Altitude™

OEM Guide

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LEITCH®

Contents

Altitude Hardware Overview

The award-winning digital disk recorder hardware platform from the Leitch Post Production group, Altitude features true dual-stream real-time HD operation, real-time multi-stream SD performance, compressed and uncompressed video, format flexibility, and exceptional future expansion capabilities. Altitude was developed with the same hardware expertise that won us a technical Emmy® Award in 2000, and packs all of its remarkable capabilities onto a single card for use in a Windows XP-based workstation.

Altitude features full-quality, online playback of two HD video streams, two dynamic graphics streams, and true dual-stream real-time HD transitions and effects. Altitude's hardware-based effects also offer full-quality immediate feedback on the HD monitor.

More than just an innovative HD platform, Altitude also features extraordinary SD real-time performance, with full-quality, real-time playback of eight SD video streams plus eight dedicated graphics streams. Ten of these video and graphics streams, in any combination, can be transitioned, layered and composited in real-time, with remaining graphics streams available as wipe borders and DVE masks.

The optional A3DX™ 3D DVE daughtercard adds one channel of real-time high-definition 3D DVE and four channels of real-time standard-definition 3D effects – including perspectives, warps and rotation – plus real-time masks, chroma/luma keying, blur and more. This effects processing happens right on the Altitude hardware, not limited by the host system's CPU or graphics card performance.

All of this real-time power can be performed on both compressed and uncompressed HD video. Recording and playback can be done in 8-bit or 10-bit uncompressed, or using our own online-quality compression format. Compressed and uncompressed footage can be mixed in real-time, without affecting performance.

Altitude supports 1080i, 1080PsF and 720p HD formats at all common frame rates, plus 525 and 625-line (NTSC and PAL) standard-definition formats. In addition to SMPTE-292 HD-SDI I/O, Altitude also features VGA HD output, enabling HD playback to be viewed on VGA monitors and inexpensive YUV displays, reducing the need for expensive HD displays. HD output is also simultaneously down-converted for monitoring on SD displays. Standard-definition I/O is available through SDI. Embedded SDI audio is supported, as well as discrete AES/EBU I/O and unbalanced analog monitoring.

Altitude also offers a choice of video storage architectures. An optional on-board dual-channel SCSI daughtercard is available, providing the fastest pipeline directly into the Altitude hardware. For those wishing to use a different type of controller or networked storage, Altitude also provides the flexibility of using separate system storage controllers over the host system bus.

Key Features and Benefits

Altitude provides a wide range of benefits for OEM applications. Not only does Altitude provide extensive hardware capabilities, but its flexible architecture, free SDK, and easy-to-use API and support tools provide tremendous advantages for developers.

Feature	Explanation and Benefits
Real-time HD performance: two video + two graphics streams	Altitude features full-quality, online playback of two HD video streams, two dynamic graphics streams, and true dual-stream real-time HD transitions and effects. This isn't CPU-based "real-time"; this is guaranteed, hardware-based dual-stream performance.

Feature	Explanation and Benefits
Optional real-time 3D effects with A3DX™ 3D DVE module	The optional A3DX™ 3D DVE module adds one channel of real-time HD 3D DVE and four channels of real-time SD 3D effects – including perspectives, warps and rotation – plus real-time masks, chroma/luma keying, blur and more. Effects can be applied to video or graphics streams. The 3D DVE uses a 16-bit pipeline to reduce quantising issues, and sub-pixel interpolation for smooth effects. This effects processing happens right on the Altitude hardware, not limited by the host system's CPU or graphics card performance. The A3DX does *not* require an additional PCI slot.
16-bit precision for wipes and 3D DVE effects	16-bit precision provides exceptionally smooth effects and transitions.
Real-time effects and transitions	Altitude offers a wide range of keyframeable, hardware-based, real-time effects and transitions, including: • wipes and dissolves • 3D transitions (fly-aways, warps, peels, etc.) *(requires A3DX)* • 2D/3D DVE *(requires A3DX)* • color correction • secondary color correction *(requires A3DX)* • proc amp controls • 32-bit graphics overlay • text rolls and crawls • speed changes and reverse playback • pixel effects (solarize, posterize) *(requires A3DX)* • masks and "garbage mattes" *(requires A3DX)* • blur *(requires A3DX)* • advanced multi-target chroma and luma keying *(requires A3DX)*
Hardware-based codecs, effects and transitions	All real-time effects processing happens right on the Altitude hardware, providing guaranteed, predictable performance and leaving the CPU's power for the most important task – your application software. Altitude's hardware-based effects also offer full-quality immediate feedback on the HD monitor. Altitude's hardware-based codecs ensure that performance is not impacted by the choice of uncompressed or compressed video.
Efficient device drivers with low CPU usage	The Altitude device drivers are efficient, with extremely low CPU usage – again helping to leaving the CPU's power for your application software.
Compressed and uncompressed (10-bit and 8-bit) video	Recording and playback can be done in 8-bit or 10-bit uncompressed, or using Altitude's online-quality LWC-1 compression format. HD storage requirements are huge, but not every project needs to be fully uncompressed. Altitude offers developers the flexibility to balance storage space and bandwidth with quality requirements. Compressed and uncompressed footage can even be mixed, without affecting performance. (Note that dual-stream real-time playback of two uncompressed video streams requires the SCSI-7000 dual-channel SCSI daughtercard.)
Feed Forward Entropy Calculation when compressing video	Altitude uses Feed Forward Entropy Calculation to calculate the entropy of the current frame or field while feeding it forward to the compression engine. The compression engine then uses the results of the entropy calculation to determine the minimum amount of compression that will be required to fit the frame or field into the desired size, providing the highest possible quality for the user's specified output data rate.

