Canon

WHITE PAPER

EOS C200

New 4K UHD / HD and Digital Cinema Camera

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Written by Larry Thorpe
Customer Experience Innovation Division, Canon U.S.A., Inc.

For more info:
cinemaeos.usa.canon.com

CINEMA EOS

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ABSTRACT

The EOS C200 is a relatively new addition to the continually evolving Cinema EOS family. It is very specifically intended as a cost-effective multiformat and multipurpose Super 35mm digital cinema camera. It employs the same single 8.85 Megapixel Super 35mm CMOS Sensor and associated high-end imaging system as the EOS C300 Mark II. It offers 13-stop HDR and a selection of wide color gamuts.

Digital Cinema Production

On the digital cinema front, a 15-Stop dynamic range and a selection of wide color gamuts support high performance motion image origination. This is augmented by on-board 4K RAW recording at 1 Gbps up to 60 fps. The reduction in data size that makes this possible is achieved by an innovative bit rate reduction strategy that Canon has termed Cinema RAW Light. 15-Stop HDR recordings are made on a CFast 2.0 card. Recording bit depth is 12-bit for 29.97 / 25.00 / 24.00 / 23.98P and it is 10-bit for 59.94 / 50 P. An associated 2048 x 1080 proxy is separately recorded to an SD card.

Television Production

For television-centric applications the EOS C200 offers origination and recording of the 4K UHD production format up to 60 fps. 1080P HD having a 13-Stop dynamic range can alternatively be recorded up to 120 fps. Standardized MPEG-4 AVC/H.264 compression is the basis for the recording codec and the signal format is 8-bit YCrCb 4:2:0. It uses an MP4 file wrapper. An alternative codec is included in the EOS C200 based upon Canon's XF-AVC. It also records the 8-bit YCrCb 4:2:0 signal format (for both UHD and HD) at the same data rates – with an MXF file wrapper that can support additional metadata recording.

Recording of these formats are made to two widely available and low-cost SD memory cards. In the video production world, this small recording file offers high efficiencies for low-budget commercial productions, corporate promotions, wedding and event coverage, and very especially, the extensive web exhibition domain. In the broadcast television domain, this choice of codec was specifically intended to offer low-cost long-duration recording sought in documentary and news magazine productions.

High Quality 1080P with HDR and WCG

In recognition of broadcast television's current high interest in also exploring the potential of 1080P HD combined with HDR and WCG the EOS C200 delivers a high quality 1920 x 1080P YCrCb 4:2:2 @ 10-bit up to 60 fps on an SDI terminal for external recording. For those interested in digital cinema origination according to the DCI 2K specification (2048 x 1080) this option can also be selected on this SDI output terminal.

1.0 A MOST NOVEL DIGITAL CINEMA CAMERA

The EOS C200 and 200B were first announced in May 2017 and made their formal debut at Cinegear 2017. The EOS C200 comes with a built-in electronic viewfinder and an array of accessories including a 4-inch touch screen LCD monitor, a versatile handle and ergonomic handgrip. The EOS C200 is standalone camera body that allows the user the flexibility to customize the camera with a wide range of accessories to fit their specific needs. The camera's small form factor is particularly suited to attachment to a gimbal or drone.

Figure 1 *The EOS C200 is on the left and the stripped down EOS C200B on the right*

1.1 EOS C200

The EOS C200 Digital Cinema camera is a "ready-to-go" production system that comes with a built-in electronic viewfinder and an array of accessories including a rotating 4-inch touch screen LCD monitor (that can be mounted for left or right eye operation), a versatile handle and ergonomic handgrip. Two XLR connectors are integral to the camera body. It has SDI, HDMI, and Ethernet output connectors.

Figure 2 *Showing the components that make up the "Ready to Go" acquisition system*

1.2 EOS C200B

The EOS C200B is a standalone camera weighing only 2.9 lbs. – making it ideal for mounting in drones and gimbals

Figure 3 *The stripped down EOS C200B is tailored for highly mobile shooting*

The novel aspect of the "hybrid" EOS C200 camera is embodied in its dual recording choice:

- Low-cost television-centric recording – ***of 4K UHD and 1080P HD***
- Innovative high-performance cinema-centric recording – ***of 4K DCI RAW***

While industry comments on the RAW recording have been largely laudatory – they have been accompanied by high criticism from some quarters on the choices made for the 4K UHD / HD capture system. This very directly centers on the YCbCr 4:2:0 @ 8-bit recording signal format. Accordingly, this White Paper will first address this central topic. It starts with an explanation of the separate but flanking roles of the EOS C300 Mark II and the new EOS C200 cameras in the larger video production world.

2.0 POSITIONING EOS C200 AND THE EOS C300 MARK II

From a high level system architectural viewpoint there are similarities between the EOS C200 and the EOS C300 Mark II cameras. Ergonomically, they are very similar as shown in Figure 4. They share an identical front-end – a Super 35mm high-performance imaging system – as shown in Figure 8 and 9. The EOS C200 embodies a variety of operational refinements that had been suggested by many who had experience with the EOS C300 Mark II and other Cinema EOS cameras. Where the two cameras radically differ, however, is in their respective on-board recording sections.

Figure 4 *The C200 (on left) retains the same basic ergonomic structure of the C300 Mark II – but it is slightly smaller and lighter (3.2 lbs. versus the 3.9 lbs. of the C300 Mark II)*

Where the design priority of the EOS C300 Mark II was to originate no-compromise highest production quality possible in both 2K DCI and HD, and the same in 4K and UHD (albeit with more limited frame rate capabilities) – the central priority of the EOS C200 was to *flank* this camera – by significantly broadening the reach of 4K UHD / HD with a radically lower cost acquisition system.

