GTEC UPS MODEL:

DISCOVERY

30 - 40 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: S3T 30-40 kVA.

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

2 SWITCHING THE UPS ON/OFF

Read the User manual (code 0MNS3TK10RUENU...) 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 Discovery series.

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 is required the load the FTDI driver.
The driver is downloadable from FTDI website found 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 2.03**" 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) ****

* Rev02 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
S3T/S3M 10-40 kVA	From FW075-0112	From FW079-0105

Tab. 1

3.5 S3SETMODEL

S3SetModel is a software included in the UcomS3 package used to correctly configure the **6R_SU0275-010x** spare part (S3T Control Card).

For the complete procedure refer to chap.12.2

4 UPS INTERNAL STRUCTURE

For further details, see the User manual code 0MNS3TK10RUENU..., the Installation manual code 0MNS3TK30RUEN… and the wiring diagrams, code:

- SBS3T_30_…
- SBS3T_40_...

4.1 UPS MODELS

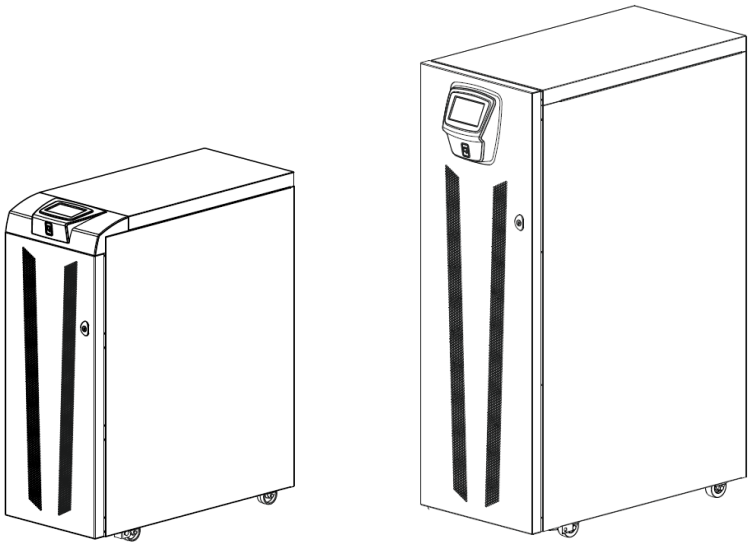


Fig. 1

ACTIVE (ACT) **XTEND (XTD)**

The Discovery UPS 30-40 is available in two version of chassis: Active and Xtend. These two versions are differenced by size, maximum number of battery blocks contained and position of the connections section (not for power size, every version can be 30 or 40 kVA).

MODEL	SIZE WxDxH [mm]	MAX NUMBER OF BATTERIES	CONNECTIONS SECTION
ACTIVE	380x850x1025	2x(20+20)	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 30-40kVA version has three-phase input and three-phase output, named S3T.

It is built by:

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

2. The input section. With the UPS situated in front of us, the input section is on the left side of the UPS. This section is composed by:
   - Input board (B0282 for S3T 30-40kVA);
   - Inductors PFC-Boost board (B0283 for S3T 30-40kVA).
   - Boost & BC power board (B0284 for S3T 30-40kVA);
   - Boost & BC driver board* (B0285 for S3T 30-40kVA);
   - DC capacitors boost board (B0286 for S3T 30-40kVA).

   * this board is installed on top of the Boost & BC power board (B0284)

3. The central section that includes the fans of the UPS and the inductors for the output side.

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:
   - DC capacitors Inverter board (B0286 for S3T 30-40kVA);
   - Inverter power board (B0289 for S3T 30-40kVA);
   - Auxiliary power supply board (B0273 – common board to all Discovery UPS);
   - Output & bypass board (B0290 for S3T 30-40kVA).

5. The switches and connections section: that includes for 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 logo RPSo board (B0305) 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

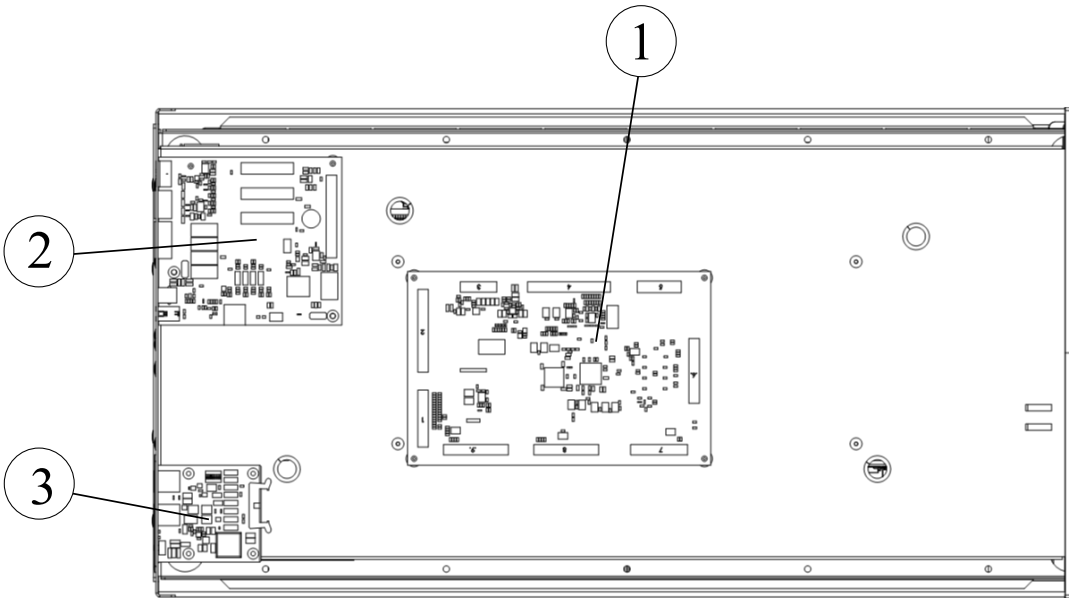


Fig. 2

1	**Control Board**	**B0275-01**
2	**Communication Board**	**B0274-01**
3	**Parallel Board (optional)**	**B0229-01**

Tab. 3

4.3.2 INPUT SECTION

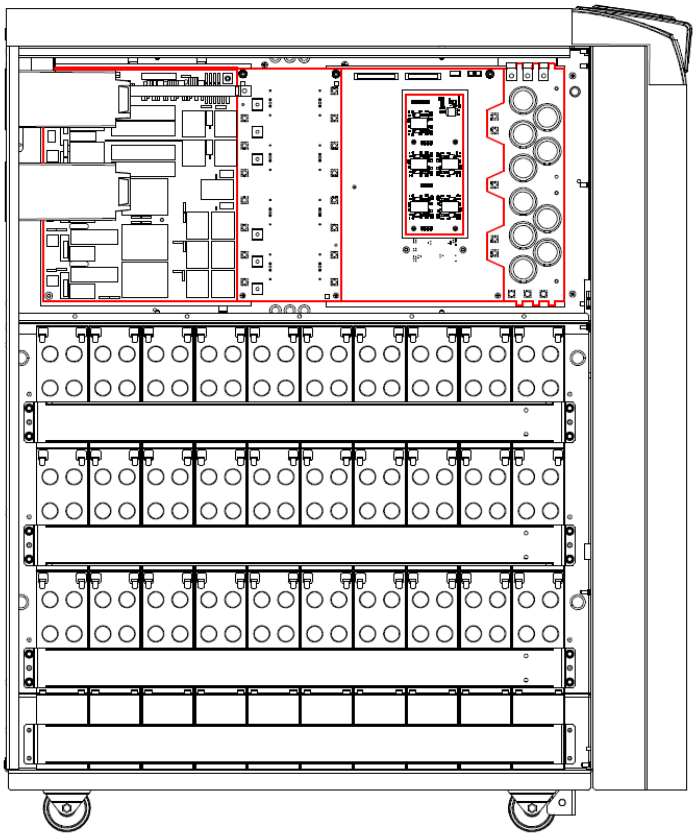


Fig. 3

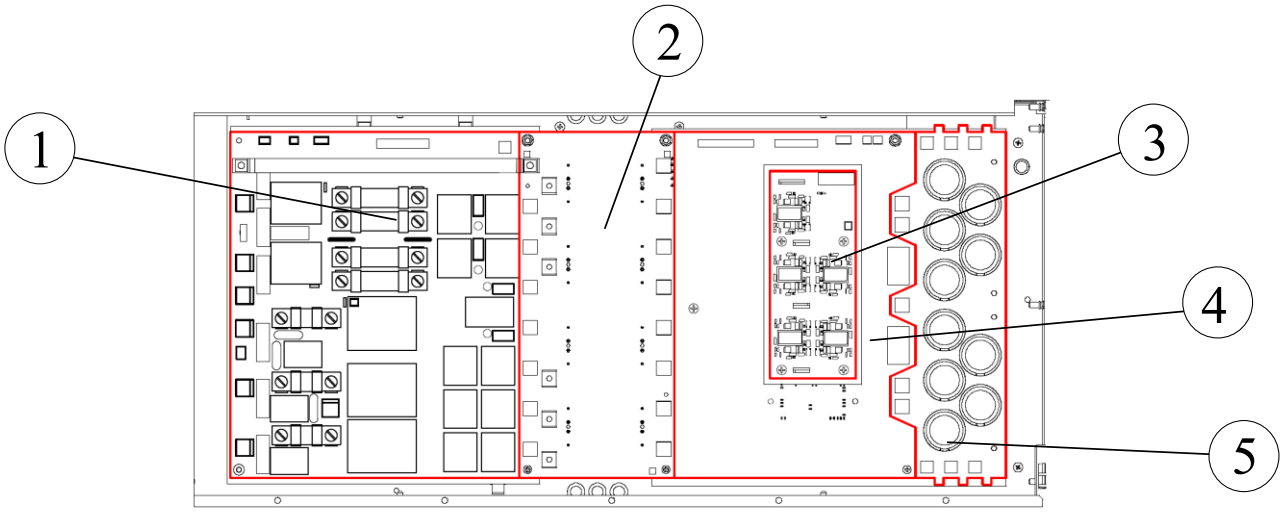


Fig. 4

1	Input Board	B0286-01 / B0286-02
2	Inductors PFC-Boost board	B0283-01 / B0283-02
3	Boost & BC driver board	B0285-01
4	Boost & BC Power Board	B0284-01 / B0284-02
5	DC Capacitors Boost Board	B0286-01 / B0286-02

Tab. 4

4.3.3 OUTPUT SECTION

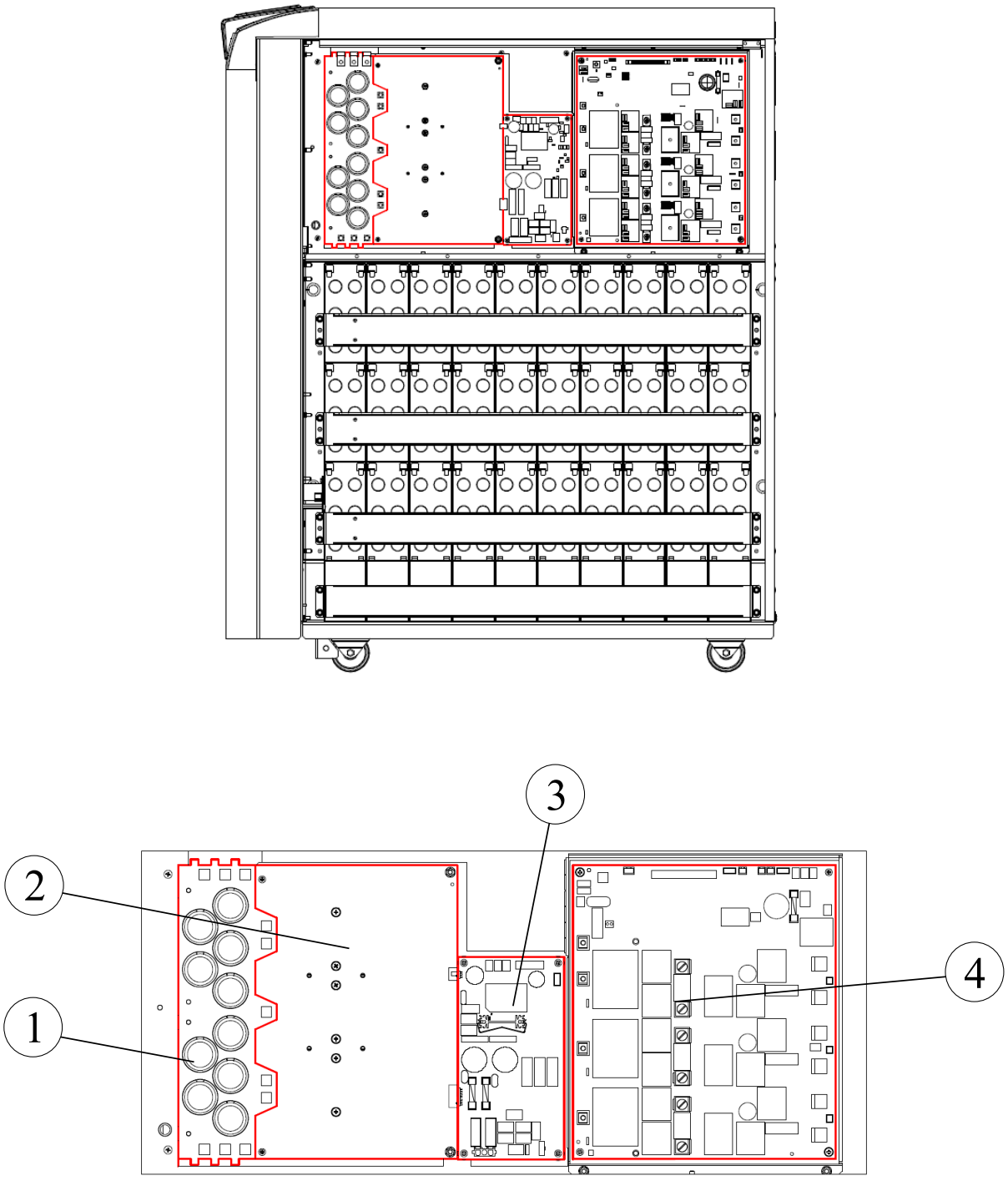


Fig. 6

1	DC Capacitors Inverter Board	B0286-01 / B0286-03
2	Inverter Power Board	B0289-01 / B0289-02
3	Aux. Power Supply Board	B0273-01
4	Output & Bypass Board	B0290-01

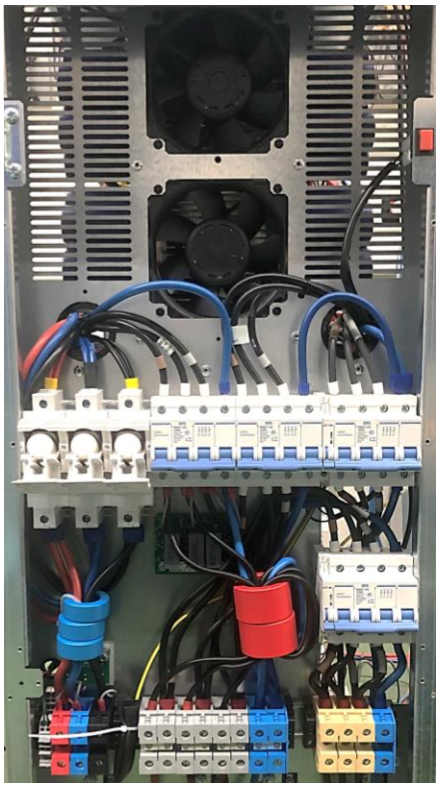
Tab. 5

4.3.4 SWITCHES AND CONNECTIONS SECTION

- **ACTIVE (ACT) CONNECTIONS:**

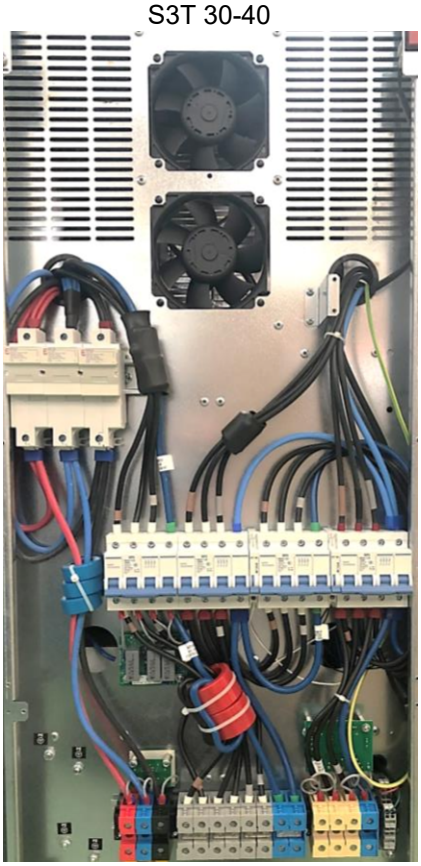
SINGLE INPUT CONNECTIONS:
S3T 30-40

DUAL INPUT CONNECTIONS:
S3T 30-40



- **XTEND (XTD) CONNECTIONS:**

S3T 30-40



4.4 FUSE LIST

4.4.1 SWBATT

ATTENTION! Fuses in SWBATT disconnect only the internal batteries.

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

UPS SIZE	FUSE SIZE	FUSE TYPE	CODE
30 kVA	22x58	80A 690V gR	0602020101
40 kVA	22x58	100A 690V gR	0602020099

Tab. 6

4.4.2 INPUT BOARD FOR 30kVA (B0282-02)

UPS SIZE	POSITION	FUNCTION	FUSE SIZE	FUSE TYPE	CODE
30 kVA	F7	Input fuse ph1	19x56	63A 240V FF	0602010058
	F9	Input fuse ph2			
	F11	Input fuse ph3			
	F2, F3	Batt+, Batt-	17,1x48	50A 500Vdc FF	0602010123
	F4, F5	CB+, CB-			

Tab. 7

4.4.3 INPUT BOARD FOR 40kVA (B0282-01)

UPS SIZE	POSITION	FUNCTION	FUSE SIZE	FUSE TYPE	CODE
40 kVA	F9	Input fuses ph1	19x56	80A 240V FF	0602010016
	F9	Input fuses ph2			
	F11	Input fuses ph3			
	F2, F3	Batt+, Batt-	17,1x48	63A 500Vdc FF	0602010107
	F4, F5	CB+, CB-			

Tab. 8

4.4.4 AUXILIARY POWER SUPPLY BOARD (B0273-01)

UPS SIZE	POSITION	FUNCTION	FUSE SIZE	FUSE TYPE	CODE
30-40 kVA	F1, F3	AC fuses	5X20	3.15A 250V GF	0602010047
	F2, F4	DC fuses	6.3x32	2A 500V GF	0602020066

Tab. 9

4.4.5 OUTPUT & BYPASS BOARD (B0290-0x)

UPS SIZE	POSITION	FUNCTION	FUSE SIZE	FUSE TYPE	CODE
30-40 kVA	F1	Aux. Redundant p. supply	6.3x32	2A 500V GF	0602020066
	F2	Inverter PH1	19x56	80A 240V FF	0602010016
	F4	Inverter PH2			
	F3	Inverter PH3			

Tab. 10

5 PRINCIPLE ELECTRICAL DIAGRAM

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

The **Fig. 7** 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) modules (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 (B0284) and on the Inverter Power Board (B0289).

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

Each module has an internal temperature sensor for the detection of under/over temperature of the stage.

The **Fig. 8** shows the input stage parts used by the UPS during battery operating mode.

The BATTERY BUCK/BOOST module (called CB/Boost_Batt in the wiring diagrams) charges the batteries when the UPS is working in normal operation mode and act as “boost” during the discharge of the batteries (bidirectional stage: buck converter/boost converter).

BC/Boost module as **Buck Converter**

The relay of the battery charger “*Batt. contact 1*” is closed for battery charge step, while the battery relays “*Batt. contact 2*” are open.

BC/Boost module as **Boost Converter**

The relay of the battery charger is still closed, the battery buck/boost module works as Boost Converter, but it has not enough power to support the load.

Therefore, with the “*Batt. Contact 2*” closed, the PFC Ph1 (BATTERY BOOST) can work in parallel with the battery buck/boost module as boost converter.

The difference between the PFC Ph1 module and the other two power modules (Ph2 and Ph3) consist in positive and the negative connections to the batteries branch for the DC operation. Refer to chap. **9.1** for a detailed scheme.

5.1 ELECTRICAL DIAGRAM – MAINS OPERATION (SINGLE PHASE)

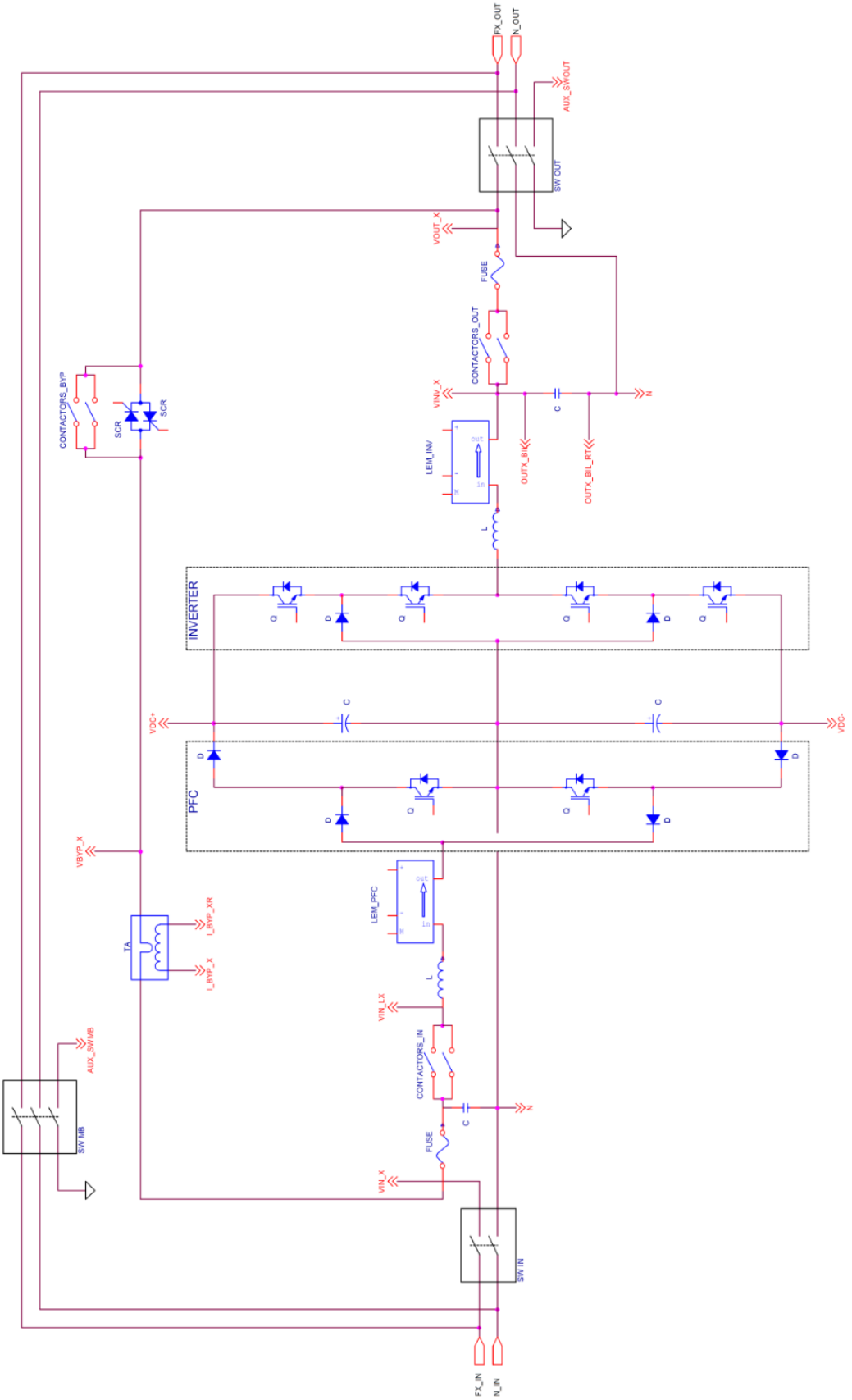


Fig. 7

5.2 ELECTRICAL DIAGRAM – BATTERY OPERATION (INPUT STAGE)

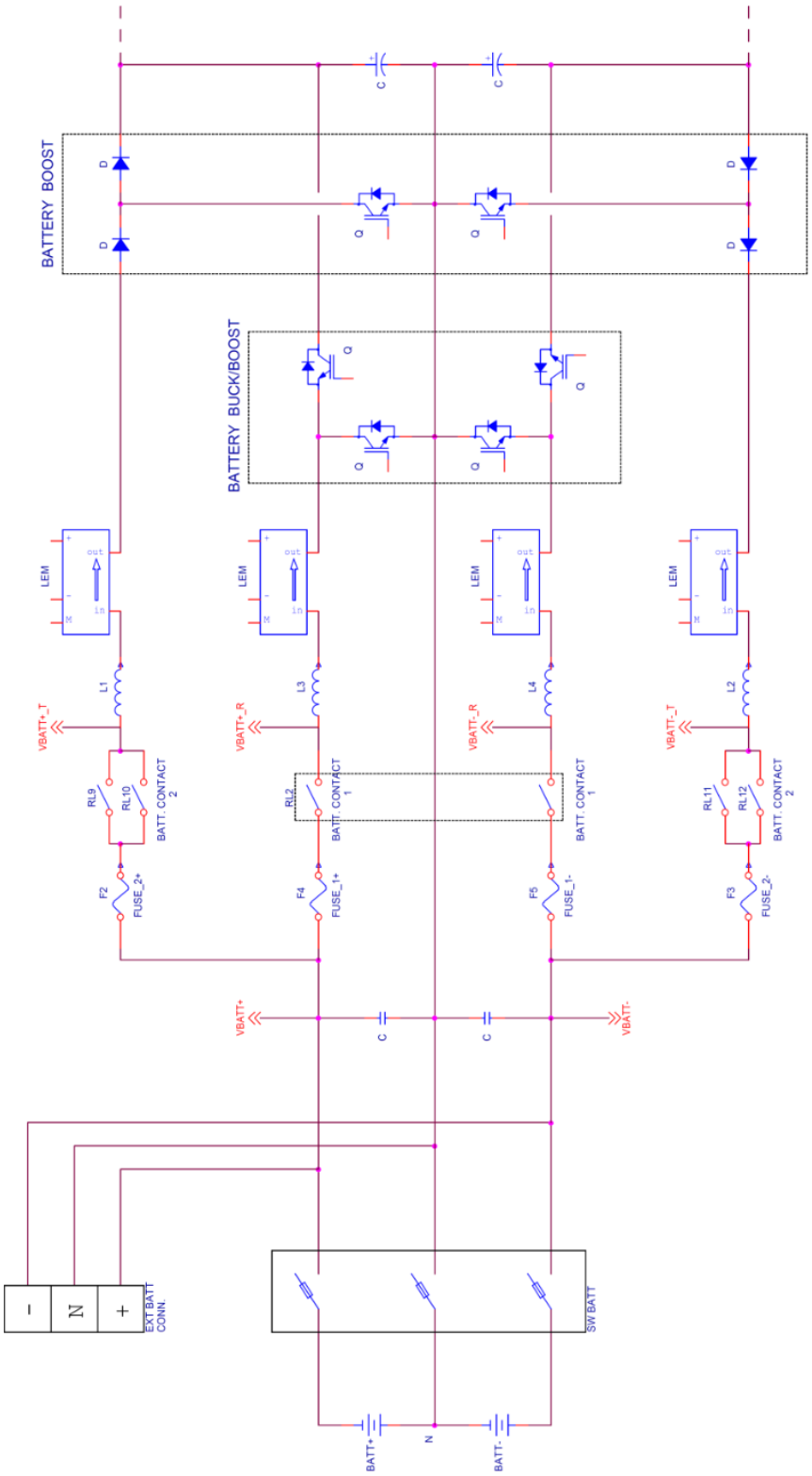


Fig. 8

6 DESCRIPTION OF THE BOARDS

6.1 AUX. POWER SUPPLY BOARD (B0273)

Version:
B0273-01 Aux. Power Supply Board

In this board there is:

1. Auxiliary power supply section (Flyback);
2. Step-down fans section;
3. Cold start section;
4. Precharge relays (RL1 and RL2 from batteries, RL3 from mains);
5. Precharge resistors.

