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PRODUCT SHEET

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UNITY INTERFACE FOR ACQ*KNOWLEDGE*

Unity® Interface for Acq*Knowledge*® allows you to easily to connect your Unity3D projects with BIOPAC acquisition hardware and analysis software.

- Create your virtual environment using industry-standard Unity.
- Connect and configure your project with Acq*Knowledge* in real time.
- Control Acquisition from Unity to Custom Markers, Digital, and Analog I/O.
- Deploy to your devices. Immerse your users and capture biofeedback for analysis.
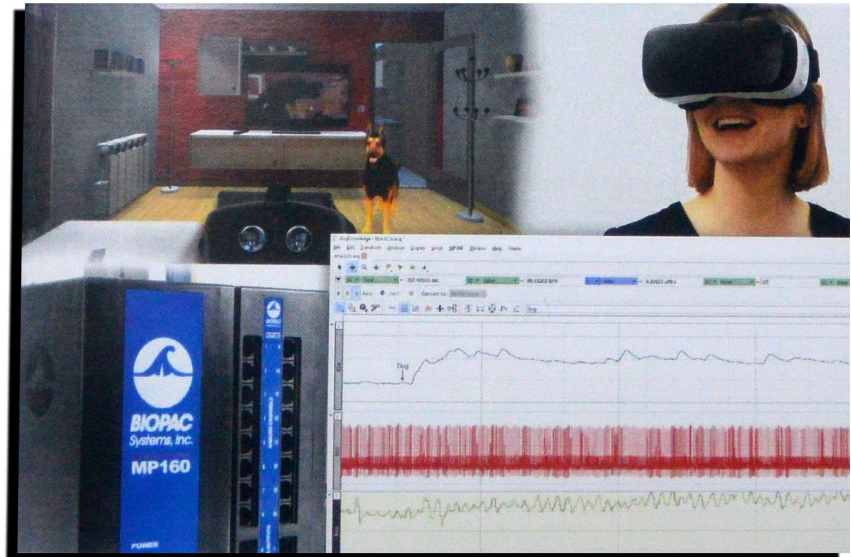
This Unity3D package allows Unity developers to access the Acq*Knowledge* network API (Network Data Transfer) v5.0 from Unity scripts without having to deal with the details of network communication, threading, and data access.

The Unity Interface for Acq*Knowledge* is compatible with recent versions of Windows and macOS.

This interface utility from The ReviaÎ Assets does not include Unity Software, Acq*Knowledge* software, or Acq*Knowledge* Network Data Transfer (NDT) license.

Unity Interface works on recent versions of Windows and MacOS and all recent version of Unity (5.5+).

Make sure the network connection is activated in Acq*Knowledge* with NDT (Network Data Transfer license).

Start Acq*Knowledge* with a small setup of digital and analog I/O you can find in the samples folder.

Watch the Unity VR Interface Demo Video for an overview of hardware setup and interface information.

SAMPLE USES

- **Buttons** | Create a small script with buttons to start, stop, or toggle the acquisition from within Unity; use the connector Component.
- **Marker events** | Again, we will write a few line of script using GenericEventSender and its õInsertGlobalEventö function. The script can be configured with default arguments set from the Unity Inspector, or use some custom values directly set from script. Here for example, we can trigger the rock fall, and send an event at the same time. You can also send other event with script-defined values.
- **Analog & Digital inputs** | Use InputChannel component, with the GetValueOrDefault function. The channels are preconfigured in the Unity inspector window. Here you can see that it will read the voltage of the battery, and detect the button press. For example, having 3.2 V from the batteryí the DIGITAL value goes from 0 to 5 Ví 0 to 5 V againí
- **Outputs** | Use OutputChannel component to set some data from the script, here for example, we will generate a Sine curve to send some data to Acq*Knowledge*. Here again, the Unity inspector will be used to configure the Output channel number. When we press õplayö, we can see the sine function, and the LED indicator
- **Digital Output** | This is the same with boolean values. Toggle the output with a GUI buttoní see it on the Acq*Knowledge* graph and the LED goes off, on, off again.