On the television front this was considered particularly important given that the broadcast industry is still only tentatively experimenting with UHD while at the same time many website services and lower-budget production businesses are more boldly embracing 4K UHD.

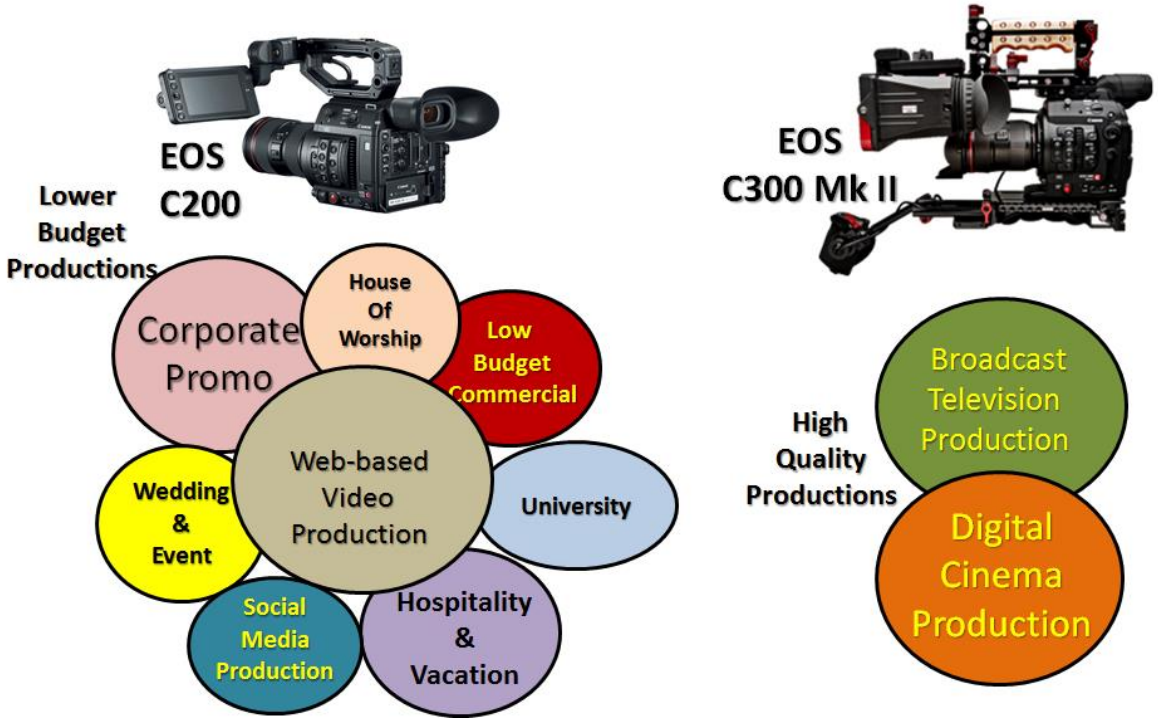

Figure 5 *The contemporary world of digital video production is far flung with broad ranging priorities and production budgets*

With the EOS C300 Mark II squarely focused on high-end program origination, the EOS C200 is intended to flank this camera – as suggested in Figure 6 – by addressing the larger and disparate lower budget video production world. At the same time, it also flanks digital cinema production with a cost-effective internal 4K RAW recording capability.

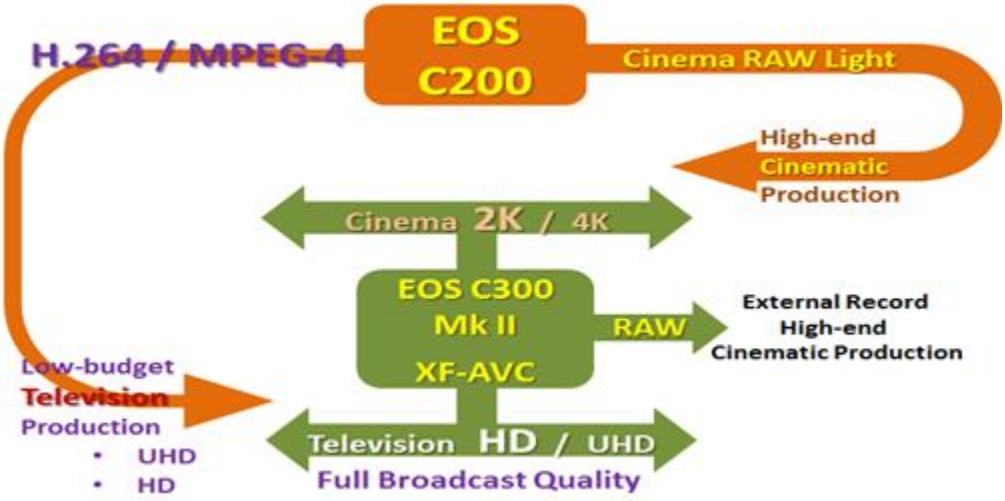

Figure 6 *EOS C300 Mark II is intended for highest performance and most flexible options in 1080P image capture while also offering a modest 4K / UHD capability – while the EOS C200 offers quite separate complementary capabilities to both the lower budget television and digital cinema sectors*

3.0 The 4K UHD / HD YCrCb 4:2:0 @ 8-bit Recording Format

3.1 A World of High Quality Digital Production

Year 2018 presides over unparalleled digital video production capabilities. Within the standardized digital video production formats of 4K DCI, 4K UHD, 2K DCI, and HD we see broad industry utilization of both RGB 4:4:4 and YCrCb 4:2:2 component coding – with each implemented at both 10-bit and 12-bit. Image performance aspirations and workflow imperatives have made these implementations the norm throughout broadcast television infrastructures. Stunning advances in both hardware and software support the most complex routing, switching, editing, grading, and image manipulation of these formats.

