Hilo

Mastering Analog to Digital / Digital to Analog Converter

User Manual
Including February 2017 Version 8 Firmware and Feature Update

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Updated: July 17, 2018

Purchase Date: _____

Dealer Name: _____

Dealer Telephone: _____

Hilo Serial Number: _____

LSlot Serial Number: _____

User Manual
Table of Contents

1   Introduction

Thank you for choosing Lynx Hilo for your audio needs. The device you have received has been precision engineered to provide the very best audio quality possible, coupled with an innovative, intuitive user interface, and a unique and powerful feature set. Hilo is one of the first pro audio devices on the market that utilizes a full-color LCD touchscreen for control, metering and configuration. Far from an unnecessary bit of "eye candy", the touch display allows quick routing and setup, as well as a variety of accurate metering and measurement tools. New features will be available in the form of downloadable firmware updates, keeping Hilo responsive to your needs for many years to come.

1.1   Overview

Hilo represents the zenith of Analog conversion, improving on Lynx's famous Aurora converters with state-of-the-art components and design techniques. The innovative design of the analog stage and converter topology allow ultra-low noise and distortion specifications, producing an unprecedented level of clarity and depth-of-image. Much more than a "me too" stereo converter, Hilo actually features three unique sets of analog outputs, each with their own Digital-to-Analog converters, and independent routing. Main Outs, Monitor Outs and Headphone Outs all can feature a unique combination of sources with independent level controls.

1.2   Features

Hilo also has an extremely generous set of Digital I/O options. Apart from AD/DA conversion tasks, Hilo is one of the most powerful digital format converters/routers on the market. Digital formats include stereo AES/EBU, Stereo S/PDIF Coaxial, Stereo Optical S/PDIF which is switchable to 8-channel ADAT light pipe, and 16 channels of communication to a host computer, via USB 2, Thunderbolt or Dante connections. Any digital input can be routed to any analog or digital output, and all digital outputs can have unique combinations of source inputs.

The unique 480 x 272 pixel LCD touch screen display makes Hilo stand out from other pro audio converters. Never before has establishing parameters and routing channels been so quick and intuitive in a high-end converter. Not only are clear and accurate meters provided, but the user can select from several meter styles. The Hilo display and features can be updated via simple computer firmware update tools, easily accessible from the Lynx website. Hilo's feature set and display options will evolve in response to user feedback and the imagination of Lynx engineers.

Hilo is also a game changer in terms of flexibility. It is well suited for recording studio use, the home recordist, mastering, audio analysis, home theater/audiophiles, as well as field recording. With AC or battery-powered DC operation, Hilo can be used "for here" or "to go". With its lightweight, portable design, no longer does the discriminating user have to choose between top rung sound quality and convenience.

1.3   In the Box

Before proceeding with the Hilo setup, let's make sure that you received everything that was included with the purchase. In the Hilo box, you should find:
- Hilo AD/DA converter
- AC Power Cord
- Hilo User's Manual
- Hilo-USB only: One 6' long Type-A to Type-B shielded USB 2.0 cable

1.4   Power and Safety Information

To prevent fire or shock hazard, do not expose this equipment to rain or moisture. Do not block any of the ventilation openings. Do not defeat the safety purpose of the grounding-type plug. A grounding type plug has two blades and a third grounding prong. The third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet. Protect the power cord from being walked on or pinched, particularly at the plugs, convenience receptacles, and the point where they connect to the Hilo. Unplug this device during lightning storms or when unused for long periods of time.

Hilo utilizes a state-of-the-art universal power supply. The power supply will auto-detect the voltage from 100V to 240V and conform appropriately. No manual voltage adjustment is necessary.

1.5   Rack-Mounting

Hilo can be mounted in standard studio equipment racks using an optional two-space rack shelf available from Lynx.

1.6 Operation Requirements

To operate Hilo successfully with your existing equipment, first let's verify that you have compatible elements for best results.

1.6.1 Audio Equipment Requirements

Hilo features a wide variety of audio I/O formats. Compatibility with these formats are, of course, only important for I/O ports that you intend to use.

- **Headphones:** The Hilo headphone jack (PHONES) is suitable for driving stereo headphones through a ¼" TRS connection. Any standard set of headphones should work with Hilo.
- **Line Inputs and Outputs:** Hilo can operate with balanced or unbalanced, line-level analog audio equipment (power amps, powered speakers, headphone amps, microphone pre-amps, mixing boards, etc.) operating at trim levels of +18 dBu; +20 dBu; +22 dBu; +24 dBu; +0 dBV; +2 dBV; +4 dBV and +6 dBV . The LINE INs and LINE OUTs use XLR connections.
- **Monitor Outputs:** The Hilo MONITOR outputs can operate with balanced or unbalanced, line-level analog audio equipment and use ¼" TRS jacks.
- **AES/EBU Inputs and Outputs**: The Hilo AES IN and OUT ports should work with any AES/EBU compatible device at standard sample rates between 44.1 kHz and 192 kHz. The AES ports utilize XLR connections.
- **SPDIF Inputs and Outputs**: Hilo supports coaxial (electrical) SPDIF connections on RCA jacks, or SPDIF Optical signals on TOSLINK connections.
- **ADAT Lightpipe:** Hilo's TOSLINK Optical connector (S/PDIF/ADAT OPT.) can be software switched between 2-channel SPDIF operation and 8-channel ADAT Lightpipe operation. When ADAT is selected, each input and output port supports up to eight channels at sample rates of 44.1 kHz and 48 kHz, four channels at sample rates of 88.2 kHz and 96 kHz, or two channels at sample rates of 176.4 kHz and 192 kHz.

1.6.2 Computer requirements

Hilo is configured to operate with Mac or PC computer systems via USB, Thunderbolt or Dante (Ethernet). Hilo USB can also be used with iOS on an Apple iPad. Check the system requirements below to insure compatibility with your platform and format.

It also is important to note that most professional audio applications place significant demands on your computer's resources, and it is therefore recommended that you meet or exceed the recommended system requirements for your Digital Audio Workstation or audio playback software, which will likely be greater than those listed for Hilo. Please refer to your audio software's documentation for more information.

- Desktop computer or laptop with at least Intel Core 2 @ 1.6 GHz, or AMD equivalent
- At least 1GB RAM

Hilo-USB
- One functional USB 2.0 port

Hilo-TB (Thunderbolt)
- One functional Thunderbolt port (Note: With Thunderbolt 3, a TBT3 to TBT2 adapter is required)

Hilo-DNT (Dante)
- Standard wired Ethernet network interface (100Mbps or Gigabit).
- Gigabit (1000Mbps) interface is required for channel counts above 32x32 @48kHz (16x16 @ 96 kHz; 8x8 @ 192 kHz).
- Wireless LAN (Wi-Fi) Ethernet interfaces are not supported

Windows
- Windows 7, Windows 8, Windows 8.1 or Windows 10

macOS
- Mac OS X 10.8.5 or higher. Hilo-DNT (Dante) requires Mac OS X 10.9.5, 10.10.5 or 10.11.

iOS
   Hilo-USB only
- iOS 7
- Apple iPad 2 or newer
- iPad camera kit for USB connection

1.7   Using this manual

To insure smooth sailing with your new product, we recommend reading through the entire manual before using Hilo. Thereafter, use the manual as a reference as needed when questions arise.

The following typographic conventions are used in this manual:

- ALL UPPER CASE TEXT refers to a specific parameter selection control (i.e. SYNC SOURCE) or a cable connection.
- Text in quotation marks indicates a parameter selection value or menu option (i.e. "EXT").
- Phrases, such as: Start > Programs > Lynx Studio Technology use the greater than symbol (">") to indicate multiple menu options or mouse selections within a software control context.

1.8   Registration

Lynx is committed to providing you with the best service possible. To help us serve you better, please be sure to register your Hilo.

Register on the web at: http://www.lynxstudio.com/register

Once you are registered you will automatically receive notifications of new products and upgrades.

2   Getting Started Hilo-USB

Hilo was designed to be a product that is so easy to use that this section of the manual would scarcely be necessary. However, it is quicker to learn how the device works in one go, then to spend precious minutes figuring things out by randomly pressing buttons. We recommend reading this section thoroughly, before putting Hilo to serious use, if you can manage it.

2.1   Unpacking

Before setting up Hilo for use, remove it from the box and verify that the box contents described in section 1.3 are all present.

If all items are present, connect the Hilo AC power cord to a grounded AC Outlet, or power distribution unit. Switch on the power switch on the back of Hilo (note: the "|" position on the power button is "On" and the "O" is "Off".)

Hilo may power up automatically when AC is applied (this varies by firmware version). If not, press the front panel standby switch and verify that Hilo powers up.

If it does not, verify that the selected AC power source is operational. If it is and the unit still will not power up, please contact Lynx technical support.

If Hilo DOES power up, move on to Set up…

2.2   Set up

Hilo was designed to be adaptable to a variety of operational environments: on a desktop for Audiophile enthusiasts, in an equipment rack for recording studios, over a mixing console for a mastering engineer, etc. If Hilo is to be used on a desktop or other flat surface, it is best to leave the pre-installed rubber feet in place. These are designed to prevent scratching of Hilo or the surface that it is set upon.

In a recording studio context, where space is at a premium, one may choose to rack mount Hilo. A rack kit for the Hilo is available from Lynx dealers, or from www.lynxstudio.com.

2.3   Cable Connections

Hilo features a treasury of I/O types, suitable to accommodate whatever audio devices you wish to integrate.
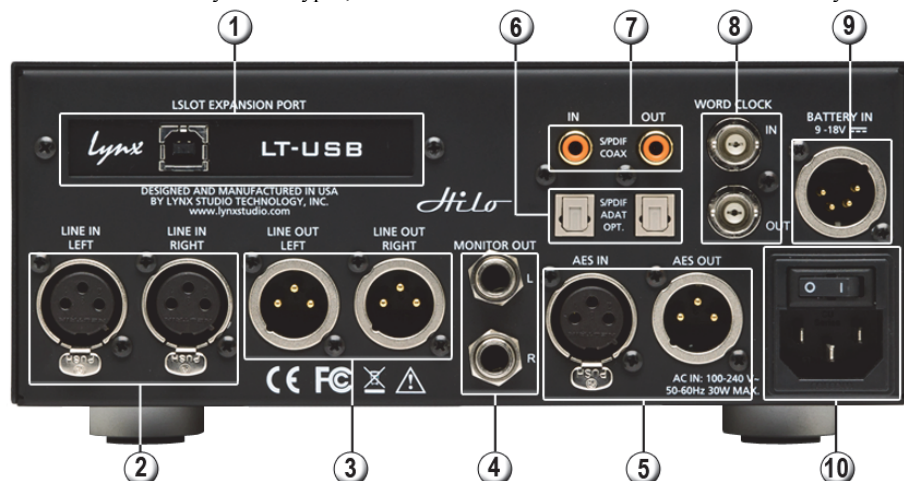
① USB Port

Cable connections may vary by system. Use the included USB cable or equivalent to connect Hilo to a USB 2.0 equipped computer. If using a third party cable, make sure that it is USB 2.0 compliant. 5 meters (16 feet) maximum.

② LINE IN

Use standard XLR cables (i.e. mic cables) to connect to a line level, balanced signal source. This input is not suitable for use with microphones, unless a microphone pre-amp is used to get mic-level signals up to line-level. Cable Concerns: If your signal source is unbalanced, consult Appendix 9.3 to determine if your cables are wired correctly for use with Hilo. For unbalanced cables, 4.5 meters (15 feet) is the maximum recommended length.

③ LINE OUT

Use standard XLR cables (i.e. mic cables) to connect to a line level, balanced signal destination. Cable Concerns If your signal source is unbalanced, consult Appendix 9.3 to determine if your cables are wired correctly for use with Hilo. For unbalanced cables, 4.5 meters (15 feet) is the maximum recommended length.

④ MONITOR OUT

Use standard ¼" cables. TRS if balanced, standard ¼" TS if unbalanced.
Cable Concerns: For unbalanced cables 4.5 meters (15 feet) is the maximum recommended length.

⑤ AES IN/OUT

Use AES XLR cables (110 Ω). Insure that the connected device supports AES3 or AES/EBU. Cable lengths of up to 100 meters (328 feet) are acceptable.

⑥ S/PDIF/ ADAT Optical

Use standard TOSLINK optical cables, of lengths up to 9 meters (30 feet).

⑦ SPDIF Coaxial In Out

Use 75 Ω S/PDIF cable with RCA connections. Recommended maximum length is 6 meters (20 feet)

⑧ Wordclock In/Out

Use standard 75 Ω wordclock cable with BNC connectors. Recommended maximum length is 9 meters (30 feet).

⑨ Battery In

DC 4-pin XLR battery pack connector. Supports 9-18 volts DC. See Appendix 5.1 for more information.

⑩ IEC Power connector

Use the included AC power cord

In Addition to the rear panel jack pack, there is one remaining cable connection on the Hilo front panel. The PHONES jack is a standard ¼" TRS connector, and is capable of driving the full range of stereo headphones available.

2.4 Initial Setup

It is important to set up Hilo in the proper order to avoid any speaker damage calamities. Follow these steps for the best results:

- Connect the AC power cord to Hilo and to a quality, surge-protected AC power source. Check the Power and Safety section of this manual for additional information.
- Connect cables from Hilo to whatever audio devices Hilo will be connected to. These could include powered speakers, mixing consoles, power amps, microphone pre-amps, effects processors, etc.
- Make sure volumes are turned down on connected equipment to avoid excessive level being sent to the equipment during setup.
- If the context of use is as a standalone AD/DA converter that will not be connected to a computer, skip ahead to section 5, and, in particular, section 5.3.4: Routing.
- If using Hilo with a Mac or PC computer, follow the installation procedure below.

2.5 Computer Set Up

All driver files and utilities mentioned in the subsequent installation steps are available on our website at:
http://www.lynxstudio.com > Support > Downloads
If a previous driver version is present, it will automatically be removed as part of the driver installation process.

Note: No driver installation is required for OS X or iOS, only for Windows.

### 2.5.1 Driver Installation for Windows 7/8/10

1. Power on Hilo with the USB cable disconnected. The Hilo driver should be installed prior to connecting the cable.
2. Download the most recent driver from the www.lynxstudio.com website and save the file to a convenient location.
3. Double-click the downloaded Hilo_DriverSetup_vX.XX.X.exe file (where X.XX.X is the version number).
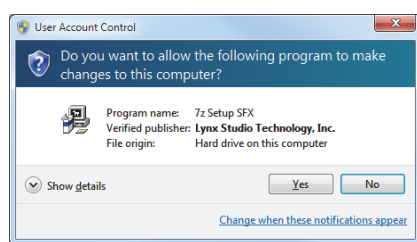
4. When the User Account Control window pops up, press "Yes" to continue.
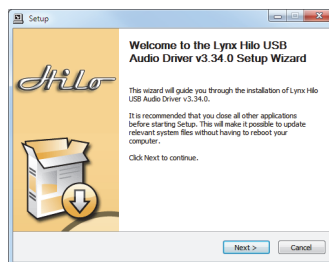
5. Press Next to continue.
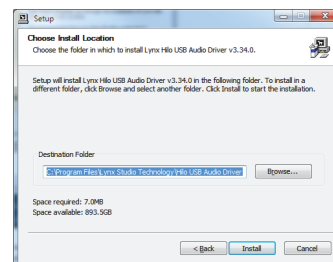
6. Press Install to continue.
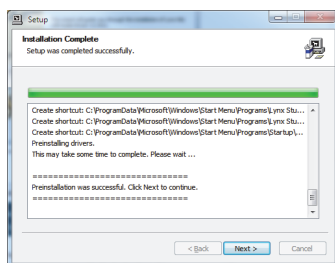
7. Press Next to complete the installation
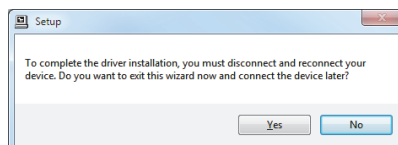
8. If this is a driver upgrade, you will be promoted to disconnect the Hilo and reconnected it.

2.5.2 Hilo Driver Devices – Windows Operating Systems

Hilo was designed to provide maximum compatibility with the most popular audio and multimedia applications that use the Windows WDM (which includes both DirectSound and MME) and ASIO driver standards. It is crucial that the applications are set up correctly for optimal operation.

WDM was developed by Microsoft and is used most typically by media playback applications, such as Windows Media Player, iTunes, Quicktime Player, as well as the default format for media players like J River Media Center, FooBar, Media Monkey, etc.

ASIO was developed by Steinberg, and was designed to address the low-latency and high channel count needs of Pro Audio and Music Production. ASIO is an option for Audio Production applications such as Pro Tools, Cubase/Nuendo, Sonar,

Samplitude/Sequoia, Audition, etc. These applications may also support MME or DirectSound, but when the option exists, we recommend using ASIO for the best performance.

2.5.2.1 WDM/Multimedia Applications

Hilo can be used as a playback device for most popular multimedia, home theater and consumer audio applications. Some such applications allow selection of specific playback devices. In these cases, one or two Hilo 8-channel play devices will be available to choose from, depending on whether Hilo is in 8 or 16 channel mode (see section 5.3.1.2.8: USB mode). These devices are labeled as "Lynx Hilo Speakers" and "USB Play 9-16". These are 8-channel devices capable of playing back multi-channel streams, like surround sound, but can also be easily used for stereo playback. When "Lynx Hilo Speakers" is selected as the play device, stereo audio will stream to Play 1+2 and with "USB Play 9-16" stereo audio will stream to Play 9+10. It is generally advisable to choose "Lynx Hilo Speakers" with any WDM program, as this will insure that audio streams to every analog and digital output on Hilo, if the Hilo is in its default state. If you wish to route a stream to a particular output, you can choose "USB Play 9-16" and route that to the desired physical output from the Routing Page, as described in section 5.3.4: Routing.

When output device selection is not an option, it can be assumed that the application uses the Windows default audio device. In this case, "Lynx Hilo Speakers" or "USB Play 9-16"should be established as the system playback default from:
Windows Vista/Windows 7 /Windows 8 and Windows 10:
Right-click Start > Control Panel > Hardware and Sound > Sound > Playback. Right-Click "Speakers Lynx Hilo" or "USB Play 9-16" and choose "Set as default device".

2.5.2.2 ASIO Application

When using an application that supports the ASIO driver standard, one must specify the Hilo ASIO driver as the appropriate audio device. Once that is established, multiple stereo input and output devices will be available for use within the application. Please note: the USB Mode from the Hilo "Settings: System" page will determine whether 8-channels or 16-channels of I/O are presented.

When using an ASIO compatible program, the appropriate ASIO device must be selected from a settings or options menu in the application. The correct choice would be "ASIO Lynx Hilo USB".

Many ASIO applications provide access to an ASIO Control Panel for the device being used. For Hilo, this button will launch the Hilo Control Panel, as detailed below.

2.5.2.3 Hilo USB Control Panel

The Hilo Control Panel provides access to operational parameters for the Hilo, including setting buffer sizes to control latency. Latency in an audio interface can be defined as the time required to process a sample from an application to the interface's audio output. A number of factors determine the achievable latency performance of a Hilo system: processor speed, operating system, sample rate, number of utilized record or play channels, system efficiency, etc.

Latency can be manipulated by changing the size of the buffers used to transfer data to and from the LT-USB card installed into Hilo.

The Hilo USB Control Panel provides access to buffer settings, both a Streaming Mode for WDM and ASIO, and also an ASIO Buffer Size control. This control panel can be launched from either the ASIO control settings within most audio applications or from "Start> All Programs> Lynx Studio Technology > "Hilo USB Control Panel".

There are three tabs in the Hilo Control Panel
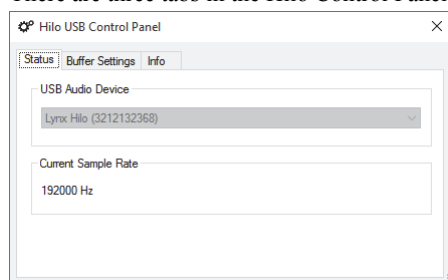
The STATUS page simply reveals the "USB Audio Device" (Lynx Hilo in this case), and the current "Sample Rate". The sample rate cannot be changed here, it is information display only.
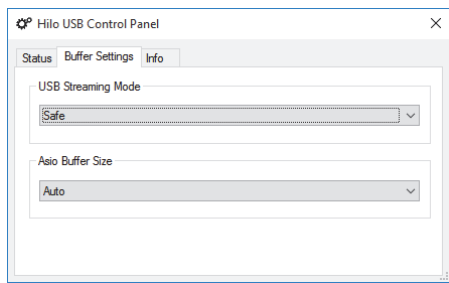
In the BUFFER SETTINGS page, the USB Streaming and ASIO buffer parameters control the size of the audio packets that are used to transfer audio to the LT-USB hardware. Smaller buffer sizes will give you lower latency.

However, if a buffer size is too small for the system or context, audio anomalies such as clicks and pops may occur. It is recommended to become familiar with altering the LT-USB buffer size to best suit the context of use.

When using ASIO based applications, both the Streaming and ASIO buffer sizes contribute to the overall latency of the system and interact in a cumulative fashion. It is not possible to set the stream buffer to a value smaller than that required for the ASIO buffer size.

When using WDM based applications, only the Streaming buffer size parameter contributes to the overall latency of the system. The ASIO buffer size is ignored. Most WDM applications also add a large amount of additional latency to ensure clean playback. For this reason, ASIO is the preferred driver model for pro-audio and low-latency situations.

To modify the latency, the "Streaming" buffer size must first be set. Choose the desired size and click "Apply". We recommend setting this value to "Low Latency" in order to have the greatest flexibility in ASIO buffer size selection. If clean audio is not possible in this state, increase the stream buffer size to "Standard". Once the Streaming size is set, you will have various options for the "ASIO" buffer size. Choose the appropriate size and click "Apply". The default state for this value is "Auto". Auto chooses a safe buffer size based on the stream buffer size selected and the sample rate being used. Once you have determined the smallest supported Stream Buffer size, you typically *will not* have to change this again. The ASIO buffer size, however, may need to be increased or lowered from time to time depending on the context of use.

Once you determine the lowest achievable buffer size, *you will typically have to double the size each time you double the sample rate, but the effective latency will remain constant*. For example, if a system is capable of operating at a buffer size of 128 samples at 48 kHz, then for a 96 kHz project, the buffer size will likely need to be increased to 256 samples.
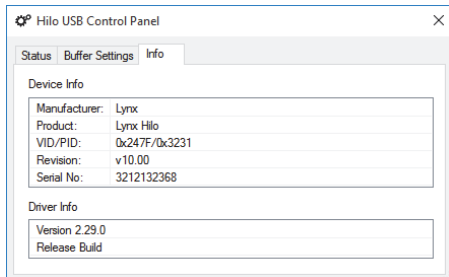
The third tab in the Hilo Control Panel opens the INFO page. This page simply reveals the connected product (again Hilo), the Revision of the LT-USB (its firmware version), serial number and driver build.

2.5.3   Installation for Macintosh OS X

Hilo will operate as a Core Audio device under OS X automatically without any driver installation required. Core Audio is the dominant audio driver model for OS X, and is used for media playback applications as well as Pro Audio applications.

Simply connect the USB cable from Hilo to your Mac OS X computer and Hilo will be immediately available for use. Please note that Hilo does require OS X version 10.6.4 or above.

2.5.3.1 OSX Audio Applications

Hilo can be used as a playback device for most popular multimedia, home theater and pro audio applications. Some such applications allow selection of specific playback devices. In these cases, a Lynx Hilo output device can be selected from the appropriate device selection menu.

In cases where the playback software does not provide access to output selections, the default output devices for the operating system will be used. In OS X, the audio out default device can be established from Applications > Utilities > Audio MIDI Setup.

When the Lynx Hilo is selected as the output sound device, channels 1&2 are active by default. In this state, audio will be sent to ALL Hilo outputs simultaneously. If you wish to mute a stream to a particular output, you can do that from the Hilo Routing Page, as describe in section 5.3.4: Routing.

2.5.3.2 Controlling Latency by Changing the Buffer Size

Latency in an audio interface can be defined as the time required to process a sample from an application to the interface's audio output. A number of factors determine the achievable latency performance of a Hilo USB system: processor speed; operating system; sample rate; number of utilized record or play channels; system efficiency; etc.

Latency can be manipulated by changing the size of the buffers used to transfer data to and from Hilo. Core Audio buffer size controls are offered within most pro audio recording applications. With Hilo, buffer sizes typically range between 32 and 2048 samples.

Smaller buffer sizes will give you lower latency. However, if a buffer size is too small for the system or context, audio anomalies such as clicks and pops may occur. It is recommended to become familiar with altering the Hilo buffer size to best suit the context of use.

Once you determine the lowest achievable buffer size, *you will typically have to double the size each time you double the sample rate, but the effective latency will remain constant*. For example, if a system is capable of operating at a buffer size of 128 samples at 48 kHz, then for a 96 kHz project, the buffer size will likely need to be increased to 256 samples.

