Hardware Specifications for Atlantis, the next generation of neurofeedback

Atlantis I

CONFIGURATION 4 X 4:
- 4 channels EEG AC/DC/Impedance
- 4 channels biopotential AC/DC/Impedance
- Additional Inputs: Event switch (stereo)
- Additional Outputs/Controls:
  - EEG-controlled Photic Stimulator
  - EEG-controlled Auditory Stimulator
  - EEG-controlled Vibrotactile Stimulator
- Relay switches input/output (stereo)
- Interface to PC: USB (optically isolated to 4500 volts)
- Power: Isolated power via USB port (magnetically isolated - no batteries)
- Standalone Power: Optional USB-rechargeable LiMH battery with controller (factory installed) (not yet available)

EEG:
- Number of EEG channels: 4
- Amplifier type: BrainMaster Triamp™ (simultaneous AC/DC/Impedance recording)
- Inputs: Bipolar: Separate Active and Reference per channel, shared isolated ground
- Connector: Proprietary 9-pin connector: signals/impedance sense/ground/power
- EEG A/D Resolution: 24 bits
- EEG A/D Accuracy: 0.023 microvolts
- EEG A/D Full Scale Range: +/- 190 millivolts

Typical EEG internal sampling/operating rate (4 channels): 1024 samples/second (with continuous impedance monitoring)
- Maximum EEG sampling rate (4 channels): 4096 samples/second (without continuous impedance monitoring)
- Maximum EEG sampling rate (1 channel): 8192 samples/second (without continuous impedance monitoring)
- Common-mode Rejection Ratio: > 120dB
- Input Impedance: > 1000 GOhm
- Input noise: < 0.5 microvolts
- Standard Operating Bandwidth: 0.0 (DC) – 120.0 Hz (1024 samples/second internal, 256 samples/second sent to PC)
- Maximum Operating Bandwidth (4 channels): DC – 2048 Hz. (4096 samples/second internal, 4096 samples/second sent to PC)
- Maximum Operating Bandwidth (1 channel): DC – 4096 Hz. (8192 samples/second internal, 8192 samples/second sent to PC) 0-10,000 Hz (1 channel)

CONTINUOUS SENSOR IMPEDANCE MONITORING FOR EEG:
- Resolution: 12 bits
- Impedance range: 0 – 1 Megohm
- Impedance accuracy: < 250 Ohm
- Front panel indicators: 8 tri-color (R/Y/G) LEDs indicating impedance via color and flash rate
- Separate indicators for active and reference leads (total 8 indicators for 4 channels)
- Impedance Indicator Levels: <5K, <10K, <20K, <50K, <100K
- Impedance data may be continually sent to PC and monitored using BrainMaster 3.0 SW future release

AUX CHANNELS:
- Number of Aux channels: 4
- Amplifier type: BrainMaster Triamp™ (simultaneous AC/DC/Impedance recording)
- Inputs: Single Ended: Single Active per channel, shared isolated ground
- Connector: 2.5mm 4-connector mini-phono jack: signals/gnd/power
- Aux A/D Resolution: 12 bits
- Aux A/D Accuracy: 0.2 millivolts
- Aux A/D Full Scale range: 0-2.5 volts
- Aux Typical sampling rate: 1024 samples/second (with continuous impedance monitoring)
- Aux Maximum sampling rate: 8192 samples/second (without continuous impedance monitoring)
- Aux impedance monitoring: 12-bit accuracy, range 10 Megohms
- Aux Standard Operating Bandwidth: 0.0 (DC) – 120.0 Hz. (1024 samples/second internal, 256 samples/second sent to PC)
- Aux Maximum Operating Bandwidth (4 channels): DC – 2048 Hz. (4096 samples/second internal, 4096 samples/second sent to PC)
- Aux Maximum Operating Bandwidth (1 channel): DC – 4096 Hz. (8192 samples/second internal, 8192 samples/second sent to PC)

INTERNAL AUTONOMOUS FUNCTIONS:
- Standard Operating rate: 1024 samples or events/second
- Modes: photic, vibrotactile, auditory feedback
- Photic: direct real-time EEG-controlled photic stimulation via built-in controller and optional LED glasses
- Auditory: direct real-time auditory feedback of EEG via. built-in controller and optional earphones or speakers.
- Vibrotactile: direct real-time tactile feedback of EEG via. built-in controller and optional vibrotactile cushion.
- Selectable modes: split (L and R separate) or combine (L+R to both eyes/ears/vibro).

