



# Plena Power Amplifiers

LBB1930/20, LBB1935/20, LBB1938/20, LBB1938/70



**BOSCH**

**en** Installation and Operation manual



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# 1 Safety

Prior to installing or operating products, always read the Important Safety Instructions which are available as a separate multilingual document: Important Safety Instructions (Safety\_ML). These instructions are supplied together with all equipment that can be connected to the mains supply.

## Safety precautions

The Power Amplifier designed to be connected to the public distribution network.

- To avoid any risk of electric shock, all interventions must be carried out with disconnected mains supply.
- The ventilation should not be impeded by covering the ventilation openings.
- Connection of external wiring to this equipment requires installation by qualified personnel only.
- The operation must only be performed by qualified personnel.
- Use the apparatus in a moderate climate.



## Caution!

These service instructions are for use by qualified service personnel only.

To reduce the risk of electric shock, do not perform any servicing other than that contained in the operating instructions unless you are qualified to do so.

## 2 About this manual

### 2.1 Manual purpose

The purpose of this manual is to provide information required for installing, configuring, operating and maintaining the Plena Power Amplifier.

The following related documents are available:

- Plena Voice Alarm System Operation manual.
- Plena Voice Alarm System Software manual.

### 2.2 Digital document

This manual is available as a digital document in the Adobe Portable Document Format (PDF). Refer to the product related information at: [www.boschsecurity.com](http://www.boschsecurity.com).

### 2.3 Intended audience

This manual is intended for installers, operators and users of a Plena system.

### 2.4 Alerts and notice signs

Four types of signs can be used in this manual. The type is closely related to the effect that may be caused if it is not observed. These signs - from least severe effect to most severe effect - are:



**Notice!**

Containing additional information. Usually, not observing a 'notice' does not result in damage to the equipment or personal injuries.



**Caution!**

The equipment or the property can be damaged, or persons can be lightly injured if the alert is not observed.



**Warning!**

The equipment or the property can be seriously damaged, or persons can be severely injured if the alert is not observed.



**Danger!**

Not observing the alert can lead to severe injuries or death.

## 2.5 Conversion tables

In this manual, SI units are used to express lengths, masses, temperatures etc. These can be converted to non-metric units using the information provided below.

1 in =	25.4 mm	1 mm =	0.03937 in
1 in =	2.54 cm	1 cm =	0.3937 in
1 ft =	0.3048 m	1 m =	3.281 ft
1 mi =	1.609 km	1 km =	0.622 mi

**Table 2.1: Conversion of units of length**

1 lb =	0.4536 kg	1 kg =	2.2046 lb
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**Table 2.2: Conversion of units of mass**

1 psi =	68.95 hPa	1 hPa =	0.0145 psi
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**Table 2.3: Conversion of units of pressure**



### Notice!

1 hPa = 1 mbar

$$^{\circ}\text{F} = \frac{9}{5} \cdot ^{\circ}\text{C} + 32$$

$$^{\circ}\text{C} = \frac{5}{9} \cdot (^{\circ}\text{F} - 32)$$

## 2.6 Copyright and disclaimer

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The content and illustrations are subject to change without prior notice.

## 2.7 Document history

Release date	Documentation version	Reason
2014.01.10	V1.0	1st edition.
2014.01.21	V1.1	2 <sup>nd</sup> edition. Minor technical data changes.

## 3 System Overview

### 3.1 Product range introduction

The Power Amplifier is part of the Plena product range. The Plena product range provides public address solutions for places where people gather to work, worship, trade, or to relax. It is a family of system elements that are combined to create public address systems tailored for virtually any application. The Plena product range includes:

- Mixers
- Pre-amplifiers
- Power amplifiers
- Music source unit
- Digital message manager
- Feedback suppressor
- Call stations
- "All-In-One" system
- Voice Alarm System
- Timer
- Charger
- Loop amplifier

The various elements are designed to complement each other using matched acoustical, electrical and mechanical specifications.

All Plena Power Amplifiers in this manual are designed for use in EN54-16 and EN60849 compliant systems.

### 3.2 Power amplifier range

The Plena Power Amplifier range consists of the following mono amplifiers:

- 120W LBB 1930/20 (2 units high).
- 240W LBB 1935/20 (2 units high).
- 480W LBB 1938/x0 (3 units high).

In this manual all illustrations show either the LBB 1938/x0 power amplifier that is 3 units high, the LBB 1930/20, LBB 1935/20 power amplifier that is 2 units high. All connections are similar between the different power amplifiers. These power amplifiers have 70V and 100V constant voltage outputs and a low impedance output for 4 or 8 Ohm loudspeakers.

Two inputs, "Priority" and "Program", give priority and controlled outputs. A 100V slave input gives connection to existing loudspeaker lines. The line inputs are balanced and have a loop-through facility. The amplifiers have overload and short-circuit protection. A temperature controlled fan and overheat protection gives high reliability. Battery operation with automatic switchover from the mains supply is available.

