

you can
Canon

DIGITAL CAMCORDER

XL H1

HDV™
HDV 1080i

Professional 1080i HD production
with XL versatility.



Canon's 1080i 1.67 Megapixel 3CCD XL H1 expands the possibilities for Standard Definition (SD) and High Definition (HD) production. It re-defines the professional video market at a time when HD is fast becoming a commercial reality for broadcasters across Europe and associated quality benefits of HD delivery are being recognised by consumers.

The camcorder supports uncompressed, as well as compressed (tape-based) workflows. Matching the requirements of professional videographers, the XL H1 is not only compatible with low-cost HDV and SD miniDV formats, it can also export uncompressed HD and SD footage via SDI (Serial Digital Interface) output. Complementing this range of production options, the camcorder is equipped with studio-standard connectivity, allowing it to be integrated into the broadcast environment and take part in multi-camera shoots.

The XL H1 re-defines the HD workflow for the next generation of video production and is a cost-efficient way for studios, production houses and low-budget digital moviemakers to meet the new demand for broadcast HD in Europe.

STUDIO INTEGRATION FOR BROADCAST

The XL H1 supports workflows at 1080/50i, with additional 25f shooting. 1080i is the most widely used broadcast standard for HD programming. The camcorder's portable chassis incorporates SDI output, Gen lock input and Time code input/output jacks, matching SMPTE (Society of Motion Picture and Television Engineers) standards for both SD and HD production.

20X OPTICAL ZOOM LENS FOR HD VIDEO

A new 20x optical zoom HD VIDEO lens, with Vari-angle Prism Optical Image Stabilization (VAP OIS), has been specially engineered for HD quality. Benefiting from Canon's expertise in the broadcast lens market, the lens inherits the XL interchangeable mount, allowing dedicated replacement lenses to be attached to the camera body. In addition, when used in conjunction with an adaptor, Canon's EF range of professional lenses for EOS digital SLR cameras can be used. Fixed focal EF lenses are suitable for HD recording.

HIGH RESOLUTION HDV

HDV is a new cross-industry video standard that was developed as a method of storing HD data on a standard miniDV cassette using MPEG-2 compression. With 1/3" 1.67 Megapixel 3CCDs, the camcorder delivers 1920 x 1080 images and the highest resolution in the HDV class*. In conjunction with superior Canon optics, the XL H1 delivers outstanding true-to-life video.

DIGITAL MOVIE MAKING

The XL H1 inherits the creative versatility of the XL series. Control over a comprehensive range of image parameters and shooting variables is available, while dedicated CINE settings are provided for digital filmmakers. These Gamma and Color Matrix options match the exposure and colour characteristics of film: one setting is provided to reproduce the film look for television viewing; a further setting has been specially developed for digital-to-film transfer (assuming that a kinescope recorder is used). 25f and even 24f (see options) shooting are also available to digital moviemakers.

FULL IMAGE CONTROL

The XL H1 features an expanded range of precise advanced image controls.

Alterations can be made to an extensive range of image variables, including independent control over a CCD's colour characteristics, allowing video output to be precisely matched with other camcorders. White balance presets are provided for Outdoor (5600K) and Indoor (3200K) environments, but more precise manual settings can also be made to specific temperature levels (increments of 100K). Matrix adjustments on six axis, Gamma, Auto Knee and Black Level adjustments are all possible.

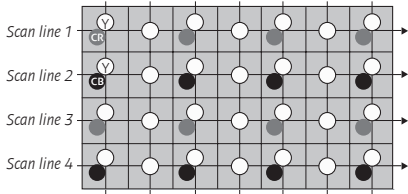
The camcorder features full manual shooting controls along with in-camera Focus Assist (Magnifying and Peaking) and up to 20 user controlled custom setups can be saved to SD card and returned to at a later date.

** As of 1 January 2006*

HIGH DEFINITION VIDEO (HDV)

HDV 1080i

HDV uses miniDV media and is streamed via a single Firewire cable. It employs MPEG-2 Video and MPEG-1 Audio Layer II (2ch) compression with a sampling rate of 4:2:0: chrominance (CR, CB) is sampled at half the rate of luminance (Y) per scan line, in both horizontal and vertical dimensions.



