apollo

HIGH-RESOLUTION INTERFACE
with Realtime UAD Processing

Hardware Manual

UA Part Number 65-40424
Revision B

UNIVERSAL AUDIO

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A Letter from Bill Putnam Jr.

Thank you for deciding to make the Apollo High-Resolution Interface part of your music making experience. We know that any new piece of gear requires an investment of time and money — and our goal is to make your investment pay off. The fact that we get to play a part in your creative process is what makes our efforts at UA meaningful, and we thank you for this.

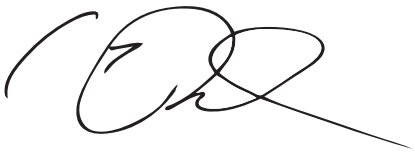
In many ways, Apollo represents the single best example of what UA has stood for over its long history; from UA's original founding in the 1950s by my father, up through our current vision of delivering the best of both analog and digital audio technologies. For more than 50 years, UA has produced some of the most coveted pieces of analog recording equipment. More recently, we have pioneered cutting edge digital signal processing which has allowed us to offer exacting digital emulations of classic analog hardware. Our unique expertise and experience across both analog and digital have allowed us to make an audio interface that we think is very special.

Starting with a high-quality analog front end, Apollo's superior sonic performance serves as its foundation. This is just the beginning, however, as Apollo is the only audio interface that allows you to run UAD plug-ins in real time, tracking and monitoring using any of our plug-ins. Want to monitor yourself through a Neve® console channel strip while tracking bass through a Fairchild or LA-2A compressor? Or how about tracking vocals through a Studer® tape machine with some added Lexicon® reverb?* No problem. This is something that only Apollo offers.

At UA, we are dedicated to the idea that technology should ultimately serve the creative process — not be a barrier. These are the very ideals my father embodied as he invented audio equipment to solve problems in the studio. With this in mind, we have crafted Apollo's Console software with an "analog workflow." The convenience of this Console workflow, along with innovations such as the Console Recall plug-in, provide ease-of-use and DAW integration for truly unique and productive experience.

As you get to know Apollo and incorporate it into your creative process, we hope that the excitement and pride that we have put into it comes through. We also hope that it earns its way into your creative process, providing you with great sound, exceptional plug-ins, and ease-of-use for years to come. Thanks.

Sincerely,



Bill Putnam Jr.

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Introducing Apollo

What is Apollo?

Apollo is a high-resolution audio interface with Realtime UAD processing onboard that gives musicians and recording engineers a no-compromise monitoring, tracking, and mixing solution. The combination of Apollo's high quality preamps, converters, and digital signal processing help you achieve the goal of making music without the common latency and potential processor shortcomings of an all-native system. Apollo leverages Universal Audio's expertise in DSP acceleration, UAD Powered Plug-Ins, and analog hardware design by integrating the latest cutting edge technologies in high-performance A/D-D/A conversion, DSP signal reconstruction, and host connectivity. Apollo acts as both an audio interface with integrated DSP effects for tracking and monitoring as well as a fully integrated UAD-2 DSP accelerator for mixing and mastering.

Apollo is available in two different configurations, which are differentiated by their DSP complement: Apollo DUO with 2 SHARC DSPs, and Apollo QUAD with 4 SHARC DSPs. Apollo DUO and QUAD have identical I/O features and functionality; the only difference is how much simultaneous plug-in processing that is available for tracking and mixing. Either way, you have an amazing sounding interface that can achieve the professional sound quality of any era in recording history by using UAD Powered Plug-Ins.

Apollo uses FireWire or Thunderbolt for computer connectivity. FireWire 800 doubles the performance of FireWire 400 and ensures the ability to use all of Apollo's I/O as well as its DSP processing. Thunderbolt is a high-speed data transmission protocol that provides faster throughput than FireWire. The Thunderbolt Option Card can be easily installed in Apollo's option card slot allowing Apollo to connect with Thunderbolt-enabled computers.

To fully realize the low latency potential of Apollo, the Console application is included and provides a familiar analog mixing console interface where you can load your favorite combination of Realtime UAD plug-ins. Setting up two custom headphone mixes is quick and intuitive and you can also set up reverbs and delays (or any other UAD effects) on two auxiliary buses for comfortable tracking of live microphones and instruments.

Achieving deep integration of Apollo's features with your favorite audio workstation software is simple thanks to the Console Recall plug-in that is compatible with VST, Audio Units, and RTAS host software. Simply place the Console Recall plug-in in any session and you have instant control over Apollo's monitoring, headphones, and Realtime UAD plug-in wet/dry options. A single button on the plug-in will automatically recall the Console configuration within the DAW session without having to manage separate Console preset files, so you can be sure that the Console mix you are working with today will be accurately recalled tomorrow.

Done tracking? Use Apollo just like any other UAD-2 device for mixing in the DAW. The full UAD Powered Plug-Ins library works with Apollo, offering the best analog emulation plug-ins available from the best companies in pro audio like Neve, SSL, Pultec, Teletronix, Studer, Lexicon, DBX, Roland, MXR, Harrison, Empirical Labs, Manley, Ampex, and many more.* A single button in the Console lets you decide to "print" or "monitor" the Realtime UAD plug-ins – so if you want the sound of your favorite console and tape machine committed into your DAW, you can print those effects on the way in.

Quite simply, Apollo delivers the sound, feel, and flow of analog recording with all the conveniences of modern digital equipment.

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Apollo Features

- Superior-sounding 18 x 24 audio interface with uncompromising UA analog design
- Realtime monitoring and tracking with premium UAD Powered Plug-Ins
- Additional mixing and mastering DSP horsepower for your sessions
- FireWire 800 built-in; user-installable Thunderbolt I/O option card (not included)

Audio Interface

- Sample rates up to 192 kHz at 24-bit word length
- 18 x 24 simultaneous input/output channels:
  - Eight channels of analog-to-digital conversion via mic, line, or high-impedance inputs
  - 14 channels of digital-to-analog conversion via:
    - Eight mono line outputs
    - Stereo monitor outputs
    - Two stereo headphone outputs
  - 10 channels of digital I/O via:
    - Eight channels ADAT Optical I/O with S/MUX for high sample rates
    - Two channels coaxial S/PDIF I/O with sample rate conversion
- Two FireWire 800 ports for daisy-chaining other FireWire devices
- 32-bit and 64-bit device drivers

Microphone Preamplifiers

- Four high-resolution, ultra-transparent, digitally-controlled analog mic preamps
- Front panel and software control of all preamp parameters
- Switchable low cut filter, 48V phantom power, 20 dB pad, polarity inversion, and stereo linking

Monitoring

- Stereo monitor outputs (independent of eight line outputs)
- Digitally-controlled analog monitor outputs maintains highest fidelity
- Front panel control of monitor levels and muting
- Two stereo headphone outputs with independent mix buses
- Independent front panel analog volume controls for headphone outputs
- Front panel pre-fader metering of monitor bus levels
- S/PDIF outputs can be set to mirror the monitor outputs

UAD-2 Inside

- DUO and QUAD models featuring two or four SHARC processors
- Realtime UAD Powered Plug-Ins processing on all of Apollo's analog and digital inputs
- Same features and functionality as other UAD-2 products when used with DAW
- Can be combined with other UAD-2 devices for increased mixing DSP
- Includes UAD Powered Plug-Ins "Analog Classics" bundle
- Complete UAD-2 Powered Plug-Ins library is available online 24/7

Software

- Console application:
  - Enables Realtime UAD Powered Plug-Ins processing
  - DSP mixer for realtime monitoring and tracking
  - Remote control of all Apollo features and functionality
- Console Recall plug-in:
  - Saves Apollo configurations inside DAW sessions for easy recall
  - Enables control of all front panel parameters from within the DAW
  - VST, RTAS, and Audio Units plug-in formats
- UAD Meter & Control Panel application:
  - Configures global UAD-2 and Powered Plug-Ins settings and monitors system usage

Other

- Easily updatable firmware
- 1U rack-mountable form factor
- One year warranty includes parts and labor

Hardware System Requirements

The host computer must meet the hardware system requirements below to use Apollo. For software system requirements, refer to the Apollo Software Manual (see page 7).

Basic audio interface I/O functionality:

- Available FireWire 800 or Thunderbolt* expansion port
  **Thunderbolt connections require the Thunderbolt Option Card (not included)*
- 512 MB RAM (1 GB or higher is strongly recommended)
- 1 GB available hard drive space
- CD-ROM drive or Internet connection for software installation

UAD-2 and Realtime UAD Powered Plug-Ins functionality:

- Internet connection for registration, UAD plug-in authorization, & updates
- Compatible VST, RTAS, or Audio Units plug-in host application software

About Realtime UAD Processing

Apollo has the ability to run UAD Powered Plug-Ins in realtime. Apollo's groundbreaking DSP + FPGA technology enable UAD Powered Plug-Ins to run with latencies in the sub-2ms range, and multiple UAD-2 plug-ins can be "stacked" in series without incurring additional latency. Realtime UAD processing facilitates the ultimate sonic experience while monitoring and/or tracking.

Realtime UAD processing is a special function that is available only within the Console application. All of Apollo's analog and digital inputs can perform Realtime UAD processing simultaneously, and Console inputs with Realtime UAD processing can be routed into the DAW for recording.

Important: Apollo, like other UAD-2 devices, can only load UAD Powered Plug-Ins which are specifically designed to run on UAD-2 DSP accelerators. "Native" plug-ins cannot run on the UAD-2 DSP.

Combining with other UAD-2 devices

Apollo can be used simultaneously with other UAD-2 devices (PCIe, SOLO/Laptop, and/or Satellite) in the same host computer system. Apollo simply adds to the DSP availability when used with other UAD-2 devices, increasing the DSP processing power so more UAD Powered Plug-Ins can be used. Up to four UAD-2 devices can be combined in the same system.

Standalone Use

Although the Console application is required to unleash the full power of Apollo, the unit can be used as a digital mixer with limited functionality without a FireWire or Thunderbolt connection to a host computer.

All currently active I/O assignments, signal routings, and monitor settings are saved to internal firmware when Apollo is powered down, and recalled when power is re-applied. Therefore the last-used settings are always available even when a host computer is not used.

Note that UAD-2 Powered Plug-In instantiations are not retained on power down, because the plug-in files reside in the host computer. However, if UAD-2 plug-ins are active when Apollo's connection to the host system is severed, the current UAD-2 plug-in configurations remain active for processing until Apollo is powered down.

About Apollo Documentation

Documentation for all Apollo components is extensive, so instructions are separated by area of functionality, as detailed below. All documentation is on the disk included in the retail package and is copied to the boot drive during software installation (Apollo documentation can also be downloaded from our website).

Apollo Hardware Manual

The Apollo Hardware Manual (available in print and PDF) contains complete information about the audio interface hardware. Included are detailed descriptions for all Apollo hardware features, control functions, and connections. Refer to the Hardware Manual (you're reading it now) to learn all about interfacing the hardware with other devices, operating the panel controls, clocking, specifications, and related information.

Apollo Software Manual

The Apollo Software Manual (PDF only) contains detailed information about how to configure and control Apollo-specific software features using the Console application and Console Recall plug-in. Refer to the Apollo Software Manual to learn how to operate these essential software tools and integrate Apollo's audio interface functionality into the DAW environment.

UAD System Manual

The UAD System Manual (PDF only) is the complete operation manual for Apollo's UAD-2 functionality and applies to the entire UAD product line. It contains detailed information about installing and configuring UAD devices, the UAD Meter & Control Panel application, how to use UAD Powered Plug-Ins within a DAW, obtaining optional plug-in licenses at the UA online store, and more. It includes everything about UAD except Apollo-specific information and individual UAD Powered Plug-In descriptions.

