

# Opti-Amp USB

Optical Bio-Amplifier System  
Software Manual Version 2.0



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**Opti-Amp USB Installation and Software Manual**

Optical Bio-Amplifier System  
Software Manual Version 2.0

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Part Number: M012010

**Manufacturer:**

Intelligent Hearing Systems  
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Miami, FL 33143  
U.S.A.

# Safety Instructions

Complying with the following warnings and caution statements will ensure safe operation of the equipment as well as the safety of the users and test subjects. These notices may be repeated as appropriate further into the manual:



## WARNING:

This symbol identifies conditions or practices that may present danger to the test subject and/or user.



## CAUTION:

This symbol identifies conditions or practices that could result in damage to the equipment or in incorrect results.



Due to safety considerations for human subjects, the hardware and all other electrically attached devices must be plugged into an Isolation Transformer compliant with the international standard IEC-60601. This is required for proper galvanic isolation.



The computer and printer used with the system must be connected to the same Isolation Transformer.



Third party equipment that was not provided or approved by IHS must not be connected to the same Isolation Transformer.



Isolation Transformers must not be placed on the floor in order to prevent the accidental ingress of fluids.



Any devices located in the patient area, connected to the Intelligent Hearing Systems devices, must be compliant with the requirements of IEC 60601-1.



Power cables shall be connected to electrical outlets approved by international standard IEC-60601. This is necessary for grounding reliability and proper isolation.



The biomedical department of your institution must make sure that the leakage current test results comply with the requirements of your region.



Computers connected to a network need to be tested for leakage current while connected to the network. A network connection may affect total leakage current.



The main power switch must remain accessible; do not position the Opti-Amp USB device in such a way that hinders access to the power switch.



The System is not explosion proof and must not be used in presence of flammable gases or substances.



Hazardous electrical output may occur. This equipment is for use by qualified personnel only.



The operator must not touch any of the electrical cables and the patient at the same time.



## ATTENTION:

This symbol identifies conditions or practices that could lead to non-hazardous, yet unintended or unexpected, consequences.



Before connecting any cables or accessories, ensure that all power switches are in the 'OFF' position.



Verify all hardware connections before every use.



The system is not protected against defibrillators. Remove patient connections before defibrillation. If defibrillation occurs, retest the system for leakage current to ensure safety.



Although they are electrically isolated, patient connections are not intended for direct cardiac contact.



To minimize the risk of infection, DO NOT reuse any device labeled as disposable; dispose of these items properly after use.



Follow your institution's guidelines for skin preparation. When performing skin preparation and/or impedance reduction in human subjects, only use supplies approved by the FDA or by your institution.



Follow your institution's procedures when cleaning the equipment. A cloth, damp with Isopropyl alcohol may be used to clean and disinfect the Opti-Amp USB device. Do not use strong cleaners that may damage the plastic enclosure. Do not allow any cleaning solution to get inside electronic components and connectors.



Do not have the equipment inspected or repaired by non-authorized third party technician. All problems must be solved using the Intelligent Hearing Systems servicing department or an IHS designated agent. Non-compliance will void the equipment warranty.



Due to cross-contamination considerations, systems used on animal subjects should never be used to test human subjects.



10D OAE probes have a built-in equalizer, making it possible to swap probes with minimal effect on the results. 10B+ Microphone probes require an external equalizer, making them system specific. Never swap the 10B+ Microphone with another unit.



Read and follow the instructions in this Hardware Installation section when installing or transferring the system.



Follow the special precautions for EMC when installing an bringing the equipment into service.



Do not operate with damaged cords or plugs. Inspect all connection cords periodically for fraying or other damage.



Plug all equipment into an earth grounded outlet, if available. These are usually marked with a green dot next to the connecting pins.



When the equipment is installed adjacent or stacked with third party equipment, the performance should be observed to verify normal operation.



Portable and mobile RF equipment may affect the performance of the equipment. Turn off or remove RF equipment in close proximity as needed.



Do not operate with broken equipment. Inspect all devices and attached accessories for signs of damage before use.



When connecting all cables, do not force the connection. Damage to the hardware may occur.



Only connect cables and accessories as specified in the provided manuals, and as instructed by IHS provided documentation. Failure to do so may result in increased emissions or decreased immunity.



Read and follow the instructions provided in the user manuals to ensure safe and proper use of the equipment.



Ensure that the patient electrode leads are correctly attached and connected to the appropriate lead socket. Inverting the electrode connections may cause incorrect or mis-interpretation of results.



The OAE probe must always be used in combination with an ear tip. Never place the OAE probe on the ear canal directly.



Non-medical equipment that will be connected to any part of the system or attached devices must comply with the necessary standards for you area, if applicable.



Turn off all equipment before connecting or disconnecting accessories.



Turn off and disconnect all equipment and all parts of the equipment when performing maintenance and cleaning.



Be aware that in environments with multiple users, the default protocol may be changed by others. Always verify the parameters before acquiring. Keeping a separate copy of specific parameters, and loading those before each use will help avoid this situation.

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# Introduction



Welcome to the Intelligent Hearing Systems family of customers. Please be sure to read all the enclosed documentation. Doing so will allow you to use the equipment safely. It will also allow you to maximize the benefits from this great investment.

## Product Features

Opti-Amp USB is an accessible optical bio-amplifier system. Some of its features are:

- Up to eight programmable EEG or OAE channels
- Programmable Gain, High Pass Filters and Low Pass Filters
- Built in electrical noise notch filter customized for your power supply,

Opti-Amp USB works under the Windows® 7, 8 and 10 operating systems. This manual assumes that you are familiar with the basic operation of these operating systems and their capabilities. Please refer to the operating system manuals when necessary.

## Computer Requirements

The following list describes the minimum computer requirements for installing and operating the IHS software.

