



# Loudspeakers Line Isolator System

PM1-LISM6, PM1-LISS, PM1-LISD



**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.



### **Old electrical and electronic appliances**

Electrical or electronic devices that are no longer serviceable must be collected separately and sent for environmentally compatible recycling (in accordance with the European Waste Electrical and Electronic Equipment Directive).

To dispose of old electrical or electronic devices, you should use the return and collection systems put in place in the country concerned.

## 2 About this manual

- Please read this manual carefully before installing and operating any of the products of the Loudspeakers Line Isolator System and the public address/voice alarm system.
- Retain all documentation supplied with the products for future reference.

### 2.1 Manual purpose

This manual provides information required for installing, configuring, operating, and maintaining the hardware products of the Loudspeakers Line Isolator System. For documentation updates, refer to the product related information on the [www.boschsecurity.com](http://www.boschsecurity.com) website.

### 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 and users of a Loudspeakers Line Isolator 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 Copyright and disclaimer

All rights reserved. No part of this document may be reproduced or transmitted in any form by any means, electronic, mechanical, photocopying, recording, or otherwise, without the prior written permission of the publisher. For information on getting permission for reprints and excerpts, contact Bosch Security Systems B.V..

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

## 2.6 Document history

Release date	Documentation version	Reason
2014.03.10	V1.0	– 1 <sup>st</sup> Edition.
2014.03.20	V1.1	– Section 2.7, new terms added. – Section 4.2.3, resistor value changed. – Section 4.2.4, minor update. – Section 7.1.2, minor update. – Section 7.2, resistor value changed. – Section 11.1, minor update. – Section 11.2, minor update. – Section 11.5, minor update.

## 2.7 Terminology used in this manual

Term	Definition
Approved	See certified.
Branch	Loudspeaker line between an Isolator Board tap-off and the last loudspeaker connected to the tap-off.
Certified	Means designed and built to conform (compliant) to the stated standard or guideline, and additionally tested and certified by an accredited notified body.
Compliant	In the framework of this manual, means designed and built to conform (compliant) to the stated standard or guideline.
Fault isolation time	The time required by the Isolator Boards to isolate a fault. This includes the time required to restore audio to the non-affected parts of the loudspeaker line after detection of a fault. In the Loudspeakers Line Isolator System this time is always less than 4 seconds.
Fault recovery time	The time required by the Loudspeakers Line Isolator System to return to the normal OK state after a detected fault has been corrected (< 100 s).
Fault reporting	The loop fault indication LED lights up, and the corresponding loop fault and general relay go to the NOK state on the Master Unit (< 90 s).
Fault reporting time	The time required by the Loudspeakers Line Isolator System to report a fault (i.e. time required to go to the fault warning condition).
Initialization	The first state that the Loudspeakers Line Isolator System goes to after system start up. The system takes a maximum of 10 seconds to initialize the loop.
Loop	Redundant loudspeaker line. All loudspeakers broadcast the same signal. A loop has a dedicated input signal from the zone output of the public address/voice alarm system at loudspeaker level. Some standards limit the number of alarm zones in a loop (e.g. a limit of 25 loudspeakers if each zone has one loudspeaker).
Loop recheck	While the Loudspeakers Line Isolator System is in a fault condition, regular rechecks are performed to check the condition of the loop.
Loudspeaker line	The loudspeaker line between the Master Unit (loop out and loop return) and the loudspeakers, including the line to the loudspeakers on the tap-off.
Loudspeaker Line Isolator System Master (PM1-LISM6)	Referred to in this manual as “Master Unit” - main product of the Loudspeakers Line Isolator System.

<b>Term</b>	<b>Definition</b>
Loudspeaker Line Isolator with Housing (PM1-LISS)	Referred to in this manual as “Isolator Board” - detects and isolates line and loudspeaker faults.
Loudspeaker DC Blocking Board (PM1-LISD)	Referred to in this manual as “DC Blocking Board” - circuit board that has the same connections as the Isolator Board, which allows for quick and convenient connection of the loudspeaker loop and tap-off connections.
Segment	The wire and/or group of loudspeakers between two Isolator Boards and between the Master Unit and an Isolator Board.
Voice alarm zone	Geographical part of an evacuation zone in which an evacuation alarm is carried out. Alarm zones are defined per installation.
Walk Test	Test mode for checking the loop by feeding the power and signal from one side of the loop only.
Zone	An area where the same signal is broadcast that can be separately addressed by the public address system.

### 3 System overview

The Loudspeakers Line Isolator System is the cost-efficient solution for preventing loss of audio function in public address and voice alarm systems as a result of loudspeaker line faults. It largely eliminates the need for expensive E30 cabling by making use of the so-called loop wiring method. The system is fully supervised and is perfectly suited for use in commercial premises, such as office buildings and hotels.

Typical applications include:

- Public address systems that cover large zones: more than 25 loudspeakers per zone.
- Voice alarm: locations that have several rooms in the same fire zone.

**The Loudspeakers Line Isolator System consists of the following products:**

#### **PM1-LISM6 - Loudspeaker Line Isolator System Master**

Referred to in this manual as Master Unit:



The Master Unit is the main component of the Loudspeakers Line Isolator System. The zone outputs of the public address/voice alarm system are connected to the Master Unit. Each Master Unit has connections for six loudspeaker loops. Each loudspeaker loop can manage 500 watts. A maximum of 50 Isolator Boards can be installed in each loudspeaker loop.

The front panel on the Master Unit has LEDs to indicate:

- The status of each loop.
- The status of the mains and back-up battery power supplies.

All fault indicators on the front panel are linked to fault relays on the rear panel.

#### **PM1-LISS - Loudspeaker Line Isolator with Housing**

Referred to in this manual as Isolator Board:



The Isolator Board has two 100 volt audio connectors for connecting to both sides of the loudspeaker loop and a third 100 volt audio connector for creating a tap-off for one or more loudspeakers. Jumper settings are provided to set the permissible loudspeaker power level (10, 36, 100 watt, or 10 watt with 20 kHz pilot tone filter), and other supervision settings.

The Isolator Boards are daisy-chained in the loudspeaker loop. Their main function is to:

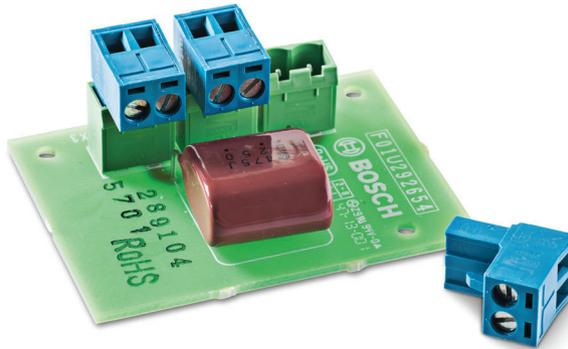
- detect and isolate short circuits in the adjacent section.
- detect and isolate open circuits, short circuits, and overloads on a tap-off.

These functions can be configured with jumper settings.

The Isolator Board can be mounted inside the included IP30 housing or in Bosch loudspeakers that have mounting provisions for loudspeaker or line supervision. A test button and LED indicator on the Isolator Board are used to check if the Isolator Board and loudspeaker cable (including polarity) are correctly connected.

### PM1-LISD - Loudspeaker DC Blocking Board

Referred to in this manual as DC Blocking Board:



The DC Blocking Board blocks DC and provides overload protection by current limiting. It has the same connections as the Isolator Board, which allows for quick and convenient connection of the loudspeaker loop and tap-off connections (maximum 20 watt loudspeaker load). The DC Blocking Board can be mounted inside Bosch loudspeakers that have mounting provisions for loudspeaker or line supervision.

## 3.1 System compatibility

The Loudspeakers Line Isolator System has been tested with the following products and product lines:

**Product lines:**

- Praesideo emergency sound system
- Plena (VAS) Voice Alarm System

**Praesideo Amplifiers:**

- Power Amplifiers: PRS-1P500, PRS-2P250 and PRS-4P125
- Basic Amplifiers: PRS-1B500, PRS-2B250 and PRS-4B125

**Plena VAS units:**

- Plena Voice Alarm Controller: LBB1990/00
- Plena Voice Alarm Router: LBB1992/00
- Plena Power Amplifiers: LBB1930/20, LBB1935/20, LBB1938/20

Before using the Loudspeakers Line Isolator System with these products and product lines, make sure you have checked and fulfilled the systems requirements, as described in:

- *Plena VAS system requirements, page 17*, and
- *Praesideo system requirements, page 18*.

The Loudspeakers Line Isolator System is compatible for use with the Praesideo family loudspeaker supervision products (LBB4440/00, LBB4441/00, LBB4442/00, and LBB4443/00).

The Loudspeakers Line Isolator System can be used in EN54-16 certified public address systems that need to comply to evacuation standards.

### 3.2 System description

The products of the Loudspeakers Line Isolator System are connected to the public address/voice alarm system by making use of the so-called loop wiring method (see following figure and table):

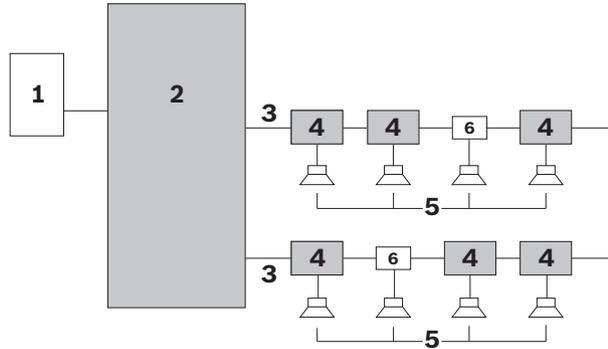


Figure 3.1: Simplified system overview

No.	Item
1	Zone output of public address/voice alarm system
2	Master Unit
3	Loudspeaker loop (one loop shown)
4	Isolator Board
5	Loudspeaker
6	DC Blocking Board

There are three different ways to install the Isolator Boards in the loudspeaker line:

- Each loudspeaker is connected to an Isolator Board in the loudspeaker line. In this case, the Isolator Board is mounted in very close proximity to the loudspeaker. See *Installation option 1: One Isolator Board for each loudspeaker*, page 21.
- A branch consisting of one or more loudspeakers is connected to the tap-off connection on an Isolator Board. In this case a DC Blocking Board must be connected to each loudspeaker (maximum 20 watt loudspeaker load).  
If open-circuit detection is required for this option, the open-circuit detection jumper on the Isolator Board should be set to ON, and the end-of-line resistor should be installed in the last loudspeaker of the branch. See *Installation option 2: Branch of loudspeakers connected to an Isolator Board*, page 23.
- One or more loudspeakers are connected in a segment or segments. In this case a DC Blocking Board must be connected to each loudspeaker (maximum 20 watt loudspeaker load). See *Installation option 3: Loudspeakers connected between Isolator Boards*, page 25.

### 3.3 System behavior

The following tables describe the system behavior of the Loudspeakers Line Isolator System. This behavior can vary depending on the selected installation option (for more information, see *Installation options*, page 20). All fault reporting is non-latching.

