NOTE: This manual will cover most of the troubleshooting and repair procedures for the code numbers listed. Some variances may exist when troubleshooting/repairing later code numbers.

VRTEX® 360

For use with machines having Code Numbers:

11382 and 11383

SERVICE MANUAL

SVM249-B | Issue Date 15-Mar
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THE LINCOLN ELECTRIC COMPANY
22801 St. Clair Avenue • Cleveland, OH • 44117-1199 • U.S.A.
Phone: +1.216.481.8100 • www.lincolnelectric.com

SAFETY DEPENDS ON YOU

Service and repair should be performed by only 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.

⚠ 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 Material Safety Data Sheet (MSDS) and the warning label that appears on all containers of welding materials.

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

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

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

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

WEAR CORRECT EYE, EAR & BODY PROTECTION

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

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

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

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

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

SPECIAL SITUATIONS

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

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

Additional precautionary measures

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

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

REMOVE all potential fire hazards from welding area.

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

SECTION A: WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

Diesel Engines

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

Gasoline Engines

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

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

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

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

FOR ENGINE POWERED EQUIPMENT.

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

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

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

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

1.e. In some cases it may be necessary to remove safety guards to perform required maintenance. Remove guards only when necessary and replace them when the maintenance requiring their removal is complete. Always use the greatest care when working near moving parts.

1.f. Do not put your hands near the engine fan. Do not attempt to override the governor or idler by pushing on the throttle control rods while the engine is running.

1.g. To prevent accidentally starting gasoline engines while turning the engine or welding generator during maintenance work, disconnect the spark plug wires, distributor cap or magneto wire as appropriate.

1.h. To avoid scalding, do not remove the radiator pressure cap when the engine is hot.

ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS

2.a. Electric current flowing through any conductor causes localized Electric and Magnetic Fields (EMF). Welding current creates EMF fields around welding cables and welding machines

2.b. EMF fields may interfere with some pacemakers, and welders having a pacemaker should consult their physician before welding.

2.c. Exposure to EMF fields in welding may have other health effects which are now not known.

2.d. All welders should use the following procedures in order to minimize exposure to EMF fields from the welding circuit:

- 2.d.1. Route the electrode and work cables together - Secure them with tape when possible.
- 2.d.2. Never coil the electrode lead around your body.
- 2.d.3. Do not place your body between the electrode and work cables. If the electrode cable is on your right side, the work cable should also be on your right side.
- 2.d.4. Connect the work cable to the workpiece as close as possible to the area being welded.
- 2.d.5. Do not work next to welding power source.

ELECTRIC SHOCK CAN KILL.

3.a. The electrode and work (or ground) circuits are electrically "hot" when the welder is on. Do not touch these "hot" parts with your bare skin or wet clothing. Wear dry, hole-free gloves to insulate hands.

3.b. Insulate yourself from work and ground using dry insulation. Make certain the insulation is large enough to cover your full area of physical contact with work and ground.

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

- Semiautomatic DC Constant Voltage (Wire) Welder.
- DC Manual (Stick) Welder.
- AC Welder with Reduced Voltage Control.

3.c. In semiautomatic or automatic wire welding, the electrode, electrode reel, welding head, nozzle or semiautomatic welding gun are also electrically "hot".

3.d. Always be sure the work cable makes a good electrical connection with the metal being welded. The connection should be as close as possible to the area being welded.

3.e. Ground the work or metal to be welded to a good electrical (earth) ground.

3.f. Maintain the electrode holder, work clamp, welding cable and welding machine in good, safe operating condition. Replace damaged insulation.

3.g. Never dip the electrode in water for cooling.

3.h. Never simultaneously touch electrically "hot" parts of electrode holders connected to two welders because voltage between the two can be the total of the open circuit voltage of both welders.

3.i. When working above floor level, use a safety belt to protect yourself from a fall should you get a shock.

3.j. Also see Items 6.c. and 8.

ARC RAYS CAN BURN.

4.a. Use a shield with the proper filter and cover plates to protect your eyes from sparks and the rays of the arc when welding or observing open arc welding. Headshield and filter lens should conform to ANSI Z87. I standards.

4.b. Use suitable clothing made from durable flame-resistant material to protect your skin and that of your helpers from the arc rays.

4.c. Protect other nearby personnel with suitable, non-flammable screening and/or warn them not to watch the arc nor expose themselves to the arc rays or to hot spatter or metal.

FUMES AND GASES CAN BE DANGEROUS.

5.a. Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. When welding, keep your head out of the fume. Use enough ventilation and/or exhaust at the arc to keep fumes and gases away from the breathing zone. **When welding with electrodes which require special ventilation such as stainless or hard facing (see instructions on container or MSDS) 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. In confined spaces or in some circumstances, outdoors, a respirator may 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.

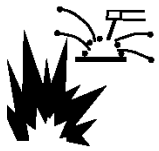
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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 material safety data sheet (MSDS) and follow your employer's safety practices. MSDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



6.a. Remove fire hazards from the welding area. If this is not possible, cover them to prevent the welding sparks from starting a fire. Remember that welding sparks and hot materials from welding can easily go through small cracks and openings to adjacent areas. Avoid welding near hydraulic lines. Have a fire extinguisher readily available.

6.b. Where compressed gases are to be used at the job site, special precautions should be used to prevent hazardous situations. Refer to "Safety in Welding and Cutting" (ANSI Standard Z49.1) and the operating information for the equipment being used.

6.c. When not welding, make certain no part of the electrode circuit is touching the work or ground. Accidental contact can cause overheating and create a fire hazard.

6.d. Do not heat, cut or weld tanks, drums or containers until the proper steps have been taken to insure that such procedures will not cause flammable or toxic vapors from substances inside. They can cause an explosion even though they have been "cleaned". For information, purchase "Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances", AWS F4.1 from the American Welding Society (see address above).

6.e. Vent hollow castings or containers before heating, cutting or welding. They may explode.

6.f. Sparks and spatter are thrown from the welding arc. Wear oil free protective garments such as leather gloves, heavy shirt, cuffless trousers, high shoes and a cap over your hair. Wear ear plugs when welding out of position or in confined places. Always wear safety glasses with side shields when in a welding area.

6.g. Connect the work cable to the work as close to the welding area as practical. Work cables connected to the building framework or other locations away from the welding area increase the possibility of the welding current passing through lifting chains, crane cables or other alternate circuits. This can create fire hazards or overheat lifting chains or cables until they fail.

6.h. Also see item 1.c.

6.I. Read and follow NFPA 51B " Standard for Fire Prevention During Welding, Cutting and Other Hot Work", available from NFPA, 1 Batterymarch Park, PO box 9101, Quincy, Ma 022690-9101.

6.j. Do not use a welding power source for pipe thawing.

CYLINDER MAY EXPLODE IF DAMAGED.

7.a. Use only compressed gas cylinders containing the correct shielding gas for the process used and properly operating regulators designed for the gas and pressure used. All hoses, fittings, etc. should be suitable for the application and maintained in good condition.

7.b. Always keep cylinders in an upright position securely chained to an undercarriage or fixed support.

7.c. Cylinders should be located:

- Away from areas where they may be struck or subjected to physical damage.
- A safe distance from arc welding or cutting operations and any other source of heat, sparks, or flame.

7.d. Never allow the electrode, electrode holder or any other electrically "hot" parts to touch a cylinder.

7.e. Keep your head and face away from the cylinder valve outlet when opening the cylinder valve.

7.f. Valve protection caps should always be in place and hand tight except when the cylinder is in use or connected for use.

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-I, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association 1235 Jefferson Davis Highway, Arlington, VA 22202.

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.

Welding Safety Interactive Web Guide for mobile devices

ELECTROMAGNETIC COMPATABILITY (EMC)

CONFORMANCE

Products displaying the CE mark are in conformity with European Community Council Directive of 3 May 1989 on the approximation of the laws of the Member States relating to electromagnetic compatibility (89/336/EEC). It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

INTRODUCTION

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

INSTALLATION AND USE

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

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

ASSESSMENT OF AREA

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

a. other supply cables, control cables, signaling and telephone cables; above, below and adjacent to the welding equipment;

b. radio and television transmitters and receivers;

c. computer and other control equipment;

d. safety critical equipment, e.g., guarding of industrial equipment;

e. the health of the people around, e.g., the use of pacemakers and hearing aids;

f. equipment used for calibration or measurement

g. the immunity of other equipment in the environment. The user shall ensure that other equipment being used in the environment is compatible. This may require additional protection measures;

h. the time of day that welding or other activities are to be carried out.

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

METHODS OF REDUCING EMISSIONS

Mains Supply

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

Maintenance of the Welding Equipment

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

Welding Cables

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

Equipotential Bonding

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

Earthing of the Workpiece

Where the workpiece is not bonded to earth for electrical safety, not connected to earth because of its size and position, e.g., ships hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the work piece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the work piece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding

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

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

As a rule of thumb, for many mild steel electrode, if the air is visibly clear and you are comfortable, then the ventilation is generally adequate for your work. The most accurate way to determine if the worker exposure does not exceed the applicable exposure limit for compounds in the fumes and gases is to have an industrial hygienist take and analyze a sample of the air you are breathing. This is particularly important if you are welding with stainless, hardfacing or Special Ventilation products. All Lincoln MSDS have a maximum fume guideline number. If exposure to total fume is kept below that number, exposure to all fume from the electrode (not coatings or plating on the work) will be below the TLV.

There are steps that you can take to identify hazardous substances in your welding environment. Read the product label and material safety data sheet for the electrode posted in the work place or in the electrode or flux container to see what fumes can be reasonably expected from use of the product and to determine if special ventilation is needed. Secondly, know what the base metal is and determine if there is any paint, plating, or coating that could expose you to toxic fumes and/or gases. Remove it from the metal being welded, if possible. If you start to feel uncomfortable, dizzy or nauseous, there is a possibility that you are being overexposed to fumes and gases, or suffering from oxygen deficiency. Stop welding and get some fresh air immediately. Notify your supervisor and co-workers so the situation can be corrected and other workers can avoid the hazard. Be sure you are following these safe practices, the consumable labeling and MSDS to improve the ventilation in your area. Do not continue welding until the situation has been corrected.

NOTE: The MSDS for all Lincoln consumables is available on Lincoln's web-site: www.lincolnelectric.com

Before we turn to the methods available to control welding fume exposure, you should understand a few basic terms:

Natural Ventilation is the movement of air through the workplace caused by natural forces. Outside, this is usually the wind. Inside, this may be the flow of air through open windows and doors.

Mechanical Ventilation is the movement of air through the workplace caused by an electrical device such as a portable fan or permanently mounted fan in the ceiling or wall.

Source Extraction (Local Exhaust) is a mechanical device used to capture welding fume at or near the arc and filter contaminants out of the air.

The ventilation or exhaust needed for your application depends upon many factors such as:

- Workspace volume
- Workspace configuration
- Number of welders
- Welding process and current
- Consumables used (mild steel, hardfacing, stainless, etc.)
- Allowable levels (TLV, PEL, etc.)
- Material welded (including paint or plating)
- Natural airflow

Your work area has adequate ventilation when there is enough ventilation and/or exhaust to control worker exposure to hazardous materials in the welding fumes and gases so the applicable limits for those materials is not exceeded. See chart of TLV and PEL for Typical Electrode Ingredients, the OSHA PEL (Permissible Exposure Limit), and the recommended guideline, the ACGIH TLV (Threshold Limit Value), for many compounds found in welding fume.

Ventilation

There are many methods which can be selected by the user to provide adequate ventilation for the specific application. The following section provides general information which may be helpful in evaluating what type of ventilation equipment may be suitable for your application. When ventilation equipment is installed, you should confirm worker exposure is controlled within applicable OSHA PEL and/or ACGIH TLV. According to OSHA regulations, when welding and cutting (mild steels), natural ventilation is usually considered sufficient to meet requirements, provided that:

1. The room or welding area contains at least 10,000 cubic feet (about 22' x 22' x 22') for each welder.
2. The ceiling height is not less than 16 feet.
3. Cross ventilation is not blocked by partitions, equipment, or other structural barriers.
4. Welding is not done in a conned space.

Spaces that do not meet these requirements should be equipped with mechanical ventilating equipment that exhausts at least 2000 CFM of air for each welder, except where local exhaust hoods or booths, or air-line respirators are used.

Important Safety Note:

When welding with electrodes which require special ventilation such as stainless or hardfacing (see instructions on container or MSDS) or on lead or cadmium plated steel and other metals or coatings which produce hazardous fumes, keep exposure as low as possible and below exposure limit values (PEL and TLV) for materials in the fume using local exhaust or mechanical ventilation. In conned spaces or in some circumstances, for example outdoors, a respirator may be required if exposure cannot be controlled to the PEL or TLV. (See MSDS and chart of TLV and PEL for Typical Electrode Ingredients.) Additional precautions are also required when welding on galvanized steel.

BIBLIOGRAPHY AND SUGGESTED READING

ANSI Z87.1, Practice for Occupational and Educational Eye and Face Protection, American National Standards Institute, 11 West 42nd Street, New York, NY 10036.

Arc Welding and Your Health: A Handbook of Health Information for Welding. Published by The American Industrial Hygiene Association, 2700 Prosperity Avenue, Suite 250, Fairfax, VA 22031-4319.

NFPA Standard 51B, Cutting and Welding Processes, National Fire Protection Association, 1 Batterymarch Park, P.O. Box 9146, Quincy, MA 02269-9959.

OSHA General Industry Standard 29 CFR 1910 Subpart Q. OSHA Hazard Communication Standard 29 CFR 1910.1200. Available from the Occupational Safety and Health Administration at http://www.osha.org or contact your local OSHA office.

The following publications are published by The American Welding Society, P.O. Box 351040, Miami, Florida 33135. AWS publications may be purchased from the American Welding society at http://www.aws.org or by contacting the AWS at 800-443-9353.

ANSI, Standard Z49.1, Safety in Welding, Cutting and Allied Processes. Z49.1 is now available for download at no charge at http://www.lincolnelectric.com/community/safety/ or at the AWS website http://www.aws.org.

AWS F1.1, Method for Sampling Airborne Particulates Generated by Welding and Allied Processes.

AWS F1.2, Laboratory Method for Measuring Fume Generation Rates and Total Fume Emission of Welding and Allied Processes.

AWS F1.3, Evaluating Contaminants in the Welding Environment: A Strategic Sampling Guide.

AWS F1.5, Methods for Sampling and Analyzing Gases from Welding and Allied Processes.

AWS F3.2, Ventilation Guide for Welding Fume Control.

AWS F4.1, Recommended Safe Practices for the Preparation for Welding and Cutting of Containers and Piping That Have Held Hazardous Substances.

AWS SHF, Safety and Health Facts Sheets. Available free of charge from the AWS website at http://www.aws.org.

LISTED BELOW ARE SOME TYPICAL INGREDIENTS IN WELDING ELECTRODES AND THEIR TLV (ACGIH) GUIDELINES AND PEL (OSHA) EXPOSURE LIMITS

INGREDIENTS	CAS No.	TLV mg/m$_3$	PEL mg/m$_3$
Aluminum and/or aluminum alloys (as Al)*****	7429-90-5	10	15
Aluminum oxide and/or Bauxite*****	1344-28-1	10	5**
Barium compounds (as Ba)*****	513-77-9	****	****
Chromium and chromium alloys or compounds (as Cr)*****	7440-47-3	0.5(b)	.005(b)
Fluorides (as F)	7789-75-5	2.5	2.5
Iron	7439-89-6	10*	10*
Limestone and/or calcium carbonate	1317-65-3	10	15
Lithium compounds (as Li)	554-13-2	10*	10*
Magnesite	1309-48-4	10	15
Magnesium and/or magnesium alloys and compounds (as Mg)	7439-95-4	10*	10*
Manganese and/or manganese alloys and compounds (as Mn)*****	7439-96-5	0.2	5.0(c)
Mineral silicates	1332-58-7	5**	5**
Molybdenum alloys (as Mo)	7439-98-7	10	10
Nickel*****	7440-02-0	1.5	1
Silicates and other binders	1344-09-8	10*	10*
Silicon and/or silicon alloys and compounds (as Si)	7440-21-3	10*	10*
Strontium compounds (as Sr)	1633-05-2	10*	10*
Zirconium alloys and compounds (as Zr)	12004-83-0	5	5

Supplemental Information:

(*) Not listed. Nuisance value maximum is 10 milligrams per cubic meter. PEL value for iron oxide is 10 milligrams per cubic meter. TLV value for iron oxide is 5 milligrams per cubic meter.

(**) As respirable dust.

(*****) Subject to the reporting requirements of Sections 311, 312, and 313 of the Emergency Planning and Community Right-to-Know Act of 1986 and of 40CFR 370 and 372.

(b) The PEL for chromium (VI) is .005 milligrams per cubic meter as an 8 hour time weighted average. The TLV for water-soluble chromium (VI) is 0.05 milligrams per cubic meter. The TLV for insoluble chromium (VI) is 0.01 milligrams per cubic meter.

c) Values are for manganese fume. STEL (Short Term Exposure Limit) is 3.0 milligrams per cubic meter. OSHA PEL is a ceiling value.

(****) There is no listed value for insoluble barium compounds. The TLV for soluble barium compounds is 0.5 mg/m3.

TLV and PEL values are as of April 2006. Always check Material Safety Data Sheet (MSDS) with product or on the Lincoln Electric website at http://www.lincolnelectric.com

MASTER TABLE OF CONTENTS FOR ALL SECTIONS

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- THEORY OF OPERATION SECTION -

Figure A.1 - Block logic diagram

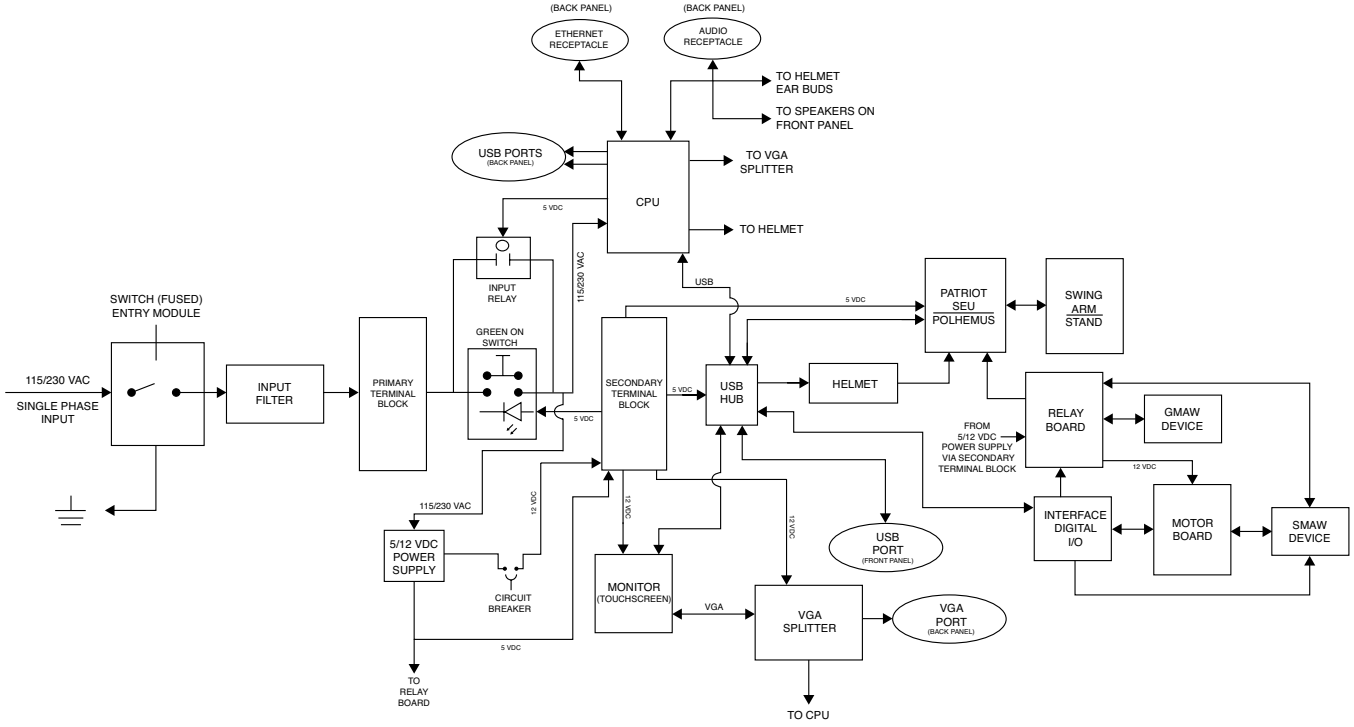
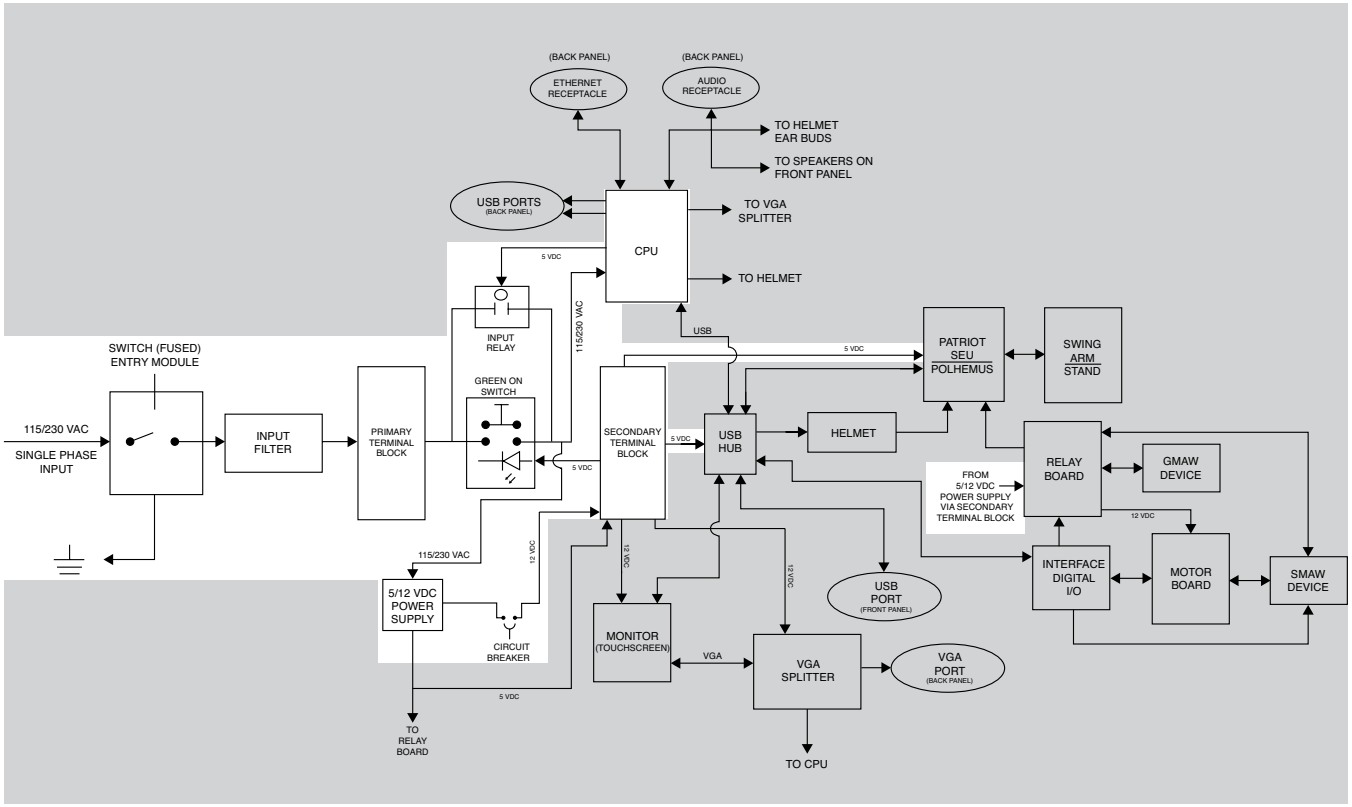


Figure A.2 - Input power & distribution



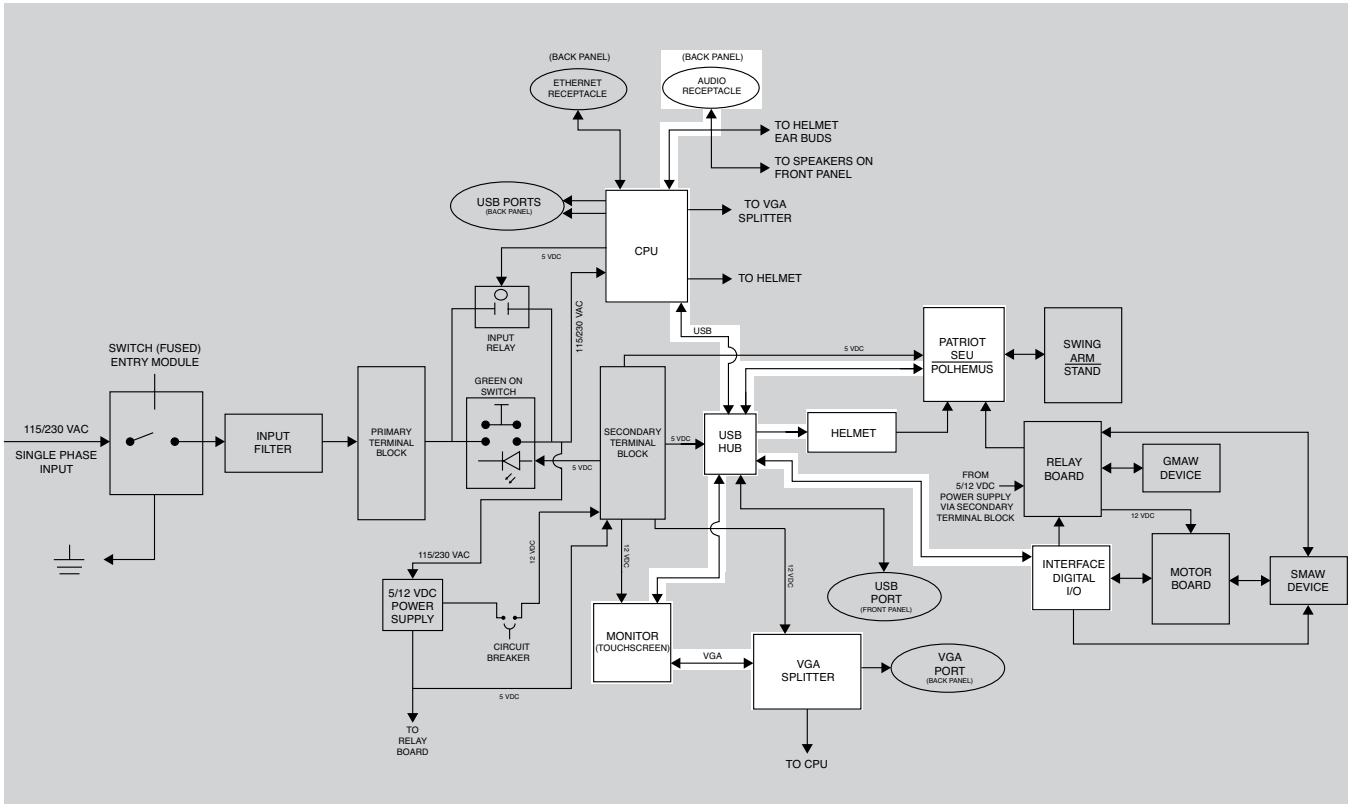
INPUT POWER & DISTRIBUTION

The single phase input power (115-230VAC) is applied to a switched (fused) entry module and continues on to an input filter and a primary terminal block. From the primary terminal block, the input power is then applied through the input relay to two components. The CPU and the 5VDC/12VDC Power Supply. These components rectify the AC input and regulate the resultant DC voltage to operate the internal electronics of the VRTEX 360. When the CPU has been energized, the momentary “ON” switch is bypassed by the input relay. The 5VDC created by the CPU is applied to the input relay. The 5VDC/12VDC Power Supply applies power to the Secondary Terminal Block. The 5VDC is direct, while The 12VDC is routed through a circuit breaker.

From the Secondary Terminal Block, 5VDC is applied to the green ON switch, Relay Board, Patriot SEU Module and the USB Hub, while 12VDC is applied to the touchscreen Monitor and VGA Splitter and Relay Board.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

Figure A.3 - Computer assembly (CPU), USB hub, monitor & video/audio components

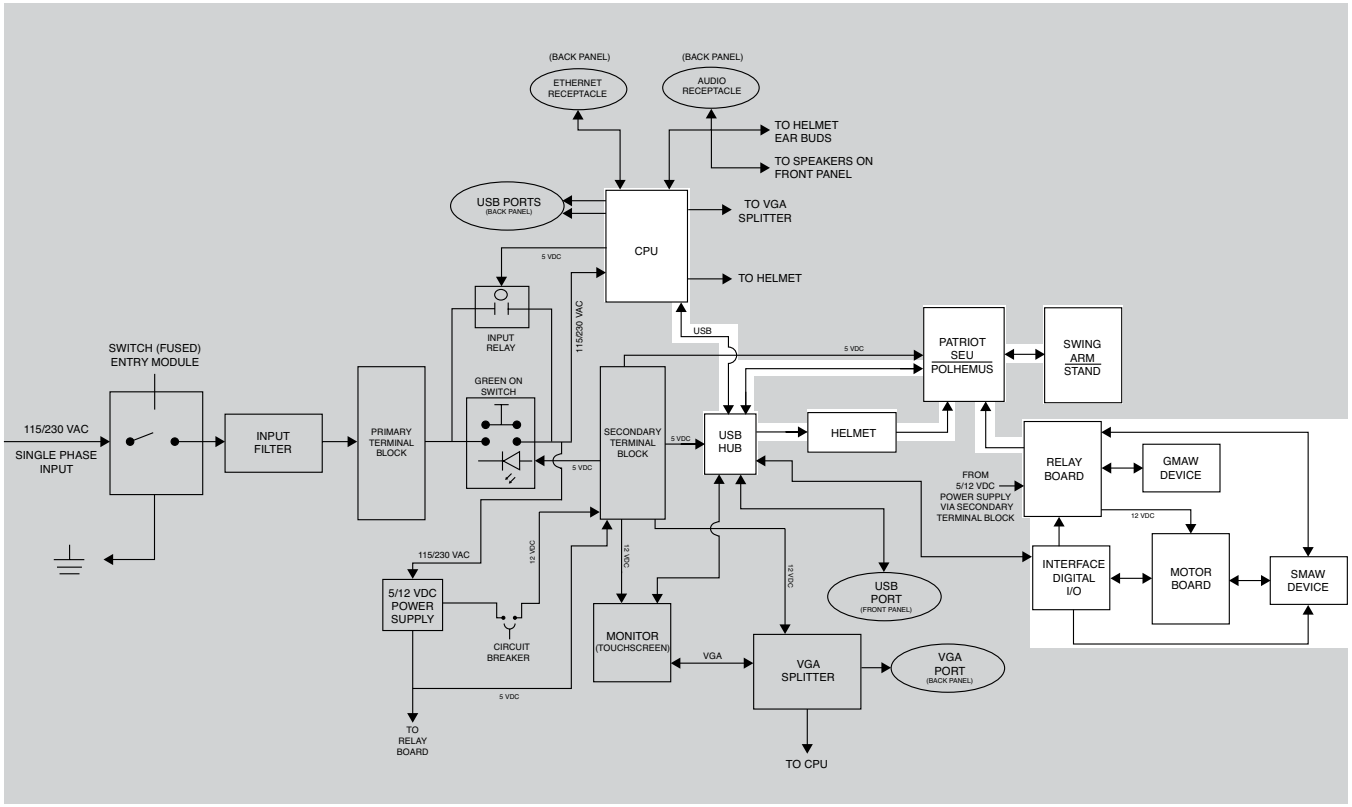


COMPUTER ASSEMBLY (CPU), USB HUB, MONITOR & VIDEO/AUDIO COMPONENTS

Once the CPU is powered up it becomes the main information processing component of the VRTEX 360. The CPU receives signals from the USB Hub. These commands originate from the touchscreen Monitor, Interface Digital I/O and various USB connections. The CPU processes these commands and sends feedback signals to the USB Hub and associated components. The CPU receives real-time feedback signals from the Patriot SEU Module (via the USB Hub) and compares them to the commands and procedure selections set forth from the touchscreen Monitor. This processed video and audio information is then sent to the VGA Splitter and the Helmet. Audio information is also sent to the Audio Receptacle.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

Figure A.4 - Patriot SEU Module, swing arm stand, helmet, relay board and welding devices



PATRIOT SEU MODULE, SWING ARM STAND, HELMET, RELAY BOARD AND WELDING DEVICES

The Relay Board receives feedback from the welding devices and sends the information to Patriot SEU Module. The Patriot SEU Module processes feedback signals it receives from the Relay Board, Swing Arm Stand and Helmet. The USB Hub provides interactive performance information to the CPU. The Welding Devices and the Swing Arm Stand interact through magnetic signals.

The Relay Board receives user procedure selections from the Interface Digital I/O. The Relay PC Board then activates either the Mig Gun Device or the Stick Electrode Device (SMAW) and interacts with the Patriot SEU Module to provide virtual welding feed back information to the CPU. When the (SMAW) Device is selected, the Motor Board is commanded by the Interface Digital I/O to retract the magnetic electrode to simulate the consumption of a stick electrode.

NOTE: Unshaded areas of Block Logic Diagram are the subject of discussion.

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HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

Service and repair should be performed by only 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. Symptoms are grouped into two main categories: Function Problems and Power-Up Problems.

Step 2. PERFORM EXTERNAL TESTS. The second column, labeled "POSSIBLE AREAS OF MISADJUSTMENT(S)", lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case cover.

Step 3. PERFORM COMPONENT TESTS. The last column, labeled "Recommended Course of Action" lists the most likely components that may have failed in your machine. It also specifies the appropriate test procedure to verify that the subject component is either good or bad. If there are a number of possible components, check the components in the order listed to eliminate one possibility at a time until you locate the cause of your problem.

All of the referenced test procedures referred to in the Troubleshooting Guide are described in detail at the end of this section. Refer to the Troubleshooting and Repair Table of Contents to locate each specific Test Procedure. All of the referred to test points, components, terminal strips, etc., can be found on the referenced electrical wiring diagrams and schematics. Refer to the Electrical Diagrams Section Table of Contents to locate the appropriate diagram.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

PC BOARD TROUBLESHOOTING PROCEDURES

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Have an electrician install and service this equipment. Turn the input power OFF at the fuse box before working on equipment. Do not touch electrically hot parts.**

⚠ CAUTION

Sometimes machine failures appear to be due to PC board failures. These problems can sometimes be traced to poor electrical connections. To avoid problems when trouble-shooting and replacing PC boards, please use the following procedure:

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock. Read the warning inside the static resistant bag and perform the following procedures:

PC board can be damaged by static electricity.

- Remove your body's static charge before opening the static-shielding bag. Wear an anti-static wrist strap. For safety, use a 1 Meg ohm resistive cord connected to a grounded part of the equipment frame.
- If you don't have a wrist strap, touch an un-painted, grounded, part of the equipment frame. Keep touching the frame to prevent static build-up. Be sure not to touch any electrically live parts at the same time.

ATTENTION

Static-Sensitive Devices Handle only at Static-Safe Workstations

Reusable Container Do Not Destroy

- Tools which come in contact with the PC board must be either conductive, anti-static or static-dissipative.
- Remove the PC board from the static-shielding bag and place it directly into the equipment. Don't set the PC board on or near paper, plastic or cloth which could have a static charge. If the PC board can't be installed immediately, put it back in the static-shielding bag.
- If the PC board uses protective shorting jumpers, don't remove them until installation is complete.
- If you return a PC board to The Lincoln Electric Company for credit, it must be in the static-shielding bag. This will prevent further damage and allow proper failure analysis.

4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

NOTE: It is desirable to have a spare (known good) PC board available for PC board troubleshooting.

NOTE: Allow the machine to heat up so that all electrical components can reach their operating temperature.

5. Remove the replacement PC board and substitute it with the original PC board to recreate the original problem.
    a. If the original problem does not reappear by substituting the original board, then the PC board was not the problem. Continue to look for bad connections in the control wiring harness, junction blocks and terminal strips.
    b. If the original problem is recreated by the substitution of the original board, then the PC board was the problem. Reinstall the replacement PC board and test the machine.
6. Always indicate that this procedure was followed when warranty reports are to be submitted.

NOTE: Following this procedure and writing on the warranty report, "INSTALLED AND SWITCHED PC BOARDS TO VERIFY PROBLEM," will help avoid denial of legitimate PC board warranty claims.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
There is jitter, shake or wobble in the helmet display and monitor.	1. Make sure the helmet is close to the work piece. The further the helmet is from the work piece the more jitter there may be in the helmet display. Also make sure there are not other objects or high frequency sources that are interfering with the system. See the ***Installation*** section of this manual. 2. Local interference such as fluorescent lights, large metallic objects and/or high frequencies.	1. Check SEN 2 connection from Patriot SEU module to helmet. See Wiring Diagram. 2. Check source connector from swing arm to Patriot SEU module. See Wiring Diagram. 3. Perform the ***Patriot SEU Module Test***. 4. If still error, contact Lincoln Electric Automation Department at 1-888-935-3878.
Holding the green button in does not shut down the VRTEX 360.	1. Holding the green button in does not shut down the VRTEX 360. This is normal.	1. Select “Menu” icon, select “Shutdown” and “Yes”. The system will begin to shutdown. 2. If still error, contact Lincoln Electric Automation Department at 1-888-935-3878.
The student reports are not accessible.	1. “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. The student report will be saved when new coupon is selected. 2. Note that some configurations only have one pass capabilities. See the Lincoln default tolerances.	1. The student reports can only be saved via the USB port on the VRTEX 360. 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 no available memory on the USB stick, the student reports will not be saved.

⚠ CAUTION

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Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
Some or none of the welding parameters, defects or discontinuities are graphing on the LASER screen.	1. These features may be turned off. Touch to select the desired features. Also, make sure that you are on a currently welded pass.	1. If still error, contact Lincoln Electric Automation Department at 1-888-935-3878.
The user is not sure which tolerances they are using.	1. Go to the instructor mode to change tolerances. Go to the login screen, select the key icon, enter pass code and select tolerances to verify tolerance set. See the ***Operation*** section of this manual.	1. If still error, contact Lincoln Electric Automation Department at 1-888-935-3878.
The VRTEX 360 does not function correctly in the VR GMAW mode. It works correctly in the VR SMAW (stick) mode.	1. Make sure the correct welding procedures are set. 2. Make sure welding on the proper side of coupon. 3. Make sure the VR GMAW device is connected properly.	1. Check the VR GMAW trigger connector for a loose or faulty connection SEN 3. See Wiring Diagram. 2. Perform the ***VR GMAW/FCAW (MIG) Device Test***. 3. The relay PC board may be faulty. 4. The VR GMAW device may be faulty.
VR SMAW (stick) device is not functioning properly.	1. Faulty connections between device and USB digital I/O device. 2. Faulty USB digital I/O device. 3. Faulty VR SMAW (stick) device.	1. Check for loose or faulty connections between the VR SMAW (stick) device and relay board. 2. Perform the ***USB Digital I/O Module Test*** and ***USB Digital I/O Module Settings Verification Procedure***. 3. Perform the ***VR SMAW (Stick) Device Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
No image on monitor. Monitor does not turn on.	1. Make sure the monitor power button is ON. See ***Figure 29***. 2. Check all cable connections at the monitor. 3. Make sure helmet (FMD) backlight is ON.	1. Check for 12 VDC at leads 901B(+) to 701D(–). If the 12 VDC is not present check the associated wiring and perform the ***5/12 VDC Power Supply Test***. 2. If the 12 VDC is present at the monitor and the monitor DOES NOT turn on the monitor may be faulty. 3. Check to make sure that VGA/DVI connections are secured on the CPU. 4. Connect a different VGA cable from the touchscreen monitor to the VGA 6 port on the back of the machine. See Wiring Diagram. 5. Perform the ***VGA Splitter Test***. 6. The CPU may be faulty (i.e., graphics card faulty).
No audio - speakers, earbuds (helmet) and caseback port.	1. Make sure the audio cables are plugged in. See Wiring Diagram. 2. Make sure the volume is UP in the sound option (instructor mode).	1. Audio cables may be faulty. 2. Speakers may be faulty. 3. Earbuds may be faulty.
As viewed through the helmet and the monitor, the entire stand assembly appears in the middle of the screen and the environment does not move.	1. Restart VRTEX 360. 2. Verify Patriot SEU module switch is on. 3. Verify USB 3 cable is connected to Patriot SEU module and to USB 3 on the USB hub. See the Wiring Diagram.	1. Check all cables and leads to the Patriot SEU module for loose or faulty connections. 2. See ***Hardware Initialization (PIMAN.EXE) Procedure***. 3. Perform the ***Patriot SEU Module Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
All of the user interface icons and indicators do not function. The machine powers up.	1. Cables not properly connected to monitor. 2. Touchscreen monitor not calibrated properly. 3. See the ***Touchscreen Monitor Calibration Procedure***.	1. Check for loose or faulty connections (USB cable) between the CPU, USB hub and monitor. See Wiring Diagram. 2. Make sure the USB hub is receiving 5 VDC from the 5/12 VDC power supply. See the Wiring Diagram. 3. The CPU may be faulty.
Some of the user interface icon controls and/or indicators do not function.	1. Touchscreen monitor not calibrated properly. 2. Possible software issues.	1. Perform the ***Touchscreen Monitor Calibration Procedure***. 2. Contact the Lincoln Electric Automation Department at 1-888-935-3878.
The user is not receiving any visual feedback information in the helmet.	1. Make sure the helmet is connected properly. 2. Make sure the software is in the virtual environment stage. (If not in virtual environment, back light in helmet should be lit, but no image will appear).	1. Restart machine. 2. Check the connections at USB 6 on the USB hub and the helmet. See the Wiring Diagram. 3. Check the DVI 1 connection on CPU. See Wiring Diagram.
Machine powers up, but login screen does not appear correctly on the monitor.	1. Cables not properly connected. 2. CMOS battery may be faulty.	1. Check for loose or faulty connections. 2. Perform the ***CMOS Battery Removal And Replacement Procedure***. 3. Perform the ***BIOS Setup Procedure***. 4. Perform the ***NVIDIA Control Panel Setup Procedure***. 5. Perform the ***Uninstall NVIDIA Programs Procedure***.

⚠ CAUTION

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Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
When the check settings are activated the incorrect settings appear.	1. Make sure all of the settings are correct for the process and parameters being used. Check for the acceptable ranges for the Lincoln defaults. 2. Check the tolerance settings in the instructor mode.	1. If still error, contact Lincoln Electric Automation Department at 1-888-935-3878.
The weld coupon arm or table image is a different configuration than the physical coupon.	1. Either the wrong coupon is on the stand or the wrong configuration has been selected in the software. 2. Press the menu icon and select change coupon type. Change the software selections so that the images on the screen match the coupon and stand position you are using. 3. The system may be located near large metal objects.	1. See ***Operation*** section.

⚠ CAUTION

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Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
POWER-UP PROBLEMS		
The VRTEX 360 does not start up when the green circular button is pressed.	1. Make sure the correct input power is being applied to the machine. 2. Be sure to hold the green circular button in for at least 5 seconds. 3. Check the input cord for loose or faulty connections at the machine and at the plug. 4. Verify fused power switch is in the ON position. If faulty, replace with 10 amp 250 volt fuses. 5. If the green circular button does not stay on, remove the plug button 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 B.1*** and ***B.2***. 6. Check 10 amp circuit breaker at rear of machine. Reset if tripped. 7. Possible drained or faulty CMOS battery.	1. Carefully check for the correct input voltage at lead 501A on the primary terminal block and lead 601A on the grey terminal block. See the Wiring Diagram. (115 / 230VAC) 2. If the correct voltage is not present check the continuity of leads 501A and 601A. See Wiring Diagram. 3. If the correct voltage is not present at the terminal blocks (leads 501A to 601A) check the functionality of the fused power switch. See the Wiring Diagram. Perform the ***Input Filter Board Test***. 4. Check for the correct input voltage at the CPU (leads 502C to 601B) when the green “ON” button is pressed. If the correct voltage is present at leads 502C to 601B check for 5 VDC at leads 801D(+) to 701F(–). 5. If the correct input voltage is present at leads 501A to 601A, check to see if the correct input voltage is present at the 5/12 VDC power supply when the green “ON” button is pressed. See Wiring Diagram. (Leads 502D to 601C). 6. If the correct input voltage is present at leads 502D to 601C at the 5/12 VDC power supply, perform the ***5/12 VDC Power Supply Test***. 7. If the correct input voltage is being applied to the CPU and the VRTEX 360 does not power-up the CPU may be faulty. 8. Perform the ***CPU Test***. 9. Perform the ***CMOS Battery Removal and Replacement Procedure***.

⚠ CAUTION

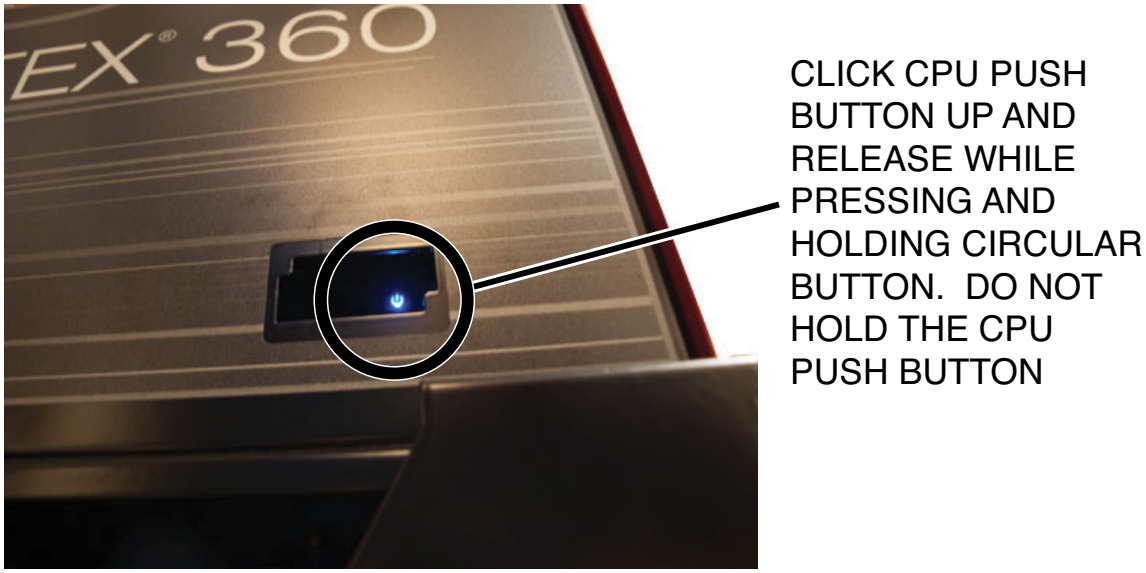
If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

Figure B.1 – Plug location

Figure B.2 – CPU push button



⚠ CAUTION

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Observe Safety Guidelines detailed in the beginning of this manual.

TROUBLESHOOTING GUIDE

PROBLEMS (SYMPTOMS)	POSSIBLE AREAS OF MISADJUSTMENT(S)	RECOMMENDED COURSE OF ACTION
POWER-UP PROBLEMS		
The VRTEX 360 does not power up when the ON button is pressed. The green indicator light does come on but does NOT stay on when the ON Switch is released.	1. Make certain the correct input voltage is being applied to the VRTEX 360 (115/230 VAC). 2. If the green circular button light does not stay on, remove the plug button 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 B.1*** and ***B.2***.	1. With the ON button activated 5 VDC should be present at the input relay coil. Terminal A1 (801D+) to terminal A2 (701F–). See the Wiring Diagram. If not, go to step 5. 2. Check for loose or faulty connections between the input relay, the red terminal block and the ON button. Check leads 502A and 501C. See the Wiring Diagram. 3. If the 5 VDC is being applied to the input relay coil and the above mentioned connections and leads are OK the input relay coil may be faulty. Perform the ***Input Relay Test***. 4. If the 5 VDC is not present with the ON button pressed at terminals A1 (801D+) to A2 (701F–) check for loose or faulty connections between the input relay coil and the CPU. See the Wiring Diagram. 5. Perform the ***CPU Test***.
The green “ON” button blinks and the VRTEX 360 does not work properly.	1. Make sure the monitor leads are properly connected. See Wiring Diagram.	1. Perform the ***5/12 VDC Power Supply Test***.

⚠ CAUTION

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

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TEST DESCRIPTION

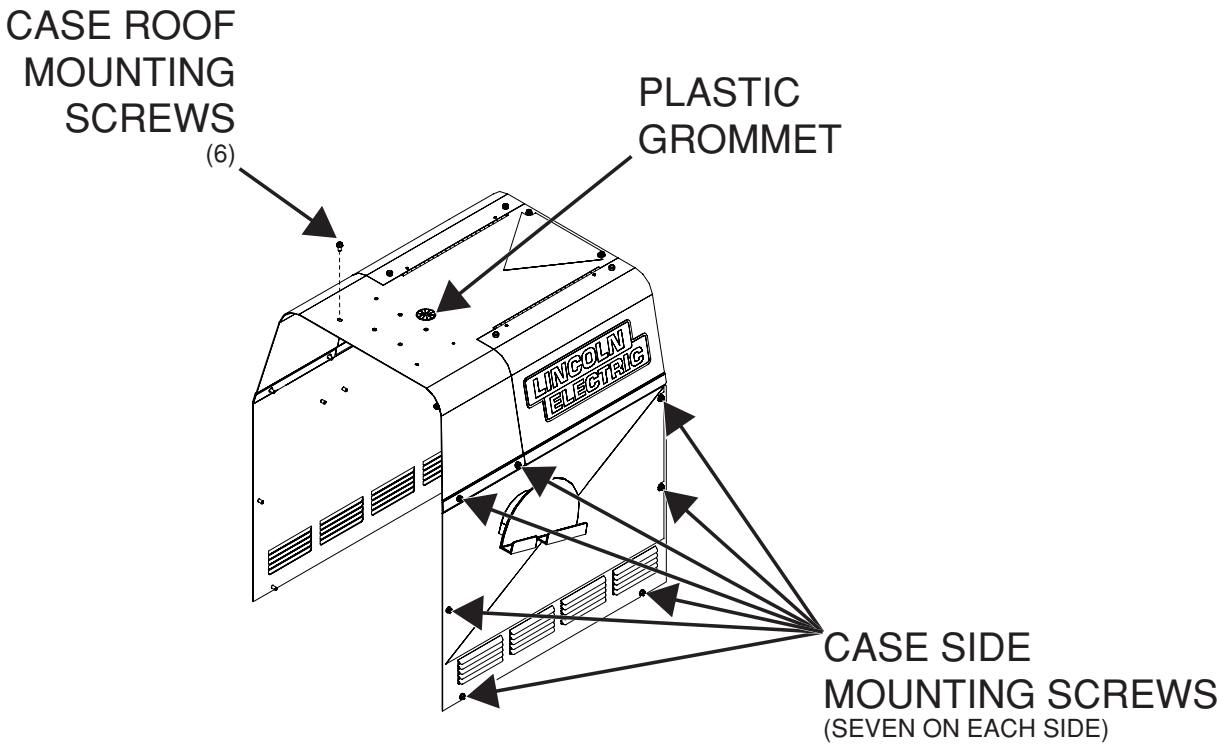
This procedure will aid the technician in the removal and replacement of the Case Covers.

MATERIALS NEEDED

3/8” Socket/Wrench

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.3 – Case cover mounting screw locations



REMOVAL PROCEDURE

1. Remove input power to the machine.

RIGHT CASE SIDE REMOVAL

1. Carefully remove the VR GMAW/FCAW device from the holder.
2. Using a 3/8” socket/wrench, remove the seven screws securing the right case side. See Figure B.3.