Feature	Explanation and Benefits
Live video processing	In addition to disk-based video and graphics streams, Altitude also provides a live video stream directly from the input. Titles, rolls, crawls, graphics and effects (including 3D DVEs with the optional A3DX 3D DVE module) can be applied to the live feed, and live video can be mixed with disk-based media – making Altitude ideal for live presentation applications, live CG/titling, live effects, etc.
Optional dual-channel SCSI disk controller daughtercard, plus support for separate storage controllers for network or system storage	For video storage, the optional SCSI-7000 dual-channel SCSI daughtercard provides the fastest pipeline directly into the Altitude hardware, and saves the slot in the host system that would be required for a separate dedicated mass storage controller. For those wishing to use a different type of controller or networked storage (for example, for server-type applications), Altitude also provides the flexibility of using separate system storage controllers for video files through the host system bus. The SCSI-7000 is required for dual-stream uncompressed operation.
Flexible HD frame formats and rates	Altitude supports 1080i, 1080PsF and 720p HD frame formats at a variety of frame rates: • 1080i @ 60 / 59.94 / 50 fields per second • 1080PsF @ 30 / 29.97 / 25 / 24 / 23.976 frames per second • 720p @ 60 / 59.94 / 50/ 30 / 24 / 23.976 frames per second
Real-time SD performance: eight video + eight graphics streams	Altitude features unparalleled standard definition real-time layering performance, with full-quality playback of eight SD video streams plus eight dedicated graphics streams (media storage data rates permitting). Ten of these video and graphics streams, in any combination, can be transitioned, layered and composited in real-time, with remaining graphics streams available as wipe borders and DVE masks. Eight channels of color correction are freely assignable across these streams, and the A3DX 3D DVE module (see above) adds four channels of simultaneous standard-def 3D DVE. Both 525 and 625-line (NTSC and PAL) are supported.
Flexible "fabric" video mixer architecture	Altitude's extensive standard-definition real-time performance is further enhanced by its flexible new "fabric" mixer architecture. This architecture provides powerful flexibility in applying mixer resources (e.g. color correctors, matte generators, mix/effects layers and DVE/DSK layers) to the video streams (most useful with the eight streams available in SD) – combining the guaranteed, real-time performance of hardware with the mixing and effects flexibility normally associated with software-based solutions. The fabric architecture also allows the two SDI outputs to be assigned completely different video mixes, to the extent that the Altitude hardware could act as two "virtual separate cards", each using different sources, DVEs and graphics, and providing different output.
HD/SD SDI Input and Output	The Altitude hardware features switchable HD/SD SDI connections for input and output. One input and two outputs are included standard with Altitude, supporting HD-SDI (SMPTE-292) in high-definition mode, or SMPTE-259 SDI in standard-definition mode. The two outputs can be routed as identical or discrete (for example, program/preview or fill/alpha), or configured as one HD and one SD, with the latter outputting the simultaneous down-conversion of the HD playback. Each input and output supports two groups (eight channels) of embedded audio. A second SDI video input is available with the optional SDI-7000 daughtercard.

Feature	Explanation and Benefits
Optional SDI-7000 Second SDI Input Daughtercard	The optional SDI-7000 daughtercard adds a second switchable HD/SD SDI input (with embedded audio support) to the Altitude hardware, enabling recording from either input individually, recording of discrete sources from both inputs simultaneously, recording of fill and key directly into a 32-bit media file, or mixing of the two live inputs.
VGA HD Monitoring Output	In addition to HD-SDI I/O, Altitude also features VGA HD output, enabling HD playback to be viewed on compatible VGA monitors and reducing the need for expensive high-definition displays. A software-selectable YUV output mode enables VelocityHD to output to analog component HD devices through VGA-BNC adapters.
Simultaneous down-conversion of HD playback and composite analog monitoring	HD output is also simultaneously down-converted for monitoring on SD displays. A dedicated composite analog video output is provided for down-converted monitoring. The SDI outputs can also be configured as one HD and one SD, with the latter outputting the simultaneous down-conversion of the HD playback.
3:2 pull-down insertion	Altitude provides 3:2 pull-down insertion at output for 59.94i output of 23.976PsF video.
Simultaneous fill & key output	The two discrete output channels can be configured to provide simultaneous fill (foreground) and key (alpha channel) output of video files with associated motion alpha channel.
Embedded audio	Each SDI input and output supports two groups (eight mono channels) of embedded audio. The SDI audio de-embedder supports both synchronous and asynchronous audio input streams. Two groups are embedded into each output at a fixed sample rate of 48kHz and locked to video. 16 and 20-bit audio word widths are supported in SD, while 16, 20 and 24-bit audio word widths are supported for HD-SDI (this applies to both embedding and de-embedding).
AES/EBU audio	Altitude features two unbalanced (BNC, 75 ohm) AES inputs (four mono channels) and four unbalanced AES outputs (eight mono channels), and supports both synchronous and asynchronous audio input streams. The sample rate converters can be bypassed to preserve inputs carrying non-audio data (e.g. AC3). The four AES outputs can be flexibly routed, enabling two AES for each of program and preview outputs, simultaneous 5.1 and stereo output, or other combinations.
Analog audio monitoring	Unbalanced stereo analog outputs are provided for audio monitoring.
Simultaneous HD playback and recording	Altitude can simultaneously record one channel of video while playing back up to two streams of video from disk (media storage data rates permitting). Thus, pre-recorded footage can be played back without interrupting recording (e.g. instant replay applications), or footage can be ingested without interrupting playback of footage from disk (e.g. mini-server applications). This functionality can also be used for "playcording", allowing the output of the media playback streams to be "mixed down" and recorded simultaneously.
Genlock input	Altitude can genlock to the SDI video capture input signal, or to the dedicated reference video input (tri-level or composite sync).

