PAVIRO Router

PVA-4R24

en User manual

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1 Important product information

1.1 Safety information

1. Read and keep these safety instructions. Follow all instructions and heed all warnings.
2. Download the latest version of the applicable installation manual from www.boschsecurity.com for installation instructions.

Information
Refer to the Installation Manual for instructions.

3. Follow all installation instructions and observe the following alert signs:

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 injured if the alert is not observed.

Warning! Risk of electric shock.

4. System installation and servicing by qualified personnel only, in accordance with applicable local codes. No user-serviceable parts inside.
5. System installation for emergency sound (except for call stations and call station extensions) in a Restricted Access Area only. Children may not get access to the system.
6. For rack-mounting of system devices, make sure that the equipment rack is of suitable quality to support the weight of the devices. Use caution when moving a rack to avoid injury from tip over.
7. The apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

Warning! To reduce the risk of fire and electric shock, do not expose this apparatus to rain or moisture.

8. Mains powered equipment shall be connected to a mains power outlet socket with a protective earthing connection. An external, readily operable, mains plug or all-pole mains switch shall be installed.
9. Only replace the mains fuse of an apparatus with a fuse of the same type.
10. The protective ground connection of an apparatus shall be connected to protective ground before the apparatus is connected to a power supply.
11. Amplifier outputs marked with ⚠ may carry audio output voltages up to 120 V_{RMS}. Touching uninsulated terminals or wiring may result in an unpleasant sensation.
    Amplifier outputs marked with ⚠ or ϟ may carry audio output voltages above 120 V_{RMS}. It requires a skilled person to strip and connect the loudspeaker wires in such a way that the naked conductors are inaccessible.
12. The system may receive power from multiple mains power outlet sockets and backup batteries.

Warning! To prevent a shock hazard disconnect all power sources prior to system installation.

13. Only use recommended batteries and observe polarity. Risk of explosion if an incorrect type of battery is used.

14. Fiber optical converters use invisible laser radiation. To prevent injury, avoid eye exposure to the beam.
15. Devices for vertical (wall) mounting supporting a user interface for operation shall only be mounted below 2 m height.
16. Devices installed above 2 m height may cause injury when falling down. Preventive measures must be taken.
17. To prevent hearing damage do not listen at high volume levels for long periods.
18. An apparatus may use a lithium coin battery. Keep away from children. If ingested, high risk of chemical burn hazard. Seek medical attention immediately.

1.2 Disposal instructions

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.

1.3 FCC statement

Warning! Changes or modifications not expressly approved by Bosch could void the user's authority to operate the equipment.

Notice!
This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV/communications equipment technician.

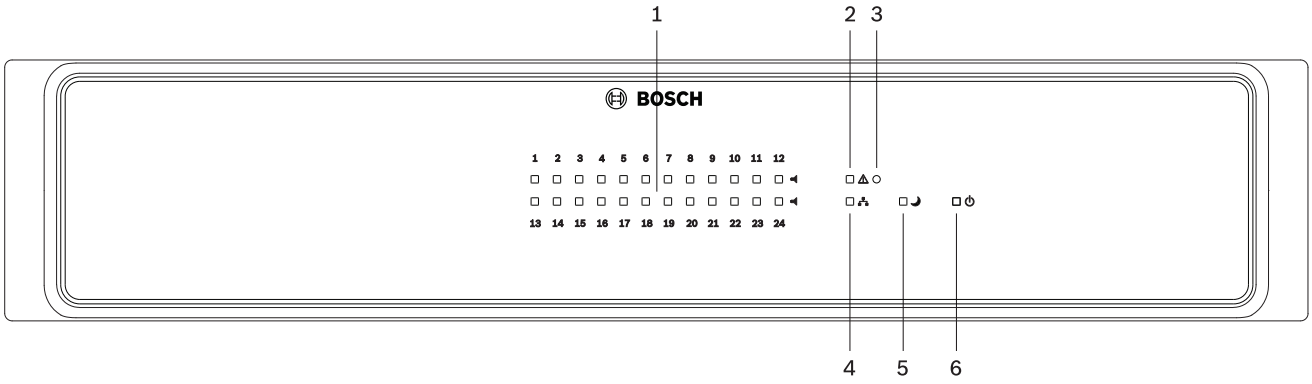
2 Short information

The PVA-4R24 24 Zone Router is a zone extension for the PAVIRO system. The PVA-4R24 adds 24 zones, 20 GPIs, 24 GPOs and 2 control relays to the system and is controlled and supervised via the CAN bus by the PVA-4CR12 (Controller).
Up to 20 routers can be connected to one controller. One router can handle up to 4000 W speaker load. The maximum load of one zone is 500 W.
The zone indicator lights on the front indicate the current status of every zone:

- Green: Zone in use for non emergency purpose
- Red: Zone in use for emergency purpose
- Yellow: Zone fault detected
- Off: Zone in idle condition