LEFT CASE SIDE REMOVAL

1. Carefully remove the VR SMAW device from the holder.
2. Using a 3/8” socket/wrench, remove the seven screws securing the left case side. See Figure B.3.

REAL PANEL ACCESS

1. Using a 3/8” socket/wrench, remove the two screws securing the rear panel. See ***Figure B.4***.
2. Lower rear panel to gain access to internal components.

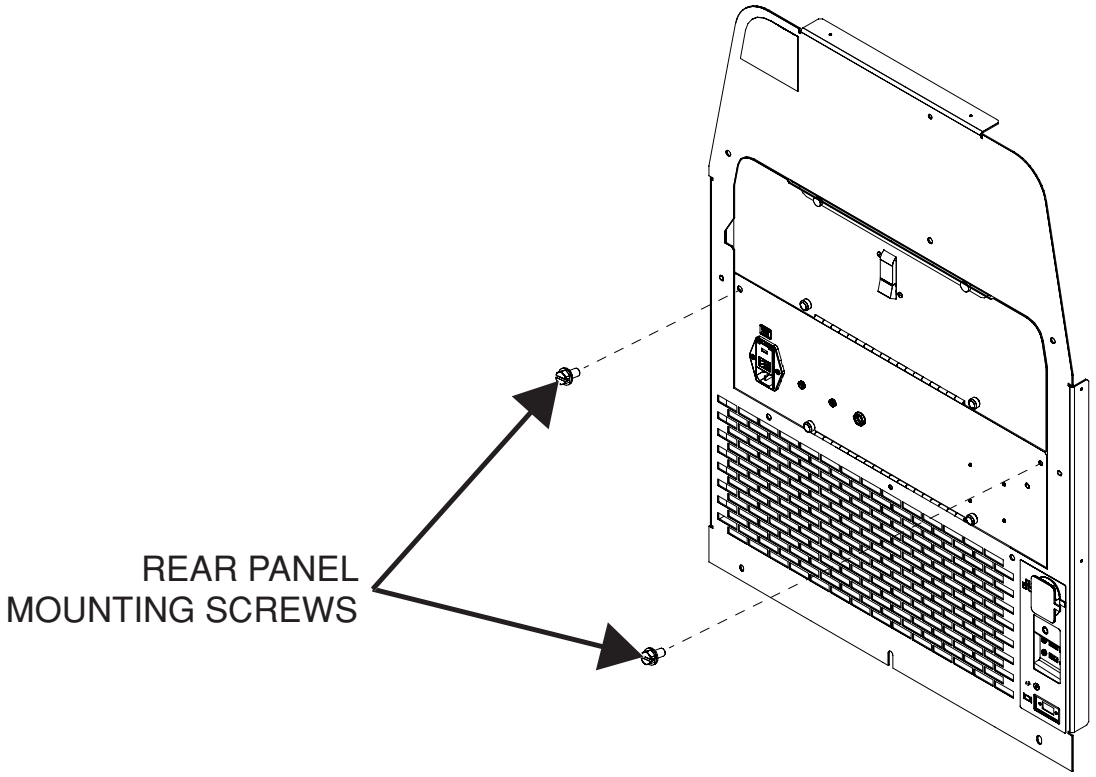
ROOF REMOVAL

NOTE: Roof removal is only necessary to replace damaged roof panels.

1. Perform the ***Monitor and Monitor Stand Removal Procedure***.
2. Using 3/8” socket/wrench, remove the six screws securing the case roof. See Figure B.3.
3. Remove the black plastic grommet securing the monitor cables to the roof. See Figure B.3.
4. Carefully remove roof from unit while negotiating wires and cables through the hole in the roof where grommet was removed.

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.4 – Rear panel access



REPLACEMENT PROCEDURE

1. Using a 3/8” socket/wrench, attach the seven screws securing the left case side to the machine.
2. Using a 3/8” socket/wrench, attach the seven screws securing the right case side to the machine.
3. Using a 3/8” socket/wrench, attach the two screws securing the rear panel to the machine.
4. Carefully negotiate monitor leads through the hole in case roof while setting in place.
5. Replace the previously removed black plastic grommet.
6. Using a 3/8” socket/wrench, attach the six screws securing the case roof to the machine.
7. Perform the ***Monitor and Monitor Stand Replacement Procedure***.

5/12 VDC POWER SUPPLY TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

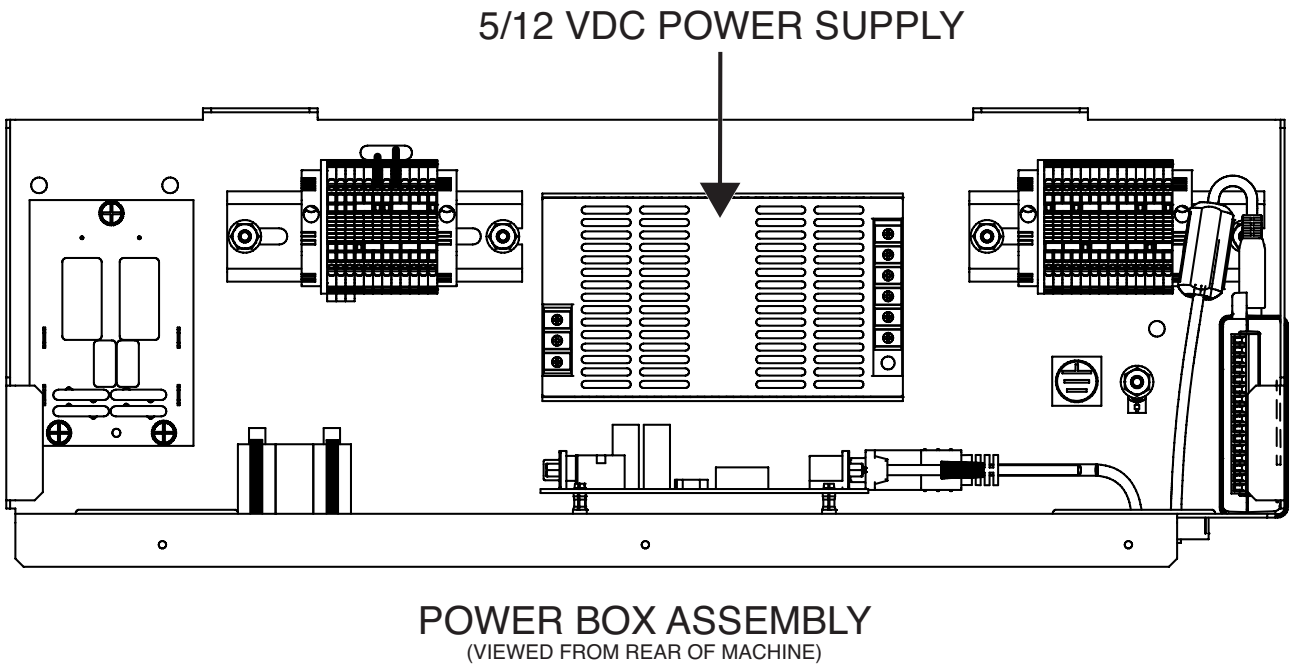
This procedure will aid the technician in determining if the 5/12 VDC Power Supply is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter

5/12 VDC POWER SUPPLY TEST *(continued)*

Figure B.5 – 5/12 VDC power supply test



PROCEDURE

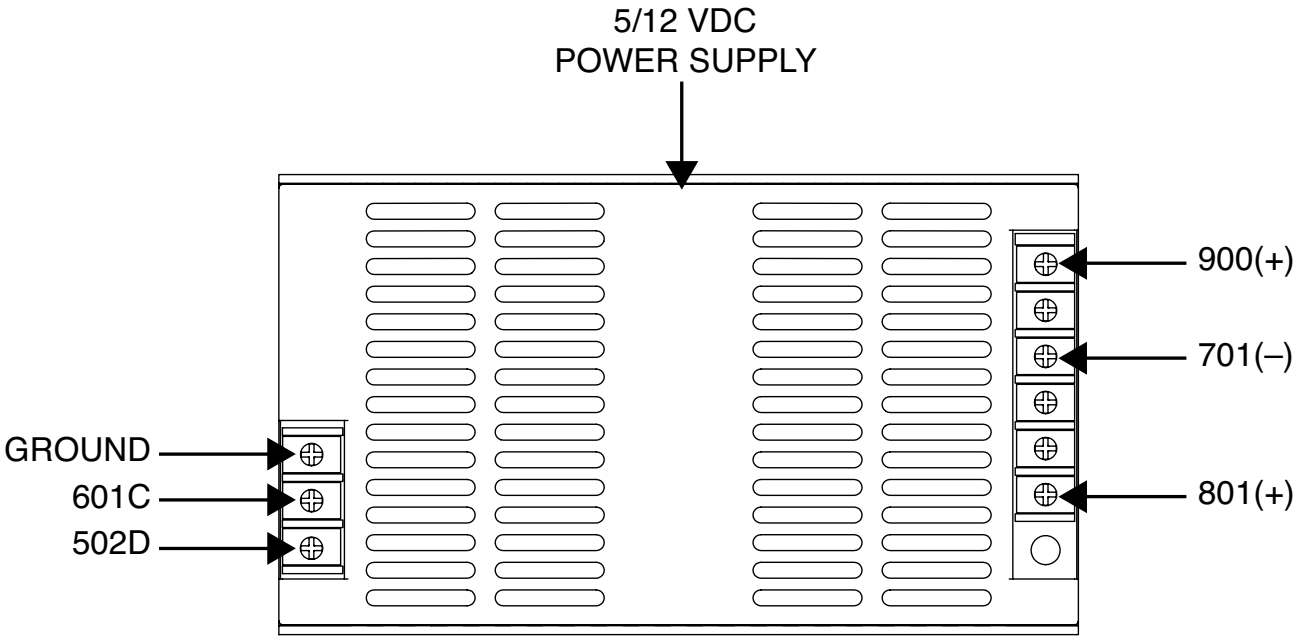
1. Perform the ***Case Cover Removal Procedure***, for rear panel access.
2. Locate the 5/12 VDC power supply. See Figure B.5.
3. Carefully apply the correct input voltage to the machine.
4. Locate leads 601C and 502D at the 5/12 VDC power supply. See ***Figure B.6***. See Wiring Diagram.
5. Check for the presence of line voltage at leads 601C and 502D. See ***Figure B.6***. See Wiring Diagram.

NOTE: Voltage should be present when the green "ON" button is pressed. This is the input power to the machine. If voltage is not present, check the voltage at the terminal blocks and the green "ON" button. See Wiring Diagram.

6. Check for 12 VDC from leads 701(-) to lead 900(+). See ***Figure B.6***. See Wiring Diagram.
7. Check for 5 VDC from leads 701(-) to lead 801(+). See ***Figure B.6***. See Wiring Diagram.
8. If the input voltage to the power supply is present from leads 601C to 502D and either the 5 VDC or the 12 VDC is not present, the 5/12 VDC power supply may be faulty.
9. If faulty, Perform the ***5/12 VDC Power Supply Removal and Replacement Procedure***.
10. Perform the ***Case Cover Replacement Procedure***.
11. Perform ***Retest After Repair Procedure***.

5/12 VDC POWER SUPPLY TEST *(continued)*

Figure B.6 – Power supply test points



INPUT FILTER BOARD TEST

⚠ WARNING

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If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

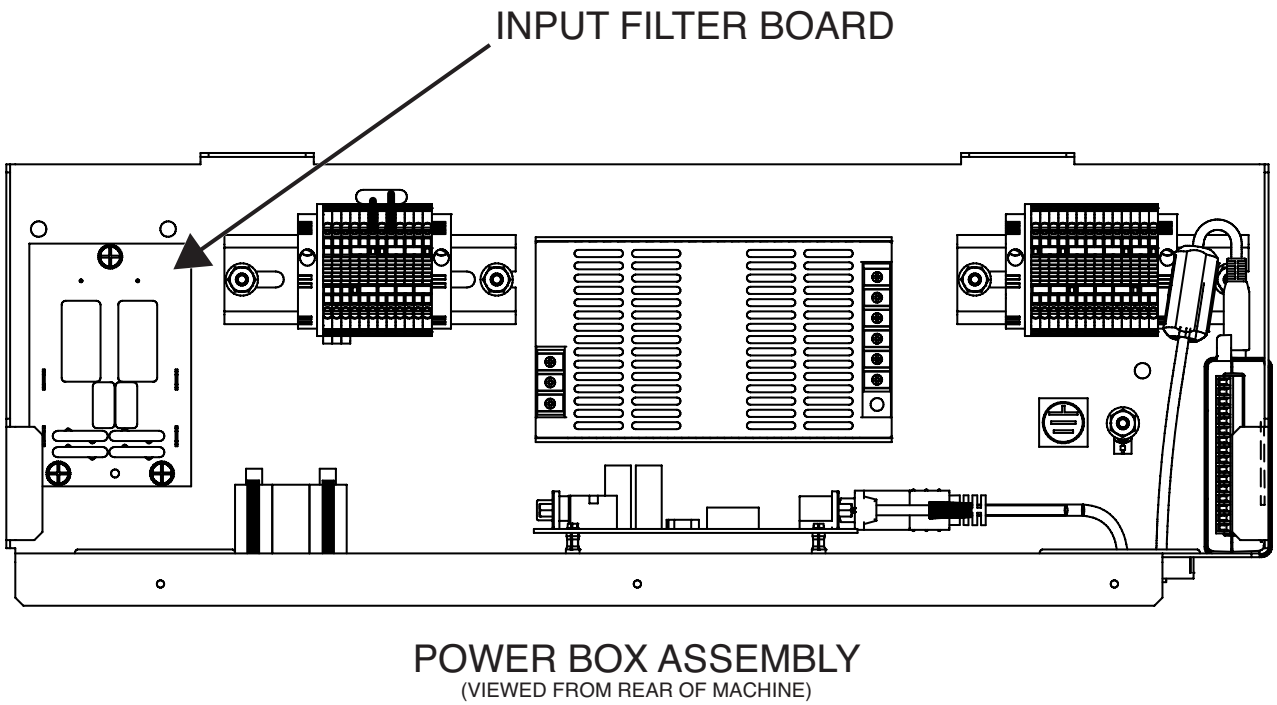
This procedure will aid the technician in determining if the Input Filter Board is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter

INPUT FILTER BOARD TEST *(continued)*

Figure B.7 – Input filter board location



PROCEDURE

1. Remove input power to the machine.
2. Make certain that the switched fused entry module (on/off switch) on the back of the machine is in the OFF (O) position.
3. Perform the ***Case Cover Removal Procedure***, for rear panel access.
4. Locate the input filter board. See Figure B.7.

NOTE: Make certain that the PC board mounting screws are tight. This will ensure that the mounting pads have good contact with the chassis.

5. Label and disconnect the four leads (601, 601A, 501 and 501A) from the input filter board. See ***Figure B.8***. See Wiring Diagram.
6. Check resistance from B1 or B4 to B2 or B3. It should be 530k Ohms. See ***Figure B.8***. See Wiring Diagram.
7. Use a capacitance meter that meets the following requirements:

FULL SCALE ACCURACY:	LESS THAN 1% ±1 DIGIT
RESOLUTION:	MINIMUM 3 DIGITS
nF RANGE DISPLAY:	MINIMUM OF 3 SIGNIFICANT DIGITS

8. Using a capacitance meter perform the capacitance and resistance tests. See ***Table B.1***.
9. If any of the resistance/capacitance tests fail, the input filter board may be faulty. Replace.
10. When testing is complete, reattach the four previously removed leads to terminals B1, B2, B3 and B4. See Wiring diagram.
11. Perform the ***Case Cover Replacement Procedure***.
12. Perform ***Retest After Repair Procedure***.
13. Make certain that the switched fused entry module (on/off switch) on the back of the machine is in the ON (-) position when attempting to power-up machine.

INPUT FILTER BOARD TEST *(continued)*

Figure B.8 – Input filter board leads

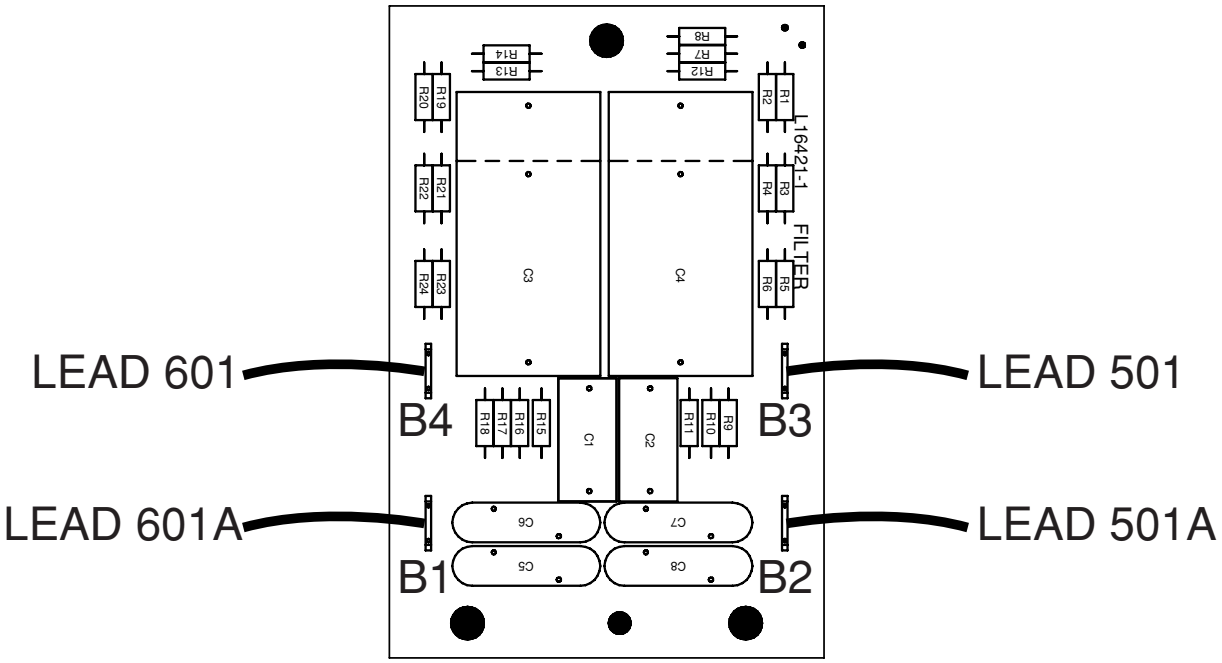


Table B.1 – Capacitance and resistance tests

DESCRIPTION	TEST POINT	TEST POINT	EXPECTED READING
Resistance Measurement	B1 OR B4	B2 OR B3	530,000 Ohms
Resistance Measurement	B2	B3	0 Ohms
Resistance Measurement	B1	B4	0 Ohms
Capacitance Measurement	B1 OR B4	Ground pad at mounting screw	39nF - 59nF
Capacitance Measurement	B2 OR B3	Ground pad at mounting screw	39nF - 59nF
Capacitance Measurement	B1 OR B4	B2 or B3	.880uF - 1.32uF

INPUT RELAY TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

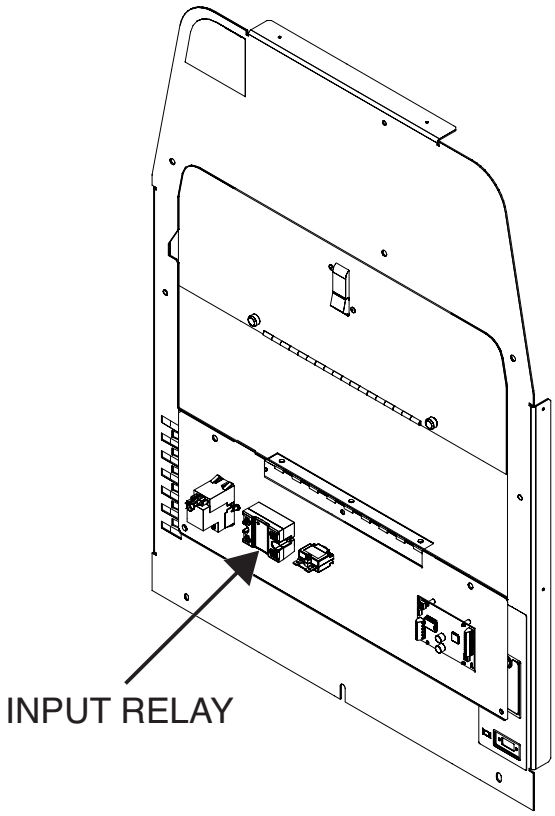
This procedure will aid the technician in determining if the Input Relay is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter

INPUT RELAY TEST *(continued)*

Figure B.9 – Input relay location



PROCEDURE

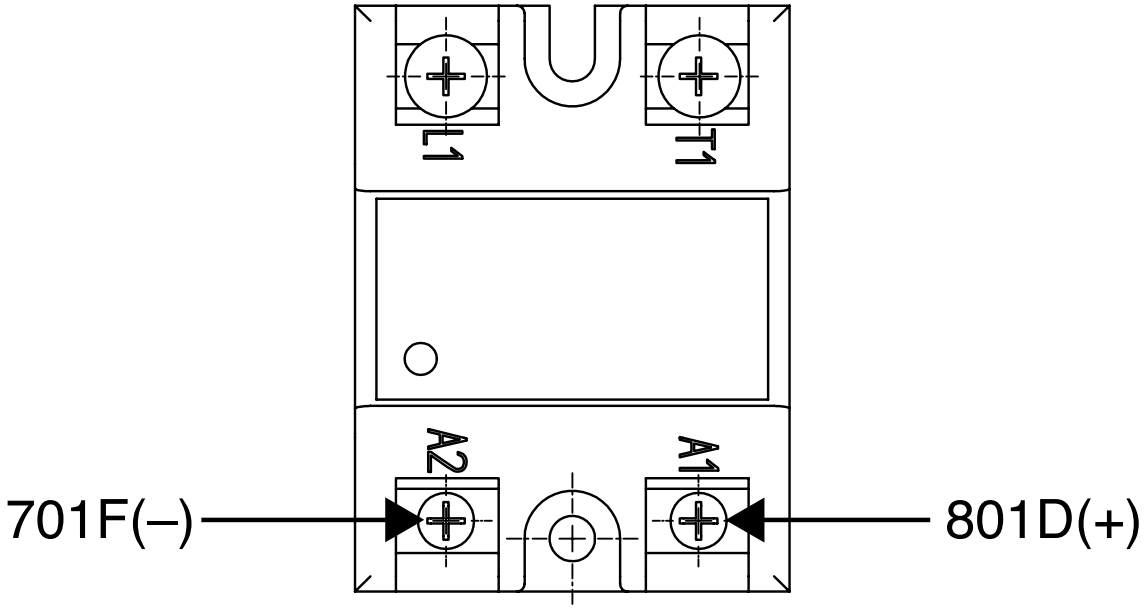
1. Perform the ***Case Cover Removal Procedure***, for rear panel access.
2. Carefully apply input power to the machine.
3. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If green "ON" button does not remain ON, it must be held in when testing voltages.

4. Locate the input relay. See Figure B.9.
5. Check for the presence of 5 VDC from lead 801D(+) to lead 701F(-) at the input relay. If 5 VDC is not present, perform the ***CPU Test***. See ***Figure B.10***. See Wiring Diagram.
6. If the input relay does not activate, it may be faulty. Contacts L1 and T1 should "close" when input relay is activated.
7. If faulty, Perform the ***Input Relay Removal and Replacement Procedure***.
8. Perform the ***Case Cover Replacement Procedure***.
9. Perform ***Retest After Repair Procedure***.

INPUT RELAY TEST *(continued)*

Figure B.10 – Input relay test points



VGA SPLITTER TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

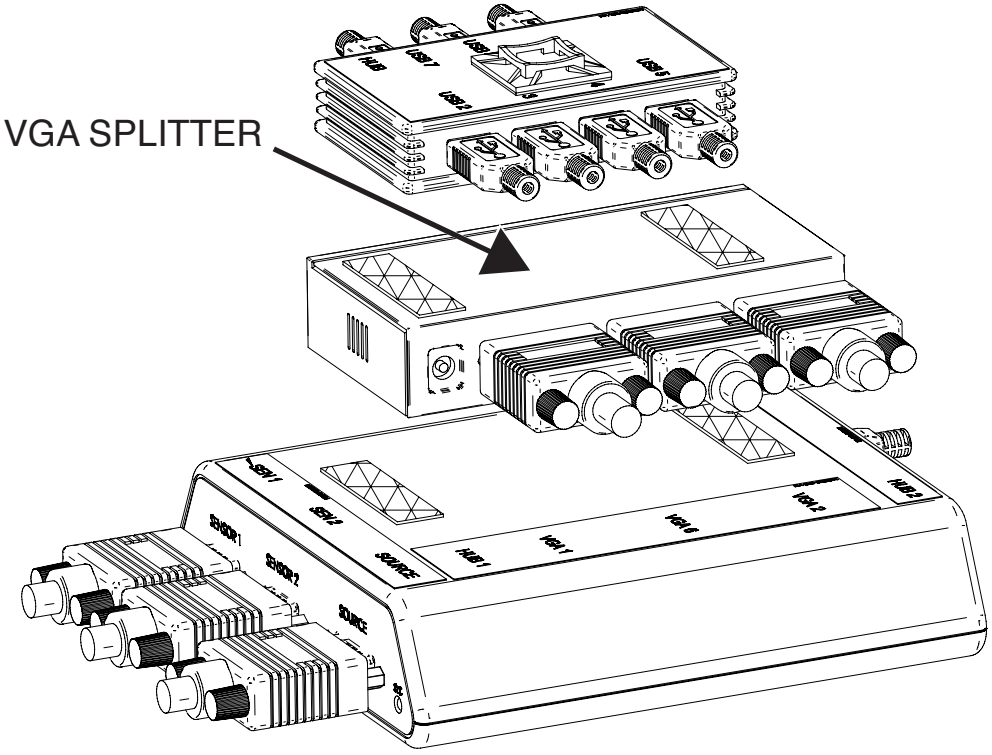
This test will aid the technician in determining if the VGA Splitter is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter

VGA SPLITTER TEST *(continued)*

Figure B.11 – VGA splitter location



PROCEDURE

1. Perform the ***Case Cover Removal Procedure***, for case sides and rear panel access.
2. Locate the VGA splitter. See Figure B.11.
3. Carefully apply input power to the machine.
4. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

5. Make certain the red light on the VGA splitter is on.
6. Check for the presence of 12 VDC at leads 901A(+) to 701E(–) at the secondary terminal block. See ***Figure B.12*** and ***Figure B.13***. See Wiring Diagram.
7. Check for loose or faulty connections at the VGA splitter and CPU.
8. Disconnect VGA 2 and VGA 1 from the VGA splitter and connect them together. If the start-up screen appears on the monitor, the VGA splitter is faulty.
9. If faulty, Perform the ***VGA Splitter Removal and Replacement Procedure***.
10. Perform the ***Case Cover Replacement Procedure***.
11. Perform ***Retest After Repair Procedure***.

VGA SPLITTER TEST *(continued)*

Figure B.12 – Terminal block location

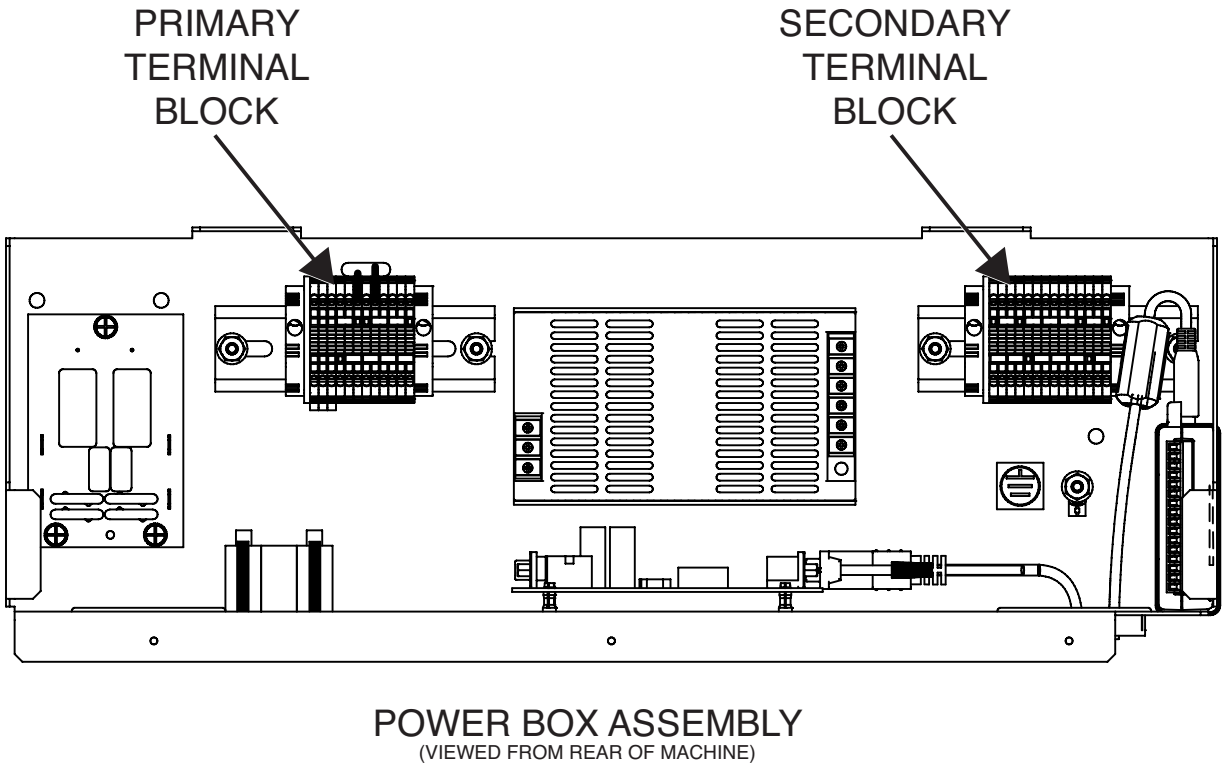
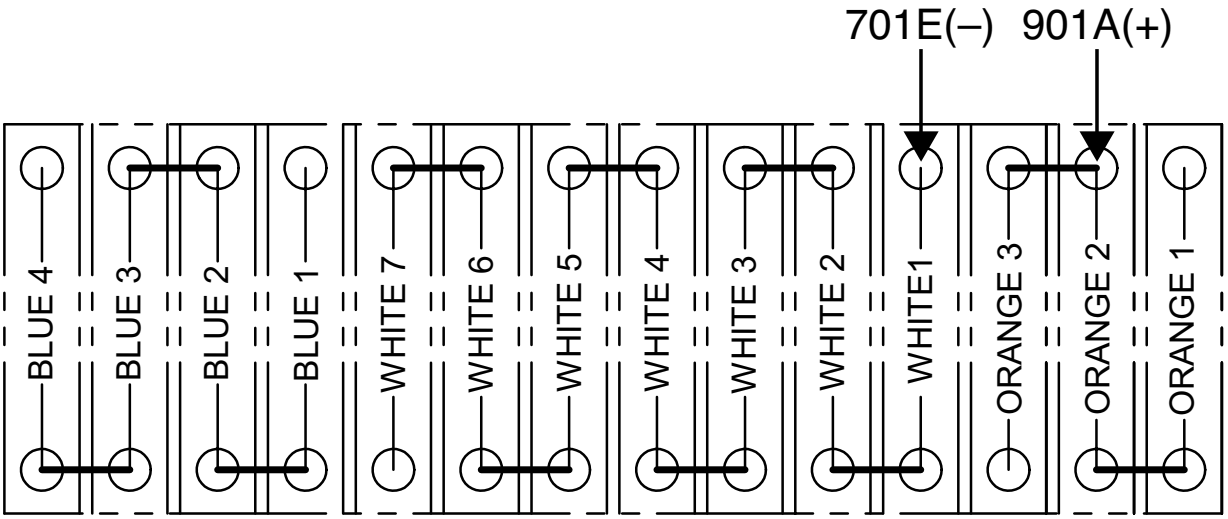


Figure B.13 – Terminal block lead locations



USB HUB TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

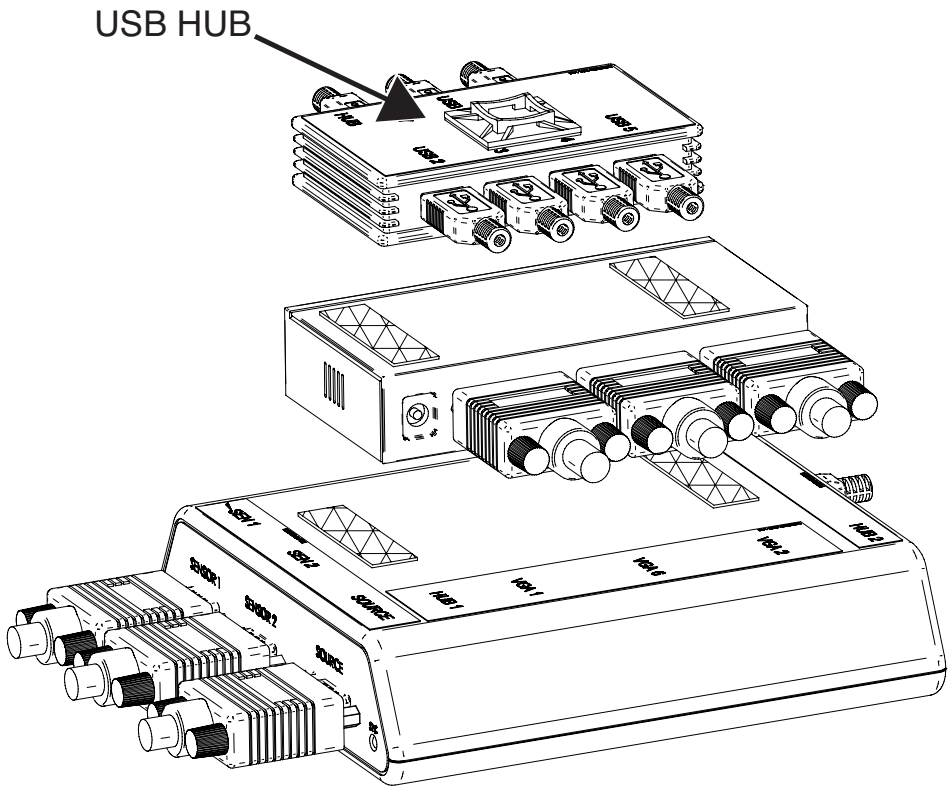
This procedure will aid the technician in determining if the USB Hub is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter
Luminating USB Mouse

USB HUB TEST *(continued)*

Figure B.14 – USB hub location



PROCEDURE

1. Perform the ***Case Cover Removal Procedure***, for case sides and rear panel access.
2. Locate the USB hub. See Figure B.14.
3. Carefully apply input power to the machine.
4. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

5. Check for loose or faulty connections at the USB hub and components attached to the hub.
6. Check for the presence of 5 VDC from 701A(–) to 801A(+) at the secondary terminal block. See ***Figure B.15*** and ***Figure B.16***. See Wiring Diagram.
7. One port at a time, plug a USB mouse with a visible LED into each port of the hub. If the LED on the mouse illuminates, that port is fine. Repeat process for every port on the USB hub. If one or multiple ports fail to illuminate, the USB hub is faulty.
8. Verify USB 7 connection between CPU and USB hub. See Wiring Diagram.
9. If faulty, Perform the ***USB Hub Removal and Replacement Procedure***.
10. Perform the ***Case Cover Replacement Procedure***.
11. Perform ***Retest After Repair Procedure***.

USB HUB TEST *(continued)*

Figure B.15 – Terminal block location

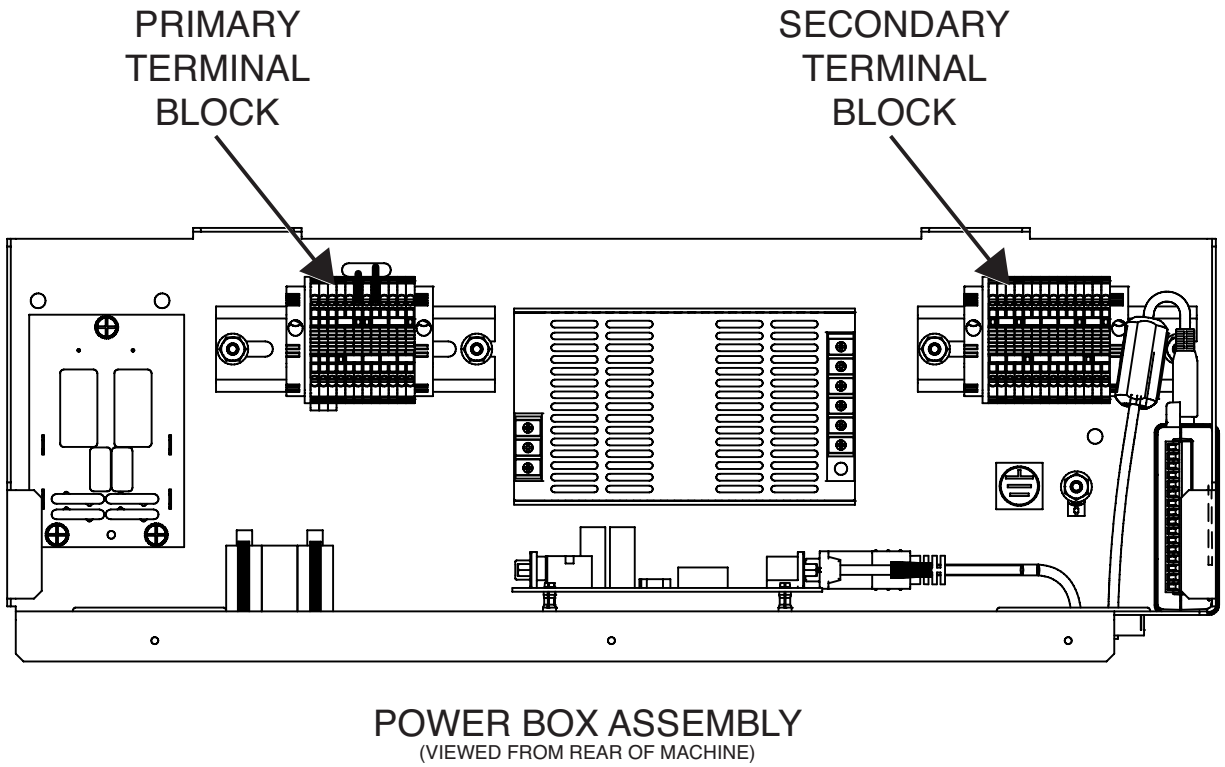
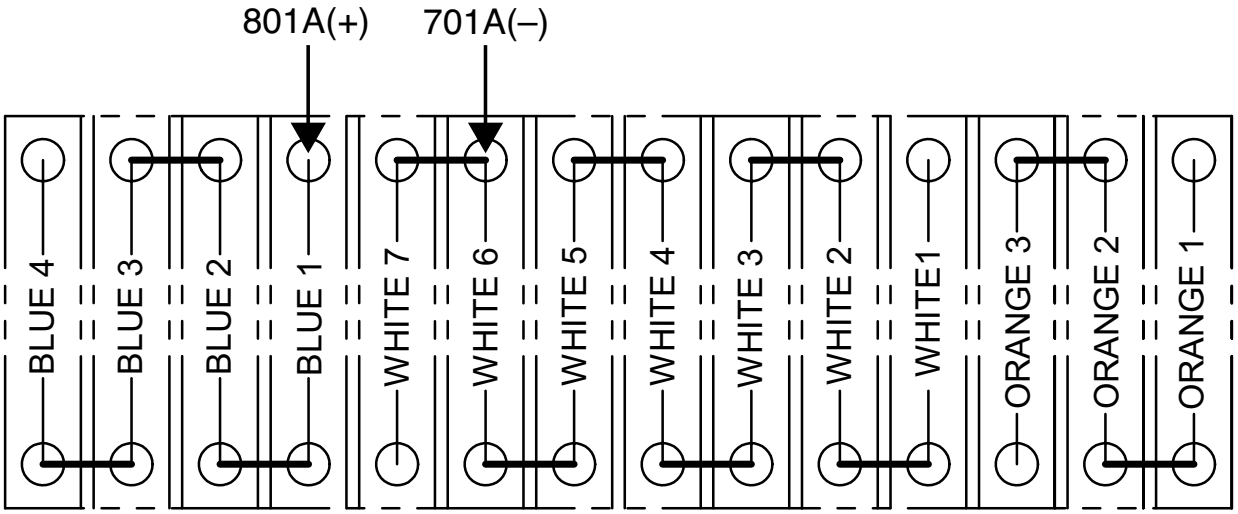


Figure B.16 – Secondary terminal block lead locations



CPU TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

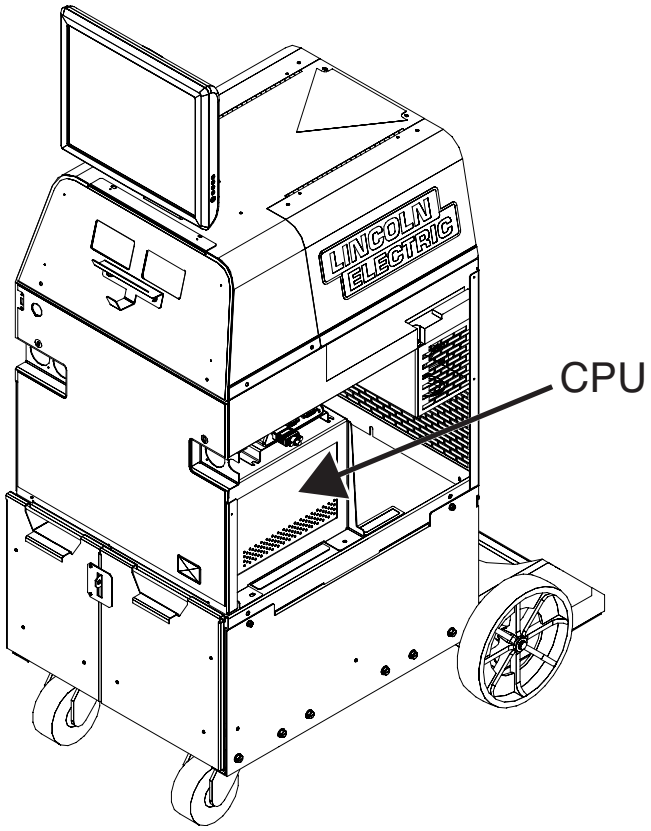
This procedure will aid the technician in determining if the CPU is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter

CPU TEST *(continued)*

Figure B.17 – CPU location



PROCEDURE

1. Perform the ***Case Cover Removal Procedure***, for case sides.
2. Locate the CPU. See Figure B.17.
3. Carefully apply input power to the machine.
4. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

5. Check for blue CPU light on front of CPU. See ***Figure B.18***.
6. Check for loose or faulty connections at CPU and all connected components. See Wiring Diagram.
7. If the machine is not ON, disconnect power cord from the CPU.
8. Check for presence of 115/230 VAC at the power cord that connects the input receptacle at the back of the CPU. See ***Figure B.19***. See Wiring Diagram.
9. To check the power cord, touch meter probes to the neutral and line connection points on the power cord. See ***Figure B.20***.
10. If line voltage is not present, check connections between the CPU and the terminal block.
11. If correct voltage is present, check for 5 VDC at leads 801D(+) to 701F(–) on the input relay. See ***Figure B.21***. See Wiring Diagram. If the 5 VDC is not present the CPU may be faulty.
12. The CPU may be faulty. Perform the ***CPU Removal and Replacement Procedure***.
13. Perform the ***Case Cover Replacement Procedure***.
14. Perform ***Retest After Repair Procedure***.

CPU TEST *(continued)*

Figure B.18 – CPU light location

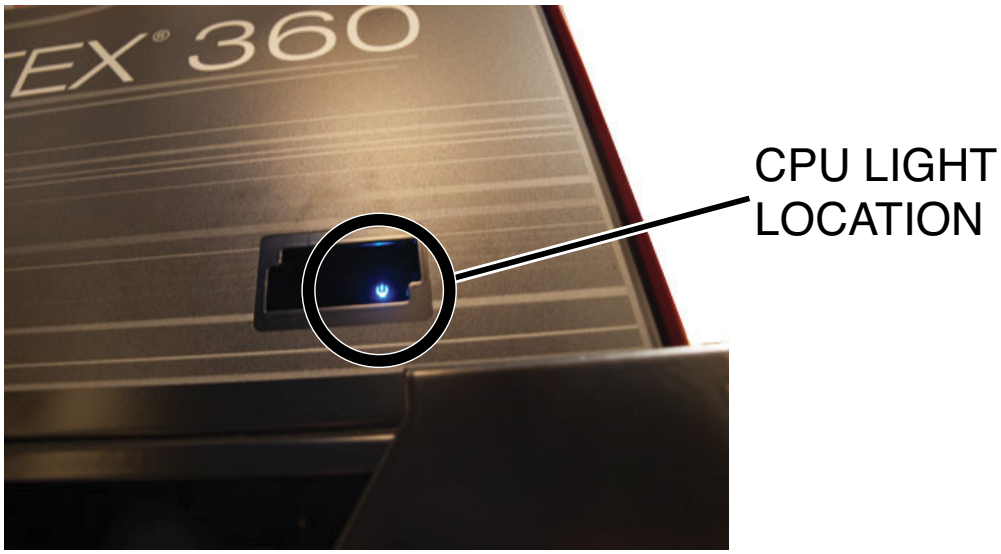
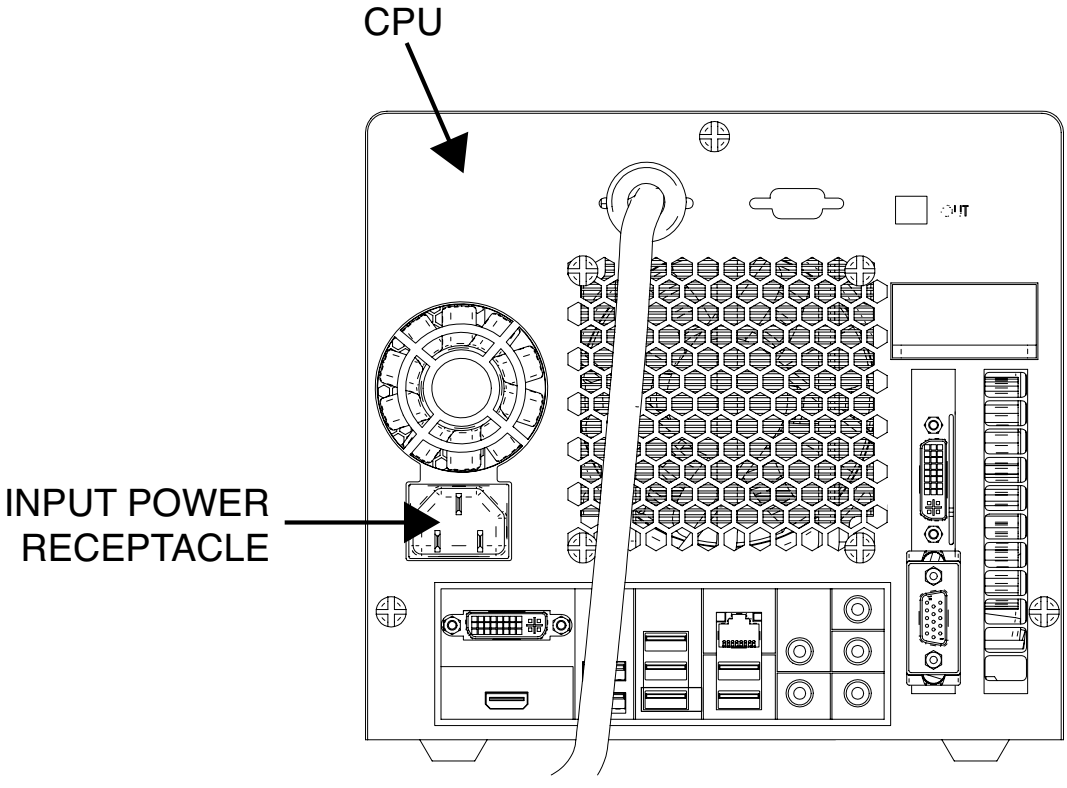


Figure B.19 – Input power receptacle location



CPU TEST *(continued)*

Figure B.20 – CPU power cord test points

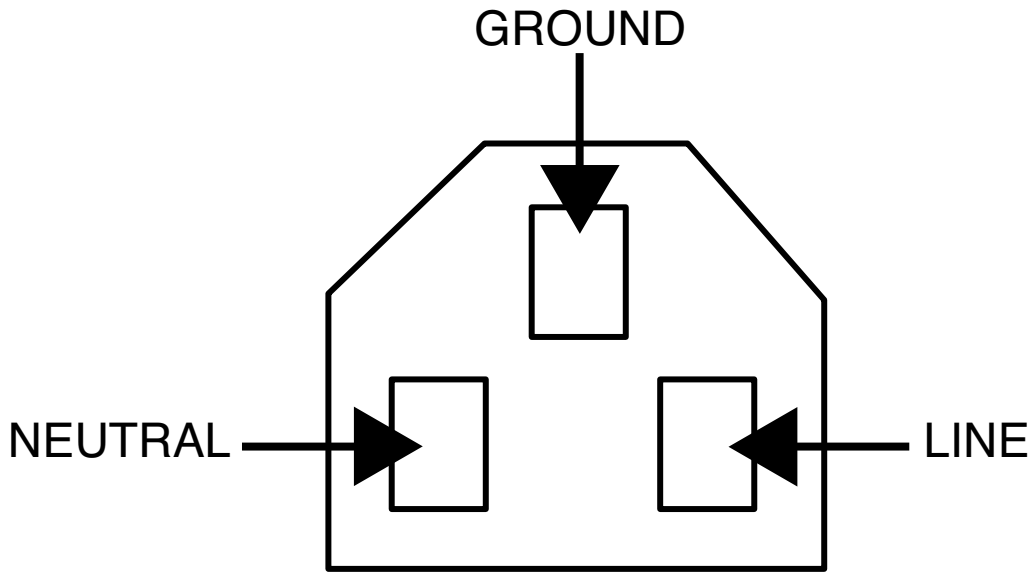
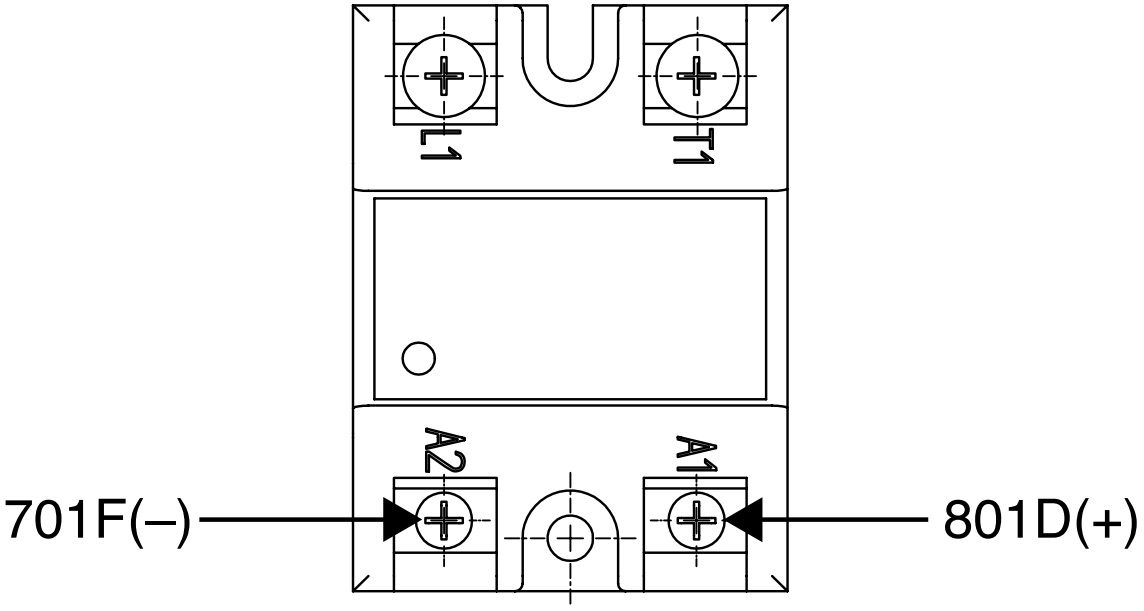


Figure B.21 – Input relay test points



PATRIOT SEU MODULE TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

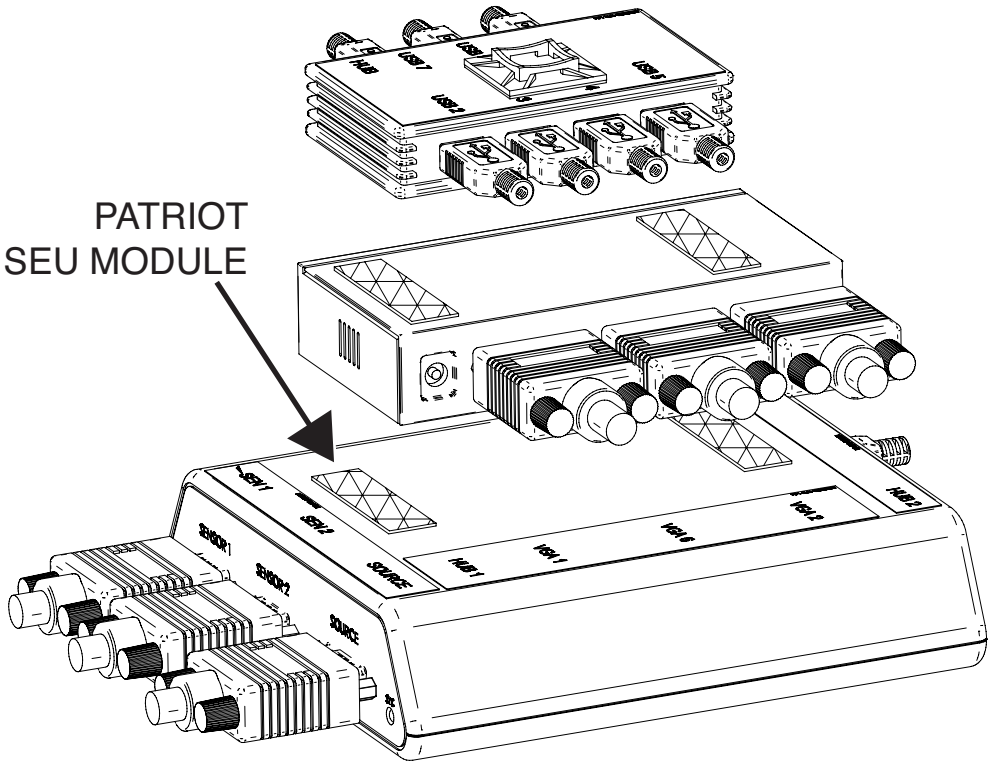
This procedure will aid the technician in determining if the Patriot SEU Module is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter
USB Keyboard
USB Mouse

PATRIOT SEU MODULE TEST *(continued)*

Figure B.22 – Patriot SEU module location



PROCEDURE

1. Perform the ***Case Cover Removal Procedure***, for case sides.
2. Locate the Patriot SEU module. See Figure B.22.
3. Carefully apply input power to the machine, make sure Patriot SEU module power switch is "ON" and check for LED light. See ***Figure B.23***.
4. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

5. Check for loose or faulty connections at the Patriot SEU module and all other connected components.
6. Check for the presence of 5 VDC from lead 801B(+) to 701B(–) at the secondary terminal block. See ***Figure B.24*** and ***Figure B.25***. See Wiring Diagram.
7. Check for 5 VDC at the Patriot SEU module input power cable. Cable will need to be disconnected from the Patriot SEU module in order to test.
8. If the correct input voltage is present but the Patriot SEU module does not function correctly the Patriot SEU module may be faulty.
9. Perform the ***Device Manager Procedure***, to verify that the system is recognizing the Patriot SEU module.
10. If faulty, perform the ***Patriot SEU Module Removal and Replacement Procedure***.
11. Perform the ***Case Cover Replacement Procedure***.
12. Perform ***Retest After Repair Procedure***.

