Convergent Design Presents
Flash XDR™
The First CompactFlash® Based
HD **X**stream **D**ata **R**ecorder

HD-SDI Source
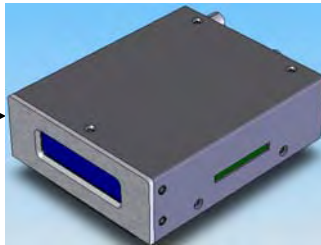
Laptop Editor

MXF / File

Satellite Uplink

ASI

Confidence Monitor

HD-SDI
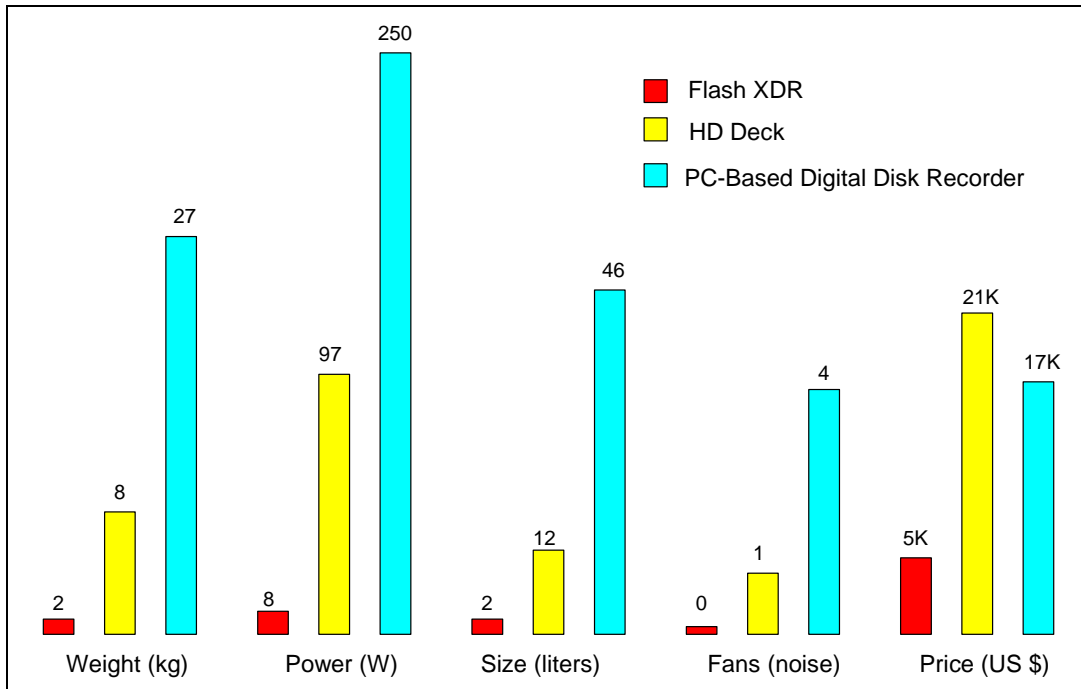(Video+Audio+TC)

HD-SDI

1394

Optional HDV
Capture Devices

Features
- HD-SDI ↔ 25, 35, 50, 100 Mbps MPEG2 (Long-GOP)
- Also supports MPEG2 4:2:2 @ 160 Mbps (I-Frame)
- 1080i, 720p, **1080p24**
- HD-SDI ↔ ASI (19.7 Mbps) for satellite up/down-link
- Embedded or External Audio, Time-Code inputs
- Record trigger input, tally light output
- Four Hot-Swappable CompactFlash Card Slots
- Enables File-Based transfers, 2x-6x real-time
- Rugged, solid-state; silent operation
- Compact, Ultra-Portable, under 1kg
- US $4995

Convergent Design

Flash XDR Re-Defines
Portability and Affordability
In HD Field (Digital Disk) Recorders

Legend:
- ■ Flash XDR (red)
- ■ HD Deck (yellow)
- ■ PC-Based Digital Disk Recorder (cyan)

Bar chart values:

Category	Flash XDR	HD Deck	PC-Based Digital Disk Recorder
Weight (kg)	2	8	27
Power (W)	8	97	250
Size (liters)	2	12	46
Fans (noise)	0	1	4
Price (US $)	5K	21K	17K

Innovative CompactFlash Based Design
- Industry-standard, non-proprietary memory
- Widely available from multiple sources, 16GB costs ≈ US $220
- 1/3 the price and 2X the performance of proprietary Flash Cards
- Price parity (per GB) with HDV Disk-Drives
- Hot-swappable, non-volatile, highly reliable (MTBF > 1M Hours)
- Solid-state, no heads to crash, tape to jam, or drop-outs
- Very low-power: 0.25 Watt (5% the power of hard-disk drive)
- Long-life: 10K Insertions / Removals, 100K Read / Write Cycles

