SVM 3051
Rev.00 07-2015

WELD PAK™ 2000

For use with machines having code number: 50291

SERVICE MANUAL

LINCOLN ELECTRIC EUROPE
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INDEX OF CONTENTS

TECHNICAL SPECIFICATIONS

NAME			INDEX	
WELD PAK™2000			K14134-1	
INPUT				
Input Voltage U_1			**EMC Class**	**Frequency**
230V ± 10% 1 – phase			A	50 / 60Hz
Input Power at Rated Cycle			**Input Amperes I_{1max}**	**PF**
7,6 kVA @ 20 % Duty Cycle (40℃)			33 A	0,66
RATED OUTPUT				
	Open Circuit Voltage	**Duty Cycle 40℃** (based on a 10 min. period)	**Output Current**	**Output Voltage**
GMAW	49 Vdc	100	80 A	18 Vdc
		20	180 A	23 Vdc
FCAW-SS	49 Vdc	100	80 A	18 Vdc
		20	180 A	23 Vdc
SMAW	49 Vdc	100	70 A	23,2 Vdc
		20	160A	26,4 Vdc
WELDING CURRENT RANGE				
GMAW		**FCAW-SS**	**SMAW**	
20A – 180A		20A – 180A	20 – 160A	
20A – 180A		20A – 180A	20 – 160A	
RECOMMENDED INPUT CABLE AND FUSE SIZES				
Fuse (time delayed) or Circuit Breaker Size			**Power Lead**	
230V				
D 25A			3 Conductor, 1,5mm^2	
DIMENSIONS AND WEIGHT				
Weight	**Height**		**Width**	**Length**
27,5 kg	600 mm		280mm	800 mm
Protection Rating	**Operating Temperature**		**Storage Temperature**	
IP23	from -10 ºC to +40 ºC		from -25 ºC o +55 ºC	

Accessories

K10429-15-3M	The gas-cooled gun LGS150 to GMAW process - 3m
K10429-15-4M	The gas-cooled gun LGS150 to GMAW process - 4m
K10429-15-5M	The gas-cooled gun LGS150 to GMAW process - 5m
KP10461-1	Gas nozzle conical Ø12mm
KP10440-06	Contact Tip M6x25mm ECu 0.6mm
KP10440-08	Contact Tip M6x25mm ECu 0.8mm
KP10440-09	Contact Tip M6x25mm ECu 0.9mm
KP10440-10	Contact Tip M6x25mm ECu 1.0mm
KP10468	Protection cap to FCAW-SS process
E/H-200A-25-3M	Welding cable with electrode holder to SMAW process - 3m
K14010-1	Work Lead -3m.
GRD-200A-35-5M	Work Lead -5m.
KIT-200A-25-3M	Lead's KIT to SMAW process: The electrode holder with lead to SMAW process - 3m Work lead - 3m
R-1019-125-1/08R	Adapter for spool type S200
K10158-1	Adapter for spool type B300
K363P	Adapter for spool type Readi-Reel®

Drive rolls to 2 driven rolls	
	Solid wires:
KP14016-0.8	V0.6 / V0.8
KP14016-1.0	V0.8 / V1.0
	Aluminum wires:
KP14016-1.2A	U1.0 / U1.2
	Cored wires:
KP14016-1.1R	VK0.9 / VK1.1

Electromagnetic Compatibility (EMC)

01/11

This machine has been designed in accordance with all relevant directives and standards. However, it may still generate electromagnetic disturbances that can affect other systems like telecommunications (telephone, radio, and television) or other safety systems. These disturbances can cause safety problems in the affected systems. Read and understand this section to eliminate or reduce the amount of electromagnetic disturbance generated by this machine.

This machine has been designed to operate in an industrial area. The operator must install and operate this equipment as described in this manual. If any electromagnetic disturbances are detected the operator must put in place corrective actions to eliminate these disturbances with, if necessary, assistance from Lincoln Electric

Before installing the machine, the operator must check the work area for any devices that may malfunction because of electromagnetic disturbances. Consider the following.

- Input and output cables, control cables, and telephone cables that are in or adjacent to the work area and the machine.
- Radio and/or television transmitters and receivers. Computers or computer controlled equipment.
- Safety and control equipment for industrial processes. Equipment for calibration and measurement.
- Personal medical devices like pacemakers and hearing aids.
- Check the electromagnetic immunity for equipment operating in or near the work area. The operator must be sure that all equipment in the area is compatible. This may require additional protection measures.
- The dimensions of the work area to consider will depend on the construction of the area and other activities that are taking place.

Consider the following guidelines to reduce electromagnetic emissions from the machine.

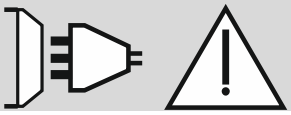
- Connect the machine to the input supply according to this manual. If disturbances occur if may be necessary to take additional precautions such as filtering the input supply.
- The output cables should be kept as short as possible and should be positioned together. If possible connect the work piece to ground in order to reduce the electromagnetic emissions. The operator must check that connecting the work piece to ground does not cause problems or unsafe operating conditions for personnel and equipment.
- Shielding of cables in the work area can reduce electromagnetic emissions. This may be necessary for special applications.

WARNING

The 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 can be potential difficulties in ensuring electromagnetic compatibility in those locations, due to conducted as well as radio-frequency disturbances.

WARNING

This equipment does not comply with IEC 61000-3-12. If it is connected to a public low voltage system, it is the responsibility of the installer or user of the equipment to ensure, by consultation with the distribution network operator, that the equipment may be connected.

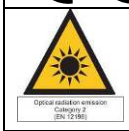


Safety

01/11

WARNING

This equipment must be used by qualified personnel. Be sure that all installation, operation, maintenance and repair procedures are performed only by qualified person. Read and understand this manual before operating this equipment. Failure to follow the instructions in this manual could cause serious personal injury, loss of life, or damage to this equipment. Read and understand the following explanations of the warning symbols. Lincoln Electric is not responsible for damages caused by improper installation, improper care or abnormal operation.

	WARNING: This symbol indicates that instructions must be followed to avoid serious personal injury, loss of life, or damage to this equipment. Protect yourself and others from possible serious injury or death.
	READ AND UNDERSTAND INSTRUCTIONS: Read and understand this manual before operating this equipment. Arc welding can be hazardous. Failure to follow the instructions in this manual could cause serious personal injury, loss of life, or damage to this equipment.
	ELECTRIC SHOCK CAN KILL: Welding equipment generates high voltages. Do not touch the electrode, work clamp, or connected work pieces when this equipment is on. Insulate yourself from the electrode, work clamp, and connected work pieces.
	ELECTRICALLY POWERED EQUIPMENT: Turn off input power using the disconnect switch at the fuse box before working on this equipment. Ground this equipment in accordance with local electrical regulations.
	ELECTRICALLY POWERED EQUIPMENT: Regularly inspect the input, electrode, and work clamp cables. If any insulation damage exists replace the cable immediately. Do not place the electrode holder directly on the welding table or any other surface in contact with the work clamp to avoid the risk of accidental arc ignition.
	ELECTRIC AND MAGNETIC FIELDS MAY BE DANGEROUS: Electric current flowing through any conductor creates electric and magnetic fields (EMF). EMF fields may interfere with some pacemakers, and welders having a pacemaker shall consult their physician before operating this equipment.
	CE COMPLIANCE: This equipment complies with the European Community Directives.
	ARTIFICIAL OPTICAL RADIATION: According with the requirements in 2006/25/EC Directive and EN 12198 Standard, the equipment is a category 2. It makes mandatory the adoption of Personal Protective Equipment (PPE) having filter with a protection degree up to a maximum of 15, as required by EN169 Standard.
	FUMES AND GASES CAN BE DANGEROUS: Welding may produce fumes and gases hazardous to health. Avoid breathing these fumes and gases. To avoid these dangers the operator must use enough ventilation or exhaust to keep fumes and gases away from the breathing zone.
	ARC RAYS CAN BURN: 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. Use suitable clothing made from durable flame-resistant material to protect you skin and that of your helpers. Protect other nearby personnel with suitable, non-flammable screening and warn them not to watch the arc nor expose themselves to the arc.
	WELDING SPARKS CAN CAUSE FIRE OR EXPLOSION: Remove fire hazards from the welding area and have a fire extinguisher readily available. Welding sparks and hot materials from the welding process can easily go through small cracks and openings to adjacent areas. Do not weld on any tanks, drums, containers, or material until the proper steps have been taken to insure that no flammable or toxic vapors will be present. Never operate this equipment when flammable gases, vapors or liquid combustibles are present.
	WELDED MATERIALS CAN BURN: Welding generates a large amount of heat. Hot surfaces and materials in work area can cause serious burns. Use gloves and pliers when touching or moving materials in the work area.

S	SAFETY MARK: This equipment is suitable for supplying power for welding operations carried out in an environment with increased hazard of electric shock.
	CYLINDER MAY EXPLODE IF DAMAGED: 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. Always keep cylinders in an upright position securely chained to a fixed support. Do not move or transport gas cylinders with the protection cap removed. Do not allow the electrode, electrode holder, work clamp or any other electrically live part to touch a gas cylinder. Gas cylinders must be located away from areas where they may be subjected to physical damage or the welding process including sparks and heat sources.
	MOVING PARTS ARE DANGEROUS: There are moving mechanical parts in this machine, which can cause serious injury. Keep your hands, body and clothing away from those parts during machine starting, operating and servicing.

The manufacturer reserves the right to make changes and/or improvements in design without upgrade at the same time the operator's manual.

Introduction

The welding machines **WELD PAK™ 2000** enables welding:

- GMAW (MIG/MAG)
- FCAW-SS
- SMAW (MMA)

The following equipment has been added to **WELD PAK™ 2000**:

- Bracket with rear wheels, M5 screws (4 units) and M5 lock nuts (4 units)
- Gun for GMAW process – 3m
- Work lead – 3m
- Gas hose – 2m

For GMAW and FCAW-SS process, the technical specification describes:

- Type of welding wire
- Wire diameter

Recommended equipment, which can be bought by user, was mentioned in the chapter "Accessories".

Installation and Operator Instructions

Read this entire section before installation or operation of the machine.

Location and Environment

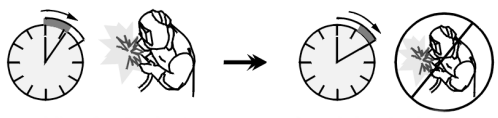
This machine will operate in harsh environments. However, it is important that simple preventative measures are followed to assure long life and reliable operation:

- Do not place or operate this machine on a surface with an incline greater than 15° from horizontal.
- Do not use this machine for pipe thawing.
- This machine must be located where there is free circulation of clean air without restrictions for air movement to and from the air vents. Do not cover the machine with paper, cloth or rags when switched on.
- Dirt and dust that can be drawn into the machine should be kept to a minimum.
- This machine has a protection rating of IP23. Keep it dry when possible and do not place it on wet ground or in puddles.
- Locate the machine away from radio controlled machinery. Normal operation may adversely affect the operation of nearby radio controlled machinery, which may result in injury or equipment damage. Read the section on electromagnetic compatibility in this manual.
- Do not operate in areas with an ambient temperature greater than 40°C.

Duty cycle and Overheating

The duty cycle of a welding machine is the percentage of time in a 10 minute cycle at which the welder can operate the machine at rated welding current.

Example: 60% duty cycle



Welding for 6 minutes. Break for 4 minutes.

Excessive extension of the duty cycle will cause the thermal protection circuit to activate.
The machine is protected from overheating by a temperature sensor.

Input Supply Connection

⚠ WARNING

Only a qualified electrician can connect the welding machine to the supply network. Installation had to be made in accordance with the appropriate National Electrical Code and local regulations.

Check the input voltage, phase and frequency supplied to this machine before turning it on. Verify the connection of ground wires from the machine to the input source. The welding machine **WELD PAK™ 2000** must be connected to a correctly installed plug-in socket with an earth pin.
Input voltage is 1x230V, 50/60Hz. For more information about input supply refer to the technical specification section of this manual and to the rating plate of the machine.

Make sure that the amount of mains power available from the input supply is adequate for normal operation of the machine. The necessary delayed fuse (or circuit breaker with "D" characteristic) and cable sizes are indicated in the technical specification section of this manual.

⚠ WARNING

The welding machine can be supplied from an engine driven generator of output power at least 30% larger than input power of the welding machine. Engine driven generator must have voltage stabilization. Otherwise, may cause a damage.
See "Technical Specifications" chapter.

⚠ WARNING

When powering welder from a generator be sure to turn off welder first, before generator is shut down, in order to prevent damage to welder!

Output Connections

Refer to points [8], [9] and [10] of the Figures below.

Controls and Operational Features

1. Power Switch ON/OFF (I/O): Controls the input power to the machine. Be sure the power source is connected to the mains supply before turning power on ("I"). After input power is connected and the power switch is turned on, the indicator will light up to indicate the machine is ready to weld.

2. Process Welding's Switch:

	GMAW (MIG/MAG) process **Warning:** Can be used to FCAW-SS process.
	SMAW (MMA) process

⚠ WARNING

When the machine is switched again on, last welding process will be recalled.

⚠ WARNING

If the push-button is pushed in GMAW process in, the output terminals will lived.

⚠ WARNING

During SMAW process, the output terminals are still lived.

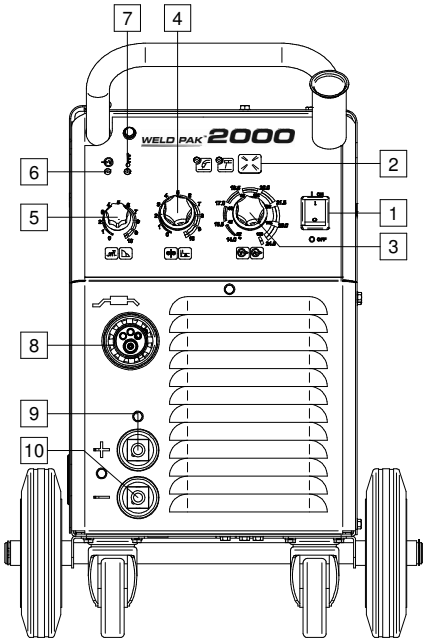


Figure 1

3. Welding Load Voltage / Current Control: Depending on welding process, this knob controls:

GMAW process		The welding load voltage and set by this knob [6] (also during welding).
SMAW process		The welding current is set by this knob [6] (also during welding).

4. WFS/Hot Start Control: Depending on welding process, this knob controls:

GMAW process		Wire feed speed WFS: Value in percentage of nominal value wire feed speed.
SMAW process		HOT START: Value in percentage of nominal value welding current during arc start current. The control is used to set the level of the increased current and arc start current is made easy.

5. Control: Depending on welding process, this knob controls:

GMAW process		Inductance: Arc control is controlled by this knob. If the value is higher, the arc will be softer and during welding is less spatters.
SMAW process		ARC FORCE: The output current is temporarily increased to clear short circuit connections between the electrode and the work piece.

6. LED Indicator Power switch: This LED lights up when the welding machine is ON and is ready to work

7. Thermal Overload Indicator: It indicates that the machine is overloaded or that the cooling is not sufficient.

WARNING

If the welding current exceed 200 A, output power will be turned off after 5 seconds. It will be indicated by Thermal Overload Indicator. Output power will be turned on again after 3 minutes.

8. EURO Socket: For connecting a welding gun (for GMAW / FCAW-SS process).

9. Positive Output Socket for the Welding Circuit: For connecting an electrode holder with lead / work lead.

10. Negative Output Socket for the Welding Circuit: For connecting an electrode holder with lead / work lead.

11. Gas Connector: Connection for gas line.

12. Power Lead with Plug (3m): Power lead with plug is a standard equipment. Connect the power lead with plug to the main supply before turning power on.

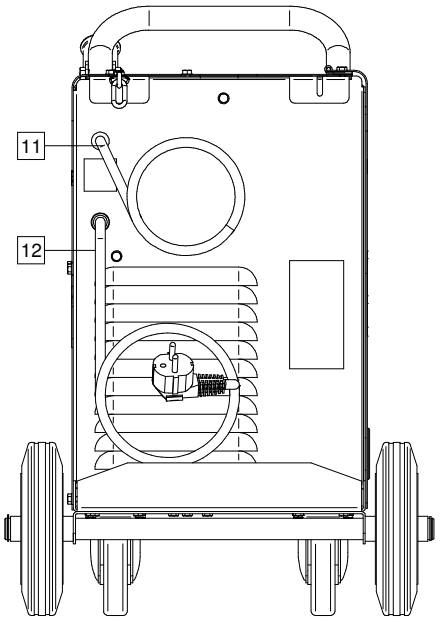


Figure 2.

