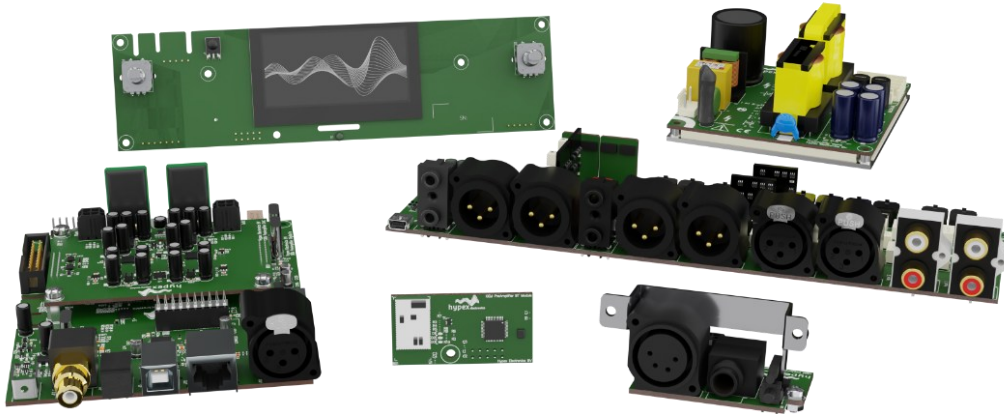


## OEM PreAmplifier kit - datasheet



### Introduction

The Hypex PreAmplifier Kit is a modular preamplifier platform designed for high fidelity audio systems. The audio signal path is fully analogue, while user interface and system management functions are controlled digitally.

The system consists of six PCB assemblies that together form the complete preamplifier platform. A universal power supply accepts an AC input between 100 V and 245 V and provides the required DC supply rails. The front interface board includes a 2.7 inch monochrome OLED display, two rotary encoders for user control, a headphone connection and an infrared receiver for remote control operation. The rear interface board provides analogue audio connectivity including balanced XLR and unbalanced RCA inputs together with trigger outputs.

Digital input functionality is provided by an integrated DAC module supporting interfaces such as AES, S PDIF, optical, USB and Bluetooth. Each input includes an individually adjustable gain offset to allow level matching between sources.

### Highlights

- Fully analogue
- 2.7" monochrome OLED display
- XLR and RCA analogue inputs
- Modular design
- Discrete op-amps & voltage regulator

### Features

- Firmware upgradable
- Remote control
- Trigger outputs
- Options:
  - DAC (AES, SPDIF, Optical, USB, Bluetooth)
  - Streaming option

### Applications

- Full analogue pre-amplifier

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## 1 Safety precautions



This module operates at mains voltage and carries hazardous voltages at accessible parts. These parts may never be exposed to inadvertent touch. Observe extreme care during installation and never touch any part of the unit while it is connected to the mains.

Disconnect the unit from the mains and allow all capacitors to discharge for 10 minutes before handling it.



Attention: Observe precautions for handling electrostatic sensitive devices. This module uses semiconductors that can be damaged by electrostatic discharge (ESD).

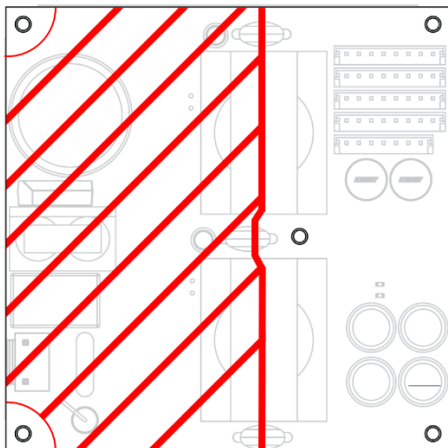
Damage due to inappropriate handling is not covered by warranty.

This product has no user-serviceable parts.



This symbol indicates the presence of hazardous voltages at accessible conductive terminals on the board. Parts that are not highlighted in red may also carry voltages in excess of 120 Vdc!

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



This is a Safety Class 2 device. When mounting the module in an enclosure, a minimum safety distance of 6mm from the module to all possible conducting parts must be ensured to keep compliance with Safety Class 2. All parts highlighted in red carry hazardous voltages. This includes parts on the top and the bottom of the board.

When this module is mounted in a tight space there needs to be at least 6mm clearance or a layer of insulation with a minimum thickness of 0.5mm between the top of the transformer and the housing.

## Précautions de sécurité



Ce module est sous tension secteur et certaines de ses pièces accessibles sont sous une tension dangereuse. Ces pièces doivent dans tous les cas être protégées contre contacts accidentels. Lors de l'installation, une prudence extrême s'impose. Ne jamais toucher les pièces du module quand celui-ci est relié au secteur. Isoler l'appareil du secteur et attendre 10 minutes pour laisser à tous les condensateurs le temps de se décharger avant de le manipuler.



Attention : Respecter les consignes de sécurité pour la manipulation d'appareils sensibles aux courants électrostatiques. Ce module est pourvu de semi-conducteurs qui peuvent être endommagés par les décharges électrostatiques (DES).

Les dommages causés par un usage non approprié sont exclus de la garantie.

Ce produit ne contient aucune pièce devant être entretenue par l'utilisateur.



Ce symbole indique la présence de tensions dangereuses aux broches de raccordement accessibles sur la carte. Les pièces non marquées en rouge peuvent être elles aussi sous une tension supérieure à 120 VCC.

**Avertissement:** Pour réduire les risques de choc électrique, ne pas exposer cet appareil à la pluie ou l'humidité.

1. Read these instructions.
2. Keep these instructions.
3. Heed all warnings.
4. Follow all instructions.
5. Do not use this apparatus near water.
6. Protect the power cord from being walked on or pinched, particularly at plugs, convenience receptacles, and the point where they exit from the application.
7. Only use attachments/accessories specified or approved by the manufacturer.
8. Unplug this apparatus during lightning storms or when unused for long periods of time.
9. Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally or has been dropped.
10. Don't run any cables across the top or the bottom of the module. Apply fixtures to cables to ensure that this is not compromised.
11. Observe a minimum clearance of 6mm with all possible conducting parts (housing etc.).
12. Natural convection should not be impeded by covering the module (apart from the end applications housing).
13. Before using this product, ensure all cables are correctly connected and the power cables are not damaged. If you detect any damage, do not use the product.
14. Changes or modifications not expressly approved by Hypex Electronics will void compliance and therefore the user's authority to operate the equipment.
15. Service or modifications by any person or persons other than by Hypex Electronics authorized personnel voids the warranty.