Auxiliary power supply generates 18V (general), 24V (regulated) for fans and 12V for internal board use (integrated).

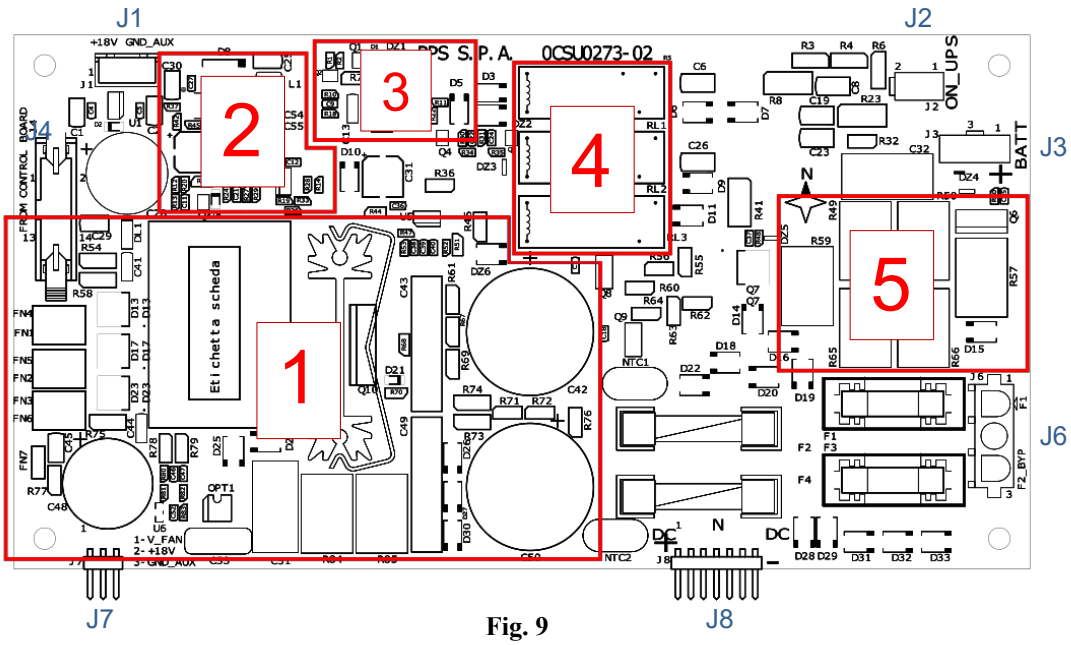


Fig. 9

Connector	Description	Note
J1	Connector to Output & bypass board	To J8 of B0290-01
J2	Connector from Cold Start SW	
J3	Connector from Input board	From J8 of B0282-0x
J4	Flat connector to Control board	To J13 of B0275-01
J7	Connector from Inverter Board	From J2 of B0289-0x
J8	Connector from Inverter Board	From J7 of B0289-0x
J6	Power connector to Output & bypass board	To FN1 and FN8 of B0290-0x

Tab. 11

Pinout connectors:

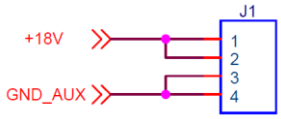


Fig. 10

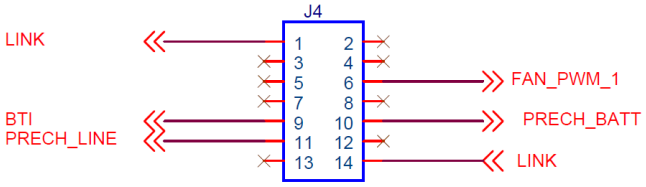


Fig. 11

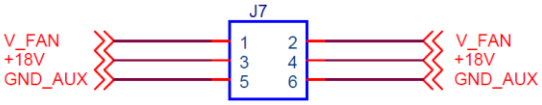


Fig. 12

6.2 COMMUNICATION BOARD (B0274)

Version:
B0274-01 Communication Board

In this board there is:

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

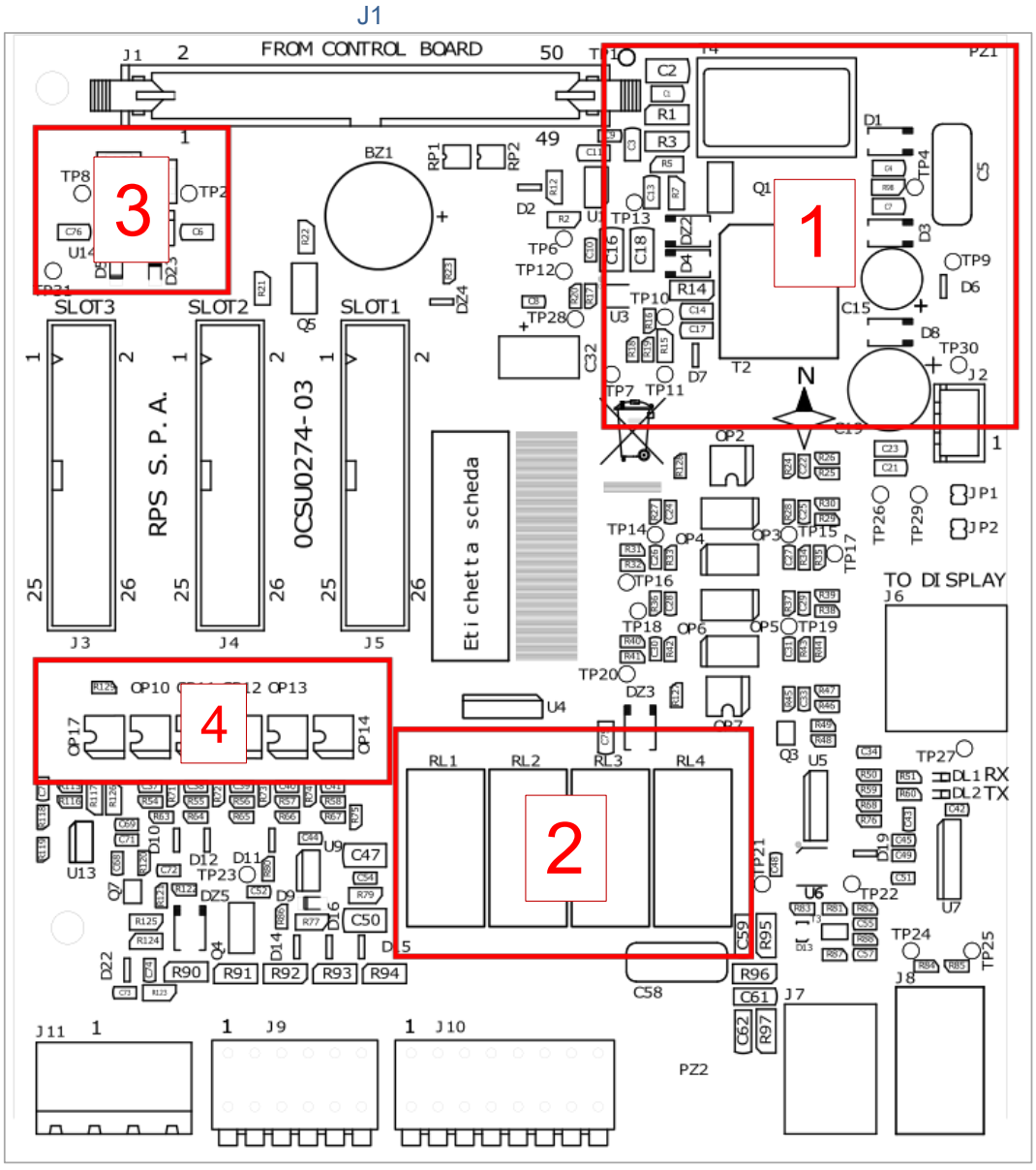


Fig. 13

Connector	Description	Note
J1	Flat connector from Control board	From B0275-01
J3, J4, J5	Slot for optional boards	(J3 is not used)
J6	Connector to display	RJ45 connect.
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. 12

Pinout connector:

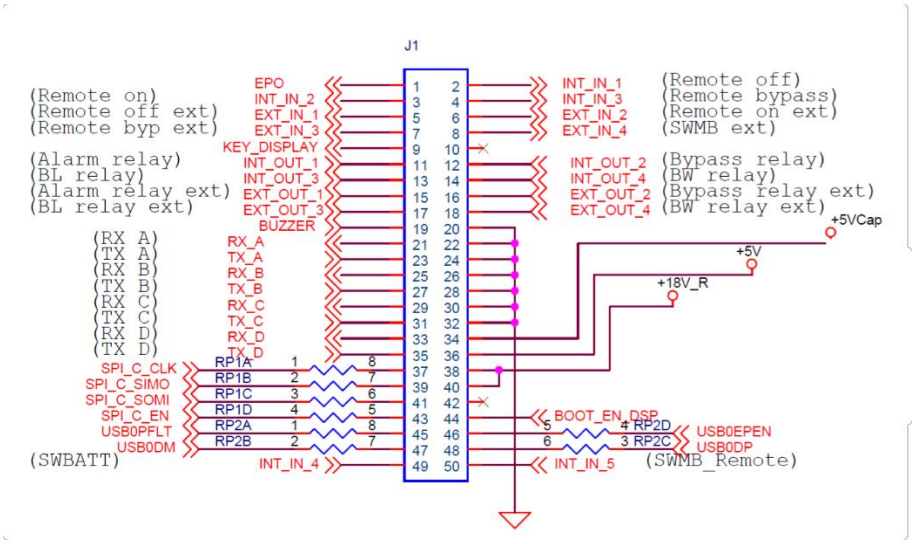


Fig. 14

6.3 CONTROL BOARD (B0275)

Version:
B0275-01 Control Board

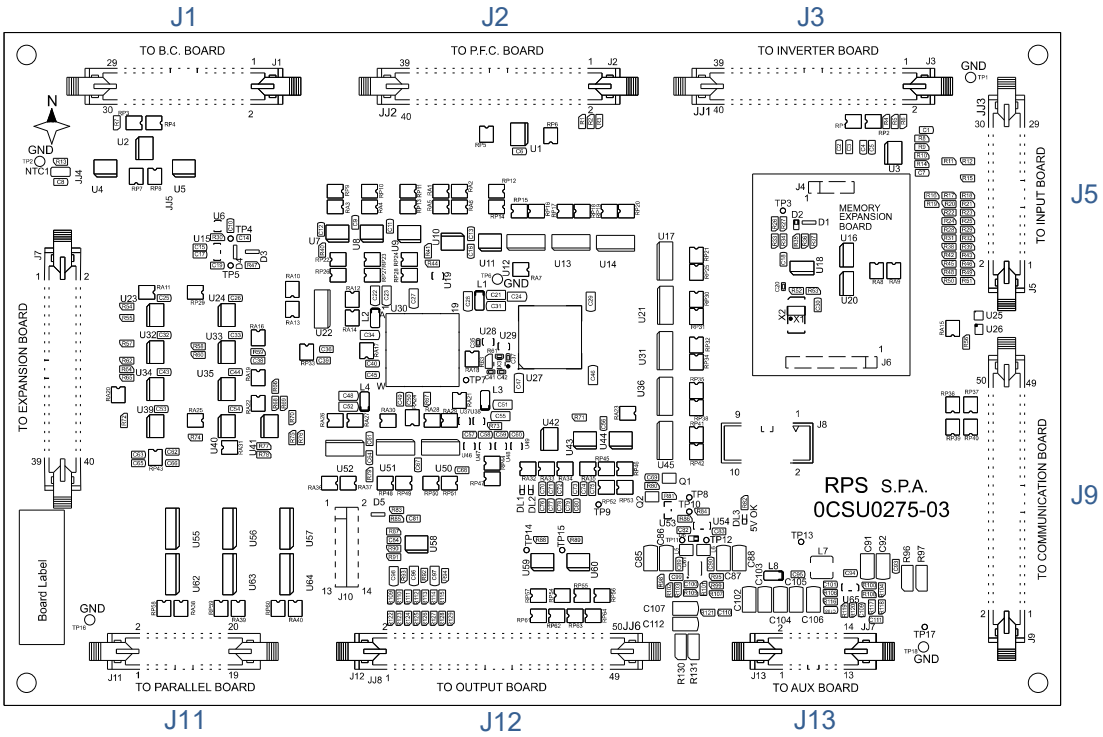


Fig. 15

Connector	Description	Note
J1	Flat connector from Boost & BC power board	From J3 of B0284-0x
J2	Flat connector from Boost & BC power board	From J1 of B0284-0x
J3	Flat connector from Inverter board	From J3 of B0289-0x
J5	Flat connector from Input board	From J4 of B0282-0x
J9	Flat connector from Communication board	From J1 of B0274-01
J11	Flat connector from Parallel board	Parallel Option
J12	Flat connector from Output & bypass board	From J6 of B0290-01
J13	Flat connector from Aux. power supply board	From J4 of B0273-01

Tab. 13

6.4 INPUT BOARD FOR 30-40 (B0282)

Version:
B0282-01 Input Board for S3T 40 kVA
B0282-02 Input Board for S3T 30 kVA

In this board there is:

1. Input fuses;
2. Input AC capacitors;
3. Input relays;
4. Battery capacitors;
5. Battery fuses;
6. Battery boost relays.
7. Battery buck/boost relay

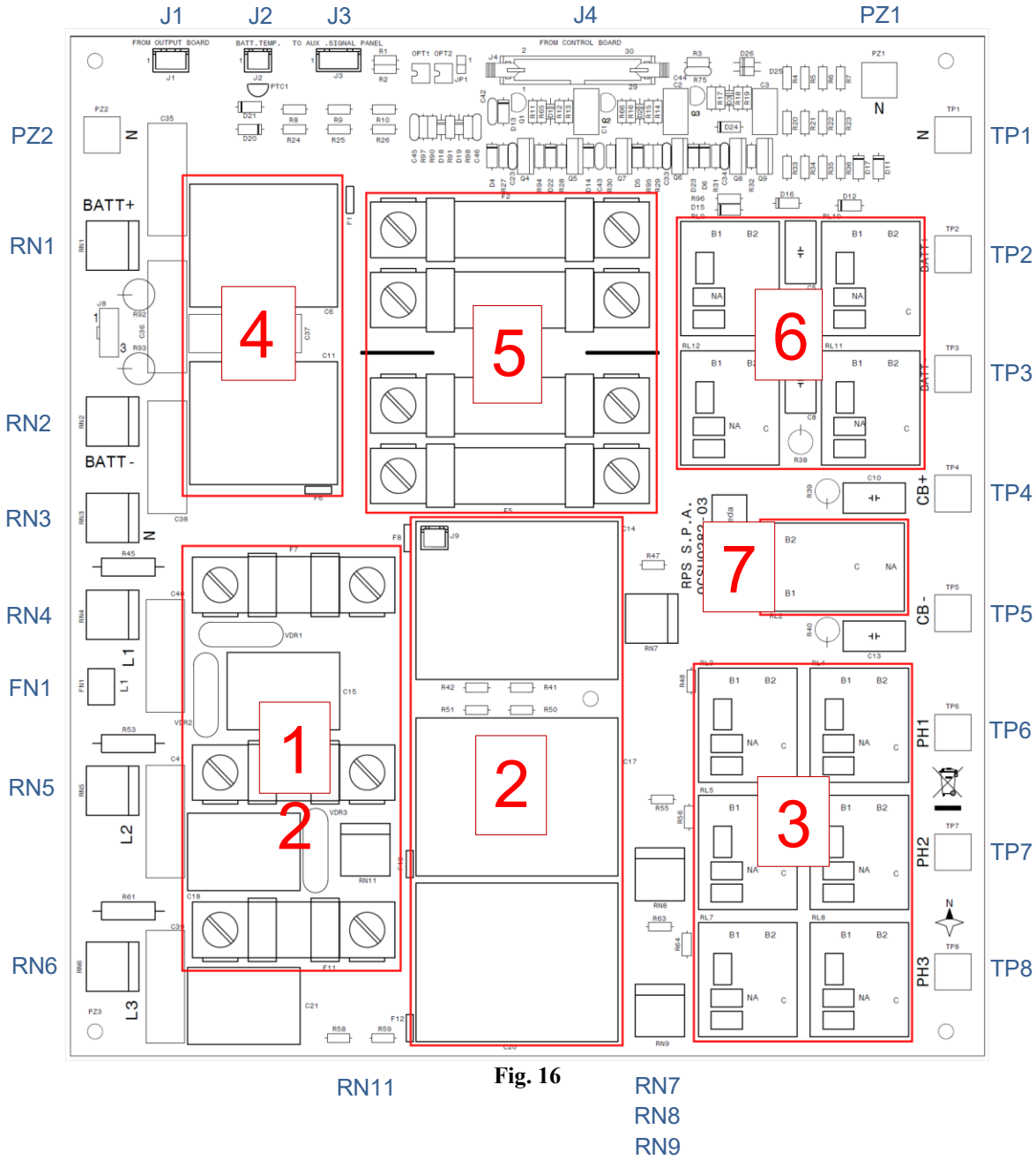


Fig. 16

Connector	Description	Note
J1	Connector to Output & byp board	To J9 of B0290-0x
J2	Connector to OUT transformer	Only OT vers.
J3	Connector from terminal	External sync and T° BBox
J4	Flat connector to Control board	To J5 of B0275-01
J9	Not used	-

L1 (RN4)	Connection from SWIN	Phase 1
L2 (RN5)	Connection from SWIN	Phase 2
L3 (RN6)	Connection from SWIN	Phase 3
N (RN3)	Connection from SWIN	Neutral
L1 (FN1)	Connector to Output & byp board	(PH1) to FN1 of B0290-0x
BATT+ (RN1)	Connection to SWBATT	
BATT- (RN2)	Connection to SWBATT	
N (PZ2)	From Neutral bar to Output & byp board	To PZ1 of B0290-0x
RN7, RN8, RN9, RN11	Not used	-
N (TP1)	Connections to Induct. PFC-boost board	To TP16 B0283-0x
BATT+ (TP2)	Connections to Induct. PFC-boost board	To TP8 B0283-0x
BATT- (TP3)	Connections to Induct. PFC-boost board	To TP9 B0283-0x
CB+ (TP4)	Connections to Induct. PFC-boost board	To TP10 B0283-0x
CB- (TP5)	Connections to Induct. PFC-boost board	To TP11 B0283-0x
PH1 (TP6)	Connections to Induct. PFC-boost board	To TP12 B0283-0x
PH2 (TP7)	Connections to Induct. PFC-boost board	To TP13 B0283-0x
PH3 (TP8)	Connections to Induct. PFC-boost board	To TP14 B0283-0x

Tab. 14

Pinout connector:

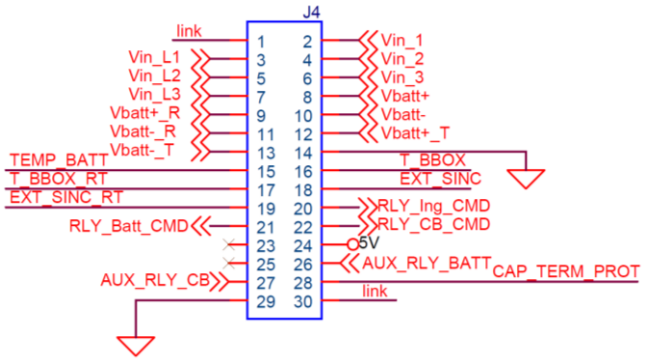


Fig. 17

6.5 INDUCT. PFC & BOOST BOARD (B0283)

Version:
B0283-01 Induct. PFC & Boost Board for S3T 40 kVA
B0283-02 Induct. PFC & Boost Board for S3T 30 kVA

In this board there is:

1. Connections for the input inductors;
2. Battery inductors.

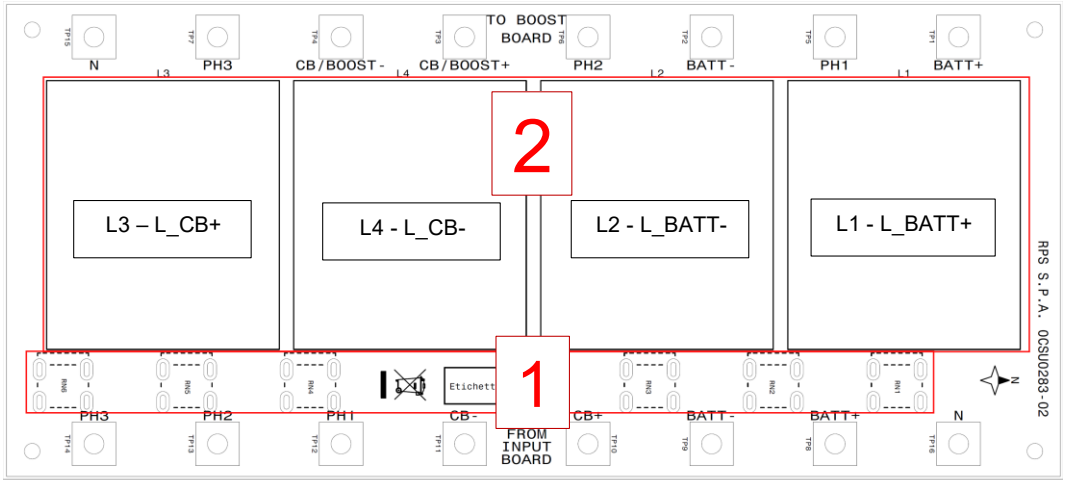


Fig. 18

Connector	Description	Note
N (TP16)	Connections from Input board	From TP1 of B0282-01x
BATT+ (TP8)	Connections from Input board	From TP2 of B0282-01x
BATT- (TP9)	Connections from Input board	From TP3 of B0282-01x
CB+ (TP10)	Connections from Input board	From TP4 of B0282-01x
CB- (TP11)	Connections from Input board	From TP5 of B0282-01x
PH1 (TP12) – RN4	Connections from Input board	From TP6 of B0282-01x
PH2 (TP13) – RN5	Connections from Input board	From TP7 of B0282-01x
PH3 (TP14) – RN6	Connections from Input board	From TP8 of B0282-01x
BATT+ (TP1)	Connections to Boost & BC power board	To TP1 of B0284-0x
PH1 (TP5)	Connections to Boost & BC power board	To TP2 of B0284-0x
BATT- (TP2)	Connections to Boost & BC power board	To TP3 of B0284-0x
PH2 (TP6)	Connections to Boost & BC power board	To TP4 of B0284-0x
CB/BOOST+ (TP3)	Connections to Boost & BC power board	To TP5 of B0284-0x
CB/BOOST- (TP4)	Connections to Boost & BC power board	To TP6 of B0284-0x
PH3 (TP7)	Connections to Boost & BC power board	To TP7 of B0284-0x
N (TP15)	Connections to Boost & BC power board	To TP8 of B0284-0x

Tab. 15

6.6 BOOST & BC POWER BOARD (B0284)

Version:
B0284-01 Boost & BC Power Board for S3T 40 kVA
B0284-02 Boost & BC Power Board for S3T 30 kVA

In this board there is:

1. PFC – phase 1 module;
2. PFC – phase 2 module;
3. PFC – phase 3 module;
4. Battery module;
5. Current sensors;
6. Temperature measurement section;
7. Power supply section for differential reading.

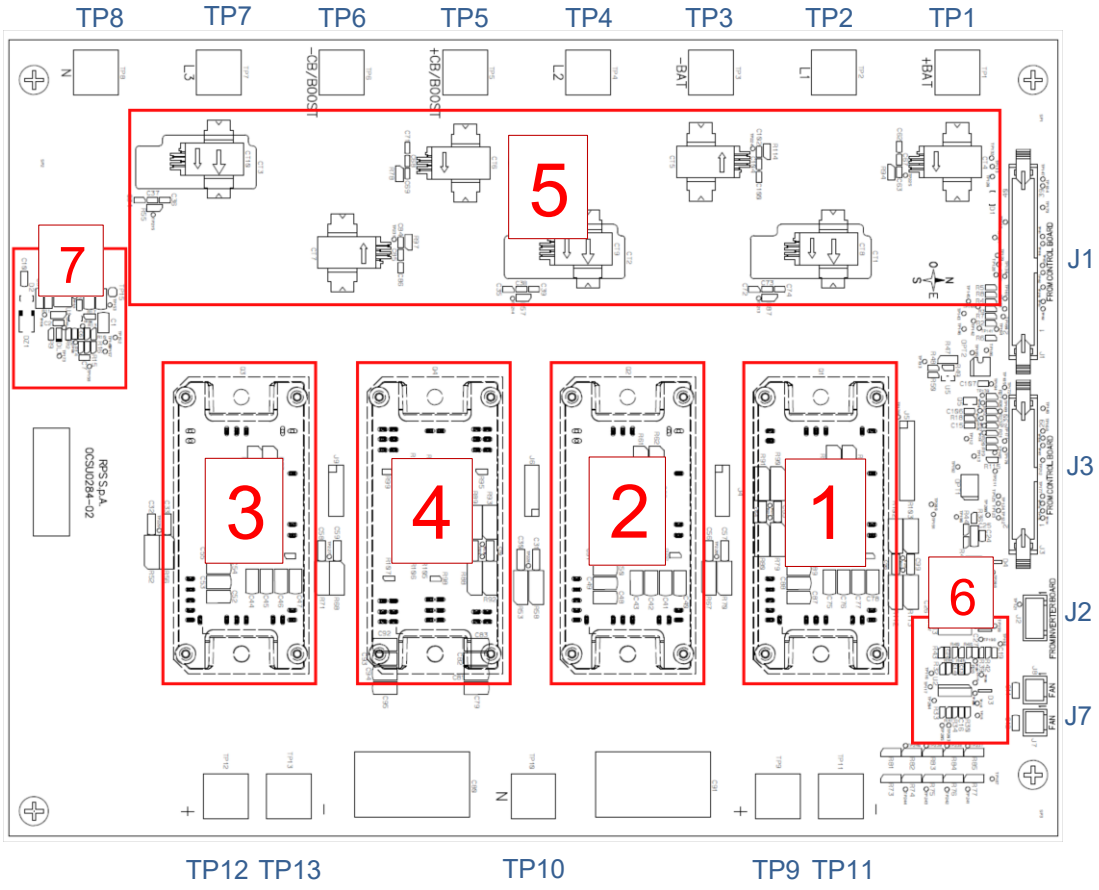


Fig. 19

On the top of the board B0284-01x is installed the Driver boost board (B0285).

Connector	Description	Note
J1	Flat connector to Control board	To J2 of B0275-01
J2	Connector to Inverter Power board	To J1 of B0289-01x
J3	Flat connector to Control board	To J1 of B0275-01
J7	Connector to fan 1	

TP9, TP12	Connections to DC Cap. Boost board	DC+ of B0286-0x
TP10	Connections to DC Cap. Boost board	Neutral of B0286-0x
TP11, TP13	Connections to DC Cap. Boost board	DC- of B0286-0x
TP1, …, TP8	Connections from Induct. PFC-boost board	From B0283-0x

Tab. 16

J1 and J3 bring to the Control board (B0275) the current readings of current sensors (LEM).