High-Performance
Solid-State Media

FireWire-800 Reader
340 Mbps I/O

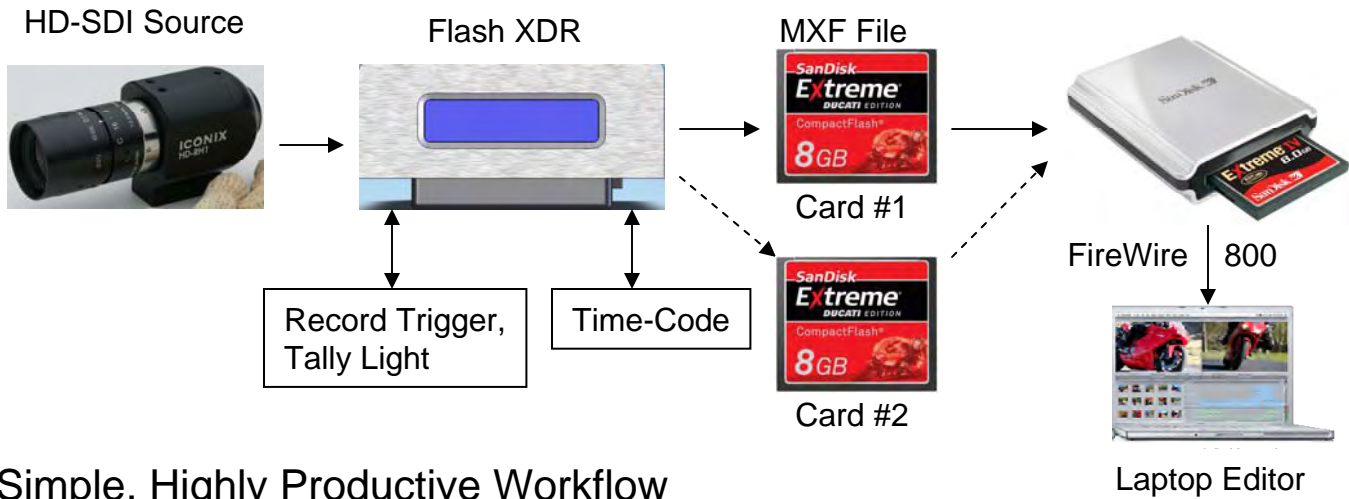## Transfer Time and Record Capacity (in Minutes)

Video Format / Bit-Rate	1080i @ 50Mbps	1080i @ 100 Mbps
1-Hour Video Transfer Time (to MAC/PC)	9.8	19
Record Capacity - 16 GB (1-16GB Card)	41	21
Record Capacity - 32 GB (2-16GB Cards)	82	42
Record Capacity - 64 GB (4-16GB Cards)	164	85

Approximate Transfer Time (in minutes) is the time required to transfer one hour of video to your NLE using the FireWire-800 Reader.

Approximate Record Capacity is shown (in minutes) assumes 2-channels of audio. **Flash XDR has four CompactFlash slots**. Currently, the largest Compact Flash card is 16 GBytes, but 32 GByte cards are expected in 2008.

CompactFlash®

Powerful File-Based Workflow
"Edit While You Shoot"

HD-SDI Source

Flash XDR

MXF File

Card #1

Card #2

Record Trigger,
Tally Light

Time-Code

FireWire 800

Laptop Editor

Simple, Highly Productive Workflow

Connect any HD-SDI source via coax (up to 150 meters) to Flash XDR. Use internal or external time-code source; the internal real-time clock will automatically add date and time information. Turn on Flash XDR and notice the instant start-up (no boot-up required) and the silent operation (no fans). Record some video to one of the two hot-swappable Compact Flash cards. Start your edit session by forcing a card eject (the box will automatically start recording to the second card). Quickly transfer (see chart) the MXF file to your laptop editor using the Firewire-800 reader. Now "edit while you (continue to) shoot", productively using your laptop as an editing tool, avoiding lengthy ingests from the old FireWire direct-to-laptop capture method.

The ultra-portable, low-power design means you can carry Flash XDR on any shoot, and enjoy a full-day of battery-powered operation. This rugged, lightweight, self-contained unit can be easily carried in a backpack, placed in a helicopter or used as a pool-feed recorder. Create simultaneous offline clones in the field from the HD-SDI output of your online HD VTR. Compact Flash cards can be readily swapped-out for endless recording possibilities. Finally, for maximum versatility, ASI and 1394 outputs support satellite uplink, Internet streaming (via ASI → IP), or recording to an HDV deck / camcorder / FireWire drive / Walkman device.

Upgrade to 160 Mbps 4:2:2 Full-Raster Quality

You're no longer limited to HDV rates, dial down the compression and select the 422P@HL profile to get full-raster 1920x1080i/p or 1280x720p 4:2:2, at 100 Mbps (Long-GOP) or 160 Mbps (I-Frame) video and up to 4-channels of uncompressed 16-bit, 48Khz audio. In addition to the standard 1080i/p and 720p formats, you can also utilize the 1080p24 rate, perfect for digital cinematography.

MPEG2 **HD422**

The high-quality Sony MPEG2 CODEC in Flash XDR provides selectable bit-rates, so you can match your rate to the job requirements. Non-proprietary, industry-standard MPEG2 means you have a wide range of editing and transmission options.

