

SONY®

PAL

BETACAM SX™

Betacam SX System



ISR Interactive
Status
Reporting

Preliminary

The Total System for the Digital Newsroom

When Sony introduced U-matic® video cassette recording in 1972, the age of electronic news gathering was launched. In the 1980's, Sony gave the world Betacam® and then Betacam SP®—workhorse formats that introduced such radical improvements in picture quality that they were quickly adopted throughout the broadcast community. Developed to take full advantage of the Betacam and Betacam SP formats, the BVW range of Sony VTRs has, for over a decade, set the standard for reliability and performance in the demanding worlds of ENG and EFP.

Now, in the 1990's, digital technology is bringing revolutionary changes to the broadcast industry. Changes that are accompanied by benefits and advantages that can be applied throughout the entire broadcast operations.

To realize these dramatic benefits, Sony introduces the Betacam SX™ system: the total solution for optimized digital acquisition and production.

Betacam SX is designed to achieve superior picture quality, faster editing, increasing system flexibility and greater productivity in every aspect of news gathering and production. The Betacam SX system combines extraordinary advantages: an advanced compression algorithm, dramatic reductions in equipment size and operating costs, the speed and creativity of non-linear disk-based editing—and the power of a total digital network.

Betacam SX uses MPEG2 4:2:2 Profile at Main Level (MPEG2 4:2:2P@ML) to maintain broadcast-quality pictures from camera and through post production. Using a robust compression algorithm that achieves higher picture quality at a reduced bit-rate, MPEG2 4:2:2P@ML is the key to superior digital acquisition, high-speed transmission from the field to the broadcast station, high-speed material upload to server, non-linear editing, cost-effective archival storage and server-based layout.

Betacam SX takes advantage of the existing SDI (Serial Digital Interface) and coaxial cable infrastructure used throughout the broadcast community. The new Sony SDDI (Serial Digital Data Interface) networking technology builds on the success of SDI—and permits the transfer of compressed video and audio material, and other data, faster than real-time without picture degradation.

The Betacam SX solution also maintains compatibility with current analogue systems. Using advanced Hybrid Recorders that combine video tape transports and hard disk drives, the Betacam SX system allows existing analogue Betacam and Betacam SP archive material to be accessed and digitized for non-linear editing.

The Sony Betacam SX System—the first system that brings news broadcasting operations the full benefit of digital technology, while maintaining the functionality and cost efficiency that will carry today's broadcasting community into tomorrow's digital world.



Broadcast Picture Quality with MPEG2 4:2:2P@ML

The Betacam SX format records 8-bit, 4:2:2 component digital signals using the advanced compression algorithm. Betacam SX recordings maintain high-quality pictures without visible artefacts, while keeping the bit-rate low to allow high-speed transmission, cost-effective digital non-linear editing and archival storage. Betacam SX picture quality exceeds that of Betacam SP. Betacam SX also preserves 608 active lines per frame including vertical blanking signal information. The Betacam SX recording format yields superior picture quality, with excellent luminance detail and improved colour resolution. The 4:2:2 sampling structure maintains the chrominance information necessary for editing and special effects—and stands up to the post production needs of news programme production.

<Betacam SX Format>

Video	
Compression	MPEG2 4:2:2P@ML
Compression rate	Approx. 1/10
Line/Frame	507 lines (525/60), 608 (625/50)
Audio	
Sampling	16-bit/48 kHz, No compression
Audio	4-ch audio
Video ancillary data	1 line/field
Extension data	20byte/frame
Longitudinal track	Time Code/Control/Aux track
Robustness	1/2 Metal
Track pitch	32µm
Tracks	10 (525/60), 12 (625/50)
Tape speed	59.575mm/s
Tape recording time	Up to 180 min with L-cassette Up to 60 min with S-cassette

