# BROADCAST NEWS


RCA "NEW LOOK"
COLOR TV CAMERA

Vol. No. 127
AUG. 1965

RCA NEW YORK

# TV Tape Player

*for COLOR as well as Monochrome*

## ...relieves busy recorder schedules at low cost for on-air playback or in-house screenings and promotions

Why tie up expensive recording equipment for playback? The TR-3 will free recorders for auditions, rehearsals, and tape productions—reducing overtime and crowded schedules. It's an economical way of adding to your present tape facilities.

Anybody can "play" the easy-operating TR-3. Makes a fine companion for film projector in clients' rooms. Use it for screening, checking and special presentations of TV tapes for advertisers and agencies. It's an ideal sales promotion tool.

The TR-3 plays all standard tapes, performs to broadcast standards, and is compatible with all quadruplex recorders. It has the same transistorized modular design as RCA's deluxe machine and delivers the same high quality pictures.

Only 66 inches high and occupying barely two square feet of floor space, the Player is mounted on casters for use in a fixed location or a mobile unit. Modern styling and two-tone blue finish make the unit as attractive as it is useful. And even the most deluxe operating features are available as accessories, such as pixlock, automatic picture control, color, and remote operation.

Want to double the efficiency of your recorders? Call your RCA Broadcast Representative. Or write RCA, Broadcast and Television Equipment, Building 15-5, Camden, N.J.

RCA **The Most Trusted Name in Television**

Vol. No. 127 | August, 1965

# BROADCAST NEWS

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## *As We Were Saying*


**OUR COVER** for this issue, as hardly anyone need be told, features our new long-awaited TK-42 Color Camera—plus Miss Linda Nickey, complete with smock, brush and palette. We hope you will forgive us if we seem to go all starry-eyed about this new camera. We've waited a long time for it. Five years since we started development. Three years in product design. Shown at two NAB's. Until our competitors got to saying we'd never build it—and sometimes we wondered. But happy day! About the time you read this, those hardy souls who ordered first will be getting theirs—and soon after, a flood.

The TK-42 marks the beginning of a new era in color. The era of everybody in. The era of almost everything in color. And, lost in the hullabaloo, but not least important, the era of color commercials. And therein lies the rub. The sagebrush can be blue—or purple, or orange; the horizon can be hazy; the heroine's eyes blurry—it affects not the story line. But let the marshmallows be tinged with green, the hair spray orange, the green giant blue—and the sponsor will be red, livid red. Mistake not, the problem is going to be in getting the product the right color, the label readable. It's not easy—as those who have been trying for ten years can tell you. The best camera the "state of the art" can devise will be barely good enough.

**THAT's WHY** the TK-42 is a complicated camera—and we don't pretend otherwise. We put in everything we could to give it maximum perform-


## *As We Were Saying*

ance. We wanted the TK-42 Camera to be better than the TK-41 Camera. We could have built a camera with three vidicon-type tubes. But it's doubtful it would have performed as well as the three orths in the TK-41. The only way to get a really good picture was to add a separate luminance channel. It could have been, of course, another vidicon-type tube. But who uses a vidicon when they want a top-quality monochrome picture? And if you are going to an orth, it might as well be the best—the 4½-inch. So there you are—and here we are—with a camera that actually is a 3-V **plus** a 4½-inch image orth channel. It's like you take a 3-V color camera, add a TK-60 monochrome camera in parallel, and put it all in one box. So it's big (but only three-fourths the size of the TK-41 in cubic inches) and heavy (but much less than the weight of the TK-41). This size is what you pay for top performance.

Actually, the overall length of the TK-42 with its built-in zoomar is about the same as the length of the 3-P Camera with its required external zoomar. The height is three inches less. Only the width of the TK-42 is greater—and width is no great handicap in maneuvering. The weight, of course, is greater—but carrying a color camera is, in any event, a two-man job. So what's the sweat?

**OUR COLOR AD SERIES** is brought to mind by discussion of our cover—the illustration for which came from this ad series. You've seen them, at least we hope you have—those four color ads with the pretty girls (and the New Look equipments!). Some of them are shown (small-size) above. Some of these you have seen, some you have not—but will soon. One is shown opposite—another on Page 49. Only the highlights of our New Look line are shown—but even so it's quite a gallery.

How this series of ads came about may be of interest. It all started about a year ago—specifically with our June 1964 issue. It was a special FM issue, and we wanted to show one of our FM transmitters on the cover. But a transmitter, even

*(Continued on Page 5)*


MOBILE TV TAPE RECORDER...TAPE AND ROLL →

*TR-5 Transportable TV Tape Recorder*

# Roll the RCA Mobile Recorder anywhere...produce finest tapes

## ...broadcast quality, color or monochrome

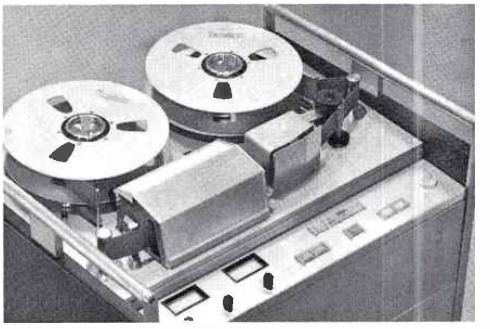
### COMPACT, CONVENIENT

The TR-5 has wheels, will travel—from one studio to another, or into the smallest of mobile units—for special events or on-location commercials. Completely transistorized, it is only 37 inches high, 33 wide, 24 deep. Built-in 2-speed operation permits it to record full hour at 15 ips, 2 hours at 7.5 ips. Designed for operation on world standards, it contains the compelling features of RCA's advanced "New Look."

*Rolls anywhere . . . makes tapes of broadcast quality.*

### QUALITY QUADRUPLEX RECORDINGS

Here are the same quality recording techniques found in the highest priced recorders. TR-5 tapes faithfully record the live realism of monochrome or color pictures now provided by the newest cameras. It produces quadruplex tapes that can be played on all standard machines.



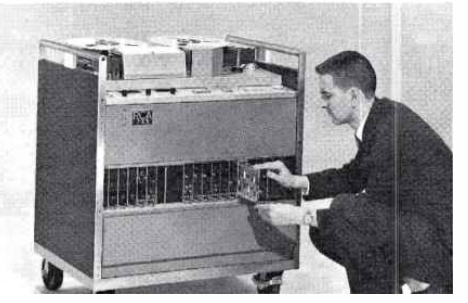
*Tapes can be played on all standard quadruplex recorders.*

### PLAYBACK CONVENIENCE

Tapes recorded in the field or studio can be played back immediately for on-the-spot previewing, or high-quality closed circuit presentation. On-air playback can be provided by adding a signal processing amplifier.

### TRANSISTORIZED MODULES

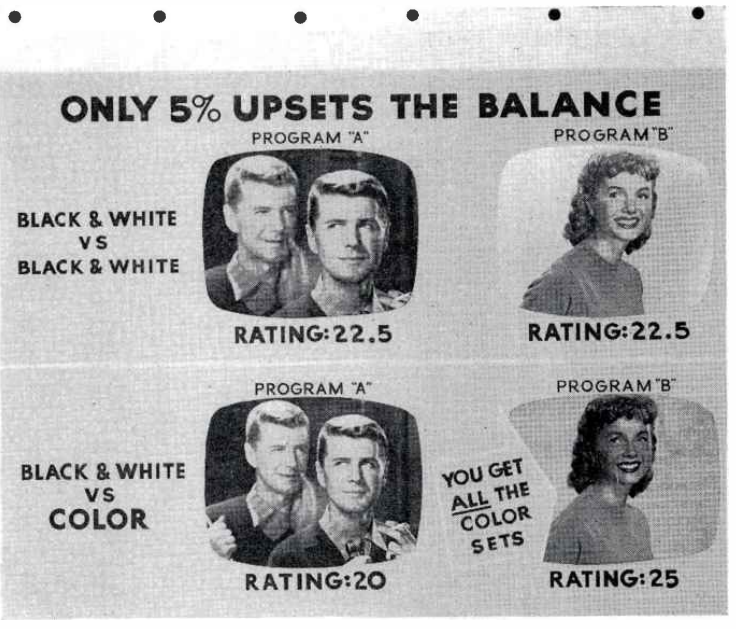
Standard plug-in modules simplify maintenance, increase operating flexibility. Transistorized circuits require less power and generate less heat . . . The TR-5 accommodates modular accessories, cue record/playback, electronic splicer, remote control.



*Uses standard transistorized modules.*

*For further information write RCA Broadcast and Television Equipment, Building 15-5, Camden, N. J. Or call your RCA Broadcast Representative.*

**The Most Trusted Name in Television**




A chart from our 1955 Color Presentation

## *As We Were Saying*

*(Continued from Page 2)*

a New Look transmitter, is a box—a nice-looking box, but a box. How to make it interesting—and glamorous? How to indicate that it was "radically different?" A pretty girl was the obvious answer to the interesting and glamorous part. And, on second thought, also to the radically different bit. This is how we rationalized it: we had never used girls (pretty or otherwise) in our advertising before—ergo, if we did so now, that in itself indicated a big change. A small excuse perhaps —but enough. And no one can say it didn't change the appearance of our ads.

So you have pretty girls—what do you do with them (in the ads!). The answer is that, if possible, you have them help to "communicate" the idea. Thus in our first ad (cover) of the series we gave Pat Coyle a bull fiddle—to indicate the long-haired quality of our new FM equipment. This ad (top left, Pg. 2) was so well received that it led naturally to others—and eventually to a whole series.

The reverse side of these ads (see opposite) shows some of the features of the equipments. But no specifications (as did our old "nuts and bolts" ads). We've found that our lowliest competitors will claim to meet our specs. And the trade magazines, through ignorance or what, will publish these claims. But the newness, the attractiveness, the quality of our New Look equipments, they can't match. And it is these things that this series of color ads is intended to portray.

**WAITING-TIME** is a status symbol in the executive aircraft business, according to Pan American. They can't deliver the Falcon Fan-Jet they are marketing until October 1966—but haven't found this an obstacle in booking orders. Apparently the longer the wait, the more the status! Maybe applies to our TK-42 Color Camera, for which some of our customers will have to wait quite a while. We feel sure the TK-42 will be a status symbol in our industry. Maybe even the wait for it will be.

**WE DON'T LIKE** to say I told you so (or, more truthfully, we do like to, but we realize it isn't good form). Anyway, now and then we give way to the urge. This time it concerns the ratings of color programs in color homes—and the effect this has on overall program ratings. NBC and others (reps, agencies and stations) are breathless with the discovery that color gives a distinct advantage in the rating game. Now isn't that interesting!

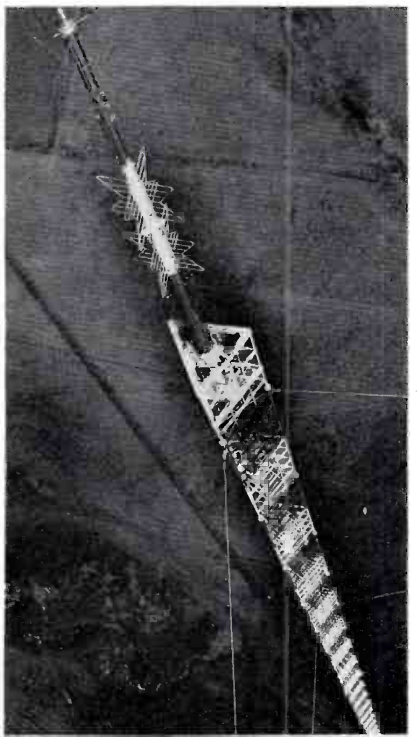
Back in 1955—just about ten years ago this month—this columnist and his boss made a presentation to the management of the NBC-owned stations. Goal of our pitch: to get NBC to "colorize" at least one of their stations (sic). Brunt of our story: color would give them an advantage in ratings—because color homes would have a predilection for color programs. Above is one of the charts we used. We predicted that when color penetration reached 5 per cent, the rating "swing" would become noticeable. You may fault the arithmetic, but hardly the idea. Later these charts were used for presentations to others. Sol Paul, publisher of TELEVISION AGE was so impressed he mentioned it in his editorial column. He referred to it as "The Taylor Theory on Color". So now comes the definitive ARB survey, which pretty much proves out the theory. Anyone for our 1975 predictions?

*(Continued on Page 46)*

# WKY-TV ADDS 51,000 TV HOMES WITH NEW RCA TRANSMITTER AND 1,602-FOOT TOWER

Turn-on time for WKY-TV's new transmitter finds Jack Lovell, Director of Technical Operations, at the console with Norman Bagwell Station Manager, Joe Jerkins, Program Manager, Tom Parrington, Assistant Manager, and Bob Hayward, Chief Engineer, a rapt audience.

New transmitter and engineering personnel are housed in these comfortable, panelled surroundings.



Even the tallest Sooners look up to new tower.

WKY-TV has put its new RCA-supplied transmitting facility into operation and is radiating its signals from a 1,602-foot tower, the tallest man-made structure in Oklahoma City. The type TT-25DL transmitter is housed in a new 4,000 square foot building at the tower's base.

Station officials report the new facility has enabled WKY-TV to add up to 51,000 homes to its primary market and, in addition, to provide better-quality pictures and sound to the 173,000 TV homes already in the market.

Located approximately one mile from the WKY-TV studios, the new tower contains more than 800 tons of steel. It was constructed in 30-foot sections by a team of 12 iron workers under the supervision of RCA engineers. The system also includes 1,650 feet of transmission line.

Jack Lovell, Director of Technical Operations for WKY, said the station's present tower and transmitter would be maintained on a standby basis to insure uninterrupted service in the event of an emergency.

## *IRAQ ORDERS RCA GEAR FOR 3 NEW TV STATIONS*

Iraqi Government and RCA negotiating teams at equipment contract signing.

The Republic of Iraq has ordered RCA television broadcast equipment for three new stations as part of a five-year TV expansion program. The new stations, costing an estimated $1.5 million, will be located in the Iraqi cities of Basra, Mosul and Kirkuk.

The equipment order—one of the largest concluded by RCA in the Middle East—was received from the Iraqi Ministry of Culture and Guidance, which also will operate the stations. Presently, there is only one TV station in Iraq, located in the capital city of Baghdad. The new stations will be built by Iraqis, with RCA providing supervisory engineering.

The five-year TV expansion program in Iraq will proceed in two phases—first, extension of television coverage throughout the country, and second, construction of a multi-million dollar studio center in Baghdad. In the first phase, Iraq will have the latest broadcasting and programming techniques, made possible by RCA's "New Look" line of television equipment. This includes two TR-22HL and six TR-4 video tape recorders, a TFR-1 film recorder, three TK-22 film cameras, three TT-11AH television transmitters and six TP-66 film projectors.

Shipments of the television equipment are being scheduled, and the three TV outlets are expected to be on the air late this year. These stations, like the one in Baghdad, will operate on European standards.

## WNYE-TV ORDERS NEW STUDIO COMPLEMENT

RCA will supply a complete television studio facility for WNYE-TV, the New York City Board of Education's new educational station, under a $400,000 contract. Cameras, tape recorders and other equipment will be installed this summer and fall in preparation for the Channel 25 station's on-the-air debut early next year.

A one-story building in Brooklyn will become the station's Television Production Center for "live" and recorded programming. Tape recording sessions will begin there in the fall to provide a program backlog for the start of broadcasting.

The RCA contract calls for three TK-60 cameras, and three TR-4 television tape recorders, among other items. In addition to the 40-by-60-foot studio, the Center will have complete facilities for broadcasts of film programming, and a switching system with special effects generator. The new TV station is the culmination of 15 years of Board of Education experience in instructional television, during which time its programs were broadcast over WPIX and WNDT, New York. The Board's radio station, WNYE-FM, has been on the air for 26 years.

When broadcasts begin in 1966, WNYE-TV will offer instructional programs for schoolroom viewing by pupils in kindergarten through Grade 12.

## *4-WAY ENTERTAINMENT UNIT OFFERS SOMETHING FOR EVERYBODY*

RCA's "future look" in electronic home entertainment is expressed by DIMENSIA IV, shown in the adjoining column, which combines television, radio, stereo phonograph and audio tape recorder in a rosewood cabinet with chrome trim.

The entertainment center, a prototype of tomorrow's home instrument design, was a highlight of RCA's exhibit earlier this summer at the National Association of Music Merchants Show. The cabinet measures three feet on each side.

DIMENSIA IV's four compartments contain separate speaker and earphone jacks for personal listening, making it possible to play all instruments simultaneously.

Lazy listening and looking with Dimensia IV, a concept of tomorrow's home entertainment center.

## TWO NEW ENGLAND STATIONS TYPIFY LOCAL COLOR BOOM

Two New England TV stations, one using local live color since its inception and the other planning a move into local color originations his fall, typify the big color TV boom of 1965 at the local station level. The two, WHDH-TV and WJAR-TV, recently signed contracts for RCA color broadcast equipment.

WHDH-TV, the Boston television station that began live color programs November 26, 1957, its first day on the air, has ordered seven new four-tube color cameras as part of a $570,000 equipment contract. Four new TK-42 live color cameras and three TK-27 color film cameras will replace the RCA three-tube cameras that have been in daily use since the "on-air" date, according to William B. McGrath, WHDH-TV Executive Vice President.

The RCA contract also calls for upgrading two of the station's TR-22 TV tape recorders to high-band operation in color, and the acquisition of a TK-22 monochrome film camera chain. Currently the station carries more than five hours daily of local live color programming, plus documentaries filmed in color at home and abroad by its own crews and locally-produced color commercials.

WJAR-TV, Providence, R. I., has ordered approximately $550,000 in RCA broadcast equipment in preparation for a move into local color programming beginning in September, according to David J. Shurtleff, Vice President and Station Manager. The station will air its first color shows from motion picture film, slides and video tape, with local live originations in color slated to start next February 1, he said. Local programming will supplement the stepped-up NBC network color schedule which WJAR-TV carries.

The RCA color equipment on order includes two TK-42 live cameras, a TK-27 film camera, a TR-22HL television tape recorder and four TP-66 film projectors. The station's purchase also includes two TK-60 monochrome cameras and two TK-22 monochrome film cameras. The RCA equipment was ordered as part of an expansion and modernization program begun last fall.

## WFAA-TV REPORT: LIKE EVERYTHING ELSE, COLOR'S BIG IN TEXAS

A complete schedule of local programming and news in full color is the prospect for WFAA-TV Dallas-Fort Worth viewers when the station's new color equipment, which includes six RCA TK-42 live color cameras, is installed.

The Texas outlet will be able to broadcast live or taped color from all three of its operations, the downtown Communications Center housing the main studios, its North Park studios in a big suburban Dallas shopping center, and its mobile unit.

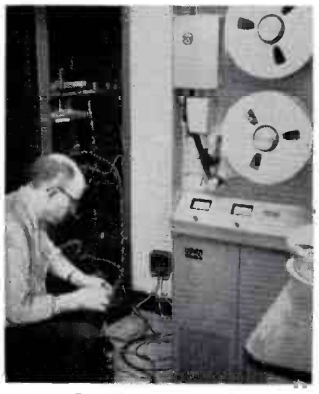
Programming plans anticipate a busy schedule for the mobile unit which, with its own power supply, can handle four color cameras in the field and house two colorized TV tape recorders.

In addition to the live cameras, with associated equipment, the contract calls for RCA to supply a TT-11AH VHF transmitter which is designed for color.

Signing contracts for WFAA-TV's purchase of RCA broadcast equipment are (from left, seated) E. C. Tracy, Division Vice President, RCA Broadcast, Technical and Scientific Sales Dept., and Jim Moroney, Jr., Vice President of station's parent Belo Corporation. Standing are: Station Manager Edwin W. Pfeiffer; Mike Shapiro, General Manager, WFAA Radio and Television; Jim Cooper, Director of Engineering for both properties, and Earl Cullum, consulting engineer.

# PGW STORYBOARD ON VIDEO TAPE PLAYER

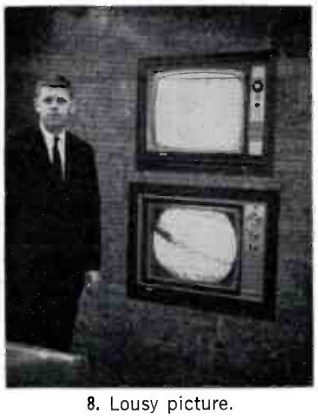
## After Initial Success With RCA TV Tape Player in New York Office, Peters, Griffin and Woodward Installs Another in Chicago Office



7. Ready to operate.


1. It's here.

4. What do we do now?



8. Lousy picture.


2. Easy boys!

5. In position.

9. Rush to RCA for scope.

3. Out of the shell.

6. Bill Key, RCA engineer.

10. Which located the problem—nice picture.


# ETV STATION RADIATES 1.2 MILLION WATTS TO COVER 50-75 MILE RADIUS

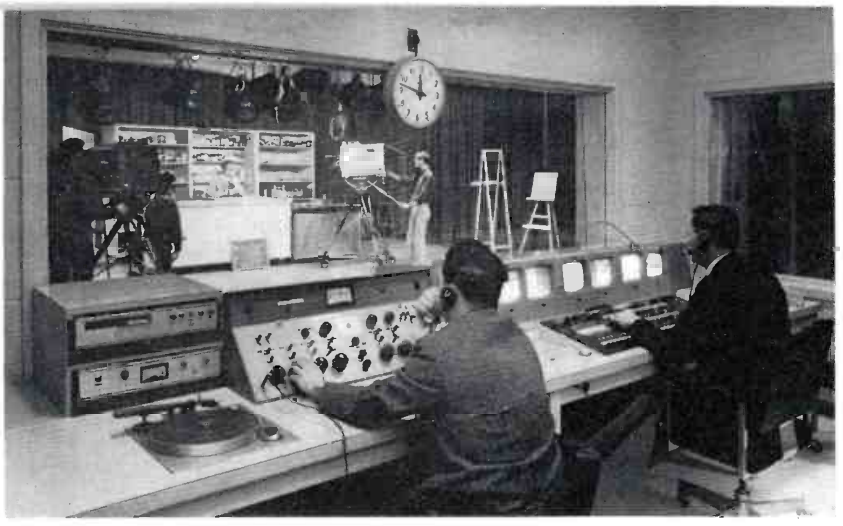
## Professional People, Stimulated by Community Spirit and "New Look" Equipment Create Efficient, Progressive Operation

**LANGUAGE ARTS TEACHER,** Mrs. Hope Mitchell, shown in studio of ETV station WCVE, as she conducts a class for students scattered over a large area of Virginia. Station also telecasts adult education features, cultural, and civic programs, in the evening. Camera is TK-60, 4½-inch image orthicon, same as used in top commercial stations.

The dreams of many civic minded citizens in the Richmond area were realized when, after years of planning and fund raising, Central Virginia's first community-owned ETV station went on the air in September, 1964. Educational programs of the non-profit outlet are now aired for approximately 200,000 students in the classrooms of 450 subscribing public, private and parochial schools—universities and colleges. Community and cultural programs are planned for UHF equipped private homes in 36 surrounding counties and cities. All this is the result of a well planned, above-average operation, including a new building designed specifically for educational television productions, the finest "New Look" RCA equipment, and professional personnel in both the television and the teaching areas.

### Surprising Signal Reception

In commenting on the outstanding performance, Mr. B. W. Spiller, station manager (formerly associated with commercial radio and TV stations in Texas and Louisiana), stated that his predictions made to



**PRODUCTION CONTROL CENTER** designed by station technical staff using RCA "New Look" equipment. Personnel monitor audio and video; perform switching to record programs on television tape. Equipment (L to R) consists of RT-7 Cartridge Tape (and turntable), BC-8 Audio Consolette, TS-40 Program Switcher.

local TV sales and service dealers before WCVE went on the air—that most of the city of Richmond installations would require an outdoor antenna—had not proven true. A simple indoor UHF "ring" antenna attached to the set is doing a good job in very many locations in Richmond. Also contributing to the excellent reception is the better-than-anticipated quality of the school receiving systems. Contractors have been putting up high-performance antennas and distribution systems, which have helped the station in all areas.

