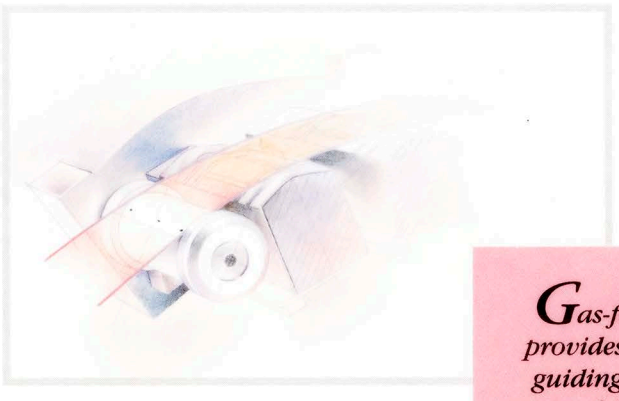
THE AMPEX VPR-3: UNCOMPROMISED PERFORMANCE IN A C FORMAT VIDEO TAPE RECORDER

AMPEX

The ultimate in analog video recording for post-production and broadcast.



Gas-film technology provides optimum tape guiding with virtually zero friction and tape wear, illustrating the no-compromise philosophy used throughout the VPR-3's design and fabrication.

"When it came right down to it, there was only one way to get a finished product like the VPR-3: Design and build it like you thought all video tape recorders should have been built—build it like you were going to service it, use it, and depend on it yourself. I suppose Ampex decided to fund the development because, after all, they built the first VTR, why not build the best one, too? So that's what happened, and here it is. The best."

NEW SOLUTIONS FOR THE CHALLENGES OF BROADCAST AND POST-PRODUCTION

The VPR-3 seemed to be almost a scientific curiosity in its development stages but at introduction, it dovetailed exactly into the new, fast, precise, and complex video editing processes.

Sandra Devlin, President Devlin Productions, New York:

"There's a new hero: a one-inch VTR (specifically, the Ampex VPR-3) which, thanks to its superior micro-processor technology, can transport the heroine (encoded videotape) from one point to another, as quickly and safely as possible, all the while displaying the picture information. Having micro-processors in the servo loop governing its transport mechanism has resulted in a tape recorder which, broadly speaking, permits control and handling of video information in a manner analogous to processing pure digital data".

Shoji Wada, VTR Section Manager; KTV, Osaka:

"We regularly cover a time delay and digest transmission for some sports programs. The game starts, for instance, at 1 p.m. and lasts two hours and 30 minutes. Transmission starts at 3 p.m. and the program must be compressed to 1 hour and 30 minutes.

"We record the game with 4 VPR-3s in sequence and mark the desirable portions on the STC menu during recording. When on the air, the marked points are cued and then played in sequence using only the desirable portions from all four VPR-3s. 500 ips shuttle speed and precise cue up to 100 points makes the job easy and dependably done.

"VPR-3 is really a marvelous machine among all Type-C. Once we were accustomed to using it, we couldn't live without it. We decided to buy five more VPR-3s this year."

Bill Breshears, President and Senior Editor, Laser Edit, Inc., Hollywood:

"We've found that the VPR-3's speed allows us to do auto-assembly much faster than in the past. The VPR-3's *user set-up* is extremely helpful, allowing our Editors to switch machines between record and playback without worry about non-matched edits. Also useful to us is the *automatic audio optimization*, which helps to assure pop-free edits on record masters. The *Zeus™ Video Processor* allows the Editor to make very clean speed-ups, slo-mos and freezes-on-the-fly without jogs or interlace twitter. With this on-line speed and convenience, plus the speed of Laser Disc Editing, we complete jobs in much less time than ever before. And, the VPR-3 is very popular with clients and Editors, alike.".

Joseph Mahedy, Chief Engineer, MTI, New York:

"Being one of the very first users of the VPR-3, MTI immediately benefited from the purchase. The most important advantages of the VPR-3 over other videotape machines is its speed, reliability, and its tape handling. Our clients see the advantages of the VPR-3 in their edit sessions, and our Editors prefer the VPR-3 for all its capabilities during an edit session.

"In our midtown facility, we use the VPR-3s not only in our editing suites but also in our *"Compugraph Designs"* division for single frame animations. At our *Image Mix* facility, we use the animate mode of VPR-3 for transferring pin registered film frames from our flying spot scanner very successfully. From a technical standpoint, I find the VPR-3 has the highest reliability of any of our tape machines. We run our VPR-3s 24 hours a day with very little downtime, and it costs less to maintain the VPR-3s. The engineering staff finds the diagnostics very handy for troubleshooting.

"With the acquisition of the *Zeus Video Processor,* video time compression and expansion are now a reality. The VPR-3 and Zeus together make up the most advanced tape machine today."