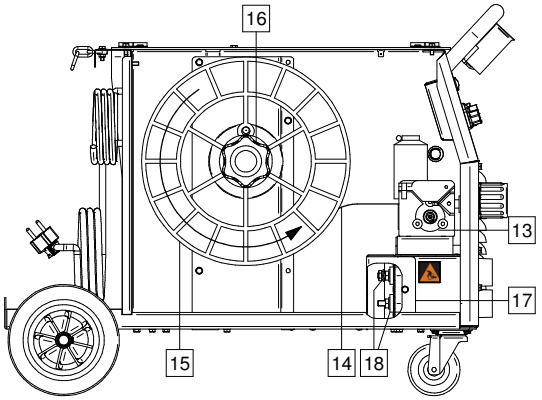


Figure 3

13. Wire Drive (for GMAW, FCAW-SS process): 2-Roll wire drive.

14. Welding Wire (for GMAW / FCAW-SS).

15. Spooled Wire (for GMAW / FCAW-SS): The machine does not include a spooled wire.

16. Wire Spool Support: Maximum 15kg spools. Accepts plastic, steel and fiber spools onto 51mm spindle. Also accepts Readi-Reel® type spools onto included spindle adapter.

17. Shield of Changing Polarity.

18. Terminal Block of Changing Polarity (for GMAW / FCAW-SS process): This terminal block enables to set the welding polarity (+ ; -), which will be given at the welding holder.

WARNING

Positive (+) polarity is set at the factory.

WARNING

Before welding check the polarity for using electrodes and wires.

If the welding polarity has to be changed, user should:

- Switch off the machine.
- Determine the wire polarity for the wire to be used. Consult the electrode data for this information.
- Take off the terminal block's shield [17].
- The tip of the wire on the terminal block [18] and work lead fix as is shown in the Table 1 or the Table 2.
- Put on the terminal block's shield.

WARNING

The machine must be used with the door completely closed during welding.

WARNING

Not use handle to move the machine during work.

Table 1.

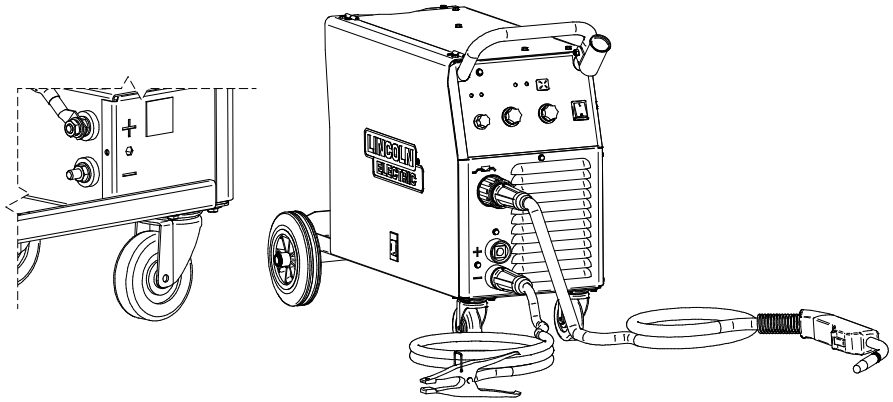
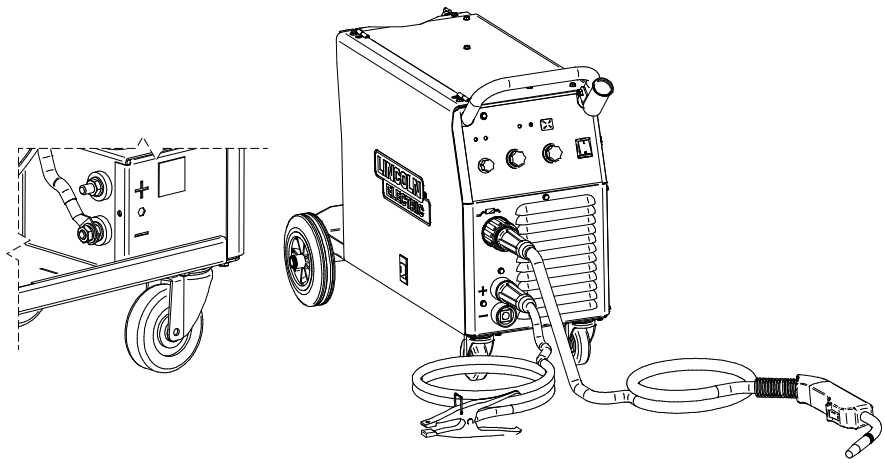
Positive polarity (factory setting)	

Table 2.

Negative polarity	

Wire Spool Loading

Wire spool type S300 and BS300 can be installed on the wire spool support without adapter.
Wire spool type S200, B300 or Readi-Reel® can be installed, but the applicable adapter must be purchased. The applicable adapter can be purchased separately(see "Accessories" chapter).

Wire Spool Type S300 & BS300 Loading

⚠ WARNING

Turn the input power OFF at the welding power source before installation or changing a wire spool.

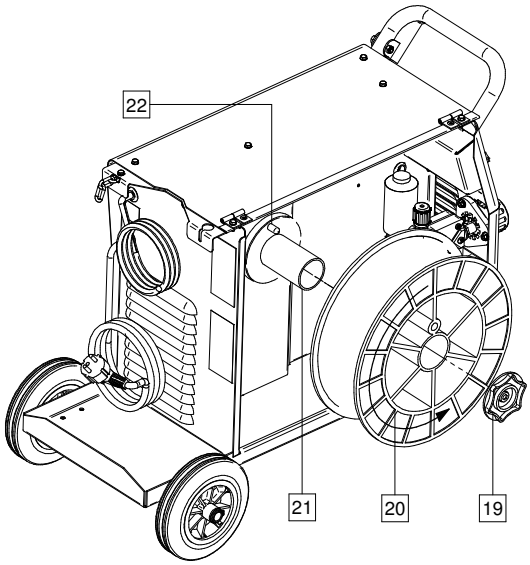


Figure 4

- Turn the input power OFF.
- Open the side panel.
- Unscrew the Locking Nut [19] and remove it from the Spindle [21].
- Place the spool type S300 or BS300 [20] on the Spindle [21] making certain the Spindle Brake Pin [22] is put in the hole in back side of spool type S300 or SB300.

⚠ WARNING

Position the spool type S300 or SB300 so that it will rotate in a direction when feeding so as to be de-reeled from bottom of the spool.

- Re-install the locking nut [19]. Make sure that the locking nut is tightened.

Wire Spool Type S200 Loading

⚠ WARNING

Turn the input power OFF at the welding power source before installation or changing a wire spool.

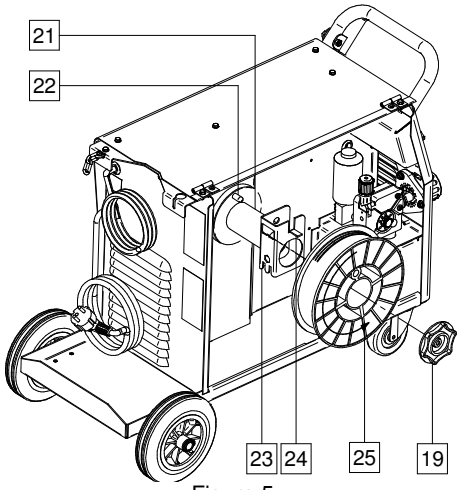


Figure 5

- Turn the input power OFF.
- Open the side panel.
- Unscrew the Locking Nut [19] and remove it from the Spindle [21].
- Place the adapter of spool type S200 [23] on the spindle [21] making certain the spindle brake pin [22] is put in the hole in back side of the adapter [23]. The adapter of spool type S200 can be purchased separately (see "Accessories" chapter).
- Place the spool type S200 [25] on the spindle [21] making certain that the adapter brake pin [24] is put in the hole in the back side of the spool.

⚠ WARNING

Position the spool type S200 so that it will rotate in a direction when feeding so as to be de-reeled from bottom of the spool.

- Re-install the locking nut [19]. Make sure that the locking nut is tightened.

Wire Spool Type B300 Loading

⚠ WARNING

Turn the input power OFF at the welding power source before installation or changing a wire spool.

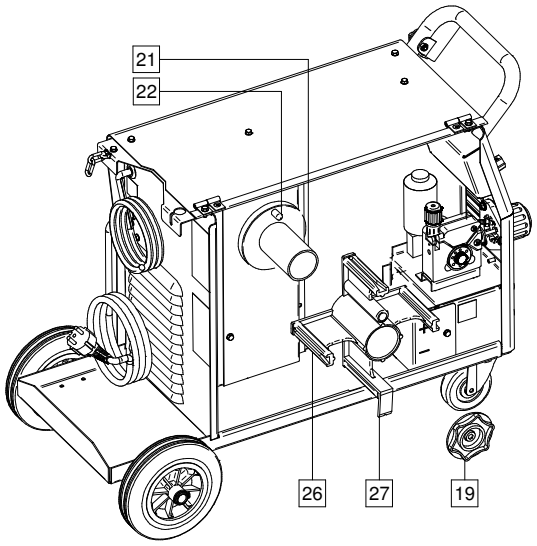


Figure 6

- Turn the input power OFF.
- Open the side panel.
- Unscrew the Locking Nut [19] and remove it from the spindle [21].
- Place the adapter of spool type B300 [26] on the spindle [21].Make certain that the spindle brake pin [22] is put in the hole in the back side of the adapter [26]. The adapter of spool type B300 can be purchased separately (see "Accessories" chapter).
- Re-install the locking nut [19]. Make sure that the locking nut is tightened.

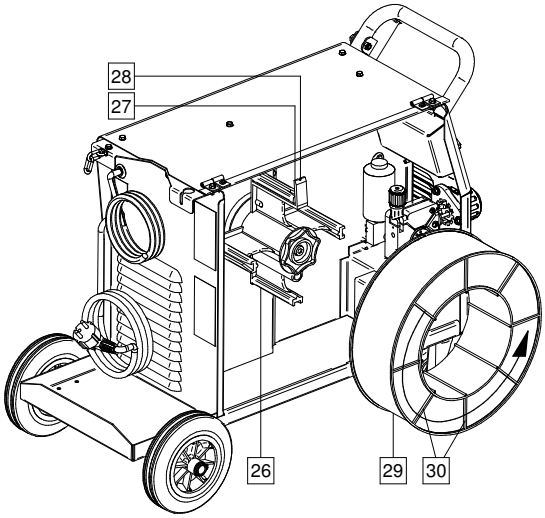


Figure 7

- Rotate the spindle and adapter so the retaining spring [27] is at the 12 o'clock position.
- Place the spool type B300 [29] on the adapter [26]. Set one of the B300 inside cage wires [30] on the slot [28] in the retaining spring tab [27] and slide the spool onto the adapter.

⚠ WARNING

Position the spool type B300 so that it will rotate in a direction when feeding so as to be de-reeled from bottom of the spool.

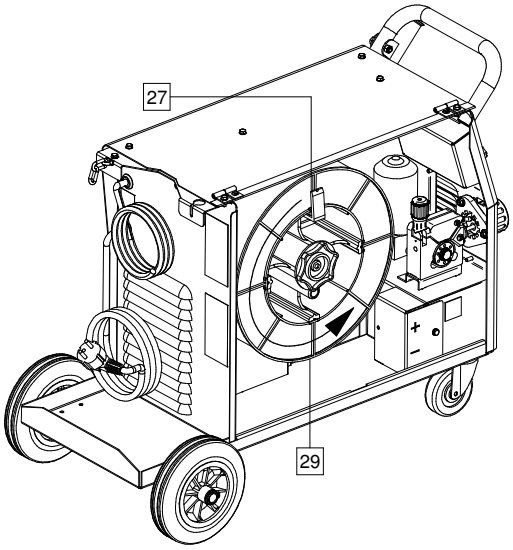


Figure 8

Wire Spool Type Readi-Reel® Loading

⚠ WARNING

Turn the input power OFF at the welding power source before installation or changing a wire spool.

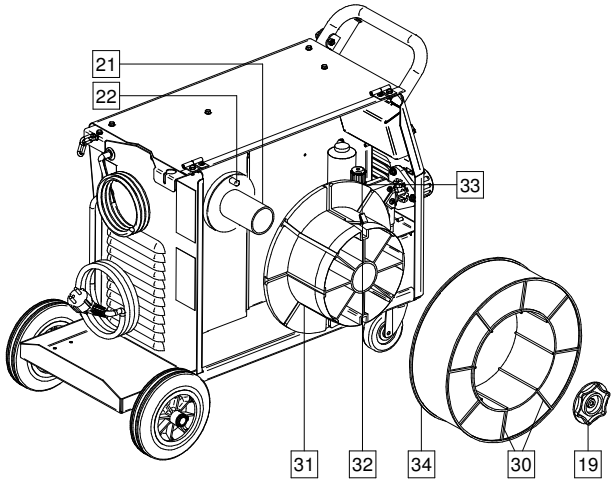


Figure 9

- Turn the input power OFF.
- Open the spool wire case.
- Unscrew the locking nut [19] and remove it from the spindle [21].
- Place the adapter of spool type Readi-Reel® [31] on the spindle [21].Make certain that the spindle brake pin [22] is put in the hole in the back side of the adapter [31]. The adapter of spool type Readi-Reel® can be purchased separately (see "Accessories" chapter).

- Re-install the locking nut [19]. Make sure that the locking nut is tightened.
- Rotate the spindle and adapter so the retaining spring [32] is at the 12 o'clock position.
- Place the spool type Readi-Reel® [34] on the adapter [31]. Set one of the Readi-Reel® inside cage wires [30] on the slot [33] in the retaining spring tab [32].

⚠ WARNING

Position the spool type Readi-Reel® so that it will rotate in a direction when feeding so as to be de-reeled from bottom of the spool.

Loading the Electrode Wire

- Turn the input power OFF.
- Open the side panel of the machine.
- Unscrew the locking nut of the sleeve.
- Load the spool with the wire [15] on the sleeve such that the spool turns anticlockwise when the wire [14] is fed into the wire feeder.
- Make sure that the spool locating pin goes into the fitting hole on the spool.
- Screw in the looking nut of the sleeve.
- Put on the wire roll using the correct groove corresponding to the wire diameter.
- Free the end of the wire and cut off the bent end making sure it has no burr.

⚠ WARNING

Sharp end of the wire can hurt.

- Rotate the wire spool anticlockwise and thread the end of the wire into the wire feeder as far as the Euro socket.
- Adjust force of pressure roll of the wire feeder properly.

Adjustments of Brake Torque of Sleeve

To avoid spontaneous unrolling of the welding wire the sleeve is fitted with a brake.
Adjustment is carried by rotation of its screw M10, which is placed inside of the sleeve frame after unscrewing the fastening cap of the sleeve.

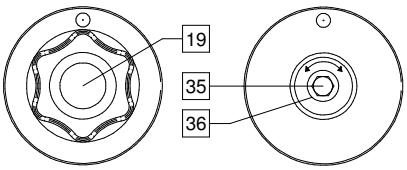


Figure 10

19. Fastening cap.
35. Adjusting screw M10.
36. Pressing spring.

Turning the screw M10 clockwise increases the spring tension and you can increase the brake torque

Turning the screw M10 anticlockwise decreases the spring tension and you can decrease the brake torque.

After finishing of adjustment, you should screw in the fastening cap again.

Adjusting of Force of Pressure Roll Force

The pressure arm controls the amount of force the drive rolls exert on the wire.
Pressure force is adjusted by turning the adjustment nut clockwise to increase force, counterclockwise to decrease force. Proper adjustment of pressure arm gives the best welding performance.

⚠ WARNING

If the roll pressure is too low the roll will slide on the wire. If the roll pressure is set too high the wire may be deformed, which will cause feeding problems in the welding gun. The pressure force should be set properly. Decrease the pressure force slowly until the wire just begins to slide on the drive roll and then increase the force slightly by turning of the adjustment nut by one turn.

Inserting Electrode Wire into Welding Gun

- Turn the input power OFF.
- Depending on welding process, connect the proper gun to the euro socket, the rated parameters of the gun and of the welding machine should be matched.
- Remote the nozzle from the gun and contact tip or protection cap and contact tip. Next, straighten the gun out flat.
- Insert the wire through the guide tube, over the roller and through the guide tube of Euro Socket into liner of gun. The wire can be pushed into the liner manually for a few centimeters, and should feed easily and without any force.

⚠ WARNING

If force is required it is likely that the wire has missed the liner of gun.

- Turn the input power ON.
- Depress the gun trigger to feed the wire through the gun liner until the wire comes out of the threaded end.
- When trigger is released spool of wire should not unwind.
- Adjust wire spool brake accordingly.
- Turn the welding machine off.
- Install a proper contact tip.
- Depending on the welding process and the type of the gun, install the nozzle (GMAW process) or protection cap (FCAW-SS process).

⚠ WARNING

Take precaution to keep eyes and hands away from the end of the gun while the wire is being come out of the threated end.

Changing Driving Rolls

WARNING

Turn the input power OFF at the welding power source before installation or changing drive rolls and/or guides.

WELD PAK™® 2000 is equipped with drive roll V0.8/V1.0 for steel wire. For others wire sizes, is available the proper drive rolls kit (see "Accessories" chapter) and follow instructions:

- Turn the input power OFF.
- Release the pressure roll lever [37].
- Unscrew the fastening cap [38].
- Change the drive roll [39] with the compatible ones corresponding to the used wire.

WARNING

Be sure that the gun liner and contact tip are also sized to match the selected wire size.