Pinout connectors:

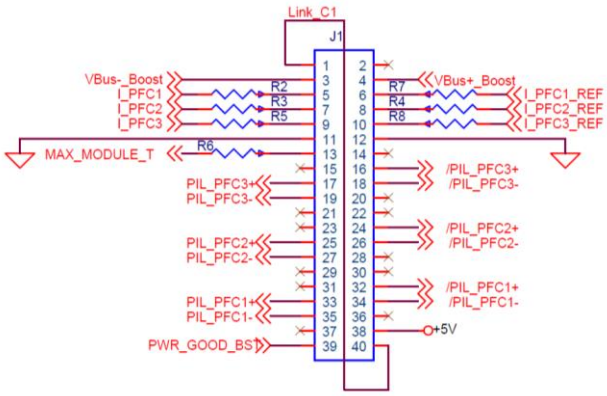


Fig. 20

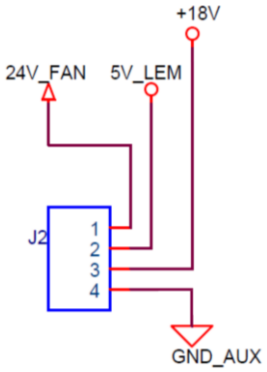


Fig. 21

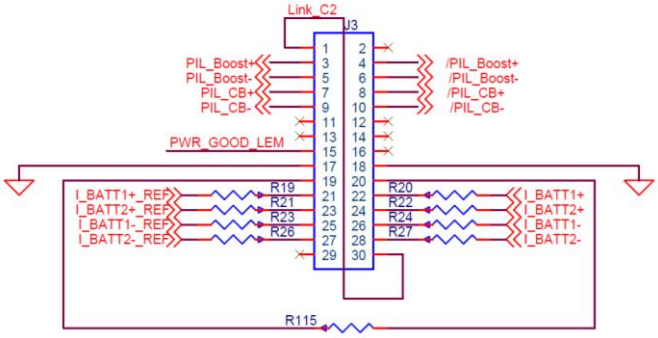


Fig. 22

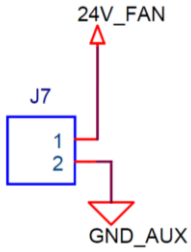
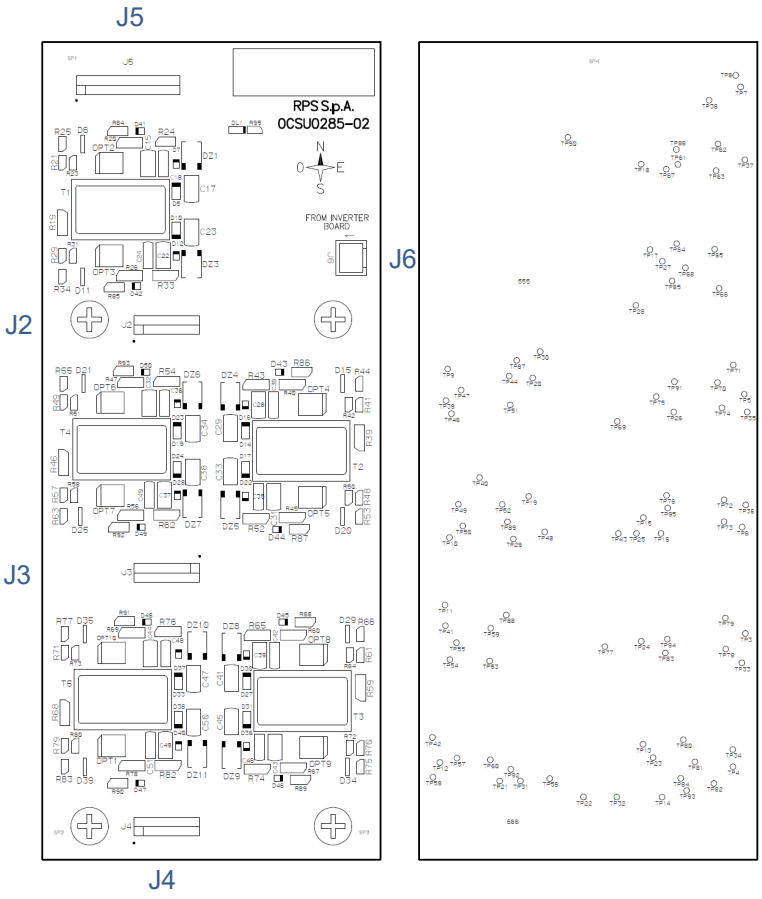


Fig. 23

6.7 DRIVER BOOST BOARD (B0285)

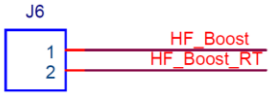
Version:
B0285-01 Driver Boost Board for S3T 30-40 kVA



Connector	Description	Note
J2	Connector from Boost & BC power board	To J4 of B0284-0x
J3	Connector from Boost & BC power board	To J6 of B0284-0x
J4	Connector from Boost & BC power board	To J9 of B0284-0x
J5	Connector from Boost & BC power board	To J5 of B0284-0x
J6	Connector to Inverter Power board	To J12 of B0289-0x

Tab. 17

Pinout connector:



6.8 DC CAPACITORS BOARD (B0286)

Version:
B0286-01 DC Capacitors Boost/Inverter Board S3T 40 kVA
B0286-02 DC Capacitors Boost Board S3T 30 kVA
B0286-03 DC Capacitors Inverter Board S3T 30 kVA

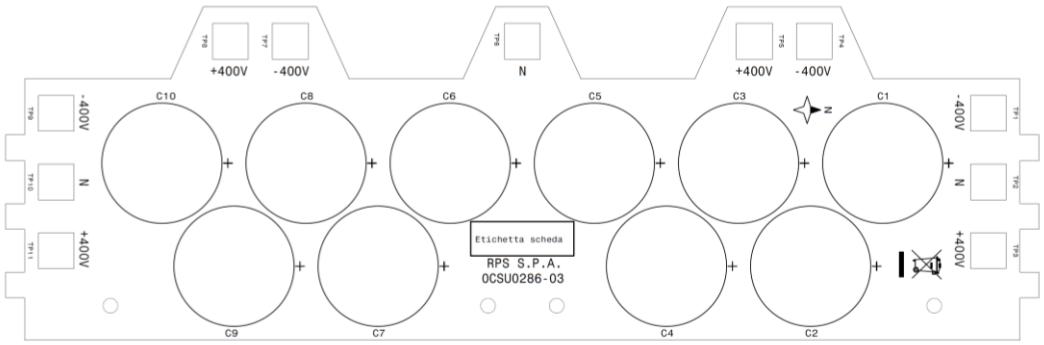


Fig. 24

Connector	Description	Note
-400V (TP4,TP7)	Connection from/to power board	From B0284-0x / To B0289-0x
N (TP6)	Connection from/to power board	From B0284-0x / To B0289-0x
+400V(TP5,TP12)	Connection from/to power board	From B0284-0x / To B0289-0x
-400V (TP1)	Connection from DC Cap. Boost Board	From B0286-01/02
N (TP2)	Connection from DC Cap. Boost Board	From B0286-01/02
+400V (TP3)	Connection from DC Cap. Boost Board	From B0286-01/02
-400V (TP9)	Connection to DC Cap. Inverter Board	To B0286-01/03
N (TP10)	Connection to DC Cap. Inverter Board	To B0286-01/03
+400V (TP11)	Connection to DC Cap. Inverter Board	To B0286-0/03

Tab. 18

6.9 INVERTER POWER BOARD (B0289)

Version:
B0289-01 Inverter Power Board for S3T 40 kVA
B0289-02 Inverter Power Board for S3T 30 kVA

In this board there is:

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

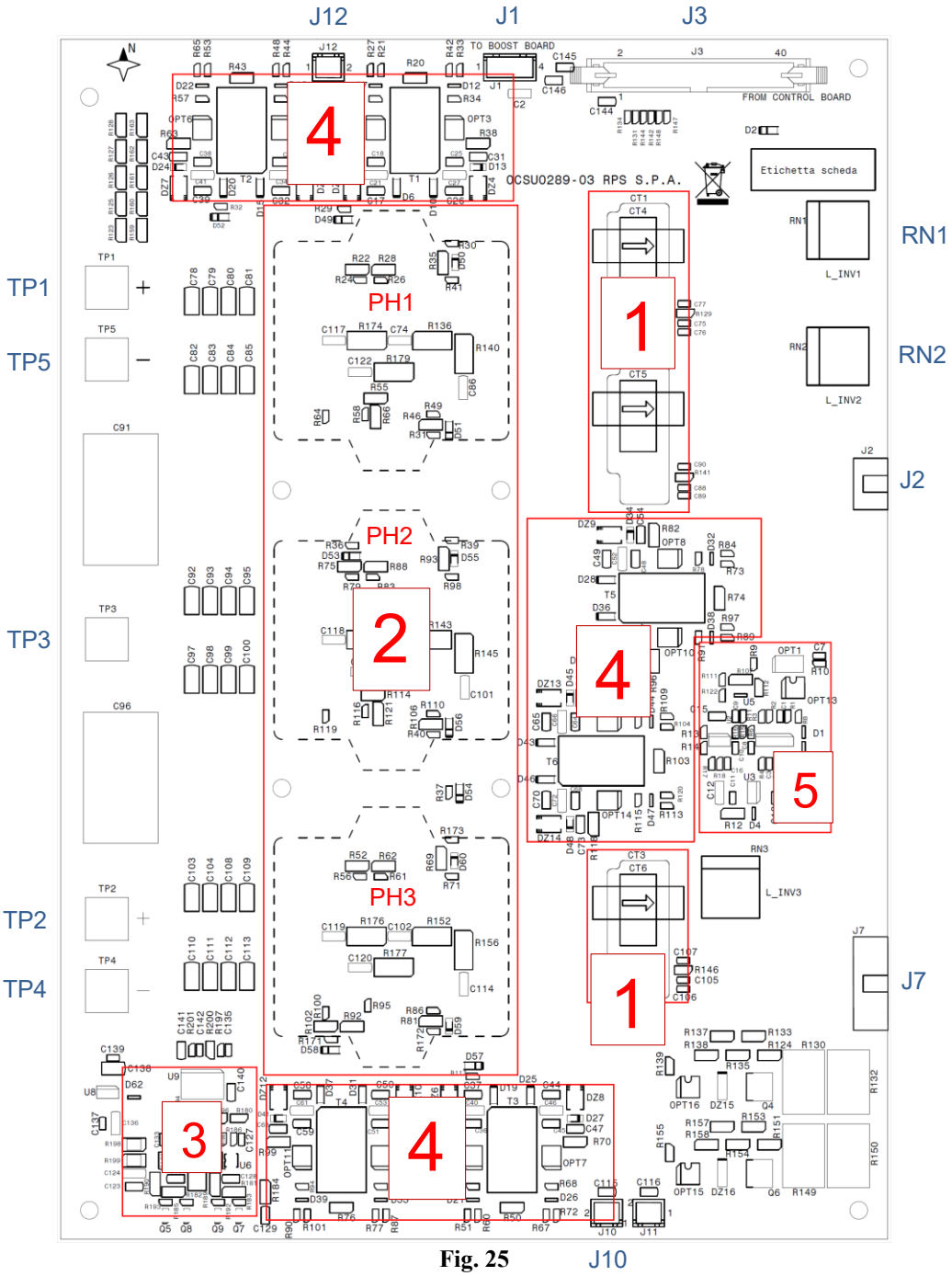


Fig. 25

Note: the pins of the three modules are made with press-fit technology (no soldering is required)

Connector	Description	Note
J1	Connector from Boost & BC power board	From J2 of B0284-0x
J2	Connector to Aux. power supply board	To J7 of B0273-01
J3	Flat connector to Control board	To J3 of B0275-01
J7	Connector to Aux. power supply board	To J8 of B0273-01
J10	Connector to fan 2	
J12	Connector from Driver boost board	From J6 of B0285-01

L_INV1 (RN1)	Connection to Output & Byp board	PH1 to RN13 of B0290-01
L_INV2 (RN2)	Connection to Output & Byp board	PH2 to RN14 of B0290-01
L_INV3 (RN3)	Connection to Output & Byp board	PH3 to RN15 of B0290-01
TP1, TP2 (+)	Connections from DC Cap. Inverter board	DC+ from TP8,TP5 of B0286-01/03
TP3	Connections from DC Cap. Inverter board	Neutral from TP6 of B0286-01/03
TP5, TP4 (-)	Connections from DC Cap. Inverter board	DC- from TP7,TP4 of B0286-01/03

Tab. 19

J3 brings to the Control board (B0275) the current readings of current sensors (LEM).

Pinout connectors:

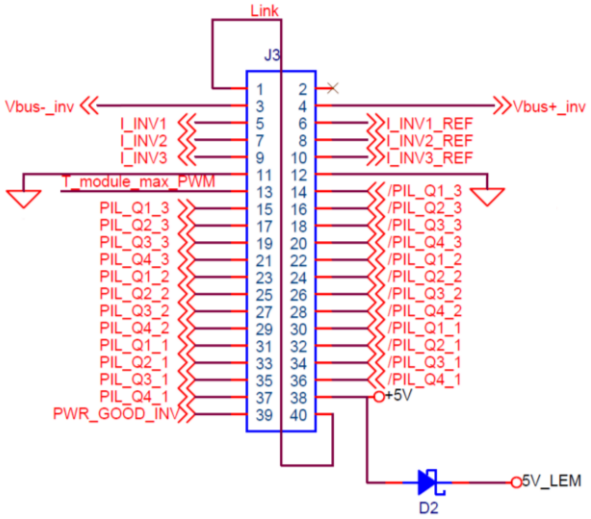


Fig. 26

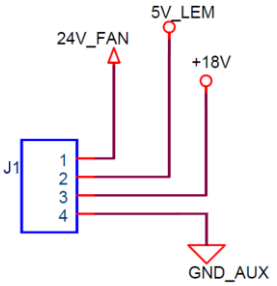


Fig. 27

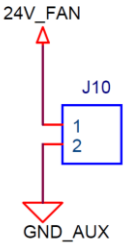


Fig. 28

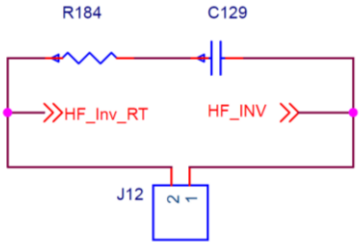


Fig. 29

6.10 OUTPUT & BYPASS BOARD (B0290)

Version:
B0290-01 Output & Bypass Board for S3T 30-40kVA

In this board there is:

1. Redundant power supply section;
2. Redundant aux power supply fuse;
3. Bypass line, with SCR and bypass relays;
4. Inverter AC capacitors;
5. Inverter output relays and fuses;

Redundant power supply section generates 18V_R for the bypass line and supplies also the Control Board in case of aux. power supply failures (B0273).

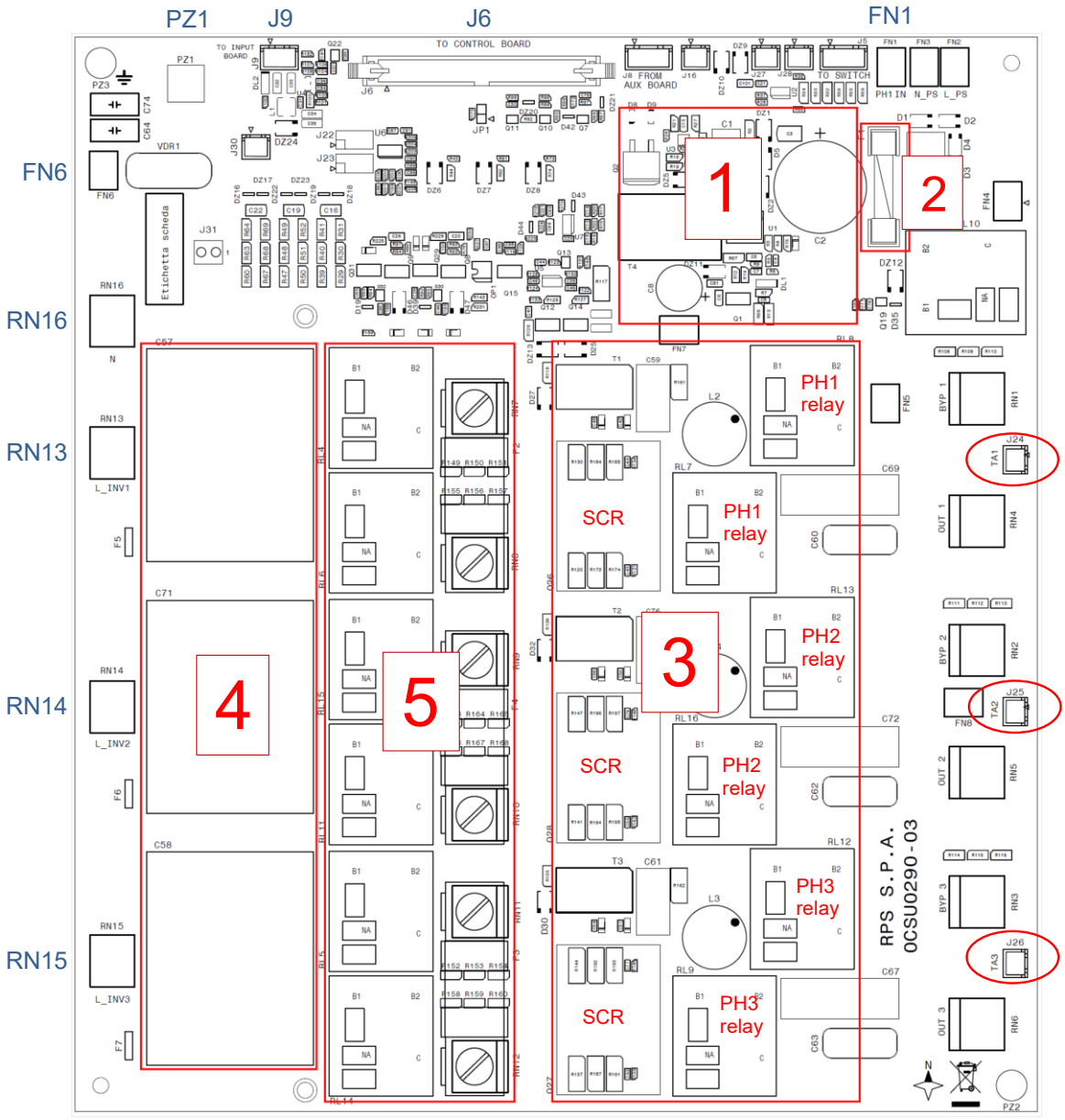


Fig. 30

Connector	Description	Note
J5	Connector to AUX SWMB and AUX SWOUT	
J6	Flat connector from Control board	From J12 of B0275-01
J8	Connector from Aux. power supply board	From J1 of B0273-01
J9	Connector from Input board	From J1 of B0282-0x
TA1 (J24)	Connectors from TA	
TA2 (J25)	Connectors from TA	
TA3 (J26)	Connectors from TA	

L_INV1 (RN13)	Power connection from Inverter power board	From RN1 of B0289-0x
L_INV2 (RN14)	Power connection from Inverter power board	From RN2 of B0289-0x
L_INV3 (RN15)	Power connection from Inverter power board	From RN3 of B0289-0x
BYP_1 (RN1)	Power connection from SWIN/SWBYP	PH1 Bypass line
BYP_2 (RN2)	Power connection from SWIN/SWBYP	PH2 Bypass line
BYP_3 (RN3)	Power connection from SWIN/SWBYP	PH3 Bypass line
PH1_IN (FN1)	Power connector from Input board/ from Aux. power supply board	From FN1 of B0282-01 From J6 of B0273-01
FN6	Earth connector	From PZ of B0288-01
PZ1	Neutral connection from input board	From PZ2 of B0282-01
OUT_1 (RN1)	Power connector to SWOUT	Phase 1
L2 (RN2)	Power connector to SWOUT	Phase 2
L3 (RN3)	Power connector to SWOUT	Phase 3
N (RN16)	Power connector to SWOUT	Neutral

Tab. 20

Pinout connectors:

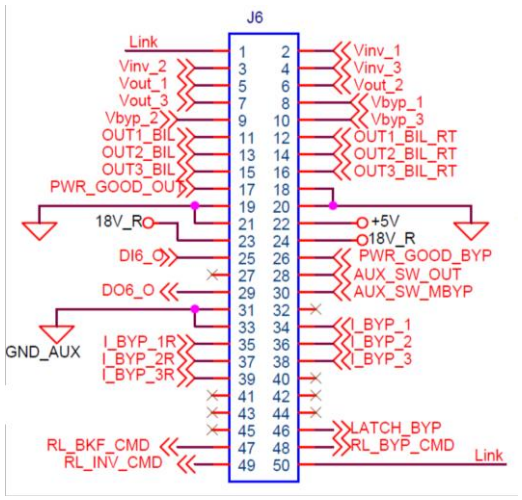


Fig. 31

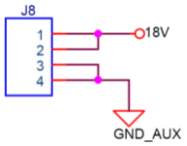


Fig. 32

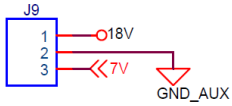


Fig. 33

6.11 FILTER CY BOARDS

6.11.1 IN/OUT FILTER CY BOARD (B0288)

Version:
B0288-01 Input filter CY board for S3T 30-40 kVA
B0288-02 Output filter CY board for S3T 30-40 kVA

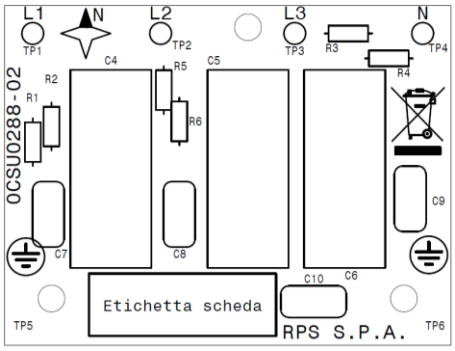


Fig. 34

6.11.2 BATTERY FILTER CY BOARD (B0390)

Version:
B0390-01 Battery filter CY board for S3T 30-40 kVA

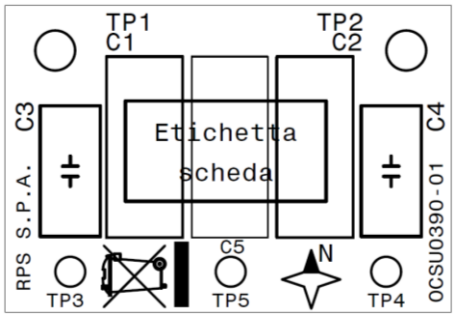


Fig. 35

6.12 LED LOGO RPS BOARD (B0305)

Version:
B0305-01 Led Logo RPS board

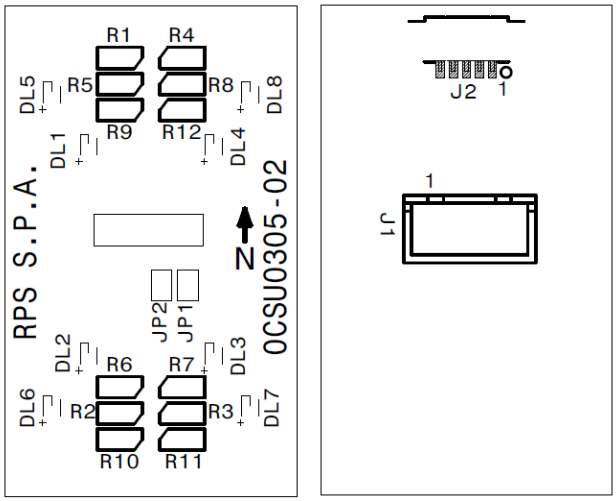


Fig. 36

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

6.13 LED NEUTRAL BAR BOARD (B0322)

Version:
B0322-01 Led Neutral bar board

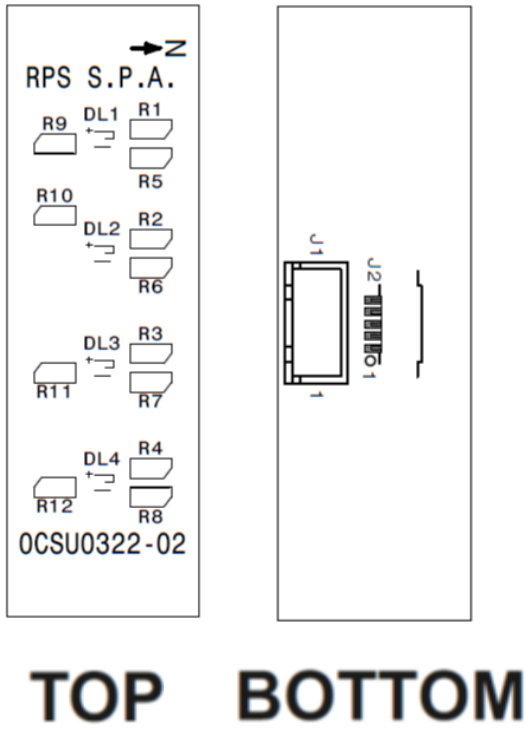


Fig. 37

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. 22

6.14 DISPLAY BOARD (B0306)

Version:
B0306-01 Display board

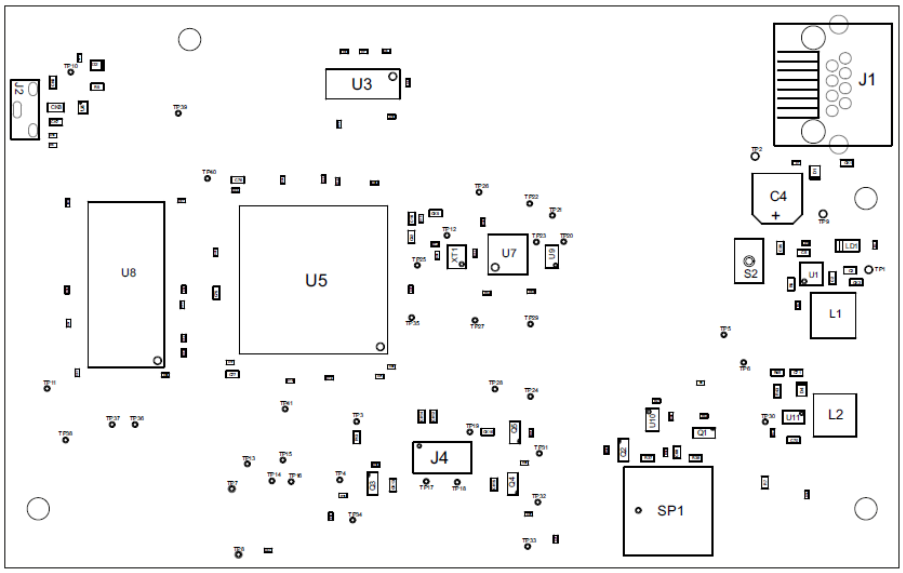


Fig. 38

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

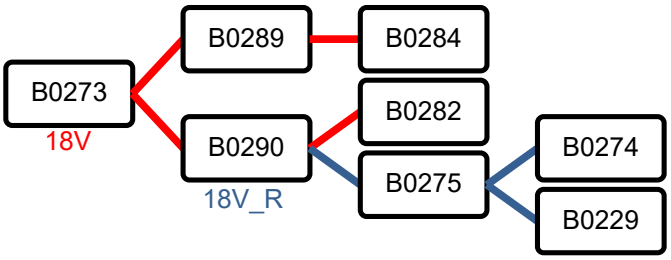
Tab. 23

7 FOCUS ON THE AUXILIARY POWER SUPPLY

The Auxiliary power supply board (B0273) takes the power from four different sources:

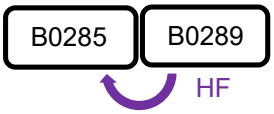
- Phase 1 of the input mains power;
- Phase 2 of the input mains power or the bypass input mains power if the UPS is dual input (this power source is also used for the redundant power supply of the static bypass);
- Direct current from the DC capacitor bank;
- Battery voltage when the UPS is turned on from battery.

