RC/I
Broadcast News

Volume No. 155, March 1975

TR-600 Quadruplex VTR . . . Small Wonder

The TR-70C . . .
A teleproduction machine with something extra.

At a list price of $103,500, which includes CAVEC & DOC, our TR-70C teleproduction machine has a lot of important extras. Extras that you probably won't find in lower cost machines.

Unsurpassed in its video and audio specifications, the TR-70C is for the broadcast station or other television facility that demands the very best in quality and performance. Operational conveniences include automatic stop cue, automatic FM standards selection, variable shuttle speed, two switchable-previewable video inputs, built-in record current optimizer and a list of others too numerous to mention here.

For assurance of day-in, day-out performance, monitoring facilities include 17 fault indicators, 13 metering readouts, and audio and control track simulplay.

Still another extra is "Cart" capability. The TR-70C is an ideal master for the TCR-100. In this capacity it doubles as both a reel-to-reel recorder and a signal processor for the Cart Machine. Its built-in Chroma Amplitude and Velocity Error Correction (CAVEC) and Dropout Compensator (DOC) are the same as those employed in the TCR-100's Signal Processing Unit (SPU).

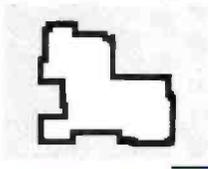There's a lot more to the story. Check your RCA representative for complete details.

The TR-70C . . . its most important extra is value.

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RCA
Broadcast News

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View Finder

Alaska Educational Broadcasting Commission Equips New ETV Station In Anchorage

The Alaska Educational Broadcasting Commission has ordered RCA studio and transmitting equipment valued at approximately $715,000 for the first educational TV station in Anchorage.

The order calls for installation of an RCA TT-17FH, 17-kW VHF transmitter and Superturnstile antenna. Studio equipment includes two TK-630 cameras, two TR-70C video tape recorders, and a TK-610B telecine island.

Marvin Weatherly, Executive Director of the Commission, said, "We'll be providing a full range of educational programming for Anchorage viewers, ranging from in-school programs to adult evening telecasts. Many of our programs will be produced locally to meet the specific needs of our audience."

The Commission currently funds educational TV stations in Fairbanks and Bethel.

Radio Quebec Orders RCA TV Transmitting Systems For Two New Stations

Radio Quebec, Canada, has ordered RCA TV transmitting systems valued at more than $1 million to establish in Montreal and Quebec City the first two UHF educational TV stations in the province.

The new stations, first in a planned network of seven, are scheduled to begin broadcasting in 1975.

The transmitting systems to be installed in each of the cities will include an RCA TTU-60C, 60-kilowatt transmitter, and a TFU-25GAL pylon antenna.

The Montreal antenna will be installed on Mt. Royal in the city's center atop an existing multiple-antenna tower. Quebec City's antenna will be mounted on top of a 32-story building.

Radio Quebec is an educational radio and TV production and broadcast organization operated by the provincial government.

The new stations will broadcast adult educational as well as in-school programming, produced in Radio Quebec's studio facilities for day and evening viewing. Radio Quebec currently distributes educational TV programming via cable systems.

Maine Public Broadcasting Network Expanding TV Coverage

The Maine Public Broadcasting Network (MPBN) is acquiring RCA broadcast equipment valued at approximately $1.8 million to expand its TV and radio facilities.

A major expansion move will be establishment of WMEG-TV, a new UHF station in Biddeford, with a TTU-30C, 30-kW transmitter and a high-gain antenna to be mounted on a 500-foot tower at Sanford, Maine.

The new outlet gives the Maine network its fourth TV transmitter, providing public TV coverage of almost all populated areas of the state. It will broadcast on Channel 26 as a satellite to the net's flagship station in Orono and will cover most of southern Maine.

Two video tape recorders and two RCA TK-28 color film systems will be installed at WMEB-TV in Orono which serves as the production and switching center for MPBN. In addition, the broadcaster has purchased a 40-foot mobile TV trailer unit, complete with five RCA TK-44B color TV cameras and a production switcher.

John Morison, General Manager for the educational network, said the mobile unit will be stationed at the Orono Production Center and its equipment used to produce color programming there. The unit also will be dispatched to cover TV-worthy events throughout the state.

The network, which is operated by the University of Maine, airs programs from the Eastern Educational TV Network and the Public Broadcasting Service, in addition to producing locally many programs especially designed for Maine viewers. Public affairs programs covering such topics as state politics, environment and government, as well as educational documentaries, are produced by MPBN.

"We also are launching a major effort in bi-lingual broadcasts to reach our many French-speaking viewers, and have begun exchanging selected programs with Canadian stations," Mr. Morison added.

RCA Scientist Proposes Electronic License Plate System To Improve Highway Safety And Automate Traffic Services

The lowly license plate someday may be the most important tool when it comes to highway safety, traffic control, anti-theft protection, vehicle inspection and automatic toll billing.

It also may prove to be a very effective way of transmitting emergency radio messages between motorists and law enforcement officials.

The key to such an automatic and almost instantaneous multi-purpose system is an electronic license plate proposed by Dr. Fred Sterzer, Director of the RCA Microwave Technology Center in Princeton, N. J.

Dr. Sterzer said the electronic license plate system, which would cost only a few dollars when manufactured in quantity, would perform three basic functions:

1. respond with a vehicle's identifying code number when electronically interrogated,

2. receive and transmit radio messages to and from a vehicle, and

3. serve as a transponder for use in a cooperative collision avoidance radar.

The heart of the electronic license plate is a sophisticated antenna system capable of receiving radio signals at one frequency and re-broadcasting the signals at double that frequency. The addition of an integrated circuit coder enables the license plate to transmit an electronic signal that distinctly identifies the vehicle carrying it.

Dr. Fred Sterzer, Director of the RCA Microwave Technology Center, Princeton, N.J., shows components of the proposed electronic license plate system.

TKP-45 Portable Color Camera At Tournament Of Roses Parade

KTLA-TV, Los Angeles, field tested a production model of RCA's new TKP-45 portable color TV camera in covering the Tournament of Roses Parade in Pasadena on New Year's Day.

The camera was used by Golden West Broadcasters Ch. 5 at street level to provide local viewers with a variety of unusual shots of the parade.

The TKP-45 operates without a backpack and is connected to the camera control unit by a small cable, less than half-inch in diameter, which may extend up to 1,500 feet. The 22-pound camera combines shoulder-mount maneuverability with studio-camera picture quality. It employs a three-tube pickup system, with an electronic viewfinder and 6X zoom lens.

Introduced at the 1974 NAB Convention, production deliveries of the new camera are scheduled for early 1975. More than 30 cameras are on order.

RCA Engineering Leader Reviews Advantages Of Circularly Polarized TV Broadcast Transmissions

Circular polarization, a new technique for transmitting TV signals, may be an effective antidote for picture ghosting, poor reception on whip and rabbit ears antennas and other TV ills. Dr. Matti S. Siukola, Leader, Advanced Antenna Development, for RCA Broadcast Systems, said field tests now under way may verify these theoretical advantages, leading to consideration of the circular polarization approach by the Federal Communications Commission.

Circular polarization field tests are being conducted by WLS-TV, Chicago, using an experimental antenna developed by RCA for the ABC-owned station. First test transmissions were at night but later the FCC authorized WLS-TV to operate the circularly polarized antenna during its full program day.

Dr. Siukola compared advantages of the new technique, a form of which has been used for FM broadcasting for some years, with those of a horizontally-polarized signal which is the current TV broadcasting method.

"It is expected at the outset that simply transmitting two signals, one horizontally and one vertically polarized, will provide much more solid TV coverage, as was the case with FM, than the present system," he said.

The vertical component can be expected to serve whip-antenna receivers better, he continued, while the combination of vertical and horizontal signal components should simplify adjustments usually needed for rabbit ears and other simple indoor antennas.

Dr. Siukola said circular polarization's most important feature is its potential for reducing ghost reception. One factor in accomplishing this is the matching of transmitting and receiving antennas to provide for "polarization discrimination."

"For instance, the direct signal will be effectively received by the circularly polarized home antenna, but a reflected signal from a wall or building will be rejected," he said.

If approved, circular polarization could be easily implemented by TV broadcasters by use of the station's authorized effective radiated power for both horizontal and vertical radiating components, thus doubling ERP, he added.

Swiss Broadcasting Corporation Orders RCA Telecine Equipment

The Swiss P.T.T. Authority on behalf of the Swiss Broadcasting Corporation has ordered RCA color telecine systems valued at approximately $330,000 for its new TV Studio Center under construction at Comano near Lugano.

Three telecine islands, each equipped with two internally-mounted RCA TK-28 film cameras and projection systems, are included in the order.

The telecine systems will enable the Swiss network, which provides broadcast services in German, French and Italian—languages spoken in Switzerland—to continue the expansion of its color program operations.

The RCA equipment will be installed in the network's new Comano, Lugano, studios, headquarters of the Italian language service. These facilities will become operational in 1976, according to Swiss broadcasting officials.

RKO General Installing RCA TCR-100's To Automate TV Station Breaks

RKO General Inc. has installed RCA TCR-100 video tape cartridge recorders to automate station breaks at three of its group TV stations, it was announced today.

WNAC-TV, Boston, WOR-TV, New York, and WHBQ-TV, Memphis are now using the RCA machines for sequential "on-air" playback of commercials, station identifications, program promotions and other short taped segments.

Lad Hlavaty, Vice President, Engineering, for RKO-Television, said that the use of the cartridge machines will simplify the stations' studio operations while maintaining the traditional technical quality of their broadcasts. He added that the TCR-100s would free existing reel-to-reel video tape recorders for programming and production work.

The RKO "cart" machines include EPIS (Electronic Program Identification System), an optional device which provides visual alphanumeric identification of the cartridges ready for playback. Each system also incorporates an electronic editor for making inserts in cartridges previously recorded.

RCA CAMERA, VTR DEVELOPMENTS OF SPECIAL INTEREST AT IBC

At the opening ceremony for the International Broadcasting Convention, held at London's Grosvenor House in late September, HRH The Duke of Kent commented on the event's involvement with ". . . the lively and dynamic world of broadcasting."

This was very much in evidence as 1700 delegates from 33 countries streamed through the hall and checked out the electronic developments on display. The visitors' specific reasons for doing so naturally were varied. But in general, they were there to catch up with the progress of the industry, and relate it to their own requirements.

RCA's exhibit included a wide choice of video developments, all designed to introduce cost savings and operational flexibility into production operations.

VTR Advances

In the tape area, the major focus was on the New Technology TR-600 recorder. Its greatly reduced size provided the first clue that it is an original design answering the technical and economic needs of the industry.

The TR-600 was operating in the PAL configuration, the standard used throughout the U.K. and most of Western Europe. Demonstrations revealed that the machine locks-up a stabilized, high-quality color picture in 1.5 seconds, owing to new circuitry and built-in automatic sub-systems usually available as extra-cost options in other quad VTR's.

Visitors closely investigated additional TR-600 features: waist-high position of the reels; a novel reel-hub design eliminating the tedium and effort from reel seating and unseating; greatly simplified threading through a straight-motion, drop-in process; and routinely used controls at the operator's fingertips.

Those who participated in hands-on demonstrations experienced the new level of easy operation the loading and unloading procedures make possible.

(Left) Improvements in PAL recording were introduced.
(Top Right) RCA's color camera theater revealed uniform picture quality between the TK-45A and TKP.
(Bottom Right) HRH The Duke of Kent (right) inspected stand with RCA's N. Vander Dussen. Division Vice President, Broadcast Systems.

Representatives from ORTF (France's national broadcast agency) felt that the distaff side of their extensive VTR operations would especially welcome these features.

In addition, delegates found immediate interest with the machine's compact size and relatively light weight, which extend its usefulness in crowded tape rooms to mobile vans.

Improvements in PAL Recording

IBC also saw the world debut of Quad II, RCA's proposed variation to the existing standard for the PAL system. This development is in direct response to European broadcasters and teleproducers' changing requirements for better technical quality and operating economy.

After watching Quad II tapes played back on a modified TR-70C, engineers saw that it is possible to obtain full quadruplex quality at half tape speed, with much improved moire performance.

What's more, attendees learned about Quad II's provision of two high-quality audio tracks. They can not only contribute further to significantly better recordings, but also satisfy increasing production requirements for voice-overs, stereo sound reproduction, bi-lingual sound tracks and separate recording of music or special effects.

Miniaturized Quad Recorder

Sharing RCA's VTR display was the TPR-10 portable quad recorder, a key element in electronic news gathering systems, and an economical alternative to the use of film for a variety of on-the-spot production jobs.

Besides the TPR-10's delivery of studio-quality color, considerable interest was shown in its playback and full-erase facilities.

Handheld Color Camera

The live camera show was also well attended throughout the convention. It provided the first demonstration outside the U.S. of RCA's new 22-pound camera head, the TKP-45A.

Using the top-of-the line TK-45A studio camera as a basis of comparison, the presentation cut back and forth to show that picture quality is virtually indistinguishable.

This is mainly due to a breakthrough in pre-amp design which the TKP incorporates. As a result, its signal-to-noise ratio is practically the same as the TK-45A's.

The camera show also demonstrated common operating characteristics such as automatic adjustments, low-light sensitivity and Scene Contrast Compression, as well as features exclusive to the portable camera.

Connected directly to the CCU, which can be located in a mobile van or studio, the TKP has no cumbersome backpack to contend with. Audiences witnessed the cameraman's ability to roam about the exhibit studio freely and concentrate on picture composition, some of which was very different.

The demonstration further suggested the TKP's many directorial advantages as the cameraman moved with the action, or used the 6-to-1 zoom lens to produce sharp, brilliant close-ups.

After almost every show, numerous visitors examined the TKP's rugged design. A lot of interest centered on the portable's 3-in. tiltable electronic viewfinder. One enthusiast dramatized its versatility as he tilted it upward and carried the live camera about baggage fashion.

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South Carolina Educational TV Expands Network

The South Carolina Educational Television Commission has ordered RCA radio and TV transmitting equipment valued at more than $1 million to expand its statewide network coverage.

Two complete TV transmitting systems and an FM radio system are included in the order.

The TV equipment—TTU-30C, 30 kW UHF transmitters and high-gain antennas—will be used to establish new educational stations in Beaufort and Sumter, S. C. A 20-kW FM transmitter, BTF-20E1, is being installed in Sumter.

Charlton Bowers, Chief Engineer for South Carolina ETV, said the network currently operates five TV stations, which cover the entire state, and an FM station in Columbia. The two new TV stations will provide a second source of local programs for their viewing areas. In addition to its broadcasts, the network supplies programming to schools around the state over 12 closed circuit channels.

The network's two complete color studios in Columbia and a fully-equipped color TV mobile broadcast unit produce most of the programming for the group's stations and closed-circuit outlets.

Brazilian Educational TV Station Orders TV Mobile Unit

TV Cultura, an educational TV station in Sao Paulo, Brazil, has ordered an RCA-equipped mobile TV van valued at approximately $675,000 to provide viewers with a greater variety of program pickups from remote locations. The station is operated by Fundacao Padre Anchieta under the sponsorship of the government of the State of Sao Paulo.

The specially-designed trailer unit will house three RCA TK-45A live color TV cameras; a TR-60 video tape recorder; production switcher; complete audio facilities; microwave link, and communications equipment.

The broadcast unit will be used throughout the state to televise cultural and educational programs. Telecasts can be relayed from the scene via the microwave link for live broadcast, or recorded on video tape for later playback from Channel 2's studio in Sao Paulo.

New ETV Station For Springfield, Mo. Equipped By RCA

Springfield Community TV, Inc., Springfield, Mo., has ordered $800,000 in RCA studio and transmitting equipment for a new educational TV station scheduled to begin broadcasts early 1975.

William Maynard, the station's General Manager, said the new broadcasting facility will provide educational TV service on Channel 21 to more than a half-million viewers in the Springfield area.

The station's daytime schedule will be made up of pre-school and in-school children's programs. Evening broadcasts will include news, cultural events, and Public Broadcasting Service programming, Mr. Maynard said.

The new transmitting system includes an RCA TTU-60C, 60-kilowatt UHF transmitter, broadcast antenna and remote control equipment.

The all-color studio is being equipped with a TK-45 live color camera, two TR-61 video tape recorders and a TK-28 film originating system.

Mobile TV Broadcast Unit To Republic Of Zaire

A complete mobile color TV broadcast unit, equipped by RCA Broadcast Systems, has been shipped to the Republic of Zaire in preparation for the beginning of color TV telecasts in that country.

The outside broadcast van will augment television facilities in Kinshasa, the Central African nation's capital.

Equipped for complete color program operations in the field, the mobile unit contains three TK-45A cameras as well as video tape recording, switching and microwave equipment.

Teletronics Orders RCA TV Studio Equipment For New Headquarters

Teletronics International, Inc., a major TV teleproduction center in New York City, has ordered RCA TV film, tape and camera equipment valued at approximately $600,000 for its new headquarters.

The order includes four TR-70C video tape recorders, two TK-28 film cameras, a multi-speed film projector, and a TKP-45 live portable color TV camera. Teletronics is expanding its operations in new and larger quarters to handle the processing of an increased volume of TV programs and commercial material.

George K. Gould, Teletronics' President, said that with the new equipment and facilities the company would operate "the most advanced post-production video tape plant in the country."

He said video tape is Teletronics' basic medium for recording, editing, duplicating and distributing TV program material. The RCA TR-70C recorders will be employed in computerized editing systems, and in the final processing and duplicating steps. The TK-28 film systems will be used to color correct filmed programs and commercials during the film-to-tape transfer process.

Teletronics is meeting the growing demand for video tape production and distribution, according to Mr. Gould. "We expect a great increase in processing of taped commercials and programs in the upcoming years, including material originally shot on film. Our new equipment, coupled with new electronic computerized techniques for final-processing of video tape, will enable us to handle this larger volume of teleproduction business," Mr. Gould said.

Previously, Teletronics installed RCA TR-70C video tape recorders as the primary recording, editing and duplicating equipment of its Miami, Florida subsidiary, Video City.

Post-Newsweek Stations Order RCA Film Cartridge Projectors

Post-Newsweek Stations, Inc., headquartered in Washington, D. C., has ordered RCA's new film cartridge projectors for each of the group's four TV stations.

Valued at approximately $260,000, the four TCP-1624 cartridge projectors will be installed at WTOP-TV, Washington, D. C.; WPLG-TV, Miami, Fla.; WJXT-TV, Jacksonville, Fla.; and WFSB-TV, Hartford, Conn.

QUAD TAPE

AN INTRODUCTION TO THE NEW TECHNOLOGY TR-600

G. Moskovitz, *Electronic Recording Equipment Product Management*

J. R. West, *Leader, Electronic Recording Equipment Engineering*

Overview: In designing the New Technology TR-600 TV Tape Recorder, the overall philosophy adopted was one of an integrated design rather than a basic machine which would be "loaded" with price-escalating accessories. The result is a total system design utilizing the latest technology in circuit design, assembly and test techniques.

The three basic objectives set for the TR-600 design team were:

(1) *High Performance*—The New Technology product must deliver video and audio performance equivalent to or better than any other broadcast quality quadruplex recorder currently available.

(2) *Simple Operation*—Increase the number of automatic functions and reduce the number of operational controls.

(3) *Medium Cost*—The new machine must sell below the price of any existing comparatively equipped broadcast quality quad recorder, and give the user more value for his money.

All of these basic objectives have been attained in the TR-600. It is low in cost, easy to operate, and delivers top quality performance.

This presentation covers the TR-600 —inside and outside—highlighting key features with illustrations and text.

For compatibility, performance, reliable interchangeability and standardization, the TR-600 is a quadruplex machine, packaged in a new horizontal configuration. For versatility, it records and plays back in highband, and is also a lowband playback machine. It can operate at both 15 ips and 7.5 ips tape speeds, with fast lock-up and fast rewind— taking only 2½ minutes maximum to rewind 4800 foot tape reel.