- Screw fastening cap [38].
- Manually feed the wire from the wire reel, the wire through the guide tubes, over the roller and guide tube of Euro Socket into liner of gun.
- Lock the pressure roll lever [37].

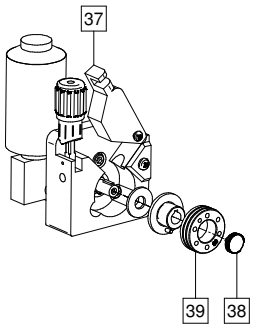


Figure 11

Gas Connection

A gas cylinder must be installed with a proper flow regulator. Once a gas cylinder with a flow regulator has been securely installed, connect the gas hose [11] to the flow regulator.

WARNING

The welding machine supports all suitable shielding gases at a maximum pressure of 5,0 bar.

WARNING

Always fasten gas cylinder properly in vertical position in a special holder on the wall or on a carriage. Remember to close gas cylinder valve after having finished welding.

WARNING

Gas cylinder can be fasten on the machine's shelf, but the height of gas cylinder doesn't have to be higher than 43in/1,1m. See the Figure 12. The gas cylinder which is fastened on the machine's shelf has to be secured by attaching it to the machine using the chain.

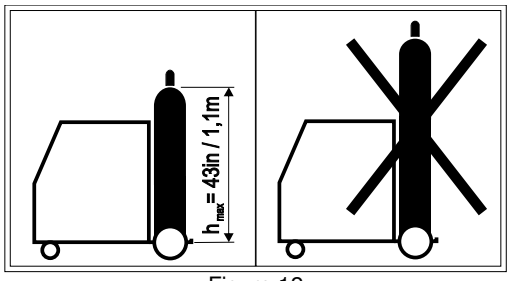


Figure 12

Welding GMAW, FCAW-SS Process

WELD PAK™2000 can be used to welding GMAW and FCAW-SS process.
WELD PAK™2000 includes the gun necessary for GMAW.

Procedure of begin welding of GMAW or FCAW-SS process:

- Place the machine conveniently near the work area in a location to minimize exposure to weld spatter and to avoid sharp bends in the gun cable.
- Determine the wire polarity for the wire to be used. Consult the wire data for this information.
- Connect output the gas-cooled gun to GMAW / FCAW-SS process to Euro Socket [8].
- Depending on the using wire, connect the work lead to output socket [9] or [10]. See [18] point – terminal block of changing polarity.
- Connect the work lead to the welding piece with the work clamp.
- Install the proper wire.
- Install the proper drive roll.
- Manually push the wire into the gun's liner.
- Make a sure, if it is needed (GMAW process), that the gas shield has been connected.
- Turn the machine on.
- Insert the wire into the welding gun.

WARNING

Keep the gun cable as straight as possible when loading electrode through cable.

WARNING

Never use defected gun.

- Close the wire drive door.
- Set the welding parameters.
- The welding machine is now ready to weld.

WARNING

The wire drive door has to be completely closed during welding.

WARNING

Keep the gun cable as straight as possible when welding or loading electrode through cable.

WARNING

Do not kink or pull cable around sharp corners.

- By applying the principle of occupational health and safety at welding, welding can be begun.

In manual mode can be set:
- The welding load voltage
- WFS (wire feed speed)
- Inductance

Welding SMAW (MMA) Process

WELD PAK™2000 does not include the electrode holder with lead necessary for SMAW welding, but the one can be purchased separately. See "Accessories" chapter.

Procedure of begin welding of SMAW process:
- Determine the electrode polarity for the electrode to be used. Consult the electrode data for this information.
- Depending on the polarity of using electrode, connect the work lead [19] and the electrode holder with lead to output socket [8] or [9] and lock them. See the Table 3.

Table 3.

			Output socket	
POLARITY	DC (+)	The electrode holder with lead to SMAW	[9]	+
		Work lead	[10]	−
	DC (-)	The electrode holder with lead to SMAW	[10]	−
		Work lead	[9]	+

- Connect the work lead to the welding piece with the work clamp.
- Install the proper electrode in the electrode holder.
- Turn the welding machine on.
- Set the welding parameters.
- The welding machine is now ready to weld.
- By applying the principle of occupational health and safety at welding, welding can be begun.

User can set functions:
- The welding current
- HOT START
- ARC FORCE

Maintenance

⚠ WARNING

For any repair operations, modifications or maintenances, it is recommended to contact the nearest Technical Service Center or Lincoln Electric. Repairs and modifications performed by unauthorized service or personnel will cause, that the manufacturer's warranty will become null and void.

Any noticeable damage should be reported immediately and repaired.

Routine maintenance
- Check condition of insulation and connections of the work leads and insulation of power lead. If any insulation damage exists replace the lead immediately.
- Remove the spatters from the welding gun nozzle. Spatters could interfere with the shielding gas flow to the arc.
- Check the welding gun condition: replace it, if necessary.
- Check condition and operation of the cooling fan. Keep clean its airflow slots.

Periodic maintenance

Perform the routine maintenance and, in addition:
- Keep the machine clean. Using a dry (and low pressure) airflow, remove the dust from the external case and from the cabinet inside.
- If it is required, clean and tighten all weld terminals.

The frequency of the maintenance operations may vary in accordance with the working environment where the machine is placed.

⚠ WARNING

Do not touch electrically live parts.

⚠ WARNING

Before the case of welding machine will be removed, the welding machine had to be turned off and the power lead had to be disconnected from mains socket.

⚠ WARNING

Mains supply network must be disconnected from the machine before each maintenance and service. After each repair, perform proper tests to ensure safety.

WARNING

ELECTRIC SHOCK can kill

Have an electrician install and service this equipment
Turn the input power off at the fuse box before working on equipment
Do not touch electrically hot parts
Prior to performing preventive maintenance, perform the following capacitor discharge procedure to avoid electric shock.

INPUT FILTER CAPACITOR DISCHARGE PROCEDURE

1. Remove main input power to the WELD PAK 2000™
2. Remove the cover following the case removal procedure available in this Service manual.
3. The capacitors are discharged by discharge resistors integrated into the main board in about 2 (two) minutes.
4. Access to the terminals **DC+** and **DC –** of the Main Board to check if capacitors are discharged is not possible without removing the board from the machine. For this reason ALL operations to remove the Main Board have to be done in a safer way using electrically insulate gloves and insulate tools (pliers, screwdrivers etc..)
5. Remove the Main Board from the machine following the removal and replacement procedure available in this manual.
6. Once the Main Board has been removed connect your multi-meter positive probe to **DC+** point and your negative probe to **DC –** and check the voltage across filter capacitors. **See Figure 1**
7. In case of presence of residual voltage follow the next steps
8. Obtain a high resistance and high wattage resistor (500-1000 ohms and 25 watts minimum). This resistor is NOT supplied with the machine. NEVER USE A SHORTING STRAP FOR THIS PROCEDURE.
9. Use electrically insulate gloves and insulated pliers. Hold the body of the resistor and connect the resistor leads across the two points **DC+** and **DC -**. **See Figure 1**. Hold the resistor in place for 10 seconds. DO NOT TOUCH CAPACITOR TERMINALS WITH YOUR BARE HANDS.
10. Check again the voltage across the two terminals. Voltage should be zero. If any voltage remains, repeat this procedure.

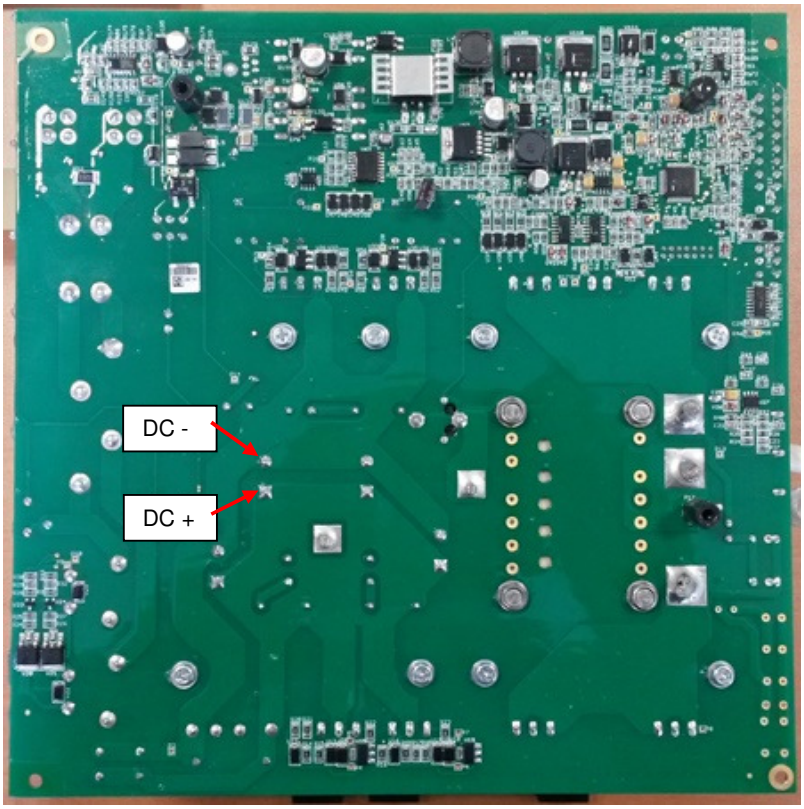


Figure 1

THERMAL PROTECTION

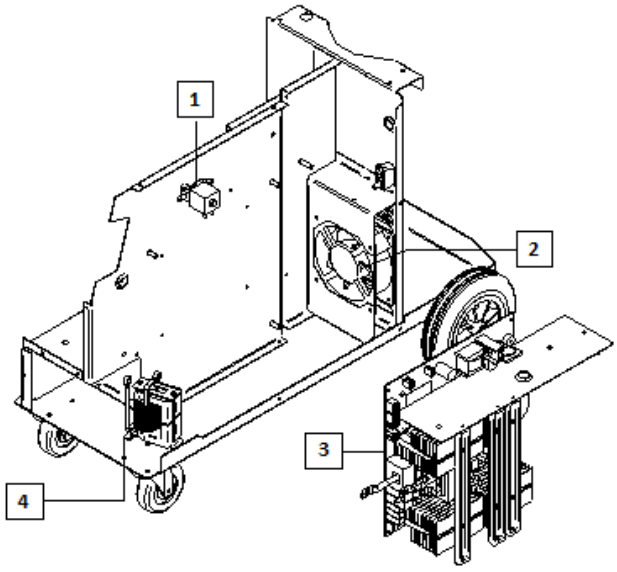
Thermal detection device protect the machine from excessive operating temperatures. Excessive temperatures may be caused by a lack of cooling air or operating the machine beyond the duty cycle and output rating. If excessive operating temperatures should occur, the yellow LED will light and the detection device will prevent output voltage or current.

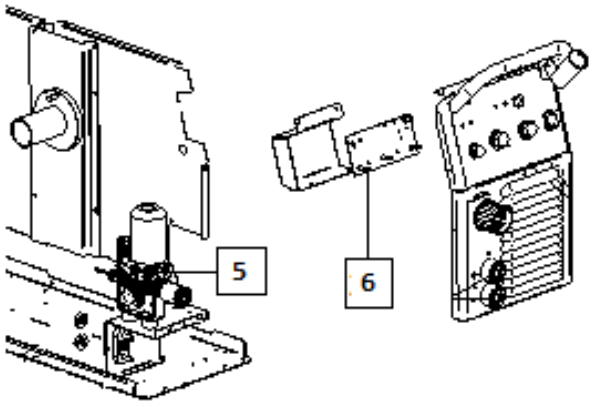
These detection device are self-resetting once the machine cools sufficiently. If the thermostat shutdown was caused by excessive output or duty cycle and the fan is operating normally, the power switch may be left on and the reset should occur within a 15 minute period. If the fan is not turning or the air intake louvers were obstructed , then the power must be switched off and the fan problem or air obstruction must be corrected.

MAJOR COMPONENTS LOCATION

WELD PAK 2000

1. Gas solenoid
2. Fan
3. Power Board
4. Output Choke
5. Wire drive assembly
6. User Interface Board

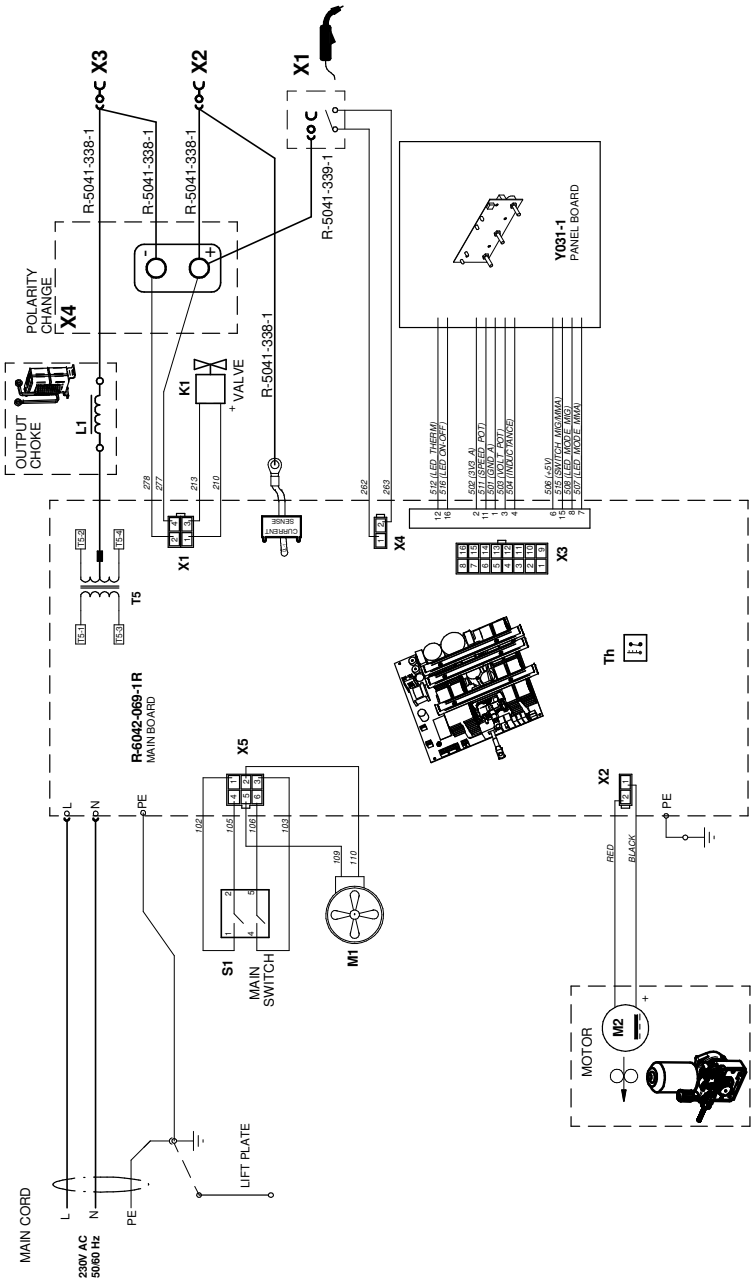


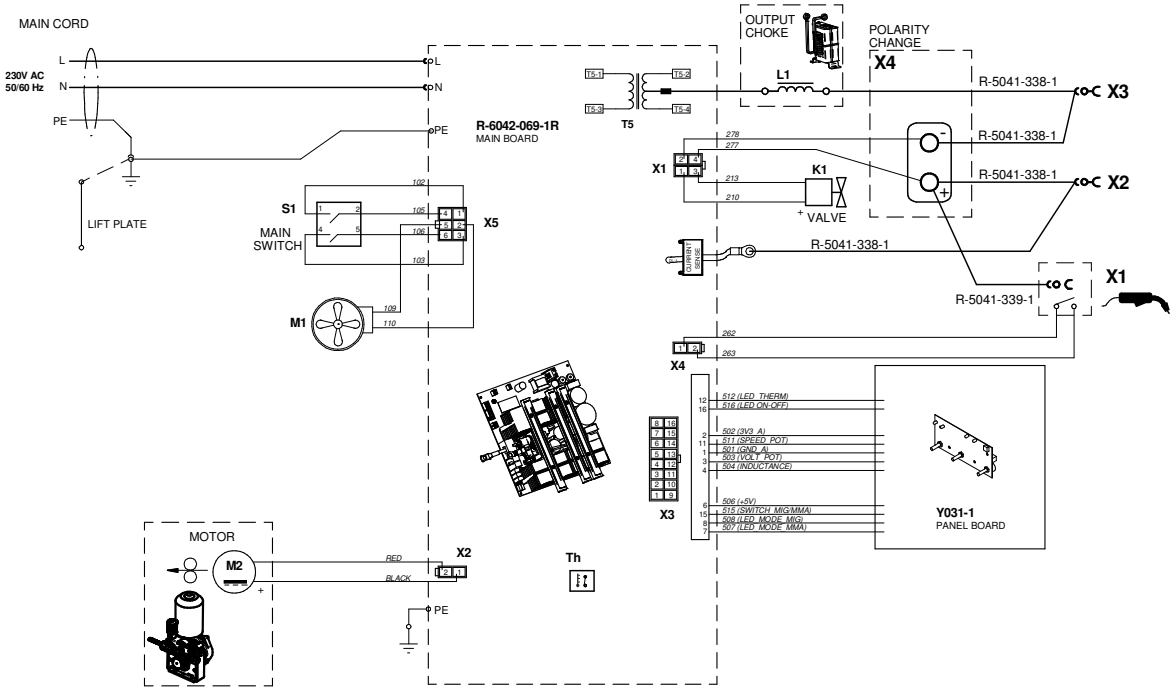


THEORY OF OPERATION

- General description
- Main Board
- Output choke – Polarity change – User Interface
- Protection Circuits
- IGBT operation

BLOCK DIAGRAM





GENERAL DESCRIPTION

The WELD PAK 2000^{TM} is an industrial arc welding power source which utilizes single phase input power, to produce constant voltage or constant current output. The welding response of these units has been optimized for GMAW, FCAW-SS, SMAW.