The board B0273 generates the **18V** to supply the different sections of the UPS, besides the 7-25V (regulated voltage) for the fans.
From the B0273 the 18V directly supplies the Inverter power board (B0289) and the Output & bypass board (B0290).
On the Output & bypass board (B0290) there is a redundant flyback that supplies some specific boards in case of a failure of the auxiliary power supply situated on the B0273 to guarantee power to the load and the communication. The redundant flyback generates the “17V5” (see the 7.1 Power supply scheme). The voltage resulting from the 18V or 17V5 is called “**18V_R**”.
The schematic below shows the 18V and the 18V_R path:

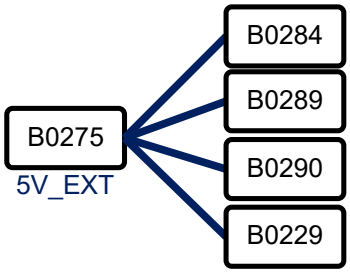


In case of an auxiliary power supply failure, the PFC and the inverter stop to work, but the logic and the communication still work by the redundant flyback on the B0290 in order to supply the load with the bypass.

The Boost & BC power board (B0284) generates the **5V_LEM** for the LEMs located on it and for the LEMs located on the Inverter power board (B0289), also in this case starting from the 18V of the B0273.
The **HF** for the inverter driver (on the B0289) and the HF for the boost driver (on the B0285) is generated in the Inverter power board (B0289) starting from the 18V of the B0273.



The Control board (B0275) generates the 5V (or **5V_EXT**) starting from the 18V_R of the B0290.
The 5V supplies the logic and the LEMs in case of a 5V_LEM failure.



OTHER POWER SUPPLIES:

- **B0290:** a **7V** Buck for the command circuit relays is supplied from the 18V (from the B0273) or from the 17V5 generates from the B0290 board (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

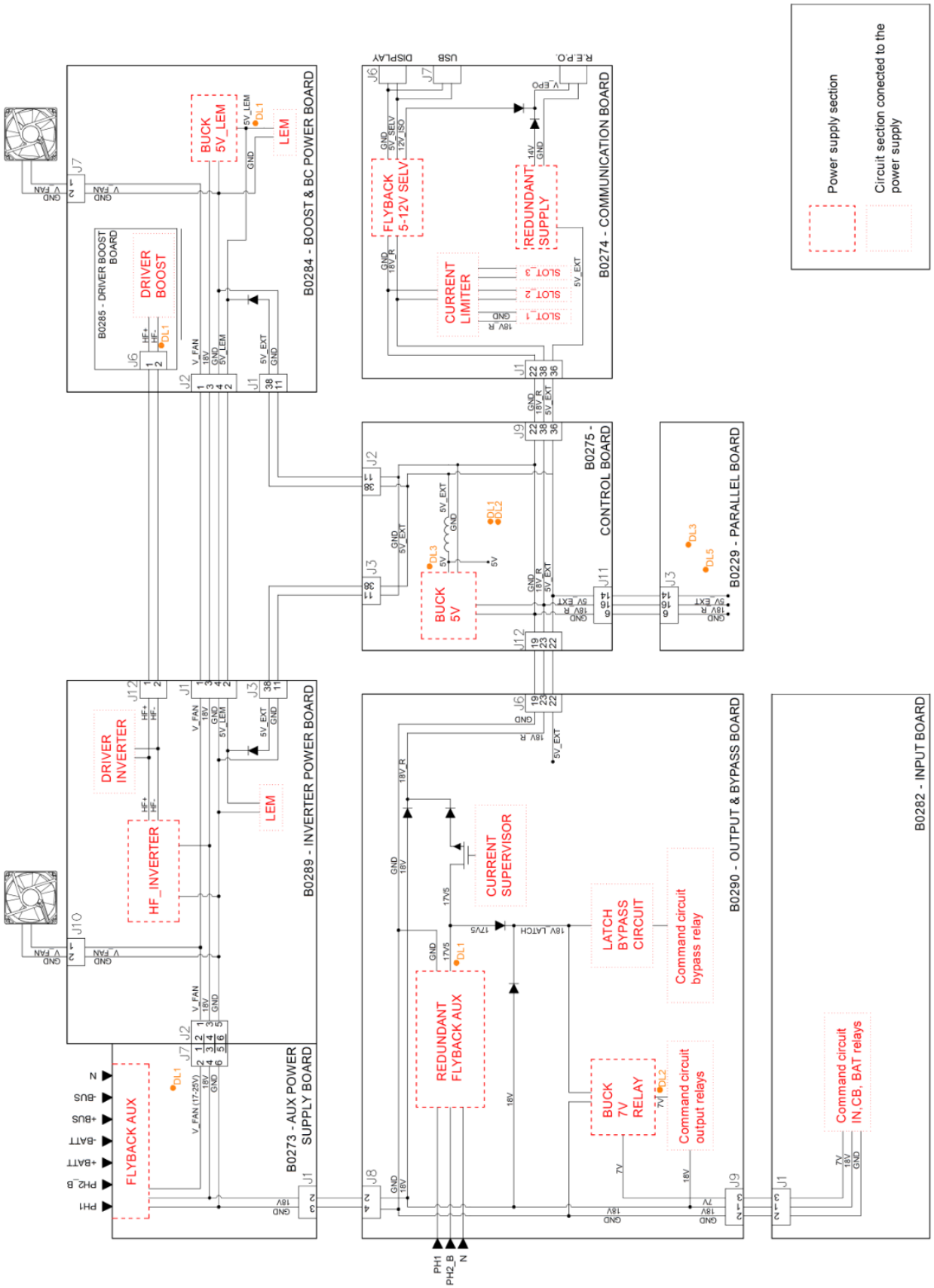


Fig. 39

7.2 AUXILIARY POWER FAULT (L01) DETECTION LOGIC

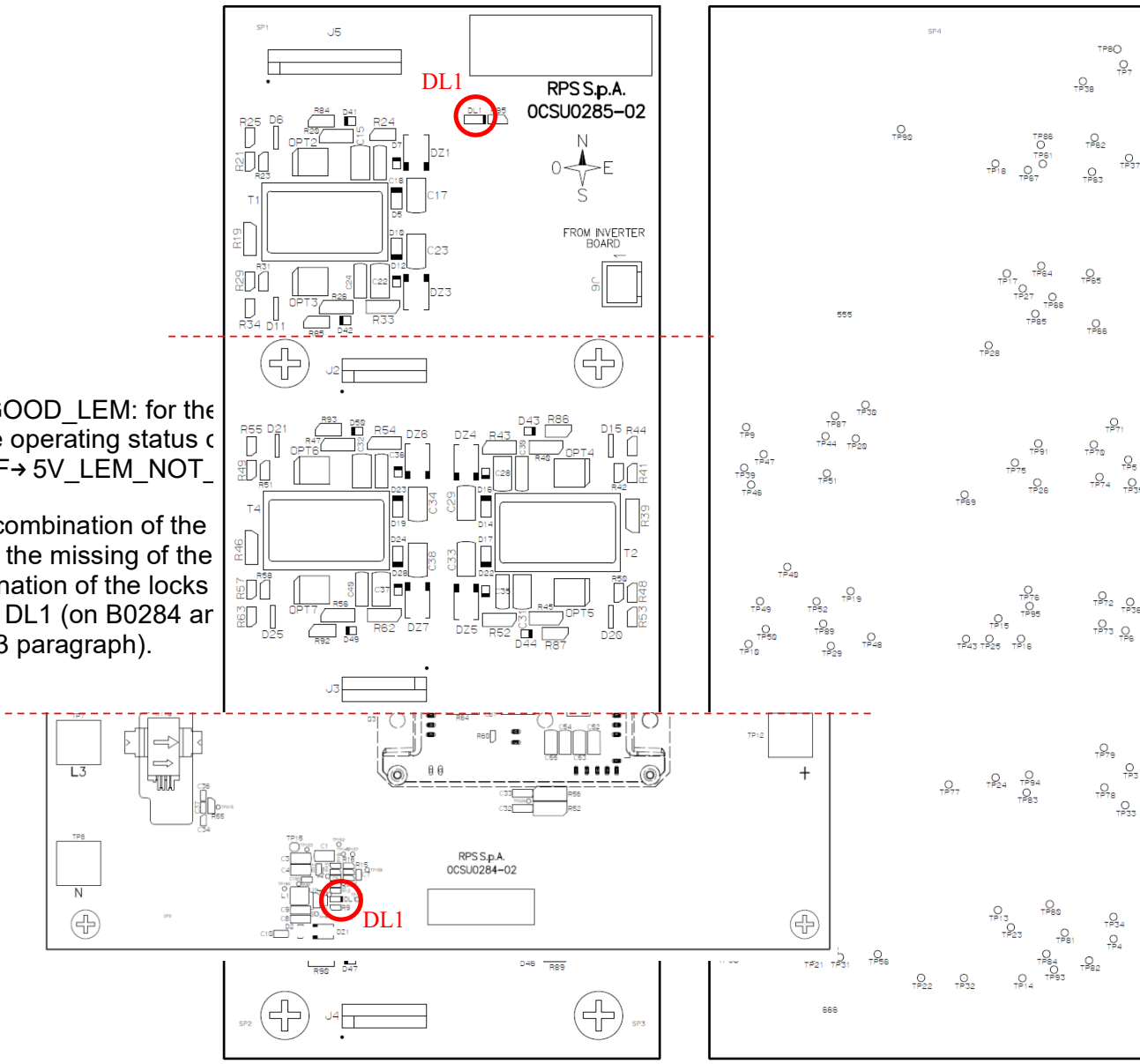
Below the list of the check involved in the detection of the lock L01.
In case of failure at least one of these checks, the logic displays the lock L01 and latch the load onto the bypass line.

7.2.1 BOOST & BC POWER BOARD (B0284+B0285) – HF POWER SUPPLY FOR BOOST DRIVER – 5V LEM POWER SUPPLY

The BC & Boost power board is affected by two checks from the control logic:

- PWR_GOOD_PFC: HF check for the PFC driver section (on B0284);

  HF LED: The HF presence **on B0285** is easily checked by DL1 **DL1** (led ON → HF_OK / led OFF→ HF_NOT_OK).



- PWR_GOOD_LEM: for the
  The operating status c
  OFF→ 5V_LEM_NOT_

Note: the combination of the
ON means the missing of the
The combination of the locks
ON except DL1 (on B0284 ar
(refer to 7.3 paragraph).

7.2.2 INVERTER BOARD B0289 – HF POWER SUPPLY FOR INVERTER DRIVER

- PWR_GOOD_INVERTER: HF check for the inverter side.

An error in this check is due to a failure in the HF power supply or can also be cause of the missing of the 18V from the B0273 board.

Note: the combination of the locks L01+L38+39 with all the signal LEDs on the boards of the UPS turned ON means a faulty of the HF power supply (refer to 7.3 paragraph).

7.2.3 OUTPUT & BYPASS BOARD B0290 – REDUNDANT FLYBACK AND 7V STEP DOWN FOR RELAYS

The output & bypass board is affected by two checks from the control logic:

- PWR_GOOD_OUT: 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);

- PWR_GOOD_BYP: redundant flyback check**.**
  The operating status can be easily checked by **DL1** (led ON→ 17V5_OK / led OFF→ 17V5_NOT_OK).

  Attention! In case of negative test result, for a fault of the flyback, the UPS **does not display L01** but a FAULT. The UPS does not lock: the system works perfectly by the Aux power supply board's flyback (board B0273).

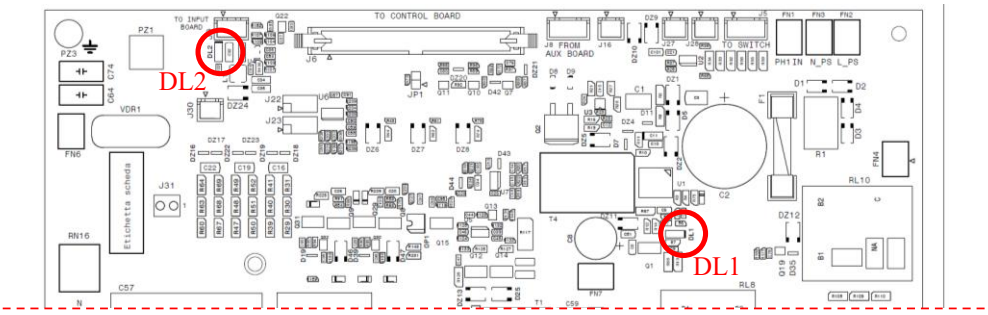


Fig. 42

7.2.4 CONTROL BOARD B0275 – 18V_R AND 5V_EXT

- 18V_OK_FPGA: 18V_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).
The 5V **not affect** the **L01** lock, but it is helpful for checking the 18V_R presence in case of this lock.

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

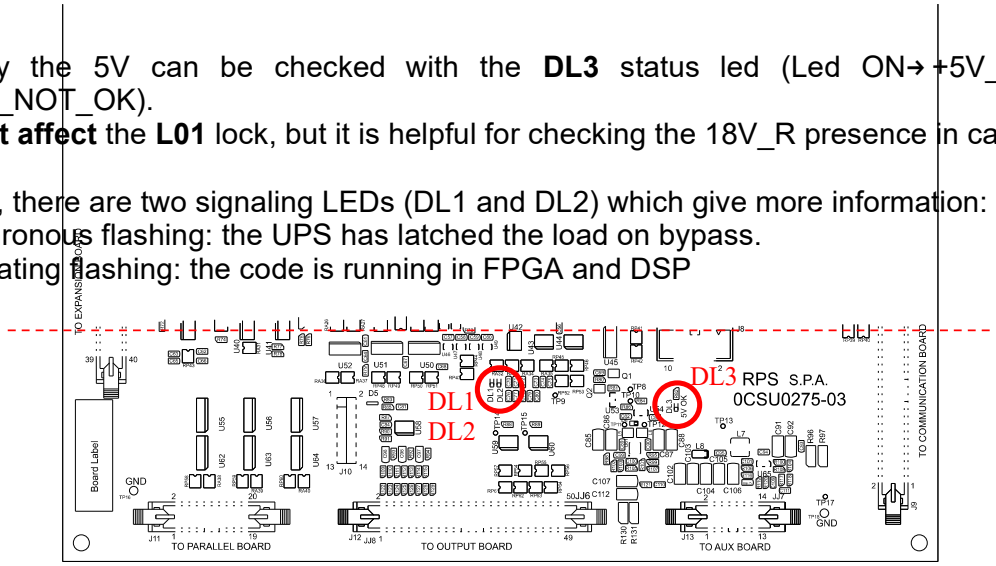


Fig. 43

7.2.5 PARALLEL BOARD B0229 – OPTIONAL

- PAR_AUX_OK: It is 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).

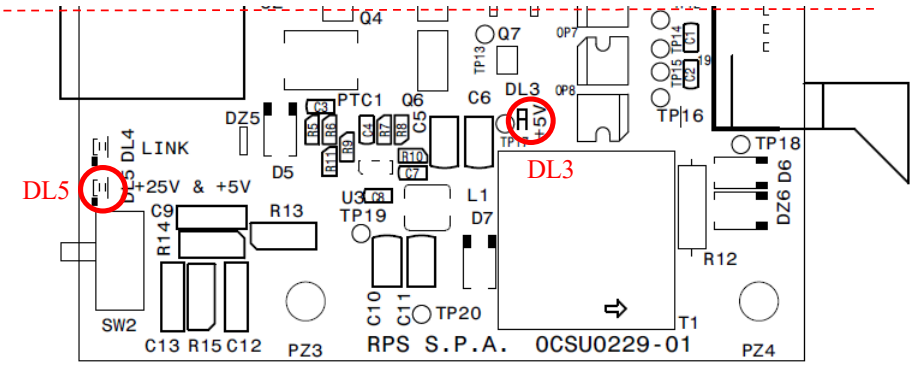


Fig. 44

7.3 POSSIBLE LEDs CONFIGURATIONS

Below a table for the detection of the possible board involved in a power supply failure. It is possible to check the status of the LEDs of the boards even with the UPS in Stand-by mode.

	LEDs status							
	B0284	B0285	B0290		B0275			
ALARMS	DL1	DL1	DL1	DL2	DL3	CAUSE		BOARD INVOLVED
L01+L38+L39	OFF	OFF	ON	ON	ON	FAULT ON FLYBACK		B0273
L01+L38+L39	ON	OFF	ON	ON	ON	HF MISSING	HF POWER SUPPLY FAULTY	B0289
L01+L38	ON	OFF	ON	ON	ON	HF MISSING ON THE BOOST DRIVER SECTION		B0284 or B0285
L01	OFF	ON	ON	ON	ON	5V_LEM MISSING		B0284
L01	ON	ON	ON	OFF	ON	7V_RELAY MISSING		B0290
(NO L01) F53	ON	ON	OFF	ON	ON	REDUNDANT P. SUPPLY FAILURE		B0290
L01	ON	ON	ON	ON	OFF	18V MISSING		B0275
L01	ON	ON	ON	ON	ON	FAULT IN THE POWER-GOOD CIRCUIT		**
COMMUNICATION LOST	ON	ON	ON	ON	OFF	5V/5V_EXT MISSING		B0275

Tab. 24

** The power good signals are explained in chapter 7.2. When it is not possible to define the faulty board by checking the LEDs status, an in-depth analysis is required.

7.4 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.

7.4.1 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 is not 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.

7.4.2 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.

7.5 FANS SPEED

The regulated voltage (17-25V) for the fans is produced by the Auxiliary power supply board (B0273).
The UPS is provided by two fans, one for the Boost & BC power board (B0284) and one for the Inverter power board (B0289), they work with the same regulated voltage.
The voltage is regulated based on the maximum temperature of the modules located on the power boards.
Below the fans voltage/speed graph based on the temperature:

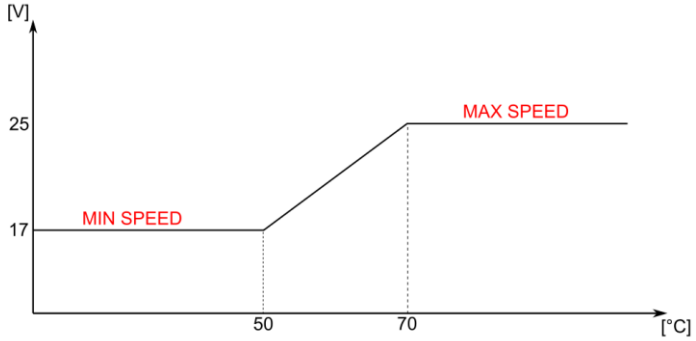


Fig. 45

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

The operating status of the regulated voltage can be easily checked by **DL1** on **B0273** (led ON→ V_FAN_OK / led OFF→ V_FAN _NOT_OK).

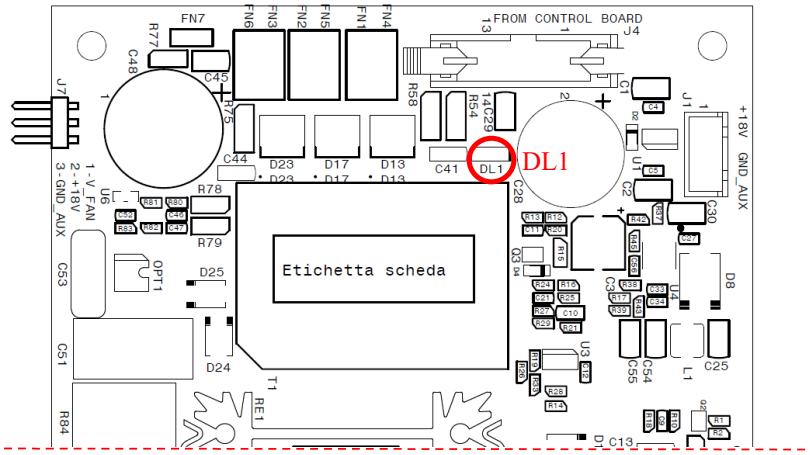


Fig. 46

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 directly using the pins dedicated for the link signal.
In the picture below is reported all the tracks about the “Link Fail” indication:

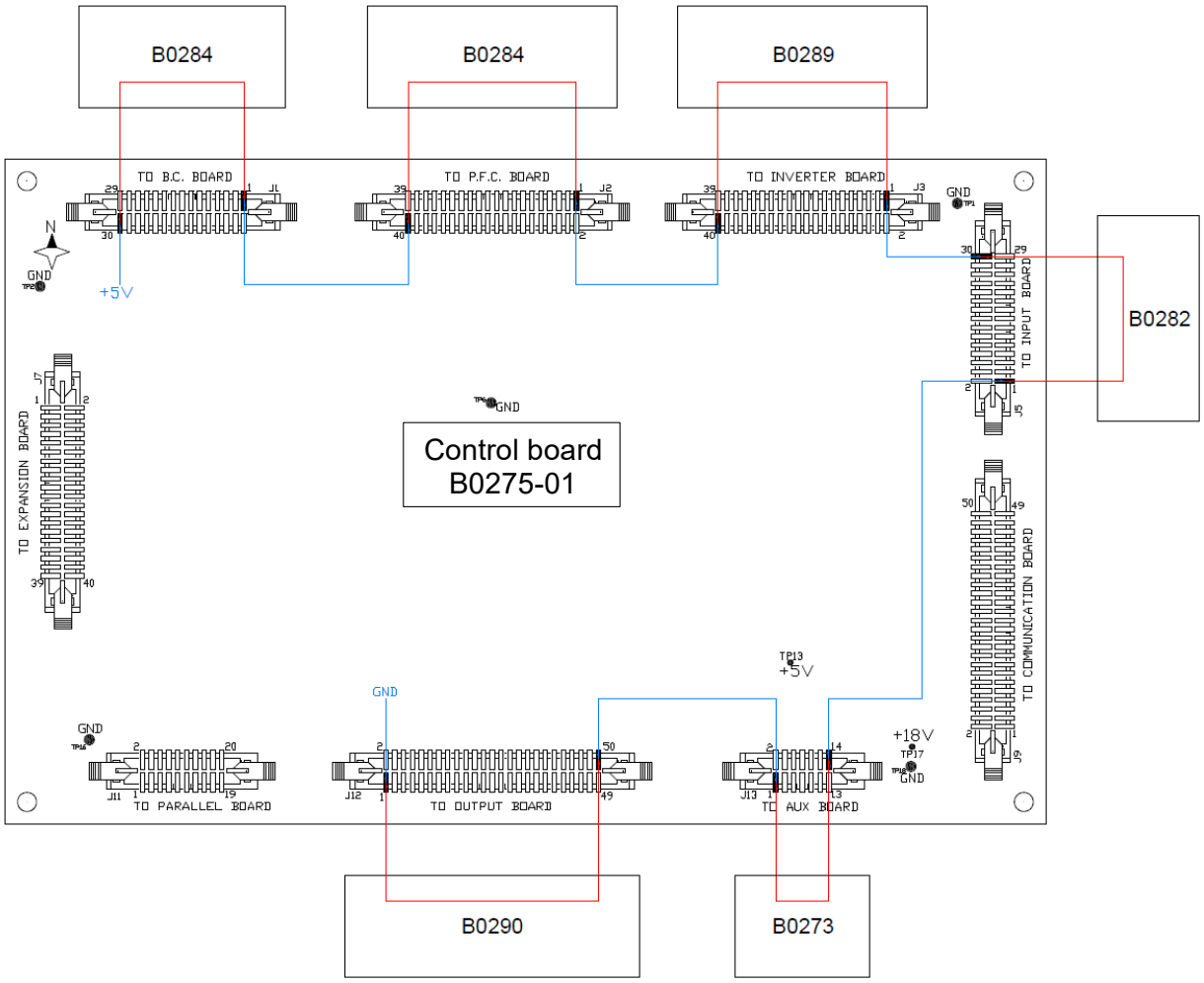


Fig. 47

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. 47).

If the test gives positive result, it means that the flat cables are connected correctly. Otherwise is necessary to check the contact of the connectors mounted on pcb, analyzing the link in several point.
Below, the table to follow to analyze the continuity signal of the link:

B0284	B0284	B0289	B0282	B0273	B0290
J1	J2	J3	J5	J13	J12
PIN30 – PIN1	PIN40 – PIN1	PIN40 – PIN1	PIN30 – PIN1	PIN14 – PIN1	PIN50 – PIN1

The L02 alarm does not include the additional boards that can be provided for the Discovery series and 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 MODULE CHECK (B0284 BOOST & BC BOARD)

The picture below shows the position of the four modules to check. Use a multimeter to check the conditions of every PFC module and the battery module as explained below. You need to remove the Boost driver board (B0285) before the module check (refer to 11.3.5)

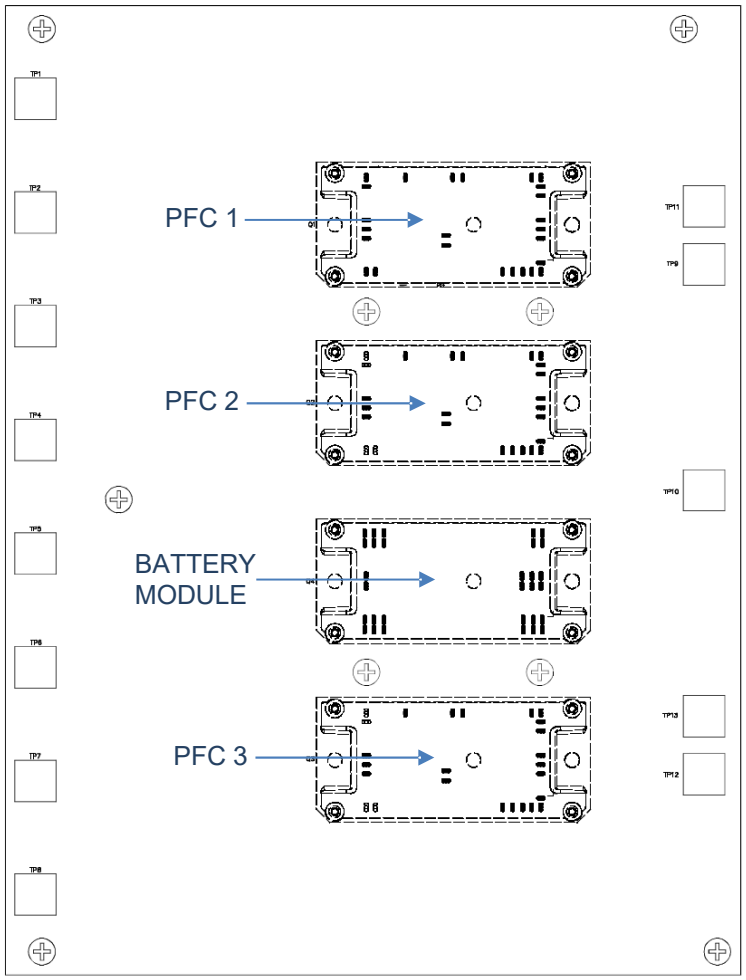


Fig. 48
B0284 board

9.1.1 PFC 1 MODULE CHECK

Check all the diodes: they should not be in short circuit or completely open.

