GTEC UPS MODEL:

SIRIUS 100 – 120 kVA

100 kVA only first version (h=1900)

SERVICE MANUAL

www.gtec-power.eu

Summary

1 Introduction

This document describes the procedures for carrying out maintenance and/or troubleshooting on UPS UTT4 100kVA-120kVA models.

2 Software operations

2.1 Saving the UPS history

In order to save the history, it is necessary to use the UcomGp suite of programs. See the appendix of this document or the specific manual for instructions relating to this application and the proper procedure to follow.

2.2 UPS Configuration

To configure the UPS, it is necessary to use the special UCOM GP software. See the specific software manual for instructions relating to this application and the proper procedure to follow.

2.3 Firmware Update

If you need to update the firmware, it is necessary to use the special "**ACCTT2PR.**Sirius **PROGRAMMING kit)** to program the microprocessor and/or DSP. See the instructions relating to this application enclosed with the kit for the proper procedure to follow.

Firmware	µProcessor	DSP
TT4	FW022-xxxx	FW023-xxxx

3 Turning the UPS on/off

All of the operations listed below can only be performed with the door open.
Consult the user manual before performing any work on the machine.

3.1 Turning off the UPS keeping the load powered

1) Close SWMB
2) Open SWIN SWOUT and SWBYP
3) Open the battery disconnector (belonging to the Battery Box connected to the machine)

3.2 Turning off the UPS disconnecting power to the load

4) Turn the UPS to standby mode from the display
5) Open SWIN SWOUT and SWBYP
6) Open the battery disconnector (belonging to the Battery Box connected to the machine)

3.3 Turning the UPS back on

1) Close the battery disconnector (belonging to the Battery Box connected to the machine)
2) Close SWIN SWOUT and SWBYP if applicable
3) Turn on the UPS by giving the “System ON” command from the display
4) If closed, open SWMB

3.4 Turning on the UPS from the battery

1) Close the battery disconnector (belonging to the Battery Box connected to the machine)
2) Close SWOUT
3) Press the “Battery Start” button and hold it down
4) Turn on the UPS by giving the “System ON” command from the display

	***CAUTION:*** *the UPS should only be turned on in this way in the absence of the mains power supply and ONLY with the SWMB switch open. It is only possible to start up with SWMB closed on UPSs with a separate connection for the bypass and when the bypass line is present.*

3.5 Additional service operations

Further service operations are available using the special UCOMGP software. See your application manual for further details.

4 Status/alarm codes

The UPS is able to monitor and report its status and any anomalies and/or faults that may occur during operation on its display panel. If there is a problem, the UPS signals the event by showing the code and the type of active alarm on the display.

4.1 Status

Status codes indicate the current status of the UPS.

CODE	DESCRIPTION
S01	Precharging in progress
S02	Load not powered (standby)
S03	Start-up phase
S04	Load powered from bypass line
S05	Load powered by inverter
S06	Battery operation
S07	Waiting for battery charging
S08	Economy mode active
S09	Ready to start
S10	UPS block - load not powered
S11	UPS block - load on bypass
S12	BOOST stage or battery charger block - load not powered

4.2 Command

Command codes indicate the presence of an active command.

CODE	DESCRIPTION
C01	Remote off command
C02	Remote load command on bypass
C03	Remote on command
C04	Battery test running
C05	Manual bypass command
C06	Emergency switch-off command
C07	Remote battery charger switch-off command
C08	Load command on bypass

4.3 Warning

Warning codes are messages relating to special a UPS configuration or operation.

CODE	DESCRIPTION
W01	Low battery warning
W02	Programmed switch-off active
W03	Programmed switch-off imminent
W04	Bypass disabled
W05	Synchronisation disabled (UPS in Free running mode)

4.4 Anomaly

Anomaly codes are “minor” problems which do not involve a UPS block but limit or prevent the use of certain features.

CODE	DESCRIPTION
A03	Inverter not synchronised
A04	External synchronisation failed
A05	Overvoltage on Phase1 input line
A06	Overvoltage on Phase2 input line
A07	Overvoltage on Phase3 input line
A08	Undervoltage on Phase1 input line
A09	Undervoltage on Phase2 input line
A10	Undervoltage on Phase3 input line
A11	Input frequency out of tolerance range
A13	Voltage on Phase1 bypass line out of tolerance range
A14	Voltage on Phase2 bypass line out of tolerance range
A15	Voltage on Phase3 bypass line out of tolerance range
A16	Bypass frequency out of tolerance range
A18	Voltage on bypass line out of tolerance range
A19	High peak power on Phase1 output
A20	High peak power on Phase2 output
A21	High peak power on Phase3 output
A22	Load on Phase1 > than the user threshold set
A23	Load on Phase2 > than the user threshold set
A24	Load on Phase3 > than the user threshold set
A25	Output disconnector open
A26	Positive branch batteries missing or battery fuses open
A27	Negative branch batteries missing or battery fuses open
A29	System temperature sensor fault
A30	System temperature <0°C
A31	System overtemperature
A32	Phase1 dissipator temperature < 0°C
A33	Phase2 dissipator temperature < 0°C
A34	Phase3 dissipator temperature < 0°C
A37	External battery temperature sensor fault
A38	External battery overtemperature
A39	Replace positive branch batteries
A40	Replace negative branch batteries

4.5 Fault

Fault codes are more critical problems than “Anomalies” because, if they persist, they can lead to the block of the UPS, even in a very short space of time.

CODE	DESCRIPTION
F01	Internal communication error
F02	Incorrect cyclical direction of the input phases
F03	Phase1 input fuse blown
F04	Phase2 input fuse blown
F05	Phase3 input fuse blown
F09	Positive branch capacitor preloading failed
F10	Negative branch capacitor preloading failed
F11	BOOST stage anomaly
F12	Incorrect cyclical direction of the bypass phases
F14	Phase1 sinusoid inverter deformed
F15	Phase2 sinusoid inverter deformed
F16	Phase3 sinusoid inverter deformed
F17	Inverter stage anomaly
F19	Positive battery overvoltage
F20	Negative battery overvoltage
F23	Output overload
F26	Phase1 output remote control switch blocked (does not open)
F27	Phase2 output remote control switch blocked (does not open)
F28	Phase3 output remote control switch blocked (does not open)
F29	Phase1 output fuse blown or output remote control switch blocked (does not close)
F30	Phase2 output fuse blown or output remote control switch blocked (does not close)
F31	Phase3 output fuse blown or output remote control switch blocked (does not close)
F32	Battery charge stage anomaly
F34	Dissipator overtemperature
F37	Battery charger overtemperature
F42	BOOST 1 battery fuse blown
F43	BOOST 2 battery fuse blown
F44	BOOST 3 battery fuse blown
// F45	Parallel communication bus open (1 point)
// F46	Parallel bypass request signal anomaly
// F47	Parallel synchronism signal anomaly

*** // = Parallel Fault**

4.6 Lock

Lock codes indicate that the UPS or a part thereof is blocked and are usually preceded by an alarm alert. In the event of the failure and consequent block of the inverter, this will switch off along with the power to the load through the bypass line (this procedure is excluded for the blocks due to considerable, persistent overloads and blocks due to short circuits).

CODE	DESCRIPTION
L01	Auxiliary power supply incorrect
L02	Disconnection of one or more internal wires
L03	Phase1 input fuse blown
L04	Phase2 input fuse blown
L05	Phase3 input fuse blown
L06	BOOST stage positive overvoltage
L07	BOOST stage negative overvoltage
L08	BOOST stage positive undervoltage
L09	BOOST stage negative undervoltage
L10	Static bypass switch fault
L11	L1 bypass output blocked
L12	L2 bypass output blocked
L13	L3 bypass output blocked
L14	Phase1 inverter overvoltage
L15	Phase2 inverter overvoltage
L16	Phase3 inverter overvoltage
L17	Phase1 inverter undervoltage
L18	Phase2 inverter undervoltage
L19	Phase3 inverter undervoltage
L20	Direct voltage in inverter output or Phase1 inverter sinusoid deformed
L21	Direct voltage in inverter output or Phase2 inverter sinusoid deformed
L22	Direct voltage in inverter output or Phase3 inverter sinusoid deformed
L23	Overload on Phase1 output
L24	Overload on Phase2 output
L25	Overload on Phase3 output
L26	Short-circuit on Phase1 output
L27	Short-circuit on Phase2 output
L28	Short-circuit on Phase3 output
// L32	Parallel synchronisation error
// L33	Parallel synchronisation signal anomaly
L34	Phase1 dissipator overtemperature
L35	Phase2 dissipator overtemperature
L36	Phase3 dissipator overtemperature
L37	Battery charger overtemperature
L38	Phase1 dissipator temperature sensor failed
L39	Phase2 dissipator temperature sensor failed
L40	Phase3 dissipator temperature sensor failed
L41	Battery charger temperature sensor fault
L42	BOOST 1 battery fuse blown
L43	BOOST 2 battery fuse blown
L44	BOOST 3 battery fuse blown
L45	Parallel communication bus interrupted (2 points)
// L46	Parallel communication anomaly
// L47	Parallel card anomaly

*** // = Parallel Lock**

5 Troubleshooting

5.1 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.

Alarm code	Description	Possible cause	Boards affected	Corrective actions
F01	Internal communication error	Programming board inserted in the communication slots	B0067	Remove the programming board from the slot
		Communication interface board failed	B0057	Replace board B0057
		B0067 board failure	B0067	Replace board B0067
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		Check whether SCR is broken → replace SCR and fuse. Check Boost diode and replace module if necessary
F09	Positive branch capacitors preloading failed	Short-circuit on inverter and or PFC stages	B0077 B0079 B0081	Replace the boards shown
		Pre-charge diodes faulty	B0102	
F10	Negative branch capacitor preloading failed	Control logic faulty	B0067 B0051 B0077	Replace the boards affected
		Input network outside the tolerances set		Check that Vin <250V
F11	BOOST stage anomaly	PFC stage short-circuit	B0077 B0079	Check IGBT modules → replace modules and driver boards
		Control logic faulty	B0051 B0067 B0077	Replace the boards affected
		PFC driver boards	B0079	Replace the board shown

F12	Incorrect cyclical direction of the bypass phases	Bypass power connection error		Check bypass power connection
F14	Phase1 sinusoid inverter deformed	Inverter stage short-circuit	B0077 B0079 B0081	Check IGBT modules → replace faulty modules and relative driver boards
F15	Phase2 sinusoid inverter deformed	Control logic faulty	B0051 B0081 B0067 B0077	Replace the boards shown
F16	Phase3 sinusoid inverter deformed	Phase-Phase short-circuit		Verify the presence of DC between phases
F17	Inverter stage anomaly	Inverter stage breakage	B0081	Replace the board shown
		Inverter stage piloting anomaly	B0051	
F19 F20	Positive battery overvoltage Negative battery overvoltage	Batteries disconnected		UPS operation while the batteries are disconnected can lead to an output overvoltage to the battery charger. Switch the UPS off and back on again and reconnect the batteries. If the UPS is responsible for operation without batteries (freq. conv.) the BC is automatically disabled
F23	Output overload	Excessive load		Reduce the load
		UPS size wrong after replacing the control board		Set the correct size
		Abnormal reading of output power	B0083 B0077 B0051 B0067	Replace the boards shown
		Error in setting output voltage		Set the correct output voltage

F26 F27 F28	Phase1 output remote control switch blocked (does not open) Phase2 output remote control switch blocked (does not open) Phase3 output remote control switch blocked (does not open)	Fault in remote control switch control circuit	B0083 B0077 B0051 B0067	Replace the boards affected
F29	Phase1 output fuse blown or output remote control switch blocked (does not close)	Fault in remote control switch control circuit	B0083 B0077 B0051 B0067	Replace the boards affected
F30 F31	Phase2 output fuse blown or output remote control switch blocked (does not close) Phase2 output fuse blown or output remote control switch blocked (does not close)	Output fuse blown		Replace blown output fuse
F32	Battery charge stage anomaly	There is no power output to the BC on one of the two battery branches	B0084	Replace board B0084
		Anomaly in the control and BC feedback signals	B0084 B0077 B0051 B0067	Check the connections of the flat cables and replace the boards shown if necessary
F34	Dissipator overtemperature	Cooling fan anomaly	B0102	• Verify the presence of DC on fans → replace fans • Check fuse Fx on board B0102, check voltage on Fy connector, check fan power link → replace board B0102
		Anomaly in the temperature reading	B0077 B0051 B0067 B0079 B0081	Check the connections between the boards affected. Replace the boards if necessary.
		Temperature sensor fault		Remove the connector of the individual sensors and perform resistance measurement. If the sensor is OK, resistance = 1 KOHM

F37	Battery charger overtemperature	BC cooling fan anomaly	B0084	• Verify that the fan installed is correct (12V) → replace the fan • Check for DC on the fan → replace the fan • Check voltage to Fx connector → replace the B0084 board
		Incorrect assembly of the conveyor	B0084	Check that the conveyor is correctly mounted to the B0084 board
		Anomaly in the temperature reading	B0084 B0077 B0051 B0067	Check the connections between the boards affected. Replace the boards if necessary.
		Temperature sensor fault	B0084	Perform sensor resistance measurement on the board: PTC1, PTC2, PTC3. If the sensor is OK, res = 1 KOHM → replace B0084 board
F42 F43 F44	BOOST 1 battery fuse blown BOOST 2 battery fuse blown BOOST 3 battery fuse blown	Battery SCR breakage	B0078	Check battery SCR

5.2 Troubleshooting Lock problems

The table below summarises useful information for solving problems related to the Lock 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	Boards affected	Corrective action
L01	Auxiliary power supply incorrect	No power to aux Sk B0082	B0082 B0077 B0051	Check that the DL1 LED is on on sk B0082 → if off, check connections and/or replace the board
		No power to aux Sk B0102	B0102 B0077 B0051	Check that the DL1 LED is on on sk B0102 → if off, check connections and/or replace the board
L02	Disconnection of one or more internal wires	Flat cables not connected or partially connected	All boards with flat cables	Check UPS flat cables connections
L03 L04 L05	Phase1 input fuse blown Phase2 input fuse blown Phase3 input fuse blown	Self-trigger or breakage of input SCR		Check whether SCR is broken → replace SCR and fuse. Check Boost diode and replace module if necessary
L06	BOOST stage positive overvoltage	Any one-way loads connected in output		Check for presence of one-way loads in output
		Short-circuit in output		Verify the presence of short-circuits in output
L07	BOOST stage negative overvoltage	Inverter stage short-circuit		Check inverter stage
L08	BOOST stage positive undervoltage	The UPS is not powered by the battery	B0078	Check the battery boost fuses and the battery SCR
		Anomaly in the control logic	B0078 B0077 B0051 B0067	Check the connections between the boards and replace if necessary
		No mains with batteries disconnected		Check the connection of the battery box and/or battery box fuses
L09	BOOST stage negative undervoltage	Boost stage breakage	B0079	Check whether IGBT modules on the boost side are broken →replace any faulty modules and their driver boards
		Inverter stage breakage	B0081	Check whether IGBT modules on the boost side are broken →replace any faulty modules and their driver boards