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VIRTUAL REALITY SYSTEMS

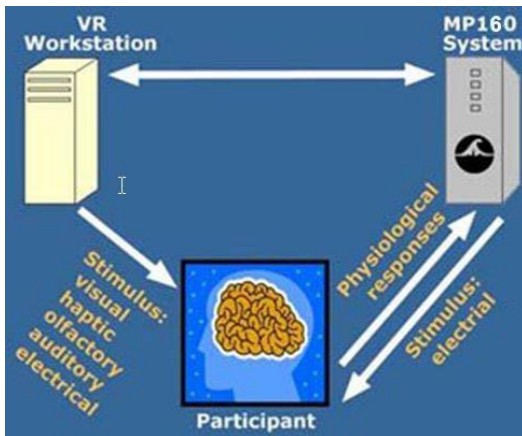| VR System Type	VizMove Turnkey VR	VizMove + Biofeedfack Utility	VizMove + MP System with wireless BioNomadix + Biofeedback Utility
Seated Systems	VR-SEAT	VR-SEAT-BIO	VR-SEAT-MP
Standing Systems	VR-STAND	VR-STAND-BIO	VR-STAND-MP
Walking Systems	VR-WALK	VR-WALK-BIO	VR-WALK-MP
Projection Systems	VR-PROJ	VR-PROJ-BIO	VR-PROJ-MP

BIOPAC VR solutions record and analyze physiological, behavioral, and subjective response data in realistic, immersive environments that would be impossible or prohibitively expensive in the real world. Systems are provided to meet specific research needs and lab space for single or multiple users: participants can be seated, standing, walking or viewing a projection.

VizMove Virtual Reality Systems allow you to start running a high-res virtual reality lab from the moment you unpack the box. A great solution for starter VR labs needing to expand stimulus delivery capabilities, VizMove Systems include everything required to create and experience interactive virtual reality applications for a variety of protocols. VizMove is available on its own, with a biofeedback utility (see BIO systems), or with an MP Research System (see MP systems). Add olfactory, haptic, and electrical stimulus for an incredible degree of realism.

System Components:	VR-SEAT Seated	VR-STAND Standing	VR-WALK Walking	VR-PROJ Projection
High performance rendering computer	x	x	x	x
VR Headset: Latest state-of-the-art headset and VizConnect output interface	x	x	x	-
3D Projectors & 3D Glasses	-	-	-	2 x shorthrow 5 x glasses
Controller: Navigate the virtual world while seated	gamepad	wand	wand	wand
PPT Motion Tracking System: max estimated tracking area	-	2 cameras up to 3m^2	4 cameras up to 7m^2	3 cameras
Vizard: Build complete, interactive VR applications and dozens of environments	x	x	x	x
Portable (laptop) option available	x	x	x	-

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VR BIOFEEDBACK SYSTEMS: VR-SEAT-BIO, VR-STAND-BIO, VR-WALK-BIO, VR-PROJ-BIO

These VR Systems combine VizMove Virtual Reality Systems with a biofeedback linking utility to tightly synchronize VR world events with real-time physiological response data from your existing MP160/150 Research System, allowing you to change the environment in real time, based on the participant's responses.

VR WITH MP SYSTEM: VR-SEAT-MP, VR-STAND-MP, VR-WALK-MP, VR-PROJ-MP

These VR systems include VizMove plus an MP Research System (MP160 hardware and Acq*Knowledge* software) with two wireless BioNomadix dual-channel signal sets of your choice for real-time wireless ECG, EMG, EDA, accelerometry, or other biometrics.

➲ Click to view a VR System Diagram

VIZARD VR DEVELOPMENT PLATFORM

Vizard's user-friendly IDE enables anyone to build sophisticated VR simulations. Vizard comes equipped with beginner tutorials to get you started.

Rapidly create a wide range of immersive 3D experiences with the most powerful, innovative virtual reality development platform. Vizard has everything you need to build complete, interactive VR applications. The software supports all standard VR hardware and easily integrates with other 3rd party software.

- Build applications quickly with easy-to-learn Python, the world's most accessible and powerful scripting language.
- Create enterprise-level VR environments with co-presence and clustering capabilities.
- Import 3D models with industry standard formats through our simple art workflow.

VIZARD'S CORE FEATURES

Rapid Application Development: Powerful simulation engine enables fast development of VR applications and includes a large variety of VR specific libraries.

