GTEC UPS MODEL:

DISCOVERY

60 kVA

SERVICE MANUAL

www.gtec-power.eu

Contents

1 INTRODUCTION

This document provides an outline for the maintenance and/or troubleshooting of the DISCOVERY UPS series: 60 kVA.

ALL OPERATIONS MUST EXCLUSIVELY BE CARRIED OUT BY QUALIFIED AND TRAINED PERSONNEL.

2 SWITCHING THE UPS ON/OFF

Read the User manual (code 0MNS3TK10F9ENUx.) before carrying out any operations on the UPS, in particularly refer to the *OPERATIVE PROCEDURES* section for:

2.1 SWITCHING OFF THE UPS WHILST DELIVERING POWER TO THE LOAD

Refer to "*SWITCHING THE SYSTEM FROM ON-LINE TO MANUAL BYPASS*".

2.2 SWITCHING OFF THE UPS WHILST CUTTING OFF THE POWER SUPPLY TO THE LOAD

Refer to "*SYSTEM OFF COMMAND*".
Open SWOUT, SWBATT, an eventual external battery switch, SWIN, SWBYP (if present) to shut down the display.

2.3 RESTARTING THE UPS

Refer to "*RESTORE THE ONLINE MODE AFTER MANUAL BYPASS"* or *"SYSTEM ON DIRECT COMMAND"*

2.4 STARTING THE UPS FROM THE BATTERY

Refer to "*SYSTEM ON VIA BATTERY (COLD START)"*

Important: this type of start-up should only be carried out if mains power is down and ONLY with the SWMB switch open. Start-up with the SWMB closed is only possible on UPS with a separate bypass option and where the bypass line is present.

NOTE: the minimum voltage for battery start-up is 212Vdc (10,6V for monoblock).

3 SOFTWARE OPERATIONS

3.1 SOFTWARE UcomS3

UComS3 is the package of applications for the advanced configuration and analysis of log files and real-time diagnostics for UPS belonging to the DISCOVERYseries.

Communication between PC and UPS, for the applications that require it, takes place via USB or the serial communication port RS232 (RJ-10 connector).
For proper communication of the PC with the UPS it is required loading the FTDI driver.
The driver is downloadable from FTDI website at the following link:
https://ftdichip.com/drivers/vcp-drivers/

The package is currently comprised of six different applications:

- S3Download – History Downloader
- S3History – History Analyzer
- S3Event – Event Analyzer
- S3RealTime – Status Analyzer
- S3Debug – UPS Debugger
- S3Config – Configurator
- S3setModel – UPS Settings

3.2 SAVING THE UPS LOG FILE

This activity should be performed before any operation is carried out on the UPS.
To save the log file use the History Downloader application provided with the UcomS3 software.

3.3 CONFIGURING THE UPS

To configure the UPS, use the dedicated S3Config of the UcomS3 software.

3.4 UPDATING DSP AND DISPLAY FIRMWARE

In order to update the DSP firmware, the dedicated "**DSPFLASH 2.05**" programming software (or later version) must be used to program the DSP. For the display, the upgrade software is available along with the firmware file.

For the instructions for these applications refer to the:

- **RM034 Revxx-EN (Firmware Upgrade) ***
- **IT-DSPFlash 2 REV.xx (User Manual) ****

* Rev04 or later version
** Rev01 or later version

The firmware to be used is listed below (Tab.1):

UPS family	DSP Firmware code	DISPLAY Firmware code
DS 60 kVA	FW095-01xx	FW079-01xx

Tab. 1

3.5 S3SETMODEL

S3SetModel is a software included in the UcomS3 package used to correctly configure the **6R_SU0275-02x** spare part (Control Card 60).

For the complete procedure refer to chap.12.2.

4 UPS INTERNAL STRUCTURE

For further details, see the User manual code 0MNS3TK10F9ENUx, the Installation manual code 0MNS3TK60NPENIx and the wiring diagrams, code:

- SBS3T_60_…

4.1 UPS MODELS

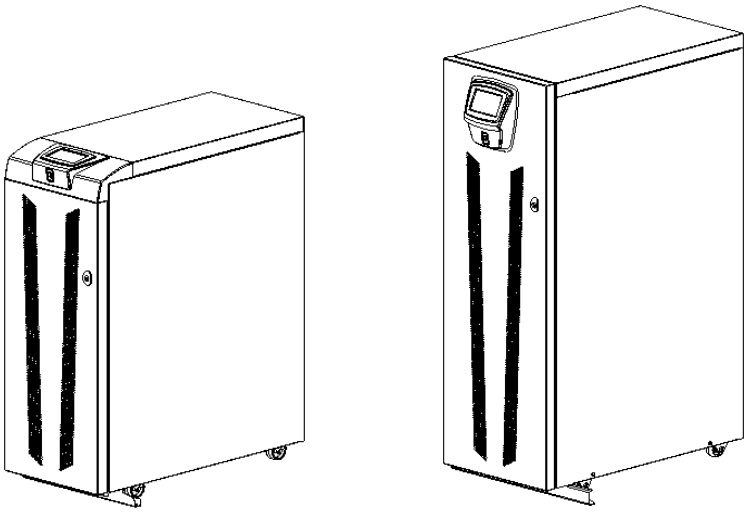


Fig. 1

Discovery DSY (ACT) **Discovery DSX (XTD)**

The Discovery UPS 60 is available in two version of chassis: Active and Xtend. These two versions are differenced by size and the possibility or not of containing the internal batteries.

MODEL	SIZE WxDxH [mm]	NUMBER OF BATTERIES	CONNECTIONS SECTION
ACTIVE	380x850x1025	-	Bottom (front)
XTEND	440x840x1320	3x(20+20)	Bottom (front)

Tab. 2

Attention! Active and Xtend are trade names.

4.2 GENERAL DESCRIPTION

The DISCOVERY series is a transformerless UPS. The 60kVA version has three-phase input and three-phase output.

It is made of:

1. A control section that includes the Logic Control board (B0275), the Communication board (B0274) and the Parallel board (B0229 – Optional). The B0274 and B0229 boards are common to all the DISCOVERY UPS. The Control board B0275 has its own specific version.

2. The bypass section. With the UPS situated in front of us, the input section is on the left side of the UPS. Depending on the UPS MODEL this section could be in the lower part (ACTIVE) or in the upper part (XTEND) of the UPS. This section includes the Bypass board (B0411 for 60 kVA), the three bypass modules and the bypass heatsink.

3. The input section. With the UPS situated in front of us, the input section is on the left side of the UPS. In case of XTEND model this section is located behind the bypass section. This section is composed by:
    - Input board (B0400 for 60kVA);
    - Inductors PFC-Boost boards (B0403 and B0404 for 60kVA);
    - Boost & BC power board (B0398 for 60kVA);
    - Signal adapter Board* (B0410 for 60kVA);

    * This board is installed on top of the Input board (B0400)

4. The output section. With the UPS situated in front of us, the output section is on the right side of the UPS, that includes:
    - Inverter power board (B0392 for 60kVA);
    - Inductors Inverter boards (B0393 and B0397 for 60kVA);
    - Output board (B0395 for 60kVA).
    - Auxiliary power supply board** (B0394 for 60kVA);

    ** this board is installed on top of the Output board (B0395)

5. The switches and connections section: that includes the switches and terminals to connect the power cables, the external synchronization cable (optional) and the external battery temperature sensor (optional). Moreover, this section includes the filter CY boards.

6. A display section: that includes the led board and the display board (B0306).

4.3 THE SECTIONS INSIDE THE UPS

Inside this paragraph, are introduced the single boards and the parts that compose each DISCOVERY UPS version.

4.3.1 CONTROL SECTION

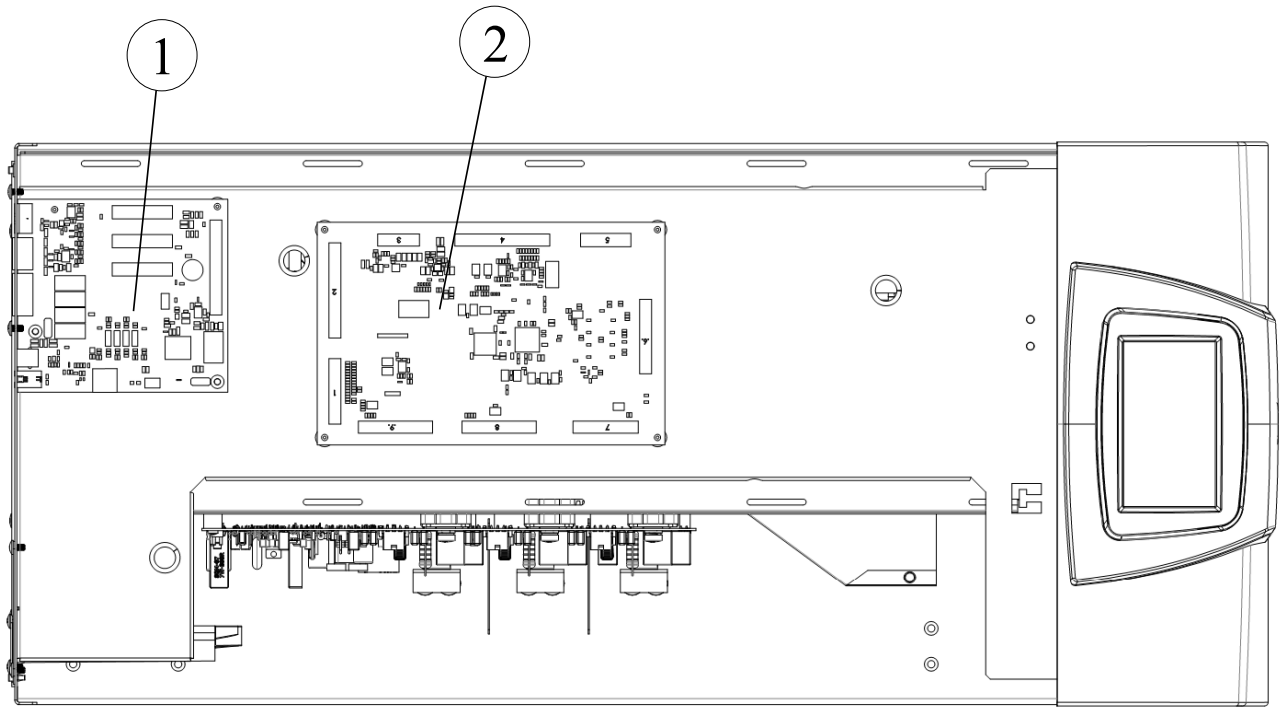


Fig. 2

1	**Communication Board**	**B0274-01**
2	**Control Board**	**B0275-02**

Tab. 3

4.3.2 INPUT SECTION

ACTIVE MODEL

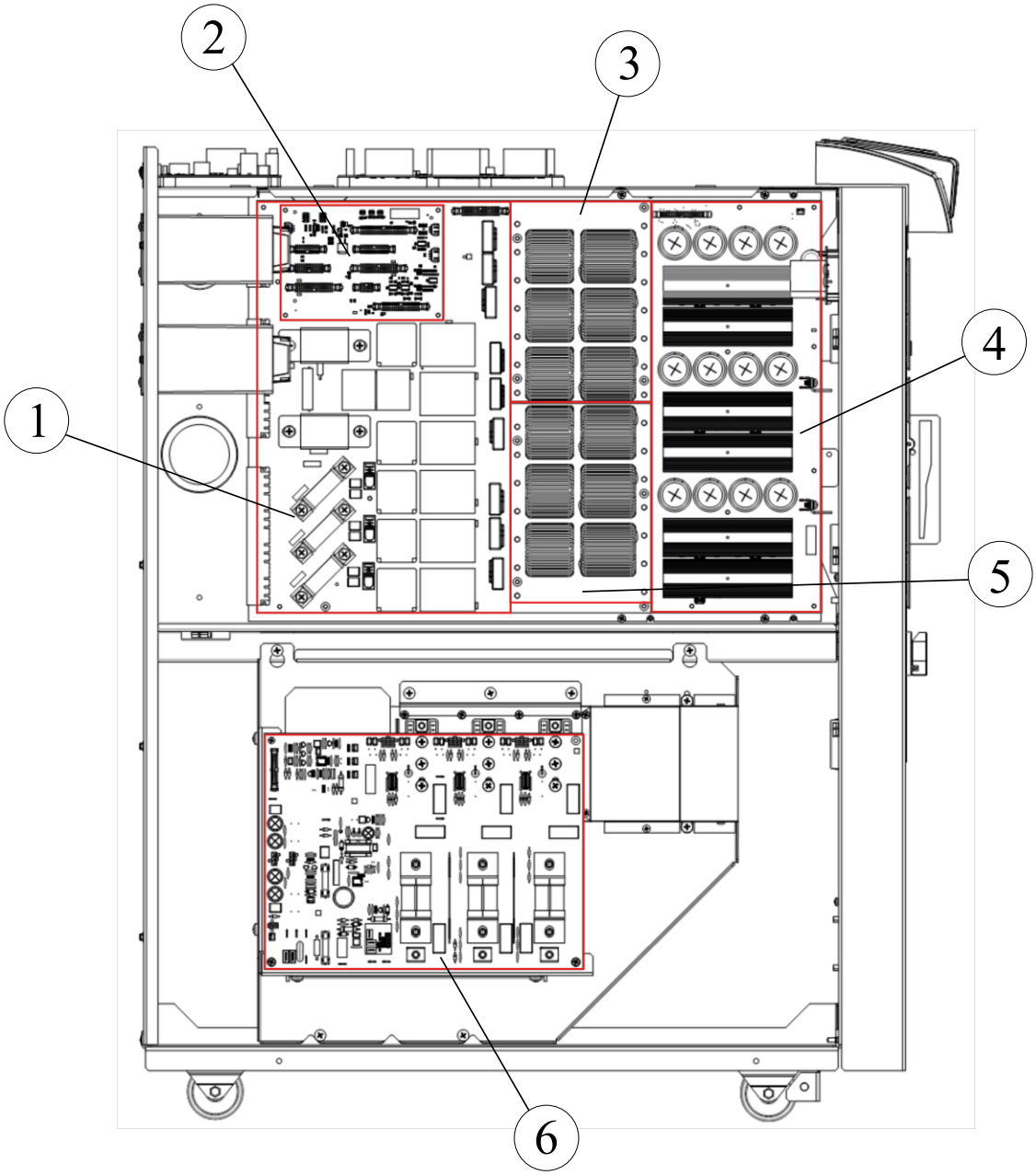


Fig. 3

1	Input board	B0400-02
2	Signal adapter board	B0410-01
3	Induct. A PFC-Boost board	B0403-01
4	Boost & BC power board	B0398-01
5	Inductor B PFC-Boost board	B0404-01
6	Bypass board	B0411-01

Tab. 4

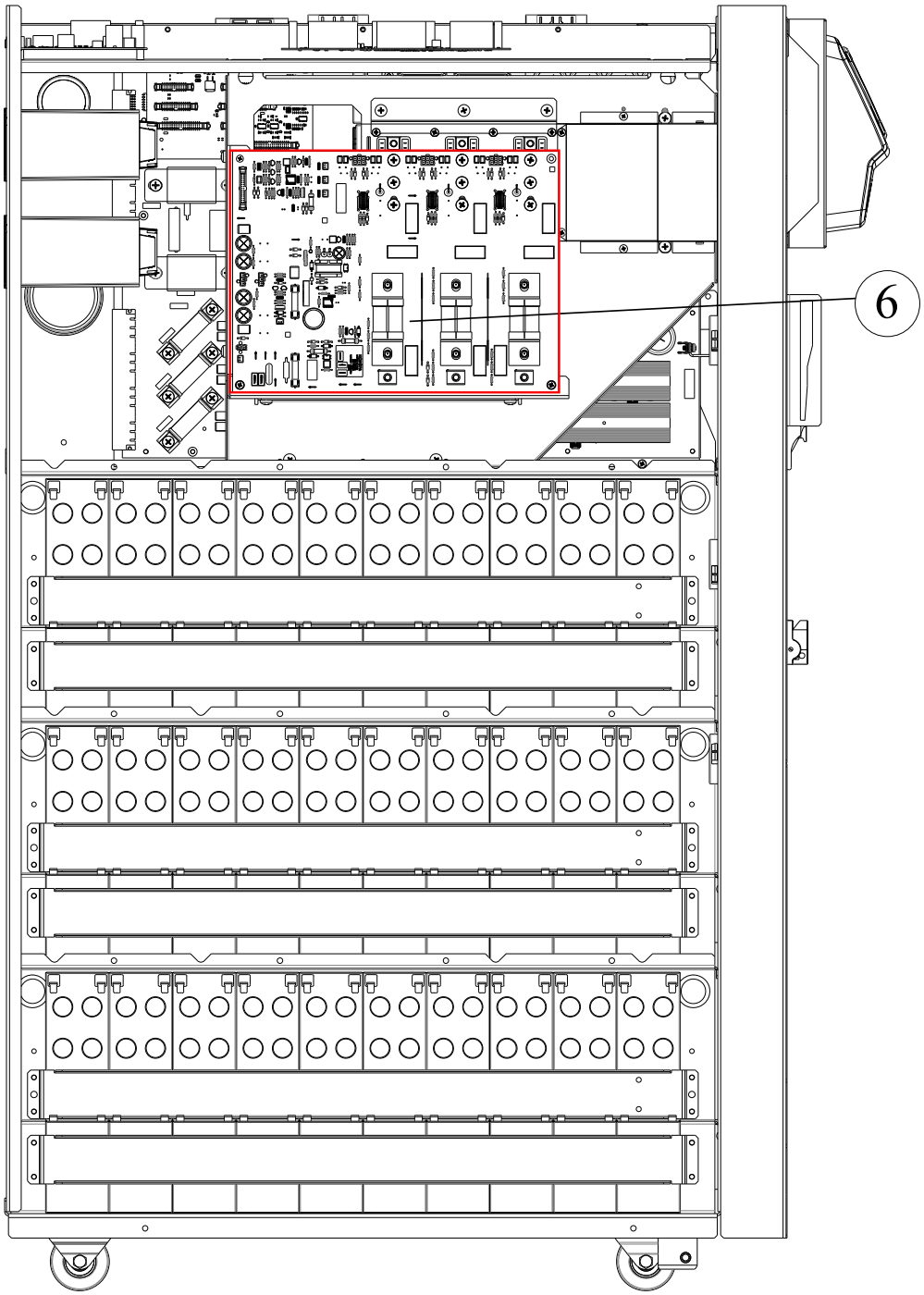


Fig. 4

To leave the necessary space for the batteries free, in the XTEND model the Bypass board is placed above the power boards in the input section. For the other boards (1-5), refer to Fig.3.

4.3.3 OUTPUT SECTION

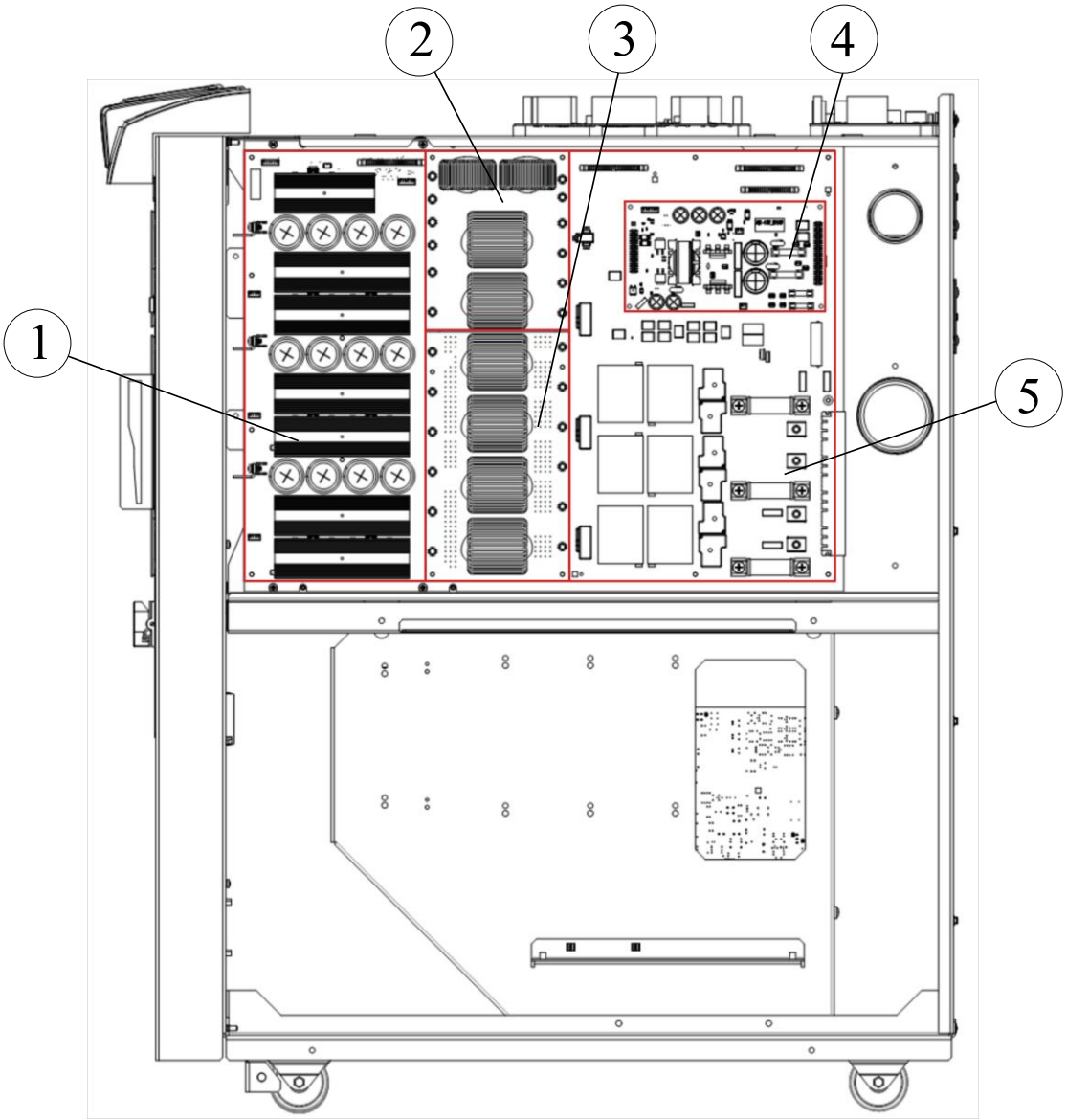


Fig. 5

1	Inverter power board	B0392-02
2	Induct. A inverter board	B0397-02
3	Induct. B inverter board	B0393-01
4	Aux. power supply board	B0394-01
5	Output board	B0395-03

Tab. 5

4.3.4 SWITCHES AND CONNECTIONS SECTION

DSY (ACT) CONNECTIONS:

Fig. 6

Single-Input

Fig. 7

Dual Input (DI)

- **DSX (XTD) CONNECTIONS:**

Fig. 8

4.4 FUSE LIST

4.4.1 SWBATT (only for XTEND model)

ATTENTION! Fuses in SWBATT disconnect only the internal batteries.

- 3x cabinet [-batt, N, +batt]
- Fuses in this table are the same for all cabinet types

FUSE SIZE	FUSE TYPE	CODE
22x58	125A 690V gR	0602010204

Tab. 6

4.4.2 INPUT BOARD (B0400-02)

POSITION	FUNCTION	FUSE SIZE	FUSE TYPE	CODE
F2 (x2)	Input fuses ph1	BS88 type	80A 500V FF	0602010086
F1 (x2)	Input fuses ph2			
F3 (x2)	Input fuses ph3			
F4, F5	Batt+, Batt-	‘000’ size	200A 750Vdc	0602010115

Tab. 7

4.4.3 AUXILIARY POWER SUPPLY BOARD (B0394-01)

POSITION	FUNCTION	FUSE SIZE	FUSE TYPE	CODE
F2, F3	AC fuses	5X20	5A 250V GF	0602010047
F1, F4	DC fuses	6.3x32	2A 500V GF	0602020066

Tab. 8

4.4.4 OUTPUT BOARD (B0395-03)

POSITION	FUNCTION	FUSE SIZE	FUSE TYPE	CODE
F6 (x2)	Inverter PH1	BS88 type	63A 500V FF	0602010107
F5 (x2)	Inverter PH2			
F4 (x2)	Inverter PH3			

Tab. 9

4.4.5 BYPASS BOARD (B0411-01)

POSITION	FUNCTION	FUSE SIZE	FUSE TYPE	CODE
F1	Aux. Redundant p. supply	6.3x32	2A 500V GF	0602020066
F2	Bypass fan fuse			
F3	Bypass PH1	‘000’ size	200A 690V aR	0602010079
F4	Bypass PH2			
F5	Bypass PH3			

Tab. 10

5 PRINCIPLE ELECTRICAL DIAGRAM

On the schematic the reading points of the logic board are highlighted. The position of those points will be very helpful in case of any problem with the unit, particularly for the fault detection (refer to chapter 10 for the map of main readings).

The Errore. L'origine riferimento non è stata trovata. shows the whole operation of the UPS through the schematic of a single phase.
The internal hardware architecture of the UPS can be divided in two main stage structure: the rectifier/boost (or input stage) and the inverter stage (or output stage).

The **rectifier/boost stage** includes three PFC/Boost (Power Factor Correction) stages (refer to chap. 9.1).

Single VDC± readings are shown as a simplification on the schematic. Actually, there are two reading points of the VDC values that are taken by the logic, one on the Boost side and one on the Inverter side (for the positive branch as well as for the negative branch). Those readings are taken respectively on the Boost & BC Power Board (B0398) and on the Inverter Power Board (B0392).

The **inverter stage** consists of a three-level type of NPC (Neutral Point Camped) inverter (refer to the chap. 9.2).

Each heatsink has a temperature sensor for the detection of under/over temperature of the stage.

The **Fig. 10** shows the input stage parts used by the UPS during battery operating mode.

The BATTERY BUCK/BOOST stage charges the batteries when the UPS is working in normal operation mode and acts as “boost” during the discharge of the batteries (bidirectional stage: buck converter/boost converter). The battery buck/boost converter is located under the PFC phase 1 heatsink.

The relays of the battery stages “*Batt. contact*” are closed after the battery presence and the correct polarity checks.

The other BATTERY BOOST stages act only as “boost” during the discharge of the batteries, therefore, in battery operation, all three phases work in parallel to support the load. (Refer to chap. **9.1** for a detailed scheme).

5.1 ELECTRICAL DIAGRAM – MAINS OPERATION (SINGLE PHASE)

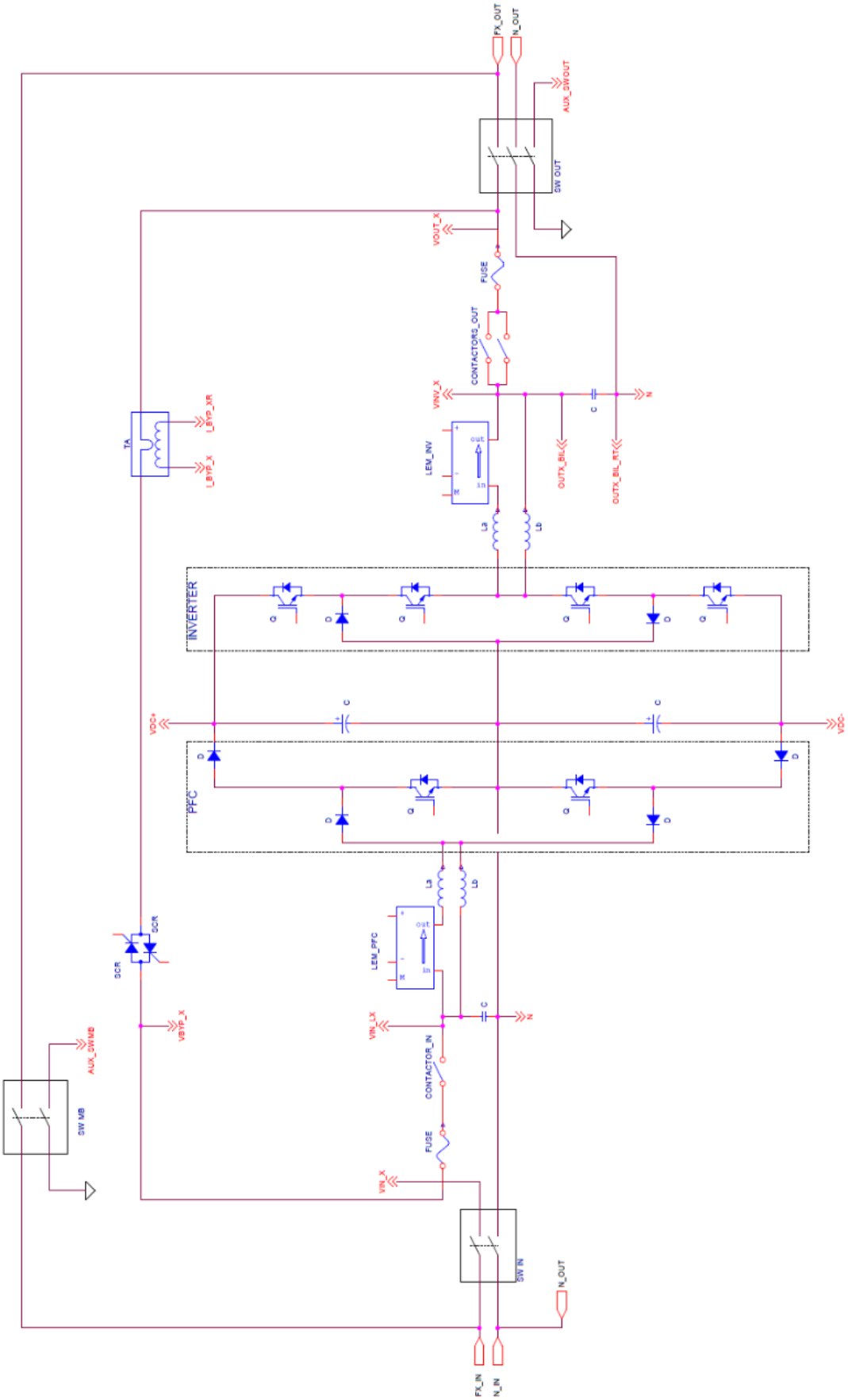


Fig. 9

5.2 ELECTRICAL DIAGRAM – BATTERY OPERATION (INPUT STAGE)

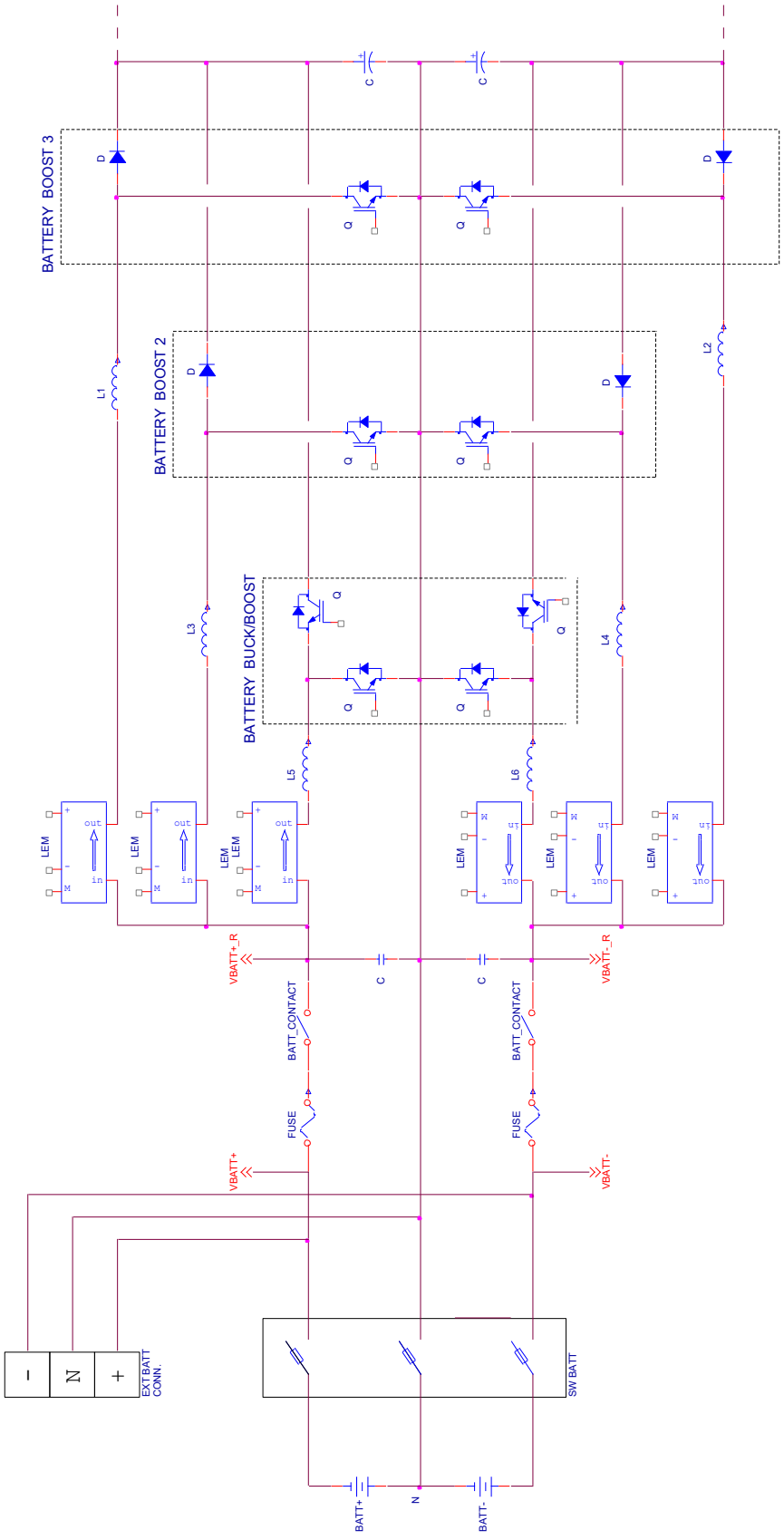


Fig. 10

6 DESCRIPTION OF THE BOARDS

6.1 COMMUNICATION BOARD (B0274)

Version:
B0274-01 Communication Board for 60 kVA

In this board there are:

1. Redundant power supply section;
2. Output relays;
3. Power supply protection section for the slots (J3, J4, J5);
4. Input opto.

