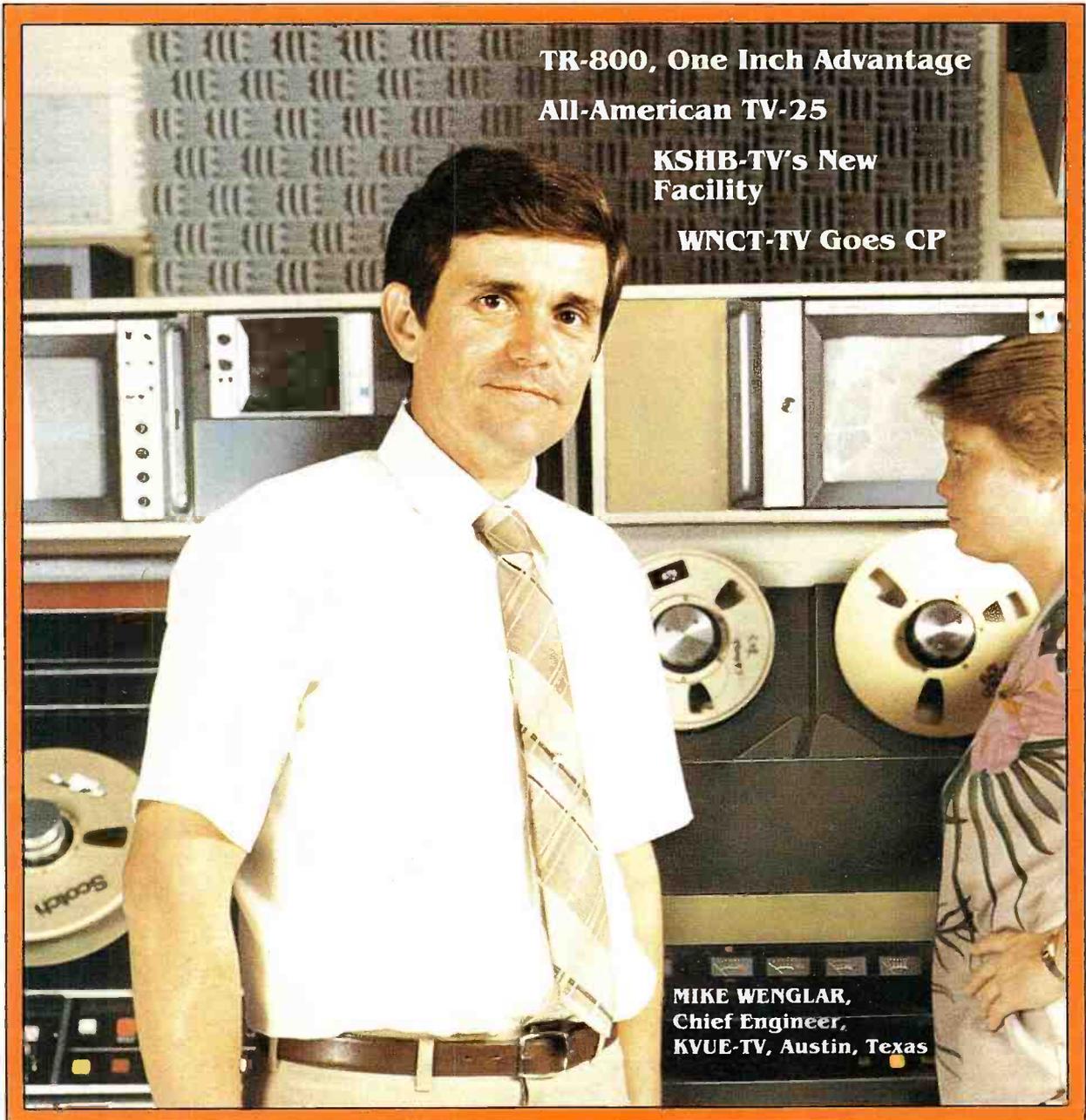


JAMISON

# RCA Broadcast News

Volume 171

Broadcast and Teleproduction Happenings



# KCST-TV SAVES

**“RCA TK-47 cameras cut set-up time and lighting costs, made troubleshooting easy, and increased our commercial production”**

... Tom Wimberly, Chief Engineer  
KCST-TV, San Diego, California

KCST-TV went through some painstaking steps before they added four new TK-47 studio cameras. They even set up a side-by-side comparison study with six other cameras.

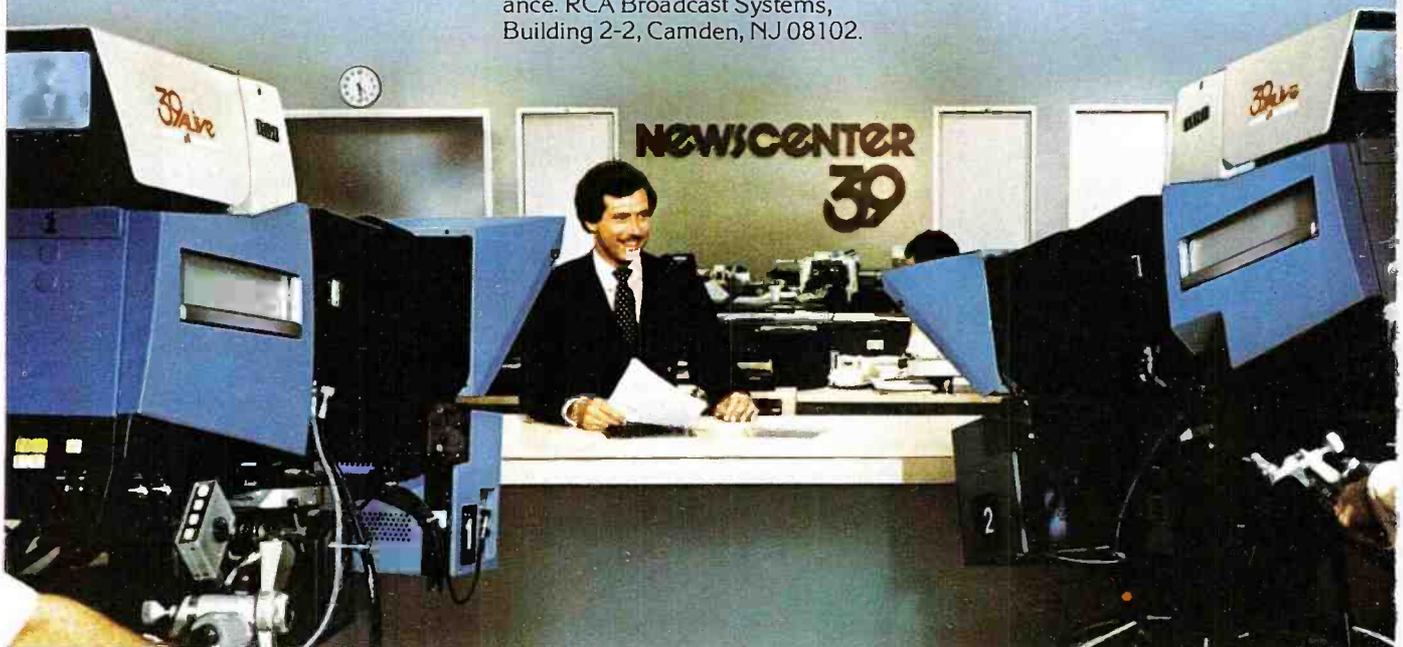
According to Tom Wimberly, Chief Engineer, it was no contest. A technical committee judged the TK-47 to be far and away the best studio camera available. Best in automatics, best in picture quality, best in cost effectiveness and best in all around performance.

That was “before”. What about on-air performance after a year of operation? Here’s what Tom Wimberly has to say:

“The TK-47 cameras have resulted in substantial cost and manpower savings. We’ve cut camera set-up time from an hour to less than ten minutes. Our studio lighting costs have dropped \$400 per month.

Camera maintenance is cut a whopping 48 hours a week. We were concerned initially about the complexity of the TK-47, but we worried needlessly. The camera is extremely reliable. When we experience an occasional problem we find that the microprocessor control makes the TK-47 easier to troubleshoot than any other camera. But best of all, we’re getting unmatched picture quality, and that’s helping us build our audience and double our commercial production.”

Find out how the TK-47 can give you a new “look” in cost-saving, time-saving, and picture quality. TK-47—it’s automatic, versatile and now available in Triax. Call your RCA Representative and ask for a showing of a tape in which six top engineering professionals tell how they are using TK-47’s in their broadcast and teleproduction operations. You’ll see why the TK-47 is first choice for savings and performance. RCA Broadcast Systems, Building 2-2, Camden, NJ 08102.



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(cover story)

Broadcasters are using the 1-inch Type C tape format increasingly and find increasing emphasis on commercial production. Stations WEHT, Evansville, Indiana; WREX, Rockford, Illinois; KVUE, Austin, Texas, WRGB, Schenectady, New York and WTRF, Wheeling, West Virginia report on the advantages of 1-inch.

### 11 ALL-AMERICAN TV-25 SHINES IN OKLAHOMA CITY

The purchase of an aging ETV station by John Blair Company presaged dramatic changes. An independent commercial program schedule. A new transmitting plant. A new broadcast center with full production capability. The result: A success story.



### 15 A MEMORABLE 11TH BIRTHDAY

KSHB-TV, Kansas City, celebrated 11 years on-air in a

big way—with new call letters, new facilities and a new location. The sparkling new TV-41 broadcast center is covered.



### 20 WNCT-TV STANDS TALL IN EASTERN CAROLINA

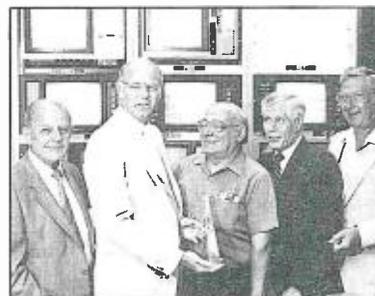
Serving Carolina "from the Capital to the Coast" is more than a catchy slogan for TV-9, Greenville, NC. A \$3 million investment in tower, circularly polarized antenna and a new transmitting plant are providing better coverage and a better signal throughout the market.

### 24 PRODUCTS IN THE NEWS

Capsule reports on a number of new and improved products are featured, including TK-47B with "Smart" RCU; TK-290 Automatic Telecine Camera; HAWKEYE video system accessories; new VHF and UHF antennas; a new 35 kW VHF transmitter, energy options for UHF transmitters, and more.

### 28 ChromaTrak: A NEW VIDEO RECORDING SYSTEM

What is the ChromaTrak video recording format? How does it operate? Why does it produce video tapes superior in quality to ¾-inch format VTR's? This presentation provides answers, with technical details amply supported by illustrations.



### ON THE BACK COVER

Manhattan-based WOR-TV received the 1982 award for "Outstanding Telecast of a Local Sporting Event" from the New York State Broadcasters Association. Proudly displaying the award are: (l to r) Dick Quodomine, C.E.; Bill Walsh, V.P. TV operations; Andres Hernandez, veteran cameraman; Bob Goodman, video; and Art Gress, T.D. For more of the story see the back cover.

# RCA

## New RCA Broadcast Management Team

RCA Commercial Communications Systems Division has restructured its broadcast equipment operations into two new business units:

• Broadcast Video Systems • Broadcast Transmission Systems



**Dennis Woywood**, Division Vice President, Broadcast Video Systems, is responsible for product management and engineering for the division's line of studio and field color television cameras, video tape recorders and control equipment. He also provides business guidance to RCA's subsidiary company in Jersey, Channel Islands which designs, assembles and tests many RCA broadcast products to meet international market requirements.

Prior to his promotion, Mr. Woywood was manager of special systems for RCA Government Communications Systems in Camden, where he was responsible for RCA's role in the development and installation of the Electronic Computer-Originated Mail (E-Com) system inaugurated by the U. S. Postal Service earlier this year.



**Joseph C. Volpe**, Division Vice President, Broadcast Transmission Systems, is responsible for product management and engineering for RCA's line of broadcast transmitters, antennas and technical services.

Previously, Mr. Volpe was director, product operations for RCA's Missile and Surface Radar activity in Moorestown, N. J., and had served as that unit's chief engineer for five years. He joined RCA in 1958 and has held managerial posts in various radar development programs.



**W. Arnold Taylor** is appointed Division Vice President, Marketing, with responsibility for marketing RCA's complete line of radio and television studio and transmitting systems to broadcasters and teleproducers.

While new with RCA, Mr. Taylor has extensive broadcast marketing experience. He was Group Vice President for Compact Video Systems, Inc., Burbank, California. Previously he served as General Manager, Sony Broadcast Division. From 1965 to 1978 he was employed by Ampex Corporation in various sales and product management positions.

Woywood, Volpe and Taylor are on the staff of Joseph B. Howe, Division Vice President, Commercial Communications Systems Division.

### Jimmy Swaggart Evangelistic Association Increases Production Capabilities

The Jimmy Swaggart Ministries, headquartered in Baton Rouge, La., is further expanding its teleproduction capabilities with the addition of RCA broadcast equipment valued at more than \$1.5 million. Included are: four TK-47T tri-axial cable automatic cameras, two TH-200A one-inch video tape recorders, production and editing switchers, and digital video effects and character generating systems.

The new equipment is being installed in the company's new production facilities and its 45-foot mobile production unit which is used to video tape crusades for the Jimmy Swaggart program, according to Dave Cooper, Director of Television Operations.

The show, with a viewing audience of five million, is broadcast by 300 television stations throughout the United States and in six foreign countries, and is used by 2,000 cable television outlets, Mr. Cooper said.

### Vendor Product Group Added By RCA

A vendor products group has been set up by RCA in Camden, N. J. to provide expanded offerings of control equipment products and systems for broadcast and teleproduction customers.

The new activity, under A. R. (Tony) Gargano as Manager, Control Equipment Products, will coordinate the acquisition, marketing and distribution of vendor products, such as switching systems, test equipment, picture monitors, graphics systems and distribution and sync equipment. Advanced digital effects equipment, still store systems and synchronizers, and master control automation systems are also handled by this activity.

### Benton J. Everett Named Director, Domestic Broadcast Sales



Appointment of Benton J. Everett as Director, Domestic Broadcast Sales, was announced by W. Arnold Taylor, Division Vice President, Marketing.

Mr. Everett is responsible for an organization selling RCA's line of radio and television studio and transmitting systems throughout the U. S.

Prior to joining RCA, Mr. Everett was National Sales Manager for Compact Video Systems, and from 1978-1981 served as a sales manager for Sony Broadcast Division.

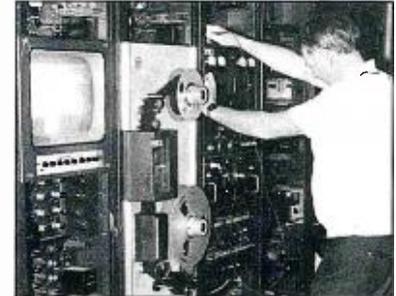
For the previous ten years he held a variety of engineering and management positions with several electronics firms.

### Long Playing TRT-1 VTR Keeps On Taping At Black Hawk College

With the emphasis on "new", "advanced" and "space age" products, it is refreshing to report on a truly vintage model VTR which has been in operation for over 20 years and is still rolling tape.

This classic RCA TRT-1 quad machine, located at Black Hawk College, Moline, Illinois, is the remaining member of three TRT-1's installed there. Two of these machines started out in the tape room of commercial station WMAR-TV, Baltimore, Maryland, and the third at WQAD-TV, Moline. Replaced with newer models in 1969, the TRT's

were moved to Black Hawk's ETV facility where they have performed yeoman service over the years, according to Robert Fletcher, Director of Educational Television.



Chief Engineer Don Bargmann checks out Black Hawk College's vintage RCA TRT-1 video tape recorder.

Colorized and updated with transistorized tone wheels, the machines were heavily used for both production and playback functions, notes Don Bargmann, Chief Engineer. The surviving TRT-1 is mostly used for playback operations and for transferring the college's extensive library of 2-inch tape masters to ¾-inch cassettes—and it's still going strong.

