

Operator's Manual

VRTEX[®] MOBILE



For use with machines having Code Numbers:

11380 and 11381



Register your machine:

www.lincolnelectric.com/registration

Authorized Service and Distributor Locator:

www.lincolnelectric.com/locator

Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

Need Help? Call 1.888.935.3877

to talk to a Service Representative

Hours of Operation:

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

After hours?

Use "Ask the Experts" at lincolnelectric.com

A Lincoln Service Representative will contact you no later than the following business day.

For Service outside the USA:

Email: globalservice@lincolnelectric.com

THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

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

SAFETY DEPENDS ON YOU

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

WARNING

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

CAUTION

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



KEEP YOUR HEAD OUT OF THE FUMES.

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

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

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

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

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

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



WEAR CORRECT EYE, EAR & BODY PROTECTION

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

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

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

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

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



SPECIAL SITUATIONS

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

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

Additional precautionary measures

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

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

REMOVE all potential fire hazards from welding area.

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



SECTION A: WARNINGS



CALIFORNIA PROPOSITION 65 WARNINGS



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.



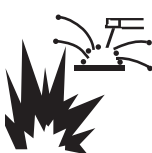
FUMES AND GASES CAN BE DANGEROUS.



- 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.



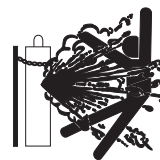
WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



- 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.

SAFETY PRECAUTIONS

Before using the FMD please read carefully these safety instructions.

Read this handbook and use the FMD device in strict accordance in order to prevent any damage to your eye, other injury, loss of visual functions, property damage or death.

We strongly advise you to get familiar with the FMD device and its capabilities before you use it for the first time.



WARNING

Misuse or overuse of this product may injure your eye or affect visual function.

Overexposure to video and flashing light may cause or aggravate the following health effects to light-sensitive users:

- Eye disease and/or injury, Glaucoma.
- Epileptic and other Seizures.
- Heart disease or high blood pressure.

Consult your physician before using the FMD if you have been diagnosed with or are susceptible to any of the above health effects.

Some users may experience a seizure when exposed to certain visual images, including flashing lights or patterns. Even people who have no history of seizures or epilepsy may have an undiagnosed condition that can cause "photosensitive epileptic seizures."

Seizures may cause loss of consciousness or convulsions that can lead to injury from falling down or striking nearby objects.

Do not use the FMD when you are drowsy or fatigued.

Immediately, stop using the FMD and consult your physician if you experience any of the following symptoms:

- Double vision or Inability to focus on the display.
- Nausea or motion sickness.
- Eye fatigue or irritation.
- Headaches or dizziness.
- Aches and pain in the neck or shoulders.



Electric Shock can kill:

- Do not use or store the FMD when wet or in wet areas.
- Do not wrap the cable around your neck, body or arms.
- Turn the power switch off and unplug the FMD when it will not be used.

General Safety Precautions:

Adjust the headband so the FMD helmet is secure and will not fall off in use. Do not use the FMD if temperature is below 0°C/32°F or above 40°C/104°F or in wet, humid, dusty or smoky areas.















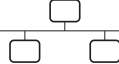
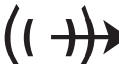
Avoid dropping or impact of the FMD frame and displays. If the FMD is damaged contact your retailer. There are no user serviceable parts. Only qualified service personnel should perform any repair on this product.

TABLE OF CONTENTS

Page

Installation.....	Section A
Graphic Symbols.....	A-1
Technical Specifications.....	A-2
Safety Precautions.....	A-3
Select Suitable Location.....	A-3
Environmental Area.....	A-3
Stacking, Tilting, Lifting, Safety Precautions.....	A-3, A-4
High Frequency Interference Protection.....	A-4
General Description.....	A-4
Hardware Uncrating.....	A-5
Hardware Overview.....	A-6
Installation.....	A-7/A-8
Right Side Component Compartment Diagram.....	A-9
Left Side Component Compartment Diagram.....	A-10
Helmet.....	A-11
Breakdown Procedure.....	A-12
Crating Procedure.....	A-13
Operation (Instructor Mode).....	Section B
User Interface Overview.....	B-1
Instructor Mode.....	B-2
To Enter Instructor Mode.....	B-2
Options.....	B-3
Update.....	B-3
Configuration File.....	B-3
Weldometer.....	B-4
Tolerance Editor.....	B-5 - B10
Operation (User Mode).....	Section B
User Interface Overview.....	B-11
To Enter The User Screen.....	B-12
Joint Configuration Selection Screen.....	B-14
Process Selection Screen.....	B-14
Stand Set-Up Screen.....	B-15
Environment Screen.....	B-15
Gas Set-Up Screen, Weld Machine Settings Screen.....	B-16
Virtual Welding Overview.....	B-17
Visual Cues.....	B-18
New Coupon.....	B-19
Live Action Student Evaluation Report (LASER) Screen.....	B-19
Technique Parameters.....	B-20
Pass Number.....	B-21
Travel Direction.....	B-21
Bead Render, Discontinuity Indicator.....	B-21
End Pass.....	B-22
Score, Student Report.....	B-22
Default Weld Process Settings.....	B-23
Accessories.....	Section C
VR SMAW Adapter Kit, Arm Rest.....	C-1
Maintenance.....	Section D
Cleaning & Maintenance.....	D-1
FMD.....	D-1
Monitor.....	D-1
Troubleshooting.....	Section E
How to use Troubleshooting Guide.....	E-1
Troubleshooting Guide.....	E-2 - E-4
Diagrams.....	Section F
Parts.....	P-713

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL

	INPUT POWER	U_1	INPUT VOLTAGE
	ON	I_1	INPUT CURRENT
	OFF		PROTECTIVE GROUND
	INPUT POWER		WARNING or CAUTION Documentation must be consulted in all cases where this symbol is displayed.
$1 \sim$	SINGLE PHASE ALTERNATING CURRENT		Explosion
	READ THIS OPERATORS MANUAL COMPLETELY		Dangerous Voltage
	USB		Shock Hazard
A	WFS/AMPS		Shock Hazard
V	VOLTS		Fuse
	VGA OUTPUT		
	ETHERNET		
	AUDIO OUTPUT		

TECHNICAL SPECIFICATIONS - VRTEX® MOBILE VIRTUAL REALITY WELDING TRAINER

INPUT			
MODEL	DESCRIPTION	INPUT VOLTAGE ± 10%	INPUT CURRENT (MAX.)
K3165-1	Standard Frequency	115/230 VAC (50/60 HZ)	4/2A Single Phase
K3165-2	Alternate Frequency	115/230 VAC (50/60 HZ)	4/2A Single Phase

WARNING

THIS PRODUCT INCORPORATES A PROTECTIVE EARTH CIRCUIT IN THE AC POWER CORD. THE AC PLUG SHOULD ONLY BE INSERTED INTO A SOCKET OUTLET PROVIDED WITH A PROTECTIVE EARTH CONTACT.

PHYSICAL DIMENSIONS			
HEIGHT	WIDTH	DEPTH	WEIGHT
32.5 in. 826 mm	19.5 in. 496 mm	38.5 in. 978 mm	125 lbs. 57 kgs.
PHYSICAL DIMENSIONS (CRATE WITH MACHINE)			
HEIGHT	WIDTH	DEPTH	WEIGHT
48.0 in. 1220 mm	24.0 in. 610 mm	48.0 in. 1220 mm	300 lbs. 137 kgs.
TEMPERATURE RANGES			
OPERATING TEMPERATURE RANGE		STORAGE TEMPERATURE RANGE	
59° - 95° F (15° - 35° C)		32° - 149° F (0° - 65° C)	
RELATIVE HUMIDITY*		OPERATING ALTITUDE	
80% For Temperatures Up To 88° F / 31° C 50% @ 104° F / 40° C		6562 Feet (2000 Meters)	
ENVIRONMENT			
This product is for use in Pollution Degree 2 environment.			

*Condensation on lenses may appear in high humidity environment. Run FMD (Face Mounted Display) for approximately 10 minutes to clear up moisture from the lenses.

Read entire installation section before starting installation.

SAFETY PRECAUTIONS

WARNING



ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF and unplug the machine from the receptacle before working on this equipment.

- Always connect the VRTEX® MOBILE to a power supply grounded according to the National Electrical Code and local codes.

SELECT SUITABLE LOCATION

The machine will not operate in harsh environments. It is important that simple preventative measures are followed in order to assure long life and reliable operation. This product is for INDOOR USE ONLY.

- Dirt and dust that can be drawn into the machine should be kept to a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance shutdown.
- Do not locate where monitor is exposed to direct sunlight.
- Do not place equipment near radiant heat sources.
- Do not place in a confined space. Allow a minimum of 3 feet of clearance around machine and stand at all times. Adequate ventilation is necessary.
- The fused power switch on the rear panel is the input power disconnect device. Do not position the equipment so that it is difficult to operate the fused power switch.
- Route and protect power cable to minimize exposure to damage.
- Single or Multi-Outlet surge protector (or Surge Suppressor) is highly recommended to protect the machine from voltage spikes going through the input line.
- An uninterruptible power supply (UPS) may be required for the protection of the system from power irregularities and disruption.

ENVIRONMENTAL AREA

Keep the machine inside and dry at all times. Do not place it on wet ground or in puddles. Never place liquids on top of the machine.

STACKING

The VRTEX® MOBILE cannot be stacked.

TILTING

Place the VRTEX® MOBILE directly on a secure, level surface.

LIFTING

If lifting the VRTEX® MOBILE is required, use two straps, each rated for 500 pounds (226.8 kg) or more. Do not attempt to lift the VRTEX® MOBILE with accessories attached to it.

SAFETY PRECAUTIONS

Do not place objects on the VR Arm or Weld Machine.

Handle the Face Mounted Display (FMD) integrated helmet with care. When not in use, the Helmet should be placed on the helmet hanger. If you will not be using the system for longer than 4 hours, shut down your VRTEX® MOBILE System.

Handle the VR SMAW adapter and VR GMAW/FCAW adapter with care. When not in use, these items should be placed in the foam on the top left side of the VR machine. These adapters are customized and cannot be used on normal welding machines.

Handle the VR Coupons with care. When not in use, store them in the foam on the top left side of the VR machine.

During lightning storms, turn off the system and unplug it from the power outlet.

Before using the FMD please read carefully these safety instructions.

Read this handbook and use the FMD device in strict accordance in order to prevent any damage to your eye, other injury, loss of visual functions, property damage or death.

We strongly advise you to get familiar with the FMD device and its capabilities before you use it for the first time.

WARNING

Misuse or overuse of this product may injure your eye or affect visual function.

Overexposure to video and flashing light may cause or aggravate the following health effects to light-sensitive users:

VRTEX® MOBILE



- Eye disease and/or injury, Glaucoma.
- Epileptic and other Seizures.
- Heart disease or high blood pressure.

Consult your physician before using the FMD if you have been diagnosed with or are susceptible to any of the above health effects.

Some users may experience a seizure when exposed to certain visual images, including flashing lights or patterns. Even people who have no history of seizures or epilepsy may have an undiagnosed condition that can cause "photosensitive epileptic seizures." Seizures may cause loss of consciousness or convulsions that can lead to injury from falling down or striking nearby objects.

Do not use the FMD when you are drowsy or fatigued.

Immediately, stop using the FMD and consult your physician if you experience any of the following symptoms:

- Double vision or Inability to focus on the display.
- Nausea or motion sickness.
- Eye fatigue or irritation.
- Headaches or dizziness.
- Aches and pain in the neck or shoulders.

Electric Shock can kill:

- **Do not use or store the FMD when wet or in wet areas.**
- **Do not wrap the cable around your neck, body or arms.**
- **Turn the power switch off and unplug the FMD when it will not be used.**

General Safety Precautions:

Adjust the headband so the FMD helmet is secure and will not fall off in use. Do not use the FMD if temperature is below 0°C/32°F or above 40°C/104°F or in wet, humid, dusty or smoky areas.

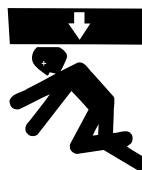
Avoid dropping or impact of the FMD frame and displays. If the FMD is damaged contact your retailer. There are no user serviceable parts. Only qualified service personnel should perform any repair on this product.

ESD SENSITIVITY

This headset eyepiece device may be sensitive to electrostatic discharge of 8 kV or higher. Observe static precautions such as discharging the body by touching the metal chassis of the grounded equipment prior to touching the eyepiece.



⚠ WARNING



FALLING EQUIPMENT can cause injury.

- **Lift only with equipment of adequate lifting capacity.**

- **Be sure machine is stable when lifting.**

- **Do not operate machine while suspended or when lifting.**

HIGH FREQUENCY INTERFERENCE PROTECTION

⚠ CAUTION

USE CAUTION WHEN OPERATING THIS MACHINE AROUND OTHER EQUIPMENT.

- **Large equipment, such as cranes, may interfere with the operation of this machine.**
- **This machine may interfere with the operation of other equipment in work/training area.**
- **High frequency processes, such as TIG machines, may interfere with the operation of this machine.**

SHORE POWER

A conductive-type interference in which an irregular input voltage and/or improper grounding can adversely affect the proper operation of your VRTEX MOBILE when connected to a shore power. As indicated in this manual, electrical interference from the power line, though small, can be present. Input line irregularities and/or improper grounding of any equipment sharing the same input line circuit could potentially affect the system. An uninterruptible power supply (UPS) may be required for the protection of the system from power irregularities and disruption.

RADIO FREQUENCY INTERFERENCE

This system contains a sensitive magnetic positioning sensor that can become disturbed in the presence of conducted RF noise in the 8 to 11 Mhz range on the AC powerline of the system, or on the gray cable leading to the Polhemus sensor. Disturbances can manifest themselves in slight jarring of the virtual environment shown on the LCD display or via the headset eyepiece. (continued)

If interference on the sensor cable is an issue, it should be repositioned such that this jarring stops. In the case of noise on the AC port being an issue, a noise suppressing ferrite bead can be added to the AC power cord which will eliminate the interference. Please contact your Lincoln Electric Support Center for details.

GENERAL DESCRIPTION

The VRTEX® MOBILE is a virtual reality arc welding trainer. This computer based training system is an educational tool designed to allow students to practice their welding technique in a simulated environment. It promotes the efficient transfer of welding skills from the classroom to the welding booth, while reducing material waste and energy consumption associated with traditional welding training.

HARDWARE UNCRATING

Tools Needed

No tools are needed for uncrating and installation of the VRTEX® MOBILE machine.