L10	Static bypass switch fault	Bypass SCR breakage	B0080	Check bypass SCR
L11 L12 L13	L1 bypass output blocked L2 bypass output blocked L3 bypass output blocked			
L14 L15 L16	Phase1 inverter overvoltage Phase2 inverter overvoltage Phase3 inverter overvoltage	Inverter output capacitor failure		Check the inverter output capacitor and replace if necessary
		Inverter operating logic anomaly	B0081 B0077 B0051 B0067	Replace the boards shown
L17 L18 L19	Phase1 inverter undervoltage Phase2 inverter undervoltage Phase3 inverter undervoltage	Phase-Phase short-circuit		Check for any DC presence in the output phases
		Anomaly in the control logic	B0081 B0077 B0051 B0067	Check the connections between the boards and/or replace the boards shown
L20	Direct voltage in inverter output or Phase1 inverter sinusoid deformed	Inverter breakage	B0081	Check whether IGBT modules on the inverter side are broken →replace any faulty modules and their driver boards
L21	Direct voltage in inverter output or Phase2 inverter sinusoid deformed	Anomaly in the control logic	B0081 B0077 B0051 B0067	Check the connections between the boards and/or replace the boards shown
L22	Direct voltage in inverter output or Phase3 inverter sinusoid deformed	Phase-Phase short-circuit		Check for any DC output
L23	Overload on Phase1 output	Excessive load		Reduce the load
		UPS size wrong after replacing the control board		Set the correct size
L24	Overload on Phase2 output	Abnormal reading of output power	B0083 B0077 B0051 B0067	Replace the boards shown
L25	Overload on Phase3 output	Error in setting output voltage		Set the correct output voltage

L26 L27 L28	Short-circuit on Phase1 output Short-circuit on Phase2 output Short-circuit on Phase3 output	Short-circuit in neutral phase output		Check for any DC between the phases and neutral in output
L34	Phase1 dissipator overtemperature	Cooling fan anomaly	B0102	• Verify the presence of DC on fans → replace fans • Check fuse Fx on board B0102, check voltage on Fy connector, check fan power link → replace board B0102
L35	Phase2 dissipator overtemperature	Anomaly in the temperature reading	B0077 B0051 B0067 B0079 B0081	Check the connections between the boards affected. Replace the boards if necessary.
L36	Phase3 dissipator overtemperature	Temperature sensor fault	B0079 B0081	Remove the connector of the individual sensors and perform resistance measurement. If the sensor is OK, resistance = 1 KOHM
L37	Battery charger overtemperature	BC cooling fan anomaly	B0084	• Verify that the fan installed is correct (12V) → replace the fan • Check for DC on the fan → replace the fan • Check voltage to Fx connector → replace the B0084 board
		Incorrect assembly of the conveyor	B0084	Check that the conveyor is correctly mounted to the B0084 board
		Anomaly in the temperature reading	B0084 B0077 B0051 B0067	Check the connections between the boards affected. Replace the boards if necessary.
		Temperature sensor fault	B0084	Perform sensor resistance measurement on the board: PTC1, PTC2, PTC3. If the sensor is OK, res = 1 KOHM → replace B0084 board

L38 L39 L40	Phase1 dissipator temperature sensor failed Phase2 dissipator temperature sensor failed Phase3 dissipator temperature sensor failed	Anomaly in the temperature reading	B0077 B0051 B0067 B0079 B0081	Check the connections between the boards affected. Replace the boards if necessary.
		Temperature sensor fault	B0079 B0081	Remove the connector of the individual sensors and perform resistance measurement. If the sensor is OK, resistance = 1 KOHM
L41	Battery charger temperature sensor fault	Anomaly in the temperature reading	B0084 B0077 B0051 B0067	Check the connections between the boards affected. Replace the boards if necessary.
		Temperature sensor fault	B0084	Perform sensor resistance measurement on the board: PTC1, PTC2, PTC3. If the sensor is OK, res = 1 KOHM → replace B0084 board
L42 L43 L44	BOOST 1 battery fuse blown BOOST 2 battery fuse blown BOOST 3 battery fuse blown	Battery SCR breakage	B0078	Check battery SCR

5.3 Generic troubleshooting

The table below summarises useful information for troubleshooting the most common problems.

CAUTION: *the table below often refers to use of the maintenance BYPASS. Please note that before restoring correct UPS operation, it is necessary to check that it is on and* ***not in STANDBY mode.***
If you experience this event, turn on the UPS entering the "SYSTEM ON" menu and wait for completion of the start-up sequence before removing the maintenance BYPASS.
For more details, ***read the sequence described in the "HOW TO TURN THE UPS ON/OFF" paragraph carefully****.*

N.B. For the exact meaning of the codes mentioned in the table, please refer to the "STATUS/ALARM CODES" paragraph.

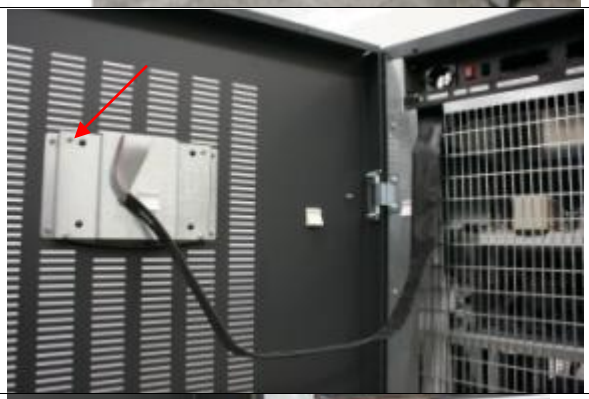
PROBLEM	POSSIBLE CAUSE	SOLUTION
THE UPS DOES NOT COME ON, DESPITE THE PRESENCE OF MAINS VOLTAGE	POSSIBLE FAILURE ON THE AUXILIARY POWER BOARD	Close the SWMB disconnector, turn off the UPS and check the state of the fuse on the board, consulting the specific chapters ("internal structure of the UPS").
THE DISPLAY AND THE FANS ARE OFF BUT THE LOAD IS POWERED	THE DISCONNECTOR BEHIND THE DOOR (SWMB) IS CLOSED AND SWIN IS OPEN	Close the SWIN and SWOUT disconnectors. Turn on the UPS and open SWMB at the end of the sequence
	DUE TO MALFUNCTIONING OF THE AUXILIARIES, THE UPS IS IN BYPASS MODE, SUPPORTED BY THE REDUNDANT FEEDER	Close the maintenance bypass (SWMB). Completely switch off the UPS. Wait a few seconds. Try to restart the UPS. If the display does not come back on or the sequence fails, close SWMB and intervene on the faulty element of the UPS, consulting the specific chapters ("internal structure of the UPS").
THE UPS OPERATES FROM THE BATTERY, DESPITE THE PRESENCE OF MAINS VOLTAGE	THE INPUT VOLTAGE IS OUTSIDE THE ACCEPTABLE TOLERANCES PERMITTED FOR MAINS OPERATION	Problem depends on the mains. Wait for the input mains to return within the tolerance range. The UPS will automatically revert to mains operation.
	POSSIBLE BREAKAGE OF FUSES INSIDE THE UPS	Activate the SWMB disconnector, turn off the UPS and check the state of the input fuses on the board, consulting the specific chapters ("internal structure of the UPS").
VOLTAGE DOES NOT REACH THE LOAD	STANDBY MODE IS SELECTED	It is necessary to change the mode, consulting the User Manual. The STANDBY OFF (relay) mode, in fact, only powers loads in the event of a blackout.
	UPS MALFUNCTIONING AND AUTOMATIC BYPASS OUT OF ORDER	Close the SWMB disconnector, turn off the UPS and then intervene on the fault, consulting the specific chapters ("internal structure of the UPS").
THE DISPLAY SHOWS C01	NO JUMPER ON THE R.E.P.O. CONNECTOR (see user manual for the location) OR NOT INSERTED CORRECTLY	Install the jumper or check that it is inserted correctly, referring to the User Manual.

PROBLEM	POSSIBLE CAUSE	SOLUTION
THE DISPLAY SHOWS C02	NO JUMPER ON THE TERMINAL FOR THE REMOTE MAINTENANCE BYPASS (see user manual for the location) OR FALSE CONTACT ON THE DISCONNECTOR.	Insert the jumper, referring to the User Manual. If the jumper is already present, check that the Fastons are inserted correctly on the auxiliary contact of the SWMB disconnector.
THE DISPLAY SHOWS ONE OR MORE OF THE FOLLOWING CODES: A30, A32, A33, A34 AND THE UPS WILL NOT START	MALFUNCTIONING OF THE TEMPERATURE SENSOR ON THE DISSIPATOR	Close the maintenance bypass (SWMB), turn off the UPS, turn the on UPS again and exclude the maintenance bypass. If the fault persists, activate SWMB, turn off the UPS and then intervene on the fault, consulting the specific chapters ("internal structure of the UPS"). It may be the temperature sensor or the control/uP+DSP boards.
THE DISPLAY SHOWS ONE OR MORE OF THE FOLLOWING CODES: A26, A27	BATTERY FUSES BLOWN OR FUSE-HOLDER DISCONNECTORS OPEN	Replace the fuses or close the Battery Box fuse-holders. CAUTION: it is advisable to replace fuses with others of the same type (see external Battery Box manual). If the fuse blows again, close the maintenance bypass (SWMB), turn the UPS off completely and open the Battery Box battery fuse-holders. Check to see if there are faults within the machine (power drawer input, battery charger or auxiliary power supplies). Check whether the connection to the Battery Box is successful. If not, it is necessary to correct the error, check the battery SCR and replace the battery and Battery Box fuses if necessary. **Caution - if inverting the battery wires, it is necessary to replace the B0084 battery charger board.**
THE DISPLAY SHOWS THE CODE S07	THE BATTERIES ARE LOW; THE UPS WAITS FOR THE BATTERY VOLTAGE TO EXCEED THE THRESHOLD SET	Wait for the batteries to charge or force switch on manually using the System On menu.

6 UPS service operations

6.1 Accessing the internal structures of the UPS

The UPS is designed so that you can access various parts without removing the wrap-around sides. In this way, it is possible to operate on the upper platform, the power drawers, the disconnector terminals and the ByPass drawer.
The steps to access the various parts of the UPS are listed below.

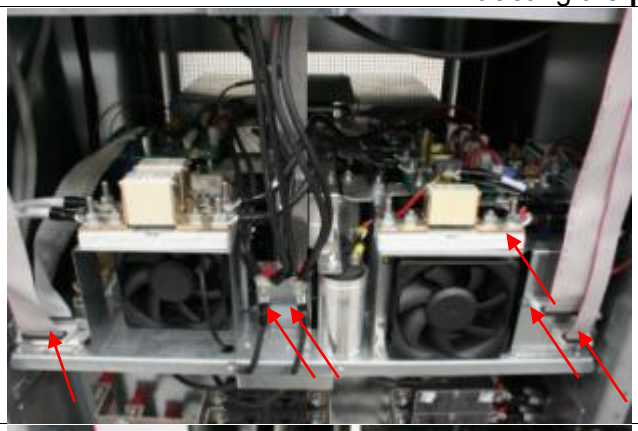
<table>
<tr><td colspan="2">Removing the door:</td></tr>
<tr><td>  </td><td>1) Open the door.</td></tr>
<tr><td>  </td><td>2) Remove the screws holding the display (these are the four innermost ones).
3) Remove the flat cable from the display.</td></tr>
<tr><td>  </td><td>4) Remove the door by removing the pins from the relevant hinges.</td></tr>
</table>

Removing the panel covering the **disconnectors**:	
	1) Remove the 8 screws holding the panel locked. 2) Pull the panel slightly outward.

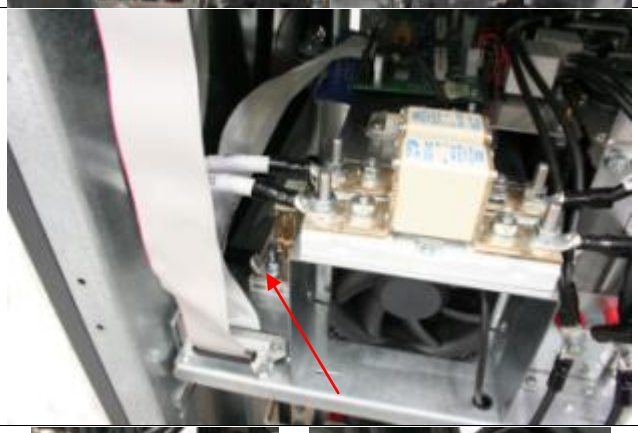
Removing the **front grille**:	
	1) Remove the 10 screws that secure the grille.

CAUTION: *when replacing the front grille, ensure that the flat cables leaving the drawers are not pinched or trapped between the grille and the frame on the UPS.*

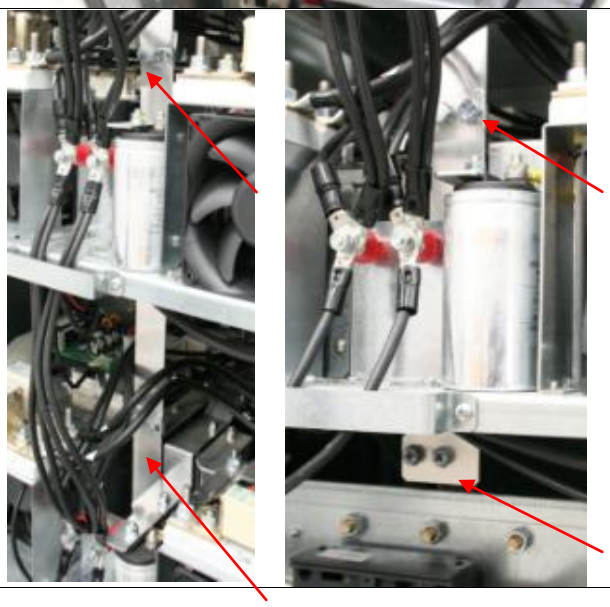
Extracting the **power drawers**:



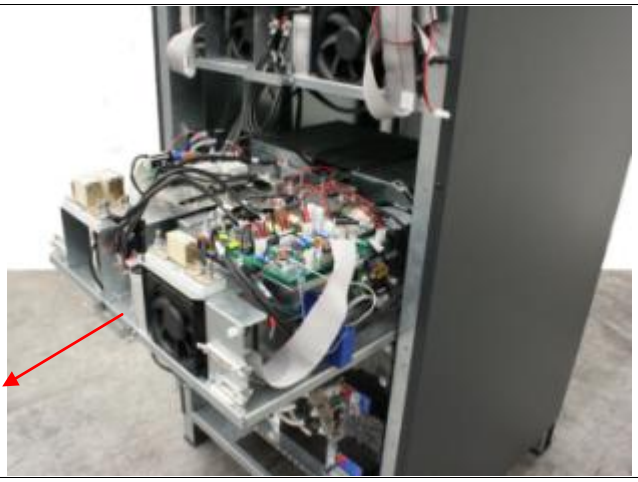
1) Remove the flat cables from the drawer of interest.
2) Remove the Bus+ and Bus- connection nuts.
3) Remove the connection to the phase input.
4) Remove the fan power cable (behind the flat cable on the right hand side of the drawer)



5) Remove the nut that secures the connection to the inverter output.



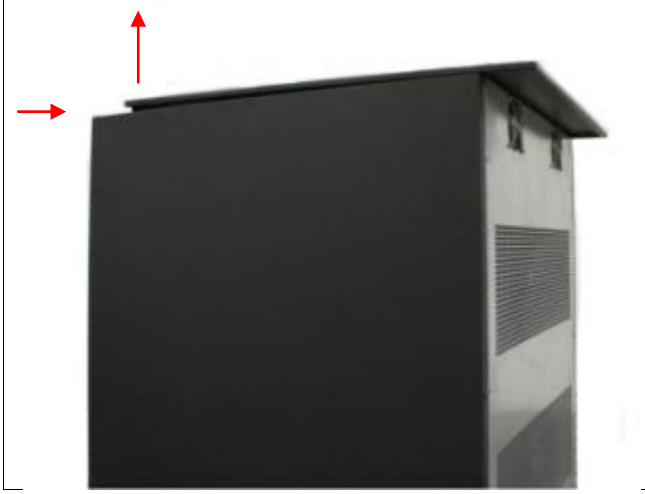
6) Remove the aluminium bars that connect the neutral to the drawers above and below.