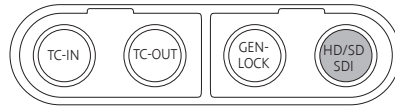
HDV is comprised of HDV1 720p and HDV2 1080i specifications. The larger image size of the 1080i specification provides more pixel information per frame than 720p does and therefore also has an increased data rate. Delivering higher quality images, the HDV2 stream is transmitted at 25Mbps, compared to 19Mbps for HDV1. 25Mbps matches the capacity of a miniDV cassette, ensuring that HDV2 makes best use of the media.

HDV2 1080i is compressed in a 12 GOP (Group of Pictures) stream, composed of Intraframe (I), Bi-directional (B) and Predictive (P) pictures. Rather than recording video frames separately, 12 frames are grouped together in successive batches. Within each group, a single representative frame is processed independently (in a way similar to normal DV) with the remaining 11 frames in the GOP subsequently compressed according to the differences between them and the primary representative frame.

By processing only one full frame of data accompanied by 11 sets of data that record only slight differences, MPEG-2 compression avoids the unnecessary repetition of image information. Since the images in each GOP are close together (equivalent to approximately 0.5 seconds of video), the differences between them are very small (dependent on recording environment).

The HDV2 1080i XL H1 uses native 16:9 CCDs with a pixel count of 1440 x 1080 and a Pixel Aspect Ratio of 1:1.333. Due to the use of non-square pixels, an HDTV monitor is able to display the XL H1's signals properly, at full 1920 x 1080 HD resolution.

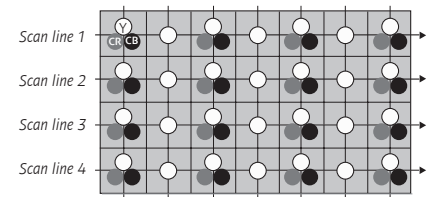
SDI (SERIAL DIGITAL INTERFACE) OUTPUT



SDI output is the standard interface connector for professional production equipment. It is used by television studios and provides the real time transport of uncompressed digital video for live feed productions as well as editing and monitoring. SDI's technical standard is detailed in SMPTE 292M and 259M. The connection is most commonly found on camcorders that have been designed primarily for broadcast use. Accordingly, SDI is compatible with a variety of broadcast standard video devices, including video monitors, tape decks (all formats) and switchers.

The XL H1 is capable of transmitting uncompressed SD and HD video over a single 75 ohm coaxial cable (BNC connector) up to a recommended distance of 30 metres with an 8-bit colour depth

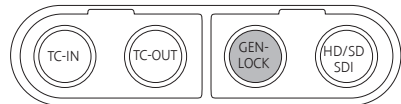
and a colour sample of 4:2:2. While the data rate for the SD-SDI signal reaches to 270Mbps, the standard data rate for HD-SDI is 1.485Gbps.



4:2:2 is also the sampling rate of DigiBeta and other professional systems: for every four samples of luminance (Y), there are two samples each of blue and red chrominance (CR, CB) per horizontal scan line. Whereas the 4:2:0 sample of miniDV and HDV output is considered to be of insufficient quality for Chroma Keying, the 4:2:2 sample rate of SDI output is ideal.

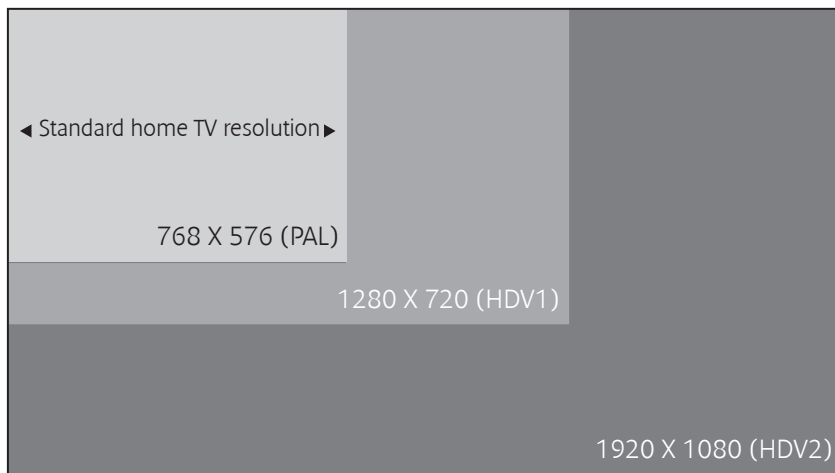
Note: the XL H1 accepts additional Gen lock data via SDI but does not support the transmission of audio and Time code signals. Therefore, XL H1 camcorders incorporate independent XLR audio and Time code input/output connections.

