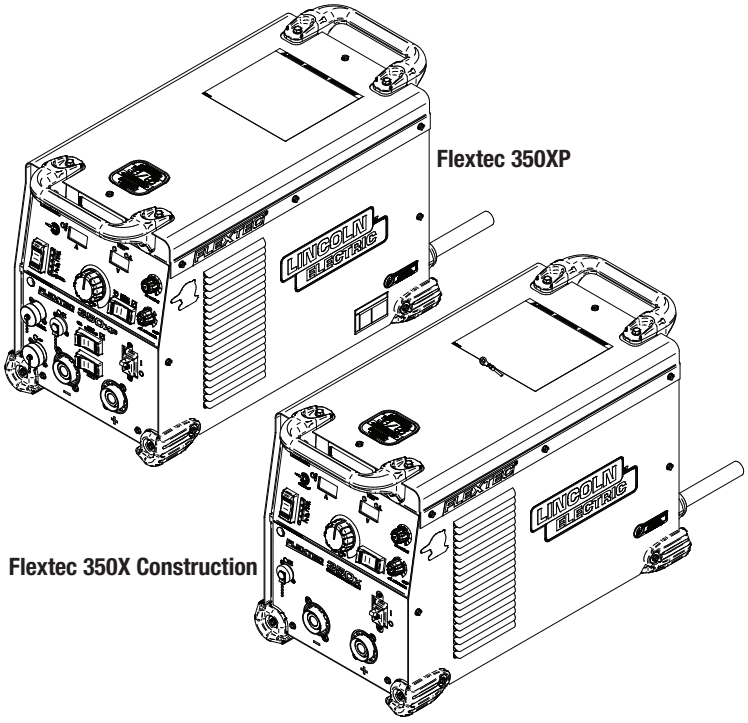
LINCOLN ELECTRIC

Service Manual

Flextec® 350XP & Flextec® 350X Construction



For use with machines having Code Numbers:

Flextec® 350XP:13067, 13069, 13071

Flextec® 350X Construction: 13066, 13068, 13070, 13073

GENUINE LINCOLN PARTS™

Register your machine:
www.lincolnelectric.com/register

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

Save for future reference

Date Purchased

Code: (ex: 10859)

Serial: (ex: U1060512345)

Need Help? Call 1.888.935.3877
to talk to a Service Representative

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

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

For Service outside the USA:
Email: globalservice@lincolnelectric.com

EAC

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

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.

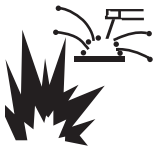
5.c. Do not weld in locations near chlorinated hydrocarbon vapors coming from degreasing, cleaning or spraying operations. The heat and rays of the arc can react with solvent vapors to form phosgene, a highly toxic gas, and other irritating products.

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.

ELECTROMAGNETIC COMPATIBILITY (EMC)

Conformance

Products displaying the CE mark are in conformity with European Community Council Directive of 15 Dec 2004 on the approximation of the laws of the Member States relating to electromagnetic compatibility, 2004/108/EC. It was manufactured in conformity with a national standard that implements a harmonized standard: EN 60974-10 Electromagnetic Compatibility (EMC) Product Standard for Arc Welding Equipment. It is for use with other Lincoln Electric equipment. It is designed for industrial and professional use.

Introduction

All electrical equipment generates small amounts of electromagnetic emission. Electrical emission may be transmitted through power lines or radiated through space, similar to a radio transmitter. When emissions are received by other equipment, electrical interference may result. Electrical emissions may affect many kinds of electrical equipment; other nearby welding equipment, radio and TV reception, numerical controlled machines, telephone systems, computers, etc.

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 compatibility in those locations, due to conducted as well as radiated disturbances.

Installation and Use

The user is responsible for installing and using the welding equipment according to the manufacturer's instructions.

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

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

Assessment of area

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

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

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

Methods of Reducing Emissions

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

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

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

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

Earthing of the Workpiece
Where the workpiece is not bonded to earth for electrical safety, nor connected to earth because of its size and position, e.g., ship's hull or building steelwork, a connection bonding the workpiece to earth may reduce emissions in some, but not all instances. Care should be taken to prevent the earthing of the workpiece increasing the risk of injury to users, or damage to other electrical equipment. Where necessary, the connection of the workpiece to earth should be made by a direct connection to the workpiece, but in some countries where direct connection is not permitted, the bonding should be achieved by suitable capacitance, selected according to national regulations.

Screening and Shielding
Selective screening and shielding of other cables and equipment in the surrounding area may alleviate problems of interference. Screening of the entire welding installation may be considered for special applications.[1]

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

PAGE

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

GENERAL DESCRIPTION

GENERAL FUNCTIONAL DESCRIPTION

The Flextec 350XP and Flextec 350X Construction are inverter based, multi-process, DC power sources that have a 5 to 425 Amp output range. The machine is capable of welding in CC and CV modes with common wire types and sizes. The Flextec 350 XP and Flextec 350X Construction are both capable of gouging in either Stick or CV modes. Two units can be paralleled in CC modes for extra gouging power. In this document, “Flextec 350XP is used to refer to the Construction model as well unless otherwise speciÿed.

The Standard and Construction models include welding modes for GMAW, FCAW, SMAW, and GTAW for a variety of materials including mild steel, some cored wires, gas shielded wires, and aluminum wires. VRD (Voltage Reduction Device) is offered supporting reduced open circuit voltages for an added measure of safety. The Flextec 350XP Standard machine includes an ArcLink setting that allows the power source to weld synergic modes with ArcLink compatible feeders.

The Flextec 350XP Standard is designed to be compatible with the current range of semi-automatic ArcLink wire feeders in addition to the analog and across-the-arc wire feeders. The Flextec 350XP Standard comes with a 5-pin ArcLink digital feeder connector, a 14-pin analog feeder connector and a 12-pin remote output connector.

The Flextec 350X Construction machine only comes with a 12-pin remote output connector and is only compatible with across the arc wire feeders and CrossLinc® compatible feeders.

All of the models of Flextec 350XP come with CrossLinc® technology for remote voltage setting, without a control cable, with CrossLinc® compatible feeders or remote controls.

RECOMMENDED PROCESSES

Flextec 350XP is designed for CC-SMAW, CC-GTAW (Touch Start TIG™), CV-GMAW, CV-GMAW-P, CV-FCAW-SS, CV-FCAW-G. CAG arc gouging is also supported in the CV and CC modes.

WELD MODE	PROCESS	COMMON MATERIALS	COMMON ELECTRODES
GTAW	TOUCH START TIG® (CC)	STAINLESS, STEEL	
SMAW	STICK-CC	ALUMINUM, STAINLESS, STEEL	6010, 6011, 7018
CV	MIG (GMAW) FCAW-GS	ALUMINUM, STAINLESS, STEEL	L-50; L-56
CV-INNERSHIELD	FCAW-SS	STAINLESS, STEEL	NR-203; NR-211, NR-440NI2
ArcLink	CV-GMAW-P*	CARBON STEEL, STAINLESS, STEEL, ALUMINUM	L50; L-56

*GMAW-P is only available in the 350XP model with ArkLink feeder.

PROCESS LIMITATIONS

- The Flextec 350XP is only suitable for the processes listed.

PRODUCT SPECIFIC INSTALLATION LIMITATIONS

CrossLinc® technology uses a communication protocol coupled on the electrode and work cables. For best performance the total voltage drop in the system should be kept under 10V.

CrossLinc® is not compatible with High Frequency TIG. If HF is in the area, the cables need to routed as far as possible from each other. Also follow all high frequency best practices, including the driven earth ground.

DESIGN FEATURES

- **Multiple process DC output range:** 5 - 425 Amps
- **Circuit breaker protected 10 amp auxiliary power** for the 350XP, 3 amp auxiliary power for the Construction.
- **Thermostatically protected** with Thermal Light.
- **Simple and Easy to Use**
- **Flexible Multi-Process Capability** – Including stick, TIG, MIG, GMAW-P, Flux-cored and CAG.
- **Bright Digital Amp and Volt Meters** – Easy to monitor, even in sunlight, and presettable for precise procedure control, display error codes for troubleshooting
- **Compact, Durable Case** – Tough IP23 enclosure rating ensures the ability to withstand extreme field environments.
- **Variable Hot Start** – Get the extra starting amperage you need for thick, rusty or dirty material.
- **Variable Arc Control** – In stick mode, vary the arc force to obtain the "soft" or "crisp" arc you want as conditions require. In CV modes vary the pinch or inductance to control spatter, fluidity and bead appearance.
- **Procedure Control –** Utilize ArcLink Feeder capabilities such as user memories and preference options.*
- **Full-Featured Remote Control Capability –** Use a foot pedal or hand control to remotely vary output up to 100 ft. (30.5 mm) away.
- **380 – 575 VAC, 50/60Hz Voltage Input** – Offers the ability to be connected anywhere in the world without manual reconnect switches or bus bars.
- **Voltage Compensation and Reliable Input Voltage Connection** – Provides consistent operation over ±10% input voltage variation.
- **Easy to Parallel Machines** in CC mode.
- **Severe Duty –** Can be stored outdoors. IP23 Rated.
- **Desert Duty Rated –** Welding outputs are rated for extreme temperature operation up to 55°C - welding output is reduced @ 55°C.
- **ArcLink® Wire Feeder Compatible –** unlock synergic modes to increase productivity and control.*
- **Synergic Modes** – for easy, repeatable welds.*
- **VRD** – reduces OCV in CC modes when not welding for added safety.
- **Low Operating Cost** – Operates at a high efficiency
- **Transport -** Reversible handles for ease of lifting.
- **CrossLinc® technology** allows for remote control of the welding output using the weld cables rather than a control cable when connected to a CrossLinc® compatible wire feeder or remote control.

*** Flextec 350XP only**

INSTALLATION

⚠ WARNING

ELECTRIC SHOCK can kill.

ONLY A QUALIFIED ELECTRICIAN SHOULD CONNECT THE INPUT LEADS TO THE FLEXTEC MACHINE. CONNECTIONS SHOULD BE MADE IN ACCORDANCE WITH ALL LOCAL AND NATIONAL ELECTRICAL CODES AND THE CONNECTION DIAGRAM LOCATED UNDERNEATH THE CASE TOP OF THE MACHINE. FAILURE TO DO SO MAY RESULT IN BODILY INJURY OR DEATH.

COMMON EQUIPMENT PACKAGES

COMMON OPTIONAL KITS & ACCESSORIES	
K3059-4	INVERTER CART (REQUIRES LOCKING FOOT KIT)
K4424-1	350XP LOCKING FOOT KIT
K5527-1	FLEXTEC TIG SOLENOID KIT
K2909-1	12-PIN TO 6-PIN ADAPTER
K3127-1	WIRELESS FOOT PEDAL (6-PIN)*
K857-2	REMOTE OUTPUT CONTROL WITH 12-PIN UNIVERSAL CONNECTOR (25 FEET)
K857-3	REMOTE OUTPUT CONTROL (12-PIN) (100 FEET)*
K870-2	FOOT AMPTROL WITH 12-PIN UNIVERSAL CONNECTOR
K963-4	HAND AMPTROL (12-PIN). *
K4421-1	MILLER RACK ADAPTOR KIT, REQUIRES A LOCKING FOOT KIT
K4345-1	CROSSLINC REMOTE

* Any accessory with a 6-pin connector also needs to use the K2909-1 12-pin to 6-pin adapter.

COMPATIBLE WIRE FEEDERS – ANALOG & ARCLINK FEEDERS	
NORTH AMERICAN SEMI-AUTOMATIC WIRE FEEDERS	
PF25M, PF84	POWER FEED SERIES (40VDC INPUT)*
LF-72, LF-74	LF SERIES (42VAC INPUT)*
ALL MODELS	FLEX FEED SERIES (42VAC INPUT)*
ALL MODELS	LN-10, DH-10 (42VAC INPUT)*
ALL MODELS	LN-25 PRO SERIES, ACTIV8
ALL MODELS	ACTIV8X / LN-25X / LN-25X WITH CROSSLINC TECHNOLOGY
EUROPEAN SEMI-AUTOMATIC WIRE FEEDERS	
PF-44, PF-46	POWER FEED SERIES (EXCLUDING PF42 & PF 40 FOR FLUX CORED)*
LF-33S, LF-33, LF-34, LF-35, LF-37, LF-38, LN-15	LINC FEED SERIES (42VAC INPUTS ONLY)*
LF-45, LF-45S,	LINC FEED SERIES (40VDC INPUTS)*
LF-22M, LF-24M, LF-24 PRO	LINC FEED SERIES (ACROSS THE ARC INPUT)

* Supported with Flextec 350XP Standard model. Flextec 350X Construction model will not support.

INPUT AND GROUND CONNECTIONS

The Flextec 350XP comes standard with a power cord. Connect the supply lines to 3 phase power and the ground according to your local and national electrical codes.

INPUT VOLTAGE SELECTION

The Flextec 350XP automatically adjusts to work with different input voltages. No reconnect switches or bus bars are required.

INPUT FUSE AND SUPPLY WIRE CONSIDERATIONS

Refer to technical specifications 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.

LOCATION

Location and ventilation for cooling

Place the welder where clean cooling air can freely circulate in through the rear louvers and out through the case sides. 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 shutdowns.

Tilting

Place the machine directly on a secure, level surface or on a recommended undercarriage. The machine may topple over if this procedure is not followed.

Lifting

The Flextec 350XP has two handles that can be used to lift the machine.

Both handles should be used when lifting the machine. When using a crane or overhead device to lift using the handles, a lifting strap should be connected to both handles. Do not attempt to lift the Flextec 350XP with accessories attached to it.

Stacking

The Flextec 350XP cannot be stacked.

Environmental limitations

The Flextec 350XP is IP23 rated for use in an outdoor environment. The machine should not be subjected to falling water during use nor should any parts of it be submerged in water. Doing so may cause improper operation as well as pose a safety hazard. The best practice is to keep the machine in a dry, sheltered area.

Do not mount the Flextec 350XP over combustible surfaces. Where there is a combustible surface directly under stationary or fixed electrical equipment, that surface shall be covered with a steel plate at least .060” (1.6mm) thick, which shall extend not less than 5.90” (150mm) beyond the equipment on all sides.

HIGH FREQUENCY PROTECTION

Locate the Flextec 350XP away from radio controlled machinery. The normal operation of the Flextec 350XP may adversely affect the operation of RF controlled equipment, which may result in bodily injury or damage to the equipment.

TECHNICAL SPECIFICATIONS -

K4271-2 Flextec 350X CONSTRUCTION - Tweco
K4272-2 Flextec 350XP STANDARD - Tweco
K4283-2 Flextec 350X CONSTRUCTION CE - Twist Mate
K4284-2 Flextec 350XP CE - Twist Mate
K3441-2 Flextec 350X CONSTRUCTION - Twist Mate
K3442-2 Flextec 350XP - Twist Mate
K4272-2-SB Flextec 350X CONSTRUCTION - Sunbelt

POWER SOURCES - INPUT VOLTAGE AND CURRENT					
PRODUCT #	**DUTY CYCLE**	**INPUT VOLTAGE ± 10%**	**INPUT AMPERES**	**IDLE AMPS**	**POWER FACTOR**
All Models	60% RATING	380 - 575V 3 Phase 50 or 60 Hz	25/28/22	.13/.16/.27	.87/.77/.62
	100% RATING		21/23/23		.84/.70/.61

POWER SOURCES - RECOMMENDED INPUT WIRE AND FUSE SIZES1				
VOLTAGE	**INPUT AMPERES**	**FUSE (SUPER LAG) OR BREAKER SIZE2**	**TYPE S, SJ, SJO AND SJT FLEXIBLE CORD WITH AMBIENT TEMPERATURE OF 30C**	**NOTES**
380/3/50	21A	35A	10 AWG	
460/3/60	23A	35A	10 AWG	
575/3/60	18A	35A	10 AWG	

1 Cord and Fuse Sizes based upon the U.S. National Electric Code and maximum output

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 current increases.

RATED OUTPUT				
PROCESS	**DUTY CYCLE**	**VOLTS AT RATED AMPERES**	**AMPERES**	**EFFICIENCY (AT RATED OUTPUT)**
GMAW (CV)	60%	31.5V	350A	0.87/.0.86/0.85
	100%	29V	300A	0.87/.0.86/0.85
GTAW (CC)	60%	24V	350A	0.83/.0.83/0.82
	100%	22V	300A	0.83/.0.83/0.81
SMAW (CC)	60%	34V	350A	0.88/.0.87/0.87
	100%	32V	300A	0.87/.0.87/0.86
FCAW-GS (CV)	60%	31.5V	350A	0.87/.0.86/0.85
	100%	29V	300A	0.87/.0.86/0.85
FCAW-SS (CV)	60%	31.5V	350A	0.87/.0.86/0.85
	100%	29V	300A	0.87/.0.86/0.85

RATED OUTPUT IEC60974-1		
DUTY CYCLE	**VOLTS AT RATED AMPERES**	**AMPERES**
60%	34	350
100%	32	300

PHYSICAL DIMENSIONS				
MODEL	**HEIGHT**	**WIDTH**	**DEPTH**	**WEIGHT**
All Models	17.0 IN (432 MM)	13.0 IN (330 MM)	27.0 IN (609 MM)	74 LBS (33.6 KG)
				79 LBS (35.8 KG)

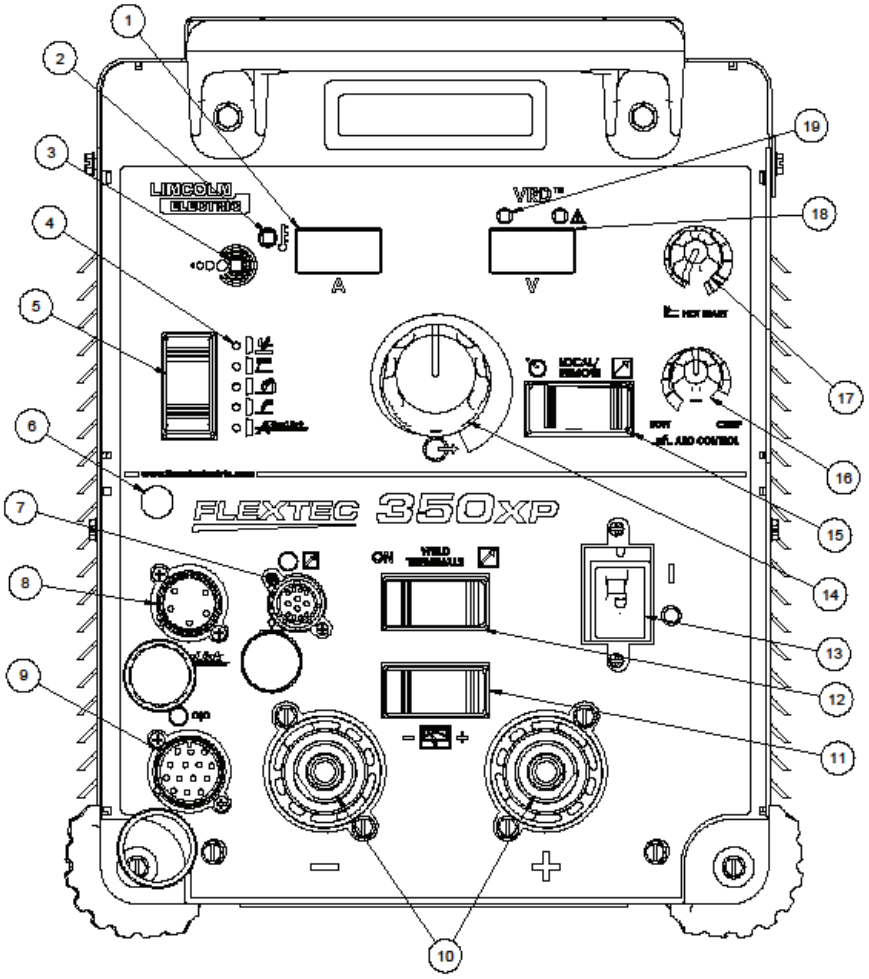
TEMPERATURE RANGES		
OPERATING TEMPERATURE	**STORAGE TEMPERATURE**	**INSULATION CLASS**
-4°F TO 131°F (-10°C TO 55°C)*	-40°F TO 185°F (-40°C TO 85°C)	CLASS H (180°C), CLASS F (155°)

AGENCY APPROVALS			
MODEL	**MARKET**	**CONFORMITY MARK**	**STANDARD**
ALL	US AND CANADA	$_{C}CSA_{US}$	CAN/CSA - E60974-1 ANSI/IEC - 60974-1 IEC 60974-1

*Power Source is de-rated at temperatures above 40C

CASE FRONT CONTROL - STANDARD

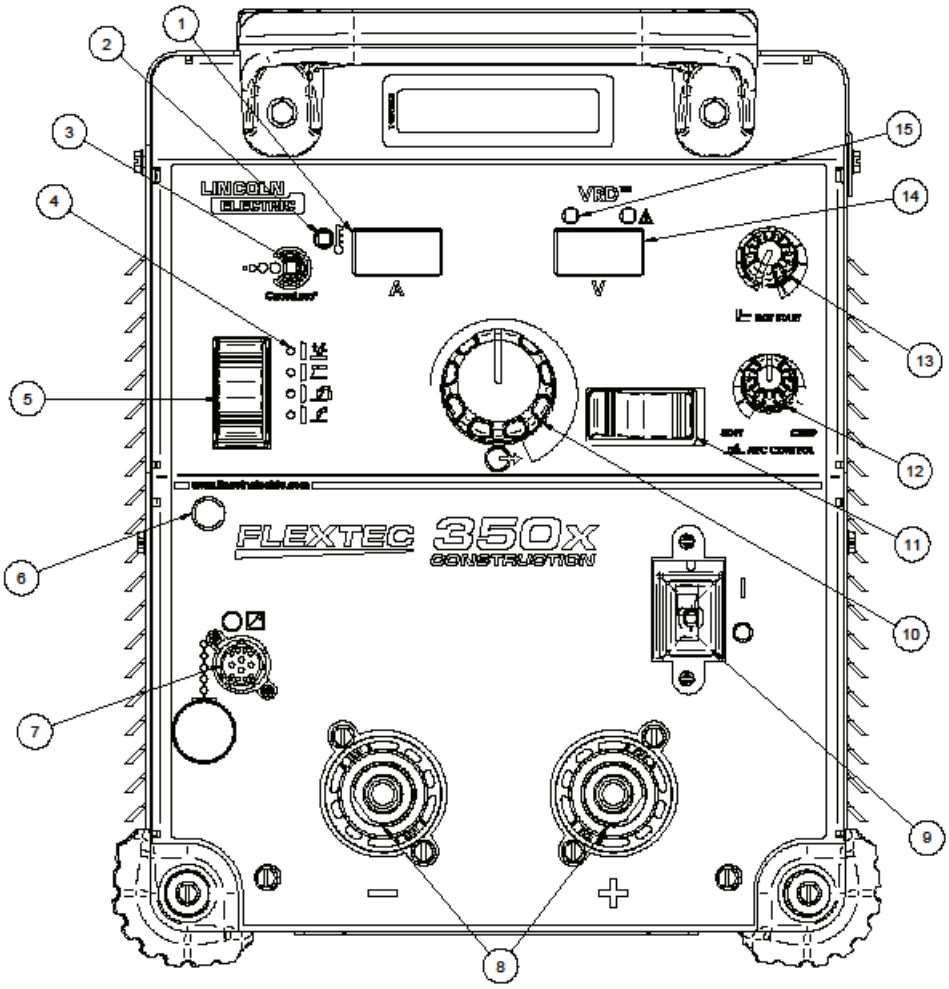
FIGURE A.1A



1. **Amperage LCD Display**
2. **Thermal LED:** A yellow light that comes on when an over temperature situation occurs. Output is disabled until the machine cools down. When cool, the light goes out and output is enabled.
3. **CrossLinc Communication Indicator:** When green, the power source is connected to a feeder via CrossLinc.
4. **Process Indicator LEDs:** Red LEDs that indicate which of the five Flextec 350XP local weld processes are engaged - CC-GTAW, CC-SMAW, CV, CV-Innershield, and ArcLink.
5. **Process Indicator Switch:** Momentary rocker switch to select weld modes.
6. **Optional TIG Solenoid Outlet:** Remove plug button to install K5527-1 TIG Solenoid Kit.
7. **12-Pin Remote:** Circular connector for attaching optional remote control devices.
8. **5-Pin ArcLink:** Wire feeder circular connector.
9. **14-Pin Wire Feeder:** Circular connector for attaching wire feeder control cables
10. **Positive and Negative Welding Output Connection**
11. **Wire Feeder Voltmeter:** Polarity selection switch matches the polarity of the wire feeder voltmeter to the polarity of the electrode.
12. **Weld Terminals On/Remote:** Selector switch sets output terminals ON all the time or remotely controlled by a wire feeder or remote device.
13. **Power Switch:** Controls input power to the Flextec 350XP.
14. **Output Control Dial:** Sets the Output Current or Voltage for the selected Weld Process.
15. **Local/Remote Selector Toggle Switch:** Choose machine output to be controlled locally through the output control knob or remotely via a remote device connected to the 12-pin or 14-pin connector (i.e. hand amptrol or K870 foot amptrol). A device connected through CrossLinc technology will override this setting.
16. **Arc Force Control Dial:** Full range selection of arc force from -10 to +10.
17. **Hot Start Control Dial:** Full range selection of hot start from 0 to 10.
18. **Voltage LCD Display**
19. **VRD LED Indicators**

CASE FRONT CONTROL - CONSTRUCTION

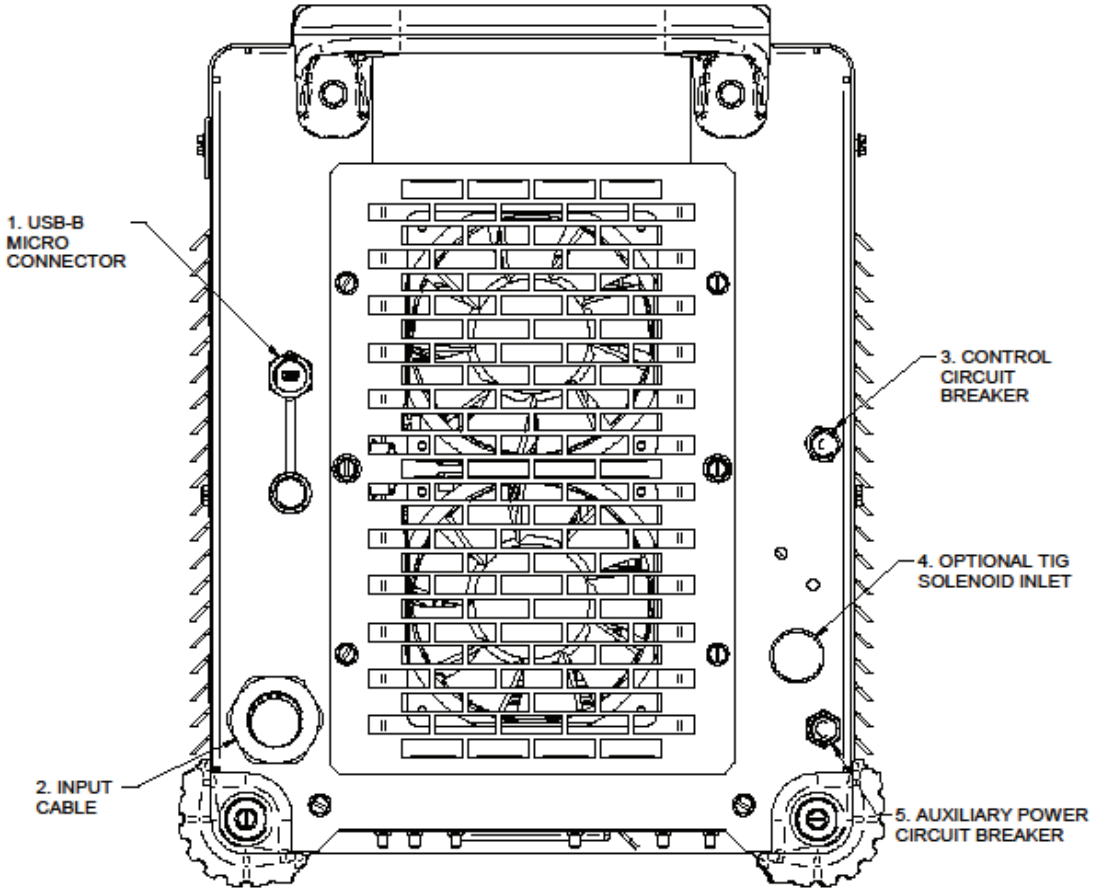
FIGURE A.1B



1. **Amperage LCD Display**
2. **Thermal LED:** A yellow light that comes on when an over temperature situation occurs. Output is disabled until the machine cools down. When cool, the light goes out and output is enabled.
3. **CrossLinc Communication Indicator:** When green, the power source is connected to a feeder via CrossLinc.
4. **Process Indicator LEDs:** Red LEDs that indicate which of the five Flextec 350XP local weld processes are engaged - CC-GTAW, CC-SMAW, CV, and CV-Innershield.
5. **Process Indicator Switch:** Momentary rocker switch to select weld modes.
6. **Optional TIG Solenoid Outlet:** Remove plug button to install K5527-1 TIG Solenoid Kit.
7. **12-Pin Remote:** Circular connector for attaching optional remote control devices.
8. **Positive and Negative Welding Output Connection**
9. **Power Switch:** Controls input power to the Flextec 350XP Construction.
10. **Output Control Dial:** Sets the Output Current or Voltage for the selected Weld Process.
11. **Local/Remote Selector Toggle Switch:** Choose machine output to be controlled locally through the output control knob or remotely via a remote device connected to the 12-pin connector (i.e. hand amptrol or K870 foot amptrol). A device connected through CrossLinc technology will override this setting.
12. **Arc Force Control Dial:** Full range selection of arc force from -10 to +10.
13. **Hot Start Control Dial:** Full range selection of hot start from 0 to 10.
14. **Voltage LCD Display**
15. **VRD LED Indicators**

CASE BACK CONTROLS

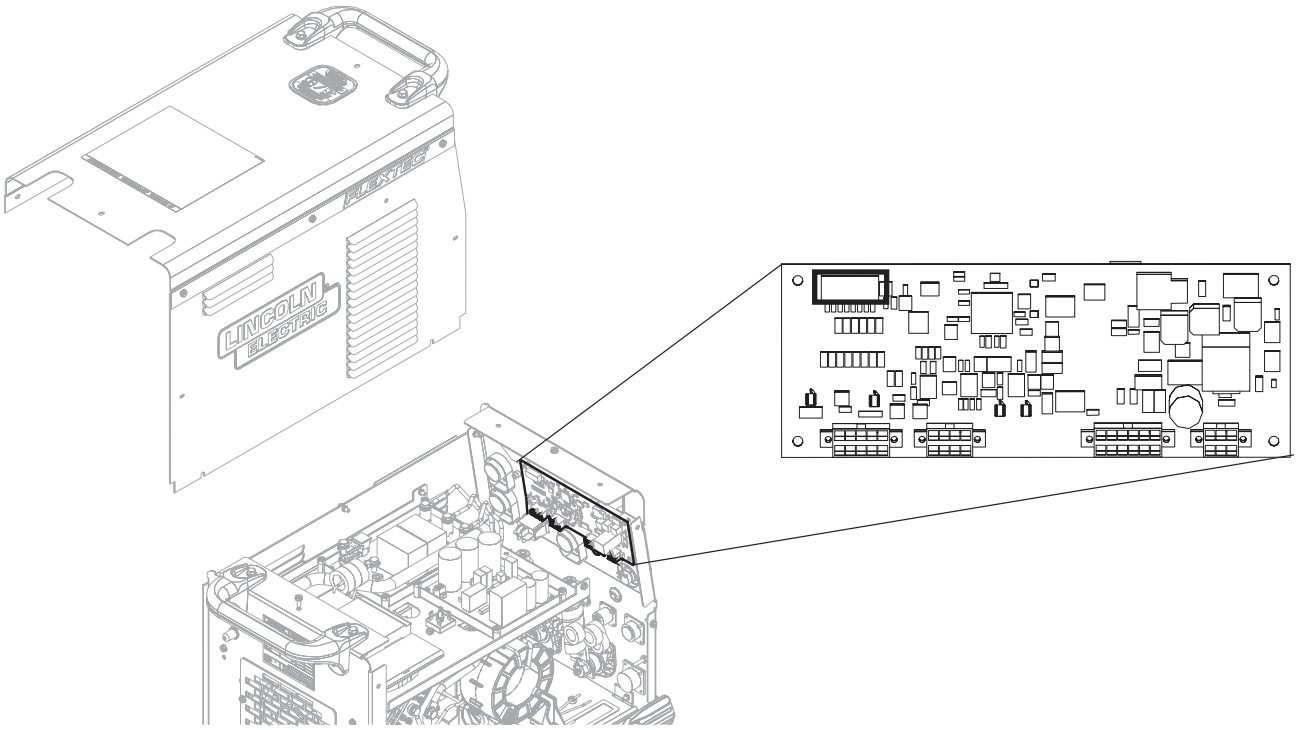
FIGURE A.2



1. **USB-B Micro Connector:** Remove cap and connect to computer to re-program machine software. Replace cap for environmental protection.
2. **Input Cable:** Comes with domestic and CE machines (not included for CCC model).
3. **Control Circuit Breaker:** 20A on all models.
4. **Optional TIG Solenoid Inlet:** Remove plug button to install K5527-1 TIG Solenoid Kit.
5. **Auxiliary Power Circuit Breaker:** 3A on Construction models, 10A on standard models.