Betacam SX Achieves Efficient Bit-Rate Reduction

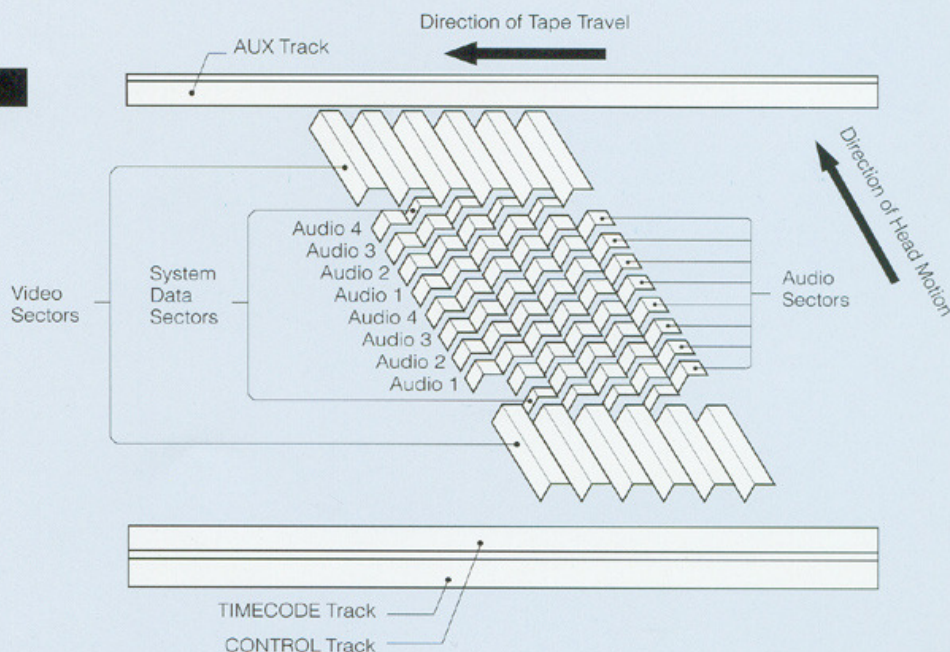
The robust compression algorithm of the Betacam SX format results in a compression ratio of 10:1 for the video signal, achieving greater efficiency both in transmitting the signal from the field to the station and in storage onto disk without sacrificing picture quality. Reducing the bit-rate enables non-linear editing systems to handle real-time video and audio signals at lower cost. The 10:1 compression ratio allows either high-speed transmission or simultaneous 2-channel transmission of different video source signals within a limited bandwidth, resulting in reduced transmission fees and facilitating the use of contribution links at reasonable cost.

The reduced bit-rate of Betacam SX recordings also yields overall cost saving in storage requirements and transmission time, making more effective use of the hardware capacity and channel bandwidth of a disk and server-based studio network system.

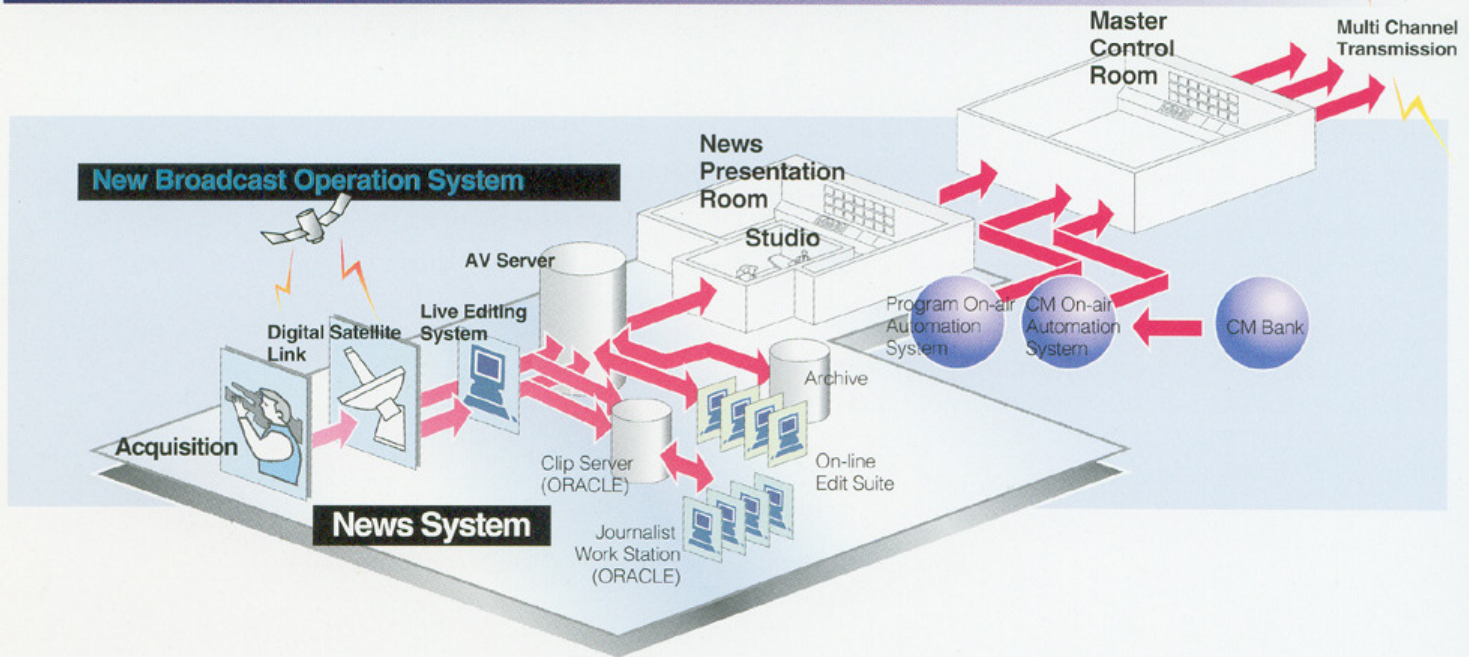
Betacam SX: The Key to the Digital Newsroom

