SONY

CINEALTA™

HDCAM™

Sony Digital Recorder

HDW-F500

Exploring New Horizons in Movie Making

The Sony HDW-F500 VTR defines a pivotal point in the development of digital recording. Based upon proven 1/2-inch tape technology the HDW-F500 is the digital high definition recorder for production, post production, mastering and the preservation of precious archive material. Either on set or on location, it provides immediate playback of shots in the full, breath-taking high definition quality. View not just composition but details such as make-up and wardrobe exactly as they will be seen in the final production. But that's not all. The HDW-F500 is supremely flexible. Pictures are recorded according to the industry agreed Common Image Format (CIF) but can be acquired at a number of different frame rates. 24 progressive frames per second (24P) to exactly match film production or switchable to 25P, 30P, 50 interlaced (50i) or 60i to work with international Digital Television (DTV) standards. Simply stated this is the first singular digital format created specifically to suit the needs of Motion Picture, HDTV, DTV, Standard Definition TV, DVD, Internet, E-cinema and all other moving picture distribution channels.

CineAlta™ — Liberating Movie Makers

CineAlta – a name we proudly introduce to symbolize the bond between cinematography and Digital High Definition imaging. It distinguishes a Sony family of products and systems that offer new creativity in the production, post production and exchange of motion pictures. It brings together the quality and universality of 24-frame cinematography with the real-time capability, efficiency and flexibility of Digital High Definition technology. It stimulates the convergence of Motion Picture Film and Digital High Definition production on a global basis.

CineAlta products, delivering cinema-quality pictures at selectable frame-rates, are simplifying International Programme Exchange by minimizing the need for standards conversion. Equally, they are opening up new possibilities for international co-production.

Movie making has been liberated with the creative empowerment of the cinematographer. It is facilitated by real-time HD image evaluation on-set, instant replay of a full-color high-resolution digital "take", real-time image optimization while shooting, a 50-minute shooting load and, most importantly, by the significant cost-benefits associated with this digital medium.

CineAlta products also ensure a seamless bridge between 24-frame film originals and a final 24P digital master. A frame of film now has a one-to-one correspondence with a progressive HD frame. The CineAlta environment readily interfaces with the computer graphics world, liberating post production. The direct color conversion of progressive 24P masters to film, and to a multiplicity of international digital HDTV and SDTV distribution formats, are the final liberation.


SONY

HDCAM – High Definition Digital Recording

Since Sony introduced the HDCAM format in 1997, it has been well proven in the USA and Japan, where it has offered highly mobile and compact 1080/60i digital acquisition and recording solutions. This highly reliable and robust format delivers superb picture quality efficiently packaged onto 1/2-inch tape. The data rate is such that, compared to other systems, the tape recordings are inherently more robust and the running costs are lower due to lower tape consumption and reduced maintenance requirements. The data rate also makes possible portable, battery-powered products such as the HDW-F900 camcorder. Also the HDCAM signal (HD SDTI) can be routed through conventional SDI routers and infrastructure. Current computer graphic workstations can access the HD signal through their current SDI I/O.

The HDW-F500 VTR acquires each picture frame according to the industry standard Common Image Format (CIF) which specifies a sampling structure of 1920 active pixels horizontally by 1080 pixels vertically.

The state-of-the-art Sony HDCAM compression scheme is a frame-based digital compression strategy, where every frame of the signal is treated as a single entity. By this HDCAM maintains exceptionally high picture quality and multi-generation robustness for both progressive and interlace signals.

Advanced digital pre-filtering and dynamic bit-allocation for luminance and chrominance components (based on the statistical analysis of the picture content) are combined with a low compression ratio of 4.4 to 1 to give a total on-tape recorded data rate of a modest 185 Mb/s at 60i. On tape the recordings are protected by very powerful error correction and concealment strategies perfected through years of Sony digital VTR development.

The on-tape recording footprint remains the same for all frame rates. The different rates are accommodated by changing drum rotation speed and linear tape speed. What this means is that a recording made at one frame rate can easily be replayed at another frame rate with no quality loss. A 24P recording made to support movie production can be replayed at the slightly higher 25P and 30P frame rate for television broadcasting. A common practice made simple by the HDW-F500. In this case the HDW-F500 will also convert audio and time code for correct 25P or 30P replay.

