
Color TV Tape Recorder, Type TR-70

- Makes superb color tapes
- Makes finest multiple generation copies
- "Instant-Switching" standards, including highband
- High performance air bearing headwheel
- FM test facility



Color Performance Features

On Air Indicator

Transistorized Audio, Picture and Waveform Monitors

Switchable Standards Including High Band

Fully Instrumented Warning and Mode Indicators
Multimeter
Pushbutton Circuit Checks

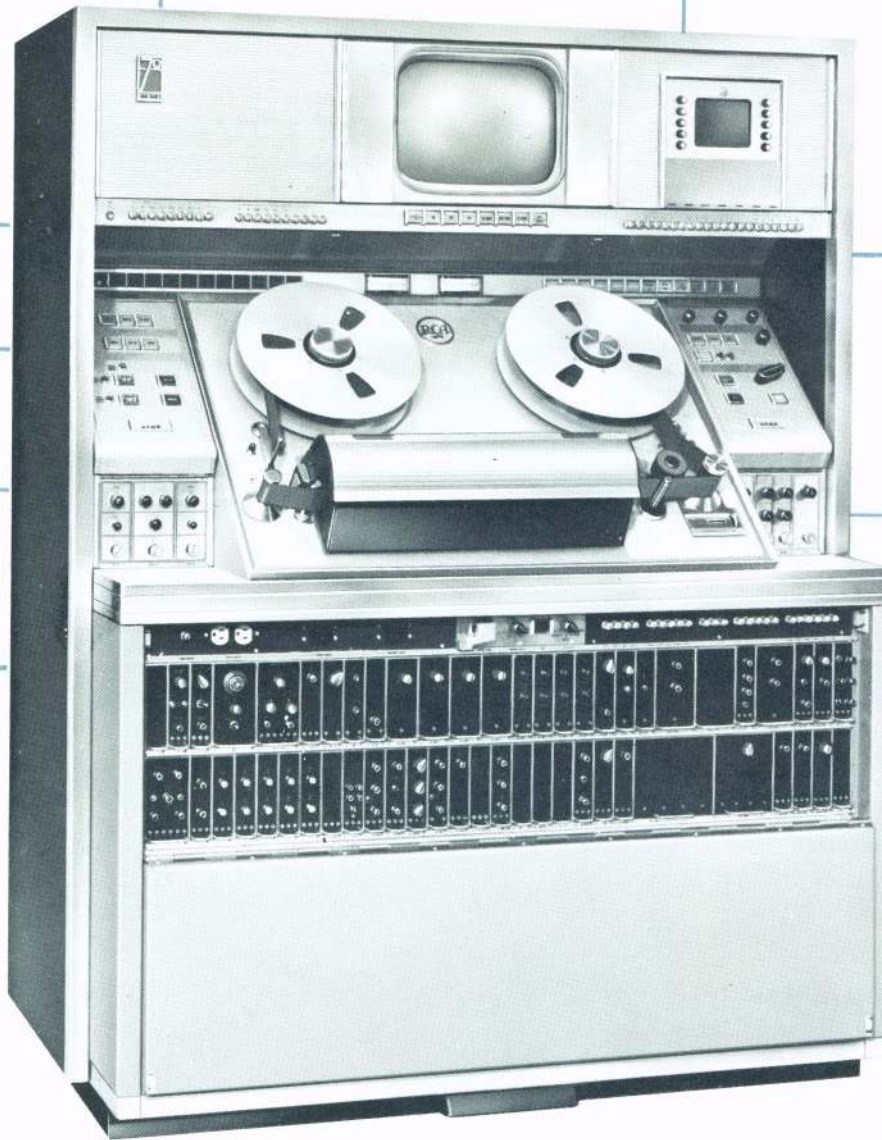
Error Proof Separate Play and Record Controls

High Performance Air Bearing Headwheel

New Tape Handling System With Tape Lifter and Conical Guides

FM Test Facility

Integrated Design for Color Operation



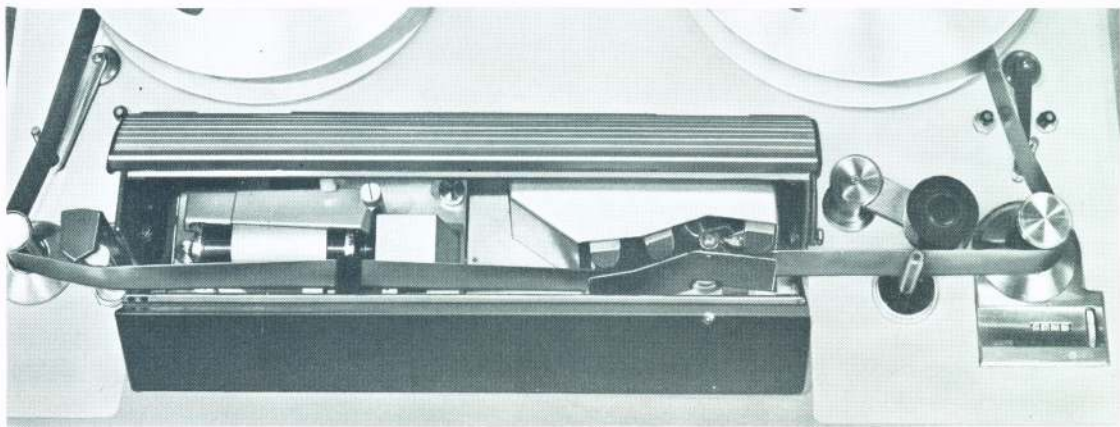
Color TV Tape Recorder, Type TR-70

The RCA Super-Deluxe TR-70 TV Tape Recorder makes possible a new level of performance in producing TV tapes of increased brilliance and realism—particularly in color. Multiple generation color tapes almost indistinguishable from original pictures are the result of new TR-70 engineering advances.

