

iAn Bioamp

Hardware Reference



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iAn BioAmp

iA4 Differential BioAmp



iA4 Overview

The iA4 is a four-channel differential bioamp targeted for use in low-channel-count, low-impedance neurophysiology recordings such as ABR, EEG, EMG, or EKG signals. The bioamp digitizes up to four channels at acquisition rates of approximately ~750 Hz, ~1.5 kHz, ~3 kHz, ~6 kHz, ~12 kHz, ~25 kHz, or ~50 kHz. The amplified digital signal is sent through the iCon or iConZ interface.

Connections to the subject (up to four differential pairs and ground) are made with standard 1.5 mm touchproof safety connectors.

- Manual impedance check buttons simplify testing and debugging of connected electrodes
- Onboard LEDs provide live feedback of the recording (+) and indifferent (-) channel impedances and activity

iA4 Features

There are selectable Sample Rate options of ~750 Hz, ~1.5kHz, ~3 kHz, ~6 kHz, ~12 kHz, ~25 kHz, ~50 kHz or system rate (maximum ~50 kHz). Using the lowest practical rate for your application improves noise performance.

A user-selectable on-board highpass filter has adjustable options of 0.3 Hz, 1 Hz, 2 Hz, 4 Hz, 8 Hz, 16 Hz, 32 Hz, or 64 Hz.

For information on software control of the iA4 and all of its available features, see the [Synapse Manual](#).

iA4 Clip Warnings and Activity Display

The status LEDs above each channel on the iA4 indicate channel activity and clip warning. LEDs for each channel are lit green to indicate an active channel and/or red to indicate a clip warning.

Clip Warning

Analog clipping occurs when the input signal is too large. When the input to a channel is within ~ 1.5 dB of the iA4's maximum voltage input range the LED for the corresponding channel is lit red to indicate that clipping may occur. This is $\sim \pm 10.6$ mV.

Activity

The activity LED is lit green whenever the channel is enabled.

iA4 Electrode Connectors

Plug the electrodes directly into the standard 1.5 mm touchproof connectors on the front of the iA4.

iA4 Impedance Checking

The impedance checker on the iA4 provides a simple check of the channel impedance relative to ground. The impedance check can either be controlled in Synapse software, or by pressing the **Imp** button on the front panel. The impedance between channel and ground will be shown on the LED indicators.

When controlling impedance check from Synapse, the available frequencies are 100 Hz, 300 Hz, 500 Hz, or 1 kHz. A 100 Hz probe frequency is used when manually pressing the **Imp** button on the front panel of the iA4.

The impedance check alternates between the (+) and (-) channel inputs every ~ 110 ms and displays the (+) input impedance on the top row of LEDs on the front of the device (red K-Ohms LED row) and the (-) input impedance in the bottom row (green K-Ohms LEDs).

When testing through Synapse software, all active channels are tested simultaneously and the highest (+) and (-) impedance of all channels is shown in the K-Ohms LED top and bottom rows respectively.

iA4 Technical Specifications

A/D	Up to 4 channels, 24-bit PCM
Sample Rate	~750 Hz, ~1500 Hz, ~3 kHz, ~6 kHz, ~12 kHz, ~25 kHz, or ~50 kHz
Maximum Voltage In	±12.5 mV
Gain	100x
Frequency Response	3 dB 0.3 Hz - 0.45*Fs (with no additional high-pass filter selected)
Highpass Filter	0.3 Hz, 1 Hz, 4 Hz, 8 Hz, 16 Hz, 32 Hz, or 64 Hz single pole digital filter
Anti-Aliasing Filtering	45% sampling rate
S/N (typical)	80 dB
Input Impedance	100 kOhm

iA16 / iA32 BioAmp



iA16 / iA32 Overview

The iA16 / iA32 is a 16- or 32-channel bioamp with a single reference connection, targeted high-impedance neurophysiology recordings such as extracellular potentials. The bioamp digitizes up to 32 channels at acquisition rates of approximately ~750 Hz, ~1.5 kHz, ~3 kHz, ~6 kHz, ~12 kHz, ~25 kHz, or ~50 kHz. The amplified digital signal is sent through the iCon or iConZ interface.

Connections to the subject are made through mini DB26 connectors to standard headstages or splitter boxes.

- Onboard LEDs provide live feedback of the recording channel activity and impedances

iA16 / iA32 Features

There are selectable Sample Rate options of ~750 Hz, ~1.5kHz, ~3 kHz, ~6 kHz, ~12 kHz, ~25 kHz, ~50 kHz or system rate (maximum ~50 kHz). Using the lowest practical rate for your application improves noise performance.

A user-selectable on-board highpass filter has adjustable options of 0.3 Hz, 1 Hz, 2 Hz, 4 Hz, 8 Hz, 16 Hz, 32 Hz, or 64 Hz. It can also be disabled for DC Coupled recording.

For information on software control of the iA16 / iA32 and all of its available features, see the [Synapse Manual](#).

iA16 / iA32 Activity Display

The channel LEDs are dim green when enabled. At ~25 kHz sampling rate and above, the channel indicators flash green when there is spike activity.

iA16 / iA32 Electrode Connectors

Plug a headstage into the DB26 connector(s) on the front of the iA16 / iA32.

iA16 / iA32 Impedance Checking

The impedance checker on the iA16 / iA32 provides a simple check of the channel impedance relative to ground. The impedance check can either be controlled in Synapse software, or by pressing the **Imp** button on the front panel. The impedance between channel and ground will be shown on the LED indicators.

When controlling impedance check from Synapse, the available frequencies are 100 Hz, 300 Hz, 500 Hz, or 1 kHz. A 100 Hz probe frequency is used when manually pressing the **Imp** button on the front panel of the iA4.