UAD Plug-Ins Manual

The features and functionality of all the individual UAD Powered Plug-Ins is detailed in the UAD Plug-Ins Manual (PDF only). Refer to this document to learn about the operation, controls, and user interface of each plug-in. It does not contain any system-related or integration information.

Host DAW Documentation

Each host DAW application has its own particular methods for configuring audio interfaces and using plug-ins. Refer to the host DAW documentation for specific instructions about using audio interface and plug-in features within the DAW.

Support Pages

The latest technical information about Apollo is posted on the Universal Audio support website. Our support pages may contain updated, late-breaking information that is not available in other publications. The URL of our support site is:

- www.uaudio.com/support

Technical Support

Universal Audio provides free customer support to all registered Apollo users. Our support specialists are available to assist you via email and telephone during our normal business hours, which are from 9am to 5pm, Monday through Friday, Pacific Standard Time.

Telephone

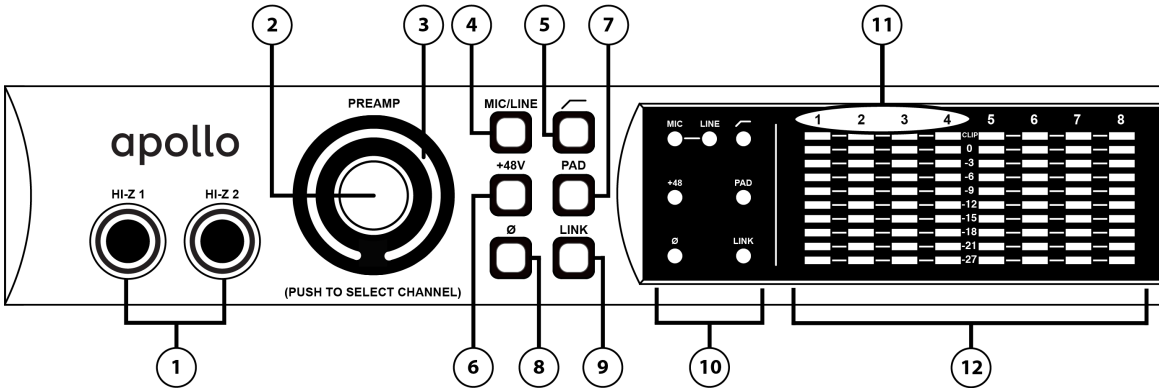
USA toll-free: +1-877-MY-UAUDIO (1-877-698-2834)
International: +1-831-440-1176
FAX: +1-831-461-1550

Online Support

To request online support via email, please visit our main support page at the URL above, then click the "Submit Support Ticket" button on the right side of the loaded page to create a help ticket.

Front Panel

This section describes the features and functionality of all controls and visual elements on the Apollo front panel. Note that all front panel functions, except the headphone volume knobs and power switch, can be controlled remotely with the Console software application.



(1) Hi-Z Inputs 1 & 2

The Hi-Z (high impedance) JFET direct inputs are for connecting low-level passive devices such as electric guitar and bass instruments into channels 1 & 2 for A/D conversion. Connect only ¼" unbalanced TS phone plugs to these inputs; TRS plugs cannot be used.

The Hi-Z inputs have an ultra-high input impedance of 2.2 Megohms that eliminates impedance loading, preserving the high-frequency content of signals from sources with high impedance outputs (such as electric guitar pickups). Hi-Z input gain levels are adjusted with the Preamp control for the associated channel.

Automatic Input Detection

Hi-Z inputs 1 & 2 use the same A/D converter channels as the corresponding Mic 1 & 2 and Line 1 & 2 inputs. When a device is plugged into a Hi-Z input, the Mic and Line inputs for the channel are overridden, the Mic/Line switch for the channel has no effect, and the stereo link is severed (if active). To use Mic or Line inputs 1 or 2, its corresponding Hi-Z input must be disconnected.

(2) Preamp Gain & Channel Select Knob

This "endless" rotary encoder with integrated pushbutton serves two functions. Rotating the knob adjusts the preamp gain for the selected input channel, and pushing the knob selects which preamp channel (1 – 4) is affected by the front panel preamp controls.

Preamp Gain

The preamp gain of analog inputs 1 – 4 is adjusted with this control. The *channel* to be adjusted (1 – 4) is set with the Channel Select function. The *input* to be adjusted (Mic, Line, or Hi-Z) is determined by the state of the channel's Mic/Line switch or Hi-Z input (if connected).

Rotating the knob clockwise increases the preamp gain for the selected channel. The available gain range for preamp channels 1 – 4 is 10 dB to 65 dB for the Mic, Line, and Hi-Z inputs.

The response of the Preamp Gain Knob is not linear; it takes more than a full revolution of the control to move through the available range. This increases the control resolution for more precise preamp gain adjustments.

Only analog inputs 1 – 4 have input gain adjustment via the mic preamp controls. To adjust signal levels for inputs 5 – 18, use the output level controls of the devices that are connected to those inputs.

Channel Select

Pushing the Preamp Knob changes the currently selected channel, which determines which input (1 – 4) is adjusted by the front panel preamp controls. A channel is selected for adjustment when its Channel Select Indicator LED (located above the channel 1 – 4 input meters; see #11 on page 11) is illuminated.

Each time the knob is pushed, the selected preamp channel is incremented. If stereo linking is active, the stereo pairs are selected.

(3) Preamp Gain Level Indicator

The amount of preamp gain for the selected channel is displayed with the ring of illuminated green indicator LEDs surrounding the Preamp Knob.

The LEDs are relative levels and are not calibrated to indicate any specific dB value. However, precise numerical dB gain values for the preamps are displayed in the Console application.

(4–9) Preamp Settings

This set of six buttons control the preamp options for input channels 1 – 4. Press the buttons to toggle the setting. The current state of each preamp option button is indicated by the Preamp Options LEDs (#10 on page 11). Each button function is detailed below.

(4) Mic/Line

This button switches between the channel's Mic and Line inputs on the rear panel. This button has no effect if the channel's Hi–Z input is connected (when a cable is inserted into the Hi-Z input, the Mic/Line LED turns off).

(5) Low Cut Filter (⟋‾)

When enabled, the channel's input signal passes through a low cut (high pass) filter. This 2nd-order coincident-pole filter has a cutoff frequency of 75 Hz with a slope of 12 dB per octave.

The Low Cut filter affects the Mic, Line, and Hi-Z inputs. Low Cut is typically used to eliminate rumble and other unwanted low frequencies from the input signal.

(6) Phantom Power (+48V)

When enabled, 48 volts of phantom power is supplied to the channel's rear panel Mic input. Most modern condenser microphones require 48V phantom power to operate. This option can only be activated when the Mic/Line switch (#4) is set to Mic.

Note: Depending on the current configuration of the hardware and software, there may be a delay when changing the 48V state to minimize the clicks/pops that are inherent when engaging phantom power. The +48V LED will blink rapidly during any delay.

(7) Pad

When enabled, the channel's microphone input signal level is attenuated by 20 dB. Pad does not affect the Line or Hi-Z inputs.

Pad is used to reduce signal levels when overload distortion is present at low preamp gain levels, such as when particularly sensitive microphones are used on loud instruments, and/or if the A/D converter is clipping.

(8) Polarity (ø)

When enabled, the polarity (aka "phase") of the input channel's signal is inverted. Polarity affects the Mic, Line, and Hi-Z inputs.

Polarity inversion can help reduce phase cancellations when more than one microphone is used to record a single source.

(9) Stereo Link

This button links the preamp controls of adjacent channels together (1 & 2 or 3 & 4) to create stereo input pairs. When channels are linked as a stereo pair, any preamp control adjustments will affect both channels of the stereo signal identically.

Only the same type of inputs can be linked (Mic/Mic or Line/Line), and the Hi-Z inputs cannot be linked.

(10) Preamp Options LEDs

These seven LEDs display the state of the preamp option button settings for the currently selected channel. Each LED is illuminated when its associated option is active. When the channel selection is changed, the LED states are updated to reflect the current settings for the selected channel.

(11) Channel 1 – 4 Select LEDs

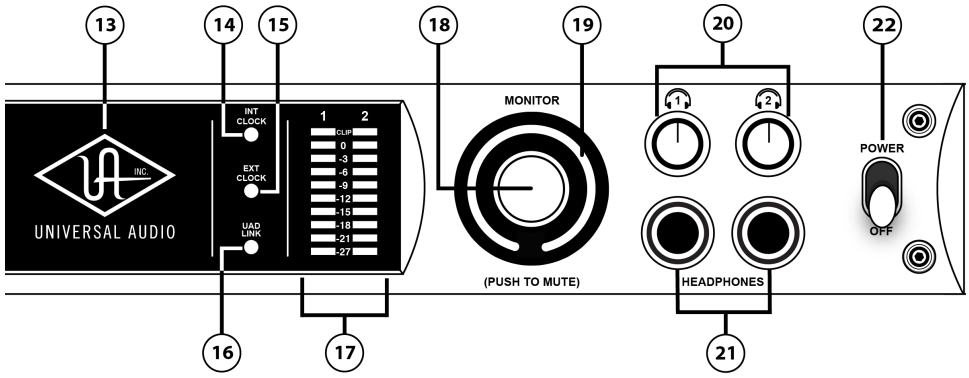
The currently selected channel is indicated by the LEDs above input level meters 1 – 4. When a channel (or channels, when stereo linked) is selected, its associated LED is illuminated. The currently selected channel is incremented when the Preamp Knob (#2) is pressed.

Note: The numbers for channels 5 – 8 do not illuminate.

(12) Input Level Meters

The 10-segment LED meters display the signal peak input levels for analog channels 1 – 8 at the input to the A/D converters. The dB values of the input meter LEDs are indicated between the meters for channels 4 and 5.

When digital clipping occurs, the red "CLIP" LED illuminates. Avoid digital clipping at the channel's A/D converter by reducing the channel's input level at its source, and/or in the case of channels 1 – 4, by reducing the preamp gain or engaging the Pad (#7) and readjusting gain as needed.



(13) Power Indicator (UA Logo)

The Universal Audio logo illuminates when the external power supply is properly connected to the AC outlet and the power input on the rear of the unit, and the Power switch (#22) is in the up position.

Clock LEDs

The Internal ("INT") and External ("EXT") Clock LEDs indicate the source and status of the system master clock. The clock source is specified in the Interface panel of the Settings window within the Console application (page 20). For more information about clocking, see "Digital Clocking Basics" on page 27.

(14) Internal Clock

When Apollo is using its internal clock as the master clock source, the Internal Clock LED is solid green. When set to external clock, this LED is not illuminated.

(15) External Clock

When Apollo is set to use an external clock as the master clock source and a valid clock signal is detected at the specified port, the External Clock LED is solid green. Apollo can be configured to use an external clock from the Word Clock, S/PDIF, or ADAT inputs. When set to internal clock, this LED is not illuminated.

If the External Clock LED is red and the Internal Clock LED is simultaneously green, Apollo is configured to use an external clock but it cannot lock to the specified source, so the internal clock is active instead. In this situation, if/when the specified external clock becomes available, Apollo will switch back to the external clock, the Internal Clock LED will turn off, and the External Clock LED will change to green.

(16) UAD Link LED

The UAD Link LED is a system status indicator. The LED is solid green when Apollo is connected to (and properly communicating with) the host computer system via FireWire or Thunderbolt, and off when not connected. When blinking red/green, the UAD drivers are not properly loaded. When solid red, the LED indicates an error state.

The Apollo software must be properly installed and configured on the host computer to enable the UAD Link, and the UAD Link must be active to use Apollo with any/all computer operations. The only time the link is not required is when Apollo is used "standalone" without a computer (see "Standalone Use" on page 7).