2.5.4 Installation for iPad

Hilo can connect to an Apple iPad with the camera kit. Hilo will operate as an audio device under iOS automatically without any driver installation required.

Simply connect the USB cable from Hilo to your iPad, and Hilo will be immediately available for use. There is no capability in iPad applications to select audio devices. Any audio that plays from the iPad will automatically be routed to the Hilo through the camera connection kit/USB cable.

3   Getting Started Hilo-TB

Hilo was designed to be a product that is so easy to use that this section of the manual would scarcely be necessary. However, it is quicker to learn how the device works in one go, then to spend precious minutes figuring things out by randomly pressing buttons. We recommend reading this section thoroughly, before putting Hilo to serious use, if you can manage it.

3.1   Unpacking

Before setting up Hilo for use, remove it from the box and verify that the box contents described in <u>section 1.3 In the Box</u> are all present.

If all items are present, connect the Hilo AC power cord to a grounded AC Outlet, or power distribution unit. Switch on the power switch on the back of Hilo (note: the "|" position on the power button is "On" and the "O" is "Off".)

Hilo may power up automatically when AC is applied (this varies by firmware version). If not, press the front panel standby switch and verify that Hilo powers up.

If it does not, verify that the selected AC power source is operational. If it is and the unit still will not power up, please contact Lynx technical support.

If Hilo DOES power up, move on to Set up…

3.2   Set up

Hilo was designed to be adaptable to a variety of operational environments: on a desktop for Audiophile enthusiasts, in an equipment rack for recording studios, over a mixing console for a mastering engineer, etc. If Hilo is to be used on a desktop or other flat surface, it is best to leave the pre-installed rubber feet in place. These are designed to prevent scratching of Hilo or the surface that it is set upon.

In a recording studio context, where space is at a premium, one may choose to rack mount Hilo. A rack kit for the Hilo is available from Lynx dealers, or from www.lynxstudio.com.

3.3 Cable Connections

Hilo features a treasury of I/O types, suitable to accommodate whatever audio devices you wish to integrate.
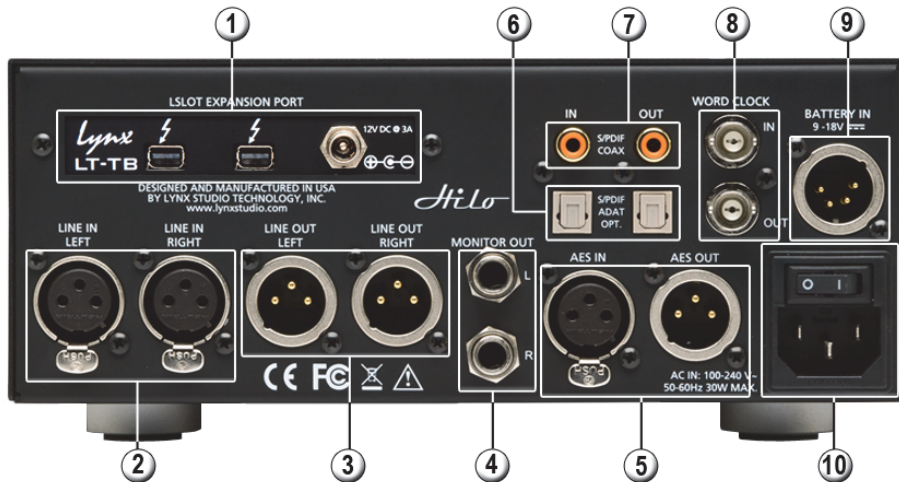
① Thunderbolt ports

Thunderbolt: Hilo-TB has been tested with standard optical and copper Thunderbolt cables. For Copper cable, one can use lengths up to 3 meters (9.8 feet). Optical cables, while somewhat more difficult to acquire, do promise operation with much longer cable lengths, up to 100 meters. Either port may be used to connect to the computer. The other port may be used to daisy-chain to other Thunderbolt devices (up to 6 total on the Thunderbolt chain).

Note: Using a Thunderbolt 3 computer will require a 3rd party adapter like the Apple MMEL2AM/A Thunderbolt 3 to Thunderbolt 2 Adapter.

12V DC port

For connecting an external AC power supply in cases where bus-powered Thunderbolt devices will be connected to the Hilo-TB

② LINE IN

Use standard XLR cables (i.e. mic cables) to connect to a line level, balanced signal source. This input is not suitable for use with microphones, unless a microphone pre-amp is used to get mic-level signals up to line-level. Cable Concerns: If your signal source is unbalanced, consult Appendix 9.3 to determine if your cables are wired correctly for use with Hilo. For unbalanced cables, 4.5 meters (15 feet) is the maximum recommended length.

③ LINE OUT

Use standard XLR cables (i.e. mic cables) to connect to a line level, balanced signal destination. Cable Concerns If your signal source is unbalanced, consult Appendix 9.3 to determine if your cables are wired correctly for use with Hilo. For unbalanced cables, 4.5 meters (15 feet) is the maximum recommended length.

④ MONITOR OUT

Use standard ¼" cables. TRS if balanced, standard ¼" TS if unbalanced.
Cable Concerns: For unbalanced cables 4.5 meters (15 feet) is the maximum recommended length.

⑤ AES IN/OUT

Use AES XLR cables (110 Ω). Insure that the connected device supports AES3 or AES/EBU. Cable lengths of up to 100 meters (328 feet) are acceptable.

⑥ S/PDIF/ ADAT Optical

Use standard TOSLINK optical cables, of lengths up to 9 meters (30 feet).

⑦ SPDIF Coaxial In Out

Use 75 Ω S/PDIF cable with RCA connections. Recommended maximum length is 6 meters (20 feet)

⑧ Word clock In/Out

Use standard 75 Ω word clock cable with BNC connectors. Recommended maximum length is 9 meters (30 feet).

⑨ Battery In

DC 4-pin XLR battery pack connector. Supports 9-18 volts DC. See Appendix 5.1 for more information.

⑩ IEC Power connector

Use the included AC power cord

In Addition to the rear panel jack pack, there is one remaining cable connection on the Hilo front panel. The PHONES jack is a standard ¼" TRS connector, and is capable of driving the full range of stereo headphones available.

3.4   Initial Setup

It is important to set up Hilo in the proper order to avoid any speaker damage calamities. Follow these steps for the best results:
- Connect the AC power cord to Hilo and to a quality, surge-protected AC power source. Check the Power and Safety section of this manual for additional information.
- Connect cables from Hilo to whatever audio devices Hilo will be connected to. These could include powered speakers, mixing consoles, power amps, microphone pre-amps, effects processors, etc.
- Make sure volumes are turned down on connected equipment to avoid excessive level being sent to the equipment during setup.
- If the context of use is as a standalone AD/DA converter that will not be connected to a computer, skip ahead to section 5, and, in particular, section 5.3.4: Routing.
- If using Hilo with a Mac or PC computer, follow the installation procedure below.

3.5   Computer Set Up

Lynx Drivers and firmware updaters are updated regularly. The most current versions can be easily downloaded from the Lynx Website: www.lynxstudio.com > Support> Downloads. Make sure that you choose LT-TB or Hilo Thunderbolt as the "Product".

If you are updating an existing driver, it is recommended to remove it before installing the new driver. In Windows, this is done from Start > Programs > Lynx Studio Technology > Uninstall Lynx Driver. From OS X, this is done by running the uninstaller that comes in the folder with the downloaded driver installer. Reboot when prompted after the Uninstall is complete. When installing drivers, make sure that all software programs, especially audio applications, are closed.

3.5.1   Driver Installation for Windows 7/8/10

1. Power up the Hilo and connect it to the computer with a Thunderbolt cable.

2. On first connection, you may receive a prompt that New Thunderbolt Devices have been attached. Click this window to have the system connect to the Hilo as a Thunderbolt Device
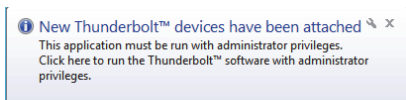
3. When the Select Device to Connect Window comes up, Choose "Always Connect". If there are multiple Thunderbolt devices connected at install time, you will need to do this for each unit. (If this is a reinstall, you will not see this dialog box. Just continue on with the subsequent steps).
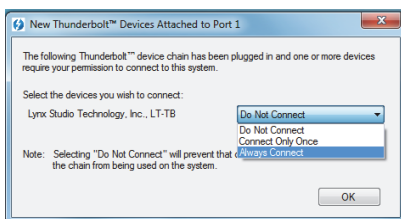
4. Locate the LT-TB driver from your downloaded files. The file name will be V2Setup###.exe (where ### is the version number of the driver)

5. Double-click the installation file to start the driver installation.

6. Accept the License Agreement by clicking "Accept"
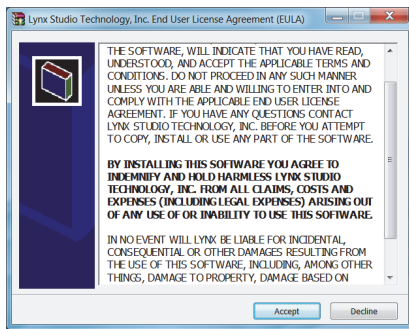
7. The installer will extract the necessary files to the C:\Lynx directory. Click "Extract" from this window
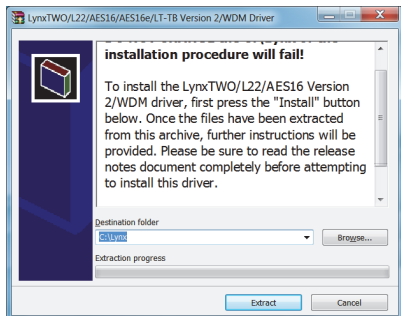
8. If you are prompted to let the program make changes to the computer, select "Yes"

9. You will next see the driver Install dialog. Click "Install"
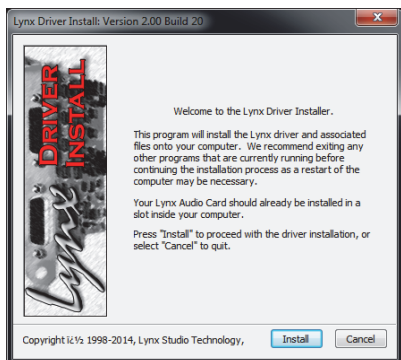
10. You may get a Windows Security Dialog Bog. If so, select "Install"
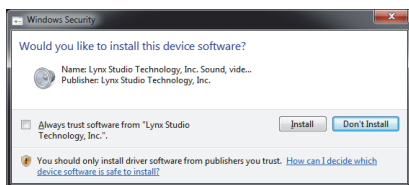
11. Driver installation will proceed

12. Finally you will receive a confirmation that the install completed successfully

13.   The Hilo TB is ready to use, no reboot necessary.

NOTE: The driver installation process installs both the Windows driver and the Hilo Remote Control application. The Hilo Remote Control application is installed into the Lynx Studio Technology program group.

3.5.2   Hilo Driver Devices – Windows Operating Systems

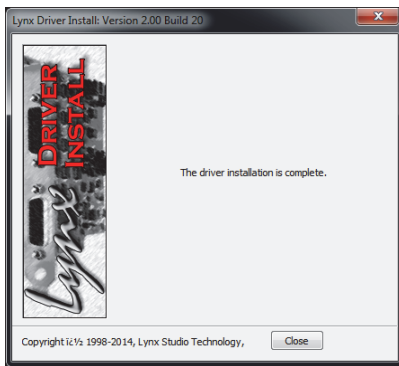Hilo was designed to provide maximum compatibility with the most popular audio and multimedia applications that use the Windows WDM (which includes both DirectSound and MME) and ASIO driver standards. It is crucial that the applications are set up correctly for optimal operation.

WDM was developed by Microsoft and is used most typically by media playback applications, such as Windows Media Player, iTunes, Quicktime Player, as well as the default format for media players like J River Media Center, FooBar, Media Monkey, etc.

ASIO was developed by Steinberg, and was designed to address the low-latency and high channel count needs of Pro Audio and Music Production. ASIO is an option for Audio Production applications such as Pro Tools, Cubase/Nuendo, Sonar, Samplitude/Sequoia, Audition, etc. These applications may also support MME or DirectSound, but when the option exists, we recommend using ASIO for the best performance.

3.5.2.1 WDM/Multimedia Applications

The Hilo-TB can be used as a playback device for most popular multimedia, home theater and consumer audio applications. Some such applications allow selection of specific playback devices. In these cases, a Hilo output device can be selected from the appropriate device selection menu. When output device selection is not an option, it can be assumed that the application uses the Windows default audio device. To use the desired Hilo output as the system default:

With Windows 7/Windows 8 navigate to: Start > Control Panel > Hardware and Sound > Sound > Playback. With Windows 10, right click the Start button and choose Control Panel > Hardware and Sound > Sound > Playback. Right-Click the desired Hilo-TB output device and choose "Set as default device". The first pair of outputs will appear as (Speakers) Hilo.

The Hilo-TB will present 8 stereo Play and Record devices to the operating system. Play devices are labeled as Hilo Speakers (this is equivalent to Play 1+2), Hilo Play 3+4, Hilo Record 1+2, Hilo Record 3+4, etc. These are pre-configured to connect to appropriate hardware I/O on the Hilo by default, although this can be user altered in Hilo Routing page or from the Hilo Remote software. There are also factory scenes pre-installed in the Hilo that provide easy access to the most popular configurations. See section 5.3.8 Scenes.

3.5.2.2 ASIO Application

When using an application that supports the ASIO driver standard, one must specify the Lynx ASIO driver as the active audio device from within the audio software. Once that is established, eight stereo input and output devices will be available for use within the application.

When using an ASIO compatible program, the appropriate ASIO device must be selected from a settings or options menu in the application. The correct choice would be "Lynx ASIO".

3.5.2.3 <u>ASIO Control Panel</u>
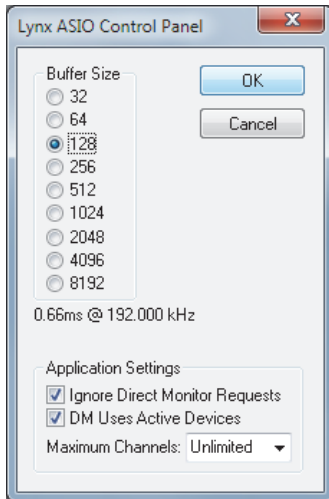
Many ASIO applications provide access to the driver's ASIO Control Panel. For a Hilo-TB, this button will launch the Lynx ASIO Control Panel.

From the Lynx ASIO Control Panel, the ASIO buffer size and system latency can be established conveniently within the audio software application. The following parameters can be altered from the Lynx ASIO Control Panel:

Buffer Size: Allows the size of the ASIO buffer, in samples, to be set. The buffer size is the primary factor in the amount of latency that a user will experience when using the Hilo TB. See <u>section 3.5.2.4 Controlling Latency by Changing the Buffer Size</u> below for details.

Latency: Displays the amount of latency in milliseconds that is the result of the selected buffer size at the active sample rate.

Ignore Direct Monitor Requests: When checked, the ASIO driver will disregard Direct Monitor commands from an ASIO software application. Since Direct Monitor calls can assign and mute monitor sources in the Routing page and the Hilo Remote, checking this box can prevent unintended changes to the monitoring scheme when an ASIO application is launched.

DM Uses Active Devices: This switch sets the Direct Monitoring scheme for the application. When unchecked, all devices (active or not) may be used for Direct Monitoring. When checked, only active devices, or devices assigned to software busses, are used for Direct Monitoring. This gets around a problem where Cubase & Nuendo might select the wrong Direct Monitoring input or output if non-contiguous devices are active.

Maximum Channels: This switch determines how many ASIO device channels will be available to the application. This is an application specific parameter. If different ASIO applications are used at different times, it is possible to have them set differently.

The primary purpose for this switch is to increase CPU efficiency and to facilitate multi-client operation. The default state is "unlimited", which means that all 16-channels are available to the ASIO application.

Most audio software allows the user to specify how many ASIO devices are used, generally in a settings or options menu. There are some applications however that grab control over ALL of the ASIO devices in the system. For example, ProTools will open all available channels regardless of the number of tracks being used in a project. This can be problematic because it uses more CPU power than is necessary, and also because there are no driver devices available to be used by another application (multi-client operation).

In these cases, setting the <u>Maximum Channels</u> control to the desired number of channels may free up some CPU overhead and allows another application to access the channels that the ASIO application is not using. As an example, if you are only using two pairs of outputs from your ASIO application, it would be appropriate top set this parameter to "4 channels".

3.5.2.4 <u>Controlling Latency by Changing the Buffer Size</u>

Latency in an audio interface can be defined as the time required to process a sample from an application to the interface's audio output. A number of factors determine the achievable latency performance of a Hilo-TB system: processor speed, operating system, sample rate, number of utilized record or play channels, system efficiency, etc.

Latency can be manipulated by changing the size of the buffers used to transfer data to and from the LT-TB. The higher the buffer size, the less work the computer has to do to stream audio to the hardware. However, a higher buffer results in more latency. Also, the higher the sample rate, the higher the buffer size needs to be. For instance, a buffer size of 128 samples at a sample rate of 44.1kHz results in 2.9 milliseconds of latency. However, at 96kHz, a buffer size of 128 = 1.33 milliseconds. Therefore the buffer size needs to be increased as the sample rate increases to maintain the same level of performance. If the buffer size is too low, you can experience

clicks, pops or distortion in the audio. This is the result of buffer under-runs, when the audio buffer is momentarily depleted because the computer cannot deliver samples quickly enough to keep it filled.

Why is latency important? It isn't in every case. Here are the main conditions where low latency is important:

Software input monitoring. This is where you are monitoring through your audio software the input signals to be recorded. The software is re-directing the input signal back out to a play device. If the buffer is too high here the performer will hear a noticeable delay between the notes they are playing and hearing the sound back through the computer. Note that with the LT-TB, zero latency hardware monitoring is available as an alternative to software monitoring. See section 5.3.4: Routing.

Virtual Instruments. Generally this would involve using a software synthesizer or other virtual sound source as an alternative to dedicated hardware like a keyboard or tone module. Frequently one would play these instruments with some sort of MIDI controller. The delay between a key being struck and hearing the resulting note from the virtual instrument is a function of latency.

Mix Automation. Virtually all DAW applications feature some sort of Mix Automation, and most allow an external Mix surface or MIDI controller to facilitate mixing within the software environment. Whether using onscreen faders or a MIDI surface of some sort, latency will determine the delay between manipulating a fader or knob, and that move being reflected in the project.

3.5.3   Installation for Macintosh OS X

1. Power up the Hilo and connect it to the computer with a Thunderbolt cable.

2. Locate the LT-TB driver from your downloaded files. The file name will be Lynx_OSX_##.zip (where ## is the version number of the driver). Double-click to expand the installer package.

3. Double-click "Lynx_OSX.pkg" that was expanded from the step above. This will start the driver installation.

4. Click "Continue" at the "Install Lynx CoreAudio Driver Installer" dialog box.
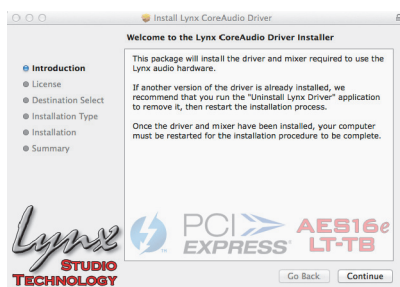
5. Click "Continue" for the Software License Agreement after reading it.
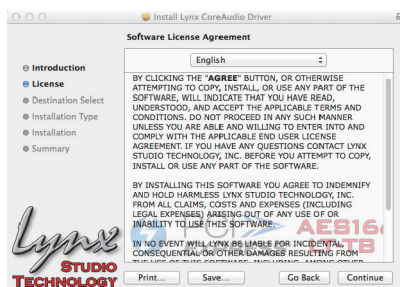
6. Click "Agree" from the next Window

7. Click "Install" in the Standard Install Window
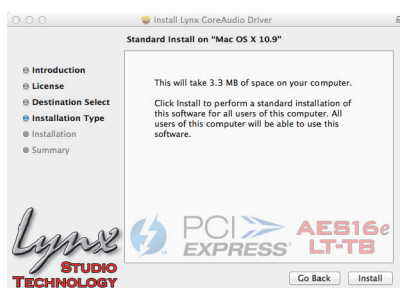
8. Type in Password and click "Install"

9. Click "Continue Installation" for prompt about restarting computer after the installation

10.   The installation will continue

11.   When complete, you will be prompted to restart the computer
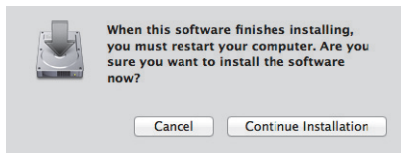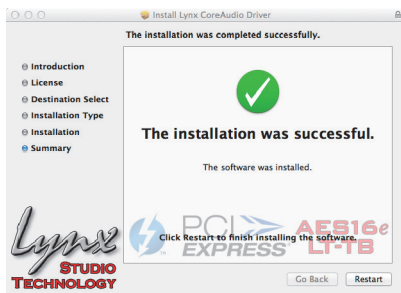

12.   After restart the driver will be installed and ready for use

NOTE: The OS X installation process installs both the Core Audio driver and the Hilo Remote application. The Hilo Remote application is installed in the "Applications" folder.

3.5.3.1 <u>OSX Audio Applications</u>

Hilo can be used as a playback device for most popular multimedia, home theater and pro audio applications. Some such applications allow selection of specific playback devices. In these cases, a Lynx Hilo output device can be selected from the appropriate device selection menu.

In cases where the playback software does not provide access to output selections, the default output devices for the operating system will be used. In OS X, the audio out default device can be established from Applications > Utilities > Audio MIDI Setup.

When the Lynx Hilo is selected as the output sound device, channels 1&2 are active by default. In this state, audio will be sent to ALL Hilo outputs simultaneously. If you wish to mute a stream to a particular output, you can do that from the Routing Page, as describe in <u>section 5.3.4: Routing</u>

3.5.3.2 Controlling Latency by Changing the Buffer Size

Latency in an audio interface can be defined as the time required to process a sample from an application to the interface's audio output. A number of factors determine the achievable latency performance of a Hilo system: Processor speed; Operating system; Sample rate; Number of utilized record or play channels; System efficiency; etc.

Latency can be manipulated by changing the size of the buffers used to transfer data to and from Hilo. Core Audio buffer size controls are offered within most pro audio recording applications. With Hilo, buffer sizes typically range between 32 and 2048 samples.

Smaller buffer sizes will give you lower latency. However, if a buffer size is too small for the system or context, audio anomalies such as clicks and pops may occur. It is recommended to become familiar with altering the Hilo buffer size to best suit the context of use.

Once you determine the lowest achievable buffer size, *you will typically have to double the buffer size each time you double the sample rate, but the effective latency will remain constant*. For example, if a system is capable of operating at a buffer size of 128 samples at 48 kHz, then for a 96 kHz project, the buffer size will likely need to be increased to 256 samples, which is exactly the same latency.

4   Getting Started Hilo-Dante

Hilo was designed to be a product that is so easy to use that this section of the manual would scarcely be necessary. However, it is quicker to learn how the device works in one go, then to spend precious minutes figuring things out by randomly pressing buttons. We recommend reading this section thoroughly, before putting Hilo to serious use, if you can manage it.

4.1   Unpacking

Before setting up Hilo for use, remove it from the box and verify that the box contents described in section 1.3 are all present.

If all items are present, connect the Hilo AC power cord to a grounded AC Outlet, or power distribution unit. Switch on the power switch on the back of Hilo (note: the "|" position on the power button is "On" and the "O" is "Off".)

Hilo may power up automatically when AC is applied (this varies by firmware version). If not, press the front panel standby switch and verify that Hilo powers up.

If it does not, verify that the selected AC power source is operational. If it is and the unit still will not power up, please contact Lynx technical support.

If Hilo DOES power up, move on to Set up…

4.2   Set up

Hilo was designed to be adaptable to a variety of operational environments: on a desktop for Audiophile enthusiasts, in an equipment rack for recording studios, over a mixing console for a mastering engineer, etc. If Hilo is to be used on a desktop or other flat surface, it is best to leave the pre-installed rubber feet in place. These are designed to prevent scratching of Hilo or the surface that it is set upon.

In a recording studio context, where space is at a premium, one may choose to rack mount Hilo. A rack kit for the Hilo is available from Lynx dealers, or from www.lynxstudio.com.