Feature	Explanation and Benefits
Optional BOB-7000 rack-mountable audio/video breakout box	The optional BOB-7000 rack-mountable breakout box consolidates all video and audio connections for a clean, professional installation. The BOB-7000 also includes a built-in USB to RS-422 adapter for RS-422 device control. The BOB-7000 also adds balanced XLR AES/EBU to the standard unbalanced BNC AES/EBU connections.
Optional BOB-7002 breakout box with video bypass	The optional BOB-7002 incorporates all of the features of the BOB-7000, plus HD/SD SDI video bypass. The BOB-7002 is ideal for on-air and mission critical applications. With the video bypass relay, SDI input #1 is bypassed directly to SDI output #1 automatically (in the case of power or signal fault) or manually (via GPI or software trigger).
GPI Inputs on BOB-7000 and BOB-7002	Two GPI inputs are provided on the optional BOB-7000 and BOB-7002 breakout boxes for remote triggering of events. The BOB-7002 also includes a third GPI input specifically for triggering the video bypass relay.
LTC Input and Output *(coming soon)*	LTC (Longitudinal Time Code) input and output connections are provided for time code support.
SDI Meta Data Support *(coming soon)*	Altitude supports meta data capture and insertion to/from the HANC and/or VANC regions of the SDI inputs and outputs.
Support for multiple cards in single host computer	Multiple Altitude cards can be used in a single host PC and controlled by a single application. Altitude and Quattrus cards can also be used together in the same host system.
FPGA technology enables future enhancements	Significant future enhancements to Altitude are also possible without any new hardware, through our extensive use of FPGAs, or field-programmable gate arrays. Leitch has been incorporating FPGA technology into our products for many years, including our Reality and Quattrus hardware. With FPGAs, new capabilities can be added through simple firmware upgrades. Thus, new features that we add to Altitude in the future can be easily deployed on existing Altitude installations.
Free SDK Including Easy-to-Use API	The Altitude SDK is *free to qualified developers*. The Altitude SDK features the same easy-to-use API architecture that many Reality and Quattrus OEM developers commented very favorably on, allowing a great deal of control without bogging down in lower-level details.
Dynamic hardware resource allocation allows simultaneous use of Velocity and OEM software	OEM applications can dynamically allocate some hardware resources (e.g. a graphics buffer and down-stream key) between the Velocity software and OEM software applications. This permits OEM plug-ins such as character generators or sub-titlers to run at the same time as Velocity. Velocity operates as normal (less the re-allocated graphics buffer), with the OEM application able to use the graphics buffer and DSK to key over the output from Velocity's timeline.
HyperThreading support in drivers	Because the Altitude drivers are multi-threaded, they can take advantage of multi-processor systems *and* single-CPU systems that support HyperThreading (which splits a single physical processor into two or more logical processors, providing faster execution at lower cost than dual CPUs).
Virtual Tape File System (VTFS)	The uniquely flexible VTFS provides direct seamless and transparent interchange between Altitude video files and all major graphic file formats. See the FAQ "What is the Virtual Tape File System?" later in this document for more information.
XML timeline files from Velocity	Velocity (version 8.0 or higher), VelocityQ and VelocityHD timeline files are stored in an XML format, providing an easy mechanism for OEM applications to import projects from our popular non-linear editing systems.

The Software Development Kit (SDK)

A complete software development kit (SDK) is available for Altitude. The SDK includes HTML documentation with direct links to the API reference, example programs, debug and release libraries, and more. The Altitude SDK features the same easy-to-use API architecture that Reality and Quattrus OEM developers commented very favorably on, allowing a great deal of control without bogging down in lower-level details.

How much does the SDK cost? How do I obtain it?

The SDK is free to authorized OEMs and qualified developers. To obtain the SDK, submit an E-mail request to sdk.support@leitch.com. In your E-Mail, provide a brief description of who you are and what you plan to use the SDK for. Upon receipt of this request, a development representative will contact you, and if you qualify, will provide the required forms (developer agreements, non-disclosure agreements, etc.). Once we receive these forms back from you completed and signed, you will be sent the SDK.

How Do I Become an Authorized OEM?

If you are interested in becoming an authorized Altitude OEM, please contact your local Leitch Post Production regional sales manager. He will work with our OEM team to determine how you intend to utilize the Altitude hardware, projected quantities you will require, etc, and to formalize any relevant contracts, non-disclosure agreements, etc.

Note that you do *not* have to be an authorized OEM in order to obtain the software development kit (SDK); the SDK is available to qualified developers, regardless of whether or not they have a formal OEM agreement with us (see the separate section about the SDK for information on how to obtain it). OEM authorization is required to be able to purchase the Altitude hardware at OEM pricing for redistribution as part of an OEM solution.

How much is OEM pricing for Altitude?

OEM pricing for the Altitude hardware is only available to authorized Altitude OEM partners, and will vary depending on quantity commitments and desired options. Your OEM sales contact will work with you to establish pricing as part of the above authorization process.

Frequently Asked Questions

Does Altitude support uncompressed or compressed video?

Both. HD storage requirements are huge, but not every application needs to be fully uncompressed. Altitude offers the flexibility to balance storage space and bandwidth with the quality requirements for your particular application. Recording and playback can be done in 8-bit or 10-bit uncompressed, or using our online-quality LWC-1 compression format (intraframe compression with its roots in wavelet technology). Compressed and uncompressed footage can be mixed in real-time without affecting performance. (Note that dual-stream real-time playback of two uncompressed streams requires the SCSI-7000 dual-channel SCSI daughtercard).

Altitude's compression supports variable compression, not just particular fixed rates, and supports compression ranges from roughly 1.5:1 to 7:1 (8-bit LWC-1 compression, relative to 8-bit uncompressed YUV), or roughly 2:1 to 9:1 (10-bit LWC-1 compression, relative to 10-bit uncompressed). When compressing video, Altitude uses Feed Forward Entropy Calculation to calculate the entropy of the current frame or field while feeding it forward to the compression engine. The compression engine then uses the results of the entropy calculation to determine the minimum amount of compression that will be required to fit the frame or field into the desired size, providing the highest possible quality for the user's specified output data rate. LWC-1 compression also works at the full raster size (i.e. 1920x1080 or 1280x720), unlike some other HD codecs that work with a subsample of the raster (e.g. 1440x1080 or 960x720).

Does Altitude offer true dual-stream real-time HD performance?

Yes. Altitude features full-quality, online playback of two HD video streams, two dynamic graphics streams, and true dual-stream real-time HD transitions and effects. With all of the "fuzzy" definitions of the term "real-time" out there, it's worth clarifying our definition. What *we* mean by real-time is *guaranteed, instant, full-quality playback on the video monitor, with no rendering required for final output*. This isn't CPU-based performance that might degrade depending on the number, combination or duration of effects. This is hardware-based dual-stream performance, with guaranteed real-time performance. (Note that dual-stream real-time playback of two 10-bit uncompressed streams requires the SCSI-7000 dual-channel SCSI daughtercard). Altitude's hardware-based effects also offer full-quality immediate feedback on the HD monitor, enabling you to build powerful full-quality HD interactivity into your applications.

Are Altitude's real-time effects hardware-based or software-based?

All real-time effects processing happens right on the Altitude hardware, providing guaranteed, predictable performance regardless of effects combinations, and without reliance on the host system's CPU or graphics card performance. In combination with the extremely low CPU usage of the Altitude device drivers, this ensures that the CPU's power is left to the most important task – your application software. Altitude's hardware-based effects also offer full-quality immediate feedback on the HD monitor, enabling you to build powerful full-quality HD interactivity into your applications. Altitude's hardware-based codecs ensure that performance is not impacted by the choice of uncompressed or compressed video.

What video I/O does Altitude support?

Altitude features switchable HD/SD SDI connections for input and output. One input and two outputs are included standard with Altitude, supporting HD-SDI (SMPTE-292) in high-definition mode, or SMPTE-259 SDI in standard-definition mode. The two outputs can be routed as identical or discrete (for example program/ preview or fill/alpha), or configured as one HD and one SD, with the latter outputting the simultaneous down-conversion of the HD playback. (A dedicated composite analog video output is also provided for down-converted monitoring.) Each input and output supports two groups (eight channels) of embedded audio. A second SDI video input is available with the optional SDI-7000 daughtercard.