An excerpt from *The Financial Times,* London:

"What used to take 2-3 days on film can now be carried out in a couple of hours on video," says Mr. Steve Dann, Joint Managing Director of *Video Tape Recorder* (VTR), a new specialty video editing service which features some of the most advanced computerized electronics in the UK. . . Its smartly decorated offices. . . house almost 2 million pounds worth of the most modern video editing equipment. Not the most expensive, says Mr. John Banks. . . Mr. Dann's partner, but the best. The editing suite at VTR has been customized by Ampex, a U.S. company which invented the videotape recorder. The suite is equipped with five Ampex VPR-3 videotape machines, claimed to be the most advanced in the world. Unsolicited testimonials from technicians are rare, but Mr. Arthur Johnson of VTR believes he can squeeze more performance out of the VPR-3's than the manufacturer's specifications. The secret of these machines is the speed with which they move several pounds of video tape across the recording heads at up to 500 inches-per-second. The bonus for the technician is a new ease and speed of tape editing."

Gary Princz, PrinczKo Productions, New York:

"The Ampex VPR-3 is the ultimate 1" VTR. I could write a book about the differences between a VPR-3 and other 1" VTRs, but to make a short statement about it, it's just awesome. The high speed shuttle and cue up to the exact frame without VITC is a blessing when you get outside tapes like we do every day. All you do is "mark in" and that is the frame that you'll get. With a pre-roll of 45 frames we do things faster than the Client can comprehend we can do in that amount of time. After getting the minor bugs out, we hardly had any down time. In *two* years it was only *two* hours with the 4 VPR-3s that we have in each of our three 1" edit suites.

"Now that we have added the ZEUS Video Processor in each of our rooms, it's like flying first class. We constantly vary speed scenes, (much more often than before), due to the steady picture that we get out of the ZEUS. Our Clients are all aware of this major improvement in video speed up from −30 frames to +90. Until now, most speed-ups were done on film chains which can only speed up to a maximum of 20%. The ZEUS is definitely the most major improvement in video post production since the ADO."

THE VPR-3: HI-TECH PROBLEM SOLVER

Though the Emmy Award winning VPR-3 is a marvel of technical achievement, the most significant achievement of the VPR-3 is what it can accomplish for you, especially in the areas of editing, animation and program compression.

TURBO (Real-time) Animation

The VPR-3's speed and accuracy allows it to do animation in a play-speed, real-time relationship. Unlike stationary mode recording, the VPR-3 does not require the complex (and often picture-degrading) pre-processing of the video signal to rearrange the video frequencies before recording. The VPR-3's play-speed recording is purely a video edit. With an 18 frame pre-roll, 3 frame post-roll and a re-cue, the VPR-3 can accomplish a 6 frame animation sequence in only 1.6 seconds (required for 1 cell) plus only a tenth of a second longer to complete the remaining 5 frames!

TURBO (Real-time) Animation

Animation status is available at a glance from a menu that reads out in English.

For The First Time, *True* Auto-Assembly With *Field* Accuracy.

The combination of a 20 millisecond lock-up time, 500 inches/sec^2 acceleration, and speed transitions comparable to disk devices allows a 30 second spot to be recued-to-play in less than two seconds.

The VPR-3 brings to editing the super-fast speeds required for uninterrupted recording of source material. You can perform single-field edits from the front panel or from the serial port. (The VPR-3 is the *only* VTR capable of searching to a field). Edits will be dead-accurate because a built-in Sc/H circuit gives the VTR immediate comparison between the input and the off-tape signal phasing, thereby ensuring perfect frame edits. The time consuming process of test edits, adjustments, and re-edits becomes a thing of the past.

When there is a mismatch between input and off-tape signals, the VPR-3's Sc/H *phasing control* allows the operator to apply an offset for correction. (And to make editing even easier, an indicator just above the Sc/H meter shows the operator that a wrong frame edit is being attempted).

The VPR-3's machine-to-machine editing capability from a single machine control panel eliminates the requirement for an expensive external edit controller in many facilities. The combination of the full-time synchronized transport and the SMPTE communication bus is the basis for this exclusive feature. Even the most complex split edits can be previewed, trimmed, shifted, performed and then reviewed using only the simple, single-function controls on the record VPR-3.

ZEUS™ Video Processing

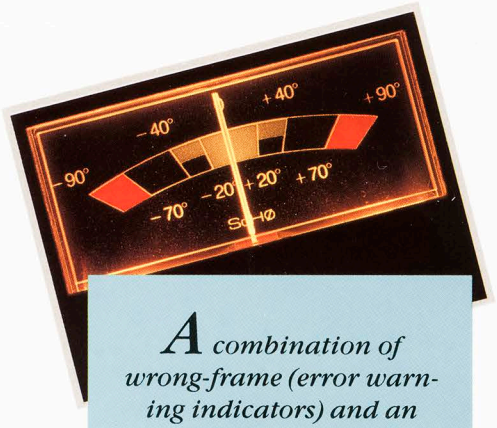
Now the ultimate in VTRs has the ultimate video processor as a companion. Integrated with the VPR-3, the Emmy Award winning ZEUS Advanced Video Processor provides revolutionary improvements in the quality and production flexibility of videotape recording.

