# LINCOLN ELECTRIC ITALIA

# SERVICE ENGINEERING MANUAL

**LINCOLN ELECTRIC ITALIA S.r.l.**
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**ITALY**

July 1996
Rev 1.0



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# INTRODUCTION

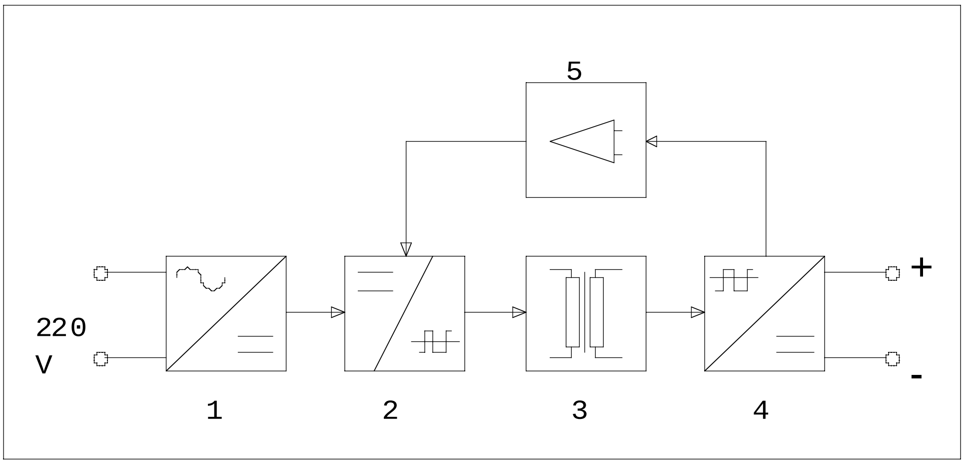
This manual has been compiled to aid and assist SERVICE ENGINEERS in the repair and maintenance of EWS inverter power sources manufactured by Lincoln Electric.

Obviously it is impossible to foresee all the various types of repairs that maybe needed but this manual will give information on all the operational characteristics and known diagnostic techniques necessary to implement any repairs that may occur.

Warning please remember that Lincoln Electric/EWS power sources require voltages between 110 and 460 V to operate therefore only suitably trained and qualified personnel should undertake any testing or work on these machines.

All Warranties offered on these machines will be declared null and void if damage occurs due to unauthorized repairs taking place.

In order to be able to carry out work on an inverter power source it is necessary to understanding the basic operating principles of inverter technology. This is best described by the use of the block diagram and detailed explanations set out below.




1) The input current is rectified and filtered through the rectifying block and filter (1).

2) The resulting DC current is then chopped into a very high frequency AC through the inverter (2).

3) This AC current is fed to the primary transformer (3) and due to the high frequency of the AC, it very efficiently converts the voltage to a level suitable for welding and cutting processes and at the same time isolates the output from the mains voltage.

4) The current from this transformer is fed through the rectifier and filter block (4) to produce a very smooth output for DC welding.

5) A control printed circuit board measures the output and ensures that the output remains within the set value.

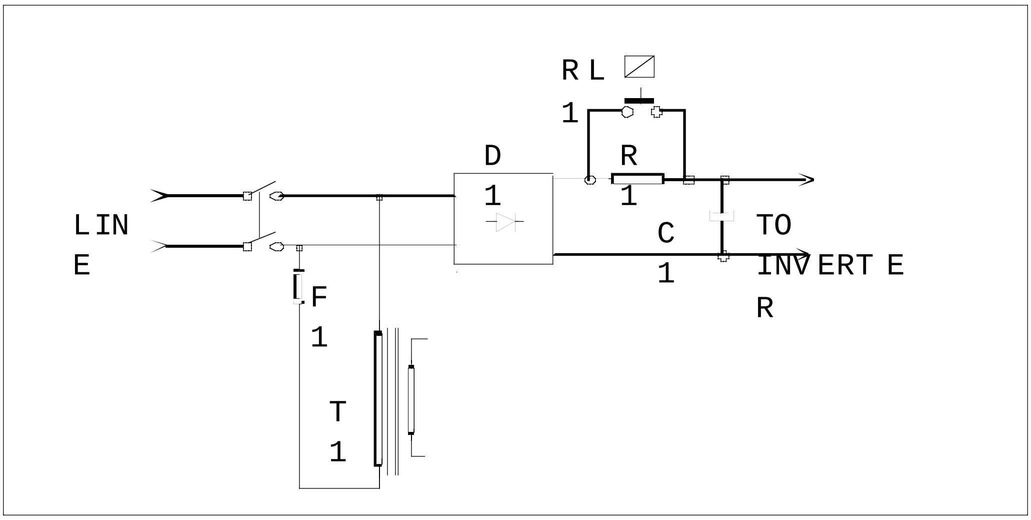
Listed below we have the detailed functions and operations of each of the above blocks.

**BLOCK 1- INPUT.**

This block has the function of providing a DC current suitable to feed the power inverter.

The main components of the block are the rectifying bridge, start resistor, start relay and auxiliary transformer.

**Input component schematic**




As all inverters contain high value capacitors (C1) it is necessary that when switching on, to limit the in rush current. This is achieved through the use of resistor (R1) which has a value between 5 and 20 Ohms. Once the capacitors are fully charged and prior to the power source starting to function the relay (RL1) will close, short circuiting the resistor (R1).

The auxiliary transformer (T1) feeds the various control circuits of the power source and is protected by the fuse (F1).



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## POSSIBLE FAILURES IN BLOCK 1 INPUT

**A) R1 GOES OPEN CIRCUIT:**

There are three main reasons for this occurring.

1. Faulty resistor (in this instance the resistor will not show signs of overheating. )
2. Start relay (RL1) failing to close prior to operation of the power source.
3. The short circuiting of certain components further along the circuit ( e.g. Short circuiting of Capacitor C1 or the inverter module).

Thus before replacing R1 it will be necessary to check for the reason for failure and take remedial action.

**B) RECTIFIER BRIDGE (D1) GOING OPEN OR SHORT CIRCUIT:**

There are two main reasons for this type of failure .

1. Rectifier bridge being subjected to an over voltage due either to spikes in the mains supply voltage, connection to a power generator or wrong supply voltage. Before replacing always check integrity of capacitor (C1) and the inverter module.
2. Due to a short circuit of capacitor (C1) or the inverter module. In this case the faulty component must also be replaced as well as the rectifier bridge D1.