Fault condition: main loudspeaker loop	System behavior
Open circuit	<ul style="list-style-type: none"> <li>– The system detects a loop fault. The fault is reported within the fault reporting time of 90 seconds.</li> <li>– No interruption of audio.</li> <li>– After resolution of the fault, the fault recovery time is &lt; 100 seconds.</li> </ul>
Short circuit	<ul style="list-style-type: none"> <li>– The system detects a loop fault. The fault is reported within the fault reporting time of 90 seconds.</li> <li>– The yellow LED indicator is lit on the Isolator Board, indicating that the adjacent segment has a short circuit.</li> <li>– Interruption of audio within the fault isolation time. Audio returns to the unaffected segments and the loudspeakers connected to the tap-offs of the Isolator Boards.</li> <li>– Loss of audio in the segment with the short circuit.</li> <li>– After resolution of the fault, the fault recovery time is &lt; 100 seconds.</li> <li>– During loop recheck audio artifacts may occasionally be heard.</li> </ul>
Short circuit inside a loudspeaker (after a DC Blocking Board)	<ul style="list-style-type: none"> <li>– The system does not detect a loop fault.</li> <li>– Loss of audio in the affected speaker.</li> </ul>

Fault condition: Isolator Board tap-off	System behavior
Open circuit	<ul style="list-style-type: none"> <li>- When end-of-line supervision is enabled on the Isolator Board, a loop fault is reported within the fault reporting time of 90 seconds.</li> <li>- The yellow LED indicator is lit on the Isolator Board that has the open circuit.</li> <li>- Loss of audio in the affected tap-off.</li> <li>- After resolution of the fault, the fault recovery time is &lt; 100 seconds.</li> </ul>
Short circuit	<ul style="list-style-type: none"> <li>- When short circuit detection is enabled on the Isolator Board, the system reports a loop fault within the fault reporting time of 90 seconds.</li> <li>- The yellow LED indicator is lit on the Isolator Board that has the short circuit.</li> <li>- Interruption of audio within the fault isolation time. Audio returns to all segments and the unaffected tap-offs.</li> <li>- Loss of audio in the affected tap-off.</li> <li>- The system re-tests the loop every 20 to 40 seconds. This can lead to audible glitches in the affected tap-off and in rare cases audible glitches in the main loop during the fault condition.</li> <li>- After resolution of the fault, the fault recovery time is &lt; 100 seconds.</li> </ul>
Overload	<ul style="list-style-type: none"> <li>- Overload threshold can be set per Isolator Board (10, 36 or 100 watts).</li> <li>- When audio is present that exceeds this threshold level, the system reports a loop fault within the fault reporting time of 90 seconds.</li> <li>- The yellow LED indicator is lit on the Isolator Board that has the overload.</li> <li>- No Interruption of audio in segments and unaffected tap-offs.</li> <li>- Loss of audio in the affected tap-off.</li> <li>- The system performs a loop recheck every 20 to 40 seconds. This may lead to audible glitches in the affected tap-off and in rare cases in the main loop while the fault condition lasts.</li> <li>- After resolution of the fault, the fault recovery time is &lt; 100 seconds.</li> </ul>

## 4 Planning

### 4.1 Delivered with products

Make sure the following items are included with your products:

Quantity	Component
	<b>PM1-LISM6 – Master Unit</b>
1	Master Unit
1	Safety instructions
1	Notice with instructions for downloading manual
1	Mains power cord
1	Set of connectors
1	Set of 19" 2U mounting brackets
	<b>PM1-LISS – Isolator Board</b>
1	Isolator Board
1	Set of connectors
1	IP30-rated housing
1	End-of-line resistor (47 kohm, 0.5 W)
1	Cable ties for strain relief
	<b>PM1-LISD – DC Blocking Board</b>
1	DC Blocking Board
1	Set of connectors

### 4.2 System Prerequisites

Make sure:

- You have downloaded the latest version of the documentation from the Bosch website: [www.boschsecurity.com](http://www.boschsecurity.com)
- You have the manufacturer approved materials to install this equipment.
- There is a mains power outlet of sufficient rating close to the intended location of the product(s).
- The installation is in a clean, dust-free environment.
- The ventilation airflow of the 19" unit(s) is unobstructed.
- The ambient temperature of the 19" unit(s) is within the operating range (-5 °C to +55 °C).
- There is sufficient free space and access at the rear of the 19" unit(s) for connectors and wiring.
- No liquid can spill into or on the products.



#### Notice!

The requirements in the following tables must be observed to ensure for correct operation of the Loudspeakers Line Isolator System and the connected public address/voice alarm system.

### 4.2.1 General system requirements

Make sure the following general system requirements are observed:

The maximum loudspeaker load of a loop is 500 watts.
The overload power setting of the Isolator Board must not be larger than 25% of the amplifier power to that loop.
The maximum cable length is 1000 m (3281 ft) per loop.
The public address system is a 100 volt constant voltage system (e.g. Bosch Plena, Bosch Praesideo).
The power consumption of the loudspeakers is between 0 and 100 watts.
The ground connections between system components is securely made.

### 4.2.2 Plena VAS system requirements

Make sure the Plena VAS system conforms to the following requirements:

The Plena VAS system is correctly configured and installed, according to the Installation and User Instructions.
The Plena VAS system is setup as a two-channel system.
One router is connected to one Master Unit. To ensure for correct ground short detection, do not connect zones from one router to more than one Master Unit or vice versa (this also applies to the router inside the Voice Alarm Controller).
Each router has a set of amplifiers for music and calls. To ensure for correct ground short detection, do not connect an amplifier to more than one router.
To ensure correct ground short detection on the Master Unit, the ground short slave switch on one connected loop is set to off, and the ground short slave on the other loops is set to on. Each zone output is connected to one loop input.
The fault outputs of the Loudspeakers Line Isolator System are connected to the input triggers of the Plena VAS system. Each loop fault output can be individually connected to the Plena VAS system, or all fault outputs can be connected in series.
On the Master Unit, the general fault output is connected in series with the master loop fault outputs. The general fault output is a normally energized fail-safe relay.
The chosen contact inputs on the voice alarm system are configured as fault input with the description "EOL + ground short". The Plena VAS system will then indicate a zone fault and a ground short simultaneously. The output contacts of the Loudspeaker Line Isolator System Master will distinguish between loudspeaker line failures and a ground short.
The short circuit check in Plena VAS is switched off.
The ground short detection in Plena VAS is switched off.
The Plena VAS system has software version 3.00.03 or higher.
The Plena VAS system has hardware version 3.0 or higher.

### 4.2.3

#### Praesideo system requirements

Make sure the Praesideo system conforms to the following requirements:

The Praesideo system is correctly configured and installed, according to the Installation and User Instructions.
PRS-NCO3 (or higher) is used as the network controller.
The Praesideo system has software version 4.1 or higher.
The PRS-16MCI (Multi Channel Interface) has hardware version 04/15 or higher.
If the MCI/BAM (basic amplifier) is used, the MCI outputs are connected to the Loudspeakers Line Isolator System.
The ground short detection for the PAM (power amplifier) and MCI/BAM outputs connected to the Master Unit is switched off.
The fault outputs of the Loudspeakers Line Isolator System are connected to the input triggers of the Praesideo system. Each loop fault output can be individually connected to the Praesideo system, or fault outputs can be connected in series.
The general fault output on the master is connected in series with the master loop fault outputs. The general fault output is a normally energized fail-safe relay.
The chosen contact inputs are configured as Zone Line fault inputs (see also the Praesideo Installation and User Instructions). The output contacts of the Loudspeaker Line Isolator System Master will distinguish between loudspeaker line failures and a ground short.
To ensure for correct ground short detection, set the power supply ground lift switch on one of the Praesideo devices to ground, and the others to floating (see also the Praesideo Installation and User Instructions).
If a PRS-4B125 amplifier is used, a DC Blocking Board or a capacitor and 33 ohm > 3 watt resistor must be used between the tap-off of the Isolator Board and the connected loudspeaker.

#### 4.2.4

#### Loudspeaker/system cable requirements

Make sure the loudspeakers and loudspeaker system cables conform to the following requirements:

All loudspeakers must be connected to the system using either an Isolator Board, DC Blocking Board, or DC blocking capacitor.
The maximum wiring gauge of cables used for the loudspeaker loop is 2.5 mm <sup>2</sup> (also check the technical specifications of the loudspeaker, by referring to the loudspeaker datasheet).
The maximum cable length of each loudspeaker loop is 1000 m (3281 ft).
The total maximum cable capacitance to ground of each loop is 600 nF, including the tap-off cable capacitance.
The total maximum cable impedance in each loop is 24 ohms.
Some standards limit the number of loudspeakers that may be lost due to a fault (for example, 25 loudspeakers). Do not install more than the maximum allowed number of loudspeakers in a segment or to the tap-off of an Isolator Board.
The maximum cable length from a tap-off to a loudspeaker is 50 m (164 ft), independent of the loop length.
When the Isolator Board is not connected in or directly next to the loudspeaker, installation option 2 applies.
When using installation option 1 or 2, with a 100 watt permissible load setting on the Isolator Board, a DC blocking capacitor of at least 22 µF must be used.
The maximum permissible load on a DC Blocking Board is 20 watts.

## 4.3 Installation options

Create an installation plan, by using one of the following installation options. Each option is described separately; however, the installation options can be combined:

### **Installation option 1: One Isolator Board for each loudspeaker**

This option ensures that a single line fault does not affect any of the loudspeakers. An Isolator Board or loudspeaker fault does not affect other loudspeakers. Some installations demand this. A maximum of 50 speakers can be connected in one loop. See *Installation option 1: One Isolator Board for each loudspeaker*, page 21.

### **Installation option 2: Branch of loudspeakers connected to an Isolator Board**

This option ensures that a fault will only lead to the loss of the loudspeakers on a tap-off and is a cost-effective way to connect more than 50 loudspeakers in a loop with some topology benefits. With this option, tap-off is monitored for short circuit and overload, plus the loop/tap-off can be monitored for open circuits. See *Installation option 2: Branch of loudspeakers connected to an Isolator Board*, page 23.



#### **Notice!**

When using the 100 watt permissible load setting of the Isolator Board in combination with the DC Blocking Board, an overload on the tap-off of the DC Blocking Board will not lead to a fault indication in the system. If fault indication is required, use at least a 22  $\mu$ F blocking capacitor instead of the DC Blocking Board.

### **Installation option 3: Loudspeakers connected between Isolator Boards**

This option ensures that a fault will only lead to the loss of loudspeakers in one segment. It is a cost-effective way to build a loop of more than 50 loudspeakers. The blocking board in the segments protects the loop against overload on the tap-off of the DC Blocking Board. An overload on the tap-off of the DC Blocking Board will not lead to a fault indication. See *Installation option 3: Loudspeakers connected between Isolator Boards*, page 25.

### 4.3.1 Installation option 1: One Isolator Board for each loudspeaker

The following figure shows how you can configure the loudspeaker line by using an Isolator Board for each loudspeaker:

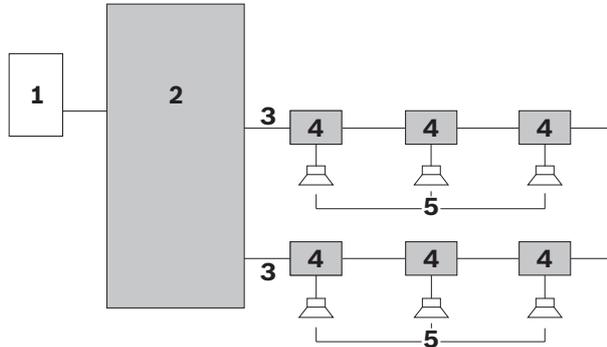


Figure 4.1: Installation option 1: One Isolator Board for each loudspeaker

No.	Item	Installation option 1: remarks
1	Zone output of public address/voice alarm system	- 100 V constant voltage line (50 Hz – 20 kHz), 500 W power handling capacity.
2	Master Unit	- See <i>Connections indicators and controls</i> , page 31. - See <i>DIP switch settings</i> , page 41.
3	Loudspeaker loop	- See <i>Connections indicators and controls</i> , page 31.
4	Isolator Board	- An Isolator Board used for each loudspeaker: - The tap-off open circuit detection jumper should be set to ON. - The tap-off short circuit detection jumper should be set to OFF. - See <i>Isolator Board settings</i> , page 43.
5	Loudspeaker	- Loudspeaker directly connected to tap-off of the Isolator Board.

