GTEC UPS MODEL:

SATURN 160 - 200 kVA

UPS Transformerless

SERVICE MANUAL

Contents

1 INTRODUCTION

This document aims to provide a simple outline for the maintenance and/or troubleshooting of problems associated with the 160-200KVA.

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

2 SOFTWARE OPERATIONS

2.1 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 GpDownload application provided with the UcomGp software. Please read the instructions for this application for the correct procedure.

With the UPS fully switched off,

close the SWBYP (in order to avoid the DC capacitor bank pre-loading stage) and save the log file.

2.2 CONFIGURING THE UPS

To configure the UPS, use the dedicated UcomGp software. Please read the dedicated manual for this software for instructions about this application and the correct procedure.

2.3 SOFTWARE UcomGp

UComGP is a package of applications for the advanced analysis of log files and real-time diagnostics for UPS belonging to the Multi Sentry range (from 10kVA to 200 kVA).
Communication between PC and UPS, for the applications that require it, takes place via serial communication port RS232.
The package is currently comprised of seven different applications:

- GpDownload – Log Downloader
- GpHistory – Log Analyzer
- GpEvent – Event Analyzer
- GpRealTime – Status Analyzer
- GpDebug – UPS Debugger
- GpCalibrate – UPS Calibrator
- GpConfig – UPS Configuration Tool
- GpOscilloscope – Oscilloscope Tool

For further information on the applications listed above please see:

- UCOMGP Manual RM900
- UCOMGP Configuration tool Manual RM901

Note:

In case of Desaturation Lock (L48) it is possible to use GpDebug or GpRealTime to obtain more details: the software will shows which phase and also which stage is faulty. If logic resets, L48 will lose these details. It is possible to remove the lock by pushing the Bells command on the UPS display if uP FW is at least FW022-0224 (Tt6_022r.id and Tt6_022r.mot) or more recent.

2.4 UPDATING THE FIRMWARE

In order to update the firmware, the dedicated "**YMSTPRG. (MICRO & DSP PROGRAMMING KIT)**" kit must be used to program the microprocessor and/or DSP. Please see the instructions for this application, attached to the kit.

The firmware to be used is the following:

Firmware	µProcessor	DSP
160-200kVA	FW022-xxxx	FW023-xxxx

To update the version firmware, closing only SWBY and opening SWIN.

3 SWITCHING THE UPS ON/OFF

See the instruction manual before carrying out any operations on the UPS.

3.1 SWITCHING OFF THE UPS WHILST DELIVERING POWER TO THE LOAD

1) Close the SWMB
2) Set the UPS to stand-by using the display
3) Open the SWIN, SWBY (if present) and SWOUT
4) Wait for the display to shut down
5) Open the disconnection switch/fuses for the UPS external battery line

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

1) Set the UPS to stand-by using the display
2) Open the SWIN, SWBY and SWOUT
3) Wait for the display to shut down
4) Open the disconnection switch/fuses for the UPS external battery line

3.3 RESTARTING THE UPS

1) Close all battery fuses
2) Close the SWIN, SWBY and SWOUT
3) IMPORTANT: Switch the UPS on by entering and confirming SYSTEM ON using the display
4) If closed, open the SWMB

3.4 STARTING THE UPS FROM THE BATTERY

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 236Vdc (11.8V for monoblock).

1) Close all battery fuses
2) Close the SWIN, SWBY (if present) and SWOUT
3) Press and hold down the "cold start" button
4) Switch the UPS on by entering and confirming SYSTEM ON

3.5 ADDITIONAL SERVICE OPERATIONS

Additional service operations are available using the dedicated UcomGp software. See the application manual for further details.

4 UPS INTERNAL STRUCTURE

For further details, see the instruction manual and wiring diagram

4.1 GENERAL DESCRIPTION

The 160-200 series UPS has three phase input and output and it is a transformerless machine, it is built by:

1. An upper section that includes the power supply and the logic control UPS (*Auxiliary Power Supply and Control Section*);
2. three power sections (*Power Section*) removable from the front, each for phase;
3. the rear section for the battery charger or double battery charger (optional) (*Battery Charge Section*);
4. the section for the switches and terminals to connect the power cables (*Switches and Connections Section);*
5. a lower section that includes the battery/ input/ bypass SCR, for each phase (*Input and Bypass Section*).

1 The *Auxiliary Power Supply and Control Section* is composed by:

- an **auxiliary power supply board** (B0059) that supplies voltage to the logic and the contactor;
- a **redundant auxiliary power supply** (B0211)
- a **precharge board** (B0231)
- a **uC/DSP board** (B0067);
- a **control board** (B0213);
- an **interface communication board** (B0056);
- two **power supplies boards** for the main and redundant fans (B0212 A e B0212 B);
- three cooling fans;
- a **fuses board** (B0240) to protect the power supply board
- a **display board** (B0057).

2 The *Power Section* is composed by:

- a **capacitors board Boost side** (B0208)
- a **capacitors board inverter side** (B0217)
- a **Boost boards (driver & signal)** (B0209 + B0210)
- an **Inverter boards (driver & signal)** (B0215 + B0216)
- output inverter capacitor (C5,C6,C7)
- input ac capacitors (C1,C2,C3,C4)
- current transducers (Lem_bdw, Lem_bup, Lem_inv)
- boost coils (Lboost_dw, Lboost_up) and inverter (Linv_A, L_invB)
- boost fans (FANA, FANB) inverter (FANA, FANB) and bulk capacitors (FAN).

3 The *Battery Charger Section* is composed by:

- a **battery charger board** (B0084) (a second B0084 can be mounted as optional)
- an Auxiliary Signal Terminals Panel
- an **output contactor driver board** (B0214)

4 The *Switches and Connections Section* is composed by:

- an input switch;
- a bypass switch;
- a manual bypass switch;
- an output switch;
- an input terminals;
- a bypass terminals;
- a battery terminals;
- an output terminals;
- EMI filter board (B0133) for output.
- output contactor, behind the switches and connections section, accessible opening left lateral panel
- input fuses for each phase.

5 The *Input and Bypass Section* is composed by:

- battery fuses for each phase;
- output fuses for each phase;
- battery SCR for each phase;
- output SCR for each phase;
- input SCR for each phase;
- two cooling fans for each phase;
- battery, input and bypass SCR board (B0207) for each phase.
- A bypass **current transducers** TA for each phase.

4.2 COMPONENTS POSITION INSIDE THE UPS.

Inside this paragraph, are described the single boards and the parts that compose each UPS section.

4.2.1 SECTIONS POSITION IN THE UPS

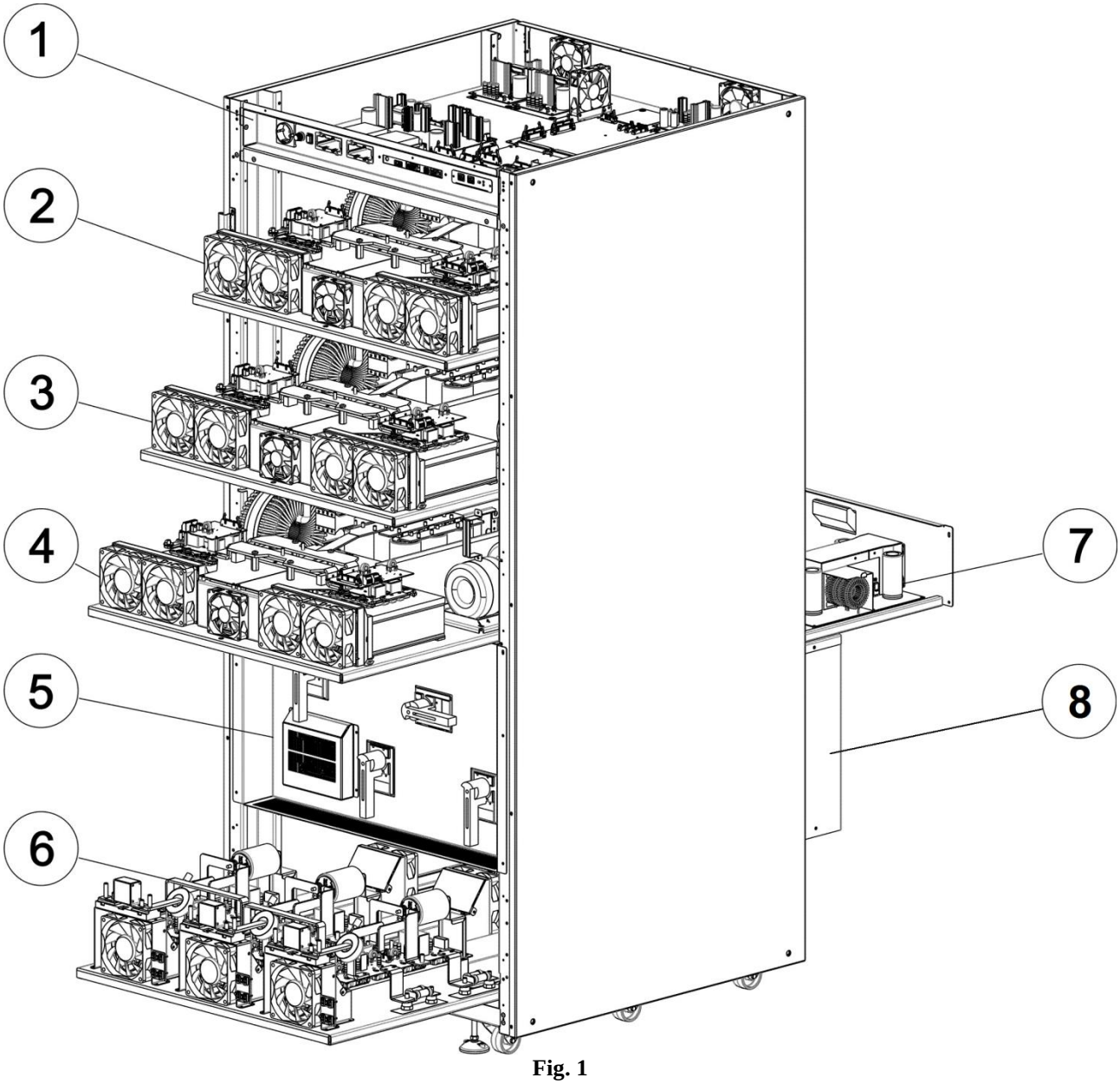


Fig. 1

1	**Aux Power Supply and Control Section**
2	**Power Section Phase 1**
3	**Power Section Phase 2**
4	**Power Section Phase 3**
5	**Switches**
6	**Main Input, Battery and Bypass SCR Section**
7	**Battery Charger Section**
8	**Connections**

4.2.2 COMPONENTS POSITIONS IN THE AUX POWER SUPPLY AND CONTROL SECTION

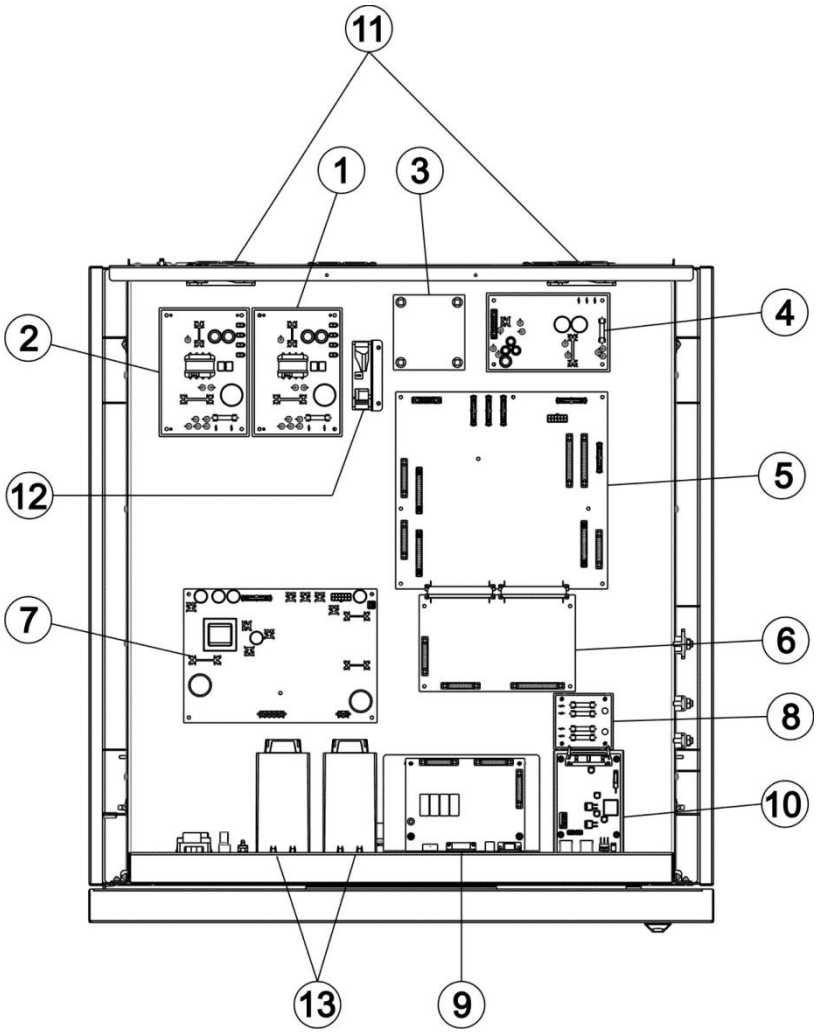


Fig. 2

1	**Fan A power supply board**	**B0212**
2	**Fan B power supply board**	**B0212**
3	**Precharge board**	**B0231**
4	**Redundant aux board**	**B0211**
5	**Control board**	**B0213**
6	**DSP+uC board**	**B0067**
7	**Aux board**	**B0059**
8	**Fuse board**	**B0240**
9	**Interface board**	**B0056**
10	**Parallel board (optional)**	**B0085**
11	**Fans connected to control board**	**Control FAN 6**
12	**Fan connected to B0212 (A) board**	**B0212 FAN 7**
13	**Communication slot**	**SLOT 1 e 2**

4.2.3 COMPONENTS POSITIONS IN THE POWER SECTION

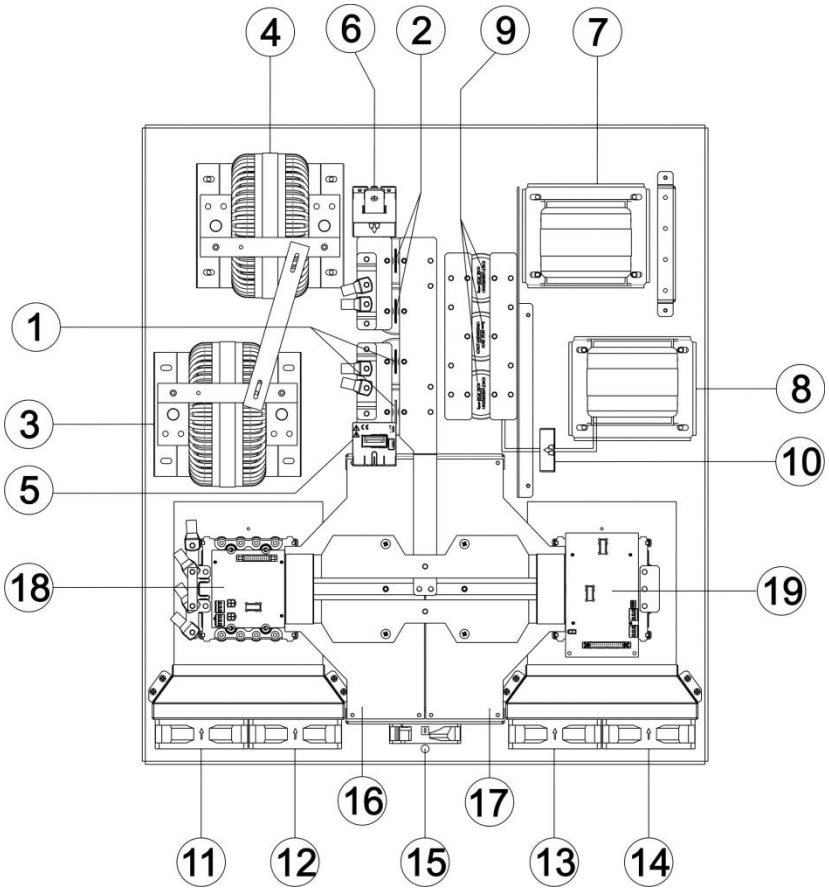


Fig. 3

1	**AC boost up capacitors**	**C3, C4 (UP)**
2	**AC boost down capacitors**	**C1, C2 (DW)**
3	**Boost up coil**	**Lboost_up**
4	**Boost down coil**	**Lboost_dw**
5	**Current boost up transducer**	**Lem_bup**
6	**Current boost down transducer**	**Lem_bdw**
7	**A inverter coil**	**Linv_A**
8	**B inverter coil**	**Linv_B**
9	**Inverter output filter capacitors**	**C5, C6, C7**
10	**Inverter current transducers**	**Lem_inv1**
11	**A boost fans**	**FAN 1**
12	**B boost fans**	**FAN 2**
13	**B inverter fans**	**FAN 3**
14	**A inverter fans**	**FAN 4**
15	**DC capacitors fans**	**FAN 5**
16	**DC capacitors boost board**	**B0208**
17	**DC capacitors inverter board**	**B0217**
18	**Boost module + boards**	**B0209+B0210**
19	**Inverter module +boards**	**B0215+B0216**

Zoom of boost stage

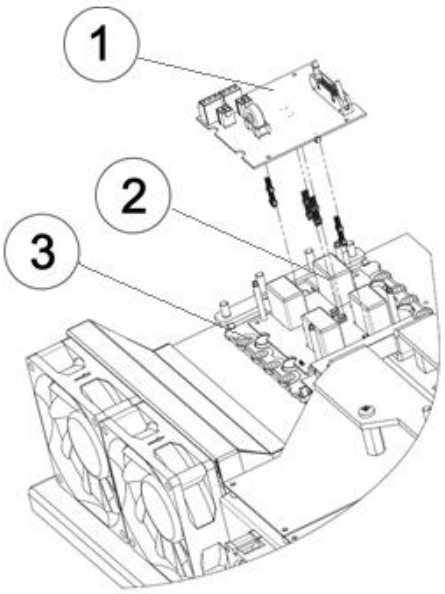


Fig. 4

Zoom of inverter stage

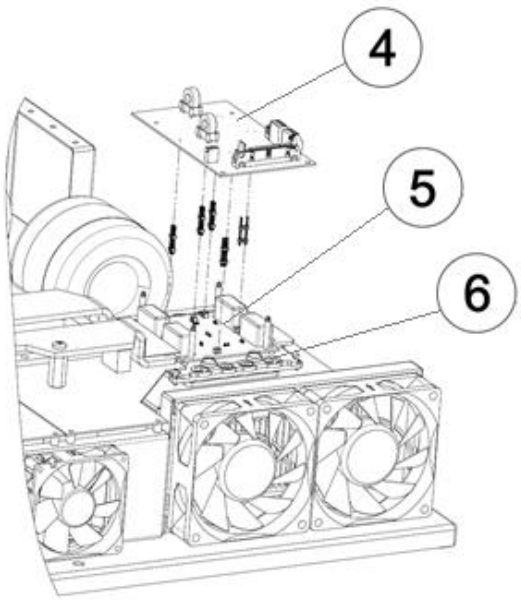


Fig. 5

1	Boost Signal board	B0210
2	Boost driver board	B0209
3	IGBT boost Module	
4	Inverter Signal board	B0216
5	Inverter driver board	B0215
6	IGBT inverter Module	

4.2.4 COMPONENTS POSITIONS ON THE BATTERY CHARGER SECTION

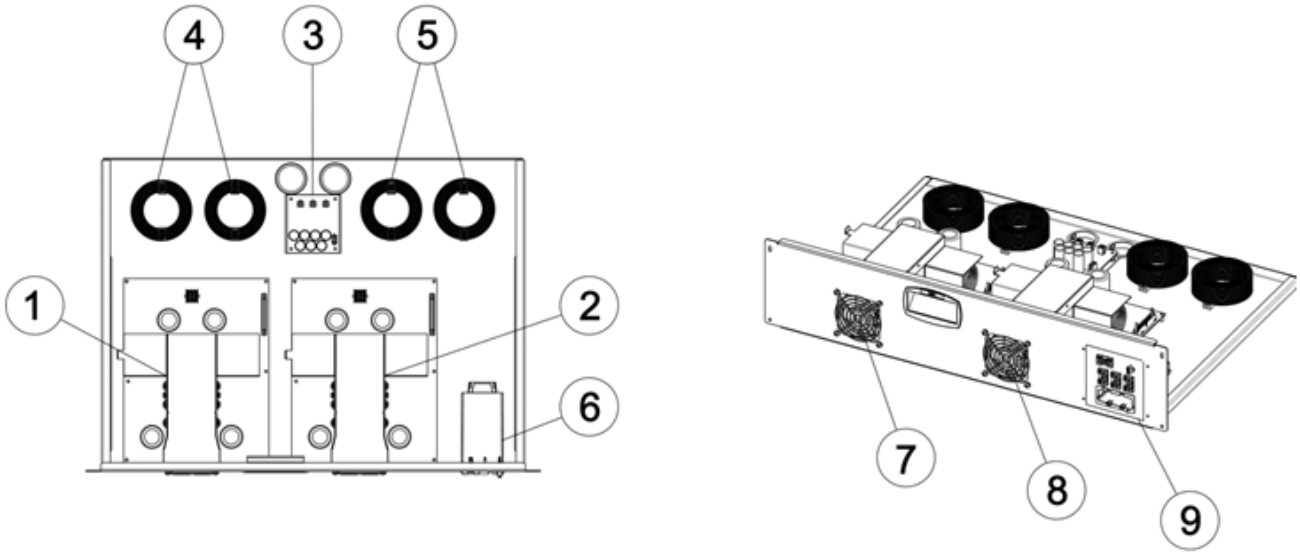


Fig. 6

1	**Battery charger board 1**	**B0084**
2	**Battery charger board 2 (optional)**	**B0084**
3	**Contactor driver board**	**B0214**
4	**Output coils (+ e -) for battery charger 1**	**L+CB1 e L-CB1**
5	**Output coils (+ e -) for battery charger 2**	**L+CB2 e L-CB2**
6	**Slot for relay I/O interface card 382 or 392**	**Relay Slot**
7	**Fan connected to battery charger 1**	**Fan battery charger**
8	**Fan connected to battery charger 2**	**Fan battery charger**
9	**Panel to connect the auxiliary signal**	**Auxiliary signal connection**

4.2.5 COMPONENTS POSITIONS ON THE TERMINALS AND SWICHES SECTION

SWITCHES SECTION

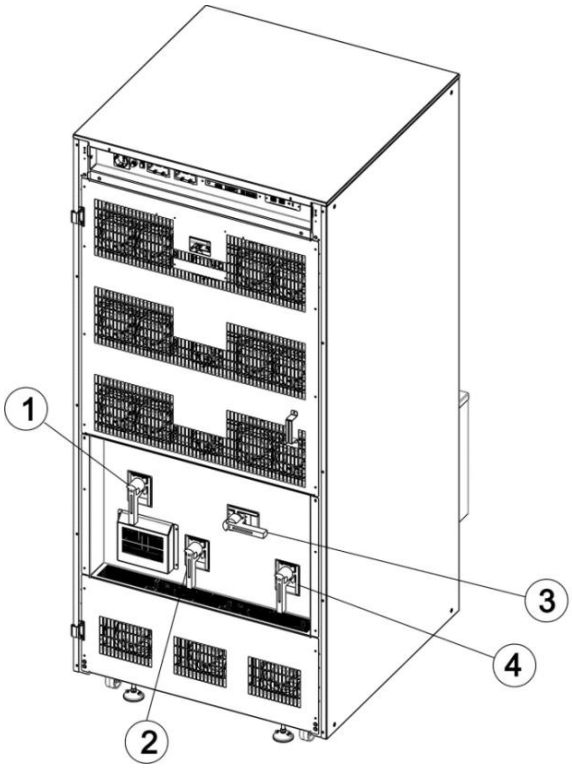


Fig. 7

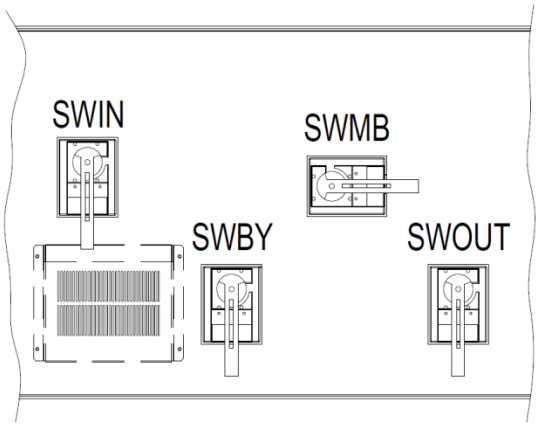


Fig. 8

1	**Input switch**	**SWIN**
2	**Bypass switch**	**SWBY**
3	**Manual bypass switch**	**SWMB**
4	**Output switch**	**SWOUT**

INPUT FUSES POSITIONS

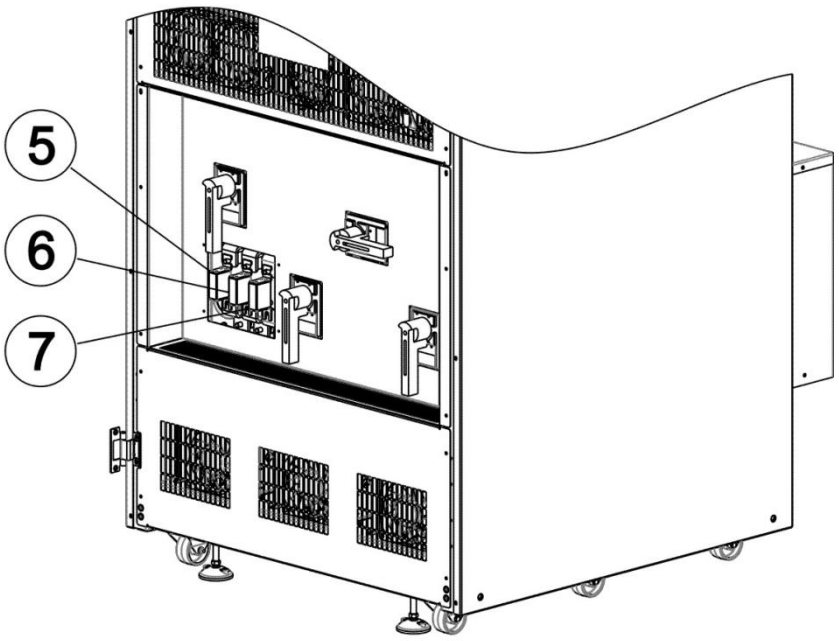


Fig. 9

7	**Input fuse on the PH1**	**Fin 1**
6	**Input fuse on the PH2**	**Fin 2**
5	**Input fuse on the PH3**	**Fin 3**

OUTPUT CONTACTOR POSITION

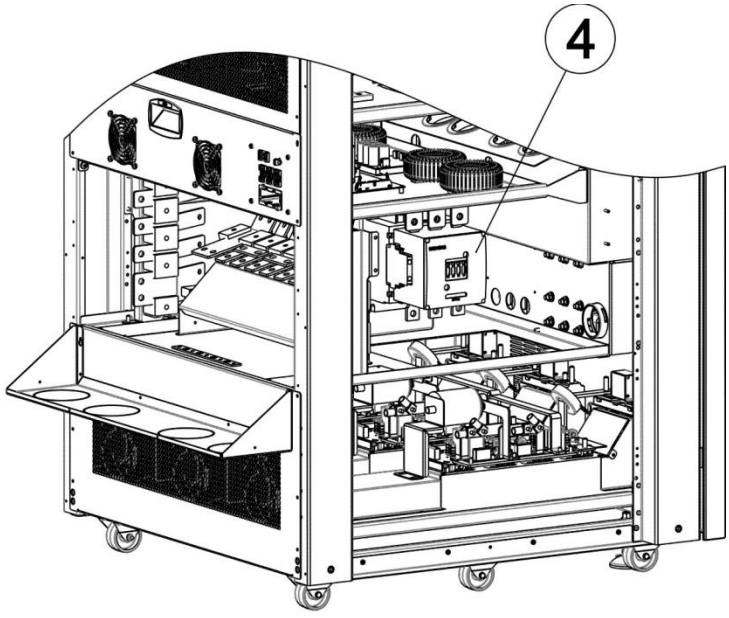


Fig. 10

4	**Output contactor**	**TL_OUT**

TERMINALS POSITION

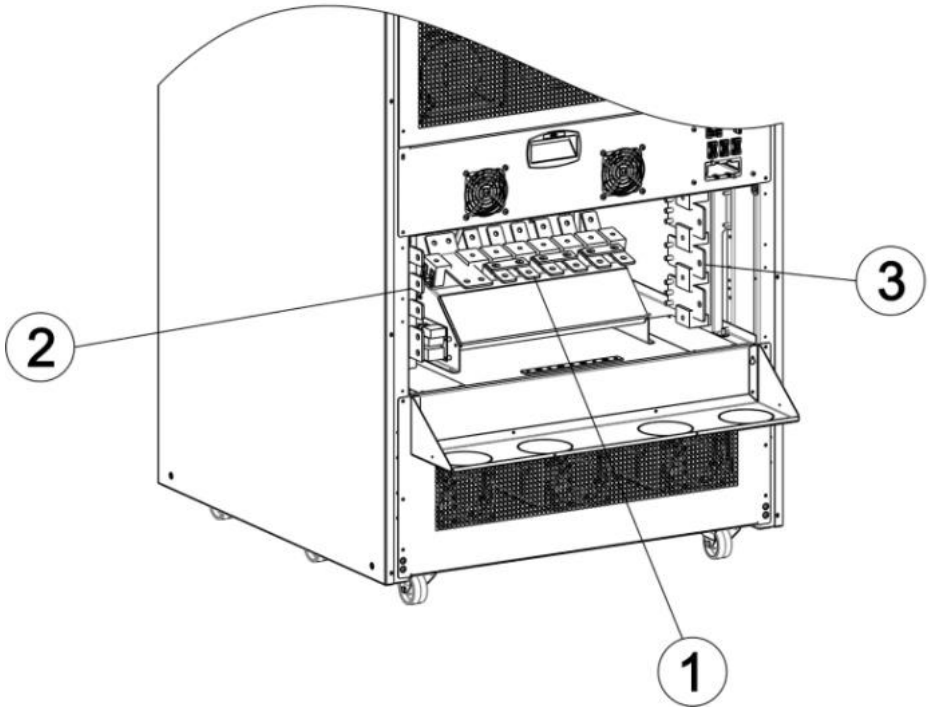


Fig. 11

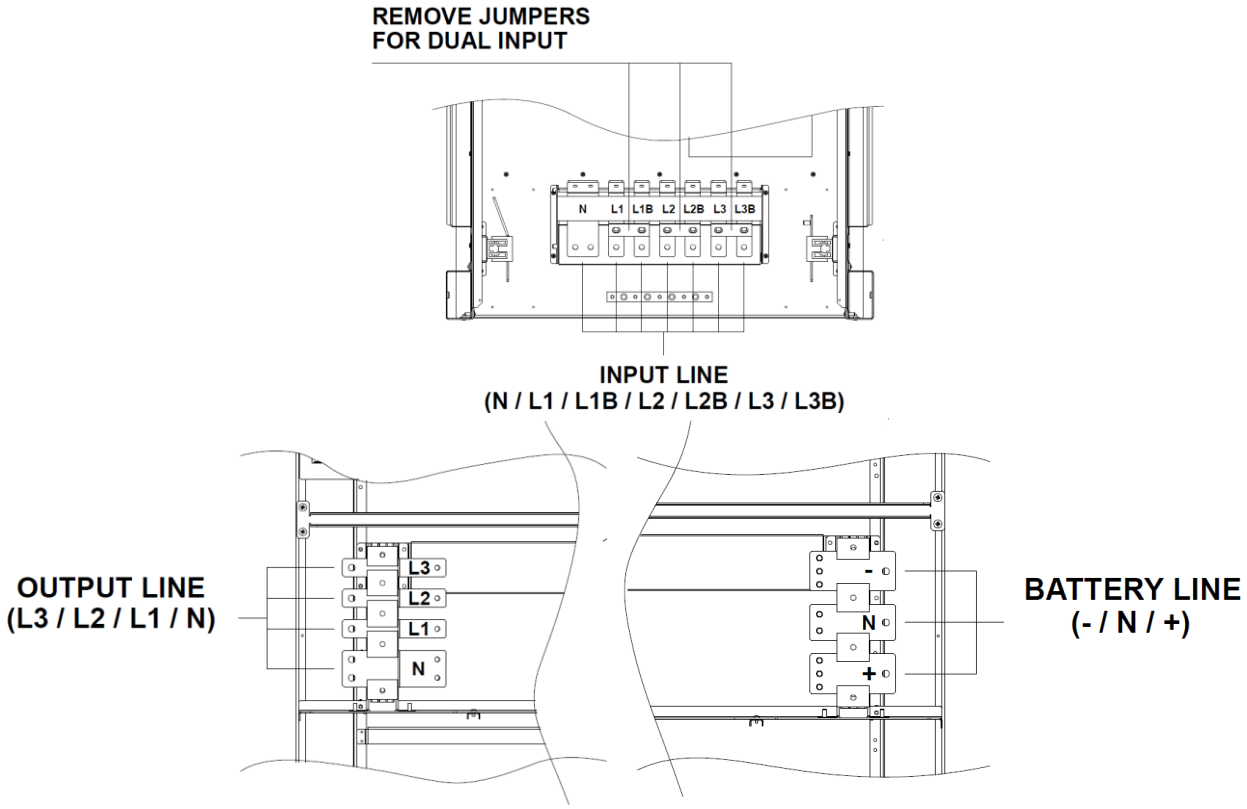


Fig. 12

1	**Main input and bypass terminals**
2	**Output terminals**
3	**Battery terminals**

