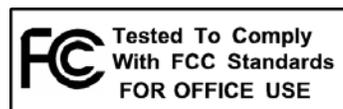


®
LAYLA 3G

®
GINA 3G

Owner's Manual Version 1.0.1 for Macintosh



Important Safety Instructions

- 1. Read Instructions** - Be sure to read all of the safety and operating instructions before operating this product.
- 2. Retain Instructions** - The safety instructions and owner's manual should be retained for future reference.
- 3. Heed Warnings** - All warnings on your Echo product and in the Owner's Manual should be followed.
- 4. Follow Instructions** - All operating and use instructions should be followed.
- 5. Moisture** - Water and moisture are detrimental to the continued good health of your Echo product. Do not install or operate your Echo product near sources of water or moisture such as sinks, damp basements, leaky roofs, etc.
- 6. Heat** – Your Echo product should be situated away from sources of heat such as heaters or radiators.
- 7. Servicing** - Do not attempt to service this unit yourself, as opening the case will expose you to hazardous voltage or other dangers. All servicing should be referred to qualified service personnel.
- 8. Damage Requiring Service** - Unplug this unit and refer it to a qualified service technician when any of the following occur:
 - a) Objects have fallen or liquid has spilled into the unit
 - b) The product has been exposed to rain or water
 - c) The product does not operate normally or when a marked change in performance is noticed
 - d) The product has been dropped or damaged in any way

Registering your product online at <http://www.echoaudio.com/support/register.php> allows us to register key information so that we may handle problems faster and inform you of advance information on upgrades and other news. Thank you in advance for registering. We hope you enjoy your Echo product.

Limited Warranty

Echo Digital Audio Corporation warrants this product, when purchased at an Authorized Echo Dealer in the United States of America, to be free of defects in materials and manufacturing workmanship for a period of one year from the date of original purchase. During the warranty period Echo shall, at its option, either repair or replace any product that proves to be defective upon inspection by Echo. Final determination of warranty coverage lies solely with Echo. Echo reserves the right to update any unit returned for repair, and reserves the right to change or improve the design of the product at any time without notice.

This is your sole warranty. Echo does not authorize any third party, including any dealer or sales representative, to assume any liability on behalf of Echo or to make any warranty for Echo.

Service and repairs of Echo products are to be performed only at the factory (see below) unless otherwise authorized in advance by the Echo Service Department. Unauthorized service, repair or modification will void this warranty.

To obtain factory service:

Contact Echo Digital Audio Corporation at (805) 684-4593, 9AM to 4PM Monday through Friday (Pacific Time). If necessary, you will be given a return authorization number. Products returned without an RA number will be refused. Echo may, at its option, require proof of the original date of purchase in the form of a dated copy of the original authorized dealer's invoice or sales receipt. Pack the product in its original shipping carton and attach a description of the problem along with your name and a phone number where Echo can contact you if necessary. Ship the product insured and freight prepaid to:

**Echo Digital Audio Corporation
6450 Via Real Suite 1
Carpinteria, CA 93013**

DISCLAIMER AND LIMITATION OF WARRANTY

Echo makes no other warranties, express, implied, or otherwise, regarding Echo products, and specifically disclaims any warranty for merchantability or fitness for a particular purpose. The exclusion of implied warranties is not permitted in some states and the exclusions specified herein may not apply to you. This warranty provides you with specific legal rights. There may be other rights that you have which vary from state to state.

In no event will Echo be liable for any lost profits, or for any consequential, direct or indirect damages, however caused and on any theory of liability, arising from this warranty and sale.

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Carpinteria, CA 93013

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Tracktion[™] is a trademark of LOUD Technologies Inc.

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Introduction

Thank you for choosing Echo Digital Audio. We think you'll find your Echo product to be an extremely flexible, high-performance tool for your computer-based hard disk recording system.

What You Should Have Received in the Box

When you opened the box, you should have found the following:

- A PCI card wrapped in an anti-static cover
- An audio interface box
- Four mounting screws with collars (Layla3G only)
- Two removable rack-mount brackets (Layla3G only)
- An interface cable

***Please note:** The cable included with your Echo3G system is a shielded data cable that has been custom manufactured to exacting standards. Use of any other cable will substantially reduce the system's overall audio quality and could damage the system.*

- A CD-ROM containing:
 - Mac OS X Drivers
 - Windows Me/2000/XP Drivers
 - PDF Owner's Manual
 - Tracktion multitrack recording, MIDI, editing, and sampling software for Mac OS X (10.2 or later) & Windows ME/2000/XP
- Quick Start Guide

System Requirements

In order to use Layla3G or Gina3G you'll need the following:

An Apple brand Power Mac with:

- An empty PCI expansion slot
- A G4 or better processor (Power Mac G5 recommended)
- A minimum 256MB RAM (512MB highly recommended)
- Mac OS X (10.2 or later)
- A fast, high-capacity IDE, SCSI or firewire hard disk drive.
- Peripheral audio equipment, such as a mixer, microphones, studio monitors, musical instruments, etc.

Note: Your Echo product may not work properly if you have a processor upgrade card installed. Echo will not be able to supply technical support if you have a processor upgrade card installed.

Installation

To properly install your Echo product you will need to: log in as an administrator, run software update, install the PCI card, install the software, and install Tracktion. The following steps will guide you through installing your Echo product.

Log In as Administrator

In order to properly install your Echo product you need to make sure that you log in to your Mac with an account that has administrative privileges. To verify that your account has administrative privileges, open “System Preferences” from the Dock or from the Apple menu, select “Show All”, and then select “Accounts” in the “System” section. Now, select your account from the list on the left and click on the “Security” tab. Make sure that the checkbox at the bottom labeled “Allow user to administer this computer” is checked. If your account does not have administrative access, then you will need to log out and log in with an account that does.

Run Software Update

Before you install anything, you should make sure that you have the most recent updates for Mac OS X installed. This is especially important. If Mac OS X is out of date, you may not be able to use your Echo product at all. To do this, open “Software Update” from the Apple menu. Download and install all of the updates, including updates for software like iTunes, iDVD, iMovie, QuickTime, GarageBand, etc.

Installing the PCI Card

Once you have logged in as an administrator, and installed the latest software updates, it is time to install the Echo hardware into your computer. Please refer to the section in your Power Mac manual for installing a PCI card.

IMPORTANT - Unplug your computer and detach all peripherals before proceeding with the following steps.

1. **Open up your Power Mac.** Make sure that you have shut down and turned off the power to your computer before opening the case. Refer to your computer's manual for a further explanation of this step if necessary.
2. **Select the PCI slot** into which you will install the card. You may use any of the available PCI slots in your computer for the card. Remove the bracket covering the expansion slot where you would like to install your Echo product. If there was a screw for the bracket, put it in a safe place, as you will need it later to complete the installation.
3. Insure that you have **fully discharged all static electricity** from your body before handling the card. This can be done through the use of a grounding strap or, more simply, by touching your bare hand to the metal casing of the computer's power supply. (For this latter method to work, the computer must be plugged in, though not turned on.) After you've discharged your static, unplug the computer before proceeding to the next step.
4. **Remove the card** from its protective anti-static bag. Handle the card carefully by its edges, and **insert it into the selected expansion slot.** Insure that the card's edge connector (the protruding edge with the gold leads) is seated firmly into the slot. Centering the card over the slot and using a gentle rocking motion while pushing downward into the slot generally works well. Be careful not to force the card into the slot, or bend or twist it while it is being inserted, as this could result in the card being damaged.
5. Now use the screw that you removed earlier, from the protective back plate, to **attach the metal bracket** on the card to the computer's rear panel.

6. **Close up your Power Mac's case**, and secure it. Reattach its power supply cord and reconnect any peripherals that you may have removed prior to beginning the installation.
7. Locate the audio interface box and the interface cable. **Securely mount the interface** into your equipment rack (Layla3G only). If you will not be mounting the box in a rack, then be sure to place the interface box in a secure location.

Plug one end of the cable into the connector on the Echo PCI card that now protrudes through the back panel of your computer, and secure the cable using the built-in screws located on both sides of the connector. **Attach the other end of the cable** to the connector on the rear of the interface labeled “computer” and fasten the cable securely with the screws.

Caution: Never connect the audio interface box to (or disconnect from) the computer while the computer is turned on. This could damage the interface box or PCI card.

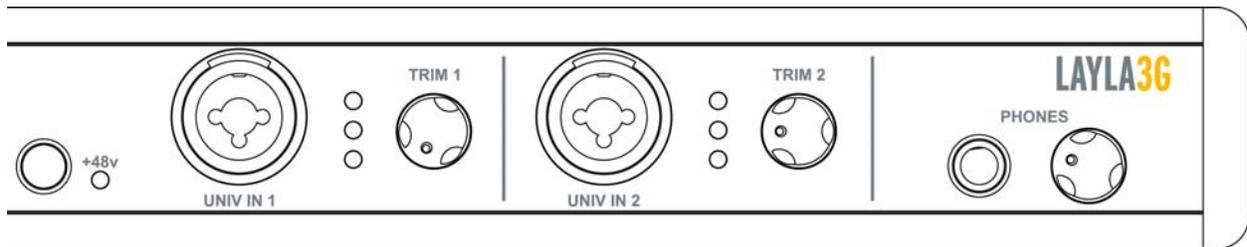
8. You can now **attach external audio devices** to the connectors on the audio interface box. Information on attaching external devices to the audio interface box may be found in the following section: “Connecting to the Audio Interface”.
9. **Turn on your Power Mac.** As a general rule, you should make sure that the volume to your speakers or headphones is turned all the way down when you power up the computer.