3 System overview

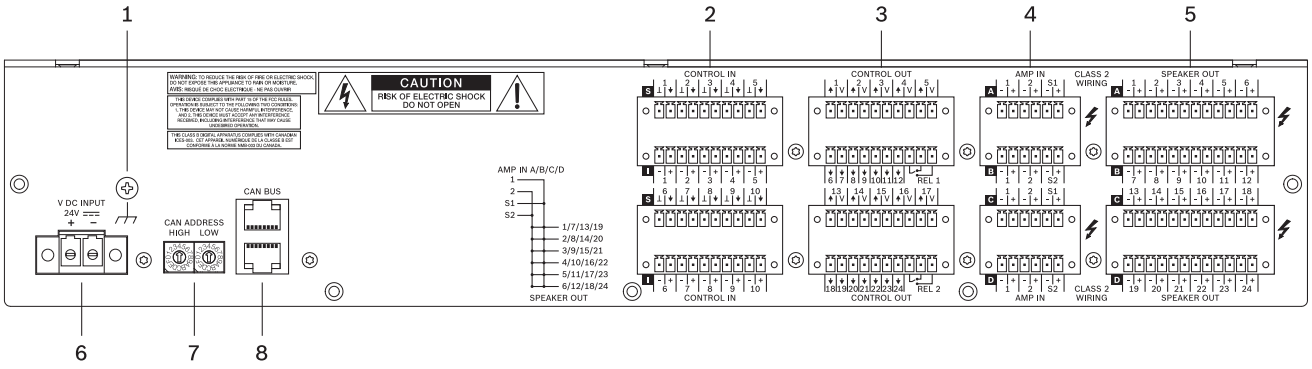
3.1 Front panel



Number	Symbol	Element	Description
1		Zone status indicator light	Indicates the status of the zone: – Green = Zone is in use for non-emergency purpose – Yellow = Zone fault detected (Note: The indication of this status has the highest priority) – Red = Zone is in use for emergency purpose – Off = Zone in idle condition
2	⚠	Combined fault warning indicator light	This indicator lights up yellow if a fault in the device is detected. Note: The fault types to be indicated via this indicator can be configured.
3		Recessed button	The button is protected to prevent it from being pressed accidentally. Use a pointed object (such as a ballpoint pen) to press the button. This button has the following functions if the CAN address of the device is **not** set to 00: – Find function: If the find function of the device is activated, press this button to deactivate the indicators. – Displaying the CAN baud rate: Press this button for at least one second. Please refer to section *Displaying the CAN baud rate, page 23*. – LED test: Press this button for at least three seconds to activate the LED test. All indicators at the front panel light up as long as the button is pressed. This button has the following functions if the CAN address of the device is set to 00: – Resetting a fault (e.g. watchdog fault): Press the button briefly to confirm a fault.

Number	Symbol	Element	Description
			– Setting/displaying the CAN baud rate: Press this button for at least one second. Please refer to section *Configuring the CAN baud rate, page 23*. – Resetting to delivery condition: Press this button for at least three seconds. Please refer to section *Resetting to factory default settings, page 28*.
4		Network indicator light	This indicator lights up green if successful data communication has been established.
5		Standby indicator light	This indicator lights up green when the device is in standby mode.
6		Power indicator light	This indicator lights up green when the power supply is OK.

3.2 Rear panel



Number	Element	Description
1	Grounding screw	Ground connection
2	CONTROL IN ports	Control port with isolated or supervised inputs. Please refer to section *Control input, page 18*.
3	CONTROL OUT ports	Control port with open collector outputs. Please refer to section *Control output, page 19*.
4	AMP IN ports	Input for 100 V (or 70 V) audio signal from power amplifier.
5	SPEAKER OUT ports	Output for speaker zones.
6	DC power input	
7	CAN ADDRESS selector switch	HIGH-byte and LOW-byte for configuring the CAN address of the device.
8	CAN BUS port	Connection with CAN bus, e.g. controller.

4 Parts included

Quantity	Component
1	PVA-4R24 Router
1	Set of connectors
1	Set of feet
1	Installation manual
1	Important safety instructions

5 Installation

This device has been designed to be installed horizontally in a conventional 19” rack cabinet.

Front attachment of the device

Refer to the following illustration to attach the front of the device, using four screws and washers. Because of painted surfaces the connection of the grounding screw at the rear panel of the device is recommended.

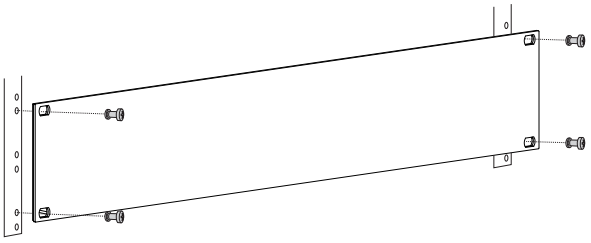


Figure 5.1: Installation of the device into a 19" rack

Caution!

The use of rack mount rails is recommended when installing the device in a rack shelf or rack cabinet to prevent the front panel from twisting or warping. If devices should be stacked in the rack (e.g. using the self-adhesive foot stands supplied) the maximum permissible load of the mount rails must be considered. Please refer to the technical specifications provided by the rack rail manufacturer.

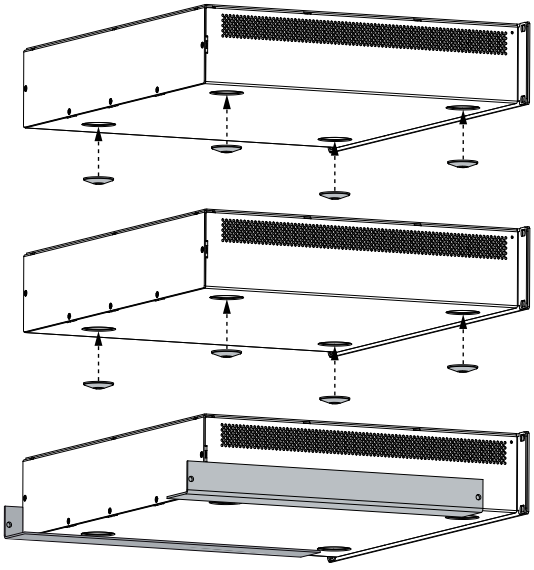


Figure 5.2: Stacking of devices using the supplied foot stands (example with 3 devices, rack mount rails are used for the bottom device only)

The device must be protected from:

- Dripping water or spray
- Direct sunlight
- High ambient temperatures or immediate sources of heat
- High humidity
- Large dust deposits
- Strong vibrations

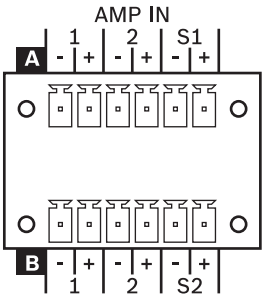
If these requirements cannot be guaranteed, the device must be regularly serviced to prevent any outages that could occur as a result of negative ambient conditions. If a solid object or fluid enters the housing, immediately disconnect the device from the voltage supply, and have it serviced by an authorized technician before it is recommissioned.