INTERNAL CONTROLS

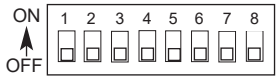
FIGURE A.3 - DIP SWITCH LOCATION ON USER INTERFACE PCB



The User Interface pc board has one bank of dip switches. As shipped from the factory and under normal conditions, the dip switches are all in the 'off' position. There are 3 instances that require a change of the dip switch.

Factory Default Setting

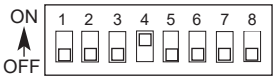
- All Switches in the 'OFF' Position



Test Mode Setting

1. **Enter a test mode.** This is utilized when the machine is connected to a grid load for servicing
   a. Turn switch #4 to the 'ON' position.

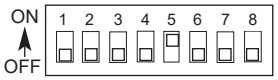
- Switch #4 in the 'ON' Position



VRD Enabled Setting

2. **Enter VRD Mode** (VRD Enabled)
   a. Turn switch #5 to the 'ON' Position

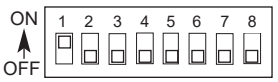
- Switch #5 in the 'ON' Position



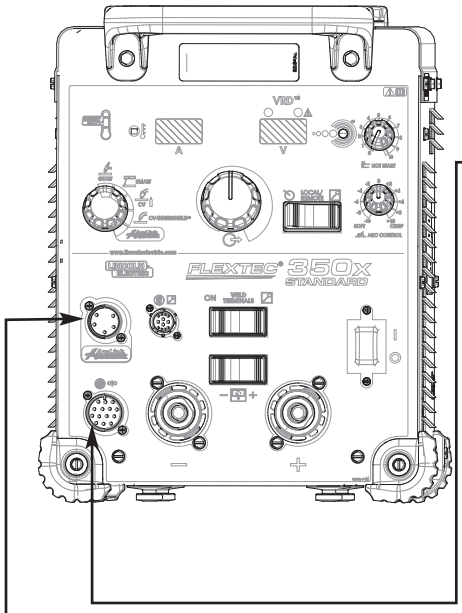
Calibration

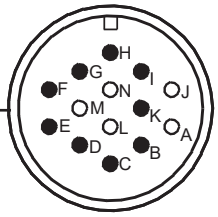
3. **Enter Calibration Mode.** This allows the machine voltage and current to be calibrated while connected to a grid load
   a. Turn switch #1 to the "ON" Position

- Switch #1 in the 'ON' Position

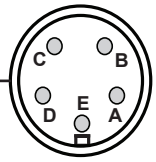


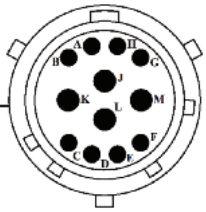
ANALOG WIRE FEEDER CONNECTIVITY



Picture	Function	Pin	Wiring
	14-PIN CONNECTOR FOR WIRE FEEDER CONNECTIVITY.	A	
		B	GROUND
		C	TRIGGER, COMMON
		D	TRIGGER INPUT
		E	77 REMOTE POTENTIOMETER, 5K
		F	76 REMOTE POTENTIOMETER, WIPER
		G	75 REMOTE POTENTIOMETER, COMMON
		H	VOLTAGE SENSE (21)
		I	40 VDC
		J	
		K	40 VDC
		L	
		M	

ARCLINK WIRE FEEDER & DIGITAL ACCESSORY CONNECTIVITY

Picture	Function	Pin	Wiring
	5-PIN CONNECTOR FOR WIRE FEEDER CONNECTIVITY	A	ARCLINK CAN
		B	ARCLINK CAN
		C	ELECTRODE SENSE LEAD
		D	40VDC
		E	40VDC COMMON

Picture	Function	Pin	Wiring
	12-PIN REMOTE CONTROL CONNECTOR FOR REMOTE OR HAND/FOOT AMPTROL AND DIGITAL ACCESSORIES.	A	ARCLINK CAN
		B	ARCLINK CAN
		C	REMOTE POTENTIOMETER COMMON
		D	REMOTE POTENTIOMETER WIPER
		E	REMOTE POTENTIOMETER +10V
		F	ALPS CONNECTION
		G	TRIGGER
		H	TRIGGER
		J	40VDC COMMON
		K	40VDC
		L	NOT USED
		M	NOT USED

RECOMMENDED ELECTRODE AND WORK CABLE SIZES FOR ARC WELDING

Connect the electrode and work cables between the appropriate output studs of the Flextec 350XP per the following guidelines:

- Most welding applications run with the electrode being positive (+). For those applications, connect the electrode cable between the wire drive input power connector and the positive (+) output stud on the power source. Connect a work lead from the negative (-) power source output stud to the work piece.
- When negative electrode polarity is required, such as in some Innershield applications, reverse the output connections at the power source (electrode cable to the negative (-) stud, and work cable to the positive (+) stud).

The following recommendations apply to all output polarities and weld modes:

- **Select the appropriate size cables per the "Output Cable Guidelines" below.** Excessive voltage drops caused by undersized welding cables and poor connections often result in unsatisfactory welding performance. Always use the largest welding cables (electrode and work) that are practical, and be sure all connections are clean and tight.

Note: Excessive heat in the weld circuit indicates undersized cables and/or bad connections.

- **Route all cables directly to the work and wire feeder, avoid excessive lengths and do not coil excess cable.** Route the electrode and work cables in close proximity to one another to minimize the loop area and therefore the inductance of the weld circuit.
- Always weld in a direction away from the work (ground) connection.

(See Table A.1)

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

TABLE A.1

RECOMMENDED CABLE SIZES (RUBBER COVERED COPPER - RATED 167°F OR 75°C)**

Amperes	PERCENT DUTY CYCLE	CABLE SIZES FOR COMBINED LENGTHS OF ELECTRODE AND WORK CABLES				
		0 to 50Ft. (0 to15m)	50 to 100Ft. (15 to 30m)	100 to 150 Ft. (30 to 46m)	150 to 200 Ft. (46 to 61m)	200 to 250 Ft. (61 to 76m)
200	60	2	2	2	1	1/0
200	100	2	2	2	1	1/0
225	20	4 or 5	3	4 or 5	1	1/0
225	40 & 30	3	3	3	1	1/0
250	30	3	3	3	1	1/0
250	40	2	2	2	1	1/0
250	60	1	1	1	1	1/0
250	100	1	1	1	1	1/0
300	60	1	1	1	1/0	1/0
350	100	2/0	2/0	2/0	2/0	2/0
350	60	1/0	1/0	1/0	2/0	3/0
400	60	2/0	2/0	2/0	3/0	4/0
400	100	3/0	3/0	3/0	3/0	4/0
500	60	2/0	2/0	2/0	3/0	4/0

** Tabled values are for operation at ambient temperatures of 104°F(40°C) and below. Applications above 104°F(40°C) may require cables larger than recommended, or cables rated higher than 167°F(75°C).

REMOTE SENSE LEAD SPECIFICATIONS

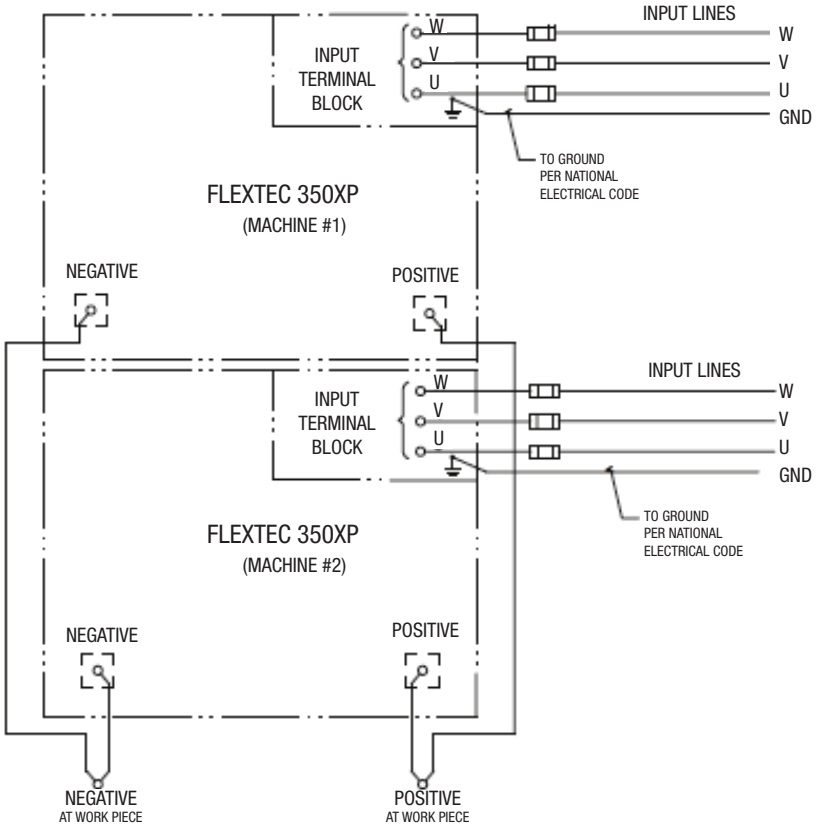
Genuine Lincoln Electric control cables should be used at all times (except where noted otherwise). Lincoln Electric cables are specifically designed for the communication and power needs of the Flextec 350XP. Most are designed to be connected end-to-end for ease of extension. Generally, it is recommended that the total length not exceed 100 feet (30.5 m). The use of non-standard cables, especially in lengths greater than 25 feet, can lead to communication problems (system shutdowns), poor motor acceleration (poor arc starting), and low wire driving force (wire feeding problems). Always use the shortest length of control cable possible, and DO NOT coil excess cable.

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

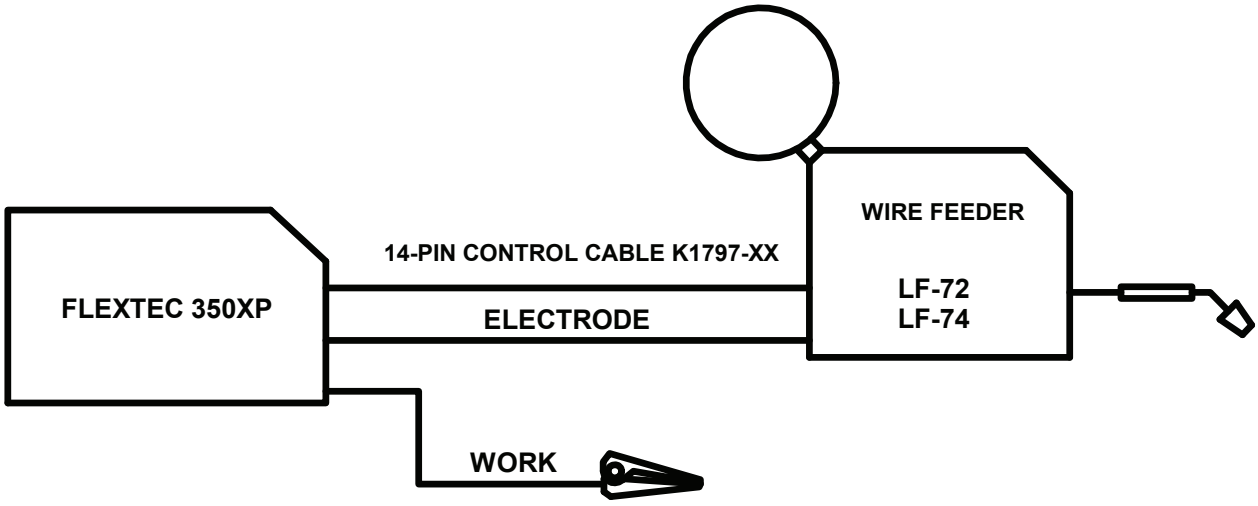
Paralleling Machines

The Flextec 350XP power sources may be paralleled for increased output requirements in constant current application. No kit is required for paralleling of Flextec 350XP power sources. The Flextec 350XP can only be paralleled for constant current processes. Connect the power sources as shown, and set the output control of each power sources to one half of the desired arc current.

Figure A.2

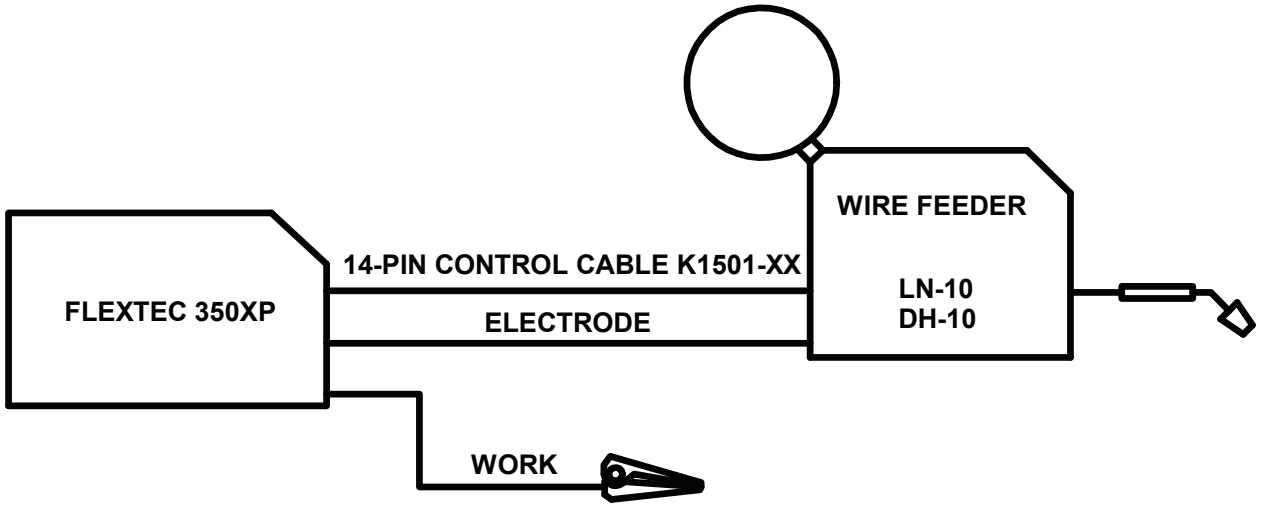


CONNECTING LF-72 AND LF-74 TO THE FLEXTEC 350XP



CONTROL SETTING	
WELD MODE	CV, CV-INNERSHIELD
WELD TERMINALS	REMOTELY CONTROLLED
REMOTE/LOCAL	LOCAL
	(REMOTE IF K2329-1 INSTALLED)
VOLTMETER POLARITY	PROCESS DEPENDENT

CONNECTING LN-10 AND DH-10 TO THE FLEXTEC 350XP



CONTROL SETTING	
WELD MODE	CV, CV-INNERSHIELD
WELD TERMINALS	REMOTELY CONTROLLED
REMOTE/LOCAL	REMOTE
VOLTMETER POLARITY	PROCESS DEPENDENT

LN-10,DH-10 Control Switch Setup

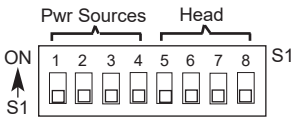
Initial set up of the LN-10, DH-10 control for the system components being used and for general operator preferences is done using a pair of 8-pole DIP switches located inside the LN-10, DH-10 control box.

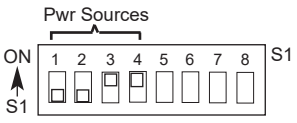
Setup DIP Switch Access

1) Shut off the input power to the LN-10, DH-10 control by turning off the power at the welding power source it is connected to.
2) Remove the two screws on the top of the LN-10, DH-10 control box door and swing the door down to open.
3) Locate the two 8-pole DIP switches, near the top left corner of the LN-10, DH-10 Control P.C. board, labeled S1 and S2.
4) Switch settings are only programmed during input power-up restoration.

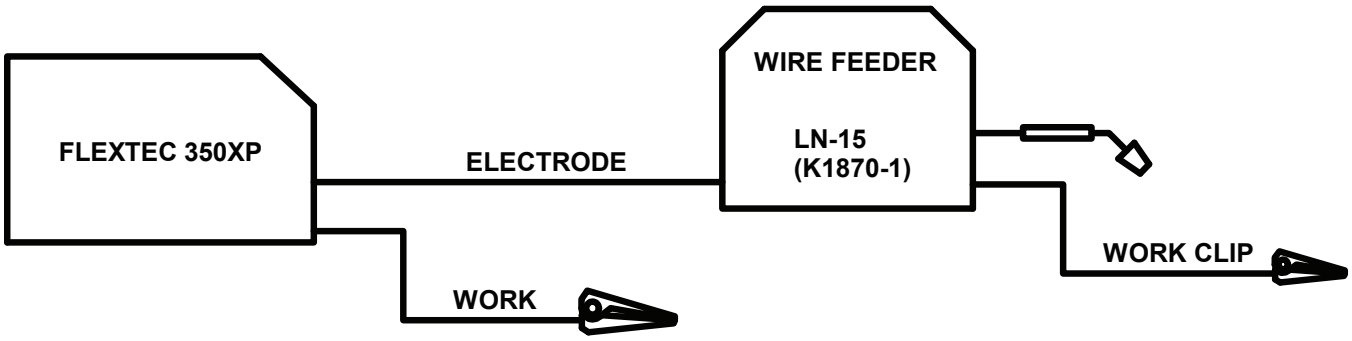
Setting the DIP Switches

The DIP switches are each labeled with an “ON” arrow showing the on direction for each of the 8 individual switches in each DIP switch (S1 and S2). The functions of these switches are also labeled and set as described below:



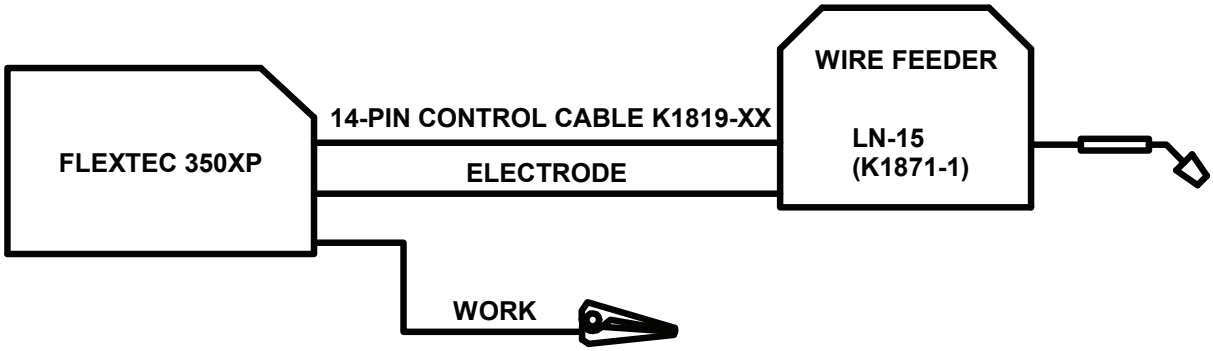


CONNECTING LN-15 (K1870-1) TO THE FLEXTEC 350XP



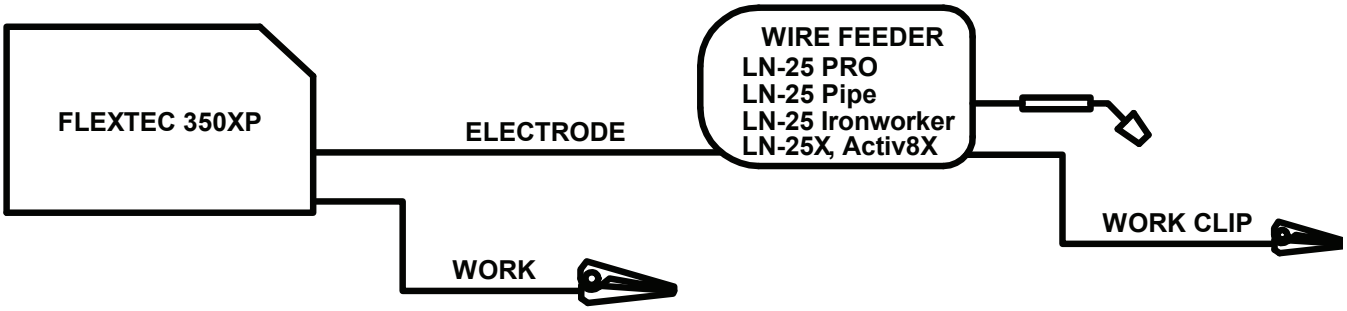
CONTROL SETTING	
WELD MODE	CV, CV-INNERSHIELD
WELD TERMINALS	ON
REMOTE/LOCAL	LOCAL
VOLTMETER POLARITY	PROCESS DEPENDENT

CONNECTING LN-15 (K1871-1) TO THE FLEXTEC 350XP



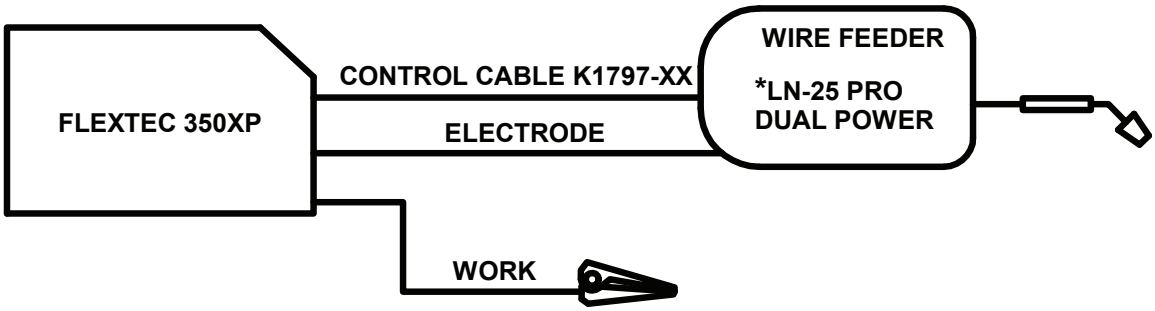
CONTROL SETTING	
WELD MODE	CV, CV-INNERSHIELD
WELD TERMINALS	REMOTELY CONTROLLED ↗
REMOTE/LOCAL	REMOTE
VOLTMETER POLARITY	PROCESS DEPENDENT

CONNECTING ACTIV8, ACTIV8X, LN-25 PRO SERIES, LN-25 PIPE, LN-25 IRONWORK AND LN-25X TO THE FLEXTEC 350XP



CONTROL SETTING	
WELD MODE	CV, CV-INNERSHIELD
WELD TERMINALS	ON
REMOTE/LOCAL	LOCAL, OR REMOTE WHEN USING CROSSLINC
VOLTMETER POLARITY	PROCESS DEPENDENT

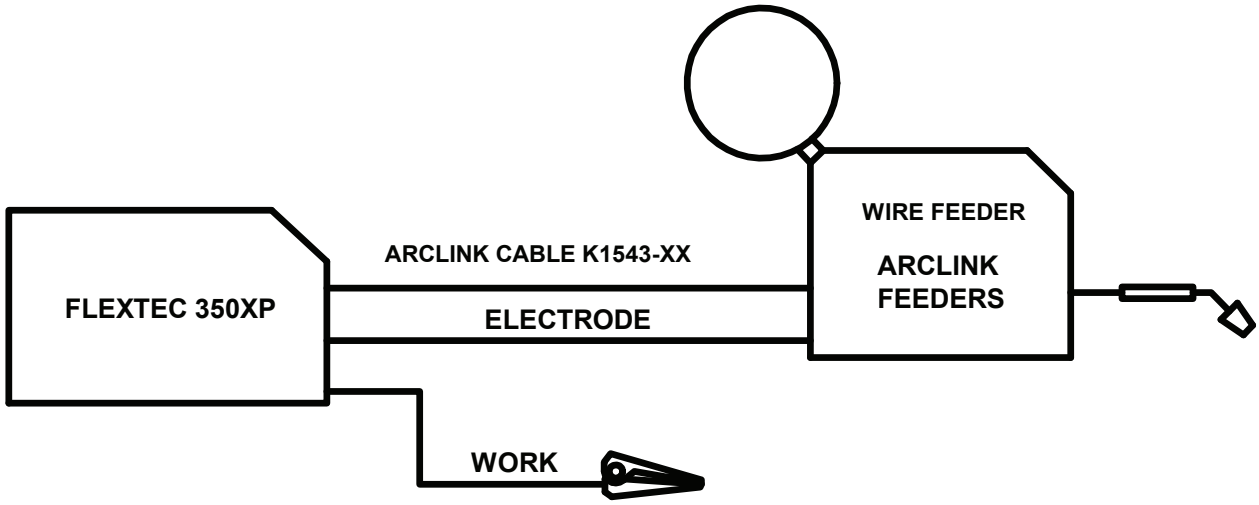
CONNECTING LN-25 PRO DUAL POWER TO THE FLEXTEC 350XP



CONTROL SETTING	
WELD MODE	CV, CV-INNERSHIELD
WELD TERMINALS	REMOTELY CONTROLLED
REMOTE/LOCAL	REMOTE
VOLTMETER POLARITY	PROCESS DEPENDENT

*CONTROL CABLE SETUP SHOWN. REFER TO LN-25 PRO CONNECTION DIAGRAM IF SETTING UP "ACROSS-THE-ARC" FEEDER.

CONNECTING ARCLINK FEEDER TO THE FLEXTEC 350XP



CONTROL SETTING	
WELD MODE	ARCLINK
WELD TERMINALS	REMOTE
REMOTE/LOCAL	N.A.
	N.A.
VOLTMETER POLARITY	N.A.

OPERATION

SAFETY PRECAUTIONS

⚠ WARNING

ELECTRIC SHOCK can kill.

- **UNLESS USING COLD FEED FEATURE, WHEN FEEDING WITH GUN TRIGGER, THE ELECTRODE AND DRIVE MECHANISM ARE ALWAYS ELECTRICALLY ENERGIZED AND COULD REMAIN ENERGIZED SEVERAL SECONDS AFTER THE WELDING CEASES.**

FUMES AND GASES can be dangerous.

- **Keep your head out of fumes.**
- **Use ventilation or exhaust to remove fumes from breathing zone.**

ARC RAYS can burn.

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

SEE ADDITIONAL WARNING INFORMATION UNDER "ARC WELDING SAFETY PRECAUTIONS" ON INSIDE OF FRONT COVER OF OPERATING MANUAL.

GRAPHIC SYMBOLS THAT APPEAR ON THE Flextec® 350XP OR IN THIS MANUAL

INPUT POWER

ON

OFF

HIGH TEMPERATURE

CIRCUIT BREAKER

WIRE FEEDER

POSITIVE OUTPUT

NEGATIVE OUTPUT

3 PHASE INVERTER

INPUT POWER

THREE PHASE

DIRECT CURRENT

U_r **REDUCED OPEN CIRCUIT VOLTAGE**

U_0 **OPEN CIRCUIT VOLTAGE**

U_1 **INPUT VOLTAGE**

U_2 **OUTPUT VOLTAGE**

I_1 **INPUT CURRENT**

I_2 **OUTPUT CURRENT**

PROTECTIVE GROUND

WARNING or CAUTION

Explosion

Dangerous Voltage

Shock Hazard

POWER-UP SEQUENCE

When power is applied to the Flextec 350XP, the displays will illuminate and the machine electronics will complete a power up sequence indicated by a scrolling bar across each seven segment display. Once the power up sequence is complete and the machine is ready for welding, the seven segment displays will indicate the voltage and amperage settings. Any ArcLink wire feeders present and connected to the 5-pin circular connector will also initialize and begin a power up sequence once power is applied to the machine.

For machines connected to CrossLinc® compatible feeders the green CrossLinc® will light indicating a connection to the feeder over the electrode cable.

DUTY CYCLE

The Flextec 350XP is capable of welding at a 100% duty cycle (continuous welding) at 300 Amps rated output.

The 60% duty cycle rating is 350 amps (based off of a ten minute cycle – 6 minutes on time and 4 minutes off time). The maximum output of the machine is 425 amps.

The Flextec 350XP is also rated for Desert Duty, elevated temperature operation, in a 55°C ambient. The machine is de-rated in the elevated temperature ambient.

THERMAL PROTECTION

Thermostats protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperature should occur, the thermostat will disable the output and run the cooling fan. The displays will remain energized during this time and the thermal light will be illuminated. Thermostats are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the Power Switch may be left on and the reset should occur within a 15 minute period.

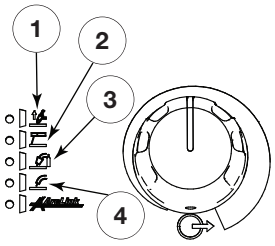
For FT350XP Construction machines the welding output will start again as soon as the thermostats close.

The FT350XP Standard output will start again if the welding output controls are set to on. Otherwise the output will be started once the controls are enabled.

MAKING A WELD

The Flextec 350XP is a multi-process inverter welder. The Weld Process Selector Switch is used to set the desired weld mode. The Flextec 350XP Standard has 4 selectable welding modes:

1. **GTAW** – This is a CC (constant current) weld mode used for touch start GTAW tig welding process.
2. **SMAW** – This is a CC (constant current) weld mode used for the SMAW stick welding process.
3. **CV** – This is CV (constant voltage) weld mode used for welding the GMAW mig welding process and the FCAW-GS, ˜ux cored gas shielded welding process.