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- **Sophisticated Vizard IDE:** Embedded interactive simulation engine enables rapid development of virtual reality applications.
- **Large variety of VR specific libraries:** Saves development time, easily extend pre-built functionality.
- **Integrated editor:** Transform content from different sources, assemble and modify your world. Includes built-in intelligent code completion, and visual debugging.
- **EXE publishing:** Share and demonstrate your applications without the need for additional software.
- **Scene editor and inspector tool:** 3D model viewer lets you quickly view assets, examine graph structures, see stats on polygon and texture usage, and preview animations.

Extensibility - Third Party Support

- **VizConnect:** Build once, deploy everywhere. Visual configurator allows you to easily connect third party VR hardware such as analog controllers, haptic devices, motion capture suits, projection systems, biofeedback devices, and more. Includes visual tools for authoring interaction behaviors such as grabbing, vehicle modes (airplane, helicopter, magic carpet), avatar inverse kinematics, and inspection tools such as a measuring tape.
- **Display Flexibility:** Render to single and multi-screen 3D projection systems including curved surfaces. Readily connect to a multitude of 3D stereoscopic devices.
- **Clustering:** Leverage advanced real-time rendering and processing of large worlds and heavy simulations. Connect up to 64 separate computers.
- **Art Workflow:** Import industry standard 2D and 3D formats. Implement advanced material shading techniques including the ability to add your own GLSL shader code.

ADVANCED FEATURES

Collaboration/Co-Presence

- yyLink together VizMove VR systems to join people together in the virtual world.
- Interact with team members in real time over a local network.

Physics Engine

- Access high performance library for simulating rigid body dynamics.
- Simulate vehicle and object interactions in virtual environments. Create robotics simulation applications.
- Utilize advanced joint types and integrated collision detection with friction.

SDK/Extendability

- Extend the functionality in C++ using the SDK included in Vizard.
- Create plug-ins that can interface with Vizard virtual reality scripts.

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SDS100 SCENT DELIVERY SYSTEM
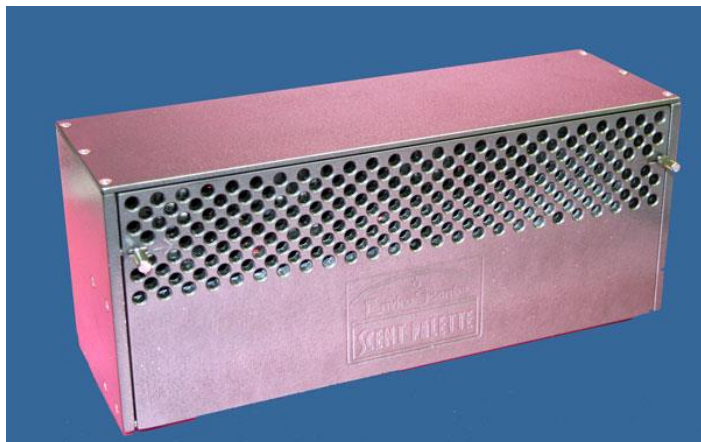
Self contained scent dispersal system—no compressor needed!

Compact, computer-controlled (USB), eight-cartridge scent* machine uses compressed air to project different scents on cue for a predetermined time followed by a burst of unscented air to clear for the next scent.

System includes software to control the delivery and duration of scents from the SDS100 unit. Scents can be triggered from a virtual reality environment. Dispersed scent covers approximately 3-6 meters in front of unit, depending on how many fans are used.

 *Scent cartridges not included; order as SCENT· over 100 scent options available.

SDS100 SPECIFICATIONS

Scent receptacles: 8

Scent dispersement*: 3 m - 6 m

Scent control: See ⠿ App Note 238 - Software options for controlling the SDS100 Scent Delivery System

Power:
   Description Wall Mount AC Adapter (2-prong flat blade)
   Input 100-240 V, 0.7 amps, 47-63 Hz
   Output 12 V, 2.1 amps

Shipping Weight: 4.08 kg (9 lbs.)

Product Dimensions (L x W x H): 33.2 cm x 13.0 cm x 15.6 cm (13.1" x 5.1" x 6.1")

NOTE: SDS100 Scent Delivery System is not available for sale to countries in the European Union.

BIOPAC
Systems, Inc.

SCENT LIST

42 Aero Camino, Goleta, CA 93117 USA
Tel (805) 685-0066 | Fa   0   -00
info@biopac.com | www.biopac.com

Scent Cartridge Options for the Scent Delivery System SDS100

CIRCLE the scents you want (SDS100 accepts 8 cartridges) and fax to BIOPAC. Scents are not returnable.