Warning!
The maximum ambient temperature of +45 °C should not be exceeded.

Standby mode
In standby mode, the power consumption of the device significantly reduces. In standby mode, the following functions are still available:
– Remote control via the CAN bus
– Monitoring of the DC input
– Function of the Control Port
Standby operation is activated via the CAN bus and indicated by the Standby indicator light.

6 Connection

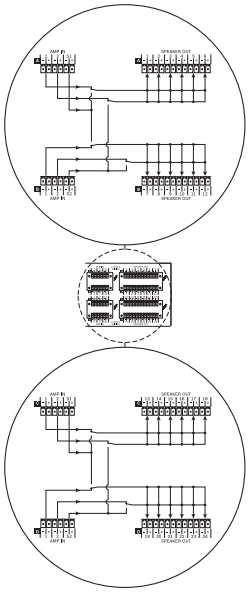
6.1 Audio input



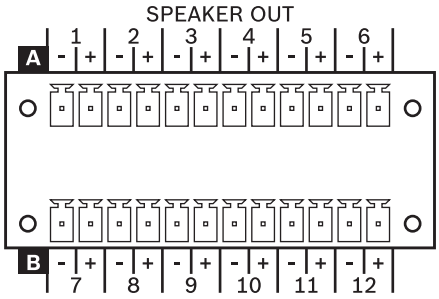
The AMP IN audio inputs allow to connect the 100 V (or 70 V) output signals of up to eight power amplifier channels to the integrated 2-in-6 router blocks A, B, C or D. Additionally there are four input channels for spare amplifiers.
The delivery includes 6-pin connectors. Conductor cross-sections of 0.14 mm² (AWG26) to 1.5 mm² (AWG16) can be used.
Recommended connecting cable: stranded wire, LiY, 0.75 mm².

Routing

Following illustration gives an overview of possible routings between the AMP IN audio inputs and the SPEAKER OUT audio outputs using the internal relays of the device. The PVA-4R24 includes four 2-in-6 routing blocks A, B, C or D. Each routing block provides 2 regular inputs, 1 spare amplifier input and 6 outputs.
Spare amplifier input S1 of AMP IN A (C) is for replacing the amplifiers connected to inputs 1 of routing blocks A (C) and B (D).
Spare amplifier input S2 of AMP IN B (D) is for replacing the amplifiers connected to inputs 2 of routing blocks A (C) and B (D).



6.2 Loudspeaker output



100 V or 70 V loudspeakers can be connected on each speaker output with the 4 (four) 12-pin connectors that are delivered with the device. Loudspeaker cables with a cross sectional area from 0.14 mm^2 (AWG26) up to 1.5 mm^2 can be used.
Recommended connecting cable: stranded wire, LiY, 0.75 mm^2 (h/w 03/00 and higher).

About the cable diameter

The voltage drop over cables should not exceed 10 %.
Cables with a higher voltage drop lead to a high proportional cable attenuation at the loudspeakers. This is particularly noticeable at higher volume levels, for example alarm signals. A high voltage drop can also cause communication problems with the EOL modules.
The following table gives an overview of the maximum cable lengths for different speaker loads depending on the cable diameters.

Cross-section [mm2]	Diameter [mm]	10 W [m]	20 W [m]	100 W [m]	200 W [m]	300 W [m]	400 W [m]	500 W [m]
0.5	0.8	1000	800	160	80	53	40	32
0.75	1.0	1000	1000	240	120	80	60	48
1.0	1.1	1000	1000	320	160	107	80	64
1.5	1.4	1000	1000	480	240	160	120	96
2.5	1.8	1000	1000	800	400	267	200	100
4.0	2.3	1000	1000	1000	640	427	320	256

Maximum loudspeaker load

The maximum rated power should not exceed 500 W per amplifier channel and/or controller/router output (see chapter 6.1.2.). The internal 2-in-6 router output block offers the possibility to distribute the 500 W amplifier power to 6 zones. If two 500-watt amplifier channels are used within a router cluster of 6 zones, up to 1000 W can be distributed to these 6 zones. The maximum rated power of 500 W at a single speaker output must not be exceeded.

Danger!

It is possible that during operation shock hazard voltages (> 140 V peak value) may be present at the outputs. Therefore, the connected loudspeaker zones have to be installed in accordance with applicable safety regulations. When installing and operating 100 V loudspeaker networks, compliance with the VDE regulation DIN VDE 0800 is mandatory. Especially, when 100 V loudspeaker networks in alarm system applications are concerned, all safety precautions have to be in accordance with the safety class 2 wiring.

Note: The breakdown voltage on the loudspeaker output from a controller/router (HW: 2.00) is 120 V between the loudspeaker cable pairs and 60 V between a loudspeaker cable pole and ground.

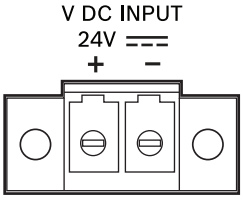
Wiring faults

Loudspeaker cables, which typically run through the entire building, are more sensitive to wiring faults.

There are different types of wiring faults as mentioned below:

- Ground fault: A ground fault is detected by the ground fault detection. If the resistance between ground and speaker wire is < 50kΩ, a ground fault is indicated.
- Short circuit or open line: A cable that is short-circuited or open is detected by the built-in impedance measurement, if the reference values are set correctly.
- Swapped zones: Swapped zones cannot be found/detected by impedance measurement, if they have approximately the same load.
- Single pole connections between two zones: Single-pole connections lead to increased crosstalk when one of the zones becomes active and/or when both zones distribute a different signal. This results in incorrect impedance values being measured. This fault cannot be detected by the ground fault detection and/or impedance measurement.
- Parallel connection of two or more zones: In this case two amplifier channels with different signals or one amplifier channel and the impedance measurement can be connected in parallel. This fault cannot be detected by the ground fault supervision and/or impedance measurement, as the impedance reference values may already have been set incorrectly.
- Crossed zones: A wire from a certain zone has been swapped with a wire from another zone. This fault cannot be detected by the ground fault detection and/or impedance measurement, as the impedance reference values may already have been set incorrectly.