### WCVE Educational Programming

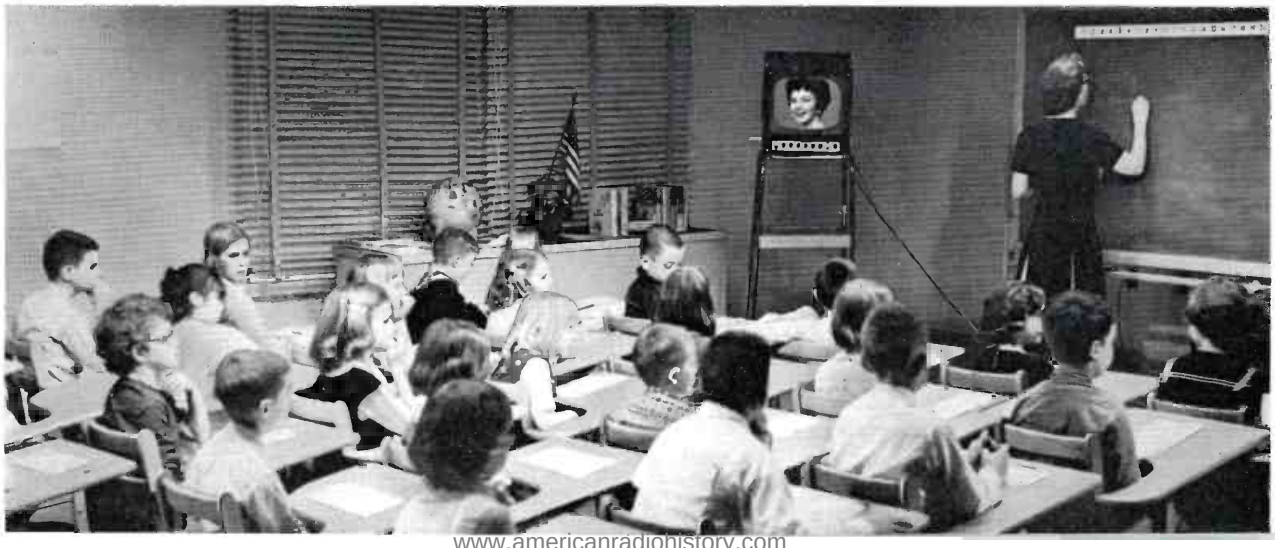
WCVE broadcasts 28 telecourses weekly to approximately 450 schools in 40 school divisions, representing 200,000 students in the State of Virginia. WCVE's daytime classroom programming consists of six hours of week day televised instruction for elementary and secondary school students, plus one hour of late afternoon adult education and college credit courses. Examples of the latter are in-service training courses in high school biology and Modern Elementary Mathematics. In addition, WCVE broadcasts approximately two hours of nighttime cultural, educational, and public affairs programs designed primarily for adults. At present, no programs are broadcast on Saturdays or Sundays.

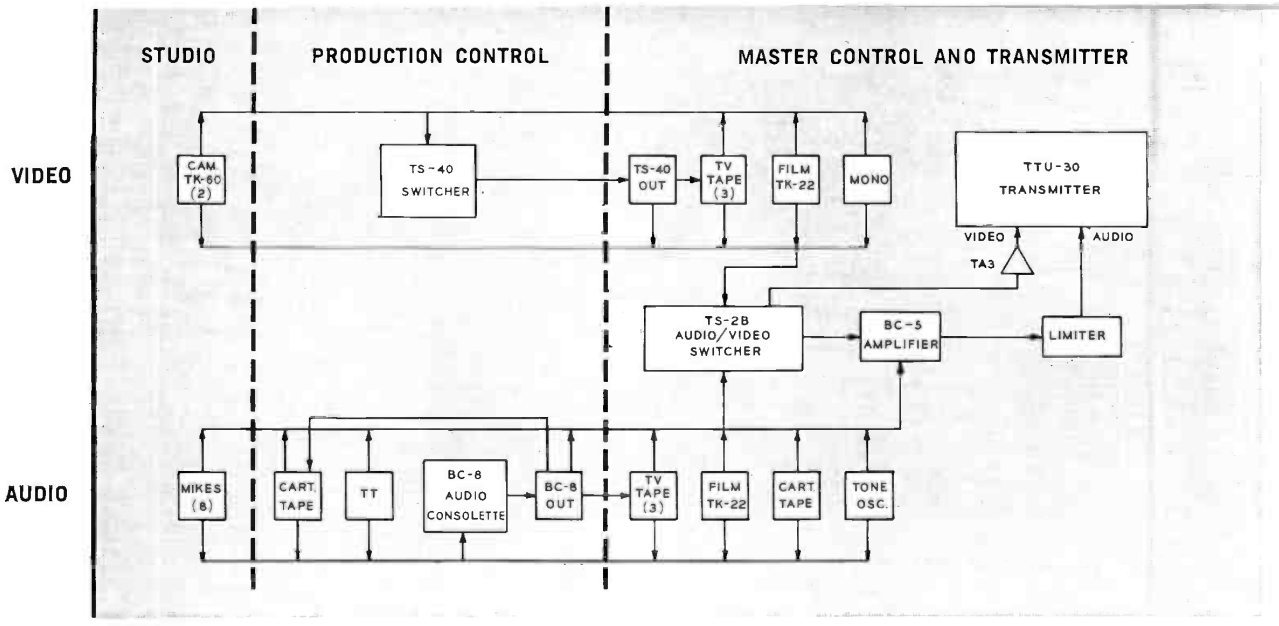
### WCVE Ownership

WCVE is owned and operated by the Central Virginia Educational Television Corporation, a non-profit community organization founded by civic, educational, and business leaders dedicated to the concept of educational television. The major portion of the $900,000 capital for the WCVE station and equipment came from contributions from local businesses, industries, civic and educational groups, and foundations. Operating costs are absorbed by fees paid by participating school divisions at $1.00 per pupil enrolled and by membership dues.

**HOME RECEPTION IS POSSIBLE** for sick or temporarily incapacitated students. The simplest of indoor antennas is usually sufficient to receive the picture, since the station is extremely powerful.

**200,000 STUDENTS IN 450 SCHOOLS** receive educational instruction. Public and private schools subscribe at cost of one dollar for pupil per year. Classroom teacher prepares pupils for the lesson, supervises viewing, and conducts follow-up after the program. Instructional television supplements classroom instruction.






**SIMPLIFIED BLOCK DIAGRAM.** This shows paralleled audio and video switching facilities, at production and master control positions. This arrangement was designed by the station technical staff.

### Conservation of Manpower

WCVE was planned and designed by Spiller and his chief engineer, John Prather. Their broadcast experience enabled them to layout the complete system, write equipment specifications, evaluate the bids—then supervise building construction and system installation. The timetable was about like this: Spiller began recruiting his staff in March, 1964. By August, the building was completed and the equipment installed. September 14 the station went "on-air."

The design objective was to conserve manpower in order to reduce costs, but without compromise in equipment quality or sacrifice of operational facility. Since no attempt was to be made to teach television operation, and only professional people (preferably with broadcast experience) were to be used, efficient use of manpower would do most towards lowering of costs. In this way more funds could be directed toward the procurement of teachers, thus promoting the primary purpose of the station—education.

### Production Control

In line with the minimum manpower operating concept, a new switching system was designed to permit the taping of lessons and the airing of taped lessons at the same time—with all necessary production switching performed by one man and from one point in production control. This meant building into the switching position complete operational controls for film, slide, and tape machines, knowing that not too much attention would be needed at camera control positions. The station's two TK-60 cameras helped in this. Their exceptional stability makes it possible to produce entire programs in the station's eight-hour operating day—without anyone shading the cameras. Further, use of an audio-follower switching system combined video and audio switching functions into one operation for on-the-air switching (which could be performed either in production control or in master control).

The result is a more efficient, one-unit production console with a composite, "non-mechanical" look. Sketch (above) shows a simplified block diagram of the system.

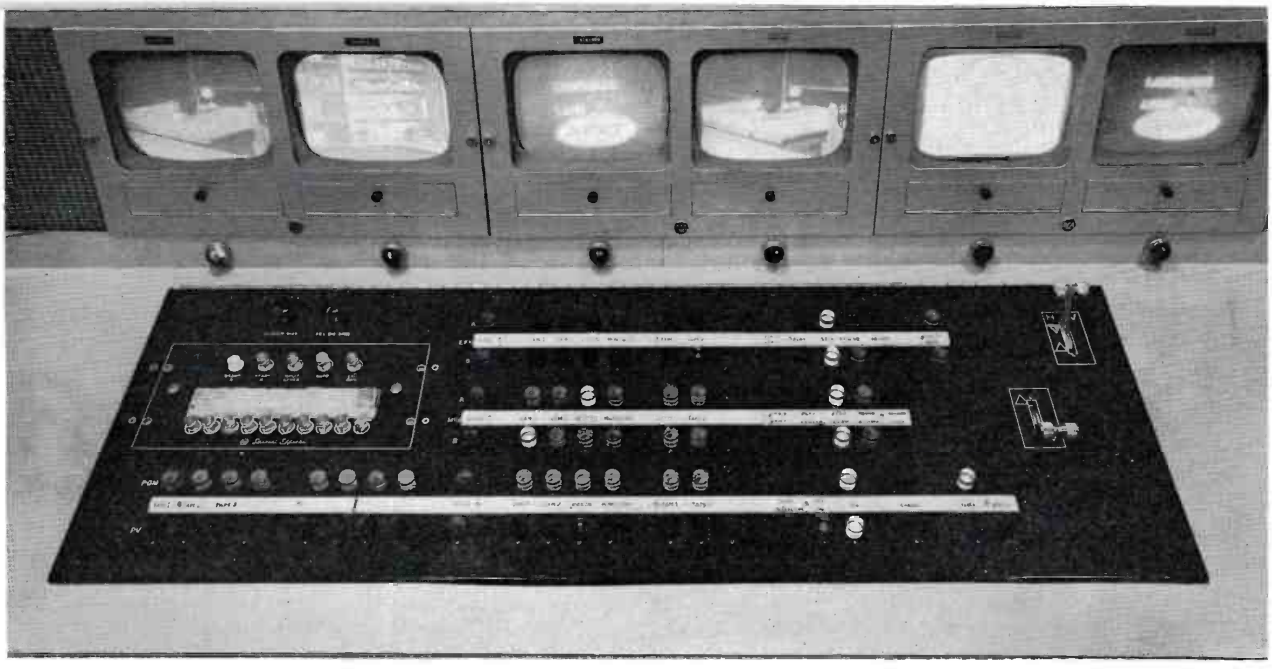
### Master Control

One large open area, combining the usual master control and transmitter rooms, houses a control console, the transmitter, tv tape, film system and support equipment.

The console contains the studio and film camera controls, picture and wave-form monitors, a line monitor switchable between the input and output of the transmitter, TS-2B program switcher, video level and operating controls for the tape machines. Also a BC-5 Consolette that was repackaged to fit into the console desk section. (It is actually used as a line amplifier in this application.)

One operator at master control handles all the switching, machine controls, transmitter control, and monitoring. This efficient control central was designed by the WCVE staff under supervision of Mr. Spiller (see illustration at right).

**SPECIAL 8-INCH TAPE REEL** used to conserve space, save on reel and shipping costs. This accommodates the usual half hour program. Mr. B. W. Spiller, station manager, uncovered a source for the cost-saving product.



**REMOTE OPERATION OF TAPE, FILM, SLIDES** is made possible by this staff-designed modification to a standard RCA TS-40 Transistorized Switching System. (Only 6 inputs of this 12-input switcher are used for switching.) Monitors are for two TK-60 Studio Cameras, TK-22 Film Camera, live, preview, tape.

## MAJOR TV EQUIPMENT

- 2 . . . TK-60 Studio Cameras
- 2 . . . TR-4 TV Tape Recorders
- 1 . . . TR-3 TV Tape Player
- 1 . . . TK-22 TV Film Camera
- 1 . . . TP-66 TV Film Projector
- 1 . . . TP-7 TV Slide Projector
- 1 . . . TS-40 TV Switcher and Special Effects
- 1 . . . TS-2B Relay Program Switcher
- 1 . . . BC-8 Audio Consolette
- 1 . . . BC-5 Audio Consolette
- 2 . . . RT-17 Audio Cartridge Tape Recorders
- 1 . . . Audio Turntable
- 1 . . . TTU-30 TV Transmitter

**COMPACTNESS OF NEW LOOK EQUIPMENT,** such as 30-KW UHF transmitter and television tape machines provide spacious master control in a relatively small room. Supervisor Dennis Starling can control studio and film cameras, transmitter and switching, and audio. Also, tape and film machines may be operated.

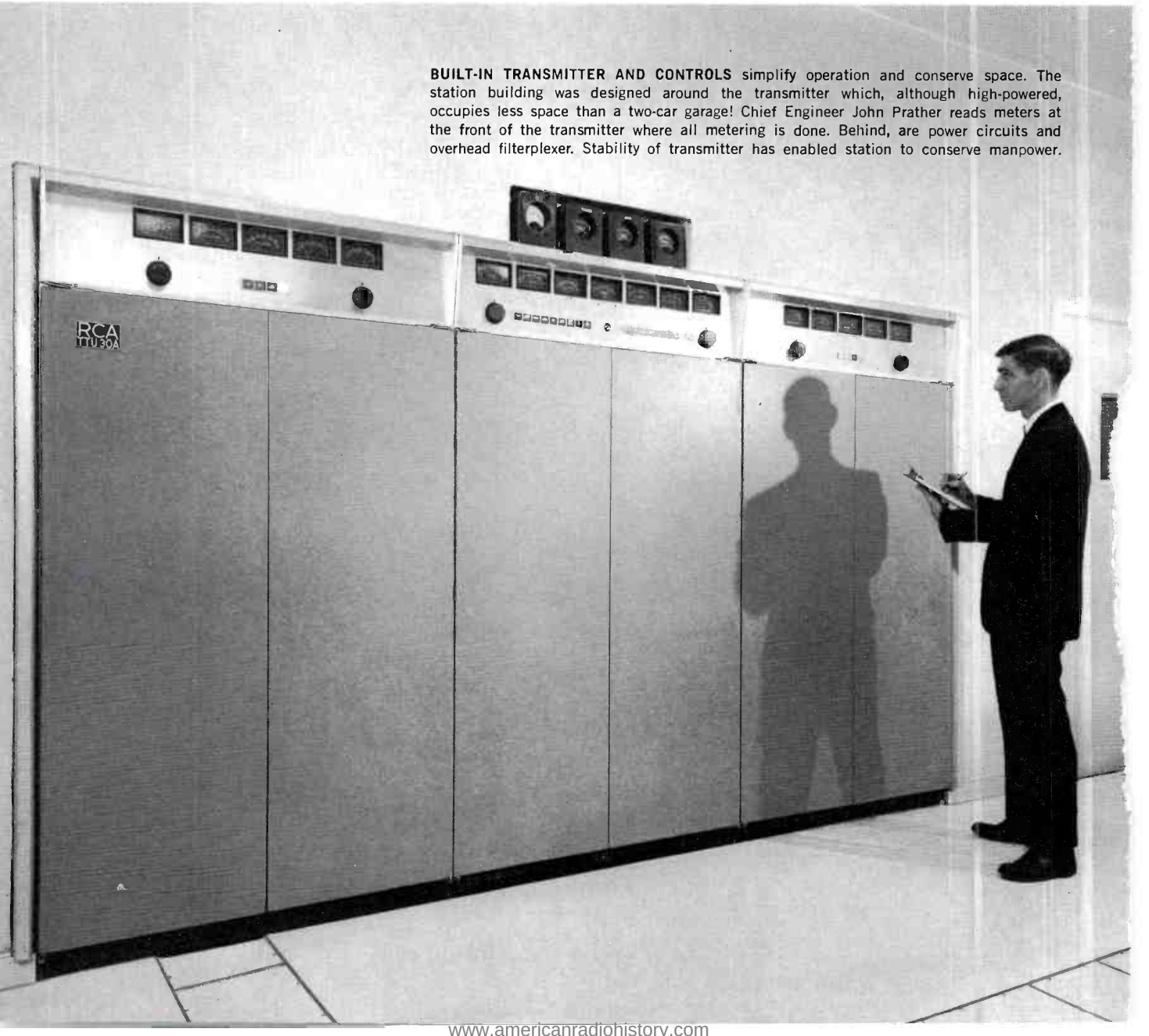
### "New Look" Equipment

The RCA television equipment helped WCVE to take the giant forward step often referred to in TV station design as the "new look". This encompasses not only attractive, colorful appearance, but combines compactness, functional layout and new standards of reliability. New modular and transistorized circuits shrink equipment size and power consumption to only a fraction of what it is in older installations. Solid-state equipment is more efficient, has longer life, and requires less attention. Furthermore, the "new look" circuits are self-adjusting, that is, they compensate for normal changes in daily use and do not drift, eliminating manual "touch-up" of controls. These factors make many devices so stable and dependable that they operate virtually unattended.

### Compact "New Look" Transmitter

The transmitter is one of the first TTU-30, 30-kw Transmitters delivered by RCA. It utilizes the new vapor-cooled klystrons, which are very easily driven and extremely stable. Furthermore, their efficiency helps reduce cost of operation.

The simplicity and compactness of the high-powered transmitter made it possible to literally design the station building around the transmitter. It requires less floor space than a two-car garage. The low-profile front-line cabinets, containing meters and pushbuttons for motor-driven controls, are built into the wall facing master control. Behind, power circuits and components are contained in a walk-in screen enclosure. An "overhead filterplexer" arrangement is used to save additional floor space, since this component never requires any attention. All metering,




**BUILT-IN TRANSMITTER AND CONTROLS** simplify operation and conserve space. The station building was designed around the transmitter which, although high-powered, occupies less space than a two-car garage! Chief Engineer John Prather reads meters at the front of the transmitter where all metering is done. Behind, are power circuits and overhead filterplexer. Stability of transmitter has enabled station to conserve manpower.

even to reading temperatures of the klystron collectors, dummy load and transmitter room components is accomplished at the front of the transmitter.

Picture and waveform monitors for the transmitter are mounted in the nearby master control console, a position from which the transmitter panel meters are visible.

According to the chief engineer, stability of the transmitter has contributed significantly to the station's low manpower concept. The transmitter is shut down at the end of each operating day . . . and within three to four minutes after starting, power is up to maximum. No attention of any kind—not even sync or blanking touch-up—is required during the eight-hour operating day.

The increased efficiency of the klystrons and the preponderance of solid-state circuits are expected to reduce operating costs to a fraction of what they would have been for the older type high-powered transmitter. These savings in space and operating costs, together with unattended operation, make the transmitter installation very efficient and economical.

### Heat Pump

The WCVE floor plan is shown below. A small area, commonly seen in most station floor plans that will be found missing here is the utility room. Air-conditioning of the building is accomplished by heat pumps. This and associated equipment, which usually occupy as much as ten per cent of the total floor area, are located outside, on the roof of the building.




**FLOOR PLAN PROVIDES FOR EXPANSION.** In the future WCVE may easily add a second studio, to increase programming service to the community as well as to schools . . . Note efficient arrangements of all administrative, teaching, and technical facilities. (Inset shows external view of station building.)


### High-Gain Pylon Antenna

The 30-kw transmitter output power is fed through 6⅛-inch diameter transmission line running the entire length of the 550 foot tower to a type TFU-46 Pylon UHF Antenna. This cylindrical, smooth-surfaced Pylon—a new development of RCA for UHF—provides a power gain of 46. As a result, the station propagates a very powerful signal to the service area—a total of 1,200,000 watts, effective radiated power (ERP).

### Coverage Estimates Exceeded

Original engineering studies had indicated the coverage would be out to about 50 miles. However, the 1.2 million watts ERP provided by a TTU-30 30-kw transmitter and high-gain TFU-46 antenna, at a height of 600 feet, have extended the primary coverage area much farther than expected.

Operating from a new studio-transmitter building, located near Bon Air in Chesterfield County, WCVE programming is picked up and used by schools as far as 75 miles to the south in Brunswick County, and 70 miles east at Deltaville.

Coverage is further increased by a translator, owned by the Albemarle County Public School Division, located on Carter's Mountain. The translator picks up the Channel 23 signal from WCVE to retransmit it on Channel 74, for reception by schools in the Albemarle area.

### TV Tape System

The original video tape arrangement was designed on the basis of producing several hours of programming daily, and airing anywhere from eight to twelve hours daily. Since the recording and playing operations would frequently occur at the same time, there was need for a minimum of two machines—at the outset.

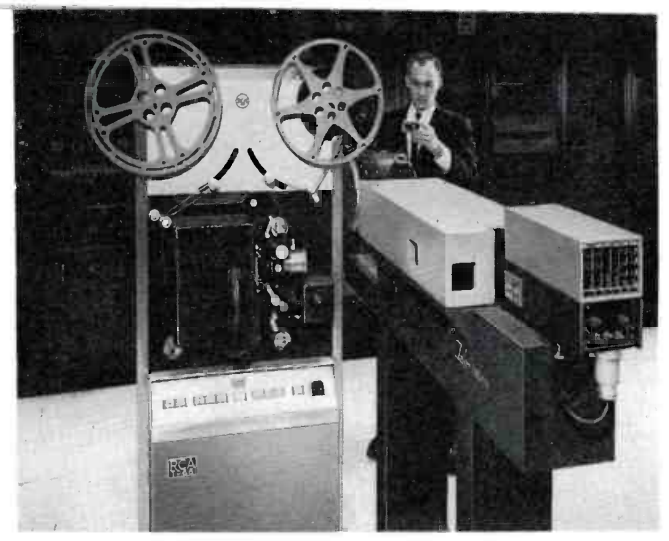
It was soon observed that one machine was occupied solely with the playback function, while the other was used almost exclusively for recording. Although it had seemed desirable to have nothing but complete systems (record-playback machines), it soon became evident that a Tape Player would be a wise addition.

**PATTERN COVERS MORE THAN 50 MILES.** Station's primary coverage reaches to schools as much as 75 miles away. High-gain RCA antenna on 600 ft. tower radiates 1,200,000 watts erp . . . Automatic translator on Carter mountain retransmits on Channel 74 to Albemarle school system. WCVE tapes are broadcast also by WSVA in Harrisonburg, and WSLS in Roanoke . . . Many receivers operate on small indoor "loop" antennas.

The Player filled the bill for daily airing of programs—in a most economical fashion (it costs less because the recorder electronics is eliminated). At the same time one of the complete machines was freed from the playback function and made available as a back-up for both recording and playing. This is a much more reliable operation.

At the start, the station was concerned about the ability of the tape machines to operate indiscriminately at either 7½ or 15 inch-per-second speed. (All programs produced by the station are done on 7½ ips tape speed which reduces tape costs by the not inconsiderate fraction of one-half.) On the other hand, programs procured from the National Educational Television Network and from the Great Plains Regional Instructional Library were on 15 ips tape. Could switching from one speed to the other be done without a lot of fuss and bother—involving time and personnel? Was it feasible for the station to program 7½-inch and 15-inch tapes one after another (back-to-back)? Experience has proved that both the TR-3 Tape Player and the TR-4 Recorder-Player can be used in this way.

The question of purchasing lower-cost, portable tape machines was never seriously considered; not merely because they are not in general use but more importantly, because they are not compatible for open-circuit applications. Moreover, the helical scan machines do not seem suitable for closed-circuit use either, since there is no compatibility among the various makes. Further, the problem of conversion to and from quadruplex is a complicating, costly factor and leads to degradation of picture quality.



**NEW TELEVISION FILM SYSTEM** handles 35mm slides and 16mm motion pictures for use by ETV instructors in their prepared presentations. Equipment includes TP-66 Film Projector, TP-7 Slide Projector, TP-11 Multiplexer, TK-22 Film Camera. This new camera operates without adjustment throughout the entire day.