- Windows Based Operating System
  - Desktop or Laptop with a 32 or 64 bit Windows 7, 8, 8.1 or 10 operating systems.
  - Virtual Machine, such as Parallels® or VMWare®, running one of the operating systems listed above.
- 4 GB of RAM.
- 10 MB of Hard Drive Space for program storage.
- WXGA graphics, 1280 x 768 resolution.
- 1 USB port.
- Mouse or Other Pointing Device.

The Opti-Amp USB hardware requires a Windows® compatible operating system with a USB port. Because of differences between manufacturers, IHS cannot guarantee compatibility with all computers. If you experience any difficulties, contact Intelligent Hearing Systems Customer's Service at 1-800-447-9783, and a representative will assist you.

## Customer Responsibility

The equipment, its components and included software shall perform reliably as long as it is operated and maintained in accordance with the instructions contained in the manuals, associated labels and inserts. A defective component must not be used. New IHS-manufactured parts should promptly replace broken, missing or worn parts. If you suspect a part of the equipment to be defective or if you need additional information, please contact IHS.

The responsibility of IHS is limited by the warranty as stated in this manual. Should the repair or replacement

of the product become necessary after the end of the warranty period, the user must consult IHS before such repair or replacement. If the product is in need of repair, do not use it until all repairs are completed, the unit is functioning properly and is appropriately tested. The owner of this product has sole responsibility for the following:

- Any malfunction resulting from improper use,
- Maintenance or repairs done by other than IHS,
- Any malfunction caused by parts that are damaged or modified by anyone other than IHS authorized personnel.

## Warranty

Opti-Amp is manufactured by Intelligent Hearing Systems Corp. (IHS), Miami, FL and is sold under the warranty herein set forth. The warranty is extended only to the buyer purchasing the device from IHS or an authorized dealer-representative.

IHS warrants this product to be free from defects in workmanship and material under normal use and service and shall conform to its original specifications for a period of one (1) year from the date of delivery. The liability of IHS under this warranty is limited, at its sole discretion, to replacing, repairing or issuing credit (*adjusted to reflect age and use of the product*) for a system or portion thereof provided that (a) IHS is notified in writing within 30 days following the discovery of a defect by the buyer, (b) the defective device is returned to IHS, and (c) IHS's examination of the device shall disclose to its satisfaction that (i) the device has not been repaired or altered by anyone, (ii) any defect has not been caused by misuse, neglect or accident, and (iii) the device has not been used for other than normal use.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, WHETHER STATUTORY OR OTHERWISE, INCLUDING AN IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE. IN NO EVENT SHALL INTELLIGENT HEARING SYSTEMS CORP. BE LIABLE FOR ANY INCIDENTAL OR CONSEQUENTIAL DAMAGES RESULTING FROM THE USE OF THIS PRODUCT OR CAUSED BY ANY DEFECT, FAILURE, OR MALFUNCTION OF THE PRODUCT, WHETHER A CLAIM FOR SUCH DAMAGE IS BASED UPON WARRANTY, CONTRACT NEGLIGENCE OR OTHERWISE.

# Hardware



The following items may be included in your system. The items included will depend on system configuration.

## Main components

This is main hardware included in every system, along with software and driver installation media.

### Opti-Amp USB Box



Fig. 1. - Opti-Amp USB Box (M012300)

### Power Supply



Fig. 2. - USB Power Supply (M011111)

### Power Cord

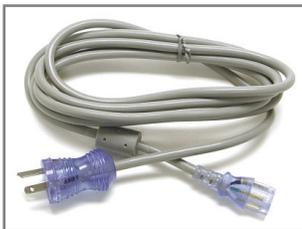


Fig. 3. - USB Medical Grade Power Cord (M011112)

### USB Cable



Fig. 4. - USB Cable (M0111113)

## EEG Components

The following components are included for systems that incorporate EEG functionality.

### Opti-Amp Transmitter

One or the other will be included depending on system configuration:



Fig. 5. - 1 Channel Opti-Amp Transmitter (M013009P)



Fig. 6. - 2 Channel Opti-Amp Transmitter (M013010P)

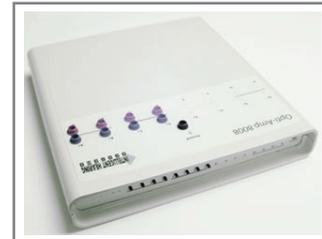


Fig. 7. - Multi-Channel Opti-Amp Transmitter (M013020P)

The Multi-Channel Opti-Amp transmitter pictured above has four channels; others may have 6 or 8 channels depending on system configuration.

### Fiber Optic Cable

A fiber optic cable with one optical lead per channel is included with each unit.



Fig. 8. - 2-Channel Fiber Optic Cable (M013200S)

Systems are supplied with a 2.5 meters cable with the number of channels applicable to the system configuration. The following versions of the Fiber Optic cables are available:

- **M013210S:** 1 Channel, 2.5 meters
- **M013200S:** 2 Channel, 2.5 meters
- **M013204S:** 4 Channel, 2.5 meters
- **M013206S:** 6 Channel, 2.5 meters
- **M013208S:** 8 Channel, 2.5 meters
- **M013211S:** 1 Channel, 5 meters
- **M013201S:** 2 Channel, 5 meters
- **M013214S:** 4 Channel, 5 meters
- **M013216S:** 6 Channel, 5 meters
- **M013218S:** 8 Channel, 5 meters

## OAE Components

An OAE microphone or probe is supplied per channel of OAE included in the system configuration.

### 10B+ OAE Microphone



Fig. 9. - 10B+ OAE Probe (M032100)

### 10D Probe



Fig. 10. - 10D OAE Probe (M032103)

## Hardware Connections

- 1 Make sure that the Opti-Amp USB box is in the OFF position (O) before proceeding.



