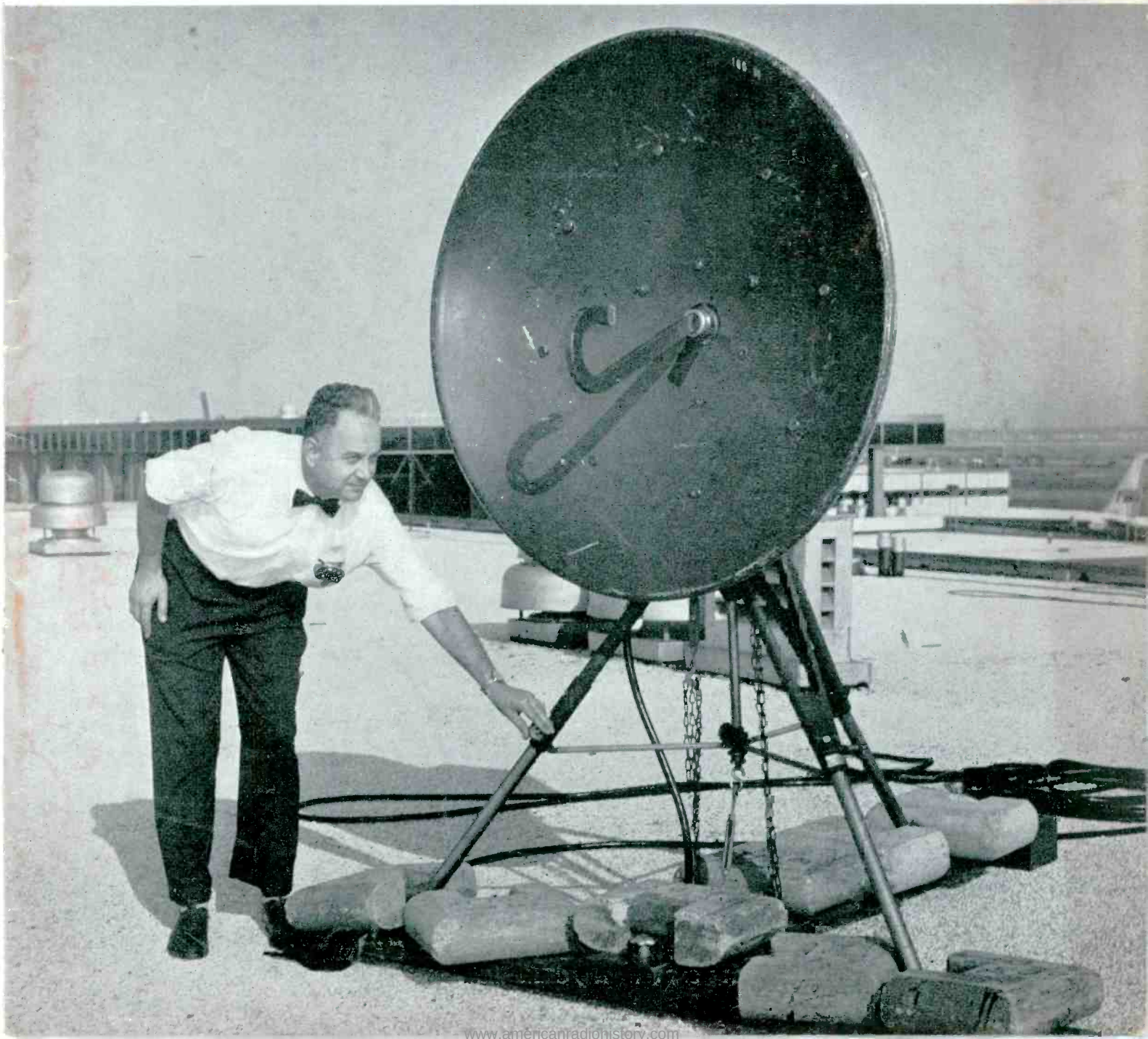
OCTOBER, 1960

Covering all phases of . . .