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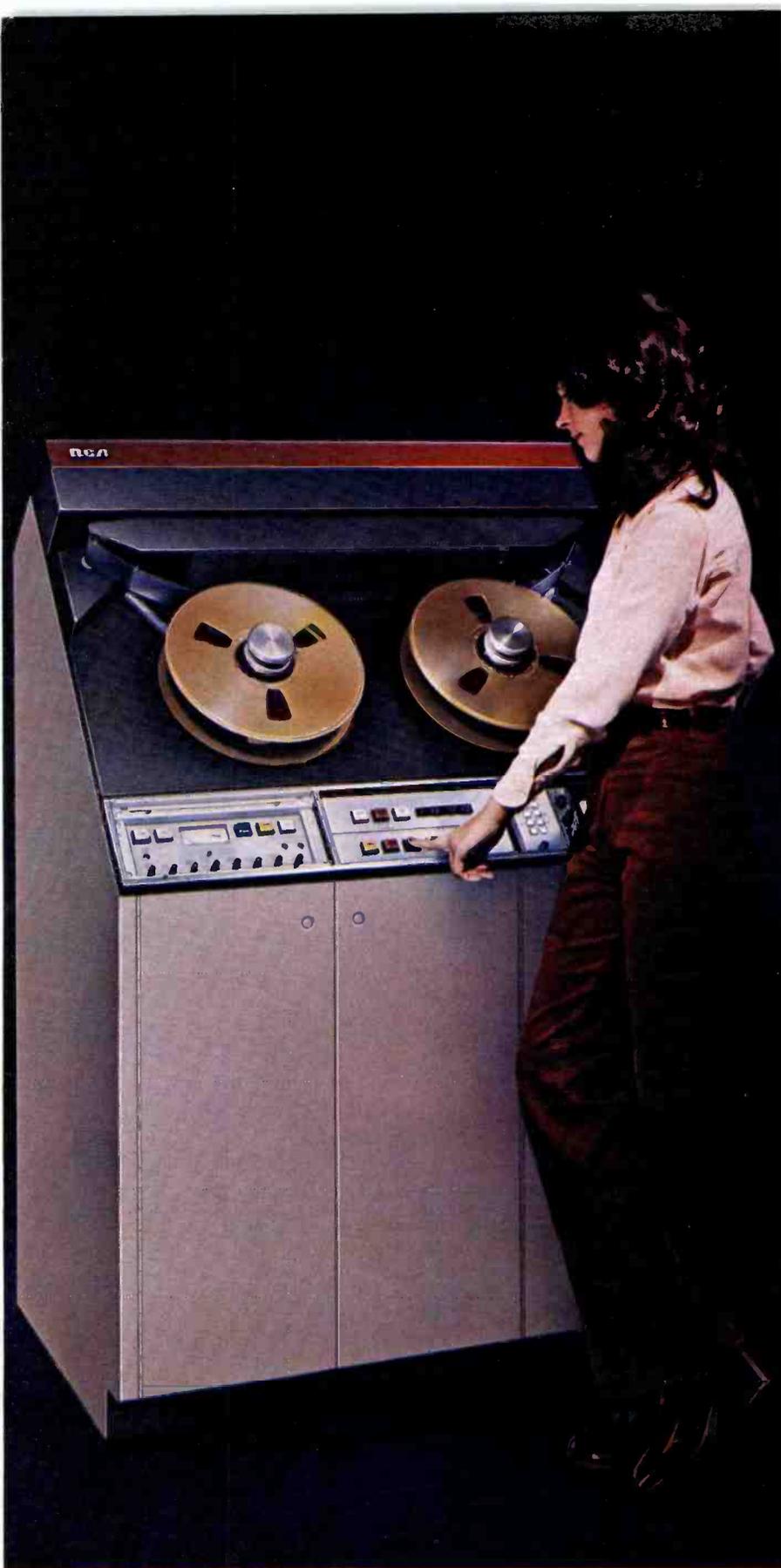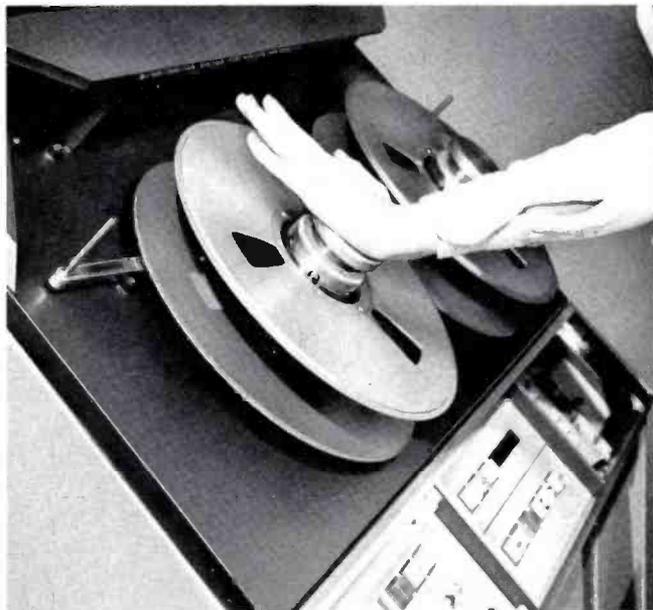
"Drop-on" reel loading feature is an operational convenience.
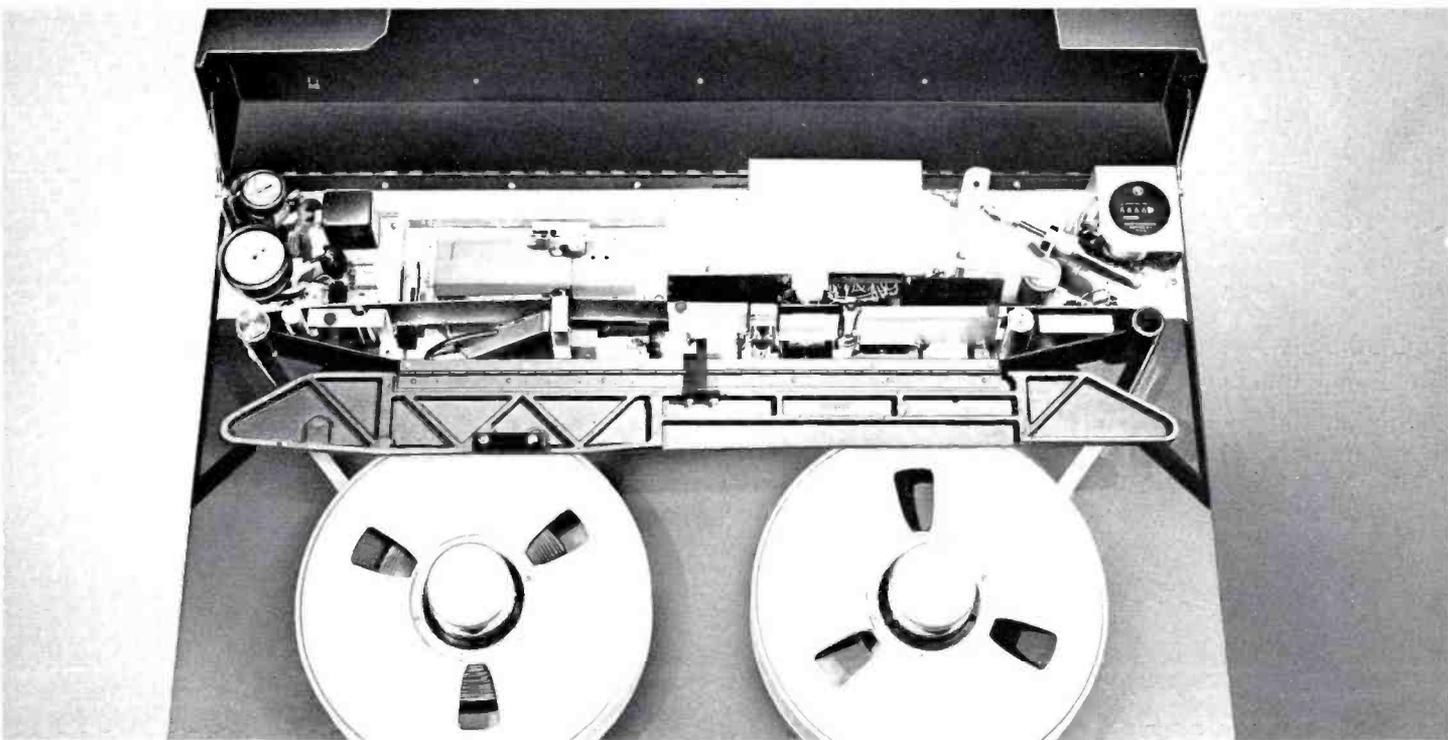
TR-600 is equipped with Alfecon II headwheel panel.

Two unique loading and threading features contribute to simpler operation of the TR-600:

"Drop-On" Reel Loading. A new "Drop-On" hub design automatically locks reels in place. Depressing the hub cap releases the reel and sets the "trigger" for seating the next reel to be loaded.

"Straight-Line Threading". Fast and foolproof. In the "Thread" mode, the tension arms and audio head swing out of the way. Pulling the tape through the slot makes threading an easy, straight-line operation.

"Straight-Line" Threading.

Economy is the watchword with the TR-600—economy of initial cost and of operating cost . . . economy of space and of power consumption. Manpower is money, so the new recorder was designed to require minimal operator skills, attentiveness, and time spent in set-up.

The TR-600 occupies an economical 6.9 square feet of floor space, weighs just 685 pounds, and gets by on a thrifty 1.3 KVA of electrical power. And economy extends to the standard RCA Highband Alfecon II headwheel panel employed in this new tape machine. Highband Alfecon II headwheel panel wear average is more than 500 hours, and over 800 of these panels have exceeded 1,000 hours of use.

The TR-600 is automatic. The following functions are *built into* the machine as automatic subsystems:
- A Chrominance Amplitude Corrector (CAC)
- Velocity Error Compensator (VEC)
- Color Dropout Compensator (DOC)
- Control Track Phasing (ACTP)
- Guide and Reel Servo Systems

Reflecting the value of integrated design, the standard TR-600 is equipped with these additional built-in subsystems:
- Single-frame electronic splicer
- Record current optimizer
- Electronic tape timer display
- Tektronix 528 waveform monitor
- Monitor selector switcher
- Loudspeaker
- Venturi vacuum system
- LED Diagnostic readout

Along with its economy, compactness and built-in automatic features, the TR-600 was designed to perform with the best quad VTR's on the market. The abbreviated specifications chart shows the high level of performance achieved by this New Technology tape system.

Abbreviated Specifications

	(Standard Tape/ 15 ips)	
	525/60	625/50
Lockup Time	1 sec (max.)	1.5 sec (max.)
Video (Highband)		
Signal/Noise	46 dB	43 dB
K Factor (2T/20T)	1%	1%
Low Frequency Linearity	1%	2%
Differential Gain	3%	3%
Differential Phase	3°	3°
Moire	43 dB	34 dB
Audio		
Signal/Noise	55 dB	55 dB
Wow/Flutter	0.1%	0.1%

Secondary Controls
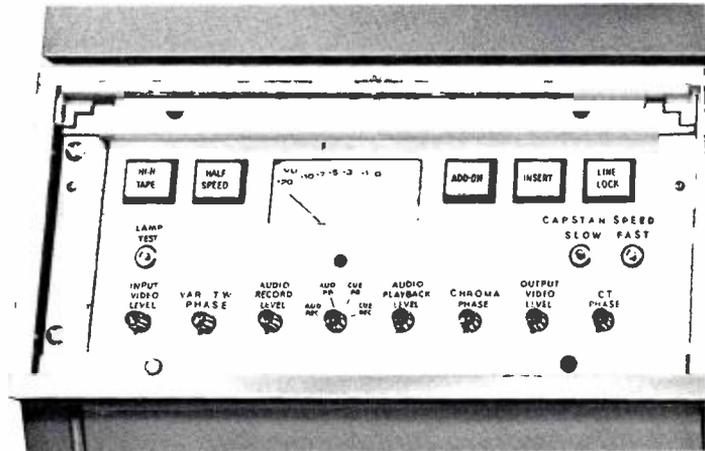
Control Panel
A three-sectioned, simplified control panel is the operating heart of the machine. For operational efficiency, frequently-used controls are clustered in the center panel, with secondary mode controls and mounting facilities positioned on the left and right panels.

Secondary Controls on Left Panel
A slide-back cover is provided for the left section of the control panel, so that the operator can close it after he has completed his adjustment. Under the cover are secondary mode controls and audio and video level controls.

The "Linelock" mode negates the servo requirement to maintain vertical coincidence. The normal TR-600 mode is to require full vertical and horizontal coincidence when playing back ("PIX-LOCK"). If a previewed tape is of poor quality, but must be used for playback, the disturbances may be minimized by going into "LINELOCK".

"Add-On" and "Insert" control the manual splicer built into the TR-600. The splicer is manual but the circuitry can accommodate editing preview and one-frame edits for animation when interfaced with appropriate external

editing equipment. "Half Speed", or 7½ ips operation, is accomplished with a push of the button when a 5 mil head panel has been installed in the machine. Another panel button is provided for use with high energy tape. If and when high energy tape become commercially available, this button would be used to change the Record/Playback audio equalization and the FM level automatically. The built-in Record Current Optimizer then facilitates easy re-optimization for recording. The TR-600 can record, play back, and erase up to 500 oersted tape.

The Lamp Test button lights all the control panel lamps which are run from a +24 volt dc supply. This automatically provides the operator with an instant confirmation of the working status of the machine. The bulb used is inexpensive, rugged and easily removed from the front, without a special tool.

The input video level can be corrected with the video level knob ±0.5 volts from the nominal 1.0 volt P-P amplitude. Provision is made on the video input card to plug in equalization for up to 600 feet of double shielded coax.

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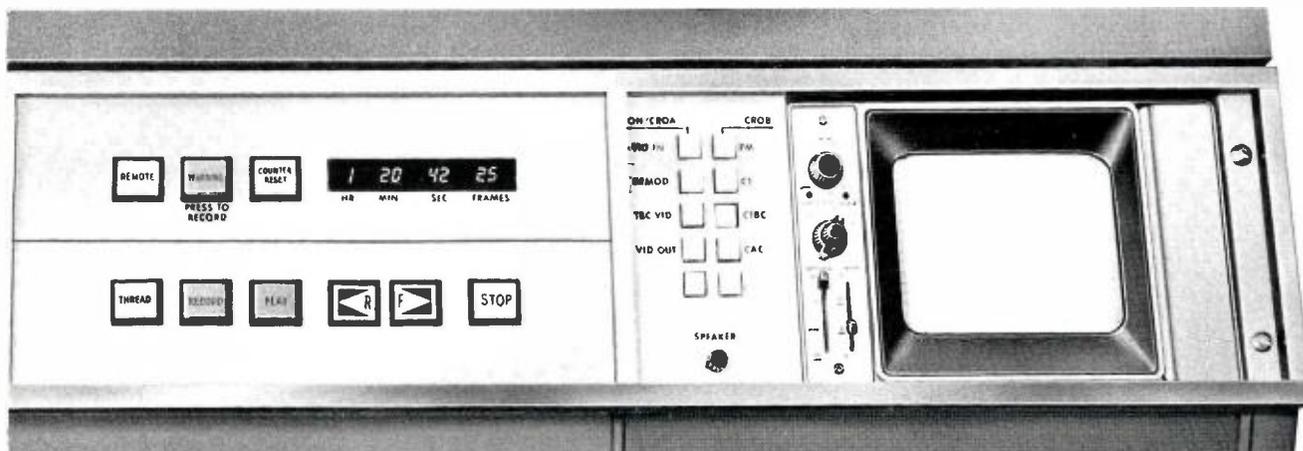
To minimize incoming low frequency disturbances, there is a built-in differential video input stage.

The Audio Record level, audio Playback level, VU meter and the monitor switch allow monitoring and setting of record and playback audio levels.
Also located in this panel are:

- A control track phasing knob which optimizes the tracking when in the manual mode (automatic control track phasing is the normal mode of operation).
- Two capstan speed pushbuttons for speeding up or slowing down the capstan for lip synchronization between two VTR's.

For servicing, the entire control panel is released by foud 90° locking screws. Being completely pluggable, it may be unlocked and operated in place or unplugged and scrviced at a work bench.

Action Center

The most frequently used tape operator functions are logically and conveniently positioned in the center control panel.

"PLAY" may be entered from "Fast Forward" or "Fast Reverse". A motion sensor is used to delay play until motion has stopped.

The "STOP" button refers to tape motion, i.e., all elements in the tape path are ready to function but the tape is not moving. In this mode, when there is no tape in the tape path, the machine automatically goes into the "THREAD" mode. The headwheel stops and the tape path is opened for threading the tape. Any mode may be entered from the "THREAD" mode.

The center panel also includes an LED read-out of tape elapsed time—with a resettable display of hours, minutes, seconds and frames. With the frames display, the VTR operator can rock the reels by hand, cueing the TR-600 to an exact frame location. An accessory is planned for the future to allow the LED display to function as a display of SMPTE Time Code during tape playback and wind modes.

("RECORD"; "WARNING"; and "REMOTE" function pushbuttons on Center Panel are described in more detail on next page.)

Right: Monitor, CRO Switcher

The right-hand section of the control panel contains the switcher for the built-in Cathode Ray Oscilloscope and an external picture monitor. Video IN, Demodulator output, TBC output and Proc Amp output video may be observed on the CRO and picture monitor output. The picture monitor and CRO are always looking at the same video when the CRO input switch is on channel A. By switching the A/B input switch on thc Tektronix 528 CRO to the B input, several waveforms may be observed.

- *FM waveform*—displays the playback FM envelope and amplitude. This wavefor mis also used when opjerating the built-in Record Current Optimizer.
- *CT*—Control Track signal may be monitored in both playback and record.
- *CTBC*—displays both monochrome and color Time Base Corrector error waveforms on a split field display.
- *CAC*—Monitors the Chrominance Amplitude Corrector channel-to-channel burst level changes and burst amplitude errors in a split field display.

Just under the switcher push-buttons is the audio/cue monitor loud speaker volume control. The speaker is located below the CRO.

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Warning Indicator (Flashing Lamp)

Location	Module	Function
3A3	Modulator	Mod Off Freq or Test Mode
3A9	Video Filter	Not Highband
3B9	Control B	Module Removed
3B9	Control B	Low Air Pressure
3C15	Guide Logic	Excessive Ht/Pnt Error
3C19	Switchlock	Tape/Ref Vertical Misalignment
3C22	Pixlock	Tape/Ref Horizontal Misalignment
3C23	TW Servo	Record Headwheel Unlock

Tables at right show how warning indicators aid in trouble-shooting by identifying "not normal" modes and system component failures.

(Below) Lighted warning lamps on front edge of modules permit quick identification of abnormal operating condition.

Warning Indicator (Continuously Lit Lamp)

Location	Module	Function
3A10	Chroma Amp Eq	Turned Off
3A11	DOC	Turned Off
3B10	CAC Detector	Turned Off
3B12	VEC Detector	Turned Off
3B25	Audio R/P	Audio Record Turned Off
3B26	Cue R/P	Cue Record Turned Off
3C15	Guide Logic	Non-Auto Mode
3C18	CT Amp	15 Hz Edit Pulse Record
3C20	Outer Loop	Manual CT Phasing
3C24	TW Proc	TW Mode Selected
3C24	TW Proc	Variable TW Phase

The "RECORD" mode is interlocked with the "Warning" indicator, and the two buttons must be depressed *simultaneously* to enter record. In this fail-safe operating arrangement, the Red "Warning" indicator button serves two functions: as an indication of a system component failure, and as an indicator of operating in a "not normal mode". The lighting or flashing of the "Warning" lamp on the center control panel is *always* accompanied by the lighting of an LED somewhere in the module bank. These red LED indicators located on the front edge of each module light or flash to warn of an abnormal operating condition. Upon seeing the "Warning" button lit, the VTR operator would open the doors to the module nest area and look for another light. This light tells him what module or circuit is not normal or what function has failed. The accompanying charts list the non-standard operational conditions and failure indications which are displayed to permit rapid diagnosis and correction.

As a further maintenance aid, all modules are accessible from the front.

A "Remote" button on the center panel delegates "Record", "PLAY", "FAST FORWARD", "FAST REVERSE" and "STOP" functions to the remote position.

Integrated Design Advantages

Words like "Integrated Design" and "New Technology" sound impressive, but what do they mean? And, what do they contribute to the TR-600?

"Integrated design" refers to built-in functions that were previously offered as accessories *and* functions that are time shared. What used to be optional add-ons become integral subsystems of the basic design. Consequently, circuitry can be eliminated, which results in better reliability and lower cost. "New Technology" refers to the use of state-of-the-art, small and medium scale integrated circuits.

A specific example is in the increased use of integrated circuits and the substantial reduction in diodes and transistors. More than twice as many IC's are used in the TR-600 as in the TR-61 —but only half as many diodes and transistors. Overall, 1300 *fewer* active devices provide the same functions— an astounding 40% reduction in individual circuit elements.

The digital logic portion of the TR-600 uses the TTL 7400 Series of integrated circuits, the most common type. These were chosen because of versatility; commonality and low cost.
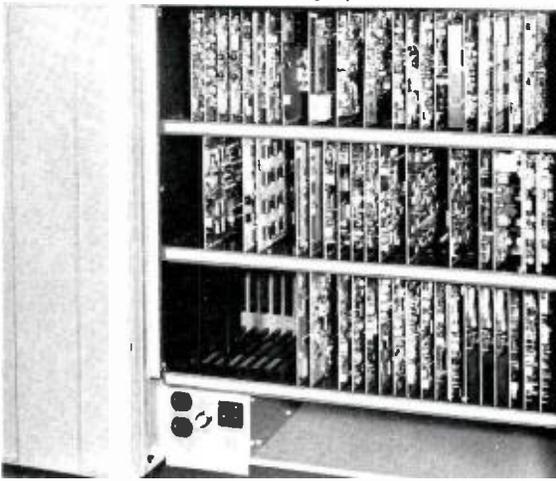
TR-600 modules are easily accessible for test and service.
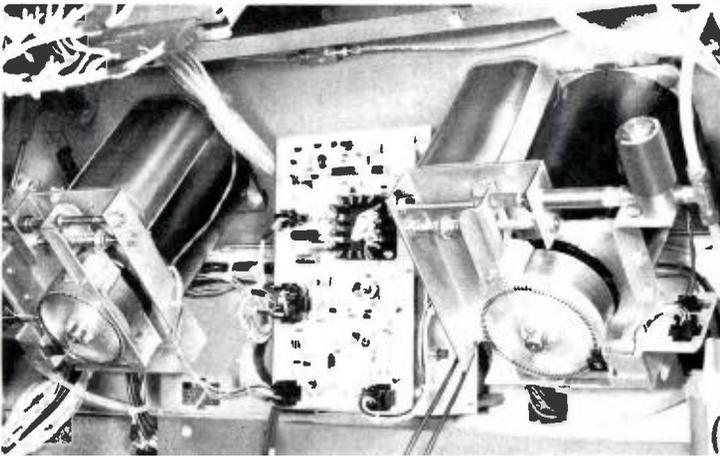
Capstan Servo.

Five Built-In Servo Systems

There are five servo systems in the TR-600:

- The *Headwheel* servo incorporates TTL logic and includes an AFC'd Reference Signal Generator for improved record reliability. The drive to the headwheel is constant-amplitude and pulse-width modulated to achieve fast synchronization of the motor.

- The *Capstan* servo is also built with TTL logic, and incorporates an edit pulse detector which senses coincidence with tape frame. Headwheel-Capstan lock-up time specification is a conservative 1.0 second maximum. The capstan is a DC printed circuit motor with a 5000 line tach which gives more reliable servo stability.

- The *Reel* servo is unique to the TR-600, utilizing tachometers on the reel motors to determine the diameter of tape on each reel. Tach pulses from the supply motor are compared with tach pulses on the take-up motor. With the tape moving at a constant speed, say 15 ips, the number of pulses tells the servo the rotational speed which corresponds to the diameter of tape on the reel and to the weight. The motor torque is then adjusted to accommodate the full range of reel sizes form 6-inch plastic reels to large 14-inch reels. As a result, tape handling is much improved, and the possibility of tape damage *minimized*. The reel servo also prodives controlled boost in start up for faster more reliable lock-up. It keeps tape tension relatively constant over any length of tape in record and play, resulting in more uniform record and playback quality over the length of the tape. Tension is also more uniform in the shuttle modes resulting in better reliability in counting for tape times. Shuttle speed is 2.5 minutes (max.) for a one-hour tape and 4.0 minutes (max.) for a 90-minute tape.

- The *Guide* servo and *Control Track Phasing* servos are both automatic, and eliminate the need for operator adjustment from tape-to-tape.