4.2.6 COMPONENTS POSITIONS ON THE INPUT AND BYPASS SECTION

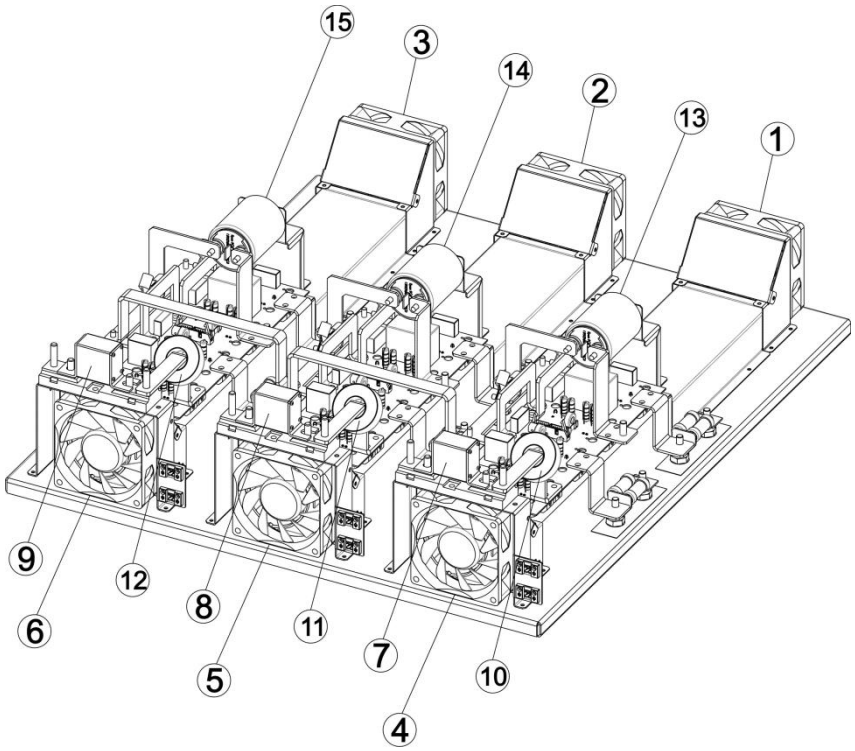


Fig. 13

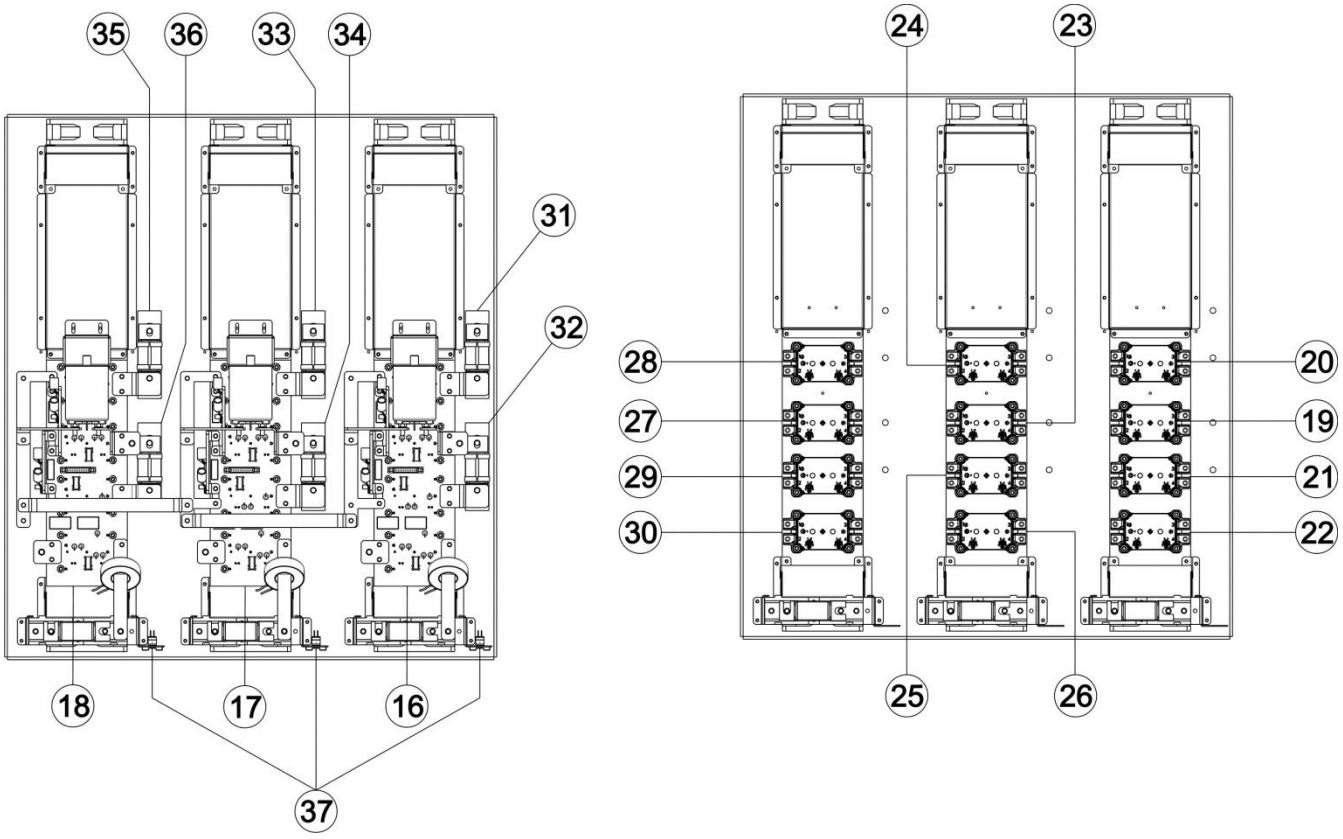


Fig. 14

1	**AC fan for the first phase**	**Fan ac1**
2	**AC fan for the second phase**	**Fan ac2**
3	**AC fan for the third phase**	**Fan ac3**
4	**DC fan for the first phase**	**Fan byp1**
5	**DC fan for the second phase**	**Fan byp2**
6	**DC fan for the third phase**	**Fan byp3**
7	**Output fuse for the first phase**	**Fuse_out1**
8	**Output fuse for the second phase**	**Fuse_out2**
9	**Output fuse for the third phase**	**Fuse_out3**
10	**Bypass current transducer for the first phase**	**Bypass_TA1**
11	**Bypass current transducer for the second phase**	**Bypass _TA2**
12	**Bypass current transducer for the third phase**	**Bypass _TA3**
13	**Input capacitor for the first phase**	**Cin_1**
14	**Input capacitor for the second phase**	**Cin_2**
15	**Input capacitor for the third phase**	**Cin_3**
16	**Driver SCR board phase 1**	**B0207 phase 1**
17	**Driver SCR board phase 2**	**B0207 phase 2**
18	**Driver SCR board phase 3**	**B0207 phase 3**
19	**Input SCR for the first phase**	**Input SCR phase 1**
20-21	**Battery SCR for the first phase**	**Battery SCR phase 1 (PLUS & MINUS)**
22	**Bypass SCR for the first phase**	**Bypass SCR phase 1**
23	**Input SCR for the second phase**	**Input SCR phase 2**
24-25	**Battery SCR for the second phase**	**Battery SCR phase 2 (PLUS & MINUS)**
26	**Bypass SCR for the second phase**	**Bypass SCR phase 2**
27	**Input SCR for the third phase**	**Input SCR phase 3**
28-29	**Battery SCR for the third phase**	**Battery SCR phase 3 (PLUS & MINUS)**
30	**Bypass SCR for the third phase**	**Bypass SCR phase 3**
31	**+ Battery fuses for the first phase**	**Battery fuses + phase 1**
32	**- Battery fuses for the first phase**	**Battery fuses - phase 1**
33	**+ Battery fuses for the second phase**	**Battery fuses + phase 2**
34	**- Battery fuses for the second phase**	**Battery fuses - phase 2**
35	**+ Battery fuses for the third phase**	**Battery fuses + phase 3**
36	**- Battery fuses for the third phase**	**Battery fuses - phase 3**
37	**Terminals to check the battery fuses**	**Check battery fuses**

4.2.7 FUSES LIST

Inside the UPS there are many fuses. To replace them, follow the list below:

Fuse function	160kW	200kW	Qty.	Position in the UPS
For + and – batteries	2x160A 690Vac aR	2x200A aR 690V 94x37	6	Input and bypass section
For input rectifier	250A aR 690V 100x20x38.5		6	Switches and connections section
For output inverter	350A aR 690V DIN80 200kA 105x63x29.5	400A aR 690V DIN80 200kA 105x63x29.5	3	Input and bypass section
For auxiliary power supply board (B0059) → FUSE1 (on cable)	20A F 500V 6,3x32		1	Auxiliary power supply and control section
For auxiliary power supply board (B0059) and redundant power supply board (B0211) → FUSE 2,3,4, 5	2A T 500V 6.3x32		4	
For fuses board (B0240) (F1,F3)	2A 500V GF 6,3x32		2	
For fuses board (B0240) (F2,F4)	20A F 500V 6,3x32		2	

IMPORTANT: if the battery fuses have to be replaced due to the previous incorrect connection of a battery box, check the battery SCR in the *"Input and Bypass Section"*

4.2.8 OTHER MAIN DIFFERENCES BETWEEN 160KVA AND 200kVA

Table of difference between sizes:

PART	160 kVA	200 KVA
Inverter IGBT module	400A	600A
Boost IGBT module	400A	600A
Boost Inductor	0LCU0059.	0LCU0050.
Inverter Inductor	0LCU0060.	0LCU0051.
B0208-B0217	10x 1360uF	12x 1360uF
B0209-B0215	9UB0209A**02.** - 9UB0215A**02.**	9UB0209A**01.** - 9UB0215A**01.**
Output contactor	225A	265A
SWITCH 3P	250A	400A
Power cables	2x 25mmq	2x 35mmq

.

4.3 UPS BLOCK DIAGRAM

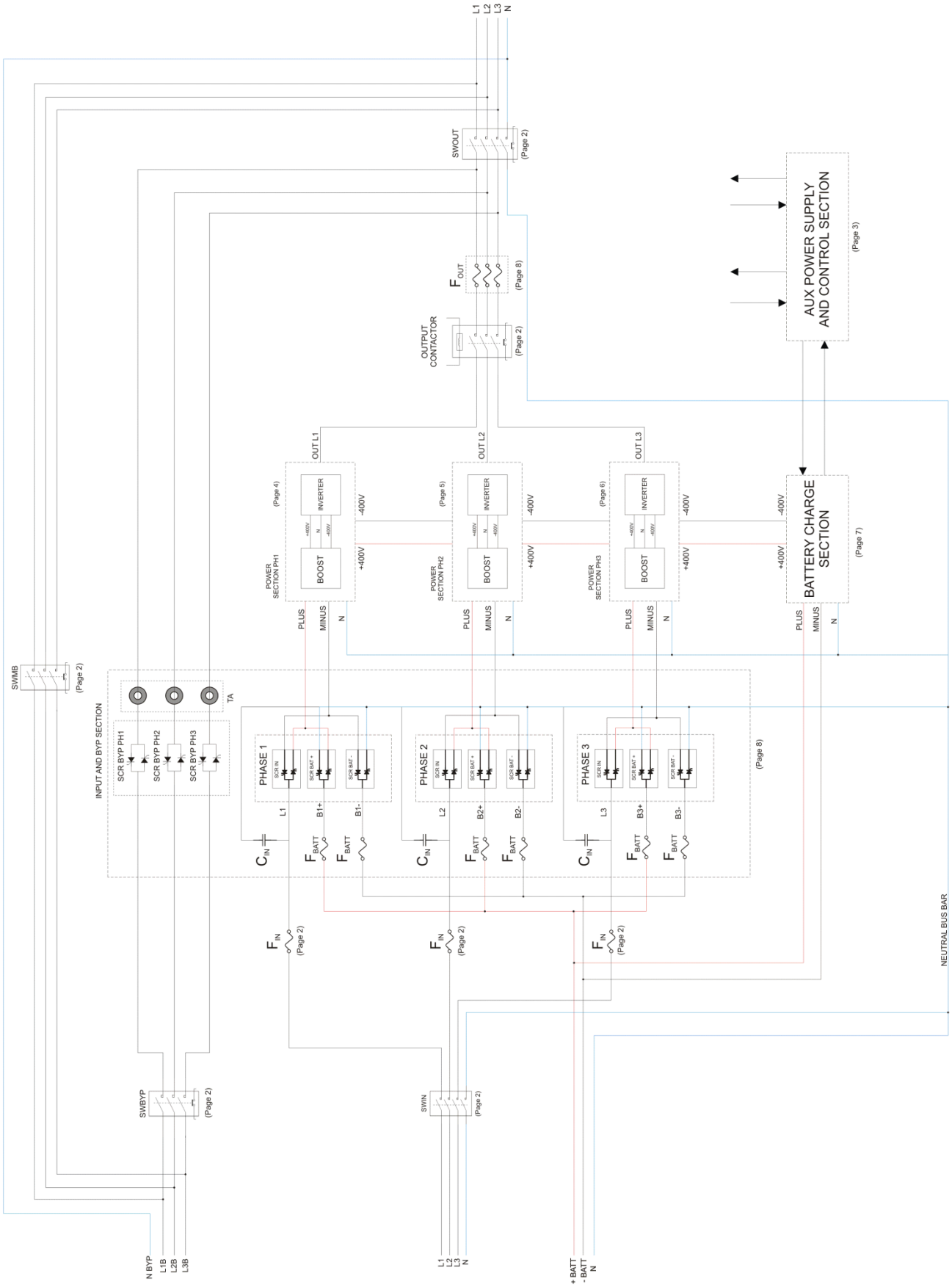


Fig. 15

4.4 SINGLE PHASE ELECTRIC DIAGRAM

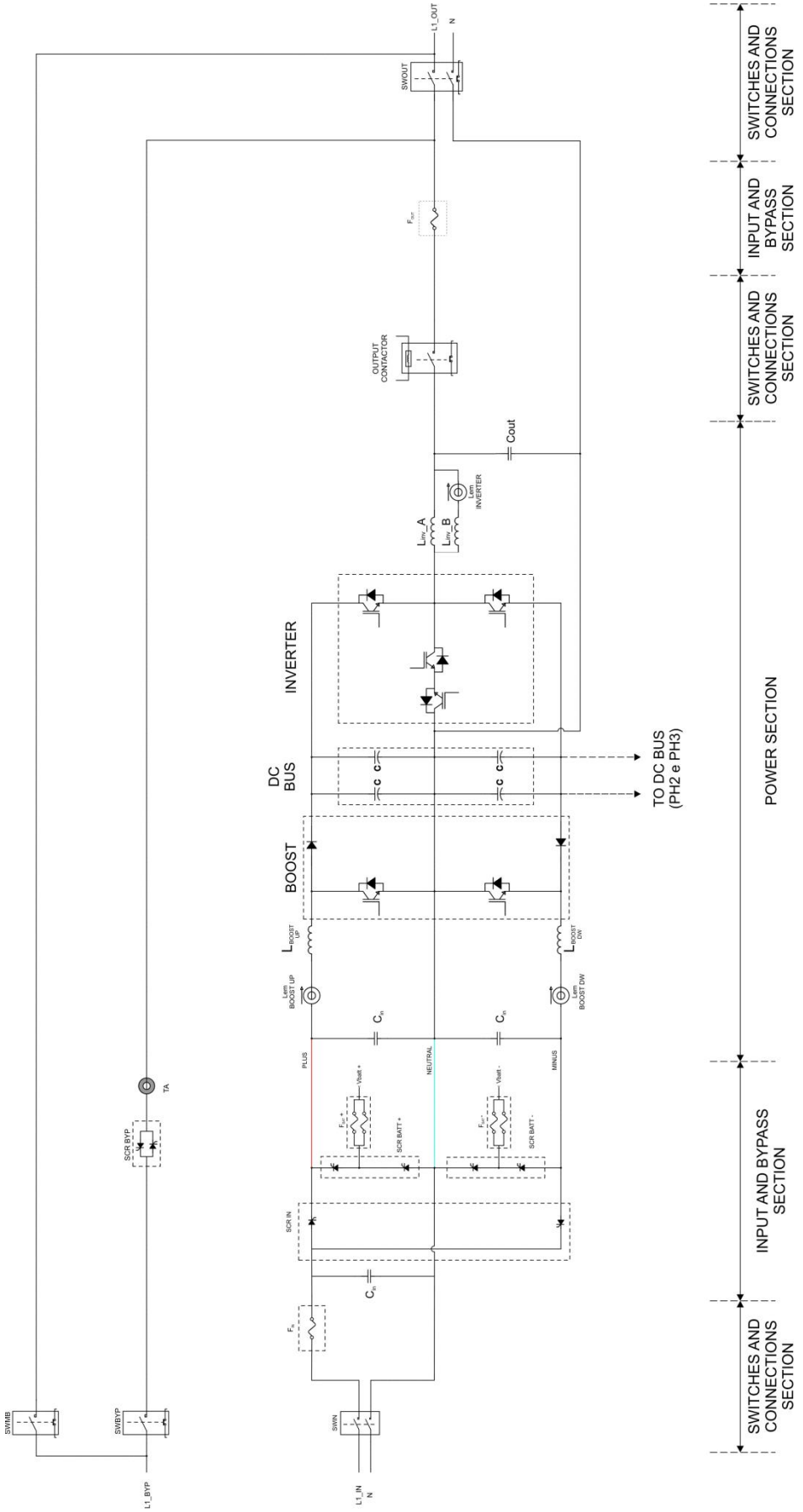


Fig. 16

4.5 MAIN AUXILIARY POWER SUPPLIES

Board **B0059** is supplied from 4 different power sources:

- from phase 1 of the input mains power;
- from phase 2 of the bypass input;
- from DC capacitor bank;
- from battery voltage only during battery start.

If there are certain fault conditions involving the B0059, the UPS logic can still be supplied via the B0211.

Board **B0211** is supplied from 2 different power sources:

- from phase 1 of the input mains power;
- from phase 2 of the bypass input.

The **B0059** board can supply the different parts of the UPS. In particular, is possible to differentiate among:

1. ±15V necessary to supply the current transducers (check also the **ADDENDUM 1 at page1** for all the tracks in the boards);
2. +24V necessary to supply the output contactor coil in the *Battery Charger Section* and the cooling fans in the *Aux Power Supply and Control Section, Power Sections, Main Input and Bypass Section* (check also the **ADDENDUM 1 at pages 2 and 3** for all the tracks in the boards);
3. ±12V necessary to supply all the analogue and digital electronics components in each boards (check also the **ADDENDUM 1 at page 4** for all the tracks in the boards);
4. HF used for SCR driving, and also in the interface communication board (B0056) to work (check also the **ADDENDUM 1 at page 5** for all the tracks in the boards).

N.B.
Below, there is a list with all kind of HF supplies:

HF for battery charger IGBT	generated by B0059	100kHz
HF for inverter IGBT	generated by B0216 (one for phase)	125kHz
HF for booster IGBT	generated by B0210 (one for phase)	125kHz
HF for battery SCR	generated by B0059 (HF_BATT)	29kHz
HF for bypass SCR	generated d by B0211 (HF_BYP)	29kHz
HF for input SCR	generated by B0059 (HF_SCRIN)	29kHz
HF for interface board (B0056)	generated by B0059	100kHz

The A and B **B0212** boards, are powered from DC capacitors bank, supply the A and B fans regulating the rotation speed in according to

- temperature reach in the UPS
- percentage of load connected
- Operating mode of UPS.

Below find all the board codes that produce the 4 types of power supplies in the UPS (previously described). For each is identified the connector number, pin number and the connected board.

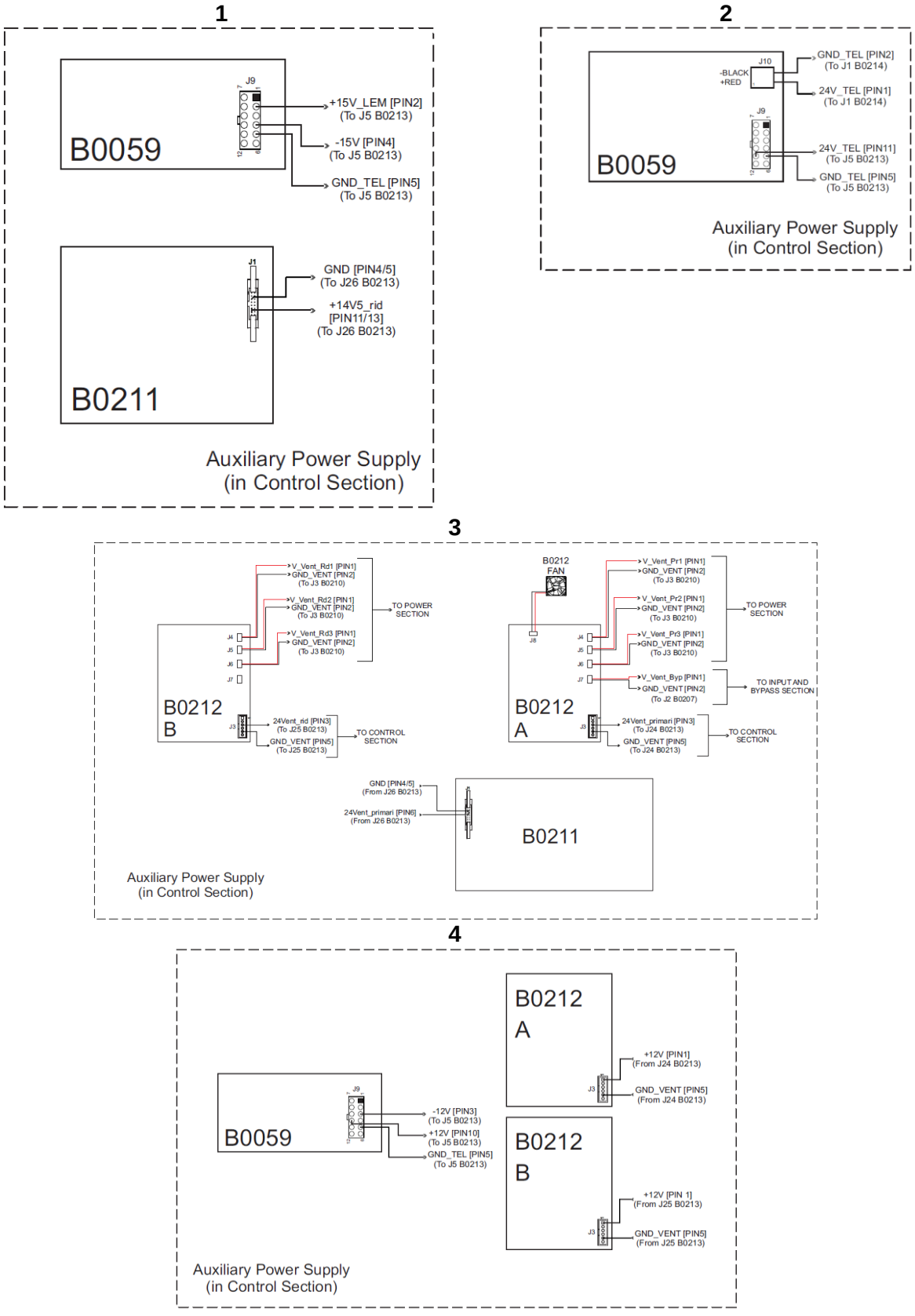


Fig. 17

For the complete power supplies wiring diagram, refer to **ADDENDUM 1.**

4.6 LOGIC AND POWER SUPPLY FOR THE FANS

In the UPS there are 26 fans (one is optional fan necessary if is present the second battery charger) distributed in the UPS boards.

4.6.1 FAN POWER SUPPLIES IN THE UPS

Position	Quantity	Size	Power supply	Board	Fan
Auxiliary Power Supply and Control Section	1 2	92x92x25 92x92x25	24VDC 24VDC	B0212(A) B0213	FAN FAN
Power Section	2 2 1	120x120x38 120x120x38 92x92x25	24VDC 24VDC 24VDC	B0212 (A) B0212 (B) B0212 (B)	FAN A FAN B FAN
Battery Charge Section	1 (+ 1 optional)	92x92x32	12VDC	B0084	FAN CB
Switches and Connections Section	0				
Input and Bypass Section	3 3	119x119x38 120x120x38	230Vrms 24VDC	B0211 B0212 (A)	FAN AC FAN.BYP

N.B.

A = primary fan
B = redundant fan

4.6.2 CONTROL LOGIC FANS

The fans control logic is described in the following paragraphs.

About the fan **FAN A**:

- when the UPS is in standby status, the fans are turned off;
- when the UPS is in standby status but the maximum temperature is over 50°C, the primary; fans work (FAN A) a low speed and when the temperature decrease under 47°C they turn off;
- when the UPS is in online status (inverter ON) and temperature is under 50°C, then the fans work at minimum speed. The speed increases linearly with the temperature up to 70°C where speed reach its maximum (100%);
- when the inverter stage turns off, the fans turn off under temperature 47°C.

Summarizing, the fans **FAN A** work when:

UPS status	**Temperature**	**FAN A**
Standby/ Inverter on	≤50°C	Off
Standby/ Inverter on	>50°C	On, but at low speed (19V) at 50°C. The voltage supply increase linearly with the temperature up to 70°C
Standby/ Inverter on	>70°C	On, at maximum speed (24V)
Standby/Inverter on	<47°C	If before it were turned on, now it will be turned off

About the fan **FAN B** turn on :

- when one of primary fans (FAN A) is blocked;
- when one of primary fans (FAN A) is damaged;
- when the load connected to the UPS increases to over 60% (turn off when the load decreases under 50%);
- When the temperature maximum gets over 80°C (turn off when the temperature decrease under 50°C).

Summarizing, the fans **FAN B** work when:

FAN A status	**Load**	**Temperature**	**FAN B**
In fault	X	X	On
In lock	X	X	On
On	>60%	X	On
On	<50%	X	If on, it will be turned off
On	X	>80°C	On
On	X	<50°C	If on, it will be turned off

N.B.

X= indifferent

About the fan **FAN AC** of bypass section, turns on when:

- there is a lock on one of bypass fans;
- there is a damaged on one of bypass fans;
- the maximum bypass temperature gets up 87°C (turn off when the temperature decreases under 50°C);
- the “ECO” mode is selected. In this case if the temperature is under 60°C start only AC fans, and up 70°C the DC fans (their rotation speed increase linearly from 10% to 100% up 90°C).

Summarizing, the fans **FAN AC** work when:

FAN BYP status	**Temperature**	**AC FAN**	**UPS status**
In fault	X	On	Standby/Inverter on
In lock	X	On	Standby/Inverter on
On	>87°C	On	Standby/Inverter on
On	<50°C	If are on, will be turned off	Standby/Inverter on
Off	<60°C	On	Eco mode
On, at minimum rotation speed for the temperature 70°C. The rotation speed increase linearly up to 90°C	>70°C	On	Eco mode
On, at maximum speed	>90°C	On	Eco mode

N.B.

X= indifferent

Attention: after each battery test will start fan test to check the absence of damaging on the fans power supply board (B0212B) and on the fans (FAN B).