The following table shows how the audio is affected in the system if installation option 1 is chosen:

Fault condition	Impact
Open circuit in the main loop	- No loss of audio.
Open circuit in the tap-off	- Only affects the loudspeaker that has a fault.
Short circuit in the main loop	- No loss of audio.
Short circuit in the tap-off	- Not applicable for this installation option. Short circuits are handled as overloads.

<b>Fault condition</b>	<b>Impact</b>
Tap-off overload	<ul style="list-style-type: none"><li>- Only affects the loudspeaker that has a fault.</li></ul>
Two or more faults on the main loop and/or tap-off	<ul style="list-style-type: none"><li>- Loss of audio between faults including the affected tap-offs.</li><li>- Audio artifacts may be present between Isolator Boards with the tap-off faults.</li></ul>

### 4.3.2 Installation option 2: Branch of loudspeakers connected to an Isolator Board

The following figure shows how you can configure the loudspeaker line by connecting several loudspeakers (branch of loudspeakers) to the tap-off connection of an Isolator Board:

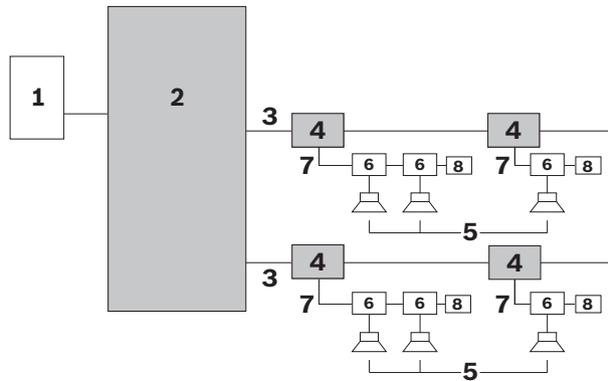


Figure 4.2: Installation option 2: Branch of loudspeakers connected to an Isolator Board



**Notice!**

When using the 100 watt permissible load setting of the Isolator Board in combination with the DC Blocking Board, an overload on the tap-off of the DC Blocking Board will not lead to a fault indication in the system. If fault indication is required, use at least a 22 µF blocking capacitor instead of the DC Blocking Board.

No.	Item	Installation option 2: remarks
1	Zone output of public address/voice alarm system	- 100 V constant voltage line (50 Hz – 20 kHz), 500 W power handling capacity.
2	Master Unit	- See <i>Connections indicators and controls</i> , page 31. - See <i>DIP switch settings</i> , page 41.
3	Loudspeaker loop	See <i>Connections indicators and controls</i> , page 31.
4	Isolator Board	- A branch of loudspeakers with DC Blocking Boards connected to the tap-off. - The tap-off can be monitored for: - short circuits. - open circuits. - See <i>Isolator Board settings</i> , page 43.
5	Loudspeaker	- Loudspeaker connected to the DC Blocking Board tap-off connection.

No.	Item	Installation option 2: remarks
6	DC Blocking Board	<ul style="list-style-type: none"> <li>– DC Blocking Board installed in each loudspeaker or inside an individual housing for each loudspeaker – see <i>Installation, page 28</i>.</li> <li>– If a DC Blocking Board is not installed in the loudspeaker/housing, a DC blocking capacitor must be used instead – see <i>Installation, page 28</i>.</li> </ul>
7	Branch of loudspeakers	<ul style="list-style-type: none"> <li>– According to some standards, a maximum of 25 loudspeakers can be connected to each tap-off.</li> </ul>
8	End-of-line resistor	<ul style="list-style-type: none"> <li>– 47 kohm, &gt; 0.5 watt resistor connected across the unused loop terminal (X2) of the last DC Blocking Board in the branch.</li> <li>– Open-circuit detection is typically used when multiple loudspeakers are connected to the tap-off or when one of the loudspeakers is connected to the Isolator Board at a distance.</li> <li>– Whether or not a branch should be monitored for open circuits depends on local standards.</li> </ul>

The following table shows how the audio is affected in the system if installation option 2 is chosen:

Fault condition	Impact
Open circuit in the main loop	– No loss of audio.
Short circuit in the main loop	– No loss of audio.
Open circuit in the tap-off	– Loss of audio on the tap-off.
Short circuit in the tap-off	– Loss of audio on the tap-off.
Tap-off overload	– Loss of audio on the tap-off.
Two or more faults on the main loop and/or tap-off.	<ul style="list-style-type: none"> <li>– Loss of audio between faults including affected tap-offs.</li> <li>– Audio artifacts may be present between Isolator Boards with the tap-off faults.</li> </ul>

### 4.3.3

### Installation option 3: Loudspeakers connected between Isolator Boards

The following figure shows how you can configure the loudspeaker line by connecting one or more loudspeakers between Isolator Boards:

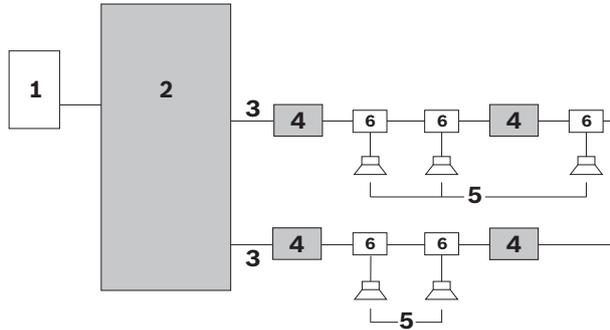


Figure 4.3: Installation option 3: Loudspeakers connected between Isolator Boards

No.	Item	Installation option 3: system requirements
1	Zone output of public address/voice alarm system	- 100 V constant voltage line (50 Hz – 20 kHz), 500 W power handling capacity.
2	Master Unit	- See <i>Connections indicators and controls</i> , page 31. - See <i>DIP switch settings</i> , page 41.
3	Loudspeaker loop	- See <i>Connections indicators and controls</i> , page 31.
4	Isolator Board	- One or more loudspeakers connected between Isolator Boards: - The tap-off open circuit detection jumper on the Isolator Boards should be set to OFF. - The tap-off short circuit detection jumper on the Isolator Boards should be set to OFF – see <i>Configuration</i> , page 41.
5	Loudspeaker	- Loudspeaker connected to the DC Blocking Board tap-off connection. - According to certain standards, a maximum of 25 loudspeakers can be connected between two Isolator Boards.
6	DC Blocking Board	- DC Blocking Board installed in each loudspeaker or inside an individual housing for each loudspeaker – see <i>Installation</i> , page 28. - If a DC Blocking Board is not installed in the loudspeaker/housing, a DC blocking capacitor must be used instead – see <i>Installation</i> , page 28.

The following table shows how the audio is affected in the system if installation option 3 is chosen:

<b>Fault condition</b>	<b>Impact</b>
Open circuit in the main loop	– No loss of audio.
Short circuit in the main loop	– Loss of audio in the segment with the short circuit.
Open circuit in the Isolator Board tap-off	– Not applicable for this option.
Tap-off overload	– Not applicable for this option.
Open circuit in the DC Blocking Board tap-off	– Loss of audio on the affected DC Blocking Board tap-off.
Short circuit in the DC Blocking Board tap-off	– Loss of audio on the affected DC Blocking Board tap-off.
Two or more faults on the main loop and/or DC Blocking Board tap-off	<ul style="list-style-type: none"> <li>– Loss of audio in the affected segments and/or affected DC Blocking Board tap-offs.</li> <li>– Audio artifacts may be present in segments that are isolated.</li> </ul>

**See also**

- *Configuration, page 41*
- *Installation, page 28*

### 4.3.4 Combining installation options

The three installation options can be combined as shown in the following figure:

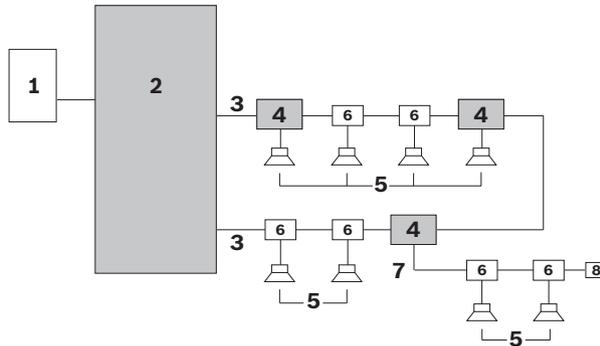


Figure 4.4: Combining installation options

No.	Item	Combined Installation
1	Zone output of public address/voice alarm system	<ul style="list-style-type: none"> <li>100 V constant voltage line (50 Hz – 20 kHz), 500 W power handling capacity.</li> </ul>
2	Master Unit	<ul style="list-style-type: none"> <li>See <i>Connections indicators and controls</i>, page 31.</li> <li>See <i>DIP switch settings</i>, page 41.</li> </ul>
3	Loudspeaker loop	<ul style="list-style-type: none"> <li>See <i>Connections indicators and controls</i>, page 31.</li> </ul>
4	Isolator Board	<ul style="list-style-type: none"> <li>Isolator Board configured for installation option 1, 2 or 3.</li> <li>Set the jumper settings on the Isolator Boards, as required.</li> </ul>
5	Loudspeaker	<ul style="list-style-type: none"> <li>Each loudspeaker connected to tap-off connection of an Isolator Board or DC Blocking Board.</li> </ul>
6	DC Blocking Board	<ul style="list-style-type: none"> <li>DC Blocking Boards connected to loudspeakers, as required.</li> </ul>
7	Tap-off for loudspeakers	<ul style="list-style-type: none"> <li>According to some standards, a maximum of 25 loudspeakers can be connected to an Isolator Board tap-off or in a segment.</li> </ul>
8	End-of-line resistor	<ul style="list-style-type: none"> <li>47 kohm, &gt; 0.5 watt resistor connected across the unused loop terminal of the last DC Blocking Board in the branch.</li> <li>Open-circuit detection is typically used when multiple loudspeaker are connected to the tap-off or when one of the loudspeaker is connected to the Isolator Board at a distance.</li> <li>Whether or not a branch should be monitored for open circuits depends on local standards.</li> </ul>

**See also**

- *Configuration*, page 41

## 5 Installation

**Danger!**

Risk of electric shock. When installing and servicing the Loudspeakers Line Isolator System, make sure 100 V audio from the public address/voice alarm system is not present at the Master Unit. Installation and service must only be done by qualified personnel.

**Caution!**

Static electricity can seriously damage electronic components. When installing and servicing equipment, make sure you use applicable antistatic devices, as required, such as antistatic mats, wrist straps, and garments.

**Notice!**

The installation of the public address/voice alarm system is not described in this manual. Refer to the *relevant manual* for more information.