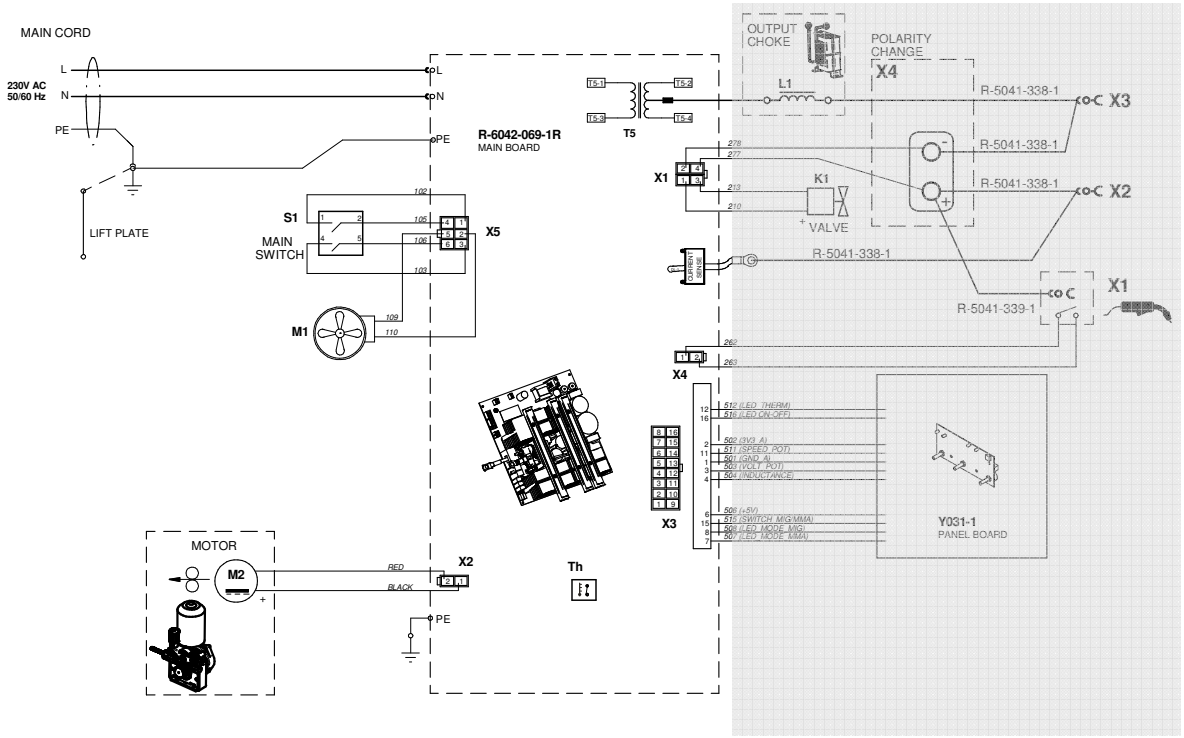
WELD PAK 2000^{TM} produce a welding output from 20 to 200 amperes in GMAW-FCAW-SS and 20 to160A in SMAW. It operates on single phase input power 230VAC. It is environmentally hardened to an IP23 rating for operating in difficult environments.

EMI FILTER

EMI filter circuit, part of the power board prevents noise from the machine from being transmitted along the main power line and vice versa, necessary to be in accordance with all relevant directives and standards.

MAIN BOARD

(INVERTER CIRCUIT – OUTPUT CIRCUIT – WIRE DRIVE MOTOR)



MAIN BOARD (INVERTER CIRCUIT, OUTPUT CIRCUIT, WIRE DRIVE CIRCUIT)

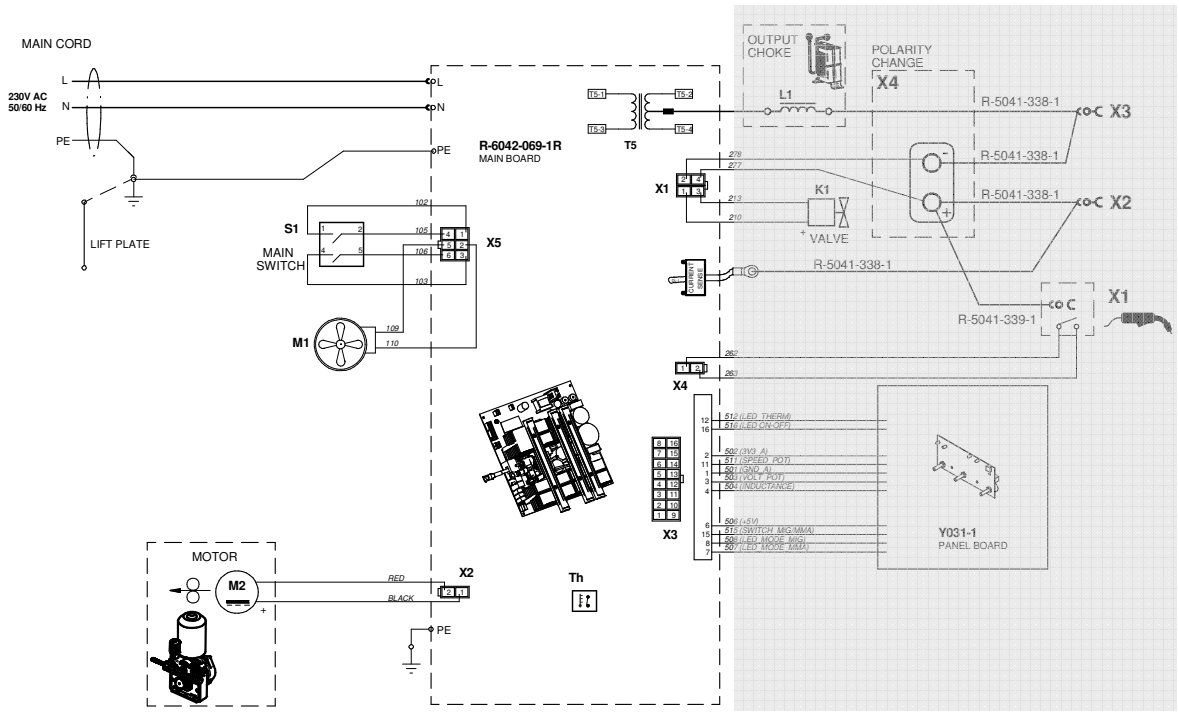
The WELD PAK 2000™ can be connected to a 230Vac +/- 10% single phase input voltage.
This unit can be also connect to engine driven generators but it must follow the below conditions:

- Vac peak voltage: below 410V.
- Vac frequency: in the range of 50 and 60 Hertz.
- RMS voltage of the AC waveform: 230Vac ± 10%.
- Power generator output power at least 30% larger than input power of the welding machine

When the machine ON/OFF switch is closed the AC input is applied to the auxiliary voltages circuit that supply the circuitry of the unit, including fans and gas solenoid. Input voltage is verified and if correct (+/- 10%) micro controller gives command to K2 relay to close and the soft-start process starts using a 25 ohms PTC to pre-charge the BUS capacitors. The 25 ohm PTC will be "shorted out" by the relay K1 contacts when pre-charge phase is finish. Command to K1 is coming from main board microprocessor.

The rectified and filtered 365Vdc is applied to the IGBT controlled full wave bridge inverter.

The IGBTs supply the main transformer winding with 40KHz current flow.
The IGBTs act as a switch assembly. This assembly feeds the primary winding of the main transformer. When current is pulsed through this primary winding, a resultant current is produced on a secondary winding of the main transformer. Current transducer located on the inverter board monitor the primary current. If the primary current become abnormally high, the inverter control circuit will shut off the IGBTs, thus disabling the machine's output.



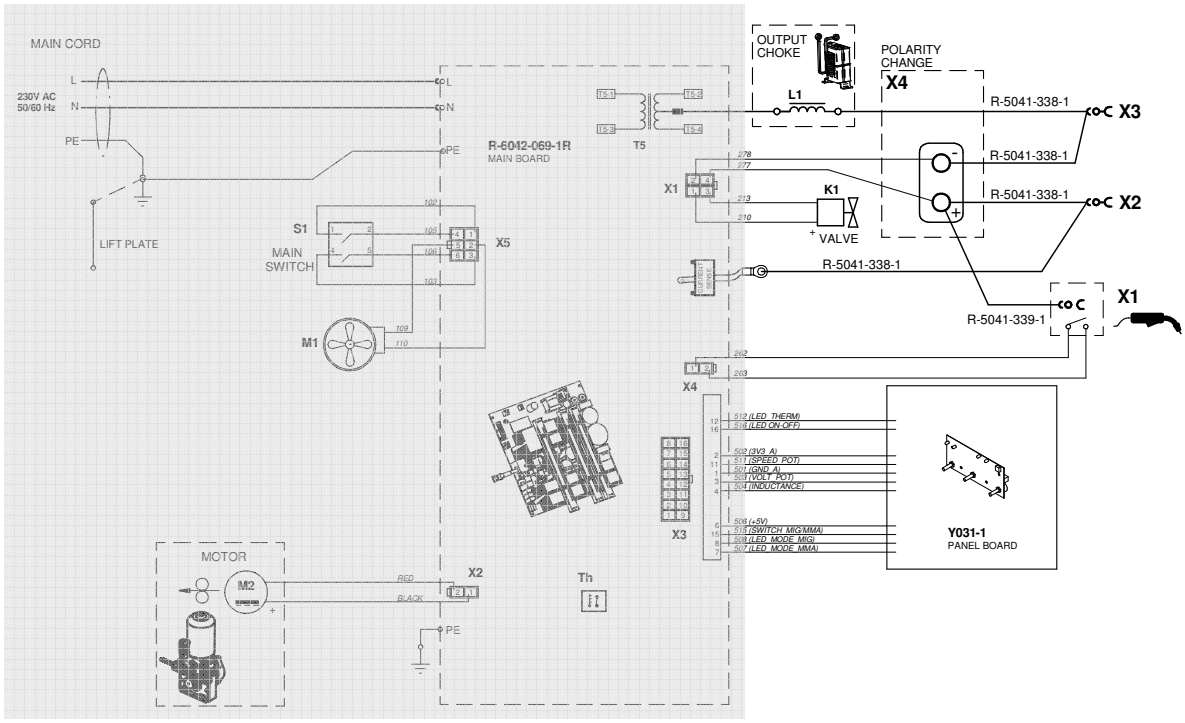
MAIN BOARD (INVERTER CIRCUIT, OUTPUT CIRCUIT, WIRE DRIVE CIRCUIT)

The main transformer, located on the main board, insulates the primary circuit from the secondary circuit.

The output circuit is also part of the main board and the rectifier diodes receive the high frequency AC output from the main transformer secondary winding and rectifies it to a DC voltage level. A filtered DC output is applied to the machine's output terminals.
An output hall current probe read the output current and send the signal to the analog control loop that manage the output current.

The wire drive motor is controlled by the main board microcontroller using PWM signals. Micro controller receives signals directly from the User Interfaces and it sends the correct PWM signal to the motor.

OUTPUT CHOKE – POLARITY CHANGE – USER INTERFACE



OUTPUT CHOKE, POLARITY CHANGE, USER INTERFACE

The DC output is applied through an output choke coil. The choke provides current filtering for the welding output.

Polarity Change terminal block enables to set the welding polarity (+ ; -), which will be given at the welding Euro connector holder. Main board output voltage feedbacks are connected to this block.

The User Interface is simple; from the potentiometers and welding process selector the user can set the desired welding values that are send directly to the main board control circuitry using analog signals.

OVERLOAD PROTECTION

WELD PAK 2000^{TM} is electrically protected from producing higher than normal output currents. An electronic protection circuit limits the current to within the capabilities of the machine.

THERMAL PROTECTION

There is one thermal device located on the output diodes heat-sink; it protects the machine from excessive operating temperature.
Excessive temperature may be caused by a lack of cooling air or by operating the machine beyond the duty cycle and output rating. If excessive operating temperature should occur, the Thermal LED indicator on the control board, will turn ON and the thermostat will prevent output current.

The thermal protection devices are self-resetting once the machine cools sufficiently. If the 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 about 8 minutes period. If the fan is not turning or the air intake louvers are obstructed, the input power must be removed and the fan problem or air obstruction must be corrected.

INSULATED GATE BIPOLAR TRANSISTOR (IGBT) OPERATION

An IGBT is a type of transistor. IGBTs are semiconductors well suited for high frequency switching and high current applications.
Drawing A shows an IGBT in a passive mode. There is no gate signal, zero volts relative to the source, and therefore, no current flow. The drain terminal of the IGBT may be connected to a voltage supply; but since there is no conduction the circuit will not supply current to components connected to the source. The circuit is turned off like a light switch in the OFF position.

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

Insulated Gate Bipolar Transistor - IGBT

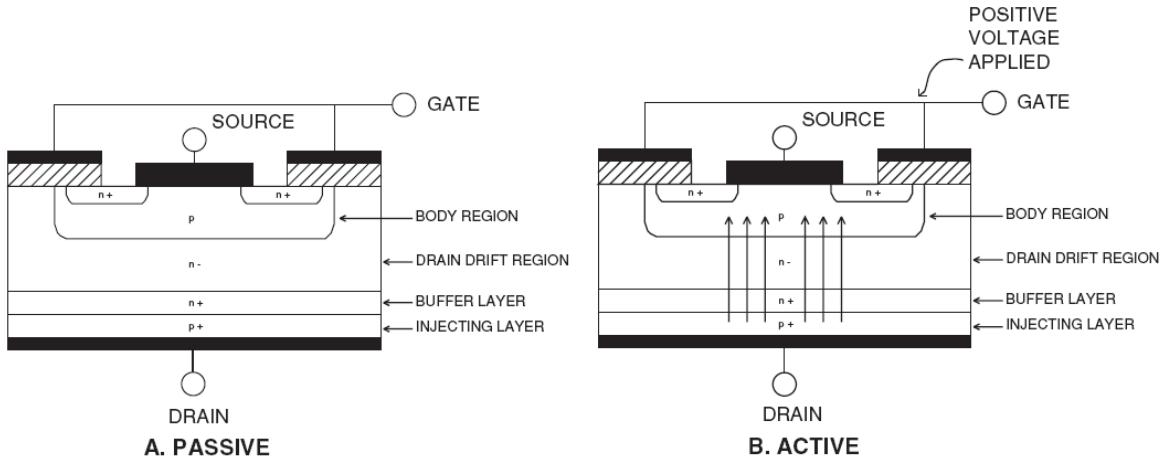
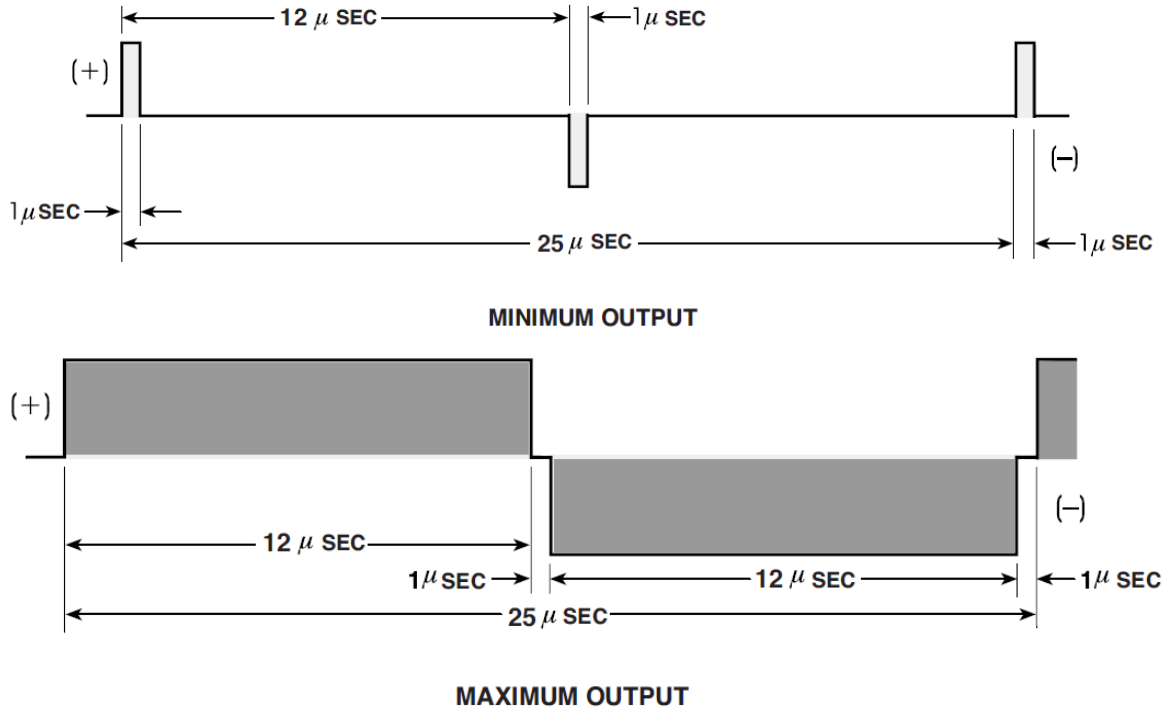


Figure E.9 - Typical IGBT outputs



PULSE WIDTH MODULATION

The term PULSE WIDTH MODULATION (PWM 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 is the varying of the pulse width over the allowed range of a cycle to affect the output of the machine.