Production and post-production facilities will especially appreciate the superb video processing and greater creative video control capabilities of the ZEUS. Its unique ability to extend practical multi-generation limits of Type C recording improves their product, and saves time and money.

Zeus™, a fully digital video signal processor, is integral to the VPR-3

Key Features Of ZEUS Processing

- ☐ No compromise 4Fsc, 9-bit digital system
- ☐ Drift and adjustment-free velocity compensation dramatically improves compensation accuracy and multi-generation video performance
- ☐ Exclusive frame averaging velocity compensator function reduces head impact error visibility
- ☐ Superior spatial-averaging dropout compensation
- ☐ Exclusive Multi-Gen Setup mode greatly improves multi-generation video performance
- ☐ Unique Decode mode allows replay of non-color framed edits with no picture shift
- ☐ Video time compression and expansion with no picture bounce or blur
- ☐ Full frame storage on command
- ☐ Comprehensive interface with VPR-3 menu control system
- ☐ Available full-function serial remote control panel



A combination of wrong-frame (error warning indicators) and an Sc/H phasing meter that quickly compares input to off-tape signals gives the operator complete control of the editing process.

Multi-Gen Setup

The VPR-3/ZEUS Multi-Gen Setup mode helps eliminate operational setup errors—a major contributor to multi-generation performance degradation.

Multi-Gen Setup is accomplished through a series of play-record-play-record recirculations through the VPR-3 and Zeus processor. From pre-recorded 1st generation reference material (i.e., color bars) the VPR-3/Zeus system generates and displays, in real-time, a sequence that quickly duplicates 10 tape generations. This 10-generation sequence is continuously repeated, so that errors are clearly displayed, and can be quickly corrected by proper system adjustment.

Multi-Gen Setup supports an increase in both the number of tape generations routinely used, and the quality of the finished video product.

Audio Quality That Rivals Professional Audio Decks

The VPR-3's audio system provides phase compensated electronics to improve stereo broadcast performance, and automatic computer set-up of all record parameters by means of a built-in audio test oscillator, audio distortion, analyzer, and digital voltmeter. This allows quick optimization for different tape types, and three complete set-ups can be stored for immediate re-call.

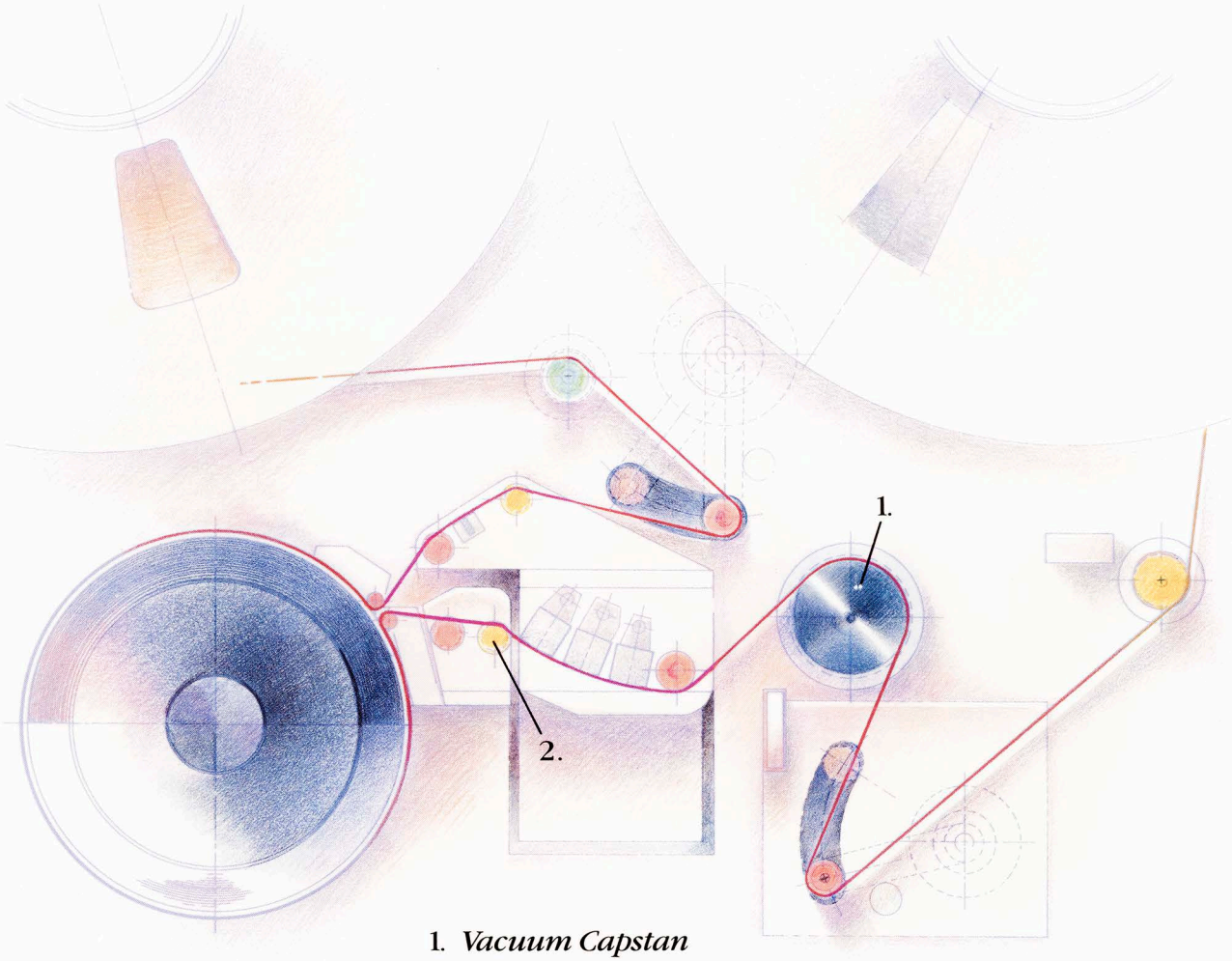
FROM AMPEX ENGINEERING EXCELLENCE COMES THE FASTEST, MOST ACCURATE, AND GENTLEST VIDEO TAPE RECORDER IN THE WORLD

