

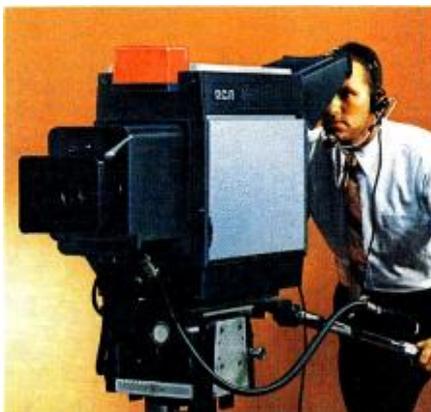
Focus on TKP-45  
Big News at NAB



# The Automatic Color Camera

## Comes the Evolution!

- 1969** RCA introduces the TK-44A, a new generation of color cameras.
- 1970** New features added. New colorplexer, miniature cable and equalizer. Improved camera cable and joystick control panel.
- 1971** The TK-44B. With more new features. Bias Light to reduce lag and RGB coring to minimize noise at low light levels. Scene Contrast Compression to bring out details in high-contrast scenes.
- 1972** First automation designs demonstrated at NAB.



## 1973. The TK-45A.

What's behind our new TK-45A color camera system is a four-year tradition of dynamic design advances in our TK-44 Series. The result: a reputation for producing the highest quality pictures in the broadcast industry.

Now, the TK-45A offers an even higher standard of excellence. Because it does everything the TK-44 does. And more, automatically.

So the TK-45A is easier to operate. And there's less that can go wrong.

White level is set by simply

focusing on a white area of the scene being shot (or a white reference card) and pushing a button.

Black level is automatically set every time the lens is capped.

And should lighting conditions change, automatic iris compensates without the help of an operator.

The new circuitry has been incorporated into a newly designed camera control unit, which reduces the number of interconnecting cables. So clutter is kept to a minimum.

With all its time-saving automatic features, the TK-45A makes top operating efficiency possible. It lets your station produce the best color pictures ever.

In other words, the TK-45A sees things your way. Automatically.

For details on its performance, and the cost-effective design approach behind it, contact your nearest RCA representative.

# RCA

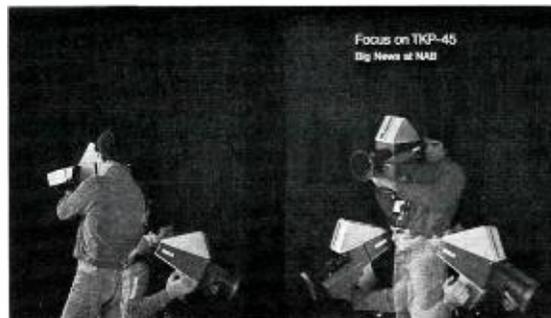
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OUR COVER—Noteworthy among the new products introduced at the NAB Convention was the TKP-45 Portable Color Camera. An ideal "on location" camera, it affords complete mobility, requires no backpack, and delivers studio-quality pictures.



## RCA Wins Emmy Award For Developing Broadcast Industry's First Video Tape Cartridge System

RCA Broadcast Systems has received an Emmy Award for developing the first video tape cartridge system to automate TV station breaks and broadcasts of other TV program sequences recorded on tape.

The Emmy was one of several awarded by the National Academy of Television Arts and Sciences for artistic and technical achievements. RCA was cited by the Academy "for its leading role in the development of the quadruplex video tape cartridge equipment."

This is the sixth Emmy that RCA has won for the best engineering or technical achievement in the field of television. The Company received its first Emmy in 1956 for the development of the tri-color picture tube which made commercial color television practical.

The latest Emmy is for developing the TCR-100—a major advance in automating television station operations.

The RCA Emmy was accepted at the Emmy Award ceremonies in Hollywood by Andrew F. Inglis, Division Vice President and General Manager, RCA Commercial Communications Systems Division of which RCA Broadcast Systems is a part.

The TCR-100 was the TV industry's first broadcast studio system to apply the cartridge-handling technique to two-inch-wide video tape on which TV picture and sound information is magnetically recorded.

In commenting on the Emmy Award, Neil Vander Dussen, Division Vice President, RCA Broadcast Systems, said "this recognition by the Academy is a tribute to a great RCA design team and to the many broadcasters who shared with us the uncertainties of pioneering a system completely new to TV station operation.



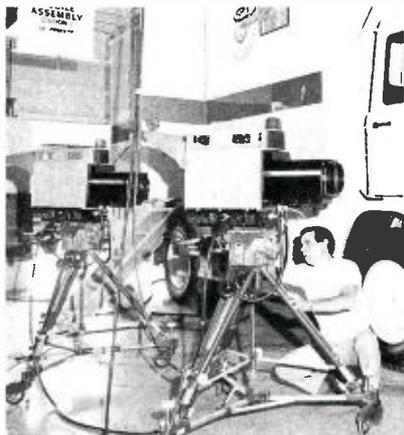
Striking a happy pose with the "Emmy" awarded RCA Broadcast Systems for developing the TCR-100 are (left to right) Arch Luther, Chief Engineer; Andrew F. Inglis, Division Vice President and General Manager, Commercial Communications Systems Division; Neil Vander Dussen, Division Vice President, Broadcast Systems, and Henry Klerx, Manager, Broadcast Product Planning. The "Emmy" was awarded to RCA by the National Academy of Television Arts and Sciences "for its leading role in the development of the quadruplex video tape cartridge equipment."

"Additionally, the award should reassure business people that innovation is a valid and practical approach to new marketing opportunities."

The idea of using the cartridge method for video tape broadcasts was first broached in 1967. A design team headed

by Arch C. Luther, now Chief Engineer of Broadcast Systems, was formed and an engineering prototype machine built and demonstrated at the National Association of Broadcasters convention in March 1969. More than 200 TCR-100's have now been delivered to television facilities around the world.

## Algerian Television Network Receives Two RCA Equipped Color TV Mobile Units



Two RCA TK-44B color cameras for Radio Television Algerian being checked out at RCA Broadcast Systems Custom Repair and Engineering facility. One of the two custom-built vans houses the cameras, video switching and audio systems, and the other carries microwave equipment for transmitting the on-location programs to the network's studios.

Algeria's national television network has taken delivery of two RCA-equipped mobile TV units, valued at approximately \$500,000.

The outside broadcast vans, equipped for complete color program operations in the field, have been placed in operation by Radio Television Algerian (RTA), the nation's government operated network.

One custom-built van houses two RCA TK-44B color cameras, control consoles and associated equipment. A TS-51 video switcher in the van assembles the complete program and provides picture transitions and special effects. Also installed in the van is a BC-100 custom audio console.

The second van contains microwave equipment for transmitting on-location programs to one of the Algerian network's studios for taping and broadcast. Living quarters for the TV crew also are provided.

RTA's main studio operation is in Algiers, and smaller facilities are located in the cities of Oran and Constantine. Broadcasts are relayed from Algiers via the non-commercial network to various parts of the country.

When the mobile units are in the field, programs will be transmitted by microwave directly to Algiers for broadcast, or to the other studios for tape recording and later broadcast.

RTA officials indicated that the new RCA vans will be used to increase remote TV coverage of sports events, cultural affairs, visits by heads of state, and other outdoor activities.

Both vans are equipped with self-contained air conditioning and dehumidification systems for operation in varying climates. Power for the television equipment is provided by an electric generator mounted in one of the vans.

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## Major Purchase By King Broadcasting Company Includes Two Cartridge Film And Tape Systems

RCA video tape and film cartridge systems, color cameras and transmitting systems valued at approximately \$1 million, have been ordered by King Broadcasting Company, Seattle, for its station group.

KING-TV, Seattle and KGW-TV, Portland, Oregon, will each be equipped with a TCR-100A and a TCP-1624 film cartridge projector, according to Jay M. Wright, King's Vice President for Engineering. KGW-TV will also receive three TK-45A studio cameras.

The TCP-1624 is the film counterpart of the TCR-100. The two systems, working together, enable the TV broadcaster to automate station breaks while maintaining flexibility to choose film or tape for presentation of commercials, news clips, station identifications and other program segments.

The TCP-1624 projects into a television camera a maximum of 24 film cartridges in a continuous sequence; each containing up to two minutes of film.

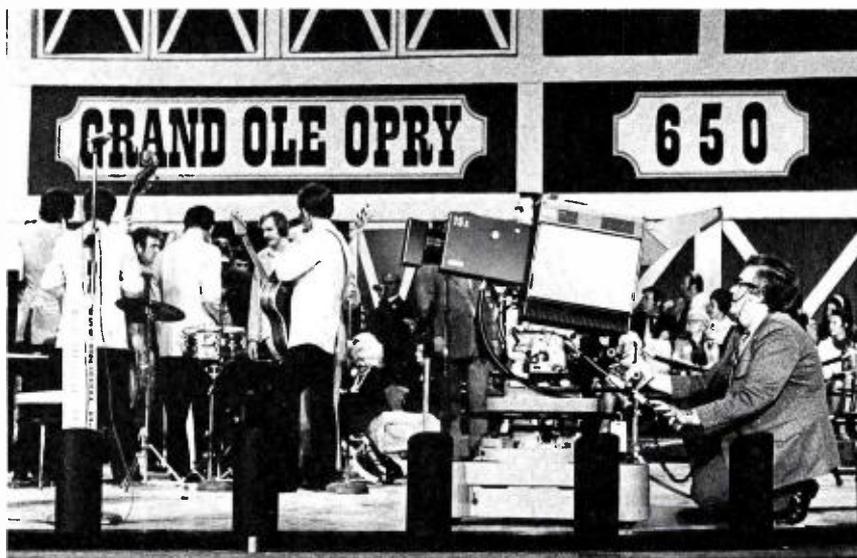
The TCR-100A to be installed at the King

stations is the latest model of the "Cart" machine which includes a built-in computer interface system and prewiring for accessories. The system has a magazine random-home feature which eliminates cartridge shuttling during a playback, record or dub sequence by allowing the operator to select the "home bin" for each operation.

Also included in the order is a 30 kW VHF transmitter, TT-30FL and a 20 kW FM transmitter, BTF-20E1 for KING-TV, and a 5 kW VHF transmitter for KGW-TV.

# IN THE VIEWFINDER

## From Opryland To Finland, TK-45A Cameras Brighten The Picture



Grand opening of the new Grand Ole Opry earlier this year included TK-45 color cameras sharing the spotlight with a stellar cast. The new Opryland facility serves as a major TV center for production of programs and commercials.

Around the world, the TK-45A is proving to be a popular successor to the TK-44. From Bloomington to Brisbane, Montreal to Melbourne, the TK-45A's are brightening the TV production scene. More than 80 of these automatic cameras have been delivered, with demand continuing to outstrip supply. Initial shipments include these:

WKAR—E. Lansing, Michigan  
WBAP—Ft. Worth, Texas  
WTAE—Pittsburgh, Pennsylvania  
KGW—Portland, Oregon  
KOB—Albuquerque  
WSM—Nashville, Tennessee  
WXYZ—Southfield, Michigan  
WDCN—Nashville, Tennessee  
Disneyworld, Orlando, Florida  
Archdiocese/Chicago  
University of Indiana, Bloomington,  
Ft. Ben. Harrison, Indiana  
CTC, Canberra, Australia  
Globcom—Canada  
TVQ, Brisbane  
SES, Mt. Gambier  
GMV, Shepparton  
BTV, Ballarat  
TNQ, Townsville  
ATVO, Melbourne  
CBC, Montreal  
Oy Mainos, Finland

## TCR-100/TR-70C Combination And TK-45A Cameras For WPRI-TV, Providence

A unique, triangle-shaped studio and office complex constructed by WPRI-TV, Providence, R. I. as a part of a complete modernization program will be equipped with RCA tape systems and cameras.

The Poole Broadcasting Co. station is installing an RCA TCR-100 video tape cartridge recorder, which will operate in conjunction with a TR-70C reel-to-reel

recorder by sharing the same signal-handling electronics.

This order represents the third TCR-100 for Poole stations, with units already installed at WJRT-TV, Flint, Mich., and WTEN-TV, Albany, N. Y.

Two RCA TK-45 live color TV cameras also are included in Channel 12's equipment order.

T. Arthur Bone, Poole's Vice President and Director of Engineering, said that WPRI-TV's new studio building was designed to facilitate production, engineering and management operations, while reducing unnecessary traffic between areas.

"The building is constructed in the shape of a triangle, which enabled us to make some unusual arrangements," Mr. Bone said. "For example, our engineering shop is located behind the master control area, so the backs of the equipment racks are right in our shop area—handy for maintenance. Master control itself is completely removed from the normal traffic pattern," he said.

## RCA Develops Light Modulator That Permits Single Laser Beam To Carry 25,000 Phone Calls or 20 TV Programs Simultaneously

As many as 25,000 persons may someday talk simultaneously over a single laser beam in a high grade telephone circuit employing a new electro-optic modulator developed by RCA scientists.

The new device—which can also modulate a laser beam to carry up to 20 TV programs at one time—represents a major electronics advance, according to Dr. William M. Webster, Vice President of RCA Laboratories, Princeton, N. J.

This is the first electro-optic modulator truly compatible with integrated circuits and capable of spatial switching, or aiming, the direction of a laser beam. It can operate over wave lengths extending from the visible to the near infrared.

Many effective modulators—which insert information into a laser beam—have been developed, but the new RCA unit is outstanding because it is simple to make and thus has low-cost potential, coupled with small size, high speed, and low voltage and power requirements.

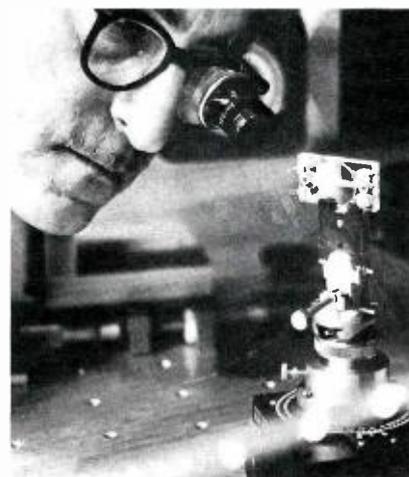
The new modulator is expected to find applications in commercial telephone, radio and television communications and specialized space and military systems using optical fiber transmission lines, as well as in a variety of systems requiring a wide range of laser modulation from a few cycles per second to billions of cycles per second (GHz).

The dimensions of the active volume of the device—made primarily of lithium tantalate—are 0.120 by 0.02 by 0.02 inches. This includes a thin film 20 millionths of an inch thick (150 strips of this film would equal the thickness of a human hair) of lithium niobate tantalate that acts as a waveguide for the laser light. The device is topped by minute interleaved metal fingers that control the functioning of the waveguide through the application of voltages.

Varying the voltage applied to the thin film waveguide alters the direction and intensity of the light passing through. These variations can be demodulated at the terminal end of the communication

system to produce the same type of electronic signals employed to provide audio and visual signals in telephone, radio, and TV systems today.

The new RCA device provides 80 per cent modulation of red light with 6 volts and of blue light with 3 volts.



**LIGHT TALK.** A laser beam controlled by an electro-optic modulator similar to the experimental unit here being examined by Dr. Jacob M. Hammer of RCA Laboratories in Princeton, N. J., represents a long step toward tomorrow's communication systems. It can modulate a laser beam to carry up to 20 TV programs at one time, or permit 25,000 simultaneous phone calls over a single circuit. The bright light spots in the picture result from the transverse diffraction of a laser beam that is used to check the basic dimensions of the modulator structure.

## WTCN-TV Minneapolis Equips New Broadcast Center With RCA Studio Cameras And Telecine Systems

As a part of its new \$5 million broadcast facility, WTCN-TV, Metromedia Television in Minneapolis, Minn., is installing RCA color TV cameras and film originating systems valued at approximately \$750,000. Five RCA TK-45A live color cameras and four TK-28 telecine systems are included in the order.

WTCN Chief Engineer Leo Domeier said

"The selection of RCA film systems was based on their superior performance and widely-held professional reputation. We chose RCA color cameras again for their quality, and for their competitive position in the market."

The new broadcast equipment will enable WTCN-TV to provide the finest production opportunities in the Midwest, as well as

the highest quality TV pictures for its audience, Mr. Domeier said.

Mr. Domeier added that the two new studios and a fully-automated master control room will greatly increase production capabilities and provide flexibility in operations. One of the studios will provide 5,000 square feet of area, the other 2,500 square feet.

# Promises, Promises and Performance to Match

Visitors to the Houston NAB Convention came looking for performance, not promises. And performance they got in the RCA Exhibit.

For example:

- The first All-Cartridge Tape and Film station break, pre-programmed and fully automatic.
- Studio-quality pictures from a new portable color camera, the TKP-45.
- A compact, low profile quad tape machine, the TR-600, with numerous built-in automatic features.
- An operating 4-channel Discrete FM Broadcast System.

And the trend toward automation of functions for simpler operation was reflected in the latest "Systems of Compatible Automatics" which were featured last year:

- Automatic Cartridge Tape
- Automatic Cartridge Film
- Automatic Studio Camera
- Automatic Telecine Camera
- Automatic Transmitters
- Automatic Control

Far from fading, these automatic systems have been expanded, refined and merged into integrated operational systems. Cautious optimism seemed to be the prevailing mood. Beyond the visible bustle of convention activity, broadcasters were backing their expressions of confidence in the future with substantial investments in new equipment.

NAB 1974 was a good show.



# NAB 1974

Video Tape

Telecine

Services

Control

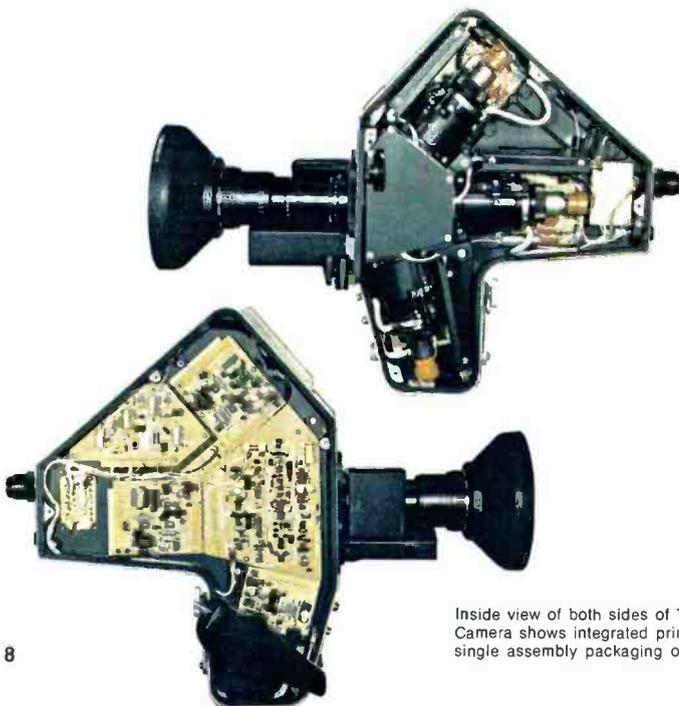
technical services

Live Studio  
Cameras



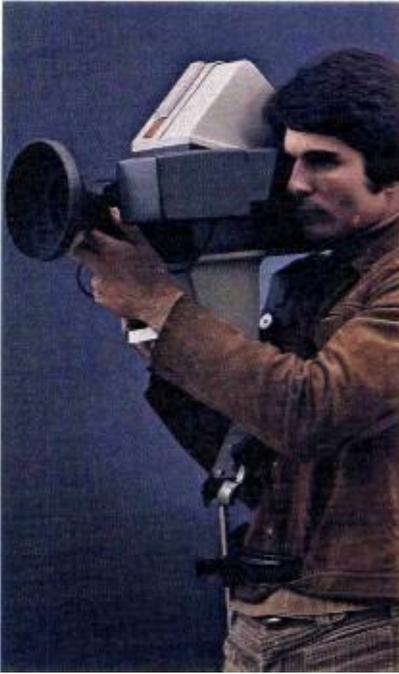


# Live Camera Studio



Along with the usual monitor displays, the Camera Control center demonstrated the compatibility and virtual interchangeability of Camera Control Units for the TK-45A and TKP-45 Cameras.