In addition to HD-SDI I/O, Altitude also features VGA HD output, enabling HD playback to be viewed on compatible VGA monitors and reducing the need for expensive high-definition displays. The VGA up-converter contains the necessary frame rate conversion and de-interlacing circuits to provide a high quality VGA output. The available selection of VGA output raster and frame rates depends on the current HD operating standard of the unit (see the specifications section for details). A software-selectable YUV output mode enables Altitude to output to analog component HD devices through VGA-BNC adapters.

What audio I/O does Altitude support?

Each Altitude SDI input (one) and output (two) supports two groups (eight mono channels) of embedded audio. The SDI audio de-embedder supports both synchronous and asynchronous audio input streams. Two groups (eight mono channels) are embedded into each SD/HD SDI video output at a fixed sample rate of 48kHz and locked to video. 16 and 20-bit audio word widths are supported in SD, while 16, 20 and 24-bit audio word widths are supported for HD-SDI (this applies to both embedding and de-embedding).

Altitude features two unbalanced (BNC, 75 ohm) AES inputs (four mono channels) and four unbalanced AES outputs (eight mono channels), and supports both synchronous and asynchronous audio input streams. The sample rate converters can be bypassed to preserve inputs carrying non-audio data (e.g. AC3). 32kHz, 44.1kHz, 48kHz and 96kHz inputs are supported, with output fixed to 48KHz at 16, 20, or 24-bit word resolution. The four AES outputs can be flexibly routed, enabling two AES for each of program and preview outputs, simultaneous 5.1 and stereo output, or other combinations. Unbalanced stereo analog outputs are provided for audio monitoring.

Does Altitude replace Quattrus in the Leitch Post Production product line?

No. Quattrus remains an active product with ongoing development, and continues to provide exceptional multi-stream standard-definition performance, with features including guaranteed playback of four simultaneous video streams, six graphics streams, and optional two or four-channel 3D DVE. Quattrus represents a powerful yet cost-effective platform for multi-layer standard-definition applications. Altitude is intended for high-definition applications, standard-definition applications requiring more than four video streams, or for those currently developing standard-definition applications and wishing a built-in path to HD with no hardware upgrades required. It represents an addition to the Leitch Post product line, not a replacement.

Are Reality and Quattrus media files compatible with Altitude (in standard-def)?

Not directly. Altitude uses the new **.ltv** video file format, whereas Quattrus and Reality use the **.dps** format. Furthermore, for compressed video, Altitude uses our new LWC-1 compression format, while Quattrus and Reality use MJPEG. Even for uncompressed media files, however, the architectural differences in the file formats preclude cross-compatibility. A standalone conversion utility is available to convert Quattrus or Reality media files to the Altitude format.

What kind of mass storage controller does Altitude require?

The optional SCSI-7000 storage daughtercard for Altitude provides dual SCSI channels for video storage. The SCSI-7000 provides the fastest pipeline directly into the Altitude hardware, and saves a valuable slot in the host system that would be required for a separate dedicated mass storage controller. For those wishing to use a different type of controller or networked storage, Altitude also provides the flexibility of using separate system storage controllers through the host system bus, though some restrictions apply (for example, sustained simultaneous playback of two uncompressed video streams is not possible without the SCSI-7000 dedicated SCSI daughtercard). The optional SCSI-7000 controller provides optimal performance.

Does Altitude support the Virtual Tape File System™?

Like all of our hardware platforms, Altitude features the Virtual Tape File System (VTFS), providing seamless and transparent interchange between Altitude video files and all major graphic file formats. While video data is stored on the system as .LTV video files, the VTFS makes the video data *also* appear to application programs as sequences of frames in a variety of common image file formats, including TGA, CIN, DPX and JPG. The key is that these frames in these formats don't actually exist until an application specifically accesses a frame – hence the "Virtual" in VTFS. When an application accesses a specific frame in its preferred format, the VTFS automatically generates that frame in that format from the actual stored .LTV video clip, with no manual conversion steps required. Similarly, an application can save a numbered frame in any of the supported formats, and it will automatically be incorporated directly into the specified video clip, ready for immediate output. The VTFS also enables simultaneous read and write network access from multiple machines without the file locking problems typical in other solutions. Note that the VTFS operates only on drives connected to the optional dedicated SCSI-7000 storage controller; VTFS functionality is not available on system or network storage.

What are the system requirements for Altitude?

Altitude requires a host system with at least one available full-length 3.3V-compatible 64-bit/66MHz PCI slot. The Windows® XP Professional operating system is required. Lists of tested compatible motherboards and VGA adapters are available on the Leitch web site in the VelocityHD product pages. For the latest system recommendations and compatibility guidelines, please contact your Leitch representative or visit us at www.leitch.com.

Altitude Hardware Options

While many OEMs will find the capabilities of the basic Altitude board to be sufficient, these options add further capabilities and expand the possible applications of Altitude.

A3DX™ *3D DVE*

The A3DX™ 3D DVE module adds one channel of real-time high-definition 3D DVE and four channels of real-time standard-definition 3D effects – including perspectives, warps and rotation – plus real-time masks, chroma/luma keying, blur and more. Effects can be applied to video or graphics streams. The 3D DVE uses a 16-bit pipeline to reduce quantising issues, and sub-pixel interpolation for smooth effects. The A3DX is a daughtercard that plugs directly into the Altitude mainboard, and does not require an additional PCI slot or IRQ.

SCSI-7000 *Dual-Channel SCSI Daughtercard*

The SCSI-7000 dual-channel SCSI daughtercard provides the fastest media storage pipeline directly into the Altitude hardware, enabling dual-stream uncompressed HD operation, and saving the slot in the host system that would be required for a separate dedicated mass storage controller.

SDI-7000 *Second SDI Input Daughtercard*

The SDI-7000 daughtercard adds a second switchable HD/SD SDI input (with embedded audio support) to the Altitude hardware, enabling recording from either input individually, recording of discrete sources from both inputs simultaneously, recording of fill and key directly into a 32-bit media file, or mixing of the two live inputs.

BOB-7000 *Rackmountable Breakout Box*

The BOB-7000 rackmountable breakout box consolidates all video and audio connections for a clean, professional installation, and includes a built-in USB to RS-422 adapter for RS-422 device control. The BOB-7000 also features balanced XLR AES/EBU connections, which are not available on the regular breakout cable (the breakout cable includes unbalanced BNC AES/EBU connections).