Single-field lock-up. 500 inches/sec² acceleration. Tape position accuracy in TV *lines*, instead of fields. Tape tension differences reduced from the typical 300-400%, to 4-5%: Easy to say, difficult to do—so difficult that the VPR-3 stands alone in the industry at this performance level.

Vacuum Capstan With High Resolution Tachometer

The precision-ground vacuum capstan is directly coupled to a low inertia, high torque DC motor assembly. This system allows the tape to be controlled from zero to ±50× play speed in a single function without tape stretch or damage. The optimum tape coupling obtained with vacuum allows the use of a high resolution integral tach instead of a separate, and less accurate, tape timer assembly.

This ultra-high resolution tachometer is accurate to within 12 television lines, providing parking accuracy superior to all other C-format VTRs. Continuous capstan control of tape motion also permits the use of a coupling servo to adjust capstan acceleration to take advantage of the VPR-3's high torque reel motors.



1. *Vacuum Capstan*
2. *Flutter Idler*

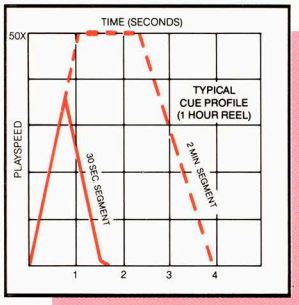
Air Guides
Roller Guides
Fixed Roller Guides

Low Friction Tape Path And Active Guide System

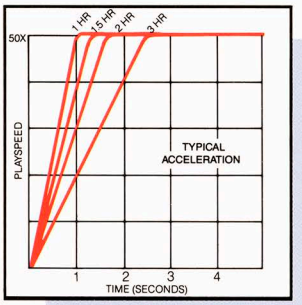
A configuration of gas-film guides at critical locations, plus precision rotary guides, reduces the effects of friction permitting very rapid changes in tape direction, regardless of temperature and humidity conditions, or tape formulations. This low friction, active tape guiding system provides constant tension and allows almost limitless high speed shuttling. It also dramatically reduces head and scanner wear, and allows reel sizes from spot to 3 hours to be used while maintaining gentle and precise tape handling.

Servoed, Fail-Safe Dynamic Braking

The VPR-3's advanced design completely eliminates the marginally effective mechanical brakes often used in VTR transport design. In the event of power failure, even at full shuttle speeds, the VPR-3's servo system brings the tape to a smoothly controlled stop, eliminating the possibility of tape damage.



The VPR-3's incomparable acceleration allows a 30 second segment to be re-cued and synchronously played in 2 seconds, using one hour reels.



A vacuum capstan directly coupled to a low inertia, high torque motor allows maximum acceleration from zero to ± 50× play speed without tape stretch or damage

A Unique, Field-Accurate Automatic Scan Tracking (AST™) System

Taking a precision reference from the direct-coupled capstan tachometer, the VPR-3's AST system knows exact tape position under all conditions and applies the necessary correction factors to produce a stable, disturbance-free picture. In the time compression and expansion modes, this system allows speed variations as small as one second per hour (up to ± 15%) to be entered.

Field Rate Color-Framer

An integral part of the video signal system is a field rate color-framer which determines the precise parking position when the tape transport is stopped. This color-framer is designed to separate one field out of four in the NTSC system or one field out of eight in the PAL system. This permits the machine, even with its "instant" start capability to operate in a fully synchronous mode at all times.

Microprocessor-Based Control

The VPR-3 control system is based on dual Z80 microprocessors. One of these processors is responsible for system control and the second controls the various input/ouput functions. The dual RS-422A serial communications ports allow control interface of the VPR-3 to a variety of serial machine controllers, including the Ampex ACE series editors and the VRC-2.