(17) Monitor Output Level Meters

The 10-segment LED meters display the signal peak output levels for monitor outputs 1 & 2 (Left & Right) at the output of the D/A converters. These meters are before the Monitor Level control ("pre-fader") and reflect the D/A converter levels regardless of the current Monitor Level and Headphone Level knob settings.

The dB values of the monitor meter LEDs are indicated between the left and right channel meters. When digital clipping occurs, the red "CLIP" LED illuminates. Avoid clipping at the monitor D/A converters by reducing the monitor bus output level and/or the channels feeding the monitor output bus.

(18) Monitor Level and Mute Knob

This "endless" rotary encoder serves two functions. Rotating the knob adjusts the monitor output level, and pushing the knob mutes the monitor outputs.

Monitor Level

Rotating the knob clockwise increases the signal level at monitor outputs 1 & 2 on the rear panel. Although this is a digital control, the monitor volume is attenuated in the analog domain, after D/A conversion (digitally-controlled analog volume). This method provides the utmost monitoring fidelity, in contrast to digital volume controls that reduce levels by truncating the word length ("dropping bits").

Monitor Mute

Pushing the Monitor knob toggles the mute state of the signals at monitor outputs 1 & 2 on the rear panel. When the monitor outs are muted, the Monitor Level Indicator (#19) is red.

Note: Monitor Mute does not mute the headphone outputs.

(19) Monitor Level Indicator

The signal level at the rear panel monitor outputs is displayed with this ring of illuminated indicator LEDs surrounding the Monitor Level knob. The LEDs are green when the monitor outputs are active, and red when the monitor outputs are muted. This meter is after the Monitor Level control ("post fader"). It indicates relative levels only and is not calibrated to specific dB values.

(20) Headphone Level Knobs 1 & 2

These analog knobs control the volume of Headphone Outputs 1 & 2 on the front panel. Each headphone output has its own volume control. Headphone levels are attenuated in the analog domain (after D/A conversion) for maximum fidelity.

(21) Headphone Outputs 1 & 2

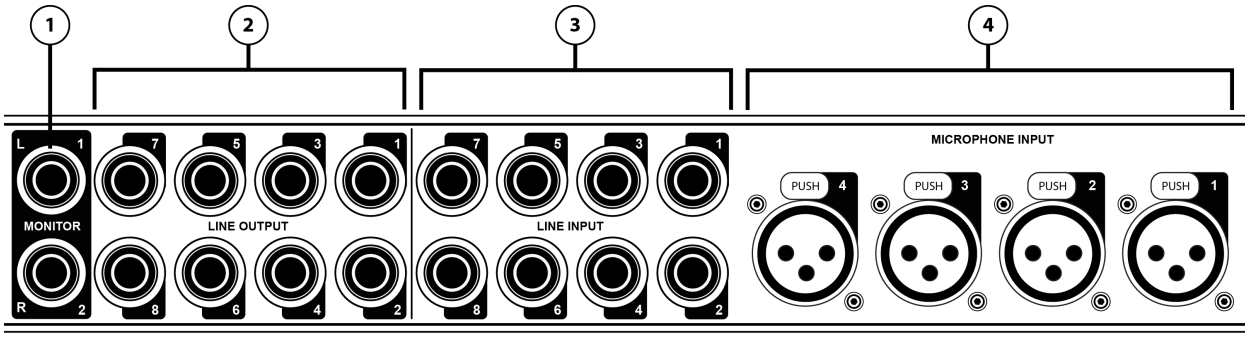
These ¼" stereo TRS phone jacks are for connecting stereo headphones to Apollo. Headphone outputs 1 & 2 are individually addressable by the device drivers and the Console application. Unique mixes can be created for each headphone output, or they can be switched to mirror the monitor outputs in the Console application or Console Recall plug-in. When mirroring the monitor outputs, the headphone outputs are unaffected by Monitor Mute (#18), to facilitate recording/tracking with headphones while the monitor speakers are muted.

(22) Power Switch

This switch applies power to Apollo. When the unit is powered on, the Universal Audio logo is illuminated. The external power supply must be properly connected for this switch to function.

Rear Panel

Analog I/O



(1) Monitor Outputs 1 & 2

These balanced ¼" TRS phone jacks are line-level analog outputs typically used for connection to a stereo loudspeaker monitoring system. The signal levels at these outputs are controlled with the Monitor Level knob (#18). Unbalanced ¼" TS cables can also be used.

The Monitor Outputs are completely independent from the eight Line Outputs. By default, the "1–2" or "Main" outputs from a DAW are routed to these outputs. Stereo panning of input signals routed to these outputs is defined within the Console and/or DAW applications.

The S/PDIF output can be configured to mirror the Monitor Outputs; see "(7) S/PDIF Ports" on page 15 for details.

(2) Line Outputs 1 – 8

The individually addressable line-level analog outputs use balanced ¼" TRS phone jacks. Unbalanced ¼" TS cables can also be used.

The Line Outputs can be configured in adjacent pairs to use –10 dBV or +4 dBu reference levels. This function is configured in the Interface panel of the Settings window in the Console application.

(3) Line Inputs 1 – 8

The individually addressable line-level analog inputs use balanced ¼" TRS phone jacks. Unbalanced ¼" TS cables can also be used. The Hi-Z inputs override the Line Inputs on channels 1 & 2.

Line Inputs 5 – 8 can be configured in adjacent pairs to use –10 dBV or +4 dBu reference levels. This function is configured on the Line 5 – 8 input channel strips in the Console application. Line Inputs 1 – 4 are fixed at a reference level of +4 dBu.

Adjacent input channel pairs can be linked for easy stereo adjustments. Stereo links for channels 1-2 and 3-4 can be established using the Link button on the front panel or in the Console application; channels 5-6 and 7-8 can be linked using the Console application only.

(4) Microphone Inputs 1 – 4

The balanced Microphone inputs use locking XLR connectors. Pin 2 is wired positive (hot). Inputs 1 – 4 are switched between Mic and Line using the front panel controls. The Hi-Z inputs override the Mic inputs on channels 1 & 2.

48V phantom power is available via the front panel switch (when the channel is selected), or from within the Console application.

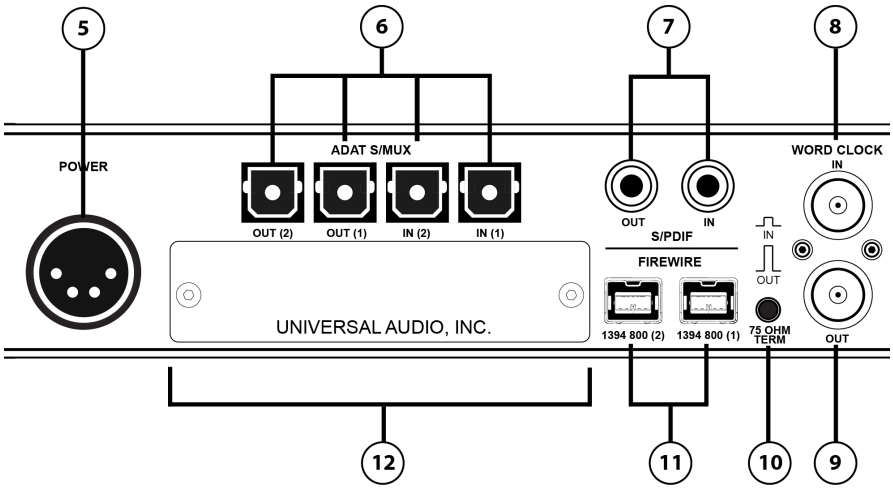
Adjacent channel pairs can be linked for easy stereo adjustments. Stereo links for channels 1–2 and 3–4 can be established using the front panel Link button or the Console application.

(5) Power Input

The included 80-watt external power supply plugs into this 4-pin locking XLR jack. Apollo requires 12 volts DC power and draws 6.5 amperes of current. To eliminate risk of circuit damage, connect only the factory-supplied power supply. Use the Power switch on the front panel to power the unit on and off.

Important: Do not disconnect the power supply while Apollo is in use, and confirm the Power switch is in the "off" position before connecting or disconnecting the power supply.

Digital I/O



(6) ADAT S/MUX Optical Ports

These ports use the ADAT Lightpipe Optical Interface protocol for interconnecting with other audio hardware devices in the digital domain. Two ADAT inputs and two ADAT outputs are provided, routing a total of eight channels of digital audio. The channels routed by these ports depend on the current system sample rate.

At sample rates of 44.1 kHz and 48 kHz, the original ADAT protocol is used, and eight audio channels are routed on one ADAT port. At higher sample rates, industry standard S/MUX is used to maintain high-resolution transfers.

Important: To utilize all eight channels with the optical ports at sample rates of 88.2 kHz and above, ADAT ports 1 & 2 must both be connected to the other device, and the other device must also support the ADAT S/MUX protocol.

The following behaviors apply to the ADAT ports:

- At sample rates of 44.1 kHz and 48 kHz, port 1 supports eight channels of I/O. Output 2 mirrors output 1, and input 2 is disabled.
- At sample rates of 88.2 kHz and 96 kHz, up to four channels of audio is routed per port (eight channels total, when both ports are used).
- At sample rates of 176.4 kHz and 192 kHz, up to two channels of audio is routed per port (four channels total, when both ports are used). Only four ADAT channels are supported at 176.4 kHz and 192 kHz.

The ADAT port channel assignments described above are summarized in this table:

ADAT PORT CHANNEL ROUTING				
Sample Rate (kHz)	**Input Port 1**	**Input Port 2**	**Output Port 1**	**Output Port 2**
44.1 & 48	1 – 8	Disabled	1 – 8	1 – 8 (mirror of port 1)
88.2 & 96	1 – 4	5 – 8	1 – 4	5 – 8
176.2 & 192	1 – 2	3 – 4	1 – 2	3 – 4

Note: The ADAT ports use TOSLINK JIS F05 optical connectors. Some devices use this type of connector for optical S/PDIF connections. However, Apollo's ADAT ports do not support the S/PDIF protocol.

(7) S/PDIF Ports

The S/PDIF ports provide two channels of digital I/O with resolutions up to 24-bit at 192 kHz via female phono ("RCA") connectors. For optimum results, use only high-quality 75-ohm cables specifically designed for S/PDIF digital audio.

Sample rate conversion can be enabled on the S/PDIF input. When the sample rate of the incoming S/PDIF signal does not match the sample rate specified in the Console application, the S/PDIF signal is converted to match Apollo's sample rate. If Apollo is set to use S/PDIF as the master clock source, sample rate conversion is inactive.

The S/PDIF output can be configured to mirror the Monitor outputs, for patching the stereo Monitor signal to the stereo S/PDIF input of other devices. This function is configured in the Interface panel of the Settings window in the Console application.

(8) Word Clock In

Apollo's internal clock can be synchronized (slaved) to an external master word clock. This is accomplished by setting Apollo's clock source to Word Clock in the Interface panel of the Settings window within the Console application (page 20), connecting the external word clock's BNC connector to Apollo's word clock input, and setting the external device to transmit word clock. If Apollo is the last device in the clock chain, the Termination switch (#10) should be engaged.

Note: Apollo can be synchronized to an external "1x" clock signal only. Superclock, overclocking, and subclocking are not supported.

(9) Word Clock Out

This BNC connector transmits a standard (1x) word clock when Apollo is set to use its internal clock (see "Clock Source" on page 20). The clock rate sent by this port matches the current system sample rate, as specified in the Interface panel of the Settings window from within the Console application.