XDCAM HD

35 50 75

25 100

HDV 19.7
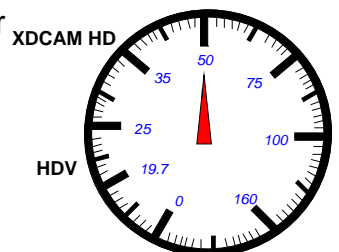
0 160

Selectable Bit-Rates,
Top Rate = 160Mbps

Convergent Design

Flash XDR™
CompactFlash® Based, HD **X**stream **D**ata **R**ecorder

Features

- **HD-SDI ↔ 18, 19.7, 25, 35 Mbps 4:2:0, or 50, 100, 160 Mbps 4:2:2 MPEG2 Bit-Rates**
- Store video internally to **CompactFlash**, or externally to Laptop, HDV deck / HDV Firewire drive
- Transfer CompactFlash video file at 2X ~ 6X real-time to NLE in MXF (OP-1A) format
- **HD-SDI** Input (with 4-channel embedded audio and time-code)
  - 1080i60/59.94/50, 1080p30/29.97/25/24/23.98, 720p60/59.94/50
- MPEG2 Profiles Supported
  - 422P@HL: 100, 160 Mbps VBR (1920x1080i/p, 1280x720p, 4:2:2, I-Frame)
  - 422P@HL: 50, 100 Mbps VBR (1920x1080i/p, 1280x720p, 4:2:2, Long-GOP)
  - MP@HL: 18, 35 Mbps VBR (1440x1080i/p, 4:2:0, Long-GOP) (XDCAM HD)
  - MP@H-14: 25 Mbps CBR (1440x1080i, 4:2:0, Long-GOP) (HDV-2)
  - MP@HL: 19.7 Mbps CBR (1280x720p, 4:2:0, Long-GOP) (HDV-1)
- Inputs: HD-SDI, ASI, Balanced Stereo Analog Audio (XLRs) – switchable between line and microphone levels with 48V phantom power (mic preamp with 10 to 65db gain), Time-Code (LTC)
- Outputs: 1394 (6-pin), HD-SDI, Balanced Stereo Analog Audio (XLRs), ASI, Time-Code (LTC)
- Audio Formats:
  - MPEG1 Layer 2, 48-KHz (384 Kbps: 2-Channel, 192 Kbps: 4-Channel)
  - Uncompressed PCM Audio (4 Channel, 48-KHz, 16/24-Bit)
- Audio Input Source: 2-channel analog balanced or 4-channel HD-SDI embedded
- **Compact: 5.0"(W) x 1.7" (H) x 6.5"(D)**, (127 x 45 x 165 mm), 1 lbs (0.5 kg)
- Low Power: 8W, +5V~+20V DC power, 4-Pin XLR; support for Anton Bauer and IDX batteries
- Record Start/Stop and Tally Light connector (4-pin Hirose)
- Rugged, all solid-state construction, no disk-drive heads to crash or tape mechanisms to jam
- Applications:
  - Upgrade video quality, improve workflow of tape-based HD Camcorders with HD-SDI output
  - Live-Event recording (churches, concerts, etc), news / courtroom pool feed
  - Mobile Trucks, Local TV Station Broadcast, Post Production, Pole Cams
  - ASI → IP (MPEG2 over Internet), ASI → Satellite Uplink
  - Sports, Nature shoots, Film documentaries, etc.
  - Helicopters, Race-Cars, Horse-Races, Airplanes, Helmet cameras
  - Off-line edits of high-end HD productions (HDCAM SR)
  - Sports, Medical, Corporate, ENG, EFP, Underwater cameras
- US $4995, available Q1 08; 16Gbyte CompactFlash cards cost ≈ US $220

Local Convergent Design Dealer Info

www.convergent-design.com   sales@convergent-design.com

Flash XDR FAQs

Description / Compatibility / Advantages

1) **Can I get a brief description of Flash XDR?**

   Flash XDR is a portable HD recorder/player and ASI I/O box designed to mount on the back of a camcorder. Flash XDR accepts an incoming HD-SDI video signal with optional audio & time-code, compresses the video/audio to MPEG2, and stores to Compact Flash (or outputs over 1394 or ASI). Flash XDR also supports playback of the video / audio. The compressed video + audio + time-code are stored in the MXF format and can be readily transferred to an NLE system.

2) **What were the design goals in developing this box?**

   a. Provide videographers / cinematographers with a tool to capture much higher quality video than available from their internal tape-based system.
   b. Direct attachment to camcorder (for "run and gun" applications).
   c. Very high quality video (MPEG2 data-rates up to 160Mbps)
   d. Enable pull-down removal (inverse telecine) for true 24p support
   e. File-based workflow
   f. Low power consumption (battery powered), lightweight, small size
   g. Rugged design, operational over a wide temperature range.
   h. ASI I/O for connectivity to satellite uplink or ASI ↔ IP converters.