## 4 Installation

The power amplifier is intended for tabletop use, however the unit can also be mounted in a 19" rack. For 19" rack installation; use:

- The 19" rack mounting brackets which come with the product.
- Standard M6 mounting screws: 16 mm thread depth, 20 mm total length.

The power amplifier has an internal fan regulated to keep the temperature inside the unit within safe operating conditions.

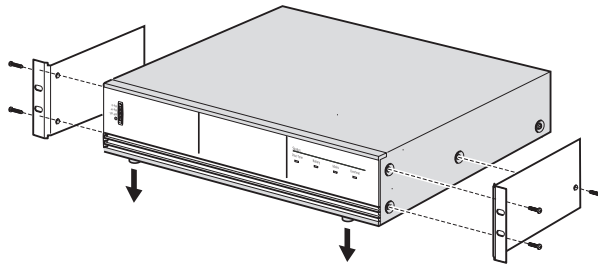


Figure 4.1: Brackets for 19" rack mounting

### Notice!

If you install the product into a 19" rack:



- Ensure that it does not exceed the overheating temperature (+45°C ambient).
- Make sure that warm air that is expelled from the side and rear can flow away.
- Ensure sufficient ventilation and enough room, about 10cm / 4" behind the unit for cables and connections.
- Use the included Bosch 19" mounting brackets (LBC 1901/00) x2.
- Remove the tabletop feet from the bottom of the unit.



## 5 Connection and indicators

### 5.1 Front panel indicators

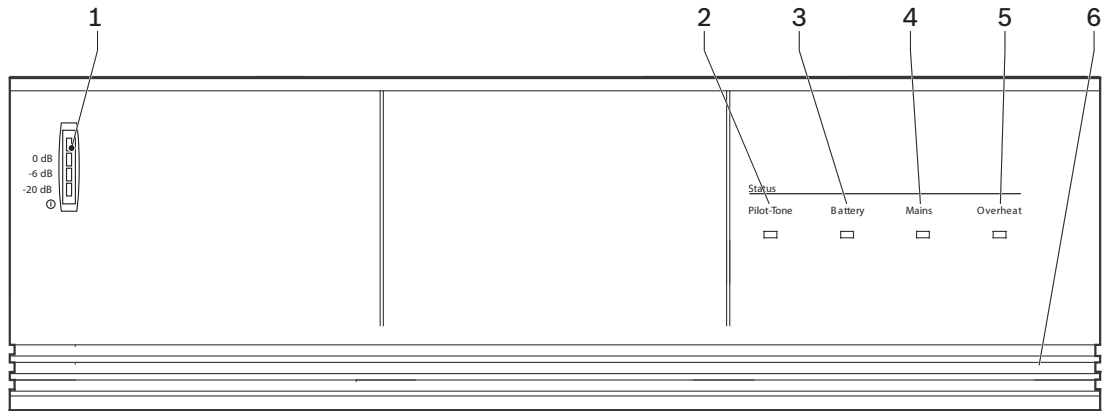


Figure 5.1: LBB 1930/20 LBB 1935/20 and LBB 1938/20

1. **VU meter** LED's for -20, -6, 0dB and power ON.
2. **Pilot-Tone** supervised function that monitors a 20 kHz pilot tone.
3. **Battery** supervised function to indicate battery operation.
4. **Mains** supervised function to indicate mains supply.
5. **Overheat** supervised function to give warning of overheating.
6. **Air inlet** cooling is made by forced ventilation from front to back. Amplifiers can be stacked on top of each other. A supply of cool air from the front is necessary.