1. Remove and save wing nuts, bolts and associated washers from both ends of crate.

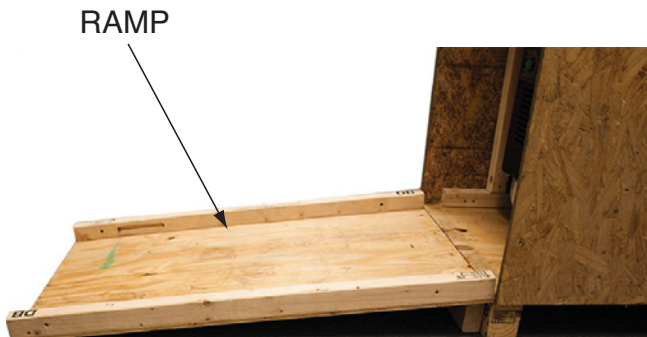
NOTE: Ends of crate are now loose and can be removed.

⚠ CAUTION

Do not damage or discard crate, crate ends, packaging or any associated hardware during this procedure as it will need to be re-used in order to transport the machine in the future.

2. Position the front panel of the crate on the floor so it forms a ramp ideal for safely unloading the VRTEX® MOBILE machine. See Figure A.1.

FIGURE A.1 – RAMP



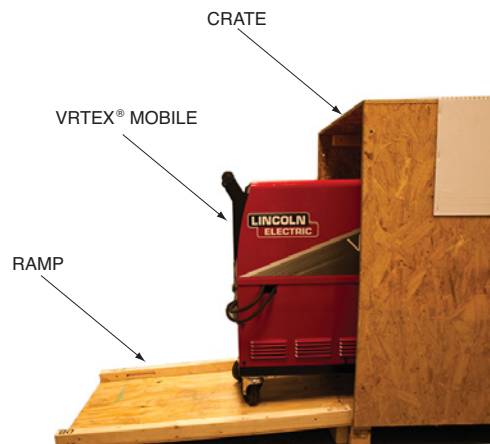
3. Remove and save the two wing nuts, bolts and associated washers securing the padded shipping brace at the inside front of the crate. Note proper positioning of padded shipping brace for future installation. See Figure A.2.

FIGURE A.2 – PADDED SHIPPING BRACE



4. Using the ramp/crate front, carefully remove the machine from the crate. See Figure A.3.

FIGURE A.3 – MACHINE REMOVAL



⚠ WARNING



FALLING EQUIPMENT can cause injury.

- Lift only with equipment of adequate lifting capacity.
- Be sure machine is stable when lifting.
- Do not operate machine while suspended or when lifting.

5. Carefully remove monitor and associated packaging from rear of crate. Save all packaging for crating and storage of the machine.

HARDWARE OVERVIEW

- Virtual Welding Machine, including:
 1. Coupon Riser Stand
 2. Coupon Riser Base
 3. Pins
 4. Unigun Handle
 5. Speakers
 6. Riser Arm Assembly
 7. VR Helmet w/ Face Mounted Display (FMD)
 8. Monitor
 9. VR GMAW/FCAW Gun holder and Helmet hanger
- VR Coupons:
 - Flat Plate (Not Pictured)
 - T-Joint
 - Groove Joint (Not Pictured)

FIGURE A.4 – MACHINE COMPONENTS

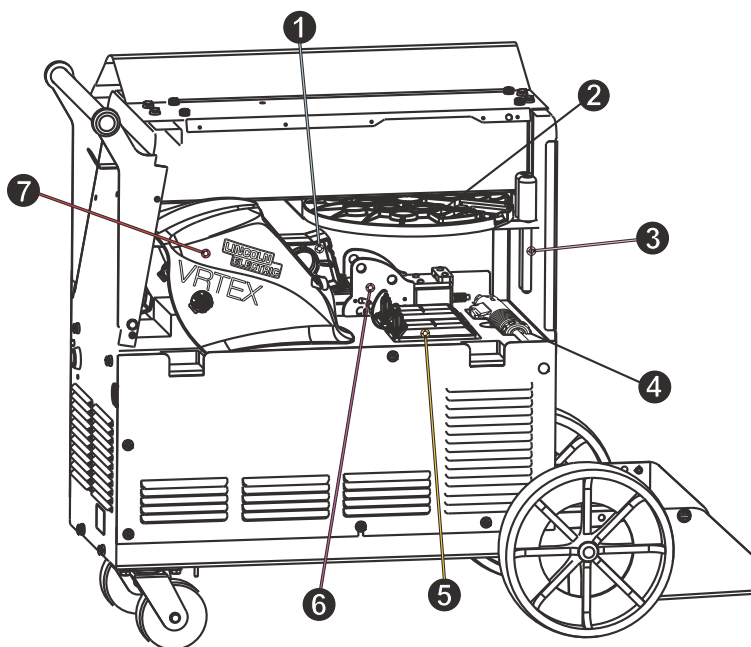
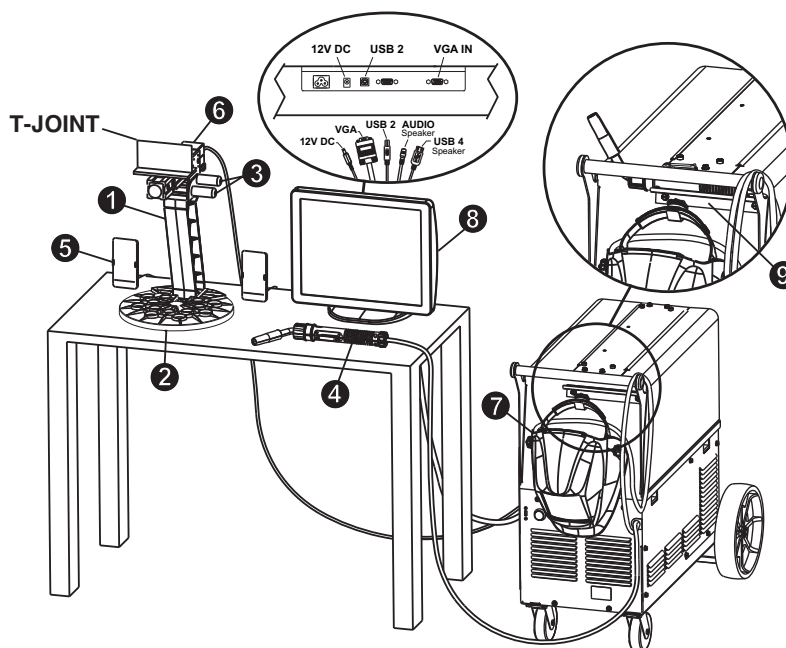


FIGURE A.5 – MACHINE COMPONENTS



VRTEX® MOBILE

LINCOLN
ELECTRIC

INSTALLATION

LOCATION

1. Decide on a location for your unit.

NOTE: The system requires approximately 8' L x 8' D x 8' H (2.4 m L x 2.4 m D x 2.4 m H) of space.

Keep the area free of obstruction for at least 3 feet in all directions of both the stand and VR weld machine. In addition, be conscious of where you are placing the unit to avoid magnetic fields, conductive and high frequency objects and processes.

NOTE: Avoid setting up the VRTEX® MOBILE near high frequency TIG machines and power sources.

Having these types of objects in the area can cause interference and result in increased jitter and/or distortion in the motion tracking.

For best results, do not install VRTEX® MOBILE machine in the welding lab. Electrical interference from power lines, though generally small, can be present. Therefore all electrical power or lighting wiring within 50 feet of the welding area shall be enclosed in grounded rigid metallic conduit. In the event the VRTEX® MOBILE is affected by interference, it is the user's responsibility to take steps to isolate and/or eliminate the interference.

An uninterruptible power supply (UPS) may be required for the protection of the system from power irregularities or disruption.

It is strongly recommended that a single or Multi-Outlet surge protector be used to protect the machine from any unwanted voltages above a safe threshold.

MULTIPLE SYSTEM INSTALLATIONS

If multiple systems are required to operate together in one location, a unique frequency transmitter can be installed during the manufacturing process at Lincoln Electric to reduce potential interference between systems. K3165-1 systems have a standard frequency source installed. K3165-2 systems have an alternate frequency source installed. For multiple system installations, alternate the K3165-1 and K3165-2 systems for best operation:

For Example: If 8 systems are to be installed in the VR welding lab, the standard and alternate frequencies should be positioned as seen below.

K3165-1	K3165-2	K3165-1	K3165-2
K3165-2	K3165-1	K3165-2	K3165-1

MONITOR

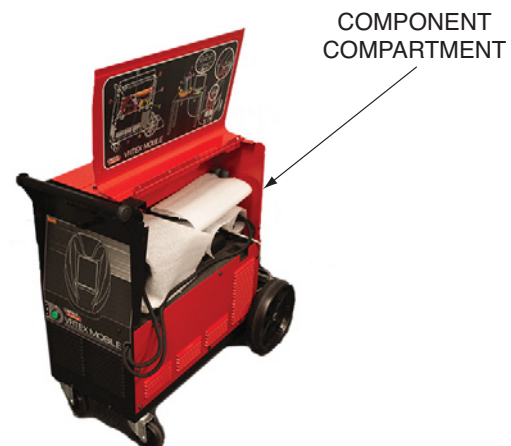
1. Place the monitor on a sturdy, flat and dry surface approximately waist high.
2. Place the machine in a location that is close enough to the monitor so the cables on the case back can reach the coupon stand and the monitor.

⚠ CAUTION

Route the cables so they do not create a tripping hazard.

3. Open the component compartment located on the right side of the machine. See Figure A.6.

FIGURE A.6 – COMPONENT COMPARTMENT



4. Carefully unwrap and remove the helmet (FMD), unigun handle, riser arm assembly, coupon riser stand and base, pins and speakers. See **Right Side Component Compartment Diagram (Figure A.10)**. Save packaging for future use.
5. Hang helmet on front of machine until ready for use.
6. Store unigun assembly in the gun bracket located on the top of case front until ready to use.
7. Locate and unpackage the following cables from the rear of the machine;
 - Riser Arm Cable
 - Audio Visual (A/V) Cable Cluster
 - Machine Input Line Cable
8. Position coupon riser base near, but not less than 18 inches from the monitor. Rubber side down.

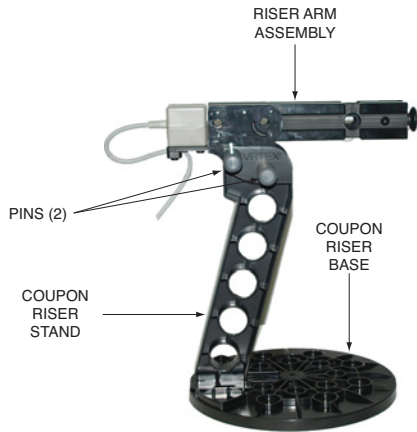
⚠ CAUTION

Position coupon riser stand at least eighteen inches from monitor and any potential source of electrical and magnetic interference.

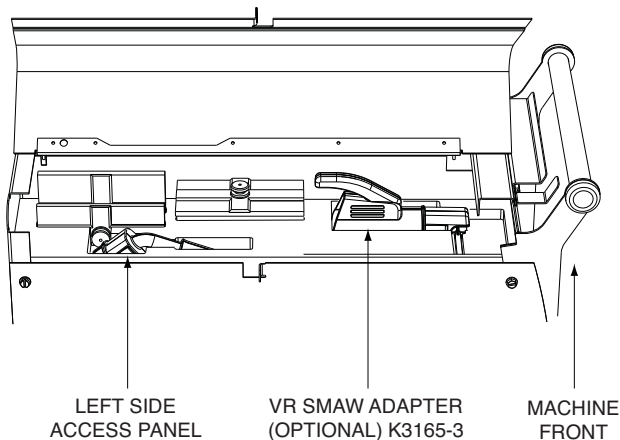
VRTEX® MOBILE



9. Insert the coupon riser stand into coupon riser base until a “click” is heard and/or felt. See Figure A.7.
10. Insert riser arm assembly on to coupon riser stand and secure using two pins. See Figure A.7.

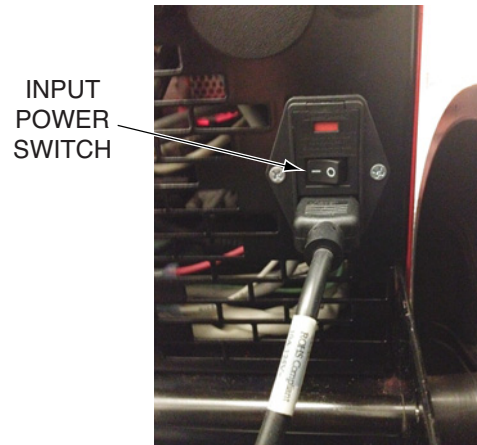
FIGURE A.7 – COUPON RISER BASE AND STAND

11. Locate unigun attachment(s) and weld coupons in the left side component compartment. See Figure A.8.

FIGURE A.8 – UNIGUN, COUPON AND ATTACHMENTS**⚠ CAUTION**

When welding in virtual reality be mindful of your real world surroundings and hazards at all times to avoid injury.

12. Connect USB and audio jack on the audio visual (A/V) cable cluster to the speakers.
13. Connect the remaining cables in the cluster to the monitor.
14. Connect the appropriate power cord at the back of the VRTEX® MOBILE. Only use power cord supplied by Lincoln Electric® Company.
15. Make certain the input power switch on the rear of the machine is in the “on” position. See Figure A.9.