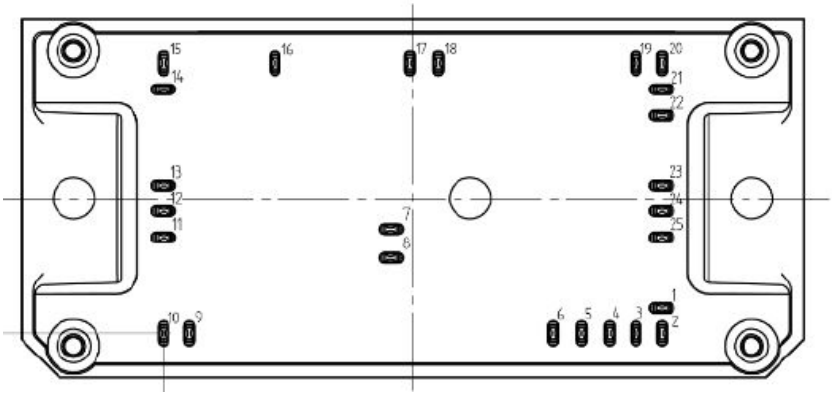


Fig. 49

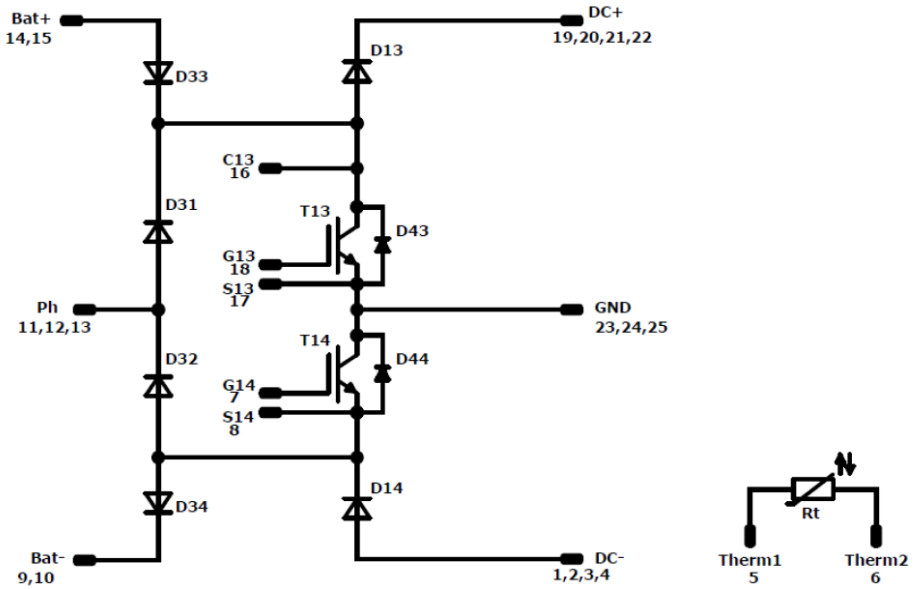


Fig. 50
Pinout of the PFC 1 module with circuit scheme

PINOUT	DIODE	Vf(*)
16 ↔ 19,20,21,22	D13	0,37
8 ↔ 1,2,3,4	D14	0,37
16 ↔ 11,12,13	D31	0,46
8 ↔ 11,12,13	D32	0,46
16 ↔ 14,15	D33	0,46
8 ↔ 9,10	D34	0,46
16 ↔ 17	D43	0,44
8 ↔ 23,24,25	D44	0,44

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.

9.1.2 PFC 2 AND PFC 3 MODULE CHECK

Check all the diodes: they should not be in short circuit or completely open.

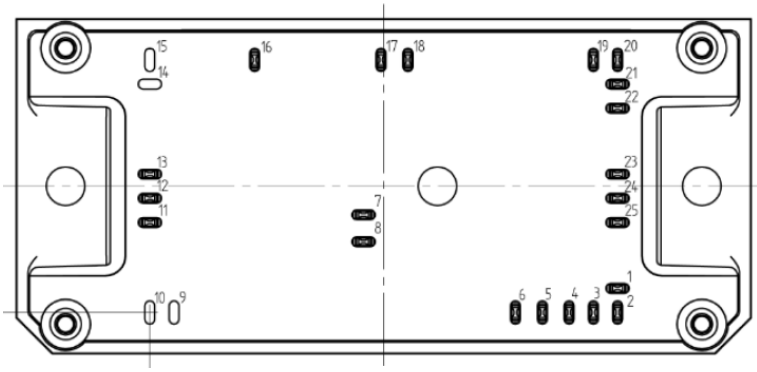


Fig. 51

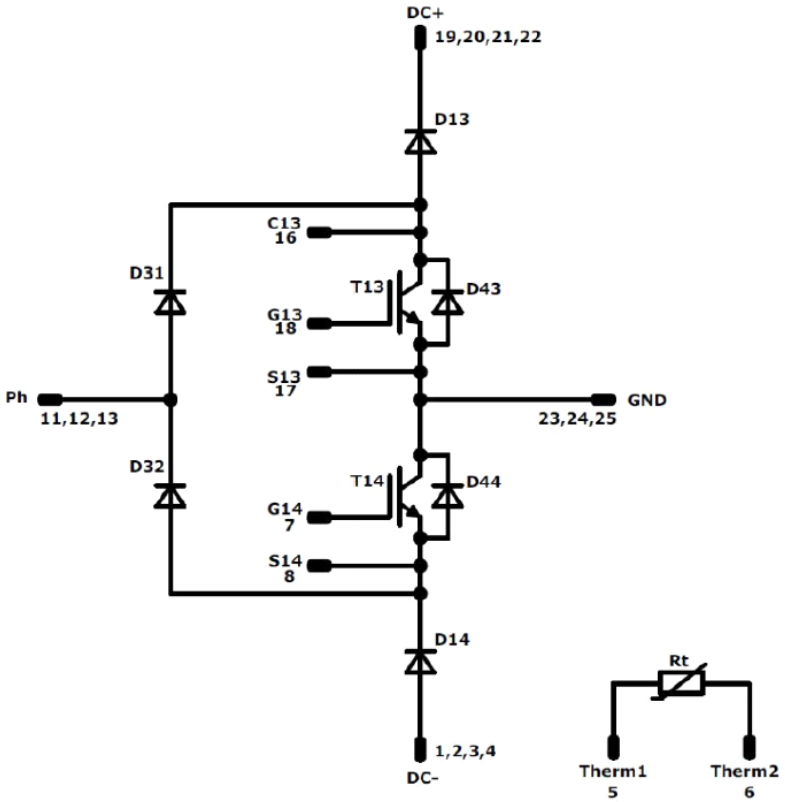


Fig. 52
Pinout of the PFC 2-3 module with circuit scheme

PINOUT	DIODE	Vf(*)
16 ↔ 19,20,21,22	D13	0,37
8 ↔ 1,2,3,4	D14	0,37
16 ↔ 11,12,13	D31	0,46
8 ↔ 11,12,13	D32	0,46
16 ↔ 17	D43	0,44
8 ↔ 23,24,25	D44	0,44

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.

9.1.3 BATTERY MODULE CHECK

Check all the diodes: they should not be in short circuit or completely open.

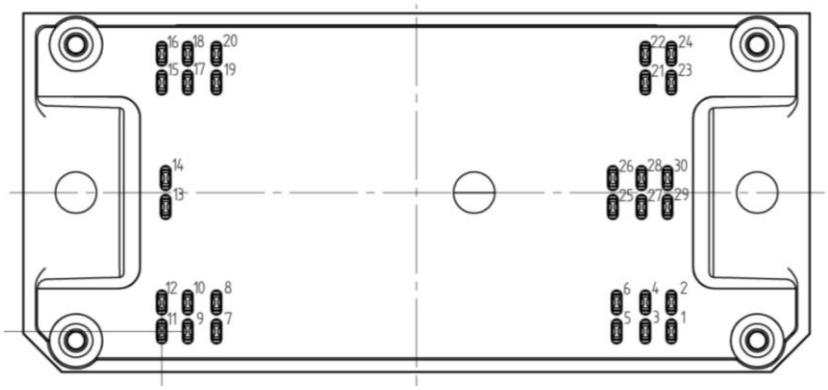


Fig. 53

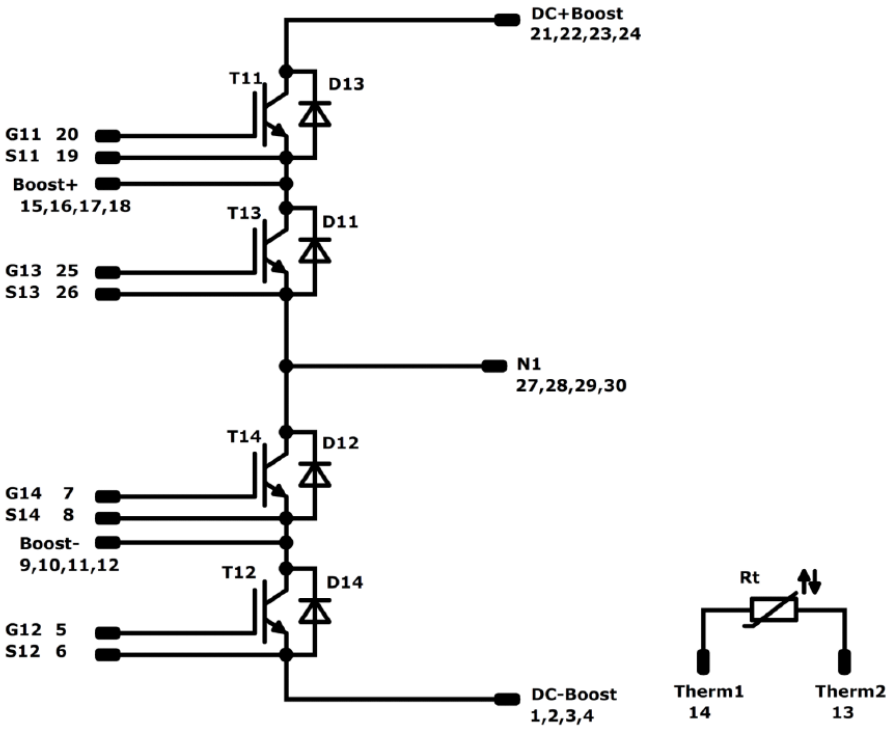


Fig. 54

Pinout of the battery module with circuit scheme

PINOUT	DIODE	Vf(*)
26 ↔ 15,16,17,18	D11	0,40
9,10,11,12 ↔ 27,28,29,30	D12	0,40
19 ↔ 21,22,23,24	D13	0,37
6 ↔ 9,10,11,12	D14	0,37

Tab. 27

(*) 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.

9.2 INVERTER MODULE CHECK – INVERTER BOARD (B0271)

The picture below shows the position of the four modules to check. Use a multimeter to check the conditions of every inverter module as explained below. You don't need to remove this board for the module check. Check the diodes: they should not be in short circuit or completely open.

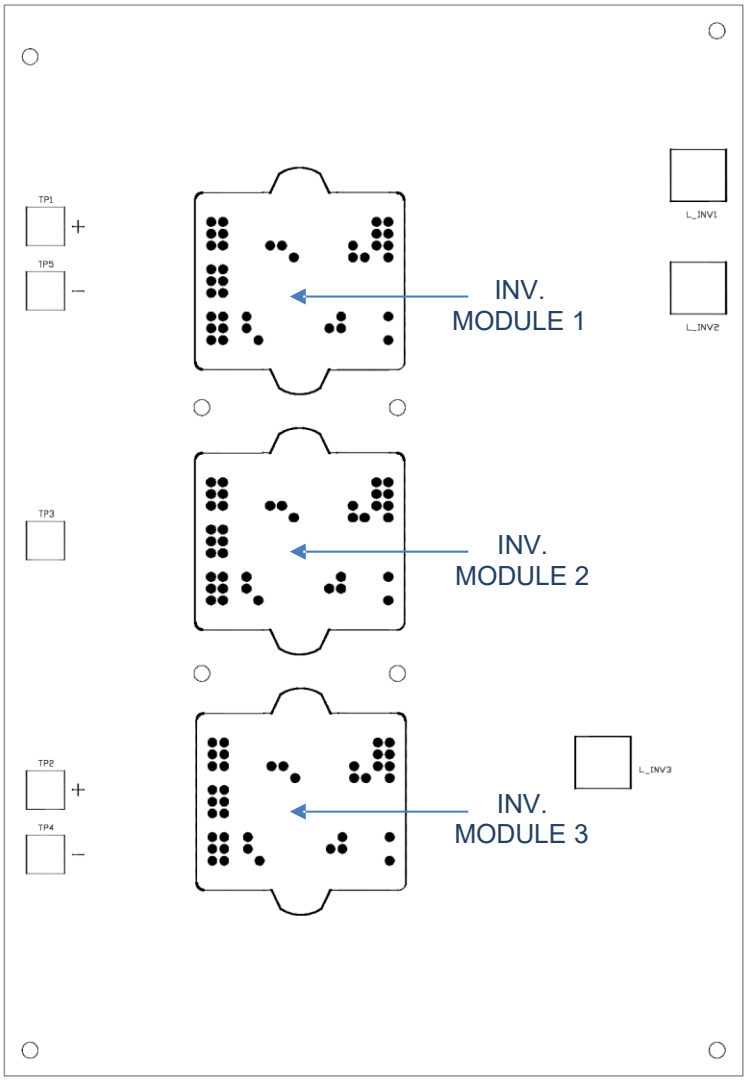


Fig. 55
B0289 board

9.2.1 INVERTER MODULE CHECK

Check all the diodes: they should not be in short circuit or completely open.

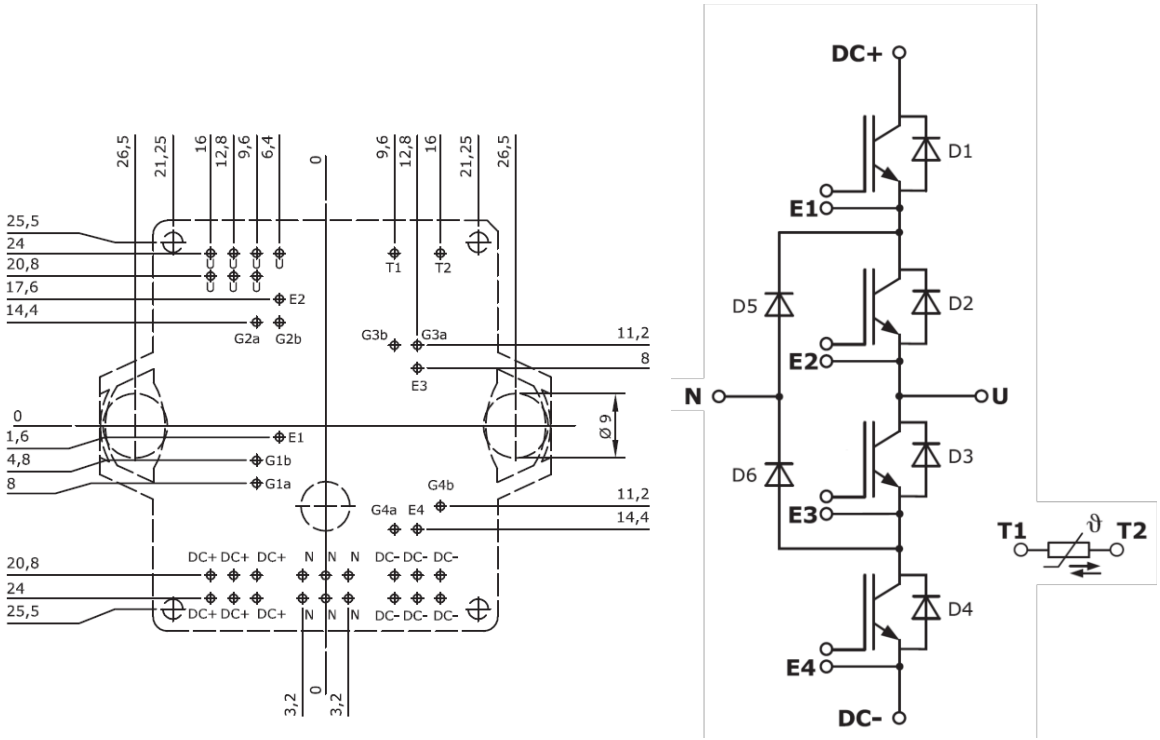


Fig. 56
Pinout of the inverter module with circuit scheme

PINOUT	DIODE	Vf(*)
DC+ ↔ E1	D1	0,39
E1 ↔ E2	D2	0,39
U ↔ E3	D3	0,39
E3 ↔ DC-	D4	0,39
E1 ↔ N	D5	0,36
N ↔ E3	D6	0,36

Tab. 28

(*) 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.

9.3 SCR MODULE CHECK – OUTPUT & BYPASS BOARD (B0290)

The picture below shows the position of the three SCR modules on B0290. Use a multimeter to check the conditions of every SCR module as explained below. You need to remove and overturning this board for the module check.

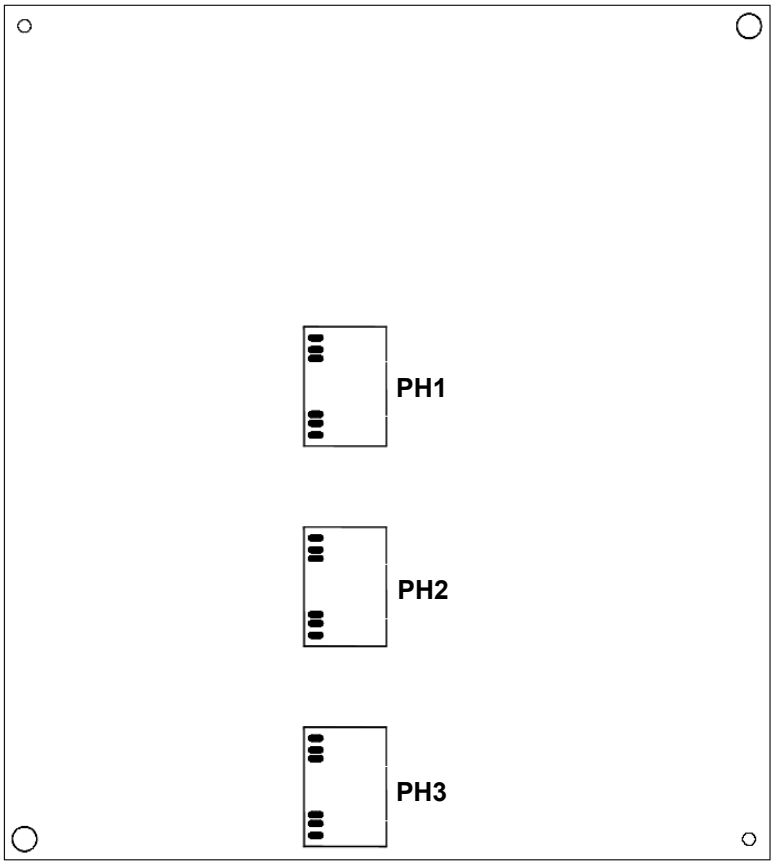


Fig. 57
Overturned board

Place the multimeter probes on pins 10-14 and 11-15 to check if they are shorted:

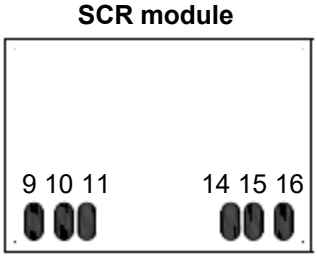


Fig. 58

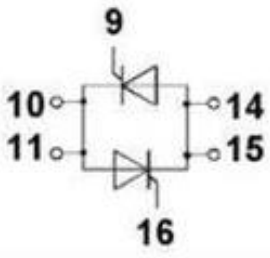


Fig. 59

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. 60

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 between the fast-on connectors for RL3-RL4 (PH1), RL5-RL6 (PH2), RL7-RL8 (PH3) on board B0282 (input board).

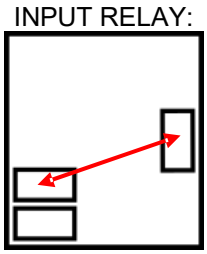


Fig. 61

(Image of an input relay: for each input relay, place the multimeter probes on the two fast-on connectors indicated by the arrows)

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).

With a multimeter set to ohmmeter mode, check the following resistances:

		Vin_1	Vin_2	Vin_3	Notes
	Input fuse	Before	Before	Before	
	B0282	R42	R51	R58	226 kOhm
See the path below	B0282	R41	R50	R59	226 kOhm
	B0282	J2-2	J2-4	J2-6	
	Flat Cable	||	||	||	
	B0275	J5-2	J5-4	J5-6	
	B0275(*)	R51	R46	R39	5,36 kOhm

Tab. 29

(*) Note: for the B0275 board, all the components are SMD.

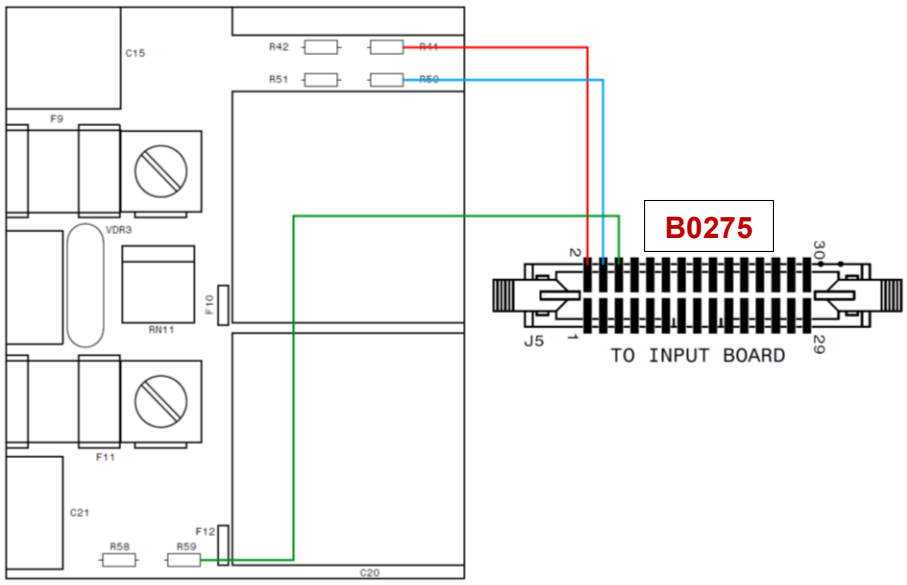


Fig. 62

(Position the probes between the resistances and the external pinouts on B0275 to test the continuity of the flat cables, as shown in the figure)

	Vin_L1	Vin_L2	Vin_L2	Notes
Input relay	After	After	After	
B0282	R48	R56	R64	226 kOhm
B0282	R47	R55	R63	226 kOhm
B0282	J2-3	J2-5	J2-7	
Flat Cable	||	||	||	
B0275	J5-3	J5-5	J5-7	
B0275(*)	R49	R43	R32	5,36 kOhm

See the path below

Tab. 30

(*) Note: for the B0275 board, all the components are SMD.

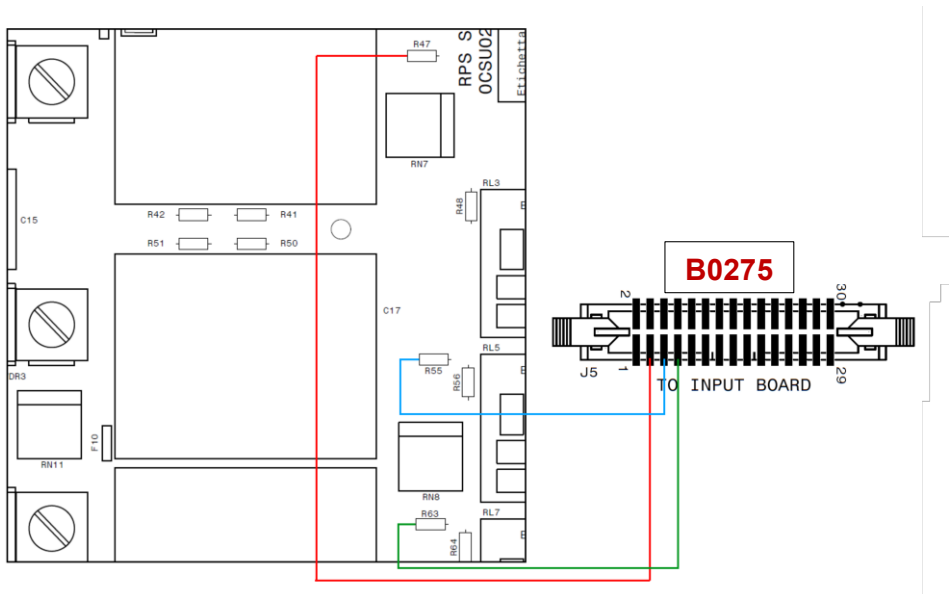


Fig. 63

(Position the probes between the resistances and the external pinouts on B0275 to test the continuity of the flat cables as shown in the figure)

10.2 BYPASS VOLTAGES

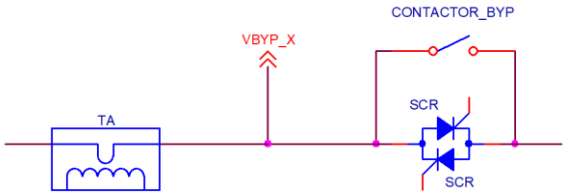


Fig. 64

Bypass voltage readings are measured near RN1 on board B0290 (output & bypass board).

Note: for the B0290 and B0275 boards, all the components are SMD. However, is shown below the table for the continuity information.

	VBYP_1	VBYP_2	VBYP_3	Notes
B0290	R110	R113	R116	150 kOhm
B0290	R109	R112	R115	150 kOhm
B0290	R108	R111	R114	150 kOhm
B0290	J6-8	J6-9	J6-10	
Flat Cable	||	||	||	
B0275	J12-8	J12-9	J-10	
B0275	R125	R112	R126	5,36 kOhm

Tab. 31

10.3 BATTERY VOLTAGES

There are six battery readings (in this chapter divided into two types of readings), measured by DSP and taken from board B0282 (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;
- VABATT± R AND VBATT± T: 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).

With a multimeter set to ohmmeter mode, check the following resistances:

10.3.1 VBATT±

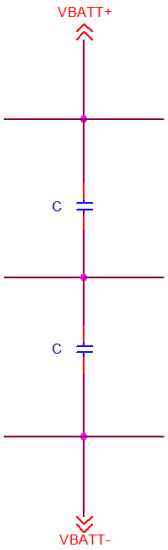


Fig. 65

	DC+	DC-	Notes
B0282	R24	R8	510 kOhm
B0282	R25	R9	510 kOhm
B0282	R26	R10	510 kOhm
B0282	J2-8	J2-10	
Flat Cable	||	||	
B0275	J5-8	J5-10	
B0275(*)	R29	R23	28,7 kOhm

See the path below

Tab. 32

(*) Note: for the B0275 board, all the components are SMD.

10.3.2 VBATT±_R AND VBATT±_T

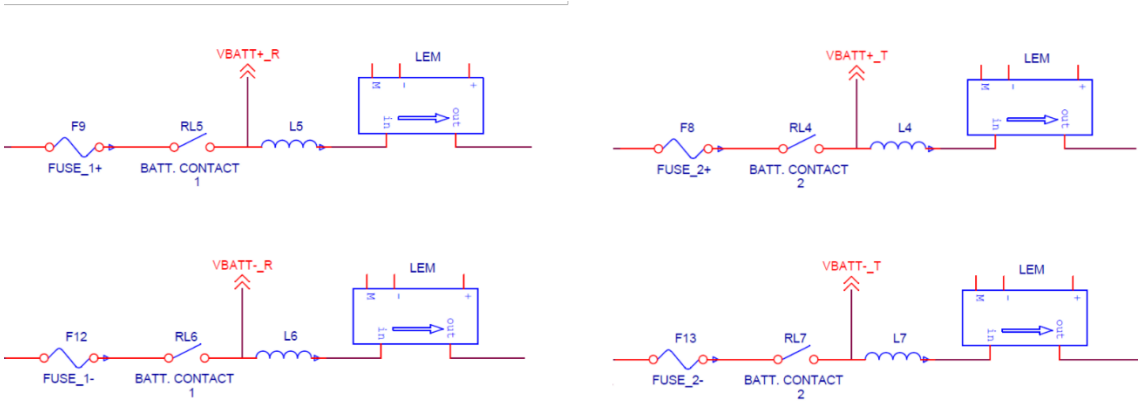


Fig. 66

- VBATT±_R

	DC+	DC-	Notes
B0282	R33	R34	510 kOhm
B0282	R20	R21	510 kOhm
B0282	R4	R5	510 kOhm
B0282	J2-9	J2-11	
Flat Cable	||	||	
B0275	J5-9	J5-11	
B0275(*)	R25	R21	28,7 kOhm

See the path below

Tab. 33

- VBATT±_T

	DC+	DC-	Notes
B0282	R36	R35	510 kOhm
B0282	R23	R22	510 kOhm
B0282	R7	R6	510 kOhm
B0282	J2-12	J2-13	
Flat Cable	||	||	
B0275	J5-12	J5-13	
B0275(*)	R18	R16	28,7 kOhm

See the path below

Tab. 34

(*) Note: for the B0275 board, all the components are SMD.

