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1. POWER SUPPLY DESCRIPTION

1.1 Introduction

The Ericsson DXX System has three levels in its power supply system; the mains power system, subrack power system units and power supply modules of the plug units.

The DXX System offers two back-up methods for power feed from 230V mains.

The BBS AC power subrack has a short time battery back-up capacity. The subrack configuration comprises an RXS-B subrack, an SRN AC/DC converter unit, a BBU 48V battery back-up unit, a BCU battery charger unit, and two BOU battery output units.

The PBS AC power subrack has two separate AC/DC converters. The subrack configuration comprises an RXS-P subrack, two SRN AC/DC converter units, two PCU power control units and four BOU battery output units.

Both systems are built into 19" subracks with two shelves. In the BBS system the battery unit is located on the lower shelf and it serves as a back-up for the AC/DC converter located on the upper shelf. In the PBS system the upper and lower shelves are identical to each other; a failure in one AC/DC converter does not switch off the power from the DXX node. Common units for both systems are the SRN AC/DC converters and the BOU output units. The BCU control units (BBS system) and the PCU control units (PBS system) have the same circuit boards but in the PCU only the AC OFF alarm function is equipped.

1.2 Subracks

1.2.1 General

The voltages to the subracks are supplied via PFU-A or PFU-A-24V units in the first slots of the subracks. PFU-A is used for battery voltages -30 V DC...-60 V DC whereas PFU-A-24 V has been designed for +19 V DC...+32 V DC. If voltage supply protection is desired, the second slots can be furnished with PFU-B or PFU-B-24 V respectively.

The PAU AC power unit is used in case only 220...240 V AC is available. The PAU unit reserves the first three positions in the subrack. The PAU power supply unit does not support protected power feeding.

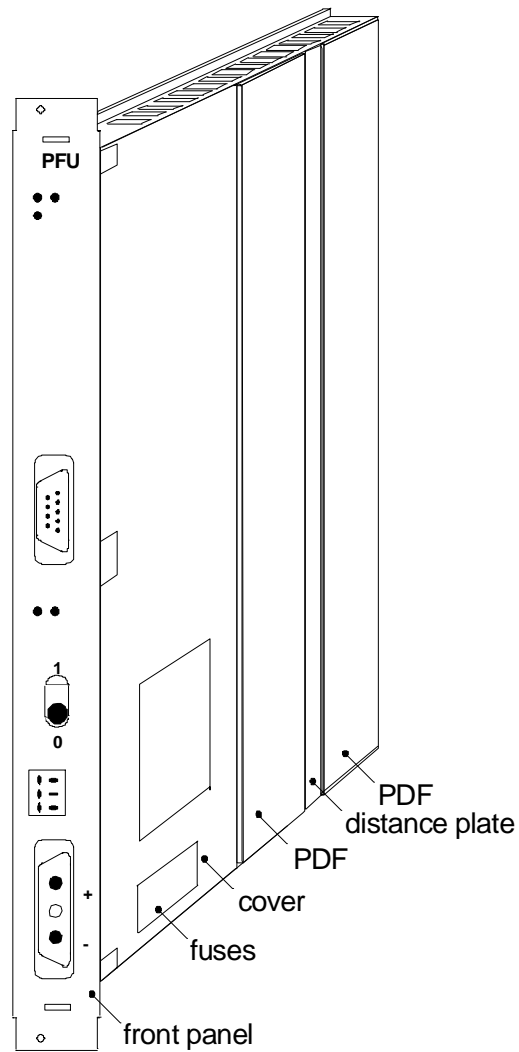
The DC voltage from these PFU or PAU power supply units is distributed to the plug units of the same subrack. The PDF switching power units of the plug units create the voltages needed by the base units and interface modules of the plug units.

1.2.2 PFU Fuse Unit

1.2.2.1 General

The PFU unit is replaced by the PFU-A unit. Basically, the fuse unit PFU contains the following parts:

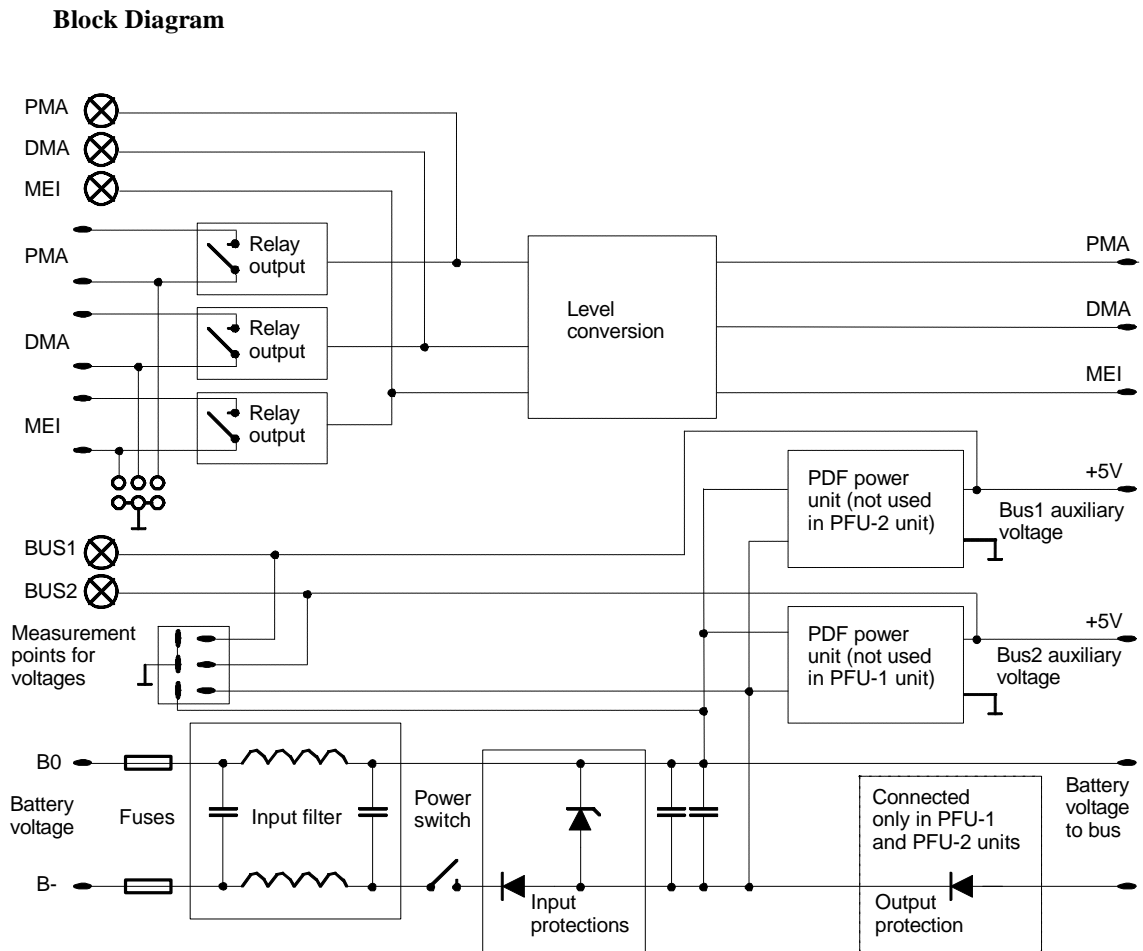
- a fuse base unit (refer to Mechanics)
- two PDF unit power supply modules
- a distance plate
- a cover
- a unit front panel



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Fig. 1: Mechanical Design of the Fuse Unit PFU

1.2.2.2 Operation of the PFU unit



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Fig. 2: Block Diagram of the Fuse Unit PFU

1.2.2.3 Unit Structure

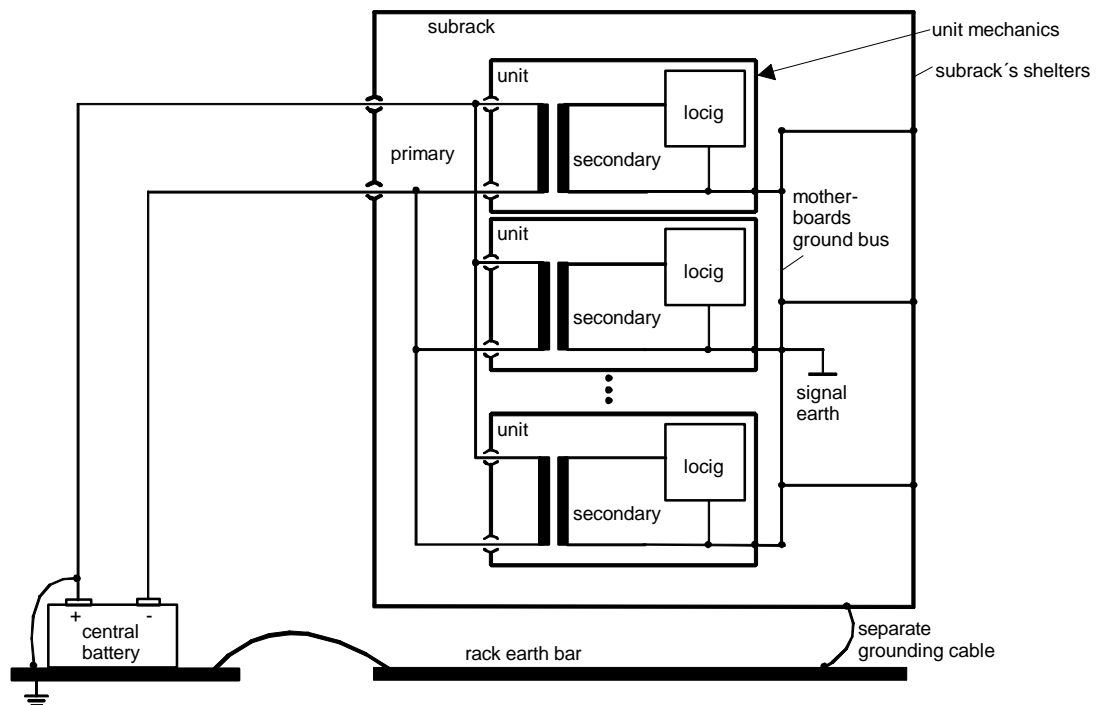
The fuse unit PFU is designed to feed battery voltage to the units in one subrack. The battery voltage connector is a male D-type 2-pin connector. The positive pole of the battery voltage is connected to pin A1 (upper pin) and the negative pole to pin A3. The input is protected against overcurrent with two delay 6.3 A fuses. The fuses can be replaced by first loosening the four screws in the protective cover over the fuses.

The input filter is designed to reduce noise levels, both towards the central battery and towards the subrack. The battery voltage is switched to the subrack through the power switch. In switch position 0 the battery voltage is disconnected. A protective diode is provided at the PFU input as a safeguard against reversed polarity voltages. A transient suppressor diode is provided against overvoltages. The battery voltage is distributed through a battery bus to all units in the subrack.

The fuse unit PFU contains two PDF 202 unit power supply modules to feed duplicated 5 V voltage to bus interface circuits of all units.

There are three alarm outputs in the PFU front panel. The equipment alarm outputs have floating contacts (relays). One pole of the contact can be connected to the equipment earth (Fig. 2). A closed contact corresponds to the alarm status. The alarm outputs can supply current up to 100 mA.

The central battery voltage is galvanically isolated from the secondary voltages, but it must be positive pole earthed at the central battery side. The signal earth (equipment earth) is connected to the rack earth bar via a separate grounding cable. The grounding cable is included in the subrack's installation accessories. Subrack mechanics (panels and EMC screens), as well as the unit mechanics (front panels, frames) are also connected to the equipment earth.

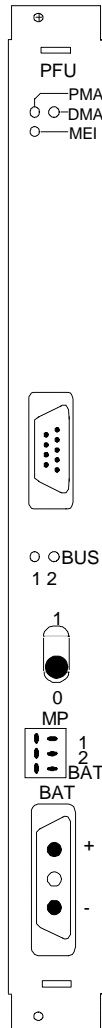


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Fig. 3: Earthings in a Subrack

1.2.2.4 Front Panel of PFU unit

The fuse unit's front panel is provided with three alarm indicators for equipment alarms (PMA, DMA, MEI), a connector for equipment alarms (D-type 9-pin male connector), two alarm LEDs for 5V auxiliary voltages, a switch for the input voltage, measurement points for the battery input voltage and 5V auxiliary voltages, and a connector for the central battery voltage 30V...60 V DC, as shown in Fig. 4 below. The pin assignments of the connectors are also shown.



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Fig. 4: Fuse Unit PFU Front Panel

Pin Usage

Pin	Signal
1, 6	PMA-alarm (floating or pin 6 connected to GND)
2, 7	DMA-alarm (floating or pin 7 connected to GND)
3, 8	-----
4, 9	MEI-alarm (floating or pin 9 connected to GND)
5	GND

1.2.3 PFU-A and PFU-B Fuse Units

1.2.3.1 General

The new PFU-A unit supports protected power feeding. The protection is possible by placing PFU-A and PFU-B units in parallel in the subrack.