## 2 Electrical Specifications

### 2.1 Power Specifications

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Line Input Voltage	-	$V_B$	85		264	Vac	1)
Line Input Frequency	-	f	47		63	Hz	1)
Fuse rating	250Vac, slow blow			2		A	2)
Power consumption	Depending on load	$P_{max}$		10	60	W	3)
Standby power	230 Vac, 50 Hz				500	mW	

**Note 1:** Operation beyond these limits may result in irreversible damage of the power supply.

**Note 2:** If the fuse is blown, please have the module serviced by a skilled technician.

**Note 3:** Basic configuration draws typical 10W

### 2.2 General Performance Data

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Output Voltage Standby		$V_{OUT}$	11.5	12	12.5	Vdc	1)
Output Current Standby		$I_{OUT,MAX}$	0	-	2	Adc	2)
Output Voltage Vaux	Symmetric	$V_{AUX}$	2x14.5	2x15	2x15.5	Vdc	1)
Output Current Vaux	Symmetric	$I_{AUX}$	0	-	800	mA	3), 4)
In-rush current	5Ω In-rush NTC, worst-case	$I_{inrush}$			75	A	
Efficiency	Full power	$\eta$	-	85	-	%	
Power consumption	Depending on load	$P_{max}$			60	W	
Standby power	230 Vac, 50 Hz OEM	$P_{standby}$		250		mW	
Switching frequency		$F_{SW}$	-	-	150	kHz	

**Note 1:** Output voltage is proportional to the mains line voltage  
(Min@180Vac, Typical@230Vac, Max@264Vac).

**Note 2:** Limited by overcurrent protection. This output is fully long-term short-circuit protected: output to ground

**Note 3:** Limited by overcurrent protection. These outputs are fully long-term short-circuit protected: outputs to ground, output to output.

**Note 4:** If one of the rails uses less current than the other rail, the cumulative current should be below 1600mA. With extremely unbalanced loads, the voltage per rail may slightly vary, however the cumulative voltage will remain 30V.

### 2.3 Environmental Specifications all modules

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Ambient Temperature	Storage		0	-	50	°C	
	Operation		0	-	50	°C	
Humidity	Max 85 percent relative humidity, non-condensing.						

## 2.4 Power supply board IO pins

This chapter describes the functional connectors of the power supply module. A connector not stated in this chapter is only used for production or quality control and must remain unconnected in the end user application. The arrow points towards pin1 of the connector.

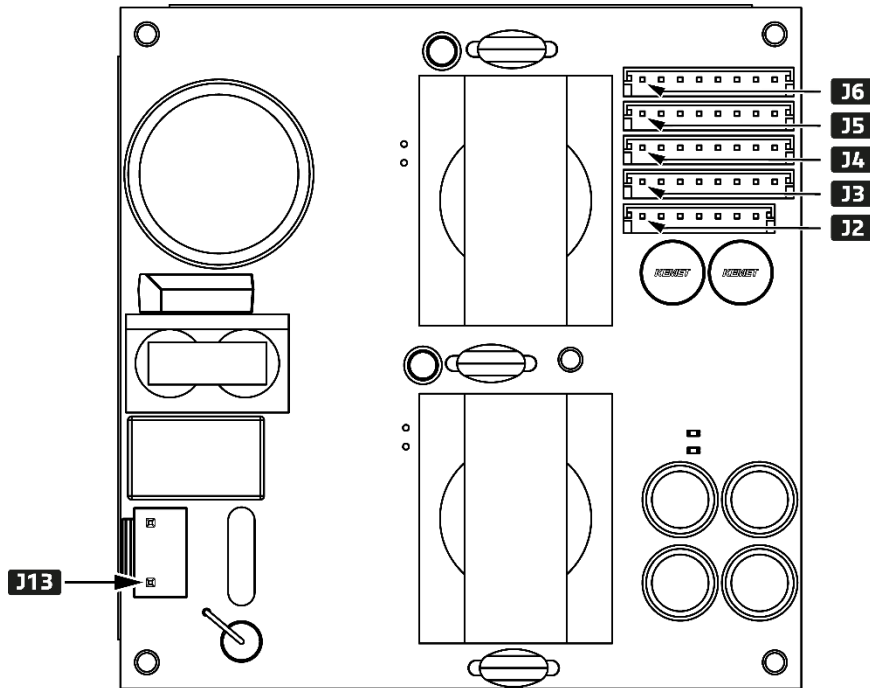


Figure 1: Power supply top view, arrows point to pins 1

## 2.5 AC Connector Specification J1

Pin	Direction	Function	Remarks
J1.1	Input	Mains input	Neutral AC
J1.3	Input	Mains input	Phase AC

**Connector type:** B2P3-VH(LF)(SN).

**Matching cable part:** VHR-3N.

## 2.6 Output Front board J2

Pin	Direction	Function	Remarks
J2.1	Output	$V_{standby}$	Positive regulated output voltage
J2.2	-	GND	
J2.3	Through	CBus	Internal communication bus
J2.4	Through	Wakeup	Signal to activate modules
J2.5	Output	AC Detect	Mains AC indicator
J2.6	Input	Supply enable	Power supply enable
J2.7	Output	Power Good	Power supply stable indicator

**Connector type equivalent:** B7B-EH.

**Matching cable part:** EHR-7.

### 2.6.1 Supply Enable

Applying a DC voltage to this input will enable the Vaux supply with a normal soft start. After removing the voltage, auxiliary output voltages will drop gradually.

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Supply Enabled	Logic High level		3,3	-	12	Vdc	1)
Supply Disabled	Logic Low level		-	-	0,8	Vdc	

**Note 1:** Current drawn MAX 2mA

### 2.6.2 Power Good

The Power Good will be activated if the main both the Standby and Vaux is within the normal operating window. If any of the supplies is out of normal operating window, Power Good will immediately be released. Power Good is an open collector output.

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Collector voltage	Open collector output		0	-	30	Vdc	
Collector current	Open collector output		-	-	10	mA	

### 2.6.3 AC Detect

The AC detect will be activated if the main the Standby supply is running. If AC is lost, after a brownout timer the Standby supply will power down. When this happens, AC Detect will be released. AC Detect is an open collector output.