When Apollo is set to use external word clock as its clock, Apollo is a word clock slave. If the incoming external word clock is within ±0.5% of a supported sample rate (44.1 kHz, 48 kHz, 88.2 kHz, 96 kHz, 176.4 kHz, 192 kHz), Word Clock Out will mirror Word Clock In with a slight phase delay (about 40ns).

Because Apollo's word clock output is not a true mirror of the word clock input, word clock out should not be used to daisy chain the word clock if Apollo is in the middle of the word clock chain. The correct method to connect Apollo in the middle of a word clock chain is to use a T-connector at Apollo's word clock input and leave Apollo's word clock output unconnected (the Termination switch should not be engaged in this scenario).

(10) 75 Ohm Word Clock Termination Switch

This pushbutton switch provides internal 75-ohm word clock input signal termination when required. Word clock termination is active when the switch is engaged (depressed).

Apollo's termination switch should only be engaged when Apollo is set to sync to external word clock and it is the last device at the receiving end of a word clock cable. For example, if Apollo is the last "slave" unit at the end of a clock chain (when Apollo's word clock out port is not used), termination should be active.

Note: For more information about clocking, see "Digital Clocking Basics" on page 27.

Host I/O

Important: Connect only one Apollo FireWire or Thunderbolt port to the host computer.

(11) FireWire 800 Ports

Apollo uses FireWire to communicate with the host computer system when the Thunderbolt Option Card is not in use. When Apollo is properly connected and configured, the UAD Link LED (#16 on front panel) is solid green.

Apollo has two FireWire 800 ports. Only one port is used to connect to the host computer; the second port can be used for daisy-chaining multiple FireWire devices such as hard drives or UAD-2 Satellite. For more FireWire information and recommended interconnections, see "FireWire Basics" on page 24.

Note: Apollo cannot be bus powered and it does not supply bus power from its FireWire ports to other devices.

(12) Thunderbolt Expansion Bay

This expansion bay is where the Universal Audio Thunderbolt Option Card is installed, providing access to all of Apollo's features and functionality via Thunderbolt enabled computers.

Refer to the documentation included in the Thunderbolt Option Card package for complete details about installation, configuration, and use of Thunderbolt with Apollo.

Software Installation

Simplified procedures for software installation are in this manual. For complete and detailed procedures, refer to the UAD System Manual.

About UAD Software

The UAD Installer installs all the software necessary to configure and use Apollo and UAD Powered Plug-Ins. It also installs the Apollo hardware device drivers so the audio interface can communicate with the host computer. Therefore the UAD Installer must be run even if you intend to use Apollo without the use of Console or UAD Powered Plug-Ins functionality.

Apollo installation, registration, and authorization consists of four main steps:

1. UAD software installation: Run the installer from download or included disk.
2. Connect Apollo to the host computer (and other gear): See example setups starting on page 21.
3. Apollo device registration: Add the device to your my.uaudio.com account.
4. UAD plug-in authorization: Download and apply the UAD authorization file.

Important: Install Software First

If you are installing Apollo software for the first time, install the software before connecting Apollo. If you are updating to a newer version of Apollo software or installing additional UAD devices, it is not necessary to remove the previous UAD software or hardware from the system, but you should still install the newer software before adding new UAD devices.

Software System Requirements

Apollo has specific host computer software requirements in addition to the hardware requirements that are listed on page 6. Refer to the Apollo Software Manual for these requirements.

Software Updates

The software in the retail package may not contain the latest Apollo software; the latest version is recommended. If the software is already installed, the UAD Meter & Control Panel application has convenient buttons that check for the most recent version. Please check our website for software updates at:

- www.uaudio.com/support/uad/downloads.html

Preparation

Close all open files and applications before starting the installation procedure. Specifically, make sure the Console, UAD Meter & Control Panel, and DAW applications are quit.

Important: Verify the computer system date and time are set correctly before installing the software and/or launching the Console or UAD Meter & Control Panel applications for the first time.

Software Installation Procedure

1. Launch the software installer. It's on the included disk or it can be downloaded from our website.
2. The installer will guide you through the installation procedure.
3. Connect Apollo to the computer with a FireWire or Thunderbolt cable and power it up. See example setups starting on page 21.
   Note: On Windows systems, at this point the driver install wizard should launch. Wait for the wizard to complete its routines before proceeding.
4. Software installation is complete. Proceed to "Registration & Authorization" on page 18.

Registration & Authorization

Simplified procedures for registration and authorization are in this manual. For complete and detailed procedures, refer to the UAD System Manual.

Apollo must be registered and authorized at my.uaudio.com to unlock its UAD-2 functionality. Apollo can be used as a "regular" audio interface (bypassing all UAD-2 plug-in features) without registration and authorization. Unlicensed UAD-2 plug-ins can be used in demo mode for 14 days without authorization.

Registration only needs to be completed once, however authorization must be completed each time the UAD software is updated. Apollo, like all UAD-2 devices, stores its authorization and UAD licenses in the device itself, so the unit can be connected to a different computer without repeating the authorization process.

Important: Registration and authorization can only be accomplished after successful software installation.

Registration & Authorization Procedure

Registration is part of the initial authorization process (it's not a separate procedure). Note that the following steps require an Internet connection to the host computer. To authorize from a system that is not online, see the UAD System Manual which is included on disk and copied to boot drive during installation.

To register and authorize Apollo when connected to the Internet:

1. Ensure that the Apollo software is installed and Apollo is powered up and connected to the computer via FireWire or Thunderbolt (the hardware and software systems must be communicating properly).
2. Open the UAD Meter & Control Panel application. It can be accessed from the Dock (Mac) or Start Menu (Windows).
3. Open the Plug-Ins panel. Access the panel by typing ⌘+P (Mac) or Ctrl+P (Windows).
4. Click the "Authorize Plug-Ins…" button to begin the registration/authorization process. Follow the onscreen instructions.
5. Double-click the authorization file that is automatically downloaded. The authorization is loaded into Apollo, and after a few seconds the "Authorizations Updated Successfully" window appears.

Registration and authorization is complete and Apollo is ready for use.

What Next?

- See "About Apollo Documentation" on page 7 to learn how to find the information you need.
- Contact our technical support team (see page 8) if you need assistance.

Device Driver Setup

Apollo's device drivers are the low-level software files that instruct the host computer system on how to communicate with the Apollo hardware. The Apollo drivers are loaded during computer startup so Apollo is ready to be used whenever host applications (Console, UAD Meter & Control Panel, DAW) are launched.

In addition to instructing the computer's operating system on how to control the Apollo hardware, the drivers are the software between the host application(s) and the Apollo hardware. The host applications use the drivers to route Apollo's input and output signals.

Console Settings Window

The Console application's Settings window is used to configure system-level audio interface I/O settings such as sample rate, clock source, and reference levels. These settings are used by host applications when they are configured to use Apollo as the audio interface. Even when Console is not open, these settings are stored by the Apollo drivers and will be used by other host applications.

Complete details are in the Apollo Software Manual but the most important aspects are covered below.

Accessing the Settings Window

Access the Console Settings Window by selecting "Settings" from the "Edit" menu within the Console application. The Console application can be accessed from the Menu Bar (Mac) or Task Bar (Windows).

Interface Settings Panel

The parameters below are in the Interface panel in the Console Settings window (items in the Console panel are detailed in the Apollo Software Manual).

Unit Selection

These settings are generally used when multiple Apollo units are connected to the same host computer simultaneously. Unit Selection determines which Apollo is being actively controlled by the Console application.

Note: Multiple Apollo units are not controlled concurrently by the Console application. To control a different unit, this setting must be switched.

Select Unit

When multiple Apollo units are connected, the Select Unit drop menu specifies which Apollo unit is being controlled by Console. If the UAD Link is inactive, only "None" is available.

When only one unit is connected, the single unit appears in this menu, providing a method to confirm that the Apollo drivers are properly communicating with the Apollo hardware.

Identify

Clicking this button will cause the currently selected unit's front panel LEDs to flash in a random pattern. This identifies the unit that is currently being controlled by Console. The current unit is changed with the Select Unit menu.

Global Interface Settings

These settings define the active sample rate and clock source for Apollo when Console is the only host application. Because these settings are part of the device drivers, when using a host DAW, these values are usually changed from within the DAW. If the settings are changed from within the DAW, the Console Settings window values are updated to reflect the changes.

Sample Rate

This setting defines the sample rate that will be used by Apollo's A/D and D/A converters and UAD Powered Plug-Ins. Higher sample rates have increased frequency response and larger storage requirements than lower rates (and with UAD Powered Plug-Ins, higher rates require more DSP).

Note that when Apollo is used with a DAW, the sample rate is set within the DAW application. In this scenario, the sample rate setting in Console is updated automatically to match the DAW's value (the value within Console does not need to be configured manually to match the DAW setting).

Clock Source

Apollo's master clock source for A/D and D/A conversion is set here. Internal clock or external clock from S/PDIF, ADAT, or Word Clock input can be specified.

Only one device in a system can be the master clock. This setting must match the host DAW setting or audio glitches could occur. For more information about clocking, see "Digital Clocking Basics" on page 27.

Line Outputs Reference Level

The reference level for line outputs 1 – 8 can be set to –10 dBV or +4 dBu in adjacent pairs with these drop menus. The value is usually set to match the nominal input level of devices connected to these outputs (a setting of +4 dBu outputs a higher signal level than –10 dBV).

Note: Reference levels for the line inputs are set in the Console application.

Monitor Output

The S/PDIF outputs can be configured to mirror the Monitor 1 & 2 outputs for connecting to the stereo inputs of other devices with digital S/PDIF inputs such as a speaker system, stereo recorder, or external D/A converter.

S/PDIF Mirrors Monitor 1–2

The stereo S/PDIF output mirrors the output of Monitor 1 & 2 when this box is checked. When Mirror mode is active, the Monitor Level knob will control the S/PDIF output level (the S/PDIF output is "post-fader" when mirrored).

Note: When this box is checked, any DAW outputs (including Console aux outputs) that are routed to the S/PDIF ports will not be heard, because the S/PDIF ports are switched to output the monitor bus instead.

DAW Settings

Digital audio workstation software contains settings to specify which audio interface will be used by the DAW for audio I/O. When Apollo is selected within the DAW to be used as the audio interface, Apollo's inputs and outputs become available for routing within the DAW.

Each DAW has unique methods for controlling the audio interface I/O settings and routings; consult the DAW documentation for specific instructions on how to setup a Core Audio (Mac) or ASIO (Windows) audio interface.

Audio Interface Buffer

The audio interface I/O buffer size is set within the DAW. This buffer size affects the amount of latency that will be generated when using Apollo's audio interface I/O and UAD Powered Plug-Ins loaded within the DAW environment.

If the DAW's software monitoring feature is used, this buffering latency may be unacceptable. However, by using Console for monitoring (without using the DAW's software monitoring feature), latency is a non-issue due to Apollo's Realtime UAD processing.

The audio interface buffer size also affects system performance. If the buffer setting is too low, glitches, dropouts, and/or distortion could occur in the audio and overall responsiveness of the host computer may become sluggish. If these symptoms occur when using Apollo, try increasing the buffer size.

Interconnections

Installation Notes

- Apollo may get hot during normal operation if it doesn't receive adequate airflow circulation around its chassis vents. For optimum results when mounting Apollo in a rack, we recommend leaving at least one empty rack space above the unit to allow adequate airflow for cooling.
- As with any sound system, to avoid audio spikes in your speakers, the following steps are recommended:
  1. Apply power to the speakers last, after all other devices (including Apollo) are powered on.
  2. Turn off the speakers first, before all other devices (including Apollo) are powered off.