### PTL Television Network Expands Studio With \$3 Million In Equipment From RCA

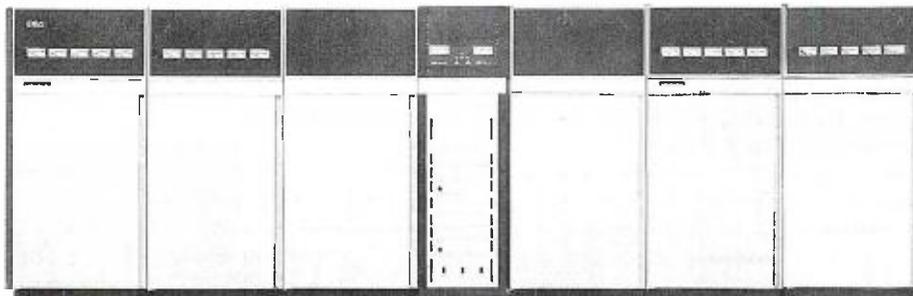
PTL Television Network, a producer of Christian programming, is expanding its studio in Charlotte, N.C. with RCA equipment valued at approximately \$3 million.

The equipment on order from RCA includes five TK-47 triaxial cameras, two TKP-46 portable studio cameras, three TR-800 one-inch video tape recorders, a graphics generator, and two Grass Valley production switchers, a 1600-7K and a 300-3AN.

PTL programming, distributed via satellite and video tape, is seen by approximately two million viewers each week.

According to the Rev. Jim Bakker, President of PTL, the new equipment should be in operation after the studio expansion is completed in the fall.

## 100th G-Line VHF Transmitter Slated For CP Operation



**WWAY-TV**, Wilmington, NC, a subsidiary of Clay Communications Inc., received the milestone 100th RCA G-Line VHF transmitter at the end of 1981, less than two years after the first unit was delivered to WCVB-TV, Boston.

Ch. 3's new transmitter, a TTG-30/30L, operating in parallel to produce 60-kW output will operate in conjunction with an RCA TDM-7A3 circularly polarized antenna mounted atop a new 2,000 foot tower.

The G-Line transmitters, man-

ufactured at RCA's facility in Meadow Lands, Pa., feature the latest in advanced solid-state design technology. Only two tubes are used, one visual and one aural, with all circuitry being solid-state up to the 1600-watt visual and 100-watt aural driver output power levels.

RCA G-Line transmitters are available for operation on world-wide broadcast standards, including NTSC, SECAM, PAL-B and PAL-M, meeting requirements for essentially all bandwidths and channel

assignments.

A broad range of power classifications and system configurations are offered, with a choice of 26 transmitter models, each specifically suited to individual requirements. Power levels range from 10 kW to 100 kW.

Parallel configurations are available to support circular polarization, to supply extra power headroom, or to provide an added measure of on-air reliability.

### WDSU-TV Begins Circularly Polarized Broadcasts

**WDSU-TV**, Ch. 6, New Orleans, has begun circularly polarized transmission, using a new RCA TDM-7A6S antenna.

The TDM (Dual Mode) is a top-mount antenna with low wind-loading, designed as a direct replacement for Superturnstile antennas on existing towers. At WDSU-TV, the TDM replaced a Superturnstile installed in 1956.

In addition to the CP antenna, the equipment order included three RCA TK-47 automatic studio cameras to expand program production capabilities.

### Brandon Productions Opens Teleproduction Operation

Brandon Productions opened its new teleproduction studio facilities in West Palm Beach, Fla. with a complement of RCA portable camera and video tape recording systems.

The equipment includes a TK-86 portable TV camera, a TH-50 portable one-inch video tape recorder, production switcher and associated equipment.

James Brandon, president of the teleproduction company, said the RCA equipment represents the first phase of equipping the new facilities, which will specialize in the production of commercials as well as features for distribution via cable television outlets.

### WBRZ-TV, Going To CP Operation With RCA Antenna And Transmitter

**WBRZ-TV**, Baton Rouge, La., will begin circularly polarized broadcasts this year following installation of a new RCA antenna and transmitter valued at approximately \$1.1 million.

The equipment on order includes a TDM-7A2 circularly polarized antenna and a TTG-30/30L 60-kilowatt parallel transmitter.

According to Bill Yordy, director of engineering for the Manship Stations, the new equipment is scheduled to be in operation by the fall of 1982, and will combine for a maximum effective radiated power (ERP) of 100 kilowatts.

## HAWKEYE's Traveling Demo System Doubles As A Versatile Mobile Production Facility



The Hawkeye van attracts an attentive audience during its visit to WIPY-TV's Philadelphia studios.

A fully equipped mobile TV unit was employed at NAB to demonstrate high quality video production capability of RCA's HAWKEYE system.

An operating complement of cameras, recorders, switching, audio and control equipment was installed in a Ford Econoline vehicle. Included were two triax-equipped HC-1 cameras with joystick remote video controls, plus two HR-2 ChromaTrak

studio VTR's and an HE-1 Edit Controller for complete flexibility in on-site editing. The cameras could also be integrated with a HAWKEYE HR-1 portable VTR for operation as a one-piece recording camera.

Since the NAB show, the van has been on the road demonstrating the performance quality and capability of the HAWKEYE system with its ChromaTrak recording format.

## Nautilus Sports/Medical Industries Expands

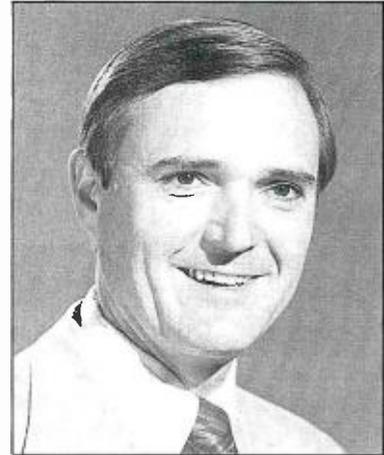
Nautilus Sports/Medical Industries is further expanding the capabilities of its television program production facilities in Lake Helen, Fla., with RCA video tape recording equipment valued at more than \$1.5 million.

The equipment on order from RCA includes 24 TH-200A one-inch helical scan video tape

recorders, including time base correctors and other accessories.

The new recording systems will be installed in the nine-studio video complex of the Nautilus TV Network, augmenting the 12 RCA TH-200 recorders and 24 TK-46 studio cameras already in operation. The production facility, scheduled for completion this year, covers 250,000 square feet of studio space, and is one of the largest and best equipped video centers

## Gaydos Named Director, Teleproduction Sales



Charles J. Gaydos has been promoted to Director, Teleproduction Sales, with responsibility for the organization which markets RCA television studio equipment to the teleproduction, corporate, educational and government customers throughout the U. S.

Previously he was Manager, Teleproduction Systems Sales, and had served as an RCA sales representative for eight years.

Mr. Gaydos joined RCA in 1961 as an international marketing representative, and later was a sales representative for RCA's professional electronic systems marketing activity.

in the world.

Nautilus TV Network produces programs for fitness centers around the country that use Nautilus exercise machines, as well as informational and instructional programs on health and fitness. The operation plans to produce 200 weekly hours of programming for cable network syndication.

# The One Inch Advantage

## Quality Commercial Production of Increasing Importance To Broadcasters



Engineers, Management, Directors and V.T. Operators are using 1-inch Type C increasingly, and find increasing importance in local commercial production, according to comments received by Broadcast News. We'll share some of the comments but first, it's important to get a clear picture of the machine they're using—the TR-800, manufactured by RCA in Camden, New Jersey.

### Features

In designing the TR-800, RCA placed emphasis on adding time efficiency to control room operations. The resultant design provides faster threading relative to the complicated threading patterns of some other 1-inch VTR's, flexible editing capabilities, maintainability through subsystem accessibility, flexible local/remote control and fast tape handling abilities with 2-hour tape reel capacity.

### Dimensions

The basic TR-800, which includes full record, playback, simulplay and monitoring capabilities is a 195 pound, 25-inch high by 22-inch wide, 28-inch deep unit.

### Design Details

Built into the TR-800 is "Guidetrack", a path from the

supply reel to the takeup reel which is combined with retractable transport tension elements, pinch roller and audio shields. When the operator presses the "Load" key, the tape path is cleared.

Additional tape handling features of the TR-800 include Dynamic Braking and End-of-Tape sensing in both directions, and at fast wind—a 90 minute reel rewinds in less than 135 seconds. The TR-800 Supertrack feature yields broadcastable pictures in reverse, still or forward modes.

### Control

Machine functions on RCA's TR-800 are fully monitored. Controls have been developed around the built-in microprocessor. Digital displays visually confirm elapsed hours, minutes, seconds, frames and tape speed (time code modules are optional). Audio and video RF metering is included along with LED warning indicators. A previewable editor and push button search-to-cue are also built in. An integral NiCad battery backup preserves VTR presets, monitoring and search-to-cue data in case of power loss.

### Maintenance

The TR-800's scanner and

head module designs make replacement of the heads on the upper drum assembly accessible. Routine replacement adjustments can be made with a screwdriver.

Most routine adjustments can be made while the machine is in use. The power supply swings out from the rear panel. In the studio console, a work light is built into the back.

### OPTIONS

#### Super Search Editor

The Super Search Editor (SSE) option expands the TR-800's basic features, giving the operator nine additional, search-to-cue points, modifiable edit point through the keyboard, a store direct mode to capture edit points on the fly, and an out transfer mode plus keyboard entry.

#### Time Code Options

The optional RCA time code modules—Time Code Generator, Time Code Reader, and Video Time Code Processor, plug into the TR-800's electronics card cage.

#### The AE-800 Time Code Editing System

Whether built-in or remotely positioned, the optional AE-800 time code editing system gives



the TR-800 user the ability to connect and control up to nine VTR's. Any combination of TR-800/AE-800, TR-600/AE-600 or TH-200/AE-600 systems may be addressed using this editing system.

## The Digital Time Base Corrector/Drop Out Compensator

The optional digital time base corrector employs both digital Drop Out Compensator and digital Velocity Error Corrector. Whether rack mounted or housed in the console, the processor controls are remoted to the control of the TR-800 for operator convenience. Broadcast quality color pictures are delivered at normal and variable play speeds. In wind modes, viewable color pictures are available up to 10 times play speed and monochrome pictures up to full wind/rewind speeds.

## The Multi-Rate Video Controller

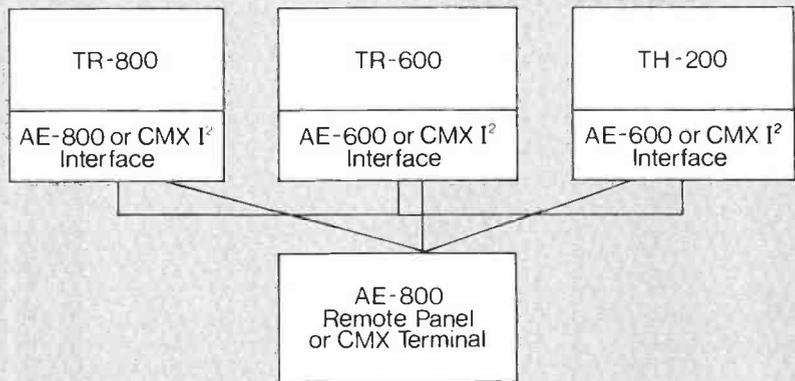
The optional Multi-Rate Video Controller, (MRVC), desk top unit is designed for sports or other applications where motion control is critical.

## Configurations

The TR-800, physically, can be set up as: Transportable—a self-contained portable version for mobile applications, Low Boy Console—with a choice of all TR-800 accessories, or the expanded Studio Console with Monitor Bridge, which adds a top assembly with two built in speakers and provision for a 12-inch color or 15-inch mono picture monitor in addition to the full custom accessory line.

## Field Experience

BROADCAST NEWS interviewed people at several TR-800 installations to assess how the units are being utilized in their operations.



## The Decision Basis For The One Inch Format

### WEHT-TV

From WEHT, Evansville, Indiana, Elmer Chancellor, Director of Engineering for both that station, and for Gilmore Broadcasting Corporation, reports his choice of 1-inch equipment was carefully made . . .

"WEHT has a reputation, built over the years, of producing high quality work. We wanted to continue to maintain the high quality standard when we purchased 1-inch (Type C) video tape machines. We looked at the 1-inch market for quite some time before making a final decision. We are replacing sixteen year old RCA quad machines with the new TR-800's. We believe that this will give us the most modern, most flexible, state-of-the-art facility in the market. Our clients have come to us for quality production work and we want to continue to maintain the image."

### WREX-TV

Gerry Meinders, Chief Engineer at Rockford, Illinois' WREX-TV chose his equipment for the competitive edge it gives his station . . .

"We thought the 800 was the most advanced machine available. We had clients that would take their production to Chicago. Now with our 1-inch

machines, WREX can offer the same editing capabilities. With the 1-inch format, the cost of tape is considerably less than quad. You get rid of the banding that is associated with quad. We do multiple generations in order to get a spot done . . . sometimes 5 and even 6 generations, and 1-inch quality really holds up."

He adds, in favor of the TR-800, "Being microprocessor controlled, if we want to add to it, it will most easily be done."

### KVUE-TV

Chief Engineer Mike Wenglar of KVUE, Austin, Texas, also favors microprocessor-based control . . .

"We feel that RCA had something unique. The industry's going toward microprocessor-under-software control. We felt that the 800 would lead the way."

### WRGB-TV

In Schenectady, New York, WRGB's Charlie King, Manager of Operations, saw the need for 1-inch quality throughout the station and carefully examined equipment at the 1981 NAB. Says King,

"We looked at all the equipment. We were impressed with the TR-800."

King goes on to note that he sees the future of local television linked to sophisticated 1-inch editing ability and reproduction quality.

"Our programming people are insisting on 1-inch quality and flexibility in their productions. Our promotional people are very intrigued with the flexibility of 1-inch. Our commercial clients have received it very favorably."

## WTRF-TV

About their acquisition of two TR-800's, George Carroll, Vice President of Production for WTRF-TV, Wheeling, West Virginia, puts it succinctly,

"RCA's editing features, reputation, and service were key factors in our TR-800 'buy' decision . . . the choice was clear."

## Commercial Production—Of Increasing Importance

Among all of the stations we spoke to, there was agreement on two major points; local commercial production is of increasing importance, and superior 1-inch quality is almost a necessity to stay ahead of the competition.

Charlie King at WRGB states, "We have been increasingly aware that the future of commercial production and time sales was in the retail area. Our clients have become very interested in going almost exclusively to 1-inch as the as the best marriage between ¾-inch portability and the 2-inch quality." He also notes, "You do encourage the local client, particularly the retailer, to come in to your shop and do your work with you. You can really be his consultant from start to finish. That's a big plus in getting the commercial in house." King indicates that an advertising schedule bought on the station that does a client's production is often a natural result of this consultation.

He continues, "We feel the sales environment at the moment emphasizes the need for an increase in retail sales. It's going to be almost a necessity in a market, to have 1-inch quality

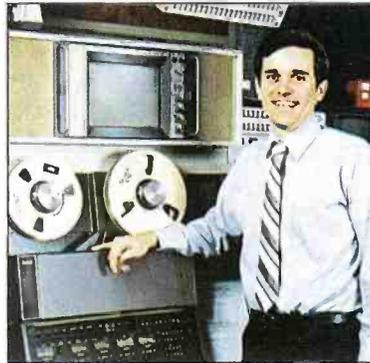
## TR-800 TV Stations' People . . .



**Elmer Chancellor, Director of Eng., Gilmore Broadcasting.**



**Earl Waitman, TV Director at WEHT, Evansville, Indiana.**



**Mike Wenglar, Chief Engineer, KVUE-TV, Austin, Texas.**



**Gerry Meinders, Chief Engineer, WREX, TV-13, Rockford, Illinois.**



**Charlie King, Manager, Operations WRGB-TV, Schenectady, NY—**



**—supervises the RCA TR-800 VTR operation at his station.**



**George Carroll, Vice President, Production, WTRF-TV.**



**Bob McFarland, Chief Engineer, WTRF-TV, Wheeling, West Virginia.**

from a remote location all the way through to on-air playback.”

At WTRF, V.P. of Production Carroll responded that, “Improved picture quality for location commercial production was our primary concern.”