AM FM TV

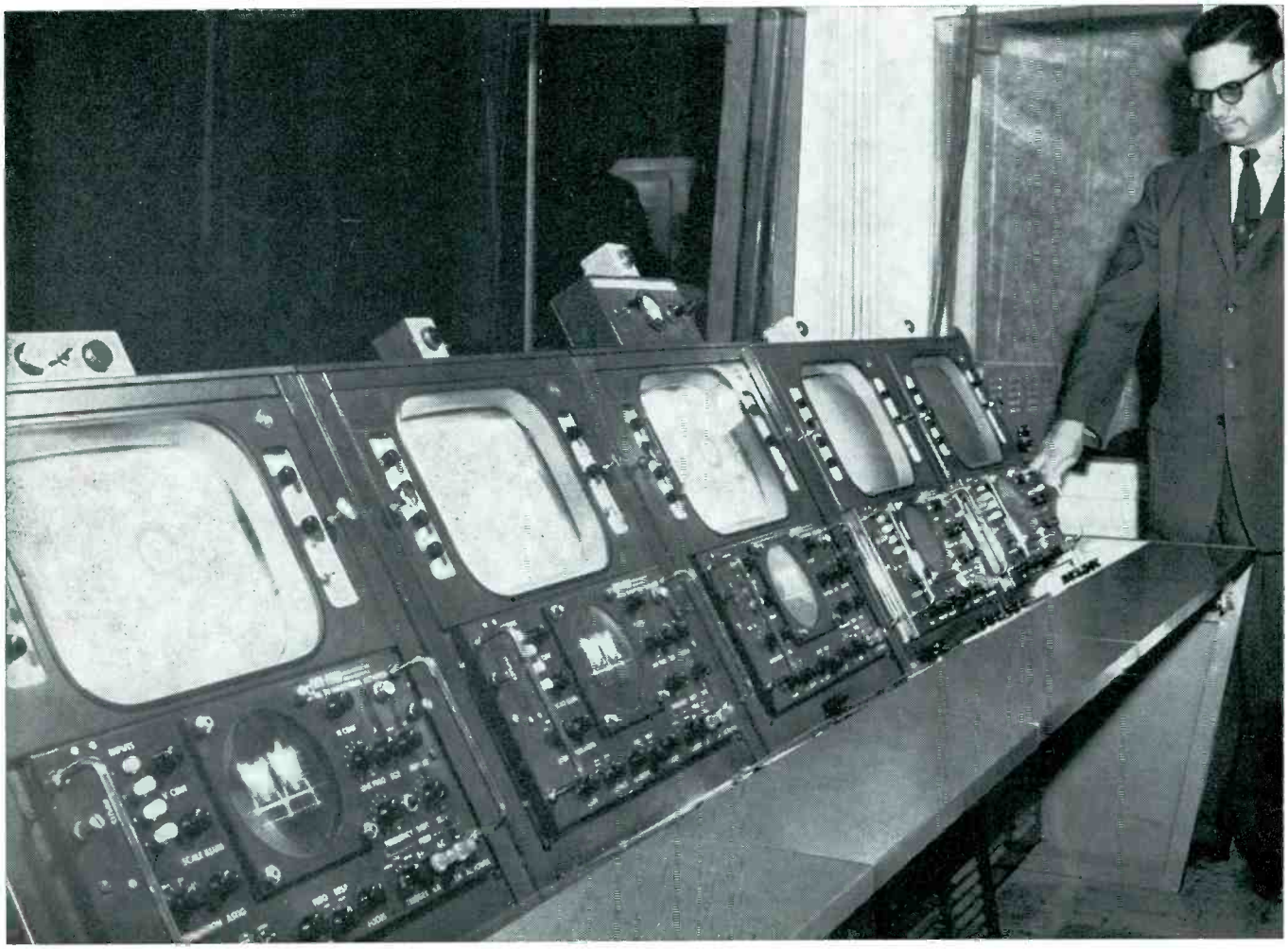
# BROADCAST ENGINEERING

THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY



# FOTO-VIDEO® Waveform Monitor Faces Facts

**— "THE FACTS OF CONTINUOUS OPERATION, DAY IN AND DAY OUT"** . . . says Charles Halle of WENH-TV, Durham, N. H. following a year's use of the new **FOTO-VIDEO** V-9B TV Waveform Monitor, the built-in features of which measure up to the precise requirements of this well-known consultant of educational TV stations.