PATRIOT SEU MODULE TEST *(continued)*

Figure B.23 – Patriot SEU module

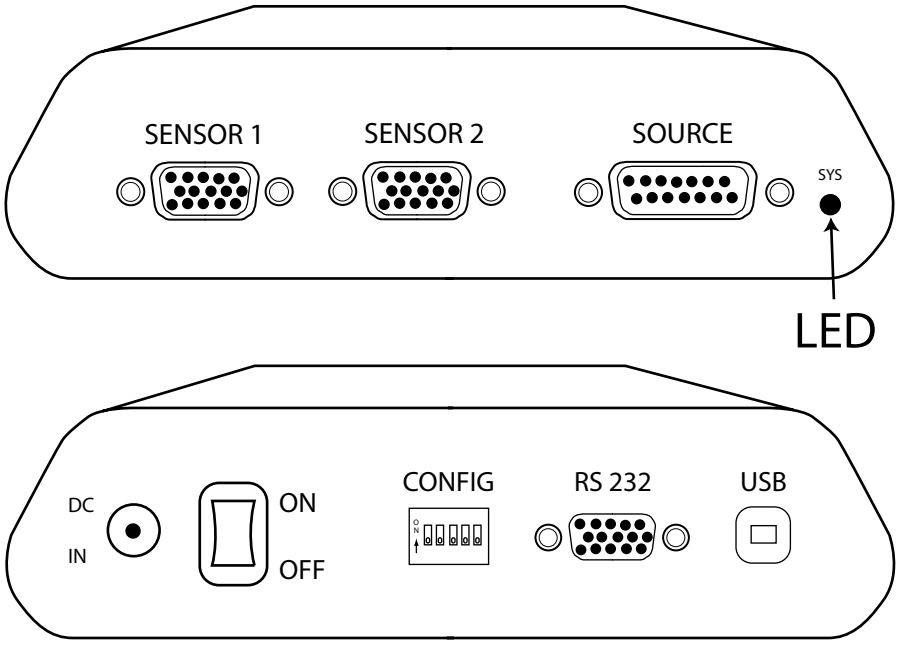
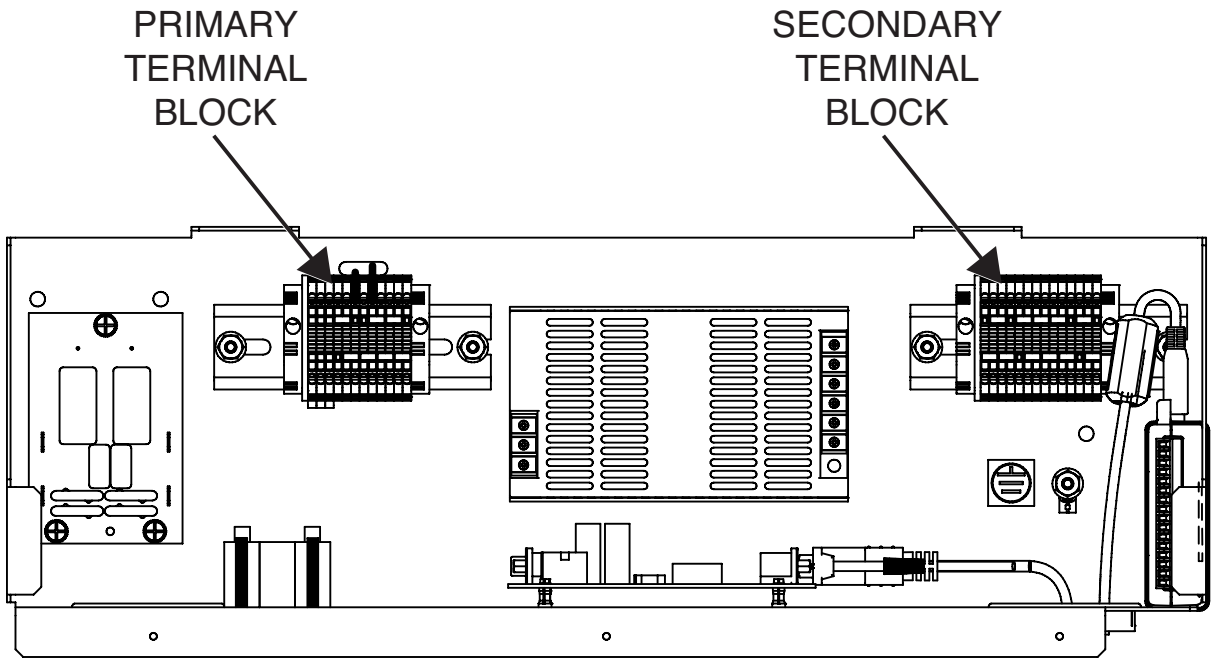


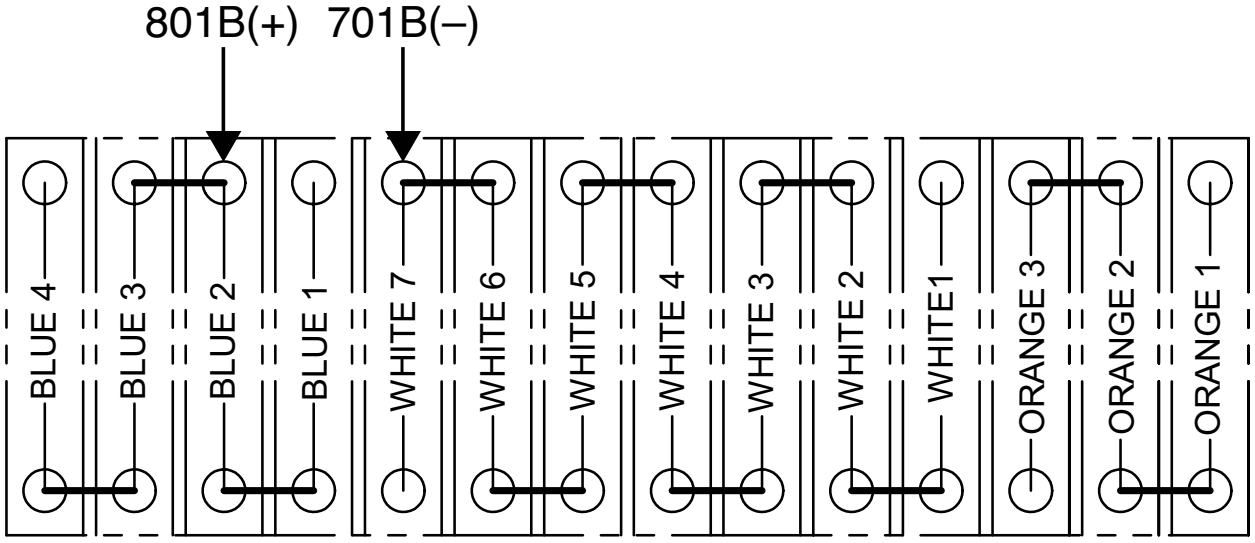
Figure B.24 – Terminal block location



POWER BOX ASSEMBLY
(VIEWED FROM REAR OF MACHINE)

PATRIOT SEU MODULE TEST *(continued)*

Figure B.25 – Terminal block lead locations



HELMET TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

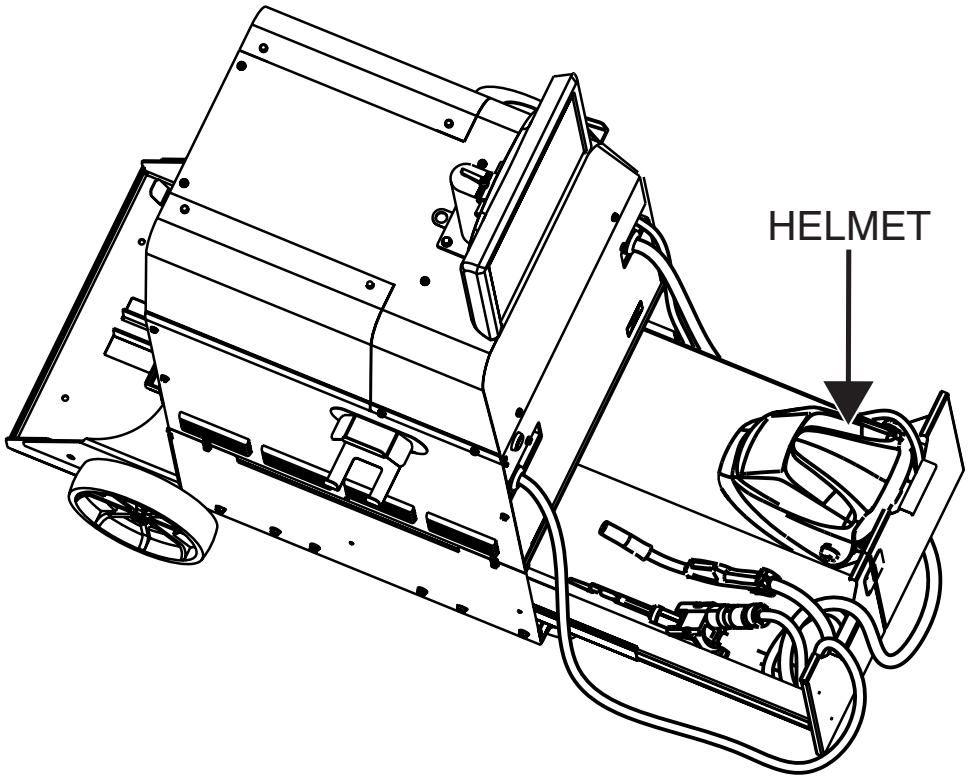
This procedure will aid the technician in determining if the Helmet (FMD) is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter

HELMET TEST *(continued)*

Figure B.26 – Helmet location



PROCEDURE

1. Perform the ***Case Cover Removal Procedure***, for case sides.
2. Locate the helmet. See Figure B.26.
3. Apply input power to the machine.
4. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

5. Check for loose or faulty connections at USB 6 on the USB hub and DVI 1 to CPU. See Wiring Diagram.

NOTE: Do not remove DVI connection prior to removing USB 6 connection.

6. Move the USB plug from USB 6 to an open port on the USB hub. If the visuals in the helmet do not appear, perform the ***USB Hub Test***.
7. If the USB hub test passes, plug the helmet directly into an open USB port in the back of the CPU. Check for visuals in the helmet. If no visuals appear, the helmet may be faulty.

NOTE: Make sure the software is in the virtual environment stage. If not in virtual environment, backlight in helmet should be lit and no image will appear.

NOTE: If no visuals appear, perform the ***Device Manager Procedure*** to verify the helmet is recognized.

8. If faulty, Perform the ***Helmet Removal and Replacement Procedure***.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform ***Retest After Repair Procedure***.

MOTOR CONTROL BOARD TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

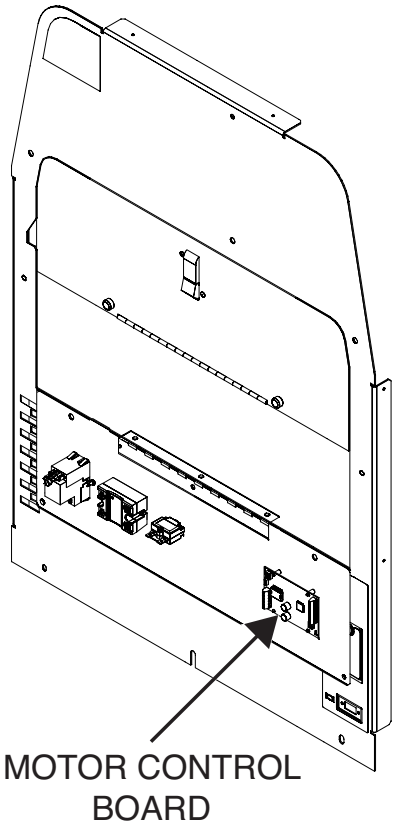
This test will help determine if the Motor Control Board is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter
Small Slotted Screwdriver

MOTOR CONTROL BOARD TEST *(continued)*

Figure B.27 – Motor control board location



PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for rear panel access.
3. Locate the motor control board inside the rear panel. See Figure B.27.
4. Using a small slotted screwdriver, be sure all leads are connected tightly to terminals. See ***Figure B.28***.
5. Carefully apply input power.
6. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

7. Enter in to welding mode. See ***Operation*** section of this manual.
8. Select VR SMAW device.
9. Using a voltmeter, check for appropriate voltages. See ***Figure B.28***. See **Table B.2**.
10. Using a voltmeter, check for 11 VDC between leads 902A and 701F. See ***Figure B.28***.
11. Perform the ***Case Cover Replacement Procedure***.
12. Perform ***Retest After Repair Procedure***.

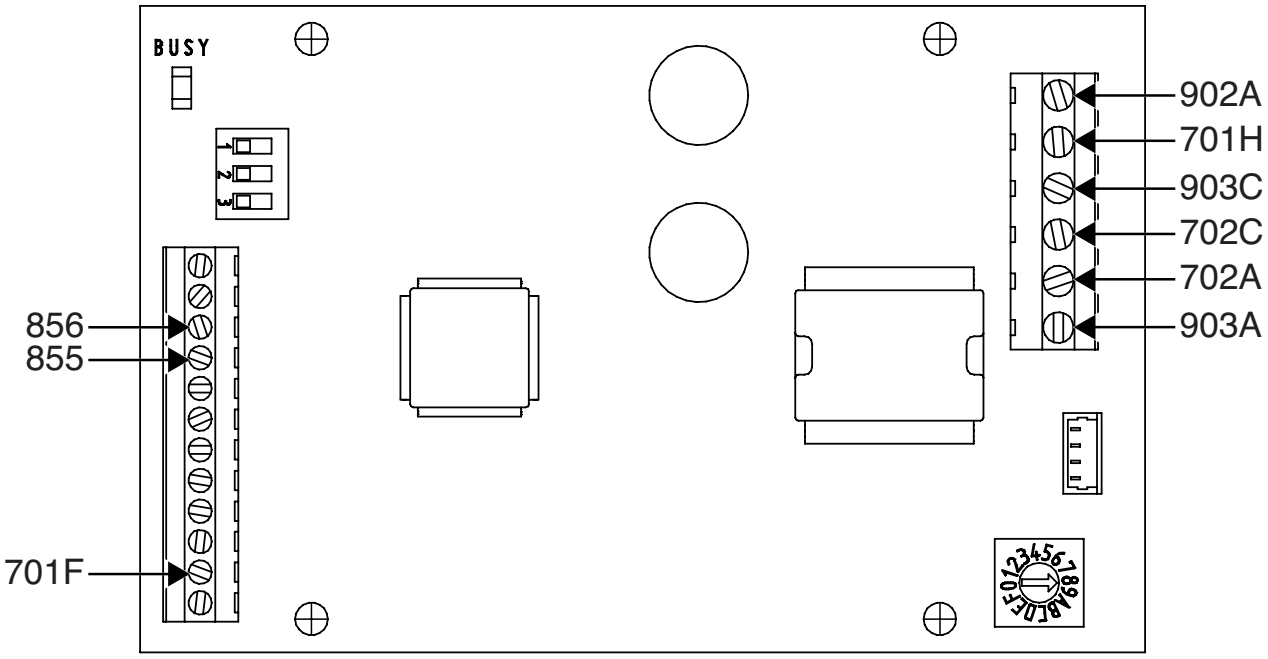
MOTOR CONTROL BOARD TEST *(continued)*

Table B.2 – Motor control board tests

TEST POINTS (+)	TEST POINTS (–)	EXPECTED READING	CONDITIONS
903C	701F	0/11 VDC	IMMEDIATELY AFTER VR SMAW WELDING
702C	701F	0/11 VDC	IMMEDIATELY AFTER VR SMAW WELDING
702A	701F	0/11 VDC	IMMEDIATELY AFTER VR SMAW WELDING
903A	701F	0/11 VDC	IMMEDIATELY AFTER VR SMAW WELDING

NOTE: Due to signal pulsing, at least two checks in the table above should read 11 VDC immediately after VR SMAW welding.

Figure B.28 – Motor control board test points



USB DIGITAL I/O MODULE SETTINGS VERIFICATION PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

This procedure will help verify the USB Digital Input / Output Module Settings.

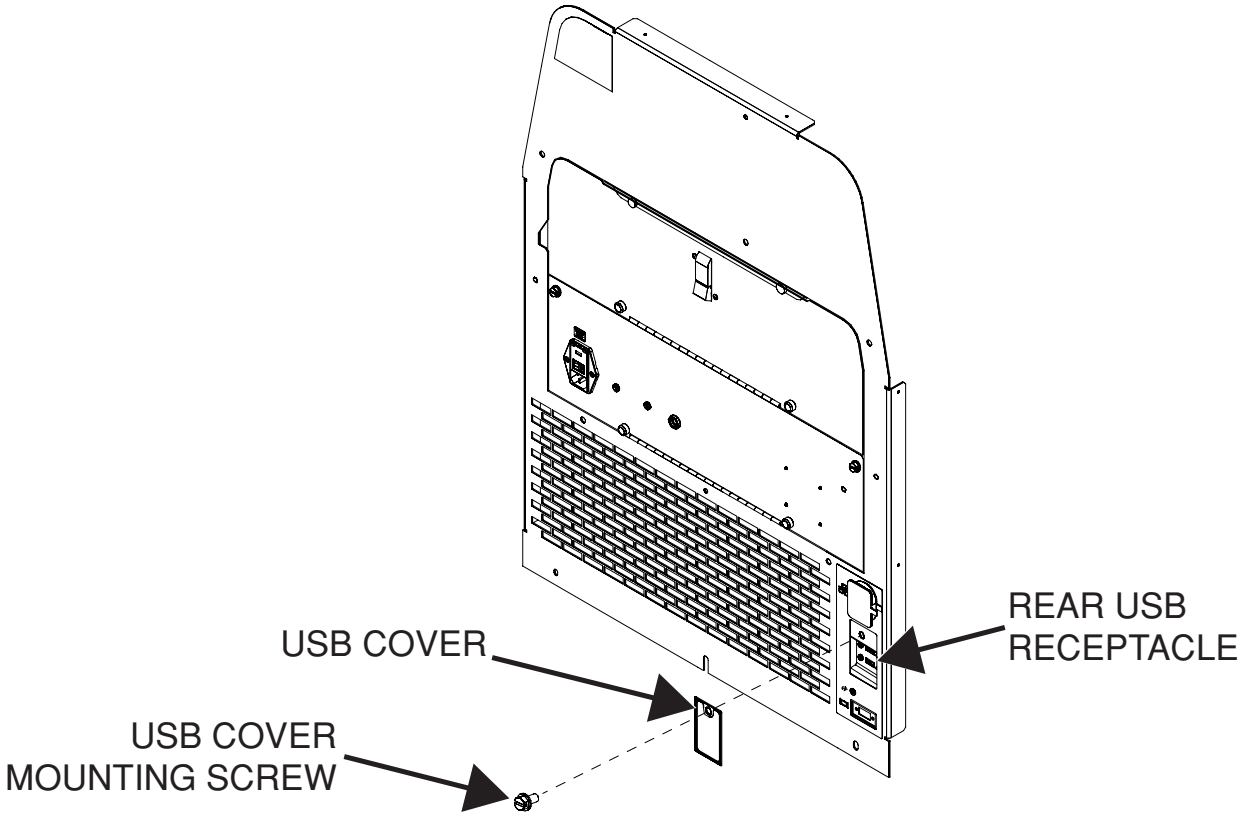
MATERIALS NEEDED

3/8” Socket/Wrench
USB Keyboard
USB Mouse

USB DIGITAL I/O MODULE SETTINGS VERIFICATION PROCEDURE

(continued)

Figure B.29 – USB rear cover removal



PROCEDURE

1. Remove the input power to the machine.
2. Using a 3/8" socket/wrench, remove the screw securing the USB cover to the rear of the machine. See Figure B.29.
3. Connect USB mouse and USB keyboard to rear USB receptacle. See Figure B.29.
4. Carefully apply input power to the machine.
5. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

6. At logon screen, on actual keyboard, press window key & "D".
7. Move mouse to bottom of screen, task bar appears. Close all programs.
8. Computer may show a "found new hardware" screen. Click "next". Then click on "connect to internet".

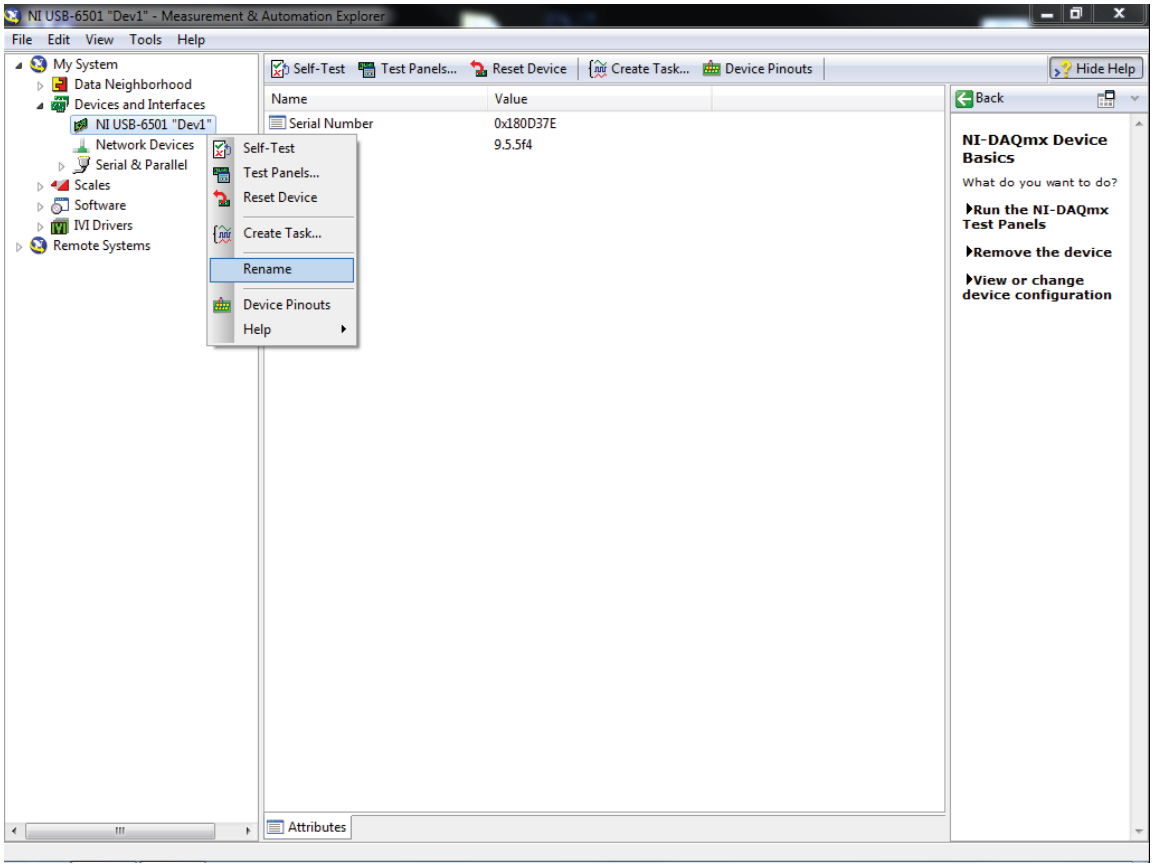
NOTE: Internet connection is not necessary.

9. Click on "Install the software automatically" and then click "next".
10. After the driver is installed successfully, click "finished".
11. Click on the following in order:
    - Start
    - All Programs
    - National Instruments
    - Measurement and Automation See ***Figure B.30***.
    - Devices and Interfaces (click "+")
    - NI-DAQmx Devices
    - Right click: NI USB 6501; "Dev1"
    - Left click: Delete
    - Left click: NI USB 6501; "Dev2"
    - Right click: Rename to ("Dev1")
12. Press "Enter".
13. Exit out of program.
14. Shut down the VRTEX 360 via a normal CPU shutdown. Click:
    - Start
    - Shut Down
15. Remove input power after CPU has completely shut down.

USB DIGITAL I/O MODULE SETTINGS VERIFICATION PROCEDURE

(continued)

Figure B.30 – Measurement & automation explorer



16. Disconnect the USB keyboard and mouse from rear USB receptacle. See ***Figure B.29***.
17. Using a 3/8" socket/wrench, attach the screw securing the USB cover to the rear of the machine. See ***Figure B.29***.
18. Perform ***Retest After Repair Procedure***.

USB DIGITAL I/O MODULE TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

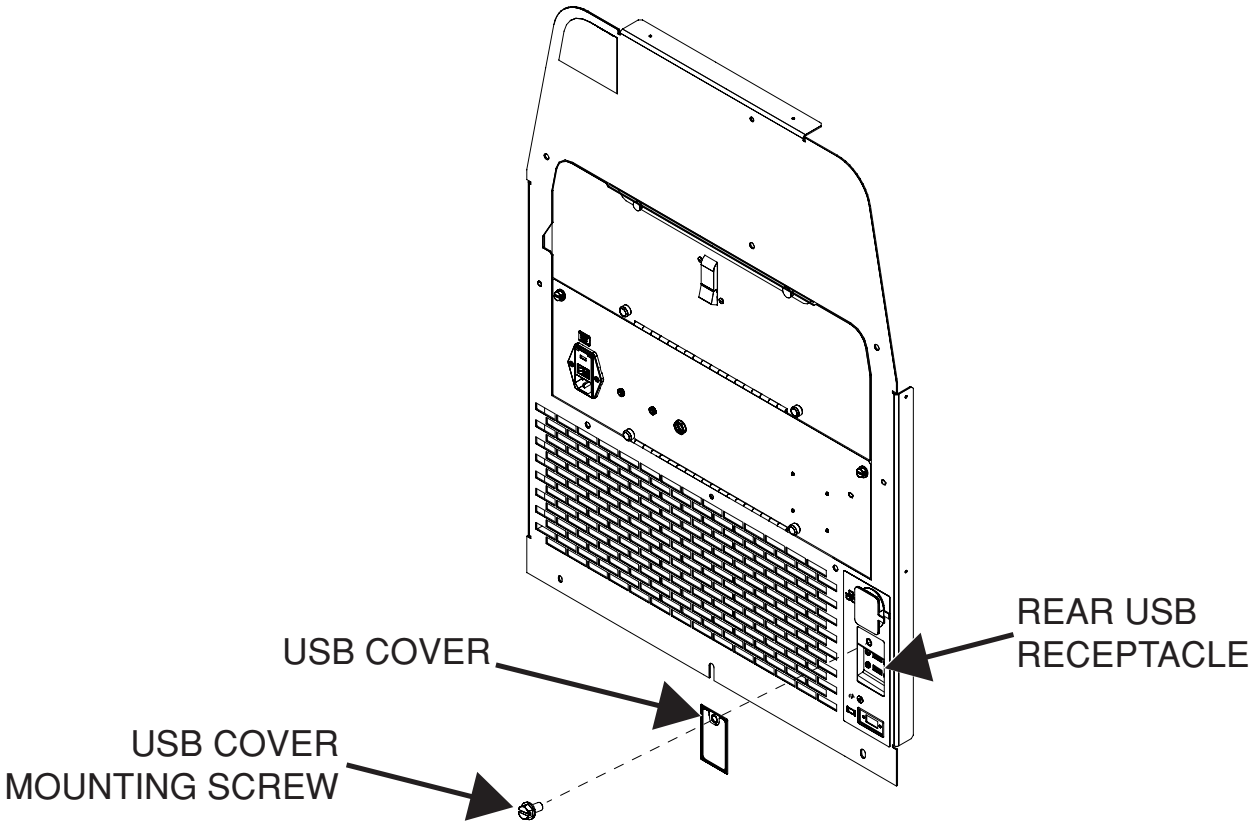
This procedure will aid in determining if the USB Digital I/O is functioning properly.

MATERIALS NEEDED

3/8” Socket/Wrench
USB Keyboard
USB Mouse

USB DIGITAL I/O MODULE TEST *(continued)*

Figure B.31 – Rear USB cover removal



PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for rear panel access.
3. Check for loose or faulty connections on USB digital I/O device. See Wiring Diagram.
4. Using a 3/8" socket/wrench, remove the screw securing the USB cover to the rear of the machine. See Figure B.31.
5. Connect USB mouse and USB keyboard to rear USB receptacle. See Figure B.31.
6. Carefully apply input power to the machine.
7. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.
8. At logon screen, on actual keyboard, press window key & "D".
9. Move mouse to bottom of screen, task bar appears. Close all programs.
10. Using the USB mouse, navigate to the start menu and choose the following options:
    - Computer
    - Device Manager, See ***Figure B.32***.
    - Data Acquisition Devices, See ***Figure B.33***.
    - USB-6501, See ***Figure B.34***.
11. To perform a self-test of the USB digital I/O use the USB mouse to choose the following options:
    - Start
    - All Programs
    - National Instruments
    - Measurement And Automation Explorer
    - Devices and Interfaces, See ***Figure B.35***.
    - NiUSB-6501 "Dev1", See ***Figure B.36***.
    - Self-Test , See ***Figure B.37***.
12. If the Self-Test passes, a success notice will appear on the screen. See ***Figure B.38***.
13. If the Self-Test fails, device may be faulty.
14. Perform the ***Case Cover Replacement Procedure***.
15. Disconnect the USB keyboard and mouse from rear USB receptacle. See Figure B.31.
16. Using a 3/8" socket/wrench, attach the screw securing the USB cover to the rear of the machine. See Figure B.31.
17. Perform ***Retest After Repair Procedure***.

USB DIGITAL I/O MODULE TEST *(continued)*

Figure B.32 – Device manager

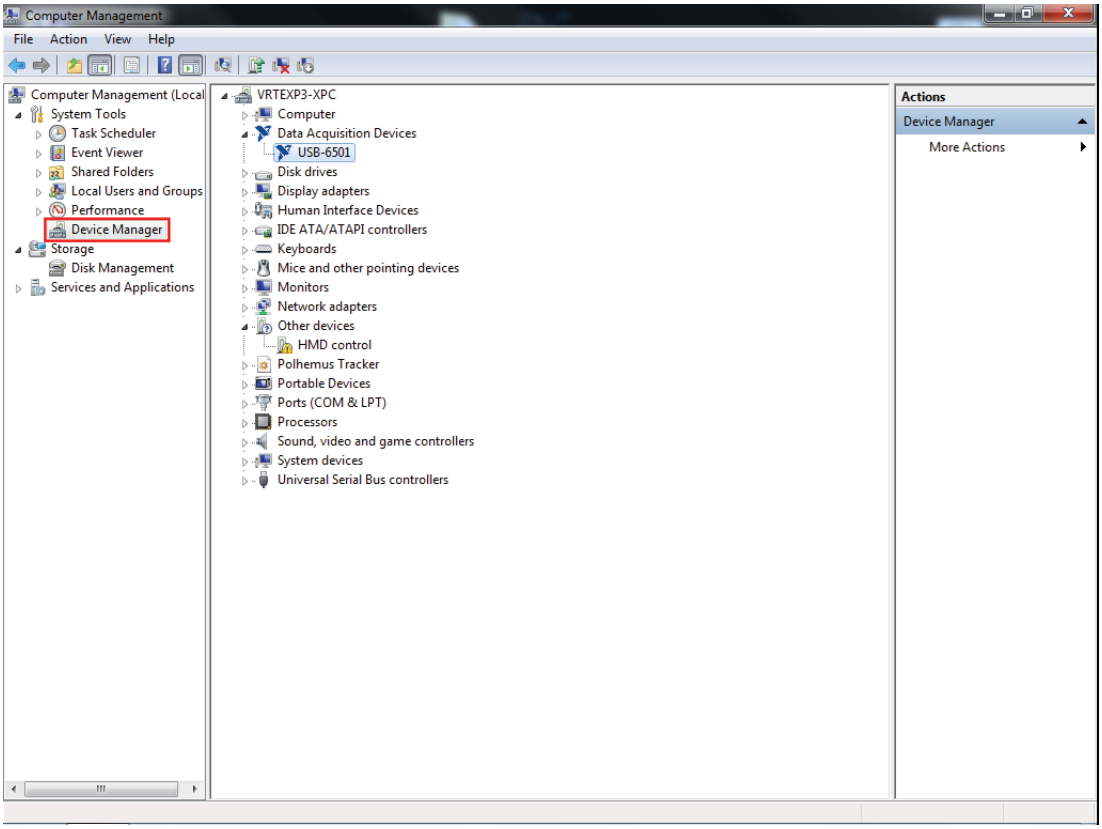
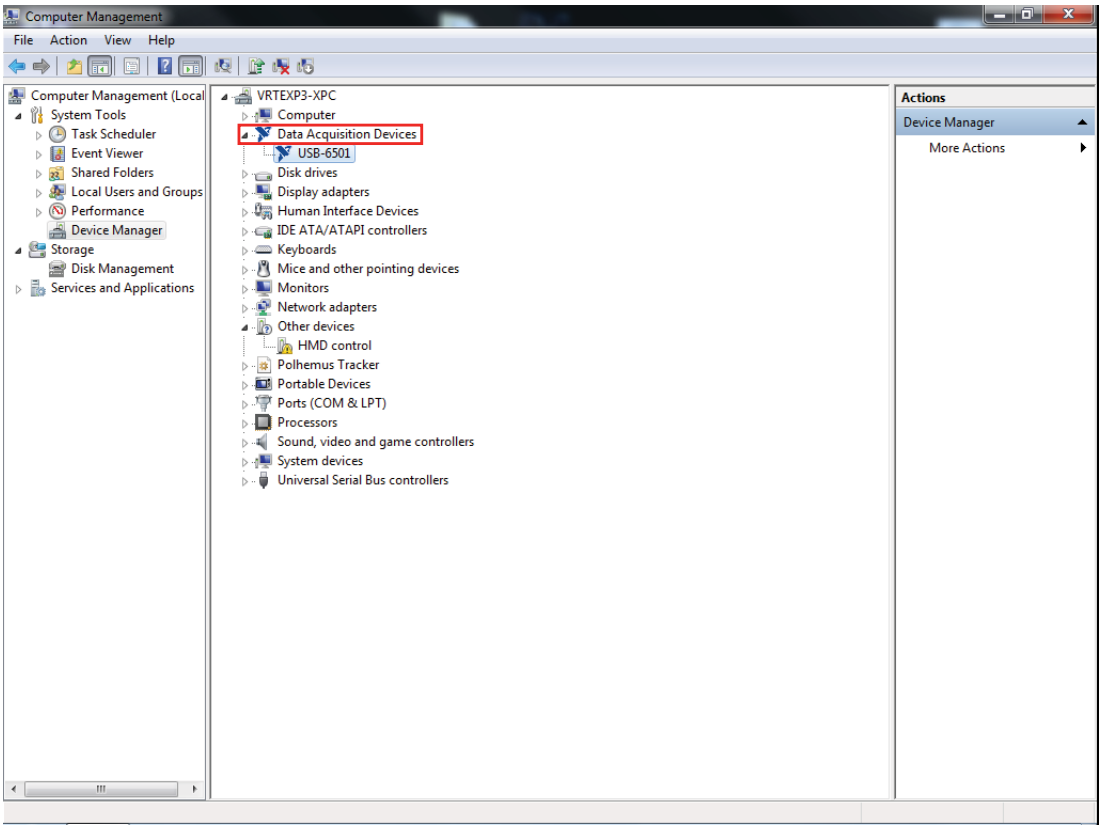


Figure B.33 – Data acquisition devices



USB DIGITAL I/O MODULE TEST *(continued)*

Figure B.34 – USB 6501

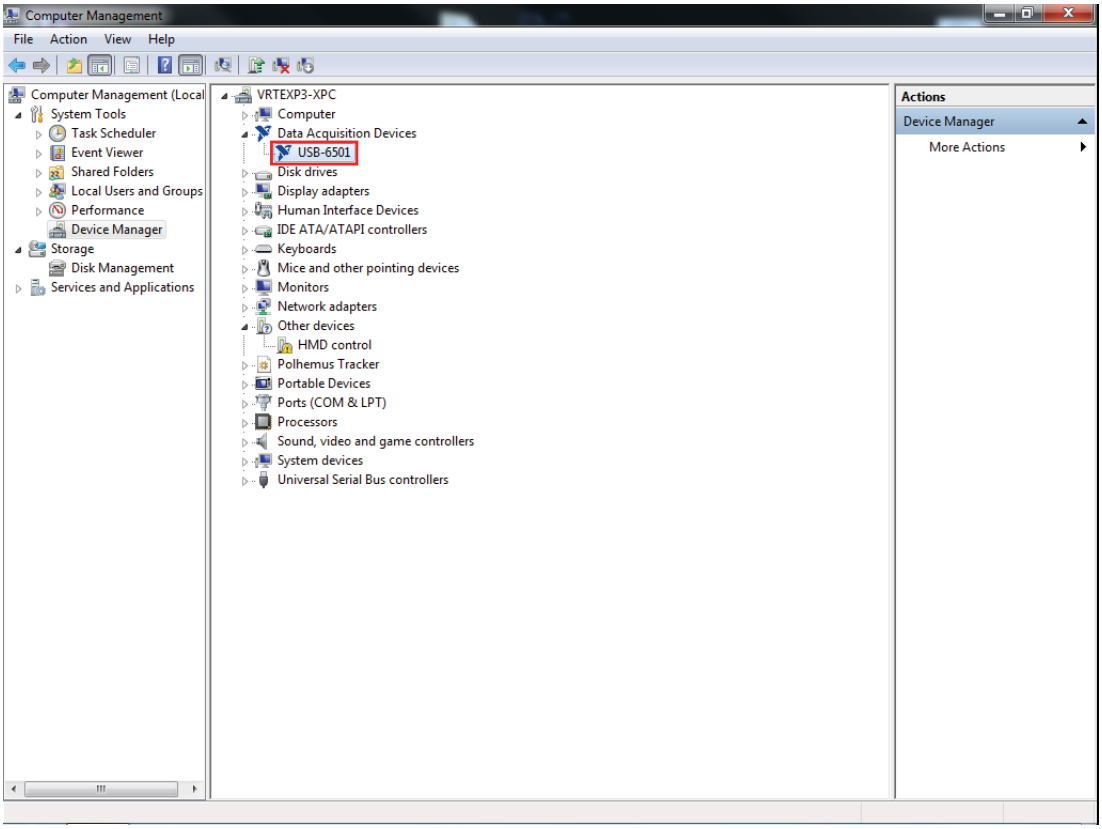
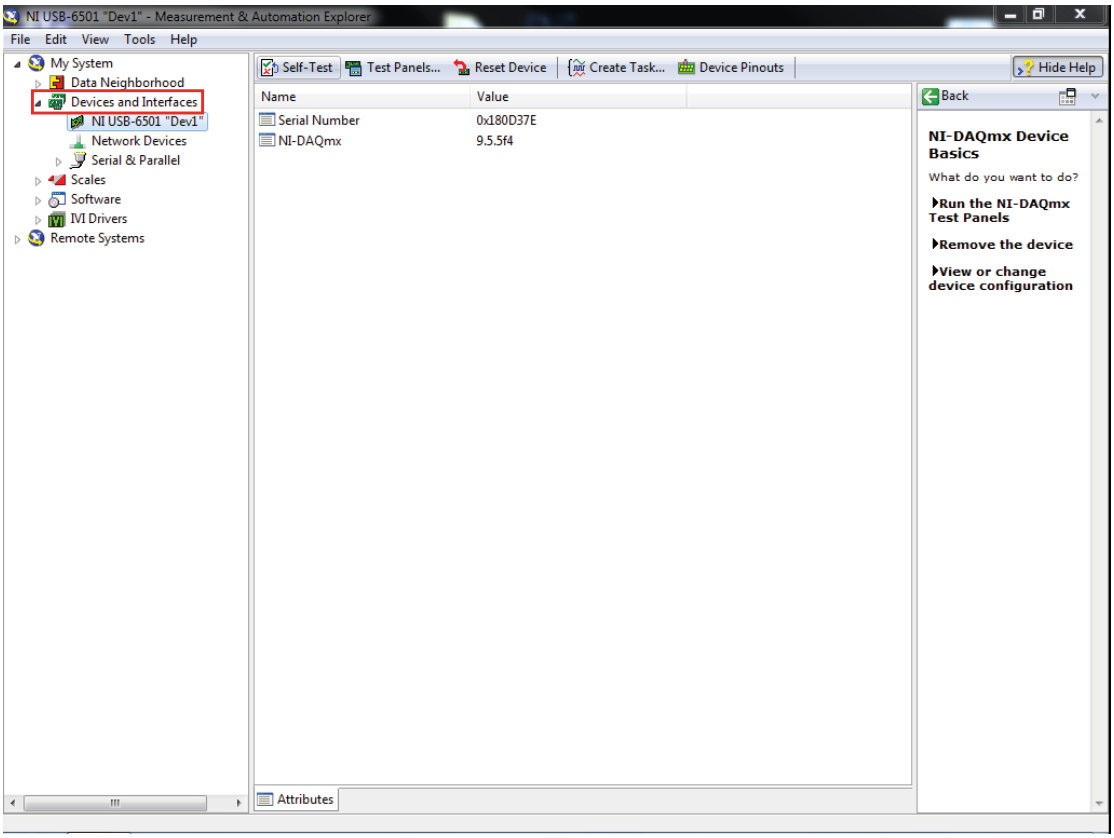


Figure B.35 – Devices and interfaces



USB DIGITAL I/O MODULE TEST *(continued)*

Figure B.36 – NI USB-6501 "Dev1"

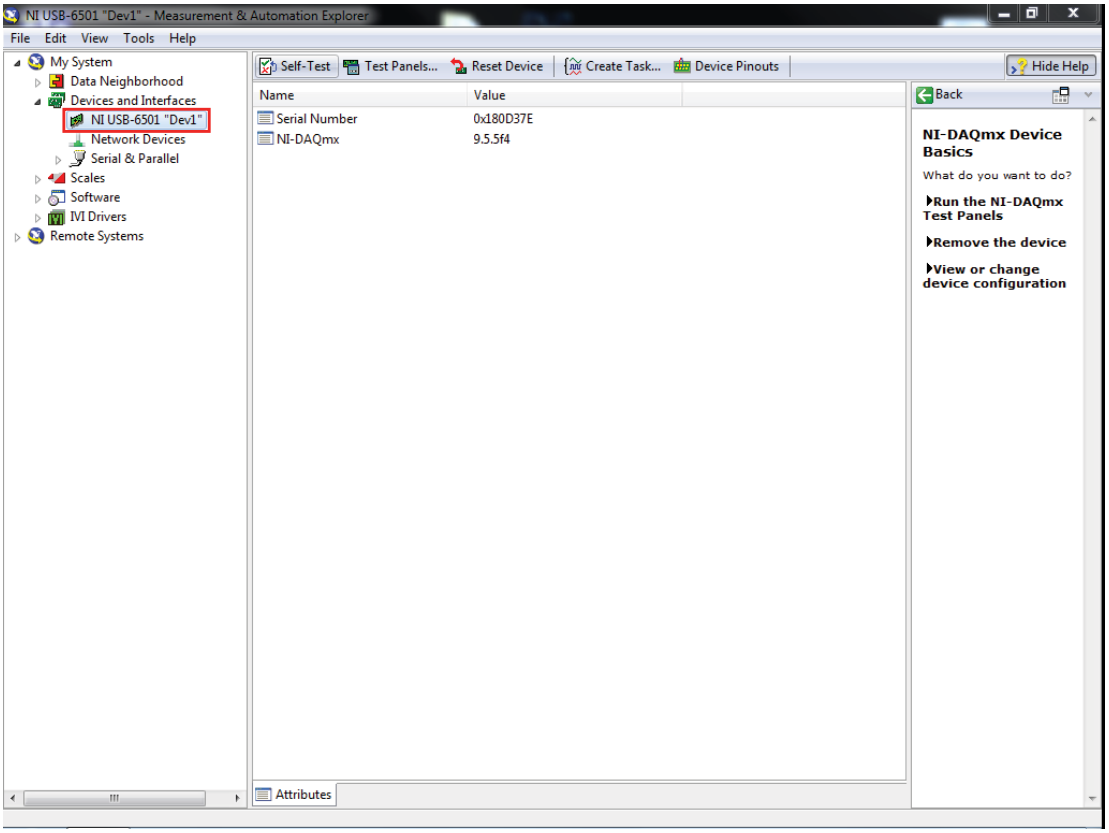
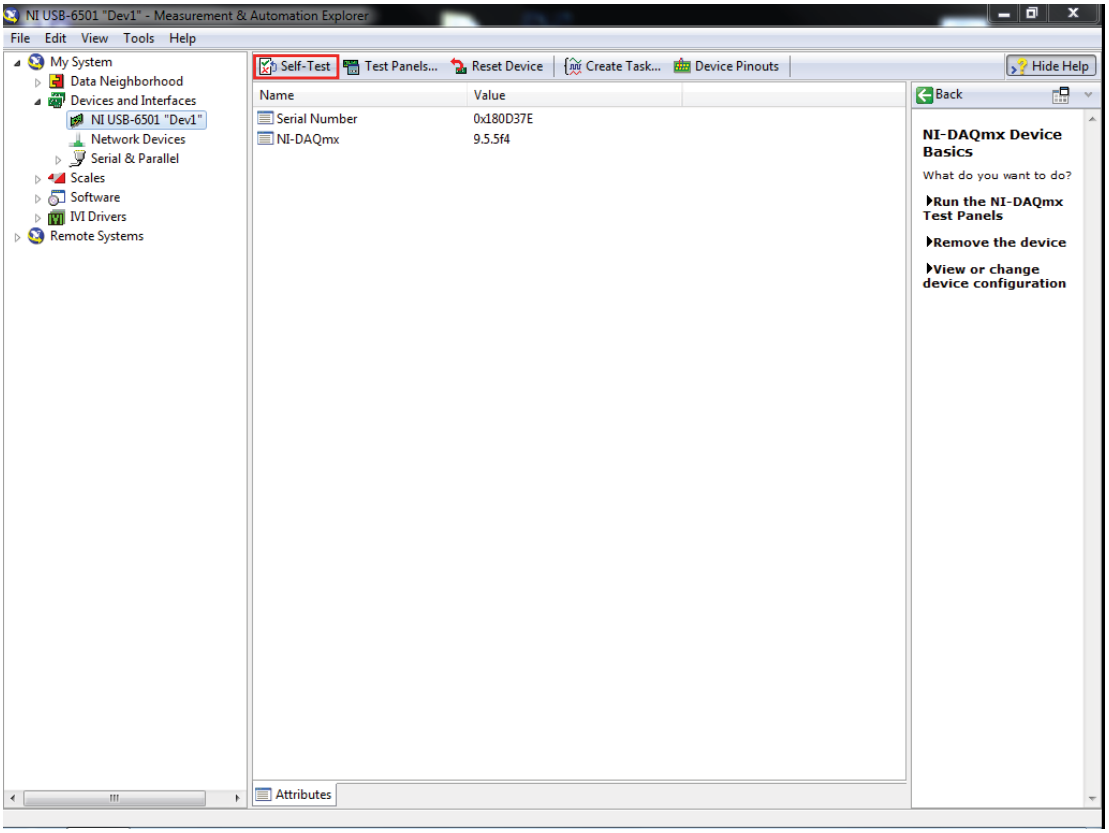
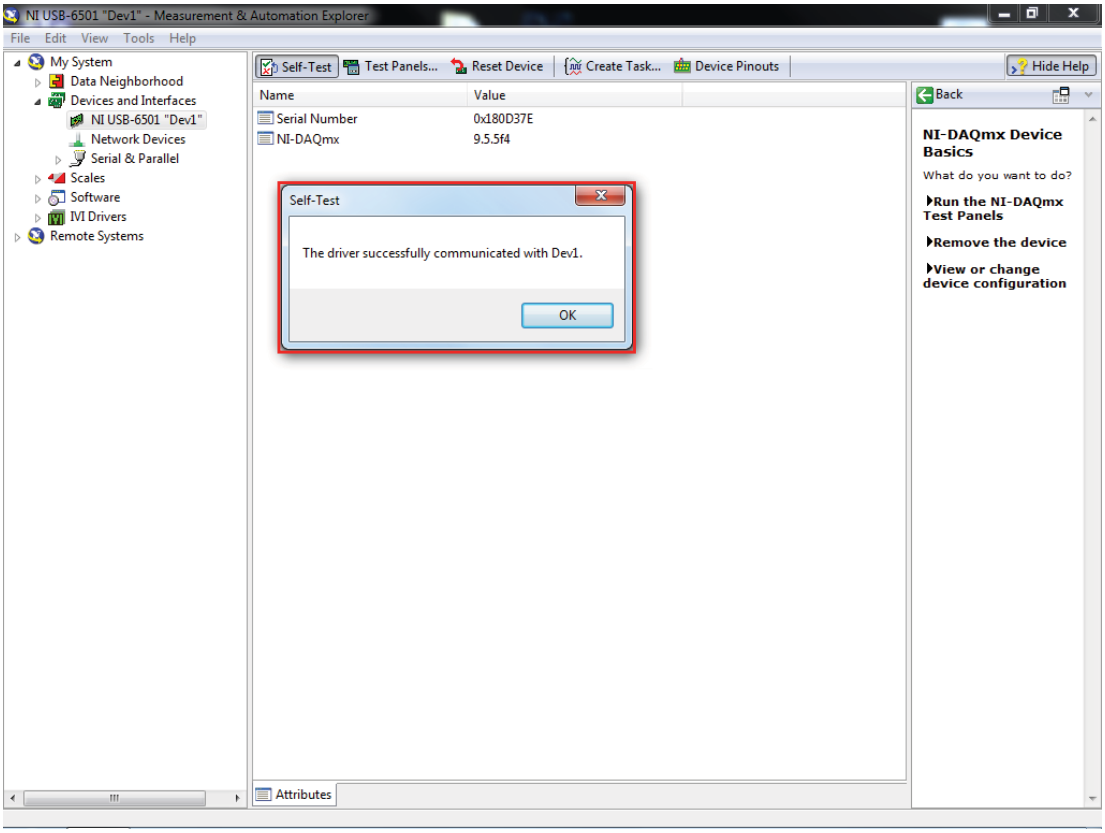


Figure B.37 – Self-Test



USB DIGITAL I/O MODULE TEST *(continued)*

Figure B.38 – Self-Test success



VR SMAW (STICK) DEVICE TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

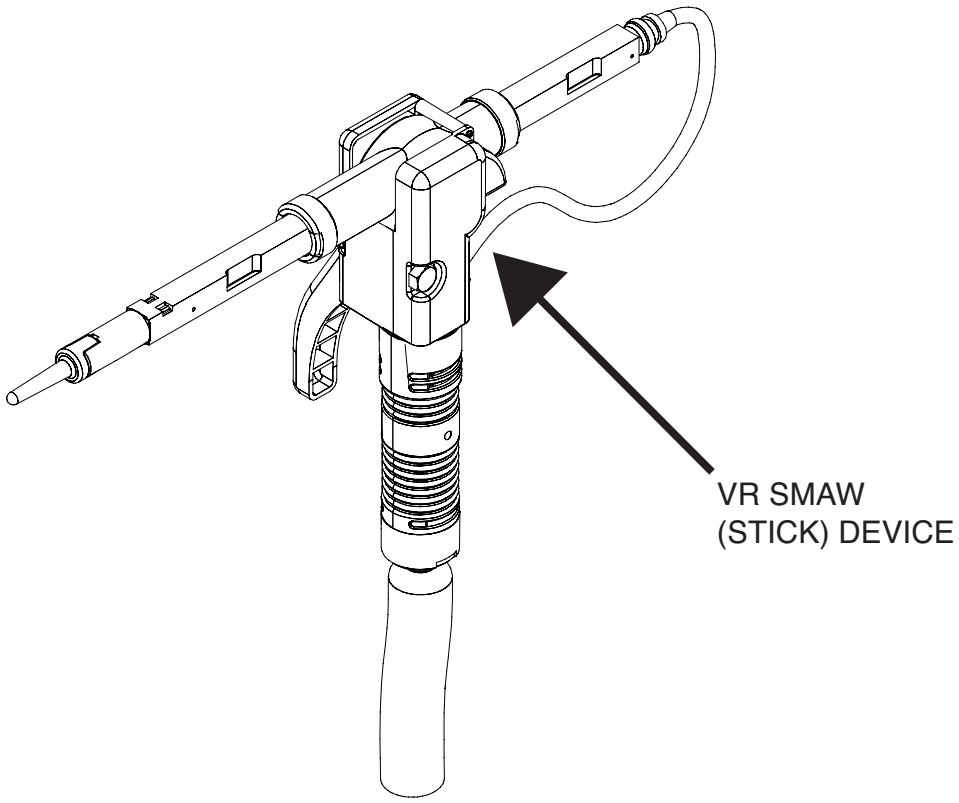
This procedure will help determine if the VR SMAW (Stick) Device is functioning properly.

