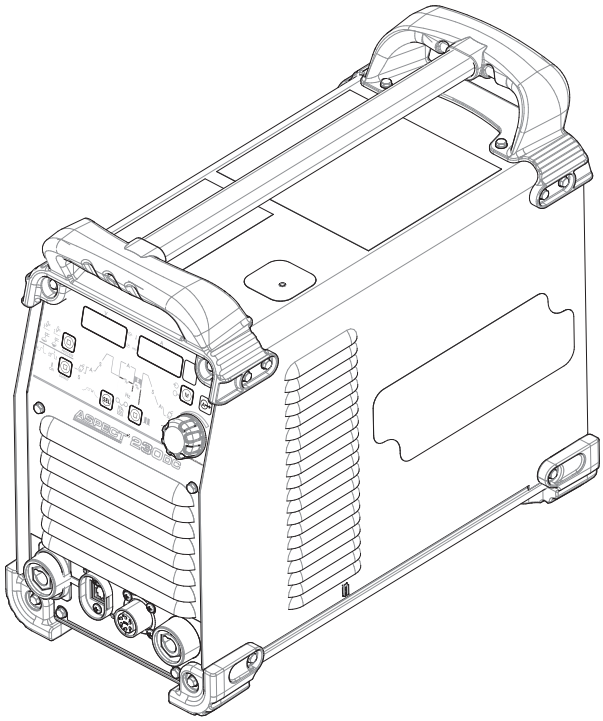
LINCOLN ELECTRIC

Service Manual

Aspect® 230 DC



For use with machines having Code Numbers:
12734

GENUINE LINCOLN PARTS™

Register your machine:
www.lincolnelectric.com/registration

Authorized Service and Distributor Locator:
www.lincolnelectric.com/locator

Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

SVM10494 | Issue Date May-22

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

THANK YOU FOR SELECTING A QUALITY PRODUCT BY LINCOLN ELECTRIC.

PLEASE EXAMINE CARTON AND EQUIPMENT FOR DAMAGE IMMEDIATELY

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

SAFETY DEPENDS ON YOU

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

⚠ WARNING

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

⚠ CAUTION

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

KEEP YOUR HEAD OUT OF THE FUMES.

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

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

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

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

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

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

WEAR CORRECT EYE, EAR & BODY PROTECTION

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

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

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

IN SOME AREAS, protection from noise may be appropriate.

BE SURE protective equipment is in good condition.

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

SPECIAL SITUATIONS

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

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

Additional precautionary measures

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

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

REMOVE all potential fire hazards from welding area.

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

SECTION A: WARNINGS

CALIFORNIA PROPOSITION 65 WARNINGS

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

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

For more information go to www.P65 warnings.ca.gov/diesel

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

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

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

Read and understand the following safety highlights. For additional safety information, it is strongly recommended that you purchase a copy of "Safety in Welding & Cutting - ANSI Standard Z49.1" from the American Welding Society, P.O. Box 351040, Miami, Florida 33135 or CSA Standard W117.2. 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.

1.i. Using a generator indoors CAN KILL YOU IN MINUTES.

1.j. Generator exhaust contains carbon monoxide. This is a poison you cannot see or smell.

1.k. NEVER use inside a home or garage, EVEN IF doors and windows are open.

1.l. Only use OUTSIDE and far away from windows, doors and vents.

1.m. Avoid other generator hazards. READ MANUAL BEFORE USE.

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 hardfacing (see instructions on container or SDS) or on lead or cadmium plated steel and other metals or coatings which produce highly toxic fumes, keep exposure as low as possible and within applicable OSHA PEL and ACGIH TLV limits using local exhaust or mechanical ventilation unless exposure assessments indicate otherwise. In confined spaces or in some circumstances, outdoors, a respirator may also be required. Additional precautions are also required when welding on galvanized steel.**

5. b. The operation of welding fume control equipment is affected by various factors including proper use and positioning of the equipment, maintenance of the equipment and the specific welding procedure and application involved. Worker exposure level should be checked upon installation and periodically thereafter to be certain it is within applicable OSHA PEL and ACGIH TLV limits.

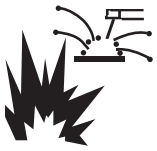
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

5.d. Shielding gases used for arc welding can displace air and cause injury or death. Always use enough ventilation, especially in confined areas, to insure breathing air is safe.

5.e. Read and understand the manufacturer’s instructions for this equipment and the consumables to be used, including the Safety Data Sheet (SDS) and follow your employer’s safety practices. SDS forms are available from your welding distributor or from the manufacturer.

5.f. Also see item 1.b.

WELDING AND CUTTING SPARKS CAN CAUSE FIRE OR EXPLOSION.



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

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

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

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

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

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

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

6.h. Also see item 1.c.

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

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

CYLINDER MAY EXPLODE IF DAMAGED.

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

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

7.c. Cylinders should be located:

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

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

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

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

7.g. Read and follow the instructions on compressed gas cylinders, associated equipment, and CGA publication P-I, "Precautions for Safe Handling of Compressed Gases in Cylinders," available from the Compressed Gas Association, 14501 George Carter Way Chantilly, VA 20151.

FOR ELECTRICALLY POWERED EQUIPMENT.

8.a. Turn off input power using the disconnect switch at the fuse box before working on the equipment.

8.b. Install equipment in accordance with the U.S. National Electrical Code, all local codes and the manufacturer's recommendations.

8.c. Ground the equipment in accordance with the U.S. National Electrical Code and the manufacturer's recommendations.

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

CONTENT/DETAILS MAY BE CHANGED OR UPDATED WITHOUT NOTICE. FOR MOST CURRENT INSTRUCTION MANUALS, GO TO PARTS.LINCOLNELECTRIC.COM.

The Aspect® 230 DC is an inverter based arc welding power source optimized for DC TIG (GTAW) and DC Stick (SMAW) welding. The Aspect® 230 DC includes TIG features, Amplitude Control, High frequency and Touch Start TIG®, 9 memory settings, Full sequencer including pulse controls, 2-step and 4-step output, Full digital controls, and Fan As Needed (F.A.N.). The Aspect® 230 DC also features Soft Stick and Crisp Stick welding modes.

A TIG Welding Cart and Cool Arc® 22 are both available as field installed options, or the entire system with welding power source is available as a fully integrated Ready-Pak®.

RECOMMENDED PROCESSES

The Aspect® 230 DC is recommended for manual GTAW and SMAW welding.

RECOMMENDED EQUIPMENT

Cooler: Cool Arc® 22 (K3475-1)

Low Conductivity Coolant (1 gal.) (KP4159-1)

Cart: TIG Welding Cart (K3949-1)

Ground Clamp and Stinger Set - 15ft (4.5m) (K2394-1)

Air Cooled 150A PTA-17 - 12.5ft (3.8m) torch (K1782-12) - or - Water Cooled 250A PTW-20 - 12.5ft (3.8m) (K1784-3) requires; Zippered Cable Cover (K918-1); Torch Twist Mate Connector (9ST14557-27)

Consumable Kit for PTW-20 (KP510)

Foot Amptrol - 25’ (7.6m) cable (K870)

Regulator w/ Flow Gauge - 3100211

PROCESS LIMITATIONS

The Aspect® 230 DC is not recommended for pipe thawing or for arc gouging.

EQUIPMENT LIMITATIONS

The Aspect® 230 DC is protected from overloading beyond the rated duty cycle and outputs of the machine. The duty cycle is based upon a 10 minute time period; a 30% duty cycle refers to 3 minutes of welding and 7 minutes of idling. If the duty cycle is significantly exceeded, the thermostatic protection will shut off the output until the machine cools to a normal operating temperature.

TECHNICAL SPECIFICATIONS ASPECT® 230 DC (K4346-1)

POWER SOURCE INPUT VOLTAGE AND CURRENT	
Max Input Amperes 120V/208V/230V/400V/460V	3-Phase NA/19/17/10/9 1-Phase 31/33/31/18/16
Input Voltage ± 10%	120[4]V Single Phase 208-460V Single or 3 Phase (includes 220, 380, 400)
Idle Power	100 Watts Max.
Power Factor @ Rated Output	.95

RECOMMENDED FUSE SIZES 1		
INPUT VOLTAGE / PHASE / FREQUENCY	**MAXIMUM INPUT AMPERE RATING**	**TIME DELAY FUSE OR BREAKER[2] AMPERAGE**
120[4]/1/50/60	31 A	30
208/1/50/60	33 A	50
230/1/50/60	31 A	50
400/1/50/60	18 A	30
460/1/50/60	16 A	30
208/3/50/60	19 A	30
230/3/50/60	17 A	20
380-415/3/50/60	10 A	20
460/3/50/60	9 A	20

RATED OUTPUT			
Input Power		**Duty Cycle**	**Rated Output Current and Voltage**
PHASE	**Voltage Frequency**		
120V Single Phase	120/50/60	100%	GTAW 110 A / 14.4 V SMAW 70 A / 22.8 V
		60%	GTAW 125 A / 15 V SMAW 85 A / 23.4 V
		35%	GTAW 150 A / 16 V SMAW 100 A / 24 V
Single or Three Phase	208-460/50/60	100%	GTAW 160 A / 16.4 V SMAW 120 A / 24.8 V
		60%	GTAW 190 A / 17.6 V SMAW 140 A / 25.6 V
		35%	GTAW 230 A / 19.2 V SMAW 180 A / 27.2 V

PHYSICAL DIMENSIONS			
HEIGHT	**WIDTH**	**DEPTH**	**WEIGHT**
16.5 in. 419 mm	9.7 in. 246 mm	19.9 in. 506 mm	46.5 lbs. (21kg.)

TEMPERATURE RANGES
OPERATING TEMPERATURE RANGE -10°C to +40°C (-4°F to +104°F)
STORAGE TEMPERATURE RANGE -20°C to +85°C (-40°F to +185°F)

IP23

OUTPUT RANGE			
Phase	**Type of Output**	**Output Current Range**	**Maximum Open Circuit Voltage[3]**
120V Single Phase	GTAW DC SMAW DC	2-150 Amps 5-100 Amps	105 Volts Max. 91 Volts Max.
208-460 VAC Single or Three Phase	GTAW DC SMAW DC	2-230 5-180	105 Volts Max. 91 Volts Max.

Thermal tests have been performed at ambient temperature. The duty cycle (duty factor) at 40°C has been determined by simulation.

1. Based on U.S. National electrical Code
2. Also called " inverse time" or "thermal / magnetic" circuit breakers; circuit breakers that have a delay in tripping action that decreases as the magnitude of the current increases
3. In some countries, U_0 is also known as open circuit voltage OCV (see CAN/CSA-W117.2)
4. The rated output is available when connected to a 30A branch circuit. When connected to a 15A branch cicuit the ratings are 75A for STICK at a 10% duty cycle and 105A for TIG at a 10% duty cycle. When connected to a 20A branch circuit the ratings are 90A for STICK at a 10% duty cycle and 120A for TIG at a 10% duty cycle.

INSTALLATION

SAFETY PRECAUTIONS

Read entire installation section before starting installation.

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this installation.**
- **Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**
- **Always connect the ASPECT® 230 DC grounding screw (behind the terminal block located near the back of the right case side) to a good electrical earth ground.**
- **Always connect the ASPECT® 230 DC to a power supply grounded in accordance with the National Electrical Code and all local codes.**

SELECT SUITABLE LOCATION

Place the welder where clean cooling air can freely circulate in through the rear vents and out through the front vents. Dirt, dust or any foreign material that can be drawn into the welder should be kept at a minimum. Failure to observe these precautions can result in excessive operating temperatures and nuisance trips.

GRINDING

Do not direct grinding particles towards the welder. An abundance of conductive material can cause maintenance problems.

STACKING

The Aspect® 230 DC cannot be stacked .

UNDERCARRIAGE LIFTING AND MOVING

When the Aspect® 230 DC is purchased as a welding package, or used with any of the available Undercarriage optional accessories, proper installation makes the Aspect® 230 DC handles nonfunctional. Do not attempt to lift the power source with an undercarriage attached. The undercarriage is designed for hand moving only; mechanized movement can lead to personal injury and/or damage to the Aspect® 230 DC.

TILTING

Each machine must be placed on a secure, level surface, either directly or on a recommended cart. The machine may topple over if this precaution is not followed.

ENCLOSURE RATING

Aspect® 230 DC power sources carry an IP23 Enclosure rating. They are rated for use in damp, dirty rain-sheltered environments.

MACHINE GROUNDING AND HIGH FREQUENCY INTERFERENCE PROTECTION

Locate the Aspect® 230 DC away from radio controlled machinery. The normal operation of the Aspect® 230 DC may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

The frame of the welder must be grounded. A ground screw marked with the symbol ⏚ is located on the rear panel for this purpose. See your local and national electrical codes for proper grounding methods.

The high frequency generator, being similar to a radio transmitter, can be blamed for many radio, TV and electronic equipment interference problems. These problems may be the result of radiated interference. Proper grounding methods can reduce or eliminate radiated interference.

Radiated interference can develop in the following four ways:

- Direct interference radiated from the welder.
- Direct interference radiated from the welding leads.
- Direct interference radiated from feedback into the power lines.
- Interference from re-radiation of "pickup" by ungrounded metallic objects.

Keeping these contributing factors in mind, installing the equipment per the following instructions should minimize problems:

1. Keep the welder power supply lines as short as possible. Input leads within 50 feet (15.2 m) of the welder should be enclosed in rigid metallic conduit or equivalent shielding. There must be good electrical contact between this conduit and the welder. Both ends of the conduit must be connected to a driven ground and the entire length must be continuous.
2. Keep the work and electrode leads as short as possible and as close together as possible. Lengths should not exceed 25 feet (7.6 m).
3. Be sure the torch and work cable rubber coverings are free of cuts and cracks that allow high frequency leakage. Cables with high natural rubber content, such as Lincoln Stable-Arc®, better resist high frequency leakage than neoprene and other synthetic rubber insulated cables.
4. Keep the torch in good repair and all connections tight to reduce high frequency leakage.
5. The work piece must be connected to an earth ground close to the work clamp, using one of the following methods:
   - A metal underground water pipe in direct contact with the earth for ten feet or more.
   - A 3/4" (19 mm) galvanized pipe or a 5/8" (16 mm) solid galvanized iron, steel or copper rod driven at least eight feet into the ground.

The ground should be securely made and the grounding cable should be as short as possible using cable of the same size as the work cable, or larger. Grounding to the building frame electrical conduit or a long pipe system can result in re-radiation, effectively making these members radiating antennas. (This is not recommended).

6. Keep all access panels and covers securely in place.
7. All electrical conductors within 50 feet (15.2 m) of the welder should be enclosed in grounded rigid metallic conduit or

equivalent shielding. Flexible helically-wrapped metallic conduit is generally not suitable.

8. When the welder is enclosed in a metal building, several good earth driven electrical grounds (as in 5 above) around the periphery of the building are recommended.

Failure to observe these recommended installation procedures can cause radio or TV interference problems and result in unsatisfactory welding performance resulting from lost high frequency power.

INPUT CONNECTION

⚠ WARNING

Only a qualified electrician should connect the input leads to the ASPECT® 230 DC. Connections should be made in accordance with all local and national electrical codes and the connection diagrams. Failure to do so may result in bodily injury or death.

A 10 ft. (2m) power cord is provided and wired into the machine.

For Single Phase Input

Connect green lead to ground per National Electrical Code.

Connect black and white leads to power.

Wrap end of red lead with electrical tape to provide 600V insulation.

For Three Phase Input

Connect green lead to ground per National Electric Code.

Connect black, red and white leads to power.

⚠ WARNING

This Class A equipment is not intended for use in residential locations where the electrical power is provided by the public low-voltage supply system. There may be potential difficulties in ensuring electro-magnetic compatability in those locations, due to conducted as well as radiated disturbances.

INPUT FUSE AND SUPPLY WIRE CONSIDERATIONS

Refer to Specification Section for recommended fuse, wire sizes and type of the copper wires. Fuse the input circuit with the recommended super lag fuse or delay type breakers (also called "inverse time" or "thermal/magnetic" circuit breakers). Choose input and grounding wire size according to local or national electrical codes. Using input wire sizes, fuses or circuit breakers smaller than recommended may result in "nuisance" shut-offs from welder inrush currents, even if the machine is not being used at high currents.

INPUT VOLTAGE SELECTION

The Aspect® 230 DC automatically adjusts to work with the input voltages listed on the rating plate. No reconnect switch settings are required.

⚠ WARNING

The ASPECT® 230 DC ON/OFF switch is not intended as a service disconnect for this equipment. Only a qualified electrician should connect the input leads to the ASPECT® 230 DC. Connections should be made in accordance with all local and national electrical codes and the connection diagram located on the inside of the right case side. Failure to do so may result in bodily injury or death.

POWER CORD REPLACEMENT

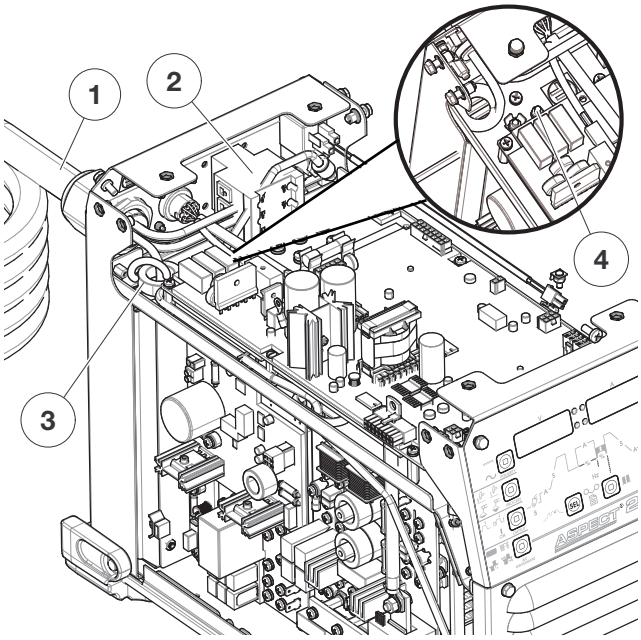
⚠ WARNING

Only a qualified electrician should connect the input leads to the ASPECT® 230 DC. Connections should be made in accordance with all local and national electrical codes and the connection diagrams. Failure to do so may result in bodily injury or death.

If the **input power cord** is damaged or needs to be replaced, an input power **switch** is located in the back of the machine with the case wraparound removed as shown in Figure A.1.

ALWAYS CONNECT THE **GROUNDING LUG** (LOCATED AS SHOWN IN FIGURE A.1) TO A PROPER SAFETY (EARTH) GROUND.

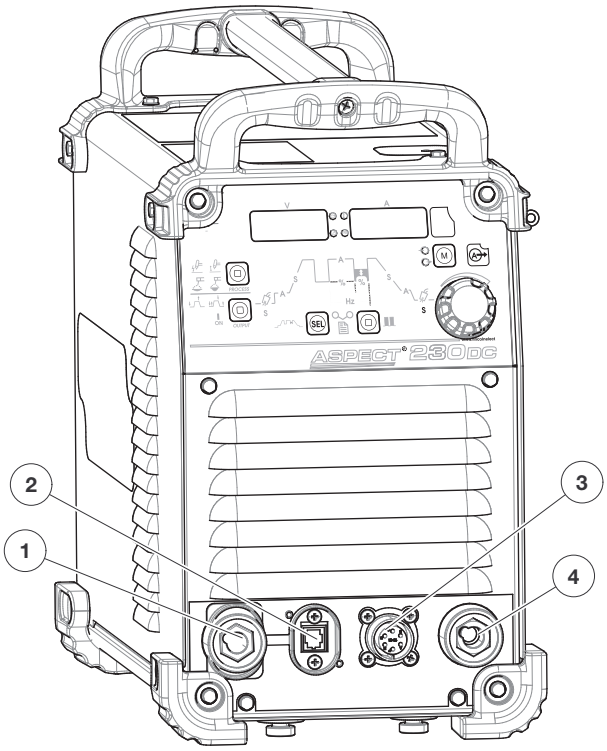
FIGURE A.1



1. **Input Power Cord**
2. **Terminal Block**
3. **Toroidal Core**
4. **Ground Lug**

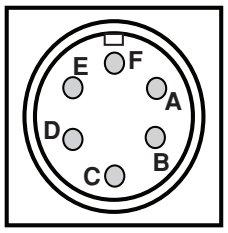
OUTPUT CONNECTIONS

FIGURE A.2



1. **Twist-Mate Electrode / Gas Output Connector**
2. **15VDC Supply for wireless foot pedal**
3. **6-Pin Remote Control Connector**
4. **Twist-Mate Work Connector**

The Aspect® 230 DC is equipped with Twist-Mate style front output connector. To connect cables, turn the power switch ”OFF.” Connect the torch Twist-mate plug into the electrode gas output receptacle on the front of the machine and turn clockwise until tight. This quick connect terminal also provides the shielding gas connection to the torch.

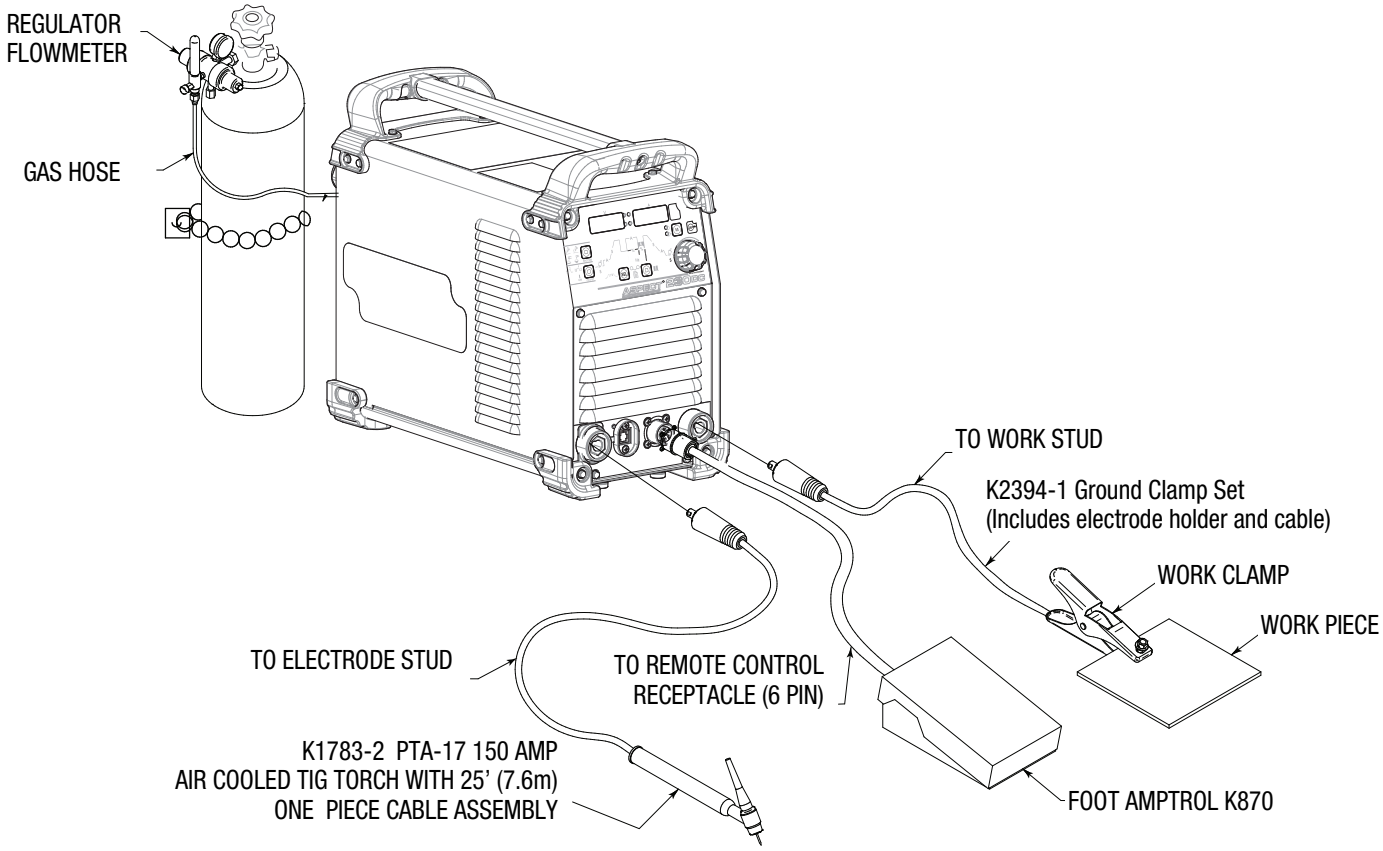


6-PIN REMOTE CONTROL CONNECTOR

Function	Pin	Wiring
6-PIN REMOTE CONTROL CONNECTOR FOR REMOTE OR HAND/FOOT AMPTROL.	A	REMOTE POTENTIOMETER, 10K
	B	REMOTE POTENTIOMETER, WIPER
	C	REMOTE POTENTIOMETER, COMMON
	D	TRIGGER, COMMON
	E	TRIGGER, INPUT
	F	GROUND

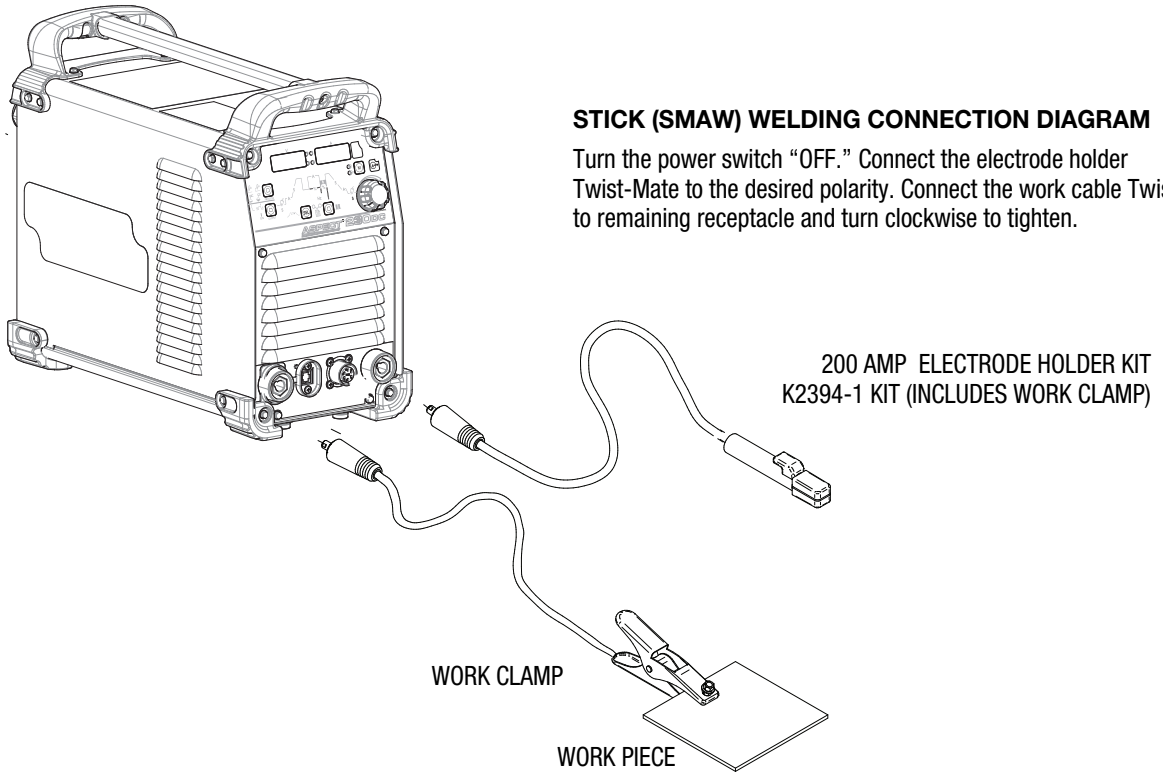
AIR COOLED TIG TORCH WITH WIRED FOOT PEDAL CONNECTION DIAGRAM

Refer to the following connection diagrams for specific information on connecting water cooled and air cooled torches.



STICK (SMAW) WELDING CONNECTION DIAGRAM

Turn the power switch "OFF." Connect the electrode holder Twist-Mate to the desired polarity. Connect the work cable Twist-mate to remaining receptacle and turn clockwise to tighten.

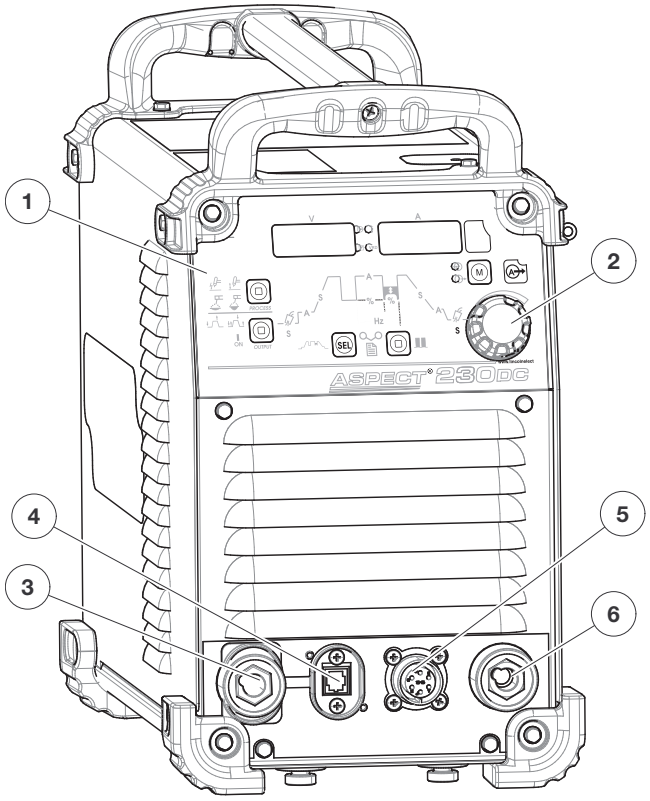


OPERATION

CASE FRONT CONTROLS

(See figure B.1)

FIGURE B.1

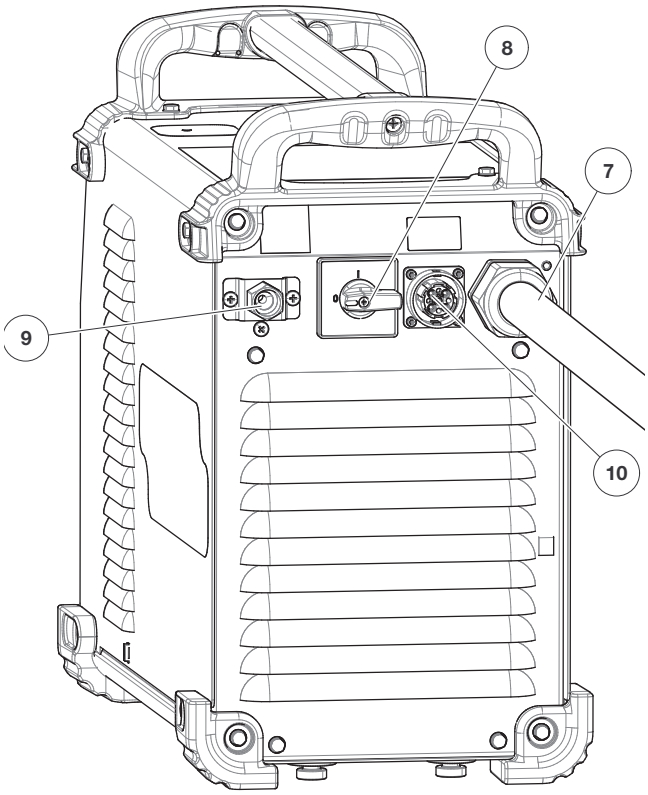


1. **User Interface** – For selecting process and parameters
2. **Control Knob –** Used to control machine output setting and to navigate through user interface menus
3. **Electrode Connector** - Connect tig torch or electrode holder
4. **15vdc Supply** - For wireless foot pedal
5. **6-Pin Remote Receptacle** – For connecting a foot amptrol or other remote control
6. **Work Connector** – For connecting the work lead

CASE BACK CONTROLS

(See figure B.2)

FIGURE B.2



7. **Input Power Cord**
8. **Power Switch -** Controls power to the machine
9. **Gas Solenoid Input**
10. **9-Pin Water Cooler Connection** - connect to a Cool Arc 22

GRAPHIC SYMBOLS THAT APPEAR ON THIS MACHINE OR IN THIS MANUAL


SAVE

ON


OFF


HIGH TEMPERATURE


CIRCUIT BREAKER

THREE PHASE

3 PHASE INVERTER


INPUT POWER


RECALL

SINGLE PHASE


MENUS


GAS CONNECTION

U_0 OPEN CIRCUIT VOLTAGE

EXIT MENU


PULSE


SEQUENCER

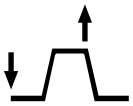

GTAW

U_1 INPUT VOLTAGE

U_2 OUTPUT VOLTAGE

INPUT POWER


WORK LEAD

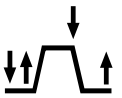

2 STEP


SMAW

I_1 INPUT CURRENT

I_2 OUTPUT CURRENT


GAS FLOW


4 STEP


PROTECTIVE GROUND

U_p PEAK VOLTAGE

Hz FREQUENCY


HIGH FREQUENCY TIG


FOOT AMPTROL

U_S SWITCHED RATED NO LOAD VOLTAGE


COOLER CONNECTION


TOUCH START TIG®


SEE OPERATOR'S MANUAL


WARNING OR CAUTION

% PERCENT


SMAW


REMOTE

VRD VOLTAGE REDUCTION DEVICE

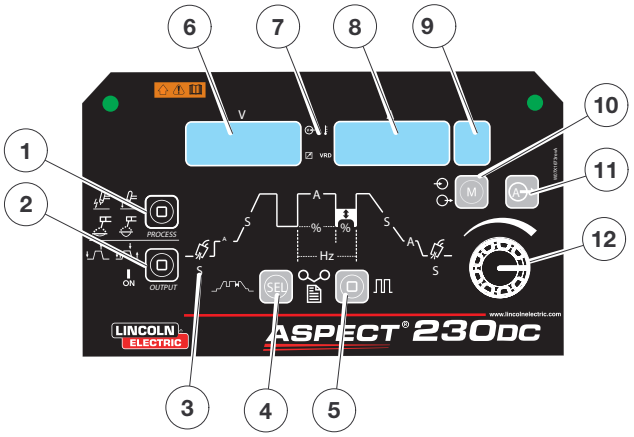

EXPLOSION


DANGEROUS VOLTAGE


SHOCK HAZARD

USER INTERFACE CONTROLS

FIGURE B.3



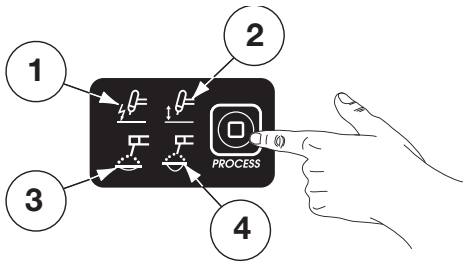
1. **Process Select** – Choose between High-Frequency TIG, Touch Start TIG®, Soft Stick (7018 electrodes), or Crisp Stick (6010 electrodes).
2. **Output Control** – Choose 2-Step, 4-Step, or Output On.
3. **Sequencer** – Allows control of options such as preflow, starting current, slope, etc.
4. **Sequencer Control** – Push to cycle through the sequencer settings.
5. **Pulse Sequencer** – Can set percent peak current, pulses-per-second, and percent background current.
6. **Voltage Display** – Displays the output voltage while welding.
7. **Status Lights** – Power on, thermal fault, remote, and VRD enable lights.
8. **Amperage Display** – Displays the current amperage setting.
9. **Memory Display** – Shows which of the 9 memory modes is currently selected.
10. **Memory Selection** – Ability to save up to 9 welding procedures and quickly recall them.
11. **Exit Menu Button** – A quick method to return to amperage adjustment from anywhere in the menus.
12. **Control Knob** – Used to set output current and to adjust settings.

Process

This switch allows the user to set the desired process. (See Figure B.4)

1. High-Frequency TIG
2. Touch Start TIG®
3. Stick – Soft Mode (7018 style electrodes)
4. Stick- Crisp Mode (6010 Style electrodes)

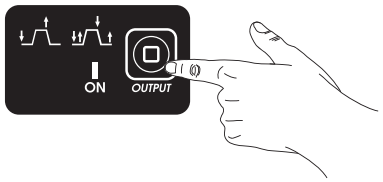
FIGURE B.4



Output Control

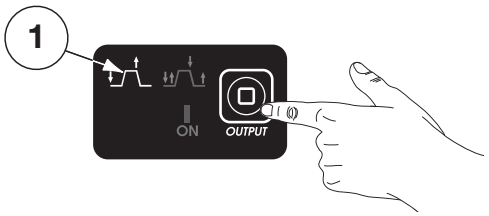
This switch allows the operator to set the desired output control method (See Figure B.5). To control the output with 2-step or 4-step, either a remote trigger (arc start switch) or remote trigger with amperage control (foot or hand amptrol) may be used.

FIGURE B.5



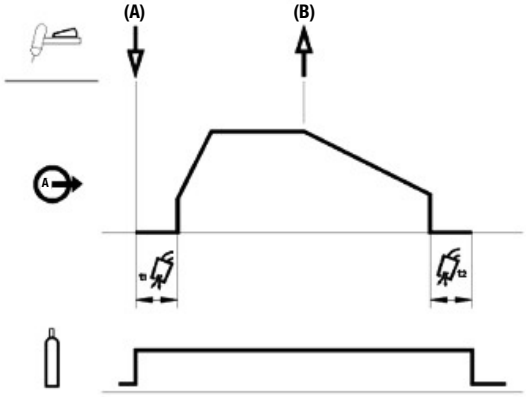
1. 2-Step (See Figure B.6 and B.7) – With 2-step trigger and a TIG welding mode selected, the following weld sequence will occur. If a standard foot amptrol is connected, it will take control of most sequencer functions, but pre-flow, starting current, finishing current, and post-flow can be defined. With an arc start switch, all sequencer functions must be defined by the user.

FIGURE B.6



A. Press and hold the torch trigger to start the sequence. The machine will open the gas valve to start the flow of shielding gas according to the set pre-flow time. After the pre-flow, the output of the machine is turned ON. The arc is started according to the selected weld mode and the specified starting current. After starting, the output current will be increased at a rate dependent on the specified initial slope time, until the operating amperage is reached.

FIGURE B.7



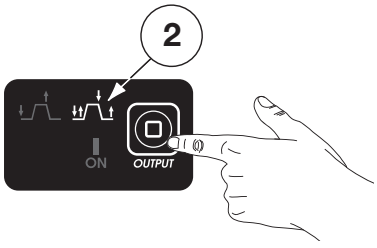
B. Release the TIG torch trigger to stop welding. The machine will decrease the output current at a rate determined by the specified final slope time, until the finishing current is reached and then the output of the machine is turned OFF.

After the arc is turned OFF, the shielding gas will continue to flow to protect the electrode and weld as specified by the post flow time.

This 2-Step sequence is the factory default setting.

2. **4-Step** (See Figure B.8) – With 4-step trigger mode and a TIG welding mode selected, the following weld sequence will occur. In 4-step, all sequencer functions should be set. If a standard foot amptrol is connected, only its trigger input is functional and the remote output control will be disabled

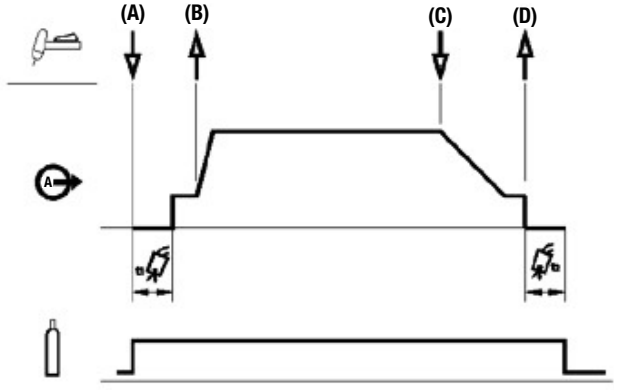
FIGURE B.8



4-Step Functionality

(See Figure B.9)

FIGURE B.9



A. Press and hold the TIG torch trigger to start the sequence. The machine will open the gas valve to start the flow of shielding gas according to the set pre-flow time. After the pre-flow, the output of the machine is turned ON. The arc is started according to the selected weld mode and the specified starting current. The starting current will be held until the torch trigger is released.