BOB-7002 *Rackmountable Breakout Box*

The BOB-7002 incorporates all of the features of the BOB-7000, plus HD/SD SDI video bypass. The BOB-7002 is ideal for on-air and mission critical applications. With the video bypass relay, SDI input #1 is bypassed directly to SDI output #1 automatically (in the case of power or signal fault) or manually (via GPI or software trigger).

Sample Applications

The following are examples of potential applications for Altitude. The possible applications are endless, but these will give you ideas of what the Altitude hardware is capable of. Some are actual applications that are in development by various OEMs using the Altitude hardware; others were developed for the Reality or Quattrus hardware and could be migrated to HD with Altitude; others are suggestions of potential applications. Many of these examples are intentionally vague, to protect the trade secrets of the OEM developers working on them.

Video Playout / Standalone Digital Disk Recorder

The Altitude hardware is ideal for incorporation into standalone video playout devices, for use either by keyboard, mouse or remote control. Altitude is ideal for integration as a video playout device for presentation applications, theater, scoreboards, as a deck replacement in a studio, or numerous other applications.

Specialized Mini-Server Applications

Altitude's above-mentioned video playout capabilities, combined with its ability to simultaneously play and record, and its support for file sharing over network-based storage (such as SANs) make it well suited to basic server-style applications. In addition to studio operations, Altitude's ability to provide extensive flexibility and capabilities in a small form-factor makes it ideal for mobile mini-server applications such as OB vans.

Live Presentation Support

Altitude's ability to mix a live source with two streams of pre-recorded HD footage is ideal for live presentation applications. Altitude can transition between live and pre-recorded footage, apply DVE effects to the live source as well as disk-based material, and apply graphics and titles to the live footage, enabling live support to be created that blends the live source with pre-edited materials with interactive or pre-determined timing.

Non-Linear Editing

While we already offer Altitude as part of a powerful, full-fledged non-linear editing solution, VelocityHD, there remain specialized NLE applications that require different toolsets and workflows unique to the particular application. The extensive hardware features of Altitude make it the ideal platform for such development.

Video for Audio Post

A number of digital audio workstation developers already offer compatibility with the Reality hardware, thereby providing a full-quality, time-accurate video reference for users editing, composing, and mixing audio for film, television and video. The Altitude hardware allows a similar process using high-definition video, particularly useful in projects utilizing HD dailies.

Character Generation and Sub-titling (Live or Post)

Altitude's ability to overlay dynamic graphics streams (including text rolls and crawls) over both live and pre-recorded video in real-time makes it ideal for both live and post-production character generation and titling applications. Plus, through dynamic hardware resource allocation, OEM titling plug-ins can run simultaneously with the Velocity software, keying over top of the output from Velocity's timeline.

Live Effects Processing

Altitude's extensive array of hardware-based real-time effects offers a variety of potential applications for live effects generation. For example, Altitude could be used to overlay a DVE window of pre-recorded video over a live feed, with speed changes, color correction and more.

Stillstore / Clipstore

A variety of still and clipstore products are already based on the Reality hardware, and Altitude's capabilities are ideal for bringing these applications into the HD domain. The Virtual Tape File System is ideal for stillstore applications, allowing seamless and transparent support of graphics file formats directly from the file system.

Video Output Device for Graphics Applications

Altitude makes an ideal HD output device for computer-based 2D and 3D graphics applications. Examples of this type of application (in standard-def) are Curious Software's use of our Reality hardware for broadcast video I/O from their Curious World Maps animated map software, and Mercator's use of Reality for map visualization

and graphical data output for broadcasts of the 2000 Russian Presidential elections. Altitude offers enhanced versions of the same features offered by Reality, bolstered by new capabilities such as network storage support.

Replay

Altitude is ideal for HD slow-motion replay applications. A wide array of other replay applications exist using our SD hardware platforms (not even necessarily slow-motion) for not only sports (such as scoreboards, broadcast, etc.) but also security and other markets. Like our earlier platforms, Altitude features the ability to play back while recording, ideal for playing back replays without interrupting the capturing of the entire event.

Medical Imaging

With miniature video cameras increasingly being used in both medical diagnosis and treatment, there is a wide range of medical imaging applications for which Altitude is well suited. Altitude's ability to process high definition video in 10-bit uncompressed is a key feature for such applications, where digital processing and interpretation of the video images must be artifact-free.

Feedback From Leitch SDK / OEM Developers

The following quotes are from developers who have used the Reality and Quattrus hardware for their OEM applications. The Altitude SDK features the same easy-to-use API architecture that drew acclaim from Reality and Quattrus OEM developers.

- "At Curious Software Reality was among the very first PC video boards we supported, and we've recently added support for Quattrus. I'm pleased to be able to tell you that the experience of supporting both boards has been entirely positive. Of all the boards with proprietary APIs, Leitch's SDK has been the most straightforward to understand and support. A huge number of our valuable software engineering hours were saved by the fact that [Leitch] supplies a simple C API rather than the highly complex COM APIs so favoured in the industry – we were able to get up and running almost immediately because of this. In addition, we received a superb level of support… I believe that our customers who use Curious World Maps in conjunction with Reality and Quattrus have been equally satisfied with the product."

  – Justin Wise, Director, Curious Software (www.curious-software.com)

- "I like the Reality hardware because of the incomparable performance/price ratio, and features such as the Virtual Tape File System and integrated dedicated hard drive controller. The SDK support is great, with thorough explanations and fast response."

  – Petr Robek, Auto Pro Lada (www.autoprolada.cz)

- "One reason we selected Reality was the simplicity of the API. It allowed us a great deal of control, and still abstracted enough functionality so as not to bog us down in the lower level details. I found it very easy to use, which ultimately lead to timely integration with our product. Also, I have been extremely pleased with Leitch's SDK support department. They have great deal of expertise and have answered all of my questions no matter how technical or simplistic. They provide immediate responses and have been there for us before, during and after the development of our project."