MATERIALS NEEDED

3/8” Socket/Wrench
USB Keyboard
USB Mouse

VR SMAW (STICK) DEVICE TEST *(continued)*

Figure B.39 – VR SMAW (stick) device



PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Locate the VR SMAW (stick) device. See Figure B.39.
4. Check for loose or faulty connections on VR SMAW (stick) device. See Wiring Diagram.
5. Using a 3/8" socket/wrench, remove the screw securing the USB cover to the rear of the machine. See ***Figure B.40***.
6. Connect USB mouse and USB keyboard to rear USB receptacle. See ***Figure B.40***.
7. Carefully apply input power to the machine.
8. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

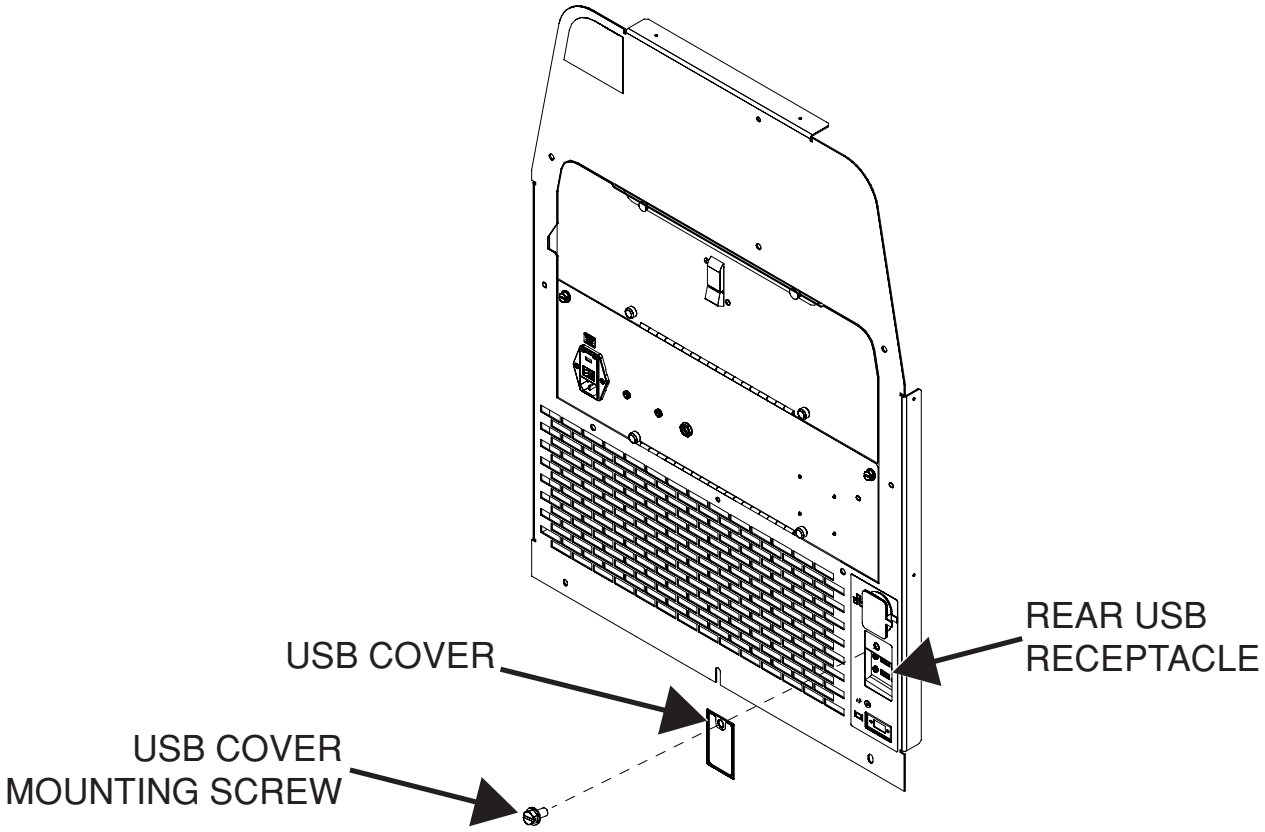
9. At logon screen, on actual keyboard, press Windows key & "D".
10. Move mouse to bottom of screen, task bar appears. Close all programs.
11. Navigate to 'C:\LEC_Welder\Executable'. See ***Figure B.41***.
12. Select Sim welder host program (SimWelderHost.exe). See ***Figure B.41***.

NOTE: It may be necessary to maximize the program screen, this can be done by double clicking the top bar of the window. Maximizing the window will allow the scroll bars to be accessible.

13. Select test override. See ***Figure B.42***.
14. Adjust the VR SMAW (stick) device to 45º and 90º positions. Verify the screen indicates the same position. See ***Figure B.43***.
15. With the stick fully retracted, adjust the 'StepperSpeed' setting to 100. See ***Figure B.44***. The stick should steadily retract.
16. While holding the VR SMAW (stick) device, adjust the 'StepperHome' setting to 1. See ***Figure B.45***. The stick should return to the home position.
17. Close program window when testing is complete.

VR SMAW (STICK) DEVICE TEST *(continued)*

Figure B.40 – USB cover removal



18. If 45º or 90º adjustment is not indicated on the screen, perform the ***Patriot SEU Module Test***. If adjusting 'StepperSpeed' and/or 'StepperHome' do not produce the desired result, perform the ***USB Digital I/O Module Test***, the ***Motor Control Board Test*** and the ***5/12 VDC Power Supply Test***.
19. If all other components test OK, the VR SMAW (stick) device may be faulty.
20. If faulty, Perform the ***VR SMAW (Stick) Device Removal And Replacement Procedure***.
21. Perform the ***Case Cover Replacement Procedure***.
22. Disconnect the USB keyboard and mouse from rear USB receptacle. See Figure B.40.
23. Using a 3/8" socket/wrench, attach the screw securing the USB cover to the rear of the machine. See Figure B.40.
24. Perform ***Retest After Repair Procedure***.

VR SMAW (STICK) DEVICE TEST *(continued)*

Figure B.41 – Sim welder host program location

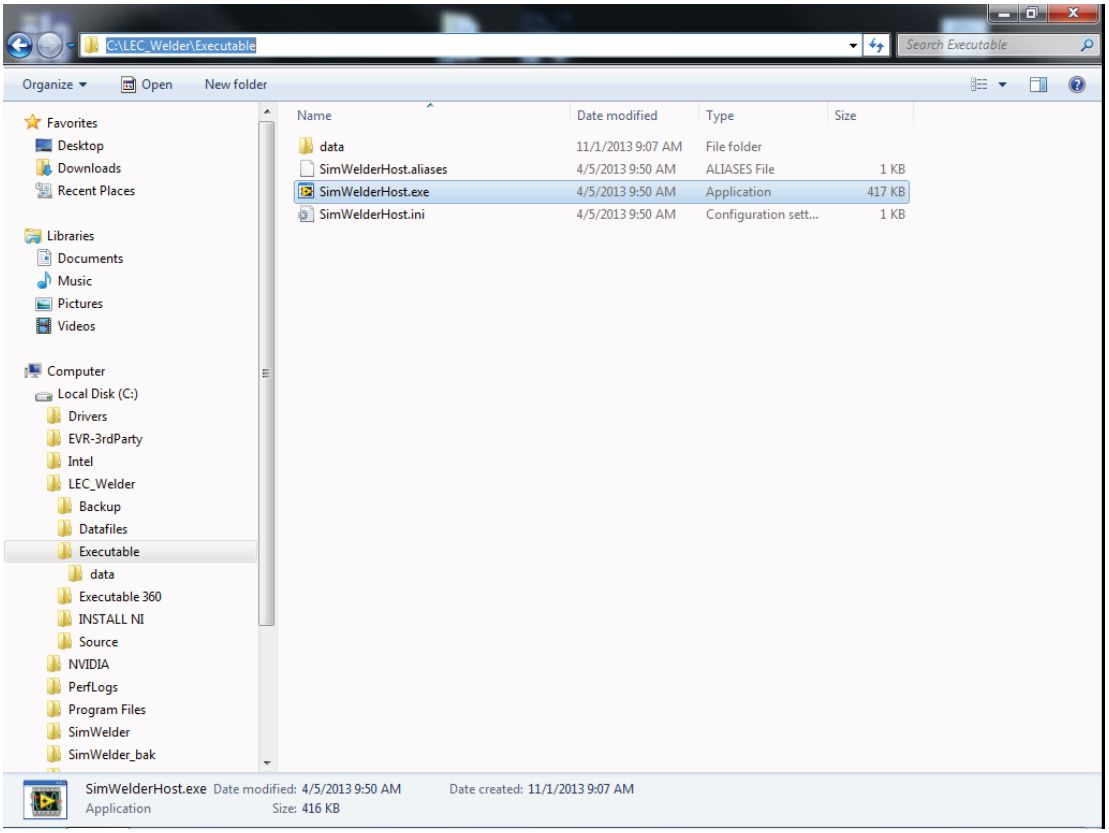
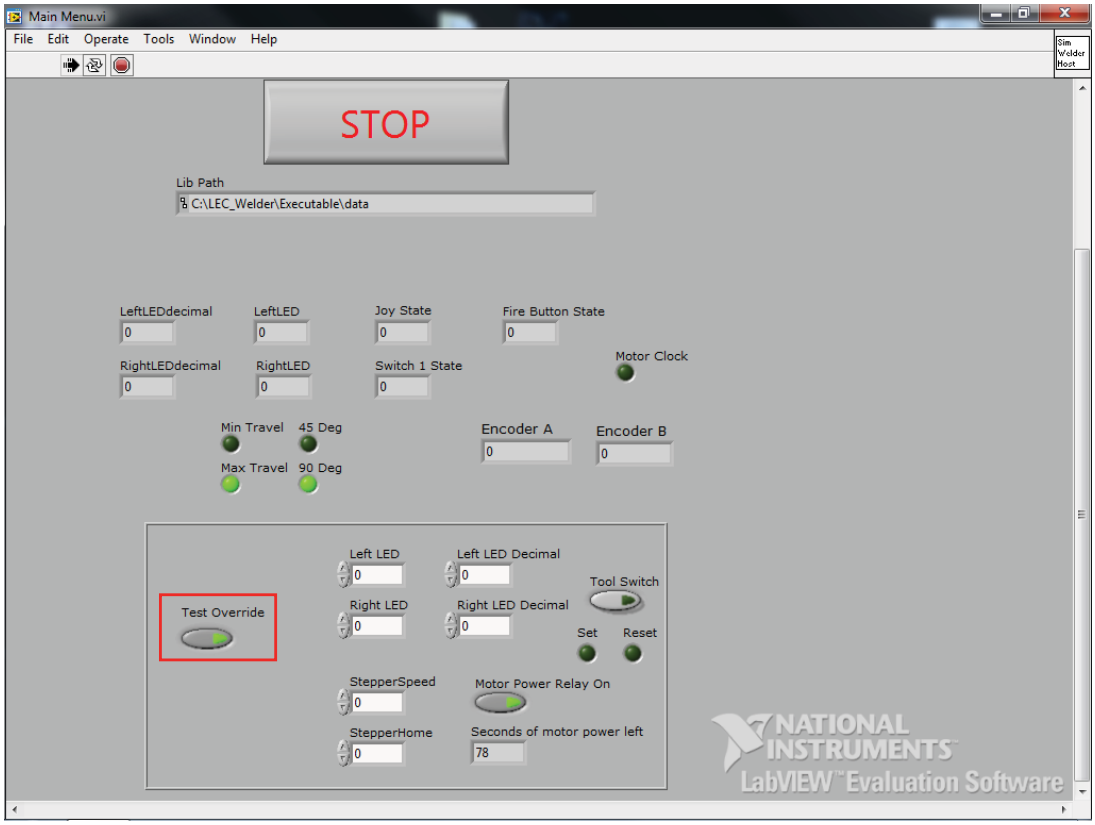


Figure B.42 – Test override



VR SMAW (STICK) DEVICE TEST *(continued)*

Figure B.43 – 45 Deg / 90 Deg

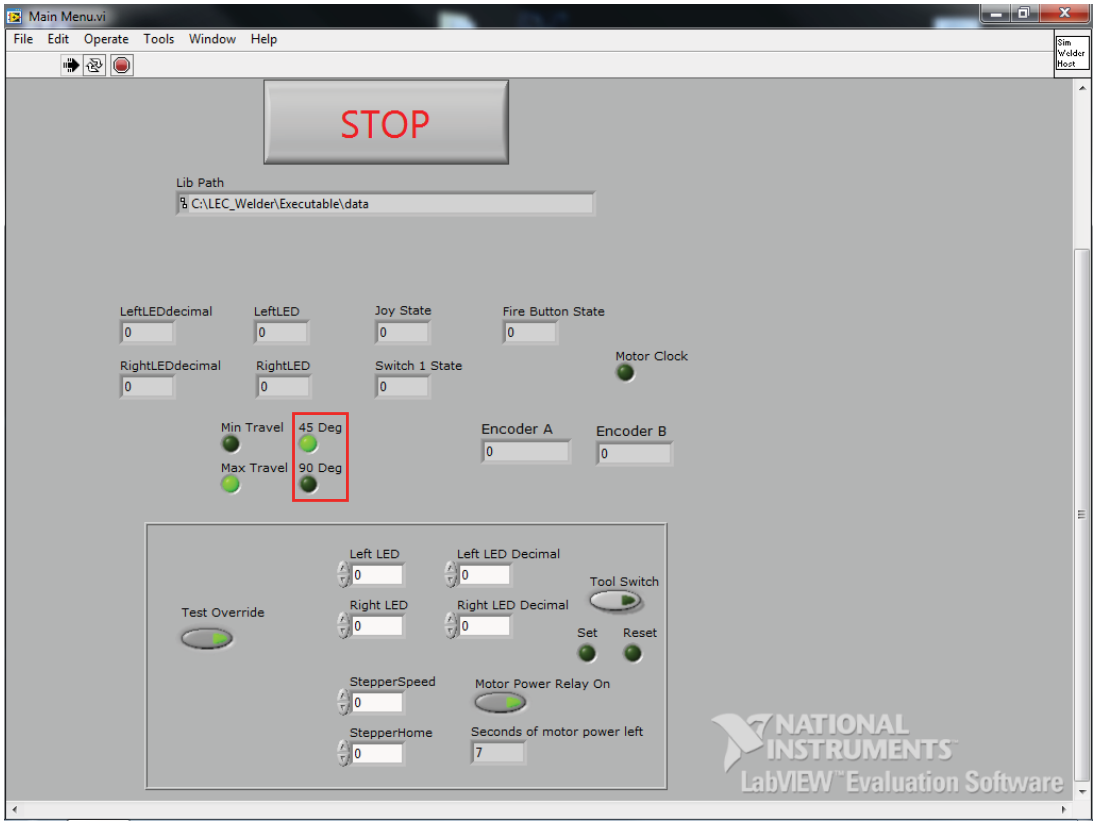
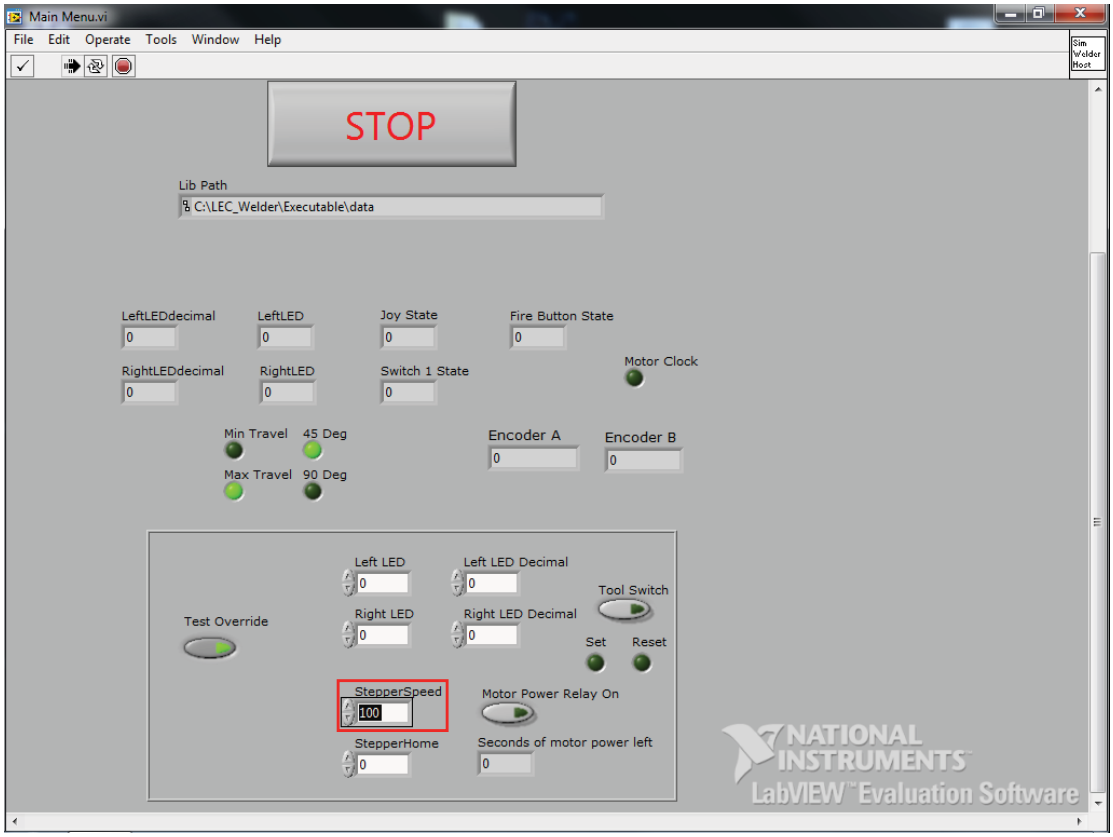
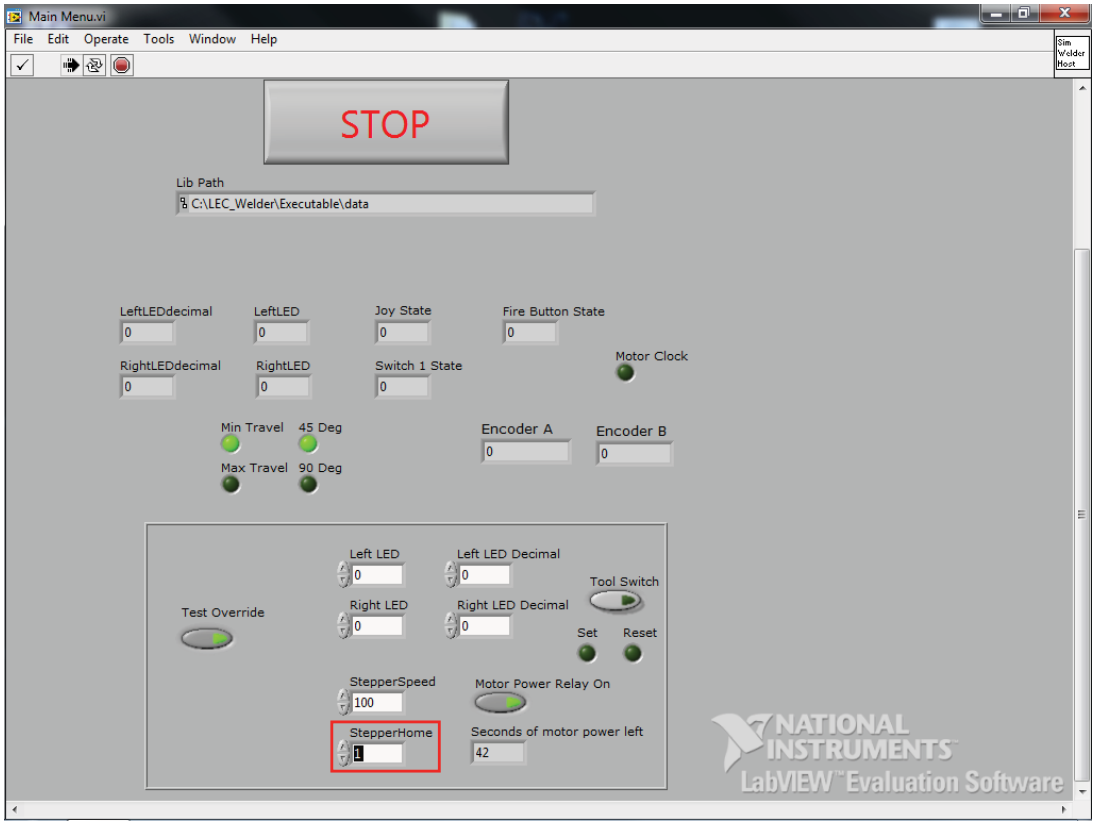


Figure B.44 – StepperSpeed selection



VR SMAW (STICK) DEVICE TEST *(continued)*

Figure B.45 – StepperHome selection



VR GMAW/FCAW (MIG) DEVICE TEST

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

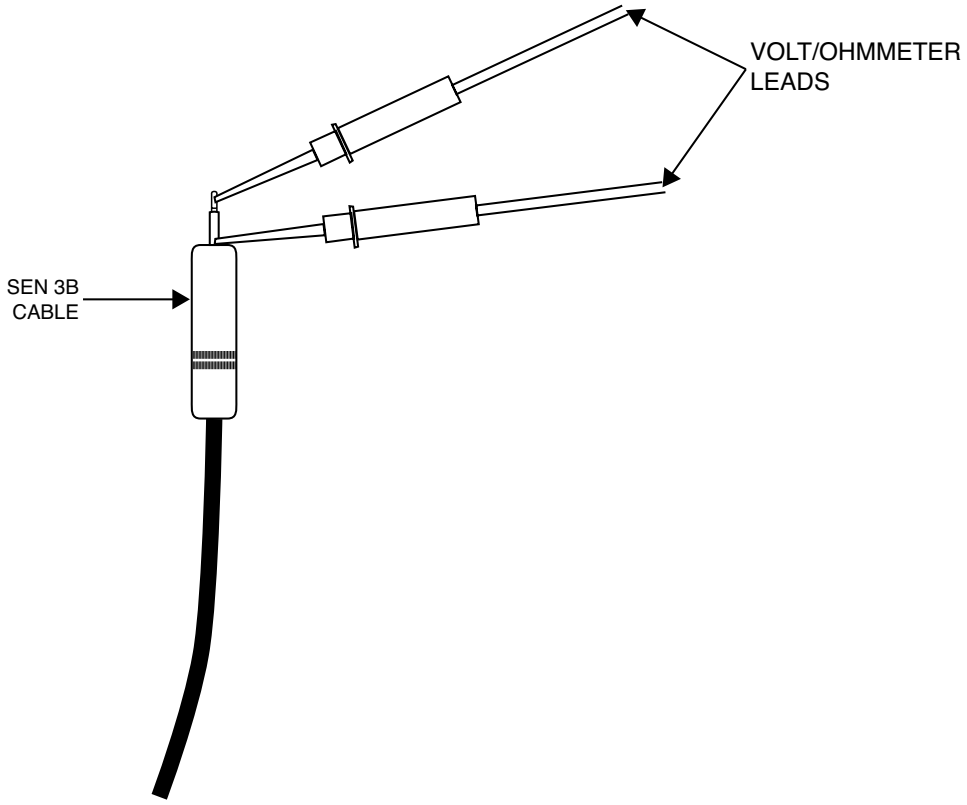
This procedure will help determine if the VR GMAW/FCAW (MIG) Device is functioning properly.

MATERIALS NEEDED

Volt/Ohmmeter

VR GMAW/FCAW (MIG) DEVICE TEST *(continued)*

Figure B.46 – VR GMAW/FCAW (mig) device test points



PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Label and disconnect the SEN 3B cable. See Wiring Diagram.
4. Check SEN 3B cable for continuity.
5. When the trigger is pulled, resistance should be less than 1 Ohm. See Figure B.46.
6. When trigger is not pulled, resistance should be greater than 100,000 Ohms. See Figure B.46.
7. If less than 1 Ohm is not present with the trigger pulled, the VR GMAW/FCAW (MIG) device may be faulty.
8. If test fails, perform the ***Patriot SEU Module Test***.
9. If all other components test OK, perform the ***VR GMAW/FCAW (MIG) Device Removal And Replacement Procedure***.
10. Perform the ***Case Cover Replacement Procedure***.

HARDWARE INITIALIZATION (PIMAN.EXE) PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

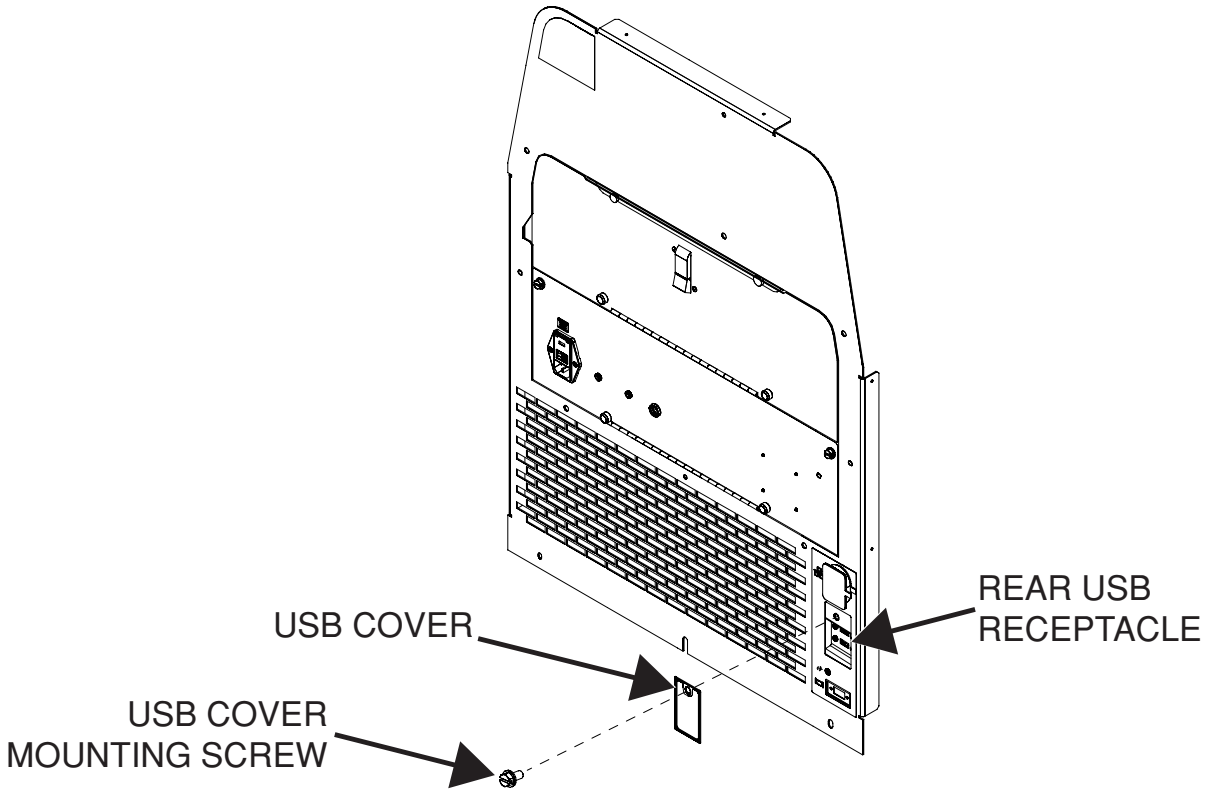
This procedure will aid in the initialization of new hardware installed into the machine after a removal and replacement procedure.

MATERIALS NEEDED

3/8” Socket/Wrench
USB Keyboard
USB Mouse

HARDWARE INITIALIZATION (PIMAN.EXE) PROCEDURE *(continued)*

Figure B.47 – USB cover removal



PROCEDURE

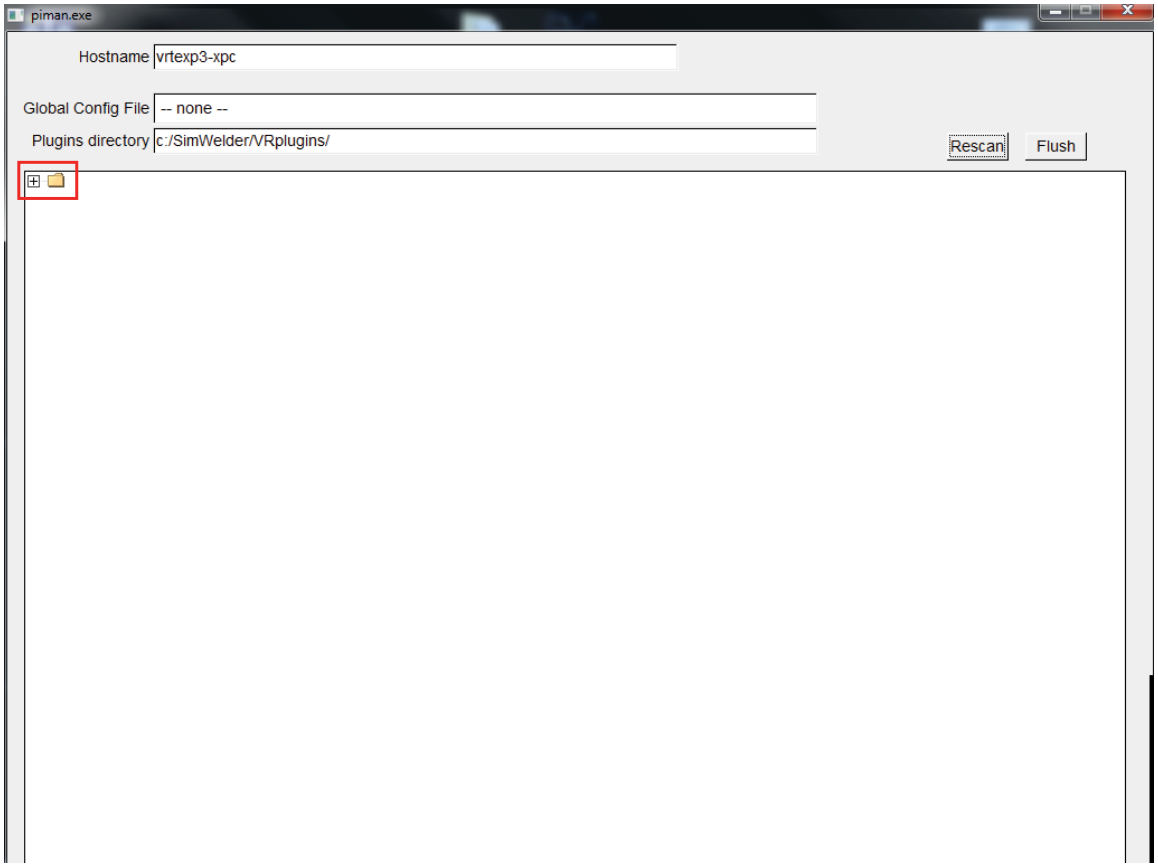
1. Remove the input power to the machine.
2. Using a 3/8” socket/wrench, remove the screw securing the USB cover to the rear of the machine. See Figure B.47.
3. Connect USB mouse and USB keyboard to rear USB receptacle. See Figure B.47.
4. Press and hold the green “ON” button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green “ON” button does not remain ON, it must be held in when testing voltages.

5. Allow VRTEX log on screen to appear.
6. At logon screen, on actual keyboard, press Windows key & “D”.
7. Move mouse to bottom of screen, task bar appears. Close all programs.
8. Using the USB mouse, navigate to the start menu and choose the following options:
    - Start
    - Explore
    - Navigate to “C:/SimWelder/VRplugins”
    - piman.exe
    - Flush
    - OK
    - piman.exe
    - Rescan
9. If procedure was successful the + symbol will appear next the folder icon in the piman program window. See ***Figure B.48***.
10. Close all open windows.
11. Power off the machine by selecting:
    - Start
    - Shutdown
12. Disconnect the USB keyboard and mouse from rear USB receptacle. See Figure B.47.
13. Using a 3/8” socket/wrench, attach the screw securing the USB cover to the rear of the machine. See Figure B.47.
14. Power on the machine and verify operation.
15. Perform ***Retest After Repair Procedure***.

HARDWARE INITIALIZATION (PIMAN.EXE) PROCEDURE *(continued)*

Figure B.48 – Piman flush success



DEVICE MANAGER PROCEDURE

⚠ WARNING

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If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

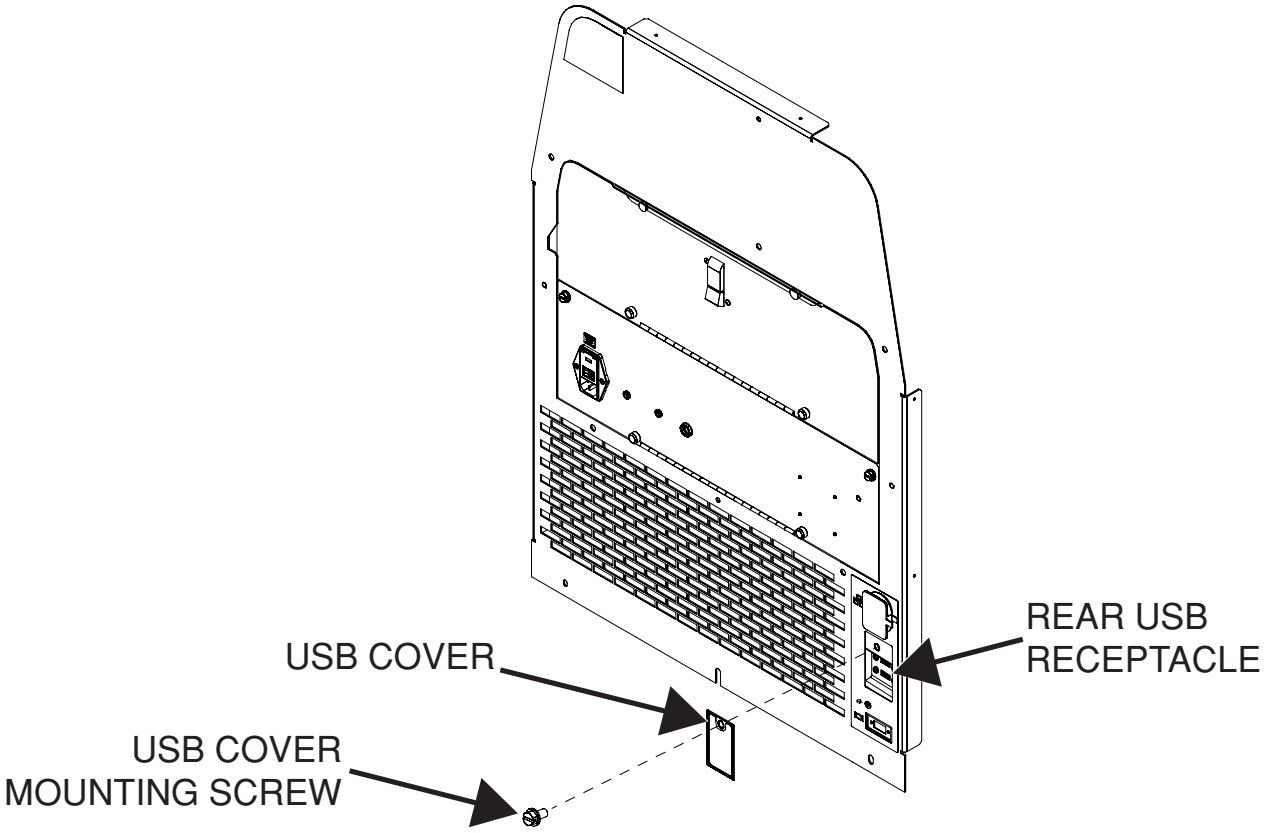
This procedure will help to determine if hardware components are being recognized by the system.

MATERIALS NEEDED

3/8” Socket/Wrench
USB Keyboard
USB Mouse

DEVICE MANAGER PROCEDURE *(continued)*

Figure B.49 – Rear USB cover removal



PROCEDURE

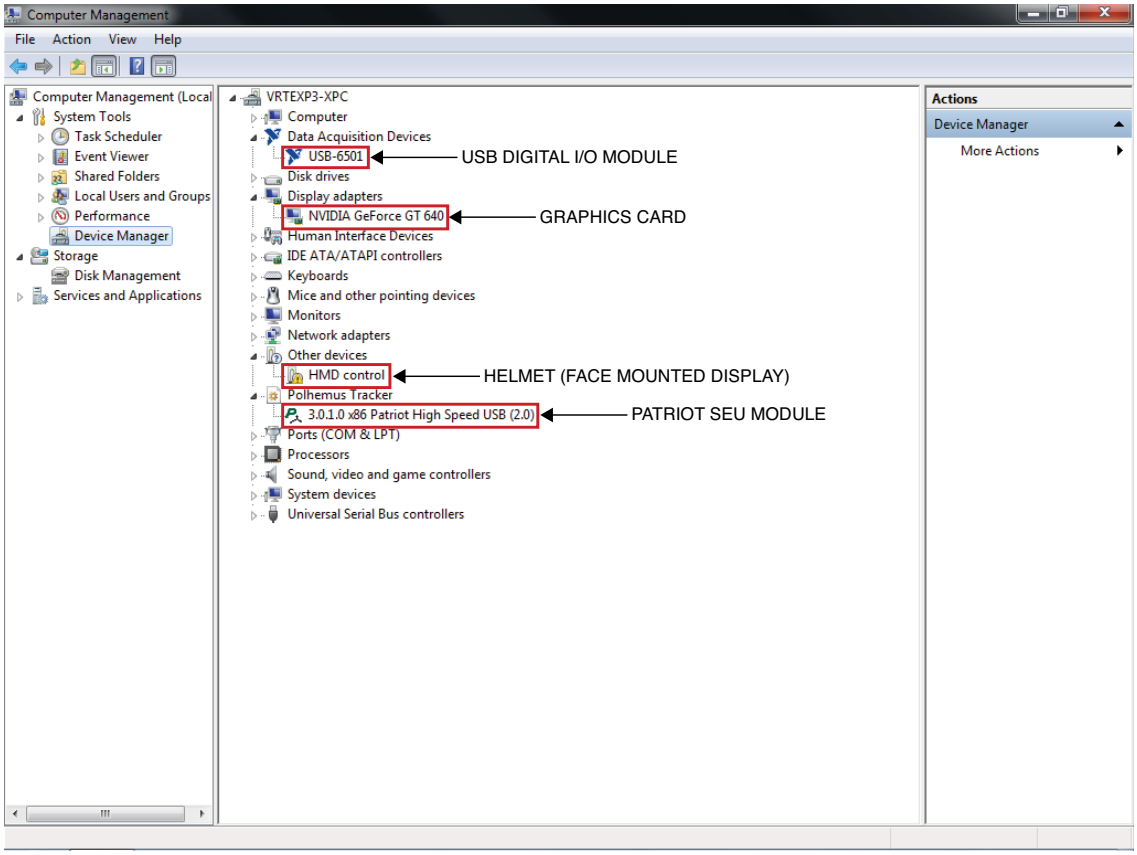
1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides and rear panel access.
3. Check for loose or faulty connections on component in question. See Wiring Diagram.
4. Using a 3/8" socket/wrench, remove the screw securing the USB cover to the rear of the machine. See Figure B.49.
5. Connect USB mouse and USB keyboard to rear USB receptacle. See Figure B.49.
6. Carefully apply input power to the machine.
7. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.

NOTE: If Green "ON" button does not remain ON, it must be held in when testing voltages.

8. At logon screen, on actual keyboard, press window key & "D".
9. Move mouse to bottom of screen, task bar appears. Close all programs.
10. Using the USB mouse, navigate to the start menu and right click on 'Computer' and select 'Manage' to open the Device Manager, See ***Figure B.50***.
11. Verify that the component in question is displayed on the screen and does not have a red X next to its name. See ***Figure B.50***.
12. Close all open windows.
13. Power off the machine by selecting:
    - Start
    - Shutdown
14. Remove input power to the machine.
15. Perform the ***Case Cover Replacement Procedure***.
16. Disconnect the USB keyboard and mouse from rear USB receptacle. See Figure B.49.
17. Using a 3/8" socket/wrench, attach the screw securing the USB cover to the rear of the machine. See Figure B.49.

DEVICE MANAGER PROCEDURE *(continued)*

Figure B.50 – Device manager



MONITOR AND MONITOR STAND REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

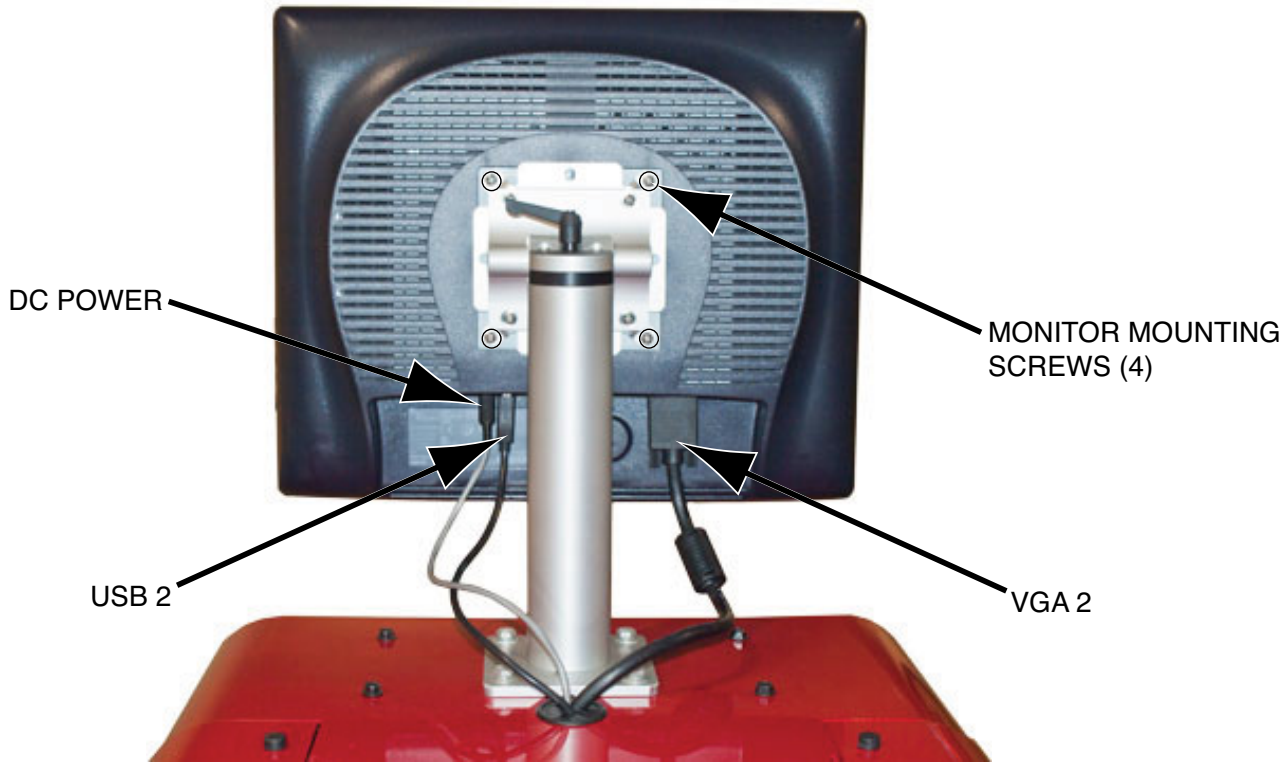
This procedure will aid the technician in the removal and replacement of the Monitor and Monitor Stand.

MATERIALS NEEDED

7/16” Socket/Wrench
Phillips Screwdriver

MONITOR AND MONITOR STAND
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.51 – VGA & power cord location



REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Disconnect the VGA 2, USB 2 and the DC power cable from the monitor. See Figure B.51. See Wiring Diagram.

MONITOR REMOVAL

3. Using a phillips screwdriver, remove four monitor mounting screws. See ***Figure B.52***.
4. The monitor can now be removed and replaced.

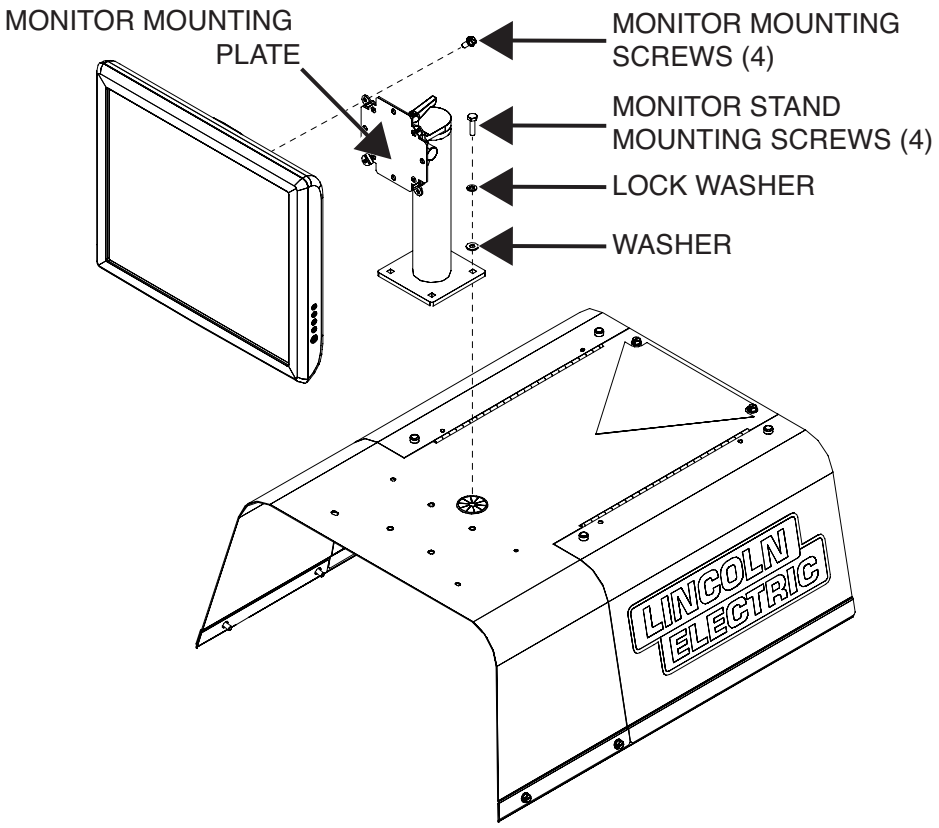
NOTE: It is not necessary to remove the monitor stand if just the monitor is to be replaced.

MONITOR STAND

5. Using a 7/16” socket/wrench, remove the four monitor stand mounting screws. Note washer placement upon removal. See ***Figure B.52***.
6. The monitor stand can now be removed and replaced.