4.6.3 VIEW BETWEEN FANS CONNECTIONS

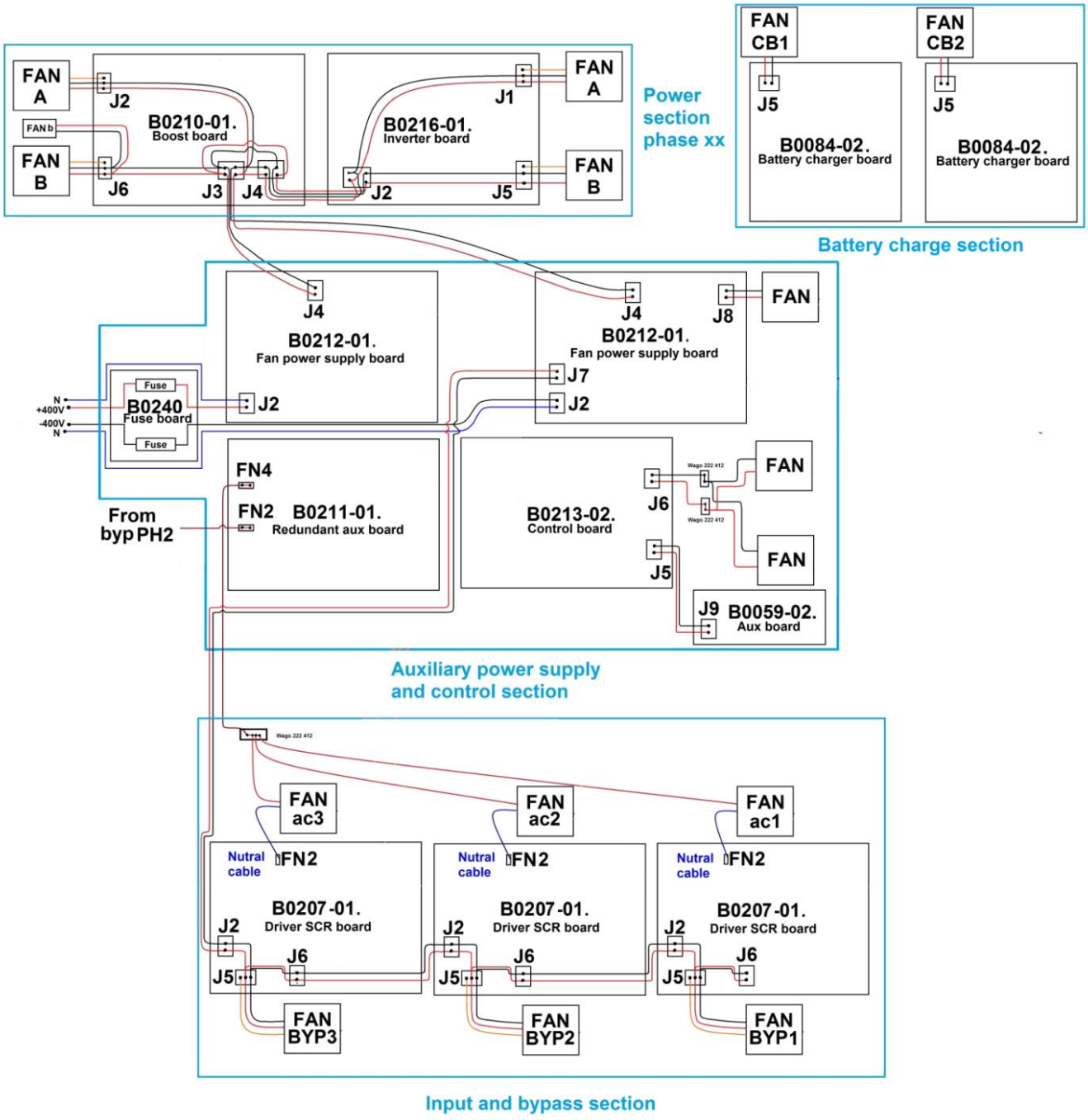


Fig. 18

4.6.4 DETAILS OF FANS CONNECTIONS

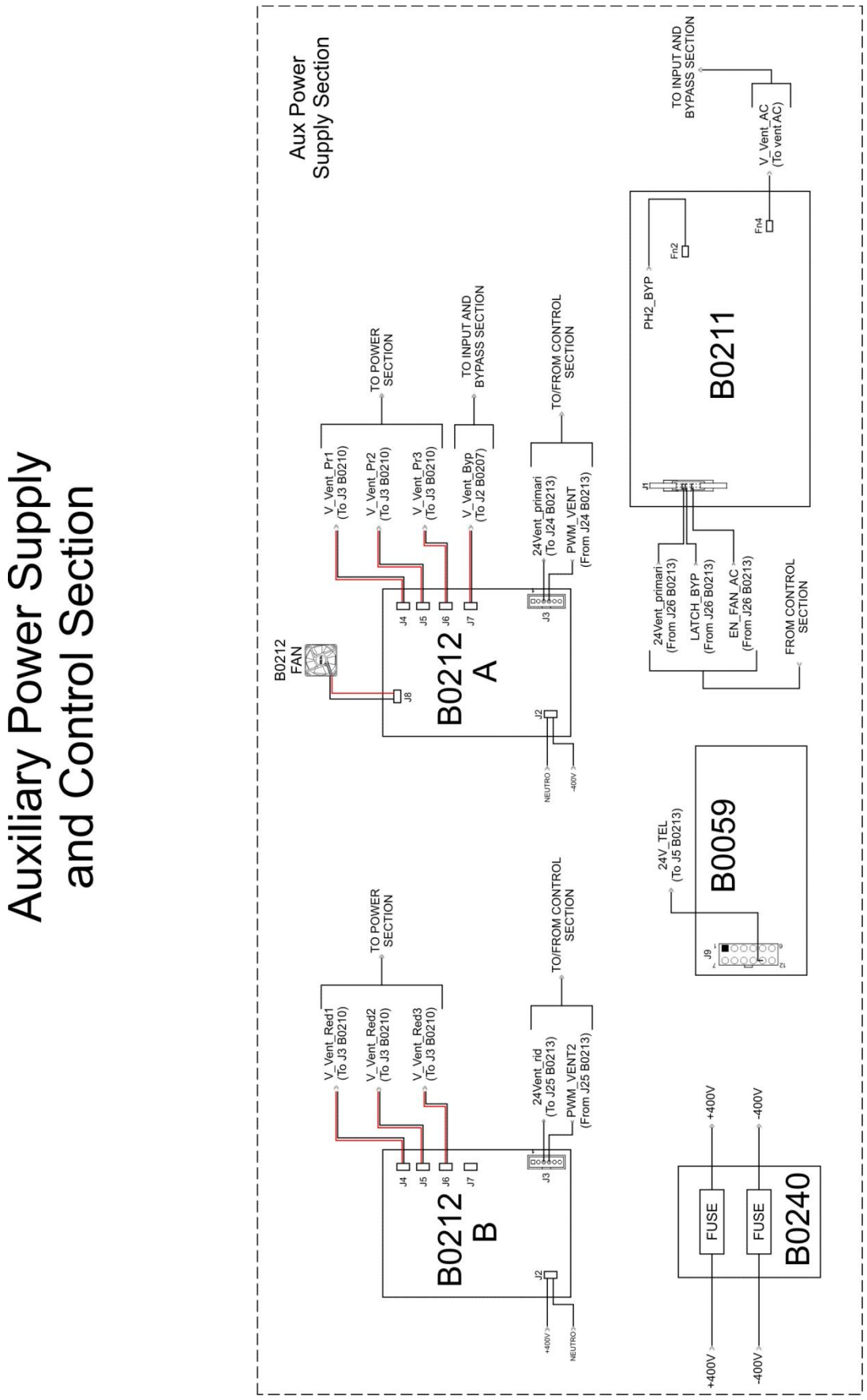


Fig. 19

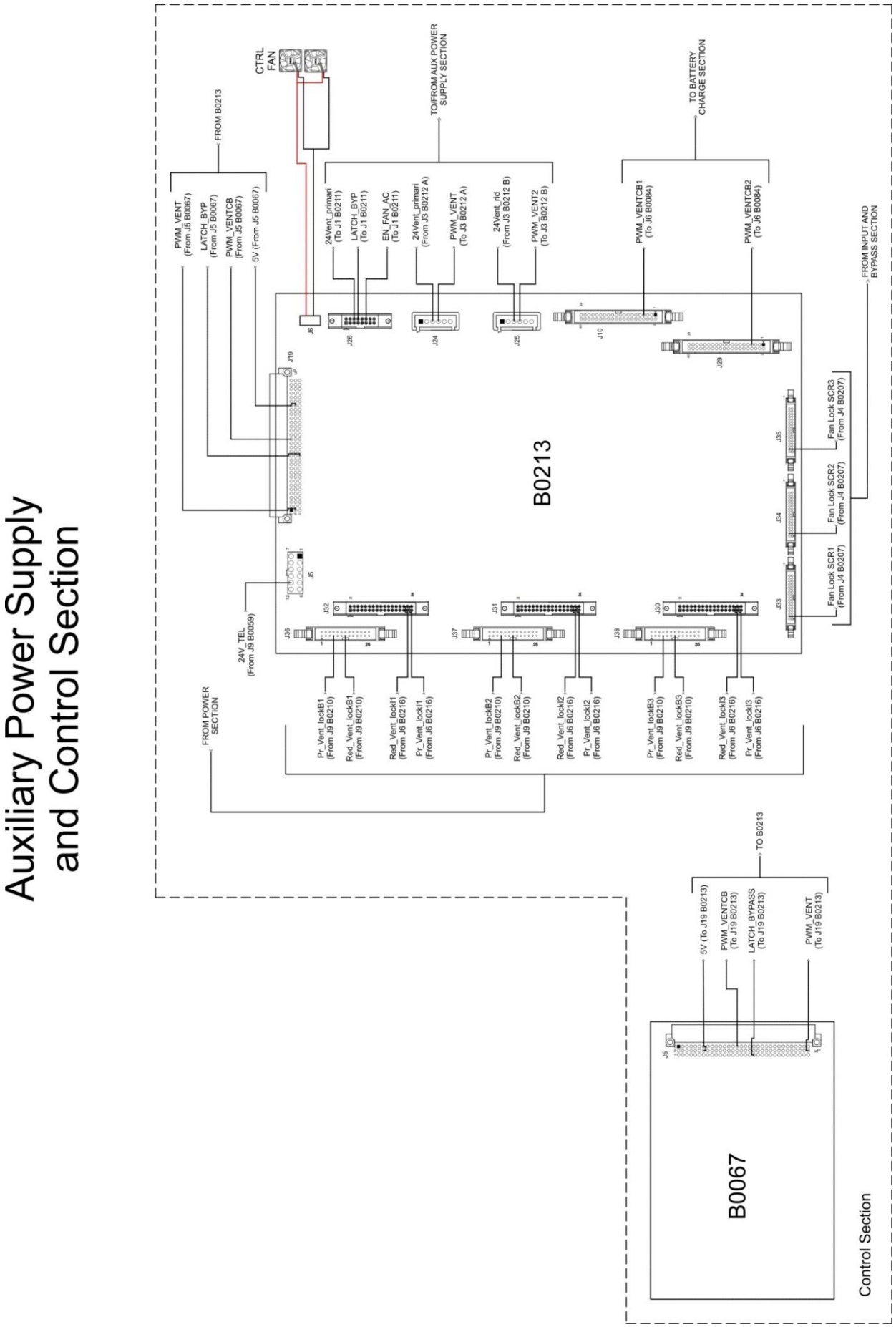

Auxiliary Power Supply
and Control Section
B0213
B0067
CTRL FAN
FROM B0213
TO/FROM AUX POWER SUPPLY SECTION
TO BATTERY CHARGE SECTION
FROM INPUT AND BYPASS SECTION
FROM POWER SECTION
TO B0213
Control Section
PWM_VENT (From J5 B0067)
LATCH_BYP (From J5 B0067)
PWM_VENTCB (From J5 B0067)
5V (From J5 B0067)
24Vent_primari (To J1 B0211)
LATCH_BYP (To J1 B0211)
EN_FAN_AC (To J1 B0211)
24Vent_primari (From J3 B0212 A)
PWM_VENT (To J3 B0212 A)
24Vent_rid (From J3 B0212 B)
PWM_VENT2 (To J3 B0212 B)
PWM_VENTCB1 (To J6 B0084)
PWM_VENTCB2 (To J6 B0084)
Fan Lock SCR3 (From J4 B0207)
Fan Lock SCR2 (From J4 B0207)
Fan Lock SCR1 (From J4 B0207)
24V_TEL (From J9 B0059)
Pr_Vent_lockB1 (From J9 B0210)
Red_Vent_lockB1 (From J9 B0210)
Red_Vent_lock1 (From J6 B0216)
Pr_Vent_lock1 (From J6 B0216)
Pr_Vent_lockB2 (From J9 B0210)
Red_Vent_lockB2 (From J9 B0210)
Red_Vent_lock2 (From J6 B0216)
Pr_Vent_lock2 (From J6 B0216)
Pr_Vent_lockB3 (From J9 B0210)
Red_Vent_lockB3 (From J9 B0210)
Red_Vent_lock3 (From J6 B0216)
Pr_Vent_lock3 (From J6 B0216)
5V (To J19 B0213)
PWM_VENTCB (To J19 B0213)
LATCH_BYPASS (To J19 B0213)
PWM_VENT (To J19 B0213)

Fig. 20

Power Section

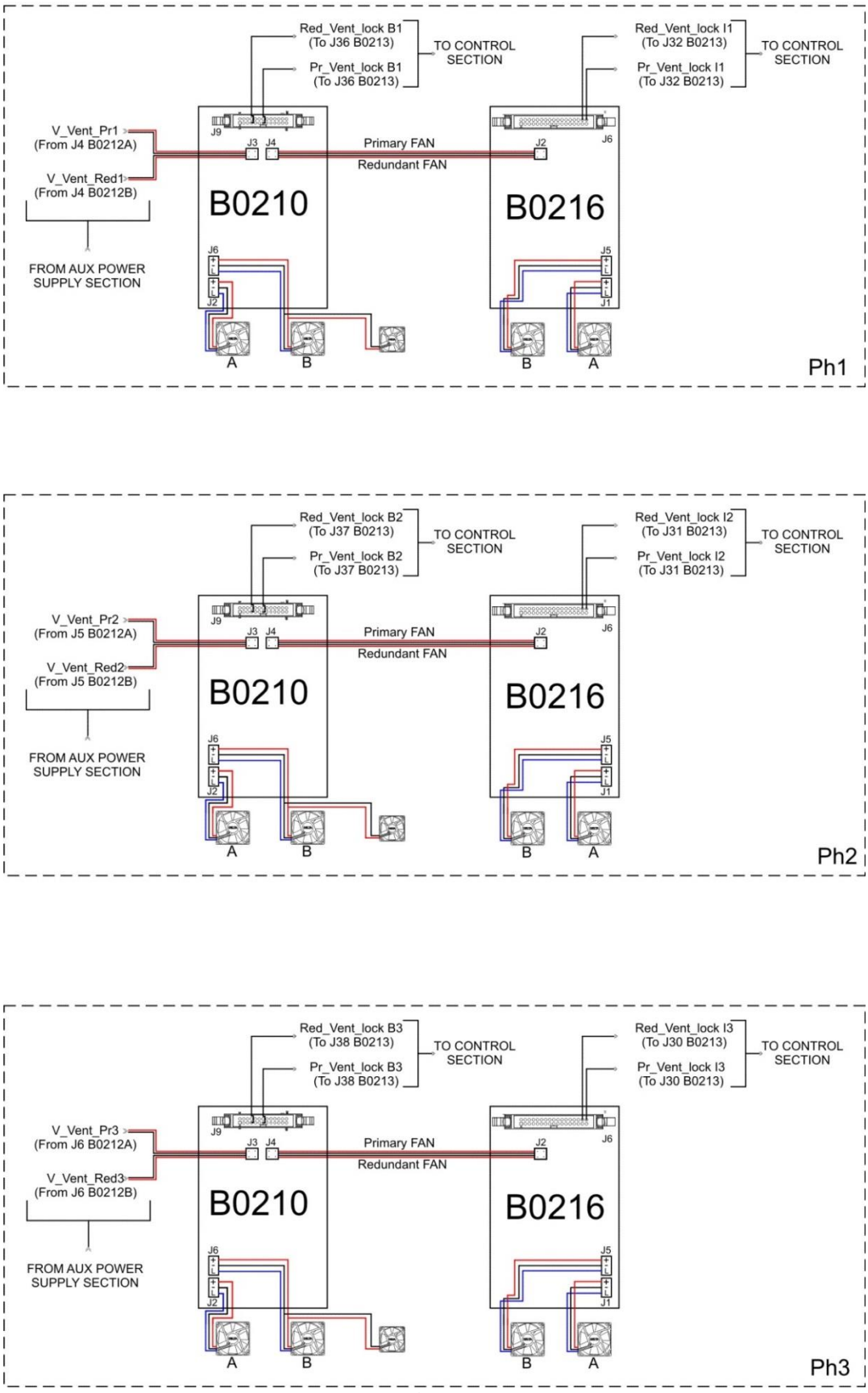


Fig. 21

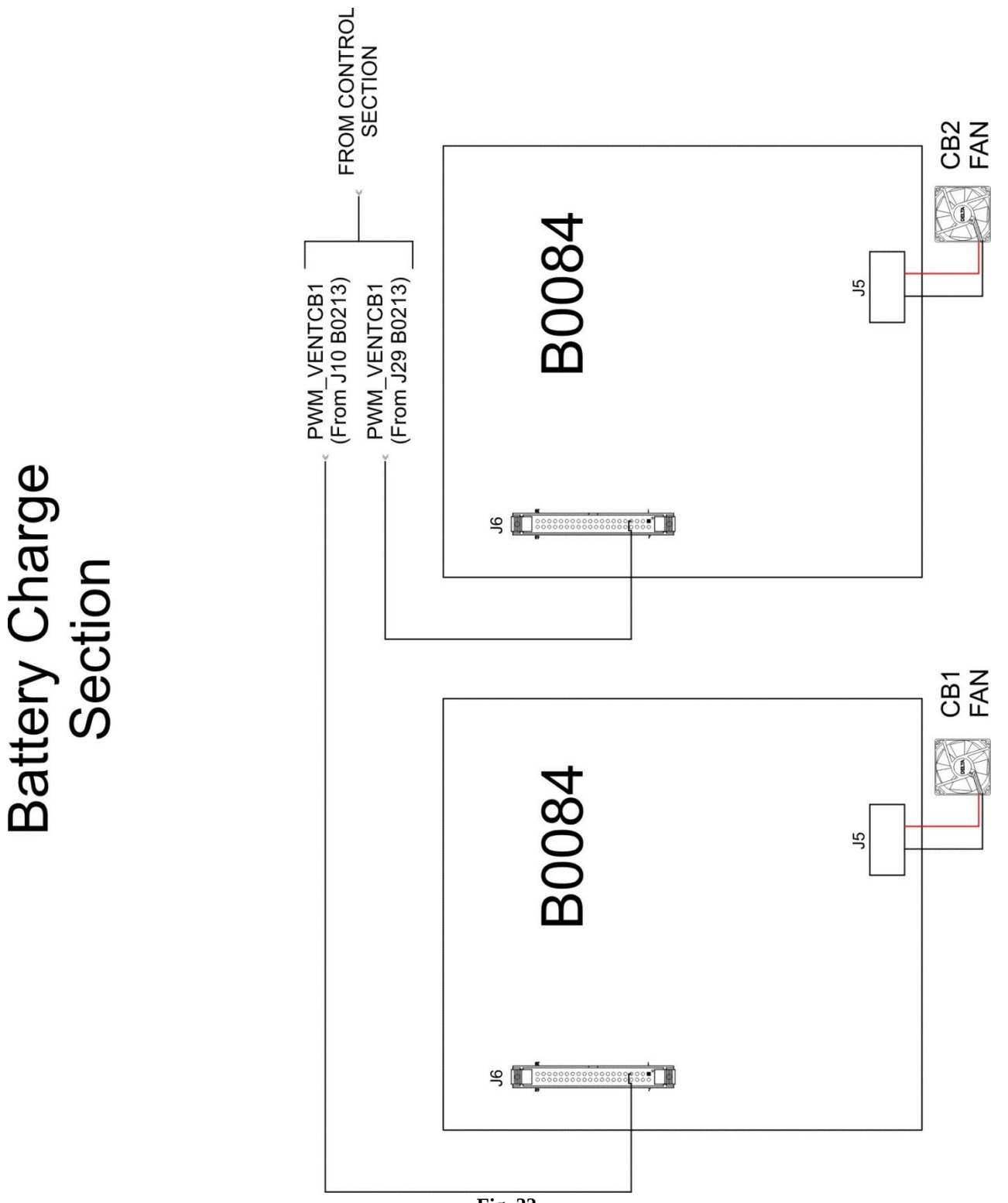

Battery Charge Section
FROM CONTROL SECTION
PWM_VENTCB1 (From J10 B0213)
PWM_VENTCB1 (From J29 B0213)
B0084
J6
J5
CB2 FAN
B0084
J6
J5
CB1 FAN

Fig. 22

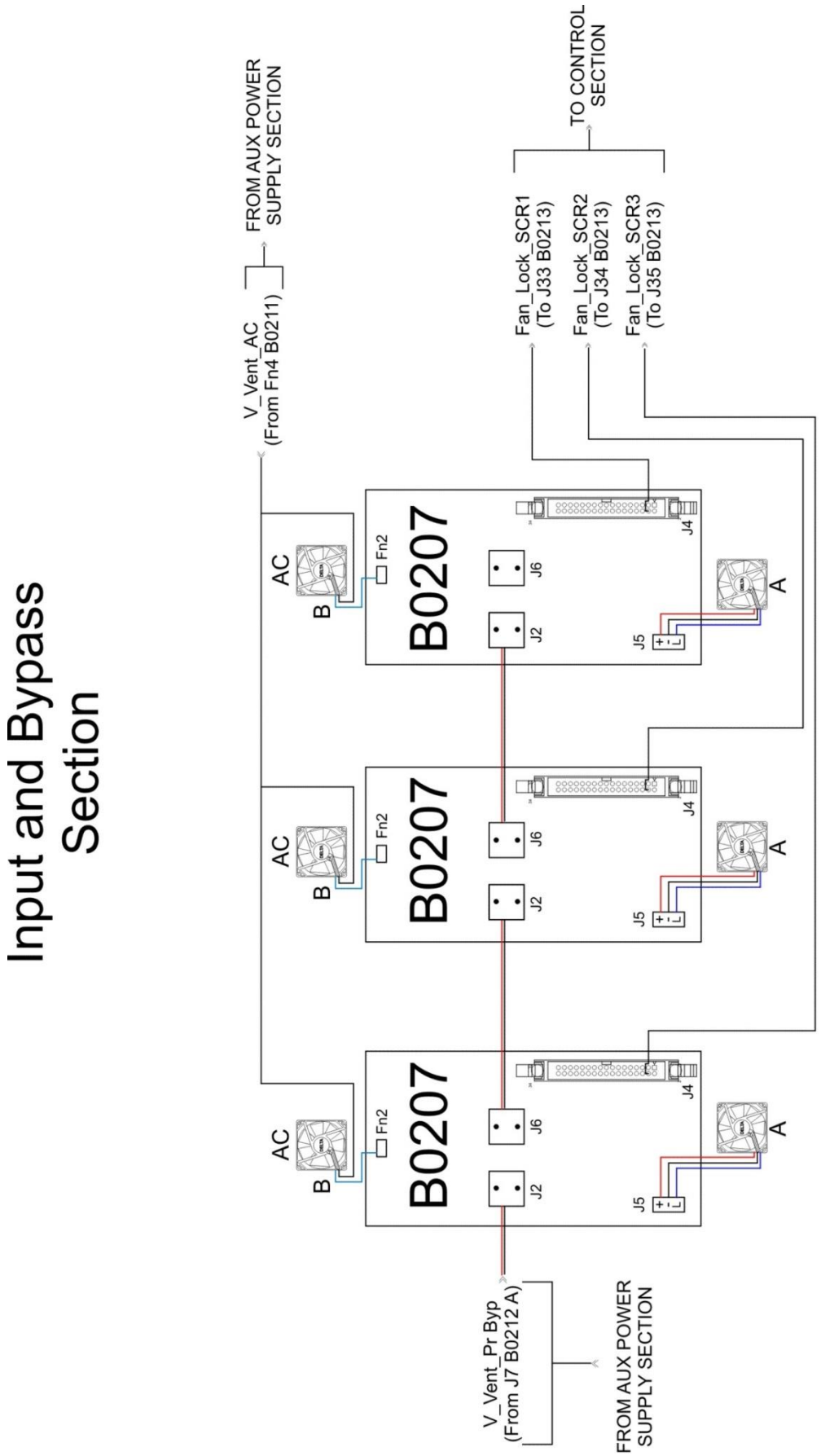

Input and Bypass Section
V_Vent_AC (From Fn4 B0211)
FROM AUX POWER SUPPLY SECTION
TO CONTROL SECTION
Fan_Lock_SCR1 (To J33 B0213)
Fan_Lock_SCR2 (To J34 B0213)
Fan_Lock_SCR3 (To J35 B0213)
B0207
AC
B
Fn2
J2
J4
J5
J6
A
Ph1
Ph2
Ph3
V_Vent_Pr Byp (From J7 B0212 A)
FROM AUX POWER SUPPLY SECTION

Fig. 23

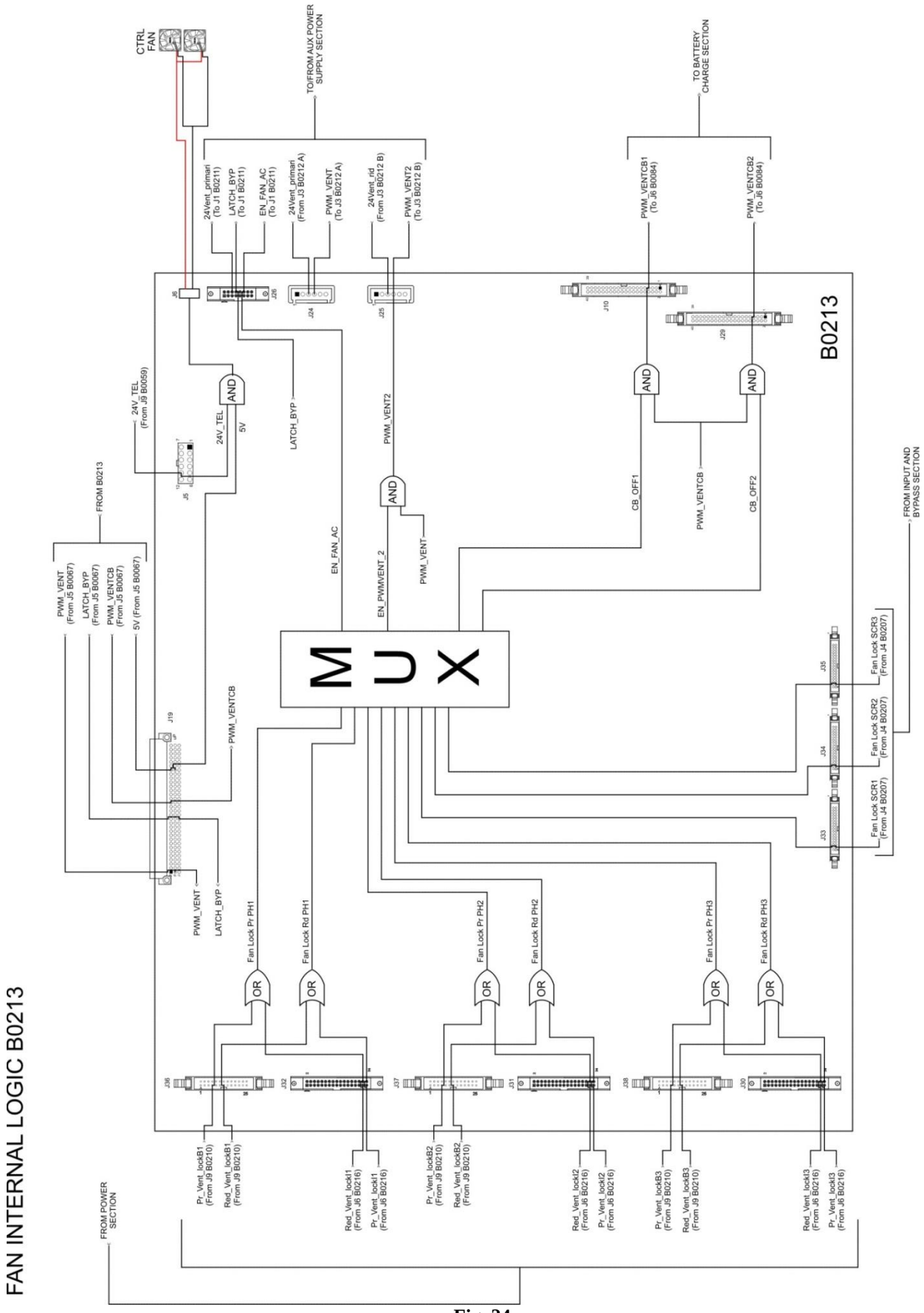

FAN INTERNAL LOGIC B0213
B0213
CTRL FAN
TO/FROM AUX POWER SUPPLY SECTION
TO BATTERY CHARGE SECTION
24Vent_primari (To J1 B0211)
LATCH_BYP (To J1 B0211)
EN_FAN_AC (To J1 B0211)
24Vent_primari (From J3 B0212 A)
PWM_VENT (To J3 B0212 A)
24Vent_rid (From J3 B0212 B)
PWM_VENT2 (To J3 B0212 B)
PWM_VENTCB1 (To J6 B0084)
PWM_VENTCB2 (To J6 B0084)
24V_TEL (From J9 B0059)
FROM B0213
PWM_VENT (From J5 B0067)
LATCH_BYP (From J5 B0067)
PWM_VENTCB (From J5 B0067)
5V (From J5 B0067)
FROM INPUT AND BYPASS SECTION
Fan Lock SCR3 (From J4 B0207)
Fan Lock SCR2 (From J4 B0207)
Fan Lock SCR1 (From J4 B0207)
MUX
AND
OR
Fan Lock Pr PH1
Fan Lock Rd PH1
Fan Lock Pr PH2
Fan Lock Rd PH2
Fan Lock Pr PH3
Fan Lock Rd PH3
Pr_Vent_lockB1 (From J9 B0210)
Red_Vent_lockB1 (From J9 B0210)
Red_Vent_lock11 (From J6 B0216)
Pr_Vent_lock11 (From J6 B0216)
Pr_Vent_lockB2 (From J9 B0210)
Red_Vent_lockB2 (From J9 B0210)
Red_Vent_lock12 (From J6 B0216)
Pr_Vent_lock12 (From J6 B0216)
Pr_Vent_lockB3 (From J9 B0210)
Red_Vent_lockB3 (From J9 B0210)
Red_Vent_lock13 (From J6 B0216)
Pr_Vent_lock13 (From J6 B0216)
FROM POWER SECTION

Fig. 24

FAN INTERNAL LOGIC B0211

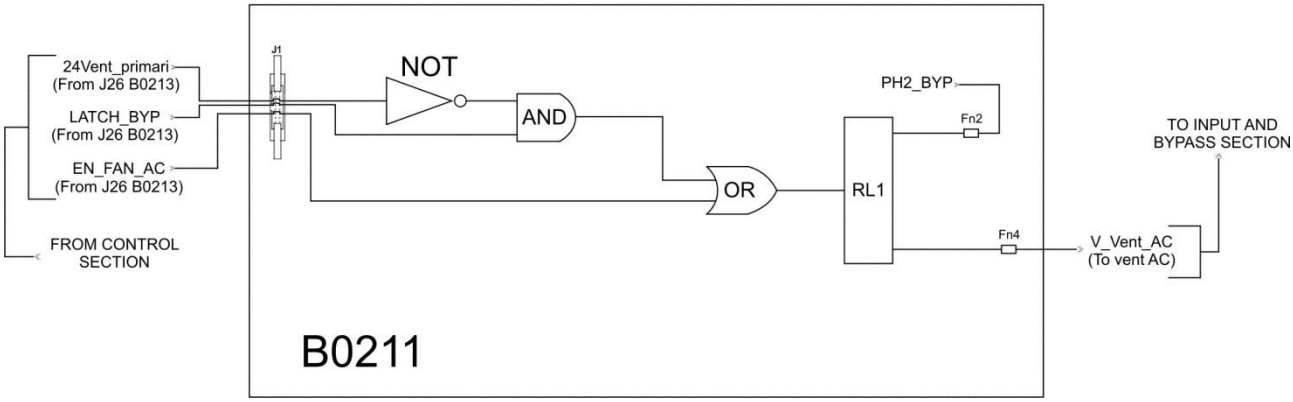


Fig. 25

For the complete fans wiring diagram, refer to **ADDENDUM 2.**

5 DESCRIPTION OF BOARDS

5.1 INTERFACE BOARD (B0056)

Version:
B0056-02. Interface Card

In the interface board you can find:

1) R47 = fuse resistor 4,7Ω 2W
2) output contacts for AS400
3) 5V linear regulator
4) 15 linear regulator

NOTE: on UPS without accessory JP3, JP4, JP6, must be close and JP1, JP2 open.