Charles Halle is director of engineering at WENH-TV, the University of New Hampshire station, at Durham. Last December, after searching the field, he chose the rugged Foto-Video—an instrument of near perfection in this exacting phase of TV signal production —as most likely to meet the "operational FACTS of LIFE" in round the clock performance without deviation of characteristics. IT DID!

Mr. Halle was so impressed with the simplicity of design, operational convenience and built-in versatility of the Foto-Video V-9B's —result of years of exacting engineering and production—that he first bought two instruments, then later ordered five more for WENH-TV.

*"Not only was the Foto-Video TV Waveform Monitor less expensive, but it also proved to be of better quality than other comparable units. It is extremely well-engineered, and a lot easier for the operators to handle. It shows that clever design may be accomplished without compromising the essentials needed in such equipment," Mr. Halle said.*

**SOME OF THE FEATURES OF THE FOTO-VIDEO V-9B TV WAVEFORM MONITOR:**

1—Four inputs, with push-button selection, affording complete monitoring facilities (both pulse width and level—ITV or broadcast cameras), or quality and level in studio or master control. Any input may be connected either front or rear.
2—Precise time and level calibration: 1-volt Zener reference for video; 4-volt Zener Pulse for sync levels; accurate .025H markers for quick sync and blanking duration settings.
3—Field expansion vertical interval to 4 inches for: counting equalizing and vertical pulses; viewing new test signals at lines 16 to 18; checking vertical pulse duration and delay.
4—Field Shift for interlace checking.
5—Both flat response and new IRE color roll-off: flat (± 0.5 DB) to 6 mc; IRE 6 DB at 1.6 (± .4) mc.
6—Triggering from all sources: internal video; external sync; external H and V drive.
7—Both line and field frequency controls to view: 1, 2 or 3 full lines; 1, 2 or 3 full fields.
8—Electronically regulated power supply.
9—Complete with case and slide-tilt assembly.
10—Continuous production; immediate delivery; low cost.