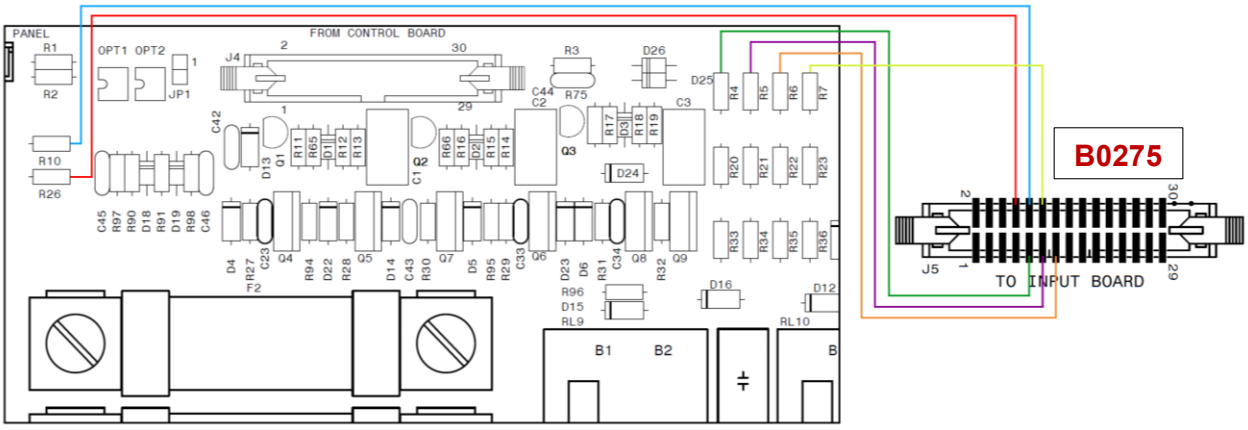


Fig. 67

(Position the probes between the resistances and the external pinouts on B0275 to test the continuity of the flat cables as shown in the figure)

10.4 INVERTER VOLTAGES

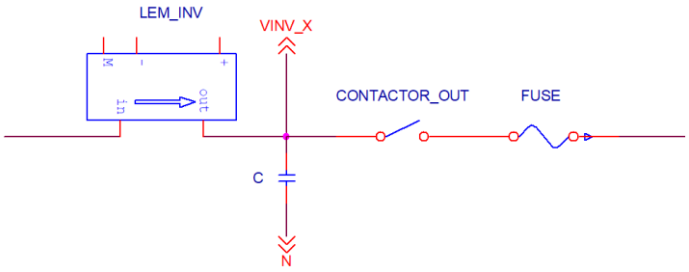


Fig. 68

The reading point of inverter voltage is exactly next to the inverter filter capacitors and each inverter reading is positioned under the related inverter fuse on board B0290 (output & bypass 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 B0290 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
B0290	R149	R163	R152	150 kOhm
B0290	R150	R164	R153	150 kOhm
B0290	R151	R165	R154	150 kOhm
B0290	J6-2	J6-3	J6-4	
Flat Cable	||	||	||	
B0275	J12-2	J12-3	J12-4	
B0275	R122	R109	R123	5,36 kOhm

Tab. 35

10.5 OUTPUT VOLTAGES

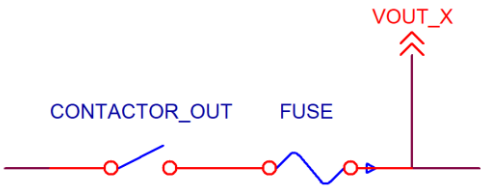


Fig. 69

The output voltage readings are taken at the output of board B0290 (output & bypass board). The reading point is next to output fuses and each output reading is positioned under the related fuse on board B0290 (output & bypass board). 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).

Note: for the B0290 and B0275 boards, all the components are SMD. However, is shown below the table for the continuity information.

	VOUT_1	VOUT_2	VOUT_3	Notes
B0290	R155	R166	R158	150 kOhm
B0290	R156	R167	R159	150 kOhm
B0290	R157	R168	R160	150 kOhm
B0290	J6-5	J6-6	J6-7	
Flat Cable	||	||	||	
B0275	J12-5	J12-6	J12-7	
B0275	R110	R124	R111	5,36 kOhm

Tab. 36

10.6 OUTPUT CURRENTS

10.6.1 BYPASS CURRENTS

Each bypass line has its TA. The TA is inserted in the cables connecting between the SWIN (or SWBYP for DI version) and the B0290 board (Output & byp. board).
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).

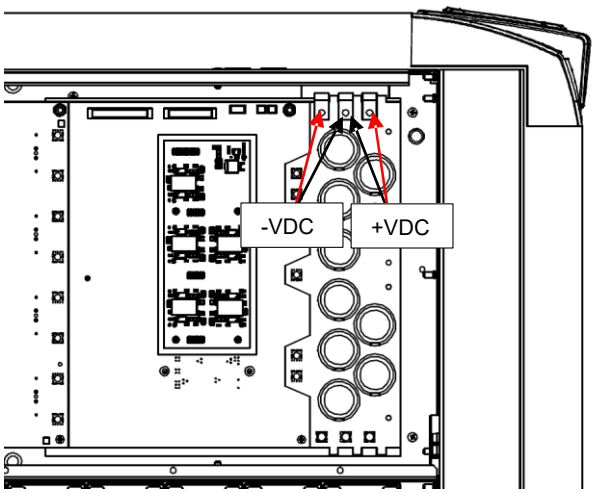
10.7 VDC VOLTAGE

The VDC voltage can be measured both on the Boost & BC power board (B0284) and on the Inverter power board (B0289).
In particular, the two DC cap. boards are connected to each other with three metallic bars: the measurements of the VDC can be performed on one of the two sides, the measurements must therefore be the same for both the boost and the inverter side.

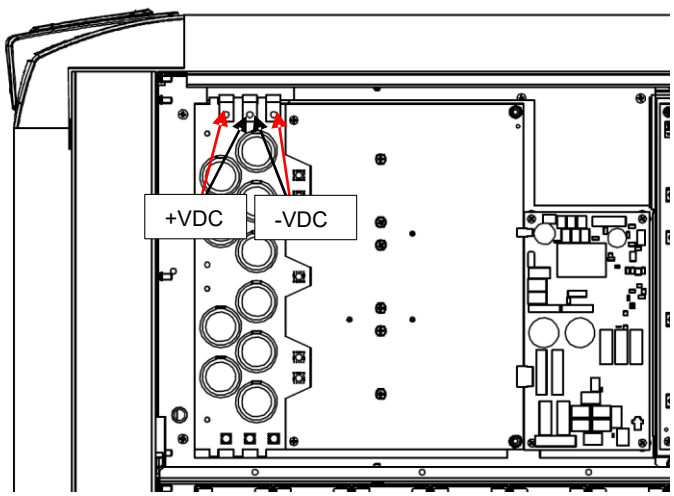
- **Check the tightening of the screws for a correct measurement.**

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. This measure determine the **actual VDC voltage**; any errors due to the measurement system can be detected by the UcomS3 Status Analyzer software.



Input Side



Output Side

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. 70). Pull out the display and then remove the RJ45 cable.

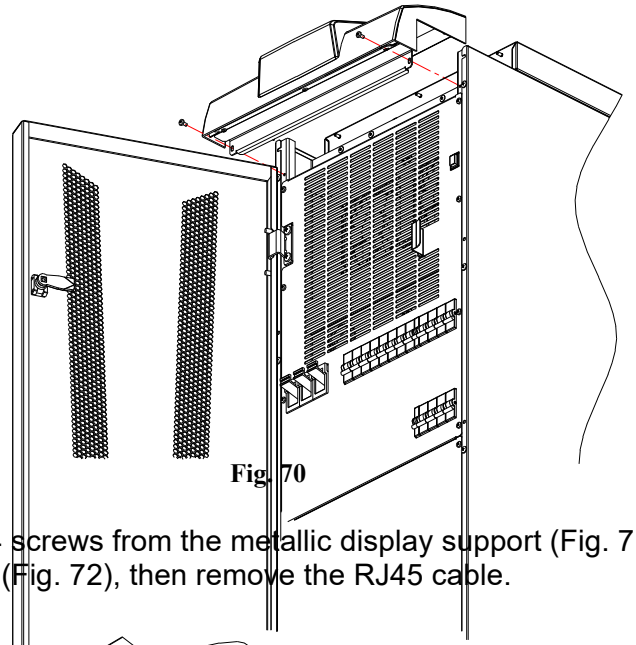


Fig. 70

- **XTD:** remove the n°4 screws from the metallic display support (Fig. 71). Remove n°4 screws from the cable cover (Fig. 72), then remove the RJ45 cable.

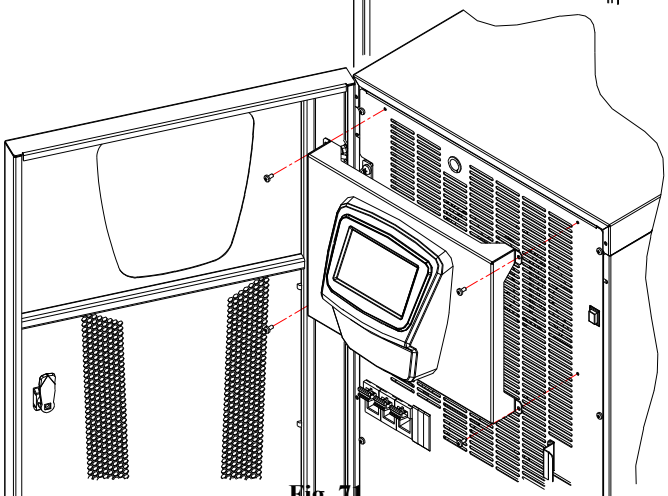


Fig. 71

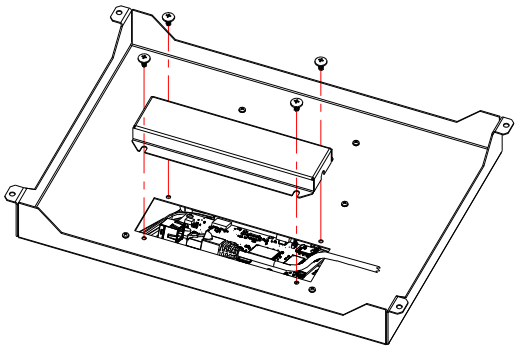
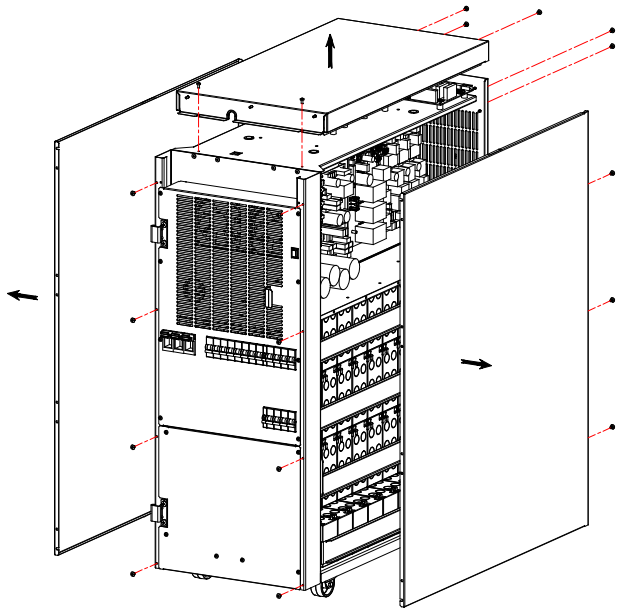


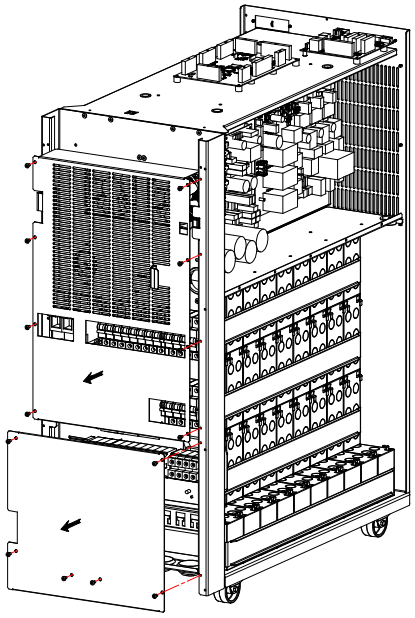
Fig. 72

11.1.2 ACTIVE 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.
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.



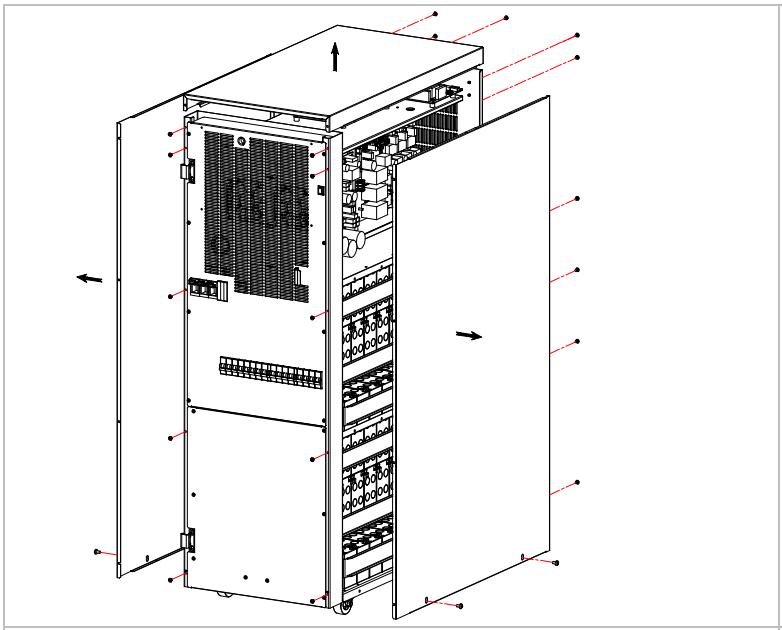
Screws for the side panels and top cover



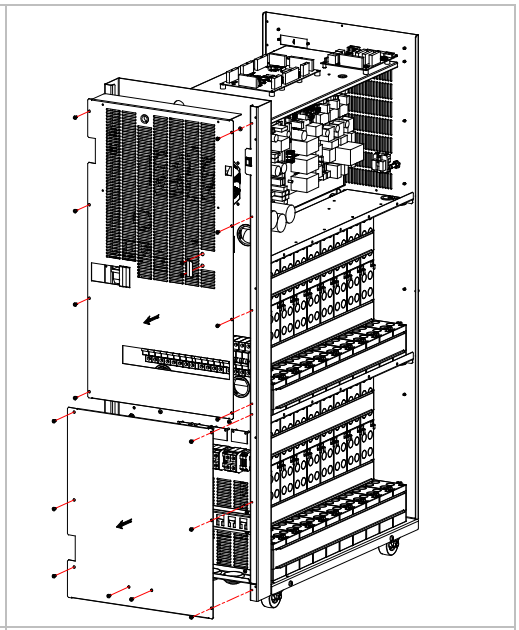
Front panels fastening screws

11.1.3 XTEND 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.



Screws for the side panel and top cover



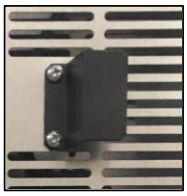
Front panels fastening screws

11.2 FAN REPLACEMENT

11.2.1 REMOVE THE FAN FROM THE CHASSIS:

1) Remove the display as shown in 11.1.1

2) Remove first the black bracket to remove the frontal protection panel.



3) Remove the side panels and then the fan cables (J10 on the Inverter power board (B0289) and J7 on the Boost & BC power board (B0284))

4) Remove the 4 plastic rivets that hold the fan to the chassis.

5) Push down the fan to extract it.

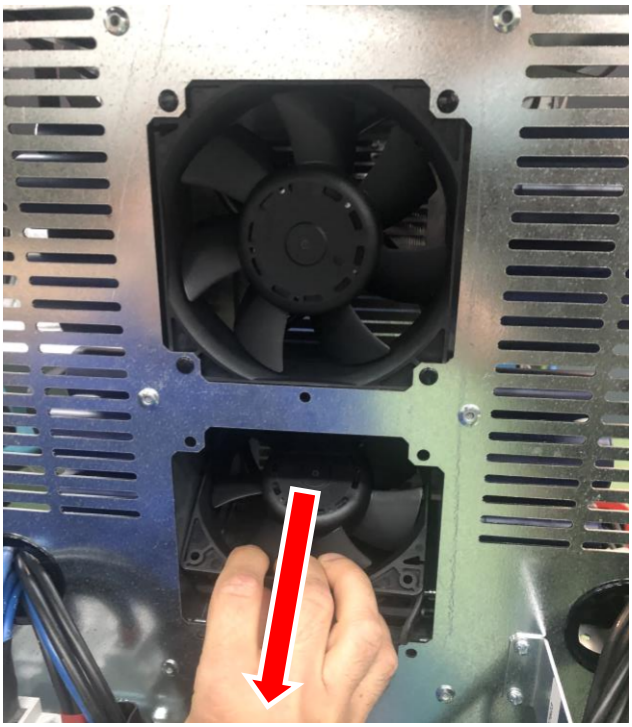


Fig. 73

Fan replacement: to fit the new fan follow the instructions for removal in reverse. Pay attention to install the fan with the label or the indicator facing inwards.

11.3 BOARDS REPLACING – 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.

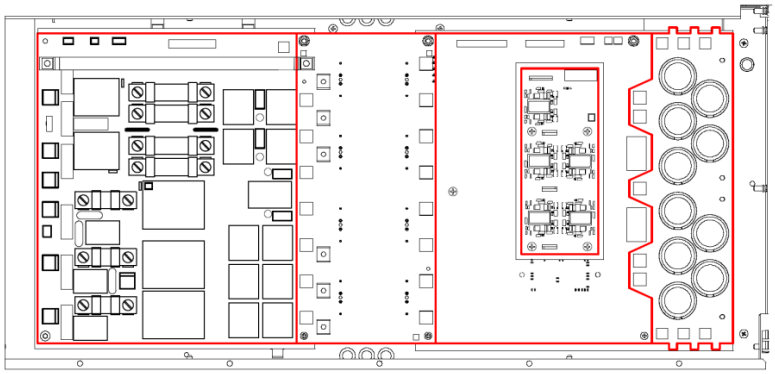


Fig. 74

11.3.1 INPUT BOARD REMOVAL (B0282-0x)

1) The input board is installed near the Inductor PFC/Boost board (B0286). For B0286, it is recommended to loosen the screws on the right side of the board and completely remove the screws on the left side of the board in order to remove the input card avoiding removing the B0286.
2) Remove all the cables of the input board and the neutral metal bar.
3) Remove the two hex nuts in the upper side of the board and then remove all the remaining screws.
4) Unscrew the lateral fixing screw and then remove the board pulling it to left.

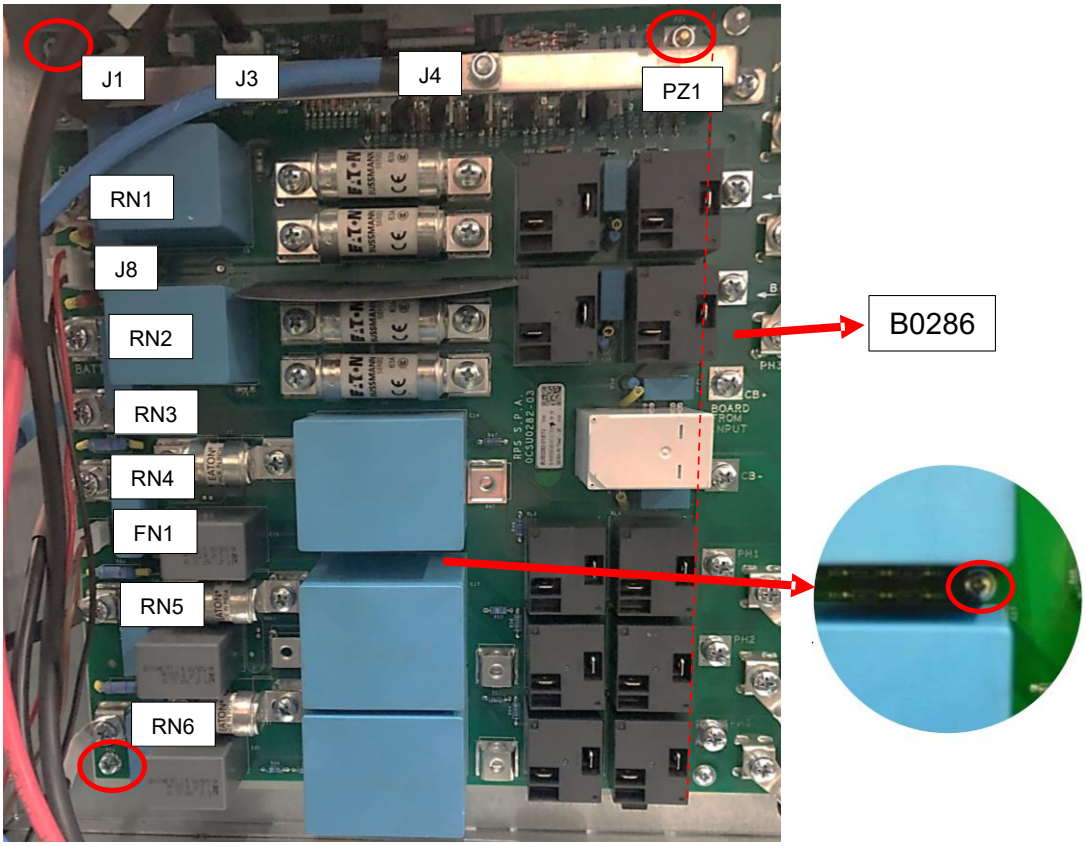


Fig. 75

11.3.2 INPUT BOARD INSTALLATION (B0282-0x)

For the installation of the Input board B0282:

1) Fix first the central screw, the hex nuts, and the remaining screw in the lower side.

2) Fix all the screws of the B0286-0x.
Make sure the screws are tightened to avoid unwa

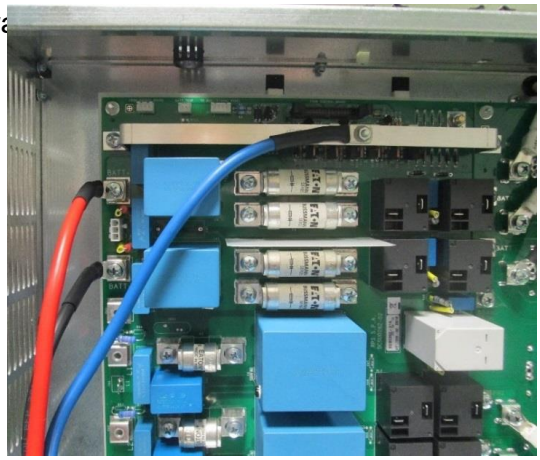


Fig. 76

3) Install the neutral bar and connect the battery cables:

J4 from SWBAT (blue – neutral)
RN1 from SWBAT (red cable – batt+)
RN2 from SWBAT (black cable – batt -)

Fig. 77

4) Connect the input phases:
RN3 from SWIN (blue – neutral)
RN4 from SWIN (brown – L1)
RN5 from SWIN (black – L2)
RN6 from SWIN (grey – L3)

5) Connect the remaining cables:
J1 from J9 of B0290-0x
J8 from J3 of B0273-01
FN1 from FN1 of B0290-0x
J3 from auxiliary signal terminal
J4 from J5 of B0275-01 (flat cable)

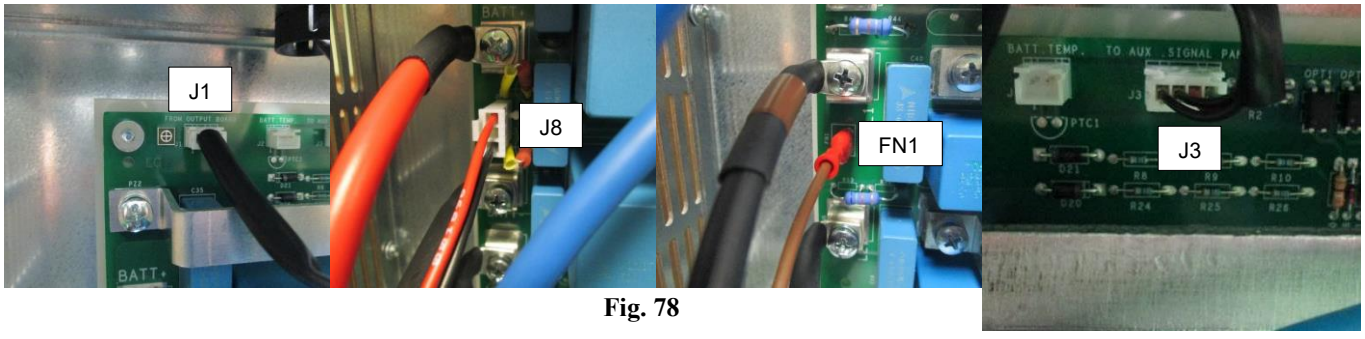


Fig. 78

11.3.3 INDUCTORS PFC & BOOST BOARD REMOVAL (B0283-0x)

1) Remove all the cables.

2) Unscrew the lateral fixing screws with the B0282-0x and B0284-0x board.

3) Remove the plastic hex nuts situated on the top of the board and the screws on the bottom of the card.

4) Be very careful when removing the board: with the board tilted, the inductors can be damaged.

Fig. 79

Board replacement: to install a new board follow the removal procedure in reverse. Make sure the screws are tightened to avoid unwanted fault.

11.3.4 DC CAPACITORS BOOST BOARD REMOVAL (B0286-0x)

1) Remove the eight screws on the top and on the left side of the board and the three screws on the right side of the board.

2) Remove the board by pulling it to the right to prevent the near components from damaging.

Board replacement: to install a new board follow the removal procedure in reverse. Make sure the screws are tightened to avoid unwanted fault.

11.3.5 BOOST & BC DRIVER BOARD (B0285-01)

1) Remove the cable J6 and the four hex screws.

2) Remove the board carefully to avoid bending the pins.

Board replacement: pay attention to install this board:

It is essential to correctly insert all the pins in the connectors that must not be bent. Once the card has been installed, check all the pins in each connector. You should see the pins come out as shown in the phot

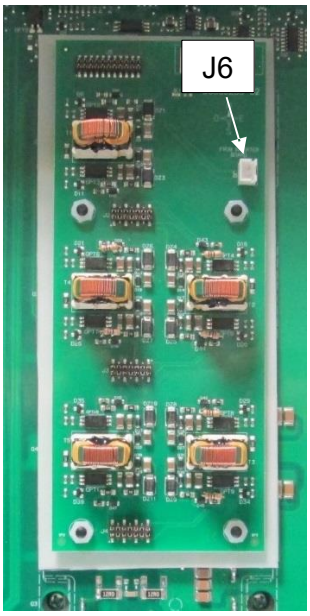


Fig. 82

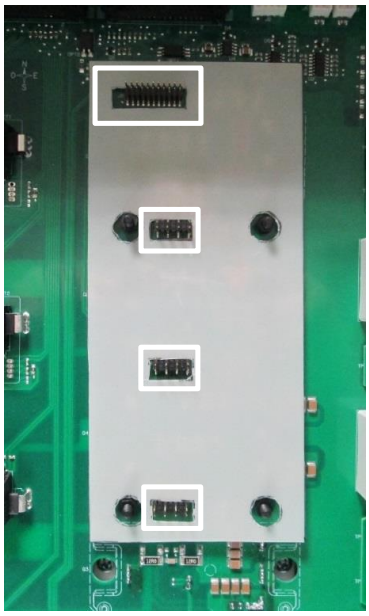


Fig. 83

11.3.6 BOOST & BC POWER BOARD REMOVAL (B0284-0x)

3) Remove the Boost & BC driver board (B0285-01) as shown in this chapter (11.3.5).

4) Remove the 4 plastic rivets positioned below the B0285-01.

5) Unscrew the 2 screws for each module.

6) Remove the DC capacitors boost board as shown in chapter (11.3.4)

7) Remove the flat cables and the JST connectors: J2, J7 and J6 of B0285.