  – Gregg Everett, Software Engineer, Kay Elemetrics Corp. (www.kayelemetrics.com)

Appendix: Altitude Specifications (without Breakout Box)

SD/HD SDI VIDEO SPECIFICATIONS	
Line/frame rates supported	• 1080i/60, 1080i/59.94, 1080i/50 • 1080PsF/30, 1080PsF/29.97, 1080PsF/24, 1080PsF/23.98 • 720p/60, 720p/59.94, 720p/50, 720p/24, 720p/23.98 • SD-525, SD-625
Standards	SMPTE 292M, SMPTE 259M-C, SMPTE 274M, SMPTE 240M, SMPTE 272M
Input Impedance	75 Ohms
Input Quantity & Connector	1 BNC (IEC 169-8)
Input Return Loss	> 18dB, typical over a frequency range of 5 MHz to 1.5 GHz > 15dB, minimum over a frequency range of 5MHz to 1.5GHz
Input Equalization	Automatic, adjustment-free cable equalization
Input Sensitivity	<100mV
Input Cable length	For HD 135m min, for SD 250m min of Belden 1694A cable
Output Impedance	75 Ohms
Output Quantity / Connector	2 BNC (IEC169-8)
Output Return Loss	> 18dB, typical over a frequency range of 5 MHz to 1.5 GHz > 15dB, minimum over a frequency range of 5MHz to 1.5GHz
Output Signal Level	800 mV ±10%
Output D.C. Offset	0.0 V + 0.5 V
Output Rise and Fall Time	< 270 ps (20 to 80% amplitude), not differing by 100 ps for HD, between 400 to 700 ps (20 to 80% amplitude) for SD
Output Overshoot	<10%
Output Jitter	< 135 ps peak-to-peak for HD < 0.2 UI (740 ps) peak-to-peak for SD
Miscellaneous	EDH insertion on output
ANALOG VIDEO SPECIFICATIONS (monitoring)	
Standards	NTSC, PAL-B (BNC: 1V, 75 Ohms)
Frequency Response	±0.4dB from 0 Hz to 5.0 MHz
Signal to Noise	>54dB
AES AUDIO SPECIFICATIONS	
Standard	AES3-1992, AES 3id-1995, EIAJ CP-340, SMPTE276M
Input Quantity & Connector	2 BNC (IEC 169-8)
Sample Resolution	16/20/24-bit
Input Sampling Rates	32kHz, 44.1kHz, 48 kHz, 96kHz
Input Impedance	75 Ohms
Input Return Loss	> 40dB, typical from 0.1Hz to 6.0MHz > 30dB, worst case from 0.1Hz to 6.0MHz
Input Sensitivity	120mVpp to 2.5Vpp
Maximum Input Signal	2.5Vpp
Rise / Fall time	5 to 30 ns (10% to 90%)
Output Common Mode Component	>30dB below output signal (0 to 6MHz)
Output Sampling Rate	48 kHz
Output Quantity / Connector	4 BNC (IEC169-8)
Output Coupling	AC Coupled

Output Impedance	75 Ohms
Output Return Loss	> 40dB, typical from 0.1 Hz to 6.0 MHz > 30dB, worst case from 0.1 Hz to 6.0 MHz
Output level	1.0V +/-10% (terminated)
Output Jitter	< 0.025UI
Output Rise / Fall time	5 to 30 ns (10% to 90%)
ANALOG AUDIO SPECIFICATIONS (monitoring)	
Sampling Rate	48 kHz
Output Quantity / Connector	2 RCA (left & right)
Output level	>3.30Vpp
Signal to Noise Ratio	>90dB A-weighted
GENLOCK (REFERENCE INPUT) SPECIFICATIONS	
Standard	SMPTE-318M
Input Quantity & Connector	1 BNC (IEC169-8)
Input Sensitivity	> 100mV
Input Impedance	75 Ohm or High-Z (software controlled)
Input Return Loss	>35dB (25Hz to 10MHz)
CMRR	>60dB @60Hz for a 10Vpp input signal
Input Types	NTSC/PAL Color black or 2V sync or Tri-level sync
OTHER SPECIFICATIONS	
LTC Input	RCA connector, 0.4Vpp to 5Vpp, High Impedance termination
LTC Output	RCA connector, 1.0Vpp to 2.0Vpp, 75 Ohms output impedance
VITC Output	BNC connector, 1Vpp, 75 Ohms output impedance
VGA Output	• 15-pin D shell (female) connector • Available VGA output raster and frame rates depends on the current HD/SD operating standard of the unit, as follows: HD Standard: 1080p/24sF (1080p/23.98sF) VGA Modes Supported: Single: 1920 x 1080 @ 48Hz (H=27 KHz, V=48 Hz) Double: 1920 x 1080 @ 48Hz (H=54 KHz, V=48 Hz) Triple: 1680 x 1080 @ 72Hz (H=79 KHz, V=72 Hz) Quad: 1920 x 540 @ 96Hz (H=60 KHz, V=96 Hz) HD Standard: 1080i/50 (1080p/25sF) VGA Modes Supported: Single: 1920 x 1080 @ 50Hz (H=28 KHz, V=50 Hz) Double: 1920 x 1080 @ 50Hz (H=56 KHz, V=50 Hz) Triple: 1616 x 1080 @ 75Hz (H=82 KHz, V=75 Hz) Quad: 1920 x 540 @ 100Hz (H=62 KHz, V=100 Hz) HD Standard: 1080i/60 (1080i/59.94) VGA Modes Supported: Single: 1920 x 1080 @ 60Hz (H=33 KHz, V=60 Hz) Double: 1920 x 1080 @ 60Hz (H=67 KHz, V=60 Hz) Triple: 1344 x 1080 @ 90Hz (H=99 KHz, V=90 Hz) Quad: 1712 x 540 @ 120Hz (H=75 KHz, V=120 Hz)