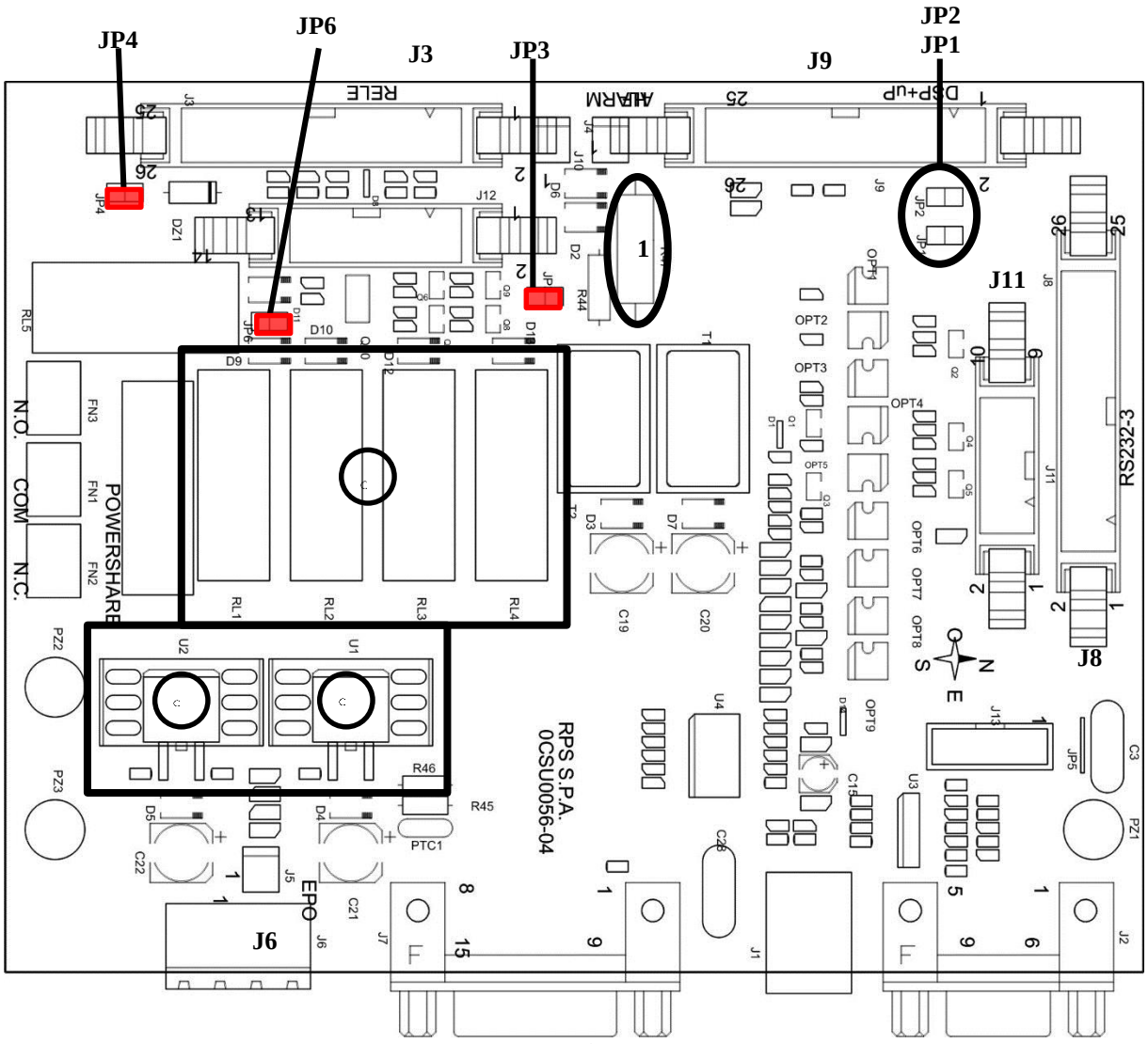
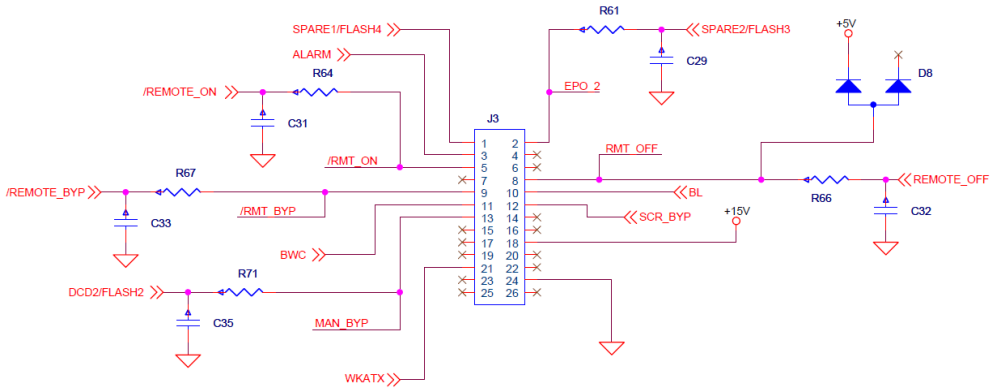


Fig. 26

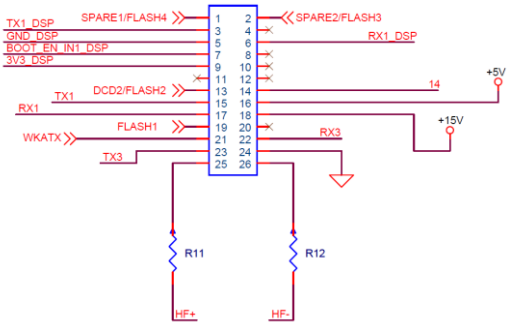
Connector	Description	Notes
J3	Flat connected to slot relay	To aux signal panel
J6	EPO connector	
J8	Flat connected to slot com. 2	To slot com. 2
J9	Flat connected to DSP-uP board and slot com. 1	To J3 B0067 and slot com. 1
J11	Flat connected to DSP-uP board	To J8 B0067

Pinout connectors:

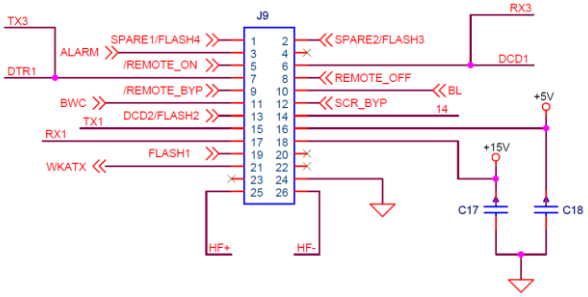
J3



J8



J9



J11

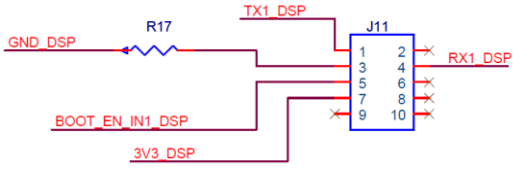


Fig. 27

5.2 DISPLAY BOARD (B0057)

Versions:

B0057-02. Display Card - Neutral Version

In the display board you can find:

1) DL1, 2, 3, 4, 5 and 6 are indication led
2) SW1, 2, 3 and 4 are selection buttons

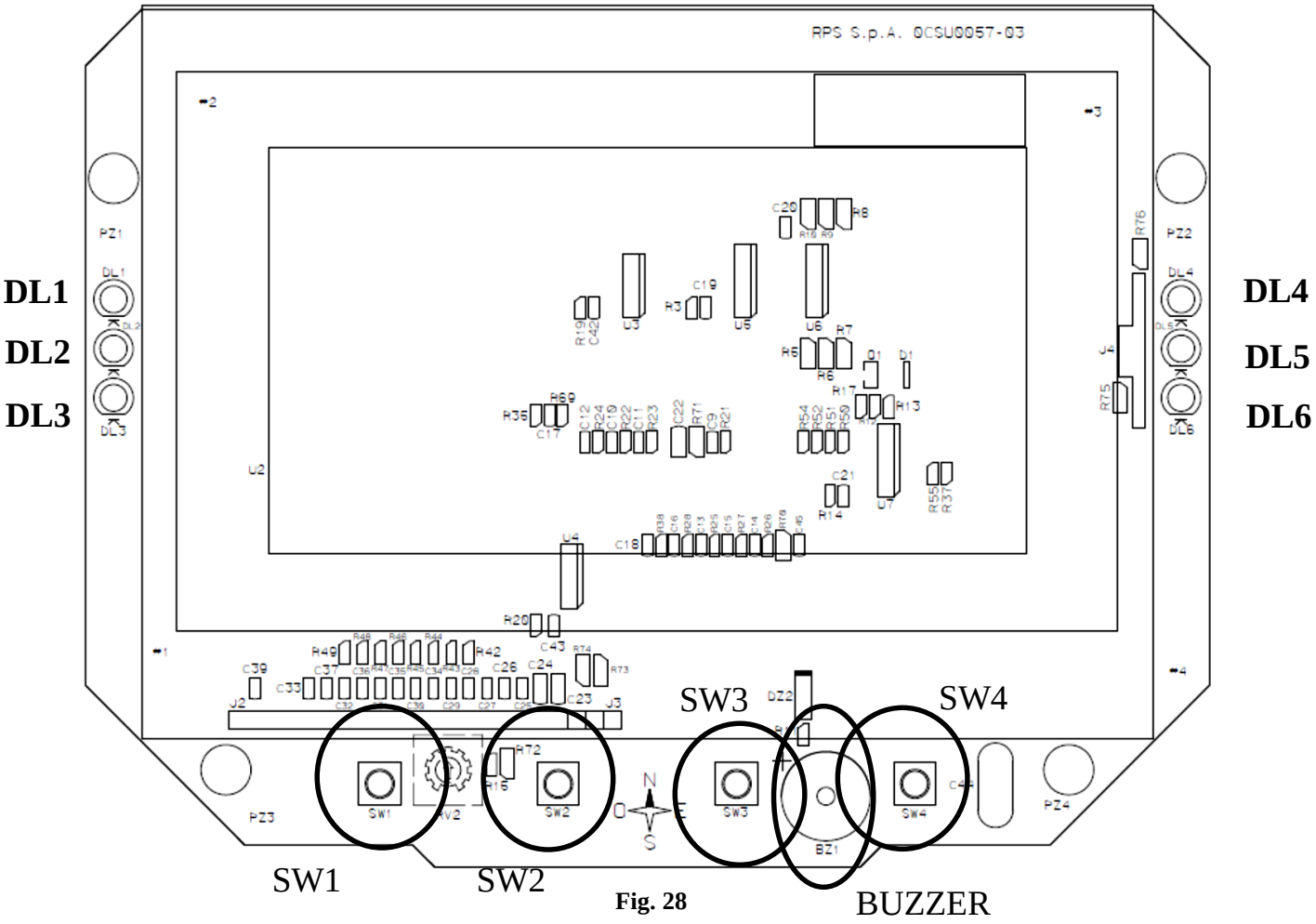


Fig. 28

Led	Description
DL1	Mains operation LED
DL2	Battery operation LED
DL3	Load on bypass LED
DL4	Standby/alarm LED
DL5	Replace batteries LED
DL6	ECO mode LED

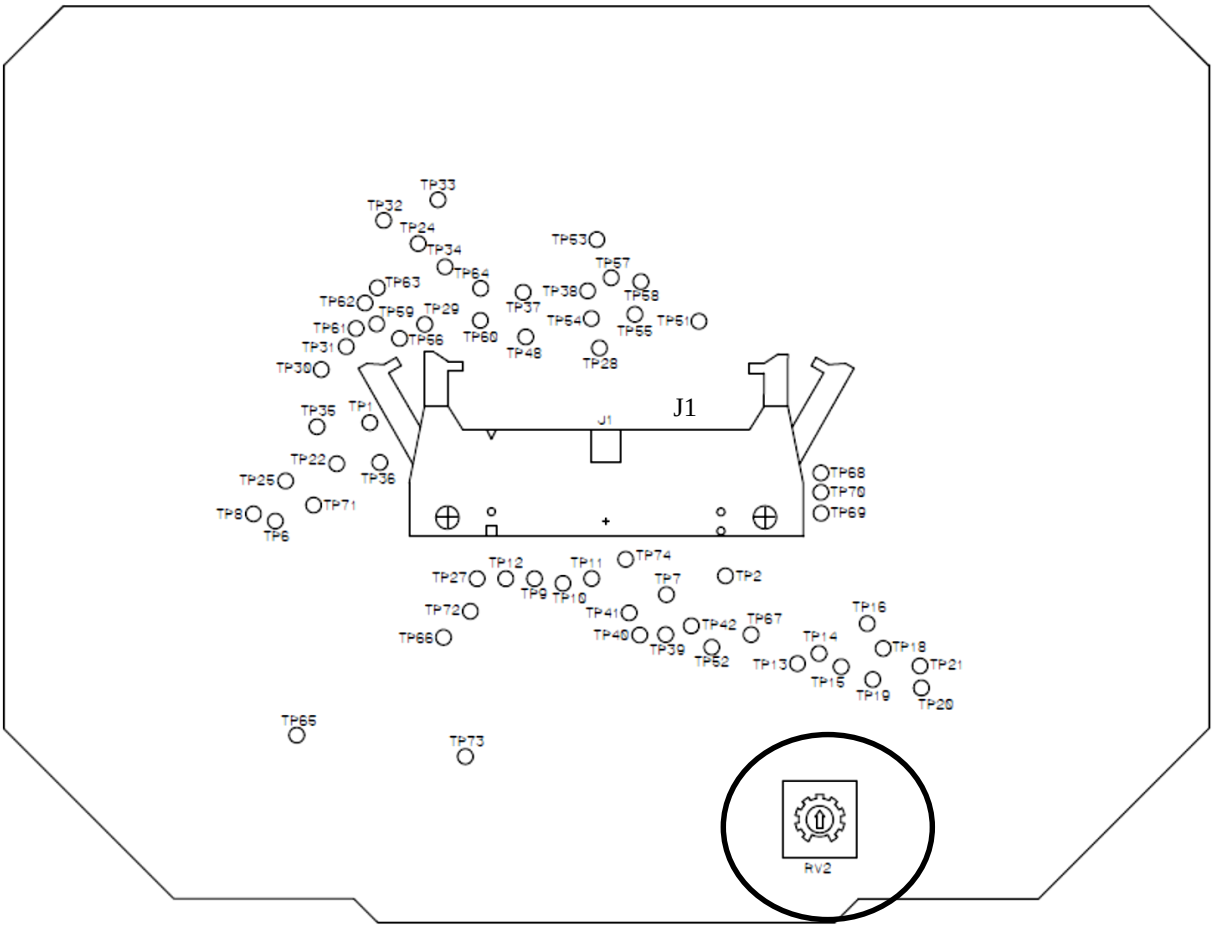


Fig. 29

Connector	Description	Note
J1	Flat connected to uC+DSP board	To J4 B0067
RV2	Trimmer for contrast level regulation	

ATTENTION: It is important when starting the UPS in a very cold environment to allow the display time to warm up before adjusting the contrast via RV2.

Pinout connectors:

J1

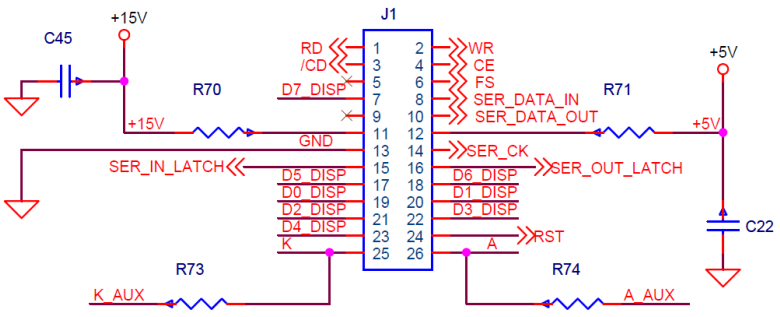


Fig. 30

5.3 POWER SUPPLY BOARD (B0059)

Version:
B0059-02. Aux Supply Card 160-200

Attention: for electrical diagram of B0059, refer to 160 -200.

On the power supply board there are two feed stages: one necessary for all the dc voltages in all the boards of UPS, the other to drive the output contactor and fans inside to section control).
In this board you can find:

1) Fuse 6,3x32 da 2A 500V GF
2) Supply +27V, +15V, +12_relè, -18V
3) Supply to drive the output contactor and fans inside to section control

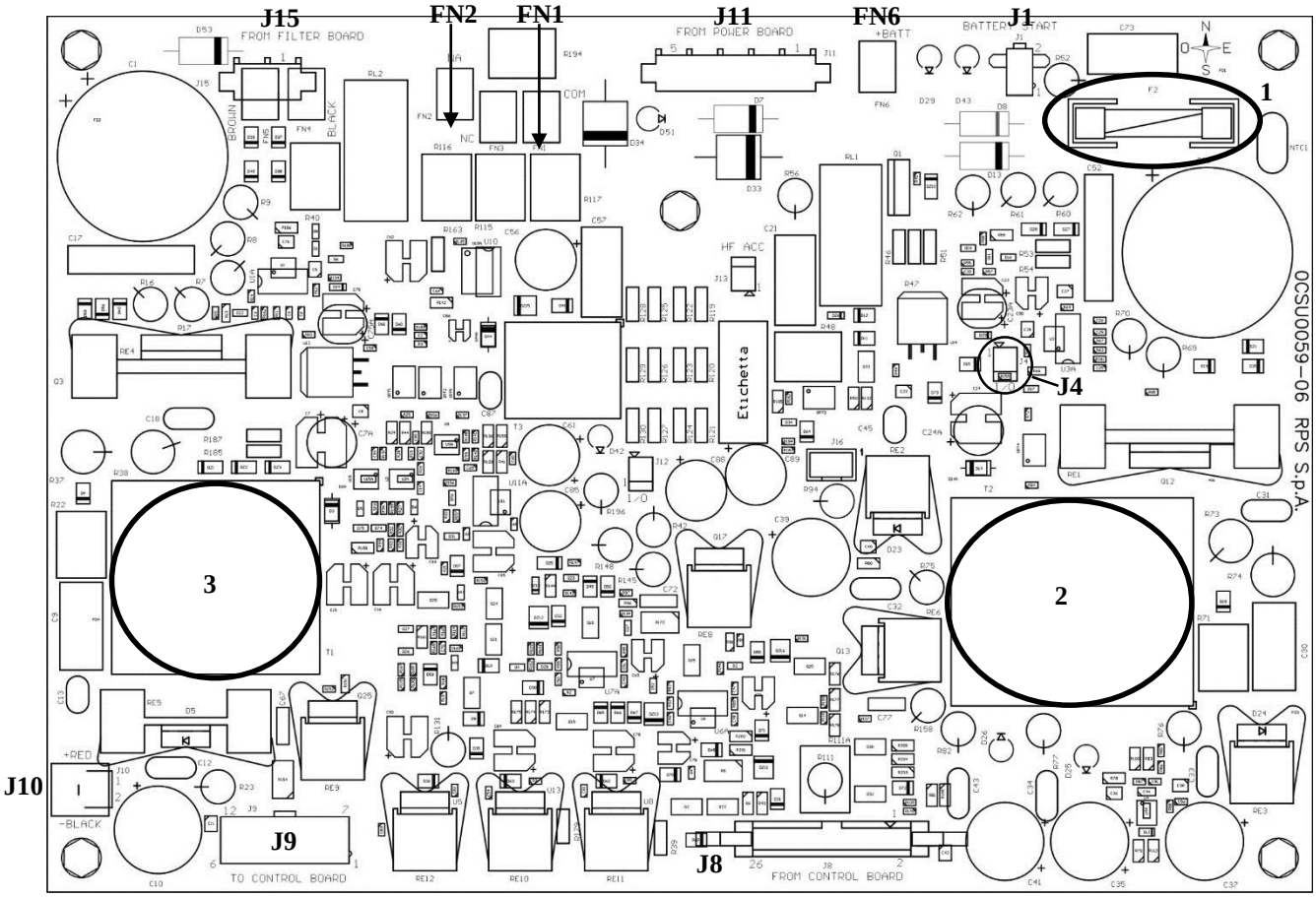
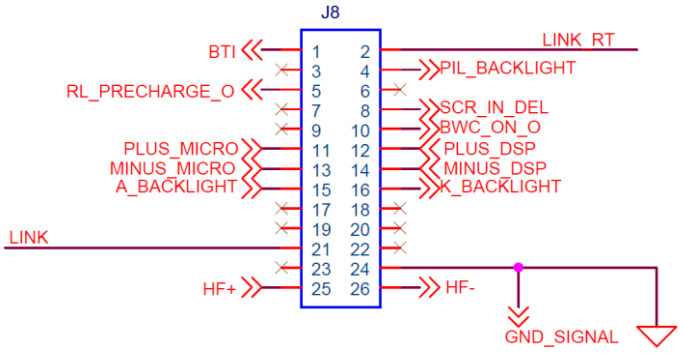


Fig. 31

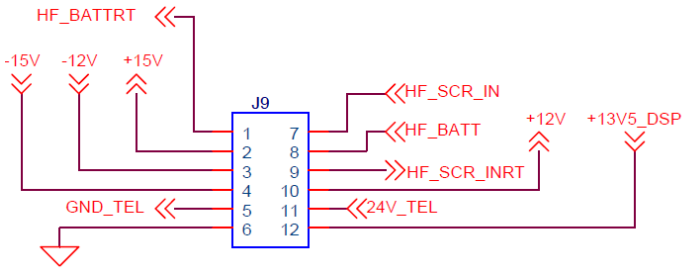
Connector	Description	Notes
J1	Vbat connector for battery start	
J4	Connector for 1/0	Jumper inserted
J8	Flat connector for the signal to control board	To J13 B0213
J9	Feed connector to control board	To J5 B0213
J10	Connector 25V to drive the contactor	To J1 B0214
J11	Feed connector +/- 400V e HF+/-	To J4 B0213 and A FN2-FN4 B0240
J15	Feed connector from main input source	From SWIN PH1 and SWBYP PH2
FN1	Connection to precharge board	To FN1 B0231
FN2	Connection to precharge board	To FN2 B0231
FN6	Connection to BATT+ (to start the UPS from battery source)	To BATTERY+ bar

Pinout connectors:

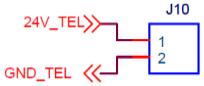
J8



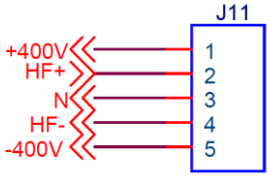
J9



J10



J11



J15

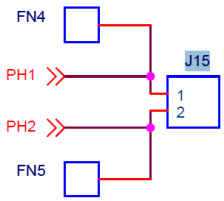


Fig. 32

5.4 uC + DSP BOARD (B0067)

Version:
B0067-01. DSP + uC Control Card for 160-200

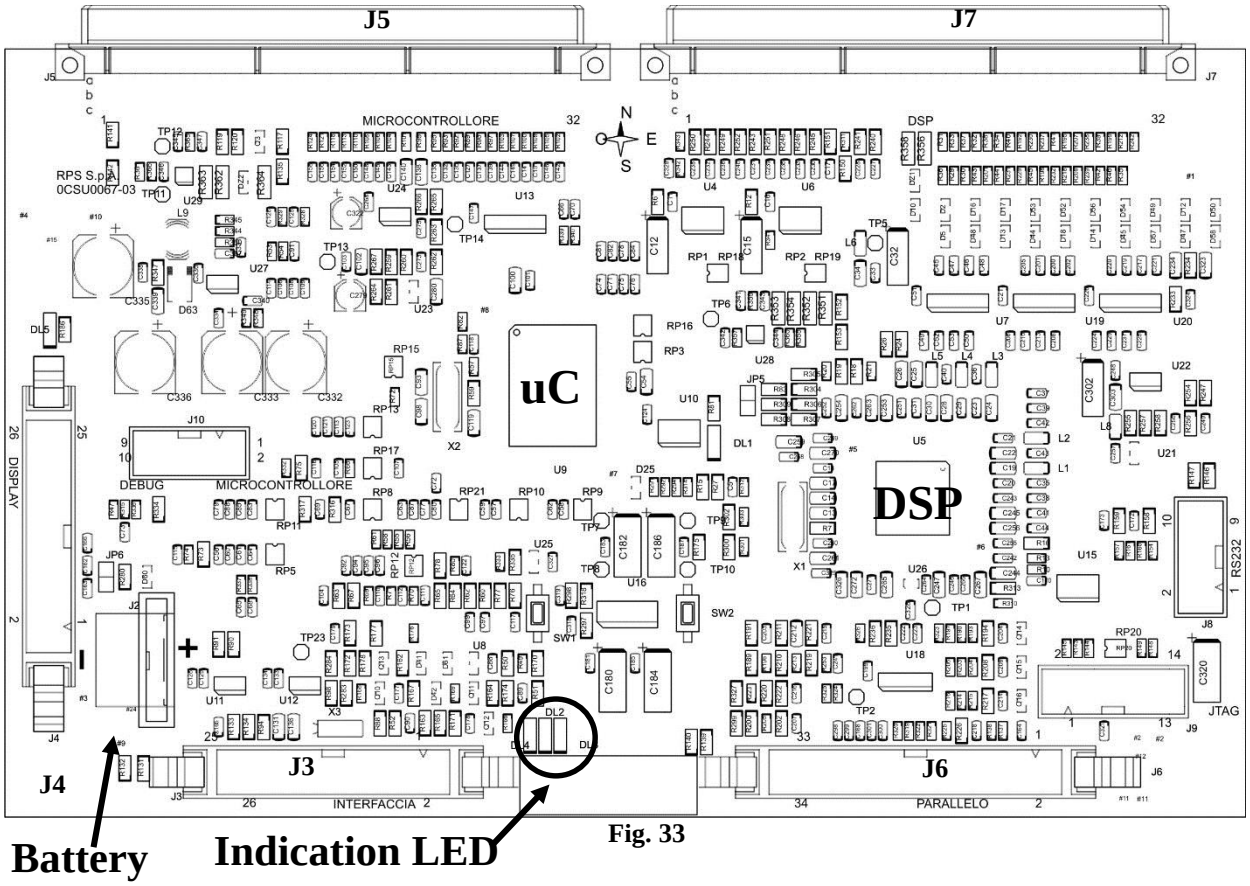


Fig. 33

Connector	Description	Note
J3	Flat connected to interface board and slot com. 1	To J9 B0056 and slot com. 1
J4	Flat connected to display	To J1 B0057
J5	Connector for uC	To J19 B0213
J6	Flat connected to parallel board	
J7	Connector for DSP	To J20 B0213
J8	Flat connected to interface board	To J11 B0056

Test Point	Voltage
Between TP11 and TP12	+5V
Between TP7 and TP8	+1,9V
Between TP9 and TP10	+3,3V
Between TP14 and TP10	+2,3V
Between TP5 and TP6	+3,3V
Between TP13 and TP10	+4,6V

Indication led	Meaning
DL1 (RED)	Reset DSP
DL2 (RED)	Reset uC
DL3 (GREEN)	+5V and +1,9V present
DL4 (GREEN)	+3,3V present

5.5 BATTERY CHARGER BOARD (B0084)

Version:
B0084-02. Batt Ch. 25A Card 125-160-200.

The battery charger board is composed by two buck converters and a battery pre-charge system. In this board you can find:

1) 2 output fuses - 10mmX38 32 A 500V
2) 2 input fuses - 6.3mmX32 25A 500V
3) pre-charge resistors from the battery (6 x 22Ω 10W)
4) input capacitors
5) Battery Charger output diodes
6) positive buck + heatsink temperature probe
7) negative buck + heatsink temperature probe
8) output capacitors
9) current sensors
10) buck inductors
11) R59 = fuse resistor 1,2Ω 500mW

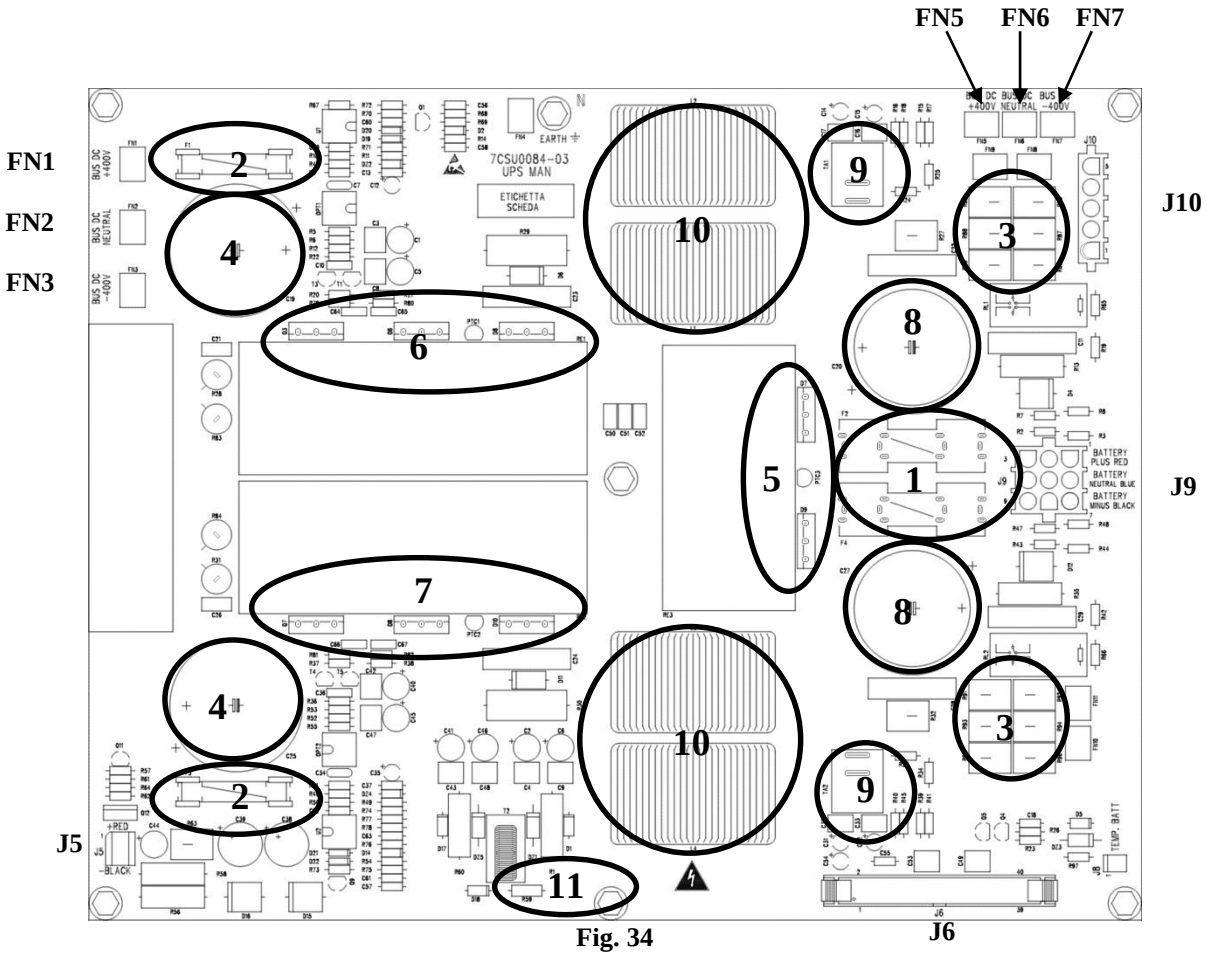


Fig. 34

In the standard version of UPS, one battery charger is used with maximum level of recharge of 25A. It is possible to double the current to 50A by adding a second battery charger (optional).

