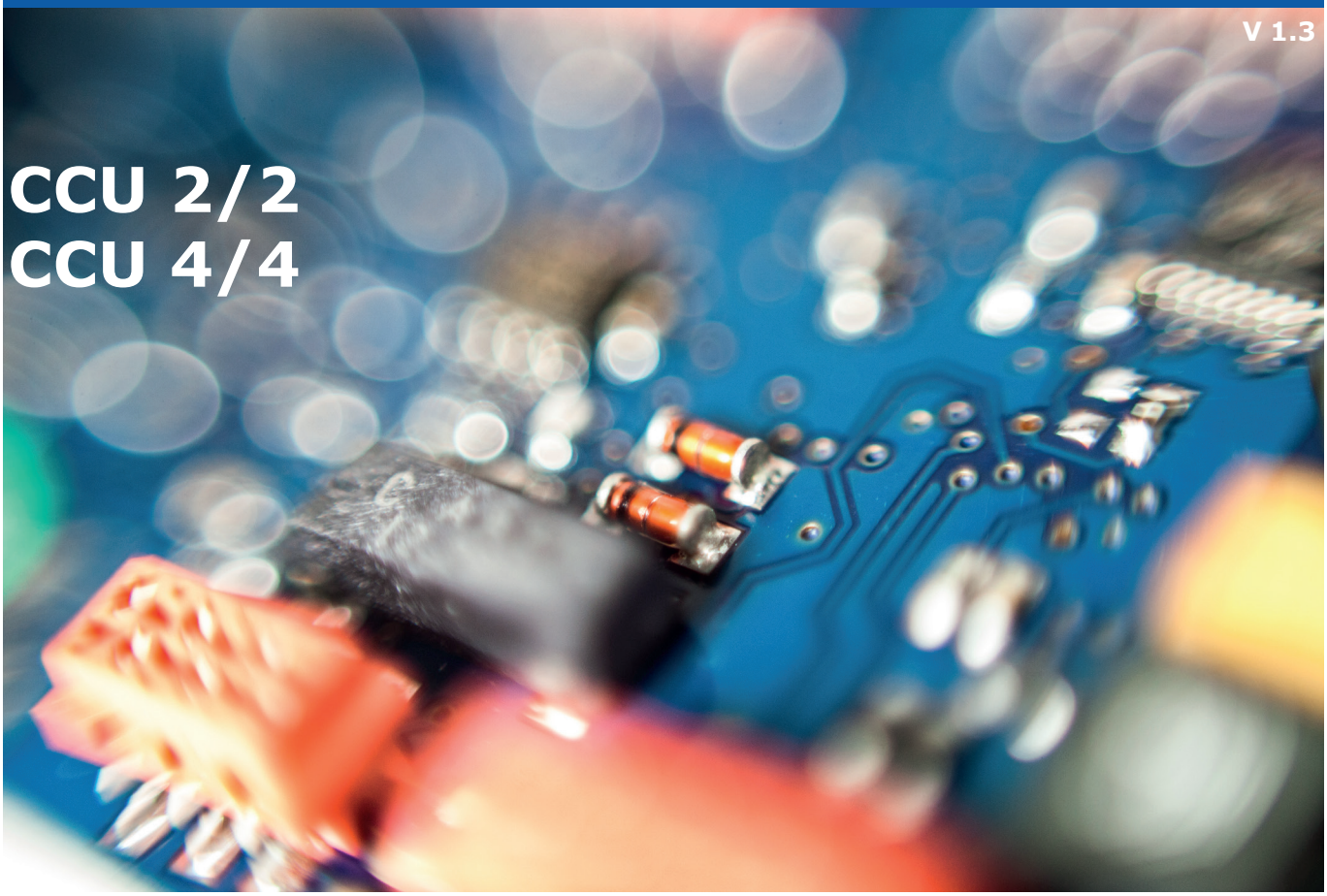
DOCUMENTATION

USER- AND INSTALLATION MANUAL PAN 2-LINE



PAN 2-Line - TRANSMISSION TECHNOLOGY BASED ON A TWO-WIRE CONCEPT

Please read this manual carefully before operating the equipment and keep it for future references.

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Contents

1. Introduction

Thank you for choosing Pan Acoustics. With the easy to use Pan 2-Line system, it is possible to replace conventional passive speakers in a very easy way. Pan 2-Line's wiring only involves two wires. Pan Acoustics products stand for highest quality and reliability. Please read this operating manual carefully before operating the equipment.

1.1. Symbols and Meanings

⚠DANGER	The symbol "Danger" indicates a danger for the life and health of persons, if the safety advices adjoining this symbol are not respected.
⚠WARNING	This symbol indicates a danger with a lower risk level, which, if ignored, could result in minor injuries or cause property damage.
⚠CAUTION	This symbol indicates endangerment with a lower risk level, which, if ignored, could result in minor or moderate injury.
⚠NOTE	The Note symbol indicates all warnings, which, if not complied with the operating instructions, may result in damage to the product.

1.2. General Information and Target Group

All specifications relating to the described products and to the safety regulations, which appear in this manual, are based on information that were available at the time of its preparation.

This guide gives information about the set-up, functions and connection of the Pan 2-Line CCU 2/2 and 4/4, to the mains and audio sources to devices having a Pan 2-Line port and is aimed to those system engineers that are tasked with the installation and operation of a Pan 2-Line system.

Pan Acoustics reserves the right to make alterations and modifications within the framework of the legal provisions and product improvements without prior notice.

All persons who use this device must have read these safety instructions carefully before operating the equipment (see also "Operating manual Pan Beam Setup"). Keep this information accessible at all times for future reference.