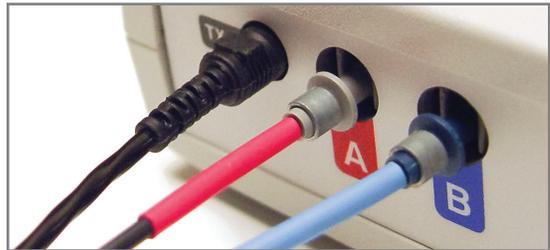
- 2 Connect the Power supply 5-pin plug into the power socket at the back of the Opti-Amp USB.



- 3 Connect the Medical Grade power cord plug to the Power Supply socket



- 4 For systems with EP channels, connect the Fiber Optic cable to the back of the Opti-Amp USB and to the Opti-Amp Transmitter box. Make sure to connect the 3-pin power plug, as well as all the available fiber channels.



- 5 For systems with OAE channels, plug the OAE probe socket to the back of the Opti-Amp USB.

- 6 Connect the Opti-Amp USB to external equipment using the front BNC connectors as needed.



- 7 Connect the USB cable to the back of the Opti-Amp USB and to an available port on the computer to be used. If the computer is ON, the computer connection light will illuminate.

## Next Steps

Do not turn the equipment ON until the software and hardware drivers are installed. Refer to the next section for instructions on how to install them. If your PC was provided by IHS with your purchase, you may skip the installation of software and hardware drivers as these were done in-factory before it was shipped.

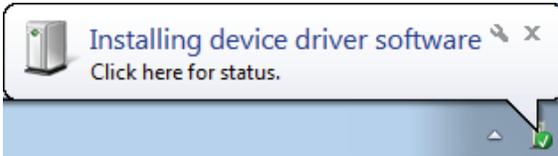
# Software and Driver Installation



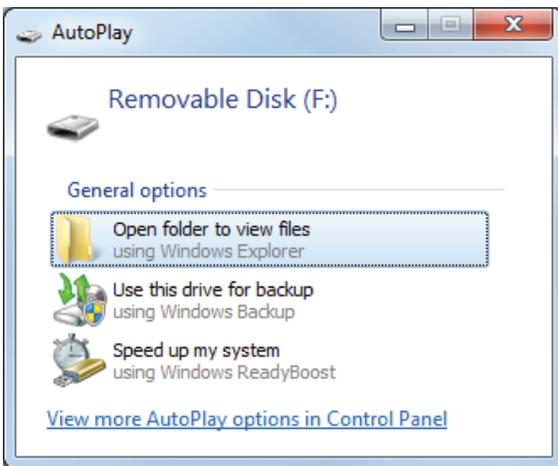
If the computer being used with the system was not purchased with it, or your hard drive had to be reformatted, you will need to install the software package and hardware drivers. It is imperative to follow these directions closely and in the proper sequence or the system may not function properly. It is recommended to start by installing the software applications and driver before turning ON the hardware. If you purchased the computer from Intelligent Hearing Systems, you may skip this section as the software programs and hardware driver have been already installed.

## Software Installation

- 1 Connect the Software Drive to a free USB port on the computer. The operating systems should recognize and install the drive automatically.



- 2 Select the **“Open Folder”** option from the AutoPlay window. Note that the drive letter and the listed options may not be exactly the same as in the following image.



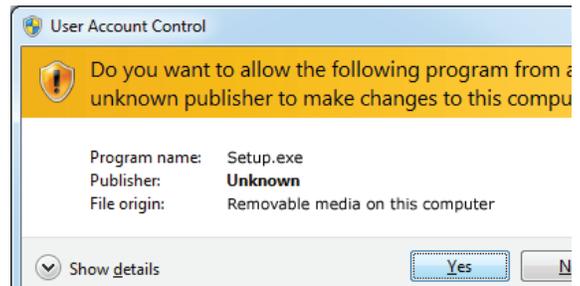
If AutoPlay does not open, then browse the computer using Windows Explorer and view the contents of the drive. Click on **“File Explorer”** for Windows 10, **“This PC”** for Windows 8, or **“Computer”** for Windows 7 to open windows explorer, then find the removable drive.



- 3 From the list of files and folders in the explorer window, double click on the file called **“Setup”**. Note that the file will show the executable extension in some computers and will read **“Setup.exe”** instead. The explorer windows may only show icons as opposed to the list detailed view shown below.

autorun.inf	Setup Information	2/4/200
IHSGEN.ICO	Icon	1/16/19
setup.exe	Application	9/23/20
SETUP.INI	Configuration sett...	6/1/201

- 4 If User Account Controls is active in your computer, you will be asked if to confirm that you want to execute the setup program. Click on **“Yes”**.



- 5 If you want to install the software to a location other than the default, change the directory on the top field of the setup program. The default location is the **“OptiAmp”** folder in your **“C”** drive.



- 6 If updating a previous installation, check the **“Update Only”** box at the bottom right of the window. For new installations, or to overwrite an existing one, make sure this box is NOT checked.



- 7 Click on the [Start] button.



- 8 When Done, click on the [Exit] button.



## Required Administrative Privileges

In computers joined to a domain, standard users will need to have full read and write privileges to the installation folder to achieve full functionality of the software. System administrators will need to enable full access to this folder by either editing the privileges at the local level, or by using group policy.

- **'C:\OptiAmp'**: This location stores the programs and settings. The location may be modified at the time of installation. The installation path must not contain spaces. All users must have full rights to this folder.

In addition, there must not be restrictions in place for users to access USB devices, as they would prevent proper operation. Installing the hardware driver using the included installation utilities ('**IHSDriverInstallation32.exe**' or '**IHSDriverInstallation64.exe**', depending on the OS bits) is highly recommended to allow for standard users to change USB ports without the need of an Information Services technician. Alternatively, plug the device into all possible USB ports during setup, and ensure the device is detected properly, so that users are not impacted by a change of port.

## Antivirus Software

There are no known incompatibilities with IHS hardware or software to operate in a computer with Antivirus Software installed. The IHS software has been tested, and found to be fully operational and without issue, in computers using antivirus software from Symantec, Trend Micro, McAfee, AVG, and Microsoft.

