# Introduction to the nanoFlash


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# Introduction to the nanoFlash

**Can I get a brief description of nanoFlash?**
The nanoFlash is a portable HD/SD recorder/player designed to mount on a camcorder. It is also suited for use in a studio environment. The nanoFlash is designed to record higher quality images than the camera itself, using the camera's uncompressed 4:2:2 HD-SDI or HDMI output.

nanoFlash accepts an incoming HD/SD-SDI video signal, with embedded audio and timecode or an HDMI video and audio signal.

The nanoFlash records the video/audio as MPEG2 at user selected bit-rates, using Long-GOP or Intraframe recording, in native Quicktime for Final Cut Pro, or MXF for Avid, Sony Vegas, Edius and other non-linear editors.

This allows the user to choose, for every shoot, an appropriate image quality, file size, file type and maximum length of recording. The data is recorded to CompactFlash cards, in either native Quicktime or native MXF file formats.

The nanoFlash uses 90% of the same code and components as the field-proven and award-winning Flash XDR. nanoFlash customers will enjoy the benefits of all many hours debugging and testing the Flash XDR.

**What are the applications for nanoFlash?**
Tapeless HD Recording and Playback, Tapeless SD Recording
(SD playback will be added in a future free firmware update.

Tapeless HD Recorder Review of Footage on any HDMI or HD-SDI Monitor or TV.

The nanoFlash records from HD/SD-SDI and HD HDMI.
(SD-HDMI is not currently supported.)

**Will nanoFlash work with my System?**
If you have a camera with standard HD/SD-SDI or HDMI output, then the answer is yes.

The NanoFlash includes both HD/SD-SDI In and Out as well as HDMI In and out. The HD/SD-SDI connections are made via a standard BNC connector, while the HDMI I/O uses the new type C mini-HDMI connector (to save space).

HDMI Type A (Large) to HDMI Type C (Mini) cables are readily available.

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**Which video input formats are supported?**
- 1920x1080i @ 60, 59.94, 50 Hz
- 1920x1080p @ 30, 29.97, 25, 24, 23.98 Hz
- 1920x1080psf, @ 30, 29.97, 25, 24, 23.98 Hz
- 1280x720p @ 60, 59.94, 50 Hz
- 720x486 @ 29.97 Hz
- 720x576 @ 25 Hz

**What CompactFlash cards can be used?**
Use only the qualified Compact Flash cards for the specified bit rates:

1. SanDisk Extreme III 32 Gigabyte CF cards
   **For bit rates up to and including 160 Mbps**
2. SanDisk Extreme IV 16 Gigabyte CF cards
   **For bit rates up to and including 220 Mbps**
3. Delkin UDMA 16 Gigabyte CF cards
   **For bit rates up to and including 220 Mbps**
4. Lexar 8/16 Gigabyte 300x CF cards
   **For bit rates up to and including 220 Mbps**

Be certain not to use counterfeit or defective cards.

The CompactFlash cards must be formatted in the nanoFlash itself.

If the card does not pass the tests the nanoFlash performs during the format, then the card cannot be used in the nanoFlash.

**Can nanoFlash auto-detect the incoming HD/SD-SDI / HDMI stream?**
Yes, auto-detect is the default setting.
The user must select either HD/SD-SDI or HDMI as input via the menu.

**Can nanoFlash be used as an HD/SD-SDI → HDMI or HDMI → HD/SD-SDI converter?**
Yes, this capability is inherent in the design.

**Does nanoFlash perform cross / down conversions?**
No, nanoFlash 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 video sources already provide this functionality.

**Does nanoFlash have a genlock input?**
No

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**How can I monitor the video?**
nanoFlash has both HD/SD-SDI and HDMI outputs which are active during record (loop thru) as well as playback.

**Is a color bar generator included?**
This is planned for a future release. Our plans are to automatically output a SMPTE color bar pattern if no incoming HD-SDI signal is detected (while the box is operating in record mode). Additionally, we plan a menu option to output a color bar pattern through the HD-SDI outputs.

**What are the audio input choices?**
Two channels of audio embedded in the HD-SDI/HDMI stream or

One Balanced Mic/Line Level audio input via a 3.5 mm mini-jack or
Two Unbalanced Mic/Line Level audio inputs via the 3.5 mm mini-jack.

No phantom power is provided and audio gain is limited to 44 dB.
All audio recording is done in 24-bit format, including analog audio.
Line level inputs are consumer line-level, -10 dB.