MINIMUM OUTPUT

By controlling the duration of the gate signal, the IGBT is turned on and off for different durations during a cycle. The top drawing above shows the minimum output signal possible over a 12.5 microsecond time period.

The shaded portion of the signal represents one IGBT group1, conducting for 1 microsecond. The negative portion is the other IGBT group. The dwell time (off time) is 12 microseconds (both IGBT groups off). Since only 2 microseconds of the 25 microsecond time period are devoted to conducting, the output power is minimized.

MAXIMUM OUTPUT

By holding the gate signals on for 12 microseconds each and allowing only 2 microseconds of dwell or off time (one microsecond during each half cycle) during the 25 microsecond cycle, the output is maximized.

The darkened area under the minimum output curve can be compared to the area under the maximum output curve. The more darkened area, the more power is present.

TROUBLESHOOTING AND REPAIR SECTION

- How to use troubleshooting Guide
- Troubleshooting Guide
- Case cover removal and capacitor discharge procedure

HOW TO USE TROUBLESHOOTING GUIDE

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

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

Step 1. LOCATE PROBLEM (SYMPTOM). Look under the column labeled "PROBLEMS". This column describes possible symptoms that the machine may exhibit. Find the listing that best describes the symptom that the machine is exhibiting. Symptoms are grouped into three main categories: Output Problems, Function Problems, and LED Function Problems.

Step 2. PERFORM EXTERNAL TESTS. The second column, labeled "CHECKS", lists the obvious external possibilities that may contribute to the machine symptom. Perform these tests/checks in the order listed. In general, these tests can be conducted without removing the case wrap-around cover.

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

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

WARNING

ELECTRIC SHOCK can kill

- Have an electrician install and service this equipment
- Turn the input power off at the fuse box before working on equipment
- Do not touch electrically hot parts
- Prior to performing preventive maintenance, perform the following capacitor discharge procedure to avoid electric shock

---

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

1. Determine to the best of your technical ability that the PC board is the most likely component causing the failure symptom.
2. Check for loose connections at the PC board to assure that the PC board is properly connected.
3. If the problem persists, replace the suspect PC board using standard practices to avoid static electrical damage and electrical shock.
4. Test the machine to determine if the failure symptom has been corrected by the replacement PC board.

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

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

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

TROUBLESHOOTING

!! WARNING !! **BEFORE CONNECT POWER SUPPLY, MAKE A CAREFUL VISUAL INSPECTION INSIDE THE MACHINE , CHECK ALL THE BOARDS AND HARNESSES.**

PROBLEMS / SYMPTOMS	POSSIBLE AREAS OF MISADJUSTMENT(S)	CHECK	RECOMMENDED COURSE OF ACTION
THE LINE CIRCUIT BREAKER TRIPS WHEN POWER SWITCH IS " ON"	• INPUT POWER BRIDGE IS IN SHORT CIRCUIT • ELECTROLYTIC CAPACITORS FAILURE • INVERTER IGBTs SHORT CIRCUITED	• PERFORM THE MAIN BOARD RESISTANCE TEST	• REPLACE THE MAIN BOARD
THE MACHINE IS DEAD, NO OUTPUT	• THERE IS NO POWER SUPPLY ON LINE • THE POWER SUPPLY CABLE IS INTERRUPTED • LINE SWITCH FAILURE • THE MAIN BOARD IS DAMAGED	• CHECK THE PHASE INPUT VOLTAGE ON THE MACHINE • CHECK THE POWER SUPPLY CABLE • CHECK THE LINE SWITCH • PERFORM THE MAIN RESISTANCE AND VOLTAGE TEST	• RECONNECT THE POWER SUPPLY • REPLACE THE INPUT POWER CABLE • REPLACE THE LINE SWITCH • REPLACE THE MAIN BOARD
YELLOW THERMAL LED LIT	• PROBLEM WITH MOTOR	• CHECK THE CORRECT DRIVE ROLL PRESSURE • CHECK THE MOTOR POWER SUPPLY	• SET THE CORRECT DRIVE ROLL PRESSURE • REPLACE THE MOTOR
YELLOW THERMAL LED LIT	• THERMAL PROTECTION HAS TRIPPED.	• WAIT THE MACHINE TO COOL, THE RESET SHOULD OCCUR WITHIN ABOUT 8-10 MINUTES • CHECK FAN AND THERMAL PROTECTION CIRCUIT	• REPLACE THE DEFECTIVE FAN • REPLACE THE MAIN BOARD
YELLOW THERMAL LED LIT	• WELDING CURRENT EXCEED 200A FOR MORE THAN 5-6 SECONDS	• IF MACHINES WILL NOT TURN ON AUTOMATICALLY AFTER 3 MINUTES, PERFORM THE MAIN BOARD CHECKS	• REPLACE THE MAIN BOARD
YELLOW THERMAL LED LIT	• THE INPUT VOLTAGE IS OVER OR UNDER THE MACHINE INPUT VOLTAGE RANGE	• CHECK THE INPUT VOLTAGE VALUE	• CONNECT THE MACHINE TO CORRECT INPUT LINE VOLTAGE RANGE OF 230Vac +/-10%
THERE IS NO WIRE FEED WHEN THE TRIGGER IS ACTIVATED. OPEN CIRCUIT VOLTAGE IS PRESENT AND GAS SOLENOID WORKS PROPERLY	• IF THE DRIVE ROLL IS TURNING A MECCANICAL RESTRICTION IN THE WIRE FEED PATH CAN BE THE CAUSE • THE GUN LINER MAY BE CLOGGED • THE DRIVE ROLL IS NOT TURNING	• CHECK THE WIRE FEED PATH FOR MECCANICAL RESTRICTION/PROBLEMS • CHECK THE GUN LINER • CHECK THE DRIVE ROLL PRESSURE • PERFORM THE MAIN BOARD VOLTAGE TEST	• REMOVE ANY POSSIBLE RESTRICTION • REPLACE THE GUN LINER • SET THE CORRECT DRIVE ROLL PRESSURE • REPLACE THE WIRE DRIVE MOTOR OR MAIN BOARD
THE ARC IS UNSTABLE	• THE CONTACT TIP MAY BE WORN • BAD OR LOOSE CONNECTIONS ON THE WORK OR GUN CABLE • WELDING POLARITY MAY IS NOT CORRECT FOR THE PROCESS BEING USED • WELDING WIRE MAY BE RUSTED OR DIRTY	• CHECK THE STATUS OF THE CONTACT TIP • CHECK THE STATUS OF THE WORK AND GUN CABLE • CHECK THE WELDING POLARITY • CHECK THE CONDITION OF THE WELDING WIRE	• REPLACE THE CONTACT TIP IF WORN • REPLACE THE WORK CABLE OR TORCH • CHANGE THE POLARITY ACCORDINGLY TO THE USED PROCESS • REPLACE THE WELDING WIRE IF DIRTY OR RUSTED
POROSITY ARE PRESENT ON WELD BEAD	• WELDING POLARITY MAY IS NOT CORRECT FOR THE PROCESS BEING USED • SHIELDING GAS OR FLOW MAY IS NOT CORRECT • THE WELDING JOINT IS CONTAMINATED	• CHECK THE WELDING POLARITY • CHECK THE SHIELDING GAS, THE GAS FLOW OR GAS SOLENOID VALVE • CHECK THE WELDING JOINT, FOR OIL, RUST OR ANY OTHER CONTAMINATIONS	• CHANGE THE POLARITY ACCORDINGLY TO THE USED PROCESS • CHANGE THE GAS TYPE OR FLOW RATE • CHECK THE GAS CIRCUIT FOR LOOSEN CONNECTIONS OR BROKEN TUBE, FAULTY GAS SOLENOID VALVE • CLEAN THE JOINT

CASE COVER REMOVAL AND DC LINK CAPACITOR DISCHARGE PROCEDURE

WARNING

Service and repair should be performed only by Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual.

If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact your Local Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed.

……

DESCRIPTION

This procedure will aid the technician in the removal and replacement of the case sheet metal cover and discharging the DC link capacitor making it safe for the technician to work on the machine.

MATERIALS NEEDED

8mm Nut driver

WELD PAK 2000™ - CASE COVER REMOVAL

Necessary tool:

- 8 mm Nut driver

Procedure:

1. Turn on/off switch to off position.
2. **Disconnect Input Power from the machine !**
3. Remove the 5 screws (A) from the upper side of the unit.
4. Remove the 5 screws (B), from the right side of the unit.
5. Remove the carefully the machine cover.
6. Follow the next session to **perform the discharge procedure**

DISCHARGE PROCEDURE

WARNING

ELECTRIC SHOCK can kill

Have an electrician install and service this equipment
Turn the input power off at the fuse box before working on equipment
Do not touch electrically hot parts
Prior to performing preventive maintenance, perform the following capacitor discharge procedure to avoid electric shock.

INPUT FILTER CAPACITORS DISCHARGE PROCEDURE

1. Remove main input power to the WELD PAK 2000™
2. Remove the cover following the case removal procedure available in this Service manual.
3. The capacitors are discharged by discharge resistors integrated into the main board in about 2 (two) minutes.
4. Access to the terminals **DC+** and **DC –** of the Main Board to check if capacitors are discharged is not possible without removing the board from the machine. For this reason ALL operations to remove the Main Board have to be done in a safer way using electrically insulate gloves and insulate tools (pliers, screwdrivers etc..)
5. Remove the Main Board from the machine following the removal and replacement procedure available in this manual.
6. Once the Main Board has been removed connect your multi-meter positive probe to **DC+** point and your negative probe to **DC –** and check the voltage across filter capacitors. **See Figure 1**
7. In case of presence of residual voltage follow the next steps
8. Obtain a high resistance and high wattage resistor (500-1000 ohms and 25 watts minimum). This resistor is NOT supplied with the machine. NEVER USE A SHORTING STRAP FOR THIS PROCEDURE.
9. Use electrically insulate gloves and insulated pliers. Hold the body of the resistor and connect the resistor leads across the two points DC+ and DC -. **See Figure 1**. Hold the resistor in place for 10 seconds. DO NOT TOUCH CAPACITOR TERMINALS WITH YOUR BARE HANDS.
10. Check again the voltage across the two terminals. Voltage should be zero. If any voltage remains, repeat this procedure.

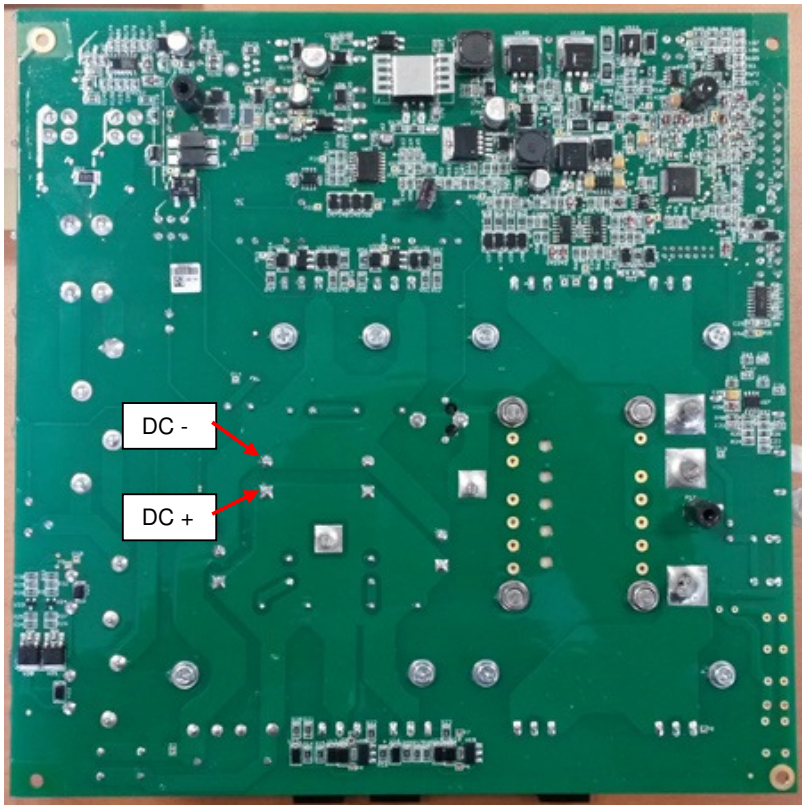


Figure 1

MAIN BOARD RESISTANCE TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact your Local Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed.

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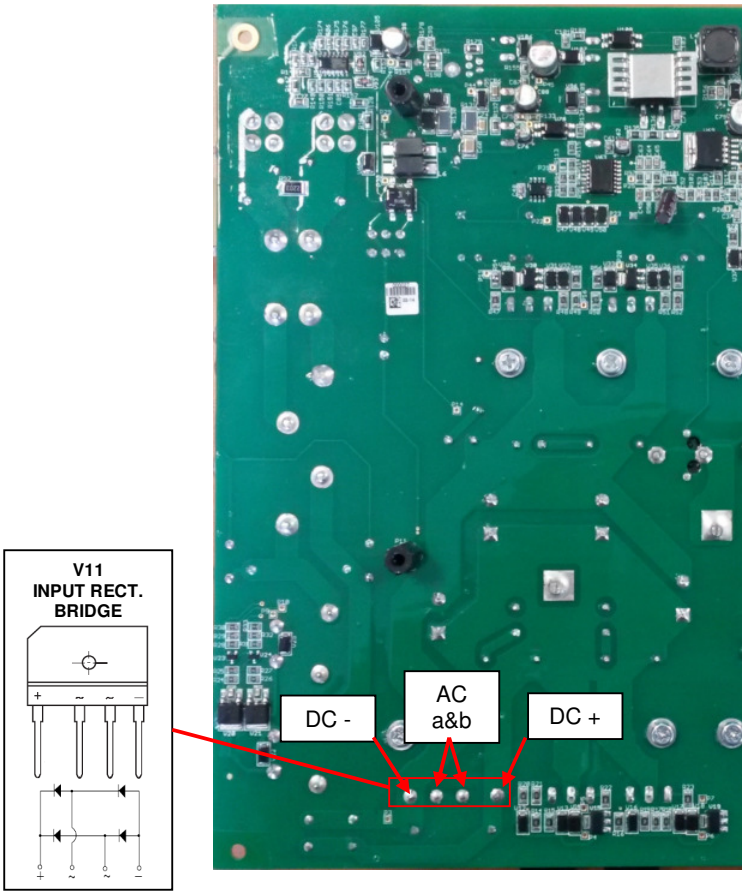
TEST DESCRIPTION

This test will determine if the main board has any " shorted " or "open" components.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram Y039

MAIN BOARD RESISTANCE TEST (continued)



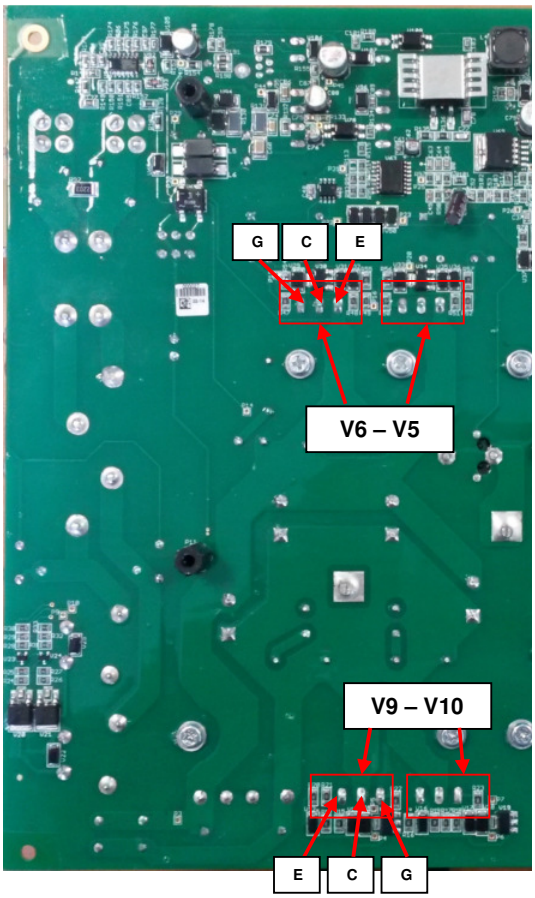
TEST PROCEDURE

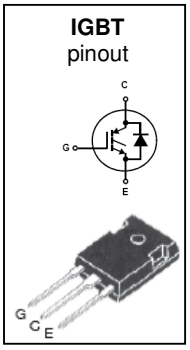
1. Remove main input power to the WELD PAK 2000™
2. Perform the **Discharge procedure**
3. Follow the Main Board disassembly operations available in this Service Manual.
4. Visually check for burned or damaged components. If any components are physically damaged the main board should be replaced
5. Using the Volt-Ohmmeter (diode test mode) check the Input Rectifier **V11** (see **Table tests 1**)