However, associated with these robust production formats there remains the implacable challenge of storage and its allied costs. These uncompressed digital formats are voraciously data hungry – none more so than the 4K formats. Where the highest performance is sought these storage costs are accepted. Those who specifically seek that quality are generally more than ready to pay for it. The Canon EOS C300 Mark II is a Super 35mm camera whose central design priorities were premised on those levels of high image quality.

But the television and video worlds are hugely diverse – as suggested in Figure 5. There is a very broad tiering in the cost / performance of the lenses, cameras, and cameras that have evolved to service the many program genres and their associated wide-ranging production budgets.

3.2 EOS C200 and the World of Low-Cost Digital Production

There are many constituencies within both the video and television worlds where the production imperative is to acquire program material at the lowest possible costs. This might be because it is especially long form – such as some documentaries and news coverage. Here, recording durations are extensive and now storage costs can become paramount.

The design priority of the EOS C200 camera in terms of its television-centric recording options was squarely focused on these latter program genres.

Long duration recording of both 4K UHD and 1080P HD on ubiquitous low-cost memory cards was a central design imperative. To achieve this – four aggressive bit rate reduction strategies were mobilized to implement that recording in the EOS C200:

1. Low-cost recording media – the now ubiquitous, readily available worldwide, and very cost-effective SD memory card
2. YCrCb 4:2:0 component coding
3. Low bit depth of 8-bit
4. Highly efficient high performance and globally standardized compression – namely Long GOP MPEG-4 AVC/H.264. This is constrained to 150 Mbps for 4K and to 35 Mbps for 1080P.

It should be stated that this is about as aggressive an overall strategy to achieve low-cost long duration recording as can be envisaged. But, it is important to note that all of the preceding video processing – prior to the formulation of the final signal format to be recorded – is conducted at an extremely high quality level – Figure 7. The subsequent video processing is entirely done at a 14-bit level and then the conversion down to the 8-bit format for recording is via a sophisticated rounding system. This produces a remarkably high subjective image quality. As has been reported in a range of technical reviews of the EOS C200 [1], [2], [3], the overall picture quality of the 4K UHD internal recordings surprised all.

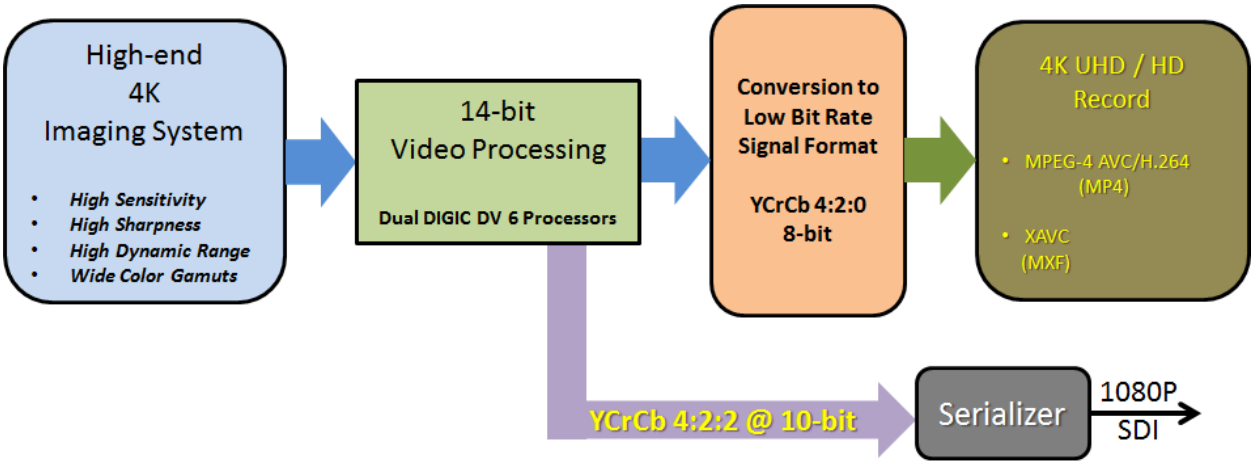

Figure 7 *EOS C200 has a high-end 4K imaging system followed by sophisticated video processing that produces a high subjective 4K UHD image quality*

4.0 COMMON IMAGING SYSTEM IN EOS C200 AND EOS C300 MARK II CAMERAS

A high priority was given to the quality of the image originated in the EOS C200. The camera uses the same Super 35mm 8.59 Megapixel CMOS image sensor as the EOS C300 Mark II. It retains the same built-in five position ND filter (0 / 2 / 4 / 6 / 8/ 10 Stop). It offers the same wide color gamut.