Elmer Chancellor at WEHT agrees, “Our local clients’ reception of the TR-800 has been very good. We believe that we can now offer them the highest quality production available in this market or in any market for that matter. We believe the quality of the work we produce will be satisfying.”

After experiences with other 1-inch machines, Denise Hodgson, V.T. Operator at KVUE finds, “It’s a lot easier to put commercials together with the TR-800.”

WREX’s Chief Engineer, Gerry Meinders, tells us that their TR-800’s use is also “. . . primarily for commercial production.” In the Rockford Market, 1-inch is “. . . a very predominant production factor.” As reported earlier, in that market the station had also felt the heat of competition from the nearby No. 3 Market, Chicago. The TR-800 now gives WREX parity, greater ability to capture and keep local business and even appeal to the larger markets’ producers.

## RCA Tech Alert, Parts Availability Appreciated

RCA’s technical support, parts availability and service all over has helped broadcasters feel comfortable with their RCA equipment.

From Gerry Meinders at WREX, “One thing I liked about getting the TR-800 was the back-up service. And parts. I have found with RCA equipment there’s usually no problem in getting them.

We have other RCA equipment and have had real good luck in getting replacement parts for it. If I’d had any problems I couldn’t solve myself, I’ll call Tech Alert

and they’ll help me out.”

At WTRF, Chief Engineer Bob McFarland simply says, “The back up of RCA with Tech Alert is good to have.”

## Editing

Whether for commercial clients, industrial clients, in the newsroom, for program production, or in on-air promotion use, the editing capabilities of the TR-800 have gained appreciation from its users.

WEHT’s Chief Engineer Chancellor says, “The TR-800 with the Super Search Editor is a very flexible editing machine. Our clients have been impressed with our editing capability.” He adds, “The machines are convenient to use, the flexibility is very good, quality is very high, and we believe our clients should be very happy with the quality of work we can produce for them.”

Earl Waitman, Director at WEHT tells us, “One tremendous feature is the search to cue. Being able to edit very accurately to the frame is something else we’re ecstatic about, with the ability to make that same edit on that very same frame any number of times, if it’s not correct the first time. Previously, on quad machines, we have not had a function like that.”

Gerry Meinders at WREX says of the station’s TR-800’s, “. . . these are opening up new areas of production. Sometimes we’re playing back and they want

to freeze frame, or they want to go into slow motion, and in some cases they’ll even want to stop it and go in reverse. This is something that we couldn’t have done without it. They definitely like the TR-800.”

From Charlie King at WRGB, “Editing with the 1-inch is so much more efficient and rapid than the 2-inch editing. In spite of the editing facilities we’ve added to the 2-inch, that’s still a much slower process. It’s certainly not as flexible a process. You don’t have the ability to almost do animation. The client can create more with 1-inch.”

## Operator Satisfaction

A person in close, constant contact with the TR-800, a V.T. operator, expresses her level of satisfaction with the machine in a very complimentary way.

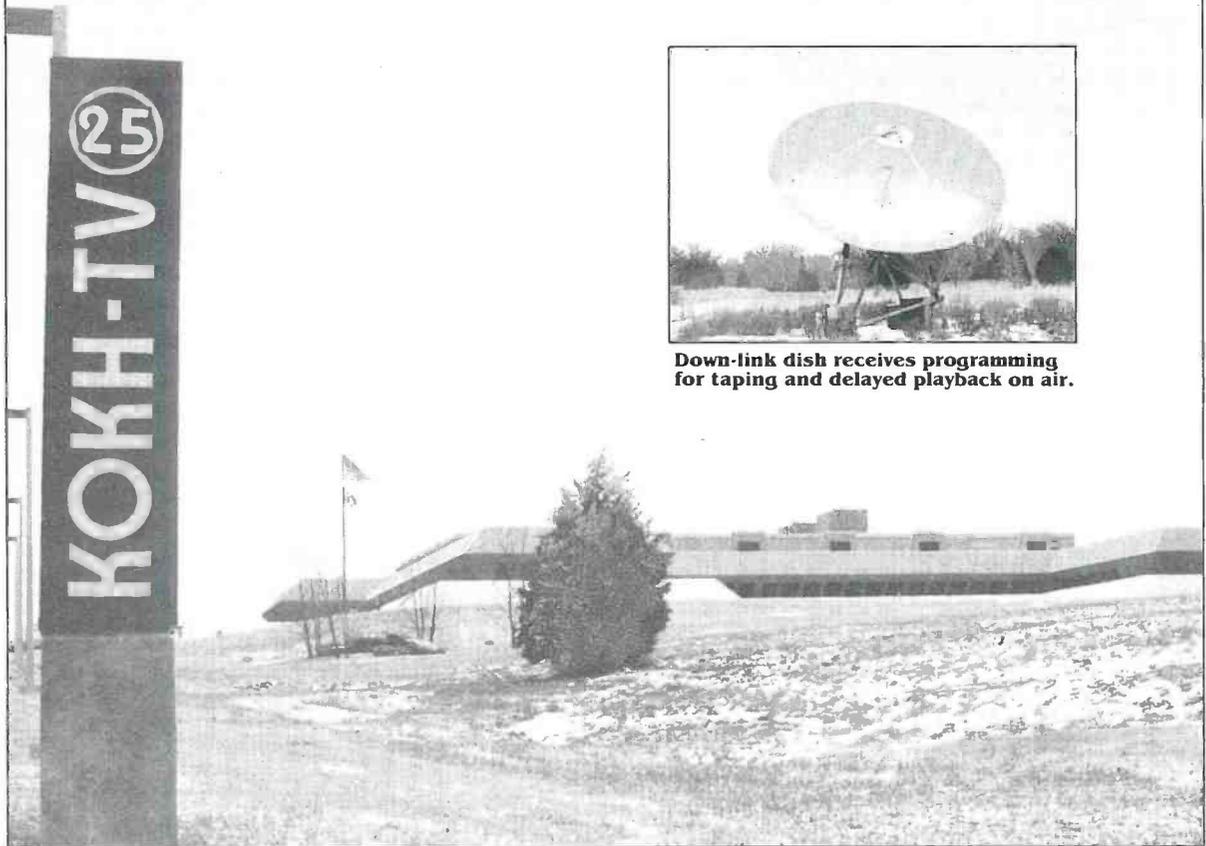
Denise Hodgson at KVUE—“I love the TR-800. It’s a lot easier to thread than any of the 1-inch machines I worked with before. With cue memories you can go by and store them and you always have them there if you have to go back and re-do something. I love the advance on or off if you want a 5 second pre-roll, or whatever. I love the auto add-on. It locks up right after you hit record. I love the out transfer. It saves a lot of time changing your output to a new inpoint. I just think it’s a fantastic machine!”



KVUE’s Denise Hodgson strikes a happy pose with her TR-800.

# All American TV-25

## Pumps New Life Into Old Oklahoma City Station



Down-link dish receives programming for taping and delayed playback on air.

All American TV-25 moved from a school house to this brand new single story, 25,000 square foot facility in mid-1980. Building houses broadcast, production and business operations.

Prior to 1979, if the transmitter went out at KOKH-TV in Oklahoma City, the major impact was that a host of students at the city's schools got out of class early that day. The station in those days was strictly an educational television station that carried curriculum programming for the school system. Outages did occur and early student departures weren't unusual. No fault of the staff. They were outstanding, but funding the station was a problem and the equipment was starting to show the wear and

tear of age.

All of that changed dramatically in 1979, however, when the John Blair Company purchased the station and obtained the necessary re-licensing from the FCC to convert to higher power and to begin planning new studio construction. That was the start of All American TV-25 (KOKH-TV). The new station went on the air in October of 1979 with studios leased from the school board in the city's Classen High School. Coverage was limited for the first few months of operation since the

school system's 15kW transmitter was utilized until the RCA TTU-60D transmitter could be installed.

A site for a new station facility was selected in the northeast section of town and while construction was underway, the RCA transmitter was also being installed along with an RCA TFU-42J Pylon antenna. The transmitter was turned on in January of 1980—a full five months before the spanking new facility was ready for occupancy.

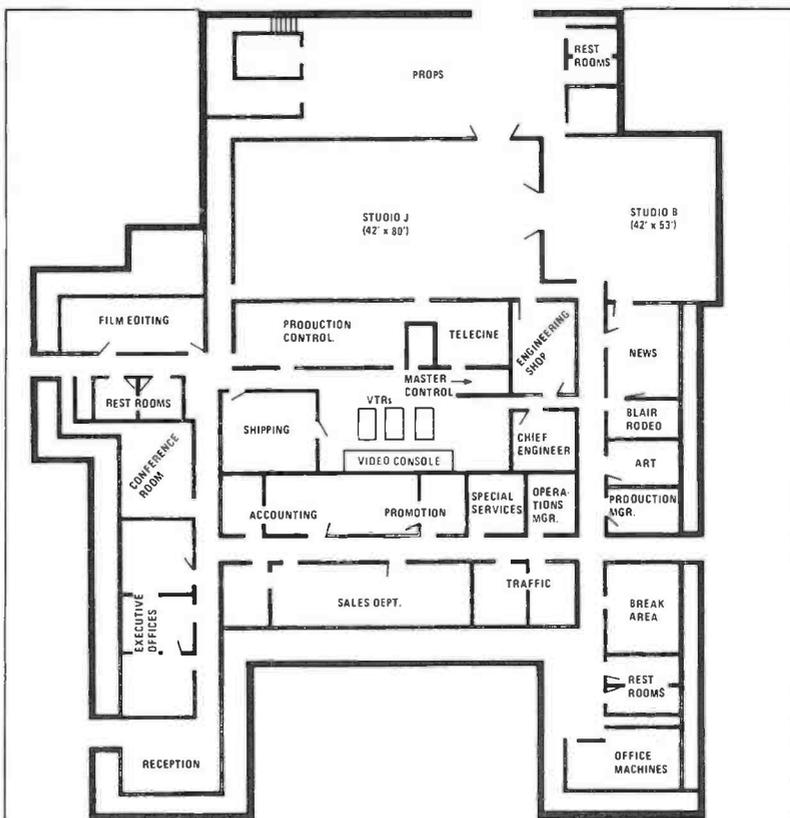
## New Station Facility

And what a facility it is! Located high on a hill, the station is an angular, sandstone colored building that has the look of a spacecraft that has just majestically glided in for a landing. It's an attractive structure that blends in esthetically with the surrounding earthtone landscape. And inside, it's a warm, functionally designed, single story 25,000 square foot building that houses business and broadcast operations plus two large studios for live and commercial productions.

The transmitter is located on the property—just across the parking lot—but far enough away to require remote operation. And jutting into the Oklahoma City sky, beside the transmitter building, is the tallest tower in town, 1,619 feet, topped off by the RCA Pylon Antenna. The tower, tall by Oklahoma standards, is tall by New York standards, too, since it is higher than the World Trade Center buildings. Five hundred yards away, on a gentle sloping hill is a 7 meter dish that's used for receiving programming for taping and delayed playback on the air.

## Growth Plan Developed

Driving force behind the resurgences of All American TV-25 is David Murphy, Vice President and General Manager of the station. David, who had previously been with PBS in New York and RKO in Los Angeles, joined the station when John Blair Company took over. He's the man behind the change that turned the operation into the number one independent TV station in the market with an effective mix of movies, sports, and special programming. But the real resurgence came about in Murphy's plan to build the operation into a major production



Floor plan for All American TV-25.

facility. That's Studio 25, the production arm of the station that today is one of the leading teleproduction companies in the area.

## Studio 25 . . . Total Production Operation

Studio 25 uses three TK-47 cameras in their operation to produce a considerable number of local commercials plus several national spots. The cameras are augmented with a Grass Valley switcher, with digital video effects and E-MEM. "We can do just about anything in video production," reports Sam Clark, Production Manager of Studio 25. "And we're constantly gaining new accounts."

The major use of the TK-47 cameras is for the daily production of the "Richard Hogue Show". The show features evangelist Richard Hogue with prom-



David Murphy (seated), Vice President and General Manager confers with D. K. Hart, Chief Engineer.

inent guests. All three cameras are used for the production and the program is beamed via satellite to the PTL Network in Charlotte, N.C. PTL puts it on their network—with a potential audience of eight million homes from coast to coast. All American TV-25 replays the show locally later in the evening.



(Upper left). "Spec" Hart, Chief Engineer stands with his TK-47 cameras that he first "discovered" on air in Dallas at the NAB in 1979.

(Upper right). Three of the TK-47 cameras are used for daily origination of the "Richard Hogue Show".

(Lower left). TTU-60D transmitter replaced 15 kW school transmitter and was on air five months before new building was operational.

(Lower right). Two TCR-100 cartridge recorders are kept busy airing all commercials for All American TV-25.

## TK-47 Automatic Cameras For On-Air and Production

"The TK-47s are really doing a job for us," reports D. K. "Spec" Hart, Chief Engineer at KOKH-TV. "We really put them through their paces, too, with the

'Richard Hogue Show' everyday and then we swing right into commercial production. We even have the 47s working many a night taping public affairs programming for the weekend."

The cameras are equipped with automatic set-up controls and with a touch of the "check" button every morning—just a few minutes before the Hogue Show—the cameras run through their daily check in seconds and are ready to go.

Spec is a veteran in the broadcast business, joining all American TV-25 from Channel 9 in Oklahoma City where he had been for 26 years. He was in on the beginning of All American TV-25 and coordinated the start up of the new station from transmitter, antenna, cameras, recorders and telecine systems to detailed system layouts of the transmitter buildings, control and production facilities.

## "Quietest Shots I'd Ever Seen"

The decision to purchase the TK-47s was based on Spec's strong recommendation after careful analysis of four other studio cameras. But Spec's first awareness of the TK-47 came about at the Dallas NAB in 1979. Here's how Spec describes his first exposure to the TK-47.

"I had attended the first day's sessions at NAB and I was back in my hotel room relaxing and unwinding a little before dinner. I switched on the television set to watch a news show. It was KDFW and the newsroom shots they were putting out were the quietest I'd ever seen. The pictures were really great and I just had to find out what kind of cameras they were using. I found out the next day. Turns out, they were the first TK-47s RCA shipped, Serial Nos. 1 thru 4."

Spec made a return visit to Dallas a few months later and got a complete rundown on the 47s from KDFW personnel. The end result was the purchase of three TK-47s for All American TV-25.

"I couldn't be happier with the performance of the cameras," reports Spec. "And there is just nowhere that we could get the kind of backup support for all of our equipment then what we get from RCA. They're responsive to our needs, and I like that."

In addition to the RCA transmitter, antennas and cameras, the station also has two RCA telecine systems (one TK-27 and one TK-28) each equipped with a TP-55 multiplexer. Current plans call for the replacement of the older TK-27 with RCA's new TK-29 system.

Two RCA TR-60 Quad Recorders and two TCR-100 cartridge machines round out the station's RCA complement. The "cart" machines are used for all com-



**Production control is nerve center for Studio 25, the station's production arm which provides daily origination of "Richard Hogue Show" and heavy commercial schedule.**

mercial airings, and the TR-60s are used by Studio 25 and for recording satellite feeds of "Entertainment Tonight" and "The Richard Simmons Show".

### Hot Entry in Oklahoma City Market

All American TV-25 has definitely graduated from a "school" station to one of the hottest entries in the very competitive Oklahoma City market.

"We're expanding our capabil-

ities in programming and in production," says Spec, "and we're keeping pace with technology. We're an independent station and we're on the air 20 hours a day. We have to have reliable equipment because we don't have the luxury of a network to fall back on. It's a different ball game for an independent but we've got the right combination of technology and talent to prosper and grow."

## The Man Behind the Growth

Youthful, dynamic David Murphy, Vice President and General Manager of All American TV-25, is the man John Blair Company tapped to plot a strategic growth plan for the new commercial station.

"I took on the challenge at the station because it really gave me an opportunity to be in on the building of a station. Not just bricks, mortar and electronics, but building toward an objective of television leadership in the community. I was in at the beginning and it was quite an experience. It was a challenge initially, working out of tight quarters in the old high school. But that start-up time gave us a few months to work out the kinks and really have the station in high gear when we moved into our new building.