Input Bridge V11 - Table tests 1

Positive Probe (RED)	*Negative Probe (BLACK)*	*Value*
ACa	**DC+**	*0.3V - 0.7V*
ACb	**DC+**	*0.3V - 0.7V*
DC+	**ACa**	*Capacitors charge*
DC+	**ACb**	*Capacitors charge*
DC-	**ACa**	*0.3V - 0.7V*
DC-	**ACb**	*0.3V - 0.7V*
ACa	**DC-**	*Capacitors charge*
ACb	**DC-**	*Capacitors charge*

MAIN BOARD RESISTANCE TEST (continued)





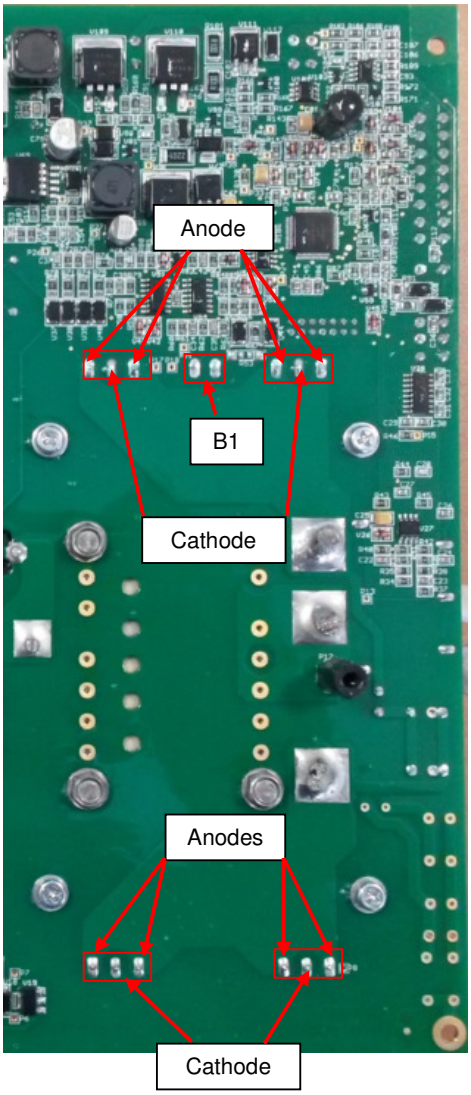
TEST PROCEDURE

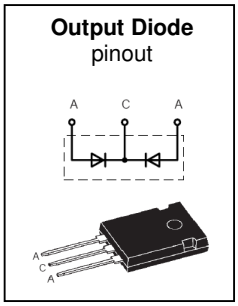
7. Check Inverter IGBT **V5-V6** and **V9-V10**, using the Volt-Ohmmeter (diode test mode), following the **Table tests 2**

IGBT V5-V6-V9-V10 - Table tests 2

Positive Probe (RED)	*Negative Probe (BLACK)*	*Value*
Emitter (E)	Collector (C)	*0.3V - 0.7V*
Collector (C)	Emitter (E)	Capacitors charge
Emitter (E)	Gate (G)	*0.3V - 0.7V*

MAIN BOARD RESISTANCE TEST (continued)





TEST PROCEDURE

7. Check the output diodes V3,V4,V7,V8 with multi meter in diode test mode, for short, following the **Table tests 3**
8. Using the Volt-Ohmmeter (ohm mode) check thermal sensor **B1** (Output Diodes heat sink) value, shall be 0 Ohms.

Diode V3,V4,V7,V8 – Table tests 3

Positive Probe (RED)	Negative Probe (BLACK)	Value
anode	cathode	0.28V - 0.7V
cathode	anode	OPEN

MAIN BOARD VOLTAGE TEST

WARNING

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TEST DESCRIPTION

This test will help to determine if the correct input voltage is being applied to the main board and also if the correct regulated voltages are being processed on the main board.

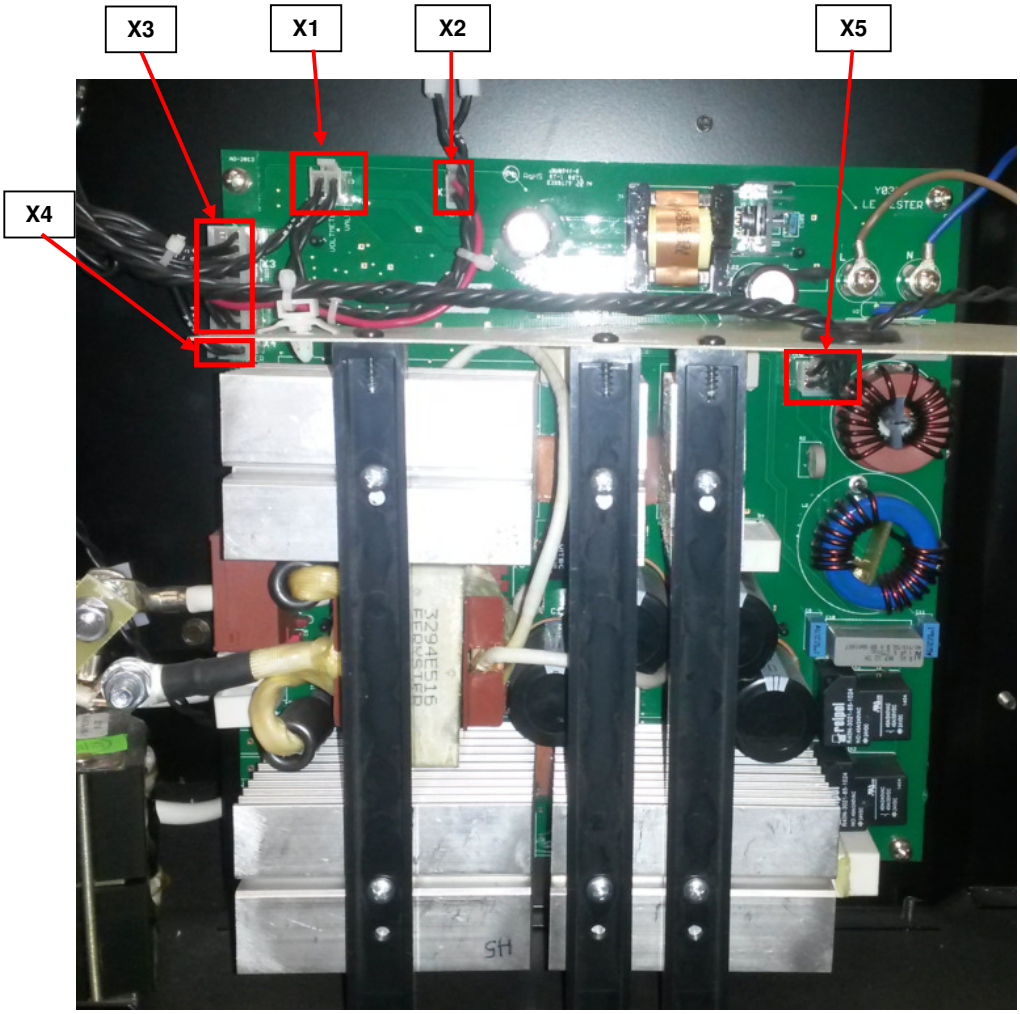
MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram Y039

MAIN BOARD VOLTAGE TEST (continued)

⚠ WARNING

DO NOT CONNECT THE SAME SCOPE GROUND BETWEEN HIGH SIDE AND LOW SIDE



TEST PROCEDURE

⚠ **Use always electrically insulate gloves during this test procedure**

1. Remove main input power to the WELD PAK 2000™
2. Follow the case removal procedure available in this Service Manual
3. Apply 230Vac +/- 15% to the WELD PAK 2000™
4. Turn the machine mains switch to ON position
5. Follow the tables tests available in the next page:

X3: Main Board to User Interface connector

Pin #	Description	Value	Notes
1	GND_A	GND_A	
2	3V3_A	+3,3Vdc	Versus GND_A
3	Volt/Amp Pot.	0Vdc= Volt/Amp pot at min value +3,3Vdc= Volt/Amp pot at max value	
4	Induct/Arc Force Pot.	0Vdc= Volt/Amp pot at min value +3,3Vdc= Volt/Amp pot at max value	
5	Not used		
6	+ 5Vdc	+5Vdc	LEDs power supply
7	MMA LED	3,3Vdc = MMA LED OFF - 1,4Vdc= MMA LED ON	
8	MIG LED	3,3Vdc=MIG LED ON - 6 Vdc=MIG LED OFF	
9	Not used		
10	Not used		
11	WFS/Hot Start	0Vdc= Volt/Amp pot at min value +3,3Vdc= Volt/Amp pot at max value	
12	TH LED	+5Vdc= Thermal LED OFF	
13	Not used		
14	Not used		
15	MIG/Stick mode	+5Vdc when mode button is pressed	
16	ON/OFF LED	+3Vdc= ON/OFF LED ON (lit)	

X2: Main Board to Wire Drive Motor

Pin #	Description	Value	Notes
1	Wire drive motor supply	+2Vdc +/- 10% = Min WFS +20Vdc +/- 10% = Max WFS	In MIG mode with trigger pressed
2			

X1: Main Board Output Voltage Feedback and Gas Solenoid

Pin #	Description	Value	Notes
1	Gas solenoid supply	+24Vdc +/-10%	In MIG mode with trigger pressed
3			
2	Output voltage feedback	49 Vdc	From polarity change block
4			

X5: Main Board to Main ON/OFF switch and Fans

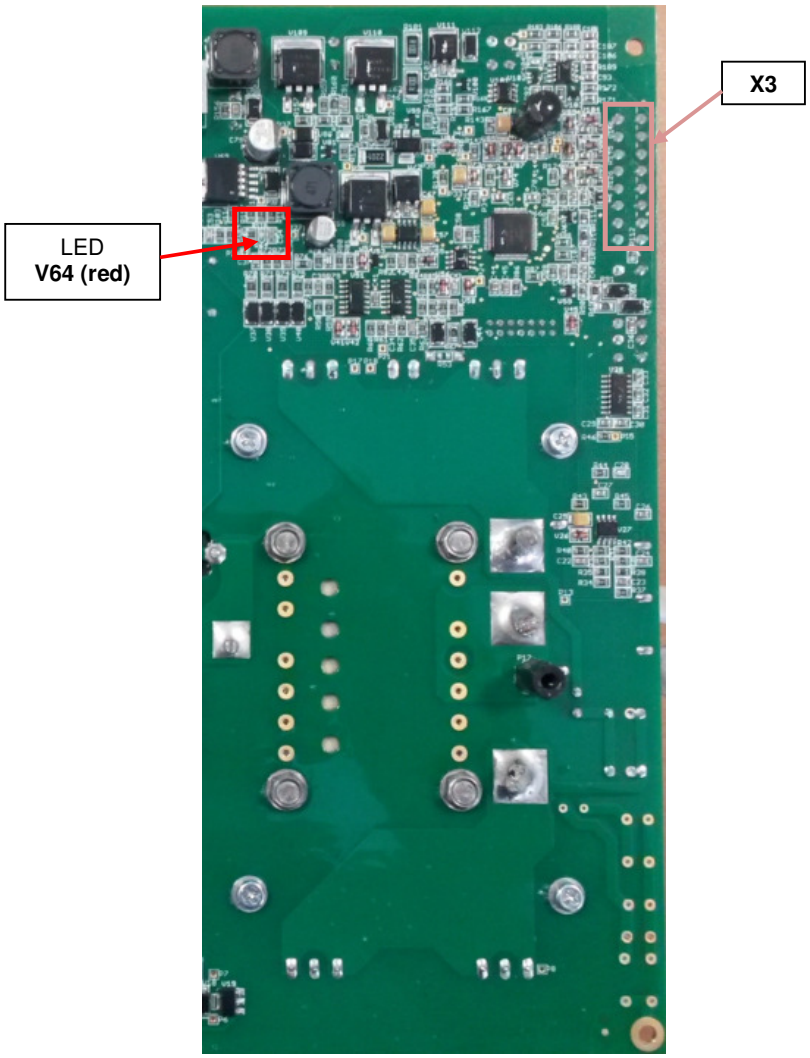
Pin #	Description	Value	Notes
1	Main Board Power Supply	230Vdc +/- 15%	Always when machine plug connected to the mains
3			
4	Main Board Power Supply	230Vdc +/- 15%	Only when ON/OFF switch to ON position
6			
2	Fan Power Supply	230Vdc +/- 15%	Always when ON/OFF switch to ON position
5			

X4: Main Board to Torch Trigger

Pin #	Description	Value	Notes
1	Mig gun trigger	0 Vdc	When trigger pressed
2		15Vdc +/-10%	When trigger released

- Connector **X1** between pin 2 and 4 = output voltage feedback (from polarity change block)

MAIN BOARD VOLTAGE TEST (continued)



LED INFORMATION:

- **V64** (red) = + 15Vdc auxiliary supply present

Note: The V64 LED can be checked without removing the PCB from the machine. If V64 is lit the red light reflection can be seen on the machine divider panel.

USER INTERFACE BOARD TEST

WARNING

Service and repair should be performed by only Lincoln Electric factory trained personnel. Unauthorized repairs performed on this equipment may result in danger to the technician or machine operator and will invalidate your factory warranty. For your safety and to avoid electrical shock, please observe all safety notes and precautions detailed throughout this manual. If for any reason you do not understand the test procedures or are unable to perform the test/repairs safely, contact your Local Lincoln Electric Service Department for electrical troubleshooting assistance before you proceed.

……..

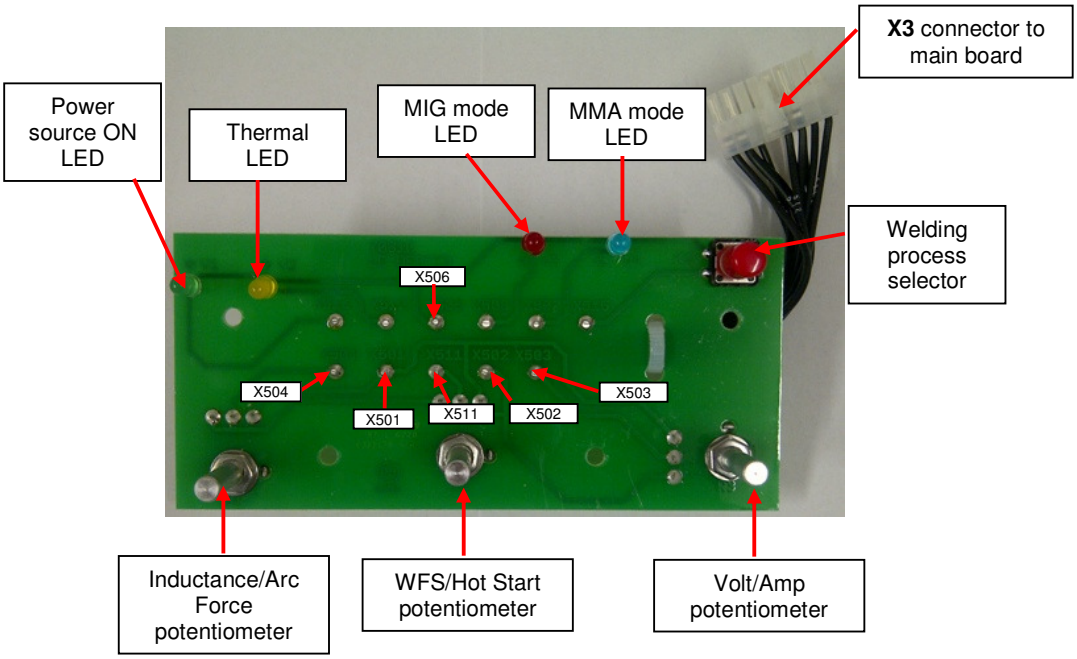
TEST DESCRIPTION

This test will help to determine if the correct input voltage is being applied to the user interface board and if it may be faulty.