Connecting to the Audio Interface

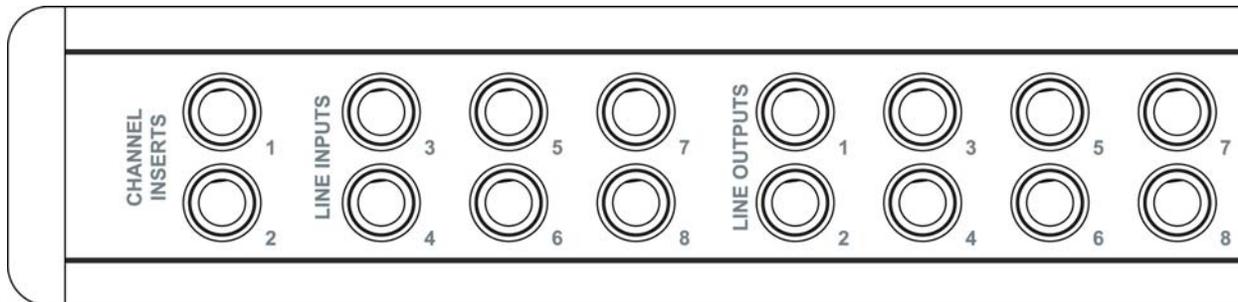
The Layla3G and Gina3G audio interfaces contain a wide variety of connections that allow great flexibility in operation. For optimal performance, it is critical to use the appropriate cabling and connectors.

Analog Inputs and Outputs – Layla3G

Layla3G’s front panel has two universal inputs (#s 1 – 2) with meters and trim knobs, a phantom power switch and light (+48v), and an amber power indicator light. There is also a ¼” headphone output jack, with a corresponding volume knob, which monitors analog outputs 1 and 2.

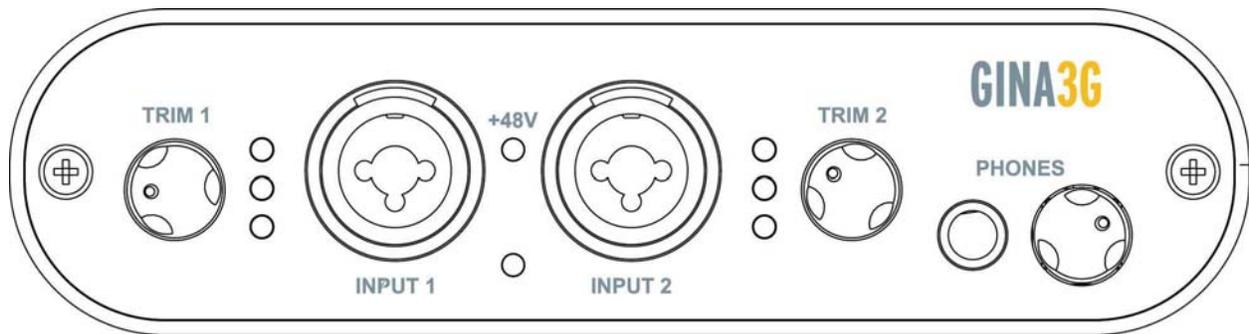


Layla3G has six analog line inputs (#s 3 – 8) and eight analog line outputs on the rear panel. These analog inputs (#s 3 – 8) operate with an input impedance of 10Kohms. The input and output connections can be used with balanced or unbalanced cables via the ¼” connectors. By default, the inputs and outputs are set to receive or send a +4dBu signal. You can switch between +4dBu and –10dBV for each individual input and output via the console software (see section below). There are also two channel inserts on the rear panel where you can connect a serial effects device (compressor, EQ, etc.) for the universal inputs (#s 1 – 2).

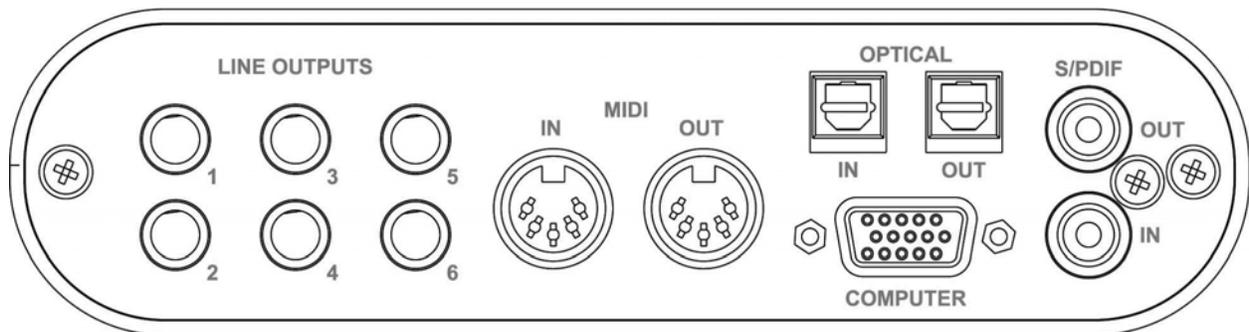


Analog Inputs and Outputs – Gina3G

Gina3G’s front panel has two universal inputs (#s 1 – 2) with meters and trim knobs, a green phantom power light (+48v), and an amber power indicator light. There is also a ¼” headphone output jack, with a corresponding volume knob, which monitors analog outputs 1 and 2.



Gina3G has six analog line outputs on the rear panel. The input and output connections can be used with balanced or unbalanced cables via the ¼” connectors. By default, the outputs are set to send a +4dBu signal. You can switch between +4dBu and –10dBV for each individual output via the console software (see section below).



Universal Inputs

The universal input connections can accept balanced or unbalanced signals via ¼” or XLR connectors. Since Layla3G and Gina3G have built-in preamps, you can just plug your microphone or guitar cable right into the universal input. No external preamp, direct box, or mixer is needed!!

To use a microphone, plug the microphone's XLR cable into any of the universal inputs. Whenever an XLR cable is connected to a universal input, the microphone preamp is enabled and the gain range of the trim knob is set to range from +10 to +58dB. The input impedance of each microphone preamp is 1.5Kohms. Full-scale input is 9dBu with the trim set to minimum gain.

Layla3G and Gina3G provide 48 volts of phantom power for microphones that require it. To enable phantom power for Layla3G, press the button labeled +48v (the LED next to it will light up) and phantom power will be provided to all microphone inputs. Gina3G has a switch in the console software for this purpose.

Note: Phantom power will not be applied to any line level equipment or guitars plugged in using cables with 1/4" connectors.

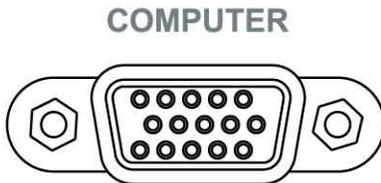
To record a guitar or line level signal, just plug a cable with a 1/4" connector into one of the universal inputs. Whenever a 1/4" cable is connected to a universal input, the guitar/line preamp is enabled and the gain range of the trim knob is set to range from 0 to +45dB. The guitar/line preamp can support both guitar & line level signals. The input impedance of each guitar/line preamp is 102Kohms. Full-scale input is 18dBu with the trim set to minimum gain.

If you want to adjust the input level of a universal input, just turn the trim knob and watch the corresponding level meter. The red light at the top will light anytime the input signal is greater than -6.5dBFS (or within 6.5dB of clipping). The yellow light represents a signal greater than -12.5dBFS and the green light represents a signal greater than -24.5dBFS.

For optimal audio quality, you should adjust the input trim knob so that your loudest recorded signal lights up the yellow light, but not the red. When the red meter light shines extra bright – you've clipped! If the signal level ever exceeds 0dBFS the signal will be "clipped" and you will hear a "pop" or "tick" in the recording. This is a *very bad thing*, and clipping should be avoided at all costs! There is enough headroom so that you can be conservative in this area, and there is no need to push the input levels right up to the edge of clipping.

The Computer Connector

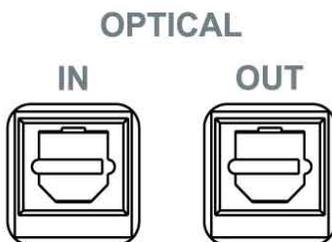
On the rear panel of the interface box is a connector labeled **COMPUTER**. It is the point at which the audio interface connects to the Echo3G PCI card inside your computer.



An Echo3G connector cable was supplied to you for this purpose. This custom made cable is manufactured to certain specifications; if you need to replace it, you should only use a replacement cable from Echo.

ADAT / S/PDIF Optical I/O

Next to the **COMPUTER** connector is a pair of connectors labeled **OPTICAL**, **IN** and **OUT**. These connectors are used to transmit digital audio data via an optical signal using special digital optical cables with Toslink connectors.

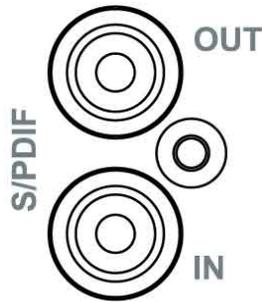


You can use this port for ADAT (8 channels) or for optical S/PDIF (stereo) I/O.

Note: Your Echo3G product is only capable of transmitting or receiving one type of digital signal at a time. You must choose either ADAT optical or S/PDIF (optical or RCA); you cannot use both simultaneously. This is set using the **Digital Mode Switch**, which can be found in the Echo Console. For more information, refer to the section of this manual that discusses the console software.

S/PDIF

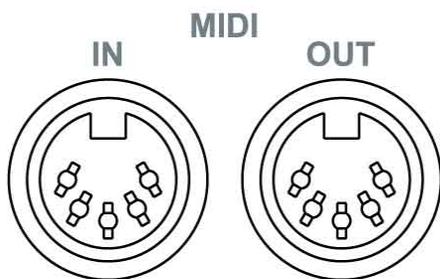
Next to the **Optical** connectors is a pair of connectors labeled **S/PDIF**, **IN** and **OUT**. These S/PDIF connectors are used to transmit digital audio data between digital audio devices via an electrical signal.