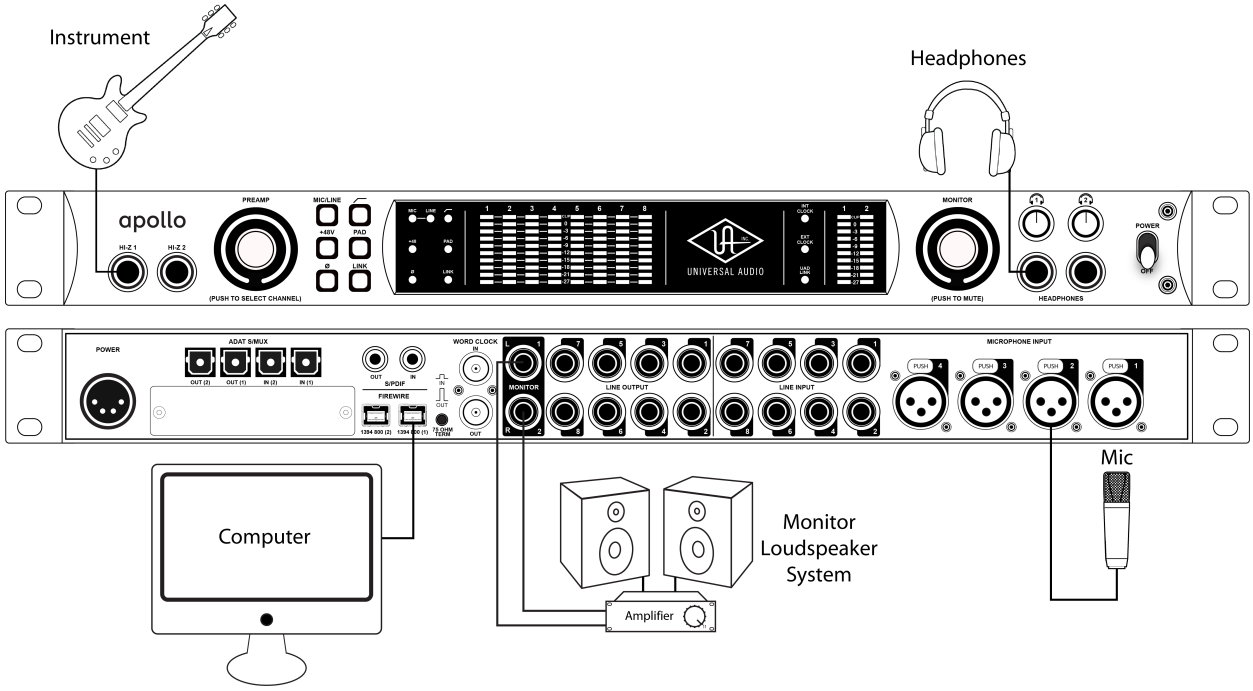
Basic Setup

This diagram illustrates a simple Apollo setup that might be used by an individual musician/engineer for recording and mixing.

The example shows an electric guitar connected to the Hi-Z input of channel 1 and a microphone connected to the XLR input of channel 2 so they can both be recorded simultaneously. Headphones are used during tracking to avoid track bleed from the monitor speakers (Monitor Mute is enabled during tracking). The left and right monitor outputs are connected to a loudspeaker system for use during mixdown.

Key points for this example:

- Two preamp channels are used (electric guitar and microphone)
- Mic/Line switch for channel 2 is set to "Mic"
- Monitor outputs are connected to powered monitors (or an amp+speaker system)



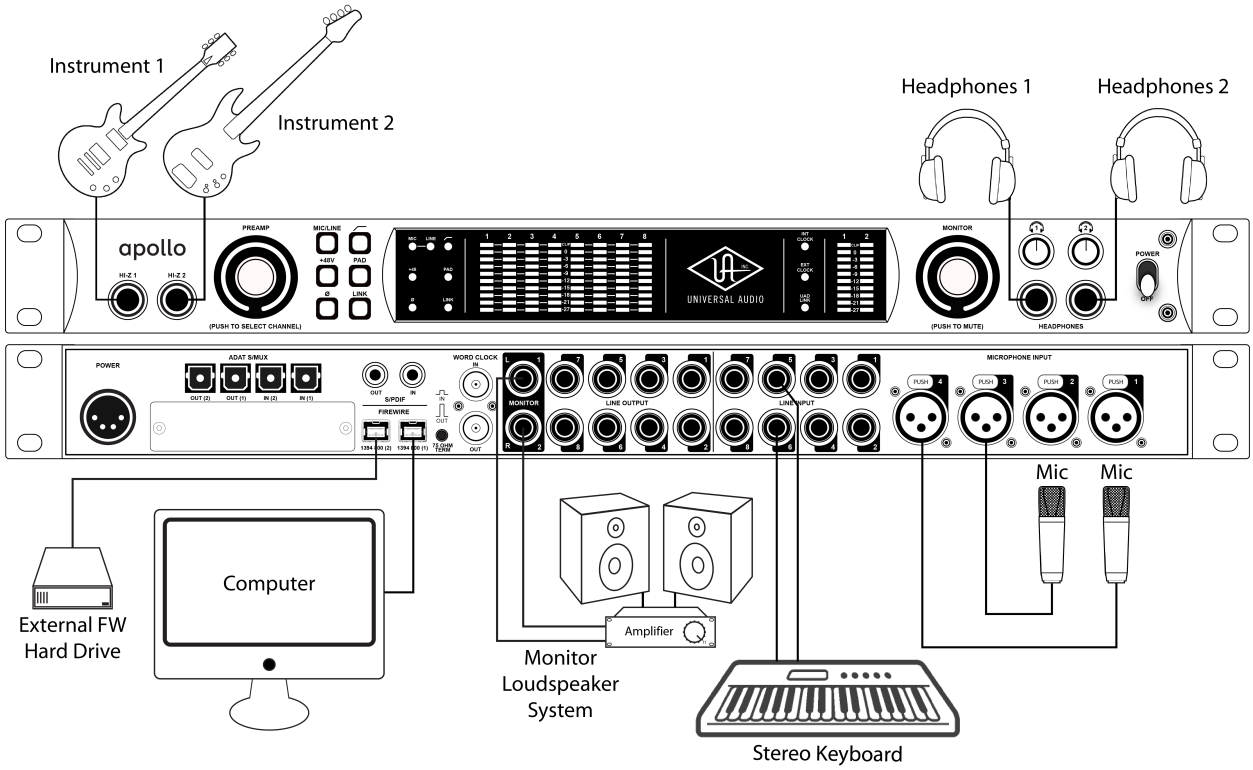
Typical Setup

This diagram illustrates an Apollo setup that might be used by two musicians that are recording simultaneously. In this setup, only analog devices are connected; digital I/O is not used.

The example shows an electric guitar and electric bass connected to the Hi-Z inputs, and microphones are connected to XLR inputs of channel 3 and 4. A stereo keyboard instrument is connected to line inputs 5 and 6, and an external FireWire hard drive is “daisy-chained” to Apollo’s second FireWire port. Both headphone outputs are used during tracking and the left/right monitor outputs are connected to a loudspeaker system for mixdown.

Key points for this example:

- Mic/Line switch for channels 3 and 4 are set to “Mic”
- Unique mixes can be sent to each headphone output for “more me” during tracking



Advanced Setup

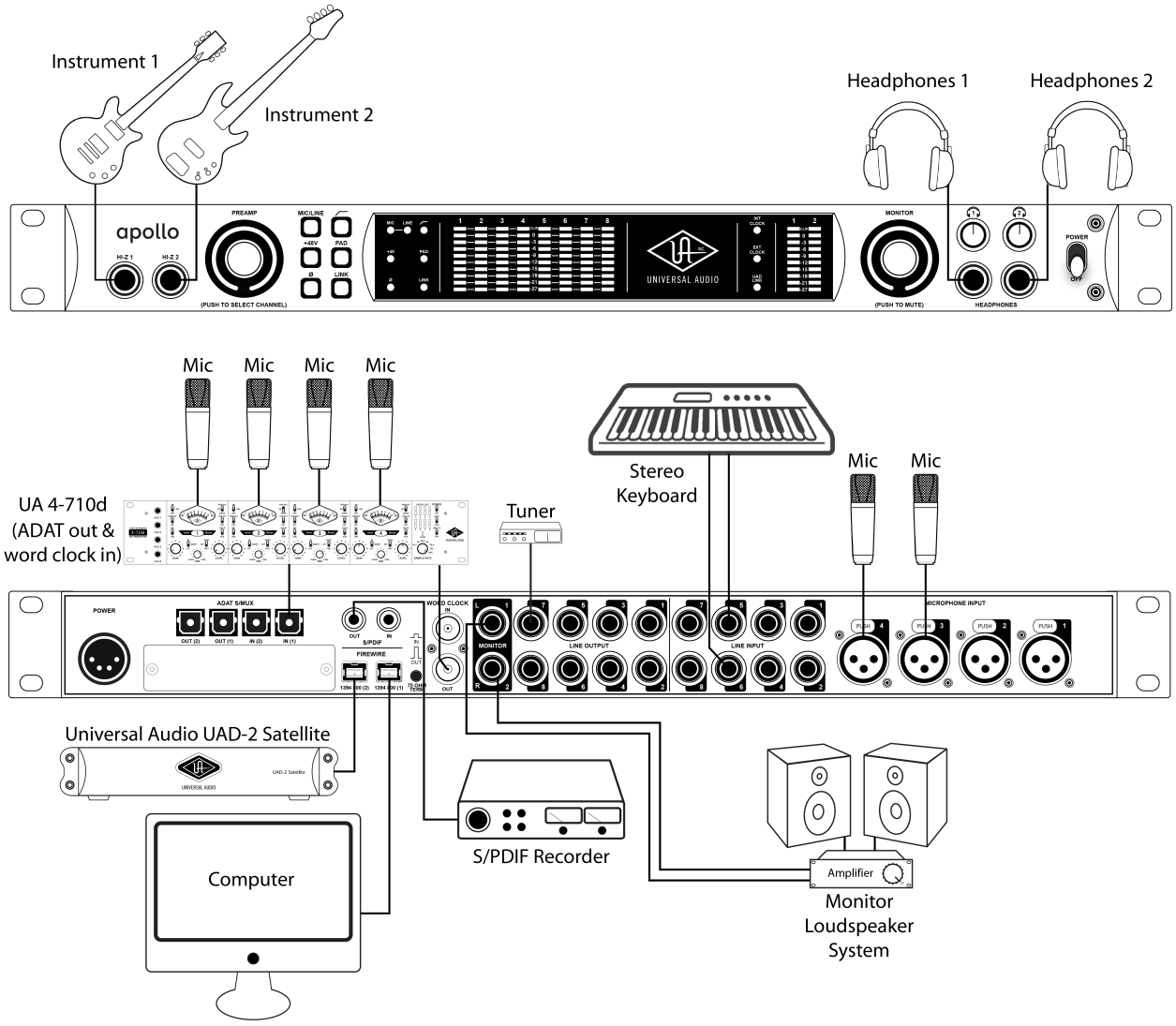
This diagram illustrates a more complex Apollo setup that might be used for recording an entire ensemble, utilizing both analog and digital I/O.

In addition to the connections in the previous example, four additional microphones are connected to UA's 4-710d Four-Channel Tone-Blending Mic Preamp w/ Dynamics. The 4-710d performs A/D conversion on these mics and their signals are digitally routed into Apollo via the ADAT Optical Interface. Apollo is the master clock source so the 4-710d is set to use external word clock (and a 75-ohm BNC word clock cable is interconnected).

The UAD-2 Satellite is connected to Apollo for additional DSP horsepower during mixdown. A digital recorder is connected to the S/PDIF outputs and a tuner is connected to analog line output 7.