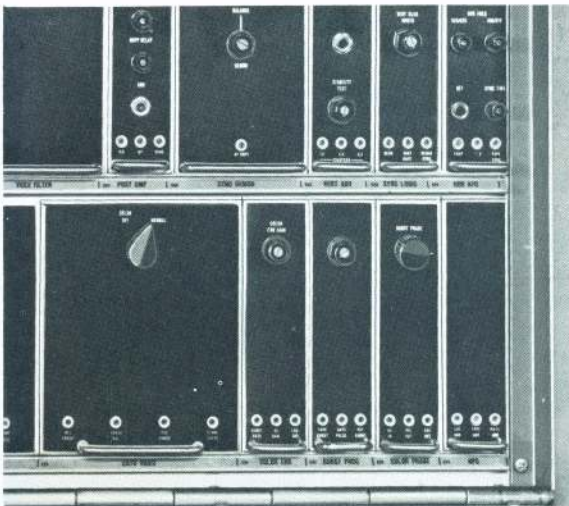
The TR-70 is a complete system within itself, designed for greatest reliability, operational convenience and picture performance in both monochrome and color

operation. There are no “extra” cost items to “add on” to obtain the color performance. Complete in a modern, beautifully styled console, the TR-70 is the ultimate in human engineering for easy, error-proof operation. The new highband air-bearing headwheel serves for all standards of operation—domestic or world wide. There is a choice of everything at the finger tips—highband, lowband, TV line standards, tape speeds, operating modes—all conveniently switchable.

Air bearing headwheel operates on all switchable tape standards—highband and lowband.



Switchable deviation standards for world wide use. International model provides choice of 405/525/625 (809 optional) line standards.



Color ATC modules (above) are pre-wired and tested at factory—an integral part of the TR-70 high band design.



TR-70 for Highband and Lowband

with built-in features for deluxe TV Taping

Description

Significant engineering advances designed to achieve superior pictures and multiple generation color copies are reflected in the TR-70. These improvements are to be noted in the s/n ratio, bandwidth, "K" factor (transient response rating), and differential phase and gain, greatly extending tape quality for both color and monochrome.

Uniform picture quality is a result of stabilized circuits in the equipment. These circuits function to correct themselves, holding a high level of performance over long periods of operation. They compensate for changes that may occur with component aging. Operators are freed from constant attention and frequent "touch up" of controls.

Switchable Standards

Highband, a new recording and playback mode that utilizes higher FM deviation frequencies for both color and monochrome, is a new development incorporated in the super-deluxe TR-70. Selection of monochrome or color FM standards (highband or lowband), TV line standards and tape speed is accomplished instantly on a push button basis. Inhibit circuits, which are incorporated in the switching logic, will not permit an incorrect selection of standards; for example, 625 line lowband color, or any other incompatible selection. All circuitry relating to the basic requirements of the system is built in. There are no

extra modules required to operate on different standards.

Faithful Multiple Copies

Advances in headwheel design coupled with new video and FM circuit techniques produce taped masters that are almost indistinguishable from the originating signals. Using the "highband" mode of operation multiple generation copies exhibit good color quality. The advance circuitry of the TR-70 is designed to complement the technical superiority of the highband technique, resulting in highest quality color reproduction over multiple generations.

Highband Headwheel

First introduced by RCA a few years ago, the air-bearing headwheel is standard equipment on the TR-22—however—in the TR-70 a new step forward results in a highband air-bearing headwheel. This headwheel operates on all switchable tape standards—highband and lowband.

New Tape Lifter

Also built into the TR-70 is a tape lifter, that permits the tape to contact a selective erase head only while actually recording. This simple method of lifting the tape away from the erase head bypasses problems arising from moving the erase head by an elaborate mechanical system. Tape life is increased and dropouts from tape wear are reduced. A further benefit is the reduction of wear to the selective erase head.

Selective Erase Head

The TR-70 includes a selective erase head, especially designed to fulfill the requirements of electronic splicing. When used with the electronic splicer, the selective erase feature permits erasure of existing video without disturbing the original recorded control track or audio track.

Pixlock Performance

Pixlock is standard on the TR-70. Long an important feature of the RCA solid state TV tape recorder system, Pixlock completely synchronizes switching between tapes, studio signals and other sources and permits fades, lap-dissolves, supers and other special effects.

Line Lock

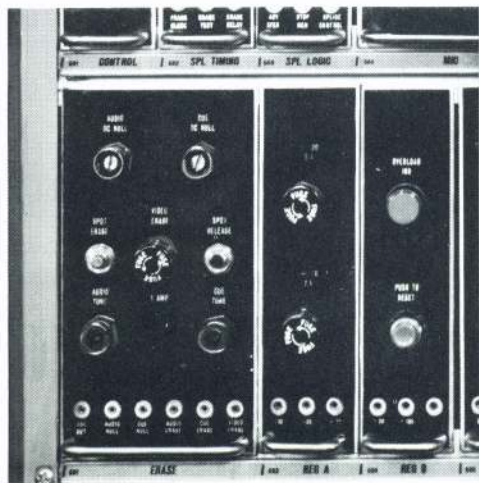
Line Lock is a valuable feature of the TR-70 that enhances the color stability of the recorder. Locking on the horizontal line frequency, the unique circuit minimizes disturbances to color that might be caused by dropouts or poor electronic or mechanical splices.

Precision ATC

The high degree of stability in the TR-70 automatic timing circuits eliminates the requirement for front panel controls and the need to adjust. Picture geometry and burst correction is automatically achieved—freeing the operator from constant touch-up of controls.