4.3   Cable Connections

Hilo features a treasury of I/O types, suitable to accommodate whatever audio devices you wish to integrate.
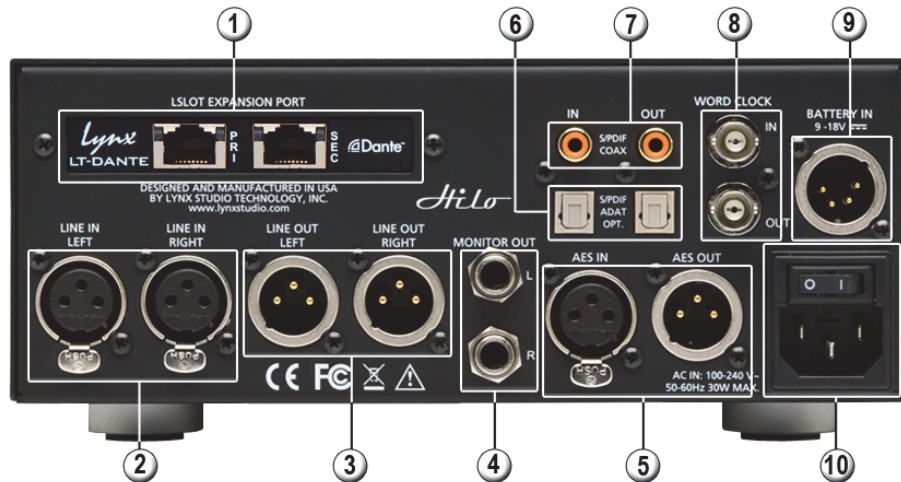
① Dante ports
Use CAT5e or CAT6 Ethernet cable. Cable lengths up to 100m are possible with hi-grade cables. Dante devices can be connected point-to-point, but if more than two devices are involved in a network, it is recommended to use a Network Switch in a 'star" configuration. Hilo-Dante can be connected to a computer through a standard Ethernet port for use with the Dante Controller software for routing and configuration, or with the Audinate Virtual Soundcard software to use Hilo as a computer audio interface.

② LINE IN
Use standard XLR cables (i.e. mic cables) to connect to a line level, balanced signal source. This input is not suitable for use with microphones, unless a microphone pre-amp is used to get mic-level signals up to line-level. Cable Concerns: If your signal source is unbalanced, consult Appendix 9.3 to determine if your cables are wired correctly for use with Hilo. For unbalanced cables, 4.5 meters (15 feet) is the maximum recommended length.

③ LINE OUT
Use standard XLR cables (i.e. mic cables) to connect to a line level, balanced signal destination. Cable Concerns If your signal source is unbalanced, consult Appendix 9.3 to determine if your cables are wired correctly for use with Hilo. For unbalanced cables, 4.5 meters (15 feet) is the maximum recommended length.

④ MONITOR OUT
Use standard ¼" cables. TRS if balanced, standard ¼" TS if unbalanced.
Cable Concerns: For unbalanced cables 4.5 meters (15 feet) is the maximum recommended length.

⑤ AES IN/OUT
Use AES XLR cables (110 Ω). Insure that the connected device supports AES3 or AES/EBU. Cable lengths of up to 100 meters (328 feet) are acceptable.

⑥ S/PDIF/ ADAT Optical
Use standard TOSLINK optical cables, of lengths up to 9 meters (30 feet).

⑦ SPDIF Coaxial In Out
Use 75 Ω S/PDIF cable with RCA connections. Recommended maximum length is 6 meters (20 feet)

⑧ Word clock In/Out
Use standard 75 Ω word clock cable with BNC connectors. Recommended maximum length is 9 meters (30 feet).

⑨ Battery In
DC 4-pin XLR battery pack connector. Supports 9-18 volts DC. See Appendix 5.1 for more information.

⑩ IEC Power connector
Use the included AC power cord

In Addition to the rear panel jack pack, there is one remaining cable connection on the Hilo front panel. The PHONES jack is a standard ¼" TRS connector, and is capable of driving the full range of stereo headphones available.

4.4   Initial Setup

It is important to set up Hilo in the proper order to avoid any speaker damage calamities. Follow these steps for the best results:
- Connect the AC power cord to Hilo and to a quality, surge-protected AC power source. Check the Power and Safety section of this manual for additional information.
- Connect cables from Hilo to whatever audio devices Hilo will be connected to. These could include powered speakers, mixing consoles, power amps, microphone pre-amps, effects processors, etc.
- Make sure volumes are turned down on connected equipment to avoid excessive level being sent to the equipment during setup.

4.5   Dante Connections

Dante is not just a means for an audio device to communicate with a computer, but also a means for an audio device to communicate directly to other Dante-enabled devices. A design principle with Dante, is that ANY Dante devices will be able to interact, regardless of manufacturer. Clocking is managed automatically between devices, and device names, states and settings are stored on the chip within every Dante device on the market. These chips are manufactured by the company that developed the Dante system, Audinate.

For this reason, there is nothing about these essential connections that is unique to Lynx Products. If you know how to configure one manufacturer's device for Dante, you'll be able to do the same for any other manufacturer's device. Creating a Dante network involves some IT principles that can be un-charted terrain for musicians and recording engineers; managed switches versus unmanaged switches, multicast versus unicast, flows, packets, etc. When setting up a Dante system it is wise to study the wealth of information that is available on the internet, particularly on www.audinate.com

Of particularly benefit is information on selecting and configuring a network switch that will be the center of your Dante ecosystem. Rather than re-invent the wheel, we recommend that Hilo-Dante users consult with the following resources when designing and configuring their system:

https://www.audinate.com/resources/technical-documentation: resources for using Audinate software, technical docs, and setup guides
https://www.audinate.com/resources/faqs: an extensive collection of Dante FAQs, covering all aspects of latency, clocking, computer integration, etc.
https://www.audinate.com/resources/networks-switches: information on network considerations, and switch selection and configuration.
https://www.audinate.com/products/manufacturer-products/dante-brooklyn-ii: Information about the Brooklyn II chip used in Hilo-Dante

Unlike most multi-component audio systems, we recommend letting the Hilo receive its clock from the Dante network whenever possible. For this reason, DANTE will become the default SYNC SOURCE in the Hilo when connected to a Dante network. The Dante controller software will allow the use of external clocking if that is necessary, but otherwise it is good practice to allow all devices in the network to receive clock through their Dante connections. Details about Dante clocking practices can be explored in the support resources above.

4.5.1   Dante computer Set Up

There are several ways that Dante hardware can be used with computers. As an audio-adapted networking protocol, the computer is just another node in the network, not unlike computers in a business network. Some Dante contexts (live sound for instance) may only use a computer for initial configuration, and never again. With other systems, the computer can be integral to the system as a recording and play device. There are three primary ways to integrate Dante devices in a computer:

4.5.1.1   Dante Controller Software

Dante controller is an application that allows control and configuration of Dante devices. This powerful tool allows users to route signals from any Dante source to any Dante destination on the network. Each device can be configured in terms of clocking, latency, device name, and transmission characteristics. Routing is achieved through a grid system, where "flows' are defined between a transmitter and a receiver.

With Dante Controller installed onto an OS X Mac, or Windows PC, devices in the Dante network will automatically appear, there are no drivers or utilities to install for this to happen. When Hilo is connected to the system, it will appear in Dante Controller as LT-DANTE (this can be easily changed from the Device Config page of DCS). Complex systems with dozens of devices in multiple rooms can be managed here, as well as simple home recording setups.

Dante Controller can be downloaded from the Audinate website at: www.audinate.com > products > software: dante controller. In addition to the file download there is a vast array of information here, including documentation and tutorial videos. We strongly

suggest diving into these materials to make your downtime minimal and allow you to utilize this powerful system to its greatest potential.

Please note: the Dante Controller software does NOT allow your Dante devices to interact with any DAW or audio playback software on your computer. It is strictly for routing and configuration. If you wish to use your Dante system for record and play, then you need:

4.5.1.2 Dante Virtual Soundcard

DVS turns your OS X or Windows computer into a Dante device. You can route to and from your computer with the Dante Controller, once Virtual soundcard is installed. DVS can present up to 64 channels to your audio software, and the streams can come from a variety of Dante Devices. Clocking is handled brilliantly behind the scenes, so manual clock configuration is not necessary.

In its simplest form, if you wish to use Hilo-Dante with your DAW, you need DVS to bridge the two. DVS is an Audinate product and Audinate charges a license fee to download and use it. DVS includes an ASIO and WDM driver for Windows and Core Audio for OSX, with a utility to set device latency and desired number of channels. When installed, the DVS enabled computer will appear in Dante Controller as Transmission (playback) AND Receive (record) devices.

Some users require lower latencies then Virtual Soundcard can achieve through the stock Ethernet port on a computer. For this reason, Audinate has released a PCIe based card that can be installed into a computer, and provides Ethernet ports just like the computer already has, but connects underneath the usual networking protocols within the OS. As a result, using one of these cards can dramatically reduce latency within your audio system. More information is available at www.audinate.com > products > manufacturer products: Dante PCIe-R soundcard.

As with Dante controller, Virtual Soundcard is extensively documented on the Audinate website. To purchase, download and learn to use it, visit www.audinate.com > products > software: dante virtual soundcard.

But what if you wish to integrate non-Dante devices into your Dante network? Well, there is a solution for that as well:

4.5.1.3 Dante Via

Via allows you to manage and route audio between Dante-enabled devices, and other PCIe, USB, or Thunderbolt audio devices. Streams can be sent from play software on one computer, through an audio interface connected to a difference computer on the network. In a multi-room system, audio can be delivered from suite to suite without transferring project or audio files, or in a home audio system, different audio sources can be streamed to various rooms, allowing central control of a whole media network.

As with the other software tools, Via can be purchased and explored at www.audinate.com > products > software: dante via.

5   Using Hilo

Hilo's Touch Screen gives it a key advantage over other converters. As all of the functions are controlled by the software that runs the touch screen, Hilo is not locked into just one way to work. We can add features. We can change the graphics. We can offer completely different user interfaces for different types of users. The Hilo user interface from three years ago is radically different than today's Hilo. In short, it has evolved. It will continue to evolve.

Hilo was designed for ease of use, without navigational clutter on the front panel.

The heart of the Hilo system is the 480 x 272 pixel front panel touch screen. This is where settings, routing, volume control and meters are displayed and managed. The Hilo screen is responsive to pressure. It may take a little getting used to the amount of pressure and accuracy required for the on-screen buttons to respond. Also, like any such device, Hilo employs navigational conventions that, although designed to be intuitive and require little or no explanation, may require a small learning curve initially.

5.1   On Power Up

The first time you power up the Hilo you will be greeted by the Calibration page. Calibration is a necessary process to insure that the Hilo touchscreen is properly responsive. Calibration involves touching DOTs in the four corners of the touch screen one at a time. The calibration dots are rather small, so some find it helpful to use a pencil eraser or something similar.

After calibration, the first screen that you will see will be the METER page. The dual Horizontal Meter set is shown below.
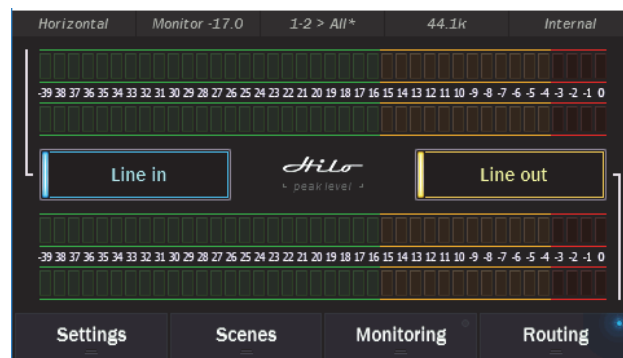
5.1.1   Headphone and Monitor Out Volume Control

If you turned Hilo off using the STANDBY switch on the front panel, all of your previous settings will be recalled. Your Headphone and Monitor Out levels will be the same as when you last used them.

Caution: *Be sure to check the volume level of the Headphone and Monitor before playing audio. You can do this by simply turning the Rotary Control. A level indicator will appear at the top of the screen.*
The Hilo PHONES Output has "jack sense", so that the headphone volume controls are only available when headphones are plugged in. If headphones are not plugged in, then the Rotary Encoder will only control the Monitor Out level. If headphones are plugged in, then pushing in the Rotary Control knob will allow you to toggle between Headphone and Monitor Out Volume Controls by default.

If you wish to have the rotary control toggle between outputs other than Monitor Out and Phones Out, then this can be changed from the ROTARY CONTROL SETTINGS button on the Settings: System page. Any combination of outputs can be selected here, including a MASTER OUT that would control levels for ALL of the outputs at one time.

5.1.1   Menu Screen conventions:

When you engage a button, it "lights up", just as if you are pushing a button on a console. The last button touched or changed will always light up when that Menu page is selected.
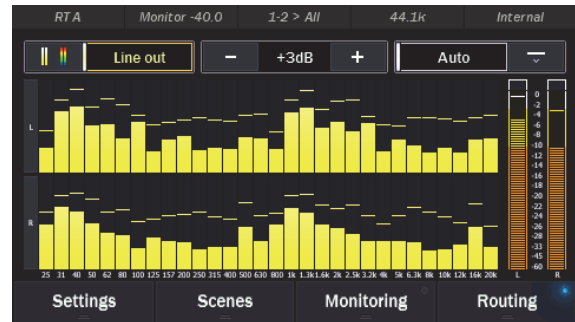
Most buttons have a dual purpose. First they display the control's current setting. Second by touching them, you can select a different setting.
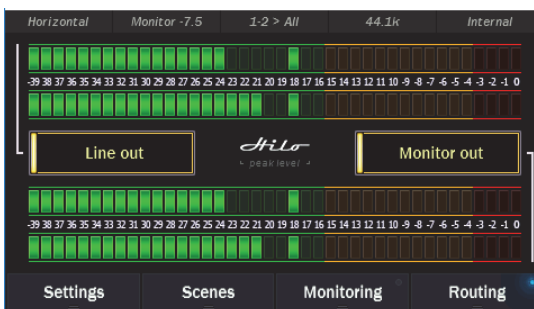
5.2   Changing the Meter Page

To change meter type, just press anywhere in the active meter and you will be able to select any of the four metering options:
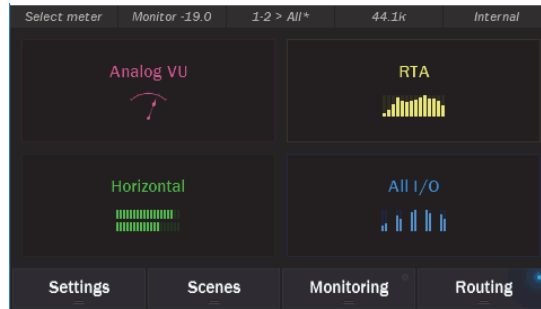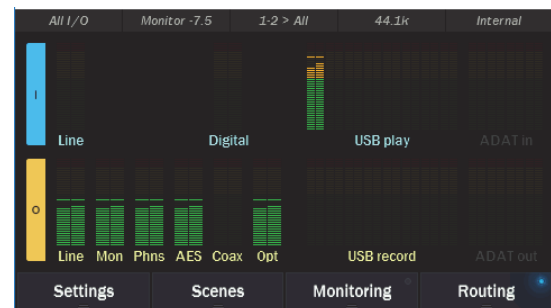

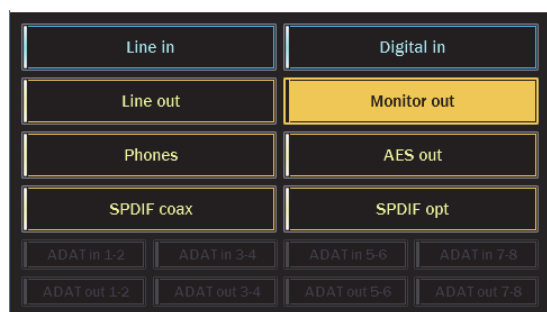**Analog VU**

RTA

Horizontal

All I/O
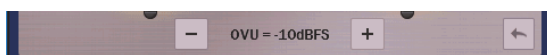
5.2.1   Meter screens in detail

5.2.1.1 Analog VU

The Analog VU was designed in house to be as accurate to a true VU meter as possible. A single stereo input or output source can be selected at a time.

To select the meter source, press into the Source Select button below the Meters and select the desired source. Inactive sources will be grayed out.

The meter has a variable range, from 0VU =-3dBFS to -30dBFS. This is useful for making the meter show relevant behavior for a wide variety of source material levels. To change the range, press the Gear icon in the bottom right corner, which will reveal the setting from between the 2 channels. Then use the + and – buttons to scroll to the desired setting. Click to exit this view

5.2.1.2 RTA

The Hilo RTA Meter is a professional 30-band Real-time Analyzer.

This stereo high resolution display is a very useful diagnostic and reference tool. The Hilo RTA computes the RMS energy in 30 frequency bands for left and right channels of a selected stereo input or output every sample period. This is a brilliant tool for mixing, mastering and even system troubleshooting. The RTA display can be customized with several parameter controls. Tapping the icon, brings up the RTA parameter settings window. Options are:


Peak Hold Reset: The Peak Hold controls can be set to Auto, or Manual. In Manual Mode the user can press the [icon] icon to capture the peak levels at any point in time.
Color Scheme: Press the bar-graph button to toggle the display between the mono-chromatic "standard" display, and the multi-chromatic "rainbow" display.
Scale: use "-" and "+" buttons to boost or cut the program material in 3dB increments to get the best meter reading. Amount of cut or boost is displayed in the text between the buttons.

5.2.1.3 Horizontal Bar Style
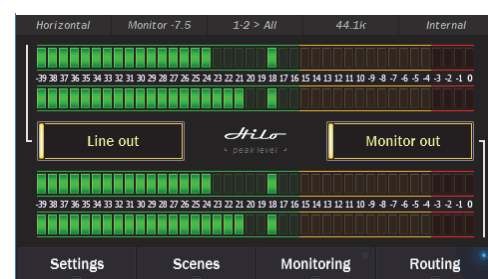
The horizontal meters are designed to show accurate level information with Peak Hold on two sources simultaneously. It can be helpful to keep an eye on a summed output while also viewing input signal strength.

To select a source, press the source select button in the left for the upper meter, and the one on the right for the lower meter.

5.2.1.4 All I/O
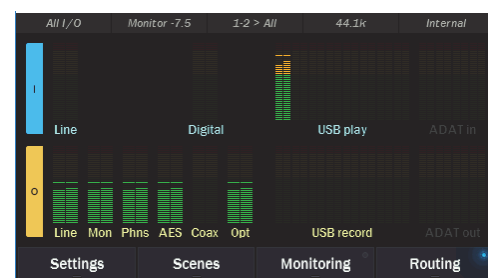
The All I/O meter page gives a global view of all input channels that are active and which outputs are receiving audio from at least one source. The ADAT I/O will be grayed out if the ADAT I/O is not active.

5.3   Navigation

There are four navigation destinations that appear at the bottom of the Hilo meter screens. These allow very rapid access to whatever parameters or features one wishes to change.

Let's look at each destination in detail:

5.3.1   Settings

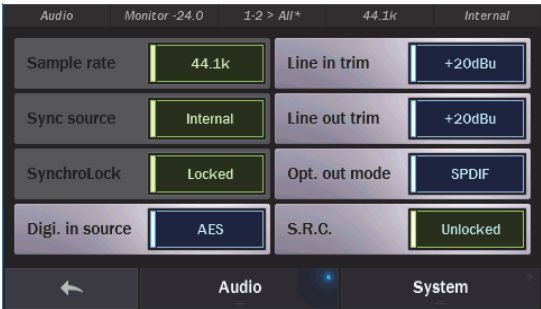This is where Hilo can be configured, dialed in, tweaked and otherwise made subservient to your requirements. After pressing the Settings Button, there are two sub-menus to choose from: Audio and System.

5.3.1.1 Settings: Audio

This is where we can adjust the "Rules of Engagement" for signals coming in or out of the Hilo. There are 8 selections here:

5.3.1.1.1   Sample Rate

Hilo will display the sample rate that it is currently operating at. If clocked externally, this may be the sample rate being generated by the clock source. If clocked Internally, the sample rate may reflect the rate of audio being played or the rate requested from an audio software application.
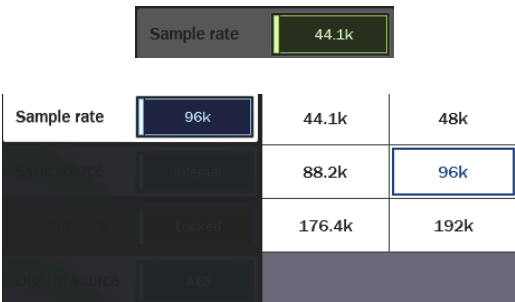
When Hilo is either clocked externally, or connected to the computer and subservient to the program or Operating System's rate (note: this is always the case with a USB connection to the computer), then the Sample Rate field is for display purposes only and is "grayed out".

If Hilo has the Sync Source set to Internal, and is either operating independently from the computer, or connected to a computer via a Thunderbolt connection, then one can manually choose a sample rate by pressing the Sample Rate button and tapping on the desired rate. Make sure that the sample rate matches the rate of the project or audio that you intend to play.

5.3.1.1.2   Sync source

This button will show the currently selected Sync Source. As with the Sample Rate button, if the Hilo is connected via USB, or being accessed by an audio application, then the button will be grayed out and for display purposes only.
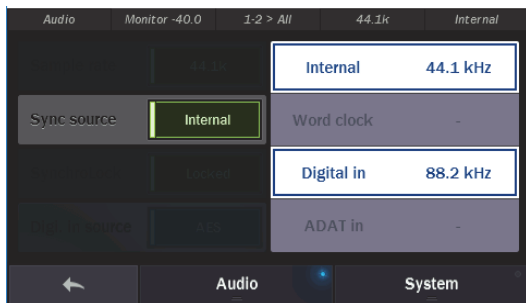
When you push the Sync Source button, you may select any of four possible sync options. If a clock source is valid, a sample rate will appear next to that selection. For instance, if a clock source is connected to the Hilo Digital input, next to "Digital in" there would appear the sample rate that the clock source is generating.

The available sources are:

- Internal: Clock driven by the Hilo's crystal oscillator.
- Word Clock: Clock derived from the **WORD CLOCK** input.
- Digital: Clock derived from the active digital input.
- ADAT In: Clock derived from the ADAT input.
- With a Hilo-Dante, Dante would also appear as a possible sync source. In a Dante system, it would be typical to set each device to slave to Dante and use the Dante Controller Software to manage clock sources

If a new clock source is selected, the rate generated by the selected device will become the current clock rate for Hilo. Only valid and active clock sources can be selected. All others are grayed out, and not selectable. With a USB Hilo, the USB cable must be removed from the back of the Hilo, before a new Sync source can be selected.

5.3.1.1.3 SynchroLock

Lynx's SynchroLock™ technology is a very effective form of jitter reduction for digital signals. Jitter is a type of clock error that may potentially result in distortion in an audio signal. SynchroLock reduces jitter by a factor of 3000:1 by using the Hilo's high resolution crystal oscillator to generate a clock signal that is phase locked to the external clock.

Compare this to attenuation of 100:1 or less for professional quality analog phase-lock loops (PLL) that are used by most Pro Audio devices. As long as the clock frequencies are within +/- 100ppm of Hilo's supported sample rates, SynchroLock will operate on the clock signal, and insure a low-jitter clock drives the Hilo and is also sent to devices downstream (i.e. clock slaves to the Hilo).
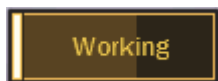
The SynchroLock operation is a two-stage process, starting with a fast-locking analog PLL to insure that there is clock sync immediately when a Sync Source or Sample Rate are selected, and concluding with the digitally controlled crystal-based secondary stage. It is normal for SynchroLock to take 1-2 minutes to achieve full lock.

There are four possible states for the SynchroLock button.

	Locked	Either Hilo is operating off of its Internal clock, or SynchroLock has achieved full lock to the specified external clock source. In this state, playback and recording of audio is possible.
	Working	Hilo is operating off of its Analog Phase Lock Loop to lock to the incoming clock signal, while the SynchroLock circuitry is performing analysis on the incoming clock signal. This may continue for 1-2 minutes. In this state, recording of audio is discouraged. Playback is acceptable, but it should be noted that there will be an audible click the moment that full lock is achieved. "Working" will occur every time a new Sync Source or Sample Rate is selected unless SynchroLock has been disabled or the Sync Source is set to Internal.
	Range	This indicates that the selected external clock signal is operating outside of SynchroLock's usable range. If this state is persistent, it is advisable to stop using the clock source responsible.
	Off	The SynchroLock circuitry has been disabled by the user. In this state, the Hilo will only clock via the Analog PLL when external Sync Sources are chosen. Pressing the SynchroLock button will toggle between On and Off. Generally, disabling SynchroLock is not recommended for the best analog performance.

5.3.1.1.4   Digital in Source
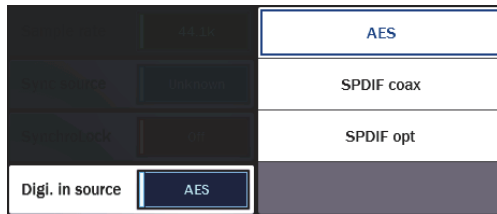
Hilo offers a choice of AES or S/PDIF as the digital input source. With S/PDIF you have the option of Coax or Optical Inputs.