3) **What cameras / camcorders are compatible with Flash XDR?**

   a. Iconix HR-1
   b. Canon XL H1, and G1
   c. Sony F900, XDCAM HD, XDCAM EX
   d. JVC GY-HD250
   e. Panasonic GP-US932
   f. Toshiba IK-HD1
   g. HDV / AVCHD camcorder (with HDMI) + Convergent Design nanoConnect
   h. Any HD-SDI source with compatible rates (see video I/O)

4) **How can I connect Flash XDR to the Canon XL H1?**

   Simply connect the HD-SDI and time-code outputs from the XL H1 directly into the corresponding inputs on Flash XDR. Since the audio is not embedded in the HD-SDI stream, you need to connect either balanced line or microphone level stereo inputs directly into Flash XDR. (If using microphone inputs, a phantom 48V power can be enabled; also the microphone gain is adjustable over a range of 10 dB to 65 dB).

   The balanced analog audio outputs can then be connected to the corresponding inputs on the Canon XL H1, so that a redundant recording of both the video and audio can be made to the HDV tape in the camcorder as well as to the Compact Flash in Flash XDR.

5) **Can I really get 1080i recording from the JVC GY-HD250 camcorder?**

   Yes, the GY-HD250 can be switched to output either 720p or 1080i HD-SDI. Internally, only 720p HDV data can be recorded to tape. However, Flash XDR accepts and records in either 720p or 1080i formats.

Flash XDR FAQs

6) **Which HD-SDI Switchers are compatible with Flash XDR?**
   Flash XDR works with any HD-SDI switcher with a compatible output format (see video I/O section). This makes Flash XDR an ideal live event recorder.

7) **How does Flash XDR compare to other HD Portable recorders?**
   Flash XDR redefines portable HD Recorders in terms of weight, size, power, noise, and price. Compared to portable PC based recorders, tape decks, or laptop + converter box, Flash XDR can be mounted to the back of a camcorder, uses far less power, produces no noise, and is more rugged. It also costs considerably less than most of these alternative solutions.

Video I/O

8) **Which video input formats are supported?**
   1080i60/59.94/50, 1080p30/29.97/25/24/23.98, 720p60/59.94/50

9) **Can Flash XDR auto-detect the incoming HD-SDI stream?**
   Yes, auto-detect is the default setting. However, the user can force a particular rate.

10) **Are component analog and / or HDMI I/O included?**
    No, in designing Flash XDR we made some tradeoffs of connectivity and physical size. We included HD-SDI with embedded audio and time-code support, but left off analog video and HDMI inputs to conserve space and power. Analog video → HD-SDI converters are available from several manufacturers, while HDMI → HD-SDI conversion can be accomplished using our low-cost nanoConnect converter.

11) **Does Flash XDR perform cross / down conversions?**
    No, Flash XDR does not perform 1080i ↔ 720p or HD ↔ SD type conversions. (Our design goals limited the power and size of the box. Also, cross / down conversion was deemed unnecessary, as most HD-SDI sources already provide this functionality).
    So, the resulting MPEG2 stream always matches the HD-SDI input format (except when pull-down removal is enabled).

12) **Can Flash XDR remove the pull-down (inverse telecine) and record in 1080p24/23.98?**
    Yes, assuming the 1080i60/59.94 HD-SDI input was created from a 24/23.98p frame rate, then Flash XDR can be programmed to remove the extra frames/fields. The HD-SDI monitor output will be the 1080p24/23.98 rate, but the video will be delayed 2 frames. The MPEG2 recorded stream will be at the 1080p24/23.98 rate also.

13) **Is the timecode input needed in order to remove the inverse telecine?**
    No, Flash XDR does not use the time-code to remove the extra frames.

14) **Can Flash XDR correct (flip) the image from the Red Rock Micro or P+S Technik Cine lens?**
    Yes, an optional frame flip can be enabled to correct the image from this lens. The HD-SDI monitor output will show the corrected image, but delayed 2 frames.

Flash XDR FAQs

15) **I have two (or more) cameras; can I synchronize the capture on a frame by frame basis (for 3-D, for example)?**

Yes, if all video sources are frame synchronized using a black burst generator to each camera, then all the video captures to each Flash XDR box will be synchronized. If the various cameras are not frame synchronized then the captures will be accurate to +/- 1 frame.

16) **Does Flash XDR have a pre-record buffer?**

Flash XDR has a 40 MByte pre-record buffer for MPEG2 data. This allows approximately 2 seconds of pre-buffer at 160 Mbps rate or 12 seconds at 25 Mbps.

17) **Can I record continuously, overwriting the oldest footage?**

This mode is contemplated for a future firmware update.

18) **Do you plan to support SD-SDI?**

Most users want DV compression for SD-SDI, which is not part of Flash XDR, so SD video support is not planned at this time.

19) **How can I monitor the video?**

Flash XDR has an HD-SDI output which is active during record (loop-thru) as well as playback.

20) **Is a color bar generator included?**

Yes, Flash XDR can be programmed to automatically output a color bar pattern if no incoming HD-SDI signal is detected (while the box is operating in record mode). Alternatively, the HD-SDI output can be forced to output a color bar pattern at any time.

Audio I/O

21) **What are the audio input choices?**

Flash XDR offers two audio input sources: 1) Up to 4-channels embedded in the HD-SDI stream, 2) 2-channel line / microphone level analog balanced (XLRs). The microphone inputs include a switchable 48V phantom power and a programmable gain (10 to 65 dB).