*(Write or telephone for complete information)*

**Foto-Video** Laboratories, Inc.  Cedar Grove, N.J. CEnter 9-6100

**West Coast Engineering and Sales Office**
**1317 West 214 St., Torrence, California — Phone FA 0-2220**

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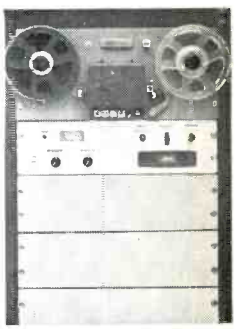
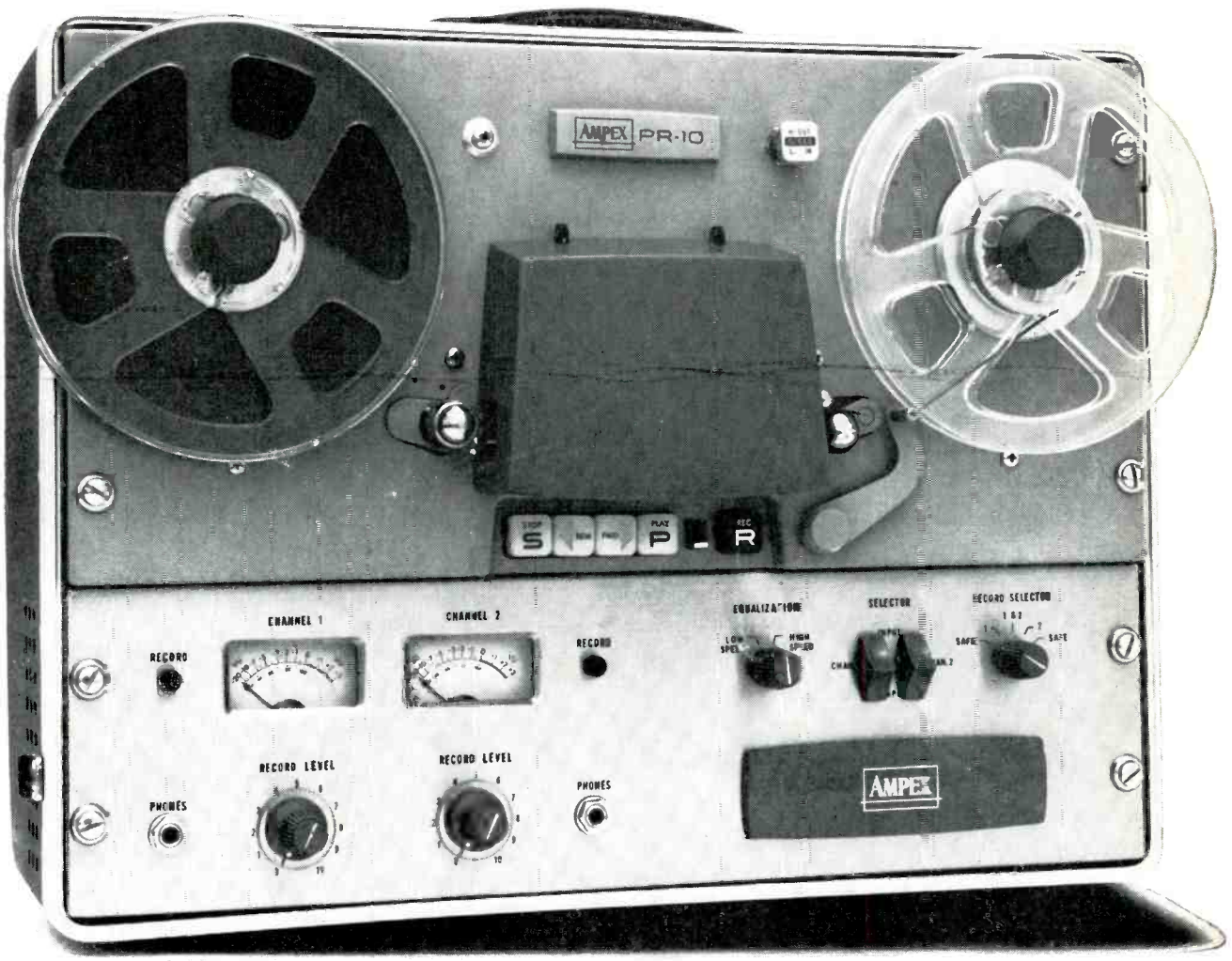
*In sound quality, in operating principle and in features, this is the compact professional recorder that will set the standards for all others. New in every detail and Ampex throughout, the PR-10 is all you expect of the name. It is a worthy companion of the big Ampex recorders that make the master tapes of nearly all the recorded performances sold in the world today. To a heritage of excellence, the PR-10 adds the completely new electrodynamic frictionless tape handling system that makes possible studio-quality performance in a compact machine. Your dealer has it. See it operate soon.*

**FEATURES AND ESSENTIAL DATA** **PR-10-2 stereo/monophonic** model records and plays back stereophonic, monophonic, sound-on-sound, cue-track, selective track and mixed or unmixed two-microphone sound • **PR-10-1 monophonic** available full track or half track • Pushbutton controls of professional relay/solenoid type • Full remote control provisions and accessory remote unit • New automatic 2-second threading accessory, optional • All new compact electronics • Professional monitoring includes A-B switches, VU meters, phone jacks and output circuits • Separate erase, record and play heads • 4-track stereo playback optional on open fourth head position • Two speeds with options: 15 and 7½ ips or 7½ and 3¾ ips • Hysteresis synchronous motor • Electrodynamic tape handling for lowest flutter ever in a portable/compact recorder • Plug-in modules for flexibility of equalization and input characteristics • Portable or rack mount • Dimensions for both models: 19" w by 14" h permitting easy replacement of many older rack recorders.