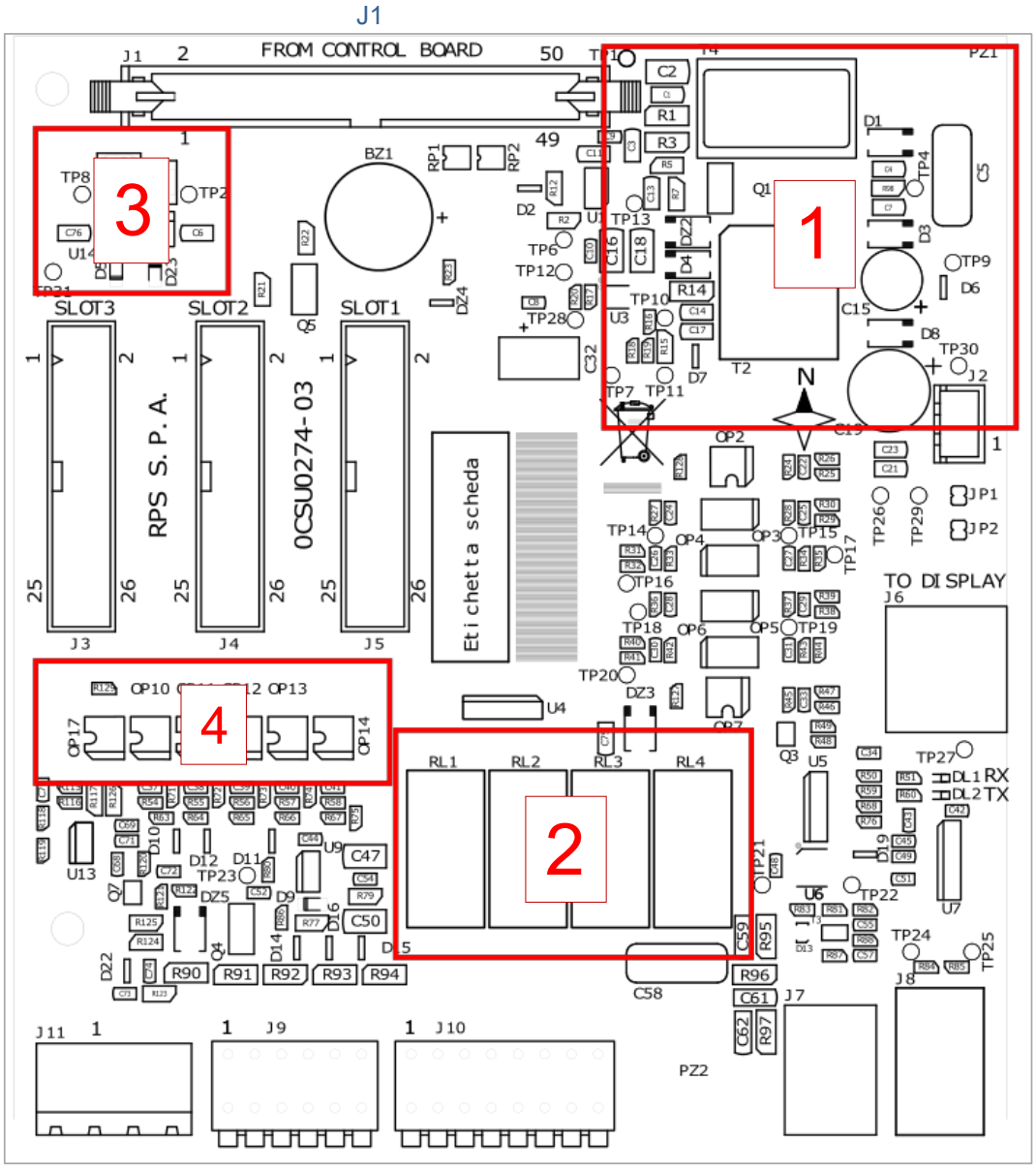


Fig. 11

Connector	Description	Note
J1	Flat connector from Control board	From B0275-02
J3, J4, J5	Slot for optional boards	(J3 is not used)
J6	Connector to display	RJ45 connector
J7, J8	USB and Serial port RS232	
J9, J10	Auxiliary signal contacts	Input opto and output relay
J11	R.E.P.O. switch (remote emergency power off)	N.C. contact – 12±2 Vdc

Tab. 11

Pinout connector:

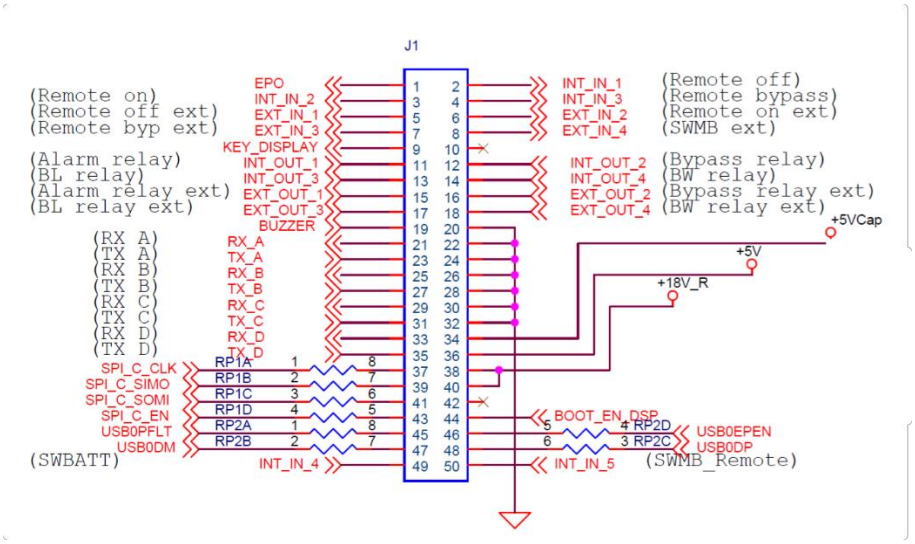


Fig. 12

6.2 CONTROL BOARD (B0275)

Version:
B0275-02 Control Board for 60 kVA

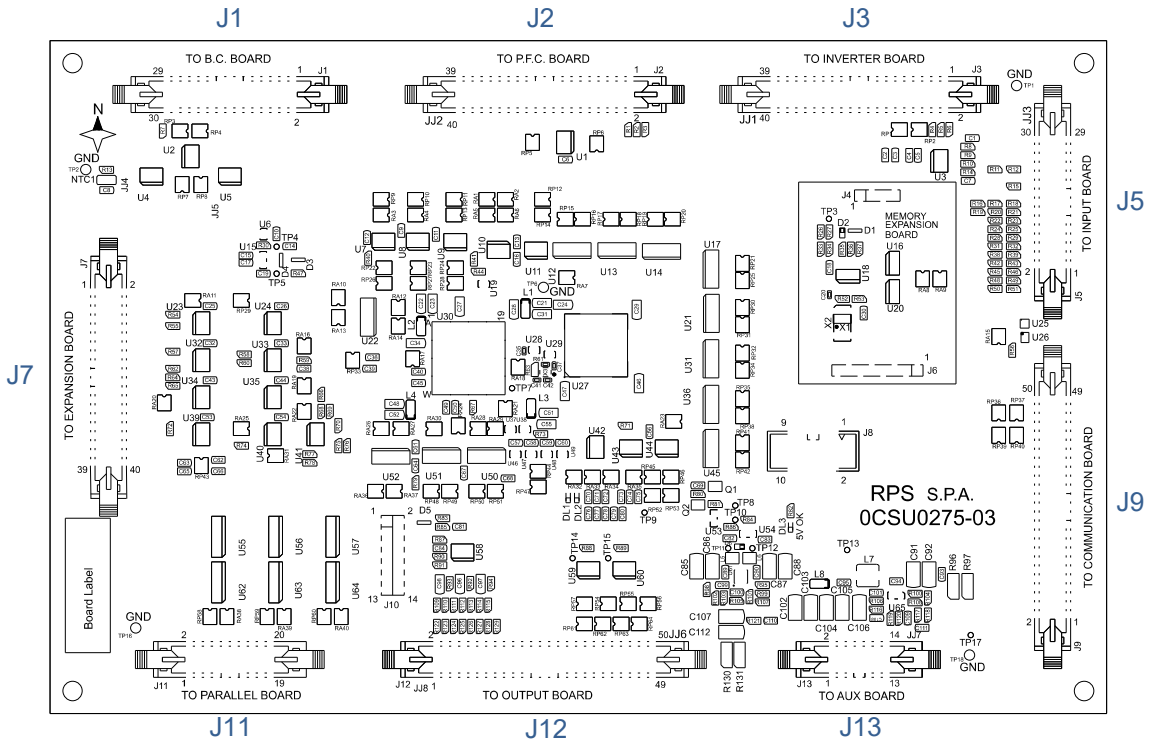


Fig. 13

Connector	Description	Note
J9	Flat connector from Communication board	From J1 of B0274-01
J1	Flat connector to Signal adapter board	To J7 of B0410-01
J2		To J4 of B0410-01
J3		To J2 of B0410-01
J5		To J1 of B0410-01
J12		To J3 of B0410-01
J13		To J12 of B0410-01
J7		To J11 of B0410-01
J11	Flat connector from Parallel board	Parallel Option

Tab. 12

6.3 INVERTER POWER BOARD (B0392)

Version:
B0392-02 Inverter Power Board for 60 kVA

In this board there are:

1. Inverter modules, one for each phase;
2. HF generation section;
3. Isolated supplies for IGBT control;
4. Temperature section.

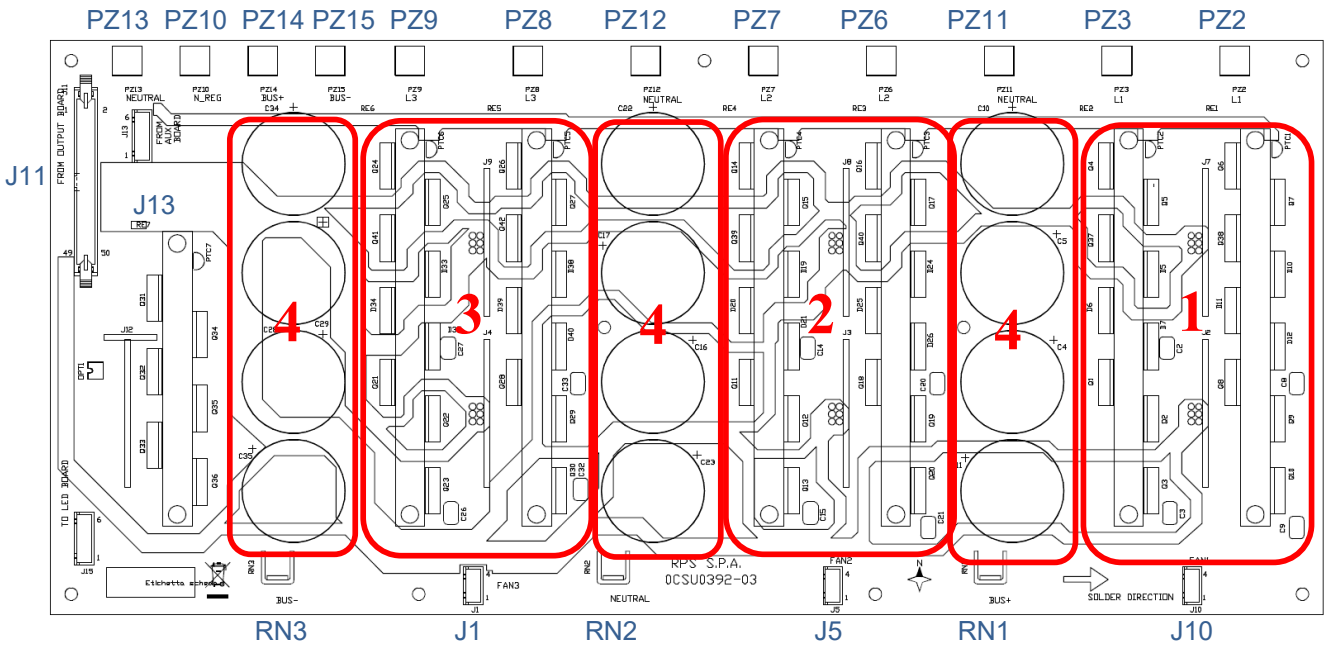


Fig. 14

Connector	Description	Note
J1, J5, J10	Connectors to fan	
J11	Flat connector from Output board	From J5 of B0395-03
J13	Connector from Aux. power supply board	From J16 of B0394-01

PZ2, PZ3, PZ6, PZ7, PZ11, PZ12	Connections from Induct. B Inverter board	To B0393-01
PZ8, PZ9, PZ10, PZ13	Connections to Induct. A Inverter board	To B0397-02
PZ14, PZ15	Bus connection for aux. power supply	To B0397-02
RN1, RN2, RN3	Bus connection to Boost & BC power board	To B0398-01

Tab. 13

6.4 INDUCTORS INVERTER BOARDS (B0393 / B0397)

Version:
B0393-01 Inductors B inverter board for 60 kVA
B0397-02 Inductors A inverter board for 60 kVA

In this board there are:

1. Inverter chokes (two per phase);

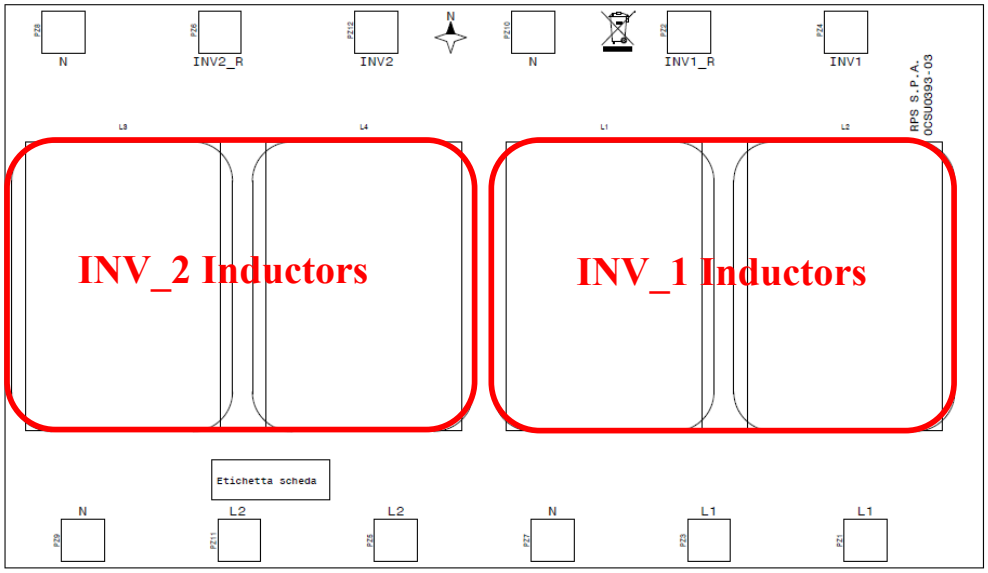


Fig. 15

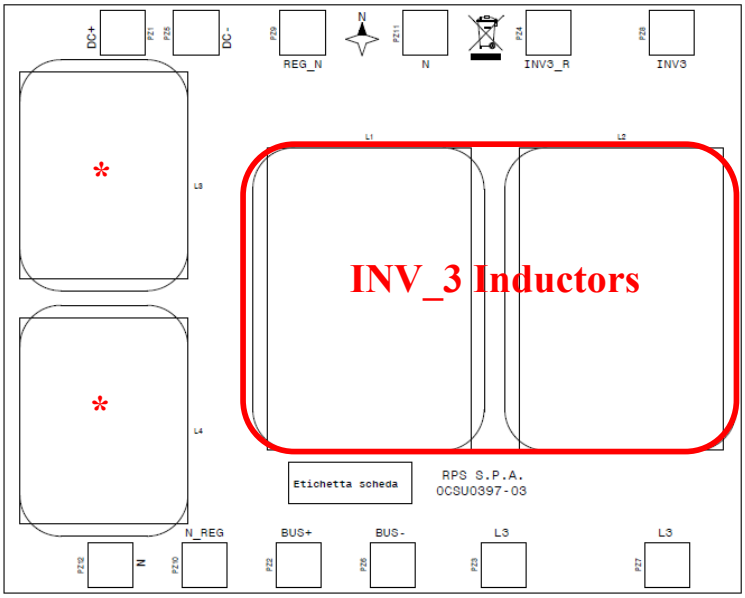


Fig. 16

* L3 and L4 are not installed.

6.5 AUX. POWER SUPPLY BOARD (B0394)

Version:
B0394-01 Aux. Power Supply Board for 60 kVA

In this board there are:

1. Auxiliary power supply section (Flyback);
2. Step-down section for relays;
3. Cold start section.

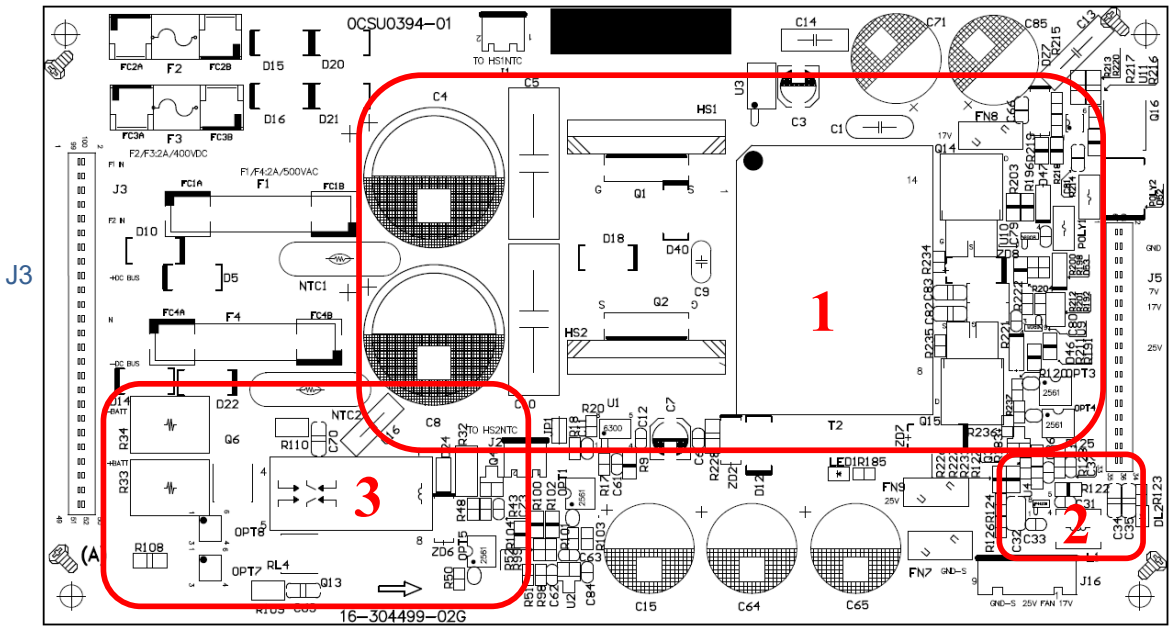


Fig. 17

Auxiliary power supply generates 17V (general), 25V (regulated) for fans.

Connector	Description	Note
J16	Connector to Inverter power board	To J13 of B0392-02
J3	Connector from Output board	From J7 of B0395-03
J5	Connector from Output board	From J6 of B0395-03

Tab. 14

Pinout connectors:

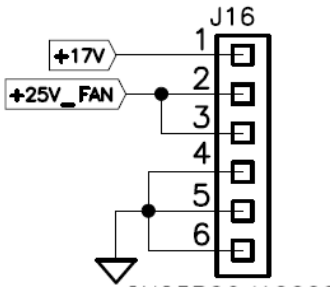


Fig. 18

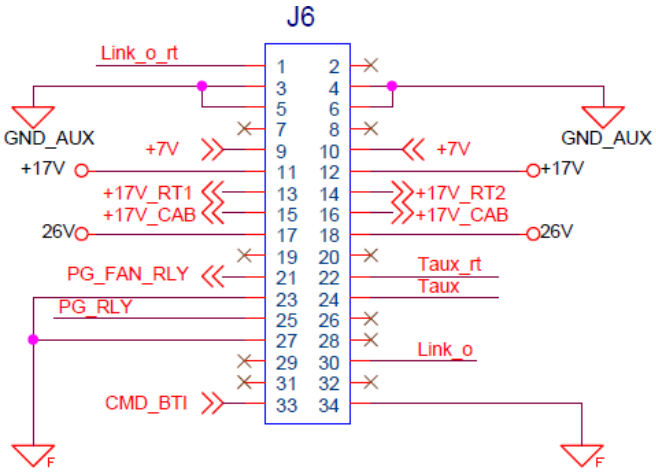


Fig. 19

6.6 OUTPUT BOARD (B0395)

Version:
B0395-03 Output Board for 60kVA

In this board there are:

1. Inverter AC capacitors;
2. Inverter Current sensors;
3. Inverter output relays;
4. Inverter fuses;
5. Precharge network (RL4 and RL5 from mains, Q5, Q9 and Q11 from battery);
6. Precharge resistors.

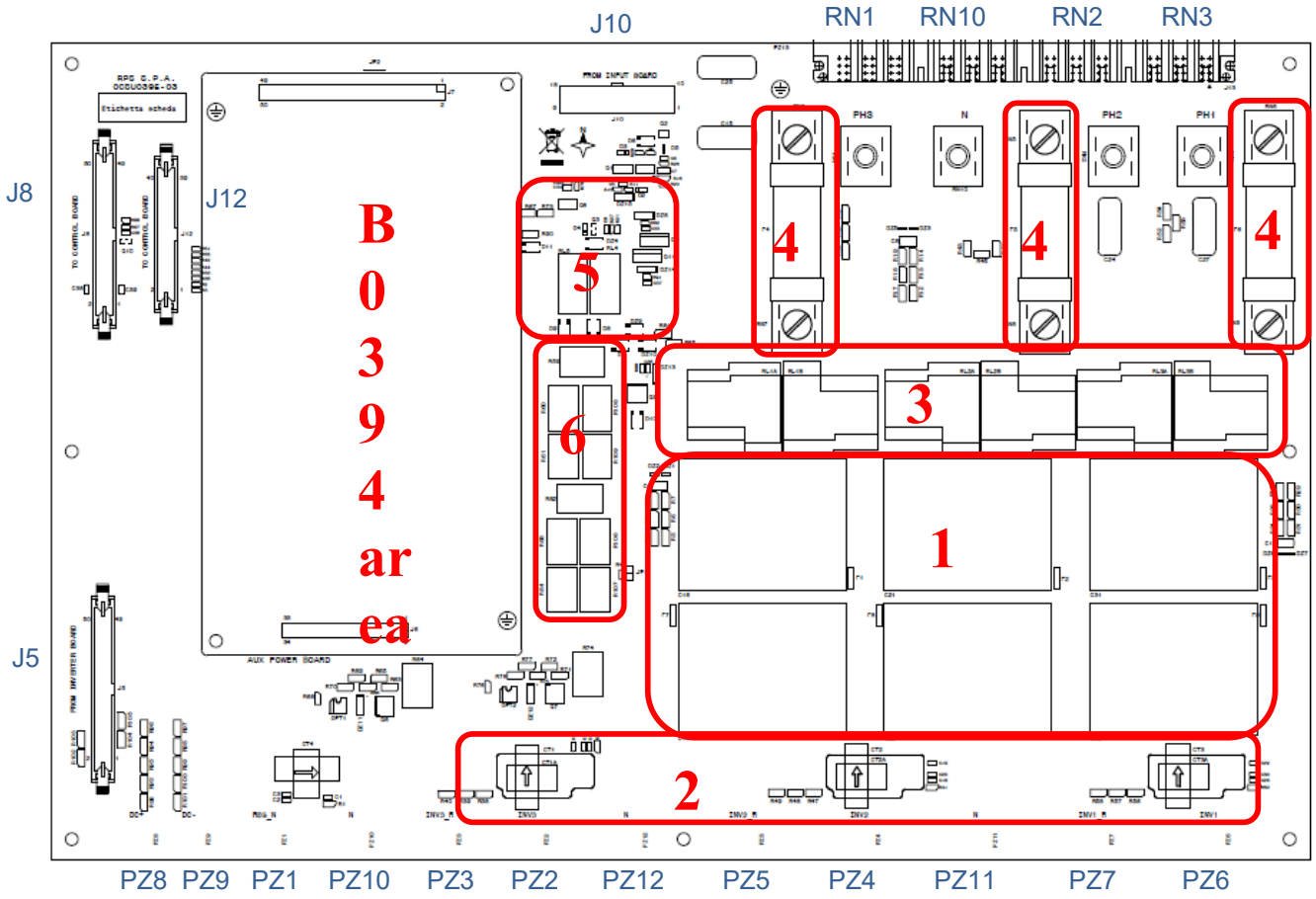


Fig. 20

Connector	Description	Note
J5	Flat connector to Inverter power board	To J11 of B0392-02
J8	Flat Connector from Input board	From J7 of B0400-02
J12	Flat Connector from input board	From J6 of B0400-02
J10	Connector from Input and bypass board	From J5 of B0400-02 and from J4 and J14 of B0411-01

PZ4, PZ5, PZ6, PZ7, PZ11, PZ12	Connections from Induct. B Inverter board	From B0393-01
PZ1, PZ2, PZ3, PZ10	Connections Induct. A Inverter board	From B0397-02
PZ8, PZ9	Bus connection for Aux. power supply board	From B0397-02
L1 (RN3)	Power connector to SWOUT	Phase 1
L2 (RN2)	Power connector to SWOUT	Phase 2
L3 (RN1)	Power connector to SWOUT	Phase 3
NOUT (RN10)	Power connector to SWOUT	Neutral

Tab. 15

Pinout connectors:

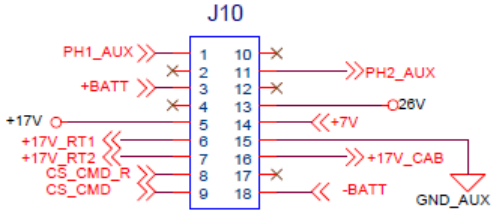


Fig. 21

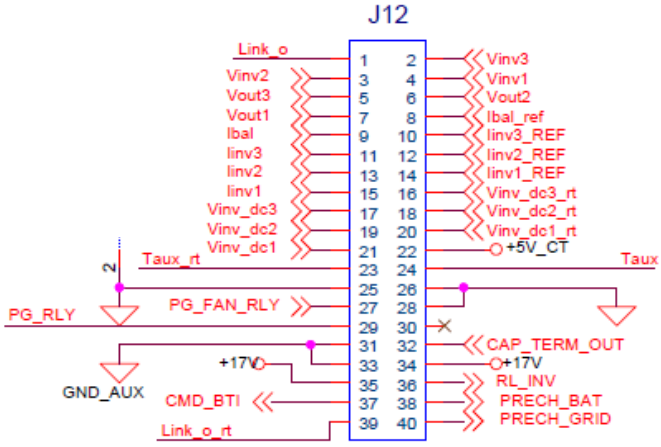


Fig. 22

6.7 BOOST & BC POWER BOARD (B0398)

Version:
B0398-01 Boost & BC Power Board for DS 60 kVA

In this board there are:

1. PFC ph.1 / BATTERY BUCK/BOOST heatsinks;
2. PFC ph.2 / BATTERY BOOST 2 heatsinks;
3. PFC ph.3 / BATTERY BOOST 3 heatsinks;
4. DC LINK electrolytic capacitors.

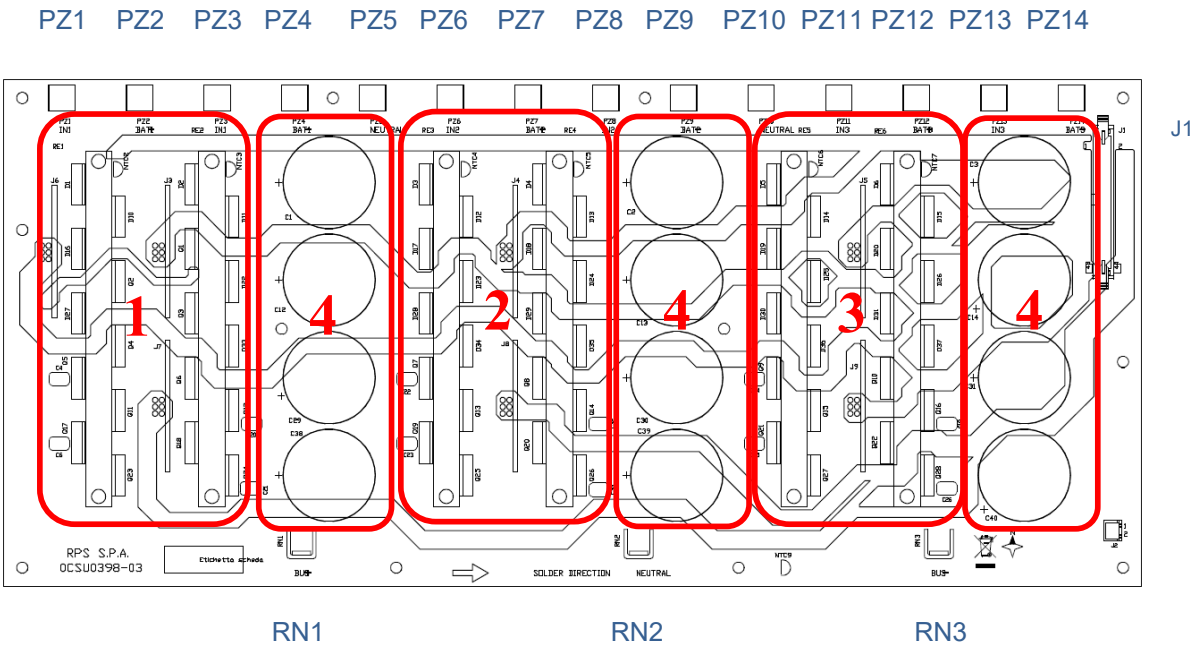


Fig. 23

Connector	Description	Note
J1	Flat connector from Input board	From B0400-02

PZ3 ÷ PZ9	Connections from Induct. PFC-boost board	From B0404-01
PZ10 ÷ PZ16	Connections from Induct. PFC-boost board	From B0403-01

Tab. 16

6.8 INPUT BOARD (B0400)

Version:
B0400-02 Input Board for 60 kVA

In this board there are:

1. Input fuses;
2. Input relays;
3. Input AC capacitors;
4. Battery capacitors;
5. Battery fuses;
6. Battery relays;
7. Current sensors.