If at any point your antivirus program reports a file inside the installation folder to be infected, please contact IHS to confirm the validity of the file and/or obtain a replacement. You may also create a scanning exception for the IHS software installation folder and the patient data folder mentioned in the previous topic.

## Hardware Driver Installation

### Pre-installing the USB Driver

The latest versions of the Opti-Amp software include a driver pre-installation utility; **this is the preferred method**. To pre-install:

1. Browse the contents of the computer hard drive using Windows Explorer. In Windows 7, click on the **"Computer"** item from the Start Menu; in Windows 8, click on **"File Explorer"** from the Start Menu (*Metro interface*), then select **"This PC"**.



2. Double click on the local **"C"** drive, then find the original software installation folder, **"OptiAmp"**.
3. Inside that folder, find the program called **"IHSDriverInstallation32.exe"** for 32 bit systems, or **"IHSDriverInstallation64.exe"** for 64 bit systems. Note that some computers may not show the **".exe"** extension.



4. Run the program that corresponds to the number of bits of your operating system to install the drivers. Running the wrong version will result in an error. If an error occurs, simply run the other program.
5. Once completed, you may connect and turn ON the OptiAmp Hardware, it should be recognized automatically.

If the IHSDriverInstallation programs are not present, then this may be an older version of the software and there are two options:

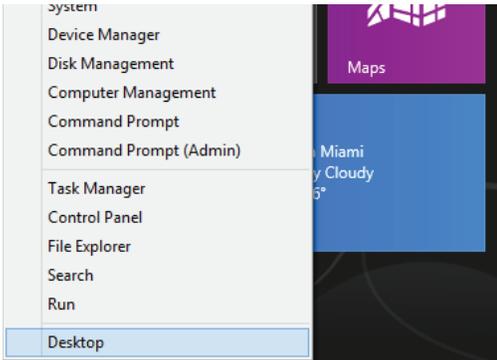
- Install a software update, then proceed with the installation as previously outlined. Note that not all systems will support an update, consult with IHS support personnel for details.
- Install the driver manually as described below.

## Installing the USB Driver Manually

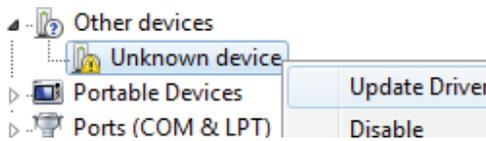
To Install the hardware drivers on your computer manually, follow the steps that correspond to your computer's operating system:

### On Windows 8 and Windows 10

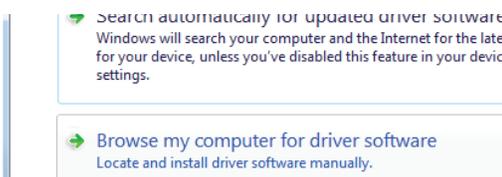
1. Make sure the Opti-Amp USB hardware is properly connected to the computer and power.
2. Turn the Opti-Amp USB ON. Windows may automatically try to find the driver in the Microsoft update site. If Windows cannot find the driver, continue with the rest of this guide.
3. Move the mouse pointer to the bottom left corner of the screen and right-click to get a pop-up menu.



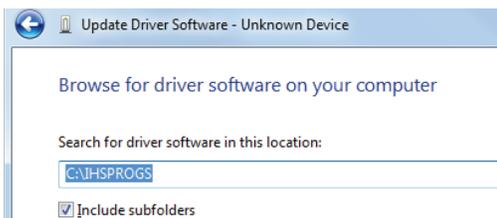
4. Select the **'Device Manager'** from the list
5. Look for the **'Unknown'** device from the list and right click on it. Select the **"Update Driver Software"** option from the menu.



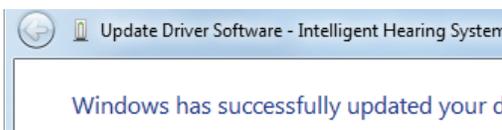
6. Click on the **"Browse my computer"** button.



7. Select the folder where the IHS software is installed. By default, this folder is **"C:\OptiAmp"**. Click **[Next]**.



8. Once completed, a message will appear showing the results of the installation. Some hardware versions may use unsigned drivers. If you are prompted about this during installation, press **"Continue Anyway"** to proceed.

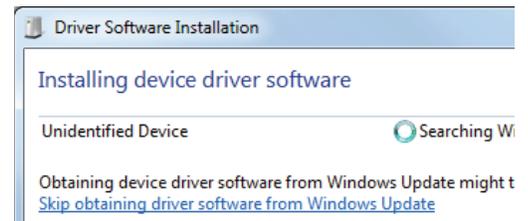


9. The device is now listed under the Universal Serial Bus Controllers.



**On Windows 7**

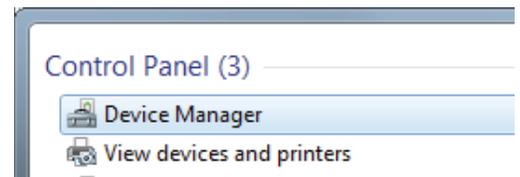
1. Make sure the Opti-Amp USB hardware is properly connected to the computer and power.
2. Turn the Opti-Amp USB ON. Windows may try to automatically find the driver in the Microsoft update site. If Windows cannot find the driver, continue.



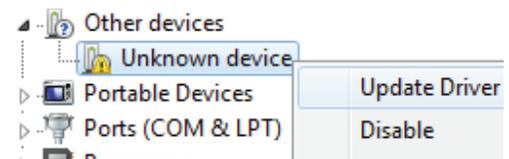
3. In the start menu, search for the device manager.



4. Select the **'Device Manager'** from the options in the **'Control Panel'**.



5. Look for the **'Unknown device'** from the list and right click on it. Select the **"Update Driver"** option from the menu.