# PR-10




*Complete descriptive literature available from Ampex. Write Dept. BE-1.*

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# BROADCAST ENGINEERING

THE TECHNICAL JOURNAL OF THE BROADCAST INDUSTRY

VOLUME 2 OCTOBER, 1960 NUMBER 10


## Contents



## Departments



## Cover Story

The speed of the Jet Age combined with videotape-recording kept the U. S. and Canadian television viewers up to date with the Olympic Games in Rome. Shown on the cover is John Triesner of CBS Television adjusting the microwave dish used to transmit pictures to the New York control room from Idlewild airport. The story of the Olympic TV pickup is in this issue.

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Check your microphone requirements, today. Do you have one for each purpose — remotes, announce, interviews, boom, general purpose? Use the handy order coupon to order any microphones you need.

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Enclose remittance with order and save shipping charges.


The GEC 1326 is especially sensitive to CRT's frequently used in weather radar displays.

# WEATHER RADAR BROADCASTING

The methods for presentation of radar images of weather conditions are analyzed and a recommended system using a special vidicon tube is described.

By W. O. CRUSINBERRY

THE USE of radar for presentation of weather conditions is rapidly becoming a desirable programming tool in the production of TV weather programs. A camera shot of the radar display, during a weather cast showing the "echos" within a radius of the station being watched, has resulted in definite viewer reaction indicating that the use of weather radar has found a place in modern TV production.

**Requirements of the System**

There are many different approaches to the task of getting the display tube presentation to the transmitter, and some of these systems will be described later in this article; however, all begin with the radar unit itself.

Most stations are using commercial airborne weather radar systems or modified versions of war surplus search radar. These units generally utilize a five-inch display tube with a P7 phosphor. Antenna and sweep rotational speed is generally in the range of 10 to 15 revolutions per

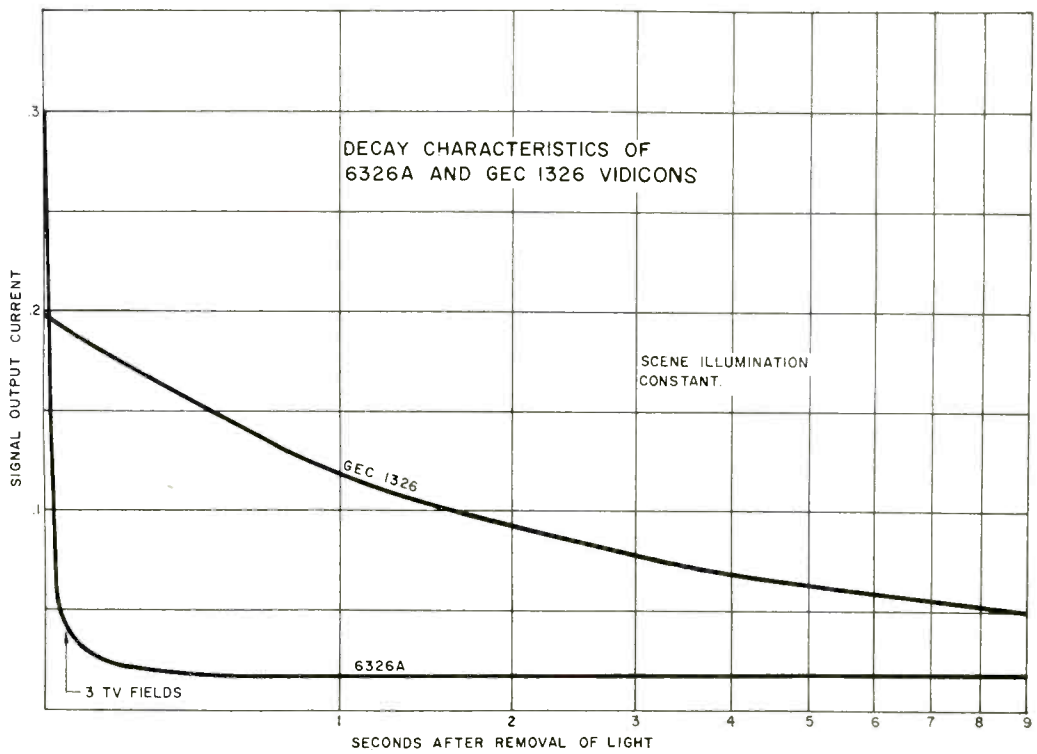



FIGURE 1

Figure 2. The weather radar pickup system at WDSU-TV New Orleans.