22) **What about AES audio I/O?**

Flash XDR does not include AES audio I/O, simply because most field production uses analog audio. However, using an external box, up to 4-channels of AES audio can be embedded into the HD-SDI stream.

23) **Can audio capture be turned off to increase Compact Flash storage time?**

Yes, audio capture can be completely turned off to save space on the Compact Flash or to allow a slightly higher compressed video data-rate.

24) **How does Flash XDR handle the audio from the Canon XL H1?**

Balanced stereo line / microphone level analog audio is fed directly into Flash XDR, then balanced stereo line-level outputs from Flash XDR are fed into the XL H1 XLR inputs.

Flash XDR FAQs

25) How is the audio sampled?

The incoming analog audio is sampled in either 16 or 24 bits at 48 KHz. Flash XDR utilizes a high-quality fully differential audio design.

26) How can I monitor the audio?

Flash XDR has two balanced analog audio outputs (XLRs) which are active during recording and playback sessions. Additionally, audio level meters can be displayed on the LCD panel.

27) Can the audio be delayed / advanced relative to the video?

Yes, the audio can be adjusted by up to +/- 4 frames relative to the video. The granularity of the adjustment has not yet been determined.

28) How is the audio written to the Flash card?

Uncompressed 16 or 24 bit (user selectable) PCM, 2 or 4 channels.

29) How is audio sent in the ASI stream?

MPEG1 Layer II compressed to 384 Kbits/sec, stereo.

MPEG2 Compression

30) Why was MPEG2 chosen?

MPEG2 offers very good quality video at relatively low data-rates. Flash XDR offers a very wide range of MPEG2 data-rates from 18 Mbps up to 160 Mbps. Additionally, the MPEG2 CODEC can be programmed to either Long-GOP or I-Frame only recording modes, allowing the user to make trade-offs between recording efficiency and ease of editing.

Compared to JPEG2000, MPEG2 is substantially faster to decode (improved playback performance) and has been widely adopted for broadcast industry (ASI requires MPEG compression). The MPEG2 hardware CODEC can provide much greater compression efficiency (storage time) compared to strictly I-Frame based CODECs such as ProRes 422 or DNxHD CODEC. (However, the MPEG2 CODEC can be configured for Long-GOP or I-Frame encoding). MPEG2 is also supported by a much wider range of NLE programs.

H.264 / AVC CODECS are not widely supported in NLE programs or by hardware manufacturers at this point in time.

31) Does Flash XDR support DV or DVCProHD?

No, Flash XDR only supports MPEG2 compression, in either Long-GOP or I-Frame only modes.

32) How is the MPEG2 compression performed?

Flash XDR utilizes a very high quality MPEG2 hardware CODEC module from Sony which is capable of both 4:2:0 and 4:2:2 sampling in both Long-GOP and I-Frame only modes. Long-GOP mode is available for data-rates up to 100 Mbps, while I-Frame only can support data-rates up to 160Mbps.

Flash XDR FAQs

33) Does Flash XDR really record at higher quality levels than HDCAM?

Yes, HDCAM resizes 1080i video from 1920x1080 → 1440x1080 and then applies 3:1:1 sampling. Flash XDR retains the full 1920x1080 raster and samples in 4:2:2. Flash XDR also has a slightly higher compressed data-rate. See chart below.

34) How does the bit-rate compare with other formats?

The table below summarizes the bit compression formats, sampling, quantization and bit-rates of the major formats.

HD Video Format Comparisons
(Approximate Increasing Quality)

Manufacturer	Sony, JVC, Canon	Panasonic	Sony	Sony	Convergent Design	Sony
Format	HDV	DvcPro HD	XDCAM HD	HDCAM	Flash XDR	HDCAM SR
Compression	MPEG2-GOP	DV	MPEG2-GOP	MPEG2-I	MPEG2-I	MPEG4-I
Sampling	4:2:0	4:2:2	4:2:0	3:1:1	4:2:2	4:2:2 / 4:4:4
Resolution - 1080	1440 x 1080	1440 x 1080	1440 x 1080	1440 x 1080	1920 x 1080	1920 x 1080
Resolution - 720	1280 x 720	960 x 720	1280 x 720	1280 x 720	1280 x 720	1280 x 720
Quantization	8-Bit	8-Bit	8-Bit	8-Bit	8-Bit	10-Bit
Max Data Rate (Mbps)	19.7-25	100	35	112 - 142	160	440

35) What are the bit-rate options available on Flash XDR?

18, 19, 19.7, 25 and 35 Mbps in Long-GOP 4:2:0 sampling
50 and 100 Mbps, Long-GOP 4:2:2 sampling
100 and 160 Mbps, I-Frame, 4:2:2 sampling

36) Does this codec work natively in FCP, Avid or Adobe?

These NLE programs currently support the 4:2:0 MPEG2 profile (HDV, XDCAM HD). We expect native support for the 4:2:2 MPEG2 profile early next year. Furthermore, these programs either directly or indirectly (through a translator program) support MXF, which is the Compact Flash data-file format used by Flash XDR.