MONITOR AND MONITOR STAND
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.52 – Monitor stand and monitor mounting bolts



REPLACEMENT PROCEDURE

1. Carefully position the monitor stand on to the roof of the machine.
2. Using a 7/16” socket/wrench, attach the four monitor stand mounting screws and washers.
3. Using a phillips screwdriver, attach the four screws securing the monitor to the monitor stand.
4. Connect VGA 2, USB 2 and DC power cables to the monitor. See Wiring Diagram.
5. Perform ***Retest After Repair Procedure***.

5/12 VDC POWER SUPPLY
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

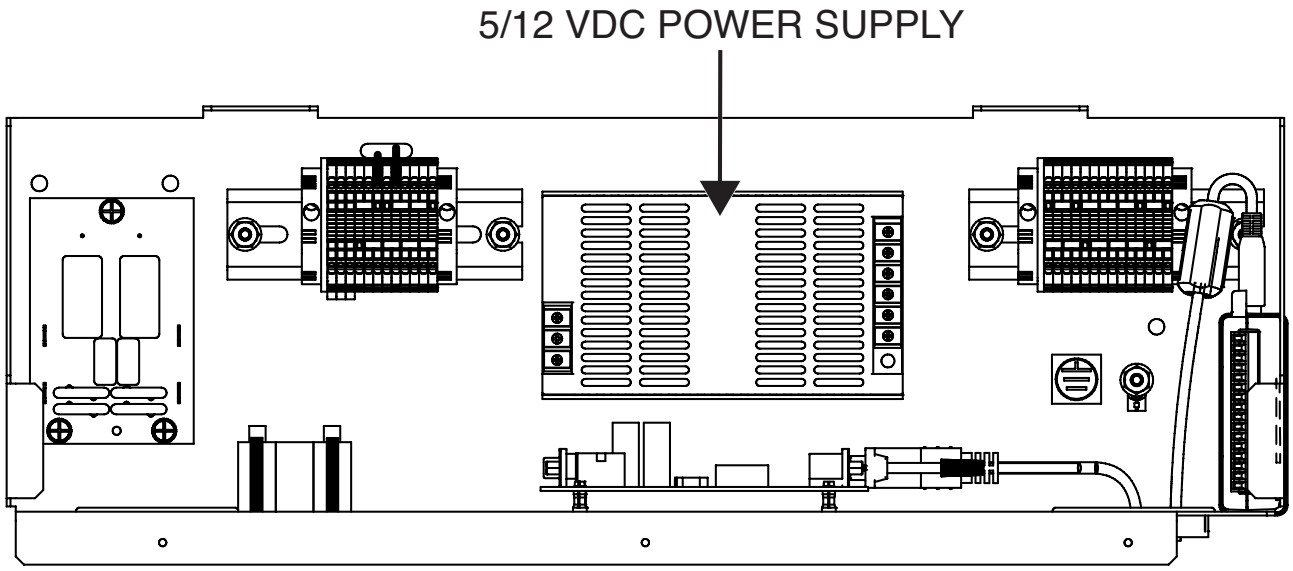
This procedure will aid the technician in the removal and replacement of the 5/12 VDC Power Supply.

MATERIALS NEEDED

Phillips Screwdriver
Small Phillips Screwdriver

5/12 VDC POWER SUPPLY
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.53 – 5/12 VDC power supply location



REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for rear panel access and case sides.
3. Locate the 5/12 VDC power supply. See Figure B.53.
4. Using a phillips screwdriver, label and remove leads 801(+), 701(–), 900(+), 502D, 601C and ground lead from the 5/12 VDC power supply. See ***Figure B.54***. See Wiring Diagram.
5. Using a small phillips screwdriver, remove the four mounting screws securing the 5/12 VDC power supply to the rear of the power box assembly. See ***Figure B.55***.

NOTE: Note placement of insulator if applicable.

5/12 VDC POWER SUPPLY
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.54 – 5/12 VDC power supply leads

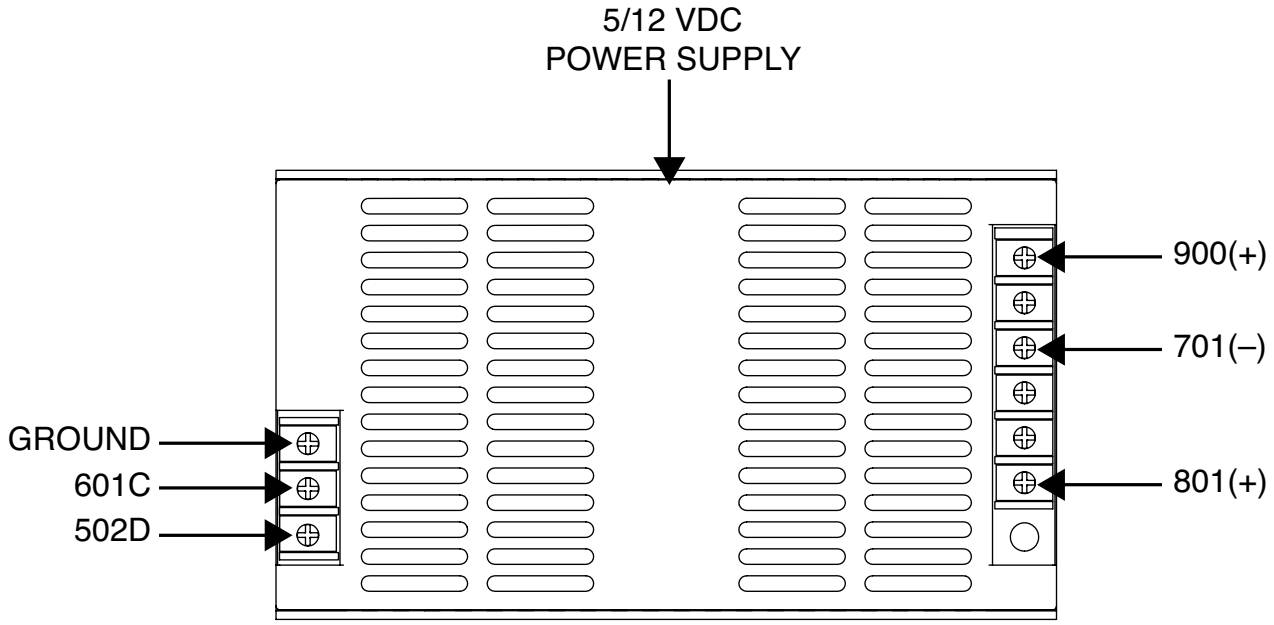
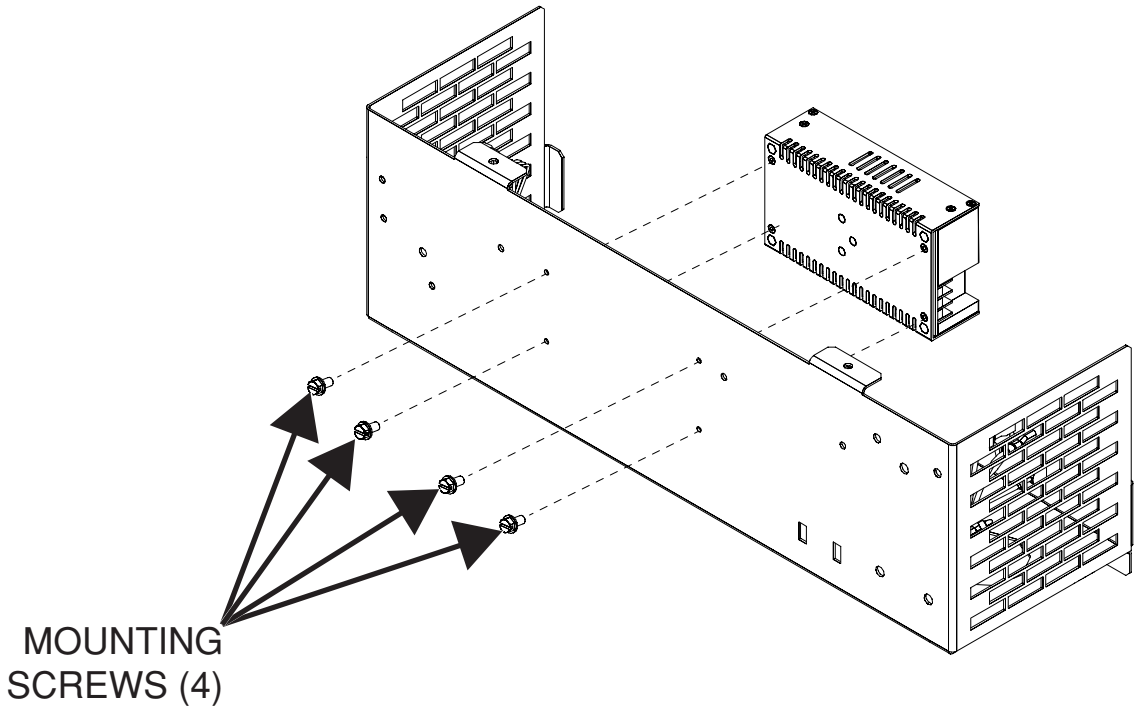


Figure B.55 – 5/12 VDC power supply mounting screw location



5/12 VDC POWER SUPPLY
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

REPLACEMENT PROCEDURE

1. Using a small phillips screwdriver, attach the four mounting screws securing the 5/12 VDC power supply to the rear of the power box. Note placement of insulator if applicable.
2. Using a phillips screwdriver, attach previously removed leads 801(+), 701(–), 900(+), 502D, 601C and ground lead to the 5/12 VDC power supply. See Wiring Diagram.
3. Perform the ***Case Cover Replacement Procedure***.
4. Perform ***Retest After Repair Procedure***.

INPUT RELAY REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

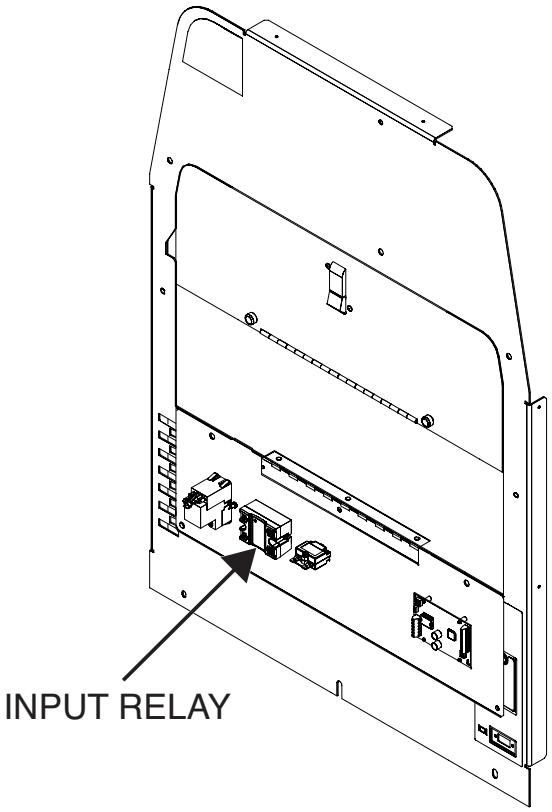
This procedure will aid the technician in the removal and replacement of the Input Relay.

MATERIALS NEEDED

Small Phillips Screwdriver

INPUT RELAY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.56 – Input relay location

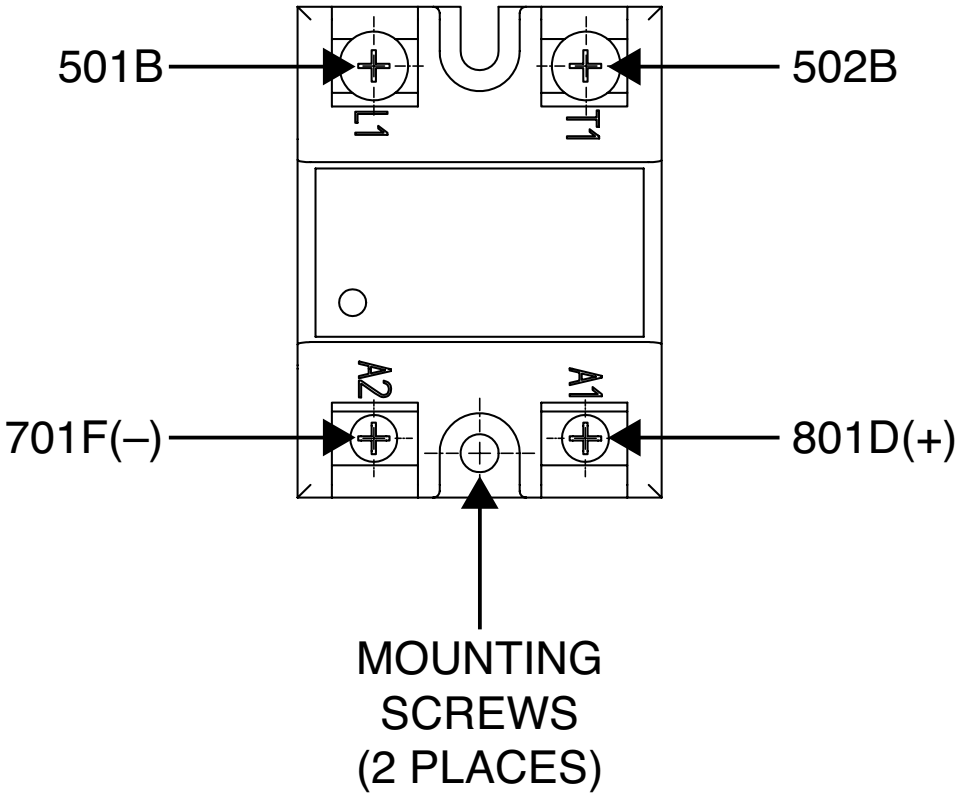


REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for rear panel access.
3. Locate the input relay. See Figure B.56.
4. Label leads 801D, 701F, 501B and 502B and their appropriate terminals. See ***Figure B.57***. See Wiring Diagram.
5. Using a small phillips screwdriver, disconnect the four previously labeled leads from terminals A1, A2, L1 and T1. See ***Figure B.57***.
6. Using a phillips screwdriver, remove the two input relay mounting screws. See ***Figure B.57***.
7. The input relay can now removed and replaced.

INPUT RELAY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.57 – Input relay lead locations and mounting screws



REPLACEMENT PROCEDURE

1. Carefully position the new input relay in the machine.
2. Using a phillips screwdriver, attach the two screws securing the input relay to the machine.
3. Using a small phillips screwdriver, attach the previously removed leads (801D, 701F, 501B and 502B) to terminals A1, A2, L1 and T1. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.
5. Perform ***Retest After Repair Procedure***.

INPUT FILTER BOARD
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Input Filter Board.

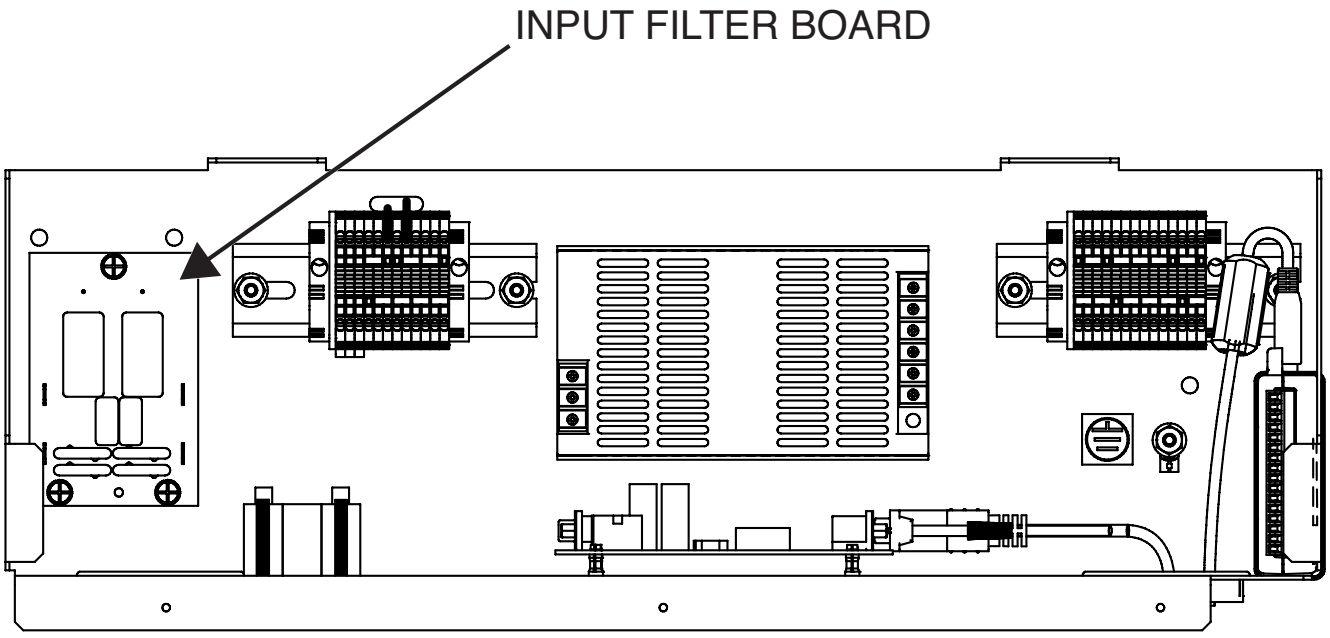
MATERIALS NEEDED

Phillips Screwdriver

INPUT FILTER BOARD

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.58 – Input relay board location



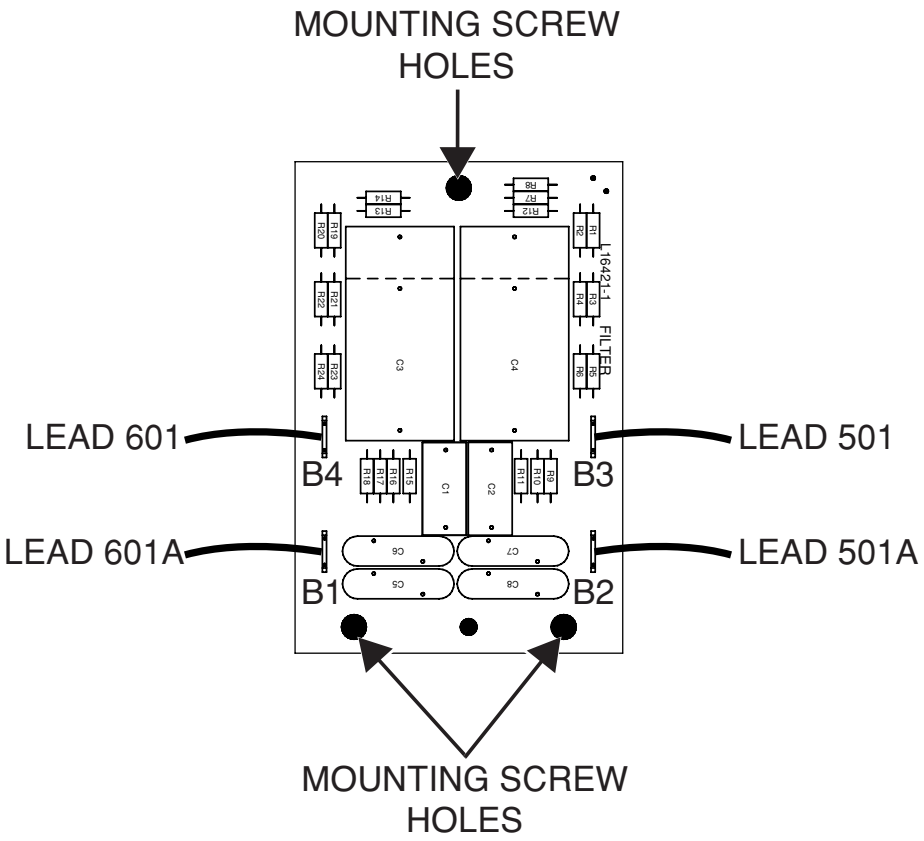
REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for rear panel access.
3. Locate the input filter board. See Figure B.58.
4. Label and disconnect the four leads (601, 601A, 501 and 501A) from the input filter board. See ***Figure B.59***. See Wiring Diagram.
5. Using a phillips screwdriver, remove the three screws securing the input relay board to the rear panel of the power box assembly. See ***Figure B.59***.
6. The input relay board can now be removed and replaced.

INPUT FILTER BOARD

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.59 – Input relay board lead and mounting screw locations



REPLACEMENT PROCEDURE

1. Carefully position the new input relay board in to the machine.
2. Using a phillips screwdriver, attach the three screws securing the input relay board to the rear panel of the power box assembly.
3. Connect the four previously removed leads (601, 601A, 501 and 501A) to the input filter board. See Wiring Diagram.
4. Perform the ***Case Cover Replacement Procedure***.
5. Perform ***Retest After Repair Procedure***.

MOTOR CONTROL BOARD
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

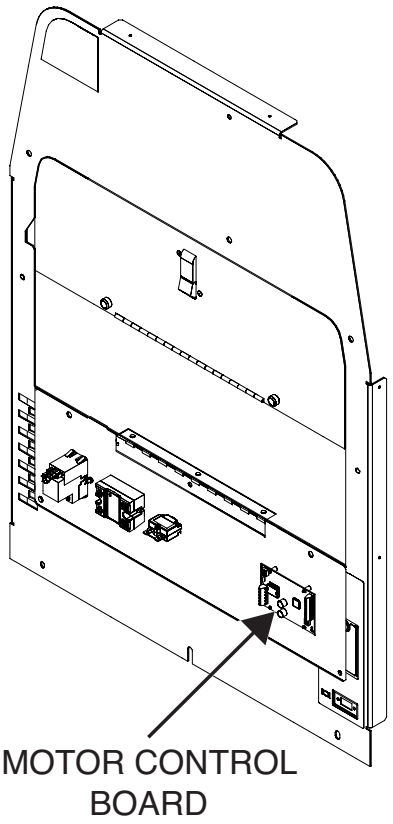
This procedure will aid the technician in the removal and replacement of the Motor Control Board.

MATERIALS NEEDED

Small Slotted Screwdriver

MOTOR CONTROL BOARD
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.60 – Motor control board location



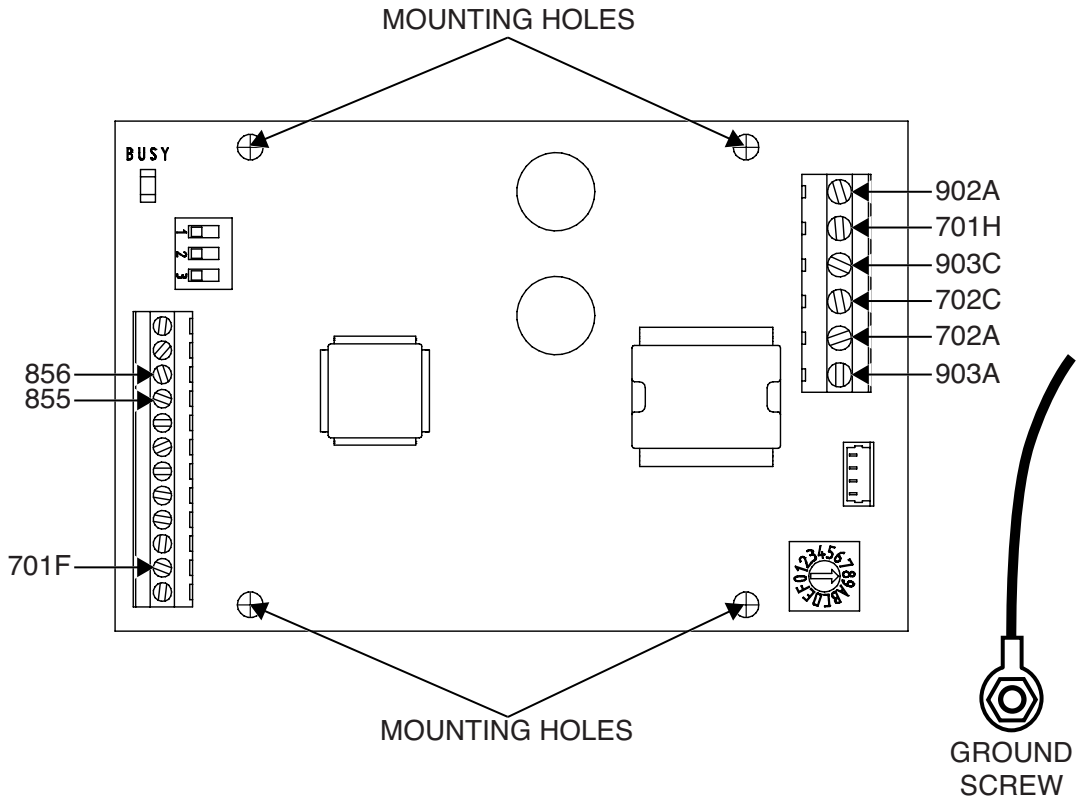
REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for real panel access.
3. Locate the motor control board. See Figure B.60.
4. Using a small slotted screwdriver, carefully label and remove leads 701F, 855, 856, 902A, 701H, 903C, 702C, 702A and 903A. See ***Figure B.61***. See Wiring Diagram.
5. Gently pry the motor control board off of the four stand-offs. See ***Figure B.61***.
6. The motor control board can now be removed and replaced.

MOTOR CONTROL BOARD

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.61 – Motor control board lead and mounting hole locations



REPLACEMENT PROCEDURE

1. Carefully position new motor control board on to the four stand-offs and press firmly until it is properly seated.
2. Using a small slotted screwdriver, attach the previously removed remove leads 701F, 855, 856, 902A, 701H, 903C, 702C, 702A and 903A. See Wiring Diagram.
3. Perform the ***Case Cover Replacement Procedure***.
4. Perform ***Retest After Repair Procedure***.

USB HUB REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

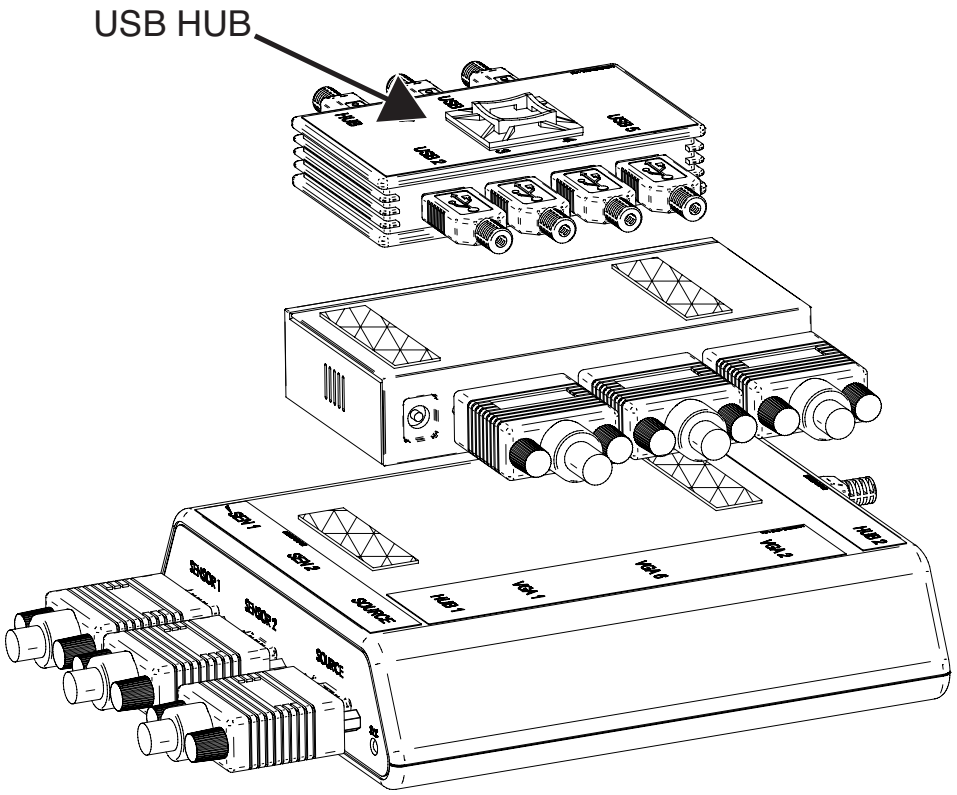
This procedure will aid the technician in the removal and replacement of the USB Hub.

MATERIALS NEEDED

Miscellaneous Hand Tools
Hook and Loop Type Fastener

USB HUB REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.62 – USB hub location

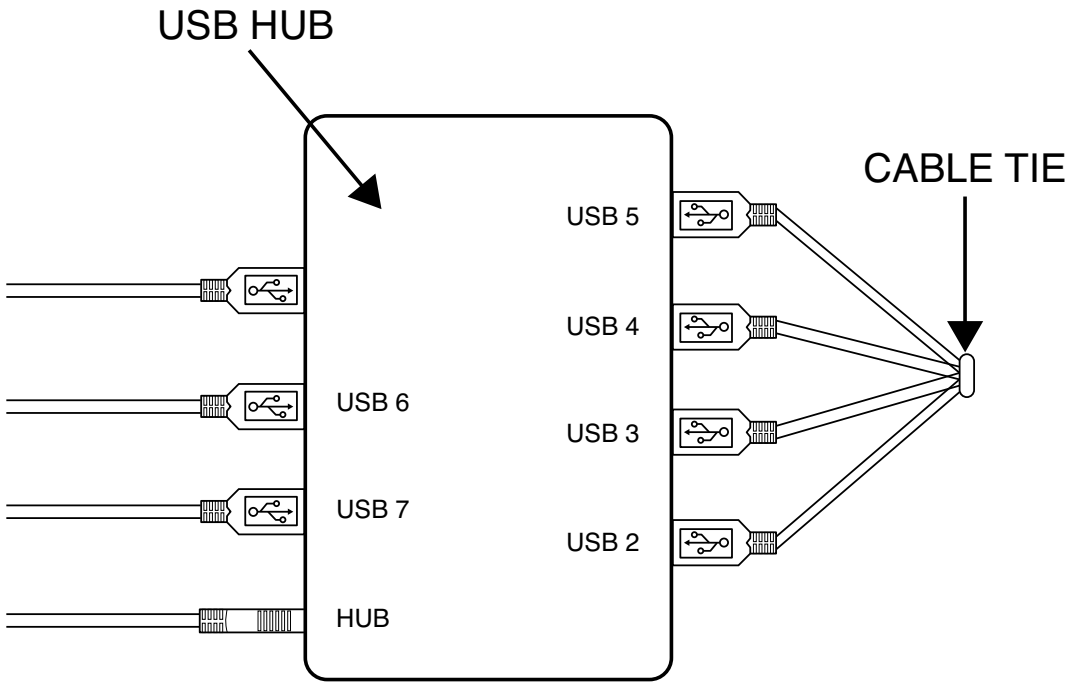


REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Locate the USB hub. See Figure B.62.
4. Label and remove all connections from the USB hub. See ***Figure B.63***. See Wiring Diagram.
5. Remove cable ties (if applicable). See ***Figure B.63***.
6. Remove and replace the USB hub. The USB hub is secured to the VGA splitter with a hook and loop type fastener.

USB HUB REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.63 – USB hub connection locations



REPLACEMENT PROCEDURE

1. Carefully place the new USB hub in to position in the machine.
2. Using the hook and loop type fastener, secure the USB hub to the VGA splitter.
3. Connect all previously removed cables to the USB hub. See Wiring Diagram.
4. Replace any previously removed cable ties.
5. Perform the ***Case Cover Replacement Procedure***.
6. Perform ***Retest After Repair Procedure***.

VGA SPLITTER REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

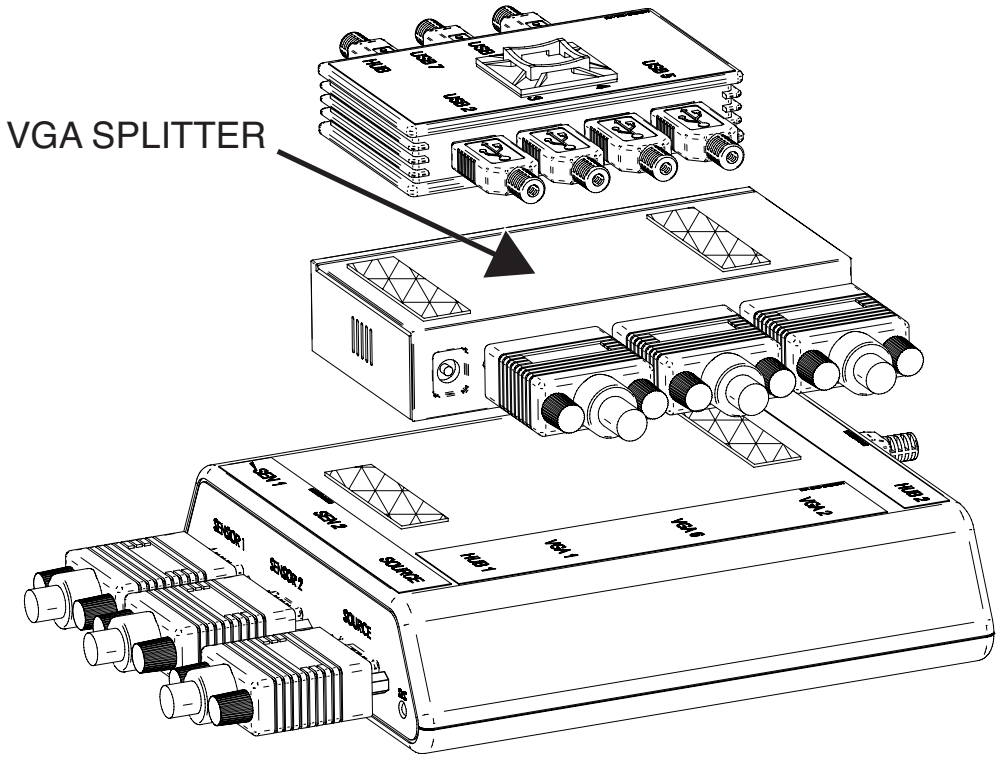
This procedure will aid the technician in the removal and replacement of the VGA Splitter.

MATERIALS NEEDED

Miscellaneous Hand Tools
Hook and Loop Type Fastener

VGA SPLITTER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.64 – VGA splitter location

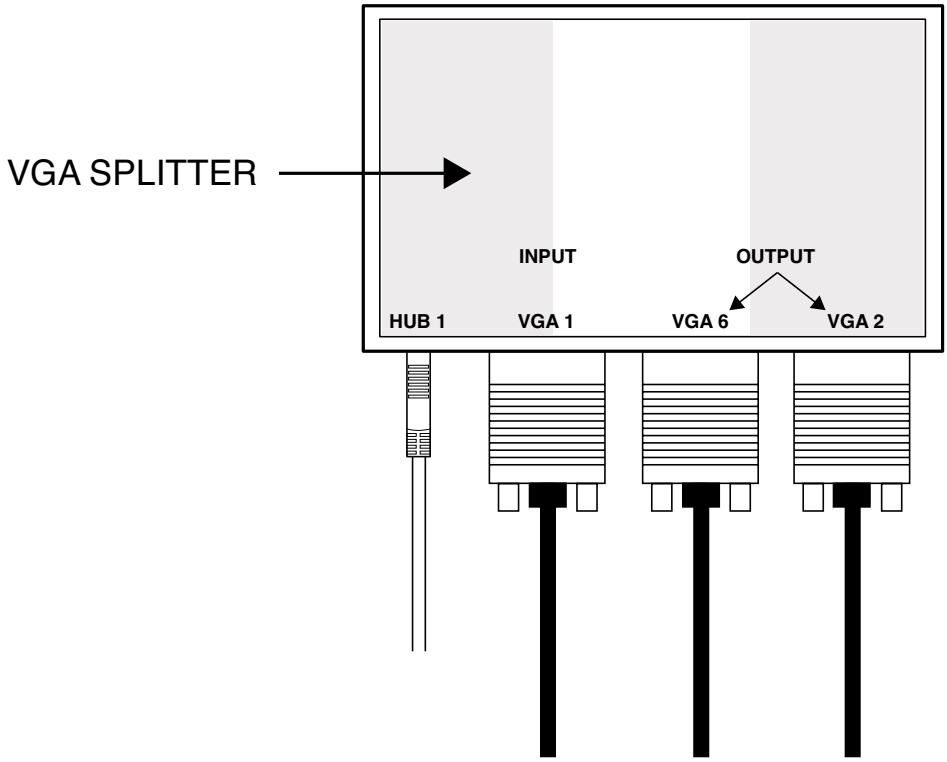


REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Locate the VGA splitter. See Figure B.64.
4. Perform the ***USB Hub Removal Procedure***.
5. Label and remove VGA 2, VGA 6, VGA 1 and the HUB 1 source power from the VGA splitter. See ***Figure B.65***. See Wiring Diagram.
6. Remove cable ties (if applicable).
7. The VGA splitter can now be removed and replaced. The VGA splitter is secured to the Patriot SEU module with a hook and loop type fastener.

VGA SPLITTER REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.65 – VGA splitter connections



REPLACEMENT PROCEDURE

1. Place the new VGA splitter into position in the machine. The VGA splitter is secured to the Patriot SEU module by a hook and loop type fastener.
2. Connect all previously removed cables and source power to the VGA splitter. See Wiring Diagram. Replace cable ties, as necessary.
3. Perform the ***USB Hub Replacement Procedure***.
4. Perform the ***Case Cover Replacement Procedure***.
5. Perform ***Retest After Repair Procedure***.

PATRIOT SEU MODULE
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

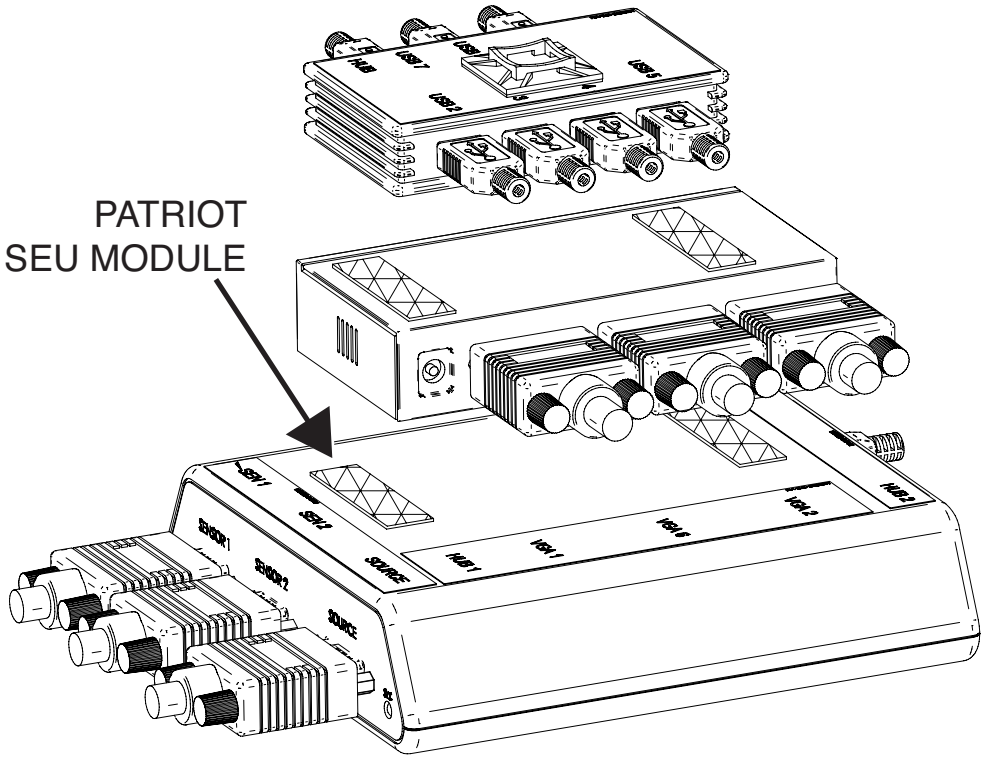
This procedure will aid the technician in the removal and replacement of the Patriot SEU Module.

MATERIALS NEEDED

Hook and Loop Type Fastener

PATRIOT SEU MODULE
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.66 – Patriot SEU module location



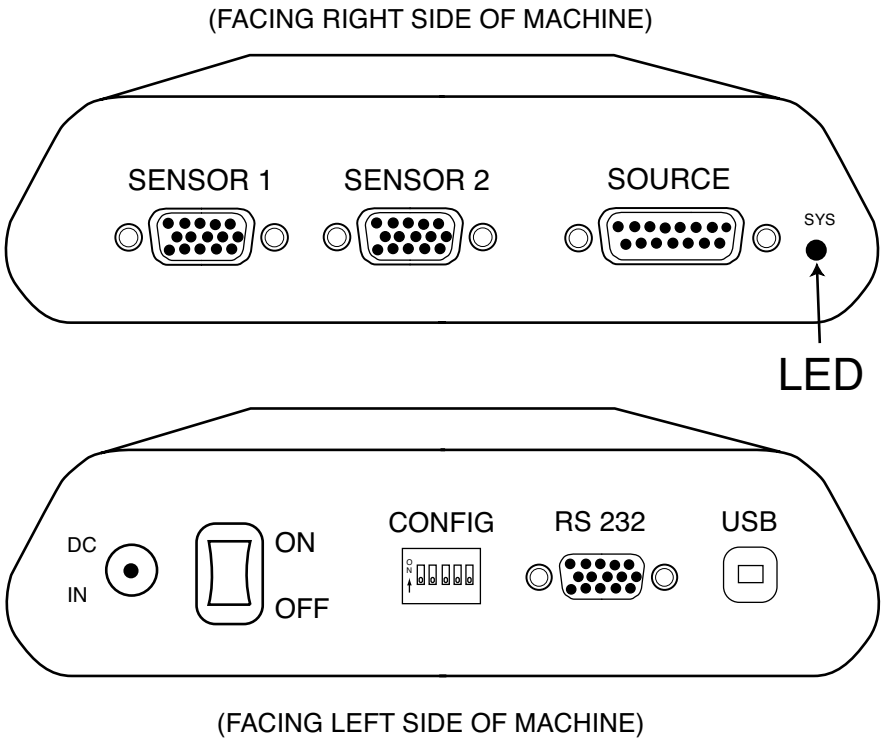
REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Locate the Patriot SEU module. See Figure B.66.
4. Perform the ***USB Hub Removal Procedure***.
5. Perform the ***VGA Splitter Removal Procedure***.
6. Remove the five associated cables connected to the Patriot SEU module. Note and label the locations before disconnecting. See ***Figure B.67***. See Wiring Diagram.
7. Carefully remove Patriot SEU module from base. See ***Figure B.67***.

NOTE: The Patriot SEU module is secured to the base with hook & loop type fasteners.

PATRIOT SEU MODULE
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.67 – Patriot SEU module lead locations



REPLACEMENT PROCEDURE

1. Carefully position new Patriot SEU module in the machine. The Patriot SEU module is secured to the base with hook & loop type fasteners.
2. Connect all previously removed cables to the Patriot SEU module.
3. Make certain that the Patriot SEU module on/off switch is in the ON position.
4. Perform the ***VGA Splitter Replacement Procedure***.
5. Perform the ***USB Hub Replacement Procedure***.
6. Perform the ***Case Cover Replacement Procedure***.
7. Perform the ***Hardware Initialization (PIMAN.EXE) Procedure***.
8. Perform ***Retest After Repair Procedure***.

CPU REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

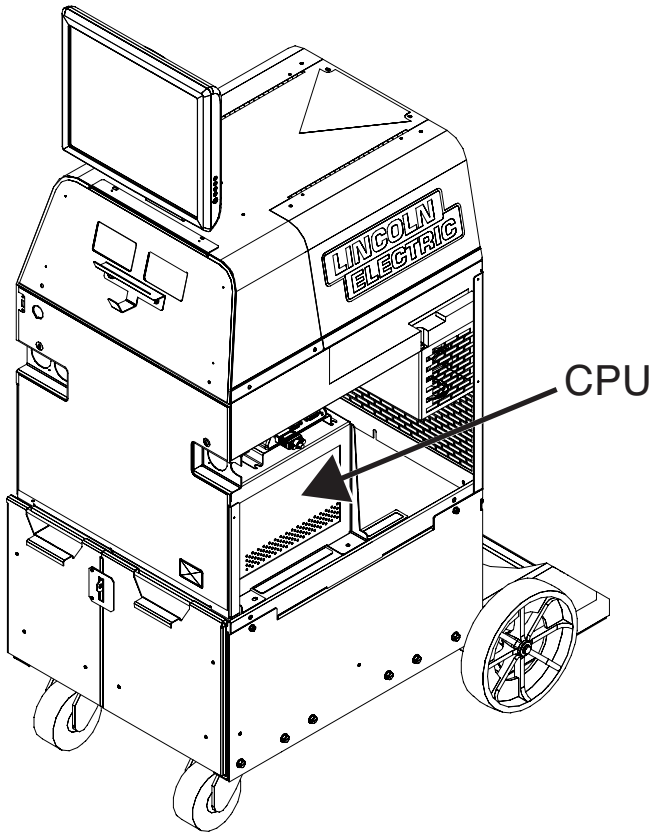
This procedure will aid the technician in the removal and replacement of the CPU.

MATERIALS NEEDED

7/16” Socket/Wrench
Phillips Screwdriver

CPU REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.68 – CPU location



REMOVAL PROCEDURE

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides and rear panel access.
3. Locate the CPU. See Figure B.68.
4. Disconnect input power cord located at the input power receptacle on the back of the CPU. See ***Figure B.71***.
5. Using a phillips screwdriver, label and disconnect leads 801D and 701F from terminals A1 and A2 on the input relay. See ***Figures B.69*** and ***B.70***. See Wiring Diagram. Note cable routing for reassembly.
6. Label and disconnect leads DVI 1 and DVI 2 from the back of the CPU. See ***Figure B.71***.
7. Label and disconnect the RED ENET cable from the back of the CPU. See ***Figure B.71***.

NOTE: Cut any necessary cable ties.

8. Label and disconnect USB 7, USB 8 and USB 9 cables from the back of the CPU. See ***Figure B.71***.
9. Using a 7/16" socket/wrench, remove the four nuts and associated washers securing the two piece CPU bracket. See ***Figure B.72***.

NOTE: The bracket is two pieces. Note position before removal.

10. Remove CPU foam pad from top of CPU. The CPU foam pad is secured to the top of the CPU using hook and loop type fasteners.
11. Carefully remove the CPU bracket.
12. Carefully disconnect audio "L" jack plug from the green audio jack on the front of the CPU. To gain access to the front of the CPU proceed to step 13. See ***Figure B.73***.
13. Carefully remove CPU out of the right side of the machine. Be sure to clear all wires prior to removal.

NOTE: Be sure to disconnect audio "L" jack on front of CPU before completely removing CPU from machine. See step 12.