When connecting devices to the S/PDIF jacks, the use of standard analog RCA audio cables is not recommended. For reliable S/PDIF operation, 75-ohm coaxial (RG59) video cables are recommended.

MIDI

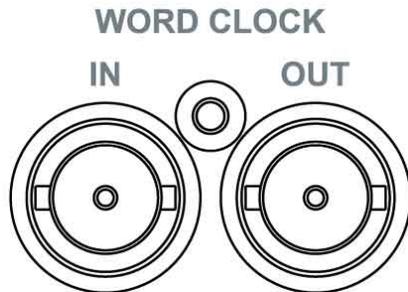
Both Layla3G and Gina3G are equipped with MIDI I/O connectors. The MIDI ports can be used for receiving MIDI time code (MTC), or sending and receiving MIDI signals between your digital audio/MIDI sequencing software and external sound modules, keyboards, MIDI controllers, etc.



MIDI cabling is highly standardized and widely available.

Word Clock (Layla3G only)

Next to the S/PDIF ports on Layla3G's back panel are the **Word Clock** connectors. These connectors allow you to synchronize one Layla3G to another Layla3G, or to other digital audio devices equipped with a Word Clock connector.



The Word Clock I/O uses a BNC connector. As with the S/PDIF I/O, a shielded 75-ohm (RG-59) coaxial video cable should be used. BNC connectors have been widely used in the electronics industry for both video and computer networking. However, computer networks use 50-ohm (RG-58) coaxial cables and not the 75-ohm (RG-59) cable used by video. For reliable word clock operation, use only video grade cables with Layla3G.

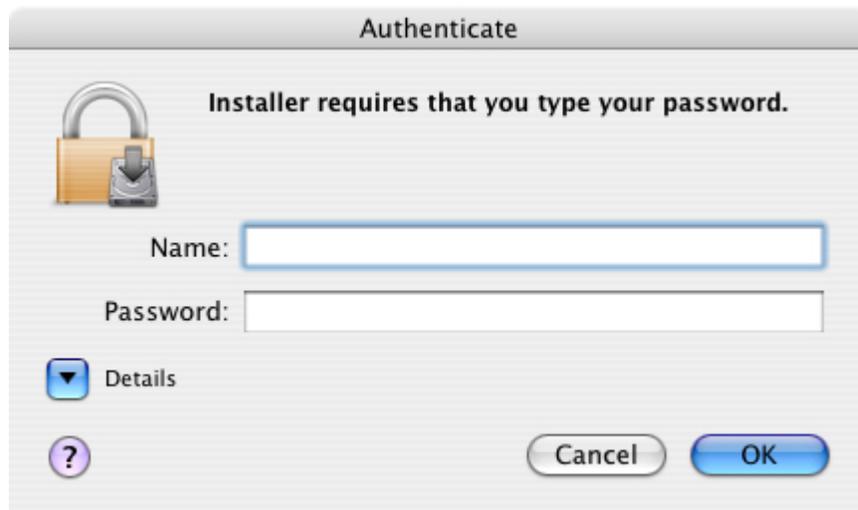
Software Installation

Now that your hardware is installed, you need to install the software. Note that the following instructions and examples are for Panther (Mac OS X 10.3). The installation for Jaguar (Mac OS X 10.2) will be similar.

1. **Power up.** Turn on your Power Mac.
2. **Insert the Echo3G Install CDROM** into your CD-ROM drive. A CDROM icon will appear on your desktop called “Echo3G”. Open it, and then open the “Echo Installer” folder.
3. **Install the console.** Just drag the icon labeled “Echo3G Console” to your Applications folder; the easiest way to do this is to drag it to the “Applications” icon in the Finder window.
4. **Start the installer.** Double-click the installer icon labeled “Install Echo3G”, and follow the on-screen instructions.



5. **Enter your password.** Once the installer has started, you'll need to reassure the Mac that you are allowed to install hardware drivers. You will be prompted to enter your password. If your account doesn't have administrative privileges, you'll have to close the installer and start over. For information on administrative privileges, return to the earlier section in this manual called "Log In as Administrator".



Once you've entered your name and password, follow the on-screen prompts. The installer will load the CoreAudio and CoreMIDI drivers.

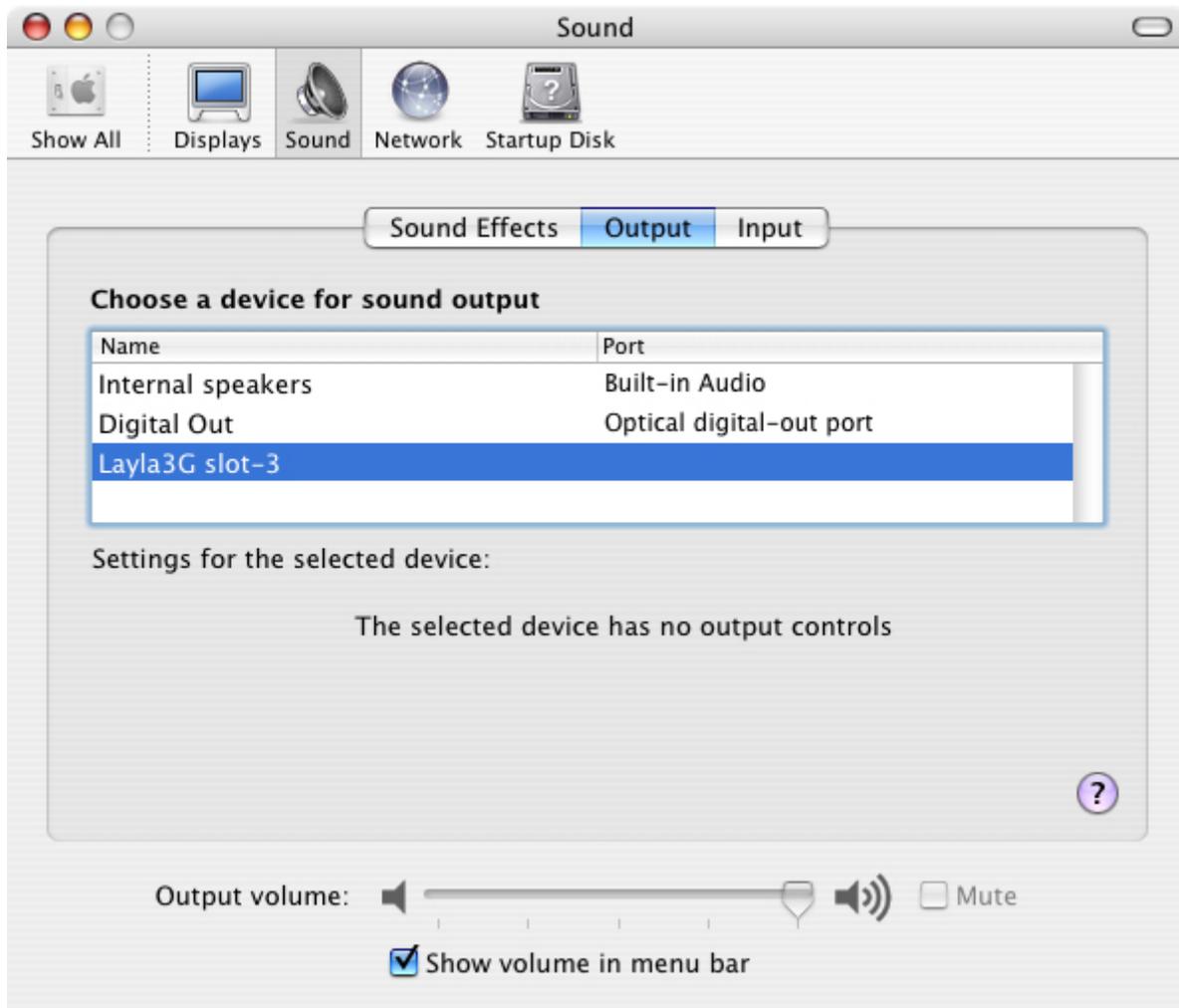
6. **Click Restart.** You should see this window when the installer is done. You will have to restart your computer to finish the installation.