Quality—Inside and Out

A look inside the TR-600 confirms the quality construction of the machine and its accessibility for test and service. This front view, with covers removed, shows the three-tier module arrangement. Modulcs slide on a rail accurately aligned to the connector pins on the backplane master board.
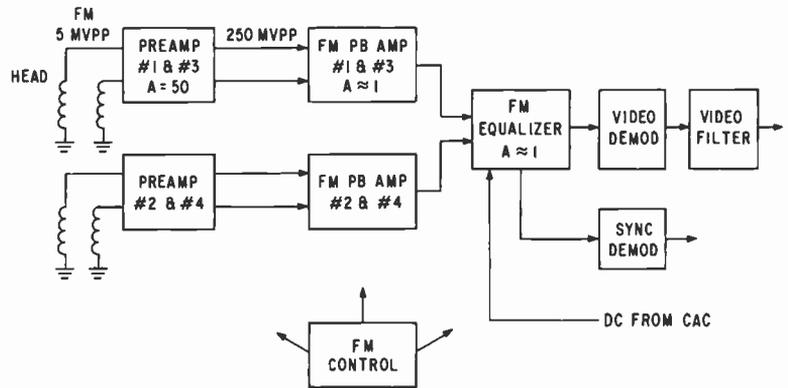
FM Playback System

In this block diagram of the FM Play-back System, the coils represent the four video heads on the headwheel panel. The TR-600 uses only two pre-amp boards for the four FM channels (instead of one board for each channel). The preamp is low input impedance and has a gain of about 50. Having low impedance means that anti-resonant controls are not required, resulting in simpler operation.

Located immediately behind the head, the preamp is accessible from the rear of the machine. The four channels of FM are fed to two FM Playback modules which are each time shared between channels 1 and 3 and channels 2 and 4. The playback amps include gain sensing electronics. Thus the gain is changed depending on whether the machine is in highband or lowband, 7½ ips or 15 ips, or using high energy tape or normal tape. Differential gain controls are provided for setup with a particular headwheel. Although the playback amp is time shared, each module still has two equalizer controls. The FM control module switches the DC controlled channel equalization to the proper channel at the proper time. The two separate channels are also combined in one channel before entering the FM Equalizer. The FM Equalizer takes the two dual channel FM feeds and com-bines them into a continuous single channel of FM. Overall equalization is provided in the FM Equalizer. The FM display for the CRO comes from this module. The FM display also includes identification of channel one. FM used by the Dropout Compensator also comes from this module. A DC control signal, fed from the Chrominance Am-plitude Corrector, changes the equaliza-tion on a line by line basis. Separate FM outputs from the equalizer drive the Video Demodulator and the Sync Demodulator. The video demodulator includes the Linear Roll-Off filter and limiter.

A separate sync demodulator permits full Time Base Corrector range and re-moves any critical setting or concern about drift or switching on the front porch.

This demodulator for sync has time constants and filtering to enhance the recovery of sync with improved signal-to-noise performance. Having a sep-arate sync demodulator thus means the video switch can be on sync tip and the switching for the sync channel leads the video switch and occurs out in the picture portion of the signal which is not used in the sync channel.
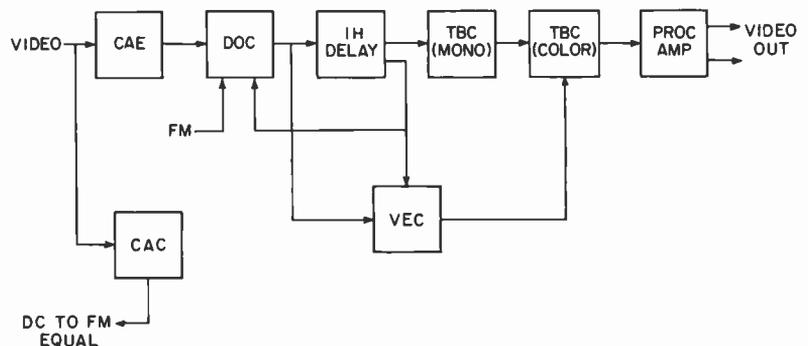
TR-600 FM Playback System

TR-600 FM Record System
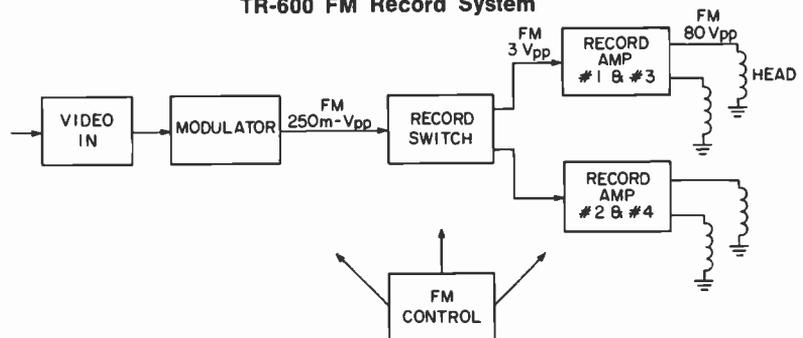
TR-600 Playback Video Path

FM Record Subsystem

The FM Record Subsystem is shown in this block diagram. Since the "Re-cord" amplifiers are on the same two module cards as the "Playback" pre-amps, only three additional modules are required for the "Record" function. As a result of improved circuit design and time-sharing electronics, *five* mod-ules in the TR-600 perform the record/ playback functions that formerly re-quired *twelve* modules. The FM control comes from the same module as shown on the Playback System block diagram.

Video to the video input module may be line equalized in 50 foot intervals up to 600 feet by plugging the desired equalizer into the socket provided on the video input module. The video enters a common mode rejection am-plifier which can remove incoming low frequency disturbances. The video is then clamped, goes through a variable gain stage, is pre-emphasized and exits to the modulator. The modulator may be described as a varactor-controlled heterodyne oscillator.

Two oscillators, one at 100 MHz, the other at 110 MHz are heterodyned to obtain the 10 MHz carrier. This type modulator gives superior linearity and results in more uniform recording from machine to machine.

The modulator includes a black reference oscillator and a white reference oscillator which may be manually inserted in the video to set deviation. The Record Switch module contains the on-off switches for the built-in Record Current Optimizer and the switches required to logically feed the FM to the two time-shared record amplifiers. Timing logic is derived from the FM CONTROL module. Also, the FM Record Equalization of 4 dB/octave is accomplished in the Record Switch. Channels 1 and 3 time-share one record amp and 2 and 4 the other.

Playback Video System

This block diagram shows the rest of the playback video path.

The Chrominance Amplitude Corrector in the TR-600 is unique in that it uses two separate modules for correcting dynamic and static errors. This correction is automatic and provides a greater correction range, with increased stability. Chrominance Amplitude correctors have been called upon in the past to correct both static and dynamic errors.

Static errors are overall burst amplitude errors, and dynamic errors are line-by-line or head-to-head differences caused by changes in the amplitude vs. frequency characteristics of the FM before limiting. This occurs in interchange from tape to tape.

The TR-600 chrominance amplitude correction system consists of two modules: CAC for the dynamic errors, and CAE for the static errors. Consequently, the dynamic range (CAC) is greater (±2.5 dB) and none of the dynamic range is used to correct static errors. This eliminates the need for the operator to adjust the individual playback amplifier equalizers for each tape. The range of the Chrominance Amplitude Equalizer or CAE for correcting overall burst amplitude static errors is ±3 dB.

The FM to the Dropout Compensator (DOC) comes from the FM Equalizer. A detector looks for a decrease of 16 dB or more in FM level. When this occurs, the video for that portion of the signal is replaced by video from the previous line which comes from the output of the 1H delay module. The DOC circuitry includes automatic chroma phasing and also an artificial dropout mode which is used for easy, accurate set-up. Replacement video also has improved quality over older systems because the main path video passes through a 1H delay line and is fed back to the DOC.

Utilizing the 1H delay line permits instantaneous correction of velocity errors on a line-by-line basis with no need for a memory element to average out velocity errors on a band-by-band basis as was done in the past. The velocity correction signal is applied as a vernier adjustment to the Color TBC. The Monochrome Time Base Corrector is an EVDL (Electronically Variable Delay Line) type with a 1.0 microsecond correction range. Correction signals for the Monochrome TBC are derived by sampling the leading edge of tape sync and comparing it to a fixed reference. The error signal is digitally derived, and a 6-bit D/A convertor is used to convert the signal to the required analog form for the EVDL.

The Color Time Base Corrector is essentially the same ase the monochrome except that it compares tape burst with reference subcarrier to derive its error signal.

The Processing Amplifier provides two line outputs from the machine. Horizontal and vertical blanking intervals are completely regenerated. A switch allows the facility of adding local sync to the video output instead of regenerated sync. All regenerated edges havc controlled risetimes and the burst is shaped. The control for the output video level is on the main TR-600 control panel.

Wire-Wrapped Backplane System

From the rear, the network of wires are connected to the copper etched printed wiring backplane. All of the modules, and even the coaxes from the pre-amp plug into the backplane.

Printed connections are made to the board connectors for grounds, power supplies, and many signal paths. Every printed wire is guaranteed error free, and what can't be printed is wire-wrapped. Wirewrap connections are machine controlled, computer checked, and the most reliable connection method available with current technology.

No Solder Connections

This entire machine harness plugs into the backplane. There are *no* solder connections used. Because everything plugs into the *machine harness*, it too is readily circuit-checked by computer to achieve consistent high quality and reliability.

Venturi vacuum system.

M6·592547
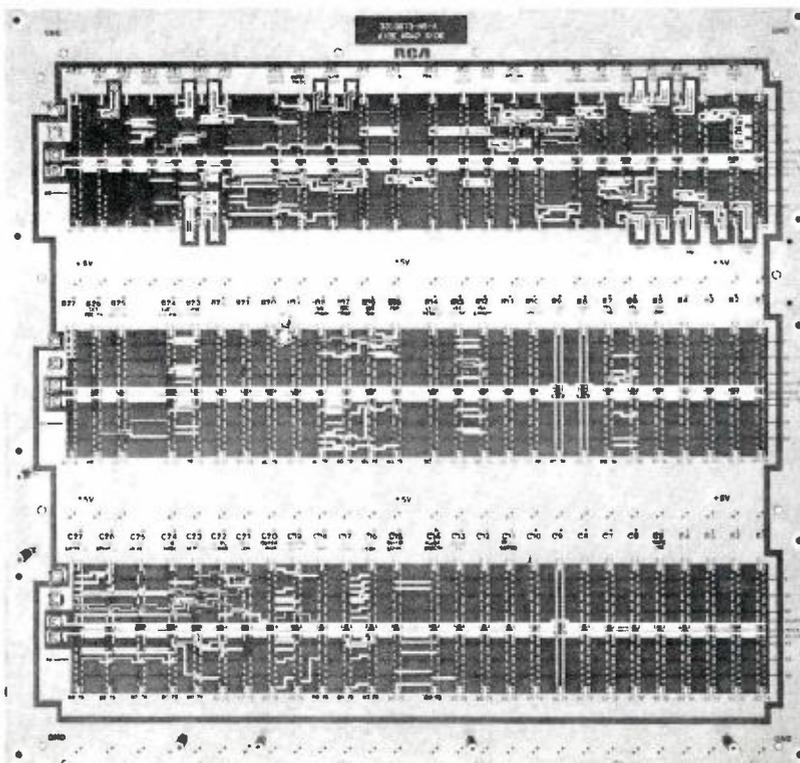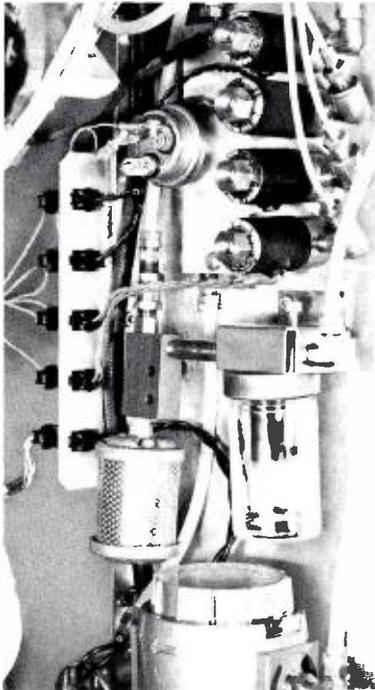
Quiet— Machine At Work

The TR-600 is an unusually quiet oper-ating tape machine, thanks to a number of design innovations:

- Convection-cooling has eliminated the need for an internal blower.
- The air compressor is externally mounted.
- The vacuum pump has been replaced by a Venturi vacuum system.

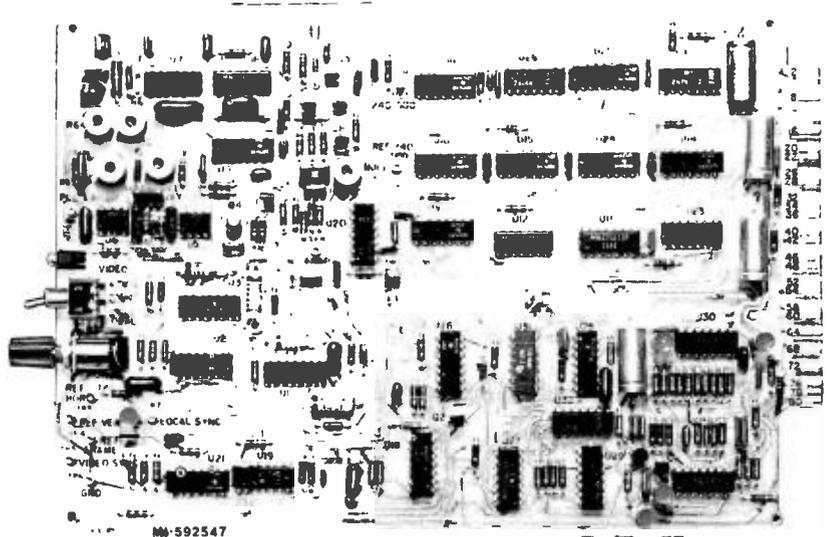### Latest Production Technology

New manufacturing techniques in pro-duction assembly and testing which yield consistent high quality and bet-ter reliability add to the value of the TR-600.

Some of these new techniques include computer controlled component inser-tion, wire destination testing of the entire machine, and computer testing of all the individual circuit cards or modules.

All of the TR-600 electronics are built on boards that are 6.4 inches high by 9 inches long. This board has the prop-er aspect ratio to permit easy printed wire access to the connector.

Hand wiring on boards has been elimi-nated. Standards for board layout have been established to permit automatic computer-controlled insertion of axial lead components. More than half of the components on TR-600 boards are automatically inserted by a computer-controlled operation. Internal test sig-nals for each module are brought out to the connector, permitting automatic testing of every board to rigid quality standards.

Testing is performed by three automatic computer testers, resulting in uniform, consistent quality.

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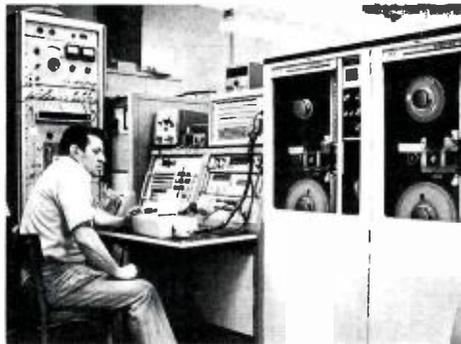
ACET

LOGIC

VATS

Automatic Tester #1—ACET

The first of the automatic testers is ACET, an acronym for Automatic Communications Equipment Test. This device is used to test modules that require only continuous wave testing, such as audio modules and power amplifiers. It automatically changes input levels and frequency and measures output response. The program stops to allow adjustments of variable components. When complete, a printout is made which indicates pass or fail and exactly what the level of performance was.

#2—Logic

LOGIC is another automatic tester which exercises the entire truth table for a module in just a few seconds.
In case of failure, a diagnostic mode is automatically initiated to aid in the isolation of the fault.

#3—VATS

The newest of the automatic testers is VATS: Video Automatic Test System. It measures frequency response, differential gain, 2^T and 20^T pulse response and all the other parameters required for the best video pictures. Testing on these automatic computer testers results in consistent, uniform high quality. □

Summary

With its advanced technology design, the TR-600 establishes a whole new set of performance/price/value parameters. It is designed as a unified, integrated system, incorporating numerous automatic subsystems for simpler operation, easier maintenance and better performance.

Innovations abound in the TR-600 —from the unique "Drop-On" loading and "Straight-Line" Threading, to the new reel servo system and the sophisticated LED diagnostic system. New manufacturing assembly and test techniques applied to the TR-600 permit more stringent and automated quality control of the product during subassembly and final system checkout.

Most important, there has been no compromise in performance. As noted previously, a major design objective was for the new tape product to deliver video and audio performance equivalent to or better than any broadcast quality quad machine on the market. The TR-600 meets today's need for a versatile, compact and economical general purpose quad recorder.
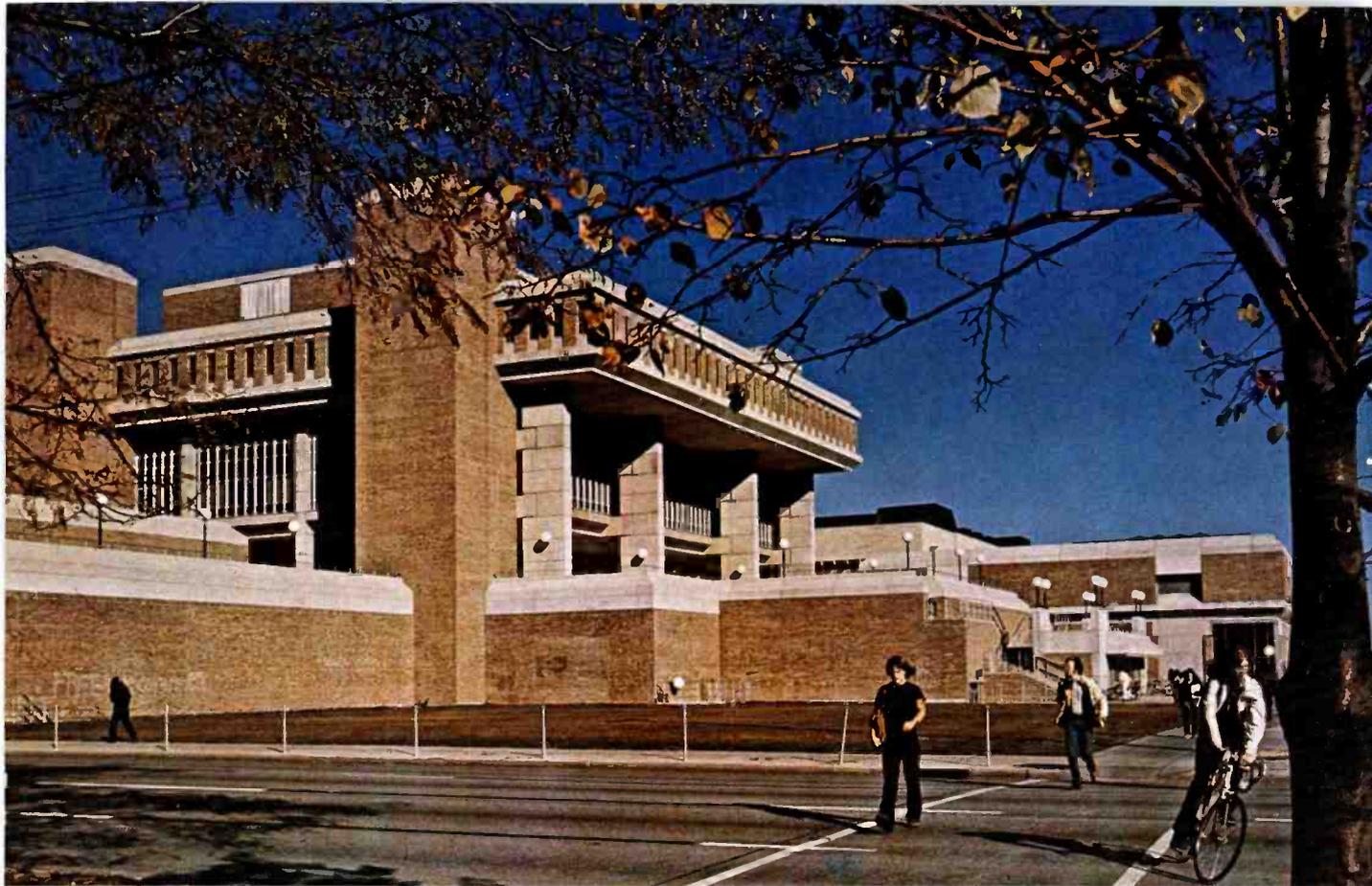
Vilas Communication Hall on University of Wisconsin's Madison Campus—home of WHA-TV; WHA-AM; Department of Communication Arts, Mass Media, Journalism and Theater.

WHA-TV FUNCTION FOLLOWS FORM

Public television station WHA-TV has a new home. Vilas Communication Hall at the University of Wisconsin was designed to make the fullest possible use of space, staff and equipment. The result: a giant leap in service to the campus, the community and the state.

* * *

Under the wide blue sky at the University of Wisconsin, there's a new twist on the famous dictum of architect Louis Henri Sullivan that "Form ever follows function."

Since the Vilas Communication Hall was opened in the summer of 1972, television production has burgeoned because the equipment is so well integrated with working space that much more of it can easily be done.

According to Station Manager and Director of Programming Anthony Tiano, "It would have been impossible for us to sit here with this magnificent plant and not do as much as possible with it. So we went out to the campus, the community and the state. And we said, 'Look, this is what we have here. How can we use it to help you?'"

The consequence of all this is that the facility is working twice as hard as it was a year ago. Which was already a doubling of the previous year's output.

Looking backward

WHA-TV has an illustrious history in broadcasting. A plaque affixed to the new hall — which is also known as the University of Wisconsin Extension Telecommunications Center — proclaims that WHA, with its original call letters 9XM, is "the oldest station in the nation." Voice and music were first broadcast from the station in 1917, and scheduled broadcasting began in 1919.

In 1922, the letters WHA replaced 9XM. And today, WHA-AM broadcasts a full schedule of public radio.

In 1954, WHA-TV became the nation's fourth public TV station when it started broadcasting on UHF channel 21, where it remains today.

The station's steady growth required that it be moved to larger quarters, so between 1964 and 1972 it resided in what has been the Dane County Highway Department garage. It was while the station was at this location that it won public television's first Emmy award with a documentary about Milwaukee's inner city called *Pretty Soon Runs Out*.

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Studio D at WHA-TV is used by the University Department of Communication Arts for teaching television production. Four TK-630 cameras in this 40' x 50' studio provide ample opportunity for students to obtain "hands-on" operating experience.

Ground was broken for Vilas Communication Hall in 1969. It was named for William F. Vilas (1840-1908), who had been a prominent U.S. Senator, Postmaster General, and Secretary of the Interior.

The plant

The Center, under the management of Director of Radio and Television and General Manager Ronald C. Bornstein, covers a full city block on the university campus in Madison, Wisconsin. Its seven floors comprise 270,000 square feet of usable space.