Before being pushed, this button shows the current selection. Upon pushing the button, you can select: AES; SPDIF Coax; or SPDIF Opt. If selecting SPDIF Optical, the Optical Out mode must be set to SPDIF from Settings: Audio.

Note: You do not need to make this choice for outputs, as all three digital outputs are independently available and assignable.

5.3.1.1.5   Line in trim

Line in trim can be set to any of eight preset trim settings. The Line in trim button shows the currently selected trim level, it is the same for the Left and Right inputs.

There are four Pro Level settings: +18 dBu; +20 dBu; +22 dBu; and +24 dBu. There are four additional levels most often used on Consumer Audio products: +0 dBV; +2 dBV; +4 dBV and +6 dBV.

When the button is pushed, a Selection Window pops up. Pushing the desired Level button resets the inputs and immediately indicates this on the Line in trim Button. You will typically hear a relay click from inside Hilo when a selection is made. It is ideal to set the Line in trim to match the Trim value of whatever audio device is connected to the Line Inputs. This insures optimum signal strength, without clipping the inputs. Check your input device's documentation for information.

Note: These are 0dBFS (full-scale) level settings, as opposed to nominal levels.

Trim pots are available to fine tune these inputs. See Appendix 9.3 XLR Connector Wiring and Adapters
This section describes the proper wiring of cables that can be used to adapt the analog audio XLR connectors on the Hilo.

5.3.2   Balanced Connections

The wiring method for balanced connections with XLR connectors to balanced TRS (¼" phone) connectors using shielded twisted pair cable (2 wire + shield) is as follows:

XLR Pin 1 (GND) to cable shield and to the TRS sleeve
XLR Pin 2 (+) to one signal wire and to the TRS tip
XLR Pin 3 (-) to the other signal wire and to the TRS ring

5.3.3   Unbalanced Connections with Twisted Pair Cable

The wiring method for unbalanced connections with XLR connectors to ¼" phone connectors (tip and sleeve only) using shielded twisted pair cable (2 wire + shield) is as follows:

XLR Pin 1 (GND) to cable shield with no connection on the other end
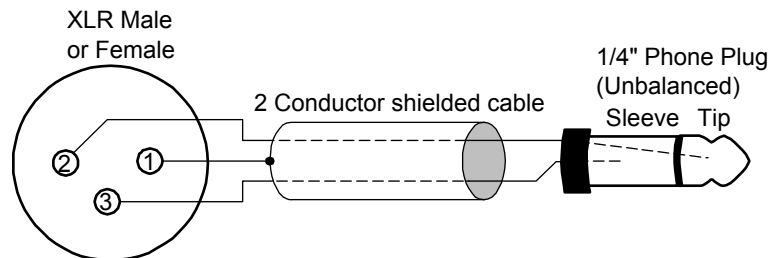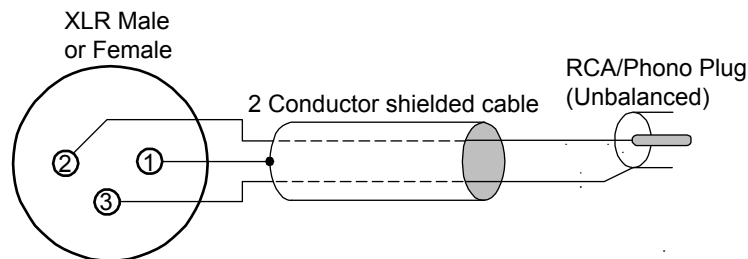XLR Pin 2 (+) to signal wire and to the ¼" phone tip
XLR Pin 3 (-) to the other signal wire and to the ¼" phone sleeve

The wiring method for unbalanced connections with XLR connectors to RCA/Phono phone connectors using shielded twisted pair cable (2 wire + shield) is as follows:

XLR Pin 1 (GND) to cable shield with no connection on the other end
XLR Pin 2 (+) to signal wire and to the Phono center pin
XLR Pin 3 (-) to the other signal wire and to the Phono sleeve

5.3.4   Unbalanced Connections with Single Conductor Cable

In some cases it may be necessary to use single-conductor cable to adapt to unbalanced devices. These cables are considerably more susceptible to interference and grounding problems than the two conductor cables shown above. Two-conductor cables should be used whenever possible.

The wiring method for unbalanced connections with XLR connectors to unbalanced ¼" phone connectors (tip and sleeve only) using coaxial cable (1 wire + shield) is as follows:

XLR Pin 1 (GND) no connection
XLR Pin 2 (+) to signal wire and to the ¼" phone tip
XLR Pin 3 (-) to the cable shield and to the ¼" phone sleeve

The wiring method for unbalanced connections with XLR connectors to unbalanced RCA/Phono phone connectors using coaxial cable (1 wire + shield) is as follows:

XLR Pin 1 (GND) no connection
XLR Pin 2 (+) to signal wire and to the Phono center pin
XLR Pin 3 (-) to the cable shield and to the Phono sleeve

Setting Trim Pots for more information.

5.3.4.1.1   Line out trim

+24dBu	+6dBV		
+22dBu	+4dBV	Line out trim	+24dBu
+20dBu	+2dBV		
+18dBu	+0dBV		

Line out trim can be set to any of eight preset trim settings, the same as for Line In.

This works exactly the same as the Line in trim. Push the button and make your selection.

<u>Note</u>: Each Line in and Line out trim can be adjusted ±0.5 dB of the established trim settings using the trim pots that are located on the bottom of the circuit board. See <u>Appendix 9.4 XLR Connector Wiring</u> and Adapters
This section describes the proper wiring of cables that can be used to adapt the analog audio XLR connectors on the Hilo.

5.3.5   Balanced Connections

The wiring method for balanced connections with XLR connectors to balanced TRS (¼" phone) connectors using shielded twisted pair cable (2 wire + shield) is as follows:

    XLR Pin 1 (GND) to cable shield and to the TRS sleeve
    XLR Pin 2 (+) to one signal wire and to the TRS tip
    XLR Pin 3 (-) to the other signal wire and to the TRS ring

5.3.6   Unbalanced Connections with Twisted Pair Cable

The wiring method for unbalanced connections with XLR connectors to ¼" phone connectors (tip and sleeve only) using shielded twisted pair cable (2 wire + shield) is as follows:

    XLR Pin 1 (GND) to cable shield with no connection on the other end
    XLR Pin 2 (+) to signal wire and to the ¼" phone tip
    XLR Pin 3 (-) to the other signal wire and to the ¼" phone sleeve

The wiring method for unbalanced connections with XLR connectors to RCA/Phono phone connectors using shielded twisted pair cable (2 wire + shield) is as follows:

XLR Pin 1 (GND) to cable shield with no connection on the other end
XLR Pin 2 (+) to signal wire and to the Phono center pin
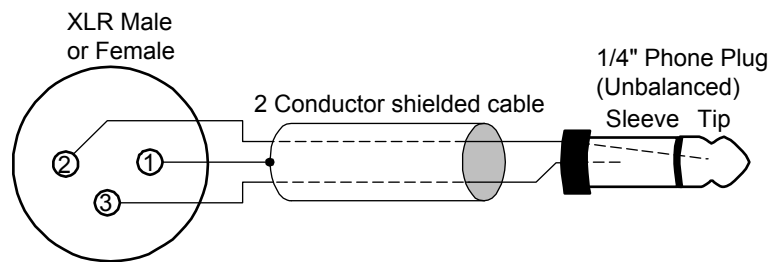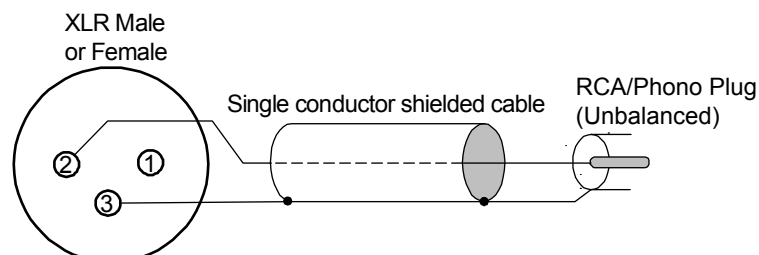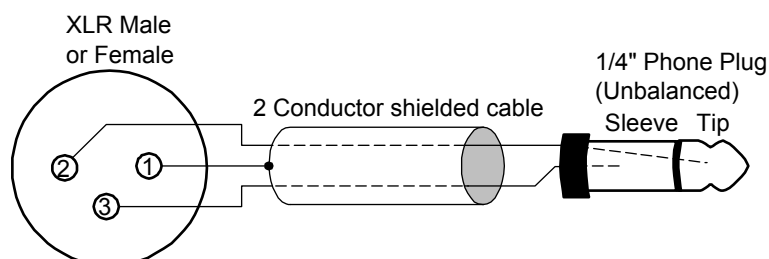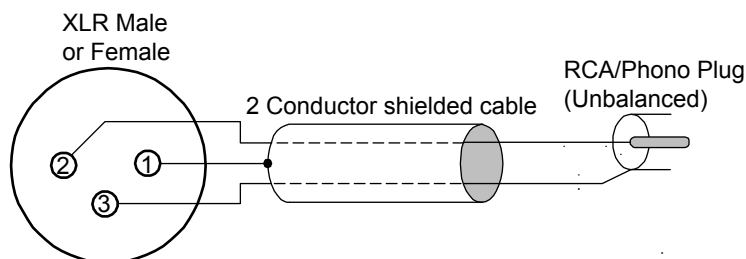XLR Pin 3 (-) to the other signal wire and to the Phono sleeve

5.3.7   Unbalanced Connections with Single Conductor Cable

In some cases it may be necessary to use single-conductor cable to adapt to unbalanced devices. These cables are considerably more susceptible to interference and grounding problems than the two conductor cables shown above. Two-conductor cables should be used whenever possible.

The wiring method for unbalanced connections with XLR connectors to unbalanced ¼" phone connectors (tip and sleeve only) using coaxial cable (1 wire + shield) is as follows:

XLR Pin 1 (GND) no connection
XLR Pin 2 (+) to signal wire and to the ¼" phone tip
XLR Pin 3 (-) to the cable shield and to the ¼" phone sleeve

The wiring method for unbalanced connections with XLR connectors to unbalanced RCA/Phono phone connectors using coaxial cable (1 wire + shield) is as follows:

XLR Pin 1 (GND) no connection
XLR Pin 2 (+) to signal wire and to the Phono center pin
XLR Pin 3 (-) to the cable shield and to the Phono sleeve

Setting Trim Pots for more information.
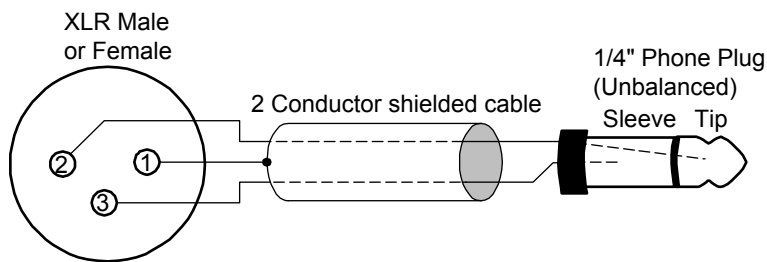
As with the Line in trims, these are best set to a value that matches the input calibration of the device connected to the Hilo's Line Outputs, thus preventing clipping or insufficient signal level.

5.3.7.1.1   Optical Out Mode
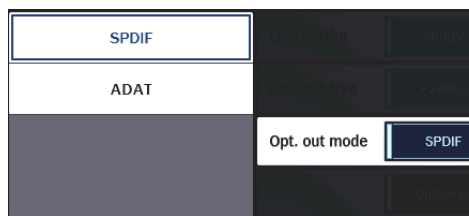
Hilo's Optical inputs and outputs can be used for either stereo SPDIF operation, or 8 channel ADAT operation (at 48 kHz). Hilo also supports the S/MUX protocol for ADAT Light pipe operation at higher sample rates. The ADAT Ports support 4-channels at sample rates of 88.2/96 kHz. Sample rates of 176.4/192kHz are not supported for ADAT S/MUX.

Output on Right.

5.3.7.1.2   Sample Rate Conversion

Hilo features a powerful Sample Rate Converter for the AES and SPDIF Inputs. When active, the onboard SRC processor can support conversion ratios up to 16:1 with 144 dB dynamic range and -140dB THD+N. The SRC will convert signals on the active Digital Input up or down to the current Sample Rate.

When the Sample Rate Converter button is tapped, SRC can be switched on or off, and information about the current sample rate, digital in rate, and the ratio of conversion, will be displayed if applicable.
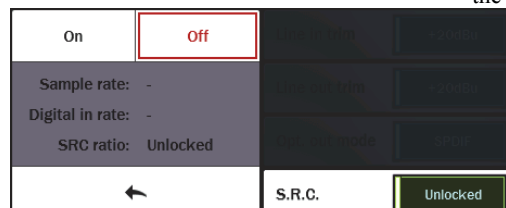
Note: even if the Current Rate and Digital In rate are the same, sometimes it is useful to have SRC engaged so that the signal streaming to the digital input can be re-clocked. This is a useful state for digital devices that do not have the option to be a clock slave.

The SRC Mode is OFF by default. When devices are connected to the Hilo digital inputs and valid clock synchronization is established between them, then it is not necessary to turn SRC ON.

5.3.7.2 Settings: System

Here's where the user can perform quite extensive customization of Hilo's operational parameters. Things that really adapt the device to your manner of working. As with the audio page, there are 8 selections here:

5.3.7.2.1   Backlight
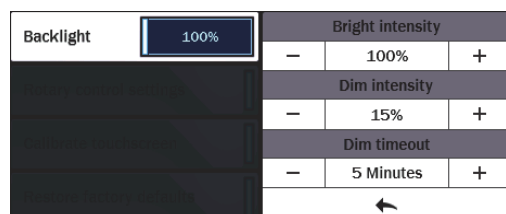
The Backlight button allows the user to adjust Hilo's appearance by using the onscreen faders or Rotary control. The value displayed in the button, is the percentage of brightness that the Hilo display is set to. Pressing the button reveals the following options:

- Bright intensity: Adjust Hilo's brightness intensity in a range of 5% to 100% in 1% increments - ideal for adapting to a variety of ambient light conditions.
- Dim intensity: Hilo defaults to dimming its' display after 5 minutes of inactivity. You can adjust the percentage of dimming that will take place when auto-dim kicks in, from completely black, to full brightness, as well as:
- Dim timeout: this determines how long of a period of inactivity before Auto-Dim will be activated. Choose in increments between 15 seconds and 5 minutes, or set to Never.

These parameters can be adjusted by using the onscreen increment/decrement buttons, or the Rotary control.

When the screen dims, Hilo will return to the established Brightness Intensity by touching the screen, moving or pressing the Rotary Control or pressing the front panel Power Switch.

5.3.7.2.2   Rotary Control Settings
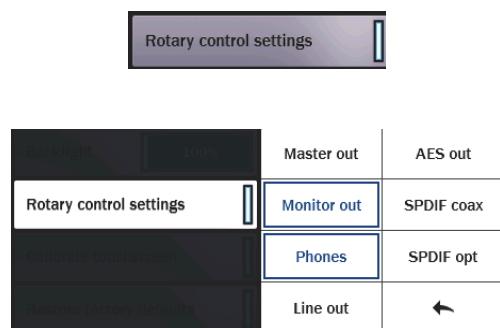
This menu allows you to select which outputs can be adjusted with the Hilo rotary encoder. By default, the Monitor Out and the Phones Out can be attenuated with the rotary encoder, and pressing in the knob will toggle between those two choices. If additional choices are selected from the Knob Settings menu, then pressing in the Rotary Encoder will toggle through all the Outputs that have been selected.

- Monitor Out and Phones Out can be de-selected by clicking in the associated boxes, and/or additional outputs can be selected by tapping their boxes.
- Any number of sources can be selected, including Master Out
- After the desired sources have been selected, turning the rotary encoder from any Hilo screen other than the Routing or Monitoring pages will change volume for the selected output and the level will be displayed graphically in the status strip at the top of the page.
- Pressing in the Rotary Encoder Knob will toggle through the available choices.

NEW FEATURE: Version 8 of the Hilo firmware adds Master Out level control. This allows easy adjustment for ALL Hilo outputs with one control. The Master Out will maintain the relative levels of attenuation for individual outputs, for instance, if the Monitor Out is attenuated by 10dB, and the Master Out is at Unity, then when the Master Out gets turned down the Monitor will be reduced from the -10 starting position. If Master Out is attenuated by -5dB, then the Monitor Out would have a total attenuation of -15dB. The relative output levels can be established by pressing in the rotary encoder to the output one desires to adjust, or they can be adjusted individually from the Routing page, see section 5.3.4, or the Monitoring page, see section 5.3.3 . Note, when the new Monitoring Page is opened, Master Out gets switched ON automatically, irrespective of the state of the Rotary Control Settings page. Since the output levels are a combination of individual channels and the Master Out, it is important to take care when switching the Master Out OFF in the Rotary Control Settings page – this can result in a "jump" in output levels if there had been some Master Out attenuation at the time it was switched off.

5.3.7.2.3   Calibrate Touchscreen

The LCD Touchscreen has a grid that detects when you touch it to select or change settings. If you find that the touch response gets slow or does not always engage properly, you may need to recalibrate the touch screen.

- Push the Calibrate Touchscreen button.
- The screen will go black and give you instructions for recalibrating the screen.

Simply follow the instructions and the last screen you were on will come up when done. Be sure to touch directly in the center of the target to give the most accurate touchscreen calibration. Some people like to use a capped pen or eraser, rather than their finger, for greater accuracy.

There are times when calibrating the touchscreen is necessary for optimum performance. However if this setting was selected unintentionally, just tap "cancel" and return to the Display Menu page.

5.3.7.2.4   Restore Factory Defaults
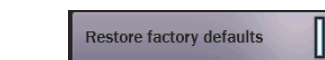
This button will return Hilo to its original factory settings. This impacts clock settings routing, trims, Digital modes, etc,

Alternatively, there are factory and user scenes available from the Scenes page. The factory scene presets may get the unit closer to a state that is suited for your purposes then the system default. More information about Scenes is in section 5.3.2.
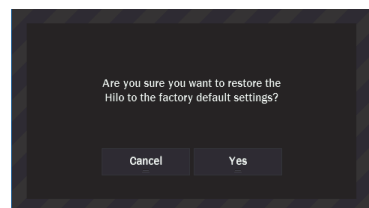
The critical factory default settings are:
SYNC SOURCE = Internal
DIGITAL IN SOURCE = AES
LINE IN and LINE OUT TRIM = +20dBu
OPTICAL OUT MODE = SPDIF
SRC = OFF
ROTARY CONTROL SETTINGS = Monitor Out and Phones
LANGUAGE = English
USB MODE = 8 Channel

5.3.7.2.5   Digital In Status

This section displays status information pertaining to the Hilo's digital inputs.
There are three possible states that will be displayed here:
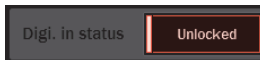
- Unlocked: Indicates the digital receiver is not locked to a valid digital signal.
- Professional: Locked to a digital receiver that is classified as Professional (typical of AES devices)
- Consumer: Locked to a Digital Receiver that is classified as Consumer (typical of SPDIF devices)

If a device is connected digitally to the Hilo, and powered up, but the Digital Input status still reports "unlocked", make sure that the Digital In Source is set to the type that matches your equipment.

5.3.7.2.6   Language

As of firmware revision 7, Hilo is now multi-lingual! From this button you can select between English, Spanish, German, French and Chinese. All of the Hilo menus and parameters will now be in the language of your choice. Please note that the onscreen keyboard for writing Scene Names will still be in English. Also, restoring defaults and updating the firmware will restore the unit to English, and the language of choice will need to be re-selected.
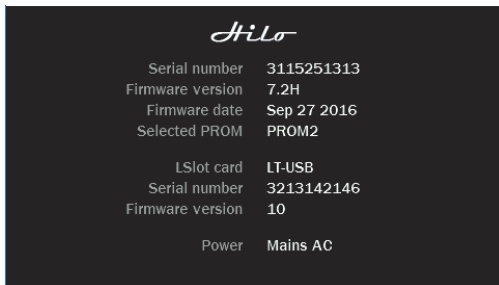
5.3.7.2.7   About

The About page reveals version and operational details about Hilo. You can use this information to determine if your Hilo is fully up to date. If there are newer firmware versions available from the Lynx website, you can update the Hilo and/or the installed LSLOT card by following the instructions in Section 6: Firmware Updates.

The "Selected Prom" line indicates which of the two EEPROMs on the Hilo mainboard are set as "Active". The default is PROM2

Please note: With an LT-TB (Thunderbolt) card installed, the LSlot card type and firmware version will not appear unless the Thunderbolt cable is connected to the computer and the driver is installed and functional.

The POWER line reveals whether the unit is running off of AC or battery power (DC). See Section 9.2 for details about battery power operation.

5.3.7.2.8   USB mode

This switch is only applicable for Hilo-USB. With USB, there are two modes of operation:

- 16 Channel operation – 16 input and 16 output channels at sample rates to 96 kHz.
- 8 Channel operation – 8 input and 8 output channels at sample rates to 192 kHz.

8 channel operation is the default.
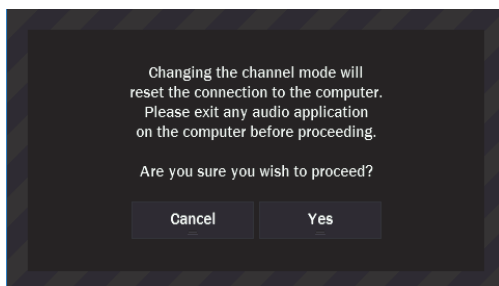
Clicking on the button will toggle Hilo between 16 channel (96 kHz maximum) and 8 channel (192 kHz) modes. You should not change this mode while an audio application is utilizing Hilo. This control resets the LT-USB and all audio will stop. When you press the button, you'll see this warning screen:

Once your audio application is closed, you may press the Yes button and the channel mode will change. You will now see the appropriate number of record and play devices in your audio applications and operating system.

When you are ready to exit the Settings Section of the Hilo, press the Exit key to return to the main menu:

5.3.8   Scenes

The Scenes page is a key element for the successful integration of the Hilo into your studio. Here is where the flexibility and customization of the Hilo can be easily managed, and where workflow is elegantly organized.
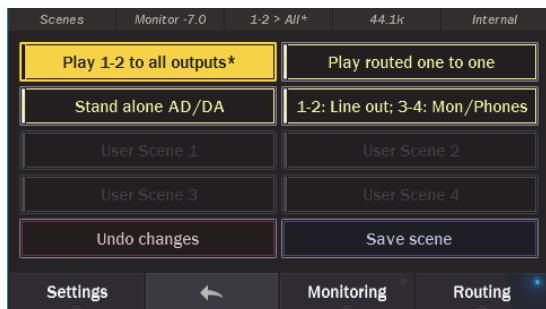
The scenes page consists of 8 rectangular scene locations. The top four are factory presets, and the bottom four are for user scenes. User scenes can be started from the default state of the Hilo, or as modification of a factory preset.

To start, let's take a look at Hilo's default routing. This is the state it is in on first power up, and also what it would return to after restoring defaults (see section 5.3.1.2.4: Restore Factory Defaults).

Hilo's default state is designed to insure that no matter what output you are listening to, you will hear audio when you press play in your audio application. To that end, Play 1+2 (the likely output your audio software will acquire by default) will stream to all outputs: Monitor out, Phones, Line out, Digital outs, etc. In addition to that, some of the other play devices go to specific Hilo outputs. On the Record side, Record 1+2 comes from the Line inputs, and Record 3+4 come from the Digital inputs.

The following chart details the state of all I/O in the Hilo's default state:

Physical Input or Output	Play or Record Device	2nd Play or Record Device
Line Out	Play 1+2	N/A
Monitor Out	Play 1+2	Play 3+4
Phones	Play 1+2	Play 5+6
AES Out	Play 1+2	Play 7+8
SPDIF Optical Out	Play 1+2	Play 9+10
SPDIF Coax Out	Play 1+2	Play 11+12
ADAT Out 1-8	Play 1+2	Play 9-16 (when ADAT is selected as Optical Output format)
Line In	Record 1+2	N/A
Digital In	Record 3+4	N/A
		Note: Record 5-8 are unassigned by default
ADAT In	Record 9-16	(only when an ADAT signal is detected on the input)

In addition to Play1+2 going to every output, the other play devices go to specific outputs. This would be a way you could send signals to a specific output and not the others. For instance if you route playback to Play 5+6 you will hear the audio through Phones, but not through Line Out or Monitor Out.

Of course, this routing scheme will not work for every user, so let's look at the factory Presets and compare how they are set up. Note: selecting a preset is simply a matter of tapping it from the Scenes page.