14. The CPU can now be removed and replaced.

CPU REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.69 – Input relay location

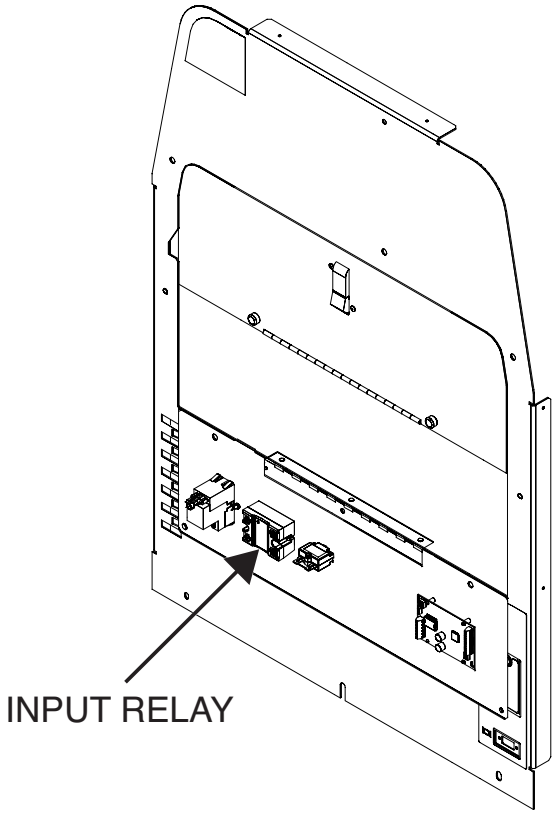
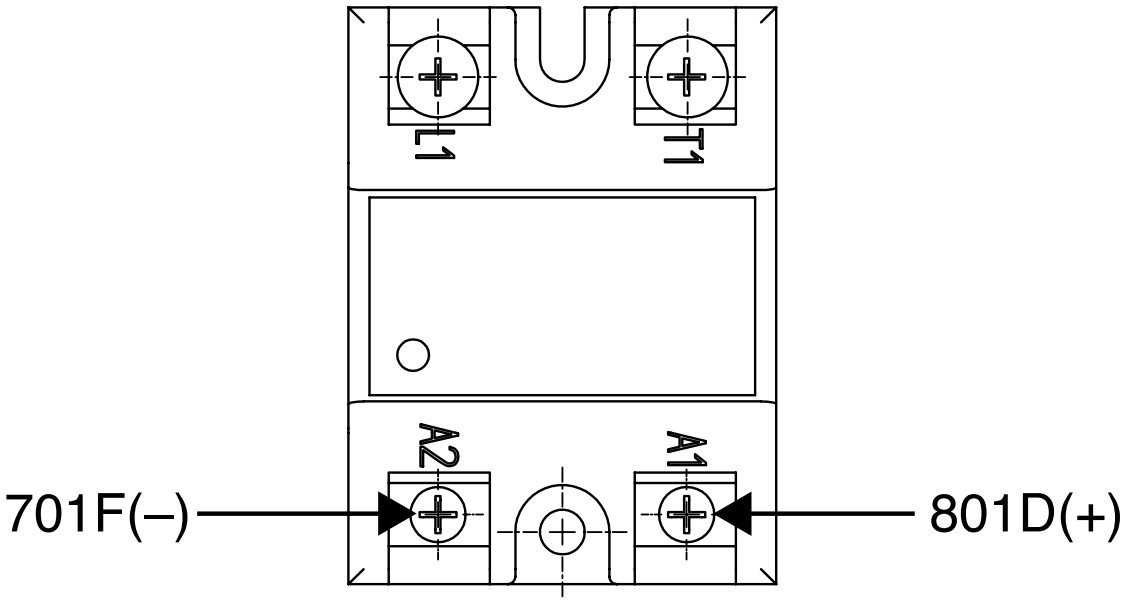


Figure B.70 – Input relay lead location



CPU REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.71 – CPU lead locations (CPU back)

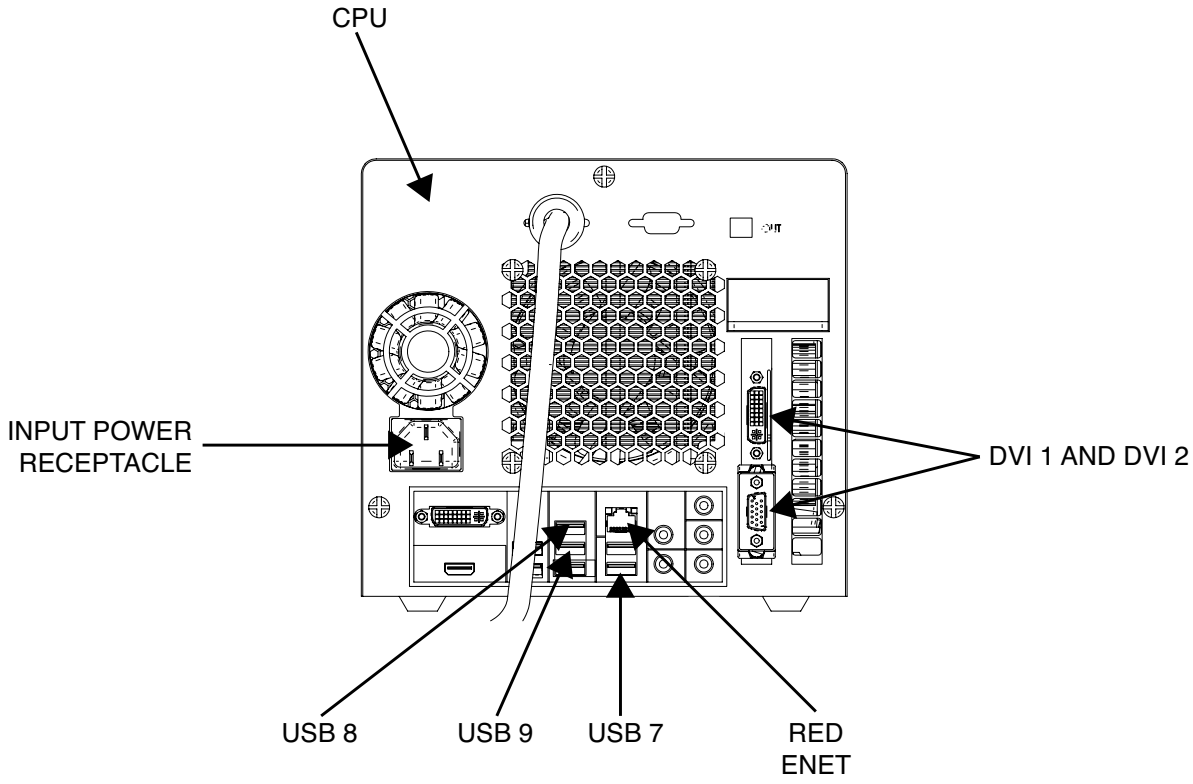
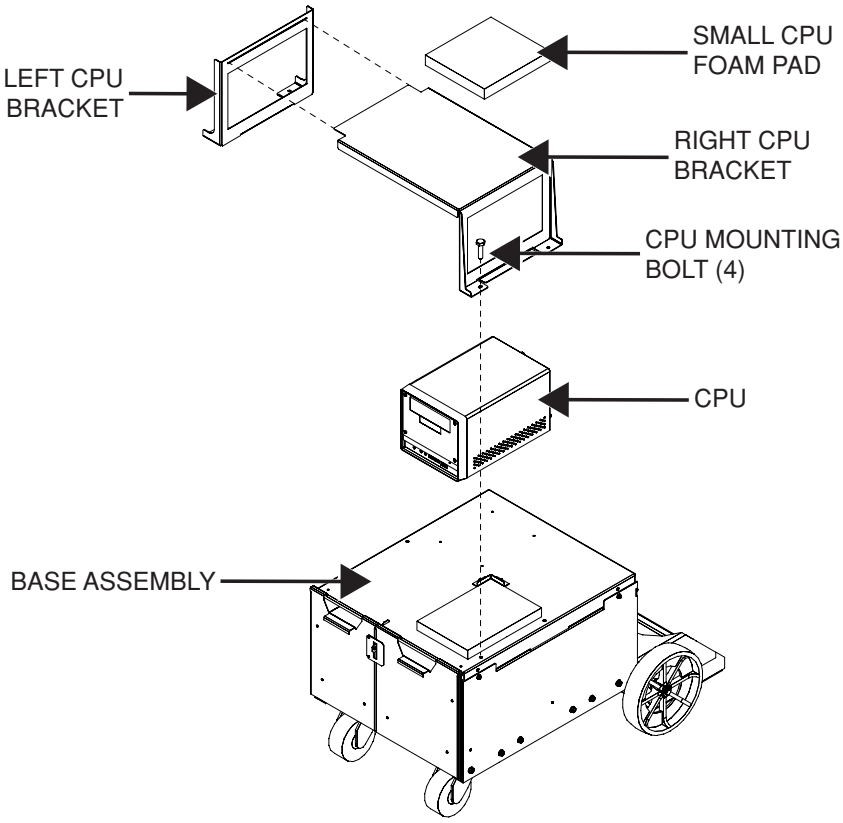
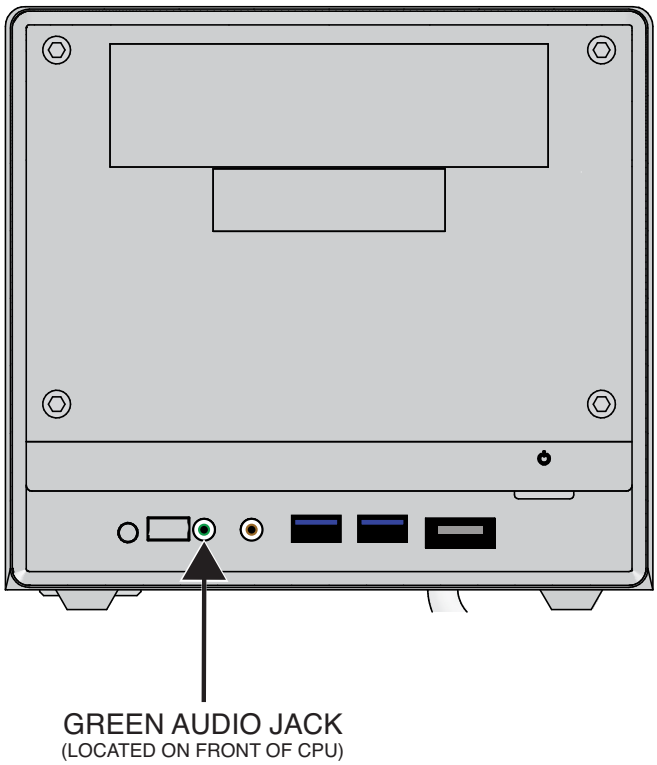


Figure B.72 – CPU mounting bolts



CPU REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.73 – Green audio jack (CPU front)



REPLACEMENT PROCEDURE

1. Carefully position the new CPU in the machine.
2. Connect audio “L” jack plug to the front green audio jack on the CPU.
3. Carefully place the left CPU bracket in to position.
4. Using hook and loop type fasteners, secure the CPU foam pad to the top of the CPU.
5. Using a 7/16” socket/wrench, attach the two nuts and associated washers securing the left CPU bracket to the machine.
6. Carefully position the right CPU bracket in to the machine, be sure both left and right CPU brackets are joined.
7. Using a 7/16” socket/wrench, attach the two nuts and associated washers securing the right CPU bracket to the machine.
8. Connect USB 7, USB 8 and USB 9 cables to the back of the CPU.
9. Connect the RED ENET cable to the back of the CPU.

NOTE: Replace cable ties as necessary.

10. Connect leads DVI 1 and DVI 2 to the back of the CPU.
11. Using a phillips screwdriver, connect leads 801D and 701F to terminals A1 and A2 on the input relay. See Wiring Diagram.
12. Connect input power cord to the input power receptacle on the back of the CPU.
13. Perform the ***Case Cover Replacement Procedure***.
14. Perform the ***Hardware Initialization (PIMAN.EXE) Procedure***.
15. Perform the ***Touchscreen Monitor Calibration Procedure***.
16. Perform the ***Digital I/O Module Settings Verification Procedure***.
17. Perform ***Retest After Repair Procedure***.

CMOS BATTERY REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

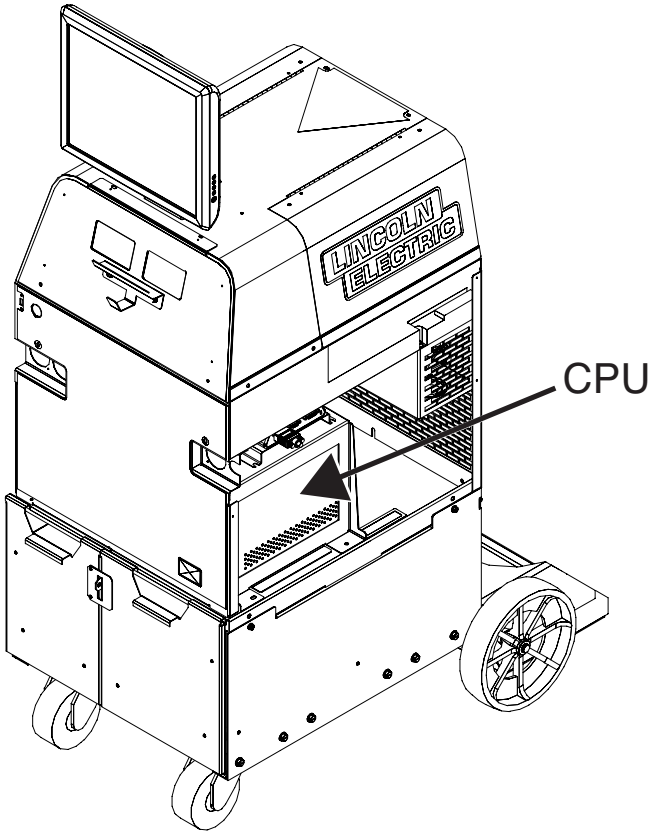
This procedure will aid the technician in the removal and replacement of the CMOS Battery.

MATERIALS NEEDED

3/8” Socket/Wrench/Nutdriver
7/16” Socket/Wrench
Phillips Screwdriver
Small Slotted Screwdriver
USB Keyboard
USB Mouse
CMOS Battery (CR2032)

CMOS BATTERY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.74 – CPU location



REMOVAL PROCEDURE

⚠ 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® 360 to a power supply grounded according to the National Electrical Code and local codes.**

STATIC-SENSITIVE DEVICE

Static electricity can damage sensitive internal components of CPU. Use caution when working inside of CPU.

1. Remove input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Locate the CPU. See Figure B.74.
4. Disconnect input power cord to CPU.
5. Using a 7/16” socket/wrench, remove the two bolts and associated washers securing the right side CPU bracket. Remove the bracket. See Figure B.74 and ***Figure B.75***.

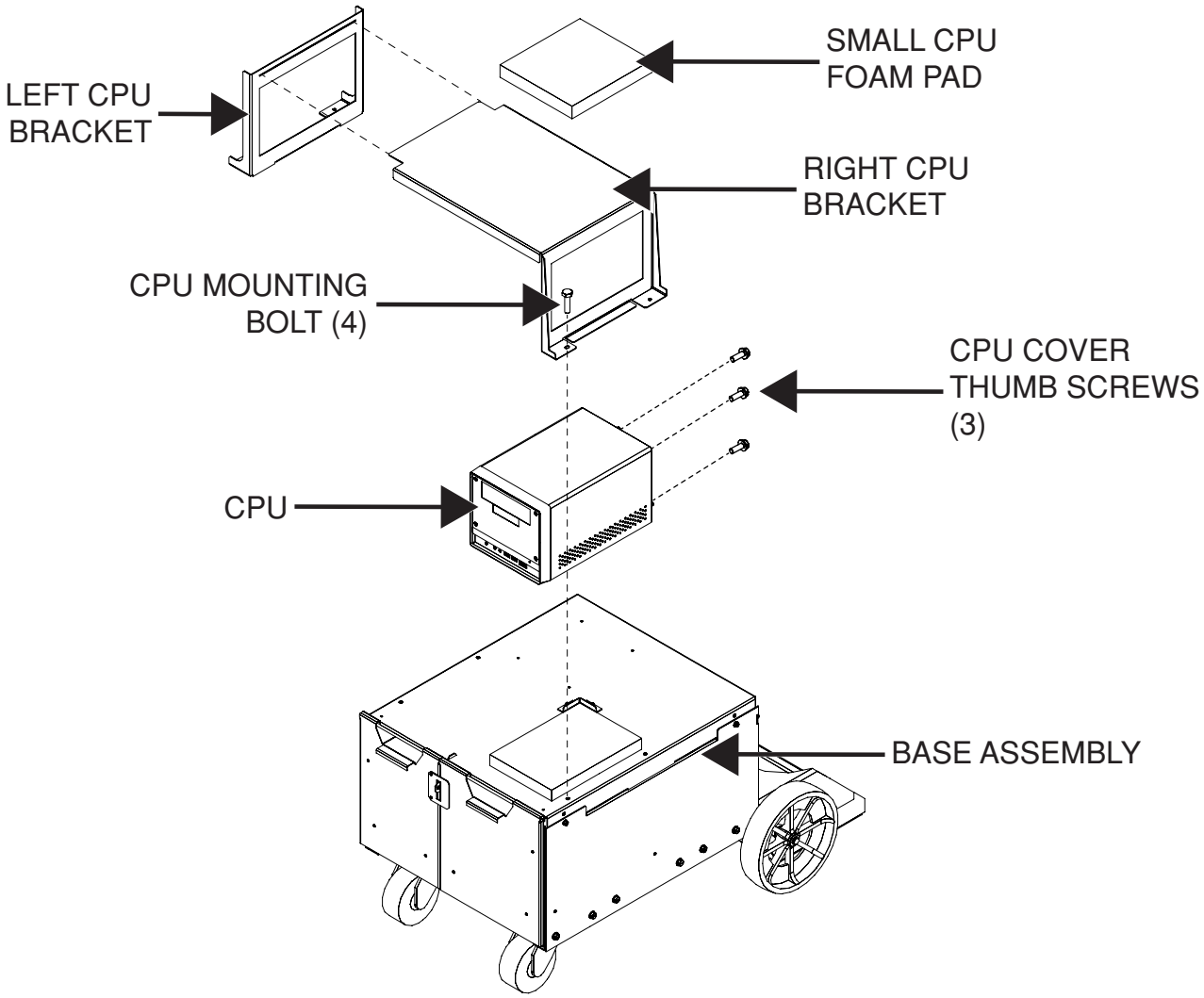
NOTE: This bracket is two pieces. The left CPU mounting bracket does not need to be removed.

6. Using a phillips screwdriver (if necessary), remove the three thumb screws from the back of the CPU securing the CPU cover. See ***Figure B.75***.
7. Carefully maneuver the CPU cover up and back to gain access to the internal components of the CPU.
8. Locate the circular CMOS battery. CMOS battery is located on motherboard inside of CPU and is easily accessible from the left side of the machine. See ***Figure B.76***.
9. Carefully remove CMOS battery from motherboard.

NOTE: A small flathead screwdriver may be necessary to gently lift up and remove CMOS battery.

CMOS BATTERY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.75 – CPU mounting component locations



CMOS BATTERY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.76 – CMOS battery location

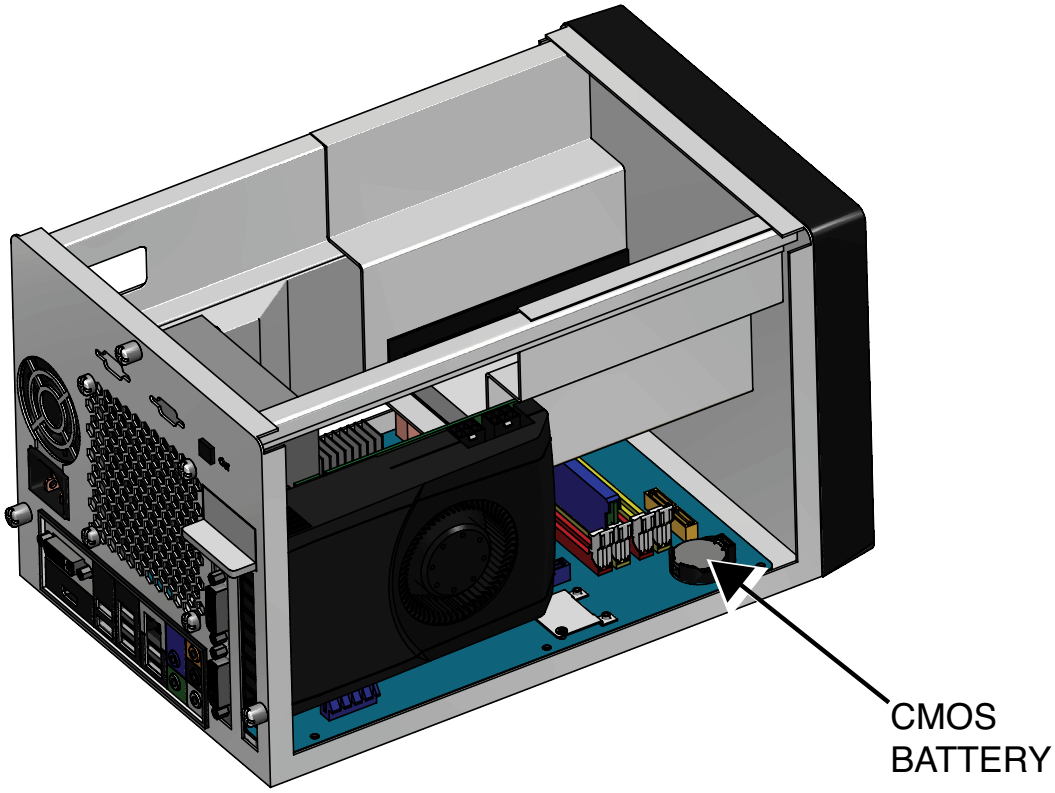
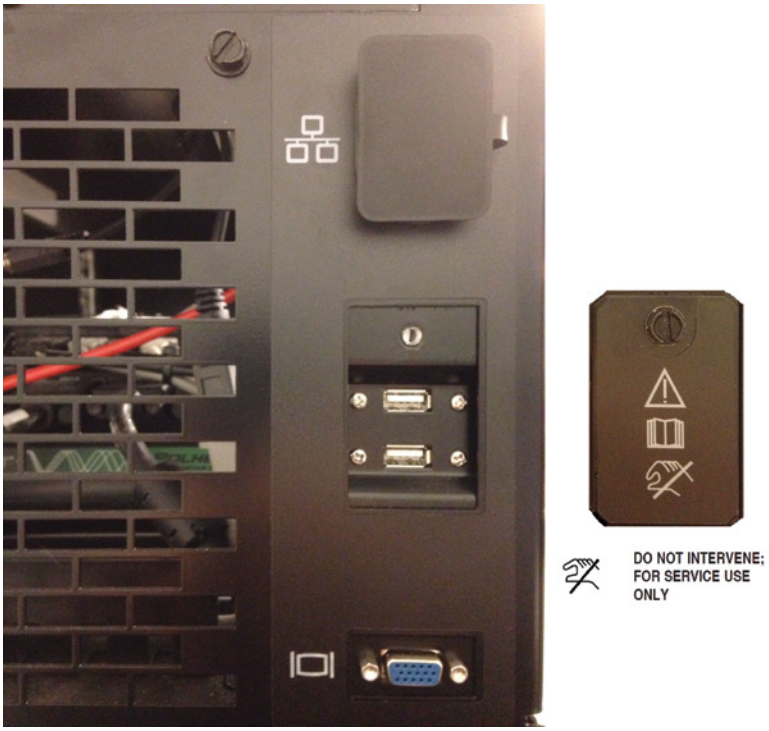


Figure B.77 – Service use only ports



CMOS BATTERY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.78 – Login screen

REPLACEMENT PROCEDURE

1. Carefully place new CMOS battery (CR2032) in to the appropriate location on the motherboard.

NOTE: Plus "+" side of CMOS battery will be facing upwards.

2. Carefully place the CPU cover in to position on the CPU.
3. Secure the three thumb screws to the back of the CPU securing the CPU cover.
4. Carefully connect input power cord to CPU.
5. Remove the plug button on the lower right part of the case front.
6. Using a 3/8" socket/wrench or nutdriver, remove the "service use only" USB ports cover plate located on the case back between the ethernet port and VGA connection. See ***Figure B.77***.

NOTE: The USB ports are to be used for service requirements only. **DO NOT USE USB DRIVES OF ANY KIND** or a potentially fatal software failure is possible.

7. Connect USB mouse and keyboard to USB ports.
8. Carefully apply input power to the machine.
9. Perform the ***BIOS Setup Procedure***.

⚠ WARNING

BIOS setup must be performed before proceeding. Potentially fatal software failure possible.

10. The machine will now proceed to load the VRTEX 360 software.
11. At the login screen, verify the correct image (Login screen) on the monitor. See Figure B.78.

NOTE: Initial Lincoln Electric Green Initiative splash screen may not appear.

12. If the correct image (Login screen) appears on the screen, proceed to the next step. See Figure B.78. If the correct image does not appear on the screen, proceed to step 17.
13. Proceed to enter the weld environment and verify duplicate image on the monitor and the FMD (face mounted display). Exit the weld environment by pressing MENU, then pressing logout and yes on the monitor.
14. On the touchscreen monitor press MENU and then select shutdown and then YES to shut down the machine.
15. Cycle the machine again and verify the correct image (Login screen) and operation.
16. Proceed to step 27 to complete the replacement procedure.
17. If the correct image does not appear, perform the ***NVIDIA Control Panel Setup Procedure***.
18. The machine will now proceed to load the VRTEX 360 software.
19. At the login screen, verify the correct image (Login screen) is on the monitor. See Figure B.78.

CMOS BATTERY REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

20. If the correct image (Login screen) appears on the screen, proceed to step 13. See ***Figure B.78***. If the correct image does not appear on the screen, proceed to step 21.
21. Perform the ***Uninstall NVIDIA Programs Procedure***.
22. The machine will now proceed to load the VRTEX 360 software.
23. At the login screen, verify the correct image (Login screen) is on the monitor. See ***Figure B.78***.
24. If the correct image (Login screen) appears on the screen, proceed to step 13. See ***Figure B.78***. If the correct image does not appear on the screen, proceed to step 25.
25. If the correct image does not appear, shut down the machine.
26. Proceed to step 9.
27. On the touchscreen monitor press MENU and then select shutdown and then Yes to shut down the machine.
28. Remove input power to the machine.
29. Disconnect the USB mouse and keyboard from the USB ports.
30. Carefully position the right CPU bracket in to the machine, be sure both left and right CPU brackets are joined.
31. Using a 7/16” socket/wrench, attach the two bolts and associated washers securing the right CPU bracket to the machine.
32. Reattach the plug button on the lower right of the case front.
33. Connect input power cord to the CPU.
34. Perform the ***Case Cover Replacement Procedure***.
35. Using a 3/8” socket/wrench or nutdriver, attach the “service use only” USB ports cover plate located onto the case back between the ethernet port and VGA connection.
36. Perform ***Retest After Repair Procedure***.

BIOS SETUP PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

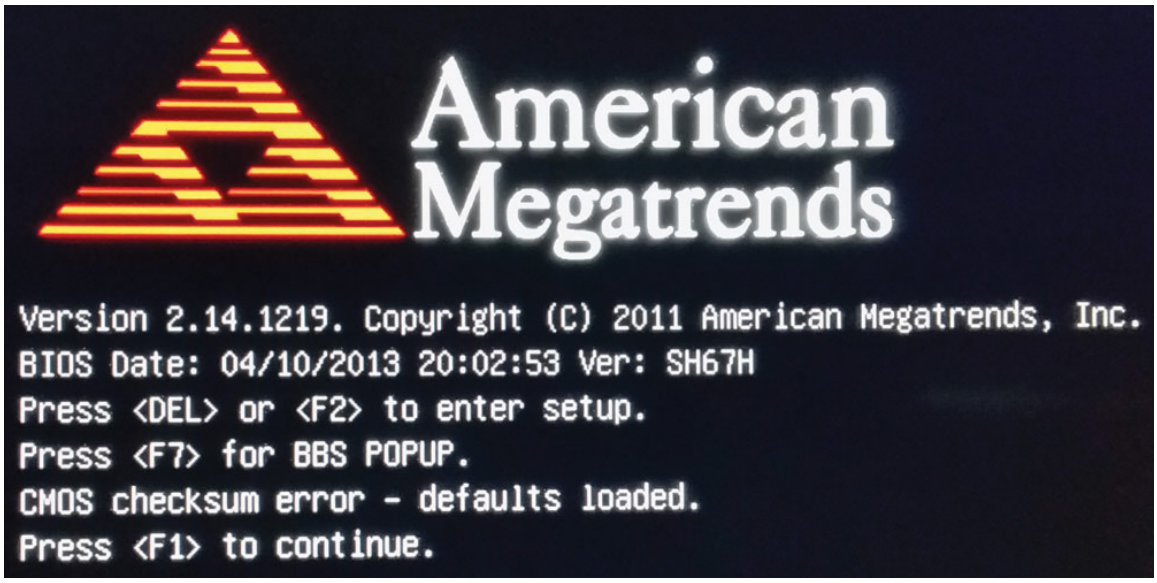
This procedure will aid the technician in completing the CMOS Battery Replacement Procedure.

MATERIALS NEEDED

USB Keyboard

BIOS SETUP PROCEDURE *(continued)*

Figure B.79 – BIOS screen



PROCEDURE

⚠ WARNING

BIOS setup must be performed before proceeding. Potentially fatal software failure possible.

1. Turn machine on by depressing the green circular button on case front. If the green button does not stay on, press and hold the green button and then press up and release the CPU push button located inside the opening in lower right part of the case front. DO NOT HOLD THE CPU PUSH BUTTON.

NOTE: If after performing above step the machine continues to turn off, repeat above step and continue to hold the green button until machine turns on.

NOTE: Using the USB keyboard, immediately press the F2 key until the BIOS setup utility appears or until boot screen appears. See Figure B.79.

2. If the boot screen appears, it will read “Press <F1> to continue.”.
3. Using the USB keyboard, press the F1 key, then immediately press the F2 key until the BIOS setup utility appears. See Figure B.79.
4. To navigate in the BIOS setup utility, use the keys shown in ***Figure B.80***.
5. Once in the BIOS setup utility, if requested to “Load Previous Values?” appears on the screen, select Yes. See ***Figure B.81***.
6. Using the USB keyboard, set the System Date and System Time to the current date and time. See ***Figure B.82***.
7. Using the USB keyboard, navigate to the “Advanced” tab. Select Power Management Configuration. See ***Figure B.83***.
8. In the “Advanced“ tab under Power Management Configuration, set the ‘EuP Function’ to ‘Disabled’. Also set the ‘Power-On after Power-Fail’ to ‘Power On’ or ‘Enabled’. See ***Figure B.84***.
9. Using the USB keyboard, navigate to the “Boot” tab. See ***Figure B.85***.
10. In the “Boot” tab under Boot Configuration, set ‘1st Boot’ to ‘Hard Disk: KINGSTON ...’. Also set ‘6th Boot’ to ‘Disabled’. See ***Figure B.85***.

NOTE: Use the enter key to make changes to the boot configuration, not the + or - keys. The boot configuration must match ***Figure B.85***.

11. Using the USB keyboard, press the F4 key to save configuration. Press the enter key for Yes. See ***Figure B.86***.
12. Return to the ***CMOS Battery Replacement Procedure***, step 10.

BIOS SETUP PROCEDURE *(continued)*

Figure B.80 – BIOS setup navigation keys

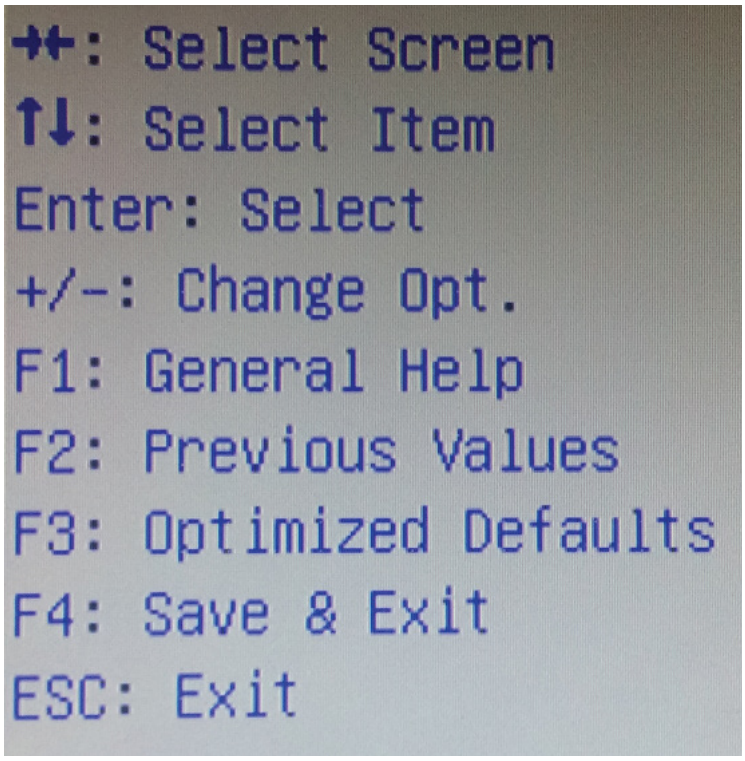
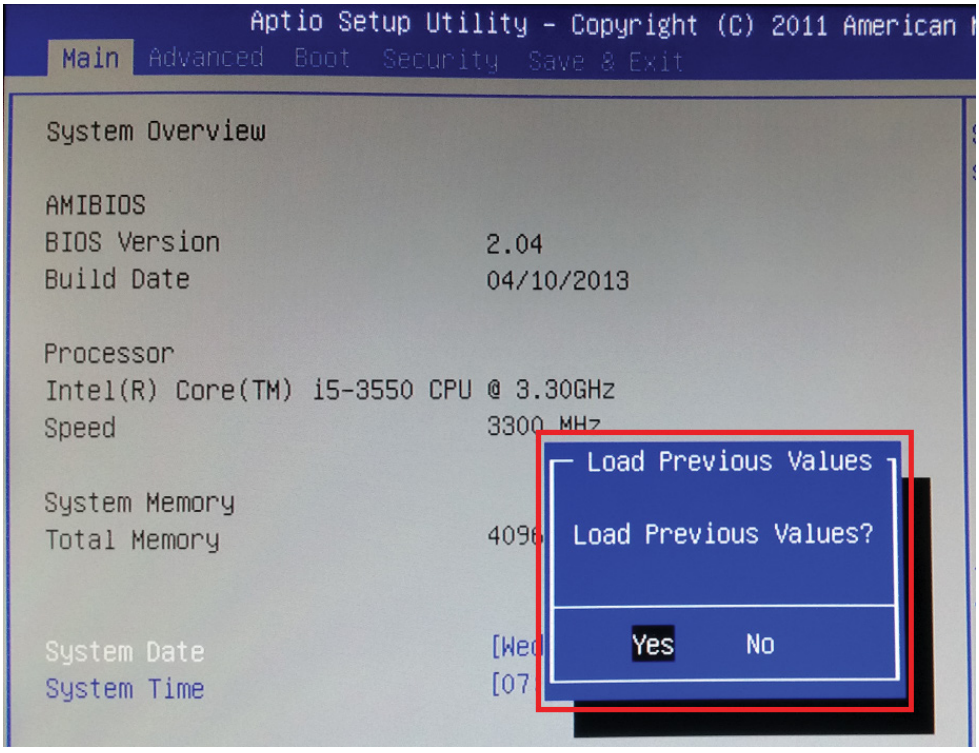


Figure B.81 – Load previous values screen



BIOS SETUP PROCEDURE *(continued)*

Figure B.82 – Set system date and time

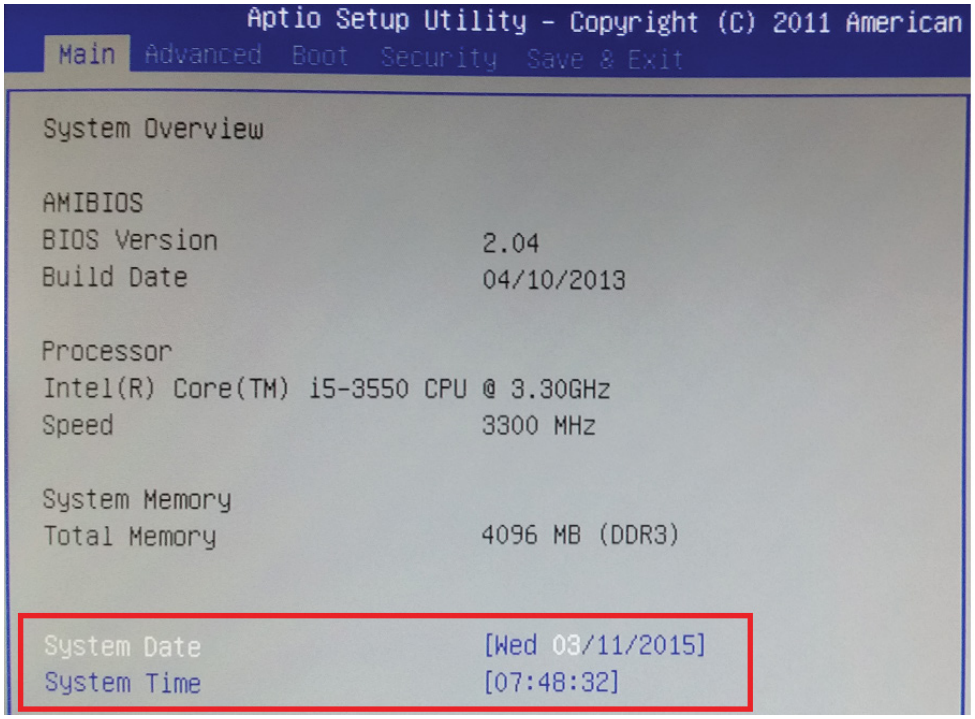
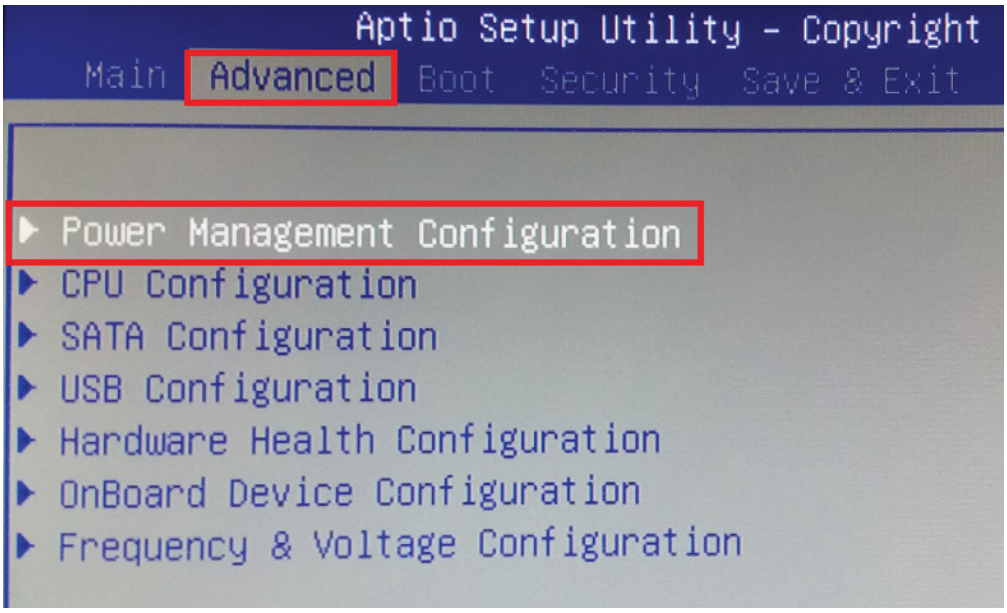


Figure B.83 – Advanced tab



BIOS SETUP PROCEDURE *(continued)*

Figure B.84 – Power management configuration

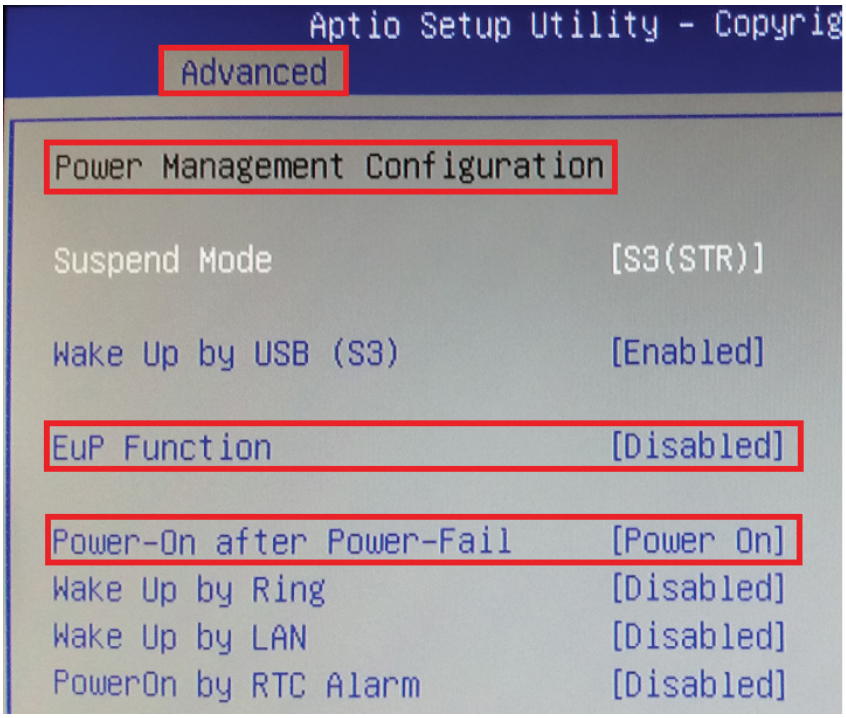
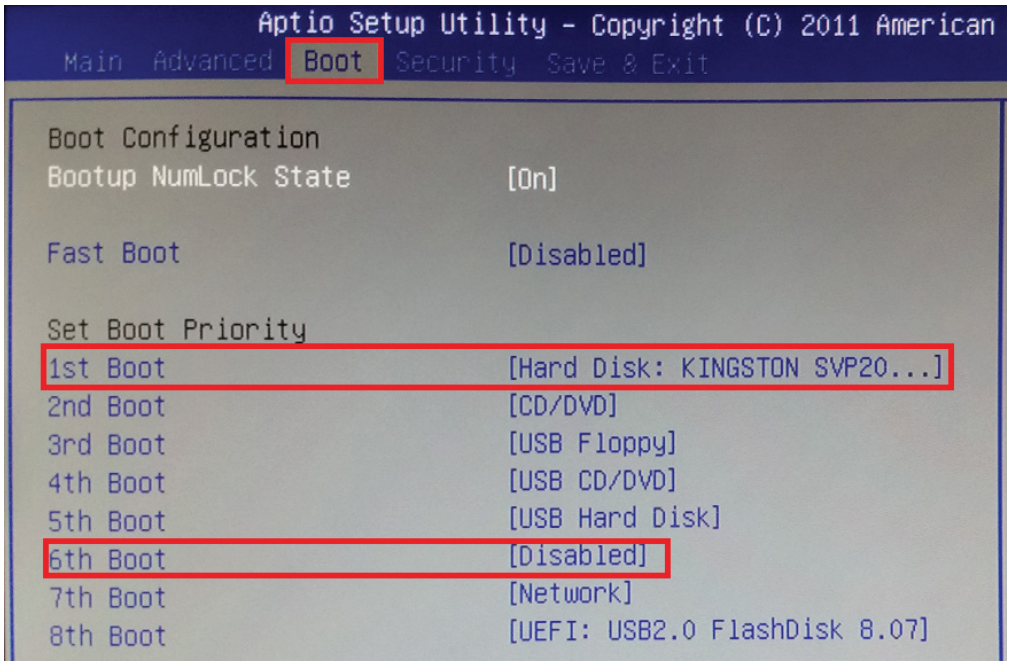
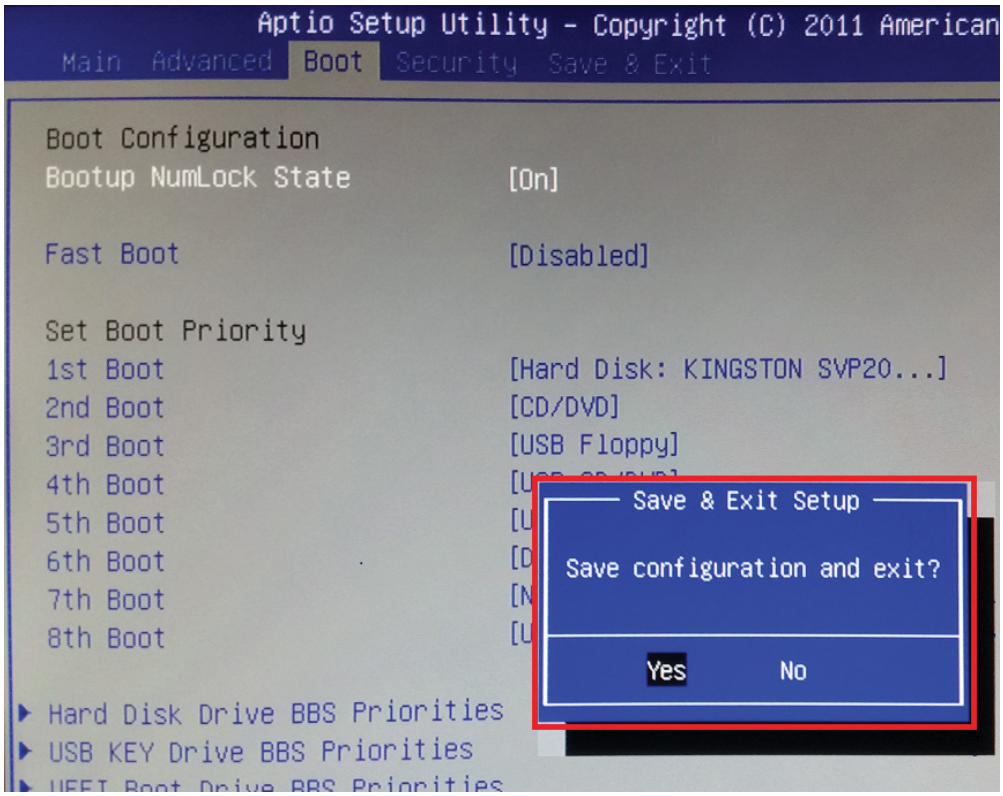


Figure B.85 – Boot tab



BIOS SETUP PROCEDURE *(continued)*

Figure B.86 – Save configuration



NVIDIA CONTROL PANEL SETUP PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

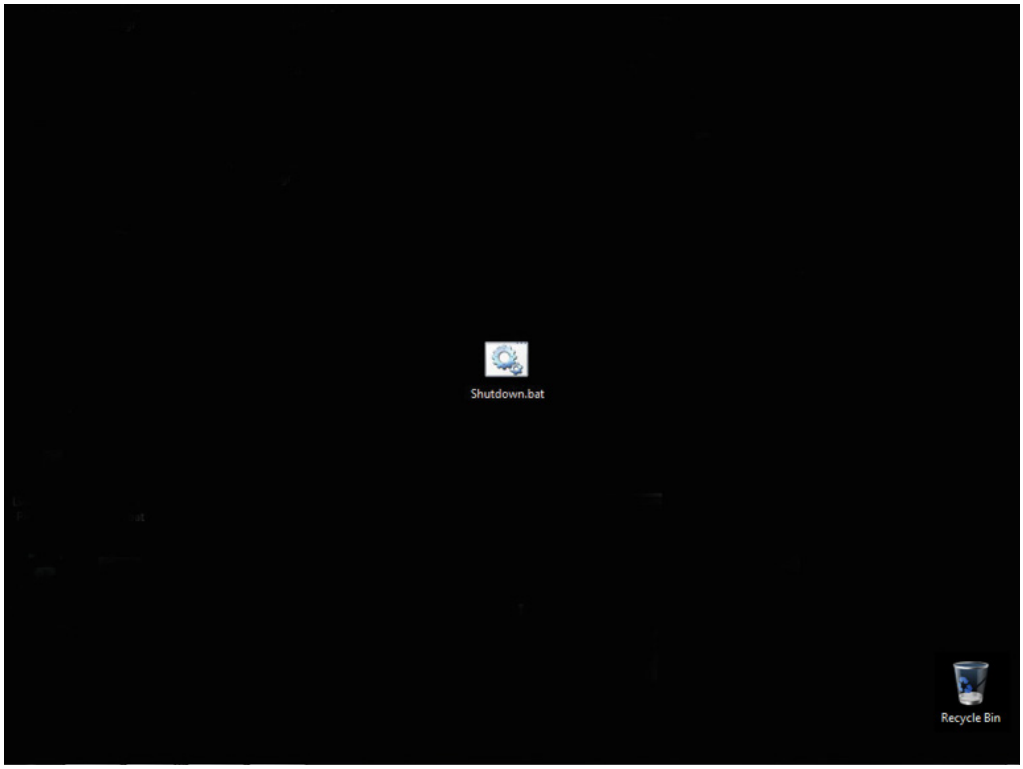
This procedure will aid the technician in completing the CMOS Battery Replacement Procedure.

MATERIALS NEEDED

USB Mouse
USB Keyboard

NVIDIA CONTROL PANEL SETUP PROCEDURE *(continued)*

Figure B.87 – Desktop



PROCEDURE

NOTE: Icons, programs and message boxes may appear both in the helmet's FMD (face mounted display) and on the touchscreen monitor.

1. Using the USB keyboard, press and hold the Windows key and then press the D key, the desktop will now be visible. See Figure B.87.
2. Using the USB mouse, move the cursor towards the bottom of the monitor until the taskbar appears. See ***Figure B.88***.
3. Using the USB mouse, right click on Crosstrainer.exe and close all windows. See ***Figure B.89***.
4. Using the USB mouse, move the cursor towards the bottom of the monitor until the taskbar appears.
5. Using the USB mouse, right click on Host Application (Main Menu. vi) and close all windows. See ***Figure B.90***.
6. Using the USB mouse, right click on the desktop and select NVIDIA Control Panel from the menu. See ***Figure B.91***.
7. If necessary, open the Display tree in the NVIDIA Control Panel and select Setup Multiple Displays. See ***Figure B.92***.
8. The displays should be set up as shown in ***Figure B.92***.

NOTE: Be sure to align the top of box 2 and 1 as indicated in ***Figure B.92***.

NOTE: If box 2 does not contain the asterix (*), right click the box and select Make Primary. See ***Figure B.93***.

9. After all changes have been made, click the Apply button and then select Yes.
10. Close the NVIDIA Control Panel.
11. Using the USB keyboard and mouse, press start and then press shutdown to shut the machine down.
12. Turn machine on by depressing the green circular button on case front. If the green button does not stay on, press and hold the green button and then press up and release the CPU push button located inside the opening in lower part of the case front. DO NOT HOLD THE CPU PUSH BUTTON.

NOTE: If after performing above step the machine continues to turn off, repeat above step and continue to hold the green button until machine turns on.

13. Return to the ***CMOS Battery Removal And Replacement Procedure***, step 18.

NVIDIA CONTROL PANEL SETUP PROCEDURE *(continued)*

Figure B.88 – Taskbar

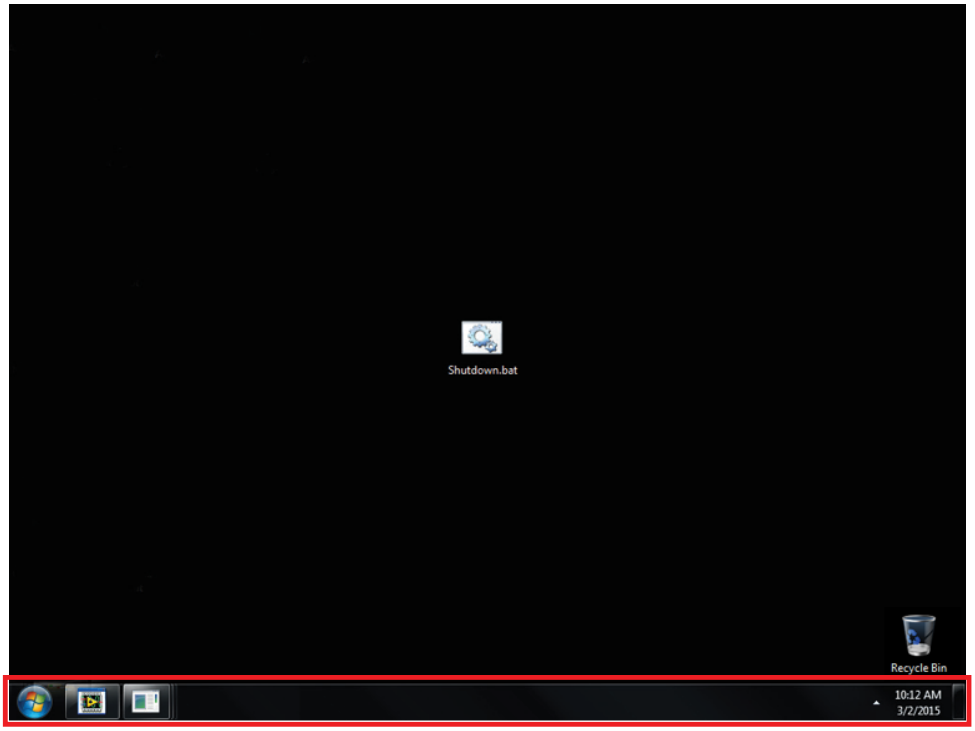
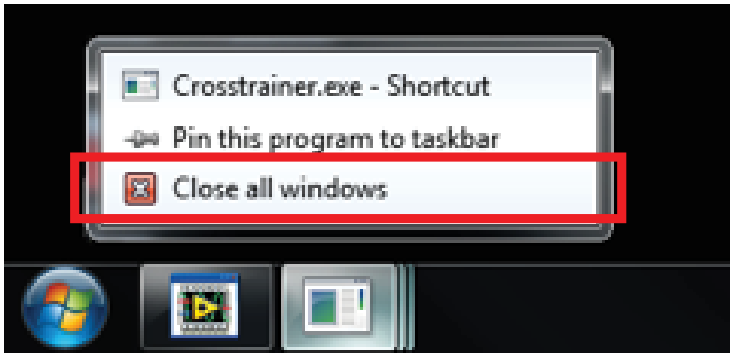


Figure B.89 – Crosstrainer.exe



NVIDIA CONTROL PANEL SETUP PROCEDURE *(continued)*

Figure B.90 – Host Application

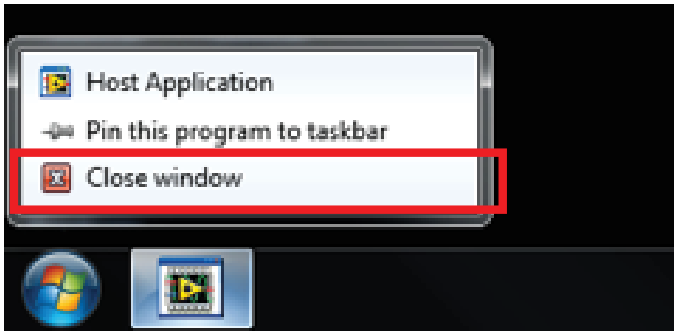
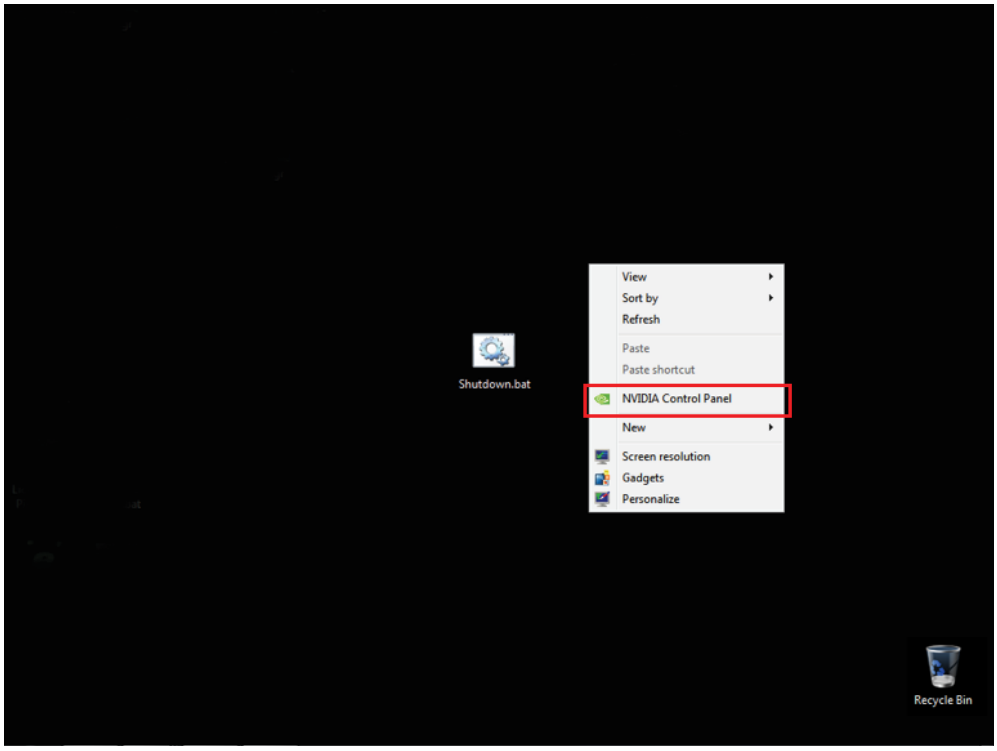


Figure B.91 – NVIDIA control panel



NVIDIA CONTROL PANEL SETUP PROCEDURE *(continued)*

Figure B.92 – Setup multiple displays

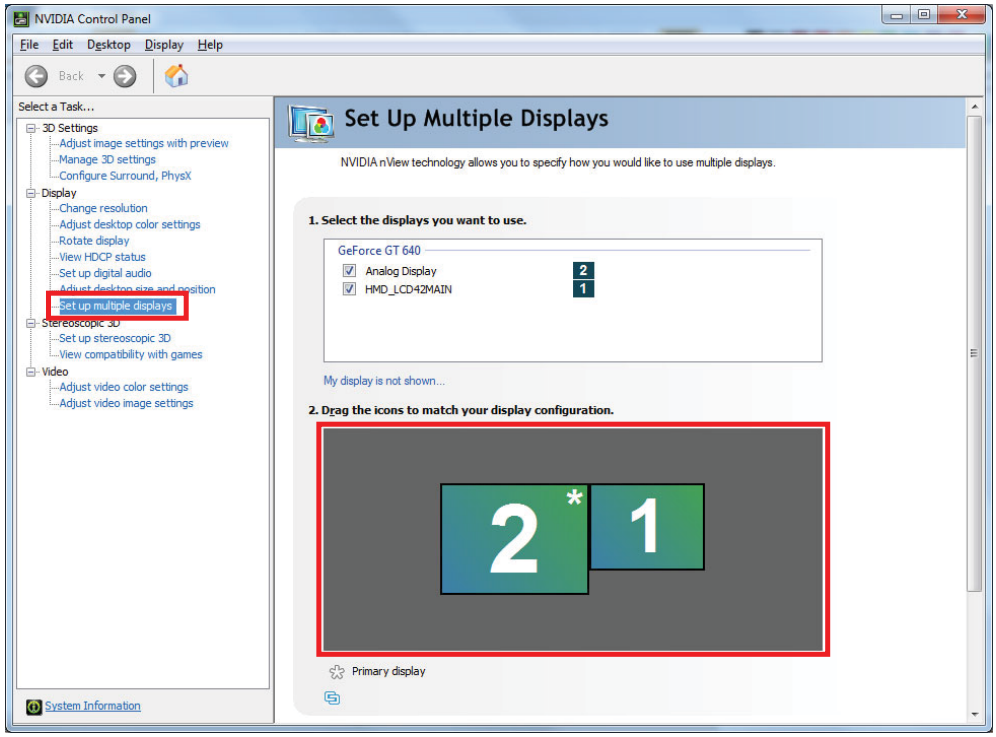
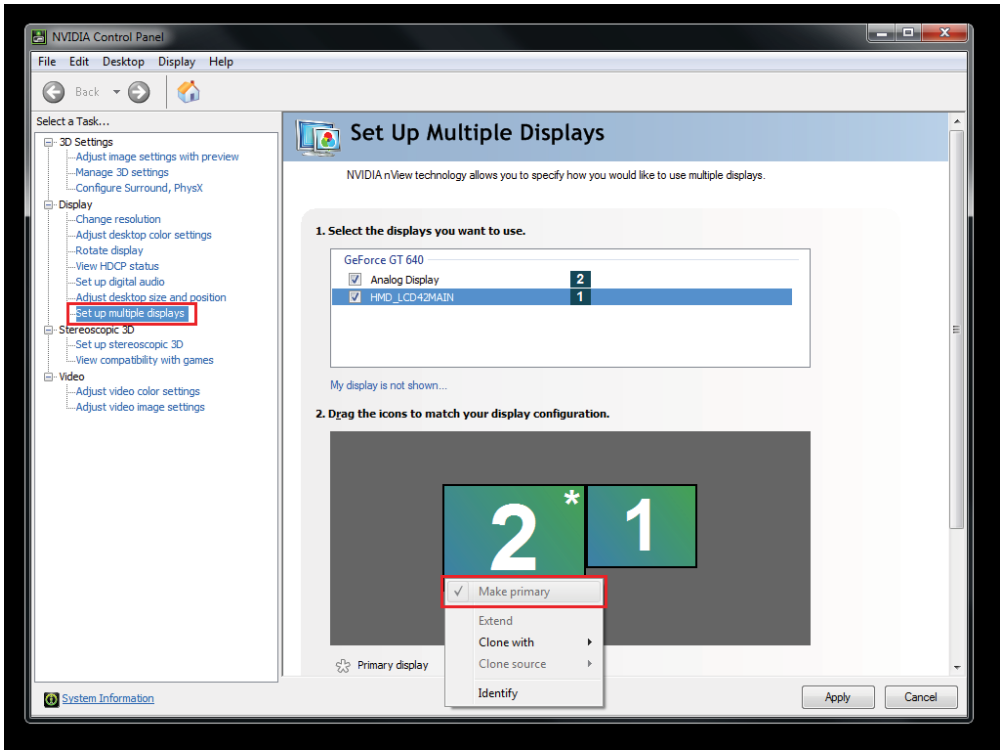


Figure B.93 – Display setup



UNINSTALL NVIDIA PROGRAMS PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3877.

