is ON.
- The tractor is an automatic piece of equipment that may be remotely controlled.
- Turn the input power OFF at the disconnect switch or fuse box before attempting to connect or disconnect input power lines, output cables or control cables.
- Do not operate with covers, panels or guards removed.
- Do not let the electrode or wire spool touch the tractor frame.
- Only qualified personnel should perform this installation.
- Insulate yourself from the work and ground.
- Always wear dry insulating gloves.

⚠ WARNING**MOVING PARTS can injure.**

- Keep away from moving parts.
- Tractor parts may move suddenly when the bolts are loosened.
- All clamps and collars must be secured before operating.
- Configure the tractor for stable operation, with a full and empty flux hopper and a full and empty spool.

Maintain clearance between parts at electrode potential and all other tractor components. Parts that are at electrode potential are:

- Wire
- Wire spool
- Wire straightener rolls
- Brass Conduit bushing adapter
- 4 screw heads on back of the wire straighter
- Feed plate and drive rolls

- Contact nozzle assembly
- Nozzle extensions
- Contact Tip

Operate the CRUISER™ only on stable and dry surfaces.

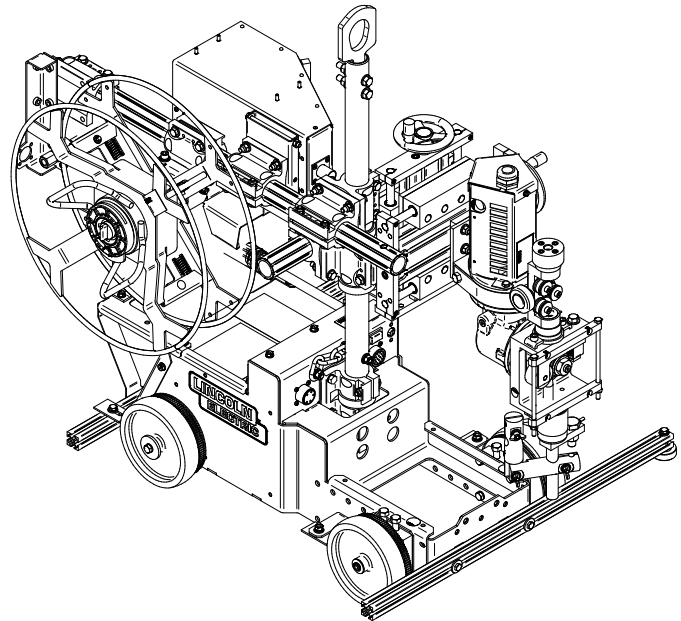
Operating the tractor on inclined surfaces requires adjusting and/or assembling the tractor differently than shipped from the factory.

Do not submerge the tractor.

It is the responsibility of the user/builder/operator to assemble the tractor to maintain safe electrical clearances and to be stable.

The tractor is rated for outdoor use (IP23S) with the wire reel enclosure installed.

Protect the CRUISER™ from preheat torches.



GENERAL ASSEMBLY

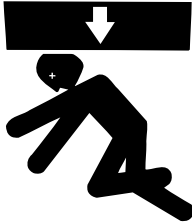
⚠ WARNING



ELECTRIC SHOCK can kill.

- Improperly secured clamps and collars may shift, causing parts at electrode potential to contact the tractor frame or other components.
- Only qualified personnel should install, use or service this equipment.

⚠ WARNING



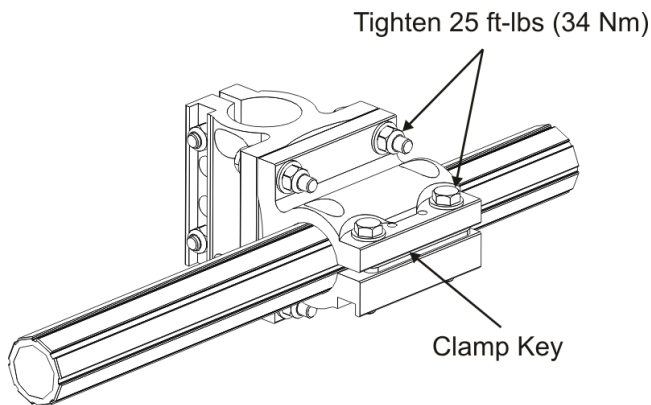
FALLING EQUIPMENT can cause injury.

- Lift only with equipment of adequate capacity
- Be sure the machine is stable when lifting.
- Do not lift the machine if the lift bail is damaged.
- Do not operate machine while suspended from lift bail.
- Failure to properly secure the clamps, collars, chains and lift bail may result in physical injury.

Clamps

- Tighten clamp bolts to 25 ft-lbs (34 Nm).
- Use clamps with a key on horizontal tubes.

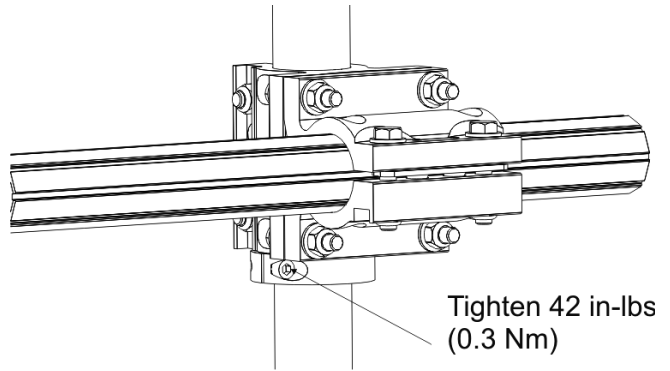
FIGURE A.1 - CLAMPS



Collars

- Tighten collar screw to 42 in-lbs (0.3 Nm)

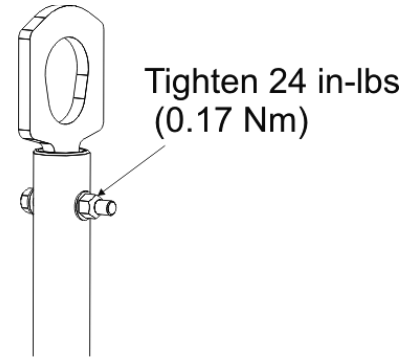
FIGURE A.2 - COLLARS



Lift Bail

- Tighten lift bail hardware to 24 in-lbs (0.17 Nm). Do not overtighten or the mast may become distorted.

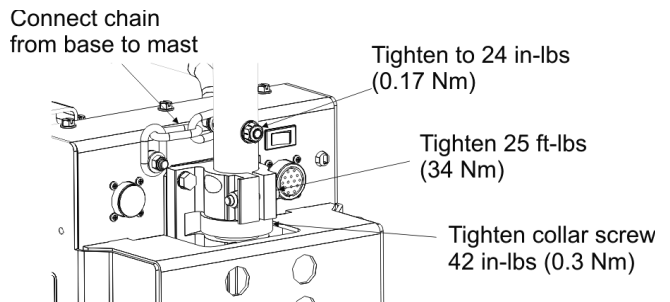
FIGURE A.3 - LIFT BALE



Chain and Mast Anchor

- The chain must be connected from the base to the mast before lifting.
- Tighten all hardware as shown.

FIGURE A.4 - CHAIN AND MAST ANCHOR



FRONT WHEELS

In almost all configurations the front wheels must remain parallel with the Cruiser base and rear wheels (See Figure A.5). Improper adjustment of the front wheels will cause inconsistent tracking of the joint, accelerate wheel wear, poor operation on K396 track and may lead to travel motor overload errors.

See Figure A.7. To steer the front wheel to the left, loosen bolt A and tighten bolt B to set the angle, then snug bolt A.

To steer the front wheel to the right, loosen bolt B and tighten bolt A to set the angle, then snug bolt B.

FIGURE A.5 - FRONT WHEEL CONFIGURATION

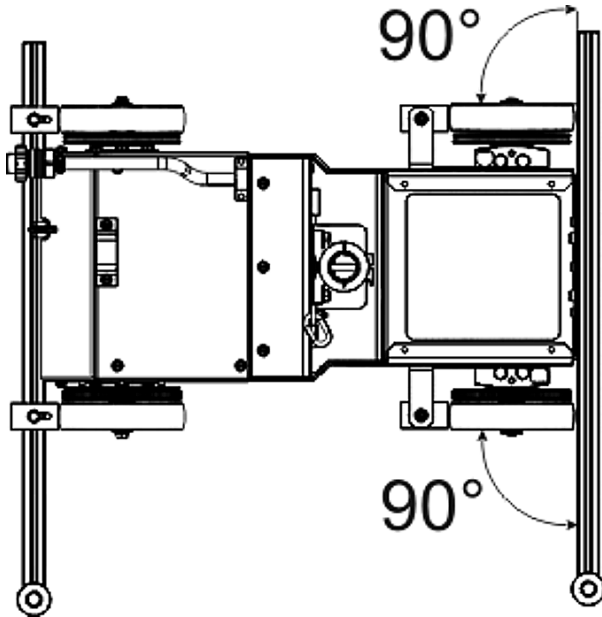
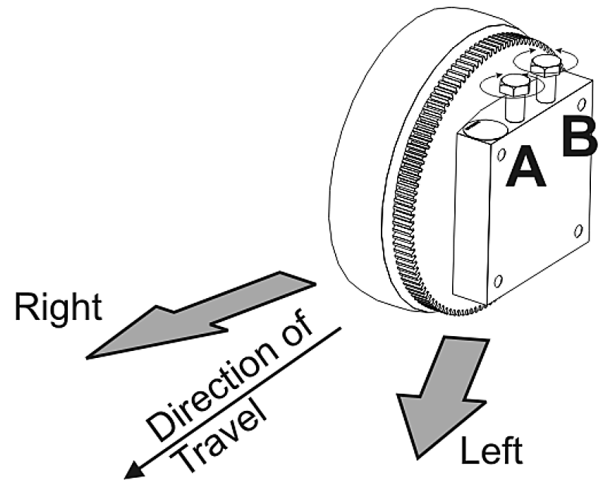
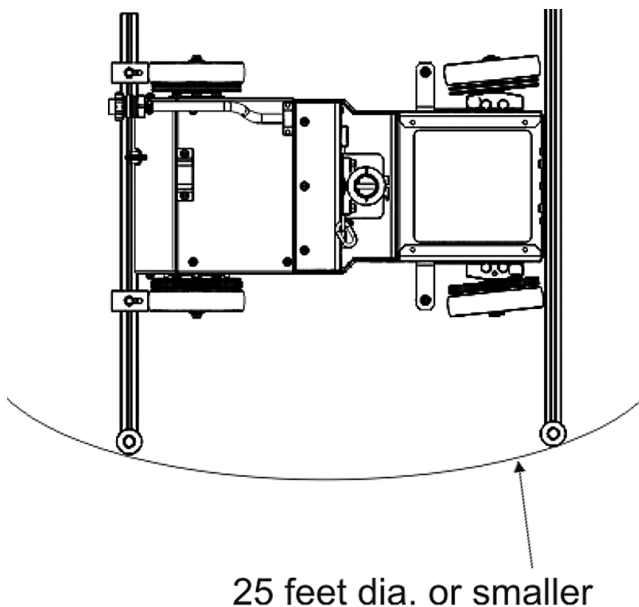


FIGURE A.7 - SETTING THE ANGLE



Only adjust the front wheels when welding a round inside or outside seam 25 feet (7.6m) in diameter or smaller (See Figure A.6). At all other times the front wheels must be set to 90°.

FIGURE A.6 - ROUND 25 FOOT DIA. SEAM

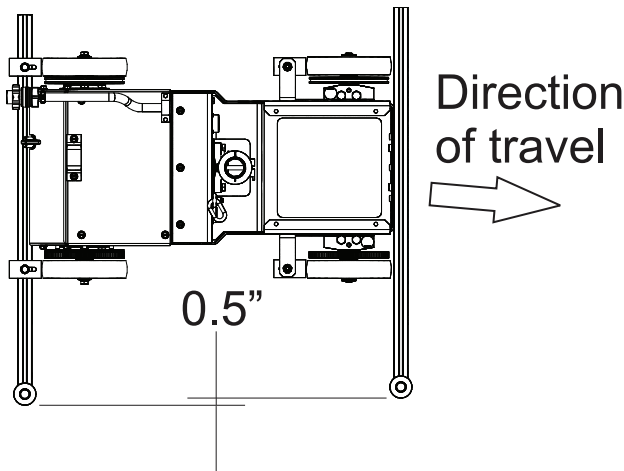


OUTRIGGERS

The outriggers “steer” the CRUISER™ along a vertical surface by driving it at a slight angle. Suggested offset between the front and rear outriggers is ½” (12.7mm). Larger offsets increase the friction driving the CRUISER™ forward and may cause travel motor overcurrent errors and rapid wheel wear.

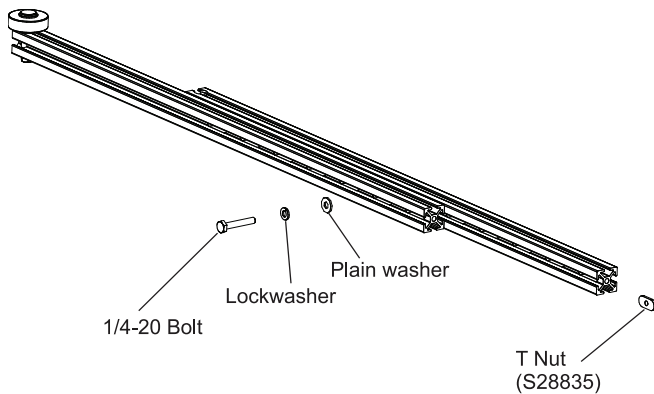
When assembling the CRUISER™, adjust the cross slide to the middle position and position the wire in the joint. Then assemble the front and rear outriggers, and make fine adjustments to the wire position using the cross slide.

FIGURE A.8 - OUTRIGGERS



The outriggers may be stacked to gain extra length. Slide a T Nut (S28835) into the extrusion and then insert a ¼-20 bolt through the outrigger slots.

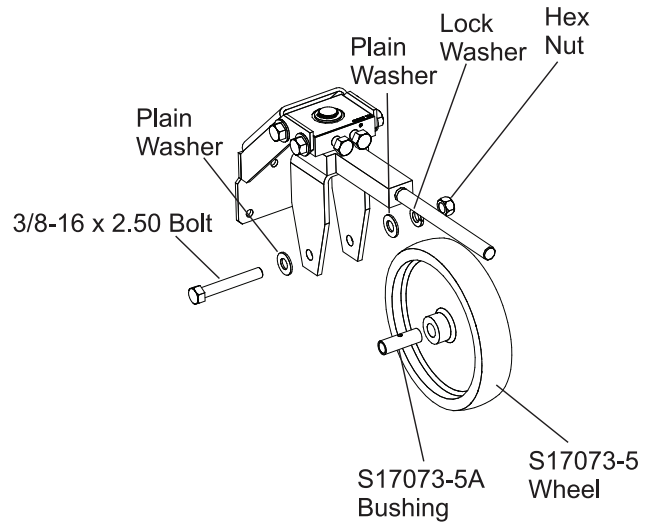
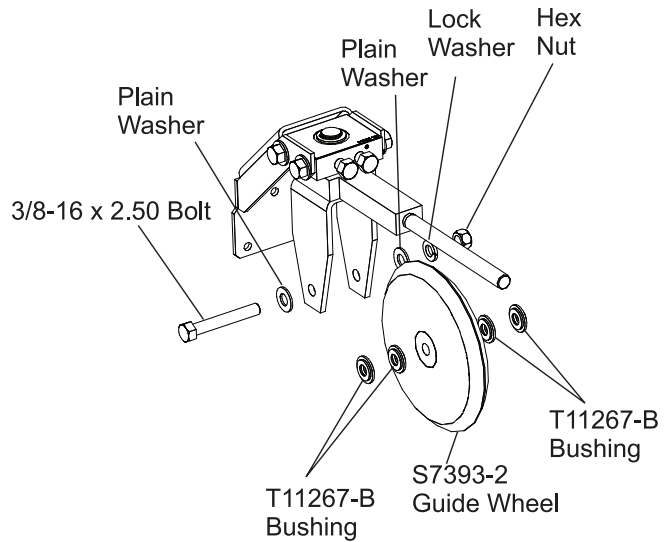
FIGURE A.9 - OUTRIGGERS EXTENSION



MANUAL STEERING MECHANISM, ASSEMBLY

As shipped from the factory, the manual steering mechanism is assembled with a guide wheel for tracking in a butt joint. The guide wheel may be replaced with a rubber wheel for manual steering.

FIGURE A.10 - MANUAL STEERING MECHANISM



MANUAL STEERING MECHANISM, ADJUSTMENT

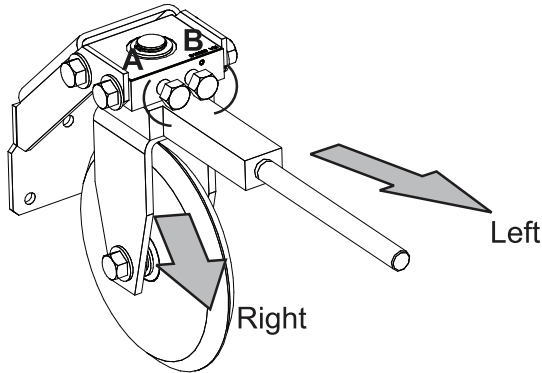
To steer the CRUISER™ to the Right:

- Loosen bolt B
- Tighten bolt A to set the wheel angle.
- Snug bolt B

To steer the CRUISER™ to the Left:

- Loosen bolt A
- Tighten bolt B to set the wheel angle
- Snug bolt A

FIGURE A.11 - ADJUSTMENT



CROSS SLIDE

Each slide has 4" (102mm) of travel.

When assembling the CRUISER™, verify that no components at electrode potential contact the frame throughout the entire travel distance of the slides.

The slides may be disassembled and then positioned relative to each other.