A
A Walk in the Woods
Animal
Animal Cracker
Apple
Apple Candy
Arancia Blossoms
Asphalt
B
Baby Powder
Baked Bread
Banana
Banana Taffy
Barbeque
Barber Shop
Birthday Cake
Bubble Gum
Burning Rubber
Buttered Popcorn
C
C Cont.
Cake
Cannabis Flower
Cantaloupe
Cantaloupe Lily
Caramel Apple
Cashmere Mist
Cedar Wood
Cemetery
Chamomile Tea
Char Broiled Grill
Cherry
Cherry Pie
Chocolate
Chocolate Chip
  Cookies
Chocolate Gelt
Chocolate Mint
Christmas Tree
Cinnamon
Cinnamon Bun
Cinnamon Donut
Cinnamon Orange
Citrus Blend
Citrus Blossom
Citrus Lotus
Clean Cotton Sheets
Coca Cola
Coconut
Coconut Almond
Coconut Beach
Coconut Mango
Coconut Vacation
Coffee
Cola
Cotton Candy
Crayon

D
Delicious Apple
Dessert Buffet
Diesel Exhaust
Dinosaur Breath
Dinosaur Dung
Dirt/Earth/Potting
  Soil
E
Earth
Engine Exhaust
Eucalyptus
Eucalyptus Mint
Everglades
Exotic Moments
F
Fart
Fireside Glow
Floral Bouquet
Floral Potpourri
Floral Shop
Florida Citrus
Flower Garden
Freesia
French Bread
French Vanilla
Fresh Cut Grass
Fresh Floral
Fresh Linen
G
Garden Rose
Gardenia
Garlic Bread
Gas Leak
Ginger
Ginger Ale
Ginger Citrus
Gingerbread
Glazed Donut
Grapefruit
Green Apple
Green Grass
Green Leaves
Green Mango
Green Tea
  Bergamot
Green Tea
  Lemongrass
Gunpowder
H
Hawaii
Herbal Mist
Holiday Spice
Honey
Honeysuckle
Honeysuckle

Hot Apple Pie
Hot Chocolate
I
Icy Cool
Incense
Island Breeze
Jasmine
Jasmine Gardenia
J-L
Jolly Rancher
Laundry Fresh
Lavender
Lavender Vanilla
Leather
Lemon
Lilac
Lily
Lily & Pear
Lime
Line Dried Linen
Lotus Blossom
M-N
Magnolia Blossom
Mandarin
Mango Coconut
Mango Margarita
Maple Syrup
Menthol
Meyer Lemon Zest
Mixed Berries
Mojito (lime &
  mint)
Moonlight Garden
Mountain Air
Musk
Musty Basement
Nagchampa
Neroli
O
Oatmeal Raisin
  Cookie
Ocean (like a fishy
  ocean)
Ocean Fresh
Ocean Mist
Oily Machinery
Orange
Orange Ginger
Orange Spice
Orchid Blossom
Oud
P-Q
Papaya Tangerine
  Coconut
Patchouli
Peaches

Pear
Peppermint
Peppermint Stick
Perfume
Pina Colada
Pink Bubblegum
Plumeria
Pomegranate
Pomegranate
  Martini
Pomegranate
  Quince
Popcorn
Pumpkin Pie
Quince
R
Race Car
Rain Forest
Raspberry
Red Currant
Redwood Forest
Relaxing Bedtime
Rich Leather
Root Beer
Root Beer Float
Rose
Rose Garden
Rosemary
Rosemary Mint
Rotten Fish
S
Safari
Sage
Sage Clary
Sagebrush
Sandalwood
Seductive
  Moments
Skunk
Spearmint
Spiced Apple
  Cider
Spiced Pear
Spiced Pumpkin
Spring Air
Spring Bloom
Stink Bug
Stinky Cheese
Strawberry
Sugar Cookie
Sulfurous Volcano
Summer
  Blossoms
Sun Dried Linen
Suntan Oil
Sweet Grass