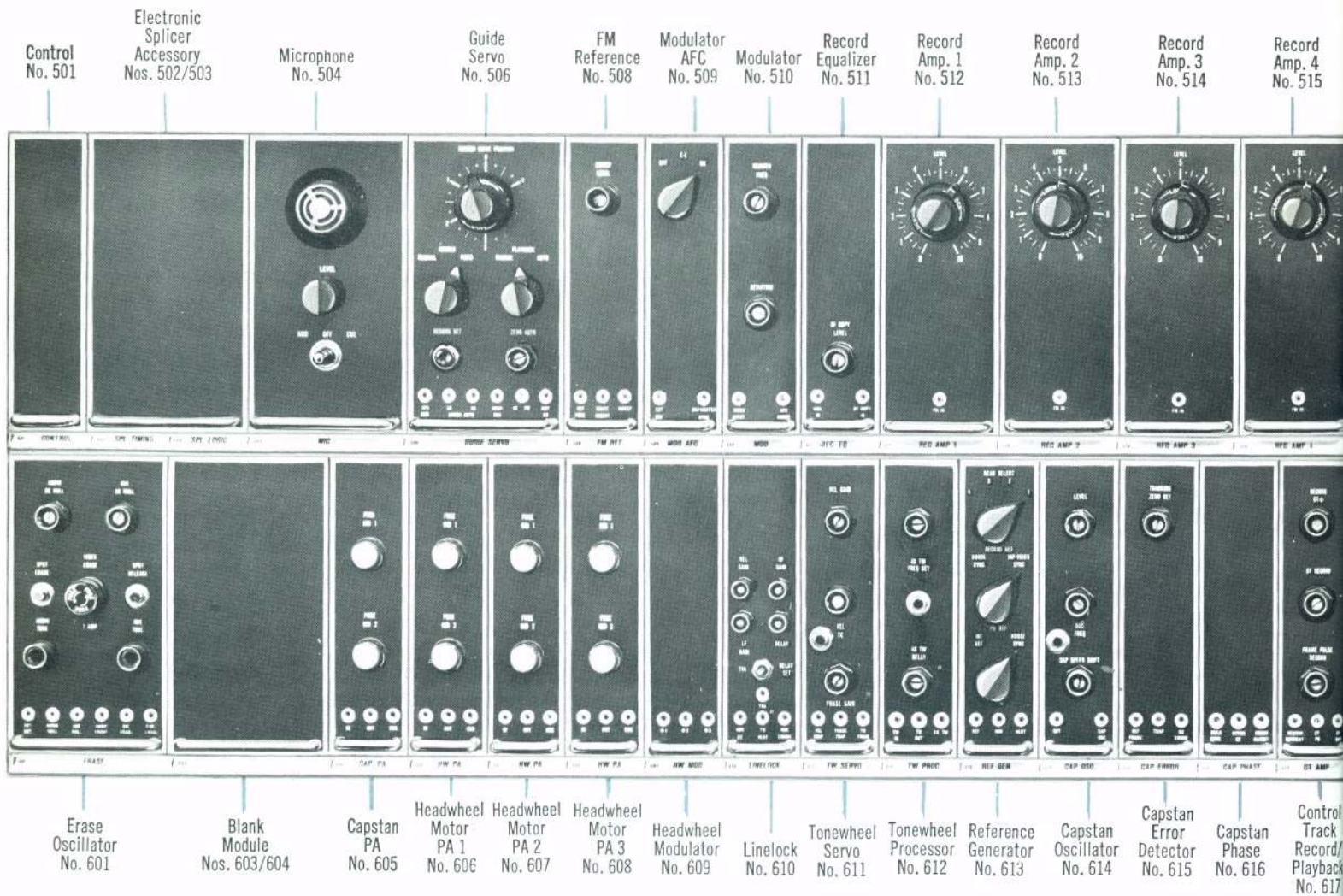
HERE, THE ULTIMATE IN QUALITY COMES EASY . . . All operating functions of the TR-70 are centered at this functional tape deck—designed to make it easy to produce consistently high quality pictures.



Spot erase—a new, quick audio editing feature.

Tape lifter and cone-shaped guide increase tape life and wear on erase head at same time reducing tape dropouts.





TR-70 Module Bank

501—Control

Part of control system. Provides inhibit logic and time delays.

502/503—Electronic Splicer Accessory

504—Microphone

Houses microphone and mike-cable reel, with microphone amplifying circuits. Permits operator to record on either audio or cue tracks.

506—Guide Servo

Control position of the guide to produce skew-free pictures. Functions in automatic, manual, record, and record-set modes of operation.

508—FM Reference

Provides a white reference frequency keyed into the vertical blanking interval of the signal for check of FM deviation. Also provides the crystal-controlled reference frequency for the modulator AFC.

509—Modulator AFC

Provides precise control of the FM modulator blank level frequency in accord with the crystal-controlled reference frequency from the FM reference module.

510—Modulator

Clamps pre-emphasized video at black level to modulate a capacity-diode-controlled heterodyne type modulator. Circuitry included for rf copy facility.

511—Record Equalizer

Provides compensation of the record drive signal so that constant current in the video head is maintained over the FM passband.

512—Record Amplifier 1

Output from record equalizer is increased in level to a value sufficient for recording on tape.

513—Record Amplifier 2

Output from record equalizer is increased in level to a value sufficient for recording on tape.

514—Record Amplifier 3

Output from record equalizer is increased in level to a value sufficient for recording on tape.

515—Record Amplifier 4

Output from record equalizer is increased in level to a value sufficient for recording on tape.

518/519/520/521—Playback Amplifier

Provides AGC control, head resonance compensation, and aperture compensation for correcting the playback characteristic of head channel No. 1-2-3-4.

522—FM Switcher

Switches between heads during playback, connecting the head scanning the tape to the output. Includes separate switching for two output channels, one for the picture and one for the sync.

523—FM Equalizer

Provides additional aperture compensation for the overall playback equalization characteristic. Also includes control circuits for the head resonance test mode.

524—FM Filter

Provides the precisely controlled overall response characteristic required for optimum signal-to-noise ratio and frequency response of the tape playback system.

525—Demodulator (video)

The FM signal is limited and demodulated to push-pull video.

527—Video Filter

Provides the low-pass filter characteristic after demodulation required for optimum noise, moire and frequency response. Appropriate filters are selected for each FM standard.