7) Slide the drawer by pulling it out. Pay attention to the side wiring, whose structural work may be damaged during extraction.

CAUTION: *When placing the power drawer on the working table, pay attention to the fan wires attached under the drawer that could be cut between the drawer sheet and the table itself.*

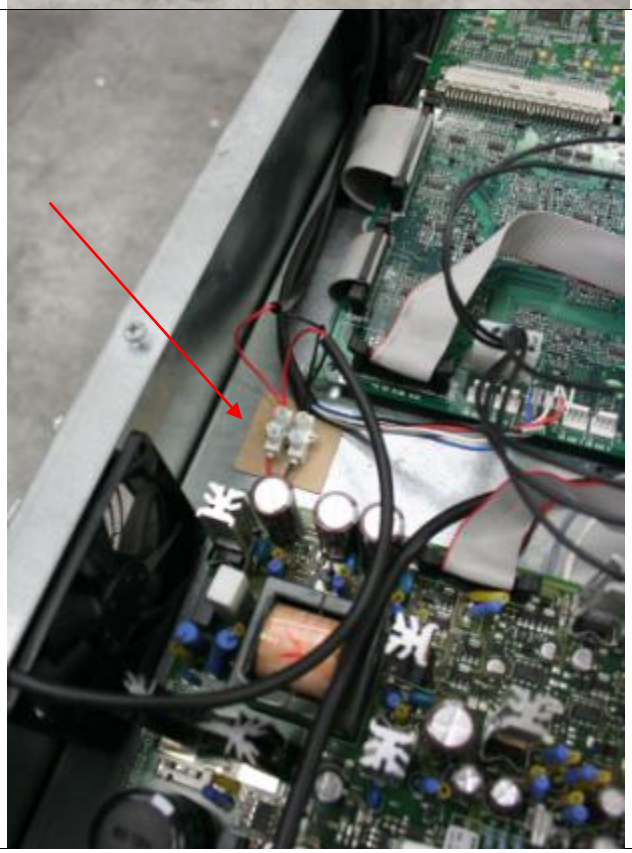
Remove the **top cover**:



1) Remove the top cover by removing the 2 screws on the front of the UPS.
2) Lift the lid and push it forwards towards the back of the UPS.
3) Remove the cover.

Removing the **back grille**:

1) Remove the top cover.



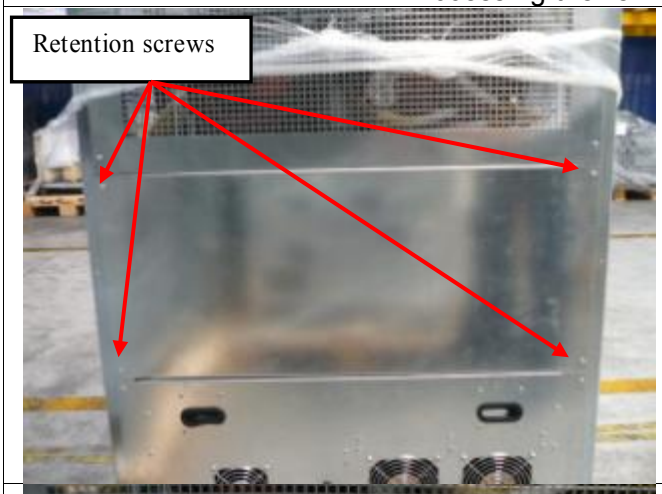
2) Release the ends of the fans attached to the terminal located on the upper platform.

3) Remove the 8 screws that secure the grille at the back of the UPS. Pull slightly outward.

CAUTION: *to remove the grille on the back, make sure to remove the fan wires from the terminal, otherwise they may be damaged.*

Accessing the **Bypass** drawer or the **Battery Charger**:

1) Remove the 4 screws that secure the drawer to the UPS.
2) Pull slightly outward.

Accessing the **remote control switch**	
	1) Remove the 4 screws retaining the 0CBCU0 panel on the back of the UPS. 2) Remove the panel
	At this point it is possible to access the remote control switch

To replace it, carry out the previous instructions in reverse order.

6.2 Replacing the fans

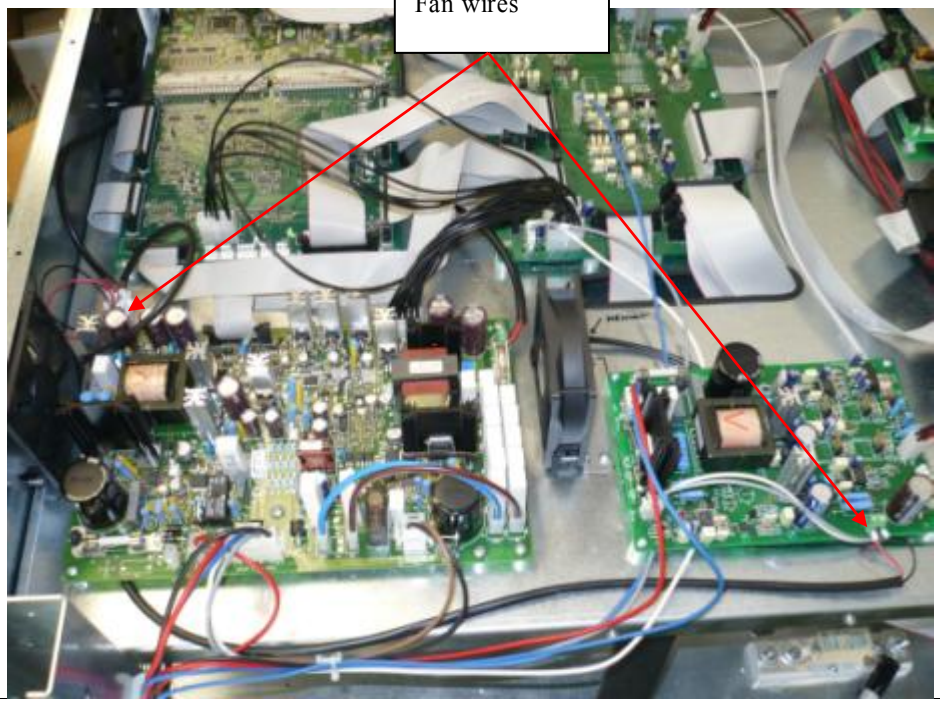
The fans can only be replaced with the machine off and when the input/output and battery disconnectors are open.

For the replacement of all the fans except the bypass fan, take the PVC sheath cable protector belonging to the fan to replace and install it on the new fan.

6.2.1 Upper level fans

The fans on the upper level come on as soon as the voltage on the DC bench exceeds 190 V.

The fans located on the upper level do not have fuses.



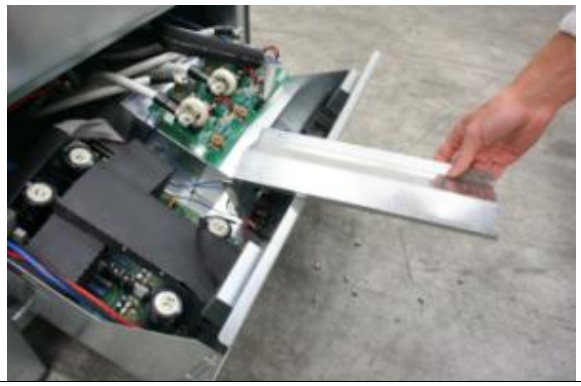
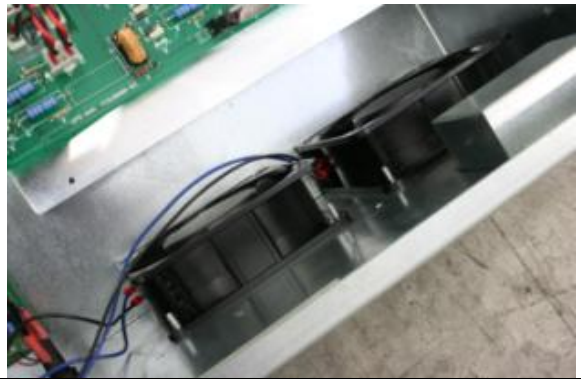
To remove the fans on the **upper level**:

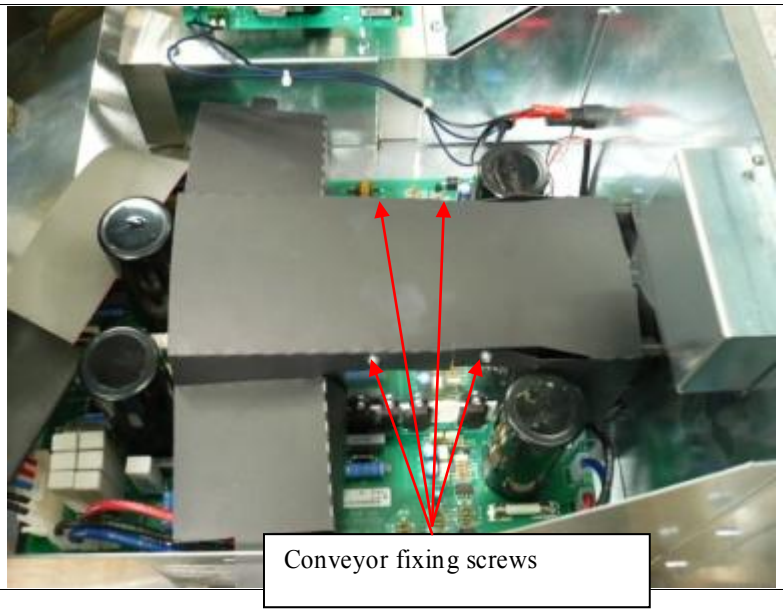
1) Remove the top cover.
2) Disconnect the fans, freeing the red and black wires from the terminal.
3) Remove the fixing screws from the fan (as well as those on the protective grille if present).

6.2.2 *Bypass fan drawer (Bypass and Battery Charger)*

The battery charger fan comes on when it is running. This does not have a fuse.

The two fans near the Bypass boards come on when the load is on the bypass line. These share the same panel fuse (2 A, 250V).

	To remove the **ByPass** fans: 1) Remove the screws that secure the ByPass drawer. 2) Remove the Bypass drawer.
	3) Remove the screws that secure the metal conveyor. Turn the conveyor to the left, taking care not to cause damage to the cables and boards.
	4) Unplug the fans, releasing the faston terminals.
	5) Remove the screws that secure the fan's protective grilles from the drawer itself.



Conveyor fixing screws

To remove the **Battery Charger** fans:

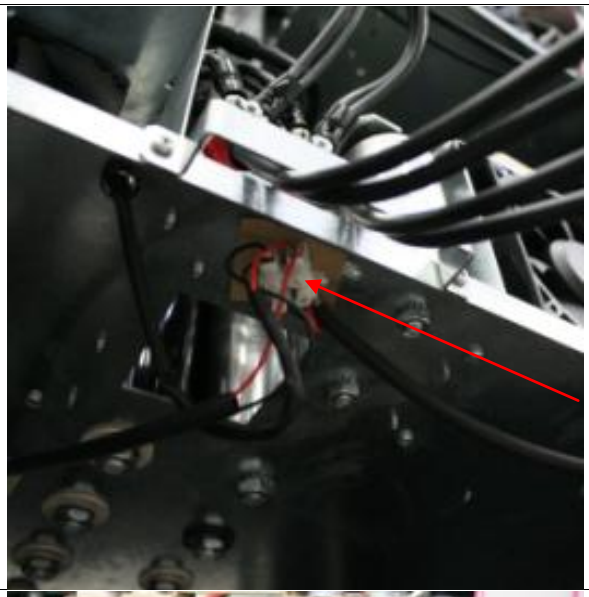
1) Remove the screws that secure the ByPass drawer.
2) Remove the Bypass drawer.
3) Remove the screws that secure the plastic conveyor. Disconnect the fans, freeing the terminals from terminal J5 on sk B0084
4) Remove the screws that secure the protective grilles on the drawer itself.

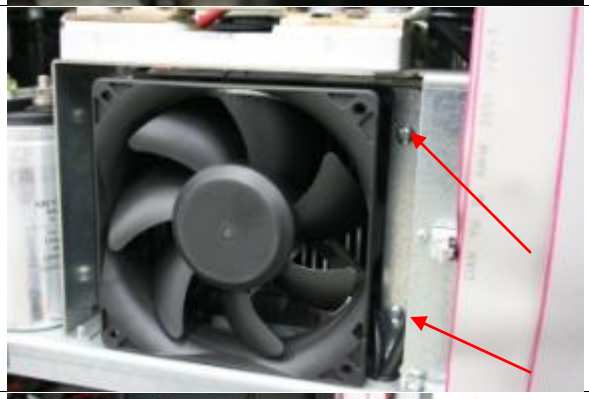
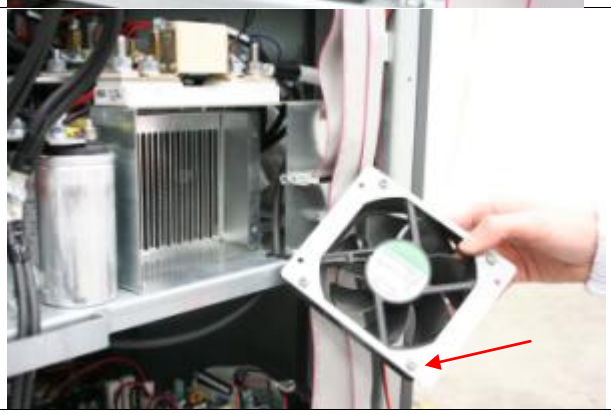
6.2.3 Power drawer fans

There are three power drawer fans: one located on the bottom of the drawer that cools the output capacitors, and 2 fronts aligned with the two dissipators for the inverter (left side) and boost (right side). They take power from terminal J10 of B0102 and are protected by the same fuse F1 located on sk B0102 (8A 250V 5X20 DELAYED).
All the above fans come on when the inverter starts.

To remove the fan close to the **capacitors**:

1) Remove the grille on the back of the UPS.
2) Disconnect the fan, releasing the terminals from the terminal located under the power drawer.
3) Remove the screws that secure the fan to the conveyor.

<table>
<tr><td>  </td><td>To remove the inverter/boost dissipator fans:
1) Remove the front grille. Disconnect the terminals from the terminal located under the power drawer*.

*In the case of the Phase 3 drawer, in order to access the terminal, it is necessary to partially extract the drawer, therefore refer to the “Power Drawer” paragraph.</td></tr>
<tr><td>  </td><td>2) Remove the fan support from the dissipator.</td></tr>
<tr><td>  </td><td>3) Remove the screws that secure the fan to the support.</td></tr>
</table>

For the installation of new fans, follow the above instructions in reverse order.

6.3 Replacing power capacitors

To replace the capacitors, refer to the document RM020 TT4 CAP. REPLACEMENT MANUAL.

7 Internal structure of the UPS

7.1 Overview

This section describes the internal structure of the UPS.

The TT4 series UPS consists of a three phase/three phase transformerless machine, designed as a triplication of a single phase structure.
This structure is located in each of the three drawers. Each of them contains the input and output connections for a single phase.
Each drawer contains **Boost side connection board** (B0078), a **Boost driver board** (B0079) and an **Inverter driver board** (B0081).

The **inverter outputs** come together in a single board (B0083) located on the lower platform near the remote control switch.