Inside view of both sides of TKP-45 Portable Color Camera shows integrated printed circuit design and single assembly packaging of optics and pickup tubes.



Newest in portable color cameras, the TKP-45 needs no backpack, yet offers automatic operating features and studio-quality pictures.



The TK-45A Camera measured up to its top rating, demonstrating its sensitivity and automatic operating features—while delivering superb, noise-free color pictures.



New Triax Cable Adapter permits using inexpensive cable between the TKP-45 camera head and CCU for distances up to 5,000 feet.

Packed audiences overflowed the studio theatre at every performance. For camera buyers, it was an exciting, convincing demonstration of how far color cameras have come—and where they're going.

The studio set was an eye-filling potpourri, providing a realistic setting for putting the cameras through their paces. The authentic Antique Shop was stocked with assorted glassware, copper utensils, chests, bird cages, carvings, clocks, statues, a loom, and a host of other memorabilia valued at more than \$40,000.

Three cameras were demonstrated: the moderate-priced TK-630; the automatic TK-45A, and a totally new portable camera, the TKP-45.

The TK-45A's picture quality; its sensitivity; its ability to handle virtually every nuance of color, any lighting situation—again demonstrated why this camera is a worthy successor to the TK-44.

One measure of quality in any color camera is sensitivity, the ability of the camera to maintain full-fidelity, full-level color pictures under widely varying conditions of light, indoors and out. The TK-45A's five foot-candle sensitivity is largely made possible by a unique internal bias light system which gives the camera the ability to cope with just about any lighting situation—just short of no light at all.

The low light level performance has other operational benefits—such as reducing studio lighting to that needed for mono-chrome cameras, with resultant savings in power and air conditioning costs.

The quality of the TK-45A was further demonstrated through such exceptional features as contour enhancement; "Chromacomp" for precise colorimetry and camera matching; prism optics; and a unique system of scene contrast compression which lets the video operator pull out details from the shadows, while leaving highlights unaffected. New also is an indoor-outdoor switch that electronically compensates for color temperature differences between studio and outdoor locations. Another switch for super-quiet pictures can increase the signal-to-noise ratio by 3 dB under ample lighting conditions. And new low-noise preamplifiers enhance performance.

This new camera is called the "Automatic TK-45A" for good reason. For instance, black balance is achieved automatically every time the cameraman or video operator caps the lens. White balance is automatically restored by framing on any white reference in a scene and pushing a button. Automatic iris simplifies video operation.

And automatic centering is an optional feature that provides precise registration during camera warm-up.

Together, these TK-45A features provide the means for achieving better color pictures with less effort, fewer technical manipulations.

Making an impressive debut was a completely new portable TV camera with TK-45 quality. The TKP-45 portable is so much like the TK-45 that it shares the type number as well as using the same camera control unit.

Until now, good color cameras weren't portable enough, and portable color cameras weren't good enough. The TKP-45 changes all that.

A compact 20-pound unit complete with 6x zoom lens and viewfinder, the TKP-45 operates without a backpack. Relieved of the load on his back, the cameraman is free to move about, to concentrate on picture composition.

Striking results were achieved as the cameraman carrying the TKP-45 glided effortlessly through the "Antique Shop" set, handling long shots, zooming in for medium closeups; crouching for extreme closeups.

Picture quality was superb—understandably so, since the TKP-45 comes with the same basic features as the TK-45A: contouring with combing; Chromacomp; automatic balance controls; prism optics; scene contrast compression; bias light, and automatic iris.

The TKP-45 is connected directly to the camera control unit by a flexible, lightweight cable, less than 1/2-inch in diameter. The cable may be up to 1500 feet long. For longer cable runs, a new Triax Cable Adapter permits using inexpensive tri-axial cable between the camera and CCU for distances up to 5,000 feet.

Portable cameras are subjected to rugged use and even abuse. The TKP-45 design acknowledges this operating condition—and does something about it. For example, just about all interconnection is integrated into a printed circuit design, yet all components are readily accessible. The lens, color-splitting optics, and lead oxide pickup tubes have been combined into a single assembly which is shock-and-vibration-isolated from the camera case and other hardware. Consequently, the TKP-45 operates and stays registered through the hardest use.

At NAB, the industry's most competent color camera team shared the spotlight—the premier TK-45A and the exciting new TKP-45 portable!

Another industry "first" was scored in the RCA "On-Air Profit Center"—a completely automated station break utilizing both tape and film cartridge systems. The two program sources—a TCR-100 Cartridge Tape System and a TCP-1624 Film Cartridge Projector—were demonstrated in tandem operation, controlled by a TAC-1 Automatic Programmer which provides for storage and display of 15 program sequences of up to seven events each.

This promising new system can increase efficiency and improve profit opportunities in ways never before possible. Tapes, films and slides merge in a unified presentation of spots, promos, ID's and PSA's. And it all happens automatically, without human intervention, without the risk of human

error. Switching among film and tape cartridges is smooth and instantaneous, with crisp, clean vertical interval switching and consistent color quality.

The best known "Profit Center" component is the widely-used TCR-100. With this tape "cart" system, less is *more*. There's less wear on heads, less tape used, less storage space, less energy and less manpower needed. It adds up to the most efficient, economical and easiest-to-operate automatic station break and production machine.

The station-tested TCP-1624 Film Cartridge Projector again demonstrated its role in achieving the automatic station break. As with other RCA Automatic Systems, the TCP-1624 is designed for easy operation.

It 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.

First the film reel is loaded into the cartridge case. The reel holds up to two minutes of film and can also be used on any standard projector. The film cart is placed on the carousel tray which holds up to 24 cartridges. The carousel is easily removed and another pre-loaded carousel put in its place.

For flexibility, the TCP-1624 can operate in either "single event" or "automatic sequential" modes. Since the system has two film transports, while one projector is running a film, the other is rewinding

# Automated Station Break



The "On-Air Profit Center" combined the talents of the TCR-100 and the TCP-1624 Film Cartridge Projector to depict the efficiency and profit potential of automatic programming.

the previously shown film and cueing up the next one. In the "single event" mode, the system is operated manually by pushbuttons.

Picture quality is the best available from film spots, and since the film doesn't get handled, it lasts longer. There's no need for extra duplicates of film spots, either. This unique system can broadcast a single spot or a sequence of spots in any combination—from 10 seconds to two minutes—without operator assistance.

TAC-1 is a new cue-operated programmer which can be set up to automatically sequence as many as 80 program segments. It can control cartridge tape and cartridge film systems as was demonstrated at NAB, or various other program sources, including reel-to-reel TV tape recorders, film and slide projectors, multiplexer mirrors, and audio tape machines. Many combinations of these machines can be integrated into the programming sequence controlled by the versatile TAC-1.

To start a commercial break (or other program sequence), the Programmer needs an end-of-message cue from the program source—or may be started manually. From there on, the TAC-1 produces sequences automatically—up to and including the return to program. The source and the number of events to be aired consecutively for each stored sequence, as well as the on-air event, are identified and displayed.

The programmer and associated source machines are loaded sequentially for the station break, in accordance with the station's program log, so a separate log is not required. And, last minute changes can be made before the next spot is scheduled for broadcast.

TAC-1 is programmed via a keyboard to play as many as seven events from each program source. Since it has a storage capacity of 15 such program sequences, several breaks can be loaded in advance. In normal operation, as sequences are switched to air, their former storage location is cleared and can be reprogrammed.

In effect, TAC-1 is the brain behind fully-flexible automatic operations—the programmer that coordinates the use of tape and film machines, adding slide and multiplexer control to station breaks. And the low price of \$9,500 makes the TAC-1 an especially attractive station addition.

With the TAC-1 Programmed orchestrating the complete station break with the Cartridge Film and Tape Systems and other program sources, automatic operation is not just a coming thing—it is already within easy reach.



Interested audiences crowded the "Profit Center" to see the cartridge tape and film systems perform station break magic. Switching among tape and film cartridges was smooth and instantaneous, with consistent color quality.



As many as 80 program segments can be sequenced automatically with the new TAC-1 Automatic Programmer. Sources can be tape, film or slide.



A major attraction at the show, the TCP-1624 can handle up to 24 film cartridges on a carousel tray. This unique system can broadcast a single spot or a sequence of spots in any combination, from 10 seconds to two minutes.

# The Quad Line Expands

A special Tape Theatre showcased the complete line of quad TV Tape Recorders. This presentation was highlighted by the announcement and demonstration of RCA's New Technology tape machine, the TR-600.

The quadruplex TR-600 is new in every respect. New shape and styling; new electronics; new performance parameters; new ease of loading and operation. And numerous built-in features. Standard features include chroma amplitude and velocity color correction (CAVEC); Drop-out Compensation (DOC); single frame electronic splicer; automatic control track phasing; record current optimizer; tape timer; waveform monitor. All of these plus a new Venturi vacuum air system, a compact design—and much less weight. Good news, too, in the pricing. At \$79,500, the TR-600 is a lot of tape machine value.

Along with the TR-600, the other RCA VTR's were in operation:

- The TR-70C Teleproduction recorder was used to demonstrate Quad IA—a method of achieving full quadruplex performance at 7½ inches per second—affording users the opportunity to cut tape costs in half.

With its stringent video and audio specifications, the TR-70C offers many advantages for teleproduction functions. Designed to produce highest quality tape masters and multiple-generation dubs, this tape machine features many built-in automated functions, including CAVEC for automatic correction of color errors, and Color Dropout Compensator (DOC). These features, in combination with a reputation for "workhorse" performance, are making the TR-70C

increasingly popular with critical tape users and producers. The TR-70C's price of \$103,000 makes it the economical buy in premium quality tape recorders.

- The medium-priced TR-61, introduced a few months before NAB as a replacement for the TR-60, incorporates new built-in features, but the price is still pegged at a modest \$75,900.

Both CAVEC and DOC have been incorporated in the TR-61. And this new machine also has an exceptionally stable digital servo system controlling the headwheel and capstan motors that provides one-second lock-up. This system is identical to that used in the TR-70C. The TR-61 is endowed with other premium recorder features such as guide servo, rear-side erase heads, long-life Alfecon II headwheels and extensive monitoring facilities.



The Tape Theatre featured a display of the complete RCA quad line, and introduced the New Technology TR-600.

These inherent performance capabilities and a compact size make the TR-61 well suited for mobile units or for studios with limited floor space. Even where space is not a factor, the budget-priced TR-61 is an excellent performance/value investment.

- The TPR-10 Portable VTR is a two-piece luggage-size system that goes anywhere, brings back quad pictures, and is an ideal field companion for the TKP-45 Portable Camera.

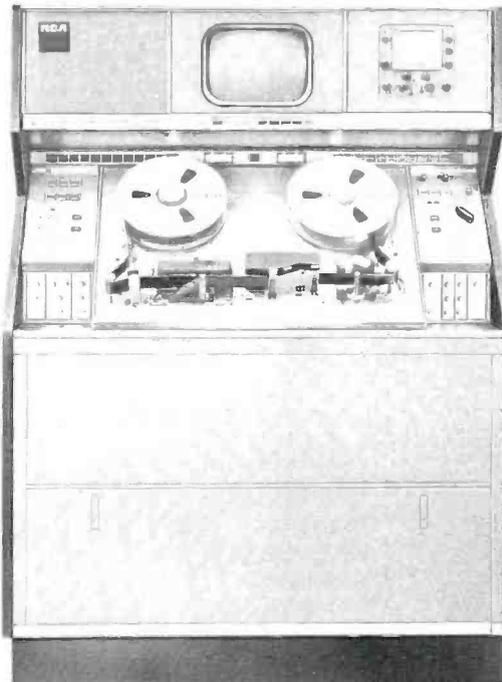
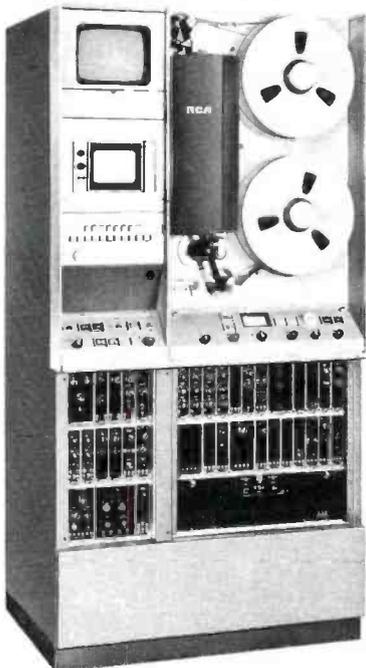
The compact size of the TPR-10 has no effect on its performance. It records full studio quality color on two-inch tape in quad format, providing 20-minutes of continuous recording time. The tapes can be played back on the spot for immediate verification. Full erase facilities are included, so re-shooting a scene is no problem.

Since the TPR-10 is small enough to fit into a small van, or even a station wagon for remotes, it can be teamed with a TR-61 in a larger mobile unit for color playback and field editing.

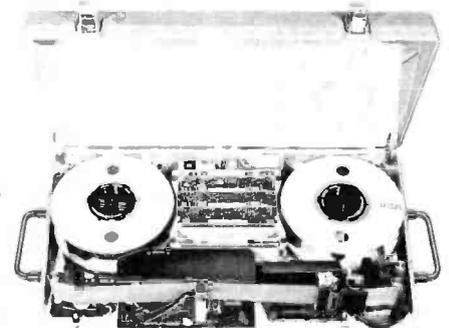


Introduced at NAB was the New Technology TR-600, a fresh departure among quad tape recorders. Smaller, lighter, and easier to operate, it includes numerous built-in features and operator aids such as drop-on loading.

The TR-61 comes complete with CAVEC and DOC, as well as a stable digital servo system for one-second lock-up.



Reliable performance and the ability to produce highest quality tape masters and multiple generation dubs are among the reasons for the growing popularity of the TR-70 with critical tape producers.



The TPR-10 packs full color quadruplex performance in a portable, luggage-size package. Instant playback and full erase facilities are useful features for "on location" assignments.



# The "Cart" Gets Better

More than 200 TCR-100 Cartridge Tape Recorders are now in operation world-wide. Aided by this wealth of user experience, the state of art advances. And so it was natural—even expected—that the TCR-100 demonstrated at NAB would include new features.

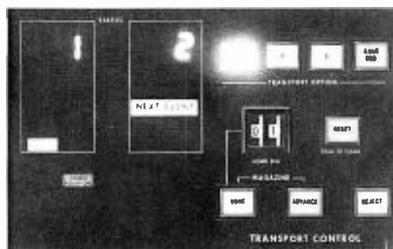
The "new" TCR-100A is a better machine and is equipped with several new features to make it even more operationally effective. It includes a built-in computer interface system and prewiring for electronic program identification, editor, and automatic control track phasing accessories. Random-Home is another feature which provides for quick handling of carts between playback and recordings. Playback, record or dub sequences are accomplished without "cart" shuttling or logging.

All of these, plus other technical improvements for added reliability. Unchanged in the "new" TCR-100A are the use-proven simplicity of operation, the ease of set-up, the flexibility of handling last-second changes or the color uniformity.

Many TCR-100 users are combining the "Cart" machine with a reel-to-reel recorder,

sharing the signal processing circuitry. This combination adds flexibility.

For example, with syndicated tape programming, automatic on-air playback is easy. Using a TR-61 or TR-70C as the "master", program tapes can be used for automatic switching between the two machines, with the TCR-100 playing the break "carts" and the TR-61 or TR-70C playing the program tape. And, while one machine is in the "play" mode, the other can be recording.



Built into the TCR-100A is the "Random Home" feature which makes it easier to go from playback to dub and back to playback again.

Production work, delayed broadcasts, short news segments, and making A-B dubs are some of the assignments the versatile Reel/"Cart" combination can handle.

The NAB TCR-100A also demonstrated the optional EPIS (Electronic Program Identification System). This valuable accessory displays a visual readout of the "carts" threaded up and cued in the tape transports. A hard copy printed EPIS output can also be provided for computer verification and for billing purposes.



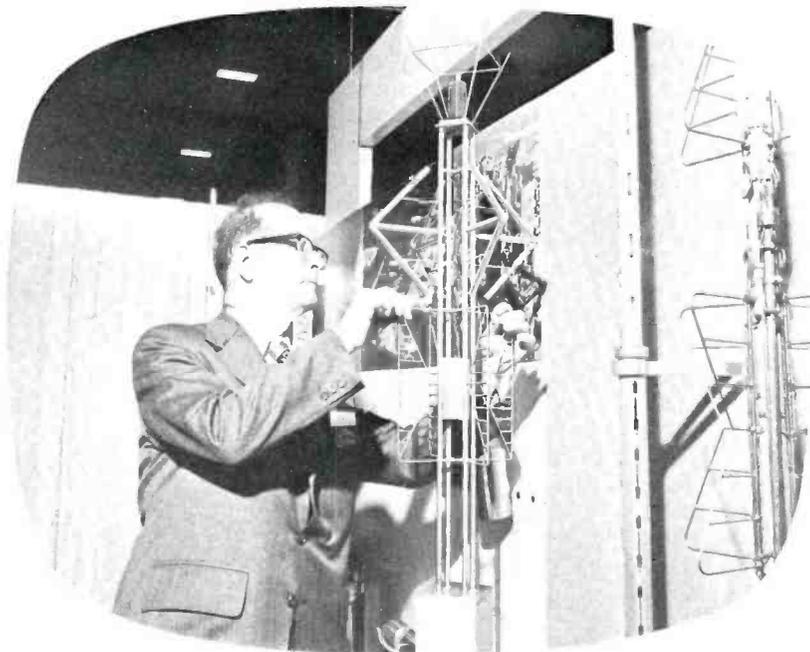
EPIS (Electronic Program Identification System) is an optional TCR-100 feature which displays an alphanumeric identification of cued and on-air cartridges.

# TV Transmitting Systems

Three TV Transmitters were featured—a UHF, a Lowband and a Highband VHF. Shown for the first time at NAB was the TTU-30C, a 30 kW UHF Transmitter which is solid state up to the final amplifier. The klystrons are the only tubes in the transmitter (1 visual, 1 aural). Two new generation, full color "F"-line VHF Transmitters were represented: The TT-25FL, 25 kW Lowband and its Highband counterpart, the TT-25FH.

In Antennas, the show news centered on circularly polarized TV antennas. The success of circular polarization in FM broadcasting has stimulated interest among TV broadcasters, since these antennas offer the potential for improved service, more solid coverage and reduction of reflections.

Comparative tests authorized by the FCC are now being conducted by WLS-TV, Chicago, utilizing two RCA antennas mounted atop the Sears Building. One antenna transmits the normal horizontally polarized signal; the other circularly polarized signals. The results of the A-B comparison tests will be evaluated and presented to the FCC to aid in their decision to permit such transmissions in the future.