N.B. At the end of D1and C1, there is a varistor that when subjected to an over voltage condition will show signs of severe failure (Explosion).

**C) CONTROL TRANSFORMER T1:** When this transformer fails, the control circuits will not be fed and thus the power source will stop functioning. In the case of a short circuited transformer fuse F1 will blow, F1 will not necessarily blow when the transformer goes open circuit and to trace the fault the voltage across each output terminal will need to be measured.

**D) CAPACITORS C1:** The first check that should be done here is a visual one examining the capacitors for swelling or over heating.
It is impossible to test the integrity of suspect capacitors without the use of specialised testing equipment, thus if there is any sign of damage at all replace all capacitors.
Warning These capacitors can under certain circumstances remain fully charged for quite a considerable time after switching the power source off, thus it is essential that before working on these capacitors they are checked with a test meter making sure the voltage has gone below 5 V.
If the capacitors are still charged for example due to failure of the discharge resistors they must be discharged using a resistor of a least 100 Ohms.
The capacitors normally have resistors in parallel that are used for stablisation (when the capacitors are in series) or for discharge. It is very rare for these resistors to fail.



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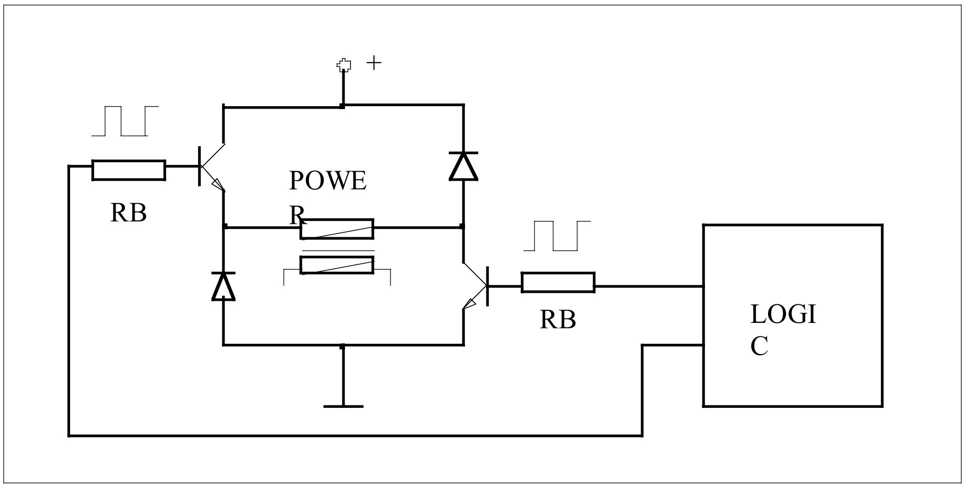
**BLOCK 2- INVERTER**

The inverter is an electronic converter that chops a DC current into an AC current having a pre-set frequency. Lincoln power sources use inverters operating at frequencies between 20 and 100 KHz.
The inverter can be divided into two main sections a logic section and a power section.
For the new power sources the logic circuit consists of a HYBRID circuit (the 5th generation power sources code n. EW 9001- EW 18001) while for inverters of the older construction, the logic circuit consists of individual components (inverter EW 6001, EW 8001, EW 12001, EW 16001).
The power section, due the continuous evolution of electronic devices consist of varying components initially using bipolar transistors with the more modern models fitted with IGBT transistors or MOSFETs of different manufacturers.
The following is some general information that can help any qualified service technician in the investigation of the cause of a failure. In certain circumstances it may be necessary to have the inverter module returned to the manufacturer for repair as it may require specialised equipment to complete the repair.



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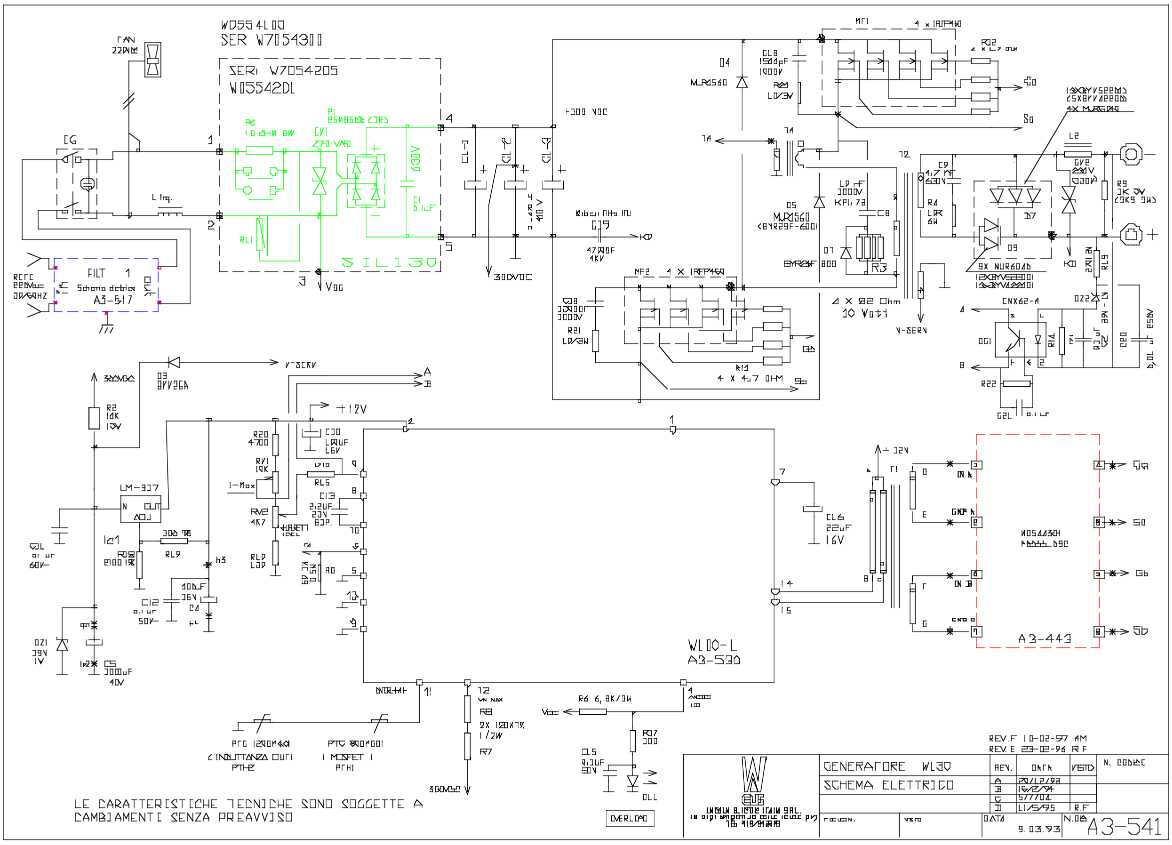