GEN LOCK INPUT



"Gen lock", which stands for "generator lock", is a system that allows the synchronisation of two or more video sources. Without synchronisation, switching between sources results in a dramatic loss in image stability, for instance during a live feed multi-camera shoot. Video images may distort, roll vertically and/or horizontally, or experience colour degradation as the monitor (or other device) attempts to lock onto a new signal.

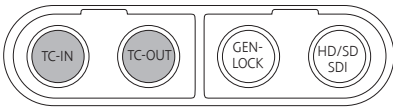
Via an input terminal, the Gen lock signal is communicated to the camcorder from a master generator. (The master generator may be another camcorder if it is equipped with an output terminal.) The information carried informs the camcorder when each frame and each interlaced line in the frame - odd or even - should begin to scan. Repeated for each scan line, Gen lock aligns horizontal and vertical video phases.



When a video signal is being outputted via SDI, camcorders such as the XL H1 receive the Gen lock signal via the SDI connection. An independent Gen lock connector is therefore provided for video footage that is exported from another source, such as Component Video.

The Gen lock signal for SD-SDI output is a Black Burst: a blanking pulse carries the sync data, immediately followed by image data output, HD footage, however, cannot be Gen locked with this standard sync signal for SD. HD-SDI output therefore requires a different type of signal. This is known as Tri-level sync and, like the Black Burst, it is repeated for every scan line.

TIME CODE INPUT/OUTPUT



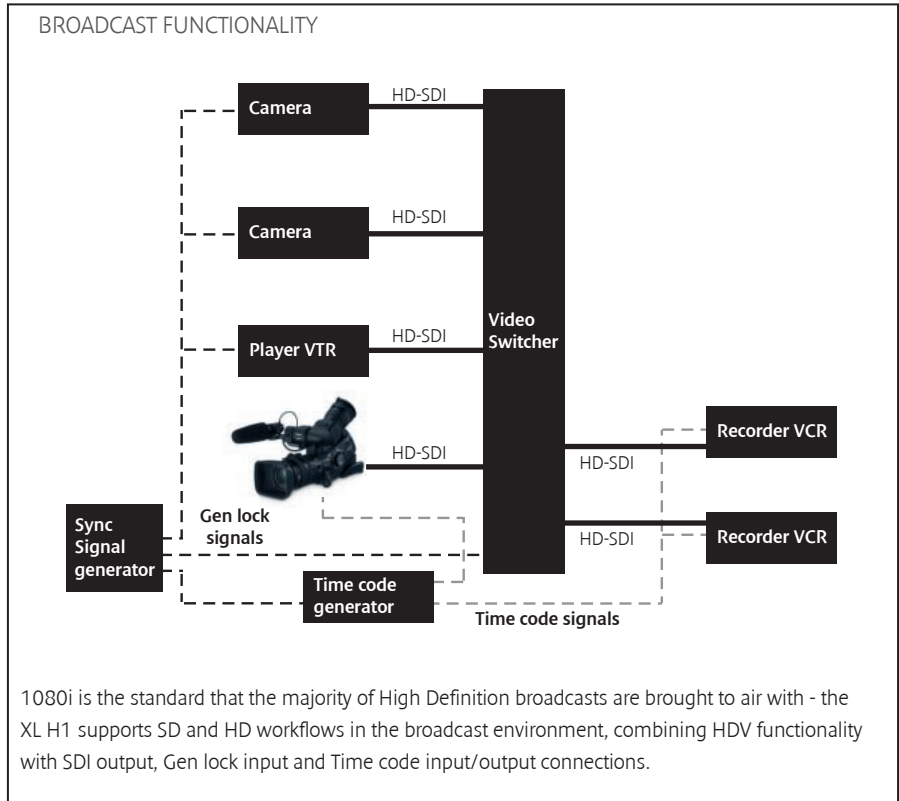
Longitudinal Time Code (LTC) is a digitally encoded signal that is recorded to tape. It is comprised of an 8 digit figure that logs video frames according to hours, minutes, seconds and frames (00:00:00:00). This Time code, set from a central generator, is used as a reference marker, synchronising the internal clocks of two or more video devices.