B. Releasing the trigger starts the initial slope function. The output current will be increased at a rate dependent on the specified initial slope time, until the operating amperage is reached.

If the torch trigger is pushed during the upslope time, the arc will immediately shut off and output will be switched OFF.

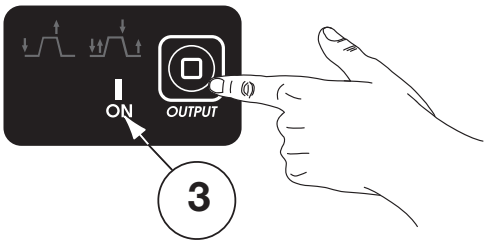
C. When the main weld is complete, push and hold the torch trigger to start the final down slope. The machine will decrease the output current at a rate determined by the specified final slope time, until the finishing current is reached.

D. The finished current will be maintained for as long as the torch trigger is held. Upon releasing the torch trigger, output will be switched OFF and the post flow time will start.

3. Output On-This function is designed to be used when TIG welding without the use of an arc-start controller. If "ON" is selected, the machine's output terminals are fully energized. Operator touches tungsten initiating the starting process. Once the tungsten is lifted from the work piece the amperage will proceed to welding amperage. Output "ON" is always illuminated when STICK welding.

(See Figure B.10)

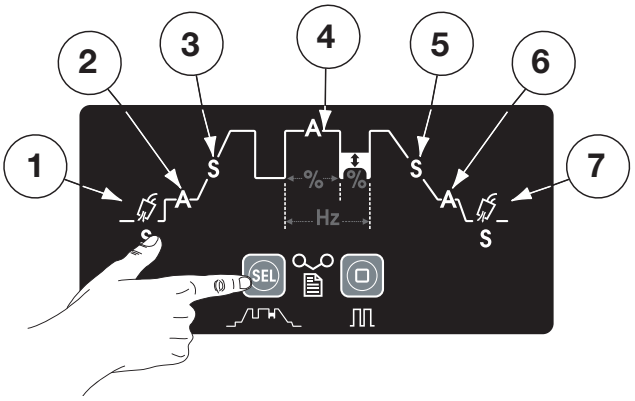
FIGURE B.10



SEQUENCER FUNCTIONS

The sequencer allows for customization of the TIG welding operation. Pressing the "SEL" button will cycle through the process graph (See figures B.11 and B.12).

FIGURE B.11



1. Pre-Flow: Sets the time in seconds that shielding gas will flow prior to arc-start initiation. Default = 0.5 sec (0-25 sec)

2. Starting Current: Sets the starting amperage for the process.

3. Initial Slope: Sets the time in seconds it takes the starting current to reach normal operating amperage. Only functions in 4-Step operation. (0-5 sec)

4. Operating Amperage: Sets max amperage for both 2-Step and 4-Step TIG welding applications.

5. Final Slope: Sets the time in seconds it takes the operating amperage to ramp down to the Finishing current. Only functions in 4-Step. (0 - 25 sec)

6. Finishing Current: Sets the finishing amperage for the process.

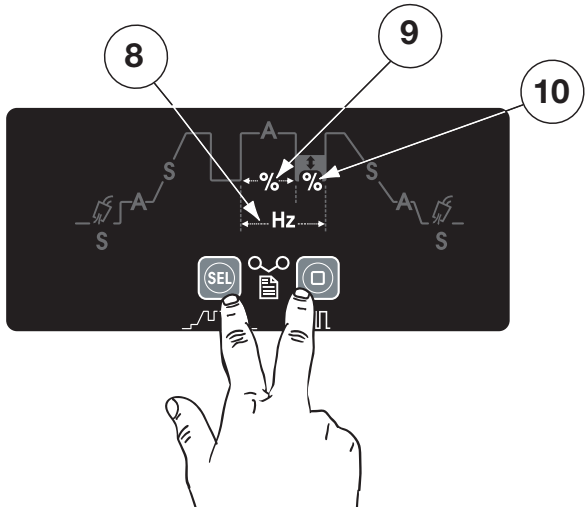
7. Post Flow: Sets the time in seconds shielding gas will flow after the arc is terminated. Default = AUTO

Range = (.1 - 60 sec)

PULSE SEQUENCER FUNCTIONS

To access the pulse menu, select the Pulse Sequencer button once and then cycle through the Sequencer with the SEL button.

FIGURE B.12



8. Pulses-Per-Second: Sets the total number of pulse cycles per second of time. (.1 - 2000 Hz)

9. Percent Peak Current: This functions sets the amount of time the pulse waveform spends at the peak current setting. This function is set as a percentage of the total time for the pulse cycle. (5 - 95%)

10. Background Current: Sets the background amperage of the pulse waveform. Background amperage is set as a percentage of the peak current.

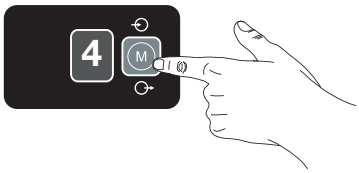
(10 - 90%)

MEMORY SELECTION:

The memory function allows the operator to save up to 9 specific welding procedures. This memory switch has two functions:

1. Save memory settings
2. Recall memory settings.

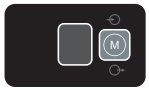
FIGURE B.13



Selecting Memory Functions

Pressing the memory button will allow the user to toggle between "saving" a memory, "recalling" a memory or operating without using a memory setting as seen in Figure B.14.

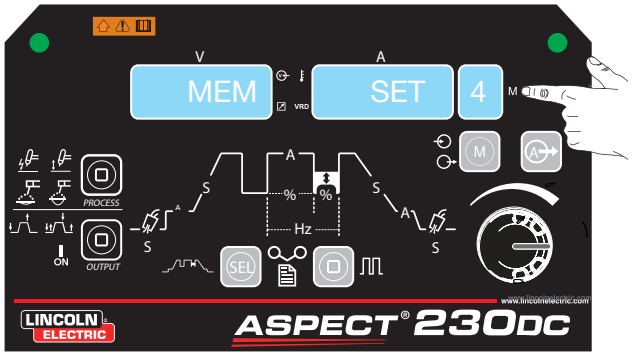
FIGURE B.14



Saving Memory Settings

In order to save process settings into a memory location it is first necessary to press the memory button so that the "memory save" icon is illuminated. Once illuminated, the number on the screen will flash to indicate this number can be changed by turning the control knob, and the voltage and amperage meters will say "MEM SET." Once the desired memory location has been selected using the control knob, pressing and holding the memory button for 3 seconds will save the settings in that location. During the 3 second hold period the "memory save" icon will flash. After 3 seconds the displayed settings will be saved to memory.

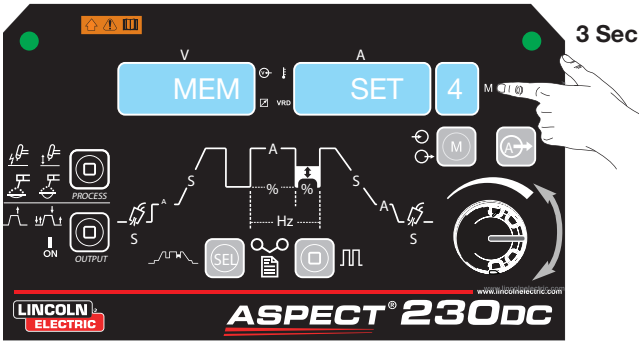
FIGURE B.15 MEMORY SET



Summary:

1. Press Memory button and display will indicate "Mem Set" icon
2. Turn Control Knob to select memory location
3. Press and hold memory button for 3 seconds to save

FIGURE B.16 SAVING

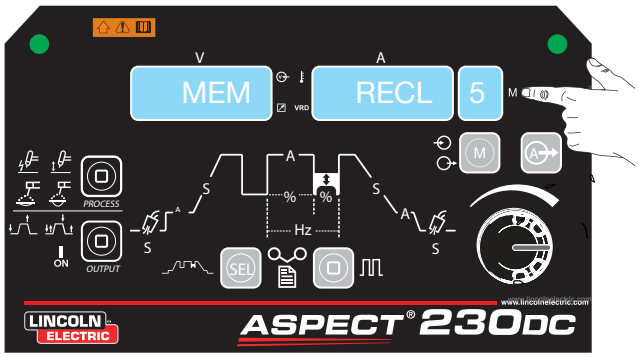


Memory Recall Settings

(See Figure B.17)

In order to recall process settings it is first necessary to press the memory button twice so that the “memory recall” is illuminated. Once the desired memory location has been selected using the control knob, pressing and holding the memory button for 3 seconds will recall the settings from that location. During the 3 second hold period the “memory recall” icon will flash. After 3 seconds the recalled settings will be displayed.

FIGURE B.17

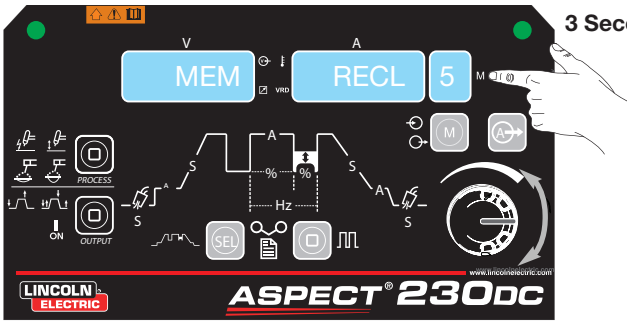


Summary:

(See Figure B.18)

1. Press Memory button to highlight “Memory Recall” icon
2. Turn Control Knob to select memory location
3. Press and hold memory button for 3 seconds

FIGURE B.18



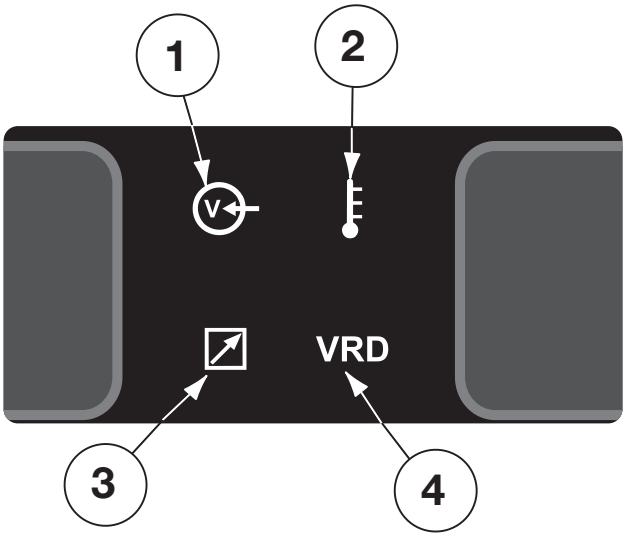
Status Lights:

(See Figure B.19)

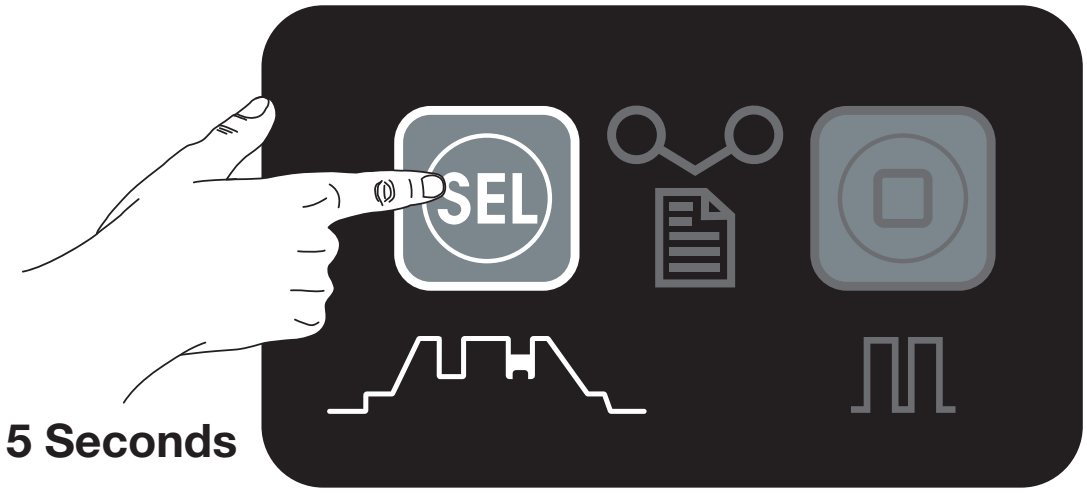
There are 4 status lights located between the voltage and amperage displays. These LEDs illuminate to display the following:

1. **Power on** – This light indicates that power has been applied to the machine and it is ready to weld. A blinking light indicates that the start up sequence is in process. When the light turns fully ON, the machine is ready to weld.
2. **Thermal Fault** – The thermal light will turn on if the machine has overheated. Welding may continue after the machine has cooled and the light switches off.
3. **Remote** – When a remote output control is connected to the 6 pin connector on the front of the machine, this LED will turn on.
4. **VRD** – When operating in VRD Mode (Voltage Reduction Device) this LED will light up when the output voltage is below 12 Volts. VRD may be turned ON / OFF in Setup Menu “SYS.”

FIGURE B.19



Hold Select button for 5 seconds to enter Menu “GTAW.”

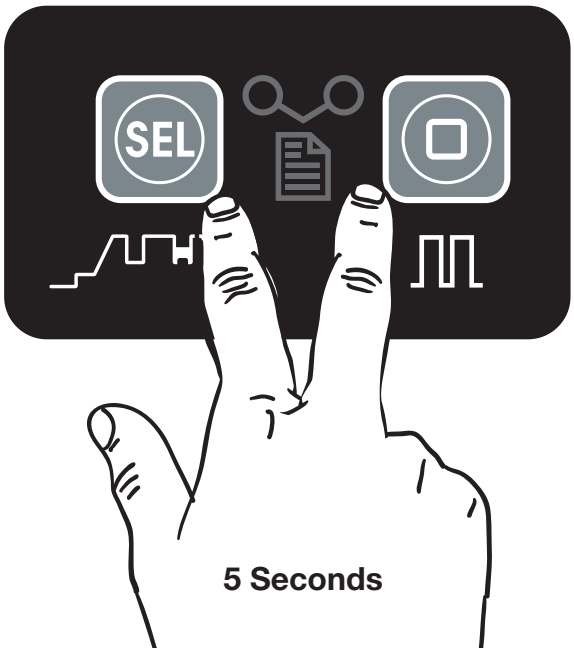


Setup Menu "GTAW" Press SEL to cycle through & rotate knob to change then SEL to save ‘A” to exit			TIG Settings
Display	**Item**	**Choices**	**Description**
2RST	Advanced Trigger	ON	Switch ON to enable 2 Step trigger with restart. See Appendix for more information.
		OFF	
4RST		ON	Switch ON to enable 4 Step trigger with restart. See Appendix for more information.
		OFF	
BILV		ON	Switch ON to enable Bi-level trigger. See Appendix for more information.
		OFF	
SPOT	Spot Timer	OFF - 100 s	Specify your spot weld time. Default = OFF.

Hold Pulse button for 5 seconds to enter Menu “SMAW.”

Setup Menu "SMAW"		Stick Settings	
Display	**Item**	**Choices**	**Description**
FRCE	Arc Force	0-75 for soft stick 75-200 for crisp stick	Specify your Arc Force setting
HSTR	Hot Start	0-75 for soft stick 50-200 for crisp stick	Specify your Hot Start setting

Hold both Select and Pulse buttons for 5 seconds to enter Menu “SYS.”



Then press ‘SEL’ to cycle through. To change, rotate knob then press ‘SEL’ to save “A’ to exit

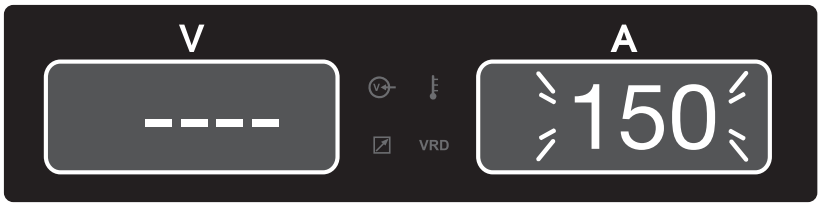
Setup Menu “SYS”		System Settings	
Display	Item	Choices	Description
VRD	Voltage Reduction Device	ON	Turn ON to enable VRD and limit machine OCV to 12 Volts
		OFF	
LED	LED Brightness	LOW	Adjusts the intensity of the display LEDs
		MED	
		HIGH	
COOL	Cooler Control	AUTO	On AUTO, the cooler turns on and off as needed. ON forces it to run continuously.
		ON	
CTRL	Control Board Software Version	-	Displays current control board software version
UI	User Interface Board Software Version	-	Displays current UI board software version
IC	Input Control Board Revision	-	Displays Input Control Board Revision
ERR	Error Messages	-	Displays error messages (See Troubleshooting Section)
HR	Arc Time	-	Displays total welding hours
CNT	Arc Counter	-	Displays total number of arc strikes amperage, memory & SYS menu
RSET	Reset to Default	YES/NO	Resets to factory default.
GRN	Green Mode	YES/NO	Allows the user to enable or disable the green mode
LOCK	Display Lockout	YES/NO	With lockout activated, all settings are frozen except amperage control, system menu and memory.

Appendix

A.1 Volt and Amp meter display while welding and idle.

While welding, the machine will show actual voltage and amperage on the meters. When the welding arc is extinguished, the meters will display (and flash) the final voltage and amperage of that weld for 5 seconds.

Figure B.25



A.2 Green Mode
(Show the V and A displays with GRN MODE)

Green mode is a feature that puts the machine in a standby condition after 10 minutes of inactivity.

- Output is Disabled.
- Fans Change to a Low Speed.
- LEDs Switch Off – Only the Power ON LED Remains Lit.
- A hash line will illuminate across the display.

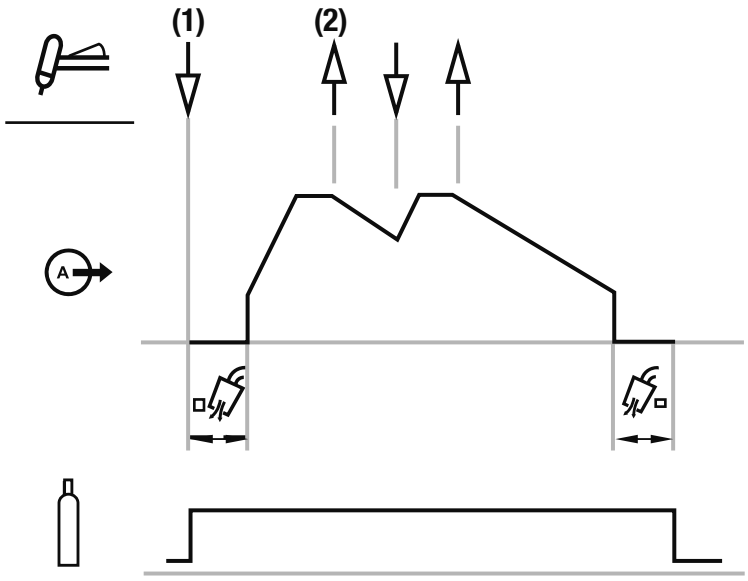
This feature will reduce the amount of dust and dirt that is drawn into the machine and will lower the machines power consumption.

To exit Green Mode, simply press the TIG remote trigger or any button on the front of the machine.

NOTE: If a Cool Arc® machine is connected to the Aspect® 230 DC, entering Green Mode will stop the coolant flow. To resume coolant flow, Green Mode must first be exited.

A.3 2-Step Trigger with Restart Sequence

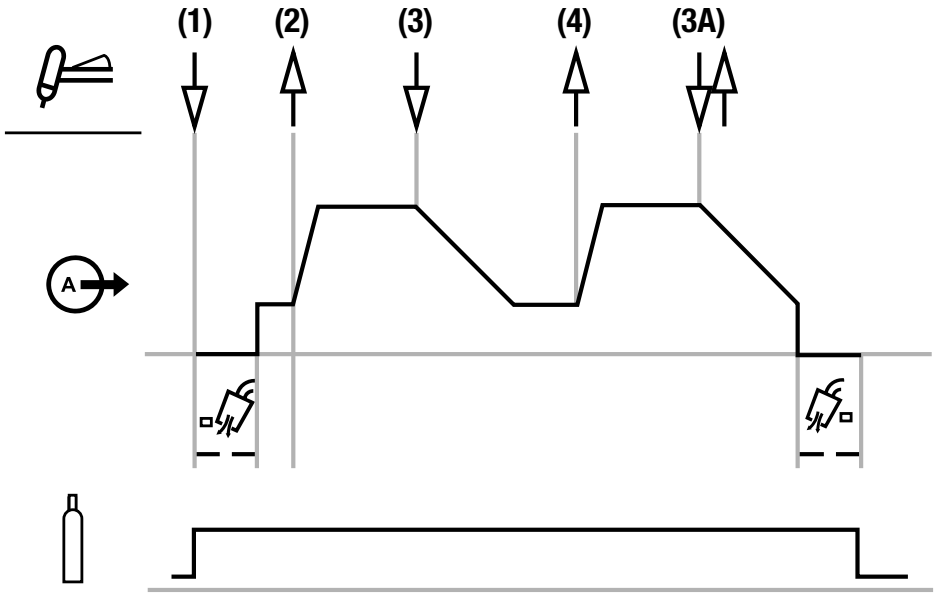
2-Step trigger with restart can be enabled in setup menu “GTAW” by switching 2RST to ON. If 2RST is ON, a TIG mode is selected, and 2-step is selected on the output section of the machine, the following sequence will occur.



This sequence is the same as 2-step, except when the switch is pressed while in final slope the welding current will ramp up again and resume. This process can be repeated as many times as necessary. When finished welding, simply release the trigger and allow the finishing current to end and the output to switch OFF followed by the post flow time.

A.4 4-Step Trigger with Restart Sequence

4-Step trigger with restart can be enabled in setup menu “GTAW” by switching 4RST to ON. If 4RST is ON, a TIG mode is selected, and 4-step is selected on the output section of the machine, the following sequence will occur.



This sequence is the same as 4-step, except when the switch is released during the finishing current, welding current will ramp up again to the operating amperage. This process can be repeated as many times as necessary. When welding is finished, quickly press and release the trigger to start the final slope, which will be followed by the finishing current at which point output is switched OFF, and the post flow will initiate.

A.5 Bi-Level Trigger Sequence

Bi-Level Trigger Sequence Bi-level trigger can be enabled in setup menu “GTAW” by switching BILV to ON. If BILV is ON, a TIG mode is selected, and 4-step is selected on the output section of the machine, the bi-level sequence will be followed. Bi-level follows the same sequence as 4-step but allows switching between operating amperage and a background current, A2. With Bi-level enabled, press the SEL button until the left display shows A2. Turning the control knob will allow the A2 level to be set as a percent of the operating current.

While welding at the set operating current, quickly press and release the trigger to switch to the A2 background current level. Quickly pressing and releasing the trigger again will switch the output back to the set operating current. Each time this trigger action is repeated the current level will switch between the two levels. When the main weld is complete, press and hold the trigger to start the final slope and finishing current. Release the switch to switch the output OFF and begin the post flow time.

GENERAL OPTIONS / ACCESSORIES

Field Installed

K870 - Foot Amptrol™ for TIG welding. The Foot Amptrol energizes the output and controls the output remotely. The Foot Amptrol™ connects directly to the 6- pin remote control connector.

K963-3 - Hand Amptrol™ for TIG welding. The Hand Amptrol™ energizes the output and controls the output remotely. The Hand Amptrol™ connects directly to the 6-pin remote control connector.

K814 - Arc Start Switch - Energizes the output for TIG welding if remote output control of the amperage is not desired. It allows on/off TIG welding at the amperage set by the Current Control on the control panel.

K3475-1 - Cool-Arc® 22 Water Cooler- Attaches underneath the Aspect® 230 DC and electrically connects to the Aspect® 230 DC. This smart cooler runs only when needed and shuts off welding if coolant flow is interrupted.

K4441-1 TIG Inverter Cart- Holds the Aspect® 230 DC, the Cool Arc® 22 and all accessories. Features low lift bottle loader and drawer for convenient storage.

K918-1 Zippered cable cover, 12.5 ft. (3.8 m)- to protect torch cables in high abrasion applications.

K918-4 Zippered cable cover, 25.0 ft. (7.6 m)- to protect torch cables in high abrasion applications.

Regulator with Flow Gauge and Hose Kit (3100211)

K2266-1 – TIG-Mate™ 17 Air Cooled TIG Torch Starter Pack. One complete easy-to-order kit packaged in its own portable carrying case. Includes: PTA-17 torch, parts kit, Harris flowmeter/regulator, 10 ft. gas hose, Twist-Mate™ adapter, work clamp and cable.

Magnum® TIG Torches – The following standard Magnum® TIG torches may be used with the Aspect® 230 DC.

- K1782-1 PTA-17 12.5 ft.(3.8m) Air-Cooled 150A
- K1782-3 PTA-17 25 ft.(7.6m) Air-Cooled 150A
- K1782-14 PTA-17 12.5 ft.3.8m) Air-Cooled 150A Ready Pak
- K1783-1 PTA-26 12.5 ft.(3.8m) Air-Cooled 200A
- K1783-3 PTA-26 25 ft.(7.6m) Air-Cooled 200A

Water cooled torches (The Cool Arc 22 is required)

- K1784-3 PTW-20 Water-Cooled 12.5 ft.(3.8m) 250A
- K1784-4 PTW-20 Water-Cooled 25 ft.(7.6m) 250A

K1622-5 Twist-Mate™ Adapter - Adapter needed for K4168-2 and K1784-3 and K1784-4 torches

NOTE: Each torch requires a Twist-Mate™ Adapter, collets, collet bodies, and nozzles and are not included and must be ordered separately.

KP2414-1 Gas Lens parts kit for PTA-9 and PTW-20 series torches.

KP508- Magnum® parts kit for PTA-17 series torches.

KP509- Magnum® parts kit for PTW-18 and PTA-26 series torches.

KP510- Magnum® parts kit for PTX-20, 20H-320-25R series torches.

K1803-3 - Work Lead Clamp with Twist-Mate™ plug, 15ft.(4.6m).

KP4159-1 Low Conductivity Coolant (1 Gal.)

K1622-3 Twist Mate Adapter for PTA-26 TIG Torch

K1622-1 Twist Mate Adapter for PTA-17 TIG Torch

MAINTENANCE

Safety Precautions

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Only qualified personnel should perform this maintenance.**
- **Turn the input power OFF at the disconnect switch or fuse box before working on this equipment.**
- **Do not touch electrically hot parts.**

⚠ WARNING

To avoid receiving a high frequency shock, keep the TIG torch and cables in good condition.

ROUTINE AND PERIODIC MAINTENANCE

Very little routine maintenance is necessary to keep your Aspect® 230 DC running in top condition. No specific schedule can be set for performing the following items; factors such as hours of usage and machine environment should be considered when establishing a maintenance schedule.

- Periodically blow out dust and dirt which may accumulate within the welder using an air stream.
- Inspect welder output and control cables for fraying, cuts, and bare spots.
- The fan motor has sealed ball bearings which require no maintenance.

OVERLOAD PROTECTION

FAN-AS-NEEDED (F.A.N.)

The Aspect® 230 DC has the F.A.N. circuit feature, which means the cooling fan will operate only as needed to assure proper machine cooling. This helps reduce the amount of dust and dirt drawn into the machine with the cooling air. The cooling fan will operate at lower speeds when the machine power is initially turned on or at idle, and continuously while the yellow Thermal Shutdown Light is lit (see Thermostatic Protection).

THERMOSTATIC PROTECTION

This welder has thermostatic protection from excessive duty cycles, overloads, loss of cooling, and excessive ambient temperatures. When the welder is subjected to an overload, or inadequate cooling, the primary coil thermostat and/or secondary coil thermostat will open. This condition will be indicated by the illumination of the yellow Thermal Shutdown Light on the front panel (see Item 2 in Figure B.19 Operation Section). The fan will continue to run to cool the power source. Postflow occurs when TIG welding is shut down, but no welding is possible until the machine is allowed to cool and the yellow Thermal Shutdown Light goes out.

NO ARC PROTECTION

The machine outputs (Background / OCV, gas and HF) will be shutdown, if the trigger is closed without welding for 15 seconds to protect the Background resistor from overheating with F.A.N. cooling off, as well as to conserve on gas waste.

FUSE PROTECTION

The cooler is protected by a 3-amp fast-acting fuse, located inside of the welding machine on top of the P.C. board. The fuse is identified as FS1. Ensure power is “off” and the machine is disconnected from power when measuring or replacing the fuse. The fuse is 600V 3-amp fast acting.

TABLE OF CONTENTS

FUNCTIONAL DESCRIPTION

The Aspect® 230 DC is an inverter based arc welding power source optimized for DC TIG (GTAW) and DC Stick (SMAW) Welding. It features auto-connect technology that allows the user to power up the machine with a variety of input voltages without the need for any reconnections by the user. The Aspect® 230 DC includes features such as Amplitude Control, High Frequency and Touch Start TIG®, 9 memory settings, Full sequencer including pulse controls, 2-step and 4-step output, Full digital controls, and cooling fans.

There are six main sections in the Aspect 230 DC machine. They are the following.

- Input Power Board
- User Interface Board
- Buck/Boost Inverter Board
- Main Transformer
- Output Power Board
- High Frequency Board

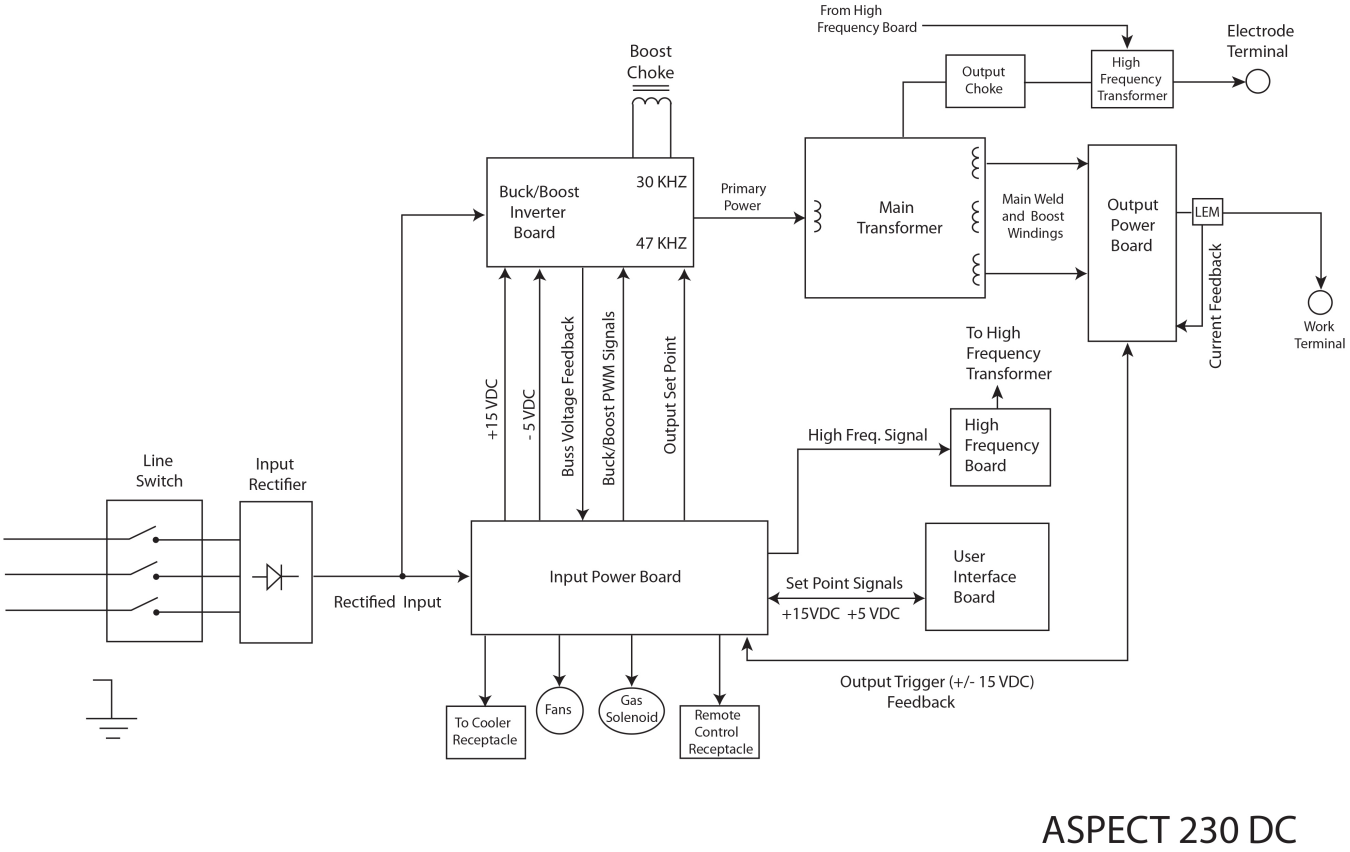


Figure E.1

INPUT SECTION

INPUT LINE SWITCH, RECTIFIER, INPUT POWER BOARD, BUCK/BOOST INVERTER BOARD

The single or three phase voltage is applied to the machine via an input line switch. This AC input voltage is then applied to a rectifier. The resultant DC voltage is applied to both the Input Power Board and the Buck/ Boost Inverter Board.

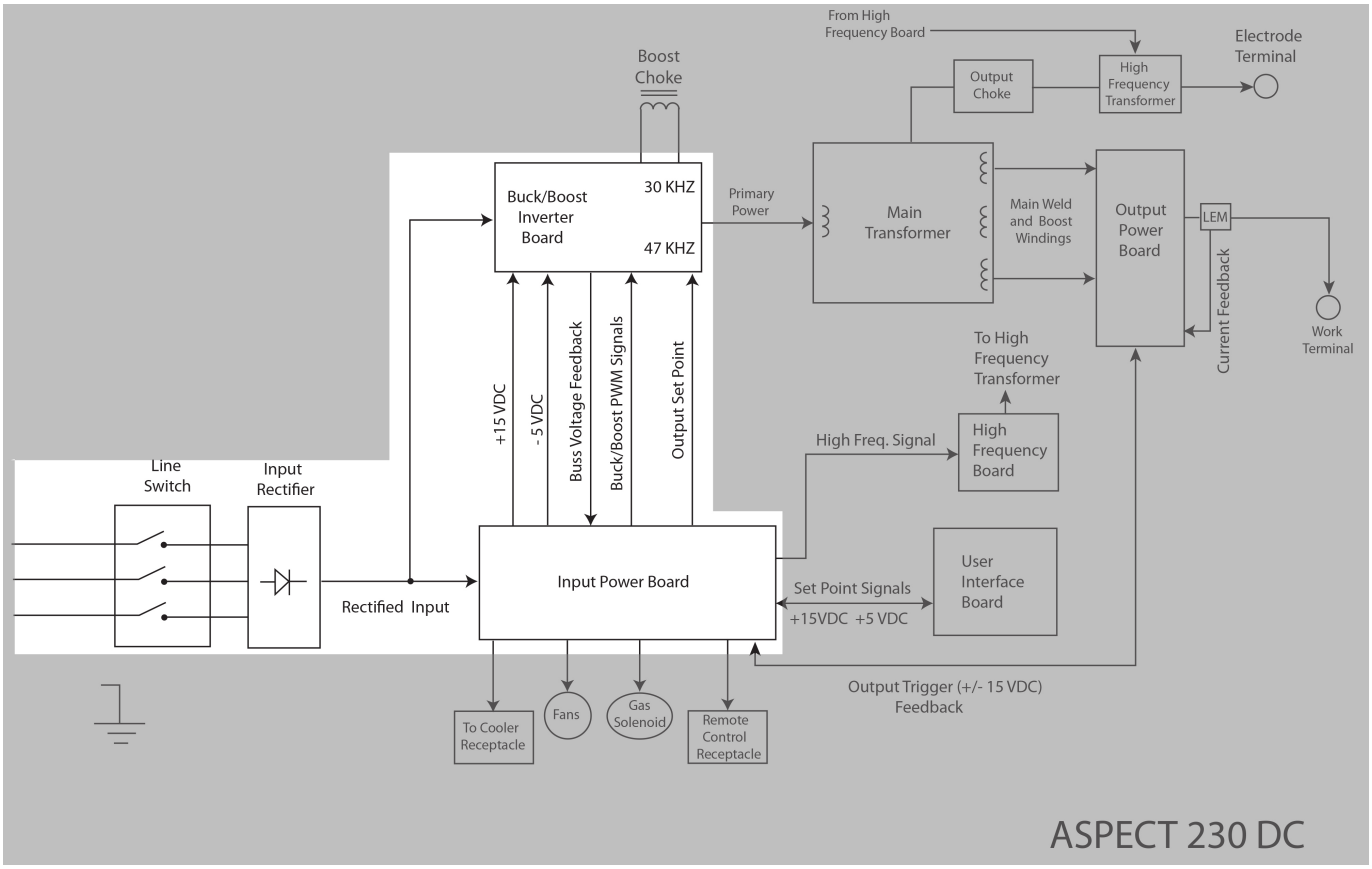


Figure E.2

INPUT POWER BOARD, USER INTERFACE BOARD

The Input Power Board regulates the DC Bus voltage (390VDC) by controlling the firing signals of the Buck/ Boost IGBTs that are located on the Buck/Boost Inverter Board. It develops these Pulse Wave Modulation (PWM) firing signals from the “Set-Point” and waveform information it receives from the User Interface Board. See IGBT Operation and Pulse Width (PWM) Operation in this section. It also creates low voltage DC supplies for the other PC boards. The control software is housed on the Input Power Board. The Input Power Board powers the cooler (400VDC), the cooling fans, the gas solenoid and interfaces with the remote control receptacle. The Input Power Board also supplies power and control signals to the High Frequency Board.

The User Interface Board receives power and display information from the Input Power Board. The User Interface Board also provides user commands and settings to the Input Power Board.