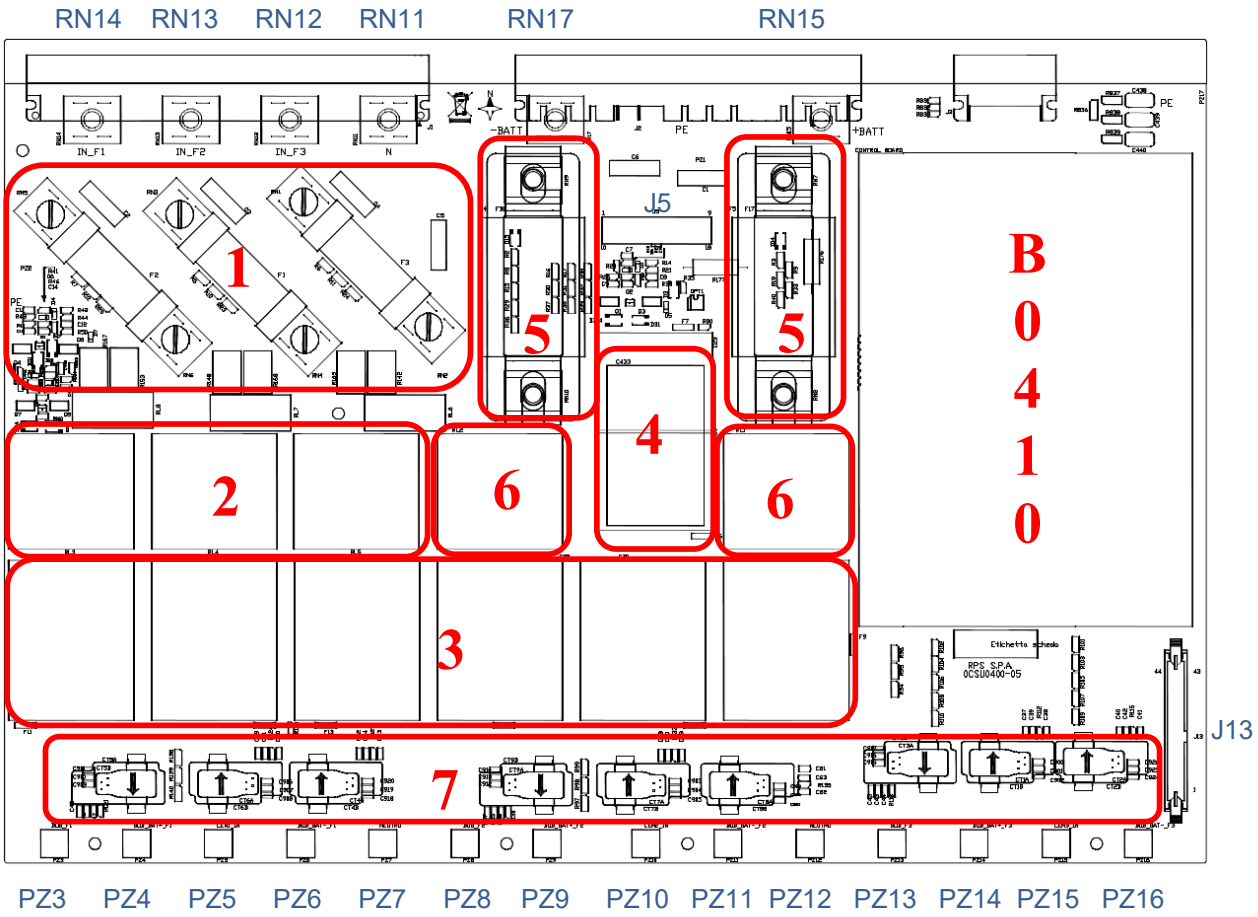


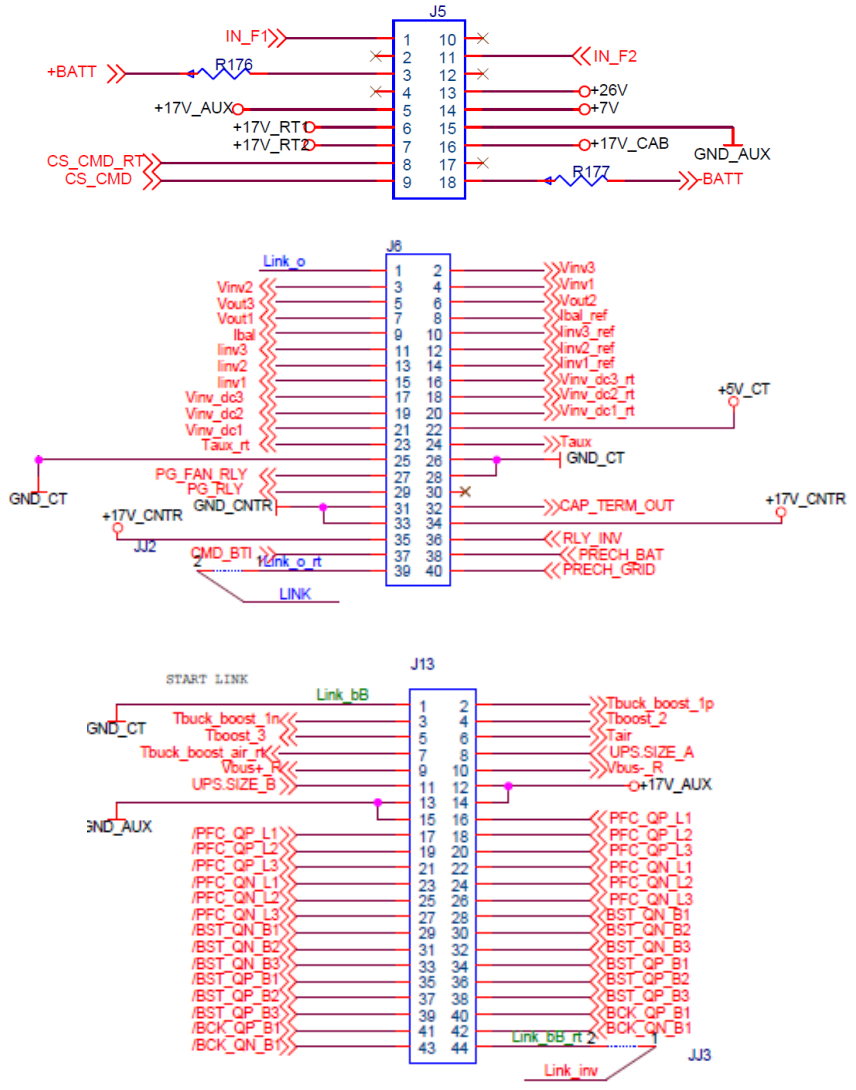
Fig. 24

Connector	Description	Note
J5	Connector to Output board and Bypass Board	To J10 of B0395-03 and to J3 of B0411 (there are 4 wires to supply the B0394 and other 4 wires with the DC voltages generated on it)
J6	Flat Connector from Output board	From J12 of B0395-03
J7	Flat Connector from Output board	From J8 of B0395-03
J13	Flat Connector to Boost & BC power board	To J1 of B0398

IN_F1 (RN14)	Connection from SWIN	Phase 1
IN_F2 (RN13)	Connection from SWIN	Phase 2
IN_F3 (RN12)	Connection from SWIN	Phase 3
N (RN11)	Connection from SWIN	Neutral
+BATT (RN15)	Connection from SWBATT	
-BATT (RN17)	Connection from SWBATT	
PZ3 ÷ PZ9	Connections to Induct. B PFC-boost board	To B0404-01
PZ10 ÷ PZ16	Connections to Induct. A PFC-boost board	To B0403-01

Tab. 17

Pinout connectors:



6.9 INDUCT. PFC-BOOST BOARDS (B0403 / B0404)

Version:
B0403-01 Induct. A PFC-Boost Board for 60 kVA
B0404-01 Induct. B PFC-Boost Board for 60 kVA

In this board there are:

1. Input inductors (two per phase);
2. Battery inductors.

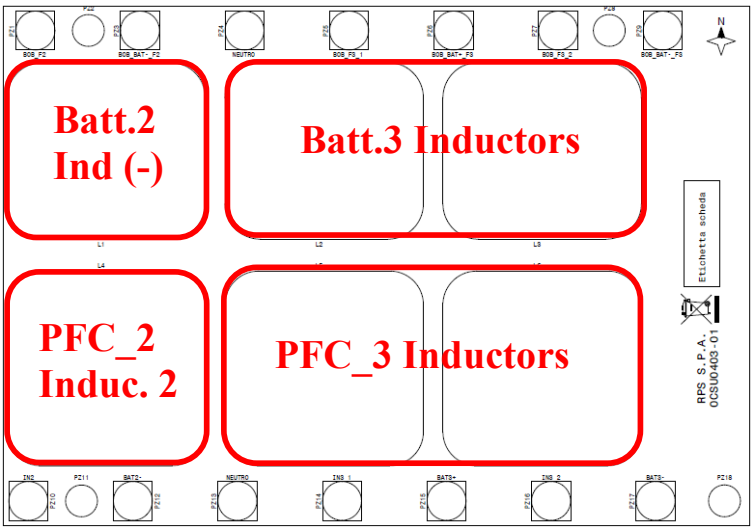


Fig. 25

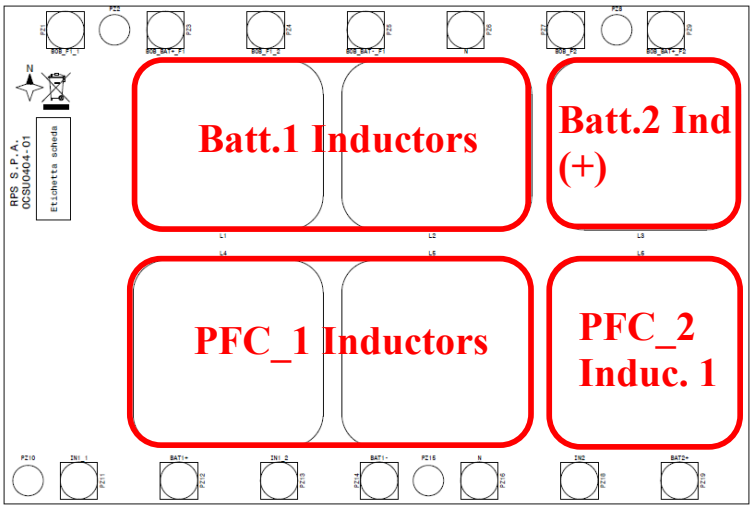


Fig. 26

6.10 SIGNAL ADAPTER BOARD (B0410)

Version:
B0410-01 Signal adapter board for 60 kVA

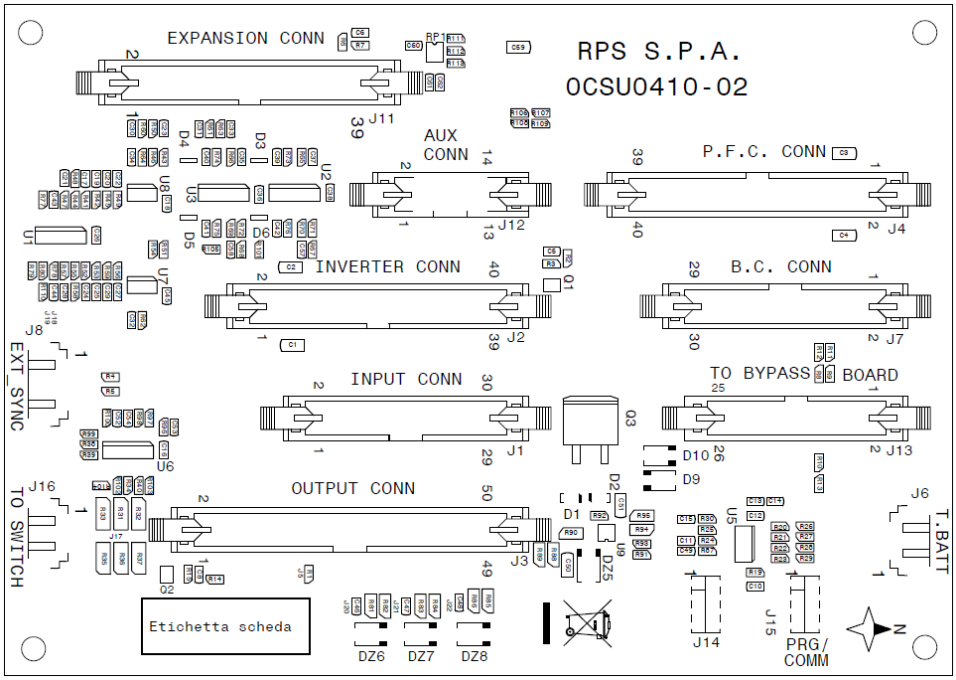


Fig. 27

Connector	Description	Note
J9	Board to board Connector for B0400 (bottom side)	From J12 of B0400-01
J10		From J10 of B0400-01
J1	Flat connector to Control Board	To J5 of B0275-02
J2		To J3 of B0275-02
J3		To J12 of B0275-02
J4		To J2 of B0275-02
J7		To J1 of B0275-02
J11		To J7 of B0275-02
J12		To J13 of B0275-02
J13	Flat connector to Bypass Board	To J4 of B0411-01
J6	To klixon of transformer (only OT version)	-
J8	To terminal blocks	-
J16	To Switch auxiliary contacts	-

Tab. 18

6.11 BYPASS BOARD (B0411)

Version:
B411-01 Bypass Board for 60 kVA

In this board there are:

1. Redundant Auxiliary power supply section (Flyback);
2. Cold start command;
3. Bypass fuse;
4. Bypass Thyristor connections;
5. Bypass Fan fuse;

Redundant power supply section generates 18V_R for the bypass line and supplies also the Control Board in case of aux. power supply failures (B0394).

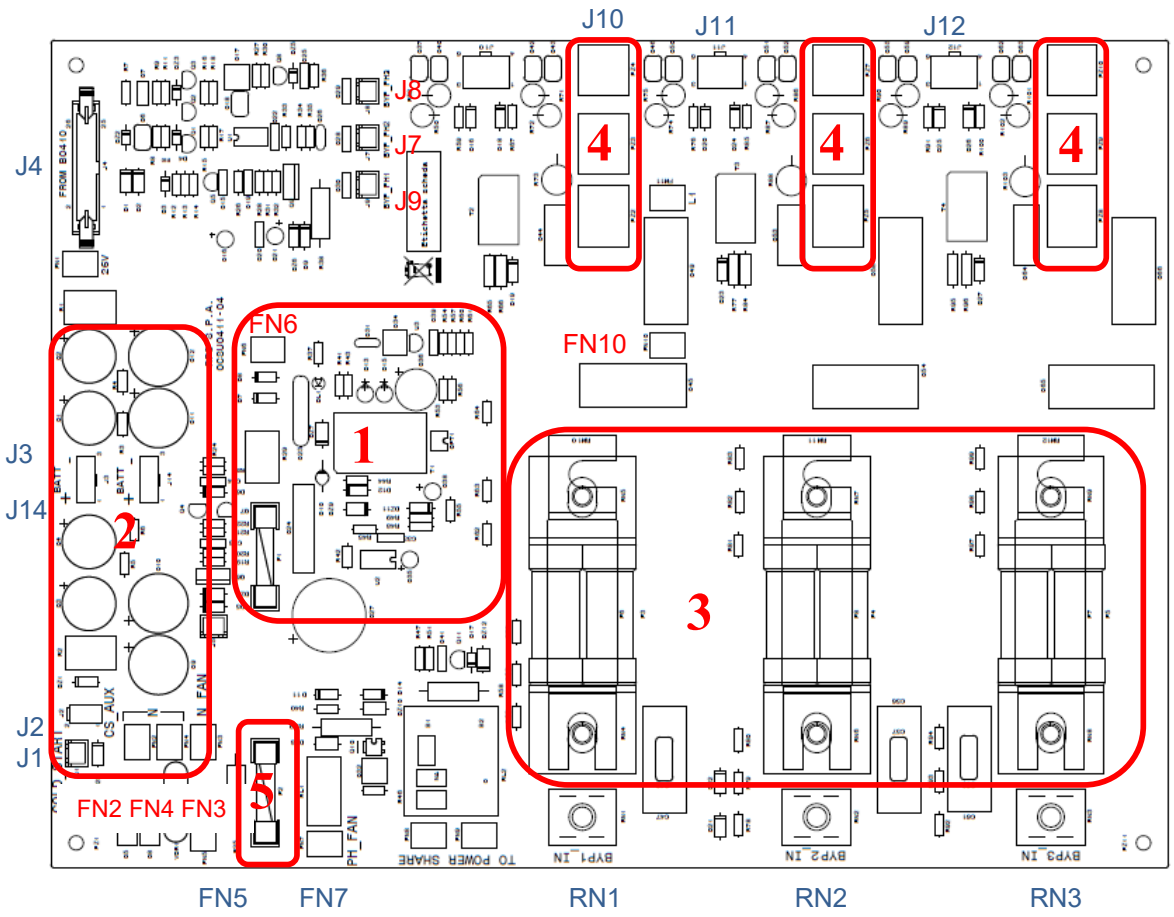


Fig. 28

Connector	Description	Note
J1	Connector from Cold Start SW	
J2, J3, J14	Cable for Cold Start command	From J5 of B0400-02 to J10 of B0395-03
J4	Flat Connector from Signal adapter board	From J13 of B0410-01
BYP_PH1 (J9)	Connectors from TA	-
BYP_PH2 (J7)	Connectors from TA	-
BYP_PH3 (J8)	Connectors from TA	-
J10, J11, J12	Thyristor driver cable connectors	-

FN6	Power connector from Input board	From RN14 of B0400-02

FN3, FN7	Line and Neutral to bypass heatsink fan	-
FN4	Neutral from SWBYP	-
FN5	Earth connector	From PZ of B0288-01
BYP1_IN (RN1)	Power connection from SWIN/SWBYP	PH1 Bypass line
BYP2_IN (RN2)	Power connection from SWIN/SWBYP	PH2 Bypass line
BYP3_IN (RN3)	Power connection from SWIN/SWBYP	PH3 Bypass line

Tab. 19

Pinout connectors:

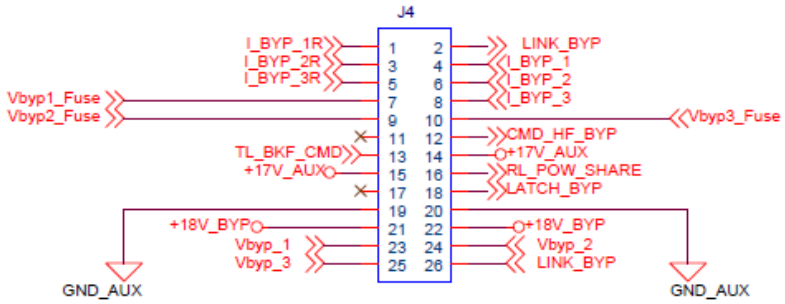


Fig. 29

6.12 LED LOGO RPS BOARD (B0305)

Version:
B0305-01 Led Logo RPS board for 60 kVA

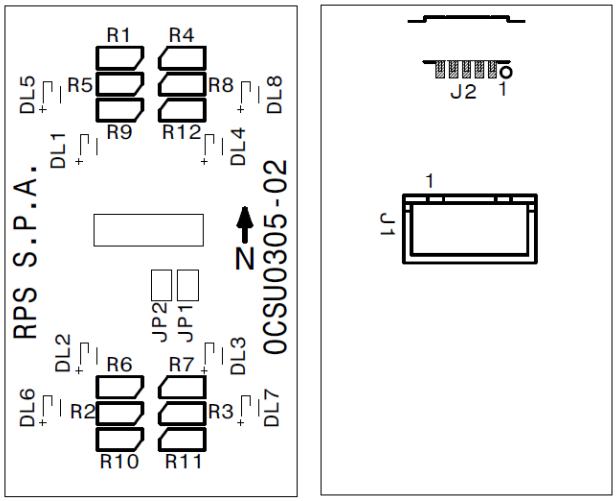


Fig. 30

Connector	Description	Note
J2	Connection to Display board	To J4 of B0306-01
J1	Arrangement for the connection to J4 of B0306	NOT USED

Tab. 20

6.13 LED NEUTRAL BAR BOARD (B0322)

Version:
B0322-01 Led Neutral bar board for 60 kVA

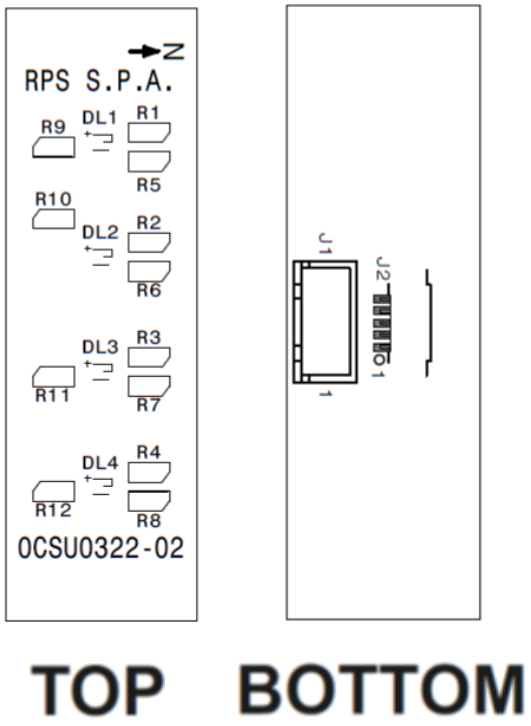


Fig. 31

Connector	Description	Note
J2	Connection to Display board	To J4 of B0306-01
J1	Arrangement for the connection to J4 of B0306	NOT USED

Tab. 21

6.14 DISPLAY BOARD (B0306)

Version:
B0306-01 Display board for 60 kVA

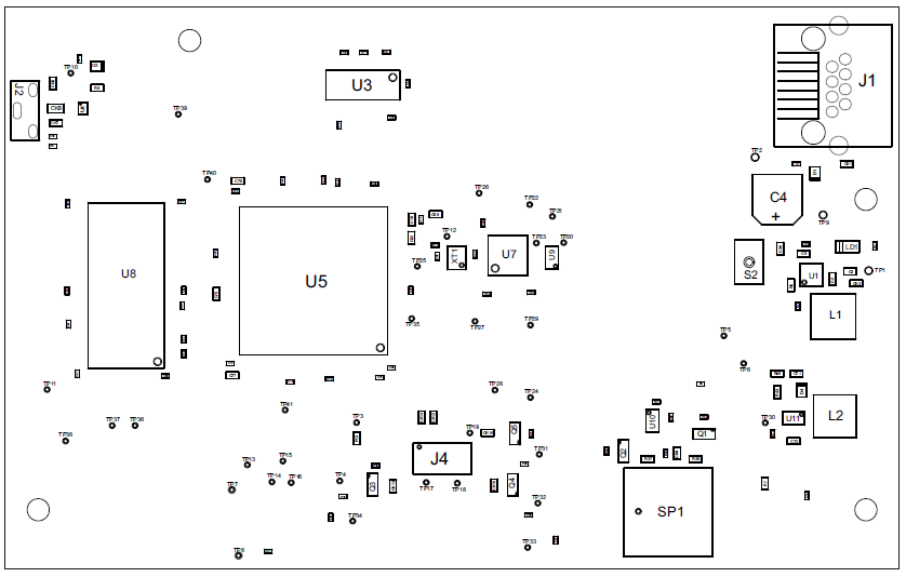


Fig. 32

Connector	Description	Note
J1	Connector UPS-display	RJ45
J2	Micro-USB connector	
J4	Connection from RPS logo board	From J2 of B0305-01

Tab. 22

6.15 FILTER CY BOARDS

6.15.1 FILTER CY BOARD (B0288)

Version:
B0288-03 Input filter CY board for 60 kVA
B0288-02 Output filter CY board for 60 kVA

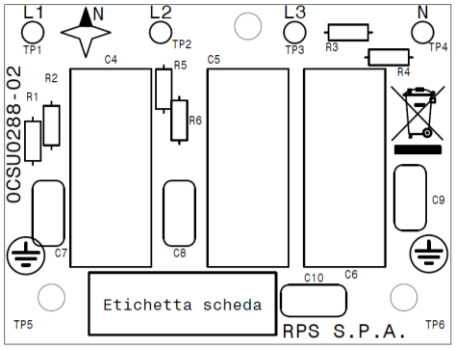


Fig. 33

6.15.2 BATTERY FILTER CY BOARD (B0390)

Version:
B0390-03 Battery filter CY board for DS 60 kVA

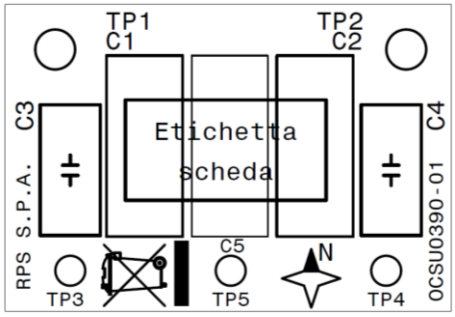


Fig. 34

6.15.3 FILTER Cx IN BOARD (B0435)

Version:
B0435-01 Filter Cx IN board for DS 60 kVA

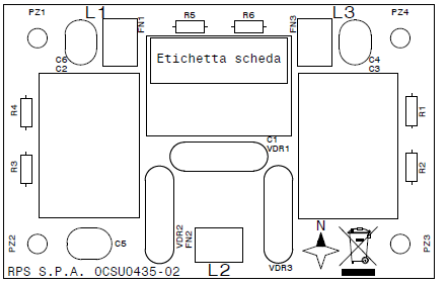


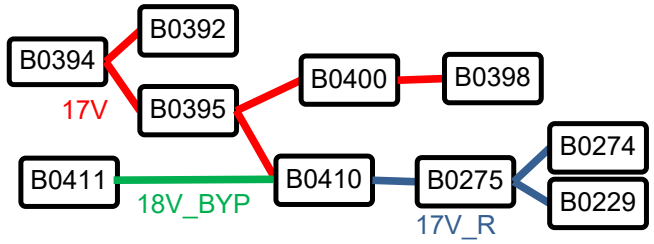
Fig. 35

7 FOCUS ON THE AUXILIARY POWER SUPPLY

The Auxiliary power supply board (B0394) takes the power from four different sources:

- Phase 1 and Phase 2 of the input mains power;
- Direct current from the DC capacitor bank;
- Battery voltage when the UPS is turned on from battery.

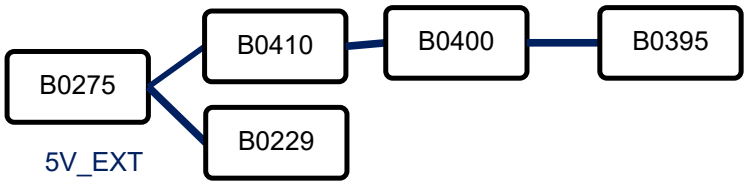
The board B0394 generates the **17V** to supply the different sections of the UPS, besides the 25V for the fans.
From the B0394 the 17V directly supplies the Inverter power board (B0392) and the Output (B0395).
On the Bypass board (B0411) there is a redundant flyback that supplies some specific boards in case of a failure of the auxiliary power supply situated on the B0394 to guarantee power to the load and the communication. The redundant flyback generates the "18V_BYP" (see the 7.1 Power supply scheme). The voltage resulting from the 17V or 18V_BYP is called "**17V_R**".
The schematic below shows the 17V and the 17V_R path:



In case of an auxiliary power supply failure, the PFC and the inverter stop to work, but the logic and the communication still work by the redundant flyback on the B0411 in order to supply the load with the bypass.

The isolated supplies for the inverter and boost drivers are generated on each single B0389 (driver boards) that are directly soldered on the two power boards B0392 and B0398.

The Control board (B0275) generates the 5V (or **5V_EXT**) starting from the 17V_R of the B0410.
The 5V supplies the logic and all current sensor LEMs.



OTHER POWER SUPPLIES:

- **B0394:** a **7V** Buck for the command circuit relays is supplied from the 25V (see the 7.1 Power supply scheme).
- **B0274:** the Communication board (B0274) has a **5-12V** flyback for the SELV supplies (for the display, the USB and the R.E.P.O.) and a redundant supply only for the R.E.P.O. in case of a 5-12V flyback failure.

For more power supply details refer to the Power supply scheme in the next page.

7.1 POWER SUPPLY SCHEME

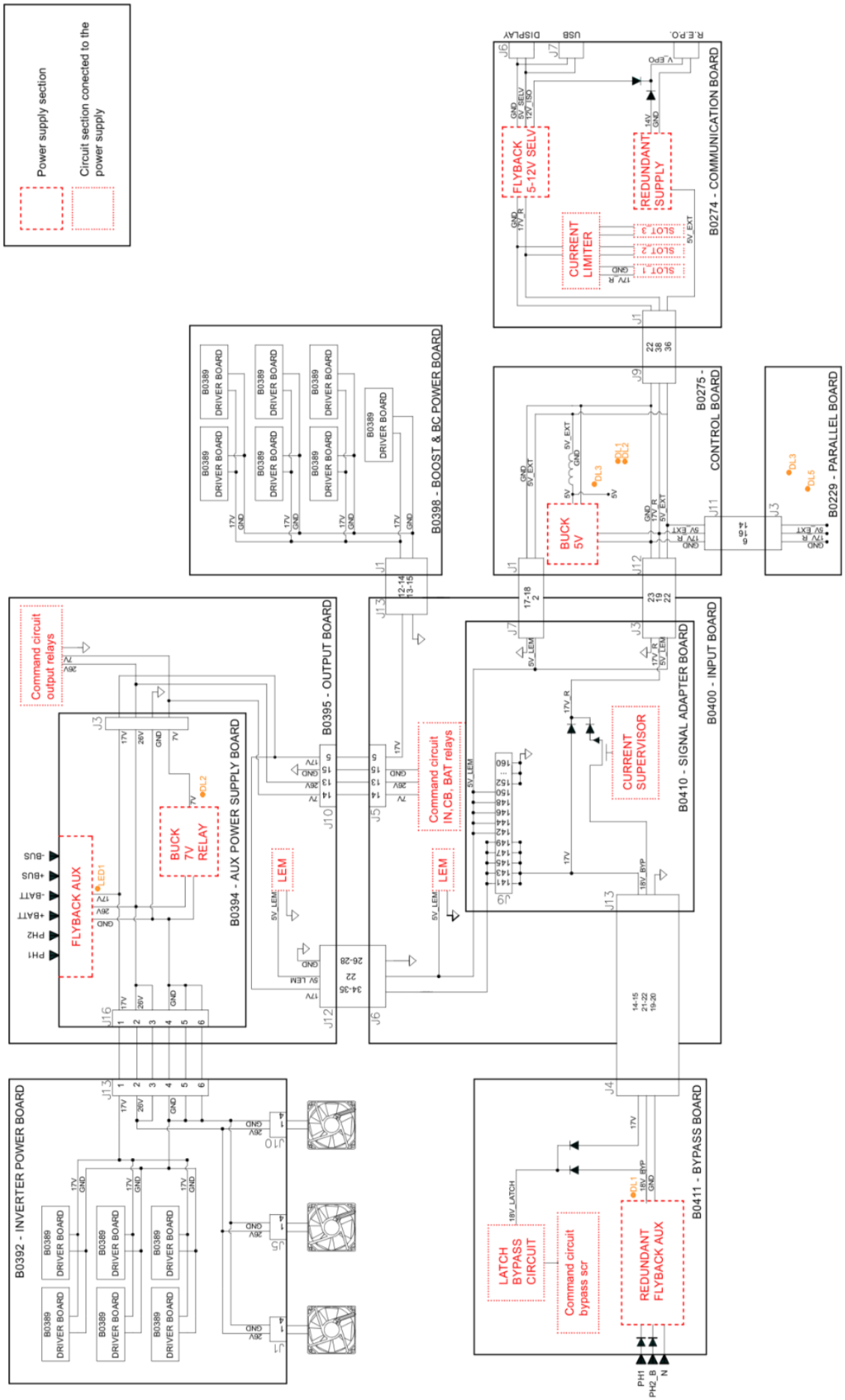


Fig. 36

7.2 AUXILIARY POWER FAULT (L01) DETECTION LOGIC

Below the list of the check involved in the detection of the lock L01.
In case of failure at least one of these checks, the logic displays the lock L01 and latches the load onto the bypass line.

7.2.1 INVERTER DRIVER and OUTPUT CURRENT SENSORS

- PG_INV_CTO: it checks the presence of the 17V power supply on B0392 and the presence of 5V on B0395 to supply LEMs.

In case of an error at this point, it is necessary to check the cable between B0394 and B0392,or check the correct connection of the flat cable between B0400 and B0395.

7.2.2 MAIN FLYBACK and STEP- DOWN 7V for RELAIS

On B0394 board there are two checks:

- PG_RLY: is a 7V check from output buck (step down for relays).
  The operating status can be easily checked by **DL2** (led ON→ 7V_OK / led OFF→ 7V_NOT_OK);

- PG_FAN_RLY: is a 26V check from output main Flyback.
  The operating status can be easily checked by **LED1** (led ON → Main Flyback is OK / led OFF→ Main Flyback is NOT_OK);

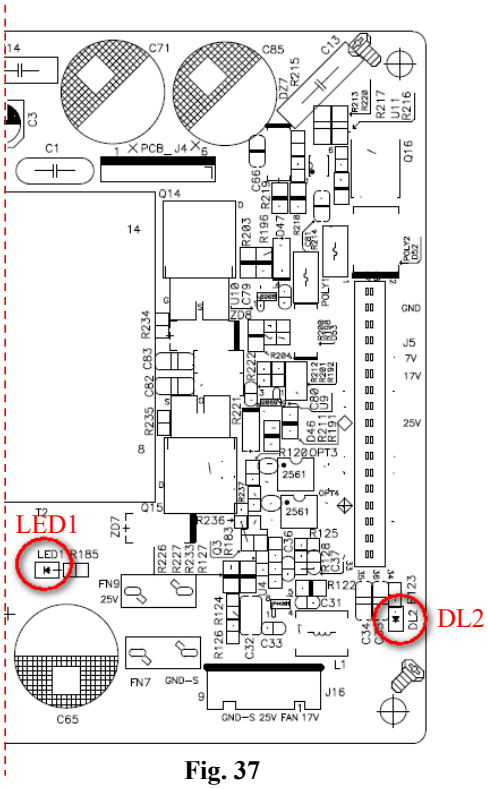


Fig. 37

7.2.3 17V_R and 5V_EXT

- 18V_OK_FPGA: 17V_R input check for the Control board (B0275). In case of a wrong check, the DSP can lock the load onto the bypass before losing the mains (bypass latch).

Note: only the 5V can be checked with the **DL3** status led (Led ON→ +5V_OK / Led OFF→ +5V_NOT_OK).