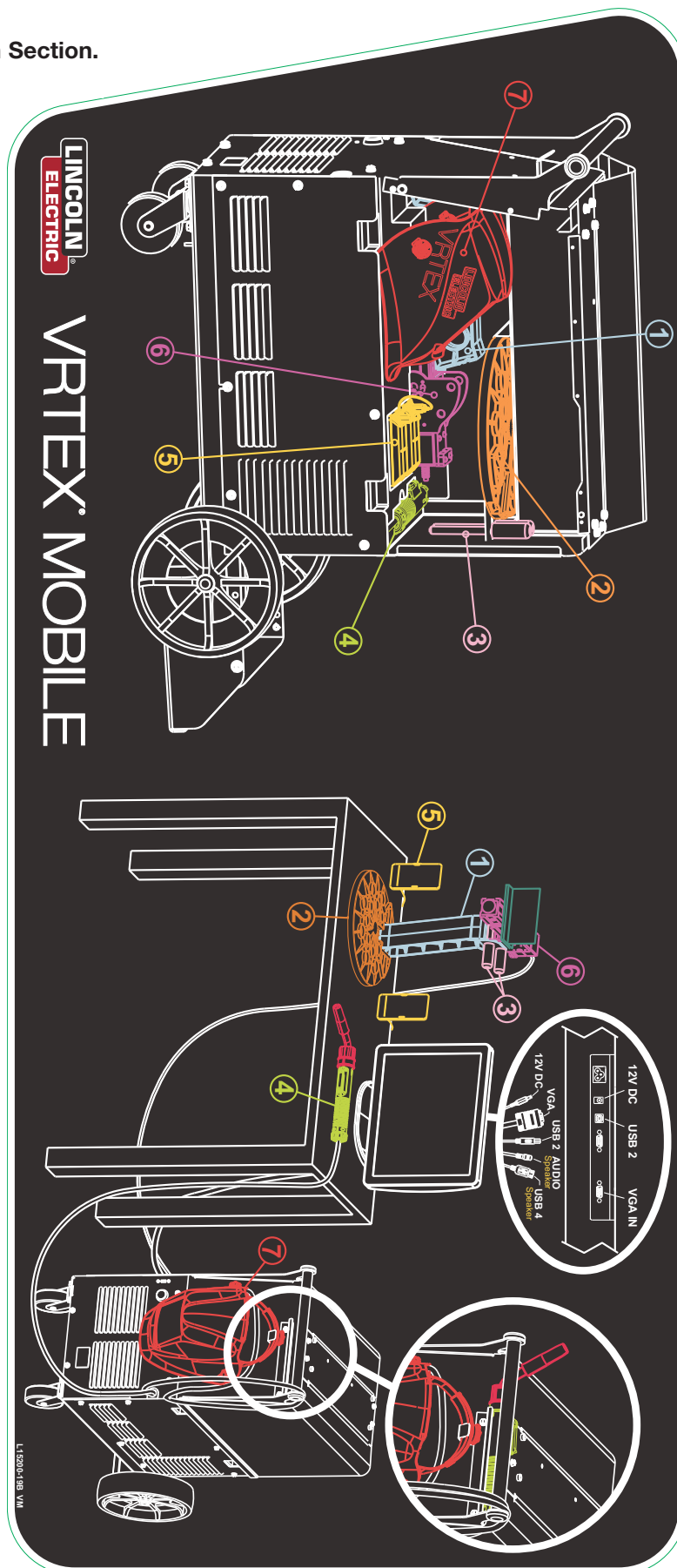
FIGURE A.9 – INPUT POWER SWITCH**⚠ WARNING**

ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF and unplug the machine from the receptacle before working on this equipment.
- Always connect the VRTEX® MOBILE to a power supply grounded according to the National Electrical Code and local codes.

FIGURE A.10 – RIGHT SIDE COMPONENT COMPARTMENT DIAGRAM

For Component number items description:
See **Hardware Overview** in this **Installation** Section.



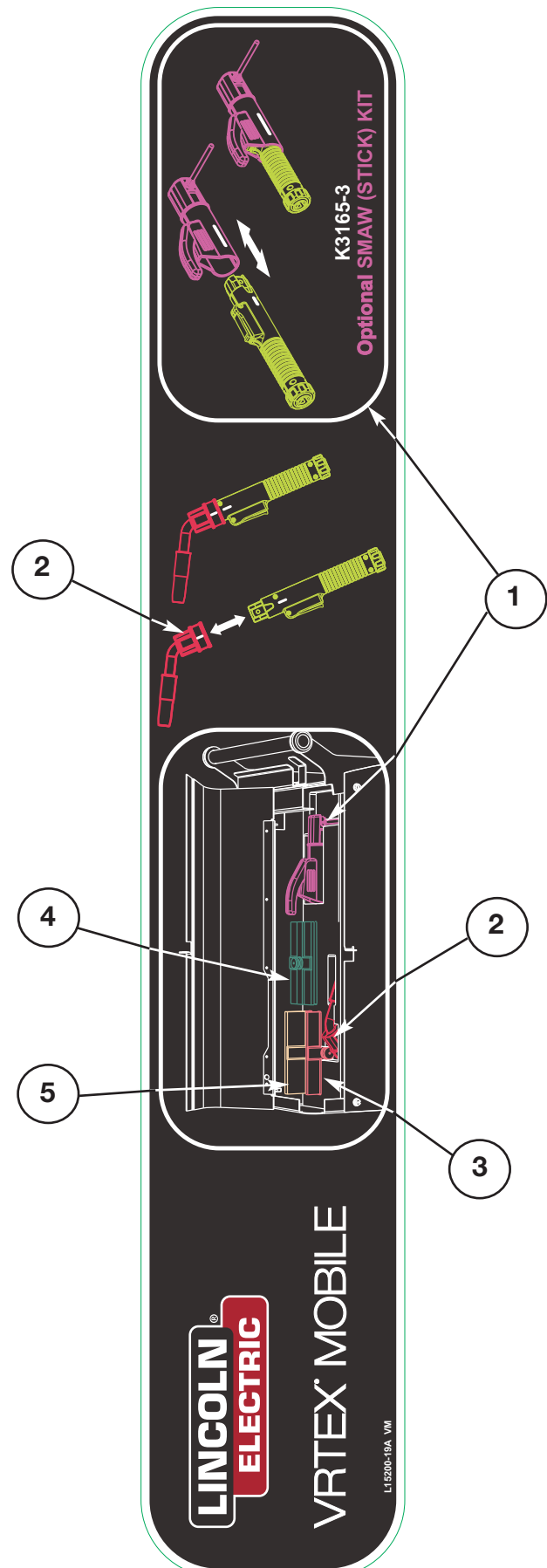
VRTEX® MOBILE

LINCOLN
ELECTRIC

FIGURE A.11 – LEFT SIDE COMPONENT COMPARTMENT DIAGRAM

COMPONENT ITEMS

1. Optional SMAW (Stick) Kit.
2. GMAW Adapter
3. Flat Coupon
4. T Coupon
5. V-Groove Coupon



HELMET

HEAD SIZE ADJUSTMENT: HEADGEAR TIGHTNESS is adjusted by pushing in the Ratchet Knob and turning to adjust for the desired head size. This knob is located at the back of the helmet. **HEADGEAR CROWN ADJUSTMENT** is made by adjusting for comfort and snapping the pin into the hole to lock securely in place.

TILT: Tilt adjustment is located on right side of helmet. Loosen the right headgear tension knob and push the top end of the adjustment lever outward until the lever's Stop Tab clears the notches. Then rotate the lever forward or back to the desired tilt position. The Stop will automatically engage again when released locking the helmet into position.

FORE / AFT ADJUSTMENT: Adjusts the distance between the user's face and lens. Fore/Aft adjustment has been pre-set at the factory. To adjust, loosen the outside tension knobs and slide forward or back to desired position and retighten. **NOTE:** Make sure both sides are equally positioned for proper operation.

HELMET LENSES*

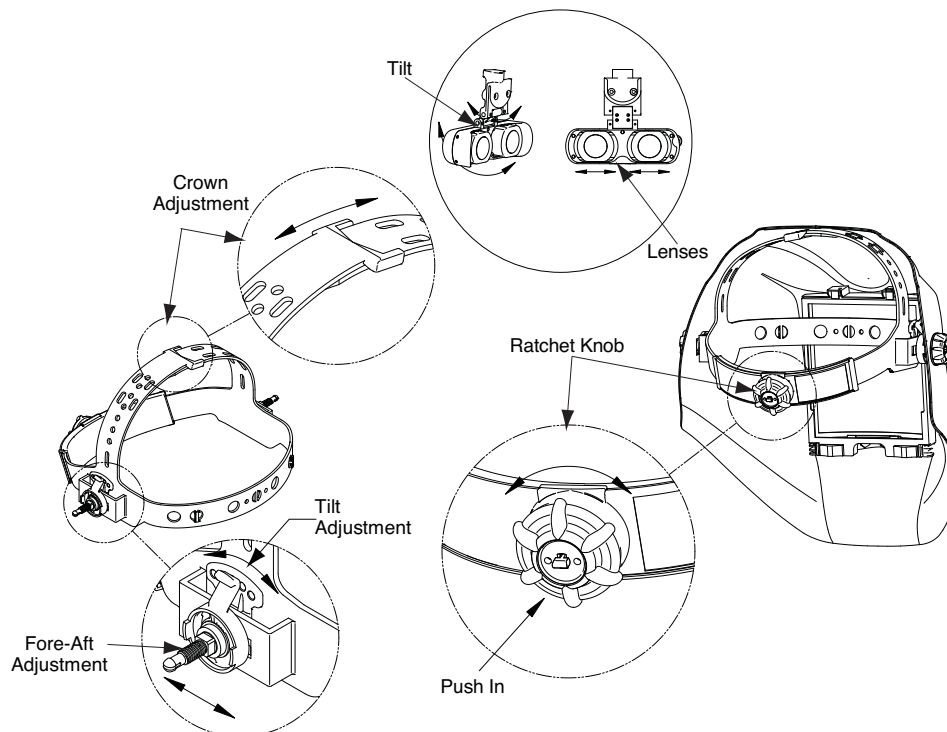
The helmet has an FMD (Face Mounted Display) on the inside. These FMD lenses display the virtual environment to the user. Each lens can be shifted left or right to align with the users eyes by applying gentle pressure. In addition, the lenses can be lifted up and down as well as shifted forward and back for the best fit. The user should make sure the lenses are parallel to their eyes. Keep the lenses clean at all times. See Cleaning and Maintenance **Section D**.

FIGURE A.13 – HELMET LENSES



NOTE: *Condensation on lenses may appear in high humidity environment. Run FMD for approximately 10 minutes to clear up moisture from the lenses.

FIGURE A.12 – HELMET ADJUSTMENTS



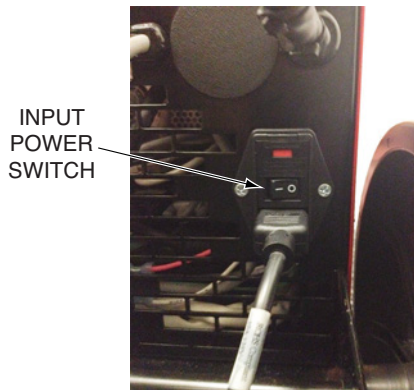
VRTEX® MOBILE

LINCOLN
ELECTRIC

BREAKDOWN PROCEDURE

1. Make certain the input power switch on the rear of the machine is on the "Off" position. See Figure A.14.

FIGURE A.14 – INPUT POWER SWITCH



⚠ WARNING



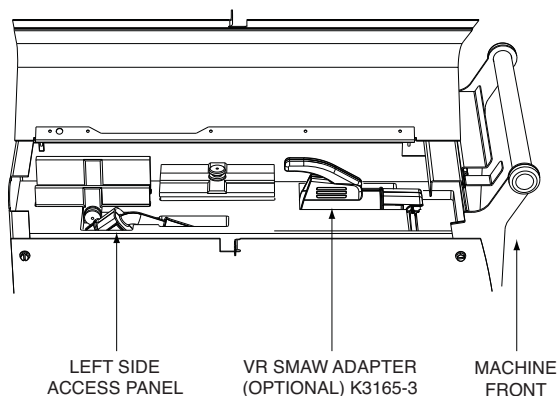
ELECTRIC SHOCK can kill.

- Only qualified personnel should perform this installation.
- Turn the input power OFF and unplug the machine from the receptacle before working on this equipment.

- Always connect the VRTEX® MOBILE to a power supply grounded according to the National Electrical Code and local codes.

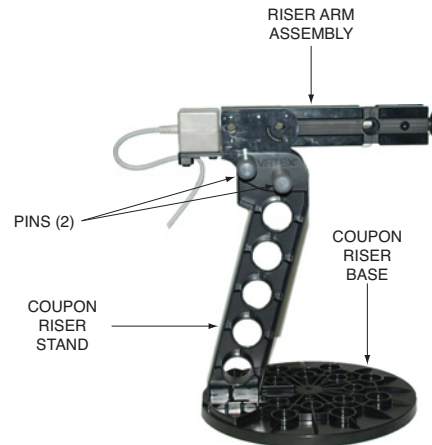
2. Disconnect the input power cord from the back of the machine.
3. Disconnect the remaining cables in the cluster from the monitor.
4. Disconnect USB and audio jack on the audio visual (A/V) cable cluster from the speakers.
5. Secure the unigun attachment(s) and weld coupons into the left side access panel. See Figure A.15.

FIGURE A.15 – UNIGUN, COUPON AND ATTACHMENTS



6. Remove riser arm assembly from the coupon riser stand by removing the two pins securing the two pieces together. See Figure A.16.
7. Remove the coupon riser stand from the coupon riser base by pressing down on the release tab located on the base and sliding off the stand. See Figure A.16. Coupon riser stand and base can now be set aside for repackaging.

FIGURE A.16 – COUPON RISER STAND AND BASE



8. Disconnect and repackage the following cables from the rear of the machine:
 - Riser Arm Cable
 - Audio Visual (A/V) Cable Cluster
 - Machine Input Line Cable
9. Carefully place components into the component compartment on the right side of the machine. See **Right Side Component Compartment Diagram (Figure A.10)**.

⚠ CAUTION

NOTE: Original packing materials, such as foam and plastic bag, are recommended if machine is to be relocated.

⚠ CAUTION

Do **NOT** ship monitor without its packaging foam.

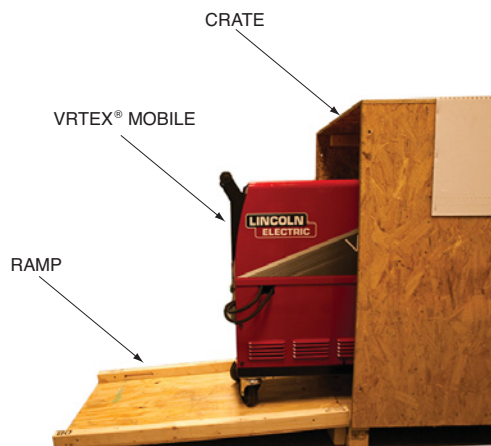
VRTEX® MOBILE



CRATING PROCEDURE

1. Using original packaging, carefully place monitor and associated packaging into the rear of crate.
2. Using the ramp/crate front, carefully position the VRTEX® MOBILE into the crate. See Figure A.17.

FIGURE A.17 – MACHINE CRATING



3. Using the two wing nuts and associated washers, secure the padded shipping brace in its original position at the inside front of the crate. See Figure A.18.

FIGURE A.18 – PADDED SHIPPING BRACE



4. Using the wing nuts, bolts and associated washers previously removed, secure the end panels of the crate into position.

FIGURE A.19 – VRTEX® MOBILE CRATE



USER INTERFACE OVERVIEW

The VRTEX® MOBILE is a virtual reality arc welding trainer. This computer based training system is an educational tool designed to allow students to practice their welding technique in a simulated environment. It promotes the efficient transfer of welding skills from the classroom to the welding booth, while reducing material waste and energy consumption associated with traditional welding training.

POWERING ON

1. Pressing and holding the **green circular button**, on the front of the machine, for 5 seconds powers up the VRTEX® MOBILE system. See Figure B.1.

NOTE: The green power button does not power down the system. Select Log Out and Shutdown from the red menu icon to turn off the system.

FIGURE B.1 – GREEN POWER BUTTON



2. The **monitor** allows the student to view the setup screens which provide an active view of the actual welding process for instructors and students. The monitor can be rotated for ease of viewing. Make certain the power button on the monitor is ON. See Figure B.2.