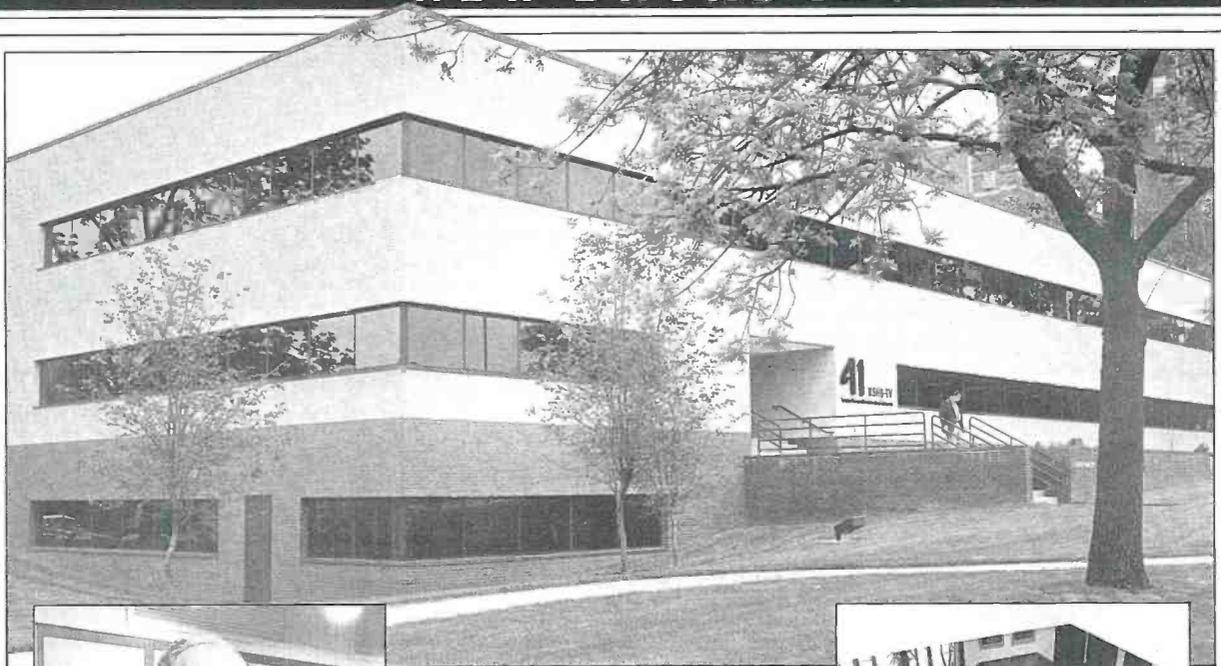
"It isn't news today to say that the broadcast business is rapidly changing. Everyone is aware of that fact. It's getting much more competitive. New stations are springing up. There's cable. DBS. And it is difficult to predict the future.

"Today's broadcaster has to develop a strategic long range plan today that will plot a course of action for the next decade. Gone are the days of month-to-month and year-to-year planning. The



**David Murphy, Vice President and General Manager of All American TV-25.**

advertising volume just isn't there to cover all the potential media opportunities that the advertiser has available. It's a real competitive situation and the station that does effective long range planning today to meet the needs of the community and at the same time, deliver a 'buying' audience, will be the leader in its marketplace next year, and ten years from now. That's our goal for All American TV-25."



**Harold DeGood,**  
Chief Engineer, KSHB-TV

# KSHB TV-41

**Celebrates its  
11th Birthday  
by moving into  
a new home**



**KSHB-TV's modern broadcast center includes a 3-story atrium to bring the "outside" in.**

On September 28, 1981, TV-41, Kansas City, marked its eleventh year on-air. Instead of funny hats, ribbons and noisemakers, the Scripps-Howard station celebrated by moving into a sparkling new building in a new location.

It celebrated by changing its call letters: The old KBMA became the new KSHB. Program changes were made, and viewers were invited to share the "new spirit, new look, new '41'".

During its first eleven years of operations, TV-41 had outgrown

its original small facility and spread out into four separate operating locations. It became an operational nightmare, with the studio in one building; studio production and master control functions in another; news and film departments in a third building, and administration and sales departments in yet another facility.

### **"A Heroic Effort"**

Chief Engineer Harold De Good lived through it all—and

appreciates the difference. He was employee #2, hired to put TV-41 on-air in 1970.

Mr. De Good wryly observed that operating a TV station from four separated locations provided more challenges than management wanted.

"It was a situation that required heroic work on the part of all of the people involved in the broadcast operation. Our people made our station as good as it could possibly be under those circumstances."

That is all in the past for TV-

# NEW BROADCAST CENTER



(top) Producers/Directors work area;  
(bottom) Engineering Reference/Conference area.



Functional layout provides a smooth work-flow pattern

41. Its new home is a modern, functional building which fits well into its location, an established apartment neighborhood overlooking Volker Park, with the renowned Nelson Gallery of Art just a block away.

TV-41's new building is amply windowed, with tinted glass, providing a light, pleasing working environment. The architects were able to take advantage of the natural terrain to fit the high-ceilinged studios at the rear where the ground slopes back. An atrium of three stories opens up the interior space, which provides an esthetically appealing look, yet is functional in making the area seem spacious, with natural lighting and a generous arrangement of live plants and foliage. Contact with the "outside world" is available from just about any location in the building. Even Master Control has a window looking out on the atrium.

When TV-41 was purchased by Scripps-Howard in 1977, plans were started immediately toward moving to a new facility.

### Smooth Flow Pattern

"The new consolidated 44,000 square foot facility provides great advantages," Mr. De Good notes in a classic understatement. "The flow pattern is smooth, with related functions grouped by areas for easy contact with all levels of station operations. Ample space is provided for current operations, with expansion capabilities."

Sales, Traffic and Administration functions moved to the new location in mid-August 1981. The technical operation followed, on September 28, eleven years to the day from TV-41's initial sign-on.

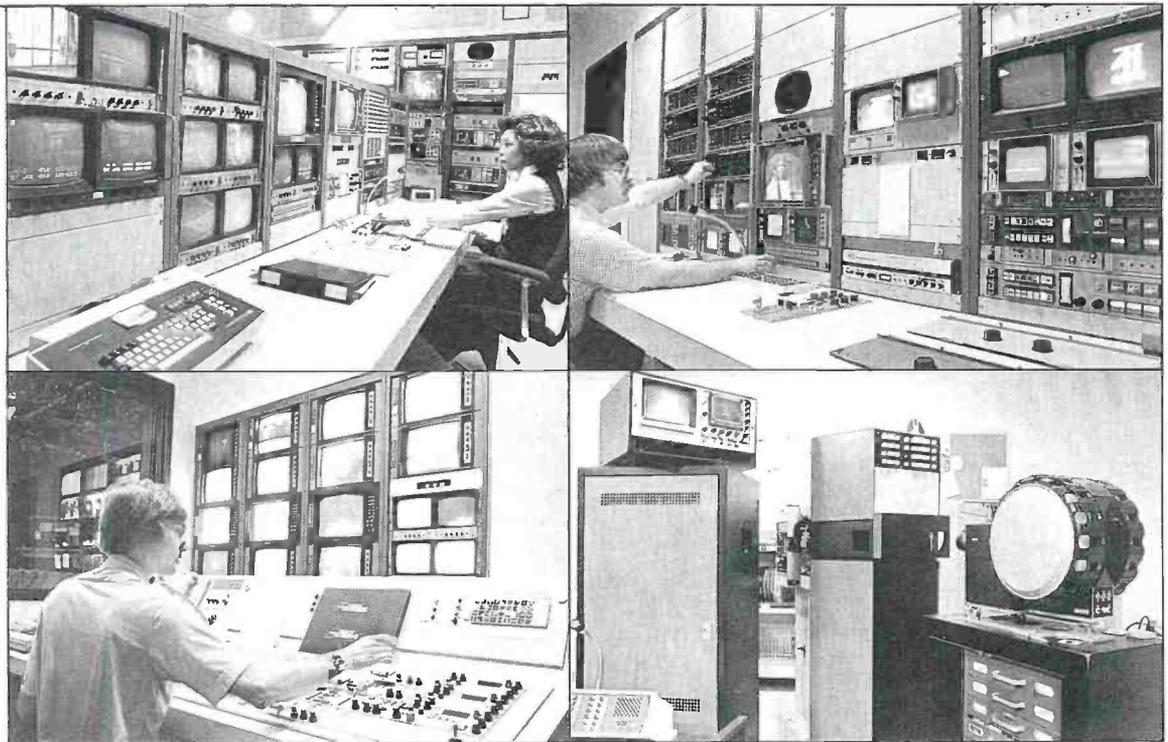
The layout of the facility is functional and compact. The first floor space across the front of the building is occupied by

Engineering administration, with the Technical Library, instruction manuals and reference material centralized. Adjoining is a space for Producer's desks with a "green" room available for small client conferences. Administrative offices are located on the floor above.

### Technical Area

The main technical space is divided into three separate areas. One space includes the Master Control console, terminal racks for distribution, monitoring and control systems. Camera CCU's are located here at a video operator position. Ample space is provided for future expansion as needed. The terminal racks are used to provide wall space, with the rear of the terminal cabinets forming one wall of the adjoining engineering maintenance facility which also provides the added advantage of easy access for servicing,

# NEW BROADCAST CENTER



Clockwise (from top right): Video Control; Telecine; Production Control; Master Control

Mr. De Good points out.

The second technical space houses Tape and Telecine. Three quad VTR's are used for on-air playback, and a video cartridge machine handles commercials. A TK-28 telecine system is installed in this area, along with a second film island which is being replaced by a new TK-29 system. An adjoining, glassed-in space is provided for production VTR's. TV-41 is in the process of switching to one-inch VTR's, according to Mr. De Good.

The cooling system is slightly different in that cold air enters from the ceiling, with return air exiting through floor ducts. Computer flooring is used for the technical area.

## Production Control

Production Control "A" is a two-level facility which looks in on the main studio, to maintain eye contact with the set. The higher level is the audio booth,

with the audio operator able to see the set as well as the bank of monitors displaying video sources.

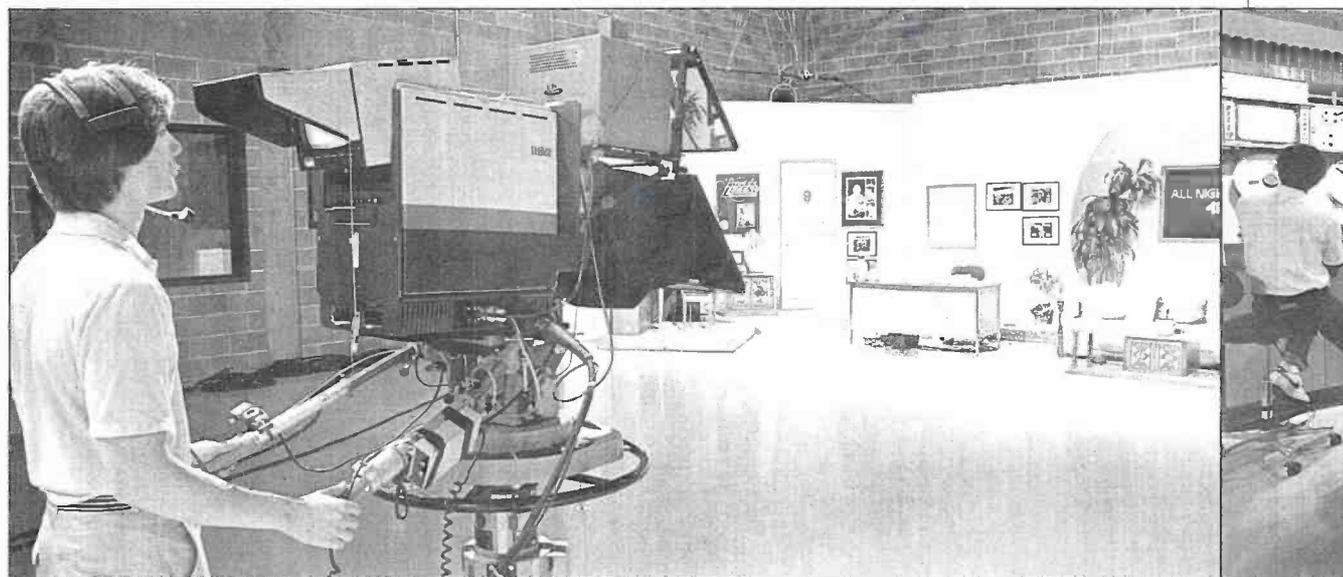
A second Production Control room looks in on Studio B. Both control rooms have the same basic layout, and the monitor configuration is identical, so operators can move from one room to the other without having to adjust to a new set-up.

The larger studio is 50' x 80' and houses several permanent sets. It is used for both program and commercial production. The studio lighting is by Strand-Century, with the lights mounted on a 19' high grid. It is a "Dimmer-Per-Circuit" system, including five racks of "SCR" dimmers with electronic patching capability. Optimum lighting set-ups are pre-programmed for frequently utilized studio productions. A cyc track runs all around the studio.

## "Workhorse" TK-46 Cameras

Four TK-46 cameras handle studio production. These can be allocated as needed—all in one studio, or divided off in any combination. The TK-46 has been a good "workhorse" camera for KSHB, Harold De Good affirms. The cameras are stable, produce excellent pictures and seldom need registering after daily set-up. Two TK-76 ENG cameras are also utilized—one for news, the other for field production.

Reliability is a key factor in TV-41 operations, since the station broadcasts 24 hours a day for six days, with a shorter schedule on Sunday when there is a midnight sign-off so maintenance can be performed on the transmitter. The transmitter is a TTU-60D which was installed in 1979, replacing the original TTU-60A. The transmitter is equipped with a Mod Anode Pulser for energy saving, and its performance has



One of TV-41's four TK-46 cameras on "All Night Live" set.

been excellent according to Mr. De Good.

## Technical Operations Function

Operating and maintaining a 24-hour broadcast facility is no small task, even with operations consolidated. At KSHB, the engineering function has a broader range of responsibilities and is called "Operations". Harold De Good's staff of 31 is responsible for building facilities as well as the technical complement. Some staff members function primarily as operators of cameras, Master Control, audio and video production switchers, videotape machines and telecine projectors. A smaller group of technicians handle equipment installation and maintenance functions.

## Switching From Old To New

During the planning and construction stages, along with his other duties, Mr. De Good served as the owner's representative, working with the architect and contractor. The long hours and attention to detail paid off. Even

the changeover of technical operations to the new facility was carefully orchestrated for a smooth transition.

In setting up the new facility, Mr. De Good made effective use of his more than thirty years of broadcast television experience. He remarks that his approach is to stay with the proven "nuts and bolts" systems and hardware rather than going for the sophisticated, more complex set-ups.

The changeover was made easier by the purchase of new equipment, including two video switchers and an audio board. The new facility was completely rewired—including sync, pulse, routing and Master Control switching—which further simplified installation. Wiring began on July 4, 1981, and the entire project was handled by the station's technical staff. Three men were assigned full time to the task, with others filling in as needed.

About a half of the equipment complement was moved from the old plant, including all seven VTR's and the ACR-25. The production facility was shut down a week before the move so the

"Cart" machine and the TK-28 telecine system could be relocated.

## "New Kansas City 41"

KMBA-TV signed off on Sunday night and signed on Monday morning from the new location and with the new call letters KSHB-TV (for Scripps-Howard Broadcasting). It was the station's 11th birthday, September 28, 1981.

The "New Kansas City 41" was widely promoted through press releases, ads, station promos. A series of "Open House" affairs were held—for employees first, then for media, civic leaders and clients. A new on-air ID, and revamped programming all called attention to the "New 41".

