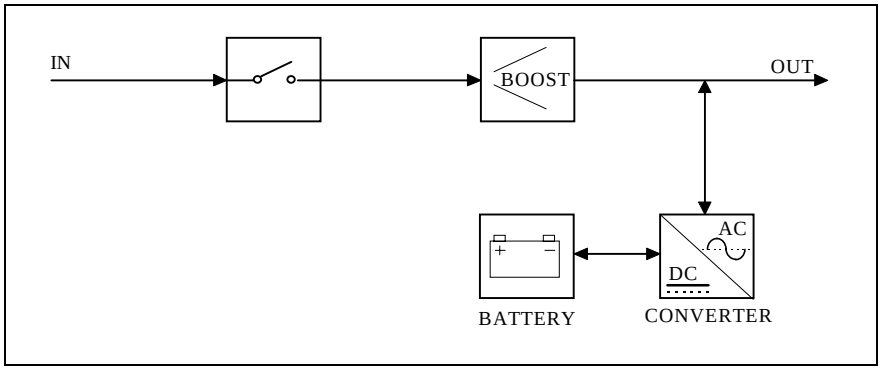
TABLE OF CONTENTS

1.- INTRODUCTION.

"POWER START" is a single phase line interactive UPS with booster. It is fully microprocessor controlled with computer communication capabilities.
The power rates are 250VA - 400VA - 600VA for 230V 50Hz and 250VA - 400VA - 600VA for 115V 60Hz all of them with cos $\varphi = 0.6$ (power factor).
It has automatic voltage regulation in two steeps, central and boost. The unit corrects the low input voltage with the boost step.
The inverter is "PUSH-PULL" with "NULL", based on MOSFET technology. The waveform is regulated pseudosine when the unit operates on-battery.
The charger is based on a lineal regulator with full rectifier bridge.



The boards' code is 500152.XXX (these codes can be changed in the future).

REVISION NOTE : If any repair or modification affecting the revision of the equipment is carried out, then this situation should be reflected on the identification sticker.

2.- EXTERNALS COMPONENTS.

2.1 - Two output leads (IEC320).

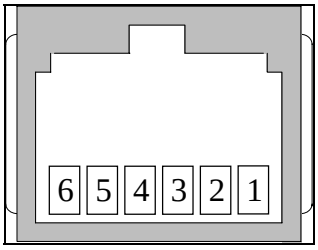
2.2 - Mains connector (IEC320).

2.3 - Fuseholder

250Vac. 5x20mm. Time-lag T. High breaking capacity.

250VA 230V	400VA 230V	600VA 230V	250VA 115V	400VA 115V	600VA 115V
2A	4A		4A	8A	

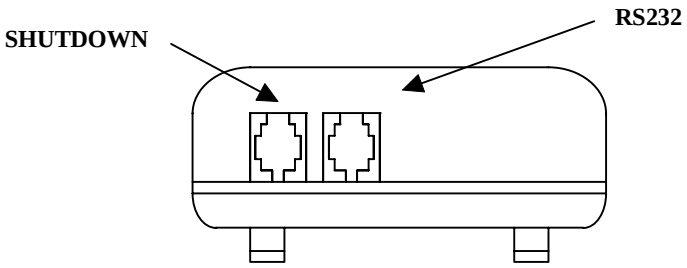
2.4 - Communication connector (RJ11 6/6)



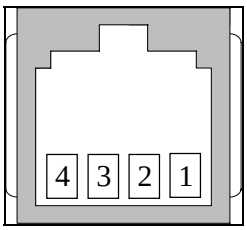
Pin	*Description*
1	+5 V @ 20mA
2	Battery Low
3	Mains Failure
4	Ground
5	RDX (Receives date from a PC)
6	TDX (Transmits data to a PC)

This connector is used to communicate with the user and maintenance Software.
"MUST BE USED WITH ONDYNE COMMUNICATION INTERFACE".
All signals work with TTL levels.