Betacam SX is the key to the Sony approach to the digital newsroom—bringing the multiple advantages of high-quality pictures and sound, high-speed transmission and low-cost operation. The compression has been carefully designed to maintain high picture quality during every phase of broadcast news operations. The compression algorithm

Tape Format



Betacam SX Format



of MPEG2 4:2:2P@ML is universally employed within the full Betacam SX product range, as well as by the digital, disk-based A/V Servers in the Sony system. This means that, throughout the total newsroom system, no picture degradation will result from the video and audio copying process.

Compatibility with Analogue Betacam & Betacam SP

The Betacam SX format uses the same size 1/2-inch cassette as current Betacam and Betacam SP equipment. Betacam SX machines have the capability to play back current analogue Betacam recordings made on oxide or metal tape. This means that archived material can be played back and media costs kept to a minimum.

This analogue compatibility provides a logical, cost-efficient migration path towards a totally digital environment. Betacam SX products provide both analogue and digital interfaces, allowing new digital products to coexist with existing analogue systems in the studio and in the field.

Current BCTM and UVWT metal tape cassettes can be used for Betacam SX recording, assuring wide availability of recording media. For digital performance at reduced cost, a new metal particle tape has also been developed for Betacam SX.

The Cost Efficiencies of Betacam SX

Betacam SX is designed to deliver all the benefits of high-quality digital performance—and also to achieve significant long-term saving in both media and hardware costs as well as minimizing operational expenditure.

Lower Tape Running Costs

The advanced signal compression technology of the Betacam SX format has brought the important advantage of longer tape recording times: up to 60 minutes on a single S-cassette, and up to 180 minutes on a single L-cassette.

Powerful error correction capability enables Betacam SX to record on low-cost metal particle tapes. Tape consumption can actually be reduced by one-half—which means that ENG acquisition and studio archival tape costs can be greatly reduced, while superior picture quality is maintained.

Reduced Maintenance Costs

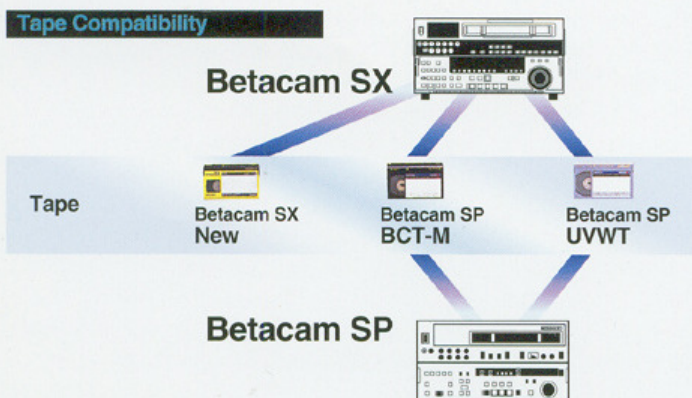
Betacam SX equipment also incorporates an Automatic Alignment System that insures the accurate tape recording and reproduction of digital data. An Automatic RF Equalizer optimizes the gain and phase of off-tape RF signals.

These automatic systems minimize the need for time-consuming manual equalization and servo system adjustments, resulting in lower maintenance costs.

Innovative Hardware Designs

Another significant economy results from the reduced bit-rate of the Betacam SX format: the ability to develop new hardware designs that reduce cost by combining multiple functions.

A dramatic example of this design efficiency is the unique Sony Digital Video Hybrid Recorder, which combines VTR and hard disk drive in a single integrated unit.



Betacam SX in Action:

The Robust Tape Format

The Betacam SX format represents a new extension of Betacam, drawing on the long experience of Sony in serving the real-world needs of the broadcast community—and combining the proven performance of 1/2-inch analogue Betacam SP with the digital technologies of D-1, D-2 and Digital BETACAM®. The robust tape format of Betacam SX records 8-bit, 4:2:2 component digital video signals and supports four channels of 16-bit/48 kHz digital audio. Its powerful ECC (Error Correction Code) automatically compensates for off-tape data errors caused by burst errors during recording and playback. This ensures virtually dropout-free acquisition of important news programme material.