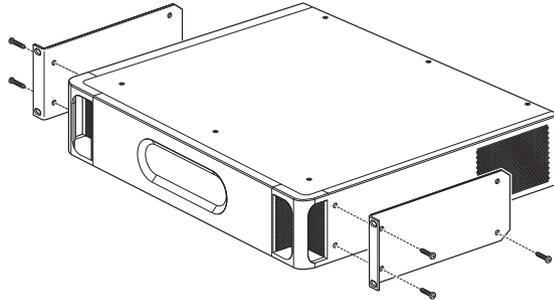
**Notice!**

Depending on the installation setup and type of loudspeaker, either an Isolator Board, DC Blocking Board, or DC blocking capacitor must be used. See *Installation options, page 20*.

## 5.1 Install Master Unit in 19-inch rack

The Master Unit can be easily installed in a 19-inch rack. To do this, use the following components:

- the 19" rack mounting brackets (supplied with the product).
- supplied mounting screws.



**Figure 5.1: 19" mounting bracket or feet installation**

If you install the product in a 19" rack, make sure:

- you take sufficient precautions when lifting the unit (the unit is heavy and may require two people for lifting).
- the rack is of suitable quality to sufficiently support the weight of the unit.
- the ambient temperature inside the rack does not exceed +55 °C.

## 5.2 Install an Isolator Board or DC Blocking Board in a housing



### Notice!

Each Isolator Board is supplied with an IP30 rated housing. Alternatively the Isolator Board can be mounted in selected Bosch loudspeakers using the mounting provisions. Refer to the appropriate loudspeaker manual.

1. Open the supplied housing.
2. Remove the applicable punch out holes from the housing, as required, depending on the type of cables being used (6 mm or 9 mm diameter holes).
3. Make sure the all-round clearance between the cable and the hole is less than 1 mm. This will guarantee the IP30 rating of the housing.
4. Use the mounting holes to secure the housing to a solid flat surface, loudspeaker or loudspeaker (fire) dome.
5. Inspect the board for signs of damage.
6. Set the jumpers to the correct positions. See *Isolator Board settings*, page 43.
7. Install the board in the housing. Click the board into the provided mounting position, making sure the snappers grip the board.
8. Fasten the board with the provided screws.
9. Connect the cables, use the provided cable ties and tether point to secure the cables and relieve the strain on the connectors.
10. For the Isolator Board, make sure that the fault indicator will still be visible through the transparent viewing hole once the board is installed.

### 5.3 Install an Isolator Board or DC Blocking Board in a loudspeaker

1. Inspect the board for signs of damage.
2. Optional: Open the loudspeaker so that you can install the board. Refer to the *installation instructions of the loudspeaker* for more information.
3. Use the mounting holes in the board to install it in the loudspeaker. If the Isolator Board does not fit inside the loudspeaker, it can be installed inside the supplied housing instead.
4. Set the jumpers to the correct positions. See *Isolator Board settings, page 43*.
5. Optional: Close the loudspeaker.

### 5.4 Install a DC blocking capacitor in a loudspeaker

**Use for installation option 2 only.** See *Installation option 2: Branch of loudspeakers connected to an Isolator Board, page 23*.

If an Isolator Board or DC Blocking Board is not used, a DC blocking capacitor must be installed in each loudspeaker.

The capacitor should be an MKT or MKP type with a rating of at least 200 VDC, and should be connected in series with the loudspeaker. The value of this capacitor depends on the load of the loudspeaker and the desired frequency response. Typically for a full range speaker, 4,7  $\mu\text{F}$  is used for 10 watts, 47  $\mu\text{F}$  is used for 100 watts. For horns the value is lower. Preferably a DC Blocking Board should be used.



#### Notice!

When using the PRS-4B125 amplifier in combination with the 10 watt permissible load setting, the DC Blocking Board must be used.



#### Notice!

When the 100 watt jumper setting is used for the tap-off of the Isolator Board, the blocking capacitor must have a value of at least 22  $\mu\text{F}$ . The DC Blocking Board is not suitable for this.

### 5.5 Install an end-of-line resistor in a loudspeaker

For Installation option 2, connect a 47 kohm, > 0.5 watt resistor across the unused loop terminal (X2) of the last DC Blocking Board in the branch.

Refer to *DC Blocking Board, page 38*.

#### See also

- *Installation option 2: Branch of loudspeakers connected to an Isolator Board, page 23*

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## 6 Connections indicators and controls

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**Danger!**

Risk of electric shock. When installing and servicing the Loudspeakers Line Isolator System, make sure 100 V audio from the public address/voice alarm system is not present at the Master Unit. Installation and service must only be done by qualified personnel.

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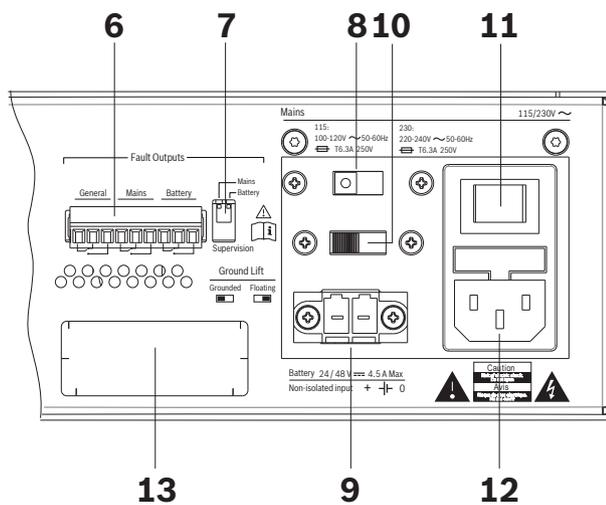
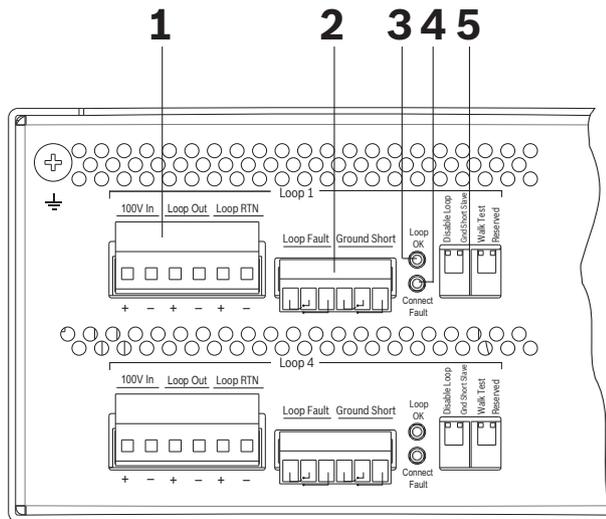
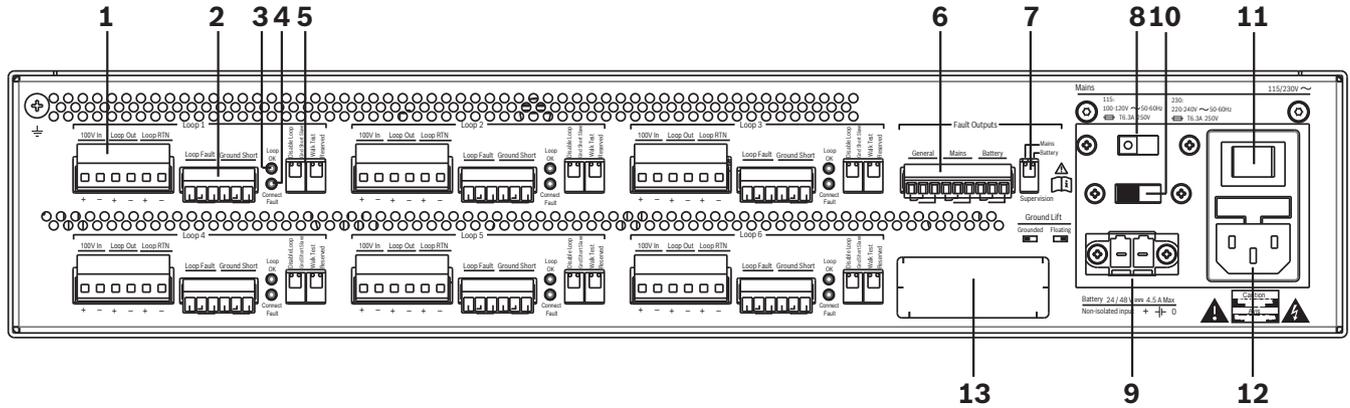
**Notice!**

For information on connecting loudspeakers, refer to the relevant operation manual or system manual for the loudspeaker. For information on the preferred cable type and length that can be used with the Loudspeakers Line Isolator System, refer to:

- *System Prerequisites*, page 16.
  - *Technical data*, page 54.
-

## 6.1 Master Unit

For an overview of the front panel of the Master Unit, refer to *Master Unit (front panel)*, page 45