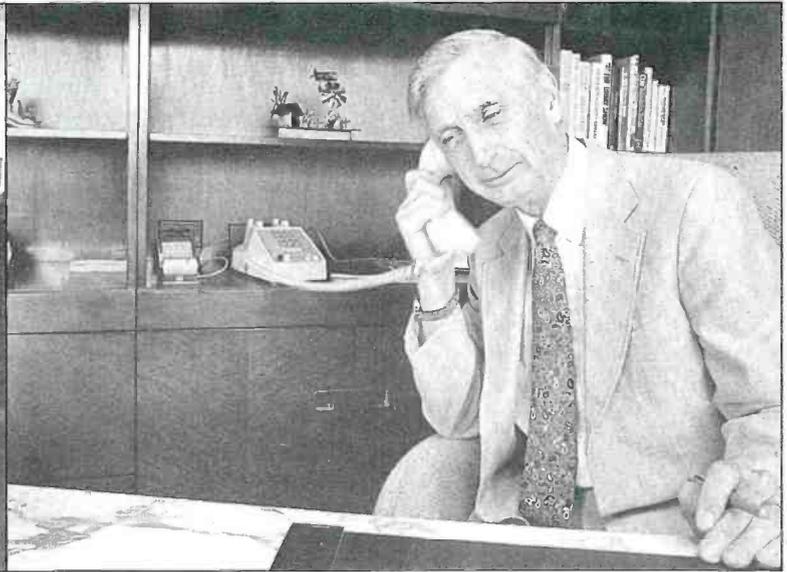
## Independent Programming

KSHB operates as an independent—even independent from other Scripps-Howard stations. An obvious advantage of operating as an independent is the flexibility and fast turn-around capability, remarks General Manager Bob Wormington.

Programming at TV-41 is inde-



Production VTR's



KSHB-TV General Manager, Bob Wormington

pendent, but not patterned. In some slots, head-to-head programming is used; in others counter programming is employed. Much of the programming is syndicated.

There is a "kid" block in the afternoon, news at 9:30 P.M. and Benny Hill at 10 P.M. An "All-Night Live" program starts at 11 P.M., with a host and telephone call-ins.

"This market is characterized by four very professional commercial television stations, all of whom are a part of strong group operations—Metromedia; (now Hearst) Meredith; Taft, and Scripps-Howard," Mr. Wormington notes.

"Although the others in the market are network affiliates, even they do a great deal of independent programming. At TV-41, of course, we do it exclusively. Our target frequently is to counter program them—and, to the extent that they stay with the network schedule, we know what that is and can counter.

### Local Window For The Community

"We try to do things that give

us a local window on the community. As an example, we tie in with major community events with a year-round series of "Salute" programs with a strong local flavor. These are upbeat programs that let our community share in positive events that are happening. We do a lot of news updates throughout the day because we feel that we can compete better that way rather than with the standard half-hour news format. And we also carry Independent Network News for worldwide coverage."

### "All Night Live"

As an independent, TV-41 has the flexibility to take advantage of current events by scheduling related programs. During "Oscar" week, the station airs past award-winning films from its library.

A successful local program added to the schedule is "All Night Live", which airs from 11 P.M. until 5 A.M. when the next day's schedule signs on. This popular "night owl" program features a host, guests, telephone calls and a potpourri of movies, serials, recorded and

live segments. "One interesting fallout from this show," Mr. Wormington relates, "is an indicator of the range of coverage achieved by TV-41 programming. We're picked up in five or six states in the region, but didn't realize how extensive the coverage was until "All Night Live" program was added to the schedule. Telephone calls are coming in from South Dakota, Arkansas, Oklahoma, Nebraska, Iowa, Kansas, and of course, Missouri. Many of the distant calls are the result of cable system pickups which represents plus coverage for us. And, when you're on the cable you have dialing parity in that every station is equally easy to tune-in—which is especially helpful for UHF broadcasters."

### The Celebration Continues

The birthday party is over, but for the New Kansas City 41, the celebration continues—with new programming, new production capabilities, expanded community service, an enthusiastic staff . . . and rising ratings.

Cheers!

## FROM ITS TALL TOWER AND CP ANTENNA, WNCT-TV SERVES CAROLINA "FROM THE CAPITAL TO THE COAST"—BETTER THAN EVER

WNCT-TV went on-air in 1953 operating from combined studio-transmitting facilities in Greenville, N.C., with an 800 foot tower, a TF-12AH Super-turnstile Antenna, and a 10 kW TT-10AH Transmitter. In 1955, a TT-50AH 50 kW Transmitter was installed to bring the station up to its authorized 316 kW ERP.

Today, the studio remains in Greenville, but TV-9's totally new transmitting facility is located at Grifton, some 15 miles to the south. The new plant includes a TTG-30/30H Parallel 60 kW Transmitter and a TBJ-13A9R circularly polarized antenna operating from a 2000 foot tower. (The site is shared with WITN-TV, Washington. BROADCAST NEWS, Vol. #168.)

WNCT-TV-AM-FM comprise the flagship operation for Roy H. Park Broadcasting, Inc. Acquired in 1962, these were the first broadcast properties of the Park

group which now includes the allowable television and radio complement.

### Better Coverage, Better Signal

Moving to circularly polarized transmission enabled Ch. 9 to achieve a substantial increase in market coverage, with a vastly better signal, notes Chief Engineer Heber Adams who has been with the station since it went on-air in 1953.

The change to CP operation from the tall tower added 1.1 million potential viewers to WNCT's coverage adds Richard B. Armfield, Jr., Vice President and General Manager. "We invested more than \$3 million in the new transmitting facility to serve new areas and to improve coverage of all areas in this market. We're reaching Wayne, Wilson and Nash counties to the West and Onslow County to the

South with a much more powerful signal. We're even getting cable coverage of the Outer Banks area off the coast which seldom picked up our signals before."

As a result of the new transmission system, Mr. Armfield continues, there has been a substantial increase in viewing outside of the present ADI market area, providing a bonus for advertisers.

One benefit of the expanded coverage remarks Woodie Webb, General Sales Manager, is a substantial increase in revenue from local advertisers in communities not previously served, notably Jacksonville and Morehead City. The sales staff has been expanded to better cover the larger market area.

### "Remarkable Improvement in Signal Strength"

Operations Manager Mac Nicholson logged more than 6,000 miles to make "before-and-after" signal strength measurements at numerous locations throughout the East Carolina market area.

The improvement in signal strength after going to the CP operation was remarkable, he says. In some areas a 10-time increase in signal was recorded,



Vice President and General Manager Richard B. Armfield, Jr. (center) reviews WNCT-TV coverage and ratings with Operations Manager Mac Nicholson (left) and General Manager Woodie Webb.



Chief Engineer Heber Adams is obviously pleased with the performance of the RCA TTG-30/30H Transmitter.

particularly in those locations which previously were fringe reception areas.

In Jacksonville, for example, some 72 miles from Greenville, the "before" TV-9 signal measured 120 microvolts. The "after" reading was 1800 microvolts.

All three network-affiliated stations in the "Down East" Carolina market (WNCT-TV, Greenville; WITN-TV, Washington, and WCTI-TV, New Bern) are fiercely competitive individually, but cooperate to promote the area and to strengthen the regional market position.

In 1977 a joint decision was made to build a single 2000 foot tower at the present Grifton, N.C., site, to be shared by the three VHF stations serving the market. (Subsequently WCTI-TV, New Bern, built its own 2000 foot tower at Trenton, N.C., with a TCL-16 CP antenna.)

With necessary FCC and FAA approvals, the project moved ahead. The tower was completed in 1979, with WITN-TV, Ch. 7 going on-air with CP operations on October 29 of that year. Exactly one year later, October 29, 1980, Ch. 9 went on air from the same site. The tower is owned and operated by a separate corporation, Tall Towers, Inc., a

joint venture of Mr. Roy H. Park and Mr. W. R. Roberson.

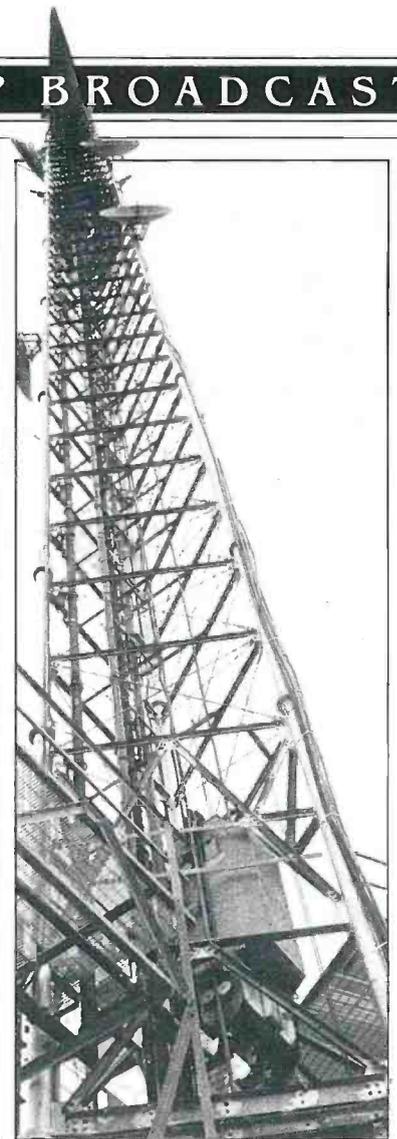
**TBJ Panel CP Antenna**

In selecting equipment for TV-9's new transmitting facility, the track record of the existing transmitting system was a factor in the decision, Mr. Adams affirms. The TF-12AH Superturustile Antenna provided 27 years of effective service, and the TT-50AH 50 kW transmitter had been an outstanding performer for 25 years.

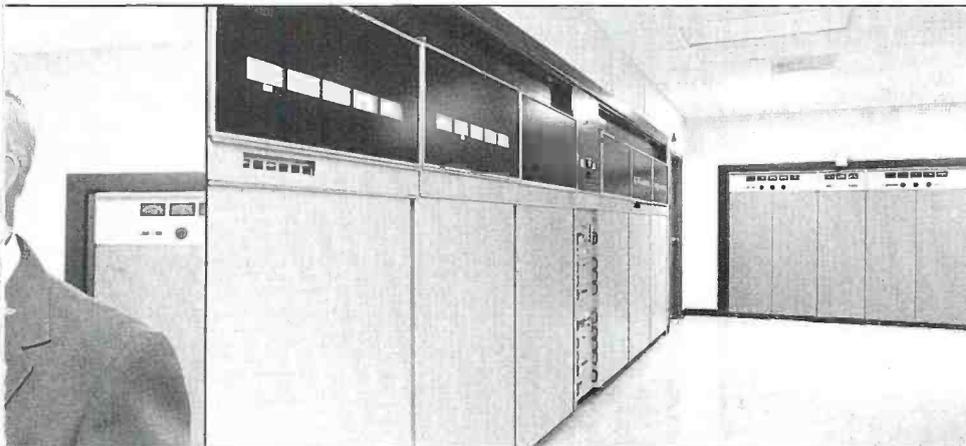
The TBJ circularly polarized antenna and transmission line were delivered in July 1980, and immediately installed on the tower. A new BFJ panel type FM antenna for WNCT-FM was installed in the fall of 1981.

Type TBJ CP antennas were selected by both Ch. 7 and Ch. 9 because this panel design lends itself to stacking and provides relatively low wind loading—a critical consideration in the "Hurricane Alley" of Eastern Carolina.

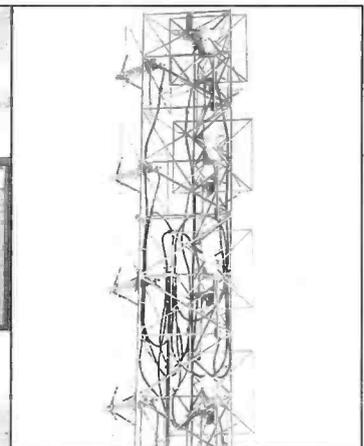
WNCT's TBJ-13A9R antenna supplied by RCA is made up of 39 panels—13 on each of the three tower facings. In addition, the Ch. 9 antenna is installed as a two-section system with a dual feed, providing a built-in standby capability. If necessary, an



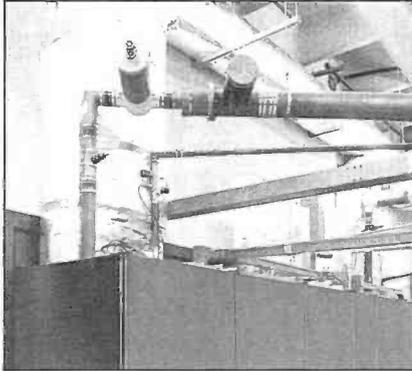
2,000-foot "tall tower" at Grifton, NC with WNCT-TV and WITN-TV ice bridges at base.



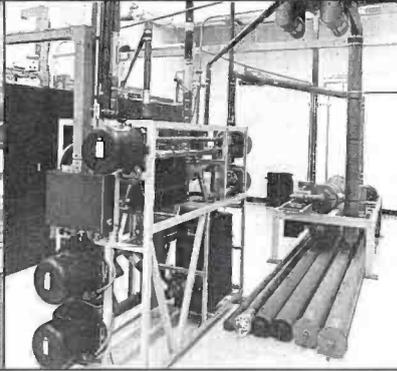
Control room area in transmitter building. Front cabinets of transmitters are framed in for noise isolation and aesthetics.



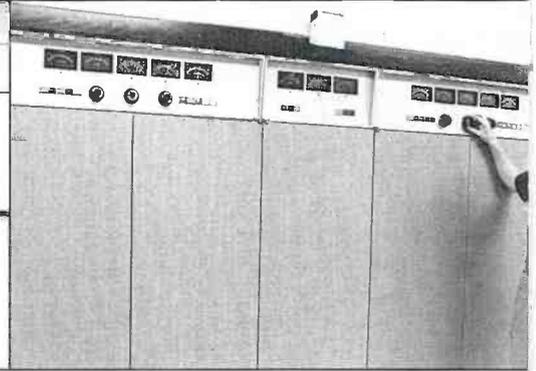
WNCT-TV's circularly polarized Type TBJ Panel antenna is made up of 39 panels.



Rear view of TV transmitter showing air exhaust system and overhead wiring ducts.



Opto-Switcher, Notch Diplexer, and transmission line manual switch.



Transmitter Engineer Murray Adams reading FM transmitter meters.

emergency patch can be made on the tower at the base of the antenna.

## TTG-30/30H 60 kW Transmitter

The new WNCT transmitter building was completed and ready in September, awaiting delivery of the TTG-30/30H parallel transmitter which arrived on October 8, leaving Mr. Adams and his staff with a tight schedule for meeting the scheduled October 29 deadline for going on-air from the new facility.

The installation went smoothly, he notes, and the air date was met by having the completed proof-of-performance measurements flown to the consultants in Washington for submission to the FCC.

The TTG-30-30H, Mr. Adams says, has proved to be an outstanding transmitter, with excellent stability, reliability and state-of-art design features. Incidental phase correction, automatic power level control, automatic VSWR overload protection and "soft" turn-on are features which enhance the operation of the transmitter, he adds.

A further advantage of the TTG-30/30H is power saving. The new transmitter operates at 44 kW peak to achieve 316 kW ERP. Since the TTG transmitter is more efficient than the TT-50AH,

power consumption is lower now, even though the power output has increased from 37 kW (with the TT-50AH) to 44 kW with the new parallel system.

## Functional, Attractive Transmitter Building

With its flat roof and sidewalls faced with brown split block, the WNCT transmitter building could easily be mistaken for a modern bank branch office. However, the 80' by 50' structure is windowless for security.

Inside, ample space is provided for the present equipment complement and for expansion if needed. The building now houses the TTG-30/30H parallel VHF transmitter and a BTF-40E 40 kW FM transmitter.

The building is divided into three areas:

- A workshop/maintenance space.
- A control area which includes monitoring and control equipment racks and the framed-in front cabinet metering panels of the TV and FM transmitters.
- The largest area which houses the rear transmitter cabinets, power supplies, Opto-switcher, notch diplexer, transmission lines, and FM Switching gear.

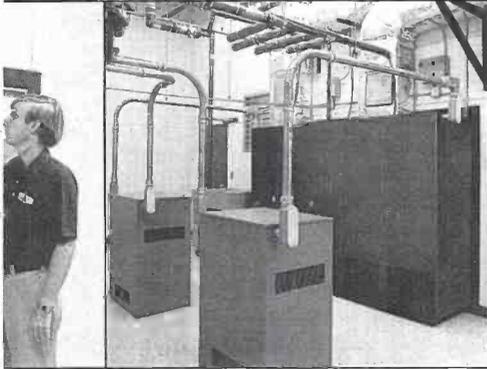
The shop and control spaces have drop ceilings and are air conditioned. The rear space is

not air conditioned, but has the full 18-foot high ceiling. Instead of installing a back-up air conditioning system, Ch. 9 opted for an emergency air handling system which draws outside air through the control room to cool the rack equipment. The air then exhausts into the rear space where it is vented out of the building.