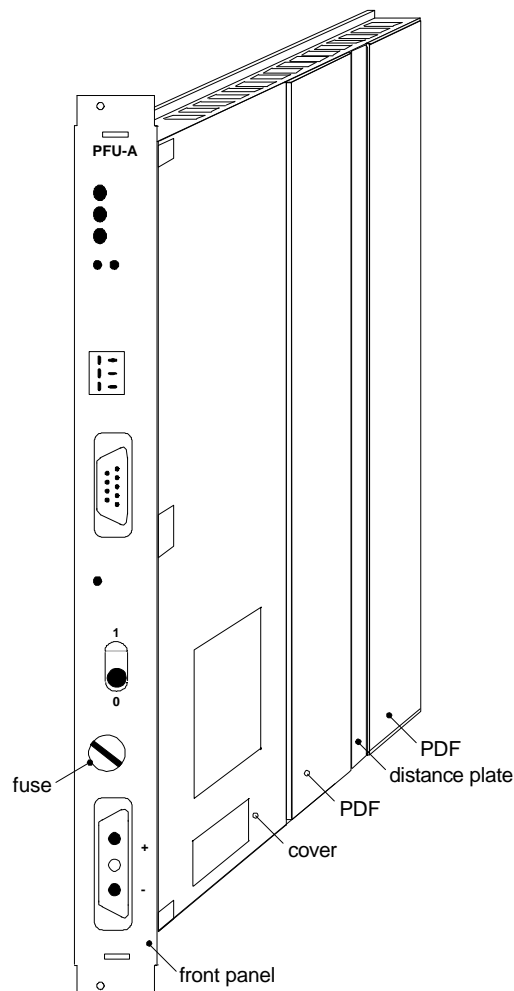
Mechanical Design

Basically, the fuse unit PFU-A contains the following parts:

- a fuse base unit PFU 201A (refer to Mechanics)
- two unit power supply modules PDF 202
- a distance plate
- a cover
- a unit front panel

The fuse unit PFU-B contains the following parts:

- a fuse base unit PFU 225 (refer to Mechanics)
- a cover
- a unit front panel

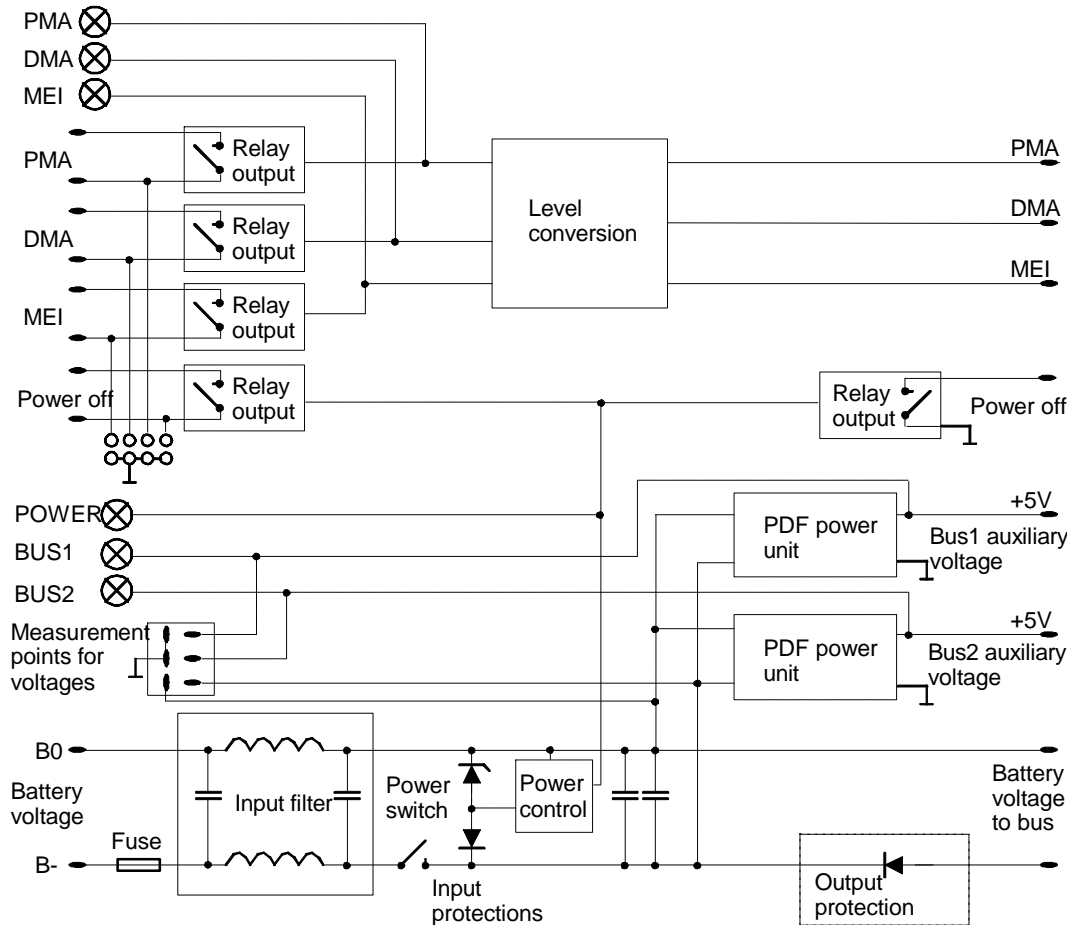


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Fig. 5: Mechanical Design of the Fuse Unit PFU-A

1.2.3.2 Operation of PFU-A and PFU-B

Block Diagram



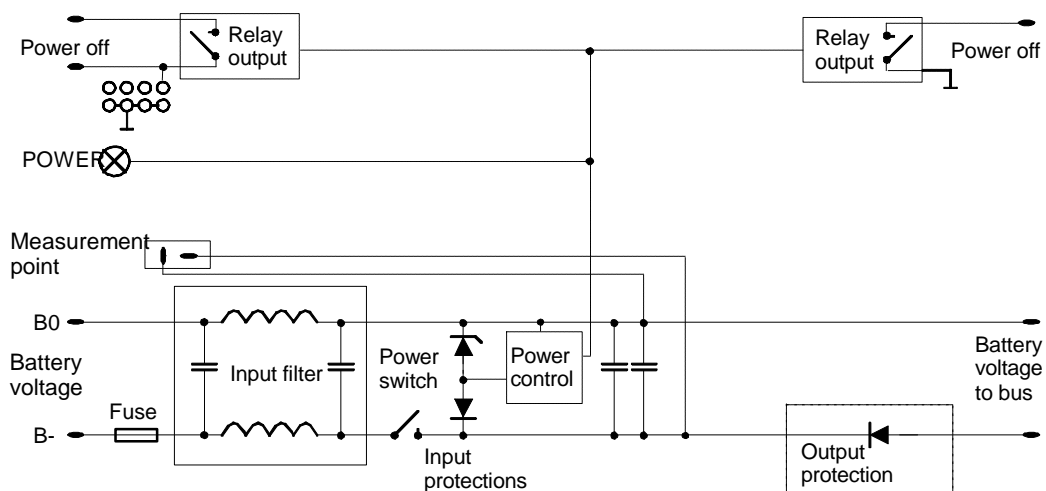
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Fig. 6: Block Diagram of the Fuse Unit PFU-A

The fuse unit PFU-A is designed to feed battery voltage to the units in one subrack; one fully equipped subrack takes up 100...150 W of power. The battery voltage connector is a male D-type 2-pin connector. The positive pole of the battery voltage is connected to pin A1 (upper pin) and the negative pole to pin A3. The input is protected against overcurrent with a delay 6.3 A fuse. The fuse can be replaced by opening the cap of the fuse holder in the front panel.

The input filter is designed to reduce noise levels, both towards the central battery and towards the subrack. The battery voltage is switched to the subrack through the power switch. In switch position 0 the battery voltage is disconnected. A protective diode is provided at the PFU input as a safeguard against reversed polarity voltages. A transient suppressor diode is provided against over voltages. A serial protective diode is also provided at the output to make it possible to duplicate the battery voltage feeding by using PFU-A and PFU-B units.

The battery voltage is distributed via a battery bus to all units in the subrack.



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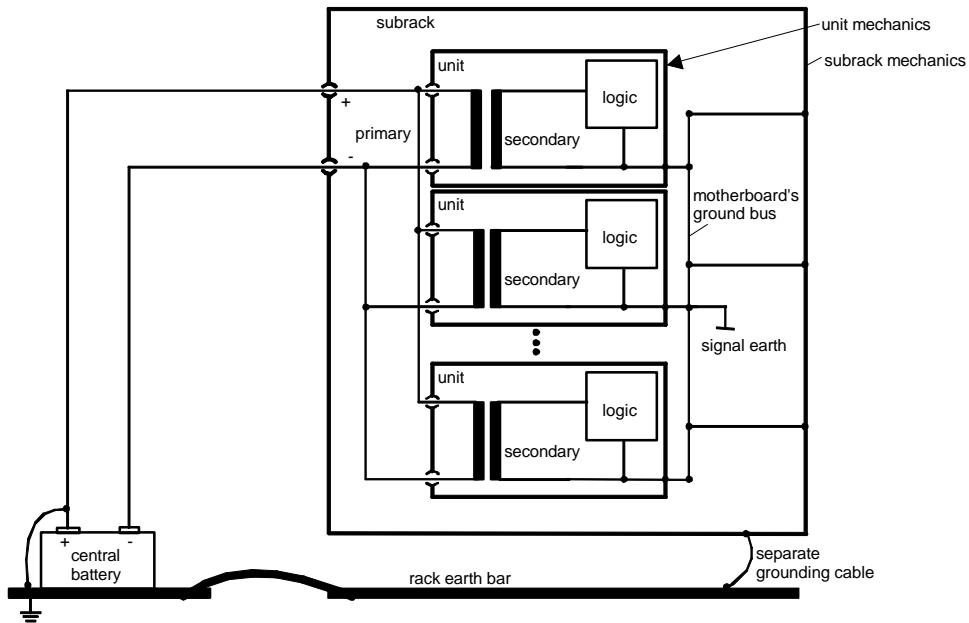
Fig. 7: Block Diagram of the Fuse Unit PFU-B

The fuse unit PFU-A contains two PDF 202 unit power supply modules to feed duplicated 5 V voltage to bus interface circuits of all units. There is no PDF 202 unit power supply module in the PFU-B unit.

There are four alarm outputs in the PFU-A front panel, and one output in the PFU-B front panel. The equipment alarm outputs have floating contacts (relays). One pole of the contact can be connected to the equipment earth (Fig. 6). A closed contact corresponds to the alarm status. The alarm outputs can supply current up to 100 mA.

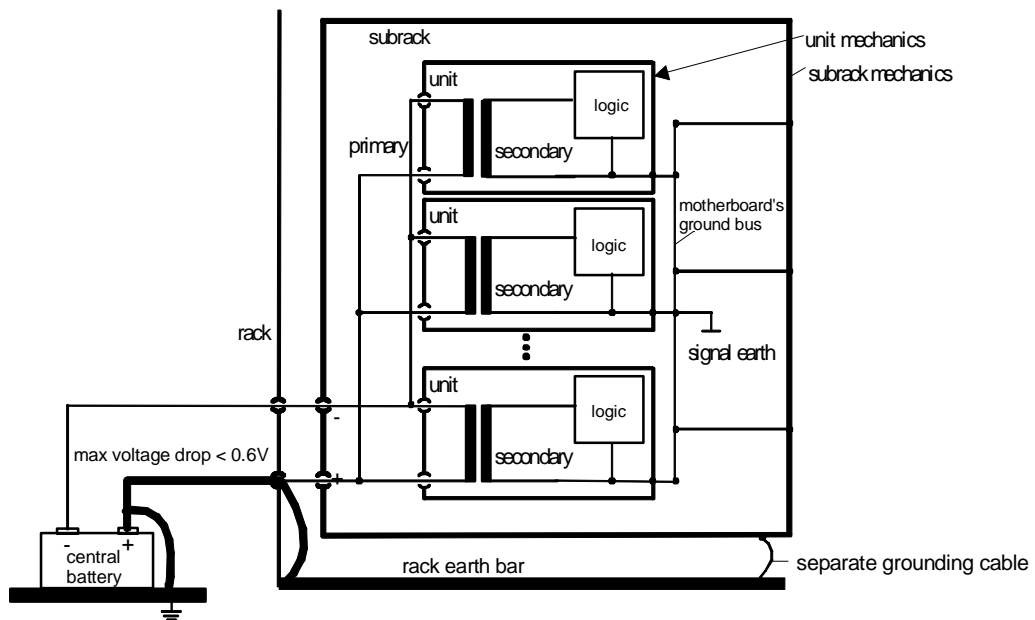
1.2.3.3 Groundings

The central battery voltage is galvanically isolated from the secondary voltages, and it must have positive pole earthed at the central battery side. The signal earth (equipment earth) is connected to the rack earth bar via a separate grounding cable. The grounding cable is included in the subrack's installation accessories. Subrack mechanics (panels and EMC screens), as well as the unit mechanics (front panels, frames) are also connected to the equipment earth. The rack earth bar can be connected to the station earth with a separate cable (Fig. 8) or via the positive battery wire (Fig. 9).



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Fig. 8: Earthings in a Subrack in 3-Wire System



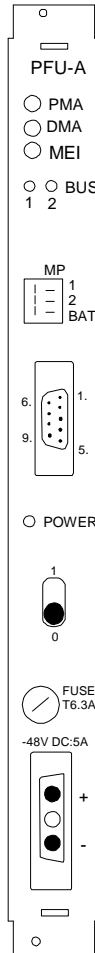
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Fig. 9: Earthings in a Subrack in 2-Wire System

In 2-wire system care must be taken that the voltage drop in positive battery feeding is less than 0.6V.

1.2.3.4 PFU-A Front Panel

The fuse unit PFU-A's front panel is provided with three alarm indicators for equipment alarms (PMA, DMA, MEI), two alarm LEDs for 5 V auxiliary voltages, measurement points for the battery input voltage and 5 V auxiliary voltages, a connector for equipment and POWER OFF alarms (D-type 9-pin male connector), a power indicator LED, a switch for the input voltage, an input fuse, and a connector for the central battery voltage -30V...-60 V DC (positive-ground-referenced), as shown below. The pin assignments of the connectors are also shown.



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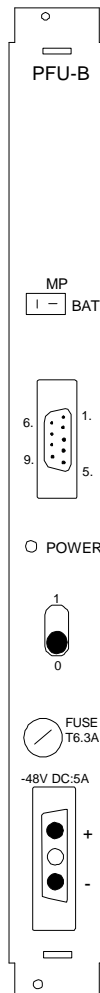
Fig. 10: Fuse Unit PFU-A Front Panel

Pin Usage PFU-A

Pin	Signal
1, 6	PMA-alarm (floating or pin 6 connected to GND)
2, 7	DMA-alarm (floating or pin 7 connected to GND)
3, 8	POWER OFF (floating or pin 8 connected to GND)
4, 9	MEI-alarm (floating or pin 9 connected to GND)
5	GND

1.2.3.5 PFU-B Front Panel

The fuse unit’s PFU-B front panel is provided with measurement point for the battery input voltage, a connector for POWER OFF-alarm (D-type 9-pin male connector), a power indicator LED, a switch for the input voltage, an input fuse, and a connector for the central battery voltage.



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Fig. 11: Fuse Unit PFU-B Front Panel

Pin Usage PFU-B

Pin	Signal
3, 8	POWER OFF (floating or pin 8 connected to GND)
5	GND

1.2.4 PFU-A-24 V and PFU-B-24 V

1.2.4.1 General

Fuse units PFU-A-24 V and PFU-B-24 V are designed to +24 V (+19...+32 V) negative pole grounded battery voltage systems.

Functionally, the units are like the PFU-A and PFU-B in -48 V system, but only the protection components are changed to the positive input, and the power supply modules PDF 209 are designed to lower voltages.

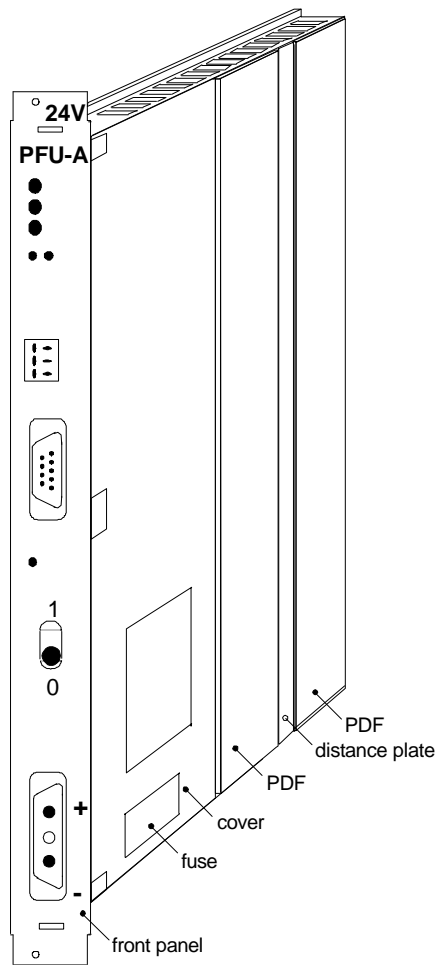
Basically, the fuse unit PFU-A-24 V contains the following parts:

- a fuse base unit PFU 226 (refer to Mechanics)
- two unit power supply modules PDF 209
- a distance plate
- a cover
- a unit front panel

The fuse unit PFU-B-24 V contains the following parts:

- a fuse base unit PFU 228 (refer to Mechanics)
- a cover
- a unit front panel

The input is protected against overcurrent with a delay 8 A fuse. The input fuse can be replaced by first loosening the four screws in the protective cover over the fuse.