The Right Media in the Right Application

Sony expertise in every aspect of video technology has led to careful evaluation of the running costs, recording times, mobility factors and industry-wide compatibility of both tape and disk media.

Sony employs tape media for applications requiring low running costs, longer recording time and higher mobility—and uses disk media when high-speed random access and non-linear operations are required. Best of all, both tape and disk media utilize the same sampling structure and compression algorithm, allowing both to work together seamlessly and efficiently in a powerful hybrid storage system—that is the beauty of the Sony Betacam SX System.



Efficient Bit Rate Reduction
for High-speed Transmission
in Network System

Audio CH ≥ 2

Right Media
in Right Application

Broadcast Picture
Quality

Compatibility with
Analogue Betacam &
Betacam SP

Robust Format

Lower Tape
Running Costs

Low Maintenance
Costs

Key to the
Total Digital
Newsroom System

BETACAM SX

- MPEG2 4:2:2P@ML
- 608 (625/50) Lines per Frame
- 1/2 Tape Consumption
- 4ch Audio
- 60-min Recording with S-cassette

Betacam SX

Upgrade Path

Broadcasters and producers can choose to upgrade to Betacam SX in simple, logical steps. This step-by-step upgrade path is designed to increase productivity while maintaining compatibility with existing equipment.

Upgrading to a Betacam SX News System

Step
1

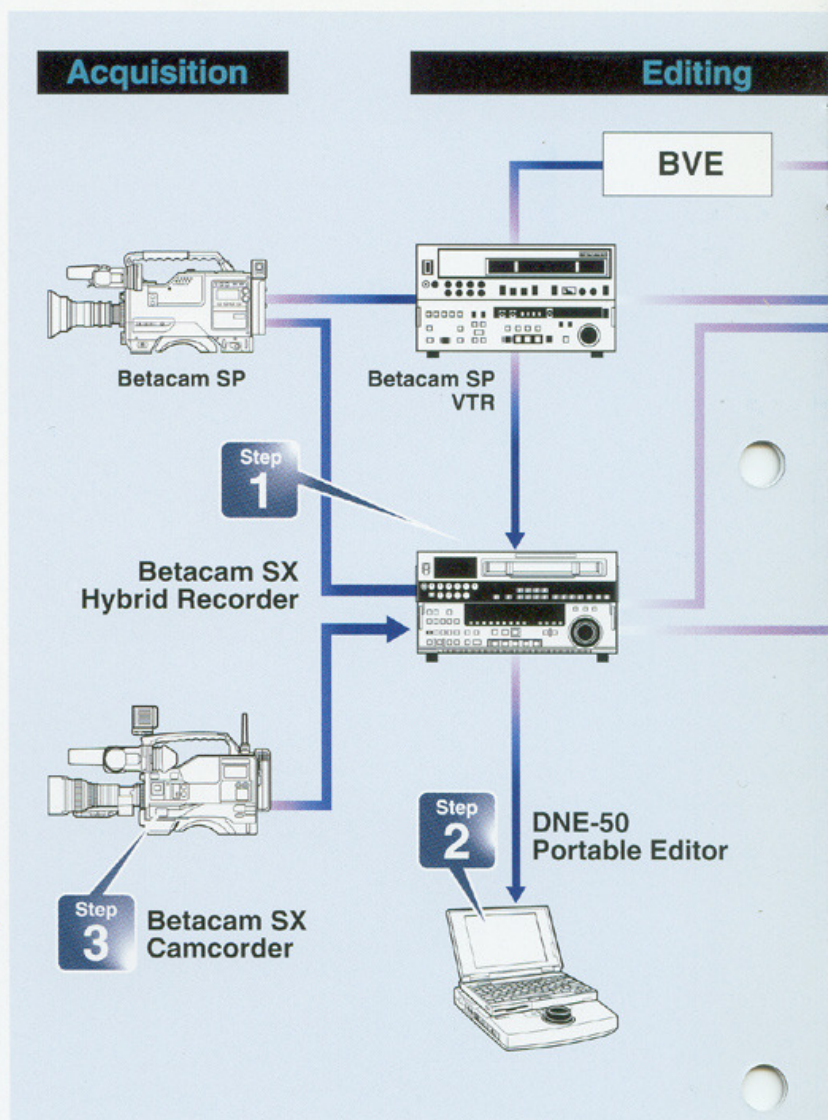
Integrating the DNW-A100P Hybrid Recorder

- Tape for archival storage.
- Betacam SX/Betacam SP playback capability.
- VTR can be controlled by current BVE edit systems.
- Digitization of tape material for non-linear editing.