Atlantis II

CONFIGURATION 2 X 2:
- 2 channels EEG AC/DC/Impedance
- 2 channels biopotential AC/DC/Impedance
- Additional Inputs: Event switch (stereo)
- Additional Outputs/Controls:
  - EEG-controlled Photic Stimulator
  - EEG-controlled Auditory Stimulator
  - EEG-controlled Vibrotactile Stimulator
- Interface to PC: USB (optically isolated to 4500 volts)
- Power: Isolated power via USB port (magnetically isolated - no batteries)
- Standalone Power: Optional UUSB-rechargeable LiMH battery with controller (factory installed) (not yet available)

EEG:
- Number of EEG channels: 2
- Amplifier type: BrainMaster Triamp™ (simultaneous AC/DC/Impedance recording)
- Inputs: Bipolar: Separate Active and Reference per channel, shared isolated ground
- Connector: Proprietary 9-pin connector: signals/impedance sense/ground/power
- EEG A/D Resolution: 24 bits
- EEG A/D Accuracy: 0.023 microvolts
- EEG A/D Full Scale Range: +/- 190 millivolts

Typical EEG internal sampling/operating rate (4 channels): 1024 samples/second (with continuous impedance monitoring)
- Maximum EEG sampling rate (4 channels): 4096 samples/second (without continuous impedance monitoring)
- Maximum EEG sampling rate (1 channel): 8192 samples/second (without continuous impedance monitoring)
- Common-mode Rejection Ratio: > 120dB
- Input Impedance: > 1000 GOhm
- Input noise: < 0.5 microvolts
- Standard Operating Bandwidth: 0.0 (DC) – 120.0 Hz (1024 samples/second internal, 256 samples/second sent to PC)
- Maximum Operating Bandwidth (4 channels): DC – 2048 Hz. (4096 samples/second internal, 4096 samples/second sent to PC)
- Maximum Operating Bandwidth (1 channel): DC – 4096 Hz. (8192 samples/second internal, 8192 samples/second sent to PC) 0-10,000 Hz (1 channel)

CONTINUOUS SENSOR IMPEDANCE MONITORING FOR EEG:
- Resolution: 12 bits
- Impedance range: 0 – 1 Megohm
- Impedance accuracy: < 250 Ohm
- Front panel indicators: 8 tri-color (R/Y/G) LEDs indicating impedance via color and flash rate
- Separate indicators for active and reference leads (total 8 indicators for 4 channels)
- Impedance Indicator Levels: <5K, <10K, <20K, <50K, <100K
- Impedance data may be continually sent to PC and monitored using BrainMaster 3.0 SW future release

AUX CHANNELS:
- Number of Aux channels: 2
- Amplifier type: BrainMaster Triamp™ (simultaneous AC/DC/Impedance recording)
- Inputs: Single Ended: Single Active per channel, shared isolated ground
- Connector: 2.5mm 4-connector mini-phono jack: signals/gnd/power
- Aux A/D Resolution: 12 bits
- Aux A/DAccuracy: 0.2 millivolts
- Aux A/D Full Scale range: 0-2.5 volts
- Aux Typical sampling rate: 1024 samples/second (with continuous impedance monitoring)
- Aux Maximum sampling rate: 8192 samples/second (without continuous impedance monitoring)
- Aux impedance monitoring: 12-bit accuracy, range 10 Megohms
- Aux Standard Operating Bandwidth: 0.0 (DC) – 120.0 Hz. (1024 samples/second internal, 256 samples/second sent to PC)
- Aux Maximum Operating Bandwidth (4 channels): DC – 2048 Hz. (4096 samples/second internal, 4096 samples/second sent to PC)
- Aux Maximum Operating Bandwidth (1 channel): DC – 4096 Hz. (8192 samples/second internal, 8192 samples/second sent to PC)

INTERNAL AUTONOMOUS FUNCTIONS:
- Standard Operating rate: 1024 samples or events/second
- Modes: photic, vibrotactile, auditory feedback
- Photic: direct real-time EEG-controlled photic stimulation via built-in controller and optional LED glasses
- Auditory: direct real-time auditory feedback of EEG via. built-in controller and optional earphones or speakers.
- Vibrotactile: direct real-time tactile feedback of EEG via. built-in controller and optional vibrotactile cushion.
- Selectable modes: split (L and R separate) or combine (L+R to both eyes/ears/vibro).