37) Can I transcode to ProRes 422, DNxHD or another CODEC?

Yes, the transcode can either be performed in software or by placing Flash XDR in playback and capturing via an HD-SDI input.

38) Can I see some sample footage?

We plan to record video footage from an HD-SDI source into 4 Flash XDR boxes simultaneously. The boxes will be set to record at the following data-rates / profiles:
   1. 1080i59.94, 4:2:0, Long-GOP at 25 Mbps (HDV)
   2. 1080i59.94, 4:2:2, Long-GOP at 50 Mbps
   3. 1080i59.94, 4:2:2, Long-GOP at 100 Mbps
   4. 1080i59.94, 4:2:2, I-Frame at 160 Mbps
We will post these results on our website for download.

Flash XDR FAQs

ASI

39) What is ASI and what advantages does it offer?

ASI is MPEG2 mapped onto an SDI transport stream. ASI allows direct connection to satellite uplink as well as internet connectivity via an ASI → IP converter.

40) What video and audio formats are supported for ASI?

ASI uses long-GOP 4:2:0 MPEG2 video and MPEG1 Layer II compressed stereo audio.

41) What ASI stream parameters can be programmed?

The complete list is still being defined, but video, audio PMT, and PCR PIDs, as well as the PAT TS ID are planned. These parameters can be saved and recalled for later use.

Recording and Playback

42) Can the box be set up for time-lapse (interval) recording?

Yes, but in I-Frame mode only. Flash XDR has an internal clock / calendar, so interval recording over a wide range of time increments will be available.

43) What are the record trigger (start / stop) options?

Record start / stop can be triggered by one of 3 selectable events:
   a) Incrementing time-code (not valid for time-of-day time-code)
   b) Record Start/Stop button on the Flash XDR box
   c) External GPI trigger

44) Can I trigger multiple cameras to start simultaneously?

Yes, the simplest approach is to connect the GPI triggers from all cameras together to one master start/stop switch.

45) Does Flash XDR support fast-forward, rewind, and single-step playback control?

Initially, Flash XDR will only support normal playback. These trick modes may be supported in the future, but only for I-Frame mode recordings.

Compact Flash

46) What is Compact Flash?

Compact Flash (CF) is an industry standard memory card widely used in digital cameras. CF utilizes solid-state NAND Flash memory, and are extremely rugged (no moving parts), consume very little power, and very reliable. CF cards are available at consumer prices in capacities up to 16 GB from at least four different manufacturers.

47) Can I write the same data to two cards simultaneously (for auto back-up)?

Yes, a pair of Compact Flash slots can be configured in RAID 1, so that the same data is written to two cards simultaneously; however the record capacity is cut in half. Writing the video/audio to two cards simultaneously creates an automatic backup; so one card could then be safely stored away, while the second card is handed off to the editor.

Flash XDR FAQs

48) **How many Compact Flash card slots on Flash XDR?**

Originally, Flash XDR was specified with two CF slots. Recently, we expanded the design to support four CF cards. Now users can enjoy much longer record times or operate the box in a RAID 1 configuration for auto-backup capability. The 1080i HDV record capacity, using 4-16GByte cards, now exceeds that of DVCAM tapes (340 vs 276 minutes), making Flash XDR an excellent choice for live-event recording.

49) **Can I hot-swap the cards and continue recording indefinitely?**

Yes, when a card (or set of cards, if operating in RAID 1 mode) is filled an LED will indicate that it's time to swap cards. The just-recorded footage can be passed to the editor to immediately begin creating the finished video.

50) **When the CF card in one slot is full, will Flash XDR automatically switch to a card in the next slot? How do I know it's time to remove the first card?**

Flash XDR will automatically close the file and switch to the next CF card when the current card is filled to capacity. There are LEDs next to the cards which indicate the current status of the card (idle, writing data to the card, ready to eject, etc). Also, the remaining capacity of the card will be displayed on the LCD panel.

51) **What are typical read / write speeds and capacities for Compact Flash cards?**

The read / write speeds of CF is based on the old Compact Disk standard of 1X = 150 KB/s. So, a 133X CF card is rated at 133 x 150 KB/s ≈ 20 MB/s or 160 Mb/s. Two of the most popular CF cards are the SanDisk Extreme III (rated at 133x or 20 MB/s) and the Extreme IV (rated at 266X or 40 MB/s). Currently the largest Extreme III card is 16GB, while the Extreme IV is limited to 8GB.

Two notes of caution on CF cards: 1) there have been some reports of fake CF cards on the market, so be very careful about your source for the cards, 2) some card manufacturers' rate their cards based on the read speed only. For example, one CF card manufacturer boasts 300X performance, which sounds great until you check the fine print and find it's 300X read and 133X write. In light of this, we plan to publish a list of qualified CF cards with measured read/write performance.