### 5.2 Rear panel connectors and switches

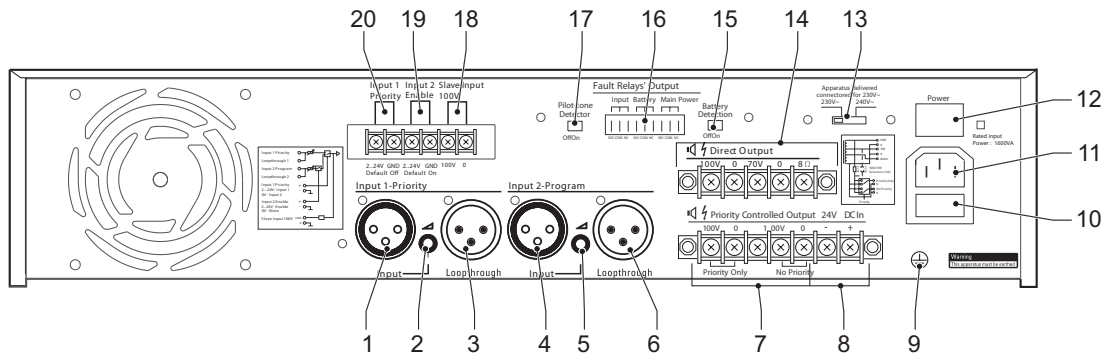


Figure 5.2: LBB 1930/20 LBB 1935/20

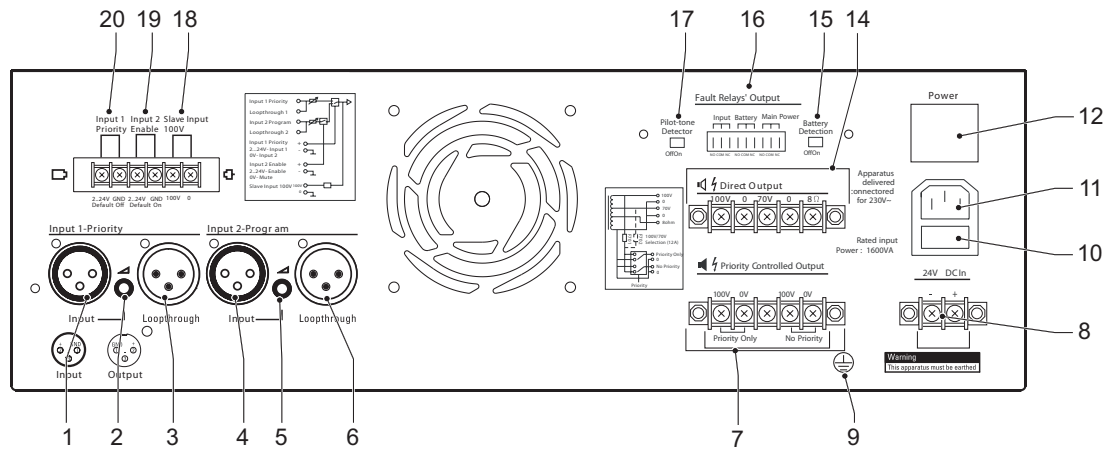


Figure 5.3: LBB 1938/x0

Note that slight deviations from the rear panel layout shown may occur.

1. **Priority line** input 1 (XLR/balanced)
2. **Level control** input 1
3. **Priority loopthrough** output 1 (XLR/balanced)
4. **Program line** input 2 (XLR/balanced)
5. **Level control** input 2
6. **Program loopthrough** output 2 (XLR/balanced)
7. **Priority controlled loudspeaker** output terminals
8. **24 Vdc** power supply terminals
9. **Earth** connection screw
10. **Mains fuse** (T10A)
11. **Mains connector** (3-pole)
12. **ON - OFF** switch
13. **Voltageselector** (Not on LBB 1938/x0)
14. **Loudspeaker direct output** terminals
15. **Battery detection**
16. **Fault relay output**
17. **Pilot-Tone** detection
18. **100 V** slave input terminals
19. **Input 2 enable** control terminals
20. **Input 1 priority** control terminals

## 5.3 Internal setting

The output voltage of the priority controlled loudspeaker outputs can be set to 70V or 100V. A high power fuse inside the unit is used as a voltage selector. Insert the high power fuse into fuse holder F701 for 100V selection (default setting), or into fuse holder F702 for 70V selection. This selection does not affect the output voltage of the loudspeaker direct outputs.

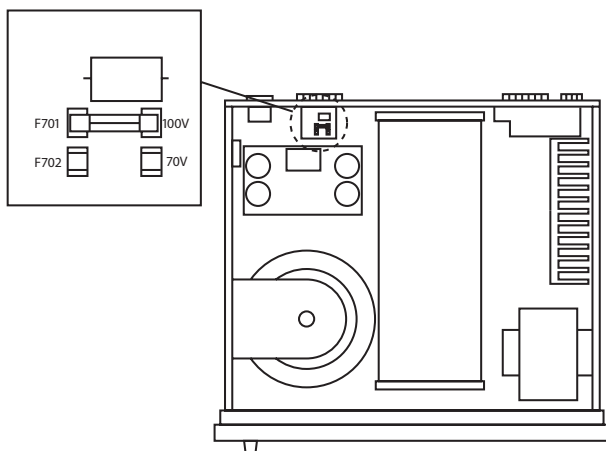


Figure 5.4: Internal fuse setting LBB 1930/20, LBB 1935/20, LBB 1938/x0

### See also

- *Rear panel connectors and switches, page 9*

## 6 External connections

### 6.1 Connect the back-up power supply

The power amplifier has a 24VDC input (8) screw terminal to connect a back-up power supply. You must connect an earth (9) to the unit to increase the electrical stability of the system.