6.3 Supply voltage

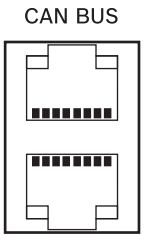


Connect a 24-volt DC source to the DC power input. The delivery includes a 2-pin connector.
Conductor cross-sections of 0.2 mm² (AWG24) to 6 mm² (AWG10) can be used.
Recommended connecting cable: flexible stranded wire, LiY, 1.5 mm².
The DC input is protected against incorrect polarity and overload. The associated fuse is located on the inside of the device and is not accessible from outside of the device.

Warning!

Never connect the positive terminal + with ground.

6.4 CAN BUS



This section contains information about the connection of the device to the CAN BUS and the correct setting of the CAN address.

Connection

The device has two RJ-45 jacks for the CAN BUS. The jacks are connected in parallel, and act as an input and for daisy chaining the network. The CAN bus allows different data rates to be used, where the data rate is indirectly proportional to the bus length. If the network is small, data rates of up to 500 kbit/s are possible. In larger networks, the data rate must be decreased (down to the minimum data rate of 10 kbit/s), please refer to section Configuring the CAN baud rate.

Notice!

The data rate is preset to 10 kbit/s in the factory.

The following table explains the relationship between data rates and bus lengths/network size. Bus lengths of over 1,000 m must be implemented only with CAN repeaters.

Data rate (in kbit/s)	Bus length (in meters)
500	100
250	250
125	500
62.5	1000

Table 6.1: Data rate and bus length of the CAN BUS

The following diagrams show the assignment of the CAN port/CAN connector.

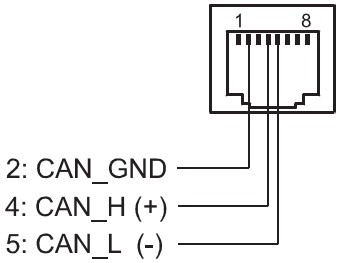


Figure 6.1: Assignment of the CAN port

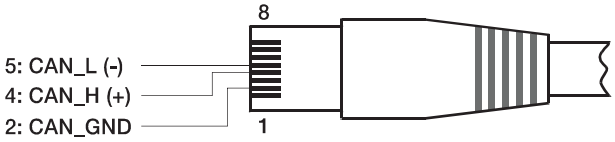


Figure 6.2: Assignment of the CAN connector

Pin	Designation	Cable color	
		T568A	T568B
2	CAN_GND	Green	Orange
4	CAN_H (+)	Blue	
5	CAN_L (-)	Blue stripes	

Table 6.2: Assignment of the CAN BUS interface

Cable specification

In accordance with the ISO 11898-2 standard, shielded twisted-pair cables with an impedance of 120 ohms must be used as the data transfer cable for the CAN bus. A terminating resistance of 120 ohms must be provided at both ends as the cable terminator. The maximum bus length depends on the data transmission rate, the type of data transmission cable, and the number of bus participants.

Recommended connecting cable: shielded twisted-pair, CAT5, 100 / 120 Ω.

Bus length (in m)	Data transmission cable		Termination (in Ω)	Maximum data transmission rate
	Resistance per unit (in mΩ/m)	Cable cross-section		
0 to 40	< 70	0.25 to 0.34 mm² AWG23, AWG22	124	1000 kbit/s at 40 m
40 to 300	< 60	0.34 to 0.6 mm² AWG22, AWG20	127	500 kbit/s at 100 m
300 to 600	< 40	0.5 to 0.6 mm² AWG20	150 to 300	100 kbit/s at 500 m
600 to 1000	< 26	0.75 to 0.8 mm² AWG18	150 to 300	62.5 kbit/s at 1000 m

Table 6.3: Relationships for CAN networks with up to 64 participants

If there are long cables and several devices on the CAN bus, terminating resistors with ohm ratings higher than the specified 120 ohms are recommended in order to reduce the resistive load for the interface drivers, which in turn reduces the voltage loss from one cable end to another.

The following table allows initial estimates for the required cable cross-section for different bus lengths and various numbers of bus participants.

Bus length (in m)	Number of devices on the CAN Bus		
	32	64	100
100	0.25 mm² or AWG24	0.34 mm² or AWG22	0.34 mm² or AWG22
250	0.34 mm² or AWG22	0.5 mm² or AWG20	0.5 mm² or AWG20
500	0.75 mm² or AWG18	0.75 mm² or AWG18	1.0 mm² or AWG17

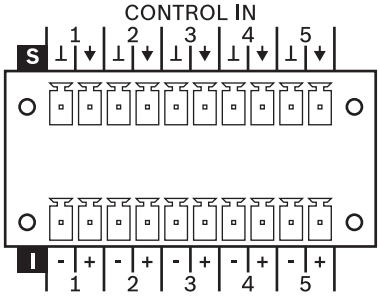
Table 6.4: CAN BUS cable cross-section

If a participant cannot be directly connected to the CAN bus, a stub line (branch line) must be used. Since there must always be precisely two terminating resistors on a CAN bus, a stub line cannot be terminated. This creates reflections, which impair the rest of the bus system. To

minimize these reflections, these stub lines must not exceed a maximum individual length of 2 m at data transmission rates of up to 125 kbit/s, or a maximum length of 0.3 m at higher bit rates. The overall length of all branch lines must not exceed 30 m.
The following applies:

– In terms of rack wiring, standard RJ-45 patch cables with 100-ohm impedance (AWG 24/ AWG 26) can be used for short distances (up to 10 m).
– The guidelines specified above for the network cabling must be used when wiring the racks with each other and for the building installation.

6.5 Control input



There are two control input ports (input 1-5 or 6-10) on the rear of the device.
The CONTROL IN port is split into two halves:

– The upper half has five freely configurable **supervised**, not isolated control inputs.
– The lower half has five freely configurable **isolated** control inputs.