A number of antenna models were on display, including one of the circularly polarized TV antenna now in operation at WLS-TV, Chicago.



Three in a row. The TV Transmitter line-up at NAB included the TT-25FL lowband, the TT-25FH highband VHF systems, and the TTU-30C UHF which is solid state up to the final stage.

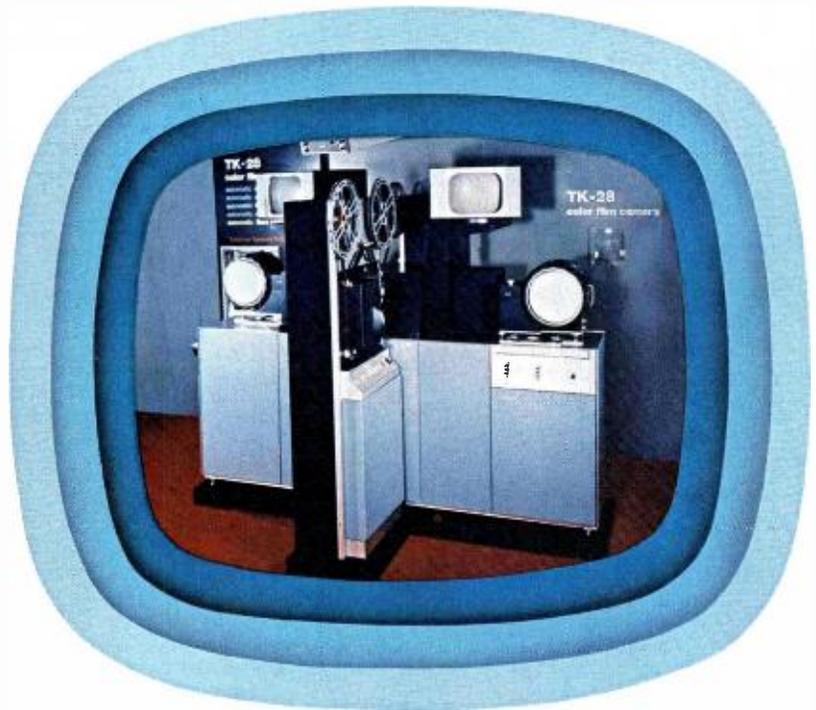
# Automatic Telecine System

In the Telecine area, the TK-28 Automatic Film System gave a glittering performance, showing why in a short span of time it has become the choice of broadcasters and teleproducers. The proof as always is in the pictures—sharp, noise-free, "live camera" quality pictures.

With its innovative design, the TK-28 opens a new era in television film reproduction, automatically correcting for film and color variations to achieve uniform picture quality. It actually improves the reproduction of original color film where necessary, and does it dependably, economically and automatically. Automatic level control in the camera compensates for variations in film density and contrast range to provide true, vivid images.

Other automatic circuits maintain color balance and correct for printing errors and color temperature variations without the need for manual painting. And, since the automatic color balance will not over-correct properly balanced film, it can be kept on line during the entire telecine operation, assuring continuous, accurate color reproduction frame-after-frame, slide-after-slide.

Two complete TK-28 systems were utilized at NAB, including one for the TCP-1624 Cartridge Film System demonstration.



# Video IV Character Generating System



Close attention was given to the Video IV Character Generating System demonstrated for the first time at NAB.

With the demonstration of RCA's Video IV system, Character Generators took a large step forward at NAB. This technically advanced system utilizes a computer-style keyboard and "floppy disc" memory to generate letters, maps and even animated figures.

The system is unusually versatile, providing up to eight separately programmable channels for on-air operation and up to eight for editing functions.

The capability of Video IV extends well beyond the customary news bulletins, sports scores and alphanumeric information TV displays. A unique feature of this system is "on site font generation" in which the operator uses the keyboard to draw bar charts, maps and other graphics, including exotic language symbols such as Arabic or Hebrew or the creation of simple cartoons.

The system uses a "floppy disc" as its memory, with each disc having a 3,000 line storage capacity. Up to eight different colors can be generated, and these can be selected for background, words, or even for individual letters in the display. A second color can be chosen for letter edging if desired.

Available systems include an economy, non-expandable single-channel; an expandable single channel (to three channels); a two-channel expandable (to five channels); and a four-channel expandable (to eight channels). One edit channel is a part of each system, and additional edit channels can be added for each program channel, up to eight.

Based on its NAB performance and field tests, the Video IV will soon be making its mark as another effective production tool.

# Aural Broadcast

Highlighting the Radio display area was a demonstration of RCA's newly-developed four-channel discrete FM stereo broadcast system.

This operating system included a four-channel FM Transmitter, plus a Turntable, a reel-type Tape Recorder, Audio Console, and a Receiver, all designed for the four-channel operating format. Special headsets permitted listeners to hear the four separate audio channels.

This system, compatible with existing two-channel and mono receivers, is now being field-tested.

Other radio products displayed and demonstrated were AM and FM Transmitters, Consoles, Signal Processing equipment, and a new Audio Automation System, the DAP-5000A, with 2,000 event memory and capable of expansion to 8,000 events and 96 program sources.



# Services . . . Services

Technical Services is new in name only. It represents the consolidation of many inter-related functions, services and operations which have been handled by various organizations within RCA.

The Technical Services area at NAB offered broadcasters the opportunity to discuss services and technical problems with staff experts. Customers could access the RCA Parts & Accessories computer at Deptford, N. J. for an immediate status report on their replacement part orders. A video terminal displayed the information.

The chief resource of RCA Technical Services is people—competent, thoroughly knowledgeable people. The organization is staffed with a multiplicity of occupational skills: Systems Engineers, Project Managers, Technical Educators, Equipment Specialists, Planners, Installers, Testers, and Servicemen.

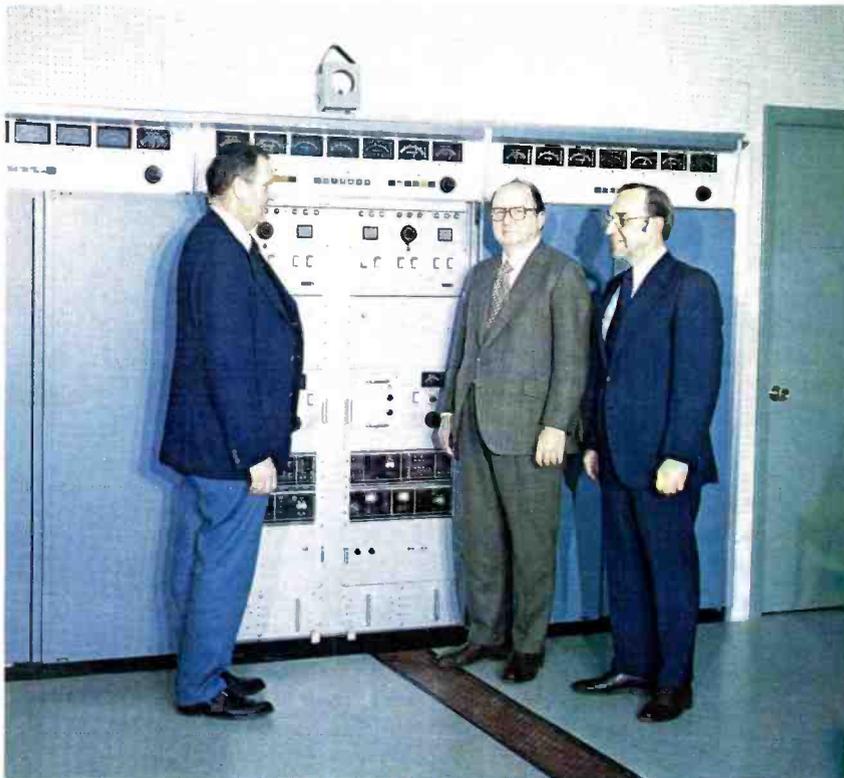


Broadcast-related Technical Services include:

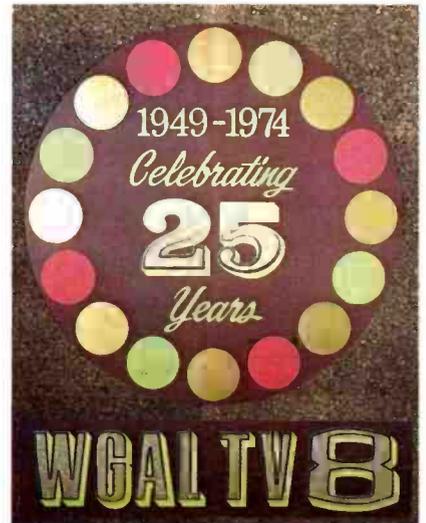
- Technical Training
- TECH ALERT
- Turnkey Installations
- Television Mobile Units
- Equipment Refurbishing
- Custom Equipment Design
- Replacement Parts

By organizing these activities as they relate to Broadcast Equipment, our goal is to improve customer service through shortening communications lines and pinpointing responsibilities. ■

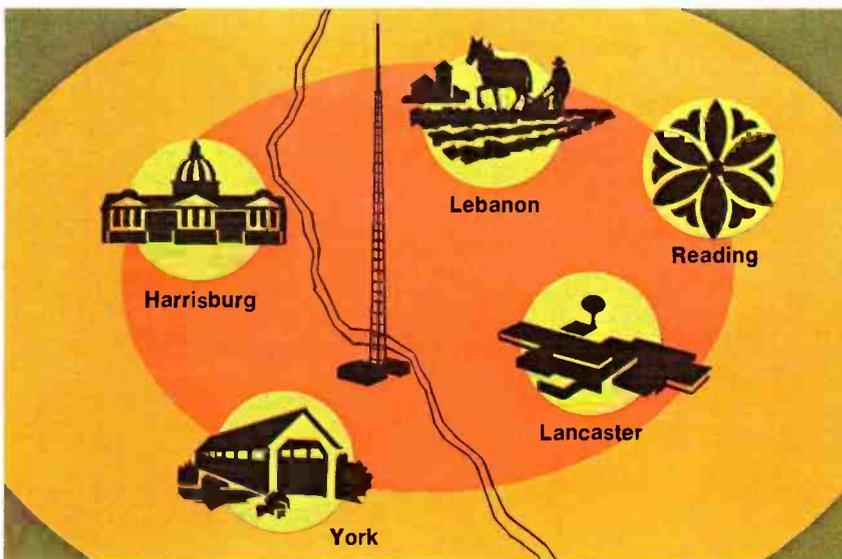
# WGAL-TV celebrates its "25th" with an all-new transmitting system



Inspecting WGAL's new 35 kw VHF Transmitter (TT-35FH) is President Clair R. McCollough, flanked by General Manager Harry Shaub on his right and Chief Engineer Wayne Seacat.



The new 747-foot tower topped with the 76-foot Traveling Wave Antenna is seen next to the old Superturnstile Antenna, which stands 502-feet above the ground.



WGAL pioneered the multi-market concept in TV coverage.

Typically, WGAL-TV, Ch. 8, Lancaster, Pa., celebrated its 25th Anniversary on air by investing in a new Antenna/Transmitting system for providing improved service to its coverage area. The new system includes a TT-35FH, 35 kW parallel transmitter and a 9-gain Traveling Wave Antenna mounted on a taller tower. The new system replaces a TT-50AH installed in 1954.

Clair R. McCollough, President of WGAL has been a part of the Steinman operation for more than 50 years. He observes that 25 years ago when WGAL started television broadcasting, TV was a novelty, and a conversation piece. Today the audience is far more sophisticated, and the task of supplying meaningful programming is far more complex.

He notes with pride that WGAL was the

37th TV station to go on-air, and Lancaster was the smallest city in the post-war, pre-freeze period to have a TV station. This fact verifies Mr. McCollough's early faith in television. And, it also confirms his foresight in developing the multi-market concept in TV coverage. Lancaster is only one of many nearby population centers which can be reached with a city-grade signal. The present antenna site at Hellam, Pa. is so situated that the Ch. 8 signal covers Harrisburg, York, Reading and Lebanon as well as Lancaster with a full strength signal. The wisdom of multi-city positioning shows in the statistics: WGAL leads its market (#53) in total homes and has been the dominant station in its market from the time it went on air 25 years ago.



Master Control as it looked in 1951.



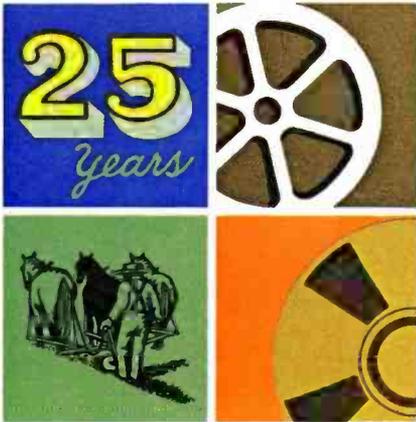
Local programming during the early days of WGAL.



The original Master Control Console.



The RCA TK-10 Camera brings back memories of a glorious era.



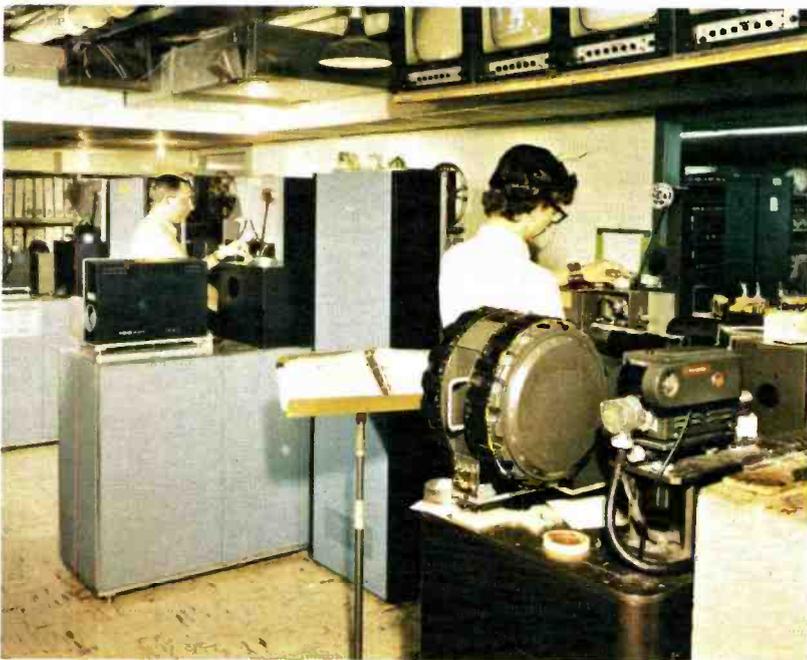
The first broadcast from fledgling WGAL-TV originated from a small studio in downtown Lancaster, with a TT-500, 500 Watt transmitter. Interestingly, the channel assignment then was "4". This, it was later found, created some co-channel spacing interference with Ch. 4 stations in New York City and in Baltimore. Consequently, when the freeze ended, WGAL was assigned Ch. 8. A TT-50AH, 50 kW VHF Transmitter was installed in 1955, along with a 12-bay Superturnstile Antenna, providing the maximum authorized ERP of 316 kW. At this time the antenna and transmitter site was moved to Hellam, which is centrally located to cover the multi-market area. The tower and antenna height was 502 feet above terrain.

The change to the Superturnstile Antenna and new Transmitter shows another facet of the WGAL operation—a recognition of the need to maintain quality facilities and programming. In 1956, another major move was made to the present studio location in suburban Lancaster. Careful planning of this facility has enabled it to keep pace with changes in the years since then.

In maintaining its market leadership, WGAL switched to color early in the game. During color's formative years, Ch. 8 had more total color programming than any other Pennsylvania station, according to Mr. McCollough. A great deal of missionary work was required of TV stations to encourage local dealers to stock television sets. Building the market required a con-



WGAL's pleasant studio facility is quite a contrast from the original storefront studio in downtown Lancaster.



TV's technological growth is displayed in this grouping of past and present WGAL film and tape sources. Shown are the contrasts between early monochrome and modern color film islands, along with those of early low-band and contemporary high-band tape machines.

tinuous promotion effort, Mr. McCollough recalls.

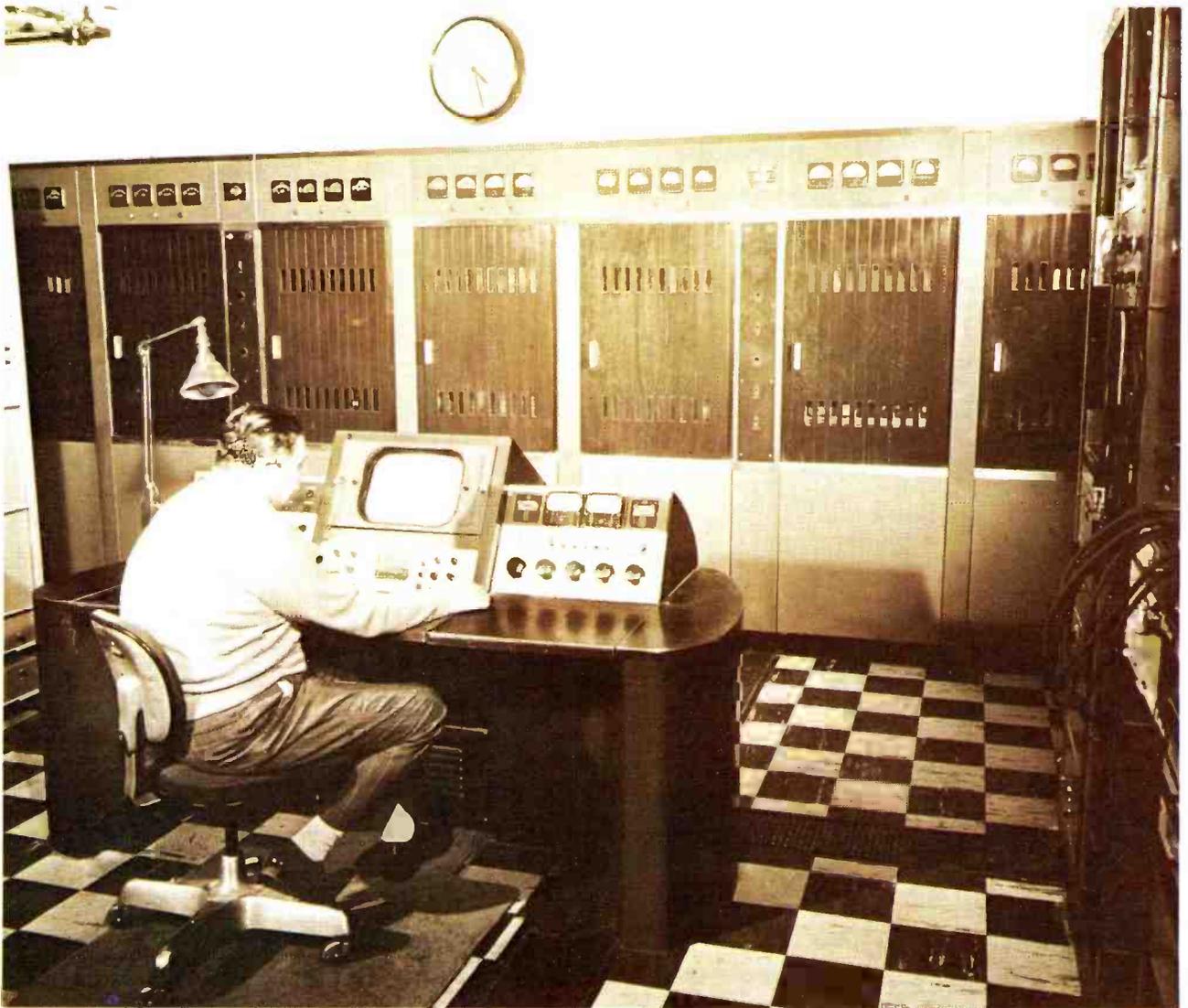
Harry J. Shaub, General Manager of Steinman stations has been associated with the Steinman group in varied managerial capacities since 1950. Mr. Shaub reflected on other factors in Ch. 8's achievement record—particularly people. Enthusiastic, dedicated and talented people.