529—Post-Emphasis

Include the necessary post-emphasis characteristic for the demodulated video, and also provides switching transient suppression and video line output functions.

530—Demodulator (Sync)

The FM signal is limited and demodulated for the sync channel.

532—Vertical Advance

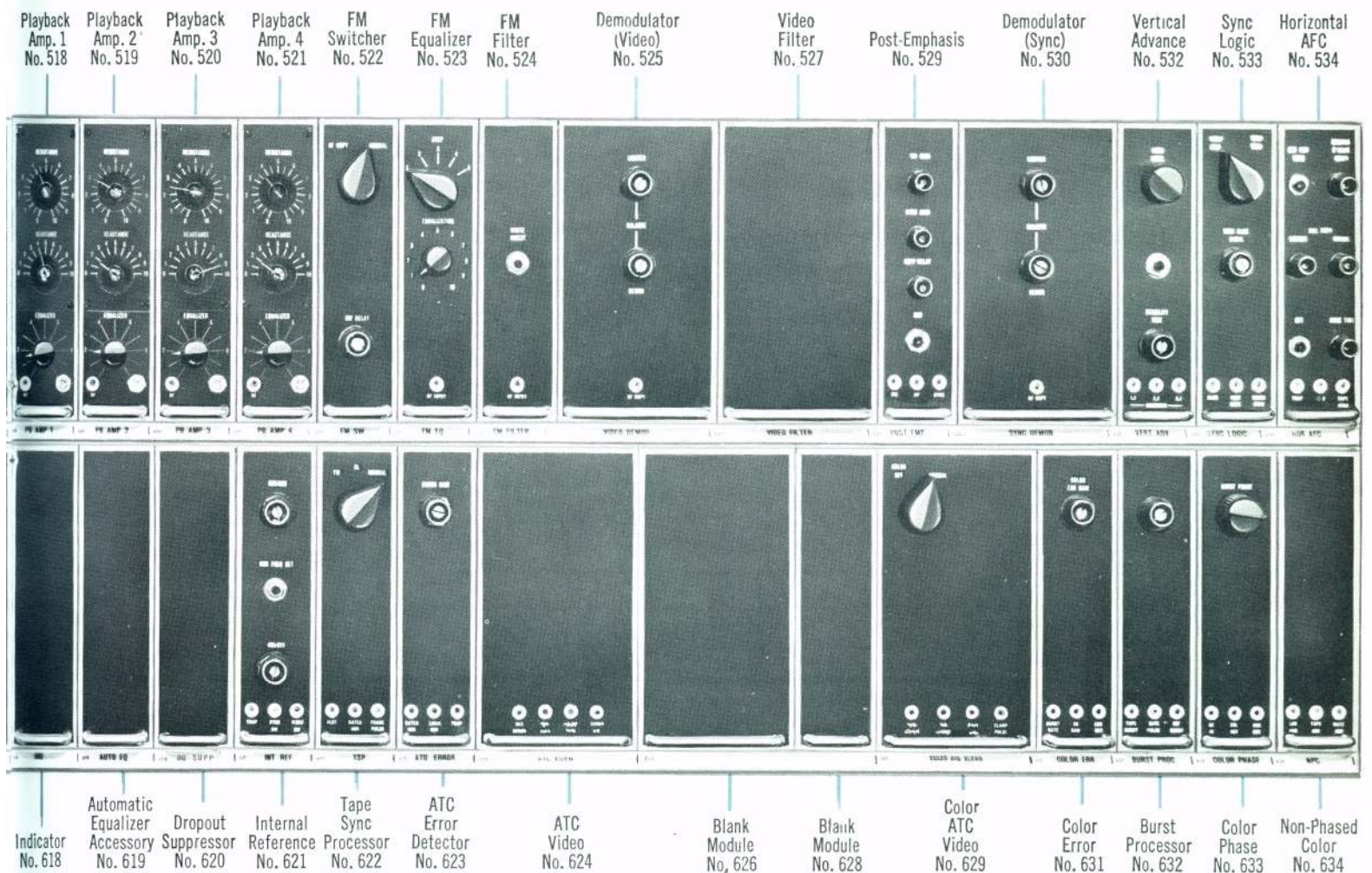
Special circuitry counts out the number of pulses in a field, to determine very accurately the position for regenerated vertical blanking.

533—Sync Logic

Generates horizontal and vertical blanking; combines them into composite blanking. Combines tape sync and regenerated horizontal sync into composite regenerated sync. Generates a start pulse which phases the counting of the vertical advance circuitry.

534—Horizontal AFC

Sync separated for the color corrected video signal is used to control the frequency and phase of a multi-vibrator. This, in combination with other circuits, generates a new horizontal sync, front porch, and blanking.



Description of Functions

601—Erase Oscillator

Supplies 87.5 kc erase and bias current to the audio, cue, and master erase heads. Also includes audio spot erase.

603/604—Blank

605—Capstan PA

Power amplifier for the capstan motor.

606—Headwheel Motor PA 1

Power amplifier for one of the three phases required by the headwheel motor.

607—Headwheel Motor PA 2

Power amplifier for one of the three phases required by the headwheel motor.

608—Headwheel Motor PA 3

Power amplifier for one of the three phases required by the headwheel motor.

609—Headwheel Modulator

Amplitude-modulates the headwheel motor-drive sine waves. Gives wide-band three-phase output.

610—Linelock

Provides line-by-line lock-up in the Pixlock and Linelock mode.

611—Tonewheel Servo

Derives error signal controlling the headwheel motor in the tonewheel mode of operation.

612—Tonewheel Processor

Shapes the tonewheel pulse and also provides 960-cycle switcher drive.

613—Reference Generator

Processes local sync to produce horizontal-rate reference, field-rate reference and frame-rate reference.

614—Capstan Oscillator

D-c error voltage controls the frequency of the oscillator which supplies the drive frequency for the capstan motor. Tape speed is thereby synchronized to local reference.