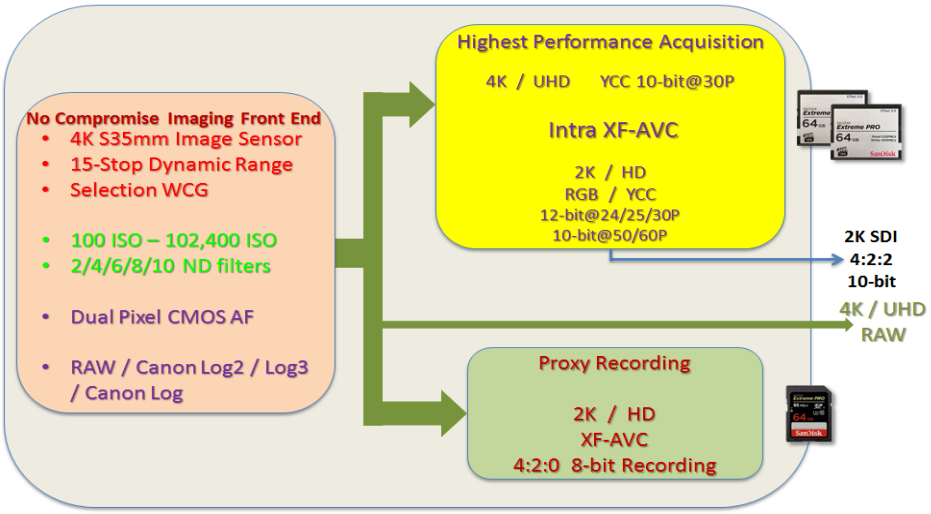

Figure 8 *The EOS C300 Mark II employs a high-performance XF-AVC codec to record any of the selectable four production formats – 4K / UHD / 2K / HD*

The difference between the two cameras is the EOS C200 either records RAW (with Canon RAW Gamma) for cinema, or a choice of MPEG-4 AVC or XF-AVC for 4K UHD / HD (with Canon Log3 or Canon Log).

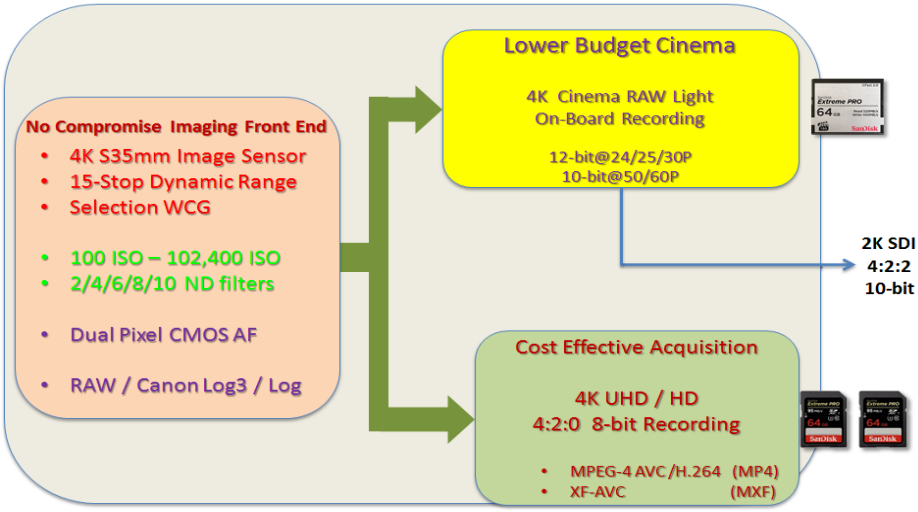

Figure 9 *The EOS C200 has a very high-end imaging system and then two options for on-board recording*

5.0 HIGH-END IMAGING SYSTEM IN THE EOS C200

The front-end imaging systems in both EOS C300 Mark II and EOS C200 are virtually identical. Accordingly, the C200 has the same very high image performance and operational flexibilities. These are summarized as follows:

1. **High Sensitivity –** the high sensitivity of the image sensor supports image capture in those situations where scene illuminace is unusually low (both cameras support sensitivity settings up to ISO 102,400). This level of sensitivity also offers creative flexibilities in setting ND filters, lens aperture, and electronic shuttering – for controlling depth of field – over a range of low light situations. The excellent Luma signal to noise ratio of 67dB (up to ISO 1600) helps produce superbly quiet imagery

2. **Very Clean Images** – Innovative internal signal extraction and readout strategies in the S35 image sensor help facilitate a total absence of debayering reconstruction errors and minimized aliasing

3. **High Picture Sharpness** – extension of the optical low pass filter cutoff was made possible because of novel anti-aliasing strategies

4. **High Dynamic Range (HDR)** – The 15-Stop range allow simultaneous capture of details in deep shadowed portions of a scene and in overexposed portions of that same scene.

5. **Constant Exposure Latitude Above and Below Reference 18% Gray –** protects the preservation of detail in both shadowed and highlight regions of a given scene over a very broad range of ISO settings. This also greatly supports “Push” and “Pull” manipulations in postproduction that seek to creatively alter the “look” of a given scene

6. **Wide Color Gamuts** – choice that can be set to ITU-R BT.709 colorimetry for HDTV programming, to ITU-R BT.2020 for UHD, and to wider color gamuts for digital cinema portrayal (or to support emulation of the look of specific motion picture film stocks)

7. **Lower Rolling Shutter Distortion** – Both cameras use a high-speed readout mechanism from the image sensor to reduce the visibility of the vertical skew distortion associated with CMOS rolling shutter

8. **Extension of White Balance Range** – on the blue side of the visible spectrum offers extended creative options as well as being able to accommodate more faithful image capture in underwater scenarios