The impedance check alternates between the recording channels and reference channel every ~250 ms and displays the channel input impedances on the front panel LEDs.

iA16 / iA32 Technical Specifications

Analog Inputs

Analog A/D Input	Up to 32 channels, 24-bit PCM
Maximum Voltage In	± 500 mV
Gain	2x
A/D Sample Rate	Up to 48828.125 Hz (adjustable in steps of approximately 750, 1500, 3000, 6000, 12000, 25000, 50000 Hz)^
Frequency Response	DC coupled: 0 Hz - $0.45 \cdot F_s$ AC coupled: 0.3 Hz - $0.45 \cdot F_s$
S/N (typical)	104 dB, single unit, $F_s = 25$ kHz, 300-7000 Hz 116 dB, differential, $F_s = 750$ Hz, 0.4-300 Hz
DC offset	$< \pm 10$ μ V
Distortion (typical)	$< 1\%$
Input Impedance	AC coupled: 100 k Ω DC coupled: 20 M Ω

^Note: If recording at ~ 50 kHz on an iA32, only 16 channels are available.

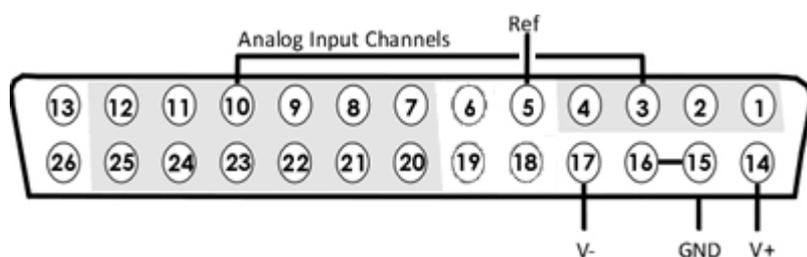
Input Connectors

The iA32 has two 26-pin headstage connectors (analog) on the front of the unit. The connectors are labeled alphabetically from top to bottom. Each connector carries signal for one bank of channels with ground and reference. The corresponding channel numbers depend on the reference mode configuration.

For simplicity sake, the diagrams below assume channels for that connector begin with channel 1. For example, A1 - A16 represent the 16 channels coming from the connected headstage. The user must increment the channel numbers by 16 (or 8 if in Differential mode) according to the mode and position of the connector. So, for the connector labeled 'A', A1 is channel 1 while on the connector labeled 'B', A1 may be channel 17.

Pinout Diagrams

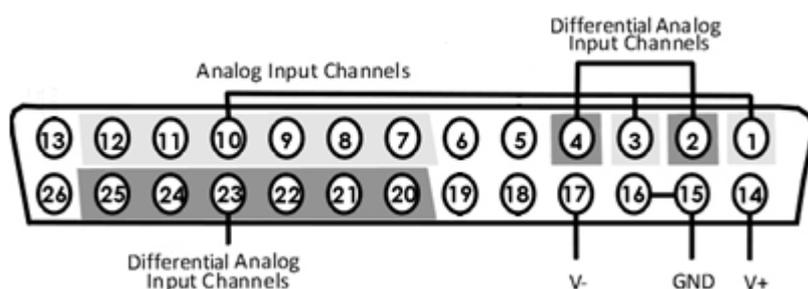
Shared Reference Mode



Pin	Name	Description	Pin	Name	Description
1	A1	Analog Input Channels	14	V+	Positive Voltage (+2.5 V)
2	A2		15	GND	Ground
3	A3		16	GND	
4	A4		17	V-	Negative Voltage (-2.5 V)
5*	Ref*	Reference*	18	NA	Not Used
6	NA	Not Used	19	NA	
7	A5	Analog Input Channels	20	A6	Analog Input Channels
8	A7		21	A8	
9	A9		22	A10	
10	A11		23	A12	
11	A13		24	A14	
12	A15		25	A16	
13	NA	Not Used	26	NA	Not Used

* Pin 5 on both DB26 connectors on the iA32 are shorted together internally.

Differential Reference Mode



 **Note**

There are 8 (+) channels and 8 (-) channels per DB26 connector. Subsequent banks are indexed by an additional 8 channels.

Pin	Name	Description	Pin	Name	Description
1	A1(+)	Analog Input Channel	14	V+	Positive Voltage (+2.5 V)
2	A1(-)	Differential Analog Input Channel	15	GND	Ground
3	A2(+)	Analog Input Channel	16	GND	
4	A2(-)	Differential Analog Input Channel	17	V-	Negative Voltage (-2.5 V)
5	NA	Not Used	18	NA	Not Used
6	NA		19	NA	
7	A3(+)	Analog Input Channels	20	A3(-)	Differential Input Channels
8	A4(+)		21	A4(-)	
9	A5(+)		22	A5(-)	
10	A6(+)		23	A6(-)	
11	A7(+)		24	A7(-)	
12	A8(+)		25	A8(-)	
13	NA	Not Used	26	NA	Not Used

 **Note**

See [Tech Note 0896](#) before attempting to make any custom connections.

iAn Sample Delay

Depends on iAn and RZ processor sample rates. All units in samples.

iAn rate	RZ @ 50 kHz	RZ @ 25 kHz	RZ @ 12 kHz	RZ @ 6 kHz
50 kHz	21	N/A	N/A	N/A
25 kHz	37	22	N/A	N/A
12 kHz	74	40	23	N/A
6 kHz	146	76	42	24
3 kHz	290	150	78	41
1.5 kHz	577	292	149	78
750 Hz	1154	580	294	150