Further information and documents are available for download from our website, www.pan-acoustics.de or send us an email to contact@pan-acoustics.de

1.3. General Safety Regulations

Before operating this system, please read the following safety regulations completely and carefully and keep it close to the device.

⚠DANGER

This equipment conforms to class 1 safety standards, which means that the appliance should only be connected to an earthed socket installed in accordance with the regulations. The protective conductor should never be separated. The input voltage of the devices you want to connect must match the local power network voltage. To avoid the risk of electrical shock and fire, it‘s important to ensure that all persons involved in the installations of the device have carefully read the operating manual.

⚠WARNING

To minimize the risk of electric shock:

- The product may not be connected to the main power, when its housing is opened.
- The product must be used only with an intact power cord.
- The product should only be connected to a mains power supply if the mains voltage corresponds to the one specified on the product.
- The power cords should be positioned in such a way, they are protected from impact damage, pinching and tensile load.
- All equipment connected together via signal cables having a connection to protective ground, must be connected to a common protective earth/ground conductor.

To reduce the risk of fire or electrical shock:

- Do not expose the device to rain, moisture or humidity.
- Do not place any container filled with water such as vases on or near the device.
- Do not cover or obstruct the ventilation grilles with textiles for example.
- Do not expose the device to excessive heat, sunshine or similar.
- Do not expose the product to naked flames (such as candles).

To avoid possible injury, the product must be switched off and secured against unintended operation in the following cases:

- There are visible signs of damage.
- It contains any loose parts.
- It does not work properly.
- It has been stored for long period in unfavourable conditions, such as outdoors, or in wet rooms.
- It has been exposed to bad stress during transport (i.e. with sensible unsuitable packaging).

To prevent damage to the product and avoid injury:

- This product should not be operated by children.

To avoid potential hearing damage caused by excessive sound levels, make sure that:

- You do not stand directly in front of an operational loudspeaker.
- You are not exposed to high volume levels for a longer period.

⚠CAUTION

To prevent damage to the product, you should avoid the following:

- Acoustic feedback.
- Distorted high-level signals over on longer period.
- Popping noises that can occur when the product is switched on, or disconnected while in use.
- Leaving the power cable plugged in if the product is not in use for a longer period.
- Operating the device in environments with high humidity.
- Using the device without adequate air circulation around.

⚠NOTE

Equipment protection and operational safety

- Pan 2-Line‘s devices should only be connected to the CCU, if the CCU is disconnected from the power supply.
- The unit is only switched off completely after having disconnected the mains plug.
- The surface should only be cleaned from outside using a dry cloth.
- The product should always be transported in its original packaging.

1.4. Product Description

The CCU is the Central Control Unit of the Pan 2-Line system (P2L). The CCU provides you the power, audio, and control data for each Pan 2-Line line (2-wire system). Up to four Pan 2-Line lines can be connected to the CCU. Each line has its own audio signal. After having installed the “Pan Beam Setup” on your PC, you can configure the connected Pan Beam P2L speakers by your PC using the USB cable. Switching of the presets stored in the Pan 2-Line system is possible via a selector switch or media panel.

The wiring of a CCU only involves two wires. The CCU can be connected to the Pan Beam P2L speakers using the 2-wire system. The speakers can be connected in a daisy chain, star or daisy-chain-star configuration structure. The distance from the CCU to the last speaker on the line could reach 150 m max. This distance depends on the cable used and its cross section.

1.5. Included in the Delivery

All Pan Acoustics products are manufactured in Germany in accordance with the current safety requirements. Each product is thoroughly tested before dispatch according to internal quality assurance guidelines.

Please examine your packaging and product carefully for any signs of damage that may have occurred during transportation and inform your dealer and delivery company immediately if this is the case. The delivery includes the following:

1x Central Control Unit CCU 2/2 / Central Control Unit CCU 4/4
1x Power cable
1x USB cabel (B)
1x Quickstart manual

2-pole connector (green): CCU 2/2 (x2) / CCU 4/4 (x4)

1.6. Definition of Terms

Pan 2-Line (P2L)
Transmission of audio, data and power supply using only 2 wires.

Pan 2-Line System
A Pan 2-Line system consists of 3 components: a 2-wire system, Central Control Unit (CCU) and Pan Beam P2L loudspeakers which feature the Pan 2-Line Technology.

Pan 2-Line CCU 2/2 | CCU 4/4
The Central Control Unit is available in 2 different versions: 2/2 and 4/4 that means 2 inputs and 2 output or 4 inputs and 4 outputs.

USB
It is a serial port for the connection of devices with a computer.

"Pan Beam Setup" Software
Software that allows the set up of the Pan Beam speakers.

EIA / RS 485
Electrical serial interfaces for duplex transmission of control data

EIA / RS 232
Electrical serial interfaces for half-duplex transmission of control data

D-Sub
Multiple standard connectors

2. Installation and Connection

2.1. Set-up Location

The Central Control Unit should be operated in a dry dusty-free environment, where a sufficient air circulation is assured.

The device may be damaged if it comes in contact with condensation.

The ambient temperature of the device should not exceed 40 °C and not 0 °C below.

⚠WARNING

When unpacking the device, please be aware of the temperature difference between the ambient temperature and the device. At higher levels of temperature difference, it is recommended to wait a sufficient time before starting up the device, in order to avoid damage due to condensation.

⚠NOTE

If the ambient temperature exceeds 40 °C, appropriate measures should be taken to save the device from overheating. If the CCU is overheated, the system switches automatically off and after it has coolded down, it switches on again.