FIGURE A.12 - SEVERAL POSSIBLE SLIDE CONFIGURATIONS

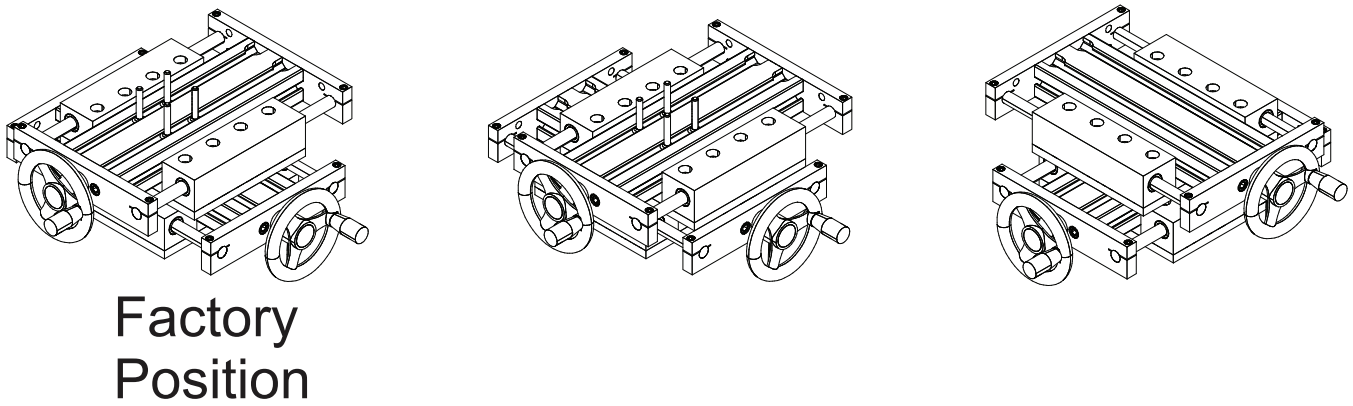
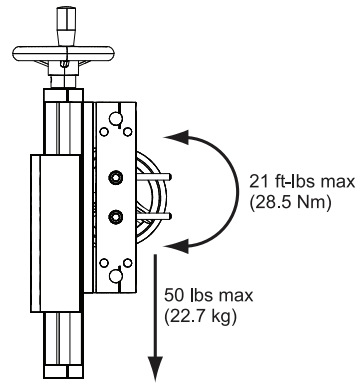


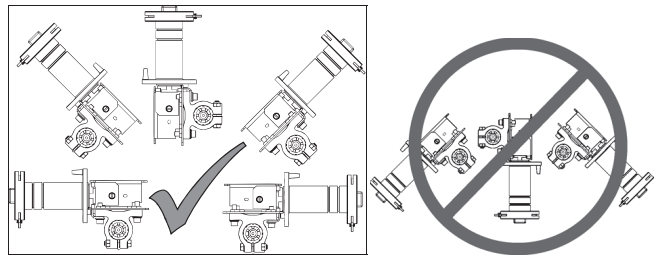
FIGURE A.13 - LOAD LIMITS



WIRE REEL SPINDLE

- Position the wire reel spindle to prevent the reel and electrode from contacting the tractor frame and base.
- The wire reel spindle must be horizontal or oriented upwards.

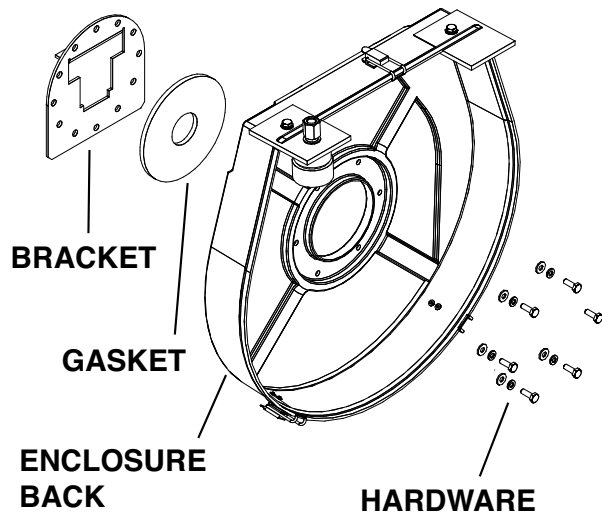
FIGURE A.14 - WIRE REEL SPINDLE



**WIRE REEL ENCLOSURE ASSEMBLY-
FOR CODES BELOW 11947**

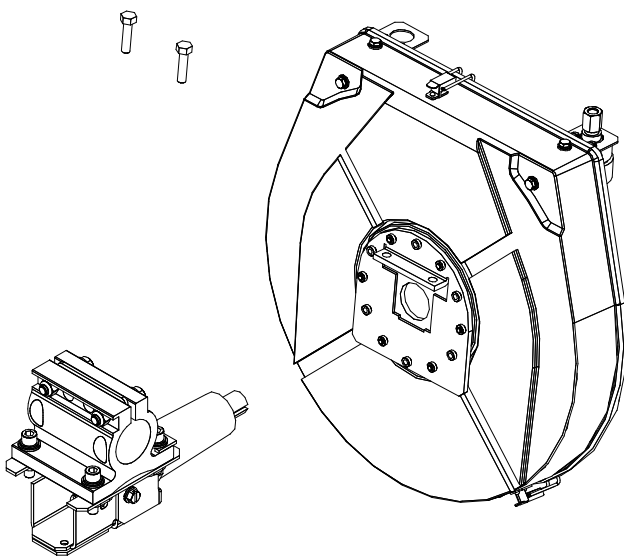
1. Determine the angular orientation of the wire reel enclosure relative to the spindle clamp. To change the angle of the enclosure, remove the 6 bolts securing the enclosure back to the mounting bracket using a 7/16" wrench. Reassemble at the desire angle, keep the gasket centered relative to the enclosure back. Provisions are made to rotate the enclosure in 30° increments.

FIGURE A.14a - ENCLOSURE ASSEMBLY



2. Unscrew the spindle brake and remove the spindle brake parts and the spindle.

FIGURE A.14b - ENCLOSURE MOUNTING

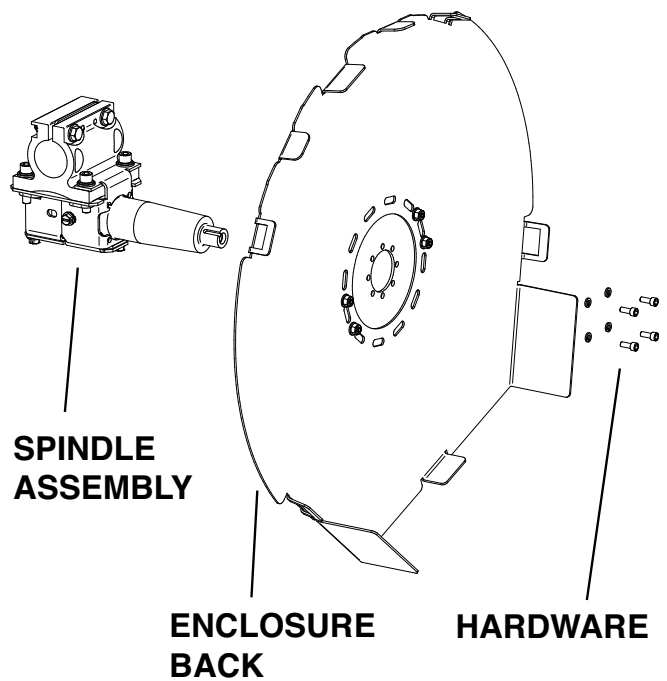


3. Remove two of the bolts from the spindle assembly using a 1/4" hex key. Assemble the enclosure back to the spindle assembly and tighten the bolts.

**WIRE REEL ENCLOSURE ASSEMBLY-
FOR CODE 11947 AND ABOVE**

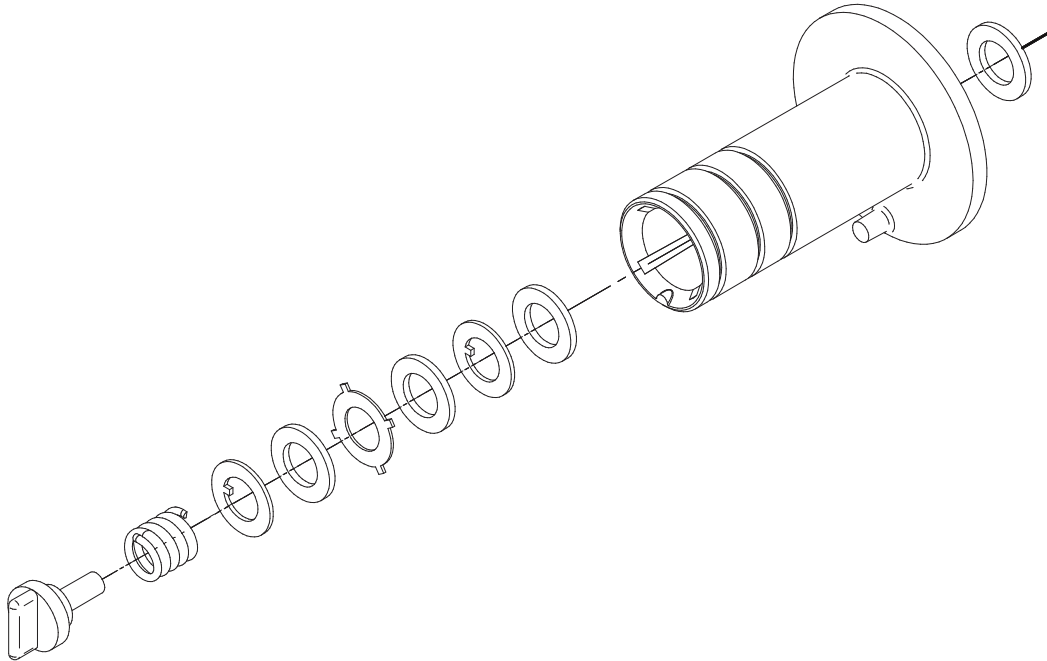
1. Remove the #10 screws and lockwashers from the spindle assembly using a 5/32" hex key.
2. Use the same hardware to fasten the enclosure backing plate to the assembly.
3. For correct wire feeding, the flat portion of the enclosure should be tilted toward the upright mast of the Cruiser.

FIGURE A.14c - ENCLOSURE ASSEMBLY



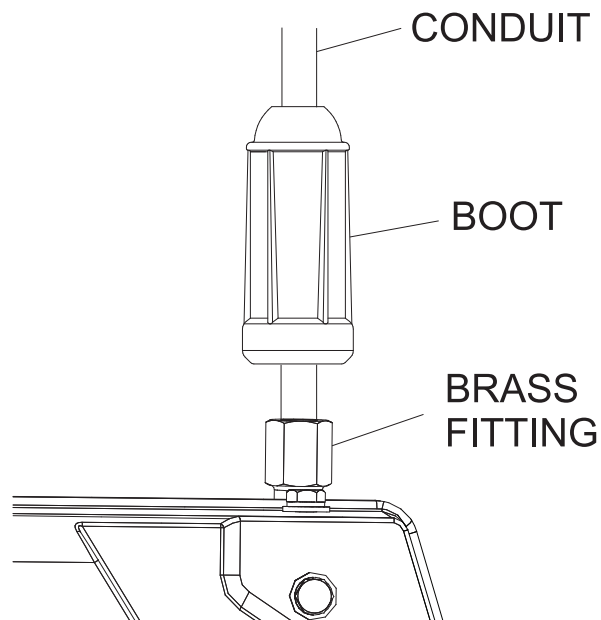
4. Reassemble the spindle parts as shown (all codes)

FIGURE A.14d - SPINDLE PARTS



5. If required, swap the position of the ball bushing assembly. Use a 7/16" wrench to loosen and tighten the hardware.
6. Thread the conduit into the brass fitting on the ball bushing assembly. Then slide the boot along the conduit and over the brass fitting.

FIGURE A.14e - CONDUIT, BRASS FITTING, BOOT

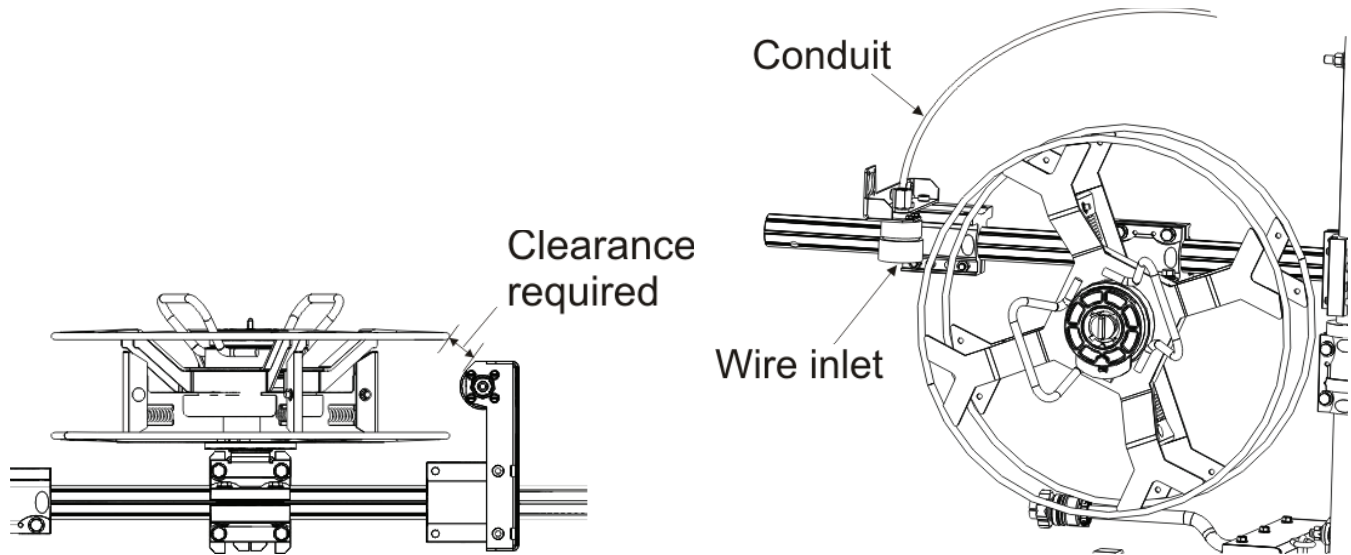


7. When assembling the enclosure cover to the enclosure back, verify the cover is evenly seated all the way around.

TAKE-OFF ARM

- Position the take off arm to prevent contact to the reel and electrode.
- Route the electrode through the conduit from the take off arm to the wire drive.

FIGURE A.15 - TAKE-OFF ARM



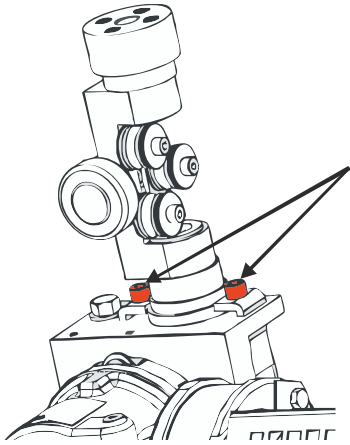
WIRE STRAIGHTENER ADJUSTMENT

The wire straightener controls the amount of cast (or “curve”) in the wire. Excessive cast may effect alignment of the wire in the joint. Too little cast may result in insufficient wire contact in the contact tip.

To adjust the wire straightener:

1. Turn off power at the welding power source.
2. Loosen the two screws holding the wire straightener to the feed plate with a 1/4” hex key.

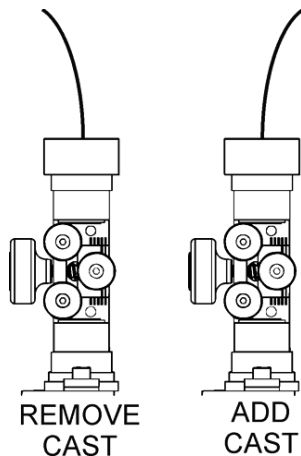
FIGURE A.16 - WIRE STRAIGHTENER SCREWS



3. Position the straightener as desired to remove or add cast to the wire.
4. Tighten the screws holding the wire straightener to the feed plate.
5. Turn power on at the welding power source.
6. Feed wire through the straightener. Adjust the amount of pressure on the wire with the straightener until the desired cast is achieved when the wire exits the tip.

NOTE: A slight curvature to the wire helps to maintain good electrical contact inside the contact tip.

FIGURE A.17 - WIRE STRAIGHTENER

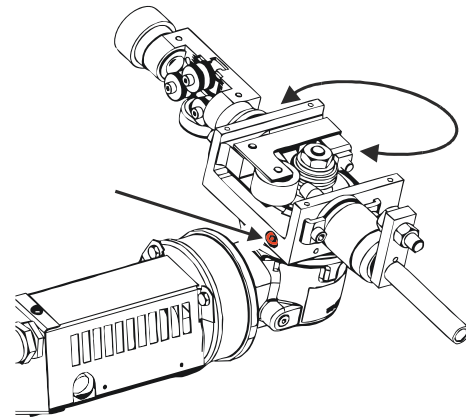


FEEDPLATE ROTATION

The feedplate of the wire drive may be rotated about the drive roll axis. Depending upon how the tractor is assembled, rotating the feed plate will change the tilt angle or the drag angle.

1. Turn off power at the welding power supply.
2. Loosen the set screw on the feedplate with a 5/16” hex key.
3. Rotate the feedplate to the new position. Do not allow surfaces at electrode potential to touch the frame, flux hopper, base or slides of the tractor.
4. Tighten the set screw to secure the feedplate.
5. As equipped from the factory, the tractor is set-up with “A” as the inlet and “B” as the outlet. To make “B” the inlet and “A” the outlet, see the SET-UP MENU.

FIGURE A.18 - FEEDPLATE ROTATION



FLUX HOPPER

The flux hopper may be mounted on either a horizontal or vertical tube, or on the wire drive. For the best flow of flux, keep the hose from the hopper to the nozzle as vertical as possible.

FIGURE A.19 - VERTICAL TUBE MOUNTING

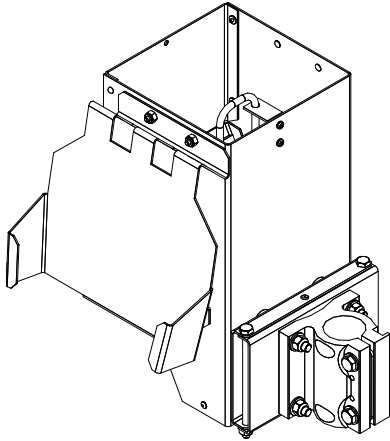


FIGURE A.20 - HORIZONTAL TUBE MOUNTING

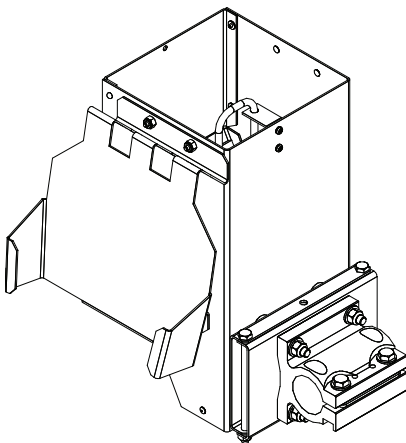
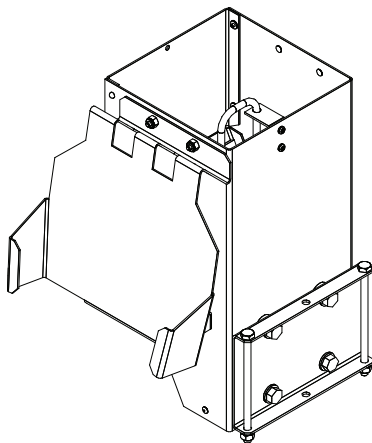


FIGURE A.21 - WIRE DRIVE MOUNTING



CABLES

ArcLink Control Cables

ArcLink Control Cables are available in two forms:

- K1543-xx series for most indoor or factory installations.
- K2683-xx series for outdoor use or when the equipment is frequently moved.