52) **Does Compact Flash have sufficient read/write bandwidth for HD video?**

Yes, CF has sufficient bandwidth and storage capacity for MPEG2 HD Video. Our preliminary calculations show that a 133X CF card should be sufficient for data-rates up to 100 Mbps, while a 266X will be required for the 160 Mbps video. Currently, we are recommending the following SanDisk CF cards (prices are from B&H Photo Video -New York):

Recommended Compact Flash Cards

SanDisk Extreme III (133X) – 16GB (US $220) – Data-Rates up to 100Mbps
SanDisk Extreme IV (266X) – 8GB (US $150) – Data-Rates up to 160 Mbps

Special note: prices and capacities subject to change. Higher capacity cards and lower prices are expected in the future.

Flash XDR FAQs

53) Why Compact Flash instead of SxS cards?

CF cards are widely available from numerous manufacturers, they are priced at $220 for a 16GB card, vs $900 for an SxS card and have sufficient I/O performance for high-quality MPEG2 video. SxS cards do offer much higher read transfer rates (800 Mbps) if plugged into an Express Card slot. However, they will likely offer no higher reads speeds than 266X speed Compact Flash when used with a USB reader.

54) What advantages /disadvantages does Compact Flash offer over disk-drive or tape-based storage systems?

Compact Flash is based on solid-state NAND FLASH memory. There are no moving parts, tapes to stretch or break, no dropouts and they are completely silent. Here's a brief comparison of Compact Flash vs hard-disk drive:

	Compact Flash	Hard Disk Drive
Mechanism	Solid State NAND FLASH	Magnetic Rotating Platters
Weight	15 g	100 g
MTBF	> 1 million hours	< 300 K Hours
Shock Resistance	2000G / 2ms	300G /2ms
Operating Temp	-25 to 85 C	5 to 55 C
Acoustics (Bels)	0	2.7
Power	0.2W	2W

Compared to tape based systems, Compact Flash offers true random access to any data file or video frame. The transfer time to your NLE is typically 2X to 6X faster (file transfer vs 1:1 video ingest). Also, Compact Flash does not exhibit dropouts like tape and has an extremely long shelf life.

55) What's the storage capacity and how fast can I transfer the files to my NLE?

Storage Capacity and Transfer Time (to NLE)

Video Format, Data-Rate	Record Capacity (Mins)	CF Card Speed	CF Card Reader	Transfer Time (Mins) per hour of recording
720p HDV (19.7 Mbps)	430	133X	USB 2.0	8
1080i HDV (25 Mbps)	340	133X	USB 2.0	10
1080i 4:2:2 (50 Mbps)	165	133X	USB 2.0	21
1080i 4:2:2 (100 Mbps)	85	133X	USB 2.0	42
1080i 4:2:2 (160 Mbps)	25	266X	FW 800	30

This table assumes 4-16GB Extreme III cards for data-rates up to 100Mbps and 4-8GB Extreme IV cards for the 160 Mbps data-rate. (Slower CF card write speeds will limit the maximum record data-rate, while slower CF card read speeds will increase the transfer time. SanDisk cards have identical read and write speeds).

Flash XDR FAQs

The transfer time is the time required to transfer one hour of video to your NLE system. CF card readers are widely available with USB 2.0 and FireWire-800 connectivity. The chart above assumes that a USB 2.0 reader is used with 133X cards and a FireWire-800 reader is used with 266X cards. 133X cards can be used with FireWire-800 reader, but will have no faster read time than the USB2.0 reader. Likewise, 233X cards can be used with a USB 2.0 reader, but the transfer times will be doubled compared to a FireWire 800 reader.

Recommended CF Card Readers

SanDisk USB 2.0 (≈US $20) – Good for Extreme III CF Cards
SanDisk FireWire 800 (≈US $60) – Best for Extreme IV CF Cards

Special note: The FireWire 800 reader can also operate at the older 400 (1394a) rate. The FireWire 400 read performance is very similar to USB 2.0

56) Is Compact Flash reliable enough for professional video?
Compact Flash has been widely adopted by professional photographers who demand the same reliability and data integrity as professional videographers. CF card manufacturers typically specify 100,000 write cycles and 10,000 card insertion / removals (well beyond typical application). The typical operating temperature range is -25 to 85 degrees C, with excellent shock and vibration characteristics. Many CF manufactures offer a limited lifetime warranty. The all solid-state construction and MTBF > 1M hours, makes Compact Flash arguably one of the most reliable media available to store your video.

57) How can I be sure that the CF card I just loaded is working properly?
Flash XDR will automatically read the card ID parameters to ensure it has sufficient I/O performance to match the current selected bit-rate. Additionally, a small file will be written to and read from the card to ensure basic operation.

58) What is the file system utilized on the Compact Flash cards?
FAT32.

59) When the file length reaches the 4GB limit imposed by FAT32, what happens?
Flash XDR automatically opens a new file and continues recording without dropping any video or audio data.

60) Can the CF cards be formatted on the box?
Yes, when a new CF card is inserted in one of the 4 slots, Flash XDR automatically reads the card ID to check for adequate performance capability (write speed). Then the file directory is read and optionally displayed on the LCD panel. If the card is not empty, then the user is prompted with the option to format the card.

61) In what file format is the MPEG2 data stored on Compact Flash?
MXF, OP-1A, in which the video and audio information is interleaved (same as Sony XDCAM HD)

Flash XDR FAQs

62) Can I record to the internal tape on the camera (for backup) and to Compact Flash simultaneously?