4. **CV-Innershield** – This is a CV (constant voltage) weld mode used for welding the FCAW-SS, flux cored self shielded welding process

(Not pictured/ArcLink - is the digital communications channel. This uses the 5-pin amphenol. Pulsed MIG is only available using an ArcLink feeder connected to the 5-pin amphenol. **Only available in Flextec 350XP model**).

The machine is also capable of gouging. Gouging can be done in either the SMAW mode or the CV and CV-Innershield modes.

In addition to the Weld Mode Selector switch, a hot start dial, output control dial and arc control dial are provided to setup and fine tune the welding procedure.

DEFINITION OF WELDING MODES

NON-SYNERGIC WELDING MODES

- A Non-synergic welding mode requires all welding process variables to be set by the operator.

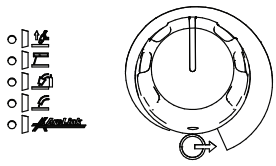
SYNERGIC WELDING MODES

- A Synergic welding mode offers the simplicity of single knob control. The machine will select the correct voltage and amperage based on the wire feed speed (WFS) set by the operator.

WELD CONTROLS AND DISPLAYS

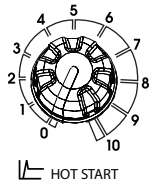
Weld Process Selector Switch

5 or 4 Position switch used to select the welding process.



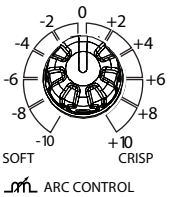
Hot Start Dial

The Hot Start control regulates the starting current at arc initiation. Hot Start can be set to ‘0” and no additional current is added at arc start. Increasing from 0 to 10 will increase the additional current (relative to the preset current) that is added at arc initiation.



Arc Force Control Dial

Full range selection of arc control from -10 to +10. In CV mode, this control is an inductance control. In stick mode, the control adjusts the arc force.

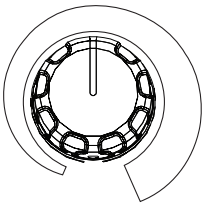


Output Control Dial

Output control is conducted via a single turn potentiometer.

Adjustment is indicated by the meters.

When in remote modes, this control sets the maximum welding current or voltage output. Full depression of a foot or hand amptrol results in the preset level of current or voltage.

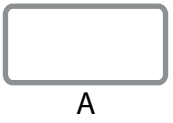


* Not included on Construction model.

Volt Display Meter

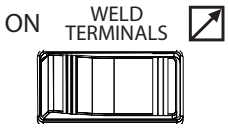
- Prior to CV operation (current flow), the meter displays desired preset voltage value (+/- .1V).
- Prior to STICK or TIG operation, the meter displays three dashes.
- During welding, this meter displays actual average volts.
- After welding, the meter holds the actual voltage value for 5 seconds. The displays blink indicating that the machine is in the "Hold" period.
- Output adjustment while in the "hold" period results in the "prior to operation" characteristics.

Amperage Display Meter



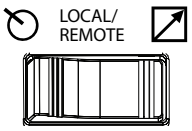
- Prior to STICK or TIG operation (current flow), the meter displays preset current value.
- Prior to CV operation, the meter displays four dashes indicating non-presettable AMPS.
- During welding, this meter displays actual average amps.
- After welding, the meter holds the actual current value for 5 seconds. The displays blink indicating that the machine is in the "Hold" period.
- Output adjustment while in the "hold" period results in the "prior to operation" characteristics

Weld Terminals On/Remote Toggle Switch *



- This switch determines the trigger location.
- When set to the ‘ON’ position, the weld terminals are at OCV (open circuit voltage) and ready to weld.
- When set to the ‘remote’ position, output is enabled through a remote trigger such as a welding gun.

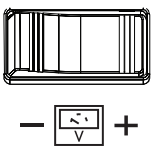
Output Control - Local/Remote Toggle Switch



- Set the switch to ‘local’ to control output at the Flextec via the Output Control dial.
- Set the switch to ‘remote’ to control output via a remote device (K857 hand amptrol or K870 foot amptrol) connected to the 12-pin remote connector or a wire feeder connected to the 14-pin connector or when using a CrossLinc® enabled wire feeder.

Wire Feeder Voltmeter Polarity Switch *

This switch configures the 21 sense lead in the 14 pin connector to the work weld terminal of the machine. Matches the polarity of the wire feeder voltmeter to the polarity of the electrode. It also configures the reading of the 67 sense lead when in ArcLink mode.



Thermal Light

This status light indicates when the power source has been driven into thermal overload. If the output terminals were "ON", the output will be turned back on once the unit cools down to an acceptable temperature level. If the unit was operating in the "REMOTE" mode, the trigger will need to be opened before or after the thermal has cleared and closed after the machine has cooled down to an acceptable temperature to re-establish output.

VRD Lights

There are two indicator lights on the case front of the Flextec 350XP above the Voltage display to indicate the status of VRD operation. As shipped, the VRD function is disabled. VRD is enabled by setting dip switch number 5 to the on position on the User Interface P.C. board. When VRD is active, a green light indicates the open circuit voltage is less than 35V peak, a red light indicates the OCV is at or above 35V peak, both lights will illuminate for 5 seconds upon power up. The behavior of the VRD lights is listed in the table below. While the VRD lights are always active when VRD has been enabled, VRD applies to the constant current modes of operation. Only in these modes will the OCV been reduced.

TABLE B.1

VRD INDICATOR LIGHTS			
MODE		**VRD "ON"**	**VRD "OFF"**
CC-SMAW CC-GTAW	OCV	GREEN (OCV REDUCED)	NO LIGHTS ARE ACTIVE
	WHILE WELDING	GREEN OR RED (DEPENDS ON WELD VOLTAGE)*	
CV-GAS C V-INNERSHIELD	OCV	RED (OCV NOT REDUCED) WELD TERMINALS 'ON'	
		RED (OCV NOT REDUCED) WELD TERMINALS REMOTELY CONTROLLED GUN TRIGGER CLOSED	
		GREEN (NO OCV) WELD TERMINALS REMOTELY CONTROLLED GUN TRIGGER OPEN	
	WHILE WELDING	GREEN OR RED (DEPENDS ON WELD VOLTAGE)*	

* It is normal for the lights to alternate between colors while welding.

BASIC MODES OF OPERATION

GTAW

This weld mode is a constant current (CC) mode featuring continuous control from 10 –425 amps.

It is intended for the GTAW TIG welding processes.

Hot Start - Hot start regulates the arc initiation current. A setting of +10 results in the most positive arc initiation.

Arc Control – This control is not used in the GTAW mode.

Weld Terminals On/Remote

- When set to the ‘ON’ position, the weld terminals are at OCV (open circuit voltage) and ready to weld.
- When set to the ‘remote’ position, output is enabled through a remote trigger.

Voltage Display – This display will display three dashed lines when the machine is in the idle state. This indicates that voltage is not settable in this weld mode. While output is enabled, the actual welding voltage will be displayed. After welding, the meter holds the actual voltage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

Amperage Display – This display will display the pre-set welding current when the machine is in the idle state. After welding, the meter holds the actual amperage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

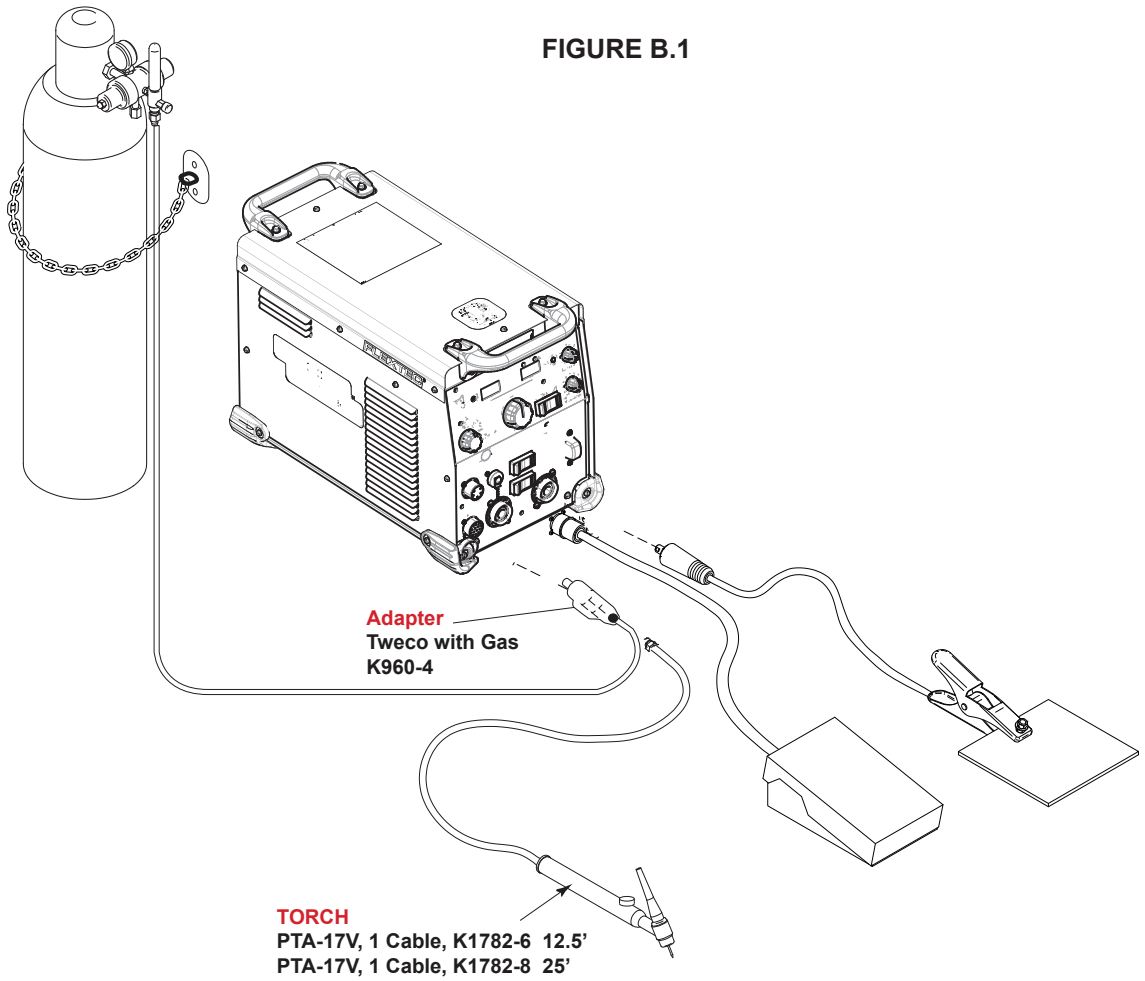
Output Control Local/Remote – When the control is set to local (no remote potentiometer/control plugged into the 12-pin or 14-pin connectors), the output is controlled through the Output Control dial on the front of the Flextec 350XP. Set this switch to ‘Remote’ when an external potentiometer/control is connected.

- When a remote potentiometer is connected and the Local/Remote toggle is set to 'Remote', the output control on the Flextec and the remote act as a master/slave configuration. Use the output control dial on the Flextec to set the maximum welding current. The remote will control output from minimum to the pre-set maximum.

Output Control Dial

- When the Local/Remote is set to Local, this dial sets the welding amperage.
- When the Local/Remote is set to Remote, this dial sets the maximum welding amperage. The remote potentiometer than controls the amperage from minimum to this pre-set maximum.

FIGURE B.1



SMAW

This weld mode is a constant current (CC) mode featuring continuous control from 15 – 425 Amps.

It is intended for the SMAW stick welding processes and arc gouging. The mode can also be used for TIG operation without changing modes (as long as Hot Start=0 and Arc Control=(-10). Values of Hot start greater than 0 will result in a higher current arc start. Values of Arc Control greater than the minimum setting of (-10) will result in a higher output that the intended preset value.).

Hot Start - The Hot Start control regulates the starting current at arc initiation. Hot Start can be set to ‘0” and no additional current is added at arc start. Increasing from 0 to 10 will increase the additional current (relative to the preset current) that is added at arc initiation.

Arc Control - The Arc Control regulates the Arc Force to adjust the short circuit current. The minimum setting (-10) will produce a "soft" arc and will produce minimal spatter and shallow penetration. The maximum setting (+10) will produce a "crisp" arc and will minimize electrode sticking with deeper penetration.

Weld Terminals On/Remote – Set to “On” so the machine is in the ready to weld state. Setting the machine to “On” enables the machine OCV.

Voltage Display – This display will display three dashed lines when the machine is in the idle state. This indicates that voltage is not settable in this weld mode. While output is enabled, the actual welding voltage will be displayed. After welding, the meter holds the actual voltage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

Amperage Display – This display will display the pre-set welding current when the machine is in the idle state. After welding, the meter holds the actual amperage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

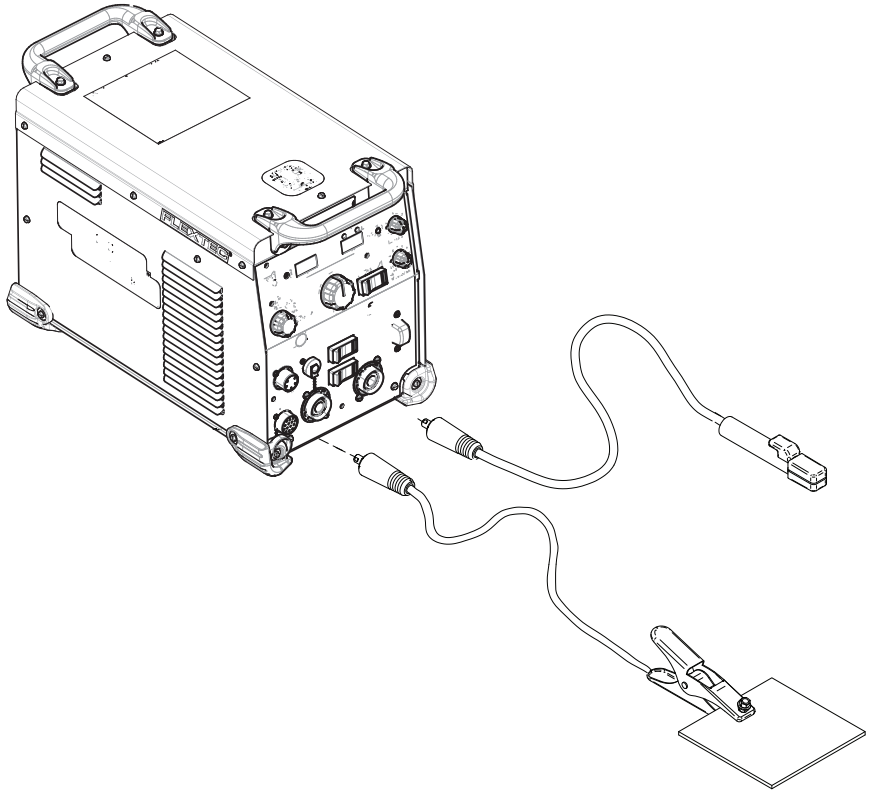
Output Control Local/Remote – When the control is set to local (no remote potentiomer/control plugged into the 12-pin or 14-pin connectors), the output is controlled through the Output Control dial on the front of the Flextec 350XP. Set this switch to ‘Remote’ when an external potentiometer/control is connected.

- When a remote potentiometer is connected, the output control on the Flextec and the remote act as a master/slave configuration. Use the output control dial on the Flextec to set the maximum welding current. The remote will control output from minimum to the pre-set maximum.

Output Control Dial

- When the Local/Remote is set to Local, this dial sets the welding amperage.
- When the Local/Remote is set to Remote, this dial sets the maximum welding amperage. The remote potentiometer than controls the amperage from minimum to this pre-set maximum.

FIGURE B.2



CV-Gas

This weld mode is a constant voltage (CV) mode featuring continuous control from 10 to 45 volts.

It is intended for the GMAW, FCAW-GS, MCAW welding processes and arc gouging.

Hot Start – Rotate from the '0' position to the '10' position to provide more energy during the start of a weld.

Arc Control – The Arc Control regulates pinch effect. At the minimum setting (-10), minimizes pinch and results in a soft arc. Low pinch settings are preferable for welding with gas mixes containing mostly inert gases as well as aluminum alloys. At the maximum setting (+10), maximizes pinch effect and results in a crisp arc. High pinch settings are preferable for welding FCAW and GMAW with CO2.

Weld Terminals On/Remote

- When set to the 'ON' position, the weld terminals are at OCV (open circuit voltage) and ready to weld. This selection is used for across the arc wire feeders. The 12-pin connector remote input is used to adjust the voltage with a master/slave relationship with the output control dial.
- When set to the 'remote' position, output is enabled through a remote trigger. The 14-pin connector remote input is used to adjust the voltage with a master/slave relationship with the output control dial.

Amperage Display – This display will display three dashed lines when the machine is in the idle state. This indicates that amperage is not settable in this weld mode. While output is enabled, the actual welding amperage will be displayed. After welding, the meter holds the actual amperage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

Voltage Display – This display will display the pre-set welding voltage when the machine is in the idle state. After welding, the meter holds the actual voltage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

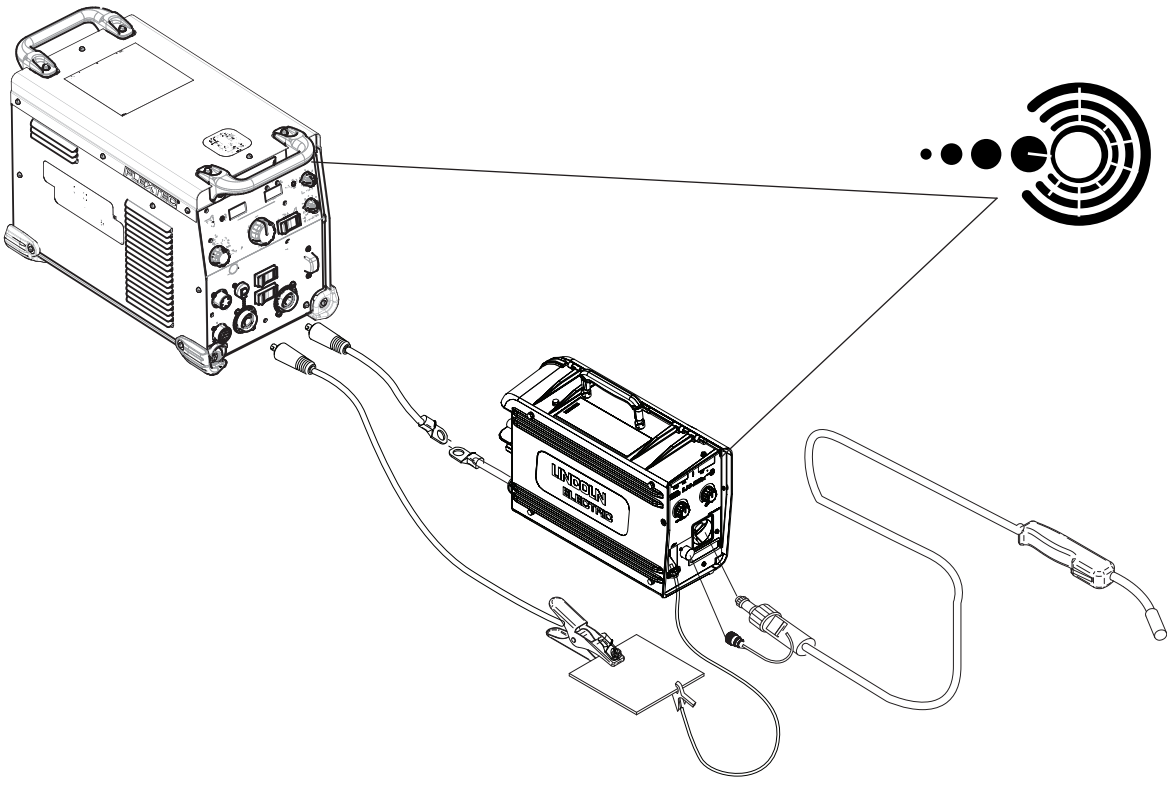
Output Control Local/Remote – When the control is set to local (no remote potentiometer/control plugged into the 12-pin or 14-pin connectors), the output is controlled through the Output Control dial on the front of the Flextec 350XP. Set this switch to 'Remote' when an external potentiometer/control is connected or using a CrossLinc® feeder.

- When a CrossLinc® equipped feeder like the LN-25X is used, output will then be controlled at the CrossLinc remote through the full range of the voltage allowable. The output control dial on the Flextec 350XP will no longer set the maximum amperage.

Output Control Dial

- o When the Local/Remote is set to Local, this dial sets the welding voltage.
- o When the Local/Remote is set to Remote, and the weld terminal switch is in the 'ON' position, this dial sets the maximum welding voltage. The remote potentiometer controls the voltage from minimum to this pre-set maximum. If the weld terminal switch is in the 'REMOTE' position, the output is controlled via the 14-pin input.

FIGURE B.3



CrossLinc® - CrossLinc is a new welding system communication technology. When using a CrossLinc enabled power source such as the Flextec 350XP and a CrossLinc enabled wire feeder such as the LN-25X, welding voltage can be controlled remotely without the use of an additional control cable.

The digital meters on the LN-25X will show the pre-set values for wire feed speed and voltage prior to welding. During welding, the meters will show actual current and voltage present at the wire feeder. After welding the meters will then flash the last welding current and voltage that was present during welding for 10-seconds after welding. If WFS or V is adjusted during this 10 second period, the meters will go back to the pre-set value.

- When a LN-25X CrossLinc enabled feeder is connected with the Flextec 350XP using the standard weld power cable and the LN-25X sense lead is attached to the work piece, the CrossLinc light will automatically illuminate on both the Flextec 350XP and the LN-25X. No additional pairing of the machine to the feeder is needed. This light indicates the CrossLinc connection is active and that control of the Flextec 350XP voltage can be made at the LN-25X feeder.
- The Flextec 350XP Weld Terminals On/Remote toggle should be set to 'ON'. This powers the weld terminals for an across-the-arc LN-25X wire feeder.
- The Flextec 350XP Output Control Local/Remote switch should be set to 'Remote' allowing for remote control of the output at the CrossLinc equipped feeder.

CV-Innershield

This weld mode is a constant voltage (CV) mode featuring continuous control from 10 to 45 volts.

It is intended for the FCAW-SS welding process and arc gouging.

Hot Start – Toggle from the '0' position to the '10' position to provide more energy during the start of a weld.

Arc Control – The Arc Control regulates pinch effect. At the minimum setting (-10), minimizes pinch and results in a soft arc. At the maximum setting (+10), maximizes pinch effect and results in a crisp arc.

Weld Terminals On/Remote

- When set to the 'ON' position, the weld terminals are at OCV (open circuit voltage) and ready to weld. This selection is used for across the arc wire feeders. The 12-pin connector remote input is used to adjust the voltage with a master/slave relationship with the output control dial.
- When set to the 'remote' position, output is enabled through a remote trigger. The 14-pin connector remote input is used to adjust the voltage with a master/slave relationship with the output control dial.

Amperage Display – This display will display three dashed lines when the machine is in the idle state. This indicates that amperage is not settable in this weld mode. While output is enabled, the actual welding amperage will be displayed. After welding, the meter holds the actual amperage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

Voltage Display – This display will display the pre-set welding voltage when the machine is in the idle state. After welding, the meter holds the actual voltage value for 5 seconds. Output adjustment while in the "hold" period results in the "prior to operation" characteristics stated above. The displays blink indicating that the machine is in the "Hold" period.

Output Control Local/Remote – When the control is set to local (no remote potentiometer/control plugged into the 12-pin or 14-pin connectors), the output is controlled through the Output Control dial on the front of the Flextec 350XP. Set this switch to 'Remote' when an external potentiometer/control is connected or using a CrossLinc® feeder.

Output Control Dial

- When the Local/Remote is set to Local, this dial sets the welding voltage.
- When the Local/Remote is set to Remote, and the weld terminal switch is in the 'ON' position, this dial sets the maximum welding voltage. The remote potentiometer controls the voltage from minimum to this pre-set maximum. If the weld terminal switch is in the 'REMOTE' position, the output is controlled via the 14-pin input.

ArcLink

This weld mode is intended to unlock basic non-synergic, synergic and pulse modes intended for use with compatible ArcLink wire feeders. All of the Flextec 350XP user interface controls are disabled in this mode and controlling the power source is accomplished from the wire feeder user interface.

Hot Start – Not used for this welding process

Arc Control – Not used for this welding process

Weld Terminals On/Remote

- Not used for this welding process
- Not used for this welding process

Output Control Local/Remote – Not used for this welding process

Output Control Dial

- Not used for this welding process
- Not used for this welding process

OPTIONAL KITS AND ACCESSORIES

K3059-4 Inverter and Wire Feeder Cart.* Rear-wheeled cart with front casters and gas bottle platform. Convenient handles allow for easy cable storage. Small footprint fits through 30 in. (762 mm) door. Not intended for use with double head wire feeders.

K3059-5 Dual Cylinder Inverter & Wire* Feeder Cart. Rear-wheeled cart with front casters and dual cylinder platform. Convenient handles allow for easy cable storage. Small footprint fits through 30 inch (762mm) door.

K3091-1 Multi-Process Switch.* Easily switch between CC and CV processes.

* Requires Locking Foot Kit (K4424-1)

K4424-1 Flextec 350 Locking Foot Kit Allows the Flextec to lock to the inverter cart, Multi-Process Switch, Cool-Arc 55 water cooler

K586-1 Deluxe Adjustable Gas Regulator & Hose Kit. Accommodates C02, Argon, or Argon-blend gas cylinders. Includes a cylinder pressure gauge, dual scale flow gauge and 4.3ft (1.3m) gas hose.

3100211 Harris Argon Flowmeter Regulator and Hose Kit

K3019-1 Arc Tracker. The Arc Tracker monitors information regarding your welding arc by connecting it between any DC welding power source and the work clamp.

Weld Fume Control Solutions. Lincoln Electric offers a wide variety of welding fume control solutions, ranging from portable systems easily wheeled around the shop to shop-wide central systems servicing many dedicated welding stations.

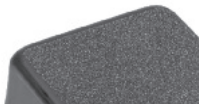
K2909-1 12-pin to 6-pin Adapter

Stick Options

K857-2 12-pin Remote Output Control with Universal Connector. Permits remote adjustment of output.

TIG Options

K870-2 Foot Amptrol®. Provides 25 ft. (7.6 m) of remote current control for TIG welding (12-pin plug connection).



K963-4 Hand Amptrol® - Provides 25 ft. (7.6 m) of remote current control for TIG welding (12-pin plug connection).

K814 Arc Start Switch (6-pin)** - May be used in place of the Foot or Hand Amptrol®. Comes with a 25 ft. (7.6m) cable. Attaches to the TIG torch for convenient finger control to start and stop the weld cycle at the current set on the machine.

** Requires K2909-1 - 12-pin to 6-pin adapter

K4345-1 CrossLinc Remote - allows for remote output control of the Flextec power source through the weld cable without additional control cables.

MAINTENANCE

⚠ WARNING

Before carrying out service, maintenance and/or repair jobs, fully disconnect power to the machine.

Use Personal Protective Equipment (PPE), including safety glasses, dust mask and gloves to avoid injury. This also applies to persons who enter the work area.

MOVING PARTS can injure.
- **Do not operate with doors open or guards off.**
- **Stop engine before servicing.**
- **Keep away from moving parts.**

Have qualified personnel do all maintenance and troubleshooting work.

VISUAL INSPECTION

Clean interior of machine with a low pressure air stream. Make a thorough inspection of all components.

Look for signs of overheating, broken leads or other obvious problems. Many problems can be uncovered with a good visual inspection.

ROUTINE MAINTENANCE

Every six months the machine should be cleaned with a low pressure air stream. Keeping the machine clean will result in cooler operation and higher reliability. Be sure to clean the following areas:

- All printed circuit boards
- Power switch
- Main transformer
- Input rectifier
- Heatsink fins
- Auxiliary Transformer
- Fans (Blow air through the rear louvers)

Examine the sheet metal case for dents or breakage. Repair the case as required. Keep the case in good condition to ensure that high voltage parts are protected and correct spacing is maintained throughout. All external sheet metal screws must be in place to ensure case strength and electrical ground continuity.

CURRENT CALIBRATION

1. Connect the resistive load bank and test voltmeter to the welding output terminals.
2. Put dipswitch 1 in the on position.
3. Rotate the Hot Start knob and Arc Control knob to the minimum.
4. Turn on the Flextec 350XP.
5. The display should read “Cur CAL”.
6. Rotate the Hot Start knob until a message scrolls across the screen.
7. Adjust the output control knob until the actual output amperage reading on the test ammeter is 300 amps +/- 2 amps.
8. Toggle the Local/Remote switch to save the calibration.
9. The display should flash “CAL SEt”.
10. Rotate the Hot Start knob to the minimum.
11. Rotate the Hot Start knob until a message scrolls across the screen.
12. Verify amperage reading on the test ammeter is 300 amps +/- 2 amps.
13. Repeat calibration steps starting from step 7 if necessary.

VOLTAGE CALIBRATION

1. Connect the resistive load bank and test voltmeter to the welding output terminals.
2. Put dipswitch 1 in the on position.
3. Rotate the Hot Start knob and Arc Control knob to the minimum.
4. Turn on the Flextec 350XP.
5. The display should read “Cur CAL”.
6. Rotate the Arc Control knob until the display reads “VoL CAL”.
7. Rotate the Hot Start knob until a message scrolls across the screen.
8. Adjust the output control knob until the actual output voltage reading on the test volt meter is 20 volts +/- .5 volts.
9. Toggle the Local/Remote switch to save the calibration.
10. The display should flash “CAL SEt”.
11. Rotate the Hot Start knob to the minimum.
12. Rotate the Hot Start knob until a message scrolls across the screen.
13. Verify voltage reading on the test volt meter is 20volts +/- .5 volts.
14. Repeat calibration steps starting from step 8 if necessary.

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

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TO RESTORE FACTORY CURRENT CALIBRATION

1. Connect the resistive load bank and test voltmeter to the welding output terminals.
2. Put dipswitch 1 in the on position.
3. Rotate the Hot Start knob and Arc Control knob to the minimum.
4. Turn on the Flextec 350XP.
5. The display should read “Cur CAL”.
6. Rotate the Arc Control knob until the display reads “Fct Cur”.
7. Rotate the Hot Start knob until a message scrolls across the screen.
8. Toggle the Local/Remote switch to save the calibration.
9. The display should flash “CAL SEt”.

TO RESTORE FACTORY VOLTAGE CALIBRATION

1. Connect the resistive load bank and test voltmeter to the welding output terminals.
2. Put dipswitch 1 in the on position.
3. Rotate the Hot Start knob and Arc Control knob to the minimum.
4. Turn on the Flextec 350XP.
5. The display should read “Cur CAL”.
6. Rotate the Arc Control knob until the display reads “Fct VoL”.
7. Rotate the Hot Start knob until a message scrolls across the screen.
8. Toggle the Local/Remote switch to save the calibration.
9. The display should flash “CAL SEt”.

TABLE OF CONTENTS

FUNCTIONAL DESCRIPTION

The Flextec 350XP is an inverter based, multi-process DC welding power source that has a 5 to 435 amp output range. The machine is designed to weld in either the constant current (CC) mode or the constant voltage (CV) mode with common wire types and sizes. It is also capable arc gouging in either the Stick or CV modes.