All wiring in the transmitter building is carried overhead rather than in trenches. A filter system cleans the incoming outside air which is pulled into the transmitter area. The air flows through the transmitters and is ducted out via two sets of louvered fans wall-mounted near the ceiling level. Only one fan is used for normal operation, but the system is thermostat-controlled so the second fan is turned on when the temperature rises to a pre-set level.

A "helper" blower is used in the FM transmitter duct, since this is a longer run. The system has functioned well, Mr. Adams says. Even when outside temperatures have exceeded 100%, inside temperature has remained in the 90's.

The roof of WNCT's transmitter building is constructed of 50 foot long pre-stressed concrete beams which are covered by insulation, 6-inches of concrete and topped by a membrane-type "Trocral" sheathing which is



Rear view of FM transmitter showing power supplies and air ducts.

easily patched if damaged by falling ice. No problems have been encountered to date.

**Programming: CBS and Local**

A CBS network affiliate, WNCT picks up network feed for prime time and daytime programming. In addition, about 20 hours of live local programming are produced each week by the station. Three half-hour news casts are aired daily.

A major production for the station is the two-hour morning show "Carolina Today" which is aired from 6-8 A.M. This popular live program has been produced by Ch. 9 since October 1959, and is still going strong. It features local people as well as personalities visiting the area,

and covers news, weather and a diversity of subject matter with emphasis on regional interests. The format is tried, true and successful.

**TK-46 and TK-76 Cameras Give Yeoman Service**

Studio productions plus commercials give two TK-46 cameras heavy usage. The cameras have been in use since 1980, with excellent stability and reliability, remarks Macon Dail, Assistant CE. The cameras produce consistently superior pictures. And, with the CP operation, TV-9's signal quality is especially noticeable on live productions, he adds.

The News Department operates four ENG cameras with 3/4-inch VTR's, and shoots about 16 stories a day, which usually result in seven 1 1/2-minute edited segments, according to News Director David Boyd. Two man news crews cover as many as 300 miles a day on assignments. All reporters are trained in camera operation and usually alternate in functioning as reporters and as camera operators.

Two TK-76 cameras are employed by TV-9 for news and production. A TK-76A is the prime news camera. In use since 1977,

it has been reliable and durable, and delivers excellent pictures, Macon Dail states.

The Creative Services department handles production work and has been successful in developing client assignments. In addition, the department is responsible for an extensive in-house promotion campaign, producing 60-80 spots per month to sustain viewer loyalty.

**Inaugurating CP Operations**

WNCT-TV introduced viewers to its new transmitting system with a live 30-minute program on the first night of CP operation—October 29, 1980. Viewers were invited to call or write, giving their reaction to the new Ch. 9 signal. The response was excellent, with calls coming from as far away as Virginia. Many callers commented that this was the first time they had been able to tune in CBS programming.

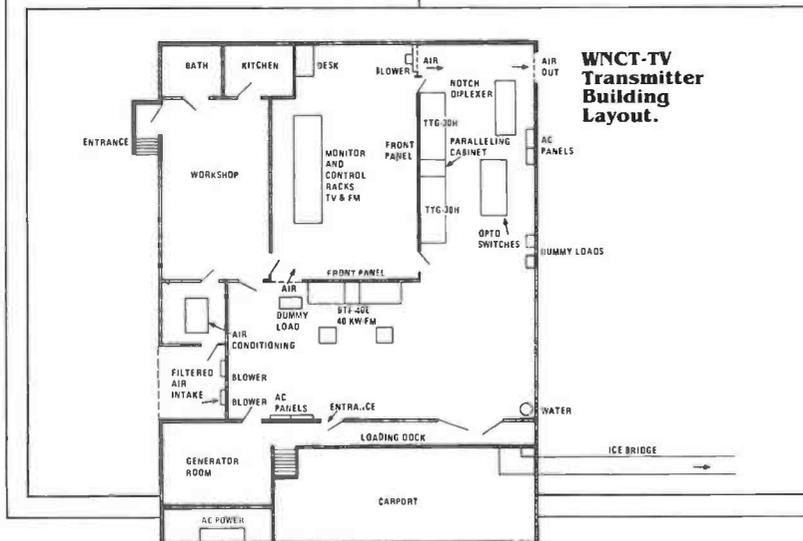
**"Serving Carolina From Capital To Coast"**

The statistics on households reached since going to CP operation are impressive. The Arbitron total cume of households viewing Ch. 9 programming grew from 253,000 in February 1980 to 310,000 in February 1982, a 22.5% increase in homes being served.

**Better-than-ever Service**

"Over Two Million People In Eastern North Carolina Now Receive A Clearer, Brighter Television Picture From WNCT-TV Channel 9."

This punch line from a recent WNCT promotion strengthens the station's long-standing slogan "Serving Carolina from the Capital to the Coast". With double the tower height, double the power and circularly polarized operation, the service is better than ever!



## TK-47B Automatic Color Camera With Added Features Plus "Smart" Remote Control

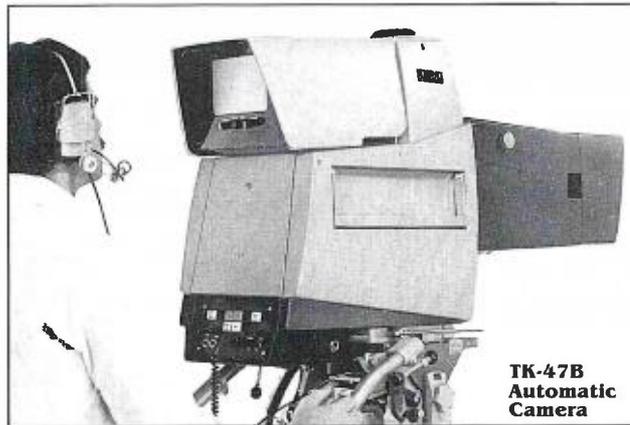
TK-47B designates the latest version of the TK-47 automatic camera, which incorporates numerous improvements in hardware and software for added operational convenience and enhanced performance.

Among the major design advances is a new "Smart" Remote Control Unit which extends the operational capabilities of the camera and provides for artistic flexibility to meet individual user requirements. The new SRCU retains all the camera control functions of the standard full function RCU, including joystick control of iris and black level, manual or automatic white and black balance, color temperature, gain, scene contrast compression and others.

### Extended Memory Capability

The microprocessor-based "smart" RCU includes a memory capability for file and recall of up to 32 selected "paint" control settings, individually optimized for various scenes, events, people and lighting conditions. The stored camera adjustment settings can be recalled either by file or scene number, or sequentially. Adjustments which are stored for each individual setting include: black paint, white paint, gamma paint, flare paint, master gain, color temperature, filter wheel, contours, contrast, iris and pedestal.

The new remote control unit also includes lens f-stop display, parameter display, and a self-test



TK-47B Automatic Camera

diagnostic capability. Digital resolvers are used to adjust the various controls, and an 8-character alphanumeric readout on the SRCU displays the selected control settings.

### Additional TK-47B Features

A new asymmetrical pin cushion and trapezoidal correction facility in the TK-47B results in improved registration performance.

For users who prefer limited manual control of iris, a new automatic iris "over-ride" capability is included in the TK-47B, and the tally light can be turned off when desired.

New hardware and software for the camera provides lens correction files which permit compensating for differences between diascope and through-the-lens viewing. For making set-up

## Technical Training Center Adds Two New Video Packages

Although RCA's Broadcast Technical Training Center is best known for its customer-training seminars, it also functions as a production center for a growing library of audio-visual materials designed to help users obtain optimum performance from their RCA equipment.

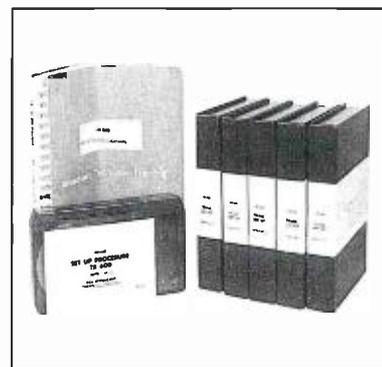
Two new training packages are now available: JW-29 for TK-29 Series Telecine Cameras, and JW-600 for TR-600 quad video tape recorders.

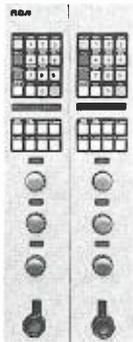
The JW-29 package consists of three one-hour video tapes (in U-matic cassettes, NTSC standards only) that explain and demonstrate the complete set-up

procedure for the TK-29 camera, including minor variations in the procedure to accommodate Saticon, Vidicon, and Lead Oxide pickup tubes. The tapes make extensive use of split-screen techniques to show exactly where each adjustment and test point is located while simultaneously showing what happens to the appropriate waveform as each control is adjusted. Along with the three tapes is a correlated TK-29 Setup Manual. Catalog CA.5301.

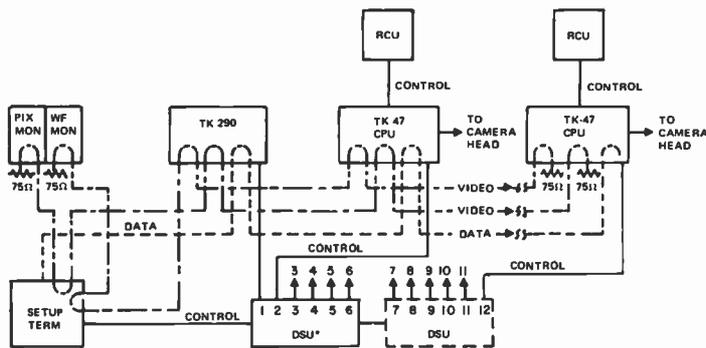
The JW-600 package consists of five one-hour video tapes (in U-matic format, NTSC standards only) that cover the complete set-up procedure for the TR-600, using production techniques similar to those used for the

JW-29 package. A copy of the Training Center's version of the TR-600 Setup Manual is included in the JW-600 package, which can serve both to train new personnel and to provide periodic "refresher" training for experienced tape maintenance people. Catalog TA.3310.





"Smart" RCU for TK-47B



Automatic TK-47 (Live) and TK-290 (Telecine) Cameras are Fully System Compatible.



TK-290 Automatic Telecine Camera

checks, either the in-lens diascope or an external chart now may be used, as preferred by the user.

### Viewfinder Display Unit

An optional Viewfinder Display Unit provides useful information to the camera operator: a small cross in the middle of the viewfinder permits exact center framing of objects; a bar graph indicates the zoom angle; and a box cursor permits the operator to form a box, a cross or a line for framing purposes.

In addition, for cameras equipped with the new viewfinder display unit, a motorized filter wheel option is available, with the filter wheel position displayed in the viewfinder readout. Filter wheel control is available at the rear of the camera, or the "smart" RCU.

### New Automatic Telecine Camera System

The TK-290, a new automatic microprocessor-controlled telecine camera system, uses the advanced technology employed in the TK-47B automatic studio camera, and the same set-up terminal is used for both cameras, making the two systems completely compatible and cost-effective. A single set-up terminal can be used for up to twelve TK-290 and TK-47 cameras in an installation.

The set-up control unit is a digital device which serves as the technical control center of the TK-290. It is connected to the camera system by a cable with twisted pairs, and can be disconnected after set-up is completed.

With the "Autocam" option, set-up of the TK-290 is accomplished at the touch of a single button on the set-up terminal. The microprocessor-controlled system automatically adjusts camera control functions, including geometry registration, shading, and tube functions like electronic focus and alignment.

The automatic camera set-up, normally required after a major change of components such as yoke or tube, takes only minutes to complete, and adjusts all three channels, including green. A "check" function of the automatics systems puts the camera through a pre-operational check of shading to verify that the camera is set up for optimum performance with all projection sources.

Along with complete control of shading, the TK-290 includes memory files which store corrections for up to six different projectors in the system. Optimum corrections for shading are stored. Switching of files from projector to projector is accomplished automatically to follow the multiplexer.

Operational automatic subsystems in the TK-290 are completely independent of the automated set-up system. Five automatic inter-related subsystems work together to electronically control all color balance and level variables and to correct for changes and variations in film.

Operational automatics in the TK-290 include: white level control, black level control, color balance, gamma balance and flare correction.

The TK-290 employs an advanced design 25mm deflection yoke based on technology developed for the TK-47 studio camera. The TK-290 yoke sets are manufactured by RCA and are selected and matched for registration by computer. The yoke construction assures maximum picture resolution, and front end design presents a low capacitance to the pickup tube target for excellent low noise characteristics.

Another feature which contributes to the TK-290's performance is an advanced registration system, called Asymmetrical Pincushion and Trapezoidal (APT) correction. This correction system provides new levels of geometry and registration precision for better on-air pictures.

## New Accessories For HAWKEYE Camera/Recorder Systems

Enhanced operational flexibility and performance result from new accessories and system improvements in the RCA HAWKEYE product line:

- Triaxial cable operation
- Multicore cable remote control
- Time code editing system interface

The HAWKEYE system includes all the key equipment components necessary for field and studio production and most production: the HCR-1 combined camera/video tape recorder; the HC-1 portable camera; the HR-1 portable half-inch video tape recorder; the HR-2 studio model video tape recorder; and the HE-1 edit controller.

A new triax adaptor with plug-in modules connected to the

rear of the HC-1 camera, allows live production remote control of the camera over universal triax cable at distances up to 5,000 feet. The operator's remote panel for the triax system provides all standard controls for production flexibility.



Joystick remote control unit for HAWKEYE triax and multicore camera systems.

mitter power consumption. They can be installed in new transmitters or field retrofitted into existing RCA TTU-30, 55, 60 and 110 systems with high efficiency klystrons.

The accompanying table lists the typical power usage and savings for the basic transmitters and for each of the options. For a TTU-110C 110 kW Transmitter equipped with all three of these devices, the total saving is typically 116 kW of power.

With the new multicore adaptor, HC-1 camera video controls can also be remote controlled up to 2,000 feet, for added versatility in EFP operations. The same joystick remote controls are used for both triax and multicore cameras.

Time code editing interface is now available for the ChromaTrak tape format via the CMX "Edge" system, as demonstrated at NAB, with other manufacturers' time code editing interfaces in process. With this capability, ChromaTrak tapes can be readily intermixed in editing systems using 3/4-inch, 1-inch, quad or other formats.

The HAWKEYE system uses an advanced baseband recording technique, called ChromaTrak, for recording on the half-inch video tape in standard 250 meter VHS cassettes. Picture quality of the new half-inch recording system is superior to that attainable from current 3/4-inch video tape recorders, particularly in the areas of chrominance signal-to-noise and chrominance resolution.

## Energy-Saving Options For RCA UHF Transmitters

Numerous design improvements and updates have been incorporated in RCA UHF Transmitters for enhanced performance and operating efficiency.

Three optional devices now available—the Mod Anode Pulser; the Aural Coupler and the Variable Visual Coupler—result in substantial savings in trans-

## New Antenna Additions: Panel VHF And Low Cost UHF Pylon

Two new additions to the RCA TV antenna product line were announced at NAB. The THP is a horizontally polarized VHF panel type antenna covering the band of 174 to 216 MHz.

The TFU-33JN, designed for intermediate power ratings up to 60 kW, is a standard omnidirectional UHF pylon antenna available on a shorter delivery cycle than more highly customized models.