"There is no finer staff in broadcasting," Mr. Shaub said with conviction. The feeling must be mutual, since the WGAL staff is studded with long-term employees, many of whom started in the radio operation and moved into TV.

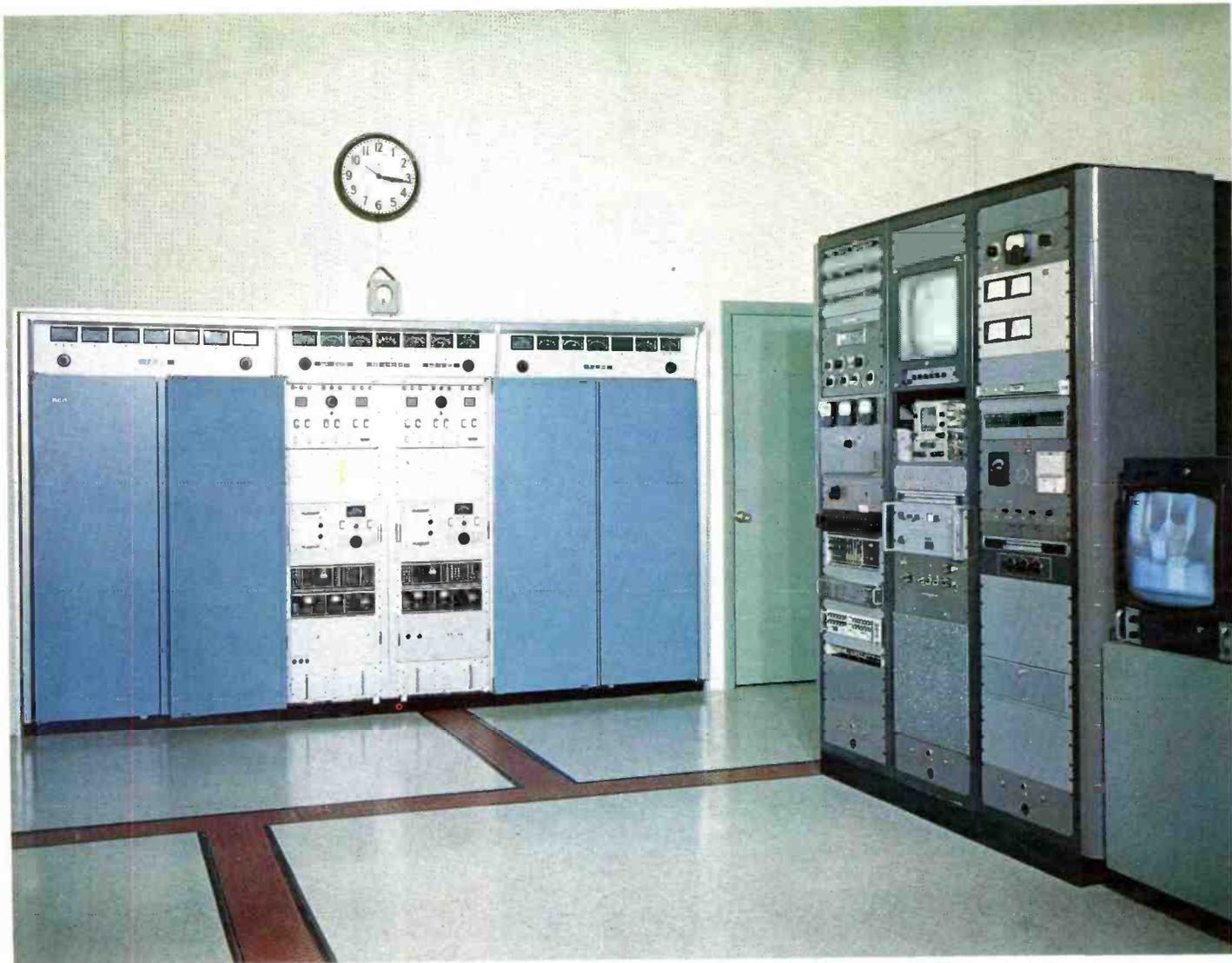
One of these "25-Plus" employees is Chief Engineer Wayne Seecat. Soft-spoken and unruffled, Mr. Seecat manages to keep the technical operation of WGAL running

smoothly without the customary turmoil and tension. This has not been an easy task, especially over the past two years while the new transmitting plant was in the planning and installation stages under the supervision of Messrs. Shaub and Seecat.

The TT-50AH transmitter had provided excellent service for some 19 years, according to Mr. Seecat, and had been modified for improved color transmission. However, technical advances in transmitter design, most notably in color performance and in remote control capability, coupled with population shifts in the WGAL coverage area made a new system desirable. After careful consideration, it was decided to replace the entire transmitting plant, including a new antenna and a higher tower.



The old 50 kw TT-50AH Transmitter and Control Console remain in the Hellam transmitter building.



The new 35 kw VHF (model TT-35FH) parallel transmitting system is actually two 17 kw transmitters providing complete redundancy and improved color transmission.



The impressive performance record of RCA's Traveling Wave Antenna made it an obvious antenna choice.

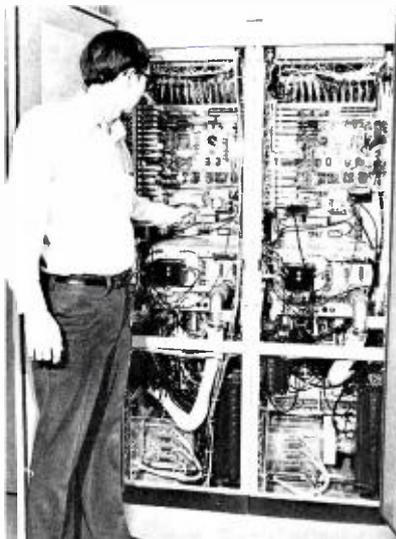
Clearance was obtained from the FAA to increase tower height by several hundred feet. Consultant Oscar Reed of Jansky and Bailey ran extensive shadow profiles from the transmitter/antenna site at Hellam, showing reflection problems and indicating theoretical coverage patterns at different antenna heights.

With the taller tower and the TW characteristics of filling nulls, it was determined that improved coverage and a better quality signal could be obtained—along with a reduction in power from 316 kW ERP to 112 kW. This cutback in power also made it possible to change from the 50 kW to the solid state 35 kW Transmitter—a real "plus" in the present energy shortage situation.

The TT-35FH parallel transmitter provides needed redundancy, Wayne Seacat says, and is designed for remote control. Since the transmitter system is actually two 17 kW transmitters, and Ch. 8 now requires only 13 kW to achieve its ERP, one side of the transmitter is sufficient for full power operation.

The WGAL transmitter also incorporates the added feature of Bi-Level Switching, which permits operating the transmitter at full power, even with one side down. Bi-Level Switching provides a 3 dB pad for Visual and a 3 dB pad for Aural. When one transmitter drops out, the bi-level switch cuts the pads and brings the on-air transmitter up to full power output in less than 3-seconds.

For further efficiency, the WGAL transmitter includes a frame-mounted OPTO-Switcher for achieving optimum VSWR. This system is particularly useful in maintaining picture quality when changing transmitter outputs.



Engineer checks transmitter's Bi-Level Switching which permits it to operate at full power, even with one side down.

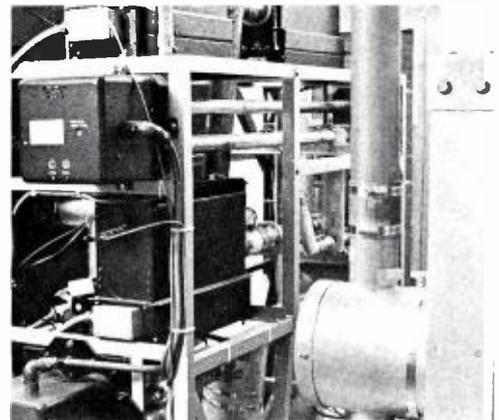
Visual and aural outputs of each transmitter side are switched as a unit, with minimum load change. Both aural and visual amplifiers of the transmitter being tested are run into test loads and the reject load of the aural transmitter becomes the test load for the aural transmitter being tested.

Mr. Seacat noted that an advantage of the twin transmitter design is having a "match" for comparing readings and measurement. The entire transmitter uses only six tubes, resulting in reduced operating and tube costs. And the solid state design also provides superior color capability and makes the transmitter easier to tune.

The transmitter building at Hellam was enlarged to accommodate the new TT-35FH. Installed adjacent to the TT-50AH which is still in place, the new transmitter

offers a dramatic visual comparison of the size reduction that new technology and solid state design have made possible.

The new WGAL tower is 747 feet, topped by the 76-foot Traveling Wave Antenna, for a total height of 823 feet above ground.



The Opto-Switcher with its combiners, coax switches and switch panel.

The TW antenna is a 9-gain, with a .6° beam tilt. The previous antenna and tower were 502 feet overall.

The TW antenna was completely pre-tested at RCA's Gibbsboro antenna "farm", including a complete run of circularity and horizontal pattern. These tests made on WGAL's frequency and checked by a field test intensity meter and strip recorder indicated that the actual measurements matched those projected by the computer.

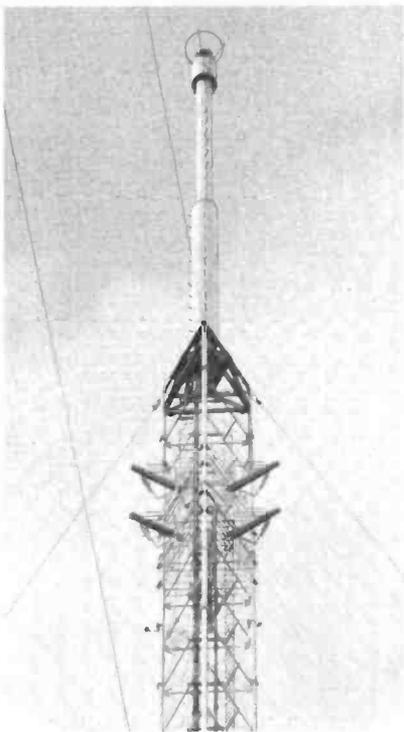
Also installed on the new tower is the latest in FM antennas, a two-layer, 6-panel BFB. The gain of this antenna is such that the WGAL-FM transmitter, a 10 kW BTF-10E1, is now operating at only 5.5 kW.



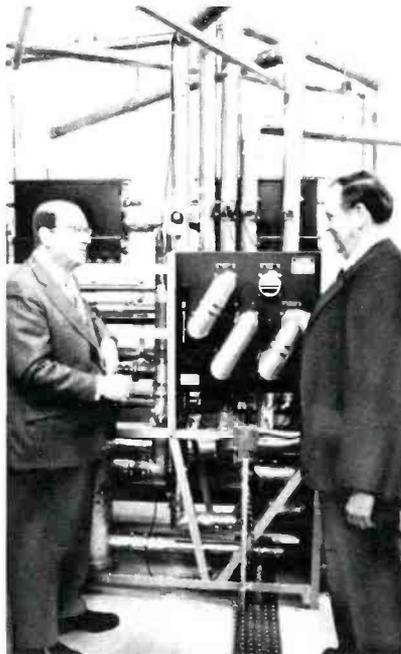
The new TT-35FH Transmitter is located on this addition made to the Hellam building.

while delivering a clear, strong signal of maximum allowed ERP over the entire coverage area.

NBC network programs are microwaved from Philadelphia to the tower at Hellam, then microwaved again to the studio for switching and back to the tower for on-air transmission.



Below the Traveling Wave Antenna at the top of the tower is WGAL-FM's new RCA two-bay-panel FM antenna, model BFB.



Wayne Seacat and Clair McCollough discuss the value of the Opto-Switcher when changing transmitter outputs.

The STL is also microwave, with multiplexed audio and video, covering the 14-mile distance from studio to antenna/transmitter site.

The change to the new antenna/transmitting system was made early this year, without fanfare or promotion. Viewer reaction, Harry Shaub is pleased to note, has been positive. All comments received have been favorable, and particularly from the fringe areas and locations which were formerly in the "nulls". The Traveling Wave provides far better coverage near the antenna site, a rapidly building suburban area.

The new Antenna/Transmitting system is another forward thrust for WGAL to keep pace with technology. Clair McCollough sees it as a part of the continuing effort to maintain market leadership through better service. That has been the philosophy of WGAL-TV for its first twenty-five years, and one that is not likely to change in the years ahead. ■

### Clair McCollough . . .

Clair McCollough, President of WGAL-AM-FM-TV, Lancaster; WTEV-TV Providence; WDEL and WSTW-FM, Wilmington, Del., has enjoyed the bustling, dynamic life that most people dream about. A vigorous, outgoing activist, Mr. McCollough's broadcast career spans some 45 years, beginning on a part-time basis in 1929 with a 50-watt radio station. In 1931, radio became a full time occupation, with the acquisition of a 500 watt station in Wilmington. Shortly thereafter, a higher-powered station in Wilmington was purchased, and in 1932 a Lancaster station, WGAL-AM was added—followed by a series of other Pennsylvania AM stations in York, Reading, Easton, Harrisburg and Hazelton. FM broadcasting was inaugurated by WGAL in the early 1940's.

One of the programming innovations initiated by Mr. McCollough was the first regional baseball network which was set up in conjunction with the Atlantic Refining Company and its advertising agency, N. W. Ayer Company. This sports network concept was the successful forerunner of similar program "packages" which are now commonplace.

Mr. McCollough's list of achievements is incredibly long, reflecting his "let's do it" philosophy. He has served as Chairman of NAB; Acting President of NAB; Chairman, NBC Affiliates; Founder first Chairman of Television Information Office; Founder and first Chairman of TV Bureau of Advertising; Chairman, Broadcast Pioneers; President, TV Pioneers.

Along with this industry activity, Mr. McCollough carried an equally long service record in non-broadcast functions—Chamber of Commerce; Boy Scouts; Cleft Palate Clinic; Community Chest; Lancaster Symphony Orchestra; Salvation Army; Big Brothers, and a host of others.

# WGAL-TV

## Comprehensive Color TV System For Corporate Training At Arthur Andersen & Co.



Exterior of Arthur Andersen & Co. Center for Professional Development, located in St. Charles, Ill. Two buildings can accommodate about 700 people for both living and meeting room space. The television facility occupies about 3,000 square feet of space in the Center.

Arthur Andersen & Co., with world headquarters in Chicago, operates from ninety-four offices around the world. It is a partnership of almost 900 active partners, a staff of 12,000 and with a business volume exceeding \$300,000,000 annually.

Extremely communication-conscious, the accounting firm operates a television facility that's as modern and well-equipped as many commercial broadcast stations. And yet, Harry Paney, Manager, Audio Visual Division, points out, "Television is only one element in the 'spectrum of media' the Company utilizes in its extensive training activity."

An example of the utilization and advantages of television is cited by Mr. Paney in an article in the January 1974 issue of *The Arthur Andersen Chronicle*, an internal publication.

"In December 1973, John March, Vice Chairman—Accounting and Auditing Practice, spoke to almost every audit partner and manager in the Firm's 94 offices throughout the world. To accomplish this by *conventional* means would have involved over 25,000 miles of air travel, a time expenditure that would have far exceeded a month, plus super-human endurance and effort. In fact, it required only a trip of about 45 miles from the Chicago office and a day spent in the Firm's television studio. Since our color studio began operation in January 1973, this experience has been repeated many times."

The field of Accounting is fast-paced and changing, continually affected by government rules and regulations, tax law changes, international trade practices, data processing methods, etc. Since Arthur Andersen provides a resource of skilled manpower, their personnel must be well informed on latest developments in areas where their services and opinions are involved.

The Company has a reputation for being progressive and innovative, and the training activity mirrors this image.

The Training Center for Arthur Andersen & Co. is located in St. Charles, Ill., some 45 miles from Chicago headquarters. With its comfortable, rural setting, classroom buildings and dormitories, the Center could easily be mistaken for a college campus. And understandably so, since that's what it was when the Company purchased the facility. Now desig-



The studio at the Center is 25 x 36 feet, adequate for their production requirements. The two TK-44B cameras with 20-210 Schneider lenses provide the range needed for long shots and closeups. This production photo includes the Firm's former Chairman, Leonard Spacek (right), with Ian Davison of London (center) and Manual Soto, Madrid, who are managing partners of these offices.



The Control Room is adjacent to the studio. All of the racks and equipment are mounted on a computer floor, making for a neat, efficient installation. Production is normally handled by a three-man control room crew: A Director who does his own switching. One man operates the TR-70 and TR-60 VTR's (both are used in original recording) from the remote panel of the Time Code Editing console—and also rides audio levels. The third crew member shades the TK-44B's via joy stick remote controls.

nated as the Arthur Andersen Center for Professional Development, the pleasant setting provides a conducive environment for the serious business of providing programs training for the Company's global office network.

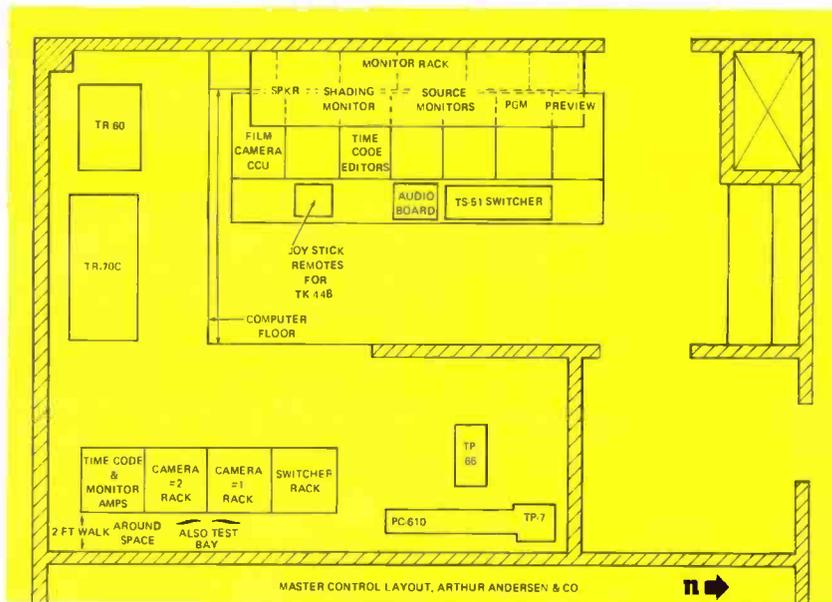
The television complement at the Center includes a studio with two TK-44B cameras, a TR-60 and a TR-70C Tape Recorder, and a TK-610 color film chain. A Time Code Editor extends the versatility of the tape equipment. Another key part of the studio system is the production switcher which has comprehensive special effects capability.