Step
2

Integrating the DNE-50 Portable Editor

- GUI-based non-linear cut editing with picture stamps.
- Remote control of the Hybrid Recorder.
- Stand-alone off-line editing on the built-in 3.5-inch MO drive.
- Scripts and notes can be added to picture stamps.



Production System Compatibility and Migration Path

Step
1

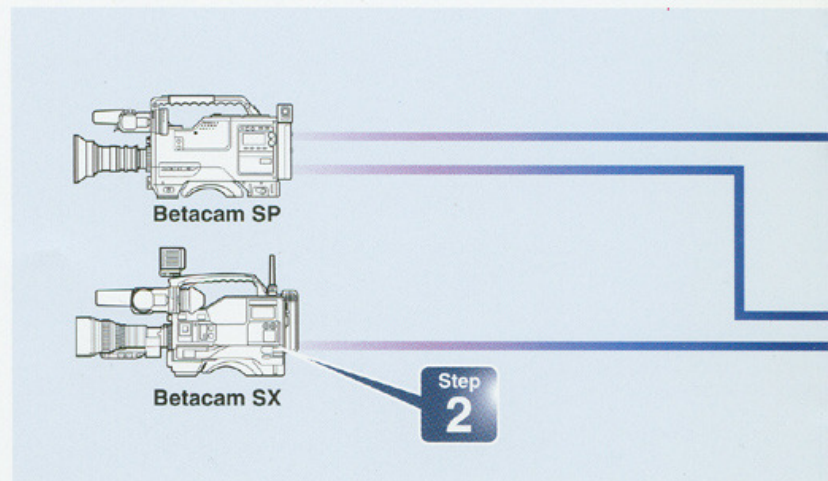
Integrating the DNW-A100P Hybrid Recorder

- Digitization of tape material.
- Step to non-linear editing.
- Playback compatibility with current analogue Betacam SP.

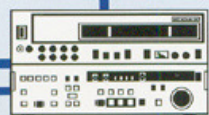
Step
2

Integrating the Betacam SX Camcorder

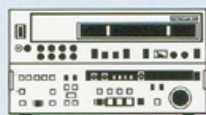
- High-speed (up to 4x real-time) downloading to the Hybrid Recorder's hard disk, for time-saving efficiency.



On Air Transmission



Betacam SP VTR



Betacam SP VTR



A/V Server

Step
4

A/V Server

Step
3

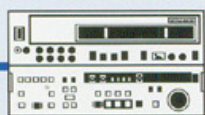
Integrating the Betacam SX Camcorder

- High-speed (up to 4x real-time) downloading to the DNW-A100P Hybrid Recorder's hard disk, for time-saving efficiency.
- Good-Shot Markers and REC Start Markers can be recorded on tape to speed the edit search process.
- High-speed transmission (up to 2x real-time) of material from field to station using the Digital Satellite Link.
- Simultaneous digitization and tape recording capability by connected to the DNE-50 Portable Editor.

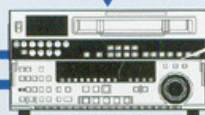
Step
4

Integrating the Audio/Video Server

- Along with Betacam SX, utilizes the same MPEG2 4:2:2P@ML standard.
- Permits high-speed filing from Hybrid Recorder into A/V Server.
- Permits the routing of video/audio material throughout the news studio network using the same compression algorithm.
- No encoding/decoding needed, so picture quality is not compromised.
- Permits flow of news material from original source to on air or archive destinations.



Betacam SP VTR



Betacam SX Hybrid Recorder

Step
1

Design and Specification subject to change without notice

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 "Betacam SX", "Power HAD" and "Hyper HAD 1000" are trademarks of Sony Corporation.
 ISR (Interactive Status Reporting) is an equipment management system developed by Sony Corporation.

The Betacam SX Product Line-up

The Sony Betacam SX product line-up answers all the needs of both field and studio newsroom operations. Its versatile interfaces and analogue compatibility with Betacam and Betacam SP make this new digital system easy to integrate into current analogue installations.

Upgrading to digital can be accomplished step by step, at a pace that suits the needs and budgets of ENG organizations and EFP producers. With the Betacam SX approach, new equipment can be added as required without compromising overall system functionality.

DNE-50

Portable Editor

The DNE-50 is a compact editor designed for dual-purpose on-line or off-line use. When connected to a DNW-A100P/A50P/A45P Digital Video Hybrid Recorder, it provides advanced non-linear on-line editing control functions with a simple "drag-and-drop" graphical user interface. The DNE-50 turns the DNW-A100P/A50P/A45P into a fully featured cuts-only non-linear, hybrid editing system.