615—Capstan Error Detector

A phase detector which compares incoming pulse to the local frame pulse and produces a d-c voltage proportional to the magnitude of the phase error.

616—Capstan Phase

The control-track pulse feeds a chain of binary counters which divide the pulse frequency by eight to produce a 30-cycle output pulse.

617—Control Track Record/Playback

The 240-cycle control track signal is amplified, filtered to produce a clean 240-cycle sine wave, clipped, and shaped into a pulse.

618—Indicator

Senses machine performance and lights warning indicator in the event of malfunction.

619—Automatic Equalizer Accessory

620—Dropout Suppressor

Circuits in this module sense dropouts from the tape and automatically insert an average picture level to minimize the system disturbance.

621—Internal Reference

Provides AFC locked to the tape horizontal sync to provide precise timing of all switching, transient suppression, sync gating and ATC pulses.

622—Tape Sync Processor

Separates tape sync from the sync channel video and provides approximate noise immunity and transient gating for all sync functions.

623—ATC Error Detector

The time base error of the separated tape sync is measured and converted to the necessary control signal for ATC.

624—ATC Video

Contains the variable delay line and driver circuits for the ATC function.

626/627/628—Blank

629—Color ATC Video

Contains the variable delay line and driver circuits for the Color ATC function.

631—Color Error

Color time base errors are detected to provide the control signal for Color ATC.

632—Burst Processor

Provides separation for burst from the tape signal for the color error detector. Also includes circuits for shaping the new burst from local subcarrier.

633—Color Phase

Provides adjustment of regenerated burst phase and system subcarrier phase.

634—Non-Phased Color

Provides necessary pulse circuits for control of the non-phased color mode.

Human Engineering

for Trouble-Free, Error-Proof Operation

Layout and design of the TR-70 are based on studies made to achieve the highest degree of coupling between the machine and the operator. Features include a tape deck set waist high at an angle of 45 degrees for ease in loading reels and threading tape. Recording and playback controls are separated to minimize errors. A series of lights signal operating modes and warn of faulty recording. Plug-in electronics make the TR-70 the easiest-to-operate and to-maintain recorder ever produced.

Professional Design

Beautifully styled to enhance any surroundings and professionally designed to aid operator efficiency, the TR-70 presents four functional areas: the monitoring area, the tape deck and operations area, module electronics area, and console base power deck.

In the monitoring area at the top of the TR-70 are the transistorized audio monitor, picture, and waveform monitors. Under the picture monitor in the center is the tape transport panel with the RECORD control panel on the left side and the PLAYBACK control panel on the right. Directly below the tape transport behind the front panel is the bank of plug-in transistor modules containing the circuitry for video and FM processing and for all the servos required by the recorder. The console base contains the power supplies, vacuum and pressure pumps, air bearing pump and main cooling blower. Front accessibility for all

normal operation and maintenance is attained by centralized plug-in electronics modules and careful mechanical layout. The TR-70 is completely self contained. There are no external accessories.

Functional Control Clusters

The TR-70 operations center is a modern, well-lighted control center designed to assist the operator in trouble-free, error-proof recording and playback of the highest quality television tapes.

Record and play functions are separated to minimize the chance of accidental erasure. Controls and indicators for the record mode are grouped on one side of the tape deck, while those for the play mode are grouped on the other side. Tape threading is simple and is facilitated by cone shaped guide posts. Twelve or 14-inch tape reels are easily loaded on and slip off with ease—they do not interfere with any controls, covers or access panels. A tape timer featuring a clutch mechanism is built into the TR-70.

Fully Instrumented

Generous monitoring and metering facilities and a full complement of indicator lights signal assurance of good performance. They also signal warning of potential trouble or faulty operation. They help to quickly pin-point and correct malfunctions—should they occur. Lights just above the tape transport on the left side flash a red warning. White lights on the right side provide a

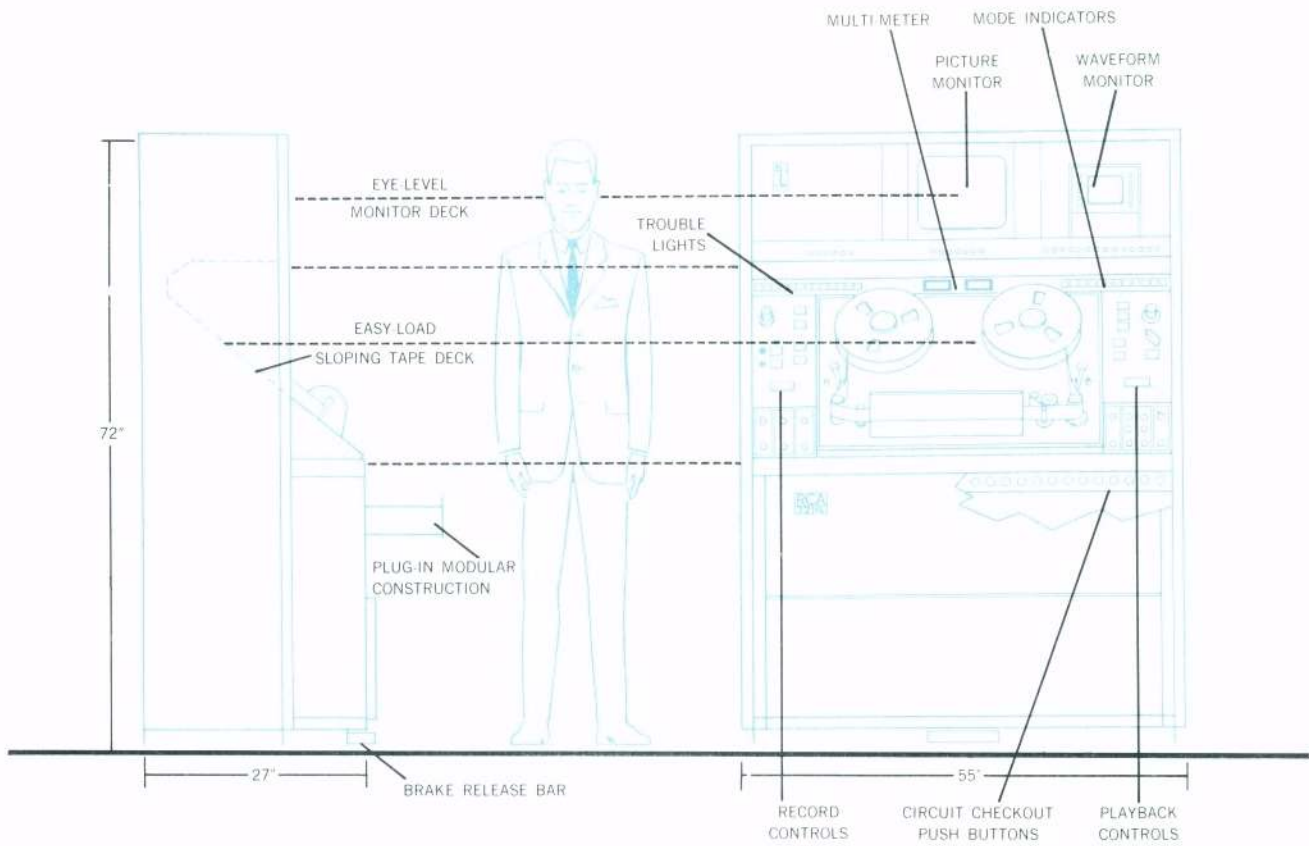
continuous indication of mode, such as the servo or FM deviation standard being used. This awareness by flicking the eyes across a row of lights is fast and foolproof.