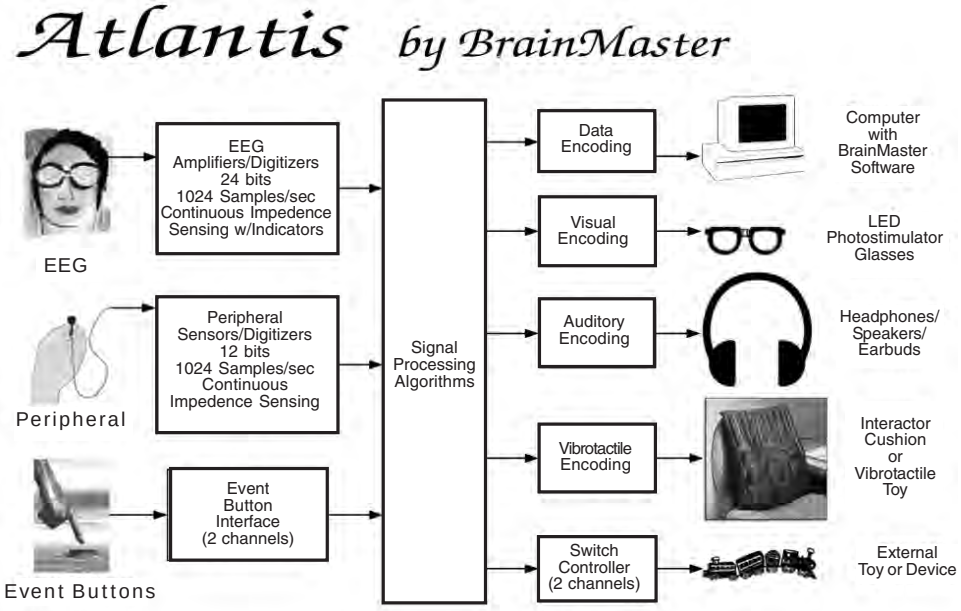
BrainMaster Technologies, Inc.
From the Decade of the Brain, Into the New Millennium

The next generation of neurofeedback is here!

The Atlantis line of biofeedback systems is the most advance neurofeedback available. Simultaneous realtime feedback produces an immersive sensory experience that is comprehensive, yet simple. All systems come with a training interface. The innovative Triamp™ bioamplifi records and reports the EEG signal, the DC and slow cortica.. potentials, and the continuous impedance measurement of the sensors in real time. The simplicity of design functionality allows you to easily conduct multi-modality feedback and control for maximum effect.

Atlantis' powerful hardware and software technology provides rapid and accurate responses and autonomous real-time EEG-controlled feedback without a PC, and realtime impedance monitoring not merely impedence *checking*. The ability to simultaneously and continuously measure the EEG signal, the DC potential, the SCP (slow-cortical potential) and the impedence of both the active and reference leads opens up opportunities for new research and clinical work.

The Atlantis II is ideal for those ready to get started in this new age of neurofeedback monitoring at an economical investment. The Atlantis I is completely expandable and provides unparalleled results.



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SOFTWARE/SYSTEM CAPABILITES & ESTIMATED 3.0 UPDATE SCHEDULE:

AVAILABLE 3rd Qtr 2006:
Standard Emulation Mode: Operates with BrainMaster 2.5SE or other compatible software (contact BrainMaster for details), providing the following:
All built-in real-time autonomous training functions (photic, vibrotactile, auditory)
Internal sampling/operating rate 1024 samples/second
Data transmission rate to PC: 256 samples/second, 2 channels EEG or 2 channels AUX
Operating bandwidth: 0.5-120.0 Hz
Able to select bank 1 (channels 1-2) or bank 2 (channels 3-4)
Continuous impedance monitoring and display via front-panel LEDs
Support of AUX channel for optional modalities via Event Wizard (skin, temp, etc)

AVAILABLE 4th Qtr 2006 -1st Qtr 2007
Additional Modalities using Aux channels:
Skin (body) potential sensing via. optional skin sensor
Skin (body) impedance sensing via. optional skin sensor
SEMG
Temperature feedback via. optional thermister sensor
Thermal feedback via. optional PIR sensor
HEG feedback via. optional HEG interface

Event detection/marking via external (isolated) switch input
External event control via built-in (isolated) relay, 2-channels, inputs and outputs

AVAILABLE 1st Qtr - 2nd Qtr 2007:
Standard Native Operating Mode: Operating on BrainMaster 3.0 software, providing the following:
All internal autonomous functions
Additional EEG-controlled photic, auditory, and vibrotactile functions & protocols
Data transmission rate to PC: 256 or 1024 samples/second (with continuous impedance monitoring), 4 channels EEG plus 4 channels Aux
EEG data to PC (24-bits, 0.0-120.0 Hz)
DC EEG to PC (16 bits, 0.0-2.0 Hz) EEG data
Slow-cortical potential SCP data to PC (16 bits, 0.08 – 5.0 Hz) EEG data

EEG impedance data to PC (12 bits)
Aux channel potential data to PC (12 bits)
Aux channel impedance data to PPC (12 bits)
Sensing of Event buttons pressed by PC (2 channels) (ATI only)
Ability to control built-in relays from PPC (2 channels, inputs & outputs)(ATI only)
HRV training via EKG signal

Enhanced Native Operating Modes: (Details to be announced in future)
High-speed data transfer, event-related potentials, etc. will be supported
Note: All specifications are preliminary, and are subject to change at any time.
"Triamp" is a trademark of BrainMaster Technologies, Inc.
All time frames are projections and subject to change without notice or responsibility.

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