In addition, there are two signaling LEDs (DL1 and DL2) which give more information:
Synchronous flashing: the UPS has latched the load on bypass.
Alternating flashing: the code is running in FPGA and DSP

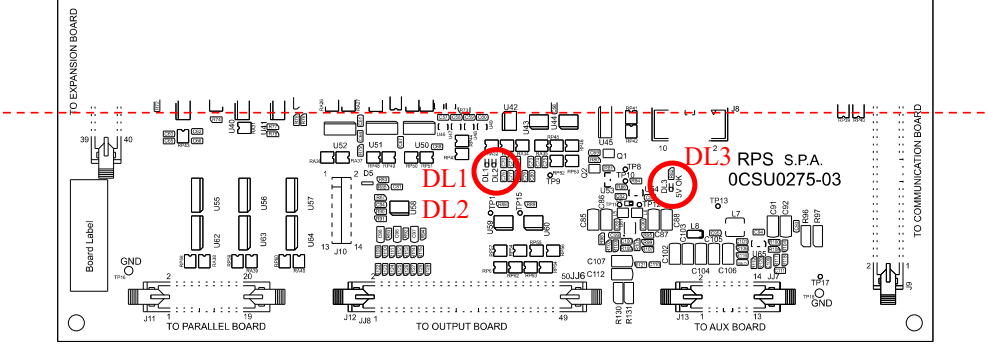


Fig. 38

7.2.4 REDUNDANT FLYBACK CONVERTER

On Bypass board a Flyback converter generates the redundant power supply for the UPS logic.
Its proper operation is verified by a circuit on B0410 (PWR_GOOD_BY).
On B0411 (Bypass Board) is possible to verify the redundant flyback status by **DL1** (led ON→ 18V_OK / led OFF→ 18V_NOT_OK).

> **Attention!** In case of negative test result, for a fault of the flyback, the UPS **doesn't display L01** but a FAULT. The UPS doesn't lock: the system works perfectly by the Aux power supply board's flyback (board B0394).

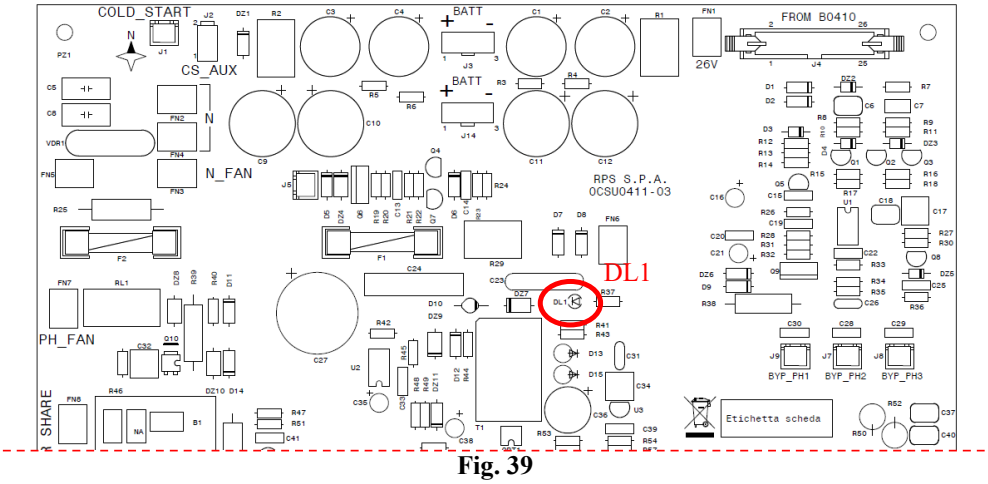


Fig. 39

7.2.5 PARALLEL BOARD B0229 – OPTIONAL

- PAR_AUX_OK: It's a check for the isolated power supply for the parallel board. If the signal par_aux_ok is not correct, the parallel board is self-isolated by the UPS.
  The operating status of the supplies on the Parallel board can be easily checked by **DL3** and **DL5** (led ON→ B0229_OK / led OFF→ B0229_NOT_OK).

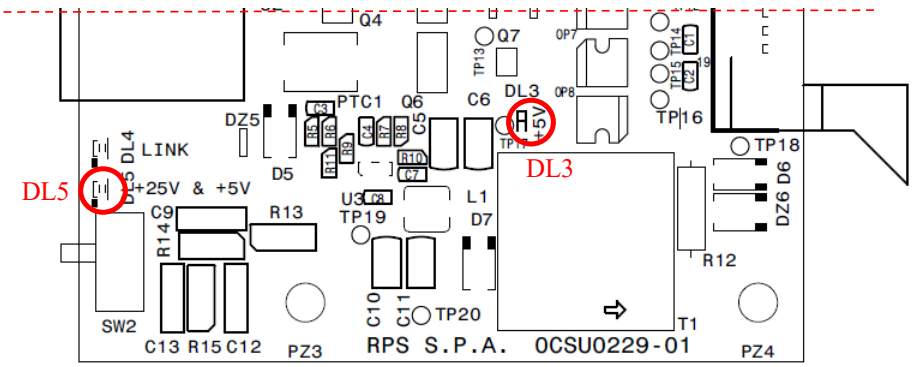


Fig. 40

7.3 LATCH ON BYPASS

Every power supply failure involves some procedures to avoid losing the load, which differ in case of the UPS is stand-alone or in a parallel system operation.

7.3.1 STAND-ALONE UPS

In case of a 5V failure of the Control board (B0275), there is an *automatic latch on bypass:* the power section of the UPS is turned off, but the load is supplied. The communication DSP-Display is lost, the display turns grey and it isn't possible to do any procedures by the display.
During the Power ON of the UPS the display still on "*Starting……*".

For the other power supplies failure, the logic still alive (by the redundant flyback) and in this case the DSP can decide when do the latch on bypass. The UPS continues to communicate.

7.3.2 PARALLEL SYSTEM OF UPS

In case of a 5V failure of the Control board (B0275), the UPS involved isolated completely itself avoiding the latch on bypass: communication stops with the other UPS, it is not possible to supply the load of the entire parallel with the UPS on bypass.
In the other case, the power section is turned off, but the communication on the CANBUS still operate for the bypass call request.

7.4 FANS SPEED

The UPS is provided by three fans, they are controlled by a PWM signal directly from FPGA.
The δ (duty-cycle) is regulated based on the maximum temperature of the heatsinks located on the power boards.
Each fan return to DSP a frequency variable square wave to give its speed feedback.
Below the fans speed graph based on the temperature:

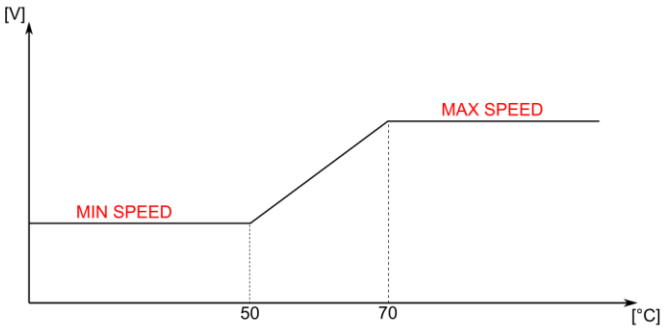


Fig. 41

Important: in case of UPS overload, more precisely **LOAD > 103%**, the fans reach the maximum speed regardless the temperature values.

8 CABLE CONNECTION CHECK ON B0275-01 (L02 LINK FAIL)

The Control board (B0275) is provided by connectors with external pinout. This allows to check the cable connections, between B0275 and B0410, directly using the pins dedicated for the link signal. In the picture below is reported all the tracks about the “Link Fail” indication:

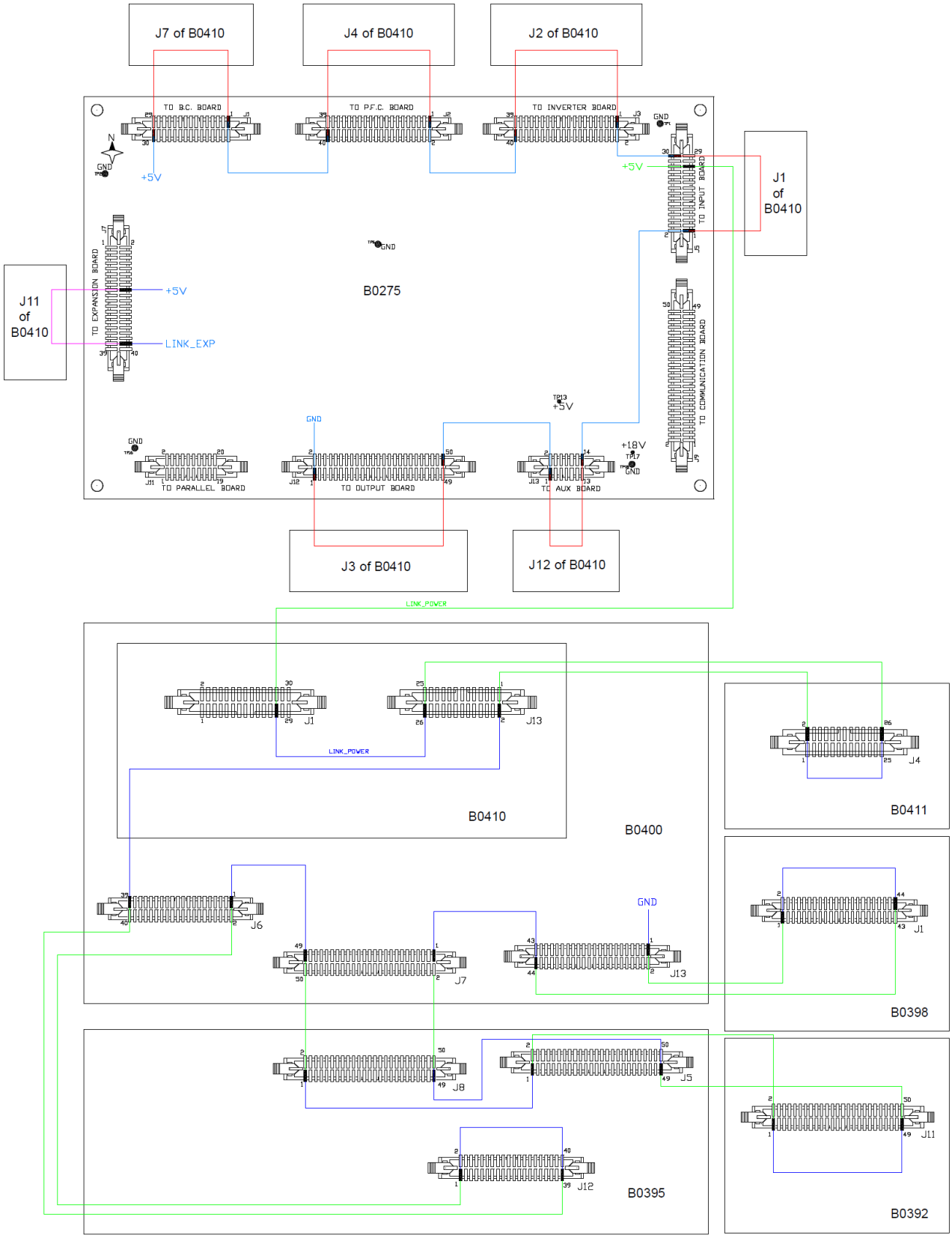


Fig. 42

In case of L02 alarm, the first step is to check the continuity signal on the Control board B0275-01 using a multimeter, with the probes between J1 – Pin30 ➔ J12 – Pin1 (see Fig. 42), and between J7 – Pin 38 ➔ J7 – Pin 18 (LINK_EXP).

If the test gives positive result, it means that the flat cables on B0275 and B0410 are connected correctly.

The L02 alarm can also appear due to a problem on connection of flat cables between the power boards. In the image below it's possible to view the path of the LINK_POWER signal to find the problem on the connection.

Using a multimeter, with the probes between J5 – Pin25 (B0275) ➔ J13 – Pin1 (B0400) (see Fig. 42).

The L02 alarm does not include the Communication board (B0274) of the UPS.

9 CHECK OF THE POWER COMPONENTS

1) Open all disconnecting switches.

2) **IMPORTANT:** completely disconnect the UPS from any power supply, including any battery cabinets, other UPS in parallel or other power sources. Make sure there is no voltage present.

3) Discharge the DC capacitor bank and wait 10-15 minutes for the voltage in the bank to reach a level close to 0V.

9.1 PFC AND BATTERY STAGE CHECK (B0398 BOOST & BC POWER BOARD)

Using a multimeter is possible to check the conditions of every PFC stage and the battery stage as explained below.

9.1.1 BATTERY POWER STAGE CHECK

For this check is not necessary to remove the board. It is enough to point on the electrical connection screws of B0398.
Check all the diodes: they should not be in short circuit or completely open.

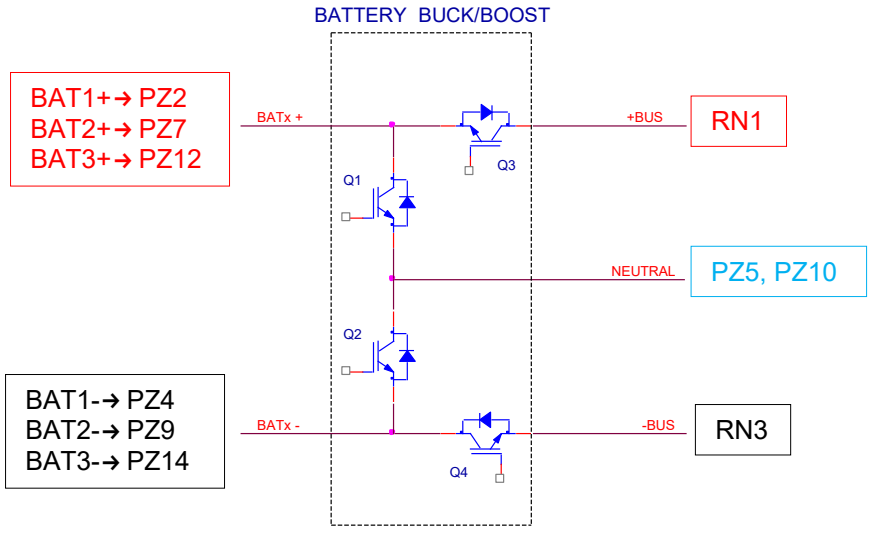


Fig. 43

For example, referring to the scheme above to test Q2 of BATTERY BOOST 2 point on:

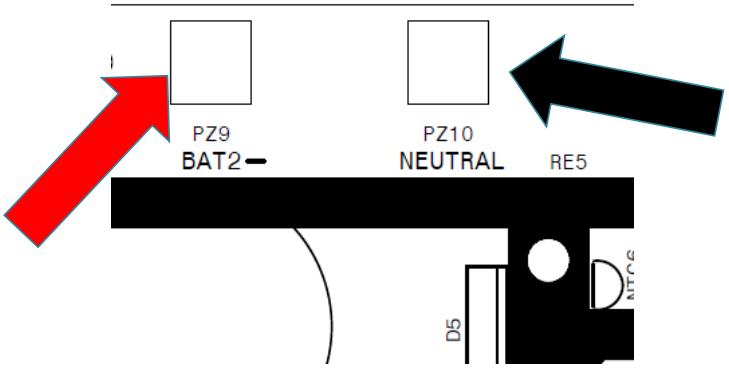


Fig. 44

In the table below you can find all the points to test each device of each BATTERY BOOST STAGE:

DIODE	PINOUT			Vf(*)
	Boost1	Boost2	Boost3	
Q1	NEUTRAL ↔ PZ2	NAUTRAL ↔ PZ7	NEUTRAL ↔ PZ12	0.41
Q2	PZ4 ↔ NEUTRAL	PZ9 ↔ NEUTRAL	PZ14 ↔ NEUTRAL	0.41
Q3	PZ2 ↔ RN1	PZ7 ↔ RN1	PZ12 ↔ RN1	0.38
Q4	RN3 ↔ PZ4	RN3 ↔ PZ9	RN3 ↔ PZ14	0.38

Tab. 23

(*) Diode voltage measurements have a tolerance range of ±0.15V: beyond this range it means a module fault. In this case it is necessary to replace the board.

9.1.2 PFC POWER STAGE CHECK

You need to remove and overturning this board for the stage check.
Check all the diodes: they should not be in short circuit or completely open.

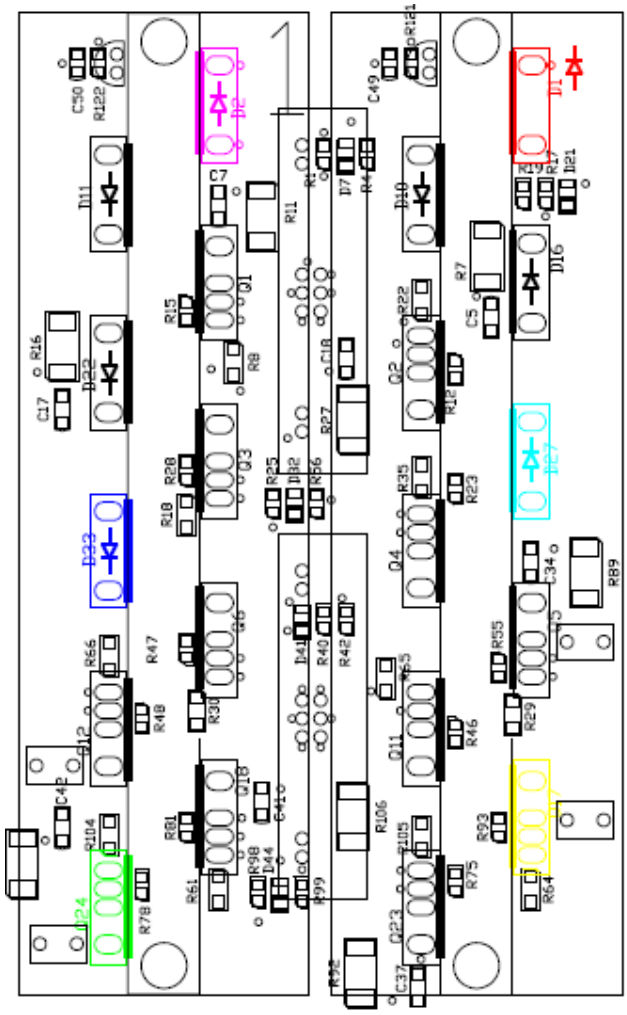


Fig. 45 – single phase

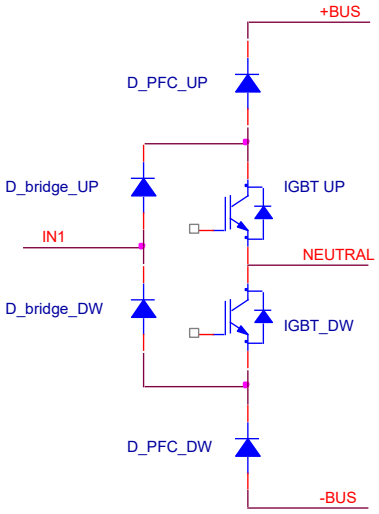


Fig. 46
Circuit scheme

The PFC phases has the same layout, to test the components follow the colour association table below by referring to the image on the left:

Component	COLOR	Vf(*)
D_bridge_UP	RED	0.38
D_bridge_DW	PINK	0.38
D_PFC_UP	CIAN	0.48
D_PFC_DW	BLU	0.48
IGBT_UP	YELLOW	0.48
IGBT_DW	GREEN	0.48

Tab. 24

(*) Diode voltage measurements have a tolerance range of ±0.15V: beyond this range it means a module fault. In this case it is necessary to replace the board.

The direction of the diode on the 4-pin IGBT is shown in the image opposite:

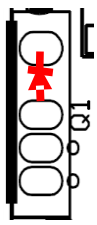


Fig. 47

9.2 INVERTER POWER STAGE CHECK – INVERTER POWER BOARD (B0392)

9.2.1 TOP SIDE OF THE BOARD

The picture below shows the pinout to check as a preliminary operation. With the UPS completely disconnected from any power supply, use a multimeter to check the conditions of every inverter stage. Check the diodes: they should not be in short circuit or completely open.

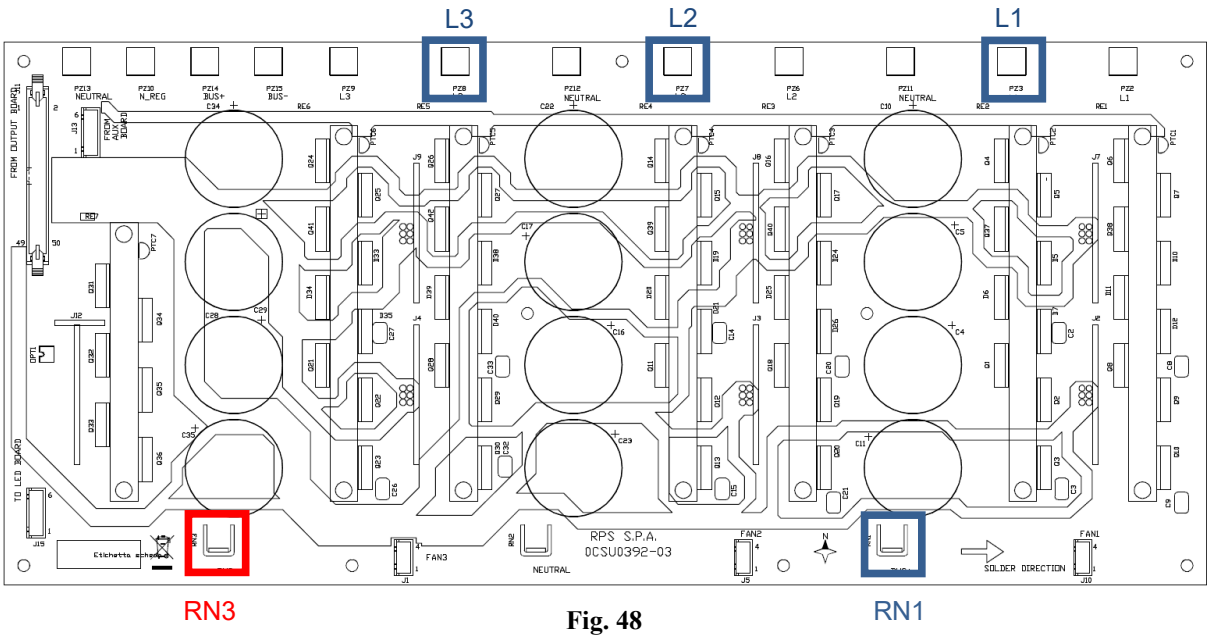


Fig. 48

B0392 board. Top side view

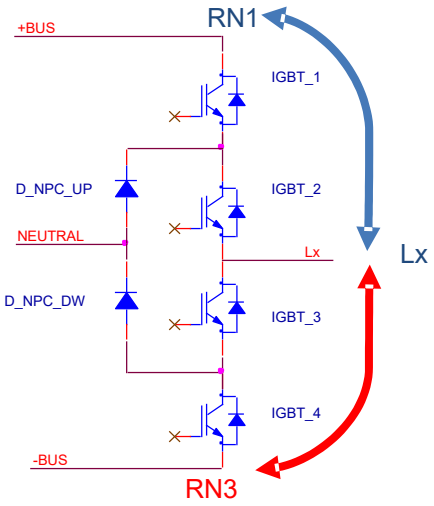


Fig. 49

PINOUT	DIODE	Vf(*)
RN1 ↔ L1	IGBT1 + IGBT2	0.76
RN3 ↔ L1	IGBT3 + IGBT4	0.76
RN1 ↔ L2	IGBT1 + IGBT2	0.76
RN3 ↔ L2	IGBT3 + IGBT4	0.76
RN1 ↔ L3	IGBT1 + IGBT2	0.76
RN3 ↔ L3	IGBT3 + IGBT4	0.76

Tab. 25

(*) Diode voltage measurements have a tolerance range of ±0.15V: beyond this range it means a module fault. In this case it is necessary to replace the board.

Attention! This is a preliminary test. If all the measures are good, you need to remove and overturning this board for the entire stage check.

9.2.2 OVERTURNED BOARD

This procedure verify the status of the remaining components and completes the check of the board. Use a multimeter to check the conditions of every inverter stage component. Check the diodes: they should not be in short circuit or completely open.

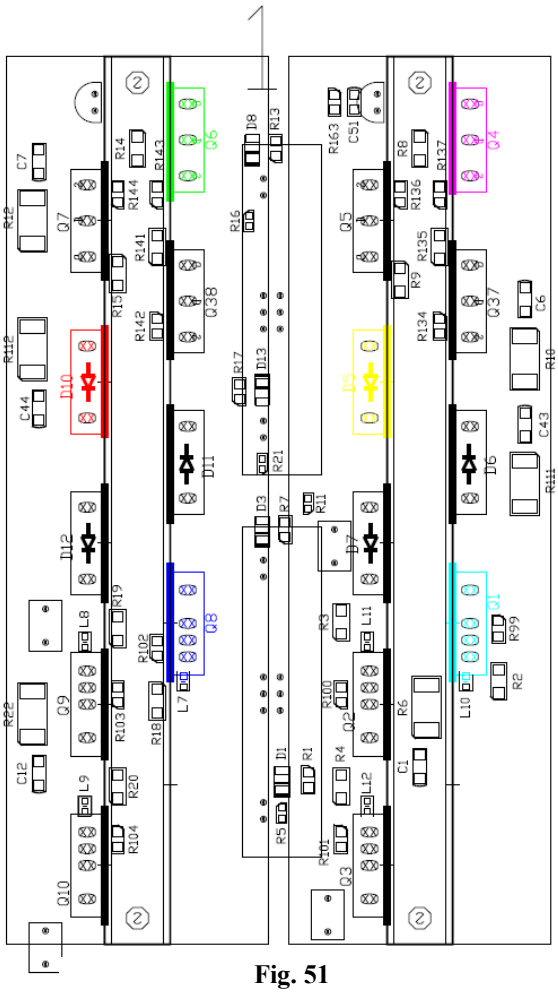


Fig. 51

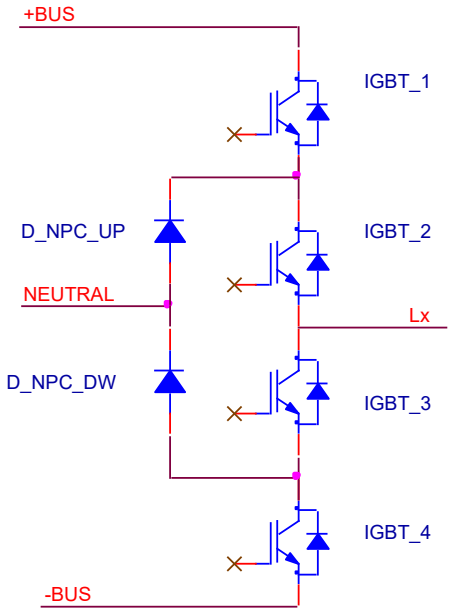


Fig. 50 – single phase
Circuit scheme

The Inverter phases has the same layout, to test the components follow the colour association table below by referring to the image on the left:

Component	COLOR	Vf(*)
D_NPC_UP	YELLOW	0.38
D_NPC_DW	RED	0.38
IGBT_1	CIAN	0.48
IGBT_2	PINK	0.48
IGBT_3	GREEN	0.48
IGBT_4	BLU	0.48

Tab. 26

(*) Diode voltage measurements have a tolerance range of ±0.15V: beyond this range it means a module fault. In this case it is necessary to replace the board.

The direction of the diode on 3-pins and 4-pins IGBT is shown in the images below:

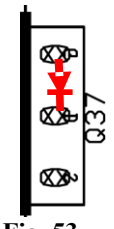


Fig. 53

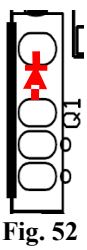


Fig. 52

9.3 SCR MODULE CHECK – OUTPUT & BYPASS BOARD (B0411)

The picture below shows the position of the three SCR modules on the board B0411. Use a multimeter to check the conditions of every SCR module as explained below.

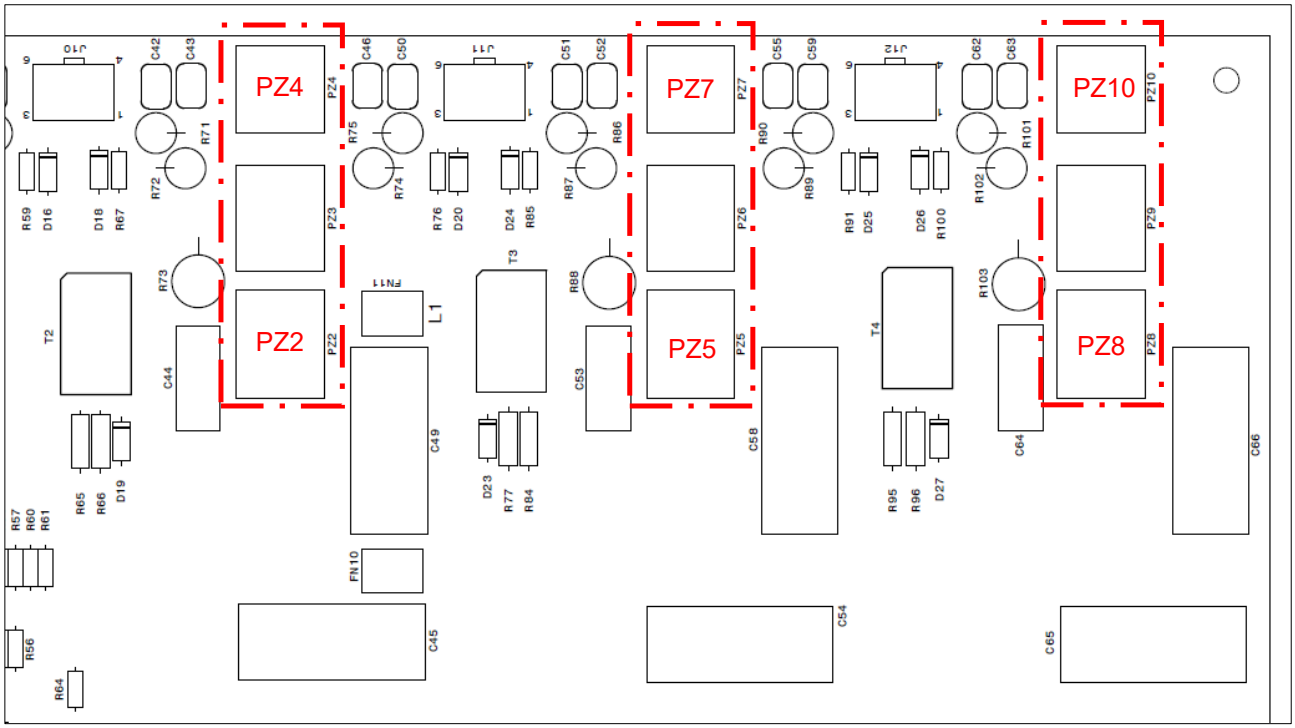


Fig. 54

Place the multimeter probes between screws as in the table below:

Component	Testing point
Thyristor_L1	PZ2 – PZ4
Thyristor_L2	PZ5 – PZ7
Thyristor_L3	PZ8 – PZ10

Tab. 27

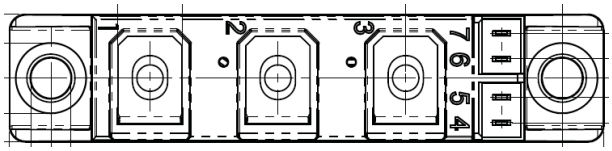


Fig. 55

10 MAP OF MAIN READINGS

The following section provides useful indications for a better understanding of reading path of the UPS and for troubleshooting.

10.1 INPUT VOLTAGES

Fig. 56

Input voltages are measured by DSP in two points: the measurement points are upstream the input fuse and downstream the input relay. The VIN_X reading is shown on display as PH-N and as PH-PH, the VIN_LX is used for internal procedure whenever the UPS works in online or eco mode. With the machine still off, check that is no short circuit across the relay contacts for RL3 (PH1), RL4 (PH2), RL5 (PH3) on board B0400 (input board).

Put the multimeter probes between fuse and:

PZ3 → for PH1
PZ8 → for PH2
PZ13 → for PH3

Test to check the continuity of the DSP signal (this test should be carried out with the UPS switched off, not supplied and with the battery disconnected).

Note: for the B0400, B0410 and B0275 boards, all the components are SMD. However, is shown below the table for the continuity information.