ArcLink/LincNet control cables are special high quality cables for digital communication. The cables are copper 5 conductor cable in a SO-type rubber jacket. There is one 20 gauge twisted pair for network communications. This pair has an impedance of approximately 120 ohms and a propagation delay per foot of less than 2.1 nanoseconds. There are two 12 gauge conductors that are used to supply 40VDC to the network. The fifth wire is 18 gauge and is used as an electrode sense lead.

Use of non-standard cables may lead to system shut-downs, poor arc starting and wire feeding problems.

The control cables connect the power source to the wire feeder, and the wire feeder to other wire feeders.

Control cables may be connected end to end to extend their length. Use a maximum of 200 feet (61 m) of control cable between components.

FIGURE A.22 - ARCLINK CONTROL CABLES

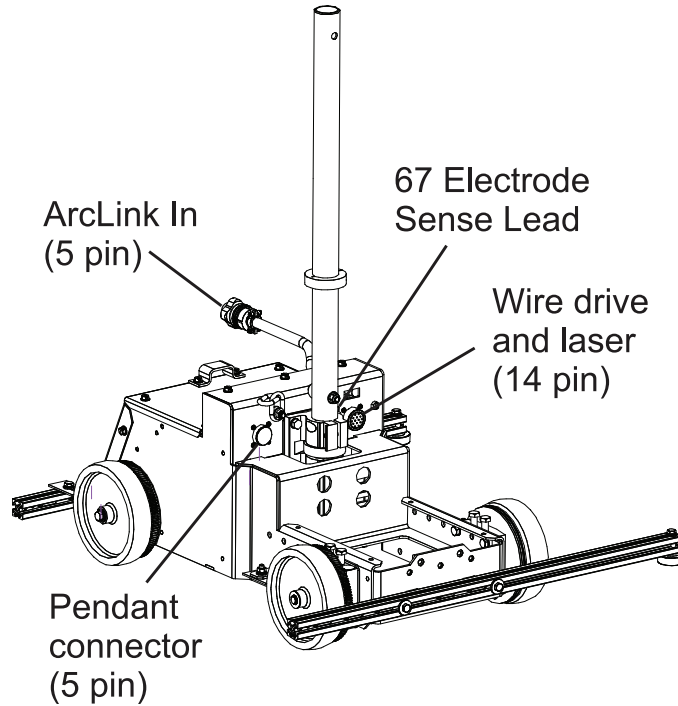


Power Source	
Pin	Function
A	ArcLink
B	ArcLink
C	67 voltage sense
D	40 VDC
E	Common

Wire Feeder	
Pin	Function
A	ArcLink
B	ArcLink
C	67 voltage sense
D	40 VDC
E	Common

CABLE CONNECTIONS

FIGURE A.23 - WIRE DRIVE MOUNTING



WELD CABLE SIZES

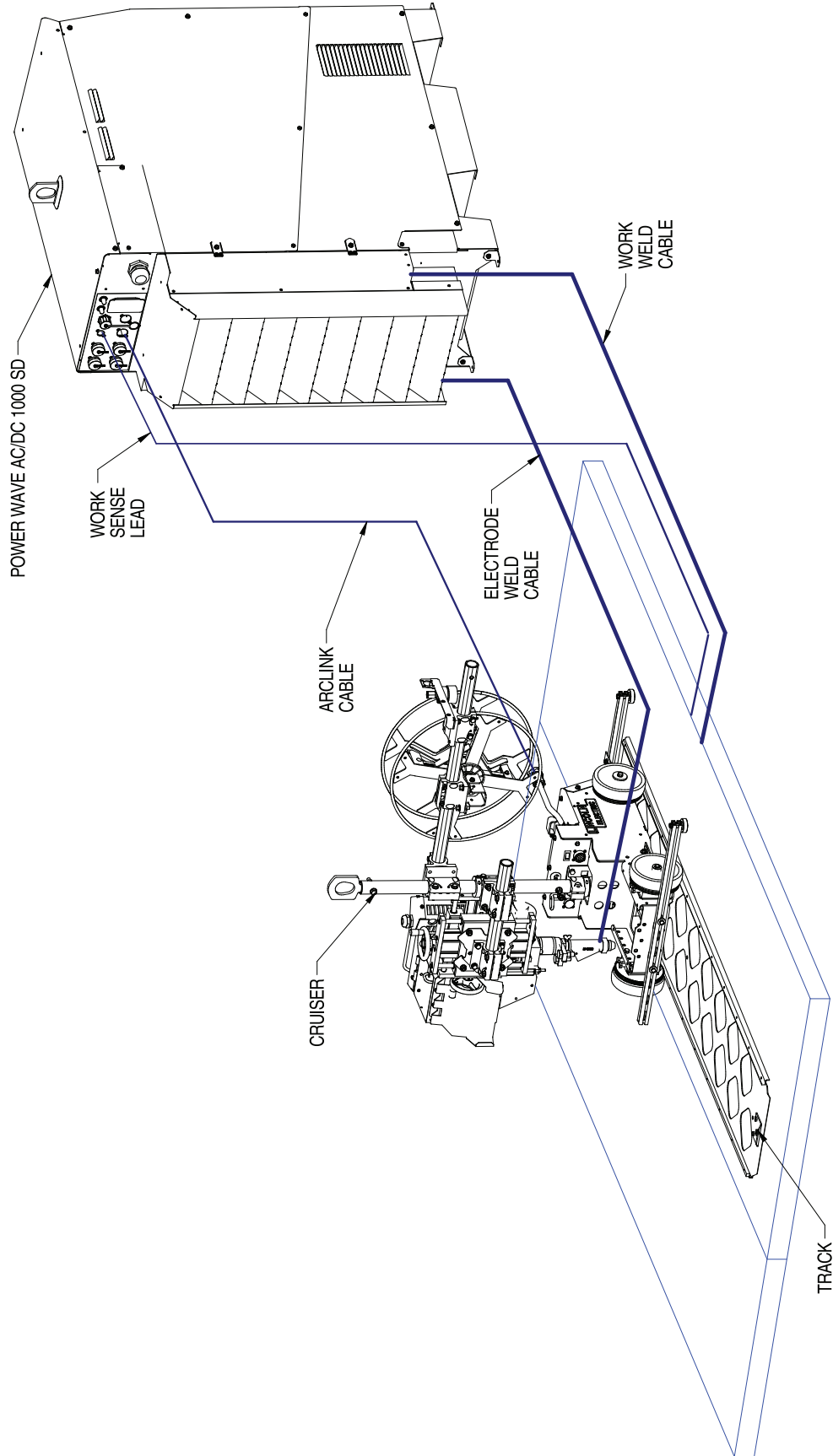
Tabulated below are copper cable sizes recommended for different currents and duty cycles. Lengths stipulated are the distance from the welder to work and back to the welder again. Cable sizes are increased for greater lengths primarily for the purpose of minimizing cable drop.

RECOMMENDED CABLE SIZES (RUBBER COVERED COPPER - RATED 75°C)**						
Amperes	Percent Duty Cycle	CABLE SIZES FOR COMBINED LENGTHS OF ELECTRODE AND WORK CABLES				
		0 to 50 Ft.	50 to 100 Ft.	100 to 150 Ft.	150 to 200 Ft.	200 to 250 Ft.
600	60	3/0	3/0	3/0	4/0	2-3/0
600	80	2-1/0	2-1/0	2-1/0	2-2/0	2-3/0
600	100	2-1/0	2-1/0	2-1/0	2-2/0	2-3/0
650	60	3/0	3/0	4/0	2-2/0	2-3/0
650	80	2-1/0	2-1/0	2-1/0	2-2/0	2-3/0
700	100	2-2/0	2-2/0	2-3/0	2-3/0	2-4/0
800	80	3-1/0	3-1/0	3-1/0	2-3/0	2-4/0
800	100	2-3/0	2-3/0	2-3/0	2-3/0	2-4/0
1000	80	2-4/0	2-4/0	2-4/0	2-4/0	4-2/0
1000	100	3-3/0	3-3/0	3-3/0	3-3/0	3-3/0
1200	80	3-4/0	3-4/0	3-4/0	3-4/0	3-4/0
1200	100	4-4/0	4-4/0	4-4/0	4-4/0	4-4/0
1500	80	4-4/0	4-4/0	4-4/0	4-4/0	4-4/0
1500	100	5-4/0	5-4/0	5-4/0	5-4/0	5-4/0

** Tabled values are for operation at ambient temperatures of 40°C and below. Applications above 40°C may require cables larger than recommended, or cables rated higher than 75°C.

SYSTEM SET-UP

FIGURE A.24 - SYSTEM SET-UP



BUTT JOINTS

Butt Joint, Track Welding

- When operating on K396 track, change the wheel calibration in the SET-UP menu to 5.65”.