POWERFUL, AND OPERATOR FRIENDLY!

When one VTR supports almost anything a user could ever want, regardless of the application, an extremely powerful control system with equally powerful software is necessary to make it easy to use. The control system described on these pages accomplishes just that.

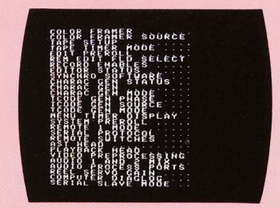
Menu-Based Operational System

The VPR-3's menu-based control system eliminates the tens of dedicated keys that would normally be required to accomplish VTR set-ups, editing function, cueing, animation, etc. This soft key approach maintains the VPR-3's incomparable operational flexibility, while providing an easy-to-learn, fast-to-use control panel that is optimized to your specialized needs.

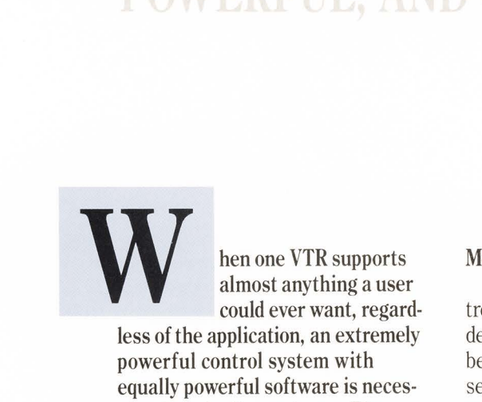
With the *user set up menu*, you can store all the functions required for any one operation, and then recall them with a single keystroke. A complete operational environment can be created in this way, minimizing the time consumed in major VTR application changes.

Status-At-A-Glance™ Displays

As a further enhancement of the VPR-3's operational interface, its Status-At-A-Glance system provides a summary, one page, English language video character display of all critical VTR operational status parameters. A second page displays all major ZEUS operational parameters. Either page may be easily selected for display on the VTR video monitor.



One button displays all critical operational status parameters on the video monitor with the VPR-3's unique Status-At-A-Glance™ feature.



An easy-to-read and easy-to-use control panel contains all VPR-3 operational controls, and includes a fluorescent menu display for position, status, and control function information.

FASTER AND EASIER TO SERVICE WITH ADVANCED SELF-DIAGNOSTICS AND FULL-ACCESS ASSEMBLIES

The VPR-3 is as sophisticated as it is versatile and powerful. High performance editing, superb animation and smooth program compression/expansion are supported by the hundreds of circuits, components and assemblies that are required to do the job—with no compromise. So along with this high performance and versatility, Ampex gives you the tools you need for quick, easy servicing.

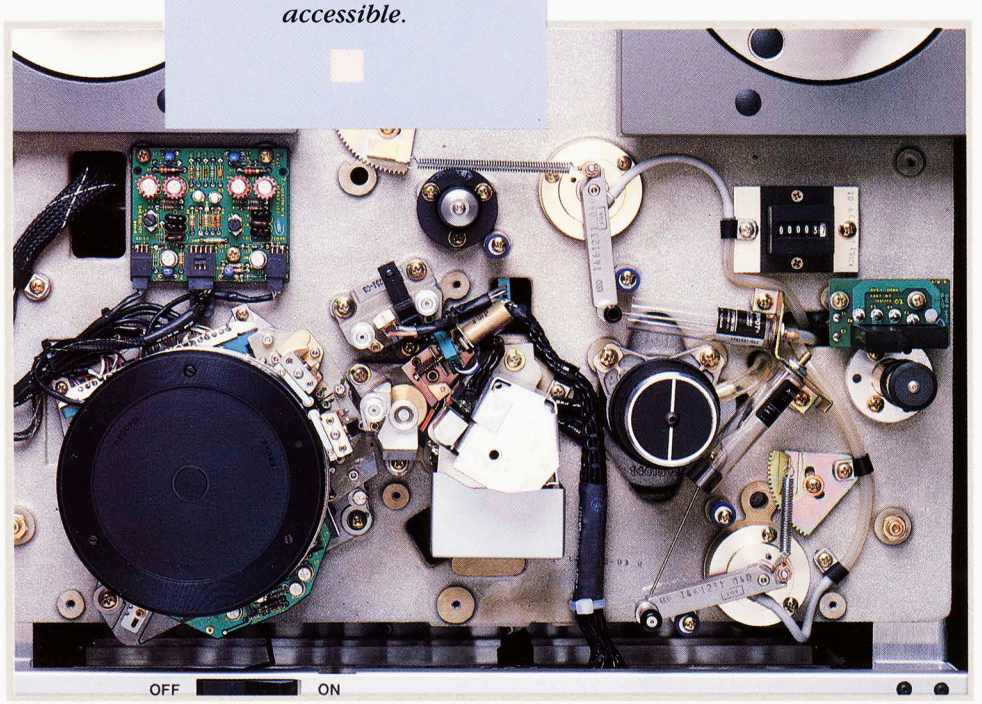
The *home menu* (and the video monitor) displays fault conditions as well as non-standard conditions, allowing the operator to quickly identify abnormal operational conditions.