Key points for this example:

- Mic/Line switch for channels 3 and 4 are set to "Mic"
- Four additional mic preamps from UA's 4-710d are routed into Apollo via ADAT Lightpipe
- Apollo is the master clock device; the 4-710d clock source is set to external word clock and the 4-710d Termination switch is engaged
  (Alternately, the 4-710d could be used as the master clock by setting the 4-710d to internal clock, setting Apollo to external ADAT clock, and eliminating the word clock cable)



FireWire Basics

FireWire (also known as “IEEE 1394” and “i.Link”) is a high-speed serial data interconnection protocol that is used to transfer digital data between devices. FireWire is commonly used to interconnect computer systems to hard drives, audio interfaces, and digital camcorders. A complete discussion of FireWire is beyond the scope of this manual, but some of the main points and how they apply to Apollo are covered below.

FireWire vs. USB

FireWire is considered superior to USB for audio purposes because it does not rely on the host processor to manage low-level data housekeeping (among other reasons). FireWire typically outperforms USB at the same rated speeds.

FireWire Bus

FireWire devices are connected to a FireWire “bus” which is comprised of all devices in the serial data stream. The FireWire specification supports up to 63 devices per FireWire bus.

Many FireWire devices and host computers have more than one FireWire connector, but these connectors almost always attach to the same FireWire bus (most computers do not have more than one FireWire bus). It is possible to add another FireWire bus to a computer, typically by adding a PCIe-to-FireWire or ExpressCard-to-FireWire adapter card.

Bus Power

Some FireWire devices can be “bus powered” which means the device derives its operating electricity from the FireWire bus itself without a power supply of its own. Apollo cannot be bus powered and it does not supply bus power from its FireWire ports to other devices.

Powering Down

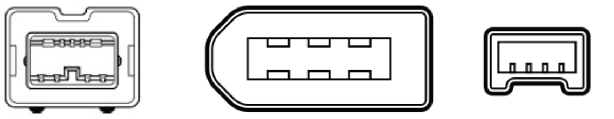
Powering down or disconnecting Apollo when UAD plug-ins are loaded could cause session data loss and/or unpredictable behavior. Quit all UAD host applications (DAW, Console, UAD Meter & Control Panel) before disconnecting Apollo.

FireWire 800 vs. FireWire 400

The most common FireWire devices are available in two speeds: FireWire 400 (IEEE 1394a), which supports transfer speeds up to 400 megabits per second, and FireWire 800 (IEEE 1394b), which supports up to 800 megabits per second. It's usually possible to determine the speed of the FireWire device by the type of FireWire connector it uses. Apollo is a FireWire 800 device.

FireWire Connectors

FireWire 800 and FireWire 400 devices use different connectors, as illustrated below. This helps to differentiate between the two device speeds; the connectors are not interchangeable.



FW 800 (9-pin) FW 400 (6-pin) FW 400 (4-pin)

FireWire 400 connectors

FireWire 400 devices typically have two types of connector: 4-pin and 6-pin. The small 4-pin FireWire 400 connector is common on digital camcorders and Windows notebook computers. The 6-pin connector is more common with hard drives and audio devices.

FireWire 800 connector

FireWire 800 devices use a 9-pin connector. 9-pin to 6-pin FireWire adapter cables are available to connect FireWire 800 devices to a FireWire 400 bus (with half the bandwidth).

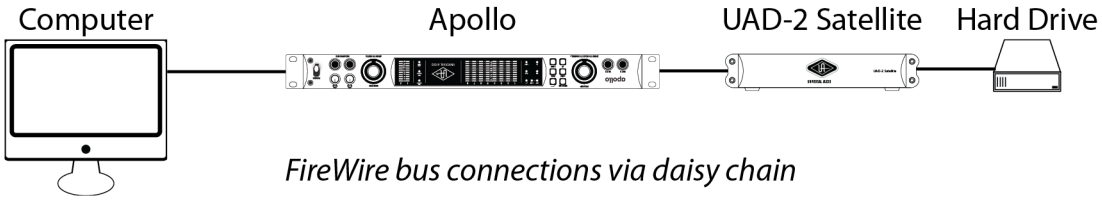
Apollo has two FireWire 800 ports to facilitate easy daisy chaining with other FireWire devices.

FireWire Repeaters and Chains

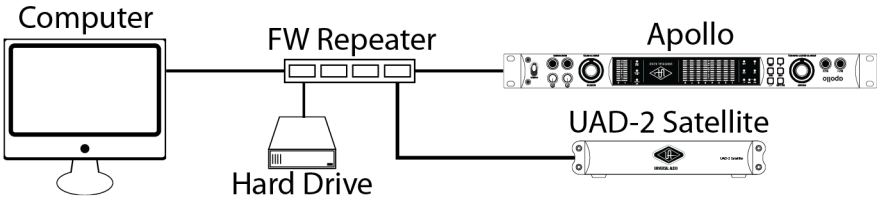
FireWire devices can be connected to each other serially in a "daisy chain," connected to a central device such as a computer with multiple FireWire ports or a peripheral FireWire repeater, or any combination of the two in a "tree chain" topology.

Apollo can function as a FireWire repeater, by using the unused port on the unit to connect other FireWire devices. Note that Apollo does not supply FireWire bus power to downstream devices.

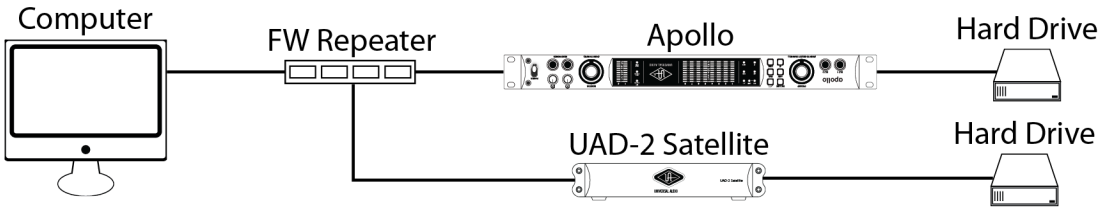
The examples below show a few of the many interconnection possibilities using daisy chains and repeaters.



FireWire bus connections via daisy chain



FireWire bus connections via repeater



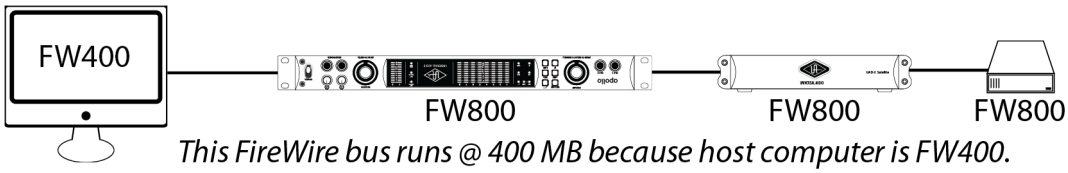
FireWire bus connections via repeater and daisy chain

Mixing FireWire Speeds

Although FireWire 400 and FireWire 800 devices can be connected to the same FireWire bus via a repeater or daisy chain, special precautions must be observed to maximize bandwidth in these situations.

FireWire 800 devices on a FireWire 400 bus

FireWire 800 devices are backwards-compatible and can be connected to a FireWire 400 bus using a 9-pin to 6-pin FireWire cable or adapter. However in this scenario any 800 megabit-capable devices on the bus (including Apollo) will operate at a maximum of 400 megabits because FireWire bandwidth cannot exceed the maximum bus speed of the host computer.



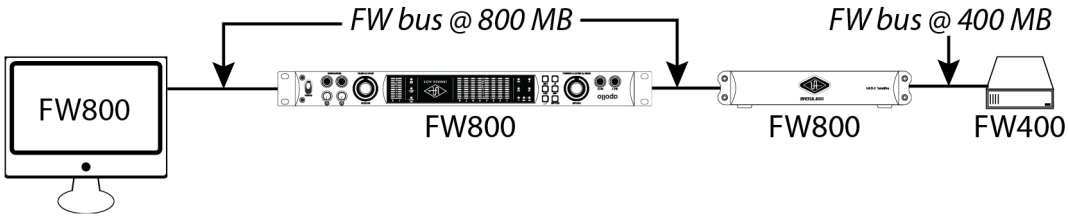
FireWire 400 devices on a FireWire 800 bus

FireWire 400 devices can be connected to a FireWire 800 bus using a 6-pin to 9-pin FireWire cable or adapter. However, if the FireWire 800 devices are located after the FireWire 400 devices in the daisy chain, all FireWire devices will operate at a maximum of 400 megabits because the FireWire 400 devices force all subsequent devices to run at FireWire 400 speeds.

It is possible to configure a FireWire bus to run at both FireWire 400 and FireWire 800 speeds simultaneously if the host computer bus is FireWire 800, supporting maximum throughput with a mix of FireWire 400+FireWire 800 devices. This is accomplished by putting any/all FireWire 400 devices AFTER any/all FireWire 800 devices in a daisy chain or tree chain. If (and only if) FireWire 400 devices are attached to a FireWire 800 bus after the end of all FireWire 800 devices in a daisy chain or tree chain, the FireWire 800 devices will operate at 800 megabits while the FireWire 400 device operates at 400 megabits. The diagram below illustrates the recommended configuration when Apollo is sharing a FireWire 800 bus with FireWire 400 devices.

Recommended Mixed Speed Setup

The example below shows the correct method of interconnecting FireWire 800 and FireWire 400 devices to a FireWire 800 computer bus. Any mixture daisy chains, repeaters, and/or tree chains may be used, as long as all the FireWire 400 devices are placed after all the FireWire 800 devices.



This FireWire bus runs optimally at both 800 megabits and 400 megabits because the FireWire 400 device is located AFTER the FireWire 800 devices in the setup.

Digital Clocking Basics

Digital clocking is a complicated issue, with a number of important aspects that are often not very well understood.

First and foremost, a digital clock is used to maintain synchronization between different digital devices. There are two primary purposes for clock synchronization:

- Digital Conversion. Analog-to-digital (A/D) conversion and digital-to-analog (D/A) conversion need extremely accurate clocking in order to correctly process the digital data. A low-quality clock can degrade the signal in many ways, including loss of transparency, clarity, imaging and transient response, as well as increased noise and distortion.
- Digital Transmission. All digital devices need accurate clocking in order to properly transfer digital data between interconnected devices. A low-quality clock can cause data reception errors, which add distortion and noise, and if the clock isn't synchronized correctly, samples may be dropped or repeated, resulting in audible clicks or dropouts.

Clock quality is defined two ways: First, the sample rate must match the signal. This is referred to as "sample rate synchronization." Second, the clock signal must be stable over both short-term and long-term clocking intervals. "Jitter" refers to short-term clock accuracy, and "stability" or "drift" refers to long-term clock accuracy. These terms are discussed in more detail below.

Sample rate synchronization is required for proper digital transmission, and is relatively easy to maintain. Basically, there must be one and only one "clock master" for all interconnected digital devices. This is done by setting one device to "master" mode (where it synchronizes to its internal clock and transmits that clock signal) and setting every other device to "slave" mode (where it receives and synchronizes to external clock), with the appropriate clock signal routed between the master and slave devices. Keep in mind that any device, whether it's the clock master or a slave, can send or receive data once everything is synchronized correctly.

When doing digital conversion, it's best to have the converter serve as the clock master. For example, if you're recording, clock everything off the A/D converter. Likewise, if you're mixing, clock everything off the D/A converter. If you're running multiple converters, use the device with the best quality clock as master.

For all-digital transfers, e.g., a digital transfer from one DAW or storage device to another, clock synchronization is maintained by simply setting up the proper master-slave relationship between devices. Digital transfers can be affected by clock jitter, but not in the same way clock jitter affects analog conversion. This is a widely misunderstood concept we'll discuss in detail below.