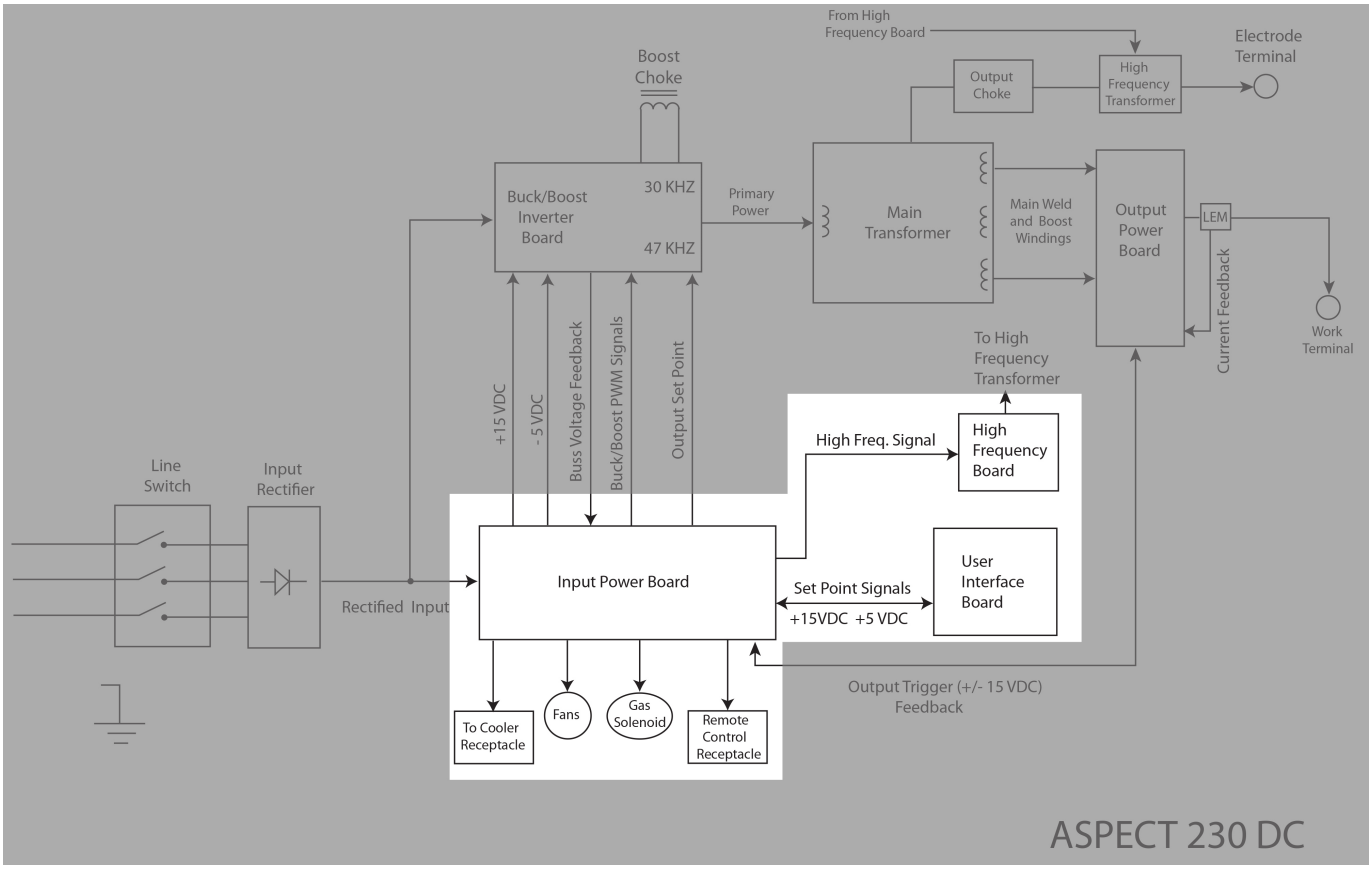


Figure E.3

BUCK/BOOST INVERTER BOARD, MAIN TRANSFORMER

The buck/boost board receives rectified input voltage from the input rectifier bridge. The main purpose of this board is to produce a constant 390 VDC regardless of input voltage. The buck boost circuit consists of a buck converter followed by a boost converter. The boost switch is active when the input voltage is at 230 VAC input or less. Under this condition the Buck switch is held ON the entire time. The buck switch is active when the input voltage is at 325 VAC or more. Under this condition the boost switch is not active for most of the time.

When the Aspect 230 DC machine is triggered (commanded) to produce welding output voltage the switches (IGBTs), located on the Buck/Boost Inverter Board, send 400V Pulse Width Modulated power (PWM) to the primary winding of the Main Transformer. The amount of “ON TIME” and frequency for the IGBTs determines the output power produced by the Aspect 230 DC. See IGBT Operation and Pulse Width (PWM) Operation in this section. There are several secondary windings incorporated within the Main Transformer. There is one main welding winding, and two auxiliary weld windings. The output of the weld windings are connected to the Output Power Board.

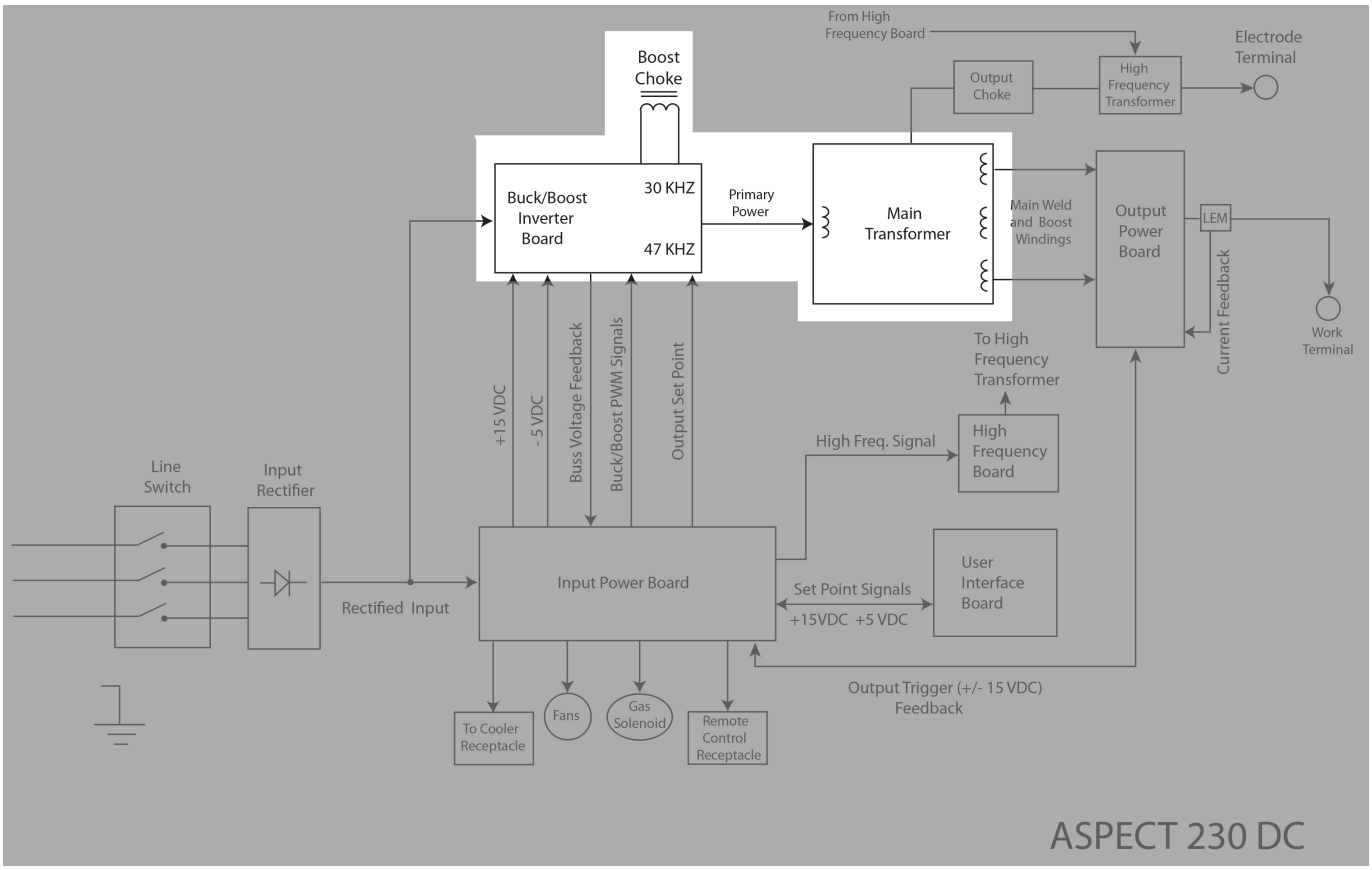


Figure E.4

OUTPUT POWER BOARD

The Output Power Board rectifies the AC voltage from the secondary windings in the Main Transformer and passes it through the Current Transducer (LEM) to the Work Output Terminal. The Output Choke, and High-frequency Transformer, are connected to Output Electrode Terminal.

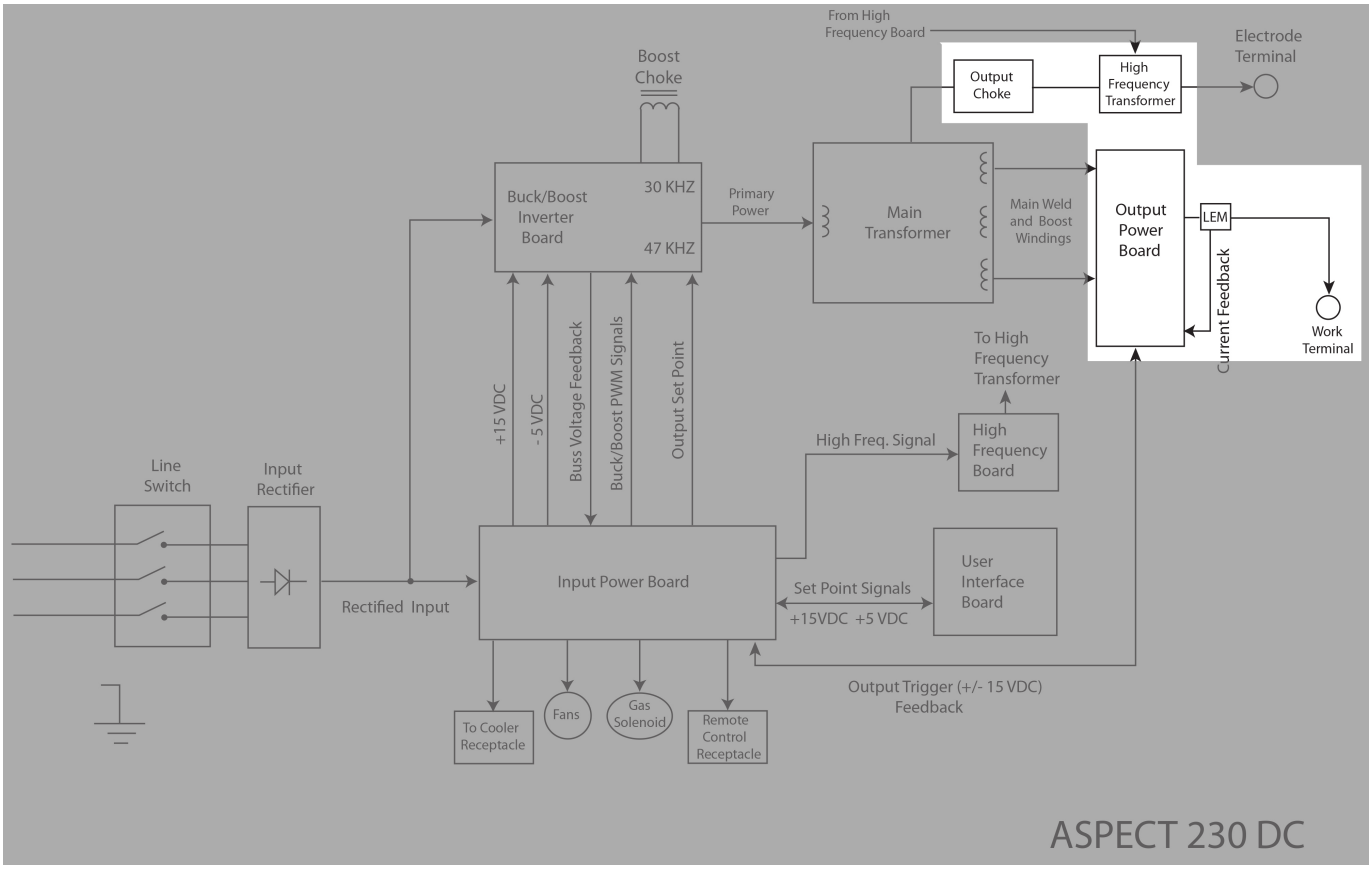


Figure E.5

HIGH FREQUENCY BOARD, HIGH FREQUENCY TRANSFORMER, CURRENT TRANSDUCER (LEM)

When the Input Power Board receives a trigger signal the High Frequency Board Receives 24VDC power and also command signals from the Input Power Board. The high frequencies created on the High Frequency Board are sent to the primary winding of the High Frequency Transformer for three seconds or until the machine senses welding current, whichever time is shorter. If the three seconds time is reached and welding current has not been established the High Frequency will stop and the machine will need to be retriggered. The secondary winding of the High Frequency Transformer is in series with the Output Choke and electrode terminal. Through transformer action the high frequency is impressed upon the welding current.

The Current Transducer monitors the output welding current and sends this feedback information to the Output Board. The Output Board then sends the feedback information to the Input Power Board.

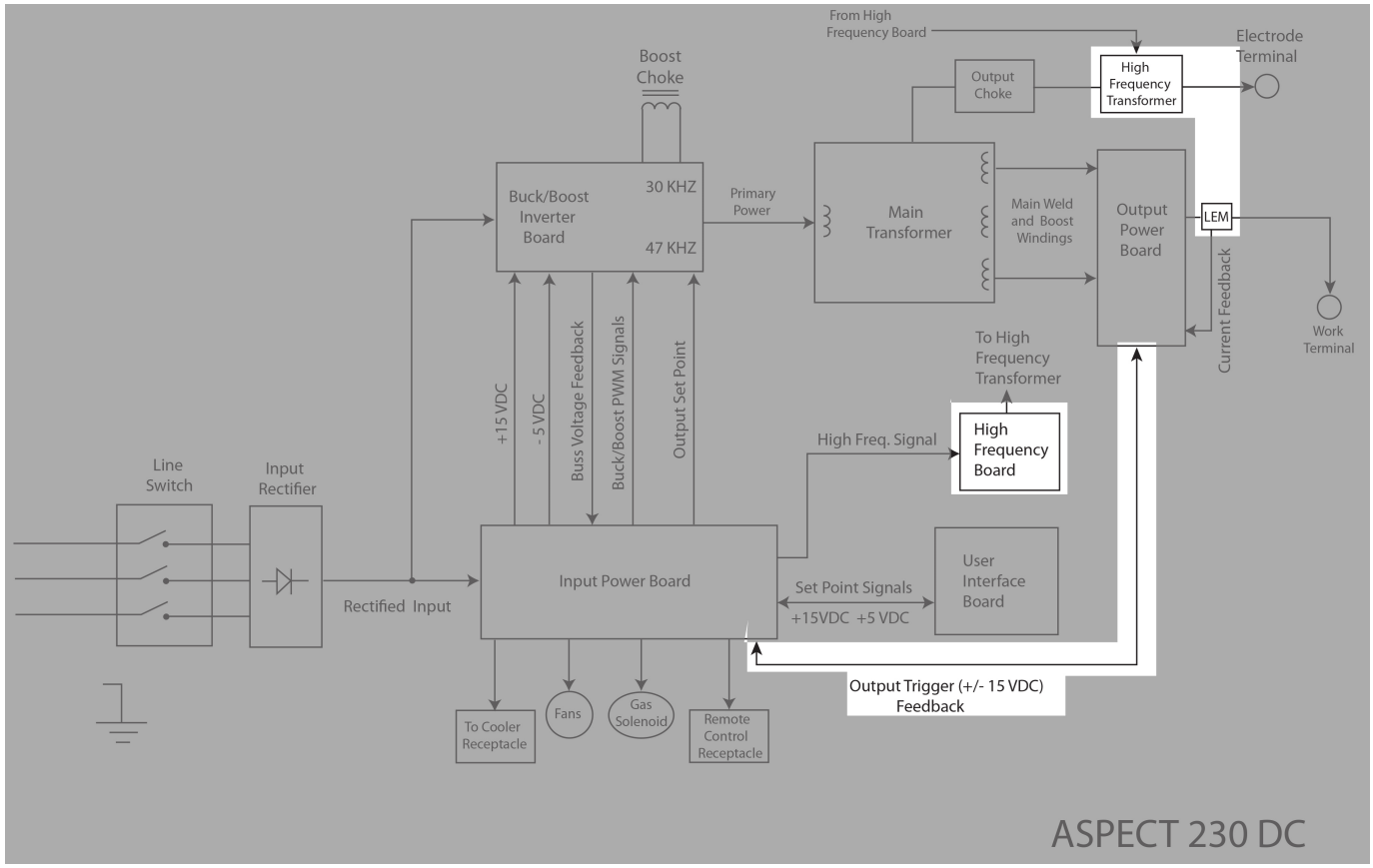


Figure E.6

MACHINE PROTECTION

THERMOSTATIC PROTECTION

This welder has thermostatic protection from excessive duty cycles, overloads, loss of cooling, and excessive ambient temperatures. When the welder is subjected to an overload, or inadequate cooling, the primary coil thermostat and/or secondary coil thermostat will open. This condition will be indicated by displaying "HIGH TEMP". The fans will continue to run to cool the power source. Postflow occurs when TIG welding is shut down, but no welding is possible until the machine is allowed to cool.

COOLING

The fans in the Aspect® 230 DC will run continuously but at different speeds dependent on loads and temperatures. This helps reduce the amount of dust and dirt drawn into the machine with the cooling air. The cooling fans will operate at lower speeds when the machine power is initially turned on or at idle.

NO ARC PROTECTION

The machine outputs (Background / OCV, gas and HF) will be shutdown, if the trigger is closed without welding for 15 seconds to protect the Background resistor from overheating with fan cooling off, as well as to conserve on shielding gas.

FUSE PROTECTION

The cooler is protected by a 3-amp fast-acting fuse, located inside of the welding machine on top of the P.C. board. The fuse is identified as FS1. Ensure power is “off” and the machine is disconnected from power when measuring or replacing the fuse. The fuse is 600V 3-amp fast acting.

OVER CURRENT PROTECTION

In the case of an over current condition the LEM will signal the Output Power Board to limit welding output.

LED'S AND FAN CONDITIONS UPON INITIAL POWER-UP OF THE ASPECT 230 DC

The fans will run at high speed for about 5 seconds and then go to low speed until machine output is enabled.

PC BOARD LED'S

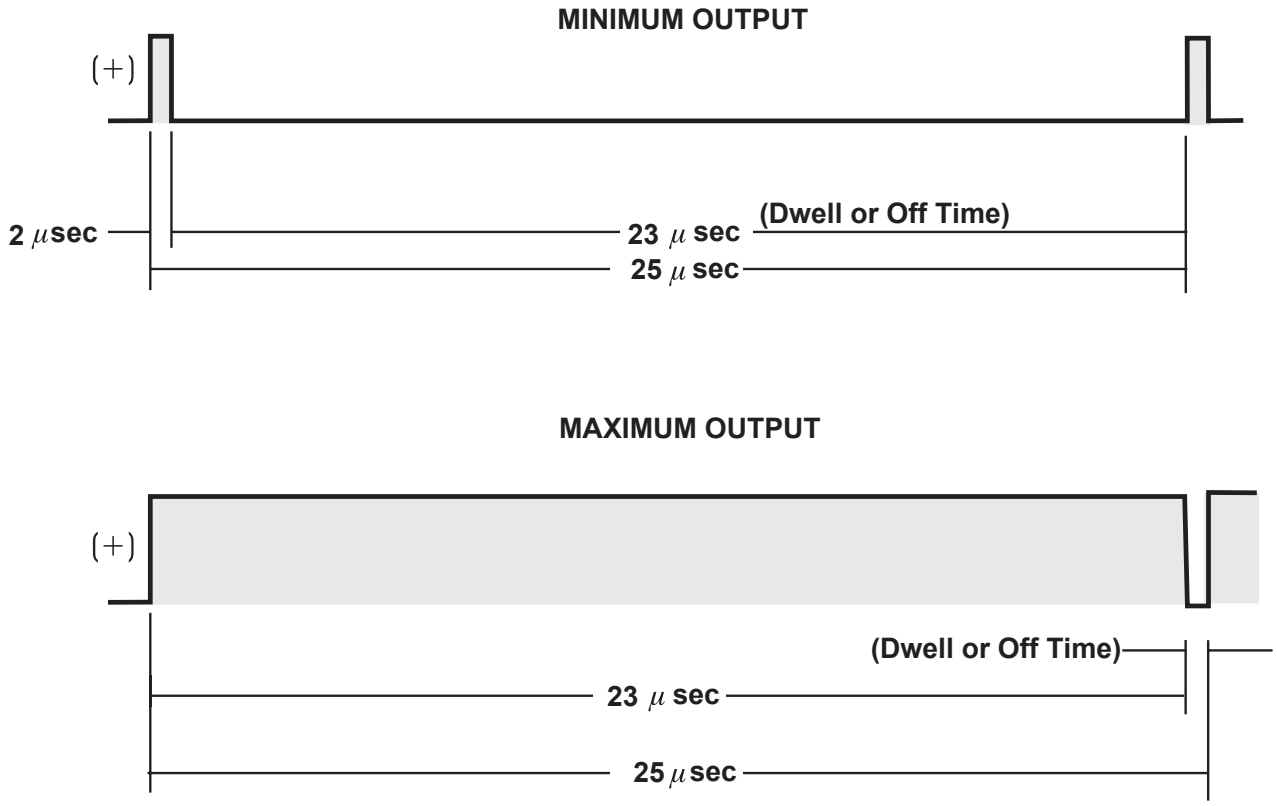
INPUT POWER BOARD LED LEGEND

LED	FUNCTION	COLOR	INDICATION
LED 1	-5VDC source	Green	Normal Status ON
LED 2	-15VDC source	Green	Normal Status ON
LED 3	+5VDC source	Green	Normal Status ON
LED 4	-5VDC source	Green	Normal Status ON
LED 5	-5VDC source	Green	Normal Status ON
LED 6	Input Power Sense	Green	Flashing = in pre-charge Solid Green = Input power good Not Lit = no Input power sensed
LED 7	Input Power Sense	Green	Flashing = in pre-charge Solid Green = Sensed 3 phase Input Not Lit = in input power sensed
LED 8	CPLD Primary Side Microcontroller	Green	Lights after 2-3 second delay
LED 9	+ 3VDC source	Green	Normal Status ON

BUCK - BOOST BOARD LED LEGEND

LED	FUNCTION	COLOR	INDICATION
LED 1	Buck Supply Created	Green	Normal Status ON
LED 2	Boost Driver Active	Green	On only when input voltage is below 380VAC
LED 3	Buck Driver is Active	Green	Normal Status ON
LED 4	High Side Driver Supply Created	Green	Normal Status ON
LED 5	High Side Driver Supply Created	Green	Normal Status ON
LED 5	Low side Driver Supply Created	Green	Normal Status ON

TYPICAL IGBT OUTPUTS



PULSE WIDTH MODULATION

The term PULSE WIDTH MODULATION is used to describe how much time is devoted to conduction in the cycle. Changing the pulse width is known as MODULATION. Pulse Width Modulation (PWM) is the varying of the pulse width over the allowed range of a cycle to affect the output of the machine.

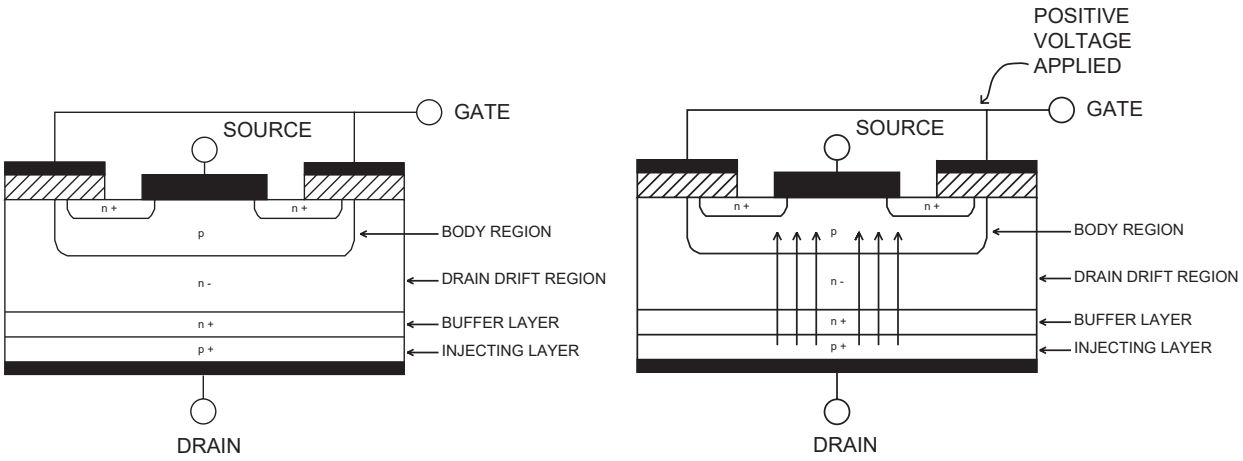
MINIMUM OUTPUT

By controlling the duration of the gate signal, the IGBT is turned on and off for different durations during a cycle. The top drawing shows the minimum output signal possible over a 25-microsecond time period. The positive portion of the signal represents one IGBT group conducting for 2 microsecond. The dwell time (off time) is 23 microseconds. Since only 2 microseconds of the 25-microsecond time period is devoted to conducting, the output power is minimized.

MAXIMUM OUTPUT

By holding the gate signals on for 23 microseconds and allowing only 2 microseconds of dwell time (off time) during the 25-microsecond cycle, the output is maximized. The darkened area under the top curve can be compared to the area under the bottom curve. The more darkened area under the curve, the more power is present.

IGBT OPERATION



INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

An IGBT is a type of transistor. IGBTs are semiconductors well suited for high frequency switching and high current applications.

Drawing A shows an IGBT in a passive mode. There is no gate signal, (zero volts relative to the source) and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction the circuit will not supply current to components connected to the source. The circuit is turned off like a light switch in the OFF position.

Drawing B shows the IGBT in an active mode. When the gate signal, a positive DC voltage relative to the source, is applied to the gate terminal of the IGBT, it is capable of conducting current. A voltage supply connected to the drain terminal will allow the IGBT to conduct and supply current to circuit components coupled to the source. Current will flow through the conducting IGBT to downstream components as long as the positive gate signal is present. This is similar to turning ON a light switch.

TABLE OF CONTENTS

TROUBLESHOOTING

HOW TO USE TROUBLESHOOTING GUIDE

⚠ WARNING

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

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

Step 1. LOCATE PROBLEM (SYMPTOM).

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

Step 2. POSSIBLE CAUSE.

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

Step 3. RECOMMENDED COURSE OF ACTION

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

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

Observe all Safety Guidelines detailed throughout this manual

Error Code	Description	Possible Cause	Course Of Action
01	Input voltage too low	Input voltage is less than 90VAC, or drops below 90VAC under load	Check the input voltage with and without a load applied, check the cable size, and fuse size.
02	Input voltage too high	Input voltage is higher than 500VAC or spikes above 500VAC during load	Check the input voltage with and without a load applied.
03	Incorrect input connection	Input voltage not configured correctly	Turn OFF the machine and check the input connections. If three phase is being applied, ensure the voltage is at least 185VAC
04	Primary side voltage lock out	Indicates that an internal auxiliary voltage fault condition is detected.	Indicates that an overload condition occurred. Turn off the machine, wait one minute and then turn the machine on.
06	Inverter voltage lock out	Indicates that an Internal Voltage fault condition is detected.	Turn off the machine, wait one minute and then turn the machine on.
Conn Err	Connection Error	A communication error between the control and UI board has occurred.	Turn off the machine, wait one minute and then turn the machine on.
10	Fan fault	This error message indicates the fan is not operating properly. This prevents over temperature damage.	Turn off the machine, wait one minute and then turn the machine on.
11	Water Cooler Fault	Insufficient coolant in the cooler, TIG torch is undersized for application, TIG torch is pinched, faulty flow sensor in the cooler.	Check the TIG torch for kinks, check the cooler connections, verify the fluid in the cooler is within the suggested limits, replace damaged torch, replace torch with a higher ampacity torch, toggle flow switch on cooler to remove the error code.
12	Water Cooler Presence Fault	Cooler is not connected to the 9-pin connector,	Water cooler was connected/disconnected during operation. Turn off the machine, connect the cooler, wait one minute and then turn the machine on.

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

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
Major mechanical or electrical damage is evident.	1. Contact your local Lincoln Authorized Field Service Facility	1. Contact the Lincoln Electric Service Department at 1-888-935-3877
The input fuses repeatedly fail or the input circuit breakers keep tripping.	1. Make certain the fuses or breakers are correctly sized for the Aspect 230DC machine. 2. The welding process may be drawing too much input current. 3. Check for error codes. See Status LED Charts.	1. Perform the ***Input Line Switch Test***. 2. Perform the ***Input Power Board Test***. 3. Perform the ***Inverter Board Test***.
The machine will not power up. No lights or displays. The machine appears to be off.	1. Make sure the proper input voltage is being applied to the machine. (check fuses/ breakers) 2. Make sure the input line switch is in the ON position..	1. Perform the ***Input Line Switch Test***. 2. Perform the ***Input Power Board Test***. 3. The User Interface Board May be faulty.
No welding output when output is triggered to be on.	1. If there is an error code see ***Status LED Charts and Error Codes***. 2. Remove all external loads from the output terminals and restart machine.	*1.* Perform the ***Inverter Board Test***. *2.* Perform the ***Transformer Test***. *3.* Perform the ***Output Power Board Test***. *4.* Perform the ***Choke Test***. *5.* Perform the High ***Frequency Transformer Test***. *6.* Perform the ***Remote Amphenol Test***.
Will not produce full welding output.	1. The input voltage may be too low. 2. See Status LED Charts and Error Codes. 3. Make sure all external welding cable connections are tight.	1. Perform the ***Current Transducer Test (LEM)***. 2. Perform the ***Output Power Board Test***. 3. Perform the ***Inverter Board Test***. 4. Perform the ***Input Power Board Test***. 5. The User Interface Board May be faulty.

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

WWW.LINCOLNELECTRIC.COM/LOCATOR

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS (CONTINUED)		
Welding output is higher than the setting.	1. See Status LED Charts and Error Codes.	1. Perform the ***Current Transducer Test (LEM)***. 2. Perform the ***Output Control Board Test***. 3. Perform the ***Output Power Board Test***. 4. The User Interface Board May be faulty.

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

WWW.LINCOLNELECTRIC.COM/LOCATOR

PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS		
The High Frequency does not work correctly.	1. Make sure the process being used requires high frequency. 2. Check the welding gun/ torch and associated wiring.	1. Perform the ***High Frequency Board Test***. 2. Perform the ***High Frequency Transformer Test***. 3. Perform the ***Input Power Board Test***.
No gas flow when output trigger is activated. There is normal welding output voltage.	1. Make sure there is gas available at the input of the gas solenoid. 2. Make sure the gas line is not obstructed. 3. Make sure the welding mode selection is correct.	1. Perform the ***Gas Solenoid Test***. 2. Perform the ***Input Power Board Test***.

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

WWW.LINCOLNELECTRIC.COM/LOCATOR

TEST PROCEDURES

HOW TO USE THE TEST REFERENCE CHART

⚠ WARNING

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

The Test Reference Chart is a nonspecific, operations based troubleshooting aide intended to identify components involved in a particular machine function. The left side of the chart consists of a listing of all major components in the machine. Across the top of the chart the three main machine functions are listed. This chart is provided to help you quickly identify possible faulty components, simply identify the particular function and refer to its specified column for a list of its related components. Simply follow the steps below.

Step 1. IDENTIFY MACHINE FUNCTION

There will be three columns with a "MACHINE FUNCTION" listed at the top. You can choose from "POWER UP", "PRIMARY OUTPUT" or 'AUXILIARY OUTPUT". Choose the column that best describes the symptom that the machine is exhibiting a problem with. Examples are as follows:

- POWER UP - machine wont turn on, blows fuses, no display
- WELDING OUTPUT - no welding output, no wire feed, cannot control output, poor welding characteristics
- AUXILIARY OUTPUT - does not power feeder, no power from 120V receptacle,

Step 2. IDENTIFY RELATED COMPONENTS

If a component is used in a particular "MACHINE FUNCTION" it will be marked in the corresponding column. These components serve a purpose for the identified "MACHINE FUNCTION" and could be related to the symptom identified as a possible faulty component.

RELATED COMPONENT LIST	MACHINE FUNCTION ASPECT® 230 DC		
	POWER UP	WELDING OUTPUT	AUXILIARY OUTPUT
Input Power Board	x		x
Input Rectifier	x		
Inverter Board	x	x	
Output Power Board	x	x	
Current Transducer		x	
UI Board		x	
Gas Solenoid		x	
High Frequency Board		x	
High Frequency Transformer		x	
Transformer		x	
Remote Amphenol			x
Choke		x	

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

Refer to Safety pages for explanation of hazards:

CHOKE TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Choke using Static and Active tests.

MATERIALS NEEDED:
5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:
1. For location of the Choke refer to Figure F.1.

Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Label and disconnect the following connections, refer to Figure F.2.

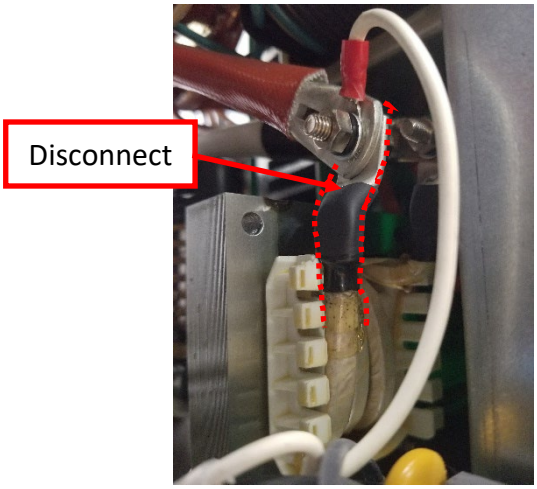


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.3 for test point locations.

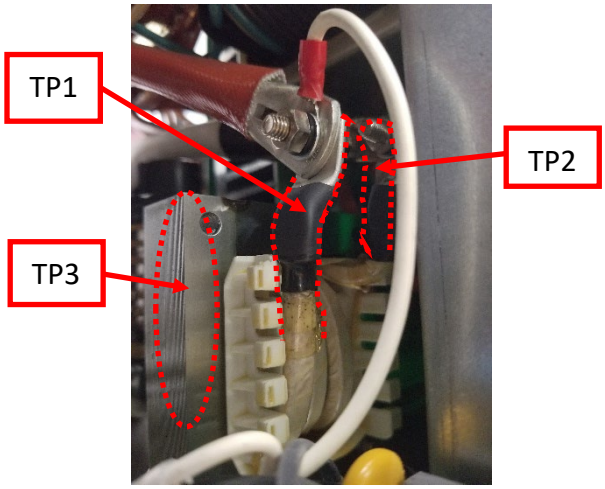


Figure F.3

Choke Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Choke	Machine Off	TP1	TP2	<1Ω
Choke		TP1	TP3	>500KΩ

Table 1

A.5. Any failed measurement indicates a defective component.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

COOLER AMPHENOL TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Cooler Amphenol using Static tests.

MATERIALS NEEDED:
5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:
1. For location of the Cooler Amphenol refer to Figure F.1.

Figure F.1

2. Perform the “Case Cover Removal” as required to gain access to the Cooler Amphenol for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations.

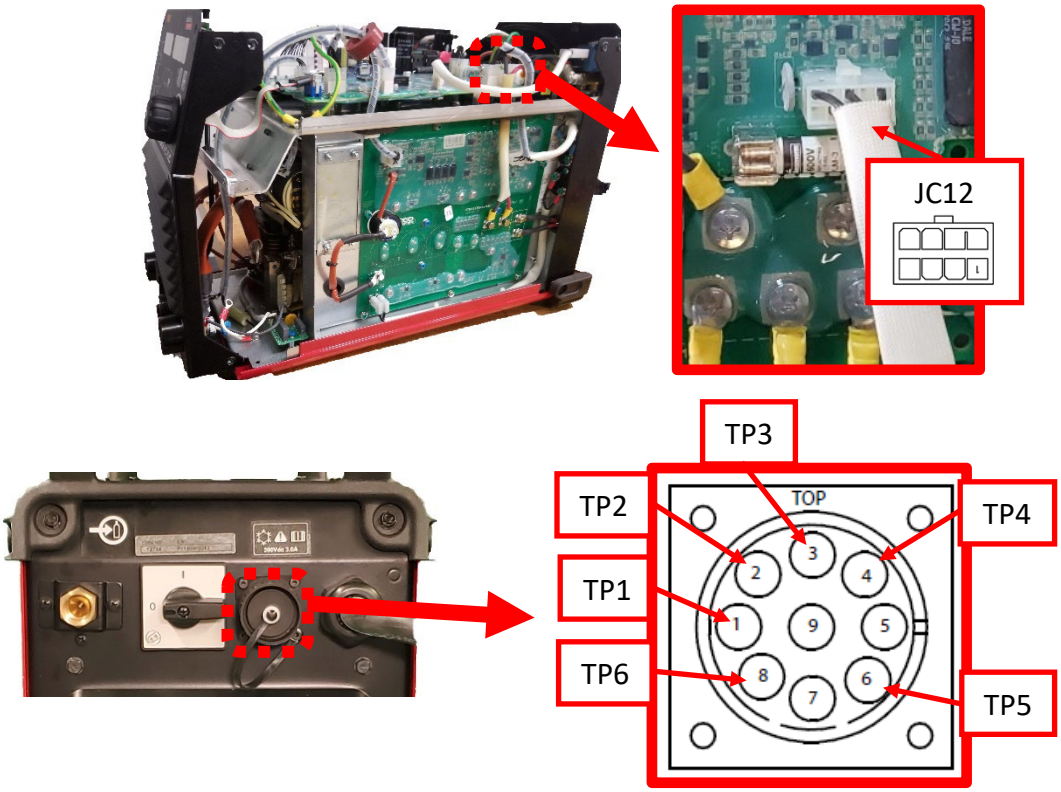


Figure F.2

Cooler Amphenol Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Cooler Common	Machine OFF	TP1	JC12 pin 1	0Ω
Not Connected	Machine OFF	TP2	JC12 pin 3	0Ω
Cooler +15V/1	Machine OFF	TP3	JC12 pin 10	0Ω
Cooler Presence	Machine OFF	TP4	JC12 pin 4	0Ω
Cooler V Bus	Machine OFF	TP5	JC12 pin 6	0Ω
Cooler On - Off	Machine OFF	TP6	JC12 pin 8	0Ω

Table 1

A.3. Any failed measurement indicates a defective component.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

CURRENT TRANSDUCER TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Current Transducer using Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Current Transducer refer to Figure F.1.

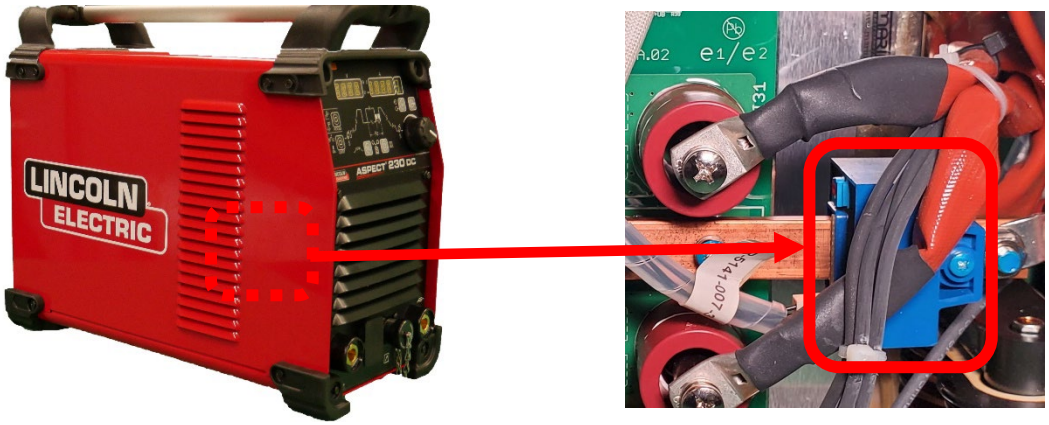


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Active Testing.

A. ACTIVE TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power. Label and remove connectors identified before proceeding. Refer to Figure F.2 for locations.

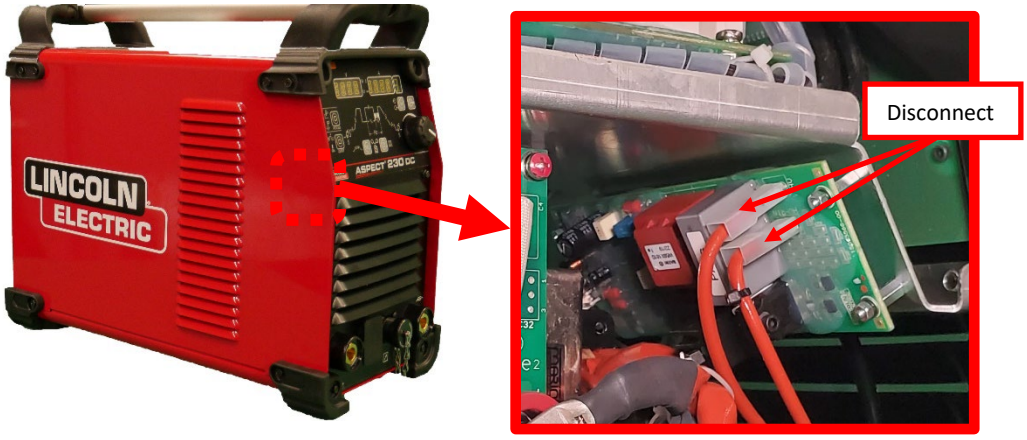


Figure F.2

A.2. Ensure the machine is properly connected external power, connected to a load bank and powered on.