### THP—"H" Panel VHF Antenna

The new H-Panel antenna is designed for square tower applications, or for mounting on a triangular tower using a square

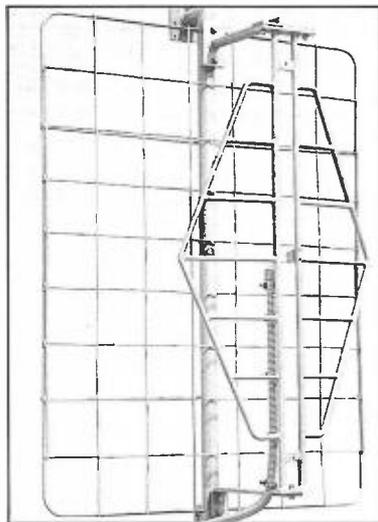
### POWER SAVINGS WITH EFFICIENCY OPTIONS

Transmitter* Model	Basic Transmitter	With Aural Coupler	And Mod-Anode Pulser	And Visual Coupler	Total Power Savings
TTU-30D	120 kW	110 kW	94 kW	88 kW	32 kW
TTU-55C	208 kW	190 kW	160 kW	150 kW	58 kW
TTU-60D	220 kW	200 kW	168 kW	156 kW	64 kW
TTU-110C	411 kW	375 kW	315 kW	295 kW	116 kW

\*The models specified are equipped with high efficiency klystrons and solid state exciters.

NOTE: All figures are typical, in kilowatts, based on 10% Aural Power.

frame. Comprising the antenna are a number of broad-banded radiators, each in the form of a rhombus mounted in front of a screen. The antenna has wide impedance bandwidth and is suitable for multiplexing several channels within the 174-216 MHz band. It can be supplied with dual line input, feeding the two sections of the antenna split vertically, providing built-in standby capability. The power rating of the antenna is quite high, even for low gains.



**THP Panel Antenna**

Omnidirectional, cardioid, skull, and peanut-shape directional horizontal patterns are available. RMS gains range from 2 to 12, with null-fill and beam-tilt provided for gains over 5.0. Catalog TT.9190 supplies additional information.

### **TFU-33JN UHF Pylon**

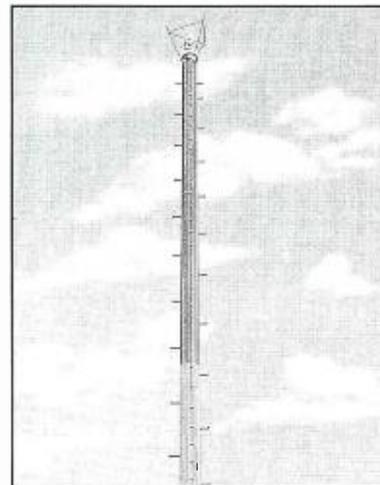
The lower cost of the TFU-33JN antenna is the result of the extensive data bank on UHF pylon antennas accumulated at RCA's Gibbsboro, N. J. antenna engineering facility. (RCA has built and delivered more than 500 pylon antennas.)

By combining techniques employed in a variety of proven antennas, RCA has devised a new model which achieves high

performance while allowing significantly reduced custom tuning and range testing.

Using the more highly customized pylon antenna models, the TFU-33JN unit requires only abbreviated testing on a turntable at the RCA facility to check vertical pattern, null fill and beam tilt, to verify performance and assure quality.

The TFU-33JN retains the characteristics of all RCA pylon antennas, including slotted steel pole construction with no protrusions; low windloading, and immunity to lightning and icing. Catalog TT.9210 has details.



**TFU-33JN Pylon Antenna**

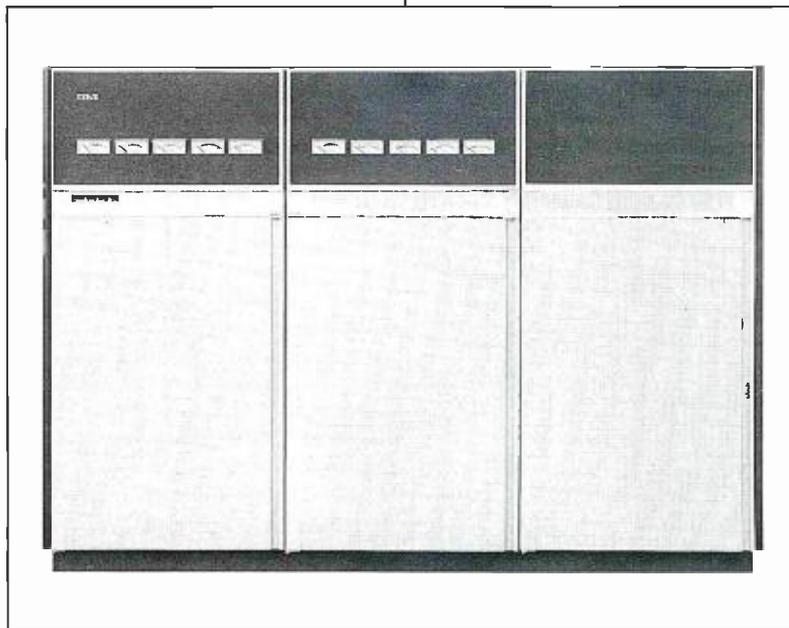
### **New 35 kW Highband TV Transmitter**

The TTG-35H, a single-ended 35 kW transmitter for highband (Ch. 7-13) TV stations, is the newest addition to RCA's G-line VHF transmitters. It is also available in a parallel configuration, TTG-35/35H for 70 kW of visual power output.

The new transmitter features the latest in advanced solid state

design technology, using only two tubes—one visual and one aural. All circuitry up to 1600-watt visual and 100-watt aural driver output power levels is solid state.

There are now 26 TTG-Series transmitter models available, with power outputs ranging from 10 kW to 100 kW. More than 100 of these transmitters, in single-end and parallel configurations, have been delivered. Catalog TT.1000D and TT.2610A.



**TTG-35H Transmitter**



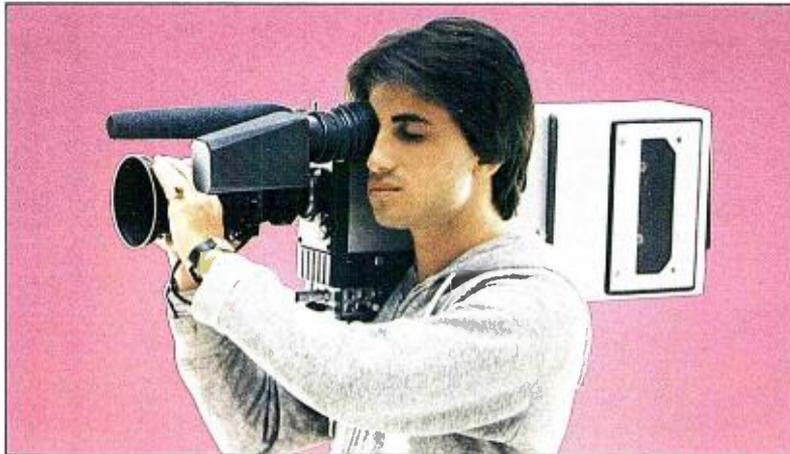
## Robert N. Hurst

Bob Hurst received his B.E.E. degree from the University of Louisville in 1951. He joined RCA's Broadcast Engineering activity that same year, and participated in the development of color television equipment.

From 1956 until 1972 he worked in the video tape recorder activity, designing the first transistorized subsystems used in these products. He was involved in the design of the TR-22, the first totally transistorized VTR, and also participated in the development of the TR-70 and the TCR-100 Cartridge Video Recorder.

Before joining the RCA Technical Training Activity in 1976, Mr. Hurst directed a group of engineers in pioneering digital television techniques. He has written and taught a transistor-design course, and has conducted courses in color television theory, semiconductor theory, video tape fundamentals, and digital television theory. He has written and presented numerous papers, and was a 1977 recipient of the Jesse H. Neal Award (the Business Press equivalent of the Pulitzer Prize) for a series of tutorial articles on digital television.

He holds 18 patents in the fields of color television, video recording, and digital television.



## A NEW RECORDING TECHNIQUE FOR THE EIGHTIES

R. N. Hurst  
RCA Broadcast Technical Training

A single glance at the HAWKEYE Camera/Recorder immediately tells the experienced television engineer that he is looking at a breakthrough of the first magnitude. Perched comfortably on a cameraman's shoulder is not only a color camera, but also a color video recorder; two key system components which, not many years ago, would have required the efforts of several strong men just to move them from place to place. Now, here is a single unit which provides both camera and recorder functions, and is easily carried and operated by one person.

But the camera/recorder's compactness is far from the only breakthrough of the HAWKEYE system. Concealed in the recording section of the camera is a new recording technology which has eradicated two of the major problems plaguing video recording since its inception, a quarter century ago. This new recording system, called ChromaTrak, records the color and luminance signals on two completely inde-

pendent tracks, thereby eliminating the crosstalk and moire problems of earlier systems, in which chrominance and luminance shared a common track. Furthermore, the color signal is recorded without the use of color subcarrier—an innovation which makes color editing as simple as monochrome editing, and ends forever the "jump left" or "jump right" of a poorly-made color edit.

As significant as these two innovations are, they are not the ChromaTrak's sole basis for its claim to breakthrough status. Packing density is significantly improved in the ChromaTrak system, and the tape cost per hour is correspondingly much lower. All these advantages may be summarized thus:

1. **Markedly Improved Color Performance:** Recording the color and luminance signals in independent tracks yields a substantial and highly visible improvement in performance, especially on multiple generations. Large colored areas are smooth and moire-free; flesh

tones never show high-light or low-light hue shifts from differential phase; color misregistration arising from group delay is not possible; streaky noise is simply not there. The "comic-book" or "cartoon" effect is gone, and the "colored waterfalls" never occur.

The additional track also allowed the system designers to provide a full-bandwidth color system, a luxury which current  $\frac{3}{4}$ -inch VTR's and other small formats do not offer. The result is a crisp reproduction of finely-detailed colored objects, especially in the orange/red and blue/cyan hues. Fine alternating vertical stripes of orange and cyan or red and blue are reproduced by  $\frac{3}{4}$ -inch systems as a colorless blur, but emerge from ChromaTrak as a clean and accurate reproduction of the original scene.

**2. Monochrome-Like Ease of Editing:** In the early 1950's, the addition of interlaced subcarrier to the line-interlaced monochrome TV system converted the monochrome two-field-per-frame repetition rate to a color four-field-per-frame repetition rate (eight fields per frame for PAL). Although this was one of the techniques that made compatible color possible, it has made tape editing very difficult. A color video recording which has subcarrier recorded on the tape can be edited only by the identification of a four-field color sequence (an eight-field sequence in PAL). Any error in the matching of fields sequences produces, as a minimum, the all-too familiar "jump left" or "jump right" at the edit point, and can produce even more dramatic disturbances.

ChromaTrak neatly steps around this problem by simply eliminating subcarrier altogether. The independent color track records the I and Q signals as they exist **before** subcarrier modulation; the resulting color tape may be edited with the ease and simplicity of the old monochrome tapes.

**3. State-of-the-Art Packing Density:** The grandfather of broadcast video tape recording systems, quad recording, moved a two-inch-wide tape through the transport at 15 inches per second, thereby recording a frame every half inch—that is, a frame (with its audio and control track) every  $2'' \times \frac{1}{2}'' = 1$  square inch. A similar calculation for Type C format shows that a square inch of tape contains about three frames' worth of audio and video. ChromaTrak, on the other hand, moves at about half of quad's speed, and the tape is only one-quarter as wide, so it puts almost eight TV frames into that same square inch of tape.

**4. Low Tape Cost:** High packing density, of course, is reflected in lower tape usage and lower tape cost. But that's only part of the ChromaTrak advantage. This new system is designed to use the VHS home cassette—a consumer-priced item. So

not only does the user NOT pay extra for the convenience of cassette loading—more a necessity than a convenience for news-gathering—but the cost per minute is substantially lower than the cost per minute of the currently popular Type C format.

**5. Wide Availability of Tape:** The choice of the VHS home video cassette for the ChromaTrak recording medium gives the system a definite plus for electronic field production as well as ENG use, in that a recording team in the field can replenish its tape stock at any video store.

**6. Multiple-Generation Capability:** Since the dubbing in the ChromaTrak system is done in component (Y, I, Q) format, the problems of subcarrier-to-luminance crosstalk (manifested as moire, differential gain, and differential phase) do not exist, nor accumulate with repeated dubbings as in other systems. Third and fourth generation tapes—the generation level most frequently aired after the post-production process—look deceptively like the original, especially in the large color areas, and in low-light and high-light color areas. Nor can group delay accumulate in repeated copying, so the fourth generation copy doesn't have the actress's lips creeping over toward her cheek. When the dubbing capability of the new format is compared to  $\frac{3}{4}$ -inch, there is absolutely no contest—a ChromaTrak dub is head and shoulders above a  $\frac{3}{4}$ -inch dub.

## TECHNICAL DETAILS

ChromaTrak is basically a helical-scan recording system, with the outstanding distinction that the video tracks on the tape occur in **pairs**—one wide track, and one narrow track. The wide track is just under 7 mils wide, and contains the luminance information, while the narrower of the pair, at  $2\frac{1}{2}$  mils, holds the color signals. A track pair, as shown in Fig. 1, is 3.7 inches long, is slanted at an

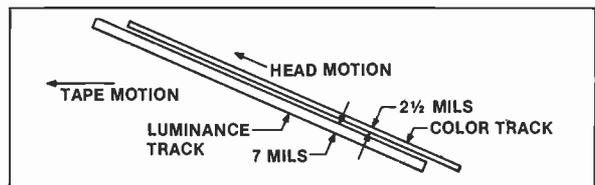


Fig. 1

angle of 4.7 degrees, and contains the information for a complete field of the video signal.

A track pair is recorded by a head pair—a luminance head for the 7-mil track, and a color head for the  $2\frac{1}{2}$  mil track. The color head lags the luminance head by about an eighth of an inch, and is placed such that a guard band about 1 mil wide exists between the recorded tracks on tape. As Fig. 2 shows, there are **two** such pairs on the drum, spaced 180 degrees from each other. Field 1 is

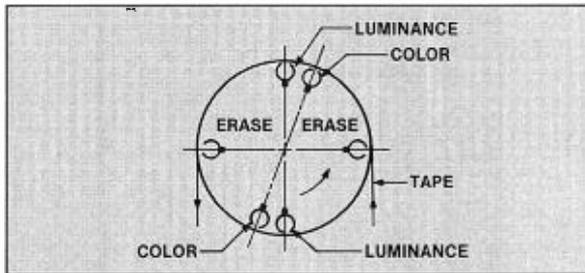


Fig. 2

always recorded by one pair; field 2, by the other pair. Since the tape is wrapped just over 180 degrees around the drum, the two successive passes of the head pairs needed to record an entire frame take place in 360 degrees of drum rotation, which indicates a drum rotational speed of 1800 RPM.

The figure also shows that provision is made for a pair of erase heads mounted on the drum, to provide the system with clean insert editing capability. When these heads are energized, they erase a 4.7-degree swath down the tape, precisely clearing the space for the new information to be added by the edit process. Without these flying erase heads, the new information would over-record the old information, and the new video at the edit point would be marred by moire from the old information, which is partially erased by the over-recording process.

Note that drum rotation and tape motion are in the same direction—the direct opposite of Type C practice.

By choosing tape direction and drum rotation to be the same, the ChromaTrak designers were able to improve frequency response related to head-to-tape contact. The result is a system which records color full bandwidth; records a luminance bandwidth of 3.6 MHz, and does all this at a head-to-tape speed of only 225 ips.

### Longitudinal Tracks

While the video tracks are being written by the heads on the drum at 225 ips, a set of four stationary heads is writing four longitudinal tracks along the top edge and bottom edge of the tape. As the tape moves through the transport at 8 ips, two high-quality audio tracks, a control track, and a time-code track are recorded on the tape by these four heads. The two high-quality audio tracks are recorded at the very top edge of the tape, as two 30-mil tracks with a 30-mil guard band between them (Fig. 3). The bottom-most longitudinal track—the control track—is a 20-mil-wide track containing a saturation-recorded 30-Hz square wave, similar in most respects to the familiar saturation-recorded 30-Hz control track of Type C. However, there is one significant omission

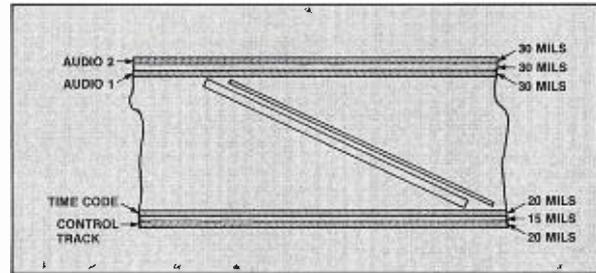


Fig. 3

in ChromaTrak's control-track signal. The 15-Hz color-frame-identification pulse doublet of Type C is not present in the ChromaTrak signal, because this new format has no need to identify color frames for correct editing. The ability to edit correctly without color framing is inherent in subcarrier-free video recordings.