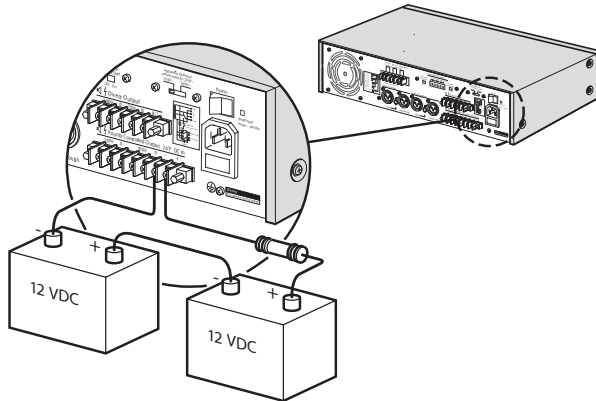


Figure 6.1: Back-up power supply

### 6.2 Connecting line input and loop-through

The power amplifier has a balanced line input for connection to a pre-amplifier or a mixer. Use the loop-through connection to connect the power amplifier to another power amplifier if more power is needed. Each power amplifier must be connected to its own set of loudspeakers. Do not connect power outputs to each other.

Use program line input 2 (4) and line loop-through 2 (6) for normal operation without priority.

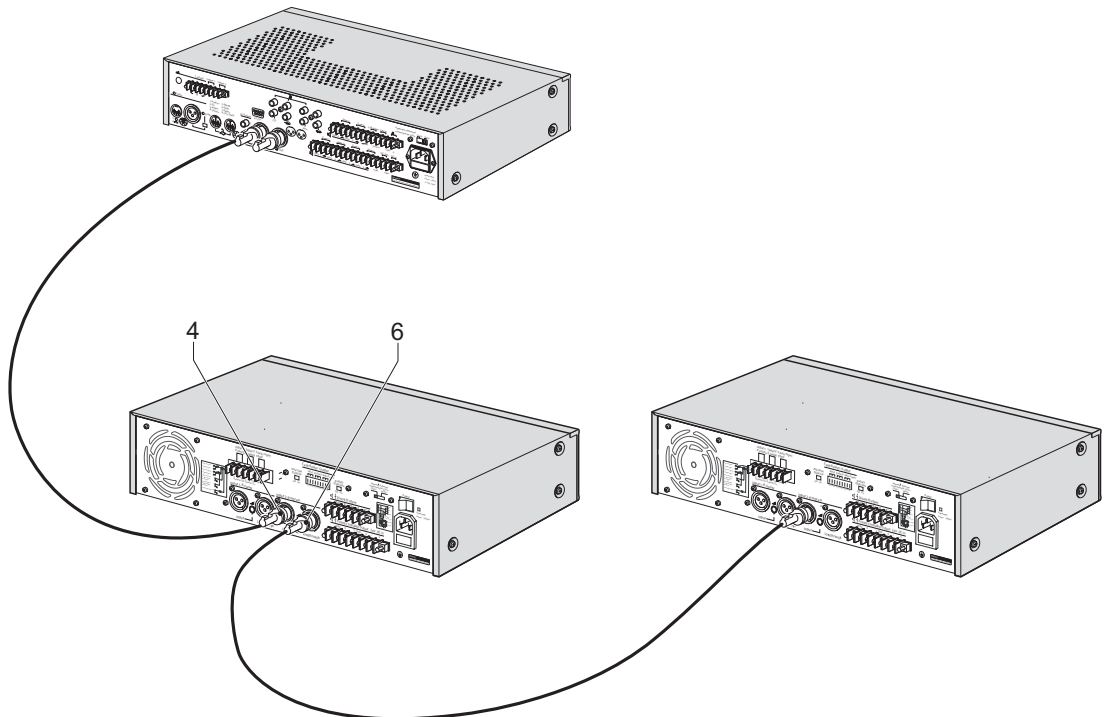


Figure 6.2: Line input and loop-through

### 6.3 100V slave input

The power amplifiers have a 100V slave input (18) that can be connected to an existing 100V loudspeaker line. In this way it is easy to connect an additional power amplifier on a remote location for more output power. The 100V input is not affected by the control terminals for input 1 priority (20) or input 2 enable (19).

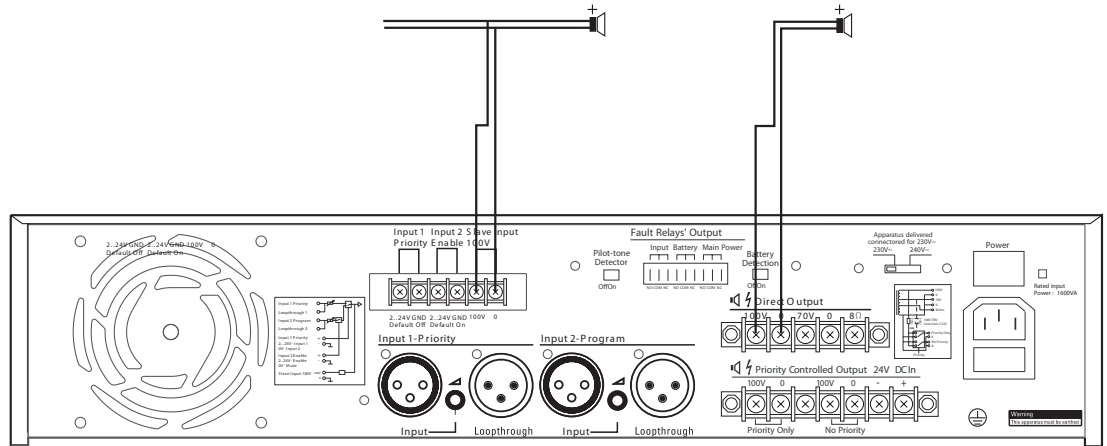


Figure 6.3: 100 V slave input



**Notice!**

If the 100V slave input is used, and the 0V and 100V are incorrectly connected, no pilot tone is detected on the power amplifier. Refer to section *Input pilot tone, page 16*, for more information.