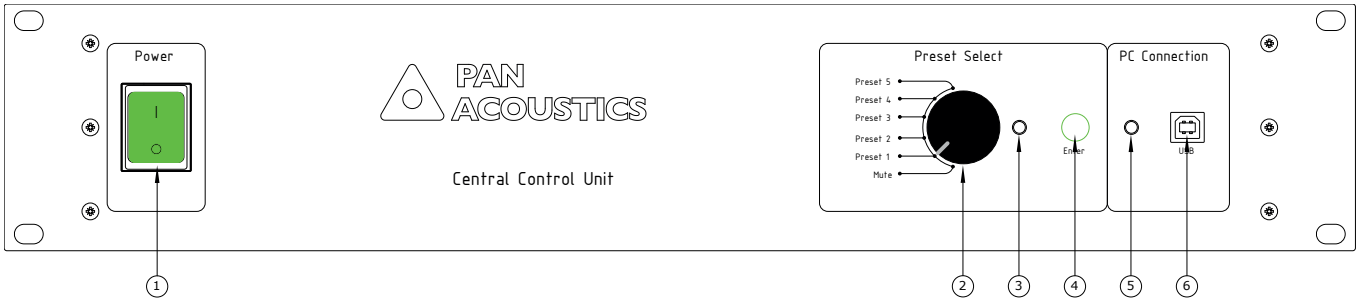
2.1.1. Rack Mounting

The CCU can be built into 19" rack cabinets. Both CCU versions 2/2 and 4/4 require two height units (88mm). The installation depth is 361mm including plug-in connector.

While rack mounting it's important to note that the ventilation slots of the cooling appliance on top of the housing may not be covered by cables, clothes or mounting units.

2.2. Connectors and Operating Controls

2.2.1. Front Panel



(1) Power switch
Switch setting 0, the device is switched off
Switch setting I, the device is turned on
The power switch lights green

(2) Control element (rotary switch)
Rotary switch helps for selecting the presets stored in connected Pan Beam P2L loudspeakers. The selection-confirmation is done by pressing the enter switch
-->See Chapter 10.1. "Rotary switch"

(3) LED 1
-->See chapter 5 "Troubleshooting"

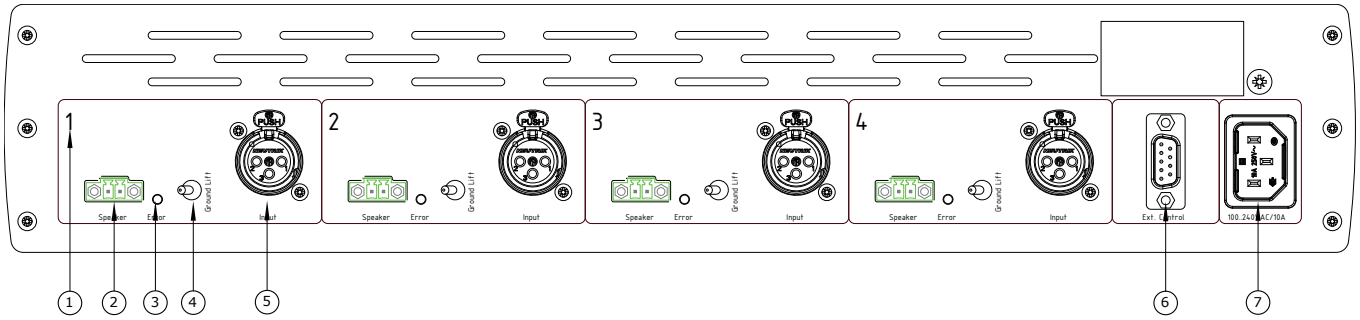
(4) Control button (Enter)
Press "Enter" to confirm the selected preset

(5) LED 2
LED lights green
-> USB connection is active

LED flashes orange
-> Data transmission occurs

(6) USB connection
USB connection for PC with "Pan Beam Setup" Software

2.2.2. Back Panel



(1) Pan 2-Line input / output
CCU 2/2 – Area 1 and 2 fitted
CCU 4/4 – Area 1 up to 4 fitted

(2) Pan 2-Line output
2-pole connection terminal with screw connection (phoenix type)
Output voltage: 48V DC
Max. Power output: 200watt

(3) LED red
LED on: short circuit on the Pan 2-Line
LED off: normal operating conditions

(4) Ground lift switch audio input
Switch setting on the left: ground lift off
Switch setting on the right: ground lift on

(5) Symmetrical Audio Input
3-pole input XLR (female)
Input sensitivity: +2 bBu

(6) Serial interface D-Sub
For connection to media control
--> see Chapter 10.2 "Media Control"

(7) Mains connection
3-pole cold-device-plug with integrated strain relief and protective earth
Supply voltage: 100 – 230V, 50/60 Hz

3. Design

The Pan 2-Line technology enables the installation of active loudspeakers with beam steering technology, using existing 2-wire network (see 3.2.). Despite the limited amount of speakers, high speech intelligibility is reached. Digitally controllable speakers such as PB 04-P2L, PB 08-P2L achieve a great coverage and precise sound focus what conventional 100V speaker would never reach. The less speakers are used, the less background noise is perceptible.