Without a Time code reference, managing any post-production work that involves more than one video source entails a higher risk that the final edit will be out of synchronisation. Time code is therefore essential to all but the most basic productions.

When an SDI transmission does not support the transmission of a Time code signal, independent Time code connections are necessary. When both input and output Time code jacks are available, the camcorder will be able to not only receive the Time code but also to export its own internally generated code data to another video device as the master signal.

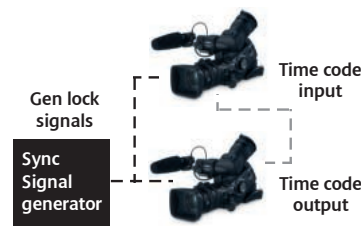
Tri-level sync, the Gen lock signal for HD video (see "Gen lock input") can also be used in conjunction with the Time code to ensure the absolute frame accuracy of a Time code across video devices. Although a Time code that is communicated to two camcorders is used to align the frames of each, the code is actually received at an indeterminate point in the

BROADCAST FUNCTIONALITY



1080i is the standard that the majority of High Definition broadcasts are brought to air with - the XL H1 supports SD and HD workflows in the broadcast environment, combining HDV functionality with SDI output, Gen lock input and Time code input/output connections.

frame scan cycle: the Time code can only log frames and not, within a frame, scan lines. There is no way of ensuring that both A and B receive the Time code at the same moment in their frame cycle. Consequently, to ensure that both A and B do begin scanning at the same time, the Time code signal can be referenced to an externally generated Tri-level sync signal.



This ensures that a precise relationship between the scanning cycle of A and B can be established. Since the sync signal used to co-ordinate the Time code informs both camcorders precisely when to begin scanning a frame, the Time code is accurately positioned at the same point (at the beginning) in the frame of both A and B.

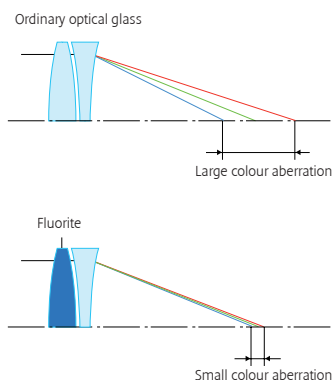
COMPONENT VIDEO OUTPUT

The Component Video signal is a professional analogue format that outputs picture information in luminance (Y) and a phase-opposite chrominance pair (CR, CB). By transmitting the separate parts of the signal independently, over three cables, output quality is boosted. The connection of the three cables to the camcorder has been simplified and is now made with just a single connector.

HD VIDEO LENS

The Canon HD VIDEO lens is constructed to the highest optical standards for HD imaging. It is composed of 12 elements in 10 groups, delivering a focal range (35mm photographic equivalent) of approximately 38.9-778mm (HD/SD 16:9 still and video recording).

The lens has twin aspherical lens elements constructed from fluorite high-refraction glass. These crystalline-based elements are cultivated for professional 35mm and broadcast use because of their ability to minimise chromatic aberration, most problematic at the upper ends of the focal range.



Since HD video has a much higher resolution than SD, focusing errors are more visible. The XL H1 is equipped with in-camera Focus Assist (Magnifying, Peaking) to help videographers achieve absolute clarity. For productions that require multiple takes from the same mark or the reproduction of dramatic automatic zoom/focus shifts, a preset function with memory backup remembers focus and zoom points for different lenses (even if they have been detached). Preset points are returned to with accuracy at variable speeds. In total, 16 adjustable zoom speeds are available.