Parameter	Conditions	Symbol	Min	Typ	Max	Unit	Note
Collector voltage	Open collector output		0	-	30	Vdc	
Collector current	Open collector output		-	-	10	mA	

## 2.7 Output modules

The following table is applicable to J3, J4, J5 and J6

Pin	Direction	Function	Remarks
J3.1	Output	V <sub>Standby</sub>	Positive regulated output voltage
J3.2	Output	V <sub>Aux+</sub>	Positive regulated output voltage
J3.3	Output	V <sub>Aux-</sub>	Negative regulated output voltage
J3.4	-	GND	
J3.5	Through	CBus	Internal communication bus
J3.6	Through	Wakeup	Signal to activate modules
J3.7	-	GND	
J3.8	Output	ACdet	Mains AC indicator

**Connector type equivalent:** B8B-EH.

**Matching cable part:** EHR-8.

### 3 Main module

#### 3.1 Performance data

MBW=20kHz (20Hz-20Khz), unweighted, all filters set to unity, gain adjust 0dB unless otherwise noted

Item	Symbol	Min	Typ	Max	Unit	Notes
Input level	$V_{IN}$		14.3 (4.0)	14.45	dBu ( $V_{RMS}$ )	XLR and RCA
Output level	$V_{OUT}$		14.3 (4.0)	14.45	dBu ( $V_{RMS}$ )	
Output level headphone	$V_{OUT}$		19		dBu	
Signal/Noise ratio	SNR		122		dB	-1dBFS Analogue in
Total harmonic distortion + noise	THD+N		-140		dB	Analogue in, -1dBFS
Noise	$V_N$		3		$\mu V$	Unweighted at unity gain
Noise headphones	$V_{N_{hp}}$		7.5		$\mu V$	Unweighted at unity gain
Input Impedance (DM) XLR	$Z_{IN, DM}$		100		k $\Omega$	Differential mode
Input Impedance (CM) XLR	$Z_{IN, CM}$		1.6		M $\Omega$	Common mode
Input impedance RCA			100		k $\Omega$	
Output impedance	$Z_{OUT}$			44	$\Omega$	
Output impedance headphone	$Z_{OUT_{HP}}$			0.5	$\Omega$	
Bandwidth	$F_c$	70			kHz	
CM Rejection Ratio	CMRR		-76		dB	All frequencies
Channel separation			-132		dB	Left/Right and inter-channel separation

#### 3.2 Mainboard IO pins

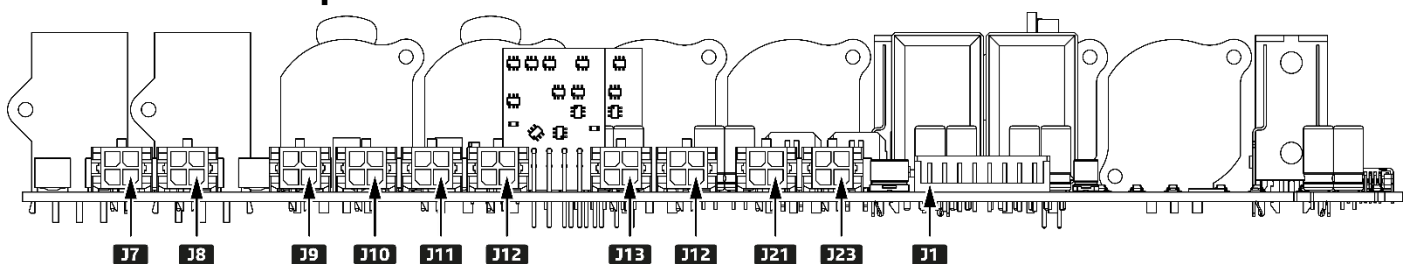


Figure 2: Mainboard internal connector overview, arrows point to pins 1

### 3.3 Internal connectors J1, J7..J14, J21, J23

#### 3.3.1 Bus connector J1

Pin	Direction	Function	Remarks
J1.1	Input	V <sub>Standby</sub>	Positive regulated output voltage (+12V typical)
J1.2	Input	V <sub>Aux+</sub>	Positive regulated output voltage (+15V typical)
J1.3	Input	V <sub>Aux-</sub>	Negative regulated output voltage (-15V typical)
J1.4	-	GND	
J1.5	Through	CBus	Internal communication bus
J1.6	Through	Wakeup	Signal to activate module
J1.7	-	GND	
J1.8	Input	ACdet	Mains AC indicator

**Connector type equivalent:** B8B-EH.

**Matching cable part:** EHR-8.

#### 3.3.2 Add-on connector J7 pinout

Pin	Direction	Function	Remarks
J7.1	Input	Left channel +	Add-on module left channel
J7.2	Input	Left channel -	
J7.3	-	GND	
J7.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

#### 3.3.3 Add-on connector J8 pinout

Pin	Direction	Function	Remarks
J8.1	Input	Right channel +	Add-on module right channel
J8.2	Input	Right channel -	
J8.3	-	GND	
J8.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

#### 3.3.4 Phono connector J9 pinout

Pin	Direction	Function	Remarks
J9.1	Output	Left channel +	Left routed input signal when Phono selected, otherwise connected to GND
J9.2	Output	Left channel -	
J9.3	-	GND	
J9.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

#### 3.3.5 Phono connector J10 pinout

Pin	Direction	Function	Remarks
J10.1	Output	Right channel +	Right routed input signal when Phono selected, otherwise connected to GND
J10.2	Output	Right channel -	
J10.3	-	GND	
J10.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 3.3.6 Phono connector J11 pinout

Pin	Direction	Function	Remarks
J11.1	Input	Left channel +	Left channel from phono add-on stage
J11.2	Input	Left channel -	
J11.3	-	GND	
J11.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 3.3.7 Phono connector J12 pinout

Pin	Direction	Function	Remarks
J12.1	Input	Right channel hot	Right channel from phono add-on stage
J12.2	Input	Right channel cold	
J12.3	-	GND	
J12.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 3.3.8 Headphones connector J13 pinout

Pin	Direction	Function	Remarks
J13.1	Output	Headphones right channel hot	
J13.2	Output	Headphones right channel cold	
J13.3	-	GND	
J13.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 3.3.9 Headphones connector J14 pinout

Pin	Direction	Function	Remarks
J14.1	Output	Headphones left channel hot	
J14.2	Output	Headphones left channel cold	
J14.3	-	GND	
J14.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 3.3.10 Internal equalizer connector J21 pinout

Pin	Direction	Function	Remarks
J21.1	Output	Gain stage left channel hot output	Left channel to equalizer add-on
J21.2	Input	Gain stage left channel hot volume	Left channel from equalizer add-on <sup>1)</sup>
J21.3	Output	Left channel cold signal	Internally connected to each other
J21.4	Output	Left channel cold signal	