9. **Selectable ND Filters** – built-in choice of 0 / 2 / 4 / 6 / 8 / 10 Stops

10. **Dual Pixel CMOS Auto Focus** – by now this technology is firmly established in terms of its precision and its accuracy. The accompanying alternative of Focus Guide is usually of higher interest to the cinema world

11. **Magnify 4x** – in the viewfinder while recording (to assist sharp focusing)

6.0 EOS C200 AND EOS C300 MK II – RECORDING OPTIONS

Front and center, the EOS C300 Mk II was intended to be a mainstay in high-end 1080P production. It supports origination of outstanding quality 1080P 2K DCI and 1080P HD at all of the standard international frame rates up to 60P. It can originate and record RGB 444 at 12 / 10-bit up to 30 P and also YCrCb 4:2:2 at 12/ 10-bit up to 60P. This is a camera that can be used for very high end television production – including episodics, drama, news magazine, special events, sports, documentaries, natural history. At the 2K level it is a powerful digital cinema camera offering an outstanding range of creative imaging options. In addition, it will originate 4K DCI and UHD at all international frame rates up to 30P.

The EOS C200, on the other hand, was specifically intended to be an altogether quite different production tool. In a sense, it flanks the redoubtable production capabilities of the C300 Mark II. It is smaller, lighter, and lower cost than the EOS C300 Mark II. It offers two radically different on-board recording options: one, a Cinema RAW Light that records 4K DCI to a single CFast 2.0 card – intended for lower budget digital cinema productions; and two, either 4K UHD or HD YCrCb 4:2:0 @ 8-bit formats using two variants of H.264/MPEG-4 LongGOP compression and recorded to two SD cards. The rationale behind the separate and complementary designs of these two Super 35mm cameras was recognition of the sheer breadth of production applications and budgets in both the television world and the digital cinema world.

7.0 EOS C200 RECORDING

7.1 Recording Options in EOS C200

The design of the EOS C200 placed a high priority on making the capture of 4K UHD program material very affordable:

7.1.1 ***On board Recording*** – of 4K UHD YCrCb 4:2:0 @ 8-bit – up to 60 fps

7.1.2 ***On-board Recording*** – of 1080-line HD YCrCb 4:2:0 @ 8-bit – up to 120 fps

7.1.3 ***On board RAW Recording*** – of 4K DCI up to 60P using Cinema RAW Light

7.1.4 ***External recording –*** of 4K DCI YCrCb 4:2:0 @ 8-bit up to 60P – via HDMI
-- of 1080-line YCrCb 422 HD up to 60P – via 3G SDI or HDMI

7.2 On Board MPEG-4 AVC / H.264 Recording of 4K UHD and 1080P HD

The EOS C200 employs the MPEG-4 AVC/H.264 codec to record both 4K UHD and 1080P HD production formats to two low-cost SD cards. This combination of a highly efficient recording file and low-cost storage contributes to very cost-effective capture of 4K UHD program material.

Table 1 On board MPEG-4 AVC / H.264 Recording of 4K UHD and 1080P HD

Video Codec	Resolution	Color Sampling & Bit Depth	Max Bit Rate (Mbps)	Frame Rates (fps)	File System	Media SD Card: Recording Duration 32 GB	Media SD Card: Recording Duration 64 GB	Audio
H.264 MPEG-4 LongGOP Variable Bit Rate	3840x2160	4:2:0 8	150	59.94/29.97/23.98/50/25/24P	MP4	25 min Class U3	55 min Card	MPEG-4 AAC-LC 2 Channel 16-bit@48kHz
	1920x1080	4:2:0 8	35	59.94/29.97/23.98/50/25/24P 120 / 100P	MP4	120 min Class 6/10/	240 min U1/U3 Card	Linear PCM 4 Channel 16-bit @48kHz

7.3 MPEG-4 AVC / H.264 Video Compression Codec

The video compression codec used in the EOS C200 is a variant of the MPEG-4 international standard. MPEG-4 is a sophisticated compression standard divided into several "Parts". The specific "Part" pertaining to the EOS C200 codec is MPEG-4 Part 10 – known as MPEG-4 Advanced Video Coding (AVC). It is one of the most commonly used formats worldwide for the recording, compression, and distribution of video content. The specific agenda underlying development of the H.264/AVC standard was to provide subjectively excellent video quality at substantially lower bit rates than previous standards – like MPEG-2. Those lower bit rates facilitate very long recording durations on standard lower-cost SD memory cards. This was central to the design strategy for EOS C200 which deploys two of these cards. Technically, MPEG-4 is a powerfully effective compression system having broad flexibilities – embodying the concept of "Profiles" and "Levels" – intended to support specific sets of performance levels and technical capabilities that can be tailored to a very wide range of applications.

The Four basic Profiles and their intended applications are identified as the following:

- **Main Profile**: Mainstream consumer profile for broadcast, packaged media (e.g. Blu Ray), digital cinematography, and storage applications
- **Baseline Profile**: For lower-cost applications with limited computing resources, this profile is for low-latency real-time applications such as videoconferencing and mobile applications
- **Extended Profile**: For IP-based video streaming applications over wireless and wired networks, this profile has relatively high compression capability and some additional strategies for robustness in terms of possible data losses over networks.
- **High Profile**: Adds more coding efficiency to all that is defined in the Main Profile, without significantly increasing complexity

Within each of the profiles there are multiple technical strategies relating to the overall compression format. Different Profiles can be combined to formulate a certain level of performance and operational dexterity that can be tailored to different applications.