8) Unscrew and remove the lateral screws with the B0286-0x board.

9) Unscrew the two fixing screws and the upper plastic hex nuts.

10) Remove the board.

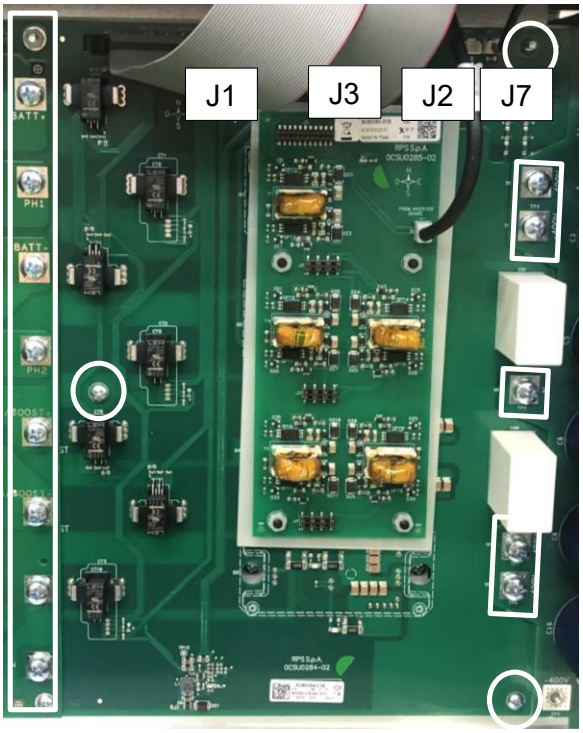


Fig. 84

11.3.7 BOOST & BC POWER BOARD INSTALLATION (B0284-0x)

For the installation of the Boost & BC Power Board B0284:

1) Make sure the modules and the heatsink are clean.

2) Apply a thin layer of thermal paste included in the spare part

   6R_SU0284-0xx S3T Boost & BC Power Card xx

   to each module:

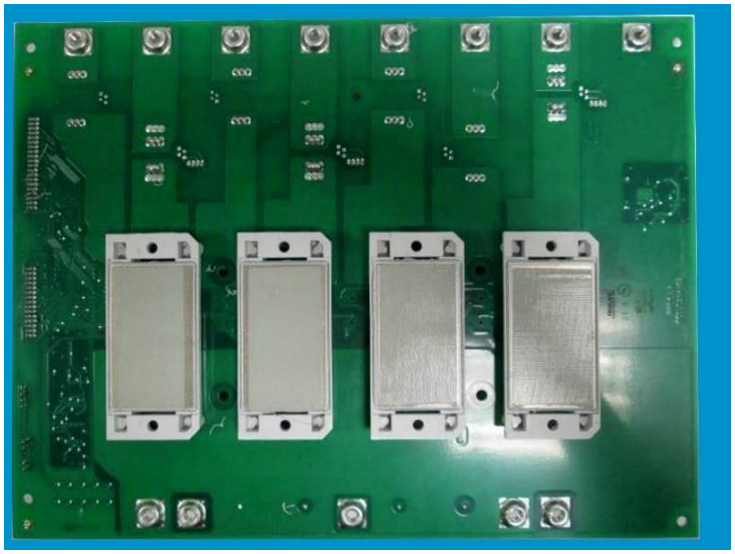


Fig. 85

3) Position the board by matching the holes in the module with the holes in the heatsink. Then fix the board with 2 screws per module.

   Note: The tightening torque of the module screws must be between **1.6 Nm ≤ Ms ≤ 2 Nm**.

4) Fix the 4 plastic rivets.

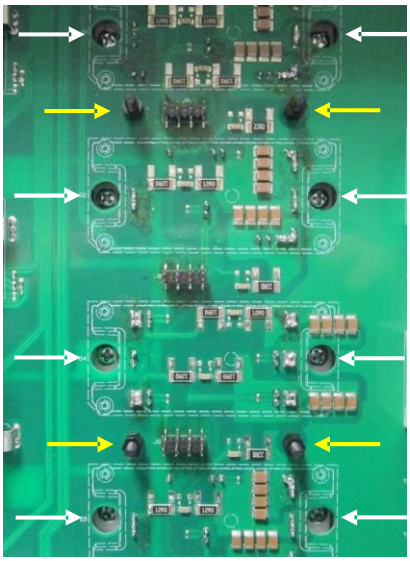


Fig. 86

5) Proceed the installation of the board following the removal procedure in reverse. Make sure the screws are tightened to avoid unwanted fault.

For the correct positioning of the cables:

J1 from Control board B0275-01
J3 from Control board B0275-01
J2 from Inverter power board B0289-0x
J7 from Fan

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.

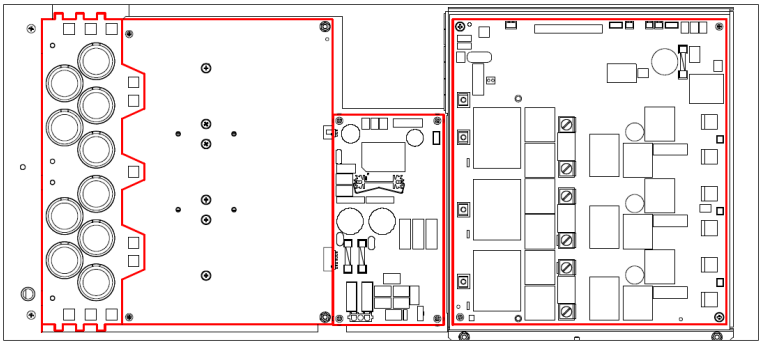


Fig. 87

11.4.1 AUX. POWER SUPPLY BOARD REMOVAL (B0273-01)

1) Unscrew the four fixing screws.

2) Remove all the cables and the flat.

3) Remove the board pulling from left to right.

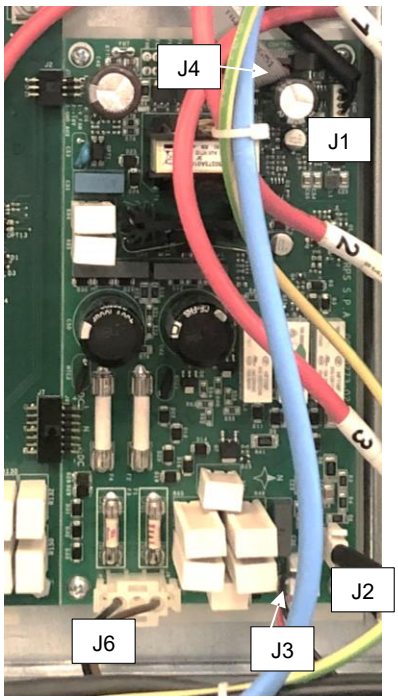


Fig. 88

Board replacement: to install a new board follow the removal procedures in reverse. See the image on the right for the correct positioning of the cables, in particular:

J1 from Output & Byp. board (B0290)
J2 from the Cold Start SW
J3 from Input board (B0282)
J4 from Control board (B0275)
J6 from Output & Byp. board (B0290)

11.4.2 DC CAPACITORS INVERTER BOARD REPLACEMENT (B0286-0x)

1) Remove the eight screws on the top and on the left side of the board and the three screws on the right side of the board.

2) Remove the board by pulling it to the right to prevent the near components from damaging.

Board replacement: to install a new board follow the removal procedure in reverse. Make sure the screws are tightened to avoid unwanted fault.

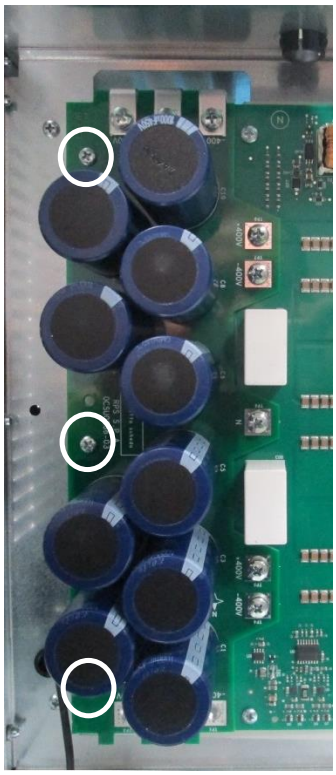


Fig. 89

11.4.3 INVERTER POWER BOARD REMOVAL (B0289-0x)

1) Remove the DC capacitors Inverter board B0286-0x (11.4.2)

2) Remove the Aux. power supply board B0273-01 (11.4.1)

3) Remove all the cables and the flat.

4) Unscrew the 4 central plastic screws and make sure to unscrew the screws of the three inverter modules.

5) Unscrew the 2 fixing screws and the 2 plastic hex nuts.

6) Remove the board.

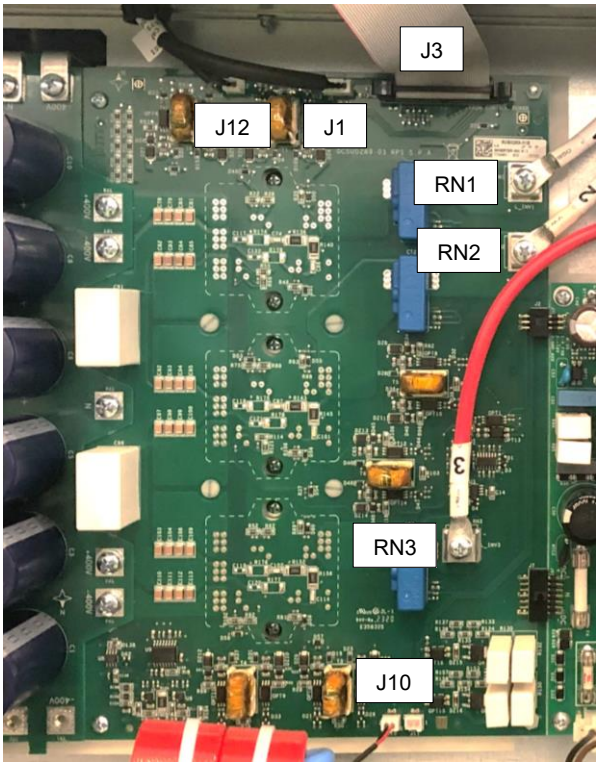


Fig. 90

11.4.4 INVERTER POWER BOARD INSTALLATION (B0289-0x)

For the installation of the Inverter Power Board B0289:

6) Make sure the modules and the heatsink are clean.

7) Apply a thin layer of thermal paste included in the spare part

6R_SU0289-0xx S3T Inverter Power Card xx

to each module:

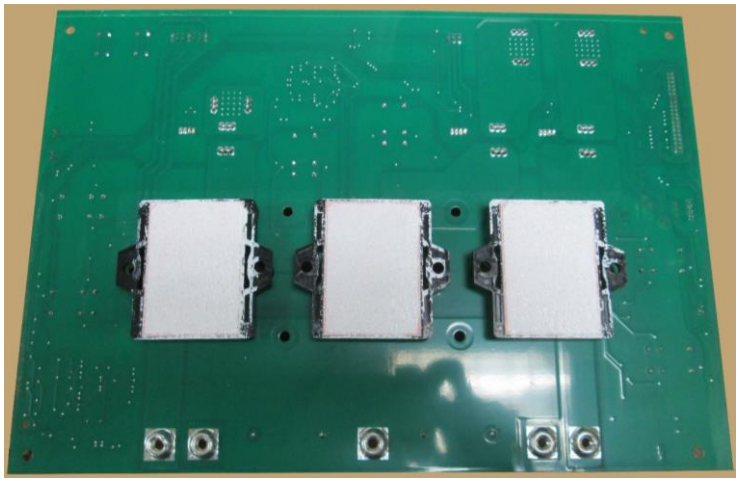


Fig. 91

8) Position the board by matching the holes in the module with the holes in the heatsink. Then fix the board with 2 screws per module.
Note: The tightening torque of the module screws must be between **1.6 Nm ≤ Ms ≤ 2 Nm**.

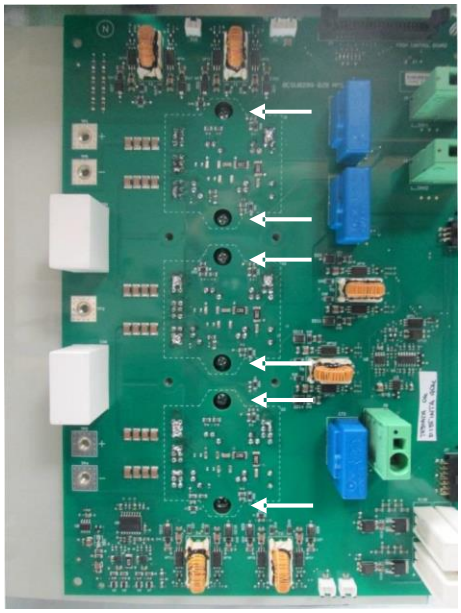


Fig. 92

9) Proceed the installation of the board following the removal procedure in reverse. Make sure the screws are tightened to avoid unwanted fault.

For the correct positioning of the cables:

J1 from Boost & BC power board (B0284-0x)
J3 from Control board (B0275-01)
J10 from FAN
J12 from Boost & BC driver board (B0285-01)
RN1 from L1 inductor (see fig.88)
RN2 from L2 inductor (see fig.88)
RN3 from L3 inductor (see fig.88)

11.4.5 OUTPUT & BYPASS BOARD REMOVAL (B0290-0x)

1) Remove all the faston and flat of the card.

2) Remove the remaining cables.

3) Unscrew the 4 lateral fixing screws.

4) Unscrew PZ1.

5) Remove the board.

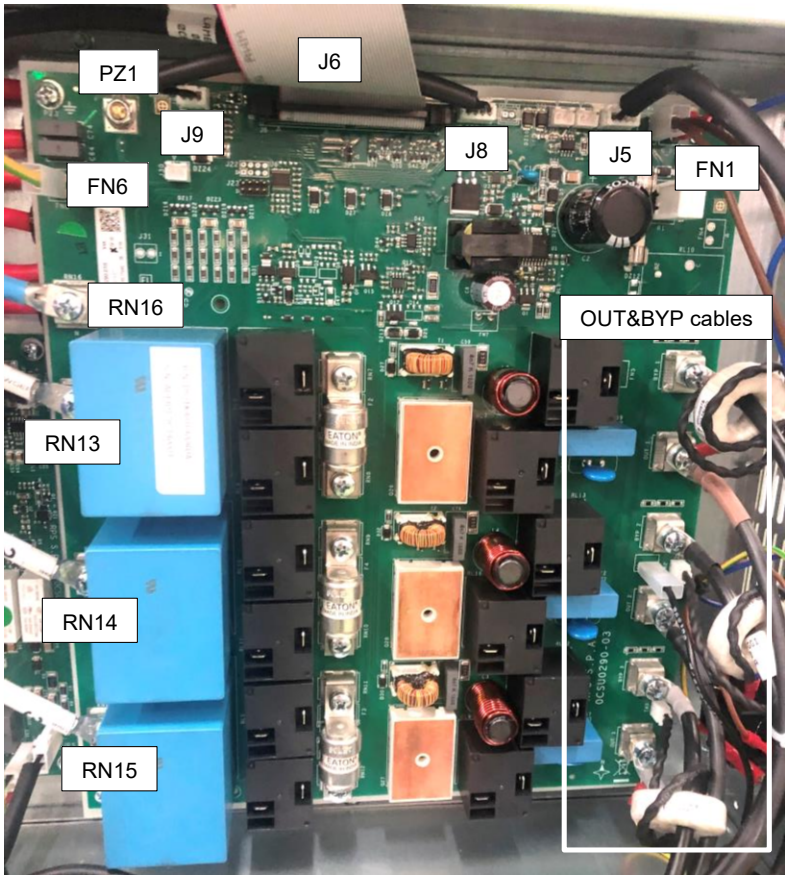


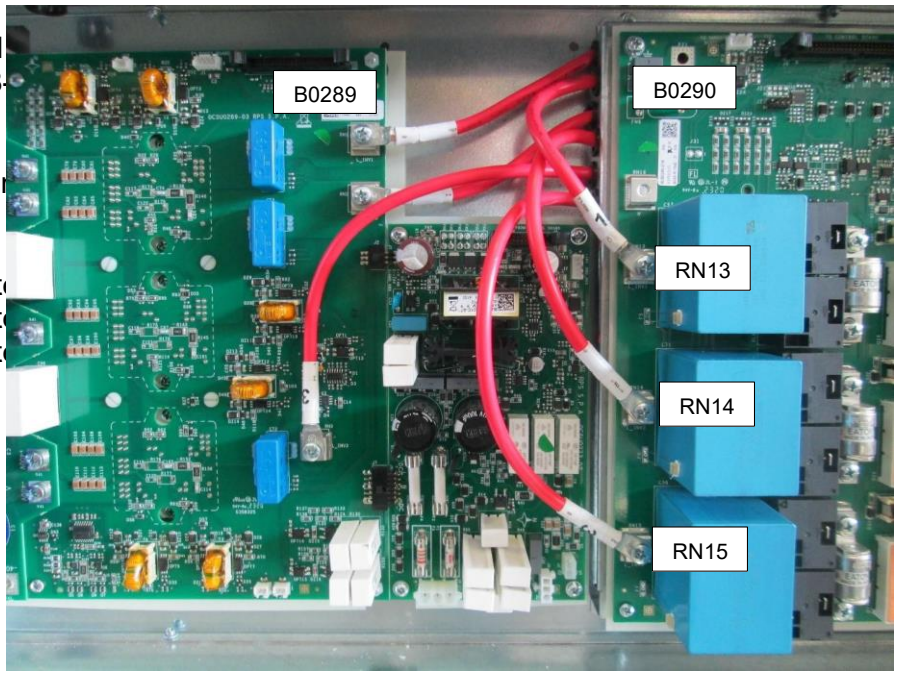
Fig. 93

Board installation: Follow the procedure in reverse. See the image for the correct positioning of the cables, in particular:

1) Connect the earth and neutral
FN6 (earth) from PZ of B0288
RN16 (N) from SWOUT

2) Connect the phases from i
(Fig.88):

RN13 (L_INV1) from L1 invert
RN14 (L_INV2) from L2 invert
RN15 (L_INV3) from L3 invert

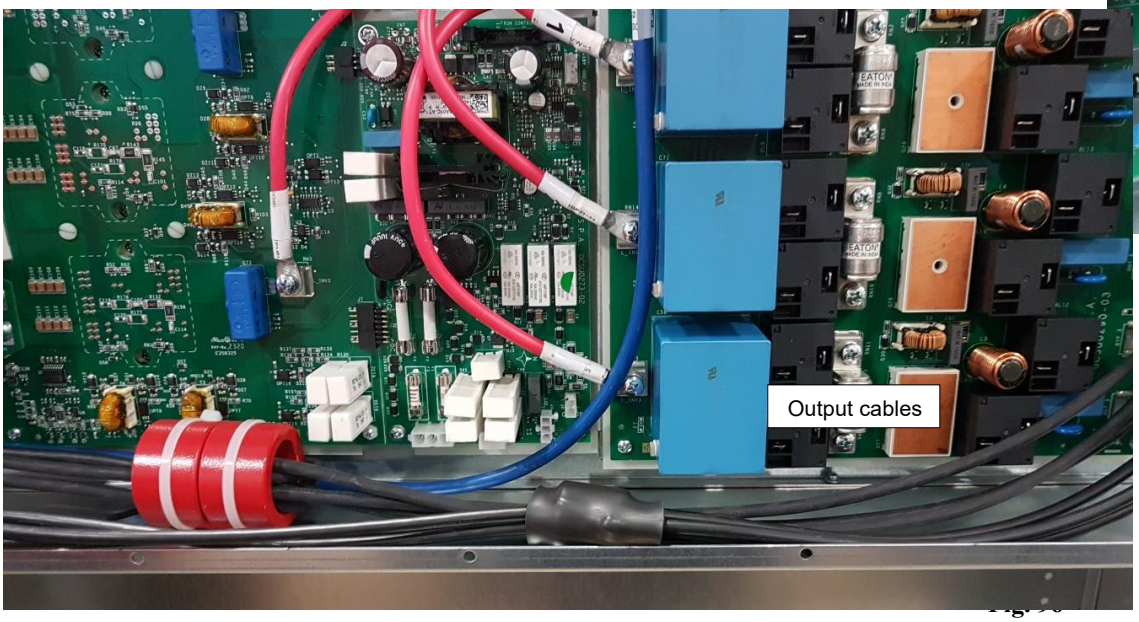


3) Connect the bypass phases and the related TA:
RN1 (BYP_1) from SWIN/SWBYP (brown cable)
RN2 (BYP_2) from SWIN/SWBYP (black cable)
RN3 (BYP_3) from SWIN/SWBYP (grey cable)

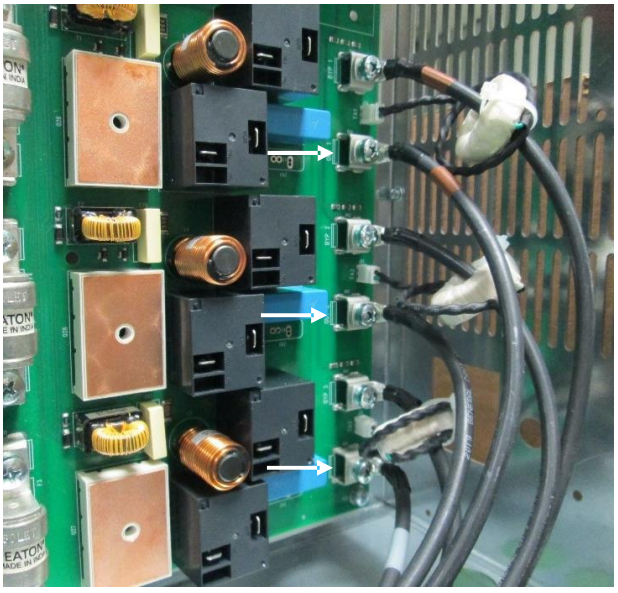
J24 from TA1
J25 from TA2
J26 from TA3

Fig. 95

Output / Bypass cables:



4) Connect the output phases:
RN4 (OUT_1) from SWOUT
RN5 (OUT_2) from SWOUT
RN6 (OUT_3) from SWOUT



5) Connect the remaining phases:
FN1 from Input board (B0282-0x) and A
power supply board (B0273-01)

FN8 from J6 of Aux. power supply (B0273-01)

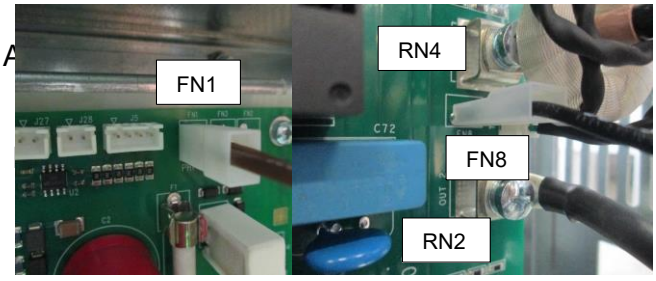


Fig. 98 Fig. 99

6) Connect the signal/flat cables:
   J5 from Aux. SWMB and Aux. SWOUT
   J8 from Aux. power supply board (B0273-01)
   J9 from Input board (B0282-0x)

For XTD version:

7) Connect:
   PZ2 Earth Cable
   FN3 blue cable from Schuko socket
   RN4 brown cable from Schuko socket

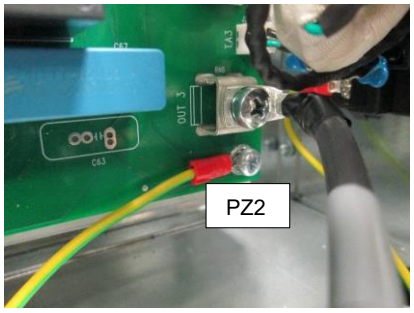


Fig. 100

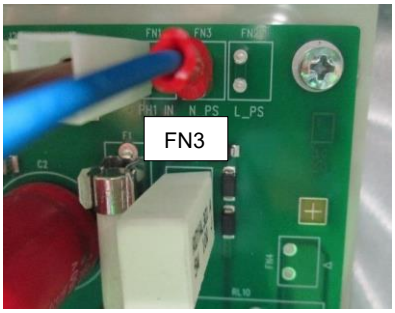


Fig. 101

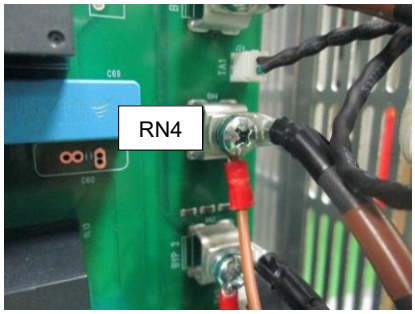


Fig. 102

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

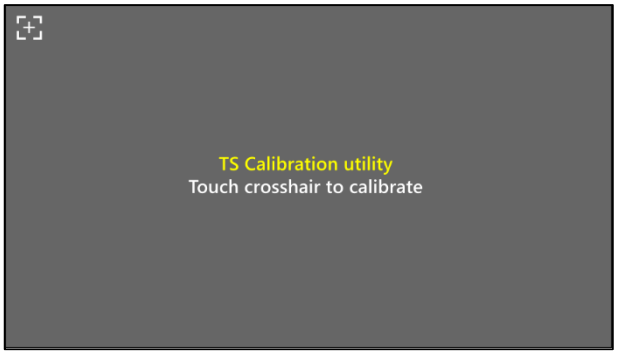
Note: if you need to feed the load close SWMB during the calibration procedure.

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

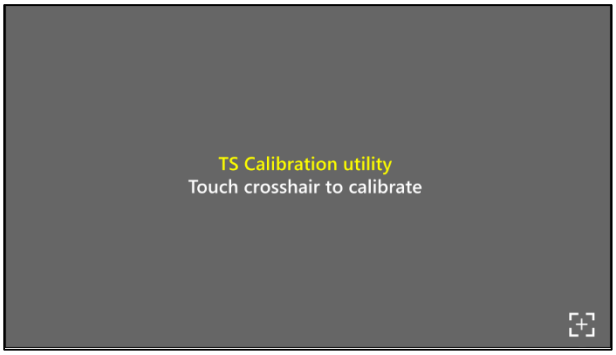
a) With the UPS switched off, close the SWIN in order to turn on the UPS, holding at the same time a finger press in a point on the display panel.
b) Follow the “12.1.3 CALIBRATION SCREEN SEQUENCE”.
c) At the end of the calibration, if previously closed, open the SWMB with unit in working condition (no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

12.1.3 CALIBRATION SCREEN SEQUENCE

The Calibration Utility will start with these steps:

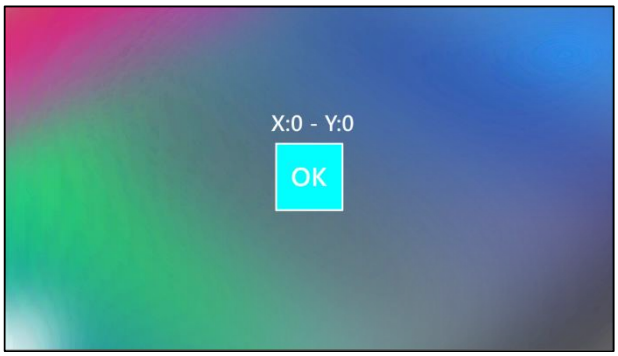


STEP 1



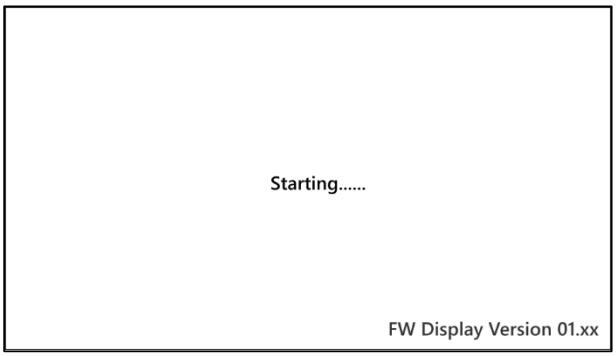
STEP 2

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 (B0275-01x) replacing.