FIGURE A.25 - TRACK WELDING FRONT VIEW

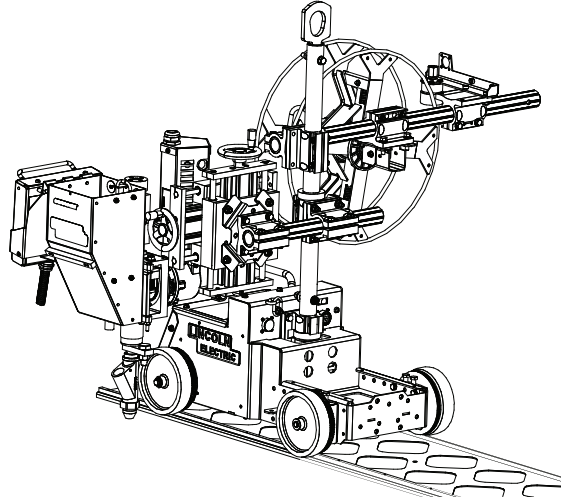


FIGURE A.26 - TRACK WELDING REAR VIEW

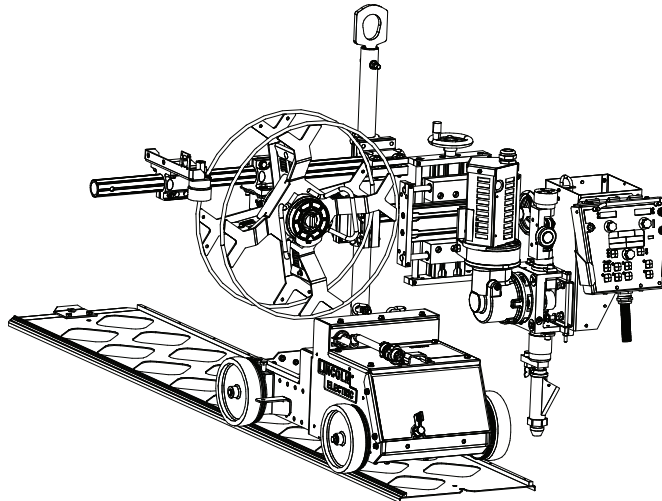


FIGURE A.27 - TRACK WELDING TOP VIEW

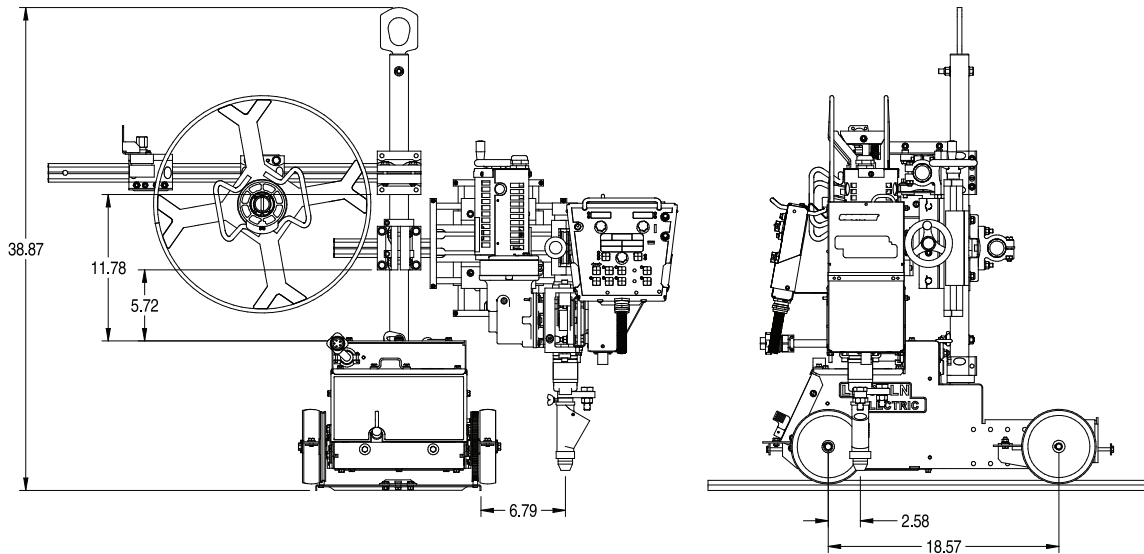


FIGURE A.28 - BUTT JOINT, 3 WHEEL, MANUAL STEER FRONT VIEW

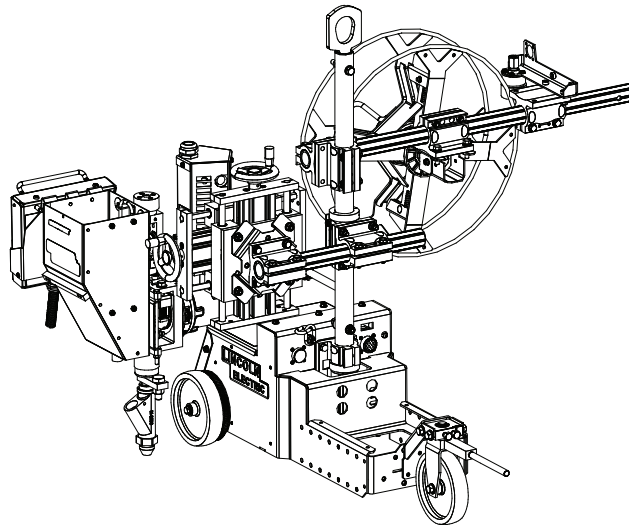


FIGURE A.29 - BUTT JOINT, 3 WHEEL, MANUAL STEER REAR VIEW

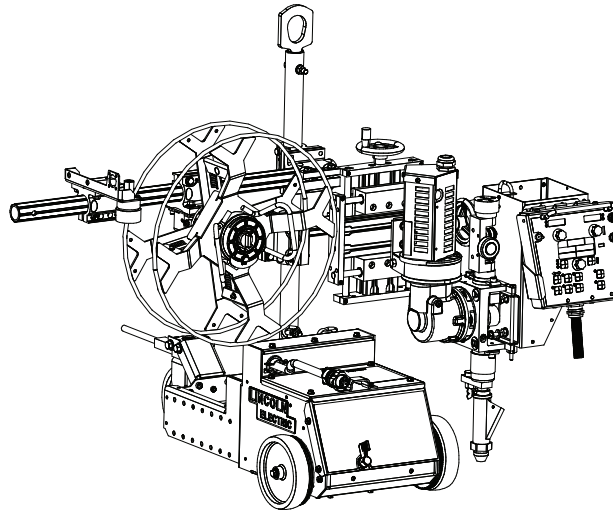


FIGURE A.30 - BUTT JOINT, 3 WHEEL, MANUAL STEER TOP VIEW

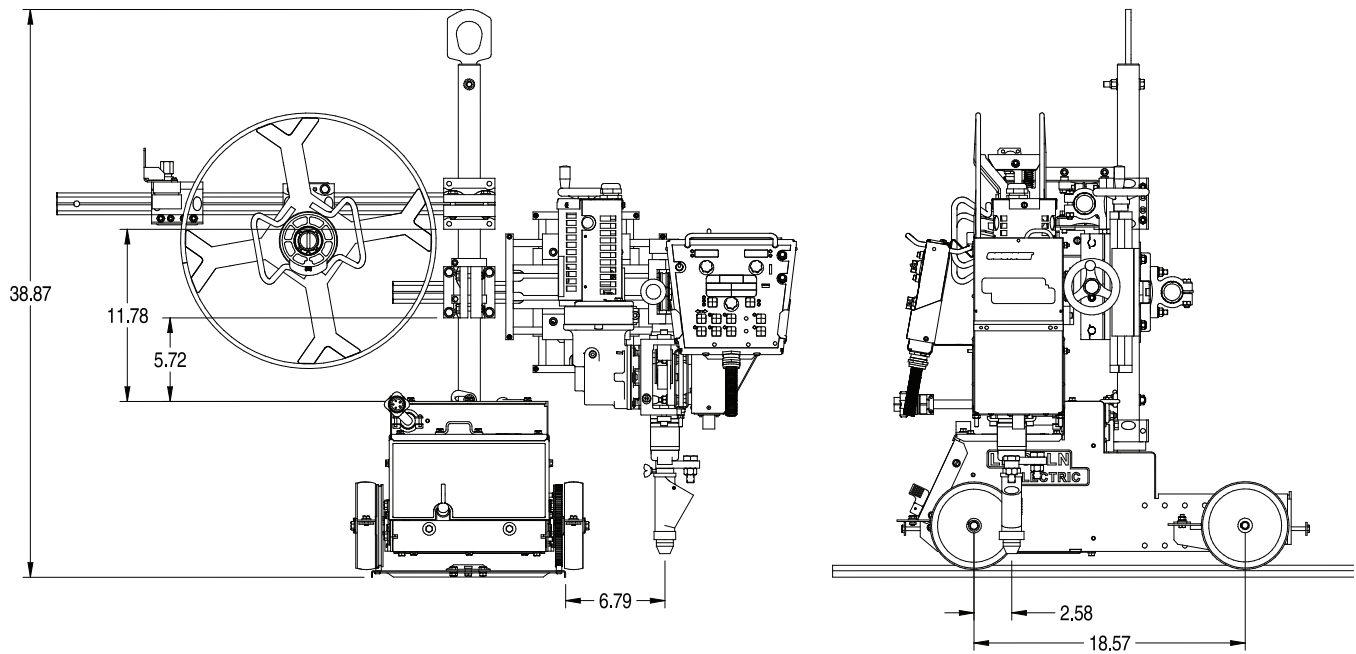


FIGURE A.31 - BUTT JOINT, 3 WHEEL, GUIDE WHEEL, FRONT VIEW

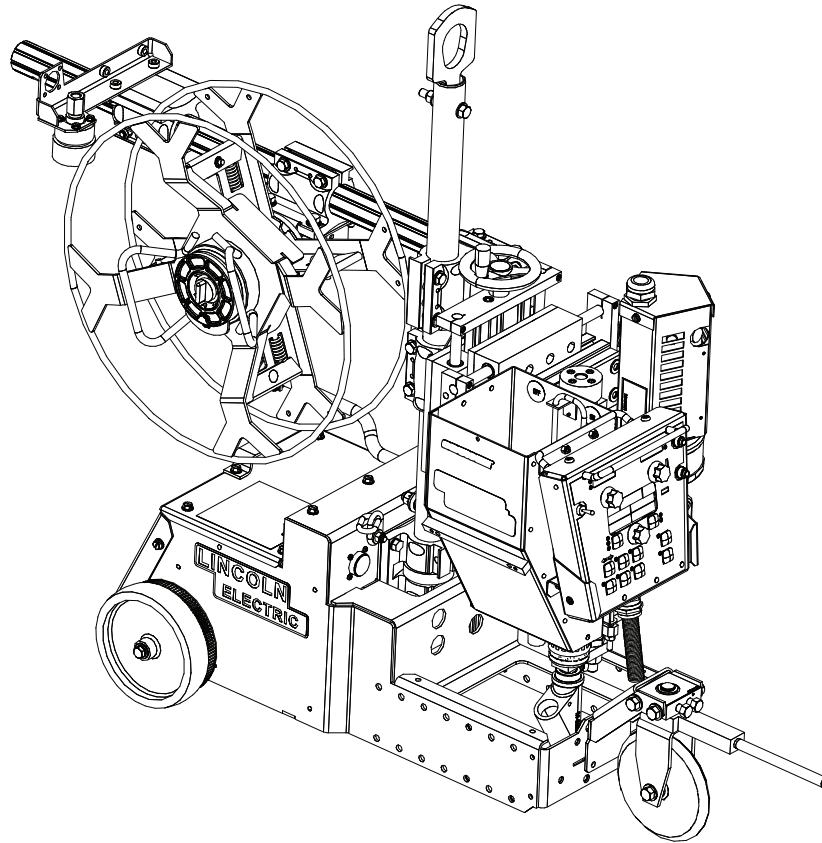


FIGURE A.32 - BUTT JOINT, 3 WHEEL, GUIDE WHEEL, REAR VIEW

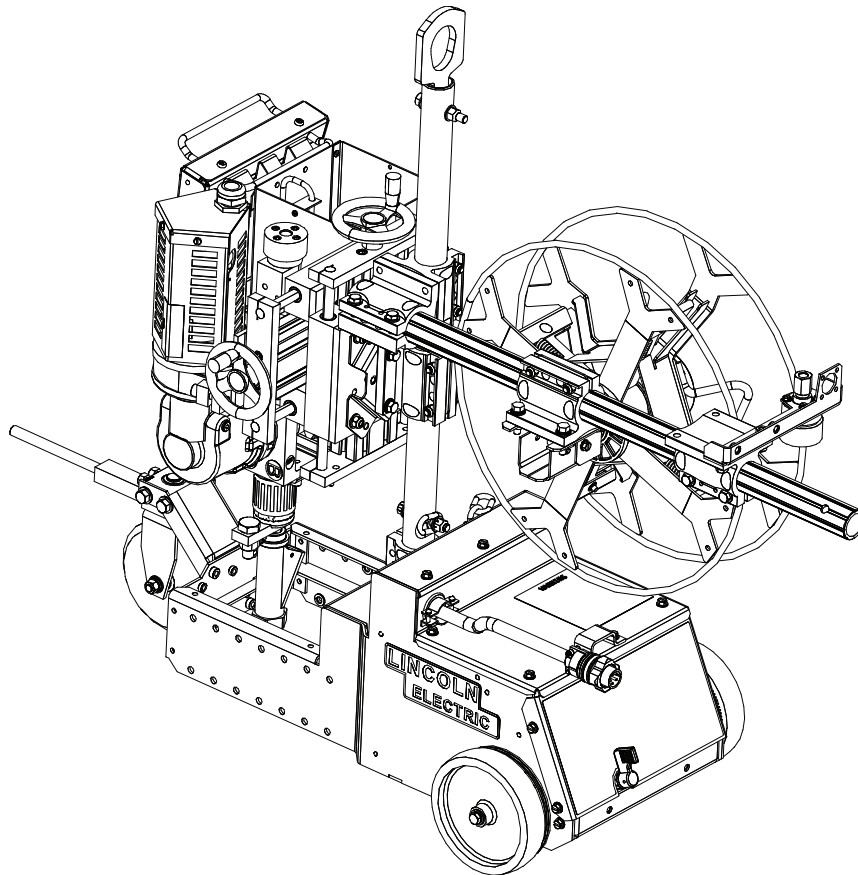
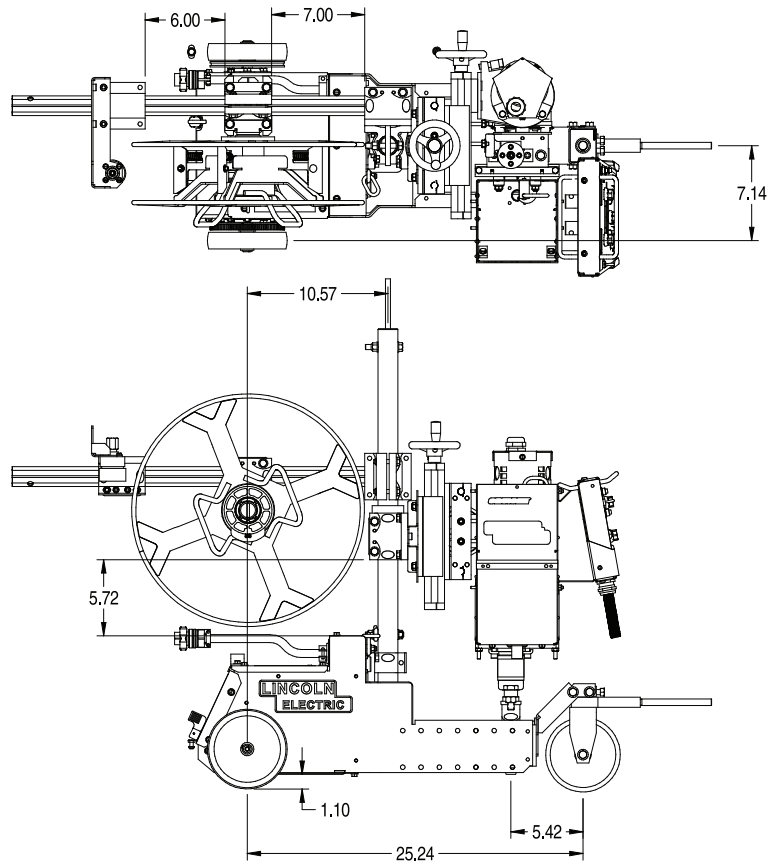


FIGURE A.33 - BUTT JOINT, 3 WHEEL, GUIDE WHEEL, TOP VIEW



FILLET JOINTS

Horizontal Fillet

Uses KP2721-2 curved nozzle extension (45°).

FIGURE A.34 - HORIZONTAL FILLET, CURVED NOZZLE EXTENTION, FRONT VIEW

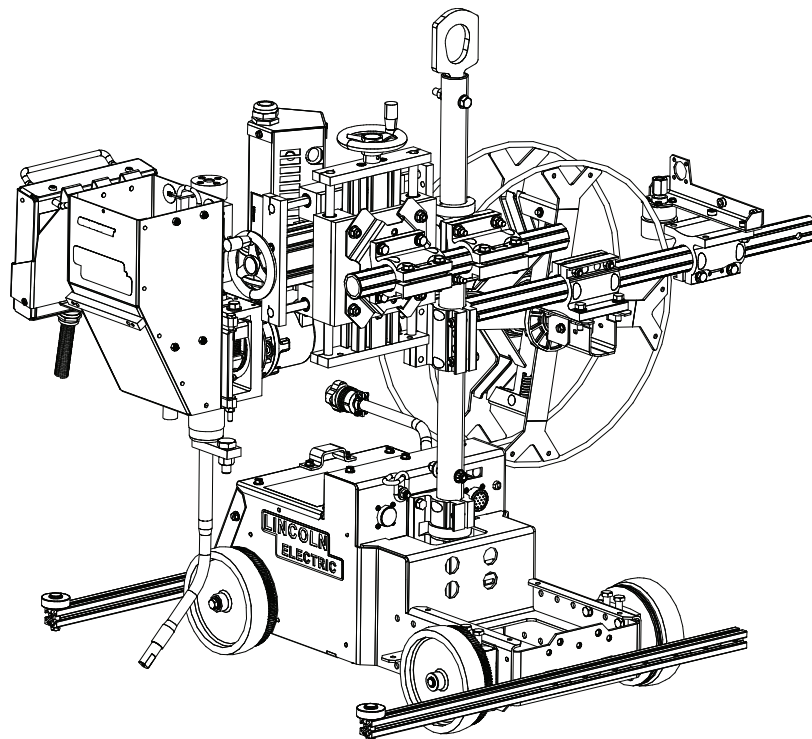


FIGURE A.35 - HORIZONTAL FILLET, CURVED NOZZLE EXTENTION, REAR VIEW

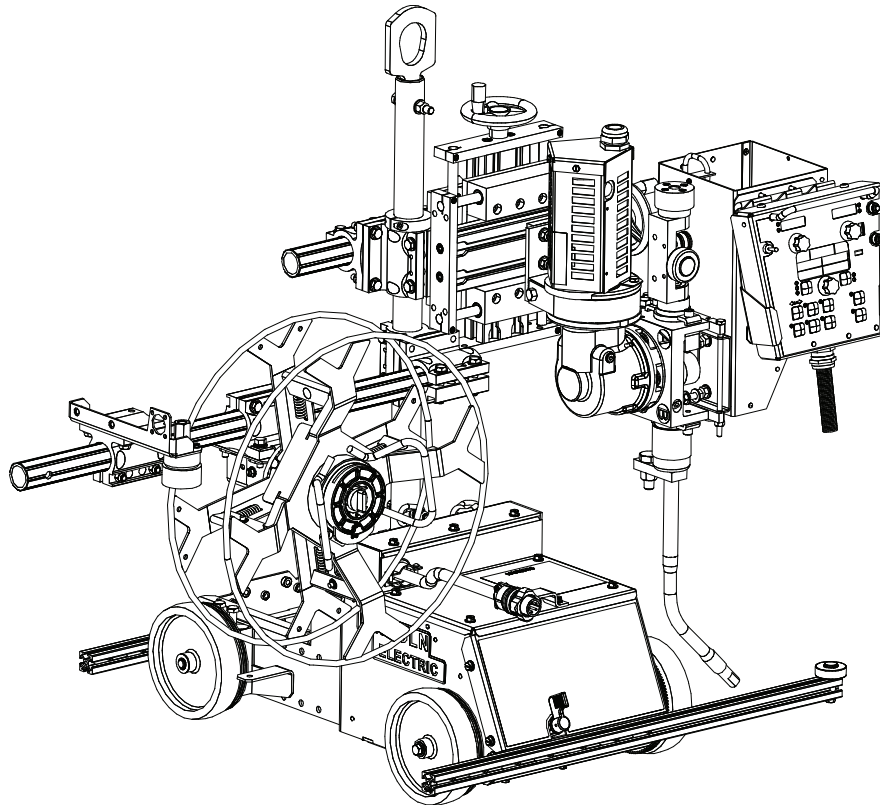
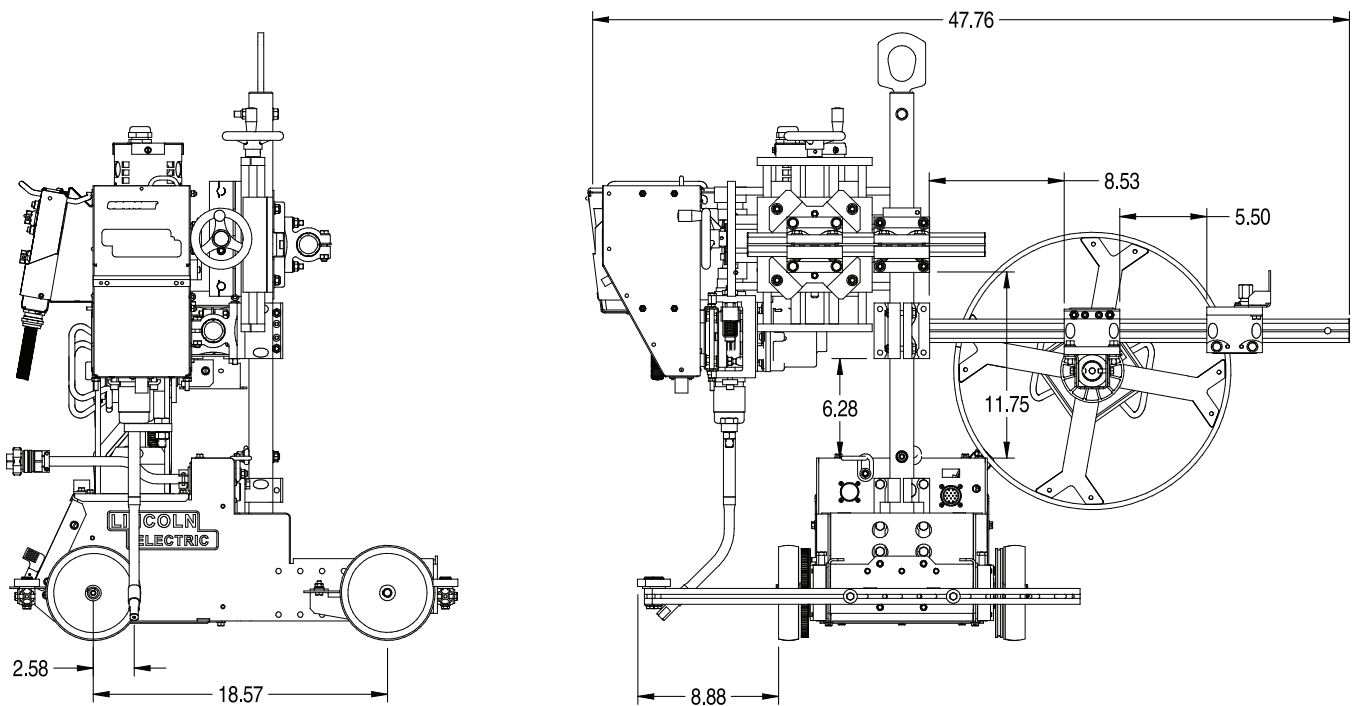


FIGURE A.36 - HORIZONTAL FILLET, CURVED NOZZLE EXTENTION, TOP VIEW



HORIZONTAL FILLET

Uses KP2721-1 straight nozzle extensions.

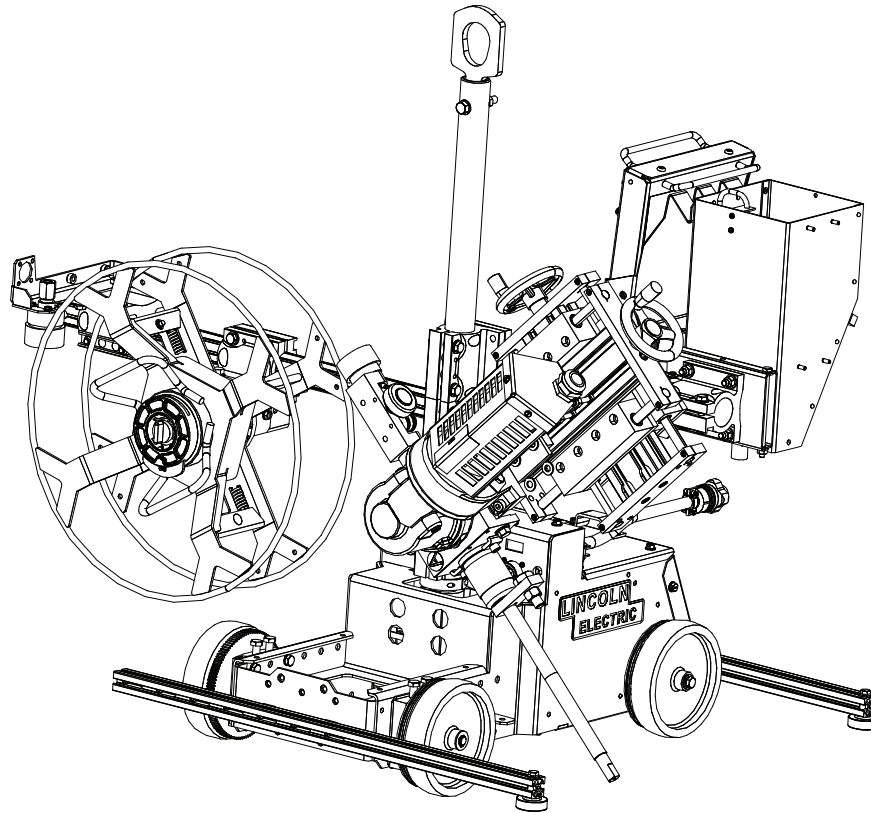
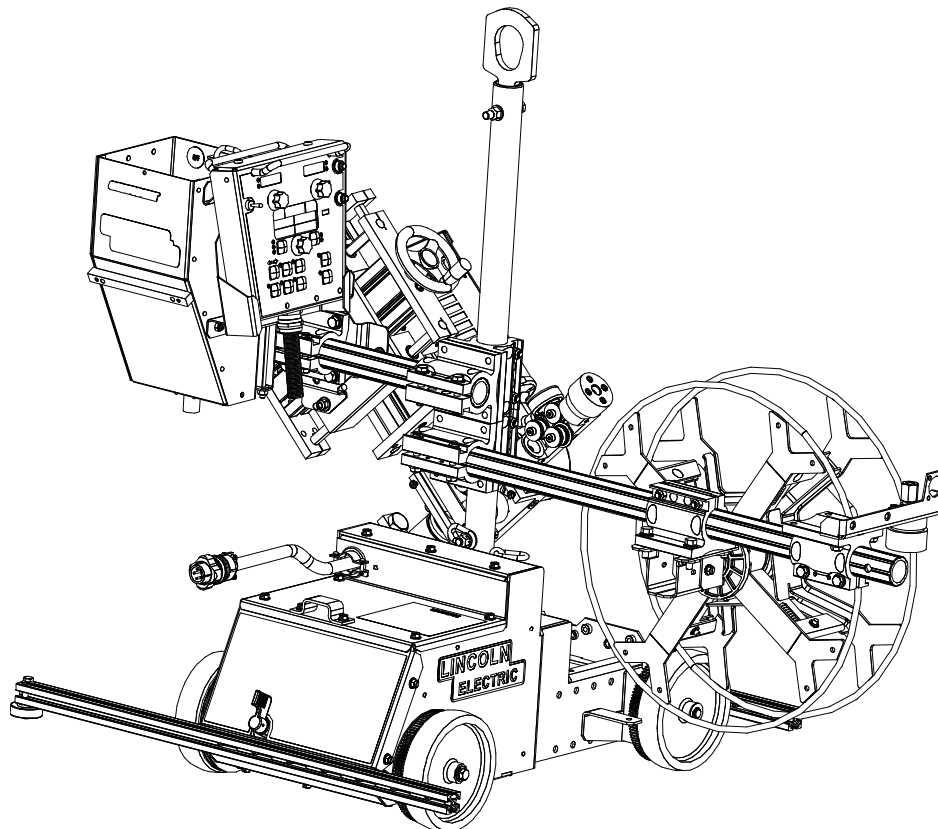
FIGURE A.37 - HORIZONTAL FILLET, STRAIGHT NOZZLE EXTENTION, FRONT VIEW**FIGURE A.38 - HORIZONTAL FILLET, STRAIGHT NOZZLE EXTENTION, REAR VIEW**