Each of the associated Levels specifies sets of constraints for key compression algorithm parameters. The combination is often referred to as the "Toolkit" of MPEG-4 to structure a specific codec – in terms of application, performance, *and cost*. Figure 10 indicates the combination of the three basic Profiles underlying the codec used in the EOS C200. Table 2 summarizes the *basic Levels and Profiles* that Canon selects from in our various cameras.

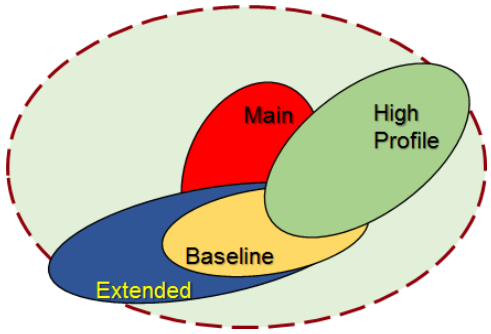

Figure 10 *Showing the combination of MPEG-4 AVC Profiles that are the basis of the high-performance codec in the EOS C200 cameras*

Table 2 MPEG-4 AVC / H.264 PROFILES and LEVELS

Profiles / Levels	Baseline	Extended	Main	High	High 10	High 422	High 444
8-bit	●	●	●	●	●	●	●
4:2:0	●	●	●	●	●	●	●
10-bit	●	●	●	●	●	●	●
4:2:2	●	●	●	●	●	●	●
4:4:4	●	●	●	●	●	●	●

Green = Yes Red = No

The four Profiles selected to form the basis of the recording codec for the EOS C200 are shown shaded in blue in table 2. It is important to note that the MPEG-4 AVC standard stipulates that this combination must be 4:2:0 @ 8-bit. This is central to achieving the much lower overall recording data rates that support long duration recording.

7.4 Context on the EOS C200 Compression Codec

As the standardization development work progressed on MPEG-4 over many years, additional Profiles and Levels were added to support the rapidly increasing sophistication of digital motion imaging systems. Figure 11 is a simplistic summary of those additional Profiles – all of which build on the Main Profile – and it also shows the general approach that Canon has adopted in our deployment of variations of that standard to our overall professional camera lineup.

Mobilizing elements from all of the Profiles, for example, is the foundation of the very sophisticated Canon codec used in the C700 and C300 Mark II high-end digital cinema cameras – the codec we term XF-AVC. It should be noted that the specific utilization of the many technical "Tools" within each of these Profiles does define the unique technical nature of the XF-AVC codec.

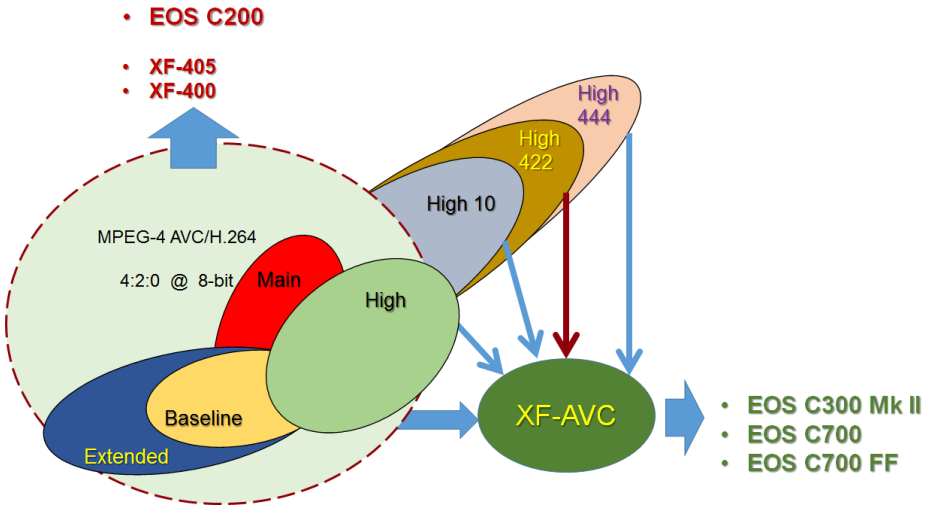

Figure 11 *A simplistic overview of the deployment of variations within the MPEG-4 / H.264 standard to the EOS C200 and separately to the high-end Cinema EOS production codecs*

7.5 File Structure for Recording in the EOS C200

The file structure used in EOS C200 is **MP4 –** an abbreviated representation of **MPEG-4 Part 14 –** which is a digital multimedia container format [based on the QuickTime File Format (QTFF) used by .MOV and .QT files] most commonly used to store video and audio. The importance of this container is that it can also store other metadata such as still images.