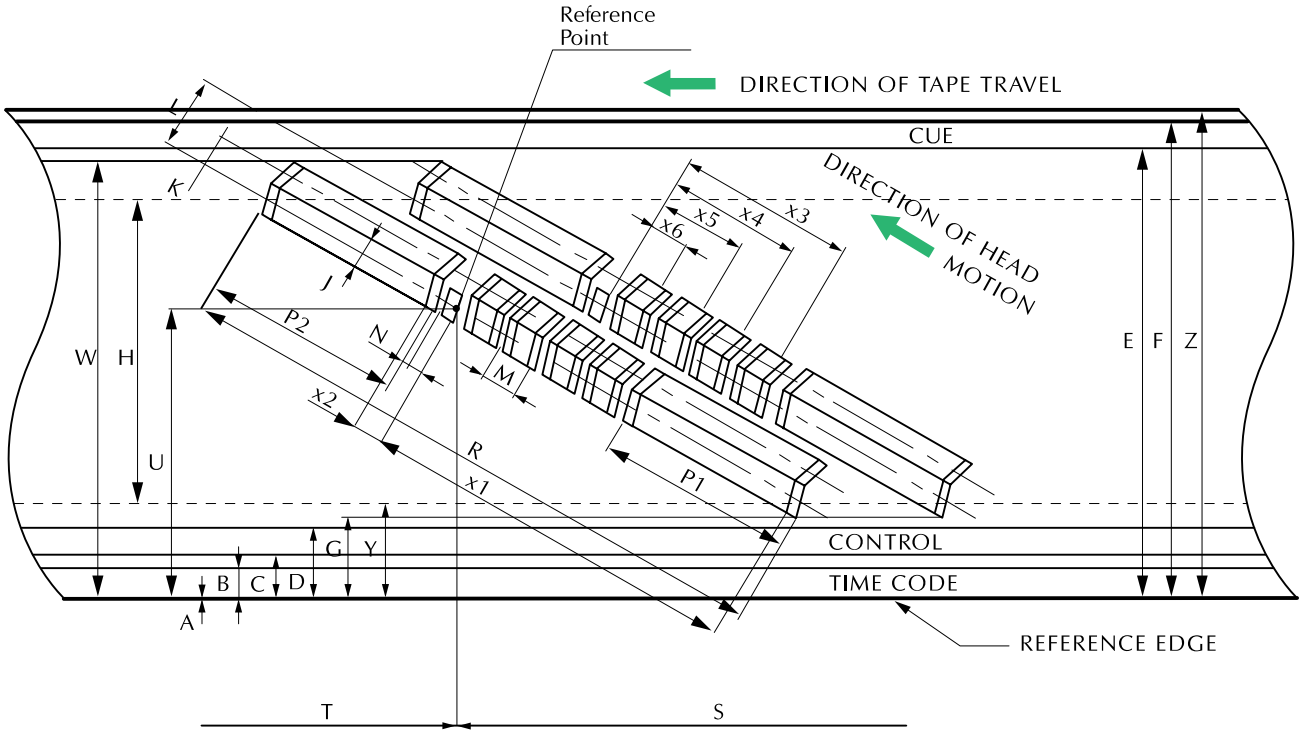
The HDCAM format

The HDCAM format maintains the same footprint for both progressive and interlaced signals. Every frame is treated as a single entity. Hence, recording of signals with different frame rates is achieved by efficient and automatic adjustment of the tape transport and drum rotation speeds. Each picture frame is recorded over 12 helical tracks.

The format also includes a newly developed digital signal processing with advanced error correction and error concealment. The error concealment system is powerful enough to provide superb picture quality even if one of the 4-playback heads is accidentally damaged. In addition, the 13.5 μm tape thickness ensures stable and reliable recording.

24P HDCAM allows a single highest resolution program master to be created, from which all other video formats (or film recordings) can be made on a global basis. Simply stated, this is the first singular digital format ever created specifically to suit the needs of Motion Picture, HDTV, television, DVD, Internet, future E-Cinema and all other electronic and digital distribution media.