TEST DESCRIPTION

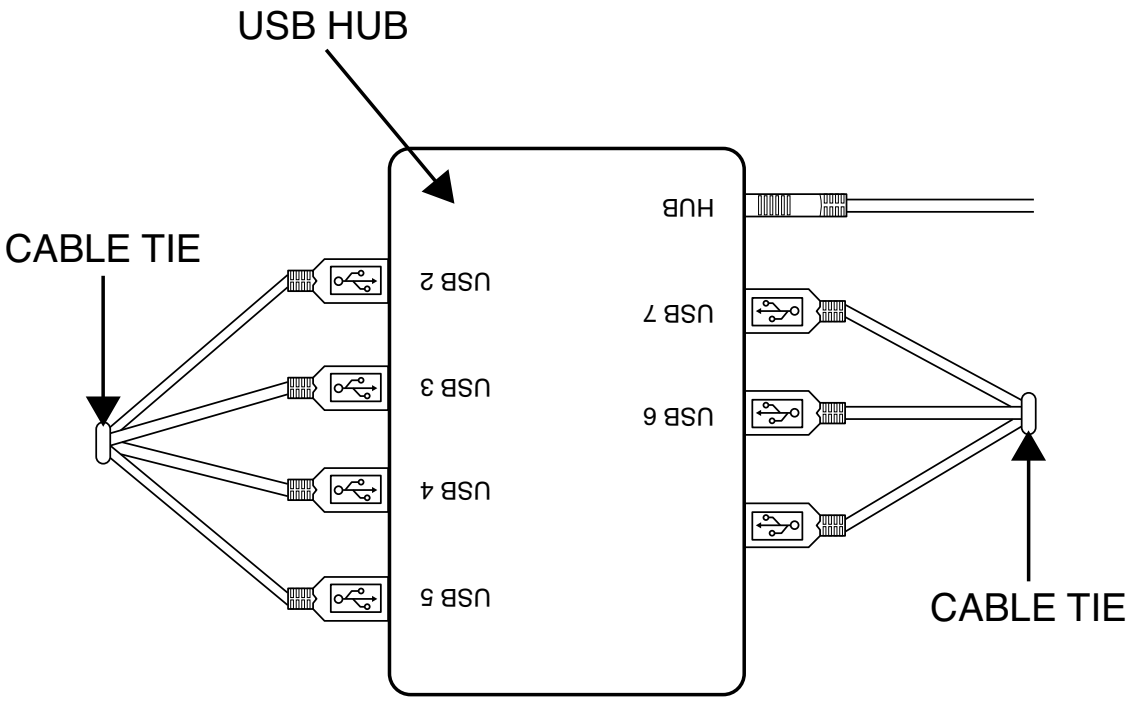
This procedure will aid the technician in completing the CMOS Battery Replacement Procedure.

MATERIALS NEEDED

USB Mouse
USB Keyboard

UNINSTALL NVIDIA PROGRAMS PROCEDURE *(continued)*

Figure B.94 – USB connections



PROCEDURE

NOTE: Icons, programs and message boxes may appear both in the helmet's FMD (face mounted display) and on the touchscreen monitor.

1. Using the USB keyboard and mouse, press start and then press shutdown to shut the machine down.
2. Remove input power to the machine.
3. Label and disconnect the FMD's (face mounted display) USB6 from the 7 port USB hub located inside of the machine. See Figure B.94.
4. Label and disconnect FMD's (face mounted display) DVI1 cable from the rear of the CPU. See ***Figure B.95***.
5. Carefully connect the correct input power to the machine.
6. Turn machine on by depressing the green circular button on case front. If the green button does not stay on, press and hold the green button and then press up and release the CPU push button located inside the opening in lower part of the case front. DO NOT HOLD THE CPU PUSH BUTTON.

NOTE: If after performing above step the machine continues to turn off, repeat above step and continue to hold the green button until machine turns on.

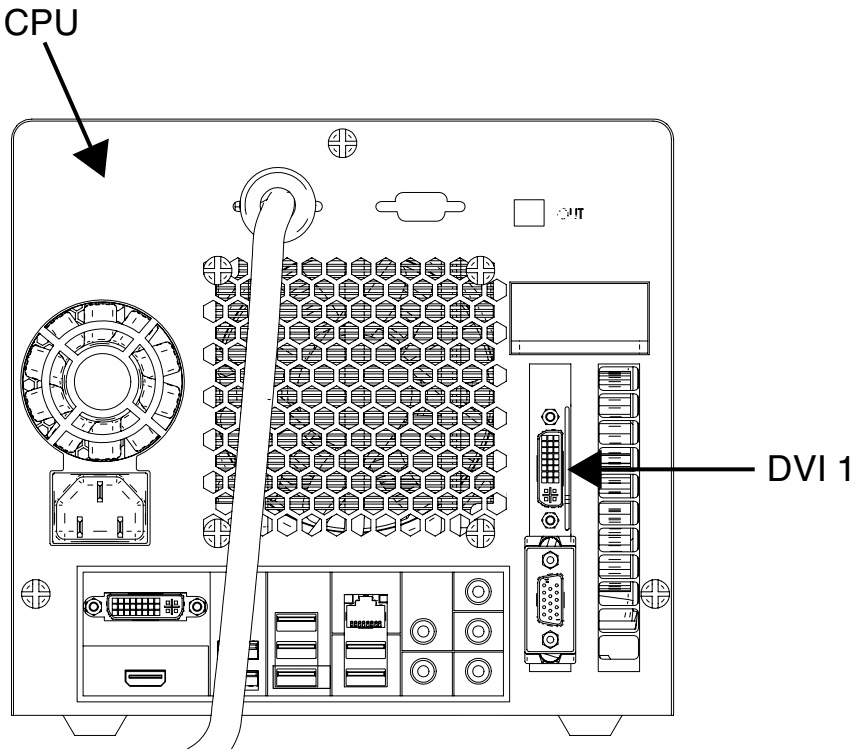
7. When the VRTEX image appears on the monitor, press and hold the Windows key and then press the D key, the desktop will now be visible. See ***Figure B.96***.
8. Using the USB mouse, move the cursor towards the bottom of the monitor until the taskbar appears. See ***Figure B.97***.
9. Using the USB mouse, right click on Crosstrainer.exe and close all windows. See ***Figure B.98***.
10. Using the USB mouse, move the cursor towards the bottom of the monitor until the taskbar appears.
11. Using the USB mouse, right click on Host Application (Main Menu. vi) and close all windows. See ***Figure B.99***.
12. Using the USB mouse, remove StartUpSim.bat shortcut from startup by left clicking the start icon, select all programs, select startup and drag and drop StartUpSim.bat onto desktop. See ***Figure B.100***.
13. Using the USB mouse, open the control panel by left clicking the start icon and selecting control panel. See ***Figure B.101***.
14. Using the USB mouse, select programs and features (icon view) or uninstall a program (category view). If necessary, scroll so that all NVIDIA programs are present. See ***Figure B.102***.
15. Uninstall all NVIDIA programs from top to bottom by right clicking the program, select uninstall and follow all screen prompts. See ***Figure B.103***.

NOTE: Several restarts will be needed. DO NOT choose to restart later. After restarts, default drivers will be installed.

16. When all NVIDIA programs are uninstalled, close the control panel.

UNINSTALL NVIDIA PROGRAMS PROCEDURE *(continued)*

Figure B.95 – FMD DVI connection



17. Using the USB keyboard and mouse, press start and then press shutdown to shut the machine down.
18. Remove input power to the machine.
19. Connect FMD's (face mounted display) DVI1 cable to the rear of the CPU.
20. Connect the FMD's (face mounted display) USB6 to the 7 port USB hub located inside of the machine.
21. Carefully connect the correct input power to the machine.
22. Turn machine on by depressing the green circular button on case front. If the green button does not stay on, press and hold the green button and then press up and release the CPU push button located inside the opening in lower part of the case front. DO NOT HOLD THE CPU PUSH BUTTON.

NOTE: If after performing above step the machine continues to turn off, repeat above step and continue to hold the green button until machine turns on.

23. Using the USB mouse, place the StartUpSim.bat shortcut back into the startup menu by left clicking the start icon, select all programs, right click startup, select open and drag and drop StartUpSim.bat from the desktop into the open explorer window. Close the window.
24. To install the NVIDIA driver, left click start icon, select computer, select Local disk (C:), select drivers, select video, double click "306.97_desktop..." application, select OK, select agree and continue, select next and select restart now. See ***Figure B.104***.
25. The machine will now restart.
26. Return to ***CMOS Battery Replacement Procedure***, step 22.

UNINSTALL NVIDIA PROGRAMS PROCEDURE *(continued)*

Figure B.96 – Desktop

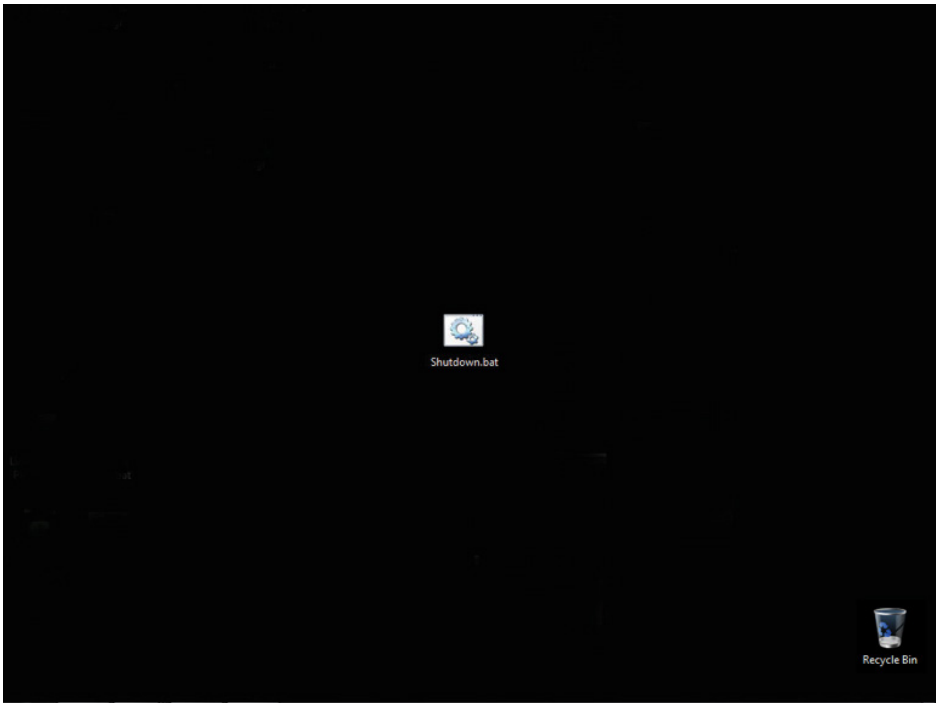
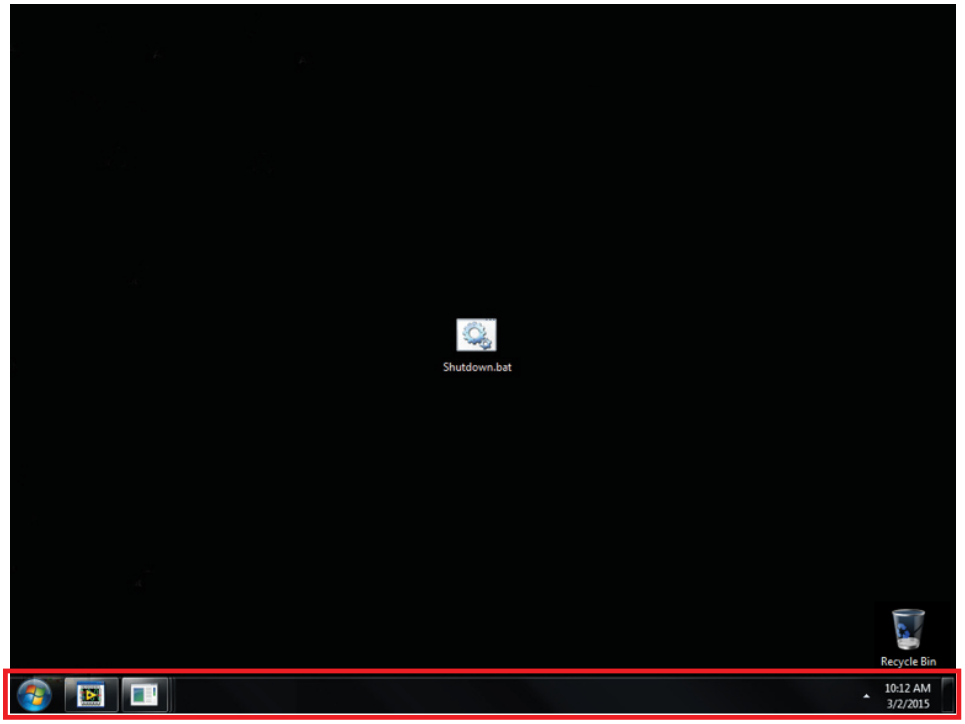


Figure B.97 – Taskbar



UNINSTALL NVIDIA PROGRAMS PROCEDURE *(continued)*

Figure B.98 – Crosstrainer.exe

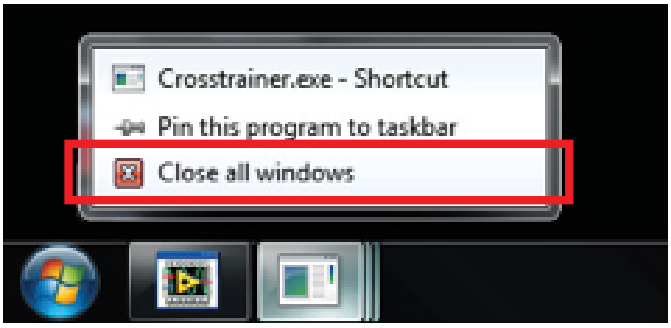
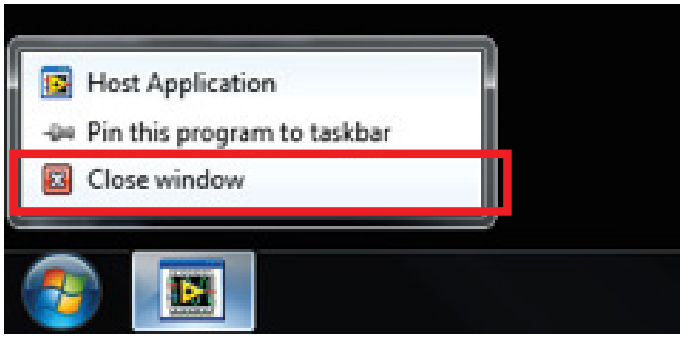


Figure B.99 – Host application



UNINSTALL NVIDIA PROGRAMS PROCEDURE *(continued)*

Figure B.100 – StartUpSim.bat

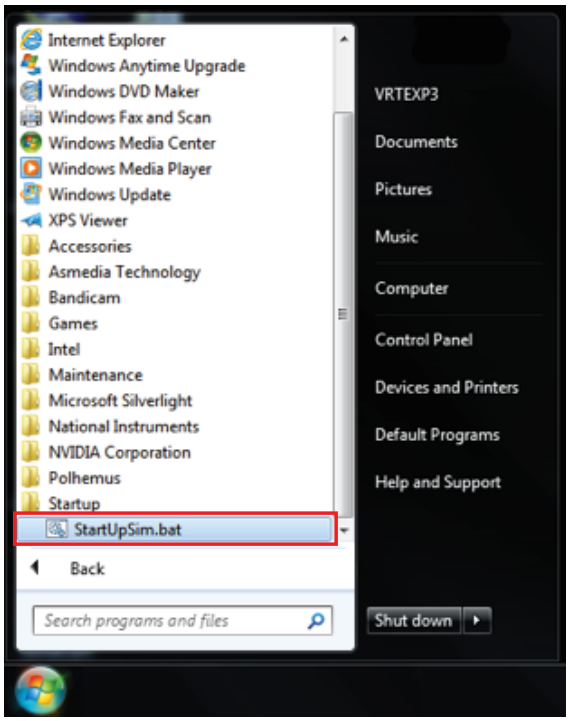
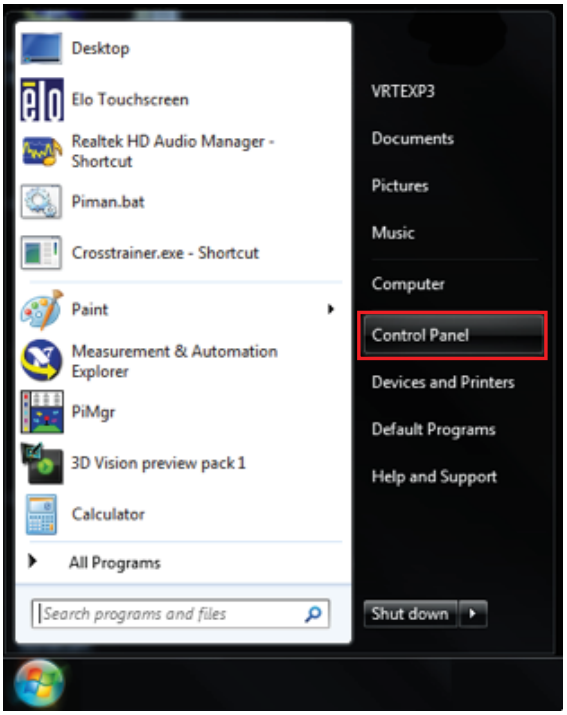


Figure B.101 – Control Panel



UNINSTALL NVIDIA PROGRAMS PROCEDURE *(continued)*

Figure B.102 – Uninstall a program

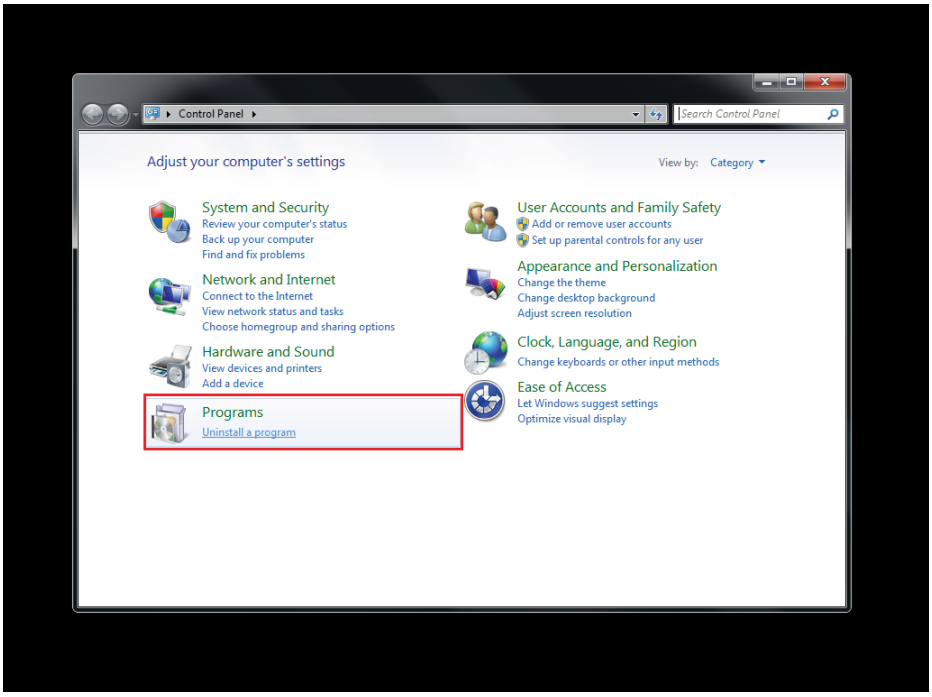
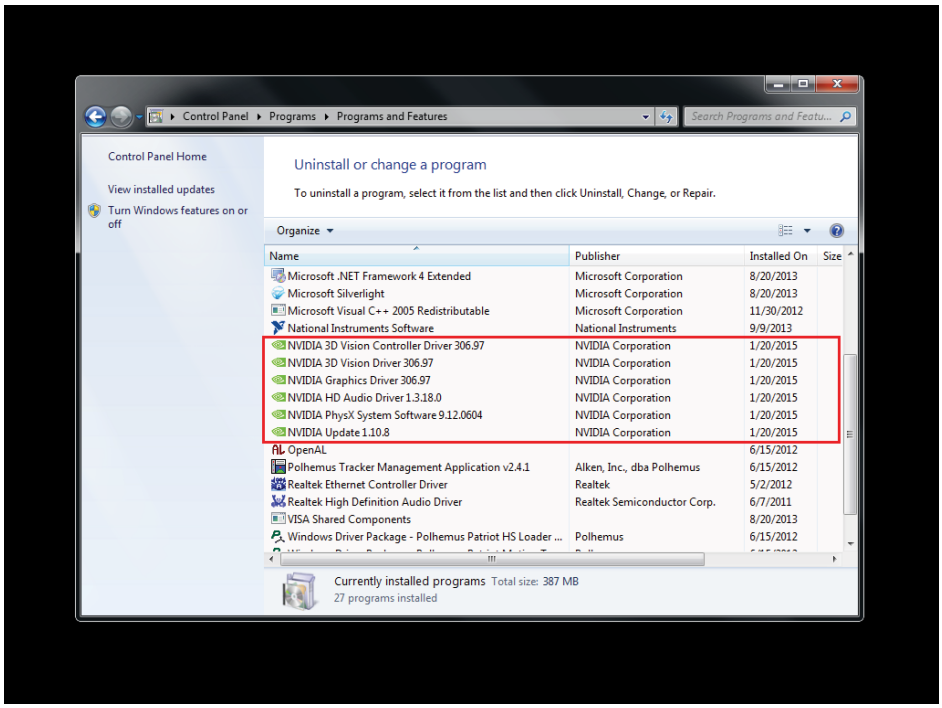
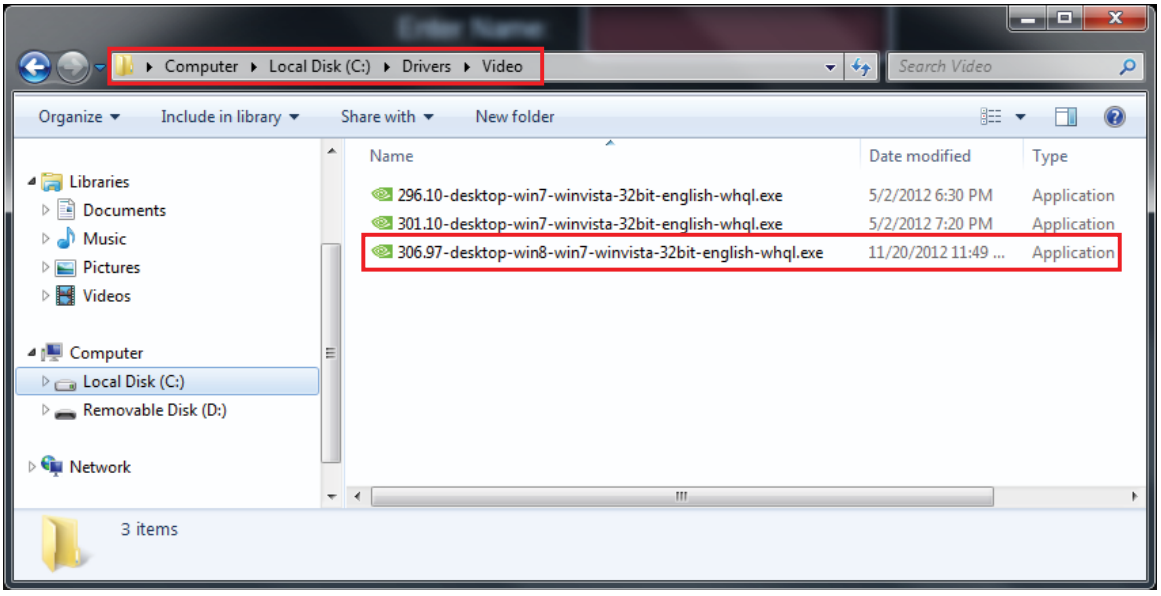


Figure B.103 – NVIDIA programs



UNINSTALL NVIDIA PROGRAMS PROCEDURE *(continued)*

Figure B.104 – Install NVIDIA programs



VR GMAW/FCAW (MIG) DEVICE REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

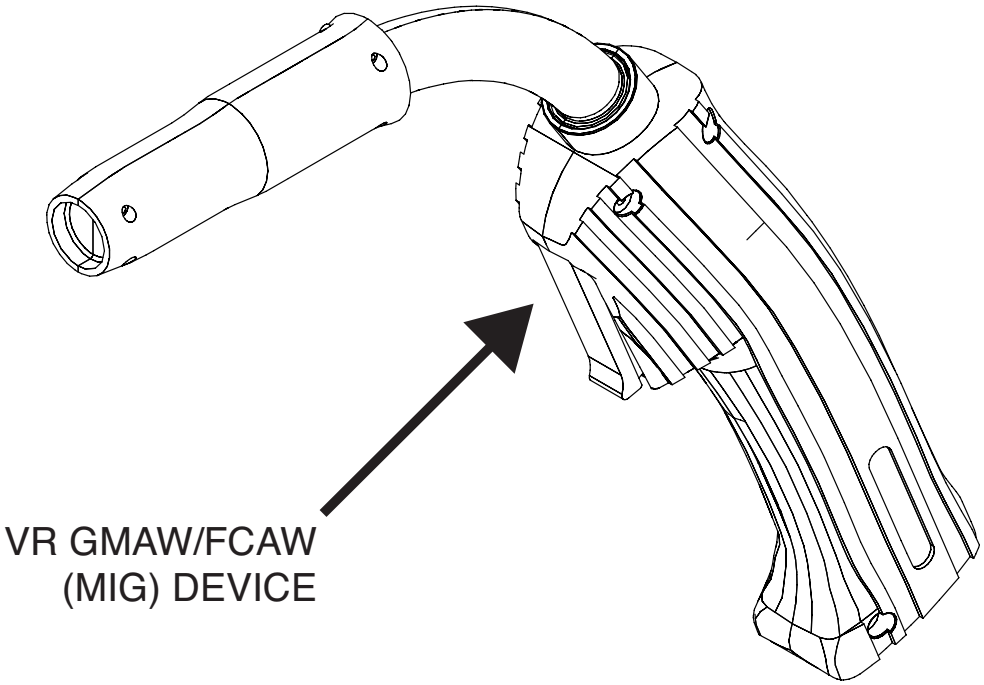
This procedure will aid the technician in the removal and replacement of the VR GMAW/FCAW (MIG) Device.

MATERIALS NEEDED

3/8” Socket/Wrench

VR GMAW/FCAW (MIG) DEVICE
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.105 – VR GMAW/FCAW (MIG) device



REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Locate the VR GMAW/FCAW (MIG) device. See Figure B.105.
4. Locate and disconnect leads SEN3A and SEN3B. See Wiring Diagram.
5. Remove any necessary cable ties.
6. Remove toroid.

NOTE: For reassembly be sure to take note of how many turns of wire pass through the toroid and also the direction and location.

7. Using a 3/8" socket/wrench, remove the two screws securing the VR SMAW (stick) device to the case front. See ***Figure B.106***.
8. The VR GMAW/FCAW (MIG) device can now be removed and replaced.

VR GMAW/FCAW (MIG) DEVICE
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.106 – Input cable location

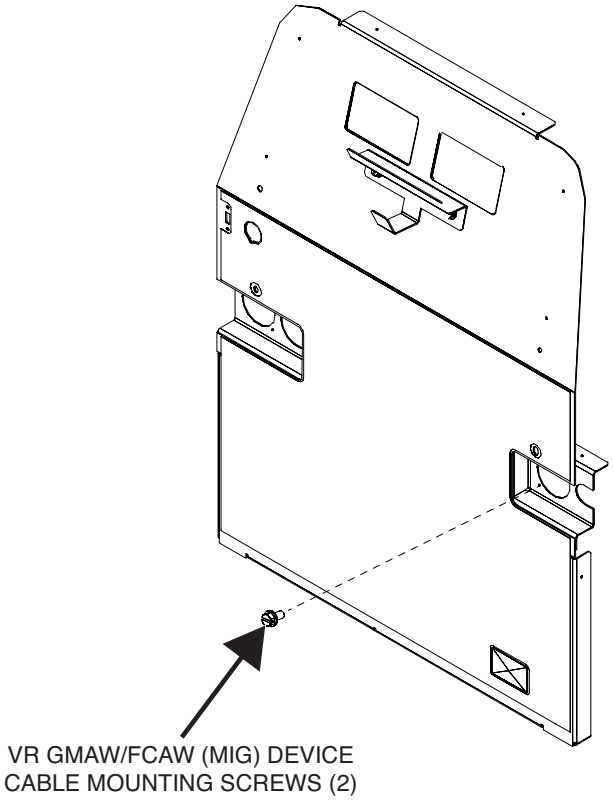
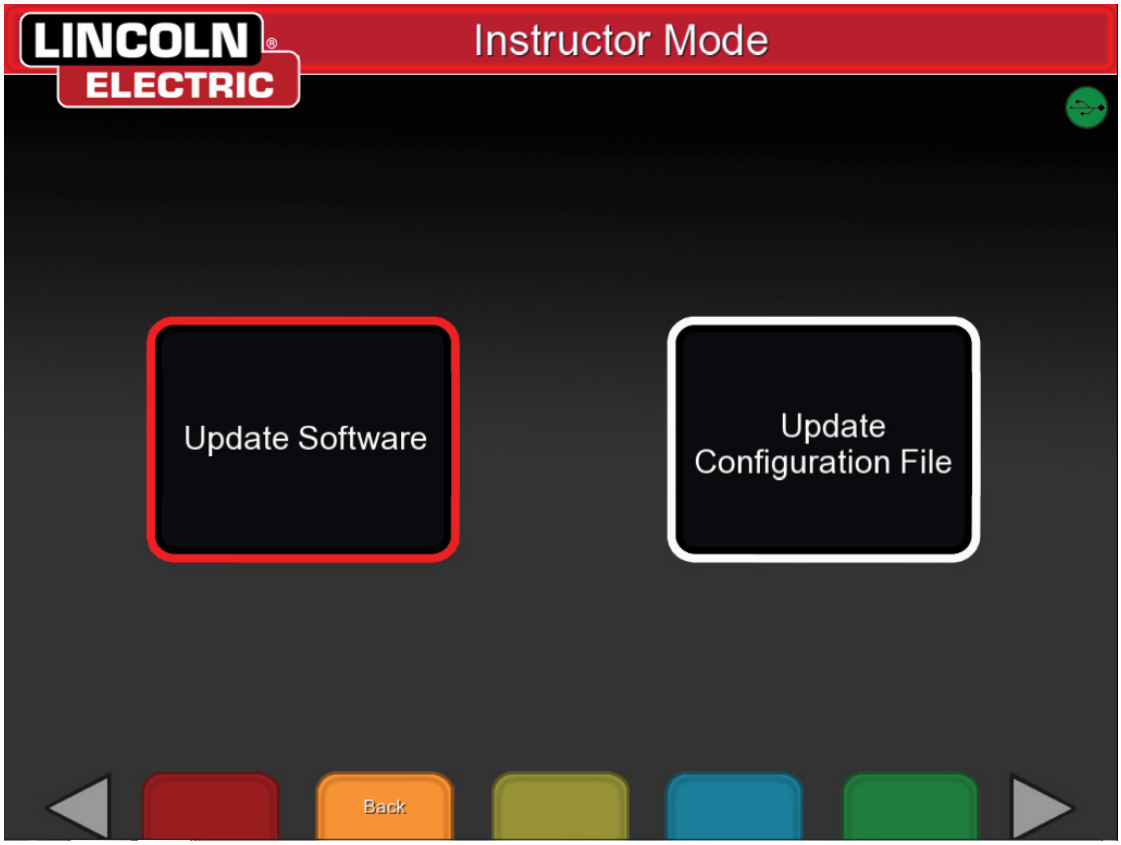


Figure B.107 – Update configuration file screen



VR GMAW/FCAW (MIG) DEVICE REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

REPLACEMENT PROCEDURE

1. Using a 3/8" socket/wrench, attach the two screws securing the VR SMAW (stick) device to the case front.
2. Replace the toroid.

NOTE: For reassembly be sure to take note of how many turns of wire pass through the toroid and also the direction and location.

3. Replace any necessary cable ties.
4. Connect leads SEN3A and SEN3B. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.
6. Carefully apply input power to the machine.
7. Press and hold the green "ON" button on the front of the machine. Hold for five seconds to start system.
8. Insert the USB stick supplied with the new VR GMAW/FCAW (MIG) device.
9. Enter Instructor mode. See ***Operation*** section.
10. Navigate to 'Update' screen, and choose 'Update Configuration File'. See ***Figure B.107***.
11. Perform the ***Hardware Initialization (PIMAN.EXE) Procedure***.
12. Perform ***Retest After Repair***.

VR SMAW (STICK) DEVICE REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

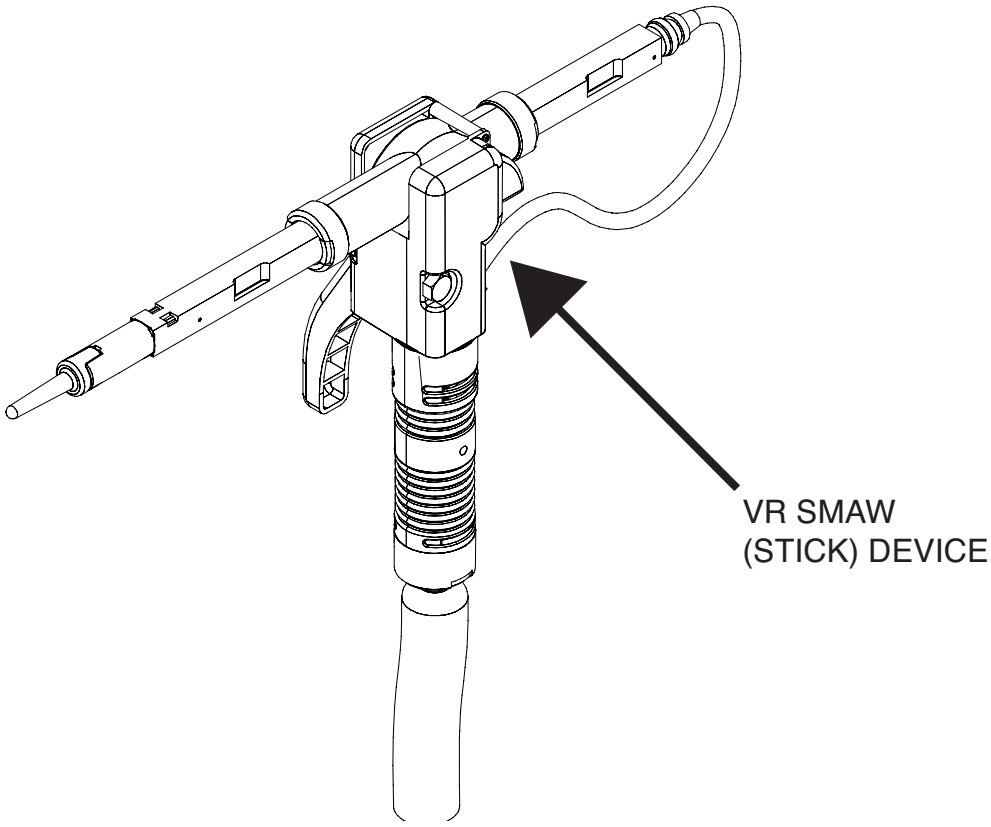
This procedure will aid the technician in the removal and replacement of the VR SMAW (Stick) Device.

MATERIALS NEEDED

3/8” Socket/Wrench

VR SMAW (STICK) DEVICE
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.108 – VR SMAW (Stick) device



REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides and rear panel access.
3. Locate the VR SMAW (Stick) device. See Figure B.108.
4. Remove toroid and follow VR SMAW (Stick) device leads to plug P1/J1 16-pin connector and disconnect. See Wiring Diagram.

NOTE: For reassembly be sure to take note of how many turns of wire pass through the toroid and also the direction and location.

5. Remove any necessary cable ties.
6. Label and disconnect SEN 4 from J3 on the relay board. See ***Figure B.109***. See Wiring Diagram.
7. Using a 3/8" socket/wrench, remove the two screws securing the VR SMAW (stick) device to the case front. See ***Figure B.110***.
8. The VR SMAW (Stick) device can now be removed and replaced.

VR SMAW (STICK) DEVICE
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.109 – Relay board lead location

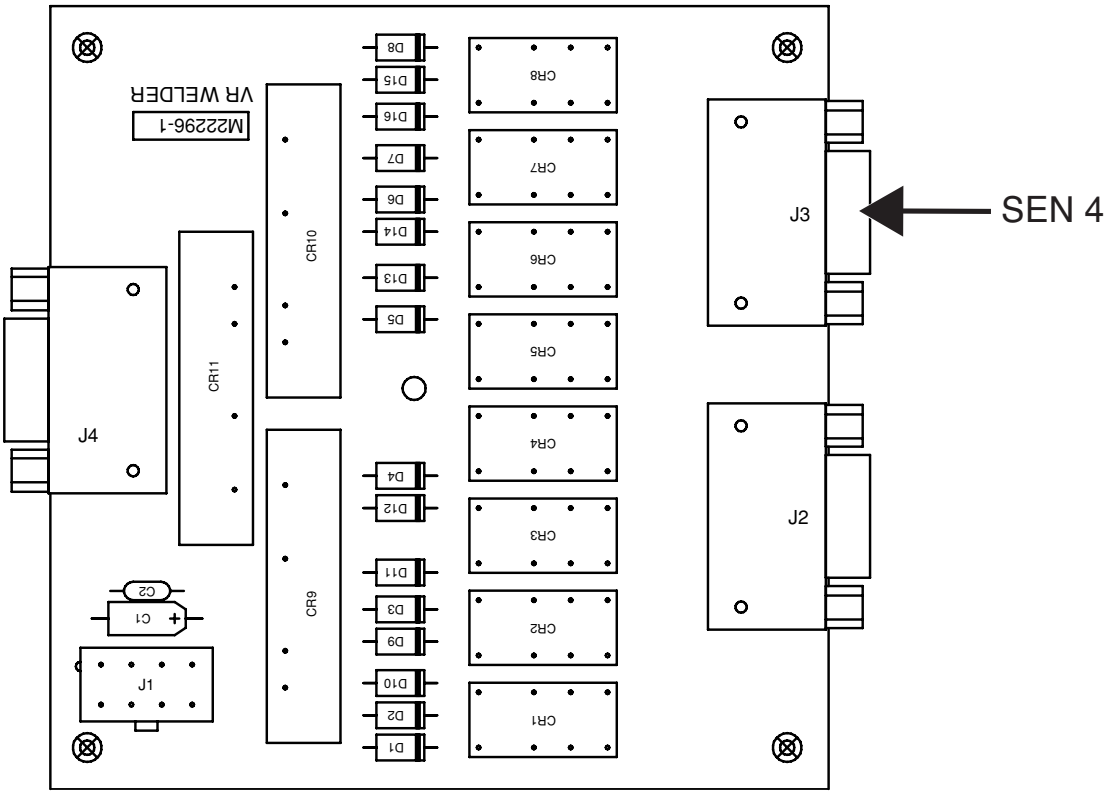
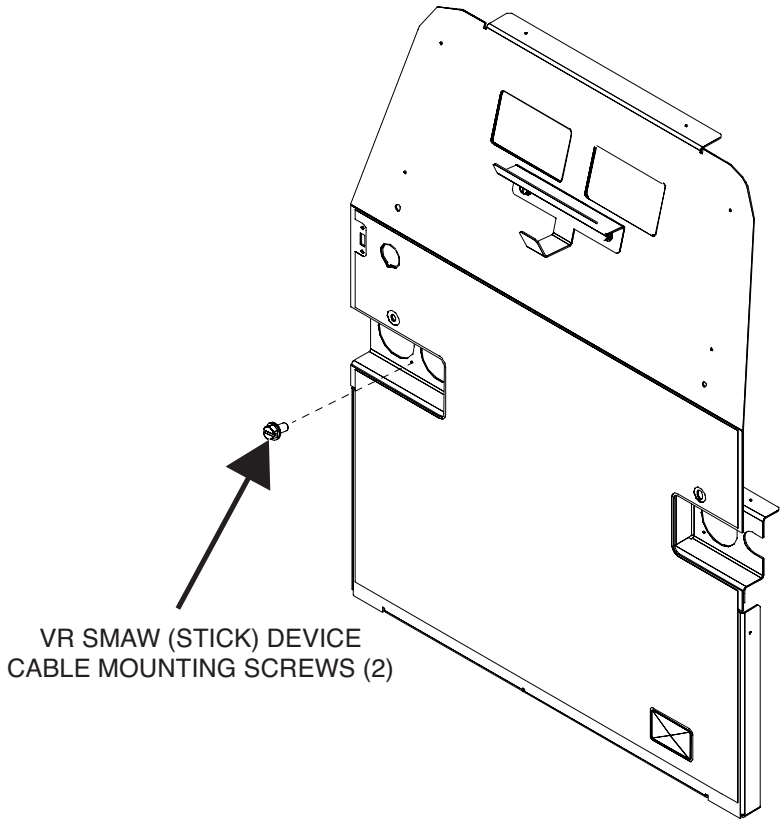
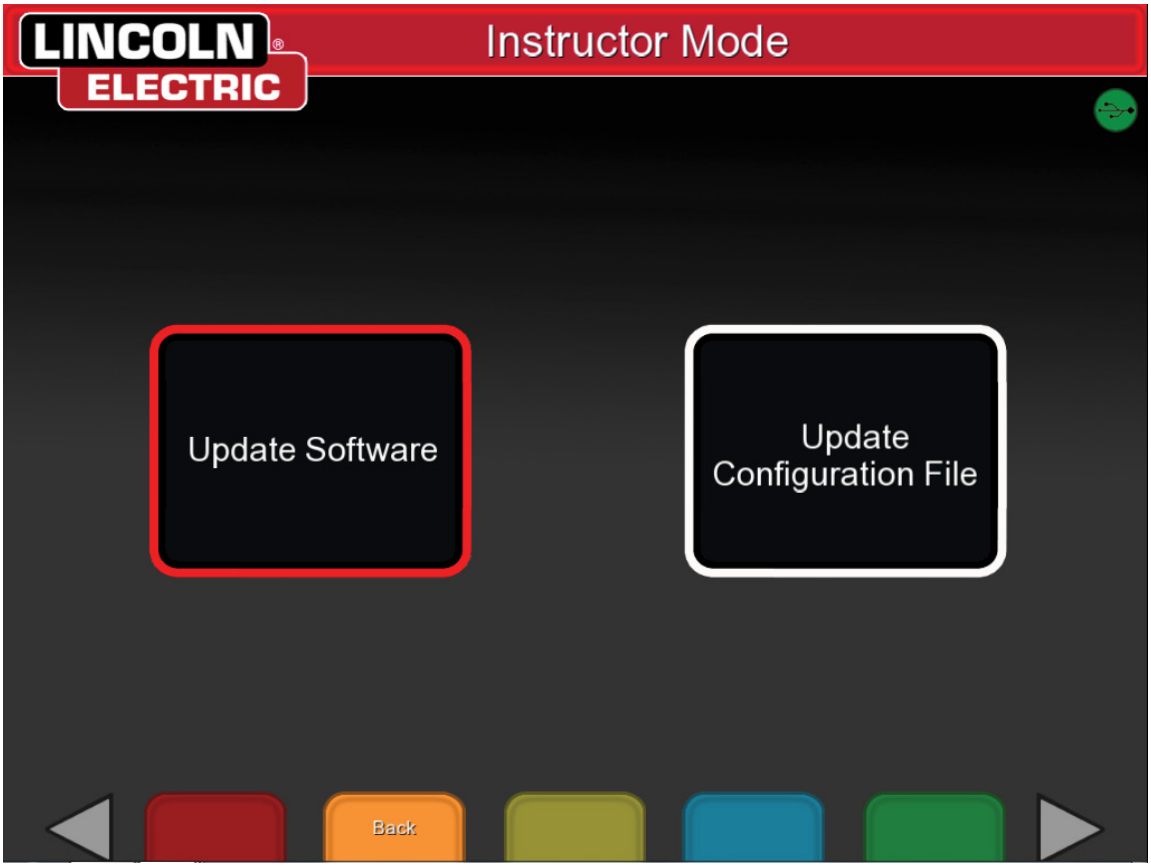


Figure B.110 – Input cable location



VR SMAW (STICK) DEVICE
REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.111 – Update configuration file screen



REPLACEMENT PROCEDURE

1. Carefully place VR SMAW (Stick) device cables through associated input cable hole on the machine case front.
2. Using a 3/8” socket/wrench, attach the two screws securing the VR SMAW (stick) device to the case front.
3. Connect SEN 4 to J3 on the relay board. See Wiring Diagram.
4. Replace any cable ties as necessary.
5. Replace toroid and route VR SMAW (Stick) device leads to plug J1 and connect. See Wiring Diagram.

NOTE: For reassembly be sure to take note of how many turns of wire pass through the toroid and also the direction and location.

6. Perform the ***Case Cover Replacement Procedure***.
7. Carefully apply input power to the machine.
8. Press and hold the green “ON” button on the front of the machine. Hold for five seconds to start system.
9. Insert the USB stick supplied with the new VR SMAW (stick) device.
10. Enter Instructor mode. See ***Operation*** section.
11. Navigate to ‘Update’ screen, and choose ‘Update Configuration File’. See Figure B.111.
12. Perform the ***Hardware Initialization (PIMAN.EXE) Procedure***.
13. Perform ***Retest After Repair Procedure***.