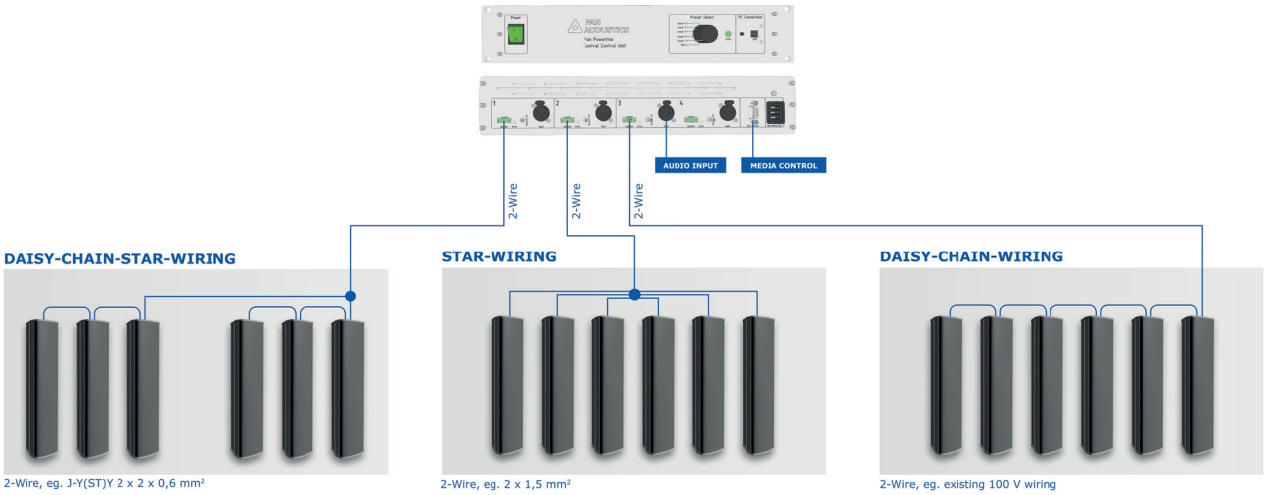
⚠NOTE

Before installing a Pan 2-Line system, please check the mains system for damaged spots, short circuit and earthing faults. Any faults or defects have to be professionally repaired. To avoid damage to the Pan 2-Line System, all products that are not included in the delivery should be removed.

3.1. System Design

A Pan 2-Line system consists of a Central Control Unit (CCU) and Pan 2-Line Pan Beam speakers. The loudspeakers can be daisy chained together or having a star-chained structure. Following structure are possible:

- Point-to-Point Connection (Daisy-Chain)
- Star-Wiring
- Meshed Network (Point-to-Point / Star-Wiring)



3.2. Cabling

The wiring requires only two wires. To ensure a maximum system performance, please make sure that the minimum cable cross section (per cable) is 0.8mm². Check that the maximum length from the last speaker to the CCU is 33m. Existing installations based on 2-wire system should have maximum cable cross section of 0.6mm².

The maximum line length of Pan 2-Line is depending on the speaker type and the network structure. The ohmic resistance of a line including all other joints should not exceed 10 ohms. If the electrical resistance is exceeded, this may result in mistakes in the signal transmission and power supply.

Connecting cables that are no longer needed can be replaced to the next connector. If this is not possible, you have to secure cable ends against short circuit e.g. through the use of heat shrinkable tubing.

4. Initial Operation

4.1. Connection

The CCU is connected to the 2-wire system using the supplied 2-pole plug.

The speakers are connected to the 2-wire system using the supplied 2-pole plug.

--> See chapter 10.6. „Pin Assignment"

⚠NOTE

During assembly of the 2-pole plug onto the 2-wire system, please ensure that the installation is professionally mounted. The installation of all the junctions, distribution boxes and connector sockets must be safely done. High transition in the connecting elements is to be avoided and if necessary action should be taken to resolve the problem. Any signs of corrosion at the cable ends should be removed. The connection of the 2-wire to the 2- or 5-pin connector can be done as desired.

4.2. Loudspeaker Set-up

Install the "Pan Beam Setup" software program on your PC.
Connect the PC to the CCU at the front of CCU using the supplied USB cable.
The LED is green lighting when the "Pan Beam Setup" has been successfully initialized.
Important notes for operation of the software see "Manual for Pan Beam Setup"

**(see chapter 2.2. Connectors And Operating Controls)*

4.3. Information about the abnormal Operation

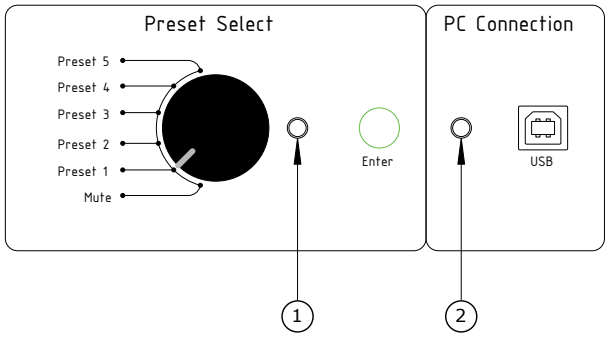
Before using the system, please read the section 2.1. on "Installation Site"

If any of the following issues occur, please contact your nearest Pan Acoustics' partner:

- The power supply cable is damaged
- A foreign body or liquid has got into the device
- The device has been exposed to rain
- The device is not working as usual i.e. you notice a significant change in its performance
- The device has been dropped
- The device housing has been damaged

5. Troubleshooting

5.1. LED Status at the Front Panel



	Display		Significance
LED 1	○	off	Device is defective / no supply voltage
	●	red light	Power amplifier in the CCU is defective, Analogue input overload
	●	green light	Ready for operation, operation via panel is possible
	●	orange light	Data communication
	✿	flashing green	Control via ext. Interface, CCU's control elements locked
	✿	flashing orange	Communication via USB connection Control elements, external control locked
	✿	flashing red/green	Amplifier faults, ext. Control active (if connected)
	✿	flashing red/orange	Amplifier faults, Control via USB, Analogue input clip
	✿	flashing green/orange	"Enter (4)" button clamps