A.3. Perform the measurements in Test Table 1 below, refer to Figure F.3 for test point locations.

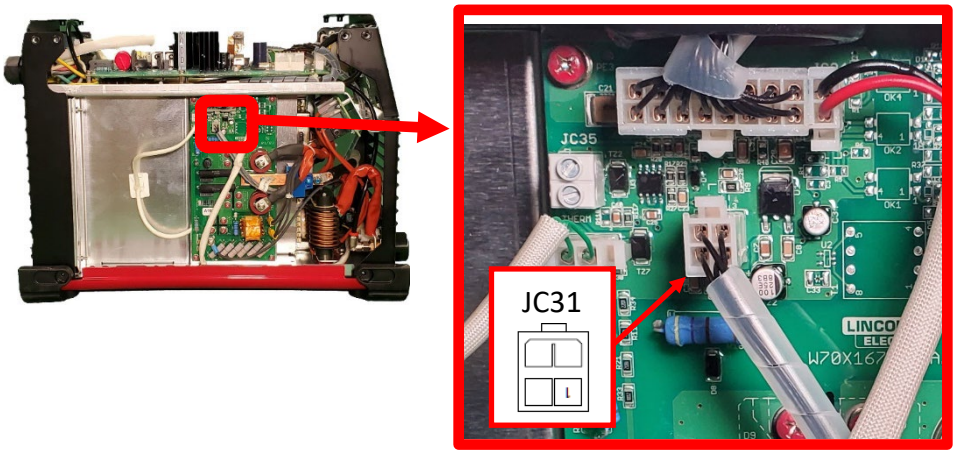


Figure F.3

Current Transducer Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Current Transducer Voltage Input	Machine On	JC31 pin 1	JC31 pin 4	~15VDC
		JC31 pin 2	JC31 pin 4	~-15VDC
Current Transducer Feedback Output	Machine On, Stick Mode, Output loaded to 100A	JC31 pin3	JC31 pin 4	~2VDC

Table 1

A.4. If the input measurements are correct and the output measurements are not correct this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

FAN TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Fan using Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Fan refer to Figure F.1.

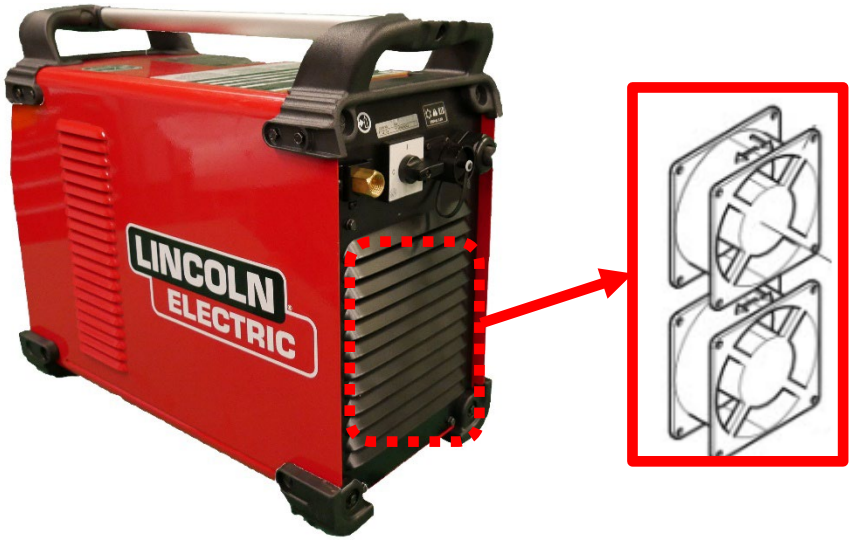


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Active Testing.

A. ACTIVE TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power. Label and remove connectors identified before proceeding. Refer to Figure F.2 for locations.

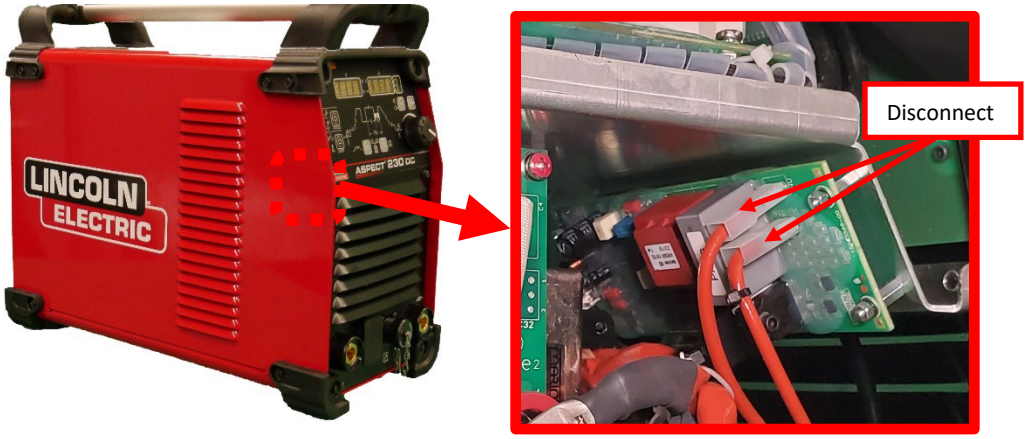


Figure F.2

A.2. Ensure the machine is properly connected external power and powered on.

A.3. Perform the measurements in Test Table 1 below, refer to Figure F.3 for test point locations.

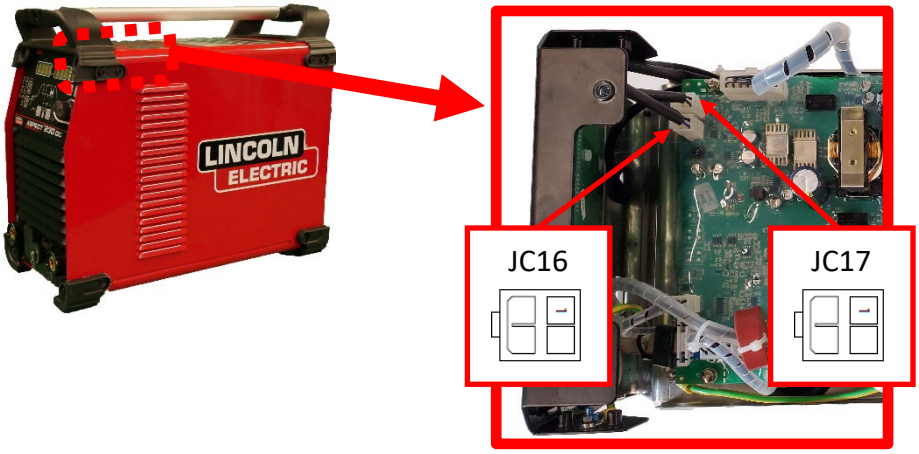


Figure F.3

Fan Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Input Fan 1	Machine ON, Fan Low Idle	JC17 pin 4	JC17 pin 1	~24VDC
PWM Control Voltage		JC17 pin 2	JC17 pin 1	~1.1VDC
Fan 1 Fault Feedback Input		JC17 pin 3	JC17 pin 1	~5VDC
Input Fan 2	Machine ON, Fan Low Idle	JC16 pin 4	JC16 pin 1	~24VDC
PWM Control Voltage		JC16 pin 2	JC16 pin 1	~1.1VDC
Fan 2 Fault Feedback Input		JC16 pin 3	JC16 pin 1	~5VDC

Table 1

A.4. Power the machine down and remove input power, label and remove connector identified before proceeding. Refer to Figure F.4 for location.

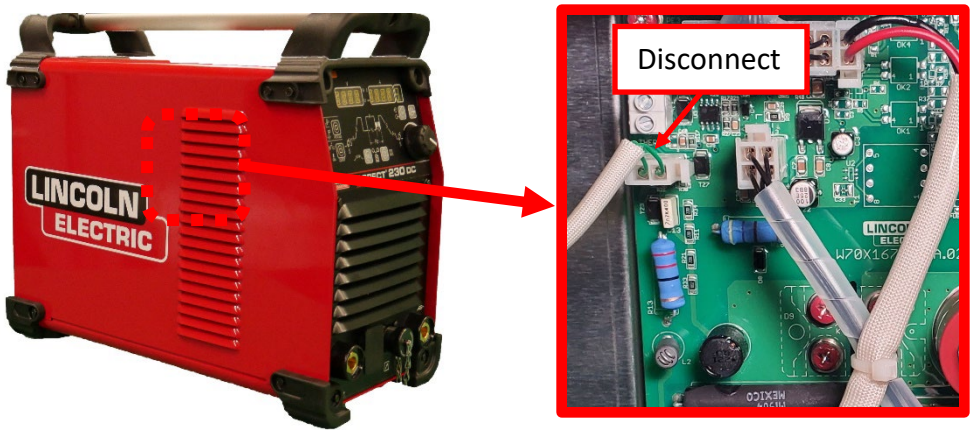


Figure F.4

A.5. Ensure the machine is plugged into external power and turned on.

A.6. Perform the active measurements in Test Table 2, refer to Figure F.3 for test point locations.

Fan Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Fan 1 PWM Control Voltage	Machine ON, Fan High Idle	JC17 pin 2	JC17 pin 1	~4.5VDC
Fan 2 PWM Control Voltage	Machine ON, Fan High Idle	JC16 pin 2	JC16 pin 1	~4.5VDC

Table 2

A.7. If the input measurements are correct and the output measurements are not correct this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

GAS SOLENOID TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Gas Solenoid using Static and Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Gas Solenoid refer to Figure F.1.

Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Label and disconnect the following connections, refer to Figure F.2.

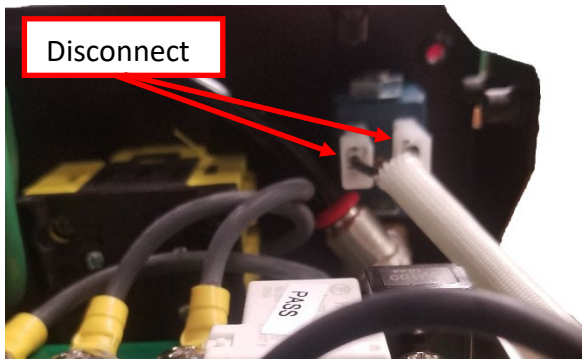


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.3 for test point locations.

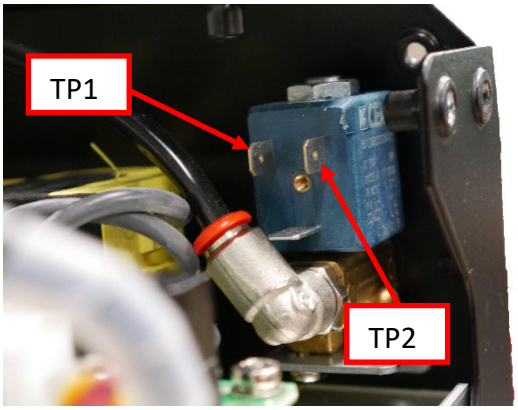


Figure F.3

Gas Solenoid Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Gas Solenoid	Machine Off	TP1	TP2	~56Ω

Table 1

A.4. If measurements are correct reconnect everything removed in step A.2 and proceed to “B. ACTIVE TESTING”.

A.5. Any failed measurement indicates a defective component.

B. ACTIVE TESTING

B.1. Ensure the machine is off, not plugged in or connected to external power. Label and remove connectors identified before proceeding. Refer to Figure F.4 for locations.

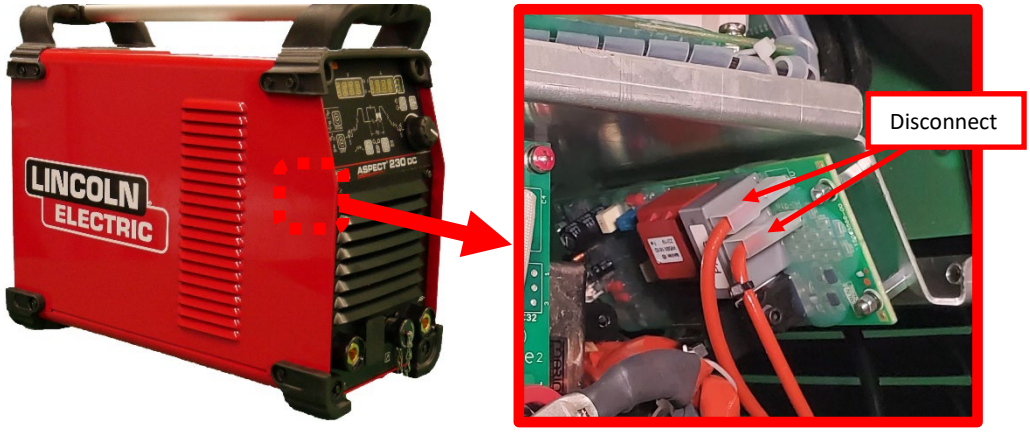


Figure F.4

B.2. Ensure the is plugged into external power, turned on, placed in DC TIG Mode with the Output turned On as directed.

B.3. Perform the active measurements in Test Table 2, refer to Figure F.5 for test point locations.

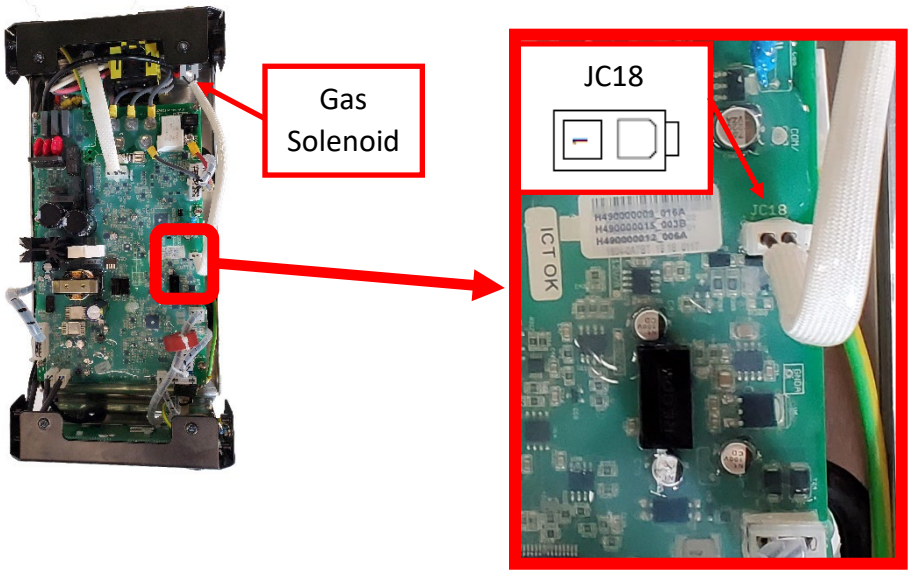


Figure F.5

Gas Solenoid Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Gas Solenoid Control input	Machine On, DC TIG mode, Output On	JC18 pin 2	JC18 pin 1	~24VDC

Table 2

B.4. If the input measurements are correct and the solenoid does not operate this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

HIGH FREQUENCY BOARD TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the High Frequency Board using Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the High Frequency Board refer to Figure F.1.

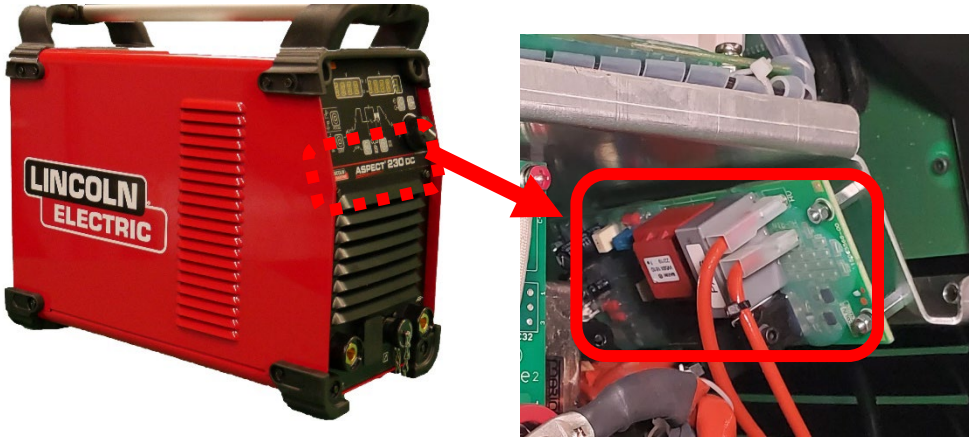


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Active Testing.

A. ACTIVE TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power. Label and remove connectors identified before proceeding. Refer to Figure F.2 for locations.

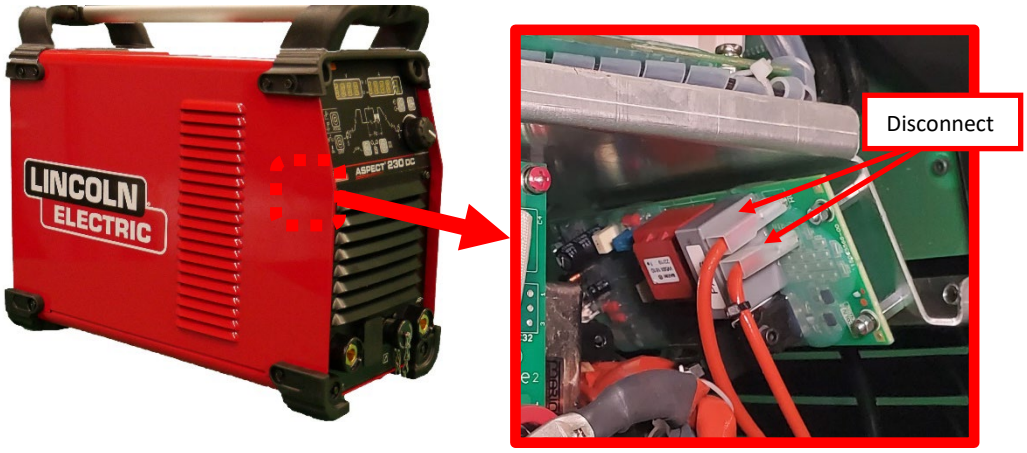


Figure F.2

A.2. Ensure the machine is plugged into external power and turned on. Turn on HF TIG mode and Output when directed.

A.3. Perform the active measurements in Test Table 1, refer to Figure F.3 for test point locations.

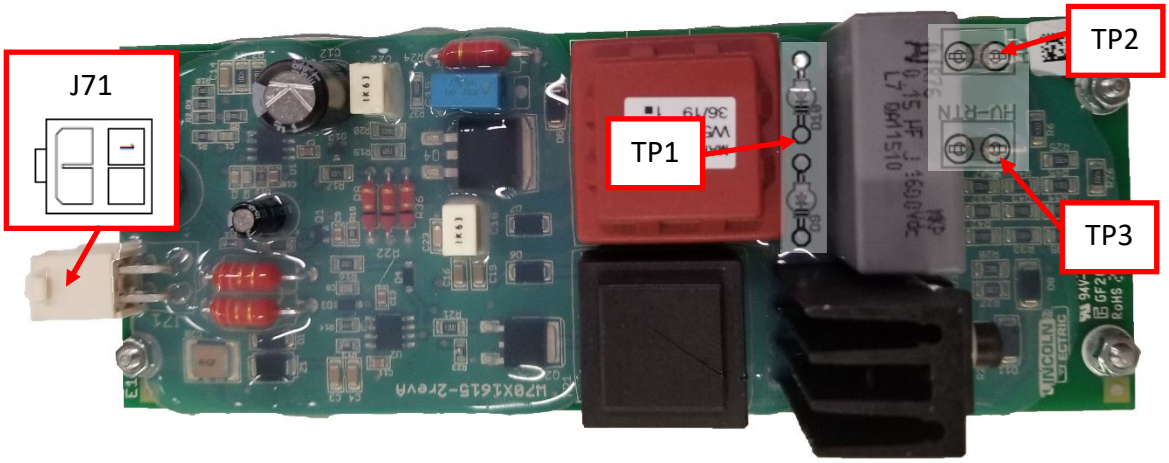


Figure F.3

High Frequency Board Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Input Voltage	Machine On	J71 pin 2	J71 pin 4	~24VDC
HF enable Input	Machine On, HF TIG Mode, Output ON	J71 pin 3	J71 pin 4	~15VDC
HF Output	Machine On, HF TIG Mode, Output ON	TP1	TP3	~818VDC
HF Output	Machine On, HF TIG Mode, Output On	TP2	TP3	~179 VAC

Table 1

A.4. If the input measurements are correct and the output measurements are not correct this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

HIGH FREQUENCY TRANSFORMER TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the High Frequency Transformer using Static tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the High Frequency Transformer refer to Figure F.1.

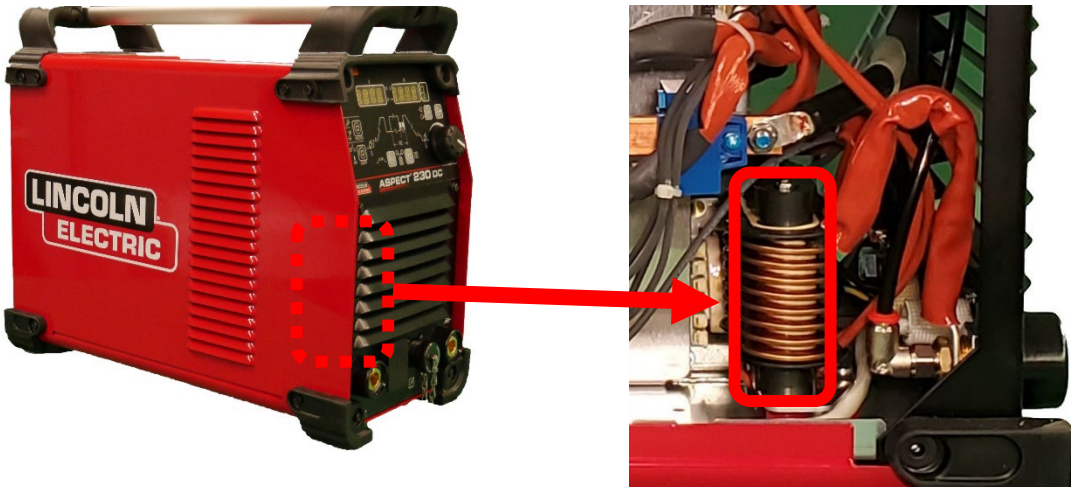


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Label and disconnect the following connections, refer to Figure F.2.

Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.3 for test point locations.

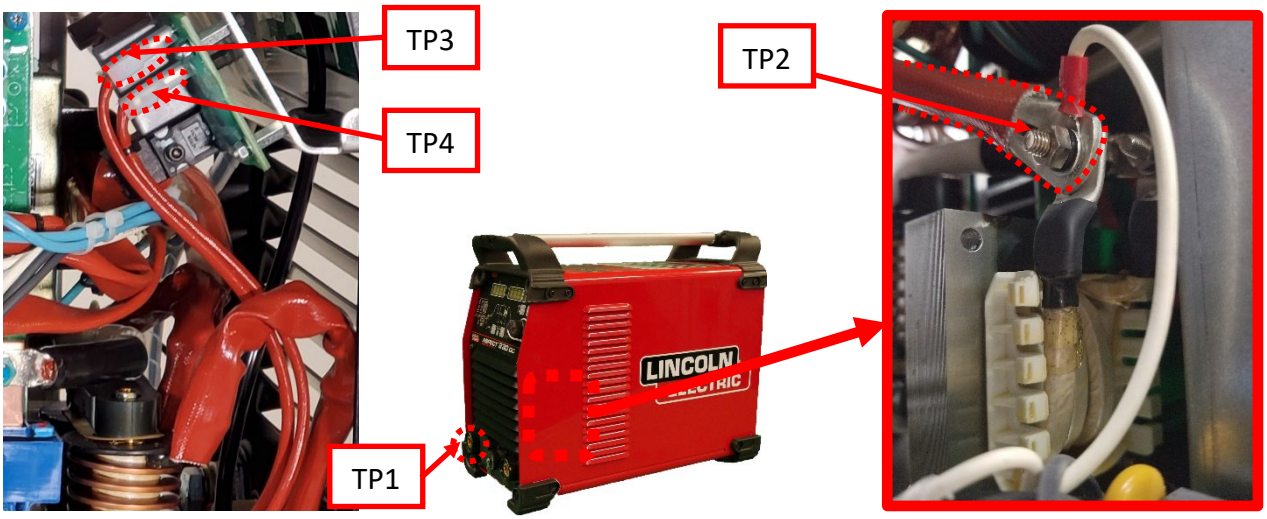


Figure F.3

High Frequency Transformer Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
High Frequency Transformer Coil (Primary)	Machine off	TP1	TP2	<1Ω
High Frequency Transformer Coil (Secondary)		TP3	TP4	<1Ω
High Frequency Transformer Isolation		TP2	TP3	>500KΩ

Table 1

A.4. Any failed measurement indicates a defective component.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

INPUT POWER BOARD TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Input Power Board using Static and Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Input Power Board refer to Figure F.1.

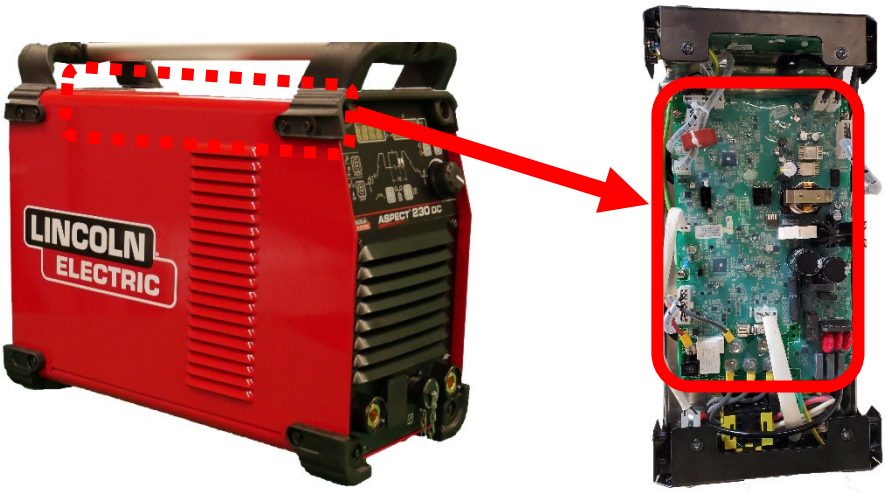


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2 Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. **NOTE: DO NOT DISCONNECT WIRES, PLUGS FROM THE INPUT POWER BOARD.**

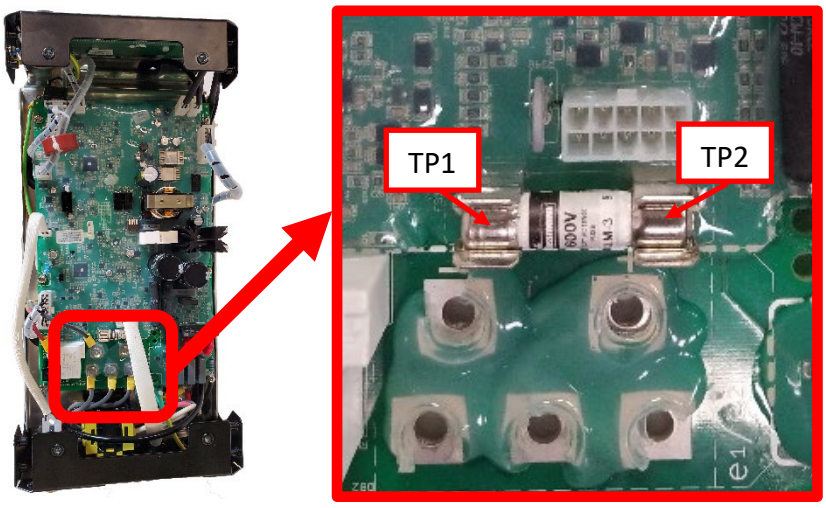


Figure F.2

Input Power Board Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
FS1 Fuse (Cooler)	Machine Off	TP1	TP2	<1Ω

Table 1

A.4. If measurements are correct proceed to “B. ACTIVE TESTING”.

A.5. Any failed measurement indicates a defective component

B. ACTIVE TESTING

B.1. Ensure the machine is off, not plugged in or connected to external power. Label and remove connectors identified before proceeding. Refer to Figure F.3 for locations.

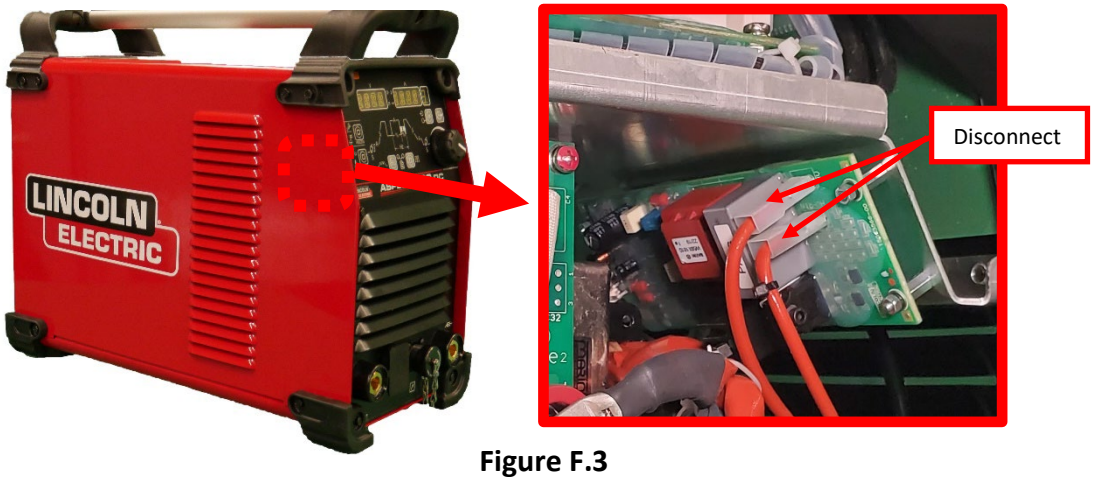


Figure F.3

B.2. Ensure the machine is plugged into external power and turned on. Turn on TIG mode, LS TIG mode and/or Output when directed.

B.3. Perform the measurements identified in Test Table 2 below, refer to Figure F.4 for test point locations. **NOTE: DO NOT DISCONNECT WIRES, PLUGS FROM THE INPUT POWER BOARD.**

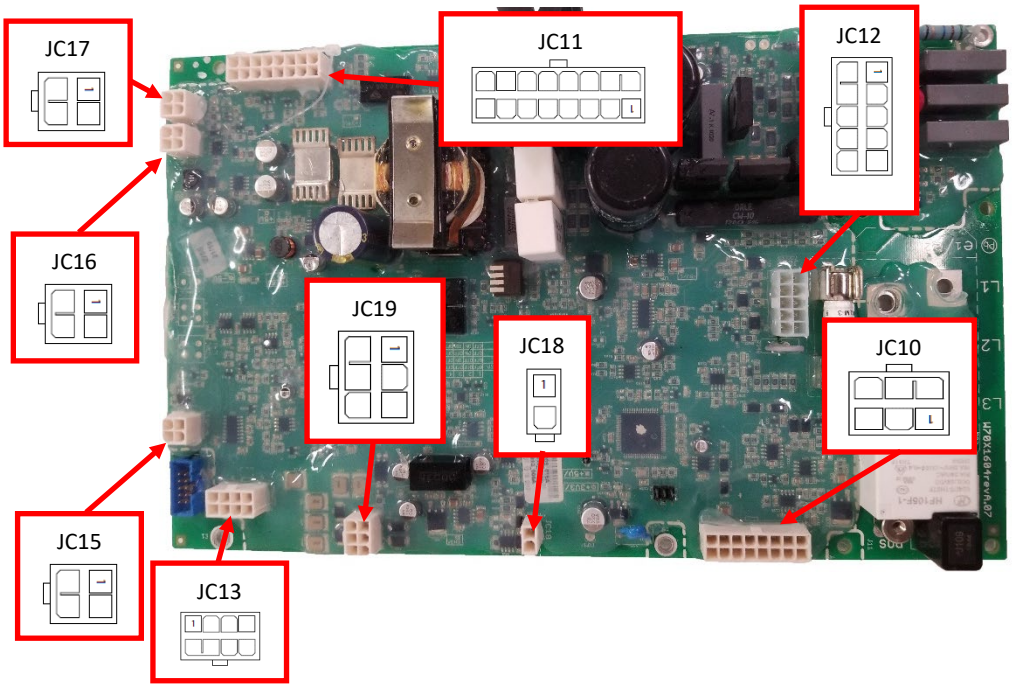


Figure F.4

Input Power Board Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Output to Gas Solenoid	Machine On, TIG Mode On, Output On	JC18 pin 1	JC18 pin 2	~24VDC
Output to Cooler	Machine On, TIG Mode On, Output On	JC12 pin 6	JC12 pin 1	~390VDC
Output to High Frequency Board	Machine On	JC15 pin 2	JC15 pin 4	~24VDC
Output to Inverter Board	Machine On	JC13 pin 2	JC13 pin 6	~13.5VDC
Output to Inverter Board	Machine On	JC13 pin 3	JC13 pin 6	~-5VDC
Input from Inverter Thermal	Machine On	JC10 pin 2	JC10 pin 8	0VDC
Output to Inverter Board	Machine On	JC10 pin 7	JC10 pin 8	~15VDC
Input from Buck-Boost (VBus)	Machine On	JC10 pin 11	JC10 pin 14	~390VDC
Input from Buck-Boost (VBus)	Machine On	JC10 pin 12	JC10 pin 14	~390VDC
Output to Output Control Board	Machine On	JC11 pin 13	JC11 pin 15	~15VDC
Thermal Error Input	Machine On	JC11 pin 12	JC11 pin 15	~13.5VDC
Output to Lift Start	Machine On, LS TIG Mode, Output On	JC11 pin 10	JC11 pin 15	~8.5VDC
Output to Trigger	Machine On	JC11 pin 7	JC11 pin 5	~15VDC
-15VDC Output Supply	Machine On	JC11 pin 3	JC11 pin 5	~-15VDC
Remote Output Supply	Machine On	JC19 pin 4	JC19 pin 5	~12VDC
Remote Output Supply	Machine On	JC19 pin 4	JC19 pin 3	~12VDC
Remote Output Supply	Machine On	JC19 pin 2	JC19 pin 1	~12VDC

Table 2

B.4. If the input measurements are correct and the output measurements are not correct this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

INPUT RECTIFIER TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Input Rectifier using Static and Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Input Rectifier refer to Figure F.1.

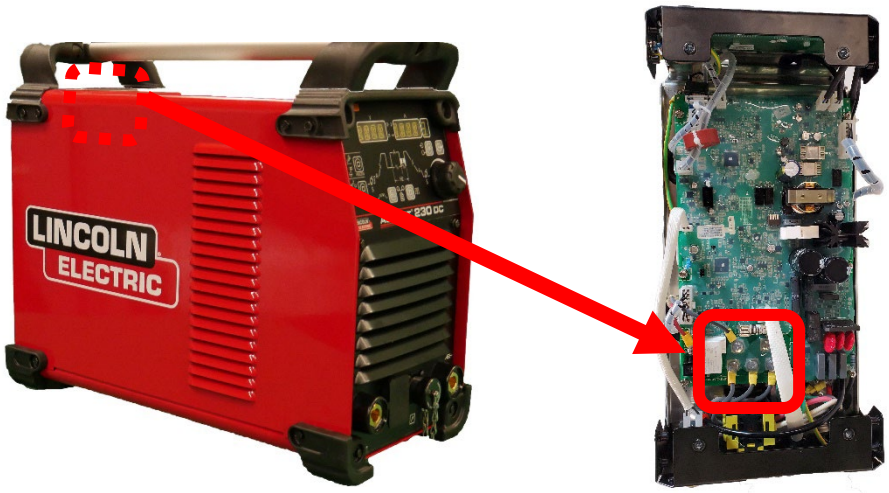


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations.

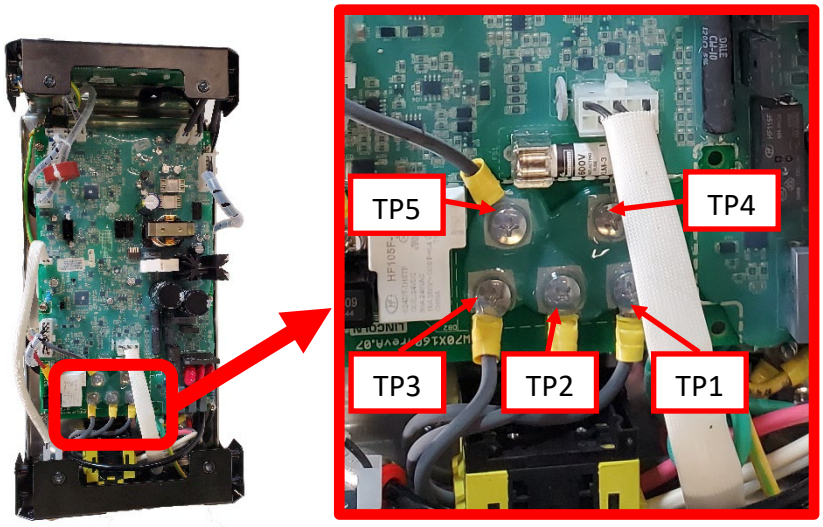


Figure F.2

Input Rectifier Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Input Rectifier	Machine Off (Meter in Diode Mode)	TP1	TP4	.3-.7VDC
		TP2	TP4	.3-.7VDC
		TP3	TP4	.3-.7VDC
		TP5	TP1	.3-.7VDC
		TP5	TP2	.3-.7VDC
		TP5	TP3	.3-.7VDC

Table 1

A.4. If measurements are correct proceed to “B. ACTIVE TESTING”.

A.5. Any failed measurement indicates a defective component

B. ACTIVE TESTING

B.1. Ensure the machine is plugged into external power and turned on.

B.2. Perform the measurements identified in Test Table 2 below, refer to Figure F.2 for test point locations.

Input Rectifier Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Line Input	Machine On	TP1	TP2	230VAC - 460VAC
		TP1	TP3	230VAC - 460VAC
		TP2	TP3	230VAC - 460VAC
Input Rectifier Output	Machine On	TP4	TP5	325VDC – 650VDC

Table 2

B.4. If the input measurements are correct and the output measurements are not correct this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

INVERTER BOARD TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Inverter Board using Static and Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Inverter Board refer to Figure F.1.

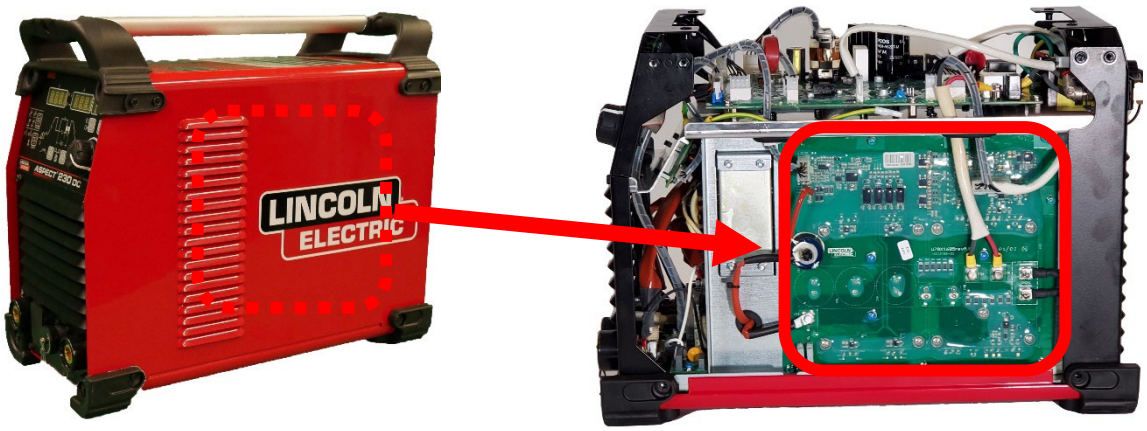


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Static and Active Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Label and disconnect the following connections, refer to Figure F.2.