**Note 1:** Only used when "Tone control" is activated in software

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 3.3.11 Internal equalizer connector J23 pinout

Pin	Direction	Function	Remarks
J23.1	Output	Gain stage right channel hot output	Right channel to equalizer add-on
J23.2	Input	Gain stage right channel hot volume	Right channel from equalizer add-on <sup>1)</sup>
J23.3	Output	Right channel cold signal	Internally connected to each other
J23.4	Output	Right channel cold signal	

**Note 1:** Only used when "Tone control" is activated in software

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

## 3.4 Backpanel connectors

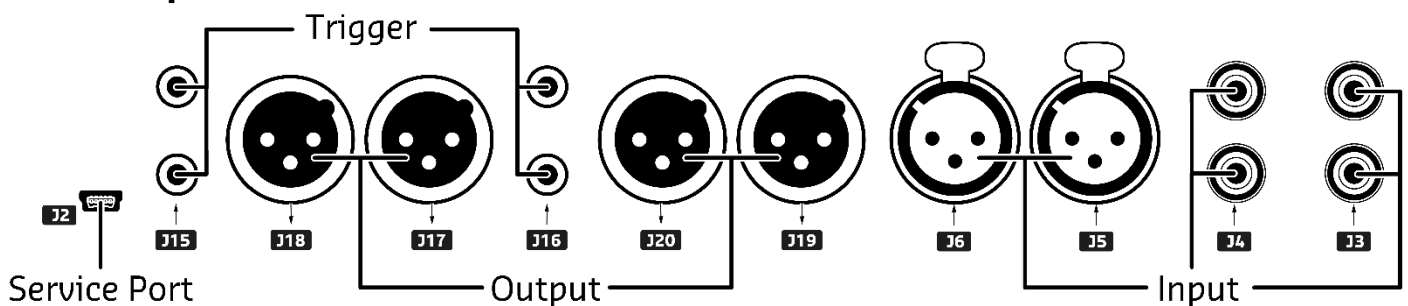


Figure 3: Mainboard backpanel connector overview

### 3.4.1 Service USB port J2

Mini-USB. Can be used to configure the PreAmplifier and update the firmware. This connection does not support USB audio.

### 3.4.2 Trigger outputs J15 and J16

2x dual 3.5mm (1/8") TS 12V/5mA max Out. Each XLR output triggers 2 devices simultaneously. The configuration handles both mono and stereo connectors.

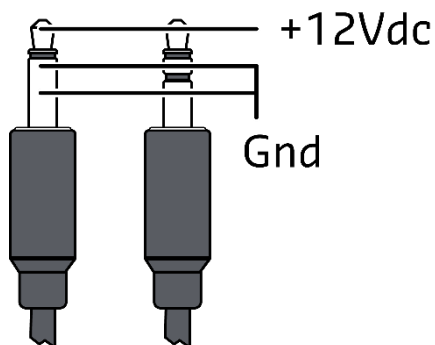


Figure 4: Mainboard trigger inputs mating jack plugs

Parameter	Direction	Min	Typ	Max	Unit	Note
PreAmp ON	Output		12		V <sub>DC</sub>	Max 5mA
PreAmp OFF			0		V <sub>DC</sub>	

### 3.4.3 2x Male XLR Stereo Balanced Analogue Outputs J18, J17 and J20, J19

Pin	Direction	Function	Remarks
J17.1	Output	Output 2: Signal Left +	
J17.2	-	GND	
J17.3	Output	Output 2: Signal Left -	Inverting
J18.1	Output	Output 2: Signal Right +	
J18.2	-	GND	
J18.3	Output	Output 2: Signal Right -	Inverting
J19.1	Output	Output 1: Signal Left +	
J19.2	-	GND	
J19.3	Output	Output 1: Signal Left -	Inverting
J20.1	Output	Output 1: Signal Right +	
J20.2	-	GND	
J20.3	Output	Output 1: Signal Right -	Inverting

### 3.4.4 Female XLR Stereo Balanced Analogue Input J6, J5

Pin	Direction	Function	Remarks
J5.1	-	GND	
J5.2	Input	Input 3: Signal Left +	
J5.3	Input	Input 3: Signal Left -	Inverting
J5.4		Release	
J6.1	-	GND	
J6.2	Input	Input 3: Signal Right +	
J6.3	Input	Input 3: Signal Right -	Inverting
J6.4		Release	

### 3.4.5 2x Female RCA Stereo Unbalanced Analogue Input J3, J4

Pin	Direction	Function	Remarks
J3.1	Input	Input 1: Left signal	Input 1 RCA-GND's both tied together and connected to internal GND through 100Ω
J3.2	Input	Input 1: Right signal	
J4.1	Input	Input 2: Left signal	Input 2 RCA-GND's both tied together and connected to internal GND through 100Ω
J4.2	Input	Input 2: Right signal	

## 4 Front module

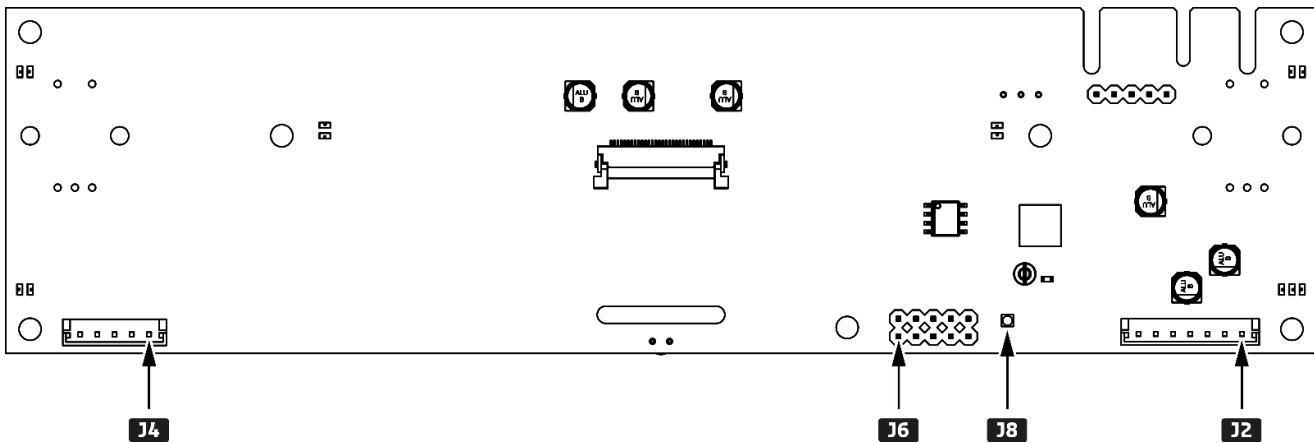


Figure 5: Frontboard connector bottom-side overview, arrows point to pins 1

### 4.1.1 Bus connector J2

Pin	Direction	Function	Remarks
J2.1	Input	V <sub>standby</sub>	Positive regulated output voltage (+12V)
J2.2	-	GND	
J2.3	Through	CBus	Internal communication bus
J2.4	Through	Wakeup	Signal to activate modules
J2.5	Input	AC Detect	Mains AC indicator
J2.6	Output	Supply enable	Power supply enable
J2.7	Input	Power Good	Power supply stable indicator