The Flextec 350XP standard machine includes an ArcLink setting that allows the machine to weld in synergic modes with ArcLink compatible wire feeders. In addition it is also compatible with Lincoln analog and across-the-arc wire feeders. The machine comes with CrossLinc technology for remote voltage setting with CrossLink compatible wire feeders, without the use of a separate control cable.

The Flextec 350XP is made up of eight main components. They are as follows:

- The Input Board
- The Switch Board
- The Main Transformer
- The Output Rectifier
- The Output Choke
- The Control Board
- The User Interface Board
- The 42VDC Bus Board

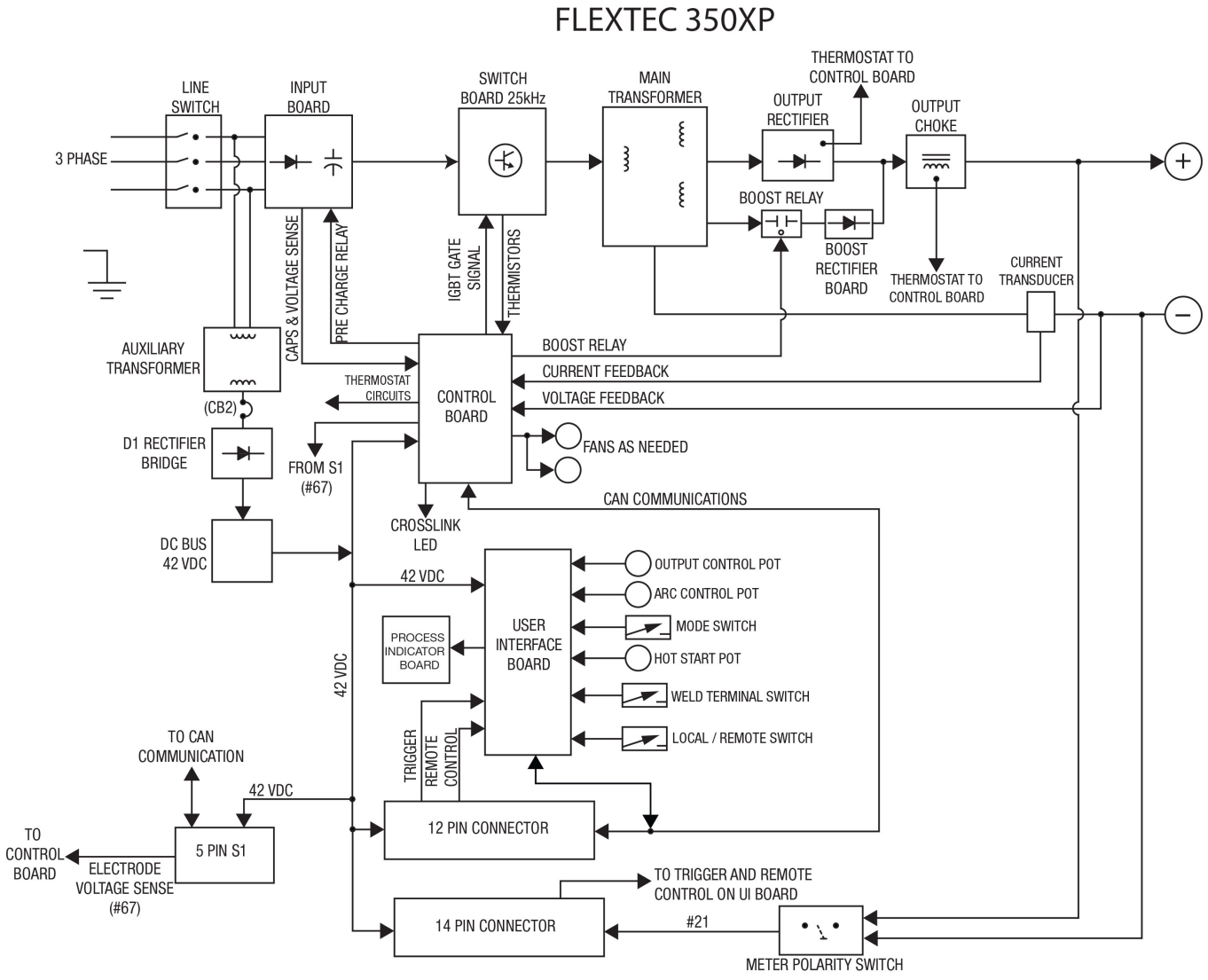


Figure E.1

POWER UP

Line Switch, Auxiliary Transformer, Input Board, D1 Rectifier Bridge, CB2, 42VDC Board, Control Board, UI Board, Switch Board

When the correct three-phase input voltage is applied to the Flextec 350XP, via the input line switch, two phases of this AC voltage are applied to the auxiliary transformer and all three phases are applied to the input board. The auxiliary transformer converts the high input voltage (380-575 VAC) to a lower secondary voltage (49-75 VAC) for operating the internal electronics within the Flextec 350XP. This secondary voltage is applied to the D1 rectifier bridge through the CB2 20-amp circuit breaker.

The unregulated DC output of the D1 rectifier bridge is applied to the 42V DC bus board. The bus board regulates the output to 42 VDC. This regulated 42 VDC is applied to the control board, the user interface board and the Arc Link and wire feeder receptacles.

The three-phase input voltage applied to the input board is rectified and applied, through a pre-charge circuit, to the DC link capacitors that are located on the input board and the switchboard. The pre-charge circuit limits the in-rush current to the DC link capacitors for approximately five seconds. The DC link capacitors clamp the voltage and store energy for the welding output. The switchboard receives the rectified and filtered DC voltage from the input board.

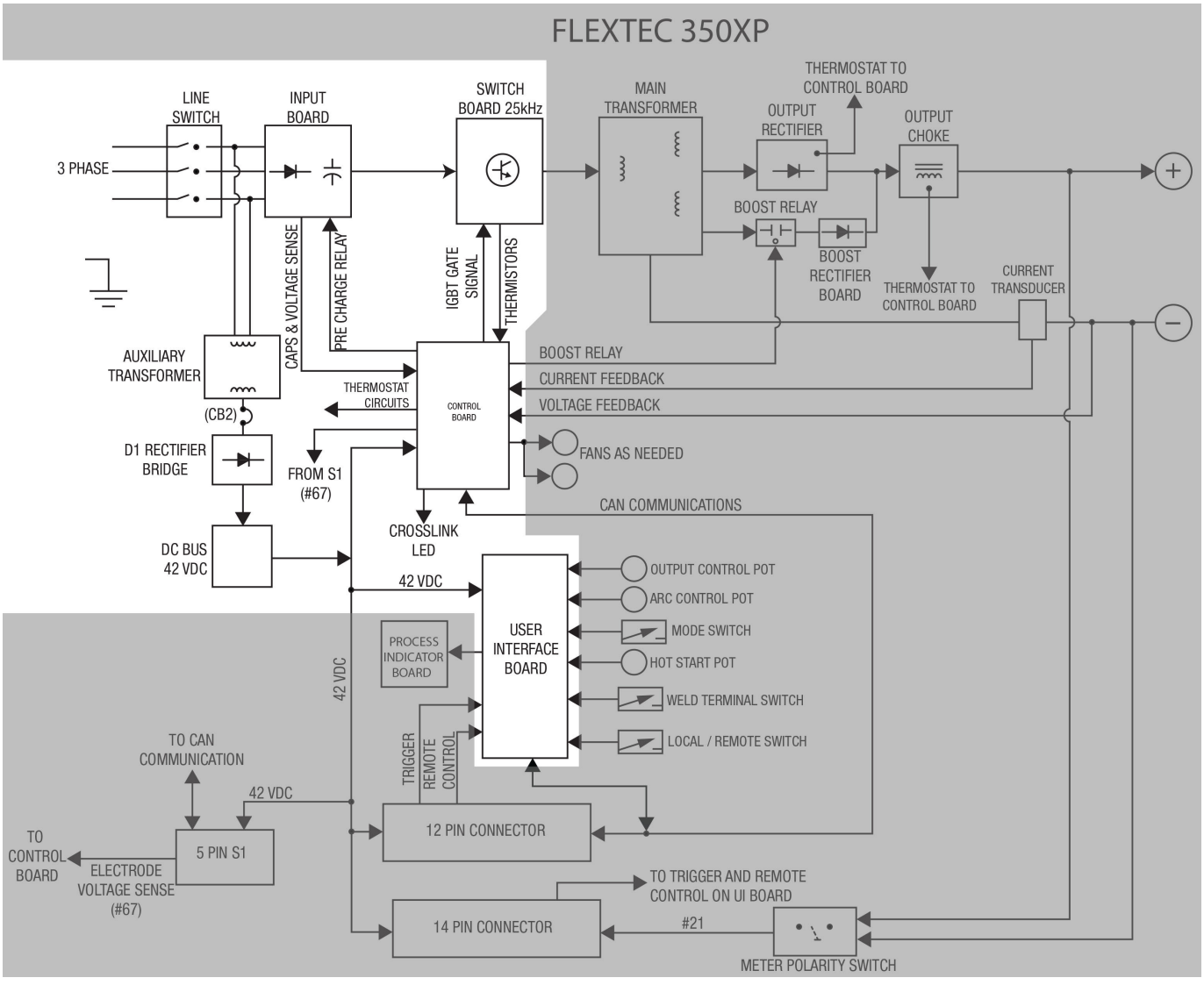


Figure E.2

SWITCHBOARD AND MAIN TRANSFORMER

Switch Board, Input Board, Main Transformer, Output Rectifier, Boost Relay, Boost Rectifier, Control Board

The main function of the switchboard is to receive and process the rectified and filtered primary power received from the input board. The IGBT circuitry on the switchboard is designed to operate from a rectified three-phase input voltage range from 380 VAC to 575 VAC. There are two quadrants of IGBTs housed on the switchboard that provide pulse width modulated power to the primary windings of the main welding transformer. The operating frequency is 25kHz. See Pulse Width Modulation and Insulated Gate Bipolar Transistor (IGBT) Operation. The switchboard has several LEDs that indicate the current status of the switchboard. LED 1 indicates the board is receiving primary voltage from the input board. The other LEDs indicate the switchboard is receiving gate drive signals from the control board. There are also two thermistors that monitor the temperatures of the IGBT quadrants.

The main transformer's primary windings receive the pulse width modulated power from the switchboard. The 25kHz. AC output that is created on the secondary weld windings is applied to the output rectifier. The boost winding of the main transformer provides a higher voltage to the boost rectifier board via the boost relay. The boost relay receives a 15 VDC control signal from the control board when welding current is being drawn. The boost circuit is only active in the SMAW mode. The weld current and DC boost current is applied through the output choke to the positive output terminal.

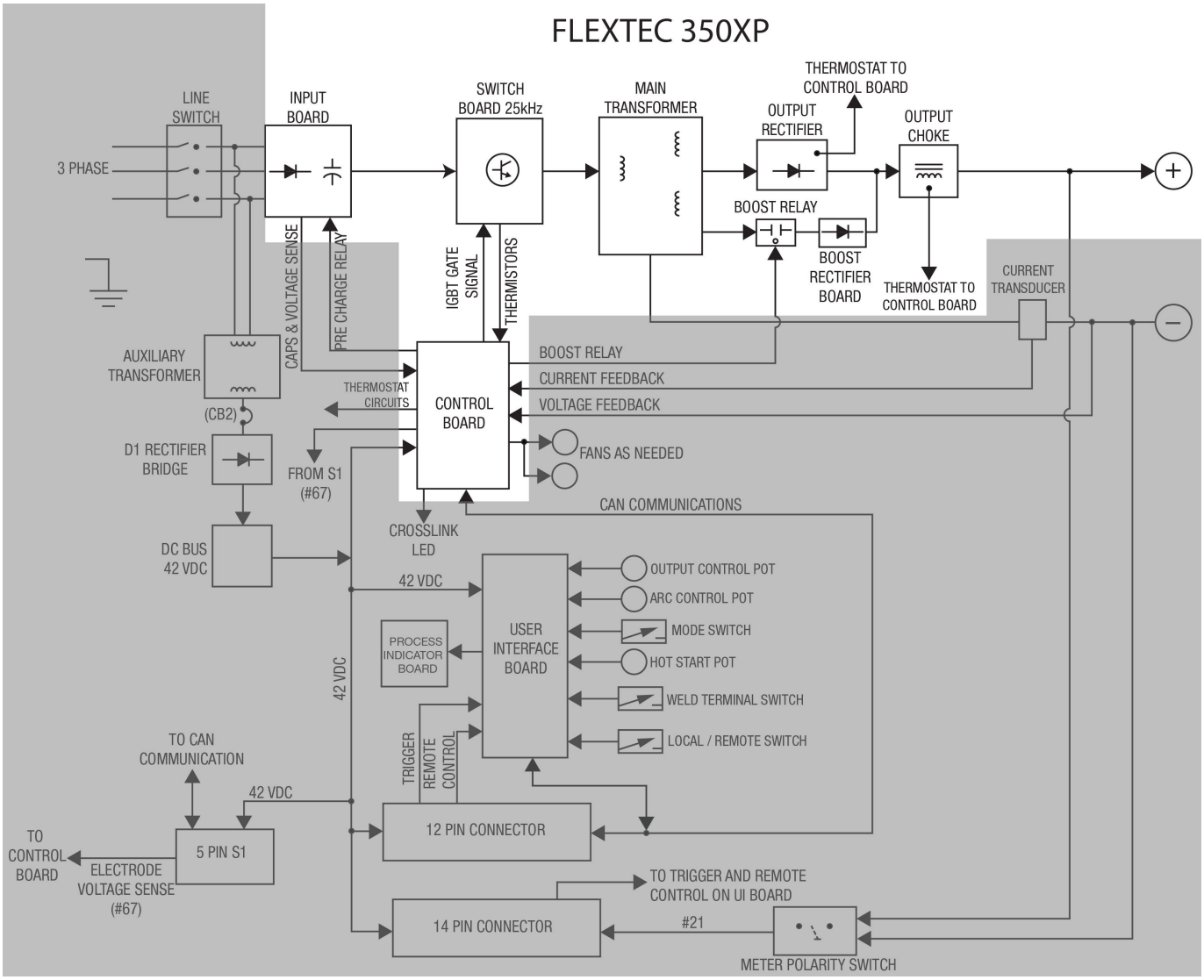


Figure E.3

CONTROL BOARD AND PROCESS INDICATOR BOARD

Control Board, Process Indicator Board, UI Board, Fans, Mode Select Switch

The control board receives input power from the 42V DC bus board. From the 42 VDC the control board creates an internal +15 VCD supply for electronics and a +5 VDC supply for ArcLink. LED 1 indicates the +15 VDC supply is functioning and LED 2 indicates the ArcLink supply is on. LED 1 on the daughter board is the ArcLink status indicator. The control board is the “master” in the ArcLink system and controls the CAN communication network.

The control board receives line input voltage and capacitor voltage information from the input board. After approximately 5 seconds from initial turn on the control board sends a signal to the relay on the input board to by-pass the pre-charge circuit and apply full input power to the Switch Board.

The control board receives welding feedback information (voltage and current) and compares this feedback information with the user commands from the user interface (UI) board. These commands are sent from the UI board to the control board via ArcLink communication protocol. The control board then sends the appropriate IGBT gate firing signals to the switchboard so that the welding output is controlled through pulse width modulation. The control board provides actual output voltage and current information to the UI board and also any error codes to display. The control board also monitors the thermostat and thermistor circuits. This control board controls and monitors the CrossLinc™ circuit and turns on the green LED when the Flextec 350XP is connected to the LN25X. The two 42 VDC fans are also controlled by the control board.

The fans will slow down their RPM until a welding load is applied to the machine. When a welding load is applied the fan’s RPM will increase to provide cooling air to the Flextec 350XP.

The Process Indicator Board activates the appropriate LED when a welding process is selected by the Selector Mode Switch.

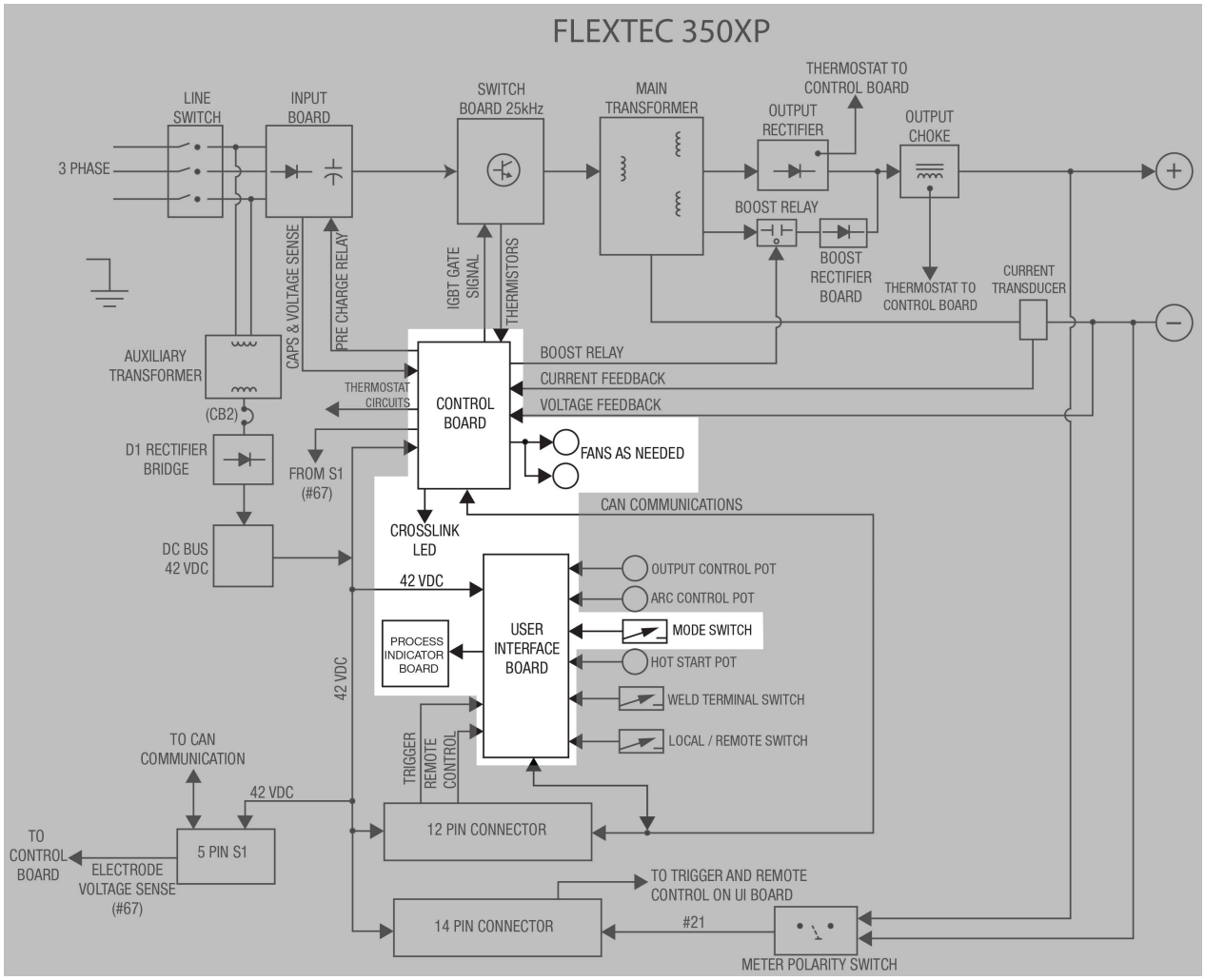


Figure E.4

USER INTERFACE (UI) BOARD

UI Board, 42VDC Bus Board, Output Control, Arc Control, Mode Select Switch, Hot Start, Weld Terminal Switch, Local/Remote Switch

The UI board is powered by the 42 VDC received from the 42V DC bus board. LED 5 indicates that the on board power supply is functioning. LED 4 is the ArcLink status indicator.

The user controls, switches and connectors allow the operator to communicate to the UI board the desired processes and welding requirements. The UI board then sends the desired parameters to the control board via ArcLink CAN communication. The UI board displays to the user the preset settings (voltage or current). During welding the UI board displays actual voltage and output current.

There are two VRD indicator lights on the front of the machine. When shipped the VRD function is disabled. VRD is enabled by setting the dipswitch on the UI board. See Operation section of the Operators manual. Several test modes can be accessed using the dipswitches on the UI board.

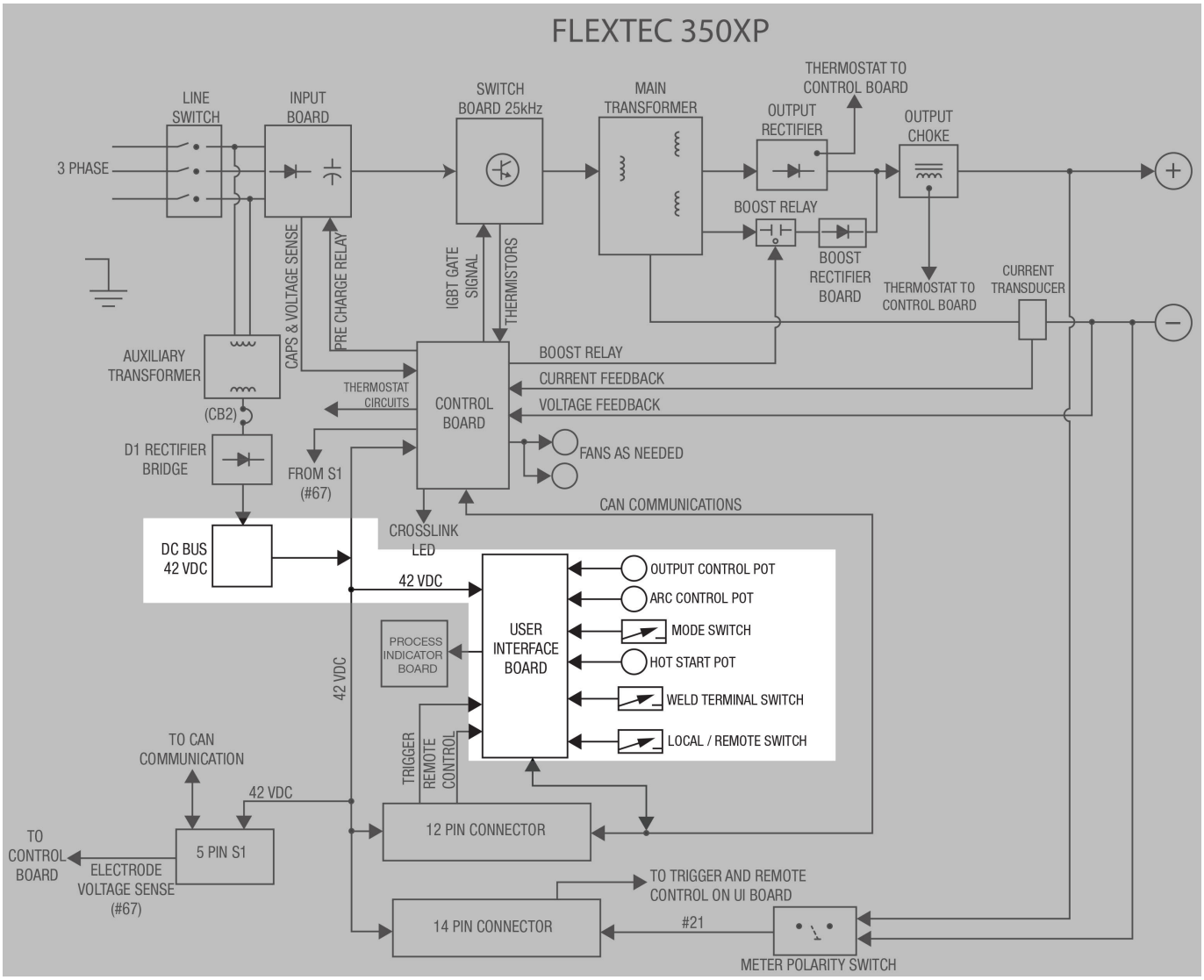


Figure E.5

OUTPUT SECTION

Main Transformer, Output Rectifier, Output Choke, Control Board, Choke Thermostat, Meter Polarity Switch

The 25KHz. AC output from the main weld winding secondary is applied to the output rectifier bridge. The resultant DC+ power is coupled through an output choke to the positive output terminal. The output choke is an inductor that provides filtering to enhance the arc performance and accurate waveform response. The choke has a normally closed thermostat that is wound into the choke winding and the signal is sent to the Control Board. The current transducer converts welding output current to a low DC voltage that is sent to the control board for welding output control.

The Meter Polarity Switch sends the electrode polarity (positive or negative) to the wire feeder receptacle (via lead #21) so the meter on the wirefeeder receives the correct electrode polarity signal.

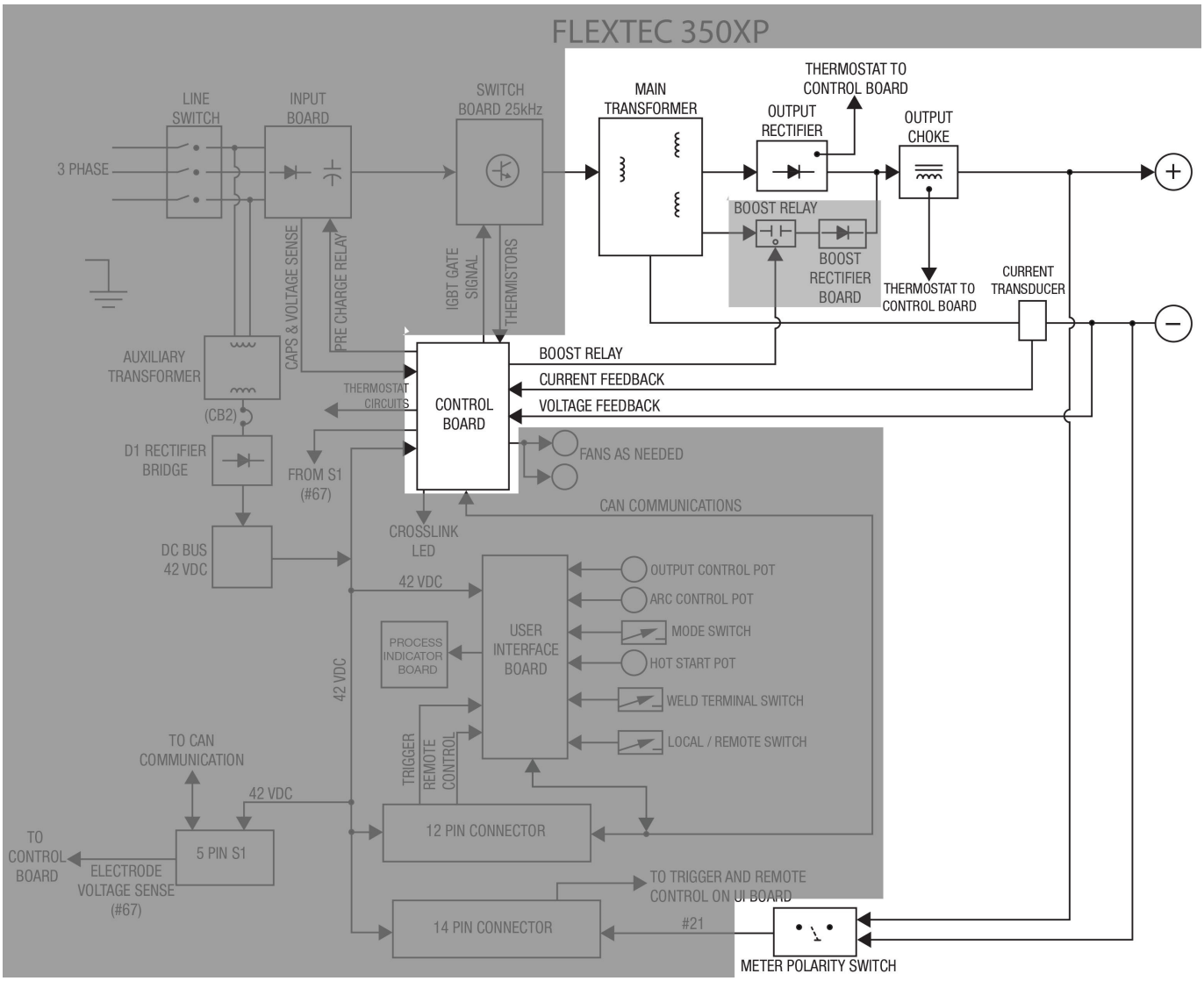


Figure E.6

CROSSLINC™ CAPABILITY

The Flextec 350XP has the ability to communicate with compatible wire feeders such as the LN25X. The two machines communicate directly over the weld cables by pulsing the OCV voltage and wire feeder current draw. This communication only occurs during an open circuit voltage (OCV) condition. Any changes made at the compatible wire feeder are sent to the power source. This functionality enables the user to adjust the welding voltage at the LN25X wire feeder without the need for a separate control cable.

PROTECTIONS

Thermal Protection

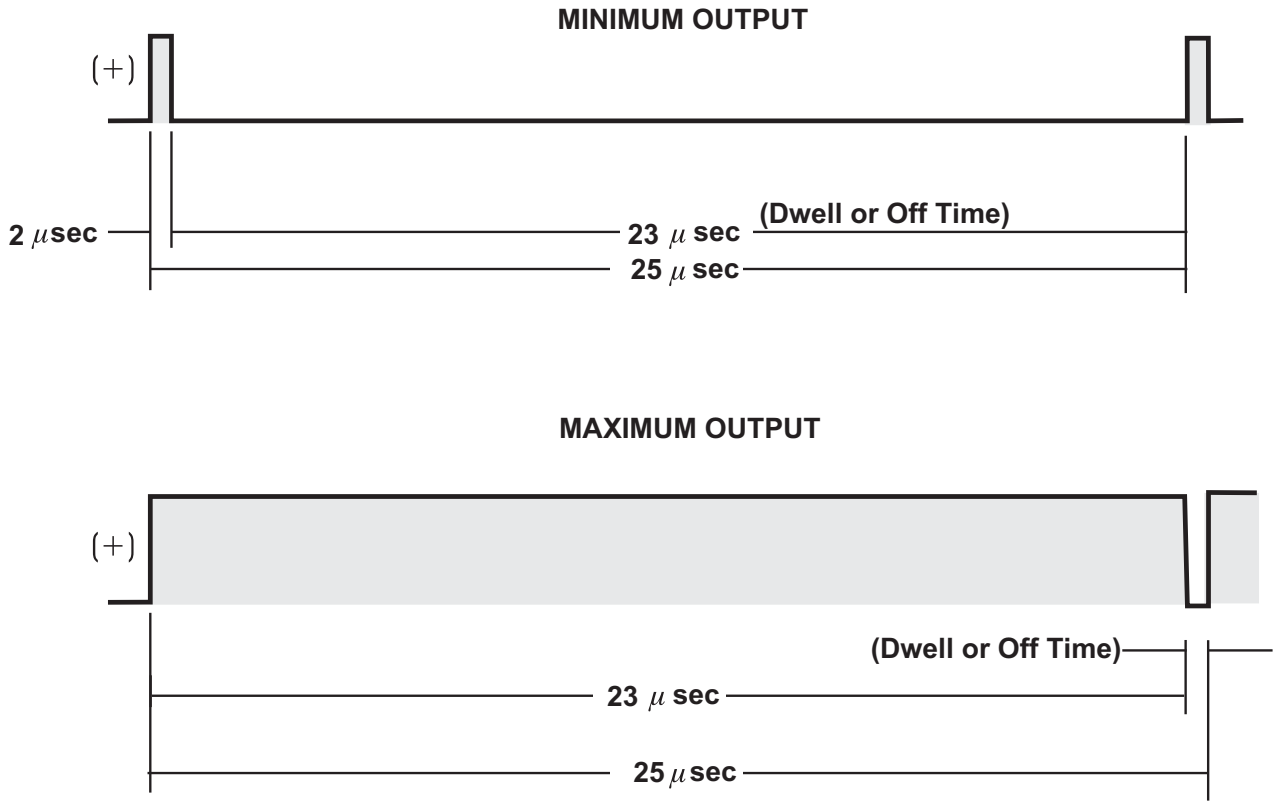
There are two separate thermal protection circuits in the Flextec 350XP. Two normally closed thermostats protect the output choke and the output rectifier bridge from over temperature. They are wired in series and are connected to the control board. These protect the machine against reduced airflow or overload. If excessive operating temperatures should occur, the thermostats will open and the fans will turn on, the thermal LED will illuminate, the output will be disabled and error 36 will be logged and displayed.