# INSPECTION PROCEDURE FOR A SUSPECTED FAILURE OF THE INVERTER MODULE

**VISUAL INSPECTION**

Check that all components, particularly the power transistors and diodes are not damaged. If any component of the power set is damaged it will be necessary to replace all the power components of the set.

A simple check can be made on the base resistors of the MOSFETs or IGBTs, if they are open it means that the module has been damaged.

The power components can fail due to internal breakdown or as a consequence of other failures in other parts of the power source such as the capacitors or its connections or "open" or, short circuits at the output of the power section caused by the transformer, or the connection to it has gone short circuit.

If the snubber resistors (EW9001=R5) go open, failure of the power transistors will almost certainly take place.

Short circuits in the sections of the power source following the power transformer, for example at the exit of the diodes, will not damage of the inverter.

It is necessary to keep in mind that all Lincoln inverters are protected against voltage peaks up to twice the value of the nominal mains value for example an EW 9001 inverter, with a 380V supply can hold a voltage of at least 1000VAC without damage occurring.

If the voltage goes above the maximum value indicated in the particular instruction manual, a yellow led on the front panel with the symbol will become illuminated and the power source will go into a blocked condition. This LED lamp is normally common with the over temperature sensers.



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If after the visual inspection no damaged components are found, it will be necessary to start inspection using test equipment.
The following is an indication on how to proceed always keeping in mind that on these power modules high voltages of 500/1000 V may be present.
The Inverter EW type 9001, has been used as the basis for this guide but the information can also be used for other types of inverters since the functions and characteristics are the same.

**INSPECTION OF THE LOGIC CIRCUIT**
With reference to the CN1 connector proceed as follows:

1. Check that between pins 2 and 4 there is a voltage of 15 VAC (+ / - 15%)
2. Using pin 8 as a reference ( 0 V) the voltage at pin 6 should be12 VDC (+/ -15%) /.
3. Using pin 8 check that on pin 3 (ON-OFF) there is a voltage greater than 8V. If this voltage is lower than 1 Vit means that a voltage or thermal safety trip has been activated blocking the inverter.
4. Using pin 8 check that on pin 1 (dutcy) a voltage between 1.5 and 5 V should be present (within this range the inverter is controlled from the minimum to the maximum output power).
5. Using pin 8 check that on pin 5 (maxcu) there is a voltage between 0.6 and 3.5 V (if the voltage gets above 3.75 V the inverter will reach its threshold preventing correct operation).

Even if, on other inverters, the pin numbers do not correspond, it is always possible to refer to the various indications of overload, dutcy and maxcu.
If all these checks give positive results, it is going to be necessary to examine the square wave driving signal that is to found at the gate or, base of the power transistors.
If any voltage specifications described above do not conform check to see if the problem is in the inverter or in other parts of the circuit; if necessary replace the other parts or the complete inverter.
On the smaller power sources (W100, W130, EX20) there is a hybrid circuit and thus a different set of checks are required. Using pin 5 as the reference point there should be:

1. On pin 2 a voltage of 12 V (+/- 15%)
2. On pin 6 a voltage that varies with the current control knob from 0 to approximately 5 V.
3. On pin 3 there will be a voltage in relationship with the output current:

0A= 0 V/ 100A= X V for W100 (130A for W130).

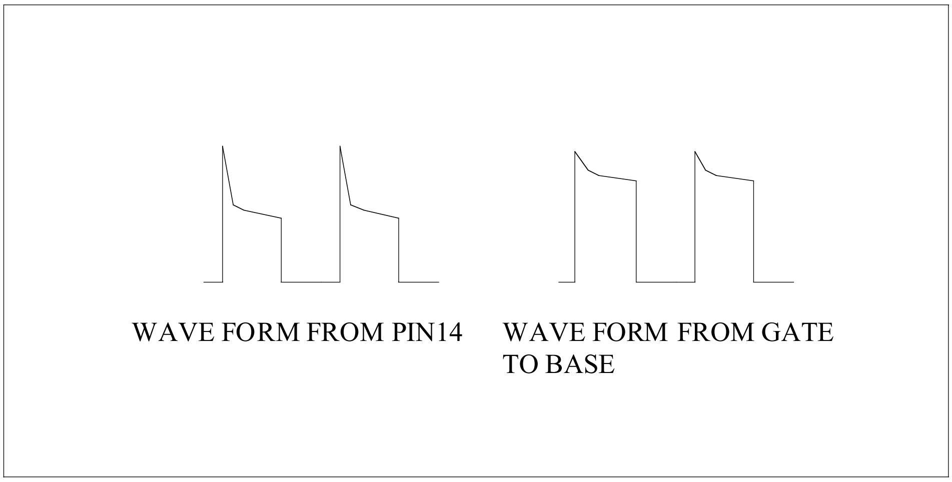
4. On pin 11 a voltage of 0.5 V, if the voltage is above 2.5V it means that a high temperature safety device has tripped.

5. On pin 4 there should be less than 0.2 V, if the voltage is higher this means that voltage protection device has been triggered.

In all the inverters, after the hybrid circuit, there is a pulse transformer and then a DRIVER to drive the power transistors.

Obviously if one of these parts has failed it will not be possible for the inverter to work at all.

By using an oscilloscope it is possible to analyse the signals from the hybrid circuit. Displayed below are examples of the type of wave forms that we would expect to see from pin 14 and from the base or gate of the power transistors.




It has to be stressed that attempts to repair inverter modules without the required specialist test equipment can be very difficult and in some cases impossible.

It is therefore advisable, before starting to perform any work on these modules that all necessary equipment and information are available to successfully complete the repair.