	Display		Significance
LED 2	○	off	USB connection fail
	●	green light	Operation via USB
	●	orange light	Data communication

5.2. Error Description

Problem	Cause	Possible Solution
No LEDs are lit	CCU switch off No electrical current flows	Switch CCU on Check the connection and supply voltage
Signal LED 1 is red	Power amplifier on CCU is defective	Contact service
The red LED on the back of CCU is illuminated	Short circuit on the Pan 2-Line	Short circuit on the Pan 2-Line is to solve by professionals
Connected Pan Beams are not recognized by the software	Pan Beams are not connected to the P2L system	Check the connection
There is no audio	No audio signal connected	Connect the audio signal via audio input
No audio despite the correct connection	Audio input is incorrectly selected	Check the audio signal Check the cabling to the sound source
No audio despite the correct connection	No audio signal The cable is damaged	Check the audio signal Check the cabling to the sound source
No connection via USB	USB cable incorrectly connected USB cable is damaged After starting the program, connect the USB cable to the USB port	Check that the component cable is correctly connected Replace the USB cable Restart the „Pan Beam Setup" Program
Media control does not work properly	Pin assignment incorrect Baud rate incorrect Incorrect instructions set	Check the Pin assignment Setting the correct baud rate Check the instructions set

If your problem does not appear in the above list, or the problem is not solved using any of these suggestions, please contact Pan Acoustics's technical support.

Please keep the packaging that the device arrived in so that, in the event of a claim, it can be returned in the original packing. This will minimize the risk of any potential damage during transportation.

5.3. Service and Repair

Servicing and repair should only be undertaken by suitably trained Pan Acoustics's personnel.

Do not carry out any servicing or repairs on the device apart from the recommended maintenance.

Contact address:
-->See chapter 9. "Contact Address"

6. Maintenance

The following should be carried out on a regular basis:

Cleaning
The device‘s housing should be regularly dusted using a damp cloth and inspected for any damage.

The following should be carried out:
The installed device should be visually inspected regularly.

- Make sure that the Pan 2-Line and the Pan Beam loudspeakers are correctly connected.
- Check the media connections.
- Check the function of the preset selector (only if the device is running with a media control system. It‘s important to disconnect the media control system for the test period.)
- Check the unit housing for damage.
- Check the power supply cable for damage.

7. EC Conformity

Pan Acoustics declares that the products CCU 2/2 and CCU 4/4 fully comply with the essential requirements and other provisions of the EU Directives 2004/108/EG and 2006/95/EG.

8. WEEE Directives (Disposal)

Electrical and electronic components must not be disposed of in your normal household waste. This symbol appears on our products. Before disposing this product, please consult your retailer or distributor.

9. Contact Address

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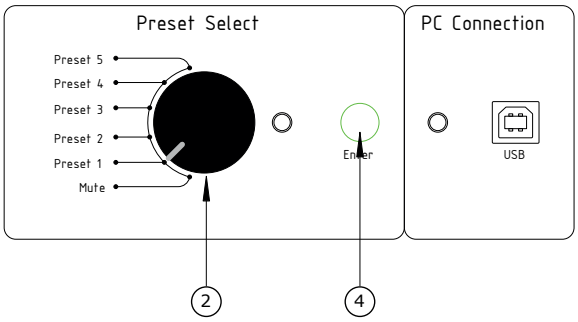
10. Annex

10.1. Rotary Switch



(2) Control element (rotary switch)
The rotary switch helps in selecting the presets stored in connected Pan Beam P2L speakers. The selection is done by operating the control element (4).

(4) Control element (Enter)
Press "Enter" to confirm the selected preset

Up to five presets stored in the Pan 2-Line system can be accessed directly, using the rotary switch "preset switch (2)". The selected preset is confirmed by operating the "Enter" button. The LED (3) flashes orange when the preset is active. LED (3) lights green after successful preset switching.

The mute status is accessed via the rotary switch (2). All connected Pan Beam P2L speakers are muted by operating the mute button.

The restart of the system is done using the mains switch. After the system has been restarted, the speakers automatically activate the latest preset that has been used.

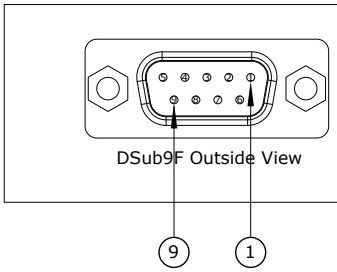
⚠NOTE

The data available for settings are stored in the connected Pan Beam P2L speakers. There are no data stored in the CCU. The onboard controller supports the transmission of control signals to the connected speakers in order to activate the selected preset. The configuration of the presets is done via the program "Pan Beam Setup".

10.2. Media Control

The presets stored in the Pan Beam P2L can be accessed via serial commands through the CCU. You can find the corresponding terminal ((6) DSUB9F) on the back of the CCU (*see chapter 2.2.2. Back Panel*).

10.2.1. Terminal Assignment



Pin No.	Signal	Direction
1	D+ (RS485)	IN/OUT
2	TXD (RS232)	OUT
3	RXD (RS232)	IN
4	N.C.	-
5	GND	-
6	N.C.	-
7	N.C.	-
8	N.C.	-
9	D- (RS485)	IN/OUT

10.2.2. Serial Commands

The serial commands can be transmitted to the CCU via RS-232 or RS-485 protocol. The commands are given in plaintext as ASCII strings via a corresponding line.