	Vin_1	Vin_2	Vin_3	Notes
Input fuse	Before	Before	Before	
B0400	R7	R5	R6	150 kOhm
B0400	R12	R10	R11	150 kOhm
B0400	R25	R23	R24	150 kOhm
B0400	J12-82	J12-84	J12-86	
Flat Cable	||	||	||	
B0410	J9-82	J9-84	J9-86	
B0410	J1-2	J1-4	J1-6	
Flat Cable	||	||	||	
B0275	J5-2	J5-4	J5-6	
B0275	R51	R46	R39	5,36 kOhm

Tab. 28

Downstream of Relay	Vin_L1 PZ5	Vin_L2 PZ10	Vin_L3 PZ15	Notes
B0400	R140	R97	R94	150 kOhm
B0400	R139	R98	R95	150 kOhm
B0400	R138	R99	R96	150 kOhm
B0400	J12-88	J12-90	J12-92	
Flat Cable	||	||	||	
B0410	J9-88	J9-90	J9-92	
B0410	J1-3	J1-5	J1-7	
Flat Cable	||	||	||	
B0275	J5-3	J5-5	J5-7	
B0275	R49	R43	R32	5,36 kOhm

Tab. 29

10.2 BYPASS VOLTAGES

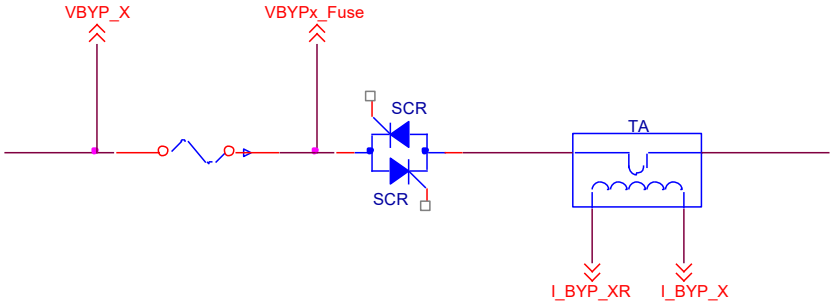


Fig. 57

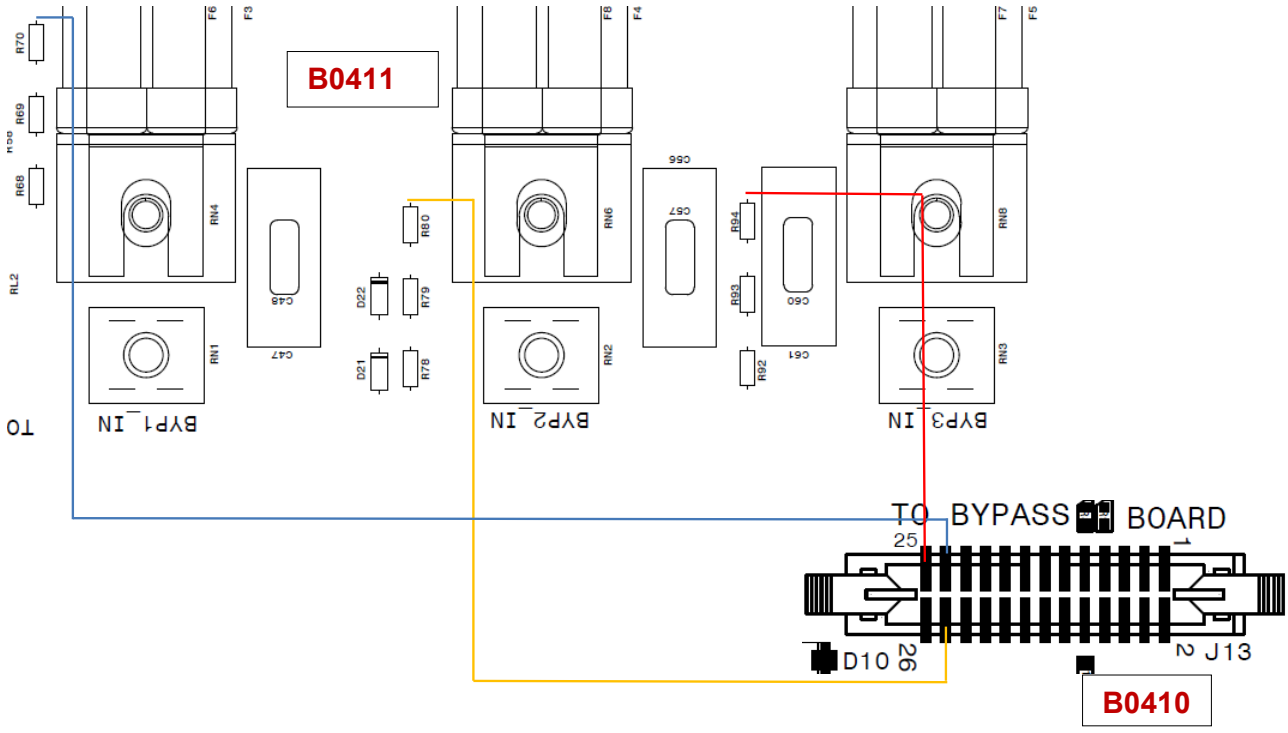
Bypass voltage readings are measured upstream and downstream the bypass fuse, on board B0411 (bypass board).
With a multimeter set to ohmmeter mode, check the following resistances:

Note: for the B0410 and B0275 boards, all the components are SMD.

Upstream of Fuse	VBYP_1 RN1	VBYP_2 RN2	VBYP_3 RN3	Notes
B0411	R68	R78	R92	150 kOhm
B0411	R69	R79	R93	150 kOhm
B0411	R70	R80	R94	150 kOhm
B0411	J4-23	J4-24	J4-25	
Flat Cable	||	||	||	
B0410	J13-23	J13-24	J13-25	
B0410	J3-8	J3-9	J3-10	
Flat Cable	||	||	||	
B0275	J12-8	J12-9	J12-10	
B0275(*)	R125	R112	R126	5,36 kOhm

See the path below

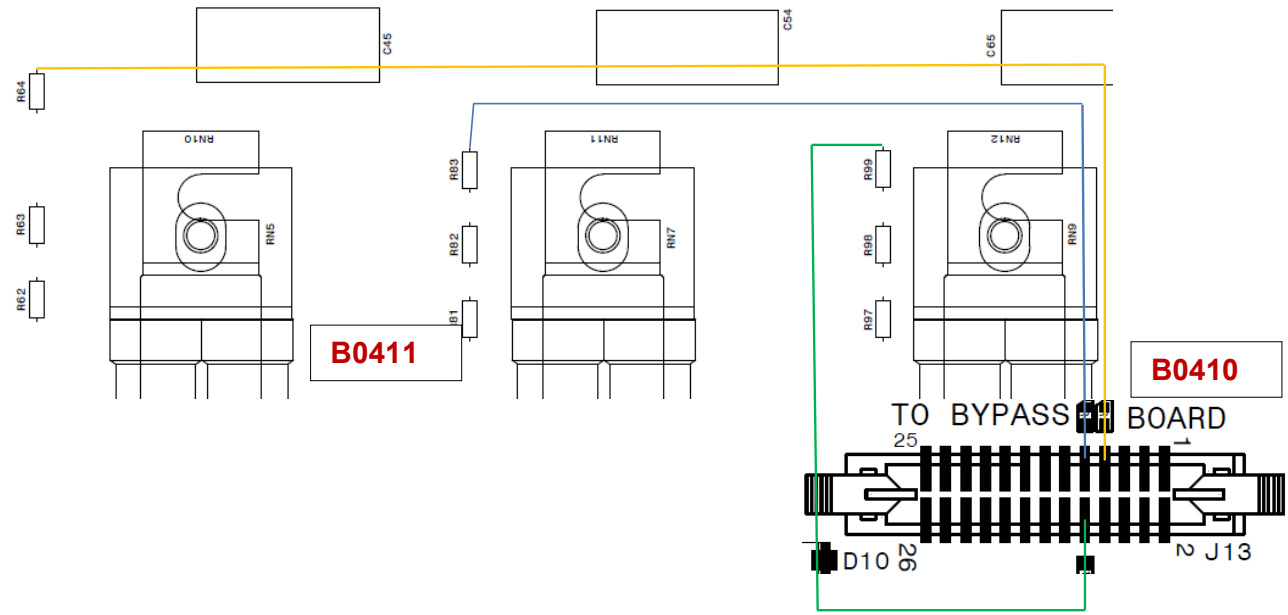
Tab. 30



	VBYP1_Fuse	VBYP2_Fuse	VBYP3_Fuse	Notes
Downstream of Fuse	RN5	RN7	RN9	
B0411	R62	R81	R97	150 kOhm
B0411	R63	R82	R98	150 kOhm
B0411	R64	R83	R99	150 kOhm
B0411	J4-7	J4-9	J4-10	
Flat Cable	||	||	||	
B0410	J13-7	J13-9	J13-10	
B0410(*)	R9	R8	R10	5,36 kOhm

See the path below

Tab. 31



10.3 BATTERY VOLTAGES

There are four battery readings (in this chapter divided into two types of readings), measured by DSP and taken from board B0400 (Input board).

- VBATT±: these readings are used for the battery present test, the wiring coherency test, the battery charge status and the “battery over voltage” alarm;
- VBATT± R: these readings are used for regulating the battery charger.

Test to check the continuity of the DSP signal (this test should be carried out with the UPS switched off, not supplied and with the battery disconnected).

10.3.1 VBATT± AND VBATT±_R

Note: for the B0400, B0410 and B0275 boards, all the components are SMD. However, is shown below the table for the continuity information.

- VBATT±

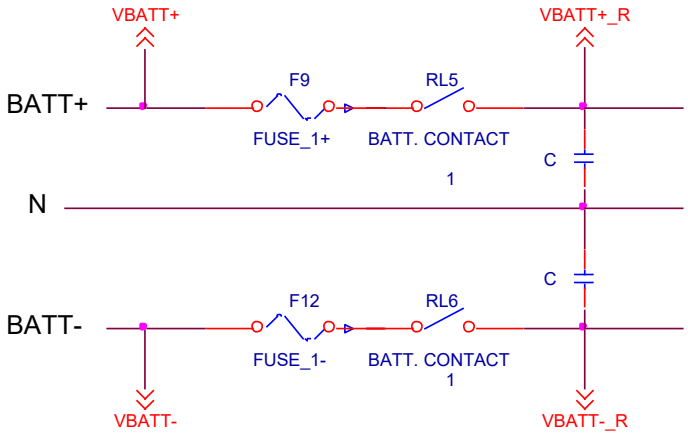


Fig. 58

	BATT+	BATT-	Notes
B0400	R3	R2	357 kOhm
B0400	R9	R8	357 kOhm
B0400	R19	R15	357 kOhm
B0400	R33	R29	357 kOhm
B0400	R40	R36	357 kOhm
B0400	J12-74	J12-76	
Connector	||	||	
B0410	J9-74	J9-76	
B0410	J1-8	J1-10	
Flat Cable	||	||	
B0275	J5-8	J5-10	
B0275(*)	R29	R23	28,7 kOhm

Tab. 32

- VBATT±_R

	DC+	DC-	Notes
B0400	R110	R109	357 kOhm
B0400	R108	R107	357 kOhm
B0400	R106	R105	357 kOhm
B0400	R104	R103	357 kOhm
B0400	R102	R101	357 kOhm
B0400	J12-78	J12-80	
Connector	||	||	
B0410	J9-74	J9-76	
B0410	J1-8	J1-10	
Flat Cable	||	||	
B0275	J5-9	J5-11	
B0275(*)	R25	R21	28,7 kOhm

Tab. 33

10.4 INVERTER VOLTAGES

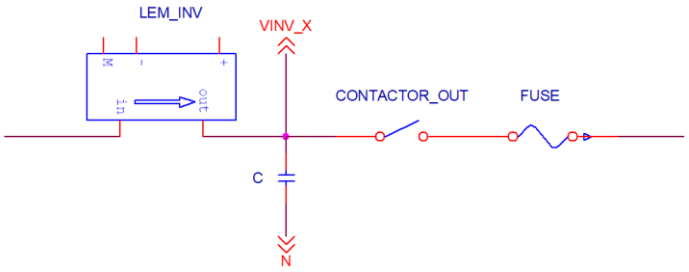


Fig. 59

The reading point of inverter voltage is exactly next to the inverter filter capacitors on board B0395 (output board).
This reading is used to check the inverter and check the status of the inverter relays and fuses (combined with the output voltage reading).

Note: for the B0395, B0410 and B0275 boards, all the components are SMD. However, is shown below the table for the continuity information.

	VINV_1	VINV_2	VINV_3	Notes
B0395	R38	R47	R56	150 kOhm
B0395	R39	R48	R57	150 kOhm
B0395	R40	R49	R58	150 kOhm
B0395	J12-4	J12-3	J12-2	
Flat Cable	||	||	||	
B0400	J6-4	J6-3	J6-2	
B0400	J10-111	J10-109	J10-107	
Connector	||	||	||	
B0410	J10-111	J10-109	J10-107	
B0410	J3-2	J3-3	J3-4	
Flat Cable	||	||	||	
B0275	J12-2	J12-3	J12-4	
B0275	R122	R109	R123	5,36 kOhm

Tab. 34

10.5 OUTPUT VOLTAGES

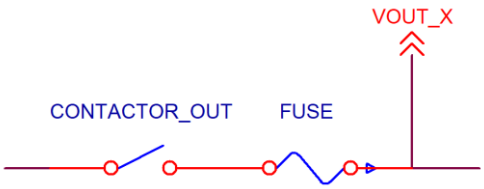


Fig. 60

The output voltage readings are taken at the output of board B0395 (output board). The reading point is next to RN1, RN2, RN3 on board B0395. This reading is used to calculate the output power (combined with the Iout reading) and to check the status of the inverter relays and fuses (combined with the inverter voltage reading).
To check for the presence of voltage, with the UPS switched on, place one probe on neutral (RN10) and test terminals RN1, RN2, RN3 (respectively phase 3, phase 2, phase 1).

Note: for the B0395, B0410 and B0275 boards, all the components are SMD. However, is shown below the table for the continuity information.

	VOUT1	VOUT2	VOUT3	Notes
B0395	R37	R46	R54	150 kOhm
B0395	R36	R45	R53	150 kOhm
B0395	R34	R43	R52	150 kOhm
B0395	J12-7	J12-6	J12-5	
Flat Cable	||	||	||	
B0400	J6-7	J6-6	J6-5	
B0400	J10-105	J10-103	J10-101	
Connector	||	||	||	
B0410	J10-105	J10-103	J10-101	
B0410	J3-5	J3-6	J3-7	
Flat Cable	||	||	||	
B0275	J12-5	J12-6	J12-7	
B0275	R110	R124	R111	5,36 kOhm

Tab. 35

10.6 OUTPUT CURRENTS

10.6.1 BYPASS CURRENTS

Each bypass line has its TA. The TA is inserted in the cables connecting between out of B0411 (Bypass board) and SWOUT switch.
They have the primary function to measure current when load is supplied by bypass line, however it is involved in backfeed control.

10.6.2 INVERTER CURRENTS

Inverter current is measured by the current transducer (LEM). This reading is shown on display and it is used to calculate the output power (combined with the Vout reading).

10.7 VDC VOLTAGE

The VDC voltage can be measured both on the Boost & BC power board (B0398) and on the Inverter power board (B0392).
In particular, the two power boards (B0398 and B0392) are connected to each other with three aluminium bars: the measures of the VDC must therefore be the same for both the boost and the inverter side.

- **Check the tightening of the screws for a correct measurement.**

Attention! This operation can only be performed with the machine switched off and with the input/output and battery disconnection switches open.

Discharge the DC capacitor bank and wait 10-15 minutes for the voltage in the bank to reach a level close to 0V.

After this check, close all the disconnection switches, restart the UPS then try again with the VDC measurement.
The easiest points to measure the **actual VDC voltage** are**:**

PZ8 (B0395) ⇛ **DC+**
PZ9 (B0395) ⇛ **DC-**
PZ10 (B0395) ⇛ **Neutral**

Any errors due to the measurement system can be detected by the UcomS3 Status Analyzer software.

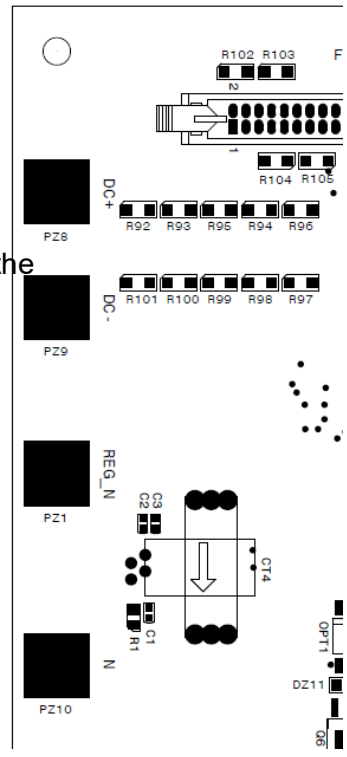


Fig. 61 – B0395 board

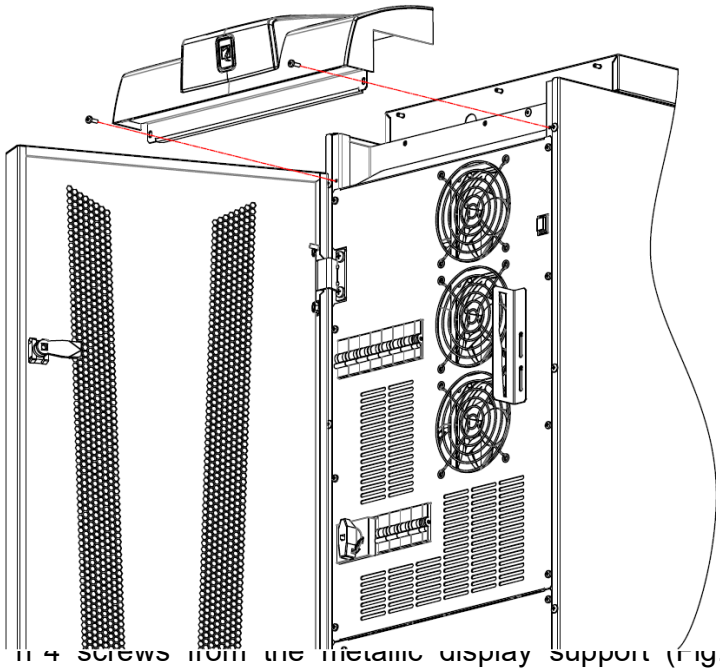
11 SERVICE OPERATIONS

Every operation can only be performed with the machine switched off and with the input/output and battery disconnection switches open.
Discharge the DC capacitor bank and wait 10-15 minutes for the voltage in the bank to reach a level close to 0V.

11.1 HOW TO OPEN THE UPS

11.1.1 DISPLAY REMOVAL

- **ACT:** in order to remove the display, unscrew the n°2 screws from the metallic support under the display (Fig. 62). Pull out the display and then remove the RJ45 cable.



- **XTD:** remove the n°4 screws from the metallic display support (Fig. 63). Remove n°4 screws from the cable cover (Fig. 64), then remove the RJ45 cable.

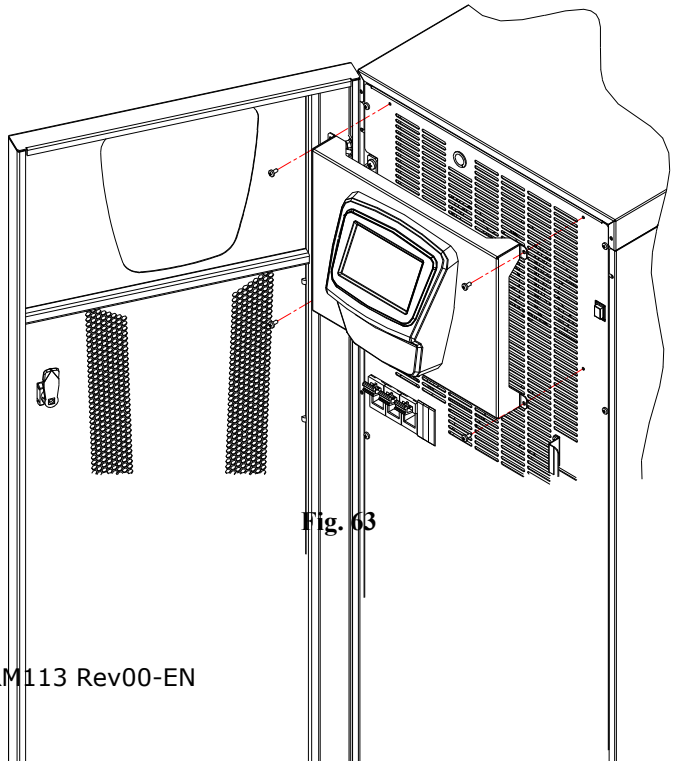


Fig. 63

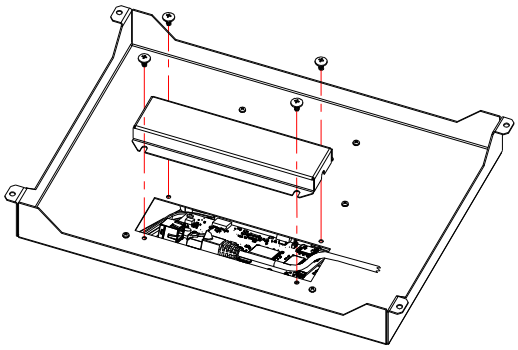


Fig. 64

11.1.2 DSY (ACT) VERSION

To access the **terminal area**, remove the lower front panel by removing all the screws.
To access the internal boards, remove the **side panels:** remove first the frontal door (refer to the Installation manual), then remove the screws, n° 8 for side panel. It is not required to remove the display. If necessary, repeat the operation for opposite side panel.
To remove the **top cover,** remove first the display (see 11.1.1), then remove the n°3 screws from the top cover on the rear of the UPS and n°2 screws on the front of the UPS.
To remove the **frontal protection panel,** remove first the frontal door (refer to the Installation manual) and the display (11.1.1), then unscrew the n° 6 screws from the protection panel.

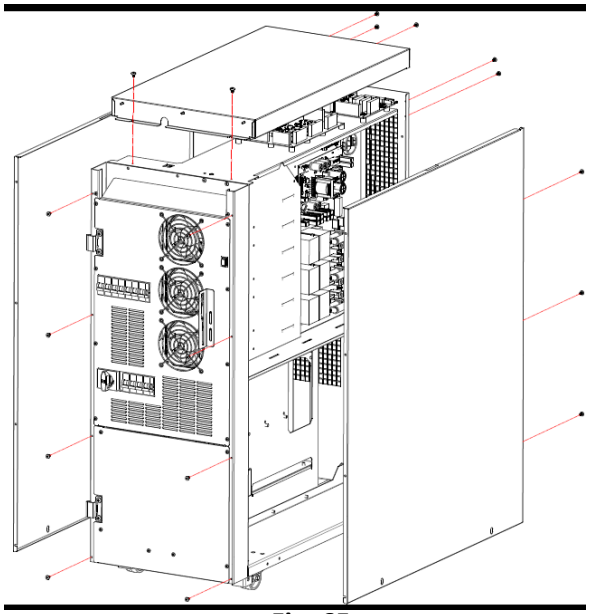


Fig. 65

Screws for the side panels and top cover

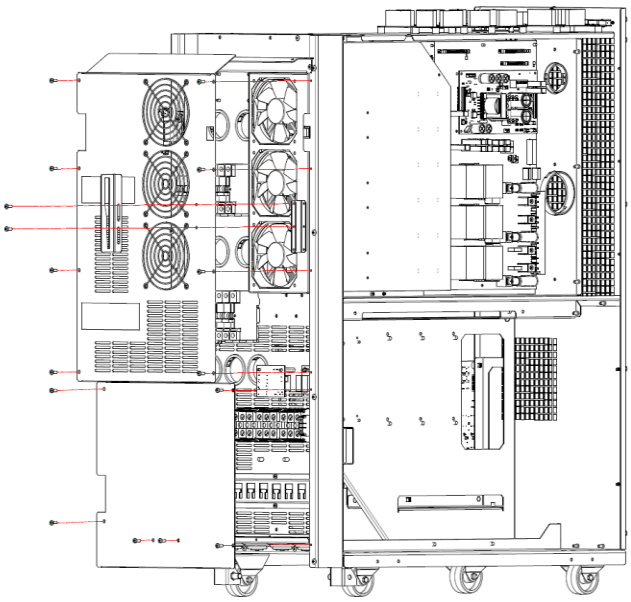


Fig. 66

Front panels fastening screws

11.1.3 DSX (XTD) VERSION

To access the **terminal area**, remove the lower front panel by removing all the screws.
To access the internal boards, remove the **side panels:** remove first the frontal door (refer to the Installation manual), then remove the screws, n° 9 for side panel. If necessary, repeat the operation for opposite side panel.
To remove the **top cover,** remove first the frontal door (refer to the Installation manual), then remove the n°5 screws from the top cover of the UPS.
To remove the **frontal protection panel,**remove first the frontal door (refer to the Installation manual) and the display (11.1.1), then unscrew the n° 8 screws from the protection panel.

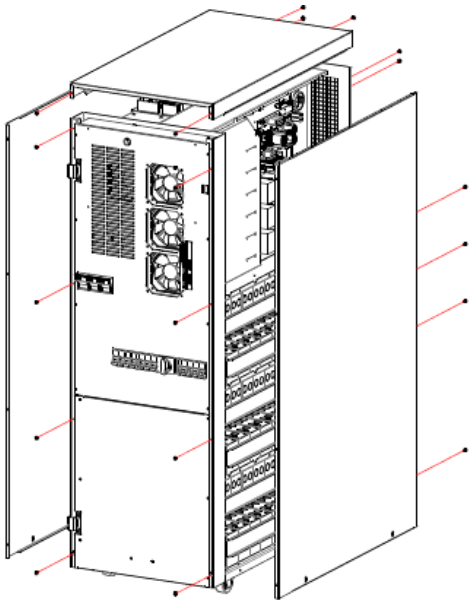


Fig. 67

Screws for the side panel and top cover

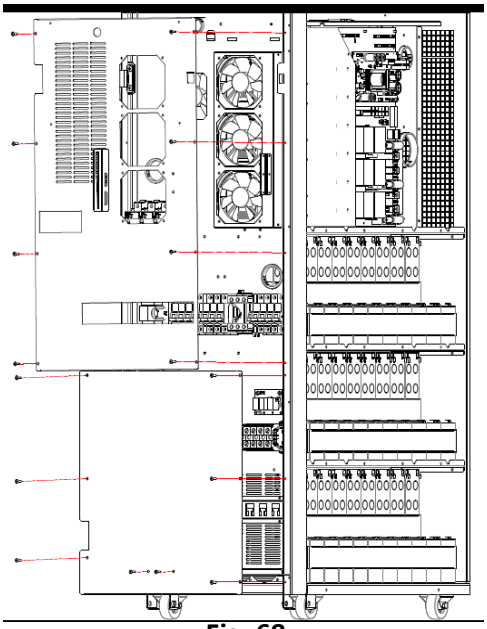


Fig. 68

Front panels fastening screws

11.2 FAN REPLACEMENT

11.2.1 REMOVAL OF THE FAN BOX:

To remove the frontal protection panel, follow chapter 11.1.2 or 11.1.3.
Remove the four screws, indicated in the pictures below, to unfix the fan box.

The fans are connected to the B0392 board, so pay attention to handling the fan box. Then disconnect the fans from the board.

Fig. 69

Fig. 70

11.2.2 REMOVE THE FANS FROM THE METALLIC FRAME:

To free the three fans, remove the 12 screws and place the new ones as shown in the picture on the right:

Fig. 71

11.2.3 AIR DUCT – STEP ASSEMBLY

BYPASS AIR DUCT:

Fig. 72

Fig. 73

Fix the lateral side of the air duct with the plastic rivets

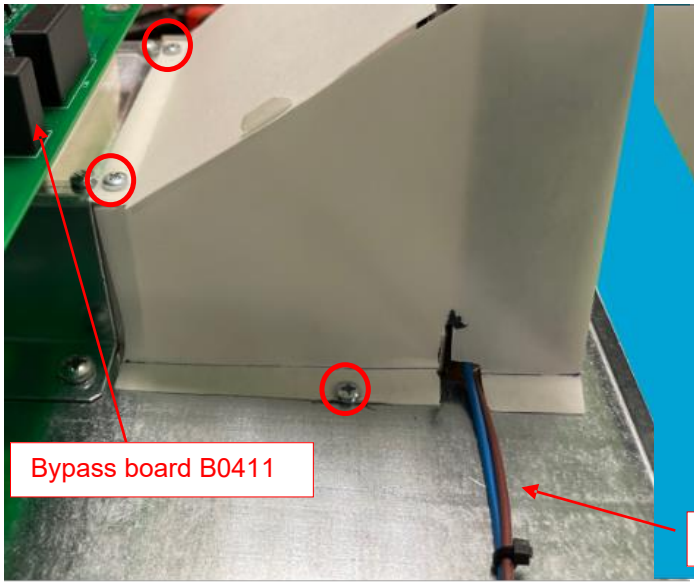


Fig. 74

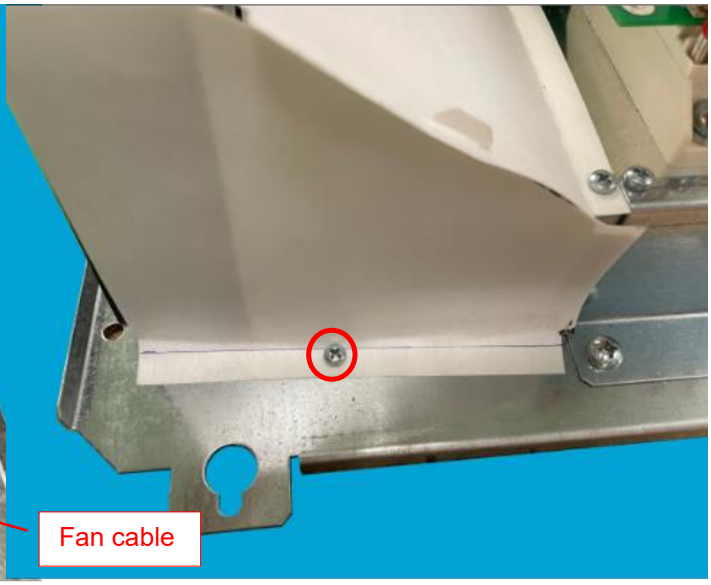


Fig. 75

Fix the air duct to the mathalic panel

Fig. 76

Detail of the plastic rivet for the duct assembling

BOOST AND INVERTER AIR DUCTS:

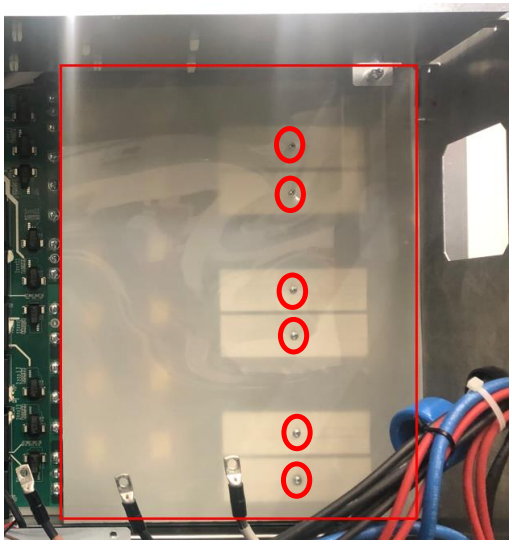


Fig. 77 - **Boost side**

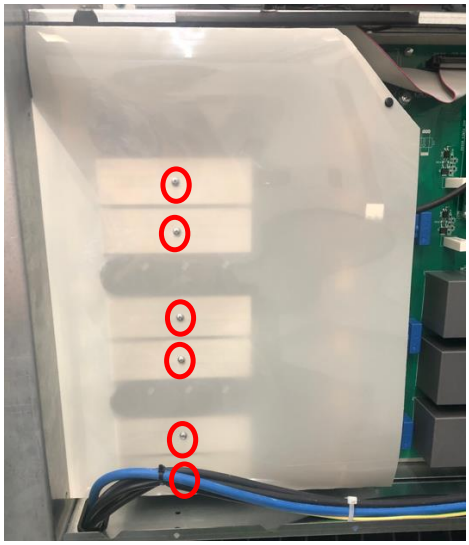


Fig. 78 - **Inverter side**

1) Only for the Xtend model, to access to the boost air duct, remove first the bypass assembly as shown in chapter 11.3.1.

2) Remove the 6 screws from the heatsinks.