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Fig. 12: Mechanical Design of the Fuse Unit PFU-A-24 V

The central battery voltage (+19...+32 V) is galvanically isolated from the secondary voltages and it must have negative pole earthed at the central battery side.

1.2.4.2 Operation of PFU-A-24V and PFU-B-24V

1.2.4.3 Block Diagrams

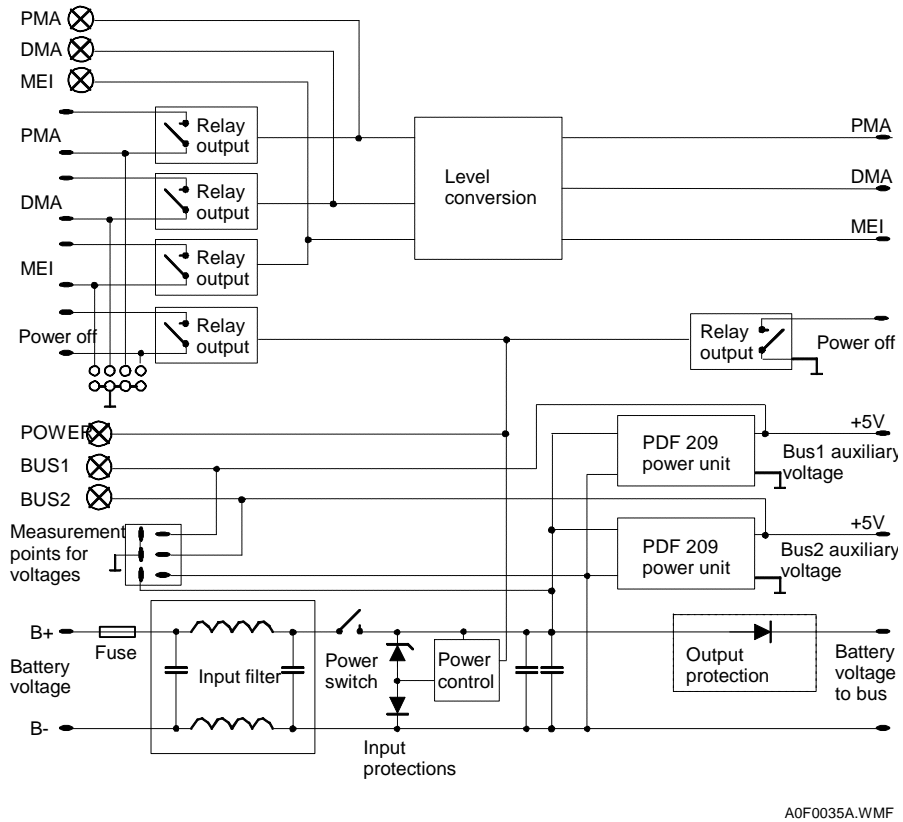


Fig. 13: Block Diagram of the Fuse Unit PFU-A-24 V

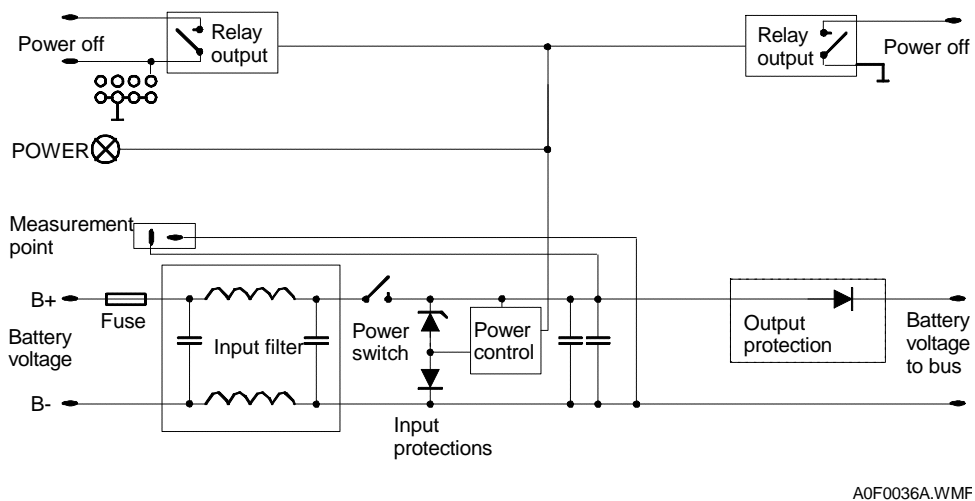


Fig. 14: Block Diagram of the Fuse Unit PFU-B-24 V

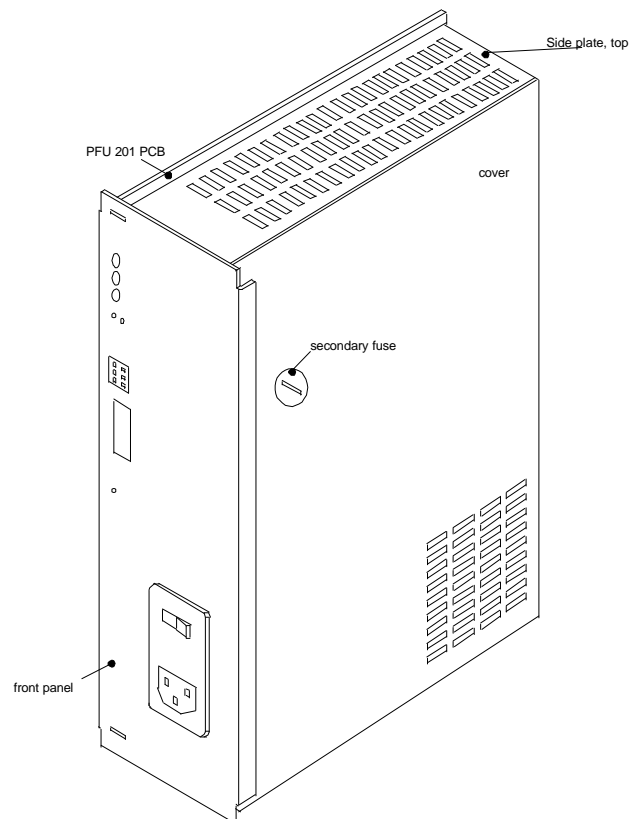
1.2.5 PAU AC Power Supply

1.2.5.1 General

Power supply unit PAU is an isolated AC/DC converter. It converts 220...240 V AC mains voltage into 50V DC voltage, which is distributed via a battery bus to all units in the subrack. The maximum output power is 120VA, which is sufficient to drive the single subrack. The PAU is an AC version of the PFU-A fuse unit, and it is integrated with the PFU-A unit. It is intended for use in subracks RXS-S, RXS-D and RXS-CD. Power supply unit PAU does not support protected power feeding.

Basically, the PAU unit contains the following parts:

- a back plate
- a side plate, bottom
- a side plate, top
- a front panel, inner
- a cover with AC/DC converter components
- a unit front panel
- a PFU PCB
- two PDF unit power supply modules
- a capacitor board

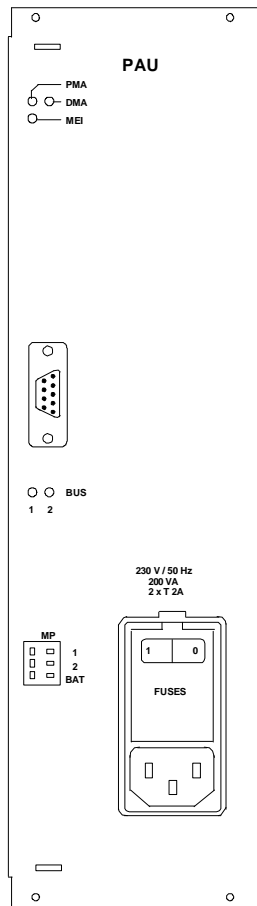


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Fig. 15: Mechanical Design of the PAU Unit

PAU Version 1.0

The front panel of a PAU unit is provided with three alarm indicators for equipment alarms (PMA, DMA, MEI), a connector for equipment alarms (D-type 9-pin male connector), two alarm leds for 5 V auxiliary voltages, measurement points for the 50 V DC secondary voltage and 5 V auxiliary voltages, a power switch, a 3-terminal connector for the 220...240 V AC mains cord and a mains filter with fuses, as shown below. The pin assignment of the connector is also shown in the table below.

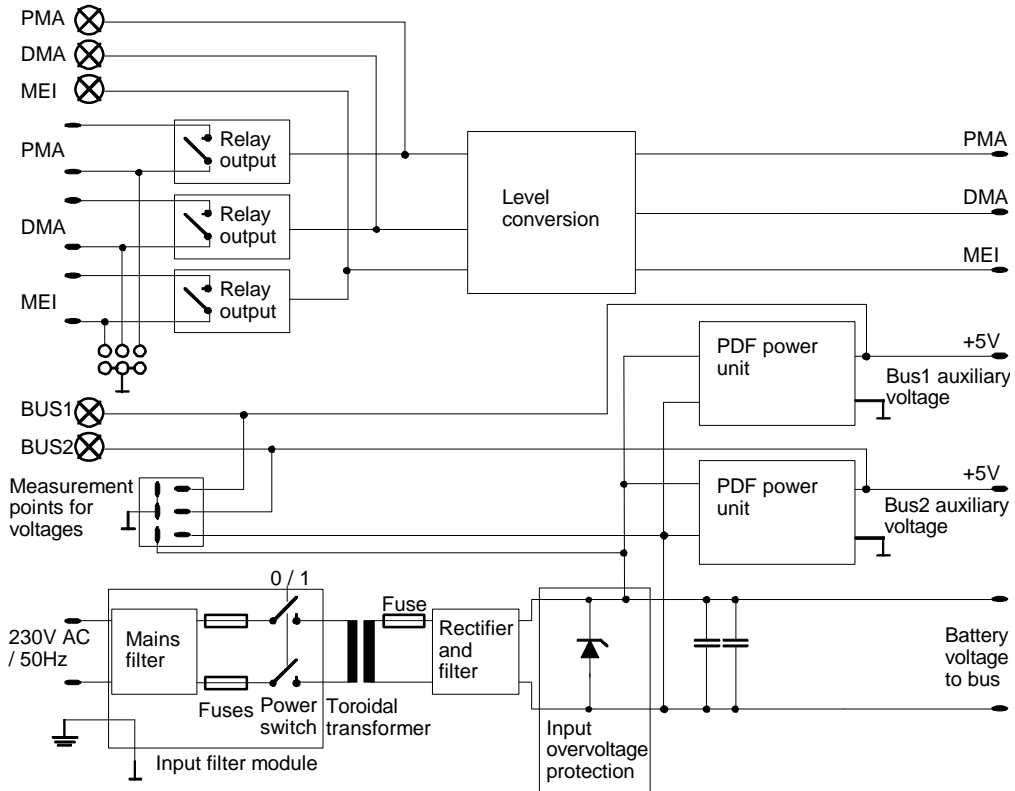


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Fig. 16: Front Panel of AC Power Supply Unit PAU

Pin Usage of PAU Version 1.0

Pin	Signal
1	PMA-alarm A
6	PMA-alarm B or GND
2	DMA-alarm A
7	DMA-alarm B or GND
4	MEI-alarm A
9	MEI-alarm B or GND
5	GND



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Fig. 17: Block Diagram of AC Power Supply Unit PAU

When the power switch is in position 0, the mains voltage is disconnected from the converter.

The power supply input is protected against overcurrents with three fuses. Two of them are on the primary side of the line transformer, and one is on the secondary side. An internal fault in the power supply may blow the fuses. The primary fuses can be replaced by opening the mains filter module on the unit's front panel. The secondary fuse can be replaced by opening the fuse holder on the cover.

CAUTION!

DISCONNECT THE UNIT FROM THE 230V MAINS SUPPLY BEFORE REPLACING THE FUSES!

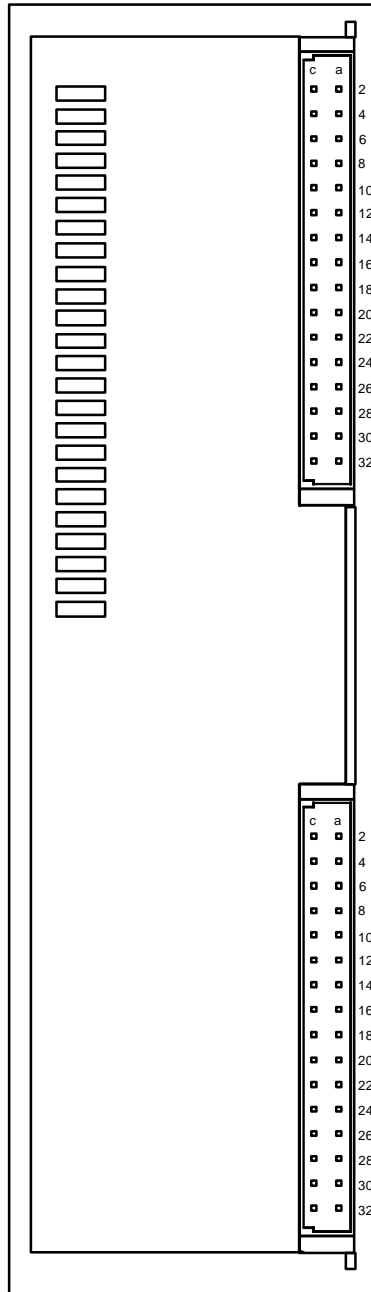
DOUBLE POLE/NEUTRAL FUSING!

The secondary voltage derived from the mains transformer (toroidal transformer) is rectified and filtered and distributed via a battery bus to all units in the subrack.

The PAU unit includes two PDF unit power supply modules to feed duplicated 5 V voltage to the bus interface circuits of the units.

There are three alarm outputs in the PAU front panel. The equipment alarm outputs have floating contacts (relays). One pole of a contact can be connected to the equipment earth (see Fig. 17). A closed contact corresponds to the alarm status. The alarm outputs can supply current up to 100 mA.