FM Test Facility

The FM Test Facility, which is completely self-contained, can be programmed to perform several special tests in optimizing the TR-70. Up until now, it has been a difficult and tedious task to prepare a tape recorder for special tests; i.e., noise, moire, frequency, and headwheel record and playback optimization. The TR-70 can be programmed by the flick of a switch. Trial and error methods of matching the headwheel panel to the electronic system are eliminated in the TR-70. Now accurate headwheel optimization, in both monochrome and color, can be achieved in a few minutes with no guess work. The TR-70 generates its own special test signal in headwheel optimization mode, thus there is no need for external test equipment.

Operation-Tested Features

Time tested features of RCA TV tape recorders are standard in the TR-70. These include continuously variable winding speed, separate guide position control for record and play, air lubricated tape guide, brake release switch, magnetic tone wheel, selective erase head, simultaneous monitoring of servo control track, spot audio erase, simultaneous audio playback and complete cue facilities.



Among the human engineering features introduced in the TR-70 are a 45-degree angle tape deck set waist-high for ease in loading reels and threading tape. Recording and playback controls have been separated to minimize errors. Monitoring facilities are located at eye and ear levels

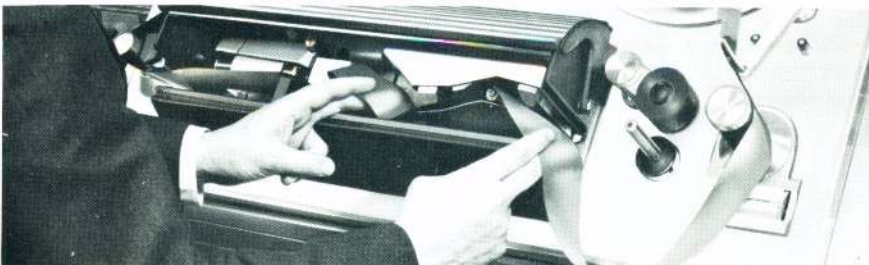
with the pushbuttons controlling their functions located immediately below each of the monitors. Also a series of warning lights, which operate continuously, prevent faulty recording. These features and others make premium performance standard in the TR-70.



Separate play and record controls.



Easy load tape deck.

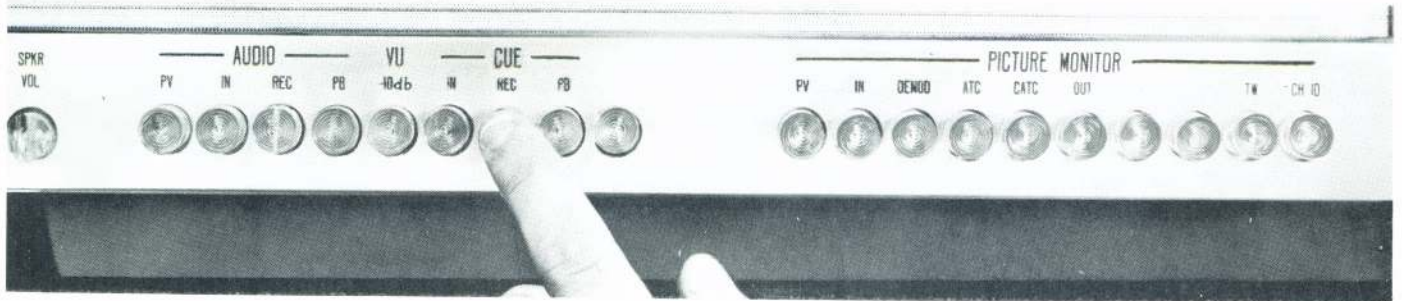


Fast uncomplicated threading.