5.3.8.1 Factory Presets

Play 1-2 to all outputs
This preset is identical to the default state. It allows a quick switch between a user or other preset state to the default state from the Scenes page.

Play routed one to one

This preset assigns the Play devices to unique outputs. This is the way to go if you need to send distinct streams to the Line Outs, Monitor out, Phones, etc.

Physical Input or output	Play or Record Device
Line Out	Play 1+2
Monitor Out	Play 3+4
Phones	Play 5+6
AES Out	Play 7+8
SPDIF Optical Out	Play 9+10
SPDIF Coax Out	Play 11+12
ADAT Out 1-8	Play 9-16 (when ADAT is selected as Optical Output format)
Line In	Record 1+2
Digital In	Record 3+4
ADAT In	Record 9-16

Stand Alone AD/DA

This preset is designed for those that use Hilo as an AD/DA converter without a connection to the computer. It routes the digital inputs to the analog outputs and vice versa.

Physical Input or output	Signal Source
Line Out	Digital In
Monitor Out	Digital In
Phones	Digital In
AES Out	Line In
SPDIF Optical Out	Line In
SPDIF Coax Out	Line in
ADAT Out 1-8	Line In (when ADAT is selected as Optical Output format)

1-2 Line out; 3-4: Mon/Phones

This scene is a small variation on the default state. This is a configuration that is popular with mastering engineers and others that need support for a signal processing chain via Line outs, and prefer mirroring the Monitor out to the Phones out for listening.

Physical Input or output	Play or Record Device
Line Out	Play 1+2
Monitor Out	Play 3+4
Phones	Play 3+4
AES Out	Play 5+6
SPDIF Optical Out	Play 9+10
SPDIF Coax Out	Play 11+12
ADAT Out 1-8	Play 9-16 (when ADAT is selected as Optical Output format)
Line In	Record 1+2
Digital In	Record 3+4
ADAT In	Record 9-16

5.3.8.2 <u>User Scenes</u>

Hilo's factory scenes were designed to cover the majority of users, but, of course, a product this flexible should bend to off-the-beaten-path requirements, and also allow recall of settings that include Sync Source, Trim levels, etc. This is where User scenes come in.

User scenes can be started from the closest factory preset to the users' intentions, or by starting from scratch using the routing and settings pages to dial in parameters. User scenes can be overwritten later if your requirements change, or if you overlooked a setting that should have been included.

In addition to routing, some parameters from the Settings pages often need tweaking for user scenes, such as: Trim levels, Digital In Source, Sample Rate Conversion mode, and Rotary Encoder Settings.

After all parameters and routing have been set as desired, return to the Scenes page to save. Here's how:
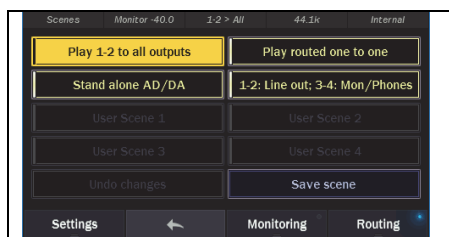
 Click the "Save Scene" button in the bottom right corner

 The four user scenes will begin flashing. Tap the one you wish to write to. Note: you can click on an existing user scene to overwrite it

 An onscreen keyboard will appear for inputting the scene name. Click the "x" at the end of name field to delete the factory name, if desired.

 Type in the desired scene name and then tap "Save"

 The new scene will now appear in the list, and will also appear as the active scene from the status strip. Scenes save volume position for outputs and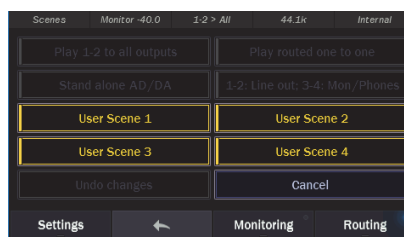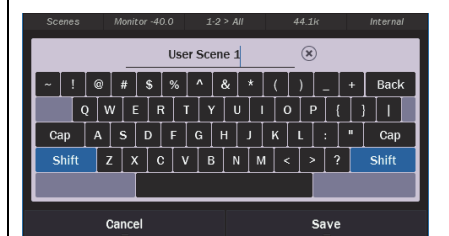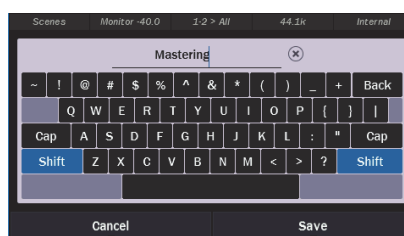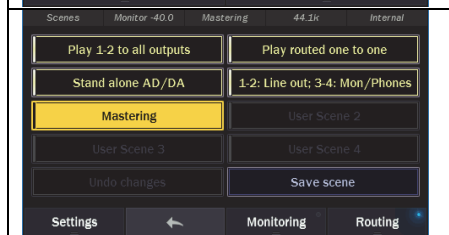 sources, so keep in mind that there may be a change in level when a scene is recalled. Adjust monitoring equipment appropriately.

5.3.9 Monitoring

The Monitoring page is new to Hilo Version 8, and adds tremendous utility to the Hilo. This page was crafted directly from user input, with the intention to have the Hilo be a viable alternative to expensive and bulky monitor controller.

This page is designed for point-to-point connection between a single source and a single output. Unlike the Routing page, it is not designed for blending of sources (i.e. computer Play + Line In going to Monitor Out). It is the best place to come if you wish to do an A > B comparison of two different sources or listen to a single source while alternating between speaker pairs.
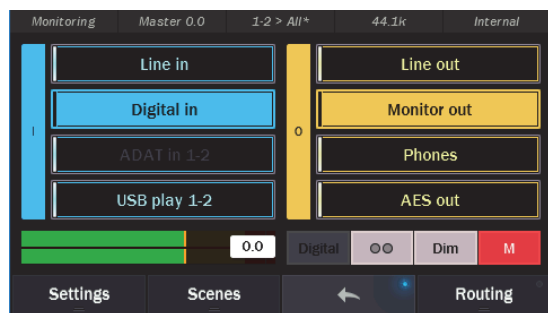
The basic premise of the monitor page is that one selects a source on the left, and a destination on the right. The active source is blue, the destination, green. If you choose a different destination, it will automatically mute the previous one. Likewise, if you choose a different source, the previous one will be muted automatically. It's easy to see how quick this would make comparing an unprocessed source, to one that had gone through your analog processing chain, or comparing the same mix through various speakers and headphones.

When the Monitor page is open, the fader controls the Master Out. This is a "meta" volume control that can attenuate all outputs on Hilo with one control. You can also set the relative level for each output, which is explained below.

There are four slots for sources and for destinations. To select which sources are displayed, simply press and hold the source selection button that you wish to change. A menu of sources will appear. Simply select the source you want and it will become active. For Record sources 7-16, click this button to reveal all of the available pairs

From this screen the fader will control the "Master Out" volume control.

Choosing destinations out is the same process as sources: press and hold a destination button to reveal a menu of choices.

From this screen, the fader will control the relative level of the output selected. This is extremely helpful if one needs to correct for a level discrepancy between two outputs. For instance, the Line Out in its default state puts out a hotter signal than the Monitor Out. From this screen you can attenuate the Line Out so that it matches the Monitor Out. The amount of attenuation, in dB, will be displayed on the fader. Also the status strip at the top of the page will indicate which output is being attenuated.

There are additional controls for the selected output (destination) devices accessible from the Monitor page.

The Monitor and Phones out both allow analog volume control, as well as digital volume control. All other outputs on Hilo only feature digital volume control. The default state for Monitor Out and Phones out is "Analog", as this is generally considered superior. There are cases though, where one may wish to attenuate from the digital domain, for instance when the sum of signals feeding an output is clipping digitally, and it would be best to attenuate before it hits the DA converter. This button allows toggling between the analog and digital level control for Monitor out and Phones out. It is disabled for all other outputs.

This controls the state of the selected output. The default state is stereo. Tapping this button allows toggling to summed mono

The Dim control attenuates the selected output by 20dB. When active, the button will flash yellow. Keep in mind that the DIM state will remain active even when you exit the Monitoring page.

The Mute button will mute the selected output. It is red when engaged, and gray when disengaged.

When you exit the Monitoring page, and open the Routing page, Hilo returns to its previous routing scheme. The levels that were established in the Monitoring page remain, however, including the Master out setting. This was done so that there would not be an unexpected jump in output level when exiting the Monitoring page, by disabling any Master Out attenuation that had been performed there. If one wishes to discard the Master Out attenuation, or just wishes to not have Master Out control be active, switch to the Settings > System page, open Rotary control Settings, and remove "Master Out" as one of the control options. Please note: if any attenuation is active on the Master Out when this is done, there may be a sudden increase in output level as that attenuation gets removed.

5.3.10 Routing

Although Hilo is, at first glance, a two channel AD/DA converter, it is really much more and this page gets down to the nitty gritty.

The Routing page is where any combination of Hilo's inputs can be routed to any combination of Hilo's outputs. The principle here was to make the various I/O formats as independent as possible, very little is "hard-wired". This is not point-to-point patching like on the Monitoring page. Multiple sources can be merged to a single output. Levels can be set and adjusted for all input sources and outputs. Sources can be mirrored to multiple outputs. Sources and outputs can be muted. This is why Hilo has an internal 32 x 32 channel mixer. This is where you get to use it.
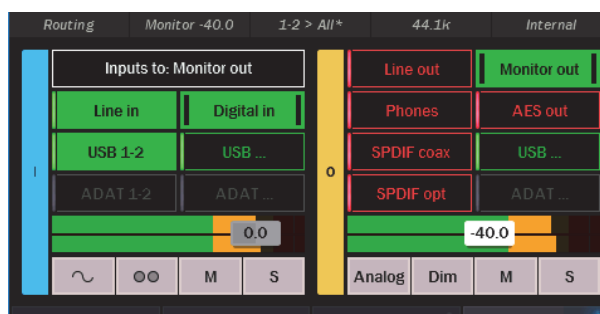
As you can see, the page is divided into input sources on the left and outputs on the right. What we are seeing here is which input sources are assigned to the displayed output. We are not turning inputs On and Off, we are turning the connection between an input and output On or Off. Think of it as a patch cables. Levels also can be managed here, both output levels and levels of monitor sources.

To understand signal flow on this page, it is important to get a grasp on what the appearance of the buttons mean. When a button is "in focus", that mean that the faders, meters and other controls apply to that input or output.

Inputs (left side of screen)		Outputs (right side of screen)
	Enabled and in focus (Active)	
	Enabled and not in focus	
	Muted and in focus	
	Muted and not in focus	

Now, let's look at the elements on the Routing page to get a better grasp on what we are seeing here.
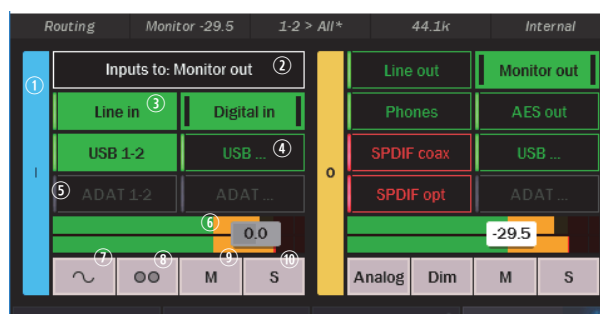
❶ This section shows input sources

❷ This label identifies which output these sources would be getting routed to

❸ These buttons can be tapped to enable or mute input sources to the active output (Monitor Out in the graphic). Note: Digital In will be whichever of the three choices; AES, SPDIF Coax, or SPDIF Optical, that have been selected in Settings > Audio.

❹ There are up to 8 stereo Play devices available to use on your Hilo (depending on the configuration). These correspond to the outputs available from within your computer audio software. Not all will fit on the input side of the Routing page. Play 1+2 has its own button, but to access the other play devices click this button and choose any of the other available Play devices. As with the main screen, devices in green are enabled, in red are muted. Use the arrow at the top to close this page.

❺ These buttons show the ADAT inputs as a source, but they are disabled. ADAT sources become available when an ADAT source is detected at the optical input. With a USB Hilo, ADAT use requires the unit to be in 16-channel mode from Settings > System.

❻ This combined fader and meter shows the level of the input source that is In Focus. With the fader you can attenuate the amount of signal from the In Focus input to the active output. Keep in mind that this does not affect the signal level of the input globally, only the level of that signal passed to the active output. For instance, in the graphic pictured, if you attenuate the fader it will reduce the signal level from the Digital in routed to the Monitor Out. It will have no effect on the Digital In routed elsewhere, the Line Out for instance. The amount of attenuation appears numerically in dB on the fader. You can control the fader with the rotary encoder. Press in to
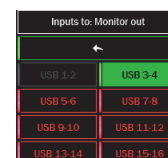
toggle between the active output fader, the in focus source fader and the master out (when master out is selected in Rotary control settings in Settings > System). There is an overload at indicator at the top of these meters. When potentially distortion-causing clipping occurs, this indicator turns red. For an input, the over indicator will activate when there are three full-scale samples in a row, which indicates a high probability that clipping has occurred.

❼ This button turns on the test tone function. When engaged, this will mute all other sources and generate a 1kHz sine wave to the active output. This is a good diagnostic tool to test an output, and can even be used to calibrate downstream devices. By default, the tone will be 20dB down from full-scale, and can be adjusted to the desired level with the fader by .5dB increments.
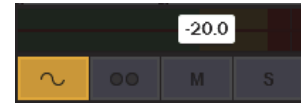
❽ This button allows selecting the monitoring mode for the in focus source. The choices are as follows:

⊕　Sum	Combines both the Left and Right inputs into one Mono stream which is sent to both the Left and Right outputs equally. The summed signal is automatically attenuated by 6dB in order to reduce the possibility of digital clipping.
◐○　Left	Audio from the Left input channel (in this case Line In Left) streaming to both output channels.
○◐　Right	The Right input channel streaming to both output channels.
◐◐　Stereo	The default. Two channels of input, streaming through a two-channel output.

Keep in mind, that this only controls the monitor state for the in focus source to the active output. If you choose "left" for Digital In routed to Monitor Out, Digital In will remain in the default state of "stereo" for the Line Out.

❾ This button controls the Mute for the in focus source. When activated, the in focus source button will also turn red.

❿ This button controls the Solo state for the in focus source. When activated, it will flash yellow and any other sources that are routed to the active output will be muted. This allows very rapid comparison of sources, A/B switching, and a convenient way for troubleshooting audio anomalies.

When Solo is activated, when you press any input source button you will hear that audio exclusively. Pressing any other input source will instantly switch to the alternate source. When done, tapping the Solo button returns Hilo to the previous state, where multiple input sources can stream to the active output simultaneously.
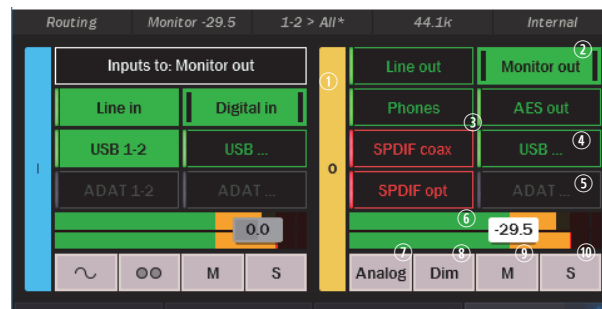
❶ This section shows Outputs

❷ Only one output will be "active" at a time on this page, and will appear as a green button. The Active output is the one that input sources on the left half of the screen can be routed to. Also, the active output is what the fader, mute and other controls will pertain to. Other outputs can have signal passing to them at the same time, but only one output at a time can be active on this page. Click another output button and then it becomes the active output.

❸ These buttons show other outputs that are not active. When the text labels are Green, they are enabled (un-muted). When the text labels are red then they are muted. When the ADAT outputs are gray, that means that ADAT is not set as the Optical out type. See Settings > Audio.

❹ There are up to 8 stereo Record devices available to use on your Hilo (depending on the configuration). The USB Record devices correspond to the input options that will appear in OSX or Windows recording software. This button will allow selection of any of these input/record devices to route to. By default Record 1+2 receives signal from Line In, and Record 3+4 receives signal from Digital In. In addition to the physical inputs, play devices can also be assigned to record devices. This has interesting possibilities for anyone who wishes to record playback streams in the computer. For instance, one can be playing audio from the internet and record it into their DAW. After selecting a Record Device, and exiting the selection menu, the selected record device will appear on the routing page as the active device.
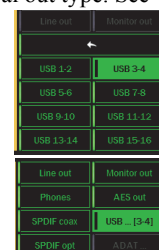
❺ These buttons show the ADAT outputs. They are pictured in a disabled state. ADAT outputs become available for routing only when the Optical out mode is set to "ADAT" in Settings > Audio. When ADAT is selected for the Optical output, then SPDIF Optical is disabled as an output selection. For ADAT use with a Hilo USB, it needs to be in 16 channel mode from Settings > System.

❻ This combined fader and meter shows the level of the active output. With the fader you can attenuate the output level. In the graphic pictured, the Monitor Out level has been attenuated by 29.5dB. The amount of attenuation appears numerically in dB on the fader. You can control the fader with the Rotary encoder. Press in to toggle between the output fader, the active source fader and the master out (when master out is selected in Rotary control settings in Settings > System). There is an overload indicator at the top of these meters. When potentially distortion-causing clipping occurs, this indicator turns red. The Over indicator is an accurate reflection of an actual overload condition and the attenuation should be performed on the input sources or digital outputs themselves when this occurs. The overload indicators will clear after 3 seconds when the overload condition stops.

❼ This button is only applicable for the Monitor Out and Phones. For these two outputs you can control both the Digital output level and the Analog output level.

Analog	This is the default position mode for Monitor and Phones out. When you adjust the Monitor/phone level with the rotary encoder, it is the analog level you are controlling. In most cases, this is sonically preferable to digital domain volume attenuation.
Digital	The default state for the digital level is maximum, at 0 dBFS. This provides the best possible signal to noise ratio, and therefore the best audio quality. Since Hilo offers you the option of routing several inputs to these outputs, you may overload the digital output and cause distortion. When this is the case, use the Digital Output control to lower the level feeding the D/A converter. Once the digital overload has been lessened, you can set the listening volume with the Analog level control. Note: dither is enabled automatically when digital attenuation is performed – this improves sonic performance and reduces digital artifacts.

❽ This button controls the Dim setting for the active output. Dim attenuates the selected output by 20dB. When activated, the button will flash yellow. Keep in mind that the DIM state will remain activated even when you exit the Routing page.

❾ This button controls the Mute for the active output. When engaged, the active output button will also turn red.

❿ This button controls the Solo state for the active output. When activated, it will flash yellow, and all other outputs will be muted. The Output solo can be used for a rapid comparison of different outputs.

When Solo is activated, pressing any other output button will allow you to instantly hear only the selected output. This is a good way to quickly compare the same source with different monitoring equipment. When done, tapping the Solo button returns Hilo to the previous state, where multiple outputs can be active simultaneously.

5.3.10.1   Routing tutorial

These powerful routing features are probably best demonstrated with a real-world scenario. Let's pretend that the Hilo is being used for a recording session, where a guitar part is being overdubbed on an existing project. The pre-recorded tracks are streaming through the Play 1&2 channels in the computer.

For cable connections, the guitar signal is coming in LINE INPUT 1. The recording engineer is listening to the MONITOR OUTPUTS feeding speakers in the control room. The performer is listening to headphones plugged into Hilo's PHONES jack.
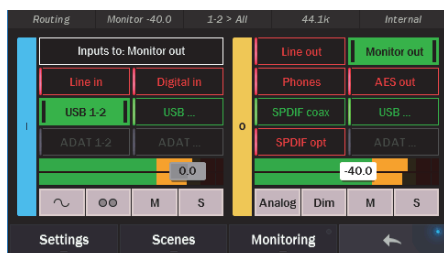
Let's start by setting levels for the recording engineer. Start by selecting "Monitor Out" as the active Output:
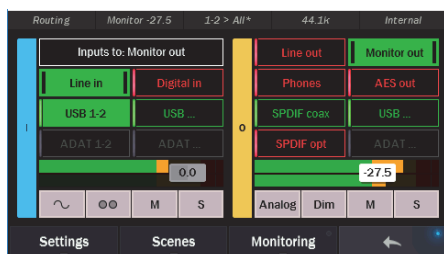
We already have signal from USB Play 1&2 carrying the streams from the computer. Now let's add Line In as a source so there is the new guitar parts along with the existing tracks. We also set Monitor out at -27.5 as a good listening level.
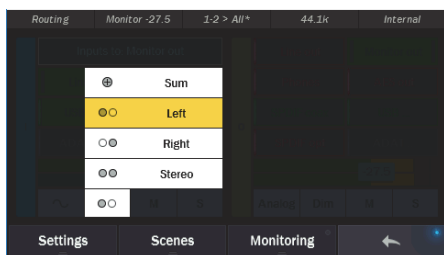
The engineer wishes to hear the guitar part in the center of the stereo field, rather than hard left, so we click the MONITORING MODE button and choose "Left" - since the signal is coming in from the left line input. Now the guitar sounds like it is panned in the center.
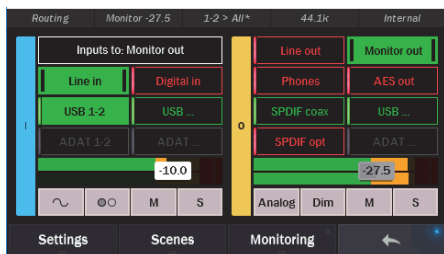
The guitar level is a bit hot compared to the mix. Let's attenuate the Line In signal by 10dB.
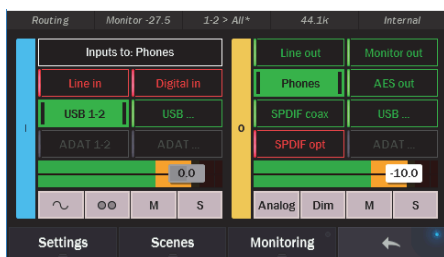
Now let's pull up the Phones Out to adjust the performer's levels. Again, USB Play 1&2 is pre-assigned as a source. We'll start with a Phones level of -10.

Now we'll add Line In, so the performer can hear their input signal. Again, we'll set the Monitoring Mode to "left" so their input signal is panned center in the headphones.
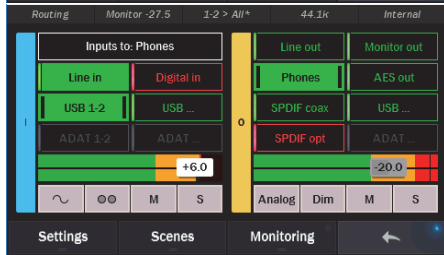
This performer likes the levels of the backing tracks louder, but the overall level down a bit, so we'll nudge the USB Play source signal up by 6dB, and attenuate the Phones output by 10dB.

Now the performer and engineer each have their own monitor mix. We're ready to record, keeping in mind that the signals from the Line In will appear in the DAW software as Record 1.

As you can see, using variations on the sequence described above, one can easily integrate outboard processors, and other sound sources into a recording session and maintain complete control over who hears what, and how loud each element will be.

5.3.11 Status Bar

At the top of every page of the Hilo screen is the status bar. This allows important information about the Hilo state to be visible at all times. Let's take a closer look.

| Routing | Monitor -40.0 | 1-2 > All* | 44.1k | Internal |
| System | Master -2.0 | 3-4 > Mon/Phs | 96k | Digital in |

Shows what page is currently displayed.	Displays the output the rotary encoder is affecting, and what the current attenuation level is. When you adjust the level the status bar will transform to a level bar.	Shows the active scene. When there is an * next to the scene name, this indicates that some alteration to the scene has been made. This can be a handy way to know if your scene needs to be re-saved with these changes.	This indicates what SAMPLE RATE the Hilo is operating at.	This displays the current SYNC SOURCE. Will be displayed with RED TEXT if the currently selected SYNC SOURCE is invalid.

5.3.12 DSD Support

DSD support was added with Hilo Firmware revision 5.

This allows Hilo to play DSD audio files received via USB, AES-3 or S/PDIF. Hilo supports the recently adopted DoP V1.1 standard which is a method for transferring DSD audio over PCM frames. Playback of DSD using this method is provided by a growing number of software vendors including Channel D and Audirvana for Macintosh, and JRiver Media Player for Windows.

Using the DSD application of your choice, connect your computer using the USB or Digital Input (AES IN; S/PDIF COAX IN or S/PDIF OPT IN). DSD audio in DoP V1.1 is automatically detected on either Play1 & 2 or the selected Digital In Source. If DSD is detected on both of these sources, priority is given to Play 1 & 2.

As DSD requires a sample rate of 176.4kHz, a Hilo USB must be in 8-channel mode to support DSD playback. See Settings > System > USB Mode. This is not a consideration with Thunderbolt or Dante systems.