The DNE-50 combines a docking station and a notebook PC in an overall size that fits easily into an attaché case and can operate on internal batteries. It also incorporates another

unique innovation: a built-in 3.5-inch magneto-optical disk drive that can record more than 40 minutes of compressed video/audio material for off-line editing on location, in a hotel room, or even while traveling. The EDL on the DNE-50 can be carried on floppy disk or transmitted by modem back to the studio for on-line editing control of the DNW-A100P/A50P/A45P and can also be read and used by existing Sony studio edit controllers.



DLE-110

Live Editor

The Sony DLE-110 Live Editor performs as a GUI-based non-linear editor when connected with the DNW-A100P/A50P/A45P Digital Video Hybrid Recorder. Simultaneous recording and editing, and endless recording can be executed on the hard drive without erasing previously reserved scenes or pictures recorded onto the hard disk.



<DLE-110>

<DNW-A100P>

DNW-7P, DNW-90P and DNW-90WSP

Camcorders

The Sony Betacam SX camcorder family provides the advantages of a fully digital acquisition tool with compact one-piece design. All three of the advanced Betacam SX camcorders combine operating simplicity, rugged design and compact, lightweight portability.

Smaller in size and weight than analogue 1/2-inch models, these new camcorders incorporate a colour video playback capability without an external adaptor. They also incorporate many useful new features, including an optional Slot-in Wireless Microphone Receiver and an Internal Light System. This all-in-one design reduces the total package weight for shooting crews in the field.

Betacam SX camcorders provide another important shooting feature: the ability to record Good-Shot Markers and REC Start Markers. Identifying these recorded segments on the GUI screen of the DNE-50 allows editors to get started faster—and saves both time and valuable hard disk storage capacity by



And when the migration to digital is complete, Sony Betacam SX will realize all the benefits of digital technology at its most advanced: broadcast picture and sound quality, non-linear editing productivity, increased transmission speed and significant economy in media usage for both acquisition and storage.

The Betacam SX line-up includes the DNW-A100P/A50P/A45P Digital Video Hybrid Recorder, the DNE-50 Portable Editor, the DLE-110 Live Editor, three camcorder models (DNW-7P, DNW-90P and DNW-90WSP), the DNV-5 Dockable VTR, the DSM-T1 Digital Satellite Modulator, the DSM-R1 Digital Satellite Demodulator and the Hybrid Station.



downloading only these selected scenes.

The DNW-7P is equipped with 2/3-inch 470K Power HAD™ IT CCDs; the DNW-90P has 2/3-inch 620K Hyper HAD 1000™ FIT CCDs. A camcorder switchable to widescreen aspect ratio, the DNW-90WSP, is also included in the range.

All models employ digital processing in the camera section and component digital recording in the VTR section. A wide range of camera adaptors can be connected: when used with the newly designed CA-755P Camera Adaptor, operation can be remotely controlled from a CCU (Camera Control Unit).