FIGURE A.39 - HORIZONTAL FILLET, STRAIGHT NOZZLE EXTENTION, TOP VIEW

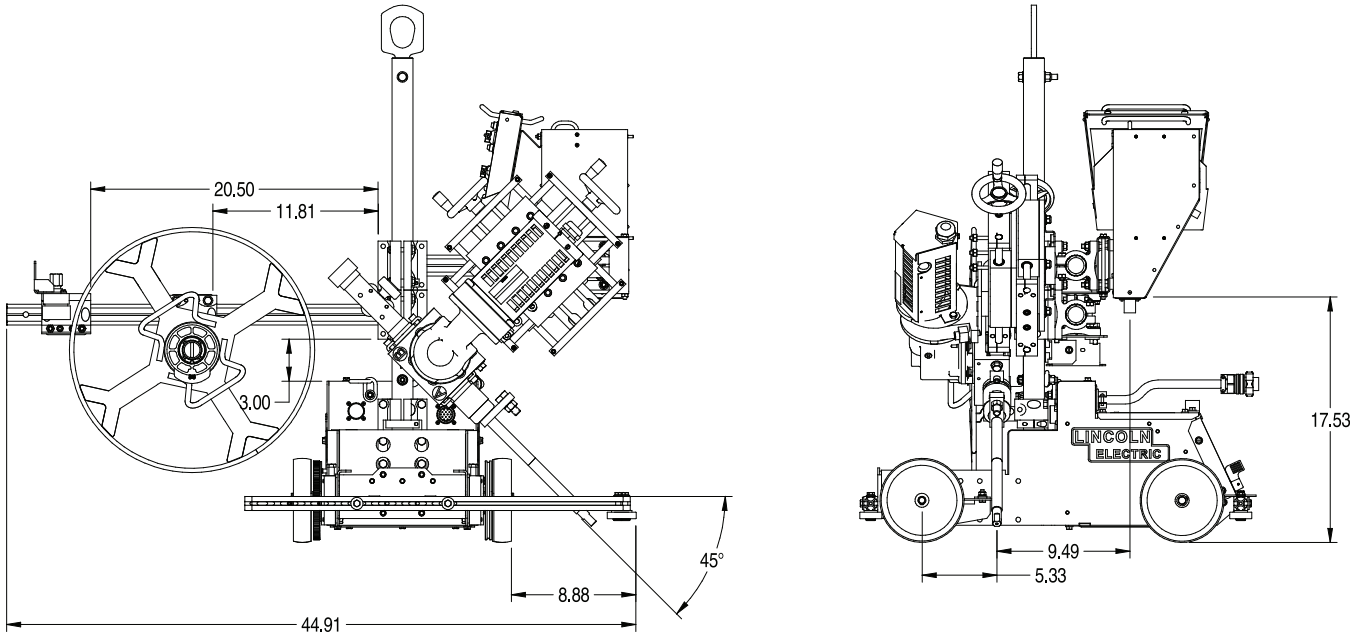
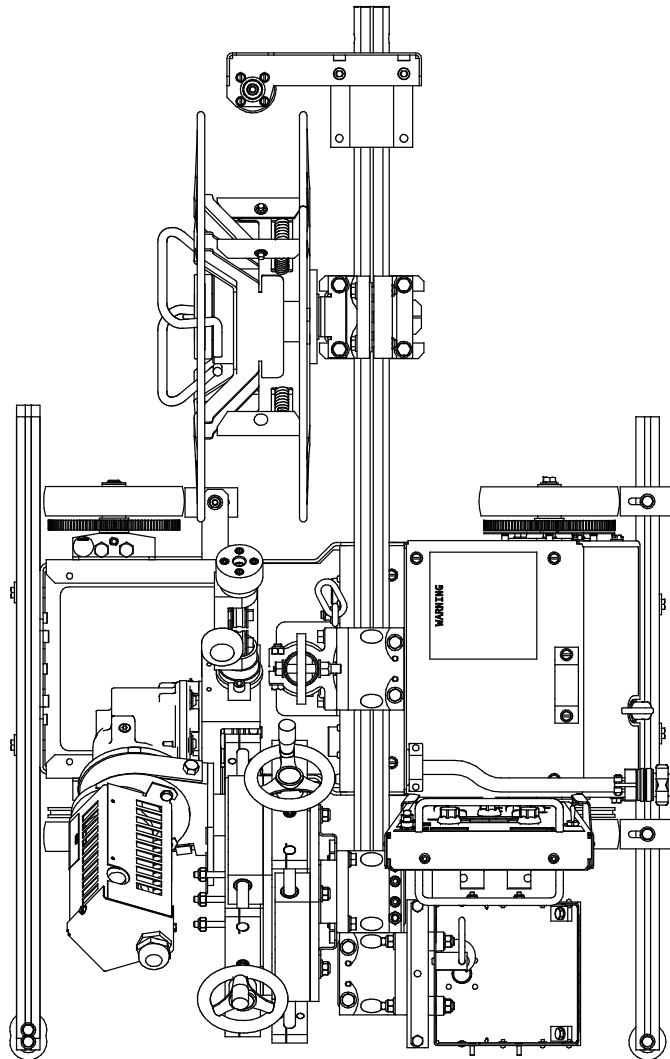


FIGURE A.40 - HORIZONTAL FILLET TOP VIEW



FLAT FILLET (TROUGH)

FIGURE A.41 - FLAT FILLET (TROUGH) FRONT VIEW

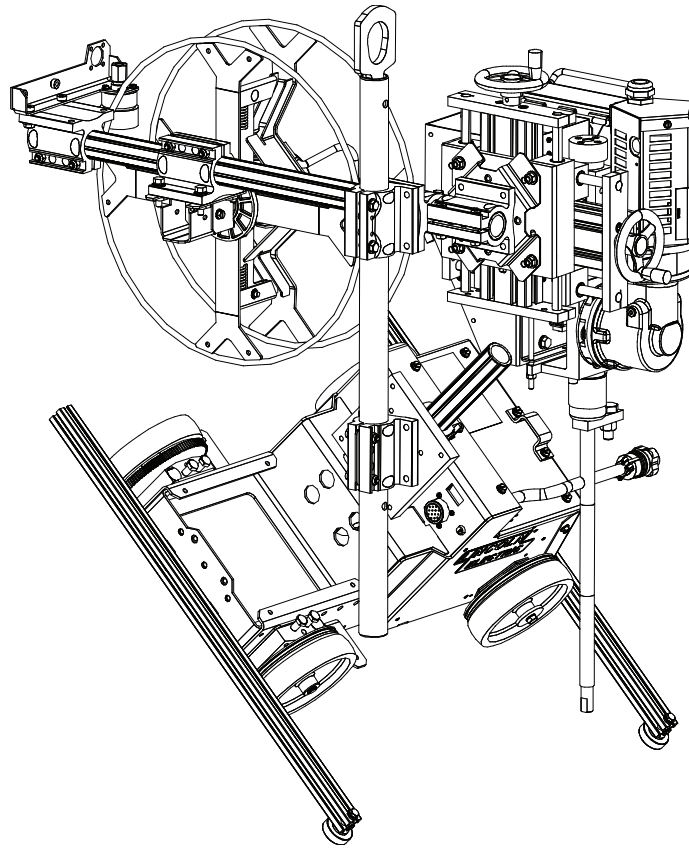
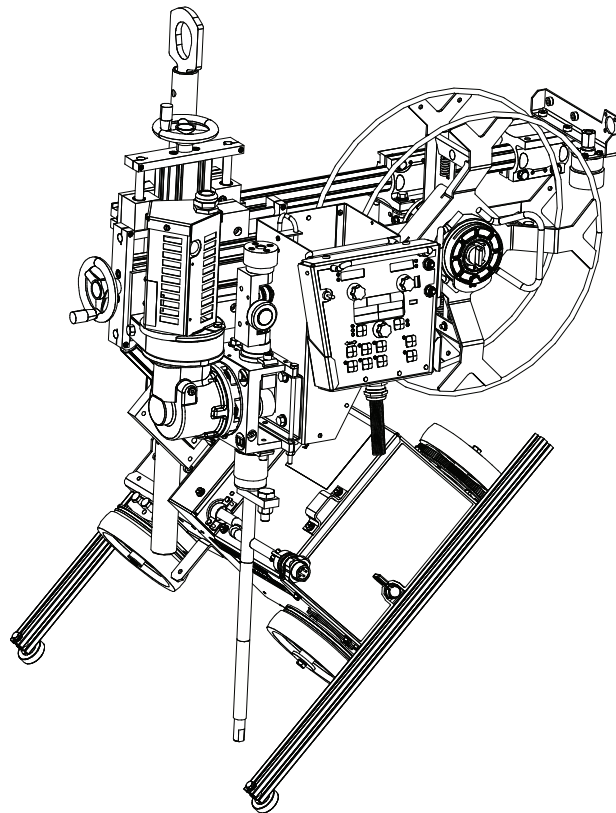


FIGURE A.42 - FLAT FILLET (TROUGH) REAR VIEW



FLAT FILLET (TROUGH) (CONTINUED)

FIGURE A.43 - FLAT FILLET TOP VIEW

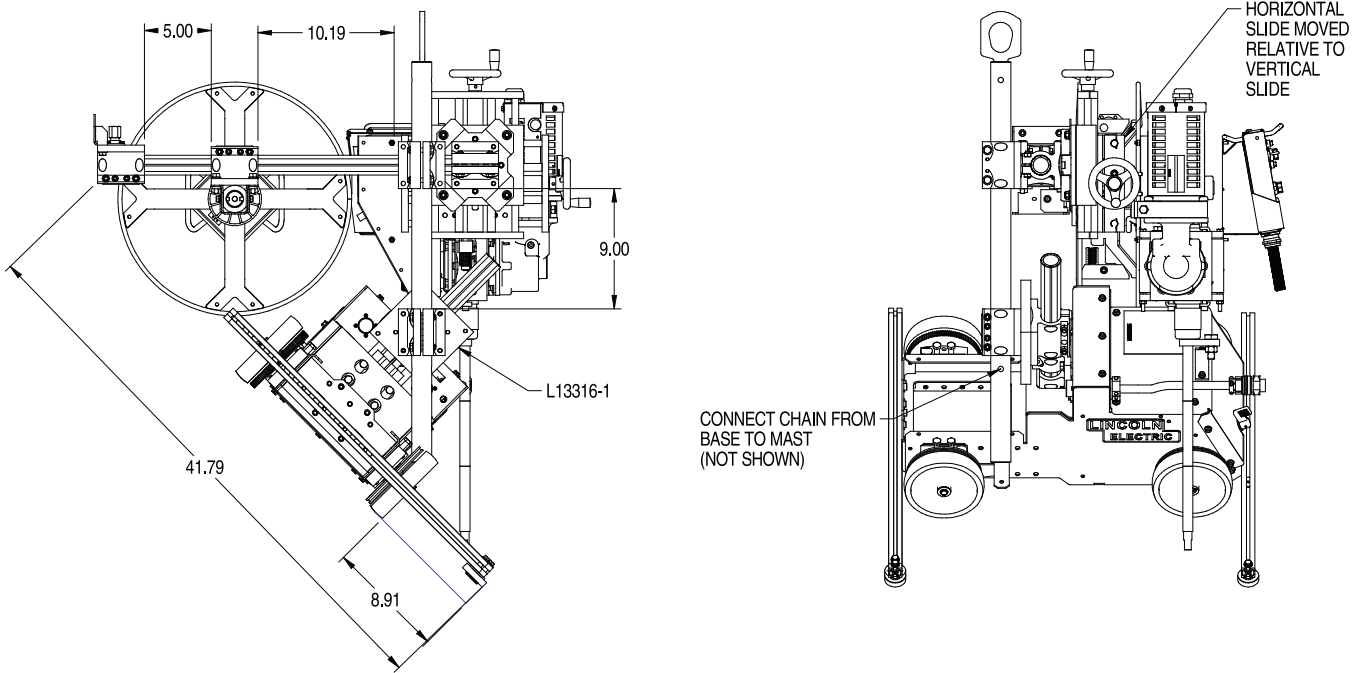
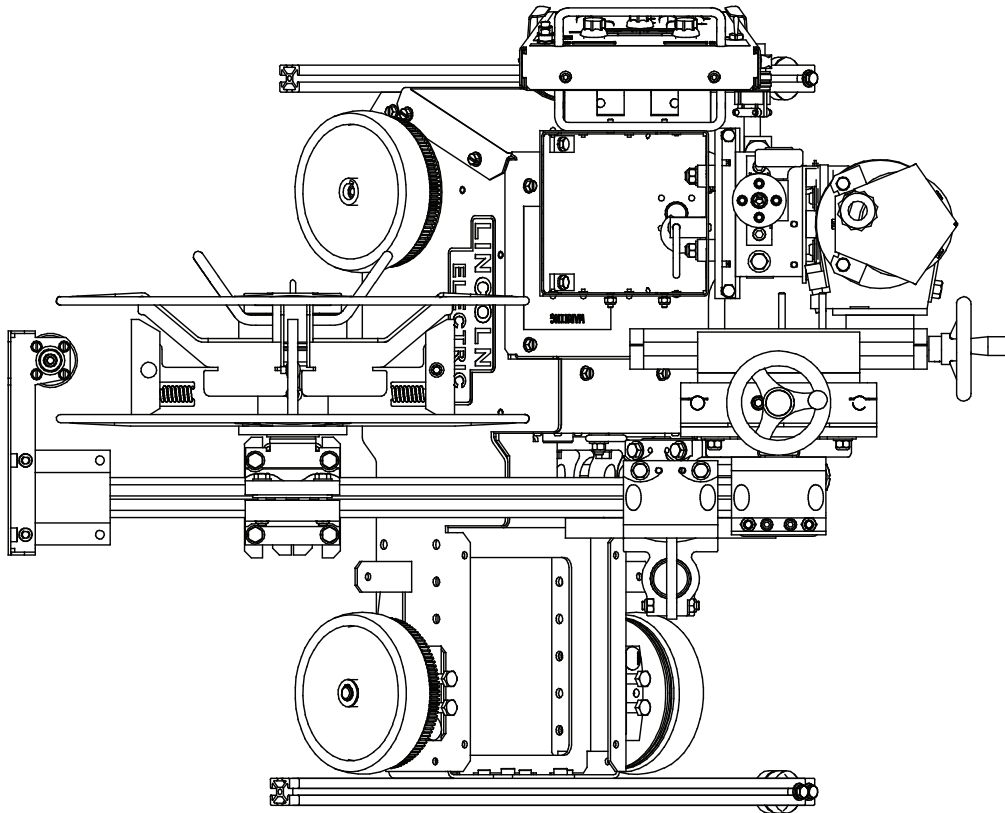


FIGURE A.44 - FLAT FILLET TOP VIEW



PIPE WELDING

Internal inner diameter welds. The CRUISER™ may be assembled to fit inside pipes with a 44" (1.1m) inner diameter.

FIGURE A.45 - PIPE WELDING FRONT VIEW

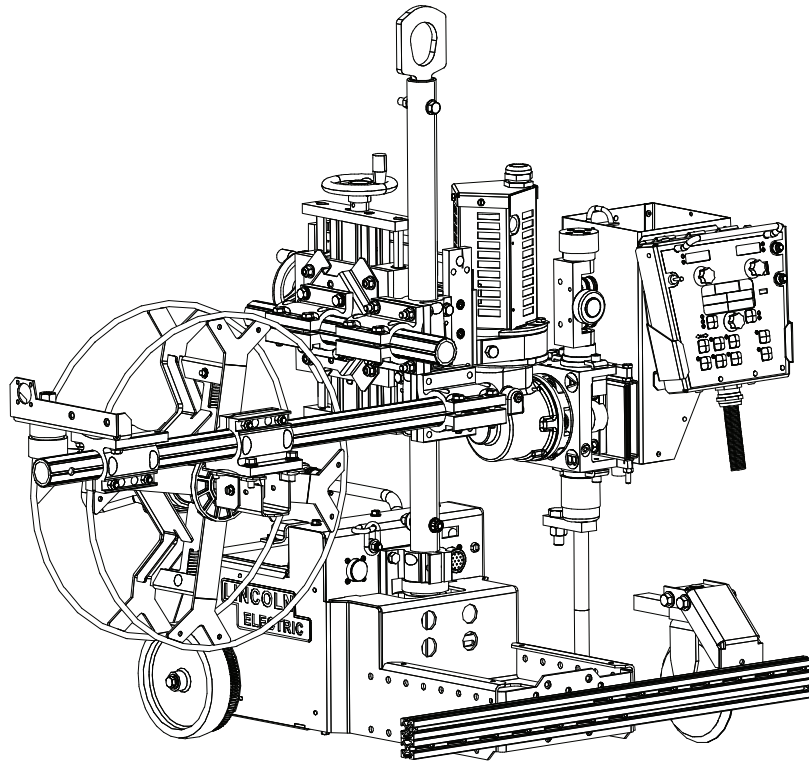
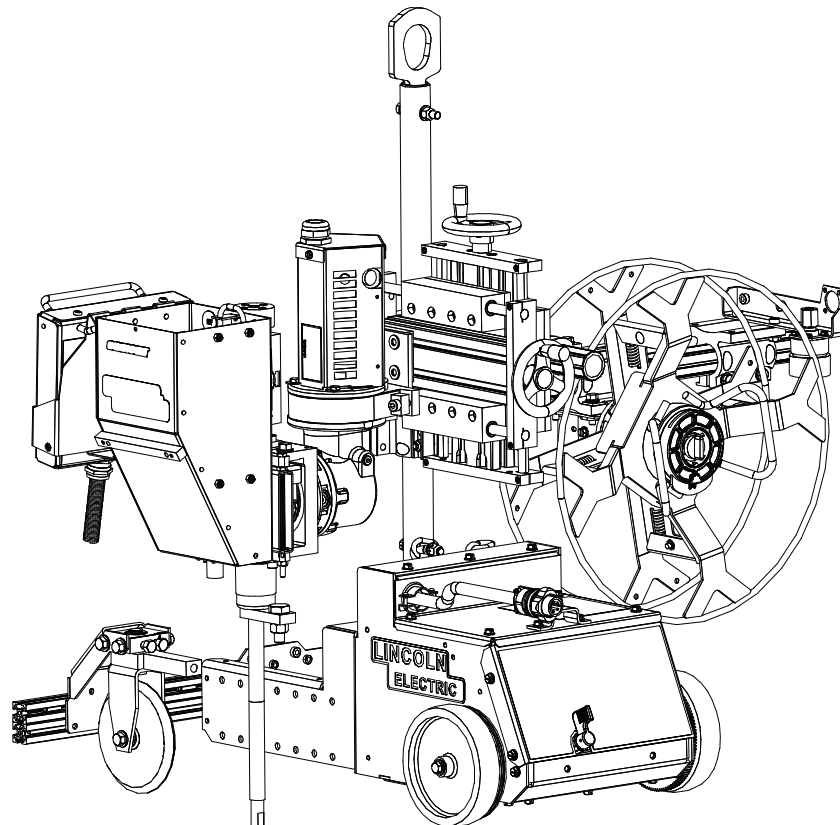