In order to retain system compatibility of progressive frames with interlaced signals, the 24P system handles each progressive frame as two segments separated in time by 1/48th of a second. A complete progressive picture frame from the acquisition device (telecine, camcorder, studio camera, etc.) is divided into two segments and as such travels through the HD SDI base-band interface (or through the SDTI infrastructure in a compressed form) in the same manner as an interlaced signal. Although the segmented signal structurally resembles an interlaced signal, it should NOT be confused with interlaced images. The segmented frame format is approved by the ITU Rec.709-3 and is supported by most of the major manufacturers. The official ITU nomenclature for this signal is 24PsF – Progressive, Segmented Frames.



Key Features

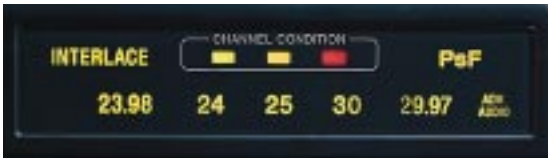
Operational Flexibility and Production Convenience

Conversion from HD to SD

The HKDV-501A option provides down conversion capability from high definition (HD) to standard definition (SD). Standard definition serial digital (SDI) and analog composite signals are output. For a 60i or 30P recording 525 signals are output. For a 50i or 25P recording 625 signals are output. Output of progressive standard definition signals (480P and 576P) is provided by means of dual linked SDI outputs.

Down conversion from 24P is also possible with the addition of the optional HKDV-507 pull down board to provide the frame rate conversion. The frame rate conversion is achieved using the recognised 3-2 pull down sequence. The aspect ratio of the standard definition output can be selected from 'Edge Crop' (with adjustable position), 'Letter box' or 'Squeeze'.

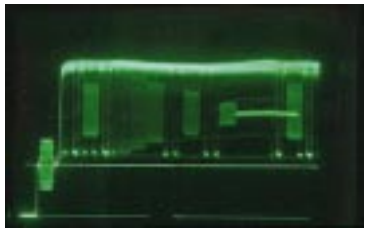
A distinct advantage of the HDW-F500 is that, with its down-conversion capability, the "super-sampled" HD origination produces standard definition 480 and 576-line PAL/NTSC signals having technical performances that are superior to those were they originated in their native formats (their horizontal and vertical MTFs are higher and the associated scanning aliasing is less).



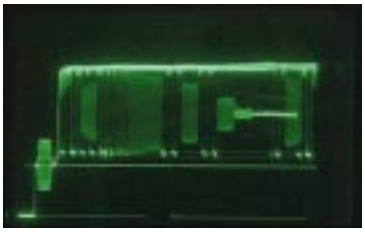
24PsF

25PsF

30PsF



Conventional 480/576-line
Digital VTR



"Super-sampled" HDCAM
Down-Converted signals

Long Recording Time on a Single Cassette

A full-length feature movie can be recorded on a single tape cassette. The HDW-F500 supports both small and large tape cassettes. Small cassettes, as recorded by the Sony HDCAM camcorder – the HDW-F900 – and large cassettes ideal for production, post production and distribution. The actual running time is dependent upon the frame rate. Typically, at 24 progressive frames per second, a small cassette will record 50 minutes and a large cassette 155 minutes.

High reliability is mandatory

The HDW-F500 bears a striking resemblance to the legendary Digital Betacam™ studio VTRs. This resemblance is more than skin deep. The tape transport design is derived from Digital Betacam thereby guaranteeing high reliability and familiar maintenance procedures.

Digital Audio and Ancillary-Data Recording

The HDCAM format records four channels (two AES/EBU stereo pairs) of non-compressed digital audio (20 bit at 48 kHz). The HDW-F500 is able to record non-audio data streams within the audio recording area by packaging the data within an AES/EBU wrapper. Furthermore, the footprint of the HDCAM also has the packet data area alternatively, so that you can select this ancillary-data to be recorded onto this packet data area or the audio data space via menu control system of the VTR.

Dolby®-E

The Dolby-E system for digital surround sound production is gaining popularity and the HDW-F500 can record the Dolby-E bit stream onto one of its AES/EBU stereo pairs. In total two Dolby-E bit streams can be recorded. The HDW-F500 can advance replay the Dolby-E bit streams during playback in order to compensate for the delay of the Dolby-E encoding / decoding process.

Editing and Playback Functionality

Pre-read Edit

The HDW-F500 is equipped with an advanced playback head to enable pre-read editing. This function allows users to edit with a single HDW-F500 and offers a cost-effective editing solution.