Its purpose is to house five separate functions in a single structure dedicated to the perpetuation of the communication arts. These functions are as follows.

(1) The University's Madison Campus School of Journalism and Mass Communications, (2) the Communication Arts Department, (3) the teaching function, (4) the Theater Department and (5) Radio and TV.

Specifying, planning for an installing the television equipment was the mandate given to Mr. Donald Borchert, WHA's Director of Engineering. The key aim, according to him, was flexibility. Thus taping and telecine equipment is located in the Master Control Room with switching equipment arranged so that any machine can be assigned to any studio in the building at will. Therefore the equipment is fully utilized, and each studio has maximum capability.

Master Control is on the third floor, and it contains the RCA quad video tape recorders—four TR-70's, a TR-60 and a veteran TR-4HB.

Gene Zastrow, Assistant Technical Director for Television, remarks that headwheel life has about doubled with RCA's new pole-tip material Alfecon II. "It's very important to us when we can get the price of headwheel time down to about a dollar an hour, and that's about where we figure it is right now," he adds.

Besides editing, tape delay and production taping, this area of Master Control is used to dub instructional tapes to the helical cassette format for closed-circuit broadcast on campus.

The telecine area has two color RCA film islands. Master Control also houses camera controls for the entire complex. Station engineers installed the equipment with a final checkout by RCA technical people.

Also on the third floor is the Network Technical Facility, which serves the six-station Wisconsin Educational Television Network. WHA is also associated with the Central Educational Network and of course the Public Broadcast Service.

Other facilities on the third floor are radio teaching studios for the Department of Communication Arts, a general electronic maintenance shop, and the TV graphic arts department.

The first floor of Vilas Hall includes the film editing facility (movie film is processed elsewhere on campus), a 16mm film preview room, photo lab for processing slides and prints, and the video tape library.

Studio areas are located on the second floor. The general run of production activity takes place in the 1850-square-foot Studio C.

For productions requiring more space, Studio A is used. It covers an area of about 6000 square feet.

There's also space set aside for a future Studio B; right now it's used for scenery storage.

Studios D and E are used by the Department of Communication Arts for instruction in teleproduction.

There are two theaters on this floor with full production capability. One is an experimental theater, the other a thrust stage theater that has been used to produce an episode of the PBS series *The Advocates.* The rest of the second floor is given over to journalism teaching laboratories, studio control rooms, dressing rooms, the set-manufacturing shop and the staging area.

WHA-TV is not limited to these studios, however. Elsewhere in the building is the Parliamentary Room, which is equipped for broadcast. And cables are permanently installed through a pedestrian bridge across the street to the Humanities Building and the Elvehjem Art Center for special programs.

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A full complement of RCA cameras serves the station. These include six TK-44Bs and two TK-630s assigned to WHA. But there are four more TK-630s serving the Communication Arts Department that are available for use by WHA. Studio C can handle up to four cameras; Studio A, up to six. RCA TK-60 black and white cameras are used for student instruction, including extensive "hands-on" operation.

The two WHA-TV TK-630s and provision for a third are built into WHA-TV's mobile van, a converted 22-foot motor home. It also houses one-inch helical tape machines and three camera control units. A marvel of compactness, the van is used for instructional programming and documentary production. A microwave relay system is expected shortly to give the van on-air production capability.

The van will be heavily used in a new series of fifteen half-hour programs to be called *Alternatives in Education*, which will be offered as a credit course for educators.

Total spending for radio and TV equipment in Vilas Hall approached three million dollars, with another $700,000

to upgrade transmitter and tower facilities. A new 30kW UHF transmitter, the two-klystron RCA Type TTU-30C, was installed and a new tower erected. Effective radiated power is now 759kW.

People, programming and production

The pride one senses at the university is not only a pride in the facility, but pride in the quality of work produced and in the caliber of the staff, both professional and student. Mark Smukler, Operations Manager, estimates that local production accounts for fifteen to twenty percent of WHA's schedule, compared with about eight to ten percent for the average commercial station.

The university is committed to provide students with paid training experience in production, and Mr. Smukler is gratified by student attitudes and performance.

"What they lack in experience, they make up for in enthusiasm, dedication and a willingness to go the extra mile," he notes. A constant problem, of course, is that students leave the university when their expertise is at its peak.

Ongoing productions at WHA include *Target*, a nightly half-hour public af-

fairs program in a magazine-style format that uses film extensively; and *Badger Sports*, which highlights the university's athletic competitions. Other sports programming is sporadic because the station is not allowed to compete with local commercial outlets. Consequently, it has to wait for a specific event until there are no takers among commercial stations.

WHA is very active in the production of special programs, too. These range from political debates at election time at all levels up to the gubernatorial, and a projected series of children's concerts featuring the Madison Civic Orchestra to be simultcast on FM multiplex radio, to a future miniseries of exercise programs for senior citizens, *Telefitness*.

The most ambitious productions at the station to date have been two dance programs: Moliere's *School for Wives*, which featured the Stockholm, Sweden Ballet and *Glimmerings*, an original ballet using student talent on both sides of the camera. Both programs made full use of chroma key, with such effects as dancers moving in and out of famous paintings. "We ended up buying one heck of a lot of blue paper," remembers Station Manager Tiano. The pro-

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Master control complex on Third Floor
This floor houses the television master control complex as well as the telecine and video tape systems; electronic maintenance shop and TV graphics art department.

Studio complex on Second Floor
The second floor includes Studios A and C and future Studio B, and related facilities: control rooms: set shop; scenery storage and staging area. Instructional and entertainment resources such as symphony orchestras, and audience participation shows can be accommodated in Studio A which has a six-camera capability. Studio C is where most regular programs are produced, and has a four-camera capability. Studios D and E, also on this floor, belong to the Department of Communication Arts and are used for student television production instruction.

Film and photo facilities on First Floor
Film previewing and editing facilities, including audio mixing and double system editing are located on the first floor, along with the film and tape libraries and photography laboratory.

Camera control area is spacious and uncluttered. Engineer Don Bednarek rides video on one of the six TK-44B cameras operated from this position. Console also Includes controls for 1—TK-28 Film System; 1—TK-27 Film System, as well as Pulse assignment and Genlock. Intercom system is a BCS-5000.

Telecine facility includes 2—TK-28 islands; 1—TK-27; 1—TK-610. WHA-TV Engineer is Dick Taugher.

Video Tape Post-production area includes three TR-70C machines, editing and monitoring equipment. Operating the TEP-1 editor is Engineer Dave Fritsch.

grams have been picked up by PBS for national airing and the latter program received a Central Educational Network Cultural Achievement Award.

An interesting upcoming series is *The American Pie Forum*, an adult career education effort that will borrow heavily from commercial TV techniques to attract and keep its audience. It will even have commercial-type breaks to be filled by public service announcements aimed at the unemployed.

The station also has extensive production activity in the instructional field including courses in Meteorology, Education, and Professional Development in Engineering. This includes credit courses both for airing and for cassette use through the university's closed-circuit system, which is soon to be upgraded. A few of the areas covered are difficult-to-duplicate experiments for the schools of medicine and pharmacy; materials-behavior programs for the college of engineering; and teacher in-service programs.

One of the latter featured film celebrities acting as teachers to local pupils. The series dramatized solutions to teacher problems.

With about 700 programs a year to produce, and only about 180 to 190 days to produce them in, activity is hectic, running at about three or four programs a day. But the station capitalizes on the willingness of staff and students to work hard. "The kids are really enthusiastic," comments Mr. Tiano. "They love the work and they love doing a great job."

Looking forward

As far as the future of WHA-TV is concerned, Station Manager Tiano is volubly optimistic. Similarly to the way the physical plant is tightly integrated to get the most out of the equipment, he foresees the station as being ever more highly integrated with the university, the community and the state. Having come to Wisconsin from a public TV station that was not closely allied with its university, he at first wanted to run the station as a straight broadcast operation.

Now, he's changed his mind. "There's too much to be gained from the interplay between us and the university," he explains.

Strong community support comes from the "Friends of 21." Among a wide range of activities, the Friends arrange for interested people from the community to tour the station and discuss broadcasting issues with the staff.

Going into the pilot project stage is a monthly series tentatively titled Tri-Op TV, which will see the station producing shows based on ideas submitted by community members. It will probably be funded jointly by the station and the Friends.

Mr. Tiano points out that evaluation of the station's performance is harder to arrive at than for a commercial venture. There's no objective yardstick such as the amount of profits earned.

"Our station is rated in terms of how well we reflect the community to itself," he goes on.

"The bottom line of my job description is that we do as much as we can with the equipment we have—so that we can return the investment back to the people.

"And we'll be doing our job by building more and more bridges to the people."

As for the station's equipment, he comments: "We have no complaints about technical quality. PBS has consistently reported back to us that our product is above average. We're delighted with the quality we're getting."

The next step, according to Mr. Tiano, is to increase staff, then up production from one shift to two, and eventually reach a full 24-hour production day.

In this way, the functions of Vilas Communication Hall will truly realize the great potential built into its design. □

Interior of WHA-TV mobile unit, showing camera controls, test and monitoring equipment. Van usually carries two TK-630's, but has the capability for handling three when needed.

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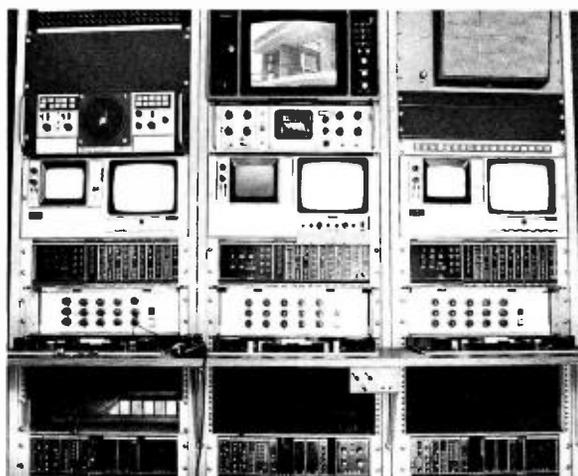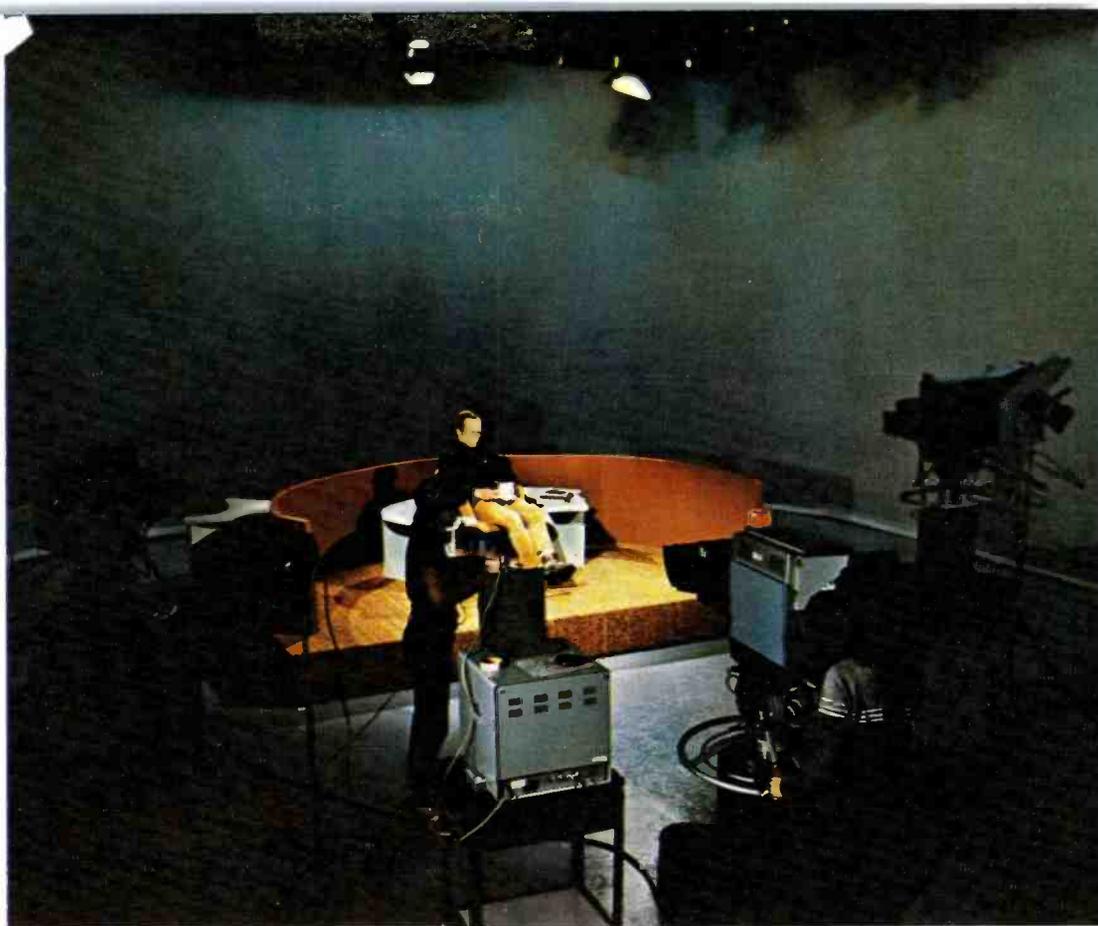
Studio C, equipped with four TK-44B cameras, is used for producing most of the regular programming for WHA-TV.

Studio A control facilities include 20-input audio mixer, and triple re-entry video switcher with dual effects and dual Chromakey.

WHA-TV's mobile unit is a compact converted motor home. Widely used for instructional programs and documentary production, it is equipped with two TK-630 cameras and helical scan VTR's. Other van facilities include 8-input audio mixer; 8 x 4 video switcher with Chromakey capability, and portable microwave. The building in the photo is Vilas Hall.

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Opryland Broadcast Center Shares Stage

"Opryland's Broadcast Center was built with the idea of luring network, syndicated and commercial advertising production here," remarks Production Manager Bill Turner.

Judging from the results achieved in the first six months of operation, the idea has caught on. With its comprehensive studio facilities, mobile unit and computerized editing system, the Broadcast Center is maintaining a full service production operation.

Among its credits are the top-rated "Country Comes Home" network special with Johnny Cash; the syndicated "Porter Wagoner Show"; "Pop Goes Country", a new series, and the Country Music Association (CMA) Awards show.

As Bill Turner says, "We've got over $2 million worth of equipment setting out there, and we've got to pay for it."

The Broadcast Center, which adjoins the new "Grand Ole Opry House" and the Opryland U.S.A. Park complex in suburban Nashville, is unquestionably one of the finest anywhere.

The studio includes a computer-controlled lighting system; seven TK-45 color cameras; a 24-input, 24-output audio board; custom video switching and effects; TK-28 Telecine system; three VTR's; a slo-mo machine and a CMX computerized editing system. Notable also throughout the studio is the number of design innovations made by the Opryland Productions technical staff.

Sophisticated Studio Systems

Opryland Production's TV studio area is indicative of the entertainment expertise which went into the planning and design of the facility. Camera

with new "Grand Ole Opry House"

studio area alone is a generous 85 feet by 85 feet. And there is audience seating for up to 300. The 30-foot high cyc is on a counter-balanced batten, and extends into a "pit" below the studio floor level. Cyc lights are also located in the sub-floor area, which provides a more uniform distribution of light, with no hot spots at the bottom. The lighting system is designed to handle virtually any contingency, with 1.5 million watts in the studio (2 million watts are available in the Opry House). Lighting is pre-set on a sophisticated computerized lighting control system with a 100-scene memory.

In the studio, theatrical type rigging, with the counterbalanced rope arrangement used for stage productions, permits "flying" sets. This same system is also used for moving the lighting battens up and down.

All wall areas in the studio are acoustically treated, and the "door" for moving in products and props is a massive 20-ton unit which rides on a single rail, providing soundproof isolation.

At the Opryland Broadcast Center, separate control rooms are provided for:

(1) Video switching and effects;
(2) Audio,
(3) Video and lighting control.

David Hall, the youthful Chief Engineer for the Center explains: "Locating the video and lighting operators in the same room permits a better inter-relation and awareness of problems affecting picture quality—since both are looking at the same scene on the same monitor".

Custom Video Switching and Effects

The video switcher provides full flexibility, with a remarkable range of Mix/Effects. The five-bank keyboard has four Mix/Effects units, with external pattern modulators, color cycler and numerous other functional features. All effects can be handled in a single quad split.

Assistant Chief Wayne Caluger notes that the versatility of this custom switching system permits accomplishing all effects in a single mix, without the need for making extra tape dubs. The result is a better quality tape master.

Facing the video switcher is a wall of monitors, displaying the output of every available video source, including: 7 cameras; 2 film chains (only one now installed); 4 VTR's; 5 Mix/Effects; 1 Character Generator; 1 Computer-Editor.

Flanking the switcher position, on one side is the Character Generator and on the other the remote controls for the film systems and VTR's.

Computer Editing System

The post-production capability of Opryland Productions is supported by a CMX computer-editing installation. This system includes a teletype machine which provides a hard copy readout of editing instructions, permitting easier

location of edited tape material if changes need to be inserted at a later date. Also tied in with the editing system is a 16-track audio tape system which permits "sweetening" the audio track without requiring extra video tape dubs. With this facility, audio tracks can be re-layed without affecting sync.

Superb Audio Facilities

As might be expected in a music-oriented environment, the audio systems in the Grand Ole Opry House and in the Broadcast Center are super.

Forty microphones cover the Opry House stage, achieving optimum sound pickup from all locations. Four independent, isolated outputs are available from each microphone, offering an unusual degree of audio flexiblity.

One output from each microphone goes to a 20-channel mixer console located in the balcony and is used for controlling and mixing "House" sound. From this position, the console operator can adjust level, equalize microphones and channels to achieve the most satisfactory sound in the auditorium—and without disturbing in any way the sound originating on the stage which is being broadcast live, or recorded.

Another output from each of the microphones is also available in the broadcast control room which is located at the rear of the Opry House. This facility is equipped with a 40-channel mixer console capable of feeding up to 16 output channels, so that multi-track master audio recordings can be produced from the Opry House stage, using latest techniques. All input channels are provided with equalization and echo send.

This colorful straw-hatted trio typifies the strutting and strumming; the music and fun atmosphere of Opryland.

Seven TK-45 cameras are used by Opryland Productions, with four assigned to the studio.

Lighting and video control consoles for the studio are both located in the same room, with individual line monitors for each operator. This arrangement permits better control of color quality.

A third isolated output from each of the microphones is used in conjunction with a stage "foldback" system. This system has a 16-channel mixer console, with the capability of echo addition, so that the artist on the stage is provided with the same quality of sound that the audience is receiving.

The fourth microphone output is delegated to the mixer console at the Production Center. Located in a separate audio control room, this 24-input, 24-output system can operate 16-track, quad or stereo. Audio cartridge tapes are frequently used for "sweetening" productions—adding music or enhancing music, applause, audience reaction, or inserting desired sound effects. An extensive effects library is maintained for this purpose.

TK-45 Cameras

Seven TK-45A color cameras are making beautiful pictures for Opryland Productions. Four of these are assigned to the studio; two ride with the mobile unit, and the seventh serves as a "swing" unit, with its rolling, rack-mounted CCU.

In selecting cameras, the technical staff determined the performance parameters and tested RCA against competing cameras, making direct, side-by-side comparisons. Tests included varying line voltage; setting up difficult lighting situations; low light level operation. Other factors which were considered, David Hall relates, were technical back-up from the supplier; replacement parts support, and use of common, locally available components.

At the time, TK-44B cameras were used for the tests, but Opryland Productions took delivery on the first TK-45A's, with improved specifications.

"In performance and in their reliability, the cameras have done everything asked of them," says Senior Video Operator Larry Bearden.

"Equal to the Task"

TK-45 features have been well utilized. One challenging situation faced by the mobile unit camera crew was at the "Masters" Water Ski Tournament at Calaway Gardens, Georgia. The skiers skim swiftly along the water, hit the take-off ramp and are airborne, silhouetted against a bright sky. Then with the descent into the water, the lighting changes rapidly, enveloping the skiers

in dark shadows. The TK-45's were equal to the task, since the camera's automatic iris accommodates the changing lighting conditions, while the scene contrast compression enhances the picture by pulling detail out of the dark areas.

Evening firework displays on the NBC Special "Midnight Train to Georgia" provided yet another opportunity for the TK-45 cameras to handle color at low light levels, with excellent results.

In taping a Hav-a-Tampa cigar commercial in the studio, the set was illuminated with only 60 footcandles to achieve a "soft" effect, David Hall recalls. To further diffuse the light, a lady's mesh stocking was used to cover the camera lens. The result was dramatic and effective—just what the client wanted.

Chromacomp is a particularly useful feature for camera matching in split screen scenes, Mr. Hall notes. Sometimes three live cameras are used in the splits.

The Opryland Productions color cameras are constantly on the move, particularly the three assigned to the remote unit. Despite their constant shuttling around, the cameras have performed extremely well indoors and out.

Mobile Unit Reflects Staff Experience

Opryland Productions mobile unit was custom-designed inside and out by their technical staff. The 4-wheeled vehicle was supplied by Grumman, built to rigid specifications and beefed up to support a full TV equipment complement. A compact 25' long, 7' wide and 10' high overall, the mobile unit is designed for maximum self-sufficiency for handling a diversity of field assignments.

It carries three TK-45A color cameras; a portable VTR; complete audio/video switching and control facilities, and even a built-in power generator. For covering sports events, a slo-mo unit is available for use in the van. The

audio console is in a separate compartment at the rear of the vehicle, behind the video racks.

The main operating area includes camera control units (CCU), monitor and test racks for the three TK-45's, plus switching, routing and intercom facilities. A monochrome camera is also carried on the van for titling. For handling more elaborate remotes, a fourth TK-45A camera is easily added. The complete CCU system for this camera, with test scope, monitor, TG-6 sync generator and 4-input audio mixer has been mounted in a short rack with casters for mobility. This rack fits inside the remote unit at the video operator's position.

Components Readily Accessible

The video racks with CCU's are mounted on a heavy metal base and a rigid top frame. Two bolts at the top hold each rack firmly in place. When unbolted, the racks can be removed from the remote unit and used for camera shows in the studio or elsewhere. The video racks are open at the back, fully accessible for service from the audio compartment located at the rear of the van, with a separate entrance door. A panel at the rear of the video racks designed by the Opryland Productions technical staff uses banana plug connectors for PL intercom and switcher tally patching. These terminations provide for quick connect and disconnects when the racks are removed from or returned to the mobile unit.