Software Configuration

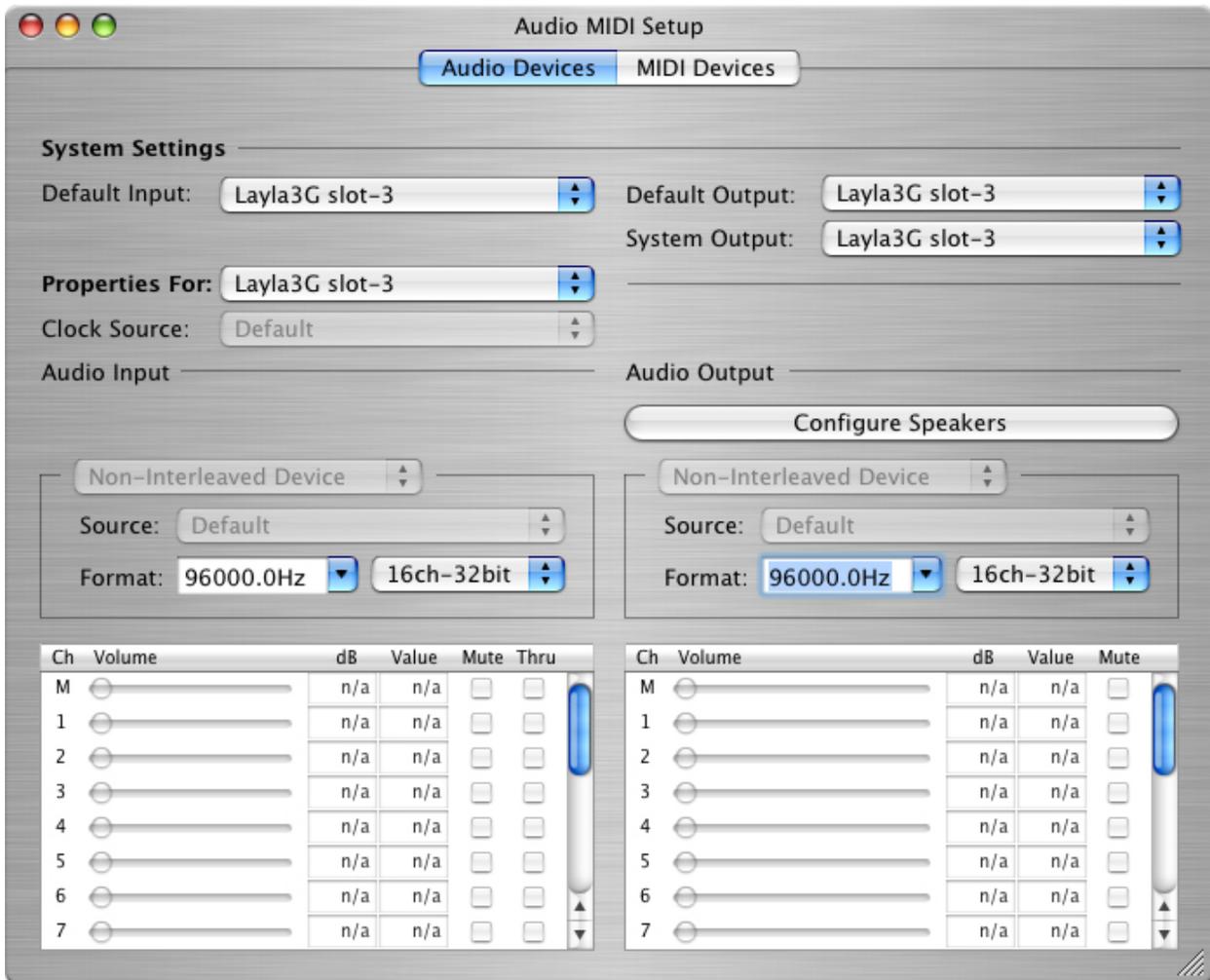
Now that you have installed the driver software, you can verify that everything is working properly.

Open “System Preferences” from the Dock or Apple menu, select “Show All”, and select the “Sound” panel. Under the “Output” tab, you should see your Echo product listed as a sound output device. If you want to use your Echo product with iTunes, iDVD, iMovie, QuickTime, etc. you will need to select it as the sound output device.

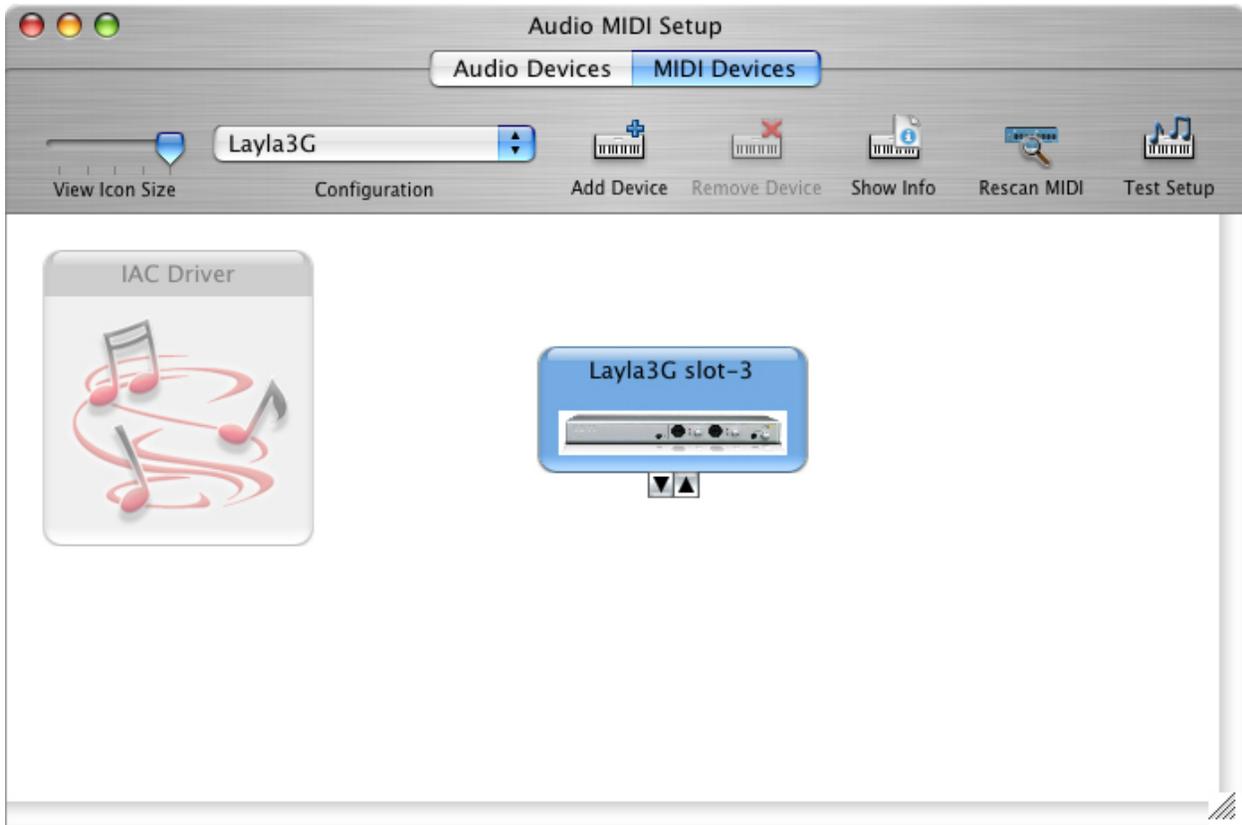


You can also check out your hardware with the “Audio MIDI Setup” application. Go to your Applications folder on your hard disk and from there to the Utilities folder. Open “Audio MIDI Setup.”

In addition to listing all the audio devices in the system, Audio MIDI Setup lets you examine the various audio formats supported by the hardware in your Mac.



By clicking on the “MIDI Devices” tab, you will display the available CoreMIDI devices. You should see your Layla3G or Gina3G hardware shown as an icon here.



Next, you’ll want to install Tracttion and learn about the Echo console software. Both are covered in the following sections of this manual.

Installing Tracktion

Both Layla3G and Gina3G come bundled with the full version of Tracktion, audio multitrack recording, MIDI, editing, and sampling software.

Install Tracktion from the Echo3G CDROM

To install the software:

1. Insert the Echo3G Install CDROM into your CD-ROM drive. A CDROM icon will appear on your desktop called “Echo3G”. Open it, and then open the “Tracktion” folder.
2. Drag the Tracktion icon to the “Applications” folder.

Tracktion comes with an HTML “Quick-start Guide” and help files that you can open from the “Help” button inside Tracktion. So, you’ll be able to get up and running with a minimum of hassles (hopefully none at all!). You can also access the Tracktion “Quick-start Guide” and help files with the F12 key on your keyboard.

Authorize your copy of Tracktion

Your copy of Tracktion will run in demo mode until you authorize it. Your Echo3G install CDROM came with a sticker that has an authorization code and a website address printed on it. Go to that website and follow the instructions to authorize your copy of Tracktion.

NOTE: DO NOT LOSE YOUR CODE!! Echo Digital Audio Corporation will not be responsible for lost Tracktion authorization codes.

Launching Tracktion and Assigning Inputs & Outputs

Now it's time to launch the actual program and set a few options:

- Locate and double-click the Tracktion icon in the “Applications” folder or wherever you copied it to earlier. You may also want to put it in the Dock for easy access.

When Tracktion first runs, it takes you to the Projects page. Move the mouse pointer over various objects on the screen and you will notice that Tracktion uses pop-up help to tell you about the interface.

Note that whenever you click on something you will see any available details, controls or settings for it in the information windows at the bottom middle of the screen. You can learn a lot just by clicking on things and reading the pop-up help.

You can also access a quick start guide and a more detailed help document by clicking on the “help!” button in the bottom left corner and selecting “show the Tracktion help pages...” or by pressing the F12 key on your keyboard. The first thing you'll want to do is set up Tracktion to play and record with your Echo product.

