NeuroPort™

BLACKROCK™ MICROSYSTEMS

The NeuroPort system is a highly-configurable, easy-to-use multichannel data acquisition system used for recording and monitoring brain electrical activity. The NeuroPort System is capable of recording both high resolution (action potentials) and low resolution (EEG) signals simultaneously and it provides the clinician with the tools to analyze them.

Applications

Example Clinical Applications

Patients undergoing surgery for diagnosis and treatment of

- Epilepsy
- Parkinson's
- Dystonia
- Traumatic brain injury
- Stroke

1 **Neural Signal Processor** – Real time processing for up to 128 electrodes, 16 auxiliary analog channels, and individual TTL or strobed word experiment events (multiple systems can be synchronized for more channels)

2 **Front-End Amplifier** – Amplifies, filters, digitizes neural signals before converting to a single, multiplexed optical output

Key Features

Hardware

- Compatible with traditional surface EEG/EMG/EKG electrodes, ECoG grids (macro and micro), individual metal microelectrodes, microelectrode arrays, and planar silicon probes
- Same recording capabilities as traditional EEG systems PLUS ability to record and monitor signals from high-impedance electrodes
- Fiber-optic link for reduced system noise
- Real-time processing of spikes and field potentials, and other physiological signals
- Scalable up to 1.024 channels
- Flexible I/O options for synchronizing with behavior, stimulus, and video systems

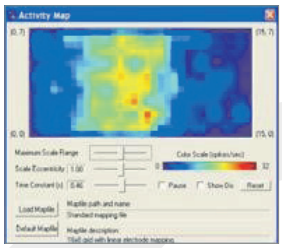
Software

- Continuous recording of spikes and field potentials (16 bit, 30 kHz)
- Per-channel selection of digital filter/sampling rate
- Digital noise (line, magnetic) cancellation
- Interface to NeuroExplorer, Spike2, MATLAB, and C/C++, and other 3rd-party software
- Adaptive spike detection, 3D spike sorting
- Remote control of data acquisition and storage
- Video synchronization and playback (available upon request)

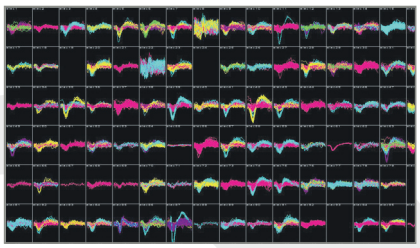
The NeuroPort GUI software

The NeuroPort GUI software provides a user-friendly interface to configure the signal processing and visualize the processed data as it is being acquired. The system's powerful and flexible digital architecture allows the user to perform a variety of online functions simultaneously from digital filtering and adaptive, 3D spike sorting to data streaming and storage.

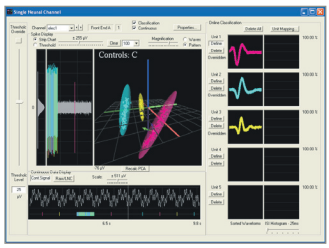
Raster
Scrolling view of spikes, filed potentials and event data



Activity map
Geometric display of spike firing rates across channels



Multichannel Display
See individual action potentials (units) on every channel



3D PCA
Quickly isolate units in 3D PCA space

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Specification

CEREBUS™ Front-End Amplifier/Digitizer

Number of Inputs	32 to 128 electrodes in banks of 32
Differential Configuration	Each input amplified with respect to the common reference in each bank
AC Input Range	-8.1 mV to 8.1 mV
AC Input Conversion	16-bit (14-bit linearity) at 1.0 µV/bit
Common Mode Rejection Input Range	+/- 3.0 V between inputs and ground
Common Mode Rejection	> 90 dB at 50/60 Hz
High Pass Filter	1st-order 0.3 Hz (full-bandwidth mode)
Low Pass Filter	3rd-order Butterworth 7.5 kHz
Input Referred Noise	< 3.0 µVrms (14 µVp-p) at full bandwidth
Input Impedance	>10^{12} Ohms || 3 pF
Input Bias/Leakage	+/- 5 pA typical, +/- 20 pA max
Channel Crosstalk	<1 LSB for all combinations
Maximum Input Voltage	+/- 5.0 V between inputs and ground
Input Connection	34-pin 2 mm male header for each bank
Ground Connection	4.4 banana jack / binding post
Output Connection	MTRJ digital fiber optic port
Headstage Power Output	+/- 5.0 V, up to 150 mA for powering optional headstages
Power Supply	Five-channel external power supply with sequencing, 120 VAC/60 Hz input
Dimensions	110 mm (H) x 42 mm (W) x 186 mm (L)
Weight	600 g

Neural Signal Processor with Experiment I/O

Digital Signal Processing	Adaptive noise cancellation and 6th-order hi/band/lo pass digital filtering; Separate digital filters for simultaneous field potential and spike processing for up to 144 channels
Front-End Input	MTRJ digital fber optic port
Experiment Analog Inputs	Sixteen +/- 5.0 V, 16-bit analog inputs for experiment or neural signals (BNC)
Experiment Analog Outputs	Four +/- 5.0 V, 16-bit analog outputs (BNC) Two line-level audio outputs (BNC + 3.5 mm)
Experiment TTL and Strobed-Word Inputs	One 16-bit input port (DB-37) with individual or strobed-word event detection
Experiment Digital Outputs	Four single-bit digital outputs (BNC), Synchronization TTL output (BNC)
Experiment Serial I/O	RS 232 port (DB-(9M), 115 kbps
PC Interface	1 Gbit ethernet
Power Supply	3-pin PC power connector (110-240 VAC, 50-60 Hz)
Dimensions	88 mm (H) x 432 mm (W) x 490 mm (L)
Weight	6.8 kg
Mounting Options	Table-top rubber feet or 2 U slot in 19-inch instrument rack

Computer Requirements (not included with system) Minimum requirements: 2 GHz Pentium or AMD processor; one available PCI slot; 60 GB hard drive; 512 MB RAM; dual-screen monitor and Windows XP, Windows 2000, Windows Vista operating system

System

Complete CEREBUS™ System

PN 4550: 128-Channel Data Acquisition System
PN 4551: 96-Channel Data Acquisition System
PN 4552: 64-Channel Data Acquisition System
PN 4553: 32-Channel Data Acquisition System

Upgrade Boards

PN 4094: 32-Channel Front-End Amplification Board

Complete CEREBUS™ System

Front-End Amplifier/Digitizer

- One fiber-optic cable (10 m)
- Four CHA-32 adapter boards
- Four 40-pin ribbon cables (20 cm)
- User guide with connection diagrams
- One 128-channel neural signal simulator

Neural Signal Processor

- One gigabit ethernet card
- One gigabit ethernet cable
- One power cable
- User guide with connection diagrams
- User interface and control software for Windows XP/Vista