While DSD is playing, any page that has level meters will show a DSD logo instead of the meters. As soon as DSD playback is stopped, the level meter page will return.

DSD Routing: Upon detection of incoming DSD audio, the signal is automatically routed to the Line Outputs, Monitor Outputs, and Headphone Output. Routing to the remaining outputs of Hilo is not affected.

6   Firmware Updates

Hilo contains firmware that is field-programmable via the computer connection. These updates improve performance and enhance functionality of Hilo. In some cases, the touch screen functions and appearance may change dramatically from firmware updates.

Additionally, the LT-USB, LT-TB and LT-DANTE cards installed into Hilo have their own firmware. There are also updates for these cards available that, similarly, can improve functionality and expand the feature set. The process for updating these cards will be covered below. First, here are the steps to insure that your Hilo is up to date and in top form:

1.   Make sure that your Hilo has a valid USB, Thunderbolt or Dante connection to the computer. For USB on Windows, or Thunderbolt for OS X or Windows, current drivers will need to be installed.
2.   Visit www.lynxstudio.com and click Support > Downloads.
3.   Select your OPERATING SYSTEM from the list, "Hilo" as the PRODUCT, and "All Types" for FILE TYPE. Click "Search".
4.   Download the Hilo Firmware Updater. Double Click to launch it.
5.   Follow the prompts (Windows Users need to accept the EULA) until you reach the Hilo Firmware Update screen. Verify that the "New Firmware Version" is higher than the "Current Firmware Version". If so, click "Update".
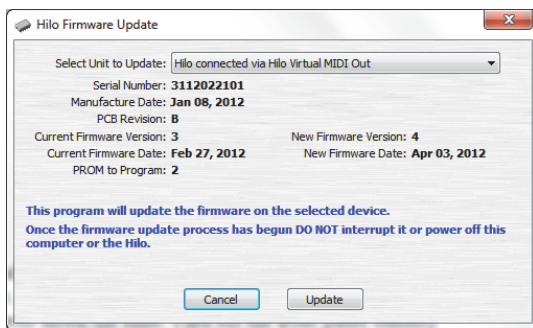
The Hilo LCD screen will display a warning screen that reads "Do not turn off the computer or the Hilo during the firmware updater process". There is also a progress bar.

6.   When the Update is complete, you will be instructed to power down Hilo. Turn off the front panel standby switch. Then turn off the rear panel power switch. Wait three seconds, then power Hilo back up.
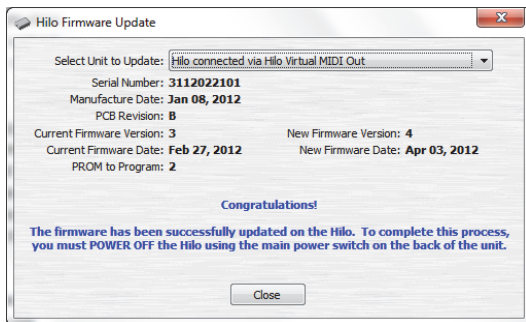
Now let's look at the methods for updating the three expansion cards

6.1   Updating the LT-USB

1.   Updating the LT-USB firmware uses the same Hilo Update application with which we update the Hilo. Launch the Hilo Update application. This time from the "Select Unit to Update" drop-down menu, choose "LT-USB".
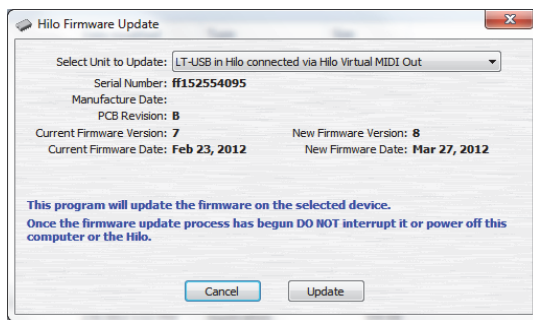
2. Verify that the New Firmware Version is higher than the Current Firmware Version. If so, click "Update".
3. When the updater is complete, close the pop-up window in your computer. Power cycle Hilo using the front panel standby switch, wait three seconds, then turn the unit back on.
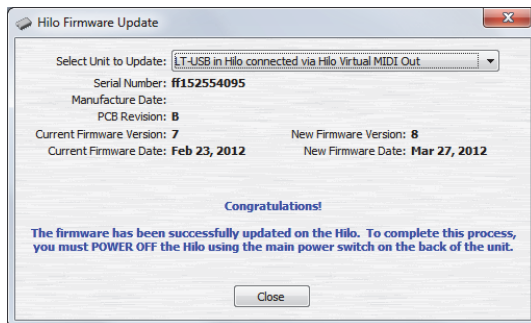
4. After programming, the computer may need to reload the driver. If you are prompted to do so, perform an automatic driver installation when prompted.

6.2   Updating the LT-TB (Thunderbolt)

1. Prior to updating, insure that the Thunderbolt driver has been properly installed and is functional.
2. The LT-TB card has its own firmware update program that can be downloaded from the Lynx website. **Visit** www.lynxstudio.com **> Support > Downloads. Product = Lynx LT-TB.**
3. Download the most recent firmware update file.
4. Make sure that all audio software and the Hilo Remote are closed.
5. Run the updater, and accept the defaults.
6. At the main updater welcome screen, make sure that the drop down menu for SELECT UNIT TO UPDATE is set to "LT-TB".
7. Verify that the New Firmware Version is higher than the Current Firmware Version. If so, click "Update".
8. When the updater is complete, close the pop-up window in your computer. Power cycle Hilo using the front panel standby switch, wait three seconds, then turn the unit back on.

6.3   Updating the LT-DANTE

The updater for the LT-DANTE is provided by the manufacturer of the Dante Brooklyn II chip, Audinate. Therefore the process is quite a bit different from the other LSLOT expansion cards. As it relies upon a third party updater program.

1. Prior to updating, insure that Hilo appears normally from the Dante Controller application.
2. Next, download the Brooklyn firmware update tool from: https://www.audinate.com/products/firmware-update-manager
3. Then download the latest firmware update file from www.lynxstudio.com **> Support > Downloads. Product = Lynx LT-DANTE.** Save this file to a convenient location on the computer.
4. Launch the Audinate Firmware Updater.
5. Select the network adapter that is connected to the Dante network and press "Next".
6. Press the "Update Dante Firmware" button.
7. Select the firmware update file downloaded in step 3, then press "Next".
8. After a few seconds, the LT-DANTE should appear. Check the box next to the LT-DANTE you wish to update.
9. Press Start. The "Ready" column will change to "Updating".
10. When the updater is complete, close the Dante Firmware Update Manager. Power cycle Hilo using the front panel standby switch, wait three seconds, then turn the unit back on.

7   Hilo Remote Control Application

Hilo Remote is a software application that allows users to conveniently control the Hilo, change settings, and view its different meter options, from their computer. Settings on the Hilo display and in the Hilo Remote software will be identical in all regards, except for scene storage. Different scenes can be saved in the computer that hosts the Hilo Remote app, and on the Hilo itself. The Hilo Remote app is available for Macintosh OSX or Windows computer, and there is also a version available for Apple iPad that can be downloaded from iPad App Store (keywords Lynx Hilo).

In addition to running the Hilo Remote on the computer that the Hilo is connected to, it is possible to use Hilo remote from a computer or iPad that is connected to the host computer via WiFi or WLAN. This use requires the Lynx Redirector tool. We will explore that solution, later in this section.

Please note that the new Master volume control function is not reflected in the current Hilo Remote app. We intend to include those features in a future update.

7.1   Hilo Remote for USB

Hilo Remote is installed automatically with the Windows Hilo USB Driver. Additionally, the latest version can always be downloaded from the Lynx Studio website: Support > Downloads > Hilo. When downloading an updated version of Hilo Remote, check the posted system requirements before installing the software. In some cases, a specific version of the Hilo firmware may be necessary for the software to function correctly (see Section 6: Firmware Updates for information about updating the Hilo firmware).

Once installed, the Hilo Remote can be launched from the Lynx Studio Technology Program group.

Hilo Remote for OS X can be downloaded from the Lynx website: Support > Downloads > Hilo. When downloading an updated version of Hilo Remote, check the posted system requirements before installing the software. In some cases, a specific version of the Hilo firmware may be necessary for the software to function correctly (see Section 6: Firmware Updates for information about updating the Hilo firmware).

Once installed, the Hilo Remote can be launched from Applications.

7.2   Hilo Remote for Thunderbolt

Hilo Remote is installed automatically with the Hilo Thunderbolt Driver for OS X and Windows. Additionally, the latest version can always be downloaded from the Lynx Studio website: Support > Downloads > Hilo. When downloading an updated version of Hilo Remote, check the posted system requirements before installing the software. In some cases, a specific version of the Hilo firmware may be necessary for the software to function correctly (see Section 6: Firmware Updates for information about updating the Hilo firmware).

Once installed, the Hilo Remote can be launched from the Lynx Studio Technology Program group in Windows, or from Applications in OS X.

7.3   Hilo Remote for Dante

Hilo Remote for Windows or OS X can be downloaded from the Lynx website: Support > Downloads > Hilo. When downloading the Hilo Remote, check the posted system requirements before installing the software. In some cases, a specific version of the Hilo firmware may be necessary for the software to function correctly (see Section 6: Firmware Updates for information about updating the Hilo firmware).

Once installed, the Hilo Remote can be launched from the Lynx Studio Technology Program group in Windows, or from Applications in OS X.

7.4   Hilo Remote for iPad

Hilo Remote for iPad can be downloaded from the App Store on your iPad. Search for "Lynx Hilo" and download the free Hilo Remote app or go to www.lynxstudio.com/hiloremote from your iPad. Hilo Remote for iPad requires Hilo firmware revision 7 or greater.

7.5   Using Hilo Remote

Hilo Remote is a single screen app for controlling the routing and various features of the Hilo. The software simply reveals and facilitates changes to the Hilo hardware, so the Remote will not launch if a Hilo is not connected to the computer and functional. In addition to the controls on the Main Window there are two menus with additional features.

The features are identical for the OS X and Windows versions. The iPad version does not allow for Open Scene or Save Scene.

7.5.1   Navigation Bar

  The bar at the top of the Hilo Remote main window, provides access to commonly used functions, and allows for customizing the displayed elements. Doing a "mouse over" will cause a pop-up to appear over each icon in the Navigation Bar, with a short description of the associated function.
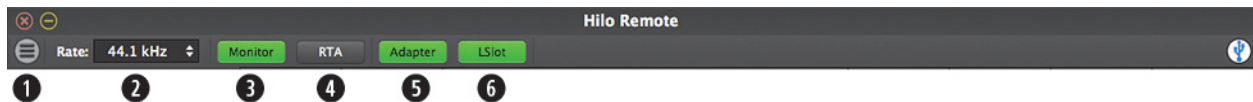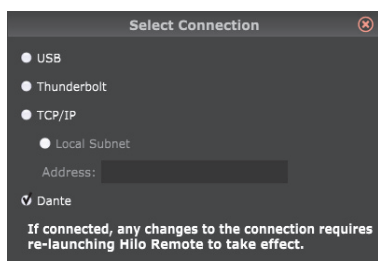

❶ Main Menu

This button launches the Hilo Remote Main Menu, where these additional controls and menus are available:
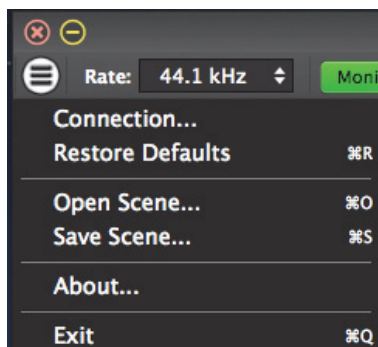
Connection:

This page reveals the method that Hilo Remote communicates to the Hilo hardware. In the rare case that both a Thunderbolt Hilo, Dante Hilo AND/OR USB Hilo were connected to the same computer, then the user could select which unit the software controlled. The TCP/IP selection would be used when Hilo Remote is installed on a computer other than the computer that is streaming audio to the Hilo. For instance, you can use an iPad or portable computer to run Hilo Remote while a desktop computer has the Hilo connected to it. Details about how to configure such a system are at the end of this section.

Restore Defaults:

This returns the Mixer (and Hilo hardware) to its factory default state. Routing, Sync Source, state of the Adapter and LSLOT panes, all can be impacted.

Restore defaults is an excellent troubleshooting tool. When things are not going as expected, this is a good first step to try.

Open Scene:

This feature allows user-defined mixer scenes to be restored. Mixer scene files can be saved to any directory on the computer's hard drive. After clicking "Open Scene" navigate to the directory where the desired scene file has been saved, highlight the file and click "Open". Please note: scenes saved from the Hilo Remote app are independent from the scenes saved on the Hilo touch screen.

Save Scene:

This feature provides the ability to save all user-selectable parameters. "Scenes" that contain the state of all device settings can be saved to a file on the computer hard drive. Recalling Scenes is a very quick and efficient way to revert Hilo to an appropriate state for different contexts of use.

Scene memory is global to all users on a single computer and is initially empty. There is no limit to the number of scenes that can be stored. After "Save Scene" is selected, A FILE NAME will need to be created and a directory selected for the mixer scene file to be written to. The current Hilo Remote parameters will be stored into scene memory. Selecting an existing scene name and clicking the Save button will overwrite that scene with the current parameters.

To delete a scene simply delete the mixer scene file from the hard drive. Please note that scenes saved from the Hilo Remote app are independent from the scenes saved on the Hilo touch screen.

When the computer is shut down, the current state is saved. When the computer is restarted, the previous state is restored. This function is independent of Mixer Scene operation.

About:
This option displays information about the Hilo, driver, and firmware as follows:

- Hilo Remote Version and Build Date.
- Mixer/Driver Version: Displays the current mixer version and build number (Windows or TB Model only).
- Build Date: Displays the date the driver and mixer were released.
- Hilo Serial Number.
- Hilo Firmware Version and Firmware Release Date.
- LSLOT Device: Displays the installed Lynx LSLOT Expansion card, in this case the LT-DANTE. Note: The LT-TB only appears here when there is a valid connection to the computer.
- LSLOT Serial Number: Displays the serial number of the Lynx LSLOT Expansion card installed.
- LSLOT Hardware Rev: Displays the hardware version of the Lynx Expansion Card.
- LSLOT Firmware Version: Displays the firmware revision of the Lynx Expansion Card.

PLEASE NOTE: The "About" window may display different information than what is shown here, depending on your configuration and versions.

❷ Rate Select
This button displays the current sample rate of the Hilo and can also be used to select a desired sample rate when the Hilo is operating off of its Internal Clock. However, when on Internal clock, the sample rate is generally determined by the audio application being used, or the default sample rate settings in the operating system.

❸ Monitor and ❹ RTA
The Hilo Remote display can be customized by the user. The Default page view is the Monitor display. This page reveals meters and faders for all input and output channels, as well as controls for Sync Source, Trim Levels, I/O parameters, etc. Monitor view can be toggled to RTA view. RTA view reveals the Hilo 30-band Realtime Analyzer. The Monitor and RTA buttons allow the user to toggle between these two views.
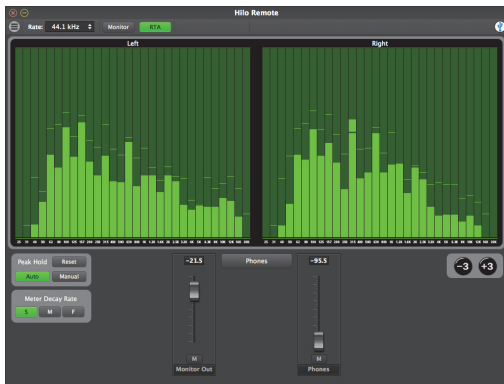
Monitor view will be explored in depth in the section below. RTA view presents the user with a high resolution Analysis Tool. This is an expanded version of the RTA that is available for the Hilo touchscreen display.

The stereo 30 band Real-time Spectrum Analyzer (RTA) is a very useful diagnostic and reference tool. The Hilo RTA computes the RMS energy in 30 frequency bands for left and right channels of a selected stereo input or output every sample period. This is a brilliant tool for mixing, mastering and even system troubleshooting

The RTA display can be customized with the following controls:

Boost or cut the program material in 3dB increments to get the best meter reading. Amount of cut or boost is displayed with a mouse over.
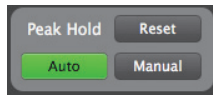
The Peak Hold controls can be set to Auto, or Manual. In Manual Mode the user can press "Reset" to capture the peak levels at any point in time.

The Decay Rate setting controls how quickly the peak hold indicators clear the screen. Choose between Slow (the default), Medium or Fast.

The source selection buttons allow the RTA to be used for any input or output on the Hilo. The faders allow analog volume control for the Monitor or Phones.
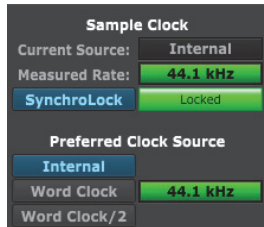
❺ Adapter

This button toggles whether the Adapter settings are visible from the Main window or not. The Adapter section, when visible, appears on the left part of the screen.

❻ LSLOT

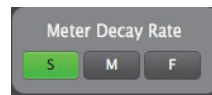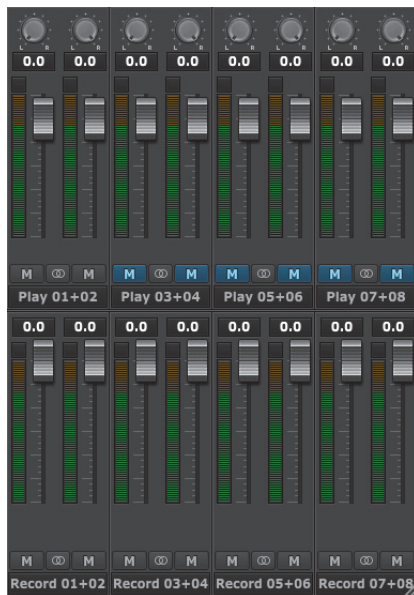This button toggles whether controls for the LSLOT Sources are visible from the Main window or not. LSLOT sources are relative to the connection method used by the Hilo, USB, Thunderbolt or Dante record and play devices in the computer. This section will show the Play Sources (signals coming FROM the computer or Dante network) in the top row, and Record Sources (Signals going TO the computer or Dante network) in the bottom row.

The settings in this section can be used to route Play streams to any of the Hilo's physical outputs, or to assign Record streams to carry signals from any of Hilo's hardware inputs. These settings can be used to mirror playback to multiple outputs, or to carry an input signal to multiple record devices.

We'll explore the routing logic and steps to use Hilo Remote for custom routing in the section below.

Now let's look at the Monitor page in greater detail:

7.5.2   Monitor Page

The Monitor page is where signals are routed, levels and pan settings are established, and meters can be viewed for all channels on the Hilo. It is visible whenever the "Monitor" button is green in the Navigation Bar. The section on the right, with the Play and Record devices, is only visible when the LSLOT button is green.

The upper row of faders are for the inputs. These are the physical inputs, Line In and Digital In, on the left, and Play streams from the computer on the right (again, only visible when "LSlot" is selected from the Navigation Bar). In 8-chanel mode (USB Only), Play Devices 1-8 will appear here, and in 16-channel mode, Play 1-16 will appear, always grouped in stereo pairs. When a valid ADAT light pipe source is connected to the Hilo ADAT Input, then the ADAT input channels will appear between the physical inputs and play devices, like this:
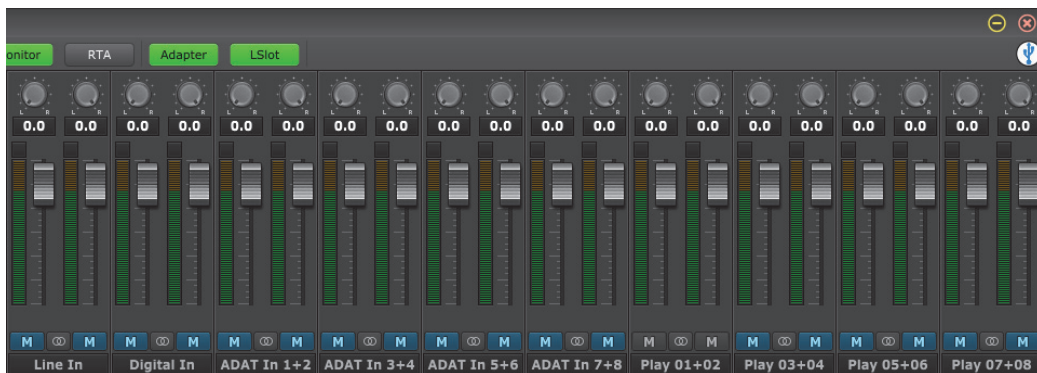
The purpose of this pane is to show input signal meter activity, allow assignment of physical inputs to record devices within the operating system, and manage the levels, routing, and pan positions of input signals being monitored through Hilo outputs.

The bottom row of the monitor page reveals the physical outputs, Line Out, Monitor Out, Phones Out, and the Digital Outputs. To the right, if the "LSLOT" button is green in the Navigation Bar, the Play streams from the computer will appear. Like with the Play Devices, in 8-chanel mode Record Devices 1-8 will appear here, and in 16-channel mode, Record 1-16 will appear. If the Optical Out Mode on the Adapter page is set to "ADAT", then the ADAT Outputs will appear between the physical outputs and the play streams, like this:
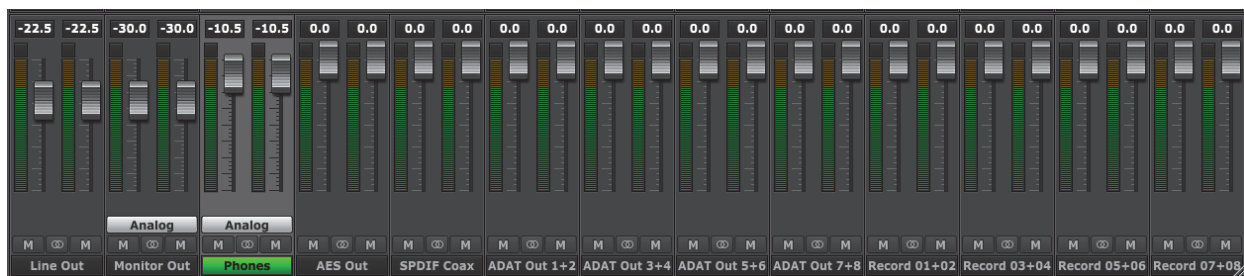
The Monitor Out and Phones channel strips have an additional button, just like in the Hilo's Routing page (see <u>section 5.3.4: Routing</u>). For these two outputs you can control both the digital output level and the analog output level. Clicking the button beneath the fader will toggle between Analog and Digital level controls.

<u>Analog Output Level</u> – This is your primary monitoring level control. Analog Monitoring is generally preferred for critical listening, as it has no effect on the depth resolution on the material being attenuated. Thus, analog is the default selection here.

<u>Digital Output Level</u> – For most critical listening contexts, the digital volumes are best left in their default position, with zero attenuation. However, since Hilo offers you the option of routing several inputs to these outputs, it is possible to overload the digital output and cause distortion. When this is the case, use the Digital Output control to lower the level feeding the D/A converter. Once the digital overload has been lessened, you can set the listening volume with the Analog level control.

To explore the controls available on the Monitor page, it makes sense to start with the outputs section, the row on the bottom. Each channel has the following elements in common:
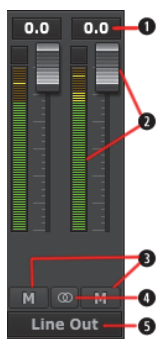
❶ **Numeric Level Indicator**
This Level Indicator displays the amount of attenuation, in dB, performed on the associated Output.

❷ **Faders and Meters**
The FADERS in the Outputs row are for attenuation of the output levels. Levels can be reduced in ½ dB increments with a click-drag of the mouse.
This is the rough equivalent to turning down the faders on a mixing board. If there are several sources assigned to that output, play and record sources, all will be attenuated when the faders are brought down. All faders, except Monitor Out and Phones when in "analog" mode, can be attenuated at the same time by holding down the CTRL key on the keyboard while click-sliding any single fader.

The METERS in the Outputs section show the level strength of the signals at the associated output. The Meters are post-fader, so there will be reduction in Meter level as the signal is attenuated.

❸ **Mutes**

The "M" Icon below the fader is for the Mutes. This switch Mutes or UnMutes the associated output.
When the "M" button is blue like this ⬛ , then the Mute is ON, and no signal will pass to the selected output. When the "M" button is gray, like this ⬛ , then the Mute button is OFF, and signal CAN pass to the selected output.

❹ **Channel Link**

In between the two Mute buttons for a pair of Inputs, is the channel link control: ⬛ . This control toggles the linked state for a pair of faders and mutes. If two channels ARE linked, then moving the fader for one of them will move both channels. Similarly, if one is muted then both will mute. If the faders between the channels are offset, when one is moved the other will snap to the same position.