**BLOCK 3- POWER TRANSFORMER**

The power transformer has the function of electrically isolating the mains voltage from the operator and also reducing the voltage to the value required by the welding or cutting process being used.

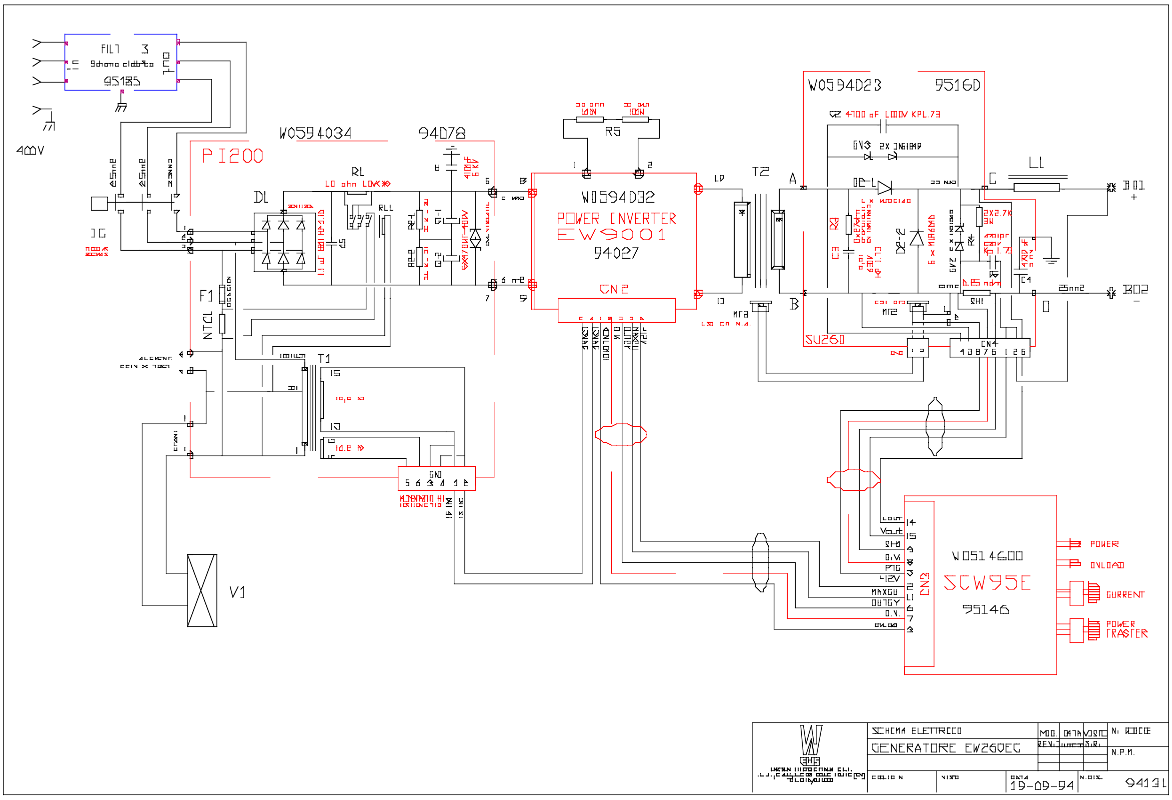
It is very unusual for this transformer to fail but it is advisable to visually check for any evidence of overheating of the windings or insulation.

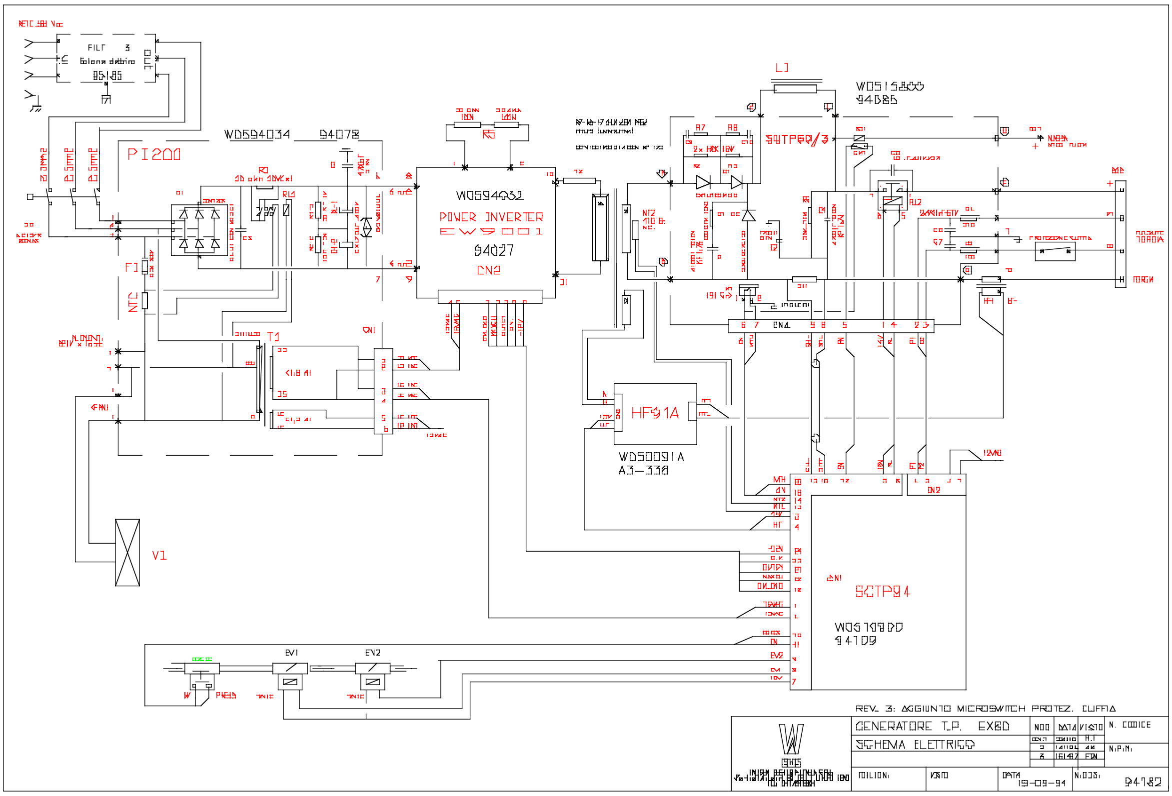
If the transformer has failed due to a short circuit on the primary or secondary winding, the inverter could also be damaged and thus it is important that the transformer is replaced before fitting a new inverter.