Standard, professional broadcast equipment is used throughout the station in order to achieve the quality of picture in harmony with the quality of the educational part of the program. In the case of tape, compatible quadruplex machines are used. Costs are reduced by using the 7½-inch speed, but this does not visibly affect picture quality. As a result, tapes can be exchanged between stations and producers without difficulty. This gives a large source of supply.

### Film System

A quite simple arrangement is employed using one 16mm TV Film Projector and one 35mm Slide Projector, together with a Multiplexer and a Film Camera. Since films are not projected in their entirety (in audio-visual fashion), there is no need for more than one film projector to insure continuity. The programs produced by WCVE are essentially live presentations, with film clips and slides utilized only occasionally by way of illustration or demonstration.

For convenience of operation, the film projector and slide projector may be operated by the program producer from his position in studio control. Here he can start and stop the film projector, or change slides on the 35mm projector, as required. This gives him complete control of production and assures a smooth flow from live to film (and vice versa) on the taped program.

The foregoing type of operation is made possible by the unusual stability of the "new look" transistorized film equipment. This new design makes possible remote control by the producer-director. The film projector does not require the usual preroll, having fast start and instant sound. The 35mm projector is likewise designed for remote change of slides. And the film camera stability is such that no video operator is required to be constantly adjusting control knobs.

**COMPATIBLE QUADRUPLEX VIDEO TAPE SYSTEM** consists of one TR-3 Player and two TR-4 Record/Players. This combination gives the station ability to record one program at the same time another is being broadcast. In addition, a third machine is available for back-up use in case either a player or a recorder is disabled.

### Professional Approach

The instructional television programs are used by teachers throughout Central Virginia as a supplement to regular classroom instruction. The classroom teacher prepares the students for each telelesson, supervises the viewing, and conducts the follow-up after the program. During the follow-up, the teacher may correlate the lesson with other subjects, direct the class in research, and initiate numerous activities growing out of the television experience.

### Courses Offered

WCVE broadcasts the following telecourses as basic instruction: 5th and 6th grade Science and 11th grade American History. The remaining telecourses are used by the classroom teacher primarily as enrichment or supplementary instruction. These include Language Arts for grades 1-6, Music for grades 2-5, Art for grades 2, 4 and 5, Mathematics for grades 2-7, Current Events for grades 6 and 7, Science for grades 4, 7, 8 and 9 and a high school course in Guidance, Economics, and The Humanities. All lessons are videotaped locally except Math for grades 4-6 furnished by KQED and 4th grade Science, furnished on tape by Midwest Airborne. The sole "live" broadcast is a 25 minute Current Events program once each week.

WCVE produces about three hours programming daily on video-tape. These tapes may either be telecast immediately or scheduled for later use. Some are "bicycled" by bus, truck, or other carriers for daily telecasts to schools from television stations in other areas of Virginia, such as WSVA-TV, Harrisonburg, and WSLS-TV, Roanoke.

### Teaching Staff

The teaching staff of WCVE currently consists of six full time studio teachers who are on leave from various school systems in the state and eight part time studio teachers who are responsible for a limited number of telelessons. The program director is Mrs. Mary Anne Franklin, who formerly served as television consultant for the Richmond Public Schools. Other educational administrators are A. Edward Ooghe, Television Coordinator, and Grover C. Hailey, Studio Artist.

Standards for qualifying studio teachers are exceptionally high. The present teaching staff of WCVE represents the very best of the 71 classroom teachers recommended by school superintendents throughout Central Virginia and who formally auditioned for the various TV teaching positions last Spring.

### Program Content and Evaluation

Each studio teacher on the staff receives regular assistance and guidance in the selection and evaluation of program material. This is provided by "steering" and "curriculum" committees each comprising from six to twelve members—principals, supervisors, classroom teachers—selected to represent the various participating areas. In addition, TV programs are evaluated by the classroom teachers who return evaluation forms covering lessons or series of lessons.

According to Mrs. Franklin, WCVE is one of the few ETV stations requiring the teacher to watch every telelesson in a classroom in order to document student reactions and to evaluate lesson effectiveness.

### Teacher's Manuals

The classroom teacher whose students are to view the TV lesson is provided in advance with a Teacher's Manual to familiarize her with the upcoming telelesson. This manual, which is prepared by the

**PROFESSIONAL TEACHING STAFF** (clockwise around table): Mr. A. Edward Ooghe, Jr. (standing) TV Coordinator; Mrs. Marriott Maynard, Math.; Mrs. Dorothy Bowles, Language Arts; Mr. Seaton B. Fulghum, Science; Mrs. Mary Anne Franklin, Program Director; Mr. Vaughan H. Howard, Science; Mrs. Kathleen Hancock, American History; Mrs. Hope Mitchell, Language Arts; and Mr. Grover C. Hailey, Studio Artist.

**STUDIO ARTISTS PREPARE VISUALS** for television class in language arts. Form and content, visual aids, and teaching manuals are either under the supervision of local committees or prepared by the studio teachers themselves. The Teacher's Manual, (for example) is prepared by the WCVE staff for distribution to subscribing schools.

studio teacher and printed in quantity for distribution to subscribing schools, contains an outline of the program content, purpose and objective of the lesson, description of the telecast and suggested related activities for the class. In some cases, bibliographies for teacher and students are included, as well as references to related subjects in standard textbooks. The manual also contains the form which the classroom teacher completes in evaluating the students' reactions and the effectiveness of the lesson.

The recent installation of new Multilith printing and processing equipment has made it possible for all manuals to be produced at the WCVE station.

### Nighttime Programming

On April 1, 1965, WCVE became the 93rd affiliate of the National Educational Television Network (NET), which provides two hours of taped and filmed cultural and public affairs programs each week night.

Some of these programs explore subjects in considerable depth. There is, for example, an hour long program on what Japan is doing to solve its population problem, a 30 minute program on recent scientific discoveries in the Antarctic, and a 30 minute program on the birth of jazz in New Orleans. Scheduled also is a 13-week series on a subject of community interest produced by WCVE.

### WCVE And The Future

The State of Virginia is committed to the development of a statewide educational television network. WCVE is one of three ETV production centers currently operating in the State of Virginia. Because of its geographical location and because of its outstanding facilities and programs, WCVE is expected to play an integral part in the development of the network.

## TYPICAL PROGRAM CLASSES PRODUCED AND TAPED BY WCVE

| *Grades* | *Subject Series* | *Title* | *Length (in minutes)* | *Length of Series (in weeks)* |
|---|---|---|---|---|
| 1 | Language Arts | Language Corner | 15 | 30 |
| 2 | Language Arts | Word Magic | 15 | 15 |
| 2, 3, 4 | Music | Let's Make Music | 27½ | 26 |
| 2 | Art | Art—Let's Look | 15 | 15 |
| 3 | Language Arts | Language Lane | 20 | 30 |
| 2 | Math | Know Numbers | 15 | 30 |
| 3 | Math | Why Numbers? | 20 | 30 |
| 4, 5, 6 | Language Arts | Highways to Communication | 25 | 15 |
| 4 | Art | Our World of Art | 27½ | 13 |
| 5 | Art | Art Is All Around Us | 27½ | 13 |
| 5 | Science | Adventures in Science | 27½ | 26 |
| 5 | Music | Patterns in Music | 25 | 30 |
| 6 | Science | The World of Science | 27½ | 26 |
| 7 | Science | New Dimensions in Science | 27½ | 26 |
| 8 | Science | Basic Biology—1st Sem. Concepts in Chemistry—2nd Sem. | 30 | 15 |
| 9 | Science | Physical Science—1st Sem. Earth-Space Science—2nd Sem. | 30 | 30 |
| 11 | American History | Issues and Ideas | 30 | 30 |
| 11, 12 | Humanities, Guidance, Economics | Focus | 45 | 30 |

**TEACHERS REHEARSE PROGRAMS** in advance of going "on-air" in order to present a smoothly flowing lesson to the unseen class. This devoted attention to perfection in detail is characteristic of the genuine professional.


# NEW LOOK
# LIVE COLOR
# TV CAMERA, TK-42

Pictures Are Better, Because of the New Concept, That Adds a "Black" Tube to the Three Color Tubes

Introduction of the 1965 RCA 4-channel color camera, type TK-42, begins a new era in color television. After more than five years of tests and demonstrations, the separate luminance principle has proved to consistently produce better color pictures. Monochrome pictures are improved also. Furthermore, in the TK-42 camera operation is simplified, requires fewer people, sets up faster. Stabilized circuits maintain high quality pictures without frequent re-adjustment.

### Advanced Camera

The separate luminance tube produces color pictures with new life and brilliance, and assures high-quality monochrome pictures. A single lens system with a 25 to 1 range of focal lengths eliminates the color-matching problem. Electronics are completely transistorized in standard modules for top performance and reliability. Circuits are more compact, accessory equipment occupies less space, and many aids to operation are built-in. Attractively styled, the TK-42 looks like what it is—RCA's finest color television camera.

### Separate Luminance Channel

The TK-42 uses four pickup tubes. Three of these tubes produce the red, green and blue components of the color signal;

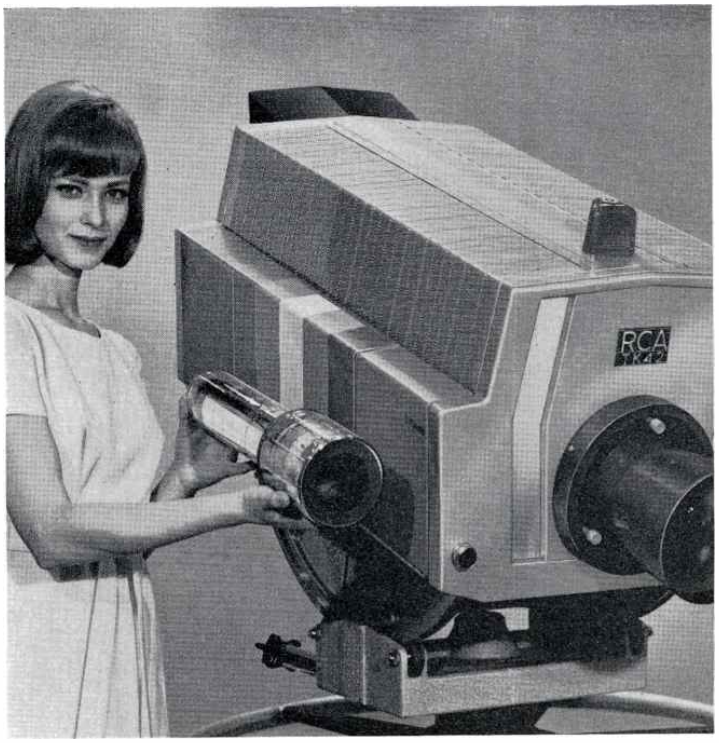



**FIG. 1.** TK-42 live color camera employs large 4½-inch I.O. luminance tube for superior pictures in color and black and white.

## Technical Advantages

The TK-42 offers a host of special convenience features that contribute immeasurably to the operation and maintenance of the color camera system. Many of these aids are not found in other cameras being marketed today, or else they are available only at extra cost:

- Built-in color bar generator
- Built-in colorplexer setup circuits
- Built-in gamma and aperture correction
- 8-inch high-brightness 150-ft. lamberts viewfinder
- Simplified N.A.M. monitoring
- Separate luminance channel
- 1.6-40 inches focal length range
- Stabilized, self-compensating circuitry
- Automatic white and black level
- Built-in test and setup facilities
- Transistorized, standard modules

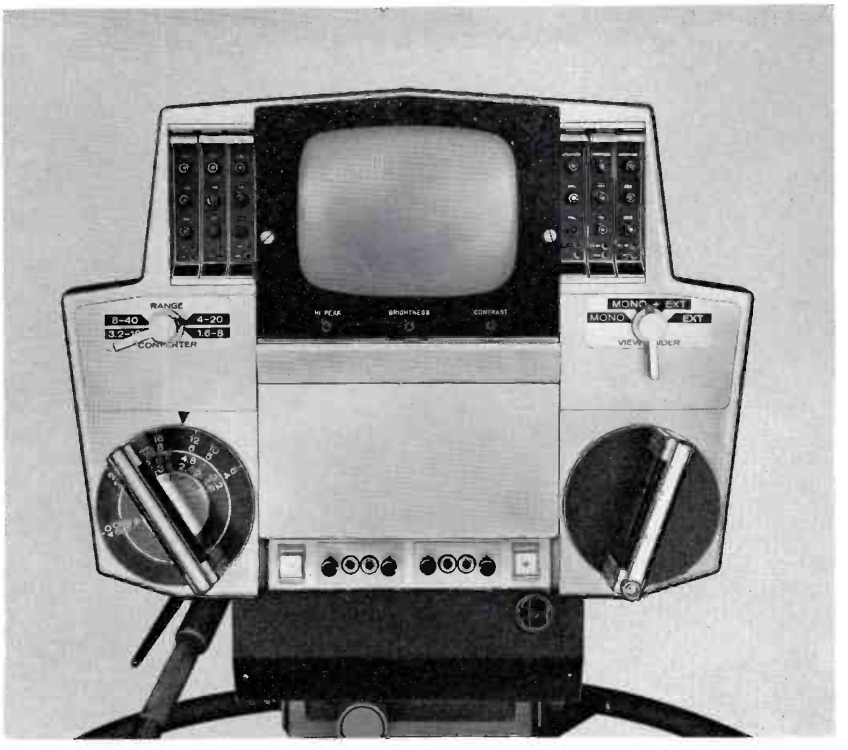



FIG. 2. Rear of camera showing large "D" handles for zoom and focus control. Handles can also be used to maneuver camera. Viewfinder is large 8-inch type. Plug-in modules are easily accessible.

the fourth tube is a 4½-inch image orthicon which provides a separate luminance or monochrome signal with resolution of the order of 700 lines.

The "Black" tube concept, also used successfully in RCA color film cameras, was developed to enhance the performance of earlier three tube color systems, particularly in reproduction of color, and to solve the recurring problem of satisfactory monochrome performance.

### Brighter, Sharper Color Pictures

The separate luminance channel in the TK-42 has important advantages for color television, particularly with respect to picture sharpness, leading to better color pictures. This separate luminance channel is added to the red, green, and blue chrominance channels, to supply high quality monochrome information. Like the black plate used in four-color printing, it adds the detail that gives "snap" to the picture.

### Better Monochrome Pictures

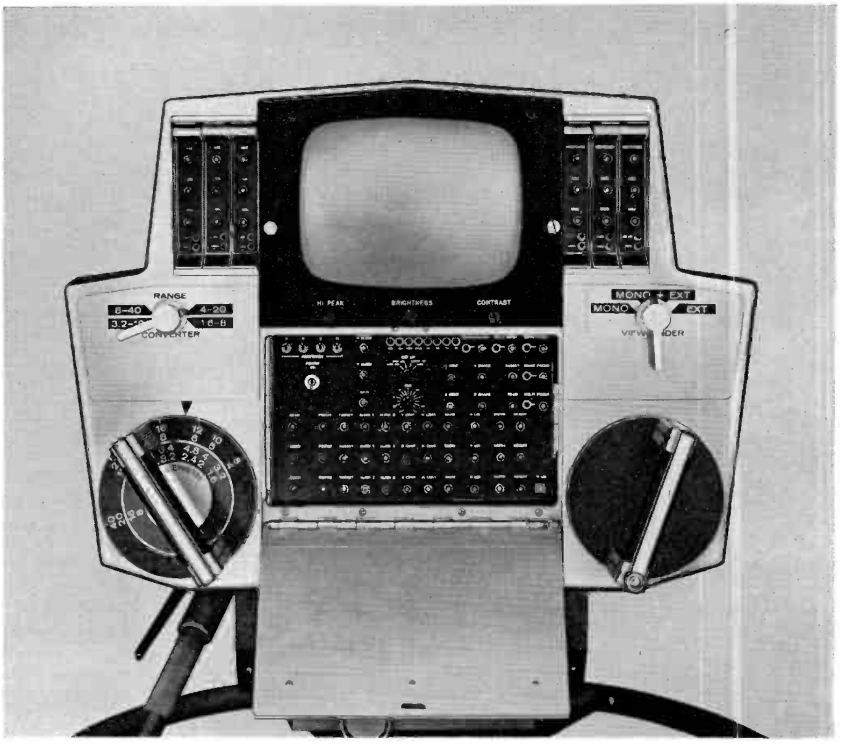
The 4½-inch image-orthicon tube used for the luminance channel also contributes quality for monochrome viewers. Pictures from the TK-42 seen on a monochrome receiver (or monitor) are comparable in resolution, gray scale, and overall quality to that obtainable from the finest 4½-inch I.O. black and white cameras, such as the Type TK-60.

### Value of "Black" Tube Principle

Use of the separate luminance channel provides a high quality monochrome signal that is produced directly by an image orthicon tube rather than by the matrixing process that is employed in three-tube color cameras. Therefore, the quality is independent of the accuracy of registration of the red, green and blue channels. The high quality monochrome signal is not only desirable for viewing the color signal on monochrome receivers, but it is also a necessary component of a high quality color signal.

Three tube color systems have no separate tube to produce this monochrome signal. Rather, an M signal component, or luminance signal, is developed by matrixing the three color tube outputs. This M signal is then combined with the I, and Q

FIG. 3. Protective cover, which also serves as cue clip board, lowered to show setup panel.



chrominance signals to form the composite color signal. Therefore, the quality of the matrixed M signal, particularly the resolution, is dependent upon the registration accuracy of the images on the color tubes. Poor resolution in the M signal component will of course impair the quality of the color signal as well as the monochrome.

### Standard, Plug-In Modules

Circuits of the camera, and rack mounted auxiliary equipment, are packaged in the form of plug-in modules, now standard for most RCA equipments. The plug-in module, which features compactness, easy access and quick replacement by spares, also permits checking under operating conditions. The standard module concept, quickly promotes operator familiarity with circuits and equipment that otherwise might take much time to acquire.

### 25 to 1 Focal Length Range

Built into the TK-42 is an extremely versatile lens system that does away with the need for a conventional lens turret and assortment of lenses. This lens system will handle virtually any requirement in the studio or field. The basic zoom lens, together with an accessory wide angle adaptor, covers a total focal length range of 25 to 1 (1.6 to 40 inches).

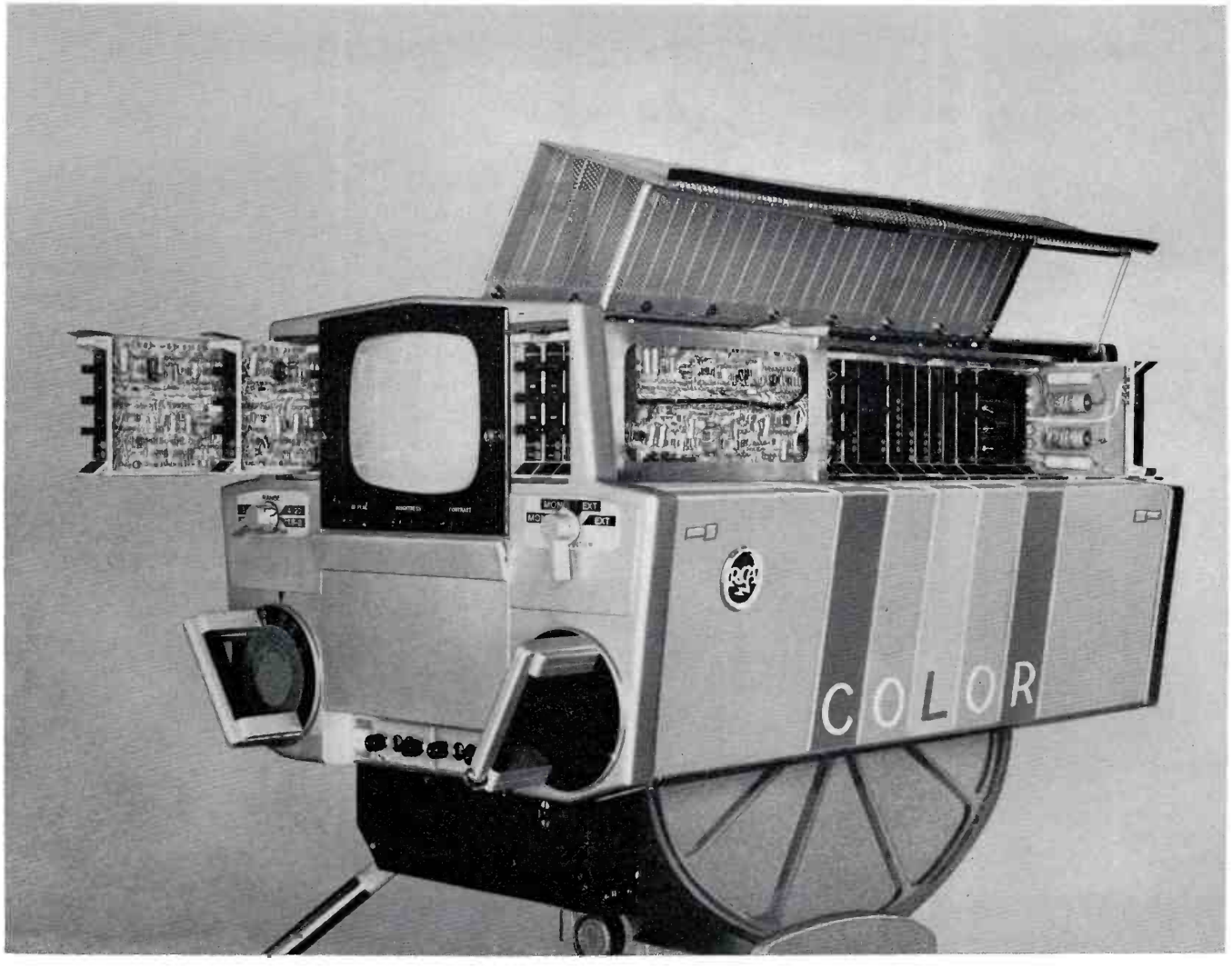
This single lens system eliminates the need for color matching lenses of various focal lengths. Lens zoom and focus is controlled at the rear of the camera by two handles. (These same handles are used to pan, tilt, and dolly the camera.)

The wide angle adaptor is used for focal lengths from 1.6 to 8 inches and from 3.2 to 16 inches. Selection between the two ranges is made smoothly by a lever at the rear of the camera—without need to refocus. Without the wide angle adaptor the zoom lens can be operated in either of two selectable ranges, 4 to 20 inches and 8 to 40 inches.

### One-Man Setup

The TK-42 camera brings to color operation a new simplicity and ease of adjust-

**FIG. 4.** Completely transistorized plug-in modules provide ultimate reliability, can be tested while operating, and are easily and quickly replaced by spares if necessary.