**Connector type equivalent:** B7B-EH.

**Matching cable part:** EHR-7.

### 4.1.2 Headphones connector J4

Pin	Direction	Function	Remarks
J4.1	Output	V <sub>3V3</sub>	3V3 power for headphone led
J4.2	Output	LED control	LED enable control signal
J4.3	Input	HPS-Jack	Headphones jack detection switch
J4.4	Input	HPS-Switch	Headphones on/off switch
J4.5	-	GND	

**Connector type equivalent:** B5B-EH.

**Matching cable part:** EHR-5.

### 4.1.3 Bluetooth module J6

Pin	Direction	Function	Remarks
J6.1	Output	V <sub>3V3BT</sub>	Bluetooth module power supply controlled by front
J6.2	-	GND	
J6.3	-	Not connected	(Uart control signal)
J6.4	-	Not connected	(Uart control signal)
J6.5	Input	Uart asynchronous input	From BT module (active low)
J6.6	Output	Uart asynchronous output	To BT module (active low)
J6.7	Output	BT reset	Active high
J6.8	-	GND	
J6.9	Input	S/PDIF audio	From BT module
J6.10	-	GND	

**Connector type equivalent:** 2-row 2.54mm pitch 10 pins vertical pinheader

#### 4.1.4 S/PDIF signal Bluetooth module J8

Pin	Direction	Function	Remarks
center	Output	S/PDIF	Bluetooth S/PDIF output (from J6.9)
frame	-	GND	

**Connector type equivalent:** Samtec RSP-122811-01

**NOTE:** Bluetooth Certified 5.2 Class 1, supported codecs: aptX, aptX-HD, aptX-adaptive, AAC, SBC.

## 4.2 Front encoders

The front module is equipped with two rotary encoders S1 and S2 (see figure 9). Each can be pressed also, to add additional functionality like source selection, menu item confirmation, mute/unmute, power up/down. The left encoder (front view) S1 is used to select a source. When pressed, a configuration menu is opened, and the encoder then is used to select an item that one wants to view or change. To select an item, press the encoder again. Use the 'Back' items to exit a particular level in the menu structure. See "User Guide PreAmplifier.pdf" for more information about the menu structure.

When the preamp is running, use the right encoder (S2) to control the volume. When pressed shortly, it will toggle the mute state of the preamp. When the encoder is pressed 2 seconds or more, the preamp will shutdown and enter the standby state. You can determine whether the preamp is in standby or running state (with the display off), by observing the white LED below the display. If the LED is off, the preamp is in standby mode, when lit white, the preamp is in running mode. Press the right encoder shortly in standby mode, to start the preamp.

**NOTE:** When in standby mode, USB is also disconnected.

## 4.3 Headphone output

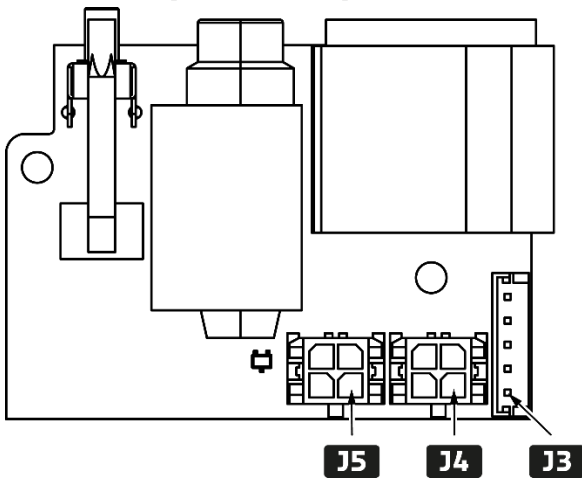


Figure 6: Headphone pcb

### 4.3.1 Headphones connector J3 (should be wired to front connector J4)

Pin	Direction	Function	Remarks
J3.1	Input	V <sub>3V3</sub>	3V3 power for headphone led
J3.2	Input	LED control	LED enable control signal
J3.3	Output	HPS-Jack	Headphones jack detection switch
J3.4	Output	HPS-Switch	Headphones on/off switch (see PB in figure 11)
J3.5	-	GND	

**Connector type equivalent:** B5B-EH.

**Matching cable part:** EHR-5.

4.3.2 Audio left connector J4

Pin	Direction	Function	Remarks
J4.1	Input	Audio signal +	Headphones left channel
J4.2	Input	Audio signal -	
J4.3	-	GND	
J4.4	-	GND	

4.3.3 Audio right connector J5

Pin	Direction	Function	Remarks
J5.1	Input	Audio signal +	Headphones right channel
J5.2	Input	Audio signal -	
J5.3	-	GND	
J5.4	-	GND	

4.3.4 1x Female XLR 4-pole Balanced Stereo HP

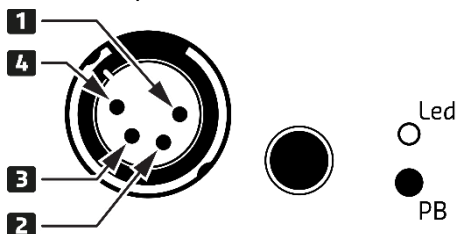


Figure 7: Headphones XLR connector, 6.35mm jack in the middle, LED and pushbutton on the right

Pin	Function
1	Left+
2	Left -
3	Right+
4	Right -

Connector type equivalent: NC4FAH-0

4.3.5 1x 6.35mm (1/4") TRS Unbalanced Stereo HP

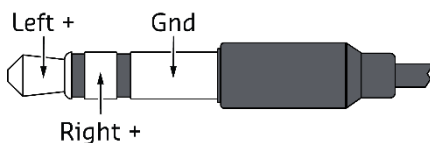


Figure 8: Headphones jack

4.3.6 LED and pushbutton (PB)

When the pushbutton is pressed, the preamp will toggle between headphones and outputs on the back. If the headphones output is selected, the LED will be lit white. The LED will be off when backpanel outputs are active.