Audio rack equipment is nested behind one of the video racks, with components mounted on a hinged panel which can be dropped down for maintenance accessibility. The audio board in the mobile unit is customized for four-channel stereo operation, with four submasters and master fader.

A power control panel in the audio compartment provides for instant changeover from external to generator power. The built-in system can generate up to 6.5 kilowatts of power.

Larry Bearden has vivid memories of readying the remote unit for operation. After the vehicle was delivered, he remembers, it took just three weeks of long days and nights to completely assemble and install the video equipment, and a little longer for the audio.

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Versatility Keeps Remote Unit in Demand

With its mobility and flexibility, the Opryland Productions remote unit operates on quick turn-arounds, and rarely rests. The van can travel economically at allowable highway speeds, giving it ample range to cover distant assignments.

It can operate as a three or four camera system. The quick connect-disconnect video rack arrangement permits removing a CCU from the van for separate single camera shows.

The remote unit can be brought in to the Broadcast Center and used for taping or broadcasting a show originating from the "Opry House"—while the TV production studio is in use for a different recording session.

And, for elaborate multi-camera shows, the remote unit's three cameras can augment the four studio cameras— and can be operated from the studio video control room by joystick control panels.

Road assignments range from golf matches to regional World Football League game pickups to water ski championships and rock concerts. The remote unit has been extensively used in Opryland's Park for taping a number of syndicated shows and specials. Various locations in the park were used as settings for taping the Porter Wagoner Show. The usual "shoot" was four half-hour shows each day.

Portable Color Cameras Coming

In the future for the mobile unit are two TKP-45 portable color cameras which will provide even more versatility for outside remotes. The van is already equipped with a roof platform and a "flying bridge" hookup to the rear bumper. Cameras can be secured and operating while the van is rolling. This will provide an extra capability for commercials or for obtaining "wild" footage of scenery and backgrounds. And, on location, these lightweight cameras can get right in the middle of the action, since they operate with small diameter cable and do not require a backpack.

The quick success of Opryland Productions' mobile unit resulted in the addition of a second, smaller portable unit. It will be used to handle jobs requiring only a single camera and VTR, and will also function as a support vehicle for hauling lighting and extra equipment needed by the main TV van.

"In Competition With Both Coasts"

"We're here to compete with both Coasts," says Bill Turner, "and Opryland has already proven that it is ready and able to handle the job. Our operation is major league in every way, with the finest equipment available for production and post-production.

"The toughest job," Mr. Turner continues, "is getting people to give Nashville even one try. The New York-Hollywood syndrome is hard to shake. Those who have come here have been pleasantly surprised, not only with the facility, but more importantly with the results. One of our clients is based in California, yet returns regularly for new tapings."

The proximity of Opryland U.S.A. Park is a distinct asset for the teleproduction center, since it is a treasure trove of realistic, attractive settings for commercials as well as shows. Theme areas—Western, Country, Showboat, New Orleans and others—provide the genuine flavor and look of the particular locale or time period represented. During the Park season—from April through October—audiences are "built-in", easily drawn from the thousands of visitors.

With Nashville's established position as a music recording center, there is an abundance of talent in the area.

"Not the least among the talents available," Bill Turner avers, "is Opryland's technical staff, a numerically small, but elite team that draws additional help when needed from the WSM Broadcast Engineering Department."

More recently, Nashville has been gaining recognition in the industry as a competent, first-rate television production center. And Opryland Productions is doing its part to build that image. □

A full spectrum of audio requirements is handled by a 24-input, 24-output system.

Opryland's custom production switcher provides ample flexibility to accommodate the full range of creative video demands.

Post-production capability at Opryland is enhanced by a sophisticated computer editing system.
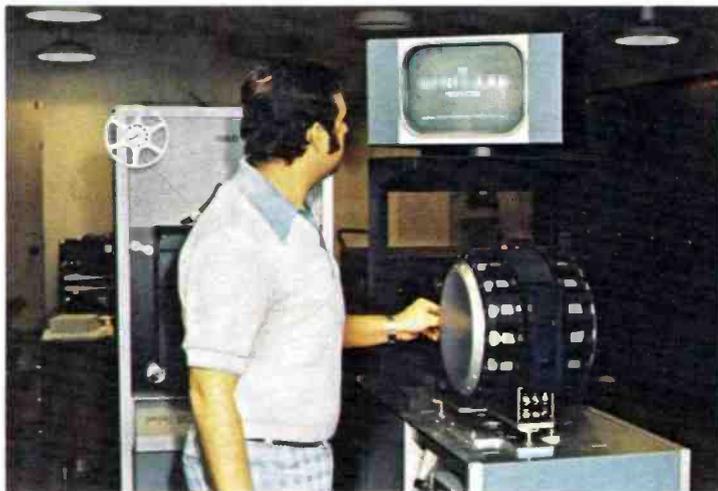
TK-28 film system permits integrating film and slides into tape productions without sacrificing quality.

One of Opryland Productions' seven TK-45 cameras has a custom, rack-mounted CCU complete with test facilities, sync generator, and audio mixer. This rolling rack permits using the camera with the mobile unit or at the studio.

Starting with a beefed-up recreation vehicle, Opryland Productions' experienced technical staff custom-designed and equipped their compact, highly mobile remote unit.

Main compartment of mobile unit includes video switching; VTR and Slo-Mo machines; camera controls for three cameras. Audio console is in a separate compartment at rear of vehicle.

Video control in mobile unit. Three camera control units and monitoring facilities are rack-mounted. Video for the fourth camera is controlled from the rolling rack to the left of the operator.

Front line cabinets, WTAF-TV's TTU-165C, 165 kW UHF Transmitter.
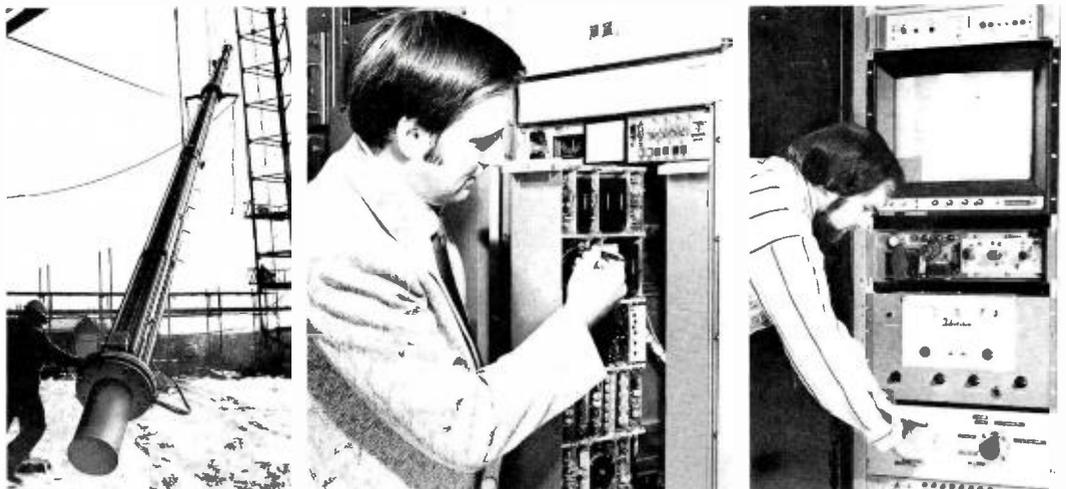
New TFU-40K pressurized omnidirectional Pylon antenna ready to lift off for ride to top of TV-29's existing 1082-foot tower.

Chief Engineer Ed Gordon checks spare exciter incorporated in TV-29's 165 kW Transmitter.

Transmitter Supervisor Dave Hackford operating controls for checking RF switching. This system, designed by TV-29 technical staff, is used for making performance proofs.

30

New 5-Megawatt Transmitting System Makes WTAF-TV "Clearly Different"

At 4:07 P.M. on February 8, 1974, in the midst of a crippling snowstorm, WTAF-TV, Philadelphia, turned on its new transmitting system. With 5 million watts of radiated signal, TV-29 became the most powerful omnidirectional station in the world. It marked another giant step in the progression of improvements made by Taft Broadcasting Company in providing better television service for the Philadelphia market.

The new transmitter is a TTU-165C 165 kW—the first of this power level built by RCA. The antenna also is unusual—a custom TFU-40K, pressurized Pylon.

As projected by Taft Broadcasting's technical staff, the new system produced a dramatic increase in market coverage, saturating the "A" market with a strong color signal. Grade "A" coverage is up 68% to 9,870 sq. miles, and Grade "B" coverage is 16,450 sq. miles, an increase of 49%.

Higher Power—Lower Operating Costs

In planning for increased power for WTAF-TV, William H. (Bill) Hansher, Corporate Vice President, Taft Broadcasting Company, determined that it would be advantageous to install a completely new transmitting plant. RCA offers several different transmitter/antenna combinations to achieve five million watts ERP, including transmitters up to 220 kW and antennas with gains exceeding 100. Mr. Hansher chose a TTU-165C Transmitter and a 40-gain TFU-40 Antenna to reach maximum ERP. The TTU-165C requires less primary power and has a lower initial cost than a 220 kW transmitter. Ed Gordon, Manager of Engineering for WTAF-TV, estimates that savings in operating cost of 25 per cent are being realized with the lower-power transmitter.

Viewing Public Reacts

Public response to the increase in power came quickly and was unanimously favorable. Many local viewers acclaimed the vastly improved picture, and distant viewers who could not pick up the signal at all before the power change, called and wrote asking how they might bring in the TV-29 picture better. Requests came from Manhattan, Baltimore, Northern New Jersey, Central and Western Pennsylvania. In most cases, the only action necessary was to orient the receiver antenna toward the Roxborough antenna site.

In viewer calls and letters, the words that kept recurring were "loud and clear", "sharp and clear", and variants of these. The Promotion Department at WTAF-TV developed the "loud and clear" messages into the current station theme of "Clearly Different". This identity for the new TV-29 spread far and wide, aided by the phenomenal surge of the Philadelphia Flyers Hockey team. When the Flyers moved into the Stanley Cup Playoffs, the station enjoyed fantastic ratings. During the series with the New York Rangers, many New York fans purchased special roof antennas to pick up the signal from Philadelphia. During one of the NHF playoff finals (Flyers vs. Boston Bruins) TV-29 garnered the highest rating in Philadelphia—a 25 rating with 50% share of market.

In the Philadelphia market which is covered by network-affiliated VHF stations and also served by several UHF channels, attractive programming and a strong signal are essential. With the higher power and increased coverage, TV-29 is realizing larger audiences at a continually growing pace. Advertisers have already responded to this viewer increase.

Unique Triplexing System

Design, assembly, test and delivery of the five megawatt transmitting system for WTAF-TV was accomplished in less than six months. The transmitter design had to provide for remote control, with adequate redundancy to meet the FCC requirement for once-a-week inspection.

Four 5-cavity 55 kW vapor-cooled klystrons are utilized in the TTU-165C transmitter to produce 165 kW visual peak power and 23.5 kW aural power. A unique triplexing system developed for this transmitter combines the outputs of three of the klystrons. As shown in the diagram (see p. 33), visual amplifiers 1 and 2 are combined through a 3 dB combiner to produce 110 kW peak power. The signal is fed into a
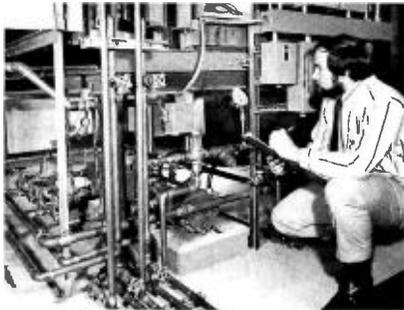
Dave Hackford checks reading on closed water system used with heat exchangers. Dual heat exchangers are installed, each capable of 110 kW operation.
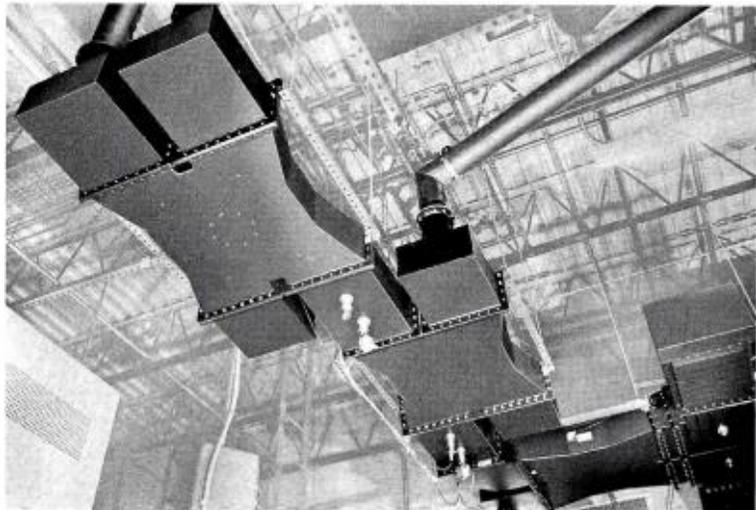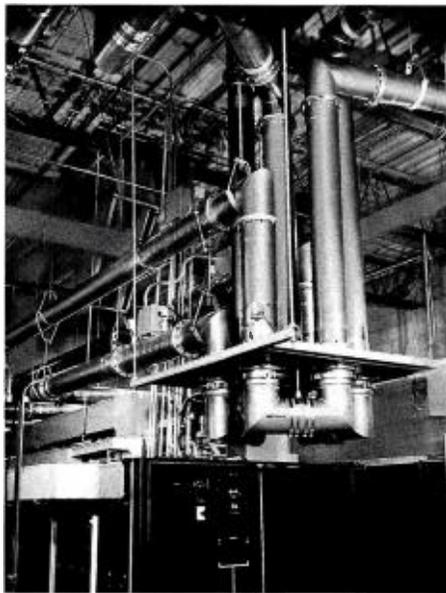
Visual switching patch panel at rear of transmitter.

Overhead view of combiner network used at WTAF-TV for producing a combined peak visual power of 165 kW.

4.77 dB combiner where it is added to the output of visual amplifier 3 for a combined visual peak power of 165 kW. Transmission lines from each visual klystron are phased to substantially reduce any reflections, thereby enhancing overall picture quality.

Ample Back-Up Protection

Back up systems and redundancy were prime considerations of Taft Broadcasting Company in planning their new transmitting plant. The TTU-165C transmitter has ample flexibility built in to accommodate klystron failures without going off-air. In addition, automatic exciter switching and a solid state standby IPA were incorporated in the system, thus providing further redundancy and meeting the remote control 20% standby power requirement of the FCC for once-a-week inspection.

The redundancy of the transmitting system has virtually eliminated the possibility of service interruption resulting from klystron failure, Ed Gordon states. For example, with the loss of one visual klystron, the system remains on air, operating at 73.5 kW power. With two visual klystrons out, the station is still on the air with 18.2 kW of transmitter power. Should the aural klystron fail, visual klystron 3 is switched into aural service.

Three unitized beam supplies are provided. Any two beam supplies have sufficient output to operate any two visual klystrons plus the aural klystron at full power, for a combined peak visual output of 73.5 kW.

Taft Broadcasting's technical staff designed a power distribution system for their transmitter. "What is different

about this arrangement is the use of separate line regulators for the individual beam supplies of the klystrons, instead of one for the system," Mr. Gordon notes. "This provided added redundancy, since the station can lose a line regulator or power supply without going off-air." Installing separate regulators in the system added to the cost, he says, but the increased on-air reliability justifies the investment.

The TTU-165C Transmitter is housed in five front line cabinets, with a rear walk-in enclosure containing the power switching and distribution equipment. The standby exciter/modulator with automatic exciter switching is housed in an additional cabinet.

Dual heat exchangers are employed in the system, each capable of 110 kW operation. One heat exchanger will operate any two visual klystrons plus the aural klystron at full power for a combined peak visual power output of 73.5 kW, providing added protection against lost air time. The combiner reject loads as well as the transmitter test loads are cooled by a closed water system.

Although the TV-29 transmitter is remote controlled, the transmitter site is currently manned for preventive maintenance 40 hours per week.

Pressurized Pylon Antenna

The Roxborough (Philadelphia) Antenna "farm" is situated in the midst of a city incinerator site which provides a polluted, highly corrosive environment for the antennas. To minimize the effect of the environment, the Ch. 29 TFU-40K Custom Pylon Antenna was modified and re-designed to be pressurized. The design incorporates a gasket seal around the slot covers and related components. The top and bottom of the antenna are also sealed, along with a special metallic asbestos "O" ring at the center flange connections of the outer pole. This omnidirectional antenna stands 100 feet tall, weighs 12 tons and is mounted on the station's existing 1,082 foot tower.

Connecting the pressurized antenna and the TTU-165C Transmitter is a new design $9\frac{3}{16}$ inch "Cap-Lock" transmission line. The TFU-40K was supplied
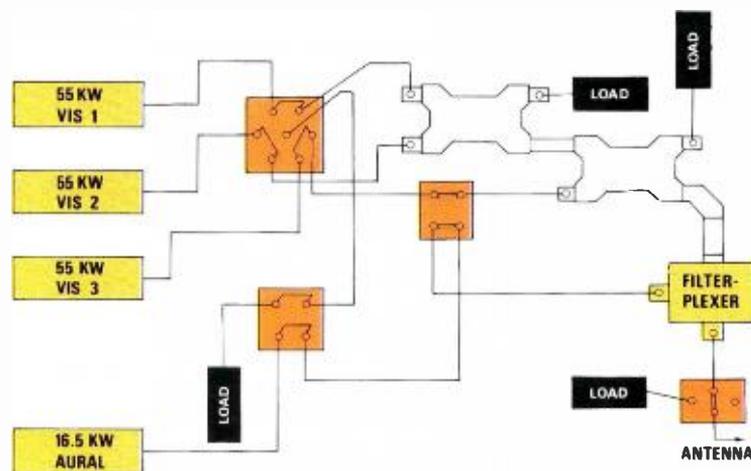
TTU-165C Transmitter combining system with aural klystron bypasss switching.

Manual coaxial patch panel for 9⅜-inch transmission line to antenna.
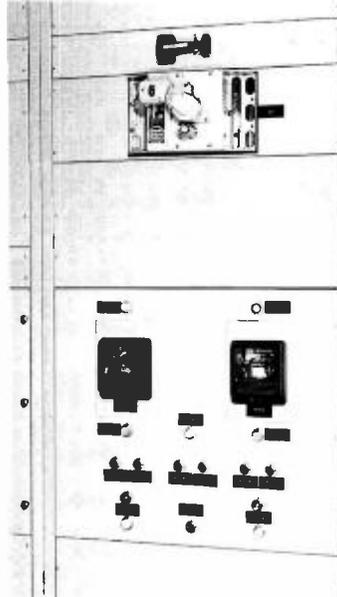
Power distribution switching system for TV-29 transmitter building. Power is stepped down from 13,200 V to 480 V.

5-million watt ribbon-cutting. Official turn-on for WTAF-TV's new transmitting plant is handled by Philadelphia Mayor Frank Rizzo. Looking on are Neil Vander Dussen (left), Division Vice President, RCA Broadcast Systems, and Bob Weigand (right) then General Manager of TV-29, and now Taft Broadcasting Company Corporate Vice President.

with beam tilt and an excellent null-filled vertical pattern to provide best possible signal levels over the Philadelphia metropolitan area.

The replaced antenna, a TFU-25G, is side-mounted lower on the tower and serves as a standby.

New Transmitter Building

The new TV-29 transmitter building is a functional 41' x 60' cinder block structure, free of frills, yet incorporating several interesting features.

Cooling is provided by 2 air conditioning units, totalling 25 tons. This is backed by an auxiliary exhaust fan system for emergency protection. If the air conditioning system fails, a heat-sensing device near the ceiling is set to go off if the inside temperature reaches 95°F. This turns on the roof fan and draws fresh air from a louvered opening in the side of the transmitter building, drawing cooler outside air across the transmitter.

A large (8-foot wide) roll-up door in the entrance side of the building is a

small construction detail which has been helpful in providing easy access to the building. The transmitter cabinets were brought through this doorway.

Power distribution is yet another example of the care taken to avoid lost air time for TV-29. Two separate power lines feed into the transmitter site, with each line coming from a different power company substation. The power lines step down from 13,200 V to 480 V. In case of a power failure, switchover to the second source is accomplished automatically after a 10-second delay to prevent switching in the event of a momentary power interruption.

The power line stepdown transformers and beam power supply units for the transmitting facility are mounted on an apron outside the building, sheltered only by the roof overhang.

"Before and After" Field Surveys

In going to the maximum ERP with the new transmitting plant, providing a strong, saturated signal for the pri-

mary market was the basic consideration, with expanded coverage next in importance.

To check the efficiency of the system, "before and after" field intensity surveys were made by Gene Liggett, Assistant Vice President for Broadcast Engineering, Taft Broadcasting.

In December, 1973 measurements were made with TV-29 operating on a TFU-25G antenna with 925 kW ERP maximum. These measurements were repeated in March 1974, after the new TTU-165C Transmitter and TFU-40K antenna system was in operation, with 5,000 kW maximum ERP, omni-directional.

The same instrumentation, calibration procedures and locations were used in both surveys to permit making a realistic evaluation of the gains or losses in field intensity after the change in transmitting facilities.

The field car used in making these measurements was equipped with a top
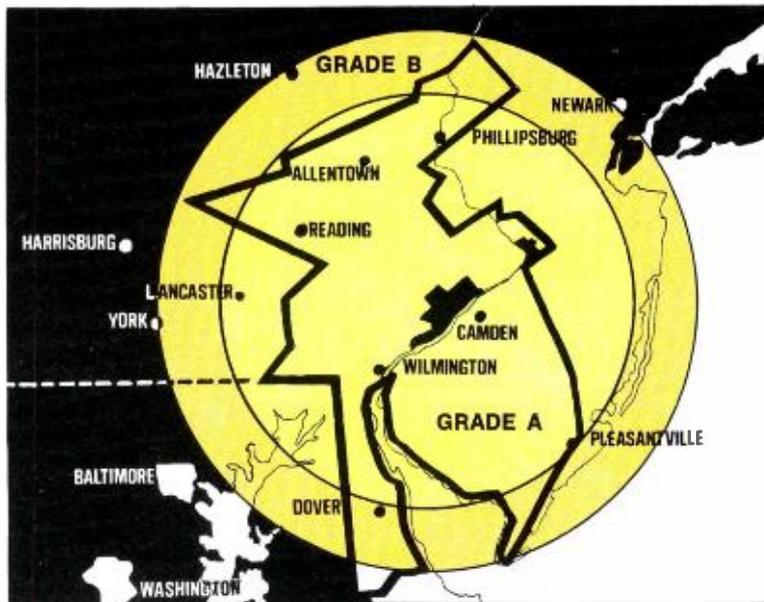
With the new transmitting system, TV-29's Grade "A" signal extends outward to cover the former Grade "B" area, an increase of 68%.