FIGURE A.46 - PIPE WELDING REAR VIEW



PIPE WELDING (CONTINUED)

FIGURE A.47 - PIPE WELDING TOP VIEW

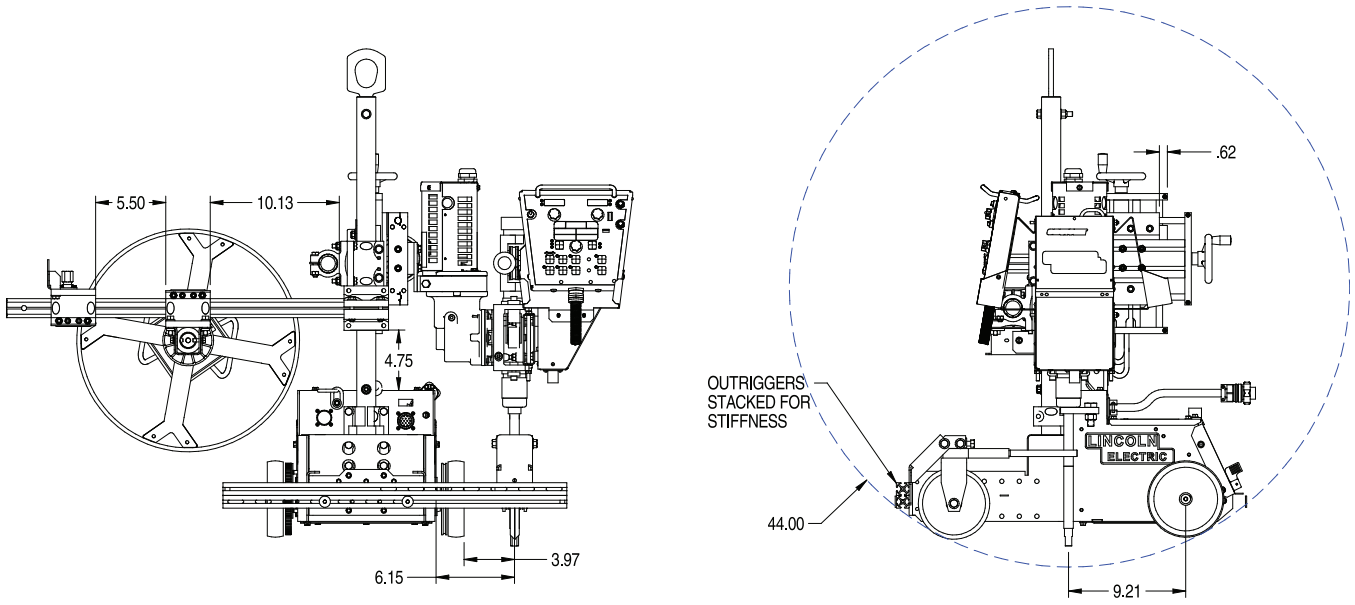
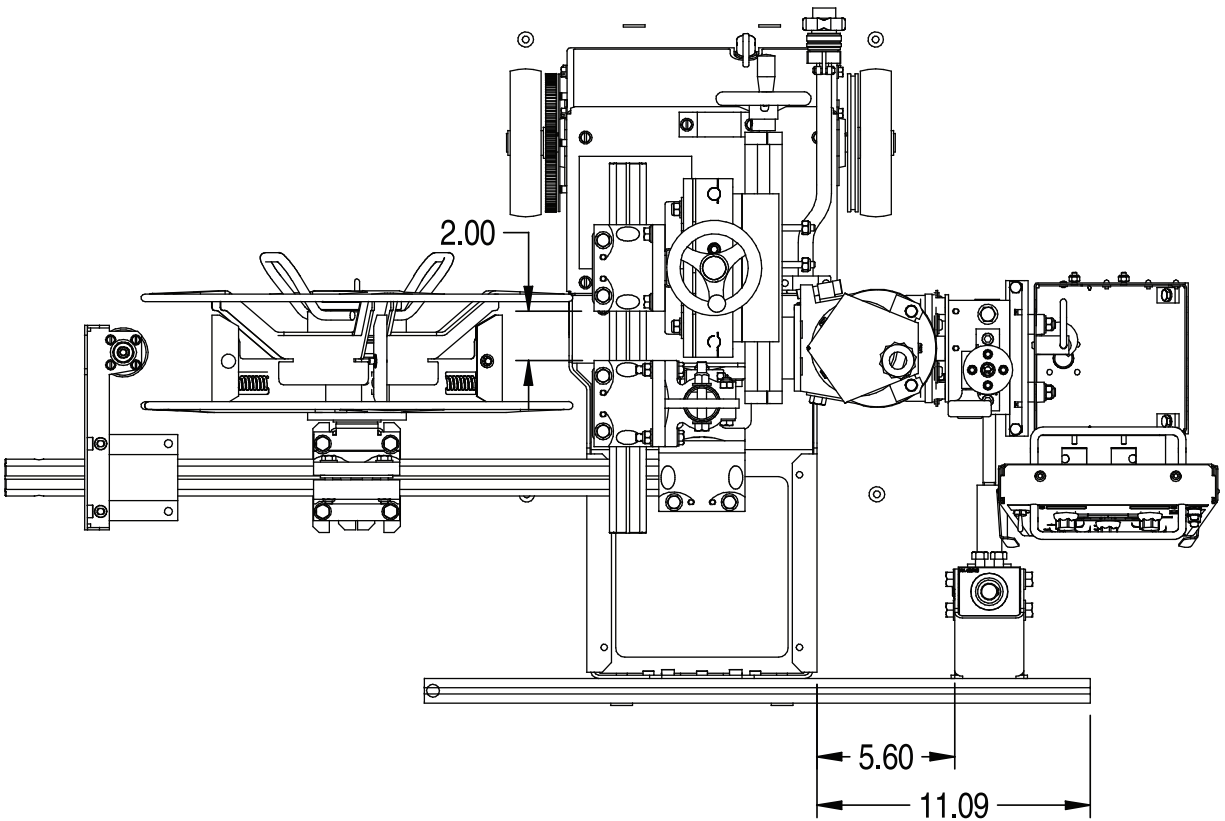
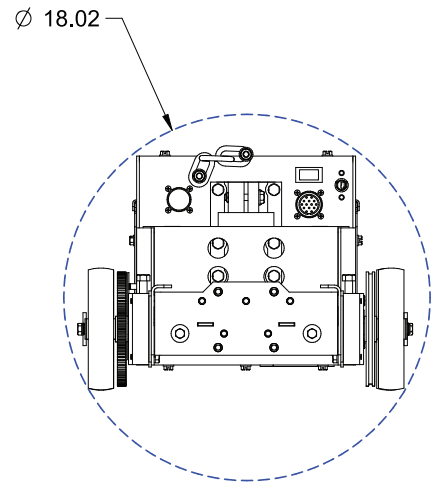
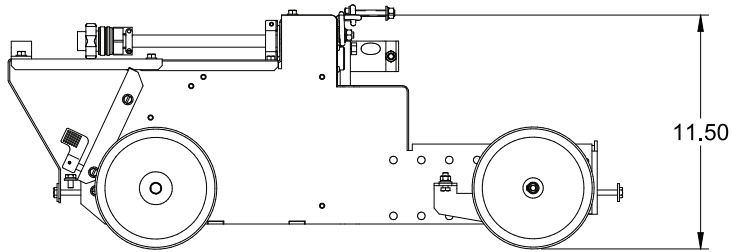
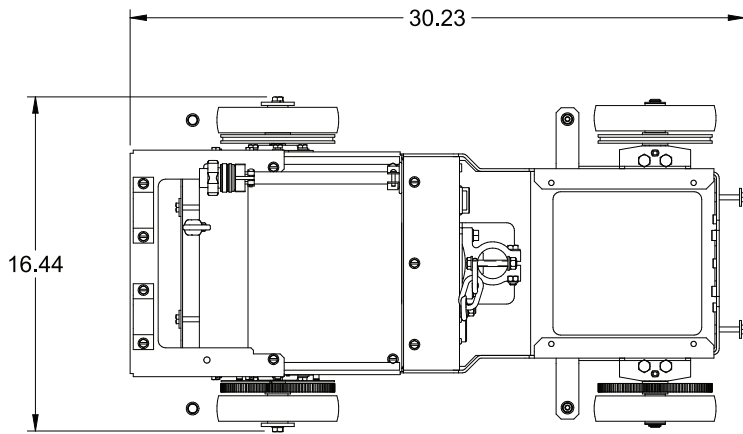


FIGURE A.48 - PIPE WELDING TOP VIEW



BASE DIMENSIONS ONLY



SAFETY PRECAUTIONS, OPERATION

⚠ WARNING



ELECTRIC SHOCK can kill.

- Turn the input power OFF at the disconnect switch before working on this equipment.
- Do not touch electrically hot parts.
- Only qualified personnel should install, use or service this equipment.
- Do not allow parts at electrode potential to touch the tractor frame, cress slides, base flux hopper or other parts.
- Disengaging the clutch does not stop the welding arc.
- Always wear dry insulating gloves.

⚠ WARNING



MOVING PARTS can injure.

- Do not leave the tractor unattended while it is welding or traveling.
- Electrode reel, drive rolls and wire straightener rolls turn during welding or inching.
- Keep gloved hands away from rotating parts.
- Keep away from pinch points.
- Do not place the tractor on inclined surfaces with the clutch disengaged.
- Only qualified personnel should install, use or service this equipment.

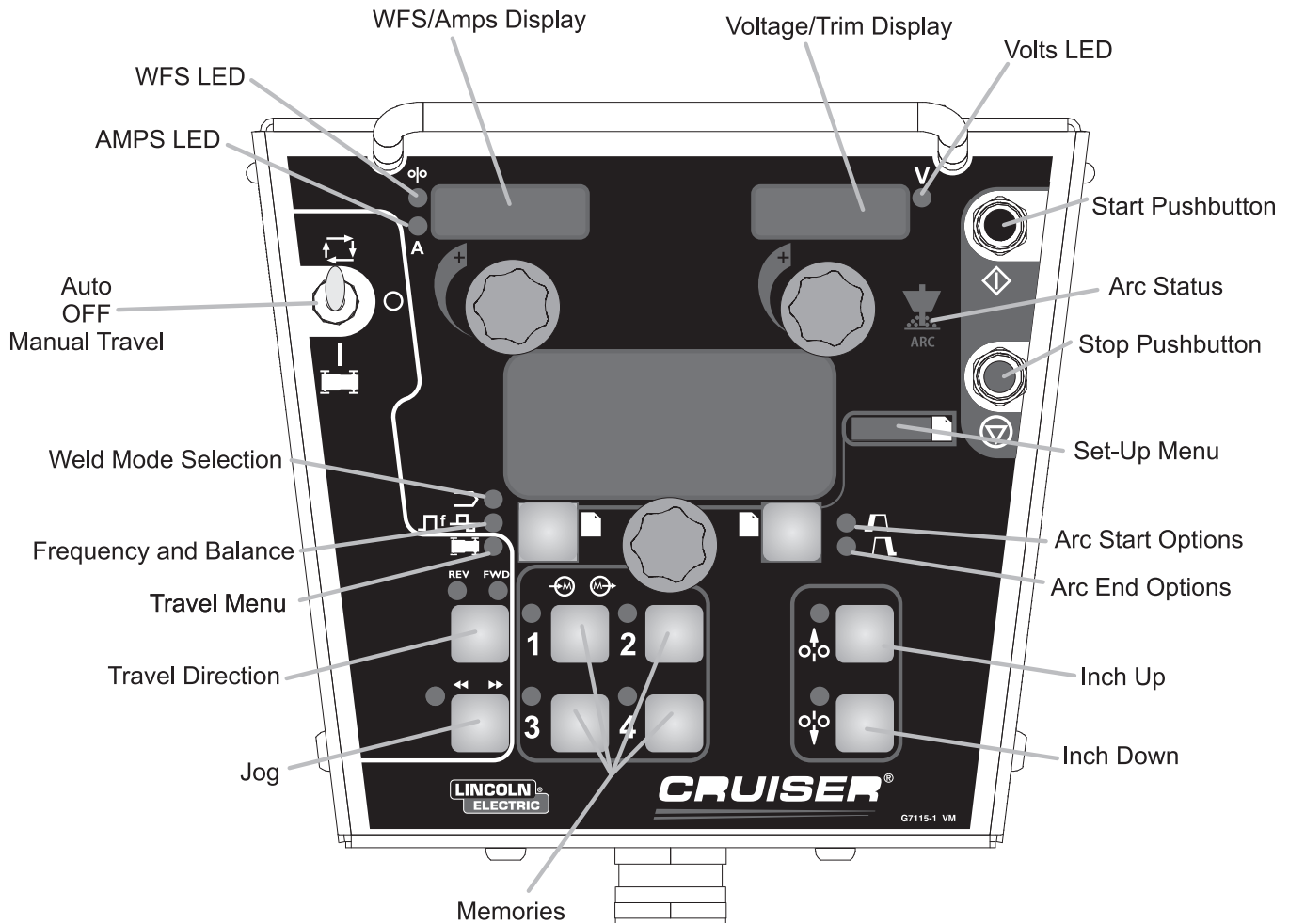
The serviceability of a product or structure utilizing the welding programs is and must be the sole responsibility of the builder / user. Many variables beyond the control of The Lincoln Electric Company affect the results obtained in applying these programs. These variables include, but are not limited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

GRAPHIC SYMBOLS

Graphic Symbols that appear on this machine or in this manual.

	Arc Link Connector		Start Weld Sequence
	Automatic Operation		End Weld Sequence
	Off		Cruiser Tractor
	On		Clutch Engaged
	Jog		Clutch Disengaged
	Feed wire up		Memory Store
	Feed wire down		Memory Recall
	Finger Crush Warning		Arc Start Options
			Arc End Options

FIGURE B.1 - PENDANT CONTROLS



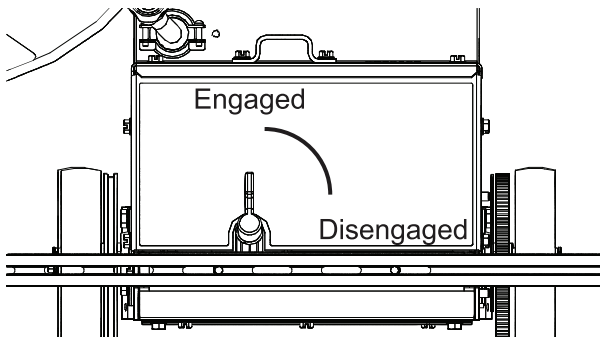
MOVING THE TRACTOR

The tractor will not travel unless the clutch is engaged. To engage the clutch, rotate the handle upwards. To disengage the clutch, rotate the handle to the 3 o'clock position.

The travel speed is adjustable from 7 to 100 in/min (1.78 to 2.54 m/min). From 7 to 20 in/min, the travel speed may be set in 0.5 inch/min increments. Above 20 in/min, the travel speed adjusts at 1.0 inch/min increments.

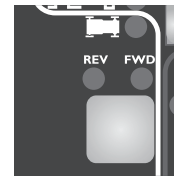
To drive the tractor without welding:

FIGURE B.2 - ENGAGE THE CLUTCH



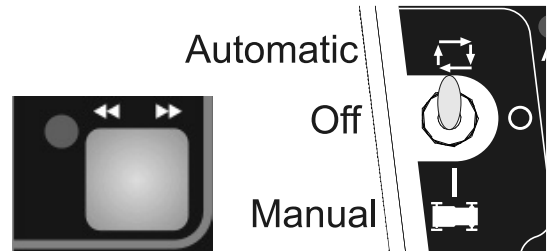
1. Engage the clutch at the rear of the tractor.

FIGURE B.3 - TRAVEL DIRECTION



2. Select either forward or reverse travel on the pendant.

FIGURE B.4 - JOB BUTTON, TOGGLE SWITCH



3. Press and hold the jog button, or place the toggle switch in the MANUAL travel position.

LASER POINTER



- **Class II laser radiation present. Do not stare into laser beam or view directly with optical instruments.**

Laser pointer is used to aid in guiding the CRUISER™. The laser pointer mounts to the nozzle or nozzle extensions. Align the wire in the joint, then position the laser pointer approximately 3” (76mm) in front of the wire, also pointing into the joint.

Turn the laser off when not welding.

TOUCH SENSE



- ELECTRIC SHOCK can kill.**
- **If the Touch Sense is enabled, the Power Source output is ON as long as the Feed Forward button is held. Avoid touching any portion of the weld circuit while feeding.**

The touch sense option, when enabled, allows the operator to feed the wire forward until it touches the workpiece. When contact to the work is made, the wire will stop.

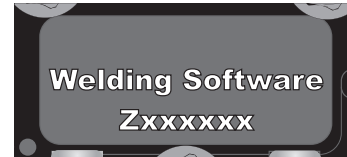
If the touch sense option is disabled, the wire is “cold” during the Feed Forward time. It will not stop when it touches the work.

POWER-UP SEQUENCE

When power is first applied to the CRUISER™ the MODE SELECT Display reads “CRUISER™ Initializing...”. Once the Power Wave AC/DC has initialized (20 to 60 seconds) a “lamp test” is performed.