## 5 Digital expansion add-on module

### 5.1 Digital input board

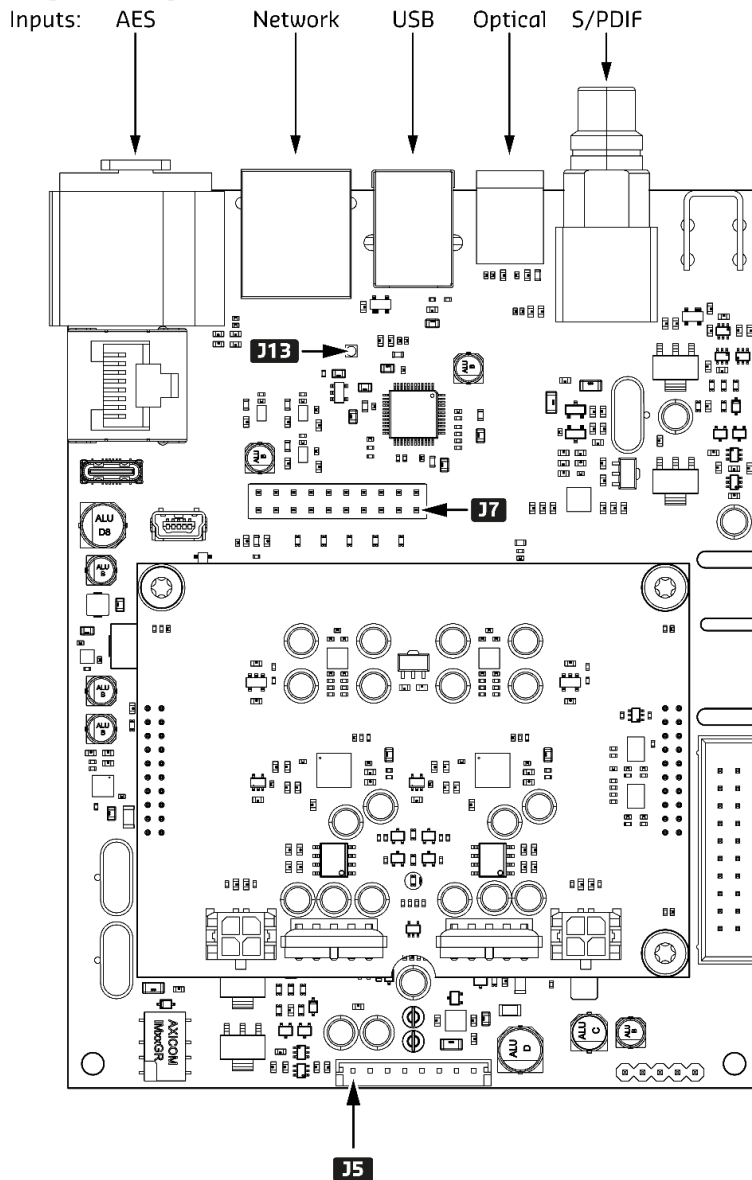


Figure 9: Digital input add-on board, arrows point to pins 1

#### 5.1.1 Bus connector J5

Pin	Direction	Function	Remarks
J3.1	Input	V <sub>standby</sub>	Positive regulated output voltage
J3.2	Input	V <sub>Aux+</sub>	Positive regulated output voltage
J3.3	Input	V <sub>Aux-</sub>	Negative regulated output voltage
J3.4	-	GND	
J3.5	Through	CBus	Internal communication bus
J3.6	Through	Wakeup	Signal to activate modules
J3.7	-	GND	
J3.8	Input	ACdet	Mains AC indicator

Connector type equivalent: B8B-EH.

Matching cable part: EHR-8.

### 5.1.2 USB-B mini connector J4

This USB connector is supposed to be connected to the Raspberry Pi through a USB-B mini to USB-A cable.

### 5.1.3 USB-C connector J17

This USB connector is used to power the Raspberry Pi through a USB-C to USB-C cable

### 5.1.4 Network connector J16

Use a CAT-5 TCP cable between the RJ45 network connector of the Raspberry Pi and J16. The RPi will then be connected to the network connector on the backpanel.

### 5.1.5 Bluetooth S/PDIF connector J13

Pin	Direction	Function	Remarks
center	Input	S/PDIF	Bluetooth S/PDIF input (from front J8)
frame	-	GND	

**Connector type equivalent:** Samtec RSP-122811-01

### 5.1.6 DAC expansion board

The optional DAC expansion board is placed on J1 and J2. Care should be taken while placing the board on these two headers. The DAC board has three mounting holes; these must match with the three mounting pins on the digital expansion board.

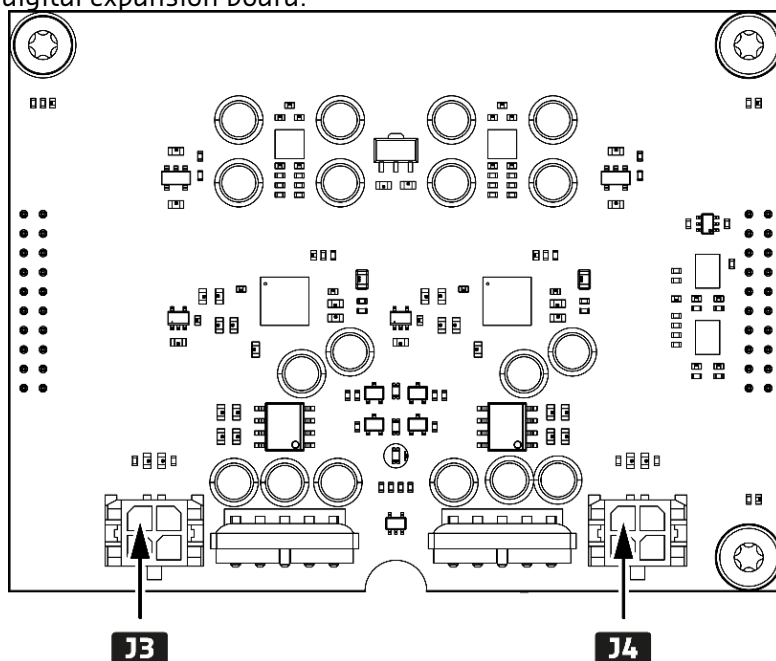


Figure 10: DAC add-on board, arrows point to pins 1

#### 5.1.6.1 DAC audio output connector J3

Pin	Direction	Function	Remarks
J3.1	Output	Left channel +	Connect through cable with J7 of main board
J3.2	Output	Left channel -	
J3.3	-	GND	
J3.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 5.1.6.2 DAC audio output connector J4

Pin	Direction	Function	Remarks
J4.1	Output	Right channel +	Connect through cable with J8 of main board
J4.2	Output	Right channel -	
J4.3	-	GND	
J4.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 5.1.6.3 DAC performance data

All audio measurements are done with AES17 20kHz filter and no weighting.