MATERIALS NEEDED

Volt/Ohmmeter
Wiring Diagram Y031-1

USER INTERFACE BOARD TEST (continued)



TEST PROCEDURE

⚠ **Use always electrically insulate gloves during this test procedure**

1. Remove main input power to the WELD PAK 2000^{TM}
2. Follow the case removal procedure available in this Service Manual
3. Follow the User Interface board removal procedure
4. Connect the User Interface board to the X3 connector on main board
5. Apply 230Vac +/- 15% to the WELD PAK 2000^{TM}
6. Turn the machine mains switch to ON position
7. Check between **X501**(GND) and **X506** for +5Vdc
8. Check between **X501**(GND) and **X502** for +3,3Vdc
9. Check between **X501**(GND) and **X511** a voltage change from 0 to 3,3Vdc when rotating the WFS/Hot start potentiometer
10. Check between **X501**(GND) and **X503** a voltage change from 0 to 3,3Vdc when rotating the Volt/Amp potentiometer
11. Check between **X501**(GND) and **X504** a voltage change from 0 to 3,3Vdc when rotating the Inductance/Arc Force potentiometer

ERROR CODES

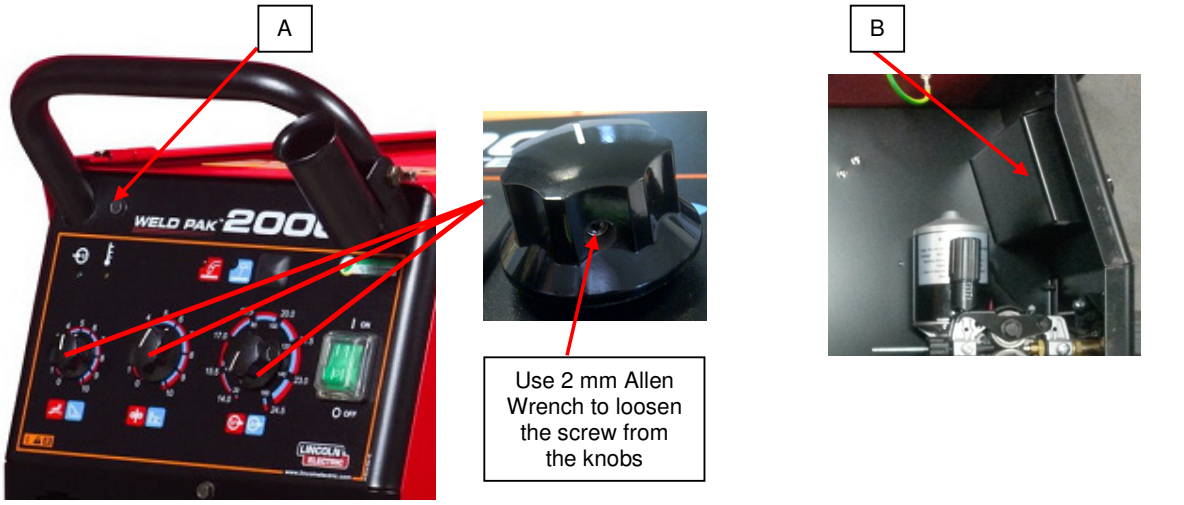
The Yellow Thermal overload LED, when lit, could indicate one of the following error conditions:

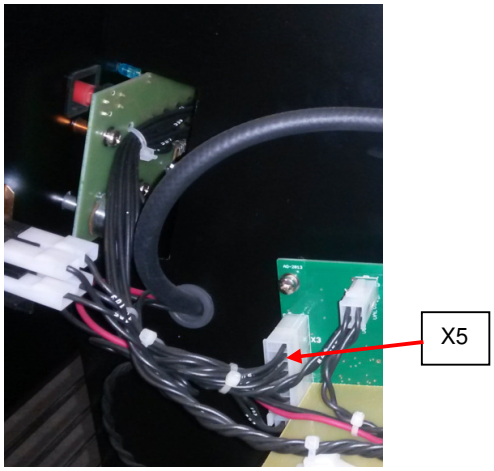
1. Output bridge thermal sensor is activated
2. The output current exceed 200A for more than 6 seconds
3. Too low input voltage is applied to the machine (less than 160Vac)
4. Too high input voltage is applied to the machine (more than 263Vac)
5. The wire drive motor current is too high

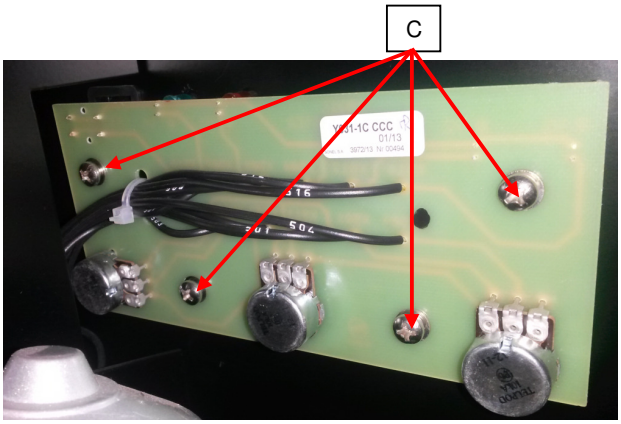
Refer to the troubleshooting table for the tests that have to be performed.

DISASSEMBLY OPERATIONS

USER INTERFACE BOARD REMOVAL AND REPLACEMENT PROCEDURE





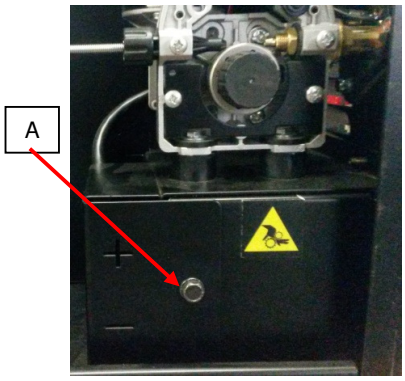


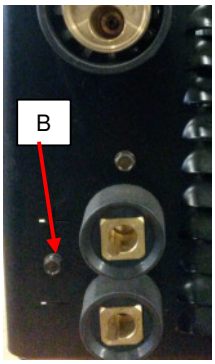
REMOVAL PROCEDURE

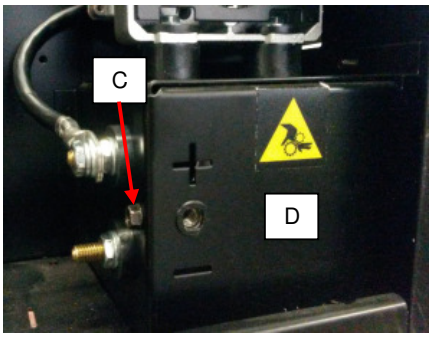
Necessary tool:

- 2 mm Allen Wrench
- Phillips screwdriver PH02
- 8mm nut driver

1. Remove main input power to the WELD PAK 2000™
2. Using the 8mm nut driver, remove the screw (**A**)
3. With a 2 mm Allen Wrench loosen the Allen screws until you'll be able to remove the 3 knobs
4. Remove the User Interface metal cover box (**B**)
5. Disconnect the connector X5 from the main board
6. Using the PH02 Phillips screwdriver remove the 4 screws (**C**) that are fixing the control board to the machine front panel
7. Remove the User Interface board from the front panel.
8. **For the control board re-assembly operations,** make the previous steps in the reverse order.





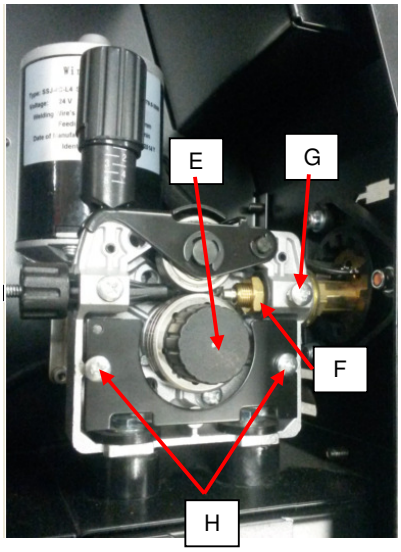


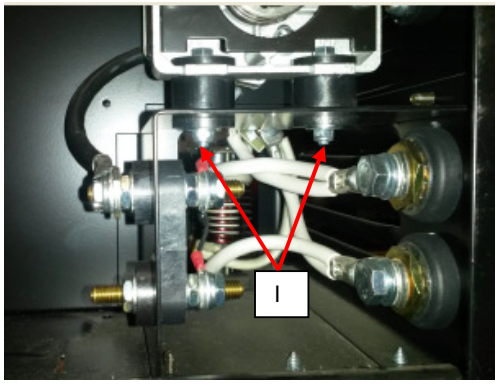
REMOVAL PROCEDURE

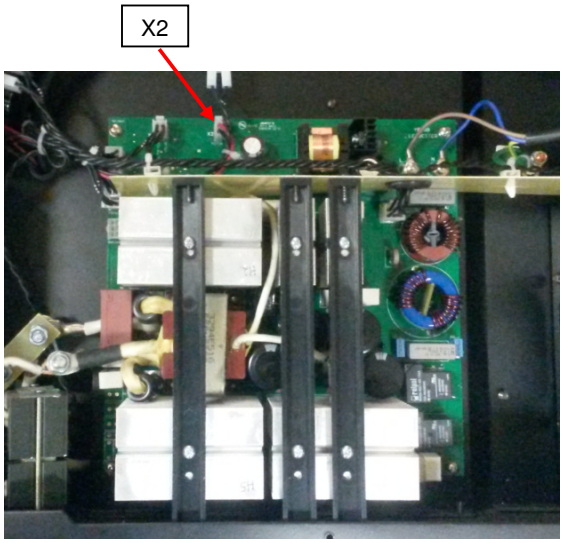
Necessary tool:

- Phillips screwdriver PH02
- 8mm nut driver
- 8mm wrench
- 14mm wrench

1. Remove main input power to the WELD PAK 2000™
2. Using the 8 mm wrench remove the screw (**A**) and remove the change polarity cover
3. Using the 8 mm wrench remove the screw (**B**) and (**C**).
4. Remove the panel (**D**) to have access to the nuts that are fixing the wire drive plate







5. Remove the fixing cap screw (**E**) that lock the drive roll and remove the drive roll and drive roll support
6. Using a 14 mm wrench remove the nut (**F**) and washer
7. Using the Phillips screwdriver remove the screw (**G**)
8. Using the Phillips screwdriver remove the two screws (**H**)
9. Using the 8mm wrench remove the two nuts (**I**) and after that remove the two bolt that are fixing the wire drive to the machine
10. Disconnect, from the main board, the harness from connector **X2**
11. Remove carefully the wire drive assembly, sliding it on the left and taking care of the plastic insulators that insulate the wire drive plate from the bottom panel.
12. **For the drive motor re-assembly operations,** make the previous steps in the reverse order.

DISASSEMBLY OPERATIONS

FAN REMOVAL AND REPLACEMENT PROCEDURE

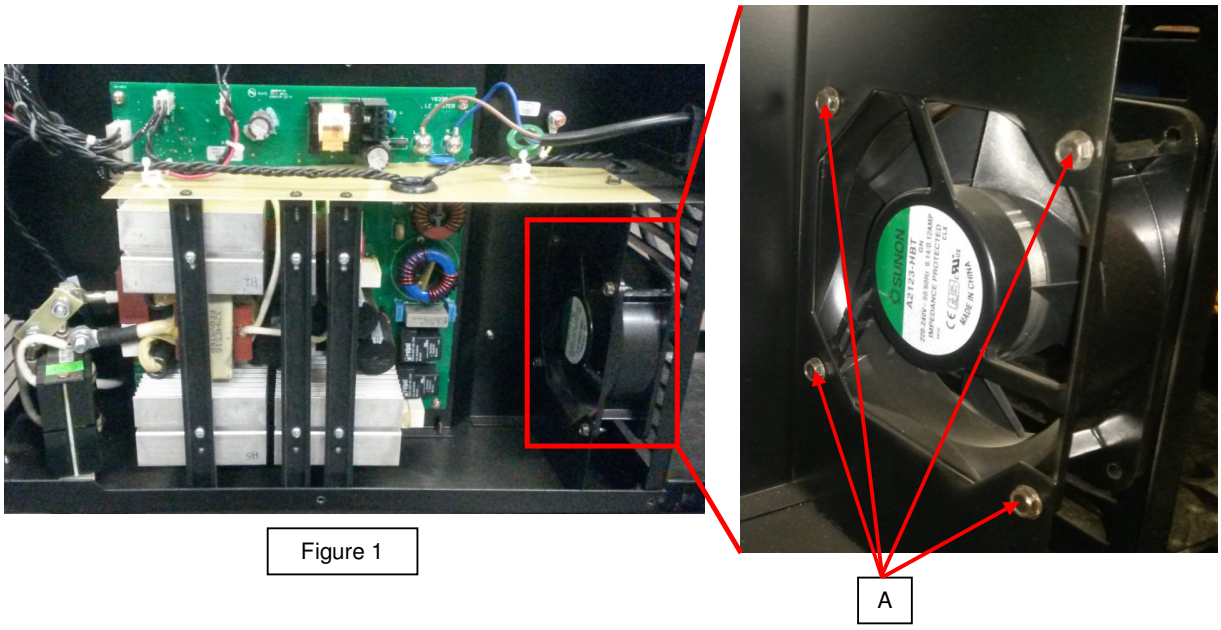


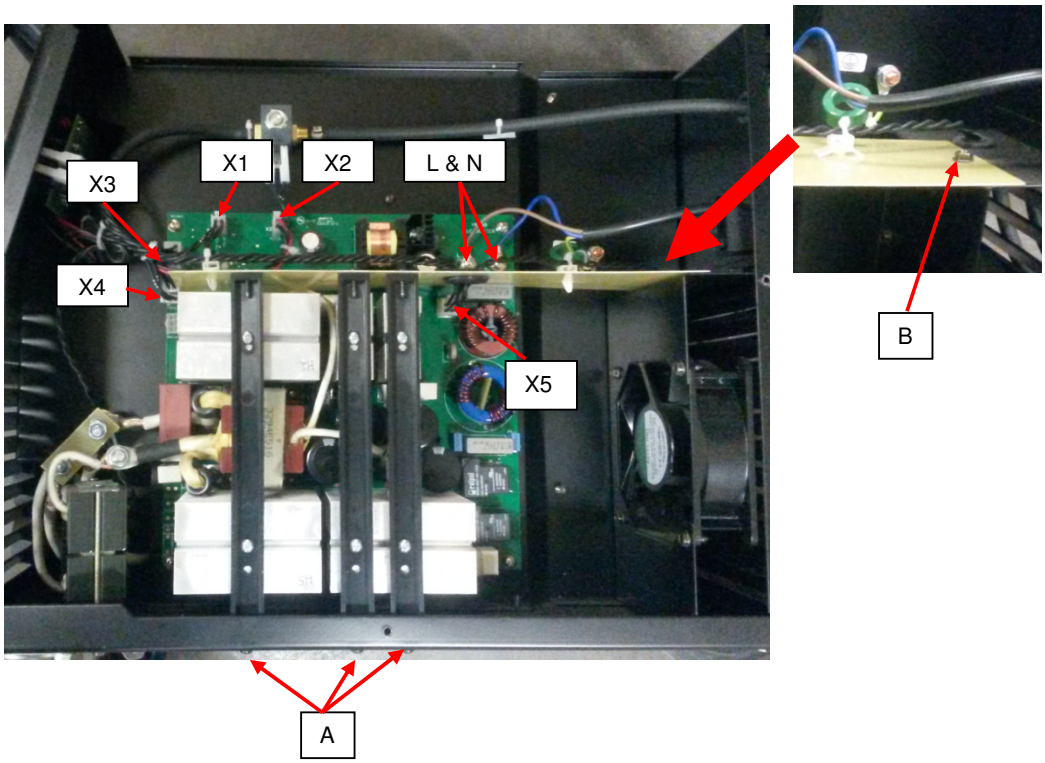
Figure 1

REMOVAL PROCEDURE

Necessary tool:

- 8 mm Nut Driver/wrench

1. Remove main input power to the WELD PAK 2000™
2. Follow the case removal procedure available in this Service Manual
3. Locate the fan on the back side of the machine. **See Figure 1**
4. Using a 8mm nut driver or wrench remove the 4 screws (**A**) that fix the fan to the fan baffle.
5. Locate the two faston connectors that supply the 230Vac to the fan and disconnect them from the fan.
6. **For fan re-assembly operations,** make the previous steps in the reverse order.