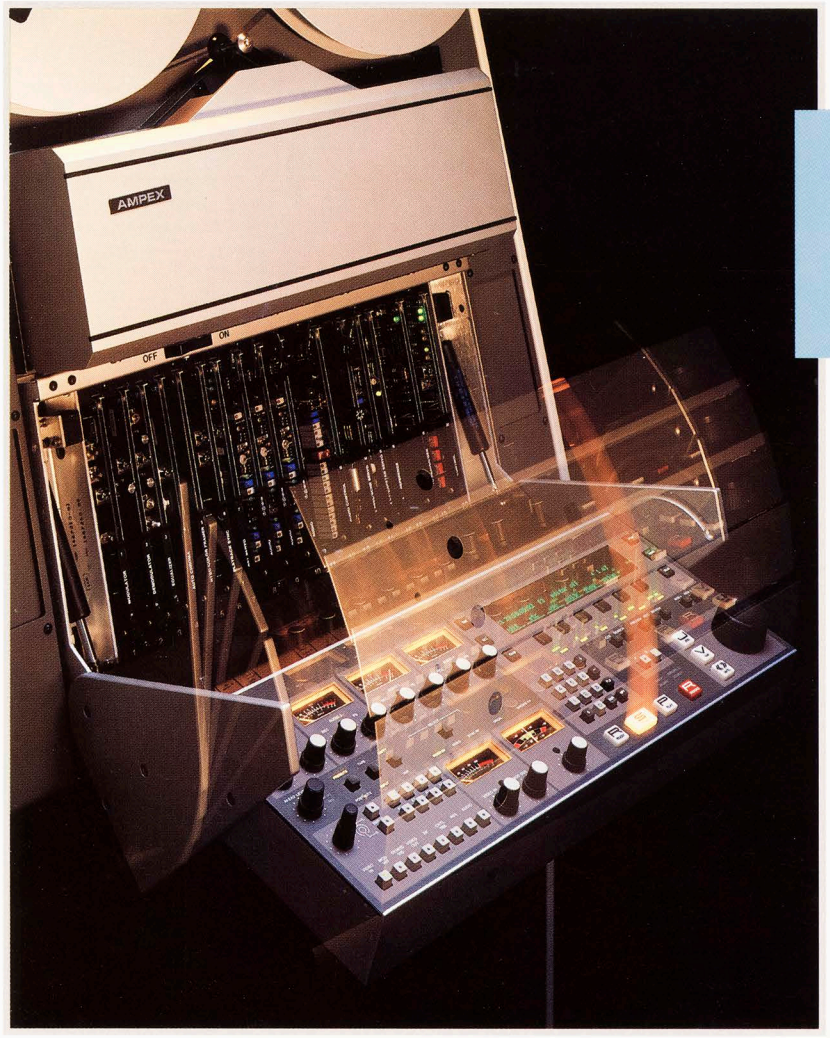
Power-up diagnostics check computer buses, power supplies and microprocessors to confirm operational status. Then, *continuous* diagnostics take over to check tape path conditions and all operational environments. The operator is informed if faults are found, and then *board* and *chip level* diagnostics are used to isolate the fault.

Diagnostic readouts on the video monitor in English tell where the trouble is.

Diagnostic menus specifically inform the operator of errors and faults in the system

The fastest, most accurate and gentlest tape transport in the world is also rugged and accessible.





Full control panel operation is maintained during access to circuit boards, even when on extenders.

Easy Accessibility

Straightforward access to circuit boards is obtained while maintaining full control panel operation. Most of the VPR-3's circuit boards are located behind a swing-down control panel that quickly moves out of the way for extender board mounting of circuit boards.

Circuit boards plug-in to two mother boards, permitting "instant" board replacement when the diagnostics so indicate. All major servo drive and power supply components inside the VPR-3 are located on plug-in assemblies for quick replacement or repair. The servo and power supply card bay can be hinged down for easy access to the rear of the tape transport and the internal air/vacuum system.

Optional Accessories

A number of accessories and options are available from Ampex to expand the operational capabilities of the VPR-3. These may be purchased with the machine, or added later as operational needs change. They include:

☐ **Sync Channel**
An option to permit all vertical sync information to be recorded according to the SMPTE/EBU Type C formats.

☐ **Four Channel Audio**
This EBU option provides a fourth high quality audio channel in the track space normally allotted to the sync channel.