FIGURE B.2 – MONITOR POWER BUTTON



VRTEX® MOBILE



The following user controls (icons) may be displayed on the monitor screen.

1. The **wire feed speed/amperage dial icon** allows the user to input wire feed speed or amperage depending on the VR welding process selected.
2. The **voltage dial icon** allows the user to input the welding voltage. This dial also allows input of trim values when pulse process is in use.
3. The left and right **white screen select arrow icons** allow the operator to cycle through various screens.
4. The **process selector switch icon** is used to select the virtual welding process (GMAW, FCAW, or SMAW (optional)).
5. The **polarity selector switch icon** is used to indicate the welding polarity for any given process (DC+, DC-, or AC).
6. The **USB port** located at the front of the machine is used to upload software and download user data from the system.
7. The **key switch icon** is located on the monitor screen and allows the instructor to access the instructor mode which includes the Weldometer®, Tolerance Editor, Options and Update screens.
8. The **high lighted icons, white arrows and multi-colored icons** perform various functions depending upon the command shown.
9. Selecting **Back** takes the user to the previous screen.

END USER LICENSE AGREEMENT

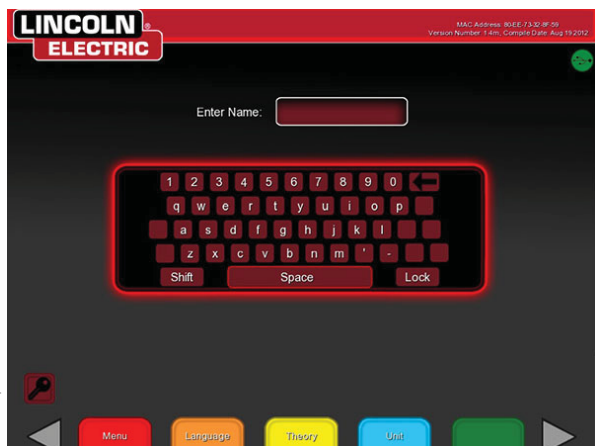
The End User License Agreement (EULA) will appear at start up of machine for the first time. Selecting "I Agree" will allow access to the VRTEX® MOBILE. The machine will shut down when "I Disagree" is selected.

INSTRUCTOR MODE

TO ENTER INSTRUCTOR MODE

1. Touch the “Key” icon located in the lower left corner of the screen. See Figure B.3.

FIGURE B.3 – MENU AND INSTRUCTION KEY



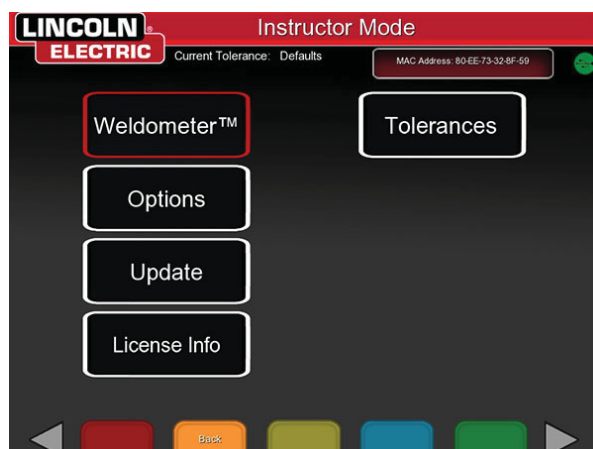
2. The default password is 1,2,3,4,5. To change the password, use the icon with the key and + sign. See Figure B.4.

FIGURE B.4 – INSTRUCTOR ENTRY MENU



3. To continue, follow the on screen instructions.
4. Select the license info icon.
5. Select the End User License Agreement (EULA) icon on white arrows.
6. The license agreement is available to read and save to a USB drive.
7. When complete touch the “license” icon and then the “back” icon.
8. The instructor’s mode screen will be displayed. See Figure B.5.

FIGURE B.5 – INSTRUCTORS MODE SCREEN



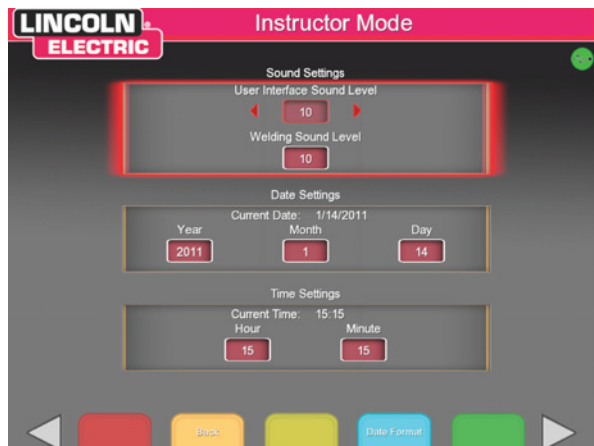
The instructor mode includes the following:

- Options
- Update
- License Information
- Weldometer™
- Tolerances

OPTIONS

The options screen, in the instructor mode, allows the user to change the volume of the user interface and welding sounds, date and time settings. See Figure B.6.

FIGURE B.6 – INSTRUCTOR MODE OPTIONS



UPDATE

OVERVIEW

The update screen, in the instructor mode, allows the user to update their software or to update specific configuration files from the USB memory device in the front of the VRTEX® MOBILE. Selecting this brings up two options:

- Update Software
- Update Configuration File

SOFTWARE

Selecting this option loads a newer version of the software if one is available on the USB in the front of the machine. Updating to a different version may shut down or restart the system.

After updating, the system may need to be shut down and restarted for changes to take effect.

CONFIGURATION FILE

Selecting this option loads any configuration changes from the USB in the front of the machine. This is used for part replacement.

WELDOMETER™

OVERVIEW

The Weldometer™ tracks virtual consumables, base material and gas usage. This information can be used to track materials and cost savings incurred by the use of virtual welding training. The Weldometer™ tracks material usage and arc time over a “trip” (since last reset) and over the VR system’s lifetime. See Figure B.7.

Arc Time keeps track of the amount of time (hours:min:seconds) students have a virtual arc struck with each process.

Base Metal tracks how many virtual coupons have been used and their cumulative weight. Note that plate 3/8" includes groove joints as well as T-joints, while plate 10GA. and 1/4" includes both T-joints and practice plates.

Gas tracks how much virtual gas has been used.

Consumables tracks the cumulative weight of each type of virtual consumable used. It also displays how many virtual SMAW (optional) electrodes are used.

At the bottom of the screen, the **Simulated Welder Time** keeps track of how long the unit has been on (time in hours:minutes:seconds).

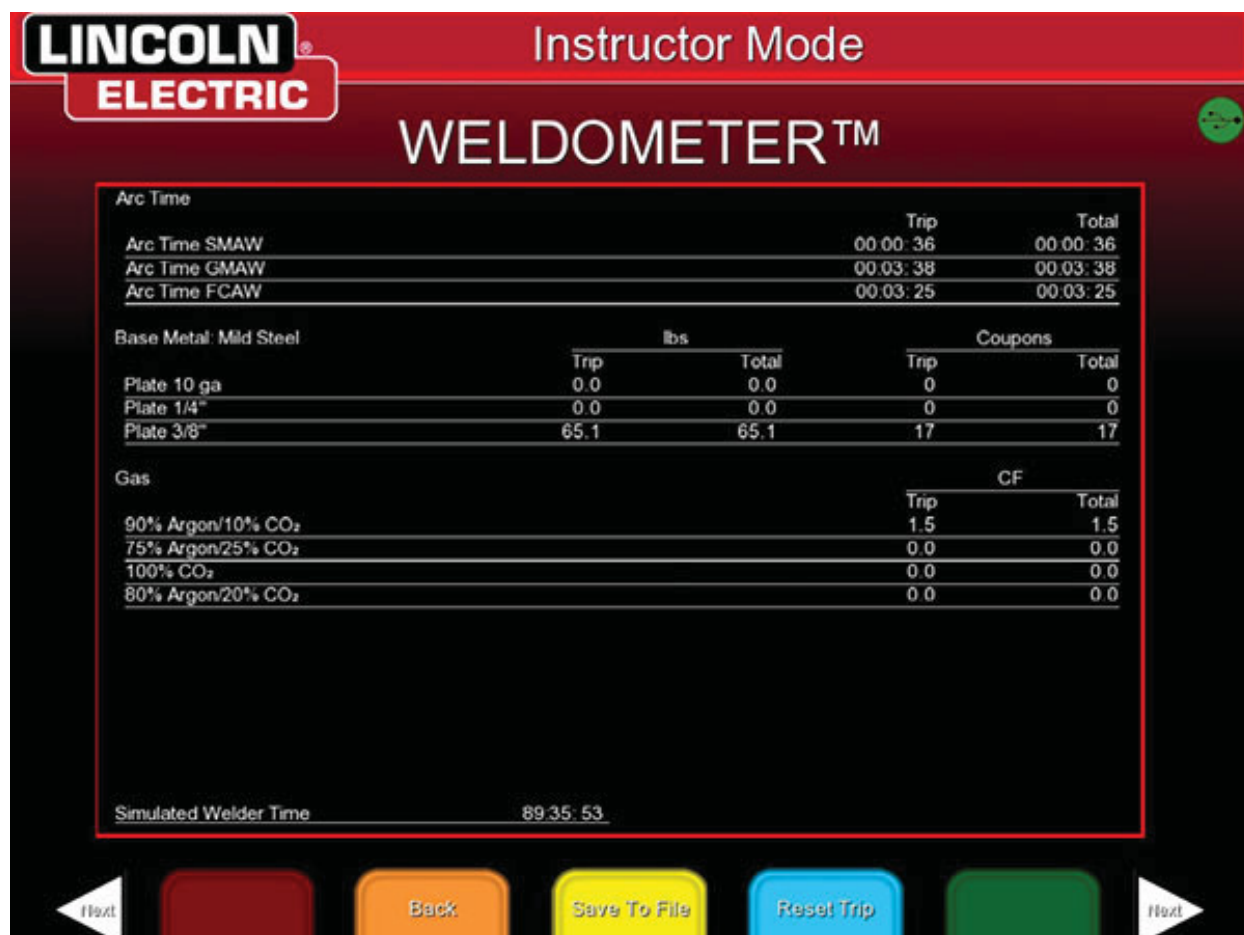
RESET TRIP

Selecting **Reset Trip** zeroes out all items in the trip column. This allows an instructor to track VR material savings over a certain time period.

SAVE TO FILE

If a USB memory device is inserted in the unit, selecting “save to file” saves a file with all of the current Weldometer™ information. Once the file has saved, the user can take the USB to a computer or printer to print, email, copy, store or view the file.

FIGURE B.7 – WELDOMETER



TOLERANCE EDITOR

(factory defaults)

OVERVIEW

The tolerance editor allows users to modify the system settings from the default to fit their curriculum. See Figure B.8.

The VRTEX® MOBILE ships with Lincoln “default” welding parameters pre-installed. The parameters can be modified by the instructor to reflect a specific welding application or technique. Under Choose Tolerance Setup the instructor can select:

- Defaults
- Entry Level
- Intermediate
- Advanced

Touch the green **Customize** icon to view the various process options listed below:

- WFS range
- Voltage range
- Amperage range
- Gas mixture
- Gas flow rate

The technique parameters ideal range values can also be viewed:

- Aim
- CTWD/Arc length
- Work angle
- Travel angle
- Travel Speed
- Whip (SMAW - Optional)

FIGURE B.8 – TOLERANCES



⚠ CAUTION

- Weave

Changing the settings in the tolerance editor will dramatically affect how the system runs, including scoring, visual cues, and discontinuities. Take care in changing the settings of the tolerance editor as not to reflect unrealistic welding situations.

CHOOSE TOLERANCE SET-UP

Displays the list of all tolerance settings currently stored on the unit. All units ship with default settings. If the user creates multiple tolerance files, the file in use is selected by selecting the red icon. This affects the visual cues, graphs, discontinuities and score. The current tolerance settings in use are also listed on this screen.

CHANGING TOLERANCE LEVELS

The following steps describe the procedure to change tolerances for the VRTEX® MOBILE:

1. Select **Tolerances**.
2. Select **Edit**.
3. Select **Create New**.
4. Enter a new tolerance name on the keyboard screen.
5. Select **Continue**.
6. Scroll through “Choose Tolerance Setup” menu.
7. Select icon with desired name by touching the name displayed in the field.

NOTE: When desired tolerance name is properly selected, that name will be displayed at the top of the screen next to “Current Tolerance”.

8. Select “Customize”.
9. Select white arrows and continue icon to scroll through tolerance setup options.

CHOOSE TOLERANCE TO LOAD

This displays the list of all tolerance sets currently stored on the USB device. Files can be transferred to and from a VRTEX® MOBILE with a USB memory device.

EDIT

This menu icon affects the file currently being shown in the choose tolerance setup window. This menu has the following options:

- Create New
- Save to USB
- Copy
- Delete
- Rename

Selecting **Create New** creates a new file on the unit. The file starts with the default settings. Selecting this icon takes the user to a keyboard screen so that a new file name can be entered.

Selecting **Save to USB** saves the current file to a USB memory device, if a USB memory device is inserted in the front of the machine.

Selecting **Copy** makes a copy of the file currently being shown on the choose tolerance setup window. The copy is identified with the same name plus an incremented number after it.

Selecting **Delete** brings up an “are you sure” dialogue. Selecting “Yes” deletes the file currently shown. The user can cancel out by selecting “No” or selecting the **Back** icon.

Selecting **Rename** brings the user to a keyboard screen where the name of the current file can be changed.

USB EDIT

This menu relates only to the files on the USB memory device. If there is a file name currently listed in the choose tolerance to load box, selecting the options on the menu will take action on that file. This menu has the following options:

- Copy to List
- Delete
- Rename
- Load from USB

Selecting **Copy to List** copies the file currently being shown on the choose tolerance to load box and saves it to the VRTEX® MOBILE.

Selecting **Delete** brings up an “are you sure” dialogue. Selecting “Yes” deletes the file currently being shown on the choose tolerance to load. This deletes the file from the USB memory device. The user can also cancel out by selecting “No” or selecting the **Back** icon.

Selecting **Rename** brings the user to a keyboard screen where the name of the current file can be changed.

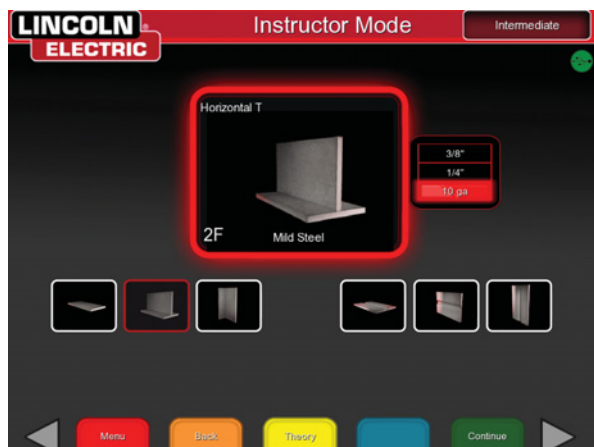
Selecting **Load** loads the names of the files currently on the USB memory device. The names show up in the ‘choose tolerance to load’ box. The user will need to select this in order to see what is on their USB memory device.