String (ASCII)	Preset function
0	Mute
1	Preset 1
2	Preset 2
3	Preset 3
4	Preset 4
5	Preset 5

Interface configuration

Baud rate	19200
Data bits	8
Parity	none
Stop bits	1
Flow control	none

10.3. Cable lengths and types

Different cable types and lengths can be used for a Pan 2-Line system. The number of Pan Beam P2L operated is depending on the cable type and length. The length information in the table below is maximum lengths. The maximum length results from the addition of all partial lengths on a Pan 2-Line.

Daisy-Chain

In a daisy-chaining system, the maximum total length is given by adding all partial lengths.

$L_{aggregate}$ = L1 + L2 + L3 + ...

L1 = CCU --> Pan Beam P2L 1
L2 = Pan Beam P2L 1 --> Pan Peam P2L 2
L3 = Pan Beam P2L 2 --> Pan Beam P2L 3

Star-Wiring System

In a star wiring system, the maximum total length corresponds to the most distant P2L speaker which must be cabled.

L_{max} = most distant Pan Beam P2L

Daisy-Chain-Star System (Meshed System)

In a meshed system, the maximum total length results from the addition of all partial lengths and jumps observed on the straight line. The longest line is the maximum total length.

⚠NOTE

The maximum resistance of a Pan 2-Line system should not exceed 10 ohms. If this limit is exceeded, the safe operation of the system is not guaranteed.

Cable Type	Cross Section (mm²)	Maximum Cable Length (Distance in Meter) CCU is fed through x "P2L speaker"				
		1 x PB 04-P2L	2 x PB 04-P2L	4 x PB 04-P2L	1 x PB 08-P2L	2 x PB 08-P2L
Telephone cable JY (ST) Y	0.6*	270 m	135 m	67,5 m	135 m	67,5 m
Telephone cable JY (ST) Y	0.8*	540 m	270 m	135 m	270 m	135 m
Loudspeaker cable	1.5**	750 m	750 m	375 m	750 m	375 m
Loudspeaker cable	2.5**	625 m	625 m	625 m	625 m	625 m

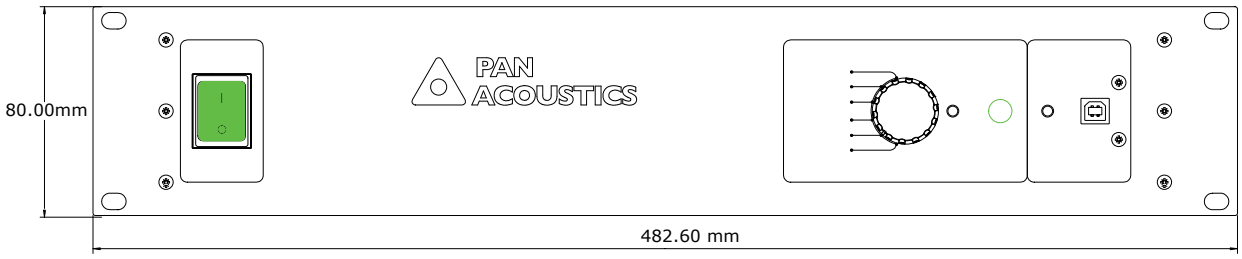
Cable Type	Cross Section (mm²)	Maximum Cable Length (Distance in Meter) CCU is fed through x "P2L speaker"			
		1 x PB 08-P2L + 2 x PB 04-P2L	1 x PB 08-P2L + 4 x PB 04-P2L	1 x PB 08-P2L + 4 x PB 04-P2L	4 x PB 08-P2L
Telephone cable JY (ST) Y	0.6*	67,5 m	45 m	30 m	33.75 m
Telephone cable JY (ST) Y	0.8*	135 m	90 m	60 m	67.5 m
Loudspeaker cable	1.5**	375 m	250 m	167 m	187.5 m
Loudspeaker cable	2.5**	625 m	417 m	417 m	312.5 m

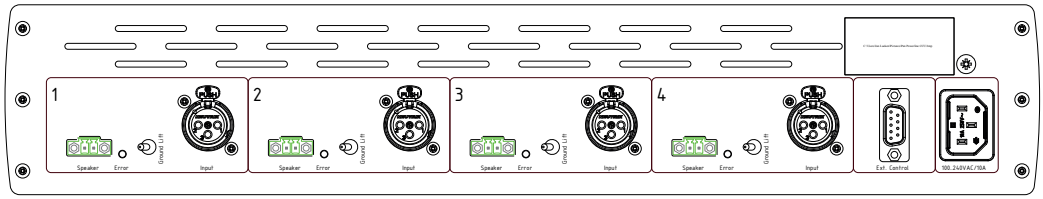
Information: a PB 16 C P2L has the same power performance as a PB 08 P2L.
All values specified in the table are based on theoretical calculations, they may differ in installations.
* Diameter (mm) / **Cross section (mm²)