3) With the help of the grooves in the chassis, remove the 4 screws. Use a long tip screwdriver:

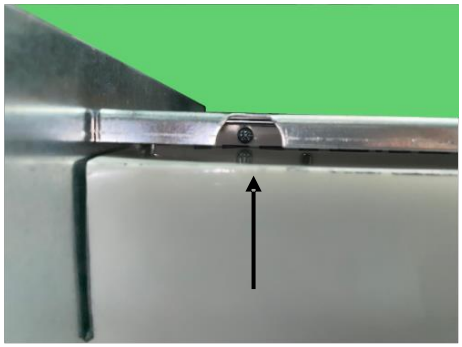


Fig. 79

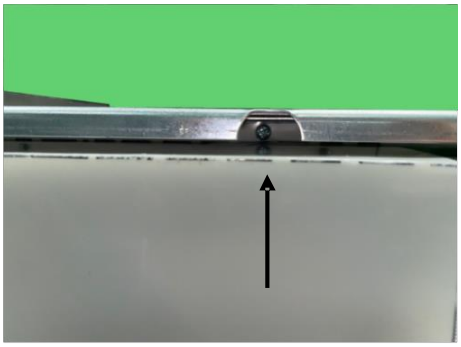


Fig. 80

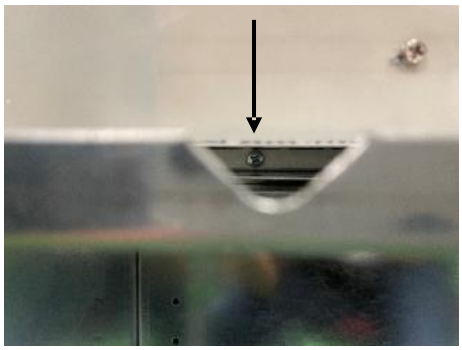


Fig. 81

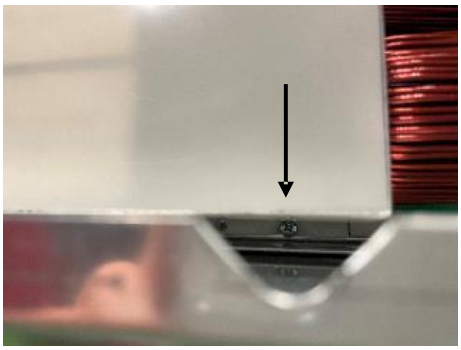


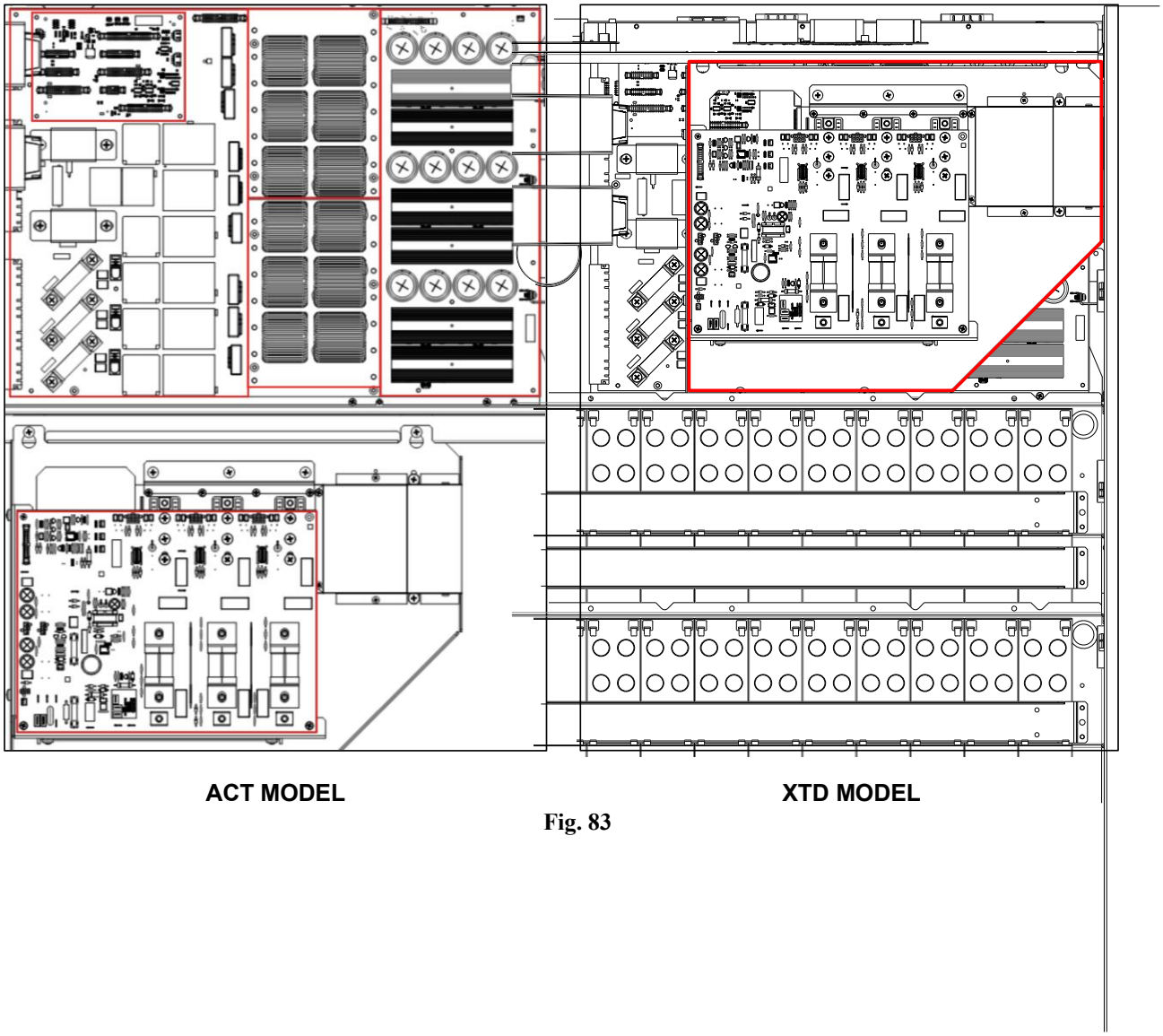
Fig. 82

11.3 BOARDS REPLACEMENT– INPUT SIDE

Below the service operations (the removal and the replacing of the boards) for the input side. For more details for the positioning of the boards see the chapter 4.3.2.

Depending on the UPS model, the procedures for replacing the boards are different.
On the output side there are no differences, but in the Xtend model, to reach the input side, it is necessary to remove the Bypass assembly and the control board shelf. For further details see the following chapters.

Follow the chapter 11.2.3 to remove the boost air duct.



ACT MODEL **XTD MODEL**

Fig. 83

11.3.1 BYPASS ASSEMBLY REMOVAL – ACCESS TO THE INPUT SIDE (Only for XTEND model)

This procedure allows the operator to access the input side of the UPS.

For replacement of the bypass board B0411 only, refer to chapter 11.3.7.

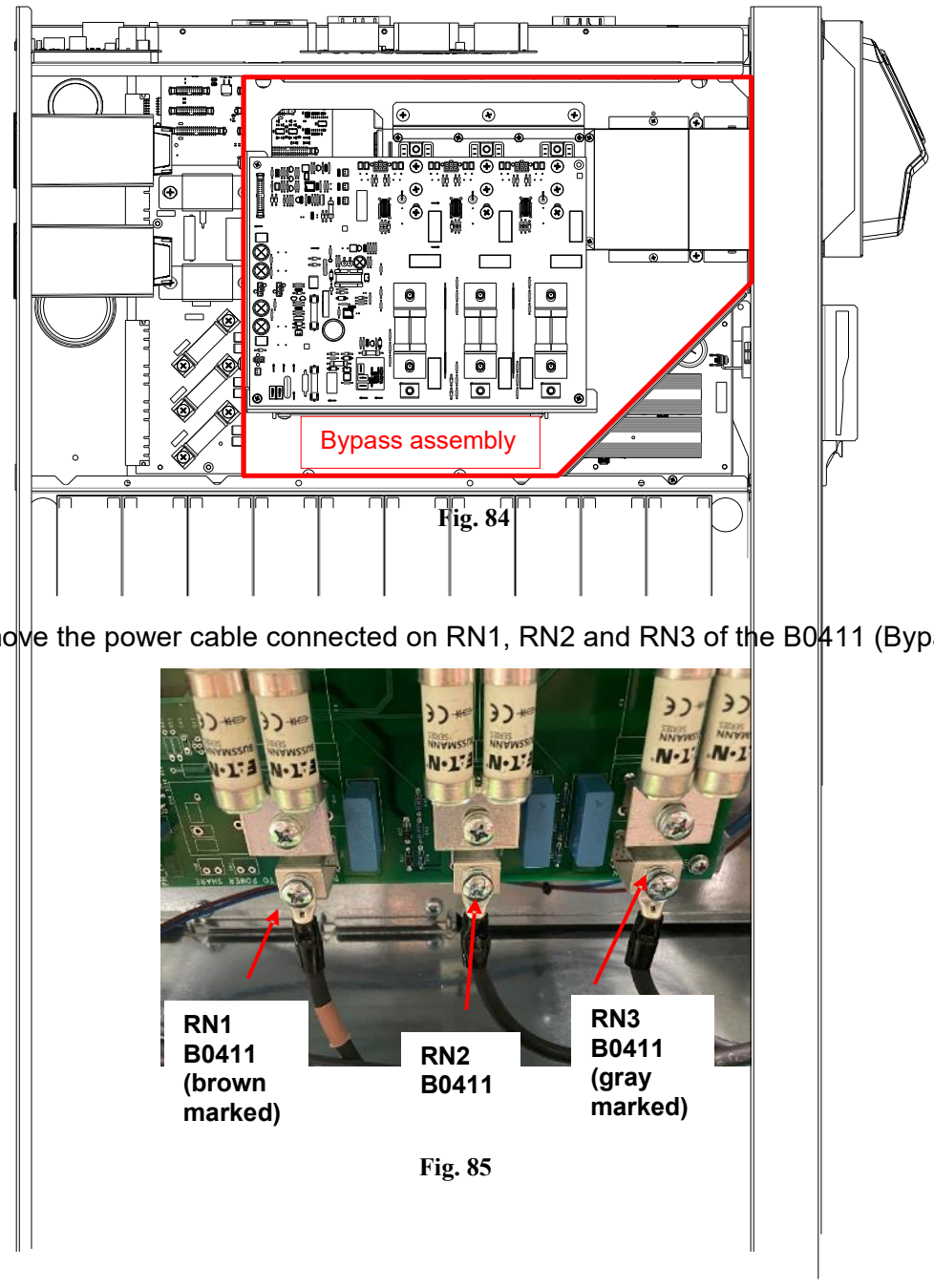


Fig. 84

1) Remove the power cable connected on RN1, RN2 and RN3 of the B0411 (Bypass board)

Fig. 85

2) Remove the other power cables fixed on the thyristors via the pillars.

Fig. 86

(PH1) (brown marked)
⇒ PZ4 B0411

(PH2)
⇒ PZ7 B0411

(PH3) (gray marked)
⇒ PZ10 B0411

3) Remove all the JST cables and the flat cable on the Bypass board B0411. Pull the J1 (Cold Start) cable completely out of the UPS.

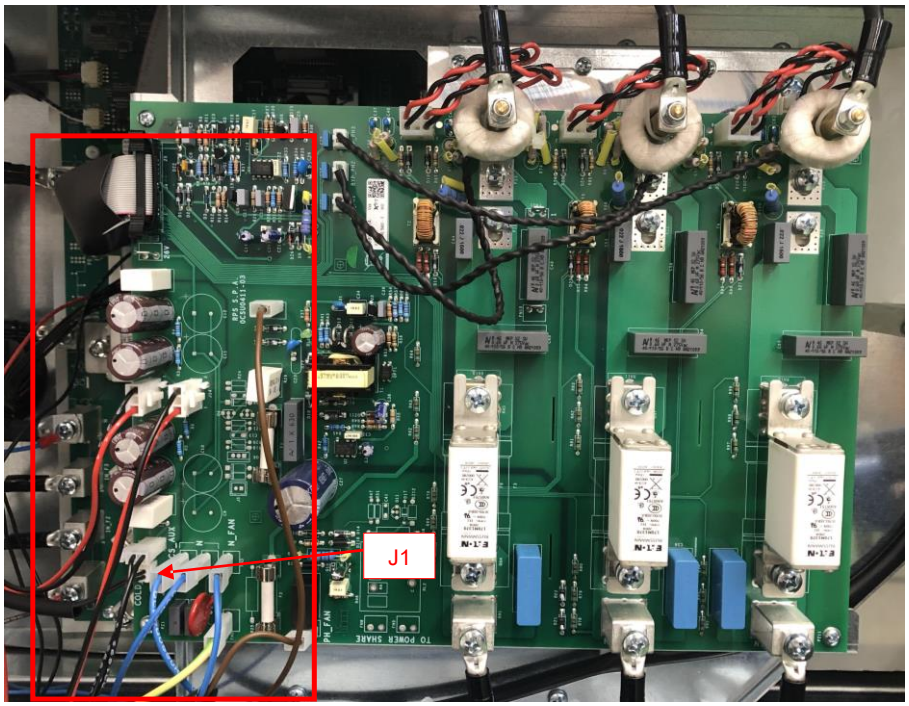


Fig. 87

4) Remove the top cover as explained in the chapter 11.1.3

5) Remove the frontal protection panel as explained in the chapter 11.1.3.
Note: pull the RJ45 display cable from the B0274 (Communication board) completely out to remove the frontal protection panel.

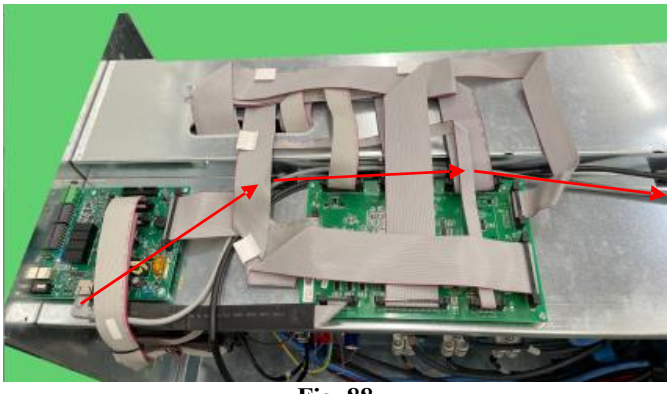


Fig. 88

6) Loosen the top two screws and the two screws at the bottom of the assembly. Then remove the entire bypass assembly.

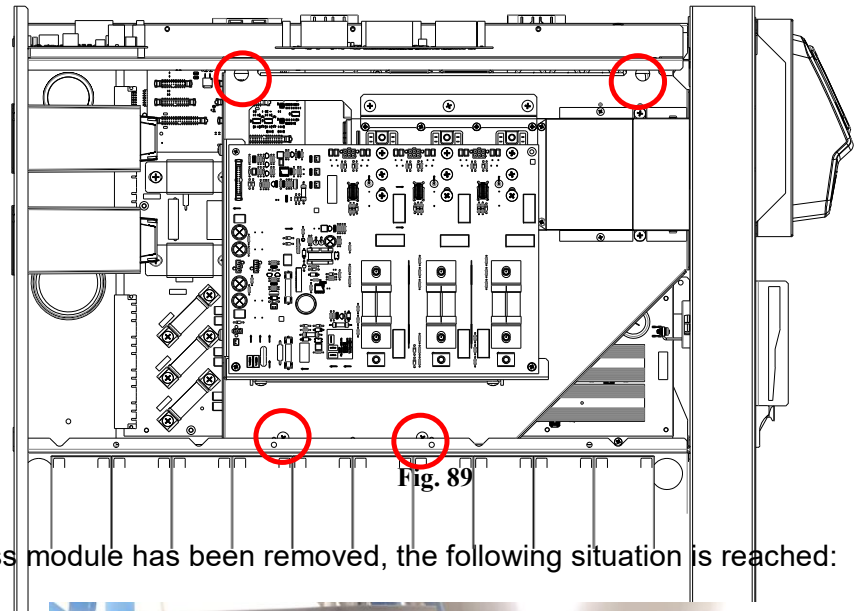


Fig. 89

Once the bypass module has been removed, the following situation is reached:

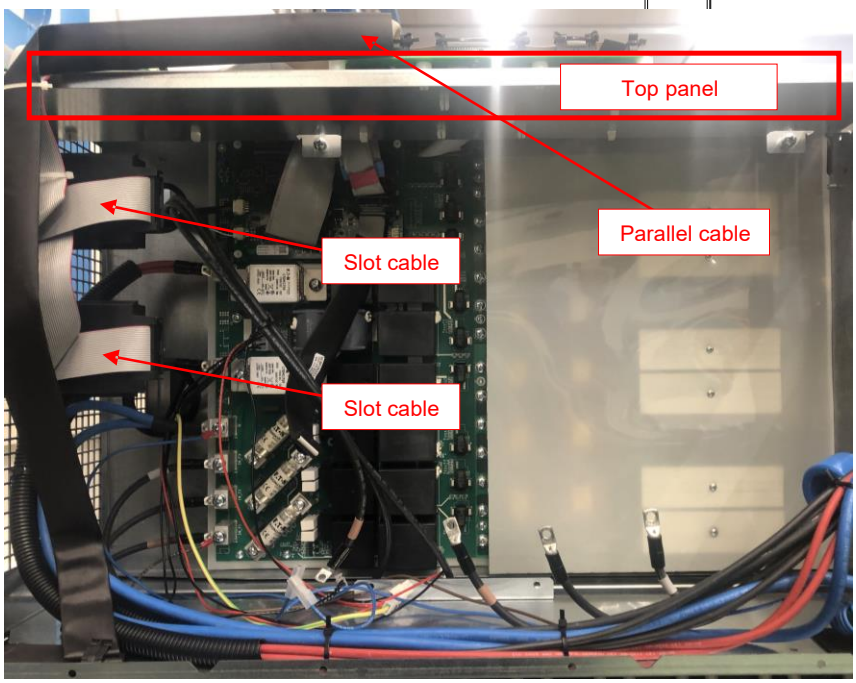


Fig. 90

1) Remove the two slot cables from Communication board B0274 and the parallel flat cable from the Control board B0275.
2) At this point it is necessary to overturn the top panel to reach the input section. Please follow the next steps.

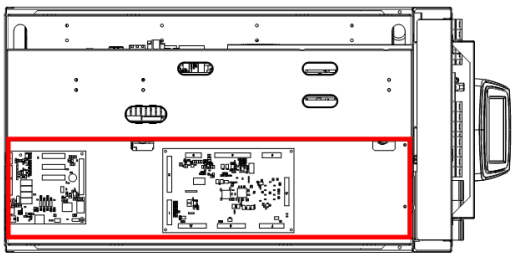


Fig. 91

3) Remove the REPO on the rear side of the UPS and the 4 screws holding the top panel, as shown in the following pictures:

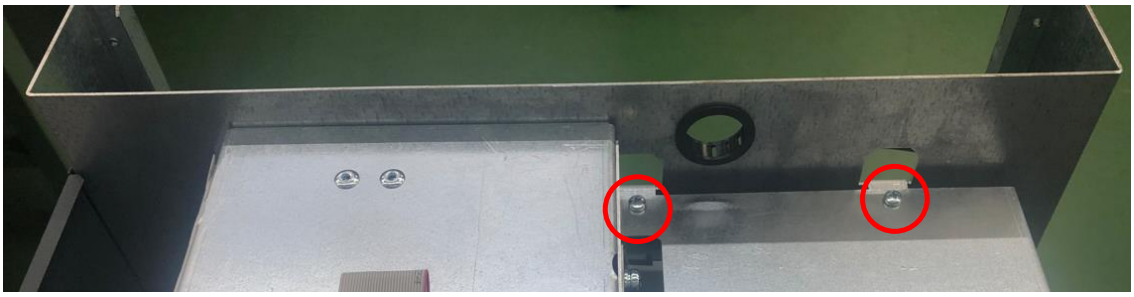


Fig. 92 - Front Side

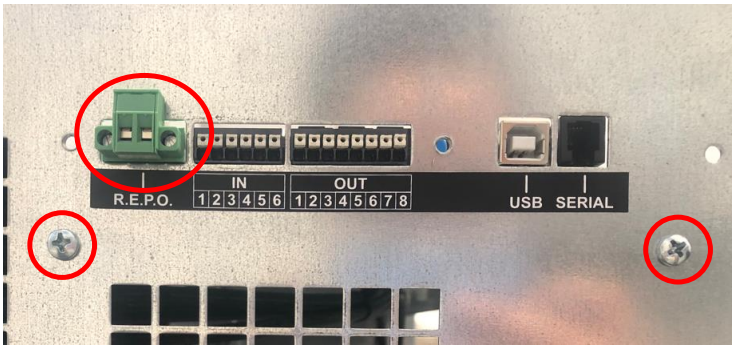


Fig. 93 - Rear side

4) Remove the 3 screws holding the top panel in the lateral side (as shown in the image below), then overturn the top panel:

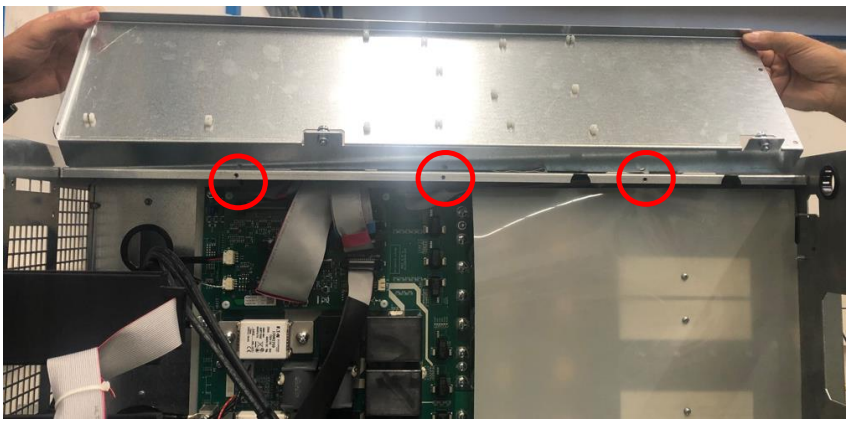


Fig. 94

It is possible now to access to all the boards of the input side.

To reinstall the bypass assembly please follow this procedure in reverse.

11.3.2 SIGNAL ADAPTER BOARD (B0410-01)

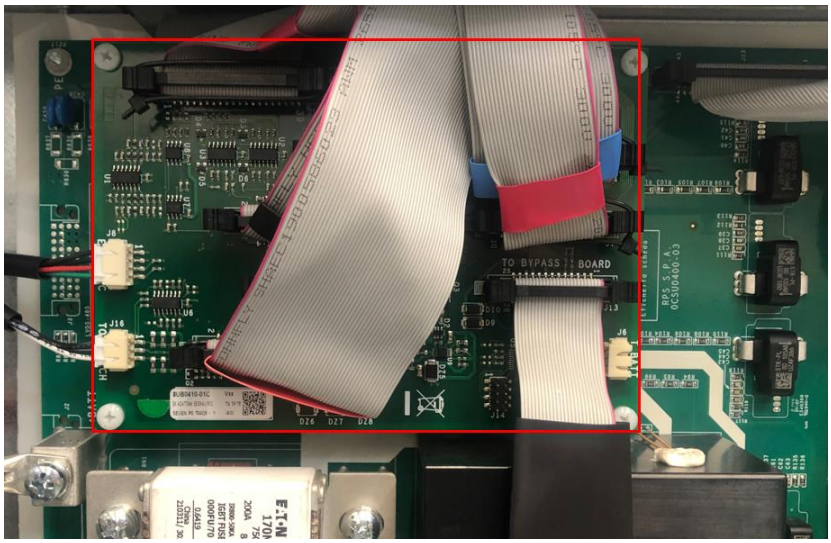


Fig. 95

1) Remove all the flat and JST cables.
2) Remove the 4 plastic screws.

Note: When reinstalling the board, pay attention to the colour marking on the flat cables:

J1 from J5 of the Control Board B0275	(black marked 30 pins flat cable)
J2 from J3 of the Control Board B0275	(black marked 40 pins flat cable)
J3 from J12 of the Control Board B0275	(red marked 50 pins flat cable)
J4 from J2 of the Control Board B0275	(blue marked 40 pins flat cable)
J7 from J1 of the Control Board B0275	(red marked 30 pins flat cable)
J8 from the auxiliary signal terminal blocks	
J11 from J7 of the Control board B0275	(red marked 40 pins flat cable)
J12 from J13 of the Control board B0275	(no marked 14 pins flat cable)
J13 from J6 of the Bypass board B0411	(no marked 26 pins flat cable)
J16 from auxiliary SWOUT/SWMB switches	

11.3.3 INPUT BOARD REMOVAL (B0400-02)

1) Remove first the signal adapter board B0410 as shown in the chapter 11.3.2.
2) Remove the 4 plastic pillars that hold the B0410 board.
3) Remove the inductors PFC-boost boards as shown in the chapter 11.3.5.
4) Remove all the cables.
5) Unscrew the following fixing screws:

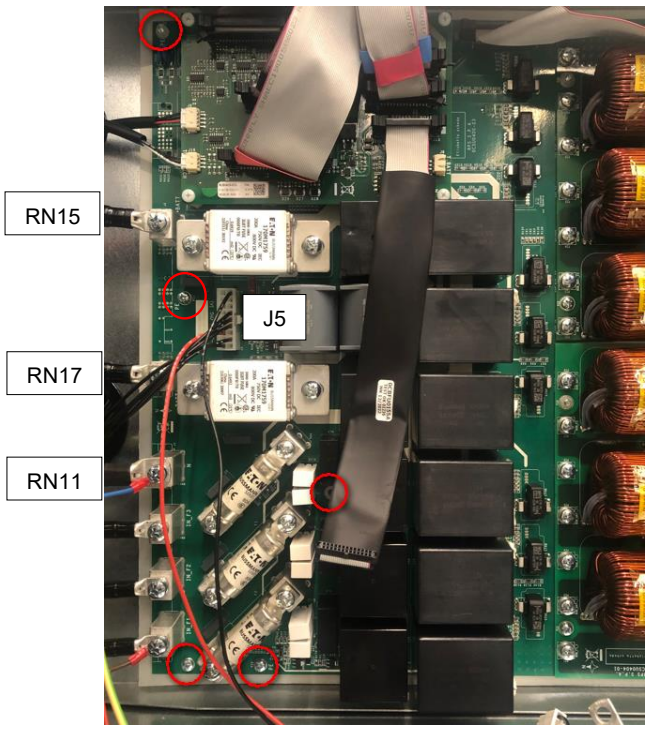
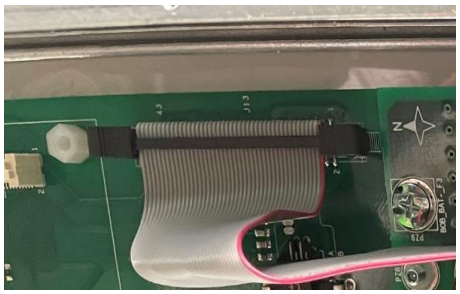


Fig. 96

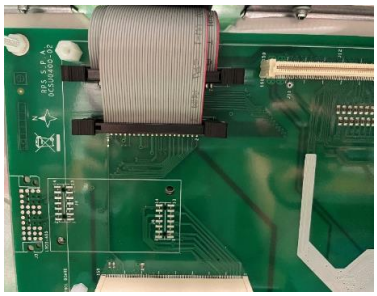
11.3.4 INPUT BOARD INSTALLATION (B0400-02)

1) Fix all the screws
2) Install the inductors PFC-boost boards
3) Connect the flat cables as shown below:



J13 from J1 of B0398 board

J7 from J8 of B0395 board



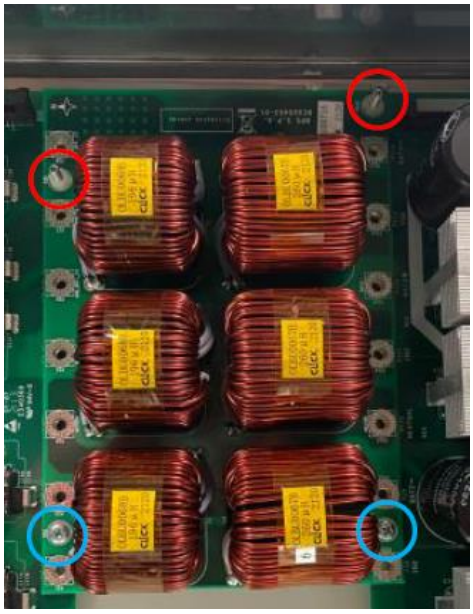
J6 from J12 of B0395 board

4) Fix the 4 plastic pillars that hold the B0410 Adapter board
5) Install the B0410 board with the help of the chapter 11.3.2.
6) Connect: RN15 (red cables +BATT) from SWBATT
   RN17 (black cables -BATT) from SWBATT
   RN11 (blue cables N) from SWBATT
   RN12 (grey cable IN_F3) from SWIN
   RN13 (black cable IN_F2) from SWIN
   RN14 (brown cable IN_F1) from SWIN
   J5 from J10 of B0395 board and from J3 of B0411 board

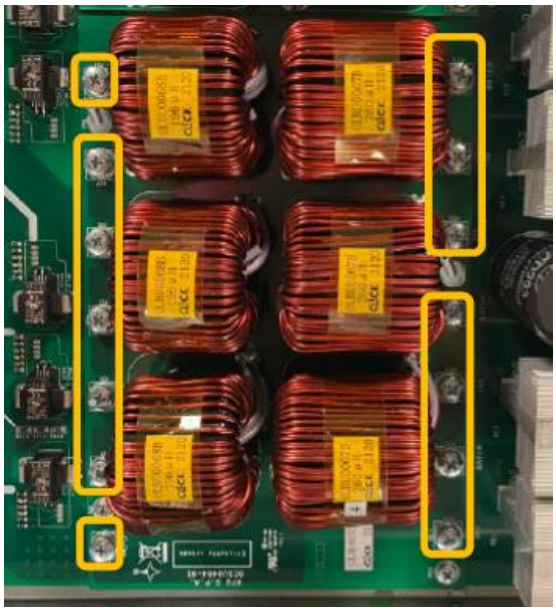
11.3.5 INDUCTORS PFC-BOOST BOARDS REMOVAL (B0403-01, B0404-01)

Remove the fixing screws and the plastic nuts as shown in the following images:

B0403-01



B0403-01



B0404-01

B0404-01

11.3.6 BOOST & BC POWER BOARD REMOVAL (B0398-01)

1) Remove the fan box as shown in the chapter 11.2.1
2) Remove the six fixing screws as shown below:

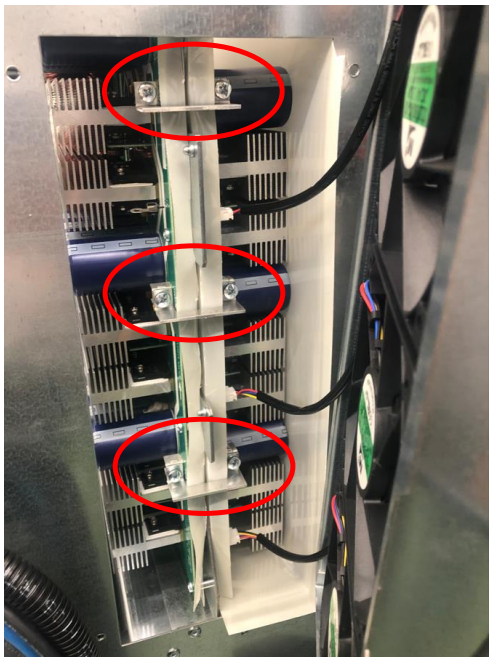


Fig. 97

3) Remove the Inductors PFC-boost boards ad shown in the chapter 11.3.5
4) Remove the flat cable J1 and the fixing screws of the board B0398-01:

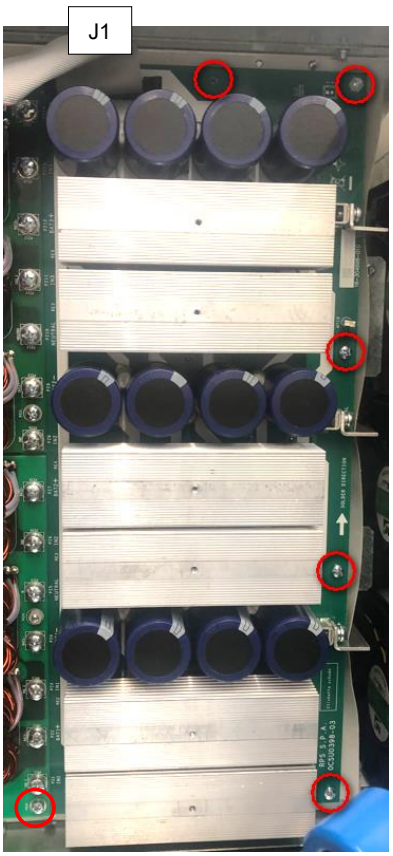


Fig. 98

Follow this procedure in reverse to install the new Boost & BC power board.