On the back of the UPS, there is an additional removable drawer that contains the board with the **ByPass** connections (B0080) and the **Battery Charger** (B0084).

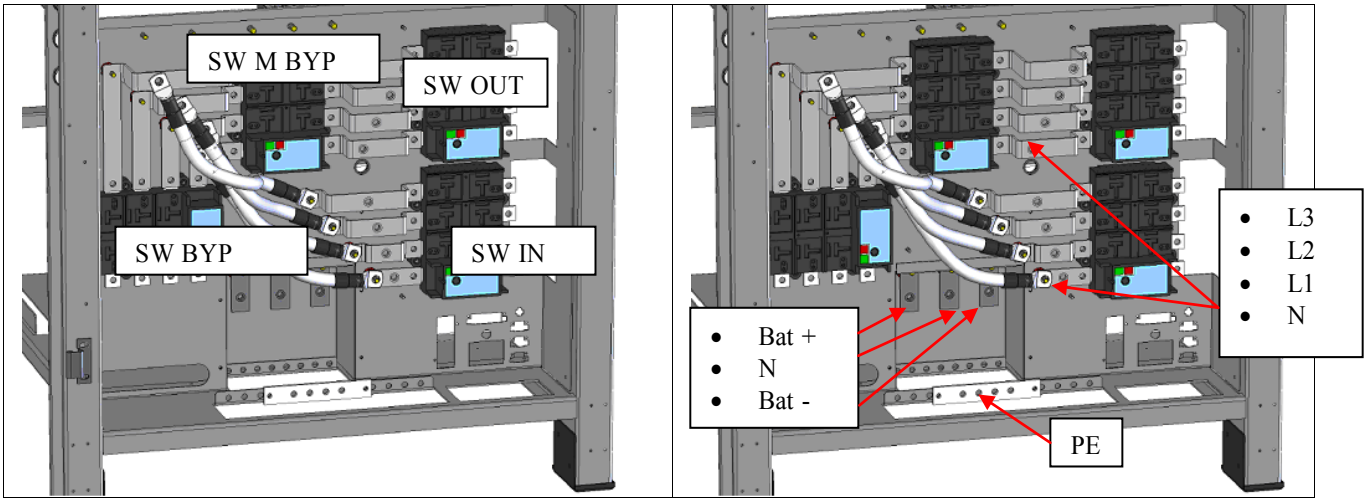
On the upper level, there are all the control logics and their power supplies.
The **auxiliary power board** (B0102) creates the power for the UPS boards.
The **24V auxiliary board** (B0082) instead provides the power for the output remote control switch and the isolated power for the IGBT piloting.
The **Microprocessor+DSP** board (B0067) contains two processors and, together with the **control board** (B0051-02), oversees the entire operation of the UPS.
B0051-02 connects to a bridge board, called an interface board (B0077) for the adaptation of the signals.
Finally, there are the **sk display** (B0057) and the communication **interface board** (B0056).

Completing the set of boards, there are three EMI filter boards (B0099) that are installed on the SWIN, SWBYP and SWOUT disconnectors.

CAUTION: *If replacing the boards, please note that the codes provided on those shown on the spare parts are different from the original UPS codes. Check with UPSERVICE regarding the correct correspondence between the two versions.*

CAUTION: *If replacing the IGBT modules, also replace their driver boards.*

7.2 Description of the disconnectors



For further details, see the appendix of the user manual.

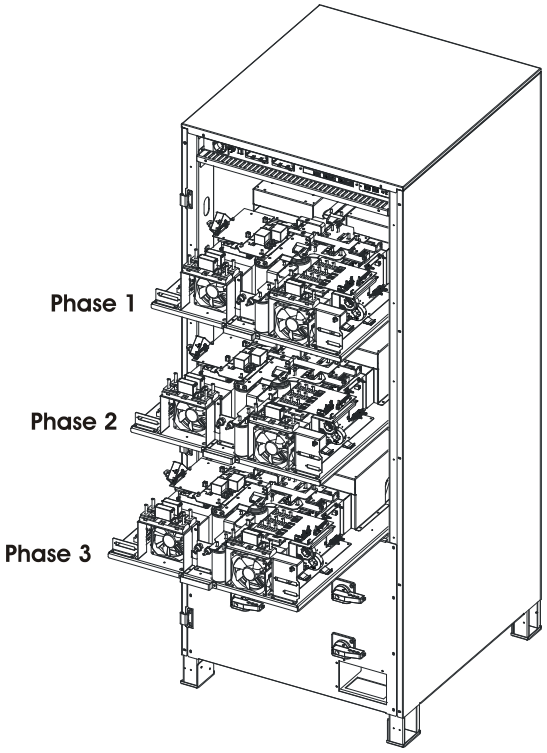
7.3 Fuse table

The UPS has several fuses. All the fuses are the same for both sizes 100kVA and 120kVA. Use the following table for replacements.

	Fuse type
Battery + and battery -	100A 690Vac gRL
Rectifier input, inverter output	250A 690Vac aR
ByPass fans	2 A, 250Vac
Auxiliary Power Board (B0102) (F1)	8A 250V 5X20mm Quick
Auxiliary Power Board (B0102) (F2)	2A, 500V 6.3x32mm GF
24V Auxiliary Power Board (B0082) (F1)	2A, 500V 6.3x32mm GF
Battery Charger Board (B0084) (F1, F3)	25A 500V 6.3X32mm Quick
Battery Charger Board (B0084) (F2, F4)	32A 400/500V 10.3X38mm GL

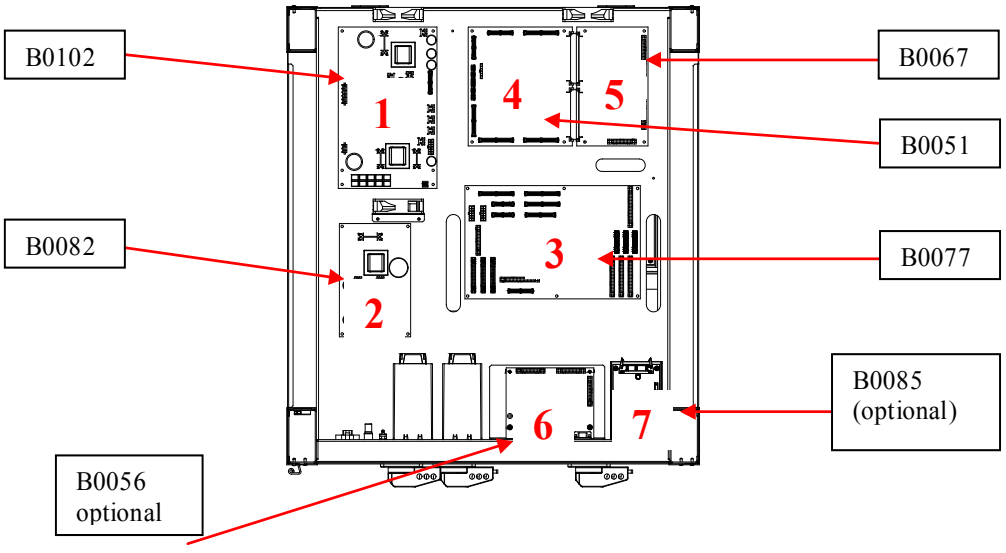
⚠	***CAUTION:*** *if replacing the battery fuses (located on the left side of the drawer) due to a previous erroneous connection of a battery box, check that the SCRs (on the right side of each drawer) are not damaged.*

7.4 Location of the power drawers



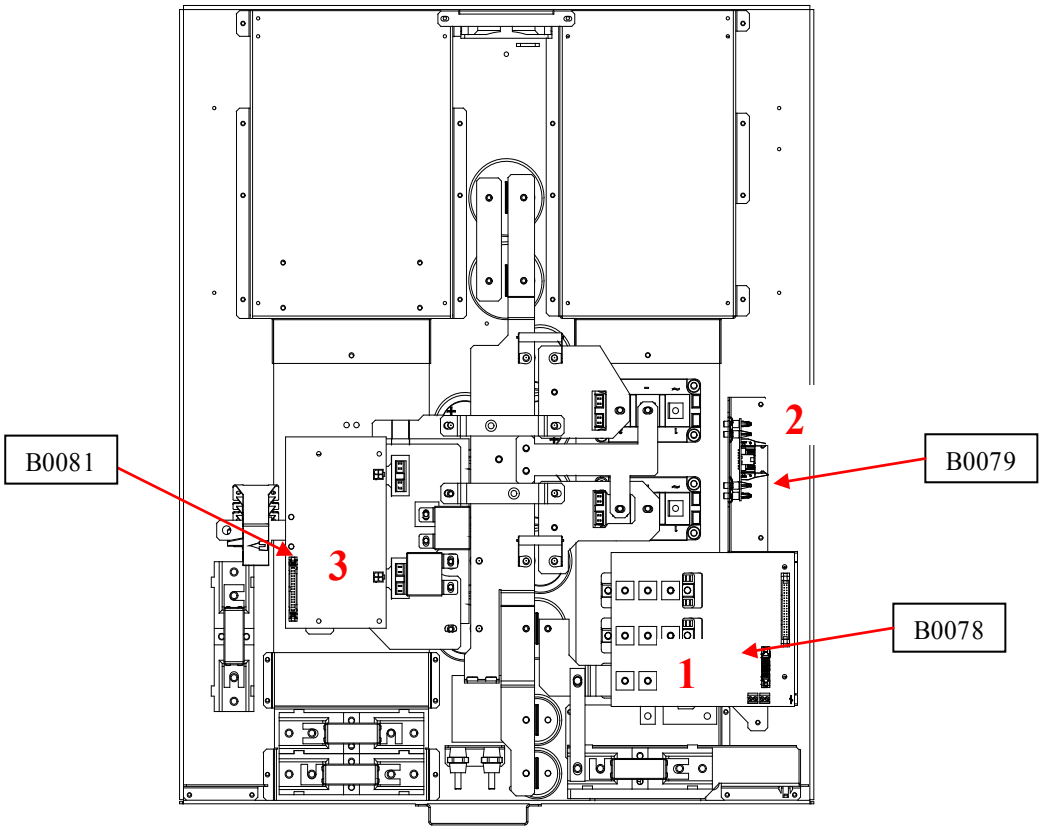
7.5 Position of the upper boards:

1) **auxiliary** power board (B0102)
2) **24V auxiliary** power board for remote control switch (B0082)
3) **signal adaptation interface** board (B0077)
4) **control** board (B0051)
5) **multi-processor** board (B0067)
6) RS232 - USB **communication** board (B0056)
7) **parallel** board (B0085) (optional accessory)



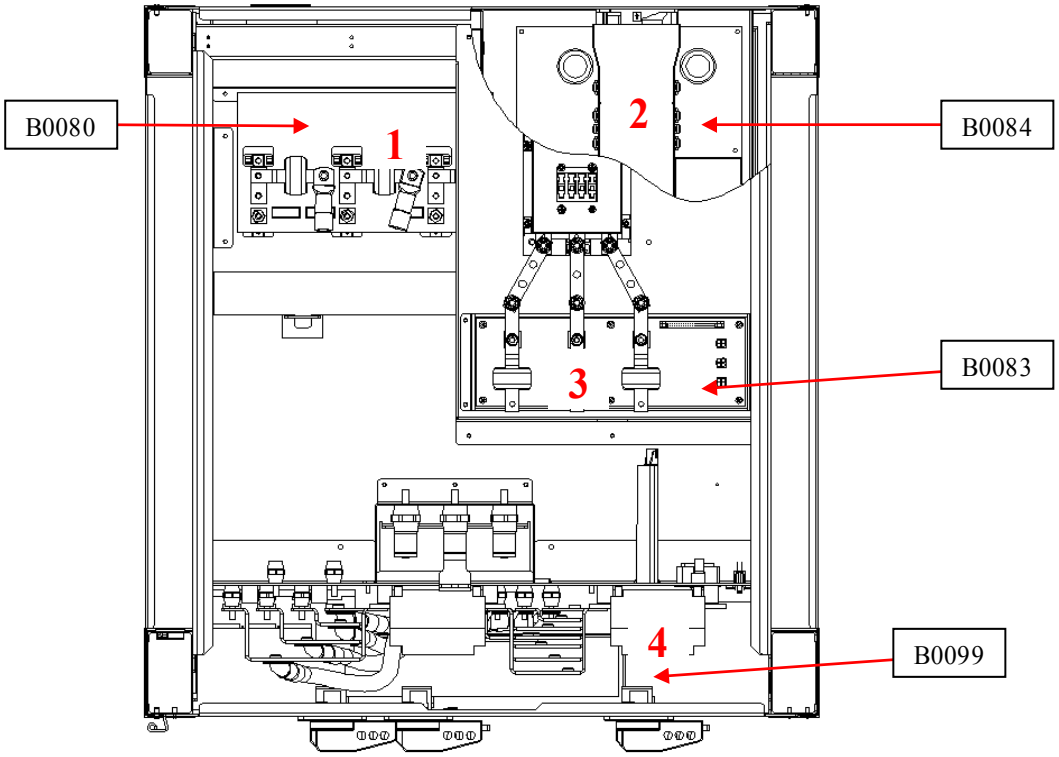
7.6 Position of the boards on the power drawers:

1) **boost side connection** board (B0078)
2) **boost driver** board (B0079)
3) **inverter driver** board (B0081)



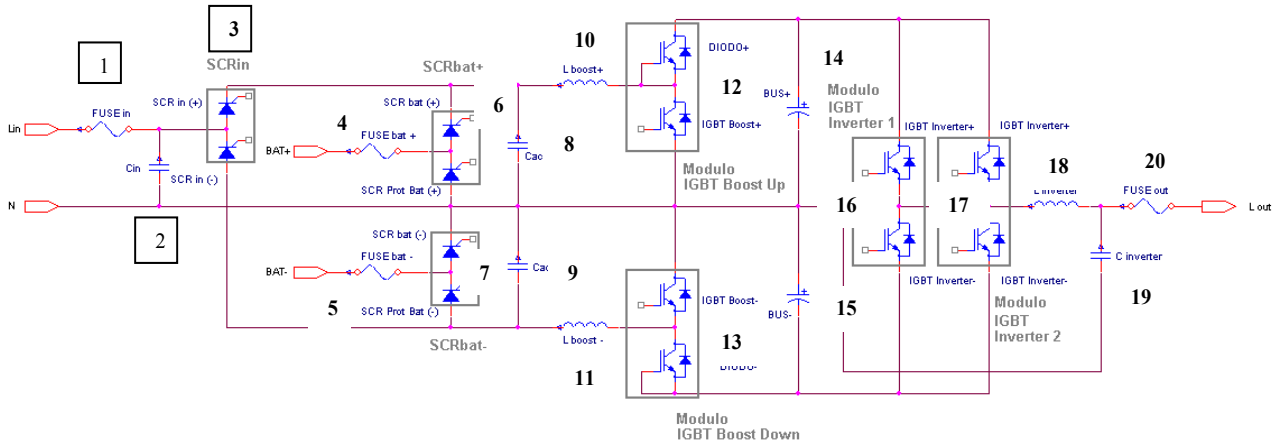
7.7 Position of the boards on the lower level:

1) **bypass connections** board (B0080) (can be accessed from the ByPass drawer)
2) **battery charger** board (B0084) (can be accessed from the ByPass drawer)
3) **output connections** board (B0083)
4) **EMI filter** board (B0099) (located on the disconnectors)



7.8 TT4 power drawer

The figure below depicts the block diagram of one phase of the UPS, showing the main elements present on the board.