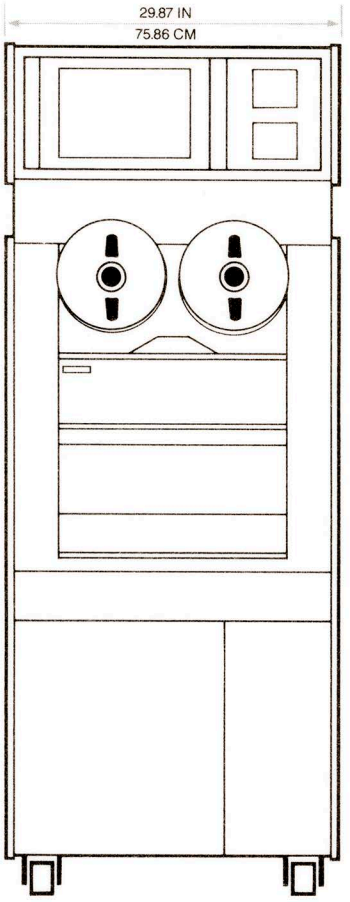
☐ **Mounting Configurations**
The VPR-3 is available in a variety of physical configurations to suit individual facility requirements.

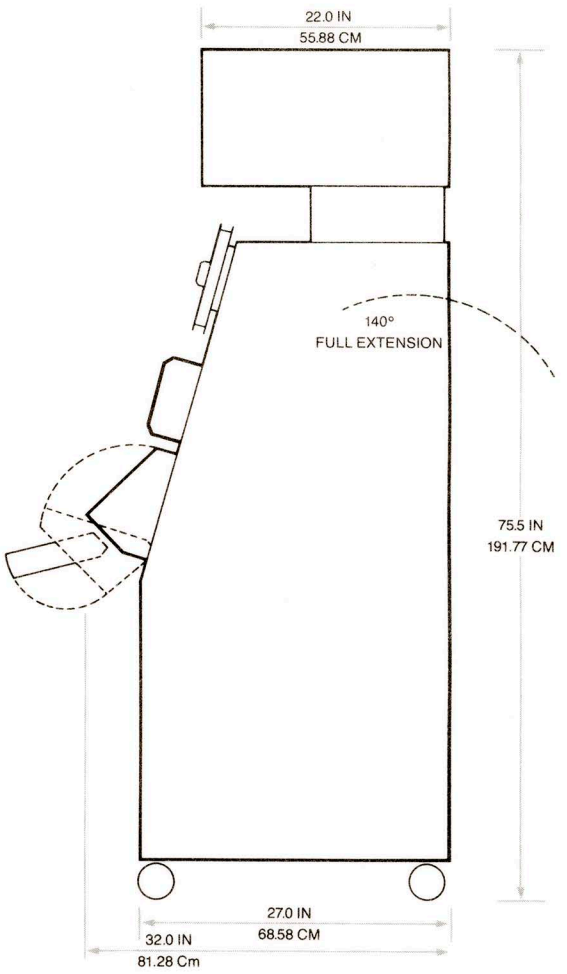
SPECIFICATIONS

VIDEO AND SYNC	NTSC/PAL-M 525/60	PAL/SECAM 625/50
Bandwidth	Flat to 4.2 MH ± 0.5 dB −3 dB at 5.0 MHz	Flat to 5.0 MHz ± 0.5 dB − 3 dB at 6.0 MHz
S/N (IEEE Standard 618-1984) using Zeus	−47 dB peak-to-peak video to RMS noise on interchange basis	−44 dB peak-to-peak video to RMS noise on interchange basis
LF Linearity	2% blanking to white (maximum)	2% blanking to white (maximum)
Differential Gain	4% blanking to white (maximum)	4% blanking to white (maximum)
Differential Phase (40 IEEE units of subcarrier through Zeus)	4° at 3.58 MHz off-tape (max)	4° at 4.43 MHz off-tape (max)
Chrominance/Luminance Delay	20 n sec (maximum)	25 n sec (maximum)
2T $\sin^2$ Pulse & Bar	1% K-factor maximum	1% K-factor maximum
Moire	−40 dB color bars 75% amplitude 3.58 MHz subcarrier	−36 dB color bars 75% amplitude 4.43 MHz subcarrier
AUDIO (Channels 1, 2, & 3)		
Frequency Response (400 Hz Ref) 100 nWb/m reference level	± 1 dB 200 Hz to 12 KHz ± 2dB 50 Hz to 18 KHz	
S/N (with respect to 8 dB above reference level) 20 Hz to 20 KHz	−56 dB Audio 1 and 2 −54 DB Audio 3 (Note 1)	− 56 dB Audio 1 and 2 −54 dB Audio 3 (Note 1) + Audio 4
Distortion (measured at 1 KHz) (3HD) @ 100 nWb/m reference level (+8 dBm) @ 251 nWb/m peak level (+16 dBm) With predistortion at 200 nWb/m (+14 dBm)	 1% maximum 3% maximum 1% maximum	
Depth of erasure on its own recording	−70 dB	
Wow & Flutter	.07% NAB unweighted (flutter tape)	.07% DIN weighted (R/P)
Playback Crosstalk (Audio 1 & 2) 1 KHz referenced to +8 dBm or 100 nWb/m	−60 dB maximum	
SIGNAL INPUTS		
Video Input (75 ohm) BNC	0.5 to 2 volts peak-to-peak	
Ref Video (75 ohm) BNC Comp sync Comp video	 0.7 to 4 volts 0.5 to 2 volts	
Audio line inputs	−24 to +24 dBm, +8 dBm nominal	
Impedance, Transformerless, True Differential	balanced; 65 K ohm resistive	
SIGNAL OUTPUTS		
Video Output (75 ohm) BNC	1.0 Volt peak-to-peak	
Audio Line Outputs, Transformerless, True Differential	+8 dBm nominal; balanced +24 dBm maximum (Note 3)	
Impedance	less than 20 ohms	
Headphone Audio Monitor	0 dBm to drive 600 ohms	
Audio Meter Circuits Switchable VU or PPM		
GENERAL		
Record Time	190 minutes nominal; 9200 feet of tape on 14″ reel	
Shuttle Time	less than 72 seconds for 60 minute tape, 3.6 minutes for a 3 hour tape	
Tape-Timer Accuracy (Control track updated)	± 0.1 Field with continuous control track	
Tape Speed	244 ± 0.5 mm/sec 9.606 ± 0.02 in/sec	239.8 ± 0.5 mm/sec 9.44 ± 0.02 in/sec
Video Writing Speed	1009 in/sec nominal	842 in/sec nominal
FM Carrier Frequencies	7.9 MHz blanking 10.0 MHz peak white	7.68 MHz blanking 8.9 MHz peak white
Audio Equalization	15 microseconds 3180 microseconds	 15 microseconds
Lock-up time from Ready Mode	20 milliseconds	Lock-up time from Scanner Off 3 seconds