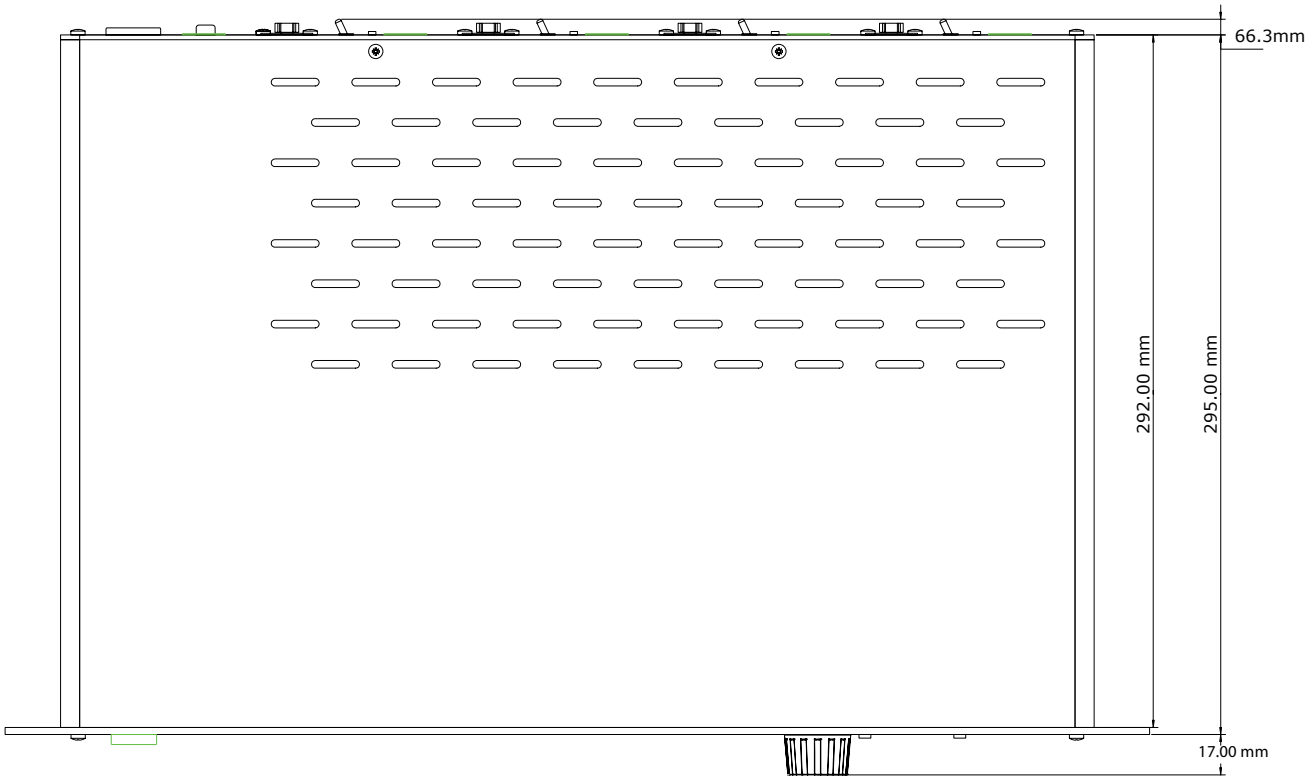
10.4. Specifications

Central Control Unit	CCU 2/2	CCU 4/4
Power consumption	AC 100-240V ~50/60Hz	AC 100-240V ~50/60Hz
Nominal power input	360VA	500VA
Peak power input	600VA	800VA
Nominal power consumption	1.5A	2.0A
Peak power consumption	2.6A	3.5A
Dimensions (WxHxD) mm	482.6 x 88.1 x 319	482.6 x 88.1 x 319
Weight	4.3 kg	4.8 kg
Enclosure	Aluminium	Aluminium
Analogue audio input	2	4
Input sensitivity	1 V_{eff}	1 V_{eff}
Pan 2-Line output (2-pole)	2	4
Pan 2-Line output power	200W per output	200W per output
Safety switches	• Short circuit • Soft start • Overload • Overheat	• Short circuit • Soft start • Overload • Overheat
Temperature range	0 °C - 40 °C	0 °C - 40 °C
Connection for the connection	• USB (B) supports: • USB 2.0 / USB 3.0 • Media control D-SUB9F	• USB (B) supports: • USB 2.0 / USB 3.0 • Media control D-SUB9F
Preset selector for Preset switching	1	1
Display	• Data communication • Short circuit • Error	• Data communication • Short circuit • Error
Control and Monitoring	„Pan Beam Setup“ Program	„Pan Beam Setup“ Program

10.5. Technical Drawing



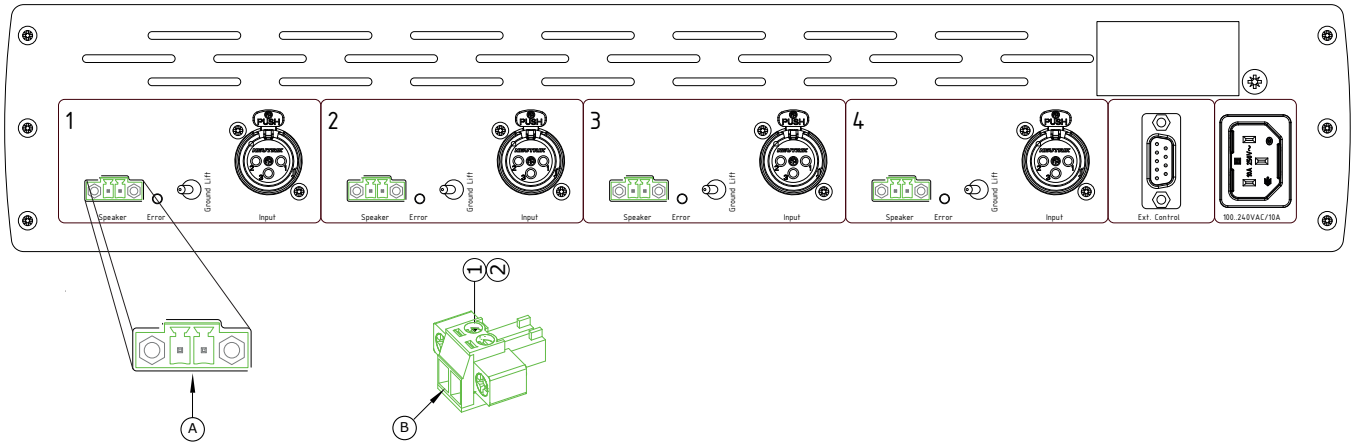




10.6. Pin Assignment

10.6.1. Pin Assignment CCU

The wiring for a Pan 2-Line system is connected to the Central Control Unit (CCU) using a 2-pin connector.