Two thermistors, located on the top and bottom switchboard heat sinks, protect the IGBT` quadrants in the switchboard. The resistance of these thermistors are read by the control board and converted to temperatures. If excessive operating temperatures should occur the fans will turn on, the thermal LED will illuminate, the output will be disabled and error 36 will be logged and displayed. These devices are self-resetting once the machine cools down sufficiently or any overload is removed. If the thermal shutdown was caused by excessive output or duty cycle and the fans were operating normally, the power switch may be left ON and the reset should occur within a 15-minute timeframe. If the fans are not functioning normally or the air intake louvers are obstructed, then the power must be removed from the machine and the fan problem or air obstruction corrected. If the machine was being operated in the “Remote” mode when the thermal fault occurred the remote trigger will needed to be opened and closed when the thermal fault has cleared to re-established output.

Under/Over Voltage Protection

The machine is protected from both over and under voltage conditions. If the DC voltage being applied to the switchboard is lower than 180 VDC or higher than 1050 VDC the machine’s output will be disabled. If the condition persists for more than one second error 711 will be displayed.

TYPICAL IGBT OUTPUTS

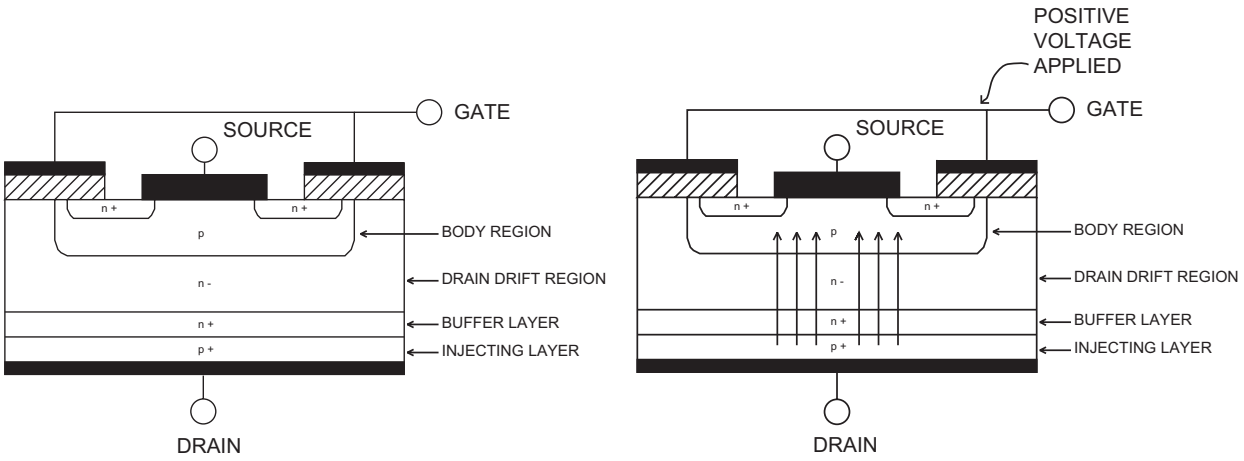


Pulse Width Modulation
The term Pulse Width Modulation is used to describe how much time is devoted to conduction in the positive and negative portions of the cycle. Changing the pulse width is known as modulation. Pulse Width Modulation (PWM) is the varying of the pulse width over the allowed range 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 the cycle. The top drawing shows the minimum output signal possible over a 40-microsecond time period. The positive portion of the signal represents one IGBT group1 conducting for one microsecond. The negative portion is the other IGBT group1. The dwell time (off time) is 19 microseconds (both IGBT groups off). Since only two microseconds of the 40-microsecond time period are devoted to conducting, the output power is minimized.

Maximum Output
By holding the gate signal on for 19-microseconds each and allowing only two microsecond of dwell time (off time) during the 40-microsecond cycle, the output is maximized. The darkened area under the top curve can be compared to the area under the curve indicates that more power is present. 1 An IGBT group consists of two IGBT modules feeding one transformer primary winding.

IGBT OPERATION



Insulated Gate Bipolar Transistor (IGBT) Operation

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

Example A shows an IGBT in 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.

Example B shows the IGBT in an active mode. When the gate signals 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 the 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.

The following "problems/symptoms" are a guide to solving issues that may be obvious with welding equipment and or cutting equipment. This document is not intended to be comprehensive. For further assistance see the Theory of Operation Section in this manual.

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.

⚠ WARNING

ELECTRIC SHOCK can kill.

- **Turn off machine at the disconnect switch on the rear of the machine and remove main power supply connections before doing any troubleshooting.**

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.

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PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
POWER UP 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 sure the input fuses or circuit breakers are properly sized.	1. Perform the **Input Board Test Procedure.** 2. Perform the **Auxiliary Transformer (T1) Test Procedur**e. 3. Perform the **Switchboard Test Procedure**. 4. Perform the **Main Transformer Test Procedure.** 5. Perform the **Line Switch Test Procedure**.
The machine is “dead”. No lights, no output, the machine appears to have no input power.	1. Make sure the Line Switch is in the ON position. 2. Check the main input fuses or breakers to make sure all three phases of the correct input power are present at the machine. 3. Check CB1 and CB2 circuit breakers in machine back.	1. Perform the **Line Switch Test Procedure**. Also check the associated leads for loose or faulty connections. See Wiring Diagram. 2. Perform the **Auxiliary Transformer (T1) Test Procedure**. 3. Perform the **42V DC Bus Board Test Procedure**. 4. Perform the **D1 Rectifier Test Procedure**.
FUNCTION PROBLEMS		
The thermal LED is “ON”. The machine regularly overheats	1. The welding application may be exceeding the duty cycle and/or limits of the machine. 2. Dirt or dust may have clogged the cooling channels inside the machine. 3. Air intake and exhaust louvers may be blocked due to inadequate clearance. 4. Make sure the fans are functioning correctly. The Flextec 350XP is equipped with F.A.N. (fan as needed) circuitry. The fans run at a high speed whenever the output current is established and will continue running for approximately five minutes after the output current is off.	1. Perform the **Thermostat #1 and #2 Circuit Test Procedure**. 2. Check the Thermistors. See the **Switch Board Test.** 3. Perform the **Fan Test Procedure**.

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.

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PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
FUNCTION PROBLEMS (CONT)		
The machine turns on but the display is not visible, flickers or has missing digits.	1. Turn the machine off and back on to re-boot.	1. Check for loose or faulty connections at the user interface board and Process Indicator Board. See Wiring Diagram. 2. Perform the **User Interface Board Test Procedure**.
The fans are running at high speed at all times.	1. Make sure there is no load on the welding output terminals.	1. Perform the **Fan Test Procedure**. 2. Perform the **Control Board Test Procedure**.
Machine will not respond to the user controls and switches.	1. Make sure the machine is in "Local" control. 2. Remove any external devices from the amphenols.	1. Perform the **User Interface Board Test Procedure**.
When selecting weld modes the LEDs do not change on the Process Indicator Board.	1. N/A	1. Perform the **Mode Switch Test**.
The CrossLinc™ function does not work.	1. Make sure a compatible wire feeder (LN-25X) is connected to the Flextec 350XP. 2. The weld voltage can only be adjusted from the LN-25X when the Flextec 350XP is in an open circuit voltage condition. (not welding) 3. The green CrossLinc™ LEDs on both machines must be illuminated.	1. Check the weld cables between the power source and the feeder. The voltage drop must be less than 10 VDC. (When welding) 2. Check the wiring between the Control Board and the User Interface Board. See the wiring diagram.
There is no gas flow when the welding gun trigger is activated. The machine does have normal open circuit voltage and the wire feeds normally.	1. Make sure the gas supply is connected to the machine properly. 2. Make sure the welding process selected requires gas coverage.	1. The Gas Solenoid may be faulty. (If so equipped) 2. Perform the **User Interface Board Test Procedure**.
The external wirefeeder does not work. Apparently there is no power being applied to the wire feeder.	1. Check the control cable connectors on the case front of the machine to make sure the wire feeder is connected properly. 2. Check the CB1 circuit breaker on the back of the machine. 3. 3.Check the control cable between the wire feeder and the Flextec 350XP.	1. Perform the **40VDC Bus Board Test Procedure**. 2. Check the wiring connected to the wirefeeder connectors for loose or faulty connections. See the wiring diagram.

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.

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PROBLEMS (SYMPTOMS)	POSSIBLE CAUSE	RECOMMENDED COURSE OF ACTION
OUTPUT PROBLEMS		
There is no open circuit voltage. The machine powers-up normally. The thermal light is NOT lit.	1. Make sure the S5 weld terminals switch is in the ON position. 2. Make sure the correct input three-phase input power is being applied to the machine. The input voltage may be too high or too low. In this case an error code might be displayed. 3. Check the heavy current carrying leads are connected to the output terminals. See the wiring diagram. 4. Make sure the S4 Local/Remote Switch is in the Local position.	1. Perform the **Switch Board Test Procedure**. 2. Perform the **Control Board Test Procedure**. 3. Perform the **S5 Weld Terminals Switch Test Procedure**. 4. Perform the **User Interface Board Test Procedure**. 5. Perform the **Output Rectifier Test Procedure**. 6. Perform the **Main Transformer Test Procedure**. 7. Perform the **Output Choke Test Procedure**.
There is a general degradation of the welding performance.	1. Make sure the correct three phase input power is being applied to the machine. 2. Make sure the machine's controls are set correctly for the welding process being used. 3. Check for poor connections or "loops" in the welding cables. 4. If using a wire feeder check for the correct and consistent wire feed speed at the wire feeder. 5. Make sure the shielding gas is correct for the welding process.	1. Perform the **Output Choke Test Procedure**. 2. Perform the **Current Transducer (LEM) Test Procedure**. 3. Perform the **Output Rectifier Test Procedure**.
The machine loses welding output during a weld.	1. A secondary over-current may have occurred. The welding application may have exceeded the current limitations of the machine. 2. Make sure the correct three phase input power is being applied to the machine. 3. Check the welding cables for loose or faulty connections.	1. Perform the **Output Rectifier Test Procedure**. 2. If in a SMAW (Stick) mode, perform the **Boost Relay Test Procedur**e.
The welding electrode is hard to start when in the SMAW (stick mode).	1. Make sure the electrode is not wet or damp. 2. Make sure the work clamp is tight to the work piece.	1. Perform the **Boost Relay Test Procedure**. 2. Perform the **Boost Rectifier Test Procedure**. 3. Perform the **Main Transformer Test Procedure**.

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.

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TEST PROCEDURES

HOW TO USE THE TEST REFERENCE CHART

⚠ WARNING

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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 FLEXTEC® ®350XP AND FLEXTEC 350X CONSTRUCTION		
	POWER UP	WELDING OUTPUT	AUXILIARY OUTPUT
40 VDC Bus Board	X	X	X
Aux Transformer	X	X	X
Boost Bridge Rectifier		X	
Boost Relay		X	
CB1		X	X
CB2	X	X	X
Choke		X	
Control Board	X	X	
Current Transducer		X	
D1	X	X	X
Fans A & B		X	
Input Board	X	X	X
Line Switch	X	X	X
Local/Remote Switch		X	
Main Transformer		X	
Mode Select Switch		X	
Output Rectifier		X	
Polarity Switch			X
Process Indicator Board		X	
Switch Board		X	
Thermostats 1 & 2		X	
User Interface		X	
Weld Terminal Switch		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.

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USING THE STATUS LED TO TROUBLESHOOT SYSTEM PROBLEMS

Errors are displayed on the user interface. In addition, there are status lights on the User Interface PC board and the Switch PC board that contain error sequences.

Included in this section is information about the status lights and some basic troubleshooting charts for both machine and weld performance.

The status lights on the User Interface board, Crosslinc®, Input board, Control board and the Switch board are dual-color LED's or green LEDs. Normal operation for each is described on the wiring diagram.

Error conditions are indicated in the following chart.

Fault Codes

ERROR CODE#	DESCRIPTION	POSSIBLE CAUSE	CORRECTIVE ACTION
6	Device that controls sequence of the welding operation halted due to an error.	Communication from the Power Source failed before mapping was complete.	Weld Terminals Remote: Re-trigger to recover from error. Weld Terminals Local: Toggle Remote/Local Switch to recover from error.
18	ArcLink Auto-Mapping Failed.	The machine could not properly configure the devices that are attached to it. This configuration problem could be caused by the type of devices that are connected to the machine or a required device that is not connected.	Refer to the Operator's Manual for proper configuration. Verify all devices in the system are properly powered.
21	Device that controls sequence of the welding operation halted due to an error.	A component of the system encountered an error during the welding sequence and caused system to stop. The component with the error could be a wire drive, a user interface or some other part fo the system.	Weld Terminals Remote: Re-trigger to recover from error. Weld Terminals Local: Toggle Remote/Local Switch to recover from error.
31	Primary Overcurrent.	Peak current through the transformer primary has exceeded its threshold.	Check the input power (voltage and frequency). Verify that the PC boards and input rectifier are in working condition and proper input power and welding output cable connections. Verify proper connections of main internal power components. Power must be cycled to the machine to reset the error.
36	Thermal Fault	Machine shut off output due to elevated internal temperatures.	1. Check for material blocking intake or exhaust louvers. • Blow air in the rear louvers to clear dirt from the fan. Note: The Fan As Needed circuitry automatically shuts off the fan 5 minutes after welding has stopped. 2. Welding output ratings may have been exceeded. Allow the machine to cool down and reset. Measure the thermostats at the Switchboard and replace if defective
45	Output Voltage Limit Exceeded	During OCV, the voltage at the studs exceeded the allowable levels.	IF VRD is enabled, the stud voltage exceeded 35 volts peak. In standard operation, the stud voltage exceeded 113 volts peak. Verify the voltage feedback leads are properly connected inside the machine. Verify the input voltage in within +/- 10% of the nominal value.
213	Communication Fault	CAN communication between the User Interface PC board and the Switch PC Board has been interrupted.	Power must be cycled to the machine to reset the error. Visually inspect the CAN harness to ensure connections and condition. Verify power supply to the User Interface and Switch PC boards. Replace defective assemblies as required.

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.

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ERROR CODE#	DESCRIPTION	POSSIBLE CAUSE	CORRECTIVE ACTION
711	DC Link Capacitor Over/Under Voltage	The voltage on the main DC link capacitors housed on the switchboard has either gone too high or too low	Verify all three phases of the AC input are connected

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.
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Refer to Safety pages for explanation of hazards:

40VDC BUS BOARD TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the 40VDC Bus Board using Active tests. This procedure will NOT test all of the circuitry on this component.

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

TEST PROCEDURE:
1. For location of the 40VDC Bus 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 plugged into external power and turned on. Observe LED1, if it is lit proceed to Step 4.

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

Figure F.2

40VDC Bus Board Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Input From D1	Machine ON	J46 Pin 1	J46 Pin 3	68–101VDC
		J46 Pin 2	J46 Pin 4	68–101VDC
40VDC Output		J47 Pin 3	J47 Pin 1	~42VDC
		J47 Pin 4	J47 Pin 1	~42VDC
		J47 Pin 7	J47 Pin 5	~42VDC
		J47 Pin 8	J47 Pin 6	~42VDC

Table 1

A.3. 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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

AUXILIARY TRANSFORMER TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Auxiliary Transformer 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 Auxiliary 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.

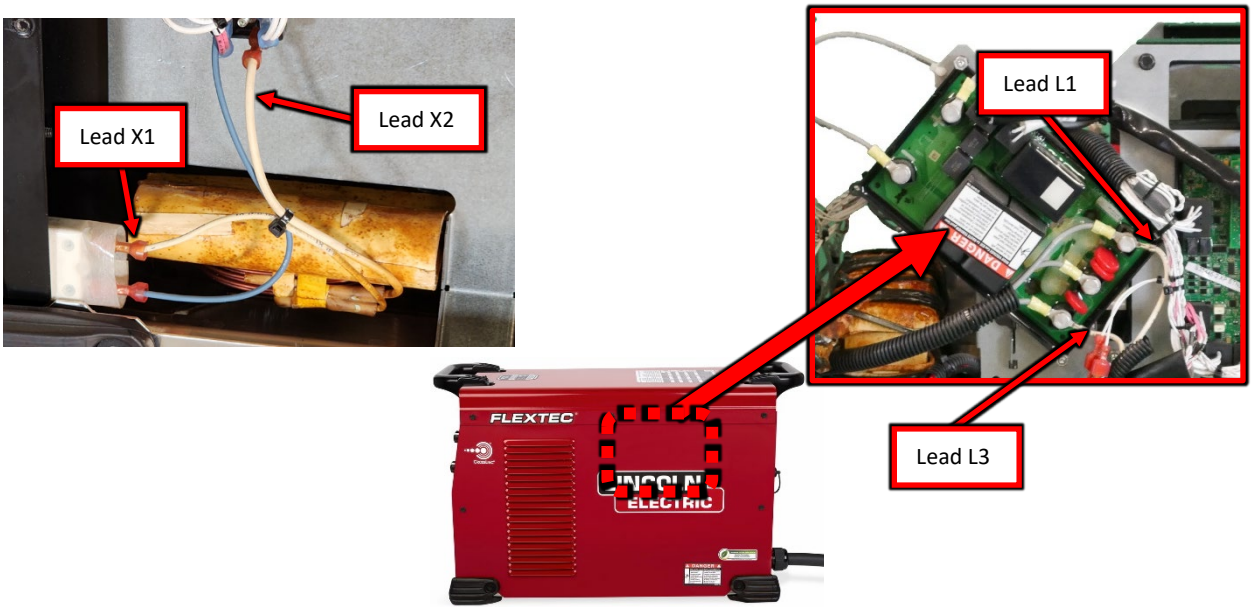


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. NOTE: MEASUREMENTS ARE MADE ON THE DISCONNECTED LEADS.

Auxiliary Transformer Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Auxiliary Transformer Primary	Leads L1, L3, X1, and X2 disconnected	Lead L1	Lead L3	< 1Ω
		Lead L1	Chassis Ground	> 500KΩ
Auxiliary Transformer Secondary		Lead X1	Lead X2	< 1Ω
		Lead X1	Chassis Ground	> 500KΩ
Primary to Secondary		Lead L1	Lead X1	> 500KΩ

Table 1

A.4 If measurements are correct reconnect anything disconnected in previous steps and proceed to “B. ACTIVE TESTING”.

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

B. ACTIVE TESTING

B.1. Ensure the machine is connected to external power and turned ON.

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

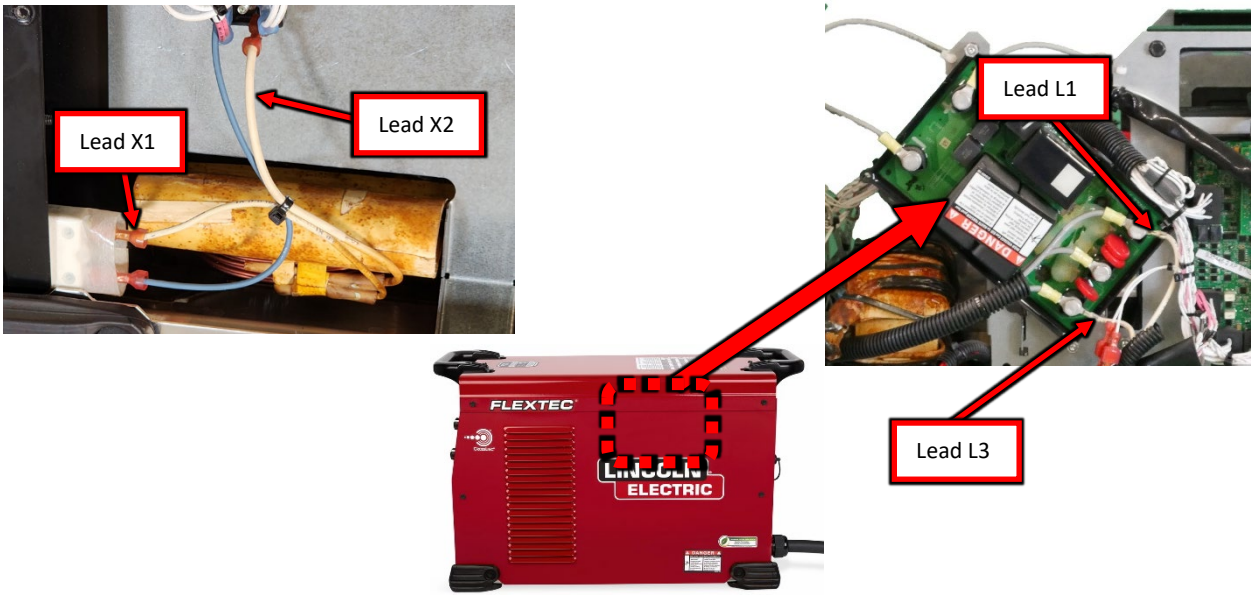


Figure F.3

Auxiliary Transformer Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Auxiliary Transformer Input	Machine ON	Lead L1	Lead L3	380 - 575VAC
Auxiliary Transformer Output		Lead X1	Lead X2	49 - 75VAC

Table 2

B.3. 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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

BOOST RECTIFIER TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Boost Rectifier 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 Boost Rectifier refer to Figure F.1.

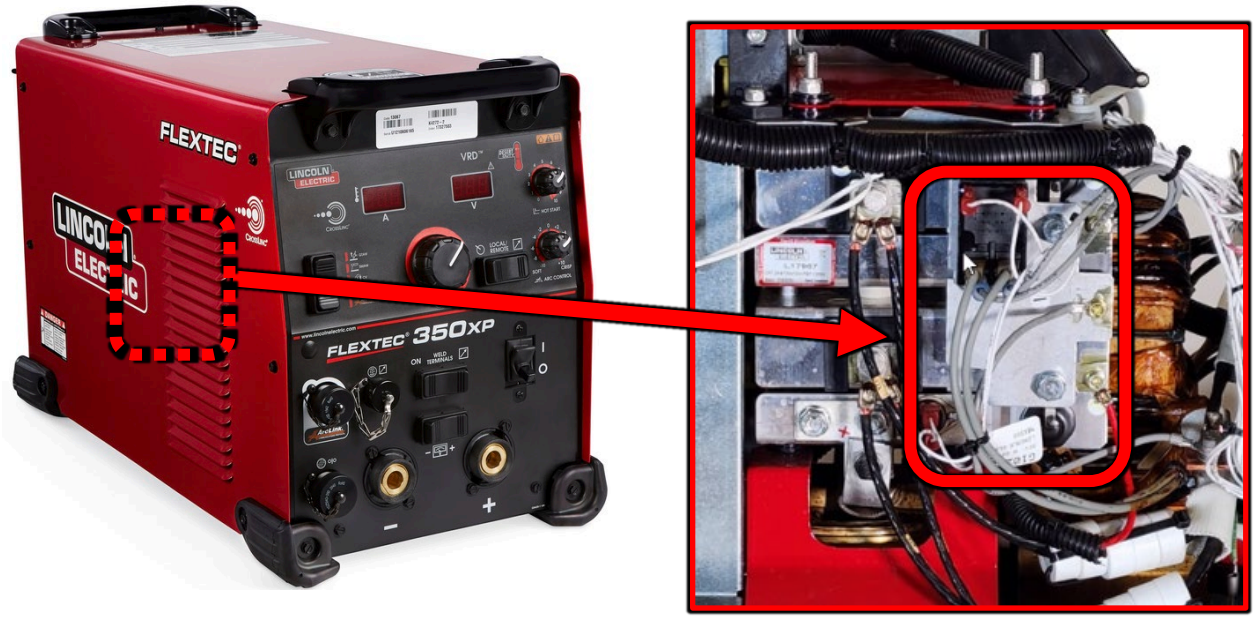


Figure F.1

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

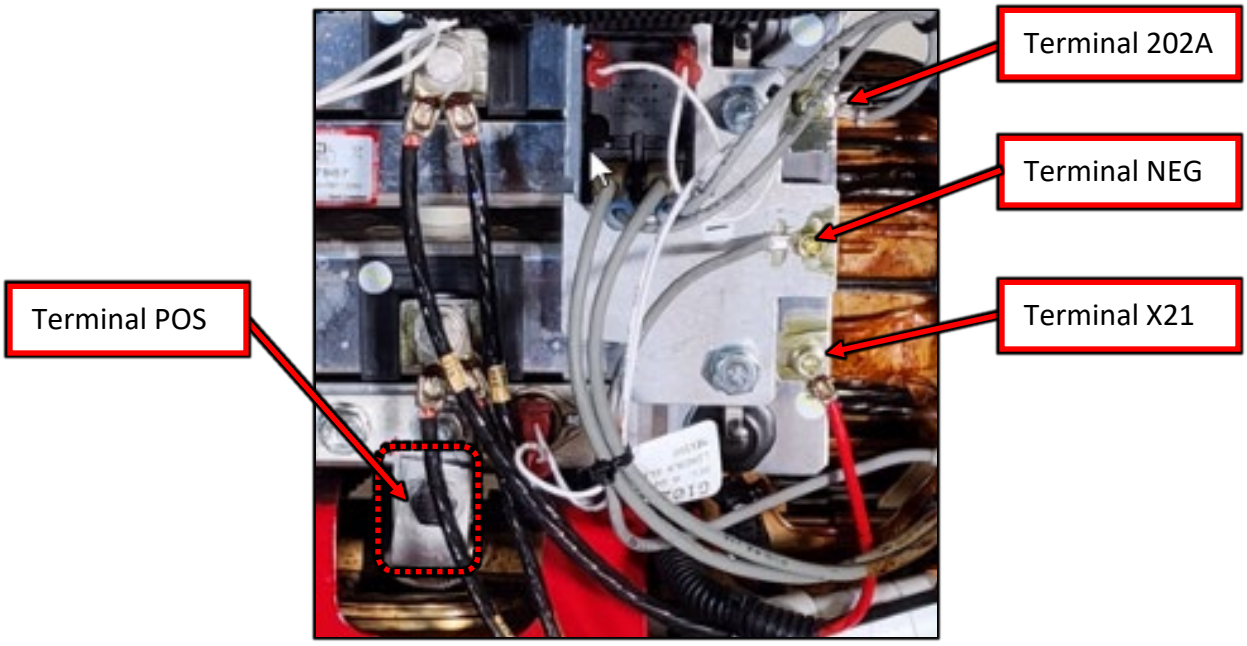


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Boost Rectifier Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Boost Rectifier	Machine OFF, Meter in Diode Mode	Terminal X21	Terminal POS	0.3-0.7VDC
		Terminal 202A	Terminal POS	0.3-0.7VDC
		Terminal NEG	Terminal X21	0.3-0.7VDC
		Terminal NEG	Terminal 202A	0.3-0.7VDC

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

BOOST RELAY TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Boost Relay 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 Boost Relay refer to Figure F.1.

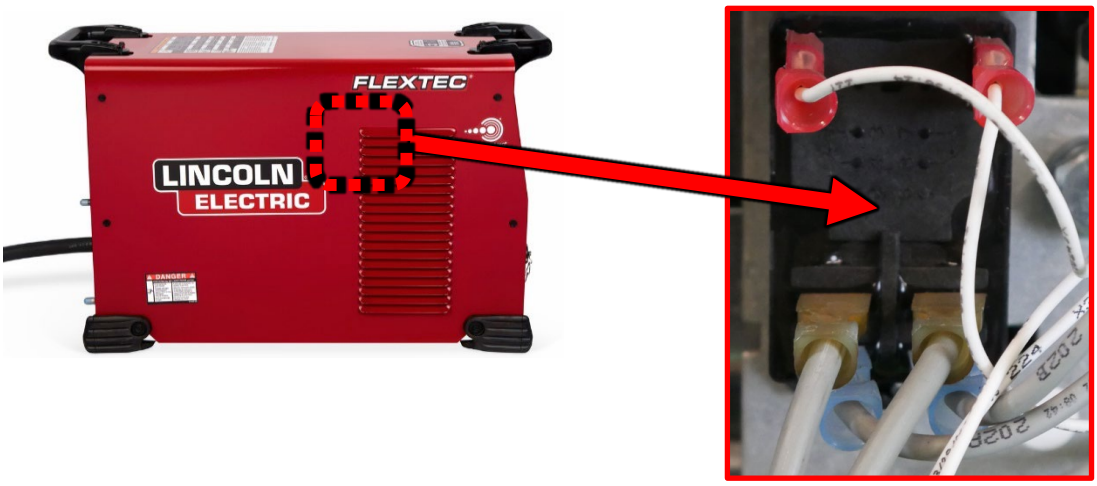


Figure F.1

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.

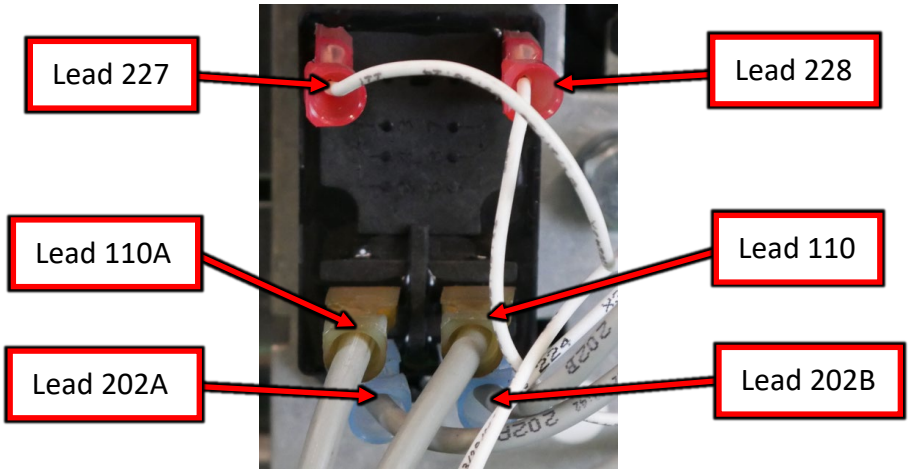


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. NOTE: MEASUREMENTS ARE MADE ON THE TERMINALS NOT THE LEADS.

Boost Relay Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Boost Relay Coil	Machine OFF	Terminal 227	Terminal 228	~84.6Ω
Boost Relay Contacts		Terminal 110A	Terminal 202A	> 500KΩ
		Terminal 110	Terminal 202B	> 500KΩ

Table 1

A.4 If measurements are correct reconnect anything disconnected in previous steps and proceed to “B. ACTIVE TESTING”.