DNW-A100P

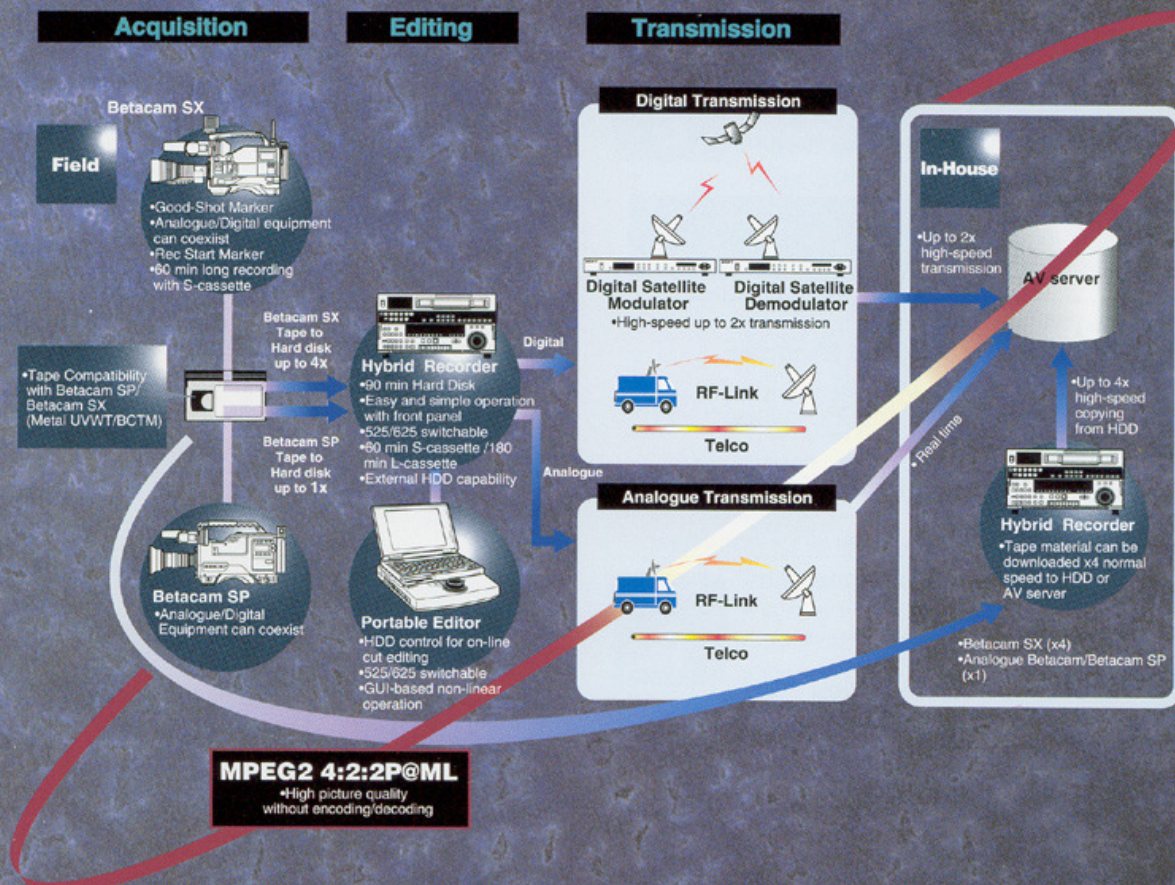
Digital Video Hybrid Recorder

The Sony DNW-A100P is a unique innovation that combines tape and disk in a single unit. Betacam SX tapes can be downloaded to hard disk at up to four times real-time for non-linear editing within the recorder. Analogue Betacam SP tapes can also be downloaded and digitized at normal speed. The DNW-A100P can be utilized for both on-line and off-line "cuts-only" editing, performing cuts quickly and frame accurately through its non-linear disk access system.

Combining tape and disk in a single unit offers significant advantages to Sony users. The hard drive can act as a buffer while the tape drive provides both acquisition input and output for archival storage.

A Digital Video Hybrid Recorder can be added to an existing system and realize the benefits of non-linear editing, fast access to material on disk drive and faster than real-time playback from disk. Time can be saved while downloading—and with full analogue compatibility, material does not have to be acquired in a digital format to perform non-linear editing.

Betacam SX in the Networking Application



DNW-A50P and DNW-A45P Digital Video Hybrid Recorders

The DNW-A50P and DNW-A45P are cost-effective Digital Video Hybrid Recorders without SDDI interfacing and high-speed tape/disk operation. The DNW-A50P gives up to 90 minutes of recording on its hard drive while the DNW-A45P records for up to 45 minutes.

DNV-5 Dockable VTR

The Sony Betacam SX system includes a dockable VTR for Betacam SX digital recording. This interfaces directly to existing portable analogue cameras via a conventional 50-pin connector. Setup conversion from analogue to digital format can be done easily in both ENG and EFP applications. Good-Shot Markers and REC Start Markers can be recorded automatically on tape and an optional Slot-in Wireless Microphone Receiver can be added.