2.5 - ONDYNE Communication Interface



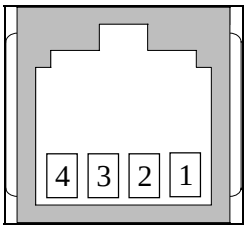
2.5.1 - RS232 connector (RJ11 type) with the following signals:



Pin	*Description*
1	Reserved (+5V @. 10mA)
2	TDX, (Transmits date to the PC)
3	Ground
4	RDX, (Receives data from the PC)

Pin 1 is reserved for special purposes. Signals 2 and 4 are “RS232” levels. This connector is used for the serial communication with the PC using the User and Technical Software.

2.5.2 - SHUTDOWN connector (RJ11 type) with the following signals:



Pin	*Description*
1	Battery Low
2	Mains Failure
3	Ground
4	----------

It is used for automatic operations such as files server shutdown, etc.
The signals are “RS232” levels.
It is necessary to use special cables such as MODEL 42 to provide Volt Free Contacts (VFC).
The “Battery Low” and “Mains Failure” logic signals are Software configurable.

2.6 - LEDs
The green LED indicates us than the unit is operating on mains and within its limits.
If the unit is operating on-battery , the red LED is on.
When the LEDs are off the unit is switched off .

2.7 - Acoustic Signals.

ON BATTERY:	One “bip” of 0,5 sec. every 15 sec. The UPS is on-battery and discharging them.
AUTOTEST MODE:	Five “bips” every 5 sec. The unit carries out an internal autotest when it starts up.
PREWARNING MODE:	One “bip” of 0,5 sec every sec. The UPS battery is low.
HISTORIC MODE:	Two fast “bips” . An event has occurred and has been storage in the UPS memory. (Mains failure, overload , etc.).
ALARM MODE:	Four small “bips” and one long “bip” every second. An user’s alarm has been activated (overload).

3.- BASIC OPERATION.

"POWER START" has no ON/OFF switch, when the mains voltage is present the unit automatically starts up. The UPS can turn its output off by the "TIME PROGRAMMER" or by "AUTO-OFF".

During the start up, the UPS does an "AUTOTEST", if the battery, internal circuits and the mains are correct, it will connect the relays supplying voltage to the output.

The microprocessor continually checks the mains, when it fails, the inverter supplies AC power to the load. The load normally operates until the battery is exhausted. The UPS automatically transfers the load back to the mains power and recharges the batteries when the mains voltage returns to normal.

The UPS provides automatic voltage regulator in two steeps, central and boost. It corrects low input voltage without drawing power from the battery. Even with low input voltage the unit can recharge the battery.

The commutation between steps is performed using relays. The unit will turn to batteries for a few seconds, thus the commutation time will be lower.

The UPS operation is fully controlled by a microprocessor that is continuously checking all the parameters and processes:

- Battery voltage.
- Output current (only on inverter).
- Mains input voltage, zero crossing points and phase.
- Output voltage.
- Vigilance of the internal voltages.
- Vigilance of the inverter.
- Relays (back - feed and voltage regulation)
- Charger of the battery
- RS232 Communication

Explanation about the types of switching off the UPS:

1.- AUTO-OFF : Automatic switch off. When the UPS is working on battery and the output current is lower than the "MINIMUM THRESHOLD" the UPS will turn its output off after 30 seconds. The unit starts up again when the mains is present.

2.- Switch off by SOFTWARE. There are three possible commands :

- IMMEDIATE switch off: the UPS will immediately cut its output off after receiving this command. The UPS will remain in "STAND-BY" mode. The UPS can be only started up using the "START UP" command.
- PREWARNING switch off: the UPS will go on batteries for a period of time equal to the "PREWARNING TIME", and then the unit will stop. The UPS will remain in "STAND-BY" mode. The UPS can be only started up using the "START UP" command.
- TOTAL switch off : After receiving this order the UPS cuts its output voltage and its internal power supply off. With this switch off mode the UPS losses the date the time and cannot communicate with the computer. It will start up when the mains come back.