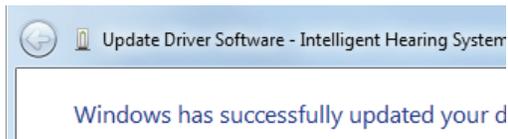
6. Click on the **"Browse my computer"** button.



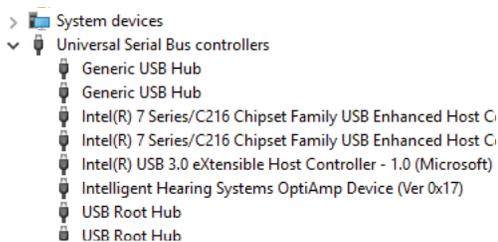
7. Select the folder where the IHS software is installed. By default, this folder is “C:\IHSPROGS”. Click [Next].



8. Once completed, a message will appear showing the results of the installation. Some hardware versions may use unsigned drivers. If you are prompted about this during installation, press “Continue Anyway” to proceed.



9. The device is now listed under the Universal Serial Bus controllers section.



## Installation under a Virtual Machine

When running a Windows operating system as a virtual machine under another operating system such as Mac OS X or Linux, make sure the USB device is connected to the virtual machine, bypassing the host operating system. For instructions on how to do this, consult the documentation of the virtualization software. Once the hardware is connected to the virtual machine, follow the steps that correspond to the guest Windows operating system in use.

## Additional Installation Steps

Some versions of the Windows operating system turn off USB Root hubs by default to conserve power after a period of user inactivity. This may cause the device to stop working properly, even when the USB hub resumes operations after sleep, hibernation, or long computer inactivity. To correct this problem:

For Windows 7, click on the [Start] button, then type “Power Options” in the search field. For Windows 8 and 10, right click on the bottom corner of the screen to show the administrative menu.



1. Choose the “Power Options” item from the list.
2. Click on “Change Plan Settings” for the currently selected power plan.
3. Click on the “Change Advanced Power Settings” option.
4. Expand the USB Settings section by clicking on the [>] or [+] sign next to it.
5. Change the “USB Selective suspend setting” values to “Disabled”.
6. Click [Apply], the [OK].

In addition, you may want to prevent the computer from going into sleep or hibernation modes so it can run uninterrupted.

## 32 bit Vs. 64 bit Operating System

The software can operate in both, 32 bit and 64 bit, environments, based on an internal software setting. The latest software will change this setting automatically as needed; a one-time warning window will alert the user of the change. Older software requires to have the setting changed manually. If neither option is available, a software update is required. Contact IHS for details and availability.

## Changing the OS Bits manually

Before changing the bits, find out how many bits your operating system uses. Right click on the ‘This PC’ (‘Computer’ on Windows 7) and select properties from the context menu. One of the fields of the properties window will specify whether the operating system is 32 bits or 64 bits. Note that most newer computers operate in 64 bits.

To change the operating system mode of the IHS software do the following:

1. Browse the computer’s C drive to find the software installation folder, “OptiAmp” by default.
2. Inside that folder, find the application called “IHSHWSet.exe” and run it.
3. Enter the system password, ‘ihs’ is the default.
4. Change the ‘OS bits’ drop down to the correct option, matching the information found in the computer properties window.

5. Click on the **[Save]** button, then **[Close]**. The settings will be applied next time the software is started.

## Uninstalling the Hardware Driver

On rare occasions, you may need to uninstall the hardware driver from the computer.

### Using the uninstaller

If the driver was installed using the pre-installer, then this option will be available; otherwise, uninstall the driver manually.

1. In the computer's control panel, click on **"Uninstall a Program"**, found in the programs section.
2. In the Programs and Features window, look for a program called **"Windows Driver Package - Intelligent Hearing Systems"**.
3. Select the item, then click Uninstall/Change.
4. Complete the uninstallation Wizard.

### To uninstall manually

If the original installation was not completed using the pre-installer, the driver will need to be deleted manually. Complete this operation with the device plugged in, then unplug it after completing it.

1. Open the Device Manager window. It can be accessed either from the control panel, or by opening the computer management console.
2. In the Universal Serial Bus Controllers section of the device list, search for a device that starts with the name **"Intelligent Hearing Systems OptiAmp Device"**, the rest of the name will depend of the version of platform installed.
3. Right click on the device and from the pop-up menu, choose **"Uninstall"**.
4. In the confirmation window that appears, make sure to check the box that reads **"Delete the driver software from this device"**. Failing to check this box will result in a partial uninstall, leaving the old driver in the windows database; if this happens, reinstall manually and then uninstall the driver again.
5. Click **[OK]** to confirm and finish uninstalling.

# Software Overview



If the software is not already installed in your computer, follow the steps on page 4. The software is accessible from the Windows start menu under the [programs > OptiAmp] folder. You may also access the program by browsing to the installation directory. It is recommended that you create a shortcut to the program on the desktop for easy access.

## Program Layout

The Opti-Amp software shows a control section for each installed amplifier channel. A maximum of 8 channels may be added to the USB box assembly. The software allows for easy switching of gain and filter settings for each channel independently. The program layout will change depending on the number of channels purchased with the Opti-Amp, the following figure shows a setup for a 2-channel system.

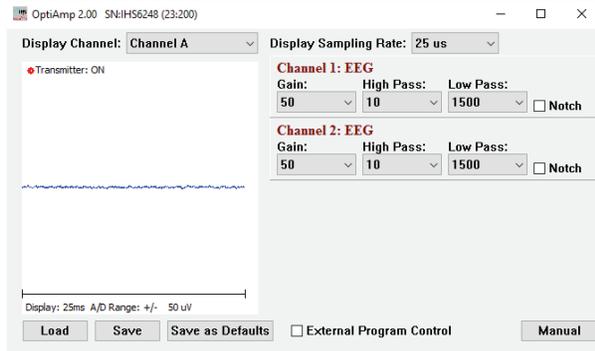


Fig. 11. - Opti-Amp main screen, 2-channel system

## EEG Channels

Each EEG channel will be labeled as such by the channel designation marker as shown in Fig. 12. EEG channels contain drop-down selectors for the Gain, High Pass filter and Low Pass filter. The Line Filter can be turned ON (checked) and OFF (unchecked) using the check box on the lower right hand corner. The built in line filter will be pre-set at factory to be 50 or 60 Hz depending on the electrical supply in your area.