TOLERANCES: JOINT CONFIGURATION SELECTION SCREEN

OVERVIEW

The user selects which configuration to modify. See Figure B.9.

**FIGURE B.9 – JOINT CONFIGURATION
SELECTION SCREEN**



TOLERANCES: PROCESS SELECTION SCREEN

OVERVIEW

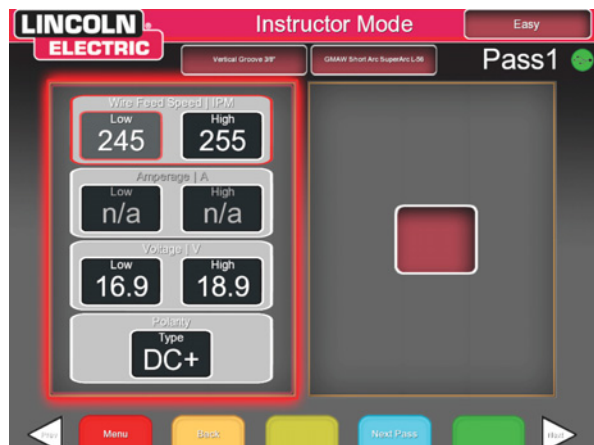
The user selects which process to modify. See Figure B.10.

**FIGURE B.10 – PROCESS
SELECTION SCREEN**



TOLERANCES: EQUIPMENT SETTINGS SCREEN

FIGURE B.11 – EQUIPMENT SETTINGS SCREEN



OVERVIEW

This screen allows for the modification of the following welding parameters (See Figure B.11):

- Wire Feed Speed
- Amperage
- Voltage
- Polarity

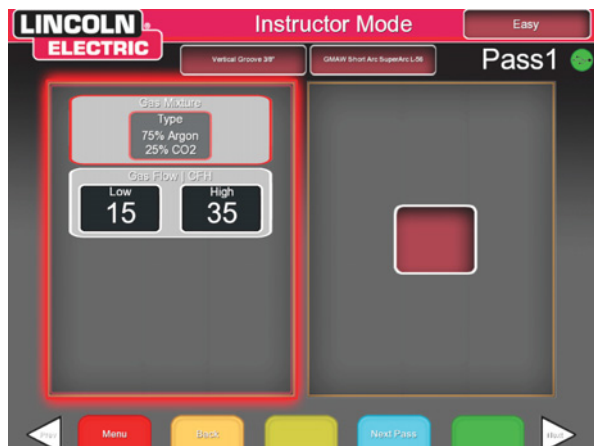
TOLERANCES: GAS SCREEN

OVERVIEW

This screen allows for the modification of (See Figure B.12):

- Gas Mixture Selected
- Gas Flow Rate

FIGURE B.12 – GAS SCREEN



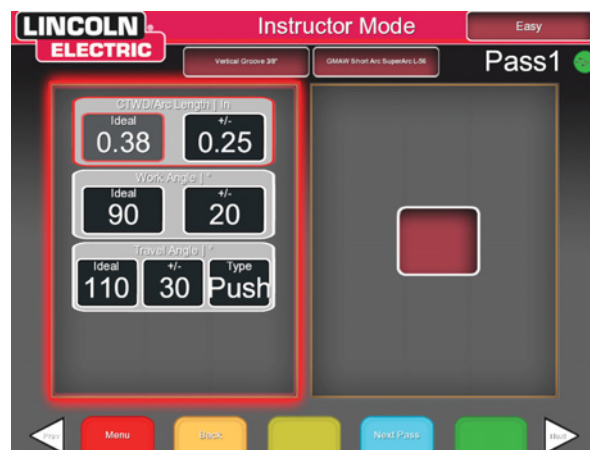
TOLERANCES: WELDING TECHNIQUE PARAMETERS SCREEN

OVERVIEW

This screen allows the modification of (See Figure B.13):

- CTWD/Arc Length
- Work Angle
- Travel Angle

FIGURE B.13 – WELDING TECHNIQUE PARAMETERS



NOTE: The travel angle for drag welding techniques should always be less than 90 degrees. The travel angle for pushing technique should always be greater than 90 degrees.

TOLERANCES: PATTERN AND AIM SCREEN

OVERVIEW

This screen allows the user to change the type of pattern being used (stringer, box weave, straight weave, whip, triangle weave) and the position of the root of the weld. See Figure B.14. The X and Y values change the location of where the weld bead should be placed. See Figure B.15. This affects the position parameter on the Live Action Student Evaluation Report (LASER) screen. The +/- determines how far off from the ideal position the student can place the electrode before it results in a misplaced weld.

FIGURE B.14 – PATTERN & AIM SCREEN

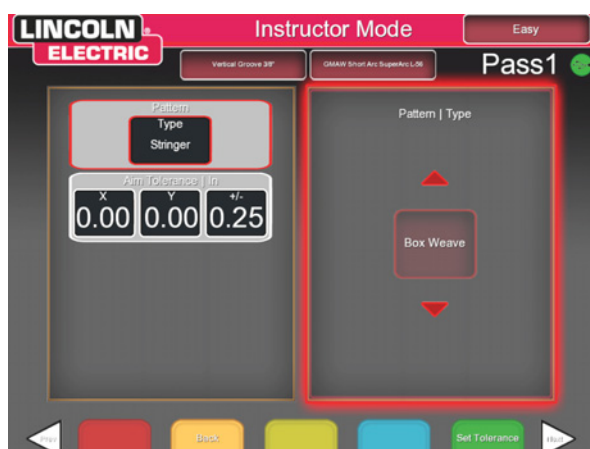
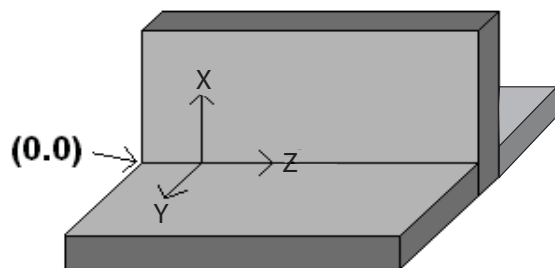
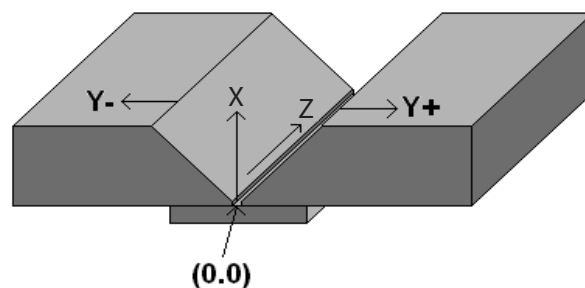


FIGURE B.15 – PATTERN & AIM SCREEN



TEE



GROOVE

TOLERANCES: WHIP AND TRAVEL SPEED SCREEN

(SMAW only - optional)

OVERVIEW

This screen allows for the modification of technique parameters relating to the whipping welding technique and travel speed including (See Figure B.16):

- Dime Spacing
- Whip Time
- Puddle Time
- Travel Speed

FIGURE B.16 – WHIP & TRAVEL SCREEN



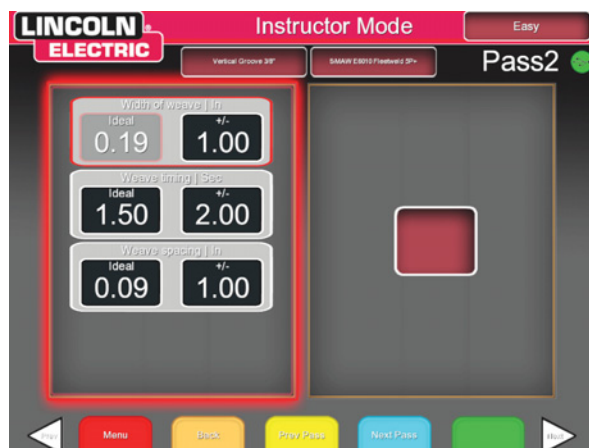
TOLERANCES: WEAWE SCREEN

OVERVIEW

This screen allows for the modification of weaving welding technique including (See Figure B.17):

- Width of Weave
- Weave Timing
- Weave Spacing

FIGURE B.17 – WEAWE SCREEN



USER INTERFACE OVERVIEW

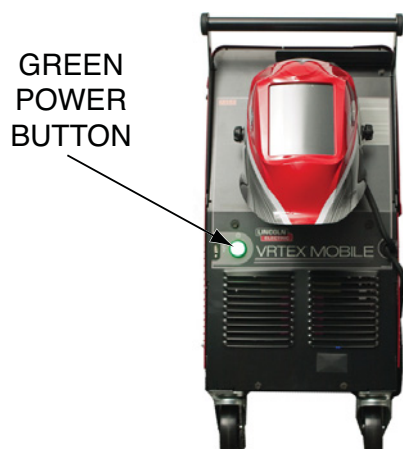
The VRTEX® MOBILE is a virtual reality arc welding trainer. This computer based training system is an educational tool designed to allow students to practice their welding technique in a simulated environment. It promotes the efficient transfer of welding skills from the classroom to the welding booth, while reducing material waste and energy consumption associated with traditional welding training.

POWERING ON

1. Pressing and holding the **green circular button**, on the front of the machine, for 5 seconds powers up the VRTEX® MOBILE system. See Figure B.18.

NOTE: The green power button does not power down the system. Select Log Out and Shutdown from the red menu icon to turn off the system.

FIGURE B.18 – GREEN POWER BUTTON



2. The **monitor** allows the student to view the setup screens which provide an active view of the actual welding process for instructors and students. The monitor can be rotated for ease of viewing. Make certain the power button on the monitor is ON. See Figure B.19.

FIGURE B.19 - MONITOR POWER BUTTON



The following user controls (icons) may be displayed on the monitor screen.

1. The **wire feed speed/amperage dial icon** allows the user to input wire feed speed or amperage depending on the VR welding process selected.
2. The **voltage dial icon** allows the user to input the welding voltage. This dial also allows input of trim values when pulse process is in use.
3. The left and right **white screen select arrow icons** allow the operator to cycle through various screens.
4. The **process selector switch icon** is used to select the virtual welding process (GMAW, FCAW, or SMAW (optional)).
5. The **polarity selector switch icon** is used to indicate the welding polarity for any given process (DC+, DC-, or AC).
6. The **USB port** located at the front of the machine is used to upload software and download user data from the system.
7. The **key switch icon** is located on the monitor screen and allows the instructor to access the instructor mode which includes the Weldometer®, Tolerance Editor, Options and Update screens.
8. The **high lighted icons, white arrows and multi-colored icons** perform various functions depending upon the command shown.
9. Selecting **Back** takes the user to the previous screen.

END USER LICENSE AGREEMENT

The End User License Agreement (EULA) will appear at start up of machine for the first time. Selecting "I Agree" will allow access to the VRTEX® MOBILE. The machine will shut down when "I Disagree" is selected.

TO ENTER THE USER SCREEN

SYSTEM SETUP INFORMATION

When setting up the virtual equipment, the user must set the welding parameters (e.g. wire feed speed for VR GMAW) within the ranges set in the tolerance editor. The system ships with Lincoln default tolerances. Lincoln default tolerances can be reviewed in the tolerance editor, or refer to the Default Weld Process Settings Chart (if using the default settings) located at the end of this OPERATION SECTION.

However, users can set and use their own tolerances for teaching beginner welders. The tolerances also determine how the user is scored on such parameters as work angle, travel angle, travel speed, position, and contact tip to work distance or arc length. The software will step the user through the following setup screens:

- Login
- Joint configuration selection
- Process selection
- Stand set up
- Environment
- Gas set up
- Weld machine settings
- Instructor's view
- Welder's view
- LASER (Live Action Student Evaluation Report)

The key icon located at the lower left corner of the screen allows the user to access the Instructor Mode with additional information and set-up pages. See **Operation (Instructor Mode)**.

- Weldometer™
- Tolerance Editor
- Options
- Update
- License Information

NOTE: If the login screen does not appear, touch the back icon repeatedly until the login screen appears. See Figure B.20.

LOGIN SCREEN

FIGURE B.20 – LOGIN SCREEN



OVERVIEW

This page allows the user to: (See Figure B.20):

- Enter Username
- Select Language Preference “Orange Icon”
- Select Imperial or Metric Units “Blue Icon”
- Shutdown System “Red Menu Icon”
- Continue to the next Setup Screen “Green Icon”
- Theory “Yellow Icon”

1. On Screen Keyboard

The user enters their name by using the on screen keyboard. The user can select shift or lock (equivalent to caps lock on a standard keyboard) at any time. If the user makes a mistake, they can select the back arrow to delete the last character entered.

2. Language

Selecting the orange language menu icon brings up the list of languages the software supports. Touch the desired icon.

FIGURE B.21 – LANGUAGE SCREEN



Select the orange language menu icon again to exit the language menu. The system stores the language selection and will automatically start up in the same language the next time.

3. Measurement Units

The blue unit menu icon brings up the measurement system. Touch the desired unit icon. Select the blue icon again to exit the measurement unit menu. Selecting **Metric** or **Imperial** converts the user interface into the corresponding measurement system. The system stores the measurement selection, so it will automatically start up in the same unit of measurement the next time. The system uses the units shown in **Table B.1**.

4. Menu

The red menu icon allows the student to shut down the system. If the user selects shutdown, a submenu appears asking the user if they are sure that they want to shut down the system. This prompt prevents the user from accidentally shutting down the system. If the user selects “Yes”, the VRTEX® MOBILE will shut down.

CAUTION

THIS METHOD SHOULD ALWAYS BE USED TO SHUT DOWN THE VRTEX® MOBILE. Failure to do this could cause damage to the system.

5. Continue

After the user enters their name and all selections outlined above have been made, the green icon is selected to continue to set up process.

6. USB Indicator

The circular USB icon in the upper right corner of the screen indicates the presence of a USB memory stick in the front of the machine. A translucent icon indicates no USB memory stick is present. A green icon indicates a USB memory stick is inserted into the front of the machine.

7. Theory Screen

Overview

The theory icon has been implemented to assist users with additional content, images and information related to the area of the application where you are working. See Figure B.22. This information can be accessed by selecting the yellow theory icon. When selected, the icon allows the student to access visual and definitional information about the different welding terms being used on each screen. Welding terms that correspond with each page are listed in the boxes on the left-hand side of the screen. When finished reviewing the theory data, the student can select the theory icon again to exit the screen.