If the necessary equipment is not available to check the transformer it is advisable to fit a new transformer.

In most Lincoln/EWS power sources thermostats protect the transformer against temperature increases of more than 15% the maximum value, in the case of overheating the power source will turn off. This will be indicated by the lighting of the yellow LED with the thermometer symbol on the front panel.

It has to be emphasised that for welding processes the voltage on the secondary winding of the transformer is around 100 V but for plasma power sources there will be a voltage of around 500 V and therefore it is imperative that a great deal of care is taking while working on these transformers.


W0594034
94078
PI200
W0594032
POWER INVERTER
EW9001
94027
CN2
W0594023
95160
T2
L1
SU260
CN4
W0514600
SCW95E
95146
POWER
OVLOAD
CURRENT
POWER
TRASTER
V1
SCHEMA ELETTRICO
GENERATORE EW260EC
19-09-94
94131


W0594034
94078
PI200
W0594032
POWER INVERTER
EW9001
94027
CN2
W0515800
94085
HF91A
WD50091A
A3-338
V1
EV1
EV2
SCTP94
W0519900
94109
REV. 3: AGGIUNTO MICROSWITCH PROTEZ. CUFFIA
GENERATORE T.P. EX80
SCHEMA ELETTRICO
19-09-94
94182

**BLOCK 4- OUTPUT**

Down line of the power transformer are the rectifying diodes along with their protective devices and a filter inductor.

TIG and PLASMA power sources also have an high frequency (HF) circuit for arc starting which is covered later in this manual.

In welding power sources the voltage of the diodes are relatively low (400/600 V) whilst in the PLASMA power sources they are relatively high (1000/1200 V).

These diodes are of the so called fast type since they have to work at the inverter frequency. In some instances these diodes will be in parallel in which case the diodes will have been carefully matched to impart a high degree of reliability to the equipment.

It follows from the above that when one diode has to be replaced it may be advisable to replace the entire group of diodes.

It should be noted that the failure of a diode does not affect the inverter since this is protected against any such occurrence.

When replacing the diodes it is imperative that the same type of diode is used and it is also important that good connections are made using a silicon paste and clamped according to the manufacturers recommendations.

Before replacing any diodes it is important that the protection against voltage spikes is still effective° e.g. on the EW 260 EC power source, the diode is protected by C3, R3 and GV2°; on the PLASMA power source EX60 they are protected by R1,R2,R3, C1,C9 and C10.

Some times it is not possible to visually check the condition of a diode but with a simple test meter (e.g. Fluke 77) it is possible to check if a set of diodes is in short circuit, however normally only one diode will have failed and thus it will be necessary to disconnect them all to find which has failed.

On many of the Lincoln/EWS power sources the diodes are protected against overheating by the use of thermostats.

These thermostats shut down the power source and this is indicated by the lighting of the yellow LED with the symbol a thermometer on the front panel.

**OUTPUT INDUCTOR.**

The function of the output inductor is to smooth out the "RIPPLE" on the output current.

It is very unlikely this inductor will fail but if it does happen, troubleshooting should proceed in the same way as with the power output transformer.

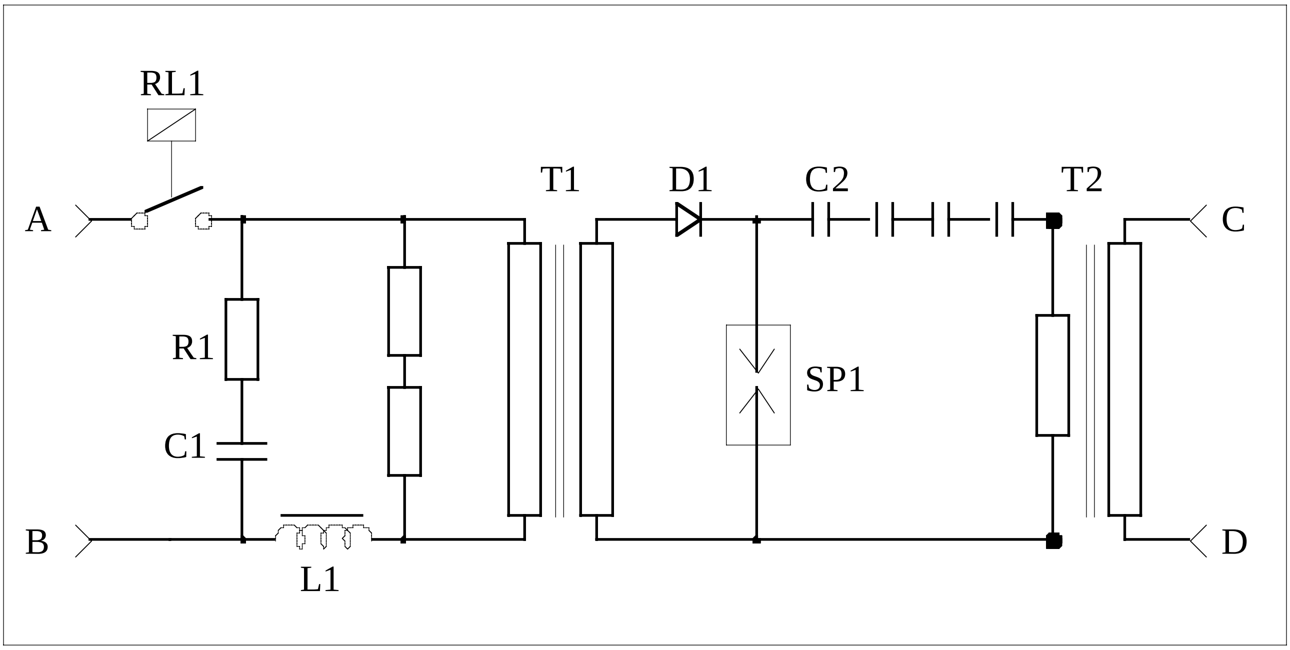
Failure of this inductor will not cause any damage to the inverter but it will cause operating problems when welding or cutting.

Some of these inductors have thermostats fitted for protection, which on tripping will cause the power source to shut down and light up the yellow LED with the thermometer symbol on the front panel.