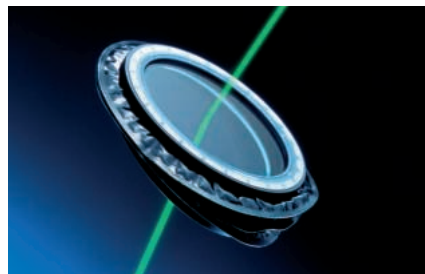
VAP OIS

A Vari-angle Prism Optical Image Stabilizer (VAP OIS) is employed to minimise image distortion. Consisting of two glass-plates that are jointed with bellows made of special film and filled with high refraction liquid, a VAP changes shape to correct lens vibration, responding within approximately 0.002 sec. Two high-speed gyroscopes detect vibration or movement and a microcomputer calculates the optimum correction value. In accordance with

the calculation, an electromagnetic actuator alters each prism's vertical angle, correcting the vibration of the optical axis to re-align the path of incoming light.

The lens's corrective fluorite lens glass refracts light rays when moved perpendicular to the optical axis. When the lens is tilted off its optical axis by vibrations, highly responsive coils on each side of the lens move the IS lens group in the direction of the vibration. Because vibration can occur in both horizontal and vertical directions, corrective optical system movements are made up/down and left/right

Subsequent analysis of images registered on the CCD, refines correction vectors, resulting in better compensation of low frequency band vibrations.



XL LENS MOUNT

The XL interchangeable lens mount system offers videographers the versatility of an open architecture video system. The mount is compatible with a range of different lenses for both SD and HD production. In combination with a separate optional adapter, EF fixed focal length lenses, designed for professional Canon EOS D-SLR cameras, are suitable for HD recording use.

Automatic flange back adjustment allows the distance from the mechanical flange of the lens (the rear edge surface of the lens mount) to the focal plane to be altered. Aligning different lenses to the camcorder body, alterations are made to correct blur when zooming to wide angles.

25F MODE

HDV2 1080i shooting does not provide progressive scanning because the 1080i specification employs interlaced CCDs to deliver higher resolution images. However,

a 25f mode is possible with the XL H1, providing 25 frame shooting.

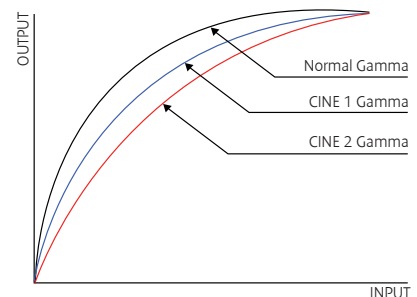
This feature is called "frame mode", designated by the letter "f". It is not called "progressive scan" because the XL H1 does not have true progressive scan CCDs.

When the camcorder is PAL/NTSC switchable, 24f mode is also possible, for direct digital-to-film transfer. (For direct transfer, 2.3.3.2 pulldown is available. For playback of 24f video on video monitors, 2.3 pulldown is available.)

CINE GAMMA AND COLOR MATRIX

For digital moviemakers, CINE Gamma and Color Matrix settings match the colour and response characteristics of film.

There are three Gamma settings and three Color Matrix settings available: "Normal", "CINE1" and "CINE2". For both Gamma and Color Matrix, "Normal" setting is based on the assumption that images will be viewed on a TV monitor. "CINE1" delivers a picture quality that resembles a movie: this is for creating images that will be screened on TV. "CINE2" setting provides adjustments suitable for direct transfer to film.



The "CINE2" settings achieve characteristics that support the conversion of data into a film format, assuming that a kinescope recorder is used. As a result, footage shot under these settings appears under exposed when viewed on an ordinary video monitor.

A RANGE OF OPTIONAL EXTRAS IS AVAILABLE, ENHANCING THE CREATIVE VERSATILITY OF THE XL H1.

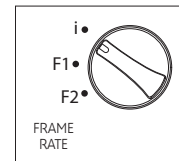
PAL/NTSC

The XL H1 is compliant with both PAL and NTSC signal systems when the upgrade is made at an authorised Canon Service Centre.

Dual PAL/NTSC compatibility expands the range of production options available. European producers are able to work in the global market with a comprehensive range of capture options, including 60i, 50i, 30f, 25f and 24f.

The F2 setting is used for 24f recording when the upgrade is made; PAL-only compliant camcorders will shoot 25f at F2.