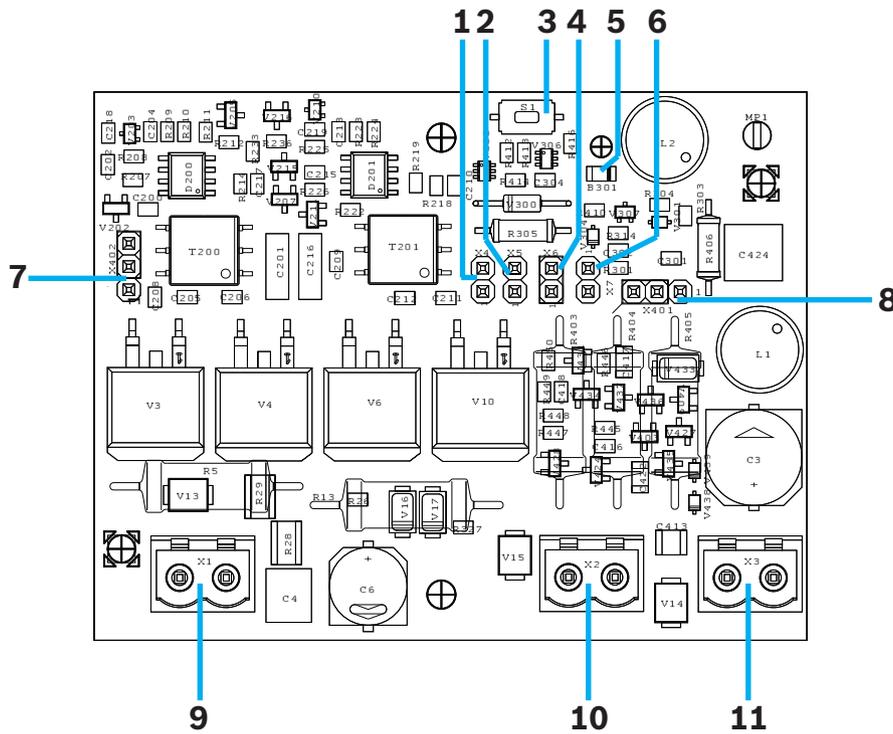


No.	Item	Description
1	100 volt audio I/O	<ul style="list-style-type: none"> <li>- 6-pin removable screw connector (pin designation from left to right):</li> <li>- 100 V In:               <ul style="list-style-type: none"> <li>- Pin 1: +100 V audio in from zone output of public address/voice alarm system.</li> <li>- Pin 2: -100 V audio in from zone output of public address/voice alarm system.</li> </ul> </li> <li>- Loop Out:               <ul style="list-style-type: none"> <li>- Pin 3: +100 V primary output to loudspeaker loop.</li> <li>- Pin 4: -100 V primary output to loudspeaker loop.</li> </ul> </li> <li>- Loop RTN:               <ul style="list-style-type: none"> <li>- Pin 5: +100 V return from loudspeaker loop.</li> <li>- Pin 6: -100 V return from loudspeaker loop.</li> </ul> </li> </ul>
2	Loop fault outputs	<ul style="list-style-type: none"> <li>- 6-pin removable screw connector (pin designation from left to right):</li> <li>- Loop fault:               <ul style="list-style-type: none"> <li>- Pin 1: Common.</li> <li>- Pin 2: Loop fault (NC).</li> <li>- Pin 3: Loop fault (NO).</li> </ul> </li> <li>- NO is open when:               <ul style="list-style-type: none"> <li>- no loop fault is detected.</li> <li>- the loop is initializing.</li> <li>- the loop is disabled.</li> </ul> </li> <li>- NO is closed when a loop fault is detected.</li> </ul> <p><b>Note:</b> The Loop Fault output contact is not triggered by ground short faults.</p> <ul style="list-style-type: none"> <li>- Ground short:               <ul style="list-style-type: none"> <li>- Pin 4: Common.</li> <li>- Pin 5: Ground fault (NC).</li> <li>- Pin 6: Ground fault (NO).</li> </ul> </li> <li>- NO is open when:               <ul style="list-style-type: none"> <li>- no ground fault is detected.</li> <li>- the loop is initializing.</li> <li>- the loop is disabled.</li> </ul> </li> <li>- NO is closed when a ground short fault is detected.</li> </ul>
3	Loop OK LED	<ul style="list-style-type: none"> <li>- This indication is active in Walk Test mode. During Walk Test mode, this indicator lights up when the loop is OK.</li> <li>- See Master Unit indicators <i>Master Unit (rear view)</i>, page 47.</li> </ul>
4	Connection fault LED	<ul style="list-style-type: none"> <li>- This indication is active in Walk Test mode. This indicator lights up when the last segment is connected in reverse polarity.</li> <li>- See Master Unit indicators <i>Master Unit (rear view)</i>, page 47.</li> </ul>

No.	Item	Description
5	DIP switches	<ul style="list-style-type: none"> <li>- Switches to select:               <ul style="list-style-type: none"> <li>- Disable loop.</li> <li>- Ground short slave setting.</li> <li>- Walk Test mode.</li> </ul> </li> <li>- See <i>DIP switch settings, page 41.</i></li> </ul>
6	Common fault outputs	<ul style="list-style-type: none"> <li>- 9-pin removable screw connector (pin designation from left to right):               <ul style="list-style-type: none"> <li>- General (fail-safe output contact):                   <ul style="list-style-type: none"> <li>- Pin 1: Common.</li> <li>- Pin 2: General fault (NC).</li> <li>- Pin 3: General fault (NO).</li> </ul> </li> <li>- NC is open when no loop or ground short fault is detected.</li> <li>- NC is closed when a loop or ground short fault is detected.</li> <li>- Mains:                   <ul style="list-style-type: none"> <li>- Pin 4: Common.</li> <li>- Pin 5: Mains fault (NC).</li> <li>- Pin 6: Mains fault (NO).</li> </ul> </li> <li>- NO is open when:                   <ul style="list-style-type: none"> <li>- no mains fault is detected.</li> <li>- mains supervision is off.</li> </ul> </li> <li>- NO is closed when a mains fault is detected.</li> <li>- Battery:                   <ul style="list-style-type: none"> <li>- Pin 7: Common.</li> <li>- Pin 8: Backup fault (NC).</li> <li>- Pin 9: Backup fault (NO).</li> </ul> </li> <li>- NO is open when:                   <ul style="list-style-type: none"> <li>- no backup fault is detected.</li> <li>- backup supervision is off.</li> </ul> </li> <li>- NO is closed when a backup fault is detected.</li> </ul> </li> <li>- The fault outputs of the Master Unit can be connected to inputs of the public address/voice alarm system.</li> </ul>
7	Mains/ Battery supervision	<ul style="list-style-type: none"> <li>- Switches to enable mains and battery supervision.</li> <li>- See <i>DIP switch settings, page 41.</i></li> </ul>
8	Voltage selection	<ul style="list-style-type: none"> <li>- Voltage selection switch for 115/230 VAC.</li> <li>- Use this switch to set the correct mains voltage for your region.</li> </ul>
9	+24-48 VDC inlet	<ul style="list-style-type: none"> <li>- DC back-up supply input connector 24-48 VDC (5A).</li> </ul>
10	Ground Lift	<ul style="list-style-type: none"> <li>- When ground lift is enabled, the technical ground (power supply) is decoupled from the safety ground (chassis).</li> <li>- See <i>Praesideo system requirements, page 18</i> and the Praesideo Installation and User Instructions.</li> </ul>
11	Power on/off	<ul style="list-style-type: none"> <li>- AC mains power switch.</li> </ul>

<b>No.</b>	<b>Item</b>	<b>Description</b>
12	Mains inlet	– AC mains input socket 115/230 VAC.
13	Type plate	– Plate containing information on product type and serial number.

## 6.2 Isolator Board



No.	Item	Description
1	Tap-off power 100 watts (X4)	- Tap-off overload threshold is 100 watts.
2	Tap-off power 36 watts (X5)	- Tap-off overload threshold is 36 watts.
3	Test button	- Momentary switch to test the loop connection of the Isolator Board.
4	Tap-off power 10 watts (X6)	- Tap-off overload threshold is 10 watts.
5	LED Indicator	- Indicator, lights up when: <ul style="list-style-type: none"> <li>- The board is powered and there is a short circuit in the adjacent segment or an overload/short circuit on the tap-off (X3).</li> <li>- The board is powered correctly and the test button is pressed.</li> </ul>
6	Tap-off power 10 watts + Pilot tone filter (X7)	- Tap-off overload threshold is 10 watts, including a 20 kHz pilot tone attenuation filter.

No.	Item	Description
7	Tap-off open circuit monitor selection (X402)	– Jumper to select the tap-off end-of-line open circuit supervision.
8	Tap-off short circuit monitor selection (X401)	– Jumper to select the tap-off end-of-line short circuit supervision.
9	(X1) 100 volt loop connection	– 2-pin removable screw connector (pin designation from left to right): – Loop connection X1+ – Loop connection X1-
10	(X2) 100 volt loop connection	– 2-pin removable screw connector (pin designation from left to right): – Loop connection X2+ – Loop connection X2-
11	(X3) 100 volt loudspeaker tap-off connection	– 2-pin removable screw connector (pin designation from left to right): – Tap-off connection to loudspeaker(s) X3+ – Tap-off connection to loudspeaker(s) X3-

**Warning!**

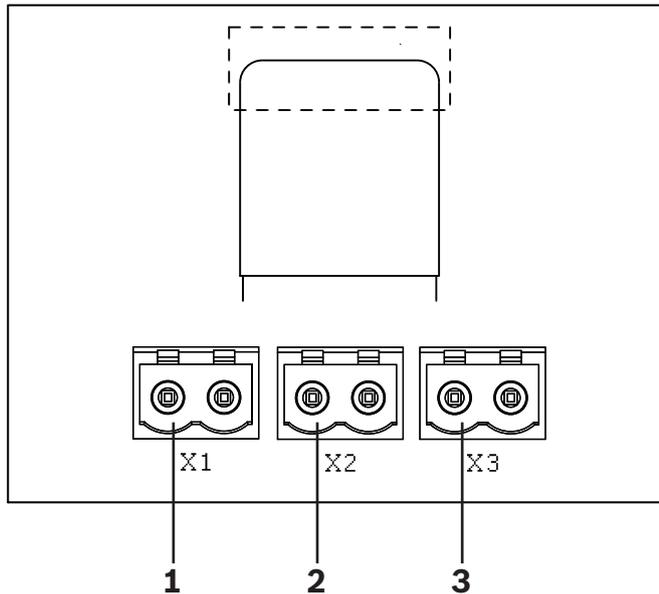
If there is a short/overload on the Isolator Board, the power resistors can get hot.

## 6.3 DC Blocking Board



### Notice!

The X1, X2, and X3 connections on the DC Blocking Board have the same numbering, polarity, and functionality as the X1, X2, and X3 connections on the Isolator Board.



No.	Item	Description
1	(X1) 100 volt loop connection	<ul style="list-style-type: none"> <li>- 2-pin removable screw connector (pin designation from left to right):               <ul style="list-style-type: none"> <li>- Loop connection X1+</li> <li>- Loop connection X1-</li> </ul> </li> </ul>
2	(X2) 100 volt loop connection	<ul style="list-style-type: none"> <li>- 2-pin removable screw connector (pin designation from left to right):               <ul style="list-style-type: none"> <li>- Loop connection X2+</li> <li>- Loop connection X2-</li> </ul> </li> </ul>
3	(X3) 100 volt loudspeaker tap-off connection	<ul style="list-style-type: none"> <li>- 2-pin removable screw connector (pin designation from left to right):               <ul style="list-style-type: none"> <li>- Tap-off connection to loudspeaker(s) X3+</li> <li>- Tap-off connection to loudspeaker(s) X3-</li> </ul> </li> </ul>

## 6.4 Connect and test loudspeaker loop

There are two ways to install a loudspeaker loop. See options A and B in this section. The principle way to install a loudspeaker loop is to power down the public address system and switch on the Master Unit (option A).

**Notice!**

The Master Unit will then output up to 32 volts DC, power limited and short circuit protected.

**Notice!**

Make sure the polarity of the entire loop is correct.

**Option A (install and check Isolator Boards one at a time)**

1. Make sure the Master Unit is switched on.
2. Set the loop to Walk Test mode, by setting the Walk Test DIP switch (5) on the Master Unit to on.
3. Connect the first segment (including the Isolator Board and/or DC Blocking Boards) to the loop out connection (1) of the Master Unit.
4. Press the test button (3) on the Isolator Board and check the LED indicator (5).
5. If the LED (5) lights up when the test button is pressed, the connection is OK.
6. If the LED (5) does not light up when the test button (3) is pressed:
  - The polarity is incorrect.
  - There is an open circuit or short circuit in the segment.
  - The Isolator Board is defective.
7. Repeat the above steps for the next segment(s).

**Notice!**

If there is a short circuit in the segment, the Isolator Board indicator on the previous segment will light up continuously.

8. Connect the last segment to the Master Unit loop return connection (1).
9. Check the loop OK LED indication (3) and connection fault LED indication (4) on the rear panel of the Master Unit:
  - If the loop OK LED (3) is on, the connection is correct.
  - If the connection fault LED (4) is on, the polarity is incorrect in the last segment.
  - If both are not lit, there is a short or open circuit in the last segment.
10. Set the Walk Test mode to off.

**Notice!**

During installation, the Master Unit will correctly display a fault in the loop until the loop has been installed correctly. When the entire loop has been installed correctly, the fault LED will switch off within the fault recovery time.

**Warning!**

In Walk Test mode the Master Unit will correctly display the status of the loop. The loop will not be redundant. Make sure to set the Walk Test mode to OFF.