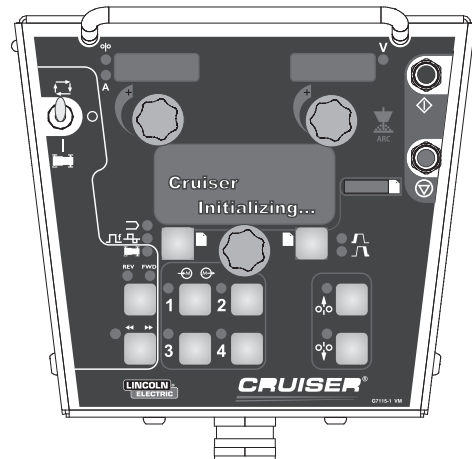
- All discrete LED’s, seven segment displays and alpha numeric displays will be turned ON for 2 seconds.
- After 2 seconds all displays are turned OFF again and the MSP Display will show:

FIGURE B.5 - MSP DISPLAY



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

FIGURE B.6 - WELD MODE INDICATOR



WIRE FEEDER SETUP

⚠ WARNING



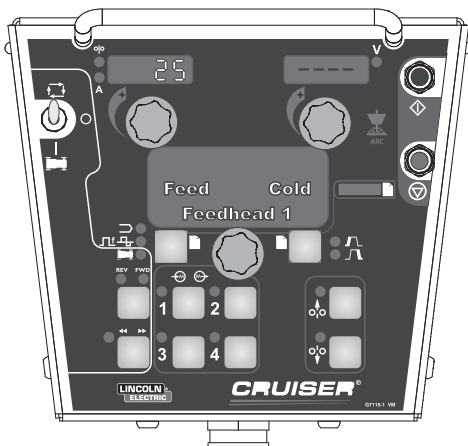
ELECTRIC SHOCK can kill.

- Prior to inserting the wire, disable “Touch Sense” (P.15 in the Setup Menu).

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

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

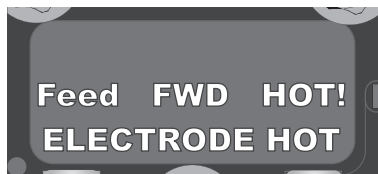
FIGURE B.7 - FEED SPEED DISPLAY



The feed speed can be changed by adjusting the control knob below the display while pressing either button. Use FEED REVERSE to retract the wire from the feed mechanism. FEED FORWARD feeds the wire downward toward the work piece.

The CRUISER™ has an option in the Setup Menu (P.15) to enable the “Touch Sense” circuitry. See the Setup Menu. When P.15 is enabled and the FEED FORWARD button is pressed, the MSP Display will read:

FIGURE B.8 - HOT FEED FEATURE

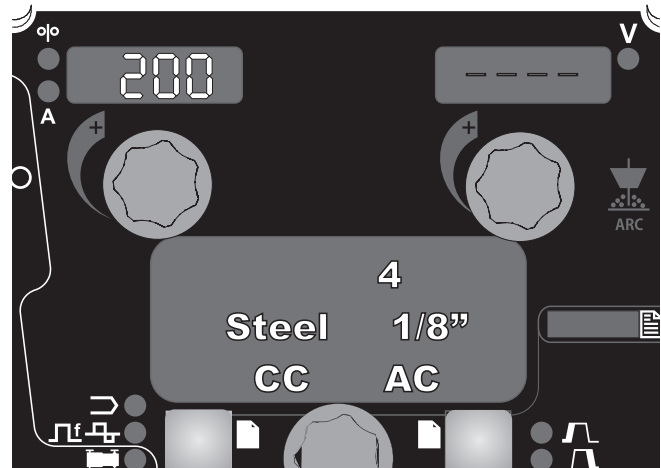


WARNING: This “Hot Feed” feature enables the output of the power source and there is voltage on the wire while feeding down. Avoid touching any exposed parts as defined in the *SAFETY PRECAUTIONS*.

CHANGING AND SETTING WELD MODES

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

FIGURE B.9 - SETTING WELD MODES

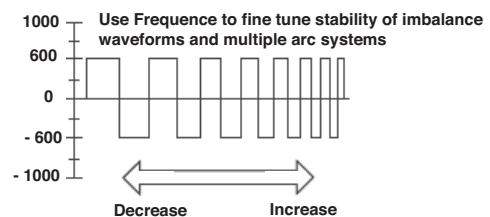
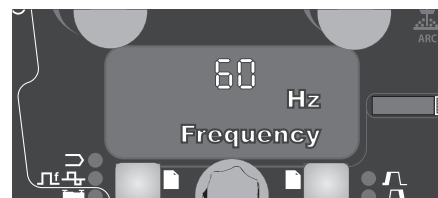


NOTE: CC Modes will show AMPS in the upper left display. CV Modes will show wire feed speed and the WFS indicator will be lit.

FREQUENCY

Press the WELD MODE selector until the FREQUENCY/ BALANCE indicator comes ON and the MSP Display reads “Frequency”. If the selected mode allows for frequency adjustment, the Control Knob can be used to select the desired frequency between 10 and 100hz.

FIGURE B.10 - FREQUENCY

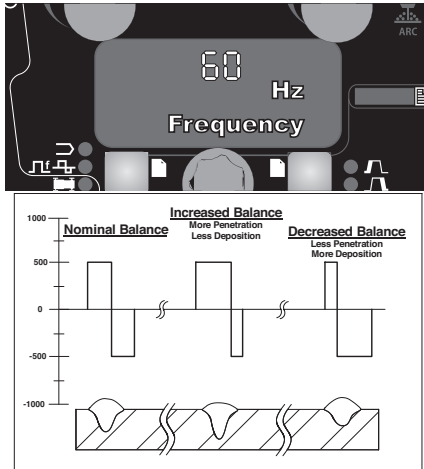


Frequency adjustment can be used to fine tune stability of imbalanced waveforms and multiple arc system.

BALANCE ADJUST

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

FIGURE B.11 - BALANCE ADJUST



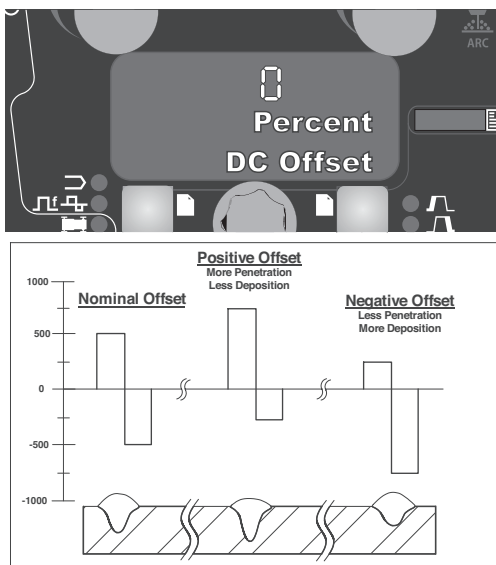
Adjusting the Balance (the ratio between Positive and Negative half cycle ‘on time’) changes the deposition for more efficient welding.

OFFSET ADJUST

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

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

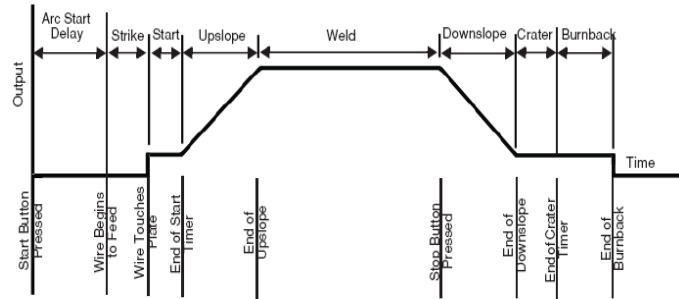
FIGURE B.12 - OFFSET ADJUST



WELD SEQUENCE

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

FIGURE B.13 - WELD SEQUENCE



START OPTIONS

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

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

START OPTIONS OPERATION

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

FIGURE B.14 - START OPTIONS OPERATION



Use the **Mode Select Panel Control** to select the desired delay time. Press the **Weld Mode Selector** to exit the Start parameters. Repeated pressing of the **Arc Start/End Options** pushbutton will scroll through the parameters. Turning the **Mode Select Panel Control**, while on a parameter will change its value. When a Start Option is set to a value other than OFF, the START OPTIONS LED will blink synchronous with the WFS or Amps and/or the Volts LED located on the Dual Display Panel prompting the user to enter these parameters. The parameters that can be set by the user in the START OPTIONS will be as follows:

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

END OPTIONS

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

- **DOWNSLOPE** determines the amount of time it takes to ramp from the weld parameters to the crater parameters. The transition is linear and may be up or down depending on the relationship between the weld and crater settings.
- **CRATER** parameters are typically used to fill the crater at the end of the weld and include both time and output settings.
- **BURNBACK** defines the amount of time the output remains on after the wire has stopped. This feature is used to prevent the wire from sticking in the weld puddle and to condition the end of the wire for the next weld. A burnback time of 0.4 second is sufficient in most applications.

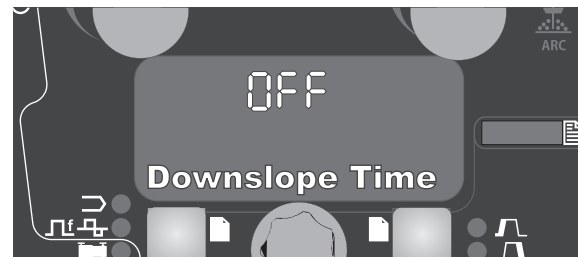
- **RESTRIKE TIME** determines how long the system will try to re-establish the arc in the event of a poor start or if the arc goes out for any reason (short circuit or open circuit). During restrike, the WFS and outputs are driven in an attempt to re-establish the arc.

- A restrike time of 1 to 2 seconds is sufficient in most applications.
- A restrike time of 0 seconds allows the restrike function to continue indefinitely.

END OPTIONS OPERATION

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

FIGURE B.15 - END OPTIONS OPERATION



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

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

MEMORIES

The CRUISER™ has 4 memories. Each memory stores :

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

FIGURE B.16 - MEMORIES



Recall a Memory:
Press 1 second

Save a Memory:
Press 2 seconds

Recall a memory with memory buttons

To recall a memory, press one of the four memory buttons. The memory is recalled when the button is released. Do not hold the button for more than two seconds.

Save a memory with memory buttons

To save a memory, press and hold the desired memory button for two seconds. When the button is initially pressed, the corresponding LED will illuminate. After two seconds, the LED will turn off. Do not hold the button for more than 5 seconds when saving a user memory.

Note that memories may be locked in the set-up menu to prevent accidental overwrite of the memories. If an attempt is made to save a memory when memory saving is locked, the message "Memory save is Disabled!" will appear briefly in the MSP4 display.

LIMITS

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

Each memory may have a different set of limits. For example, memory 1 may limit the WFS to 100 through 120 in/min, and memory 2 may limit the WFS to 140 through 160 in/min, while memory 3 may have no WFS limits.

Parameters are constrained by machine limits, or by setting memory limits. When memory limits are enabled, the parameter will flash whenever an attempt

FIGURE B.17 - LIMITS



Set Limits:
Press 5 seconds

is made to exceed the memory limit value. The parameter will not flash if an attempt is made to exceed the machine limit.

Limits may be set for:

- Wire Feed Speed
- Voltage
- Amperage
- Travel Speed
- Frequency
- Balance
- DC Offset
- Arc Start Options
- Arc End Options

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

To set limits, press the desired memory button 1-8 and hold for 5 seconds. Release the memory button when the LED begins to blink rapidly and the MSP4 displays "Memory X Set Limits" as shown below.

FIGURE B.18 - MEMORY SET LIMITS

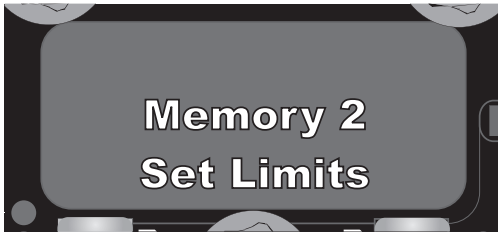
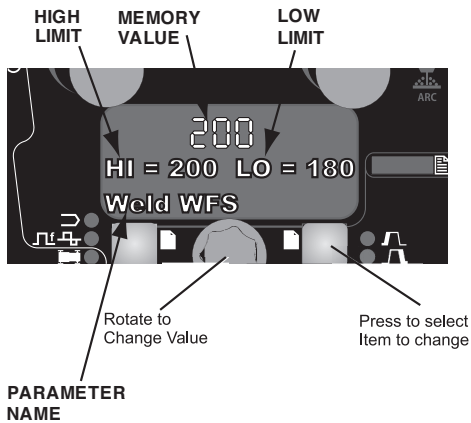


FIGURE B.19 - MEMORY SET LIMIT DISPLAY



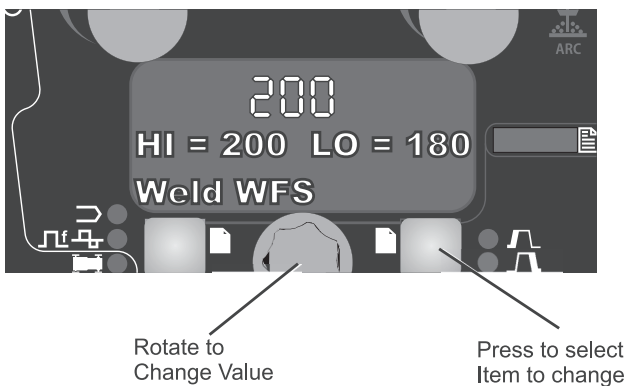
SETUP will illuminate on the MSP4 panel and the display will show the following:

Four items show on the MSP4 panel.

- Memory Value
- High Limit
- Low Limit
- Parameter Name

One of these items will flash to indicate which item will change when the MSP4 encoder is rotated. Press the right button on the MSP4 panel to select the item to change.

FIGURE B.20 - MSP4 PANEL



The Limits Setup menu shows a list of all parameters available for the weld mode stored in the memory chosen

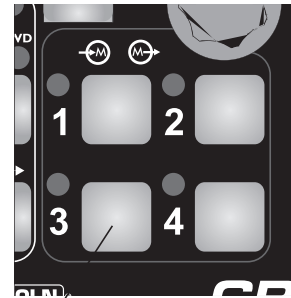
To lock a parameter to a specific value that cannot be changed, set the high and low limits to the same value.

The memory value must always be less than or equal to the high limit, and greater than or equal to the low limit.

After setting limits, press the memory button with the flashing LED. The MSP4 will ask to save or discard the limit changes just made. Press the left MSP4 for button (YES) to save and enable the limits and exit. Press the right MSP4 button (NO) to exit and leave limits unchanged.

ENABLING/DISABLING LIMITS

FIGURE B.21 - ENABLING LIMITS



Enable Limits:
Press 10 seconds

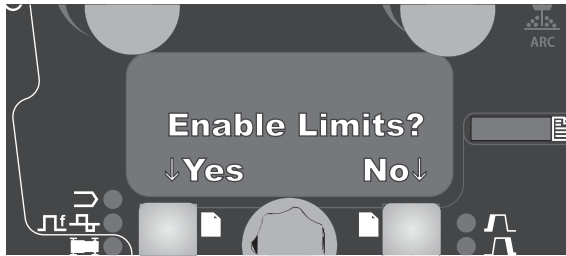
Limits for each memory may be enabled or disabled by pressing and holding the appropriate memory button for 10 seconds. Release the memory button when the MSP4 display shows the following:

FIGURE B.22 - ENABLE/DISABLE LIMITS



SETUP will light and the MSP4 displays the following:

FIGURE B.23 - ENABLE/DISABLE LIMITS DISPLAY



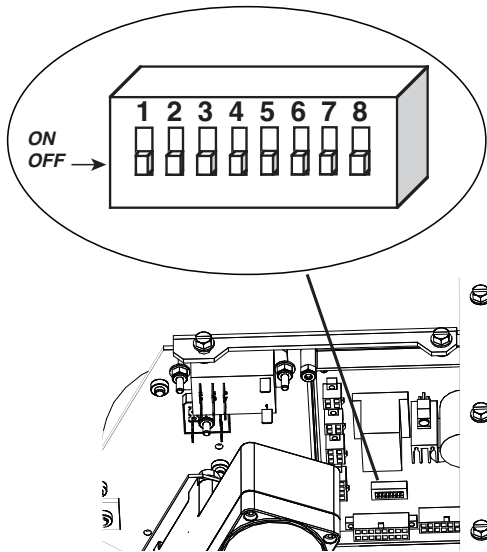
Press the left MSP4 button (YES) to enable limits or the right MSP4 button (NO) to disable limits. Disabling limits does not change any limits values that may have been previously set.

DIP SWITCHES

The DIP switches on the pc boards are set at the factory and do not require adjustment.

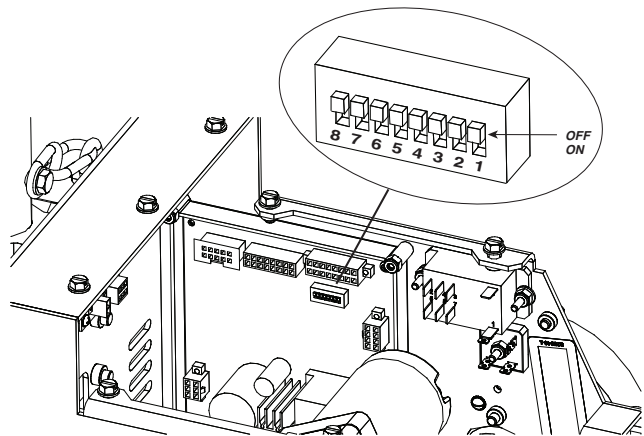
Travel Board DIP Switches

All the DIP switches are in the OFF position.



Wire Drive Board DIP Switches

All the DIP switches are in the OFF position.



SET-UP FEATURES MENU

The Setup Menu gives access to the set-up configuration. Stored in the set-up configuration are user parameters that generally need to be set only at installation. The parameters are grouped as follows:

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

To access the set-up menu, press the right and left buttons of the MSP4 panel simultaneously. Note that the set-up menu cannot be accessed if the system is welding, or if there is a fault (The status LED is not solid green).

Change the value of the blinking parameter by rotating the SET knob.

To exit the set-up menu at any time, press the right and left buttons of the MSP4 panel simultaneously. Alternately, 1 minute of inactivity will also exit the set-up menu.