For digital moviemakers, 24f shooting also includes the option for 2.3.3.2 pulldown, perfectly suited for direct digital-to-film transfer. 2.3.3.2 pulldown creates the 24 frames of film from 60i footage. (For playback of 24f on video monitors, 2.3 pulldown is available: this is the traditional way of transferring 24 frame film to NTSC video.)



CONSOLE

Complementing the XL H1, Canon's new CONSOLE software is a powerful studio tool for PC. CONSOLE manages the recording and playback of SD and HDV data and includes support for the recording of footage straight onto a computer's hard disc drive (HDD).

CONSOLE allows PC users full remote control of the XL H1 via a single IEEE 1394 (Firewire) cable. Using the software, users take control of image variables, including Gamma, Master Pedestal, Color Phase and AE metering, and can also operate and adjust zoom, focus, white balance, iris, frame rate and shutter speed settings. Still image capture, custom preset and Focus Assist functions can also be controlled via the PC.

CONSOLE has an intuitive menu system and easy setup mode. It allows split screen views of record and playback controls/viewing windows: video captured to the PC's HDD can be reviewed in the playback window while a new shot is being monitored in the record display.

Additional features include wave & vector monitors, allowing precise adjustments to be made to video and phase parameters.

CONSOLE system requirements

- OS: Microsoft Windows XP Home Edition or Professional (Service Pack 2 required)
- CPU: Pentium 4 2GHz or better; Pentium M 1.5GHz or better; (Pentium 4 3.2GHz or better recommended)
- RAM: 512 MB or more (1 GB or more recommended)
- Free Hard Disk Space:
 - For installation 30 MB or more
 - For video recording 1 GB or more
- File System: NTFS
- Interface: IEEE1394 (OHCI compliant)
- Compatible Camcorders: XL H1, XL2



For more information on the XL H1 and its accessories, visit www.canon-europe.com/xlh1



CAMERA	
Image sensing device	1/3-inch CCD
Image size	3-CCD horizontal pixel shift
System	1.67 Megapixels per CCD
Total pixels PAL/NTSC	HD: Approx. 1.56 megapixels
Number of effective pixels (per CCD) PAL/NTSC	SD/4:3: Approx. 1.17 Megapixels
	SD/16:9: Approx. 1.56 Megapixels
Lens	Depending on lens. The following specifications apply when the HD 20x zoom XL5.4-108mm L IS II is installed.
Optical zoom magnification	5.4 - 108mm
Focal length	None
Digital zoom	f/1.6 - 3.5
F-number	
Aperture leaves (Number of leaves)	6 leaves, iris diaphragm
Zoom speed	Fixed speed (16 speed level settings available)
Handle zoom	Variable speed/Fixed speed
Grip zoom	(16 speed level settings available)
Filter diameter	72mm
Image stabilizer	
Image stabilization system	Optical compensation (Vari Angle Prism compensation)
Sensing method	Angle detection and movement vector detection
Minimum illumination	
Auto mode	Approx. 6 lux ((when i is selected) shutter speed 1/50, Gain 18dB)
Manual mode	Approx. 0.4 lux ((when i is selected) shutter speed 1/3)
SHOOTING FUNCTIONS	
Photometry System	Full auto mode, Auto mode, Night mode, TV mode, Centre weighted average
Centre weighted average	
Evaluative photometry (128-segments)	Spotlight mode
Exposure adjustment	
AE lock	Included. EXP. LOCK button operation (Auto mode, TV mode, AV mode only)
AE shift	Included. AE SHIFT dial operation (± 2 levels) (Auto mode, TV mode, AV mode only)
Gain setting	Auto/Gain select (-3, 0, +3, +6, +12, +18 dB) Set to Auto in Full Auto and Night mode, Spotlight mode is fixed at 0 dB.
Shutter speed	
Shutter speed setting (at TV priority)	13 levels (1/3, 1/6, 1/12, 1/25, 1/50, 1/120, 1/250, 1/500, 1/1000, 1/2000, 1/4000, 1/8000, 1/16000 sec)
In Auto mode	i: 1/50 to 1/500 sec, F1: 1/25 to 1/500 sec
Night mode	i: 1/3 to 1/500 sec, F1: 1/3 to 1/500 sec
Aperture value (HD 20x zoom): AV priority	f/1.6, 2.0, 2.8, 4.0, 5.6, 8.0, 9.5, CLOSE
Image quality adjustment	
Skin setting	Skin detail setting can be made after making hue, chroma, area and Y level adjustments.
Custom preset	Gamma, knee, black, master pedestal, setup level, sharpness, H detail, H/V balance, coring, NR (1/2), color matrix, color gain, hue, RGB gain independent, matrix (6-axis adjustment)
White balance	
Auto	Yes
Preset/Set	Outdoor (5600 K), Indoor (3200 K), Set (2 available), Color temperature setting (increments of 100 K)
Focus Mode	AF, MF, One-push AF, Preset focus
MF operation	Focus ring operation
Time code	
Countup system	Rec Run, free run, Recrun Preset, hold
Start value setting	"00:00:00:00", Set, Reset selectable
Still image recording	Yes (1920 x1080)
Zebra pattern	Yes (Level adjustment: selectable from 70%, 75%, 80%, 85%, 90%, 95%, and 100%)
Digital fade	Yes (White, black fader)
Colour bars with tone	Yes
Clear scan	Yes
REC review	Yes
Standby switch	Yes