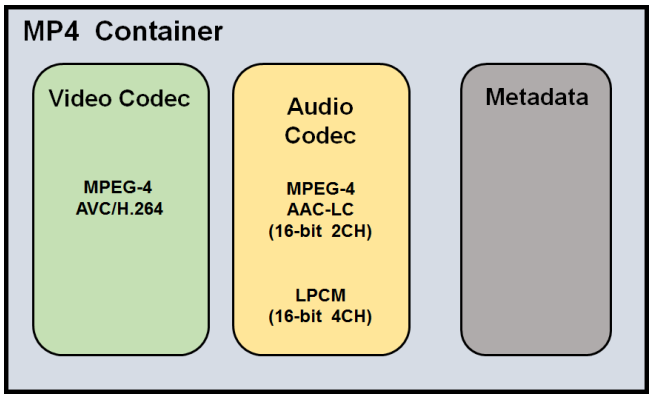

Figure 12 *Illustrating the MP4 container used for EOS C200 recording – which includes separate compression for audio and video tracks*

Canon chose the MP4 container to enable the EOS C200 camera to seamlessly integrate into a wide range of usages:

- Movie video, audio, and still images can be merged into a single MP4 file which is available to readily play on various devices
- MP4 media files can be sent to other people via email in a timely manner because the high level of bit rate reduction in the MPEG-4 AVC / H.264 codec produces a small file size
- MP4 enables FTP file transferring over the internet. This is expedited by the small file size and low bandwidth

The overall advantage of MP4 is that it can be saved as a single file and is much easier to move, copy, and upload to websites.

7.6 Alternative On-Board XF-AVC Recording of 4K UHD and 1080P HD

An alternative to the MPEG-4 AVC / H.264 codec with the MP4 wrapper is the Canon XF-AVC codec that is inside an MXF OP-1A wrapper. It retains the YCrCb 4:2:0@8-bit format to achieve essentially the same high file efficiency. This recording option supports the capture of an abundance of metadata to the file and it can be viewed using the Canon XF Utility software (as employed in the EOS C300 Mark II and EOS C700 cameras). Important to also note that this XF-AVC supports the current HDTV interlaced formats of 1080@59.94i / 50i for both internal recording and for the SDI interface – as there are still many video services worldwide that are totally interlace based.

Table 3 On board XF-AVC Recording of 4K UHD and 1080P HD

Video Codec	Resolution	Color Sampling & Bit Depth	Max Bit Rate (Mbps)	Frame Rates (fps)	File System	Media SD Card		Audio
						Recording Duration		
						32 GB	64 GB	
XF-AVC	3840x2160	4:2:0 8	160	59.94/29.97/23.98/50/25/24P	MXF	25 min	50 min	Linear PCM 4 Channel 16-bit @ 48 kHz
						Class U3	Card	
Variable Bit Rate	1920x1080	4:2:0 8	45	59.94/29.97/23.98/50/25/24P 59.94i / 50i 120 / 100P Slow-Mo	MXF	90 min	185 min	
						Class 6/10/U1/U3 Card		

8.0 ON BOARD RAW RECORDING – CINEMA RAW LIGHT

This is a lightweight version of the RAW format used in the high-end Cinema EOS cameras like the EOS C700 and EOS C700 FF and it was developed to support *on board* recording in the EOS C200 to a CFast 2.0 card. A proprietary bit rate reduction strategy is deployed that lowers the total RAW data to between 1/3 and 1/5 that of the Cinema RAW of the EOS C700 and other Cinema EOS cameras. It captures all of the 15-stop dynamic range of the imaging system and offers high overall performance to those interested in top-tier HDR image capture for digital cinema production. It support 10-bit and 12-bit recording at a data rate of 1Gbps (that is independent of frame rate and bit depth) – as shown in Table 4. An impressive 68 minutes can be recorded on board in the EOS C200 to a 512 GB CFast 2.0 card in contrast to some 39 minutes to a 2TB drive in the external Codex CDX-36150 recorder used with the EOS C700.

Cinema RAW Light differs from traditional RAW files in that it does not record frame by frame. Instead, using a proprietary format developed by Canon it compiles the RAW data into a single Canon RAW Movie file we term .CRM. This Cinema RAW Development software transcodes Cinema RAW Light files into a variety of file types which offer great flexibility in integrating into standard color grading software. Those files include Apple ProRes 4444, both 10-bit and 16-bit DPX, and EXR.

When the EOS C200 is set to capture in Cinema RAW Light, it is accompanied by a recording of 2K DCI (2048 x 1080) proxy files at 35Mbps (using the MP4 wrapper) to an SD card – as shown in Table 4. This supports a workflow that allows for immediate offline editing. These lightweight files are an easily playable version of the RAW recording allowing immediate viewing (applying an optional LUT if required). The 2K files can also be used as convenient and immediate dailies.

Table 4 4K Cinema RAW Light and accompanying 2K RAW Light Proxy

Video	Resolution	Color Sampling & Bit Depth	Max Bit Rate (Mbps)	Frame Rates (fps)	File System	Media CFast *(VPG-130 spec)* Recording Duration		Audio
						128 GB	256 GB	
Cinema RAW Light	4096 x2160	10 Bayer RGB RAW 12	1000 1000	59.94 / 50P 29.97 / 23.98 / 25 / 24.0P	CRM	15 min	30 min	Linear PCM 4 Channel 24-bit @48kHz
Proxy File	2048 x1080	4:2:0 8	35 45	59.94/29.97/23.98/50/25/24P	MP4 MXF	Media 15 min	SD Card 30 min	AAC-LC 2 Channel 16-bit @ 48kHz

The XF-AVC proxy contains camera and lens metadata matching the Cinema Raw Light files, which facilitates offline editing.

EOS C200 uses a proprietary Color Gamut and OETF when capturing its RAW data. When Canon RAW Light is processed the data can be conformed to a range of OETF curves (Canon Log 2, Canon Log3, Canon Log, and ITU-R BT.709) and color gamuts (ITU-R BT.2020, Canon Cinema Gamut, DCI P3, ITU-R BT.709) can be applied. Published reports on the RAW performance have been very positive [3].