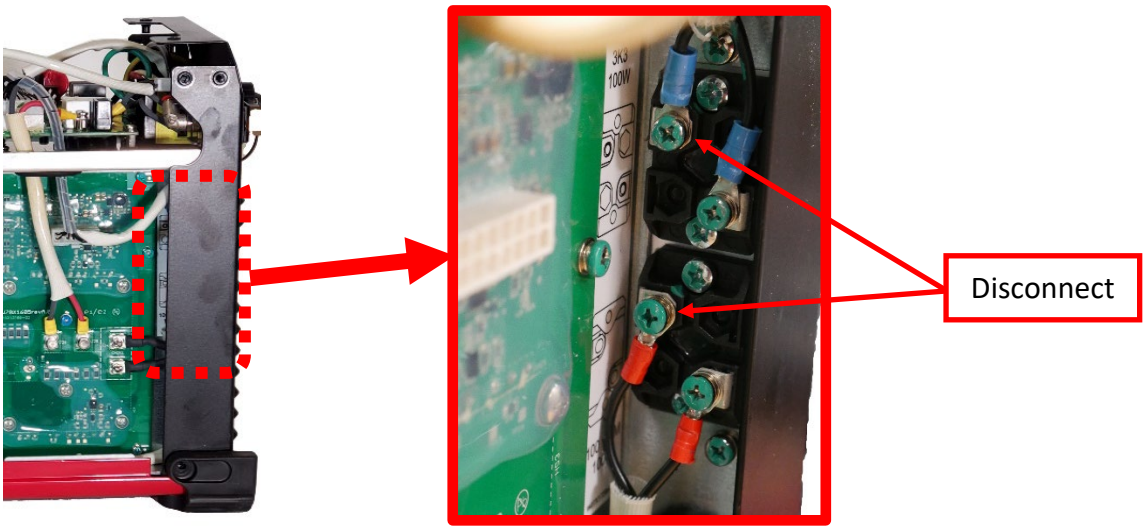


Figure F.2

A.2. Perform the static measurements in Test Table 1, refer to Figure F.3 for test point locations.

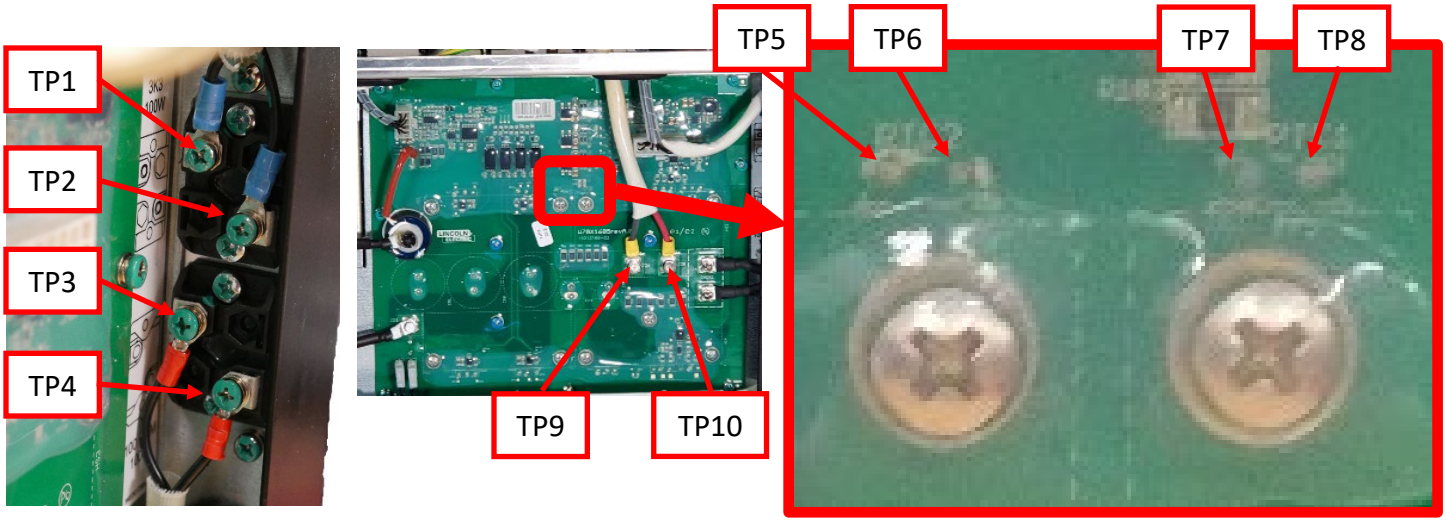


Figure F.3

Inverter Board Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
R1	Machine Off	TP1	TP2	~100Ω
R2		TP3	TP4	~3K Ω
PTC1		TP5	TP6	60 -70 Ω
PTC2		TP7	TP8	40 -50 Ω
Inverter Board Input		TP9	TP10	~271K Ω

Table 1

A.4. If measurements are correct reconnect everything removed in step A.2 and proceed to step A.6.

A.5. Any failed measurement indicates a defective component.

A.6. Perform the static measurements in Test Table 2, refer to Figure F.3 for test point locations.

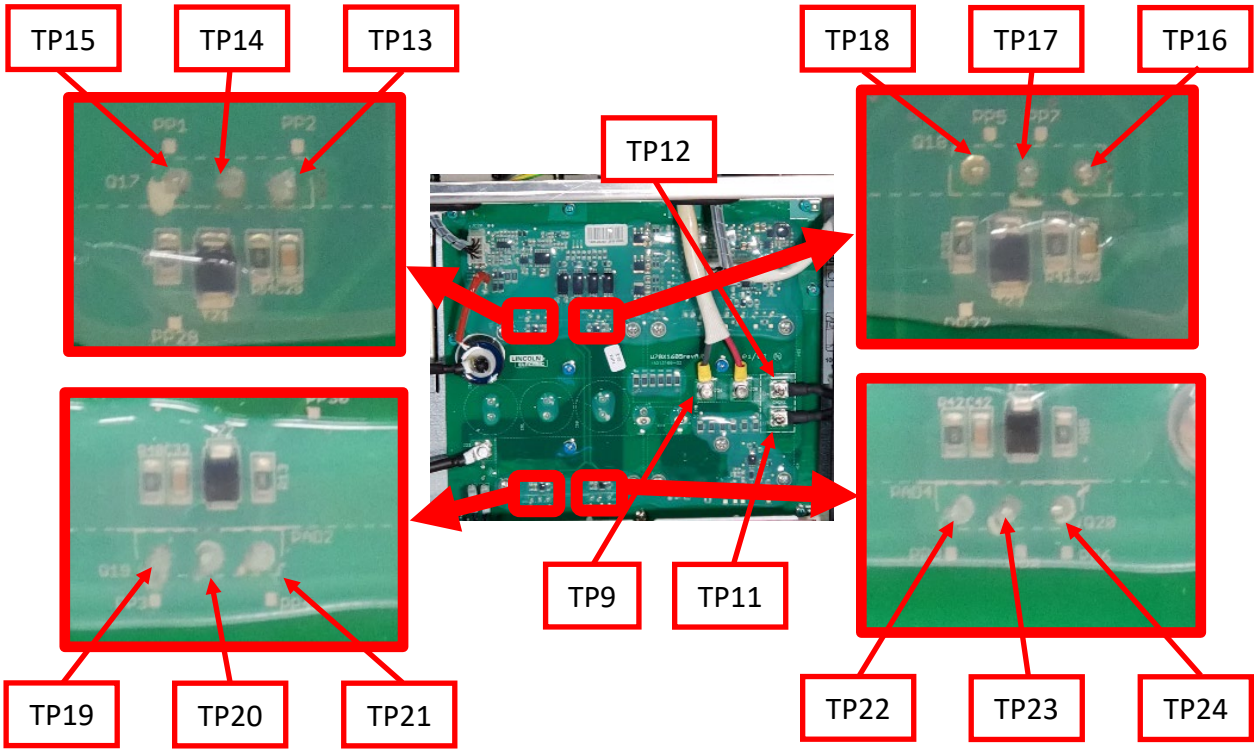


Figure F.3

Inverter Board Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Boost IGBT	Machine Off (Meter in Diode Mode)	TP12	TP9	OLVDC
		TP9	TP12	.3-.7VDC
Buck IGBT		TP11	TP9	OL VDC
		TP9	TP11	.3-.7VDC
Inverter IGBT Q17		TP13	TP14	.3-.7VDC
		TP14	TP13	OLVDC
		TP13	TP15	1.2VDC
Inverter IGBT Q18		TP16	TP17	.3-.7VDC
		TP17	TP16	OLVDC
		TP16	TP18	1.2VDC
Inverter IGBT Q19		TP19	TP20	.3-.7VDC
		TP20	TP19	OLVDC
		TP19	TP21	1.2VDC
Inverter IGBT Q20		TP22	TP23	.3-.7VDC
		TP23	TP22	OLVDC
		TP22	TP24	1.2VDC

Table 2

A.7. Any failed measurement indicates a defective component

A.8. If measurements are correct proceed to “B. Active Testing”.

B. ACTIVE TESTING

B.1. Ensure the machine is off, not plugged in or connected to external power. Label and remove connectors identified before proceeding. Refer to Figure F.4 for locations.

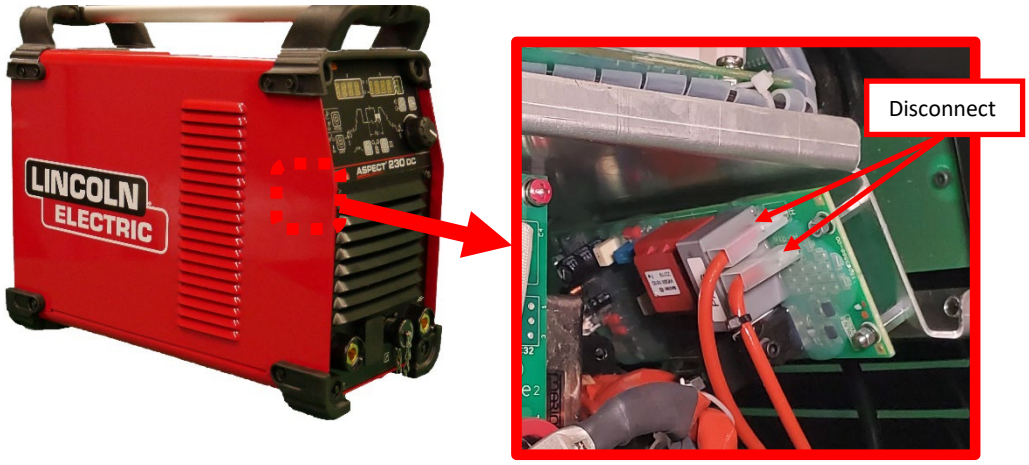


Figure F.4

B.2. Ensure the machine is connected to external power and powered On.

B.3. Perform the measurements in Test Table 3 below, refer to Figure F.5 for test point locations.

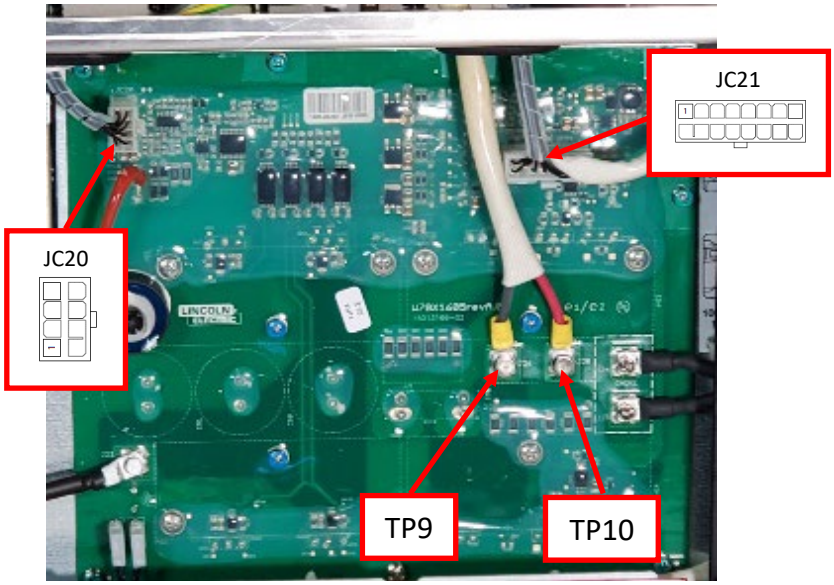


Figure F.5

Inverter Board Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Input from Input Board	Machine On	TP10	TP9	325VDC – 650VDC
Input from Input Board	Machine On	JC21 pin 4	JC21 pin 6	~390VDC
		JC21 pin 11	JC21 pin 8	~390VDC
		JC21 pin 12	JC21 pin 14	~390VDC
Auxiliary Input from Input Board	Machine On	JC20 pin 2	JC20 pin 6	~15VDC
Auxiliary Input from Input Board	Machine On	JC20 pin 3	JC20 pin 6	~-5VDC
Auxiliary Input from Input Board	Machine On	JC21 pin 7	JC21 pin 8	~15VDC

Table 3

B.4. If the input measurements are correct and the output measurements are not correct this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

OUTPUT POWER BOARD TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Output Power Board using Static and Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Output Power Board refer to Figure F.1.

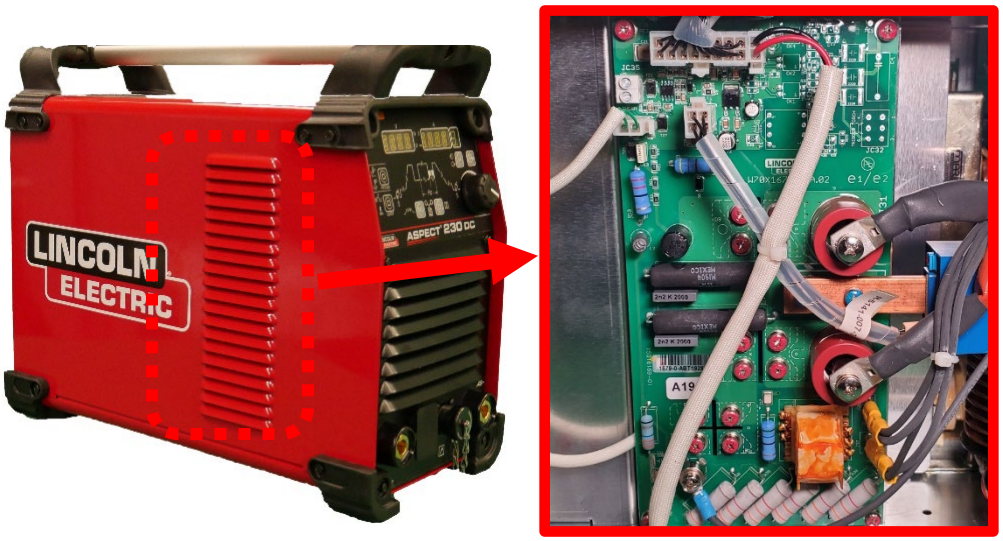


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Label and disconnect the following connections, refer to Figure F.2.

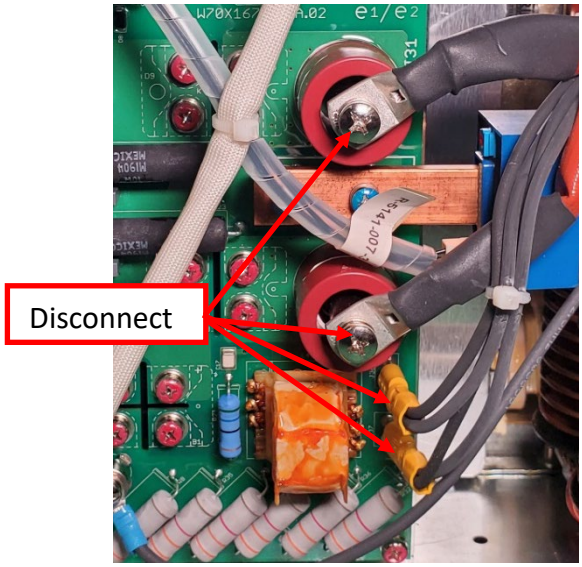


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.3 for test point locations. **NOTE: DO NOT REMOVE ANY MOLEX CONNECTORS FROM BOARD.**

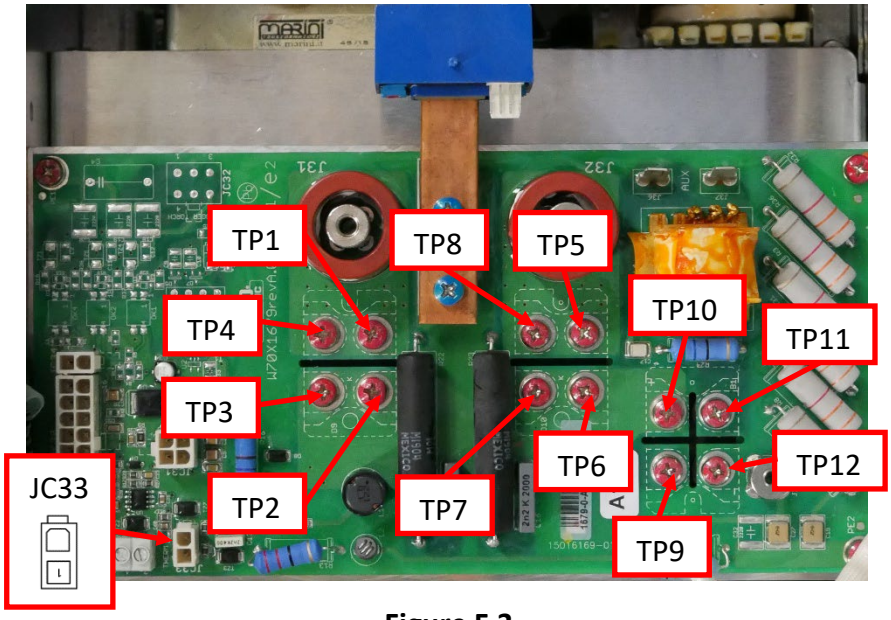


Figure F.3

Output Power Board Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Output Diode D9	Machine Off (Meter set to Diode)	TP1	TP2	.310 VDC
		TP4	TP3	.310 VDC
Output Diode D10		TP5	TP6	.310 VDC
		TP8	TP7	.310 VDC
Output Bridge B1		TP9	TP10	.35 VDC
		TP11	TP10	.35 VDC
		TP12	TP9	.35 VDC
		TP12	TP11	.35 VDC
PTC	Machine Off	JC33 pin 1	JC33 pin 2	62 Ohms

Table 1

A.4. If measurements are correct reconnect everything removed in step A.2 and proceed to “B. ACTIVE TESTING”.

A.5. Any failed measurement indicates a defective component.

B. ACTIVE TESTING

B.1. Ensure the machine is off, not plugged in or connected to external power. Label and remove connectors identified before proceeding. Refer to Figure F.4 for locations.

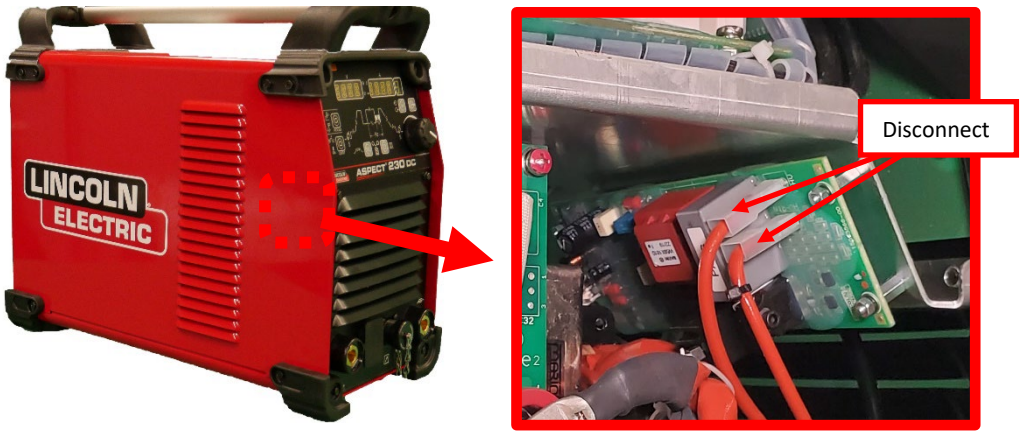


Figure F.4

B.2. Ensure the machine is plugged into external power, turned on, placed in Stick Mode, Output turned On and/or placed on a Load Bank as directed.

B.3. Perform the active measurements in Test Table 2, refer to Figure F.5 for test point locations.

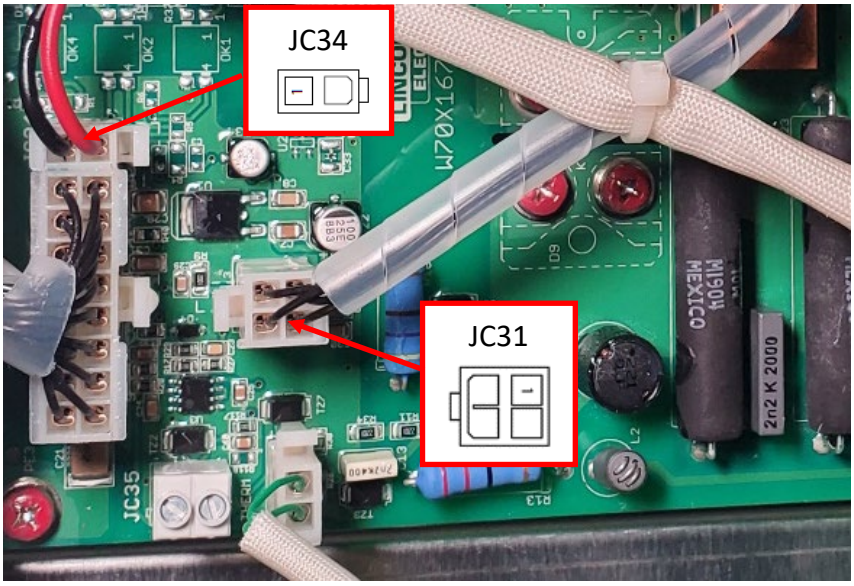


Figure F.5

Output Power Board Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Wireless Supply Voltage Output	Machine On	JC34 pin 2	JC34 pin 1	15 VDC
Current Transducer Input	Machine On	JC31 pin 1	JC31 pin 4	15 VDC
Current Transducer Input		JC31 pin 2	JC31 pin 4	-15 VDC
Current Transducer Output	Machine On, Stick Mode, Loaded @ 100A	JC31 pin 3	JC31 pin 4	2 VDC

Table 2

B.4. If the input measurements are correct and the output measurements are not correct this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

REMOTE AMPHENOL TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Remote Amphenol using Static and Active tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Remote Amphenol refer to Figure F.1.

Figure F.1

2. Perform the “Case Cover Removal” as required to gain access to the Remote Amphenol for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations.

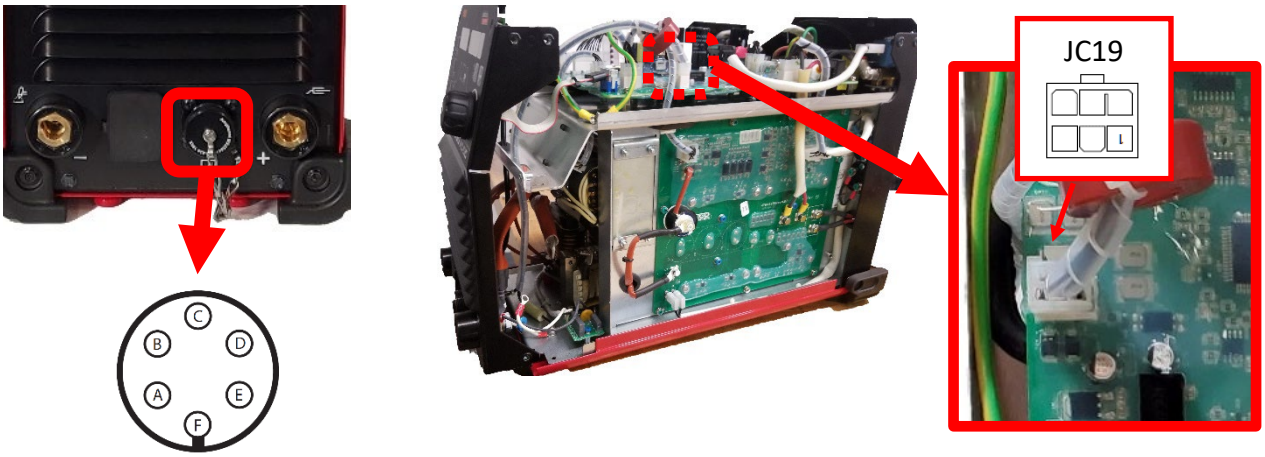


Figure F.2

Remote Amphenol Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Remote Amphenol	Machine OFF	JC19 pin 4	A	<1Ω
	Machine OFF	JC19 pin 3	B	<1Ω
	Machine OFF	JC19 pin 5	C	<1Ω
	Machine OFF	JC19 pin 1	D	<1Ω
	Machine OFF	JC19 pin 2	E	<1Ω

Table 1

A.3. Any failed measurement indicates a defective component.

B. ACTIVE TESTING

B.1. Power the machine down and remove input power, label and remove connectors identified before proceeding. Refer to Figure F.3 for locations.

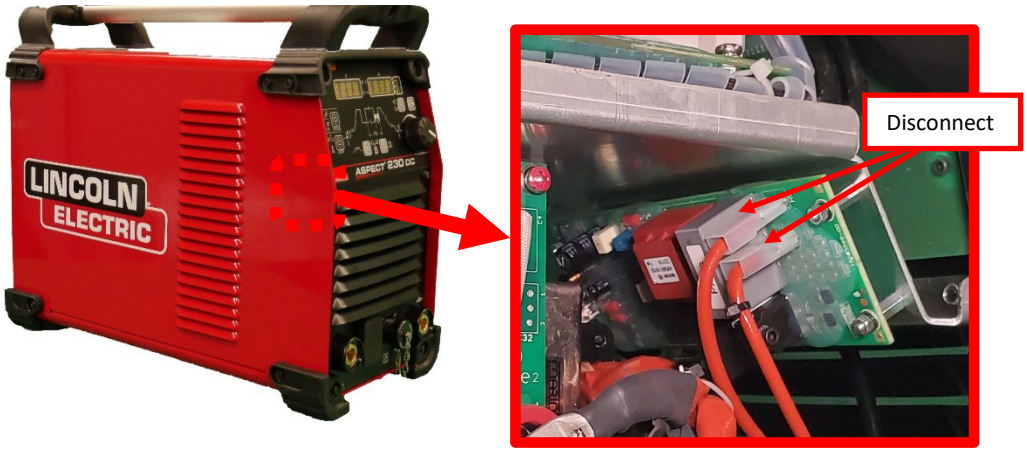


Figure F.3

B.2. Ensure the machine is plugged into external power and turned on.

B.3. Perform the active measurements in Test Table 2, refer to Figure F.4 for test point locations.

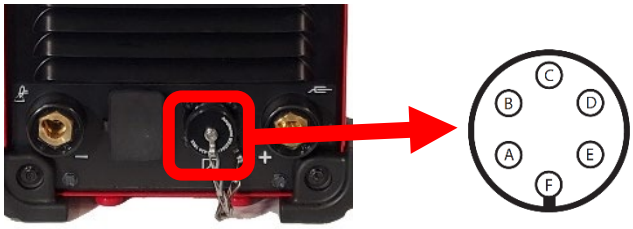


Figure F.4

Remote Amphenol Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Amphenol	Machine On	A	C	~12VDC
Amphenol	Machine On	A	B	~12VDC
Amphenol	Machine On	B	C	0 VDC
Amphenol	Machine On	E	D	~12VDC

Table 2

B.4. If the input measurements are correct and the output measurements are not correct this component may be faulty.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

Refer to Safety pages for explanation of hazards:

TRANSFORMER TEST PROCEDURE

TEST DESCRIPTION:

This procedure will determine the proper function of the Transformer using Static tests.

MATERIALS NEEDED:

5/16” Nut Driver
Digital Multi-Meter
Wiring Diagram
Machine Schematic
Required P.P.E.

TEST PROCEDURE:

1. For location of the Transformer refer to Figure F.1.

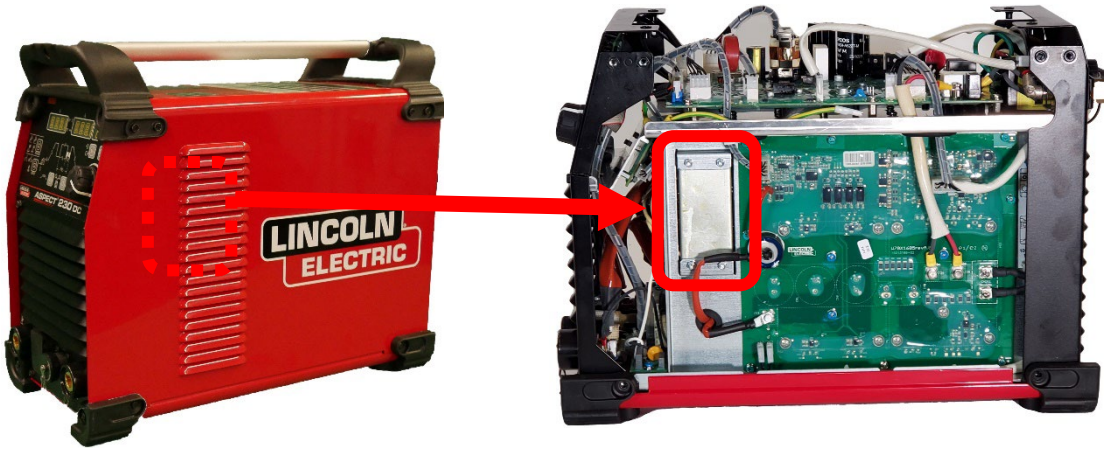


Figure F.1

2. Perform the “Case Cover Removal” to gain access for testing.

3. Perform the Static Testing.

A. STATIC TESTING

A.1. Ensure the machine is off, not plugged in or connected to external power.

A.2. Label and disconnect the following connections, refer to Figure F.2.

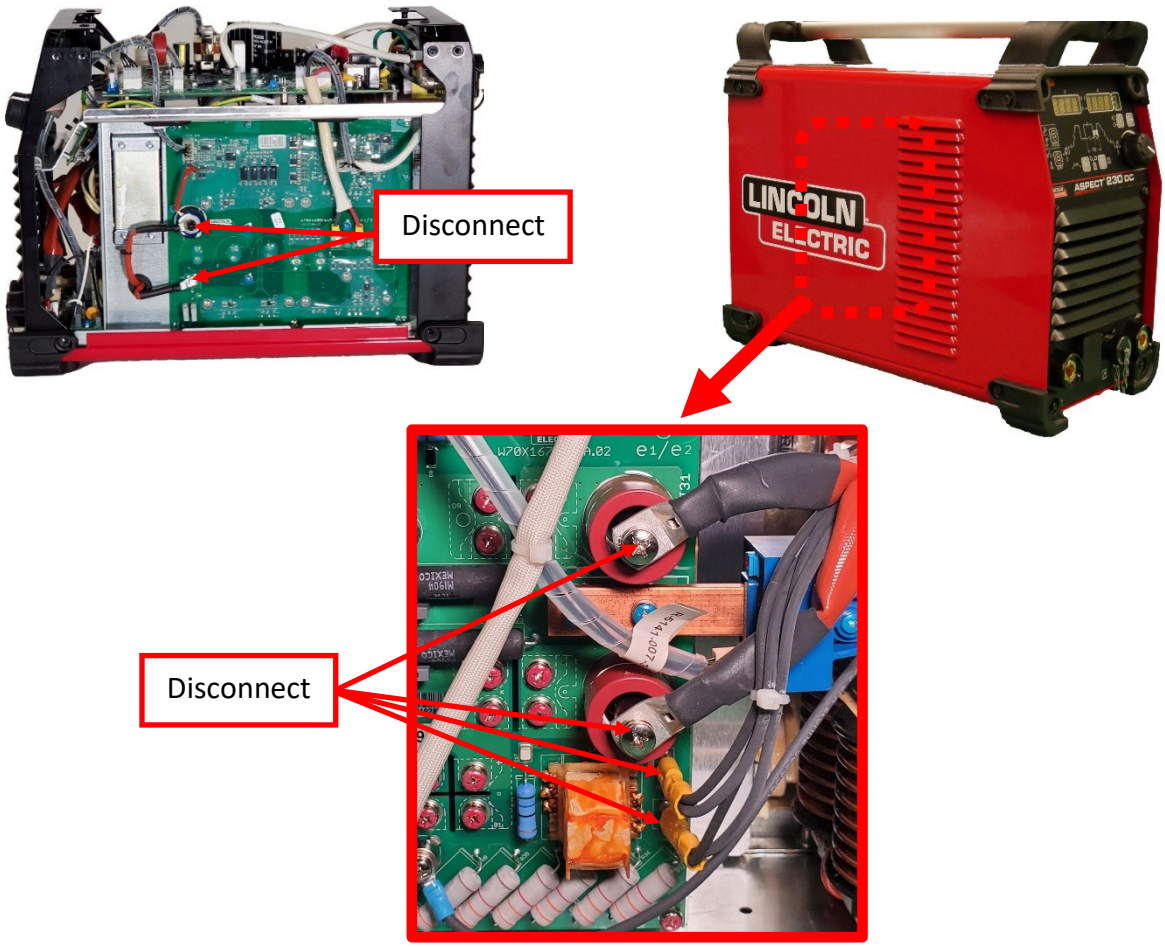


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.3 for test point locations.

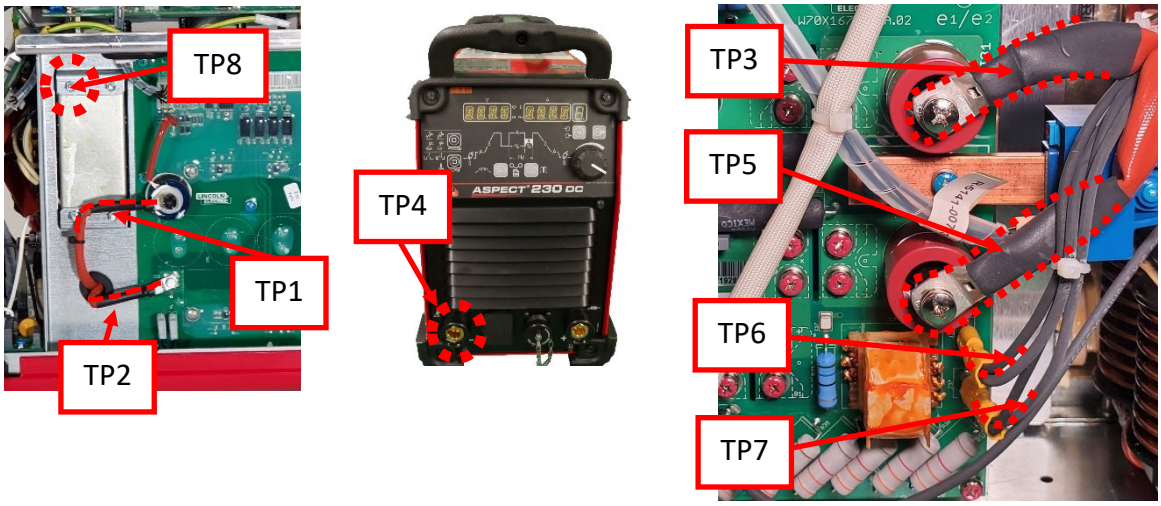


Figure F.3

Transformer Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Transformer Coil (Primary)	Machine Off	TP1	TP2	<1Ω
Transformer Coil (Secondary) SEC 1		TP3	TP4	<1Ω
Transformer Coil (Secondary) SEC 2		TP5	TP3	<1Ω
Transformer Coil (Secondary) AUX 1		TP6	TP7	<1Ω
Primary/Secondary Isolation		TP1	TP3	>500KΩ
Primary/Secondary Isolation		TP1	TP5	>500KΩ
Primary/Secondary Isolation		TP1	TP6	>500KΩ
Grounded Primary		TP1	TP8	>500KΩ
Grounded Secondary		TP3	TP8	>500KΩ
Grounded Secondary		TP5	TP8	>500KΩ
Grounded Secondary		TP6	TP8	>500KΩ

Table 1

A.4. Any failed measurement indicates a defective component.

4. If problems with the machine persist, refer to the “Test Reference” chart for other possible faulty components. Reconnect anything disconnected in previous steps.

CASE COVER REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Case Covers.

MATERIALS NEEDED

Phillips Screwdriver
8mm Nutdriver
Wiring Diagram

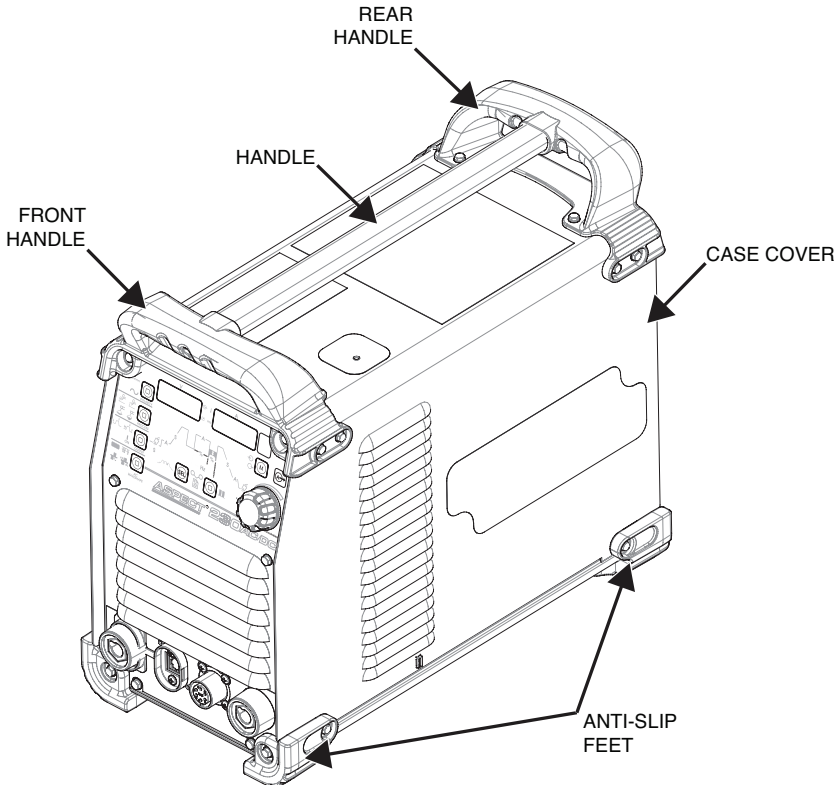
REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Using an 8mm nutdriver, remove the 16 screws securing the front / rear handles to the machine. See ***Figure F.1***. Do not attempt to remove front / rear handles currently.
3. Using an 8mm nutdriver, remove the four screws and washers from the anti-slip feet. See ***Figure F.1***. Do not attempt to remove the rubber corners.
4. Using the handle, carefully maneuver the case cover off the machine. Note the ground wire attached to the roof of the case cover. See Wiring Diagram.
5. Perform any tests / replacement procedure.

REPLACEMENT PROCEDURE

1. Carefully position the case cover over the machine.
2. Carefully attach the ground wire to the roof of the case cover. See Wiring Diagram.
3. Using an 8mm nutdriver, attach the four screws and washers to the anti-slip feet.
4. Using an 8mm nutdriver, attach the 16 screws securing the front / rear handles to the machine.

Figure F.1 – Case cover components



INTERNAL BASE REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Internal Base.

MATERIALS NEEDED

8mm Nutdriver
Phillips Screwdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Carefully place the machine onto its side to gain access to the internal base.
4. Using an 8mm nutdriver, remove the 12 screws and washers securing the four anti-slip feet to the machine. See ***Figure F.1***.
5. Using a Philips screwdriver, remove the four screws securing the four sleeves to the bottom of the internal base. See ***Figure F.2***.
6. Using an 8mm nutdriver, remove the four screws securing the internal base to the machine. See ***Figure F.2***.
7. Label and disconnect the ground lead from the internal base. See ***Figure F.3***. See Wiring Diagram.
8. The internal base can now be removed.

