RA16BA Medusa Base Station

RA16BA Overview

Recommended for single or dual channel extracellular recordings and low channel count EEG's, EMG's and evoked potential recordings (such as ABRs), the Medusa Base Station is a versatile signal processor designed to acquire, filter, and process data digitized on one of our preamplifiers. The RA16 acquires digitized signals from a Medusa preamplifier over a fiber optic cable, providing loss-less signal acquisition between the amplifier and the base station.

PCM analog outputs can be used for a wide variety of signal production tasks, including control of motors, electrical stimulation, and monitoring analog signals during acquisition.

Power and Communication

The RA16 mounts in a System 3 zBus Powered Device Chassis (ZB1PS) and communicates with the PC using any of the zBus PC interfaces. The ZB1PS is UL compliant, see the *ZB1PS Operations Manual* for power and safety information.

Software Control

Software control is implemented with circuit files developed using TDT's RP Visual Design Studio (RPvdsEx). Circuits are loaded to the processor through TDT run-time applications or custom applications. This manual includes device specific information needed during circuit design. For circuit design techniques and a complete reference of the RPvdsEx circuit components, see the *RPvdsEx Manual*.

RA16BA Features

Status Lights

The four lights on the left-hand side are status lights that relate to the amplifier.

Active — The active light blinks when there is no active connection between the base station and the amplifier. The active light is

	on when there is a connection to an amplifier and the amplifier is on.
Error	The error light blinks when there is a communication error between the base station and the amplifier.
Clip	The clip light is a warning light and flashes when any channel on the connected amplifier produces a voltage approaching the maximum input of the amplifier. The light will flash rapidly to warn that clipping may occur if the signal exceeds the maximum input voltage.
Battery	The battery light flashes when the battery voltage is low. The Li-Ion battery voltage decreases rapidly once this indicator light is on. Data acquisition will suffer if the battery is not charged soon after this warning.

Digital Out Lights

There is one digital out LED for each digital output bit. Each LED will light when a logical high (1) is sent out on the corresponding digital output bit. The digital out lights can be used to indicate clipping or spike detection on a channel.

Trigger

Allows input of an external digital trigger.

Link and Amplifier Ports

The Base Station has two sets of fiber optic ports. The Link port outputs the signals that are input to the amplifier port. This allows multiple base stations to be linked for complex or high channel count processing. The Amplifier port is used to connect the base station to a Medusa preamplifier for the acquisition of analog signals.

Stereo Output

The stereo output samples from the first two channels of the digital-to-analog converters (DACs) so that users can monitor signal properties with headphones or speakers. The left speaker monitors channel one of the DAC and the right speaker monitors channel two.

Use the Ch (channel) parameter on the channel inputs to change which analog channels are being monitored.

Analog and Digital Outputs

Each base station comes with 16 digital output bits and eight analog output channels. See “RA16 Technical Specifications” on page 4-11, for DB25 pinout. Each DAC uses 18-bit sigma-delta parts for high quality signal conversion. Sigma-delta converters provide superior conversion quality and extended useful bandwidths, at the cost of an inherent fixed group delay. For the RA16BA the DAC Delay is 18 samples.

Sampling Rate Considerations

There are no onboard analog-to-digital converters (As) on the Medusa base station. When acquiring data, a preamplifier does this conversion. Since the fiber optic connection from a preamplifier to the base station has a transfer rate limitation of ~25 kHz, circuits utilizing this data acquisition must use a sample rate of ~25 kHz or less. Otherwise (i.e. circuits with digital-to-analog conversion only), the maximum sample rate is ~50 kHz.

Force

Pushing a paper clip in to the pinhole next to the clip light deletes the microcode on the base station. Once the microcode is deleted the RA16 base station will need to be reprogrammed.

USB Transfer Rates

USB transfers are limited to 100,000 samples per second of 32-bit data. 16-channels of ~25 KHz data produce 400,000 samples of data per second. Data reduction techniques such as Compress to 16 and Shuffle to 16 will reduce the data size without significant loss of information. Selective channel analysis and filtering can further reduce the amount of data transferred.

Memory

The RA16BA Medusa comes standard with 32MB of RAM. At 16-channels in 16-bit mode, 32MB would give around 40 seconds of continuous data acquisition. Each additional base station could add an additional 2.5 minutes of continuous data acquisition.

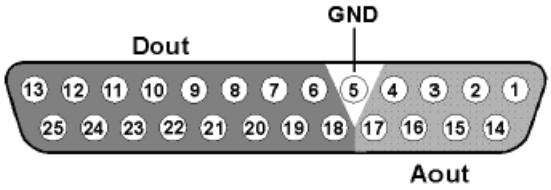
RA16 Technical Specifications

Note: The RA16BA has no onboard AD converters. Technical specifications for the AD converters are found under the preamplifier's technical specifications.

DSP	50 MHz Sharc 21065, 150 MFLOPS
Memory	16 MB SDRAM or 32 MB SDRAM
D/A	8 channels, 18-bit sigma-delta
Sample Rate	48.828 kHz maximum
Frequency Response	3 dB at 3 Hz - Nyquist (~1/2 sample rate)
Voltage Out	+/- 10.0 V (AC coupled)
S/N (typical)	90 dB (20 Hz to 25 KHz)
Distortion (typical)	-70 dB for 1 KHz output at 0.7 Vrms
Sample Delay	18 samples

Fiber Optic Ports	1 16-channel Input and 1 Link Port (24 kHz maximum sample rate)
Digital Inputs	1 bit
Digital Outputs	16 bits
Input Impedance	NA
Output Impedance	20 Ohm

DB25 Analog/Digital I/O Connector Pin Out



Pin	Name	Description		Pin	Name	Description
1	A1	Analog Output Channels		14	A2	Analog Output Channels
2	A3			15	A4	
3	A5			16	A6	
4	A7			17	A8	
5	GND	Ground		18	D0	Digital Output Bits
6	D1	Digital Output Bits		19	D2	
7	D3			20	D4	
8	D5			21	D6	
9	D7			22	D8	
10	D9			23	D10	
11	D11			24	D12	
12	D13			25	D14	
13	D15					

Note: TDT recommends the PP16 patch panel for accessing the Digital I/O.