## SIMPLICITY AND COMPACTNESS OF TK-42 COLOR CAMERA CHAIN

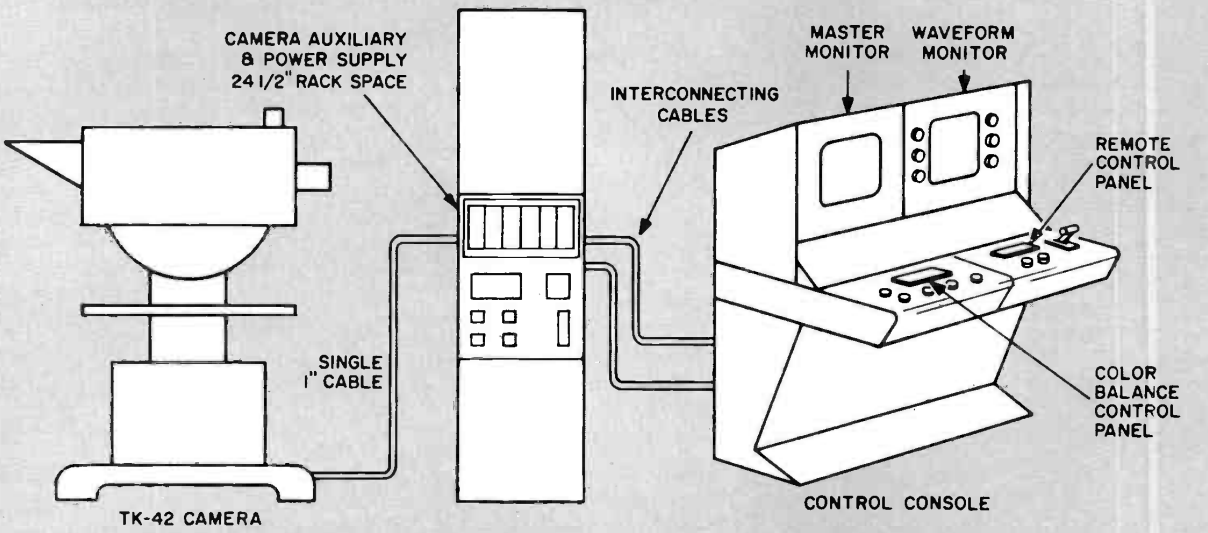



FIG. 5. Diagram shows equipment space saving features and operational flexibility.

## COMPARISON OF 3- AND 4-CHANNEL COLOR SYSTEMS

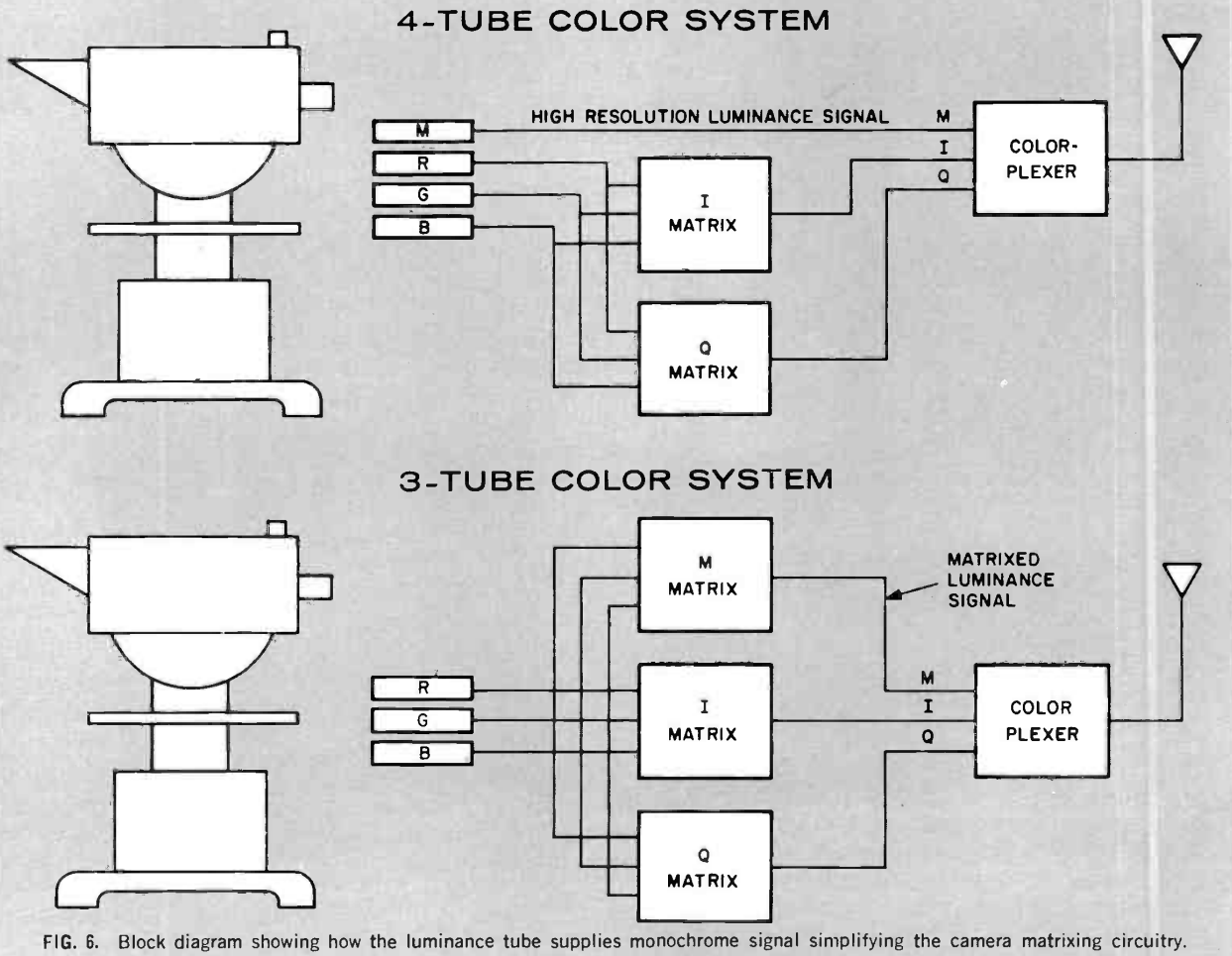



FIG. 6. Block diagram showing how the luminance tube supplies monochrome signal simplifying the camera matrixing circuitry.

ment, making it possible for one man to achieve camera setup without an assistant. No vectorscope is needed. Special camera test pulses, as well as image orthicon alignment circuitry, and a color bar generator are built into the camera equipment, cutting down on the amount of plant equipment required. Also, an accessory I-Q module is available to provide a standard EIA color bar signal for plant use.

### Semi-Automatic Operation

No other camera offers as many features for simplified operation. Several functions previously performed manually can now be automatic. There is provision on the control panel to permit either manual or automatic operation.

Control of the four channels proportionately and simultaneously is accomplished by automatic white and black level controls, maintaining the proper modulation and picture colorimetry. The result is accurate control of picture brightness and color quality at all times.

Monitoring of the 4-channel TK-42 is simpler than other camera systems that require continual observation of three separate (R, G, B) waveforms to maintain the correct signal levels.

The TK-42 monitor display features the simplicity of a single waveform—familiar to monochrome operators. This is made possible by special circuits that accomplish non-additive mixing of M, B, R, G signals.

### Functionally Styled

Styled for ease of handling and operation, the center of the viewfinder kinescope is near to the optical axis of the taking lens. Thus, the camera operating height is more convenient at all times, with the viewfinder in a position normally near the eye level of the operator. This results in a lower center of gravity, increasing the mechanical stability. Incorporated in the new camera are solid-state transistorized modules that simplify service, give top performance. The camera is functionally styled to give fast, easy access to the modules as well as a very attractive appearance to the eye.

### Fully Transistorized

Except for the high voltage rectifier in the viewfinder, the TK-42 is completely transistorized. Thus, advantage is taken of all the space and power saving benefits of solid state circuitry, as well as the increased reliability, reduced maintenance and improved performance these circuits bring. Transistors used are readily available, unmatched types requiring no selection for replacement.

### Stabilized Circuitry, Stays Adjusted

Uniformly high performance over long periods of time without day-to-day alignment is a feature of the circuits of the TK-42. It is the result of extensive stabilizing techniques that are employed throughout the camera chain. This assures day-after-day high-quality color pictures, without long set-up times or continual readjustments.

A unique cooling and heating system maintains optimum temperatures for the four pickup tubes, to help prevent any variations in camera performance. Aging of components and ambient temperature changes are compensated for by feedback stabilization circuits. Precise reference devices maintain critical voltages and currents at proper values. Some are stabilized to less than 0.1 per cent variation. As a result, the TK-42 comes up to operation for rehearsal pictures in only one minute after starting. And, after on-air pictures are once achieved they stay that way without a lot of "fiddling and fuss."

### Simplified Camera System

New equipment features in the TK-42 simplify the television system by reducing the amount of equipment needed. The only input signals required for the camera are sync, blanking, subcarrier, and burst flag. Horizontal and vertical drive pulses derived from sync are generated within the camera. Also, video output is automatically corrected for colorplexer and camera cable delay, eliminating any need for pulse distribution amplifiers and delay lines for other cameras in the system. Furthermore, the TK-42 uses only a single camera cable one-inch in diameter.

### Compact Auxiliary Gear

The camera auxiliary, including power supply and a built-in color bar generator, requires only 24½ inches of rack space. Two control panels, one a remote panel 4 by 7 inches, and the other a color control panel 8 by 7 inches, mounted in a standard 20-inch control console. A picture monitor and a waveform monitor are also mounted side-by-side in the same compact console.

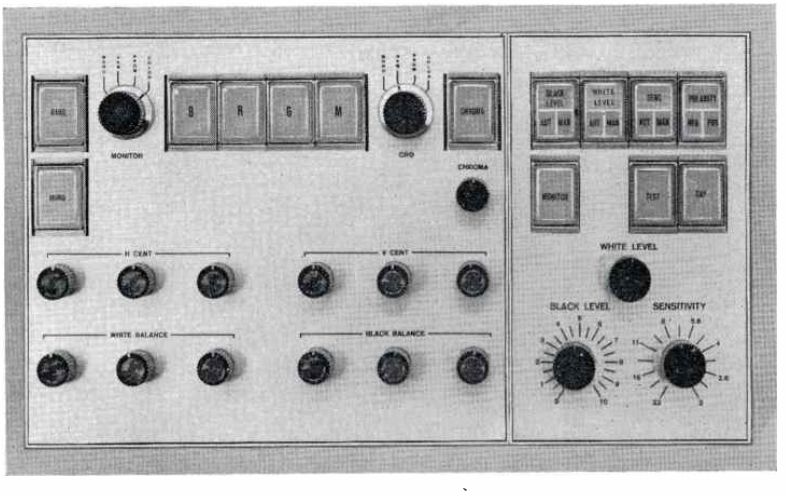
### World Wide Versatility

The TK-42 is designed to operate on power sources in the ranges of 90 to 130 volts or 180 to 260 volts at 47 to 63 cycles, and on international 625-line, 50-field, or 525-line, 60-field television standards. Individual color burst filters are available for each standard. Or, the TK-42 can be equipped with both filters, if desired, for switchable operation on either standard.

### Proven Performance

The 4-channel color system has been in development for more than five years. The first luminance channel color camera, the TK-42X, was introduced to broadcasters at an NAB Convention in Chicago back in 1962. Impressed by its performance, broadcasters voted in favor of the 4-channel concept. More years of testing and several more NAB demonstrations followed. This was combined with the experience that went into the design and production of more than 450 TK-41 color cameras. Now RCA presents the final result, the TK-42, with the belief that it is truly the most advanced and most efficient color television camera.

FIG. 7. Simplified control panels consist of color quality control (left) and remote control panel, can be mounted in table top of 20-inch desk section.



RCA NEW LOOK

A COMPLETELY NEW CONCEPT IN COLOR TV CAMERAS

# the best of color

# starts with black!

## *Like the black plate in four-color printing, this radically new camera uses a "black tube" to produce perfect color pictures*

Ask any printer and he'll tell you that four-color printing needs a black plate to supply "snap" to the color picture. For the same reason, the TK-42 color camera has a separate luminance (black) tube added to the red, green and blue (color) tubes. Result: Finest detail and superior color pictures.

Everything about this great new camera contributes to the finest, most reliable color reproduction ever provided. Stabilized circuitry permits it to operate for long periods without adjustment. Completely transistorized, plug-in modules provide highest performance and reliability. Big 4½-inch image orthicon tube in luminance channel provides high quality monochrome pictures, as well as highest quality color pictures.

The separate luminance principle has been proved by more than 5 years of intensive engineering, product research and field testing. Several models have been demonstrated at three NAB Conventions. In 1962, broadcasters registered their choices regarding the separate luminance principle, as well as other features. The result is the TK-42...a new standard of color picture quality!

This 4½-inch image orthicon (black tube) is used in the separate luminance channel to sharpen the color picture and to assure a high-quality monochrome picture.


Transistorized modules afford easy servicing, are more reliable, and provide highest performance.

Call your RCA Representative for the complete story. Or write RCA Broadcast and Television Equipment, Building 15-5, Camden, N. J.

RCA®

**The Most Trusted Name in Television**

# "UNILOCK" SYNCHRONIZES PICTURES AND SOUND FROM NON-SPROCKETED MACHINES

## Interlocks Tape and Film Equipments For Playback In Sync Without Re-Dubbing

It is common knowledge that motion picture cameras, film projectors and other sprocketed mechanisms can be locked together through start and stop cycles, and may even be run backwards in complete synchronism. But anyone who has tried interlocking non-sprocketed devices—such as audio and TV tape recorders—is aware of the problems and uncertainty of synchronization.

Using sync signals, such as the 60 cycle sync tone used with ¼-inch audio tape or the 240 cycle control signal applied to television tape, it is *possible* to control the playback speed of the two machines.

Once the machines are brought into "sync" position, they continue to operate interlocked in this position. The problem, however, has been in achieving interlocked operation *from a standstill mode*. Due to differences in the starting time of non-sprocketed machines, and the lack of interlocking reference signals between the two machines, there was no way to guarantee that the machines would come up to speed in an interlocked position.

### Unilock Achieves Absolute Referencing

These problems are now solved by Unilock, an RCA equipment now available from the Broadcast and Communication Products Division. With it, interlocked playback of any audio tape recorder, TV tape recorder, newsreel film projector, sound film reproducer or TV film projector in absolute reference to each other is a reality.

Unilock ("universal interlock") is a solid state device that permits two or more tape or film machines to operate interlocked with the same degree of accuracy as sprocketed mechanisms.

An outstanding feature of Unilock is that the machines need not start together. Unilock has a memory storage of ±100 film frames—that is, it will synchronize

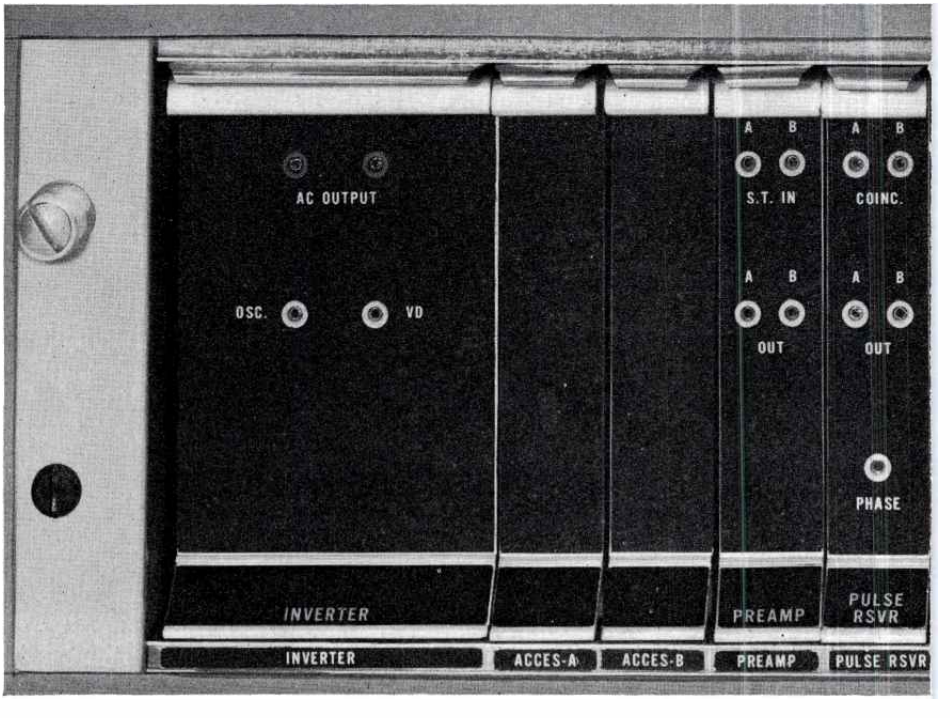



**FIG. 1.** Unilock all solid state circuitry is contained in five basic plug-in modules, mounted in standard 19-inch rack, 5¼ inches high.

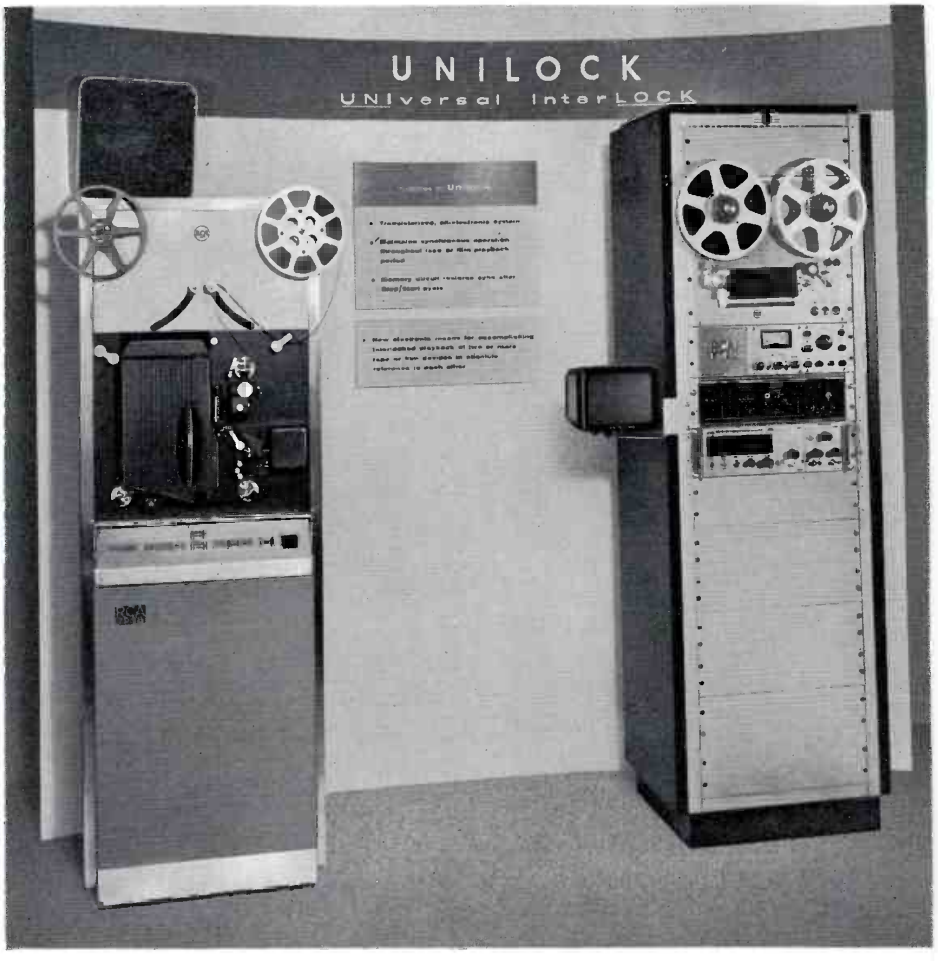


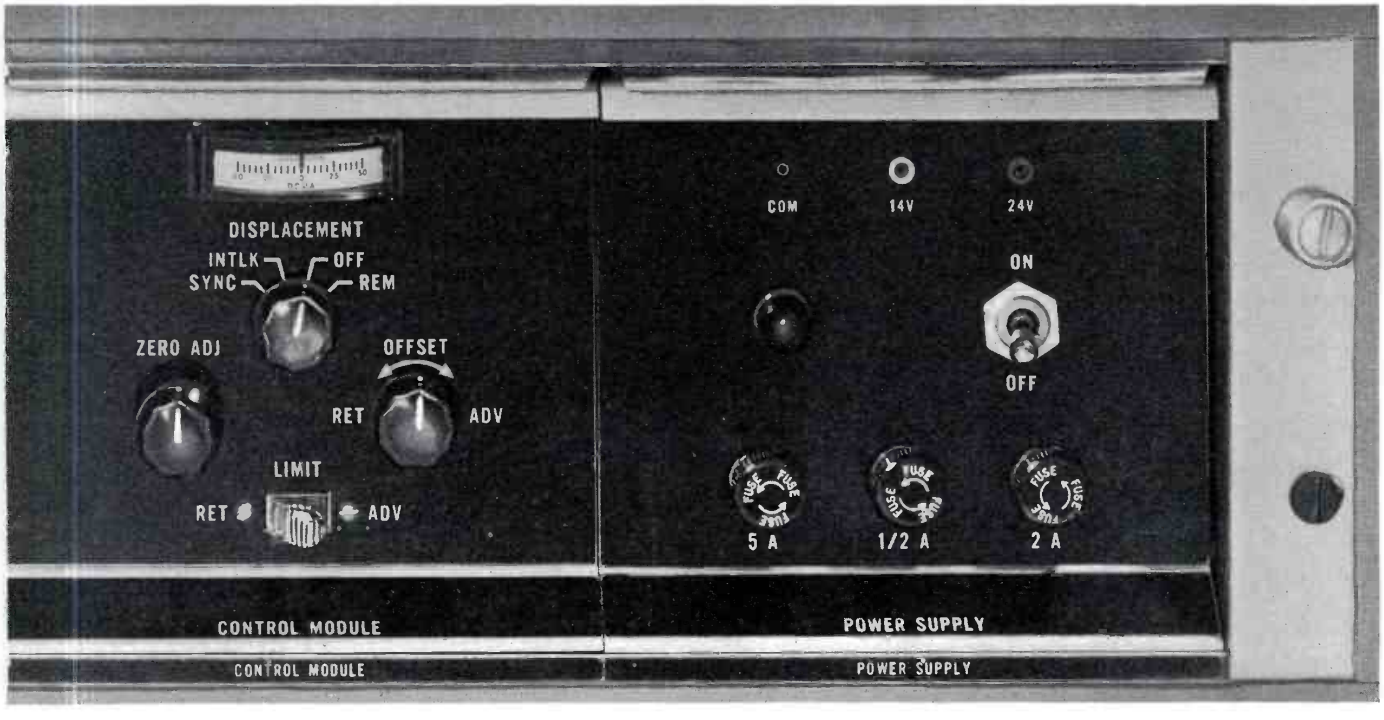

FIG. 2. Unilock performance was demonstrated in RCA's equipment exhibit at the 1965 NAB convention.

two machines that are as much as 100 frames apart. Upon reaching speed, Unilock maintains a locked condition to an accuracy of $\pm\frac{1}{2}$ frame.

Unilock was demonstrated early this year at the NAB Convention, and the system was described in a technical paper presented by Mr. Donald McLaughlin at the March meeting of SMPTE in Los Angeles.