3.- TIMER switch off: The UPS switch off will be carried out at the time and the date recorded. The UPS will remain in “STAND-BY” mode. The UPS will start up with the “TIMER” switch or with “START UP” command if the mains is present.

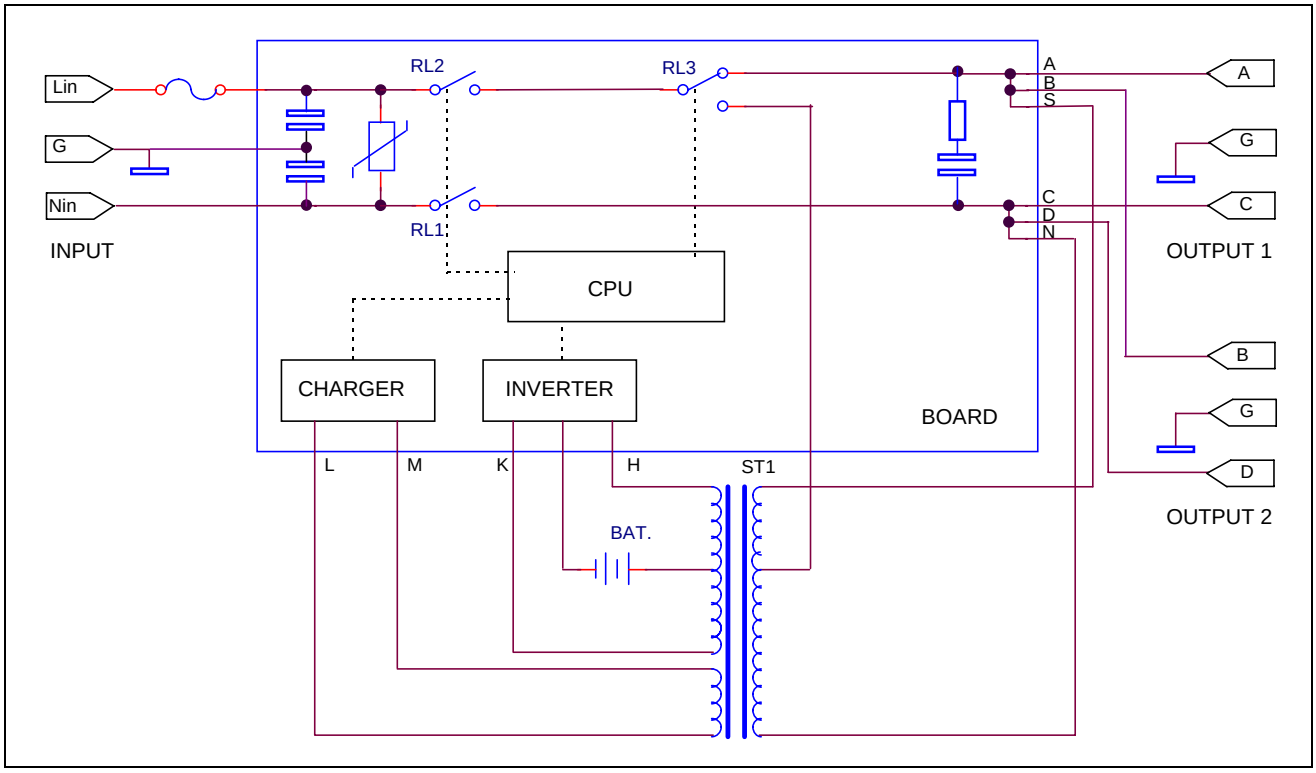
4.- Stop due to protection: The UPS has one protective feature that could force it to stop (Short circuit in the Output). The UPS will remain in “STAND-BY” mode.