REPLACEMENT PROCEDURE

1. Carefully position the internal base onto the machine.
2. Connect the ground lead to the internal base. See Wiring Diagram.
3. Using an 8mm nutdriver, attach the four screws securing the internal base to the machine.
4. Using an 8mm nutdriver, attach the 12 screws and washers securing the four anti-slip feet to the machine.
5. Using a Philips screwdriver, attach the four screws securing the four sleeves to the bottom of the internal base.
6. Carefully place the machine into the upright position.
7. Perform the ***Case Cover Replacement Procedure***.

8. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Anti-slip foot locations

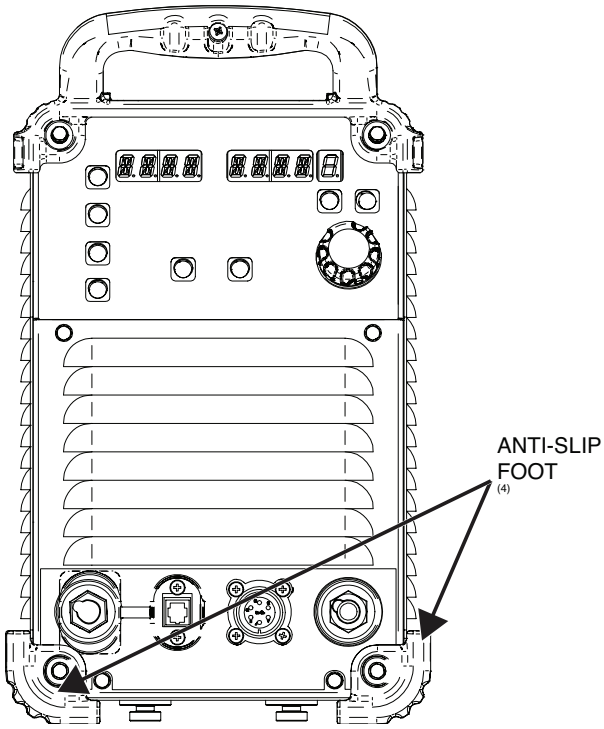


Figure F.2 – Internal base sleeve and mounting screw locations

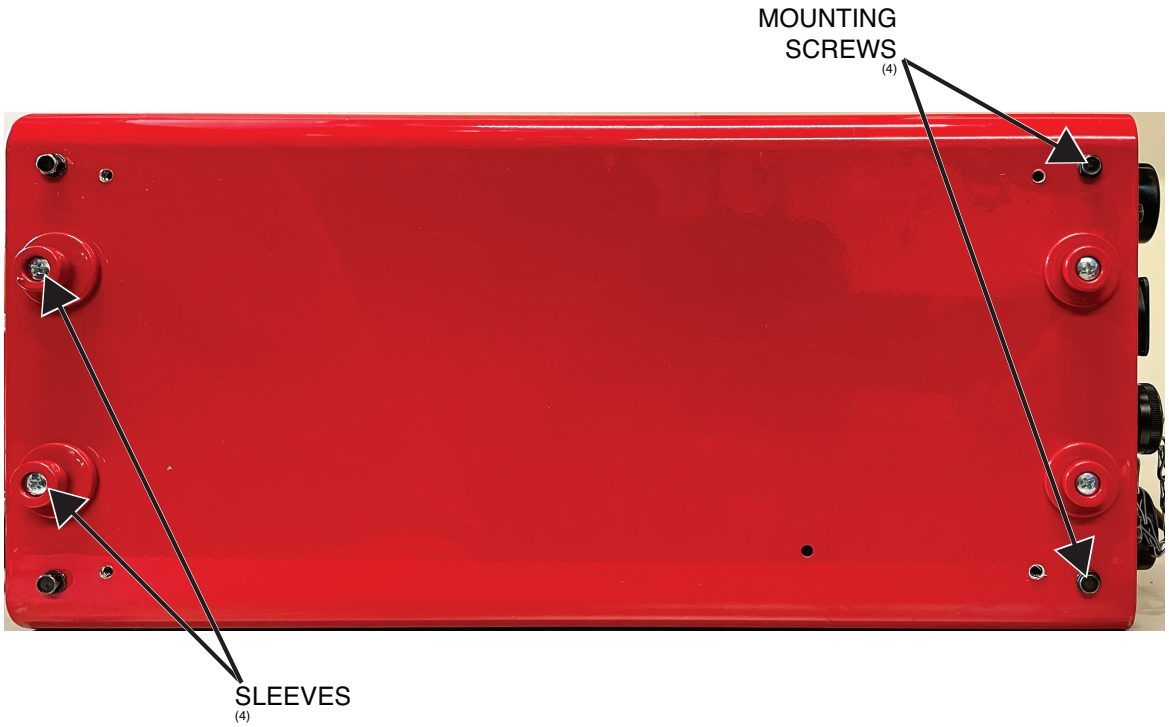
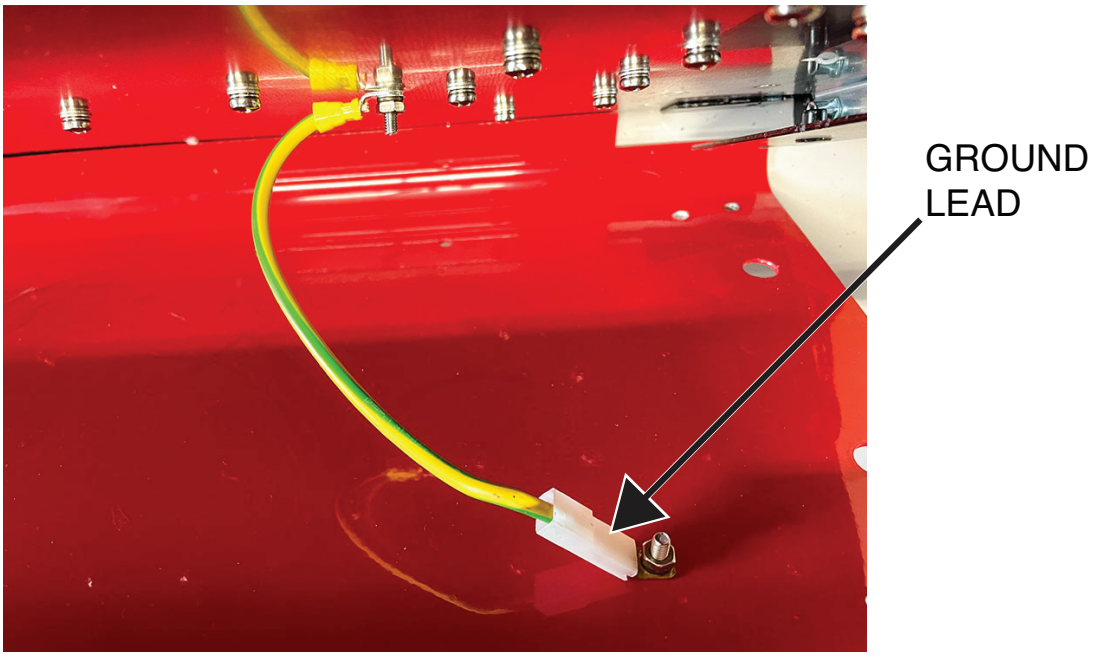


Figure F.3 – Ground lead location



GAS SOLENOID REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Gas Solenoid.

MATERIALS NEEDED

Phillips Screwdriver
3/8” Open-End Wrench
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Label and disconnect the two leads from the rear of the gas solenoid. See ***Figure F.1***. See Wiring Diagram.
4. Carefully disconnect the gas hose from the gas solenoid. See ***Figure F.1***. See Wiring Diagram.
5. Using a Philips screwdriver, remove the two screws securing the anti-rotation bracket to the rear of the machine. See ***Figure F.2***.
6. Using a 3/4” open-end wrench, remove the brass hose fitting from the rear of the machine. See ***Figure F.2***.
7. Using a Philips screwdriver, remove the screw located below the previously removed brass hose fitting. See ***Figure F.2***.
8. The gas solenoid can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new gas solenoid into the machine.
2. Using a Philips screwdriver, attach the screw located below the previously removed brass hose fitting.
3. Using a 3/4” open-end wrench, attach the brass hose fitting from the rear of the machine.
4. Using a Philips screwdriver, attach the two screws securing the anti-rotation bracket to the rear of the machine.
5. Connect the gas hose to the gas solenoid.
6. Connect the two leads to the rear of the gas solenoid. See Wiring Diagram.

7. Perform the ***Case Cover Replacement Procedure***.
8. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Gas solenoid leads and gas hose location

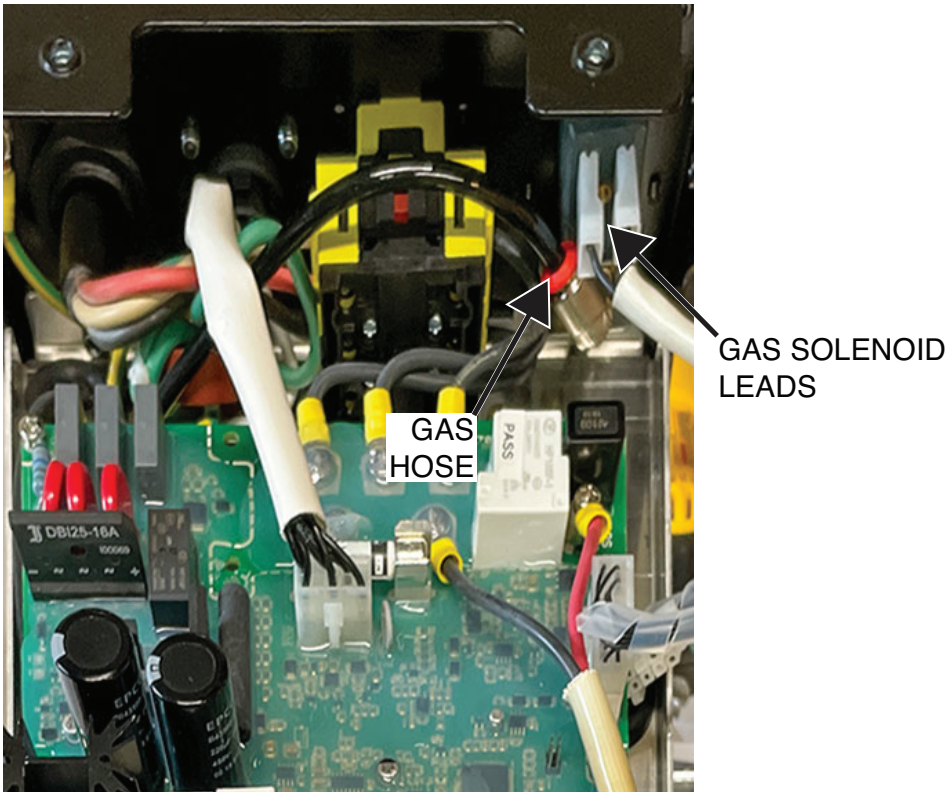
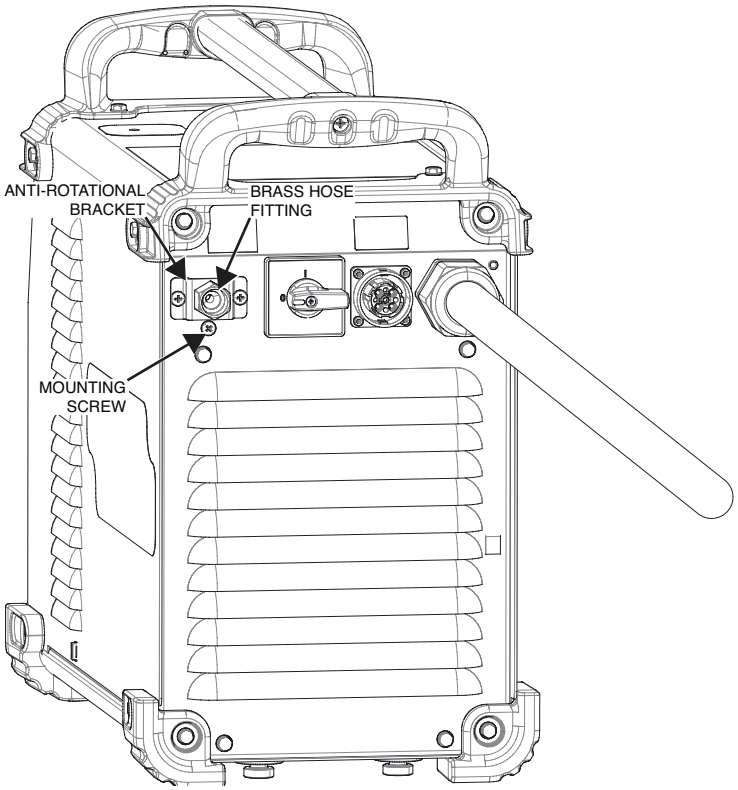


Figure F.2 – Anti-rotation bracket, brass hose fitting and mounting screw location



INVERTER BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Inverter Board.

MATERIALS NEEDED

8mm Nutdriver
7mm Nutdriver
Phillips Screwdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Label and disconnect plugs JC20, JC21, J27 and J22 from the inverter board. See ***Figure F.1***. See Wiring Diagram.
4. Using an 8mm nutdriver, loosen the two screws, lock washers and flat washers securing leads to terminals J26(-) and J25(+) on the inverter board. See ***Figure F.1***. See Wiring Diagram.
5. Using an 7mm nutdriver, remove the two screws, lock washers and flat washers securing leads to terminals J23 and J24 of the inverter board. See ***Figure F.1***. See Wiring Diagram.
6. Label the main transformer primary lead (black lead). See Wiring Diagram.
7. Carefully remove the rubber insulator from terminal TA1 of the inverter board. See ***Figure F.1***. See Wiring Diagram.
8. Using a Philips screwdriver, remove the screw located under the previously removed rubber insulator. See ***Figure F.1***. See Wiring Diagram.
9. Using a 7mm nutdriver, remove the screw securing the primary transformer lead to terminal TA1. See ***Figure F.1***. See Wiring Diagram.
10. Using a Philips screwdriver, remove the nine screws, lock washers and flat washers securing the inverter board to the machine. See ***Figure F.2***.
11. Carefully maneuver the inverter board out of the machine.
12. The inverter board can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new inverter board into the machine.
2. Using a Philips screwdriver, attach the nine screws, lock washers and flat washers securing the inverter board to the machine.
3. Using a 7mm nutdriver, attach the screw securing the primary transformer lead to terminal TA1. See Wiring Diagram.
4. Using a Philips screwdriver, attach the screw located under the previously removed rubber insulator.
5. Attach the rubber insulator to the previously installed screw at terminal TA1 of the inverter board. See Wiring Diagram.
6. Using a 7mm nutdriver, attach the two screws, lock washers and flat washers securing leads to terminals J23 and J24 of the inverter board. See Wiring Diagram.
7. Using an 8mm nutdriver, tighten the two screws, lock washers and flat washers securing leads to terminals J26(-) and J25(+) on the inverter board. See Wiring Diagram.
8. Connect plugs JC20, JC21, J27 and J22 to the inverter board. See Wiring Diagram.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Inverter board plug and terminal locations

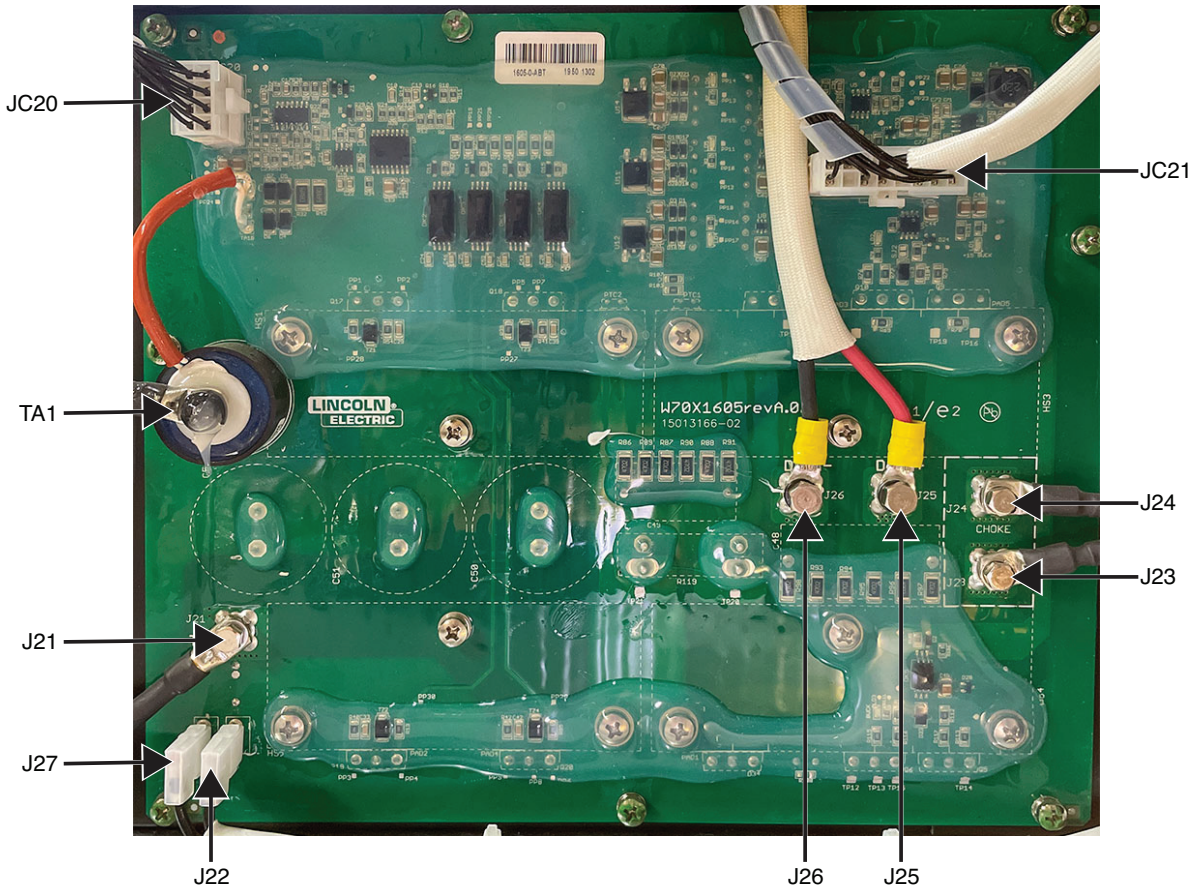
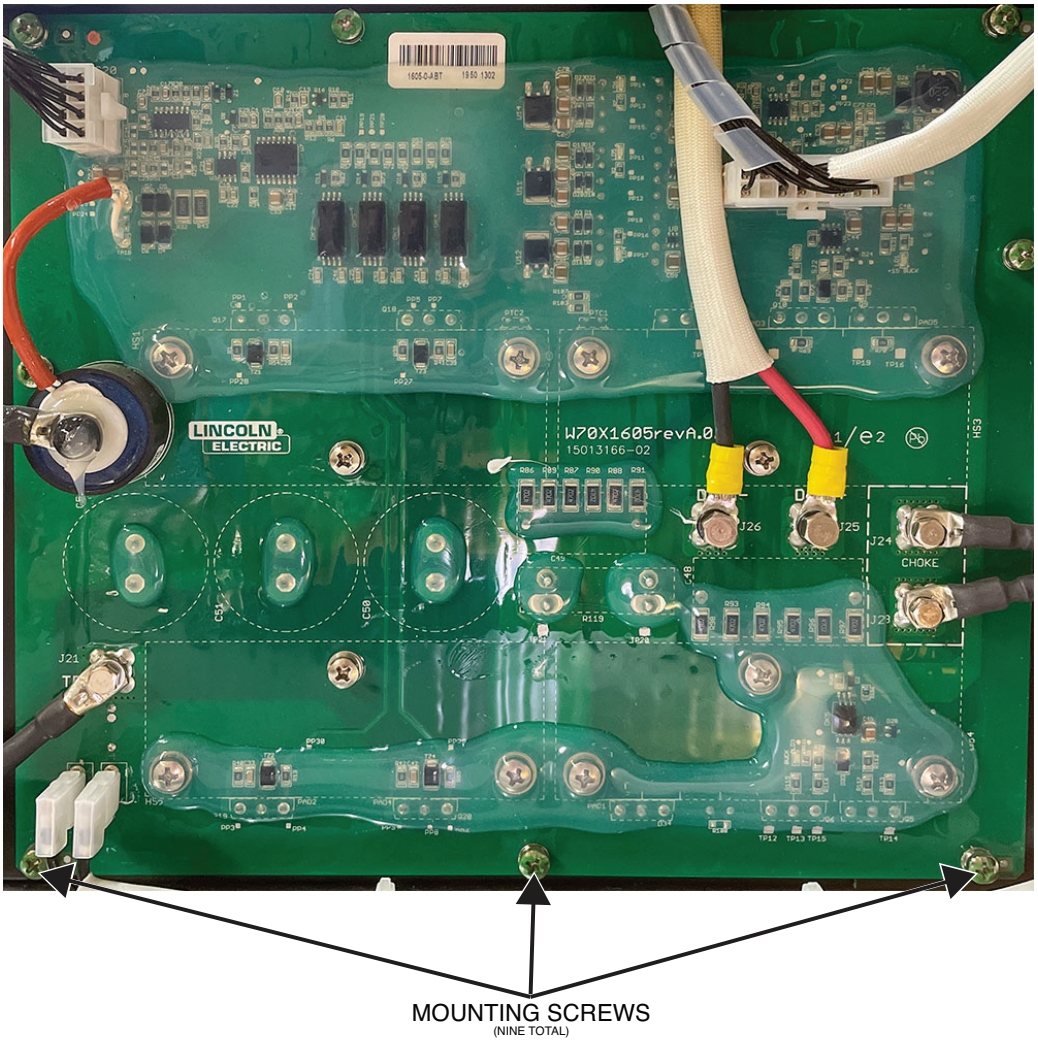


Figure F.2 – Inverter board mounting hardware locations



CURRENT TRANSDUCER REMOVAL (LEM) AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the LEM.

MATERIALS NEEDED

10mm Nutdriver
Phillips Screwdriver
Wiring Diagram

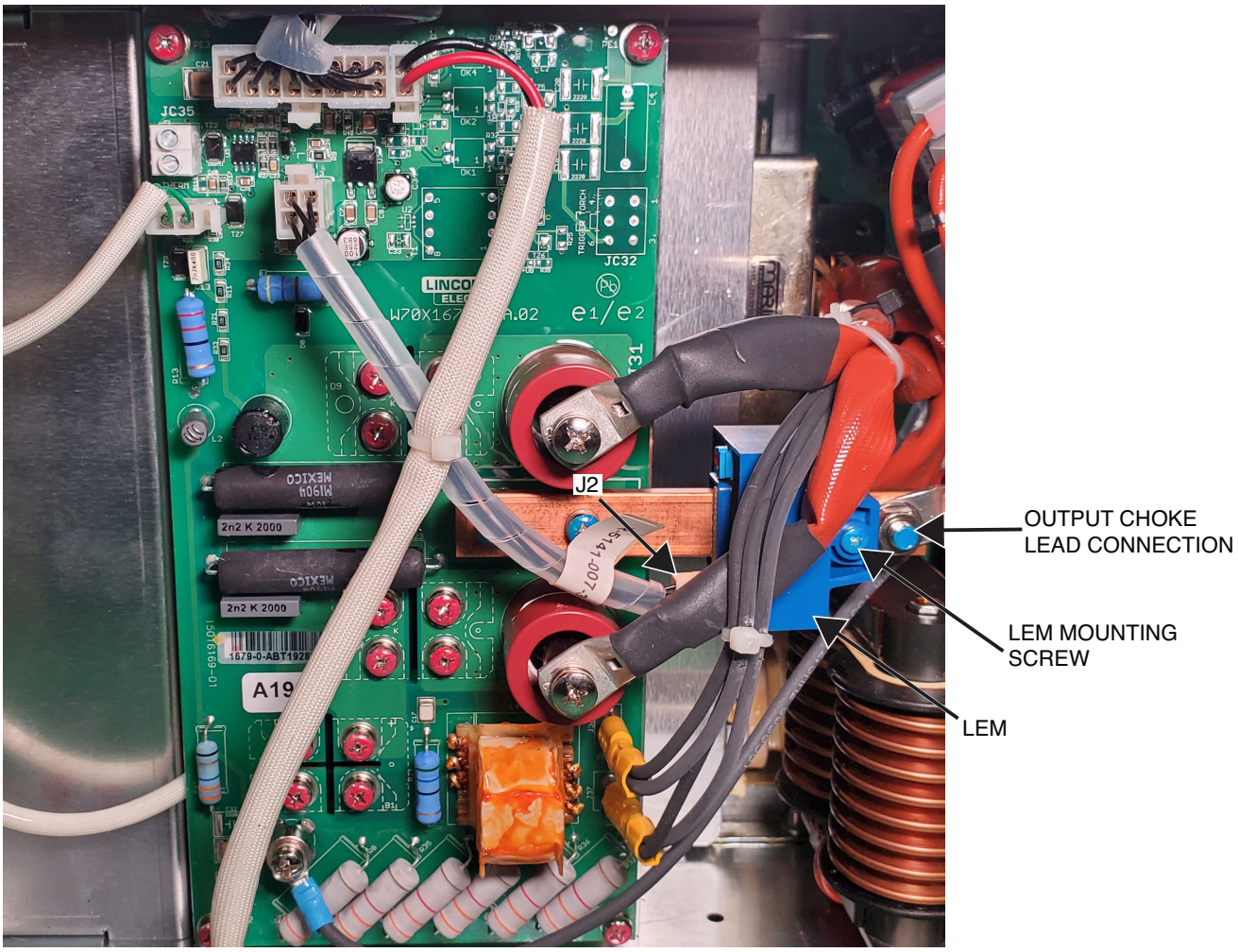
REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Label and disconnect plug J2 from the LEM. See ***Figure F.1***. See Wiring Diagram.
4. Using a 10mm nutdriver, remove the bolt, nut, lock washer and flat washer securing the output choke lead to the bus bar. See ***Figure F.1***. See Wiring Diagram.
5. Using a Philips screwdriver, remove the screw securing the LEM to the bus bar. See ***Figure F.1***. Note insulator placement for reassembly.
6. The LEM can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new LEM onto the bus bar.
2. Using a Philips screwdriver, attach the screw securing the LEM to the bus bar.
3. Using a 10mm nutdriver, attach the bolt, nut, lock washer and flat washer securing the output choke lead to the bus bar. See Wiring Diagram.
4. Connect plug J2 to the LEM. See Wiring Diagram.
5. Perform the ***Case Cover Replacement Procedure***.
6. Perform the ***Retest After Repair Procedure***.

Figure F.1 – LEM, plug J2, output choke lead connection and LEM mounting screw locations



INPUT POWER BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Input Power Board.

MATERIALS NEEDED

Phillips Screwdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Label and disconnect plugs JC13, JC10, JC11, JC12, JC14, JC15, JC19, JC16 and JC17 from the input power board. See ***Figure F.1***. See Wiring Diagram.
4. Using a Philips screwdriver, remove the screw, lock washer and flat washer securing the negative lead to the input power board. See ***Figure F.1***. See Wiring Diagram. Label and disconnect the negative lead.
5. Using a Philips screwdriver, remove the screw, lock washer and flat washer securing the positive lead to the POS terminal on the input power board. See ***Figure F.1***. See Wiring Diagram. Label and disconnect the positive lead.
6. Using a Philips screwdriver, remove the three screws, lock washers and flat washers securing leads to the ac terminals on the input rectifier module. See ***Figure F.1***. Label and disconnect the three AC leads.
7. Using a Philips screwdriver, remove the screw (at the positive input rectifier module terminal), lock washer and flat washer securing the input power board to the input rectifier module. See ***Figure F.1***.
8. Using a Philips screwdriver, remove the six screws, lock washers and flat washers securing the input power board to the machine. See ***Figure F.2***.
9. The input power board can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new input power board into the machine.
2. Using a Philips screwdriver, attach the six screws, lock washers and flat washers securing the input power board to the machine.

3. Using a Philips screwdriver, attach the screw (at the positive input rectifier module terminal), lock washer and flat washer securing the input power board to the input rectifier module.
4. Using a Philips screwdriver, attach the three screws, lock washers and flat washers securing leads to the ac terminals on the input rectifier module. See Wiring Diagram.
5. Using a Philips screwdriver, attach the screw, lock washer and flat washer securing the positive lead to the POS terminal on the input power board. See Wiring Diagram.
6. Using a Philips screwdriver, attach the screw, lock washer and flat washer securing the negative lead to the input power board. See Wiring Diagram.
7. Connect plugs JC13, JC10, JC11, JC12, JC14, JC15, JC19, JC16 and JC17 to the input power board. See Wiring Diagram.
8. Perform the ***Case Cover Replacement Procedure***.
9. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Input power board plug and lead locations

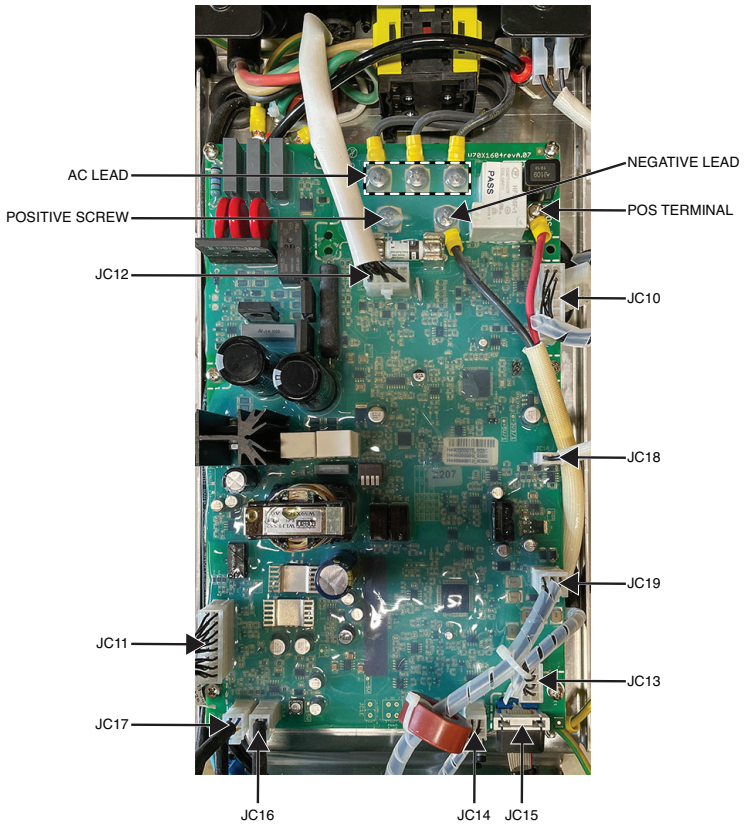
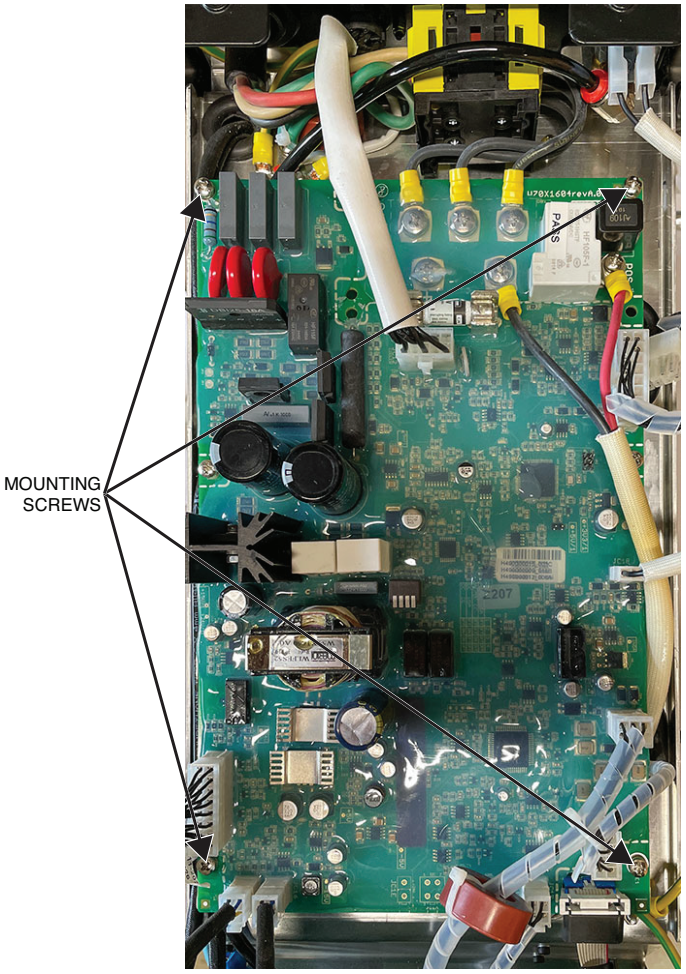


Figure F.2 – Input power board mounting hardware locations



HIGH FREQUENCY BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the High Frequency Board.

MATERIALS NEEDED

8mm Nutdriver
6mm Open-End Wrench
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Using an 8mm nutdriver, remove the four case front mounting screws. See ***Figure F.1***.
4. Using an 8mm nutdriver, remove the nut, lock washer and flat washer securing the ground lead to the case front. See Wiring Diagram.
5. Carefully disconnect ribbon connector JC14 from the input power board. See Wiring Diagram. This will allow for the front panel to be gently moved forward just enough to gain access to the components located behind.
6. Label and disconnect plug J71 from the high frequency board. See ***Figure F.2***. See Wiring Diagram.
7. Label and disconnect the two high frequency leads from the high frequency board. See ***Figure F.3***. See Wiring Diagram.
8. Using a 6mm open-end wrench, remove the four nuts, spacers and washers securing the high frequency board to the machine. See ***Figure F.3***.
9. The high frequency board can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new high frequency board into the machine.
2. Using a 6mm open-end wrench, attach the four nuts, spacers and washers securing the high frequency board to the machine.
3. Connect the two high frequency leads to the high frequency board. See Wiring Diagram.
4. Connect plug J71 to the high frequency board. See Wiring Diagram.
5. Connect ribbon connector JC14 to the input power board. See Wiring Diagram.

6. Using an 8mm nutdriver, attach the nut, lock washer and flat washer securing the ground lead to the case front. See Wiring Diagram.
7. Using an 8mm nutdriver, attach the four case front mounting screws.
8. Perform the ***Case Cover Replacement Procedure***.
9. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Case front mounting screw locations

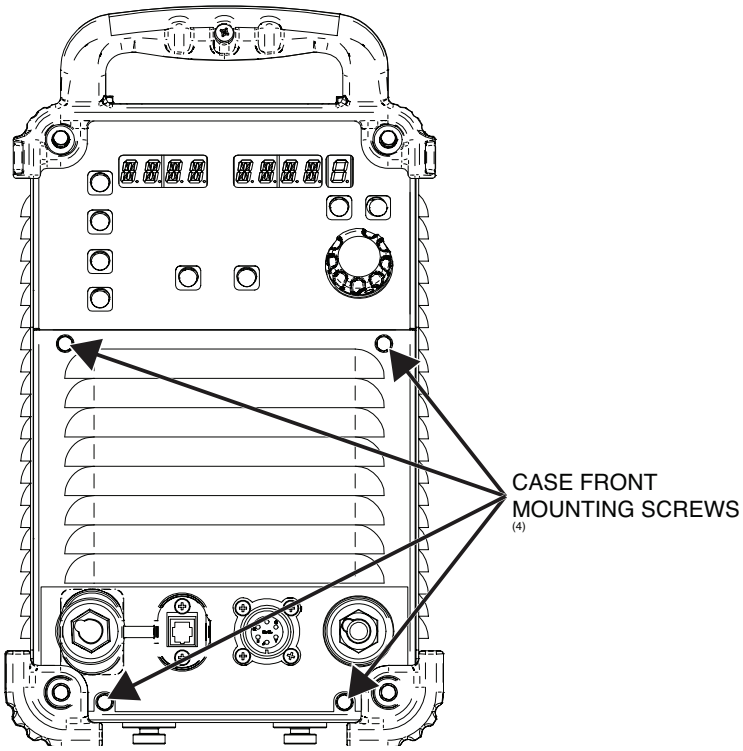
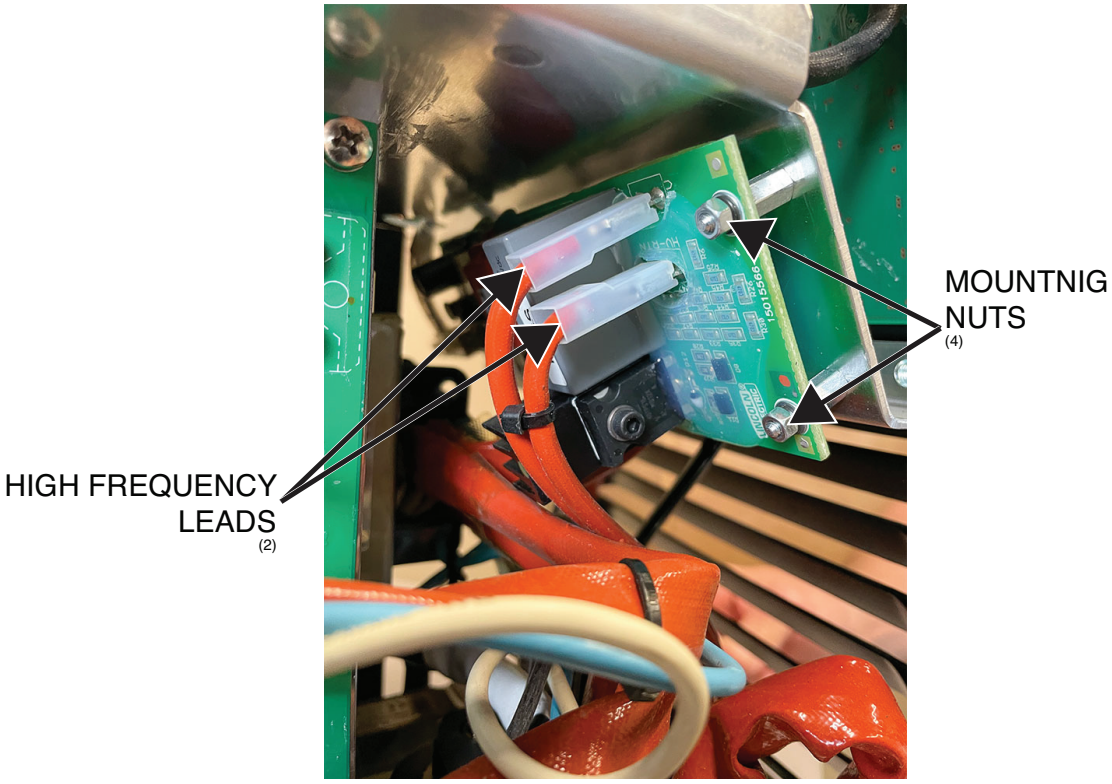


Figure F.2 – Plug J71 location

Figure F.3 – High frequency leads and mounting nut locations



CHOKE REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Choke.

MATERIALS NEEDED

8mm Nutdriver
8mm Open-End Wrench
Phillips Screwdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 AC/DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Using an 8mm nutdriver, remove the four case front mounting screws. See ***Figure F.1***.
4. Using an 8mm nutdriver, remove the nut, lock washer and flat washer securing the ground lead to the case front. See Wiring Diagram.
5. Carefully disconnect the ribbon connector JC14 from the input power board. See Wiring Diagram. This will allow for the front panel to be gently moved forward just enough to gain access to the components located behind.
6. Using an 8mm nutdriver, and an 8mm open-end wrench, remove the bolt, nut and associated washers securing the heavy lead and small snubber to the Choke. Note washer placement for reassembly. See ***Figure F.2***. See Wiring Diagram.
7. Using an 8mm nutdriver, and an 8mm open-end wrench, remove the bolt, nut and associated washers connecting the Choke to the output power board. Note washer placement for reassembly. See ***Figure F.2***. See Wiring Diagram.
8. Perform the ***Internal Base Removal Procedure***.
9. Using a Philips screwdriver, remove the two screws, lock washers and flat washers securing the Choke to the machine. See ***Figure F.3***.
10. The Choke can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new Choke into the machine.