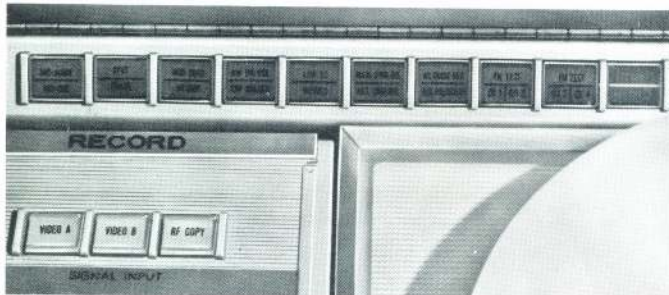
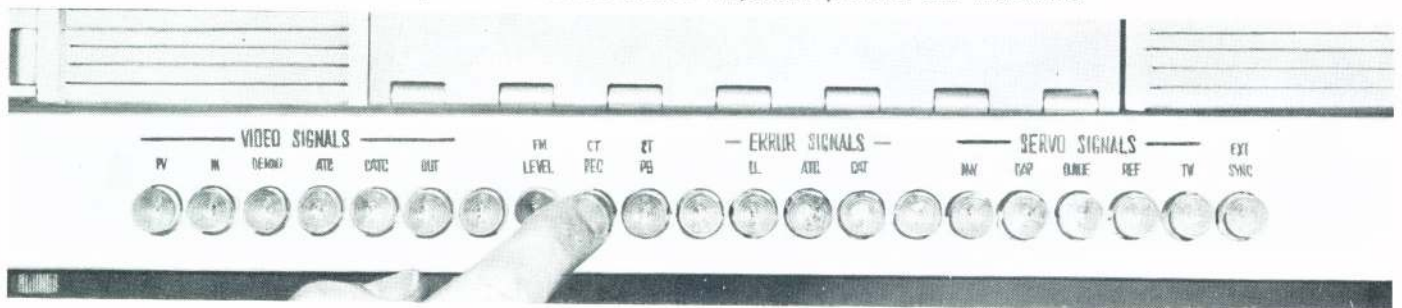


Full instrumentation.

Fully Instrumented for Peak Performance



Multi-position switchers monitor important pictures and waveforms.

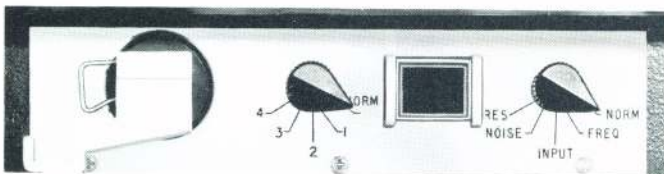


Expanding warning indicating system.

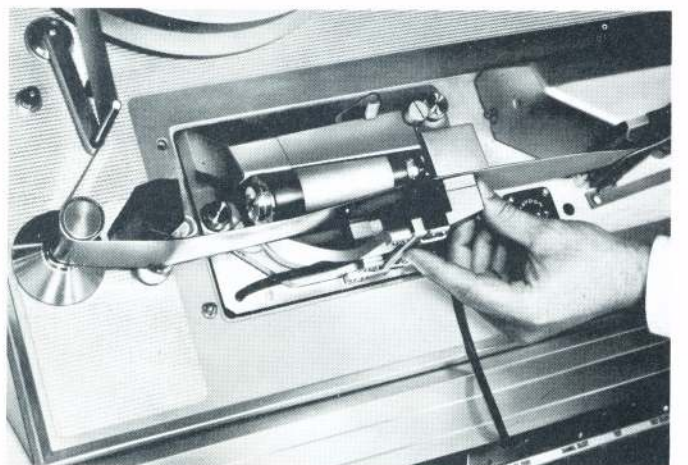


Non-standard mode indicator panel.

New FM Test Facility



Integrated safety circuits while in test mode.

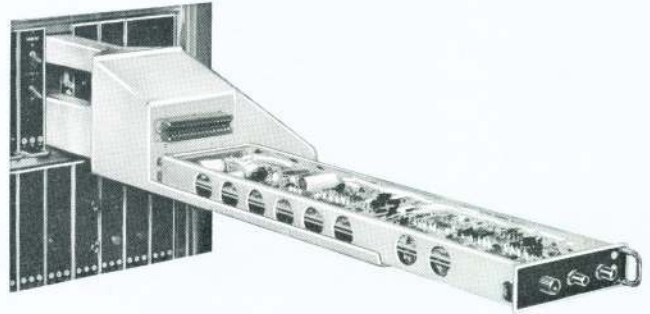


Test probe mounts on panel for quick and accurate set up of headwheel to system.

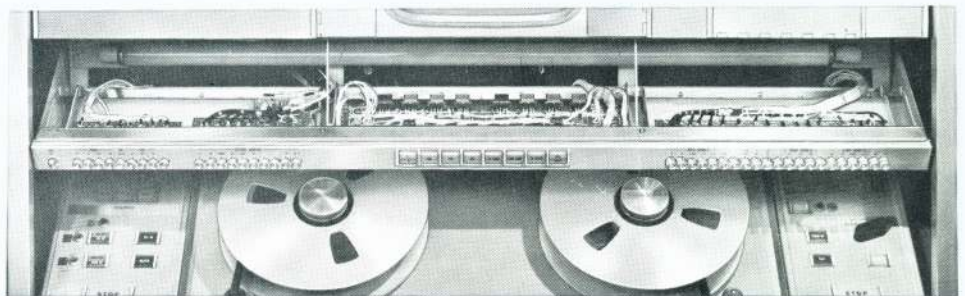
Accessibility for Preventive Maintenance