PARAMETER	DEFINITION
P.0	Press the left button to exit the set-up menu.
P.1	WFS units Metric = m/min wire feed speed units English = in/min wire feed speed units (default)
P.2	Arc Display Mode Amps = The left display shows Amperage while welding. (default) WFS = The left display shows Wire Feed Speed while welding.
P.3	Display Options This setup parameter was previously named "Display Energy" If the previous software revision had this parameter set to display energy, that selection will remain. This option selects the information displayed on the alphanumeric displays while welding. Not all P.3 selections will be available on all machines. In order for each selection to be included in the list, the power source must support that feature. A software update of the power source may be needed to include the features. Standard Display = The lower displays will continue to show preset information during and after a weld (default). Show Energy = Energy is displayed, along with time in HH:MM:SS format. Show Weld Score = The accumulative weld score result is shown.
P.12	Travel Options This menu is used to change the travel options for a travel carriage, including wheel size and starting and ending functions. Press the right MSP4 button to enter the Travel Options menu and rotate the encoder to select either wheel size, starting or ending options. Press the right MSP4 button to select the option. Press the left MSP4 button to set the value and exit. Rotate the encoder to select other options, or press the left MSP4 button to exit the menu. Travel Start Options Start Button = Travel begins with the start button (default) Arc Strike = Travel begins with arc strike. Travel End Options Stop Button = Travel ends with the stop button. (default) Arc Out = Travel ends when the arc extinguishes. Wheel Size default value = 6.0" wheel size for track welding = 5.65" range = 3.0" to 12.0"

PARAMETER	DEFINITION
P.14	<p>Reset Consumable Weight This parameter only appears with systems using Production Monitoring. Use this parameter to reset the initial weight of the consumable package.</p>
P.15	<p>Cold-Inch Touch Sense Option Enabled = touch sense is active when inching wire forward. Disabled = touch sense is inactive when inching wire forward. (default)</p>
P.18	<p>Wire Drive Gear Ratio. Set this parameter to match the gear ratio of the wire drive. 142:1 (default) 95:1 57:1</p>
P.19	<p>Wire Drive Direction The feed plate of the wire drive is reversible and the wire straightener and the nozzle assembly may be swapped. The feed plate can feed from A (inlet) to B (outlet); or B (inlet) to A (outlet). Set this parameter to match the “Forward” direction of wire feeding. A → B (Default) B → A</p>
P.21	<p>Shutdown 2 Function Select This option allows selection of the Shutdown 2 input function on the control box. Normal Shutdown = The Shutdown 2 input functions as a standard shutdown input that locks out all input buttons (default) Output Disable = The Shutdown 2 input functions as a machine output lockout to disable the welding circuit but still allow cold feeding of the wire.</p>
P.23	<p>Trigger Fan-Out For Sub-Arc Lead Arc machines only. Allows the Lead Arc User Interface to control all machine triggers in a multi-arc system. No = Only the machine connected to the User Interface can be triggered on and off (default). Yes = All machines in the system can be triggered on and off simultaneously.</p>
P.80	<p>Sense from Studs. Use this parameter for diagnostic purposes only. When power is cycled, P.80 is automatically reset to False. False = Sensing for the electrode (67) and work (21) is determined by the DIP switches of the system. True = Sensing for the electrode (67) and work (21) is measured at the studs of the power source and the DIP switch settings are overridden.</p>
P.99	<p>Show Test Modes Many weld tables include special modes for testing and servicing the welding system. Set this parameter to YES to show all test modes. When the power source is turned off, the Show Test Modes parameter automatically reverts back to “NO”.</p>

PARAMETER	DEFINITION
P.100	<p>View Diagnostics Diagnostics are only used for servicing the Power Wave system. Yes = Shows P.101 through P.500 in the SETUP menu. No = Only P.0 through P.100 are shown in the SETUP menu.</p>
P.101	<p>Event Logs Press the right MSP4 button to view the Event Logs. Rotate the encoder to select the object to read and then press the right MSP4 button. Various software information will appear about key system events. Press the left MSP4 button to exit.</p>
P.102	<p>Fatal Logs Press the right MSP4 button to view the Fatal Logs. Rotate the encoder to select the module to read and then press the right MSP4 button. Various software information will appear about critical module actions. Press the left MSP4 button to exit.</p>
P.103	<p>Software Version Press the right MSP4 button to view the software loaded into each module (p.c. board). Rotate the encoder to select the module to read and then press the right MSP4 button. The panel will display the main software version loaded into the module. Press the left MSP4 button to exit.</p>
P.104	<p>Hardware Version Press the right MSP4 button to view the hardware version of each module (p.c. board). Rotate the encoder to select the module to read and then press the right MSP4 button. The panel will display the main hardware version loaded into the module. Press the left MSP4 button to exit.</p>
P.105	<p>Welding Software Press the right MSP4 button to view the welding software version inside the power source. Press the left MSP4 button to exit.</p>
P.106	<p>Ethernet IP Address Press the right MSP4 button to view the IP address of the Ethernet board. If no Ethernet Board is installed, the display shows “No Enet Found.” Press the left MSP4 button to exit.</p>
P.107	<p>Power Source Press the right MSP4 button to view the type of power source connected to the control box. Press the left MSP4 button to exit.</p>
P.500	<p>Parameters that are P.500 and higher are only accessible with Weld Manager. See Weld Manager documentation for details.</p>

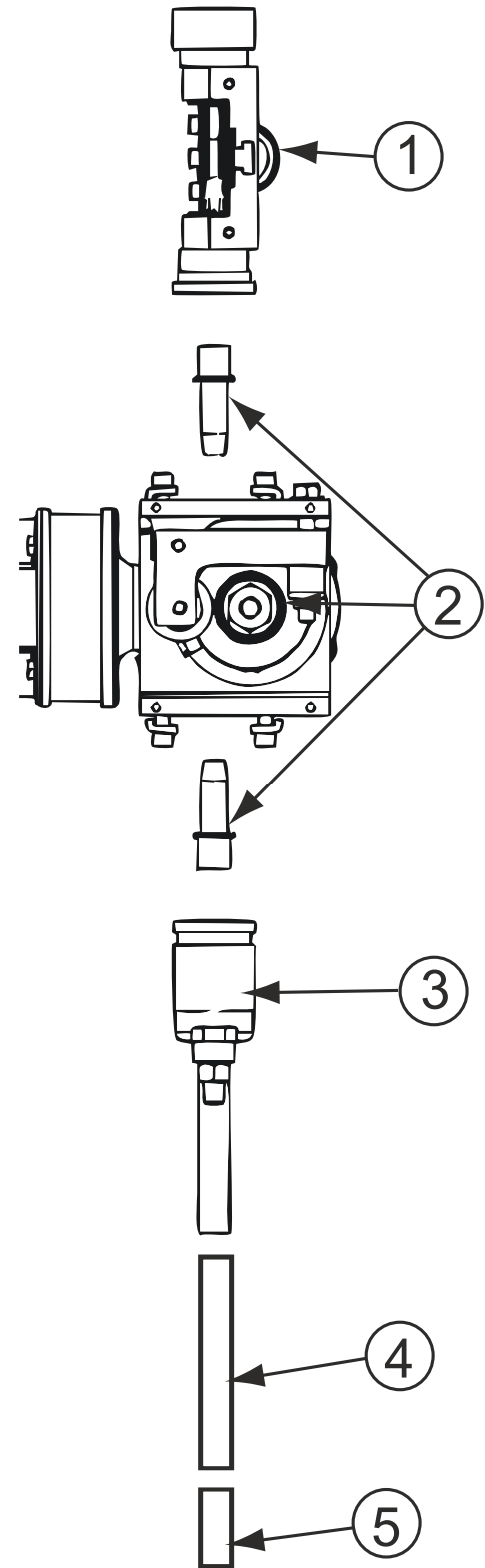
OPTIONAL KITS AND ACCESSORIES

DRIVE ROLL AND GUIDE TUBE KITS

ITEM	K#	DESCRIPTION
1	K1733-5	Wire Straightener
2	KP1899-1	Drive Roll/ Guide Tube Kit, 3/32-7/32
	KP1899-2	Drive Roll/ Guide Tube Kit, 1/16, 5/64, 3/32
	KP1899-3	Drive Roll/ Guide Tube Kit, 035, 045, 052
	KP1899-4	Drive Roll/ Guide Tube Kit, 045, 052 cored
3	K231-5/64	Contact Nozzle Assembly, 5/64 (2.0mm)
	K231-3/32	Contact Nozzle Assembly, 3/32 (2.4mm)
	K231-1/8	Contact Nozzle Assembly, 1/8 (3.2mm)
	K231-5/32	Contact Nozzle Assembly, 5/32 (4.0mm)
	K231-3/16	Contact Nozzle Assembly, 3/16 (4.8mm)
	K231-7/32	Contact Nozzle Assembly, 7/32 (5.6mm)
4	KP2721-1	Nozzle Extension, 5"
	KP2721-2	Nozzle Extension, 45° Curved
	T12929	Flux Hose Clamp
	T11807	Nozzle Extension Insulator
5	KP1962-3B1	Contact Tip, 3/32
	KP1962-1B1	Contact Tip, 1/8
	KP1962-4B1	Contact Tip, 5/32
	KP1962-2B1	Contact Tip, 3/16
	KP1962-5B1	Contact Tip, 7/32
	K148A or K148B	Positive Contact Nozzle Assembly
	K285	Concentric Flux Cone Assembly to use with K148A or K148B

K231 nozzles are rated up to 600 Amps

K148 nozzles are rated up to 1000 Amps



K3090-1	Tube and clamp kit	Includes: one 30" aluminum splined tube; one 15" aluminum splined tube; one 30" steel tube; 8 clamp assemblies with keys; 2 outrigger assemblies; hardware.	
K3089-1	Cross Slide Assembly	Includes: two slides with 4 inches of travel. (1 cross slide assembly included with each tractor.)	
K1733-5	Wire Straightener	Includes: A three roll wire straightener with adjustable pressure. (1 included with each tractor)	
K396	Track Section	Includes: a single section of 70 in (1.8m) of track.	
K3070-1	Tiny Twin Kit for the tractor	Includes: 2 nd spindle, drive rolls, 57:1 gears.	
K1543-xx	ArcLink Control Cable	Includes: 5 pin to 5 pin tractor to power source control cable. Cables may be connected end-to-end to make a longer cable. Connectors are black anodized aluminum.	
K2683-xx	ArcLink Control Cable, Heavy Duty	Includes: 5 pin to 5 pin tractor to power source control cable. Cables may be connected end-to-end to make a longer cable. Female connector is a brass spin nut. Male connector is made from stainless.	
K1504-1	60 lb Coil Adapter	Includes: one coil adapter for use with 2" spindles.	

Accessories Included with the CRUISER™:

- Conduit Tubing, 5 feet (1.5 m)
- 5/32" 600 Amp contact nozzle assembly
- 5/32" contact tip
- Nozzle extension, 5 inches long (127 mm)
- Nozzle extension insulator
- Nozzle extension, 45° Curved
- Flux tubing
- Flux Hose Clamps
- Wire Reel Assembly
- Wheels for track operation
- Manually guide steering wheel (LT-7 like)
- Front and Rear outriggers
- Wire Reel Enclosure

Does not include a control cable.

ROUTINE MAINTENANCE

Blow out the slides

PERIODIC MAINTENANCE

Check wire drive motor brushes

Lube gearbox for wire drive

HOW TO USE TROUBLESHOOTING GUIDE

WARNING

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).

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

Step 2. POSSIBLE CAUSE.

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

Step 3. RECOMMENDED COURSE OF ACTION

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

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

CAUTION

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

Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
A wire drive motor overload occurs. (Error 81)	<ol style="list-style-type: none"> 1. Examine the contact tip for wear and proper size. Replace as necessary. 2. Verify the correct drive rolls and inner wire guide are installed in the wire drive. 3. Do not use more idle roll pressure than necessary. Check for proper setting. 4. Verify that the wire pulls easily through the take-off arm bushing and conduit. 5. Check that the wire straightener is not exerting excessive load on the wire. 6. If using 57:1 gear ratio, switch to 95:1 or 142:1 7. If using 95:1 gear ratio, switch to 142:1. 	<p>If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.</p>
A travel motor overload occurs. (Error 81)	<ol style="list-style-type: none"> 1. Verify the Cruiser rolls freely when the clutch is disengaged. 2. Check for excessive loads caused by dragging long cables. 3. When using the outriggers to steer the Cruiser, set the offset between the front and rear outriggers at 0.5" (12.7mm). 4. Verify the front wheels are perfectly straight. 	
Error 215	<ol style="list-style-type: none"> 1. Check that all of the DIP switches on the travel drive board and the wire drive board are in the OFF position. 	
Frequency and Balance do not appear on the display.	<ol style="list-style-type: none"> 1. Verify a AC square wave weld mode has been selected. 	
The wire feeder does not feed wire and the drive rolls do not spin.	<ol style="list-style-type: none"> 1. Verify the power source is turned on. 2. Verify the circuit breaker for the wire feeder power (on the power source) has not tripped. 3. Verify power is being supplied to the wire feeder. 4. Check that any equipment connected to the external shut-off inputs has not faulted. 	

⚠ CAUTION

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

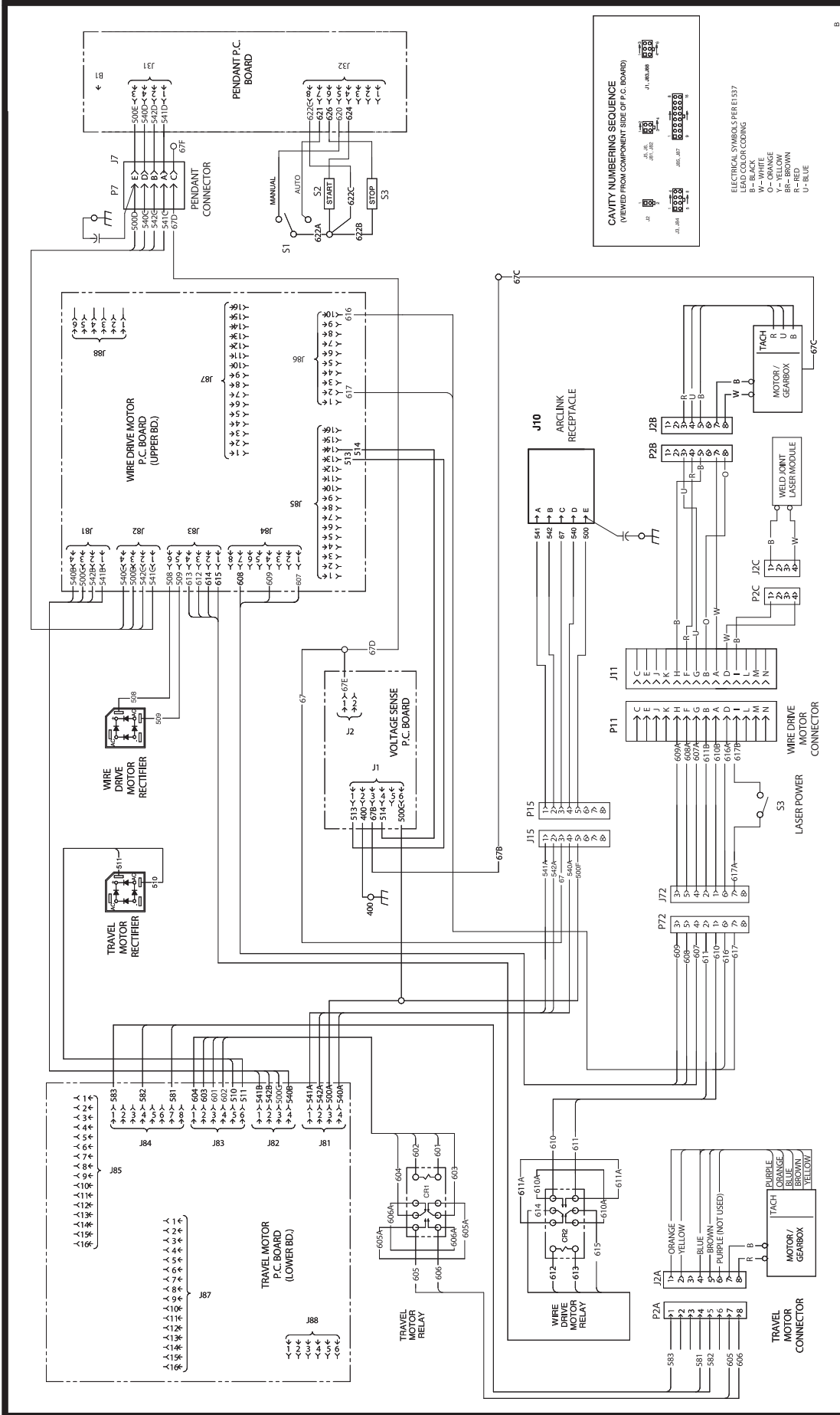
Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENTS(S)	RECOMMENDED COURSE OF ACTION
The wire drive feeds wire in the wrong direction.	1. Change P19 wire feed direction parameter in the Set-Up menu.	If all recommended possible areas of misadjustment have been checked and the problem persists, Contact your local Lincoln Authorized Field Service Facility.
The wire drive speed is incorrect.	1. Verify the gear ratio of the wire drive and P18 match.	
When the welding arc is activated, the drive rolls spin but no arc is present.	1. Check all electrode and work connections.	
The Cruiser welds for a short period, then the arc goes out, the wire stops, travel continues, and no error codes are displayed on the pendant.	1. Check for loose or damaged work and electrode sense leads.	
The arc goes to full output.	1. Verify work sense lead is making a good connection and there is no damage to the lead. 2. Check the electrode sense lead at the Cruiser and make sure it is a good connection.	

⚠ 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.

WIRING DIAGRAM - DIGITAL CRUISER



G5905-1

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

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

			
<ul style="list-style-type: none"> ● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone. 	<ul style="list-style-type: none"> ● Turn power off before servicing. 	<ul style="list-style-type: none"> ● Do not operate with panel open or guards off. 	WARNING
<ul style="list-style-type: none"> ● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases. 	<ul style="list-style-type: none"> ● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio. 	<ul style="list-style-type: none"> ● No operar con panel abierto o guardas quitadas. 	Spanish AVISO DE PRECAUCION
<ul style="list-style-type: none"> ● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail. 	<ul style="list-style-type: none"> ● Débranchez le courant avant l'entretien. 	<ul style="list-style-type: none"> ● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés. 	French ATTENTION
<ul style="list-style-type: none"> ● Vermeiden Sie das Einatmen von Schweißrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes! 	<ul style="list-style-type: none"> ● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!) 	<ul style="list-style-type: none"> ● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen! 	German WARNUNG
<ul style="list-style-type: none"> ● Mantenha seu rosto da fumaça. ● Use ventilação e exaustão para remover fumo da zona respiratória. 	<ul style="list-style-type: none"> ● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas. 	<ul style="list-style-type: none"> ● Mantenha-se afastado das partes moventes. ● Não opere com os painéis abertos ou guardas removidas. 	Portuguese ATENÇÃO
<ul style="list-style-type: none"> ● 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。 	<ul style="list-style-type: none"> ● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。 	<ul style="list-style-type: none"> ● 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
<ul style="list-style-type: none"> ● 頭部遠離煙霧。 ● 在呼吸區使用通風或排風器除煙。 	<ul style="list-style-type: none"> ● 維修前切斷電源。 	<ul style="list-style-type: none"> ● 儀表板打開或沒有安全罩時不準作業。 	Chinese 警告
<ul style="list-style-type: none"> ● 얼굴로부터 용접가스를 멀리하십시오. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시오. 	<ul style="list-style-type: none"> ● 보수전에 전원을 차단하십시오. 	<ul style="list-style-type: none"> ● 관널이 열린 상태로 작동치 마십시오. 	Korean 위험
<ul style="list-style-type: none"> ● ابعء رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها. 	<ul style="list-style-type: none"> ● اقطع التيار الكهربائي قبل القيام بأية صيانة. 	<ul style="list-style-type: none"> ● لا تشغل هذا الجهاز إذا 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.

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