Map of Philadelphia area, showing locations included in WTAF-TV "before-and-after" field intensity surveys.
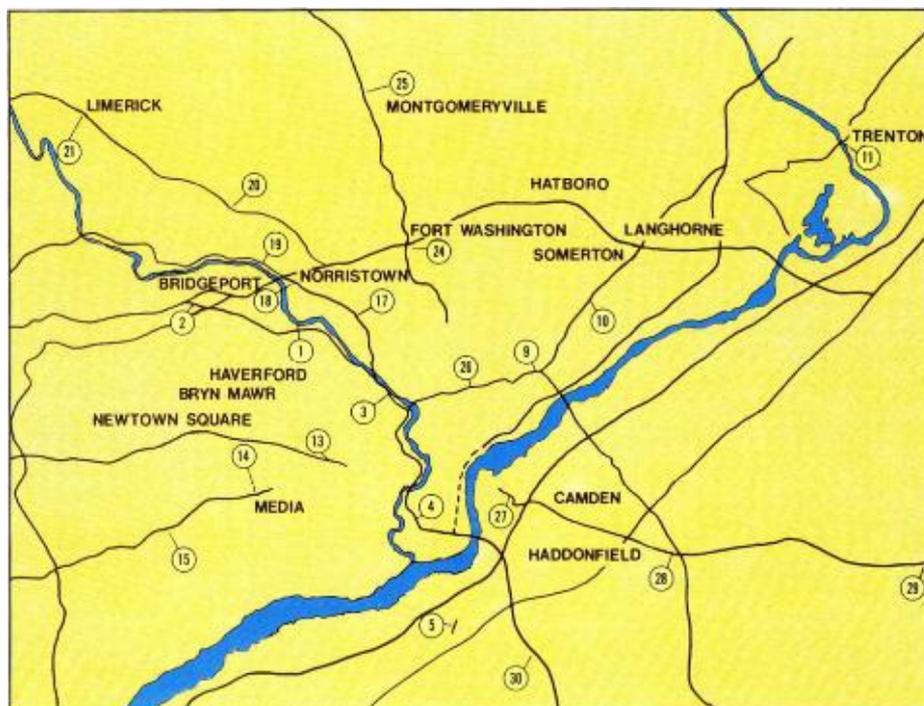
antenna mount and speedometer cable take-off to drive an Esterline-Angus chart recorder. The UHF field meter used was a Stoddart Model NM52A, powered by a 12 VDC to 110 VAC power inverter. The Stoddart Model NM52A with a dipole antenna installed on the car's antenna mounted at 10 feet above ground. The meter movement of the Esterline-Angus chart recorder was connected to the recorder output of the field meter and the chart drive was connected to the speedometer take-off. The resultant recordings were a plot of field intensity versus distance.

These measurements verified the marked improvement in signal strength and the increased "A" and "B" coverage areas. Overall, performance of the new system operating at the five megawatt maximum ERP resulted in the gains in signal strength expected.

From the antenna location out to about 10 miles, Ch. 29 experienced practically no areas where there was a reduction in signal strength with the new system. Greatest gains were realized at distances of 10 miles or more, where the Ch. 29 gains *averaged* about 7 dB, which is the ratio of the increase in power (925 kW to 5000 kW ERP maximum).

Overall Results Excellent

In commenting on the switch to higher power, Mr. Gordon acknowledged, "When you have Serial #001 of a product, you can expect some problems, and we have encountered a few. But the transmitter system has proved out. Its reliability record is good, and overall results are excellent. We're getting a sharp, strong color signal throughout our market areas."

In the first six months of operation with the new transmitting system, TV-29 has operated for 56 hours at reduced power levels. This statistic is significant, Mr. Gordon notes, because without the redundancy, the station would have been off-air for this period of time.

With its five million watts of omni-directional power, WTAF-TV is indeed "Clearly Different"—from the seashore to the mountains—and even more so in the primary market area in between. □

Power distribution and protection system designed by Taft engineers provides separate line regulators for the individual klystron beam supplies.
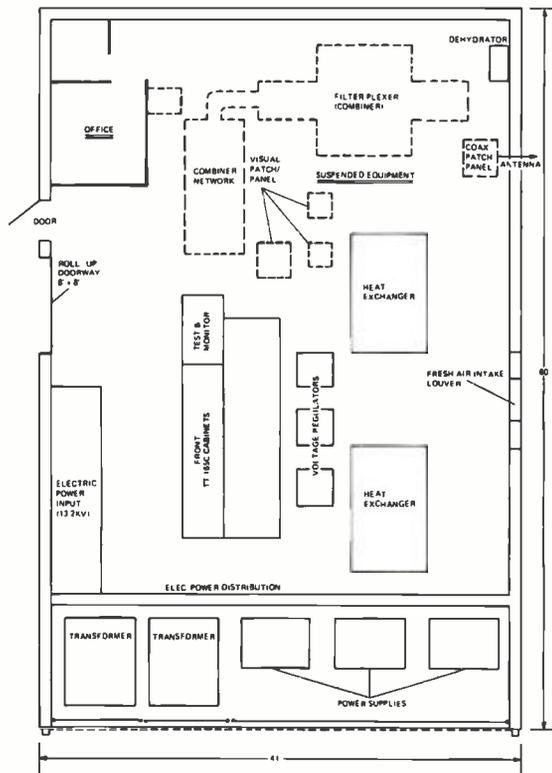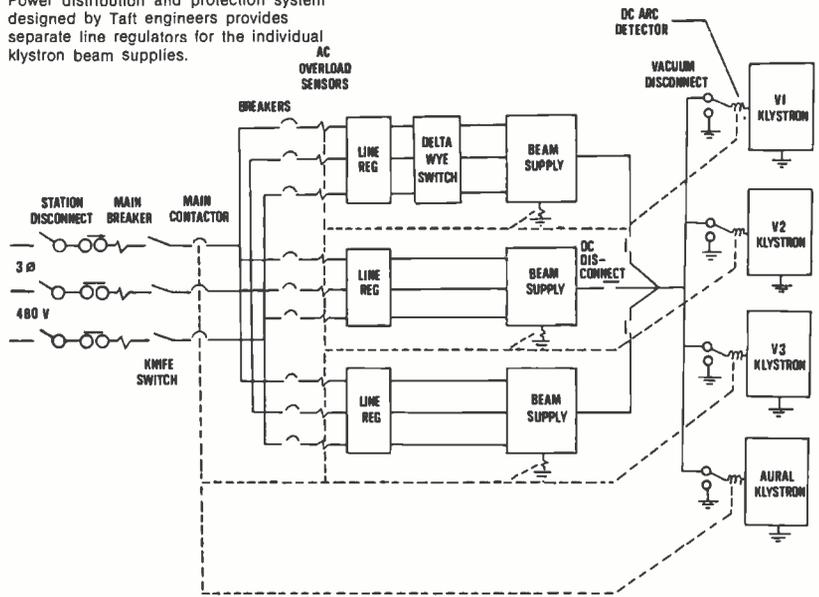
Floor plan, WTAF-TV Transmitter Building.
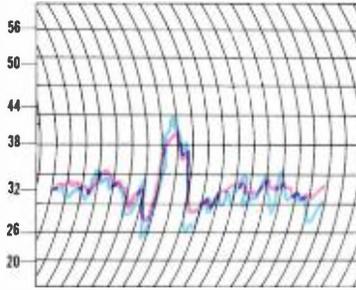
West Radial — 4.2 miles
Schuylkill Expressway & Rte. 23
Map Location #1
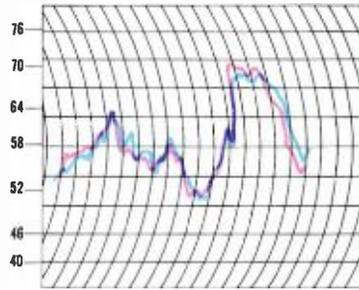
Southeast Radial — 8.8 miles
Rte. 676 & Passyunk
Map Location #4
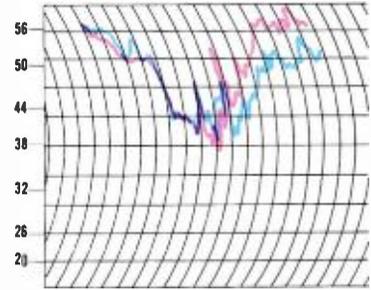
Southwest Radial — 5.9 miles
Junction, Rte. 1 & Rte. 3
Map Location #13
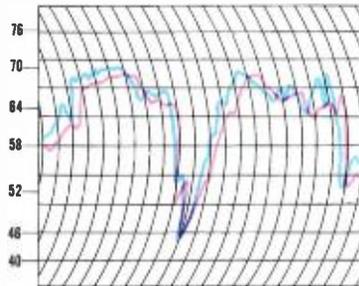
North Radial — 6.3 miles
Junction, Rte. 309 & Turnpike
Map Location #24

This series of field intensity measurements (left
and above) show that the new TV-29 antenna had
no adverse effect on close-in signal areas.

Northeast radial field intensity measurements,
showing improvement in signal with new
system for outlying coverage areas. Charts
cover from 8.6 miles to 37 miles from the
antenna site (right and below).

New Transmitting system, TFU-40K Antenna,
5,000 kW ERP.

TFU-25G Antenna, 925 kW ERP.
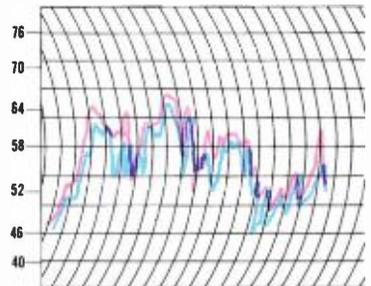
Northeast Radial — 8.6 miles
Harbison & Rte. 1
Map Location #9
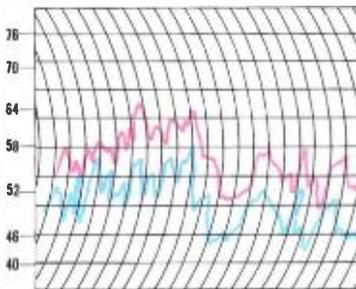
Northeast Radial — 12.0 miles
Rte. 1 & Red Lion Road
Map Location #10
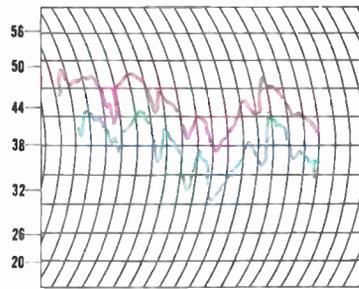
Northeast Radial — 27.5 miles
Trenton, N. J.
Map Location #11
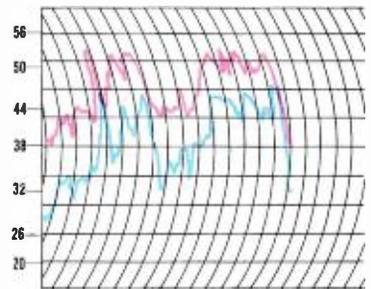
Northeast Radial — 37 miles
Rte. 571 & Rte. 1
Map Location #12

37

BRITISH TV COMMERCIAL FACILITY

Three TR-70C's, with switchable PAL/NTSC
standards, are used for recording and editing.
They operate under full remote control
from a computer console.

BETS ON TAPE'S FUTURE

Keith Ewart's impressive Wandsworth premises, which house fully equipped color VTR studios permanently committed to TV commercials.

Production of video tape commercials in England has been on an upward spiral, and industry observers predict that it's the only way it can continue to go. With the use of equipment such as the TCR-100 Video Cartridge Recorder, the opportunities and incentives for advertisers to produce their commercials on video tape are growing.

Riding successfully on this brand-new British trend is London's Ewart and Company, which provides VTR service wholly dedicated to the production of television commercials.

Alongside film production facilities, owner-operator Keith Ewart recently installed over a million dollars' worth of broadcast equipment for this new-purpose studio. Heart of the installation are three RCA TR-70C recorders interfaced directly with a CDL computerized editing system.

This overall major commitment indicates British advertisers' and agencies' growing recognition of the inherent benefits of VTR for commercial production. It also reflects Ewart's belief in the medium.

Unlike most people in the field, he was able—through business success—to put his money where his mouth is. In 1967, he built a two-stage studio complex and production facility in Wandsworth, south of the Thames, at a cost (out of his own pocket) of more than a million dollars. It was the first film studio in London completely dedicated to the production of television commercials by one production company.

Ewart equipped it with the latest and most sophisticated film production equipment: a comprehensive sound department; an in-house optical department and so forth. And with vague vision, but no specific plan in mind, he also made sure that each stage had a separate control room and that video cable ducts were embedded in the walls.

As such, the studio was a success, and operated viably as one of London's foremost production houses—and one of the few companies to work consistently for the important European market for a long time.

Confronts Tape-Film Question

But Keith Ewart is a restless man, and (very important in the commercial production business) a perfectionist. The very success of his film operation seemed to take the challenge out of the business for him. But perhaps more importantly, as an erstwhile still photographer he began to become impatient with the motion picture process because of its inherent imperfections, and the slow rate at which the system progressed from shooting to dailies through post-production to opticals and answer prints.

He also became somewhat restive about the way in which commercials themselves were conceived and produced. "I don't believe," Ewart states, "that the way we should be making commercials in the Seventies is a quick look at the storyboard and off to the Bahamas."

So after considerable thought, he polled London's advertising agencies on their views about his establishing a videotape facility for commercials in London. The fact that their replies were not completely positive seemed to goad him into action. He closed down one of his film production studios (Stage A)

and hired the best television engineering advice he could find.

Recognizes Tape's Potential

After exhaustive inquiries into the equipment available and into the kinds of applications it has for television commercial production, he dipped into his own pocket once again. To establish a television facility totally designed around the needs of commercials rather than program production, he purchased three TR-70C video tape machines, a computerized editing system, several color cameras and all the necessary signal processing equipment.

"I bought the equipment because it seemed to be the right thing to do in terms of the way the industry ought to be going," Ewart comments. "But it was only after it was installed that I became a true convert to video tape. It's the best system of *photography* I know. Its photographic abilities have scarcely been touched yet."

Apart from three special effects which aren't used very often (reverse motion, enlargement of a portion of the frame and smooth slow motion), Ewart says that there's nothing that film can do that video tape can't do as well. The company impresses on its potential clients that the great virtue of tape over film is that the tape system is specific to television. It uses an electrical analog of television's primary colors—red, green and blue. Film, on the other hand, uses the photographic primaries of magenta, cyan and yellow which, at best, is a compromise with the television system.

Rugged Signal Determines Choice

The equipment was selected on the basis that every link in the chain must be as good as possible for the job it has to do. The requirements of commercials are such that the absolute state-of-the-art must be achieved at every stage. This is Ewart's own perfectionist point of view, and that of the agencies using the studio who feel there is no question of anything being "second best" or "good enough". It has to be the best.

After evaluating all the recorders on the market, Ewart's technical advisers settled on the TR-70C. It was found

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to be capable of recording a rugged, fully compatible highband signal which stands up under most replay conditions. Ewart explains that it's important to bear in mind that the studio has no control over the type or condition of replay used by the television station. So the final tape coming out of Ewart's must give the station the best possible chance without the need to correct or engage in complicated new set-up procedures. (British practice is to set up commercials for replay on CCIR 100% bars. So as long as set-up is correct, stations will *not* adjust parameters during replay.)

Creatively Controlled Editing

Editing takes place via the on-line computer system, working directly with the two-inch masters. All recording takes place in duplex, and one of the two masters is immediately removed to Ewart's vaults to protect the client against accidents to the other master.

Ewart looked closely at off-line systems. But he concluded that the advantages of working with high-quality pictures combined with the reduced editing time needed for commercials as opposed to programs justifies staying with the two-inch originals.

For assembling commercials Ewart has employed creative editors, rather than mere mechanics on their VTR strength. So it's felt that the staff can make a considerable creative contribution to the editing process. This could not be realized with an out-of-house off-line approach. However, if clients wish, they can take away cassette dubs of the material shot with keyed-in time code display to allow them to produce their own decision lists off-line. Or, as some clients prefer, they can obtain from Ewart a 16mm kine with keyed-in time code.

The computer-controlled editing system is a fairly familiar process. Based on EBU/SMPTE standard time codes, it is capable of: searching and cueing "in" and "out" points and frame-by-frame movement of edit points. It also offers full mix-effects capability interfaced with the system's vision switcher. Audio-follow-video or separate audio editing and dubbing is available through an eight-track studio recorder which also reads and records time code.

Punched-Paper Decision List

Possibly the most important aspect of the computerized editing system operating with the TR-70's is the fact that each decision is recorded on punched paper tape.

If, at any point, a client wants to change an editing decision, the system is capable of not only recreating all the edit decisions previously made, but also incorporating the new edit, and then bringing the editor back up to date. It does this by going back to the master instead of redubbing the edited tape and thus losing a generation.

Paper tapes are filed with masters, and if a client needs a new version of his commercial at any subsequent time— perhaps for a new price or a new pack shot—he can get it simply by going straight back to the master elements instead of dubbing a dub.

The editing system requires new and different knowledge and skills on the part of the client as well as the staff editors. There is no comparison with the cut-and-cement film editing process with which most agency producers are familiar—which is why some of them still prefer to work with 16mm kines. But once an agency producer understands the system, he tends to become an enthusiast.

Full and Easy Control

At Ewart's, the editing suite is not separated from the machines them-

From pre-production to release, shooting tape commercials at Ewart's normally takes from one to two weeks, as opposed to six to eight weeks for a similar film job.

selves. The TR-70's are arranged in a U-pattern at one end of the VT area.

This arrangement lets both clients and supervising editor sit at the computer console at the other end, and watch the monitor displays while keeping in close contact with the equipment itself at all times.

The quiet operation of the TR-70's ensures that ambient noise levels are low, and high-quality sound reproduction is provided by monitor speakers in the VTR area. All the machines operate under full remote control from the computer console, and one VT assistant handles loading and setup during editing sessions on all three machines.

What's more, with the fast lock-up time and stability of the TR-70's, the computer-controlled editing system lets clients and editors concentrate on the creative functions of video editing.

A Purposely Exclusive Shop

The Ewart studio is not for hire to anyone and everyone. It's part of the total

The Ewart approach to tape editing puts the TR-70's at one end of the room, clients and supervising editor at the computer console at the other. This arrangement allows full and easy control of editing, plus close contact with the equipment at all times.

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service offered by the Ewart production company—and, indeed, over on Stage B, the company's film operation continues. Ewart himself and the other director on his staff, former Ogilvy, Benson & Mather agency producer Martin J. Locke, direct most of the commercials produced in the house. However, if an agency wants to use another director, the company will undertake a co-production. But not every commercial director in London can avail himself of Stage A's VTR facilities. "I want people who are also committed to video tape to come here," says Ewart. "I don't want them here to patch up a panic job, or because they're late on their airdates. What happens then is that when it goes wrong they blame the tape medium instead of their own lack of commitment to it or understanding of it."

Rather than offer the studio and facilities on an hourly basis, Ewart delivers a package service for definite reasons. In the past, agencies have been shy of using VTR by the hour as production budgeting and estimating have been along unfamiliar and sometimes difficult lines.

Ewart offers the agency a complete bid on each commercial just as it would receive on a film commercial. The burden of estimating time required in studio and in post-production is removed from the agency, which is frequently not equipped to make such judgements.

As a matter of interest, VTR budgets are more or less at parity with those for film for similar jobs, though real savings are made when there are complicated optical effects to be done. As for time savings, the agency's are considerable. Ewart says that the average tape job takes between seven and fourteen days. With films, six to eight weeks must be allowed from pre-production to bulk prints.

Tape—The New Movement
The London agencies, having worked mostly with film for the eighteen years since commercial television started, are in the midst of a period of adjustment.

But the breakthrough has occurred. Until Ewart came along, most tape commercials in the UK were either for local advertisers or for products (like newspapers) where speed in getting to air was of the essence. Now several major national advertisers, including consumer-products companies such as Procter & Gamble, are starting to use tape as a matter of course rather than on an experimental basis.

Ewart is offering the agencies the same kind of intense commitment to commercials, and the same kind of perfectionism that they have come to expect from the film production companies. The microscopic care and devotion they find there is a major factor in promoting tape as a prime production medium.

Missionary Work with the Agencies
This past summer has been devoted to proselytizing the British agency business. Ewart sponsored a series of full-scale, one-day seminars in which agency people were taken step-by-step through the video production process. They were allowed to operate (some of) the equipment hands-on, and were shown examples from the US and the UK of video tape's abilities.

What they learned was—as Ewart believes—that tape should be used for its pictorial and editorial virtues, not for reasons of economy or speed. "You're being unfair to yourself if you expect a finished job by tomorrow night."

But tape does take up less time, because there's no hanging about while a film lab tries to get opticals and answer prints right. Ewart suggests, for instance, that two days should be allocated for the director to arrive at his first cut. The studio *can* turn a job around in a matter of hours if necessary, and will do so if its creative standards are not compromised in the process. But the rule of thumb is between seven and fourteen days from pre-production to release, as against six to eight weeks for a similar film job.

Ewart—The Image Maker
Keith Ewart has been in TV commercial production since British commercial television began in 1955. He started his career as a distinguished still photographer, working for major advertisers and for prestige magazines like Harper's Bazaar, and then became one of the first people with a background

other than feature films to work in television commercial production. Working from a small studio in Glebe Place, Chelsea, he became an immediate success, and throughout the late fifties and early sixties he was one of the most prolific directors of commercials in the UK.

So to Keith Ewart, the photographer, it's the pictures that count in the final analysis. He is satisfied that within the capabilities of the technology of his video equipment, carefully chosen and carefully integrated together, he is offering one of the best picture-making capabilities available in Britain today.

The cameras deliver crisp and faithful output. The signal path is clean and flexible. And the honest, rugged recording abilities of the TR-70's can be trusted not to degrade the qualities of the pictures fed to them. All of that, together with the commitment and dedication of the crew, combines to give advertisers more confidence in the video-tape medium.