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

B. ACTIVE TESTING

B.1. Label and disconnect leads 110A, 110, 202A and 202B, refer to Figure F.3. Ensure the machine is turned ON, placed in STICK MODE and properly loaded @200A.

B.2. Perform the measurements in Test Table 2 below, refer to Figure F.3 for test point locations. NOTE: ENSURE LEADS 110A, 110, 202A AND 202B ARE DISONNECTED.

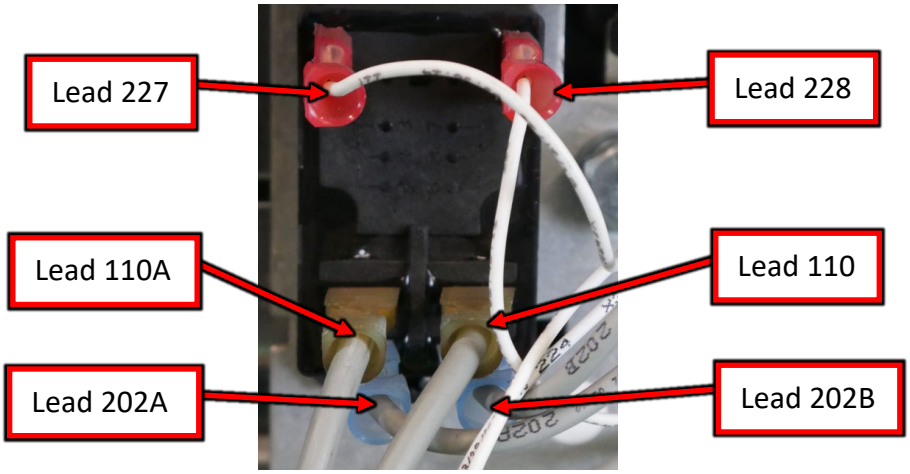


Figure F.3

Boost Relay Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Relay Input	Leads 110A, 110, 202A and 202B disconnected, Machine ON, Stick Mode, Output ON, Machine loaded @200A	Lead 227	Lead 228	12-15VDC
Relay Contacts		Terminal 110	Terminal 202A	< 1Ω
		Terminal 110A	Terminal 202B	< 1Ω

Table 2

B.3. If the input measurements are correct and the Relay Contact 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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

CB1 TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of CB1 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 CB1 refer to Figure F.1.

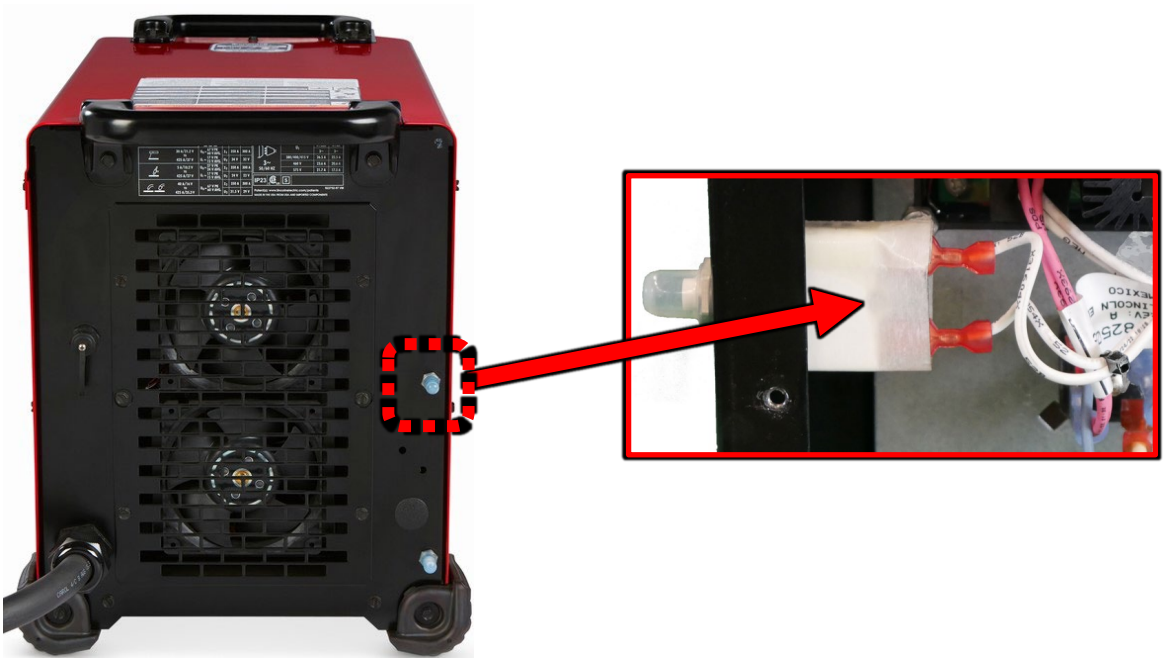


Figure F.1

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 and that CB1 is not tripped.

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

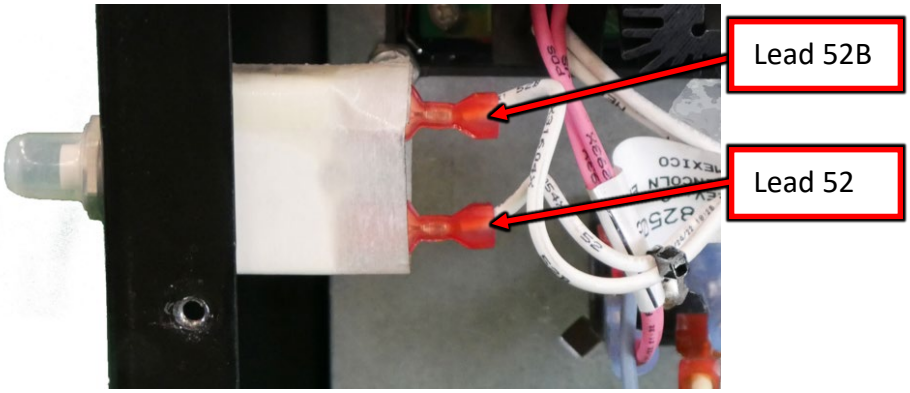


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

CB1 Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
CB1	CB1 not tripped	Terminal 52	Terminal 52B	< 1Ω

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

CB2 TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of CB2 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 CB2 refer to Figure F.1.

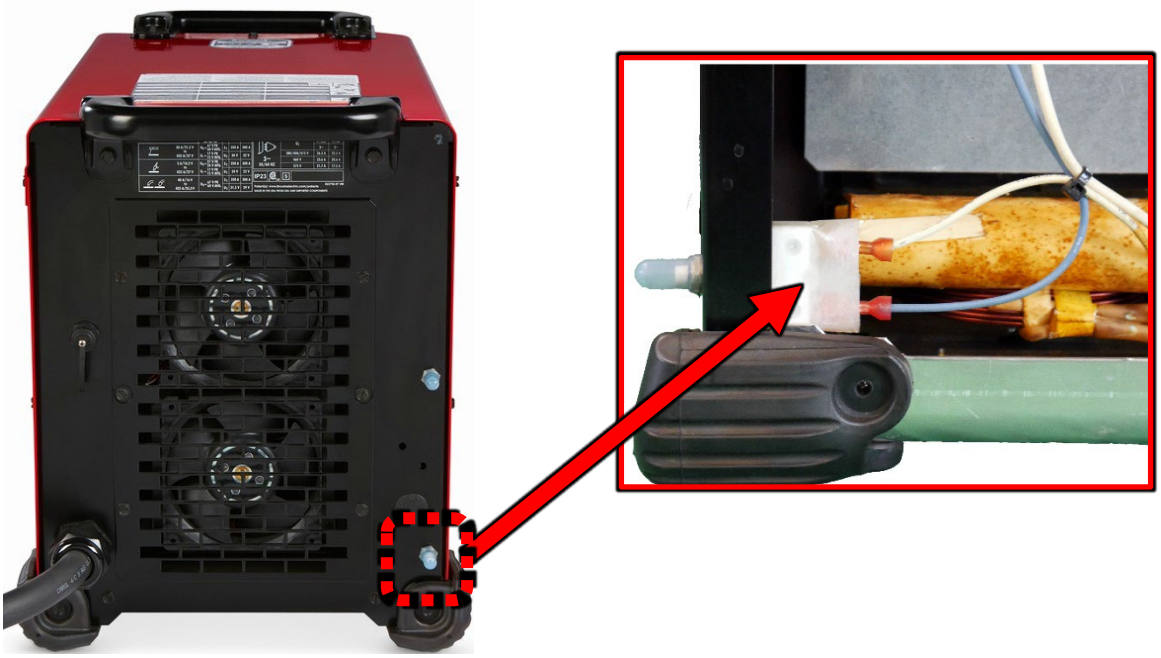


Figure F.1

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 and that CB2 is not tripped.

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

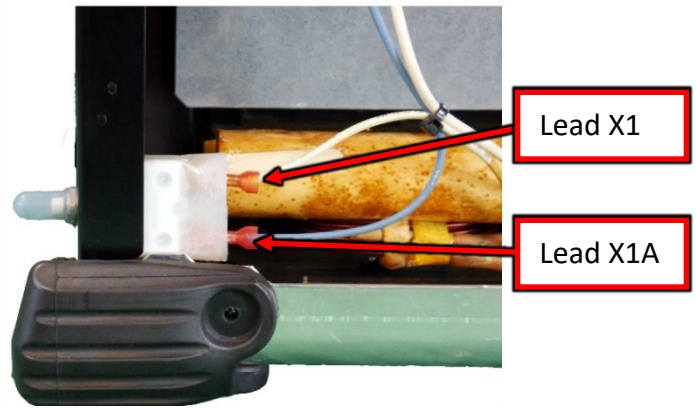


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

CB2 Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
CB2	CB2 not tripped	Terminal X1	Terminal X1A	< 1Ω

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

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 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.

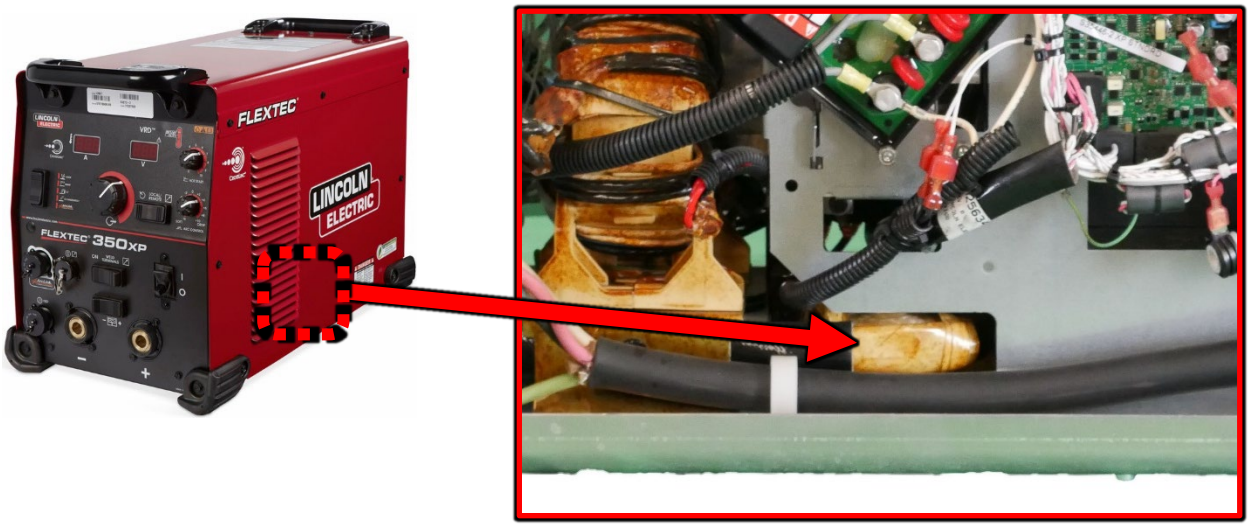


Figure F.1

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.

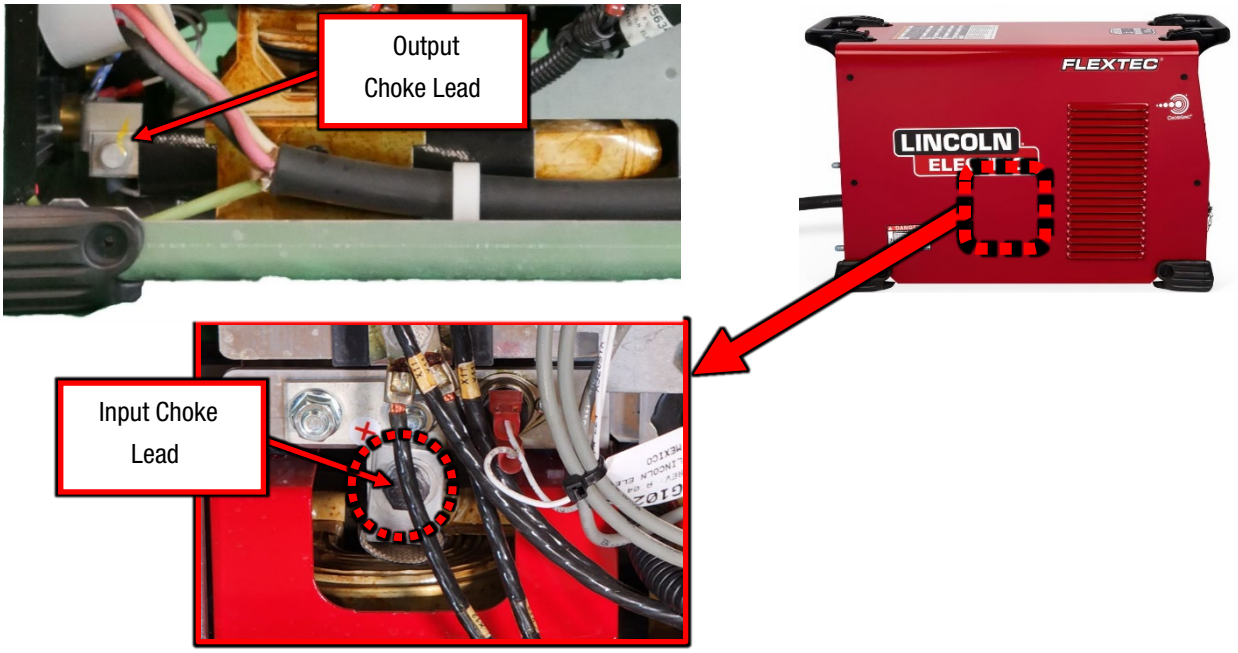


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Choke Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Choke	Machine OFF, Choke leads disconnected	Input Choke Lead	Output Choke Lead	< 1Ω
		Input Choke Lead	Case Ground	> 500KΩ

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

CONTROL BOARD TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Control Board using Static and Active tests. This procedure will NOT test all of the circuitry on this component.

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

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

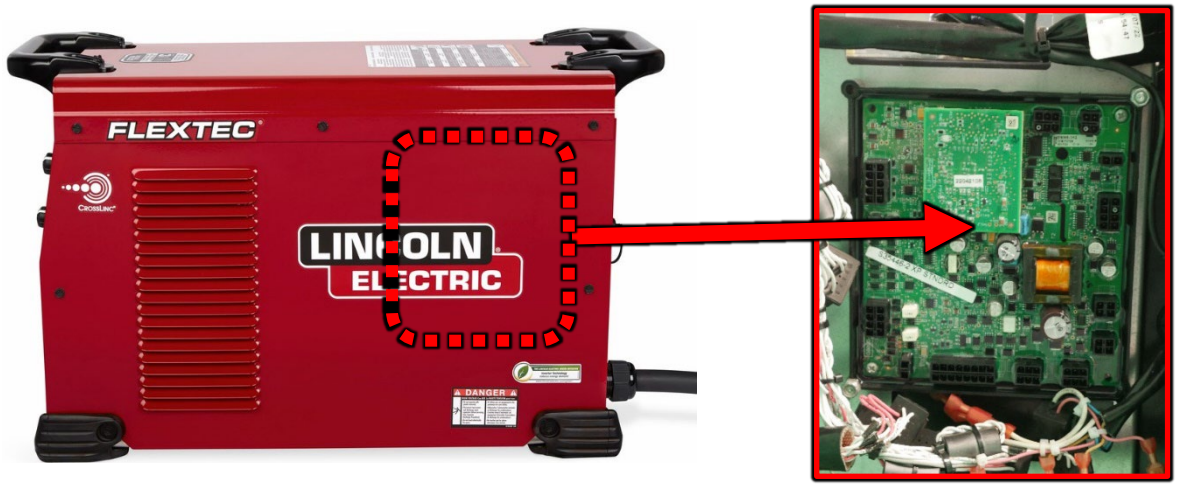


Figure F.1

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

3. Perform the Active Testing.

A. 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: LEADS REMOVED FROM IMAGE ONLY, DO NOT DISCONNECT ANY CONNECTORS.

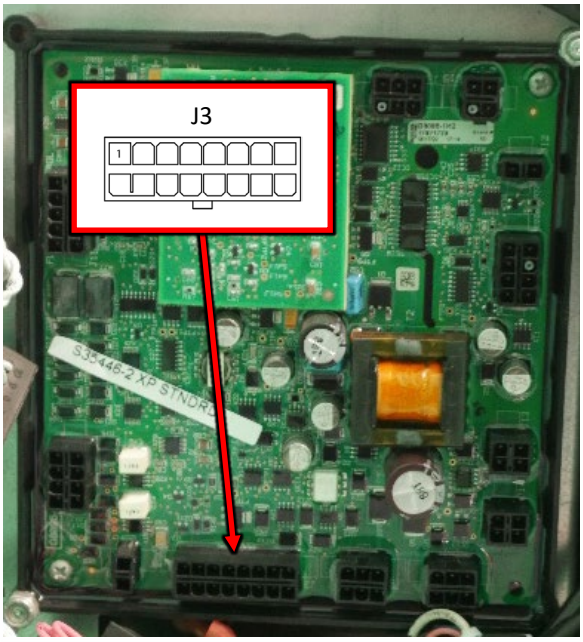


Figure F.2

Control Board Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Thermostat	Machine OFF	J3 Pin 5	J3 Pin 13	~0.8Ω

Table 1

A.3. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step B.1.

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

B. ACTIVE TESTING

B.1. Ensure the machine is plugged into external power and turned on, set the machine "Condition(s)" as directed in Table 1.

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

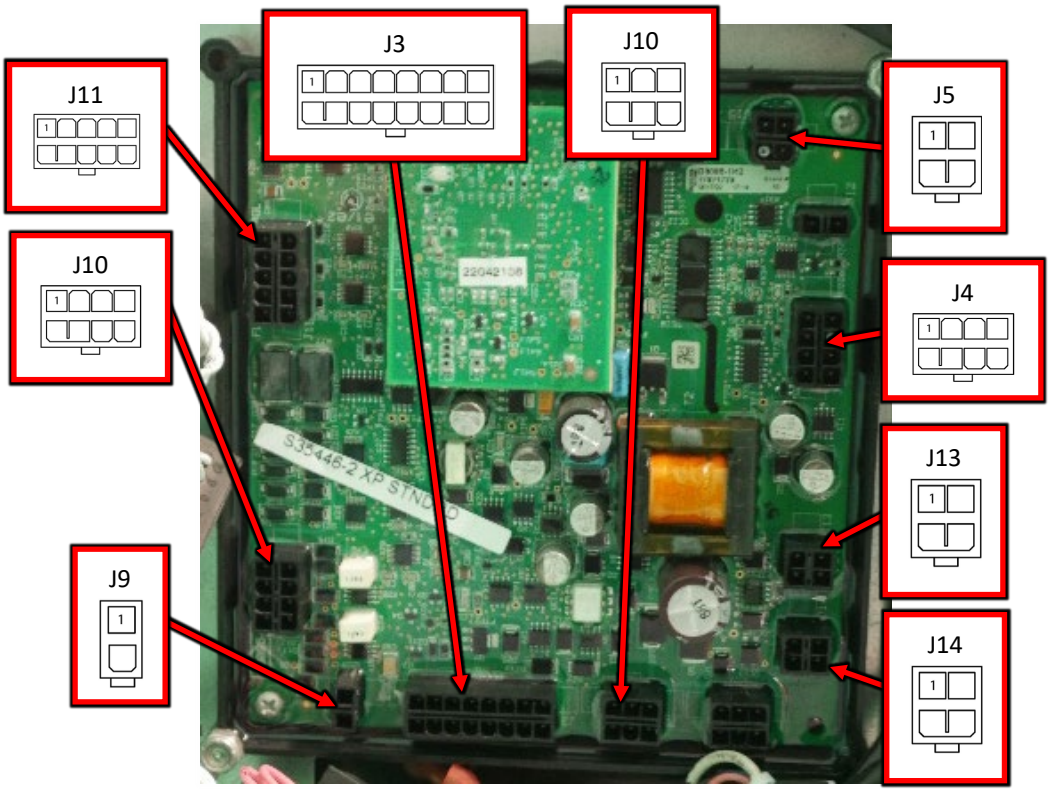


Figure F.3

Control Board Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Pre-charge	Machine ON	J15 Pin 4	J15 Pin 1	~15VDC
V_Pri_CAP		J4 Pin 1	J4 Pin 3	2.2 - 3.3VDC
5V Primary		J4 Pin 4	J4 Pin 3	~5VDC
V_Pri_Rect		J4 Pin 6	J4 Pin 3	2.2 - 3.3VDC
Gate Drive Output	Machine ON, Output ON	J10 Pin 5	J10 Pin 1	25KHz
Gate Drive Output		J10 Pin 8	J10 Pin 4	25KHz
Fan A Output		J13 Pin 4	J13 Pin 3	40 - 42VDC
		J13 Pin 2	J13 Pin 3	20KHz
Fan B Output		J14 Pin 4	J14 Pin 3	40 - 42VDC
		J14 Pin 2	J14 Pin 3	20KHz
Boost Relay Output	Machine ON, Output ON, Stick Mode, Machine loaded @200A	J3 Pin 3	J3 Pin 11	~15 VDC
Current Transducer Supply Voltage Output	Machine ON	J11 Pin 4	J11 Pin 9	12 - 15VDC
		J11 Pin 5	J11 Pin 9	-12 - 13VDC

Table 2

Control Board Active Test (Continued)				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Current Transducer Feedback Input	Machine ON, Output ON, Stick Mode, Machine loaded @200A	J11 Pin 10	J11 Pin 9	1.6 VDC
Stud Sensing Input	Machine ON, Output ON, Stick Mode	J11 Pin 1	J11 Pin 2	60 - 62 VDC
Stud VPK Input		J9 Pin 2	J9 Pin 1	60 - 62 VDC
Input Supply	Machine ON	J5 Pin 4	J5 Pin 3	40 - 42 VDC

Table 2 (Continued)

B.3. 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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

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 plugged into external power and turned on, set the machine "Condition(s)" as directed in Table 1.

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

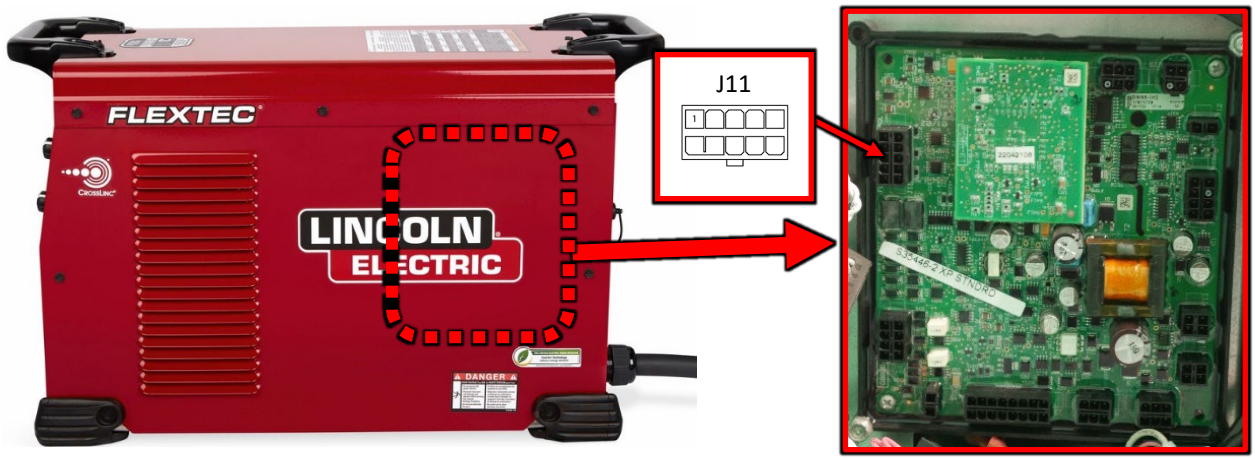


Figure F.2

Current Transducer Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Current Transducer Supply	Machine ON, STICK Mode, Loaded @200A	J16 Pin 1	J16 Pin 4	12 to 15VDC
		J16 Pin 2	J16 Pin 4	-12 to -15VDC
Current Transducer Feedback		J16 Pin 3	J16 Pin 4	1.6VDC

Table 1

A.3. 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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

D1 TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the D1 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 D1 refer to Figure F.1.

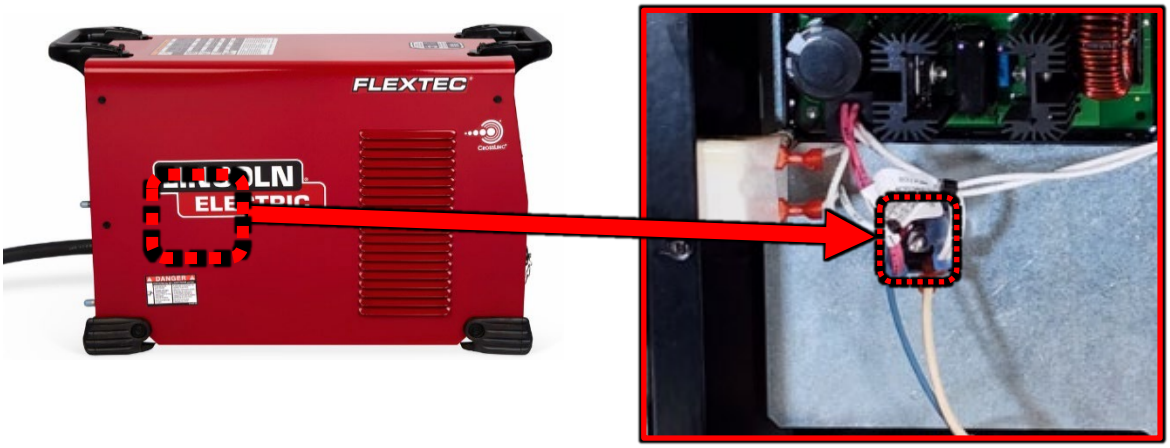


Figure F.1

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.

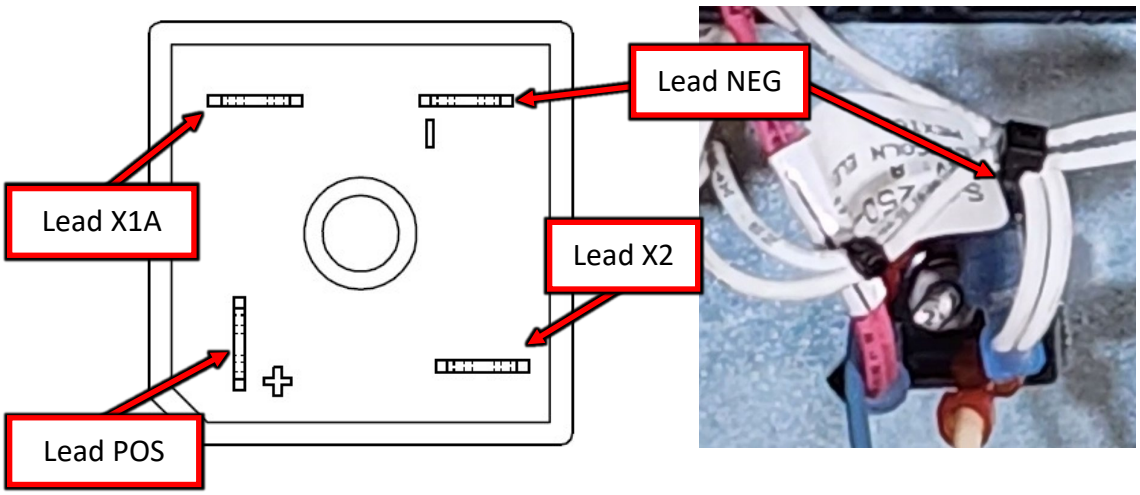


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. NOTE: MEASUREMENTS ARE MADE ON THE TERMINALS NOT THE REMOVED LEADS.

D1 Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
D1	Machine OFF	Terminal X1A	Terminal POS	0.3 – 0.7VDC
		Terminal X2	Terminal POS	0.3 – 0.7VDC
		Terminal NEG	Terminal X1A	0.3 – 0.7VDC
		Terminal NEG	Terminal X2	0.3 – 0.7VDC

Table 1

A.4 If measurements are correct reconnect anything disconnected in previous steps and 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.3 for test point locations.

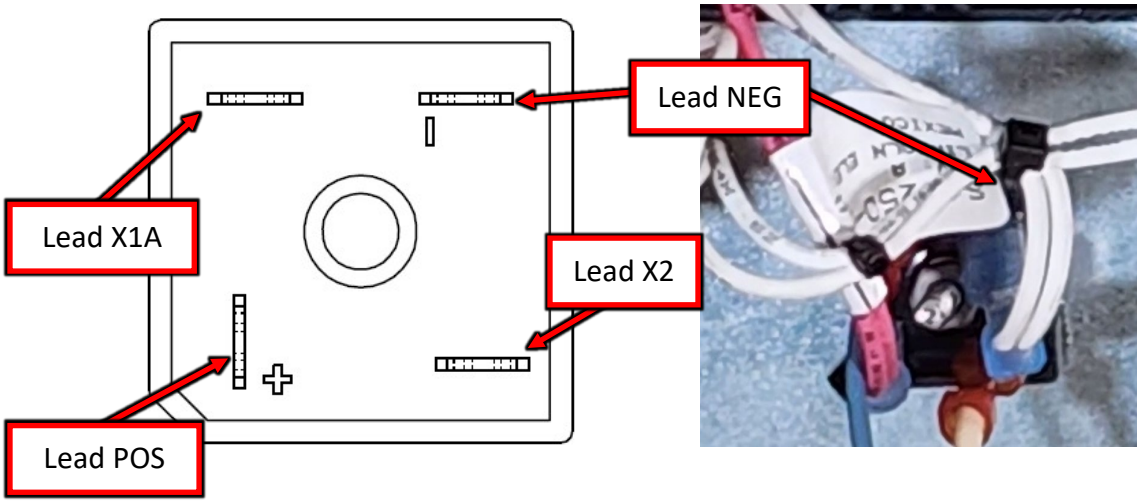


Figure F.3

D1 Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
AC Input	Machine ON	Terminal X1A	Terminal X2	49-75VAC
DC Output		Terminal POS	Terminal NEG	67-100VDC

Table 2

B.3. If the input measurements are correct and the Relay Contact 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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

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 plugged into external power and turned ON.