## HIGH FREQUENCY CIRCUIT.

An High Frequency circuit is used in both the TIG and PLASMA power sources to start the arc without the torch or the electrode touching the working surface.

**HF 91 DIAGRAM**




In all Lincoln/EWS power sources the high frequency circuits are energised from the secondary of the power transformer at the inverter frequency.

This works in the following fashion°:

1. The voltage feed comes from terminals A and B of the secondary or an additional winding of the output power transformer. This current is a square wave at inverter frequency (20/60 kHz).

2. The relay RL1 activates the high frequency system and in turn is controlled from the process control card.

3. The L1inductor is calibrated for the right output power of the system.

4. The R1 and C1 filter stops any noise coming from transformer T1.

5. The transformer T1 is a transformer that works at the inverter frequency with the secondary winding at a high voltage. Within this transformer there is diode D1 that rectifies the output current.

6. Capacitors C2 (normally 5 mounted in series to obtain the required voltage) are charged to a value controlled by the spark gap of the electrodes SP1.



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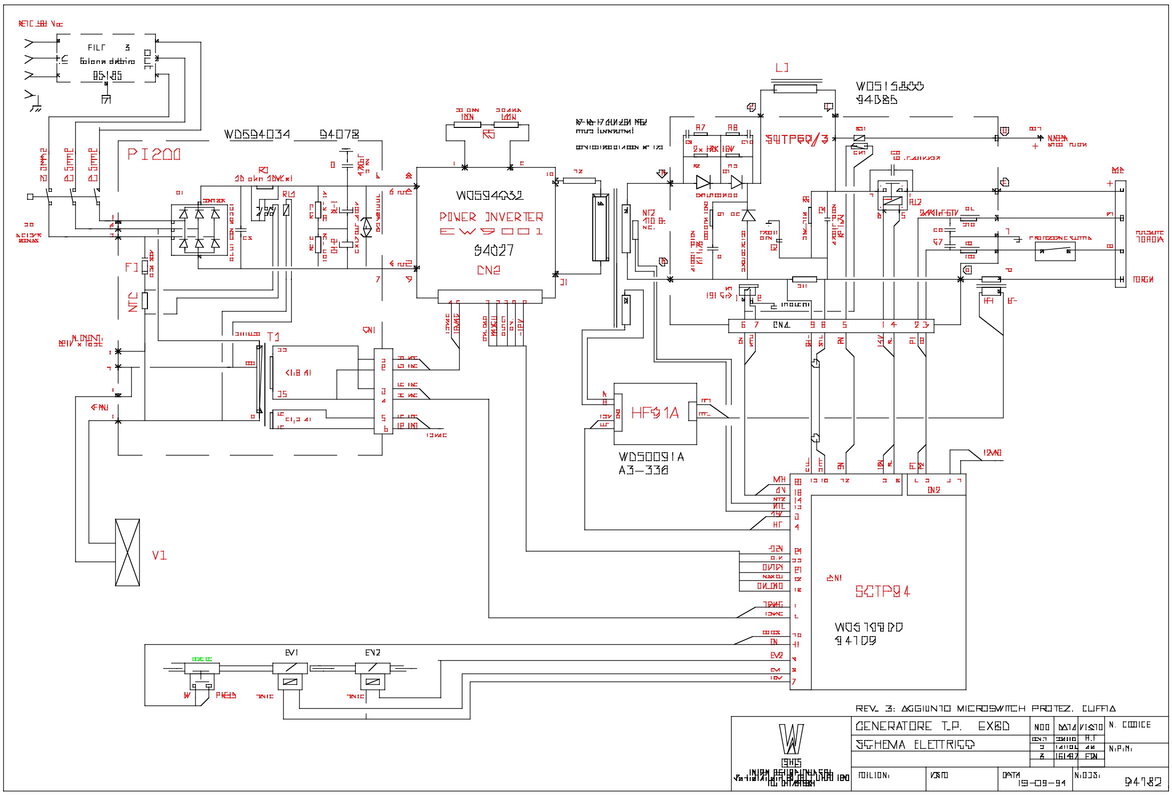


7) The adjustment of the spark gap depends upon the power source or the process being used, the larger the distance, the higher the voltage spikes on the output.

8) Transformer T2 transfers these spikes on to the welding circuit.

**<u>Troubleshooting the high frequency circuit:</u>**

1) First of all it is necessary to make sure that the square wave voltage is available at terminals A and B. This voltage is present when the inverter is working and therefore when there is output current.
This check can be done with an oscilloscope between terminal A and B.

2) Check the integrity of the inductor L1°;

3) Check that the relay RL1 has activated°;

4) Check the spark gap of the electrodes and the integrity of the capacitor C2

5) If everything checks out OK and there is no spark across the spark gap the most likely cause of failure will be transformer T1.

Please note that LINCOLN ELECTRIC can supply as a spare part the complete HF card, the above information is designed to aid in the repair of the card itself.



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**CHANGES IN BLOCK 4 FOR PLASMA CUTTING POWER SOURCES.**

As already mentioned, the plasma cutting power sources make use of high voltage output transformers, and all components have to be sized accordingly° and thus the output diodes are of a high voltage type.

The output inductor L1 has characteristics decidedly different from those used with welding power sources.

The procedures for the checking of these machines will be similar to those used with welding power sources bearing in mind the higher voltage outputs associated with many of the components..

On the output section of these power sources there are additional devices (relay, pilot arc, and sensor BS1) which together with logic circuits control the necessary operational characteristics.

We will see in the section named search breakdowns how to search for possible damage of the aforesaid devices.

**BLOCK 5- CONTROL CARDS.**

LINCOLN ELECTRIC manufactures power sources for Stick , MIG,TIG welding and for plasma cutting.

For each one of these processes a control card has been designed whose main function, (apart from some minor controls) is that of checking the output current or voltage of the power source and making sure they stay within the set values.

A shunt in the welding output circuit provides a signal to the control card which then compares this with the set value to maintain and regulate the inverter output.

For the MIG process the control will be of both output voltage and current.

LINCOLN ELECTRIC/EWS Complete control cards are available as spare parts, but by the use of the electrical drawings supplied, trained service engineers can undertake repairs directly on relevant cards when required.