HELMET REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

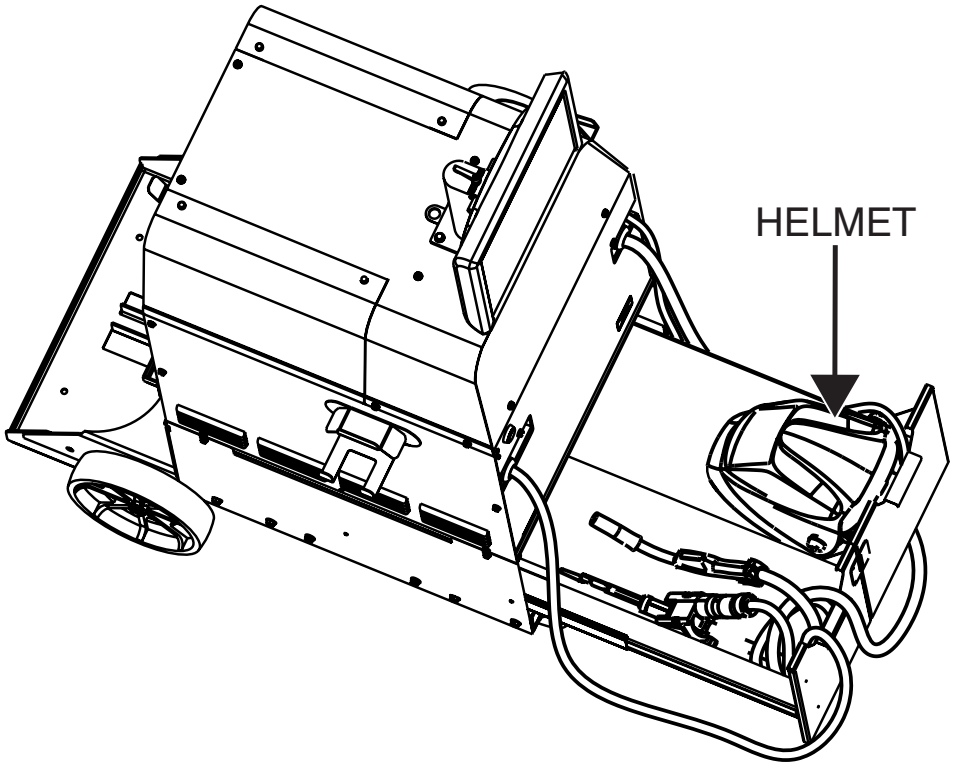
This procedure will aid the technician in the removal and replacement of the Helmet.

MATERIALS NEEDED

Miscellaneous Hand Tools

HELMET REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.112 – Helmet location



REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Locate the helmet. See Figure B.112.
4. Disconnect USB 6 cable from the USB hub. See ***Figure B.113***. See Wiring Diagram.
5. Disconnect SEN 2 serial connection from Patriot SEU module. See ***Figure B.114***. See Wiring Diagram.
6. Disconnect DVI 1 from the back of the CPU. See ***Figure B.115***.
7. Label and disconnect audio cable (AUD 2) from the splitter. See Wiring Diagram.
8. Remove any necessary cable ties.
9. Remove toroid and save for replacement procedure.

NOTE: For reassembly be sure to take note of how many turns of wire pass through the toroid and also the direction and location.

10. Remove strain relief grommet from wires and save for replacement procedure.
11. Route cables through front of the machine.
12. The helmet can now be removed and replaced.

HELMET REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.113 – USB 6 connection location

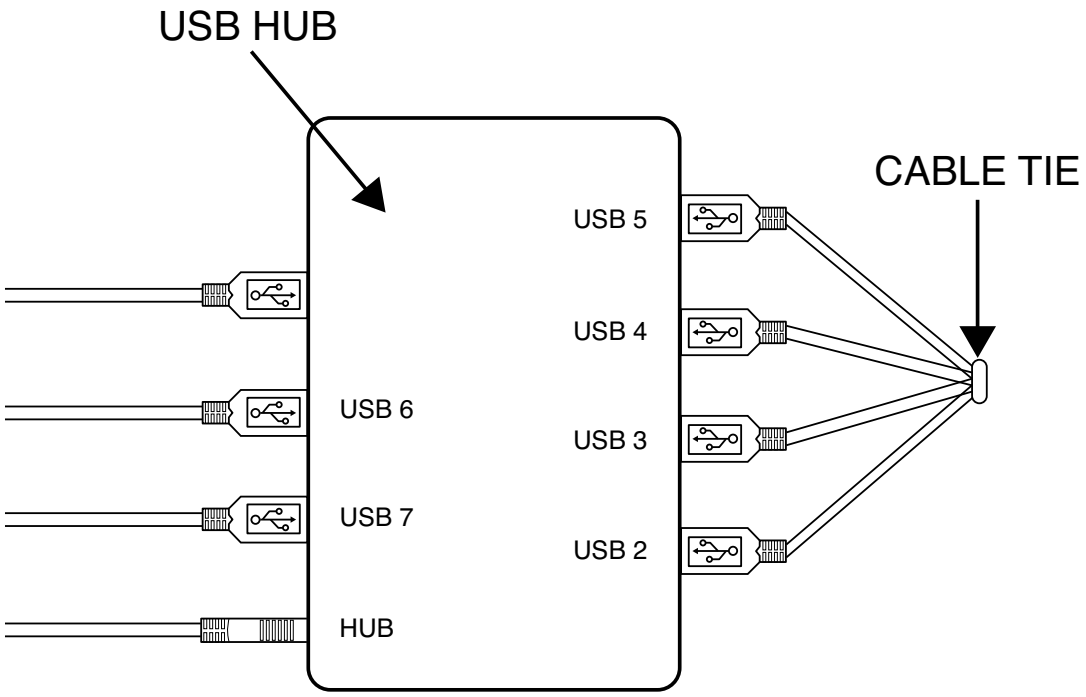
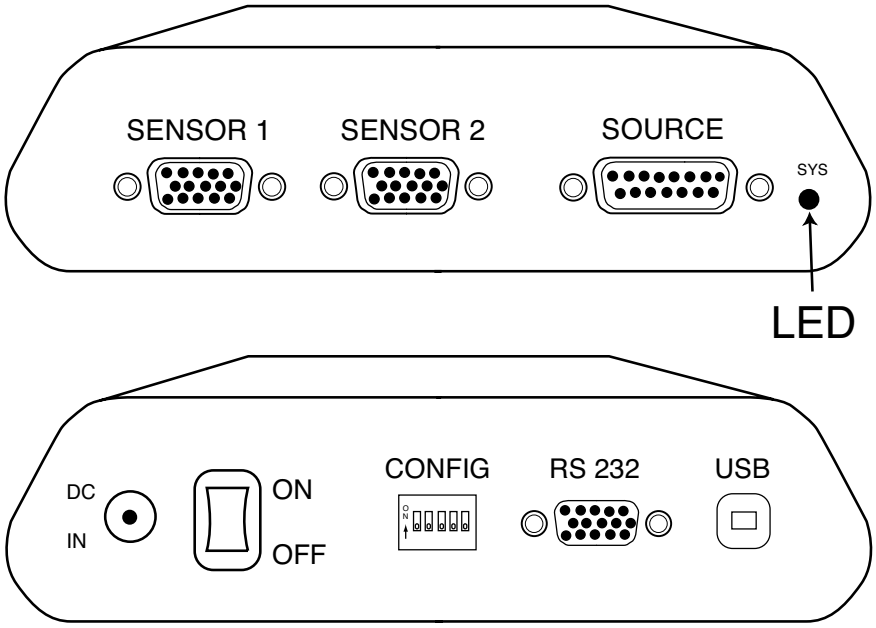


Figure B.114 – Patriot SEU module serial connection location

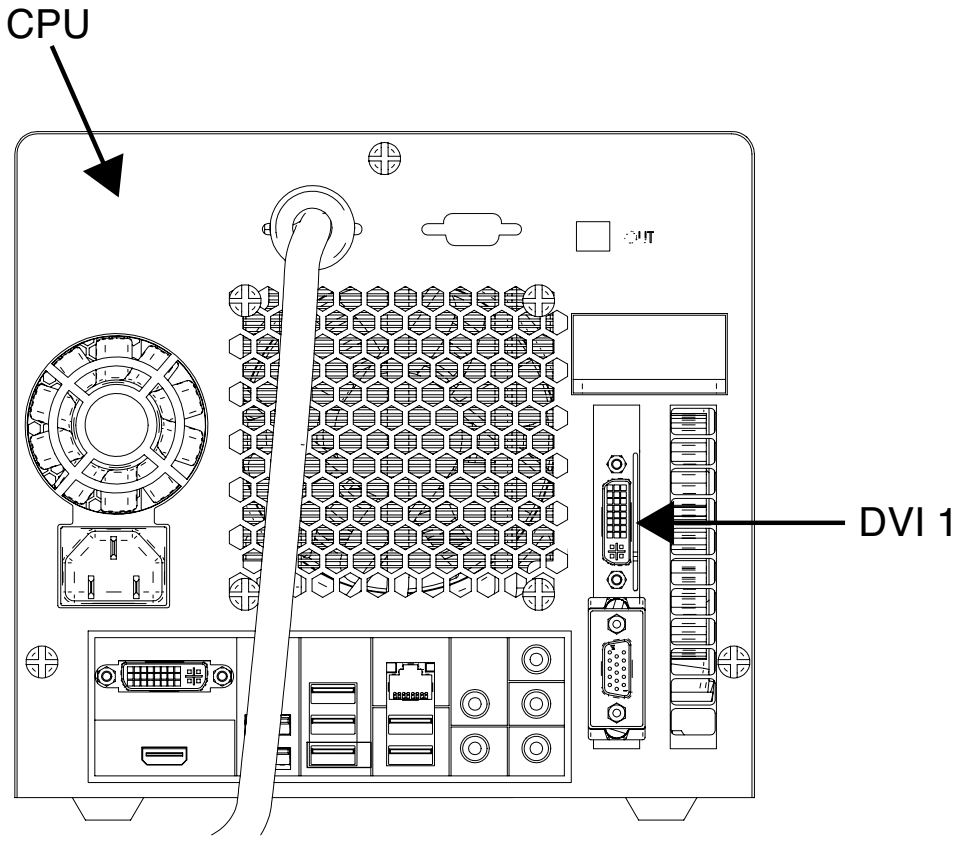
(FACING RIGHT SIDE OF MACHINE)



(FACING LEFT SIDE OF MACHINE)

HELMET REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.115 – DVI 1 connection location



REPLACEMENT PROCEDURE

1. Carefully route the helmet cables through the front of the machine.
2. Attach the previously removed strain relief grommet to the wires.
3. Replace toroid.

NOTE: For reassembly be sure to take note of how many turns of wire pass through the toroid and also the direction and location.

4. Replace cable ties as necessary.
5. Connect audio cable (AUD 2) to the splitter. See Wiring Diagram.
6. Connect DVI 1 to the back of the CPU.
7. Connect SEN 2 serial connection to the Patriot SEU module. See Wiring Diagram.
8. Connect USB 6 cable to the USB hub. See Wiring Diagram.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform the ***Hardware Initialization (PIMAN.EXE) Procedure***.
11. Perform ***Retest After Repair Procedure***.

TOUCHSCREEN MONITOR CALIBRATION PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

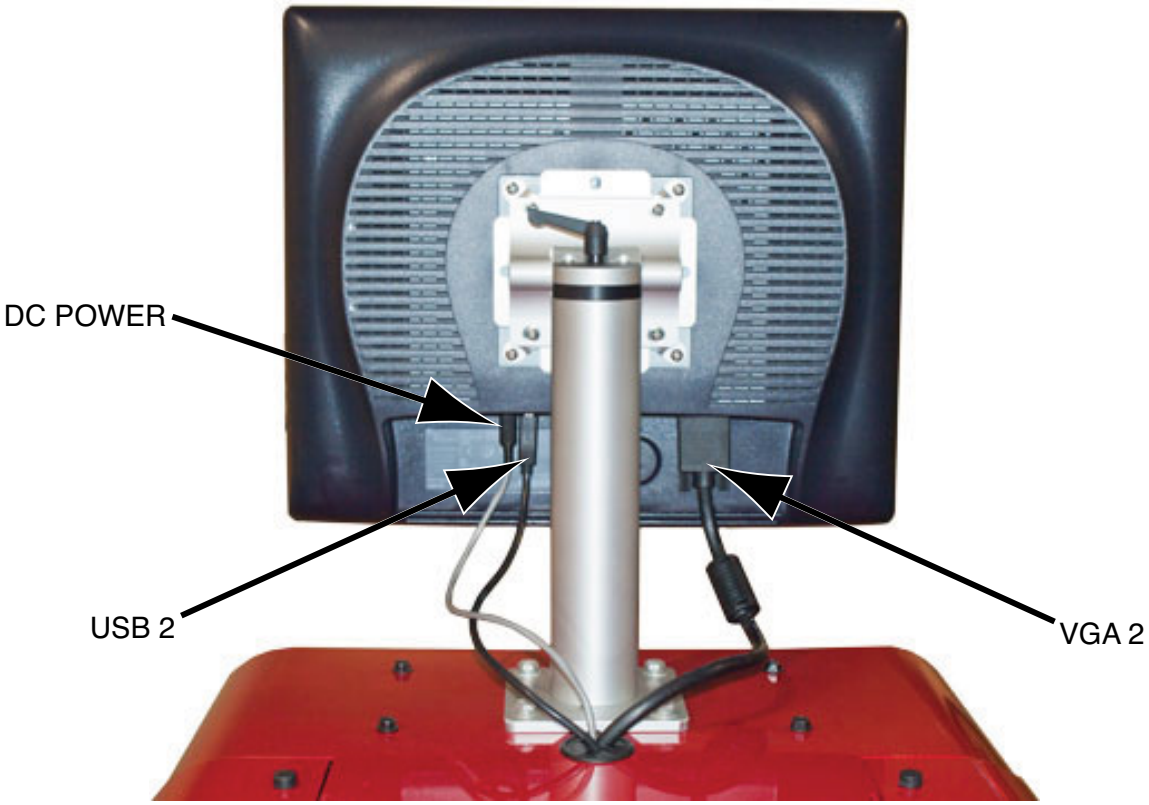
This procedure will aid the technician in the calibration of the Touchscreen Monitor.

MATERIALS NEEDED

3/8” Socket/Wrench
USB Mouse
USB Keyboard

TOUCHSCREEN MONITOR CALIBRATION PROCEDURE *(continued)*

Figure B.116 – Touchscreen monitor connections



PROCEDURE

1. Connect cables to monitor. See Figure B.116.
2. Using a 3/8" socket/wrench, remove the screw securing the USB cover to the rear of the machine. See ***Figure B.117***.
3. Connect USB mouse and USB keyboard to rear USB receptacle. See ***Figure B.117***.
4. Apply input power and start up the machine by pressing and holding the green ON button for 5 seconds.

NOTE: The monitor power button is located to the lower right of the monitor screen; allow the machine to start up the simulation software until the keyboard login screen appears.

5. Press "WINDOWS" key + letter "D" to allow the Windows desktop to appear.
6. Move the mouse cursor to the bottom of the screen to display the Windows task bar.
7. Right click the mouse and close all programs. If prompted, select "CLOSE THE PROGRAM" in the message box that may appear.
8. Left click the arrow icon on the right side of the task bar. Double-click the "ELO" icon and select "Align." See ***Figure B.118***.
9. Three separate targets will appear on the screen. Touch target icons to calibrate accordingly.
10. Select the "Sound" tab and uncheck "Beep on touch." Select "Apply" and click "OK." Close program.
11. Navigate the mouse cursor to the bottom of the desktop to display the task bar and shut down the CPU.
12. Disconnect USB mouse and keyboard from the rear USB receptacle.
13. Perform ***Retest After Repair Procedure***.

TOUCHSCREEN MONITOR CALIBRATION PROCEDURE *(continued)*

Figure B.117 – USB cover removal

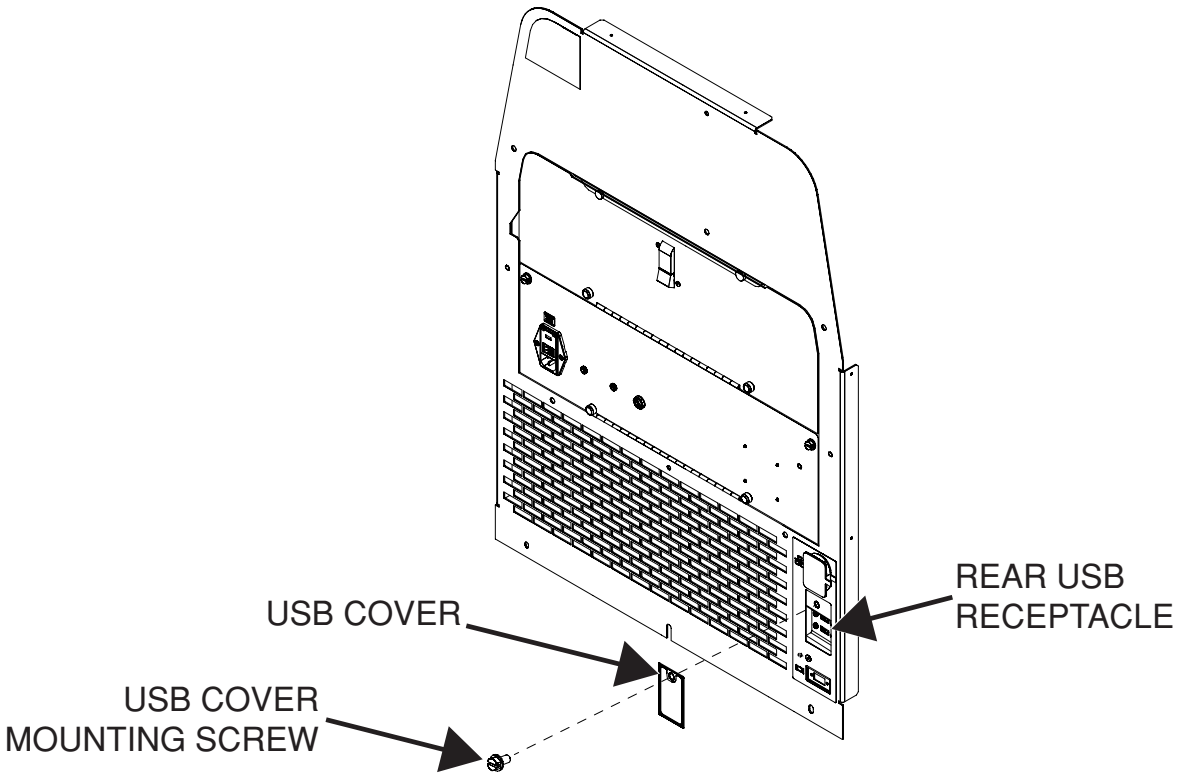
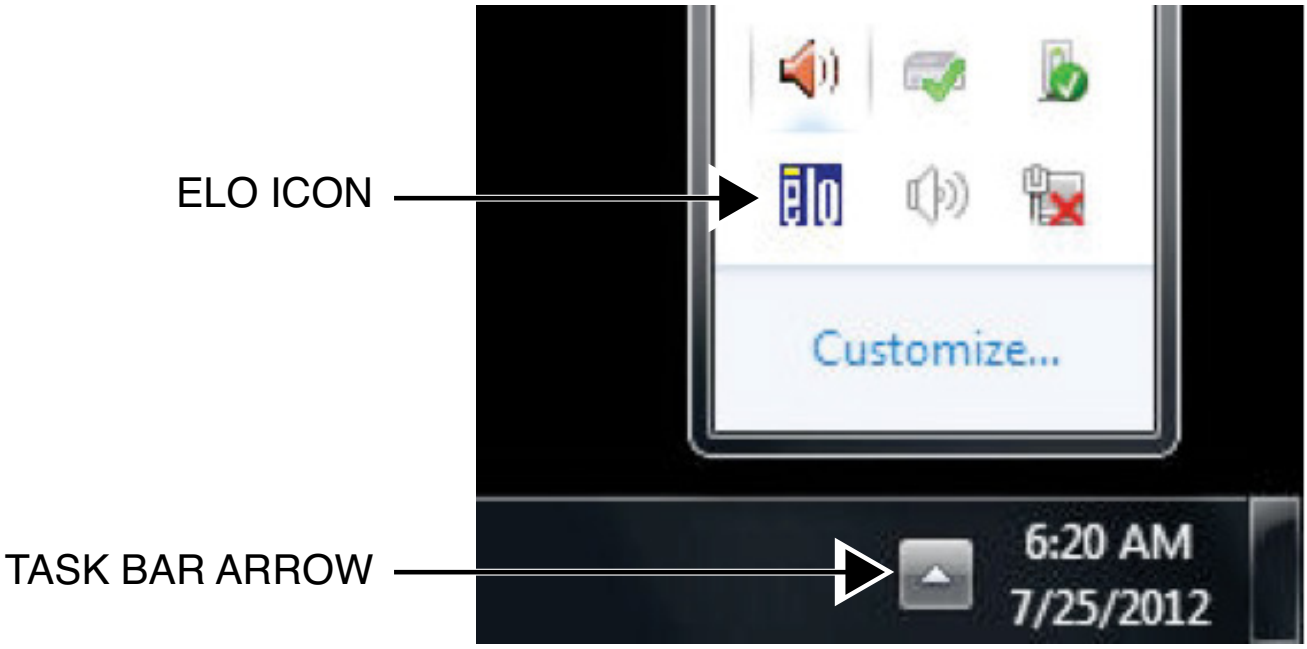


Figure B.118 – Monitor calibration screen shot



GREEN ON BUTTON
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Green ON Button.

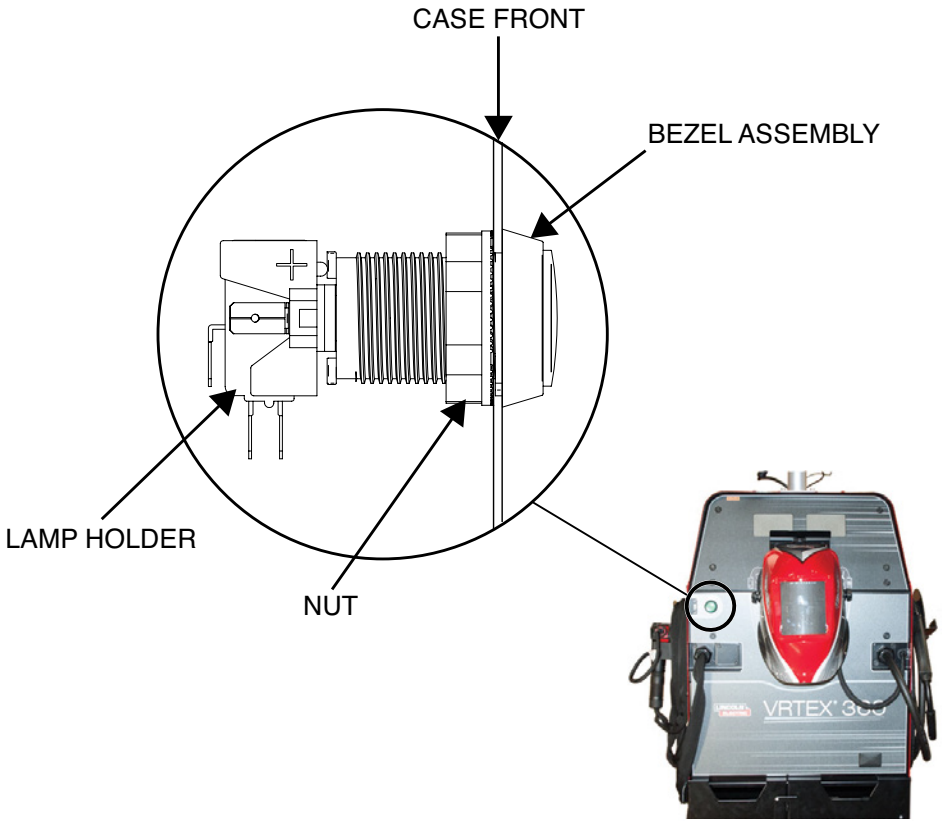
MATERIALS NEEDED

Adjustable Wrench

GREEN ON BUTTON

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.119 – Green ON button location



REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for left case side.
3. Locate the green ON button. See Figure B.119.
4. Take hold of the lamp holder assembly and gently rotate (counter-clockwise) to remove from the bezel assembly. See Figure B.119.

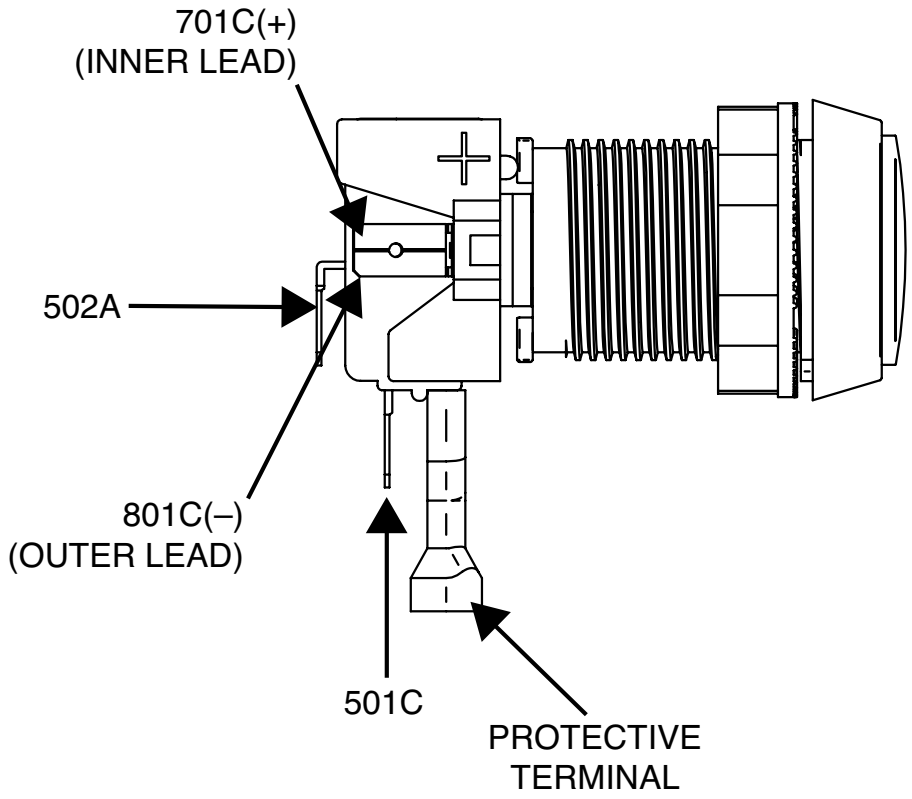
NOTE: Take note of the angle of the lamp holder assembly for reassembly.

5. Disconnect leads 502A, 501C, 801C and 701C from the lamp holder assembly. See ***Figure B.120***. See Wiring Diagram.
6. Using an adjustable wrench, remove the nut securing the bezel assembly to the case front. See Figure B.119.
7. Remove the black bezel assembly from the front of the machine. See Figure B.119.
8. Replace the green ON button.

GREEN ON BUTTON

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.120 – Green ON button lead location



REPLACEMENT PROCEDURE

1. Secure the bezel assembly to the case front.
2. Connect leads 502A, 501C, 801C and 701C to the lamp holder assembly. See Wiring Diagram.
3. Assure the protective terminal is in place on the new lamp holder assembly. Failure to do so may cause electric shock. All terminals must be covered prior to machine start-up.
4. Install the lamp holder assembly by gently pushing and rotating clockwise in position securing it to the bezel assembly.
5. Perform the ***Case Cover Replacement Procedure***.
6. Perform ***Retest After Repair Procedure***.

SWING ARM
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the Swing Arm.

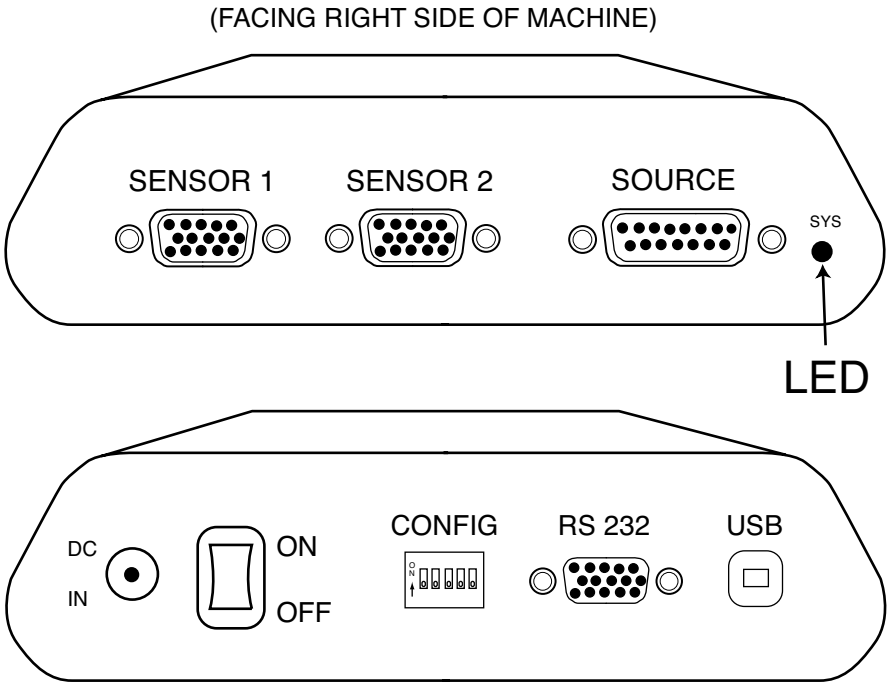
MATERIALS NEEDED

Miscellaneous Hand Tools

SWING ARM

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.121 – "Source" cable connection on Patriot SEU module



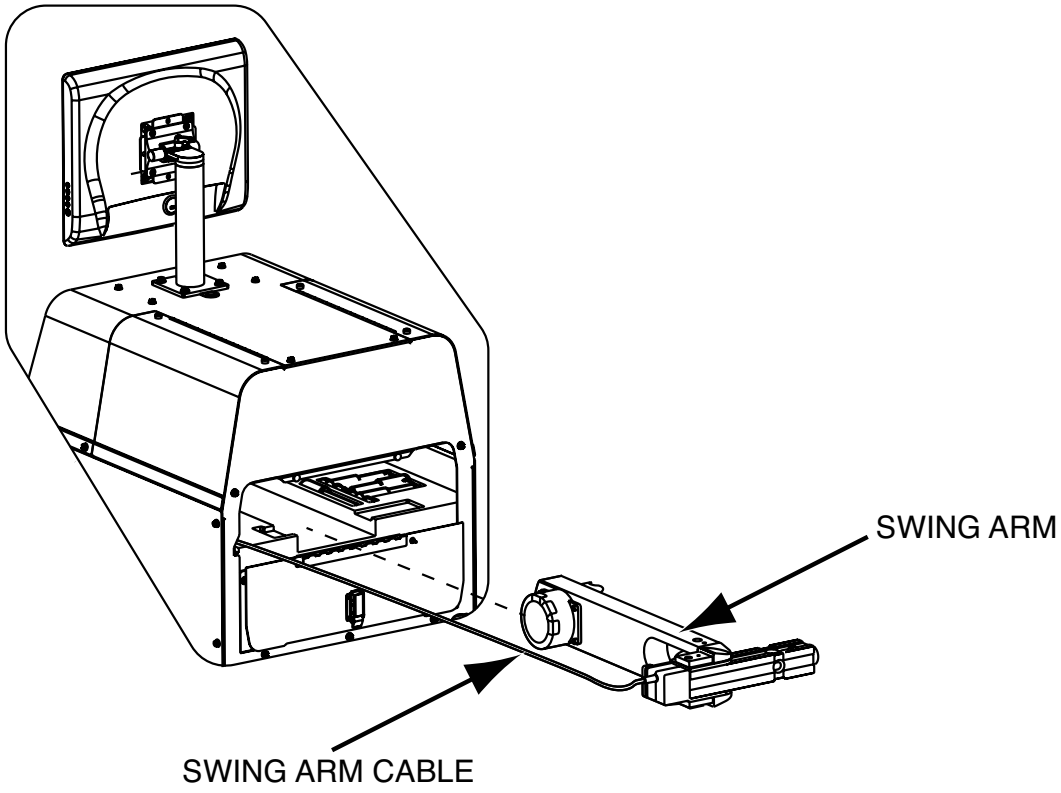
REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for case sides.
3. Remove any coupons that are inserted into the swing arm.
4. Disconnect the cable labeled "SOURCE" from the Patriot SEU module. See Figure B.121.
5. Remove the strain relief from the swing arm cable at the right side of the machine. See ***Figure B.122***.
6. Remove any cable ties.
7. Open the access door on the back of the machine.
8. Remove the swing arm cable through the case back.
9. Carefully slide the swing arm off of the top of the table mounting post.
10. The swing arm can now be removed and replaced.

SWING ARM

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.122 – Swing arm cable



REPLACEMENT PROCEDURE

1. Carefully slide the swing arm on to the top of the table mounting post.
2. Carefully route the swing arm cable through the case back.
3. Close the access door on the back of the machine.
4. Attach the strain relief to the swing arm cable at the right side of the machine.
5. Connect the cable labeled “SOURCE” to the Patriot SEU module. See Wiring Diagram.
6. Replace cable ties as necessary.
7. Perform the ***Case Cover Replacement Procedure***.
8. Perform the ***Hardware Initialization (PIMAN.EXE) Procedure***.
9. Perform ***Retest After Repair Procedure***.

RELAY BOARD REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Automation Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

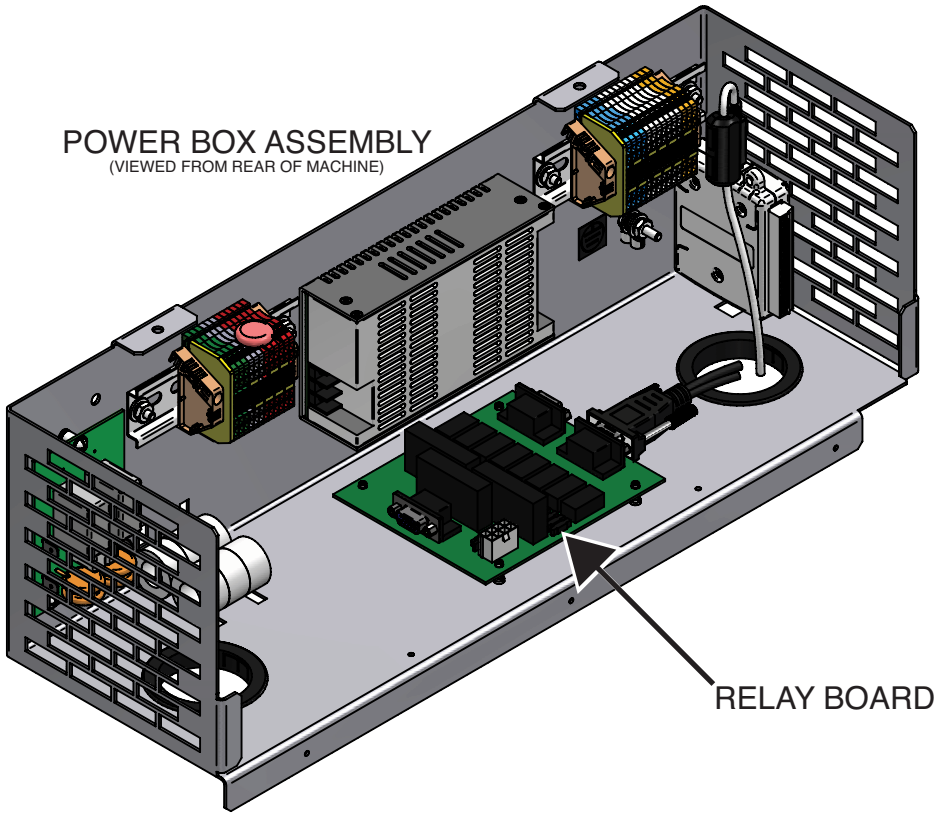
This procedure will aid the technician in the removal and replacement of the Relay Board.

MATERIALS NEEDED

Miscellaneous Hand Tools

RELAY BOARD REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.123 – Relay board location

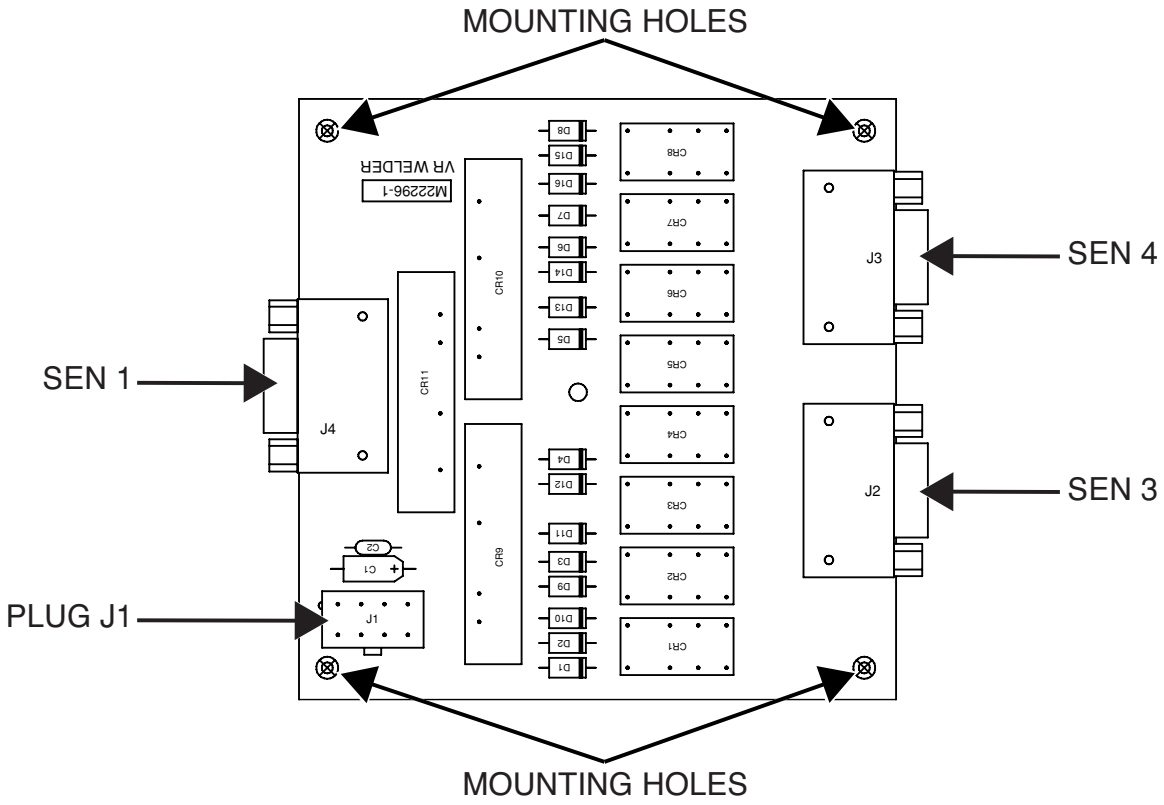


REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for rear panel access.
3. Locate the relay board. See Figure B.123.
4. Label and remove SEN 1, SEN 3 and SEN 4 (SMAW) leads from the relay board. See ***Figure B.124***. See Wiring Diagram.
5. Label and remove plug J1. See ***Figure B.124***. See Wiring Diagram.
6. The relay board is now ready for removal. Carefully lift the board up and away from the four stand-off's which are located at each corner of the board. See ***Figure B.124***.
7. The relay board can now be removed and replaced.

RELAY BOARD REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.124 – Relay board lead, plug and mounting hole locations



REPLACEMENT PROCEDURE

1. Carefully position the relay board in to the machine.
2. Carefully press the board on to the four stand-off's securing each corner of the board to the machine.
3. Attach plug J1. See Wiring Diagram.
4. Attach leads SEN 1, SEN 3 and SEN 4 (SMAW) to the relay board. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.
6. Perform ***Retest After Repair Procedure***.

USB DIGITAL I/O MODULE
REMOVAL AND REPLACEMENT PROCEDURE

⚠ WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or 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.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact the Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed. Call 1-888-935-3878.

TEST DESCRIPTION

This procedure will aid the technician in the removal and replacement of the USB Digital I/O Module.

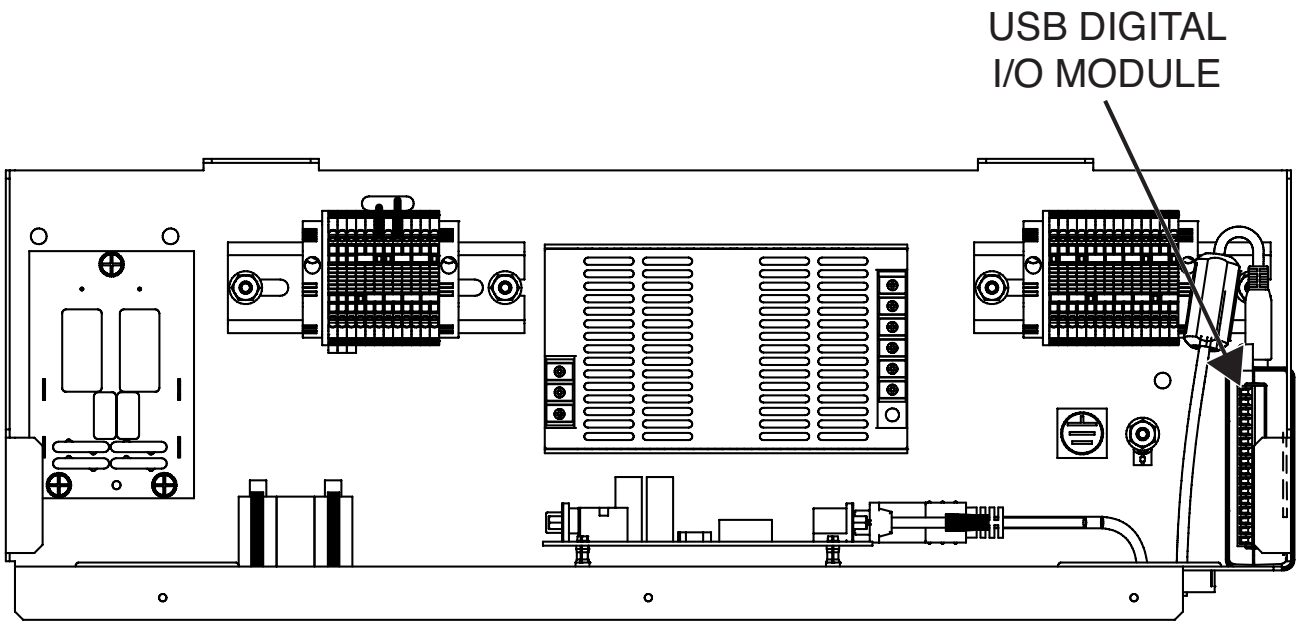
MATERIALS NEEDED

3/8” Socket/Wrench
Hook And Loop Fastener

USB DIGITAL I/O MODULE

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.125 – USB digital I/O module location



POWER BOX ASSEMBLY
(VIEWED FROM REAR OF MACHINE)

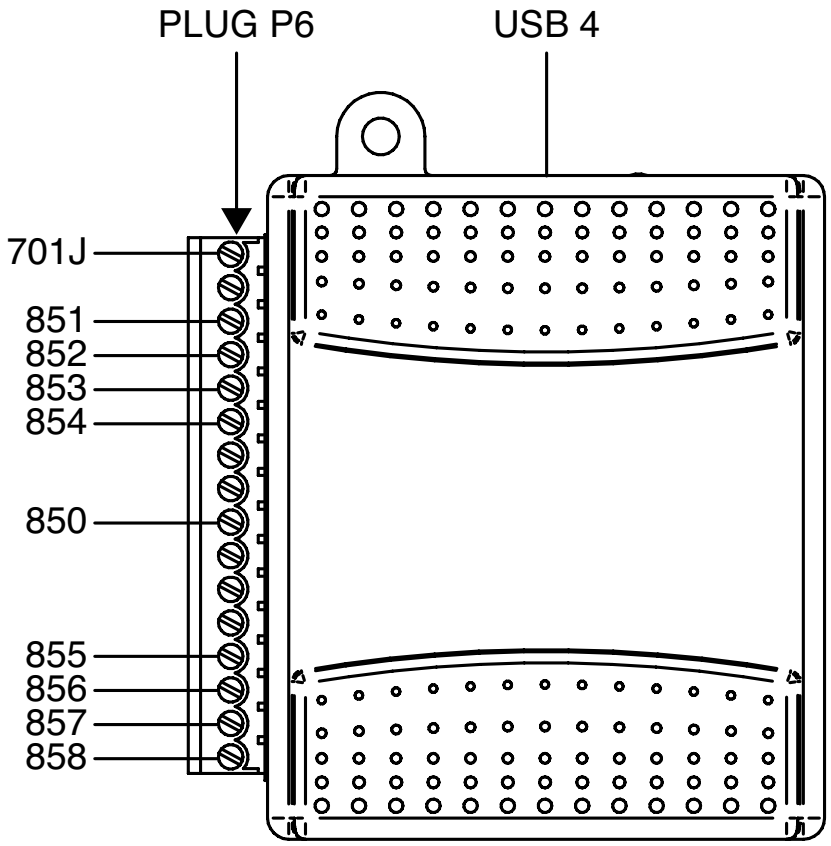
REMOVAL PROCEDURE

1. Remove the input power to the machine.
2. Perform the ***Case Cover Removal Procedure***, for rear panel access.
3. Locate the USB digital I/O module. See Figure B.125.
4. Label and remove plug P6 from the USB digital I/O module. See ***Figure B.126***. See Wiring Diagram.
5. Label and disconnect the USB 4 cable from the USB digital I/O module. See ***Figure B.126***. See Wiring Diagram.
6. Remove cable tie securing the USB digital I/O module to the power box assembly.
7. The USB digital I/O module can now be removed and replaced. Note the hook and loop fastener securing the USB digital I/O module.

USB DIGITAL I/O MODULE

REMOVAL AND REPLACEMENT PROCEDURE *(continued)*

Figure B.126 – USB digital I/O module lead locations



REPLACEMENT PROCEDURE

1. Using hook and loop fastener, position the USB digital I/O module in to the power box assembly.
2. Using a cable tie, secure the USB digital I/O module to the power box assembly.
3. Connect the USB 4 cable to the USB digital I/O module.

NOTE: If replacing USB cable along with the USB digital I/O module be certain that the toroid is secured to the USB cable.

4. Attach plug P6 to the USB digital I/O module. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.
6. Perform the ***USB Digital I/O Module Settings Verification Procedure***.
7. Perform ***Retest After Repair Procedure***.

RETEST AFTER REPAIR

DESCRIPTION

This procedure will aid the technician in testing the basic operations of the VRTEX 360 after any repair or replacement procedure has been completed.

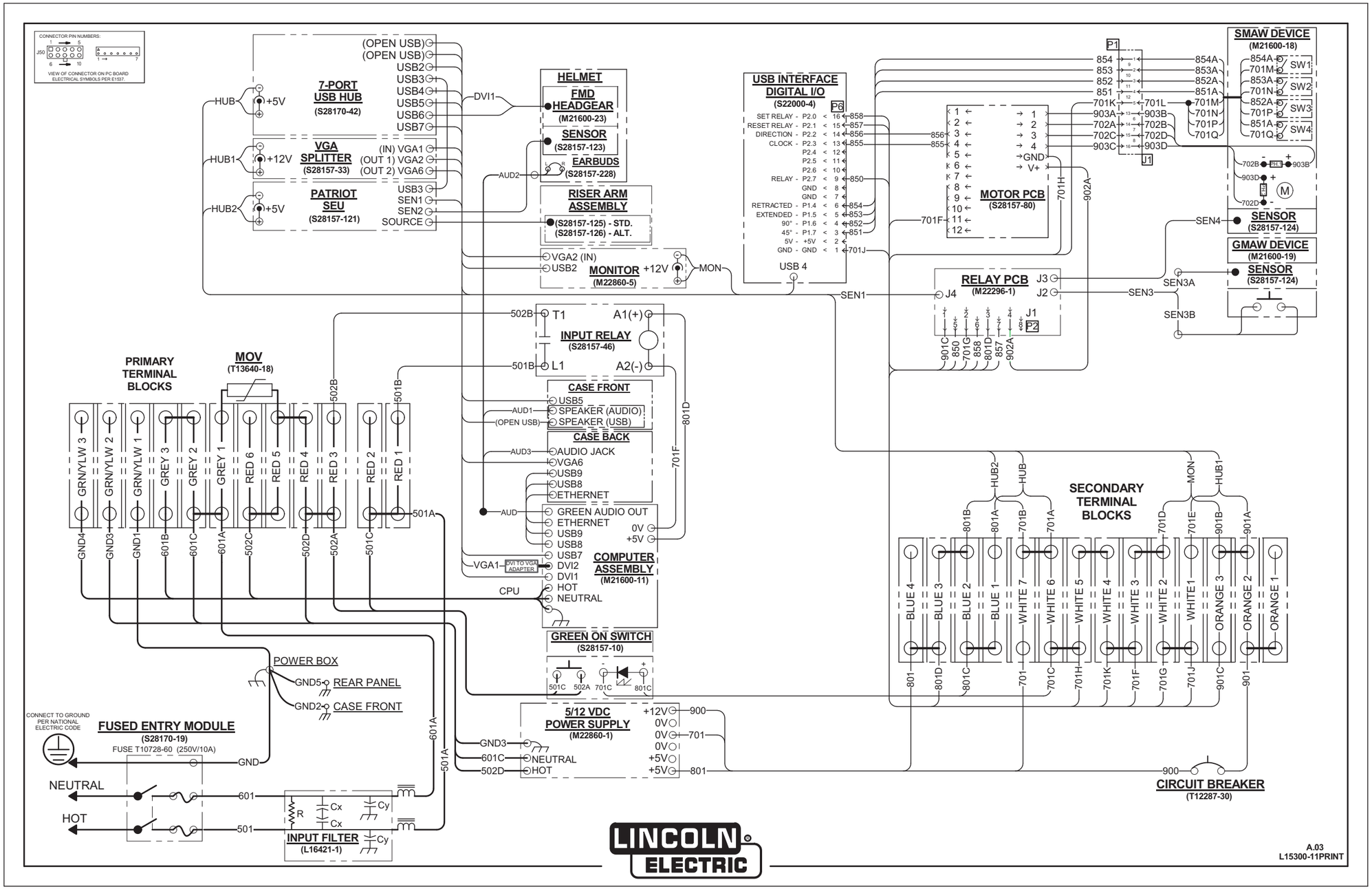
1. Make sure the swing arm, helmet, speakers, monitor, VR GMAW/FCAW gun and the VR SMAW devices are properly connected to the unit and not damaged.
2. Connect the machine to the 115/230 VAC power source.
3. Using the green ON button, turn on the VRTEX 360. Keep the button depressed for at least 5 seconds.
4. When the unit has "booted-up" proceed with login. See ***Operation*** section of this manual.
5. Insert a USB memory device into the USB port on the front of the machine.
6. Navigate through the following: See the ***Operation*** section of this manual.
    a. Select coupon – must match actual coupon in arm (i.e., 3/8" plate must show when selected).
    b. Using the process selector icon, select GMAW or SMAW.
    c. Proceed with settings. See the ***Default Weld Process Settings***.
7. Check the functionality of all icons. They must function as labeled. Listen for an audible signal when icons are selected.
8. Check the functionality of the VR GMAW/FCAW and VR SMAW devices in all positions and with every coupon. When welding there must be visual information in the helmet. If external speakers are used there must be audio information when welding.
9. Check all three different views using the right and left select arrow icons.
10. Make certain that weld pass information can be saved in the USB memory device. See the ***Operation*** section of this manual.
11. Select menu, logout, then "Yes". Login screen with keyboard appears.
12. Press the key icon and enter the pass code. The instructor mode screen should appear. Press back button.

NOTE: If no pass code is available. Call Lincoln Electric Automation Department at 1-888-935-3878.

13. Select menu, then "Shutdown". Select "Yes". The machine should shutdown.

TABLE OF CONTENTS
- DIAGRAMS SECTION -

WIRING DIAGRAM - CODES 11382 & 11383 (L15300)



NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The wiring diagram specific to your code is pasted inside one of the enclosure panels of your machine.