An interesting and significant aspect of the Arthur Andersen & Co. approach to training, notes Mr. Paney, is that there is no "lock-step" adherence to any particular medium. The objective of each training problem determines the vehicle used—slides, charts, audio cassette/workbook, film, video tape or other. With a full range of audio-visual presentation techniques available, potential utilization becomes a carefully weighed criterion in considering equipment investments. So it was with the TV facility.

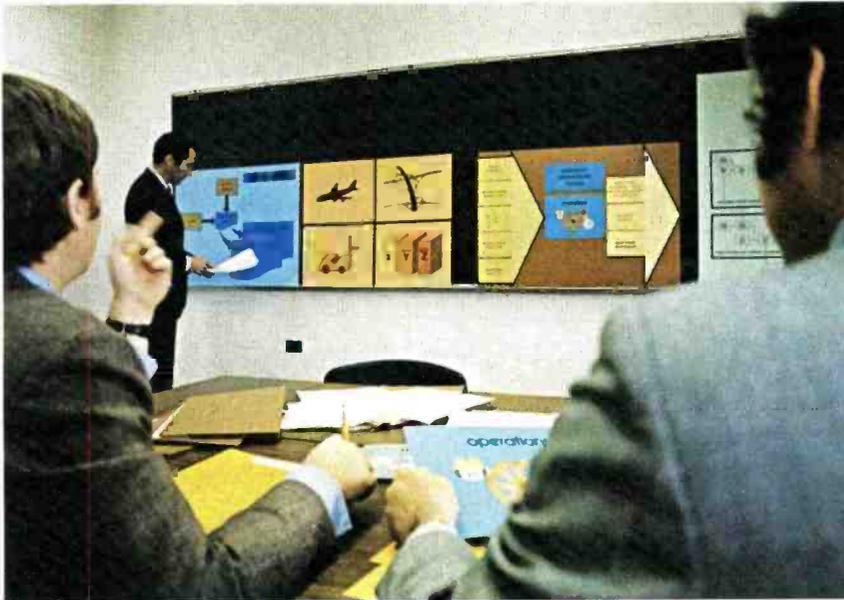
Broadcast quality color equipment represents a major move up from the original television experiment some eight years ago. At that time rented monochrome cameras and a helical scan video tape recorder were used in training the Firm's professional personnel in college campus recruiting techniques. Instructional tapes on other subjects followed, including an experimental distribution set-up involving the sending of selected tapes to ten of the Firm's offices. This test demonstrated the effectiveness of video tape as a communications tool, but also pointed up the problems of standardization, reliability scan equipment and the need for economical playback equipment.

The recording advantages of video tape had been proven despite playback difficulties of the helical scan. Recordings on tape are less expensive to make than motion picture film, for example. Immediate playback and editing make it possible for the speaker to evaluate his performance at once and remake a segment if necessary. Elaborate scripting, which is essential in motion pictures, can be avoided in many cases.

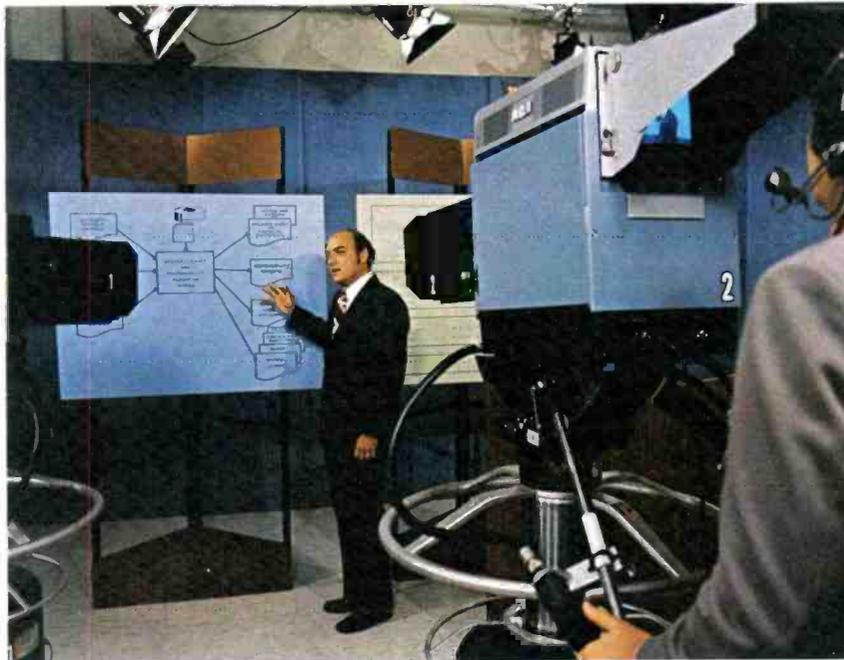
In 1970 when the Center for Professional Development was acquired, a modest



Time Code Editing provides frame-accurate editing, expanding the capability of the two-camera studio. Tapes are planned to take full advantage of the editing system to make a more interesting end product.



Script conferences are an important part of the careful pre-planning of all programs. With accounting material, there is always the problem of legibility as well as the usual concern with design and color.



The TK-44B's and the quad tape format have proven to be the best answer to achieving good legibility of accounting information. All production and editing are on the TR-70C and TR-60. These are dubbed down to 3/4 videocassette format for distribution. The quality in color and sharpness is the best available.

television production facility was purchased. This basic monochrome system consisted of cameras, 1" helical scan VTR's and switching capability.

This system provided considerable operating experience; however, with their extensive involvement in audio-visuals, the Firm's training staff was aware of the limitations of their monochrome system. Thus, for training programs where color was desirable, the production facilities of commercial broadcasters were rented to achieve better quality tape "masters".

With the development and rapid acceptance of video cassettes, the Company investigated the merits of this new delivery medium and determined that it offered an economical and reliable method of duplication and distribution of video programs for domestic and international offices. The picture quality achieved by the video cassette exceeded the performance capability of the 1" helical scan VTR's, particularly when going beyond the first generation tapes. In 1972, the Firm purchased 3/4-inch "U-Matic" cassette players and monitors for all their offices.

After a thorough analysis, it was decided to move beyond the "industrial" level equipment up to a broadcast quality system. This was a significant step; the cost was much more than double that of the industrial-level equipment. More space would be needed in the center for both studio and control room. These problems were outweighed by the advantages. Accounting information is, by nature, full of fine visual detail, flow charts, graphs and financial statements and to be effective television pictures must be as sharp and stable as the state of technology allows. Considerable time and money are spent in developing programs, and the recording process is expensive no matter what type of equipment is used.

Demonstrated performance superiority was, of course, a basic advantage of the RCA equipment package selected by Arthur Andersen & Co. The sensitivity, stability and picture detail of the TK-44 far exceeded the lower cost offerings. And it was also easier to set up and operate. The quadruplex tape recorders, in conjunction with the color fidelity of the TK-44's, provide the sharp tape masters necessary for multiple generation dubbing.

### Pioneering Achievements

Since its initial modest move into television some eight years ago with a monochrome system, Arthur Andersen & Co. has achieved an impressive pioneering record:

- First company to install complete broadcast quality color studio system with full video tape recording facilities
- First U. S. firm to purchase and utilize video cassettes
- First to use video cassette distribution internationally in a company-wide video tape network

(Note: Subsequent to the Arthur Andersen & Co. venture into broadcast color in 1972, the trend has moved rapidly in this direction. Today there are more than a dozen major corporate installations utilizing broadcast type color facilities.)

Four equipment racks are used: one for the TS-51 switcher electronics; two for the TK-44B control units, test bay and distribution amplifiers; one for the time code generator and audio equipment.



The film system includes a TK-610 camera, a TP-66 16mm projector, and a TP-7 slide projector. All "location" shooting is done on 16mm film.

Maintenance is handled by Arthur Andersen & Co.'s engineering staff. Participation in RCA's technical seminars and the comprehensive service manuals supplied have aided in developing the in-house maintenance capability. Since the system was put into operation, outside assistance has not been needed for equipment repairs or maintenance.



Parts availability, service and implementation capability as well as availability of on-going technical support were additional factors considered in making the system purchase.

Acquiring the needed equipment is only a basic requirement. Most important and much more difficult, according to Mr. Paney, is programming. Material must be of attention-holding, professional calibre, and must be fitted to the television format. Many of the lecture type courses had to be re-structured to maintain pace and interest and to avoid the "talking blackboard" syndrome typical of early ventures into television. Visuals and illustrations need to be used extensively, and the presentation must be carefully prepared to cover the subject fully in a logical and informative way that will not lose the viewer.

Training is conducted in the numerous Company offices, utilizing material supplied from the Chicago headquarters, as well as locally developed material. In addition, there are training courses which involve bringing personnel in from the field offices. Since this is both costly and time-consuming, it is expected that the use of video tapes can substantially reduce requirements for conducting "live" training sessions at the Chicago area facilities.

#### System Utilization

The color television system has added a communication dimension by providing every employee in the Firm the opportunity to see and hear top executives. As might be expected, by far the largest user of the studio is the Training Division. The Firm-wide Audit Staff Training School has been shortened by three days, or about 20% by a program in local offices which is a prerequisite to attending the school. Certain topics are taught by video tape instruction and the effectiveness of this training is increased. This saved some

5,200 man-days of occupancy at the Center in 1973 alone. Two of the four weeks of the Computer Fundamentals Course is now given in the operating offices and is based in part on video instruction.

Several new courses which can be taken completely in the local office include video instruction—pointing up another advantage in that video tapes can be used whenever personnel are ready and available for training. There is no need to wait for the course to be offered in the St. Charles Center or regionally.

Recruiting is a large user of video techniques. And the medium is ideally suited for orientation—including a demonstration tape showing prospective employees visiting an office how Arthur Andersen & Co. uses television in training.

Still another effective use of the TV studio at St. Charles is for closed circuit presentations. At the 1973 New Managers' Meeting, 30 rooms at the Center were wired to receive television, and all presentations by management were made from the studio.

Questions were fed back to the studio through the Center's intercom system. All in attendance agreed that the small groups watching in their own rooms, asking questions, then discussing the subject with their instructors was a highlight of the session. The same closed-circuit technique has been used at the last two annual partners' meetings, in Washington and Chicago. This format permits more involvement and discussion of the points made than is possible in one room with almost 900 partners.

For Arthur Andersen & Co.—operating in a dynamic industry on a world-wide basis—quick, effective communication is essential. Television helps by providing a rapid turn-around time for dissemination of vital information. To quote Mr. Paney again, "As the Firm continues to grow, the ability to communicate becomes more difficult. As accounting and business problems become more complex, the need for training increases. The success of our video project will be measured by the same yardstick as any other project the Firm has undertaken—will it improve our operations, is it cost effective, will it assist in maintaining a superior level of client service? Our experience to date so far is encouraging." ■



Harry E. Paney, Manager, Audio Visual Division, has worked in motion pictures and television as a cameraman, film editor, writer and director. He is a member of SMPTE, Industrial Audio Visual Association, and Professional Photographers of America.

#### Editor's Note:

Much of the material for this BROADCAST NEWS report has been extracted from a more extensive article entitled "Video Tape: A New Communications and Training Tool" written by Harry Paney, Manager, Audio Visual Division, and published in the January 1974 issue of THE ARTHUR ANDERSEN CHRONICLE.

## In Wyoming, Weather Is More Than Conversation and Commuter Convenience

Weather is a universally popular subject. In high population density urban centers such as New York City, Chicago or San Francisco, commuters are interested in travel conditions or whether to wear topcoats or to carry umbrellas to the office.

The "big, wonderful Wyoming" audience served by KTWO-TV, Casper, Wyoming, is also vitally interested in the weather—and for more compelling reasons.

K-2's extensive weather reports and forecasts are avidly checked by ranchers and stockmen who can lose millions of dollars from severe, unexpected storms. There are more than seven million head of stock in the state. Utilities—the electric power and telephone companies—also use

the K-2 weather projections to anticipate emergency service demands and to have crews and equipment available to handle such situations. Recreation is a prime source of income in the summer, and those involved in tourism are concerned with weather potential—as, of course, are the tourists themselves.

Providing this statewide weather coverage is the responsibility of Don Hardy. "Our equipment," Don remarks, "includes Weather Facsimile Receivers linked to the National Weather Service at Silver Springs, Maryland and to Kansas City, our regional forecast area office. And, we have special weather circuits to the NWS offices in the state. Last July we installed a NOAA Weather Wire Loop with a receive-only Type 28

machine for hard-copy reception of state and local weather information and weather bulletins."

Mr. Hardy generously credits former KTWO weatherman John Field with many of the weather reporting innovations and improvements made at the station during the past several years.

Don Hardy's weather broadcasts make use of all available data, covering conditions throughout the state. The time allotted to weather varies, ranging up to 12 minutes, the length depending upon conditions.

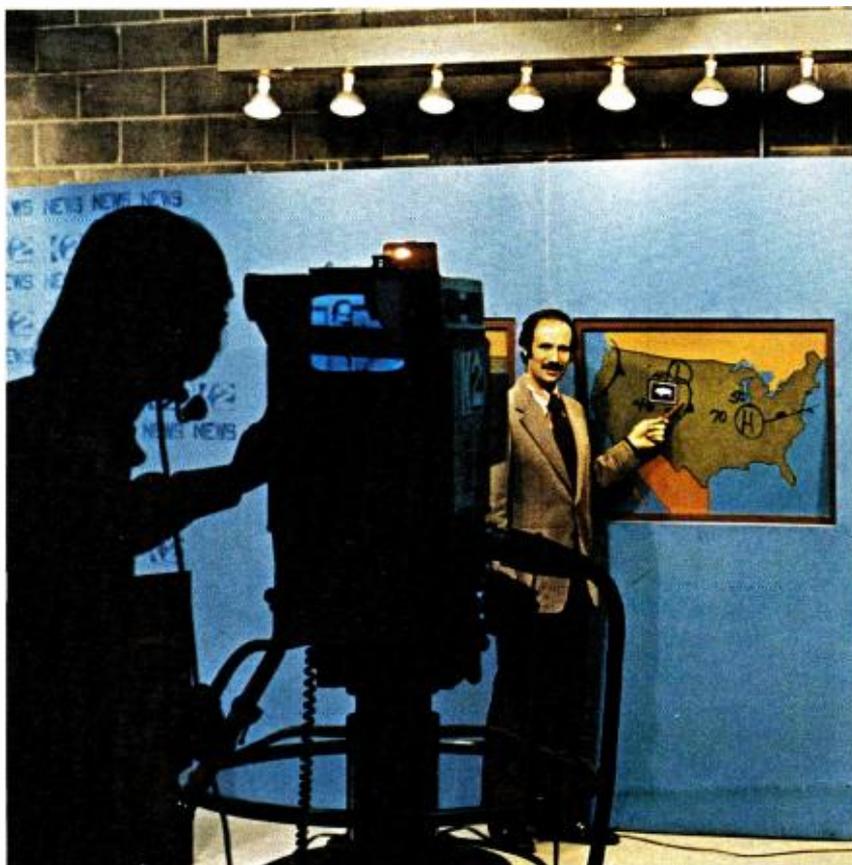
The NWS office in Casper—as a service to the public—issues a series of summaries covering typical weather patterns for various Wyoming localities. This information is frequently used by Mr. Hardy as "fill" to explain variations in weather and its causes in different locations. This personalizing of the weather is carried even further by K-2, with recorded comments from viewers throughout the state who call to report noteworthy weather or changing conditions in their area.

Mr. Hardy starts making up his evening weather report about 4: PM, using time-lapse satellite pictures and surface maps. The satellite pictures are received from NBC via microwave feed each day. The latest surface map covering upper air, wind, and other data is checked at 5: PM, and temperature and various gauge readings are made at 5:15 PM. The evening weather report is slotted for 5:40 PM.

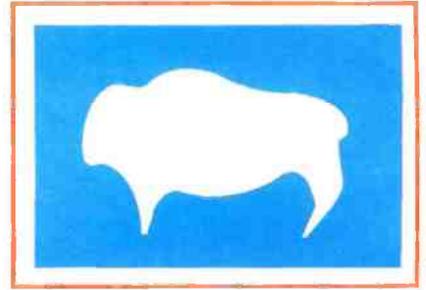
How hard is it to report weather? "Tougher than most kinds of broadcasting, because you have to be able to interpret for the viewers— putting technical terms into everyday 'street' language," responds Hardy.

E. D. (Bob) Merrill, Station Manager for K-2 notes that the comprehensive weather coverage provided by the station is a costly public service, but one which K-2 is happy to offer.

A HarriScope Broadcasting Corp. station, K-2 is equipped with one TK-44 camera which handles production assignments as well as news and weather. Louis Tysver, Chief Engineer, wryly comments that having one color camera puts a premium on creativity and ingenuity for the station's production and program staff—not to mention a strain on the engineering staff. Backing up the TK-44 is a monochrome



On camera at KTWO-TV, Casper, Wyoming, is the station's weatherman, Don Hardy. K-2 provides comprehensive weather service for the entire state and has received a number of commendations for the excellence of its reports.



TK-15 which is also used for televising the weather maps received from the wire service.

One set, in an efficient corner arrangement, is used for the News-Sports-Weather report. The camera pans and changes angles during commercial breaks. In handling the weather, scenic slides are Chromakeyed behind the weatherman.

Mr. Tysver acknowledges that a second color camera would be a welcome addition. However, he says, the K-2 production crew keeps the TK-44 busy for commercials as well as program production. By careful blocking and taping of segments, and using Chromakey, a character generator and slide and film sequences, very effective results are



achieved. Mr. Tysver particularly likes the TK-44's ease of operation and its true color reproduction.

K-2 has received commendations from the National Weather Service and the U. S. Forest Service for forecasting and dissemination of weather information. And just as important to the staff are the numerous compliments received from viewers who appreciate the service.

The top-calibre weather service provided for Wyoming by KTWO-TV refutes the notion that you have to be big to be good. ■



Preparing for the evening weather report, Don Hardy checks the weather facsimile receiver and weather wire service machines, and takes readings of the rain gauge, temperature shack and other station instruments.



## TCR-100 and TK-44's Work Tirelessly for TV Network In Mexico

Consider the production of 4000 half-hour taped programs a year, as well as the airing of four back-to-back taped segments ten times an hour. By most operating standards, they are extraordinary tasks. But at Televisa, S.A., one of Mexico's TV network companies, they are day-to-day procedures taken well in stride with the help of TK-44's and a TCR-100.

This equipment is part of Televisa's base of operations in Mexico City. And from the standpoint of organization and arrangement, they are possibly unique among those of the world's commercial television enterprises. The company owns equipment and studios, sells time and produces and controls programming for four individual channels serving the capital city and all of Mexico.

### TV Production Empire

To meet the requirements of this huge broadcast plan, Televisa has divided its equipment facilities into two, physically distinct major installations within the metropolitan area.

In the Chapultepec section are the originating studios of Channels 2, 4, 5 and 8—the last of which has improved its broadcast operations with the TCR-100. They are billeted together in a rambling five-story building known as the Chapultepec Television Center.

In the San Angel district, Televisa operates a mammoth production center where the TK-44's are located. There, electronic equipment has taken over what was

formerly an outspread movie lot studded with five huge sound stages.

They are now inhabited with an army of electronic technicians, administrators, actors, producers, writers and musicians cranking out 4000 half-hour taped shows a year. By sheer volume, that makes Televisa one of the largest programming operations in the world.

All of this material is distributed to the Televisa stations. It accounts for approximately 40 percent of programming on Channel 2; 15 percent on Channel 4, 15 percent on Channel 5 and 30 percent on Channel 8. Each channel takes up the slack with self-generated material—live and taped studio shows and film features—and provides for a succession of breaks throughout its programming line-up.