### 6.4 Constant voltage loudspeakers

The power amplifier can drive 100V constant voltage loudspeakers at full power (100V) or half power (70V). Connect the loudspeakers in parallel and check the loudspeaker polarity for in-phase connection. The summed loudspeaker power should not exceed the rated amplifier power.

### 6.5 Low impedance loudspeakers

Connect low impedance loudspeakers to the 8 ohm/0 terminals. This output can deliver the rated output power into an 8 ohm load. Connect multiple loudspeakers in a series/parallel-arrangement to make the combined impedance 8 ohm or higher. Check the loudspeaker polarity for in-phase connection.

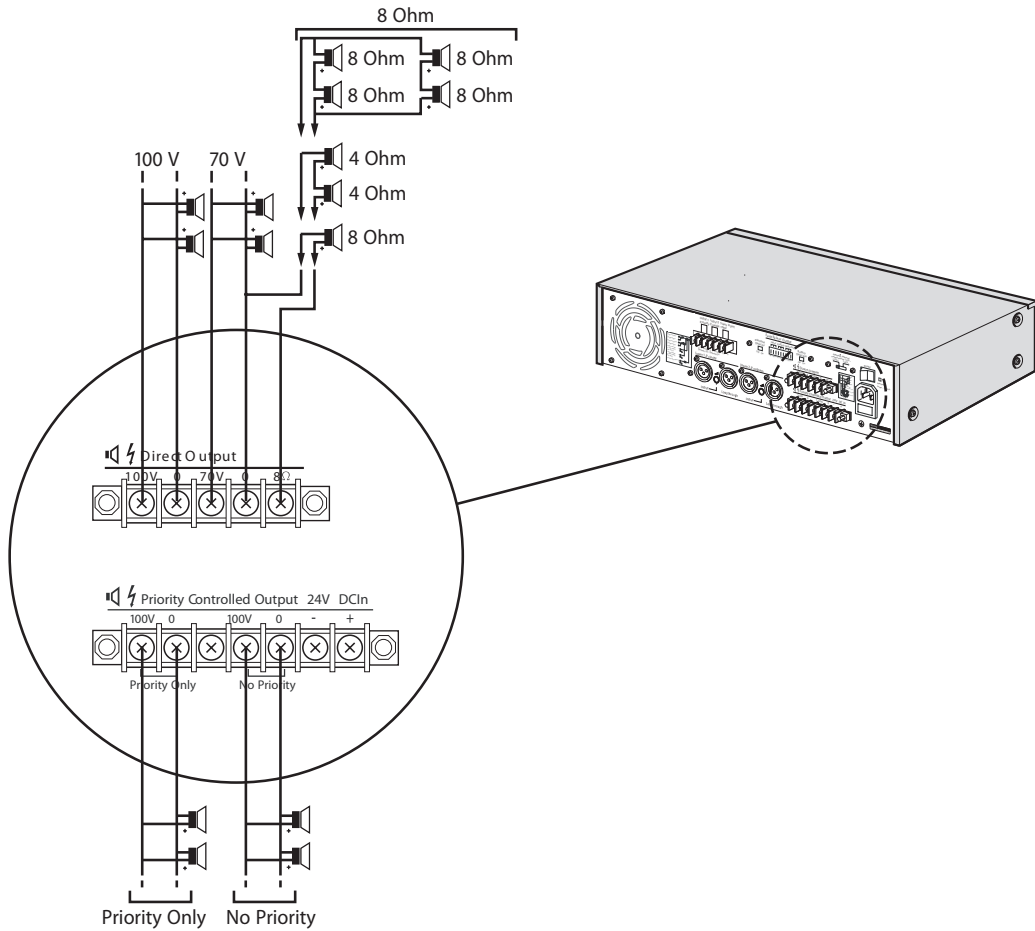


Figure 6.4: Priority input and control terminals

## 6.6 Priority controlled loudspeaker

Loudspeakers connected to the Priority Only output will receive only audio signals with priority, like calls from a call station.

Loudspeakers connected to the No Priority output will receive all audio signals, such as music, but no signals with priority, like calls.

## 6.7 Power

Use the mains lead to connect the amplifier to the power supply.