Figure 3. KRLD-TV in Dallas has their radar indicator and vidicon camera installed in the transmitter master control.

minute. The indicator brightness is controllable as well as video gain or "contrast," and of course the range of the scan and the resultant range markers are variable.

Interesting originality has been shown in the methods used by various stations in packaging the radar indicator, a map overlay and the pickup camera into an integral unit.

The requirements of the weather radar system vary from one station to another, and from one producer or director to another. Some desire direct feed from the radar pickup to the video system, while others may desire presentation on a monitor in the studio so that the weathercaster can use a pointer in discussing the weather picture. Both methods are in use in TV stations across the country. In all cases, however, one of the most important requirements is a pickup camera tube which will provide the proper amount of retentivity or storage to display the "targets" properly on the viewer's screen and yet allow a change in range on the radar display without the necessity of a period of time for "erasing" and hence a loss in program continuity.

Almost mandatory also, from a production standpoint, is a method of "overlaying" a map of the area being scanned by the radar.

### The Camera Pickup Method

The use of a studio I.O. for pickup of the radar display directly or from a separate studio monitor has disadvantages, one of which is the tying up of a studio camera and cameraman which results in increased production cost and a reduction in production flexibility.

Multiplexing the radar display tube image into an existing film camera is seldom attempted for two reasons. (1) The addition of extra equipment in the film projection room, highly impractical in most stations, and (2) the requirements of a vidicon for film pickup are entirely different than those desirable in radar display pickup. The most important of these is the retentivity or "lag" characteristics of the vidicon which must be of an optimum value for proper camera pickup and maximum readability on the viewers screen.

Utilization of a storage cathode ray tube for the radar display has been successfully tried at some stations; however, in addition to being considerably more expensive, the necessity for "cutting away" from the radar display for erasing when a change of range is desired limits its flexibility from a production standpoint.

The storage type vidicon designed for long time storage of the image is also limited in application by the necessity for an extensive erasure period when the image is changed.

The most desirable system, taking all factors into consideration, is one utilizing a separate vidicon camera and a vidicon designed specifically for pickup from radar weatherscopes, with a simple optical multiplexing system, or a method of direct overlay of a map. The camera may be any one of the small compact industrial type vidicon cameras available today. Two of these systems in use will be discussed in further detail later in this article.

### The Requirement of the Vidicon Tube

The vidicon tube itself must have a retentivity or decay characteristic such that the echo from even small weather formations will remain visible in detail on the screen for almost a full revolution of the radar sweep, and yet will decay sufficiently fast

*(Continued on page 10)*

| RELATIVE ILLUMINATION | DECAY OF SIGNAL CURRENT IN ONE SECOND |
|---|---|
| 0 | 40 % |
| 2 | 52.5 % |
| 4 | 57.5 % |
| 8 | 68 % |
| 16 | 72 % |
| 32 | 74 % |
| 64 | 85 % (TO DARK CURRENT) |