Mexico City's mosaic murals, like Televisa's soap opera programming, relate tales of human conduct and experience.



### Narrow Commercial Schedule

Six days of the week, commercial air time is limited to six hours of each channel's ten-hour broadcast day. (Sundays carry 12½ hours of transmissions.) So the ability to handle the highest volume of commercial spots possible, along with other necessary short segments, is essential to profitable operations.

At Channel 8, the TCR-100 has made short-event sequencing highly efficient and flexible, and allowed the station to take full advantage of market opportunities.

Chief Engineer Humberto Alvarez explains: "Before the TCR went on the air, our broadcast day was hectic, especially during prime-time hours. We were confronted with transitions from live studio programs to tape and film, all of which was interspersed with spot reels of station ID's, promos, public service announcements plus commercials packed into our evening programming.

"They were, and still are, aired not only at the beginning and end of a program but also during breaks throughout. But since we've upgraded our operating procedures, life is a lot easier in many departments of the station and parent company. Televisa's advertising time salesmen, for example, find that they can go after previously restricted extra business."

With the Cart machine, Channel 8 now handles a maximum amount of advertising, as well as other short segment material, with ease. Each day, about 70 cartridges are used to produce about 240 scheduled playbacks. They consist mainly of 30 to 60 second commercials; 20 to 30 second promos; 10 to 12 second station ID's plus special programming material.

Short-event sequencing begins at sign-on, 2:30 pm. Children's shows, and breaks including only station ID's and program promos, characterize the afternoon schedule until commercial air time begins with the evening news at 6:30 pm. From then on the sequences of commercials and other short taped events intensify and gradually slacken as the station approaches sign-off at 12:30 am; 2:30 am on Sundays.

### Selling a Quality Image

The role of most national advertisers is limited to just buying time for their messages. There's no sharing of production costs nor say in program decisions.

On a daily basis, Televisa's four channels air literally hundreds of short-event taped sequences. With the TCR-100 shown here, TV 8 has taken an automated approach to handling its 240 playbacks each day.



With this clearly defined distinction between advertising and programming, Channel 8's saleability rests heavily on the shows Televisa sees fit to produce, and a sound technical presentation. Ensuring smooth automatic transitions, dependable performance and consistent color quality, the TCR has allowed Channel 8 to make the most of its commercial time.

All of this has elicited an enthusiastic response from Mr. Alvarez: "The machine's reliability and ruggedness contribute to a more professional on-air look. In the last seven months, for example, there has been no downtime due to mechanical or electrical disturbances. These prime advantages really prove the machine's worth, especially in view of the increased commercial business they have helped generate."

### Better Continuity

The TCR has also removed programming and scheduling restrictions the reel-to-reel machines previously imposed. Discussing better accuracy in scheduling, Gonzalo Carvajal—who is responsible for program continuity—said that control-room mistakes in bringing multiple spotting to the air have virtually been eliminated, adding: "The TCR's convenient and simple programming of all our taped segments

makes for precise scheduling, which allows a smooth succession of visual elements to flow onto the homeviewers' screens.

"And it gives me a lot of flexibility in assuring continuity of all of Channel 8's programming. For example, if re-distributing one short segment or a whole sequence is necessary, I can rest assured it can be done easily with video cartridges. Because they can be loaded and unloaded so simply, and programmed as inserted, a last-minute change is never a problem."

When asked further about the station's new way of life since adopting tape cartridges, Mr. Carvajal went on to say: "We really have no clock-hour conflicts, just a lot of latitude in scheduling programming and station breaks. What's more, the human aspect of spotting has become a lot easier. We can program several upcoming sequences in advance, when there is time to think, just by following the log that I and everybody else use."

### Less Physical Effort

The Cart machine is located in the Master Control Room, along with the telecine islands and reel-to-reel recorders. Because of the manpower savings the TCR's automated operations make possible, there are never more than four people directly

involved with master-control operations. The work force includes a VTR operator, plus three others for film, audio and master control switcher.

Mr. Carvajal, commenting on the man-hour savings and the more efficient use of time, said: "During air time, the reel-to-reel machines are busy with playback of programming or with late afternoon news feeds from all over the world. The TCR has let us divert the station-break activities that would otherwise be assigned to the reel-to-reel's, and made it possible for the VTR operator to devote his time to this work."

The VTR operator can start the sequence of cartridge playback, but this function is remoted to the Master Control console, introducing still another convenience to control-room operations. As a result, the VTR operator doesn't have to stay at the TCR just to push buttons, and the Master Control operator handles all on-air programming.

#### **Additional Conveniences**

The TCR permits dubbing from another recorder or other video source while the system is on air. However, Channel 8's relatively late startup of the broadcast day usually affords adequate time to perform dubbing before sign on.

But this is not to say that the TCR's recording and dubbing capabilities don't make a difference to Channel 8. Because the machine has two transports, it's a real time-saver during dubbing sessions. The VTR operator plays back a just-dubbed cartridge for checking, while recording another tape on the other transport; or dubs from one transport to the other.

This is a practical advantage because Channel 8 contracts for a lot of local commercial production which, incidentally, the Cart makes possible. Studios elsewhere in the Chapultepec complex produce finished spots and send them on master reels for transfer to cartridges.

If the commercial is a simple one, then the signal is fed to Master Control and it's put directly on a cartridge. Agencies also supply commercials, but on film. If their insertion frequency is high, Channel 8 dubs them onto cartridges too.

#### **More Than a Spot Player**

But that's only half the cartridge story at Channel 8. Station personnel utilize its

production and programming capabilities too. Program promos are usually made in the mornings for later airing that same day. A segment of the master tape for one of the station's upcoming shows is fed from the reel-to-reel machine onto the cartridge machine. Voice-over is added to the audio track with the audio mixer in the control room and, if desired, graphics are inserted with the aid of a camera in an adjoining studio and the Master Control Room's switcher.

Innovative station personnel have also discovered the extra advantage of program assembly. Just by switching pre-recorded cartridge material into a live, tape or film show, they can provide additional scenes or special effects. Besides opening and closing sequences for Channel 8-produced shows, it provides an extra video source for, and adds some drama to, the single-camera evening news show. A cartridge tape, on which the Master Control room scene is recorded, is chroma keyed into the signal of the live portion of the colorcast.

Another extended application is the airing of public service messages. They reserve a total of 15 minutes in each day's programming for these special messages. Channel 8 dubs each one, usually of four to five minutes' duration, onto two cartridges and programs them for the appropriate break-time insertions.

"Here," Alvarez remarked, "is another area where we really appreciate the smooth transition the machine's vertical interval switching ensures."

#### **Cost- and Time-Effective Installation**

Other advantages Channel 8 and Televisa management like are the reduced engineering costs. One specifically mentioned by Mr. Alvarez is the savings in refurbishment of headwheel panels. "The TCR's original headwheels are still going strong after 18 months of continuous service. In all that time, I would estimate that the panels have withstood about 130,000 playbacks, and it looks like they can handle a lot more."

Another cost reduction concerns setup, the time for which is greatly reduced and simplified by use of the standard color-reference tape. It assures proper setup and provides a quick, easy way to match each tape output to standard levels. "So consistent is the color quality of our playbacks," Mr. Alvarez stated, "that the

VTR operator monitors the TCR's signals infrequently."

Presently, Channel 8 has about 400 cartridges in its library. For easy identification and quick retrieval, they carry color-coded labels: yellow for commercial spots; green for station promos; blue for ID's; red for public service announcements; and orange for program promotions. Visible even when in the TCR-100's changer mechanism, the brightly colored labels afford additional, last-minute assurance that the proper types of segments are loaded into the machine.

#### **Coast to Coast, Border to Border**

Televisa has quite a stake in television. Through repeaters, microwave links and affiliated stations, it provides a nationwide television service. In so doing, the affiliated stations receive programming support from Mexico City; and those associated with Channel 8 get the high-quality playback of TCR commercials aired throughout the network.

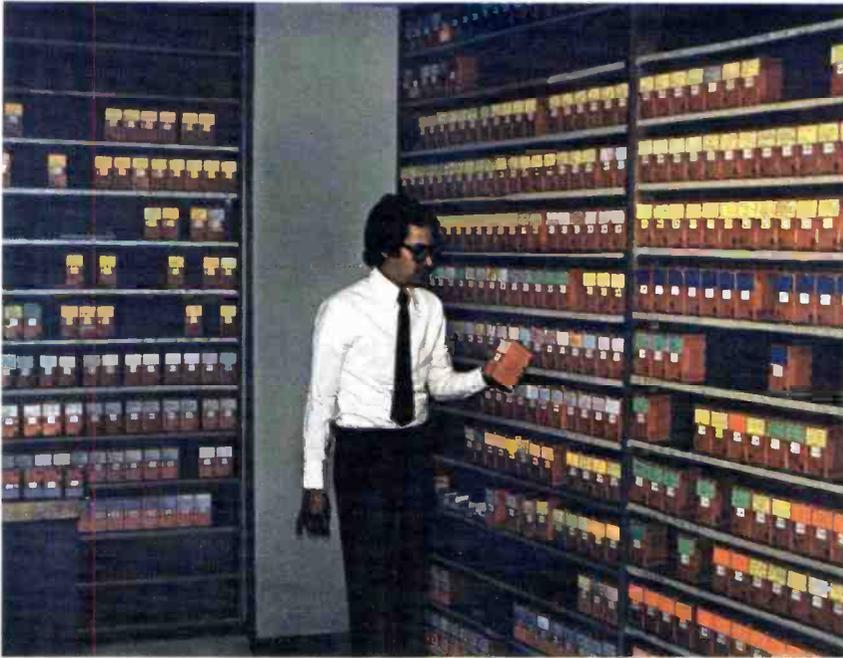
Channel 2 has 51 repeaters to provide almost total coverage of Mexico. Channel 4, with five repeaters, links both coasts; Channel 5 serves the Valley of Mexico and Veracruz. Through 17 repeaters and two translators, Channel 8 covers 80 percent of the country, as far north as Chihuahua State next to the U.S. border and as far south as the state of Veracruz.

This vast communications network has also facilitated bringing more live television programs in from the United States than ever before. In fact, as mentioned earlier in the article, Channel 8 routinely picks up worldwide news feeds, and provides network coverage of a major U.S. event and relays it live over their full 19-station network. For example, live colorcasts from the States have included professional ball games and the Rose Bowl Parade in Pasadena.

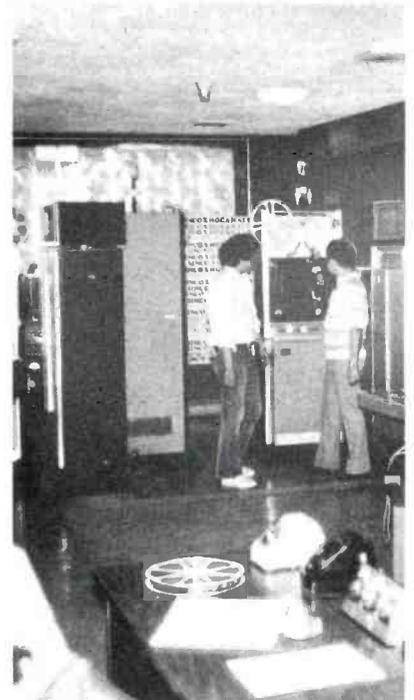
#### **Impressive Equipment Array**

The growth of Televisa's role in Mexican TV is perhaps best illustrated by its staggering equipment investment in Mexico City alone.

Touring Chapultepec's facilities, one finds a variety of 31 seasoned television cameras. Fourteen are in outside broadcast vans, four are in the Master Control Room camera studios (one in each). Thirteen used in the production studio block include



Stored in the library or loaded in the TCR, TV 8's cartridges allow quick retrieval and positive identification owing to a color coding system. Pictured is station staffer Antonio Piiego selecting a commercial spot identified with a yellow label.



Each of the four channels beams its color signal with an RCA 25 kW transmitter like the one shown here in Channel 2's studios (left). Film facilities at Channels 2, 4 and 5 (right) feature TK-27 telecine islands which see heavy use. Totally, the Televisa stations show 13,000 hours of movies and filmed serials yearly.

RCA TK-43 color cameras still very much in demand for live programs, which last year added up to nearly 8000 hours.

Other RCA television systems form a sizable portion of the total facilities—film chains, multiplexers, switching apparatus and transmitters. For example: Channel 2 has two TK-27 telecine islands with TP-66 projectors, and a TT-25BL 25 kW transmitter. The original transmitter, an RCA TT6ALN 6 kW unit, serves as standby. This transmitter setup is identical to that for both Channels 4 and 5, each of which also has two TK-27 film islands. The telecine facilities couldn't be busier as they already handle almost 13,000 hours of movies and filmed serials yearly.

#### **Quality Dictates Use of TK-44's**

At the San Angel complex, three TK-44B's complement nine other video cameras—all used among five large sound stages each also outfitted with switchers, tape recorders, energy plants and prop shops.

The set studios range in sizes from 9150 sq. ft. (850 sq. m.) to 12,900 sq. ft. (1200 sq. m.) in which a mixture of programming is made: video dramas, musicals, serious panel shows and soap operas.

According to camera engineer Sealtiel Pelaez Mendez, shows requiring top color quality go before the TK-44's located in Studio Six. He said: "We recognize the superior performance of these cameras and insist on their use whenever consistently high picture quality is desired."

Explaining further, he went on to say: "Compared to the other cameras, they are really advanced, providing premium pictures with minimal noise, which is far less than that of any other camera we have."

#### **Cameras Operate 49 Hours per Week**

The RCA cameras have been in use about three years, seven days a week and generally at least seven hours a day. They are shooting almost continuously within a complex schedule resembling assembly-line production. For example, as many as three soap opera episodes are recorded in any one day.

"The cameras are easy to set up," Mendez continued, "and very stable, which is perhaps one of the most important time-saving features in our operations. We allow

an hour for warm-up and check for stability during the grinding schedule. But it really isn't necessary because the cameras are always optically aligned. We do it because it's just good engineering practice."

Program directors favor Studio Six, as they are partial to the TK-44's low-light capability. "It enables them," Mendez stated, "to introduce dramatic lighting into a scene, and is frequently used in our production of musicals and soap operas, which are very popular in Mexico."

#### **Hidden Earphones**

The soap operas, or telenovelas as they call them, constitute much of the programming San Angel generates. And like everything else Televisa does, they are made with production-line efficiency. A notable aspect of this operation is a Mexican invention called "Apuntador".

This is a closed-circuit, walkie-talkie "teleprompter" system. It beams lines of dialogue to actors equipped with miniature earphones wired to tiny, inconspicuous transistor receivers. With this assist, Televisa packs away several episodes a day.

Each production studio at San Angel has a low-power transmitter and an antenna surrounding the set. One person sits in front of a monitor with a script and transmits the appropriate lines to each actor.

#### **Evolution of a Giant**

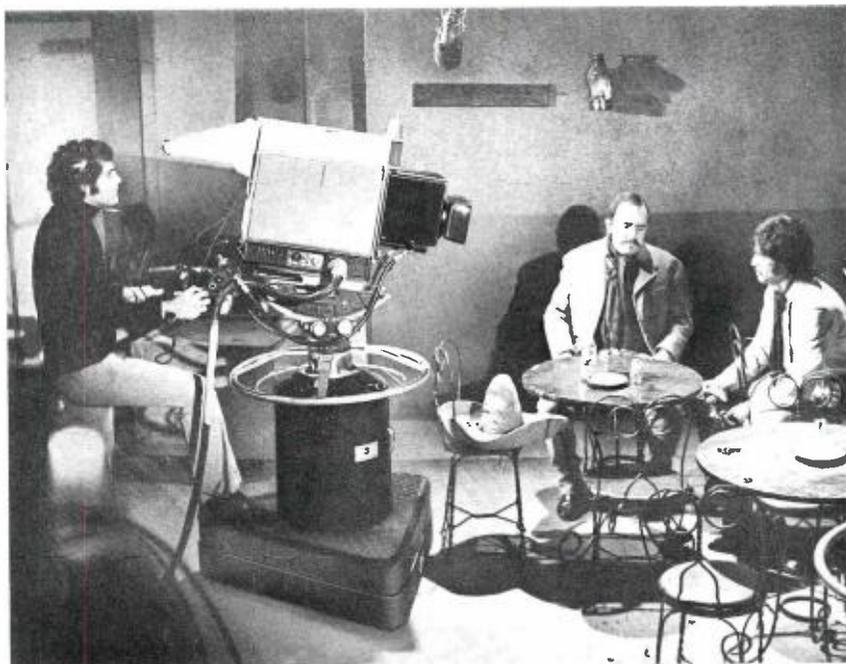
Televisa operations like those at San Angel haven't always been that extensive. Relatively speaking, its origins were somewhat modest. Through consolidations and acquisitions, today's activities can trace their history back to 1946—when the first television transmission occurred in Mexico City. In a small room used as a studio, Channel 4 was born. It operated

The San Angel production center, where television cameras roll with production-line efficiency.





At least 49 hours every week, the TK-44's crank out a variety of programming at San Angel. Typical are the topical discussion show (above), *The World We're Living In*, and soap operas such as *La Tierra* (below) set against the Mexican Revolution.



sporadically until September 1950, when it joined forces with a newly formed station designated Channel 5. Then in 1951, Mr. Emilio Azcarraga V. spotted television's potential and started Channel 2, thus establishing a company by the name of Telesistema, operating out of the Chapultepec studios.

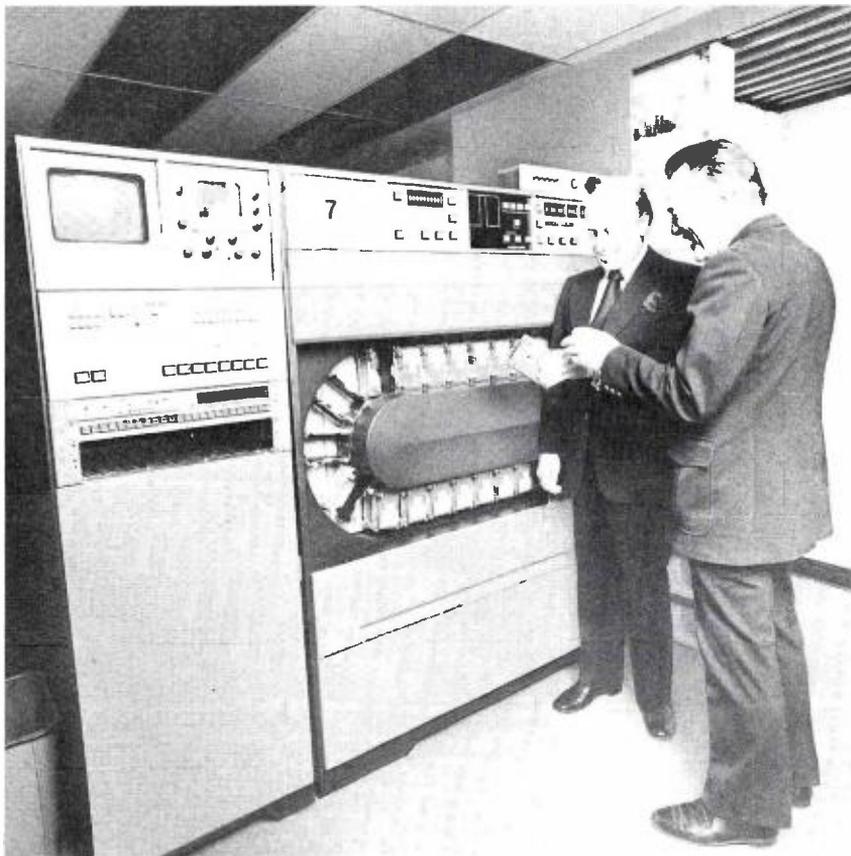
In 1955, Channels 2, 4 and 5 consolidated their operations to allow reductions through common production costs and formed Telesistema Mexicano, S.A.