Output Connectors in the AC Power Supply PAU



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Fig. 18: Output Connectors in the AC Power Supply PAU

CN1 Pin Usage

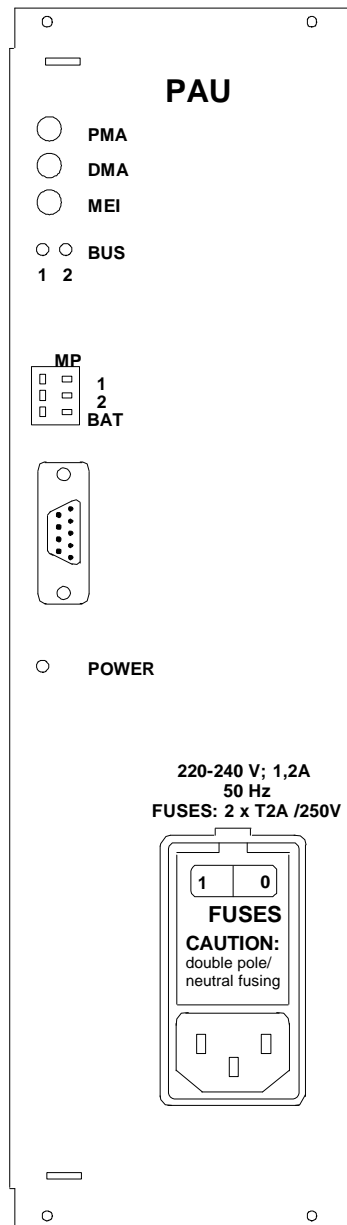
Pin	Signal
a,c 2	+5.1V, Bus1 auxiliary
a 4	PMA-alarm
c 4	DMA-alarm input
a 6	unused alarm
c 6	MEI-alarm
a,c 8	GND
a 10	PDF 2/+12V test
c 10	PDF 1/+12V test
a 12	PDF 2/-10V test
c 12	PDF 1/-10V test
a,c 16	GND
a,c 24	GND
a,c 30	GND
a,c 32	GND

CN2 Pin Usage

Pin	Usage
a,c 2	+5.1V, Bus2 auxiliary
a,c 8	GND
a,c 16	GND
a,c 24	GND
a,c 30	0V (output)
a,c 32	+50V (output)

PAU Version 2.0

The PAU unit's front panel is provided with three alarm indicators for equipment alarms (PMA, DMA, MEI), two alarm LEDs for 5 V auxiliary voltages, measurement points for the 50 V DC secondary voltage and 5 V auxiliary voltages, a connector for equipment and POWER OFF (not included in version 1.0) alarms (D-type 9-pin male connector), a power indicator LED (not included in version 1.0), a power switch, a 3-terminal connector for the 220...240 V AC mains cord and a mains filter with fuses, as well as the pin assignment of the connector, as shown below.



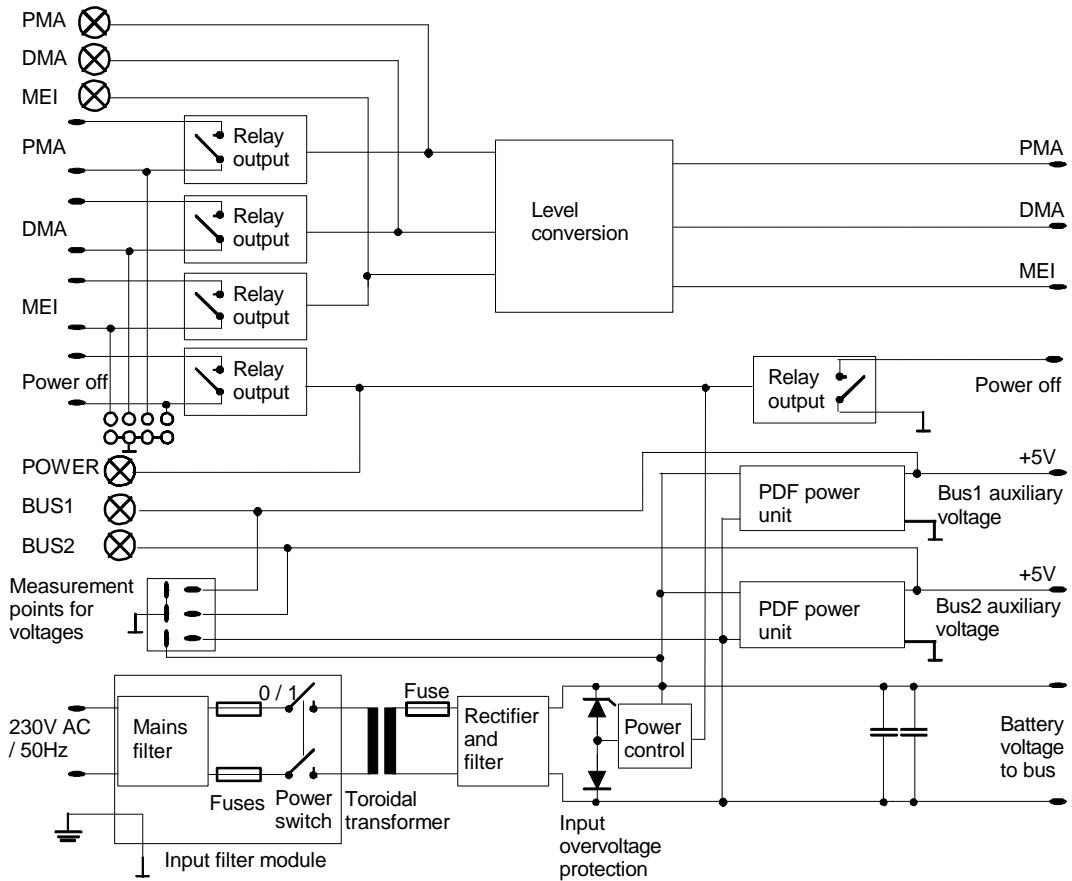
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Fig. 19: AC Power Supply Unit's PAU Front Panel

Pin Usage PAU Version 2.0

Pin	Signal
1, 6	PMA-alarm (floating or pin 6 connected to GND)
2, 7	DMA-alarm (floating or pin 7 connected to GND)
3, 8	POWER OFF (floating or pin 8 connected to GND)
4, 9	MEI-alarm (floating or pin 9 connected to GND)
5	GND

The figure below shows the block diagram of the power unit PAU.



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Fig. 20: Block Diagram of the PAU Unit

When the power switch is in position 0, the mains voltage is disconnected from the converter.

The power supply input is protected against overcurrent with three fuses. Two of them are on the primary side (delay 2A fuse) and one is on the secondary side of the line transformer (delay 6.3A fuse). An internal fault in the power supply may blow the fuses. The primary fuses can be replaced by opening the mains filter module in the unit's front panel. The secondary fuse can be replaced by opening the cap of the fuse holder in the cover.

CAUTION!

DISCONNECT THE UNIT FROM THE 230V MAINS SUPPLY BEFORE REPLACING THE FUSES!

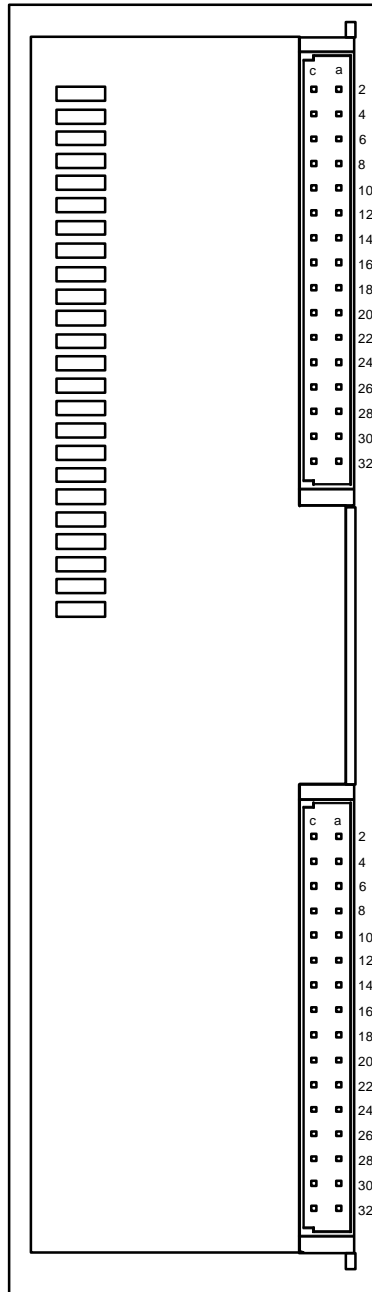
DOUBLE POLE/NEUTRAL FUSING!

The secondary voltage derived from the mains transformer (toroidal transformer) is rectified and filtered and distributed through a battery bus to all units in the subrack.

The PAU unit contains two PDF power supply modules to feed duplicated 5 V voltage to bus interface circuits of all units.

There are four alarm outputs in the PAU front panel (three outputs in version 1.0). The equipment alarm outputs have floating contacts (relays). One pole of the contact can be connected to the equipment earth (Fig. 20). A closed contact corresponds to the alarm status. The alarm outputs can supply current up to 100 mA current.

PAU AC Power Supply Output Connectors



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Fig. 21: PAU Output Connectors

CN1 Pin Usage

Pin	Signal
a,c 2	+5.1V, Bus1 auxiliary
a 4	PMA-alarm input
c 4	DMA-alarm input
a 6	Power off alarm output
c 6	MEI-alarm input
a,c 8	GND
a,c 16	GND
a,c 24	GND
a,c 30	GND
a,c 32	GND

CN2 Pin Usage

Pin	Usage
a,c 2	+5.1V, Bus2 auxiliary
a,c 8	GND
a,c 16	GND
a,c 24	GND
a,c 30	0V (output)
a,c 32	+50V (output)

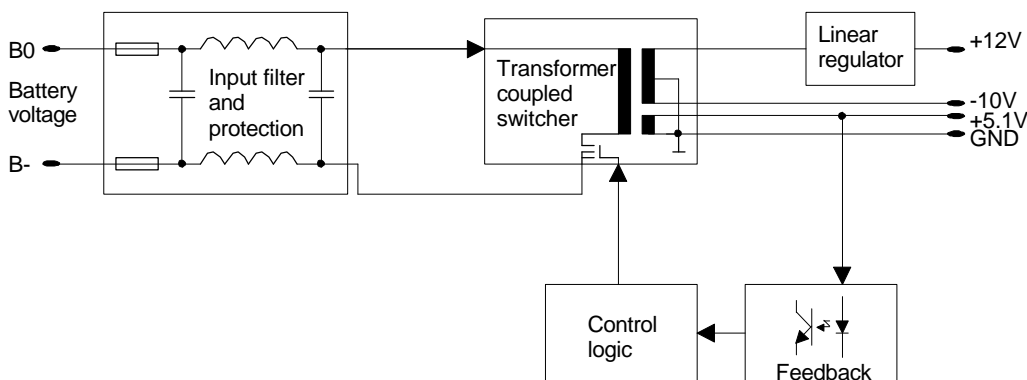
1.2.5.2 Unit Power Supply Modules PDF

The PDF is a flyback mode, transformer-coupled switched power supply module operating on -30...-60 V DC battery voltages (PDF 209 and PDF 489 operating on +19...+32 V DC battery voltages).

Unit Power Supply Modules PDF 202, PDF 204, PDF 209, PDF 446, PDF 452, PDF 458, PDF 488, PDF 499, PDF 489, PDF 520, PDF 518, PDF 524 and PDF 553

Operation of the PDF Modules

Block Diagram



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Fig. 22: Block Diagram of the PDF Unit Power Supply Module

There are four different versions of the -48V input PDF modules, namely PDF 202, PDF 204, PDF 488 and PDF 499. The only difference is the mechanics, and that they are used on different base units. The CCS Unit has its own special PDF unit, PDF 446 (input voltage -48V). For +24V input voltage there are two different PDF modules, namely PDF 209 and PDF 489. The difference between the two is again the mechanics. The other unit specific PDF modules are PDF 446 (for CCS and CCO), PDF 452 and 458 (for GMU), PDF 520 (for AIU), PDF 518 for FRU, PDF 524 for ISD-LT and PDF 553 (for CCS-UNI and CCO-UNI).

Connectors

There are two interface connectors in the PDF module: one for the battery voltage and one for the output voltages. The battery voltage connector is a female 2 x 3 pin connector and the output connector is a female 2 x 6 pin connector.

The input is galvanically isolated from the outputs with the transformer and an opto-isolator. Fusible resistors (fuse on PDF 209 and PDF 489) protect the input against overcurrent, and the current limiting circuit limits the short circuit currents of the output.

The power supply module contains one power switching circuit. The control circuit of the switching circuit is realized with a current-mode pulse-width modulator IC circuit (PWM). The +5.1 V output is provided with a monitoring circuit which controls the PWM via an opto-isolator. The +12 V output is stabilized with a linear regulating IC. The -10 V output is unstabilized.

1.2.5.3 PAU Technical Specifications**Electrical Specifications**

Rated input voltage range	220...240 V AC
Frequency	50 Hz
Input power; maximum	200 VA
Output power; maximum	120 VA
Input overcurrent protection	Fuses 2 x T2A/250V (mains) Fuse T6.3A/250V (secondary)
Input overvoltage protection	Transient protection diode
Isolation: main/secondary (50 V) secondary/logic voltages secondary/case	1500 V AC 500 V DC 500 V DC
Output voltage/current	50V DC $\pm 20\%$ /2.4 A
Auxiliary output voltages	2 x +5.1 V $\pm 5\%$ /2A
Output ripple voltage (50 V output)	< 4 Vpp
Alarm outputs: Max allowable voltage Max allowable current Voltage loss at 50 mA current Transition and settling time Overvoltage protection	Relay contacts 60 V DC or 42.4 V AC 100 mA < 1 V (10 ohm serial resistor) < 8 ms RC filter circuit
Environmental conditions Environmental operating conditions	ETS 300 019-B Class 3.1 (Combination of IEC 721-3-3 classes 3K3/3B1/3C2/3S2/3M1)
Condition - normal operating conditions - exceptional operating conditions	Temperature +5...+35 °C -5...+45 °C Humidity < 85% RH, non-condensing < 90% RH, non-condensing

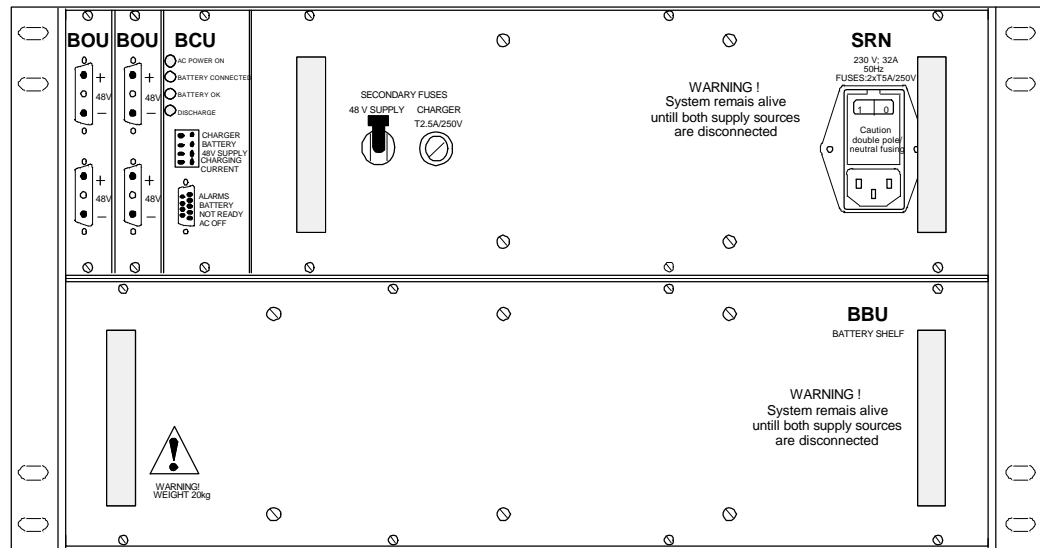
Mechanical Specifications

Width	76 mm
Height	262 mm
Depth	175 mm
Weight	3.5 kg

1.3 Battery Backup System, BBS

1.3.1 General

BBS is a separate AC-power subrack with a short time battery backup capacity. The subrack configuration comprises a subrack RXS-B, an AC/DC converter unit SRN, a 48V battery backup unit BBU, a battery charger unit BCU and two pieces of battery output units BOU. All units are 128 mm high.