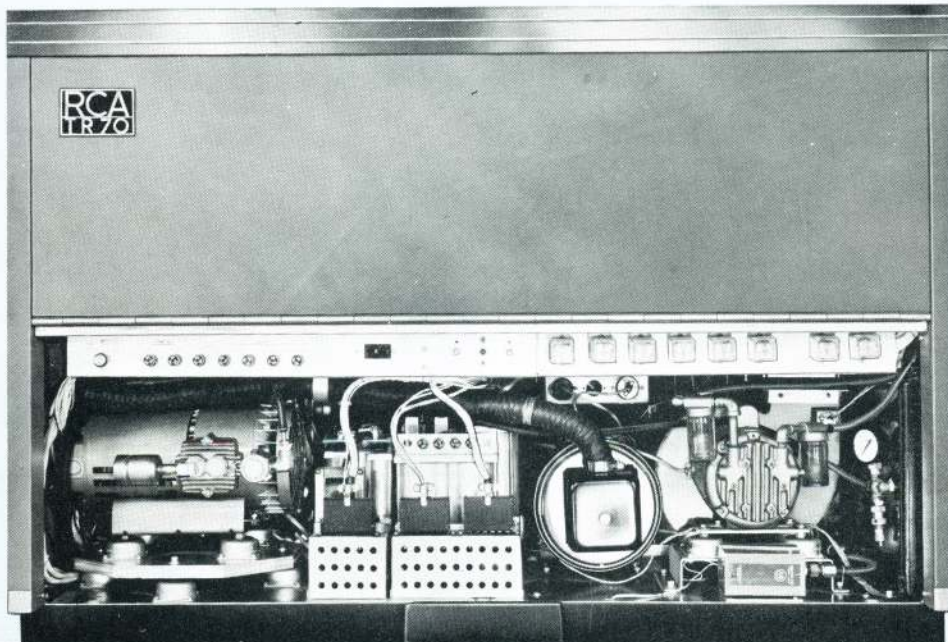
Slide and tilt mounted monitoring — accessibility plus.



Similar module layout and construction — module extender for servicing — easy to maintain.



Slide-out switcher panel and components.



Cover removed to expose power deck and control panel. Air Bearing compressor is built in.

Specifications

General

Recording Medium	Magnetic tape 2" wide	
	50 Field	60 Field
Tape Speed	15.6 in. (39.7 cm) 7.8 in. (19.8 cm)	15 in. (38.2 cm) 7½ in. (19.1 cm)
Picture-Sound Separation	14.8 frames sound leading, 29.6 @ 7½ in.	18.5 frames sound leading, 37 @ 7½ in.
Recording Time	92 min. on a 14 in. reel (7200 ft.) 184 @ 7½ in.	96 min. on a 14 in. reel (7200 ft.) 192 @ 7½ in.
Rewind Time	Approx. 5 min. for 7200 ft. reel	Approx. 4 min. for 7200 ft. reel
Recording Time Reference	To incoming video signal or an external reference	
Playback Time Reference	To an external reference or an internal precision oscillator	
Stopping Time	Less than .2 seconds from Record or Play mode	
		Start time for stabilized sound and picture (color): 5 seconds from standby mode; 6 seconds from stop mode
		Tape Interchangeability: Tapes made on any machine may be played back on any other machine providing they are made in accordance with all applicable proposed SMPTE recommended practices and proposed ASA standards.
		Tape Timer: Accumulated time measured in minutes and seconds. Accuracy within 3 seconds per hour.
		Stability (with ATC) Total jitter and geometric distortion, including drift over a 30 second period: 50 ns peak-to-peak
		Temperature: 0°C to 45°C
		Relative Humidity: 20%-90%
		Lock Up Time from Stop Mode for Stable Audio and Video; Color Mode: Less than 6 seconds, normal or half speed
		Lock Up Time from Stand-by or Set-up for Stable Operation: Less than 5 seconds, normal or half speed

Video (Color System Characteristics)

	Lowband		Highband	
	525/60	625/50	525/60	625/50
Frequency Response (100 kHz ref.)	±1 dB 30 Hz—3.8 MHz -3 dB max. at 4.2 MHz	±1 dB 25 cps—4.5 Mc -3 dB max. at 5.0 Mc	±0.5 dB 30 Hz—4.1 MHz -3 dB max. at 4.5 MHz	±0.5 dB 25 Hz—5.5 MHz -3 dB max. at 6.0 MHz
Signal-to-Noise—(Normal Speed) (Peak-to-peak Video/RMS Noise)	43 dB (Mono) 40 dB (Color)	42 dB (Mono) (Color) not applicable	46 dB	43 dB
Transient Response (2 T sine ² input)	2%	2%	Less than 1.5%	Less than 1.5%
Rise Time or Fall Time (20 ns or less on input)	120 ns max.	100 ns max.	120 ns	80 ns
Low Frequency Linearity (Blanking to White)	2% max.	2% max.	1% max.	1% max.
Differential Gain (Blanking to White)	Less than 4%	not applicable	Less than 4%	Less than 5%
Differential Phase	5° at 3.58 MHz	not applicable	Less than 5° at 3.58 MHz	Less than 5° at 4.43 MHz
Moire (Color bars, 75% modulation)	24 dB	not applicable	40 dB or better	34 dB or better

Audio

50/60 Hertz	Program	Cue
Frequency Response	±2 dB 50 Hz, 15 kHz	±2 dB, 50 Hz, 12 kHz except 20 dB notch at 240/250 Hz
Flutter and WOW (For components from 0.5 to 250 Hz)	0.2% RMS	0.2% RMS
Signal-to-Noise	55 dB	40 dB or better

Mechanical

Transport	Centrally located at 45 deg. angle and at a reel height of 48" (122 cm)
Cooling	Filtered, forced air
Dimensions: Width (overall)	55" (140 cm), Width (Less End Panels) 53" (134 cm), Height 71¼" (181 cm), Depth 26½" (67 cm)
Shipping Information:	Width 61¼" (155.5 cm), Depth 35" (88.8 cm), Height 84" (213 cm), Volume 125 ft. ³ (3.75 M ³), Gross Weight 1800 lbs. (816 kg)

Ordering Information

The Type TR-70 Tape Recorder is available for operation on 525, 625, 405 and 819 line tv standards.

Two basic models are available:

- (1) a 525 line machine
- (2) a switchable machine for 525/625/405 or (optional 819) line operation

They may be ordered as follows:

- For 525 line operation, specify ES-43583
 For 525/625/405 line operation, 50 Hertz, specify ES-43585-405
 For 525/625/819 line operation, 50 Hertz, specify ES-43585-819

All models include the following equipment complement:

- 1 TV Tape Recorder (Console Mounted) complete
- 1 Headwheel Panel Assembly (Air-bearing)
- 2 End Panels
- 1 Kit of Maintenance Materials
- 1 Monochrome Video Alignment Tape