The line level input typically work well with mixer “tape outputs” and a simple 3.5 mm tip-ring-sleeve cable is all that is needed to connect a mixer to the nanoFlash.

It is best to verify that the audio feed to the nanoFlash is not too hot.
For many “Tape Outputs” it may be appropriate to attenuate the output to allow appropriate headroom for the nanoFlash.
With the luxury of 24-bit audio, it is always best to record a little low so that unexpected loud passages can be recorded without distortion.

The audio is stored in PCM (uncompressed) 24-bit, 48-kHz format.

**How can I monitor the audio?**
Audio levels are displayed on the LCD panel (2-Channels, -60 to 0 dB). nanoFlash has analog headphone out which can be changed to consumer line-level audio out, -10 dB, via the menu.

**Can the audio be delayed / advanced relative to the video?**
In a future release, the audio will be adjustable by up to +/- 4 frames relative to the video. The granularity of the adjustment has not yet been determined.

**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 is extremely rugged (no moving parts, no fans), consumes very little power, is very reliable, low-cost and is available with a lifetime warranty from some manufacturers.

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**Does Compact Flash have sufficient read/write bandwidth for HD video?**
Yes, Compact Flash has more than sufficient (read/write) bandwidth and storage capacity for very high-quality MPEG2 HD Video without stripping across multiple cards.

**Can I write the same data to two cards simultaneously (for auto back-up)?**
This is planned for a future release. This will allow you to create two original masters simultaneously. The same data will be written to two cards simultaneously. Writing the video/audio to two cards creates an automatic backup; so one card could then be safely stored away, while the second card is handed off to the editor.

**How many Compact Flash card slots on nanoFlash?**
nanoFlash supports two CF cards. Users can enjoy very long record times, as nanoFlash will automatically close one clip and start another on the next available CompactFlash card. This is seamless across both record and playback.

**Can I hot-swap the cards and continue recording indefinitely?**
This is planned for future release

**Can you record seamlessly from one CompactFlash card to another?**
Yes, as the remaining record capacity on the current CompactFlash card reaches a critical level, the nanoFlash automatically closes the current file, and then opens a new file on the next card. This process is completely transparent to the user, for both record and playback. No frames of video or audio are lost during this process. This means that you are not limited, in length of recording, to the amount of footage that will fit onto one CompactFlash card.

**How do I know it's time to remove a Compact Flash card?**
There are bi-color LEDs next to each CompactFlash card slot, which indicates the current status of the card (idle, writing data to the card, ready to eject, etc). Also, the overall remaining capacity of each card is displayed on the LCD (0 to 100%), as well as the total number of minutes available across all cards.

**How fast can I transfer the files to my local hard-drive?**
For 50/100 Mbps recordings, the files will transfer approximately 6 or 3 times faster than real-time, this depends on the bit-rate of the recording and the throughput capabilities of your computer configuration. (One-Hour recording can be transferred in 10 or 20 minutes).

**Can the CF cards be formatted on the nanoFlash?**
Yes, both CompactFlash cards can be formatted simultaneously. The formatting process takes under 10 seconds for two 32 GB cards.

**Be certain to remove all cards with footage before formatting any cards, as the formatting process formats both cards.**

**Why was MPEG2 chosen?**
MPEG2 is a very well proven, widely accepted format that offers many advantages in a portable HD/SD recorder/player, such as nanoFlash.

Advantages include:
Sophisticated compression - I-Frame-Only (Intraframe) as well as
Long-GOP recording.
Proxy recording will be available in a future release.
Near universal native NLE support: FCP, Avid, Edius, Vegas, Premiere (pending)
No need to transcode or translate files, plays directly off the CF card, if desired.
Comprehensive HD and SD format support.

## Recording and Playback

**Can the box be set up for time-lapse (interval) recording?**
This will be available in a future release. nanoFlash has an internal clock / calendar, so interval recording over a wide range of time increments will be available. This is accomplished by recording the desired frames using I-Frame Only option.
Long-GOP is not suitable for time-lapse recording.