Confidence Playback

Separate playback heads immediately following the recording heads allowing off-tape video and audio monitoring during recording. Therefore the quality of a recording can be immediately verified without stopping the production.

Slow Motion Replay and Special Effects

Using the Dynamic Tracking™ feature the HDW-F500 is capable of noiseless, continuously variable picture replay in the range of –1 to +2 times normal playback speed. Ideal for slow motion, reverse action and reverse zoom shots.

High Speed Picture Search

Time is money and so the HDW-F500 provides high speed picture search with recognizable color pictures up to +/- 60 time normal playback speed (24P mode).

Digital Jog Sound

Complete reproduction of all four channels of digital audio is possible within a speed range of –1 to +1 normal playback speed to allow the exact location of dialogue or music beats to be found.

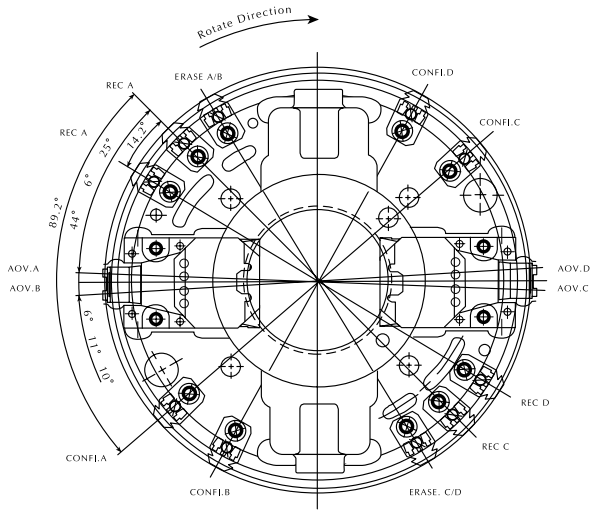
VITC (Vertical Interval Time-Code) Read/Write

The HDW-F500 can read and write time code at any speed. The VITC facilitates Play, Still, and Slow-motion all with precise time-code information.

Advanced control panel

The HDW-F500 control panel will be familiar to many current operators being similar to the advanced control panel of the Digital Betacam VTRs. It incorporates direct access keys for rapid configuration and the facility to store machine set-ups and configurations on removable PCMCIA:SRAM memory cards.

HEAD POSITION



Video Remote Controller

An optional video remote controller replicates the important video image controls of the front panel onto a remote panel.

Versatile I/O capability

The HDW-F500 can be interfaced to its external environment at a number of levels.

- HD-SDI input and outputs for digital, uncompressed, 10 bit component I/O conforming to SMPTE-292M with a bit rate of 1.5 Gb/s. These signals carry HD video, four channels of digital audio and auxiliary data.
- HD-SDTI input and outputs for digital HDCAM signals containing the compressed HD video and four channels of audio within the familiar 270 Mb/s standard SDI wrapper. This allows the HDCAM signals to be, for example, routed though existing SDI infrastructures or stored on conventional SDI based disc recorders. Using HD-SDTI I/O perfect copies, or clones of material, with zero quality loss, can be made.
- Analog composite outputs are available when the optional HKDV-501A down converter board is fitted.
- Digital Audio I/O - two stereo pairs of AES / EBU digital audio I/O are available.
- Analog Audio I/O - all four audio channels and the cue track are available on analog audio I/O. Two additional analog monitor audio outputs are included.
- Reference – the HDW-F500 can be synchronized to either 525, 625, 1125/59.94 or 1125/60 reference signals.

Options

The operational flexibility of the recorder is enhanced by a comprehensive range of plug-in option boards:

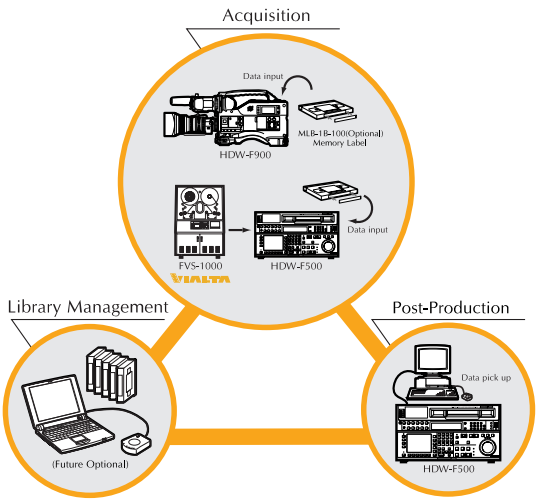
- HKDV-501A, High Definition to Standard Definition Down Converter Board
- HKDV-502, HD Line Converter Board
- HKDV-503, Video Remote Controller*
- HKDV-506A, SDTI Interface Board
- HKDV-507, HD Pull-Down Board

*This product may not be available in some countries. For the Details, please contact your nearest Sony office.