Connections of battery charger

Connector	Description	Note
J5	Connector for CB FAN	
J6	Flat connected to control board	To J10 B0213 CB1
		To J29 B0213 CB2 (OPT)
J9	Battery charger board output connection	Connected to battery bar +/-/N
J10	Battery charger board input connection	Connected to dc bar +400/-400/N
FN1	Wire on board +400V	A FN5 B0084
FN2	Wire on board N	A FN6 B0084
FN3	Wire on board -400V	A FN7 B0084

Pinout connectors:

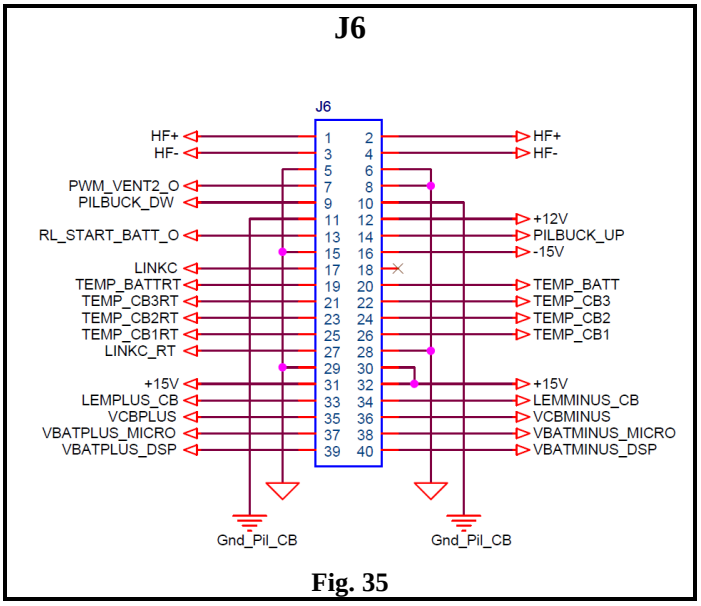


Fig. 35

5.6 PARALLEL BOARD (B0085)

Version:
B0085-01. Parallel Card (all sizes)

In this board you can find:

1) SW1 to select the “Start” o “Continue” mode
2) Yellow led indicates that SW1 is in “Start” position
   Green led indicates that the parallel board is powered
3) SW2 to select the terminating resistor
4) SW3 the input communication line is opened or closed
5) SW4 the output communication line is opened or closed
6) R5 = fuse resistor 6,8Ω 500mW

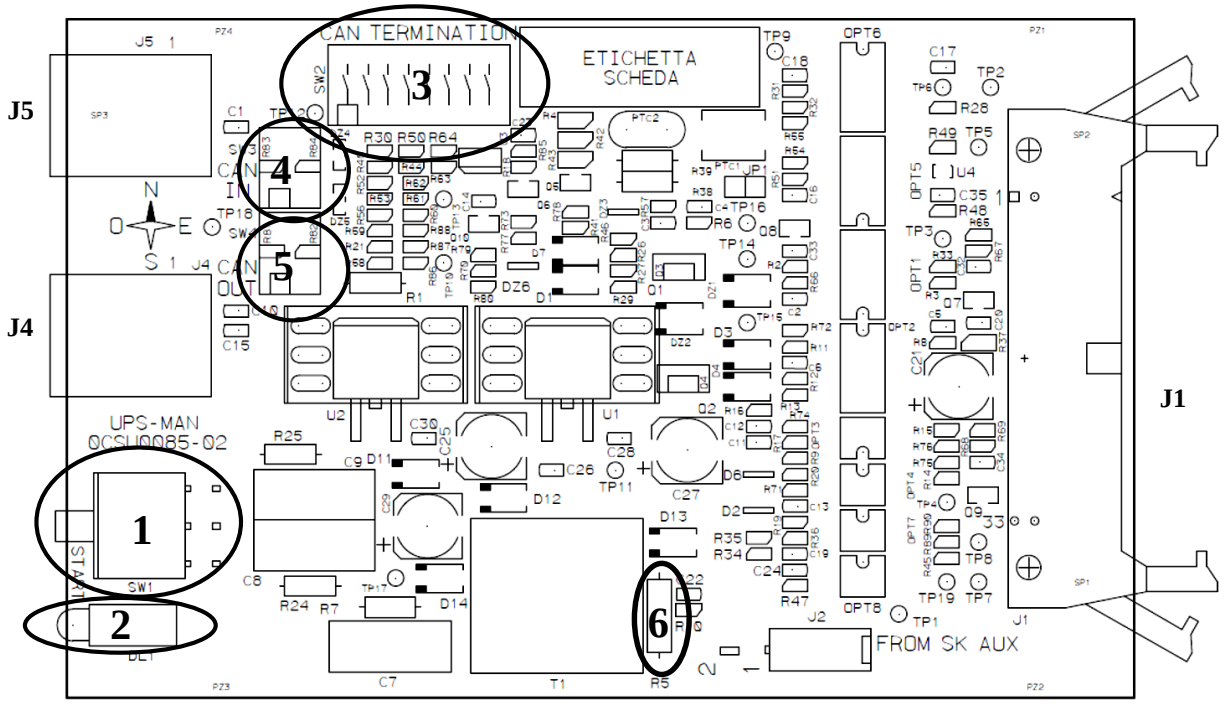


Fig. 36

Connector	Description	Note
J1	Flat connection to uC+DSP board	To B0067
J2	Connection to auxiliary board	A J4 B0211
J4	Output communication line RJ45- OUT	To other B0085 (UPS in parallel)
J5	Input communication line RJ45- IN	From other B0085 (UPS in parallel)

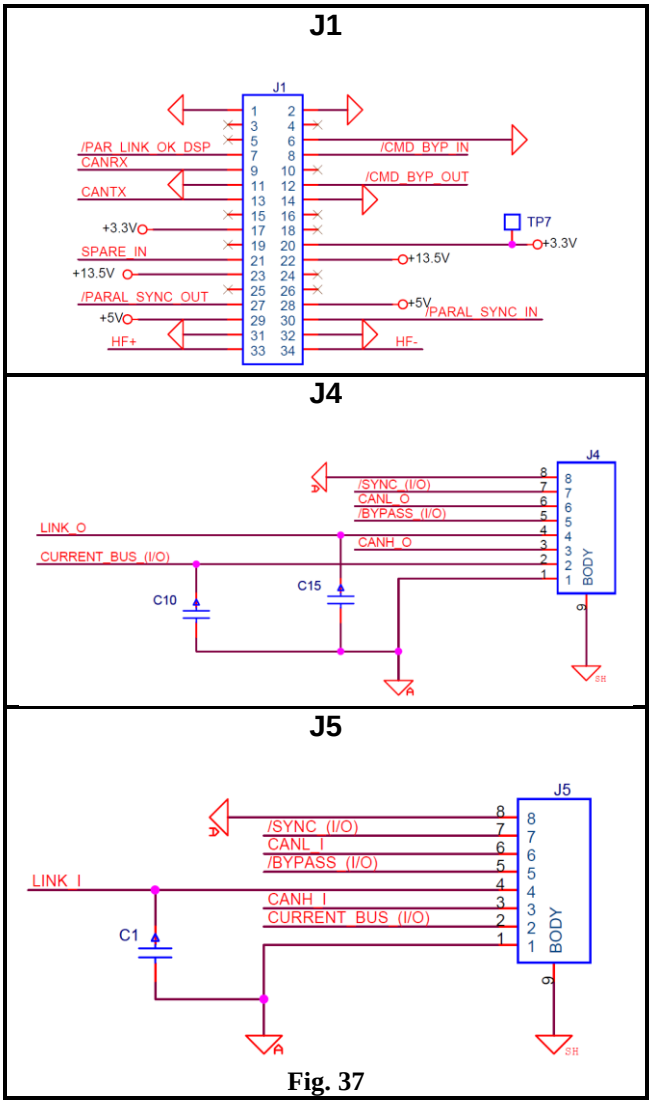

J1
J1
/PAR_LINK_OK_DSP
CANRX
CANTX
+3.3V
SPARE_IN
+13.5V
/PARAL_SYNC_OUT
+5V
HF+
/CMD_BYP_IN
/CMD_BYP_OUT
TP7
+3.3V
+13.5V
+5V
/PARAL_SYNC_IN
HF-
J4
J4
/SYNC_(I/O)
CANL_O
/BYPASS_(I/O)
CANH_O
LINK_O
CURRENT_BUS_(I/O)
C10
C15
BODY
J5
J5
/SYNC_(I/O)
CANL_I
/BYPASS_(I/O)
LINK_I
CANH_I
CURRENT_BUS_(I/O)
C1
BODY

Fig. 37

5.7 EMI FILTERS BOARD (B0133)

Version:
B0133-05. Output Filter Card 160-200

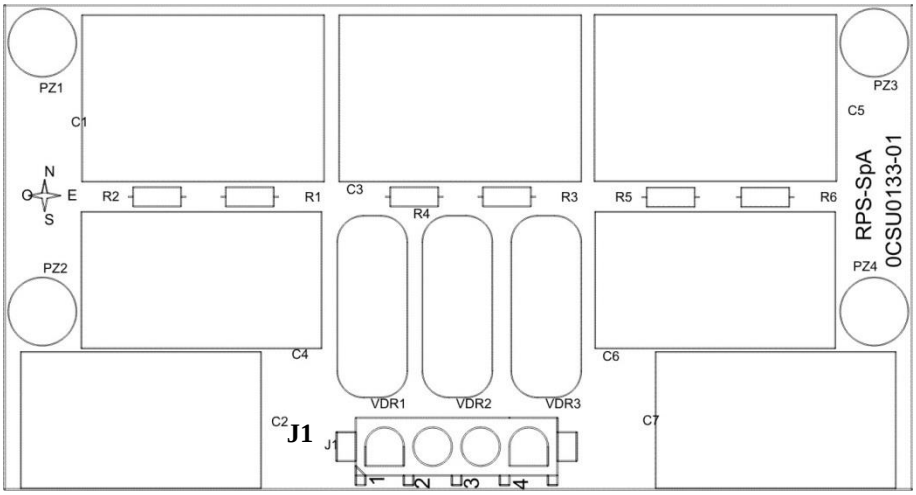


Fig. 38

Connector	Description	Note
J1	Connected to output phases	Output bar PH1/PH2/PH3

Pinout connectors:

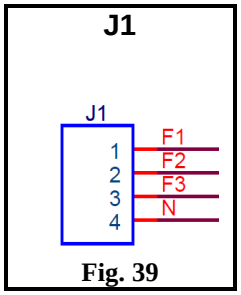


Fig. 39

5.8 DRIVER SCR BOARD (B0207)

Version:
B0207-01. Driver SCR Card 160-200

In this board you can find:

1) T1 = base drive transformer for bypass SCR
2) T2 = base drive transformer for input SCR
3) T3 = base drive transformer for battery SCR
4) R17 = fuse resistor 1,2Ω 500mW for bypass SCR
5) R24 = fuse resistor 1,2Ω 500mW for input SCR
6) R25 = fuse resistor 1,2Ω 500mW for battery SCR

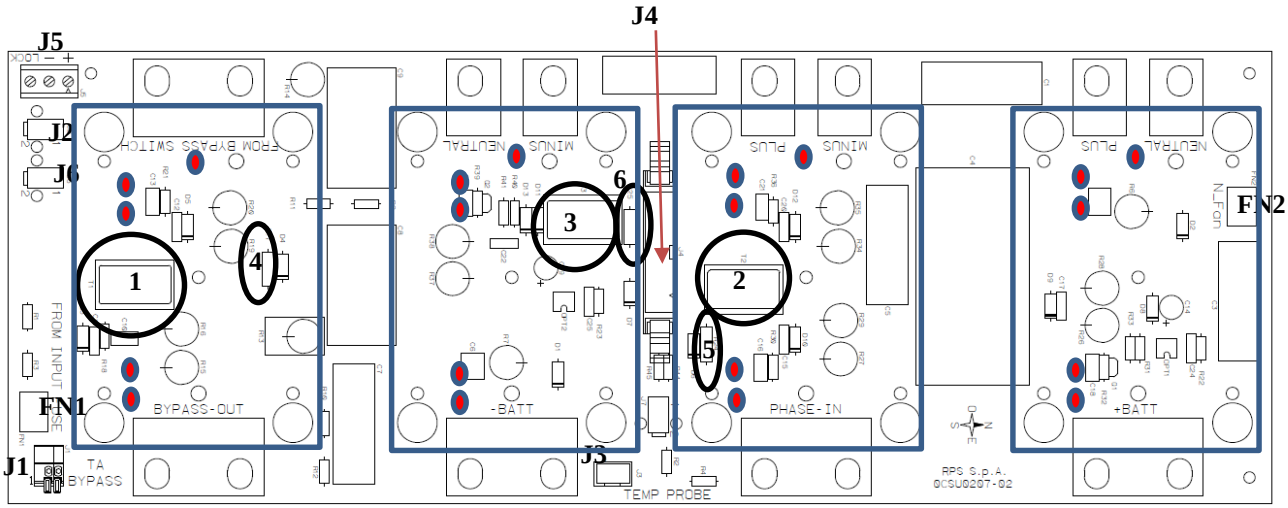


Fig. 40

BYPASS	BATT-	INPUT	BATT+

Note

The contact between the B0207 board and the SCR components is done using the springs on SCRs module.

For the PHASE 1

Connector	Description	Note
J1	Connector for TA PH1	
J2	Connector to feed the primary bypass fans	From J6 B0207 PH2
J3	Connector for temperature probe on heatsink PH1	NTC probe
J4	Flat connected to control board	From J33 B0213
J5	Connector to feed the fans and LOCK on PH1	
FN1	Connector from input fuse on PH1	
FN2	Connector to feed the secondary bypass fans (AC fans) on PH1	

For the PHASE 2

Connector	Description	Note
J1	Connector for TA PH2	
J2	Connector to feed the primary bypass fans	From J6 B0207 PH1
J3	Connector for temperature probe on heatsink PH2	NTC probe
J4	Flat connected to control board	From J33 B0213
J5	Connector to feed the fans and LOCK on PH2	
J6	Connector to feed the primary bypass fans PH3	To J2 B0207 PH1
FN1	Connector from input fuse on PH3	
FN2	Connector to feed the secondary bypass fans (AC fans) on PH2	

For the PHASE 3

Connector	Description	Note
J1	Connector for TA PH3	
J2	Connector to feed the primary bypass fans	From J7 B0212 (A)
J3	Connector for temperature probe on heatsink PH3	NTC probe
J4	Flat connected to control board	From J35 B0213
J5	Connector to feed the fans and LOCK on PH3	
J6	Connector to feed the primary bypass fans PH2	To J2 B0207 PH2
FN1	Connector from input fuse on PH3	
FN2	Connector to feed the secondary bypass fans (AC fans) on PH3	

Pinout connectors:

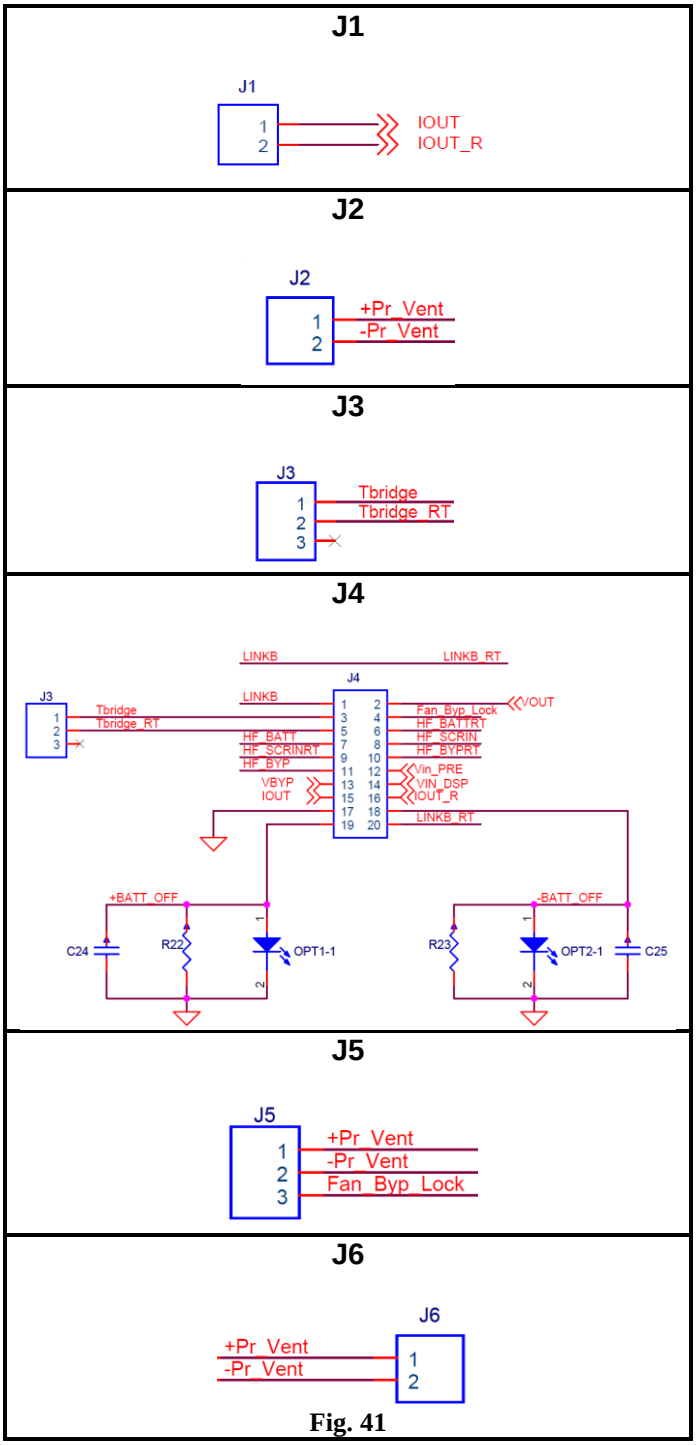


Fig. 41

5.9 DC CAPACITORS BOOST BOARD (B0208)

Versions:
B0208-01. DC Capacitors Boost Card 200 kVA
B0208-02. DC Capacitors Boost Card 160kVA

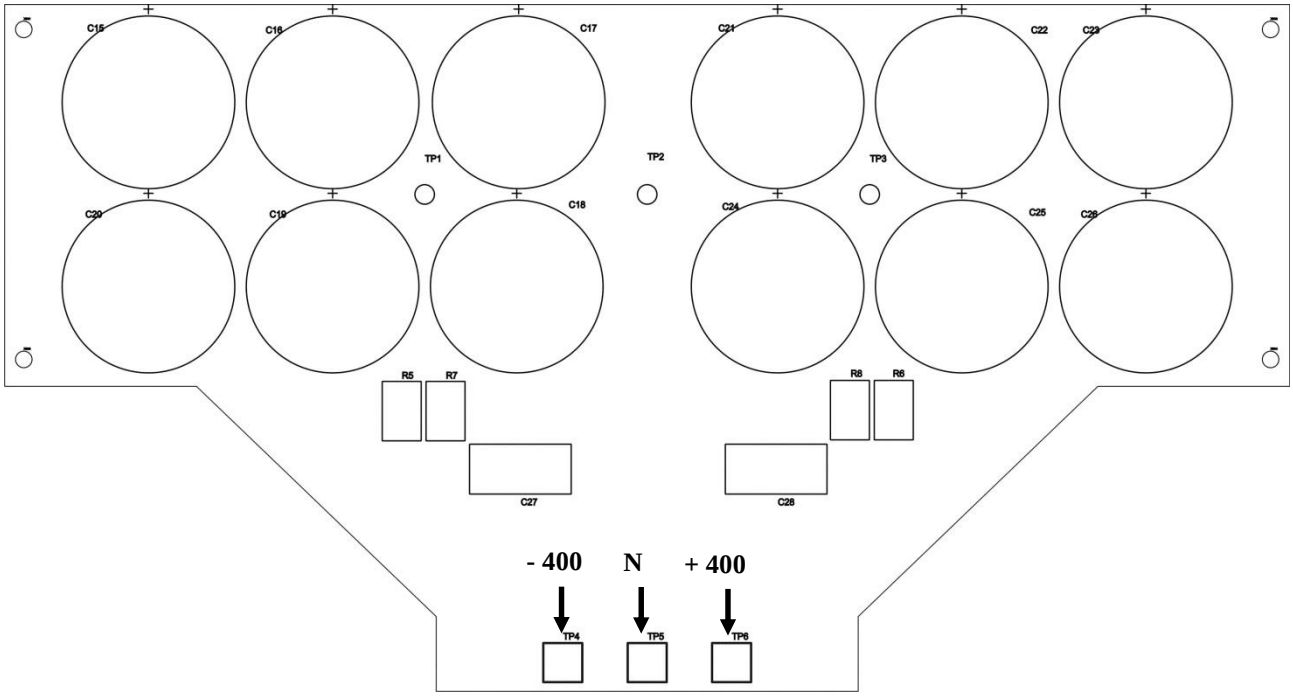


Fig. 42

5.10 BOOST DRIVER BOARD (B0209)

Versions:
B0209-01. Driver Boost Board 200kVA
B0209-02. Driver Boost Board 125-160kVA

The driver boost board is connected to the signal board B0210 through the pinstrip connectors.
Note: This is not listed as spare part because it comes together with the BOOST IGBT MODULE.

In this board you can find:

1) driver and electronic desat circuit for boost up
2) driver and electronic desat circuit for boost down

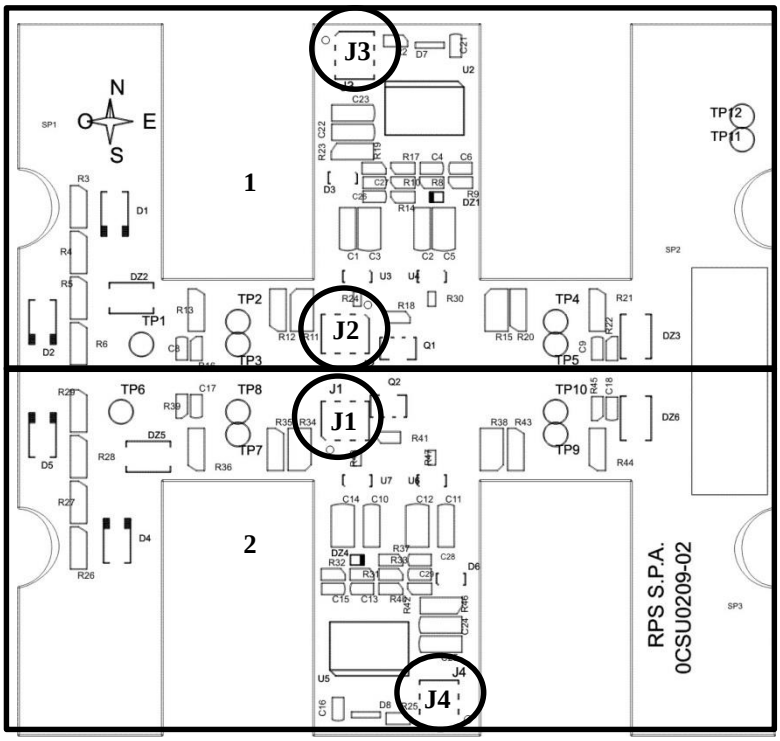
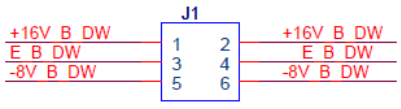
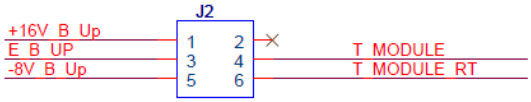


Fig. 43

Connectors on B0210 board:

Connector	Description	Note
J1	Power supply Boost DW	 Connected to J8 B0210
J2	Power supply Boost UP + module IGBT temperature	 Connected to J14 B0210
J3	Signals and Power supply at Boost UP optoisolator	Connected to J10 B0210
J4	Signals and Power supply at Boost DW optoisolator	Connected to J13 B0210

5.11 SIGNAL BOOST BOARD (B0210)

Version:
B0210-01. Boost Signal Card 125-160-200kVA

Inside the board there are:

1) R18 = fuse resistor 1,2Ω 500mW
2) buffer to drive the booster IGBT
3) electronic circuit for HF power supply
4) electronic circuit to indicate boost up / down fault
5) resistors of measure the booster currents
6) electronic circuit to measure in module temperature

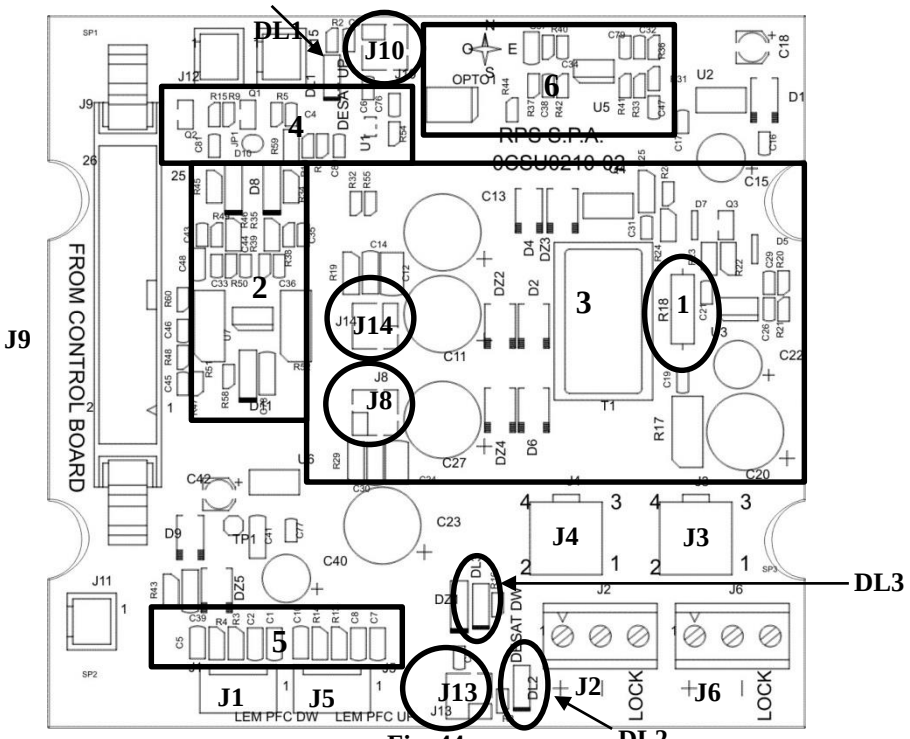
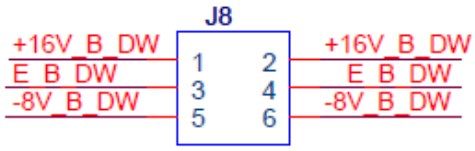
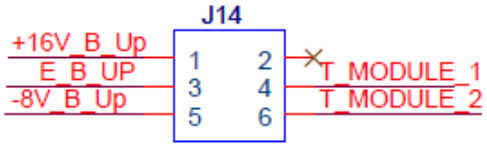


Fig. 44

Connector	Description	Note
J1	Connector include power supplies and e LEM boost UP signal	To LEM boost DW
J2	Connector for primary fans (A)	Power supplies + LOCK
J3	Power supply connector for fans	From J4 B0212 (A e B) PH1
		From J5 B0212 (A e B) PH2
		From J6 B0212 (A e B) PH3
J4	Connector for power supplies fans	To J2 B0216
J5	Connector include power supplies and e LEM boost DW signal	From LEM boost UP
J6	Connector for secondary fans (B)	Power supplies + LOCK
J9	Flat connector for signal to control board (PH1,PH2,PH3)	To J36 B0213 (PH1)
		To J37 B0213 (PH2)
		To J38 B0213 (PH1)

Connectors on B0209 board:

Connector	Description	Note
J8	Boost DW power supplies	 Connected to J1 B0209
J14	Boost UP power supply + module temperature	 Connected to J2 B0209
J10	Signals and Power supply at Boost UP optoisolator	Connected to J3 B0209
J13	Signals and Power supply at Boost DW optoisolator	Connected to J4 B0209

Led indications:

LED	Description	Note
DL1 (RED)	Indication for Boost UP DESAT	On if DESAT has triggered on Boost UP
DL2 (RED)	Indication for Boost DW DESAT	On if DESAT has triggered on Boost DW
DL3 (GREEN)	Signals for HF	On if the +24HF is present

5.12 REDUNDAND AUX BOARD (B0211)

Version:
B0211-01. Redundant AUX PW Supply Card

Inside B0211 board there are:

1) Dc power supplies +27V, +14,5V
2) Bypass latch circuit
3) F1= Fuse T 2A 250V 5x20

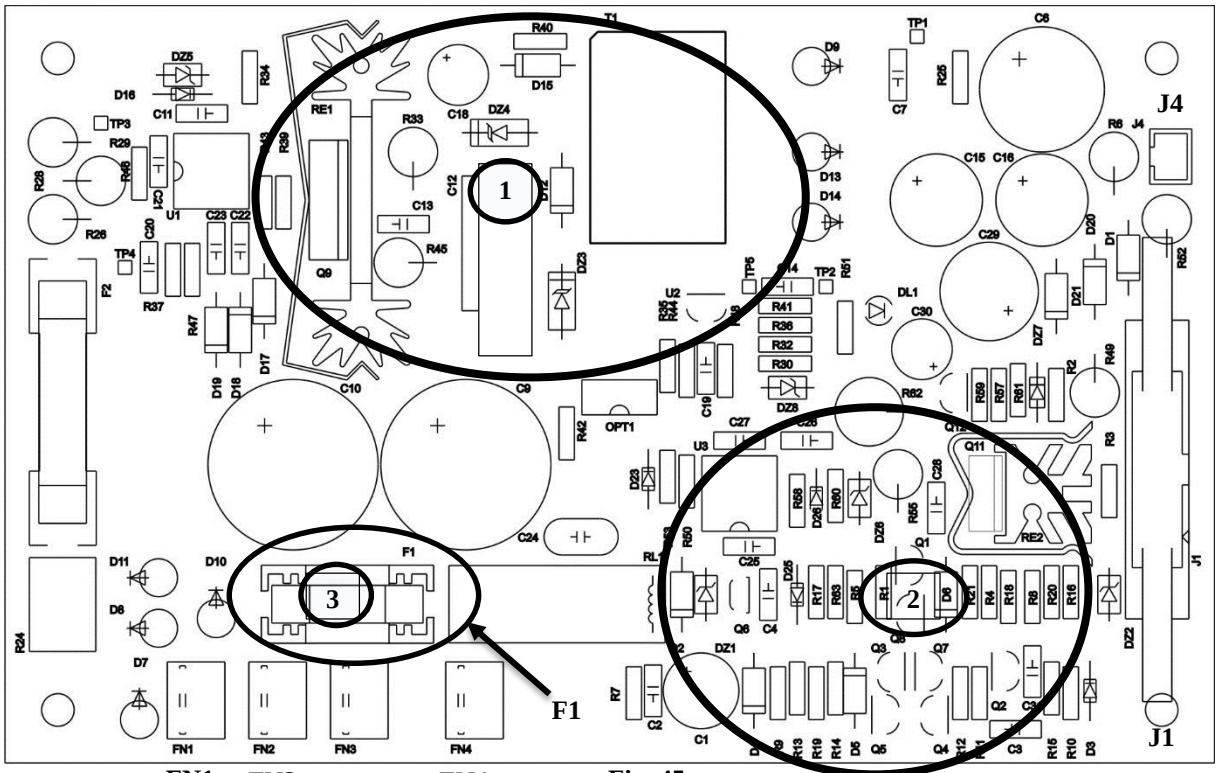


Fig. 45

Connector	Description	Note
J1	Flat connected to control board	To J26 B0213
J4	Connector for parallel board	
FN1	Connector for input fuses PH1	
FN2	Connector for SW BYP PH2	
FN3	Connected to neutral busbar (N)	
FN4	Power supply for AC bypass fans	

Test Point	Voltages present
Between TP1 and TP5	+27V
Between TP2 and TP5	+14,5V
Between TP3 and TP4	+13V

Indication led	Meaning
DL1 (GREEN)	On if power supply is on

Connector pinout:

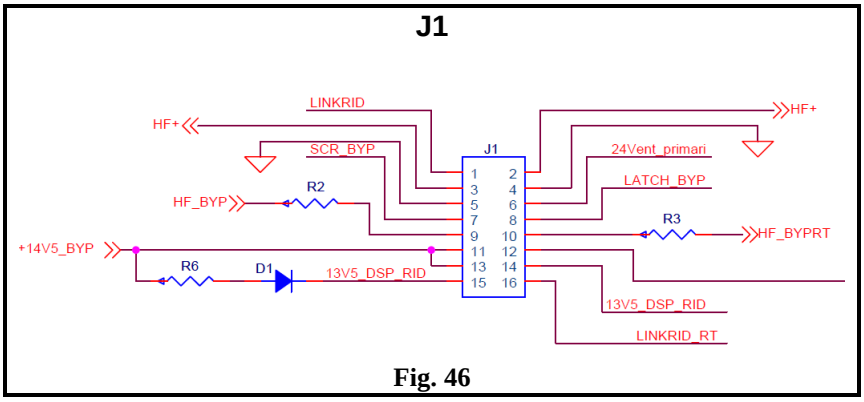


Fig. 46

5.13 FAN POWER SUPPLIY BOARD (B0212)

Version:
B0212-01. Fan Power Supply Card

On the UPS there are two fan power supplies: A for primary fans FAN A and B for redundant fans FAN B.