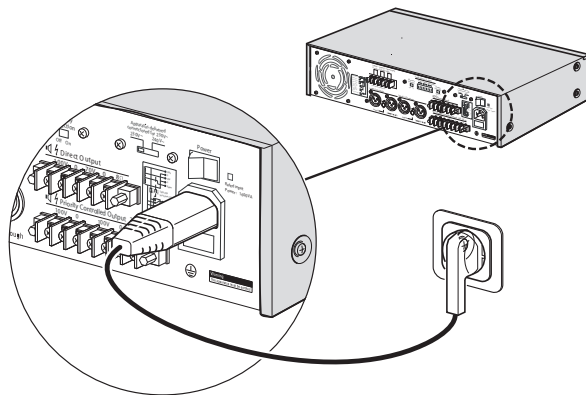


Figure 6.5: Mains lead

## 7 Supervision

Supervision is provided for:

- Pre-amplifier and power amplifier function
- Battery and mains supervision

Relays are provided on the rear panel for the each supervised function and are normally energized (fail-safe). Each relay has 3 contacts, normally open, common and normally closed. If an application does not need supervision, the indicators on the front panel can be set to “OFF” with the switches next to each relay output. The relays always function and are independent of the indicator switch setting.

### 7.1 Input pilot tone

The Plena Voice Alarm System uses a pilot tone of 20kHz at -20dBV to supervise the pre-amplifier, the connections between the pre-amplifier and the power amplifier and function of the power amplifier. If the input signal from the pre-amplifier stops, the mains and battery fail, or the power amplifier stops for any other reason, the pilot-tone stops, the pilot-tone fault indication shows on the front panel and a signal is given on the Input fault relay. If the power amplifier stops through overheat, then the overheat indicator shows on the front panel, the signal is given on the Input fault relay.

The pilot-tone detection indicator can be set to “ON” or “OFF” with the pilot-tone detection switch (17), see *Rear panel connectors and switches, page 9*. The pilot-tone indicator on the front panel is set to “OFF”, but the fault relay switch still functions.

### 7.2 Battery supervision

The power amplifier supervises the availability of the back-up power supply.

If the battery supply fails the battery fault indication shows on the front panel and the battery fault relay switches over.

The battery supervision indicator can be set to “ON” or “OFF” with the battery detection switch (15), *Rear panel connectors and switches, page 9*. The battery indicator on the front panel is set to “OFF”, but the fault relay switch still functions.

The amplifier will work between 20VDC and 26.5VDC. Below 20VDC the amplifier will shut down if the mains is not present.

The amplifier will automatically switch from primary power (mains) to backup power (24VDC), this changeover is automatic. During switch over a glitch can be heard in the audio signal, typically this lasts less than 1 second, maximum 2 seconds duration.

### 7.3 Mains supervision

The power amplifier supervises the availability of the mains supply. If the mains supply fails (falls below the threshold of -20%), and the back-up power supply takes over, the fault relay moves to the NOK position. A mains fault indication shows on the front panel and a fault state is given by the mains fault relay.



## 8 Operation

### 8.1 Switch ON

Put the power switch on the rear of the power amplifier in the “I” position.