Content Information

Content is king. It is the asset. What is it, where did it come from, how was it made. All valuable pieces of information. Using a system called TeleFile this information can be managed. Low cost cassette labels containing a memory IC, with contact-less, induction coil transmission, store the information. The HDW-F500 can read and write from these labels and an additional reader/writer unit, for use under PC control, is available for stand-alone reading and writing.

Contents Management with TeleFile

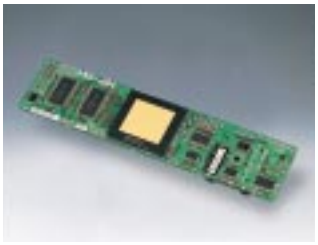


One World – One Model

All products with the CineAlta mark, are designed for world-wide use and for smooth, straightforward, international collaboration and program material exchange. This philosophy is embodied in the world's first, truly global, HD VTR. The Sony HDW-F500 multi-frame-rate HDCAM Digital High Definition Recorder fully complies with the ITU 709-03 (1999) recommendation for High Definition Production and International Programme Exchange and can be switched to operate in any of the 50 and 60Hz regions of the world. In addition it can operate in accordance with the new 24P world production standard and deliver both a digital high definition signal output and simultaneously a digital standard definition signal output – ideal for future simul-casting.

Optional Accessories

HKDV-501A,
High Definition to Standard
Definition Down Converter Board



HKDV-502,
HD Line Converter Board

HKDV-503,
Video Remote Controller

HKDV-506A,
SDTI Interface Board

HKDV-507,
HD Pull-down Board

BKDW-509,
50-pin Parallel Remote Kit

RMM-110,
Rack Mount Kit

BCT-124HDL/64HDL/40HD/22HD,
HDCAM Video Cassette Tapes

BCT-HD12CL,
Video Head Cleaning Cassette Tapes

HDW-F500 Specifications

General	
Power requirements	100 to 240 V AC (±10 %, 50/60 Hz)
Power consumption	230 W
Operating temperature	+ 5 °C to +40 °C (+41 °F to +104 °F)
Storage temperature	-20 °C to +60 °C (-4 °F to +140 °F)
Operating humidity	25 % to 80 % (Relative humidity)
Mass (Approx.)	35 kg (77 lb. 2 oz)
Dimensions (W x H x D)	427 x 237 x 520 mm (16 3/4 x 9 3/8 x 20 1/2 inches)
Tape speed	77.4 mm/s (24P mode)
Digital recording/Playback time	Max. 155 min with BCT-124HDL cassette (24P mode)
Fast forward/rewind time	Approx. 3 min with BCT-124HDL cassette
Search speed range	±60 times normal playback speed (24P mode)
Servo lock time	1.0 sec or less (From standby on)
Load/unload time	6.0 sec or less
Input/output	
HD serial V/A input	BNC (x1 with a monitoring loop-through), Serial digital (1.485 Gb/s), SMPTE 292M/BTA S-004/ITU-R.BT 709
HD reference video input	BNC (x1, with a loop-through), Tri Level sync, 0.6 Vp-p, 75 Ω, sync negative
SD reference video input	BNC (x1, with a loop-through), Black Burst, 0.286 Vp-p, 75 Ω, sync negative
Digital audio input (CH1/2, CH3/4)	BNC (x2, with 2 loop-through), AES/EBU
Analog audio input (CH1/2/3/4/Cue)	XLR-5-pin type (Male) Low OFF: -60 dBu, high impedance, balanced High OFF: +4 dBu, high impedance, balanced High ON: +4 dBm, 600 Ω termination, balanced
Time code input	XLR-3-pin type, (Male x1), 0.5 to 18 Vp-p, 10 kΩ, balanced
HD serial V/A output	BNC (x4, with a character out), Serial digital (1.485 Gb/s), SMPTE 292M/BTA S004/ITU-R.BT 709
Pull-down output (Optional BKDV-507 required)	BNC (x2), with character