The delivery includes 10-pole connectors. Conductor cross-sections of 0.14 mm² (AWG26) to 1.5 mm² (AWG16) can be used. Recommended connecting cable: shielded flexible stranded wire, LiY, 0.5 mm². The control port is configured in IRIS-Net.

Caution!
The maximum permissible voltage on a control input is 32 V.

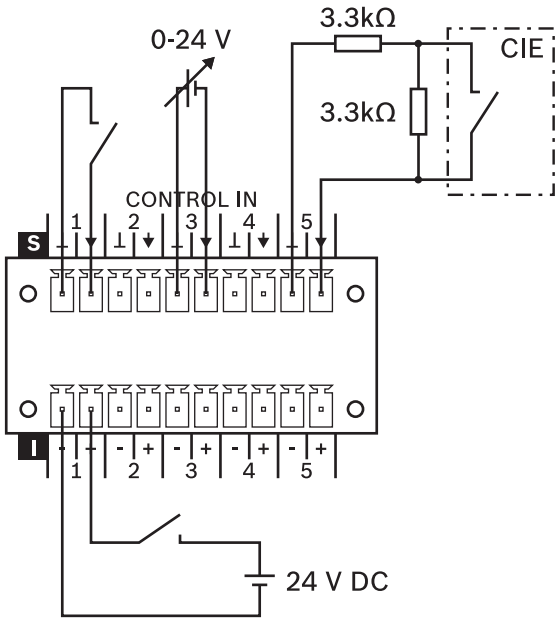


Figure 6.3: Using supervised or isolated inputs of the CONTROL IN port

Supervised control inputs

The supervised control inputs can be used as

– normal logical (high/low) input (with low <= 5 V or high >= 10 V) or
– supervised input with states active, not active, open circuit or short circuit.

When using a supervised input (e.g. for connecting a CIE) add two resistors as illustrated above (if not already included in the outputs of the connected device).

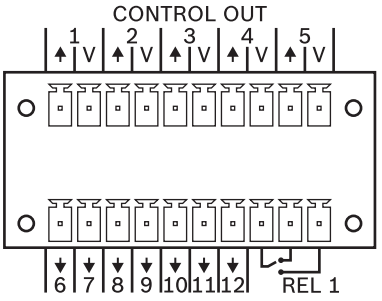
Notice!

The supervised inputs are internally equipped with 8.2 kΩ pull up resistors. The ground pins are equipped with a common self resettable 140 mA fuse.

Isolated control inputs

The isolated control inputs can be used as normal logical (high/low) input (with low <= 5 V or high >= 10 V) only. This inputs comply with VDE 0833-4.

6.6 Control output



Control outputs

The freely programmable control outputs are designed as open collector outputs that have a high resistance (open) when not active (OFF/inactive). When active (ON/active), the outputs are closed to ground.

Recommended connecting cable: shielded flexible stranded wire, LiY, 0.5 mm².

Caution!

The maximum permissible current per output is 40 mA. The maximum permissible voltage is 32 V.

To operate externally connected elements, a voltage source is available on the connection V (the voltage at connection V is identical to the device input voltage); see also the following illustration. The ground pin is equipped with a common self resettable 750 mA fuse.

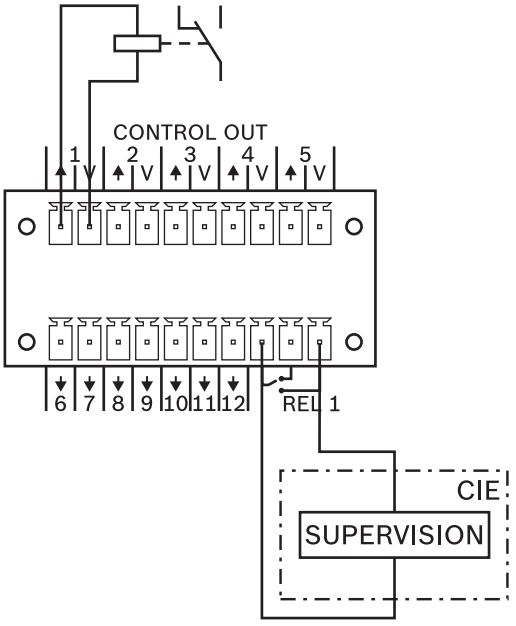


Figure 6.4: Connecting a relay and the supervision contacts of a CIE to the CONTROL OUT port

Control relay

The control relay REL (changeover contact) can be used as VDE 0833-4 compliant output. The IRIS-Net software allows the user to configure the parameters or fault types for which the changeover contact should switch over. To integrate the device into the hazard alert systems, a normally-closed contact (standby current principle) is recommended.

Caution!

The maximum load of the control relay is 32 V/1 A.

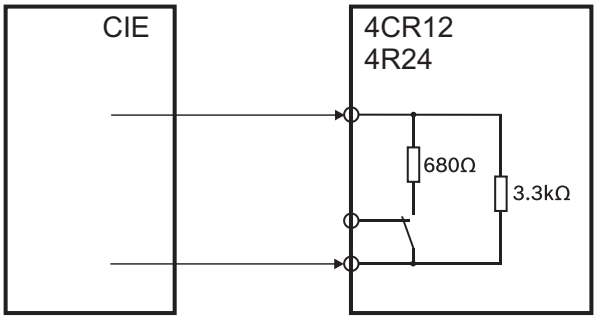
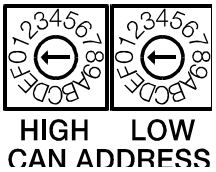


Figure 6.5: Internal configuration of the REL contact (VDE 0833-4)

7 Configuration

7.1 Setting the CAN address



The CAN address of the device is set using the two address selector switches HIGH and LOW. Addresses 1 to 250 (01 hex to FA hex) can be used in a CAN network. The address is set using the hexadecimal numbering system. The LOW selector switch is for the low-order digit and the HIGH selector switch is for the high-order digit.