**Option B (install all Isolator Boards and then check loop)**

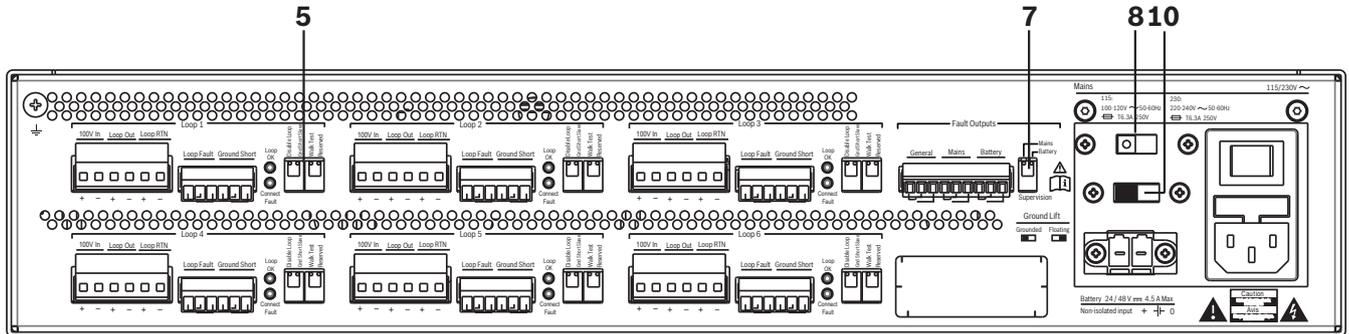
1. Install the entire loop, by connecting all Isolator Boards and all DC Blocking Boards to the Master Unit.
2. Switch on the Master Unit.
3. Set the loop to Walk Test mode, by setting the Walk Test DIP switch (5) on the Master Unit to on.
4. Check the loop OK LED indication (3) on the rear panel of the Master Unit.
5. If the loop OK LED (3) is on, the connection is correct.
6. If the loop OK LED (3) does not light up:
  - Check the test button (3) and LED indicator (5) on each Isolator Board as described in option A.
  - Alternatively turn on the public address/voice alarm system and broadcast audio, then perform a walk test in the loop to determine at which point the audio stops.
7. After rectifying the problem, recheck the system.
8. Set the Walk Test mode to off.

**See also**

- *Installation options, page 20*

# 7 Configuration

## 7.1 Master Unit settings



### 7.1.1 Voltage/ground selection

No.	Item	Description
8	Voltage selection	Voltage selection switch for 115/230 VAC. Use this switch to set the correct mains voltage for your region.
10	Ground Lift	When ground lift is enabled, the technical ground (power supply) is decoupled from the safety ground (chassis). See <i>Praesideo system requirements</i> , page 18, and the <i>Praesideo Installation and User Instructions</i> .

### 7.1.2 DIP switch settings

There is a 2-way DIP switch (5) on the rear panel of the Master Unit for each loudspeaker loop. These DIP switches are used for configuration purposes.



**Notice!**

DIP switch numbering is from left to right. A DIP switch in the up position is OFF; A DIP switch in the down position is ON.

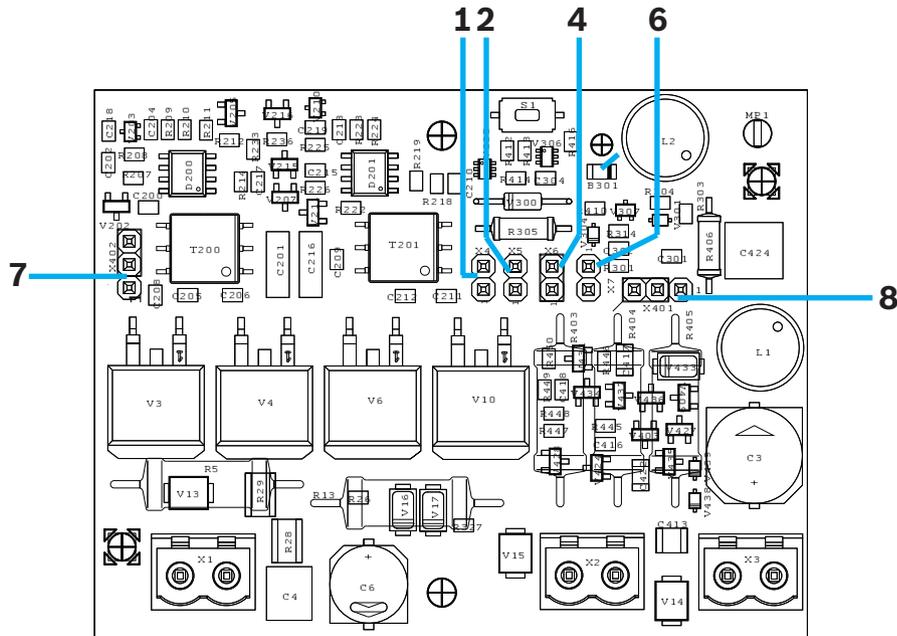
No.	DIP switch	Description	Setting	System status
5	1	Disable Loop	OFF (default)	– Loop enabled.
			ON	– Loop disabled. When a loop is disabled, all indications of that loop are turned off. <b>Note:</b> If no loop is enabled, all indications on the front of the Master Unit are off, including the mains and backup indication.

No.	DIP switch	Description	Setting	System status
	2	Ground short Slave	OFF (default)	– Use this selection for Praesideo and direct topology systems (i.e. zones with independent amplifier channels).
			ON	– Use this selection for Plena Voice Alarm and bulk switched systems, i.e. systems that use routers with relays. Multiple zones share one amplifier and a common return. For these systems, set one loop ground short slave switch to OFF, and set the other loop ground short slave switches of the Master Unit to ON.
	3	Walk Test	OFF (default)	– Walk Test mode inactive. – Loop OK LED (3) and Connect Fault LED indication (4) on the rear of Master Unit are inactive. – Refer to <i>Master Unit (rear view)</i> , page 47.
			ON	– Walk Test mode active. – Loop OK LED (3) and Connect Fault LED indication (4) on rear of Master Unit are active. – Refer to <i>Master Unit (rear view)</i> , page 47.
	4	Reserved	OFF	– Reserved.
			ON	– Reserved.
7	1	Mains supervision	OFF (default)	– Mains fault reporting deactivated (LED and fault relay).
			ON	– Mains fault reporting activated (LED and fault relay).
	2	Battery supervision	OFF (default)	– Backup fault reporting deactivated (LED and fault relay).
			ON	– Backup fault reporting activated (LED and fault relay).

**See also**

- *Master Unit*, page 32

## 7.2 Isolator Board settings



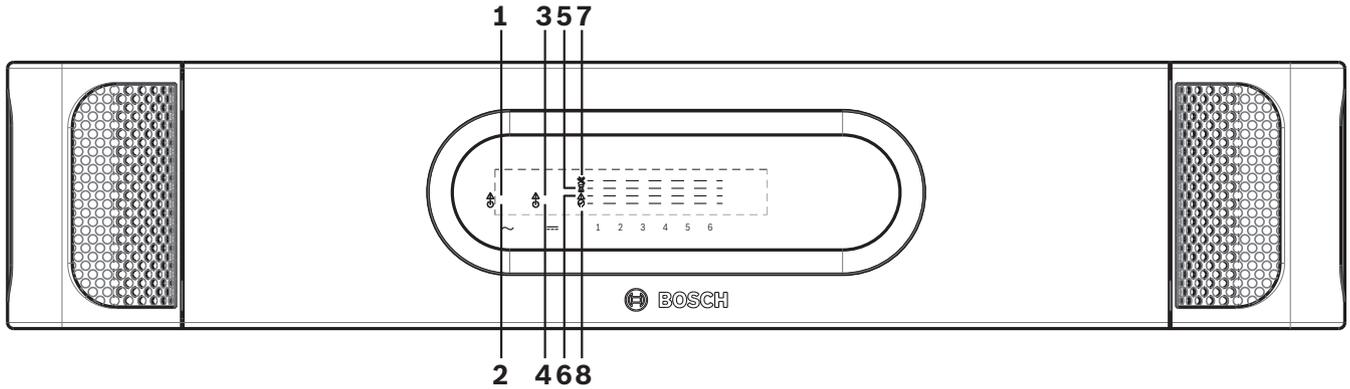
No.	Jumper Type	Description	Value	Setting
1	2-pin jumper (X4)	Maximum permissible load	100 W	<ul style="list-style-type: none"> <li>- This setting determines the overload detection level. Use this setting if the loudspeaker load on the tap-off is between 36 watts and 100 watts.</li> <li>- When the 100 watt jumper setting is used for the tap-off of the Isolator Board, the blocking capacitor must have a value of at least 22 <math>\mu</math>F.</li> </ul>
2	2-pin jumper (X5)	Maximum permissible load	36 W	<ul style="list-style-type: none"> <li>- This setting determines the overload detection level. Use this jumper setting if the loudspeaker load is between 10 watts and 36 watts.</li> </ul>

No.	Jumper Type	Description	Value	Setting
4	2-pin jumper (X6)	Maximum permissible load	10 W (default)	<ul style="list-style-type: none"> <li>This setting determines the overload detection level. Use this jumper setting if the loudspeaker load is 10 watts or less.</li> </ul> <p><b>Note:</b> If a PRS-4B125 amplifier is used, a 33 ohm &gt; 3 watt resistor must be used in series with the loudspeaker connected to the tap-off of the Isolator Board.</p>
6	2-pin jumper (X7)	Maximum permissible load + pilot tone filter	10 W + 20 kHz pilot tone attenuation of 15 dB at 10 watt load	<ul style="list-style-type: none"> <li>This setting determines the overload detection level. Use this jumper setting if the loudspeaker load is 10 watts or less and 20 kHz filter is required.</li> </ul> <p><b>Note:</b> If a PRS-4B125 amplifier is used, a DC Blocking Board or a 33 ohm &gt; 3 watt resistor must be used in series with the loudspeaker connected to the tap-off of the Isolator Board.</p>
7	3-pin jumper (X402)	Tap-off open circuit detection	ON (default)	<ul style="list-style-type: none"> <li>Can be used for installation options 1 or 2.</li> </ul> <p><b>Note:</b> For installation option 2, an end-of-line resistor must be used on the tap-off.</p>
			OFF	<ul style="list-style-type: none"> <li>Must be used for installation option 3.</li> </ul>
8	3-pin jumper (X401)	Tap-off short circuit detection	ON	<ul style="list-style-type: none"> <li>Can be used for installation option 2.</li> </ul>
			OFF (default)	<ul style="list-style-type: none"> <li>Must be used for installation option 1 and 3.</li> </ul>

## 8 Operation

The Loudspeakers Line Isolator System is autonomous. Colored LEDs on the front panel of the Master Unit indicate the status of the system.