5.- Exhausted Autonomy: If the UPS is on battery the UPS will stop when the time of “AUTHORIZED AUTONOMY” has passed or the battery voltage reaches 10V. The UPS will remain in “STAND-BY” mode.

Notes:

In “STAND-BY” mode the UPS is consuming battery for its internal electronic circuits. In order to preserve the battery energy this power supply will be stopped when the “MAXIMUM TIME IN STAND-BY” has finished or the battery voltage has reaches 11V. The unit must be recharged after a long time in storage.

BLOCK DIAGRAM



4.- MAINTENANCE PROCEDURE

1º If the UPS does not provide the expected back up time, recharge the battery for at least 8 hours. If the autonomy is still low replace the battery. (Take care not to damage the LEDs' cover during the replacement).

Replace the battery with the same type as originally installed (Sealed lead acid, maintenance free 12V - 7Ah), supplied by the UPS manufacturer (Chloride Part. No.580085.000) with a polarised connector. The battery contains toxic materials. Dispose of battery properly (must be recycled).

2º Look inside the unit and look for any damage. (Take care not to damage the LEDs' cover when you are opening the unit).

3º Check battery fuses. If the fuses are broken we can change them but not without knowing the cause of this failure.
The battery fuses are on the PCB. They are automotive fuses of 30A and 32V

4º Connect the UPS to the mains for 1 or 2 seconds, this is only to wake-up its circuits .

5º Check the historic to find the possible fault. If the unit doesn't communicate perhaps there's something wrong in the communication circuit or in the microprocessor or with the voltage.

6º Use the soft to verify that the system variables have the right values.

7º Apply the mains and wait for the start up. If the unit doesn't start, check the "AUTOTEST BYTE" and see why it hasn't started. If everything is right, check the "STATUS BYTE" to verify if the unit was stopped by Software or by "TIMER".

8º When the UPS is operating, we must calibrate it with the automatic calibration program.

9º Finally, discharge the unit for a few minutes with the nominal charge and later plug the unit to the mains for at least eight hours to totally charge the battery.

NOTE: In the next figure you can see the correct position of the PCB wires. Recommended for security, put the black wire (Neg. Batt.) in the last position. And take care not to touch the heatsinks with this wire.

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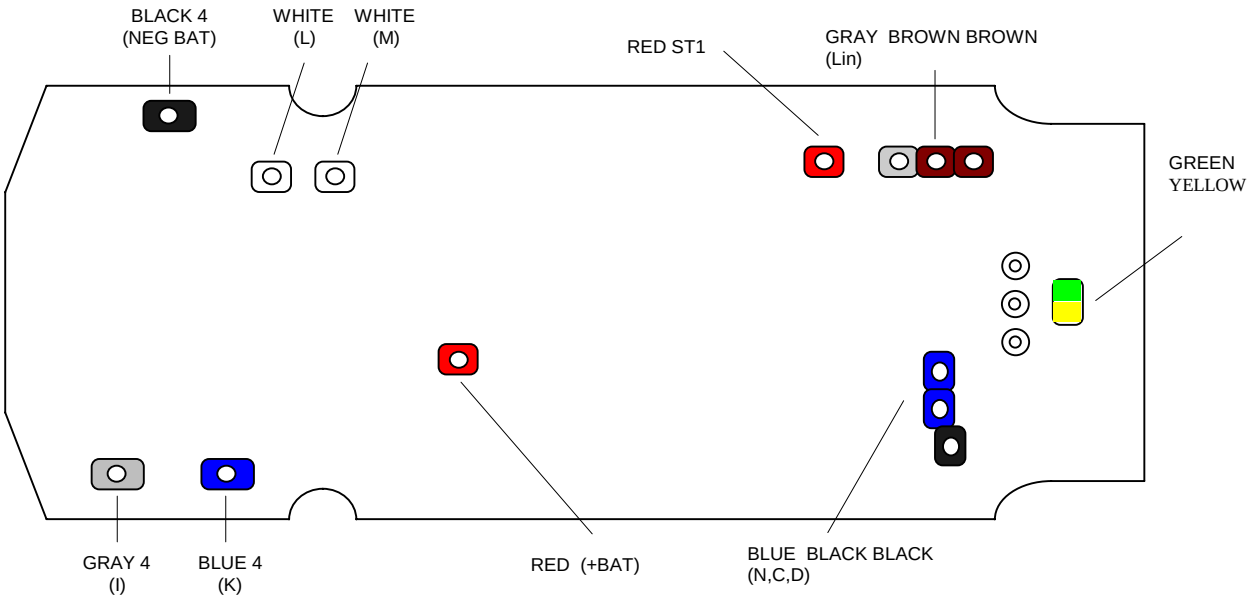
WIRES SOLDER TO THE POWER START BOARDS