(A) Pin Assignment
Pin 1 and Pin 2

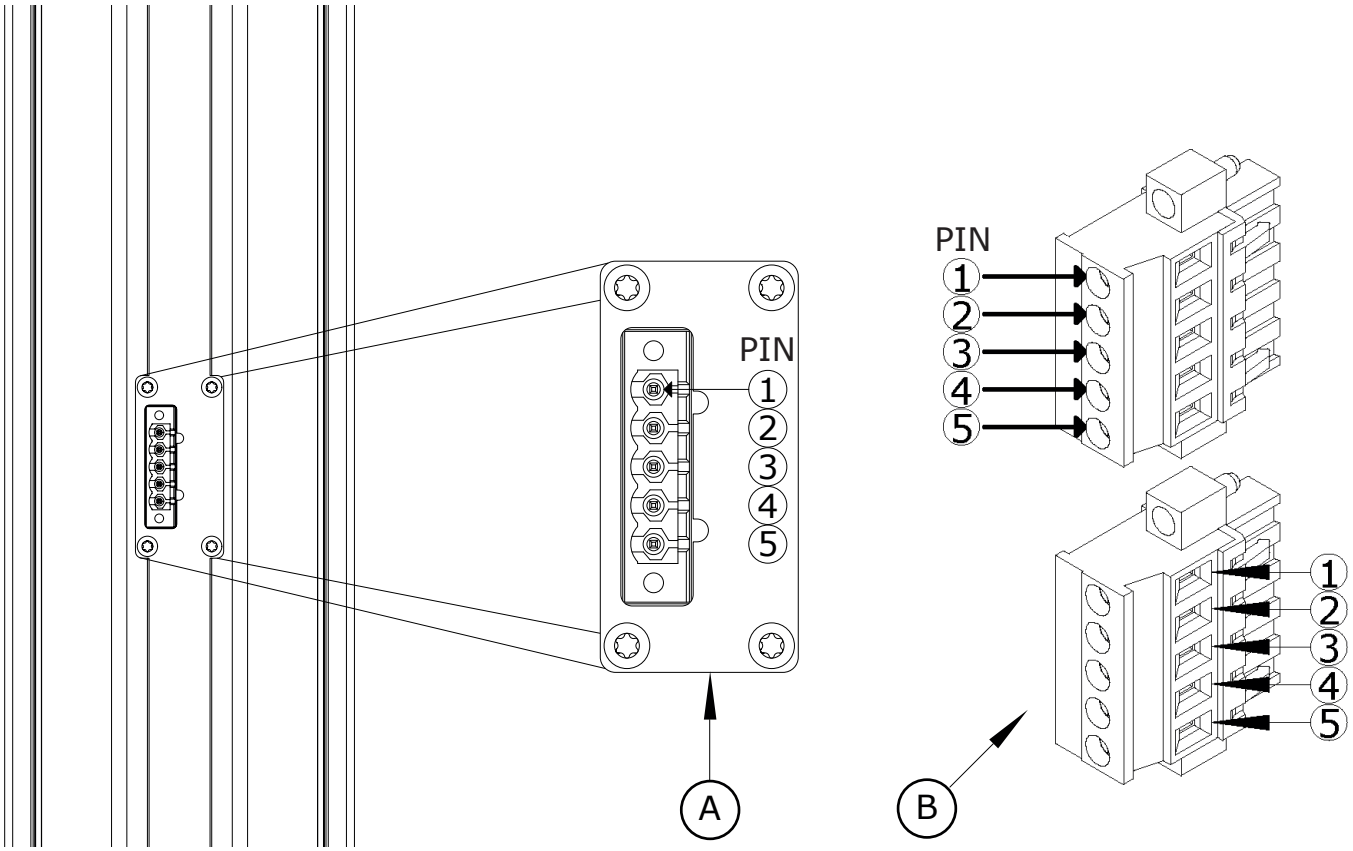
(B) 5-pole-Connector
maximum cross section 2.5 mm²

Pin	PPL
1	PPL+
2	PPL-

> ⚠NOTE
> Attention should be paid to the polarity within a pair of wires. When the polarity is rotated +/- to - / +, the system detects this and adjusts the polarity internally accordingly.

10.6.2. Pin Assignment Loudspeaker

Speaker of the Pan Beam series with Pan 2-Line technology, are connected via a 5-pin connector to the Pan 2-Line system.



(A) Pin Assignment
Pin 1 to 4 are connected
Pin 5 not in use

(B) 5-pole-Connector
maximum cross section 2.5 mm²

Pin	PPL
1	PPL+
2	PPL-
3	PPL+
4	PPL-
5	n.c.

Pins 1 and 2 are provided as input. Pins 3 and 4 for a loop through.
PIN 5 is not used. The pagination is done from top to bottom.

⚠NOTE

Pin 1 and 2 are provided as input. Pin 3 and 4 for a through-cut. Pin 5 is not used. The count is from top to bottom. Attention should be paid to the polarity within a pair of wires. When the polarity is rotated +/- to - / +, the system detects this and adjusts the polarity internally accordingly.

PAN ACOUSTICS

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