Linked is the default state for pairs of inputs. To "un-link" a pair, click on the link icon and it will change to a single circle: ⬛ . In this state, the mute, fader and pan controls operate on a single channel independently.

❺ **Output Button**
This identifies the outputs that are applicable to the fader and mute controls, and is also used to facilitate routing. Hilo Remote uses an output oriented approach to routing. Clicking on an output button, "selects" that output for sources to be assigned to it. When selected, the output label button is green. In this state, sources from the Record or Play sections can be un-muted, thereby set to stream to the "selected" output.

In the mixer's default state, each output has one or more LSLOT play devices routed to it. All physical outputs (record streams excepted) have Play 1+2 assigned to it. When you click through to select different outputs, Play 1+2 will show as un-muted for all of them. In addition, some outputs have Play 1+2 as well as other Play pairs.

This is the default state for all Hilo physical outputs:

Line Out: Play 1+2
Monitor Out: Play 1+2 and 3+4
Phones: Play 1+2 and 5+6
Digital Out XLR (AES):   Play 1+2 and 7+8
Digital Out Coax: Play 1+2 and 11+12
Digital Out Optical: Play 1+2 and 9+10
ADAT Out 1-8:   Play 1+2 and 9-16 (when Hilo is in 16-channel mode)

To add sources to an output, click an output button to select it and it will turn green. Then un-mute Record and/or Play sources from the Input Row. Signals from those sources will now stream to that output. When multiple sources are assigned to a single output, it is often necessary to attenuate the individual sources to prevent excessive level from causing distortion to the output.

In addition to allowing signal from an input or play stream to be routed to a desired output, these monitor sources can be panned and attenuated individually. To look into these features, let's have a closer look at the Input Section of the Monitor page (the top row).
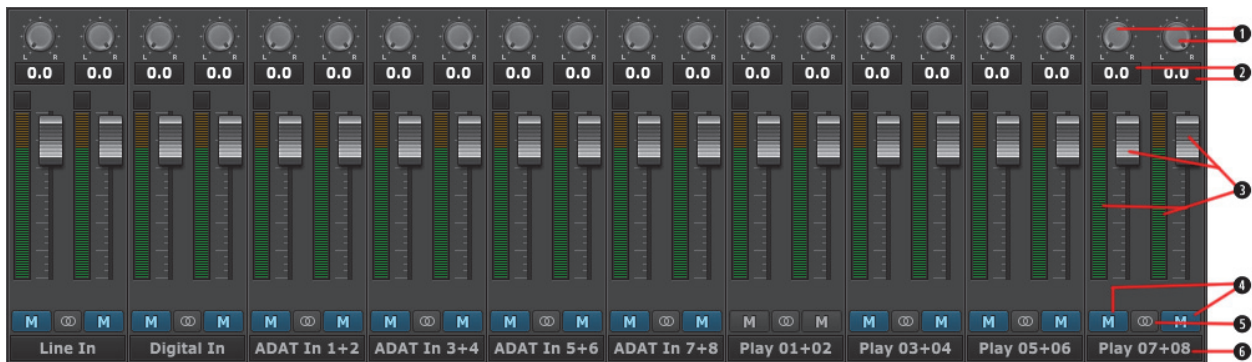
❶ <u>Panner</u>

The Panner knob controls the pan position of the input as it is being monitored through an output. IT HAS NO EFFECT ON THE RECORDED SIGNAL. It is only pertinent to monitoring. You would only hear the results of the panning if an input signal was being monitored through Hilo's outputs.

When channels are linked, then the pan controls are linked as well. Moving the pan control to the left will make the linked channel's pan control move a corresponding value to the right. When the channels are unlinked, as when recording a mono source, then the pan control will move the signal anywhere with the stereo spectrum.

To change the pan position, click in the proximity of the pan knob and move the cursor from left to right, or right to left.

❷ <u>Numeric Level Indicator</u>

Displays the amount of attenuation performed on the associated record source. This is attenuation for the Monitor level of the signal; it has NO bearing on the level being recorded through an audio application. It is applicable to Monitoring Level only (how loud that signal source is through the output you are listening to).

❸ <u>Faders and Meters</u>

The METERS on the Input section show the level strength of the signals at the associated input. The METER level will reflect the signal that will be recorded into audio software. The METER will not reflect attenuation to the input signal as it is being monitored. When you lower the fader, the METER level will not change, however the change WOULD be reflected in the meters of the output this signal was routed to.

The FADERS are for attenuating the signal of the input as it is being hardware monitored. For instance, if you are routing a signal from LINE IN Left, through MONITOR OUT, and the input signal is too loud relative to the rest of the mix, you would lower the fader under LINE IN Left to correct that. The signal level being recorded for LINE IN Left will not change, but the level through the outputs as you are monitoring the performance will go down.

The Fader position is specific to the connection between the input and an output. So, using the example above, if you have attenuated the signal of LINE IN Left, through MONITOR OUT, but then you select LINE OUT from the Output Section, the fader for the LINE IN Left will return to whatever position is established for that connection.

To reiterate, the faders are for the level of a specific connection between an input and an output. It will not affect the level of the input source monitored through an output that is not selected, nor will it affect the level of the audio being recorded.

 ❹ **Mutes**

The "M" Icon below the fader is for the Mutes. This switch Mutes or UnMutes the input signal routed to an output. As with the faders, this control is specific to the patch point between the input source, and the selected output. It does not control whether the input signal itself is muted, or whether that input signal can be recorded.

When the "M" button is blue like this , then the Mute is ON, and no signal will pass to the selected output. When the "M" button is gray, like this , then the Mute button is OFF, and signal WILL pass to the selected output.

Inputs are muted by default. When an output is selected from the outputs pane, inputs need to be un-muted to become active. When an input source is no longer being monitored, then it is good practice to mute it again so that unintended mic bleed or system noise is not corrupting the signal path.

❺ **Channel Link**

In between the two Mute buttons for a pair of Inputs, is the channel link control: . This control toggles the linked state for a pair of faders and mutes. If two channels ARE linked, then moving the fader for one of them will move both channels. Similarly, if one is muted then both will mute. If the faders between the channels are offset, when one is moved the other will snap to the same position. The linked state also impacts the Pan controls. If one pan pot is moved to the left the other will move a corresponding amount to the right. For instance, if the left pot is set to -25, the right channel will pan to +25.

Linked is the default state for pairs of inputs. To "un-link" a pair, click on the link icon and it will change to a single circle: . In this state, the mute, fader and pan controls operate on a single channel independently.

❻ **Input Label**

This identifies the Input that is applicable to the fader, pan, mute and input select controls.
The MONITOR page can be used to create complex headphone mixes for an artist, allow mirroring of play streams to multiple outputs, even send completely different source material to different speaker pairs. Here are some visual examples of routing configurations that are possible:
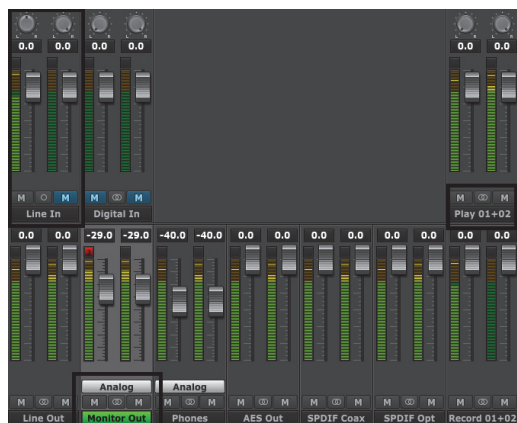
In this example, the selected output is MONITOR OUT. We are sending signal from Play 1+2, existing tracks from a multi-track session.

In addition we are sending signal from the LINE INPUT left channel. The Line Inputs were "un-linked", and only the left channel is un-muted, so signal is passing only from the left channel. Note, that the pan position for LINE IN left is in the center, so the source will be heard equally through both channels of the MONITOR OUT.

The Play 1+2 streams are at zero attenuation, as is the Line In. Monitor Out is attenuated by 29dB.

This would be a common configuration for overdubbing into a project.

In this example, four stereo stems are sent from the DAW to the PHONES out.

The PHONES level is attenuated by 34dB. The stems also have varying levels, Play 1+2 is attenuated by 18dB, Play 5+6 by 11dB, whereas Play 3+4 and 7+8 are at unity

Here, all of the channels are linked as stereo pairs. Keep in mind, the settings in the Input row are relative to the Output selected. If Line Out is selected, the mute states, fader positions and channel link status of the input devices would be completely different.

This example shows a unique capability of the Hilo – the option to route a playback stream directly to a record stream. This is a great tool for capturing streaming audio from any source, without degradation.

To set this up, select the Record Device you wish to carry the signal to be recorded. In the graphic we chose "Record 1+2". Then un-mute the Play device carrying the audio to be recorded, in this case "Play 1+2".

Now when we play audio from the source, we can open a recording app, choose "Record 1+2" for input and record that signal digitally.

7.5.3   Adapter Section

The Adapter Section is where the clock settings for the Hilo are established and monitored, as well as Trim and Digital Format settings.
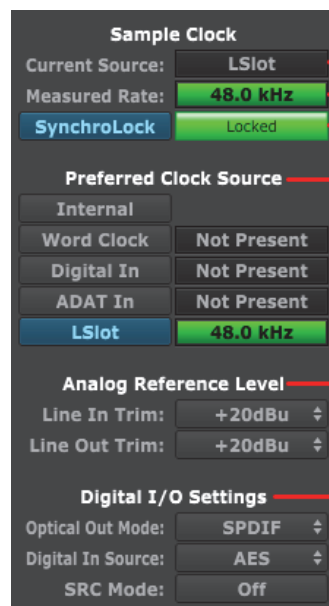
❶ **Current Source**
This displays the clock source that is active. This may differ from the selection in the "Preferred Clock Source" section, if an invalid or offline clock source had been chosen there.

❷ **Measured Rate**
Whether Hilo is operating off of its Internal Clock, or some External Clock Source, this button displays the sample rate that the onboard frequency counter is measuring.

❸ **SynchroLock**
The SynchroLock button turns the SynchroLock clocking system On and Off. SynchroLock is Lynx's proprietary technology for attenuating jitter on clock inputs and providing a stable clock for all digital signals passed through the Hilo.

The progress bar to the right of the SynchroLock button displays the various lock stages of SynchroLock and can show the following indicators:

Working: In this state SynchroLock is analyzing the input clock signal and making adjustments to frequency and phase. This process typically takes one to two minutes to complete. The progress bar shows percentage remaining towards final lock: When phase lock has been achieved, the Yellow "Working" indicator changes to the green "Locked" indication.
Locked: Indicates the SynchroLock system has achieved final lock to an incoming clock signal. This indicator will also appear when the SYNC SOURCE is set to "Internal".
Range: Indicates that the selected external clock source is not within the SynchroLock lock range.
Disabled: Indicates that SynchroLock has been turned off.

❹ **Preferred Clock Source**

This portion of the Adapter section provides control of Hilo's clock source. The default source is "Internal" and this is appropriate for the majority of users. Clock sources available to choose from are:
- Internal: Clock derived from the on-board crystal oscillator.
- Word Clock: Clock signal from BNC WORDCLOCK connector.
- Digital In: Clock derived from the active digital input.
- ADAT In: Clock derived from the ADAT input.
- LSlot: Clock derived from the LSlot add-in card, when applicable. For Dante systems, this is generally the preferred clock source.

If the selected Preferred Clock Source is not also displayed as the Current Source at the top of the Adapter page, it would be for one of the following reasons:

1. The selected source is not present or the connected device is not generating a valid clock signal. In these cases, Hilo will operate from its internal clock until a valid clock signal is connected to the selected clock source.

2. The selected clock source is generating a sample rate outside of the Hilo's usable range (i.e. 22 kHz). This can be corrected by setting the clock source to a supported sample rate (44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz).

3. The Clock Source was selected when the Hilo Drivers were being accessed by some software application. In this case, the Preferred Clock Source will become the Current Source when the card is no longer being accessed.

❺ **Analog Reference Level**

This section is where the Trim levels can be set for the Hilo's Line Inputs and Line Outputs. Trims can be set to any of eight preset trim settings, and they are the same for the Left and Right channels.

There are four Pro Level settings: +18 dBu; +20 dBu; +22 dBu; and +24 dBu. There are four additional levels most often used on Consumer Audio products: +0 dBV; +2 dBV; +4 dBV and +6 dBV.
Note: These are 0dBFS (full-scale) level settings, as opposed to nominal levels.

When the trim button is clicked, a menu displays the choices. You will typically hear a relay click from inside Hilo when a selection is made.

Trim pots are available to fine tune these inputs. See Section 9.3: Setting Trim Pots for more information.

❻ **Digital I/O Settings**

This section is were settings specific to the Hilo's Digital I/O can be configured.

Optical Out Mode: This drop down can select operation of the Hilo's Optical Digital Output, The default is stereo SPDIF, but can be toggled to 8-channel ADAT light pipe mode.
Digital in source: Hilo offers a choice of AES or S/PDIF as the digital input source, with AES being the default. With S/PDIF, there is the option of Coax or Optical Inputs. If selecting SPDIF Optical, the Optical Out mode must also be set to SPDIF.
SRC Mode: Hilo features a powerful Sample Rate Converter for the AES and SPDIF Inputs. When active, the onboard SRC processor supports for conversion ratios up to 16:1 with 144 dB dynamic range and -140dB THD+N. The SRC will convert signals on the active Digital Input up or down to the current Sample Rate. It is also useful for re-clocking signals from devices that cannot operate as a clock slave. The default state for the SRC is OFF.

7.6 Using Hilo Remote from a WiFi or WLAN connected computer.

In some cases it is useful to run the Hilo Remote from a computer other than the one that Hilo is streaming audio to and from. This could be for control over a dedicated media server, a situation where level changes are made while monitoring from the "sweet spot" using an iPad, or cases where audio is streamed from one computer to another and it is desirable to control the parameters of both from a single computer.

7.6.1 Requirements

The Hilo Remote Control software can be installed onto an OS X Mac with 10.6 or above, a Windows PC with Windows 7 or above, or on an iPad with iOS 7 or above. The Hilo Remote can be downloaded from the Lynx website: Support > Downloads > Hilo. For iOS, the Hilo Remote is available from the iPad AppStore (keyword : Lynx Hilo). In addition to Hilo Remote, the Lynx Redirector will also be required. This utility can be downloaded from lynxstudio.com > Support > Downloads > Hilo. In addition to the software, three basic hardware elements are required for Remote Control to work:
1.) Host Computer (If a Windows computer, driver version 1.55 or above needs to be installed and functional)
2.) Target Computer or Tablet
3.) Router (Wi-Fi/WLAN)

The Host computer must be running LynxRedirector and be directly connected to the Hilo either via USB or Thunderbolt. Additionally, the Host Computer must be connected to your network router either via Ethernet cabling or over Wi-Fi (direct Ethernet cabling will provide the best performance). The Target Computer/Tablet running Hilo Remote must also connect to your network router either via Ethernet cabling or over Wi-Fi. Please note that LynxRedirector cannot work over a Dante network as Hilo Remote can communicate with the Hilo directly over Dante.

7.6.2 Initial Setup

First, make sure your Hilo is connected directly to the Host Computer and the driver is loaded (Hilo-USB does not need a driver to be loaded on OS X).

Next, make sure the Host Computer is connected to your network and has been assigned an IP address (this should happen automatically).

Launch LynxRedirector on your Host computer.
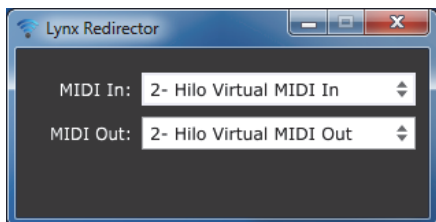
If your Hilo is connected via USB, you will see a screen similar to this.

If your Hilo is connected via Thunderbolt, you will see a screen similar to this.

You need only make a change to LynxRedirector if you have multiple Hilo's connected to the Host Computer.

Next, make sure your Target Computer/Tablet is connected to the same network as the Host Computer and has been assigned an IP address (again, this should happen automatically).

Finally, launch Hilo Remote on the Target Computer/Tablet. You should see the Wi-Fi connected icon on the right side of the toolbar:

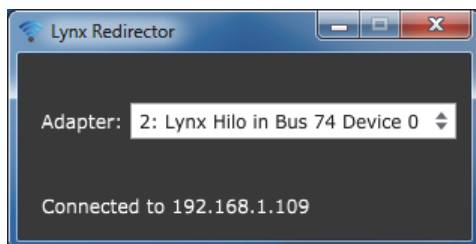You should also see the "Connected to" indicator with the IP address of the Target Computer/Tablet show up on LynxRedirector on the Host Computer.

You should now be able to control your Hilo using Hilo Remote on the Target Computer/Tablet.

7.6.3   Frequently Asked Questions

Q) After I have connected to the Host computer, my Hilo Remote keeps showing disconnected, why?
A) Hilo Remote will time-out and disconnect from LynxRedirector if it doesn't get a message from the Hilo for 3 seconds. This will

be shown in Hilo Remote as a disconnected Wi-Fi icon: . This can occur if you are out-of-range of your Wi-Fi router, or if there is heavy Wi-Fi traffic causing missed packets for Hilo Remote. Move closer to your router, or reduce the Wi-Fi traffic then Hilo Remote will automatically try and re-establish the connection.
Q) Can I run more than one copy of Hilo Remote?
A) The Hilo can only communicate with one copy of Hilo Remote at a time. If you launch Hilo Remote on the Host Computer, it may not be possible to also launch Hilo Remote on the Target Computer/Tablet. Exiting Hilo Remote will cause the Hilo to stop communicating with any other Hilo Remote that may be running. The second Hilo Remote will go into its "disconnected" state after 3 seconds and it will automatically try and reestablish communication with the Hilo.
Q) My Host Computer is on a different sub-net, or is completely different network, how can I connect?
A) Hilo Remote V1.0.0.6 and up allows you to specify the Host Computer's IP address using the Select Connection dialog on the Target Computer/Tablet:
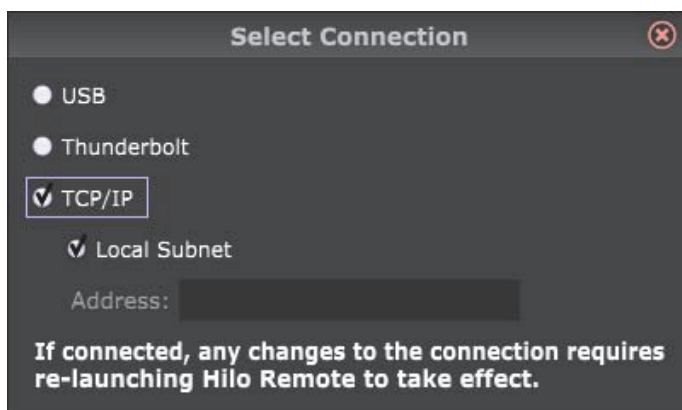
Simply uncheck the "Local Subnet" check-box, then enter the IP Address, Computer Name or Domain Name in the "Address:" field.
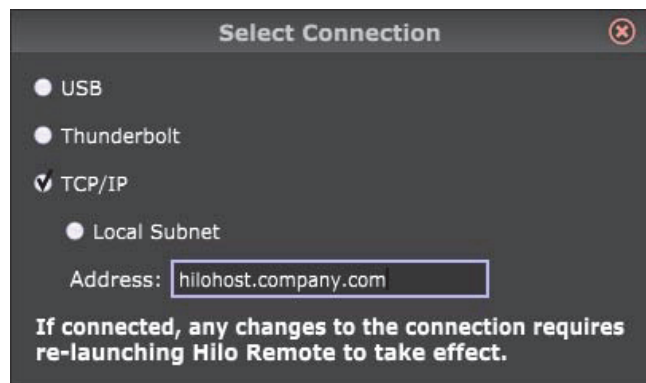
If the Host Computer is separated from the Target Computer/Tablet across a wide-area network (such as behind a router with NAT [Network Address Translation]), you will need to specify the router's IP Address and open port 5645 to forward to your Host Computer. Port 5646 is used to communicate between the Host Computer and the Target Computer/Tablet, so you would need to open port 5646 to forward to the Target Computer/Tablet.
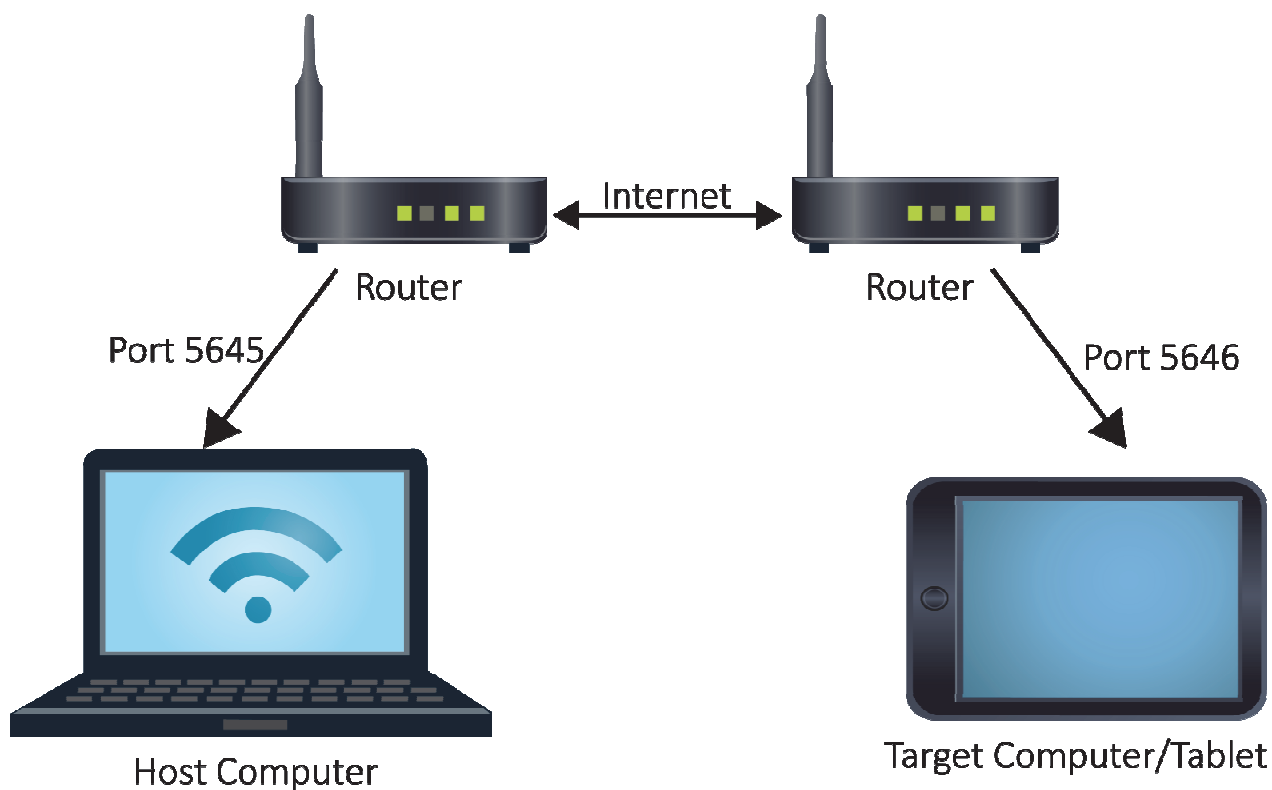
8   Support

We are devoted to making your experience with Hilo trouble-free and productive. If the troubleshooting and operational sections of this manual did not help resolve your questions, several support options are available to you:

8.1   Lynx Website Support Resources

Logging on to http://www.lynxstudio.com > Support, will provide several options for resolving your support issues:

Downloads
> A library of current firmware and driver files are available for download and installation. Check back regularly to insure that your Hilo is up-to-date.

Contact Tech Support
> For direct attention from the Lynx Technical Support Staff, registered users can submit a support ticket online that details their problem and steps they've taken to resolve it. Most Support Ticket submissions are responded to within 24 hours.

Frequently Asked Questions
> An extensive catalog of FAQs derived directly from our most common tech support inquiries. Our FAQ section is updated regularly and designed to allow users to find the answers to their most common questions quickly.

Lynx Support Forum
An online Lynx users support forum provides a venue for customers to post questions and issues and receive responses from other users as well as Lynx technical administrators. Searching previous posts is often an excellent way to uncover valuable information about Hilo operation and troubleshooting.
See http://www.lynxstudio.com/forum

Support Documents and User Manuals
> A library of useful "how-to" documents, troubleshooting aids and charts are available for 24/7 assistance. User Manuals are also conveniently available online for all Lynx products
> Facebook Support Information Group
> Like us? Then Like us on Facebook to be alerted to the latest support, product and product information.