Power save	Yes
Audio	DV recording: 16-bit 2ch (48 kHz), 12-bit 4ch (32 kHz) 4-channel synchronous recording is possible
DV	HDV recording: 2ch recording/MPEG-1 Audio layer II, 4ch recording/MPEG-2 Audio layer II
Microphone	stereo/mono switch
Mic level recording	XLR and RCA
Line level recording	XLR and RCA
Wind screen	Yes (ON/OFF)
Viewfinder	
Size	2.4-inch (16:9 widescreen)
Pixels	215,000 pixels
Image quality adjustment	Yes (Brightness, Contrast, Color, Sharpness Adjustment, Black and White supported)
Position adjustment	Yes, front and back, and side to side adjustment
VCR	
Playback system	
Frame playback	DV recording: Forward/Reverse, HDV recording: Forward only
Slow playback ($\pm 1/3$, $\pm 1/10$ speed)	DV recording: Forward/Reverse
2x speed playback	HDV recording: Forward only
1x speed playback	DV recording: Forward/Reverse
Cue/Review	HDV recording: Forward/Reverse (speed is 1x speed)
Search	DV/HDV recording: Forward/Reverse
Date search	DV recording: 11.5x speed, HDV recording: 8x speed
Index search	Yes
End search	Yes
Date code display	Yes
Zero set memory	Date and time display, Shooting data
	Yes
SYSTEM	
Interface (jacks)	
Microphone input jack	Front microphone jack (with 5 V DC jack), rear microphone jack (XLR jack supporting phantom power supply: 2 systems), accessory shoe jack (supporting Microphone Adapter MA-300)
Headphone output	3.5 mm mini jack
HDV/DV terminal	Input/Output IEEE1394 Firewire
Video jacks	S-Video, BNC jack (composite, input, output)
SDI	Component connection (output only)
AV terminal	HD-SDI, SMPTE 292M;
LANC jack	SD-SDI, SMPTE 259M
Time code jack	RCA pin (V: input/output, A: input/output 2 systems)
Gen lock terminal	Yes
Memory card terminal	Yes, input, output
Electronic View Finder connections	Yes
Analogue signal to DV signal conversion	SD Card
Microphone attenuation	1. Colour EVF
Microphone level meter	2. CRT BW EVF
World clock	Yes
Tally lamp	Yes (Only microphones connected to the front microphone and rear XLR jacks)
Remote control	Yes
Accessory shoe	Yes
Custom key	Yes, supporting EX Speedlite flashes
DV control	Yes (2 available)
Backup power supply	Yes
Battery pack power	Lithium coin battery (built-in)
	BP-930, BP-945, BP-950G, BP-970G lithium-ion battery
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Canon

Canon Inc.
30-2 Shimomaruko 3-Chome
Ohta-Ku, Tokyo 146-8501
Japan

Europe, Africa and Middle East

Canon Europa N.V.
P.O. Box 2262
1180 EG Amstelveen
The Netherlands
www.canon-europe.com

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