Standard Definition V/A output (Optional BKDV-501A required)	BNC (x3, with a character out), D1 serial digital (270 Mb/s), SMPTE 259M
Analog I/O down converted output (Optional BKDV-501A required)	Composite: BNC (x1 with a character out) 1.0 Vp-p, 75 Ω, sync negative) SD sync: BNC (x1, Black Burst, 0.286 Vp-p, 75 Ω, sync negative)
Analog I/O reference output	1125 Sync: BNC (x2), Tri Level sync, 0.6 Vp-p, 75 Ω, sync negative
Digital audio output (CH1/2 CH3/4)	BNC (x2), AES/EBU, unbalanced
Analog audio output (CH1/2/3/4/Cue)	XLR-3-pin type, (Female x5), +4 dBm, (With a 600 Ω load), low impedance, balanced
Monitor output (L/R)	XLR-3-pin type, (Female x2), +4 dBm, (With a 600 Ω load), low impedance, balanced
Time code output	XLR-3-pin type, (Female x1), 2.2 Vp-p low impedance, balanced
Phones	JM-60 stereo phone jack, - ∞ to –12 dBu (With an 8 Ω load), unbalanced
HD SDTI input/output	BNC (x2), Input/output, Serial digital
Remote 1 input	D-sub 9-pin, Female, Sony 9-pin remote interface
Remote 1 output	D-sub 9-pin, Female, Sony 9-pin remote interface
RS-232C	D-sub 25-pin, Female
Video control	D-sub 9-pin, Female (For optional HKDV-503)
Parallel remote (Optional BKDW-509 required)	D-sub 50-pin, Female
Panel remote	D-sub 15-pin, Female
Digital video performance	
Sampling frequency	Y: 74.25 MHz, PB/PR: 37.125 MHz
Quantization	10 bits/sample of input-output signals (8 bit sample for internal compression process)
Compression	Coefficient recording system
Channel coding	S-NRZI PR-IV
Error correction	Reed-Solomon code
Error concealment	Adaptive three dimensional
Analog composite output performance (With optional HKDV-501A)	
Bandwidth	Y: 0 to 5.75 MHz +5.0 dB/-3.0 dB
S/N ratio	56 dB or more
Y/C delay	15 ns or less
K Factor (2T Pulse)	1 % or less
Output SCH phase	Based upon RS-170A/CCIR R.624-3
Digital audio performance	
Sampling frequency	48 kHz (Synchronized with video)
Quantization	20 bits/sample
Wow & flutter	Below measurable level
Headroom	20 dB (Or 18 dB selectable)
Emphasis	T1 = 50 μs, T2 = 15 μs (on/off selectable in recording mode)
Analog audio output performance	
A/D quantization	20 bits/sample
D/A quantization	20 bits/sample
Frequency response	20 Hz to 20 kHz, +0.5 dB/-1.0 dB (0 dB at 1 kHz)
Dynamic range	More than 95 dB (At 1 kHz emphasis ON)
Distortion	Less than 0.05 % (At 1 kHz, emphasis ON, reference level)
Cross talk	Less than –90 dB (At 1 kHz, between any two channels)
Cue truck	
Frequency response	90 Hz to 12 kHz ± 3 dB
S/N ratio	More than 45 dB (At 3 % distortion level)
Distortion	Less than 2 % (T.H.D at 1 kHz, reference level)
Wow & flutter	Less than 0.2 % rms
Supplied Accessories	
	AC power cord (1) RCC-5G, 9-pin remote cable (1) PSW4 x 16screws, for rack mounting (4) SRAM 64 KB memory card (1) Operation manual (1) Maintenance manual part 1 (1)
Optional Accessories	
	HKDV-501A, HD-SD Converter board HKDV-502, HD Line converter board HKDV-503, HD Digital Video Controller HKDV-506A, SDTI input and output board HKDV-507, HD Pull-down board BKDW-509, Parallel 50-pin interface kit RMM-110, Rack Mount Adapter BCT-HD12CL, Cleaning Cassette BCT-124HDL/64HDL/40HD/22HD, HDCAM tape cassette

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Distributed by

V-11121
MK7536V1SMC00MAR

Printed in Japan