Item	Symbol	Min	Typ	Max	Unit	Notes
Output level	$V_{OUT}$			14 (4.1)	dBu ( $V_{RMS}$ )	
Signal/Noise ratio	SNR			128.5	dB	
Total harmonic distortion + noise	THD+N			-117.5	dB	-1dBFS
Dynamic range	DR			127	dB	
Channel crosstalk				-147	dB	

### 5.1.6.4 DAC supported input formats

Function	PCM support	DSD support	Notes
S/PDIF (input)	Up to 192kHz/24bits	No	
Optical (Toslink)	Up to 192kHz/24bits	No	
AES/EBU	Up to 192kHz/24bits	No	
USB type B	Up to 384kHz/32bits	DoP: Up to DSD 256 Native: Upto DSD 256	
Network	Up to 384kHz/32bits	DoP: Up to DSD 256 Native: Upto DSD 256	1)
Bluetooth	48kHz/16bits	No	

**Note 1:** An additional internally installed streaming board is connected to an internal USB port of the digital input board. Supported formats depend on the chosen streaming board and software.

## 5.2 Digital expansion board: backpanel input connectors

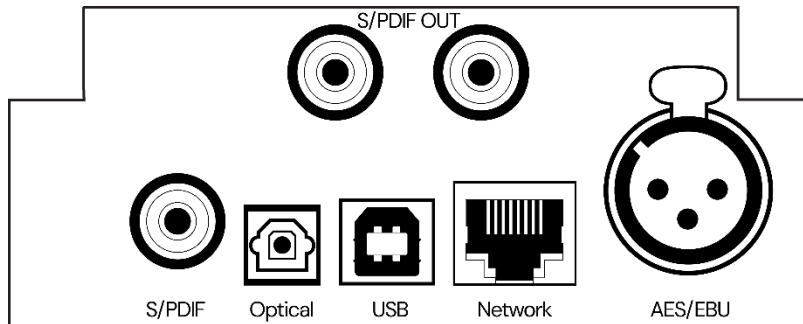


Figure 11: Digital expansion board with FusionConnect mounted

### 5.2.1 S/PDIF

RCA Unbalanced 2-channel



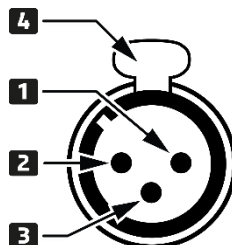
### 5.2.2 Optical input

Optical/Toslink 2-channel



### 5.2.3 AES<sub>3</sub> input

XLR balanced 2-channel



Pin	Direction	Function	Remarks
1	-	GND	
2	Input	AES+	
3	Input	AES-	
4		Release	

### 5.2.4 USB audio

USB-B 2.0



### 5.2.5 Network audio

RJ-45 TCP/IP Connector. Direct link to internal RJ-45 connector.



### 5.3 FusionConnect board

Hypex FusionAmps can be connected to the FusionConnect outputs with an S/PDIF cable. It sends digital audio to the FusionAmps dependent of the selected source. If an analog source is selected it will be first digitized by the ADC on the FusionConnect board. The FusionConnect outputs also support communication with the FusionAmps. Supported commands are mute, volume, power-on and standby. Due to conversion time, some delay will be added to the outgoing audio signal.

#### 5.3.1 FusionConnect S/PDIF OUT

2x RCA Unbalanced 2-ch. digital audio out (S/PDIF).



Figure 12: FusionConnect S/PDIF outputs

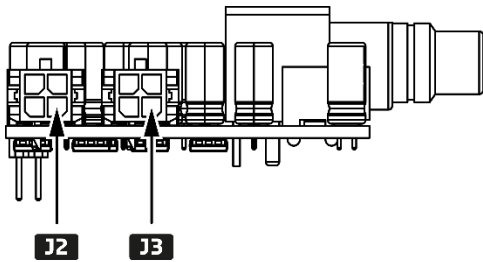


Figure 13: FusionConnect board, arrows point to pins 1

#### 5.3.2 Audio input connector J2

Pin	Direction	Function	Remarks
J2.1	Input	Left channel +	Left channel from main board, dependent on selected source
J2.2	Input	Left channel -	
J2.3	-	GND	
J2.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

#### 5.3.3 Audio input connector J3

Pin	Direction	Function	Remarks
J3.1	Input	Right channel +	Right channel from main board, dependent on selected source
J3.2	Input	Right channel -	
J3.3	-	GND	
J3.4	-	GND	

**Connector type:** Molex microfit 4 pins male 43045-0400

**Matching cable part:** Molex cable assembly series 214755

### 5.3.4 ADC performance data

When the selected source is an analog source, the analog output of the main board is sent through the on-board ADC to the S/PDIF output.

All audio measurements are done with AES17 20kHz filter and no weighting.

Item	Symbol	Min	Typ	Max	Unit	Notes
Input level	$V_{IN}$			14 (4.1)	dBu ( $V_{RMS}$ )	
Signal/Noise ratio	SNR			119	dB	
Total harmonic distortion + noise	THD+N			-112	dB	-1dBFS
Dynamic range	DR			119	dB	
Channel crosstalk				-139	dB	
Bandwidth	$F_c$			40	kHz	
Conversion delay						

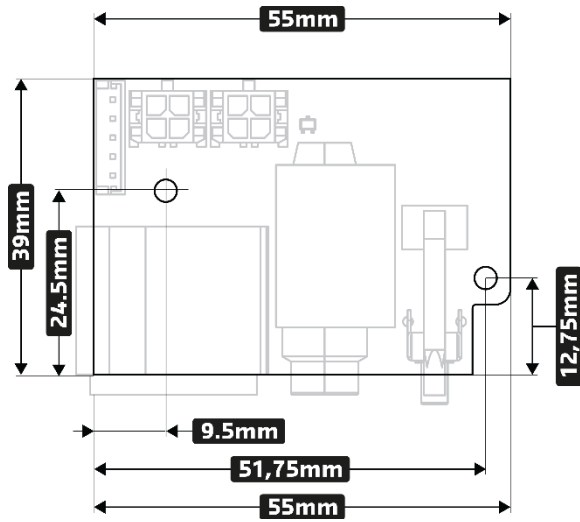
### 5.3.5 ADC supported output formats

Function	PCM support	DSD support	Notes
S/PDIF (output)	93.75kHz/24bits	No	<sup>1)</sup>