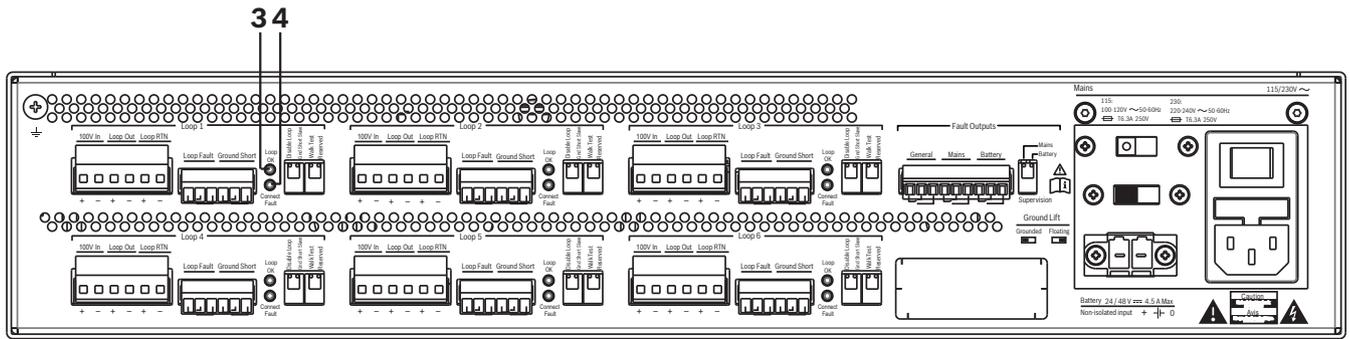
### 8.1 Master Unit (front panel)



No.	LED	Color	Description	
1	Mains power	Green	ON	– Master Unit is supplied with mains power and is switched on.
			OFF	– Master Unit is not supplied with mains power or is switched off.
2	Mains fault	Yellow	ON	– Master Unit is not supplied with mains power but is supplied with backup power, and mains supervision is enabled.
			OFF	– Master Unit is supplied with mains power. – Master Unit is switched off or not supplied with mains or backup power. – Mains supervision is switched off.
3	Backup power	Green	ON	– Master Unit is supplied with backup power.
			OFF	– Master Unit is not supplied with backup power. – Backup power voltage is below 18 volts.
4	Backup fault	Yellow	ON	– Backup power voltage is below 21 ±1 volts and the Master Unit is supplied with mains power and battery power supervision is enabled.
			OFF	– Backup power is present. – The Master Unit has no mains power and backup power is below 18 volts. – The battery supervision is set to OFF.

No.	LED	Color	Description	
5	Loop OK	Green	ON	<ul style="list-style-type: none"> <li>- No fault detected on loudspeaker loop.</li> <li>- Master Unit/loudspeaker loop is not initializing.</li> </ul>
			OFF	<ul style="list-style-type: none"> <li>- Fault detected on the loudspeaker loop.</li> <li>- Master Unit/loudspeaker loop is initializing.</li> <li>- Loop is disabled.</li> </ul>
6	Loop fault	Yellow	ON	<ul style="list-style-type: none"> <li>- Fault detected on loudspeaker loop.</li> </ul>
			OFF	<ul style="list-style-type: none"> <li>- No fault detected on loudspeaker loop.</li> <li>- Master Unit/loudspeaker loop is initializing.</li> <li>- Loop is disabled.</li> </ul>
7	Loop initializing	Yellow	ON	<ul style="list-style-type: none"> <li>- Loudspeaker loop is initializing. Time required for loop to build up before a loop fault can be triggered.</li> <li>- Maximum initialization time = 10 seconds after start up.</li> </ul>
			OFF	<ul style="list-style-type: none"> <li>- Loudspeaker loop initialization finished.</li> <li>- Loop is disabled.</li> </ul>
8	Walk Test mode	Yellow	ON	<ul style="list-style-type: none"> <li>- Walk Test is enabled.</li> </ul>
			OFF	<ul style="list-style-type: none"> <li>- Walk Test is disabled.</li> </ul>

## 8.2 Master Unit (rear view)



The following indicators are active when the loop is enabled and the Master Unit is in walk test mode:

No.	Description	Color	LED status	System status
3	Loop OK	Green	ON	<ul style="list-style-type: none"> <li>No fault detected on the loudspeaker loop.</li> </ul> <p><b>Note:</b> This indication is immediate.</p>
			OFF	<ul style="list-style-type: none"> <li>Fault detected on the loudspeaker loop.</li> </ul>
4	Connection Fault	Yellow	ON	<ul style="list-style-type: none"> <li>The loudspeaker connections between the last Isolator Board and the loop return are reverse connected.</li> <li>May indicate a connection fault in the loop before the last Isolator Board, depending on the number of Isolator Boards in the loop.</li> </ul>
			OFF	<ul style="list-style-type: none"> <li>All segments are connected correctly, if Loop OK LED (3) is on.</li> <li>Open circuit in the loop.</li> <li>Loop is disabled.</li> </ul> <p><b>Note:</b> This indication is immediate.</p>

## 8.3 Commissioning

**Notice!**

Power up the Loudspeakers Line Isolator System before powering up the public address/voice alarm system.

1. Power up the Loudspeakers Line Isolator System at the mains.
2. Switch on the backup power supply for the Loudspeakers Line Isolator System. System initialization will take place automatically. During initialization of the system, the loop initializing LED (7) will be lit on the front panel of the Master Unit. When this LED goes out, the system is ready for use (maximum initialization time = 10 seconds).
3. Switch on the public address/voice alarm system.
4. Perform a commissioning test (Walk Test) for each loop. See *Walk Test*, page 48.

**Notice!**

After power down, the Master Unit must remain off for at least 30 seconds before powering up again.

## 8.4 Walk Test

When the Master Unit is set to Walk Test mode, the power and signal is fed from one side of the loop only, enabling an easy check of the system.

During Walk Test mode, the Master Unit will display a continuous loop fault until the loop is installed correctly. When the loop is installed correctly:

- the connection fault LED (4) on the rear panel of the Master Unit will switch off within the fault recovery time.
- The loop OK LED (3) on the rear panel of the Master Unit will light up immediately.

**Walk test procedure**

1. Make sure the Master Unit is switched on.
2. Set the loop to Walk Test mode, by setting the Walk Test DIP switch (5) on the Master Unit to on.
3. Route audio to the loop.
4. Check each loudspeaker for output.
  - Alternatively measure the pilot tone with a measurement device (applicable if pilot tone is present in the system, and the pilot tone filter is not being used).
  - Alternatively use the test button (3) on the Isolator Board to confirm the power to each connected loudspeaker.
5. Check the loop OK LED (3) on the rear panel of the Master Unit. If the loop OK LED is on, the connection is correct.
6. Set the Walk Test mode to off.

For problem solving during the Walk Test, refer to *Troubleshooting*, page 49.

## 9 Troubleshooting

### 9.1 Troubleshooting table

Problem	Possible cause	Possible solution
No audio from the system, and all indicators on the Master Unit are off.	Master Unit is not powered.	<ul style="list-style-type: none"> <li>– Make sure the Master Unit is powered and switched on.</li> <li>– Check mains fuse.</li> </ul>
	No loops enabled.	<ul style="list-style-type: none"> <li>– Enable at least one loop.</li> </ul>
PA system reports ground short fault incorrectly while Loudspeakers Line Isolator System does not report a ground fault.	Ground short supervision is enabled on the PA system.	<ul style="list-style-type: none"> <li>– Disable ground short supervision on the PA system, because the Loudspeakers Line Isolator System takes over the ground short supervision.</li> </ul>
Ground short is reported on all loops of the Master Unit.	Praesideo: Wrong version of PRS-16MCI is used.	<ul style="list-style-type: none"> <li>– Use correct hardware version: HW 04/15 or higher.</li> </ul>
	Plena: <ul style="list-style-type: none"> <li>– Ground short slave switches of the Master Unit are incorrectly set when used with a Plena system.</li> <li>– An amplifier is used on more than one router.</li> <li>– More than one router is connected to the Master Unit.</li> <li>– There is a ground short in one of the loops.</li> </ul>	<ul style="list-style-type: none"> <li>– Set one ground short slave switch to OFF, the rest to ON.</li> <li>– Connect two amplifiers exclusively to a router.</li> <li>– Connect one router (or controller) to one Master Unit.</li> <li>– Set the system in two channel mode.</li> </ul>
PRS-16MCI report (ground) fault on all channels.	Praesideo SW < 4.1 used.	<ul style="list-style-type: none"> <li>– PRS SW 4.1 or higher is compliant with the Loudspeakers Line Isolator System.</li> </ul>
No audio in the entire loop.	PA system is turned off.	<ul style="list-style-type: none"> <li>– Check if the PA system is turned on.</li> </ul>
	PA system not connected.	<ul style="list-style-type: none"> <li>– Check loudspeaker connections from the PA system to the Master Unit.</li> </ul>

Problem	Possible cause	Possible solution
	No audio is routed.	<ul style="list-style-type: none"> <li>– Make sure the system is routing audio to the system, by connecting a loudspeaker to the loop input connections of the Master Unit.</li> </ul>
Amplifier indicates amplifier failure or overload.	Load on the loudspeaker loop is too high.	<ul style="list-style-type: none"> <li>– Check the total load with an impedance measurement device on the loop input of the Master Unit, while the Master Unit is switched on.</li> <li>– Match the total load to the amplifier output power.</li> </ul>
Amplifier indicates short circuit temporarily.	Short circuit in the loop or tap-offs.	<ul style="list-style-type: none"> <li>– Normal behavior. It is possible that the public address system briefly indicates an auto-resolving short circuit while the Loudspeakers Line Isolator System is resolving a short circuit (&lt; 4s).</li> </ul>
Amplifier and or Loudspeakers Line Isolator System indicates fault only during audio broadcasting, Installation option 1.	There is an overload on an Isolator Board tap-off.	<ul style="list-style-type: none"> <li>– Check load on the Isolator Board.</li> <li>– Check for short circuits.</li> </ul>
Intermittent audio in a loop, Installation option 3.	Short circuit after DC decoupling in a segment when not using a DC Blocking Board or a 33 ohm resistor and decoupling capacitor in series with a loudspeaker.	<ul style="list-style-type: none"> <li>– Use a DC Blocking Board or a 33 ohm resistor and decoupling capacitor in series with the loudspeaker.</li> </ul>
Intermittent audio in a loop, Installation option 1 and 2.	PRS-4B125 amplifier reports amp failure, because of an overload on tap-off and neither a DC Blocking Board or a 33 ohm resistor and decoupling capacitor are used in series with the loudspeaker.	<ul style="list-style-type: none"> <li>– Use a DC Blocking Board or a 33 ohm resistor and a decoupling capacitor in series with the loudspeaker.</li> </ul>

Problem	Possible cause	Possible solution
	<p>Amplifier overload is triggered, because the Isolator Board tap-off setting is 100 watt, and the blocking capacitor is less than 22 <math>\mu</math>F.</p>	<ul style="list-style-type: none"> <li>- Use at least a 22 <math>\mu</math>F capacitor for each loudspeaker when using the 100 watt setting.</li> </ul>
	<p>Amplifier overload is triggered, because the overload setting on the Isolator Board is more than 25% of the available amplifier power.</p>	<ul style="list-style-type: none"> <li>- Set the permissible load to 25% or less of the amplifier power.</li> </ul>
<p>No audio from a loudspeaker, Installation option 1.</p>	<ul style="list-style-type: none"> <li>- Loudspeaker connection is faulty.</li> <li>- Short jumper in ON position.</li> <li>- Loudspeaker load exceeds maximum permissible load setting of the Isolator Board.</li> <li>- Isolator Board is defective.</li> <li>- Loudspeaker is defective.</li> </ul>	<ul style="list-style-type: none"> <li>- Make sure all settings and connections are OK.</li> <li>- Check with another Isolator Board.</li> <li>- Check with known good loudspeaker.</li> </ul>
<p>No audio from a speaker or branch, Installation option 2.</p>	<ul style="list-style-type: none"> <li>- Loudspeaker load exceeds maximum permissible load setting.</li> <li>- End-of-line is not sensed by Isolator Board.</li> <li>- Isolator Board is defective.</li> <li>- Loudspeaker is defective.</li> <li>- DC Blocking Board or 33 ohm resistor with DC blocking capacitor not installed for PRS-4B125.</li> </ul>	<ul style="list-style-type: none"> <li>- Make sure all settings and connections are OK.</li> <li>- Check end-of-line resistor value (47 kohm).</li> <li>- Check for DC voltage at the Isolator Board tap-off and end of the branch:                             <ul style="list-style-type: none"> <li>- &lt; 10 V = short circuit.</li> <li>- 12 V – 16 V = OK.</li> <li>- 21 V = open circuit.</li> </ul> </li> <li>- Check with another Isolator Board.</li> <li>- Check with known good loudspeaker.</li> <li>- Use a DC Blocking Board or a 33 ohm resistor and a decoupling capacitor in series with the loudspeaker.</li> </ul>