In this board you can find:

1) Fans power supply
2) Electronic circuit to regulate the speed fans
3) F2= Fuse T 8A 250V 5x20

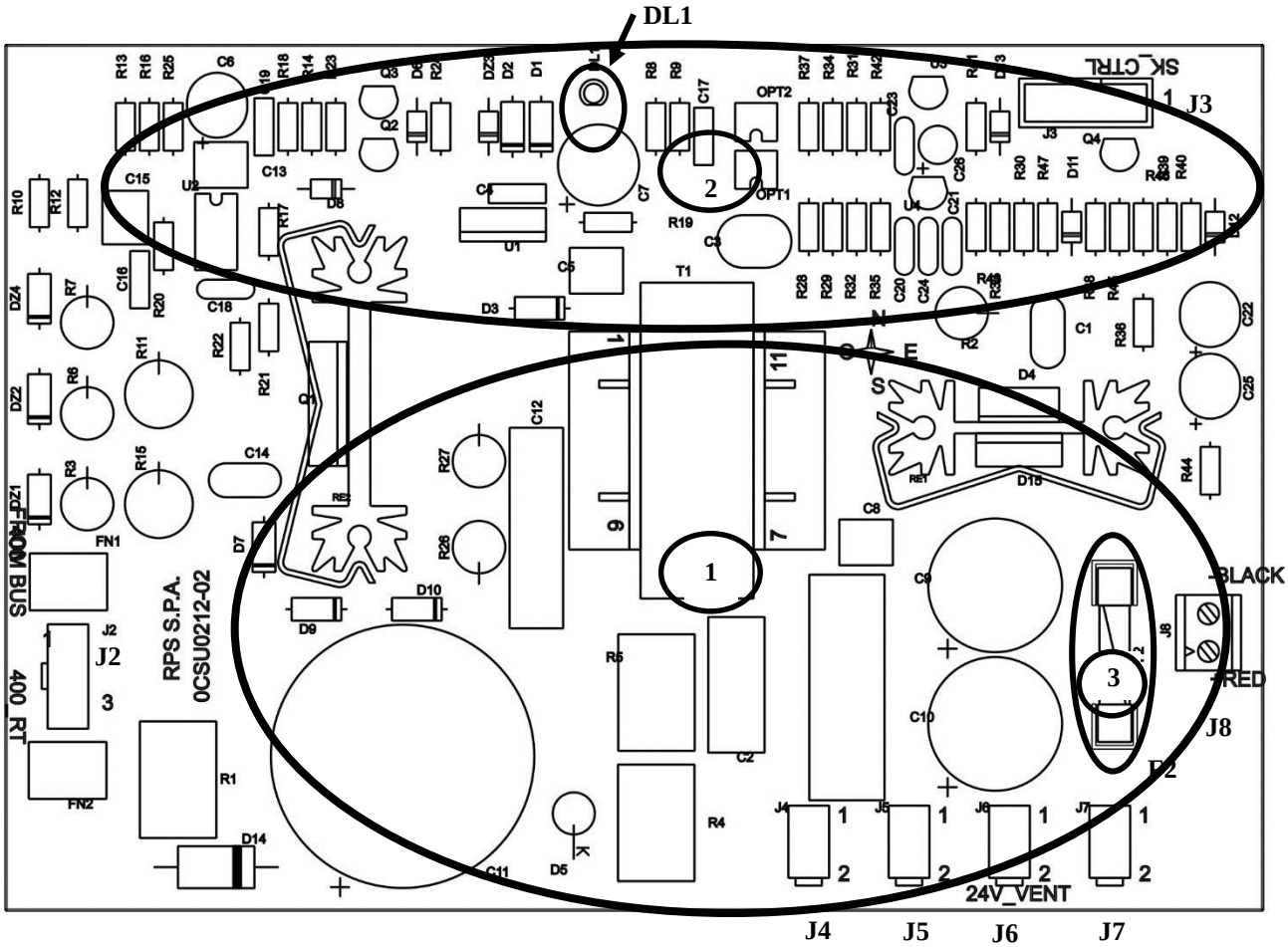


Fig. 47

Primary power supply for A fans (external):

Connector	Description	Note
J2	Power supply connector	From N bar and FN3 B0240
J3	Connector to control board	To J24 B0213
J4	Power supply connector DC bypass fans	To J3 B0210 PH1
J5	Connector to supply the primary fans on PH1	To J3 B0210 PH2
J6	Connector to supply the primary fans on PH2	To J3 B0210 PH3
J7	Connector to supply the primary fans on PH3	To J2 B0207 PH1
J8	Power supply connector for fan	

Redundant power supply for B fans (internal):

Connector	Description	Note
J2	Power supplies connector	From N bar and FN1 B0240
J3	Connector to control board	To J25 B0213
J4	Connector to supply the secondary fans on PH1	To J3 B0210 PH1
J5	Connector to supply the secondary fans on PH2	To J3 B0210 PH2
J6	Connector to supply the secondary fans on PH3	To J3 B0210 PH3

LED	Description	Note
DL1 (GREEN)	Fans led	On if the fans are feeded

Pinout connector:

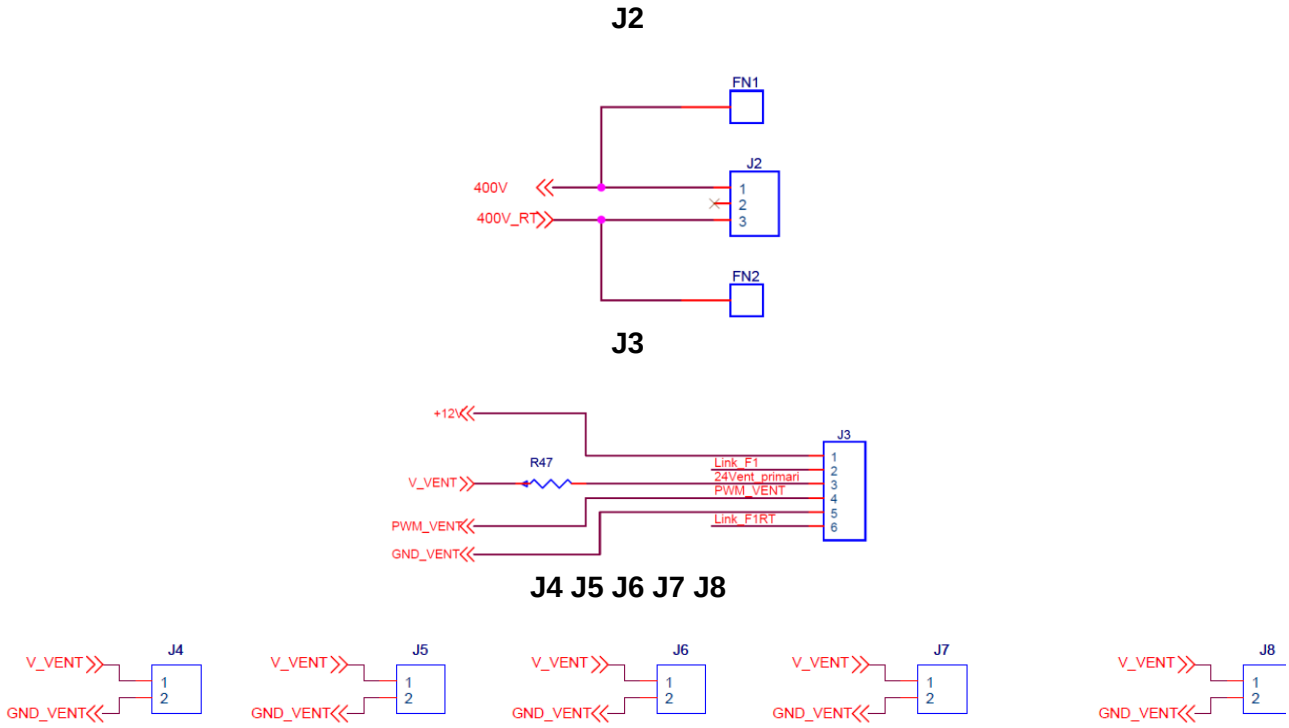


Fig. 48

5.14 CONTROL BOARD (B0213)

Versions:
B00213-01. Signal Control Card 200 kVA
B00213-02. Signal Control Card 160 kVA

Connectors position on the control board:

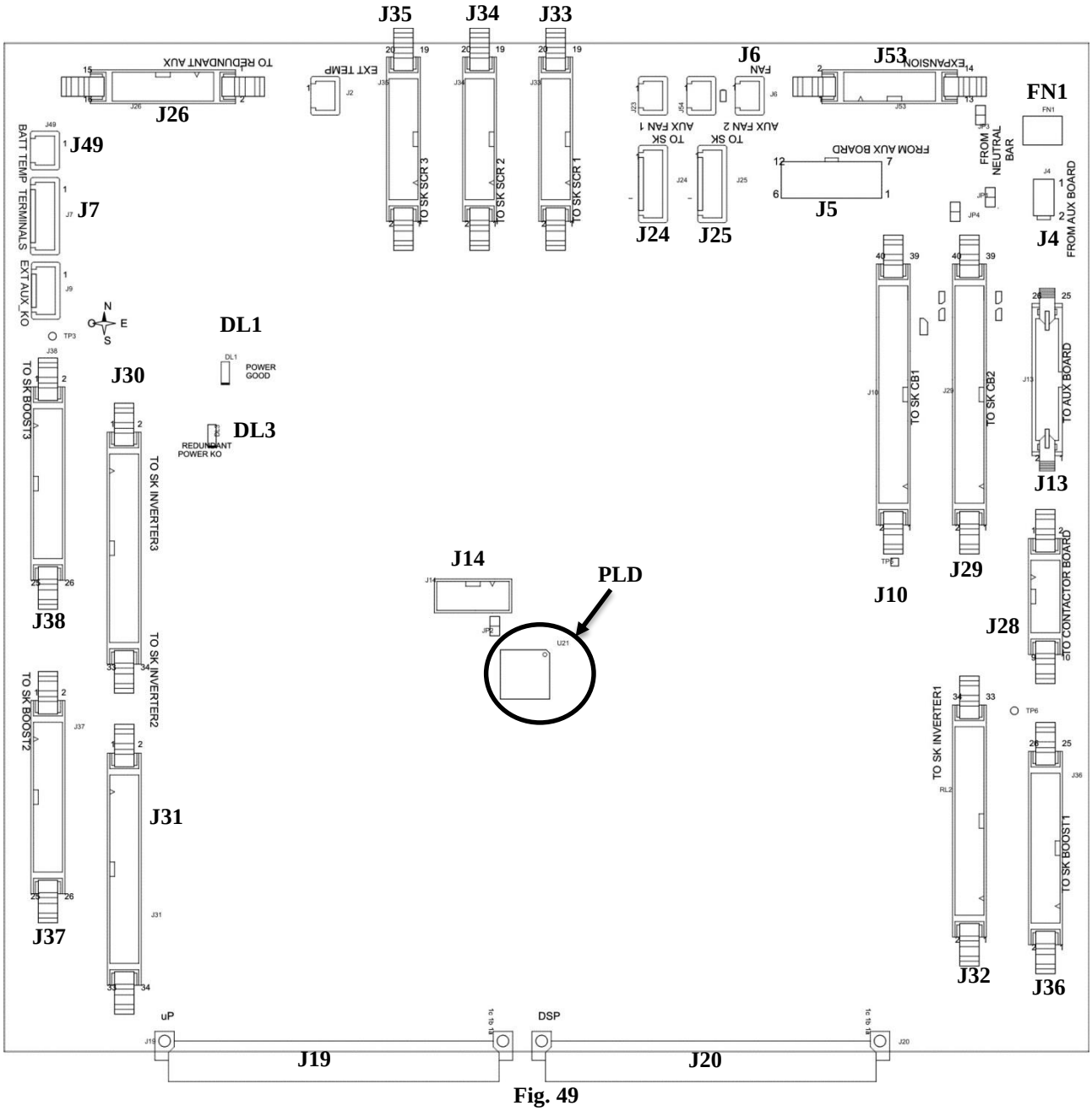


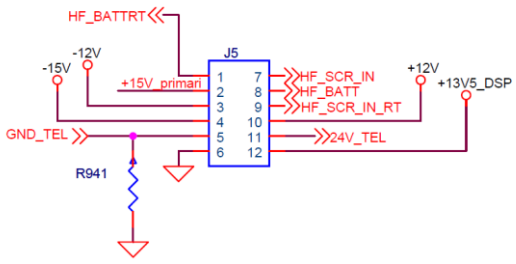
Fig. 49

Connector	Description	Note
FN1	Neutral connector	Connected to neutral bar
J4	HF+/- connector	From J11 B0059
J5	Power supply connector	From J9 B0059
J6	Fans power supply connector	To fans in the section
J7	Connector for auxiliary signals	To auxiliary signal panel
J10	Flat for battery charger (CB1)	To J6 B0084
J13	Flat for signals from aux power supply board	From J8 B0059
J14	JTAG (for PLD programming)	
J19	Connector for uP signals	From J5 B0067
J20	Connector for DSP signals	From J7 B0067
J24	Connector to primary fans power supply board	To J3 B0212 (A-primary)
J25	Connector to redundant fans power supply board	To J3 B0212 (B-secondary)
J26	Flat to redundant fans power supply board	To J1 B0211
J28	Flat to driver output contactor	To J2 B0214
J29	Flat second battery charger (CB2-optional)	To J6 B0084
J30	Flat signals inverter PH3	To J6 B0216 (PH3)
J31	Flat signals inverter PH2	To J6 B0216 (PH2)
J32	Flat signals inverter PH1	To J6 B0216 (PH1)
J33	Flat signals to driver SCR PH1	To J4 B0207 (PH1)
J34	Flat signals to driver SCR PH2	To J4 B0207 (PH2)
J35	Flat signals to driver SCR PH3	To J4 B0207 (PH3)
J36	Flat signals booster PH1	To J9 B0210 (PH1)
J37	Flat signals booster PH2	To J9 B0210 (PH2)
J38	Flat signals booster PH3	To J9 B0210 (PH3)
J49	Connector for BATT_TEMP	To auxiliary signal panel
J53	Connector to expansion card	

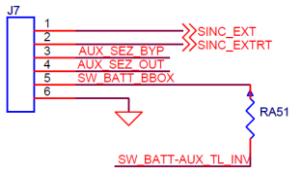
LED	Description	Note
DL1 (GREEN)	POWER GOOD	On if the power supply is OK
DL3 (RED)	REDUNDANT POWER KO	Off if the redundant power supply is OK

Pinout connectors:

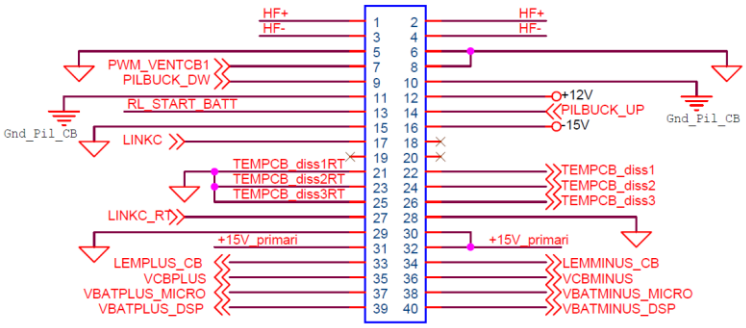
J5



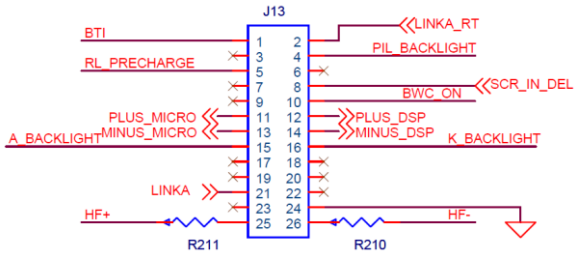
J7



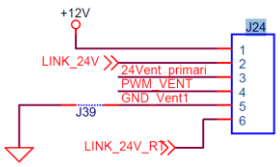
J10 J29



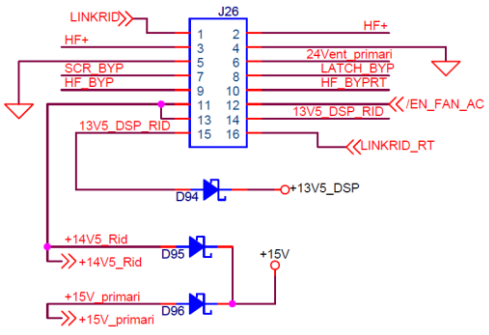
J13



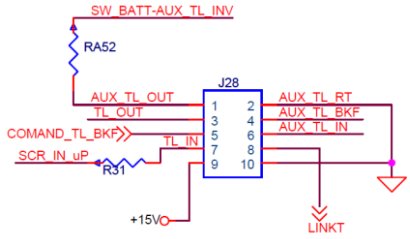
J24 J25



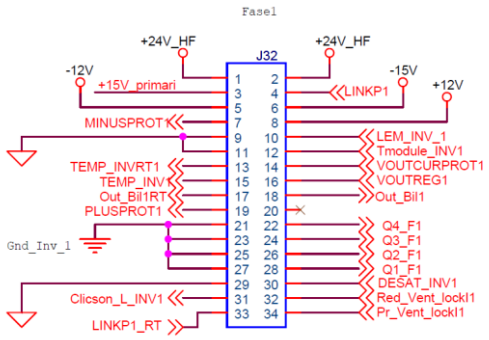
J26



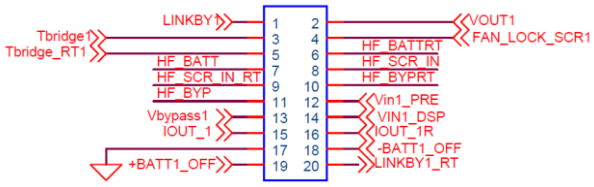
J28



J30 J31 J32



J33 J34 J35



J36 J37 J38

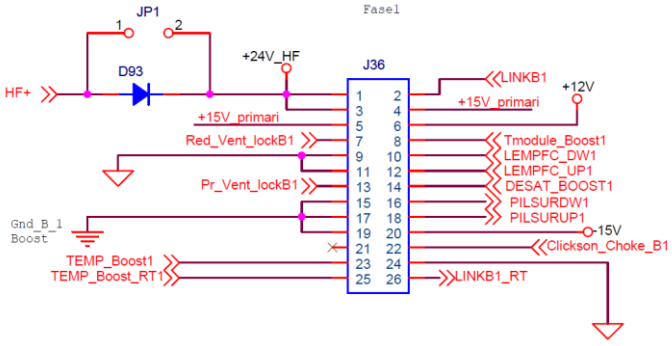


Fig. 50

5.15 CONTACTOR DRIVER BOARD (B0214)

Version:
B0214-01. Contactor Driver Card

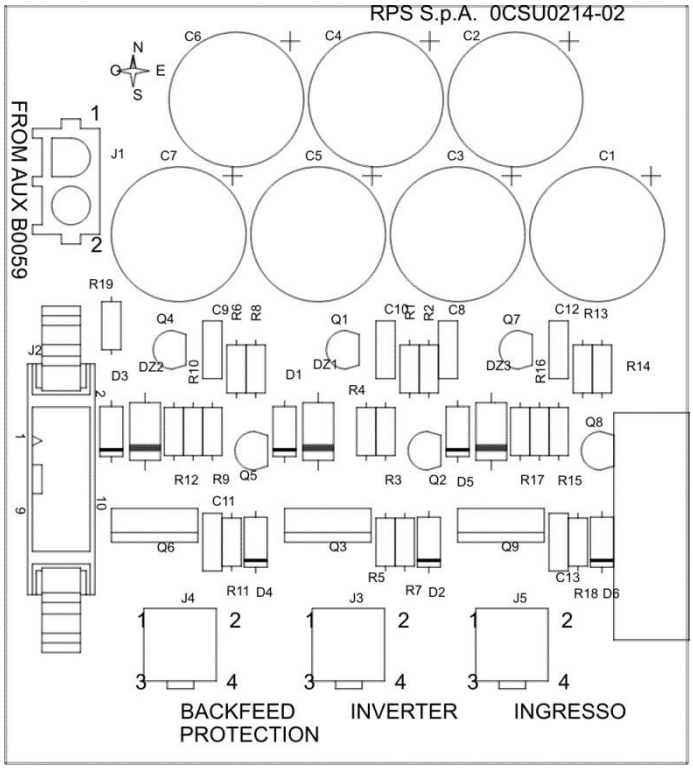


Fig. 51

Connector	Description	Note
J1	Connector from auxiliary power supply	From J10 B0059
J2	Connector signal flat from control board	To J28 B0213
J3	Connector to drive the contactor	To contacts A1/A2 of contactor

Pinout connectors:

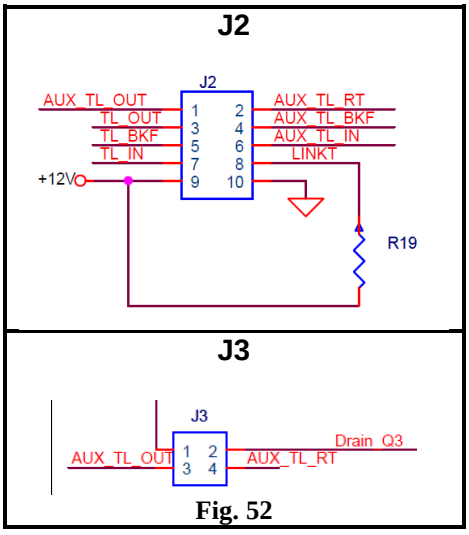


Fig. 52

5.16 INVERTER DRIVER BOARD (B0215)

Versions:
B0215-01. Driver inverter Board 200 kVA
B0215-02. Driver inverter Board 125-160 kVA

Note: This is not listed as spare part because it comes together with the INVERTER IGBT MODULE

The inverter driver board is connected to signal inverter board B0215 through the pin strip connectors, highlighted in the figure below, necessary to drive the 4 IGBTs:

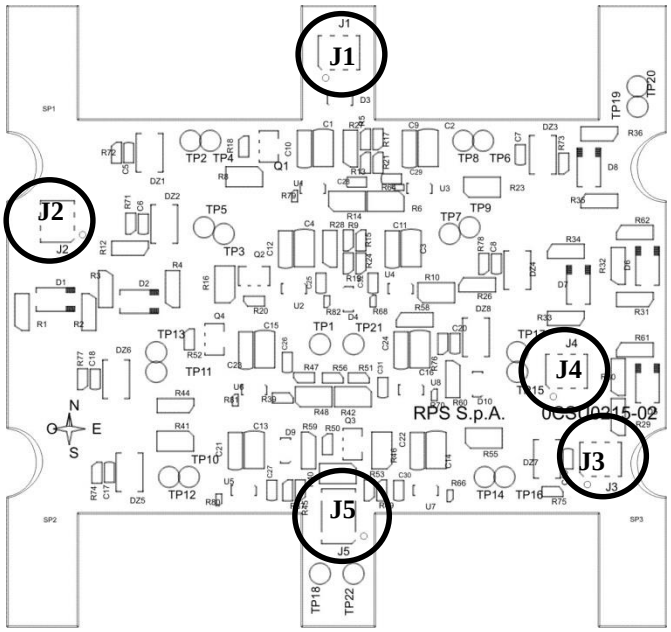
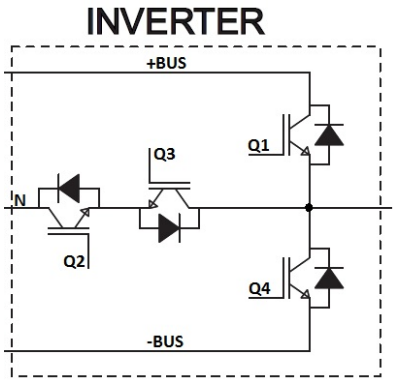
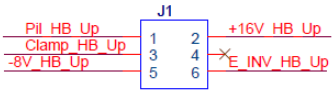
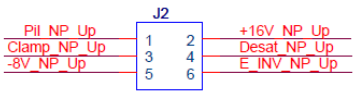
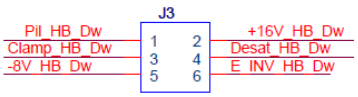
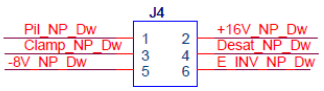


Fig. 53



Connectors on the B0215 board:

Connector	Description	Note
J1	Power Supplies Q1 (IGBT HB_Up inverter)	 Connected to J10 B0216
J2	Power Supplies Q2 (IGBT NP_Up inverter)	 Connected to J11 B0216
J3	Power Supplies Q4 (IGBT HB_Dw inverter)	 Connected to J13 B0216
J4	Power Supplies Q3 (IGBT NP_Dw inverter)	 Connected to J12 B0216

J5	DESAT (IGBT HB_Up inverter) and module temperature	Connected to J9 B0216

5.17 INVERTER SIGNAL BOARD (B0216)

Version:
B0216-01. Inverter Signal Card 160-200 kVA

In the board there are:

1) R26 = fuse resistor 1,2Ω 500mW
2) R35 = fuse resistor 1,2Ω 500mW
3) buffer to drive 4 inverter IGBTs
4) HF for IGBT
5) resistors to measure the inverter currents
6) electronic circuit to measure in module temperature
7) resistive divider to measure the output voltage
8) electronic circuit to measure the unbalance output voltage

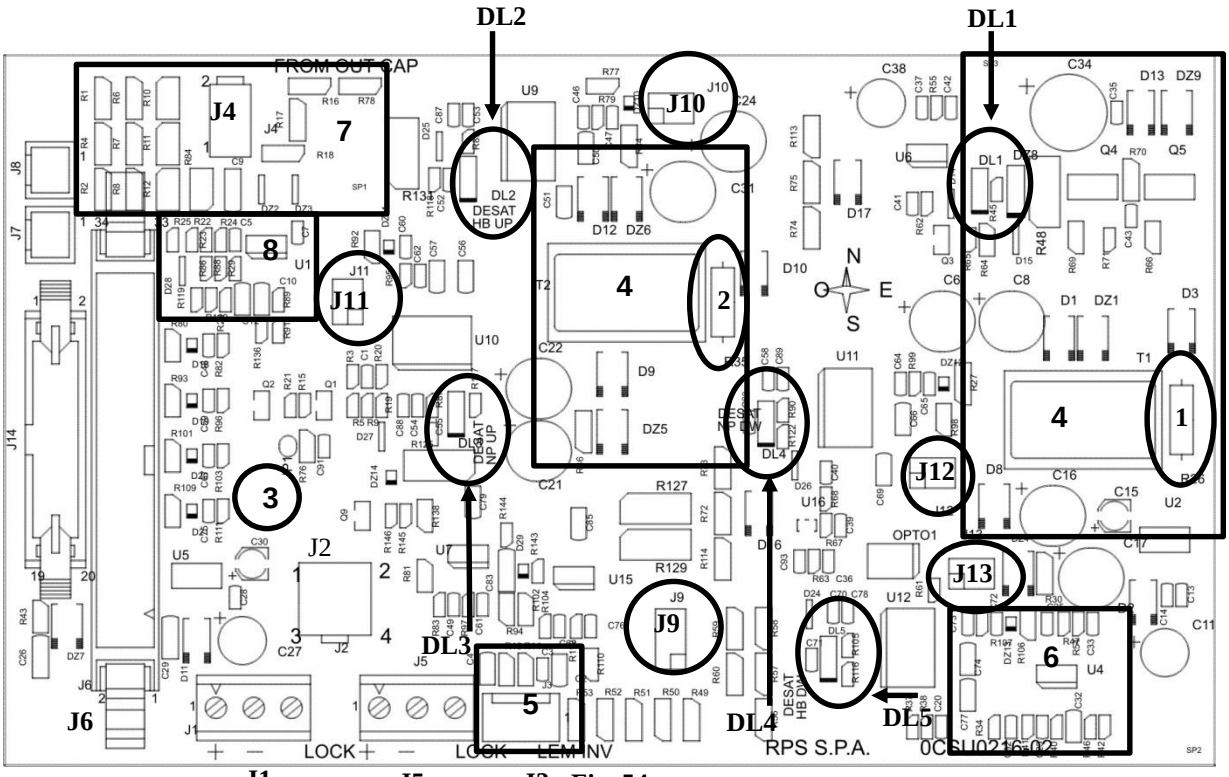
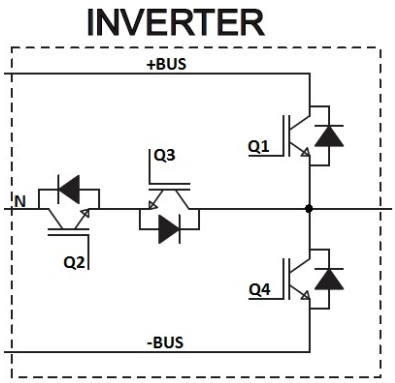
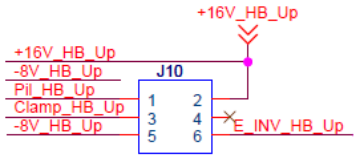
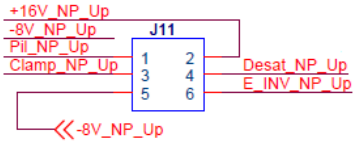
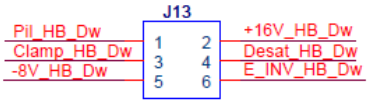
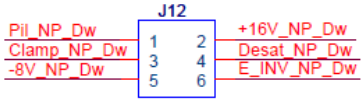


Fig. 54

Connector	Description	Note
J1	Connector for primary fan (A)	+ LOCK on power supply
J2	Connector to fed the fans from signal boost board	From J4 B0210
J3	Connector to fed the LEM inverter	To inverter LEM
J4	Connector for the output voltage measure	
J5	Connector for secondary fan (B)	+ LOCK on power supply
J6	Connector for signal flat connected to output board (PH1,PH2,PH3)	To J32 B0213 (PH1)
		To J31 B0213 (PH2)
		To J30 B0213 (PH3)

Connections from B0125 board:



Connector	Description	Note
J10	Power Supplies Q1 (IGBT HB_Up inverter)	 Connected to J1 B0215
J11	Power Supplies Q2 (IGBT NB_Up inverter)	 Connected to J2 B0215
J13	Power Supplies Q4 (IGBT HB_Dw inverter)	 Connected to J3 B0215
J12	Power Supplies Q3 (IGBT NP_Dw inverter)	 Connected to J4 B0215
J9	DESAT (IGBT HB_Up inverter) and module temperature	Connected to J5 B0215

LED indication:

LED	Description	Note
DL1 (GREEN)	Indications for HF	On if the signal +24HF is present
DL2 (RED)	DESAT Q1 inverter indication	On if DESAT has triggered on Q1
DL3 (RED)	DESAT Q2 inverter indication	On if DESAT has triggered on Q2
DL4 (RED)	DESAT Q3 inverter indication	On if DESAT has triggered on Q3
DL5 (RED)	DESAT Q4 inverter indication	On if DESAT has triggered on Q4

5.18 DC CAPACITORS INVERTER BOARD (B0217)

Versions:
B0217-01. DC Capacitors Inv Card 200 kVA
B0217-02. DC Capacitors Inv Card 160 kVA

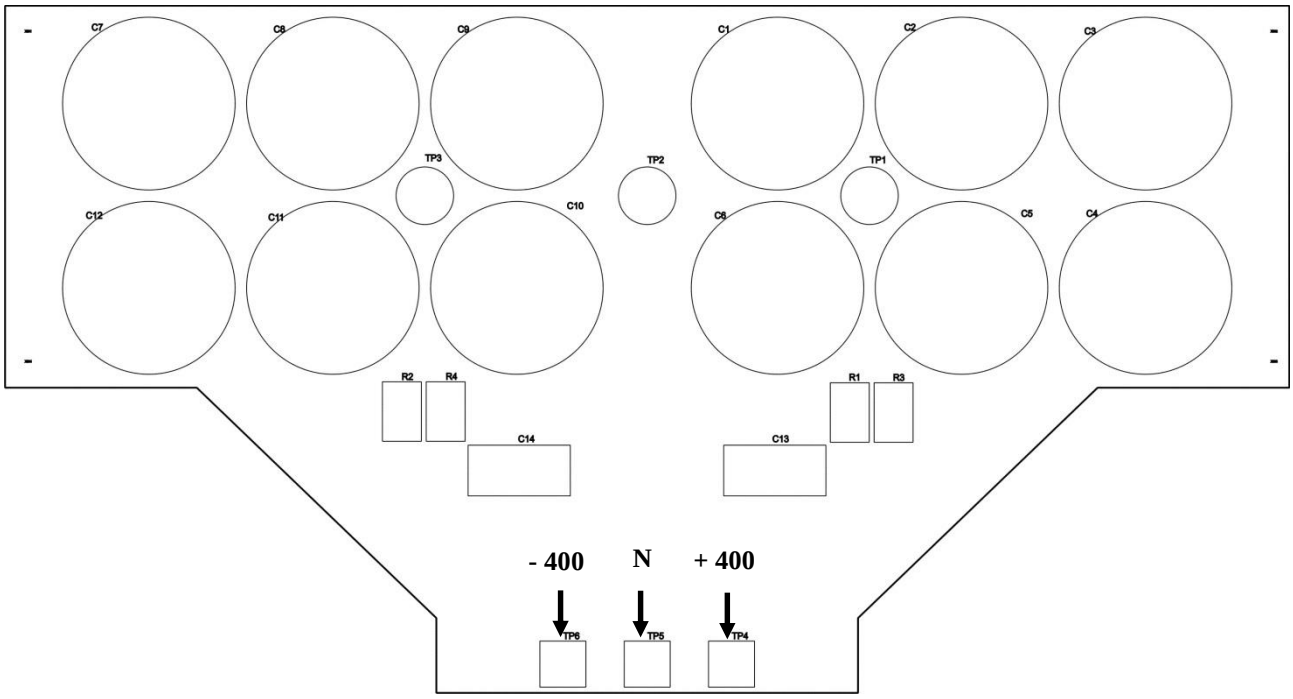


Fig. 55

5.19 PRECHARGE BOARD (B0231)

Version:
B0231-01. Resistance Precharge Card

Values of the precharge resistors: R1=R2=R3=R4=R5=R6=R7=R8=R9=4.7Ω 25W 5%

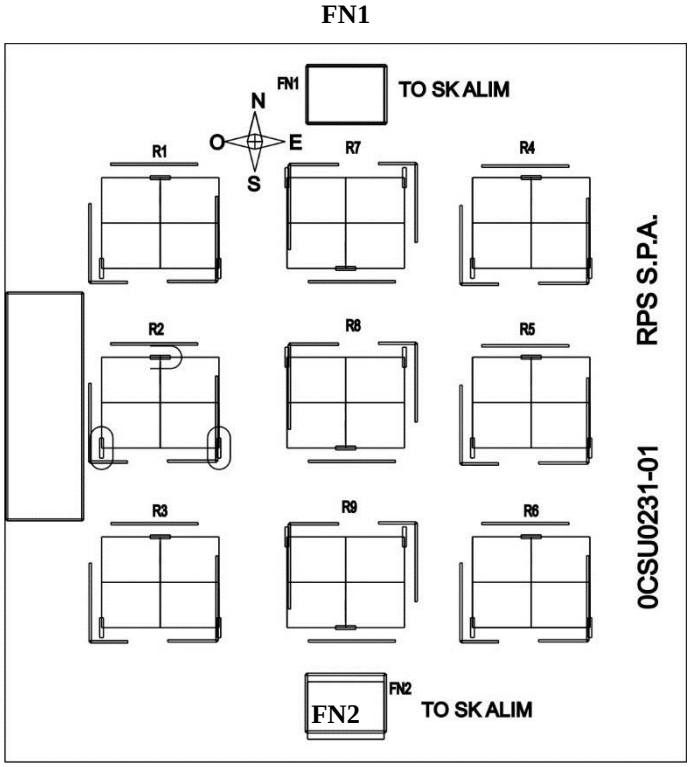


Fig. 56

Connector	Description	Note
FN1	Connector to auxiliary power supply	To FN1 B0059
FN2	Connector to auxiliary power supply	To FN2 B0059

5.20 FUSE BOARD (B0240)

Version:
B0240-01. Aux DC Fuse Card 160-200 kVA

Inside the board there are:

- F1 = 2A 500V 6,3X32 GF fuse
- F2 = 20A 500V 6,3X32 faster fuse
- F3 = 2A 500V 6,3X32 GF fuse
- F4 = 20A 500V 6,3X32 faster fuse

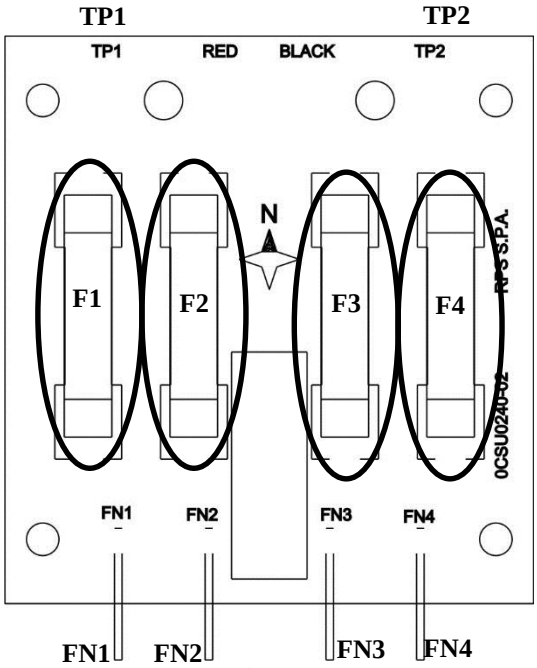


Fig. 57

Connector	Description	Note
TP1	Connection to +400V	Connected to +400V bar
TP2	Connection to -400V	Connected to -400V bar
FN1	Connector to secondary B0212 board	To J2 B0212 (B)
FN2	Connector to auxiliary power supply board	To J11 B0059
FN3	Connector to primary B0212 board	To J2 B0212 (A)
FN4	Connector to auxiliary power supply board	To J11 B0059

6 AUXILIARY POWER SUPPLY LOCK

6.1 AUX KO (L01) DETECTION LOGIC

A logic test must be carried out on the control board to check whether the auxiliary power supplies are present and correct. The test is performed:

- on +3V3, +12V, -12V e +5V voltages (for analogue/digital parts of the control board and uC DSP board);
- on HF+ voltage, in particular on +27Vdc, is created by auxiliary power supply board B0059 or redundant power supply board B0211, for the boost and inverter IGBTs, for the battery charger and for the communication interface board.
- on +24V voltage (from B0059 board) to fed the fans of "*AUXILIARY POWER SUPPLY AND CONTROL SECTION*"

If all the power supplies are correct, the UPS starts up; otherwise, the machine stops and displays L01.