FIGURE B.22 – THEORY SCREEN



TABLE B.1 – MEASUREMENT UNITS

MEASUREMENT UNITS	Imperial		Metric	
	Abbrev.	Details	Abbrev.	Details
Coupon Thickness	in.	inches	mm	millimeters
Gas Flow Rate	CFM	cubic feet per minute	LPM	liters per minute
Wire Feed Speed	IPM	inch per minute	MPM	meters per minute
Weldometer™ - Base Metal	lbs	pounds	kg	kilograms
Weldometer™ - Gas	CF	cubic feet	L	liters
Weldometer™ - Consumables	lbs	pounds	kg	kilograms

JOINT CONFIGURATION SELECTION SCREEN

OVERVIEW

The user selects which joint configuration they want to virtually weld. First, the user selects the joint and position. A rotating view of the highlighted coupon shows in the upper area. For some configurations, the user will be given the choice of material thickness to choose from. See Figure B.23.

FIGURE B.23 – JOINT CONFIGURATION SCREEN



BACK

Selecting **Back** takes the user back to the previous screen.

PROCESS SELECTION SCREEN

OVERVIEW

This screen allows the user to select the welding processes. See Figure B.24. To change among VR GMAW, VR FCAW, and VR SMAW (optional), the user touches the desired processes. If a process is not supported for the selected material/thickness, it is grayed out on this screen and cannot be selected. To choose among different sub-processes, touch the appropriate icon.

At the top of the screen, the user can see the coupon position and thickness selected. As the user continues to set up the simulation, additional information will be added to the right of this readout, so that the user can reference what has previously been selected.

FIGURE B.24 – PROCESS SELECTION SCREEN



MENU ICON

Selecting **Logout** brings the user back to the login screen, with the user's name removed.

CHANGE COUPON TYPE

Selecting **Change Coupon Type** goes back to the configuration selection screen.

BACK

Selecting **Back** takes the user to the previous screen.

STAND SET-UP SCREEN

OVERVIEW

The correct VR stand information must be put into the software for the VRTEX® MOBILE to operate properly in all virtual welding applications. See Figure B.25.

FIGURE B.25 – STAND SET-UP SCREEN



COUPON INSERTION

Insert one of the VR coupons into the desired position in the physical VR stand. See Figure B.26. Make sure the coupon is fully seated into the track and then lock the coupon in place by pushing in the knob at the end of the arm. To release, pull the knob into the unlocked position and remove the coupon. When the system is in use, the coupon should always be locked in place to assure system accuracy.

CAUTION

Position coupon stand at least eighteen inches from monitor and any potential source of electrical and magnetic interference.

FIGURE B.26 – VR COUPON (UNLOCKED POSITION)



ENVIRONMENT SCREEN

OVERVIEW

The VRTEX® MOBILE comes pre-configured with a number of different virtual welding environments. To select an environment, the user touches the desired icon. See Figure B.27.

CAUTION

When welding in virtual reality be mindful of your real world surroundings and hazards at all times to avoid injury.

FIGURE B.27 – ENVIRONMENT SCREEN



MENU

Selecting **Logout** takes the user back to the login screen, with the user's name removed.

BACK

Selecting **Back** takes the user to the previous screen.

GAS SET-UP SCREEN

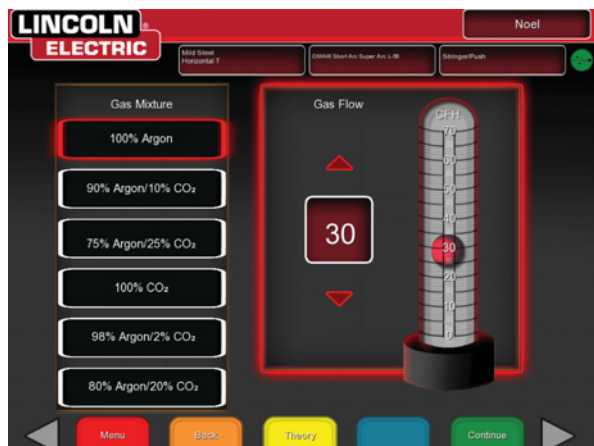
OVERVIEW

On this screen, the user selects the gas mixture and gas flow rate. See Figure B.28. The correct gas mixture and flow rate must be entered according to the tolerance editor. If acceptable values are not entered, this will be indicated on a later screen and the user may have to go back and change the selection on this screen.

To select the gas mixture, touch the desired icon. The available gas mixtures are shown on the gas set-up screen below.

To select the gas flow rate, touch the desired arrow icon or the gas flow meter.

FIGURE B.28 – GAS SET-UP SCREEN



MENU

Selecting **Logout** takes the user back to the login screen, with the user's name removed.

BACK

Selecting **Back** takes the user to the previous screen.

WELD MACHINE SETTINGS SCREEN

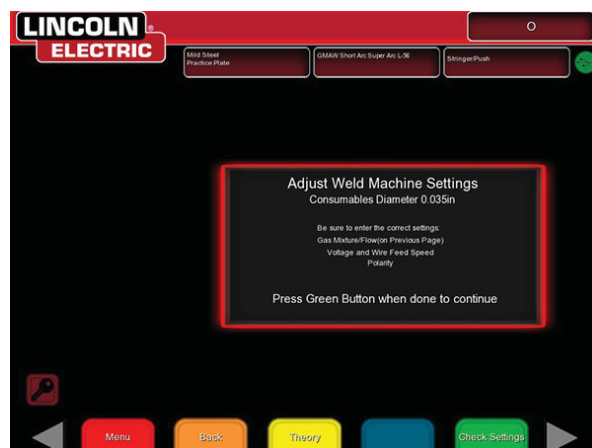
OVERVIEW

The user must enter the proper welding procedure and process settings, including wire feed speed, amperage, voltage, polarity and trim where applicable. See Figure B.29. As in the gas setup screen, the user must enter values within the acceptable range as governed by the tolerance editor. If not, they will be notified by the incorrect weld setting screen when the green check settings icon is selected. See **Figures B.30 and B.31**.

The user changes the wire feed speed or amperage by rotating the virtual wire feed speed/amperage dial. The display above the dial indicates the setting.

The user changes the voltage by rotating the voltage dial. The display above the dial indicates the setting. Some processes may not allow the user to pre-set the voltage, in which case the display will be blank.

FIGURE B.29 – WELD MACHINE SETTING SCREEN



POLARITY SELECTOR

Change the polarity by rotating the virtual polarity selector icon. The user can select the following:

- AC
- DC+
- DC-

If default tolerances are being used, see the **Default Weld Process Settings** included in this manual.

Once the user has set the welding parameters, they should select the green check settings icon. If the user has entered any settings outside the acceptable range specified by the settings in the tolerance editor, the incorrect weld setting screen will appear.

The user will then have to change any settings that are incorrect. If the settings are correct and the green check settings icon is selected, the welder's view screen will appear on the monitor and in the helmet's stereo visor. The user will then be able to start virtual welding.

FIGURE B.30 – INCORRECT WELD SETTINGS SCREEN

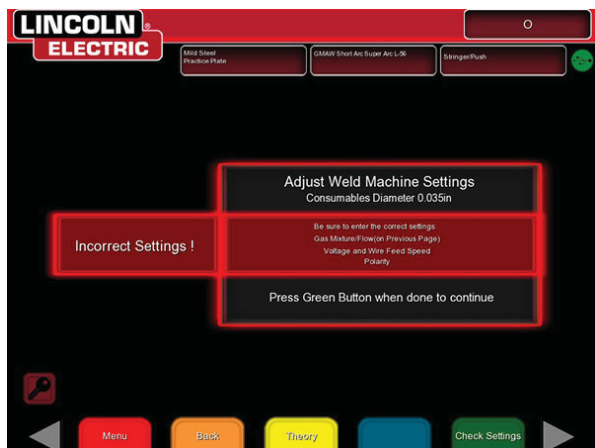


FIGURE B.31 – CORRECT WELD SETTINGS SCREEN



MENU

Selecting **Logout** brings the user back to the login screen, with the user's name removed.

BACK

Selecting **Back** goes back to the previous screen.

VIRTUAL WELDING OVERVIEW

While a user is welding, observers can see the welder's view, Live Action Student Evaluation Report (LASER) screen, or instructor's view displayed on the monitor. See Figure B.32. The welder's view shows what the user with the helmet on is seeing through the FMD. The Live Action Student Evaluation Report (LASER) screen displays a real time graph of the weld being made and gives a score when the user selects "end pass". The instructor's view allows another user to zoom in/out, pan and rotate the coupon to view the weldment from different angles in real time.

UPPER OVERLAYS

The welding technique set in the tolerance editor and other process details are displayed on the upper right portion of the screen.

MENU

Selecting **Logout** brings the user back to the login screen, with the user's name removed.

ORANGE ACTION AND CUES ICON

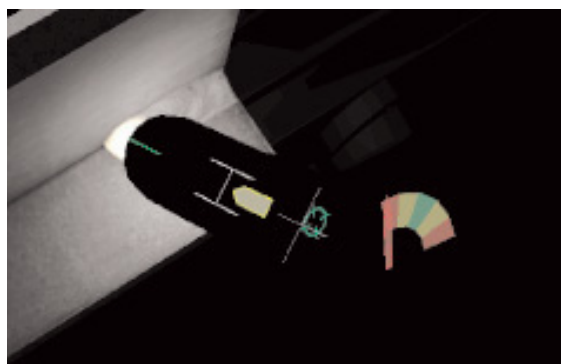
The orange action menu icon has the following options:

- Quench
- "Cheater" Lens – Off, 1.25X, 1.5X, 1.75X, 2X
- Travel Speed Visual Cue
- AIM
- Travel/Work Angles Visual Cue
- CTWD (Contact To Work Distance) Visual Cue
- Trim
- Weave
- Whip (SMAW only - Optional)

These options are only available when applicable to the welding process.

Trim cuts back the VR GMAW or VR FCAW wire. **Quench** simulates quickly cooling the metal.

FIGURE B.32 – USER SCREEN VIEW



VISUAL CUES

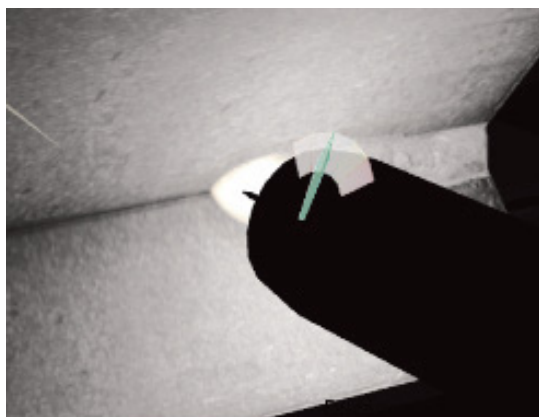
Visual cues are aids to help users learn faster. The travel speed, CTWD, arc length, and travel/work angle cues indicate whether the user is within the tolerances set in the tolerances editor. Generally, these cues are color coded as well as symbolic. When cues are red, they indicate being out of tolerance. Yellow cues indicate close to tolerance, but not optimal. Green cues indicate being within tolerance and close to optimal.

The “**Cheater**” **Lens** magnifies the image as seen by the user in the helmet and in the welder’s view. The user can toggle between Off, 1.25X, 1.5X, 1.75X, 2X select their option with the red select icon.

Travel Speed turns on the travel speed visual cue. This cue is located on the side of the VR GMAW/FCAW Gun or VR SMAW (optional) device. See Figure B.33. This cue uses the color coding position to indicate travel speed.

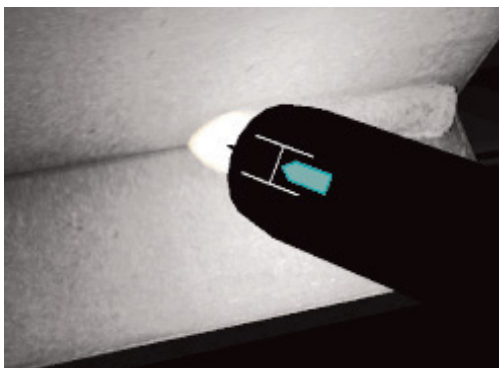
NOTE: The goal is to keep the arrow in the center of the graph which will also keep it green.

FIGURE B.33 – TRAVEL SPEED VISUAL CUE



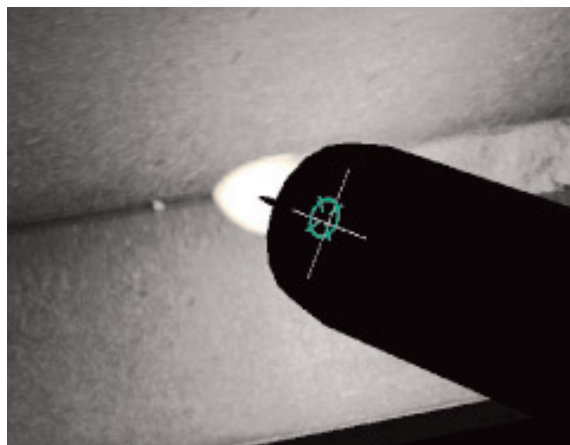
The **CTWD** (Contact Tip To Work Distance) cue is only available for VR GMAW and VR FCAW processes. This cue uses color and position to indicate proper CTWD. See Figure B.34. The goal is to get the tip of the green arrow on the line of the “H” bar and keep the arrow color green.

FIGURE B.34 – CTWD (CONTACT TIP TO WORK DISTANCE)



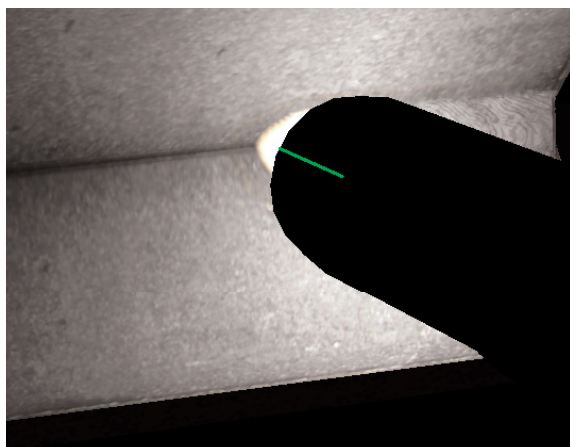
The **Travel/Work Angle** cue can be used with the SMAW (optional), GMAW or FCAW processes. See Figure B.35. The goal of this cue is to center the circle in the cross hair and keep the color green.

FIGURE B.35 – TRAVEL/WORK ANGLE



The **Aim** cue can be used with the VR SMAW (optional), VR GMAW or VR FCAW processes. See Figure B.36. The goal of this cue is to position the VR GMAW/FCAW Gun or VR SMAW (optional) device so the aim cue is a thin green line. This indicated that the weld is being made in the correct location or position.

FIGURE B.36 – AIM



NEW COUPON

Selecting the blue new coupon menu icon instantly replaces the current coupon with a fresh, unwelded coupon. Note that this is a quick way to start over on the same configuration and process but that it will remove all passes from the coupon and the graphs on the LASER screen.