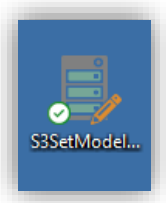
Before replacing the control board, it is recommended to download the .scd file in order to restore the UPS confiuration settings at a later time.

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

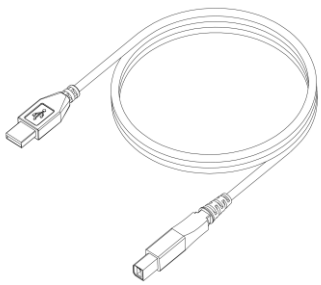
The related spare part (**6R_SUB0275-01x**) contains the generic Control board (without factory settings) and must it be correctly configured by the user via software (included in the UcomS3 package), according the nominal power of the UPS, the output configuration and the personalisation (RPS or Neutral personalisation can be defined using the software).

12.2.1 REQUIREMENTS

- S3setModel software
  Note: this software is provided already 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_SU0275-01.

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, disabled 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:

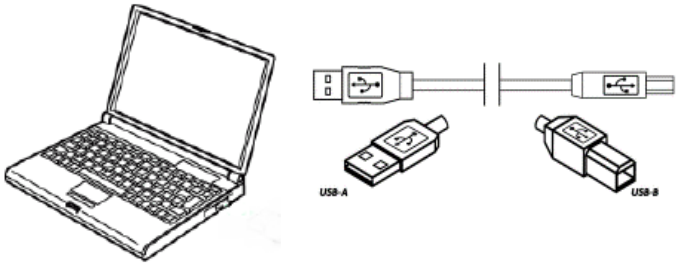


Fig. 103

c) Run S3setModel.exe

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

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

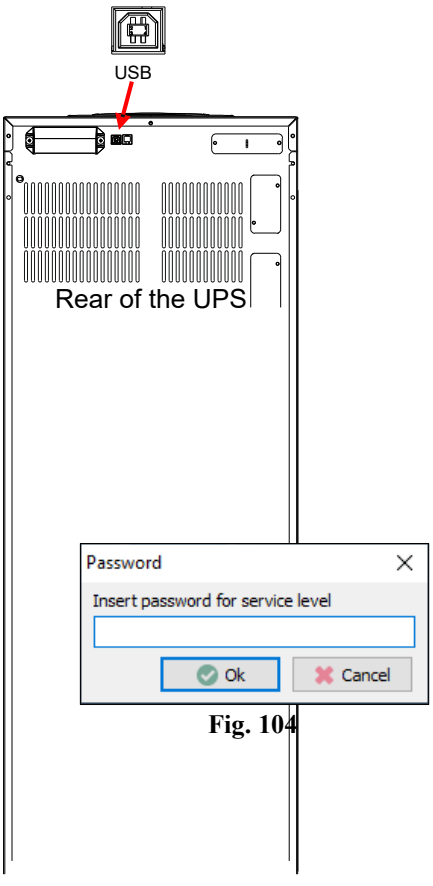


Fig. 104

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.

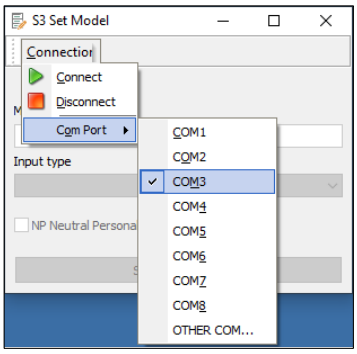


Fig. 105

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

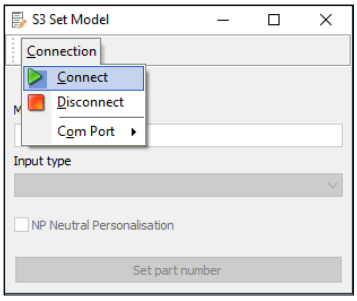


Fig. 106

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

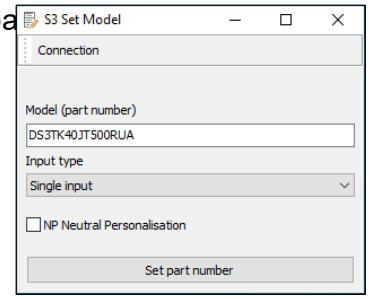


Fig. 107

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

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

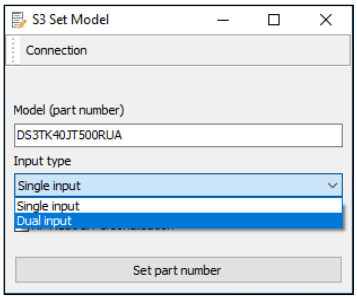


Fig. 108

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

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

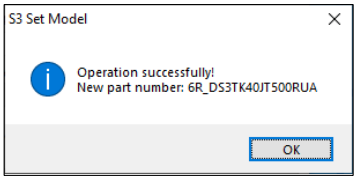


Fig. 109

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. 112). 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 (B0275-01x) 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**

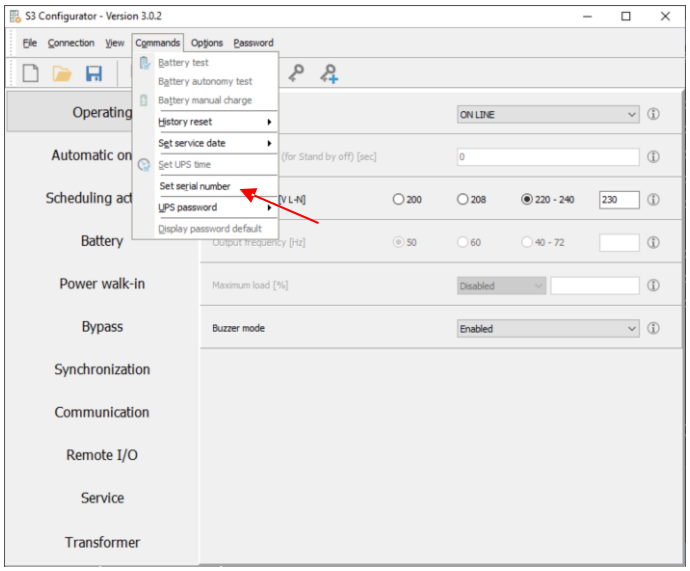


Fig. 110

- 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. 111) and on the UPS Info page of the display (Fig. 112):

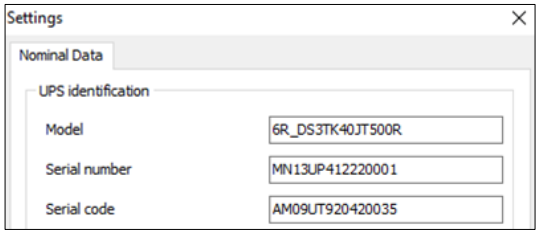


Fig. 111

(View → Settings from S3Config)

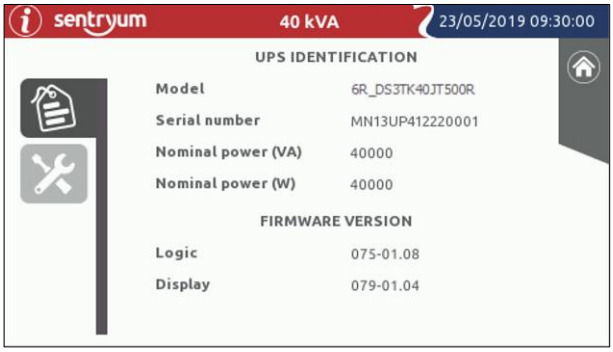


Fig. 112

(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	B0282	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	B0284 B0289	Verify the modules state shown in chapter 9. If necessary, replace the board involved
F05	Phase 3 input fuse blown or input contact does not open	Control logic faulty	B0275	Replace the board

F06 F07 F08	Phase 1 input relay does not open Phase 2 input relay does not open Phase 3 input relay does not open	Input relay blocked	B0282 B0284	Check relays. If necessary, replace the board involved Verify the modules state shown in chapter 9. If necessary, replace the board
F09	Pre charge of the positive capacitor branch failed	Precharge resistor opened	B0273	Check the precharge resistors (*) If necessary, replace the board
F10	Pre charge of the negative capacitor branch failed	Short circuit on Vdc BUS	B0284 B0289	Verify the modules state shown in chapter 9. If necessary, replace the board involved

(*)
With the UPS completely disconnected from any power supply (make sure there is no voltage present), check R49 and R66, then check R50 and R65 (approximately 44Ω for each series of resistors).

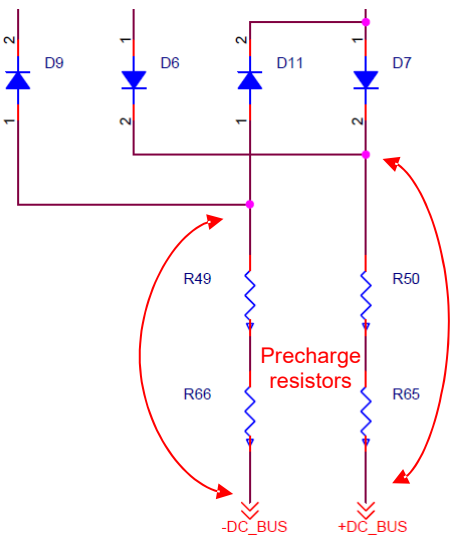


Fig. 113

B0273

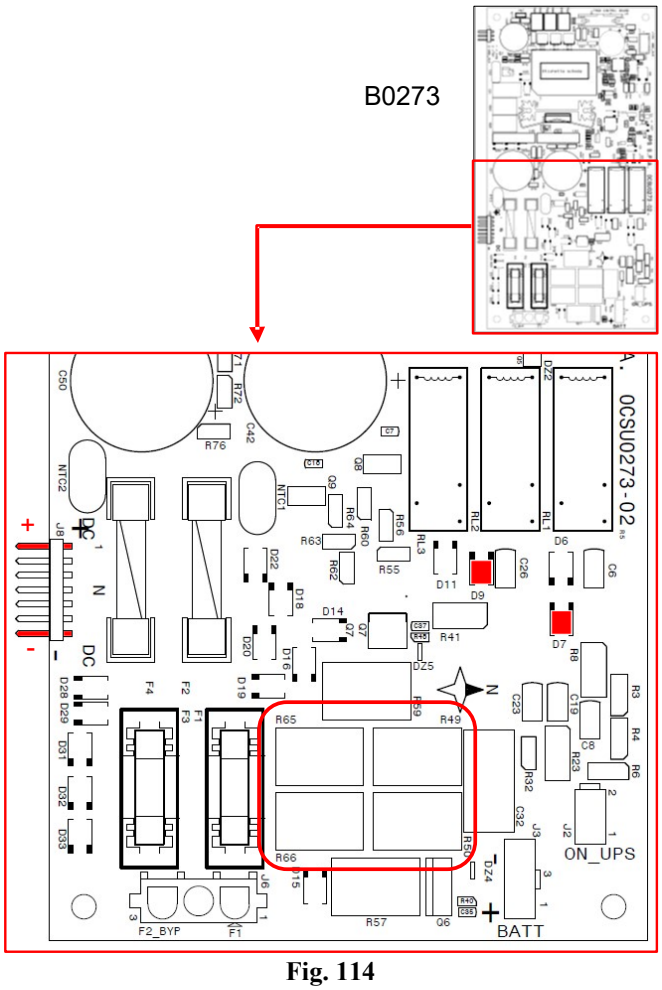


Fig. 114

<table>
<tr><td rowspan="3">F11</td><td rowspan="3">Boost stage anomaly</td><td>The boost stage doesn’t complete the “Power on” procedure</td><td rowspan="2">B0284</td><td>Check the bus (Vdc) voltages (ch. 10.7)

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

If necessary, replace the board</td></tr>
<tr><td colspan="5">(*) Check that each flat is connected correctly:
<table><tr><td>B0284</td><td>B0275</td></tr><tr><td>J1</td><td>J2</td></tr><tr><td>J3</td><td>J1</td></tr></table>Tab. 37</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>
<tr><td>F14

F15

F16</td><td>Phase 1 sinusoid inverter deformed

Phase 2 sinusoid inverter deformed

Phase 3 sinusoid inverter deformed</td><td>Type of applied load strongly distorting or regenerative</td><td></td><td>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</td></tr>
</table>

F19	Overvoltage of the positive battery branch	Battery charger error	B0284	Verify the Battery module state shown in chapter 9. If necessary, replace the board
		Control logic faulty	B0275	Replace the board
F20	Overvoltage of the negative battery branch	Battery readings faulty	B0282	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 between the faston of the relays and the neutral (B0282). Each measurement must be around ± 272,4 V.				
F21	Undervoltage/fault of the positive battery branch (battery/fuse)	Battery circuit opened or SWBATT fuse blown		Check for fuses blown
F22	Undervoltage/fault of the negative battery branch (battery/fuse)			Replace the batteries
F23	Output overload	Excessive load		Reduce the load
		Output power reading faulty	B0275 B0290 B0289	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	Phase 1 output contact does not open	Output relay blocked	B0290	Check relays. If necessary, replace the board
F27	Phase 2 output contact does not open			
F28	Phase 3 output contact does not open			

F29 F30 F31	Phase 1 output fuse blown or output contact fault Phase 2 output fuse blown or output contact fault Phase 2 output fuse blown or output contact fault	Output fuses blown or the relay does not close	B0290	Check for blown fuses and relays
			B0289	Verify the modules state shown in chapter 9. If necessary, replace the board
F32	Battery charger stage fault	Saturated controller or module faulty	B0284	Check before the tightening screw with B0276 board. If necessary, replace the board
		BC control and feedback signals faulty	B0275	Check J5 flat connection (and J4 of B0282 board). If necessary, replace the board.
F33	Failure of the system to measure the battery voltage	Battery readings faulty	B0282 B0275	If necessary, replace the board involved

- Disconnect the flat connector J4. With tester set in Ω, measure each resistors series of B0282 board, as shown below:

B0282

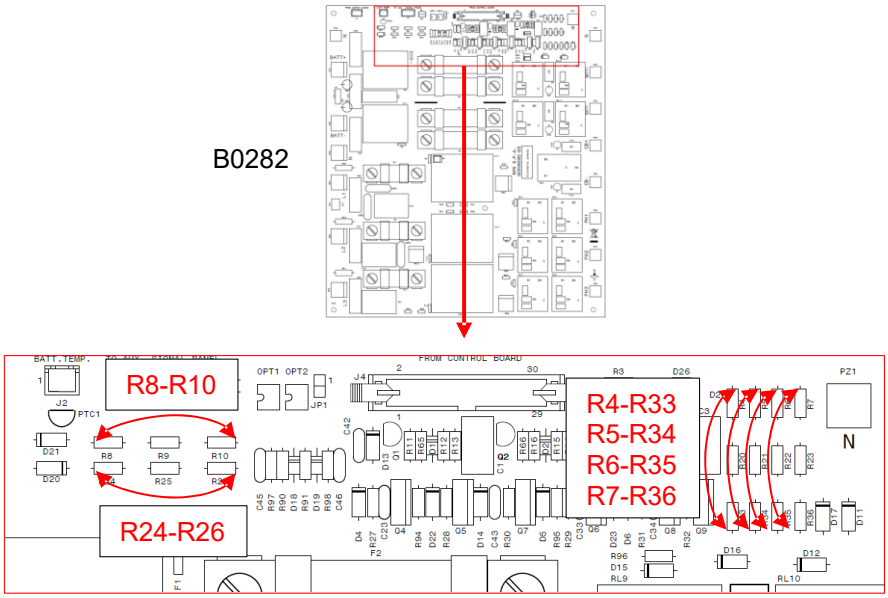


Fig. 115

For each measure it must be checked:
measurement(Ω) = 1500 kΩ ± 40 kΩ
If this condition is not valid, it is necessary to replace the B0282 board

F34	Power module heatsink over temperature	Cooling fans faulty		Check for connection and short circuit at fans (*) → replace fans
		Temperature readings faulty	B0284 B0289	Check the interconnections between the affected boards If necessary, replace the boards
		Temperature sensor faulty		

(*)
With the UPS ON, check the fan connector (J7 for B0284, J10 for B0289, see chap. 6) by testing the voltage. The reading must be between 17V and 25V.

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
F39	Failure of the system to measure the DC bench voltage	DC bench readings faulty	B0284 B0289	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.

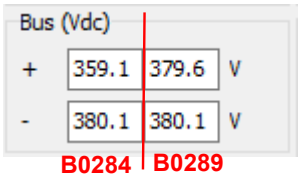


Fig. 116

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

F40	Fuse of the BC positive branch blown	Short-circuit/fault on PFC/battery module	B0284	Check for blown fuses. Verify the modules condition shown in chapter 9. If necessary, replace the board involved
F41	Fuse of the BC negative branch blown			
F42	Fuse of the boost positive branch blown			
F43	Fuse of the boost negative branch blown			
F45	Communication bus open in a parallel system (one point)	Single point parallel link failure	B0282	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 1	The relay status is not consistent with the command given by the microcontroller	B0282 B0275	If necessary, replace the board involved
F50	Fault in the signal command of the battery contact 2			
F51	Short-circuit on battery contact 1	Battery relay blocked	B0282	Check relays. If necessary, replace the board involved
F52	Short-circuit on battery contact 2		B0284	Verify the modules state shown in chapter 9. If necessary, replace the board

F53	Fault on the redundant auxiliary power supply for bypass line	Redundant auxiliary power supply faulty	B0290	Check for blown fuse and the state of the redundant auxiliary power supplies led. (*) Check the redundant auxiliary power supply's voltage (**)

(*)
For the position of the fuse (F1) and the led (DL1) see the image below.

(**)
With a voltmeter measure between PZ1 (neutral) and FN7 (see the image below) and check:

With UPS ON the measurement must be less than 13.9V or more than 16.65V to bring about the fault.

However, if the measurement is less than 16.65 at the time of "Power on" command, the UPS doesn't complete the power on procedure and displays F53.

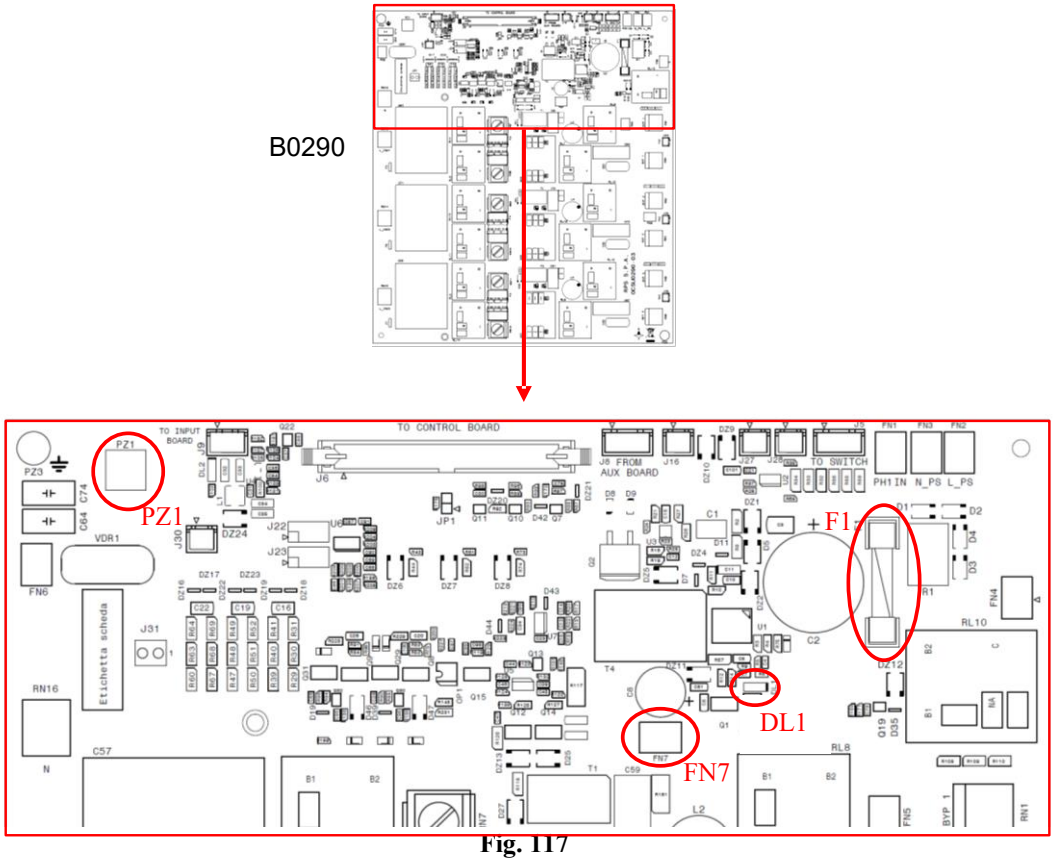


Fig. 117

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	B0284 B0275	Replace the board involved
F57	Calibration error INV		B0289 B0275	
F58	Calibration error BAT		B0284 B0275	
F59	Output board communication error	Microcontroller on B0272 doesn't work or flats not connected	B0275 B0290	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	B0272 B0275	Replace the board involved

Tab. 38

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	B0284 B0289 B0290 B0273 B0275	Detailed description of L01 in ch. 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	B0282	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	B0275	Replace the board
L05	Phase 3 input fuse blown or input contact fault	Short-circuit on Bus (Vdc) from PFC/inverter fault	B0284 B0289	Verify the modules condition shown in chapter 9. If necessary, replace the board involved

L06	Boost positive stage overvoltage	Any unidirectional or regenerative loads connected at output	B0284	Check for the presence of unidirectional loads at the output (*)
		Short-circuit on bypass line	B0289 B0290	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 is 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 load type 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	B0289	Verify the modules state shown in chapter 9. If necessary, replace the board involved
		Boost stage fault	B0284	
L09	Boost negative stage undervoltage	SWBAT fuses blown		Check for blown fuses
L10	Bypass static switch fault (Back Feed Protection)	Bypass SCR blown or bypass relay blocked (does not open)	B0290	Check bypass SCR by testing the bypass relays. If necessary, replace the board
L11	L1 bypass output unavailable for contact fault	Bypass command circuit faulty	B0290 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	B0289	Replace the board involved
L15 L16	Phase 2 inverter overvoltage Phase 3 inverter overvoltage	Feedback readings faulty	B0289 B0290 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	B0289 B0290 B0275	Check the good position of J6 flat of B0290 and the relative cable.
L20	Direct voltage on inverter output or deformed inverter sinusoid of phase 1	Inverter board faulty	B0289	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	B0290	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	B0289 B0290	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	B0290	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	Cooling fans faulty		Check for connection and short circuit at fans(*) → replace fans
L35	Inverter stage over temperature	Temperature readings faulty	B0284 B0289	Check the interconnections between the affected boards. (**) If necessary, replace the boards
		Temperature sensor faulty		

(*)
With the UPS turned ON, check the fan connector (J7 for B0284, J10 for B0289, see ch. 6) by testing the voltage. The reading must be between 17V and 25V.

L38	Temperature sensor of the boost stage fault	Short-circuit or open circuit of the temperature sensor (internal the module)	B0284 B0289	If necessary, replace the board involved (*)
L39	Temperature sensor of the inverter stage fault	Temperature readings faulty		
(*) L38 and L39 + L01 means the HF is missing. Check the cables (see the power supply scheme on chapter 7).				
L42	Battery fuse blown	Short-circuit/fault on PFC/battery module	B0284	Check for blown fuses. Verify the modules state shown in chapter 9. If necessary, replace the board involved
L43	Battery contact locked shorted (does not open)	Battery contact blocked	B0282	Check RL9, RL10 and RL11, RL12. If necessary, replace the board
L44	Phase 1 input contact locked shorted (does not open)	Phase 1 input contact blocked	B0282	Check the input fuses and the RL3, RL4 relay. Verify the modules 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	B0290	Check for blown fuses. If necessary, replace the board

L51	Short-circuit on battery charger output	Battery charger blocked for short circuit detected	B0282	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 0MNS3TK10RUxxUx (MAN S3T 30-40 xx)
- Installation Manual 0MNS3TK30RUxxIx (MAN S3T 30-40 DRW xx)
- Wiring diagram SBS3T_30_... (Wiring Diagram S3T 30)
  SBS3T_40_... (Wiring Diagram S3T 40)
- Firmware Upgrade Manual RM034 Rev02-… (S3T-S3U Firmware Upgrade) (*)
- Alarm Code Manual RM110 Rev0x-… (Alarm codes Discovery S3T and
- Spare Part List S3U) SPLa20xx_BB_S3T_xx_rev0x

(*) Or later version

15.2 BOARDS LIST

15.2.1 S3T THREE-PHASE 30-40

BOARD		DESCRIPTION	QUANTITY FOR UPS
S3T 30	**S3T 40**		
B0273-01	B0273-01	S3T Aux Power Supply Card	1
B0274-01	B0274-01	S3T Communication Card	1
B0275-01	B0275-01	S3T Control Card	1
B0282-02	B0282-01	S3T Input Card	1
B0283-02	B0283-01	S3T Induct. PFC-Boost Card	1
B0284-02	B0284-02	S3T Boost & BC Power Card	1
B0285-01	B0285-01	S3T Boost & BC Driver Card	1
B0286-02	B0286-01**	S3T DC Cap Boost Card	1
B0286-03	B0286-01**	S3T DC Cap Inverter Card	1
B0289-02	B0289-01	S3T Inverter Power Card	1
B0290-01	B0290-01	S3T Output & Bypass Card	1
B0305-01*	B0305-01*	S3T Led RPS Logo Card	1
B0306-01	B0306-01	S3T Display Card	1
FILTER CY BOARD			
B0390-01		S3T Filter Cy BATT Card	1
B0288-01		S3T Filter Cy IN Card	1
B0288-02		S3T Filter Cy OUT Card	1

* B0322-01 S3T Led Neutral Bar Card (for Neutral version)

** B0286-01 S3T DC Cap Boost / Inv. Card (for Boost & Inverter side)

15.3 6R_S3T40CB00 – S3T FLAT AND SIGNAL CABLES 30-40

Below the list and quantities of flat and signal cables included in the 6R_S3T20CB00-A spare part:

Cod.	Description	Qty	Board	S3T version	
0CBFU0093A	S3T Flat for Input board	1	B0282↔B0275	ACT	XTD
0CBFU0096B	S3T Flat for Boost & BC power board	1	B0284↔B0275	ACT	XTD
0CBFU0097B	S3T Flat for Boost & BC power board	1	B0284↔B0275	ACT	XTD
0CBFU0098C	S3T Flat for Output & Byp board	1	B0290↔B0275	ACT	XTD
0CBFU0108A	S3T Flat for Aux. power supply board	1	B0273↔B0275	ACT	XTD
0CBFU0111A	S3T Flat for Communication board	1	B0274↔B0275	ACT	XTD
0CBFU0113B	S3T Flat for Inverter power board	1	B0289↔B0275	ACT	XTD
0CBFU0114B	S3T Flat for Parallel board	1	B0229↔B0275	ACT	XTD
0CBFU0115A	S3T Flat for Communication Slot 2	1	B0274	ACT	XTD
0CBFU0116A	S3T Flat for Communication Slot 1	1	B0274	ACT	XTD
0CBSU0044A	S3T Cable for auxiliary power supply	1	B0284↔B0289/B0273↔B0290	ACT	XTD
0CBSU0109C	S3T Cable for HF power supply	1	B0285↔B0289	ACT	XTD
0CBSU0398B	S3T Cable for auxiliary power supply	1	B0282↔B0290	ACT	XTD
0CBSU0511A	S3T Cable for Battery start signal	1	B0273	ACT	
0CBSU0462A	S3T Cable for external auxiliary signals	1	B0282↔B0290	ACT	
0CBSU0473A	S3T Cable for Battery start signal	1	B0273		XTD
0CBSU0610A	S3T Cable for external auxiliary signals	1	B0282↔B0290		XTD
0TCU0087B	S3T TA for bypass line	1	B0290	ACT	XTD

(*) The revision of the codes refers to the date: 09/2021