**What are the record trigger (start / stop) options?**
Record start / stop can be triggered by one of 4 selectable events:
1. None (nanoFlash setup for playback only)
2. Incrementing time-code (Requires Record Run timecode)
3. Record Start/Stop button on the nanoFlash box
4. External Remote Control switch

**Does nanoFlash support fast-forward, rewind, or pause playback control?**
Initially, nanoFlash only supports normal playback. Fast-forward and pause will be part of a future firmware update. However, nanoFlash can very quickly jump from file to file during playback, allowing you to quickly find any footage.

**What parameters are displayed on the LCD screen during recording?**
a. Total remaining capacity (in minutes) remaining across all CF cards.
b. CF card level meters (0 to 100%)
c. Current Time-Code (HH:MM:SS:FF)
d. Current Video Input Format (1080i59.94, etc., or No SRC (No Source Detected)
e. Audio Level Meter (2-Channels: -60 to 0 dB)
f. File Name and Recording Format (MXF or QT)
g. Battery Voltage
h. Internal Temperature of the nanoFlash

**What is the file naming convention is used in nanoFlash?**
File Names are 8 character name + 3 character extension (.mov or .mxf)
File name = XXYYYZZ
XX = Camera ID or Unit ID, Set by the user
YYY = Clip Number (which increments with each record session)
ZZZ = File number (which increments automatically across 4GB boundaries)

**How will the nanoFlash respond if I lose the HD/SD-SDI or HDMI source during record?**
The nanoFlash will simply close the current clip, wait for the video input to become valid and then restart recording by opening a new clip.

**Can I lock out the keypad during recording (backpack usage)?**
Yes, if you select the remote control trigger, the keypad is locked-out during a record session. You can also disconnect the remote cable during a record, if desired.

**Does nanoFlash have a record review option?**
A record review function, which plays back the last 10 seconds of video after a record session is complete is planned in a future firmware update.

**Can I erase the last clip?**
No, this would cause the file structure to become fragmented and thus impair with our ability to record high-bit rate HD files.

## Time-Code Input / Generator

**Does nanoFlash have an internal clock?**
Yes, a high-precision real-time clock is included.

**Does nanoFlash have an LTC time-code input?**
nanoFlash can receive timecode from an LTC source or HD/SD-SDI embedded. nanoFlash also has an internal time-code generator, but can not source (output) timecode. The timecode input is part of the Hirose 10-Pin Remote Control connection. We offer a remote control with BNC timecode input.

**Can I jam-sync the time code?**
No, not at this time. This is planned for a future release.

**What are the time-code input options?**
a. Embedded in HD/SD-SDI stream per RP-188
b. LTC-In
c. Internal Record-Run (with preset option)
d. Time-of-Day

**Can I see some sample footage?**
Please see our website for sample footage and image comparisons: www.convergent-design.com.

**What about metadata?**
nanoFlash will support metadata in a future release. The complete list is still under development, but information such as time-of-day, location, shoot number, event, DP, etc are planned.

## Mechanical / Power / Environmental

**What is the size and weight of nanoFlash?**
The nanoFlash is 4.2" (L) x 3.7" (W) x 1.4" (D), (107x94x36mm), and weight approximately 16oz (400 g).

**When does the nanoFlash go from Active to Standby Power?**
nanoFlash can detect the presence of a valid HD/SD-SDI input. Therefore, it can be programmed to switch from active state (5.6 Watts power, recording, 4.6 Watts, playback) to standby state (0.2 Watts of power) when the HD/SD-SDI signal is turned off (when you turn off your camera, or the HD-SDI cable is unplugged).

nanoFlash requires about 3 seconds to reboot when the HD/SD-SDI signal re-appears. nanoFlash automatically powers down the SDI transmitter and the HDMI I/O if no cable connection is detected. All power-saving modes can be turned off via a menu option.

**Does nanoFlash include a battery or any power supply?**
nanoFlash has a 4-pin Hirose power jack for battery power, or for DC supplied from the supplied 110/220V AC power supply. The input voltage can be from 6.5 to 19.5 Volt DC. The input is protected from short duration reverse polarity power.

**How can I power the nanoFlash?**
The nanoFlash power input is a 4-Pin Female Hirose connector.
The mating plug is a Hirose HR10A-7P-4S (Solder) or HR10A-7P-4SC (Crimp).

We offer the following power cables:

Our most popular is a D-Tap to 4-Pin Female Hirose for Anton Bauer, IDX or Swit battery systems.

4-Pin XLR to 4-Pin Female Hirose

4-Pin Female Hirose to bare leads

4-Pin Male Hirose to 4-Pin Female
Other custom cables are built upon request.