T- U
Taffy
Tango Mango
Tobacco Shop
Tomato Basil
Tropical Breeze
Tropical Mango
Twilight Memories
V
Vanilla
Vanilla Caramel
Vanilla Fantasy
Vanilla Grapefruit
Vanilla Wafer
Vermillion Sky
Vicks Vapor Rub
Vintage Gardenia
Volupta Bliss
W-
Waffle Cone
Warm Vanilla
  Sugar
Waterfall Stream
Watermelon
Wedding Cake
Whiskey
White Bread
White Tea &
  Citrus
White Tea &
  Ginger
Winter Forest
Wood Fire
Y-Z
Ylang Ylang
Your Dad's
  Cologne
Your Moms
  Perfume
Yummy Vanilla
Yuzu Kumquat

12.05.2018

BIOPAC virtual worlds are ready to run without programming. The source code is also available for user customization and further development of the world (*see page 12*). Two tutorial demonstration worlds— Iowa Gambling Task and Pit—are detailed and fully documented, including source code, to greatly assist users who wish to create or modify the existing environments and start creating their own.

BIOPAC has a selection of compatible 3D graphical models and sound files to further expedite the development process. The VR software uses a simple scripting language to create rich 3D environments and rapid results. BIOPAC will also undertake the creation of custom worlds, ensuring that you get the precise functionality your protocol demands.

BIOPAC VR Systems provide users with a variety of environment options and time horizons.

- Use the BIOPAC worlds and start working immediately
- Customize the BIOPAC worlds to personalize the environment
- Follow the detailed tutorials with source code to create your own worlds
- Employ BIOPAC to develop a custom ready environment

Movement can be controlled by the experimenter and/or participant's physiological reactions.

Data analysis is simplified with automatic scoring of the data. The current state of the environment, participant, and/or audience is marked in the physiological data record.

ACROPHOBIA — VRWORLD-ACROPHO

Participants ride a construction elevator in an environment designed to emphasize the perception of height. There are seven floors (different heights) for the elevator and two modes of the experiment:

Subject feedback—Physiological responses are fed back to the VR world and progress to the next level is allowed/prohibited based on SCR and SCL response levels.

Experimenter-controlled—Progress to the next level is initiated by a keystroke from the experimenter.

Physiological responses are analyzed in real-time to determine when the participant should move to the next height level.
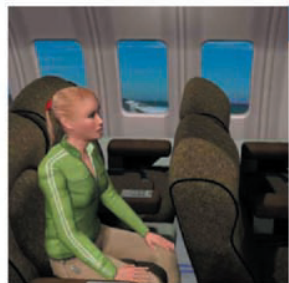
FEAR OF FLYING — VRWORLD-FLYING

Participants are immersed in a virtual airplane and experience take-off, normal flight, and turbulence. Tactile feedback is employed (via the HDS100 haptic delivery system) to enhance the physical experience. The experimenter can trigger events, such as take-off sequence, turbulence, cabin announcements, etc.

Order Worlds separately or combine Acrophobia, Flying, Public Speaking, and Cue Reactivity with VRWORLDS-PACK

PUBLIC SPEAKING — VRWORLD-SPEAK

In this social anxiety environment, participants deliver a speech from behind a podium. The speech text is presented on a display on the podium and can be scrolled via a joystick. Audience size can be controlled. The audience state or attitude—e.g., bored, interested, rude, or indifferent—is set by the researcher during the experiment. Audience behavior is defined using avatar animations and is not limited to the animations included with the environment.

CUE REACTIVITY — VRWORLD-CUE

Participants are exposed to a sequence of rooms along a corridor that contain different stimulation environments. Neutral environments and stimulus environments are included, and the environments can be expanded. The number of rooms as well as the objects in the rooms can be modified. This paradigm can be used to investigate the relationship between addictions/craving, physiological response, and the way the stimulus is presented in the environment. For instance, observe how participants react to cigarettes on a table.

IOWA GAMBLING TASK

Participants follow the classic Iowa Gambling Task experiment, in which they choose between decks of cards with unpredictable payoffs—reward or penalty, net gain or loss. Card appearance and win/lose probabilities can be modified. Provided in English and French. Skin conductance response before and after participants make a choice can easily be analyzed.

- *Tutorial demonstration world—includes source code.*

PIT

The Pit is a great demonstration of the power of virtual reality. The world displays a pit in the ground with a plank of wood placed across it. Participants must walk across the plank to safely reach the other side of the pit. As they walk across the virtual plank, the world tracks their movement and updates the display. A Precision Position Tracker system is required to monitor subjects as they walk across the plank.