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# TROUBLESHOOTING

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

## ==== OUTPUT PROBLEMS =====

| PROBLEMS / SYMPTOMS | POSSIBLE AREAS OF MISADJUSTMENT(S) | CHECK | RECOMMENDED COURSE OF ACTION |
|---|---|---|---|
| THE LINE CIRCUIT BREAKER TRIPS WHEN POWER SWITCH IS ON | 1) INPUT FILTER BOARD FAILURE<br>2) INPUT POWER BRIDGE IS IN SHORT CIRCUIT<br>3) ELECTROLYTIC CAPACITORS FAILURE<br>4) VARISTORE FAILURE | 1) VISUAL INSPECTION AND MULTIMETER CHECK<br>2) MULTIMETER CHECK<br>3) VISUAL INSPECTION AND MULTIMETER CHECK<br>4) VISUALLY INSPECT VARISTORE | 1) REPLACE<br>2) REPLACE INPUT BOARD<br>3) REPLACE INPUT BOARD OR POWER INVERTER (EW18001)<br>4) REPLACE INPUT BOARD |
| THE MACHINE IS DEAD, NO OUTPUT, NO FAN | 1) THERE IS NO POWER SUPPLY ON LINE<br>2) THE POWER SUPPLY CABLE IS INTERRUPTED<br>3) LINE SWITCH FAILURE<br>4) INPUT FILTER BOARD FAILURE<br>5) THE INPUT POWER BOARD IS DAMAGED | 1) CHECK THE PHASE INPUT VOLTAGE ON THE MACHINE<br>2) CHECK THE POWER SUPPLY CABLE<br>3) CHECK THE LINE SWITCH<br>4) CHECK THE INPUT FILTER BOARD<br>5) CHECK INPUT POWER BRIDGE AND INPUT POWER BOARD | 1) RECONNECT THE POWER SUPPLY<br>2) REPLACE THE INPUT POWER CABLE<br>3) REPLACE THE LINE SWITCH<br>4) REPLACE THE INPUT FILTER BOARD<br>5) REPLACE THE INPUT POWER BOARD |
| THE PILOT LIGHT IS OFF, BUT THE FAN RUNS | 1) THE INPUT POWER BOARD IS DAMAGED<br>2) THE HARNESS IS DAMAGED<br>3) POWER INVERTER FAILURE<br>4) CONTROL BOARD FAILURE | 1) CHECK THE LOW VOLTAGE , 12 Vac AND 15 Vac ON THE CN 1 CONNECTOR (ON THE INPUT POWER BOARD)<br>2) CHECK THE HARNESS<br>3) CHECK THE LOW VOLTAGE 12 Vdc ON CN 2 CONNECTOR OF THE POWER INVERTER<br>4) CHECK THE LOW VOLTAGE 12 Vdc ON THE CONNECTOR OF THE CONTROL BOARD (SEE THE WIRING DIAGRAM) | 1) IF NO VOLTAGE, REPLACE THE INPUT POWER BOARD<br>2) IF IT IS DAMAGED REPLACE IT<br>3) IF NO VOLTAGE, REPLACE THE POWER INVERTER<br>4) IF THE VOLTAGE IS OK REPLACE THE CONTROL BOARD |
| THE PILOT LIGHT IS OFF NO OUTPUT , NO FAN | 1) THE AUXILIARY TRANSFORMER ON INPUT POWER BOARD HAS | 1) CHECK THE FUSE F 1 ON INPUT POWER BOARD<br>2) CHECK THE RESISTANCE | 1) IF IT IS BROKEN REPLACE THE INPUT POWER BOARD<br>2) IF IT IS < 300 ohm REPLACE |

| | | | |
|---|---|---|---|
| | FAILED<br>2) THE FAN IS DAMAGED | OF FAN WINDING<br>(> 300 ohm ) | IT |
| THE PILOT LIGHT IS ON , FAN RUNS, THE ALARM LIGHT<br>IS OFF BUT THERE IS NO OUTPUT | 1) THE LOCAL/REMOTE SWITCH IS IN REMOTE POSITION,BUT THERE IS NO REMOTE CONTROL<br>2) INPUT POWER BOARD FAILURE<br>3) POWER INVERTER FAILURE<br>4) THE OUTPUT DIODE IS IN SHORT CIRCUIT | 1) CHECK THE LOCAL / REMOTE SWITCH POSITION<br>2) CHECK IF THERE IS ABOUT 620 Vdc ( ONLY 230 Vac INPUT ) AND ABOUT 540 Vdc (ONLY 400Vac INPUT) ON THE ELECTROLYTIC CAPACITORS<br>3) VISUAL INSPECTION AND CHECK THE POWER COMPONENTS(DIODES AND IGBTs),WITH MULTIMETER,ON THE POWER INVERTER; ALSO CHECK THE LOGIC CIRCUIT<br>(SEE THE GENERAL SERVICE MANUAL)<br>4) CHECK THE OUTPUT DIODES | 1) SET IT CORRECTLY<br>2) IF THERE IS NO VOLTAGE REPLACE THE INPUT POWER BOARD<br>3) IF THERE ARE PROBLEMS REPLACE POWER INVERTER<br>4) REPLACE OUTPUT BOARD |
| THE PILOT LIGHT IS ON BUT THERE IS NO OUTPUT AND OVERLOAD LIGHT IS ON | 1) ONE OR MORE THERMAL PROTECTIONS HAVE TRIPPED<br>2) THE POWER SUPPLY IS TOO HIGH | 1) CHECK FAN<br>1A) CHECK IF THE VARIOUS THERMAL PROTECTIONS ARE NORMALY OPEN WHEN THE MACHINE IS COLD<br>2) CHECK THE INPUT VOLTAGE | 1) REPLACE FAN<br>1A) REPLACE FAILURE THERMAL PROTECTIONS<br>2) CONNECT AT RIGHT INPUT VOLTAGE |
| **(ONLY FOR PLASMA CUTTING)**<br><br>PILOT LIGHT IS ON BUT THERE IS NO OUTPUT AND THE AIR LOW LIGHT IS LIT | 1) THERE IS NO AIR CONNECTED TO THE MACHINE<br>2) THE PRESSURE IS NOT REGULATED CORRECTLY<br>3) THE PRESSURE SWITCH IS FAILURE | 1) CHECK<br>2) CHECK THE CORRECT PRESSURE<br>3) BY-PASS A PRESSURE SWITCH AND VERIFY IF THE AIR LOW LIGHT IS OFF | 1) CONNECT THE AIR<br>2) SET THE CORRECT PRESSURE<br>3) REPLACE THE PRESSURE SWITCH |
| THE PILOT LIGHT IS ON , PUSHING THE TORCH BUTTON THERE IS NO OUTPUT, BUT THE AIR OR GAS FLOW ( HF DOES NOT WORK) | 1) THERE IS NO OUTPUT VOLTAGE<br>2) HF FAILURE | 1) CHECK PREVIOUS POINTS<br>2) CHECK THE OCV WITH THE MULTIMETER<br><br>**NOTE !!! ALWAYS DISCONNECT THE HF BOARD BEFORE MEASURING** | 1) CHECK PREVIOUS POINTS<br>2) IF THERE IS OCV REPLACE THE HF BOARD |
| **===== WELDING/CUTTING PROBLEMS =====** | | | |
| THE MACHINE IS WELDING / CUTTING BUT THERE IS NO OUTPUT CONTROL | 1) POTENTIOMETER FAILURE<br>2) THE SHUNT SCREWS ARE LOOSE<br>3) CONTROL BOARD FAILURE | 1) CHECK THE POTENTIOMETER<br>2) CHECK THE SCREWS<br><br>3) ........................................... | 1) REPLACE THE POTENTIOMETER<br>2) TIGHTER SCREWS<br>3) REPLACE THE CONTROL BOARD |
| THE MACHINE DOES NOT EXECUTE THE CONTROL BOARD FUNCTIONS | 1) CONTROL BOARD FAILURE | 1) .......................................... | 1) REPLACE THE CONTROL BOARD |
| THE MACHINE DOES NOT | 1) THE EXTENSION CORD IS | 1) ......................................... | 1) USE A CORRECT |