Audio Settings

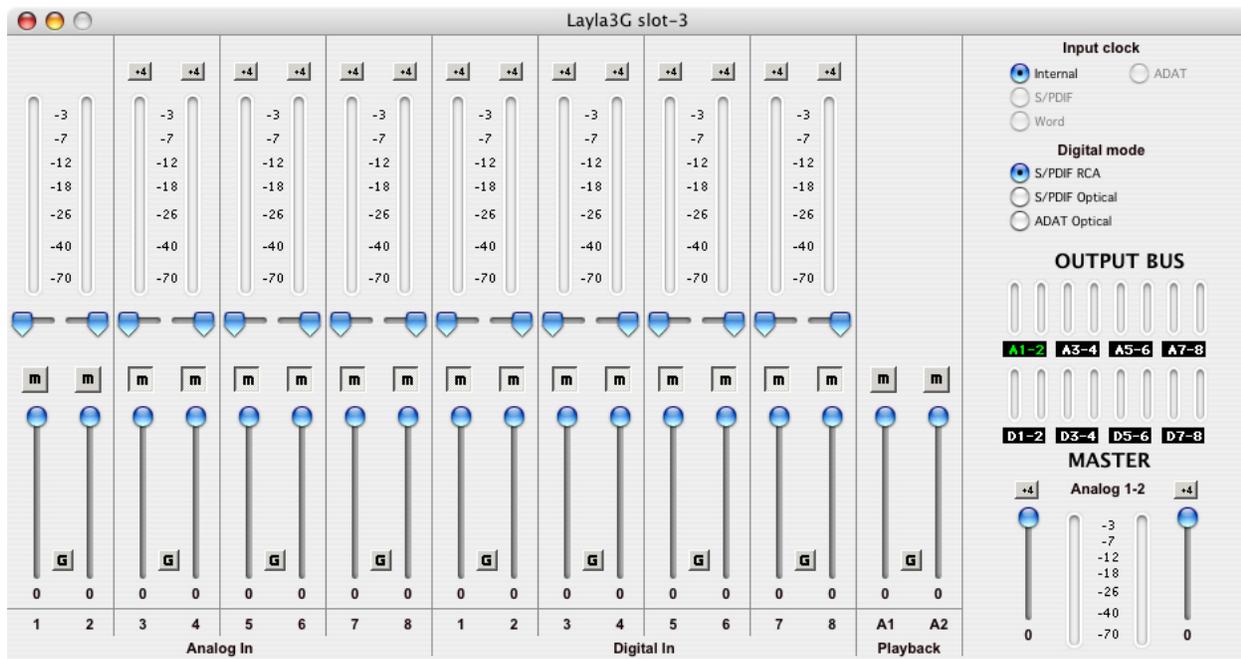
1. Click the “Settings” tab at the top of the screen.
2. Select “Audio Devices” on the left.
3. Where it says “Wave device:” click on the drop down menu and select your Echo product from the list.
4. Now you should be able to see a list of the available audio devices for your Echo product. Go ahead and enable the inputs and outputs you want to use with Tracktion by clicking on the red X and waiting for it turn into a green checkmark.
5. Make sure one of your Echo product’s outputs is the “default wave output”, and that it is hooked up to some speakers or headphones. You can check this setting on the right side of the “Settings – Audio devices” screen of Tracktion.
6. Now you’re ready to play some music. Click on the “Projects” tab at the top of the screen and select one of the sample projects that come with Tracktion.
7. You will see a listing of all the files for that project in the large area to the right. Double-click on the file with the same name as the project. This will open the project.
8. Now click on the play button in the bottom right section of the screen and you’ll hear the sample project with your new Echo product.
9. Enjoy the music!!

There are more detailed instructions for Tracktion in the HTML “Quick-start Guide” and help files, which are available by hitting the F12 key while in Tracktion. You can also find hints and tips in the Tracktion user’s forums available through the Tracktion webpage here: <http://www.mackie.com/products/tracktion/>

This completes the installation of the hardware and software for Layla3G and Gina3G.

Echo3G Console

If you followed the instructions in Step 3 of the “Software Installation” section of this manual, then you installed a “virtual control surface” application called the Echo3G Console. The console allows you to control the audio I/O and clocking functions of your Echo product, and it brings these controls to a single easy-to-use location. From the console you can control the output levels, select synchronization clocks, select the digital mode, and adjust input monitoring. The examples in this section are for the Layla3G console, but the Gina3G console operates similarly.



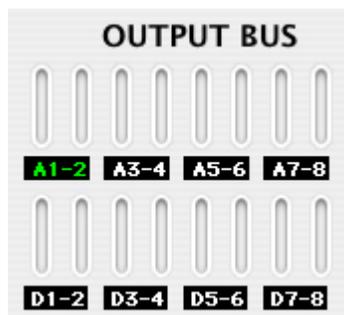
You can open the Echo3G console by going to the “Applications” folder and double-clicking on the icon. Alternately, you can drag the icon to the Dock for easier access and just open it from there. If you have more than one Echo3G product, a console window will open for the first one found in your Power Mac. To switch to the console for another Echo3G product, just select it from the “Active Card” menu.

Console Window

The basic metaphor for the console interface is a digital mixing board, and it works in terms of *output busses*. An output bus is a stereo pair of outputs on your hardware. For example, analog outputs 1 and 2 are an output bus. The console window allows you to select an output bus and control what is mixed and sent to that output bus. Audio played through the selected channels by an application, any analog input, and any digital input may be mixed to an output bus.

Output Bus Select

The output bus select panel is on the middle right of the console window.



Eight different output busses are shown here: four analog busses in the top row and four digital busses on the bottom row. Each bus has its own button marked with either an A or D (Analog or Digital) and a channel number pair. The green button is the currently active bus. In this case Analog 1-2 (A1-2) is the active bus.

Clicking on an output bus button simply selects the **settings that are displayed**. This means all input monitor parameters such as volume, pan, and mute **only apply** to the audio coming out **Analog outputs 1 and 2** of Layla3G. To select, view and change the input monitoring and playback settings for another set of outputs you must select a different output bus by clicking on one of the output bus buttons. Alternately, you can use the function keys F1 through F8.

Master Output Bus Control

The master output bus control is the area at the bottom right of the console window. At the top is the label “Analog 1-2.” This indicates you are currently controlling everything mixed to analog outputs 1 and 2. These channels correspond to the currently selected button on the output bus select panel.

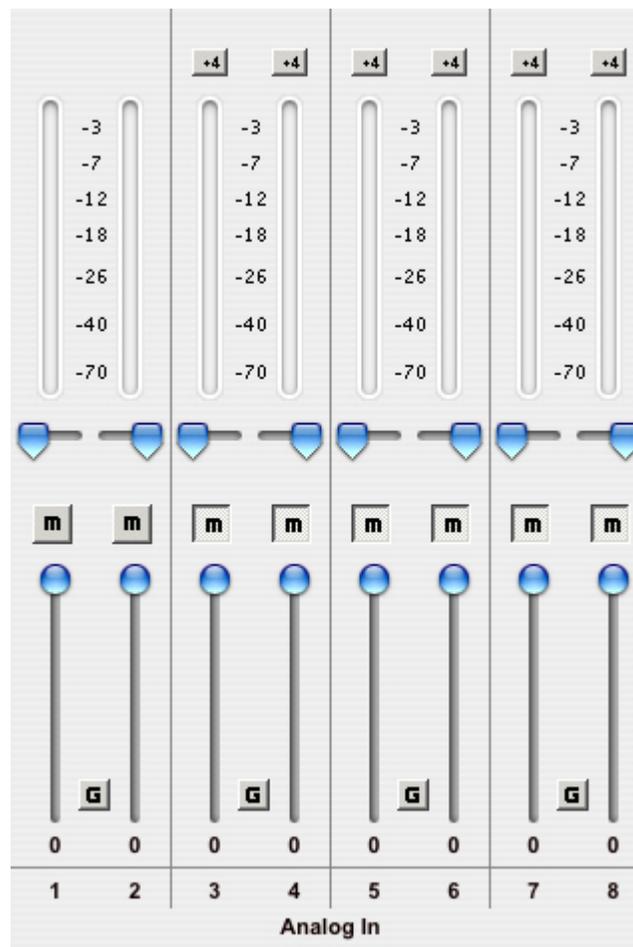


The two buttons labeled “+4” are the *nominal level* select buttons. Since they both read “+4,” this indicates these outputs are sending a +4dBu (professional level) signal. To send a –10dBV (consumer level) signal, click the button. This feature allows you to connect either professional or consumer gear to each output.

The *faders* affect **everything being mixed to this bus**. Thus, pulling the fader down will make both the input monitors and playback quieter. Clicking on the readout below the fader will allow you to enter a numerical value for the fader setting.

Analog Inputs

The controls for the analog inputs are on the left side of the console window and have the label “Analog In” at the bottom. There is one strip, or *input channel*, corresponding to each of Layla3G’s eight physical analog inputs. The input level meters and nominal level buttons remain viewable at all times, whereas the input monitor controls (pan, mute, faders and gang) that are viewable will change depending on which output bus is currently selected.



The topmost control is a button labeled “+4”; this button allows you to select the nominal level for this analog input. Since the button currently reads “+4,” it is ready to accept a +4 dBu signal. Click the button to change this input to –10 dBV mode. This button will affect the level of what you record as well as the monitor level. Below the “nominal level” button is the peak meter for this channel, labeled

in decibels. Once again, these are visible at all times. Please note that there are no nominal level buttons for inputs 1 and 2 since they have trim knobs on the front of the audio interface box.

For Gina3G, you will find a phantom power button labeled “+48v” at the top of the input channel for analog inputs 1 and 2. This button toggles the phantom power on and off for the universal inputs (1 and 2).

The input monitor controls are a little more complicated. Basically, there is *a different set of input monitor controls for each output bus*, but *only one set is viewable and changeable at a time*. In the example above, the only set of input monitor controls that is viewable and changeable is the one for the output bus called “Analog out 1/2”. To see and change a different set of input monitor controls you will need to select a different output bus (see the “Output Bus Select” section above).

Below the peak meters are the input monitor controls starting with the monitor pan slider. This control changes how the input channel is monitored between the two channels of the currently selected output bus. Note that this does not affect your recording. Below the pan slider is the monitor mute. This controls whether or not you want this input channel to be mixed directly out to the currently selected output bus. Again, this does not affect recording. This is followed by the monitor fader, which controls the input monitor level. Like the pan and mute controls, this does not affect your recording level. Also, clicking on the readout below the fader will allow you to numerically enter a fader setting.

The *gang button*, marked with a “G,” sets the gang mode. If you are in gang mode, the mute buttons and nominal level buttons will work together for the left and right channels; for example, clicking the mute on one channel activates the mute button on the other channel. Also, ganging the faders ties them together so they will maintain their relative placement with regard to each other. Holding down the Shift key temporarily reverses the state of the gang button; that is, if the gang button is down, holding down shift puts you in non-ganged mode and vice versa.