Yes, in fact this is the recommended operation.

63) Can I erase the last clip?

Yes, you can erase the last clip, but not any randomly selected clip. In order to obtain optimum CF card performance, all file writes must be sequential.

64) Will Convergent Design publish a list of qualified cards?

Yes, we hope to qualify up to four different card manufacturers. Initially, SanDisk will be the preferred manufacturer.

HDV Support

65) Can I stream HDV to a Sony M25U / JVC HD50 deck?

Yes, you can connect Flash XDR and stream HDV video to a Sony M25U deck (1080i only) or to a JVC HD50 deck (720p only)

66) Can I stream HDV to a Firestore / Citidisk?

We plan to test and qualify these HDV storage devices just after product introduction.

67) Will the box stream to an external HDV device and record to Compact Flash simultaneously?

No, but you can set up the Compact Flash cards in a RAID 1 configuration and record identical video/audio to two cards simultaneously, thus creating an automatic backup.

Time-Code / Real-Time Clock

68) Does Flash XDR have an internal clock?

Yes, a high-precision real-time clock is included.

69) Does Flash XDR have a time-code input?

Yes, multiple boxes can be jam-synced to a master time-code generator.

70) Can Flash XDR act as a time-code generator?

Yes, Flash XDR can be programmed as a master time-code generator; other boxes can then be slaved to this master.

File Transfer / NLE Support

71) How do I transfer the video to my NLE for editing?

You can use a USB 2.0 or FireWire-800 reader to transfer the video files directly to your NLE. See Compact Flash section for more details.

72) Can I import the captured video directly into Final Cut Pro, Avid, Adobe or Vegas?

We expect support from these NLEs in early 2008.

Flash XDR FAQs

User Interface / Updates / Control

73) How is the box configured?

Users can enter a profile using the selector input and the built-in LCD screen. Up to 16 profiles can be defined and later recalled. The configuration file can be stored on Compact Flash and uploaded to additional Flash XDR boxes.

74) What about metadata?

Flash XDR will support metadata. The complete list is still under development, but information such as time-of-day, location, shoot number, event, DP, etc are planned.

75) How are field updates performed?

New firmware can be downloaded from our website and written to a Compact Flash card. The CF card can be inserted into Flash XDR and the firmware updated using a built-in utility.

Mechanical / Power / Environmental

76) What is the size and weight of Flash XDR?

Flash XDR is about the size of a external USB disk drive: 5.0" (W) x 1.7" (H) x 6.5" (D) (127 x 45 x 165 mm) and weighs about 1 lb (0.5 Kg).

77) Does Flash XDR have an internal fan?

No, Flash XDR utilizes internal heat sinks to dissipate the heat to the aluminum case. Fans were deemed too noisy and an added reliability issue.

78) What material is used for the cabinet?

Aluminum is the primary material, since it is both lightweight and has excellent heat conduction characteristics.

79) Can I mount Flash XDR to the back of my camcorder?

Yes, we are working on several different mounting options with IDX and Anton Bauer batteries. We plan to offer numerous mounting options to most popular cameras.

80) Does Flash XDR include a battery or any power supply?

A 110/220V wall wart is included. Flash XDR has a standard 4-pin XLR power jack.

81) Can I mount Flash XDR to an Anton Bauer / IDX battery?

Yes, we'll have mounting plate option holes in the bottom of the case.

82) How much power does Flash XDR consume?

Power is estimated at 8 Watts.

83) Can Flash XDR operate off the 7.4V Lithium Ion battery on my camcorder?

Yes, the box is designed to operate off a wide power supply range of +5.0 to +20V.

Flash XDR FAQs

84) Can Flash XDR be used in high vibration applications (race cars, airplanes, helicopters, etc)?

> We believe that Flash XDR will operate in these high vibration conditions and plan to test the box accordingly.

85) What is the operational temperature range?

> The exact temperature range won't be known until early 2008. We are trying to maximize this range as we expect Flash XDR will be used in the Artic Circle as well as the Sahara Desert. Industrial Grade Compact Flash is rated for -25 to 85 degrees C, but we'll need more testing before we know if Flash XDR can operate over this range (or wider). However, we do expect Flash XDR to operate over a much wider range than tape or disk-drive based systems.

86) What humidity levels are acceptable?

> This will be tested when we have a finished prototype box; however, we expect the acceptable humidity levels will be much greater than tape-based systems.

87) What happens if I lose power during a record session?

> The last file will be corrupted. We do plan to add a file repair utility in a future firmware upgrade.

88) Does Flash XDR have internal temperature sensors?

> Yes, if the temperature approaches a maximum operating level, then a warning message will be displayed on the LCD screen. If the temperature exceeds safe levels, the box will automatically close open files and power down to prevent damage.

General Questions

89) What's included in the shipping package?

> The final package contents has not been determined, but likely the Flash XDR box, a 110/220V universal power supply and a small Compact Flash card loaded with a training video.

90) What is the availability of Flash XDR?

> Q1 2008 is our target introduction date.

91) How long is the warranty?

> This has not yet been determined.