The power drawer of each phase contains the input and output stage of the UPS.
The main elements are:

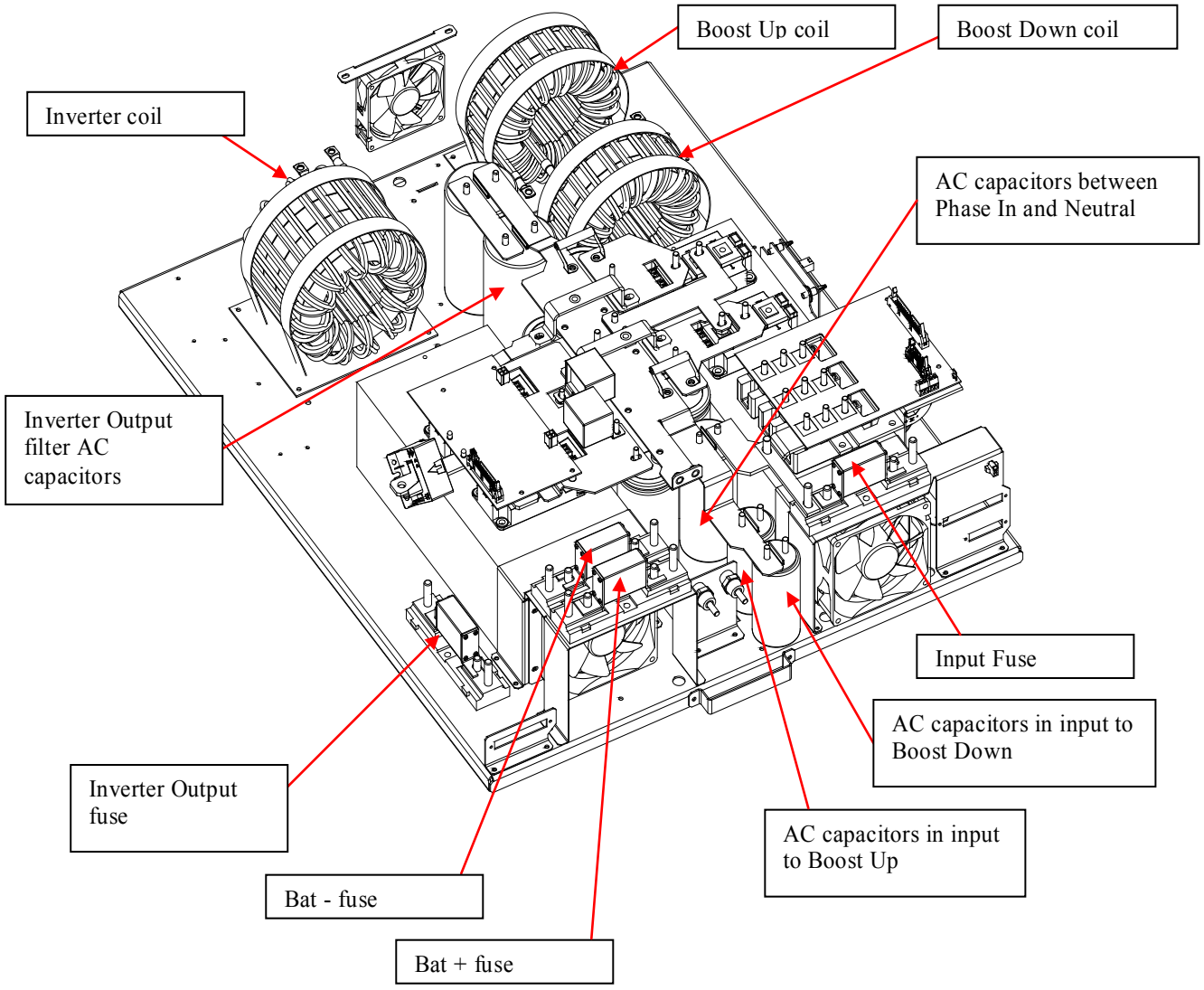
1) Input fuse
2) Input capacitor
3) Input SCR
4) Battery + fuse
5) Battery - fuse
6) Bat + SCR
7) Bat - SCR
8) Cboost +
9) Cboost-
10) Boost Up inductor
11) Boost Down inductor
12) Boost Up IGBT Module
13) Boost Down IGBT Module
14) Positive bench
15) Negative bench
16) Inverter IGBT1 module
17) Inverter IGBT2 module
18) Inverter inductor
19) Inverter capacitor
20) Output fuse
21) Boost dissipator temperature sensor
22) Inverter dissipator temperature sensor
23) Boost Up current sensor
24) Boost Down current sensor
25) Inverter current sensor

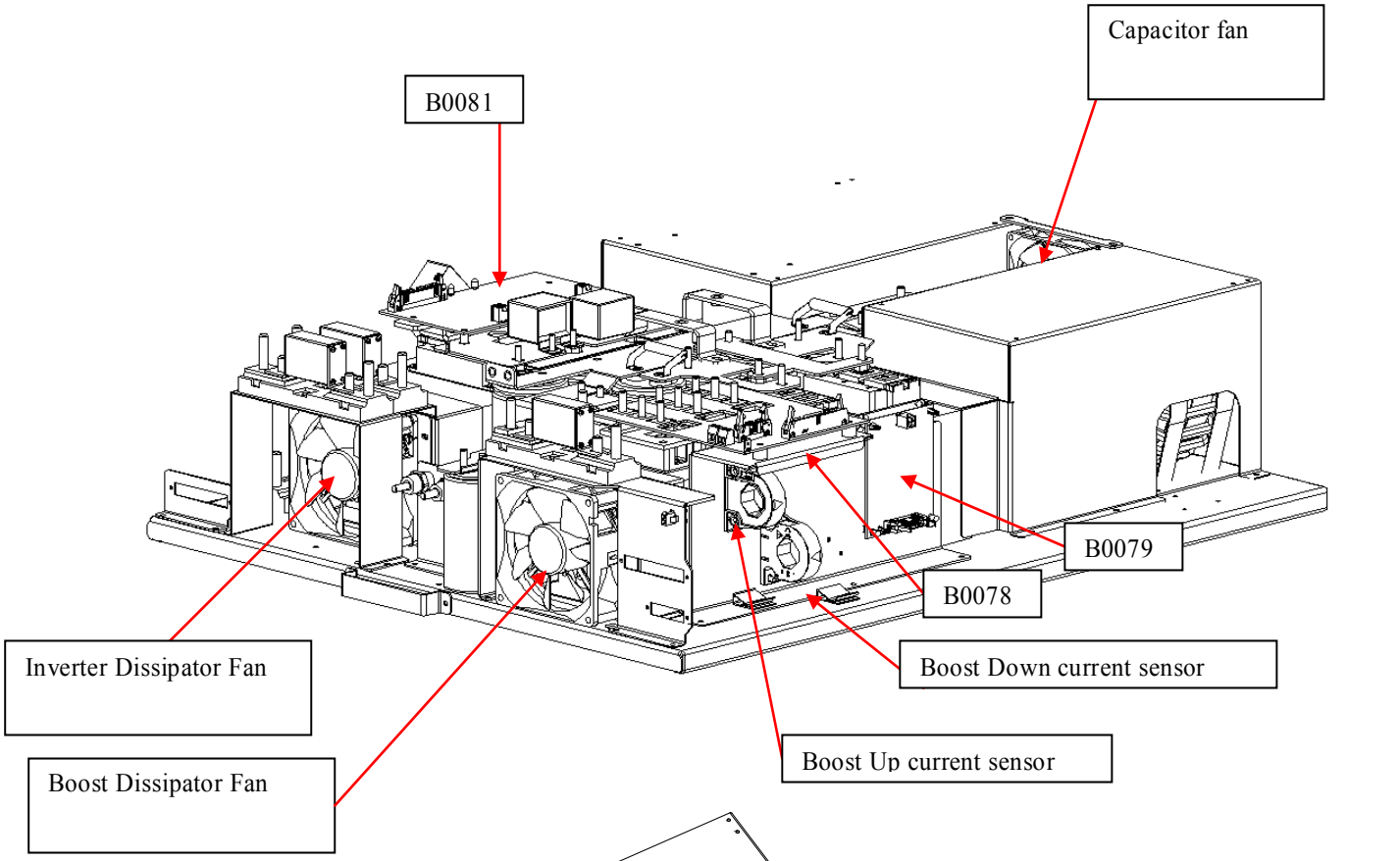
N.B.

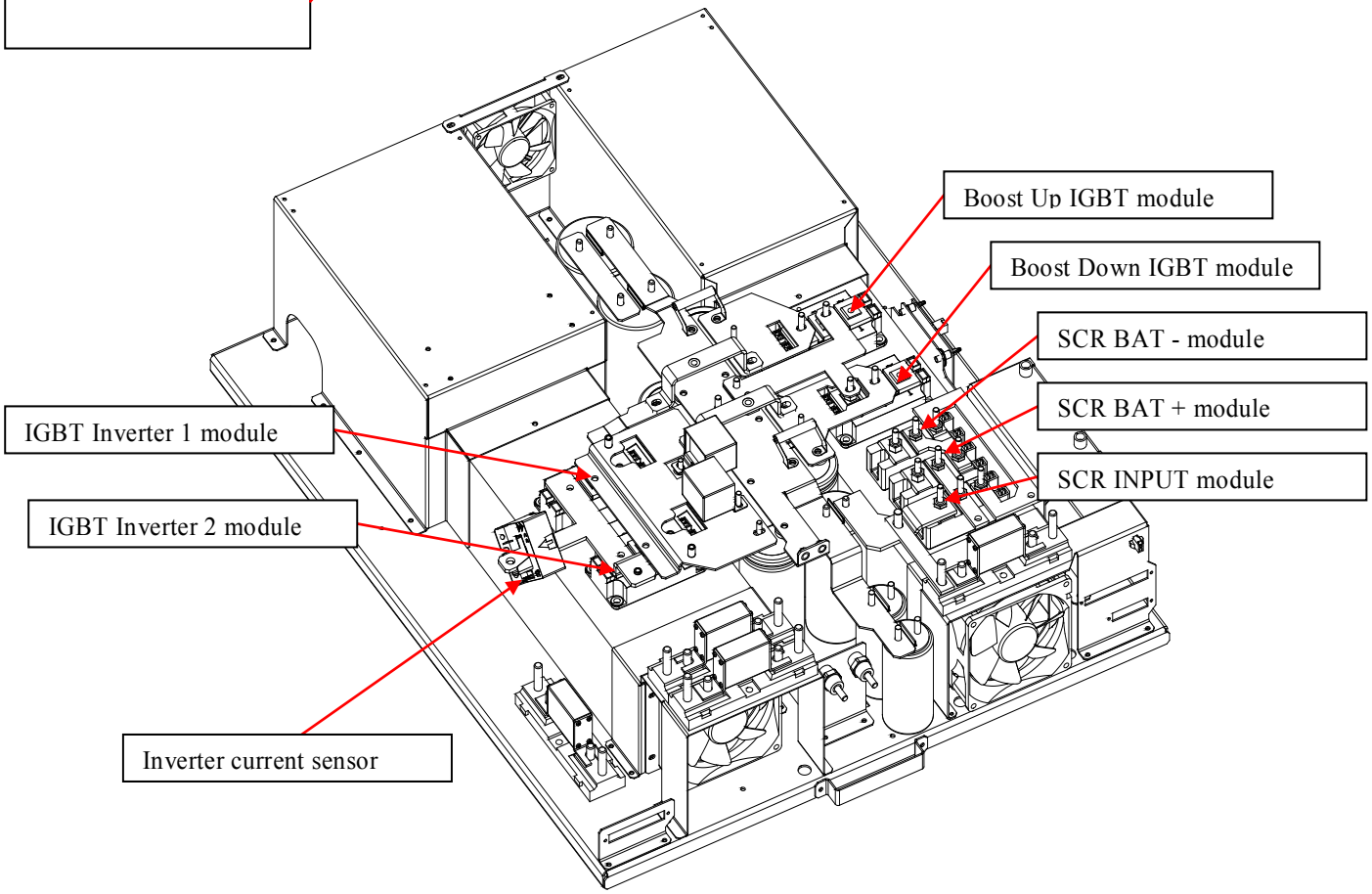
The Boost is achieved using a module containing two IGBTs. One of these is always kept off (via a welded 0R between Gate and Emitter) and its freewheeling diode is used.
This applies to both Boost Up and Boost Down.

The inverter for each phase is a Half Bridge, and is composed of two IGBT modules connected in parallel.

The figures below show the location of various elements within the drawer.

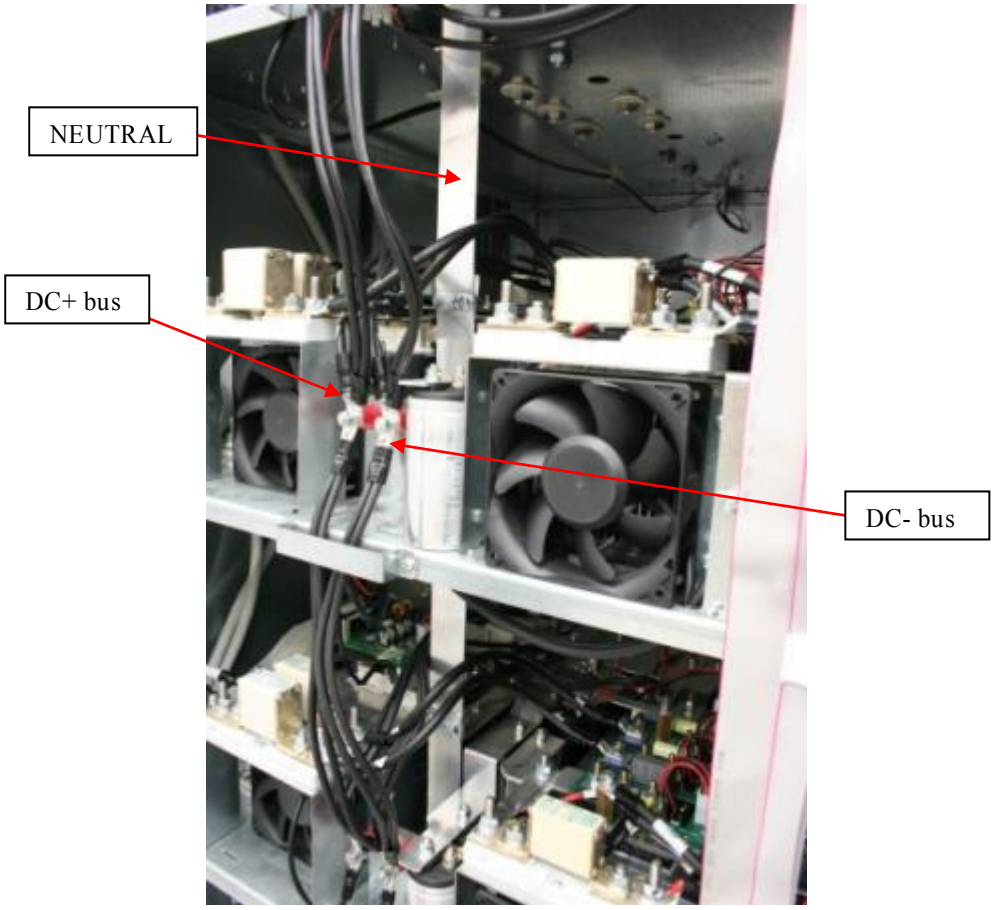



Capacitor fan
B0081
B0079
B0078
Inverter Dissipator Fan
Boost Down current sensor
Boost Dissipator Fan
Boost Up current sensor


Boost Up IGBT module
Boost Down IGBT module
SCR BAT - module
SCR BAT + module
SCR INPUT module
IGBT Inverter 1 module
IGBT Inverter 2 module
Inverter current sensor