Notice!
Each address may only occur once in the system, otherwise network conflicts will occur.

The address 0 (00 hex, set on delivery) ensures that the device is disconnected from the remote communication. This means that the device does not appear in the system, even if it is connected to the CAN bus.

HIGH	LOW	Address
0	0	Stand-alone
0	1 to F	1 to 15
1	0 to F	16 to 31
2	0 to F	32 to 47
3	0 to F	48 to 63
4	0 to F	64 to 79
5	0 to F	80 to 95
6	0 to F	96 to 111
7	0 to F	112 to 127
8	0 to F	128 to 143
9	0 to F	144 to 159
A	0 to F	160 to 175
B	0 to F	176 to 191
C	0 to F	192 to 207
D	0 to F	208 to 223
E	0 to F	224 to 239
F	0 to A	240 to 250
F	B to F	Reserved

Table 7.5: CAN addresses

7.2 Displaying the CAN baud rate

To display the CAN baud rate, press the Recessed button and keep the button pressed down for at least one second. Three front panel indicator lights then display the set baud rate for two seconds, afterwards all indicators light up (“LED test”). Please refer to the following table for details.

Baud rate (in kbit/s)	Zone status indicator light of zone 23	Zone status indicator light of zone 24	Network indicator light
10	Off	Off	**On**
20	Off	**On**	Off
62.5	Off	**On**	**On**
125	**On**	Off	Off
250	**On**	Off	**On**
500	**On**	**On**	Off

Table 7.6: Displaying the CAN baud rate via indicator lights on the front panel

7.3 Configuring the CAN baud rate

The CAN baud rate can be configured using a UCC1 USB-CAN CONVERTER or directly on the front of the device.

Changing the CAN baud rate

Notice!
The CAN baud rate can only be changed if the CAN address is set to 00.

To change the CAN baud rate, perform the following steps:

1. Press the Recessed button and keep the button pressed down for at least one second. The CAN baud rate is indicated for two seconds, please refer to the section entitled “Displaying the CAN baud rate” for more information.
2. As soon as the CAN baud rate is displayed, release the Recessed button. Please note that if the button is pressed for more than 3 seconds, the device will be reset to factory settings.
3. Briefly press the Recessed button to switch to the next-higher CAN baud rate. The LEDs indicate the new setting.
4. Repeat step 3 until the desired baud rate has been set. (Example: To change the baud rate from 62.5 kbit/s to 20 kbit/s, press the Recessed button exactly five times, i.e. 62.5 > 125 > 250 > 500 > 10 > 20).
5. The new CAN baud rate is applied two seconds after the last time that the Recessed button is pressed.

8 Operation

8.1 Line supervision

For loudspeaker line supervision three different options are available. They differ in performance, cost, and suitability for various applications and situations.
In general the device can detect open circuit and short circuit. In case of an open circuit only a fault message will be generated. In case of a short circuit a fault message will be generated and the loudspeaker line will be automatically deactivated to avoid influence to other loudspeaker lines.

8.1.1 Impedance measurement

The PVA-4CR12 controller provides a function to measure the loudspeaker cable impedance. This function puts a sinus signal on the loudspeaker cable connection and measures the effective current and voltage. The impedance value of the loudspeaker cable (= cable and loudspeaker) is calculated based on the measurement results. Impedance measurement can only be done in non-active loudspeaker cable outputs.
To detect impedance deviations in the loudspeaker cable, caused by an open or shorted cable connection, a failure-free loudspeaker cable reference value must have been measured and stored beforehand. All future impedance measurements are only compared against the impedance reference value. When an impedance value exceeds the accepted and configured tolerance, a failure is reported.
The calibration of impedance measurement circuits is not necessary because the system only notices impedance tolerances. In this way, absolute failures of values are mathematically eliminated.
The measuring frequency and voltage can vary within given borders and can be adapted to the local conditions, like used loudspeaker types and cables or mains power. In general, it is recommended not to deviate from given default values. If the frequency is too high, the measurement signal might be audible. If the frequency is too low, the measured impedance value may be outside the specified range as lower frequency decreases the impedance of the loudspeaker's transformer.

Notice!
Starting with the controller/router version HW: 02/00 (see product label), the measuring generator has a protective circuit with high-impedance resistors to protect against external voltages. Therefore, the measurement voltage at the outputs of the configured loudspeaker cable may vary depending on the impedance of the loudspeaker cable.

Loudspeaker cable impedance
The impedance of the loudspeaker cable can be affected by several negative factors:
– **Ambient temperature:**
The loudspeaker cables, the transformers and the loudspeaker coils are usually made of copper. Copper has a temperature coefficient of α = 3.9 1/K.
In other words, the resistance changes by about 4% with a temperature change of 10 °C.
Example:
In a parking garage, the impedance of the loudspeaker cable can change by a factor of about 16% between winter (-10 °C) and summer (+30 °C).
– **Measuring frequency:**
A defective loudspeaker might not be detected if long loudspeaker cables with a higher measuring frequency are used, due to the fact that the cable impedance (or cable capacitance) might become dominant compared with the loudspeaker impedance.

Example:
The impedance value for 20 kHz for a cable with a capacitance value of 100 nF/km and a length of 200 m is about 400 Ω. A 5 W loudspeaker has an impedance of about 2000 Ω. The impedance of the cable including the loudspeakers is about 330 Ω. If the cable is broken near the loudspeaker, the impedance difference is 70 Ω, which is about 21%.

– **Loudspeaker impedance:**

The impedance of the loudspeaker depends on the frequency. The transformers in the loudspeakers have a low impedance value at low frequencies. It is important to ensure that the measurement limits (see Table 8.9) for the specific measurement frequencies are not exceeded, especially for high-power loudspeakers.
Example:
The Sx300PIX loudspeaker has an impedance value of about 110 Ω at 1 kHz, but an impedance value of 50 Ω at 30 Hz.

– **Ground fault:**

A ground fault of the loudspeaker cable can affect the impedance measurement of the loudspeaker cable. If a ground fault and an impedance error are displayed simultaneously, the cable ground fault must be corrected first.