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**Can nanoFlash be used in high vibration applications (race cars, airplanes, helicopters, etc)?**
The Flash XDR and nanoFlash has been field proven in a number of these applications, so we expect that nanoFlash will also work well in these extreme conditions (it's 100% solid-state, no moving parts).

Four nanoFlashes were used successfully during the recording of the 2009 X Games under rough conditions.

**What is the operational temperature range?**
The exact ambient temperature range is not currently known, but we are tentatively specifying -35 to 50 degrees C. The internal temperature range is much higher.

Readings of 50 to 90 degrees C for the internal temperature are perfectly acceptable. We do recommend, however, for most applications that you provide adequate ventilation for the nanoFlash to keep the internal temperatures to a more reasonable level.

Our Flash XDR has been tested to over 100 degrees C internally without failure and it ceased operation at 105 degrees C, but the unit was not harmed.

**What humidity levels are acceptable?**
The exact humidity range is not currently known, but we are tentatively specifying 5% to 90%, non-condensing.

We expect you to protect the nanoFlash from rain and water.

**What happens if I lose power during a record session?**
Currently, the last file (a sub-clip) will be corrupted and thus will be lost. During a long recording session, the overall recording is broken down into files (sub-clips), each under 4 Gigabytes each. Only the last sub-clip will be corrupted. We plan to develop software to recover this file.

Also, there is a menu item, which allows you to control the maximum file size of each file, from 20% to 100% of our typical 3.5 GB file sizes. A low value should be used if you expect to lose power while recording.

**Does nanoFlash 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.

**How long does it take to boot up nanoFlash from power-on?**
Approximately 5 seconds.

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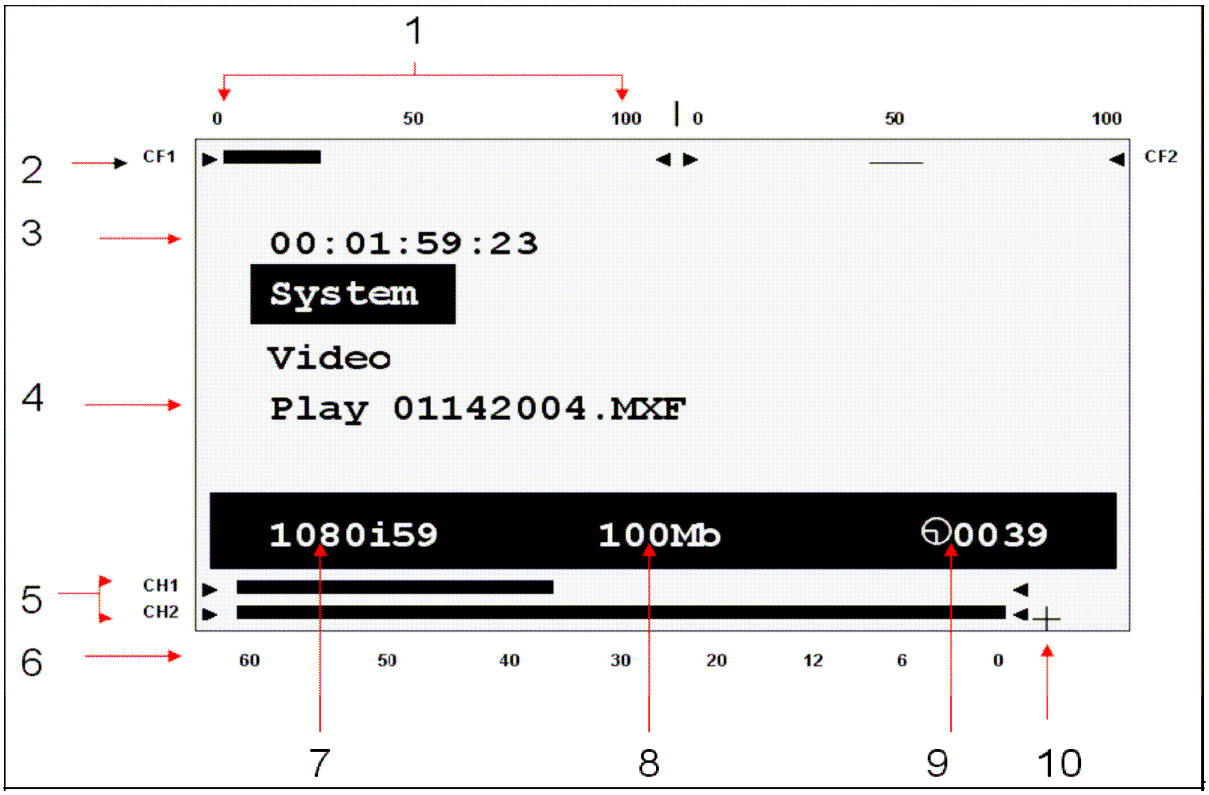
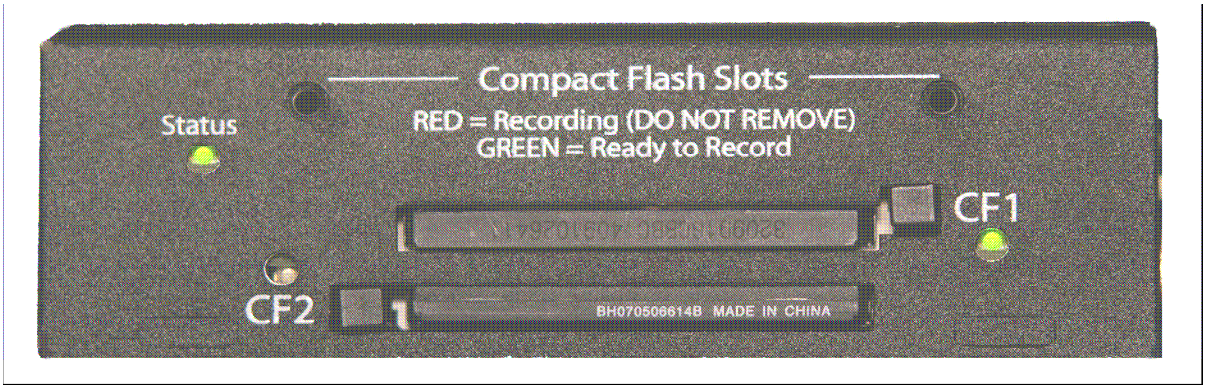
**How are field updates performed?**
New firmware can be downloaded from our website, unzipped, and written to a Compact Flash card. The card can be inserted into nanoFlash and the firmware via a message prompt.