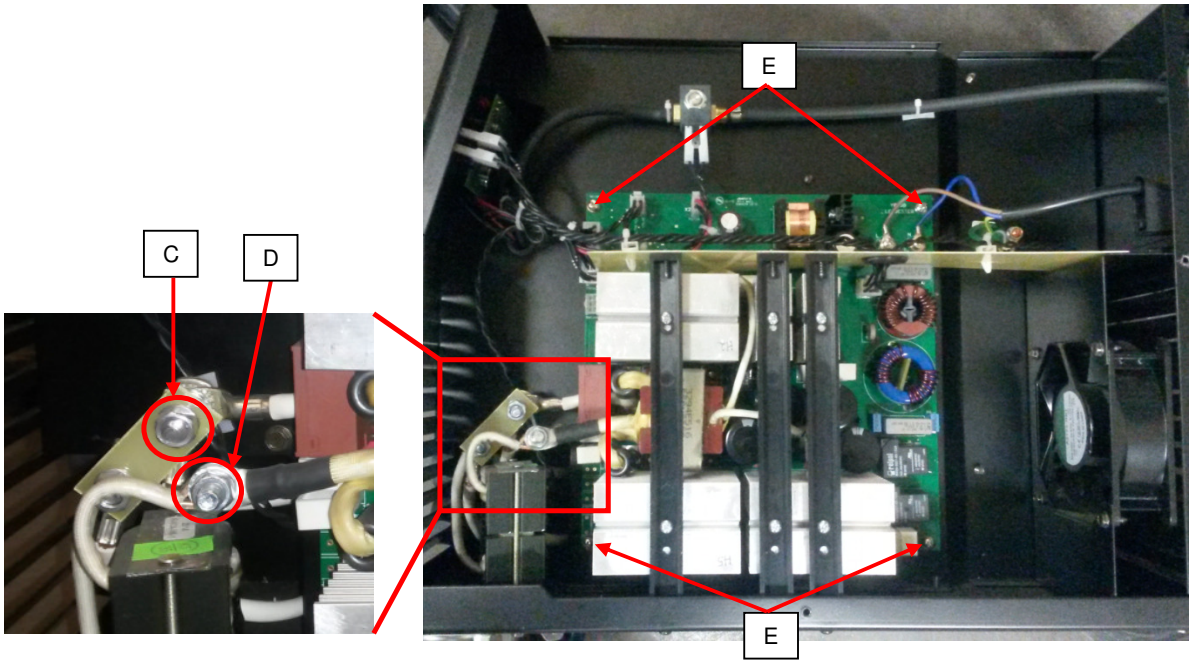


REMOVAL PROCEDURE

Necessary tool:

- Phillips screwdriver PH02
- 8 mm nut driver
- 2x 13mm wrench

1. Remove main input power to the WELD PAK 2000™
2. Follow the case removal procedure available in this Service Manual
3. Disconnect from the main board all connectors X1,X2, X3,X4,X5
4. Using the Phillips screwdriver PH02 remove the two power supply cables L &N
5. Using a Phillips screwdriver remove the 3 screws (**A**)
6. Using the 8 mm nut driver remove the screw (**B**)



REMOVAL PROCEDURE (continued)

7. Using the two 13mm wrenches unscrew the nuts (**C**) and (**D**). Label the two cables and remove the two bolts.
8. Using the Phillips screwdriver PH02 remove the 4 screws (**E**) at the corners of the main board.
9. Remove carefully the main board from the machine, taking care of the SMD electronic components mounted on the opposite side of the board.
10. **For the main board re-assembly operations,** make the previous steps in the reverse order.

RETEST AFTER REPAIR

Should a machine under test be rejected for any reason requiring the removal of any mechanical part that could affect the machine's electrical characteristics, or if any electrical components are repaired or replaced, the machine must be retested.

Machine input and output

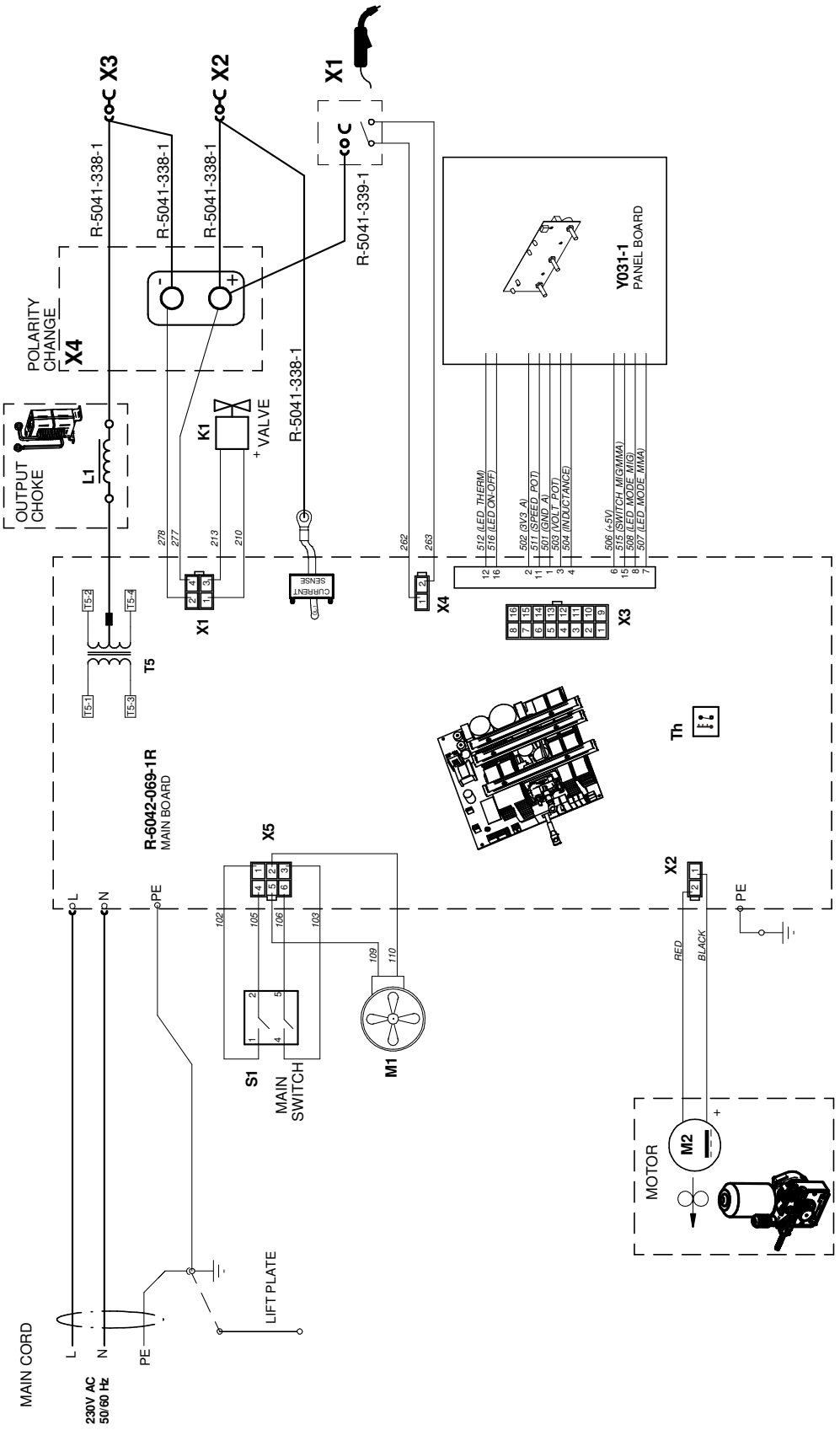
Input Voltage	Input Current	Rated Output
230Vac/1ph/50Hz	33A max	180A@20%

Output current range GMAW - FCAW	**20 – 200 Amps**
Output current range SMAW	**20 – 160 Amps**

Open Circuit Voltage	**49 Vdc**

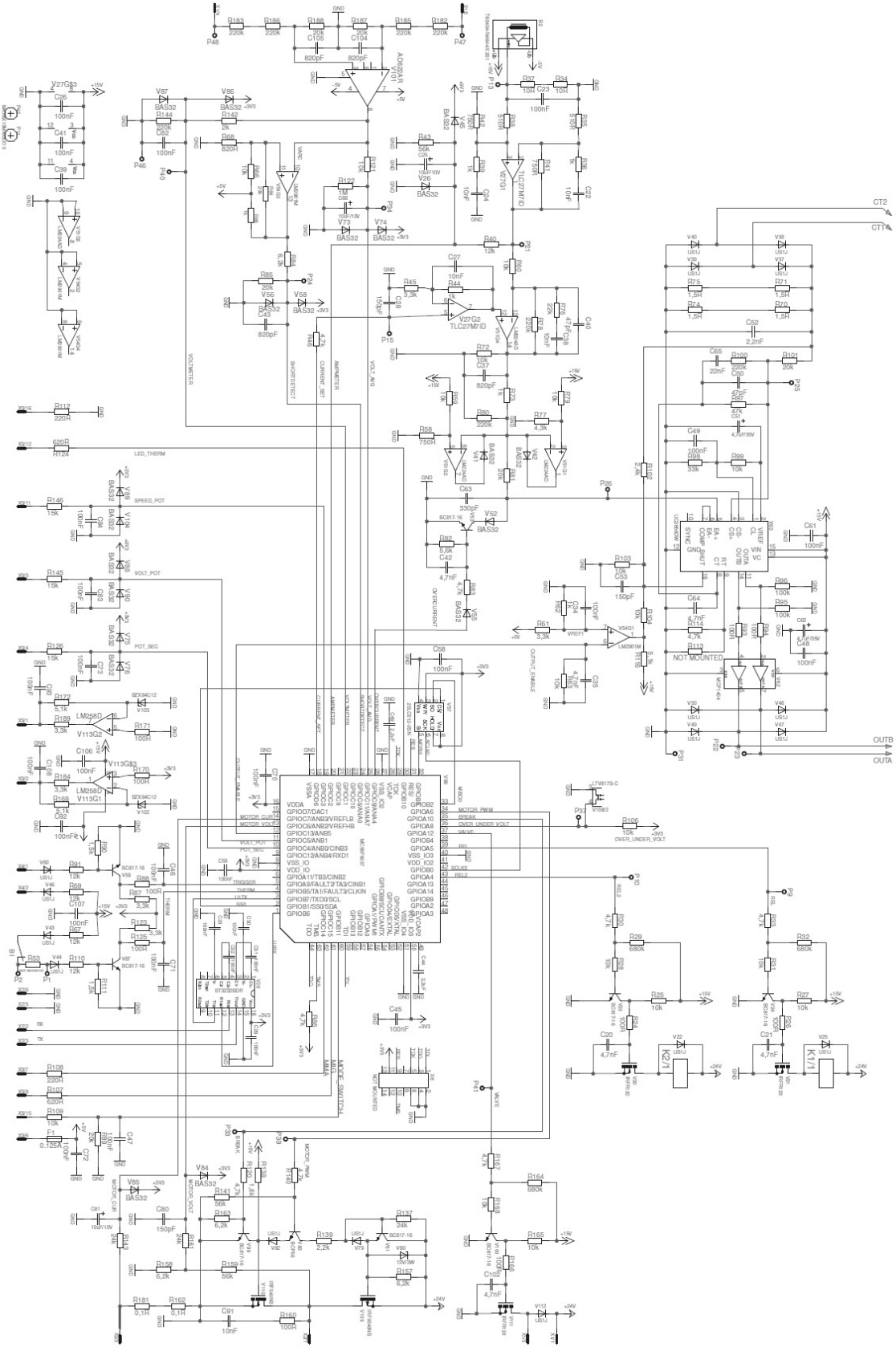
ELECTRICAL SCHEMATICS

Block Diagram



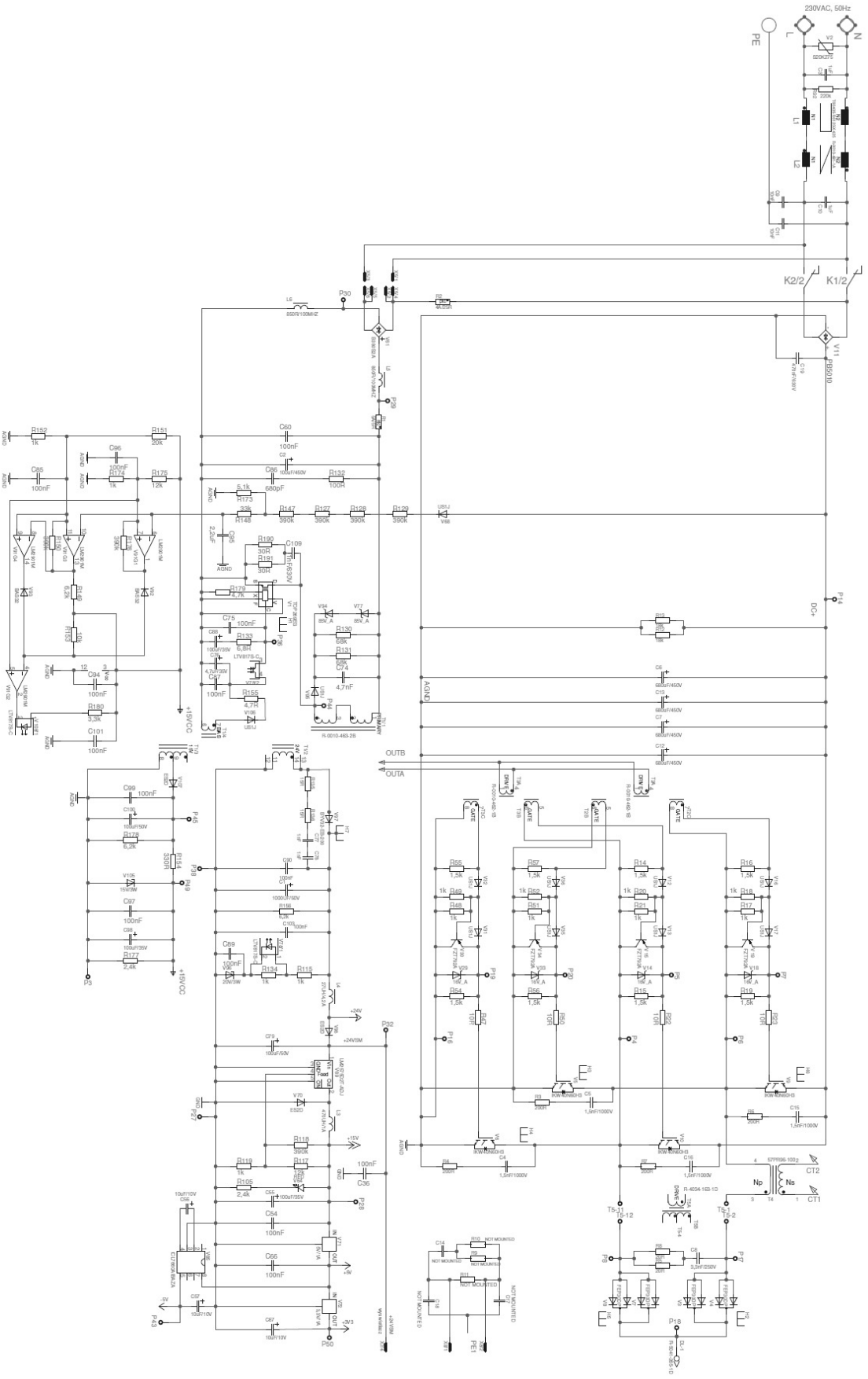
ELECTRICAL SCHEMATICS

Main Board Schematic Y039. Page 1/2



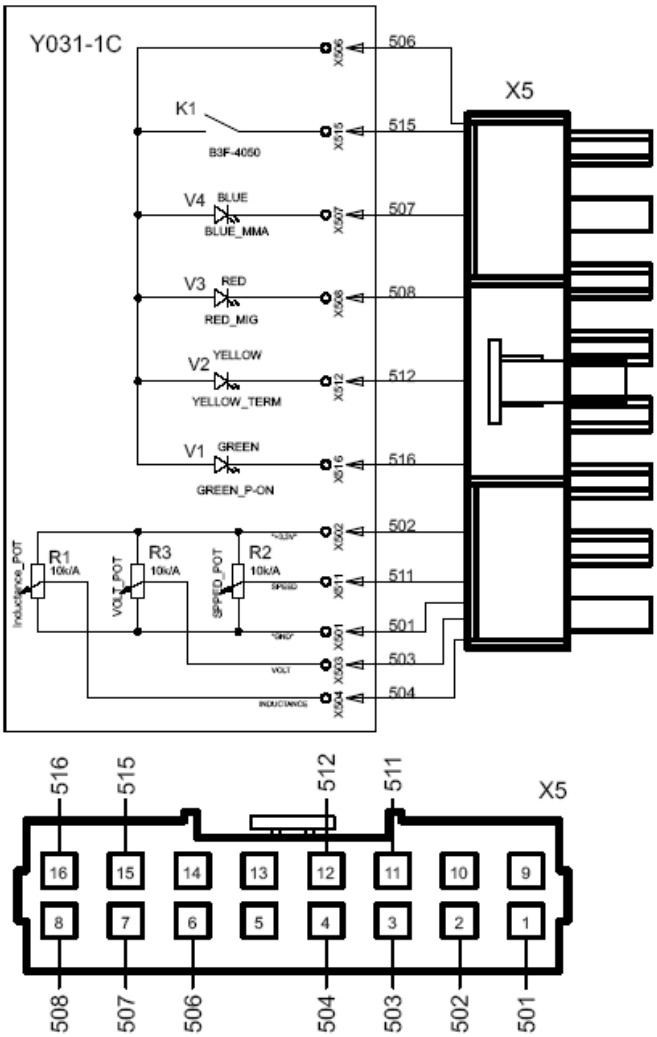
ELECTRICAL SCHEMATICS

Main Board Schematic Y039. Page 2/2



ELECTRICAL SCHEMATICS

User Interface Schematic Y031-1



NOTE