Parameter	Value
Impedance range	20-10000 Ω (corresponds to 500 W to 1 W)
Impedance tolerance	6% ± 2 Ω
Frequency range	20-4000 Hz
Voltage range	0.1-1.0 V

Table 8.7: Impedance measurement specification

Notice!
The total impedance connected at the output on the amplifier (loudspeakers and cabling) must be within the specified impedance range in terms of the test frequency (see the table entitled “Impedance measuring specification”).

Notice!
To detect a line interruption to a single speaker, or the failure of a single speaker, the following instructions must be observed: Do not connect more than five speakers to one speaker line. All speakers on the speaker line must have the same impedance.

8.1.2 EOL slave module

End-of-line (EOL) technology enables the loudspeaker lines to be monitored for short-circuit and interruptions. The EOL modules can be used for permanent supervision on not active and active speaker lines, e.g. for speaker lines with permanent background music or if passive volume controls are used.

Method of operation

An EOL slave module PVA-1WEOL is installed at the end of the speaker line. The speaker line is used for both the power supply of the module (via the non-audible pilot tone) and for bi-directional communication between the EOL master in the output stage and the EOL slave module (using very low-frequency signals). If a communication error occurs – for example, if the EOL master does not receive a response from the slave – then an error message is generated. The unique addressing of the slave modules means that multiple slave modules can be connected to one speaker line.

For communication between the master and the slave modules, the EOL slave modules must be connected to ground. The shielding on the speaker cable, a free wire in the speaker cable, or any other available ground point – such as the safety ground of the power supply system – can be used for this purpose. The resistance R_G between an output line of the amplifier and ground must be at least 1.5 MΩ. The capacity C_G between an output line of the device and the ground must not be greater than 400 nF.

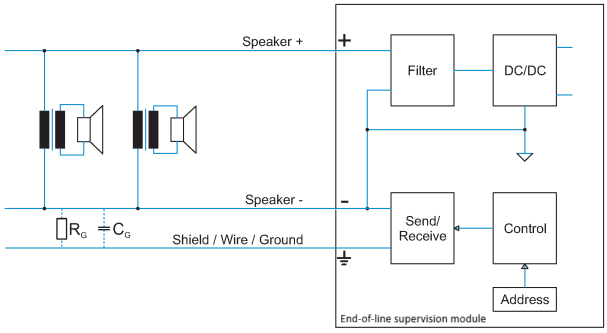
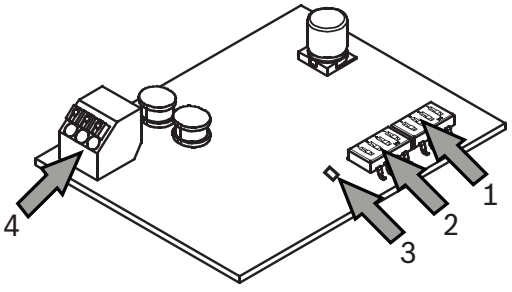


Figure 8.1: Circuit diagram (R_G and C_G are caused by the loudspeaker installation, e.g. wire type, length)

EOL monitoring function setup

Connect the EOL slave modules to the end of the speaker line. Set the desired address at the DIP switches . For details please refer to the installation note of the PVA-1WEOL.



8.1.3 Plena EOL

The Plena end-of-line boards can be used for permanent supervision on not active and active speaker lines. The PLN-1EOL module can be used e.g. for speaker lines with permanent background music or if passive volume controls are used.

Plena end-of-line boards PLN-1EOL monitor the presence of a pilot tone on a loudspeaker line. The board connects at the end of a loudspeaker line and detects the pilot tone signal. This signal is always present on the line: when back ground music (BGM) is playing, when a call is in progress, and when no signal is present. The pilot tone is inaudible and at a very low level (e.g. -20 dB). When the pilot tone signal is present, an LED lights up, and a contact on the board is closed. When the pilot tone fails, the contact opens, and the LED goes off. If mounted at the end of the loudspeaker line, this applies to the integrity of the whole line. Presence of the pilot tone signal does not depend on the number of loudspeakers on the line, the load on the line, or the line capacitance. The contact can be used to detect and report faults on a loudspeaker line.

Several EOL boards can be daisy-chained to a single fault input. This allows a loudspeaker line with several branches to be monitored. Since the background music also includes a pilot tone signal, there is no need to interrupt background music.

Please refer to the system manual for details about installation and configuration.

8.2 Pilot tone

This device includes an internal, configurable pilot tone generator and signal amplifier, which can be switched to the speaker zones. The pilot tone generator is configured using the IRIS-Net software.

Parameter	Value/Range
Generator status	On/Off
Signal frequency	18000-21500 Hz
Signal amplitude (depends on load)	1-10 V

Notice!
Under certain conditions (e.g. high signal level or loudspeakers with high sensitivity in the high frequency range) it may be possible that people can hear the pilot tone. In this case, increase the frequency of the pilot tone.

8.3 Amplifier input supervision

Each 100 V input (AMP IN) is equipped with level/pilot tone monitoring. This allows the connected amplifier and associated wiring to be supervised.

Parameter	Value/Range
Frequency	1000 - 25000 Hz
Voltage	> 3 Veff
Test cycle	< 10 seconds

The supervision can be switched on/off with the IRIS-Net software.

9 Maintenance

9.1 Firmware update

IRIS-Net can be used to update the firmware on the device. Depending on the CAN data rate used, the update will take one or more minutes to complete. Since development work is always being performed in relation to all system software, it may be necessary to update the firmware on the controller. Any software incompatibilities are displayed in IRIS-Net. For more information on firmware updates, please refer to the IRIS-Net documentation.