- *Tutorial demonstration world—includes source code.*

![BIOPAC Systems, Inc. logo]

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TRACK2 ORIENTATION TRACKER (3 DOF)

This multi-purpose subminiature 3D orientation sensor is designed for use in real-time orientation tracking applications. It includes three types of sensing elements (tri-axial MEMS gyros, tri-axial MEMS accelerometers, and tri-axial magneto-resistive magnetometers) and comes equipped with an onboard processor and embedded orientation algorithms allowing for direct integration into systems without interfacing a PC. For PC-based integrations, the system comes with a set of libraries that allow users to modify algorithm and/or sensor parameters on-the-fly to suit individual protocols.

TRACK2 interfaces via USB and connects directly to the VR Toolkit included in all VR Workstations; intro, advanced, and ultimate Workstations include one TRACK2.

Also available pre-mounted to high-res head mounted display—see HMD1B-TRACK.

Use additional sensors to track limb movement.

SPECIFICATIONS

Output data: Quaternion, Euler angles, Raw data (angular rate, acceleration, magnetic field strength)
Internal update rate: 500 Hz
Start-up time: < 1 sec
Range (pitch, roll, yaw): full 3D
Angular Resolution: = 0.01 deg
Static Accuracy: yaw = 1 deg; pitch, roll = 0.2 deg
Repeatability Accuracy (yaw): < 0.5 deg
Gyro Range: ±1200 deg/sec
Accelerometer range: ±2 or 6 g
Magnetometer range: ±2 gauss
Operating temperature: -40° to +85° C
Storage temperature: -40° to +85° C
Electrical Supply voltage: 3.5 to 5.7 V
Power consumption: < 300 mW
Interface
Standard: TIA/EIA-485A (half-duplex)
Baud Rate: 1,000,000 bps
Byte Size: 8 bits
Stop Bites: 1 bits
Parity: No
Dimensions: 50.7 × 14.5 × 9.2 mm

NEW! Virtual Reality System for Neuroscience Research

Now researchers can take experimental investigations of emotion and attention to the next level with **aLIAS**: A Lifelike Immersive Affective Stimulation System. Developed in partnership with WorldViz, the **aLIAS** package is a plug-and-play system designed to work seamlessly with the latest HMD technology from Oculus* to create a sophisticated stimulation solution that is truly budget friendly.

*Oculus Rift sold separately

Inducing an emotional state in laboratory settings requires researchers to use various techniques approximating the immersion of the participant in a real-life situation. Such techniques could involve reading stories, looking at pictures and videos or using actors. These methodologies suffer, in various degrees, from limitations in ecological validity and/or experimental control.

BIOPAC and WorldViz have developed a virtual reality based stimulation protocol that aims to deliver lifelike stimulation while maintaining very high experimental control. A collection of stimulation scenarios has been created and is constantly augmented; it is designed so that researchers can expand it easily. Physiological data can be recorded throughout the experiment and markers for events and conditions are automatically added to the physiological data record over the network. The physiological data is recorded using the wireless BioNomadix and MP150 system with Acq*Knowledge* and Network Data Transfer.

aLIAS: Complete Researcher Control Ready-to-Run Scenarios Fully Customizable

aLIAS allows Oculus Rift users to adjust the order of the stimulation, control the inter stimulus interval and ambient sound and other sound effects without the need for programming. This is a ready to run, plug-and-play series of scenarios that are designed to operate with the Oculus DK2 head mounted display. The range of scenarios will increase and customers can develop their own content. The source code for the aLIAS system is available for further development

aLIAS Features:

- Delivery of 3D stimuli through virtual reality
- Used for the study of emotion
- Real-life scenarios, not static images
- High degree of experiment control
- Physiological response recorded with the stimulus presentation
- Event markers recorded with the physiological data for analysis

aLIAS: Affecti e Immersi e Emotional VR Stimuli Packages

Plug-and-Play System for use ith Oculus™ Rift*

Package One Ne Customers
Complete System for Neuroscience Research, featuring:*

- aLIAS-LAPTOP: Laptop Computer for aLIAS
- Vizard: Virtual Reality Toolkit
- aLIAS-SRC: aLIAS VR Source Code
- BIOPAC MP150: MP150 System with Acq*Knowledge* 4.4.1 and NDT license, plus BioNomadix**