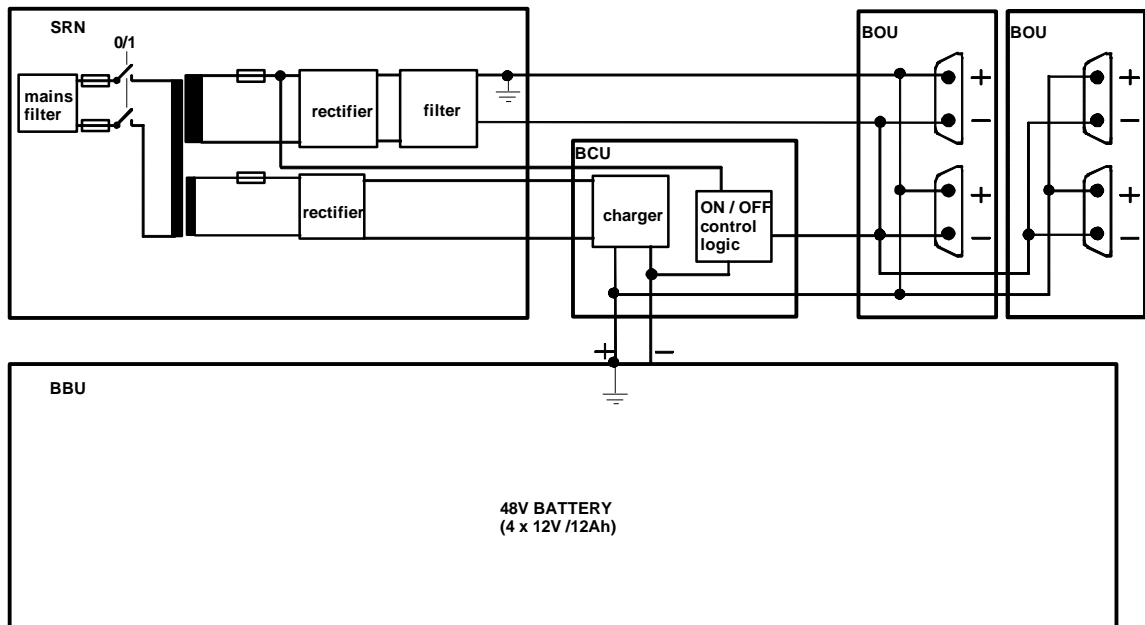


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Fig. 23: BBS Subrack

NOTE!

The system supports a possibility to continuous power feeding to for example two pieces of RXS-S subrack, when the mains voltage is missing.



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Fig. 24: Block Diagram of the BBS Subrack

WARNING!

System remains alive until both supply sources SRN and BBU are disconnected.

1.3.1.1 BBS Units: SRN, BBU, BCU, BOU

- AC/DC Converter Unit, SRN
- Battery Backup Unit, BBU
- Battery Charger Unit, BCU
- Battery Output Unit, BOU

1.3.1.2 AC/DC Converter Unit, SRN

SRN

The SRN is a linear type AC/DC converter unit. 230V AC input voltage is converted to -48V DC (positive pole grounded) supply output (rectified and filtered), and 67V charger voltages (rectified). The unit can drive up to 360VA to the load and 60VA to the battery charger.

SRN Operation

SRN Block Diagram

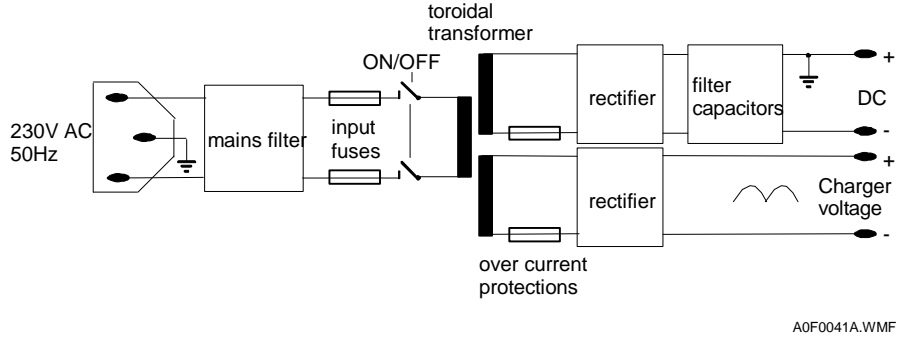


Fig. 25: Block Diagram of the SRN Unit

The unit's front panel is equipped with a 3-terminal connector for 230V AC mains cord and a mains filter with 2 pcs T 2.5A fuses. The unit must be connected to a wall socket-outlet with a protective earth contact. There is also a magnetic circuit breaker for DC voltage and a T 2A fuse for charger voltage. An internal fault may blow the fuses. The primary fuses can be replaced by opening the mains filter module on the unit's front panel. The charger fuse can be replaced by opening the cover of the fuse holder on the front panel. The operating lever of the circuit breaker moves to the "OFF" position when an overload causes the breaker to trip. The breaker can be reactivated by moving the lever to the "ON" position. The nominal tripping current of the breaker is 15A.

WARNING!

Disconnect the unit from the 230V Mains before replacing the fuses!

Front Panel of the SRN Unit

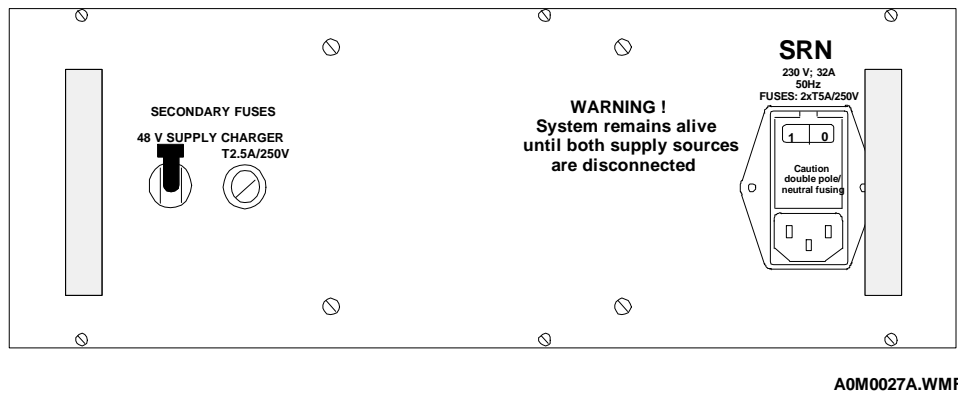


Fig. 26: Front Panel of the SRN Unit

Technical Specifications

For Technical Specifications of the SRN Unit, see page 42

1.3.1.3 Battery Backup Unit, BBU

BBU

BBU consists of 4pcs of 12V/12Ah serial connected lead-acid batteries. The positive pole of the battery is connected to the case (ground), so the nominal voltage is -48V DC.

BBU Operation

BBU Block Diagram

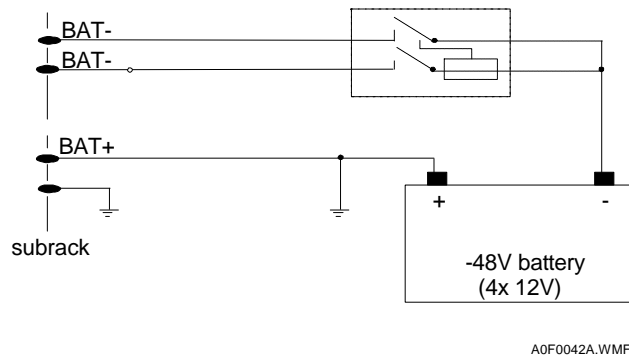


Fig. 27: Block Diagram of the BBU Unit

The battery can drive about 2.5h to 150VA load and about 0.5h to 360VA load (see figure below). If the voltage drops to about 43V, the BCU unit disconnects the load. After disconnection it takes 2...5 h charging time before it can be discharged again. The time depends on the discharge current. A magnetic circuit breaker for overcurrent is added to version 2.0.

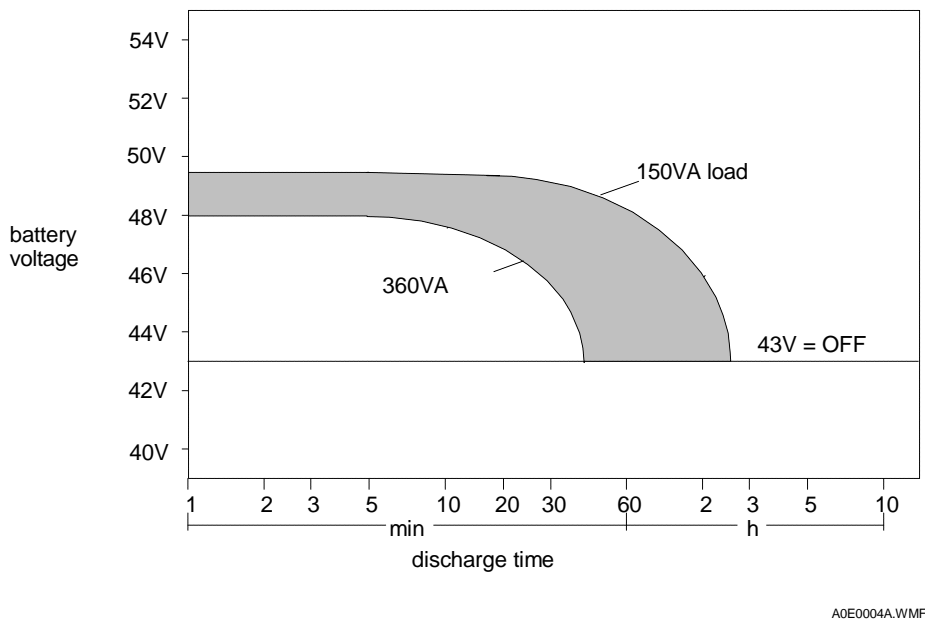
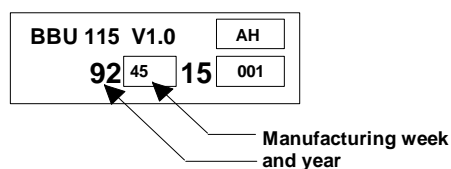


Fig. 28: Discharge Duration Time at 20 °C Temperature

Avoid use of the battery in over 40 °C temperature since damage may occur even though the battery may still operate.

It can be expected that the batteries operate three to four years in standby service, so it is recommended that the batteries are changed every three years. The manufacturing time is marked on the serial number label.



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Fig. 29: Serial Number Label

Note that when you install the BBU unit to the subrack, the BCU unit discharges the batteries with about 50mA current if you don't switch the BBU off or if you don't connect the SRN unit to the 230 V mains.

WARNING!

Batteries present an energy and a chemical hazard.

Battery Handling Precautions

- Do not place the battery close to fire.
- Do not short the terminals.
- Do not disassemble or reassemble the battery.
- When the battery cracks and dilute sulphuric acid contacts skin or clothes, wash it off immediately with water. When dilute sulphuric acid contacts one's eyes, wash them with plenty of water and see a doctor.

Technical Specifications

For Technical Specifications of the BBU Unit, page 42

1.3.1.4 Battery Charger Unit, BCU

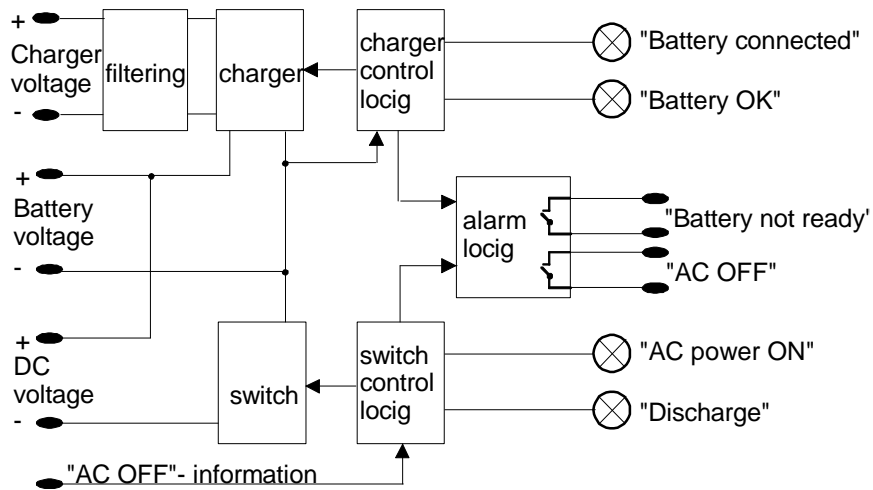
General

BCU unit is a battery charger unit. It is also the control unit of the BBS system.

When the AC is connected to the subrack, the BCU charges the batteries with current limited constant voltage and if the AC is disconnected, the BCU unit connects the batteries to the load, and give an information to alarm output. If the battery voltage drops to about 43V the BCU unit disconnects the load to avoid over discharging the batteries.

After disconnection, the battery voltage must be charged to about 50V before it can be discharged again. It takes about 2...5 h and during this time the alarm connector gives a "Battery not ready" signal.

The figure below shows the block diagram of the BCU unit.



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Fig. 30: Block Diagram of the BCU Unit

Operation**Indicators**

The unit's front panel is provided with four indication leds, four measurement points and an alarm connector for system alarms.