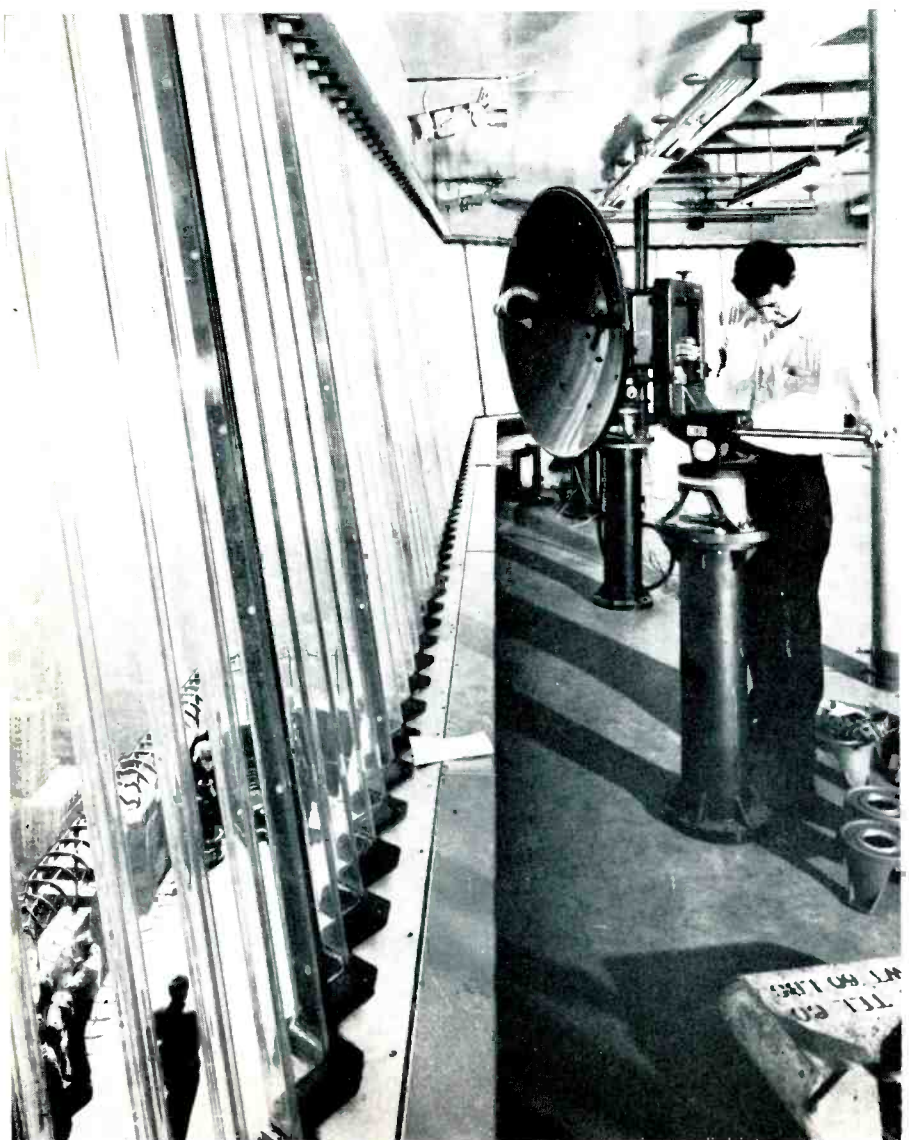
Table I

# Empire State Microwave Relay Station

## Plexiglas enclosed microwave installation triples the capacity of Empire State relay facilities.

A 560- SQ. FT. enclosure, made of transparent Plexiglas, has been installed recently by the New York Telephone Co. at its micro-wave relay station on the 87th floor of the Empire State Building. This enclosure—high in the clouds over Manhattan—has enabled the station to increase the number of its transmission antenna discs from four to twelve on this side of the building.

Figure 1—This 6-ft. high, corrugated Plexiglas enclosure goes fully around the east side of the 87th floor of the Empire State Building. The enclosure protects twelve micro-wave disc antennas one of which is shown being installed here.



The purpose of the station is to relay television pictures from TV cameras to broadcasting points. The station's 50-inch micro-wave disc antennas receive a TV picture from the point of origin, *e.g.*, a studio, sporting field, or celebrity's living room, and then transmit the picture to a specific broadcasting point, where the picture is re-transmitted to the public—or to a closed circuit audience.

Because the antennas must be installed on the periphery of the building, it is necessary to protect them against the elements—particularly the high winds (up to 80 mph) frequently encountered from time to time atop the Empire State Building.

Prior to the installation of the large, "full-sweep" enclosure (Figure 1), the antennas were located on an open platform, just above the observation deck. Each individual transmission disc was protected by an igloo-shaped dome, made of Plexiglas acrylic plastic (Figure 3), and these domes—7 ft. in diameter by 9 ft. high—occupied so much of the available platform area that there was room for only four antennas in the space. (There are also four dome-protected antennas on the west side of the building which have not yet been replaced.)