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| HAVE MAXIMUM OUTPUT | TOO LONG AND WIRE SECTION TOO SMALL<br>2) ONE PHASE IS NOT CONNECTED<br>3) POWER CABLES ARE LOOSE<br>4) THE CONTROL BOARD IS OUT OF CALIBRATION | 2) CHECK ALL THE PHASES<br>3) CHECK ALL THE POWER CABLES<br>4) ........................................... | EXTENSION CORD ( SEE THE INSTRUCTION MANUAL )<br>2) RECONNECT THE PHASE<br>3) TIGHTER SCREW<br>4) REPLACE THE CONTROL BOARD |
| THE MACHINE HAS HIGH WELDING OUTPUT AND NO CONTROL | 1) POTENTIOMETER FAILURE<br>2) CONTROL BOARD DAMAGED | 1) CHECK THE POTENTIOMETER<br>2) ............................................. | 1) REPLACE POTENTIOMETER<br>2) REPLACE CONTROL BOARD |
| THE MACHINE IS CUTTING WITH ARC PILOT ONLY | 1) THE GROUND CABLE IS DISCONNECTED<br>2) THE ARC PILOT RELE , ON OUTPUT BOARD,HAS FAILED<br>3) CONTROL BOARD FAILURE | 1) CHECK THE CONNECTION AND THE GOOD CONTACT ON THE WORK PIECES<br>2) VISUAL INSPECTION AND MULTIMETER CHECK<br>3) ........................................... | 1) RECONNECT<br>2) REPLACE OUTPUT BOARD<br>3) REPLACE CONTROL BOARD |
| THE PILOT LIGHT IS ON BUT PUSHING THE TORCH BUTTON THE MACHINE IS DEAD | 1) TORCH IS DAMAGED<br>2) CONTROL BOARD FAILURE<br>3) THERE IS NO TORCH SAFETY COLLAR ON THE FRONT PANNEL | 1) CHECK THE TORCH<br>2) .......................................<br>3) CHECK IF TORCH SAFETY COLLAR IS PRESENT | 1) REPLACE THE TORCH<br>2) REPLACE THE CONTROL BOARD<br>3) PUT THE TORCH SAFETY COLLAR ON THE FRONT PANNEL |
| THE MACHINE IS ALWAYS CUTTING WITH 40 AMPERES (ONLY FOR PC100 / PC100C ) | 1) LOCAL / REMOTE SWITCH IS ON REMOTE POSITION AND THERE IS NO REMOTE CONTROL CONNECTED | 1) CHECK ITS POSITION | 1) SET IT CORRECTLY |
| THE TORCH ELECTRODE AND NOZZLE DULL TOO FAST | 1) THERE IS NOT ENOUGH AIR<br>2) THE TORCH ELECTRODE AND NOZZLE ARE NOT ORIGINAL PARTS | 1) CHECK THE TORCH TUBE AND THE SOLENOID VALVE<br>2) .......................................... | 1) REPLACE THE TORCH OR THE SOLENOID VALVE<br>2) USE ORIGINAL PARTS |
| THE MACHINE IS CUTTING WITH INTERMITTENCE | 1) THERE IS NOT ENOUGH AIR PRESSURE<br>2) PRESSURE SWITCH FAILURE | 1) CHECK THE CORRECT WORK PRESSURE IN THE INSTRUCTION MANUAL<br>2) CHECK THE PRESSURE SWITCH | 1) SET AT CORRECT PRESSURE<br>2) REPLACE IT |
| THE PILOT LIGHT IS ON BUT THE MACHINE IS NOT WELDING VERY WELL | 1) THERE IS LOW WELDING CURRENT FOR THE STICK USED<br>2) ARC FORCE DEVICE FAILURE | 1) CHECK USED CURRENT<br>2) ............................................... | 1) SET AT CORRECT PARAMETER<br>2) REPLACE THE CONTROL BOARD |
| THE GAS ALWAYS FLOWS | 1) THE POST FLOW IS SET AT MAXIMUM<br>2) GAS SOLENOID VALVE FAILURE<br>3) CONTROL BOARD FAILURE | 1) CHECK ON THE CONTROL PANNEL THE POST GAS KNOB POSITION<br>2) CHECK THE VOLTAGE BETWEEN THE TERMINALS<br>3) ........................................... | 1) SET AT DESIRED VALUE<br>2) REPLACE THE GAS SOLENOID VALVE<br>3) REPLACE THE CONTROL BOARD |

G.B

Celle ligure 30/10/98