Clock jitter is short-term variations in the timing of edges of a clock signal, as opposed to clock drift, which is long-term variation in the clock rate. A clock could be very stable over the long term, but still have jitter, and vice versa. Timing variations are caused by noise and/or interference. If the noise/interference is a high-frequency signal, the result is jitter, and if the noise/interference is a low-frequency signal, the result is drift. As an analogy, a car with an out of balance wheel may drive straight, but you'll get lots of vibration (jitter); conversely, a car with a loose steering wheel might have a smooth ride, but it will drift all over the road.

Clock drift affects long-term synchronization, like sound to picture, and can introduce slight pitch variations in the audio. Usually however, the drift is so slow that these pitch variations are only tiny fractions of a cent, and thus unnoticeable.

Clock jitter affects digital transmission and digital conversion differently, as follows:

- Clock jitter in digital transmission can be caused by a bad source clock, inferior cabling or improper cable termination, and/or signal-induced noise (called “pattern-jitter” or “symbol-jitter”). Digital signal formats like AES/EBU, S/PDIF, and ADAT all embed a clock in the digital signal so the receiving device can synchronize to the transmitted data bits correctly. The clock used for data recovery is extracted from the signal using a clock synchronization circuit called a phase-locked-loop (PLL). This data-recovery PLL must be designed to respond very quickly to attenuate high-frequency jitter and avoid bit errors during reception. This clock from the data-recovery PLL cannot be used to generate the clocks used for digital conversion without further clock conditioning! This is a very common design flaw in most low- and mid-range digital converters.
- Clock jitter in digital conversion is what most people refer to when they discuss jitter. It’s easily observed in a digital signal by looking at its spectrum in the frequency domain. A jittery signal will have “side-lobes” around each frequency and/or spurious tones at random, inharmonic frequencies. Usually, the jitter will be worse with higher signal frequencies. You can test your converters by sampling a high-quality 10 kHz sine wave, and viewing it in the frequency domain (available with any good wave editing software package).

All modern over-sampling digital converters require a clock (called “m-clock”) that is many times (typically several megahertz) higher than the sample clock. M-clock is easy to generate when the converter is the clock master, but quite difficult to generate correctly when the converter needs to sync to an external clock.

External clock typically comes from a dedicated word clock input, or is extracted from the incoming digital AES/EBU, S/PDIF, or ADAT signal. Word clock cannot be used by the converters until it is multiplied up to the m-clock rate. This requires a PLL or other frequency multiplier circuit which will either be cheap and jittery, or expensive and clean, depending on who makes the converter. As we said earlier, the clock recovered from the digital inputs is unsuitable for use as the converter’s m-clock, but because it’s conveniently at the same frequency, many designers don’t bother cleaning up this signal.

Since the clock recovery, clock multiplier, and clock conditioning circuitry define the jitter for analog conversion, no external clock source can clean up the jitter introduced by these circuits, regardless of how perfect the external source clock is. The best they can do is avoid making it any worse, but this is hardly worth the cost: It’s much better (and less expensive) to use a good converter like Apollo than it is to try and fix a bad one with an expensive master clock. The only reason to spend money on a high-quality master clock is to ensure that multiple devices are synchronized correctly. This is essential for working with audio for film/video, or when synchronizing multiple high-quality converters. A poor master clock can also affect imaging and clarity in a multi-track environment.

Apollo provides high-quality A/D and D/A conversion for recording and/or playback. With its pristine audio path, high-quality clocking, and simple front panel controls, it makes a great master or slave audio interface for every digital studio, and thus provides a very cost effective way to improve overall sound quality.

Specifications

All specifications are typical performance unless otherwise noted, tested under the following conditions: 48 kHz internal sample rate, 24-bit sample depth, 20 kHz measurement bandwidth, with balanced output.

SYSTEM	
I/O Complement	
Microphone Inputs	4
High-Impedance Inputs	2
Analog Line Inputs	8
Analog Line Outputs	8
Analog Monitor Outputs	2 (1 stereo pair)
Headphone Outputs	2 stereo (independent mix buses)
ADAT	Up to 8 channels via dual I/O ports with S/MUX
S/PDIF	1 stereo input, 1 stereo output
FireWire 800 (IEEE 1394b)	Dual ports
Thunderbolt (via Option Card)	Dual ports
Word Clock	1 input, 1 output
A/D – D/A Conversion	
Supported Sample Rates (kHz)	44.1, 48, 88.2, 96, 176.4, 192
A/D Bits Per Sample	24
Simultaneous A/D conversion	8 channels
Simultaneous D/A conversion	14 channels
Analog Round-Trip Latency	1.1 milliseconds @ 96 kHz sample rate
Analog Round-Trip Latency with four serial UAD-2 plug-ins via Console application	1.1 milliseconds @ 96 kHz sample rate
ANALOG I/O	
Analog Inputs 1 – 8	
Frequency Response	20 Hz – 20 kHz, ±0.1 dB
Channel Separation (Crosstalk)	>120 dB
Microphone Inputs 1 – 4	
Jack Type	Female XLR Balanced (pin 2 positive)
Phantom Power	+48V, Switchable
Dynamic Range	118 dB (A–weighting)
Signal-to-Noise Ratio	118 dB (A–weighting)
Total Harmonic Distortion + Noise	–110 dB
Equivalent Input Noise	–128 dB
Common-Mode Rejection Ratio	>60 dB (10’ cable)
Input Impedance	5.4 Kilohms
Gain Range	+10 dB to +65 dB
Pad Attenuation	20 dB
Maximum Input Level (Minimum Gain, with Pad)	23.9 dBV
Maximum Input Level (Maximum Gain, with Pad)	–31.1 dBV

(continued)

Hi–Z Inputs	
Jack Type	¼” Male (Mono TS plug required)
Dynamic Range	117 dB (A–weighting)
Signal-to-Noise Ratio	117 dB (A–weighting)
Total Harmonic Distortion + Noise	–103 dB
Input Impedance	2.2 Megohms
Gain Range	+10 dB to +65 dB
Maximum Input Level (Minimum Gain)	10 dBV
Maximum Input Level (Maximum Gain)	–45 dBV
Line Inputs 1 – 4	
Jack Type	¼”Male TRS Balanced
Dynamic Range	117 dB (A–weighting)
Signal-to-Noise Ratio	117 dB (A–weighting)
Total Harmonic Distortion + Noise	–107 dB
Common-Mode Rejection Ratio	>60 dB (10’ cable)
Stereo Level Balance	±0.05 dB
Input Impedance	10 Kilohms
Gain Range	+10 dB to +65 dB
Maximum Input Level (Min Gain)	18 dBV
Maximum Input Level (Max Gain)	–37 dBV
Line Inputs 5 – 8	
Jack Type	¼” Male TRS Balanced
Dynamic Range	117 dB (A–weighting)
Signal-to-Noise Ratio	117 dB (A–weighting)
Total Harmonic Distortion + Noise	–107 dB
Common-Mode Rejection Ratio	>60 dB (10’ cable)
Stereo Level Balance	±0.05 dB
Input Impedance	10 Kilohms
Gain Settings	+4 dBu / –10 dBV (selectable)
Maximum Input Level (+4 dBu)	18 dBV
Maximum Input Level (–10 dBV)	–6 dBV
Line Outputs 1 – 8	
Jack Type	¼” Male TRS Balanced
Dynamic Range	118 dB (A–weighting)
Frequency Response	20 Hz – 20 kHz, ±0.1 dB
Signal-to-Noise Ratio	118 dB (A–weighting)
Total Harmonic Distortion + Noise	–106 dB
Stereo Level Balance	±0.05 dB
Channel Separation	>120 dB
Output Impedance	600 Ohms
Maximum Output Level	18 dBV

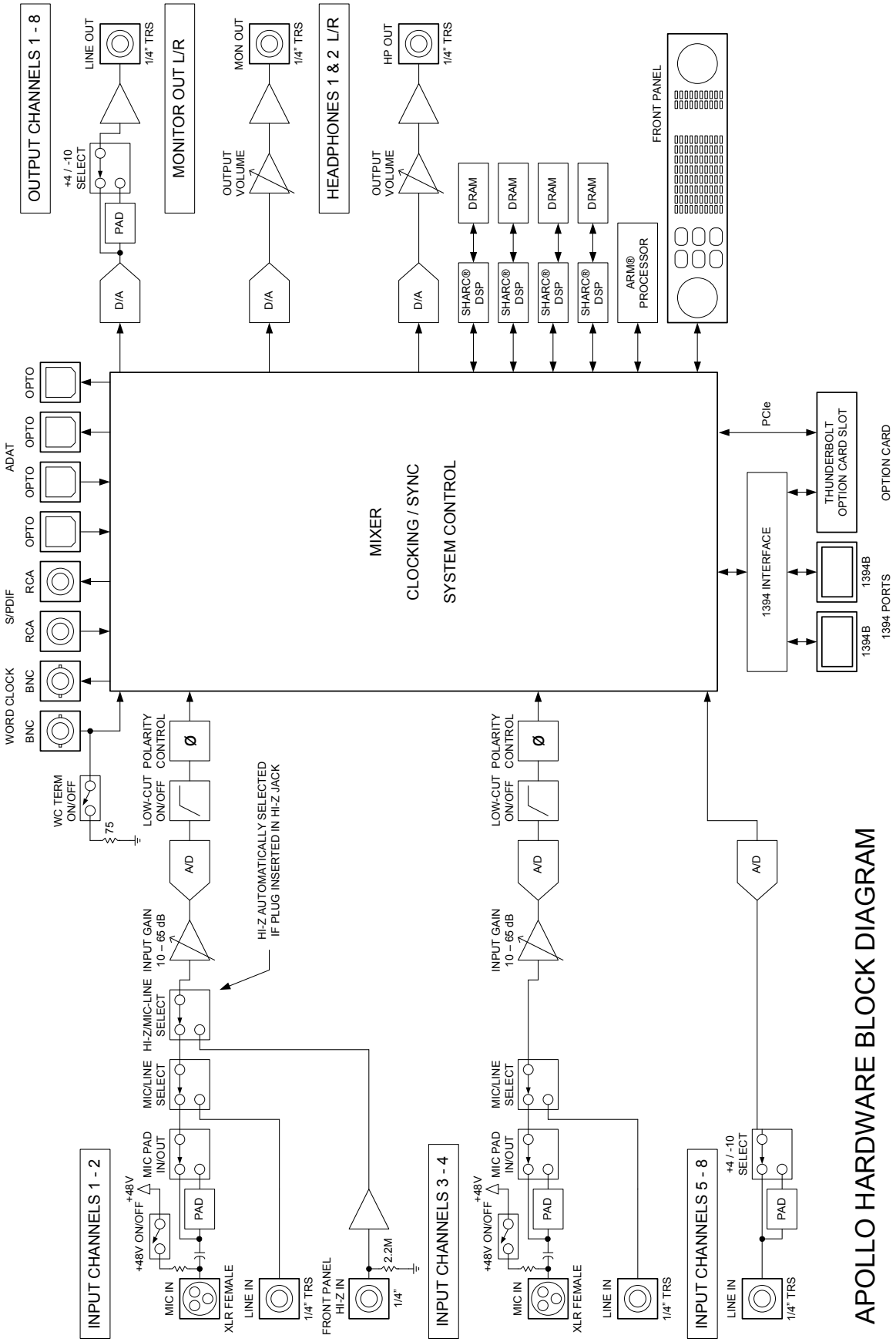
(continued)