11.3.7 BYPASS BOARD REMOVAL (B0411-01)

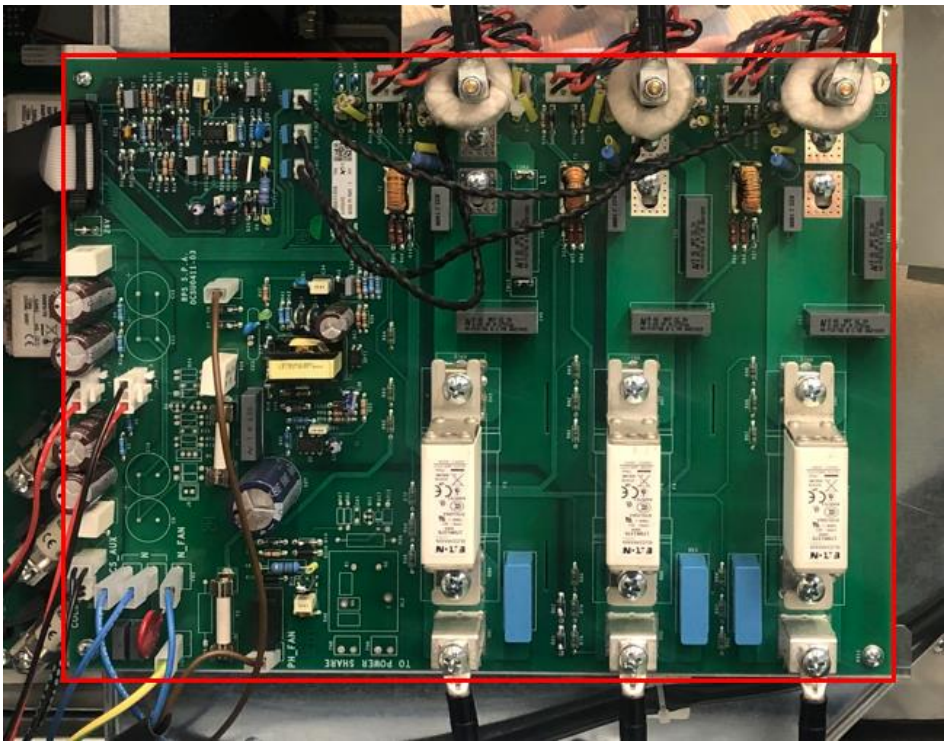
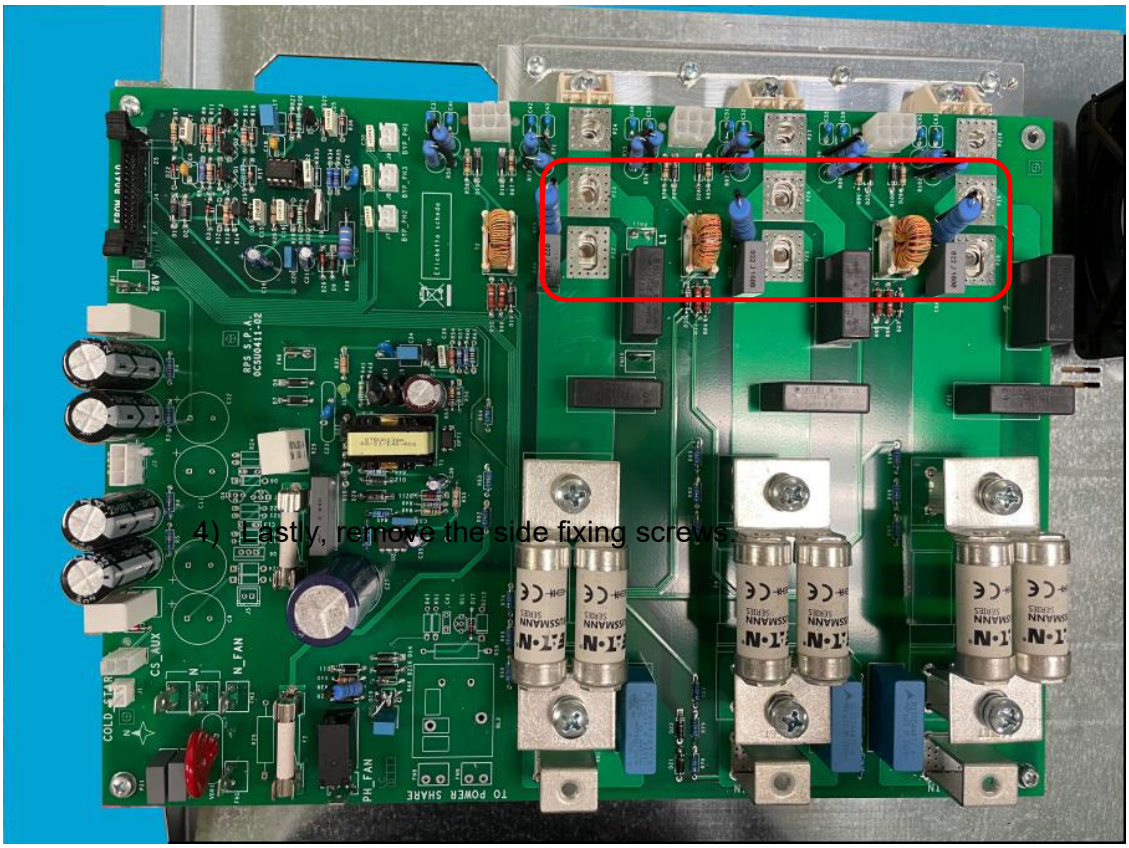


Fig. 99

1) Remove all the cables from the board
2) Remove the three brass pillars connected to the SCR
3) Remove the remaining SCR's screws:



4) Lastly, remove the side fixing screws.

11.3.8 BYPASS SCR REPLACEMENT

1) Remove the bypass board B0411 as shown in the chapter 11.3.7
2) Remove completely the defective SCR by unscrewing the two fixing screws.
3) Make sure to remove completely the thermal paste from the heatsink:

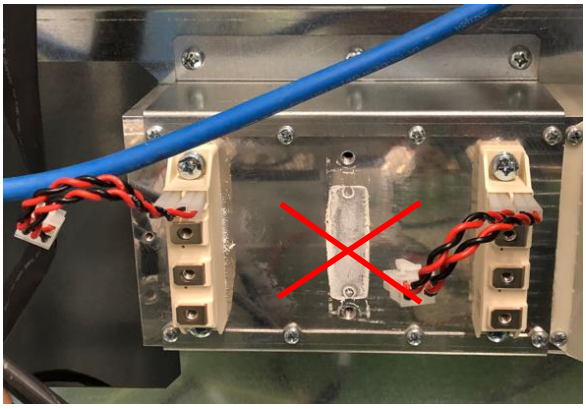


Fig. 101

4) Apply a thin layer of thermal paste on the new SCR:

Fig. 102

5) Install the new SCR. Pay attention to the correct positioning of the SCR (the driver connectors must be positioned on the upper side)

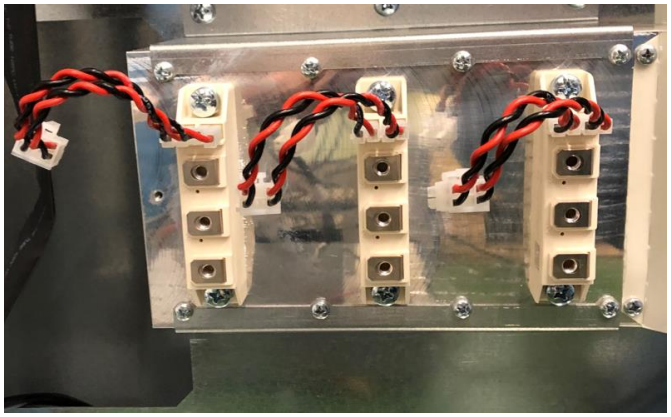


Fig. 103

6) Reconnect the SCR driver cables and reinstall the Bypass board as shown in the chapter 11.3.9.

11.3.9 BYPASS BOARD INSTALLATION (B0411-01)

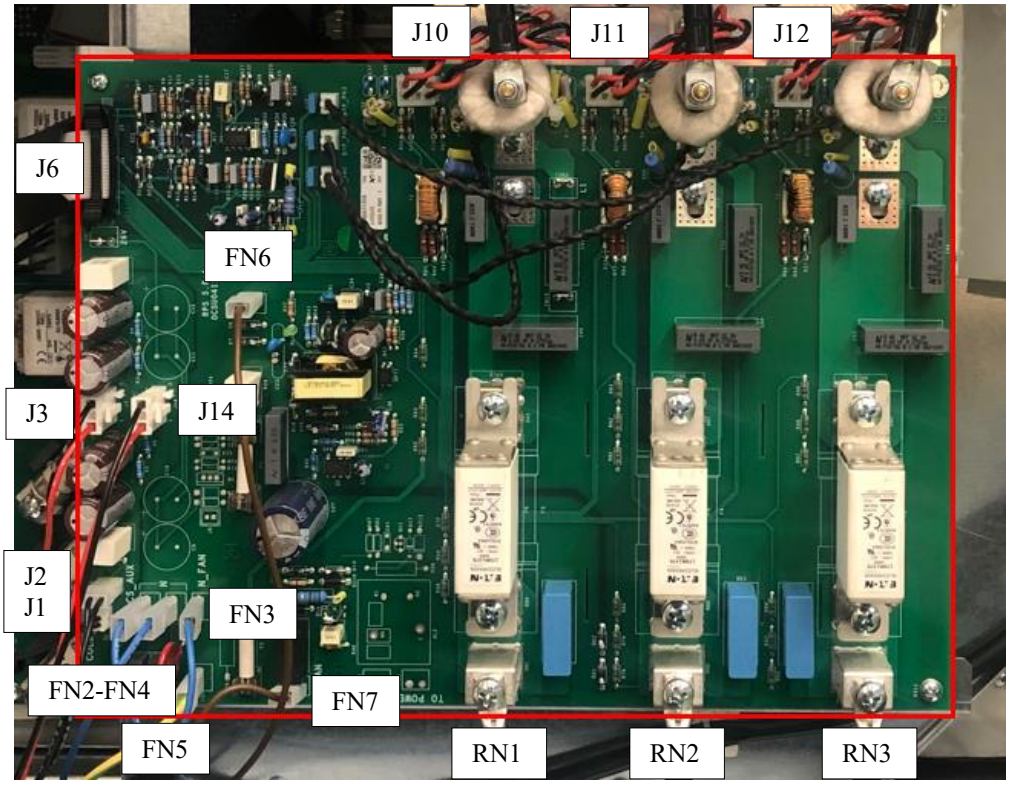
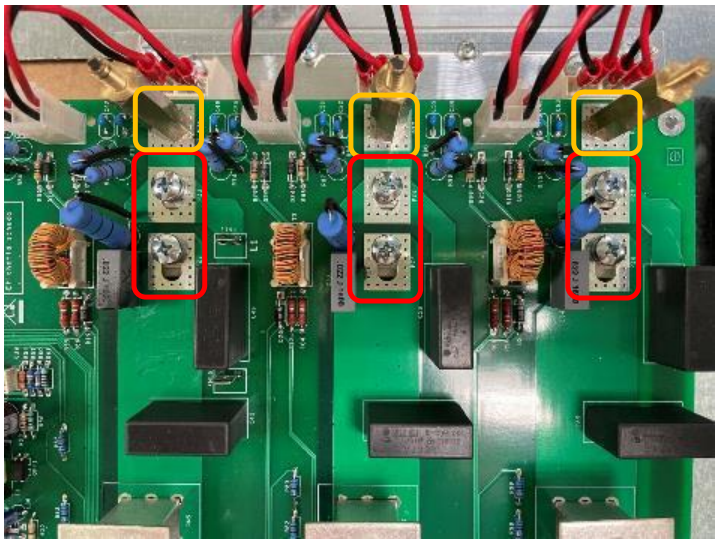


Fig. 104

1) After fixing the lateral screws, install the SCR driver connectors J10, J11 and J12.
2) Install the three brass pillars with a tightening torque of 2.5Nm. Then fix the other screws of the SCR modules with a tightening torque of 5Nm:



3) Install the thyristors (with the arrow coming out of the board) and the output power cables as shown below:

Fig. 106

(PH1) (brown marked)
⇨ PZ4 B0411

(PH2)
⇨ PZ7 B0411

(PH3) (gray marked)
⇨ PZ10 B0411

4) Proceed with the cables:

FN3 (N_FAN) → blue cable from bypass fan
FN7 (PH_FAN) → brown cable from bypass fan
RN1 (BYP1_IN) → brown marked cable from PH1 SWIN or SWBYP (DI version)
RN2 (BYP2_IN) → black marked cable from PH2 SWIN or SWBYP (DI version)
RN3 (BYP3_IN) → grey marked cable from PH3 SWIN or SWBYP (DI version)
FN2 (N) → blue cable from RN11 of B0400 (Input board)
FN4 (N) → blue cable from RN10 of the B0395 (Output board) (DI VERSION)
FN6 → brown cable from RN14 of the B0400 (Input board)
J3 (BATT) → red and black cables from J5 of B0400 (Input board)
J14 (BATT) → red and black cables from J10 of B0395 (Output board)
J2 (CS AUX) → black cables from J10 of the B0395 (Output board)
FN5 → earth cable from PZ of the B0288-02 (Filter Cy OUT board)
J1 → black cables from Cold start switch
J6 → flat cable from J13 of the B0410 (Signal adapter board)

11.4 BOARDS REPLACEMENT – OUTPUT SIDE

Below the service operation (the removal and the replacing of the boards) for the output side. For more details of the positioning of the boards see the chapter 4.3.3.

Follow the chapter 11.2.3 to remove the inverter air duct.

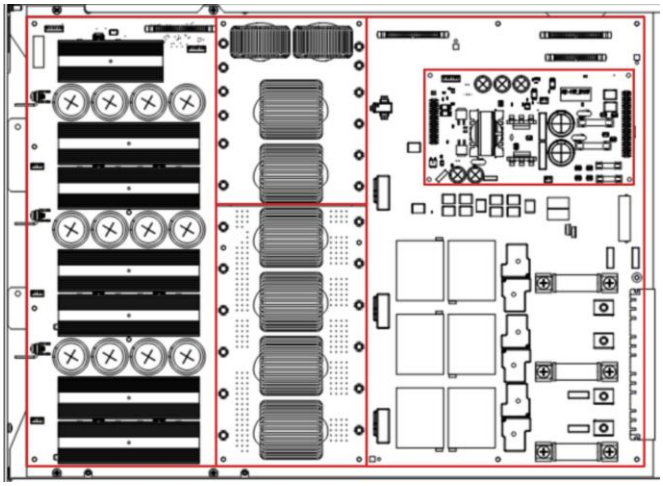


Fig. 107

11.4.1 AUX. POWER SUPPLY BOARD REMOVAL (B0394-01)

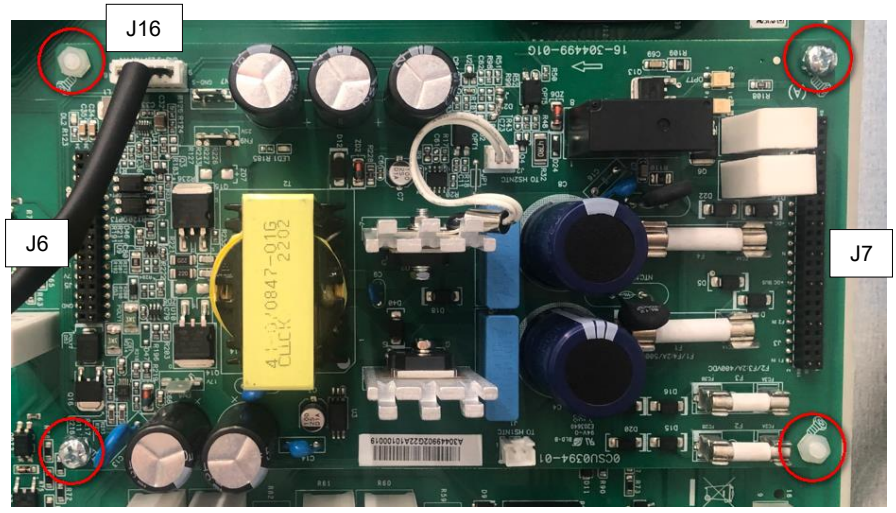


Fig. 109

Note for the installation of the new aux. power supply board: when inserting the board, take care not to twist the underlying pins of the J6 and J7 connectors. It is essential to ensure proper contact between board connectors J6 and J7 of the B0394 and the corresponding connectors on the board below B0395. Once the board is installed, check that all pins are visible:

Fig. 108

11.4.2 INDUCTORS INVERTER BOARDS (B0397-02, B0393-01)

Follow the images below to remove the plastic nuts and the fixing crews:

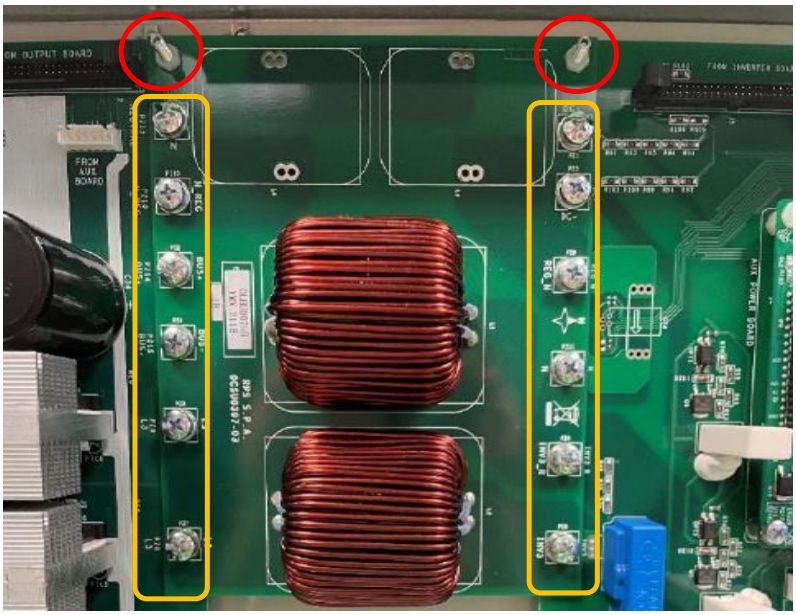


Fig. 110

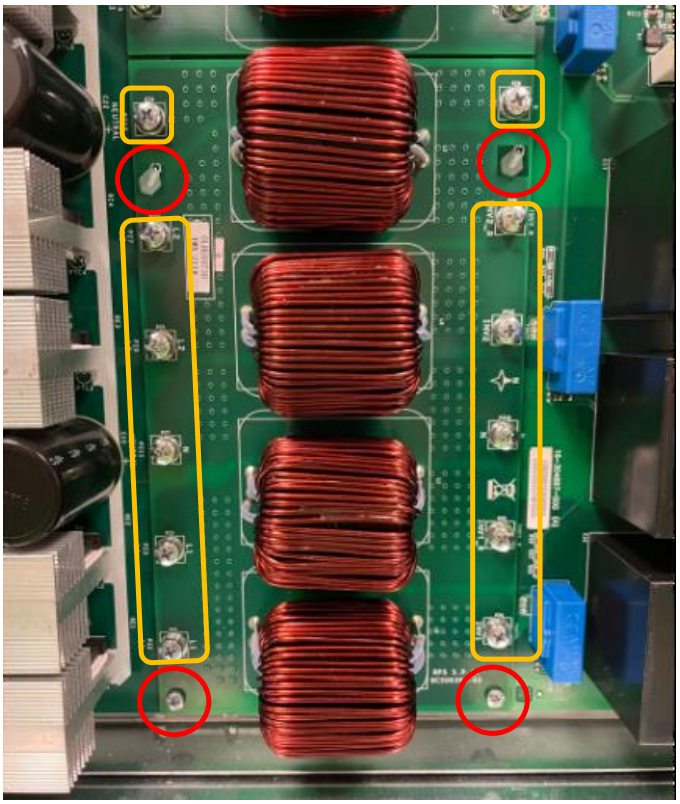


Fig. 111

11.4.3 INVERTER POWER BOARD (B0392-02)

1) Remove the fan box as shown in the chapter 11.2.1
2) Remove the six fixing screws as shown below:

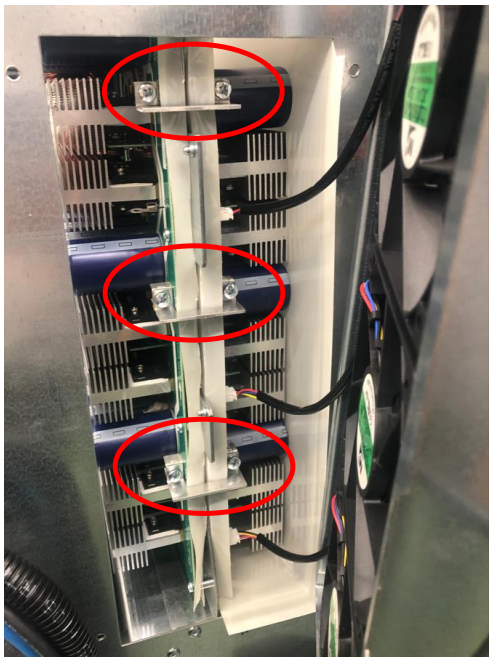


Fig. 112

3) Remove the Inductors inverter boards as shown in the chapter 11.4.2
4) Remove the flat cable and the fixing screws of the board B0392-02:

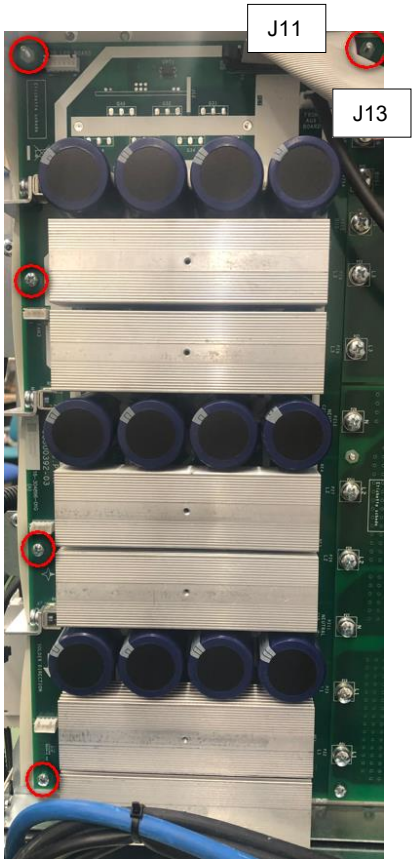


Fig. 113

Follow this procedure in reverse to install the new Inverter power board.

11.4.4 OUTPUT BOARD REMOVAL (B0395-03)

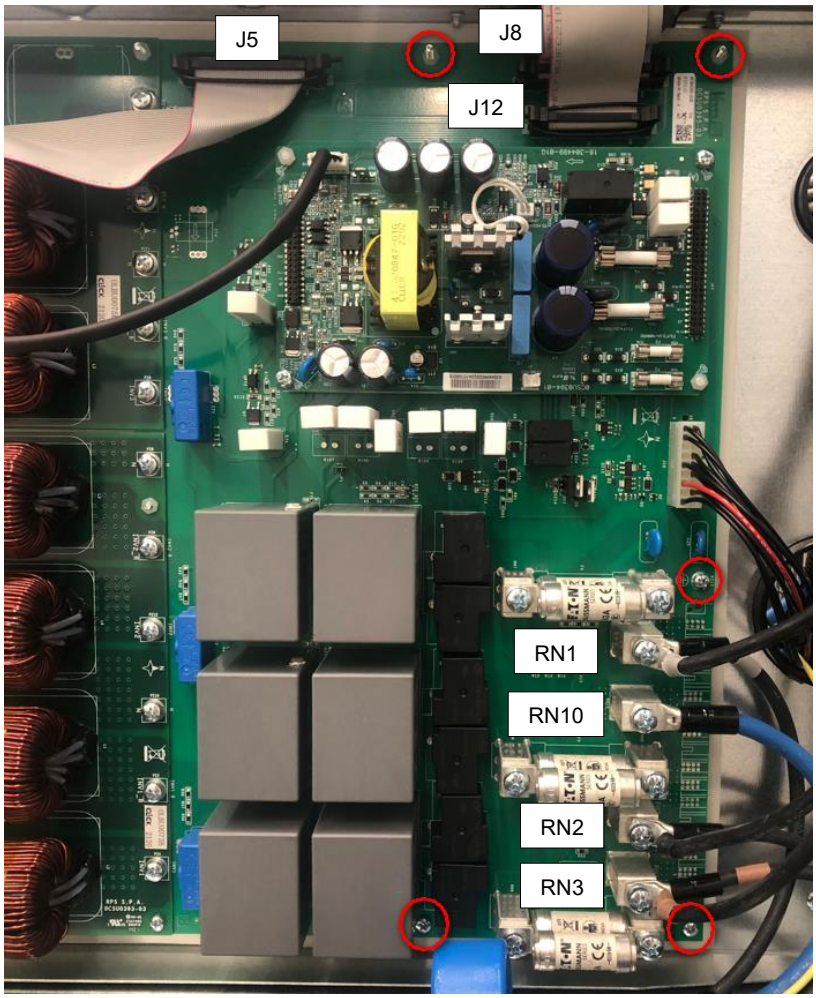


Fig. 114

1) Remove first the Inductors inverter boards as shown in the chapter 11.4.2
2) Remove the Aux. power supply board as shown in the chapter 11.4.1
3) Remove the two metallic pillars that hold the aux. power supply board to the chassis (the plastic pillars can remain attached to the board.
4) Remove all the cables and the screws indicated in the picture.

Note for the installation of the new board: please follow this procedure in reverse, and reconnect the following cables

J5 flat cable from J11 of the B0392 board
J8 flat cable from J7 of the B0400 board
J12 flat cable from J6 of the B0400 board
J10 cable from J4 and J14 of the B0411 and from J5 of the B0400
RN1 (PH3) power cable from PZ10 of the B0411 and to SWOUT
RN10 (N) power cable from FN4 of the B0411 and to SWOUT
RN2 (PH2) power cable from PZ7 of the B0411 and to SWOUT
RN3 (PH1) power cable from PZ4 of the B0411 and to SWOUT

12 SERVICE PROCEDURES

12.1 DISPLAY CALIBRATION

The display calibration procedure can be performed when the display is not calibrated or when the display is not reactive. For the display calibration follow the procedure below.

12.1.1 DISPLAY CALIBRATION WITH THE UPS ON (THE LOAD IS STILL FED BY THE UNIT)

a) Disconnect the display and remove the RJ45 cable (refer to 11.1.1).
b) Reconnect the RJ45 cable holding at the same time a finger press in a point on the display panel.
c) Follow the “12.1.3 CALIBRATION SCREEN SEQUENCE”.
d) At the end of the calibration, reinstall the display.

12.1.2 DISPLAY CALIBRATION WITH THE RESTART OF THE UPS

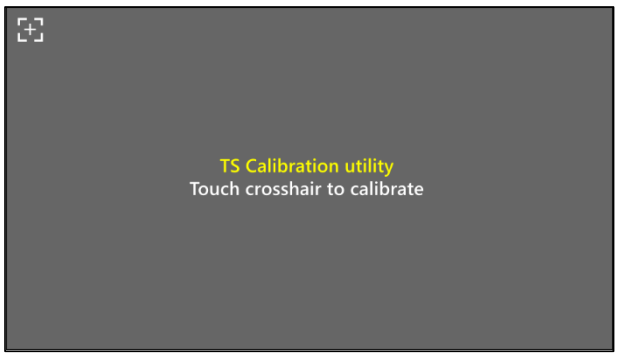
Note: if you need to feed the load close SWMB during the calibration procedure.

WARNING! While SWMB is closed, any disturbance on mains or blackout will affect the load.

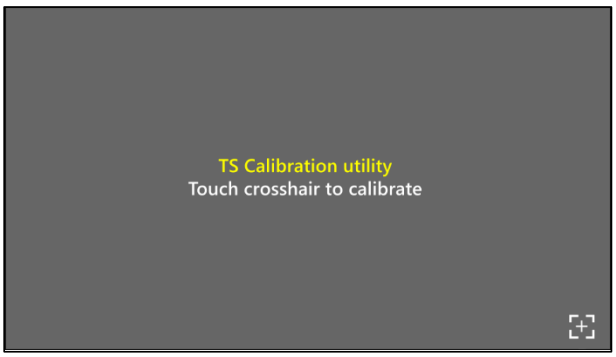
a) With the UPS switched off, close the SWIN in order to turn on the UPS, holding at the same time a finger press in a point on the display panel.
b) Follow the “12.1.3 CALIBRATION SCREEN SEQUENCE”.
c) At the end of the calibration, if previously closed, open the SWMB with unit in working condition (no stand-by status to avoid losing the load).

12.1.3 CALIBRATION SCREEN SEQUENCE

The Calibration Utility will start with these steps:

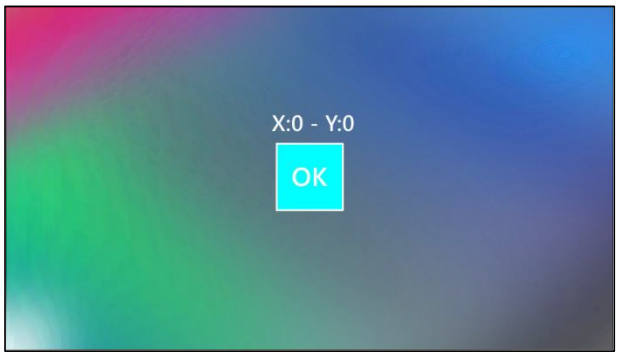


STEP 1



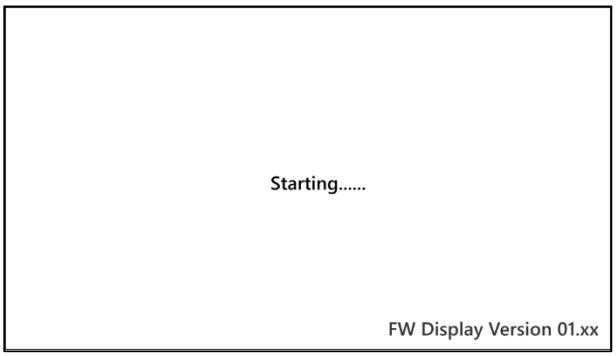
STEP 2

Press the correct points indicated on the display



STEP 3

X and Y must both be “0”



STEP 4

End of a correct calibration procedure

12.2 UPS CONFIGURATION AFTER THE CONTROL BOARD REPLACING (B0275)

This paragraph ensures the correct configuration of the UPS after the Control board (B0275-02x) replacing.

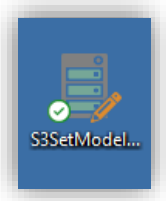
Before replacing the control board, it is recommended to download the .scd file in order to restore the UPS confiuration settings at a later time.

The Control board is installed in a single generic version on each DISCOVERY model and is then configured with the appropriate factory settings.

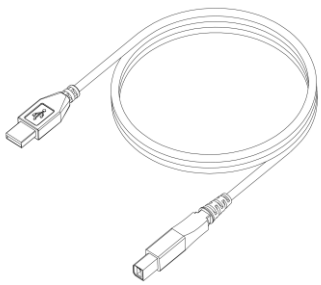
The related spare part (**6R_SUB0275-02x**) contains the generic Control board (without factory settings) and it must be correctly configured by the user via software (included in the UcomS3 package), according to nominal power of the UPS, the output configuration and the personalisation (RPS or Neutral personalisation can be defined using the software).

12.2.1 REQUIREMENTS

- S3setModel software
  Note: this software is already provided inside the file 0SWU02903. (UCOM S3 x.x_xx Service Software) and it can run only with full license activation.



- USB cable (A to B)
  Note: the cable is provided with the UPS



The S3setModel software works only when the B0275-01 is a **spare part**:
6R_SU0275-02.

Only this code will allow the program to recognize the spare part and establish the connection

12.2.2 PROCEDURE TO CONFIGURE THE UPS

The **SWMB** must remain closed if it is necessary to keep the load powered by the manual bypass line. For additional information please refer to the Operative Procedures written in the User Manual.

Attention! In case of blackout the load will be lost

a) Switches status (to start the procedure):

SWIN → closed
SWBYP → open (if present)
SWOUT → open
SWBAT → open

Important: make sure the UPS remains in "**Stand-by**" during the procedure: when the SWIN is closed, the UPS will automatically go into stand-by (with the battery charger off). If the "Auto system on" is enabled, disable it first by S3Config service software of UcomS3. No further action is required.

If the Control board (B0275) is not properly configured, the UPS will not work correctly.

b) Connect the PC to the UPS trough a USB cable as picture below:

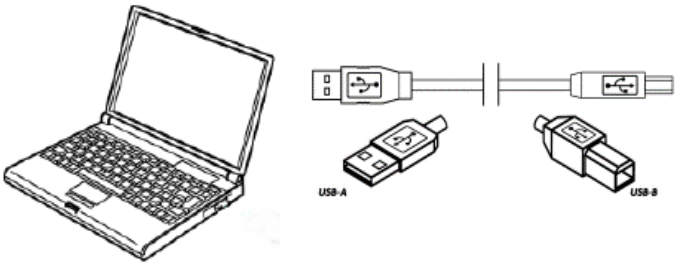


Fig. 115

c) Run S3setModel.exe

d) In order to run the program, a password is required.

Service level password: ***6R_model***.

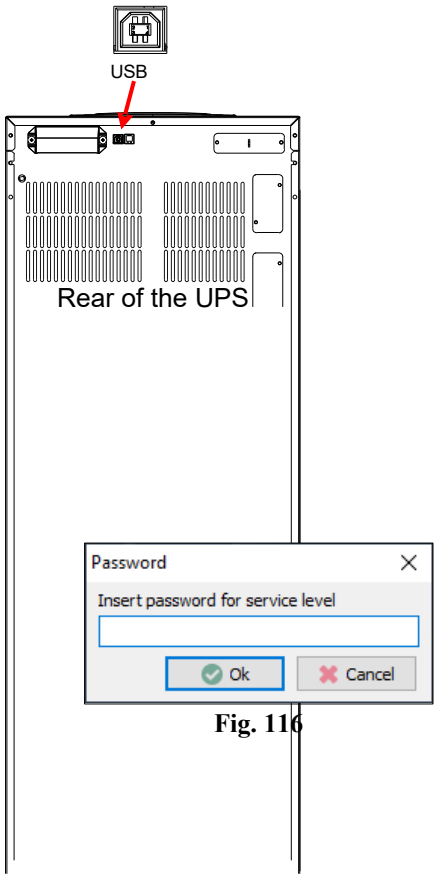


Fig. 116

e) Select the correct COM port.
Note: this setting is mandatory also for the USB connection. Select the correct virtual COM associated the USB port.

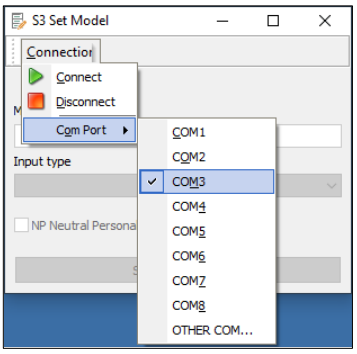


Fig. 117

f) Click the “Connect” icon to establish the connection.

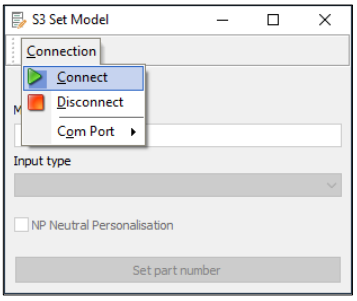


Fig. 118

g) Type the P/N found on the UPS label in the “Model (part number)” field.