WHITE SCREEN SELECT ARROWS

Touching the white screen select arrows allow the user to rotate through the LASER screen, instructor's view and welder's view.

WELDER'S VIEW SCREEN

Overview

This screen shows the virtual view as seen by the user wearing the helmet.

INSTRUCTOR'S VIEW SCREEN

Overview

This screen shows the coupon and virtual weld in real time. See Figure B.37. An observer can rotate and/or zoom in or out on the coupon. This view also shows the VR GMAW/FCAW gun or VR SMAW (optional) device being used.

NOTE: Changing views on the monitor does not change the user's view in the helmet.

**FIGURE B.37 – INSTRUCTOR'S VIEW
(POOR WELD)**



LASER SCREEN

(Live Action Student Evaluation Report)

Overview

This screen summarizes the student's welding performance. Detailed information about the student's welding technique for each pass are displayed on this screen. See Figures B.38, B.39 and B.40.

**FIGURE B.38 – LASER SCREEN
(GOOD WELD)**



**FIGURE B.39 – LASER SCREEN
(HORIZONTAL WELD) NO WELD**



**FIGURE B.40 – LASER SCREEN
(GOOD VERTICAL WELD)**



FIGURE B.41 – LASER SCREEN (GRAPH, DEFECTS, DISCONTINUITIES, ETC.)



TECHNIQUE PARAMETERS

The upper left area of the screen shows the technique parameters being tracked and the graph of these parameters is located to the right. See Figure B.41. When the user welds, each parameter is graphed using a line that is of the same color as the technique parameter box. For example, "position" is written in the blue box and indicated by the blue line. The left side of the graph represents the left side of the coupon, and the right side represents the right side of the coupon. For vertical welds, the graph is rotated so that it is vertical, with the bottom representing the bottom of the coupon and the top representing the top of the coupon. The graph also shows how close the parameter was to the ideal value. The ideal value is indicated by the red line located in the center of the graph. This value is determined by the tolerance editor settings. The upper and lower white lines represent the acceptable maximum and minimum values that the parameter should be within. These values are also determined by the tolerance editor setting. Anything above the top white line or below the bottom white line is out of tolerance. The closer the user is to the ideal line, the better the weld. Each parameter can be toggled on or off of the graph by touching the appropriate icon.

Position is the user's ideal weld root location. This location can change with each pass. When weaving, the ideal location is considered the centerline of the weave.

Contact Tip to Work Distance (CTWD) (for VR GMAW and VR FCAW) and **Arc Length** (for VR SMAW (optional)) are the distances from the tip of the VR GMAW/FCAW gun or VR SMAW (optional) device to a plane going through the ideal position location. See Figures B.42 and B.43.

FIGURE B.42 – CONTACT TIP TO WORK DISTANCE (CTWD)

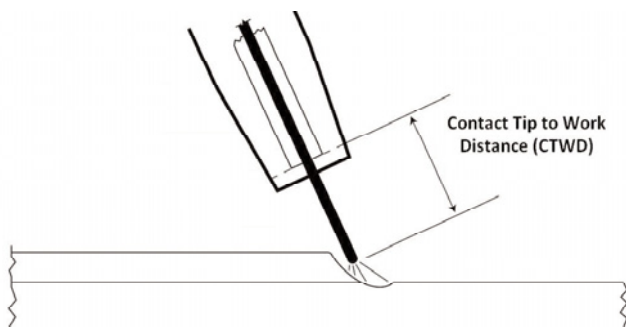
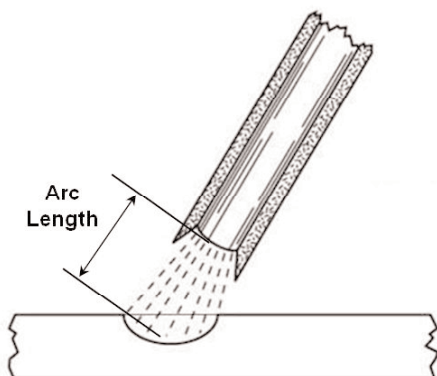
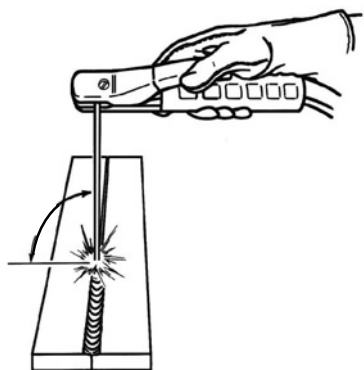


FIGURE B.43 – ARC LENGTH



Work Angle is the angle between the electrode and workpiece as seen in Figure B.44.

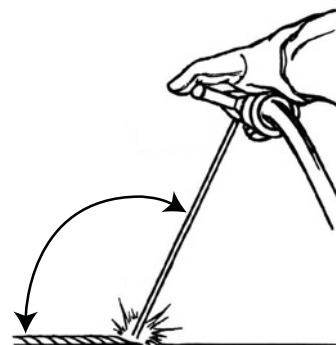
FIGURE B.44 – WORK ANGLE



WORK ANGLE

Travel Angle is the angle between the electrode and the workpiece in the direction of travel. See Figure B.45. The upper right area of the screen displays if the user should be pushing or dragging. If the user pushes when they should be dragging, they will not receive maximum points. For pipe welding, this is the angle between the electrode and the tangent of the pipe at that point.

FIGURE B.45 – TRAVEL ANGLE



TRAVEL ANGLE

PASS NUMBER

The pass number is displayed on the left center of the screen. To change the pass being viewed touch the arrow icons.

TRAVEL DIRECTION

The travel direction is located on the right side in the middle of the screen. When the user first starts to weld, a travel direction is sensed by the system and an arrow indicating the direction is displayed. For visual cues, the system assumes these directions. The visual cues will automatically adapt to the travel direction used when the arc is struck.

BEAD RENDER

An image of the completed pass appears in the middle of the screen.

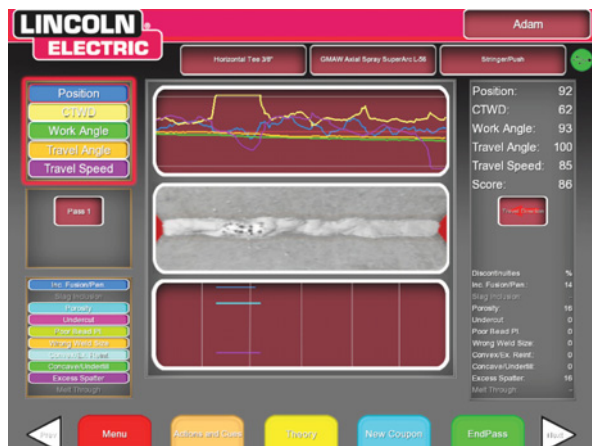
DISCONTINUITY INDICATOR

The lower left side of the screen list potential discontinuities. See **Figure B.46**. When a student uses incorrect welding techniques, this causes specific weld discontinuities. A line is drawn at the location indicating these discontinuities. For example, too long an arc length will cause porosity.

Potential discontinuities include:

- Incomplete Fusion/Penetration
- Porosity
- Undercut
- Poor Bead Placement
- Wrong Weld Size
- Convex/Excessive Reinforcement
- Concave/Underfill
- Excess Spatter

FIGURE B.46 – POTENTIAL DISCONTINUITIES



END PASS

When the user selects the green “End Pass” menu icon, the pass is scored, a snapshot of the weld is taken, and the percentages of the weld containing discontinuities are calculated. **If the user has inserted a USB device, selecting “End Pass” also automatically saves a student report to the USB memory device at the front of the weld machine.** If no USB memory stick is present, a red circle with a cross through it will appear on the USB icon in the upper right hand corner of the screen. This also indicates that the student report has not saved. Allow 10 seconds after selecting the “End Pass” icon to allow time for the file to be saved. Student reports are not saved internally on the VRTEX® MOBILE. If the file is not saved on the USB device at the time of the weld and another weld is made, the previous weld data will be lost.

SCORE

On the upper right of the screen, a score for each parameter is calculated. The closer each parameter is to the ideal value, the higher the score will be (out of 100). The total score at the bottom of the scoring section is calculated as an average of each parameter. To achieve the maximum score, the weld must be made on the entire length of the coupon.

STUDENT REPORT

The student report is a PDF file that captures the graph, discontinuities, bead render, score and other information about the weld. See Figure B.47. This PDF file can be printed or archived from another computer to track student progress. Example of PDF below shows students record.

FIGURE B.47 – STUDENT REPORT

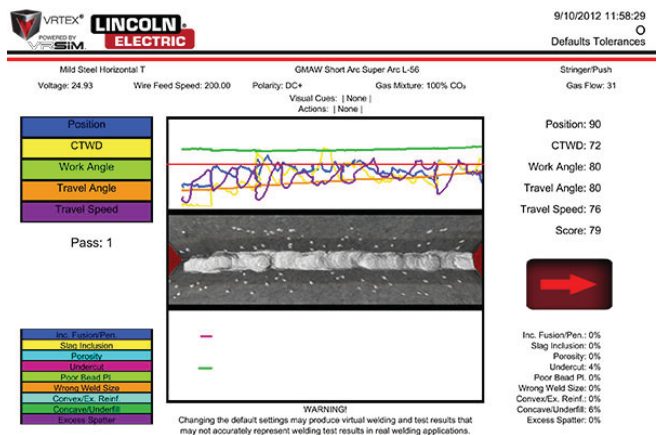


FIGURE B.48 – DEFAULT WELD PROCESS SETTINGS

VRTEX® Mobile - Default Weld Process Settings										
WPS #	VR Welding Process	Consumable Type	Lincoln Brand	Gas Mixture	Gas Flow (CFH)	Position	Mat'l (in)	WFS (ipm) or amps	Voltage	Polarity
1	SMAW	1/8" E6010 (3.2 mm)	Fleetweld 5P+	NA	NA	Flat	1/4" (6 mm)	90 (±5)	NA	DC+
2,3	SMAW	1/8" E6010 (3.2 mm)	Fleetweld 5P+	NA	NA	2F, 3F up	3/8" (10 mm)	90 (±5)	NA	DC+
4,5,6	SMAW	1/8" E6010 (3.2 mm)	Fleetweld 5P+	NA	NA	1G, 2G, 3G up	3/8" (10 mm)	90 (±5)	NA	DC+
7	SMAW	1/8" E7018 (3.2 mm)	Excalibur 7018	NA	NA	Flat	1/4" (6 mm)	125 (±5)	NA	DC+
8,9	SMAW	1/8" E7018 (3.2 mm)	Excalibur 7018	NA	NA	2F, 3F up	3/8" (10 mm)	125 (±5)	NA	DC+
10,11,12	SMAW	1/8" E7018 (3.2 mm)	Excalibur 7018	NA	NA	1G, 2G, 3G up	3/8" (10 mm)	125 (±5)	NA	DC+
13	SMAW	1/8" E6013 (3.2 mm)	Fleetweld 37	NA	NA	Flat	1/4" (6 mm)	100 (±5)	NA	AC
14	SMAW	1/8" E6013 (3.2 mm)	Fleetweld 37	NA	NA	2F	10 GA. (2.5 mm)	100 (±5)	NA	AC
15	SMAW	1/8" E6013 (3.2 mm)	Fleetweld 37	NA	NA	3F down	10 GA. (2.5 mm)	125 (±5)	NA	AC
16,17	SMAW	1/8" E6013 (3.2 mm)	Fleetweld 37	NA	NA	1G, 2G	3/8" (10 mm)	110 (±5)	NA	AC
18	SMAW	1/8" E6013 (3.2 mm)	Fleetweld 37	NA	NA	3G	3/8" (10 mm)	90 (±5)	NA	AC
19	GMAW - S	.035" ER70S-6 (1.0 mm)	SuperArc L-56	75/25	25-35 (12-16.5 l/min)	Flat	1/4" (6 mm)	250 (±5) (6.3 m/min)	18	DC+
20,21	GMAW - S	.035" ER70S-6 (1.0 mm)	SuperArc L-56	75/25	25-35 (12-16.5 l/min)	2F, 3F down	10 GA. (2.5 mm)	250 (±5) (6.3 m/min)	18	DC+
22	GMAW - S	.035" ER70S-6 (1.0 mm)	SuperArc L-56	75/25	25-35 (12-16.5 l/min)	2F	1/4" (6 mm)	375 (±5) (9.5 m/min)	20	DC+
23	GMAW - S	.035" ER70S-6 (1.0 mm)	SuperArc L-56	75/25	25-35 (12-16.5 l/min)	3F up	1/4" (6 mm)	275 (±5) (7.0 m/min)	18	DC+
24	GMAW - S	.035" ER70S-6 (1.0 mm)	SuperArc L-56	75/25	25-35 (12-16.5 l/min)	1G	3/8" (10 mm)	350 (±5) (8.9 m/min)	20	DC+
25	GMAW - S	.035" ER70S-6 (1.0 mm)	SuperArc L-56	75/25	25-35 (12-16.5 l/min)	2G	3/8" (10 mm)	320 (±5) (8.0 m/min)	19.5	DC+
26	GMAW - S	.035" ER70S-6 (1.0 mm)	SuperArc L-56	75/25	25-35 (12-16.5 l/min)	3G up	3/8" (10 mm)	250 (±5) (6.3 m/min)	17.9	DC+
27	GMAW - Spray	.045" ER70S-6 (1.2 mm)	SuperArc L-56	90/10	25-40 (12-19 l/min)	Flat	1/4" (6 mm)	400 (±5) (10.0 m/min)	27	DC+
28	GMAW - Spray	.045" ER70S-6 (1.2 mm)	SuperArc L-56	90/10	25-40 (12-19 l/min)	2F	3/8" (10 mm)	375 (±5) (9.5 m/min)	26.5	DC+
29	GMAW - Spray	.045" ER70S-6 (1.2 mm)	SuperArc L-56	90/10	25-40 (12-19 l/min)	1G	3/8" (10 mm)	370 (±5) (9.4 m/min)	26.5	DC+
30	GMAW - Pulse	.045" ER70S-6 (1.2 mm)	SuperArc L-56	90/10	25-40 (12-19 l/min)	2G	3/8" (10 mm)	130 (±5) (3.3 m/min)	.95(trim)	DC+
31	GMAW - Pulse	.045" ER70S-6 (1.2 mm)	SuperArc L-56	90/10	25-40 (12-19 l/min)	3G up	3/8" (10 mm)	130 (±5) (3.3 m/min)	.95(trim)	DC+
32	FCAW - G	.045" E71T-1 (1.2 mm)	UC 71A85	75/25	40-50 (19-23.5 l/min)	Flat	1/4" (6 mm)	275 (±5) (7.0 m/min)	25	DC+
33,34	FCAW - G	.045" E71T-1 (1.2 mm)	UC 71A85	75/25	40-50 (19-23.5 l/min)	2F, 3F up	3/8" (10 mm)	275 (±5) (7.0 m/min)	25	DC+
35,36,37	FCAW - G	.045" E71T-1 (1.2 mm)	UC 71A85	75/25	40-50 (19-23.5 l/min)	1G, 2G, 3G up	3/8" (10 mm)	275 (±5) (7.0 m/min)	25	DC+
38	FCAW - S	5/64" E71T-8 (2.0 mm)	NR- 232/233	NA	NA	Flat	1/4" (6 mm)	140 (±5) (3.5 m/min)	20	DC-
39,40	FCAW - S	5/64" E71T-8 (2.0 mm)	NR- 232/233	NA	NA	2F, 3F up	3/8" (10 mm)	155 (±5) (4.0 m/min)	21	DC-
41,42	FCAW - S	5/64" E71T-8 (2.0 mm)	NR- 232/233	NA	NA	1G, 2G	3/8" (10 mm)	130 (±5) (3.3 m/min)	21	DC-
43	FCAW - S	5/64" E71T-8 (2.0 mm)	NR- 232/233	NA	NA	3G up	3/8" (10 mm)	125 (±5) (3.2 m/min)	19.5	DC-

VRTEX® MOBILE



K3165-3 - VRTEX® Mobile SMAW Kit

K3268-1 - VRTEX® Arm Rest

CLEANING & MAINTENANCE

FIGURE D.1 – HELMET (FMD)

FMD

Taking proper care of the FMD (Face Mounted Display) is important for optimal functioning of the equipment. Occasionally, the FMD lens should be wiped with the lint free lens wipe that is provided. This can be done to remove fingerprints from the lenses. You can also use a lens cloth (e.g., from a camera shop). Paper towels or household cloths may scratch or damage the lenses and should not be used. Avoid exposing the FMD to liquids. Cleaning solutions should not be used to clean the FMD. Do not use Isopropyl alcohol or solutions containing alcohol to clean the lenses or plastic parts on the FMD. You can also use a camera pressure canister to occasionally blow out dirt.