Note 1: Audio 3 channel has wide-band capability for Time Code (S/N WB-30 dB)
Note 2: All specifications are based on Ampex 196 Tape or equivalent.
Note 3: Can be readjusted downward by 12 dBm.

Ampex reserves the right to make product and specification changes at any time without notice.





PHYSICAL DIMENSIONS

	Rack Mount	Table Top	Studio Console w/ Monitor Bridge & TBC
Height	29.75 in. 75. 56 cm.	30.5 in. 77.47 cm.	75.5 in. 191.77 cm.
Width	19.0 in. (Note #4) 48.26 cm.	22.0 in. 55.88 cm.	29.875 in. 75.86 cm
Depth	25.75 in. 65.4 cm.	26.5 in. 67.31 cm.	32.00 in (Note 5) 81.28 cm.
Weight	270 lb. 122.47 kg	275 lb. 124.74 kg.	650 lb. 294.84 kg

TEMPERATURE & HUMIDITY

Temperature	0-45°C
Humidity	10%-90% RH (non-condensing)

POWER INPUT

Power Line Frequency	50 & 60 Hz single phase
Input voltages	95/105/115/125/135 Volts AC ± 5% 190/210/230/250/270 Volts AC ± 5%
Input Current (Table Top)	115 vac Nominal 3.5 Amps * 230 vac Nominal 1.8 Amps †
(Lowboy console TBC and color monitor bridge)	115 vac Nominal 14 Amps * 230 vac Nominal 7.0 Amps †

Note 4: +2″ Front Mounting Trim & Control Panel
Note 5: Removable Control Panel reduces depth to 27″

* Additional 12 Amp. 1 sec shuttle start surge
† Additional 6 Amp. 1 sec shuttle start surge

FOR INFORMATION ON AMPEX BROADCAST VIDEO PRODUCTS CONTACT THE VIDEO SALES MANAGER NEAREST YOU.

CALIFORNIA
(415) 367-2202
Redwood City
(818) 365-8627
San Fernando

GEORGIA
(404) 491-7112
Atlanta

ILLINOIS
(312) 593-6000
Arlington Heights

MARYLAND
(301) 530-8800
Bethesda

NEW JERSEY
(201) 825-9600
Allendale
(212) 947-8633
New York

TEXAS
(214) 960-1162
Carrollton

UTAH
(801) 487-8181
Salt Lake City

WASHINGTON
(206) 251-8682
Kent

AUSTRALIA
(008) 023124
North Ryde, NSW

BELGIUM
067/214921
Nivelles

BRAZIL
(021) 541-4137
Rio de Janeiro

CANADA
(416) 821-8840
Mississauga, Ont.

COLOMBIA
236-4659
Bogota

FRANCE
(01) 4270-5500
Paris

W. GERMANY
(069) 60580
Frankfurt (Main)

HONG KONG
3-678051
Kowloon

ITALY
(06) 55461
Rome

JAPAN
(03) 767-4521/2/3
Tokyo

MEXICO
554-9255
Mexico, D.F.

NETHERLANDS
030-612921
Utrecht

SPAIN
(91) 241-0919
Madrid

SWEDEN
08/28 29 10
Sundbyberg

SWITZERLAND
(037) 81.31.11
Fribourg

UNITED KINGDOM
(0734) 875200
Reading, Berks.

VENEZUELA
782-3255
Caracas

AMPEX Ampex Corporation
Recording Systems Division

Litho in U.S.A.—2/88—V-1123