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

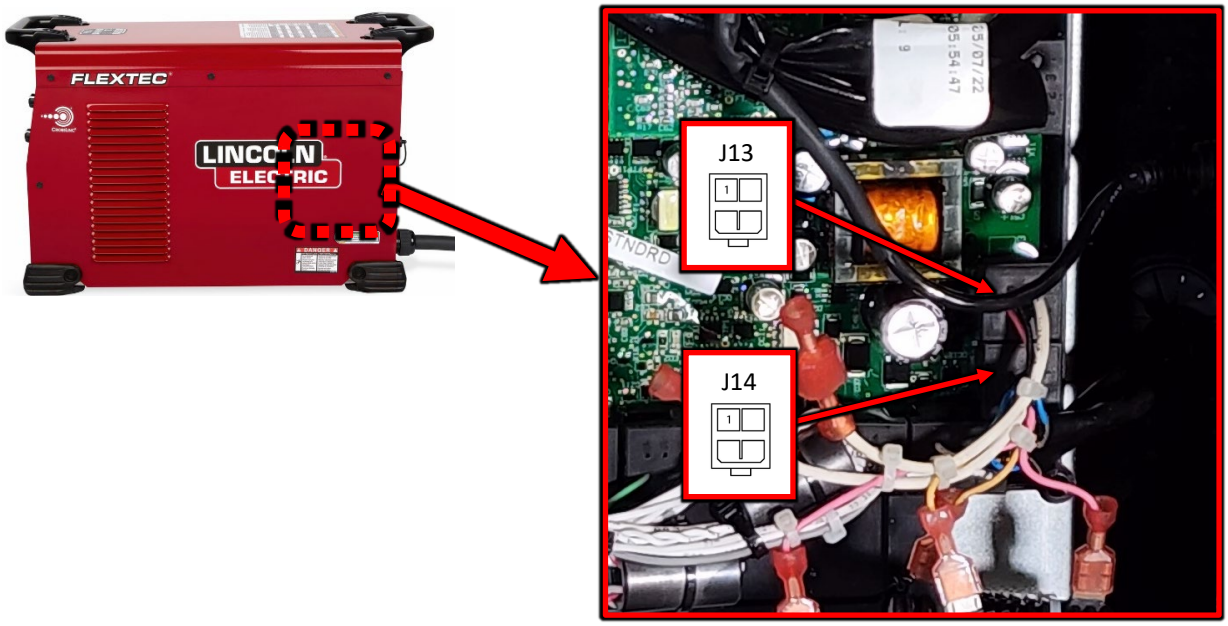


Figure F.2

Fan Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Top Fan (A)	Machine ON	J13 Pin 4	J13 Pin 3	~42VDC
		J13 Pin 2	J13 Pin 3	20Khz
Bottom Fan (B)		J14 Pin 4	J14 Pin 3	~42VDC
		J14 Pin 2	J14 Pin 3	20Khz

Table 1

A.3. 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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

INPUT BOARD TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Input Board using Static and Active tests. This procedure will NOT test all of the circuitry on this component

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 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.

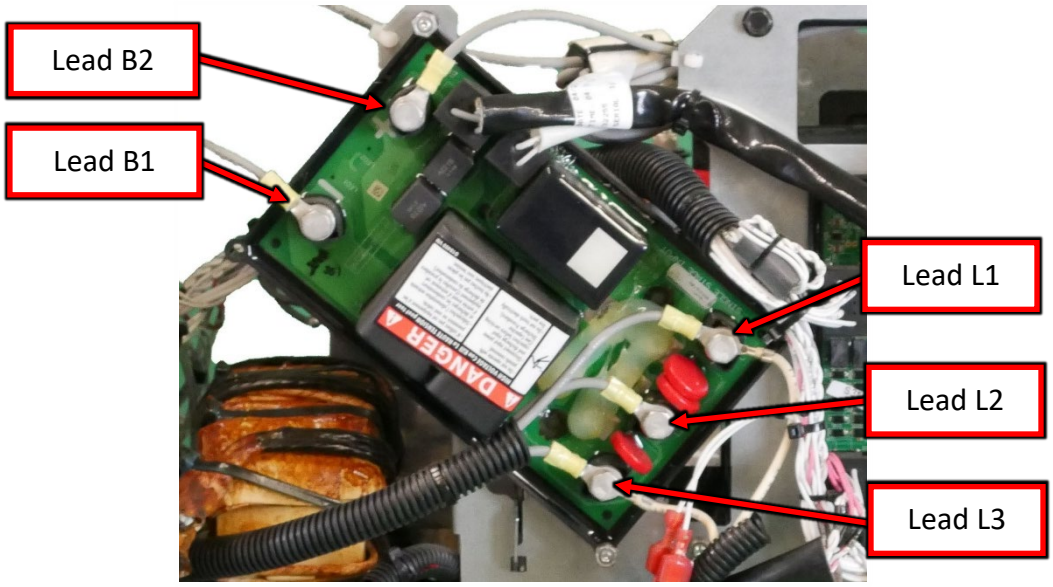


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point locations. NOTE: MEASUREMENTS ARE MADE ON THE TERMINALS NOT THE REMOVED LEADS.

Input Board Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Input Board	Machine OFF, Meter set to Diode mode	B1	L1	0.3 - 0.7 VDC
		B1	L2	0.3 - 0.7 VDC
		B1	L3	0.3 - 0.7 VDC
		L1	B2	0.3 - 0.7 VDC
		L2	B2	0.3 - 0.7 VDC
		L3	B2	0.3 - 0.7 VDC

Table 1

A.4 If measurements are correct reconnect anything disconnected in previous steps and 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.3 for test point locations.

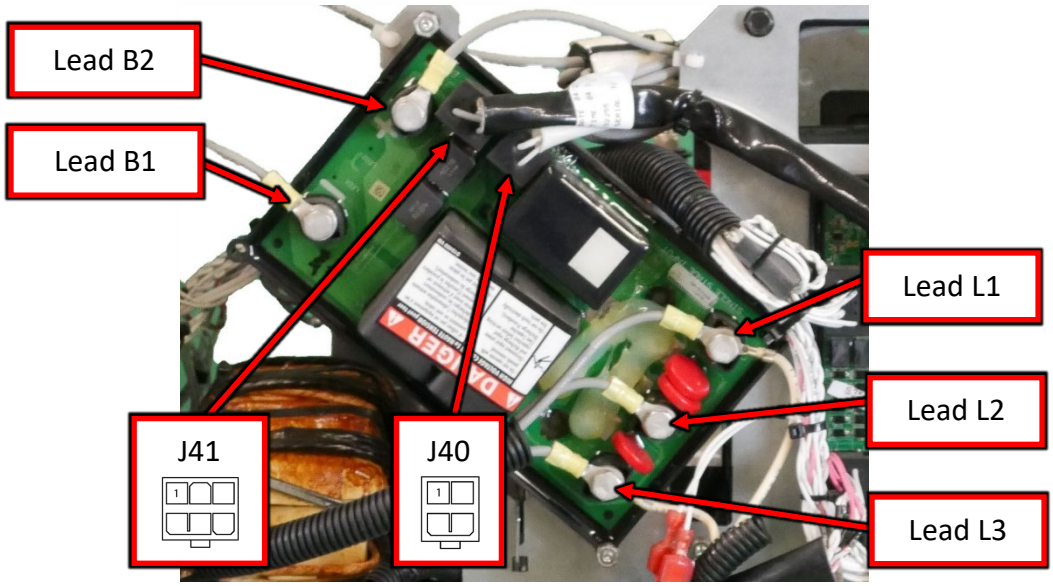


Figure F.3

Input Board Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Input Board (Input)	Machine ON	L1	L2	380 - 575VAC
		L2	L3	380 - 575VAC
		L1	L3	380 - 575VAC
Input Board (Output)		B2	B1	537 – 813VDC
V_PRI_CAPSENSE Output		J41 Pin 1	B1	~ 2.2 – 3.3VDC
V_PRI_PFCSENSE Output		J41 Pin 6	B1	~2.2 – 3.3VDC
Pre-charge Relay Input		J40 Pin 4	J40 Pin 1	~15VDC

Table 2

B.3. 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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

LINE SWITCH TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Line Switch 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 Line Switch refer to Figure F.1.

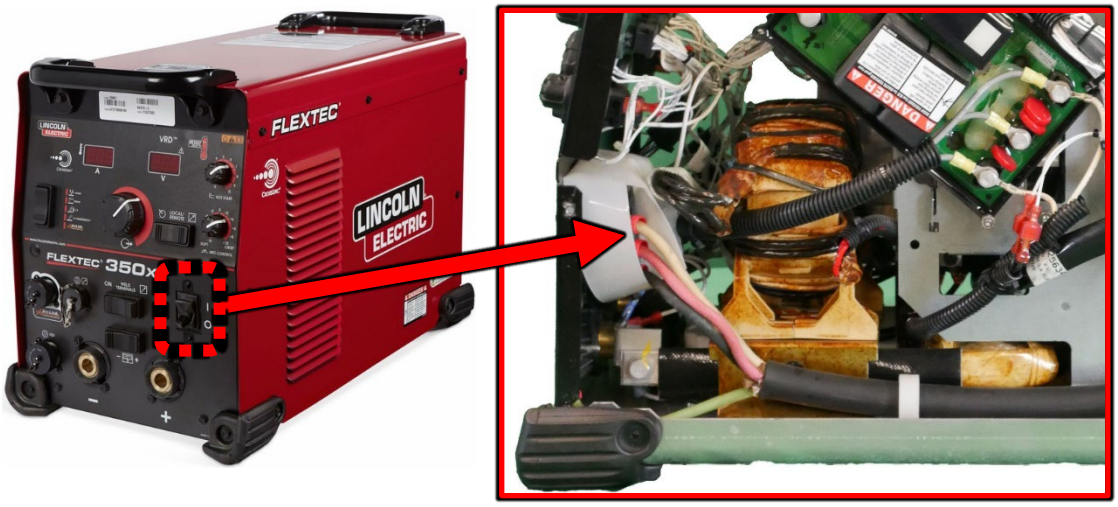


Figure F.1

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, set the switch "Condition(s)" as directed in Table 1.

A.2. Label and disconnect L1, L2 and L3 connections, refer to Figure F.2.

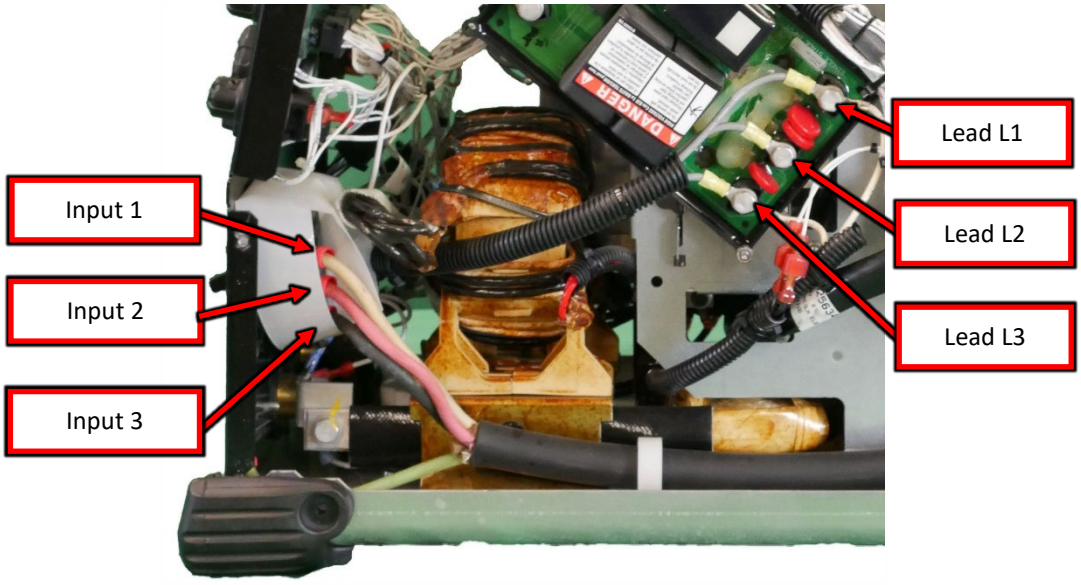


Figure F.2

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

Line Switch Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Line Switch	Line Switch set to ON	Terminal Input 1	Lead L1	< 1Ω
		Terminal Input 2	Lead L2	< 1Ω
		Terminal Input 3	Lead L3	< 1Ω
	Line Switch set to OFF	Terminal Input 1	Lead L1	> 500KΩ
		Terminal Input 2	Lead L2	> 500KΩ
		Terminal Input 3	Lead L3	> 500KΩ

Table 1

A.4 If measurements are correct reconnect anything disconnected in previous steps and 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.3 for test point locations.

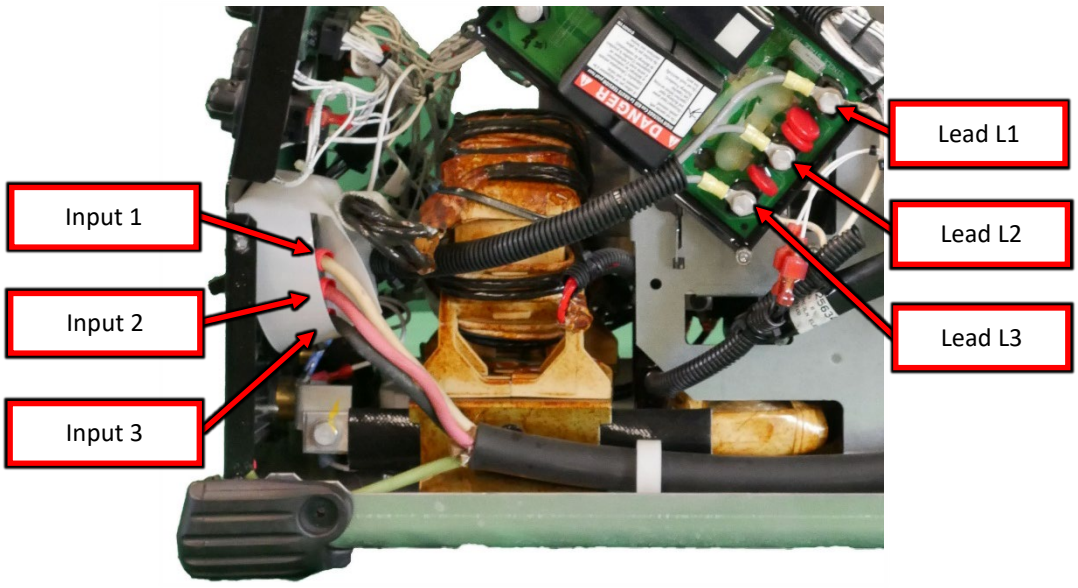


Figure F.3

Line Switch Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Line Switch Input	Machine ON	Input 1	Input 2	380 - 575VAC
		Input 2	Input 3	380 - 575VAC
		Input 1	Input 3	380 - 575VAC
Line Switch Output		L1	L2	380 - 575VAC
		L2	L3	380 - 575VAC
		L1	L3	380 - 575VAC

Table 2

B.3. 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. When all testing and repair procedures are complete perform the “Retest After Repair Procedure”.

Refer to Safety pages for explanation of hazards:

LOCAL REMOTE SWITCH TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of Local Remote Switch 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 Local Remote Switch refer to Figure F.1.

Figure F.1

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

3. Perform the Static Testing.

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.

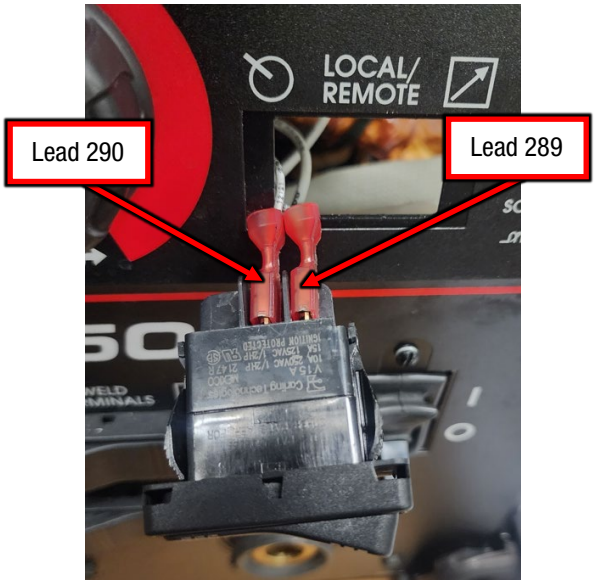


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Local Remote Switch Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Local Remote Switch	Switch set to LOCAL	Terminal 290	Terminal 289	< 1Ω
	Switch set to REMOTE	Terminal 290	Terminal 289	> 500KΩ

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

MAIN TRANSFORMER TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Main 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 Main Transformer refer to Figure F.1.

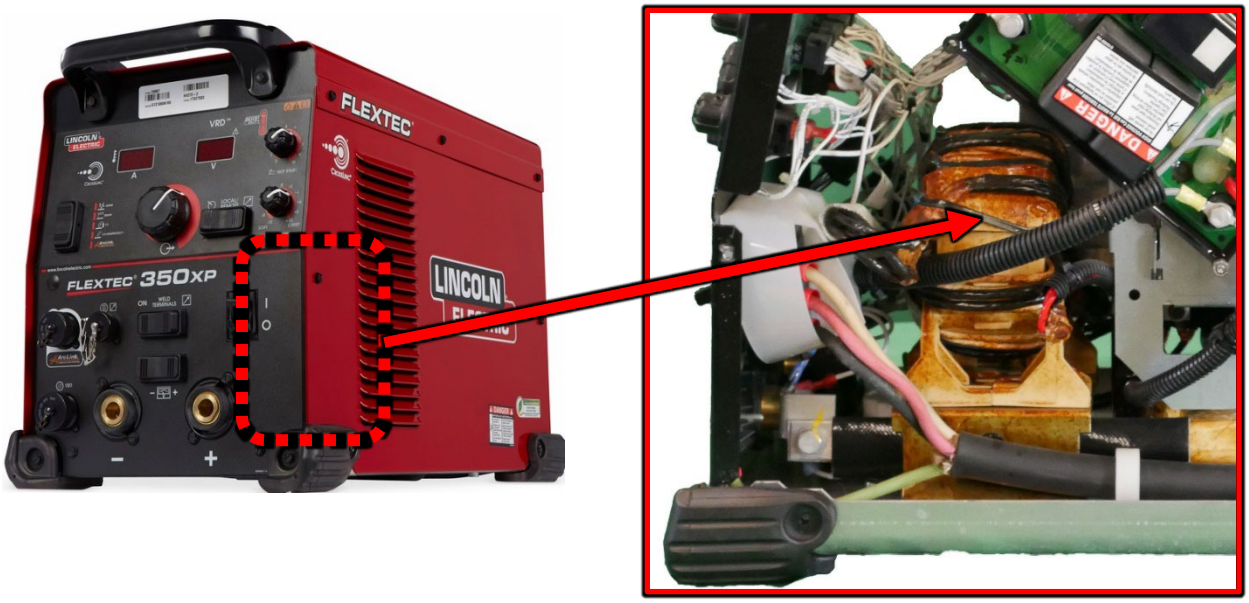


Figure F.1

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.

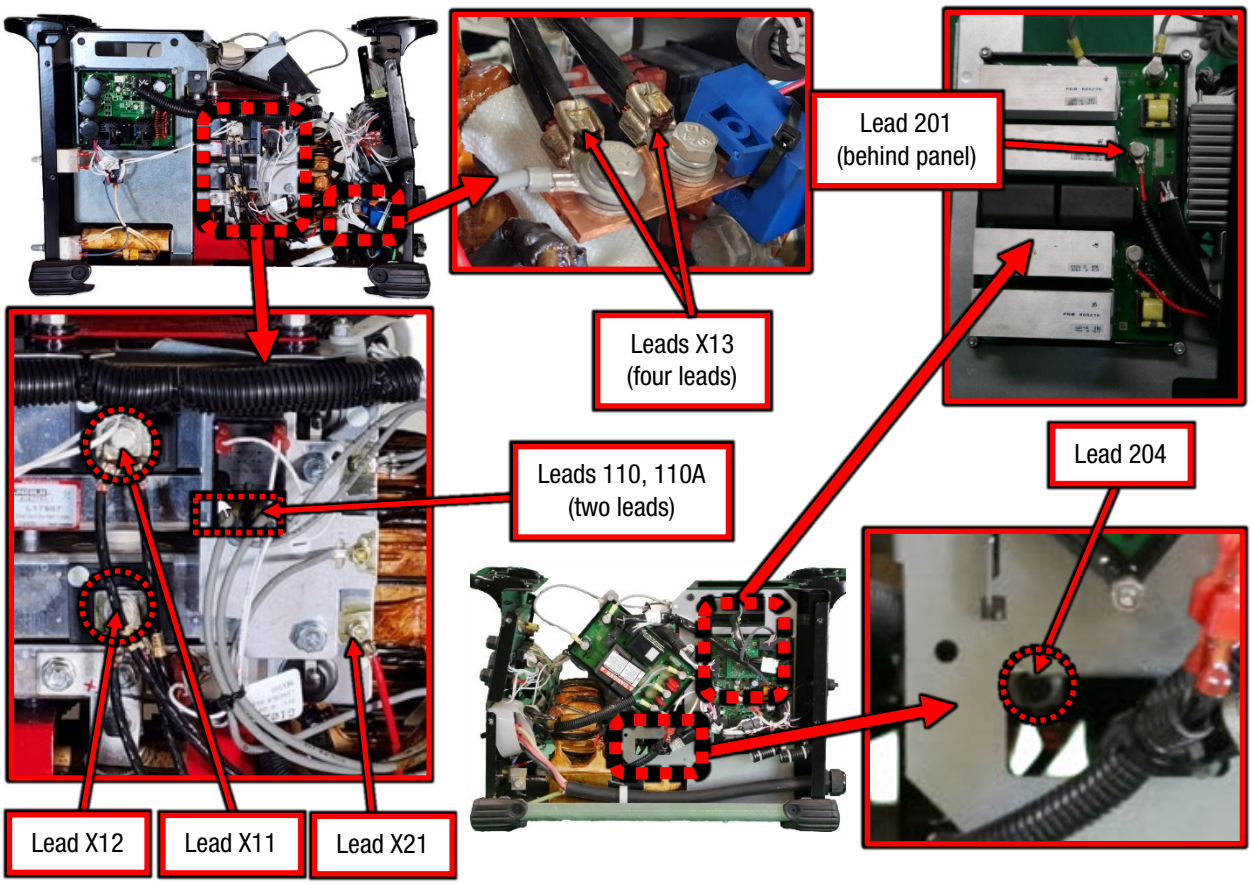


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE LEADS NOT TERMINALS.

Main Transformer Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Transformer Primary	Machine OFF	Lead 201	Lead 204	< 1Ω
		Lead 201	Chassis Ground	> 500KΩ
Transformer Secondary		Lead X11	Lead X13	< 1Ω
		Lead X12	Lead X13	< 1Ω
		Lead X21	Lead 110 & 110A	< 1Ω
		Lead X11	Chassis Ground	> 500KΩ
		Lead X21	Chassis Ground	> 500KΩ

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

MODE SELECT SWITCH TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Mode Select Switch 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 Mode Select Switch 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.

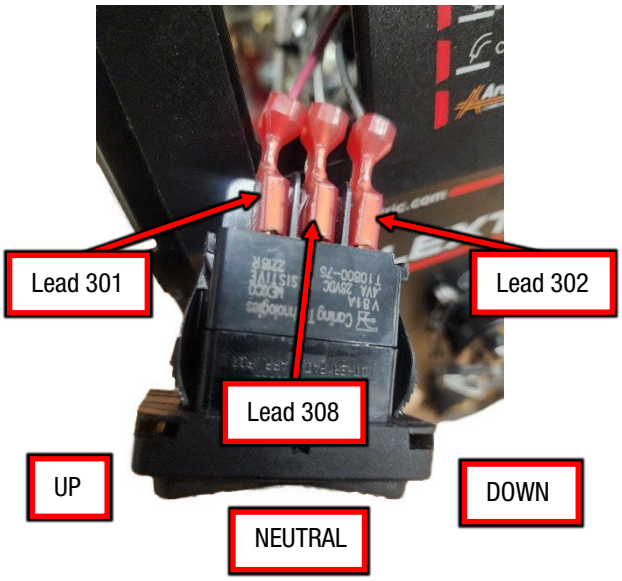


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Mode Select Switch Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Mode Select Switch	Switch UP	Terminal 302	Terminal 308	< 1Ω
	Switch NEUTRAL	Terminal 302	Terminal 308	> 500KΩ
	Switch DOWN	Terminal 301	Terminal 308	< 1Ω
	Switch NEUTRAL	Terminal 301	Terminal 308	> 500KΩ

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

OUTPUT RECTIFIER TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Output Rectifier 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 Output Rectifier refer to Figure F.1.

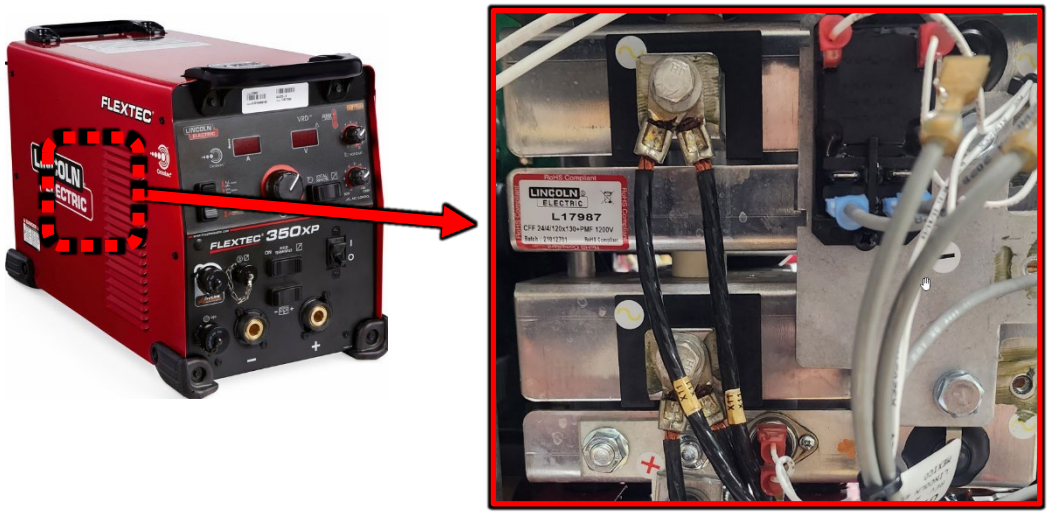


Figure F.1

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. Label and disconnect the following connections, refer to Figure F.2. NOTE: LEADS X11 AND X12 REMOVED FOR CLARITY IN FIGURE F.2.

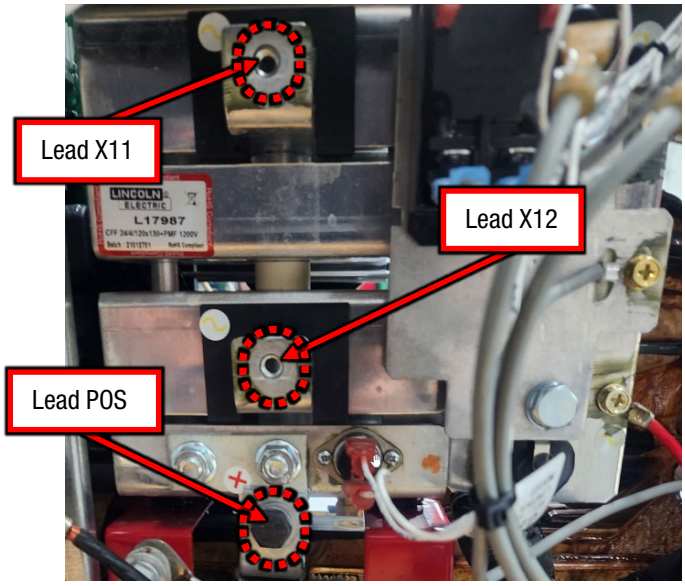


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Output Rectifier Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Output Rectifier	Meter set to DIODE mode	Terminal X12	Terminal POS	0.3 - 0.07VDC
		Terminal X11	Terminal POS	0.3 - 0.07VDC

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

POLARITY SWITCH TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Polarity Switch 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 Polarity Switch 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.

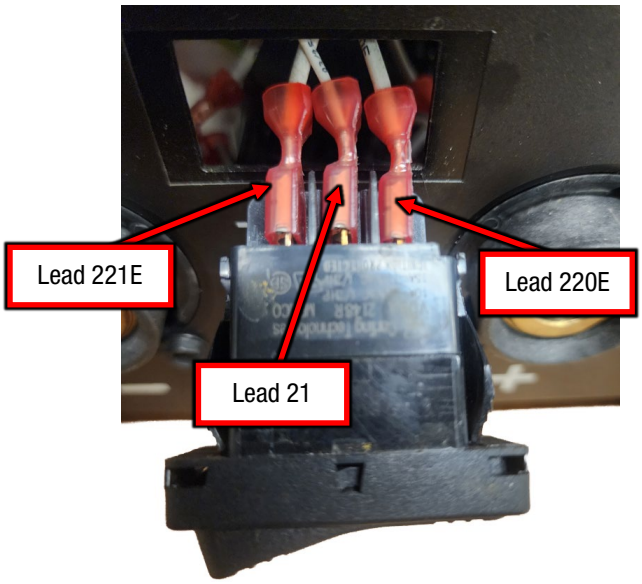


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Polarity Switch Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Polarity Switch	Polarity Switch set to POSITIVE	Terminal 221E	Terminal 21	< 1Ω
		Terminal 220E	Terminal 21	> 500KΩ
	Polarity Switch set to NEGATIVE	Terminal 220E	Terminal 21	< 1Ω
		Terminal 221E	Terminal 21	> 500KΩ

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

SWITCH BOARD TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Switch Board using Static tests. This procedure will NOT test all of the circuitry on this component

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

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

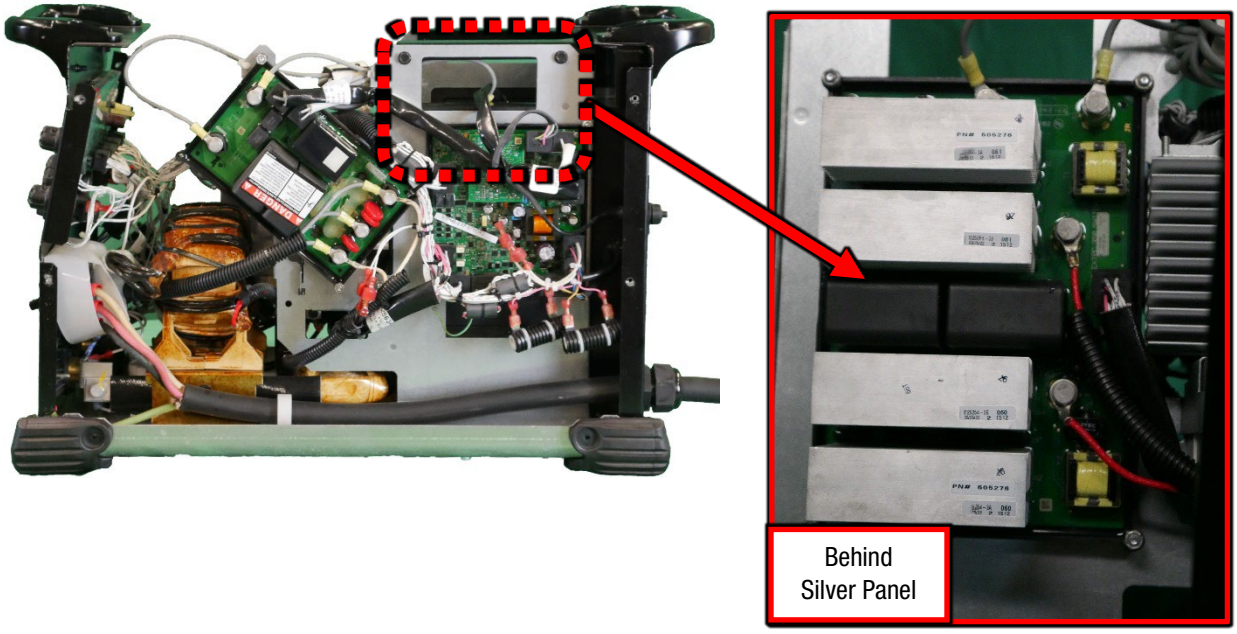


Figure F.1

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.