Digital Inputs

The controls for the digital inputs are to the right of the Analog Inputs and have the label “Digital In” at the bottom. Their operation is identical to the analog inputs.



Whether you are monitoring the S/PDIF or the ADAT inputs depends upon the digital mode (see below) you have selected. If you are in one of the S/PDIF modes (RCA or optical), the S/PDIF inputs will correspond to digital inputs 1 and 2, and the controls for the other digital input channels will affect nothing. If you are in ADAT mode, all of the digital input controls will be fully functional, with the eight ADAT inputs corresponding to digital inputs 1 through 8.

Playback Strips

To the right of the digital input channels, you can find controls for the playback strips, which have the label “Playback” at the bottom. They control the level of audio being played by a software application out of the currently selected output bus. These controls operate the same as the input monitor controls, except there are no pan sliders. The example below is for analog outputs 1 and 2, but the playback strip and controls being viewed is changed by which output bus has been selected.

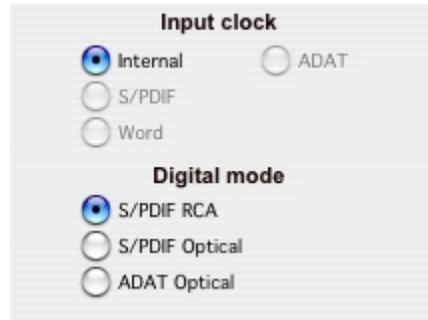


Adjusting Playback Volume

Output volume adjustments are made in the digital domain. When you lower a volume fader below 0dB, you are actually decreasing the number of available bits, thereby taking away from the potential dynamic range of the system. Therefore, we suggest that whenever possible you leave the output faders (Playback & Output Bus) set to 0dB, and perform any necessary attenuation on your external mixer. When the playback volume controls are set to 0dB and the input signal approaches the maximum pre-clipping level, you can achieve the full 24-bit dynamic range of the system.

Input Clock and Digital Mode Settings

The upper right area of the console window is where you select your input clock source and digital mode.



If a given synchronization source (input clock) is detected, the corresponding input clock button will be available for selection. Any input clocks that are unavailable will be grayed out. In the above example, only the Internal clock is available. In order for a digital input clock (S/PDIF or ADAT) to be detected the console must be set to the appropriate digital mode. Also, you may only select the digital mode if there aren't any applications actively playing or recording. The console defaults to S/PDIF RCA digital mode. To use the S/PDIF Optical I/O or ADAT optical I/O on your audio interface you will need to select the corresponding digital mode. Your Echo product is only capable of using one digital mode at a time.

Note: Sample rates above 48kHz will not be available while ADAT mode is selected. This is because ADAT does not support sample rates higher than 48kHz.

Synchronizing Multiple Devices

Layla3G and Gina3G are designed to work alongside other audio equipment. If you are planning on using Layla3G or Gina3G with other audio equipment, please note the following:

Echo hardware can also peacefully coexist with audio equipment from other manufacturers, but be aware that operating *alongside* another product is not the same as operating *with* it. In order for accurate synchronization to occur, the other audio product(s) must support a synchronization mode that is compatible with your particular Echo hardware. Without such synchronization, the individual pieces of equipment will act independently of each other. This scenario may be fine for some musical applications; however, it is not appropriate for situations where sample-accurate synchronization is required.

Let's take a brief look at the various synchronization types.

Word Clock – (Layla3G only) The **Word Clock** connectors can be found on Layla3G's back panel. When Layla3G is set to "Internal" this synchronization clock runs at Layla3G's selected sample rate. Think of it as a kind of electronic metronome, which clicks back and forth at the digital sample rate. It is one of the most widely used forms of synchronization in digital audio. Layla3G is always generating Word Clock on its Word Clock output BNC connector. Although it can generate Word Clock at any sample rate it is set to, Layla3G can only sync to Word Clock if the master device is set to a sample rate between 30kHz and 100kHz. Otherwise you will get noise and/or loss of sync.

Note: When synchronizing your Echo product to an external device via S/PDIF or Word Clock, if the sample rate is changed on the external device then you may have to reset the input clock setting on your Echo product. To do this, merely click on the input clock button again (S/PDIF or Word).

S/PDIF – The Sony/Phillips Digital Interchange Format is a serial bit-stream that has a clock signal embedded in the data stream. When recording from an S/PDIF source, whether via optical cables or RCA cables, Layla3G & Gina3G will utilize the synchronization clock that is embedded in the S/PDIF while they decode the bit-stream. Layla3G & Gina3G can only sync to S/PDIF clock if the master device is set to a sample rate between 30kHz and 100kHz. Otherwise you will get noise and/or loss of sync.

Note: When recording from a S/PDIF port, you must select **S/PDIF** as the input clock. For greater flexibility, this is not done automatically. If you find that your S/PDIF recordings contain pops or skips, be sure that you have selected **S/PDIF** as your input clock.

ADAT – The Alesis ADAT optical interface can send and receive up to 8 simultaneous channels of digital audio data over fiber optic cables. Unlike wire cables, fiber optic cables do not add noise or interference. Layla3G & Gina3G can send out (or “master”) ADAT clock as well as slave to it. If you want Layla3G or Gina3G to slave to an ADAT clock, just set the input clock to the **ADAT** setting. Layla3G/Gina3G can only sync to ADAT clock if the master device is set to a sample rate between 40kHz and 50kHz. Otherwise you will get noise and/or loss of sync.

Note: To preserve the high audio quality of Layla3G/Gina3G’s converters it is best to use the **Internal** input clock setting instead of synchronizing to an external ADAT clock, which may add unwanted jitter to the signal.

Now let’s take a look at some sample configurations and how you might set them up from a synchronization standpoint.

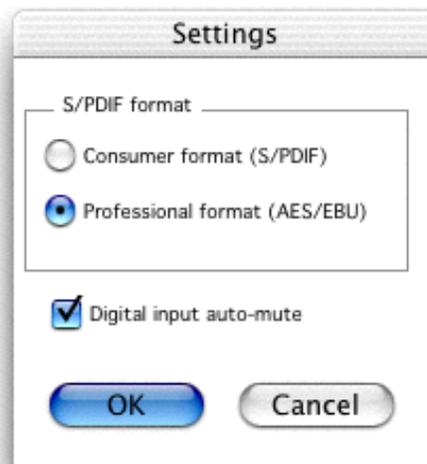
Let’s start with a simple example. Suppose that Layla3G is the only audio device used in your system. Since you have no other devices to synchronize with, simply select **Internal** for Layla3G’s input clock. Layla3G will then use its own clock to control its operation.

Now a little more complicated set-up: You have two Layla3Gs connected. Simply set Layla3G #1 to **Internal** for its input clock. Now connect the first Layla3G to the second one via a BNC cable running from Word Clock Out on Layla3G #1 to Word Clock In on Layla3G #2. Now select **Word** for Layla3G #2's input sync. The second Layla3G will slave to the first one and your Layla3Gs will now operate in unison.

No matter how many devices you are synchronizing, the concept is essentially the same. You are merely “daisy-chaining” devices together using compatible clocks. One device will operate as the source of the master clock, with each successive device using that clock to sync.

Console Settings

The settings window (File menu – Settings...) for the Echo3G console lets you set the S/PDIF output format and the digital input auto-mute.



Layla3G and Gina3G can transmit digital information in either of two formats: “professional” or “consumer.” The primary difference between the two is in the implementation of the SCMS copy protection bit, which, in the Consumer format, prevents the user from making digital copies of a digital copy.

The S/PDIF output defaults to the Consumer format. If you are recording from your Echo hardware into a professional DAT deck, CD recorder, or Mini Disc recorder, the device may not be able to recognize the signal until you switch the output to Consumer.

Select the appropriate format for your DAT, CD recorder, or Mini Disc recorder (if you don't know which one to use and are having difficulties, simply try the one that is not currently checked).

Note: No Echo hardware transmits the SCMS bit, regardless of which format is selected.

The digital input auto-mute automatically silences the S/PDIF and ADAT inputs when they are not synchronized to an external clock. This avoids problems where extremely loud digital noise is heard when signals at differing sample rates are sent to the digital-in or when a digital cable is unplugged. If you are having trouble receiving a signal on your digital inputs, uncheck this box.

Contacting Echo Customer Service

If you experience any trouble with your Echo hardware please go to the support area of our website at www.echoaudio.com, and check out the FAQ's we have there. If you can't find a solution to your problem there, please fill out the provided technical support email form. This form will be sent to our technical support staff, and they will respond to you quickly. **Please fill out the form completely.** The best way to get the help you need is by giving us plenty of detailed information about your computer system, your audio software and hardware, and the problem you are having.

We do ask you to please read through this manual and the support area of our website before contacting us. Also, you may find an answer to your problem in the Appendices of this document – starting on the next page.

Thank you for buying an Echo product!

Contacting Mackie Customer Service

Note: All Tracktion support issues are handled solely by Mackie. **Please do not call Echo for technical support regarding Tracktion.**

You can find helpful information about Tracktion and links to user and support forums on the Internet at: <http://www.mackie.com/products/tracktion/>

If you are still having problems with Tracktion you can contact Mackie Technical Support here: <http://www.mackie.com/support/index.html>

Appendix A: General Troubleshooting Guide

Problem: You can't get Layla3G or Gina3G to install properly under Mac OS 8, OS 9, or OS X (10.1 or lower).

Solution: There is no driver support for Layla3G or Gina3G under Mac OS 8 or 9. There is only driver support for Mac OS X (10.2 or later).

Problem: You've installed the OS X driver, but the hardware isn't listed in the System Preferences or the Audio MIDI Setup application.