7.9 *Front connections between drawers*

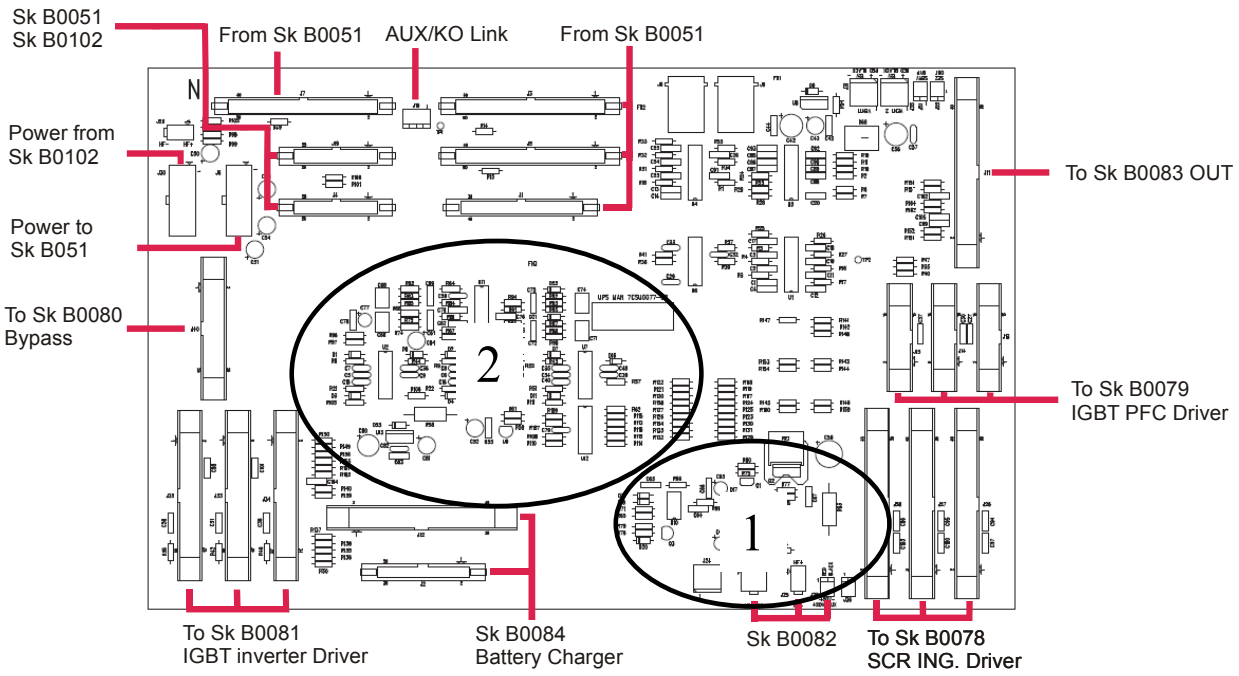
The picture below shows the connections between the drawers. These are visible with the front grille removed.



8 Description of the boards

8.1 Signal adaptation interface board (B0077)

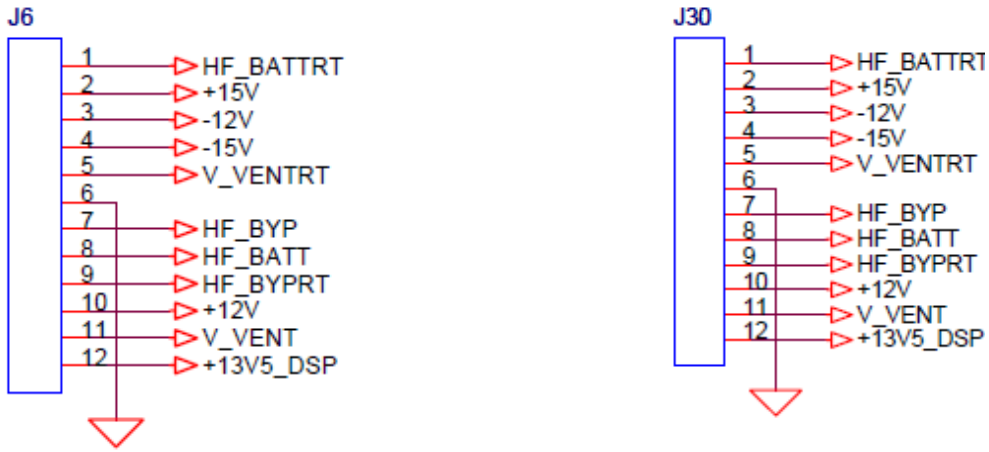
This board implements an adaptation between the control board and the auxiliary power board signals of the TT2 and the specific structure of the TT4. The following are present: power dissipator temperature reading conditioning, input SCR closing circuit, additional aux_ko relative to the 24Vdc aux, current sensor drop resistors.



1) Input SCR piloting
2) Dissipator temperature reading

Connector	Description	From	To
J1	Signals for inverter output boards	B0051	J32, J33, J34, J11
J2	Signals for battery charger board	B0051	J12
J3, J5, J7	Signals for bypass and input boards	B0051	J40, J26, J27, J28
J4	Command signals from aux power board	B0102	J19
J6	Power from aux power sk	B0102	J30
J10	Additional power board aux ko signal	Aux Ko circuit	B0051
J11	Connection to B0083 board	J32, J33, J34	B0083
J12	Connector for battery charger board	J2	B0084
J13, J14, J15	Connections for boost driver boards	J3, J5, J7	B0079
J19	Command signals connection for B0051 board	J4	B0051
J20	IGBT HF signal for aux ko	B0082	Aux Ko circuit
J23	General HF signal	B0102	HF UPS
J25	27V signal for remote control switch aux power sk	J23	B0082
J26, J27, J28	Connections for boost input boards	J3, J5, J7	B0078
J29	20V signal for aux ko	B0082	Aux Ko circuit
J30	Power connections for B0051 board	J6	B0051
J32, J33, J34	Connections for inverter output boards	J1	B0081
J40	Connection for bypass board	J3, J5, J7	B0080

J6 and J30 connector diagram:

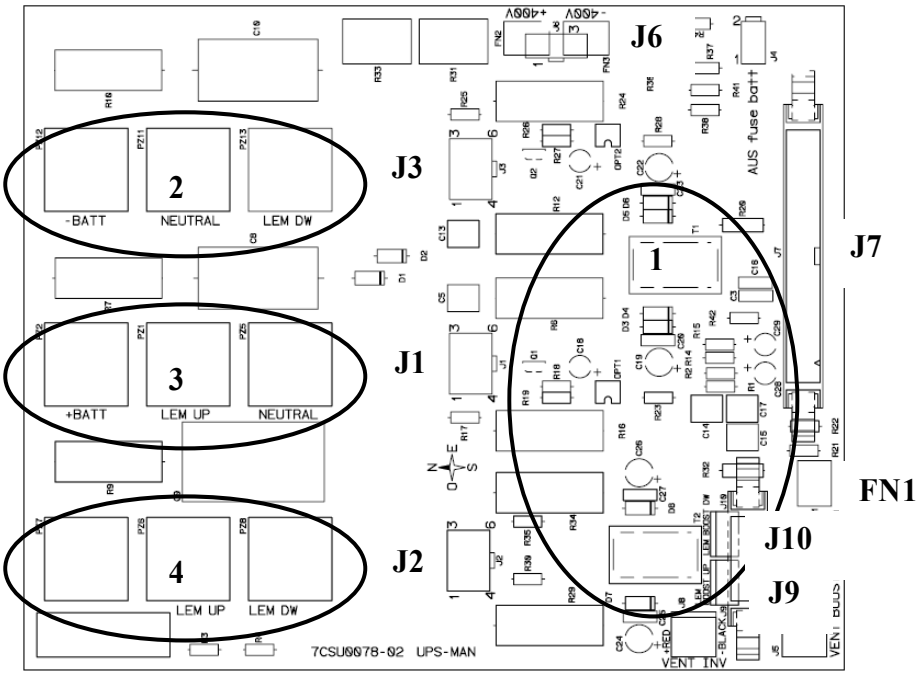


8.2 Boost side connection board (B0078)

The connections board contains the piloting of the SCRs.
The main elements of the B0078 board are:

1) Isolated power supplies
2) Battery - SCR
3) Battery + SCR
4) Input SCR

The figure below shows the location of various elements within the board.

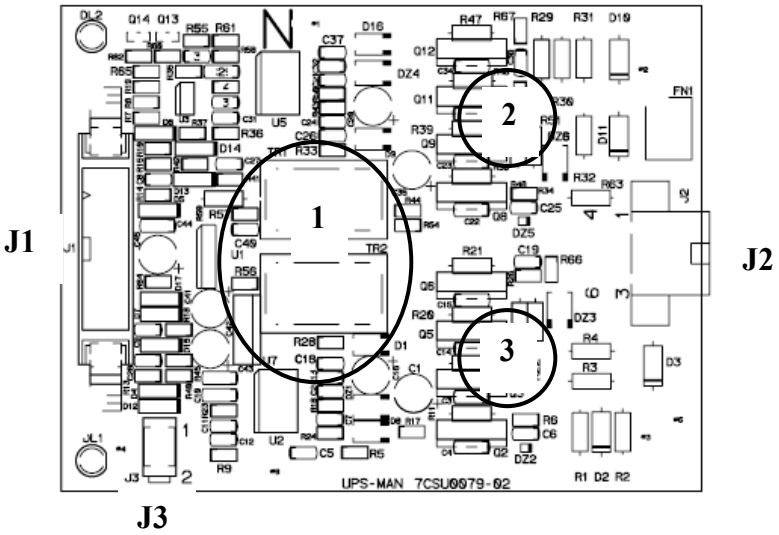


Connector	Description	Remarks
J1, J2, J3	SCR piloting signal	
J6	DC BUS protection signal connector	
J7	Flat cable connection to interface board	Flat to B0077
J9, J0	Connection for Boost LEM	
FN1	Connection for reading input voltage	

8.3 Boost IGBT driver board (B0079)

The board provides the isolated piloting for the IGBTs. The main elements of the B0079 board are:

1) Isolated power supplies
2) IGBT UP driver
3) IGBT DOWN driver



Connector	Description	Remarks
J1	Flat cable connection for interface board	Towards sk B0077
J2	IGBT Boost piloting signals	
J3	Boost dissipator temperature sensor connection	

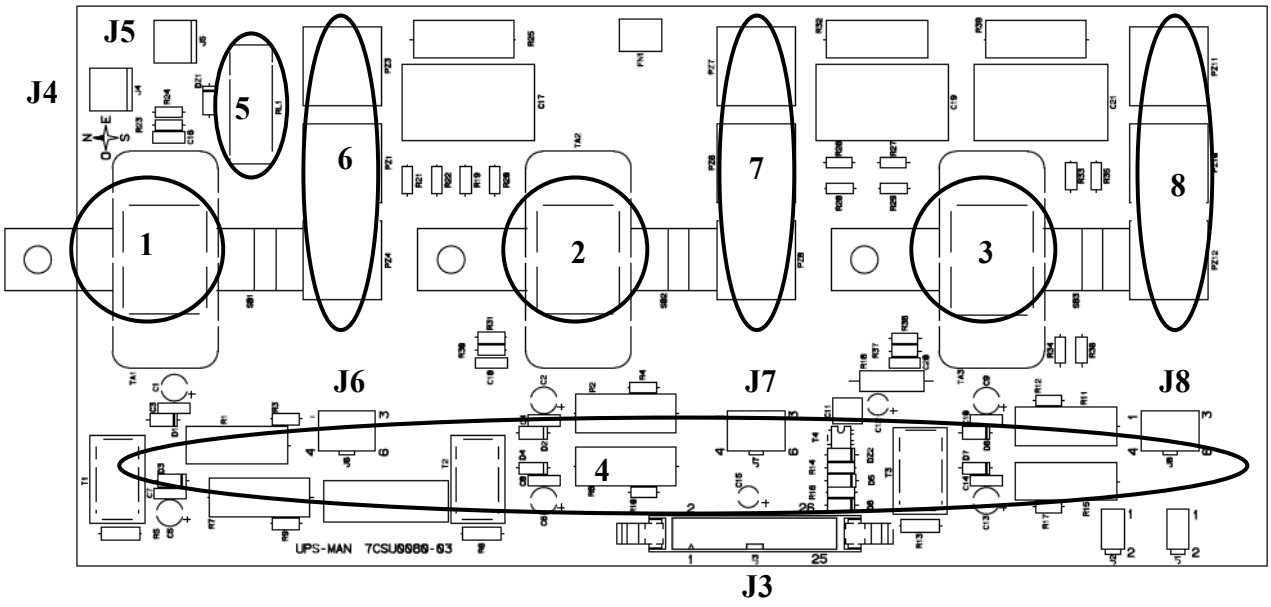
LED	Description	Remarks
DL1	Red LED indicates IGBT UP protection intervention due to overcurrent	Reset on logic shutdown
DL2	Red LED indicates IGBT DW protection intervention due to overcurrent	Reset on logic shutdown

8.4 *Bypass connections board (B0080)*

The connections board contains the ByPass SCRs.
The main elements of the B0080 board are:

1) Phase1 TA
2) Phase2 TA
3) Phase3 TA
4) Isolated power supplies
5) Fan relay
6) Phase 1 SCR
7) Phase 2 SCR
8) Phase 3 SCR

The figure below shows the location of various elements within the board.