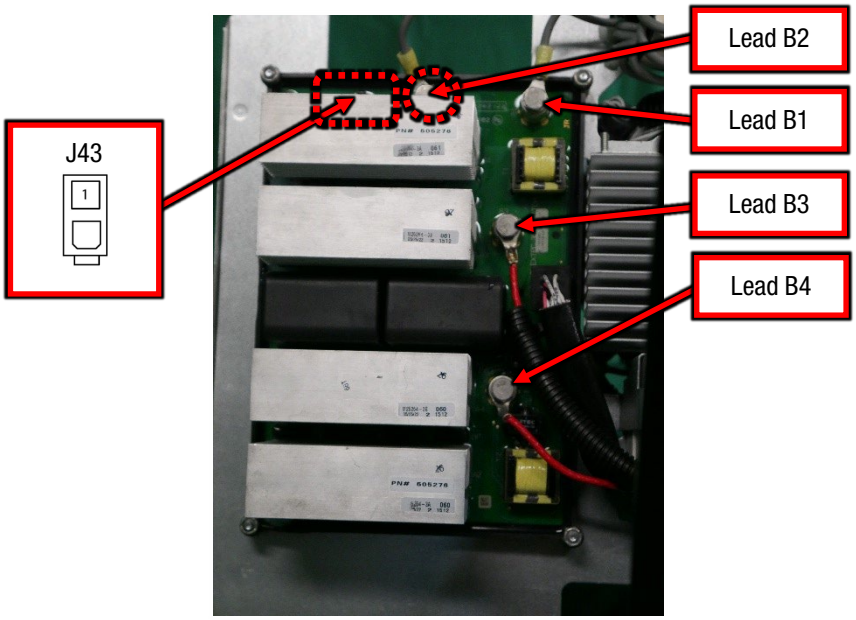


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Switch Board Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Switch Board IGBT's	Machine OFF, meter in DIODE mode	B3	B2	0.3 - 0.7VDC
		B4	B2	0.3 - 0.7VDC
		B1	B3	0.3 - 0.7VDC
		B1	B4	0.3 - 0.7VDC
Thermistors	Machine Off, meter set to Resistance	J43 Pin 1	B2	~10KΩ
		J43 Pin 2	B2	~10KΩ

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

THERMOSTAT 1 TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of Thermostat 1 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 Thermostat 1 refer to Figure F.1.

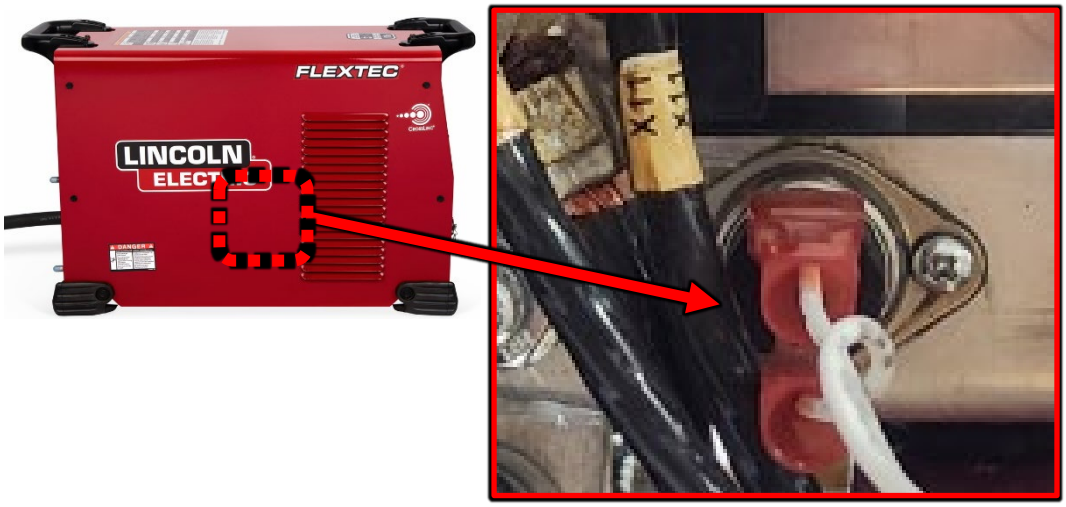


Figure F.1

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.

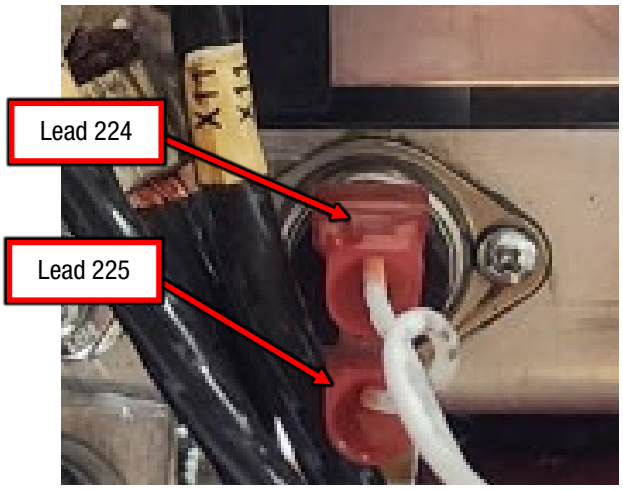


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Thermostat 1 Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Thermostat 1	Machine OFF	Lead 224	Lead 225	< 1Ω

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

THERMOSTAT 2 TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of Thermostat 2 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 Thermostat 2 refer to Figure F.1.

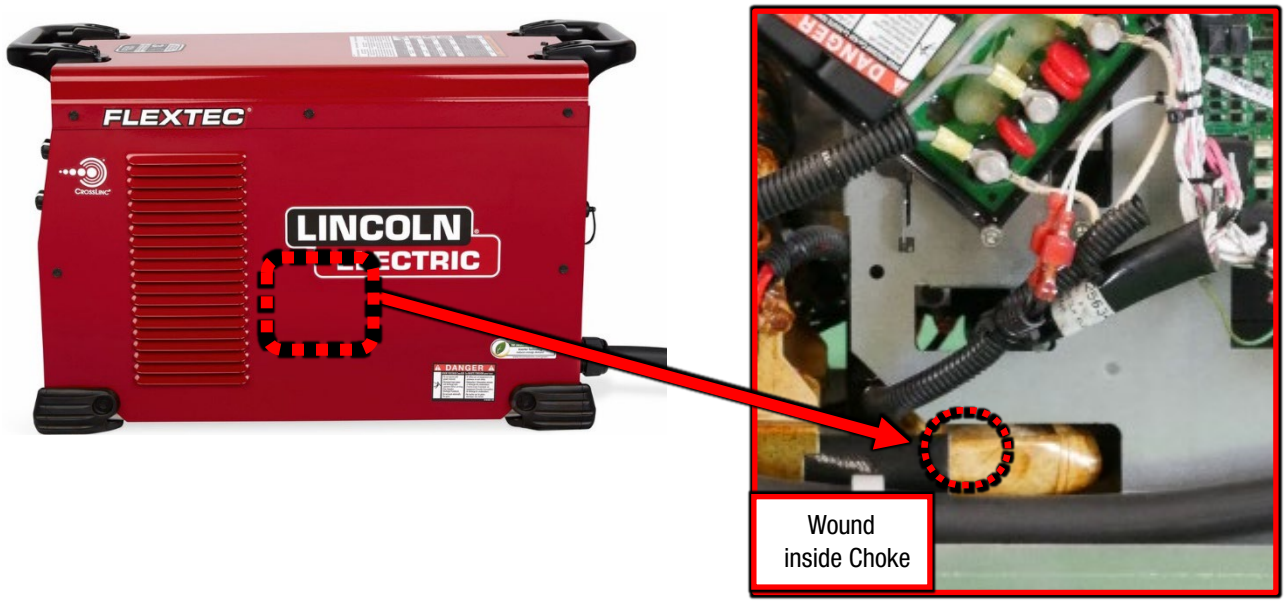


Figure F.1

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.

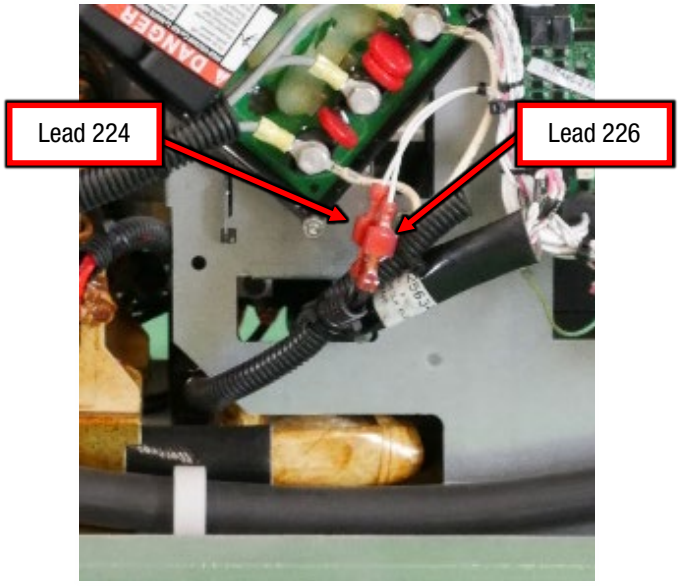


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE LEADS TOWARDS THE CHOKE.

Thermostat 2 Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Thermostat 2	Machine OFF	Lead 224	Lead 226	< 1Ω

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

USER INTERFACE BOARD TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the User Interface Board using Active tests. This procedure will NOT test all of the circuitry on this component

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

TEST PROCEDURE:
1. For location of the User Interface Board refer to Figure F.1.

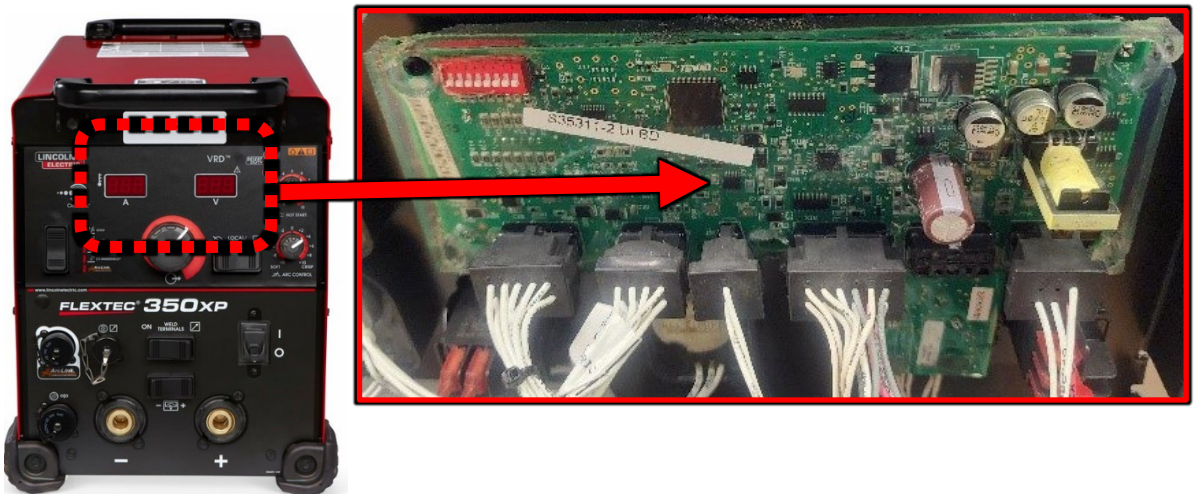


Figure F.1

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 plugged into external power and turned on, set the machine "Condition(s)" as directed in Table 1.

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

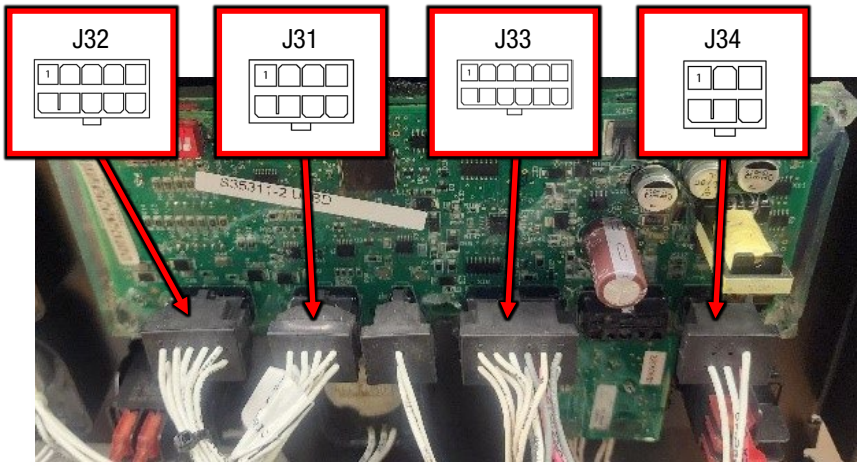


Figure F.2

User Interface Board Active Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
UI Board Input	Machine ON	J34 Pin 4	J34 Pin 3	40 – 42VDC
Arc Control switch Output		J31 Pin 7	J31 Pin 1	~10VDC
Arc Control switch Input	Machine ON, Arc Control from Min to Max	J31 Pin 6	J31 Pin 1	0 – 10VDC
Hot Start Control Output	Machine Turned ON	J31 Pin 7	J31 Pin 2	~10VDC
Hot Start Control Input	Machine ON, Hot Start from Min to Max	J31 Pin 4	J31 Pin 2	0 – 10VDC
Output Control switch Output	Machine ON	J31 Pin 8	J31 Pin 3	~10VDC
Output Control switch Input	Machine ON, Output Control from Min to Max	J31 Pin 5	J31 Pin 3	0 – 10VDC
Weld Terminal switch Output	Machine ON, set to OFF	J33 Pin 4	J33 Pin 9	15VDC
Local / Remote switch Output	Machine ON, set to REMOTE	J33 Pin 3	J33 Pin 10	15VDC
Process Indicator Output	Machine ON	J33 Pin 12	J32 Pin 10	5VDC
Remote Trigger Output		J32 Pin 9	J32 Pin 1	15VDC
Remote POT Output		J32 Pin 4	J32 Pin 7	10VDC
Remote POT Input		J32 Pin 3	J32 Pin 6	10VDC
Mode Select Switch Input		J33 Pin 2	J34 Pin 6	15VDC
Mode Select Switch Input		J33 Pin	J34 Pin 6	13.9VDC

Table 1

A.3. 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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

Refer to Safety pages for explanation of hazards:

WELD TERMINAL SWITCH TEST PROCEDURE

TEST DESCRIPTION:
This procedure will determine the proper function of the Weld Terminal Switch 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 Weld Terminal Switch 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.

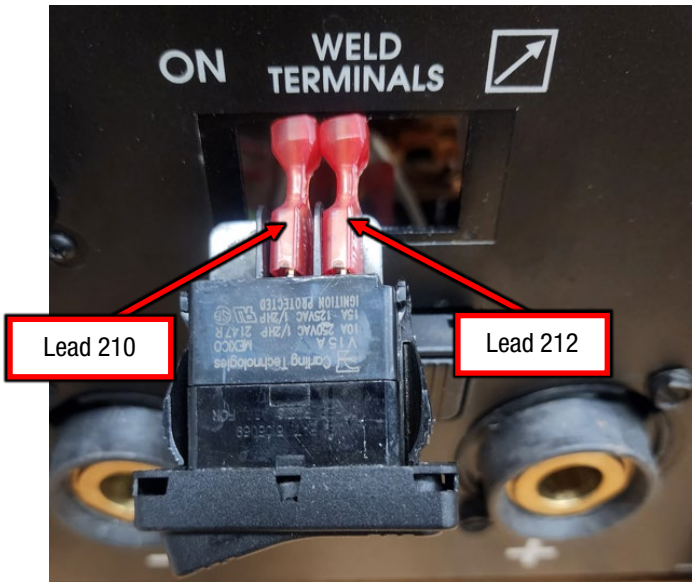


Figure F.2

A.3. Perform the static measurements in Test Table 1, refer to Figure F.2 for test point Locations, set the switch "Condition(s)" as directed in Table 1. NOTE: MEASUREMENTS ARE TAKEN ON THE TERMINALS NOT LEADS.

Weld Terminal Switch Static Test				
Component/Circuit Tested	Condition(s)	+Meter Lead	-Meter Lead	Expected Value
Weld Terminal Switch	Machine OFF, Weld Terminal set to ON	Terminal 210	Terminal 212	< 1Ω

Table 1

A.4. If measurements are correct, reconnect anything disconnected in previous steps and proceed to step 4.

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. When all testing and repair procedures are complete perform the "Retest After Repair Procedure".

RETEST AFTER REPAIR
FLEXTEC 350XP

Retest a machine:

- If it 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.

INPUT VOLTAGE, AMPERES, AND IDLE CURRENT

Input Voltage 50 or 60 Hertz	Maximum Input Amperes	Idle Amperes
380VAC – Three Phase	28 Amps	0.13 Amps
460VAC – Three Phase	25 Amps	0.16 Amps
575VAC – Three Phase	22 Amps	0.27 Amps

RATED OUTPUT

Duty Cycle	Volts at Rated Amps	Output Amperes
60%	34 VDC	350 Amps
100%	32 VDC	300 Amps

OPEN CIRCUIT VOLTAGE

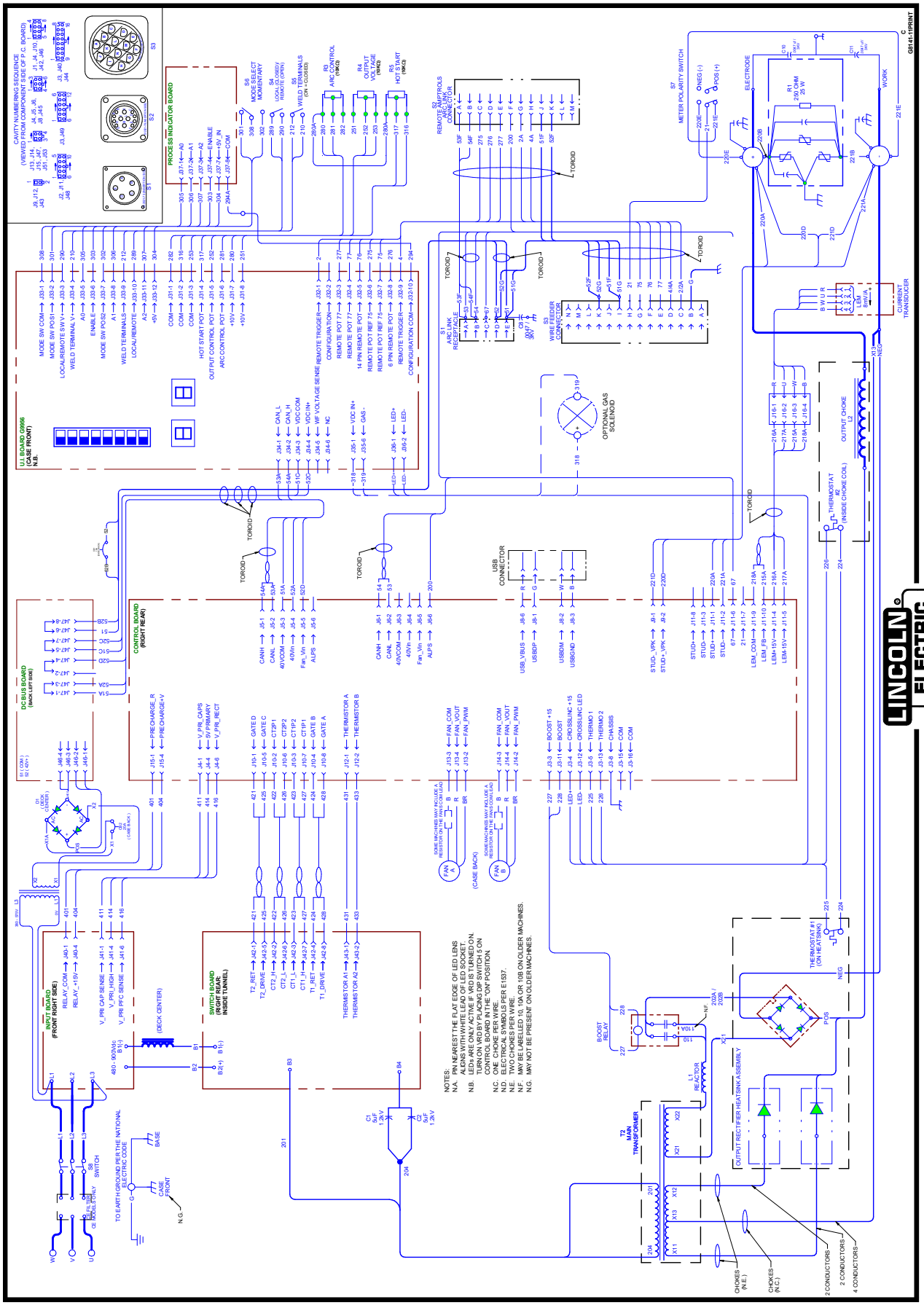
Maximum 60-63VDC

WELDING PROCESSES

Process	Duty Cycle	Output Volts	Output Amps	OCV
GMAW (CV)	60%	31.5VDC	350 Amps	61.5VDC
GMAW (CV)	100%	29VDC	300 Amps	61.5VDC
GTAW (CC)	60%	24VDC	350 Amps	24.5VDC
GTAW (CC)	100%	22VDC	300 Amps	24.5VDC
SMAW (CC)	60%	34VDC	350 Amps	61.5VDC
SMAW (CC)	100%	32VDC	300 Amps	61.5VDC
FCAW (CV)	60%	31.5VDC	350 Amps	61.5VDC
FCAW (CV)	100%	29VDC	300 Amps	61.5VDC
ArcLink	60%	31.5VDC	350 Amps	61.5VDC
ArcLink	100%	29VDC	300 Amps	61.5VDC

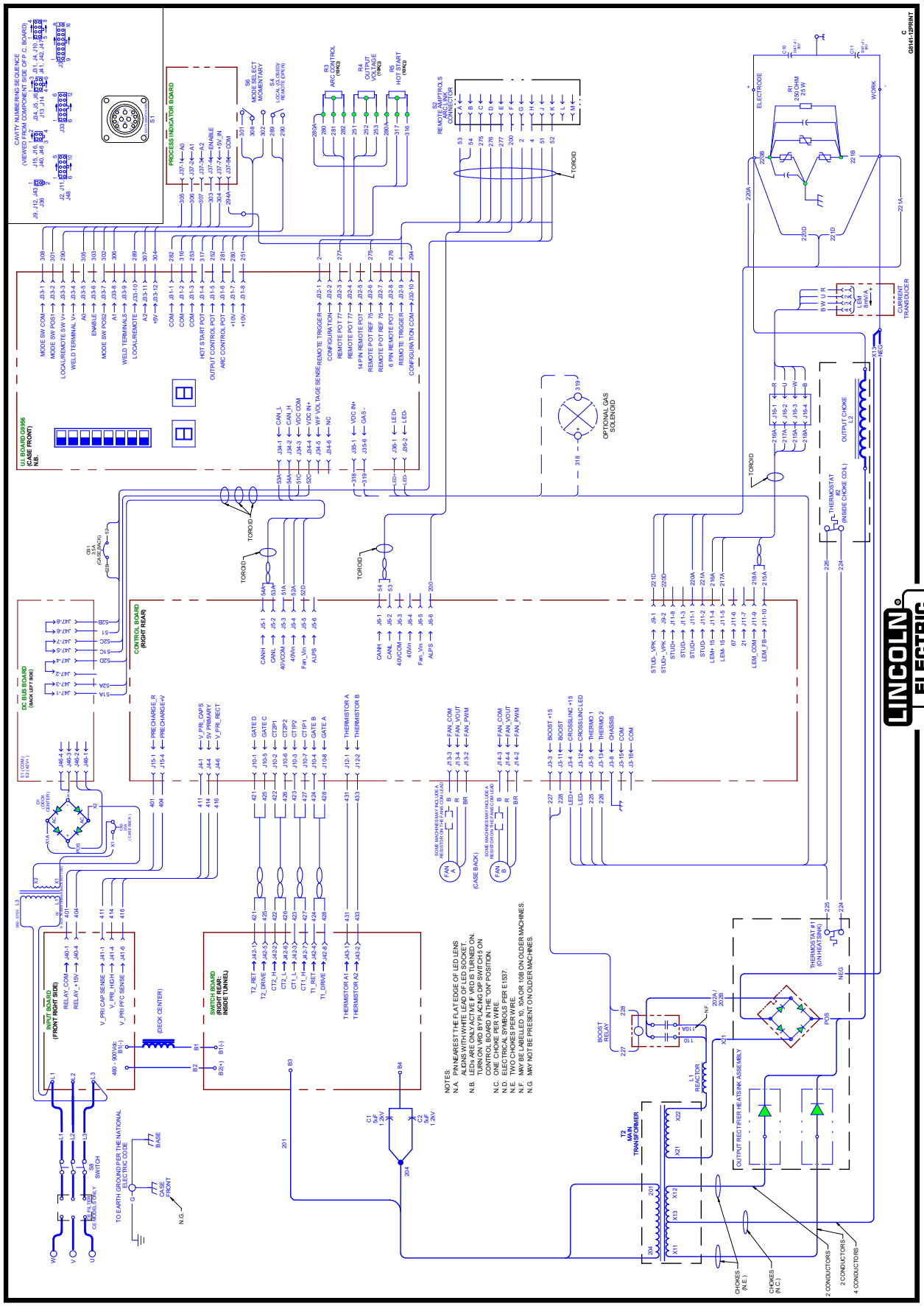
- Perform the "Case Cover Replacement Procedure".

WIRING DIAGRAM - CODE 13067, 13069, 13071



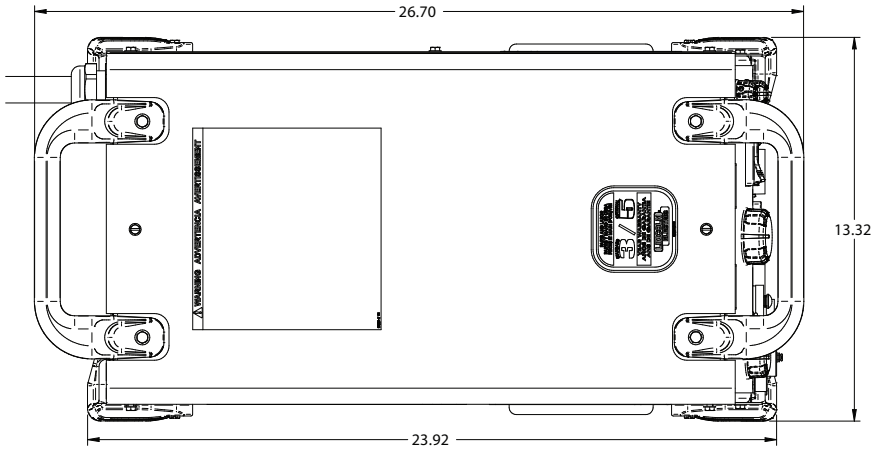
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment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

WIRING DIAGRAM - CODE 13066, 13068, 13070, 13073

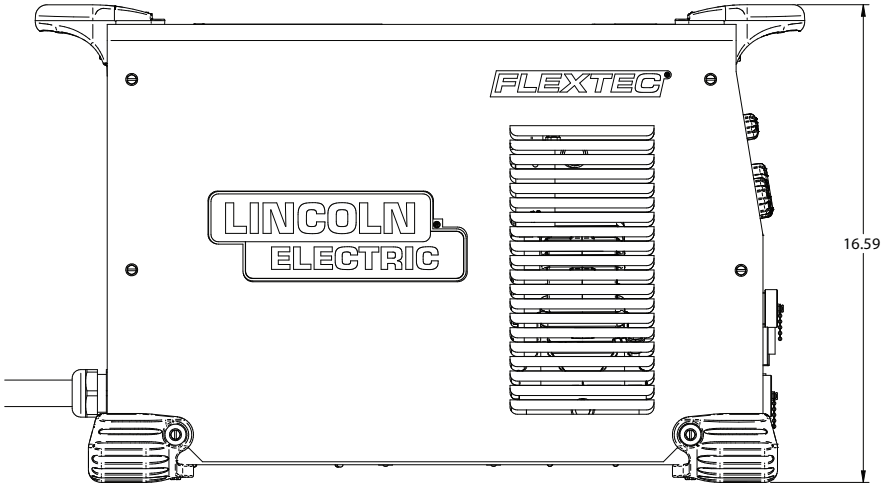


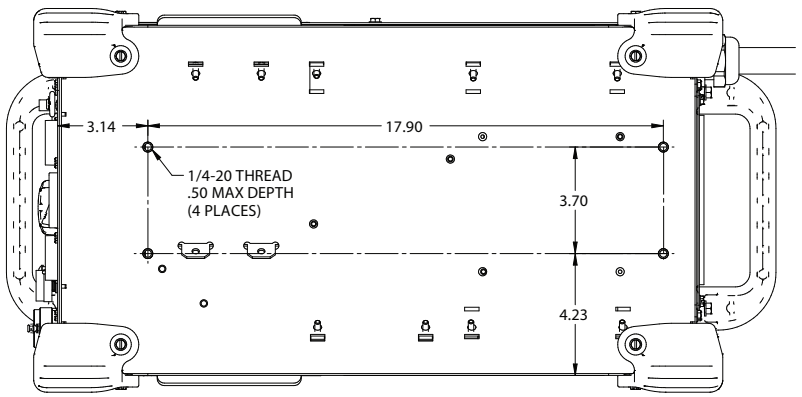
NOTE: This diagram is for reference only. It may not be accurate for all machines covered by this manual. The specific diagram for a particular code is pasted inside the machine on one of the enclosure panels. If the diagram is illegible, write to the Service Department for a replacement. Give the equipment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

DIMENSIONAL PRINT



TOP VIEW





BOTTOM VIEW

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 throug 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.

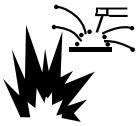
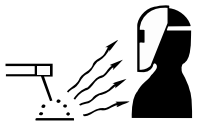
Welding Electrode – A consumable component of the welding circuit through which current is conducted between the electrode holder and the arc that becomes part of the weldment.

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絶緣。	● 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捍材料，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 ÿelds, 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 speciÿcations 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 speciÿc 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 ÿtness for any customers' particular purpose or any other equivalent or similar warranty is speciÿcally disclaimed.

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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.

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