Solution: Your installation of OS X may be out of date. Try running Software Update; you'll find it in the System Preferences.

Problem: You're having problems installing the driver or a driver update.

Solution: Sometimes the Echo installer will not work correctly if you have older installation files from an Echo3G or Echo24 product. What you need to do is open "Finder" from the Dock, select "Find..." from the "File" menu, search for any files that contain "Echo3G" or "Echo24", and delete them. Then, restart your computer and try the Echo installer again.

Problem: You upgraded your computer with a processor upgrade card and now your Echo product doesn't work.

Solution: Your Echo product is not compatible with processor upgrade cards. It only supports genuine Apple processors without upgrades. You will have to uninstall the processor upgrade card to get your Echo product to work again with your computer.

Problem: You can't use more than one Echo product at a time with your audio software.

Solution: This is a limitation of your audio software. Currently, Apple's CoreAudio spec does allow multiple hardware devices to be used simultaneously by an audio software program, but some audio software currently does not support this feature.

Problem: You are unable to get your DAT recorder to recognize your Echo product's S/PDIF output.

Solution: Digital information is transmitted in either of two modes, "professional" or "consumer." The professional mode is usually implemented in devices that are likely to be used in professional recording environments, whereas the consumer mode is commonly implemented on equipment designed for home use in the consumer market. The primary difference between the two modes is in the implementation of the SCMS copy protection bit, which, in the consumer format, prevents the user from making digital copies of a digital copy. In most professional equipment, this copy protection bit can be turned off or on according to the user's needs. In consumer products, the SCMS bit is always enabled.

Unfortunately there is no way for the transmitting device to automatically detect which format the receiving device is able to accept. If you have a DAT deck that is not able to read the S/PDIF output from your Echo product, chances are the card is transmitting in the mode that the deck is not equipped to handle.

We have provided a software switch in the driver that allows you to select which mode is transmitted. To access this switch go to the **Console**. In the **File** menu select **Settings**, and then select either **S/PDIF Professional** or **S/PDIF Consumer**. Select the appropriate format for your DAT (if you don't know which one to use, simply select the one that is not currently checked). Now try recording to your DAT again.

Important note: No Echo product transmits the SCMS bit; regardless of which mode is selected.

Problem: When you play an audio file, it plays at an altered pitch.

Solution: When your Echo product is set to synchronize with an external device, it will play back at the rate generated by that device. If the sound you are playing was sampled at 11kHz (for example), but you are synchronized with a device running at 44.1kHz, the sound will play back at this faster rate. You have four choices - ignore the altered pitch, switch to your Echo product's internal clock, change the sample rate of the external device, or use a different device for the sound playback.

Problem: Your Echo product doesn't seem to recognize the synchronization clock to which it is connected.

Solution: Although it may seem obvious, the first thing to check is that there is a physical connection between the device generating the clock and your Echo product. Just because multiple devices are connected to the same computer doesn't mean they are synchronized. Next, be sure that you have selected the desired input clock source in the **Console**.

Problem: You're syncing to an external device and suddenly you've lost sync.

Solution: Whenever your Echo product is syncing to an external device and you change the sample rate in that device, you may need to reset the input clock setting in the Echo console software. Just click on the input clock button to reset it.

Problem: Recordings made using the S/PDIF port contain occasional pops or skips.

Solution: When recording with the S/PDIF port, you must manually select the S/PDIF clock as the input clock. This can be done using the **Console**.

Problem: You keep hearing a high-pitched squealing sound or your S/PDIF or ADAT signal has gone crazy.

Solution: Reset the sample rate of your Echo product. You may have set the sample rate to 11kHz or 22kHz. Because neither S/PDIF nor ADAT support these rates, you will have problems syncing until you reset the sample rate to one within spec (like 44.1 or 48kHz). You can do this through your audio program's controls or by playing an audio file of the appropriate sample rate through your Echo product's outputs. Then you will be able to sync properly.

Problem: The sound cuts in and out, or the left or right channel doesn't work.

Solution: You may have a bad audio cable. Try using a different cable in the problem channel.

Problem: There is no sound unless I pull the audio plug out a little.

Solution: Not all ¼" plugs are made to the exact same dimensions. Try a plug/cable from a different manufacturer.

Appendix B: Introduction to Digital Recording

Converting Sound into Numbers

In a digital recording system, sound is represented as a series of numbers, with each number representing the voltage, or amplitude, of a sound wave at a particular moment in time. The numbers are generated by an *analog-to-digital converter*, or ADC, which converts the signal from an analog audio source (such as a guitar or a microphone) connected to its input into numbers. The ADC reads the input signal several thousand times a second, and outputs a number based on the input that is read. This number is called a *sample*. The number of samples taken per second is called the *sample rate*.

On playback, the process happens in reverse: The series of numbers is played back through a *digital-to-analog converter*, or DAC, which converts the numbers back into an analog signal. This signal can then be sent to an amplifier and speakers for listening.

In computers, *binary numbers* are used to store the values that make up the samples. Only two characters, 1 and 0, are used. The value of a character depends on its place in the number, just as in the familiar decimal system. Here are a few binary/decimal equivalents:

<u>BINARY</u>	<u>DECIMAL</u>
0000000000000000	0
0000000000000001	1
0000000000000011	3
0000000000000111	7
0000000000001111	15
0000000000011111	31
1111111111111111	65,535

Figure A. Binary numbers and their decimal equivalents

Appendix B: Introduction to Digital Recording

Each digit in the number is called a *bit*. The binary numbers expressed in figure A are sixteen bits long, and have a maximum value of 65,535. The more bits that are used to store the sampled value, the more closely it will represent the source signal. In a 16-bit system, there are 65,535 possible combinations of zeroes and ones; so 65,535 different voltages can be digitally represented. (see figure A above).

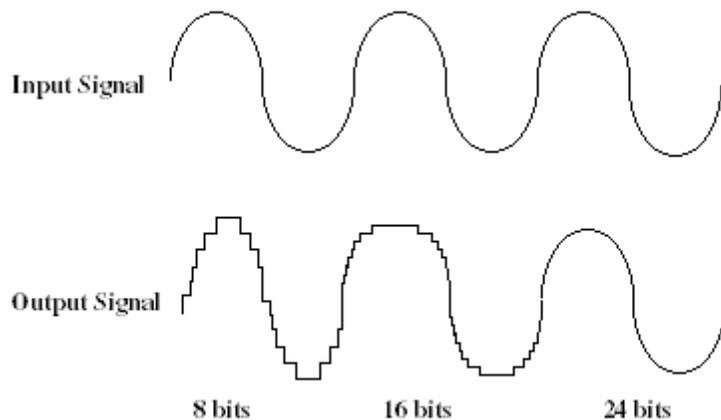


Figure B. The more bits there are available, the more accurate the representation of the signal and the greater the dynamic range.

Your Echo product's analog inputs use 24-bit ADCs, which means that the incoming signal can be represented by any of over 16 million possible values. The output DACs are also 24-bit; again, over 16 million values are possible. The S/PDIF inputs and outputs also support signals with up to 24-bit resolution. Your Echo product processes signals internally with 24-bit resolution to insure that there is no degradation to the audio signal as it is processed through the system.

The number of bits available also determines the potential dynamic range of the device. Moving a binary number one space to the left multiplies the value by two, so each additional bit doubles the number of possible values that may be represented. Each doubling of the number of values provides 6dB of additional dynamic range (see decibel section below). So, a 24-bit system can theoretically provide 144dB of dynamic range (6dB times 24 bits = 144dB) versus a 16-bit system with a maximum dynamic range of only 96dB.

Also important to the quality of a digital recording is the frequency with which the samples are stored, called the sample rate. In order for a waveform to be faithfully digitized, it must be sampled at a minimum of twice the highest frequency to be stored. Failure to sample frequently enough results in a kind of distortion called aliasing. (If you like technical issues, do some research on The Nyquist Theorem, which explains why this happens). In addition to aliasing, sampling too slowly will result in reduced high frequency reproduction. Your Echo product allows you to sample sound at up to 96,000 times per second.

Once the waveform has been transformed into digital bits, it must be stored. When sampling in stereo at 96kHz using a 24-bit word size, the system has to accommodate 4,608,000 bits per second. In the past, storing this vast amount of data was problematic. Today, computer-based digital recording systems record the data directly to the computer's hard disk. Today's hard disks are capable of storing large amounts of data, though the performance of hard drives can vary substantially. The speed and size of your hard drive will be a major determining factor in how many tracks of audio you will be able to simultaneously record and playback.

Decibels

Audio signal levels are generally expressed in units called "decibels" which are abbreviated as "dB". This is a "logarithmic" scale where each doubling of signal level is represented by an increase of 6dB. Therefore a signal of 6dB is twice as big as a 0dB signal and a signal of 12dB is four times as big as a 0dB signal.

Since digital audio signals are represented by binary data, each bit of audio information represents 6dB. A 16-bit number can represent a total range of 96dB and a 24-bit number can represent a total range of 144dB (6 times the number of bits). It's much easier to say that one signal is 72dB less than another instead of saying it is 1/4096 the size of the other one. It also more accurately represents the way we hear sounds, since the smaller signal in the above example will still be audible and not appear to be only 1/4096 as loud when we listen to it.

Just as there are different types of degrees used to represent temperature (Fahrenheit, Celsius, etc), there are different types of decibels used to represent the

level of analog audio signals. The most common are dBu and dBV decibels. Both of these represent voltage levels and still double for every increase of 6dB. It is only the reference point, or 0dB level that is different. A 0dBV signal has a voltage level of 1.0 volts. A 0dBu signal has a voltage level of .775 volts. Since .775 is approximately 2dB less than 1.0, converting dBV levels into dBu levels is as simple as subtracting 2dB (2.21 to be exact).