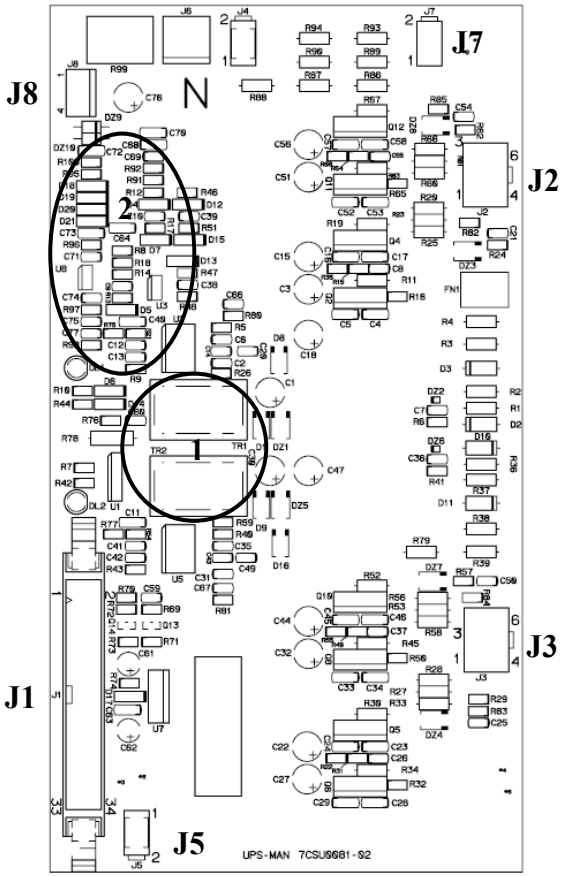
Reset on logic shutdown

Connector	Description	Remarks
J3	Flat cable connection for interface board	Towards sk B0077
J4, J5	Connectors for bypass fans	
J6, J7, J8	SCR piloting signal connectors	

8.5 Inverter IGBT driver board (B0081)

The board provides the isolated piloting for the INVERTER IGBTs. This board also contains the circuitry for the readings of output and balance current and voltage. The main elements of the B0081 board are:

1) Isolated power supplies
2) Balance reading

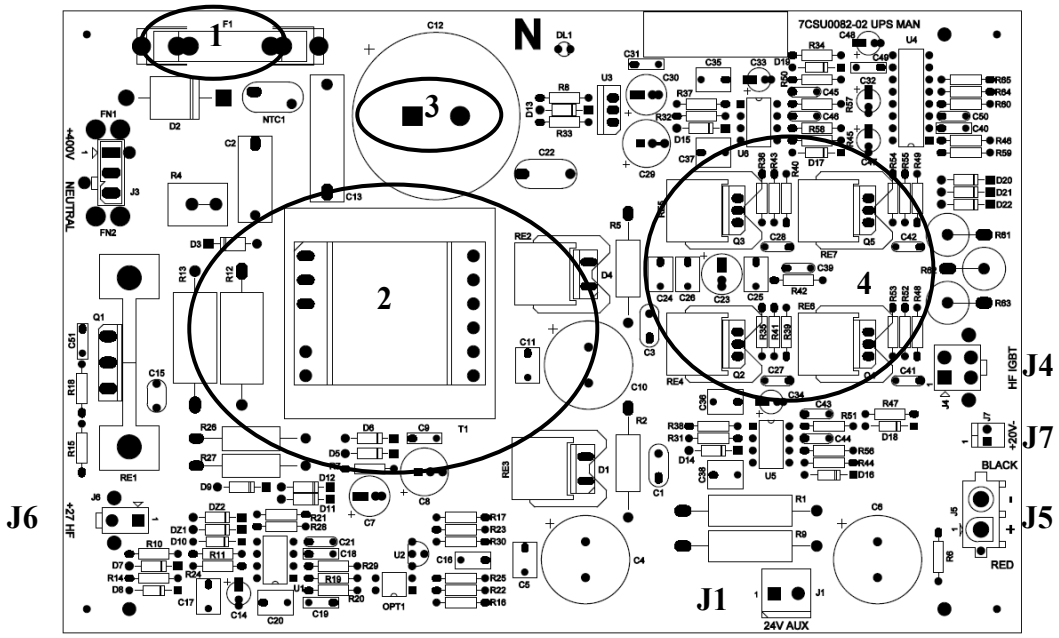


Connector	Description	Remarks
J1	Flat cable connection for interface board	Towards sk B0077
J2, J3	Connections for IGBT Inverter piloting signals	
J5	Inverter dissipator temperature sensor connection	
J7	Connection for reading inverter voltage	
J8	Connection for LEM Inverter	

8.6 24V auxiliary power board for remote control switch (B0082)

The board provides power to energise the output remote control switch and the isolated power supplies for the IGBTs. The main elements of the B0082 board are:

1) 6.3x32 fuse - 2A 500V GF
2) 24V power supply
3) input capacitor
4) IGBT isolated power supplies



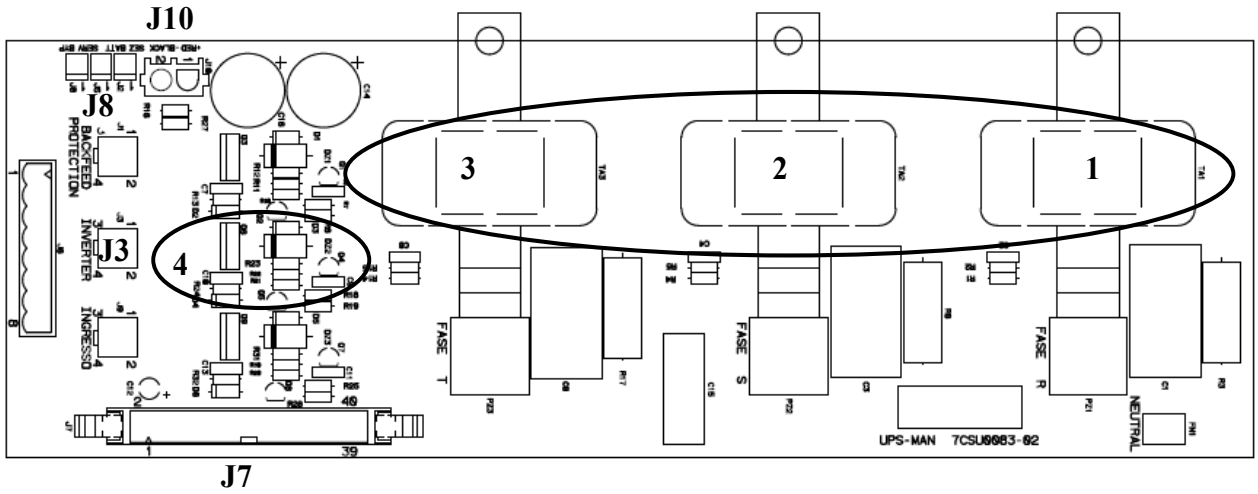
Connector	Description	Remarks
J1	Upper level fan power connector	
J4	Connector for HF IGBT	Towards B0077
J5	Connector for output remote control switch power	Towards B0083
J6	27 V power supply connector	From sk B0077
J7	Power control connector	Towards sk B0077

8.7 Output board (B0083)

The output board contains the TA current readings.
The main elements of the B0083 board are:

1) Phase 1 output current sensor
2) Phase 2 output current sensor
3) Phase 3 output current sensor
4) Inverter remote control switch piloting

The figure below shows the location of various elements within the board.

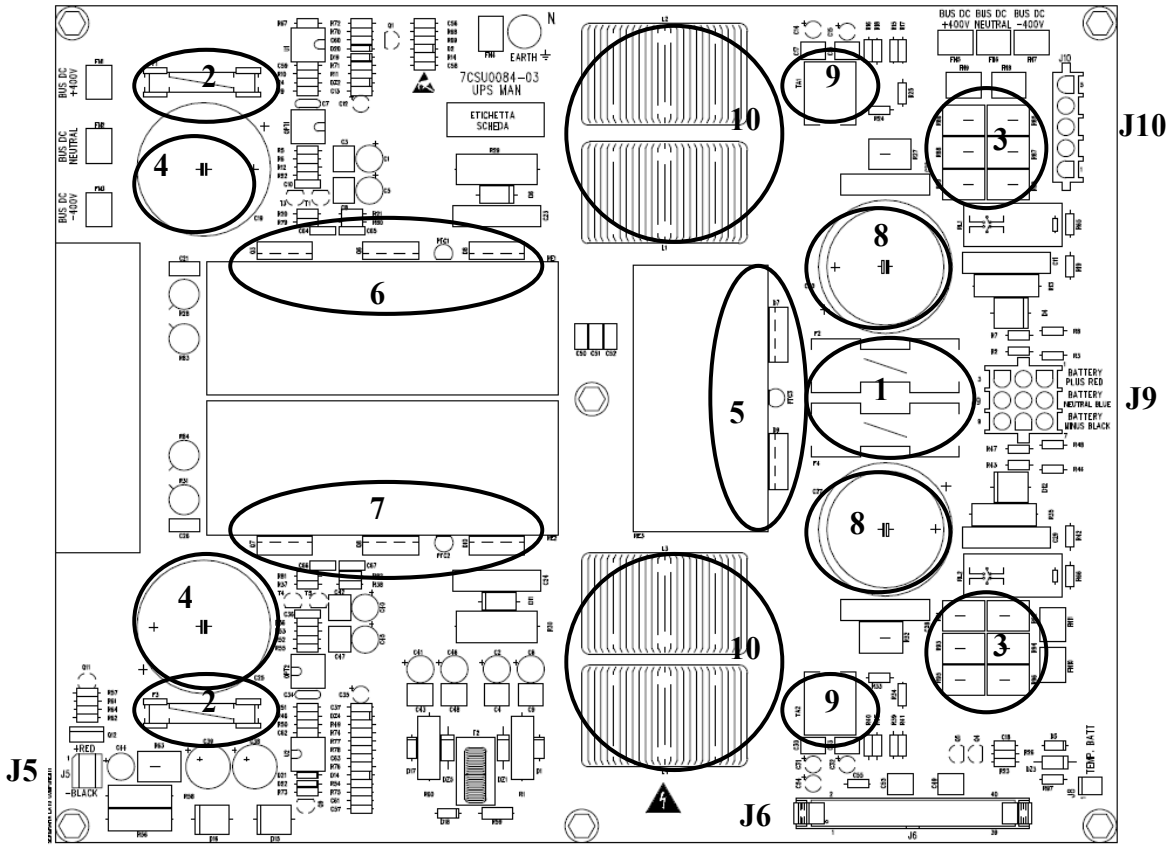


Connector	Description	Remarks
J3	Connector for output remote control switch piloting	Towards remote control switch
J7	Flat cable connection to interface board	From B0077
J8	Connector for Service bypass signal	From service bypass disconnector aux
J10	Remote control switch power connector	From sk B0082

8.8 Battery charger board (B0084)

The battery charger board is composed of two buck converters and also contains the battery pre-charge. The main elements of the B0084 board are:

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 + dissipator temperature sensor
7) negative buck + dissipator temperature sensor
8) output capacitors
9) current sensors
10) buck inductors

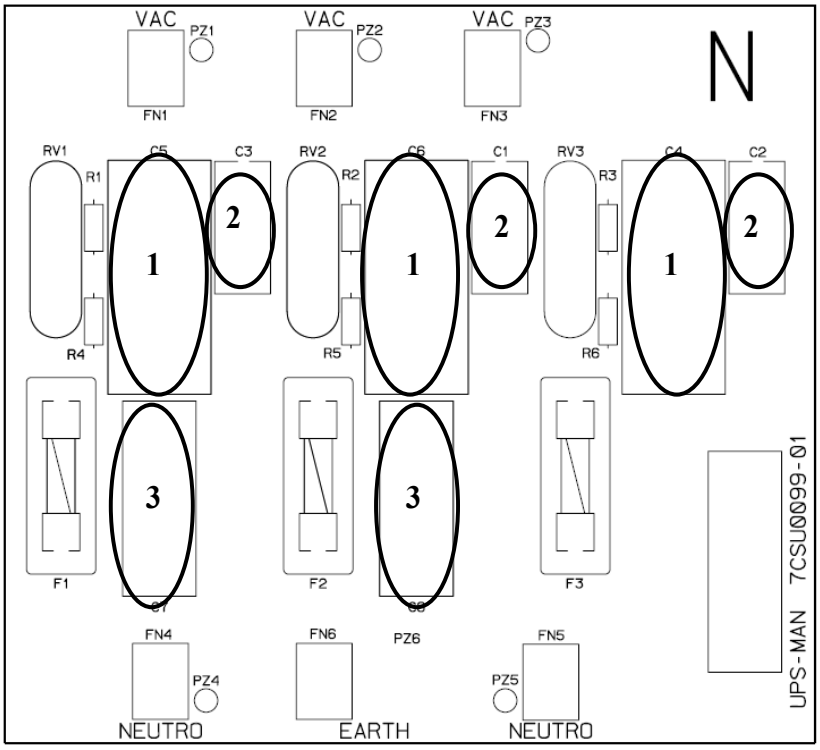


Connector	Description	Remarks
J5	Fan power connector	
J6	Flat cable connection to interface board	From B0077
J9	Battery charger sk output connection	Towards battery bars
J10	Battery charger sk input connection	From bus +/- 400

8.9 EMI filters board (B0099)

The filter board is installed on each disconnector, except on the Service Bypass disconnector. The main elements of the B0082 board are:

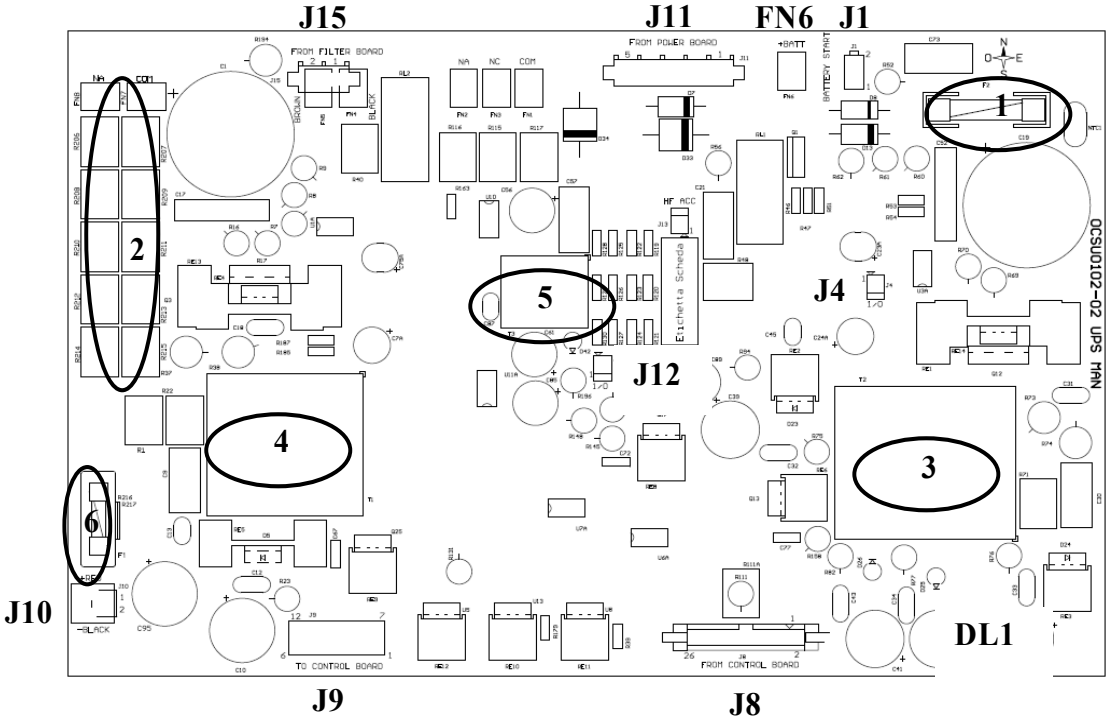
1) Cx capacitors phase 1-2-3
2) Cy capacitors phase 1-2-3
3) Cy capacitors neutral



8.10 Auxiliary power board (B0102)

The auxiliary power board is composed of two flyback power supplies and also contains the preload from the mains. The main elements of the B0102 board are:

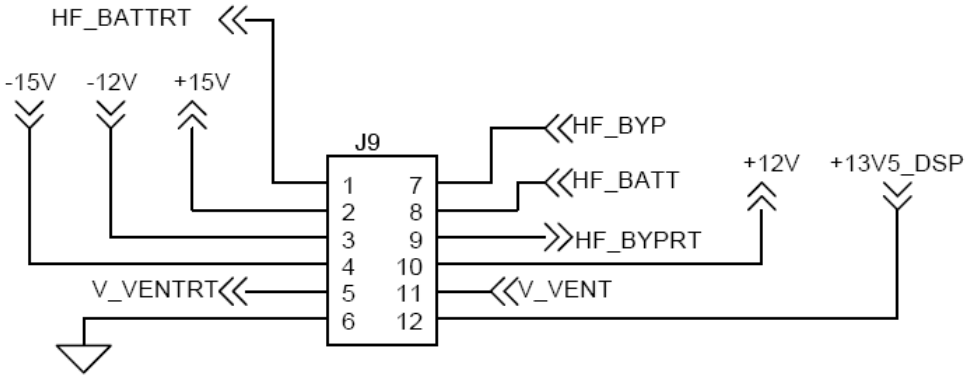
1) 6.3x32 fuse - 2A 500V GF
2) preload from mains
3) +27, +15, +12_relay, -18V power supply
4) fan power supply
5) redundant bypass power supply
6) 8A 250V 5X20 delayed fan power supply output fuse