2. Using a Philips screwdriver, attach the two screws, lock washers and flat washers securing the Choke to the machine.
3. Perform the ***Internal Base Replacement Procedure***.
4. Using an 8mm nutdriver, and an 8mm open-end wrench, attach the bolt, nut and associated washers connecting the Choke to the output power board.
5. Using an 8mm nutdriver, and an 8mm open-end wrench, attach the bolt, nut and associated washers securing the heavy lead and small snubber to the Choke. See Wiring Diagram.
6. Connect the ribbon connector JC14 to the input power board. See Wiring Diagram.
7. Using an 8mm nutdriver, attach the nut, lock washer and flat washer securing the ground lead to the case front. See Wiring Diagram.
8. Using an 8mm nutdriver, attach the four case front mounting screws.
9. Perform the ***Case Cover Replacement Procedure***.
10. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Case front mounting screw locations

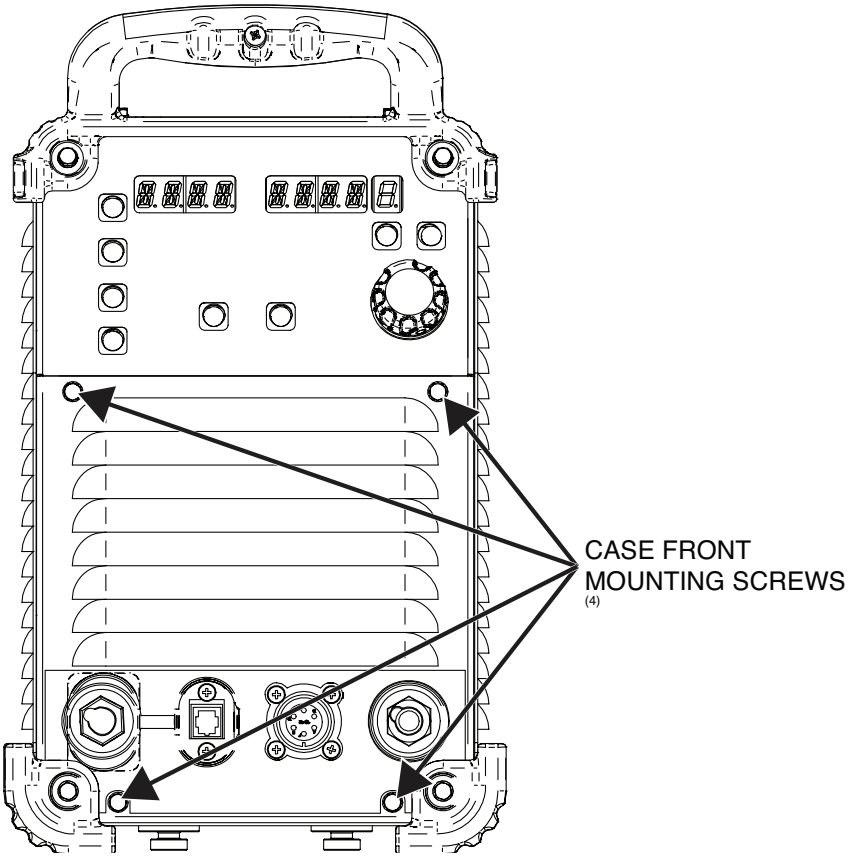


Figure F.2 – Choke lead locations

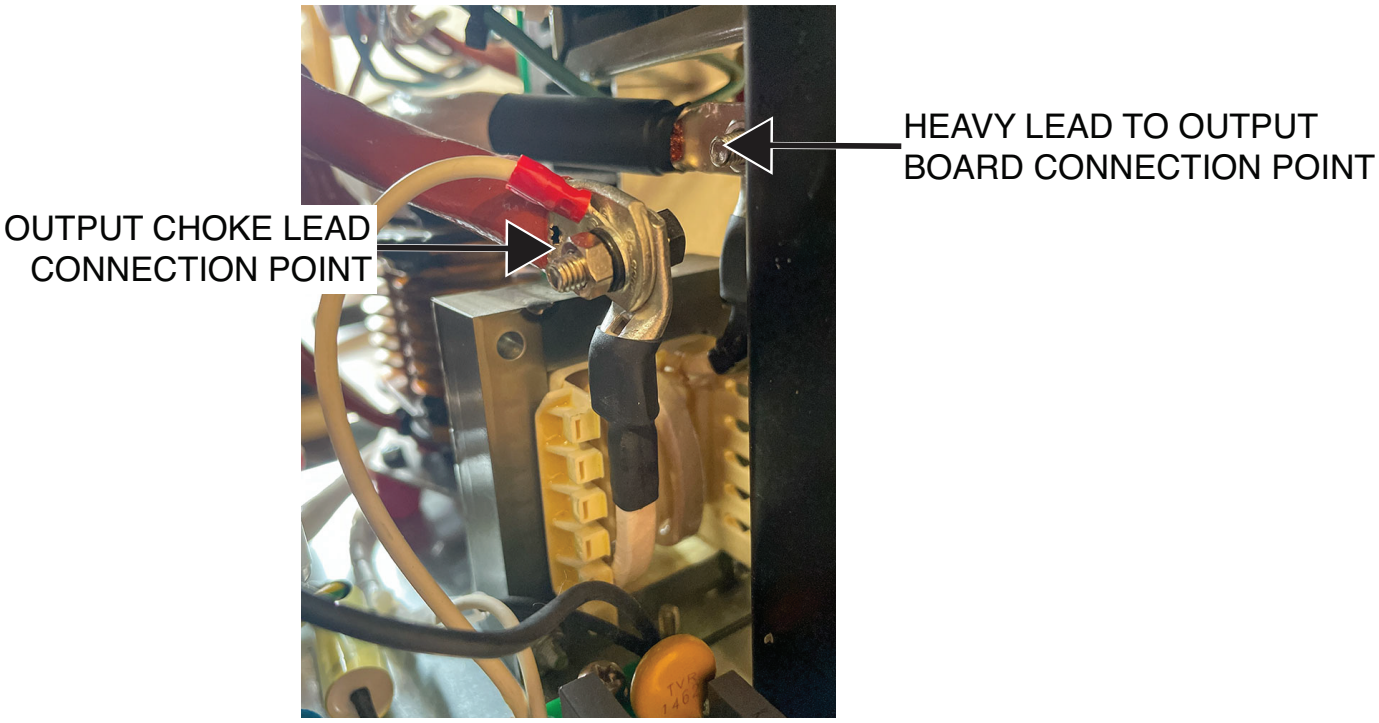
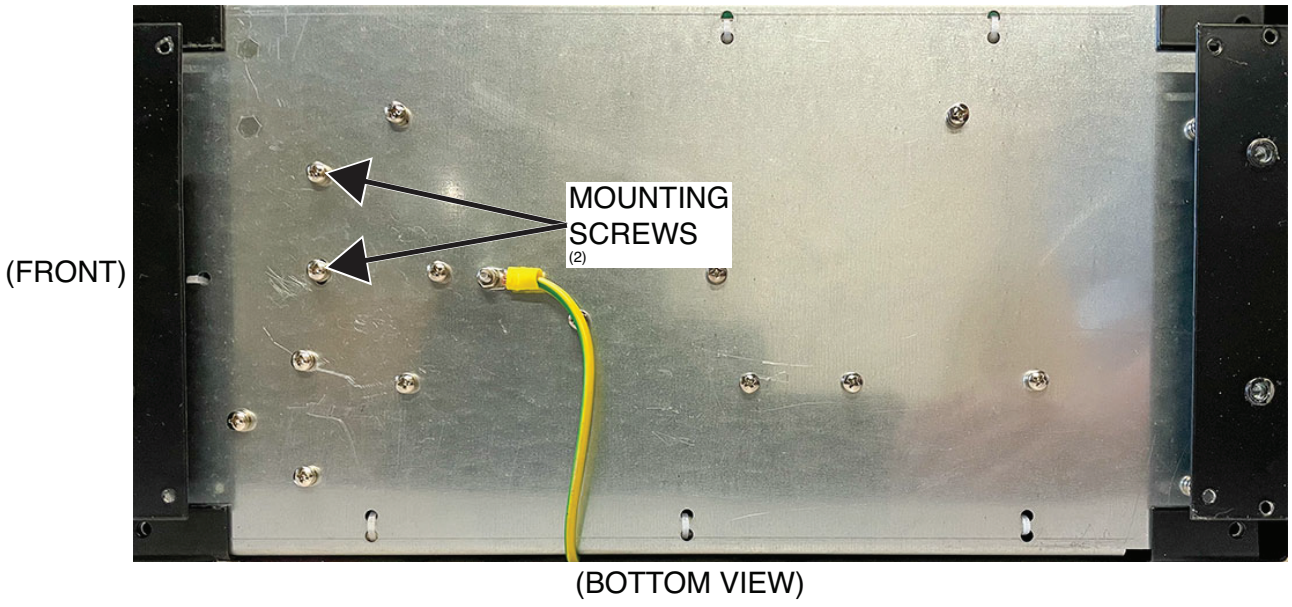


Figure F.3 – Choke mounting screw locations



HIGH FREQUENCY TRANSFORMER REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the High Frequency Transformer.

MATERIALS NEEDED

8mm Nutdriver
13mm Wrench
17mm Wrench
Phillips Screwdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 AC/DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Using an 8mm nutdriver, remove the four case front mounting screws. See ***Figure F.1***.
4. Using an 8mm nutdriver, remove the nut, lock washer and flat washer securing the ground lead to the case front. See Wiring Diagram.
5. Carefully disconnect the ribbon connector JC14 from the input power board. See Wiring Diagram. This will allow for the front panel to be gently moved forward just enough to gain access to the components located behind.
6. Remove the two Primary Leads from the High Frequency Board, see ***Figure F.2***.
7. Using an 8mm nutdriver, disconnect the heavy lead connecting the High Frequency Transformer to the Choke. See ***Figure F.3***. See Wiring Diagram.
8. Using a 13mm wrench and a 17mm wrench, remove the High Frequency Transformer lead from the electrode output terminal. See ***Figure F.4***. See Wiring Diagram.
9. Perform the ***Internal Base Removal Procedure***.
10. Using a Philips screwdriver, remove the three screws, lock washers and flat washers securing the High Frequency Transformer to the case base. See ***Figure F.5***.
11. The High Frequency Transformer can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new High Frequency Transformer into the machine.

2. Using a Philips screwdriver, attach the three screws, lock washers and flat washers securing the High Frequency Transformer to the case base.
3. Perform the ***Internal Base Replacement Procedure***.
4. Using a 13mm wrench and a 17mm wrench, attach the High Frequency Transformer lead to the electrode output terminal. See Wiring Diagram.
5. Using an 8mm nutdriver, connect the heavy lead connecting the High Frequency Transformer to the Choke. See Wiring Diagram.
6. Connect the two Primary Leads from the High Frequency Board
7. Connect the ribbon connector JC14 to the input power board. See Wiring Diagram.
8. Using an 8mm nutdriver, attach the nut, lock washer and flat washer securing the ground lead to the case front. See Wiring Diagram.
9. Using an 8mm nutdriver, attach the four case front mounting screws.
10. Perform the ***Case Cover Replacement Procedure***.
11. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Case front mounting screw locations

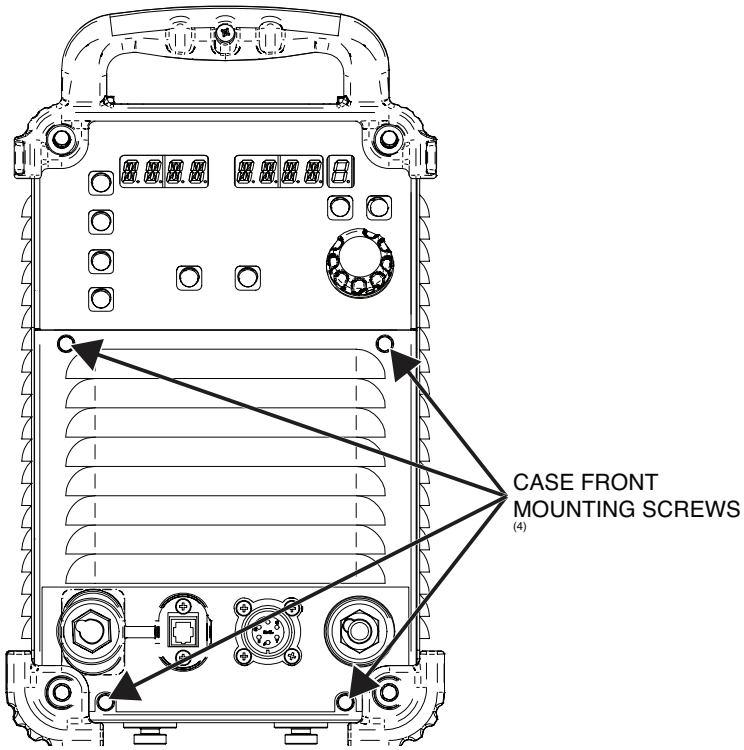


Figure F.2 – High Frequency Transformer Primary Lead connections

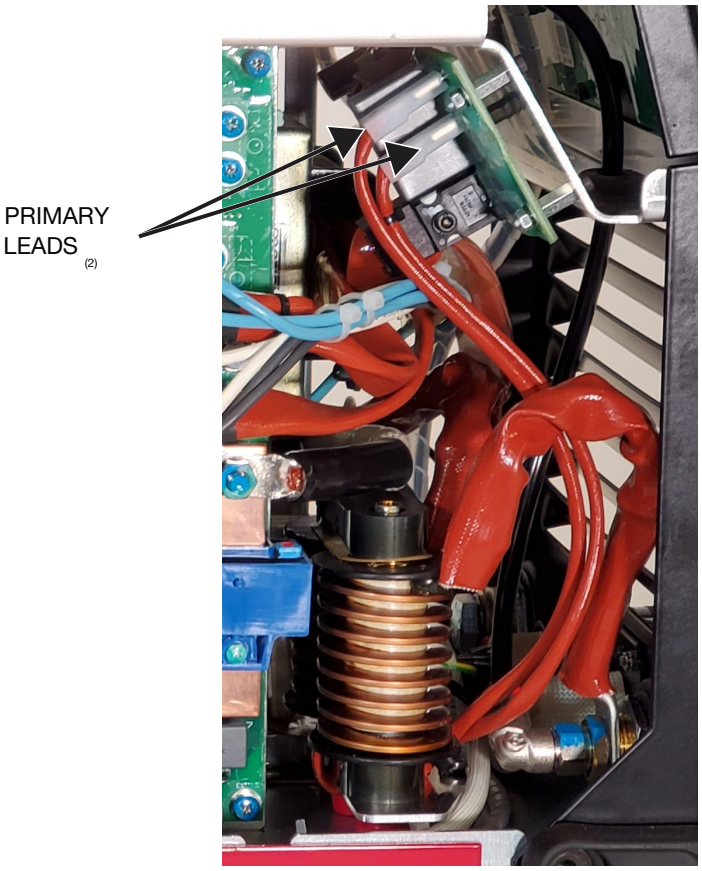


Figure F.3 – High Frequency Transformer heavy lead connection point location

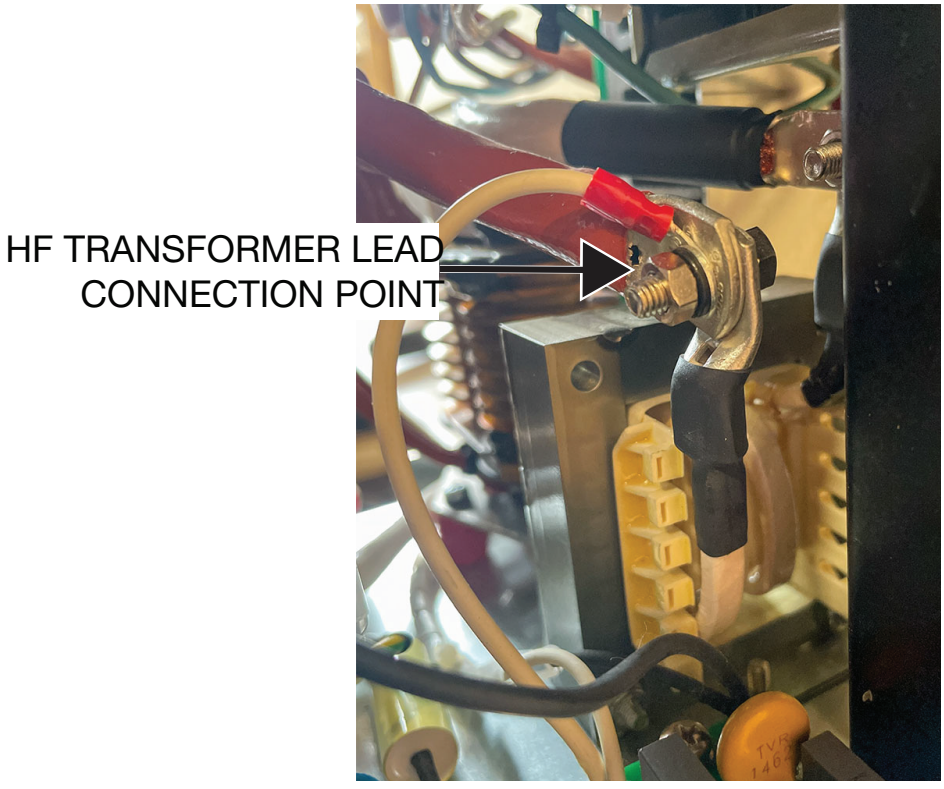


Figure F.4 – High Frequency Transformer lead location

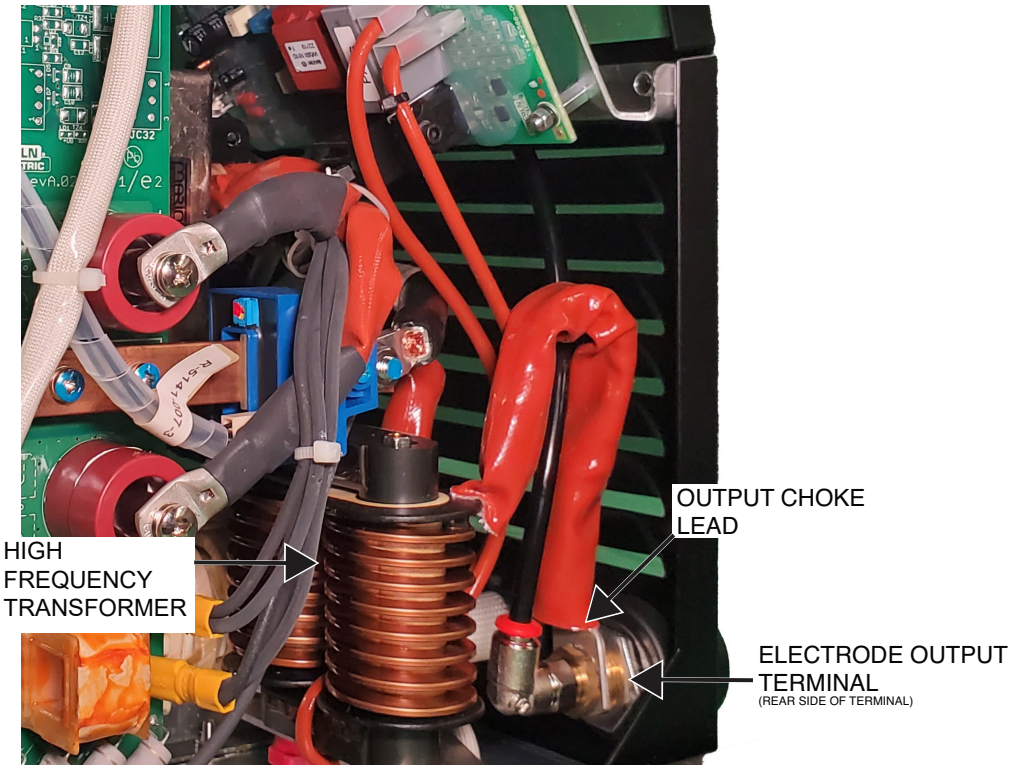
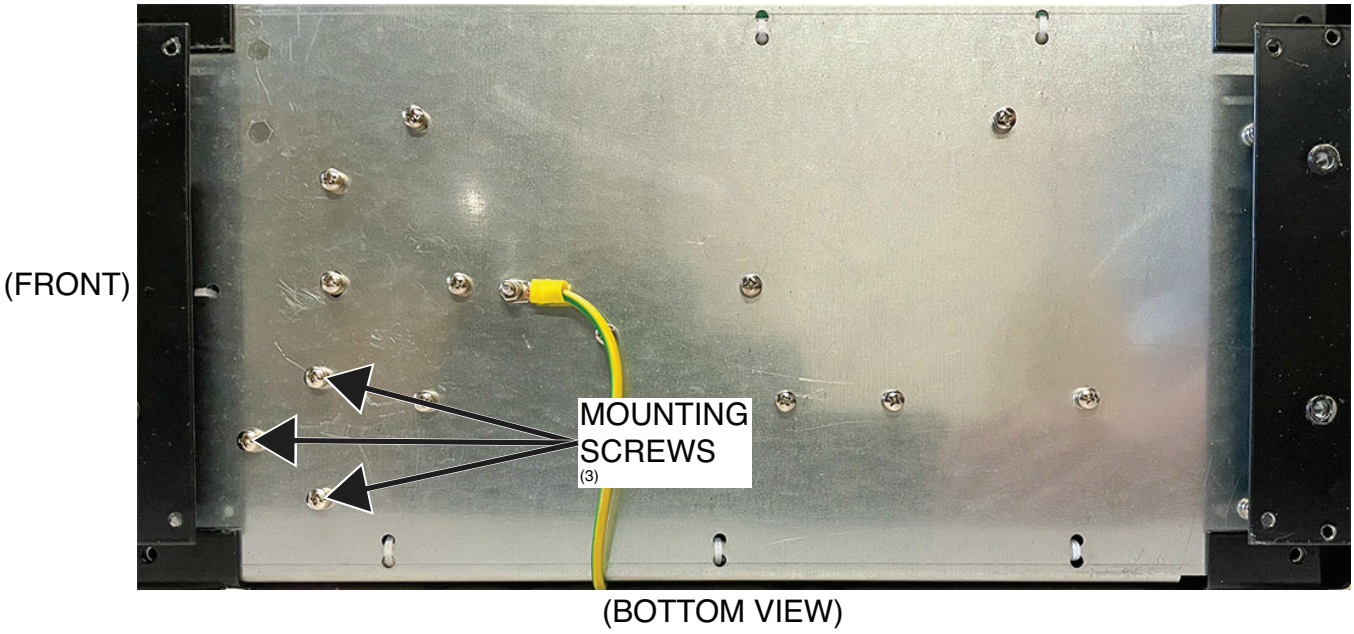


Figure F.5 – High Frequency Transformer mounting hardware locations



DISPLAY BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Display Board.

MATERIALS NEEDED

8mm Nutdriver
2mm Allen Nutdriver
2.5mm Nutdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Using an 8mm nutdriver, remove the four case front mounting screws. See ***Figure F.1***.
4. Using an 8mm nutdriver, remove the nut, lock washer and flat washer securing the ground lead to the case front. See Wiring Diagram.
5. Carefully disconnect the ribbon connector JC14 from the input power board. See Wiring Diagram. This will allow for the front panel to be gently moved forward just enough to gain access to the components located behind.
6. Using a 2mm Allen nutdriver, loosen the set screw securing the encoder knob to the front panel. See ***Figure F.2***. Retain encoder knob for reassembly.
7. Using a 2.5mm nutdriver, remove the six screws securing the display board to the machine. See ***Figure F.3***.
8. The display board can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new display board into the machine.
2. Using a 2.5mm nutdriver, attach the six screws securing the display board to the machine.
3. Using a 2mm Allen nutdriver, loosen the set screw securing the encoder knob to the front panel.
4. Connect the ribbon connector JC14 to the input power board. See Wiring Diagram.
5. Using an 8mm nutdriver, attach the nut, lock washer and flat washer securing the ground lead to the case front. See Wiring Diagram.

6. Using an 8mm nutdriver, attach the four case front mounting screws.
7. Perform the ***Case Cover Replacement Procedure***.
8. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Case front mounting screw locations

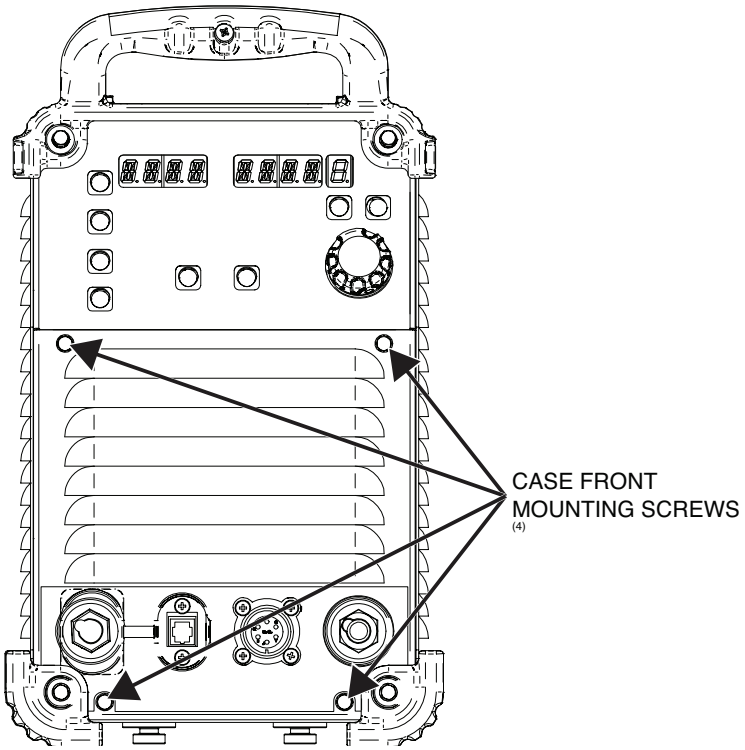


Figure F.2 – Encoder knob location

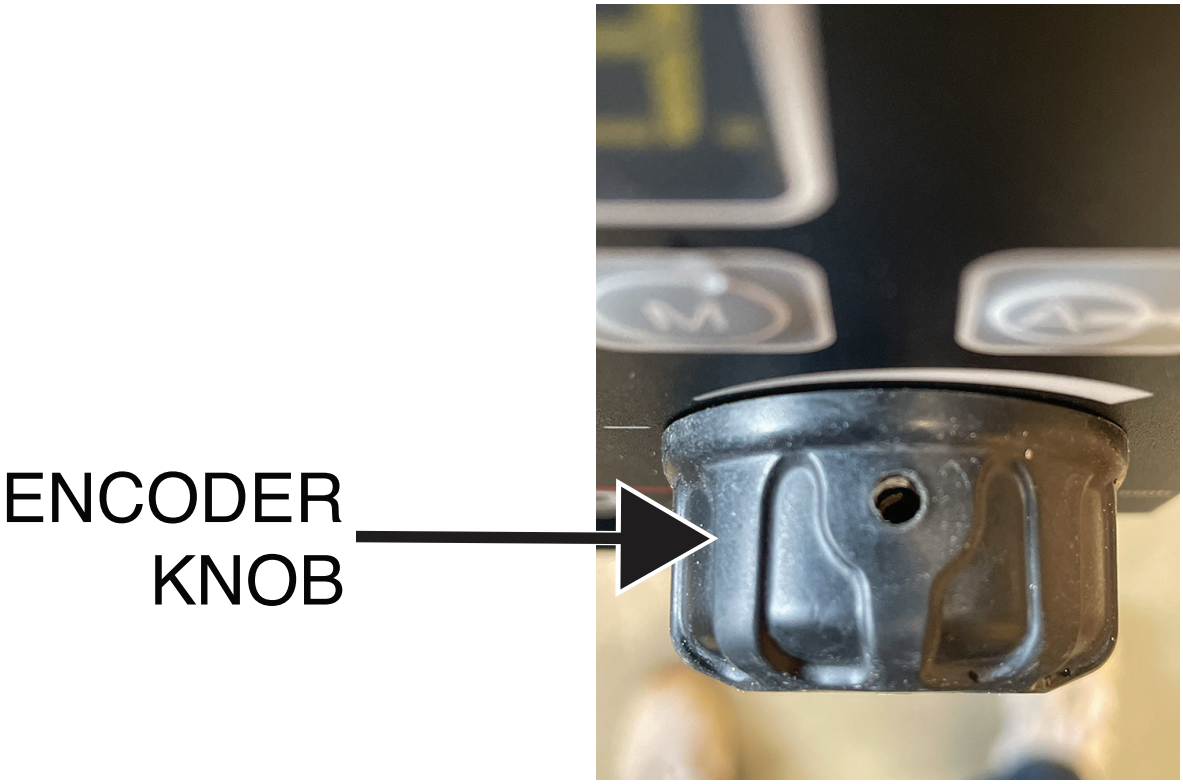
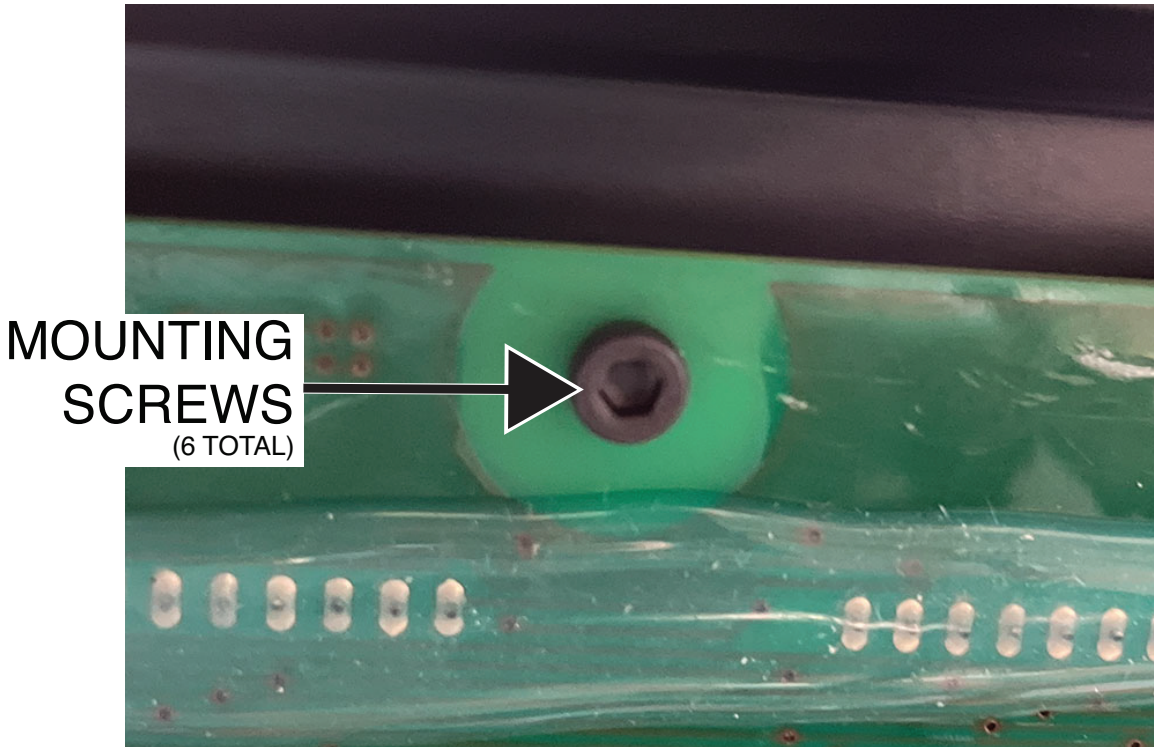


Figure F.3 – Display board mounting screw locations



MAIN TRANSFORMER REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Main Transformer.

MATERIALS NEEDED

Phillips Screwdriver
7mm Nutdriver
Wiring Diagram

REMOVAL PROCEDURE

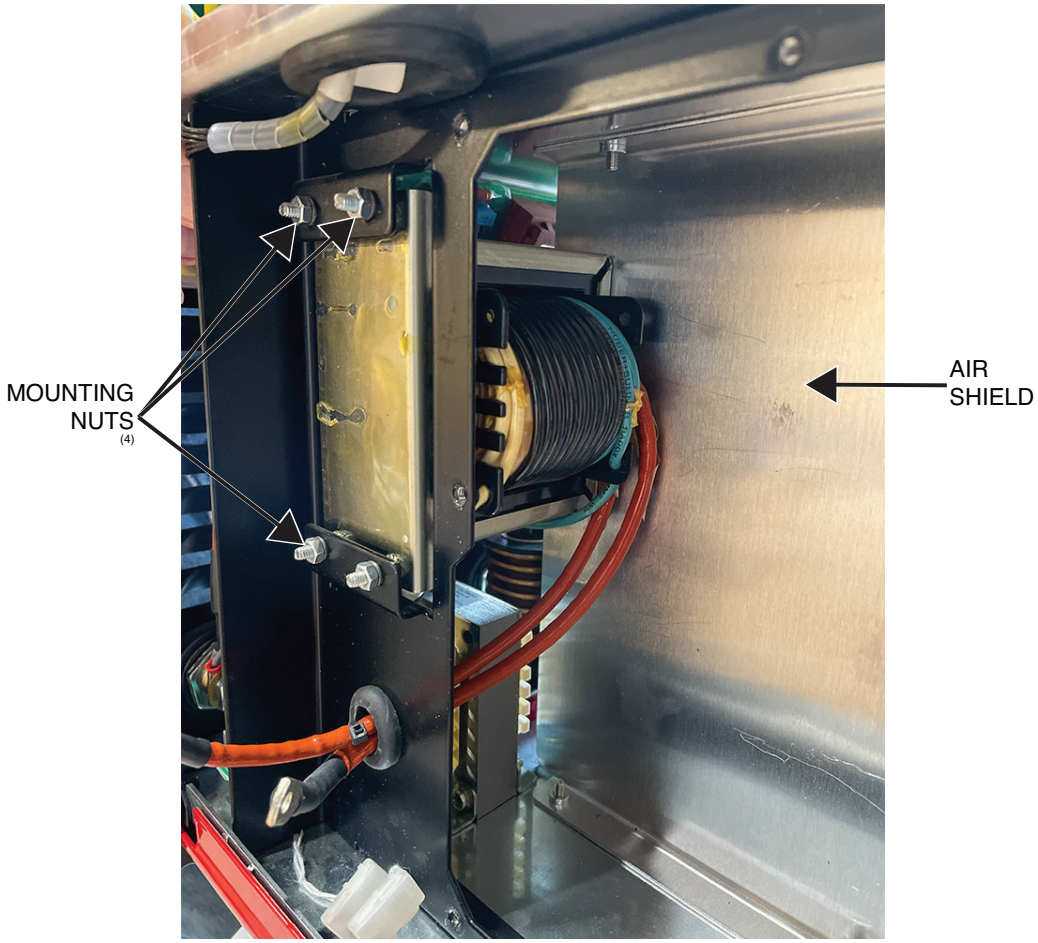
1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Perform the ***Inverter Board Removal Procedure***.
4. Perform the ***Input Power Board Removal Procedure***.
5. Perform the ***Internal Base Removal Procedure***.
6. Using a Philips screwdriver, remove the four screws and washers securing the air shield to the machine. See ***Figure F.1***.
7. Carefully maneuver the air shield to allow for the removal of the main transformer.
8. Using an 7mm nutdriver, remove the four nuts and lock washers securing the main transformer to the machine. See ***Figure F.1***.
9. The main transformer can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new main transformer into the machine.
2. Using an 7mm nutdriver, attach the four nuts and lock washers securing the main transformer to the machine.
3. Carefully maneuver the air shield into its proper position.
4. Using a Philips screwdriver, attach the four screws and washers securing the air shield to the machine.
5. Perform the ***Internal Base Replacement Procedure***.
6. Perform the ***Input Power Board Replacement Procedure***.
7. Perform the ***Inverter Board Replacement Procedure***.

8. Perform the ***Case Cover Replacement Procedure***.
9. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Air shield and mounting hardware locations



OUTPUT POWER BOARD REMOVAL AND REPLACEMENT PROCEDURE

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 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 the removal and replacement of the Output Power Board.

MATERIALS NEEDED

Phillips Screwdriver
10mm Nutdriver
Wiring Diagram

REMOVAL PROCEDURE

1. Carefully remove input power to the Aspect 230 DC machine.
2. Perform the ***Case Cover Removal Procedure***.
3. Label and disconnect leads J36 and J37 from the output power board. See ***Figure F.1***. See Wiring Diagram.
4. Using a Philips screwdriver, remove the screw, lock washer and flat washer securing the two leads to terminal J31 on the output power board. See ***Figure F.1***. See Wiring Diagram. Label leads for reassembly.
5. Using a Philips screwdriver, remove the screw, lock washer and flat washer securing the two leads to terminal J32 on the output power board. See ***Figure F.1***. See Wiring Diagram. Label leads for reassembly.
6. Using a Philips screwdriver, remove the screw, lock washer and flat washer securing the lead to terminal J35 on the output power board. See ***Figure F.1***. See Wiring Diagram. Label lead for reassembly.
7. Label and disconnect plugs JC30, JC31, JC33 and JC34 from the output power board. See ***Figure F.1***. See Wiring Diagram.
8. Label and disconnect plug J2 from the LEM. See ***Figure F.1***. See Wiring Diagram.
9. Using a 10mm nutdriver, remove the bolt, nut, lock washer and flat washer securing the output choke lead to the output power board bus bar. See ***Figure F.1***. See Wiring Diagram. Label leads for reassembly.
10. Using a Philips screwdriver, remove the 14 screws and associated washers securing the output power board the machine. See ***Figure F.2***. Retain the bus bar for reassembly.
11. Remove the four standoffs from the output power board.
12. Using a Philips screwdriver, remove the four screws, lock washers and flat washers securing the output power board to the machine. See ***Figure F.2***.

13. Using a Philips screwdriver, remove the ten screws (five in top and five on bottom) securing the heatsink to the machine.
14. Cut cable ties as necessary to allow for the removal of the output power board.
15. The output power board can now be removed and replaced.

REPLACEMENT PROCEDURE

1. Carefully position the new output power board into the machine.
2. Using a Philips screwdriver, attach the ten screws (five in top and five on bottom) securing the heatsink to the machine.
3. Using a Philips screwdriver, attach the four screws, lock washers and flat washers securing the output power board to the machine.
4. Attach the four standoffs to the output power board.
5. Carefully position the bus bar onto the output power board.
6. Using a Philips screwdriver, attach the 14screws and associated washers securing the output power board the machine.
7. Using a 10mm nutdriver, attach the bolt, nut, lock washer and flat washer securing the output choke lead to the output power board bus bar. See Wiring Diagram.
8. Connect plug J2 to the LEM. See Wiring Diagram.
9. Connect plugs JC30, JC31, JC33 and JC34 to the output power board. See Wiring Diagram.
10. Using a Philips screwdriver, attach the screw, lock washer and flat washer securing the leads to terminal J35 on the output power board. See Wiring Diagram.
11. Using a Philips screwdriver, attach the screw, lock washer and flat washer securing the two leads to terminal J32 on the output power board. See Wiring Diagram.
12. Using a Philips screwdriver, attach the screw, lock washer and flat washer securing the two leads to terminal J31 on the output power board. See Wiring Diagram.
13. Connect leads J36 and J37 to the output power board. See Wiring Diagram.
14. Replace cable ties as necessary.
15. Perform the ***Case Cover Replacement Procedure***.
16. Perform the ***Retest After Repair Procedure***.