Signals are also occasionally represented with units of dBm. This is an older unit that measures power instead of voltage levels with 0dBm representing 1 milliwatt. Earlier tube-based audio equipment used standardized input and output impedances of 600 ohms, so a 0dBm signal was produced with a voltage of .775 volts. Since most of today's equipment uses impedances other than 600 ohms, it is more useful to represent signals by voltages rather than power and the dBu unit was introduced. A signal level of 0dBu is identical to a level of 0dBm.

Digital signals, after they are recorded, no longer directly represent any physical quantity such as voltage or power and 0dB is generally used to represent a "full-scale" or maximum signal level. All other signal levels are lower and are expressed as negative decibels. Most meters on digital equipment have 0dB at the top and range downward from there. A signal that is 30dB below full scale would simply be referred to as a -30dB signal.

Nominal Signal Levels and Headroom

Today's equipment is generally referred to as +4dBu equipment (professional) or -10dBV equipment (consumer). These levels are the typical or "nominal" signal levels you can expect to see with professional (studio) equipment such as mixers or with consumer equipment such as home stereos and CD players. A +4dBu signal has a voltage level of 1.23 volts and a -10dBV signal has a voltage level of .316 volts.

The above nominal levels represent typical or average levels that are often exceeded when recording loud signals such as drum beats. The difference between the nominal level and the loudest signal that can be recorded without clipping is called "headroom". Your Echo product provides approximately 14dB of headroom allowing an 18dBu signal to be recorded.

Unbalanced and Balanced Inputs and Outputs

An unbalanced signal, commonly used for guitars and consumer electronics, contains two components, a ground signal and a “hot” or active signal. The ground is the barrel of a ¼” connector and the shell of an “RCA” style connector.

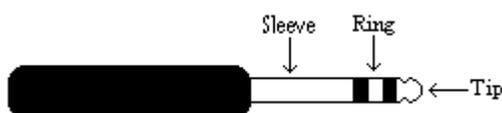
A balanced signal contains two active signals instead of one in addition to the ground. These are referred to as the “plus” and “minus” signals. A balanced input amplifier amplifies the difference between these two signals. Any extraneous noise picked up from power lines or other sources will appear equally on both the plus and minus inputs. This is called “common mode” noise since it is common to both signals and the input amplifier will subtract the noise on the minus input from the noise on the plus input.

If the input amplifier is perfectly balanced and the noise on both plus and minus is precisely equal, the noise will completely cancel out. In the real world this is not the case and some of the common mode noise will still make it through, although at a much reduced level. How well an input amplifier rejects this common mode noise is called the “common mode rejection ratio” (abbreviated as CMRR) and is expressed in dB.

Balanced outputs typically drive the plus and minus components of a balanced signal in one of two ways. A “differentially” balanced output signal is one where the minus output is the mirror image of the plus output. That is, if the “plus” output is at +1 volt, then the “minus” output is at –1 volt.

An “impedance” balanced output provides most of the benefits of a differentially balanced output at a lower cost. In this case only the plus component actually carries the signal. The minus component is tied to ground through a resistor so that the output impedance matches that of the plus component. Since the impedances are matched, any noise added to the minus component will still be approximately the same as that picked up by the plus component and will be subtracted out by the input amplifier. Your Echo product uses this type of output.

Balanced signals connect with either XLR connectors or TRS (tip, ring, sleeve) connectors. Your Echo product uses XLR connectors for microphones and TRS connectors for connecting balanced (or unbalanced) line level signals.



The three sections of a TRS connector are used to transmit the three components of a balanced signal (T = plus, R = minus, S = ground).

Dynamic Range

Dynamic range represents the difference between the maximum signal that can be recorded and the “noise floor”, or level of noise with no signal present. A system with a high dynamic range will be quieter than one with a lower dynamic range. Dynamic range is a very important specification, and your echo product uses converters that have very high dynamic range.

Theoretically, a 24-bit system has a dynamic range of 144dB and a 16-bit system has a dynamic range of 96dB. Two questions immediately come to mind:

- 1) Why does my Echo product only have a dynamic range of 110 to 114dB?
- 2) For mastering 16-bit CDs with a dynamic range of 96dB, isn't anything more than 96dB just overkill?

First, today's analog-to-digital converters typically produce a full-scale input voltage with an input of +7dBu. If they were to have 144dB of dynamic range, they would have to be capable of resolving signals as small as -137dBu (7dBu - 144dBu) or approximately 10 nano-volts. That's 10 *one-billionths* of a volt! Transistors and resistors produce noise in this range just by having electrons moving around due to heat. Even if the converters could be perfectly designed to read these levels, the low noise requirements of the surrounding circuitry such as power supplies and amplifiers would be so stringent that they would either be impossible or too expensive to build.

In answering the second question, consider the fact that music is often compressed or amplified after it is recorded, and that some headroom is necessary when recording to avoid clipping. The only way that 96dB would be adequate is if all music were recorded so that the peaks were just under full-scale and no compressing or amplification was going to be applied after recording. Any time recorded music is amplified, so is the noise at the low end. Your Echo product has enough dynamic range to allow sufficient headroom and post-processing to be applied while still keeping the noise either off the CD completely or down as far as possible.

Appendix C: Specifications

Layla3G - Audio Performance

Analog Inputs (x2 balanced universal XLR/TRS & x6 balanced TRS):

- Universal Inputs (x2 balanced XLR/TRS):
 - Frequency Response: 10Hz to 20kHz, ± 0.1 dB
 - THD+n: <0.002% A-weighted
 - Microphone Input Level (balanced XLR):
 - EIN: -130dBu
 - Dynamic Range: 112dB A-weighted
 - Input Impedance: 1.5Kohms
 - Gain Adjustment: +10 to +58dB
 - Maximum Input Level at Minimum Gain: +9dBu
 - Guitar/Line Input Level (balanced TRS):
 - Dynamic Range: 110dB A-weighted
 - Input Impedance: 102Kohms
 - Gain Adjustment: 0 to +45dB
 - Maximum Input Level at Minimum Gain: +18dBu
- Normal Line Inputs (x6 balanced TRS):
 - Frequency Response: 10Hz to 20kHz, ± 0.1 dB
 - Dynamic Range: 113dB A-weighted
 - THD+n: <0.0015% A-weighted
 - Linearity: ± 0.01 dB, 0dBFS to 100dBFS
 - Crosstalk: <0.0003%, 20Hz to 20kHz
 - Nominal Input Level: +4dBu or -10dBV
 - Input Impedance: 10Kohms
 - Maximum Input Level: +18dBu

Analog Outputs (x8 balanced TRS):

- Frequency Response: 10Hz to 20kHz, ± 0.1 dB
- Dynamic Range: 114dB A-weighted
- THD+n: <0.002% A-weighted
- Linearity: ± 0.5 dB, 0dBFS to 100dBFS
- Crosstalk: <0.0002% @ 1kHz
- Nominal Output Level: +4dBu or -10dBV
- Maximum Output Level: +17.5dBu

Layla3G - Hardware

- Host Interface: PCI bus mastering card
- Two high quality mic preamps with phantom power (+48v)
- Six balanced ¼” analog inputs with precision 24-bit 128x oversampling analog-to-digital converters
- Eight balanced ¼” analog outputs with high performance 24-bit 128x oversampling digital-to-analog converters
- S/PDIF digital I/O with up to 24-bit resolution
- ADAT optical digital I/O
- Trim control, level meter, and channel inserts for analog inputs 1 and 2
- Headphone output with volume control
- On-board 56-bit / 100Mhz Motorola DSP
- 24-bit data resolution maintained throughout entire signal path
- Multiple sample rates from 8kHz to 96kHz
- Variable sample rate feature lets you select any rate between 25kHz – 100kHz
- MIDI In/Out
- Word clock I/O

Gina3G - Audio Performance

Analog Inputs (x2 balanced universal XLR/TRS):

- Frequency Response: 10Hz to 20kHz, ± 0.1 dB
- THD+n: $< 0.002\%$ A-weighted
- Universal Inputs:
 - Microphone Input Level (balanced XLR):
 - EIN: -130dBu
 - Dynamic Range: 112dB A-weighted
 - Input Impedance: 1.5Kohms
 - Gain Adjustment: +10 to +58dB
 - Maximum Input Level at Minimum Gain: +9dBu
 - Guitar/Line Input Level (balanced TRS):
 - Dynamic Range: 110dB A-weighted
 - Input Impedance: 102Kohms
 - Gain Adjustment: 0 to +45dB
 - Maximum Input Level at Minimum Gain: +18dBu

Analog Outputs (x6 balanced TRS):

- Frequency Response: 10Hz to 20kHz, ± 0.1 dB
- Dynamic Range: 114dB A-weighted
- THD+n: $< 0.002\%$ A-weighted
- Linearity: ± 0.5 dB, 0dBFS to 100dBFS
- Crosstalk: $< 0.0002\%$ @ 1kHz
- Nominal Output Level: +4dBu or -10dBV
- Maximum Output Level: +17.5dBu

Gina3G - Hardware

- Host Interface: PCI bus mastering card
- Two high quality mic preamps with phantom power (+48v)
- Six balanced ¼” analog outputs with high performance 24-bit 128x oversampling digital-to-analog converters
- S/PDIF digital I/O with up to 24-bit resolution
- ADAT optical digital I/O
- Trim control and level meter for analog inputs
- Headphone output with volume control
- On-board 56-bit / 100Mhz Motorola DSP
- 24-bit data resolution maintained throughout entire signal path
- Multiple sample rates from 8kHz to 96kHz
- Variable sample rate feature lets you select any rate between 25kHz – 100kHz
- MIDI In/Out

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