5.- ELECTRONIC BOARD OPERATION

5.1 Measurements circuits.

5.1.1 *Battery Voltage*: R8 and R9 provide to the microprocessor PD2 pin (analogy input) an image of the battery voltage.

5.1.2 *Output Current*: The UPS will only measure the output current when operating on-battery. It measures the MOSFET power transistors VDSon. This voltage is amplified with IC4D and is applied to the PD4 pin.

5.1.3 *Mains Measurement*: In the microprocessor PD1 pin there is an image of the input voltage, this is provided by TR1 transformer, a bridge rectifier (D21, D22, D23 and D24) and a divider (R15, R43).

TR1 and previous diodes make an interruption to the micro (IRQ) when the mains crosses zero. This signal is filtered through R30 and C17.

With the previous circuit and R13, the micro knows the mains voltage phase.

The diodes D13, D14 and D15 are used as pull-up protection.

5.1.4 *Output Voltage*: Through a bridge rectifier (D18, D19, T4 and T5) and a divider (R29, R48) is performed the measurement of the output voltage in the input PD7.

5.2 Charger block and internal mains

The L and M terminals are connected to the transformer winding charger. This signal is rectified with D4, D3, T4 and T5. IC5 regulates the charger voltage in function of the voltage of the ADJ pin. With IC2B, the micro can stop the charger. The control of the charger current is made with R19, R20, R21 and R22.
The battery or IC5 supply the voltage for the internal circuits. IC3 output supplies five volts.

5.3 Start up circuits.

When there is mains voltage, the transformer TR1 voltage switches T3 on, T1 is also switched on and IC3 supplies 5V.
When the mains is cut off or out of range, the microprocessor supplies voltage to PB0 during “STAND-BY”.

5.4 Reset Circuits.

This circuit makes a reset to the microprocessor when the 5V supply drops bellow the security level. IC2A compares supply voltage, through R33 and R34, with a reference of 0,6V fixed by D1 and R32.

5.5 Output Block.

The A, B, S and N, C, D are the UPS output terminals. When the unit works with mains RL2 and RL3 (Back-Feed relays) are activated, when it’s on-battery RL2 and RL3 aren’t activated.
RL1 controls the steps (Central and Boost). In normal operation the RL1 isn’t activated and the unit is in the central step. When the input voltage is low the boost step is activated (RL1).