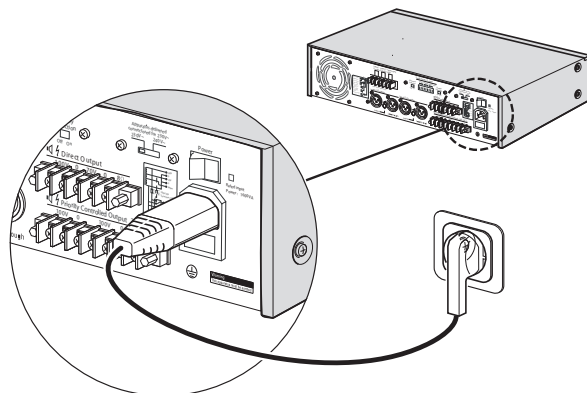


Figure 8.1: Power switch and power connection

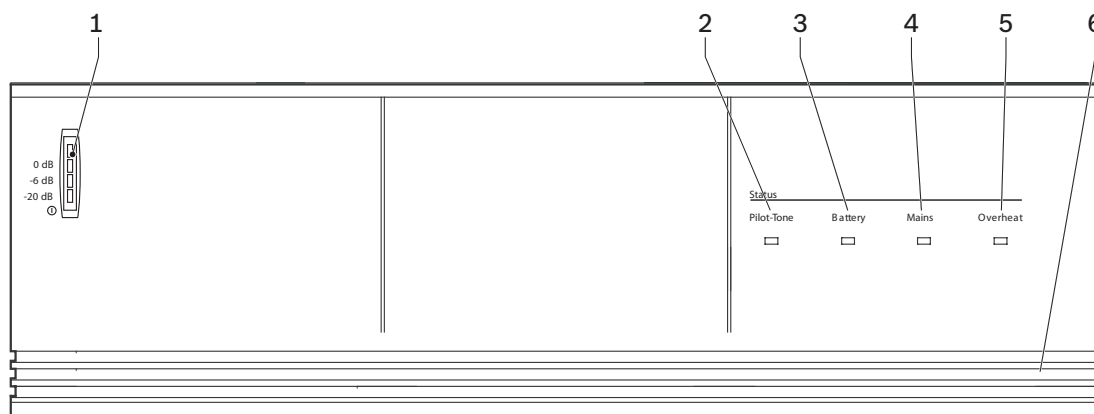


Figure 8.2: LBB 1930/20 LBB 1935/20, LBB 1938/x0

If mains power or back-up power is available, the VU-bar (1) on the front of the power amplifier is lit and shows the output level of the amplifier.

If the internal temperature reaches a critical limit due to poor ventilation or overload, an overheat protection circuit switches “OFF” the power stage. The overheat indicator (5) shows on the front panel and the Input fault relay switches over if the power stage is switched “OFF” by the overheat protection circuit. The Battery operation indicator (3) lights up if the mains power supply is failing and the back-up battery is in use.

## 8.2 Connecting the priority input and using the control terminals

The power amplifier is provided with a balanced priority input (Input 1-Priority) to connect to a pre-amplifier or mixer.

Refer to figure 5.2 and 5.3. Apply a control voltage of 2...24V to the input 1 priority control terminals **(20)** to switch “ON” the priority input **(1)** and mute the program input **(4)**. A local music source can be connected to the program input and a remote emergency system to the priority input. The emergency source must be able to supply the 2...24V control voltage to override the local music source. The program input can be remotely controlled by using a switch that is connected to the input 2 enable control terminals **(19)**. Closing the switch forces the input to <2V and disables the program input.

### Application example of the use of the power amplifier control terminals

You can use up to 6 power amplifiers in combination with the Plena LBB1925/10 System Pre-amplifier to build a powerful multi-zone sound system. Zone switching of BGM and calls is done via the LBB1925/10 zone relays in combination with the power amplifier control terminals. The LBB1925/10 controls the background music by distributing 24VDC via the music zone relays to the input 2 enable control terminals **(19)**. The LBB1925/10 controls the calls by distributing 24VDC via the call zone relays to the input 1 priority control terminals **(20)**. Each power amplifier serves one loudspeaker zone. Each zone can be “OFF”, or receive music or a call.

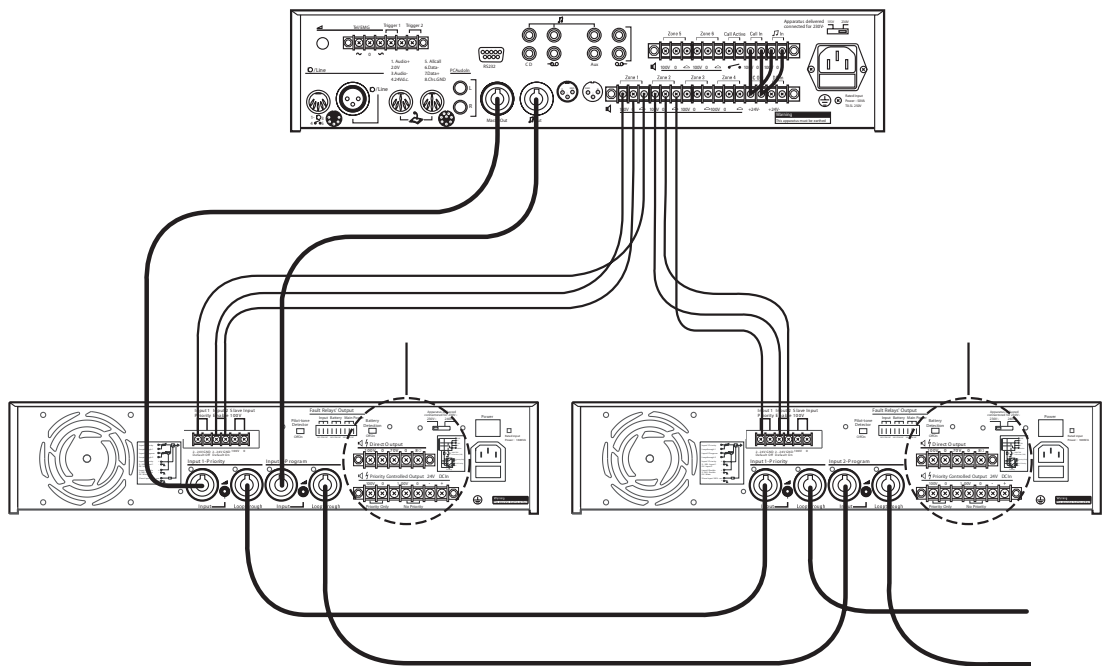


Figure 8.3: LBB1925/10 and power amplifier control terminals example

## 9 Maintenance

The units require minimum maintenance, however to keep the units in good condition, the following tasks should be carried out.