Meanwhile, Channel 8 was aborning in the City of Monterrey. It prospered and expanded into Mexico City taking up residence in the San Angel motion picture studios in 1968. Then in January of 1973, Channel 8 merged operations with Telesistema to form what is today Televisa.

Now with 1800 employees and 80 stations throughout the country, the company is an important element in Mexican television. It has even made its mark elsewhere, exporting its programs to Central and South America and U.S. affiliates in Los Angeles and San Antonio. ■

## TCR-100 Users in Canada Comment on Cartridge Convenience

Ernie Rose (right), Vice President of Engineering at Vancouver's CHAN-TV, explains the simplicity of operation of the TCR-100 to the station's President, J. R. Peters. The RCA Video Cartridge Recorder has been automating CHAN station breaks since early in 1973.



Canadian broadcasters are experiencing a steady growth in the use of short video-taped segments. On a local level, taped commercials and promos represent a greater percentage of a station's output than they did just a year or two ago.

Left to only reel-to-reel machines, the situation becomes a double-edged sword. With the increase in revenues accelerating tape traffic usually brings about, there is often a decrease in the production capability of the staff and reel-to-reel recorders.

But all of that is changing for the better with a number of Canadian broadcasters—thanks to the RCA TCR-100 video tape cartridge machine. Television broadcasters in Toronto, Edmonton, Winnipeg and Vancouver are finding that the automated cartridge machines are paying for themselves in terms of savings in time and labor. Reel-to-reel machines are being freed from unproductive playback; and VTR operators in turn are being released for important and more rewarding production work.

CHAN-TV in Vancouver was the first Canadian station to bring automated programming to its station-break operations. Its TCR has been in use for over a year now. "Since then," according to CHAN's Vice-President of Engineering, Ernie Rose, "it has become an indispensable part of our technical operations. If we ever took this machine out of here, our technicians would have to work a lot harder and there would be a lot more errors.

"The TCR has greatly simplified our station's lifestyle," Rose comments further. "We used to have to do a great deal of assignment work to be able to run two or three commercials back-to-back before and after a video-taped show. But with the TCR, a technician can walk in with an armload of cartridges, load and program them, and then simply push a button to start a complete automatic sequence.

"The cartridges," he continues, "completely enclose the tape and protect it from dust and dirt, as well as damage during storage and handling. But equally important is the fantastic head life we get on this machine." The headwheels feature long-wearing Alfecon II pole-tip material.

Another contributing factor to reduced wear is the TCR's playback format. Consider, for example, the airing of a 30-second segment. For reel-to-reel, average head-to-tape contact time with line up, run-up and what have you is around 140 seconds. With the Cart, head-to-tape contact time for the same spot is drastically reduced to around 32 seconds. So the net result is lower video headwheel costs.

At CFRN-TV in Edmonton, the TCR-100 has been on stream since mid-August 1973. Ted Wadson, Director of Engineering, asserts that it would be interesting indeed if they tried to take it out.

"We'd have a revolution on our hands. Our technicians think the world of the cart machine because it removes an awful lot of the tension we used to have scheduling our reel-to-reel machines between commercial playback and program production."

The TCR at Toronto's CFTO is doing the work of three or more reel-to-reel machines during station breaks. According to George Malcolm, Assistant Director of Engineering, it has given his station an ease of operation it didn't have before. "We can do more work now because we've eliminated the time-consuming tasks of setting up and playing back a spot reel."

Planning the automation of the station's master control, George Malcolm also likes the TCR because of its electronic logic. "We have a computer here and the 'Cart' machine can interface with it easily. Eventually I will be able to go on-air completely computerized."

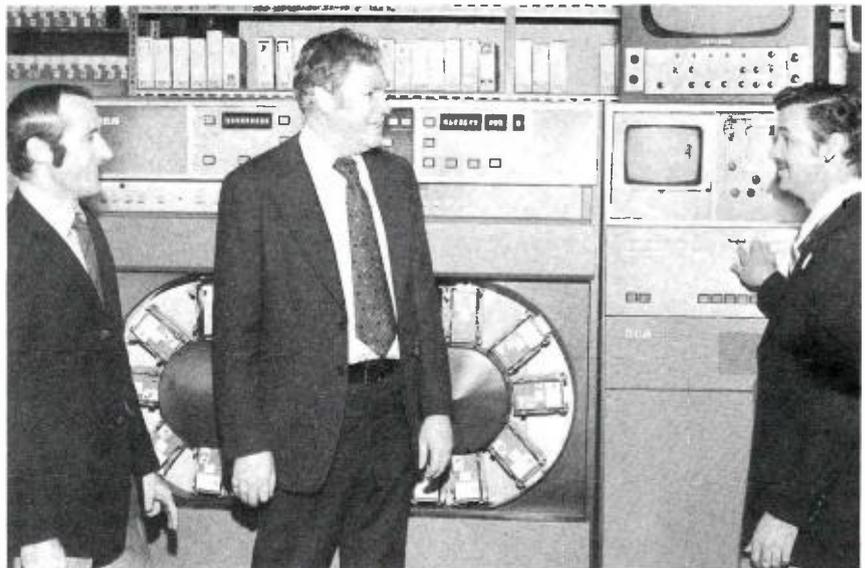
Another marked improvement is the better physical treatment CFTO's reel-to-reel machines are now getting. Because of the TCR, these machines no longer are subjected to thousands of fast rewinds, plus cueing stops and starts, the daily station breaks previously required.

From all these comments, it's not difficult to understand why other broadcasters in Canada have opted for cartridge convenience. Two of the latest ones there are CKY-TV in Winnipeg and Ontario's new Global Television. ■



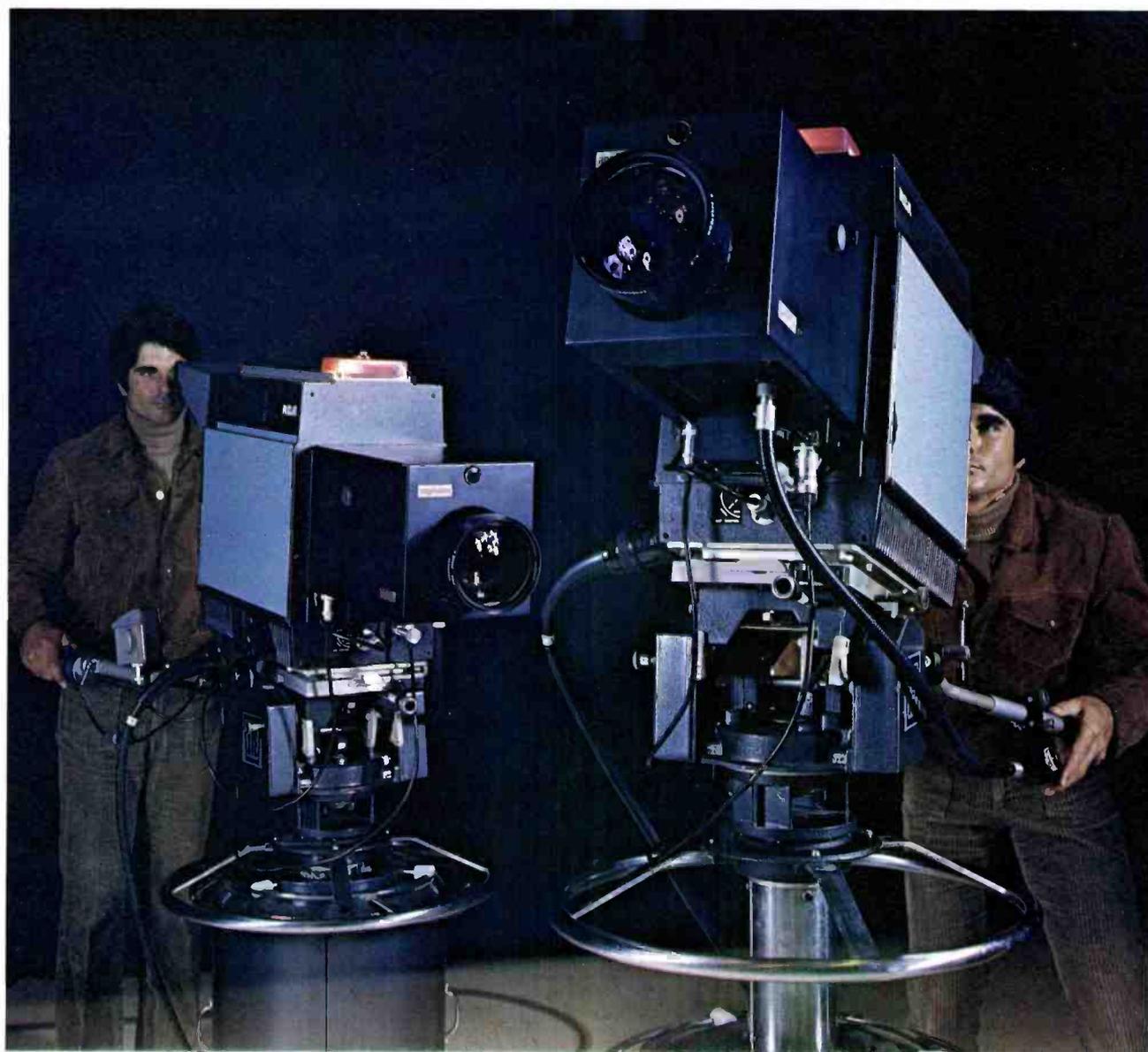
Ted Wadson, Director of Engineering at Edmonton's CFRN-TV, loads the station's new TCR-100 Video Cartridge Recorder with commercials and other station break material. Mr. Wadson says that use of the RCA "Cart" machine has "significantly reduced errors during breaks and resulted in fewer makegoods",

At CFTO-TV in Toronto, VTR Supervisor Doug McCormick (left) demonstrates the ease of operation of the station's new TCR-100 Video Cartridge Recorder to George Malcolm, C.E.T. (center) Assistant Director of Engineering and George Walter (right), Engineering Liaison Officer. According to George Malcolm, the RCA "Cart" machine will eventually be interfaced with a computer.



# Design and Operation Of A New Automatic Color Camera – TK-45A

Laurence J. Thorpe, C. Eng. MIEE  
Senior Engineer,  
Broadcast Studio Equipment Engineering



Exploiting the advantages of digital integrated circuits and new production techniques, RCA engineers have developed a new generation live color camera. Called the TK-45A, it features automated operational controls which are designed to simplify normal shooting, and contribute to consistently high quality picture details—all without the need for highly skilled camera operators.

The TK-45A evolved from the TK-44 Series which produces color pictures broadcasters consider to be the industry standard. The new model retains all the features field-proven in over 700 TK-44's—superior video performance, colorimetry and stability. It adds to these the automated operating controls, plus other refinements (internal and external) to facilitate video processing.

Broadcasters desiring optimum picture performance with little technical manipulation should appreciate the design philosophy behind the TK-45A. And that was to change not for the sake of change but for improvement only.

RCA conducted a careful study of broadcasters' camera requirements. It revealed a need for using fewer people to operate more cameras, and the fact that operating adjustments were made much more frequently than those required for setup.

If you consider the typical last-minute adjustments made by an operator prior to "shooting" a scene, the value of the TK-45A's automatics will be readily apparent. Assuming that the basic camera and processor have been pre-aligned, there remains only a check on black balance, white balance, iris setting and registration.

So the decision was made to incorporate automatic circuitry to assist the operator in these areas.

#### **Automatic Operation of the TK-45**

The camera's iris automatically compensates for changes in lighting level without the help of an operator. Automatic white color balance, for a given scene illumination, is set simply by focusing on a white area of the scene and pressing a button. Automatic black balance is accomplished every time the lens is capped.

The camera head was altered so that the viewfinder could be completely enclosed with a metal shield. This reduces viewfinder "ringing" when the camera is operated under high sensitivity or maximum gain.

All of the electronic operating features are integral to a newly designed camera control unit (CCU), consisting of compact module frames that reduce the number of interconnecting cables and thus keep cable clutter to a minimum.

As the TK-44 camera is very easy and logical to set up, and subsequently remains very stable, the basic system concept has been left virtually unchanged in the TK-45A. But there are a few minor improvements in this area which evolved from state-of-the-art advances. For example, the high voltage on the PbO tubes has been raised to 930V (680V in TK-44) which helps enhance resolution and beam landing characteristics of the Plumbicon tubes themselves.

The major change, however, is in the area of actual camera operation. Following a detailed study program and consultations with many varied customers, operations which should be automated were defined, and the particular manner in which the automation should function was clarified.

#### **Auto Black Balance**

Black balance is generally considered the most vulnerable electrical operating parameter in a color camera. This is particularly so as gamma and scene contrast compression greatly exaggerate the smallest unbalance which might occur, for example, as a result of a slight variation in the bias lighting system. The TK-45A has an automated circuit which completely removes the burden of manually rebalancing or, for that matter, even checking for unbalance. By merely depressing the CAP button (either at the camera head or at the remote-control position) two events take place: the camera is optically capped and an automatic circuit is initiated which restores the Green, Red and Blue capped black electrical signals accurately to zero volts dc in the processor. This action can be observed by looking at the colorplexer output where the color subcarrier will be seen to reduce to zero. The system stores the correction in a

digital memory. It maintains this particular balance until the CAP is depressed again, at which time that correction will be updated if a subsequent unbalance has occurred. Once the operator becomes familiar with the TK-45 he will reach a point of confidence where he caps the camera and knows that his system is accurately black balanced.

#### **Auto White Balance**

Another important operational tool is the automatic white balance. Here the operator is not dealing with electrical camera aberrations per se but with a scene that undergoes a color temperature variation. This may be due, for instance, to the continual change in sunlight during the course of a day when shooting outdoors. Ordinarily, correcting a color shift requires periodic readjustment by using RGB white paint controls while the camera is viewing a white object in the scene. In the TK-45A, this process has been automated. Whenever the video engineer decides that white balance should be checked, he instructs the camera operator to place a chosen white object in the center of the viewfinder's raster. Either the cameraman or the remote operator then depresses a button labelled "BALANCE". This initiates an automatic circuit which electrically adjusts the Red and Blue video gains to match that of Green precisely. This too is a digital system which stores the correction in a digital memory. There it remains, unless updated by re-initiating the balance button. Again, with time, the operator will gain sufficient confidence to the point whereby checking white balance on an oscilloscope can be discarded.

#### **Auto Iris**

The TK-45A offers the choice of controlling the iris manually from a remote position, or automatically by actuating a switch. The latter action introduces an automatic circuit to control the iris servomechanism. This auto iris circuit functions by sampling the Red, Blue and Green video signals in a non-additive mixing scheme, and deriving from this signal a proportional control which interfaces with the iris servomechanism to complete the control loop. The system will adjust the iris to maintain 100 IRE units of output video regardless of scene lighting variations.

### New Preamp and Video Amplifier

Certain state-of-the-art circuitry designed for the automatic TK-28 telecine camera is also utilized by the TK-45A. Most notable is the TK-28 type preamp which employs some 56 dB of negative feedback producing a lower input impedance and hence reducing the visible effect of tube capacitance variations and the vulnerability of the system to electrostatic pickup. In addition, the feedback provides the classic improvements associated with negative feedback in factors such as gain stability and low distortion.

A new video amplifier follows the preamp, which performs new functions enhancing the setup procedure for the camera. To set beam currents precisely at twice the signal level (for good highlight-handling

capability), a remotely switchable video attenuator has been introduced. This facilitates the beam setup from the setup panel. To restore camera color balance quickly, when transferring between indoor and outdoor color temperatures, a switch has been provided in the camera head to switch the gains appropriately in the three channels. This change was formerly accomplished in the TK-44 through use of an optical filter wheel. The TK-45 offers either the electronic or optical system for restoration of balance, the particular choice of which is generally made on the basis of sensitivity.

### Aperture Correction

Historically, the TK-44A employed a novel aperture system which generated a

horizontal and vertical contour from the Green signal, and added this to the matrixed luminance signal. The horizontal aperture correction was "combed" and had a peak level occurring at sub-carrier frequency. While not producing a flat frequency response in the luminance signal, this did provide a very good subjective result and a considerable improvement in signal-to-noise performance when large amounts of aperture correction were being applied.

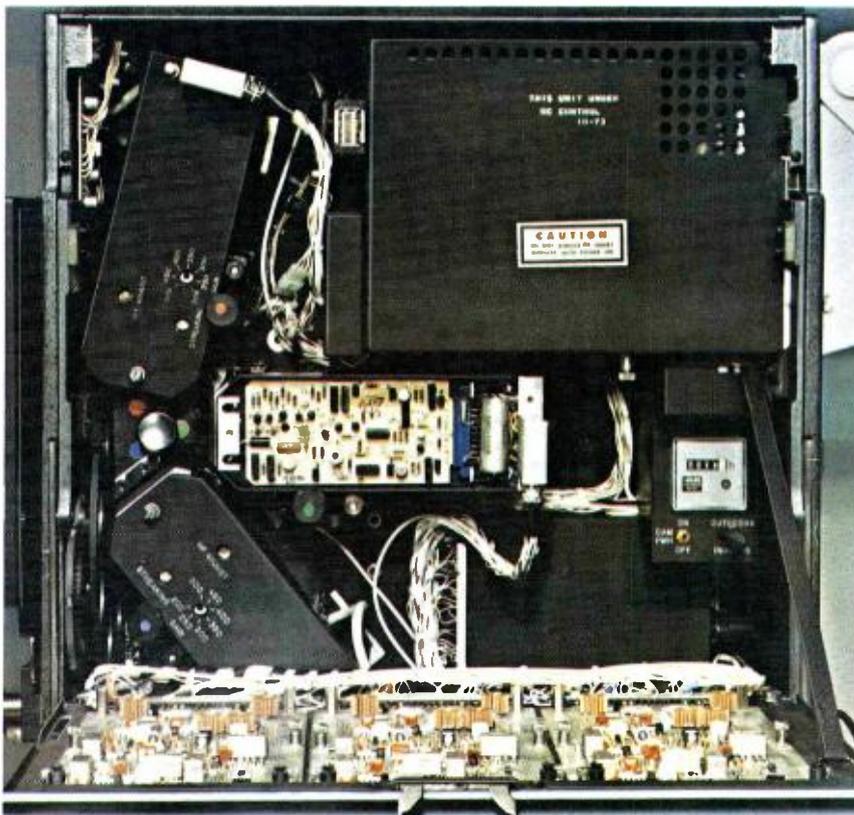
But internationally, this form of correction proved to be controversial, particularly among customers who adhere to specifications typified by Great Britain's IBA Code of Practice (100% modulation of 400 TV lines in luminance and in-band deviation no greater than 1dB). For this reason, another aperture system was designed that can be plugged into the TK-45 CCU immediately converting it to the "out-of-band" aperture correction. Unplugging this module allows the system to revert automatically to the "in-band" correction described above. While catering to different international specifications, this system also has the useful feature of providing two different forms of enhancement at the director's disposal. This can be very useful in production houses for optimizing the picture subjectively for a particular scene content.