## LCD Screen Layout

The LCD screen will change in appearance depending on the operating mode. This is the essential layout information:




1. Compact Flash Card levels: 0 to 100% full
2. Individual Compact Flash Level Indicators
3. Time-code Display
4. Play Menu Line with current file name displayed
5. Audio Channels 1-2 Level Indicators
6. Audio level markers (-60dB to 0dB)
7. Current Video Source Format
8. Recording (compressed) bit-rate
9. Total remaining record time (minutes) across all cards
10. Audio Over-Range Indicator




## Left Side Connections

• **CompactFlash Slots (2):** Insert (at least 1) solid-state Compact Flash card(s) face up for record and playback.

• **CompactFlash LEDs:** Compact Flash Status:
> No Light means no card inserted or the card has not been properly recognized.
> Solid green means card is OK and ready for use.
> Flashing Red means card is being written to during a record session (do not remove card).
> Flashing green means card is being read from during playback (do not remove card).
> Solid Red means the card is full.

Note: At this time, CompactFlash cards may only be added or removed while the nanoFlash is idle, in other words, not recording or playing back.

A future release will allow “Hot Swapping” of the CompactFlash cards.


## Bottom Connections

• **Status:** General indicator.
> Solid Green: cards are inserted and ready to record.
> Solid Red: recording.

• **Remote Control / LTC input:** 10-pin Hirose locking connector for external trigger and tally light control. Close the switch once for record trigger and once again for record stop. Also used for Linear Timecode input.

• **Power:** 4-pin Hirose locking connector power input.

• **On/Off** Power Button.
Pressing the power button **will always power down the unit**, regardless of the circumstances. The power button is recessed to prevent accidental activation.

• **HDMI In**: non-locking mini-HDMI input.

• **HDMI Out**: non-locking mini-HDMI output.

• **SDI/ASI In:** SDI or ASI video source for recording.

• **SDI/ASI Out:** SDI re-clocked stream with embedded audio and time code, or ASI re-clocked output stream.

• **Analog Audio In**: 3.5 mm consumer line level or microphone 2 channel stereo input.

• **Headphone Out**: 3.5 mm headphone out.