The normal information from the leds is as follows:

AC POWER ON:	Indicate that AC voltage is connected to the subrack. This led indicates also if DC voltage is missing.
BATTERY CONNECTED:	Indicates that the BBU unit is installed in the subrack.
BATTERY OK:	Indicates that the battery is ready for discharging (voltage over 50V after 100% discharging). After installing the BBU unit in the subrack, this led may lit although the battery voltage is less than 50V. This means that all discharge capacity is not yet in use.
DISCHARGE:	This led lit when the battery is connected to the load.

From the measurement points you get the following information:

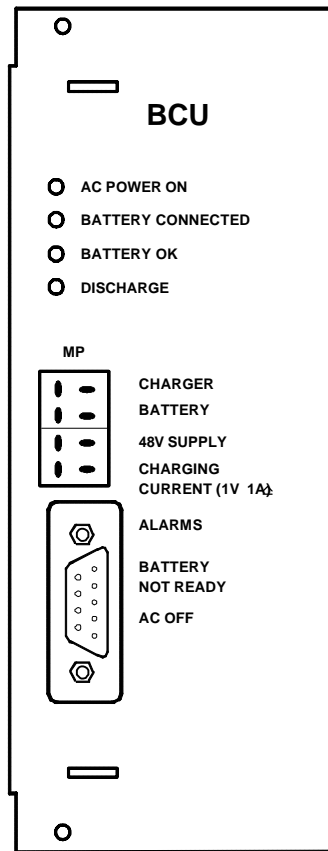
CHARGER:	You can check the charger input voltage, which is normally 60...75V depending on the charging current and the mains voltage.
BATTERY:	From this measurement point you can check the battery voltage. This must be between 40V (empty) to 53.5V (full).
48V SUPPLY:	From this measurement point you can measure the voltage that goes to the load. Normally this is the DC voltage from the SRN unit and it is between 45V to 55V. When AC voltage is OFF or the magnetic circuit breaker is open this measurement point gives the battery voltage which is connected to the load.
CHARGING CURRENT:	From this measurement point you can check the "charging current". The information is in volts, but it is measured over 1ohm resistor, so the reading of the volt meter means same reading in amperes. For example 0.5V reading means 0.5A charging current. The normal readings are between 0.05V...1.0V (50mA...1A).

From the alarm output connector you get two alarms conditions:

BATTERY NOT READY:	The opposite information to the led information "BATTERY OK".
AC OFF:	The opposite information to the led information "AC POWER ON"

The alarm outputs have floating contacts (relays). One pole of the contact can be connected to the equipment earth. A closed contact corresponds to the alarm status. The alarm output can supply current up to 100 mA.

Front Panel of the BCU Unit



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Fig. 31: Front Panel of the BCU Unit

Pin Usage 9-pin D-type male connector

Pin	Signal
1, 6	Battery not ready (floating or pin 6 connected to GND)
2, 7	Battery not ready (floating or pin 7 connected to GND)
3, 8	AC OFF (floating or pin 8 connected to GND)
4, 9	AC OFF (floating or pin 9 connected to GND)
5	NC

Technical Specifications

For Technical Specifications of the BCU Unit, page 42

1.3.1.5 Battery Output Unit, BOU**General**

This figure shows the block diagram of the BOU unit.

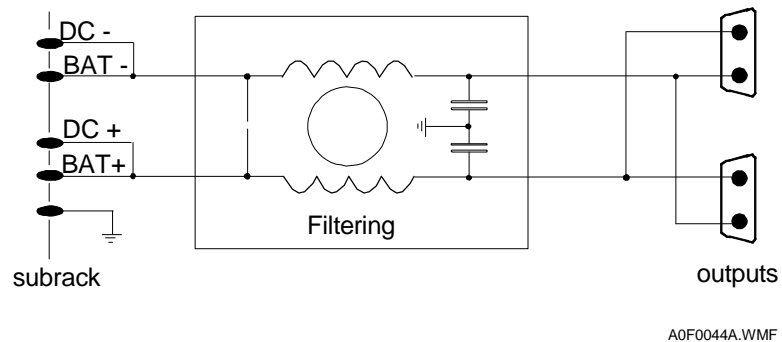
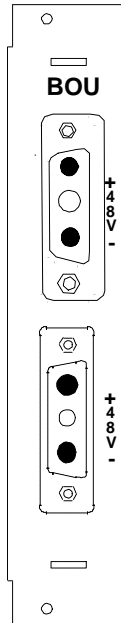


Fig. 32: Block Diagram of the BOU Unit

Operation of the BOU Unit**A Common Interface for DC and Battery Voltages**

There are two BOU units in the system BBS. Both of them are designed to drive one subrack (<180VA). There are also two identical interface connectors in the unit's front panel. This makes it possible to use protected power feeding. The positive pole of the voltage is connected to pin A1 (upper pin) and the negative pole to pin A3.

Front Panel



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Fig. 33: Front Panel of the BOU Unit

Technical Specifications

For Technical Specifications of the BOU Unit, page 42

1.3.2 Subrack, RXS-B

1.3.2.1 Subrack Installation and Cabling

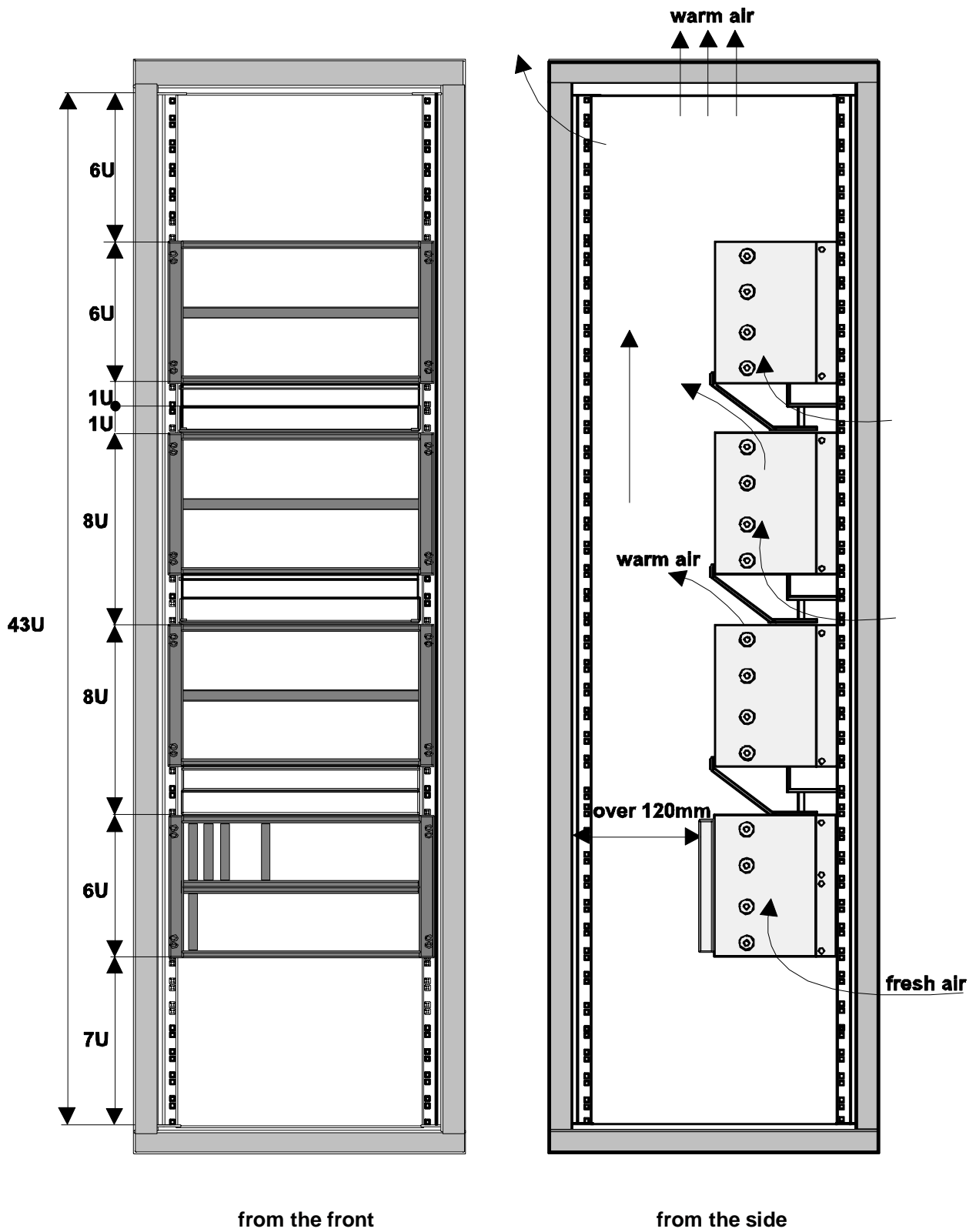
Subrack RXS-B is intended for installation in a 19-inch rack. The subrack's height is 266 mm and its width without side mounting brackets is 447.8 mm. The subrack can be installed in a rack having a minimum depth of 400 mm.

Doors should not be used in the racks, because free air flow must be ensured. The back side of the rack must be left free, because of the rack's cabling. It is not allowed to connect subracks back to back, because of excessive heat generation.

At least a 2U (88.9mm) high opening must be left at the bottom of the rack for sufficient air intake.

If several subracks are mounted in a 19" rack, an air deflector plate (nr. 883200200) should be used between the subracks. The lowest subrack in the rack does not need the air deflector plate. It is recommended that the lowest subrack is RXS-B subrack, because of the maximum operating temperature of the batteries.

The figure below shows an example of an installation in a 19" rack. A space of minimum 2U (88.9 mm) is required at the bottom of the rack for intake of fresh air. An air deflector plate should be installed between every subrack and an air duct (depth over 120 mm) should be left between the rear of the subrack and the rack's back panel. The top cover and the back panel of the rack must be equipped with sufficient vent slots, and a space of minimum 1U (44.45mm) is required at the top of the rack for outflow of warm air.



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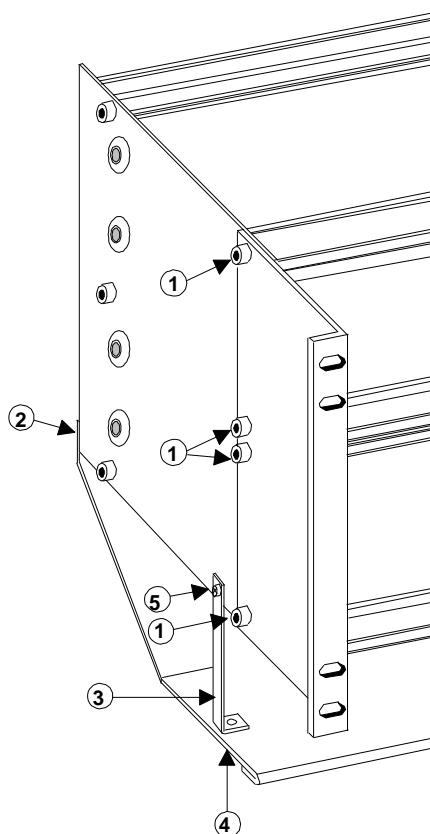
Fig. 34: RXS-B and RXS-S Subracks in 19" Rack

Installation in a 19-Inch Rack

The subrack is installed in a 19" rack by using two 80 x 23 x 3mm size angle profiles (nr. 883200282). These profiles are mounted under the M5x10 size hex recessed head screws that fasten the subrack's front profiles to the side panels. Using a 4mm Allen key, the four hex recessed head screws on one side are detached. The profile is mounted under the screw, then the screw is tightened with fingers. When the profile is under each of the screws, the screws are tightened with the Allen key. The angle profile of the other side is mounted similarly.

If the hex recessed heads are too high and hinder installation, M5x10 size pan head screws can be used instead of the original screws.

The figure below shows the mounting of the angle profile under the hex recessed head screws (number 1) and the mounting of the air deflector plate (if needed).

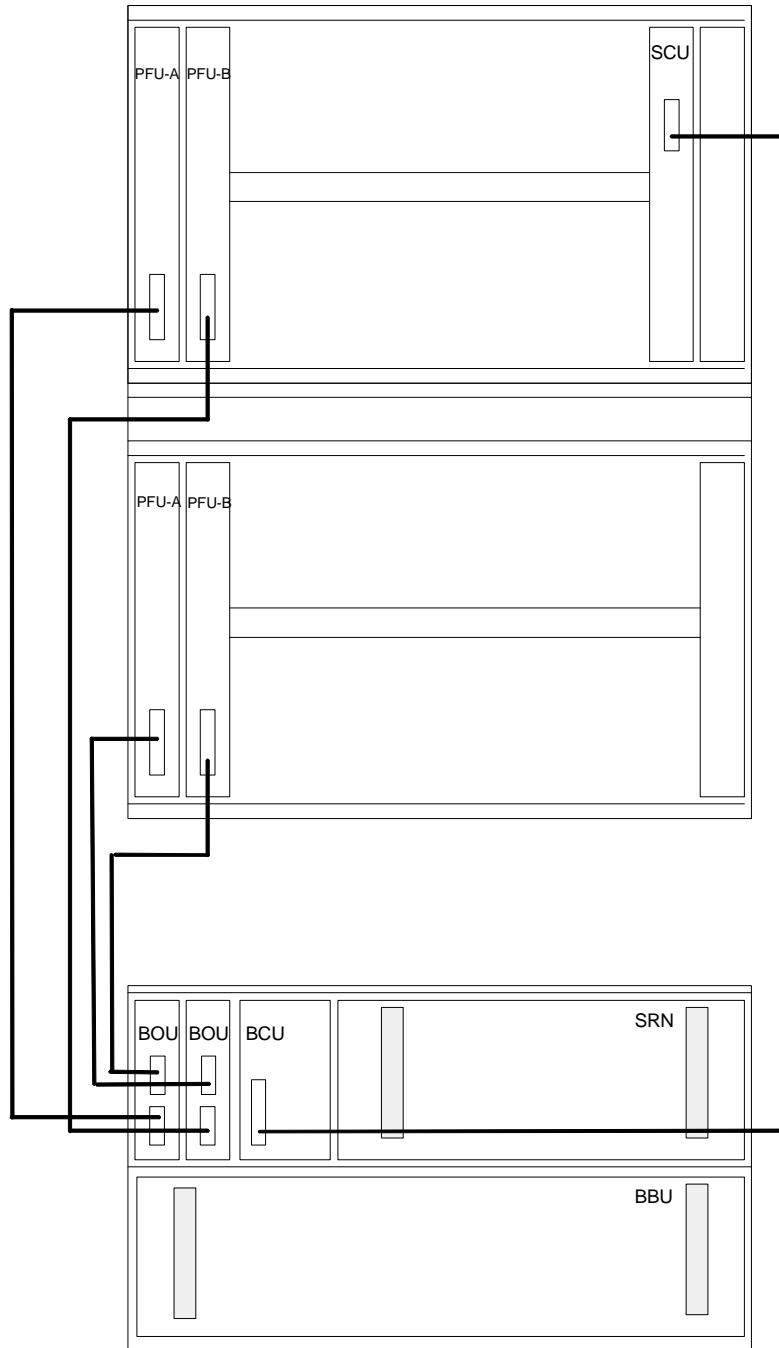


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Fig. 35: Angle Profile and Air Deflector Plate Mounting for Subrack Installation in a 19" Rack.