### Chroma Processing

The TK-44A introduced the system of chroma processing. This technique derives a set of color difference signals from the basic R, G and B signal, and uses them on a selective basis in a "non-linear" matrix to derive correction signals for the three primaries and their three complements. This system worked well, but subsequent development in the TK-28 program refined the system somewhat by adding the correction signals to the U and V color difference signals which circumvented potential problems arising from RGB mistracking.

### Scene Contrast Compression

The TK-45 employs a novel system called Scene Contrast Compression which brings out picture detail that may be hidden in the dark areas of a scene. A classic case is a football game when half the field is in bright sunlight and the other half in deep shadow cast by perhaps a grand-



Video side of TK-45A camera. The cover has been removed from one video pre-amp (on yoke) and from the three video amplifiers at the bottom.

stand. Such a situation could introduce a contrast range of hundreds to one. So, it is of utmost importance that the camera can resolve detail in both luminance and chrominance, in the shadow and sunlit areas simultaneously (for distinction of team colors, for example).

To accommodate portions of the picture within shadow areas in a scene, a luminance signal derived by matrixing the RGB components is amplified and black-stretched. The amount of black stretch is continuously variable. The chrominance values are then multiplied by the modified luminance segment, raising the gain in the dark portion of the picture.

This multiplication technique maintains color balance since the hue signals precisely follow the change in luminance gain (see chart on next page).

The Scene Contrast Compression circuitry provides a single, continuously adjustable selector. It varies the camera transfer characteristic gain at low light levels to bring faint scene details in a high contrast situation into the effective operating range of the television system. Single-knob control is easily accomplished.

Under adverse field and studio lighting conditions, Scene Contrast Compression becomes a very useful tool in enhancing the camera's performance.

#### **Auto Centering Option**

Prior to a program take, most operators will do a final check of registration.

Generally, this consists of rocking the horizontal and vertical electrical centering controls of the Red and Blue tubes to inspect their registration with Green. Experience has shown that in modern cameras the usual source of mis-registration is confined to a minute drift of these centering control currents. In many instances, no drift will have taken place. Or if it has, it is debatable whether such a fractional change can be seen even under close scrutiny. Nevertheless, most operators will manually misalign the centering and then restore it to the best of their ability. Often, it is this last-minute adjustment, sometimes made under operational duress due to tension prior to a major show, which in fact introduces the mis-registration.

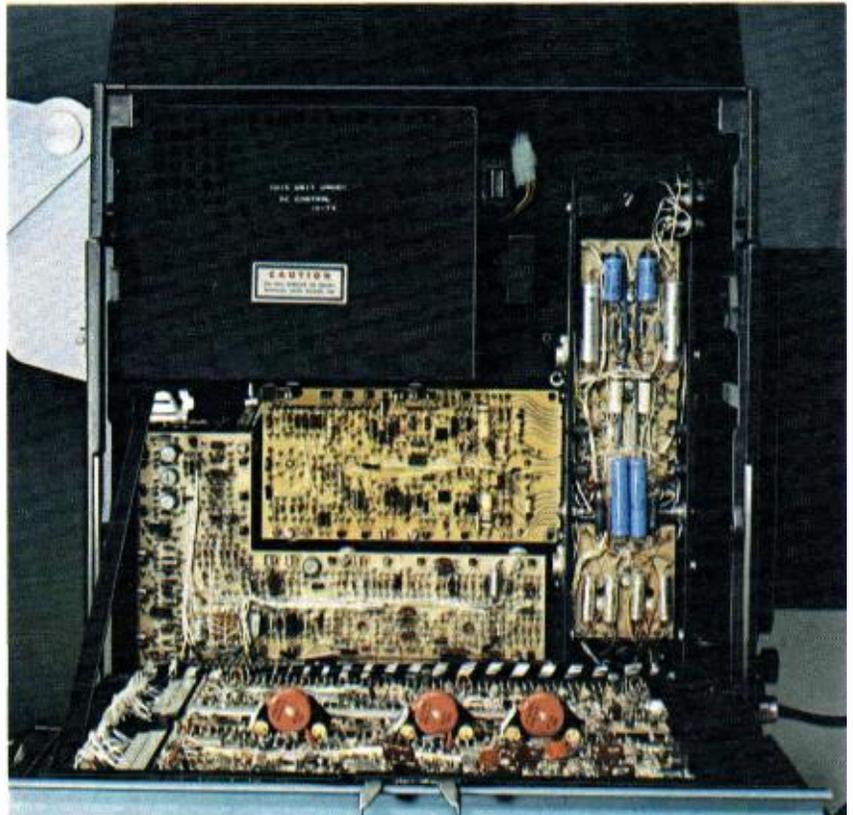
RCA developed the optional automatic centering system to solve this centering

"mop-up" in a definitive manner, without the need for a human operator. In correcting registration errors, a digital sampling system compares edge information (in both the horizontal and vertical directions) of the Red and Blue videos with the Green video. To accomplish this, the camera should be aimed at a stationary scene containing a suitable amount of horizontal and vertical detail, or a test chart. Then, when the video level is normalized and the camera white balanced, the operator depresses a button labelled "INITIATE" on the auto centering module. The system then corrects the centering in about three or four seconds with a precision exceeding that of the best human adjustment.

Automatic centering in this case has not been designed as a tube setup aid coping

with large centering differences. It has been optimized to precisely correct minute centering aberration of 1% or less. In other words, the TK-45A is set up in a manner similar to the TK-44, where the three tubes are registered to within 0.05% of picture height in Zone A. The inherent stability of the camera will not require any more registration adjustments over very extended periods of time.

The auto centering in the TK-45A is employed to cope with the fractional drifts traceable to yoke warm up. Its greatest value is the complete elimination of human intervention. One important aspect of the philosophy behind it is that a conscious decision is made by an operator to update the digital memory by choosing a scene and depressing the



Deflection and power supply circuits on the TK-45A. Wiring covers have been removed.

INITIATE button. When the centering is corrected, perhaps 3 seconds later, the system switches itself off and the camera is ready for operation. The main point here is that the RCA system is not a continually correcting loop using normal scene information, a route chosen by some manufacturers and fraught with potential problems such as confusion in the automatic circuitry when certain color scenes are viewed.

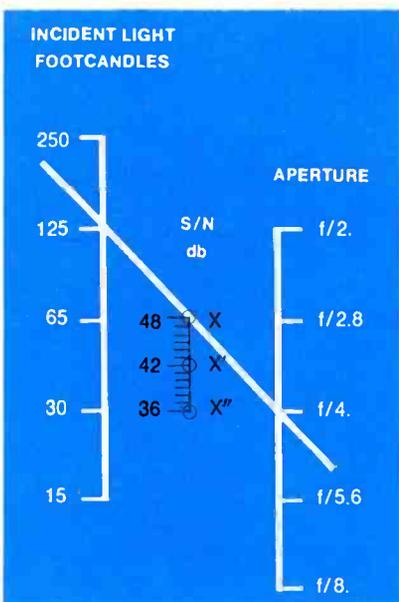
**Sensitivity**

Like its predecessor, the TK-45A is also ultra-sensitive, delivering good, noise-free pictures with very little scene illumination.

This is made possible by:

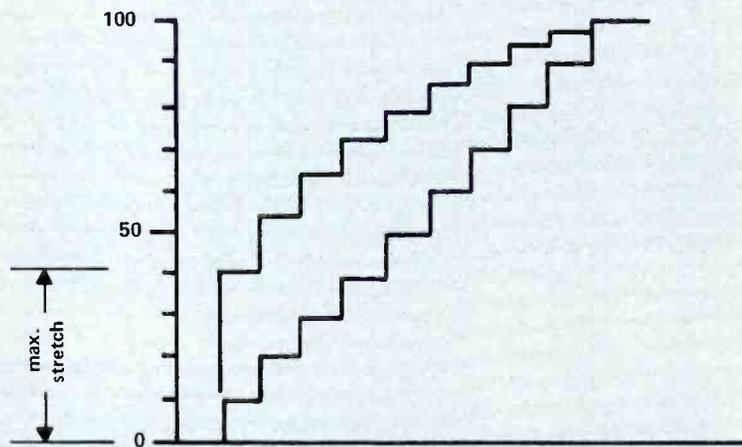
1. The camera's inherent optical sensitivity
2. Low noise video system
3. "Combing" of the contour detail signal

Full video output can be obtained with scene illumination of as little as five foot-candles. Under such conditions, moving subjects present no lag problem. This is effectively accomplished with the TK-45A by a bias light system in which a small amount of illumination is applied to the face of each pickup tube. The result is a higher signal current and, thus, less visible picture distraction.



**BRIGHT AREAS UNAFFECTED**

**PARTICULARLY IMPORTANT FOR OUTDOOR WORK**



Scene Contrast Compression.

**Camera Control Unit**

The CCU, compared to that in the TK-44 system, has been substantially reduced in physical size. All of the CCU electronics setup and local operating adjustments have been consolidated completely into two module frames which fit into rack space 10½ inches high (267 mm).

The former elaborate setup tray of the TK-44 has been replaced by three plug-in modules whose front panels contain all of the controls. The TK-45A's CCU can now

be placed in an equipment rack in a central apparatus area or, if required, in an operating console.

The TK-45 has adopted a philosophy of essentially fixed video gain in the camera head with all video balancing being accomplished in the CCU. The reverse was true in the TK-44. The new system is following a philosophy developed for the TK-28 film camera which works very well in practice.

The circuitry developed for the TK-28 has been employed to quite an extent in the new TK-45 CCU. This includes an integrated circuit multiplier for gain control and modulation shading, a new gamma circuit, and the novel master pedestal (black level adjustment without white level variation) system. A linear matrix has been added on an optional basis to convert the camera from TK-44 (essentially NTSC) colorimetry to System I colorimetry (with negative lobes).

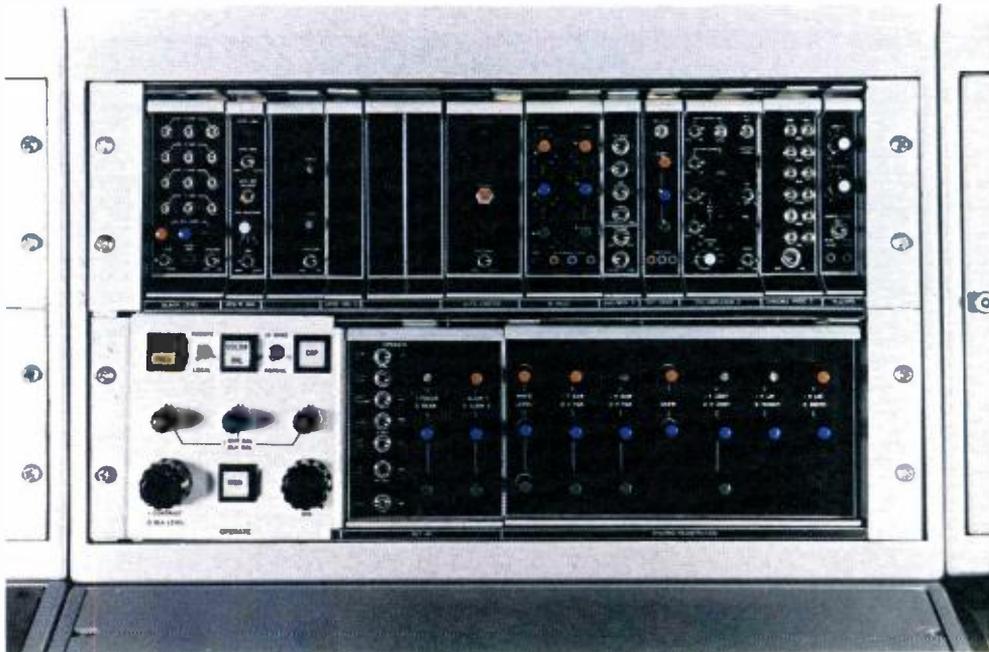
The TK-45A can be supplied to meet any of the international color video standards such as NTSC, PAL, and SECAM. ■

**Guide To Chart**

Sensitivity and S/N for TK-45A is specified as follows:

When the camera is viewing a 60% reflectance Munsell under 125 footcandles incident light of 3200K and the Iris aperture is 1/4, output from the chain shall be 0.7V white and S/N ratio not less than 48dB, using an applied gamma correction of 0.5, no aperture correction, no RGB coring, chroma off, a typical set of PbO tubes and a bandwidth of 4.2 MHz.

Under normal conditions, just swing the line on the X axis. If video gain is increased so that 65 footcandles gives full level at 1/4, then S/N will drop to 42dB.



Compact TK-45A CCU is complete in a single unit of two module frames. The lower section includes the control panel, setup panel and the shading/registration controls.

## SUMMARY

The TK-45A color camera, with its automated functions, was designed for production use. All of the performance features of the TK-44 are retained, including quick set-up, easy operation, stability, sensitivity—and, of course, unsurpassed color fidelity.

With automatic iris, automatic white balance and automatic black balance, the TK-45A requires far fewer technical manipulations by the operator. The result: greater consistency of performance and more production in the time available.

# When a low-priced broadcast camera looks like a good buy, keep right on looking.

Take a good look inside. Check out the design and construction features.

Then think about what they mean in terms of reliability, maintenance, and long-term picture quality after the camera has been put to a lot of hard, daily use.

Look at the RCA TK-630 color camera.

The heart of its optical system is a simple one-piece sealed prism rather than the ordinary arrangement of mirrors.

It's simpler to maintain; stays in perfect alignment; eliminates the secondary reflections that even slight contamination of mirror surfaces can cause.

And for stability, the entire optical system is mounted on a sturdy bed-plate for extra rigid support of pickup tubes, lens and prism.

The result? Less shock and vibration. Extra dependability. And pictures that stay sharp and true.

Components are easily accessible so maintenance is fast and simple. The pickup tubes for example, can be replaced in two minutes. Without disturbing the

optical alignment and causing deterioration of picture quality.

Circuit modules are easy to get at, too. And they're totally solid state for compactness and long life.

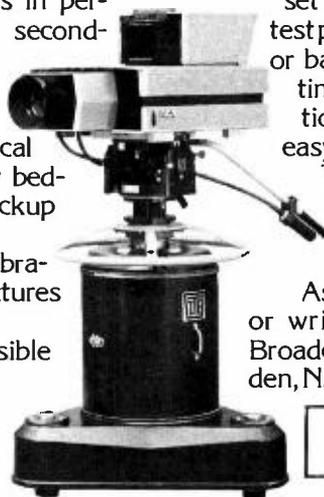
And the TK-630 is made for portability — with a plug-in detachable viewfinder and carrying handle that make it easy for one man to carry.

There are other quality features which set the TK-630 apart: Calibrated test pulse; built-in encoder with color bar generator; automatic pulse timing; deflection failure protection; electronic lens capping, easy setup. And many more.

The new low price is the first thing that looks good about the TK-630.

But by no means the last.

Ask your RCA Representative, or write for new brochure. RCA Broadcast Systems, Bldg. 2-5, Camden, N.J. 08102.



# RCA

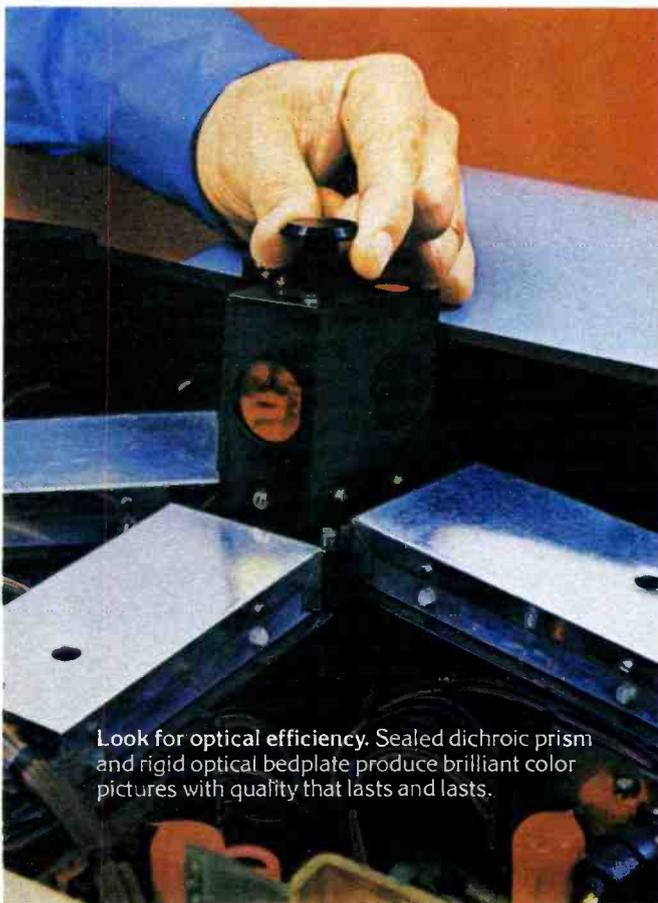
## New TK-630 color camera.



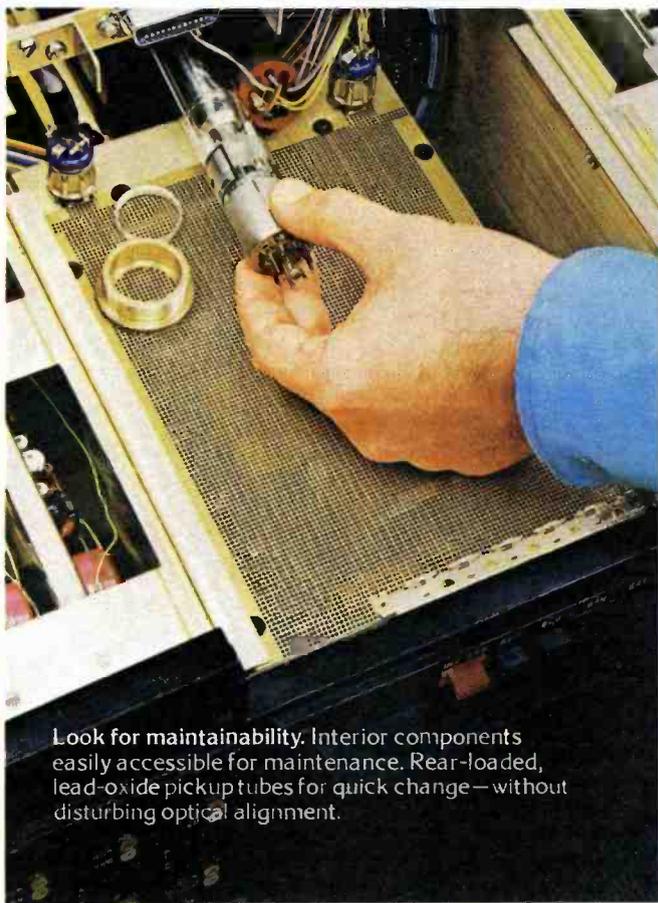
Look for **versatility** in field or studio use. Plug-in viewfinder quickly detaches for easy portability.



Look for **rugged construction**. An extra measure of design integrity. Sturdy circuit boards take hard knocks. Premium components for extra life.



Look for **optical efficiency**. Sealed dichroic prism and rigid optical bedplate produce brilliant color pictures with quality that lasts and lasts.



Look for **maintainability**. Interior components easily accessible for maintenance. Rear-loaded, lead-oxide pickup tubes for quick change—without disturbing optical alignment.