8.2   Telephone Support

Telephone support is available by calling +1 (714) 545-4700 extension 206 from 9AM to 5PM Pacific Time, Monday through Friday, excluding United States Holidays.

8.3   Registering your Hilo

Lynx is committed to providing you with the best service possible. To help us serve you better, please be sure to register your Hilo. Register on the web at: http://www.lynxstudio.com/register.html
➢   Once you are registered you will automatically receive notifications of new products and upgrades.

8.4   Return Policy

If you have a unit that you suspect is defective or is malfunctioning contact Lynx technical support via one of the means described above for diagnosis. If the technician determines that the unit is faulty, they will issue an RMA number so you can send the unit in for repair. Units received without a valid RMA number will be refused. All RMA numbers are valid for 30 days from the date of issue.

9 Appendices

9.1 Methods of Connection

Hilo doesn't just sound great, it is impressively versatile as well. There are a number of ways to use Hilo in a wide variety of contexts.

9.1.1 USB 2.0

A single USB cable connection to a Mac or Windows computer, Uses the Lynx LT-USB card.

9.1.2 Thunderbolt

This allows a high-speed, single cable connection to the latest crop of Thunderbolt equipped Mac and PC computers. For detailed information about how this functions, refer to the Hilo/TB manual on the www.lynxstudio.com website. Uses the Lynx LT-TB card.

9.1.3 Dante

For use within any Ethernet-based Dante network. Uses the LT-DANTE card.

9.1.4 ProTools Digilink

Unlike the Hilo/USB and Hilo/TB, adding ProTools Digilink compatibility to a Hilo requires purchasing the Lynx LT-HD card and replacing the LT-USB, LT-TB or LT-DANTE card in the Hilo. In this case, the LT-USB, LT-TB or LT-DANTE card should be retained, as there is no way to update Hilo's firmware through the Digilink connection. When an update is available, re-installing the original card and connecting to the computer via USB, Thunderbolt or Dante will allow the updater to be run.

With an LT-HD card installed, the Hilo can be connected to a ProTools HD Native, HDX or PT|HD system with a standard Digilink cable (note: a Digilink to Mini Digilink adapter is necessary for use with the HD Native or HDX cards). In this state, Hilo will appear to the ProTools software as an HD I/O interface, with 16 channels of analog I/O. Distribution of channels will be the same here as it is with USB: the first pair of Playback channels is distributed to all outputs equally, then the remaining playback channels are distributed as follows:

Line Out:	Analog 1+2
Monitor Out:	Analog 1+2 and 3+4
Phones:	Analog 1+2 and 5+6
Digital Out XLR (AES):	Analog 1+2 and 7+8
Digital Out Coax:	Analog 1+2 and Analog 11+12
Digital Out Optical:	Analog 1+2 and Analog 9+10
ADAT Out 1-8:	Analog 1+2 and Analog 9-16

For operational specifics, please refer to the LT-HD manual on the www.lynxstudio.com website: Support > User Manuals > Lynx LT-HD

9.1.5 Standalone

Hilo can operate with no expansion card installed, as a strictly standalone AD/DA converter/ format converter/ router / Sample Rate converter, etc. With the LT-USB card removed (as an example), the USB Play and Record devices will disappear from the Output Mix Routing page, and as metering choices. All routing and audio settings can still be controlled from the Hilo touch screen.

In general, it would be advisable to keep the LT-USB, LT-TB or LT-DANTE card installed even if one intends to use Hilo as a standalone device. These provide the means to program with firmware updates, so removing them would prevent the option of keeping the unit updated. There is no specific advantage to removing the installed LSLOT card, other than that the Record and Play devices would no longer appear.

9.2 Battery Information

Hilo can operate off of a portable DC Battery Pack for field recording or whenever AC power is not available. The **BATTERY IN** connector is located directly above the AC connector on the Hilo back panel.

Battery Packs can be purchased from retailers of video cameras and other electronics equipment. Almost any lead acid or lithium battery should work as long as it has the following characteristics:
- 9-18 Volts. Typical choices are either 12V or 14V.

- A 4-pin XLR connector. The connection should have pin 4 hot, and pin 1 for ground. No other pins are connected. This is a standard configuration.
- Hilo consumes 22 Watts. Check with the battery's stated watt hours to determine operating time you can expect with a fully charged battery. For instance, a 60 watt-hour battery would provide up to 2.72 hours of operation.

9.3   XLR Connector Wiring and Adapters

This section describes the proper wiring of cables that can be used to adapt the analog audio XLR connectors on the Hilo.

9.3.1   Balanced Connections

The wiring method for balanced connections with XLR connectors to balanced TRS (¼" phone) connectors using shielded twisted pair cable (2 wire + shield) is as follows:

XLR Pin 1 (GND) to cable shield and to the TRS sleeve
XLR Pin 2 (+) to one signal wire and to the TRS tip
XLR Pin 3 (-) to the other signal wire and to the TRS ring

9.3.2   Unbalanced Connections with Twisted Pair Cable

The wiring method for unbalanced connections with XLR connectors to ¼" phone connectors (tip and sleeve only) using shielded twisted pair cable (2 wire + shield) is as follows:

XLR Pin 1 (GND) to cable shield with no connection on the other end
XLR Pin 2 (+) to signal wire and to the ¼" phone tip
XLR Pin 3 (-) to the other signal wire and to the ¼" phone sleeve

The wiring method for unbalanced connections with XLR connectors to RCA/Phono phone connectors using shielded twisted pair cable (2 wire + shield) is as follows:

XLR Pin 1 (GND) to cable shield with no connection on the other end
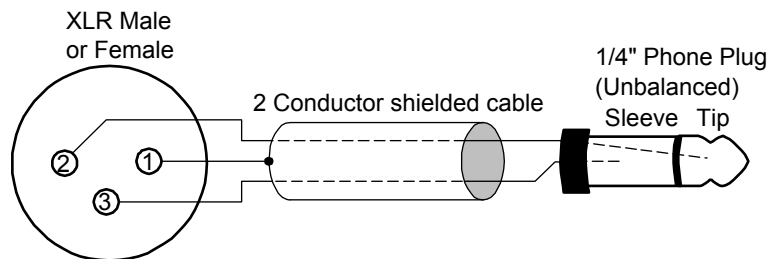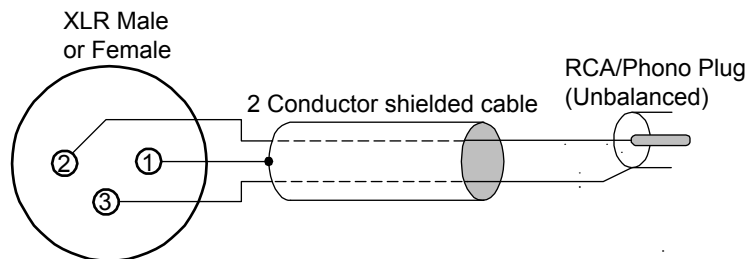XLR Pin 2 (+) to signal wire and to the Phono center pin
XLR Pin 3 (-) to the other signal wire and to the Phono sleeve

9.3.3 Unbalanced Connections with Single Conductor Cable

In some cases it may be necessary to use single-conductor cable to adapt to unbalanced devices. These cables are considerably more susceptible to interference and grounding problems than the two conductor cables shown above. Two-conductor cables should be used whenever possible.

The wiring method for unbalanced connections with XLR connectors to unbalanced ¼" phone connectors (tip and sleeve only) using coaxial cable (1 wire + shield) is as follows:

XLR Pin 1 (GND) no connection
XLR Pin 2 (+) to signal wire and to the ¼" phone tip
XLR Pin 3 (-) to the cable shield and to the ¼" phone sleeve

The wiring method for unbalanced connections with XLR connectors to unbalanced RCA/Phono phone connectors using coaxial cable (1 wire + shield) is as follows:

XLR Pin 1 (GND) no connection
XLR Pin 2 (+) to signal wire and to the Phono center pin
XLR Pin 3 (-) to the cable shield and to the Phono sleeve

9.4   Setting Trim Pots
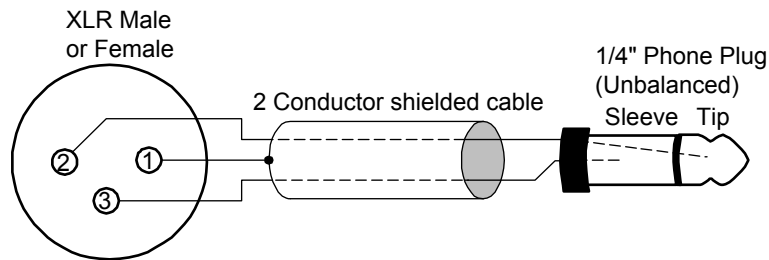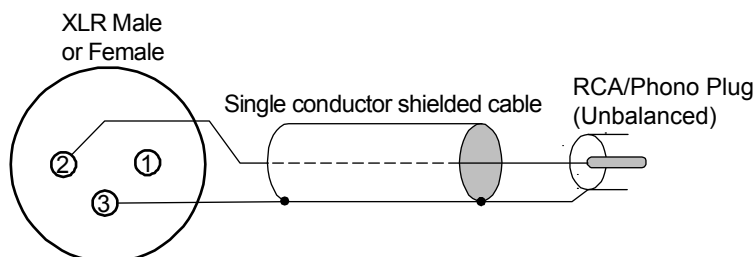
As discussed in sections 3.4.5 and 3.4.6, Hilo's Line Inputs and Line Outputs can be set to Trim values of +18 dBu; +20 dBu; +22 dBu; +24 dBu; +0 dBV; +2 dBV; +4 dBV and +6 dBV. These trim positions are factory calibrated to these values within 1/100th of a dB. Trim levels can be selected from the Hilo Home Page. These set levels will satisfy the overwhelming majority of Hilo users.

In some cases, these levels may need to be tweaked to match the reference level of gear that is not calibrated as accurately. Also, in time and due to changes in temperature, it may be necessary to tweak trim levels to set them back to their original reference.

For this purpose, Hilo has ultra-accurate, 25-turn trim pots accessible from the bottom of the chassis that can be used to adjust + or - .5dB from the established trim level. Here are the steps to calibrate via these trim pots:
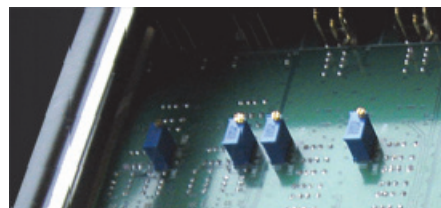

1.   Remove the plate from the bottom of Hilo. There are four screws that hold it in place. The front-right rubber foot will need to be removed to allow access to one of the screws. Locate the input and output trim pots on the underside of the Hilo main board.
2.   Set the Line In and/or Line Out trim levels on the Hilo Home page to the value closest to your desired level.

3.   It is best to use sine wave tones to adjust trims. If adjusting Input trim levels, send tones from an external device and measure the results in either software or a scope with digital inputs. It is best to avoid analog input routed to analog output paths for this kind of calibration. If adjusting Hilo Output Trims, send tones from a software source via the USB connection, or tones from an external device connected to one of Hilo's digital inputs routed to the Line Out. Make sure that the entire signal path is set to unity gain.
4.   Adjust the trims clockwise to increase the gain on the inputs or outputs, or counter clockwise to decrease gain until the desired reference level is achieved.

Keep in mind that this variation will also be represented in other trim levels that are selected. For instance if a trim level of +22dB is active, and the trim pots have altered that to 22.25dB, if later a trim value of +24dB is selected from the Hilo, the resulting signal will be +24.25 dB.

9.5   Setting the Monitor out Level Mode

By default, the Hilo Monitor Outputs are calibrated to a maximum of +10dBu. This is a standard reference level for powered monitors. If the Monitor Outputs are to be used with powered monitors or a power amp connected to passive monitors, then this setting is likely appropriate.

If instead, one wishes to connect the Monitor Output to some other professional line level device, then it may be desirable to set the Monitor Out to its alternate setting, which is +24dBu.
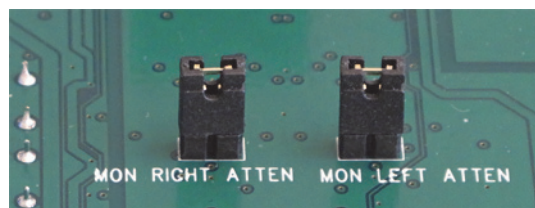
Monitor Output Level Default +10 dBu
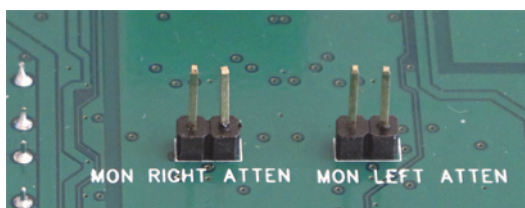
Monitor Output Level Option +24 dBu

This setting is established with jumpers on the Hilo mainboard. To access them, remove the bottom plate on the Hilo (it will be necessary to remove one of the rubber feet to accomplish that). The pins in question are labeled Mon Right Atten (short for Monitor Output Right Channel Attenuation) or Mon Left Atten. Removing the jumpers sets the levels to the alternate +24dBu mode.

If the desired level is less than +24dBu (+22dBu) for instance, then you can additionally attenuate with the Hilo Monitor Out volume control.

10 Troubleshooting & User Tips

Q. Why are there circles and red lines through my Sample Rate, Sync Source and SynchroLock icons?
A. When Hilo is connected via USB, these controls lock out. Hilo will respond to Sample Rates changes that occur in your DAW. To make changes when not using your DAW, go to the Sound Control Panel in Windows or to AUDIO MIDI SETUP in a Mac.

Q. I want to change my Sync Source but it is locked out.
A. To change SYNC SOURCE when USB is connected, you must first disconnect USB from Hilo, set your SYNC SOURCE, then re-connect the USB cable.

Q. What does the white box around the Input Source mean?
A. That means that that Input is in "Focus". In other words, the Input Level Fader, Metering and ON/OFF state are for that selected (Focused) input. This is useful since you may have multiple Inputs feeding an Output and may want to check levels, etc. for one of them.

Q. I have multiple sources coming into Hilo and they are all mixing onto the same tracks in my DAW.
A. In the OUTPUT MIX ROUTING PAGE, select the Output (e.g. USB REC 1 &2) and make sure you do not have any unwanted Inputs being routed to that Output. To turn off an Input, tap the ON button so it becomes a red OFF or you can tap the Input (once if it is already in "Focus" or twice if it is not) until it turns red.

Q. My monitor level (or phones) is turned up but the audio is still very low.
A. Check the Input Level for the Inputs feeding that Output and make sure they are at a sufficient level. Also, for MONITOR OUT and PHONES, tap the "Analog" button (at the bottom of the Outputs field) to switch it to the Digital Level, and make sure that level was not turned down.

Q. My output level is turned down but the audio is distorted.
A. Check your Input Levels to your selected Output. The Input Source Level has the ability to be raised higher than "0" level and thus can add gain that may distort your output.

Q. I am mixing Inputs to my Monitors (or Phones , and the Output is distorting. I like the mix of the Inputs and I do not want to have to turn down each Input one at a time. What can I do?
A. Tap the "Analog" button (at the bottom of the Outputs field) to switch it to the Digital Level. This is the digital output level before it feeds the analog MONITOR and PHONES. Bring the Digital Level down until you are not hitting the "Overs" on the Output Meters.

Q. When do I use the Sample Rate Converter?
A. There are two situations where you would the SRC:
1) When your digital inputs to Hilo are coming in at a sample rate that differs from the sample rate of Hilo. Hilo will up-or-down sample the input signal to match itself and
2) If your digital sources are coming in at the *same* sample rate as Hilo, but your digital sources have no ability to clock slave to Hilo (e.g. consumer CD players). The SRC will re-clock the digital input signal to make sure it is in Sync with Hilo's clock.

Q. I am using a mono input into the Line In of Hilo. I have the Line In assigned to my Monitors and Phones Output but I am only hearing it one side (the side it is connected to). Why?
A. To monitor a mono input signal in the center of the stereo field, go to the Output Mix Routing Page and select the Input you would like to monitor (make sure the white box is around the Input so that it is "focused" or selected). Under the Input Meters is the MONITOR MODE select button. Tap that button to launch the menu of options. If your signal source is plugged into the Left Input of the selected source, then select "Left". If it is plugged into the Right Input, Select "Right". On the OUTPUT METERS you should now see your signal on the both the left and right sides. Note: The MONITOR MODE selection is active PER INPUT and PER OUTPUT. While this makes the feature very flexible, keep in mind you may need to select the correct mode for multiple outputs (such as MONITOR OUT and PHONES).

11 Specifications

Line In L/R

THD+N	-114 dB @1kHz, -1dBFS, 20kHz filter, +22dBu trim
Dynamic Range	121 dB, A-weighted, -60dBFS signal method
Frequency Response	± 0.01 dB, 20 – 20kHz
Crosstalk	140 dB maximum @ 1kHz, -1dBFS signal
Full-scale trim settings:	+ 0dBV, +2dBV, +4dBV, +6dBV, +18dBu, +20dBu, +22dBu, +24dBu

Female XLR connectors

Line Out L/R

THD+N	-109 dB @1kHz, -1dBFS, 20kHz filter, +22dbu trim
Dynamic Range	121 dB, A- weighted, -60dBFS signal method
Frequency Response	± 0.02 dB, 20 – 20kHz
Crosstalk	-135 dB maximum @ 1kHz, -1dBFS signal
Full-scale trim settings	+ 0dBV, +2dBV, +4dBV, +6dBV, +18dBu, +20dBu, +22dBu, +24dBu

Male XLR connectors

Monitor Out L/R

THD+N	-107 dB @1kHz, -1dBFS, 20kHz filter, volume at max
Dynamic Range	121 dB, A- weighted, -60dBFS signal method
Frequency Response	± 0.02 dB, 20 – 20kHz
Crosstalk	-135 dB maximum @ 1kHz, -1dBFS signal
Output level at max volume	+24dBu or +10dBu, jumper selectable

TRS connectors

Headphone Out

THD+N	-107 dB @1kHz, -1dBFS, 20kHz filter, volume at max
Dynamic Range	121 dB, A- weighted, -60dBFS signal method
Frequency Response	± 0.02 dB, 20 – 20kHz
Crosstalk	-130 dB maximum @ 1kHz, -1dBFS signal
Output level at max volume	+19dBu

¼" phone jack on front panel

Digital I/O

AES/EBU	Transformer-coupled on XLR connectors
S/PDIF I/O coax	Transformer-coupled on RCA jacks
S/PDIF I/O optical	On optical connectors
ADAT I/O	8 channels at 48 kHz when selected on optical connectors

Sample Rates

All standard rates up to 192 kHz using SynchroLock sample clock generator

Synchronization Options

Internal
External word clock I/O   75ohm TTL signal on BNC connectors
AES/EBU or S/PDIF inputs

LSlot™ Expansion Port

Supports Lynx LSlot expansion cards with up to 32 input and outputs simultaneously

LCD Display

480 x 282 LCD Touch Screen

Other

AC Power	110 to 230 VAC, 30 watts;
Battery Power	9-18 volts DC on 4-pin XLR
Size	8.50" wide x 3.25" tall x 10.00" deep (216mm x 83mm x 254mm)
Shipping Weight	12 pounds (5.4kg)

Certifications

CE and FCC Class B EMI, CE Product Safety

12 Certifications

12.1   FCC DECLARATION OF CONFORMITY

MANUFACTURERS NAME: Lynx Studio Technology, Inc.
MANUFACTURER ADDRESS: 190 McCormick Avenue
                                  Costa Mesa, CA 92626, U.S.A.
TELEPHONE   (714) 545-4700
COMPLIANCE TEST REPORT NUMBER: D11123R1
COMPLIANCE TEST REPORT DATE: January 12, 2012
TYPE OF EQUIPMENT: Professional A/D and D/A Converter
EQUIPMENT CLASS: Residential, Commercial, Light Industry, Urban Outdoors, Dedicated Studios
MODEL NUMBER: Hilo
CONFORMS TO THESE SPECIFICATIONS: CFR Title 47 FCC Part 15 Subpart B Class B per CISPR 22 Limits
TEST PROCEDURE: ANSI C63.4
YEAR OF MANUFACTURE: 2011

This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation.

If the unit does cause harmful interference to radio or television reception, please refer to your user's manual for instructions on correcting the problem.

I the undersigned, hereby declare that the equipment specified above conforms to the above requirements.

Costa Mesa, California
January 12, 2012

Robert J. Bauman
Compliance Engineer

12.2   CE EMC DECLARATION OF CONFORMITY

MANUFACTURERS NAME: Lynx Studio Technology, Inc.
MANUFACTURER ADDRESS: 190 McCormick Avenue
                                Costa Mesa, CA 92626, U.S.A.
TELEPHONE   (714) 545-4700
COMPLIANCE TEST REPORT NUMBER: D20110Q1
COMPLIANCE TEST REPORT DATE: January 12, 2012
TYPE OF EQUIPMENT: Professional A/D and D/A Converter
EQUIPMENT CLASS: Residential, Commercial, Light Industry, Urban Outdoors, Dedicated Studios
MODEL NUMBER: Hilo
CONFORMS TO THESE SPECIFICATIONS: EN 55103-1:2009 for environment categories E1 – E4 which references the following
                                specifications:
                                        EN 55013:2001, EN 55014:2002, EN 55022:2006,
                                        EN 61000-3-2:2006, EN 61000-3-3:2008
                                EN 55103-2:2009 for environment categories E1 – E4 which references the following
                                specifications:
                                        EN 61000-4-2:2001, EN 61000-4-3:2008, EN 61000-4-4:2004,
                                        EN 61000-4-5:2006, EN 61000-4-6:2007, EN 61000-4-11:2004

YEAR OF MANUFACTURE: 2011

I the undersigned, hereby declare that the equipment specified above conforms to the above directives and standards.

Costa Mesa, California
January 12, 2012

Robert J. Bauman
Compliance Engineer

12.3   CE SAFETY DECLARATION OF CONFORMITY

MANUFACTURERS NAME: Lynx Studio Technology, Inc.
MANUFACTURER ADDRESS: 190 McCormick Avenue
                                Costa Mesa, CA 92626, U.S.A.
TELEPHONE   (714) 545-4700
COMPLIANCE TEST REPORT NUMBER: D20118S2
COMPLIANCE TEST REPORT DATE: January 23, 2012
TYPE OF EQUIPMENT: Professional A/D and D/A Converter
EQUIPMENT CLASS: Residential, Commercial, Light Industry, Urban Outdoors, Dedicated Studios
MODEL NUMBER: Hilo
CONFORMS TO THESE SPECIFICATIONS: EN 60065:2002 + A1:2006 + A2:2010 + A11:2008 + A12:2011
YEAR OF MANUFACTURE: 2011

I the undersigned, hereby declare that the equipment specified above conforms to the above directives and standards.

Costa Mesa, California
January 23, 2012

Robert J. Bauman
Compliance Engineer

Hilo

One year Free Labor / One year Parts Exchange
This product must be returned to the factory for repair.

Who Is Covered?

You must have proof of purchase to receive warranty service. A sales receipt or other document showing when and where you purchased the product is considered proof of purchase. This warranty is enforceable only by the original retail purchaser. To be protected by this warranty, the purchaser must register online within 14 days of purchase.

What Is Covered?

Warranty coverage beings the day you buy your product. *For one year thereafter*, Lynx shall, at its sole and absolute option, either repair or replace free of charge any product that proves to be defective on inspection by Lynx or its authorized service representative. In all cases disputes concerning this warranty shall be resolved as prescribed by law. All parts, including repaired and replaced parts, are covered only for the original warranty period. When the warranty on the product expires, the warranty on all replaced and repaired parts also expires.

What Is Excluded?

Your warranty does not cover:

- Labor charges for installation or setup of the product.
- Product repair and/or part replacement because of misuse, accident, unauthorized repair or other cause not within the control of Lynx.
- A product that requires modification or adaptation to enable it to operate in any country other than the country for which it was designed, manufactured, approved and/or authorized, or repair of products damaged by these modifications.
- Incidental or consequential damages result from the product, damage to property, damage based on inconvenience or on loss of use of the product, and, to the extent permitted by law, damages for personal injury. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation or exclusion may not apply to you.
- A product that is used for rental purposes.

To Get Warranty Service…

To obtain warranty service, the purchaser must first call or email Lynx at the email address or telephone number printed in Section 8 to obtain a Return Authorization Number and instructions concerning where to return the unit for service. All inquiries must be accompanied by a description of the problem. All authorized returns must be sent to Lynx or an authorized Lynx repair facility postage prepaid insured and properly packaged. Proof of purchase must be presented in the form of a bill of sale, canceled check or some other positive proof that the product is within the warranty period. Lynx reserves the right to update any unit returned for repair. Lynx reserves the right to change or improve design of the product at any time without prior notice.

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LYNX STUDIO TECHNOLOGY, INC.