Just above the control track, and separated from it by a 15-mil guard band, is the track space reserved for time code. In this 20-mil-wide track, the built-in time code generator of the shoulder-mounted camera always records standard SMPTE Time Code, for use in later editing of the tape. The time code thus recorded may be either drop-frame or non-drop frame, may be either clock time or accumulated recording time, and may be either NTSC code or PAL code.

Present 3/4-inch formats record time code in the video vertical interval only. Therefore, an insert edit made on these older formats must inevitably erase the time code along with the deleted video. In contrast, ChromaTrak places time code in this longitudinal track, so that an insert edit in a ChromaTrak recording does not destroy the time code reference.

### Contrast With The Old

The contrast between conventional video recording systems and the new ChromaTrak system is shown very clearly in the next two figures. In a conventional camera, (Fig. 4) the signals from the

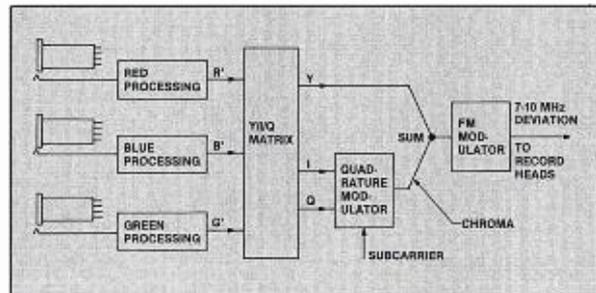


Fig. 4

red, blue, and green pick-up devices are first processed (for such matters as clamping, clipping, and gamma correction) and then are fed to a

Y/I/Q matrix, where the red, blue, and green signals are converted to the corresponding Y, I, and Q signals. The I and Q color signals are then fed to a quadrature modulator, where the I signal amplitude-modulates a 0 degree subcarrier, and the Q signal amplitude-modulates a 90 degree subcarrier. The two resulting subcarrier signals are summed inside the modulator block of the figure, and the resulting signal is summed again with the Y signal from the matrix. This triple sum is sent to a tape recorder's FM modulator, where it becomes a single combined FM signal to be recorded on a single track.

In contrast, the ChromaTrak system, (Fig. 5) never combines the Y signal with the I/Q signal.

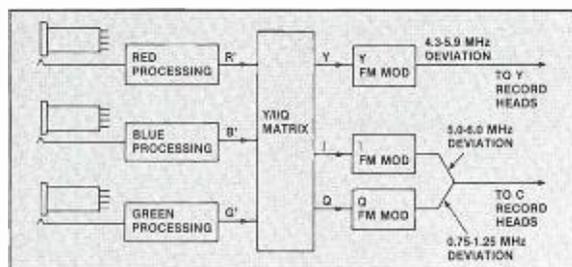


Fig. 5

Each of the three signals goes to its own FM modulator; the Y FM signal goes to its own record heads and track; the I and Q FM signals are combined, and the sum is fed to the color heads and color track. Luminance and color are thus so well separated that crosstalk is virtually impossible. And even though I and Q are summed before recording, the summing is done in such a way that the I-signal FM becomes the recording bias for the Q-signal FM; thus, the crosstalk between the two color signals is about the same as the crosstalk in an audio recorder between the audio signal and the bias—which is, in a word, negligible.

### The Y-Signal FM System

Anyone familiar with conventional video tape recording will recognize the ChromaTrak FM-recording technique for the Y signal. As shown in Fig. 6, the Y signal is used to deviate an FM carrier from 4.3 MHz (at sync tip) to 5.9 MHz (at peak

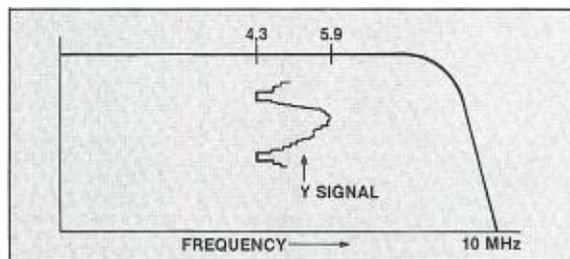


Fig. 6

white). Note that the absence of subcarrier color signals in this channel completely eliminates the need for placing the Y signal FM on one of the relatively moire-free "shelves", such as the 7-to-10-MHz highband shelf used in Quad and Type C. The ChromaTrak designers were therefore free to place the FM carriers at a lower frequency, without incurring the severe moire which would result from placing the FM signals so low in a conventional single-track system.

### Pre-Emphasis With A New Twist

The Y signal is pre-emphasized, just as in Quad and Type C, but with an added feature called **incremental pre-emphasis**. This technique allows a large amount of pre-emphasis to be applied selectively to the fine, small-amplitude detail in the picture, while restricting the amount of pre-emphasis applied to large transitions. The result is an improvement in the signal-to-noise ratio of incremental transitions. This improvement is obtained without incurring the "bearding" or playback signal breakup which usually accompanies attempts to use large amounts of pre-emphasis.

During playback, complementary incremental de-emphasis circuits restore the signal to its normal bandwidths and proportions before it is sent to the machine output.

### I And Q Signals In The FM Domain

As an earlier figure (5) showed, I and Q each has its own FM modulator, and the signals from these modulators are summed before being applied to the recording heads writing on the color track. However, if the summed signals were simply applied together to the single color track as conventional saturation-recorded FM signals, the cross-talk between the two signals would be unforgivable. Instead, the higher-frequency I signal is applied at a level which is a full 12 dB above the low-frequency Q-signal level. Hence, the I signal serves as recording bias for the Q signal, which is therefore linearly recorded. The "bias"—the I signal FM—is saturation recorded, just as are most VTR FM signals. These two separation methods—a sizable frequency difference, and the clever use of a "bias"/"signal" relationship between I and Q—results in a color signal recording which has virtually no crosstalk between the two color components.

### A Close Look At Q Recording

The Q signal, as shown previously in Fig. 5, is delivered from the Y/I/Q matrix and applied to its own private FM modulation system. Included in this modulation system is a conventional pre-em-

phasis network, but no incremental pre-emphasis. The resulting FM deviation is shown in Fig. 7. If there happens to be no Q signal from the matrix, the Q FM carrier will rest at 1.0 MHz. When the maximum Q signal is applied, the Q FM carrier will deviate from 0.75 MHz to 1.25 MHz. This FM signal is then attenuated to be 12 dB below the I-signal FM level before being summed with that signal for recording.

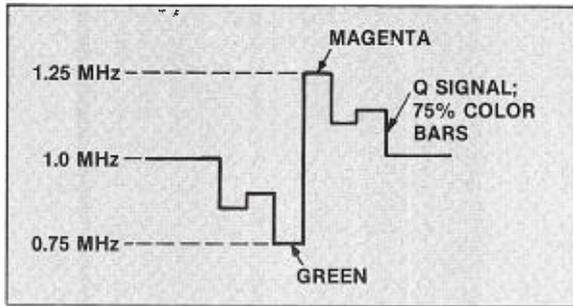


Fig. 7

## Details Of The I Signal

The I signal which emerges from the Y/I/Q matrix is also applied to its own private pre-emphasis FM modulation system. The deviations for the FM signal from the modulator are shown in Fig. 8.

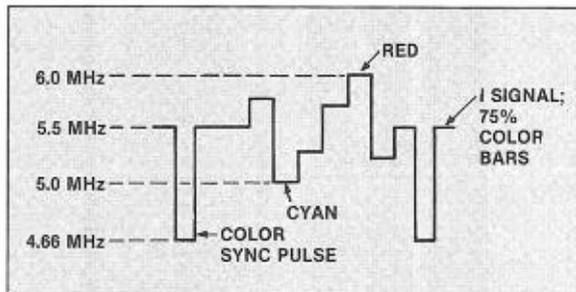


Fig. 8

As can be seen, resting frequency for the I FM signal is 5.5 MHz; full deviation swings the carrier from 5.0 MHz to 6.0 MHz. Note carefully, though, that once per line, a sync pulse is included in the I signal, and this sync pulse deviates the carrier downward to 4.66 MHz.

This I-signal sync pulse represents an elegant electronic method of avoiding expensive mechanical tolerances in the drum. Since the color signals and luminance signals are recorded and played by separate heads, these heads must deliver signals to the output which are timed to within a few nanoseconds of each other. Since each five nanoseconds of tolerance on color timing represents about a microinch of head-placement tolerance on the drum, good color timing would require extremely tight and extremely expensive tolerances

on head placement, if we were to rely on mechanical tolerances alone to achieve color timing.

Instead, a sync pulse is added to the I channel, and, in the playback mode, this sync pulse is compared against the sync pulse in the luminance channel. Any error between these two pulses' timing is applied to a simple TBC in the color (I and Q) signal path, thereby removing any head-to-head timing errors between luminance and color.

## Performance

When a ChromaTrak recording is played back, both picture quality and editing performance attest to the correctness of the system approach. Since the luminance signal is alone in its own channel, the moire from subcarrier that has been endured in past recording systems is simply not there. A full-saturation red field looks as though it were coming from a signal generator.

Also, since there is no subcarrier on the color track to be time-modulated by jitter, there is a complete freedom from visible streaky noise usually seen in other systems despite the best efforts of TBC's.

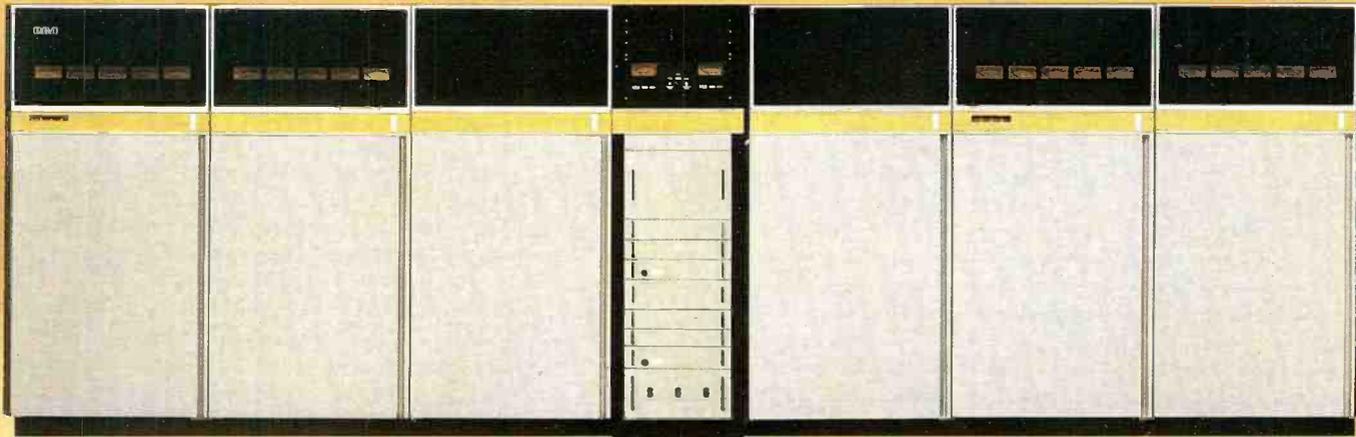
Since differential phase and differential gain are, by definition, a result of intermodulation between luminance and chrominance, the ChromaTrak system, with its complete separation of luminance and color signals, cannot contribute to the generation of these signal faults.

Group delay, which has caused the mis-registration and cartoon effects which have afflicted past recording systems, cannot affect two separate channels, so the colors are at all times precisely aligned with the proper areas of the luminance signal.

## Summary

As the art and science of video recording move into the eighties, ChromaTrak promises to be the breakthrough in the science that will make possible new breakthroughs in the art.

Freed from weight and size restrictions by HAWKEYE; freed from editing restrictions by subcarrier-free tape signals, and freed from dubbing deterioration by the dual-track format, the producers, directors and artists who use the equipment will find in HAWKEYE and ChromaTrak the means for creating new dimensions in their art.



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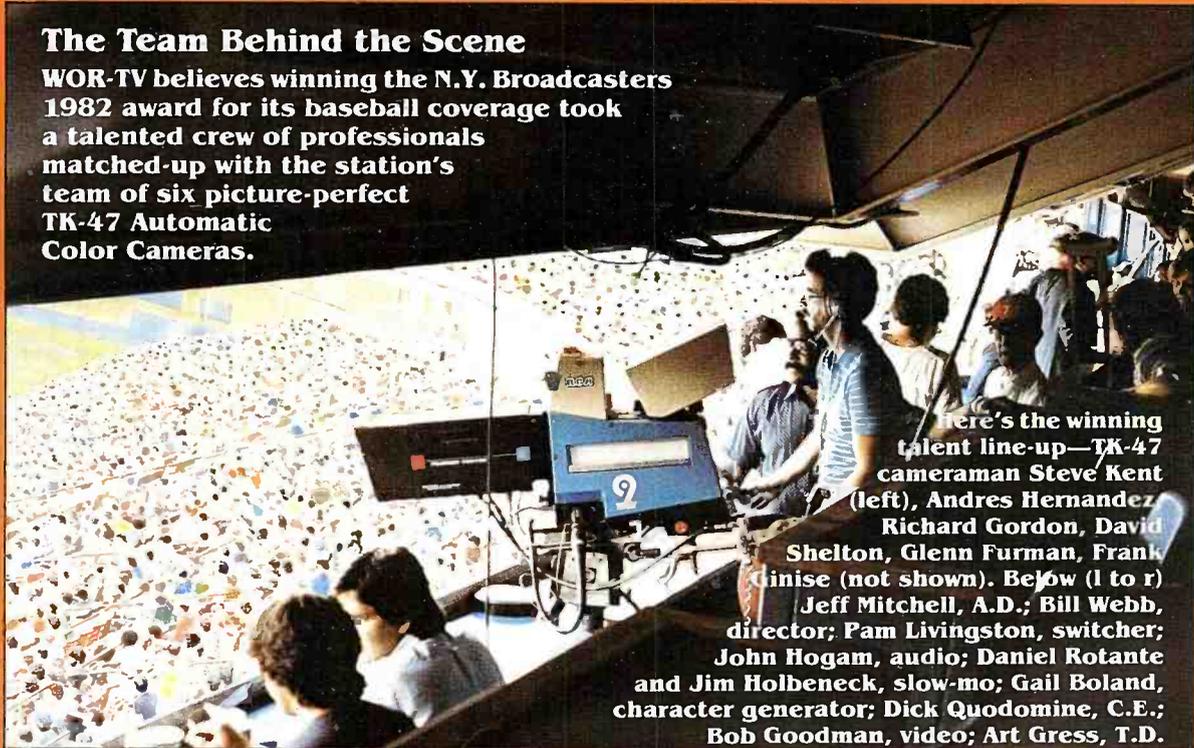
See your RCA Representative soon for complete and compelling technical data. Or write: RCA Broadcast Transmission Systems, Building 2-2, Camden, NJ 08102.

**RCA**



## The Team Behind the Scene

WOR-TV believes winning the N.Y. Broadcasters 1982 award for its baseball coverage took a talented crew of professionals matched-up with the station's team of six picture-perfect TK-47 Automatic Color Cameras.



Here's the winning talent line-up—TK-47 cameraman Steve Kent (left), Andres Hernandez, Richard Gordon, David Shelton, Glenn Furman, Frank Ginise (not shown). Below (l to r) Jeff Mitchell, A.D.; Bill Webb, director; Pam Livingston, switcher; John Hogam, audio; Daniel Rotante and Jim Holbeneck, slow-mo; Gail Boland, character generator; Dick Quodomine, C.E.; Bob Goodman, video; Art Gress, T.D.