And in the precise, visually-oriented world of commercial production, where production values are important, Ewart is pushing the frontiers of image-making forward. "We've only just scratched the surface," he says. And people in the British advertising industry are beginning to realize just what it is that they have available to them. □

AUTOMATIC CARTRIDGE SYSTEM FOR 16mm TELEVISION FILM

A. E. Jackson, *Telecine Engineering* and A. H. Lind, *Manager, Broadcast Studio Equipment Engineering*

Thousands of short pieces of 16mm film on small reels or hubs are received by television stations every year. In the United States, 500 to a thousand or more of these short segment films are played back every week by a typical TV station.

The short films are sometimes spliced together and handled on "commercial spot reels", but in most instances, they are played back one small reel at a time. Either way involves a great deal of handling for incoming inspection, identification, cataloging, storage, retrieval for playback. Also for playback, the film reel must be loaded, threaded, cued, played, rewound, unspliced, spliced, etc.

Needed: A Cartridge Film Projector

A cartridge loading automatic film handling projector is a logical and desirable answer to this problem.

To meet this well-defined need, RCA, with assistance from the Eastman Kodak Company, developed a 16mm film cartridge projector—the TCP-1624. This system, demonstrated at the 1973 and 1974 NAB Conventions, is now in production, with initial deliveries scheduled for early 1975.

At the outset of this development project, the program logs of nine television stations (one network, six U. S. TV stations and two Australian stations) for a total of 44 days were analyzed to determine the distribution (by length/duration), of the film segments used.

It was found that 89% of the film segments used during this period fell in the duration period of 10 to 120 seconds. The numbers will vary from station-to-station but the significant fact is that the percentage of short segments of film is high.

The Cartridge Concept

The cartridge concept is well established for rapid and convenient handling of film and tape media. Cartridge film for pictures and cartridge tape for sound have been widely used for some time in the business and consumer field as has cartridge audio tape for broadcast use. More recently, the cartridge concept for video recording and playback has gained quick acceptance in TV broadcasting.

Special-Design 16mm Reel

For this new cartridge system, a compatible 16mm reel, and a plastic case which encloses it, has been designed. The new reel is compatible with currently used 16mm reels and thus can be loaded on existing 16mm reel-to-reel projectors. Moreover, the film-loaded reel can be quickly placed in the cartridge case without the use of tools. Once loaded in the cartridge case, there is no further physical contact required for the usage life of the film.

The reel, which is molded of an anti-static ABS plastic, has a larger than conventional hub diameter, solid flanges, plus a keying groove on one side and radial surface splines on the other side

BY A. E. JACKSON & A. H. LIND
Broadcast Systems Engineering

for positive coupling in high speed reeling. It conforms with present ANSI (USA) standards for projection reels. The capacity of the reel is 75 feet of 6 mil film, or two minutes plus leader and trailer at a 25 frame projection rate.

For purposes of automatic threading in the projector, a pre-formed stiff Mylar leader approximately 13.5 inches long is attached to the film. The presence of this leader as an outside wrap-around when the film is in the cartridge adds further protection to keep dirt from reaching the film. The stiff leader does not preclude threading the film on a reel-to-reel machine, since its width is the same as the 16mm perforated film and it is sufficiently flexible that it will wind on a take-up reel quite readily.

10-Second-to-2-Minute Program Segments

While the reel is designed for a maximum film program load of 2 minutes, it can contain any length of film down to 1 frame of program. However, it was designed for an anticipated minimum of 10 seconds of program material which is slightly more than the maximum recycle time when a 2 minute cartridge is utilized in the projector. Thus with the program segments ranging from 10 seconds to 2 minutes in duration, it is possible to intermix them in any manner and still provide continuous picture output from the automatic projector. While it is possible to utilize thinner base film and contain a
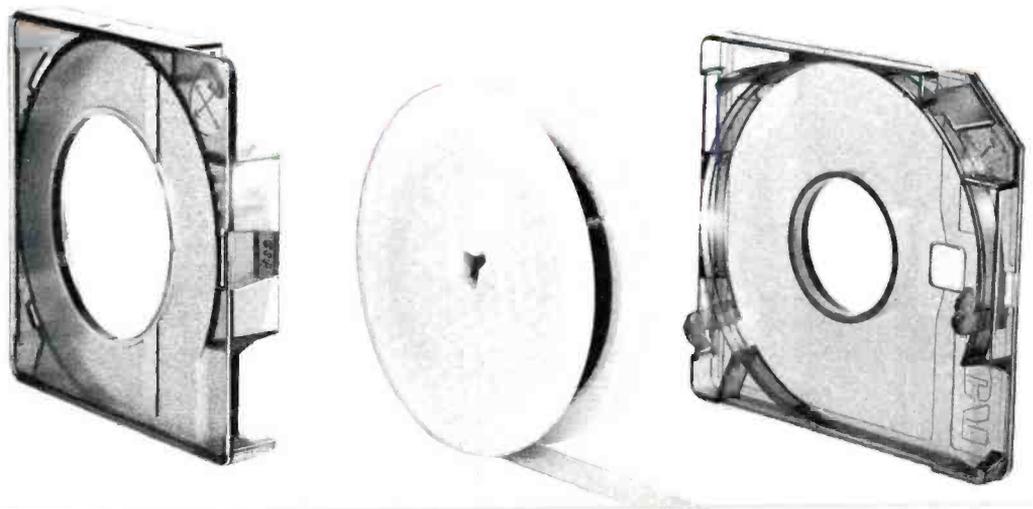
TK-28 Film Island with TP-7; TP-66, and TCP-1624 Cartridge Film System.

New reel designed for the TCP-1624 is compatible with currently used 16 mm reels.

longer playing time on the reel, this would in turn increase the minimum playing time possible while retaining the intermix capability since the rewind period for the maximum length of film establishes the minimum recycle time.

Cartridge Film System

Film cartridges are loaded in a circular magazine which has a capacity of 24 cartridges. The magazine is removable from the projector which makes it convenient to load either on or off the machine. The TCP-1624 automatic projector is designed to occupy the same position in a telecine island as a standard TV reel-to-reel projector such as a TP-6, TP-66, Eastman 285 or CT-500, etc. The projector is a 2-channel machine with internal optical multiplexing to combine the optical outputs into a single telecine island multiplexer input. The dual transport design provides continuous picture output from the projector with sequential playback of the cartridges as loaded in the magazine. The projector is designed with excellent access to the cartridges in the magazine. Rapid, last moment changes can be made, if required, except for the two cartridges that are in the playing stations within the projector housing. Any intermix of

program material between 10 seconds and 2 minutes is possible while retaining the continuous picture capability.

The projector contains these functional subsystems:

1. Magazine Drive
2. Cartridge Transfer and Playback Stations
3. Film Transports
4. Optical/Magnetic Sound Systems
5. Lamphouse and Projection Optics
6. Optical Multiplexing
7. Power Supply and Systems
8. Control Logic
9. Film Take-up Bin

* * *

Briefly, the sequence of events in the operation of the automatic projector are as follows:

1

The cartridge is transferred from the magazine to its playback station where a motor driven puck drives the stiff leader vertically downward into and through the film transport loading path. The film path through the transport for loading is an open, unimpeded chute with strategically placed guides to channel the stiff leader through it

and into a slack bin at the bottom of the machine. The slack bin serves as a receptacle to collect the film as it leaves the transport during playback.

2

A proximity sensor detects the presence of the leader when it enters the slack bin and causes the film drive at the cartridge to stop.

3

The sensor also initiates the film threading cycle which starts at the lower sound sprocket and progressively establishes the film running path back toward the cartridge.

4

Once this is accomplished, the film is run in at normal projection speed to a cue mark which stops it with the first "on air" frame in the gate. The film is now ready for an air playback on command. The same loading action occurs on the second transport with film cartridge #2. Thus at the conclusion of the initial loading, both transports are brought to a film cued, ready state. After cartridge #1 has played back, cartridge #2 is available for continuing picture output and the automatic cartridge change cycle for cartridge #1 is initiated.
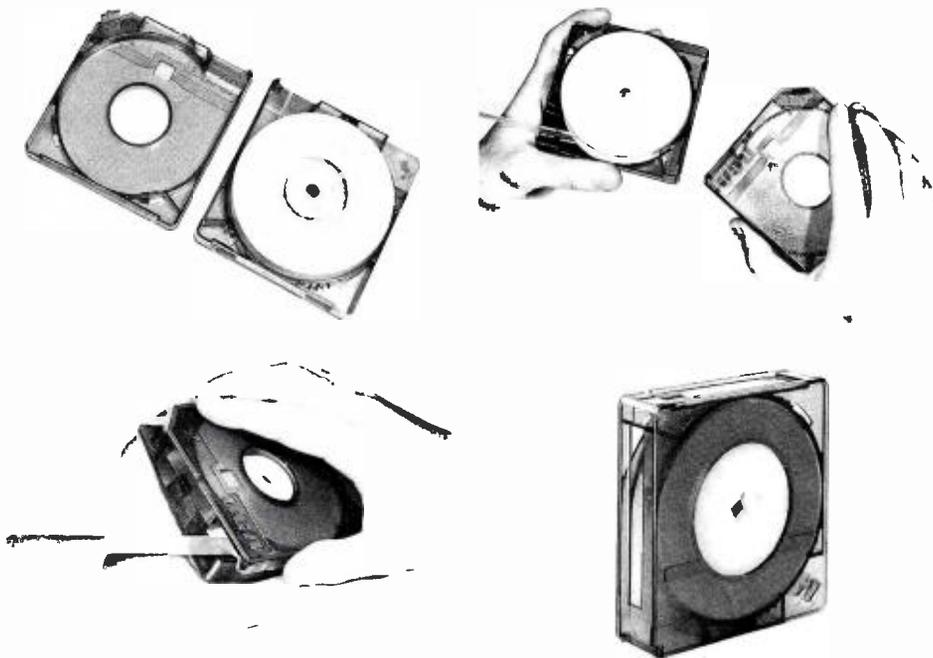
Loading the reel in the cartridge is quickly done, without the need for tools, as shown in this photo sequence.

The film path first opens to the load state and the film is then rewound at high speed. When rewinding is completed, the cartridge is transferred back to its location in the magazine and cartridge #3 is transferred to the playback station, threaded, and cued to be ready for the next playback command. The maximum time required for the cycle from detection of the end message cue on cartridge #1 to the cued and ready condition for cartridge #3 is less than 10 seconds.

As the film is running in at normal speed to the cued first frame position, the presence of magnetic sound track is sensed and the magnetic sound playback channel automatically selected. If a magnetic track is not detected, the sound channel remains in the optical playback mode.

Both the sound exciter and the optical projection lamps have standby lamps as back-up with automatic changeover mechanisms to shift them into service whenever the primary lamps fail. This changeover is displayed on the status readout panel of the projector (located above the cartridge magazine) to remind maintenance personnel that the primary lamp has failed.

Telecine Island System Compatibility

The TCP-1624 is designed to be another building block in the universal telecine island system which has been available in building block form since the early 1950's. The output optical axis of the TCP-1624 is 48" from the floor and it is designed to fit in existing telecine island systems such as the TK-27/TP-15, PE-240/EK-Model 2, TK-27/TP-55, and the TK-28/TP-55. It can be installed to project into the multiplexer input ports currently occupied by TP-6, TP-66, Eastman 275, 285, CT-500, etc., reel-to-reel 16mm projectors.
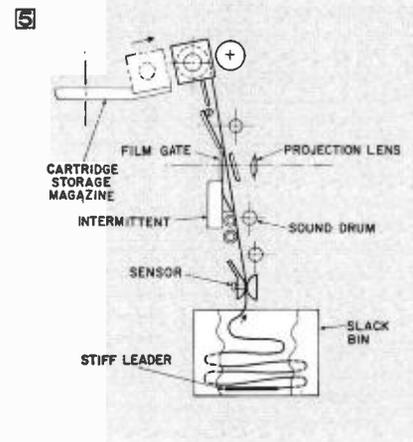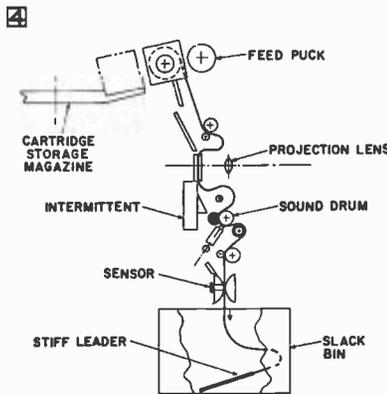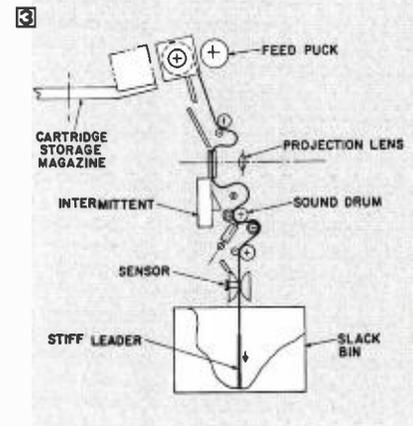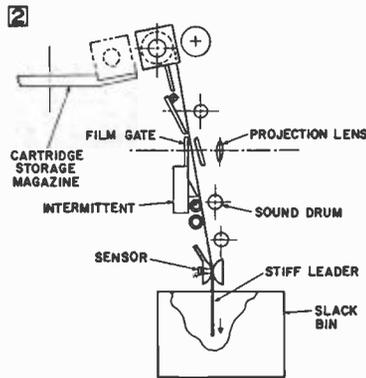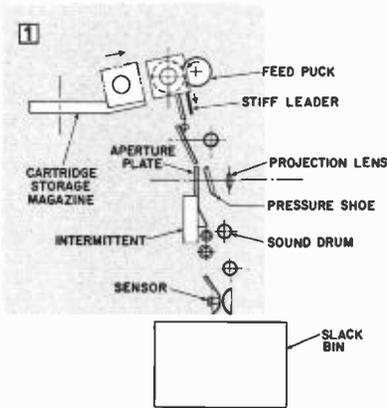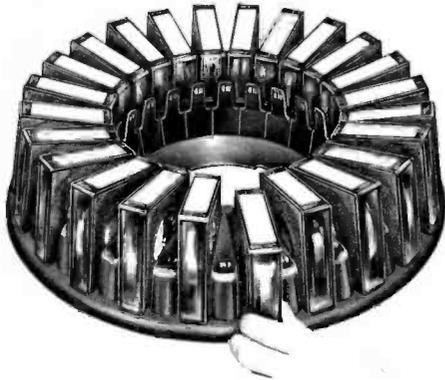
Cartridge magazine for TCP-1624 accommodates up to
24 film cartridges. Program material of ten seconds
to two minutes duration may be intermixed.

The TCP-1624 is a two-channel machine, with internal optical
multiplexing to combine the optical inputs into a single
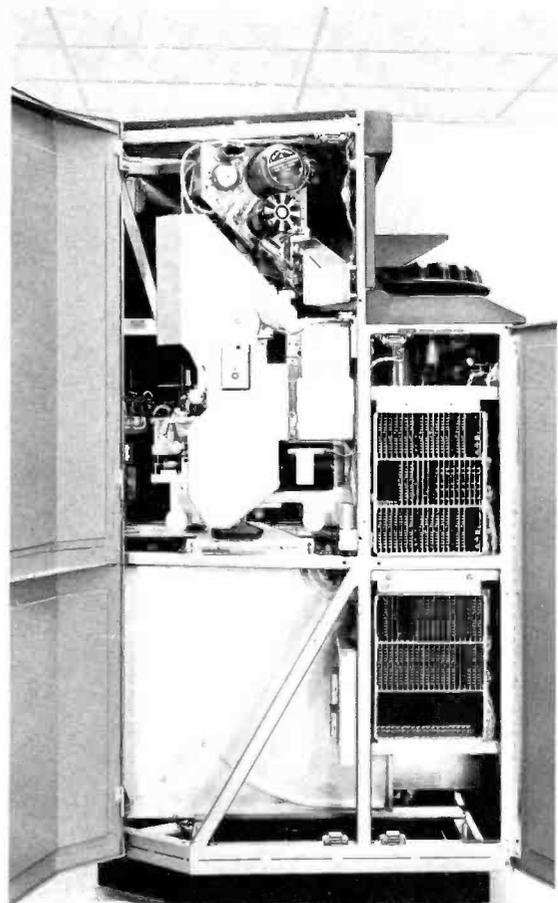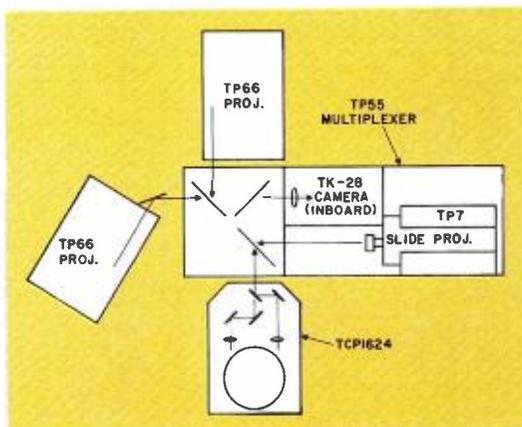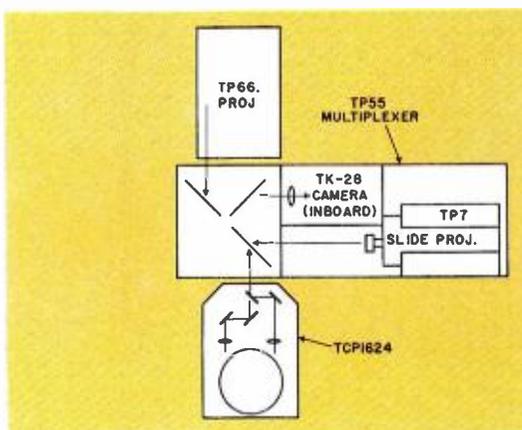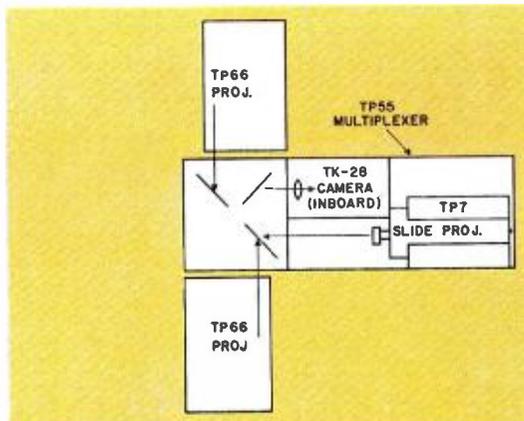telecine island multiplexer input.
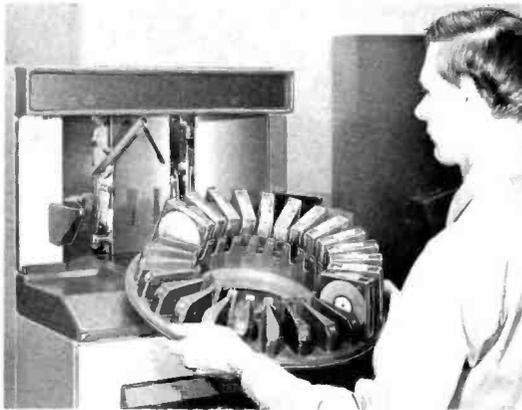
Changing pre-loaded cartridge magazines
is a simple operation.
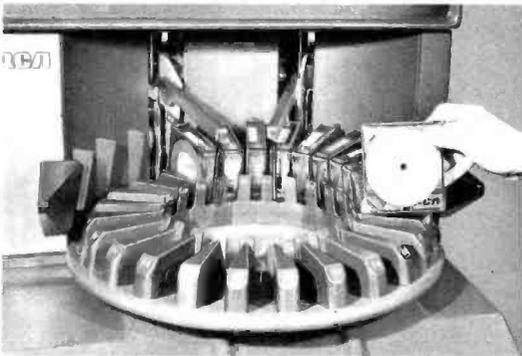
Rapid access to cartridges permits making last-minute
changes with ease and confidence.

Side view, with access doors open, showing
transport mechanism and control logic.
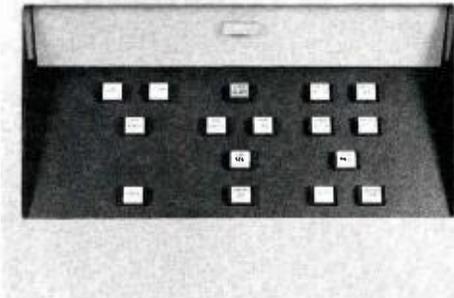
Local operational control
panel at rear of TCP-1624.

Remote Control Panel
for TCP-1624.

Summary

This brief report highlights the TCP-1624, an exciting new tool for automatically handling short segments of 16mm film in 24 frames-per-second, 60-field television systems.

Designed for easy operation, the cartridge projector features two identical, self-threading projection systems with automatic cue, zero pre-roll, automatic switching between optical and magnetic sound tracks, and automatic film rewind. For added flexibility, it can operate either in "automatic sequential" or "single event" modes. The films are loaded, stored and subsequently handled in cartridge form. This eliminates the inconvenience and time involved in manually threading individual film segments onto conventional projectors, or of splicing up a "spot reel".
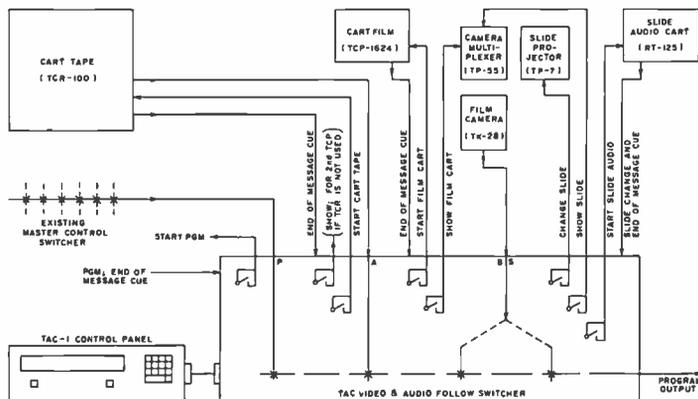
The TCP-1624 is designed to do for film spots what the TCR-100 does for tape spots. And, since the two "Cart" machines are fully compatible, automatic station breaks involving tape and film can be routinely programmed. ☐

A typical current RCA telecine island contains a TK-28, TP-55B, a TP-7 and two TP-66 reel-to-reel projectors. In such an installation, it is very simple to replace one TP-66 with the TCP-1624. If the deletion of one reel-to-reel 16mm projector presents an operational problem, it is possible to arrange the telecine island so that in addition to the TK-28, TP-55B, TP-7, two TP-66's, the TCP-1624 is accommodated. Thus the facility of two reel-to-reel projectors is retained.