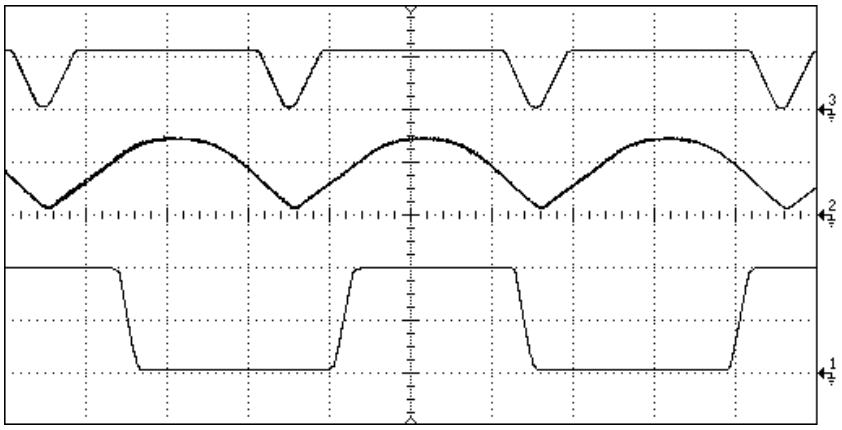
5.6 Power Block.

It is a Push-Pull converter (T7, T10 and T8, T9) and Null (T4 and T5). With IC4A, IC4B and IC4C the micro controls the power MOSFET.

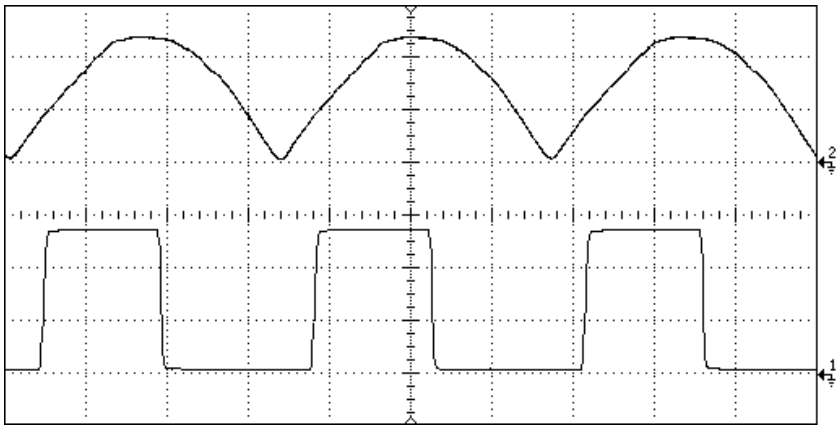
5.7 Protection Circuit for VDSon.

With this circuit the micro studies the MOSFET current when the unit is on-battery. IC2C compares the VDSon with a reference voltage fixed by R12 and R46, so that if the VDSon is higher than the reference voltage, IC2C sends an interruption to the micro. IC2D initialises the protection in each branch.

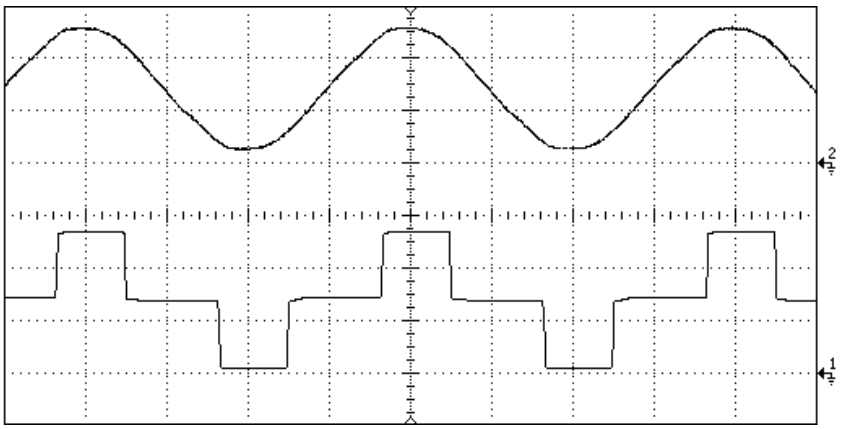
5.8 Boards Signals.



Mains voltage measurement (3.- Zero crossing IRQ)
(2.- Mains voltage)
(1.- Mains phase)



Output voltage measurement (2.- On mains)
(1.- On inverter)



Output voltage waveform (2.- On mains)
(1.- On inverter)