Package T o E isting Vizard Users
Complete System for Neuroscience Research for current Vizard users, featuring:*

- aLIAS-SRC: aLIAS VR Source Code
- BIOPAC MP150: MP150 System with Acq*Knowledge* 4.4.1 and NDT license, plus BioNomadix**

Package Three – E isting BIOPAC Users
Complete System for Neuroscience Research for current BIOPAC customers with MP150 Systems, eaturing:*

- aLIAS-SRC: aLIAS VR Source Code
- Vizard: Virtual Reality Toolkit
- aLIAS-LAPTOP: Laptop Computer for aLIAS
- Acq*Knowledge* 4.4.1 with NDT license for Network Data Transfer functionality

Other Options A ailable: Contact BIOPAC for Details

Contact BIOPAC to learn more or re uest a uotation

_____

Oculus Rift sold separately

** BIOPAC MP150 systems include one BioNomadix module for PPG and EDA with Pulse Transducer, EDA Electrode Leads and EDA Electrodes Network Data Transfer (NDT) Licensed Functionality

BIOPAC—Inspiring people and enabling discovery about life.
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PRODUCT SHEET

HMD A HEAD-MOUNTED DISPLAY HIGH RES

The HMD2A* offers virtual and augmented reality developers and users a high-fidelity head-mounted display with unprecedented visual clarity and acuity at an affordable price.

The HMD2A is built around a high-contrast Organic Light Emitting Diode (OLED) microdisplay. The microdisplay provides 1280 x 1024 pixels per eye in a low-power, compact design. The patent-pending eyepieces display the image across a 50° diagonal field-of-view with <2% distortion, making the see-through compatible optics ideal for professional augmented reality applications that require precision alignment between real and virtual environments. The HMD2A works equally well as a see-through or fully immersive display. A removable cover can be quickly applied to allow users the flexibility to develop both virtual and augmented reality applications using the same HMD. And the HMD2A supports standard motion tracking devices from InterSense, Ascension, Polhemus, and others via a tracker platform mounted on the back of the HMD.

The simplicity and performance of this HMD is at the forefront of immersive display technology and development. Unsurpassed visual fidelity is designed into a lightweight, ergonomically friendly device that is both easy to use and comfortable to wear. HDMI cables from the HMD plug directly into the image source with no additional video processing electronics. Stereo headphones, built-in microphone, and programmable buttons compliment the high-resolution visuals to provide the rich, immersive experience required in the most demanding training and simulation applications.

HMD2A SPECIFICATIONS

Optical	FOV	Vertical 32°
	FOV	Horizontal 40°
	FOV	Binocular (diagonal) 50°
	See-Thru Transmission	44%
	Pupil Size	10, Non-Real mm
	Eye Relief	23 mm
	Geometric Distortion	-2% Maximum (Barrel)
	Brightness (MAX)	23 fL
	Contrast	10000:1
	Image Defect Criteria	available on request
	Spatial Resolution	1.88 arcmn/pxl
Microdisplay	Display Technology	Organic Light-Emitting Diode (OLED)
	Resolution	SXGA 1280 x 1024
	Color Depth	24-BIT (8 bits per R,G,B)
Video	Video Input Format	SXGA 1280 x 1024 @ 60 Hz
	Video Interface	DVI over HDMI
	Latency	< 0.002 ms
Audio	Headphone Response	15-25,000 Hz
	Headphone Impedance	60 Ohms
	Microphone	Standard Integrated, Shell-mounted Microphone
	Mic Transducer Principle	Electret
Controls	Interpupillary Distance (IPD)	*Range*: 53-73 (Independent left and right) mm
Po er	Power Supply	*Input*: 100-240 VAC, 0.3A 50-60 Hz. *Output*: +5 V DC, 2 A min
Physical	Size (envelope)	14.2 L x 9.0 W x 8.6 H max in
	Mass	1050 g
Compliancy	CE Compliance	CE Compliant
	RoHS Compliance	RoHS Compliant
Mfg Warranty	Included: one year	additional 1-year warranty add-ons available up to 3 years max

nVIS nVisor ST50

Specifications are subject to change without notice

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TSD190 HAPTIC (TACTILE) STIMULATOR

The TSD190 is a haptic (tactile) stimulator. The TSD190 is ergonomically designed to strap onto a variety of body locations and it incorporates an internal electromagnetically actuated plunger which can be used to mechanically stimulate a 1.5 mm diameter area of skin surface. Both plunger force and travel can be infinitely adjusted between zero and a specified maximum value. Applications include somatosensory and other types of tactile sensory tests. It's possible to employ the TSD190 in an averaging-type sensory nerve test to determine the speed of propagation and activation threshold of somatosensory nerves.