Fig. 12. - EEG Channel Layout

## EEG Channel Gains

The Opti-Amp USB provides eight (8) EEG Gain settings: 5, 10, 25, 50, 100, 150, 200, and 300 K. To select the desired gain setting, simply select it from the drop-down menu.

Listed Gains are the standard gains normally included in the device, actual gain values may vary if your system was special ordered. Refer to the drop down gain menus for actual gain values that apply to your system. Gain settings may be custom made to any eight values between 5 K and 300 K.

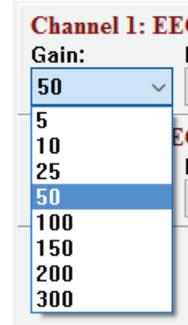


Fig. 13. - EEG Channel Gains

## EEG Channel Filters

The Opti-Amp USB provides eight (8) high pass filter settings between 1 and 500 Hz, and eight low pass filter settings between 30 and 5000 Hz. To select the desired filter setting, simply select it from the drop-down menu. Listed filters are the standard filters normally included in the device, actual filter values may vary if your system was special ordered. Refer to the drop down filter menus for actual filter values that apply to your system. Filter settings may be custom made to any 16 values between 0.5 Hz and 10 kHz.

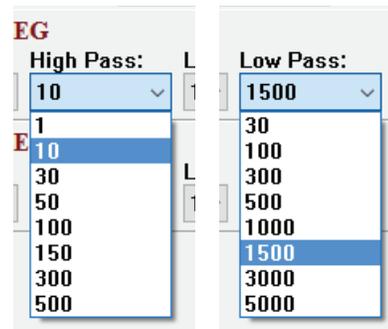


Fig. 14. - High Pass and Low Pass EEG Channel Settings

## OAE Channels

Each OAE channel will be labeled as such by the channel designation marker as shown in Fig. 15. OAE channels contain settings for the Gains. The TrOAE Filter can be turned ON and OFF using the check box on the lower right hand corner.

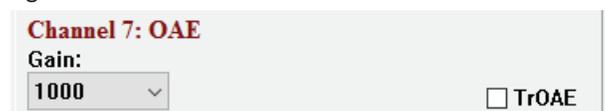


Fig. 15. - OAE Channel Layout

## OAE Channel Gain

The Opti-Amp USB provides eight (8) OAE Gain settings: 100, 200, 500, 1000, 2000, 4000, 8000, and 10000. Listed Gains are the standard gains normally included in the device, actual gain values may vary if your system was special ordered. Refer to the drop down gain menus for actual gain values that apply to your system. Gain settings may be custom made to any eight values up to 10000.

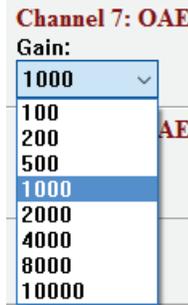


Fig. 16. - EEG Channel Gains

## TrOAE Filters

The TrOAE filter can be activated by checking the box to the bottom right of the desired channel, see Fig. 17. The use of filters acts to the detriment of the acquisition of DPOAE recordings, however, active filters are necessary for the acquisition of TrOAE data. Checking the TrOAE Filter activator will bring online the active filters. The active filter has a range of 450 Hz to 5 kHz. Make sure you deactivate this option when acquiring DPOAE recordings.



Fig. 17. - OAE Channel Layout

## EEG Display

The left side of the software window can be used to view the incoming EEG for the selected channel

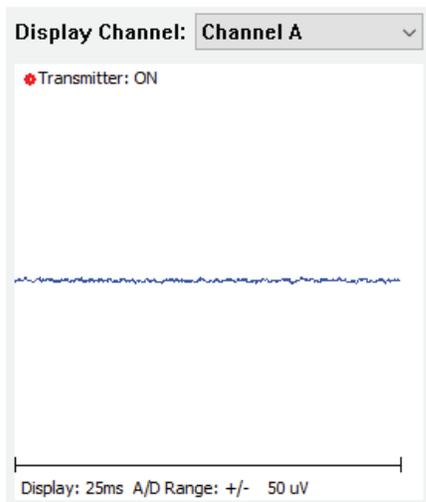


Fig. 18. - Opti-Amp main screen, 2-channel system

The displayed channel can be selected by using the drop-down menu above the graph. The graph displays data for 1000 data points across, where the sampling rate of the points is defined by the “*Display Sampling rate*” drop-down menu.

## Display Sampling Rate

The display sampling rate determines the resolution of the data shown on the EEG display area.

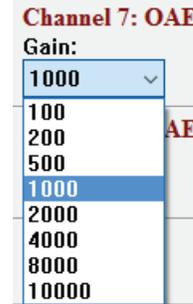


Fig. 19. - EEG Channel Gains

The chosen sampling rate has no impact on transmitted data, it only determines the rate at which the data is sampled for display purposes of this software.

## External Program Control

The check box at the bottom of the window will determine if the program will scan the Windows® clipboard for changes to the channel settings. Refer to the following Chapter for details about controlling the program using external tools.

## Settings

All the selections made in each of the EEG and OAE channels may be saved to a file for later use. To save them, simply click the [Save] Button. Using the [Save as Default] button will make the settings file the starting setting; when the software is opened, the default settings file loads automatically.