- Clean the units:
  - Periodically clean the units with a damp, lint-free cloth.
- Clean the air inlets:
  - The units can collect dust from the operation of the internal fans. The air inlets of the units should therefore be cleaned on a yearly basis.
- Periodically check unit connections and grounding:
  - To ensure that all cable connections to the units are secure.
  - The ground (Protective Earth) connection of the system components.



### **Warning!**

Dangerous mains voltages are present inside the units. Disconnect the main power supply before doing any maintenance tasks.

## 10 Technical data

### 10.1 Electrical

#### 10.1.1 Mains voltage

LBB 1930/20 LBB 1935/20	230 / 115 VAC , $\pm$ 10%, 50 – 60 Hz
LBB 1938/20	230 VAC, 50 – 60 Hz
LBB 1938/70	110 VAC, 50 – 60 Hz

#### 10.1.2 Battery voltage

Battery voltage	24V DC, 20 - 26.5 V
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#### 10.1.3 Rated power

LBB 1930/20	400 VA
LBB 1935/20	960 VA
LBB 1938/x0	1600 VA

## 10.2 Performance

### 10.2.1 Signal performance

Frequency response	50 Hz - 20 kHz (+1/-3 dB @ -10 dB ref. rated output)
Distortion	<1% @ rated output, 1 kHz

### 10.2.2 Signal-to-Noise Ratios

LBB 1930/20	> 80 dB
LBB 1935/20	> 85 dB
LBB 1938/x0	> 90 dB

**10.2.3****Line inputs**

<b>3 pin XLR balanced</b>	
Sensitivity	1 V
Impedance	20 kohm
CMRR	> 40 dB (50 Hz - 20 kHz)
<b>100V input, screw unbalanced</b>	
Sensitivity	100 V
Impedance	330 kohm

**10.2.4****Loudspeaker outputs**

<b>Line loopthrough output (3 pin XLR balanced)</b>	
Nominal level	1 V
Impedance	Direct connection to line input
<b>Maximum rated output power - 70/100V output</b>	
LBB 1930/20	240 W
LBB 1935/20	240 W
LBB 1938/x0	480 W
<b>8 Ohm outputs</b>	
LBB 1930/20	31 V / 120 W
LBB 1935/20	44 V / 240 W
LBB 1938/x0	62 V / 480 W
<b>Power reduction@24 V battery operations</b>	
Reference rated power	-1 dB (LBB 1935/20) -2 dB (LBB 1930/20 LBB 1938/x0)

## 10.2.5 Power consumption

Power (mains)	LBB 1930/20	Unit
Full power	274	Watt
- 3 dB	193	Watt
- 6 dB	143**	Watt
10V	41	Watt
Idle	18	Watt
<b>Backup power (24VDC)</b>		
Full power	7	Amp
- 3 dB	6	Amp
- 6 dB	4**	Amp
10V	1	Amp
Idle	0.1	Amp
Full power	168	Watt
- 3 dB	144	Watt
- 6 dB	96	Watt
10V	24	Watt
Idle	2.4	Watt

Power (mains)	LBB 1935/20	LBB 1938/x0	Unit
Full power	451	987	Watt
- 3 dB	340	715	Watt
- 6 dB	244**	508**	Watt
10V	55	113	Watt
Idle	16	25	Watt
<b>Backup power (24VDC)</b>			
Full power	12	32	Amp
- 3 dB	11	26	Amp
- 6 dB	8**	18**	Amp
10V	2	4	Amp
Idle	0.3	1	Amp
Full power	288	768	Watt

<b>Power (mains)</b>	<b>LBB 1935/20</b>	<b>LBB 1938/x0</b>	<b>Unit</b>
- 3 dB	264	624	Watt
- 6 dB	192	432	Watt
10V	48	96	Watt
Idle	7.2	24	Watt

\* Output limited to -3dB

\*\* Corresponds to pink noise and voice on full power

\*\*\* Output limited for sine wave signal to -3dB

## 10.3 Mechanical specifications

### Dimensions

Width	19"
Height (including feet)	2 Unit models: 100 mm 3 Unit models: 145 mm
Depth	2 Unit models: 250 mm 3 Unit models: 370 mm
19" Mounting brackets	Included

### Weight

LBB 1930/20	10.5 kg
LBB 1935/20	12.5 kg
LBB 1938/x0	25.0 kg

## 10.4 Environmental conditions

Operating temperature range	-10 to +55°C
Storage temperature range	-40 to +70°C
Relative humidity	< 95%
EMC emission	According to EN55103-1
EMC immunity	According to EN55103-2
Acoustic noise level of fan	< 45 dB SPL @ 1m at maximum speed





**Bosch Security Systems B.V.**

Torenallee 49

5617 BA Eindhoven

The Netherlands

**[www.boschsecurity.com](http://www.boschsecurity.com)**

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