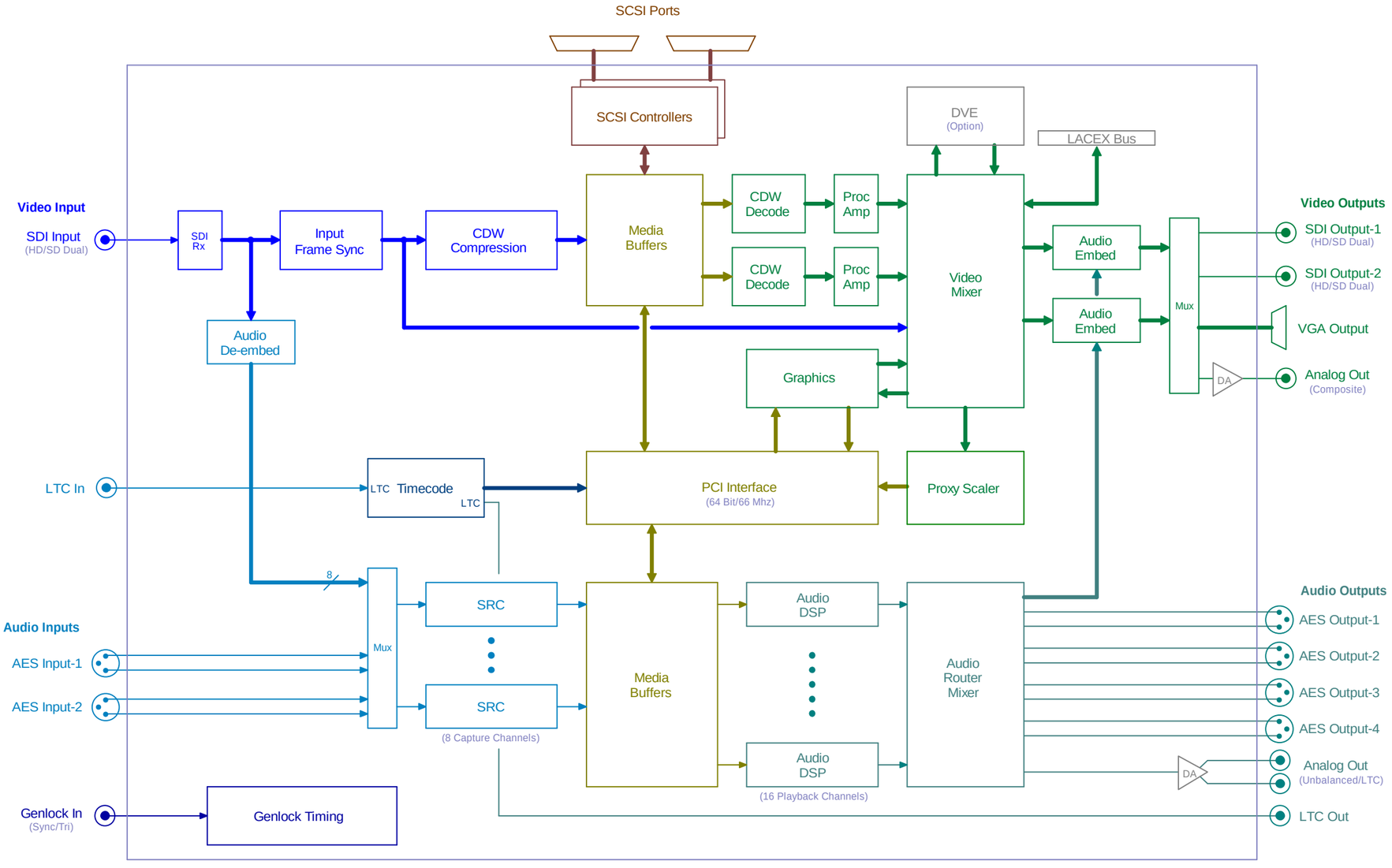
	HD Standard: 720p/24 (720p/23.98) VGA Modes Supported: Double: 1280 x 720 @ 48Hz (H=36 KHz, V=48 Hz) Triple: 1280 x 720 @ 72Hz (H=79 KHz, V=72 Hz) Quad: 1280 x 720 @ 96Hz (H=80 KHz, V=96 Hz) HD Standard: 720p/50 VGA Modes Supported: Single: 1280 x 720 @ 100Hz (H=37 KHz, V=50 Hz) Double: 1280 x 720 @ 100Hz (H=75 KHz, V=100 Hz) Triple: 1280 x 720 @ 150Hz (H=112 KHz,V=150 Hz) HD Standard: 720p/60 (720p/59.94) VGA Modes Supported: Single: 1280 x 720 @ 120Hz (H=45 KHz, V=60 Hz) Double: 1280 x 720 @ 120Hz (H=90 KHz, V=120 Hz) SD Standard: 486i/59.94 VGA Modes Supported: 720 x 486 @ 60Hz (H=31 KHz, V=60 Hz) SD Standard: 576i/50 VGA Modes Supported: 720 x 576 @ 50Hz (H=31 KHz, V=50 Hz)
PCI Bus Interface	PCI 2.0, 64Bit/66MHz
DARS input	1 BNC (IEC 169-8), 100 mV to 1.1Vp-p, 75 Ohms, AES3-1992

SDI-7000 (Second SDI Input) Specifications (without Breakout Box)