Connector	Description	Remarks
J1	Vbat connector for battery start	
J4	Connector for 1/0	Put jumper
J8	Flat cable connector to interface board	From B0077 board
J9	UPS logic power connector	Towards B0077 board
J10	Power drawer fan power connector	
J11	DC BUS, HF connector	
J12	Connector for 1/0	
J15	Mains power connector	PH1 → from J15-1 input PH2 → from J15-2 bypass
FN6	+batt connector for battery start	

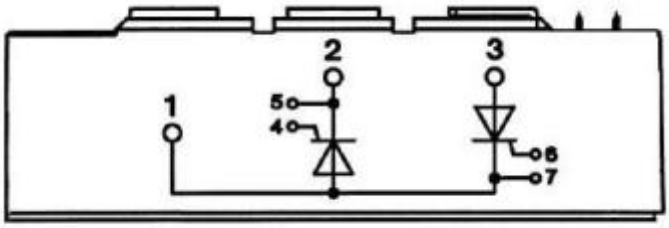
LED	Description	Remarks
DL1	Aux power good signal LED	

UPS logic power connector (J9) diagram



8.11 Note about replacing the boards

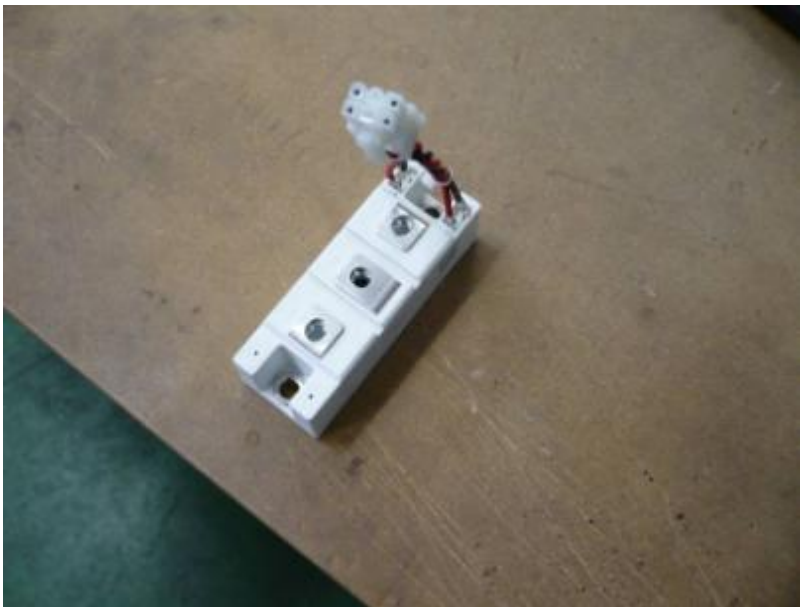
For each size of UPS, in the event of the breakage of the inverter, in addition replacing any faulty modules, it is necessary to use the tester to check the condition of the input SCR of the other two phases.
The component in question is the battery SCR and input SCR stage. These are modules present on each power drawer.
More specifically, using the diagram and pinout shown below as a reference, check that the two SCRs are not short-circuited or open between the anode and cathode (screw terminals 3-2).



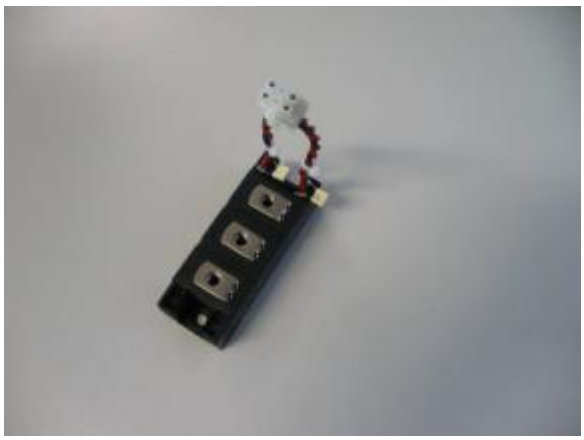
8.12 Notes for spare parts

8.12.1 SCR Modules (Input/Bypass)

Semikron SCR SKKT 162 module (White case)



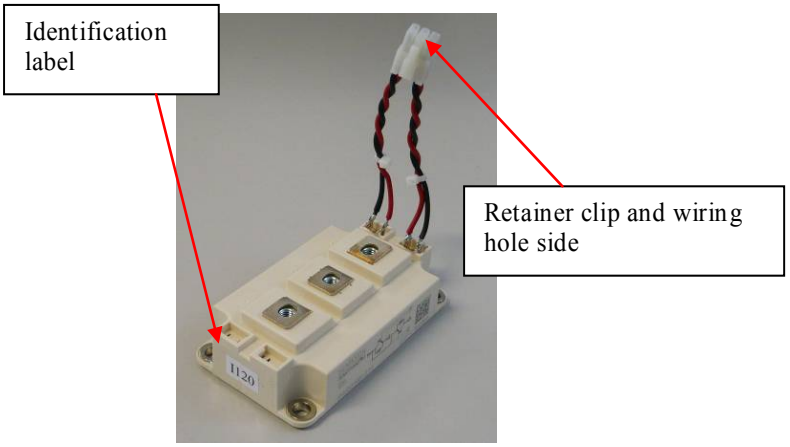
SCR Ixys MCC162-12 module (Black case)



8.12.2 Inverter IGBT modules

	Inverter IGBT module code	Label
100 KVA	0405010140	I100
120 KVA	0405010139	I120

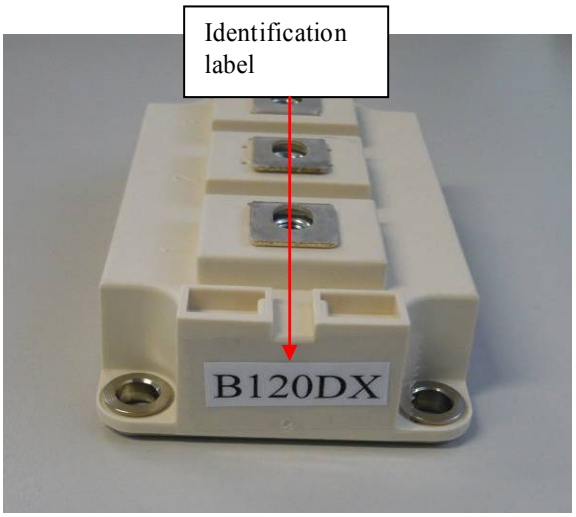
Affix the identification label on the side of the module opposite the piloting. Choose the appropriate label shown in the table above.

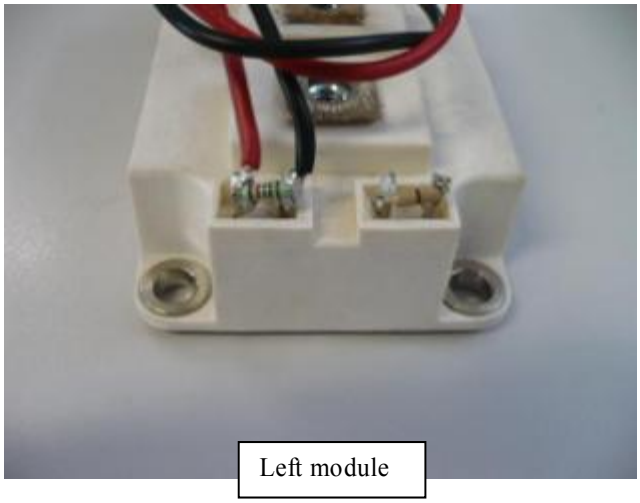


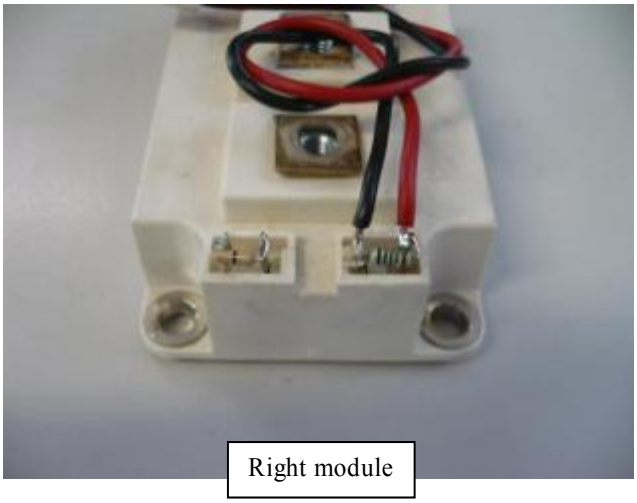
8.12.3 Boost IGBT Modules

Module identification table

	Boost IGBT Module code	Label
100 KVA	0405010139	B100DX
120 KVA	0405010139	B120DX







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

The input voltages are read by both the microcontroller (µC) and the DSP. The point of reading of this magnitude, however, is different: the µC reads the voltage upstream from the input fuse while the DSP reads it downstream.
The display shows the reading of the µC.
With the machine off, using a multimeter, check that the input fuse on the drawer is intact.
It is 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
	Fuse 250A	Before	Before	Before	
	B0078	FN_1	FN_1	FN_1	
	B0078	R21	R21	R21	150 kR
->	B0078	R22	R22	R22	150 kR
	B0078	J7-11	J7-11	J7-11	
	Flat Cable	||	||	||	
	B0077	J26-11	J27-11	J28-11	
	B0077	J3-6	J5-6	J7-6	
	Flat Cable	||	||	||	
	B0051	J3-6	J4-6	J5-6	
->	B0051	R291	R294	R295	150 kR

(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 250A	After	After	After	
	B0078	PZ_7	PZ_7	PZ_7	
	B0078	R3	R3	R3	150 kR
->	B0078	R4	R4	R4	150 kR
	B0078	J7-10	J7-10	J7-10	
	Flat Cable	||	||	||	
	B0077	J26-10	J27-10	J28-10	
	B0077	J3-10	J5-10	J7-10	
	Flat Cable	||	||	||	
	B0051	J3-10	J4-10	J5-10	
->	B0051	R298	R299	R300	150 kR

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 B0080 board.
To check the presence of voltage, with the UPS turned on, point between neutral and pin 1 of the bypass SCR module.
This reading is designed 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):

		Phase 1	Phase 2	Phase 3	Note
	B0080	PZ_3	PZ_7	PZ_11	
	B0080	R19	R26	R33	150 kR
->	B0080	R20	R27	R34	150 kR
	B0080	J3-6	J3-8	J3-10	
	Flat Cable	||	||	||	
	B0077	J40-6	J40-8	J40-10	
	B0077	J3-9	J5-9	J7-9	
	Flat Cable	||	||	||	
	B0051	J3-9	J4-9	J5-9	
->	B0051	R271	R292	R293	150 kR

9.3 Battery 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 in the power drawer (before and after the battery fuse) to see whether there is voltage is compared to the neutral. If the fuse is open, replace it.

In the event that there is no voltage before the fuse, check the voltage before and after the sk B0084 output fuses (positive at the top in relation to the north of the board and negative at the bottom). If this is also open, replace it. If there is voltage but the UPS continues to indicate the lack of batteries, it is necessary to check the connection of the reading system.

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	J9-1/2/3 (= F2)	J9-7/8/9 (= F4)	
	B0084	R7	R43	150 kR
->	B0084	R8	R44	150 kR
	B0084	J6-37	J6-38	
	Flat Cable	||	||	
	B0077	J12-37	J12-38	
	B0077	J2-5	J2-6	
	Flat Cable	||	||	
	B0051	J7-5	J7-6	
->	B0051	R278	R289	150 kR

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	J9-1/2/3 (= F2)	J9-7/8/9 (= F4)	
	B0084	R2	R47	150 kR
->	B0084	R3	R48	150 kR
	B0084	J6-39	J6-40	
	Flat Cable	||	||	
	B0077	J12-39	J12-40	
	B0077	J2-7	J2-8	
	Flat Cable	||	||	
	B0051	J7-7	J7-8	
->	B0051	R277	R288	150 kR

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 J7 connector on the B0081.
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).

To check the presence of voltage, with the UPS turned on, point between neutral and the head of the inverter output fuse.

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
	B0081	J7-1	J7-1	J7-1	
	B0081	R93	R93	R93	150 kR
->	B0081	R94	R94	R94	150 kR
	B0081	J1-16	J1-16	J1-16	
	Flat Cable	||	||	||	
	B0077	J40-5	J40-7	J40-9	
	B0077	J1-33	J1-35	J1-37	
	Flat Cable	||	||	||	
	B0051	J6-33	J6-35	J6-37	
->	B0051	R323	R324	R325	150 kR

9.5 Output voltages

The readings of the output voltages are read by the DSP only. The sampling point is in B0080 bypass board. To check the presence of voltage, while the UPS is turned on, the neutral on the neutral and with the other prod downstream from SWOUT (touch the screw of the respective phase).
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).

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
	B0080	PZ_1	PZ_6	PZ_10	
	B0080	R21	R28	R35	150 kR
->	B0080	R22	R29	R36	150 kR
	B0080	J3-5	J3-7	J3-9	
	Flat Cable	||	||	||	
	B0077	J40-5	J40-7	J40-9	
	B0077	J1-10	J1-12	J1-14	
	Flat Cable	||	||	||	
	B0051	J6-10	J6-12	J6-14	
->	B0051	R301	R302	R303	150 kR

9.6 Output currents

The output currents are read by the DSP only. The reading is taken by TA located on the output of each individual phase on the B0083 board. The TA reads the output current, which is the supplied by the inverter with UPS on-line or by the bypass with UPS from the bypass. The TA is inserted in the cables connecting the sk B0083 with SWOUT. This reading is used to calculate the output power (combined with the Vout reading).

10 Appendix

10.1 UcomGp software

UCOM GP is a software package for advanced analysis of the historical archives and real-time diagnostics of UPS's belonging to the Sirius families (from 10 to 120kVA)
Communication between PC and UPS, for programs that require it, is via RS232 serial communication port.
The package currently consists of seven different programs:

- GpDownload – History Downloader
- GpHistory – History Analyzer
- GpEvent – Event Analyzer
- GpRealTime – Status Analyzer
- GpDebug – Debug UPS
- GpCalibrate – Calibrate UPS
- GpConfig – Configure UPS

For more details on the programs listed above, please see:

- RM900 UCOMGP Manual
- RM901 UCOMGP Configurator Manual

10.2 List of useful documents

–	User manual	0MNUTT4... (TT4 Manual)
–	UcomGp Manual	RM900
–	UcomGP Config Manual	RM901
–	Electrolytic capacitor replacement manual	RM020
–	Programming Manual	0MNU073NP... (uP PROGRAMMING INST.)
–	Wiring Diagram:	SBTT4...
–	B0051 board:	MC0051... (TT4 control sk)
–	B0056 board:	MC0056... (communication interface sk)
–	B0057 board:	MC0057... (display sk
–	B0067 board:	MC0067... (DSP+uC sk)
–	B0077 board:	MC0077... (TT4 signal adaptation interface sk)
–	B0078 board:	MC0078... (TT4 boost side connections sk)
–	B0079 board:	MC0079... (TT4 boost IGBT driver sk)
–	B0080 board:	MC0080... (TT4 bypass connections sk)
–	B0081 board:	MC0081... (TT4 inverter IGBT driver sk)
–	B0082 board:	MC0082... (TT4 aux 24V aux. power supply sk)
–	B0083 board:	MC0083... (TT4 output sk)
–	B0084 board:	MC0084... (TT4 battery charger sk)
–	B0085 board:	MC0085... (parallel sk) (optional)
–	B0099 board:	MC0099... (TT4 EMI filter sk)
–	B0102 board:	MC0102... (TT4 auxiliary sk)