Problem	Possible cause	Possible solution
No audio from a segment installation option 3.	<ul style="list-style-type: none"> <li>- Loudspeaker load exceeds maximum amplifier power.</li> <li>- Short in segment.</li> </ul>	<ul style="list-style-type: none"> <li>- Make sure the loudspeaker load in the loop matches the available amplifier power.</li> <li>- Check for short circuits by using the Walk Test mode.</li> </ul>
Intermittent audio on a tap-off, Installation option 1 and 2.	There is a short or overload on a tap-off. The system will retry the loop every 15 to 35 seconds.	<ul style="list-style-type: none"> <li>- Use the Walk Test mode to locate the problem.</li> <li>- Check the affected tap-off for short circuit or overload.</li> <li>- Check the overload settings on the Isolator Board.</li> </ul>
Intermittent audio on a tap-off and or segment, Installation option 1 and 2.	There are two or more faults in a loop. Artifacts may be heard in the loop between the first and last fault, including tap-offs. The system will retry the loop every 15 to 35 seconds.	<ul style="list-style-type: none"> <li>- Use the Walk Test mode to locate the problem.</li> <li>- Check connections and settings at the first defective location.</li> </ul>

## 10 Maintenance

The system requires minimum maintenance. Maintenance must only be done by qualified personnel. To keep the system in good condition, refer to the following sections:

**See also**

- *Clean the air inlets, page 53*
- *Check the connectors and grounding, page 53*
- *Perform a Walk Test, page 53*

### 10.1 Clean the air inlets

- The Master Unit can collect dust as a result of the internal fans.
- Once a year you should use a vacuum cleaner to clean the air inlets of all units in the 19-inch racks.

### 10.2 Check the connectors and grounding

- Check all connections for wear or damage
- Make sure all screw terminals and ground (PE) connections are fully tightened.

### 10.3 Perform a Walk Test

Regularly perform a Walk Test, according to local regulation or contractual obligations. See *Walk Test, page 48*.

# 11 Technical data

## 11.1 Master Unit

### Electrical

<b>Mains power supply</b>	
Voltage	115 / 230 VAC, $\pm 10\%$ , 50/60 Hz
Fuse rating	T6.3 A, 250 V
Inrush current	Time: < 10 ms; $\leq 30$ A
Max. power consumption	150 W

<b>Battery power supply</b>	
Voltage	18 – 56 VDC nominal 24 or 48 VDC
Backup fault detection level	$21 \pm 1$ VDC
Max. backup power current	4.5 A

<b>Hardware Interfaces</b>	
100 V audio I/O (loop 1-6)	Pluggable screw connector
Fault output (loop 1-6)	Floating contacts 24 V, 1 A
Fault relays except general fault relay	<ul style="list-style-type: none"> <li>– OK state is normally de-energized</li> <li>– NO is open</li> </ul>
General fault relay	<ul style="list-style-type: none"> <li>– OK state is Failsafe, normally energized</li> <li>– NC is open (failsafe)</li> </ul>

<b>Performance</b>	
Max. number of Isolator Boards in loop	50
Power handling capacity per loop	500 W
Frequency range	50 Hz – 20 kHz

<b>Max. sum blocking capacitance</b>	
Max. sum blocking capacitance per loop	4700 $\mu$ F
Max sum blocking capacitance per tap-off	220 $\mu$ F

<b>Fault detection and reporting</b>	
Loop open circuit detection	≥ 10 kΩ detected on loudspeaker line return
Loop short circuit detection	≤ 10 Ω detected on primary output and return
Fault isolation time (50 Isolator Boards or less per loop)	≤ 4 s
Ground short	< 50 kohm



Figure 11.1: Battery power consumption 24 Vdc

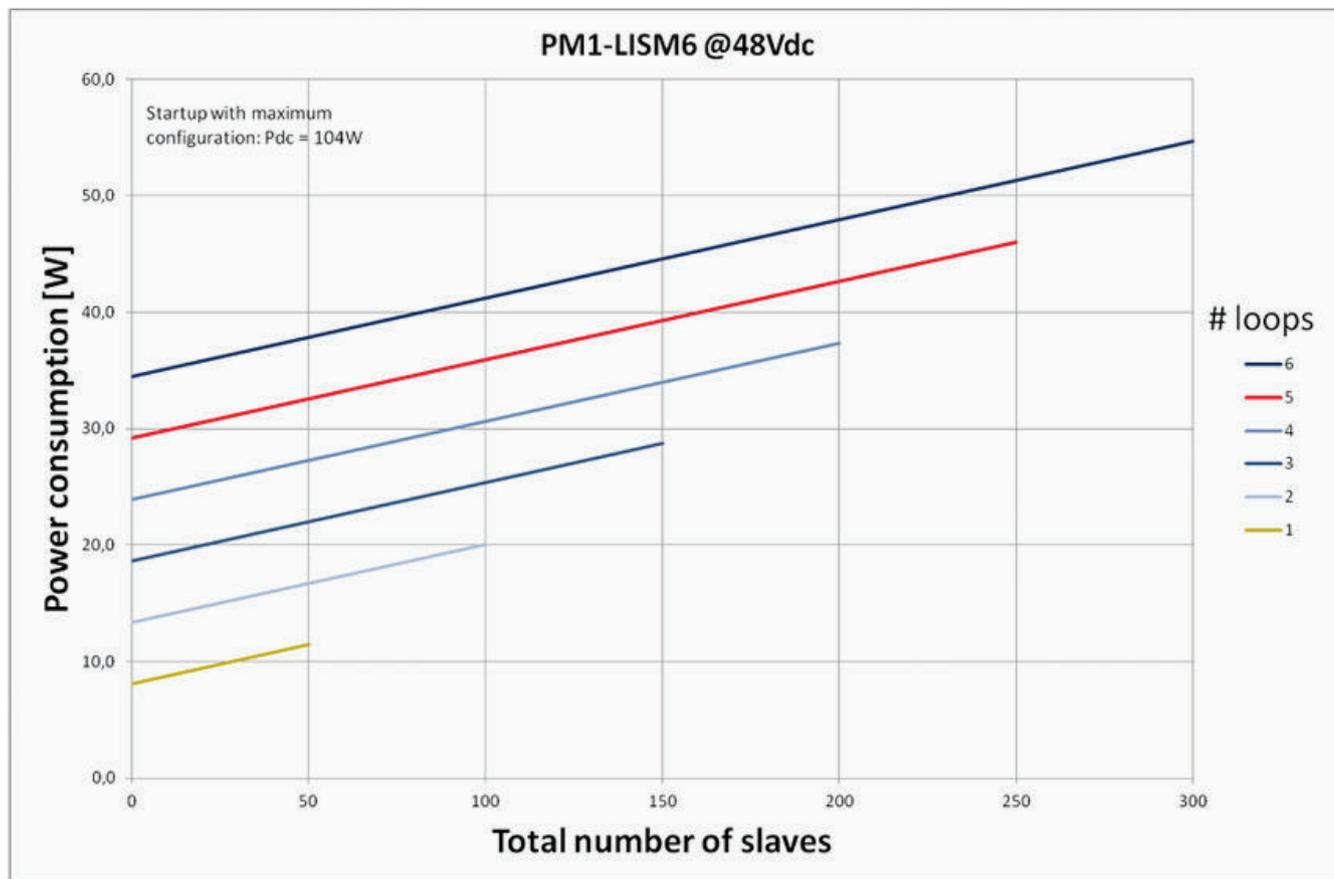


Figure 11.2: Battery power consumption 48 Vdc

**Mechanical**

<b>Dimensions (H x W x D)</b>	
For 19" rack use, with brackets	88 x 483 x 400 mm (3.5 x 19 x 15.7 in)
in front of brackets	40 mm (1.6 in)
behind brackets	360 mm (14.2 in)
Weight	15.9 kg (35.05 lb)
Mounting	19" rack
Color	Charcoal with silver

**Environmental**

Operating temperature	-5 °C to +55 °C (+23 °F to +131 °F)
Storage temperature	-20 °C to +70 °C (-4 °F to +158 °F)
Relative humidity	15% to 90%
Air pressure	600 to 1100 hPa

## 11.2 Isolator Board

### Electrical

Loudspeaker loop connection	120 VAC audio, max 5 A
Maximum loop though loudspeaker load	500 W
Maximum tap-off load	100 W
Test fault indicating LED	Yellow
Test button	Momentary

### Mechanical

Dimensions (H x W x D)	78 x 60 x 32 mm (3.0 x 2.3 x 0.6 in)
Housing	150 x 150 x 75 mm (5.9 x 5.9 x 2.9 in)
Mounting options	<ul style="list-style-type: none"> <li>- Ready mounted in the supplied housing</li> <li>- Mounted inside the loudspeaker</li> <li>- Mounted in an IP-65 housing (an optional mounting bracket LBB 4446/00 is required)</li> </ul>
Weight	Approx. 180 g (6.3 ounces)
Color	Red
Fire-resistant properties	UL60065
Ingres protection	IP30
Punch out holes for cables	<ul style="list-style-type: none"> <li>- 3 holes for 6 mm wires</li> <li>- 3 holes for 9 mm wires</li> </ul>

### Environmental

Operating temperature	-5 °C to +55 °C (+23 °F to +131 °F)
Storage temperature	-20 °C to +70 °C (-4 °F to +158 °F)
Relative humidity	15% to 90%
Air pressure	600 to 1100 hPa

## 11.3 End of line resistor

### Electrical

End of line resistor	47 kohm, > 0.5 W resistor
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## 11.4 DC Blocking Board

### Electrical

Loudspeaker loop connection X1, X2	120 VAC audio, max 5 A
Maximum loop though loudspeaker load	500 W
Tap-off X3	20 W on tap-off
High pass filter	67 Hz at 20 W load 34 Hz at 10 W load

### Mechanical

Dimensions (H x W x D)	60 x 45 x 30 mm (2.7 x 1.8 x 0.6 in)
Mounting	Internally mounted in the loudspeaker (an optional mounting bracket LBB 4446/00 is required)
Weight	Approx. 16 g (0.6 ounces)

### Environmental

Operating temperature	-5 °C to +55 °C (+23 °F to +131 °F)
Storage temperature	-20 °C to +70 °C (-4 °F to +158 °F)
Relative humidity	15% to 90%
Air pressure	600 to 1100 hPa

## 11.5 Approvals

Safety	acc. to EN 60065
Emission	acc. to EN 55103-1
Immunity	acc. to EN 55103-2, and EN 50130-4
Maritime	acc. to EN 60945
Evacuation	acc. to EN 54-16

## 11.6 Compliance

Compliant for use as described in	NEN2575, VDE0833, and BS5839
Evacuation	acc. to EN 60849



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