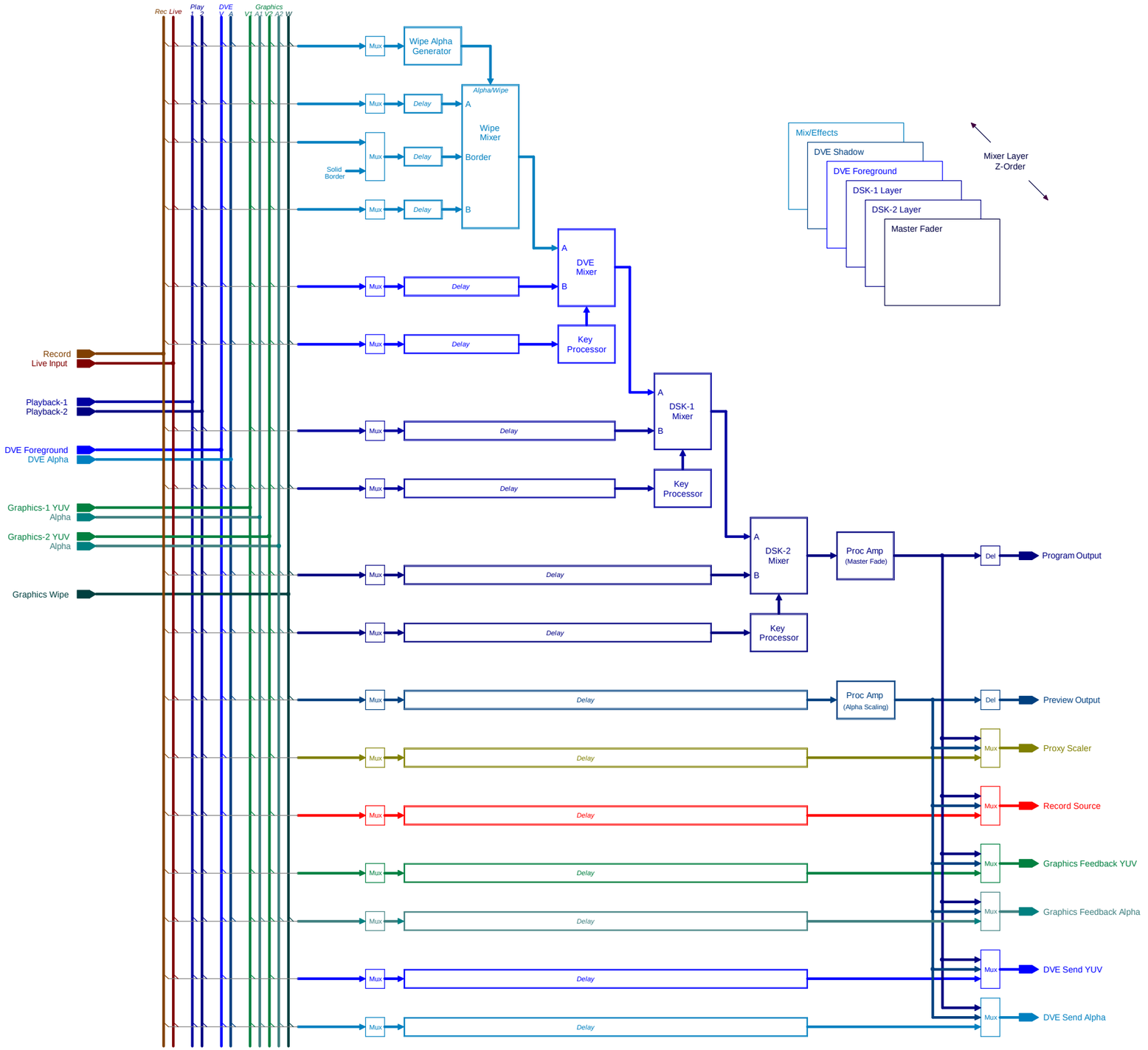
SD/HD SDI VIDEO SPECIFICATIONS	
Line/frame rates supported	• 1080i/60, 1080i/59.94, 1080i/50 • 1080PsF/30, 1080PsF/29.97, 1080PsF/24, 1080PsF/23.98 • 720p/60, 720p/59.94, 720p/50, 720p/24, 720p/23.98 • SD-525, SD-625
Standards	SMPTE 292M, SMPTE 259M-C, SMPTE 272M
Input Impedance	75 Ohms
Input Quantity & Connector	1 BNC (IEC 169-8)
Input Return Loss	> 18dB, typical over a frequency range of 5 MHz to 1.5 GHz > 15dB, minimum over a frequency range of 5MHz to 1.5GHz
Input Equalization	Automatic, adjustment-free cable equalization
Input Sensitivity	<100mV
Input Cable length	For HD 100m min (greater with BOB-7000/7002), for SD 250m min of Belden 1694A cable

Altitude Block Diagram

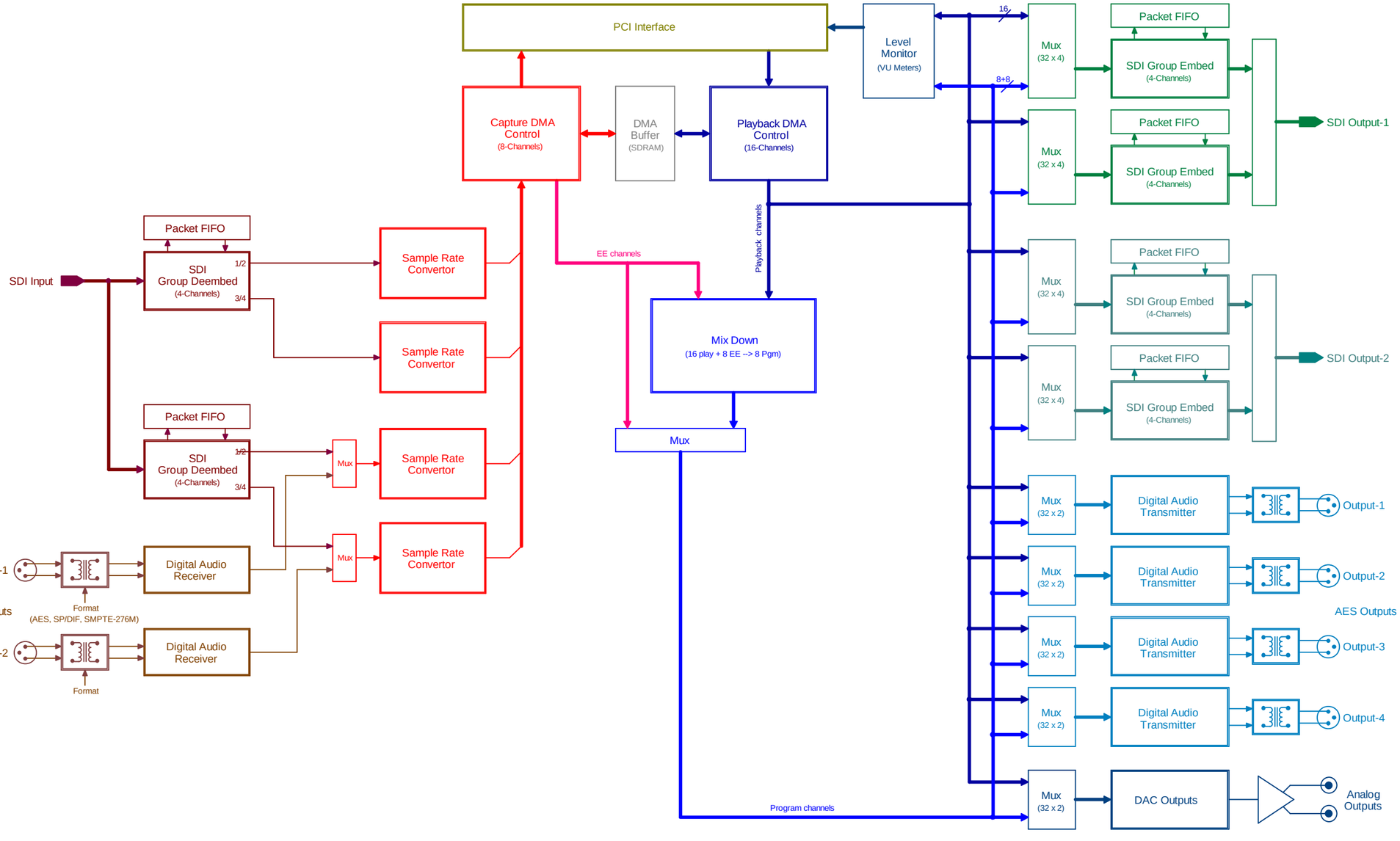
(System I/O Detail)



Altitude Video Mixer Block Diagram



Altitude Audio Block Diagram



Altitude SD Video Mixer Abstract