The TSD190 connects directly to the STM100C stimulation module. Plunger activation force, width of stimulus pulse, and pulse repetition rate are established via the Acq*Knowledge* Set up Stimulator window. To output a stimulus waveform which has a precisely controlled rate-of-change in both onset and offset, ramp up or down the applied stimulus voltage to the TSD190. The TSD190 will respond to any kind of applied waveform, such as square, triangle, sinusoidal or arbitrary.

Visual or audio cues can be replaced or augmented with haptic feedback. For one example, see *Kahol K., French, J., et al.* (2006). Evaluating the Role of Visio-Haptic Feedback in Multimodal Interfaces through EEG Analysis. <u>Augmented Cognition: Past, Present and Future</u>. D. Schmorrow, K. Stanney and L. Reeves. Arlington, VA, Strategic Analysis, Inc.: 289-296.

TSD190 SPECIFICATIONS

Stimulus Plunger Diameter:	1.5 mm
Stimulus Pulse Widths:	1 msec (min) to 100 msec (max)
Waveform Stimulus Types:	Digital or Analog Drive
Stroke length:	(0-3 mm) - set screw adjustable
Force:	(0-1.5 Newton) - adjustable via applied stimulus voltage (0-24 V)
Interface:	Connects directly to STM100C Stimulator (External Stim Port)
Input Connector:	6.35 mm male phono plug
Cable length:	2 meters
Velcro Omni® Strap (included):	30 cm long x 25 mm wide
Weight:	39 grams
Length:	62 mm
Diameter:	22 mm

BIOPAC® Systems, Inc.

PRODUCT SHEET

info@biopac.com
support@biopac.com
www.biopac.com

HDS100 HAPTIC DELIVERY SYSTEM

Replacement actuators/isolators available as **R HDS**.

The HDS100 haptic delivery system provides tactile feedback during virtual reality experiments and includes:

- audio amplifier that connects to a computer sound card
- actuators & isolators that vibrate based on the sound from the sound card
- interface cables to an existing sound card, to actuators, and signal to HDS100 *and* speakers

Actuators are placed under chair legs or on a platform and deliver vibrations based on the VR environment (e.g. movement of elevators).

The system is compatible with SuperLab, E-Prime, Vizard VR Toolkit, and other presentation systems that interface the computer's sound card.

HDS100 SPECIFICATIONS

Includes:

- **1 amplifier**
    - Features remote control and rear-mounted IR Input
    - Bass management, filter and gain control for limitless personalization
    - Drives up to four linear actuators with two channels 150 W each RMS (6 ohm)
    - Rack mountable with optional ears
    - Variable Low Pass Filter (20-600 Hz)
    - Three inputs (Left, Right, LFE)
    - Signal sense auto on/off
    - Ultra quiet variable speed fan
    - Size 2U (43 cm x 9 cm x 36 cm) or (48 cm x 9 cm x 36 cm with optional Rackmount Adapters)

- **linear actuators**—Patented electromagnetic motors deliver extraordinarily accurate low-frequency motion to a wide range of furnishings. These updated actuators deliver improved performance, especially when producing infrasonic frequencies (below 20 Hz). New magnet structure with a vented center pole allows air to move in and out more efficiently. The Shadow-8 also sports a new 8 ohm drive coil and an increased range of motion. Actuators are constructed with rare earth magnets and grained and anodized aluminum.

- **motion isolators**—These motion isolators dramatically reduce the amount of tactile motion transmitted to the floor and surrounding environment, effectively isolating the tactile sensation to the couch or chair. Motion Isolators are made of a high quality mark-free rubber.

- **Interface cables**

- HDS100 to an existing sound card: 3.5 mm stereo phone plug to dual RCA Y (CBL120)
- HDS100 to actuators: 18 gauge, 7.3 m
- signal to HDS100 *and* speakers: stereo splitter, 13.5 mm