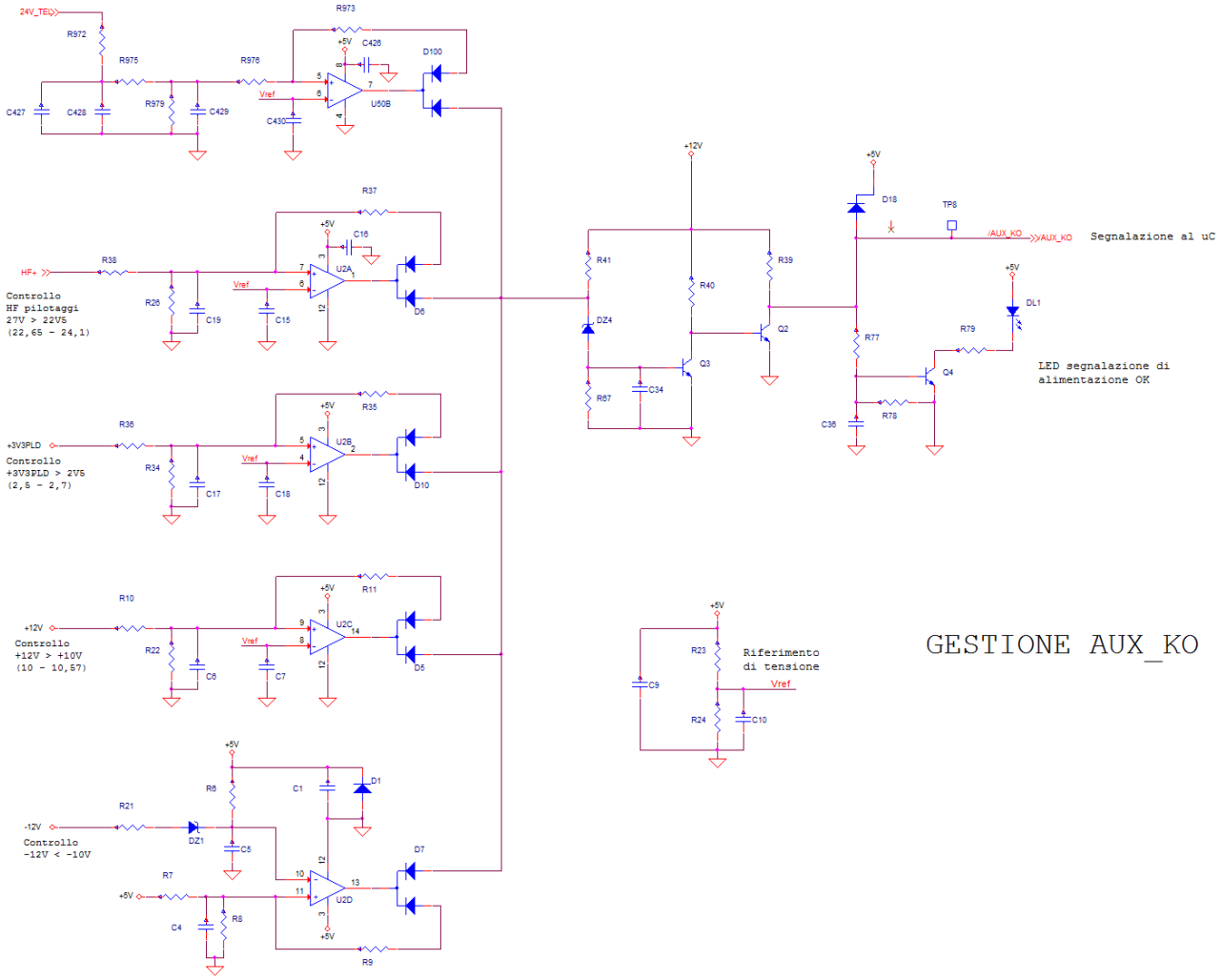


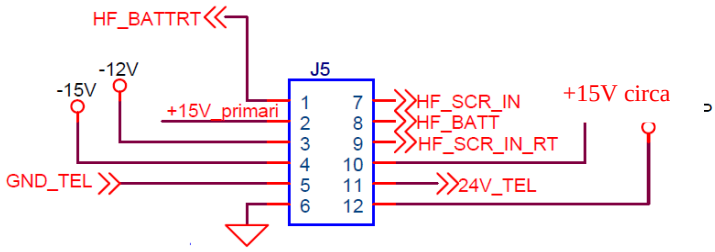
Fig. 58

The difficulty to resolve this kind of fault lies in identifying the cause of the problem. In particular, it is necessary to understand why the control logic of board B0213 has failed.

6.2 CHECK AUX VOLTAGE (L01)

To understand the problem about the L01 alarm, is necessary to check the voltage/s not present. So, is possible to measure, on control board B0051, these points (with UPS in standby mode):

Fig. 59



On the connector J5 on board B0213 without to disconnect the cable, measure between the pins
2 & 6 → +15V
3 & 6 → -12V
4 & 6 → -15V
10 & 6 → +12V
12 & 6 → +15V

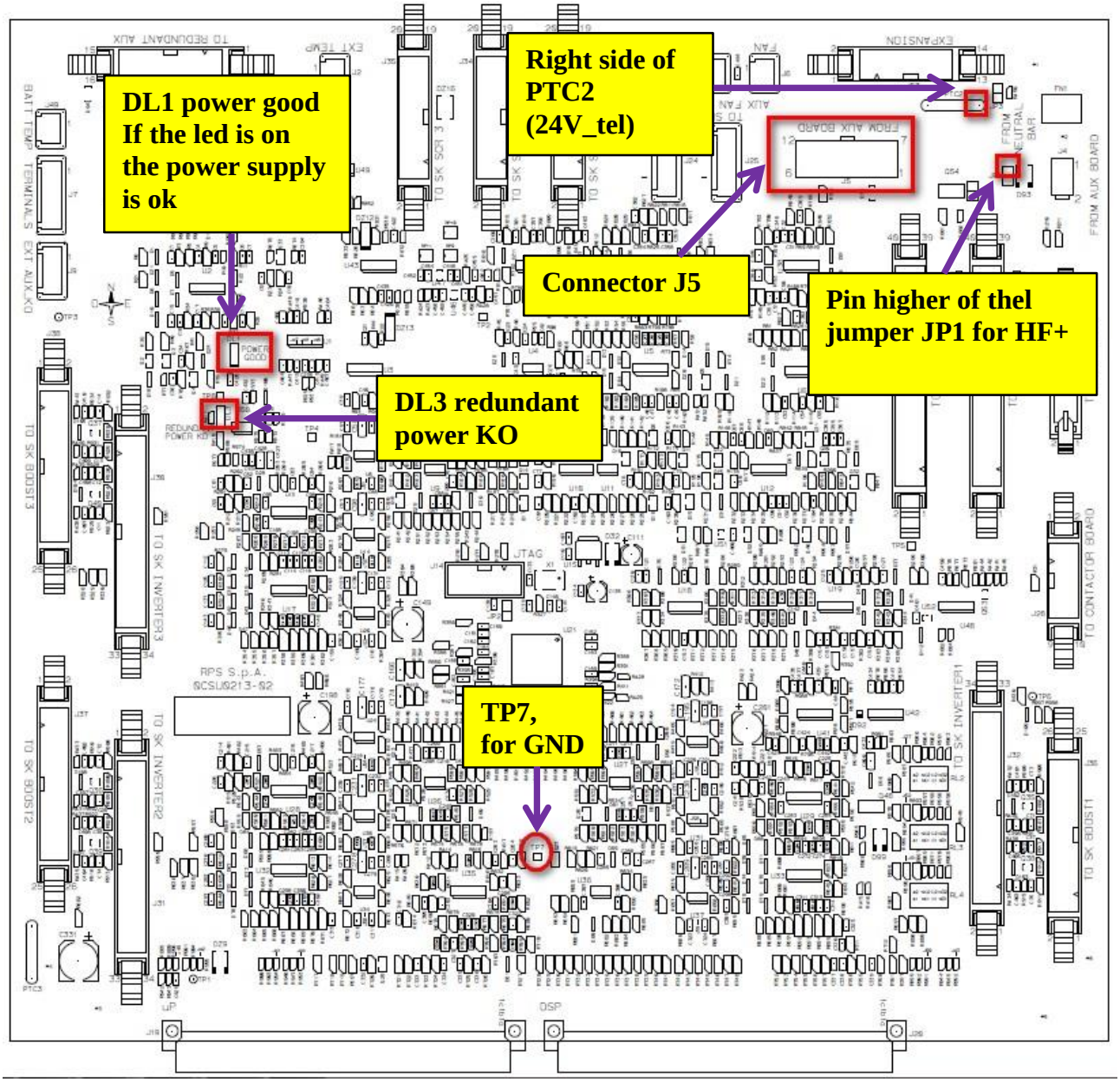


Fig. 60

- Between higher pins of JP1 and TP7 → 27V
- Between PTC2 and TP7 → 24V

6.3 ANALISYS OF MAIN POWER SUPPLY

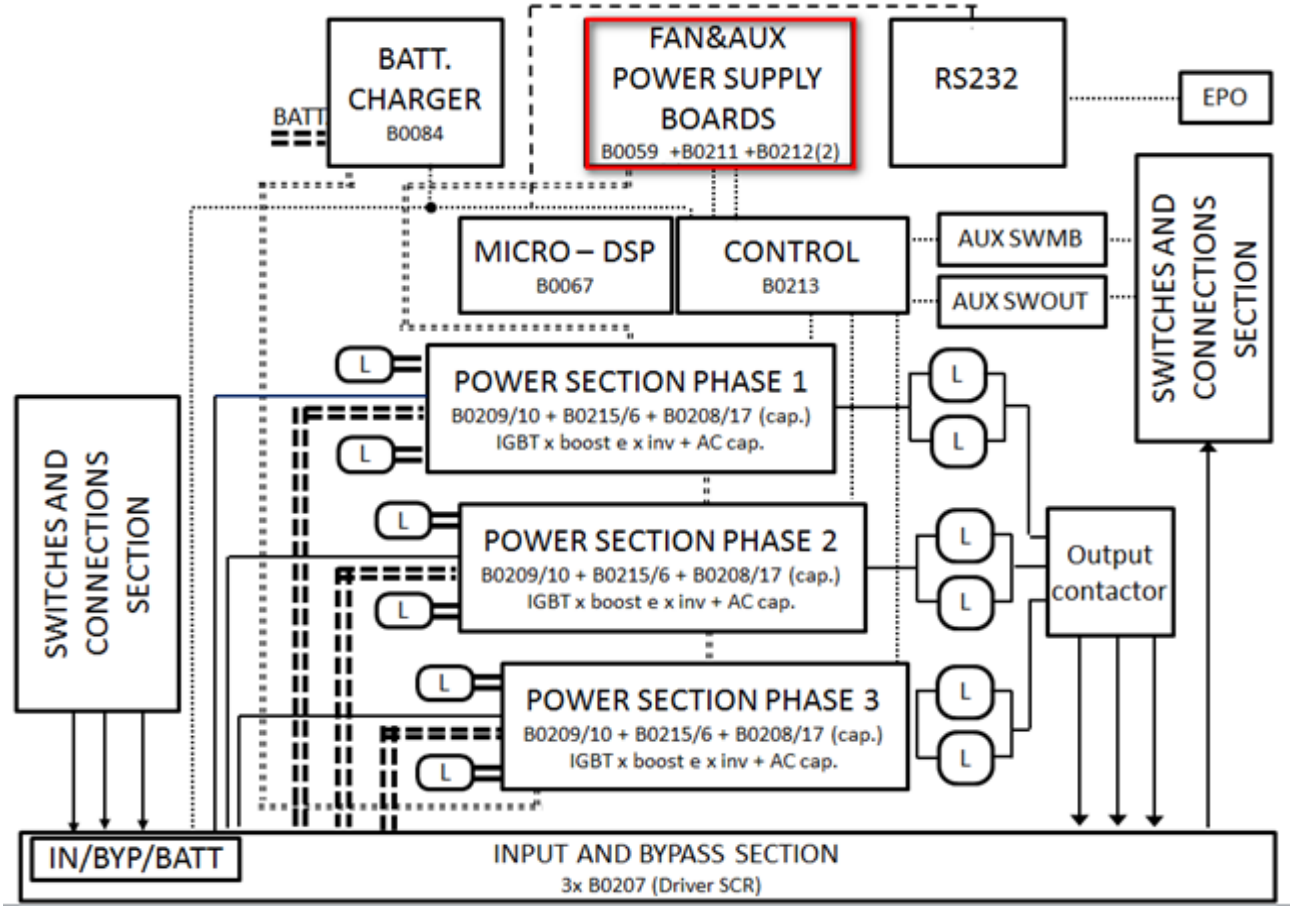


Fig. 61

OBSERVATIONS

If the auxiliary power supply unit ceases to provide the correct power supply (i.e. the 12V or HF supplies), the logic board stops the UPS and displays error L01.
In the most serious cases the machine cannot switch on if the voltage supplied from the power supply unit is insufficient to activate the logic board.
The presence of power supply voltages can be checked directly on board B0059 by disconnecting connector J9 (**with the UPS completely switched off**) and leaving J11 connected closing the SWIN. Check for the presence of power supply voltages and, if possible, the presence of the HF+ supply (measuring between HF+ and N with the multimeter in DC mode, the reading should be approx. 27V).

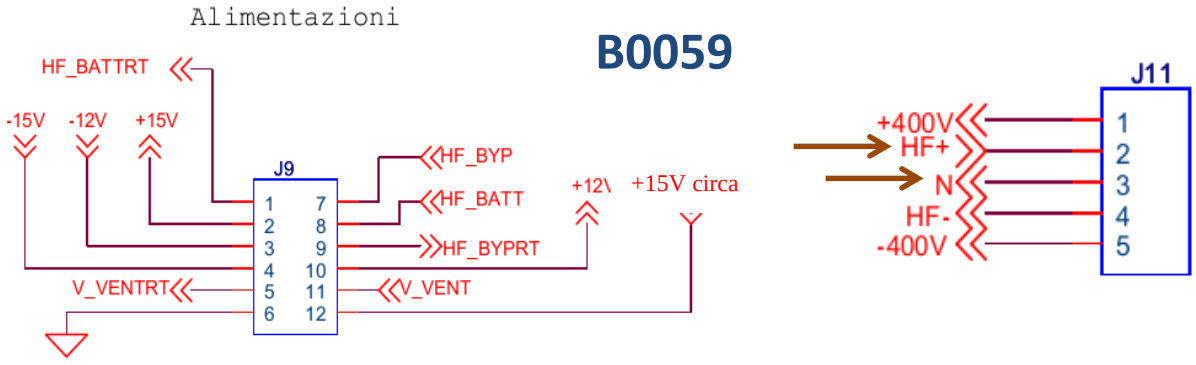


Fig. 62

6.4 ANALISYS ON MICRO DSP / CONTROL BOARD

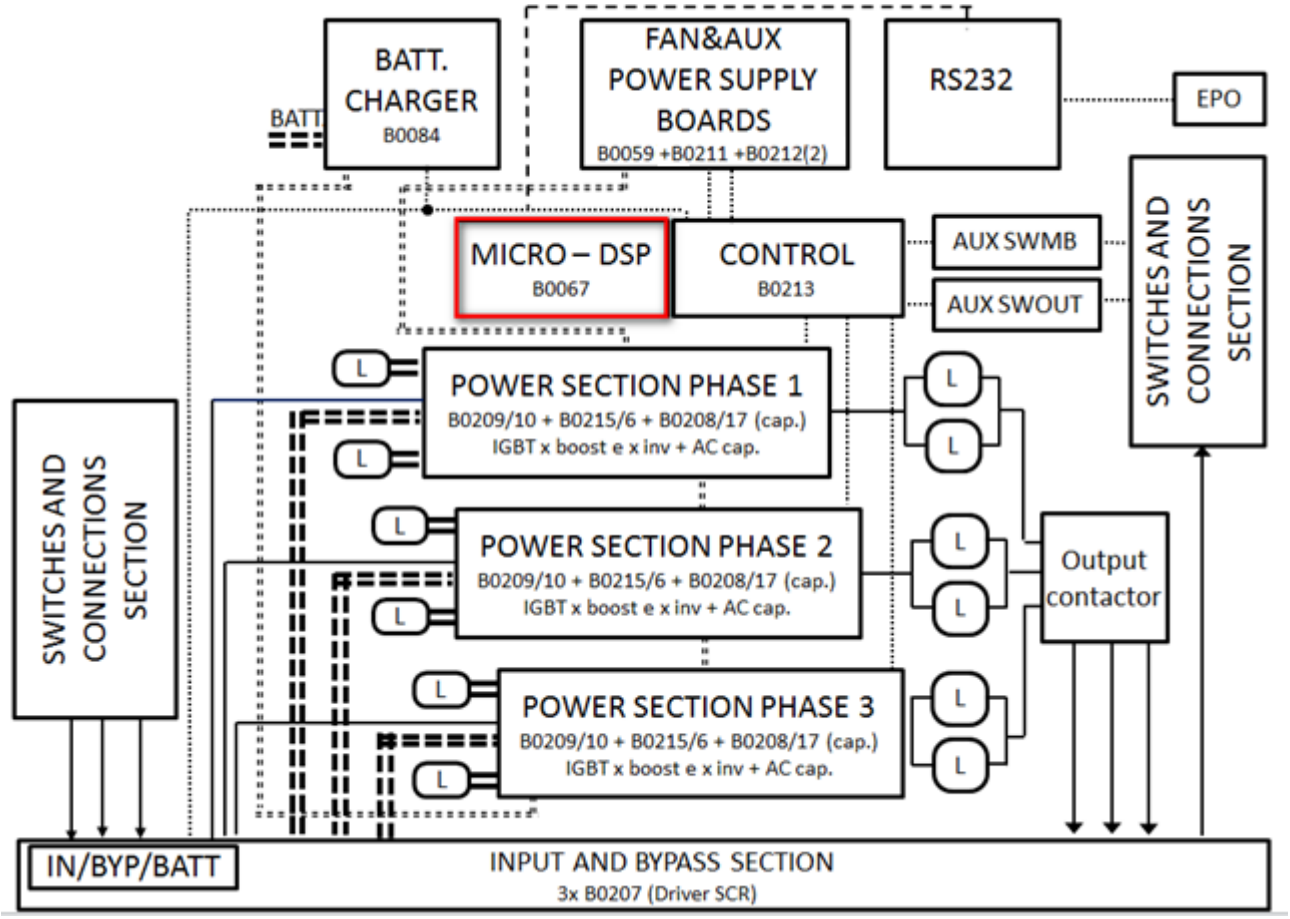


Fig. 63

It is possible that a fault on the logic boards, which affects an integrated circuit, may produce error L01 due to an error in the auxiliary power supplies test.

6.5 ANALISYS ON BOARD RS232

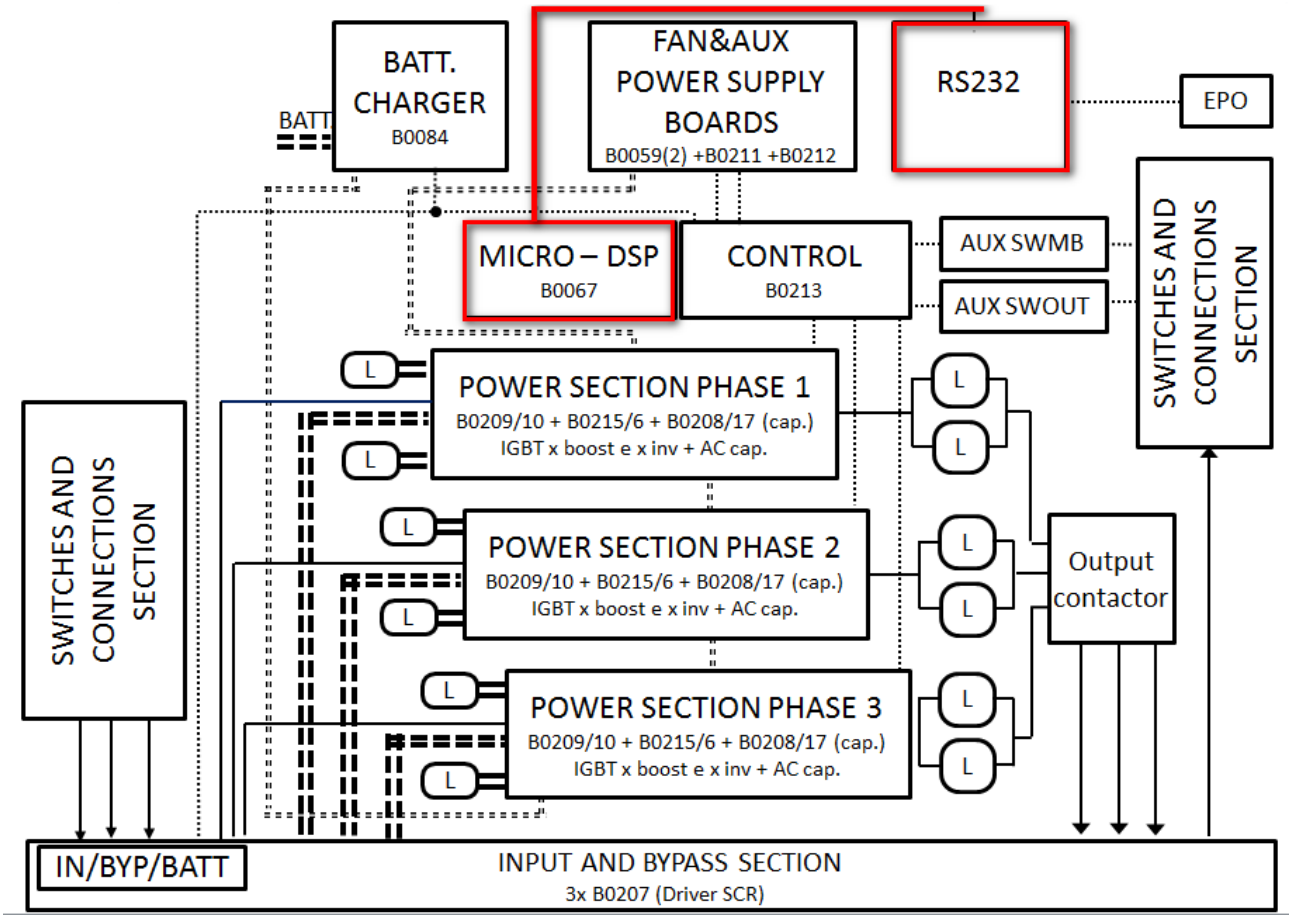


Fig. 64

The failure of a component of board RS232 (supplied by a HF line directly through the control board and DSP micro board) could cause error L01. Often, in the event of the failure of this board, the UPS also signals that the EPO is disconnected, or that a remote command is present (in reality this is a false command generated by the fault).

A serious fault may also damage the power supply unit, which should, if necessary, be replaced along with board RS232.

7 VERIFY THE COMPONENTS CONDITION

Following visible damage inside the UPS that requires the replacement of a power assembly, it is also necessary to check the status of all the other power boards (even if they appear not to be damaged).

1) Open all disconnecting switches.
2) **IMPORTANT:** completely disconnect the UPS from any power supply, including any battery boxes, 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.

7.1 BOOST MODULE CHECK

The picture below shows the diagram and the pinout to check. Use a multimeter to check the conditions of the boost module. Check all the diodes: they should not be in short circuit or completely open. There must be the polarization junction voltage. Check also, all the fuses on board B0240:

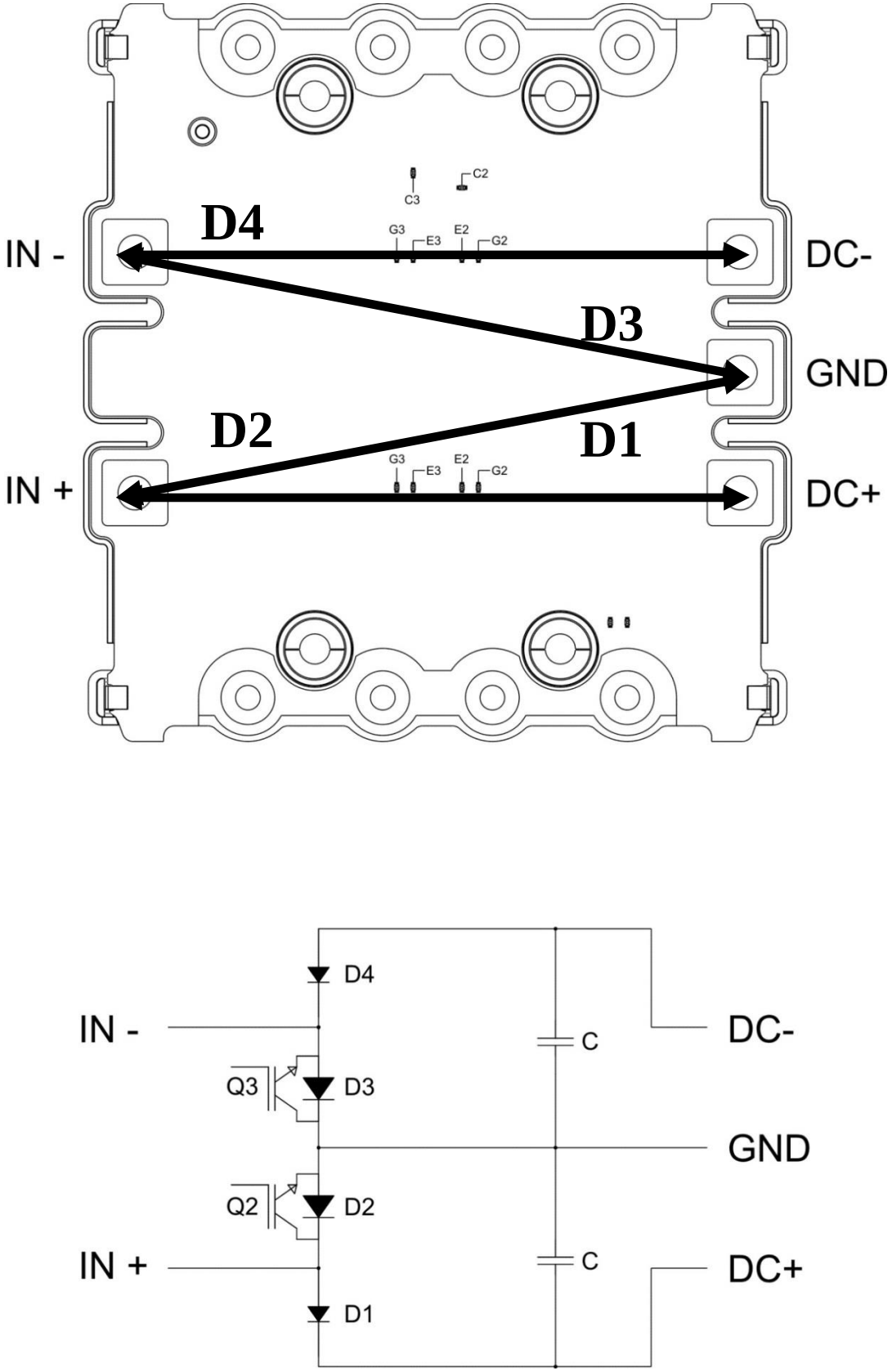


Fig. 65

In case of damage of boost module, replace it together with driver boost board (see part list).

7.2 INVERTER MODULE CHECK

In the picture below is reported the diagram and the pinout to check, using a multimeter, the conditions about the inverter modules. Check all the diodes: they have not to be in short circuit or completely open. There must be the polarization junction voltage (attention, only between NEUTRAL and PH have to result open the diodes D2 and D3).

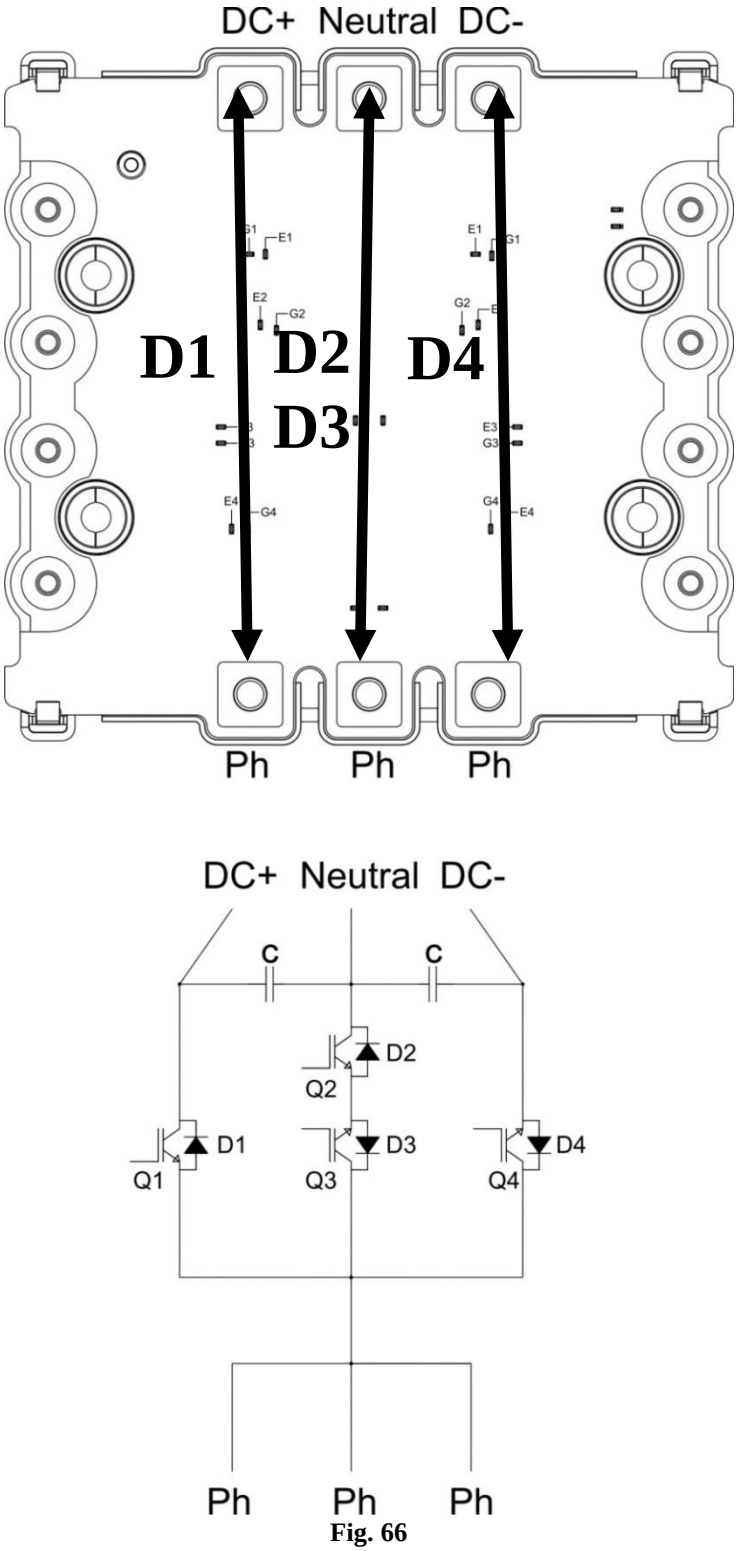


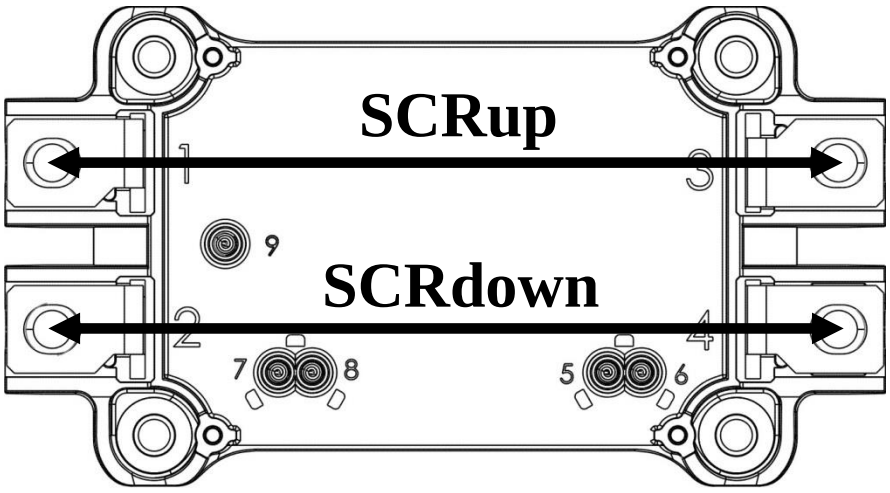
Fig. 66

In case of faulty inverter module, replace it together with inverter driver board (see part list).