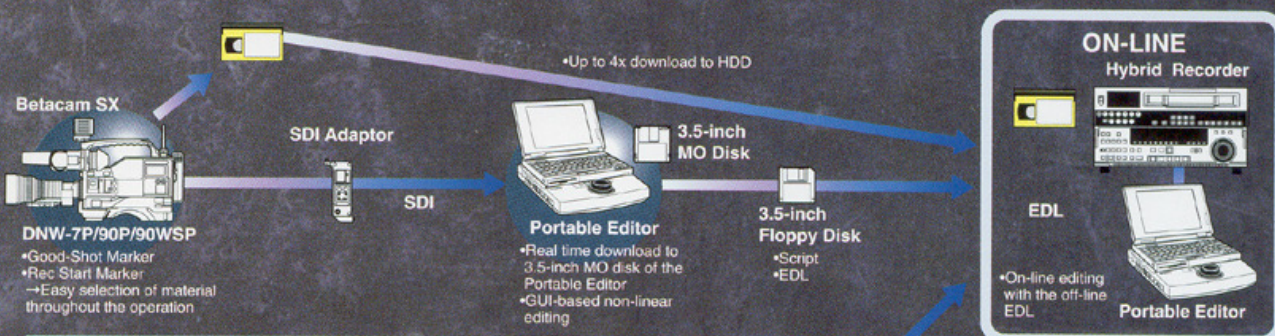
DSM-T1 Digital Satellite Modulator

DSM-R1 Digital Satellite Demodulator

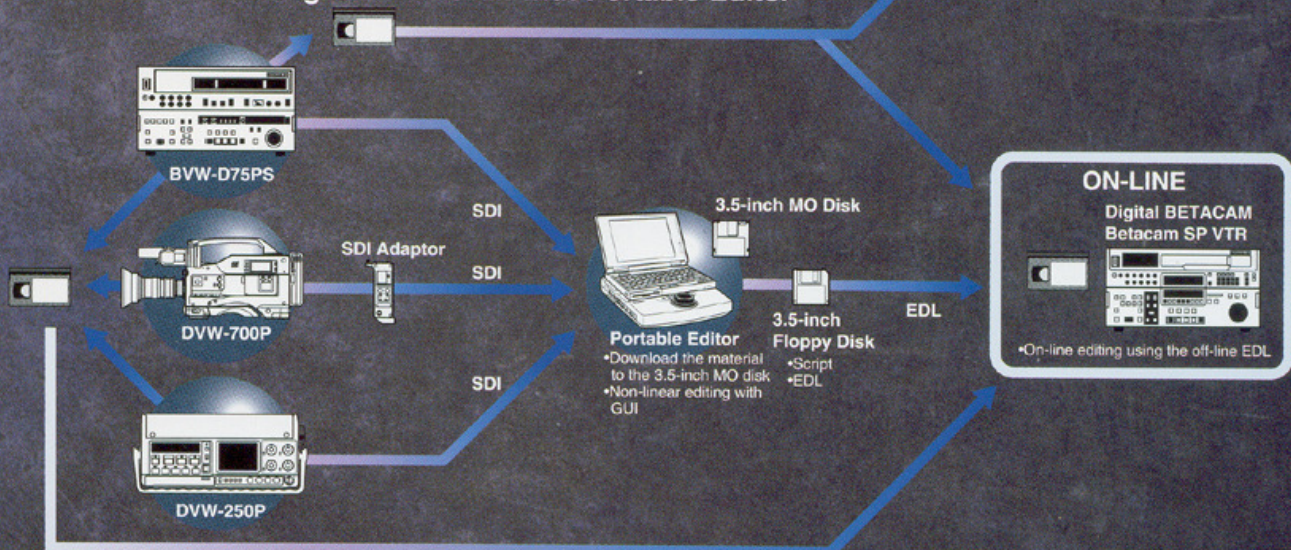
The DSM-T1 and DSM-R1 are designed to save time by allowing high-speed and multi-channel transmission of Betacam SX recordings from field to studio via satellite. Their versatile interface supports equipment upgrades and simultaneously adds powerful features to the total Betacam SX system.

Betacam SX Stand Alone Application

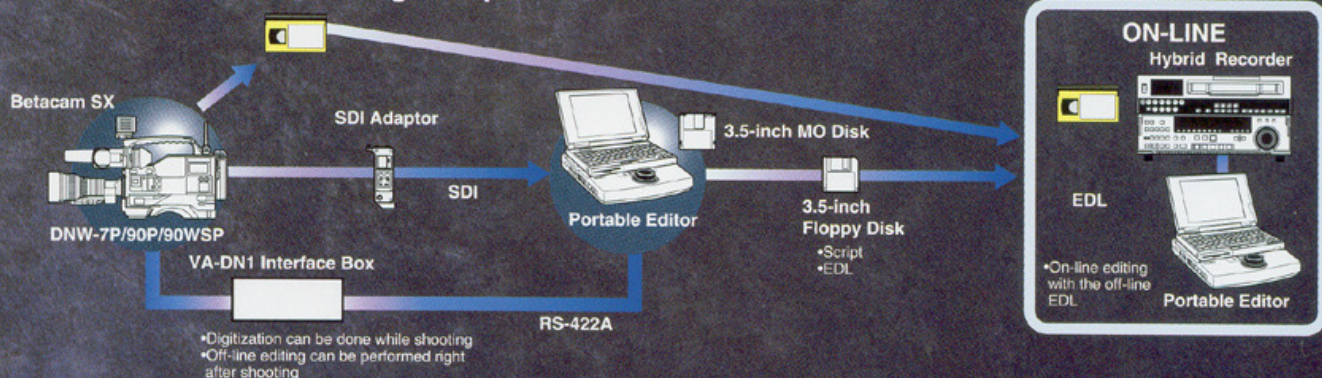
• Field Off-line Capability with the Portable Editor



• Betacam SP and Digital BETACAM with Portable Editor



• Simultaneous Recording to Tape and 3.5-inch MO Disk



Hybrid Station

Built-in VTR, hard disk drive and LCD GUI bring editing functions together in one unit. (available soon)



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