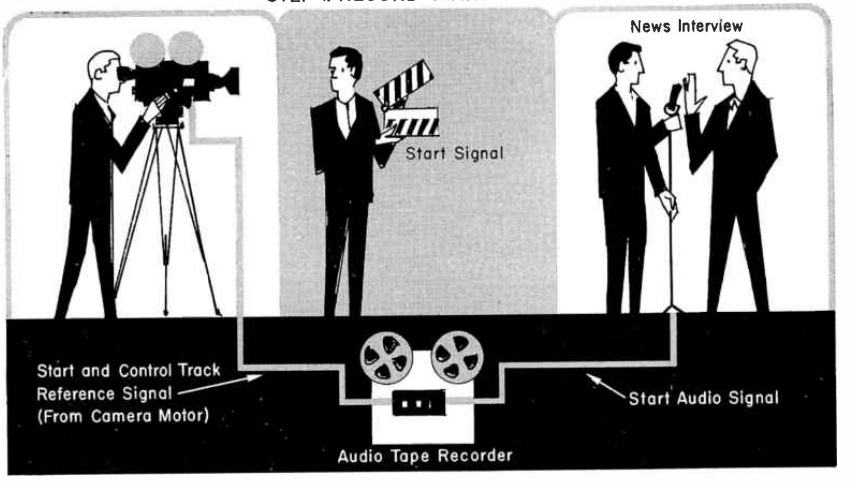
### Simplifies Playback of On-Location Recordings

Unilock capitalizes on the convenience and time saving advantages that the ¼-inch magnetic tape recorder offers for re-

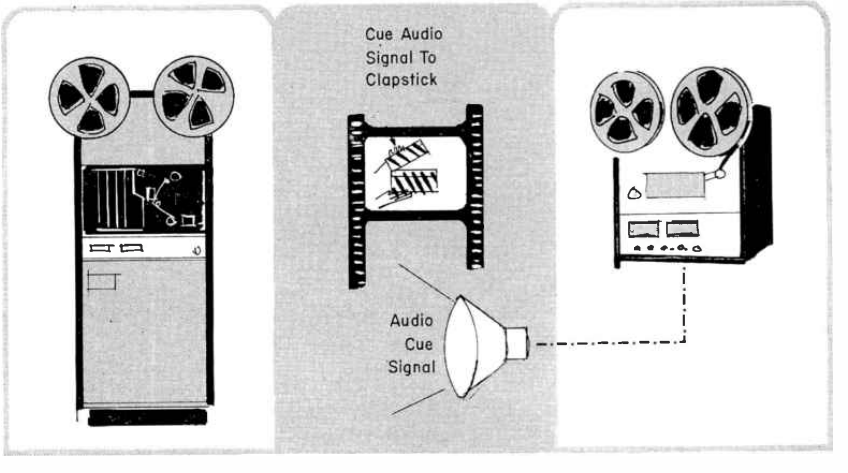


# How to use "UNILOCK"

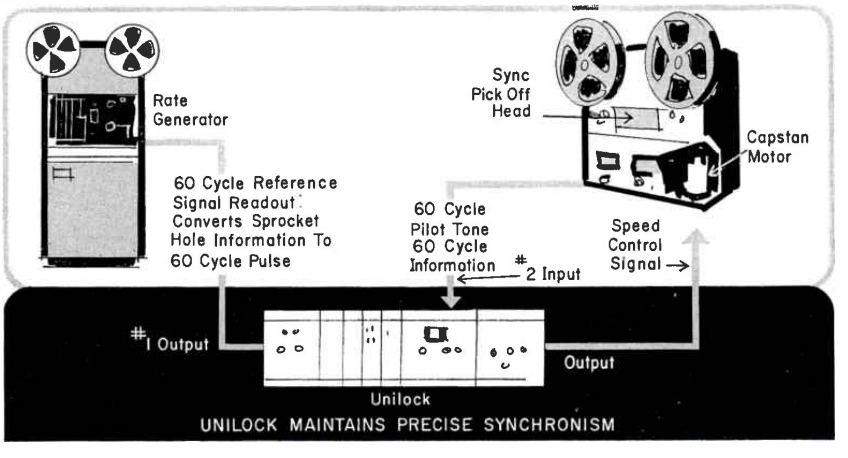
STEP 1. RECORD START MARKS




STEP 2. CUE-UP FOR PLAYBACK OPERATION




STEP 3. START FILM AND TAPE MACHINES FOR INTERLOCK PLAYBACK




cording sound on inexpensive tape recorders in the field. For news or feature production, ¼-inch audio tape has become almost the universally preferred method of recording sync sound. The excellent quality of sound as well as the development of lightweight, well-engineered audio recorders makes the choice of this equipment quite logical. Recording of reference signals is not a problem—several such systems are already commercially available. However, what has been lacking is an accurate, reliable PLAYBACK system . . . Unilock fills this need.

Before Unilock, to assure accurate, synchronous playback, it was necessary to make a re-dubbing transfer from audio tape to sprocket film magnetic tape. This accuracy is now accomplished by Unilock without the extra transfer operation.

Here's how it works: During the recording process, a 60 cycle tone—generated either from the power source or from a tone wheel "pipper" attached to the film camera—is added to the audio tape. This tone on the ¼-inch tape serves as a "magnetic sprocket hole", and is used to synchronize the audio recorder and film projector during playback. With Unilock, an audio tape recorder started as much as four seconds before or after the film projector to which it is to be interlocked will be quickly brought into synchronism for perfect playback.

### Locking-In Audio and TV Film

TV station news departments will be interested in Unilock to synchronize audio tape machines with 8 mm or 16 mm TV film projectors for interlocked playback of sound and picture. With Unilock, ¼-inch tape recorders may be used as a recording medium for sound while the TV picture, either live or taped, is being recorded on film, since it enables subsequent interlocked playback of the ¼-inch tape sound track. Unilock receives synchronizing information from the sprocket mechanism of the projector and from the magnetic control tracks on the audio tape to control the speed of the capstan in the audio tape recorder.

### Locking-In Audio and TV Tape

With Unilock, all the advantages of double system sound are also applicable to TV tape. The control track (already on the TV tape) and a sync signal that has been recorded on the ¼-inch audio tape, act as electronic "sprocket holes" to maintain a synchronous playback or locked condition between the machines. Sound can be recorded on audio tape during picture taping, or transferred from the audio tape to video tape after editing, or vice versa.

The result is complete, split-second synchronization of picture and sound.

### Synchronizing Several Tape Machines

In addition to the interlock function between audio tape, TV tape and film projection equipment, Unilock also provides synchronous operation (locked to power line) of tape machines, correcting for tape slippage and machine speed variations. Any number of audio tape recorders can be synchronized to provide multiple distribution channels for redundancy, or for other purposes. One Unilock equipment is required for each unit.

### Tool for Recorded Interviews, Travelogs

Unilock makes practical the lip-syncing of projected 8 mm, 16 mm or 35 mm motion picture film with sound recorded during personal interviews on a ¼-inch tape recorder, or commentary recorded from scripts for travelogs. Synchronized playback of audio tape with film permits independent recording of sound over the picture in the convenience of the studio rather than in the field.

### Quick Editing of TV Tape or Film

Audio tape carrying the sound for TV tape or motion picture film programs, and synchronous with both the tape and film machines through Unilock, offers a means for quick and efficient editing of material during production or when updating. There is complete assurance that the audio tape machine can be run in perfect synchronism with TV tape and TV film reproducers.

### Adaptable to Complex Systems

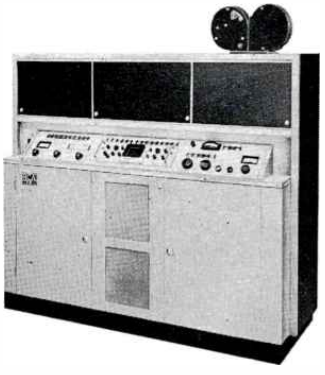
Unilock can be used in a variety of systems—the simplest one being to interlock a ¼-inch audio tape machine with another non-sprocketed unit, or with a sprocket driven device. A complete application involving ten Unilock systems is installed at the U.S. Information Agency in Washington. This elaborate Unilock system provides a means of interlocking up to eight TV tape recorders, two ¼-inch audio tape machines, four film projectors, and four 16 mm magnetic reproducers. Unilock facilitates the dubbing of sound as well as the conversion of English sound tracks to sound tracks in other languages.

### How Unilock Operates

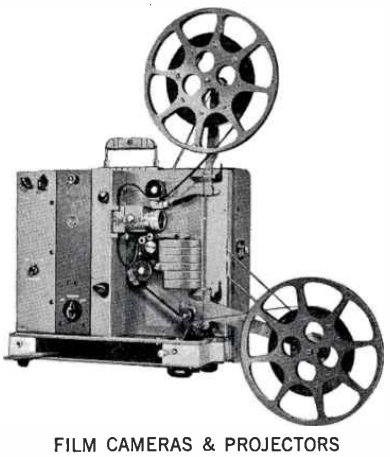
Unilock controls the motor speed of one of the devices to be synchronized by

## Universal Application — Operates With All These Film and Tape Devices

TV FILM PROJECTORS



TV FILM RECORDERS



FILM CAMERAS & PROJECTORS

FILM SOUND RECORDERS

TV TAPE RECORDERS

AUDIO TAPE RECORDERS

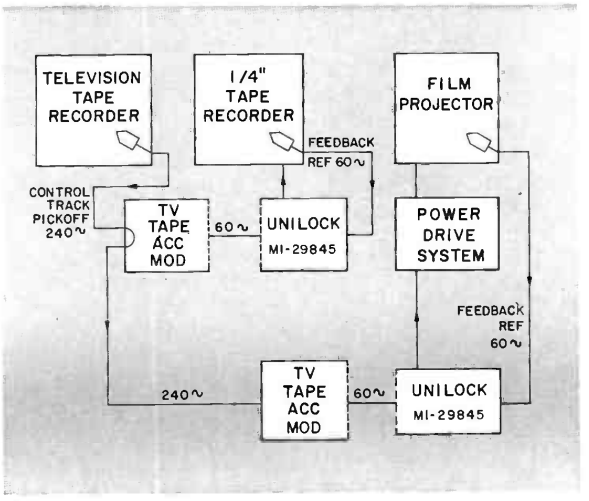



FIG. 3. Audio tape recorder and film projector locked to TV tape recorder.

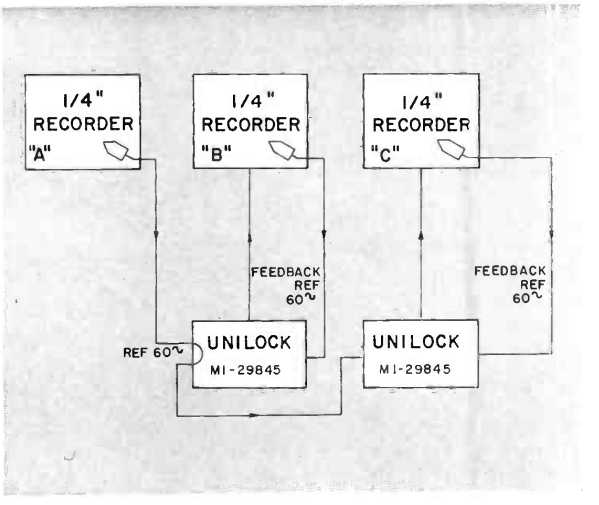
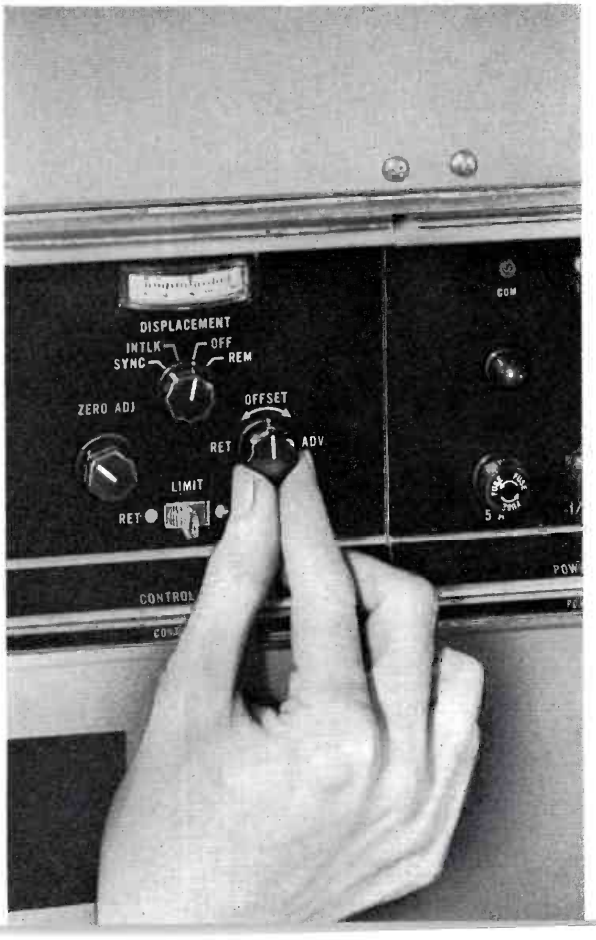



FIG. 4. Audio tape recorders "B" and "C" locked to tape recorder "A".

FIG. 5. Control for advancing or retarding machine speed manually.



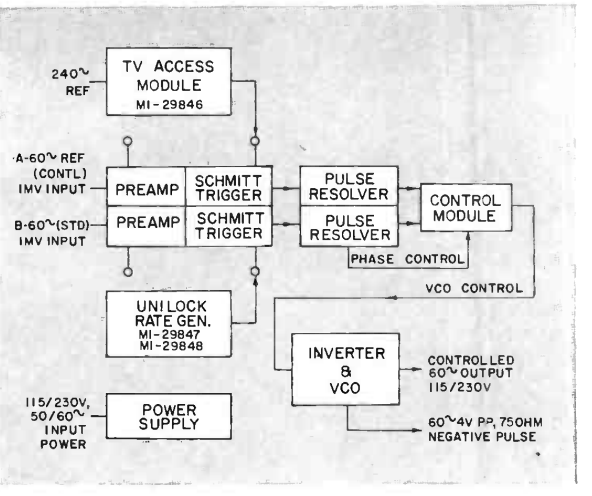




FIG. 6. Unilock system block diagram.

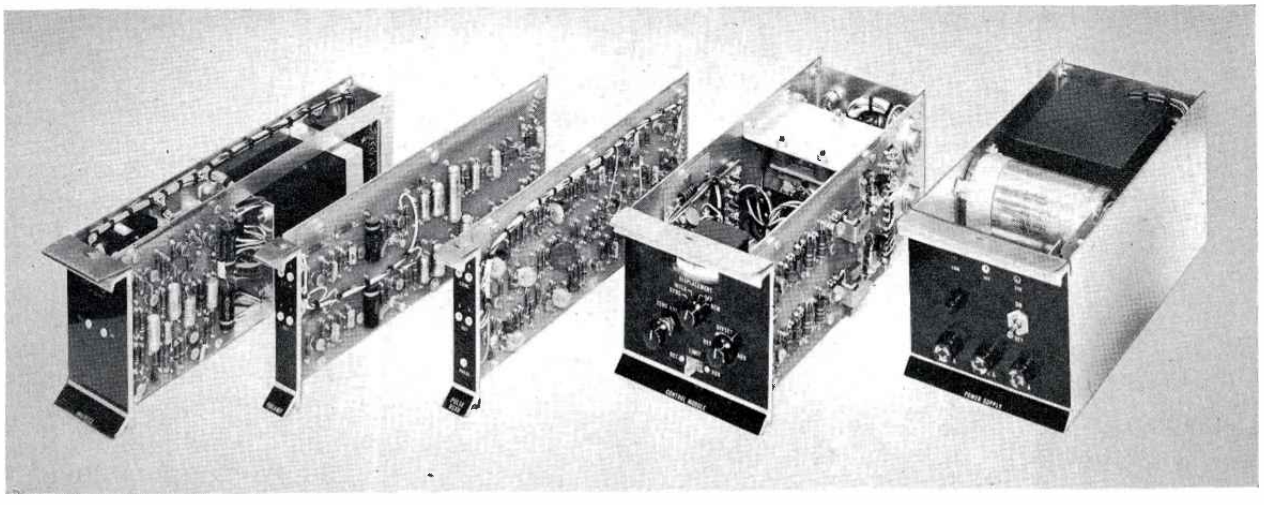


**FIG. 7.** Unilock plug-in modules consist of an inverter, preamplifier, pulse resolver, control module and power supply.

varying the frequency of the motor supply voltage.

Assume a TV film projector is interlocked with an audio tape recorder, and Unilock is controlling the speed of the tape recorder capstan motor. After the initial "lock-up", the system continues to run phase locked—frame-for-frame—as long as there is no external influence. If the audio tape recorder, however, should be held back momentarily or slips—say for a few frames —Unilock circuits will then count out error pulses which will increase the frequency of the capstan motor voltage source. This speeds up the capstan until the tape recorder and film projector are again synchronized and the two equipments once more run phase locked. No frames will have been lost or gained after the correction has been made.

Controls make it possible manually to advance or retard the timing of one machine compared to the other.

### Digital Circuits

The basic circuits of Unilock are shown in the block diagram. A 60-cycle reference signal or pilot tone from each of the units to be interlocked is fed into separate amplifiers and converted to pulses by Schmitt triggers. Computer-like circuitry in Unilock then compares the pulse counts received from the interlocked devices, obtains a signal representing timing differences and makes a correction by controlling the speed of one of the mechanisms. Upon reaching zero, or "no pulse difference," Unilock becomes a phase sensitive device controlling motor speed by phase comparison. Unilock provides a 30-watt, 115 volt 60 cycle ($\pm 12$ cycles) signal to drive the audio capstan motor or to reference the television tape recorder.

### Memory Storage Feature

A non-volatile storage permits Unilock to "remember" non-synchronous conditions to plus or minus 100 frames in terms of a 24 cps frame rate. Thus, two machines can be started as much as four seconds apart and still be synchronized. The memory will store an error indefinitely, or until reset to zero. For example, if the two machines should be stopped, the stored memory will re-accumulate the coasting errors and synchronize the machines when they are started again. Start-stop operation, if limited to only two or three times, does not materially affect accuracy of the memory.

### Completely Transistorized

Unilock employs solid state circuits with all their advantages of reduced size, lower power requirements and greater reliability.

The system consists of these completely transistorized plug-in modules: preamplifier, pulse resolver, control module, inverter and power supply, plus an accessory module that is used with TV tape systems. The frame containing the plug-in modules occupies a space only 19 inches wide by 5¼ inches high. Reference signal rate generators for 16 mm or 35 mm film projectors and sync heads (or "pick-offs") for audio tape recorders are also a part of the Unilock system.

### Simplicity of Installation

Installation is relatively simple and consists of mounting the rate generators or sync heads in the machines to be interlocked, installing the frame containing the plug-in electronic modules in an equipment rack or other convenient location, and making necessary interconnections.

The pick-off for the ¼-inch audio tape recorder is a magnetic head installed in the head assembly. Space is available in

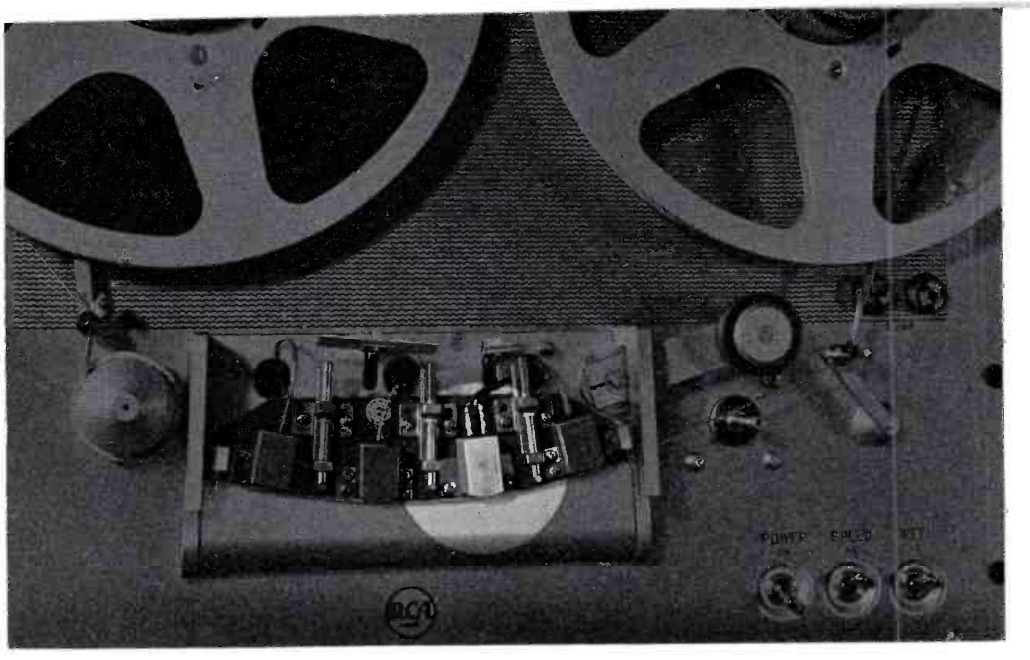
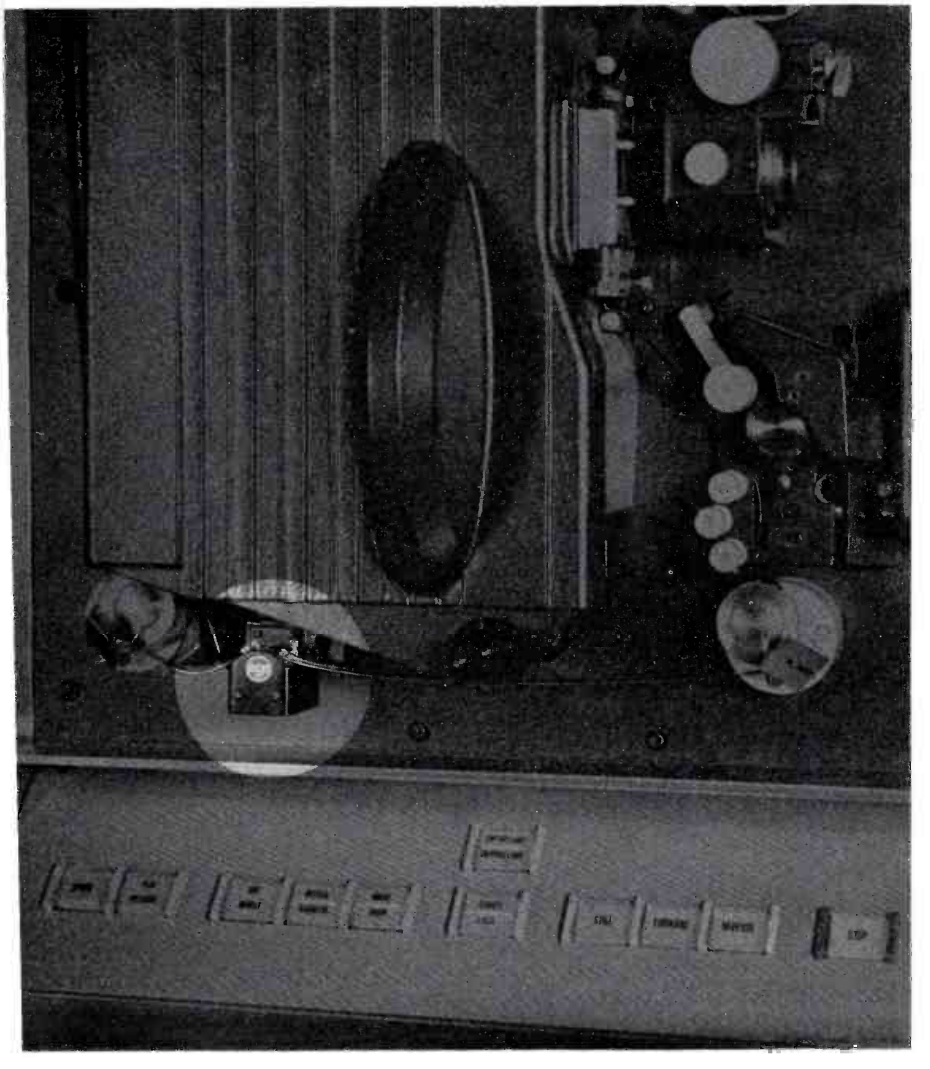


FIG. 8. Sync head ("pick-off") installed on RT-21 audio tape recorder.

FIG. 9. Reference signal rate generator installed on TP-66 film projector.



most recorders for special purpose heads such as this. The rate generator used for sprocketed devices is an electro-optical device operated by the sprocket holes in the film, and can be installed in any convenient point in the film path.

### Universal Operation

Unilock equipment is designed to operate with most RCA audio tape recorders, TV tape recorders, film projectors and film recorders, as well as many of these equipments of other manufacture. Unilock is available for operation on 50 or 60 cycle, 115 or 230-volt power sources.

### Available Accessories

Accessories developed for use with the Unilock system include a TV tape module to convert the 240 cycle control track pulse to a 60 cycle pulse, and optical rate generators for use with 16 mm and 35 mm film equipments. Output of the reference signal generator is 60 cycles at normal 24 frames per second film speed.