Monitor Outputs 1 – 2	
Jack Type	¼" Male TRS Balanced
Frequency Response	20 Hz – 20 kHz, ±0.1 dB
Dynamic Range	115 dB (A–weighting)
Signal-to-Noise Ratio	114 dB (A–weighting)
Total Harmonic Distortion + Noise	–103 dB
Channel Separation	>120 dB
Stereo Level Balance	±0.05 dB
Output Impedance	600 Ohms
Output Gain Range	-78 dBV to 18 dBV
Maximum Output Level	18 dBV
Stereo Headphone Outputs 1 & 2	
Jack Type	¼" Male TRS Stereo/Unbalanced
Frequency Response	20 Hz – 20 kHz, ±0.1 dB
Dynamic Range	113 dB (A–weighting)
Signal-to-Noise Ratio	113 dB (A–weighting)
Total Harmonic Distortion + Noise	–101 dB
Channel Separation	>114 dB
Output Impedance	12 Ohms
Output Gain Range	0 dBV to 15 dBV
Maximum Output Level	80 milliwatts
DIGITAL I/O	
S/PDIF	
Jack Type	Phono (RCA)
Format	IEC958
ADAT	
Jack Type	Optical TOSLINK JIS F05
Format	ADAT Digital "Lightpipe" with S/MUX
Channel Assignments @ 44.1 kHz, 48 kHz	Port 1 = Channels 1 – 8, Port 2 = 1 – 8 (mirrored)
Channel Assignments @ 88.2 kHz, 96 kHz	Port 1 = Channels 1 – 4, Port 2 = Channels 5 – 8
Channel Assignments @ 176.4 kHz, 192 kHz	Port 1 = Channels 1 – 2, Port 2 = Channels 3 – 4
Word Clock	
Jack Type	BNC
Lock Range	±0.5% of any supported sample rate
Word Clock Input Termination	75 Ohms, switchable
Synchronization Sources	
Internal, Word Clock, S/PDIF, ADAT	

(continued)

Electrical	
Power Supplies	External AC to DC Power Supply Brick Internal DC to DC Power Supply
AC Connector Type	IEC Male
AC Requirements	100V – 240V AC, 50 – 60 Hz
DC Connector Type	XLR 4-Pin Locking Male (Neutrik P/N NC4MDM3-H)
DC Requirements	12 VDC, ±5%
Maximum Power Consumption	6.5 amperes
Environmental	
Operating Temperature Range	0º Celsius to 40º Celsius
Storage Temperature Range	–40º Celsius to 80º Celsius
Operating Humidity Range	10% – 95% Non-Condensing
Altitude	0 to 6000’
Mechanical	
Dimensions	
Width	19”
Height	1.75” (1U rack space)
Depth, Chassis Only	12.125”
Depth, Including Knob & Jack Protrusions	13.5”
Shipping Box (Width x Depth x Height)	24” x 17” x 8”
Weight	
Shipping Weight (with box & accessories)	18 pounds
Weight (bare unit)	9.1 pounds
Package Contents	
Apollo Audio Interface	
External Power Supply	
Apollo Hardware Manual	
Software Installation Disk	
6’ FireWire 800 cable	
(2) IEC AC Power Cables (USA & Europe)	
Set of (4) Rack-Mount Screws	
Universal Audio Product Catalog	

Hardware Block Diagram



Troubleshooting

The table below lists some common operational issues and steps you can take to help resolve the situation. If you need further help, contact our technical support team (see page 35).

SYMPTOM	ITEMS TO CHECK
Unit won't power on	• Confirm power supply connections at power supply input and back of unit • Confirm Power switch is not in "OFF" position • Confirm AC power is available at wall socket by plugging in a different device
No monitor output	• Confirm connections, power, and volume of monitoring system • Confirm monitor knob is turned up • Confirm monitor outputs are not muted (push monitor knob) • Confirm monitor LEDs are active (check signal flows)
Can't hear channels 1 – 4	• Confirm preamp gain is turned up for the channel(s)
Can't hear mic or line input(s)	• Confirm mic/line switch setting is correct for the channel • Confirm nothing is plugged into the channel's Hi-Z input
Can't hear Hi-Z input(s)	• Confirm volume on connected device is turned up • Confirm Hi-Z input cable is 1/4" TS only (not TRS)
Can't hear mic input(s)	• Confirm +48V phantom power is on (if required by microphone)
Preamp controls have no affect on channel	• Confirm desired channel is selected for control (push Preamp knob) • Preamp controls are available for channels 1 – 4 only
Can only adjust input channels 1 – 4	• Signal levels for all other inputs, including digital inputs, are adjusted at the device connected to those inputs
Audio glitches and/or dropouts during playback	• Increase audio buffer size setting • Confirm clocking setups (check cable connections and confirm all device clocks are synchronized to one master clock device)
Undesirable echo/phasing	• Confirm input monitoring is not enabled in both Console and DAW
UAD Link LED is red	• Confirm FireWire or Thunderbolt connections • Confirm Apollo software is installed • Restart computer and power cycle Apollo • Reinstall Apollo software • Try a different FireWire or Thunderbolt cable
Static and/or white noise is heard when nothing is plugged in	• Lower preamp gain to minimum on all unused preamp channels (mic preamps can emit noise even when nothing is plugged in) • Some UAD plug-ins actually model the noise characteristics of the original equipment; defeat the noise model in the plug-in GUI or mute the channel containing the plug-in to temporarily mute the noise

Additional Resources

Universal Audio Website

Our website contains a wealth of information about our full line of products, as well as videos, software updates, FAQs, the online store for purchasing plug-in licenses, and a great blog that features hot tips, techniques, and interviews with your favorite artists, engineers and producers. Find us online at:

- www.uaudio.com

Technical Support

Universal Audio provides free customer support to all registered Apollo users. Our support specialists are available to assist you via email and telephone during our normal business hours, which are from 9am to 5pm, Monday through Friday, Pacific Standard Time.

Telephone

USA toll-free: +1-877-MY-UAUDIO (1-877-698-2834)
International: +1-831-440-1176
FAX: +1-831-461-1550

Online Support

To request online support via email, please visit our main support page at the URL below, then click the "Submit Support Ticket" button on the right side of the loaded page to create a help ticket.

- www.uaudio.com/support

Maintenance

Apollo does not contain a fuse or other user-replaceable parts. The unit is internally calibrated at the factory and recalibration should never be required. No internal user adjustments are available.

Voltage Selection

Although there are only two versions of the Apollo hardware unit (DUO and QUAD), the retail package contents for these models depend on the destination market; the difference is the included power supply unit (PSU). The PSU for Japan accepts 100VAC only, while the PSU for the rest of the world is auto-sensing for 110VAC – 240VAC. Be sure to use only the correct PSU for your region.

Warranty

UNIVERSAL AUDIO HARDWARE LIMITED WARRANTY

Universal Audio warrants that its hardware will be free from defects in materials and workmanship for one (1) year after it has been acquired by the original end-user purchaser, subject to normal use.

This warranty applies only to genuine Universal Audio products when sold by Universal Audio or a Universal Audio authorized reseller, distributor, or dealer.

This warranty does not cover claims for damage due to abuse, neglect, alteration, or attempted repair by unauthorized personnel and is limited to failures arising during normal use that are due to defects in material or workmanship in the product.

To see the full terms of the Universal Audio Hardware Limited Warranty, which contains additional information and exclusions, or to process a warranty claim, please see: www.uaudio.com/support or call 877-698-2834 and we will send you a copy. This limited warranty gives you specific legal rights. You may also have other rights which vary by state or country.

Repair Service

If you are having trouble with Apollo, the first step is to consult the Troubleshooting table on page 34. If that doesn't help, contact our technical support team using any method on page 35 (customers outside the United States should contact your local distributor). When calling for help, please have the product serial number available and have your unit set up in front of you, powered, up, and exhibiting the issue.

If your hardware is not working properly, our goal here at UA is to get you up and running again as soon as possible. If it is determined your product requires repair, you will be informed about where to ship it and a Return Merchandise Authorization number (RMA) will be issued to you. The RMA number MUST be displayed on the outside of your shipping box (please use the original factory packing materials if at all possible). We will match the shipping method you use to get it to us (i.e., if you ship it to us via UPS ground, we will ship it back to you UPS ground; if you overnight it to us, we will ship it back to you overnight). You'll pay the shipping costs to us (including warranty repairs); we ship it back to you free of charge. Qualified repair service under warranty is, of course, also free of charge. For gear no longer under warranty, ask your technical support representative about the current bench repair costs. Non-warranty repairs are charged an hourly labor rate plus parts. We'll do our best to service your unit as quickly as possible.

Notices

Important Safety Information

Before using this unit, be sure to carefully read the applicable items of these operating instructions and the safety suggestions. Afterwards, keep them handy for future reference. Take special care to follow the warnings indicated on the unit, as well as in the operating instructions.

1. **Water and Moisture** - Do not use the unit near any source of water or in excessively moist environments.
2. **Object and Liquid Entry** - Care should be taken so that objects do not fall, and liquids are not spilled, into the enclosure through openings.
3. **Ventilation** - When installing the unit in a rack or any other location, be sure there is adequate ventilation. Improper ventilation will cause overheating, and can damage the unit.
4. **Heat** - The unit should be situated away from heat sources, or other equipment that produce heat.
5. **Power Sources** - The unit should be connected to a power supply only of the type described in the operating instructions, or as marked on the unit.
6. **Power Cord Protection** - AC power supply cords should be routed so that they are not likely to be walked on or pinched by items placed upon or against them. Pay particular attention to cords at plugs, convenience receptacles, and the point where they exit from the unit. Never take hold of the plug or cord if your hand is wet. Always grasp the plug body when connecting or disconnecting it.
7. **Grounding of the Plug** - This unit is equipped with a 3-wire grounding type plug, a plug having a third (grounding) pin. This plug will only fit into a grounding-type power outlet. This is a safety feature. If you are unable to insert the plug into the outlet, contact your electrician to replace your obsolete outlet. Do not defeat the purpose of the grounding-type plug.
8. **Cleaning** - Follow these general rules when cleaning the outside of the unit:
   a. Turn the power Off and unplug the unit
   b. Gently wipe with a clean lint-free cloth
   c. Do not use aerosol sprays, solvents, or abrasives
9. **Nonuse Periods** - The AC power supply cord of the unit should be unplugged from the AC outlet when left unused for a long period of time.
10. **Damage Requiring Service** - The unit should be serviced by a qualified service personnel when:
    a. The AC power supply unit has been damaged; or
    b. Objects have fallen or liquid has been spilled into the unit; or
    c. The unit has been exposed to rain; or
    d. The unit does not operate normally or exhibits a marked change in performance; or
    e. The unit has been dropped, or the enclosure damaged.
11. **Servicing** - The user should not attempt to service the unit beyond that described in the operating instructions. All other servicing should be referred to qualified service personnel.

Disclaimer

The information contained in this manual is subject to change without notice. Universal Audio, Inc. makes no warranties of any kind with regard to this manual, including, but not limited to, the implied warranties of merchantability and fitness for a particular purpose. Universal Audio, Inc. shall not be liable for errors contained herein or direct, indirect, special, incidental, or consequential damages in connection with the furnishing, performance, or use of this material.

Trademarks

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Federal Communications Commission Compliance

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 this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

European Commission Compliance

We hereby declare that the equipment listed herein conforms to the harmonized standards of the following European Commission Directives: 2004/108/EC and 72/72/EC.

Trade Name: Apollo High-Resolution Audio Interface
Model Number: Apollo QUAD, Apollo DUO

Test Information is contained in a report by Atlas Compliance & Engineering, Inc.
Dated November 23, 2011
Report No.: 1145UAlapo1394_ce_ce

65-40424 Rev B 120130

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