8.1 Supporting 3rd Party Vendors for Cinema RAW Light

As of April 2018 the EOS C200 Cinema RAW Light files are supported by most of the major global editing / postproduction vendors:

PARTNERS	APPLICATIONS / SYSTEMS	
Adobe	Premiere Pro	
Avid	Media Composer	*Plugin*
Apple	Final Cut Pro X	*Plugin*
GV	Edius Pro	
BMD	DaVinci Resolve	
FilmLight	Baselight Series	
Pomfort (Germany)	Silverstick (XT) (Mac) / LiveGrade Pro (Mac)	
IN2Core (Slovakia)	Qtake	

9.0 EOS C200 CONNECTIVITY

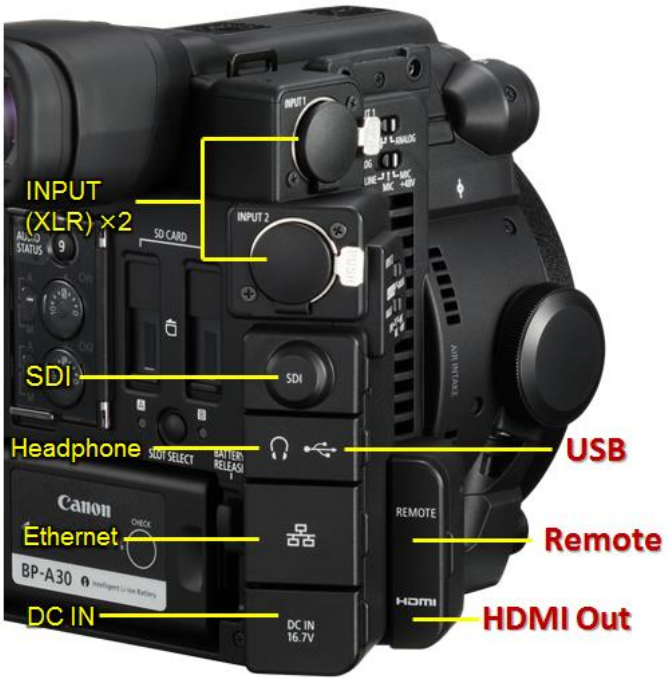

Figure 13 *Showing the connectivity embodied in the EOS C200*

9.1 Remote Control of EOS C200

When the EOS C200 is mounted on a crane or jib-arm all of the basic video functions can be controlled from the RCV-100 remote video panel.

Figure 14 *The RC-V100 video control panel supports remote control of video and also lens zoom, iris, and focus (including the Canon CINE SERVO lenses)*

Browser Remote allows the camera to be remotely operated from a tablet or other terminal – including remote focusing operations. The selected focusing area can be moved by touch. In situations such as shooting from a crane or drone aerial shooting this empowers accurate AF shooting. The EOS GPS Receiver GP-E2 can be connected to EOS C200 (using a USB cable) and provides location and time information that is recorded during shooting.

Figure 15 **EOS** *C200 system connectivity includes remote control from a compatible tablet*

10.0 SUMMARY

The primary application for the EOS C200 is in lower budget theatrical motion picture production. It is centered on the 4K DCI specification (4096 x 2160) for digital cinema applications. The 15-Stop dynamic range and a selection of wide color gamuts will support high performance motion image origination. This is significantly augmented by on-board 4K RAW recording at 1 Gbps up to 60 fps. The reduction in data size that makes this possible is achieved by a bit rate reduction strategy that Canon has termed Cinema RAW Light. Recordings are made on a CFast 2.0 card. The recording bit depth is 12-bit for 29.97 / 25.00 / 24.00 / 23.98P and it is 10-bit for 59.94 / 50 P. A 2048 x 1080 proxy is separately recorded to an SD card. Wide latitude in postproduction grading and easy conversion to a range of other formats is accomplished in post processing of this unique RAW signal format.

For television-centric applications the EOS C200 separately offers origination and recording of the 4K UHD (3840 x 2160) production format up to 60fps. In the interest of supporting the television broadcast industry's carefully paced exploration of 4K UHD the recording of this format is made to two of the readily available and low-cost SD cards. The MP4 codec is used to record the 8-bit YCrCb 4:2:0 UHD signal format at an impressive 150 Mbps that provides extended recording durations sought in documentary and news magazine productions. The camera can also originate and record standard 1920 x 1080 HD as 8-bit YCbCr 4:2:0 MP4 at 35 Mbps.

For those whose systems operate with the MXF file container the EOS C200 offers an alternative encoder using the Canon XF-AVC compression system with the MXF file format. This also supports origination and recording of the 4K UHD (3840 x 2160) 8-bit YCrCb 4:2:0 production format up to 60fps as well as the standard 1920 x 1080 HD 8-bit YCrCb 4:2:0.

At the same time, in recognition of broadcast television's current high interest in also exploring the potential of 1080P HD combined with HDR the EOS C200 delivers a high quality 1920 x 1080 YCrCb 4:2:2 @ 10-bit on an SDI terminal. For those interested in digital cinema origination according to the DCI 2K specification (2048 x 1080) this option can also be selected on this SDI output terminal. These formats can be recorded on a variety of widely available digital recorders. The image performance of both of these 2K / HD formats is enhanced by the use of Canon's Over Sampling HD Processing which significantly reduces aliasing while facilitating a high video MTF.

11.0 REFERENCES

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