You may want to clean the inside of the helmet occasionally. Be sure to do so without exposing the FMD to any unacceptable materials, as explained above.

The FMD should be kept in a clean and dry location out of direct sunlight. Avoid dirty or sandy environments, as these can lead to scratching of optics and damage the FMD mechanical adjustments.

MONITOR

CAUTION

The monitor is a touch screen and can be damaged by poking it with any object other than the pad of your finger. Use care when cleaning screen. Use only a soft dry cloth (cotton or flannel). Avoid chemicals and solvents (alcohol, benzene, acidic or alkaline solvent cleaners). Avoid granular or abrasive cleaning agents.



COMPUTER

The computer runs the clock of a Complementary metal–oxide–semiconductor (CMOS) battery (CR2032). It is recommended that CMOS battery be replaced every 24 months.

Note:

- In case of a drained battery an additional step might be necessary to power up the unit. See **Troubleshooting Section**.
- Time and date will be reset on the student report.

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
There is jitter, shake or wobble in the Helmet display and Monitor.	The helmet is too far from the work piece. The further the helmet is from the work piece the more jitter there may be in the helmet display.	Move helmet closer to work piece. Check for loose or faulty connections between the Helmet/Monitor and the VRTEX® MOBILE machine. See the Wiring Diagram.
	Local interference such as fluorescent light, large metallic object and/or high frequencies.	Make sure there are not other objects or frequencies that are interfering with the system. See the Installation section.
The weld coupon image is a different configuration than the physical coupon.	Either the wrong coupon is on the stand or the wrong configuration has been selected in the software.	Press the menu icon and select 'change coupon type'. Change the software selections so that the images on the screen match the hardware you are using.
When the check settings are activated the incorrect settings appear.	The settings in the Instructor Mode are incorrect.	Make sure all of the settings in the tolerance editor are correct for the process and parameters being used. Check for the acceptable ranges for the Lincoln defaults.
Holding the green button in does not shut down the VRTEX® MOBILE. This is normal.	Holding the green button in does not shut down the VRTEX® MOBILE. This is normal.	To shut down the VRTEX® MOBILE select Menu and then select Shutdown. The green button is not used for system shutdown.
The students' reports are not accessible.	USB not in front of machine.	The students' reports can only be saved via the USB port on the front of the VRTEX® MOBILE. Plug in a USB memory device into the front of the machine. If a USB memory stick is not plugged into the USB port or if there is not available memory on the USB stick, the students' reports will not be saved.

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.

VRTEX® MOBILE



Observe all Safety Guidelines detailed throughout this manual

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
Previous weld pass data is not accessible on the LASER screen.	“End Pass” must be activated before starting a new pass. If a new coupon is started the data will only be available for the first pass. Again; “End Pass” must be selected before a new pass is started	Use the touch screen to go to pass number and change which pass data you are looking for. Note that some configurations only have one pass capabilities. See the Lincoln default tolerances.
The user is not sure of which tolerance set they are using.	The tolerance set displayed in the tolerance editor is the one being used. The tolerance set can also be read from the student report.	Go to the instructor mode to change tolerances. Go to the login screen, select the key symbol, enter pass-code and select tolerances to verify tolerance set. See the Operation section.
The machine was shut down and will not turn back on when the green circular button is pressed.	The system may still be in the shut down mode.	Wait 20 seconds, then press and hold the green circular button for 5 seconds to start the machine.
The user cannot weld a second pass.	The joint configuration may be set up for one pass only.	Check the tolerance editor to verify the joint configuration allows for multiple pass welding.
The VR FCAW/GMAW and/or VR SMAW (optional) device(s) location does not correspond with the image shown in the FMD (Face Mounted Display) device.	The system may be located near large metal objects.	Move the system to a suitable location. See the Installation section.
The VRTEX® MOBILE does not start up when the green circular button is pressed.	Make sure the correct input power is being applied to the machine. Verify fused power switch is in the On position. Fuse may be faulty.	Be sure to hold the green circular button in for at least 5 seconds. If the green circular button does not stay on, remove the plug on lower part of case front. Press and hold the green circular button and then press up the push button inside the sheet metal. See Figures E.1 and E.2 . Replace with 10A/250V fuse only.

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.

VRTEX® MOBILE



Observe all Safety Guidelines detailed throughout this manual

FIGURE E-1 – PLUG BUTTON LOCATION

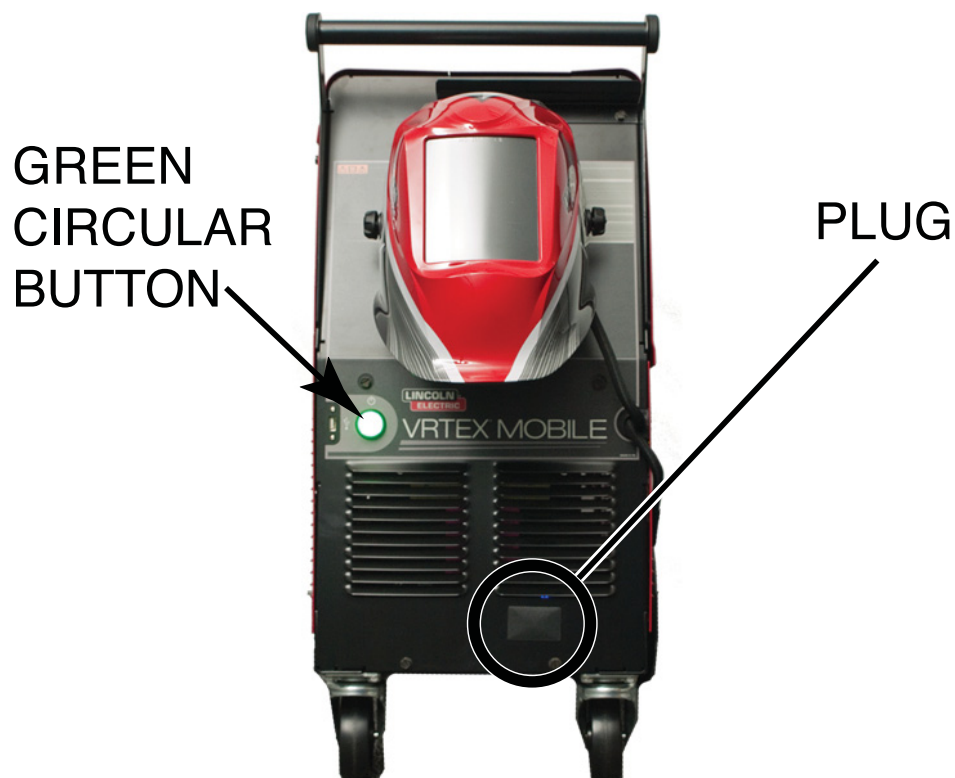
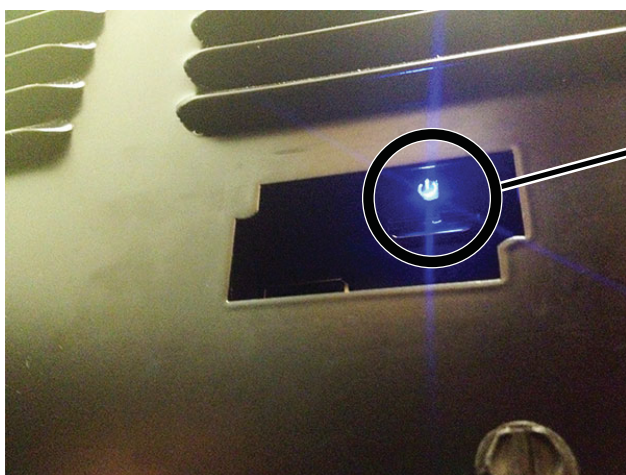


FIGURE E-2 – PUSH BUTTON LOCATION



CLICK CPU
PUSH BUTTON
UP AND RELEASE WHILE
PRESSING AND HOLDING
THE GREEN CIRCULAR
BUTTON. DO NOT
HOLD THE CPU
PUSH BUTTON.

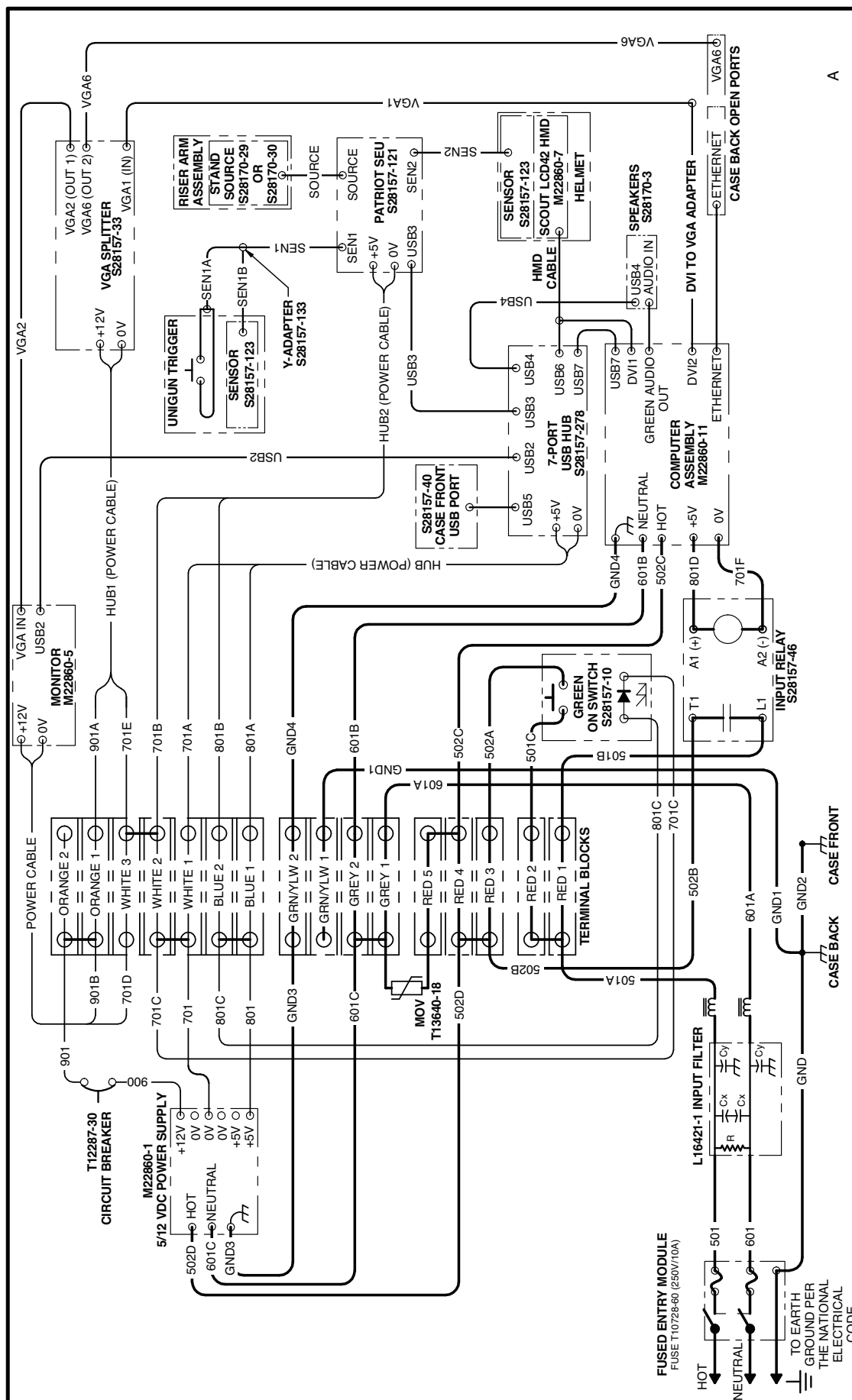
⚠ CAUTION

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.

VRTEX® MOBILE



M22860-14



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 enclosure panels 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. Aíslese 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触带电部件及焊条。 使你自己与地面和工件绝缘。 	<ul style="list-style-type: none"> 把一切易燃物品移离工作场所。 	<ul style="list-style-type: none"> 佩戴眼、耳及身体劳动保护用具。
Korean 위험	<ul style="list-style-type: none"> 전도체나 용접봉을 젖은 형갑 또는 피부로 절대 접촉치 마십시오. 모재와 접지를 접촉치 마십시오. 	<ul style="list-style-type: none"> 인화성 물질을 접근시키지 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 الألكترود بجسد الجسم أو بالملابس 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して下さい。 	<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"> ● 판넬이 열린 상태로 작동치 마십시오. 	Korean 위험
<ul style="list-style-type: none"> ● ابعد 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 تشغيل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه. 	Arabic تحذير

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

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

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

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

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

CUSTOMER ASSISTANCE POLICY

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

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

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



THE LINCOLN ELECTRIC COMPANY

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