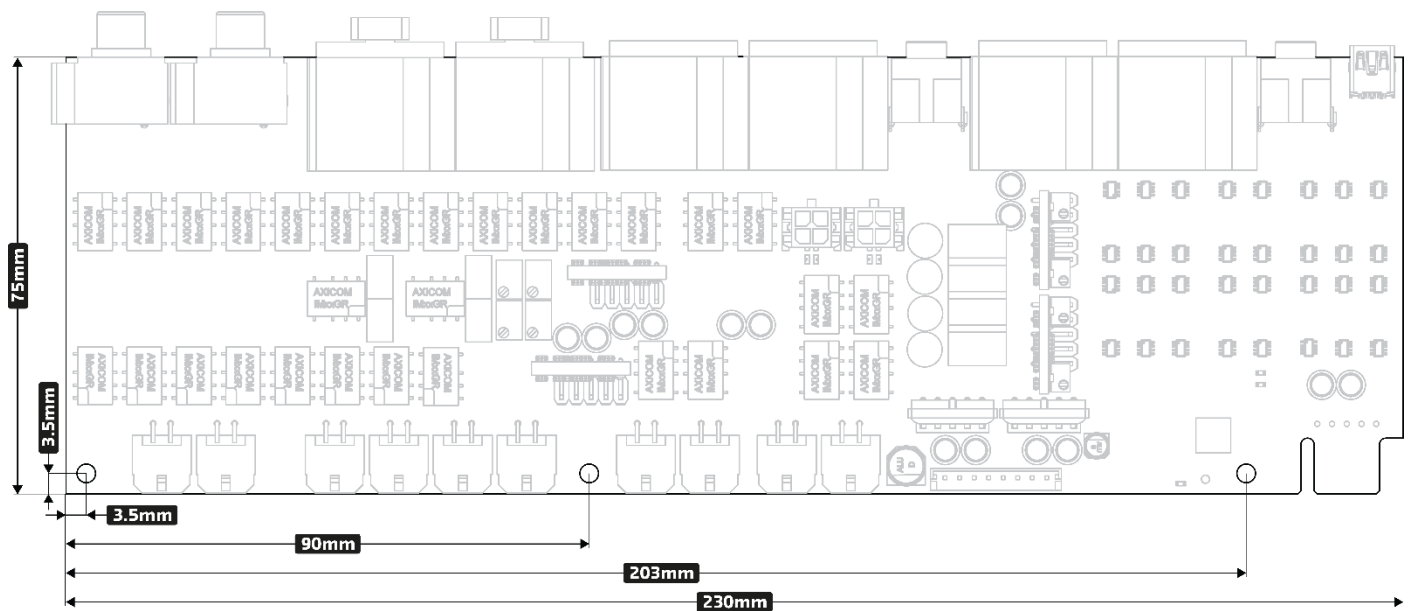
**Note 1:** All formats, PCM and DSD, are converted to PCM 93.75 kHz



### 6.3 Headphones module

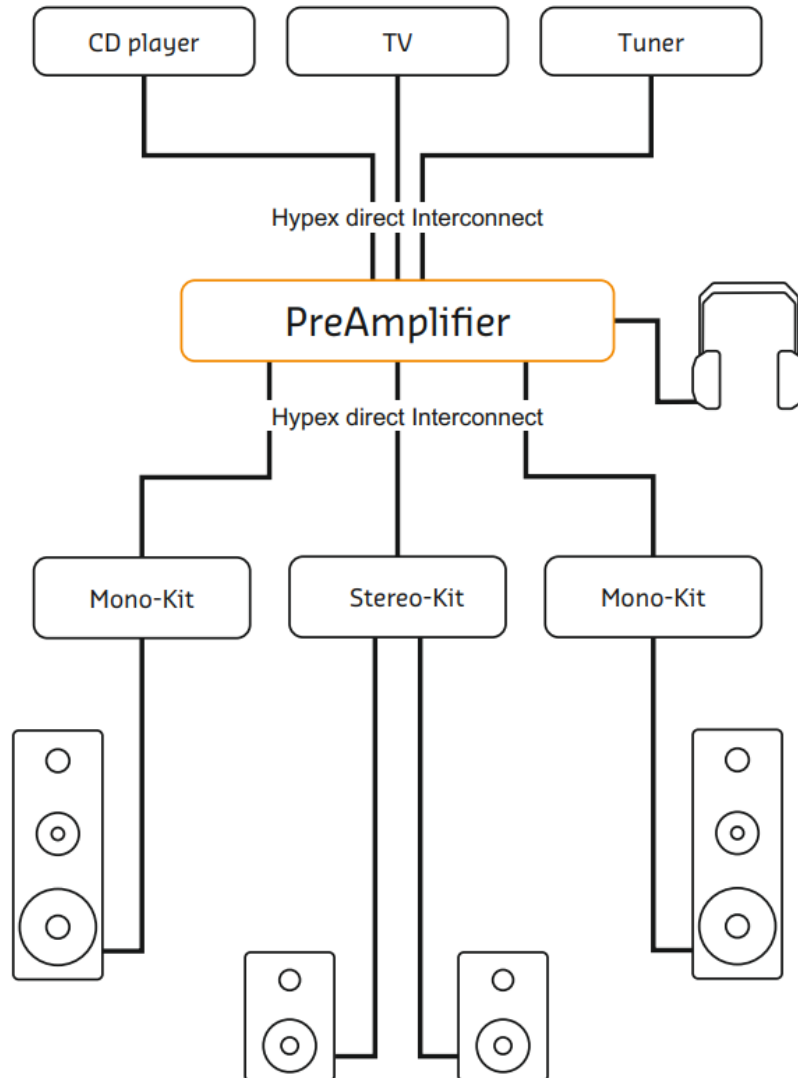


### 6.4 Main module





## 7 Setup example



## 8 Revisions

Document revision	Kit revision	Change log	Date
R01	0100	Initial document	June '26

## 9 Disclaimer

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