### Summary

Development of Unilock makes practical the electronic interlocking of tape and film devices with the same degree of accuracy as sprocketed mechanisms; thus it adds a new degree of ease and efficiency in processing recording assignments in radio, television and film. Unilock will substantially improve the economy of tape, film and sound operations in any studio, and at a modest cost.

# UNIVERSAL COAXIAL TRANSMISSION LINE

## New Features Make Installation Foolproof and Increase Reliability

by B. K. KELLOM, *Product Analyst*
*Antenna Merchandising Department*

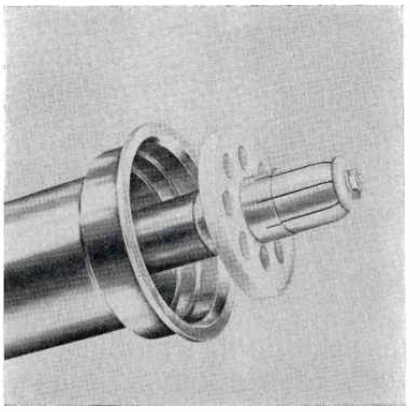


**FIG. 1.** Universal transmission line "female" flange with inner conductor pulled out to show construction. Teflon anchor normally fits against smallest shoulder on inside of flange.

As TV towers grew taller and taller, transmission-line reliability came under close scrutiny. RCA made a study of the limitations inherent in the lines of the day and, as a result, developed *Universal* transmission line during 1957.* This line has proved to be the most versatile and dependable line available for all television and FM applications. Recent improvements have increased its usefulness.

### New Features

The first of these improvements is the introduction of a truly reliable expansion joint in the inner conductor to eliminate the galling that causes failure. The second improvement utilizes heliarc welding instead of silver solder in fastening the flanges to the copper tubing to increase the strength of the bond between the two without annealing the copper.

### For VHF and UHF

The name, *Universal*, springs from the fact that this transmission line is electrically capable of handling both VHF and UHF as compared to the VHF-only characteristics of its predecessor. Although this fact is of no particular consequence to individual broadcasters, (because they operate either VHF or UHF and never both in the same system) it does indicate the degree of perfection the design attains by being completely frequency insensitive.

### Why UNIVERSAL Is Different

At first glance, there is little difference between ordinary and *Universal* line: both are "flanged" lines; both utilize the 20-foot length; both are fabricated of high-conductivity copper tubing; both utilize the 3- and 6-inch diameter and so on.

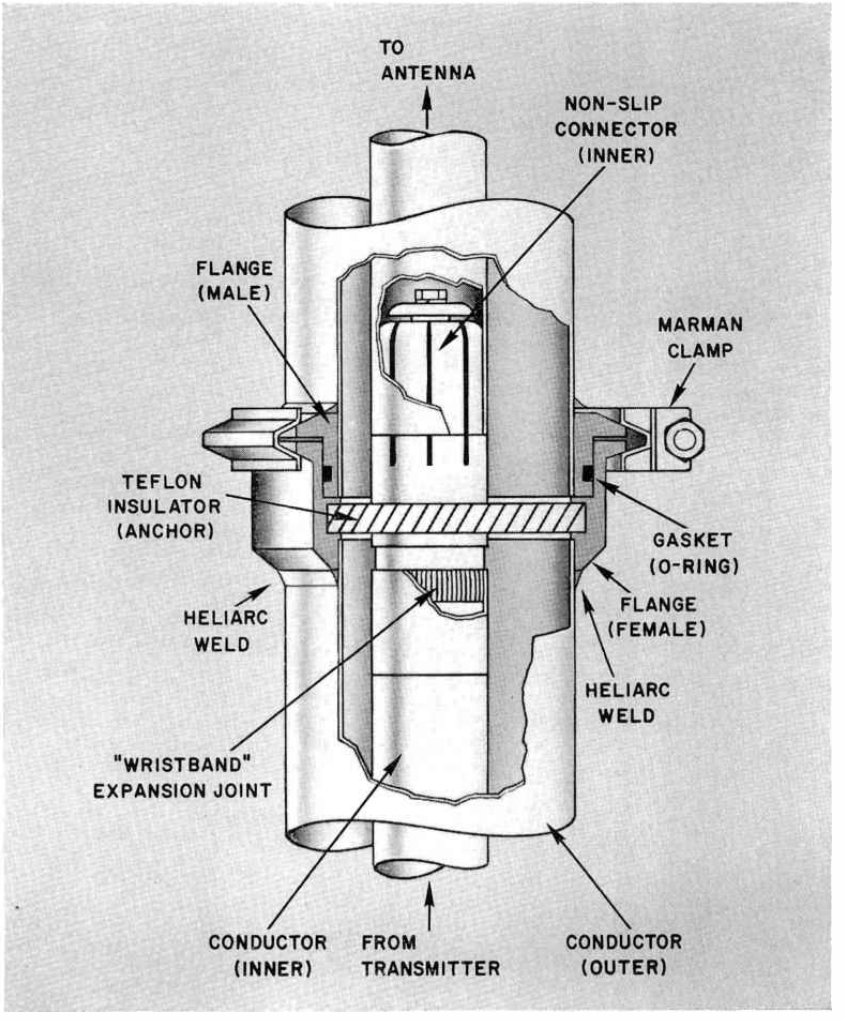



**FIG. 2.** Universal transmission line coupling in cross-section. The "sexed" coupling prevents misalignment during installation and the fully-captive "O-ring" gasket assures a leakproof joint. Heliarc-welded flanges are superior in mechanical strength and electrical conductivity.

* "Universal Co-Axial Transmission Line." W. N. Moule, *Broadcast News*. Vol. 100. April, 1958.

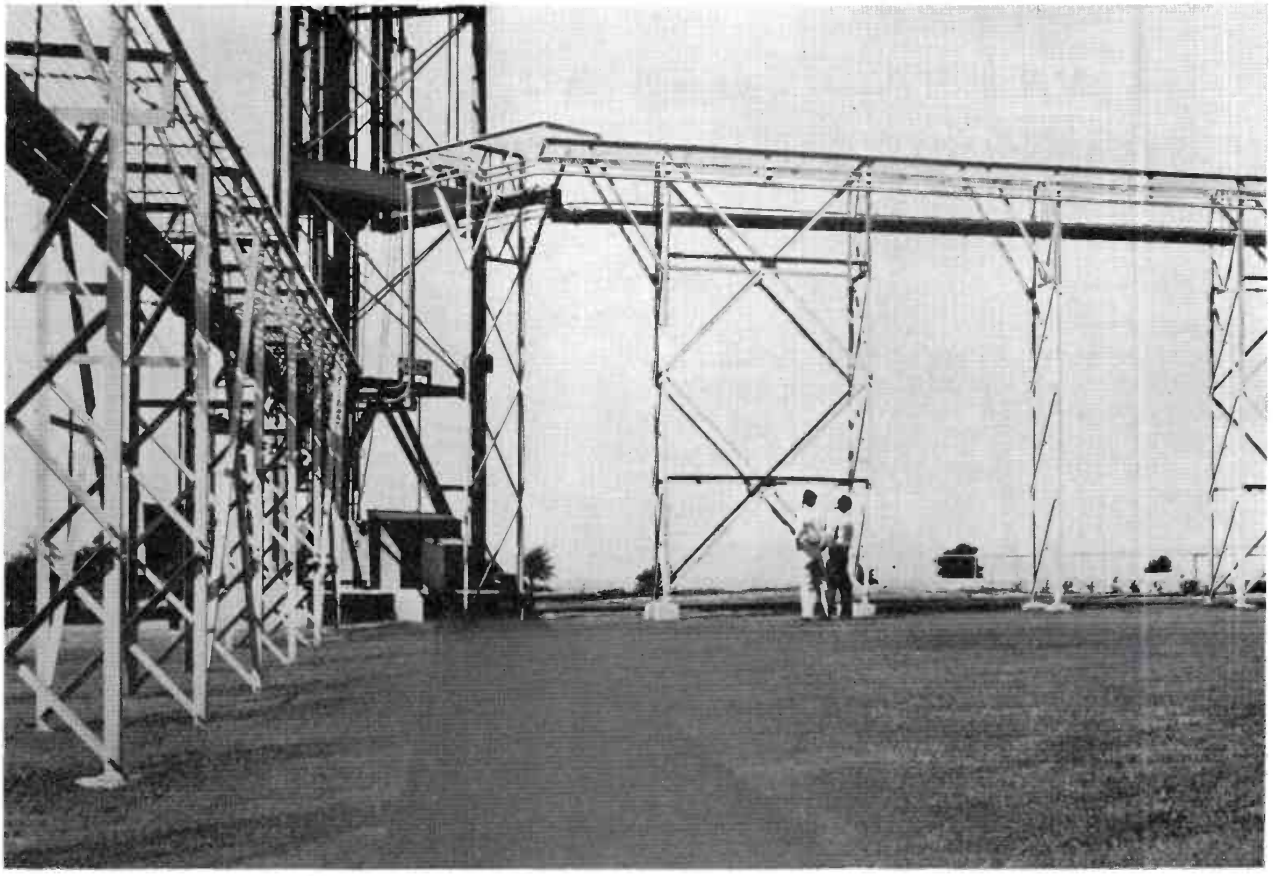
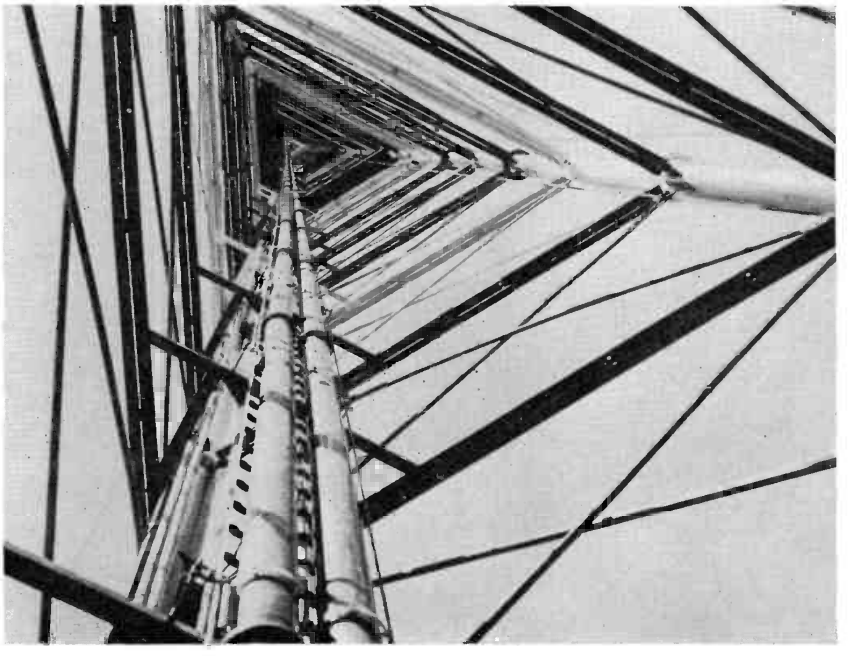


**FIG. 3.** Transmission-line complex at base of two-antenna tower. Note falling-ice shields above each transmission-line run parallel to ground.

**FIG. 4.** Two side-by-side runs of Universal transmission line inside a triangular cross-section tower. Spring-tensioned hangers allow movement of line owing to thermal expansion and contraction.



A deeper look, however, turns up many differences between the two. Some of these differences are of great significance.

### Unique Expansion Joint

Probably the most significant difference is *Universal* line's "wristband" expansion joint in the inner conductor, see Fig. 2. The unique design uses a silver-plated beryllium-copper spring (with an oblong cross-section) that connects the inner surface of the tubing to the outer surface of the connector assembly. Because of the many contact points around the diameter of the wristband, the joint offers excellent conductivity at any point in its travel. This joint operates completely without lubrication—initially or subsequently. This is in contrast to the connectors of ordinary transmission line which may—or may not—be coated with lubricant during assembly. In the lubricated designs, the lube has a tendency to dry out and copper galling is sure to follow.

The impact of the "wristband" expansion joint is made very clear when one realizes that a 1000-foot run of ordinary transmission line has at least 50 possible sources of line failure because of the 50 lubricated joints that, after some years of service, may or may not still be lubricated. *Universal* line cannot run out of lubricant because it uses none to start with.

### "Goof-Proof" Couplings

*Universal* transmission line stands alone in the field of coupling design. These are "sexed" couplings with a fully-captive gasket and a single-bolt clamp.

"Sexed" means that the mating flanges of the line sections are male and female. The design is such that the clamp fits only when the two flanges are fully mated (see Fig. 2). Thus, an inadvertent misalignment, during installation, cannot be missed when the clamp is installed. This, obviously, prevents less-than-satisfactory original installation and the "cropping-up" of a bad coupling at some date after installation.

The single-bolt clamp is of the "Marman" type which completely surrounds the beveled edges of the two flanges as shown in Fig. 2.

The fully-captive gasket—of neoprene plastic—is in the form of an "O" ring and, because of the flange design, results in a perfect seal initially and for the life of the line.

### Teflon Insulation

It is essential that the inner and outer conductors of a co-axial transmission line be precisely concentric. In addition, the insulation between the two must offer high dielectric strength.

These two requirements place a heavy burden on the material used to support the inner conductor because it must offer dimensional stability and superlative dielectric qualities at the same time. There are many materials "eligible" for this duty such as glass, porcelain, steatite and some thermo-setting plastics. Each has some limitation which is hard to overcome, however, one plastic, polyfluorethylene—popularly known as *Teflon*—is a standout because of its low-loss characteristics, its dimensional stability and its inability to absorb moisture. As a matter of fact, Teflon is twice as effective as glass as an insulator —without the fragile quality of glass.

### Welded Flanges

For added strength and electrical conductivity, the flanges of *Universal* transmission line are *heliarc* welded to the hard-drawn copper tubing. Welded flanges are superior to silver-soldered ones in mechanical strength (because the welding does not anneal the hard copper) as well as electrical conductivity.

Heliarc welding, for the curious reader, is electric-arc welding performed in an atmosphere of helium. The helium atmosphere precludes atmospheric oxygen from the meltpoint and thus prevents oxidation in the meltpoint. The result is a permanent, high-quality weld.

### Three Diameters; Two Impedances

*Universal* transmission line is manufactured of high-quality, hard-drawn copper tubing in three "standard" diameters: 3⅛; 6⅛ and 9 3/16 inches (OD). The smaller of the three offers a characteristic impedance of 50 ohms; the two larger sizes, 75 ohms.

As a general rule, the larger diameters are used in long-length (tall-tower) installations. However, the 9-inch line may not be used at frequencies above those of Ch. 40 (626-632 mc).

This limitation is the result of—to use an engineer's term—"moding". At the higher frequencies, the spacing between the inner and outer conductors becomes greater than the wavelength of the energy and the line becomes a "short circuit." The alternatives, then, are to use either the 6⅛-inch line or a waveguide-type of transmission line for long-run installations which operate at channels higher than Ch. 40.

### Six-Inch Line

Six and one-eighth-inch line combines power-handling capabliity with very low signal attenuation (the converse of efficiency) in a 75-ohm characteristic impedance. In essence, the 6⅛-inch line is an excellent combination of impedance, efficiency and economy for the high-power station regardless of operating frequency, UHF or VHF.

### Three-Inch Line

The 3⅛-inch line is the lightest weight of the three and also the least expensive. However, the small diameter limits its cross-section and the small cross-section limits its power-handling capability which, in turn, reduces its utility for high-power, high-channel-UHF operations. Mountaintop, "stub"-tower stations can use the 3-inch line to good advantage when the lower relative efficiency is of little consequence.

### Nine-Inch Line

The 9-inch line is, by far, the most efficient transmission line for stations operating at frequencies up to those of Ch. 40. To illustrate, compare the power-transmission efficiencies of 1000 feet of 6-inch line with the efficiency of the same length of 9-inch line at a frequency of, say, Ch. 35 (efficiency of both sizes increases slightly at lower frequencies). The 6-inch line delivers 75 per cent of its input power to the "far" end; 9-inch line delivers 84 per cent to the "far" end. In terms of kilowatts, this means that only 37.5 kw of a 50-kw transmitter power reaches the antenna input when the 6-inch line is used while the 9-inch line delivers 43 of the 50 kw to the antenna under the same circumstances. In a system using an antenna with a power gain of 30, this difference in efficiency amounts to some 165,000 watts (5.5 × 30) of effective radiated power (ERP). The difference is even greater with an antenna of a higher power-gain.

This power "loss" can be also expressed in terms of transmitter operating costs. To illustrate, assume that for every kilowatt of transmitter power, three kilowatts of utility (commercial) power is consumed. In the comparison above, there was a 12.5-kw loss in transmitter power with the 6-inch line and a 7-kw loss with the 9-inch line. The difference amounts to 5.5 kw. This, multiplied by the factor of three, adds up to 16.5 kwh of commercial power "wasted" for every hour of transmitter operation. At 2¢ per kwh, this is 33¢ per hour; in a 7000-hour broadcast "year," this waste amounts to $2310.00 per year and $23,100.00 in ten years of operation. This is only in terms of the cost of utility power: the costs involved in replacement tubes and other transmitter maintenance are in addition to this expense.

Naturally, the 9-inch line costs more initially but, over the usual write-off period of 10 years, the extra investment returns in increased coverage and lower transmitter operating costs.

### Proved In Use

In summary, *Universal* transmission line offers unparalleled reliability as a direct result of the unique "wristband" expansion joint (that needs no lubrication); the "goof-proof" flange design; the captive "O-ring" gasket; the one-bolt, Marman-type clamp; the heliarc-welded flanges and the "transparent" inner-conductor insulators.

As of this date, more than 175,000 lineal feet of *Universal* transmission line (at 95 stations) has been installed in broadcast systems and not one electrical failure has occurred.

# 100% SOLID-STATE MOBILE RADIO

by NORMAN C. COLBY, *Manager*
*Communications Products Engineering*

## New RCA Super-Fleetfone Features Continuous Duty Operation and Lowest Battery Drain for On-the-Air, On-the-Spot Broadcasting

With RCA's recent introduction of the Super-Fleetfone, the first 100 per cent solid-state mobile radio with a continuous duty transmit rating, broadcasters are provided with an extremely reliable radio for use in originating remote newscasts and other "on-air" voice transmissions. The new Super-Fleetfone mobile radio is available in the 150 megacycle band with 30 watts of transmitter output across the entire band, and in the 450 megacycle band with 15 watts of transmitter power. Many other features of special significance to the broadcaster include instant transmission, low battery drain, modular construction of case, circuits and components, and low servicing frequency.

It should be noted that while the voice quality of the Super-Fleetfone is greatly improved over previous mobile designs, the audio bandwidth is limited to the range between 300 and 3000 cps. This should be acceptable to most broadcasters for on-the-spot news reports.

In addition to using the Super-Fleetfone as a remote broadcasting station, the unit provides the broadcaster with a superior mobile 2-way radio for conventional dispatching, coordination and control of mobile crews and facilities.

### Rated for Continuous Duty

While the need for long transmissions is not of prime importance in regular land mobile radio operations, it does provide the user with added insurance that the radio cannot be damaged by prolonged transmissions. Continuous duty operation is, of course, a prime requisite for broadcasters in order that important remote news flashes can be originated on-the-spot for long periods of time. Heavy transmit usage of the Super-Fleetfone will not degrade performance or result in deterioration of components. As an extra measure of protection, a built-in thermal sensor in the transmitter guards against excessive heat build-up caused by external conditions such as vehicle exposure to scorching sun. Even if the trunk temperature exceeds 140 degrees, the transmitter will continue to operate at reduced power to compensate for the critical temperature rise.

### Peak Reliability

The Super-Fleetfone is completely solid state. There are no tubes, relays or mechanical moving parts with the single exception of an antenna relay in the 450 megacycle model. Even this single relay is replaced in the 150 megacycle model with a self-powered solid-state switch.

### Lowest Battery Drain

Because of the extended transmissions required in the broadcasting service, it is essential that power consumption be kept to an absolute minimum. The Super-Fleetfone draws the lowest drain in both transmit and receive operation of any comparable mobile radio unit available today. In full transmit operation, the drain is only 10 amps. at 13.6 volts for both the 150 and 450 megacycle models. Both receiver models draw only 0.2 amps. at 13.8 volts. Battery drain is so low, in fact, that no indicator "on" light is used on the unit because the inclusion of a pilot light would actually double the battery drain in the transmit/ready condition!

### Instant Transmission

This feature is particularly desirable for broadcasters since it eliminates "dead

**FIG. 1.** Complete solid-state Super-Fleetfone "in car" installation includes compact transmitter/power supply/receiver unit, combination control unit and frequency selector, microphone and speaker.

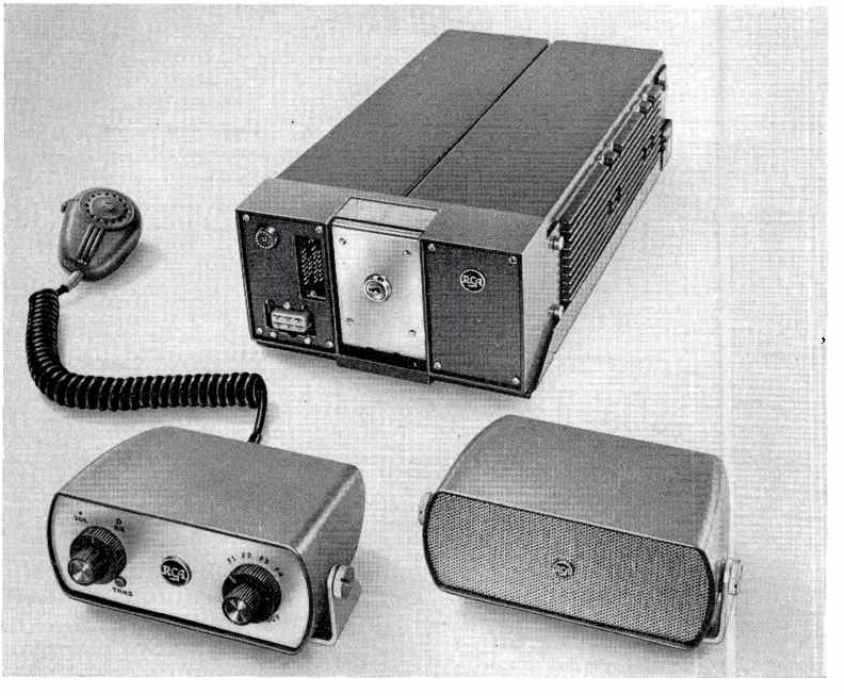


FIG. 2. Under dash installation of Super-Fleetfone operating controls shows alternate single control unit for one frequency operation. The Super-Fleetfone can transmit continuously at low battery drain. And, there's no warm-up waiting. It's ready to talk whenever you are.

FIG. 3. Show-off Gloria Kirby displays new solid-state radio unit. Note clean, simplified circuitry design of Super-Fleetfone. Cylindrical component at bottom of transmitter chassis is self-powered solid-state antenna switch.

FIG. 4. Gloria holds two of the tiny RCA "overlay" transistors that give the Super-Fleetfone higher power at higher frequencies. Overlay technique reduces number of transistors required, simplifies circuitry for peak performance and reliability.

air" that could occur when switching from studio to mobile origination. The Super-Fleetfone is ready to go "on-air" whenever desired. There is no warm-up delay! The unit is ready to transmit as soon as the microphone button is pushed.

### Simplified Circuitry

Extensive use of RCA "overlay" transistors in the Super-Fleetfone bring higher power to high-frequency equipment. With the overlay design, fewer transistors are required, complex protective circuitry is unnecessary, circuits are greatly simplified, and equipment reliability reaches a new peak.