Products
News

TAC-1 Automatic Programmer Control Unit.

Typical TAC-1 Functional Diagram.

Automatic Programmer For Station Breaks

TAC-1 is a cue-operated programmer designed to simplify and automate station breaks. It can operate with a variety of video tape, film, and audio sources, performing all of the switching and machine control functions for handling complete station breaks automatically.

The TAC-1 system stores and displays up to 15 program sequences of as many as seven events each. The source and number of events to be aired consecutively are identified and displayed on an LED readout, as is the "On-Air" event. Last-minute changes are easily made.

Since it is designed for use in existing as well as new facilities, TAC-1 is an economical means of automating station breaks. It works with tape machines, both reel-to-reel and cartridge (video and audio); with 16mm projectors and slide projectors such as the TP-66 and TP-7, and with the new cartridge film projector, TCP-1624.

In operation, the TAC-1 accepts an end-of-message cue from each of its sources and performs the appropriate machine control functions—multiplexer-mirror operations, slide changes, projector starts, etc.—according to preloaded program sequences. At station break time, TAC-1 switches—either on cue from the program source or on manual pushbutton command—from the main program source to the machines which are pre-loaded to air the spots, promos, ID's or PSA's scheduled for the break. It operates these according to the pre-set sequence stored in its memory. At the end of the break, TAC-1 automatically switches back to the line program from Master Control.

The display/programming panel for TAC-1 is only a rack-frame wide and 5¼ inches high, and the rack modules take up less than a single rack-width of space.

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Multi-Purpose Switchers

TSP-107 designates a new series of multi-purpose, low-cost video and audio switchers which are designed for use where vertical interval video switching is not necessary.
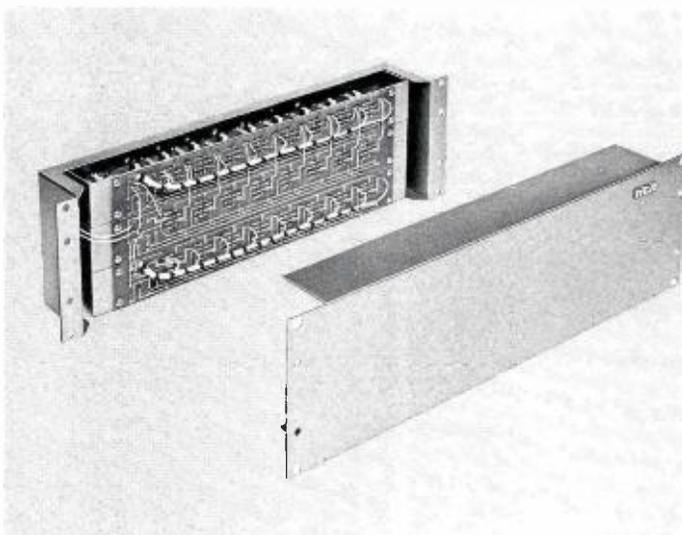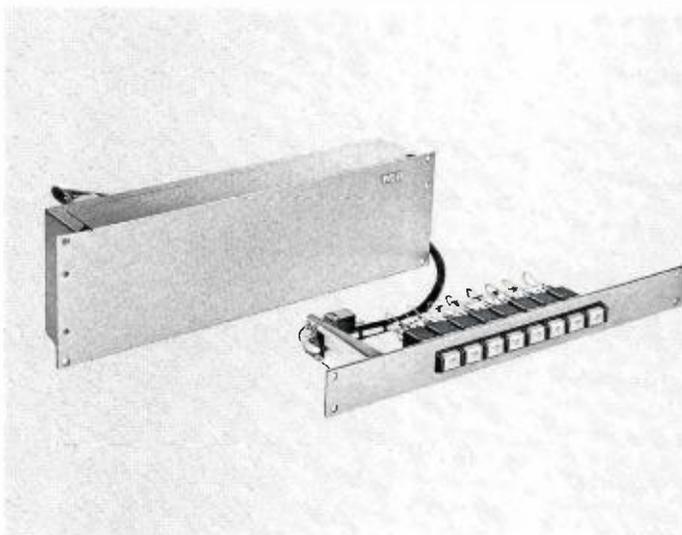
Employing highly reliable, hermetically-sealed miniature relays for crosspoints, the basic switcher is comprised of:
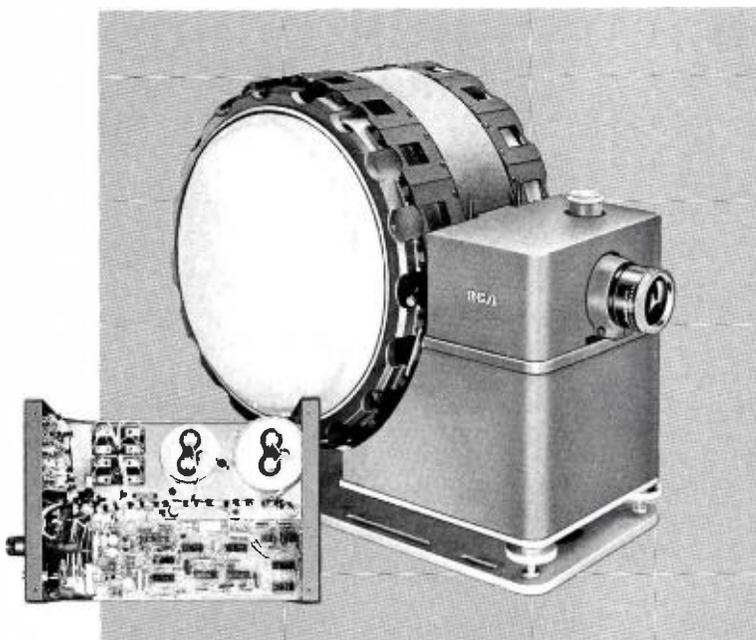
1. A rack-width switcher chassis, 5¼ inches high

2. Switcher modules (Type "A" and Type "B")

3. Remote Control Panels

The switcher chassis has provision for mounting three or fewer switching modules. Type "A" switcher modules have BNC connectors for eight video inputs and one video output. The Type "B" modules use barrier terminal strips for low frequency signals such as balanced audio, waveform-stairstep and monitor-key. The printed circuit board in each module has provision for transistorized latching circuitry for the crosspoint relays, and button-tally power to the control panel.

Two types of 8 x 1 Remote Control Panels are available for use with TSP-107 Switchers. The first includes eight momentary pushbutton switches with tally lights; the second has a program latch switch to provide either 8 x 1 latch switching or momentary closure of any of seven crosspoints with automatic return to the "Program" or eighth crosspoint. For installations utilizing existing remote control switches, 20-pin male cable connectors are available separately to mate with remote control connectors on the switching modules.

Ten standard pre-assembled, system-tested general and special purpose switchers are offered, including: 8 x 1; 16 x 1; 24 x 1; RGB Chroma Key; camera set-up; audio-follow-video, and others. Catalog TV.4810 has detailed information.

TK-28 Maintenance Rack

A short, rolling equipment rack is recommended for set-up and maintenance of TK-28 Film Cameras. The rack of monitoring and test equipment is particularly useful for TK-28's which are mounted inside TP-55B Multiplexers. The same set-up can also be used with TK-27 Cameras.

A suggested rack layout is illustrated.

Rack height, approximately 48-inches.

*RM-529 or Half-Rack 529 or 528.
**Shelf Area for Meters, etc.

Solid State Control For TP-7

Operation of TP-7 Slide Projectors is improved with the installation of a newly designed Solid State Control box. The new control unit (MI-40199-S) is an exact replacement for the Relay Control box supplied with the projector. It can be installed in a matter of minutes, and provides a number of operational advantages.

Zero-axis-crossing solid state relays and modern logic circuits are employed, eliminating switching transients which can generate "glitches" in adjacent video equipment. There are no arcing contacts, since switching occurs only when the instantaneous AC voltage crosses the zero axis.

In reverse operation, the "Off-Air" drum automatically moves one position, maintaining proper slide sequence in forward or reverse modes. Tally lights on the TP-7 display the status of the "On-Air" drum at all times, since the lamps are not turned off during the change cycle. A complete cycle occurs when the "Change" button is pressed.
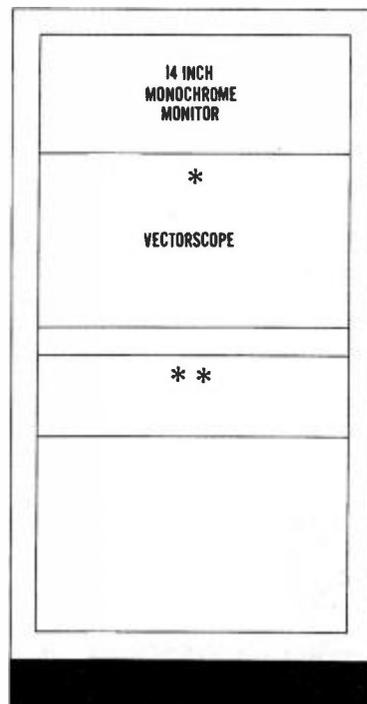
The MI-40199-S Solid State Control box is priced at $1250. New TP-7 Projectors from production now include the Solid State unit instead of the Relay Control Box.

Rx For Tired Microphones

Hundreds of 77-D's, 44-BX's, BK-6's and a long list of other quality RCA microphones are being refurbished now rather than being discarded.

Broadcast Systems' CRAE Shop (Custom Repair and Engineering) in Camden performs this reconditioning service on RCA broadcast microphones. Microphones are checked, repaired, tested and returned to customers with performance certified to equal original specifications. For price schedule and shipping instructions, write to Technical Services, RCA, Building 2-8, Camden, N. J. 08102.

Automatic Cartridge Video Tape Eraser

Increased use of video tape cartridge systems has resulted in a requirement for efficient bulk erasure of cartridges.

A new Automatic Cartridge Tape Bulk Eraser can erase up to four cartridges at a time, handling either TCR-100 or ACR-25 cartridges.

This new system is a self-contained, table-height unit, similar in construction to the current model bulk eraser supplied for erasing magnetic tape and film.

Erasing is accomplished by rotating the cartridges in an alternating current magnetic field of high flux density. An air core type coil is used, eliminating the possibility of erasure "spokes". Tape is erased down to the noise level of the magnetic medium in an 18-second cycle. The erase cycle is fully automatic, controlled by a motor-operated mechanism. Two models are available: ES-29975A for 60 cycle operation; ES-29977A for 50 cycle operation.

Update Kit For TA-60B Mixers

Performance of TA-60B Video Mixing and Insert Amplifier systems can now be enhanced at modest cost with the addition of a new update kit. Components and detailed instructions for
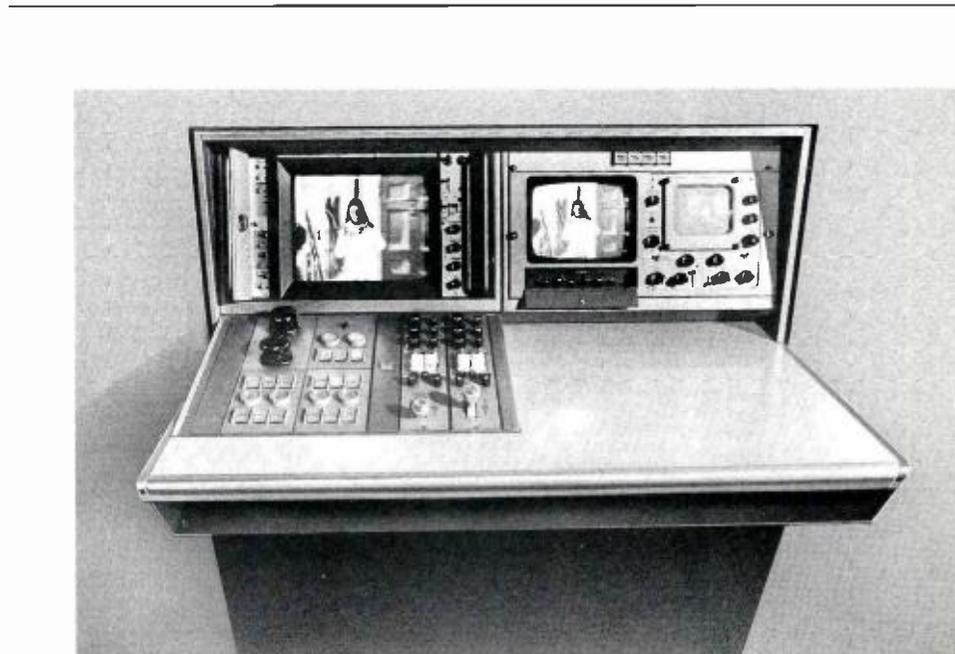
Universal Mounting Adaptor For Camera Control Panels

The MI-557823 Universal Mounting Adaptor allows intermixing of two joy-stick control panels with either four 4¼" x 7" or two 8½" x 7" control panels. It is especially useful where TK-28 and TK-27 control panels are to be combined in one console housing or where existing 8½" x 7" TK-44A panels are to be used in conjunction with the TK-45 Joystick control. The joysticks may be mounted on either the right or left side of the console.

replacement of LDR's (Light Dependent Resistors) with new LED Photoresistors are included in the kit.

The LDR's have sealed incandescent tubes which discolor with use, resulting in degradation of performance. The new long-life LED Photoresistors are not subject to the deterioration effects experienced with the LDR's, and will maintain original performance specifications for an extended period.

Kit #TSP-102 includes components and selected LED Photoresistors plus detailed instructions for updating the two Video Input Modules and the Video/ Pulse Output Module of one TA-60B system. Kits are priced at $74.50, complete.

TKP
inside
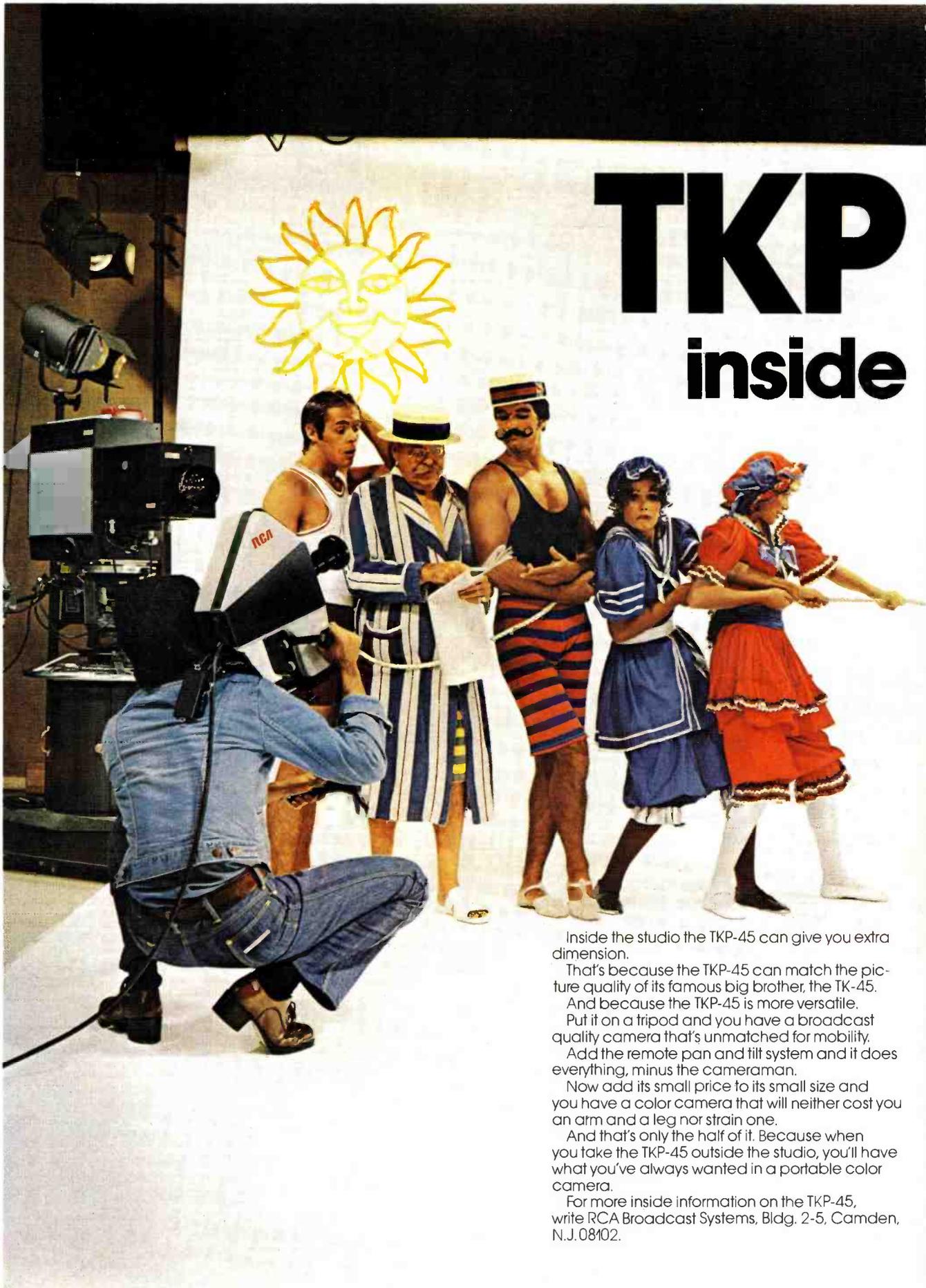
Inside the studio the TKP-45 can give you extra dimension.

That's because the TKP-45 can match the picture quality of its famous big brother, the TK-45.

And because the TKP-45 is more versatile.

Put it on a tripod and you have a broadcast quality camera that's unmatched for mobility.

Add the remote pan and tilt system and it does everything, minus the cameraman.

Now add its small price to its small size and you have a color camera that will neither cost you an arm and a leg nor strain one.

And that's only the half of it. Because when you take the TKP-45 outside the studio, you'll have what you've always wanted in a portable color camera.

For more inside information on the TKP-45, write RCA Broadcast Systems, Bldg. 2-5, Camden, N.J. 08102.

45
out

Outside the studio, you'll find that the TKP-45 isn't a lot of problems like many other color portables.

Some of which are either too big in size (back-breaking).

Or, not big enough in quality (heartbreaking).

The TKP-45 weighs only 22 pounds (with the lens). And doesn't require a heavy backpack or large bulky cables that trip you up.

Also, there are fewer controls to manipulate. Because the TKP-45 has all the famous automatic features of the TK-45.

Features like automatic white balance. Automatic black balance. And automatic iris.

That all works out better for you because it's less work for you.

All for more convenience. More operational simplicity. And greater performance.

The TKP-45. Another reason why users of high quality color cameras buy RCA more than all other makes combined.

For more outside information on the TKP-45, write RCA Broadcast Systems, Bldg. 2-5, Camden, N.J. 08102. **RCA**
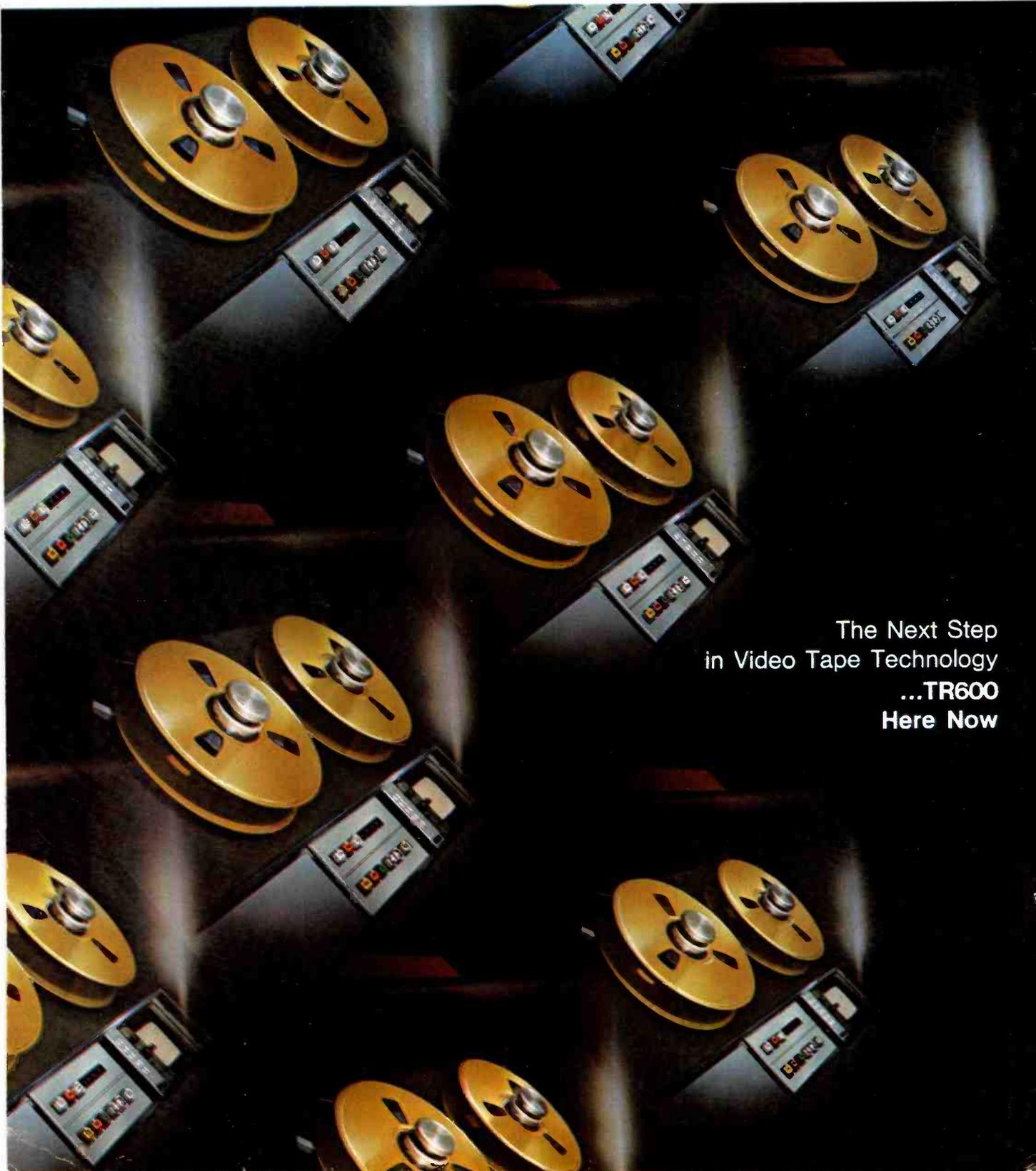
The Next Step
in Video Tape Technology
...TR600
Here Now