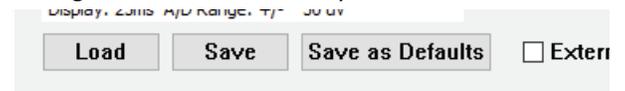


Fig. 20. - Opti-Amp main screen, 2-channel system

To load a previously saved settings file, simply click the [Load] button.

When the system is used in multi-user environments, it is recommended to save a backup copy of your default settings, in case a different user changes the default settings without your knowledge.



## External Controls

The Opti-Amp parameters can also be controlled from another application using the Windows Clipboard to send and receive information. To enable this option, select the **“Enable External Program Control”** check box on the lower right side of the Opti-Amp dialog box. If you wish this option activated the next time you run the Opti-Amp software, save the current settings as the Default settings.



Fig. 21. - External Program Control activation check box

## Available Instructions

The following are the instructions that the Opti-Amp program will parse and understand when placed on the Windows® clipboard.

- **OPTIAMP-CHx-GAIN=n:** This instruction will change the gain of channel ‘x’ to the value of the ‘n<sup>th</sup>’ option from its corresponding drop-down menu. E.g. ‘**OPTIAMP-CH3-GAIN=2**’ will set the gain of the third channel to 10 K (the second option).
- **OPTIAMP-CHx-HP=n:** This instruction changes the high pass filter of channel ‘x’ to the value of the ‘n<sup>th</sup>’ option from its corresponding drop-down menu. E.g. ‘**OPTIAMP-CH1-HP=6**’ will set the high pass filter of the first channel to 150 Hz (the sixth option)
- **OPTIAMP-CHx-LP=n:** This instruction changes the low pass filter of channel ‘x’ to the value of the ‘n<sup>th</sup>’ option from its corresponding drop-down menu.
- **OPTIAMP-CHx-SWITCH=ON:** This instruction will activate the line filter of channel ‘x’.
- **OPTIAMP-CHx-SWITCH=OFF:** This instruction will deactivate the line filter of channel ‘x’.
- **OPTIAMP-SAVE:** This option will save the current set of settings of all channels as the default.
- **OPTIAMP-CLOSE:** This option closes the application.

## Testing Instructions

The simplest way to test the communications with the software module is to run Notepad and type in some instructions. Position the Opti-Amp software and the Notepad window in such a way that you can see both program windows at the same time on your computer screen. Type an Opti-Amp instruction in Notepad, highlight the instruction and press **[Ctrl] + [C]** to copy the text to the Clipboard. You should see the appropriate value change on the Opti-Amp dialog window.

## Additional Tips

It is important not to lock out the Windows Clipboard by continuously reading or writing to the Clipboard. This will not allow other applications to write or read from the Clipboard. A delay or interrupt method may be used in order to allow the Opti-Amp application time to read and write to the Clipboard.

It is also important to read the format of the data currently on the clipboard. If another application places graphical data on the clipboard, reading it as a text may cause your application to crash.

The Opti-Amp program allows you to save the current settings as defaults. The next time you run the Opti-Amp program, all the default settings will be loaded and the Opti-Amp hardware programmed accordingly. The only way to make sure that all the settings are set as your application desires is to program all the settings each time you run your application. If someone changes the settings and saves them as the default settings, your application will not know if those values have been changed or not. Unless you are sure that no one can modify your settings, you should not assume that the loaded default values are the ones you want to use

# Electrode Polarities

## 6



### Single channel transmitter

The single channel transmitter box has three electrode positions: a **Red**, **Blue**, and a **Black**. The functions of each position need to be physically switched on the Opti-Amp transmitter by flipping the '**Left-Right**' lever to the correct position. Failing to change the lever position may result in an inverted recording; however, the response will be acquired regardless of settings.

- When the Switch is set to **"Right"** on the Amplifier:
  - The **Red** electrode is the inverting electrode (-).
  - The **Blue** electrode is the ground.
  - The **Black** electrode is the non-inverting electrode (+).
- When the Switch is set to **"Left"** on the Amplifier:
  - The **Red** electrode is the ground.
  - The **Blue** electrode is the inverting electrode (-).
  - The **Black** electrode is the non-inverting electrode (+).

### Dual channel transmitter

The dual channel transmitter box has five electrode positions: two **Red**, two **Blue**, and one **Black**. In These type of transmitters, the **Red** positions are always the inverting electrodes, the **Blue** positions are always the non-inverting electrodes, and the **Black** position is always the ground, shared between all channels. The polarity of the electrode positions will not change regardless of software settings. One set of **Red** and **Blue** positions corresponds to each channel, clearly marked on the amplifier itself as A and B.

### Multi channel transmitter

Systems with more than two acquisition channels use a large Opti-Amp transmitter box, which can house up to eight pre-amplifier channels. The unit will have a variable amount of **Red** and **Blue** electrode sockets, based on the number of channels. All **Red** sockets correspond to inverting electrodes (-), and all **Blue** sockets correspond to non-inverting electrodes (+) for their respective channels. The **Black** electrode socket is always the ground electrode shared between all channels.

