

# BrainX

## Introduction (*Professional, Intuitive and Powerful*)

The screenshot displays the BrainX software interface. The top menu bar includes File, Edit, View, Auditory, Visual, Video, Sensorimotor, Cognitive, Paradigm, Tools, Window, and Help. Below the menu is a toolbar with various icons for stimulus types and editing. The main window shows a table of stimuli with columns: Stimulus ID, Mode, Trigger, Response, Trial, Duration, Interval, Name, SIFrnd-Ti..., SIFrnd-Intvl, and Enrollment. The table lists 17 stimuli, alternating between Link and Response modes. Below the table is a section for stimulus editing, including a 'Dynamic List...' checkbox and a 'Present Order' table. The 'Present Order' table has columns: Present Order, Name, Duration(ms), Interval(ms), and Expected Time. It lists 23 items, alternating between PatternLink and Response Selection events.

Stimulus ID	Mode	Trigger	Response	Trial	Duration...	Interval(...)	Name	SIFrnd-Ti...	SIFrnd-Intvl	Enrollment
1	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLi...	None	None	Yes
2	Response...	PP1-716;	Keyboard...	1	10 (ms)	0 (ms)	Response...	None	None	Yes
3	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLi...	None	None	Yes
4	Response...	PP1-712;	Keyboard...	1	10 (ms)	0 (ms)	Response...	None	None	Yes
5	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLi...	None	None	Yes
6	Response...	PP1-73;	Keyboard...	1	10 (ms)	0 (ms)	Response...	None	None	Yes
7	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLi...	None	None	Yes
8	Response...	PP1-73;	Keyboard...	1	10 (ms)	0 (ms)	Response...	None	None	Yes
9	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLi...	None	None	Yes
10	Response...	PP1-723;	Keyboard...	1	10 (ms)	0 (ms)	Response...	None	None	Yes
11	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLink	None	None	Yes
12	Response...	PP1-722;	Keyboard...	1	10 (ms)	0 (ms)	Response...	None	None	Yes
13	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLink	None	None	Yes
14	Response...	PP1-720;	Keyboard...	1	10 (ms)	0 (ms)	Response...	None	None	Yes
15	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLink	None	None	Yes
16	Response...	PP1-710;	Keyboard...	1	10 (ms)	0 (ms)	Response...	None	None	Yes
17	Link	PP1-70;	Non	1	1950 (ms)	0 (ms)	PatternLink	None	None	Yes

  

Present Order	Name	Duration(ms)	Interval(ms)	Expected Time
1	PatternLink1	1950 (ms)	0 (ms)	1.95 s
2	Response Sele...	10 (ms)	0 (ms)	1.96 s
3	PatternLink2	1950 (ms)	0 (ms)	3.91 s
4	Response Sele...	10 (ms)	0 (ms)	3.92 s
5	PatternLink3	1950 (ms)	0 (ms)	5.87 s
6	Response Sele...	10 (ms)	0 (ms)	5.88 s
7	PatternLink4	1950 (ms)	0 (ms)	7.83 s
8	Response Sele...	10 (ms)	0 (ms)	7.84 s
9	PatternLink5	1950 (ms)	0 (ms)	9.79 s
10	Response Sele...	10 (ms)	0 (ms)	9.80 s
11	PatternLink	1950 (ms)	0 (ms)	11.75 s
12	Response Sele...	10 (ms)	0 (ms)	11.76 s
13	PatternLink	1950 (ms)	0 (ms)	13.71 s
14	Response Sele...	10 (ms)	0 (ms)	13.72 s
15	PatternLink	1950 (ms)	0 (ms)	15.67 s
16	Response Sele...	10 (ms)	0 (ms)	15.68 s
17	PatternLink	1950 (ms)	0 (ms)	17.63 s
18	Response Sele...	10 (ms)	0 (ms)	17.64 s
19	PatternLink	1950 (ms)	0 (ms)	19.59 s
20	Response Sele...	10 (ms)	0 (ms)	19.60 s
21	PatternLink	1950 (ms)	0 (ms)	21.55 s
22	Response Sele...	10 (ms)	0 (ms)	21.56 s
23	PatternLink	1950 (ms)	0 (ms)	23.51 s

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Features and specifications of this software program are subject to change without notice. This manual contains information and images about BrainX, its user interface, GUI and its other signal processing algorithms, publications that are protected by copyright.

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Thank you.

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### *Warnings and Cautions*

This software can be used to design paradigms for magnetoencephalography (MEG), electroencephalography (EEG) and functional resonance imaging (fMRI).

The following warnings and cautions appear in this guide. Please ensure you are aware of all the operations and interpretations.

## Preface

BrainX is designed to be professional, intuitive and power. To reach the goals, all the stimulation modules have been tested by professional researchers/scientists/clinicians. The graphic user interface (GUI) has been optimized so that who are not familiar with EEG, MEG and fMRI can also use it.

## What is BrainX?

BrainX is a stimulus delivery, experimental control and performance assessment software system for neuroscience and clinical assessments. BrainX runs on Windows and uses standard or customized computer hardware. BrainX was designed for behavioral and physiological experiments that collect fMRI, EEG (ERP), MEG (ERF), reaction time, and electrophysiological (e.g. single neuron) data. At the same time, BrainX is very flexible and has many features that make it applicable to a diverse range of applications (see Features). BrainX is designed to provide the best possible timing accuracy and timing verification on standard hardware (see Timing Overview). BrainX can be used to design sophisticated paradigm with a few clicks.

## The strength of BrainX

In comparison to other similar software packages, BrainX has unique strength in timing, productivity and powerful.

### ***Timing***

Functional brain data (e.g. evoked potential or evoked magnetic fields) typically requires precise time. For example, accurate information about the actual time of events is often critical for data averaging. BrainX is optimized to provide precise time. To obtained precise time, BrainX uses system kernel drivers to:

- (1) Directly control the hardware (video cards, audio cards, serial ports, parallel ports)
- (2) Multi-threads to handle operating system and device drivers
- (3) Monitor all input and output events
- (4) Check and disable “interruption programs” such system background activity.

### ***Productivity***

BrainX has been developed and tested more than 20 years. It has many internal modules that have been well tested and debugged. Therefore, those modules can be used without any programming. Users can make a paradigm with a few clicks.

### ***Powerful***

BrainX has unique “stimulation patterns”, which includes parallel pattern, link pattern and response-pattern. Those patterns can include visual, auditory, video, somatosensory and motor stimuli. In addition, link pattern can include a parallel pattern and the response-pattern can include parallel and

link patterns. Furthermore, a response-selection pattern can include another response-selection pattern.

### BrainX and DirectX

BrainX uses DirectX (version 9.0 and later) on windows. DirectX is a software library available for free from Microsoft. If you are unable to run BrainX and receive the error message you need to install DirectX.

### The goal of the development of BrainX

Our design goals for BrainX is to extend support to Windows XP/Vista/7/8, enhance the power of the product, improve usability, and maintain compatibility with past releases in order to ensure an enticing and smooth upgrade path. We want to make BrainX an essential tool for anyone conducting fMRI/EEG/MEG and computer-based behavioral research. Towards these ends, BrainX 4 include the following new features: (1) Native support for 64-bit Windows; (2) Support for parallel port (PCI, PCI Express), serial port and USB port signaling. (3) Dynamically create and modify the timing and content of stimulus sequences. (4) Full support Unicode (e.g. Asian, Arabic, and Hebrew script). (5) Easy and flexible randomization. (6) Support joystick (DirectX compatible) for paradigms.