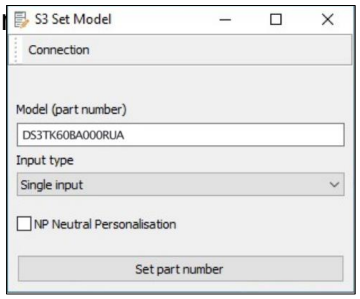


Fig. 119

h) Select the appropriate Input type (Single-Input or Dual-Input).

Note: "NP Neutral Personalisation" can be selected for the UPS neutral display.

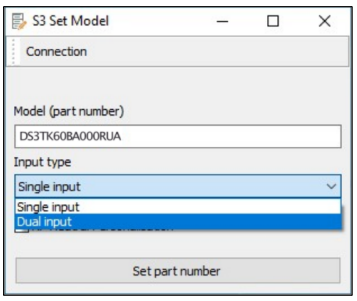


Fig. 120

i) Click “Set part number” to end the procedure.

A message will inform you of the success of the operation.

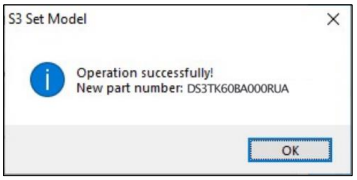


Fig. 121

12.2.3 PART NUMBER (P/N) CHECK AND RESTORING OF THE UPS OPERATION

- Turn OFF and ON the UPS to check the change made.
- Check that not anomalies are present on the status bar (except for the anomalies due to the SWs opened).
- Check on the UPS info page of the display panel the changes made on chap. 12.2.2. The **Model** on the UPS Identification must contain the new part number set previously (see Fig. 124). The nominal power of the UPS must be compatible with the Model.
- If the Model is correct according with the changes made, it is possible to restore the UPS operation. Refer to the “Operative Procedures” written in the User Manual to restore the UPS normal operation without losing the load.
- Remember to enable the “Auto system on” ONLY if previously disabled.

12.2.4 SERIAL NUMBER (S/N) SETTING

When the Control board (B0275-02x) is replaced, the serial number displayed on the info page will be different from the serial number of the UPS label.
The “new” serial number displayed is related to the replaced Control board and in case of necessity, it must not be confused with the serial number of the UPS.
For this reason, **it is recomended to restore the UPS S/N. This operation is possible with the S3Config** of UcomS3 Service software.

Procedure with S3Config:

- [Connection → Com Port] select the COM for both USB and Serial Port
- or [Connection → Connect] to establish the connection laptop-UPS
- or [File → Download] to get the configuration file from the UPS
- Commands → Set serial number → **enter the S/N of the UPS into the field**

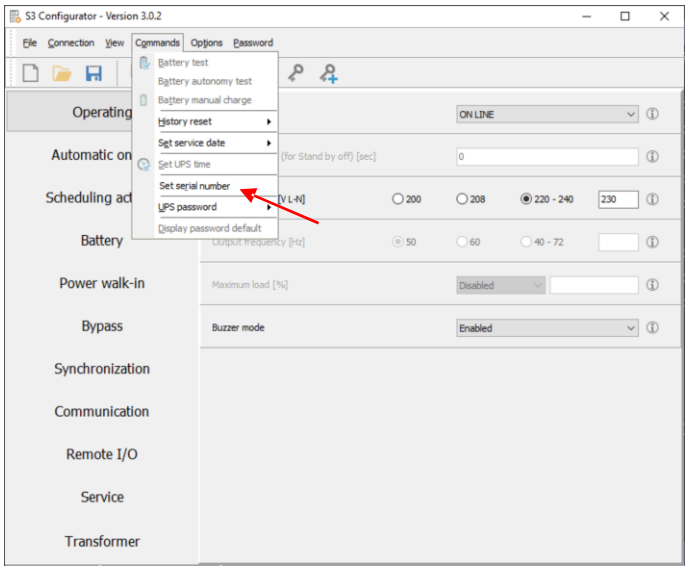


Fig. 122

- Wait about 20 seconds after making the change and download the configuration file again
- Check that the correct **Serial number** is shown on the “Settings” of S3Config (Fig. 123) and on the UPS Info page of the display (Fig. 124):

Fig. 123

(View → Settings from S3Config)

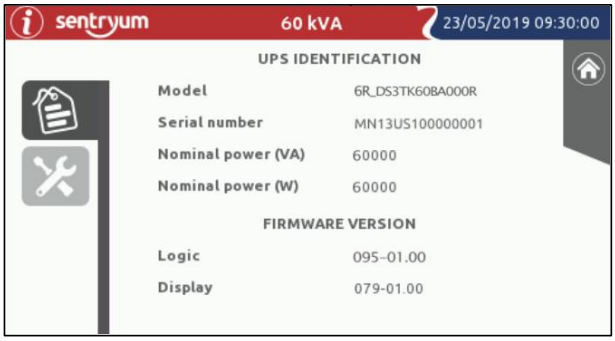


Fig. 124

(Wait for the timeout of the display to check the change made)

Note: the new Serial code indicates the spare part serial code. It cannot be changed.

- At this point it is possible to upload the .scd file which already contains the correct settings or to set manually the necessary parameters/configurations.
-  or [Connection → Disconnect] to exit the connection.

13 STATUS / ALARM CODES

For information on the meanings of status/alarm codes refer to the document:
code RM110 Rev.-xx “ALARM CODES”.

14 TROUBLESHOOTING TABLES

The UPS is able to check and display its status and any faults and/or failures that may occur during operation on the display panel. In the event of a problem, the UPS reports the event by displaying the type of alarm and alarm code on the display panel.

14.1 TROUBLESHOOTING ‘FAULT’ TYPE PROBLEMS

The tables below provide useful information for troubleshooting problems connected with 'fault' type alarm codes. The table does not cover all possible UPS failure causes, the information contained here should be considered as a suggestion of the possible causes of problems and how they might be resolved.

Alarm code	Description	Possible cause	Boards affected	Corrective actions
F01	Internal communication error	Communication error between DSP and FPGA	B0275	Replace the board
F02	Incorrect cycle of the input phases	Input phases connection error		Check input phases connection
F03	Phase 1 input fuse blown or input contact does not open	Input fuses blown or relay blocked	B0400	Check for blown fuses and relays. If necessary, replace the board involved
F04	Phase 2 input fuse blown or input contact does not open	Short-circuit on Bus (Vdc) from PFC/inverter fault	B0398 B0392	Check the power components, refer to chapter 9. If necessary, replace the board involved
F05	Phase 3 input fuse blown or input contact does not open	Control logic faulty	B0275 B0410	Check the connections between the board and if necessary replace the board

F06	Phase 1 input relay does not open	Input relay blocked	B0400	Check relays. If necessary, replace the board involved
F07	Phase 2 input relay does not open		B0398 B0392	Check the power components, refer to chapter 9. If necessary, replace the board involved
F08	Phase 3 input relay does not open			
F09	Pre charge of the positive capacitor branch failed	Precharge resistor opened	B0395	Check the precharge resistors (*) (**) If necessary, replace the board
		Short circuit on Vdc BUS	B0398 B0392	Check the power components, refer to chapter 9. If necessary, replace the board involved
F10	Pre charge of the negative capacitor branch failed	Pre charge of the battery film capacitors failed	B0398 B0400	Problem or short circuit on battery film capacitors. If necessary, replace the board involved

(*)
With the UPS completely disconnected from any power supply (make sure there is no voltage present), check R60 and R61, then check R83 and R84 (approximately 44Ω for each series of resistors).

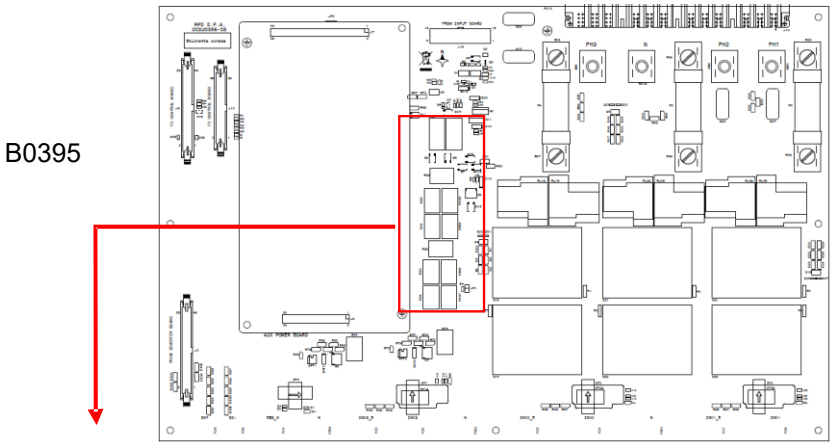


Fig. 125

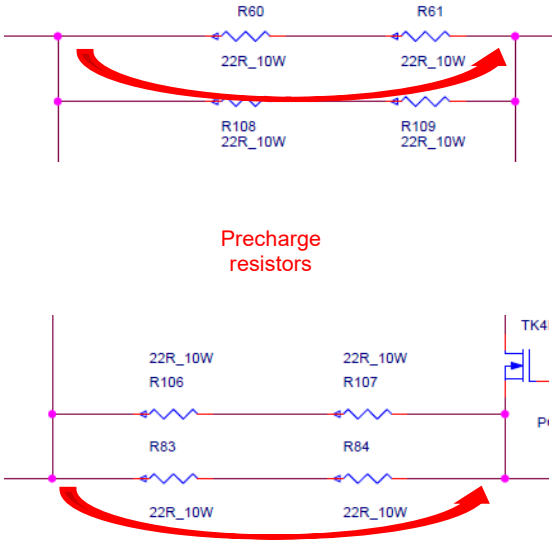


Fig. 126

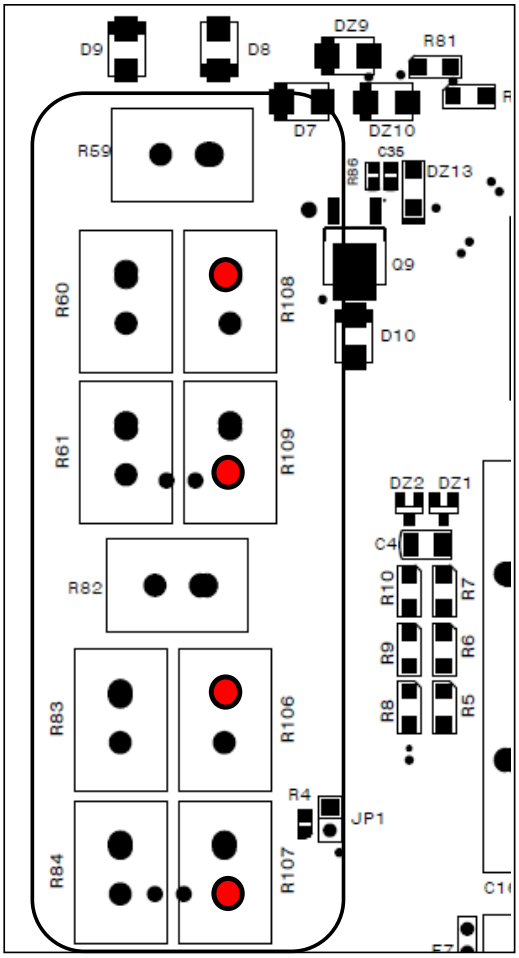


Fig. 127

(**) if the problem occur during precharge from battery is necessary to check also R59 and R82 (approximately 22Ω for each resistor):

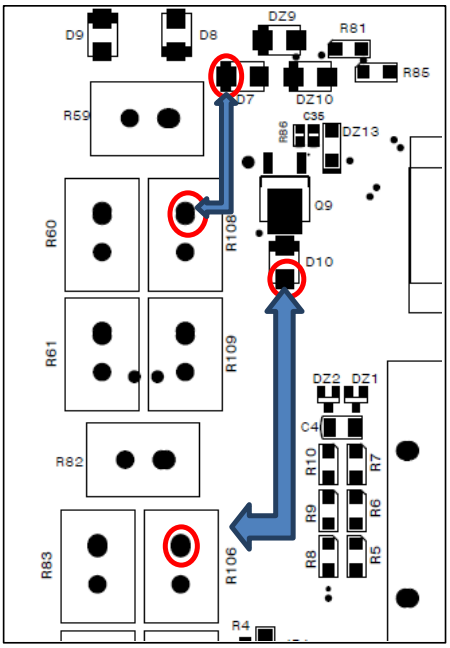


Fig. 128

<table>
<tr><td rowspan="4">F11</td><td rowspan="4">Boost stage anomaly</td><td>The boost stage doesn’t complete the “Power on” procedure</td><td rowspan="2">B0398</td><td rowspan="2">Check the bus (Vdc) voltages (ch. 10.7)

Check the tightening screws

If necessary, replace the board</td></tr>
<tr><td>Boost stage faulty</td></tr>
<tr><td>Open inductance</td><td>B0403
B0404</td><td>Check the inductances (*)

If necessary, replace the board</td></tr>
<tr><td>Control logic faulty</td><td>B0275 /
B0410</td><td>Check the flats connection (**)

If necessary, replace the board</td></tr>
<tr><td colspan="5">(*) Follow the wiring diagram SBS3T_60_xx-x to identify and test the inductances.

(**) Check that each flat is connected correctly:

<table><tr><td>B0410</td><td>B0275</td></tr><tr><td>J4</td><td>J2</td></tr><tr><td>J7</td><td>J1</td></tr></table>
<table><tr><td>B0400</td><td>B0398</td></tr><tr><td>J13</td><td>J1</td></tr></table></td></tr>
<tr><td>F12</td><td>Incorrect cyclic direction of bypass phases</td><td>Connection error in bypass power supply</td><td></td><td>Check bypass power supply connection</td></tr>
<tr><td>F13</td><td>Temporary overvoltage boost</td><td>Any unidirectional or regenerative loads connected at output</td><td></td><td>Check for the presence of unidirectional loads at the output</td></tr>
</table>

Tab. 36

F14 F15 F16	Phase 1 sinusoid inverter deformed Phase 2 sinusoid inverter deformed Phase 3 sinusoid inverter deformed	Type of applied load strongly distorting or regenerative		Check if there is a regenerative load opening output switch of the UPS. Check if the type of load does not absorb more inrush current. In this case is necessary a UPS with more power. Load type very distorting
F19 F20	Overvoltage of the positive battery branch Overvoltage of the negative battery branch	Battery charger error	B0398	Verify the Battery stage shown in chapter 9. If necessary, replace the board
		Control logic faulty	B0275 B0410	Check the flats connection (*) If necessary, replace the board
		Battery readings faulty	B0400	Replace the board involved
- Turn the system off and then on again with the batteries connected. After the battery relays are closed, measure the voltage from Battery fuse and the neutral (B0400). Each measurement must be around ± 272,4 V.				
F21 F22	Undervoltage/fault of the positive battery branch (battery/fuse) Undervoltage/fault of the negative battery branch (battery/fuse)	Battery circuit opened or SWBATT fuse blown		Check for fuses blown Replace the batteries
F23	Output overload	Excessive load		Reduce the load
		Output power reading faulty	B0275 B0410 B0395	Replace the affected board

F25	Inverter takes power from output	Power return from the applied load		Check the presence of a regenerative load
- Check the presence of L10, then solve this lock before F25 fault				
F26 F27 F28	Phase 1 output contact does not open Phase 2 output contact does not open Phase 3 output contact does not open	Output relay blocked	B0395	Check relays. If necessary, replace the board
F29	Phase 1 output fuse blown or output contact fault	Output fuses blown or the relay does not close	B0395	Check for blown fuses and relays
F30 F31	Phase 2 output fuse blown or output contact fault Phase 2 output fuse blown or output contact fault		B0392	Check the power components, refer to chapter 9. If necessary, replace the board involved
F32	Battery charger stage fault	Saturated controller or module faulty	B0398	Check first the tightening screw of B0403 and B0404 boards. If necessary, replace the board
		BC control and feedback signals faulty	B0275 B0410	Check the flats connection (*) If necessary, replace the board

(*) Check that each flat is connected correctly:

B0410	B0275
J4	J2

B0400	B0398
J13	J1

Tab. 37

F33	Failure of the system to measure the battery voltage	Battery readings faulty	B0400 B0275	If necessary, replace the board involved
F34	Power module heatsink over temperature	Temperature readings faulty	B0392 B0398 B0410	Check the interconnections between the affected boards. If necessary, replace the boards
		Temperature sensor faulty		
F35	Over temperature of the transformer	Cooling transformer fans faulty		Check for short circuit at fans and the eventual fan fuse open ➔ replace fans
		Connections faulty		Check the connections
		Excessive load for long time		Reduce the load
F36	Fan speed not correct	Cooling fans faulty		Check for connection and short circuit at fans (*) ➔ replace fans
F39	Failure of the system to measure the DC bench voltage	DC bench readings faulty	B0395 B0398	Check the Bus (Vdc) readings by software “S3RealTime” (Status Analyzer). If necessary, replace the board involved

It is possible to determine which board is involved in the measurement failure by the **Status Analyzer** of the UcomS3 service software.

The value that differs from the other measures (with at least 20V difference) determines the board involved in the system measurement failure.

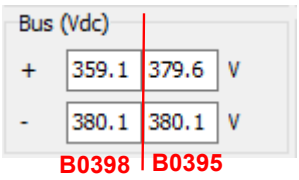


Fig. 129

For a further check of the Vdc voltage on the UPS, refer to chap. 10.7.

F40 F41	Fuse of the BC positive branch blown Fuse of the BC negative branch blown	Short-circuit/fault on PFC/battery stage	B0398	Check for blown fuses. Check the power components, refer to chapter 9. If necessary, replace the board involved
F45	Communication bus open in a parallel system (one point)	Single point parallel link failure	B0229 B0275	Check the interconnections between the affected boards, if necessary, replace the board
F46	Anomaly of bypass request in a parallel system	Bypass call request not confirmed in HW		
F47	Anomaly of synchronization line in a parallel system	Frequency message different to the HW frequency		
F48	Wrong position of neutral battery cable	Battery connection error		Check the position of neutral battery cable
F49	Fault in the signal command of the battery contact	The relay status is not consistent with the command given by the microcontroller	B0400 B0410 B0275	Check the flat cable between J1 of B0410 and J5 of B0400. If necessary, replace the board involved
F51	Short-circuit on battery contact	Battery relay blocked	B0400	Check relays. If necessary, replace the board involved
			B0392 B0398	Check the power components, refer to chapter 9. If necessary, replace the board involved

F53	Fault on the redundant auxiliary power supply for bypass line	Redundant auxiliary power supply faulty	B0411	Check for blown fuse F1 and the state of the redundant auxiliary power supplies led DL1. Check the redundant auxiliary power supply's voltage (*)

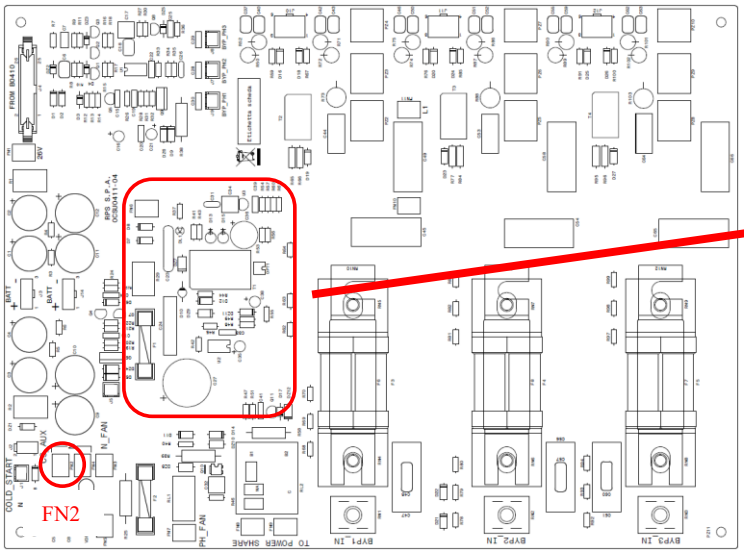


Fig. 131

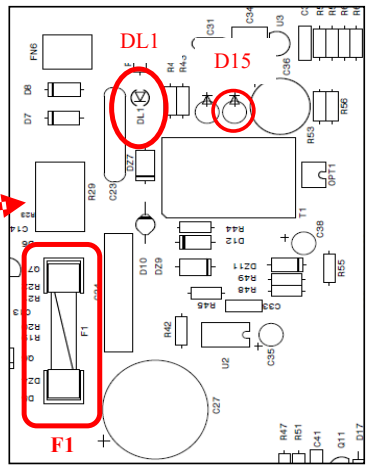


Fig. 130

(*)
With a voltmeter measure between FN2 (neutral) and catode of D15.

With input line or bypass line present, the measurement have to be more than 13.9V. In this case the redundant power supply works fine.

F54 F55	Memory access error A Memory access error B	EEPROM faulty	B0275	Replace the board
F56	Calibration error PFC	Error in zeroing of LEM offsets	B0400 B0275	Replace the board involved
F57	Calibration error INV		B0395 B0275	
F58	Calibration error BAT		B0400 B0410 B0275	

F59	Output board communication error	Microcontroller on B0410 doesn't work or flats not connected	B0275 B0410	Check that the flats are correctly connected. If necessary, replace the board involved
F60	Comm. Board link fault	The flat from the Control Board to the Communication Board is not connected or Control Board faulty	B0274	Check that the flat of the B0274 is correctly connected
			B0275	Replace the board
F61	Calibration error BYP	Error in zeroing of bypass reading offsets	B0411 B0275	Replace the board involved

14.2 TROUBLESHOOTING ‘LOCK’ TYPE PROBLEMS

The tables below provide useful information for troubleshooting problems connected with 'lock' type alarm codes. This table does not cover all possible UPS failure causes, the information contained here should be considered as a suggestion of the possible causes of problems and how they might be resolved.

Alarm code	Description	Possible cause	Boards affected	Corrective actions
L01	Auxiliary power supply incorrect	Aux power supplies missing	B0392 B0394 B0410 B0275	Detailed description of L01 shown in chap. 7
L02	Disconnection of one or more internal connection cable of the boards	Flat cables not connected or partially connected	All boards with flat cables except B0274	Check the connections of the UPS flat cables. Refer to chap. 8
L03	Phase 1 input fuse blown or input contact fault	Input fuses blown or the relay does not close	B0400	Check for blown fuses and relays. If necessary, replace the board involved
L04	Phase 2 input fuse blown or input contact fault	Control logic faulty	B0410 B0275	Replace the board
L05	Phase 3 input fuse blown or input contact fault	Short-circuit on Bus (Vdc) from PFC/inverter fault	B0392 B0398	Check the power components, refer to chapter 9. If necessary, replace the board involved

L06	Boost positive stage overvoltage	Any unidirectional or regenerative loads connected at output	-	Check for the presence of unidirectional loads at the output (*)
		Short-circuit on bypass line	B0411	Check the bypass relays
L07	Boost negative stage overvoltage	Resistance opened in the Control Board	B0275	Replace the board

Check if the neutral cable is connected.

(*)
- Check if there is not regenerative load opening output switch of UPS. If present, try to dissect the loads (if it's possible) to find the regenerative load.
- Check on UcomS3 Configurator the voltages on capacitors bank must not be different between them. If they are very different, turn on the UPS and open the output switch and recheck the voltages on capacitors bank: correct readings indicate that the type of load is not suitable for UPS.

NOTE FOR PARALLEL SYSTEM: The whole parallel system can generate L06/L07 if also only one UPS has a failure.

L08	Boost positive stage undervoltage	Inverter stage fault	B0392	Check the power components, refer to chapter 9. If necessary, replace the board involved
L09	Boost negative stage undervoltage	Boost stage fault	B0398	
		Fuses blown		Check for blown fuses
L10	Bypass static switch fault (Back Feed Protection)	Bypass SCR blown	B0411	Check bypass SCR. If necessary, replace the failed module. Verify the SCR modules as shown in chapter 9.3.
L11	L1 bypass output unavailable for contact fault	Bypass command circuit faulty	B0411 B0275	If the problem is on all three phases together, there is a failure on the command circuit. Replace the affected board.
L12	L2 bypass output unavailable for contact fault			
L13	L3 bypass output unavailable for contact fault	Bypass contact faulty		Replace the board involved

L14	Phase 1 inverter overvoltage	Presence of high peaks	B0392 B0395	Replace the board involved
L15 L16	Phase 2 inverter overvoltage Phase 3 inverter overvoltage	Feedback readings faulty	B0395 B0410 B0275	Check the capacitance measurement of the AC capacitors. If necessary, replace the board involved
L17 L18 L19	Phase 1 inverter undervoltage Phase 2 inverter undervoltage Phase 3 inverter undervoltage	Inverter reading faulty	B0392 B0395 B0410 B0275	Check the good position of flat cables connected to the B0395 and the flat cables between the B0410 and the B0275.
L20	Direct voltage on inverter output or deformed inverter sinusoid of phase 1	Inverter board faulty	B0392	Replace the board involved
L21	Direct voltage on inverter output or deformed inverter sinusoid of phase 2	Control board faulty	B0275	
L22	Direct voltage on inverter output or deformed inverter sinusoid of phase 3	Inverter capacitor faulty for capacity loss	B0395	Check the capacitance measurement of the AC capacitors. If necessary, replace the board
L23 L24	Overload on phase 1 output Overload on phase 2 output	Excessive load or Power Reduction mode activated		Reduce the load or disable the Power reduction via Ucoms3 Configurator
L25	Overload on phase 3 output	Output power reading faulty	B0395	Replace the affected board (*)

(*)
With the UPS idles, check the output current by software “S3RealTime”: if the current is not close to 0 amps, try to turn the UPS in Eco mode to exclude the output board if the current is not close to 0 amps yet.

L26 L27 L28	Short-circuit on phase 1 output Short-circuit on phase 2 output Short-circuit on phase 3 output	Short circuit at output		Check for the presence of short-circuit between the phases and neutral (and between phase-phase) at the output Check the good position of the cables to the UPS terminals.
L29 L30 L31	Phase 1 output fuse blown or output contact fault Phase 2 output fuse blown or output contact fault Phase 3 output fuse blown or output contact fault	Output fuse blown or output contact does not close	B0395	Check for blown fuses and relays. If necessary, replace the board If the problem is on all three phases together, replace the board
L32	Synchronisation error in parallel system	HW Sync. Frequency differ from message for 5 cycles	B0229	Occurs only on Slave. Replace the board
L33	Synchronisation signal anomaly in a parallel system	Physical Loss of HW sync. signal	B0229	Occurs only on Slave. Replace the board

L34	PFC/Boost/BC stage over temperature	Clogged heatsinks		Try to clean the heatsinks
		Temperature readings faulty	B0392 B0398	Check the interconnections between the affected boards. If necessary, replace the boards
L35	Inverter stage over temperature	Temperature sensor faulty		
L38	Temperature sensor of the boost stage fault	Short-circuit or open circuit of the temperature sensor (internal the module)	B0392 B0398 B0410	If necessary, replace the board involved.
L39	Temperature sensor of the inverter stage fault	Temperature readings faulty		
L42	Battery fuse blown	Short-circuit/fault on PFC/battery module	B0398	Check for blown fuses. Verify the power stages state shown in chapter 9. If necessary, replace the board involved
L43	Battery contact locked shorted (does not open)	Battery contact blocked	B0400	Check RL1 and RL2. If necessary, replace the board
L44	Phase 1 input contact locked shorted (does not open)	Phase 1 input contact blocked	B0400	Check the input fuses and the RL3 relay. Verify the power stages state shown in chapter 9. If necessary, replace the board involved
L45	Communication bus interrupted in a parallel system (two points)	Two point parallel link open	B0229	Check the interconnections between the affected boards. If necessary, replace the board
L46	Communication bus anomaly in a parallel system	Parallel communication faulty		
L47	Parallel board anomaly	Parallel board faulty		

L49	Output AC capacitor fault	Thermal fuse open on AC inverter capacitor	B0395	Check for blown fuses. If necessary, replace the board
L51	Short-circuit on battery charger output	Battery charger blocked for short circuit detected	B0400	Replace the board
L52 L53 L54	Active power error for phase 1 Active power error for phase 2 Active power error for phase 3	No output connection or active power out of range		Check the output connections and for output fuses blown. If necessary, an in-dept analysis is required
L55 L56 L57	Reactive power error for phase 1 Reactive power error for phase 2 Reactive power error for phase 3	Reactive power out of range		Internal anomaly for multiple causes. An in-dept analysis is required

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15 APPENDIX

15.1 LIST OF USEFUL DOCUMENTS

- User Manual 0MNS3TK10F9ENUx (MAN DS 10-60)
- Installation Manual 0MNS3TK60RUxxIx (MAN 60 DRW)
- Wiring diagram SBS3T_60_... (Wiring Diagram DS 60)
- Firmware Upgrade Manual RM034 Rev04-… (Firmware Upgrade) (*)
- Alarm Code Manual RM110 Rev0x-… (Alarm codes DISCOVERY)
- Spare Part List Spare Part List DISCOVERY

(*) Or later version

15.2 BOARDS LIST

BOARD	DESCRIPTION	QUANTITY FOR UPS	
B0274-01	Communication Card	1	
B0275-02	Control Card	1	
B0322-01	Led Neutral Bar Card	1	
B0306-01	Display Card	1	
B0392-02	Inverter Power card 60	1	
B0393-01	Induct. B Inverter Card 60	1	
B0394-01	Aux Power Supply Card	1	
B0395-03	Output Card 60	1	
B0397-02	Induct. A Inverter Card 60	1	
B0398-01	Boost & BC Power Card 60	1	
B0400-02	Input Card 60	1	
B0403-01	Induct. A PFC-Boost Card 60	1	
B0404-01	Induct. B PFC-Boost Card 60	1	
B0410-01	Signal Adapter Card 60	1	
B0411-01	Bypass Card 60	1	
FILTER CY BOARD		**ACT**	**XTD**
B0390-01	Filter Cy BATT Card 30-60	-	1
B0390-02	Filter Cy BATT Card 60	1	-
B0288-03	Filter Cy IN Card 60	1	1
B0288-02	Filter Cy OUT Card 30-60	1	1
B0435-01	Filter Cx IN Card 60	1	1

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15.3 6R_S3T60CB00-A – FLAT AND SIGNAL CABLES DS 60

Below the list and quantities of flat and signal cables included in the 6R_S3T60CB00-A spare part:

Cod. (*)	Description	Qty	Boards	version
0CBFU0100A	Flat for Communication Slot 1	1	B0274	DSX/XTD
0CBFU0115A	Flat for Communication Slot 1	1	B0274	DSY/ACT
0CBFU0135A	Flat for Parallel Card	1	B0229↔B0275	DSY/ACT
0CBFU0136B	Flat for Input / Output Card	1	B0400↔B0395	DSY/ACT-DSX/XTD
0CBFU0137B	Flat for Input / Output Card	1	B0400↔B0395	DSY/ACT-DSX/XTD
0CBFU0138B	Flat for Input / Boost & BC Card	1	B0400↔B0398	DSY/ACT-DSX/XTD
0CBFU0139B	Flat for Inverter / Output Card	1	B0392↔B0395	DSY/ACT-DSX/XTD
0CBFU0154A	Flat for Signal Adapter Card	1	B0410↔B0275	DSX/XTD
0CBFU0155A	Flat for Bypass Card	1	B0410↔B0411	DSX/XTD
0CBFU0156A	Flat for Signal Adapter Card	1	B0410↔B0275	DSX/XTD
0CBFU0157A	Flat for Signal Adapter Card	1	B0410↔B0275	DSX/XTD
0CBFU0158A	Flat for Communication Card	1	B0274↔B0275	DSY/ACT-DSX/XTD
0CBFU0159C	Flat for Parallel Card	1	B0229↔B0275	DSX/XTD
0CBFU0160A	Flat for Signal Adapter Card	1	B0410↔B0275	DSX/XTD
0CBFU0161A	Flat for Signal Adapter Card	1	B0410↔B0275	DSX/XTD
0CBFU0162A	Flat for Signal Adapter Card	1	B0410↔B0275	DSY/ACT-DSX/XTD
0CBFU0163A	Flat for Signal Adapter Card	1	B0410↔B0275	DSX/XTD
0CBFU0164A	Flat for Signal Adapter Card	1	B0410↔B0275	DSY/ACT
0CBFU0165A	Flat for Bypass Card	1	B0410↔B0411	DSY/ACT
0CBFU0166A	Flat for Signal Adapter Card	1	B0410↔B0275	DSY/ACT
0CBFU0167A	Flat for Signal Adapter Card	1	B0410↔B0275	DSY/ACT
0CBFU0168A	Flat for Signal Adapter Card	1	B0410↔B0275	DSY/ACT
0CBFU0169A	Flat for Signal Adapter Card	1	B0410↔B0275	DSY/ACT
0CBFU0170A	Flat for Signal Adapter Card	1	B0410↔B0275	DSY/ACT
0CBSU0679A	Cable for Battery start signal	1	B0411	DSY/ACT-DSX/XTD
0CBSU0696A	Cable for auxiliary signals	1	B0410	DSY/ACT
0CBSU0681A	Cable for auxiliary signals	1	B0410	DSX/XTD
0CBSU0694B	Cable for Bypass Card	1	B0411↔B0400↔B0395	DSY/ACT
0CBSU0677B	Cable for Bypass Card	1	B0411↔B0400↔B0395	DSX/XTD
0TCU0087B	DS TA	1	B0411	DSY/ACT-DSX/XTD

(*) The revision of the codes refers to the date: 05/2024