## Hardware Specifications

GENERAL	
Part Number	M012300
Operating Temperature	15°C to 40°C
Storage Temperature	0°C to 50°C
Relative Humidity	15% to 90% at 40°C Non-Condensing
Atmospheric Pressure	None Specified
Mode of Operation	Continuous
Degree of Mobility	Portable Equipment
Vibration and Shock	N/A
Expected Lifetime	5 Years from date of manufacture

ELECTRICAL SPECIFICATIONS	
Rated Input Current	5A, 2.5A, 0.5A
Rated Frequency	50/60 Hz
Rated Input Voltage	+5V, +15V, -15V DC
Rated Max Input Power	N/A
Fuse Type	N/A
Fuse Rating	N/A

## Power Supply

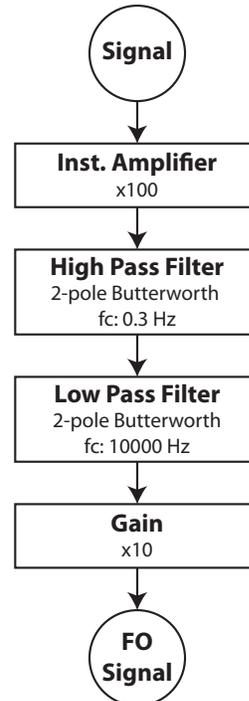
GENERAL	
Part Number	M011111
Operating Temperature	0°C to 70°C
Storage Temperature	-40°C to 85°C
Relative Humidity	5% to 95% at 40°C Non-Condensing
Altitude	0 - 3048 m (0 - 10000 ft)
Mode of Operation	Continuous

ELECTRICAL SPECIFICATIONS	
Rated Input Current	1.3 A
Rated Input Frequency	50-60 Hz
Rated Input Voltage	100-240 V~
Rated Max Output Power	45W
Rated Output Voltage	+5 V, +15 V, -15 V DC
Rated Output Current	5 A, 2.5 A, 0.5 A (correspondingly)
Protection	Overcurrent and Overvoltage
Approval	IEC 60601-1

## Opti Amp Transmitter

SPECIFICATIONS FOR M013009P, M013010P, M013020P.	
Operating Temperature	0°C to 70°C.
Relative Humidity	15% to 90% at 40°C Non-Condensing.
Atmospheric Pressure	500-1050 nPa.
Common Mode Rejection	≥ 105 dB @ 1 kHz ≥ 120 dB @ 50/60 Hz with notch filter ON.
Noise Level	≤ 0.333 μV RMS (1-3000 Hz).
Input Impedance	> 5 MΩ.
Coupling	AC.
Built-in Impedance Test	1 kHz.
Isolation	Fiber Optic Cable for signal, DC-to-DC transformer for power.
Power	15 V DC, 140 mA.

## Transmitter Filters and Gain



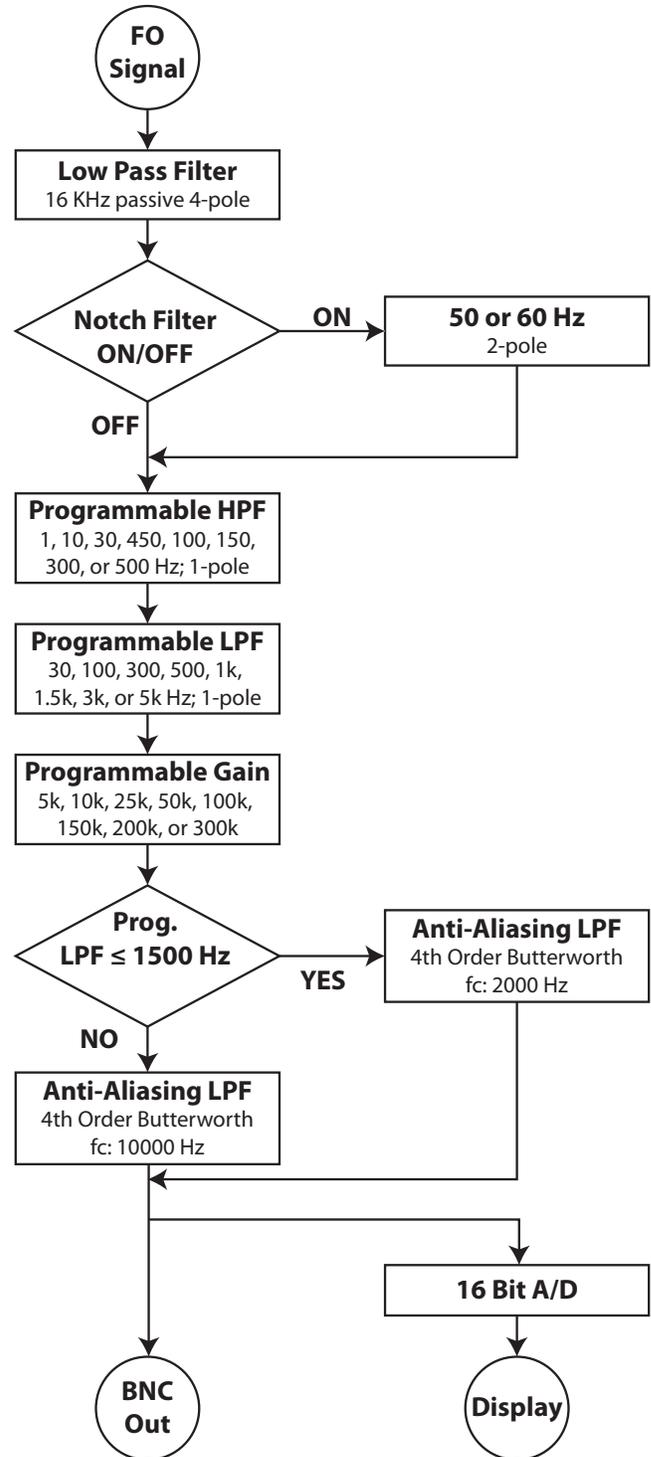
## Optical Receiver Board

The Receiver board, internal to the platform, contains the optical receiver units, low-pass filters, high-pass filters and gain settings. Depending on the number of acquisition channels of your system, connectors will be available on the back plate of the platform.

GAIN SETTINGS	
Amplification (x1000)	5, 10, 25, 50, 100, 150, 200, 300

FILTER SETTINGS	
Low Pass (-6 dB/Oct.)	30, 100, 300, 500, 1000, 1500, 3000, 5000
High Pass (-6 dB/Oct.)	1, 10, 30, 50, 100, 150, 300, 500
Line Filter (-12 dB/Oct.)	On/Off (50 or 60 Hz)

## EEG Channel Filters and Gain



## OAE Channel Filters and Gain