7.3 MODULES SCR CHECK

If the PFC or the INVERTER module is blown, is necessary to replace the components fault (IGBTs modules, board, etc.), and also to verify using a multimeter the condition of rectifier bridge on other two phase.

In particular, using the diagram and pinout below reported, verify that the input, bypass and battery SCR are not in short circuit or completely open between anode and cathode but measuring the forward polarization voltage.



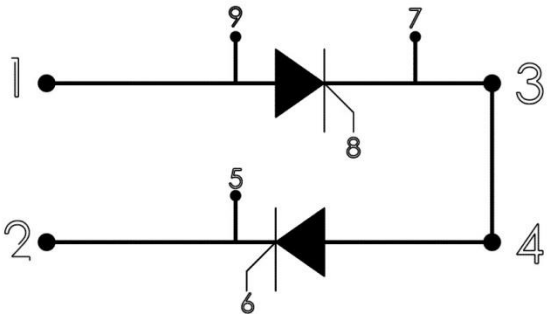


Fig. 67

If some scr are damaged, replace it together the input board relative.

7.4 CABLE CONNECTION CHECK (L02 - LINK FAIL)

If necessary, verify on the control board B0213 using a multimeter in ohm:

- the resistance value between the testpoints TP1 e TP6 that must be in the range 0÷18Ω
- the resistance value between the testpoints TP6 e TP7 that must be in the range 1kOhm÷0,75KΩ

With UPS in standby mode, verify on the control board B0213 using a multimeter in volt:

- The voltage between the testpoints TP6 e TP7 that must be 4,5±0,2V.

If all the tests give positive result, it means that the flat cable are connected correctly. Otherwise is necessary to verify the contact with the connector mounted on pcb.

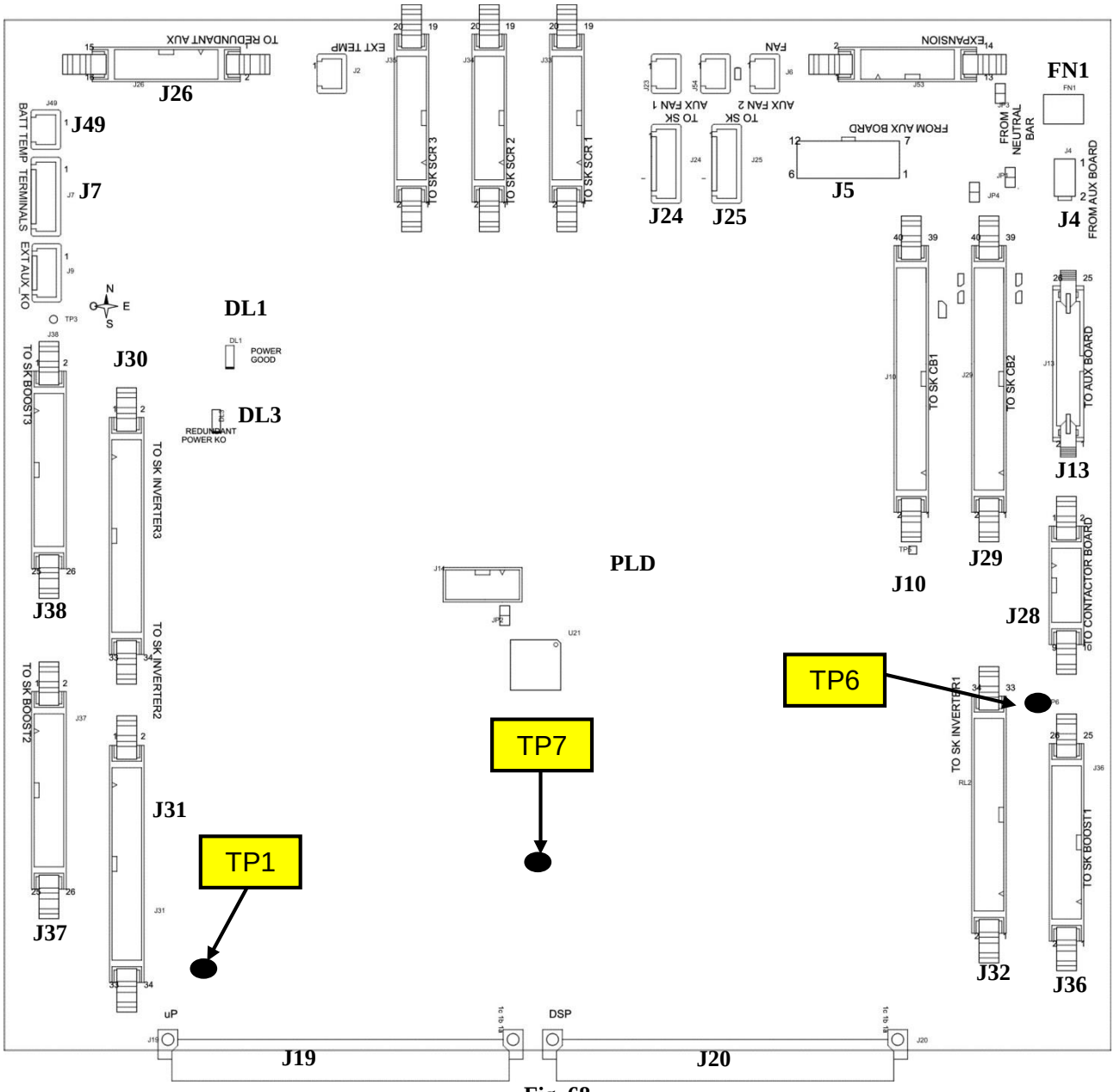


Fig. 68

In the picture below is reported all the track about the “Link Fail” indication:

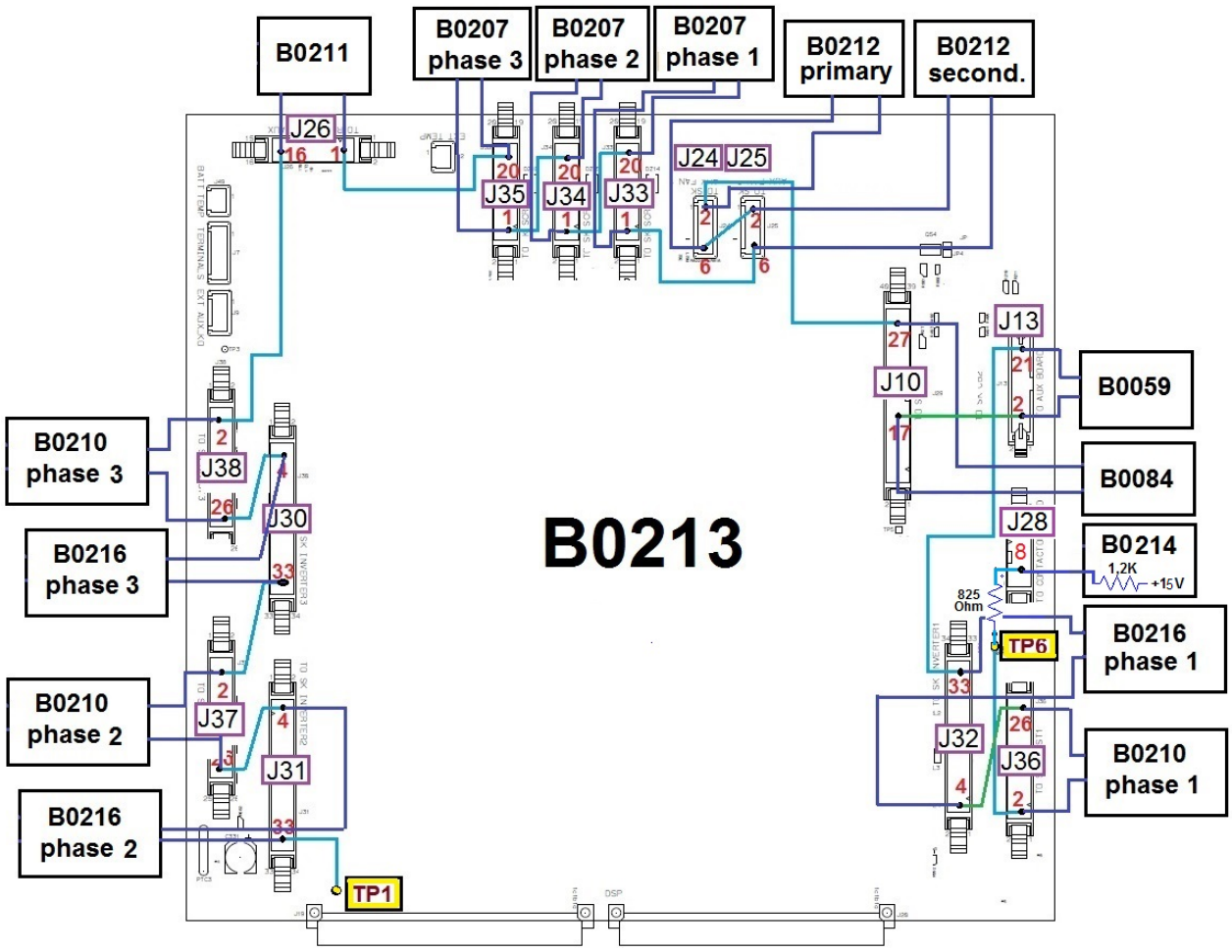


Fig. 69

TP6 ↓ ↑													TP1
J36 → J32 → J13 → J10 → J24 → J25 → J33 → J34 → J35 → J26 → J38 → J30 → J37 → J31													
Pin2 → Pin26	Pin 4 → Pin33	Pin21 → Pin2	Pin17 → Pin27	Pin2 → Pin6	Pin2 → Pin6	Pin1 → Pin20	Pin1 → Pin20	Pin1 → Pin20	Pin1 → Pin16	Pin2 → Pin26	Pin4 → Pin33	Pin2 → Pin26	Pin4 → Pin33

8 SERVICE OPERATION ON UPS

8.1 Replacing Inverter Module

The operation is described in details in manual:

- Replacing Inverter Module 0MNADMST014ENI..

Relative kit are:

- 160 kVA: **6R_ MSTK6II0-.**
- 200 kVA: **6R_MSTP0II0-.**

8.2 Replacing Boost Module

The operation is described in details in manual:

- Replacing Boost Module 0MNADMST013ENI..

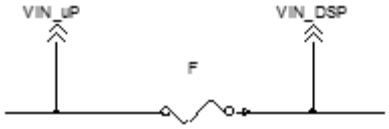
Relative kit are:

- 160 kVA: **6R_MSTK6IB0-.**
- 200 kVA: **6R_MSTP0IB0-.**

9 MAP OF THE MAIN READINGS

The following paragraph will set out some useful points for deeper analysis of UPS problems.

9.1 INPUT VOLTAGES



Input voltages are measured by the µC and DSP; the measurement points are however different: the µC measures the voltage upstream of the input fuse and input contact, whilst the DSP measures it downstream from them.
The VIN_uP reading on the display is shown as PH-N whilst the VIN_DSP reading on the display is shown as PH-PH (this is only visible with the input relay closed, during start-up the reading is therefore only available at the end of the pre-loading stage).
With the UPS off, using a multimeter, check that the input fuses are intact.
It is also possible to see this by observing the appropriate indicator on the fuse itself.

Test to verify the continuity of the reading signal of the µC (**test to be performed while the UPS is not powered and is switched off**):

		Phase 1	Phase 2	Phase 3	Note
	SW_IN	SW_IN1	SW_IN2	SW_IN3	
	B0207	FN1	FN1	FN1	
	B0207	R3	R3	R3	150 kOhm
->	B0207	R1	R1	R1	150 kOhm
	B0207	J4-12	J4-12	J4-12	
	Flat Cable	||	||	||	
	B0213	J33-12	J34-12	J35-12	
->	B0213	R597	R557	R256	1,37 kOhm

(Go between the two points with the symbol "->" to check the continuity of the flat cables)

Test to verify the continuity of the reading signal of the DSP (**test to be performed while the UPS is not powered and is switched off**):

		Phase 1	Phase 2	Phase 3	Note
	Fuse F	After	After	After	
	B0207	Fin	Fin	Fin	
	B0207	R4	R4	R4	150 kOhm
->	B0207	R2	R2	R2	150 kOhm
	B0207	J4-14	J4-14	J4-14	
	Flat Cable	||	||	||	
	B0213	J33-14	J34-14	J35-14	
->	B0213	R745	R743	R747	887 R

(Go between the two points with the symbol "->" to check the continuity of the flat cables)

9.2 BYPASS VOLTAGES

The readings of the bypass voltages are read by the µC only. The sampling point is exactly at the entrance of the bypass on the B0207 board.
This reading is used to synchronise the inverter and to enable or disable the use of the bypass.

Test to verify the continuity of the signal (test to be performed while the UPS is not powered and is switched off) using a multimeter set in ohm:

		Phase 1	Phase 2	Phase 3	Note
	SW_BYP	SW_BYP1	SW_BYP2	SW_BYP3	
	B0207	R11	R11	R11	150 kOhm
->	B0207	R9	R9	R9	150 kOhm
	B0207	J4-13	J4-13	J4-13	
	Flat Cable	||	||	||	
	B0213	J33-13	J34-13	J35-13	
->	B00213	R199	R558	R257	- - -

(Go between the two points with the symbol "->" to check the continuity of the flat cables)

9.3 BATTERIES VOLTAGES

The readings of the battery voltages of both the µC and the DSP are taken at the output of the battery charger board B0084.
The reading appearing on the display is the one taken by the µC. Battery charger adjustment, the battery present test, battery charging status and the “battery overvoltage” alarm refer to this.
The reading taken by the DSP is used instead for internal adjustments only.

First of all check the battery connections before and after the battery fuse to see whether there is voltage is compared to the neutral. If the fuse is open, replace it.

Using a multimeter in ohm test to verify the continuity of the µC signal (test to be performed while the UPS is not powered and is switched off and the Battery Box fuses are open):

		DC +	DC -	Note
	B0084	J9-1	J9-7	
	B0084	R7	R43	249 kOhm
->	B0084	R8	R44	249 kOhm
	B0084	J6-37	J6-38	
	Flat Cable	||	||	
	B0213	J10-37	J10-38	
->	B0213	R706	R674	7,15kOhm

(Go between the two points with the symbol "->" to check the continuity of the flat cables)

Using a multimeter in ohm test to verify the continuity of the DSP signal (test to be performed while the UPS is not powered and is switched off and the Battery Box fuses are open):

		DC +	DC -	Note
	B0084	J9-1	J9-7	
	B0084	R2	R47	249 kOhm
->	B0084	R3	R48	249 kOhm
	B0084	J6-39	J6-40	
	Flat Cable	||	||	
	B0213	J10-39	J10-40	
->	B0213	R711	R760	4,99 kOhm

(Go between the two points with the symbol "->" to check the continuity of the flat cables)

9.4 INVERTER VOLTAGES

The readings of the inverter voltages are read by the DSP only. The sampling point is exactly on the inverter filter capacitor inverter, which attaches to the J4 connector on the B0216.
This reading is designed to control the inverter and to check that status of the remote control switch and inverter fuses (combined with the output voltage reading).

Using a multimeter in ohm test to verify the continuity of the signal (test to be performed while the UPS is not powered and is switched off):

		Phase 1	Phase 2	Phase 3	Note
	B0216	J4	J4	J4	
	B0216	R6	R6	R6	90,9 kOhm
	B0216	R7	R7	R7	90,9 kOhm
->	B0216	R8	R8	R8	90,9 kOhm
	B0216	J6-16	J6-16	J6-16	
	Flat Cable	||	||	||	
	B0213	J32-16	J31-16	J30-16	
->	B0213	R699	R638	R330	27,4 kOhm

(Go between the two points with the symbol "->" to check the continuity of the flat cables)

9.5 OUTPUT VOLTAGES

The readings of the output voltages are read by the DSP only. The sampling point after bypass SCR, on the B0207 board. This reading is designed to calculate the output power (combined with the Iout reading) and to check the status of the remote control switch and inverter fuses (combined with the inverter voltage reading).

Using a multimeter in ohm test to verify the continuity of the signal (test to be performed while the UPS is not powered and is switched off):

		Phase 1	Phase 2	Phase 3	Note
	Out Fuse	F_out1	F_out2	F_out3	
	B0207	R12	R12	R12	150 kOhm
->	B0207	R10	R10	R10	150 kOhm
	B0207	J4-2	J4-2	J4-2	
	Flat Cable	||	||	||	
	B0213	J33-2	J34-2	J35-2	
->	B0213	R757	R753	R755	301 kOhm

(Go between the two points with the symbol "->" to check the continuity of the flat cables)

9.6 BYPASS CURRENTS

Each bypass line has its TA. The TA is inserted in the cables connecting between the B0207 board and the output fuse.

They have the primary function to measure current when load is supplied by bypass line. This reading (DSP only) is used to calculate the output power (combined with the Vout reading).

The same TA is used also as Fault Bypass TA. It measures the leakage current (500mA range) when SCR are not driven and no current flow is expected.
This is achieved by changing the TA measure resistor: uP selects the right one by closing a signal relays on B0213.

10 TROUBLESHOOTING

The UPS can check and to indicate on display all the anomalies/faulties about its operations. When happen a problem the UPS indicates the event on display with relative error code and kind of alarm.

10.1 TROUBLESHOOTING FAULT PROBLEMS

The table below summarises useful information for solving problems related to the Fault category of alarm codes. The table does not cover all possible causes of failure of the UPS. The information is intended as a hint to the possible cause of the problem and its possible resolution.

Code	Description	Possible cause	Board affected	Corrective action
F01	Internal communication error	Programming board inserted in communication slot	B0096	Remove programming board from slot
		Faulty Interface board.	B0056	Replace B0056 board
		Faulty B0067	B0067	Replace B0067 board
F02	Incorrect cyclical direction of the phases	Input phases connection error		Check input phase connection
F03 F04 F05	Phase 1 input fuse blown Phase 2 input fuse blown Phase 3 input fuse blown	Self-trigger or breakage of input SCR	B0207	Verify the diode damaged and fuses. Replace B0207 board
F09	Positive branch capacitor preload failed	Short circuit in inverter and/or PFC stages	B0240 B0231	Replace the affected boards
		Control logic faulty	B0067 B0213	
F10	Negative branch capacitor preload failed	Input relay out of tolerance values		Check that Vin < 250V
F11	Boost stage fault	PFC stage short circuit	B0209 B0210	Replace the affected boards
		Control logic faulty	B0067 B0213	

F12	Incorrect cyclic direction of bypass phases	Connection error in bypass power supply		Check bypass power supply connection
F14	Sinusoid Phase 1 inverter distorted	Inverter stage short circuit	B0215 B0216	Replace the affected boards
F15	Sinusoid Phase 2 inverter distorted	Control logic faulty	B0067 B0213	
F16	Sinusoid Phase 3 inverter distorted	Phase-Phase short circuit		Check for SC between phases
F17	Inverter stage faulty	Inverter stage blown	B0215 B0216	Replace the affected boards
		Control logic faulty	B0067 B0213	
F19 F20	Positive battery overvoltage Negative battery overvoltage	Batteries disconnected		UPS operation with the batteries disconnected may lead to an overvoltage at the battery charger output. Shut down and restart the UPS and reconnect the batteries. If the UPS is set up for operation without batteries (freq. conv) the CB is automatically disabled
F23	Overload at output	Excessive load		Reduce the load
		Wrong UPS size following control board replacement		Set the correct size
		Output power reading faulty	B0215 B0216 B0067 B0213	Replace the affected boards
		Error in output voltage setting		Set the correct output voltage

F26 F27 F28	Phase 1 output relay blocked (does not open) Phase 2 output relay blocked (does not open) Phase 3 output relay blocked (does not open)	Failure in relay control circuit	B0067 B0213 B0214	Replace the affected boards
		Relay with damaged contacts		Replace the relay
F29 F30 F31	Phase 1 output fuse blown or output relay blocked (does not close) Phase 2 output fuse blown or output relay blocked (does not close) Phase 3 output fuse blown or output relay blocked (does not close)	Failure in relay control circuit	B0067 B0213 B0215	Replace the affected boards
		Output fuse blown		Replace blown output fuse
		Relay with damaged contacts		Replace the relay
F32	Battery charger stage faulty	Output voltage from CB is missing in one of the two battery branches	B0084	Check the flat cable connections and if necessary replace the affected boards
		CB control and feedback signals faulty	B0084 B0067 B0213	
F33	Battery Measures Error	Difference of >5V between uP/DSP readings	B0084 B0067 B0122	Check the flat cable connections and if necessary replace the affected boards
F34	heatsink overheated	Cooling fans faulty	B0059 B0212	Check for SC at fans → replace fans
		Temperature readings faulty	B0067 B0213	Check the interconnections between the affected boards, if necessary replace the boards

		Temperature sensor faulty		Check temperature sensors
F37	Battery charger over temperature	CB cooling fan faulty	B0084	Check that the fitted fan is correct (12V) → replace fan Check for SC at the fan → replace fan Check voltage at connector Fx → replace board B0084
		Incorrect duct installation	B0084	Check that the duct secured to board B0084 is correctly installed
		Temperature readings faulty	B0084 B0067 B0213	Check the interconnections between the affected boards, if necessary replace the boards
		Temperature sensor faulty	B0084	replace board B0084
F39	VDC BUS MEASURES ERROR	BUS DC measure difference uP/DSP >20V	B0102 B0067 B0122	Check the interconnections between the affected boards, if necessary replace the boards
F42 F43 F44	BOOST 1 battery fuses blown BOOST 2 battery fuses blown BOOST 3 battery fuses blown	Battery SCR blown	B0207	Check battery SCR
F45	Parallel link Open	Single point parallel link failure	B0085	Check the interconnections between the affected boards, if necessary replace the boards
F46	PARAL. R_BYP- LINE FAULT	Bypass call Request not confirmed in HW		
F47	PARAL. SYNC. LINE FAULT	Frequency message different to the HW frequency		

10.2 TROUBLESHOOTING LOCK PROBLEMS

The tables below provide useful information for troubleshooting problems connected with 'lock' 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.

Code	Description	Possible cause	Boards affected	Corrective action
L01	Incorrect auxiliary power supply	Aux power supplies missing B0059	B0059	Check that LED DL1 is lit on B0059 → if it is not lit check connections and/or replace board.
L02	One or more internal cables disconnected	Flat cables not connected or partially connected	All boards with flat cables	Check the connections of the UPS flat cables
L03 L04 L05	Phase 1 input fuse blown Phase 2 input fuse blown Phase 3 input fuse blown	input diode blown	B0207	Check if diode is blown → replace the fuse. Check Boost module
L06	Overvoltage at positive BOOST stage	Any unidirectional loads connected at output		Check for the presence of unidirectional loads at the output
		Output short circuit		Check for the presence of short circuits at the output
L07	Overvoltage at negative BOOST stage	Inverter stage short circuit		Check inverter stage
L08	Undervoltage at positive BOOST stage	The UPS does not have battery operation	B0207	Check the battery boost fuses and battery SCR
		Control logic faulty	B0067 B0213	Check the connections between the boards and if necessary replace them
		No mains power with the batteries disconnected		Check the battery box connection and/or battery box fuses
L09	Undervoltage at negative BOOST stage	Boost stage blown	B0210 B0209	Check PFC module and if necessary replace it
		Inverter stage blown	B0215 B0216	Check inverter module and if necessary replace it
L10	Static bypass switch faulty	Bypass SCR blown	B0207	Check bypass SCR and if necessary replace it

L11 L12 L13	Bypass output blocked L1 Bypass output blocked L2 Bypass output blocked L3			
L14 L15 L16	Overvoltage at phase 1 inverter Overvoltage at phase 2 inverter Overvoltage at phase 3 inverter	Inverter output capacitor faulty		Check the inverter output capacitor and if necessary replace it
		Inverter operating logic faulty	B0067 B0213	Replace the affected boards
L17 L18 L19	Undervoltage at Phase 1 inverter Undervoltage at Phase 2 inverter Undervoltage at Phase 3 inverter	Phase-Phase short circuit		Check for SC between the output phases
		Control logic faulty	B0067 B0213	Check the connections between the boards and/or replace the specified boards
L20	DC voltage at inverter output or Phase 1 inverter sinusoid distorted	Inverter blown	B0215 B0216	Check the inverter module for blown components → replace module if necessary
L21	DC voltage at inverter output or Phase 2 inverter sinusoid distorted	Control logic faulty	B0067 B0213	Check the connections between the boards and/or replace the specified boards
L22	DC voltage at inverter output or Phase 3 inverter sinusoid distorted	Phase-Phase short circuit		Check for the presence of SC at the output
L23	Overload at Phase 1 output	Excessive load		Reduce the load
L24	Overload at Phase 2 output	Output power reading faulty	B0067 B0213 B0215 B0216	Replace the affected boards
L25	Overload at Phase 3 output	Error in output voltage setting		Set the correct output voltage

L26 L27 L28	Short circuit at Phase 1 output Short circuit at Phase 2 output Short circuit at Phase 3 output	Short circuit at neutral phase output		Check for the presence of SC between the phases and neutral at the output
L32	PARAL. SYNC. ERROR	HW Sync. Frequency differ from message for 5 cycles	B0085	Occurs only on Slave. Replace the board.
L33	PARAL. SYNC. LINE FAULT	Physical Loss of HW sync. signal	B0085	Occurs only on Slave. Replace the board.
L34	Phase 1 heatsink overheated	Cooling fans faulty	B0212	Check for SC at fans → replace fans Check R194 on board B0059, check voltage at connector J10, check fan power supply link → replace board B0059
L35	Phase 2 heatsink overheated	Temperature readings faulty	B0084 B0067 B0213	Check the interconnections between the affected boards, if necessary replace the boards.
L36	Phase 3 heatsink overheated	Temperature sensor faulty		Check temperature sensors and replace them if necessary; see relative page.
L37	Battery charger overheated	CB cooling fan faulty	B0084	Check that the fitted fan is correct (12V) → replace fan Check for SC at the fan → replace fan Check voltage at connector J3 → replace board B0084
		Incorrect duct installation	B0084	Check that the duct secured to board B0084 is correctly installed
		Temperature readings faulty	B0084 B0067 B0213	Check the interconnections between the affected boards, if necessary replace the boards
		Temperature sensor faulty	B0084	Replace board B084

L38	Phase 1 heatsink temperature sensor faulty	Temperature readings faulty	B0067 B0213	Check the interconnections between the affected boards, if necessary replace the boards
L39	Phase 2 heatsink temperature sensor faulty	Temperature sensor faulty		Check temperature sensors
L40	Phase 3 heatsink temperature sensor faulty			
L41	Battery charger temperature sensor faulty	Temperature readings faulty	B0084 B0067 B0213	Check the interconnections between the affected boards, if necessary replace the boards
		Temperature sensor faulty	B0084	Replace board B084
L42	BOOST 1 battery fuses blown	Battery SCR blown	B0207	Check battery SCR
L43	BOOST 2 battery fuses blown			
L44	BOOST 3 battery fuses blown			
L45	PARALLEL BUS DIVISION	Communication bus interrupted in a parallel system (two points)	B0085 B0085 B0085	Check the interconnections between the affected boards, if necessary replace the boards
L46	PARAL. COMMUNICAT. FAULT	Communication bus anomaly in a parallel system		
L47	PARALLEL BOARD FAULT	Parallel board power supplies anomaly		
L48	IGBT PROTECTION DETECTED	Lock for IGBT desaturation detected (After a reset of logic)	B0209 B0210 B0215 B0216	Check LED of driver board, pin strip connections.
L48.01	IGBT PROTECTION L1 BOOST	Lock for IGBT Boost desaturation detected (before a reset of logic)	B0209 B0210	Check LEDs of driver board, pin strip connections in the relative phase and stage.
L48.02	IGBT PROTECTION L2 BOOST			
L48.03	IGBT PROTECTION L3 BOOST			

L48.04 L48.05 L48.06	IGBT PROTECTION L1 INV IGBT PROTECTION L2 INV IGBT PROTECTION L3 INV	Lock for IGBT Inverter desaturation detected (before a reset of logic)	B0215 B0216	Check LEDs of driver board, pin strip connections in the relative phase and stage.

11 APPENDIX

11.1 LIST OF USEFUL DOCUMENTS

- User Manual
- UPS installation manual
- Wiring diagram:

- Replacing Inverter Module
- Replacing Boost Module
- Programming manual
- Alarm code manual
- UcomGp instruction manual
- UcomGp Configurator
- SparePartList

11.2 BOARD LIST

Board	SPL Description	Quantity for UPS
B0056-02	Interface Card	1
B0057-02	Display Card (NEUTRAL version)	
B0059-03	Aux Supply Card 160-200 kVA	1
B0067-01HKE	DSP+µC Control Card for 160 kVA	1
B0067-01HPL	DSP+µC Control Card for 200 kVA	
B0084-02	Batt Ch. 25A Card 125-160-200 kVA	1/2
B0085-01	Parallel Card (Included in: Parallel KIT)	1
B0133-05	Output Filter Card 160-200 kVA	1
B0207-01	Driver SCR Card 160-200	3
B0208-02	DC Capacitors BoostCard 160 kVA	3
B0208-01	DC Capacitors BoostCard 200 kVA	
B0209-02	Boost driver card for 160 kVA (Included in: 6R_MSTK6IB0-.)	3
B0209-01	Boost driver card for 200 kVA (Included in: 6R_MSTP0IB0-.)	
B0210-01	Boost Signal card 125-160-200 kVA	3
B0211-01	Redundant AUX PW Supply Card (160-200kVA	1
B0212-01	Fan Power Supply Card (160-200 kVA)	2
B0213-02	Signal Control Card 160 kVA	1
B0213-01	Signal Control Card 200 kVA	
B0214-01	Contactor Driver Card 160-200 kVA	1
B0215-02	Inverter driver card for 160 kVA (Included in: 6R_ MSTK6II0-.)	3
B0215-01	Inverter driver card for 200 kVA (Included in: 6R_MSTP0II0-.)	
B0216-01	Inverter Signal Card 160-200 kVA	3
B0217-02	DC Capacitors Inv Card 160 kVA	3
B0217-01	DC Capacitors Inv Card 200 kVA	
B0231-01	Resistance Precharge Card (160-200 kVA)	1
B0240-01	Aux DC Fuse Card 160-200 kVA	1