### Lowest Servicing Frequency

Because of the inherent reliability in solid-state design, the need for equipment servicing is greatly reduced. When necessary, routine inspections of the equipment are facilitated by built-in metering circuits; also circuits which permit measurement of RF output power. Only simple test instruments are required. The rugged, compact case, housing the power supply, transmitter and receiver, is built "to take it" under the most grueling conditions. It is the same type of equipment widely used in construction rigs, police cars and ready-mix concrete trucks, so it has to be able to stand-up under the worst possible conditions and still keep operating efficiently.

### Operating Convenience

An integrated control head incorporating "off-on" switch, volume and squelch controls, and multiple frequency selector switch is packaged in an attractive housing, easily installed under the vehicle dash. A companion speaker and microphone completes the operating controls. As an alternate choice, separate control heads for "off-on" and frequency selection can be provided in place of the integrated control head. This latter assembly has color-coded cabling for simple plug-in to a junction strip connected by cable to the transmitter/receiver.

**SPECIFICATIONS† FOR THE RCA SUPER-FLEETFONE**

| | | |
|---|---|---|
| Power Source | 12 volts | DC battery positive or negative polarity |
| Dimensions | Height, 4⅞"; Width, 9¼"; Length 16½" | |
| Weight | 32 lbs. | |
| Temperature Range | −30 to +60 C | |
| **Transmitter** | **150 MC** | **450 MC** |
| Power Output | 30 watts minimum | 15 watts minimum |
| Battery Drain | 10 amps at 13.6 volts | 10 amps at 13.6 volts |
| Frequency Range | 148-174 mc | 450-470 mc |
| Frequency Stability | ±0.0005% | ±0.0005% |
| Frequencies Possible | 4, max. spread 2 mc | 4, max. spread 3 mc |
| Modulation | ±5 kc for 100%* | ±15 kc for 100% |
| Duty Cycle | Continuous (EIA) | Continuous (EIA) |
| FCC Type Acceptance | CT2-30J | CT3-15C |
| *Wide Band (±15 kc deviation) available on order. | | |
| **Receiver** | | |
| Sensitivity (20 db quieting) | 0.45 microvolts | 0.5 microvolts |
| (EIA Sinad) | 0.35 microvolts | 0.4 microvolts |
| Squelch Sensitivity (Threshold) | 0.15 microvolts | 0.25 microvolts |
| Selectivity (20 db quieting) | 100 db at ±15 kc | 100 db at ±35 kc |
| (EIA Sinad) | 80 db at ±30 kc | 80 db at ±50 kc |
| Spurious Response | −100 db minimum | −100 db minimum |
| Frequency Stability | ±0.0005% | ±0.0005% |
| Frequencies Possible | 4, max. spread 600 kc | 4, max. spread 2 mc |
| Audio Output | 5 watts | 5 watts |
| Battery Drain | 0.2 amps at 13.8 volts | 0.2 amps at 13.8 volts |
| Duty Cycle | Continuous (EIA) | Continuous (EIA) |
| †Specifications subject to change without notice. | | |

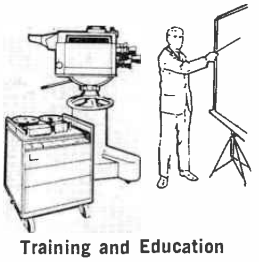
# NEW MOBILE TV TAPE RECORDER

## Produces Standard Quadruplex Tapes
## Has Monochrome Playback Facility
## and Provides a Low-Cost Color System

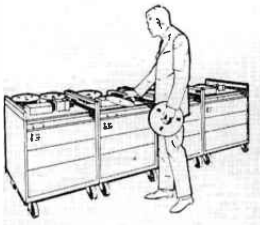
FIG. 1. TR-5 Mobile TV Tape Recorder.

## VARIETY OF APPLICATIONS

Mobile Recording



Training and Education



Tape Duplication

Client Presentations

Now, for the first time, the broadcaster has a mobile TV tape recorder that is truly operational in the field as well as studio, while maintaining all the technical excellence of the larger fixed station TV tape recorders. The TR-5 is an economical recorder that produces high quality quadruplex tapes (at only a small fractional cost over non-compatible systems) and meets the exacting requirements of color. By itself, the TR-5 may be used for recording color tapes. Mated with the TR-3 Color Tape Player it provides a complete color tape system.

### Complete Mobility

Since it is easily moved from place to place, the TR-5 opens up possibilities for fast taping and screening of on-the-spot commercials and programs. It's small size —less than 2 by 3 feet and 3 feet high— makes it easily transported in vans or planes. The TR-5 is one more important addition to a complete line of RCA "new look" TV tape machines designed to meet the specific needs of the broadcaster in the fast pace of today's requirements.

### Monochrome Playback Facility

Although designed primarily for use as a recorder, the TR-5 will also provide high quality playback for checking, editing, client presentations, and other closed circuit applications. It can be used for "on-air" playback through the addition of an external signal processor. It then becomes a complete record and playback machine for monochrome.

### Economy Color System

The basic TR-5 without any modification includes the facility for recording color in its original high fidelity, and producing quadruplex tapes that can be aired or played back on any compatible player such as the 22HL, TR-4 and TR-3 machines. When used for color recordings in the field, the TR-5 is usually first checked out using the studio color system as a reference. While the TR-5 is not designed to play color, it can be mated with the TR-3 player that has been equipped with the color ATC accessory. This, then, provides a low cost color record/play TV tape combination, a package that provides flexibility and mobility.

### Broadcast Quality

The recording quality of a tape machine is of primary importance whether it is being used in the studio or in the field. The mobile TV tape recorder is of value to the user only if it records standard high quality tapes that are in no way inferior to those he is accustomed to getting from large studio recorders. In the past, studio recorders have been made mobile by broadcasters (sometimes at great expense and difficulty) in order to get highest quality pictures. With the advent of the TR-5, this is no longer necessary. It is designed to produce tapes of studio quality, and at the same time incorporates the important characteristics of an efficient mobile facility that can be easily transported and set up for all taping applications. It is the smallest mobile tape recorder made that will produce standard broadcast quality tapes— both monochrome and color.

### Switchable Speeds and Standards

The TR-5 incorporates built in two-speed operation which is switchable, and switchable world-wide TV line standards

### FEATURES OF TR-5

- Built in two-speed operation, switchable standards
- Fully transistorized, standard modules
- Compact . . . easily transportable
- Built in Switchlock
- High quality quadruplex recordings . . . color and monochrome
- Monochrome playback for viewing of tapes
- Economical color recorder

### APPLICATIONS FOR TR-5

- For broadcast and closed circuit use in studio or for remotes
- For taping and immediate viewing of on-location commercials . . . indoor or outdoor.
- For program taping and editing . . . in the studio or in the field.
- For high quality duplication of tape masters.
- For recording color as well as black and white subjects.

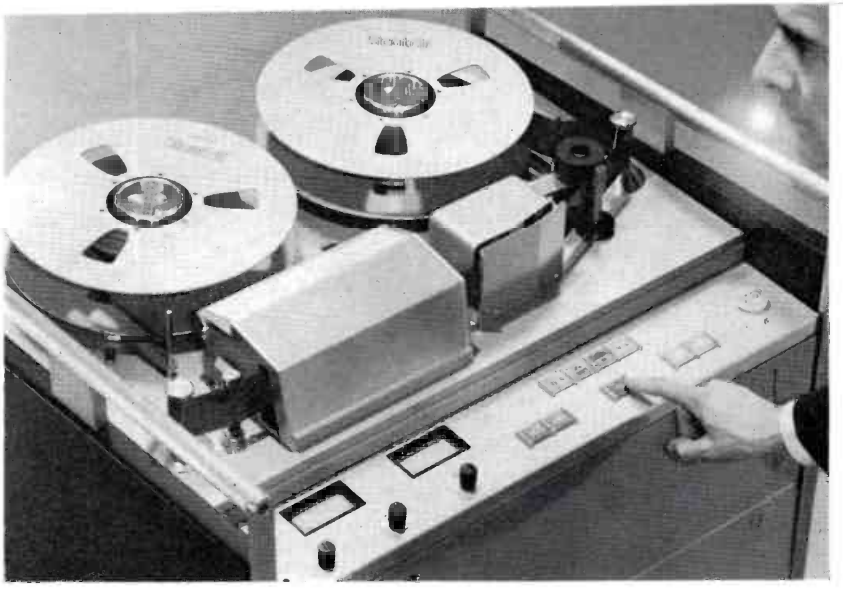
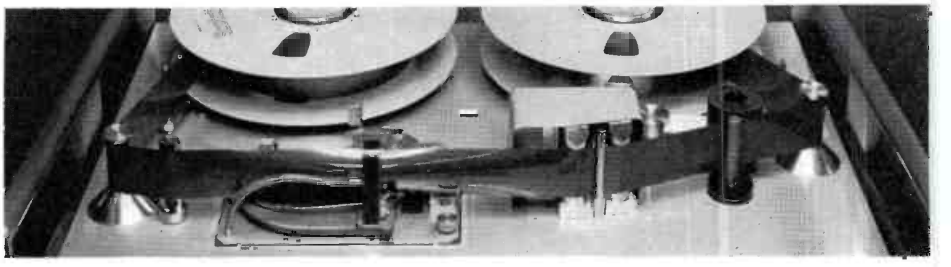


**FIG. 3.** Low contour horizontal tape deck and control panel provide convenient, waist high operations center.

**FIG. 4.** TR-5 incorporates quadruplex headwheel (cover removed) and air flotation turnaround posts for the tape bearing surface.



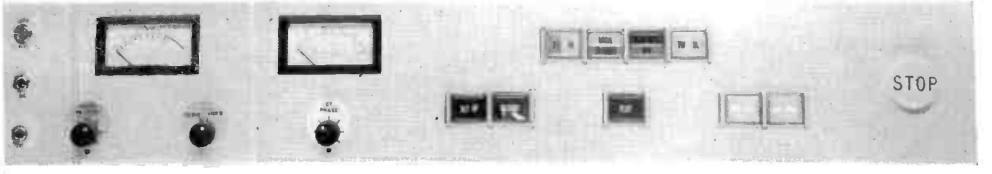



**FIG. 5.** Centralized controls simplify operation. Lighted pushbuttons indicate operating modes. Inhibit circuits reduce operator errors.

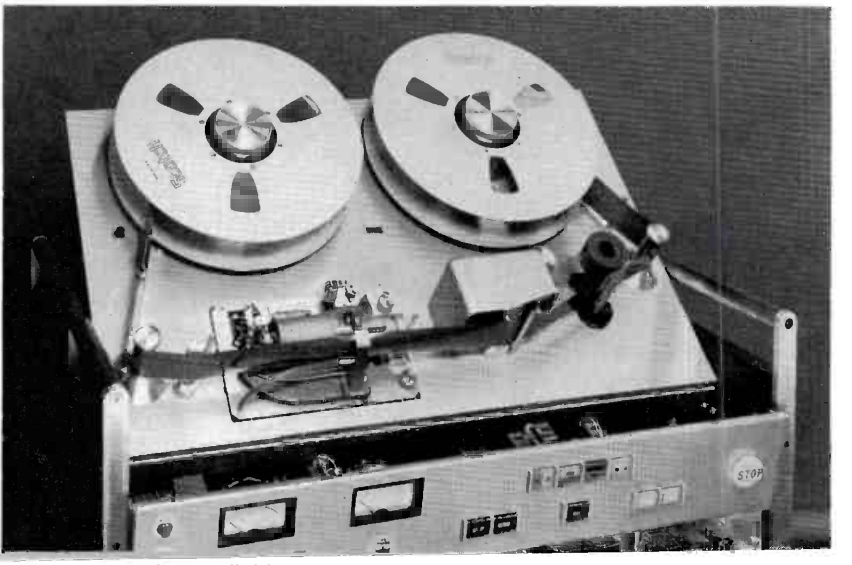


**FIG. 6.** Tilting of pivoted tape transport panel and control panel gives complete access to underside components.

for universal tape operation. Choice of tape speeds is 7½ or 15 ips. Selectable standards are 405 line, 525 line and 625 line. Conversion to 230 volt, 50 cycle operation for international applications is readily accomplished by changing internal power connections.

### On-Location Commercials

So compact and easily transported is the TR-5 that conceivably it might be set up for taping at the client's place of business . . . in his store, his plant or showrooms. Or, the taping may be done outdoors . . . at the ball game, or at picnics and parades. The TR-5 can be an integral part of a TV mobile pickup unit. For checking purposes it provides for immediate on-the-spot playback viewing of the recording.

### In-Studio Taping

Complete mobility makes it practical to roll the TR-5 between studios and control rooms or to virtually any location in the TV plant . . . perhaps to the station cafeteria for taping a dairy commercial . . . to an audition room . . . or to studios for pre-taping program rehearsals. It can be used to relieve other recorders in special taping and editing sessions. Being an excellent aid in handling peak production loads. As a player it serves for checking and screening, and for special client presentations.

### Tape Duplicating

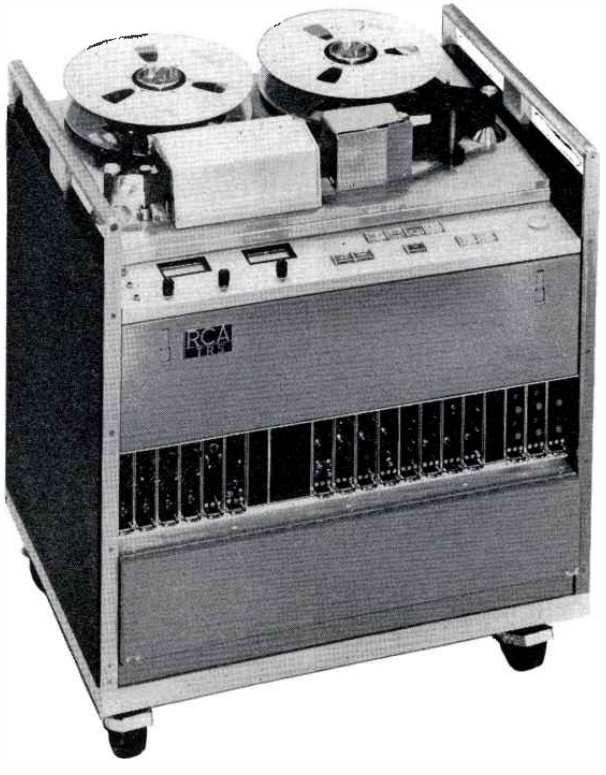
Because of small size, it is practical to set up a tape duplicating center using TR-5 recorders. Several of the machines would occupy only a small space in the plant—or in a mobile unit. Such a tape center can mean an inexpensive method of recording two or more tape masters simultaneously, and all with the same high fidelity.

### Advantages of Quadruplex

Among the methods of TV tape recording, only quadruplex, largely because of its superior quality and stage of perfection, has had universal acceptance, and thus has become a standard or "compatible" technique. Libraries of pre-recorded material made available by broadcast stations and educational organizations are primarily for use on quadruplex machines.

Quadruplex came into being as a practical method of handling the tremendous

FIG. 7. Front panel removed to show transistorized plug-in circuit modules.



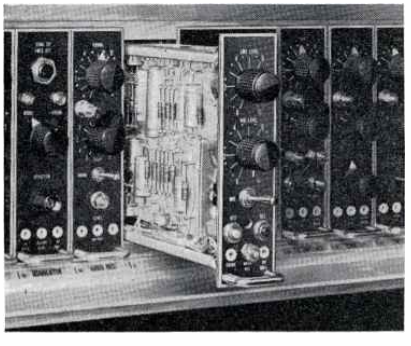


FIG. 8. Cue record/playback accessory provides a means for recording voice, tone or digital cue information along one edge of the tape.

FIG. 9. Electronic splicing and editing accessory provides means for adding or inserting program segments.

tape speed required for wide-band response and good picture quality. For example, to get 4-mc response, a head-to-tape speed of at least 1500 inches per second must be achieved. To gain this speed with linear movement of the tape with respect to head, it is necessary to pull tape at nearly 85 mph. Instead, the quadruplex technique moves the tape linearly at 15 ips and employs a wheel with four video heads mounted 90 degrees apart and spinning at about 14,000 rpm to write consecutively across the width of the video tape.

Quadruplex achieves better than 4-mc response to produce standard, high-quality broadcast tapes. Another significant advantage results in reduced tape costs, by providing a headwheel that writes at half the normal track size. Thus, without changing head-to-tape speed, tape consumption is reduced by a factor of 50 per cent. Many broadcasters now use 7½ ips for recording, and retain the advantage of playback of previously recorded tapes at 15 ips.

### Agency Applications

The TR-5 is an inexpensive recorder for advertising agency use in preparing pilot commercials, for research in production techniques, and for playback of programs and commercials. Because the TR-5 performs with the same professional quality of more costly studio recorders, the playback performance satisfies the most critical client requirements.

### Military and Educational Uses

The TR-5 provides a compact and economical record/playback unit that can serve either as the primary TV tape equipment or as an adjunct to present facilities in military and educational TV systems. It's ideal for quickly rolling from one room to another, or for use in the field taping demonstrations and other events. Playback can be immediate in the field or on classroom monitors and closed circuit TV systems. Picture quality is comparable to that of larger quadruplex recorders, and tapes are produced to SMPTE standards.

### Matches RCA "New Look" Group of Recorders

Though it occupies only half the space of other members of the RCA family of tape recorders, the TR-5 has all the essential "new look" components and features of the larger recorders. The TR-5 is completely transistorized and modularized, a necessity for any tape unit today. Some of the standard modules used are identical to those on larger RCA recorders, contributing to reduced parts costs, uniform operation and ease of servicing.

The machine is 33 inches wide, 37 inches high—including the large five-inch diameter casters—and 24 inches deep, permitting it to roll through standard doorways. It is completely self-contained, housing all pumps, blowers and power supplies.

### Advanced Control Features

The control panel of the TR-5 comprises a unique switching, metering and signaling system that takes all the guesswork out of TV tape operations. Five lighted pushbuttons at the top of the panel control tape speed, local or remote operation, fast forward, fast reverse, and tonewheel or switchlock timing mode. Switchlock is a precise timing circuit that prevents rollover.

On the same control panel, the VU meter doubles as an audio and video level indicator. Another dual purpose meter continuously reads record current of the four video heads and also serves in setting carrier frequency in the modulator.

### Easy to Operate

The TR-5 is easily operated by personnel without special skills or extensive training. Standard 12½-inch reels provide a full hour or recording at 15 ips or two full hours at 7½ ips. The low-contour horizontal tape transport has all the conveniences and fine performance qualities of the TR-3 and TR-4 machines to aid threading and operation. All mode switches are lighted pushbuttons giving the operator instant indication of operating conditions. All necessary inhibit logic is included to prevent activation of operating modes in an incorrect sequence.

### Built-In Switchlock

The TR-5 incorporates switchlock as a standard servo feature. This precise timing mechanism allows the operator the advantage of virtually roll-free switches from tape signals to other TV sources or vice versa.

### Ease of Servicing

Design of the TR-5 emphasizes accessibility of parts throughout. Both the control panel and the tape transport assemblies are pivoted, giving access to all components on the undersides. Transistorized plug-in modules are easily checked while operating in the equipment, or quickly removed for repair or spare replacement. A module can be changed as fast as it can be pulled out and replaced with another. Semiconductor circuits last longer and require less attention.

### Accessories

Accessories available for the TR-5 include an audio cue channel, electronic splicer and remote control panel. The cue and splicer accessories are both in the form of transistorized modules which can be plugged into the TR-5 module frame after appropriate modification. The cue record/playback accessory provides a means for recording voice, tone or digital information along one edge of the video tape. Cue recording is independent of video recording; sound may be dubbed in during playback while previewing a video signal or simultaneous with video recording. The electronic splicer accessory permits program segments to be added to a pre-recorded segment or inserted within it. Operation of this electronic accessory is at either of the two tape speeds, or at any of the three TV line standards. The control panel permits remote control of modes such as stop, fast-forward wind, reverse wind, record and play.

An additional accessory, the air-bearing conversion kit, permits use of a video head that further improves stability of recording and playback.

### Conclusion

The TR-5 is the truly mobile quadruplex TV tape recorder for monochrome and color. It represents a significant size reduction with unprecedented ease of handling. It produces the same excellent quadruplex tapes as the highest priced recorders. It incorporates such advances as switchable line standards and tape speeds, and operates on 50 or 60 cycle power. When mated with the TR-3 color player it provides a flexible color tape system. The TR-5 will be a welcome addition to any broadcast or closed circuit facility that has need for a low cost transportable recorder.

FIG. 10. Remote control panel permits remote operation of recorder/player.

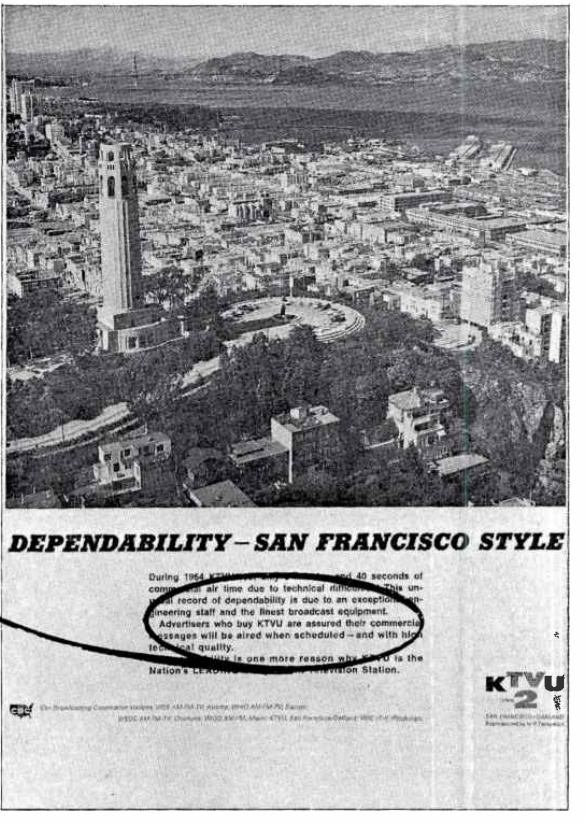
# ECONOMY COLOR PACKAGE

FIG. 11. Combining TR-5 with TR-3 player provides most flexible color record/playback system available.


TR-3 Color Tape Player


TR-5 Color Tape Recorder

**During 1964 KTVU lost only 5 minutes and 40 seconds of commercial air time due to technical difficulties. This unusual record of dependability is due to an exceptional engineering staff and the finest broadcast equipment.**




*(Continued from Page 5)*

**CAN YOU TOP THIS** record? KTVU, San Francisco, in its last-month's ad (see above) says it lost only 5 minutes and 40 seconds of commercial air time in 1964. Gives credit to "exceptional engineering staff and the finest broadcast equipment." Won't come as any surprise to you that KTVU's transmitter is an RCA TT-25CL. Other Cox stations, viz WSB-TV, Atlanta; WSOC-TV, Charlotte, N. C.; WHIO-TV, Dayton Ohio; and WIIC, Pittsburgh, also have RCA transmitters.

## *As We Were Saying*

**AS CHIVAS REGAL SAYS**—"one of us has to be kidding." Maybe we shouldn't even point it out—but they keep putting it in, and there is always a danger that someone will believe it. We mean that paragraph that says:

> *This is the kind of customer acceptance that will put more than 100 - -4-V's on the air by autumn. No other manufacturer can even approach this record of field-proven performance and market approval. For details on broadcasting's most-accepted 4-V color film camera . . .*

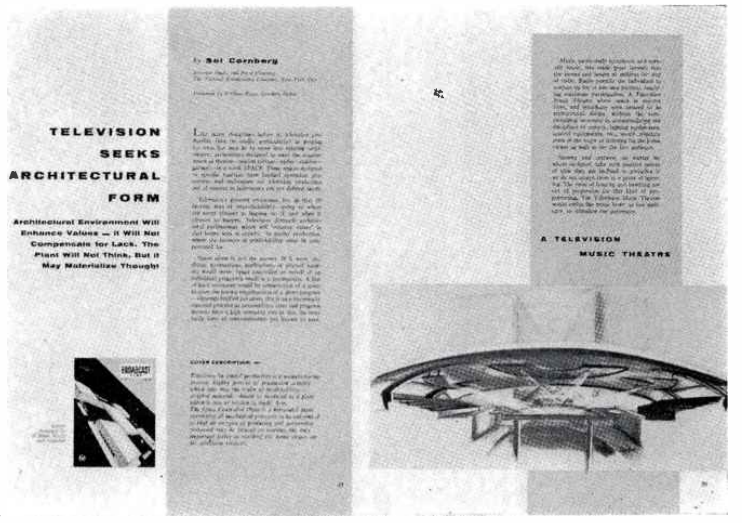
Maybe someone should tell them that we are now shipping our TK-27 4-V Color Film Cameras at the rate of one a day. And long before the September equinox (which Webster says is "autumn") we will have passed the 100 mark (sic). By the end of December it should be 200, and by next NAB close to 300. "broadcasting's most accepted?"—you name it.