If the subrack is not the lowest subrack in the rack, the air deflector plate (nr. 883200200) is mounted to the rear of the subrack with 4 pcs. of M3x8 size pan head screws and to the side panels with 2 pcs. of self-tapping 4.2 x 6.5 screws, 2 pcs. of M3x4 size pan head screws and bracket nr. 880113060 (see numbers 2 to 5 in figure above). The air deflector plate is attached to the subrack before installation in the rack.

The subrack is grounded with a separate grounding cable that is included in the subrack's installation accessories. The cable is attached under the mounting screw of the subrack's lower rear profile. A serrated washer must be inserted between the conductor lug terminal and the side panel to ensure electrical continuity between the subrack and the grounding conductor.



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Fig. 36: Cabling When BBS Is Used

1.3.2.2 Unit List of the BBS System

RXS-B		Power Subrack for BBS System	
	RXS 113	Single Subrack	1/RXS-B
	RKX 262	Air Deflector Plate	1/RXS-B
	RKX 490	Installation Accessories	1/RXS-B
SRN		AC/DC Converter Unit	1/RXS-B
	SRN 114	AC /DC Converter Unit	1/SRN
	RKC 266	AC Power Cable	1/SRN
BCU		Power Control Unit	1/RXS-B
	BCU 116	Battery Control Base Unit	1/BCU
BOU		Battery Output Unit	2/RXS-B
	BOU 118	Battery Output Base Unit	1/BOU
BBU		Battery Backup Unit	1/RXS-B
	BBU 115	48V DC Battery Backup Unit	
Cables	11117150	BCU-SCU Alarm Output Cable, 2 m	0...1/RXS-B
	11117162	BCU-BCU Alarm Output Cable	0...1/RXS-B
	11117163	BOU-PFU Power Cable, 2.5 m	0...2/BOU

1.3.3 Technical Specifications of the BBS System**1.3.3.1 SRN**

Input voltage	230V AC $\pm 10\%$
Frequency	50 Hz
Input current; maximum	3.2A
Input overcurrent protection	Fuses 2x T5A/250V
Output voltage	48V DC $\pm 20\%$
Output current max	8A
Output power max	360 VA
Output overcurrent protection	15A magnetic circuit breaker
Charger voltage	65V _{peak} $\pm 20\%$; full wave rectified, not filtered
Charger current	1A
Charger overcurrent protection	Fuse T2.5A/250V
Height	128 mm
Width	327 mm
Depth	220 mm
Weight	6.6 kg

1.3.3.2 BBU

Batteries	4 pcs. 12V/12Ah lead acid batteries
Nominal voltage	48V DC
Over current protection	10A Magnetic circuit breaker (not in V1.0)
Height	128 mm
Width	428 mm
Depth	220 mm
Weight	18.5 kg
Operating temperature	+5...+35°C

1.3.3.3 BCU

Input voltage	65V peak +/-20%; full wave rectified, not filtered
Charger current	1A
Maximum charging voltage	53.4V / 25°C
Temperature compensation	-0.06V/ °C
Height	128 mm
Width	51 mm
Depth	180 mm
Weight	0.4 kg
Alarm output	Relay contact
Max allowable voltage	60 V DC or 42.4 V AC
Max allowable current	100 mA
Voltage loss at 50mA current	<1 V (10 ohm series resistor)

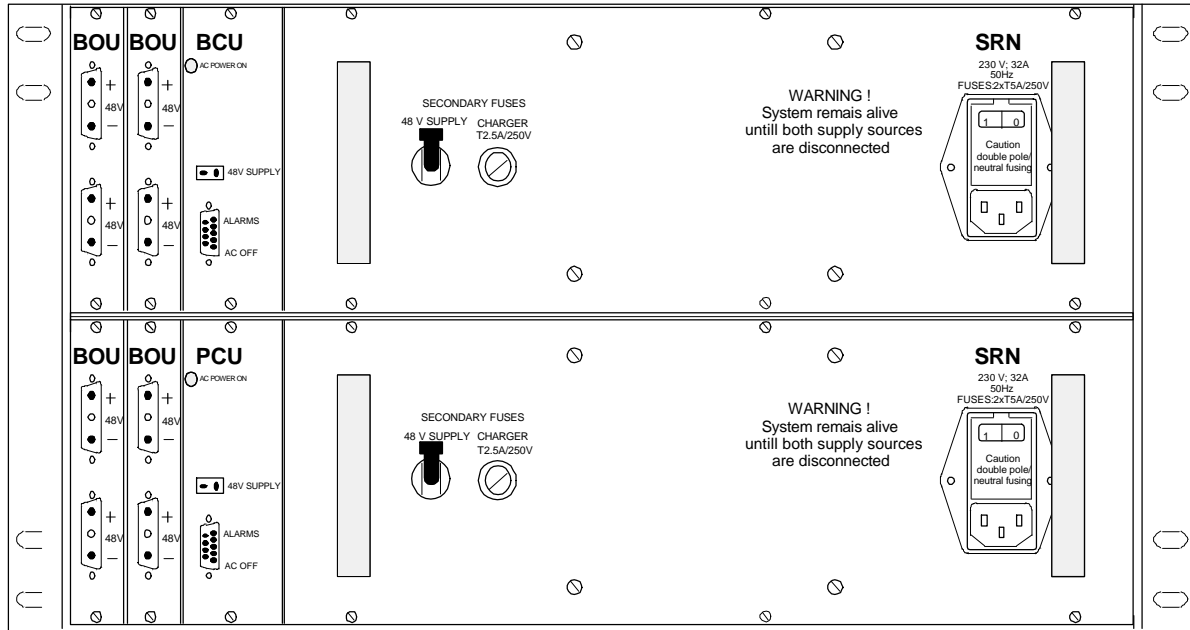
1.3.3.4 BOU

Input voltage	48V DC ±20%
Output voltage	48V DC ±20%
Output current max	6A continuous
Height	128 mm
Width	25 mm
Depth	180 mm
Weight	0.3 kg

1.4 Power Backup System, PBS

1.4.1 General

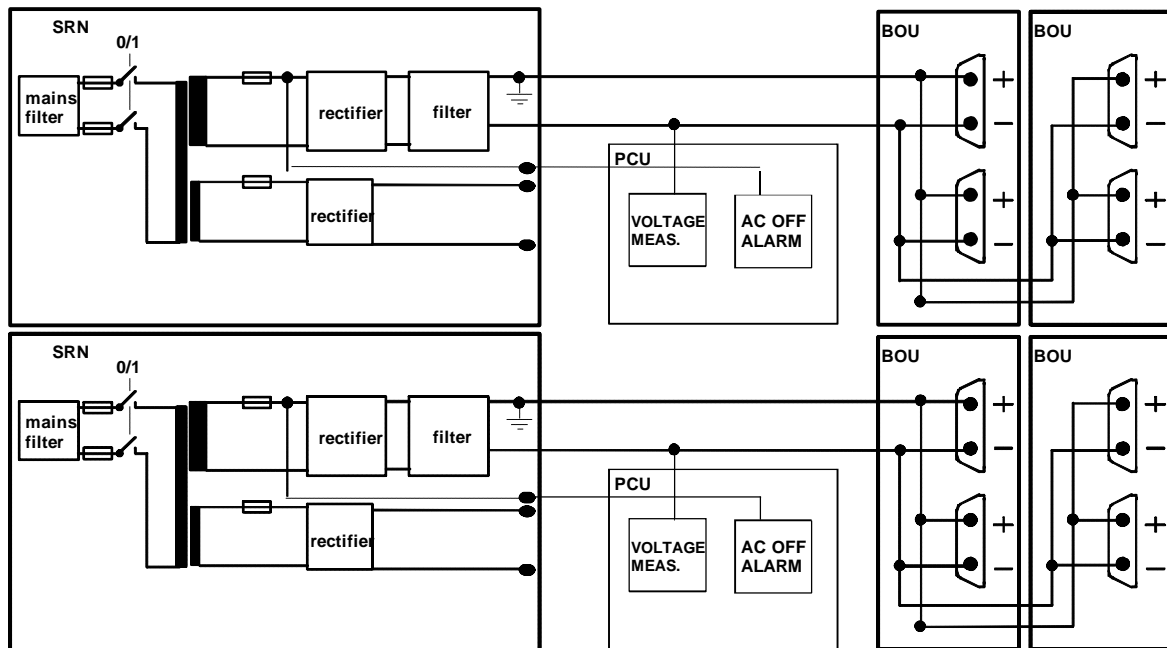
The PBS is a separate AC power subrack with two AC/DC converters. The subrack configuration comprises of a subrack (RXS-P), two AC/DC converter units (SRN), two power control units (PCU) and four battery output units (BOU). All units are 128 mm high.



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Fig. 37: The PBS Subrack

The system will, for example, support a duplicated power feeding to two pieces of RXS-S subrack.



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Fig. 38: Block Diagram of the PBS System

WARNING! *The system remains alive until both SRN units are disconnected!*

1.4.1.1 Units in PBS System

- AC/DC Converter Unit, SRN
- Power Control Unit, PCU
- Battery Output Unit, BOU

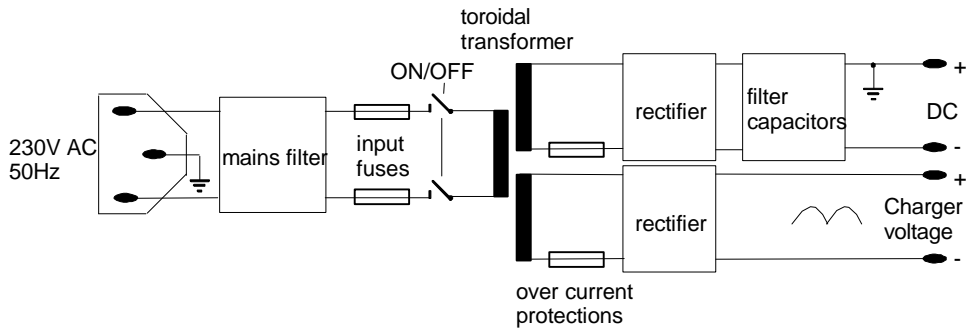
1.4.1.2 AC/DC Converter Unit, SRN

General

The SRN is an AC/DC converter unit of linear type. 230V AC input voltage is converted to -48V DC (positive pole grounded) supply output (rectified and filtered) and 67V charger voltages (rectified). The unit can drive up to 360VA to the load and 60VA to the battery charger.

Operation of the SRN Unit

Block Diagram of the SRN Unit



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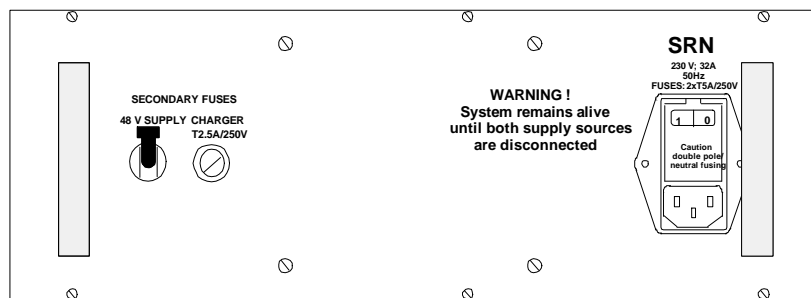
Fig. 39: Block Diagram of the SRN Unit

The unit's front panel is equipped with a three-terminal connector for 230V AC mains cord and a mains filter with two T 5A fuses. **The unit must be connected to a wall socket outlet with a protective earth contact.** There is also a magnetic circuit breaker for DC voltage and a T 2.5A fuse for charger voltage. An internal fault may blow the fuses. The primary fuses can be replaced by opening the mains filter module on the unit's front panel. The charger fuse can be replaced by opening the cover of the fuse holder on the front panel. The operating lever of the circuit breaker moves to the off position when an overload causes the breaker to trip. The breaker can be reactivated by moving the lever to the on position. The nominal tripping current of the breaker is 15A.

WARNING!

Disconnect the unit from the 230V mains before replacing the fuses!

Front Panel of the SRN Unit



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Fig. 40: Front Panel of the SRN Unit

Technical Specifications

For Technical Specifications of the SRN Unit, see page 55

1.4.1.3 Power Control Unit, PCU**Indicators**

When the AC is connected to the subrack, the PCU indicates it with an AC power on LED; if the AC is disconnected, the PCU unit gives an information to alarm output.

Operation**Information**

The LED indicates the following:

AC POWER ON AC voltage is connected to the subrack.

From the measurement point you get the following information:

48V SUPPLY From this measurement point you can measure the DC voltage, which is between 45V and 55V.

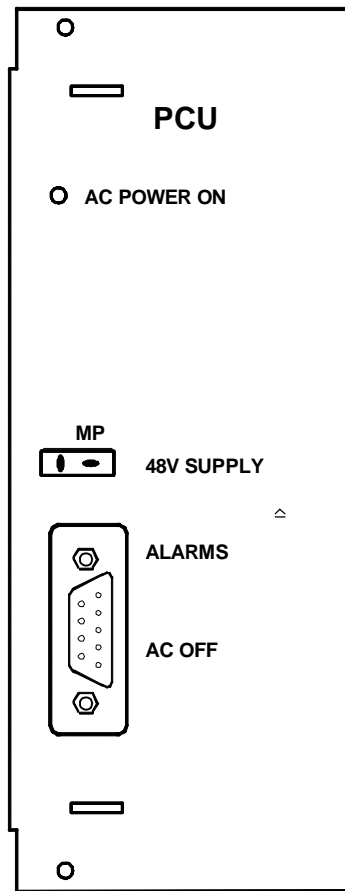
From the alarm output connector you get one alarms condition:

AC OFF AC voltage is not connected to the subrack.

The alarm output has a floating contact (relay). One pole of the contact can be connected to the equipment earth. A closed contact corresponds to the alarm status. The alarm output can supply current up to 100 mA.

Front Panel

The unit's front panel is provided with one indication LED, one measurement point and an alarm connector for the AC off alarm.



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Fig. 41: Front Panel of the PCU Unit

9-pin D-type male connector

Pin	Signal
1, 6	NC
2, 7	NC
3, 8	AC OFF (floating or pin 8 connected to GND)
4, 9	AC OFF (floating or pin 9 connected to GND)
5	NC

Technical Specifications

For Technical Specifications of the PCU Unit, see page 55

1.4.1.4 Battery Output Unit, BOU

DC Voltages

The BOU unit provides an interface for DC voltages.