9.2 Resetting to factory default settings

The device is programmed in the factory with the following functions and properties:

Parameter	Setting/description
CAN baud rate	10 kbit/s
Speaker out relays	Off (all zones switched to AMP IN 1)
GPI	Digital input (no supervision)
GPO	Off
Internal pilot tone generator	Off

Table 9.8: Device factory default settings

The device settings can be reset to the default values manually or using IRIS-Net. To perform a manual reset, perform the following steps **with the device switched on**:

1. Disconnect the device from the CAN BUS.
2. Set the address to “00” using the CAN ADDRESS selector switch on the rear panel.
3. Press the Recessed button on the front panel and keep the button pressed down for three seconds.

The device has now been reset to the factory default settings.

Caution!
Before reconnecting the device to the CAN BUS, note the CAN baud rate, which may change under certain circumstances.

10 Technical data

Electrical

Audio inputs (100 V)	AMP IN: 4 x 6-pin port
– Max. voltage	120 V_{eff}
– Max. current	7.2 A
– Max. power	500 W
Audio outputs (100 V)	SPEAKER OUT: 4 x 12-pin port
– Max. voltage	120 V_{eff}
– Max. current	7.2 A
– Max. power	500 W
CONTROL IN	4 x 10-pin port
– Control inputs	– 10 supervised inputs (0-24 V, U_{max} = 32 V) – 10 isolated inputs(Low: U ≤ 5 V DC; High: U ≥ 10 V DC, U_{max} = 32 V)
CONTROL OUT	4 x 10-pin port
– Control outputs	24 Low Power outputs (open collector, U_{max} = 32 V, I_{max} = 40 mA)
– Control relay	2 (NO/NC relay contacts, U_{max} = 32 V, I_{max}= 1 A)
Interfaces	
– CAN BUS port	2 x RJ-45, 10 to 500 kbit/s (for controller, router, amplifier connection)
DC power input	21-32 V DC
Power consumption	5-60W
Maximum supply current (24 V)	
– Standby	– < 250 mA
– Idle/announcment/alert	– < 800 mA

Environmental

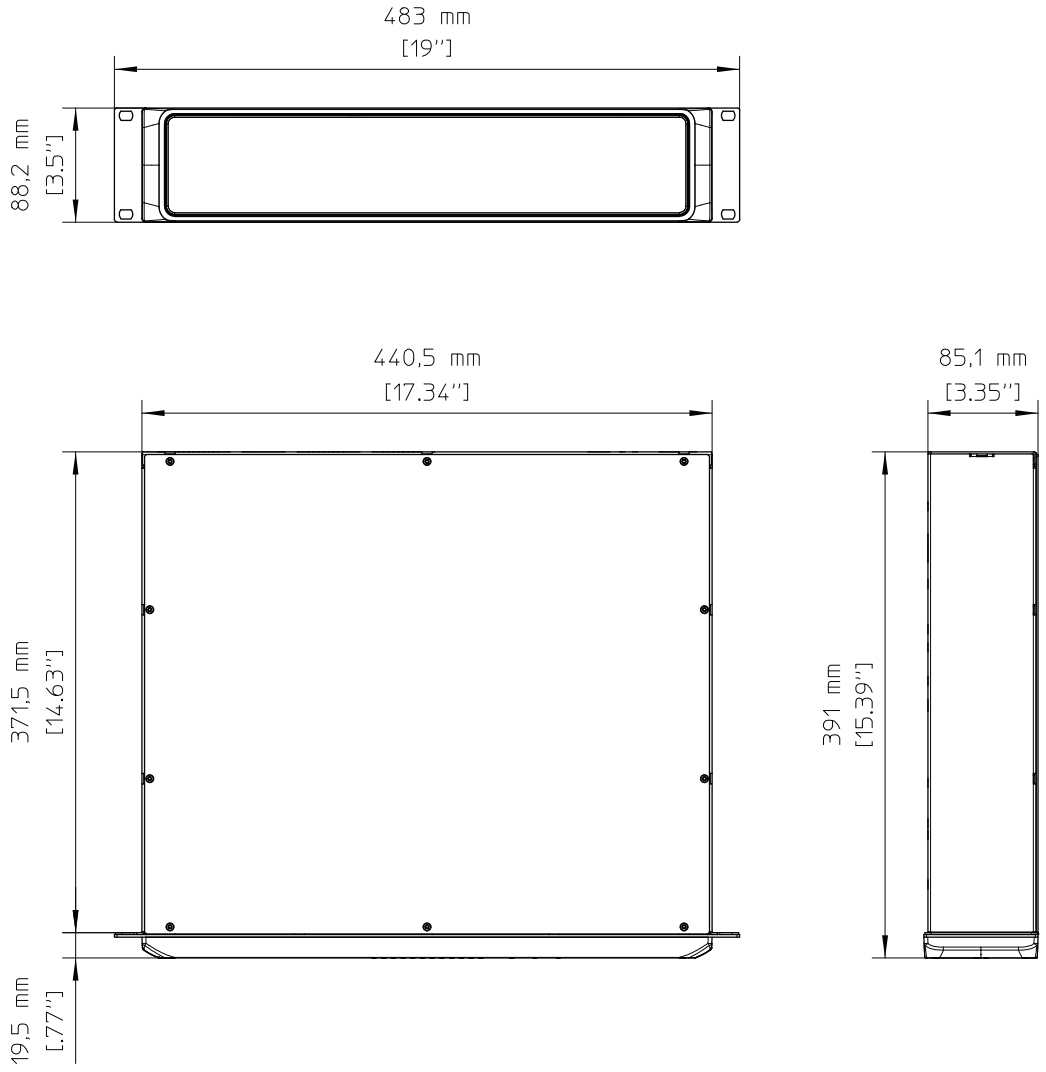
Operating temperature	-5 °C to +45 °C (+23 °F to +113 °F)
Storage temperature	-40 °C to +70 °C (-40 °F to +158 °F)
Humidity (non-condensing)	5% to 90%
Altitude	Up to 2000 m

Mechanical

Dimensions (HxWxD)	88 mm x 483 mm x 391 mm

Weight (net)	8.2 kg
Mouting	Standalone; 19 in. rack
Color	Black with silver

10.1 Dimensions



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