The TK-27—as we've pointed out before—has been three years in development and design. We wanted a camera that would incorporate all of our new look ideas—and that would be preeminent for a long time to come. It took longer—but now we have it, and we're rolling. We do regret that some of our customers couldn't wait.

**IF YOU CLAIMED** the most respected letters in broadcasting (WGN's theme), you would make sure—as WGN has done—that most of your equipment bore the most respected letters in equipment.

**IF YOU HAD** the quality touch (WFAA's theme song), you would order six RCA TK-42 Color Cameras—as WFAA did (see Page 8)—after "looking at them all" at NAB. With associated gear—including an RCA TT-25DL Transmitter—it adds up to more than half of the $1.3 million WFAA has announced it is spending for new color equipment. Nice to have you back, fellows!

**IF YOU LIVED** in San Francisco (KRON-TV's theme), you would order over $1 million of new RCA equipment as KRON-TV did. Total is a record for a single order from a single station. Means KRON-TV will have an all-new studio facility—all "New Look" from entrance to exit. Harold See,




Pages from
Broadcast News No. 95
June, 1957

*As We Were Saying*

station manager; J. L. Berryhill, station chief engineer; and staff did exceedingly thorough job of studying and planning—before ordering. Worked with RCA engineers for over a year before making decision which indicates confidence in ability of RCA to do the whole job.

**SOME THINGS TAKE LONGER** comments Sol Cornberg in a note calling our attention to the fact that the Metropolitan Opera is doing "opera in concert form" at Lewisohn Stadium this summer. Some readers may remember that way back in 1957, Sol advocated this in an article entitled "Television Seeks Architectural Form" (BROADCAST NEWS No. 95, June 1957).

Sol, who designed the original "Home" and "Today" studios for NBC, is known for his advanced ideas, "out-in-the-blue" some people have said of them. But as time goes on, more and more of them materialize. And we're sort of proud that we recognized them when—and occasionally gave them space in BROADCAST NEWS. Most of his early ideas involved rather elaborate production facilities (on the theory that they would save "in studio" time). But when it came to the design of a "Television Music Theatre" (see above), he went all the way in the other direction. That he could do so is perhaps the best test of the functionality of his thinking. What he said on the page above bears repeating:

> "Music, particularly symphonic and operatic music, has made great inroads into the homes and hearts of millions by way of radio. Radio permits the individual to conjure up his or her own pictures, implying maximum participation. A **Television Music Theatre** where opera in concert form, and symphony were catered to in architectural design, without the compromising necessary in accommodating the disciplines of scenery, lighting equipments, control equipments, etc., would reinstate some of the magic of listening for the home viewer as well as for the live audience.
>
> "Scenery and costume, no matter by whom designed, take such positive points of view they are inclined to prejudice if we do not accept them to a point of ignoring. The costs of housing and handling are out of proportion for this kind of programming. The Television Music Theatre would entice the music lover, as live audience, to stimulate the performer."

**MAYBE** what Sol feels about "the magic of listening" has a wider implication. Maybe television has been overvisualizing. Maybe it would be better to sometimes let the individual "conjure up his own pictures." Most people who read a book, and then see a movie based on it, are disappointed. Hollywood's most stupendous scenes fall far short of their own mental images. What Hollywood Indian could inspire the mortal terror of Uncas the first time you read "The Last of the Mohicans?" And those pathetic knights of the round table—jousting with cardboard shields in a dusty cornfield—how do they compare with your youthful imaginings? For that matter when did reality ever compare with dreaming?

Where does this chain of thought lead? To axing the kinescope—Lancaster should hope not. To occasionally capping the camera lens—probably not. But to less diagramming, less animation, less split-screening, less zooming, less flashbacks, less fancy backgrounds—let's hope so. Remember, children, the magic is in letting the listener (viewer) imagine, conjure, envision, dream.

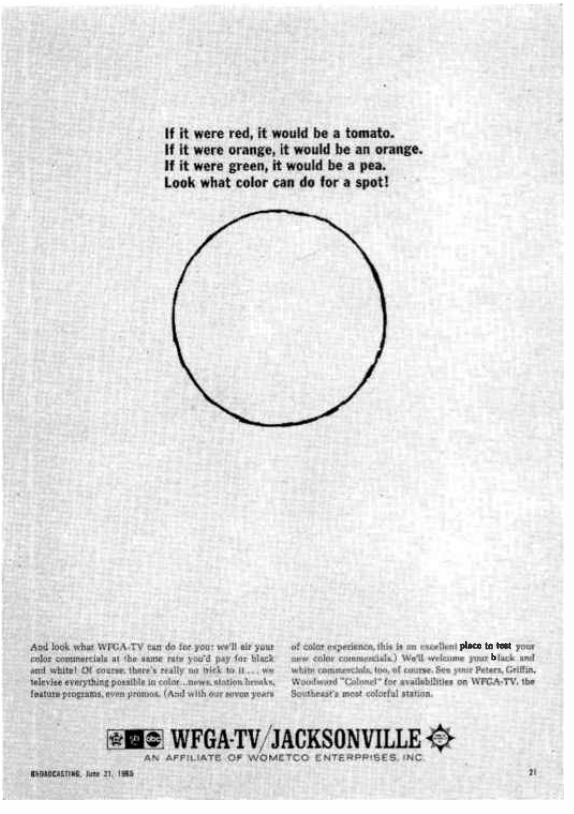
**QUOTES OF THE MONTH**

". . . Color is undoubtedly the sponsor's wave of the future."

—from SATURDAY REVIEW

"Ever Try to Sell a Gray Orange?"

—from a Collins, Miller & Hutchings advertisement





## *As We Were Saying*

"Walt Disney didn't invent the Wonderful World of Color; nature did."

—Hy Safran in ADVERTISING & SALES PROMOTION

"To the Chinese this is the year of the snake. To the Television Industry it is the year of the peacock."

—Gene Smith in the NEW YORK TIMES

"There is no true color memory. In the absence of a sample or proof, you cannot accurately match a color previously seen or described."

—from an article in AVERTISING & SALES PROMOTION

". . . A peacock lays eggs, too."

—Goodman Ace in SATURDAY REVIEW

"In advertising, in the end as in the beginning, is the word—no matter how supported by picture, sound effects or stage craft."

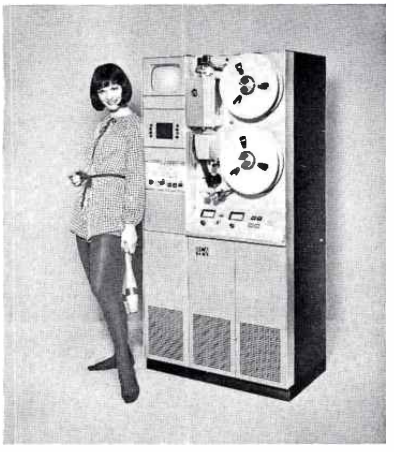
—James Webb Young in SATURDAY REVIEW

**ADS OF THE MONTH,** or leastwise two that caught our eye, were those of WFGA-TV and WKBS (see above). Demonstrating the merits of color in a pure black-and-white ad takes some ingenuity (we know, we've tried). WFGA, no newcomer to this column, has figured out how to do it. In the other direction, the September-morn ad of WKBS is about as corny as they can get. But it caught our eye—and it conveyed a message. And what more is an ad supposed to do?

**SLEEPER OF THE YEAR** turns out to be our TR-3/4/5 series of tape recorders. Originally these recorders were conceived of as "stripped-down" versions of our big recorder. They were intended for use by stations who didn't need all the frills of those who were producing for networking or syndication. But it hasn't worked out just that way. Basically the TR-3/4/5 are still stripped-down machines. But so many "optional" features (ATC, Color, Electronic Editing, Drop-Out Compensator) have been made available that the TR-4 Recorder (shown opposite) when equipped with "the works" will do almost as many things as the "high-priced two." The TR-3 Player, used in combination with the TR-4 makes the latter even a better buy. For example, a TR-3 with two TR-4's (as shown on Page 17) provides practically the equivalent, in recording time, of a three-recorder setup. The TR-5 Recorder (see Page 3) is presently the only portable quadruplex tape recorder. Its use provides "quadruplex quality" on remotes and eliminates the need for re-recording from slant track.

As a result of the economy, the provision for adding features as needed, and the obvious advantages of a compatible family, a large number of stations, both large and small, have standardized on the TR-3/4/5. We're both surprised and pleased—and so are the stations.

—The Armchair Engineer



*RCA Compact Quadruplex*
*TV Tape Recorder Type TR-4*

# Slim size . . . trim cost . . . make the RCA TR-4 ideal

# . . . for producing standard broadcast TV tapes

Deluxe in everything but price, this compact quadruplex recorder, makes and plays color or monochrome tapes. It's the answer for installations where low initial cost and broadcast quality pictures are desired. Complete in a slim 22 by 33 inch cabinet (5½ ft. tall), the TR-4 has built-in picture and waveform monitors, metering circuits, simplified control panel.

## COLOR CAPABILITY

The TR-4 is readily adaptable to color operation. By adding a group of color modules, the TR-4 becomes a complete color recorder and player. Color circuits offer precise stabilization and a high order of performance.

## HIGH-BAND OPERATION

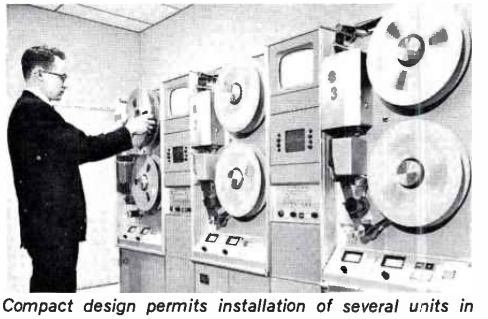
New circuit components needed for high-band operation may be added to the TR-4. With such circuits, high band can be selected as a second mode of operation, with all its benefits, including the production of color and monochrome tapes of particularly high quality—even in multiple generation copies.

## "NEW LOOK" FEATURES

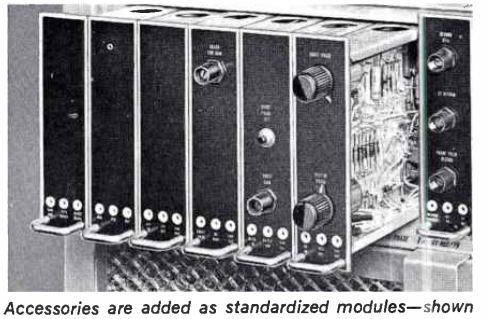
Transistorized circuits in modular form are used throughout. Operational stability readily permits semi-automatic pre-set operation and remote control. Features now standard include air-lubricated tape guides, magnetic tone wheel, solid state control system, built-in switchlock, and two-speed operation.

## AVAILABLE ACCESSORIES

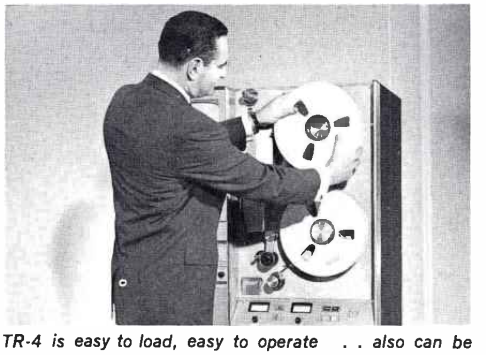
Accessories include automatic timing corrector, cue record/playback, and electronic splicing. Standardized modules, on this and other RCA TV Tape Recorders assure high quality, and simplicity in adding accessories.



*Compact design permits installation of several units in close quarters.*



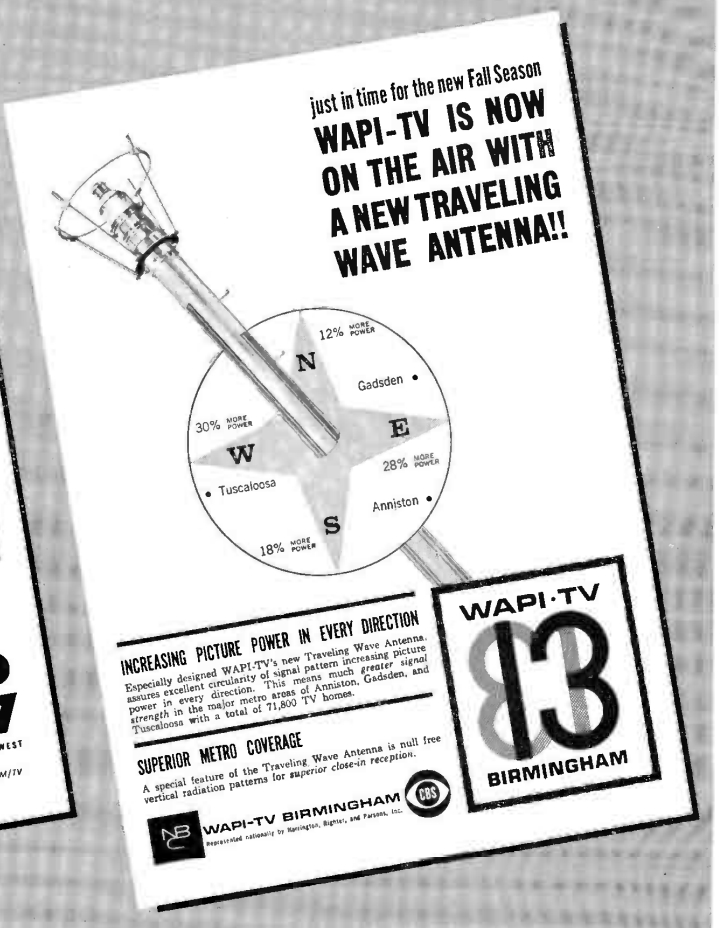
*Accessories are added as standardized modules—shown here is Color ATC.*



*TR-4 is easy to load, easy to operate . . . also can be remote controlled.*

*For further information, write RCA Broadcast and Television Equipment, Building 15-5, Camden, N.J.*

**The Most Trusted Name in Television**


# They switched...

# and are they glad!

KIRO and WAPI are two of a growing number of TV stations that have switched from another type of antenna to the RCA "Traveling Wave" Antenna. Both of these stations are so pleased with the improvement that they have taken ads (above) to tell about it.

Naturally, we are pleased, too—but we are not surprised. Some sixty stations have installed RCA "Traveling Wave" Antennas in the past few years.

The "Traveling Wave" Antenna, like other RCA broadcast equipments—cameras, tape recorders, transmitters—is for those who want the best. Your RCA sales representative will be pleased to tell you about it in detail. RCA Broadcast and TV Equipment, Building 15-5, Camden, N.J.

RCA®

**THE MOST TRUSTED NAME IN TELEVISION**

# RCA SERVICE KEEPS ALL YOUR AM, FM, TV EQUIPMENT IN TOP CONDITION

TR-22

**TAKE ADVANTAGE OF THE FOLLOWING SERVICES OFFERED BY RCA:**

**Video Tape Recorder Service • TV Camera Overhaul • TV Transmitter Overhaul • Installation Supervision • Microphone and Pick-Up Repairs • Transmitter Performance Measurements • Antenna Inspection Measurements • Console Repairs • Microwave Service • TV Projector Service • Custom Fabrication • Teletypewriter Maintenance**

Your audience demands a superior signal which requires top performance from all your station equipment. RCA Broadcast Service is planned to assure you of meeting this objective. More than 30 years in the broadcast industry have provided a background of solid service experience. This is the type of protection broadcasters have relied on for years, the kind of protection you can count on . . . contract or per-call . . . from the experts in the service business, RCA Service Company. To guard performance of all your equipment . . . simply telephone one of the following field offices: Atlanta (phone 355-6110), Chicago (WE 9-6117), Phila. (HO 7-3300), Hollywood (OL 4-0880). Or contact Technical Products Service, RCA Service Company, A Division of Radio Corporation of America, Bldg. 203-1, Camden, N.J. 08101.

**The Most Trusted Name in Electronics**

RCA NEW LOOK

# "Set-and-Forget"
## TV FILM SYSTEM

## Get great pictures . . . week after week . . . without fiddling or fuss

In RCA's "New Look" Film System, entirely new camera circuits take over the daily manual adjustments, so that once set, they can be forgotten—for a long time—and picture quality doesn't deteriorate. This film system includes projectors, camera, and multiplexer, all designed and built by RCA, to work together to best advantage. The result is a "matched" system, that is ideal for turning out top quality film programs, promos, announcements, and commercials.

**TP-56 AUTOMATED FILM PROJECTOR.** Cues itself, automatically changes burnt-out projection and sound lamps, can't ever lose a loop. Fully transistorized for top reliability. Offers conveniences for creative production including instantaneous start, projection of still frames, and reversing of film.

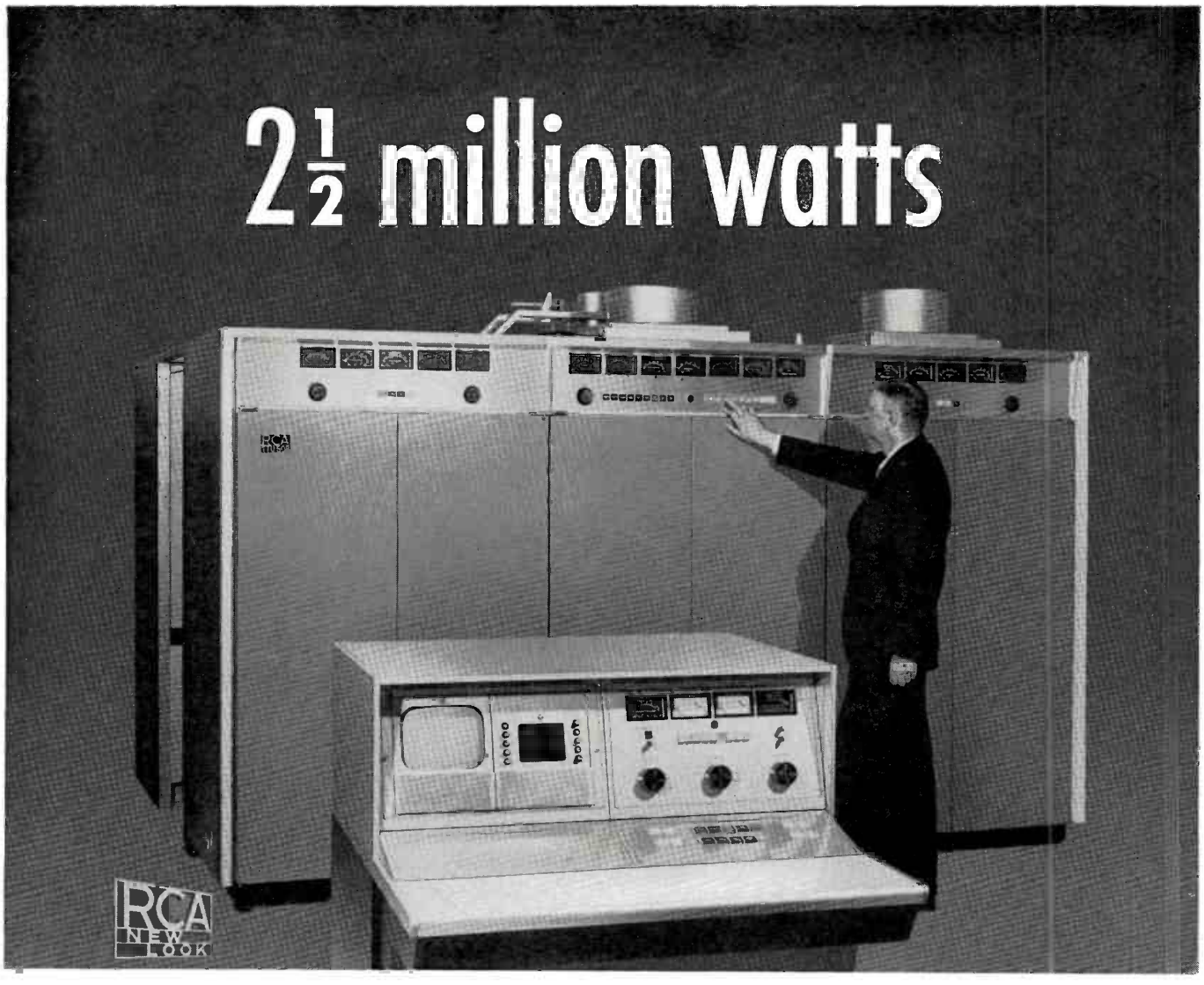
**TP-7 SLIDE PROJECTOR.** Provides for semi-automatic operation. Holds a total of 36 slides. Dual-drum design, it projects standard 2x2 inch slides with excellent optical resolution and contrast. Single lamp source assures uniform image brightness.

**TK-22 TRANSISTORIZED CAMERA.** Works week after week without adjustment, for production of finest pictures. Latest technical features include 1½ inch big-picture vidicon tube, with electrostatic focus for ultra-stable performance. Automatically maintains control over black level, white level and gain. Modular construction affords fast service, greater reliability.

Call your RCA Representative for the full story on RCA carefree film systems. Or write RCA Broadcast and Television Equipment, Building 15-5, Camden, N. J.

RCA **The Most Trusted Name in Television**

# 2½ million watts




## ...from this 55-kw UHF transmitter —no larger than a 30!

Less than 9 by 12 feet and only 77 inches high, this remarkable TTU-50 transmitter, with high-gain antenna, radiates as much as 2½ million watts erp. It's designed for remote control and has full-fidelity direct FM modulation. Note its smart, compact appearance with new transistorized console. And check these superior operating features:

**QUICK-CHANGE KLYSTRONS.** Either klystron, aural or visual, may be easily changed in approximately 5 minutes—from power-off to power-on. Klystrons are integral-cavity type, which permit factory pre-tuning...warranted 6000 hours aural, 3000 hours visual.

**COST-CUTTING VAPOR-COOLING.** Vapor-cooled klystrons permit use of smaller, more economical heat transfer equipment. Vapor cooling is many times more efficient than water cooling, thus helping to reduce operating costs.

**SPACE-SAVING INSTALLATION.** Requires about the same space as the RCA 30-kw. Walk-in cabinet design and use of vapor cooling both contribute to unusual compactness. Furthermore, a room with *ordinary ceiling height* accommodates this transmitter.

**ULTRA-FAST OVERLOAD PROTECTION.** If an antenna fault occurs, both aural and visual carrier are cut off in less than 7 microseconds.

**MODULAR SILICON RECTIFIERS.** Reduce cost of primary power, increase reliability and power supply efficiency. Modular design makes for easy replacement if ever necessary.

**OTHER UHF TRANSMITTERS.** Also in this new line are the 30-kw (also with integral-cavity klystrons), a completely air-cooled 10-kw and a 2-kw that can be easily expanded to a 10-kw.

For more information, call your RCA Broadcast Representative. Or write RCA Broadcast and Television Equipment, Building 15-5, Camden, N.J.

With this unique carriage, klystron change can be accomplished quickly.

RCA THE MOST TRUSTED NAME IN TELEVISION

3J4929

Tmk(s) ®

Printed in U.S.A.