Operation

Block Diagram of the BOU Unit

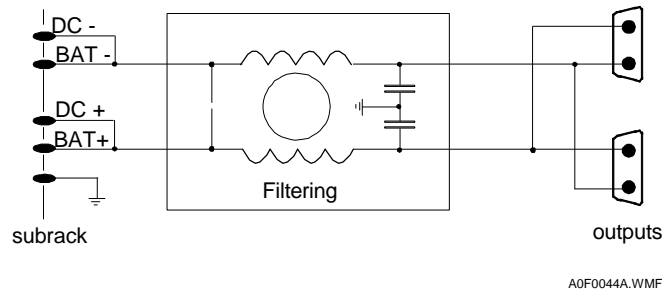
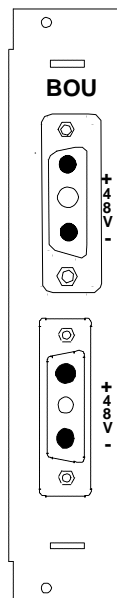


Fig. 42: Block Diagram of the BOU Unit

There are four BOU units in the system PBS. Each of them is designed to drive one subrack (<180VA). There are also two identical interface connectors in the unit's front panel. In the PBS system the other connector is not needed. The positive pole of the voltage is connected to pin A1 (upper pin) and the negative pole to pin A3.

Front Panel



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Fig. 43: Front Panel of the BOU Unit

Technical Specifications

For Technical Specifications of the BOU Unit, see page 55

1.4.2 RXS-P Subrack

1.4.2.1 Subrack Installation and Cabling

Subrack RXS-P is intended for installation in a 19" rack. The subrack's height is 266 mm and its width, without side mounting brackets, 447.8 mm. The subrack can be installed in a rack the minimum depth of which is 400 mm.

Doors should not be used in the racks, because free air flow must be ensured. The back side of the rack must be left free because of the rack's cabling. Because of excessive heat generation, it is not allowed to connect subracks back-to-back.

At least a 2U (88.9 mm) high opening must be left at the bottom of the rack for sufficient air intake (see figure below).

If several subracks are mounted in a 19" rack, an air deflector plate (#883200200) should be used between the subracks. The lowest subrack in the rack does not need the air deflector plate.

Fig. 44 shows an example of an installation in a 19" rack (height 34U). A space of minimum 2U (88.9 mm) is required at the bottom of the rack for the intake of fresh air. An air deflector plate should be installed between every subrack and an air duct (depth over 120 mm) should be left between the rear of the subrack and the rack's back panel. The top cover and the back panel of the rack must be equipped with sufficient ventilation slots, and a space of minimum 1U (44.45 mm) is required at the top of the rack for outflow of warm air.

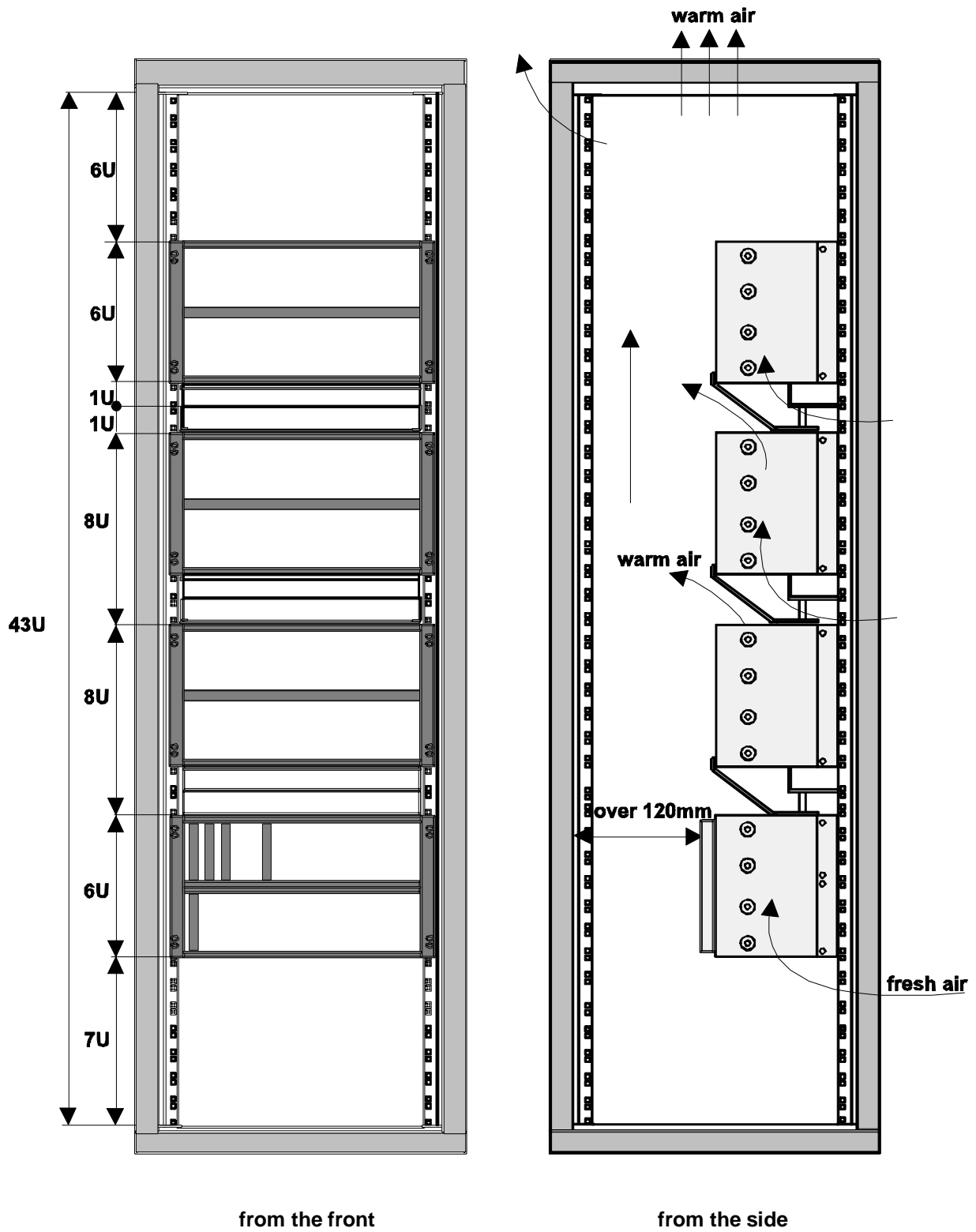


Fig. 44: RXS-P and RXS-S Subracks in a 19" Rack

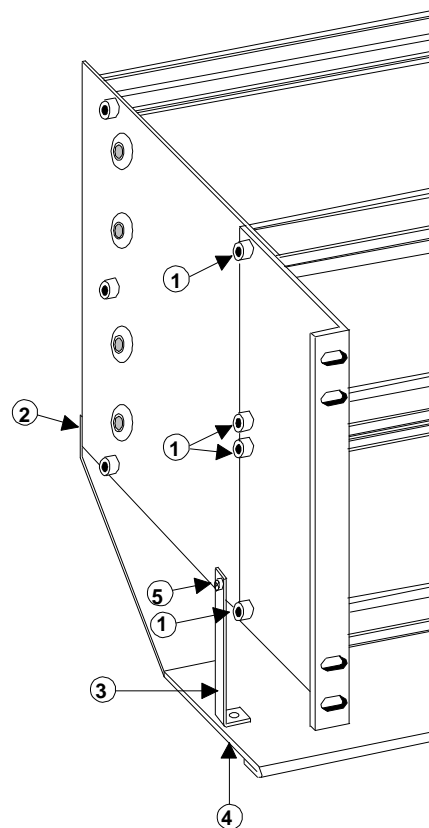
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Installation in a 19" Rack

The subrack is installed in a 19" rack by using two 80 x 23 x 3 mm size angle profiles (#883200282). These profiles are mounted under the M5x10 size hex recessed head screws that fasten the subrack's front profiles to the side panels. Using a 4-mm Allen key, the four hex recessed head screws on one side are detached. The profile is mounted under the screw, then the screw is tightened with fingers. When the profile is under each of the screws, the screws are tightened with the Allen key. The angle profile of the other side is mounted similarly.

If the hex recessed heads are too high and hinder installation, M5x10 size pan head screws can be used instead of the original screws.

Fig. 45 shows the mounting of the angle profile under the hex recessed head screws (#1) and the mounting of the air deflector plate (if needed). If the subrack is not the lowest subrack in the rack, the air deflector plate (#883200200) is mounted to the rear of the subrack with four M3x8 size pan head screws, and to the side panels with two self-tapping 4.2 x 6.5 screws, two M3x4 size pan head screws and bracket #880113060 (see numbers 2 to 5 in figure below). The air deflector plate is attached to the subrack before installation in the rack.



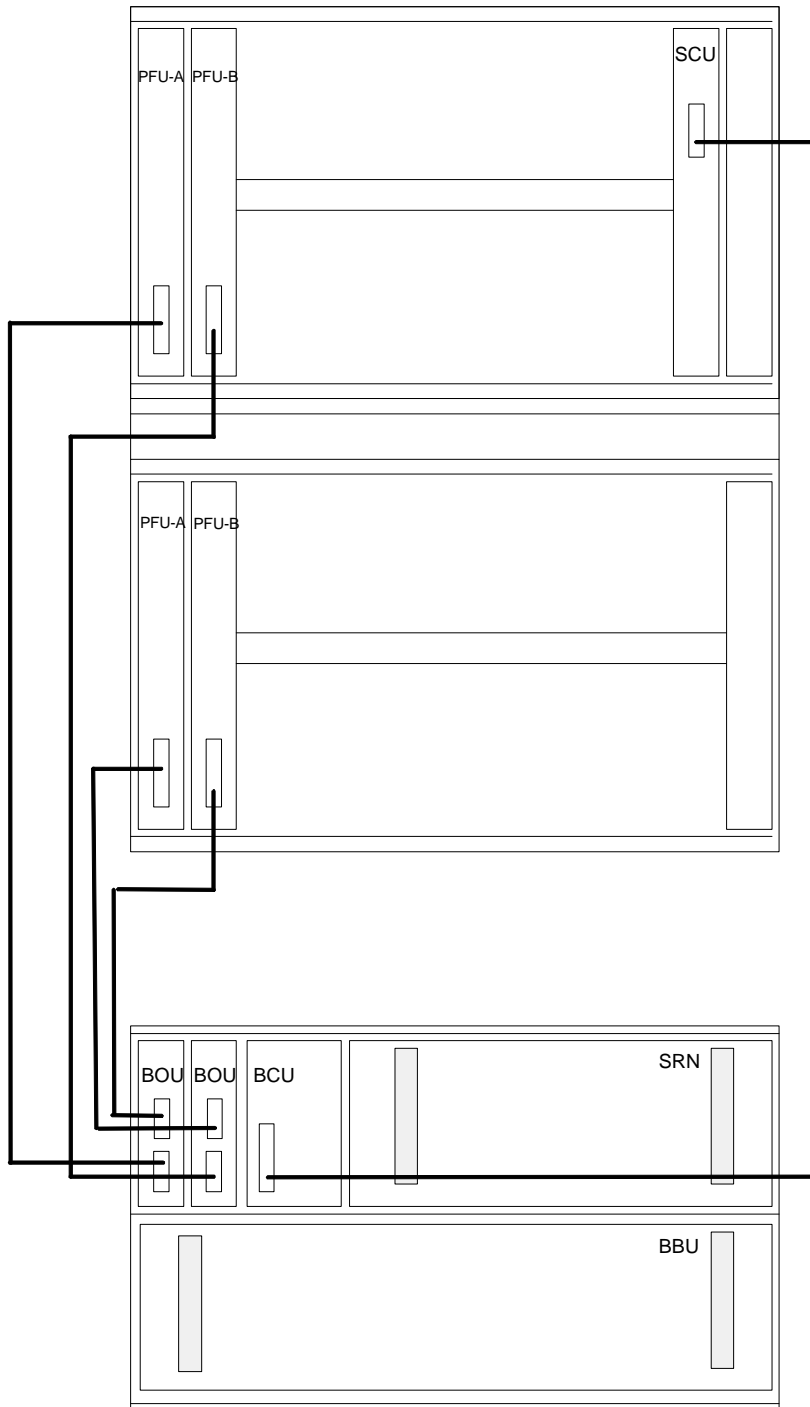
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Fig. 45: Angle Profile and Air Deflector Plate Mounting for Subrack Installation in a 19" Rack

The subrack is grounded with a separate grounding cable which is included in the subrack's installation accessories. The cable is attached under the mounting screw of the subrack's lower rear profile. A serrated washer must be inserted between the conductor lug terminal and the side panel in order to ensure electrical continuity between the subrack and the grounding conductor.

Cabling

Fig. 46 shows an example of cabling when a double subrack and duplicated AC power feeding (power backup system) is used.



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Fig. 46: Cabling When Duplicated AC Power Is Used

1.4.2.2 Unit List of the PBS System

RXS-P		Power Subrack for PBS System	
	RXS 120	Single Subrack	1/RXS-P
	RKX 262	Air Deflector Plate	1/RXS-P
	RKX 490	Installation Accessories	1/RXS-P
SRN		AC/DC Converter Unit	2/RXS-P
	SRN 114	AC /DC Converter Unit	1/SRN
	RKC 266	AC Power Cable	1/SRN
PCU		Power Control Unit	2/RXS-P
	PCU 123	Power Control Base Unit	1/PCU
BOU		Battery Output Unit	4/RXS-P
	BOU 118	Battery Output Base Unit	1/BOU
Cables	11117150	PCU-SCU Alarm Output Cable, 2 m	0...1/RXS-P
	11117162	PCU-PCU Alarm Output Cable	0...1/RXS-P
	11117163	BOU-PFU Power Cable, 2.5 m	0...2/BOU

1.4.3 Technical Specifications of PBS System**1.4.3.1 SRN**

Input voltage	230V AC \pm 10%
Frequency	50 Hz
Input current; maximum	3.2A
Input overcurrent protection	Fuses 2x T5A/250V
Output voltage	48V DC \pm 20 %
Output current max	8A
Output power max	360 VA
Output overcurrent protection	15A magnetic circuit breaker
Charger voltage	65V _{peak} \pm 20%; full wave rectified, not filtered
Charger current	1A
Charger overcurrent protection	Fuse T2.5A/250V
Height	128 mm
Width	327 mm
Depth	220 mm
Weight	6.6 kg

1.4.3.2 PCU

Alarm output	Relay contact
Max allowable voltage	60 V DC or 42.4 V AC
Max allowable current	100 mA
Voltage loss at 50mA current	<1 V (10 ohm series resistor)
Height	128 mm
Width	51 mm
Depth	180 mm
Weight	0.2 kg

1.4.3.3 BOU

Input voltage	48V DC \pm 20%
Output voltage	48V DC \pm 20%
Output current max	6A continuous
Height	128 mm
Width	25 mm
Depth	180 mm
Weight	0.3 kg

1.5 Installation of the Power Supply Systems

For the installation of the BBS System, see Chapter 1.3.2.1.

For the installation of the PBS System, see Chapter 1.4.2.1.