Figure F.1 – Output power board terminal, plug and lead locations

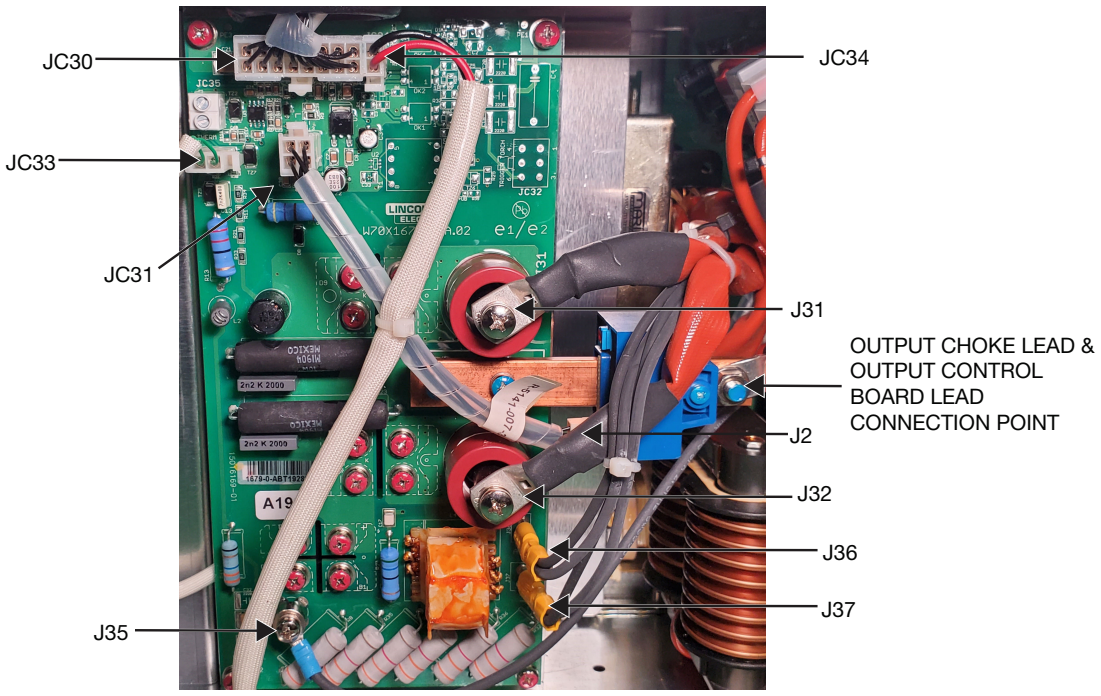
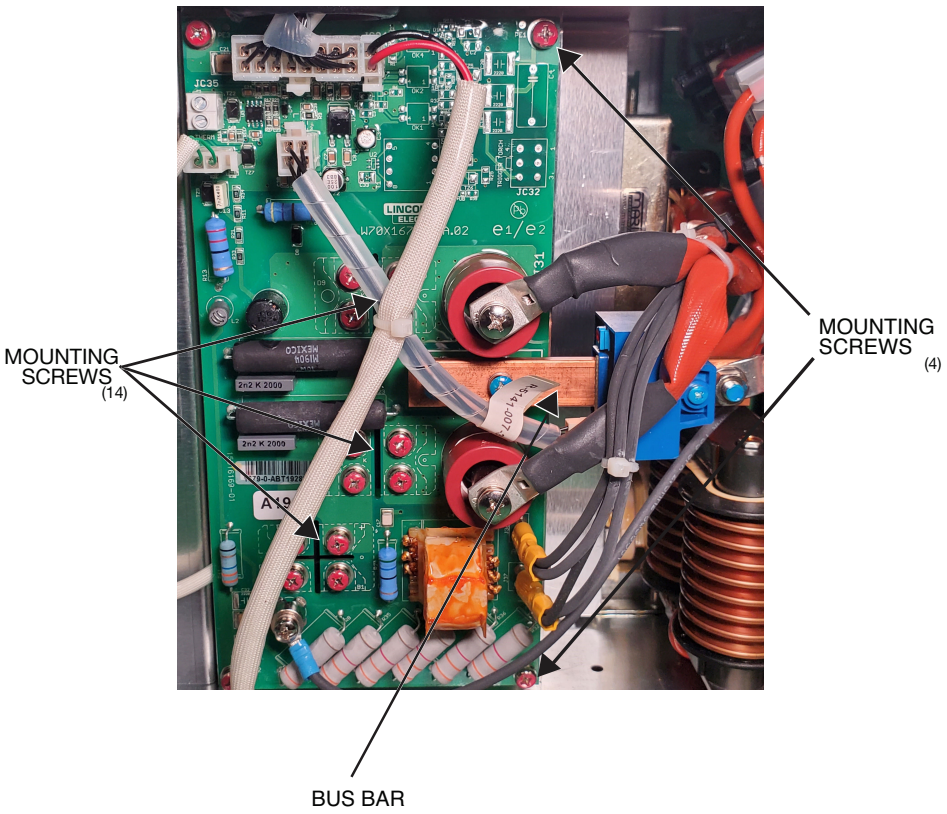


Figure F.2 – Output power board mounting screw and bus bar locations



ASPECT 230 DC

RETEST AFTER REPAIR

Retest a Machine:

- If a machine is rejected under test for any reason that requires you to remove any mechanical part which could affect the machine's electrical characteristics**.**

OR

- If you repair or replace any electrical components**.**

Inputs at Rated Machine Output

Input Voltage	Input Current
120 VAC Single Phase	31 Amps
208 VAC Three Phase	19 Amps
230 VAC Three Phase	17 Amps
380-415 VAC Three Phase	10 Amps
460 VAC Three Phase	9 Amps

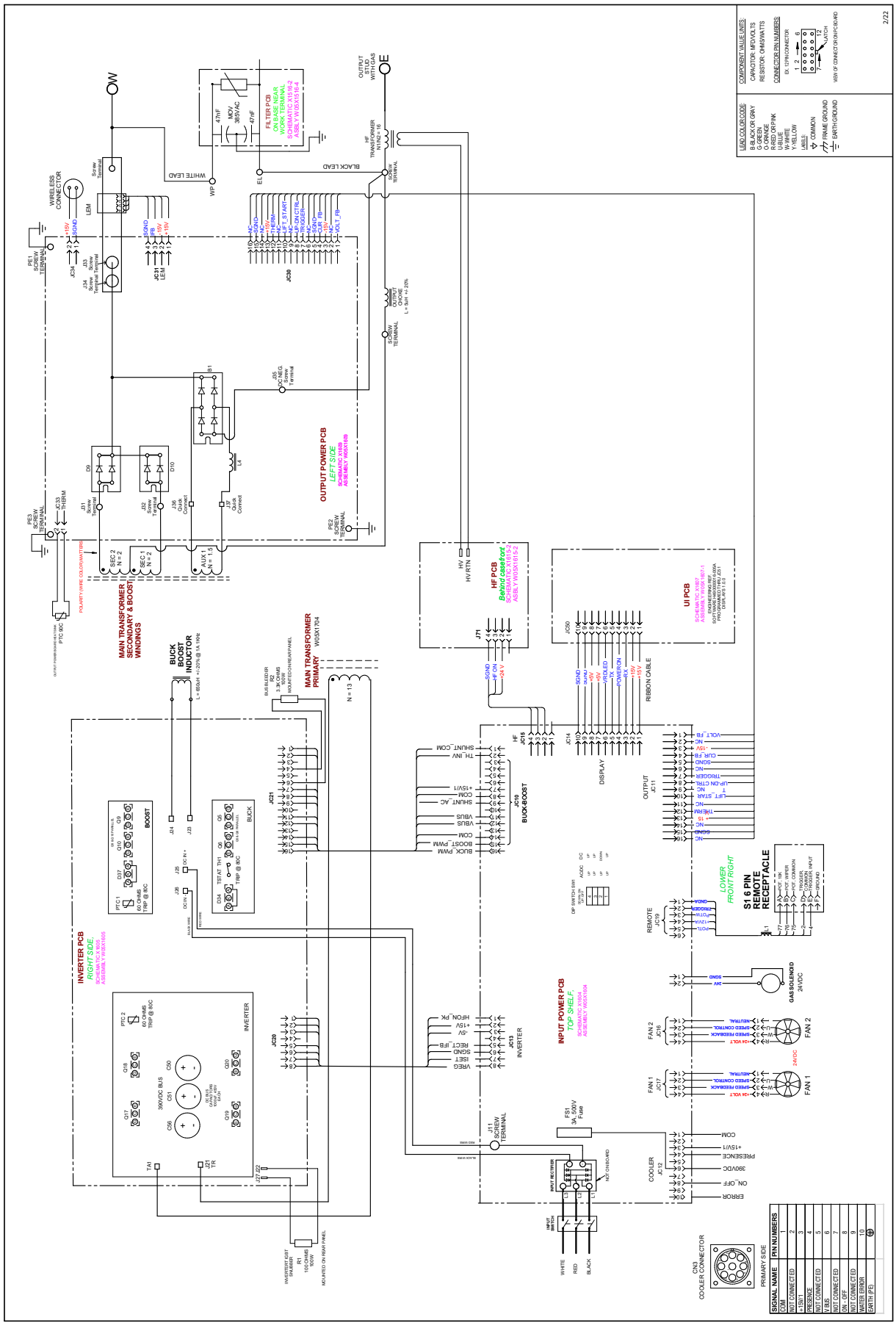
Rated Outputs

Input Voltage	Duty Cycle	Rated Output
120 VAC Single Phase	100%	GTAW 110A @ 14.4 VDC SMAW 70A @ 22.8 VDC
208 VAC to 460 VAC Three Phase	100%	GTAW 160A @ 16.4 VDC SMAW 120A @ 24.8 VDC

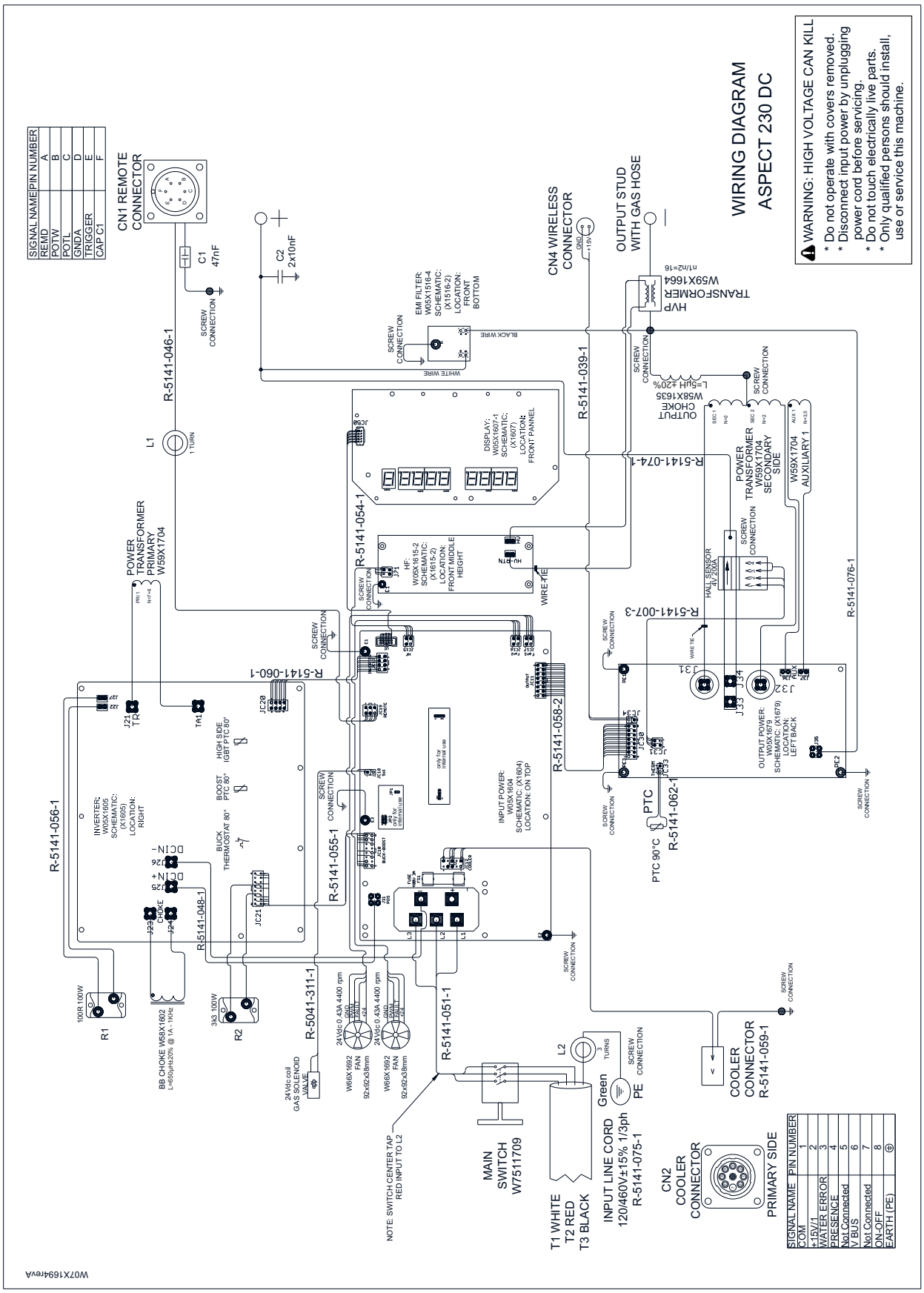
Output Ranges

Input Voltage	Type of Output	Output Range	Maximum Open Circuit Voltage
120 VAC Single Phase	GTAW DC	2 – 150 Amps	105 Volts
120 VAC Single Phase	SMAW DC	5 -100 Amps	91 Volts
208 VAC to 460VAC Three Phase	GTAW DC	2 – 230 Amps	105 Volts
208 VAC to 460VAC Three Phase	SMAW DC	5 – 180 Amps	91 Volts

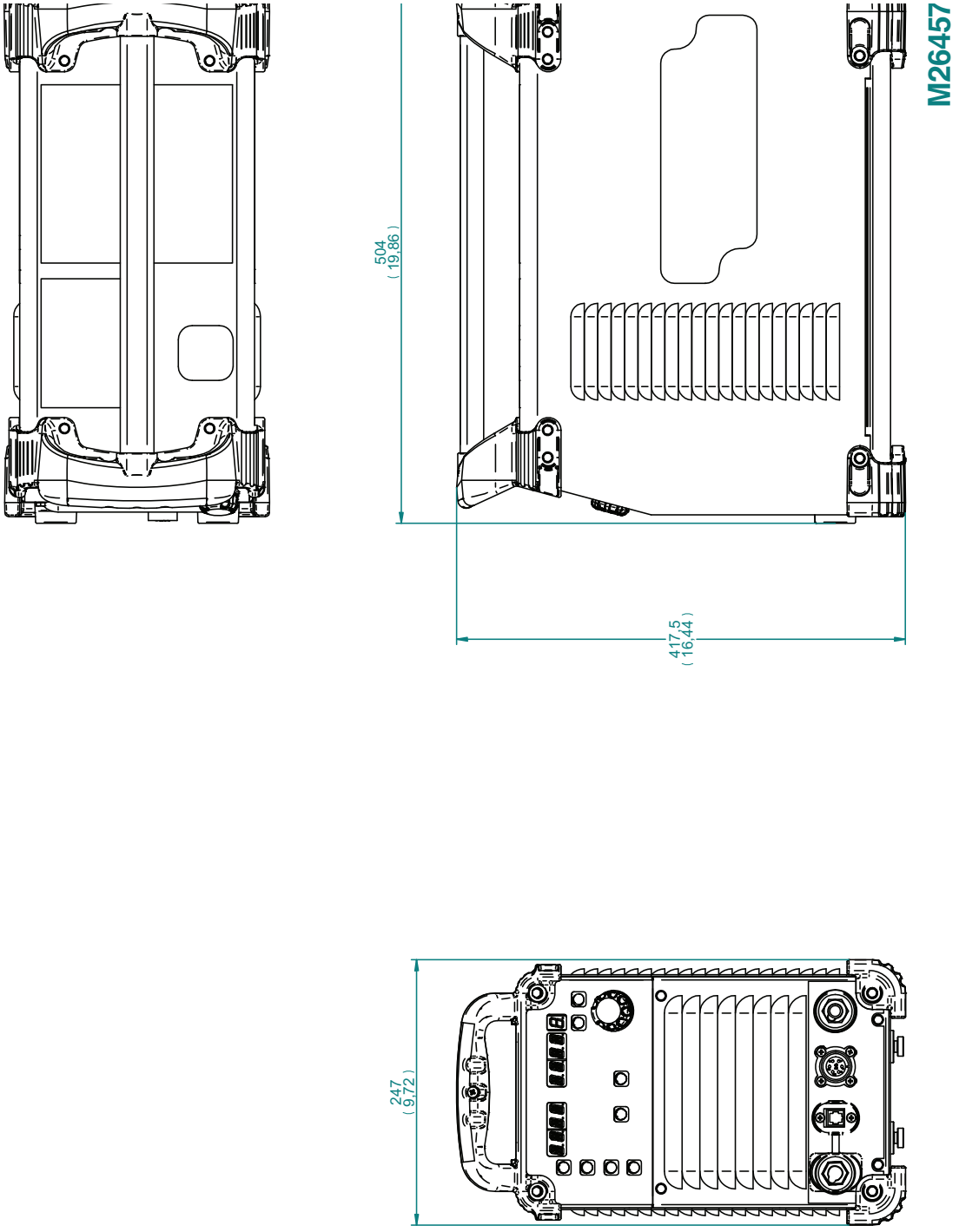
ASPECT 230 DC MACHINE SCHEMATIC G10632 REV: A.01



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



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



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

2 Step – When the gun trigger is pulled, the welding system cycles through the arc starting sequence and into the main welding parameters. The welding system will continue to weld as long as the gun trigger is activated. Once the trigger is released, the welding system cycles through the arc ending steps.

3 Phase voltage – Three AC voltage sources that are phase shifted 120° with respect to each other.

4 Step – The 4 step trigger adds to the welder's comfort when making long welds by allowing the trigger to be released after an initial trigger pull. When the gun trigger is pulled, the welding system cycles through the arc starting sequence and into the main welding parameters. Welding stops when the trigger is pulled a second time and then released and the welding system cycles through the arc ending steps.

A-lead – The single wire used to configure the machine reconnect for various input Voltages.

AC (Alternating Current) – Voltage or current that changes polarity or direction, respectively, over time.

Active Condition – The machine is energized either by connection to a power source or has some kind of mechanical motion within the unit.

Alternator – An electric generator that produces alternating current. The main function of this device is to change mechanical energy into electrical energy. The mechanical energy can be supplied by either a motor or engine.

Ampere (Amp) – The standard measurement unit of current flow. Symbol: A

Anode – The positively charged electrode of a device.

Arc Control (Pinch) – Adjusts how quickly the current will rise when the wire is shorted to the work resulting in a soft or crisp arc.

Arc Force – A temporary increase of the output current during SMAW welding when the arc is too short.

Arc Length – The physical gap between the end of the electrode and the weld puddle.

Across the Arc – The device is electrically connected to the welding terminals. This device is powered by the same voltage that is used for welding.

Arc-link cable – Used between the power source and wire feeder in a bench system and between the power source, control box and wire drive in a boom system. This 5 pin cable supplies voltage from the power source to power the feeder and also transmits digital signals between the two.

Armature – The part of an electric device that includes the main current-carrying winding and in which the electromotive force is induced.

Armature Reaction – A force set up by the current induced in the armature of a generator that results in altering as to both magnitude and direction the flux due to the field magnet.

Asynchronous Welder Generator – An alternator that utilizes an air-gap rotating magnetic-field between a stator and a rotor to interact with an induced current in a rotor winding. It is sometimes called an induction generator.

Auxiliary Windings – Stator winding used to power the auxiliary connections.

Battery – A combination of two or more cells electrically connected to work together to produce electric energy.

Block Diagram – visual representation of a machine that utilizes simplified blocks to represent the principal parts or functions of the machine.

Boost Converter – The boost converter increases applied voltage to a higher level. This circuitry only applies to DC voltage and is only active if the applied voltage is below a predetermined value.

Bridge Rectifier – A type of full wave rectifier which uses four or more diodes in a bridge circuit configuration to efficiently convert the Alternating Current (AC) into Direct Current (DC).

Brushes – An electrical contact which conducts current between stationary wires and moving parts, most commonly in a rotating shaft.

Buck Converter – The buck converter decreases applied voltage to a lower level. This circuitry only applies to DC voltage and is only active if the applied voltage is above a predetermined value.

Buck/Boost Converter – The combined buck/boost circuitry is utilized to increase or decrease an applied voltage to a predetermined value.

CAN communication – Controller Area Network (CAN bus) is a robust vehicle bus standard designed to allow microcontrollers and devices to communicate with each other's applications without a host computer. It broadcasts messages to the nodes presented in a network.

Cathode – The negatively charged electrode of a device.

Capacitance – The ability of a body to store an electrical charge.

Capacitor – A device used to store an electric charge, consisting of one or more pairs of conductors separated by an insulator. Capacitance is measured in Farad's (F) and some capacitors are polarity sensitive which is typically noted on the device as such.

Circuit Breaker – A device to prevent excessive current flow in a circuit that may be caused by a short circuit or heavy loads. The circuit breaker will stop the flow of current (open) if such a situation occurs.

Collector – The positively charged electrode of a transistor device.

Commutator – A cylindrical ring or disk assembly of conducting members, individually insulated in a supporting structure with an exposed surface for contact with current-collecting brushes and mounted on the armature shaft, for changing the frequency or direction of the current in the armature windings.

Conductor – A type of material that allows the flow of charge (**electrical** current) in one or more directions

Connectors – Various devices for connecting one object to another.

Constant Current – A process where the power source keeps the current as constant as possible even when the operator varies the arc length. The voltage varies, formerly known as "variable voltage". Mainly used for Stick and TIG welding.

Constant Voltage – A process where the power source keeps the voltage as constant as possible and allows amperage to vary considerably. Mainly used for MIG and Flux core welding using wire feeders.

Contactor – A mechanically or electrically operated switch used in high current applications.

Control cable – A multistrand cable used for transmission of power, command and feedback information.

Crosslinc – A welding system communication technology. When using a Crosslinc enabled power source and wire feeder, welding voltage can be controlled remotely, through the welding cable without the use of an additional control cable.

Current – The flow of electrons through a conductor.

Current Transducer – A device used to detect DC current flow.

Cycle – One complete wave of alternating current or voltage.

DC (Direct Current) – A voltage or current that never crosses zero and maintains current flow in one direction.

Diode – A device used in a circuit that allows current to flow in one direction only. Typically current flow will occur if the diode's anode is more positive than its cathode. Typical configurations used can be: blocking, flashing, free-wheeling, full wave bridge rectifier, half wave rectifier.

Display – An electronic device with a screen used for displaying information.

Duty Cycle – The percentage of a ten (10) minute period that a power source can operate its rated load before exceeding its thermal limit.

Efficiency – The ratio of the output power divided by the input power.

Electrical Interference (noise) – Unwanted noise or other effects from electromagnetic radiation.

Electricity – The flow of electrons through a conductor from the source to a ground.

Electrode Negative – When the electrode is connected to the negative output terminal.

Electrode Positive – When the electrode is connected to the positive output terminal.

Electromagnetism – Magnetism developed by a current of electricity.

Emitter – The negatively charged electrode of a transistor device.

Encoder – An electro-mechanical device that converts the angular position or motion of a shaft or axle to digital output signals.

Excitation – The process of generating a magnetic field by means of an electric current. The source of this can be from a magnet or an external voltage source.

Excitation Windings – Stator winding that powers the excitation process in an alternator or generator.

Farads – The standard measurement unit of capacitance. Symbol: f

Feedback – To provide actual output information to a control circuit so as to maintain a constant output.

Feeder Winding – Stator winding that powers the wire feeders.

Field Windings – The stationary windings of a generator.

Field Current – The current flow through the Field Windings

Light Emitting Diode (LED) – A semiconductor device that emits light when an electric current passes through it.

Flashing – A generic term referring to the initial excitation of an electrical magnetic field.

Forward Biased – When voltage is applied to a semiconductor device in the direction that allows current to flow.

Frequency – The number of occurrences of a repeating event (cycles) per unit of Time.

Full Wave – A rectifier that converts alternating current into continuous current and that utilizes both halves of each cycle of the alternating current.

Fuse – An electrical safety device that operates to provide overcurrent protection of an electrical circuit. Its essential component is a metal wire or strip that melts when too much current flows through it, thereby interrupting current flow.

Gate – Is the control terminal in a semiconductor device. Typically a small voltage is applied to the Gate to trigger or latch the device.

Generator – An electric generator that produces direct current. The main function of this device is to change mechanical energy into electrical energy. The mechanical energy can be supplied by either a motor or engine.

GFCI (Ground Fault Circuit Interrupter) – A device which interrupts current flow when it senses an imbalance between the outgoing and incoming current.

Ground Connection – A safety connection from a welding machine frame to an earth ground.

Half Wave - A rectifier that utilizes one half cycle of alternating current and suppresses the other.

Henry – The standard measurement unit of inductance. Symbol: H

Hertz – The standard measurement unit of electrical frequency. Symbol: Hz

High Frequency – A high frequency used for arc ignition and stabilization when TIG welding.

Hot Start – Increases the output amperage for a designated amount of time at the start of a weld.

Insulated Gate Bipolar Transistor (IGBT) – A high speed solid state switching device that can be turned on by applying a voltage signal to the gate. When the gate signal is removed the IGBT will turn off. An IGBT will operate on DC voltage only.

Inductance – The tendency of an electrical conductor to oppose a change in the electric current flowing through it.

Inductor – A passive component which stores the electrical energy in a magnetic field when the electric current passes through it.

Interpole Coils – Utilized in generators. They counteract the effects of armature reaction.

Inverter – circuitry that changes direct current (DC) to alternating current (AC).

Life Cycle – The length of time a product is introduced to consumers until it's removal from the shelves.

Motor – An electrical device that converts electrical energy into mechanical energy.

Magnetic Field – The area around a magnet or coil in which there is magnetic force.

Magnetic Flux – The measurement of the total magnetic field lines that pass through a given surface area.

Magnetism – The force that arises from the motion of electric charges.

MOLEX – Is the vernacular term for a two-piece pin and socket interconnection that was pioneered by Molex Connector Company.

Negative Temperature Co-efficient (NTC) – A type of thermistor in which the resistance decreases in relation to a rise in temperature.

OCV (Open Circuit Voltage) –The potential voltage in the welding circuit before the arc is initiated or a load applied; measured in volts.

Ohms – The standard measurement unit of electrical resistance. Symbol: Ω

Ohm's Law – current passing through a conductor is proportional to the voltage over the resistance. I = V / R.

Parallel Circuit – a circuit that has multiple current paths.

Peak Value – The maximum value attained by the current during one cycle. There is a positive and negative peak.

Peak to Peak Value – The maximum value attained by both peaks during one cycle.

Phase – A relative variation or change of state or a cycle.

Phaseback (foldback) – A current limiting feature (a type of overload protection).

Pilot Arc – The electrical pathway between the torch nozzle and electrode tip. This function aids in the transfer of current from the electrode tip to the work piece.

Polarity – The polarity of the electrode as compared to the polarity of the work piece.

Positive Temperature Co-efficient (PTC) – A type of thermistor in which the resistance increases in relation to a rise in temperature.

Potentiometer – It is a variable resistor with three terminals. The middle terminal is adjustable. The potential at the third terminal can be adjusted to give any fraction of the potential voltage across the two outer terminals.

Power – The rate, over time, in which electrical energy is transferred within an electrical circuit.

Power Factor – The ratio of the real power that is used to do work to the apparent power that is supplied to the circuit.

Printed Circuit Boards – A physical device that houses one or more electrical circuits.

Pulsating DC – A periodic current which changes in value but never changes direction.

Rated Load – The average amperage and voltage the power source is designed to produce for a given specific duty cycle time period. For example, 400 amps, 36 load volts, at 60 percent duty cycle.

RCBO (Residual Current Breaker with Over-current) – A combination of a RCD and Circuit Breaker.

RCD (Residual Current Device) – Detects imbalance in the currents of the supply and return conductors of a circuit. Does not protect against shorts.

Reactor – An electrical magnetic component used to maintain current at constant levels by resisting any changes in the current.

Reconnect Panel – Used to configure the machine's internal components for various input power voltages

Rectification – The process of converting alternating current to direct current.

Relay – An electrically operated switch used in low current applications.

Resistance – The opposition to the passage of an electric current through a conductor. Measured in Ohms (Ω) and is not polarity sensitive.

Resistor – Used to regulate voltage and current levels in a circuit.

Reverse Biased – When voltage is applied to a semiconductor device in the direction that does not allows current to flow.

Rheostat – A two terminal adjustable resistor that may have its resistance value changed without opening the circuit in which it is connected, thereby controlling the current through the circuit.

Ripple – The residual periodic variation of the DC voltage within a power supply which has been derived from an alternating current source.

RMS (Root Means Squared) – The same amount of heat dissipation across a resistor as Direct Current.

Rotor – A rotating component of an electromagnetic system in an electric motor, or alternator.

RPM (Revolutions per minute) – A unit of rotational speed or the frequency of rotation around a fixed axis.

Saturation – The state reached when an increase in applied external magnetic field cannot increase the magnetization of the material further.

Saw Tooth Wave Form – A non-sinusoidal waveform. It is so named based on its resemblance to the teeth of a plain-toothed saw.

Schematic Diagram – A representation of the electronic components of a machine utilizing graphic symbols rather than realistic pictures.

Schematic Symbols – A standardized pictogram used to represent various electrical and electronic devices or function.

Series Circuit – a circuit that has only one current path.

Series - Parallel Circuit – a circuit that has both a single current path and multiple current paths.

Silicon Controlled Rectifier (SCR) – Very similar to a Diode in which it allows current to flow when the anode is more positive than the cathode. However, current flow will occur only if a small signal is applied to its Gate and will stop flowing when the voltage drops to zero or goes negative.

Shunt – A type of low value resistance used to detect circuit current.

Sinusoidal Wave Form – A curve that describes a smooth repetitive oscillation of a waveform.

Slip Rings – An electromechanical device that allows the transmission of electrical power from a stationary to a rotating structure. Normally a copper or brass circular device attached to a rotating member.

Solenoid – An electromechanical device that when energized acts like a magnet so that a movable core is drawn into the coil when a current flows and that is used especially as a switch or control for a mechanical device (such as a valve).

Source – Provides the electrical potential that is required for electricity to flow.

Spark Gap Generator – Used to initiate and maintain the arc in a TIG machine.

Square Wave Form – A type of waveform where the signal has only two levels. The signal transitions between these levels at regular intervals and the switching time is very rapid.

Standard Units of Measurement – Is a quantifiable language that helps everyone understand the association of the object with the measurement.

Static Condition – The machine is not connection to a power source and has no mechanical motion.

Stator – The stationary part of a rotary system, found in electric alternators, generators and electric motors.

Switch – A mechanical device used to interrupt the flow of current in a circuit. Switches are essentially binary devices: they are either completely on (closed) or completely off (open).

Tachometer – A device or circuit used to measure the rotations of a mechanical device.

Thermistor – A type of resistor in which resistance changes due to temperature, two main types: Positive Temperature Co-efficient (PTC), Negative Temperature Co-efficient (NTC).

Thermostat – A mechanical device that interrupts or closes a circuit when a pre-determined temperature limit is reached.

Toroid – A device used to filter unwanted electrical noise.

Trigger Interlock – The gun trigger will stay closed (activated) as long as welding current is flowing and will open (deactivate) when welding current stops.

Transformer – A device with a group of mutually-inductive coils used to magnetically induce AC power from one coil to the other. Typical examples are as follows:

> ***Isolation Transformer*** – A transformer usually used for circuit protection.
>
> ***Step Down Transformer*** – A transformer where the secondary voltage is lower than the primary voltage.
>
> ***Step Up Transformer*** – A transformer where the secondary voltage is higher than the primary voltage.
>
> ***Current Transformer*** – A type of transformer used as a current monitoring device.
>
> ***Power Transformer*** – A transformer that contains multiple primary windings to accommodate a variety of input voltages.

Twisted Pair – A cable consisting of two wires of a single circuit twisted around each other for the purposes of improving electromagnetic compatibility.

Voltage – The pressure or difference in electrical potential between two points in a circuit that causes current to flow.

Volts – The standard unit of measurement for Voltage. Symbol: V

User Interface – A device where interactions between operators and machines occur.

Watts – The standard measurement unit of electrical power. Symbol: W

Watts Law – power of an electrical circuit is the product of its voltage and current. P = I x V.

Weld Winding – Stator winding that provides the power for the welding components.

Welding Electrode – A consumable component of the welding circuit through which current is conducted between the electrode holder and the arc that becomes part of the weldment.

Welding Gun – In semi-automatic or automatic welding, a device to transfer current and guide the electrode wire into the arc puddle.

Wire Harness – A system of insulated conducting wires bound together with insulating materials.

Wiring Diagram – a simple visual representation of the physical connections and physical layout of the electrical system of the machine.

WFS (Wire Feed Speed) – The speed at which the consumable wire is fed into the weld joint puddle.

			
WARNING	● Do not touch electrically live parts or electrode with skin or wet clothing. ● Insulate yourself from work and ground.	● Keep flammable materials away.	● Wear eye, ear and body protection.
Spanish **AVISO DE PRECAUCION**	● No toque las partes o los electrodos bajo carga con la piel o ropa mojada. ● Aislese del trabajo y de la tierra.	● Mantenga el material combustible fuera del área de trabajo.	● Protéjase los ojos, los oídos y el cuerpo.
French **ATTENTION**	● Ne laissez ni la peau ni des vêtements mouillés entrer en contact avec des pièces sous tension. ● Isolez-vous du travail et de la terre.	● Gardez à l'écart de tout matériel inflammable.	● Protégez vos yeux, vos oreilles et votre corps.
German **WARNUNG**	● Berühren Sie keine stromführenden Teile oder Elektroden mit Ihrem Körper oder feuchter Kleidung! ● Isolieren Sie sich von den Elektroden und dem Erdboden!	● Entfernen Sie brennbarres Material!	● Tragen Sie Augen-, Ohren- und Körperschutz!
Portuguese **ATENÇÃO**	● Não toque partes elétricas e electrodos com a pele ou roupa molhada. ● Isole-se da peça e terra.	● Mantenha inflamáveis bem guardados.	● Use proteção para a vista, ouvido e corpo.
Japanese **注意事項**	● 通電中の電気部品、又は溶材にヒフやぬれた布で触れないこと。 ● 施工物やアースから身体が絶縁されている様にして下さい。	● 燃えやすいものの側での溶接作業は絶対にしてはなりません。	● 目、耳及び身体に保護具をして下さい。
Chinese **警 告**	● 皮肤或濕衣物切勿接觸帶電部件及銲條。 ● 使你自己與地面和工件絕緣。	● 把一切易燃物品移離工作場所。	● 佩戴眼、耳及身體勞動保護用具。
Korean **위 험**	● 전도체나 용접봉을 젖은 헝겁 또는 피부로 절대 접촉치 마십시요. ● 모재와 접지를 접촉치 마십시요.	● 인화성 물질을 접근 시키지 마시요.	● 눈, 귀와 몸에 보호장구를 착용하십시요.
Arabic **تحذير**	● لا تلمس الاجزاء التي يسري فيها التيار الكهربائي أو الالكترود بجلد الجسم أو بالملابس المبللة بالماء. ● ضع عازلا على جسمك خلال العمل.	● ضع المواد القابلة للاشتعال في مكان بعيد.	● ضع أدوات وملابس واقية على عينيك وأذنيك وجسمك.

READ AND UNDERSTAND THE MANUFACTURER'S INSTRUCTION FOR THIS EQUIPMENT AND THE CONSUMABLES TO BE USED AND FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES.

SE RECOMIENDA LEER Y ENTENDER LAS INSTRUCCIONES DEL FABRICANTE PARA EL USO DE ESTE EQUIPO Y LOS CONSUMIBLES QUE VA A UTILIZAR, SIGA LAS MEDIDAS DE SEGURIDAD DE SU SUPERVISOR.

LISEZ ET COMPRENEZ LES INSTRUCTIONS DU FABRICANT EN CE QUI REGARDE CET EQUIPMENT ET LES PRODUITS A ETRE EMPLOYES ET SUIVEZ LES PROCEDURES DE SECURITE DE VOTRE EMPLOYEUR.

LESEN SIE UND BEFOLGEN SIE DIE BETRIEBSANLEITUNG DER ANLAGE UND DEN ELEKTRODENEINSATZ DES HERSTELLERS. DIE UNFALLVERHÜTUNGSVORSCHRIFTEN DES ARBEITGEBERS SIND EBENFALLS ZU BEACHTEN.

● Keep your head out of fumes. ● Use ventilation or exhaust to remove fumes from breathing zone.	● Turn power off before servicing.	● Do not operate with panel open or guards off.	**WARNING**
● Los humos fuera de la zona de respiración. ● Mantenga la cabeza fuera de los humos. Utilice ventilación o aspiración para gases.	● Desconectar el cable de alimentación de poder de la máquina antes de iniciar cualquier servicio.	● No operar con panel abierto o guardas quitadas.	Spanish **AVISO DE PRECAUCION**
● Gardez la tête à l'écart des fumées. ● Utilisez un ventilateur ou un aspirateur pour ôter les fumées des zones de travail.	● Débranchez le courant avant l'entretien.	● N'opérez pas avec les panneaux ouverts ou avec les dispositifs de protection enlevés.	French **ATTENTION**
● Vermeiden Sie das Einatmen von Schweibrauch! ● Sorgen Sie für gute Be- und Entlüftung des Arbeitsplatzes!	● Strom vor Wartungsarbeiten abschalten! (Netzstrom völlig öffnen; Maschine anhalten!)	● Anlage nie ohne Schutzgehäuse oder Innenschutzverkleidung in Betrieb setzen!	German **WARNUNG**
● Mantenha seu rosto da fumaça. ● Use ventilação e exhaustão para remover fumo da zona respiratória.	● Não opere com as tampas removidas. ● Desligue a corrente antes de fazer serviço. ● Não toque as partes elétricas nuas.	● Mantenha-se afastado das partes moventes. ● Não opere com os paineis abertos ou guardas removidas.	Portuguese **ATENÇÃO**
● ヒュームから頭を離すようにして下さい。 ● 換気や排煙に十分留意して下さい。	● メンテナンス・サービスに取りかかる際には、まず電源スイッチを必ず切って下さい。	● パネルやカバーを取り外したままで機械操作をしないで下さい。	Japanese **注意事項**
●頭部遠離煙霧。 ●在呼吸區使用通風或排風器除煙。	●維修前切斷電源。	●儀表板打開或沒有安全罩時不準作業。	Chinese **警 告**
● 얼굴로부터 용접가스를 멀리하십시요. ● 호흡지역으로부터 용접가스를 제거하기 위해 가스제거기나 통풍기를 사용하십시요.	● 보수전에 전원을 차단하십시요.	● 판넬이 열린 상태로 작동치 마십시요.	Korean **위 험**
● ابعد رأسك بعيداً عن الدخان. ● استعمل التهوية أو جهاز ضغط الدخان للخارج لكي تبعد الدخان عن المنطقة التي تتنفس فيها.	● اقطع التيار الكهربائي قبل القيام بأية صيانة.	● لا تشغل هذا الجهاز اذا كانت الاغطية الحديدية الواقية ليست عليه.	Arabic **تحذير**

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

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

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

이 제품에 동봉된 작업지침서를 숙지하시고 귀사의 작업자 안전수칙을 준수하시기 바랍니다.

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

CUSTOMER ASSISTANCE POLICY

The business of Lincoln Electric is manufacturing and selling high quality welding equipment, automated welding systems, consumables, and cutting equipment. Our challenge is to meet the needs of our customers, who are experts in their fields, and to exceed their expectations. On occasion, purchasers may ask Lincoln Electric for information or technical information about their use of our products. Our employees respond to inquiries to the best of their ability based on information and specifications provided to them by the customers and the knowledge they may have concerning the application. Our employees, however, are not in a position to verify the information provided or to evaluate the engineering requirements for the particular weldment, or to provide engineering advice in relation to a specific situation or application. Accordingly, Lincoln Electric does not warrant or guarantee or assume any liability with respect to such information or communications. Moreover, the provision of such information or technical information does not create, expand, or alter any warranty on our products. Any express or implied warranty that might arise from the information or technical information, including any implied warranty of merchantability or any warranty of fitness for any customers' particular purpose or any other equivalent or similar warranty is specifically disclaimed.

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

WELD FUME CONTROL EQUIPMENT

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.

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