In addition to limiting the number of antennas that could be installed, the dome enclosures had other disadvantages. They tended to accumulate material from the air which adversely affected transmission, and they were exposed to possible breakage from falling ice which

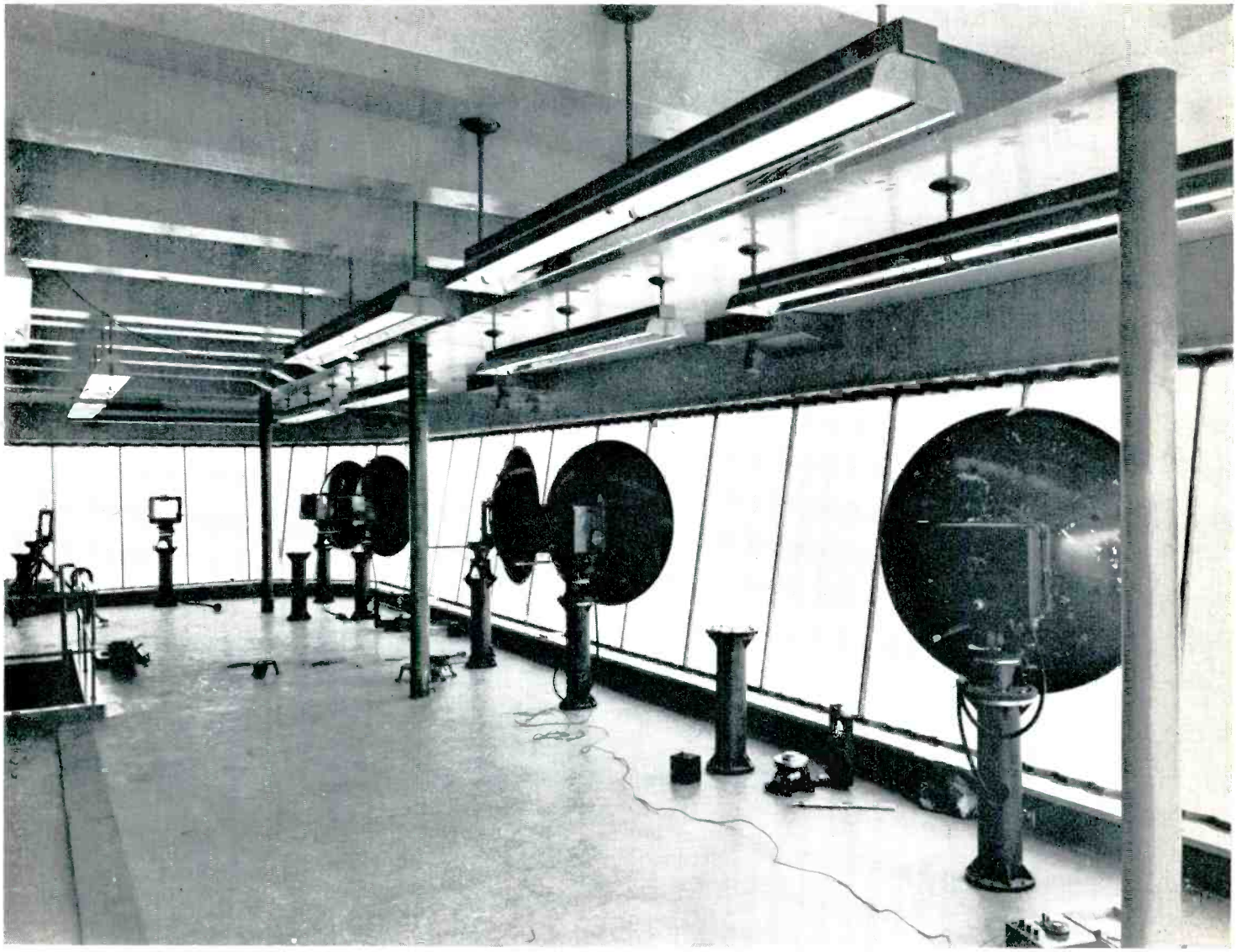


Figure 2—East side view of the New York Telephone Co.'s relay station shows some of the partially installed 50-inch micro-wave disc antennas which are used to relay TV picturesto broadcasting stations.

builds up on—and then drops from—the building's high mast during fall and spring months.

The new location on the 87th floor solves these difficulties. Here, there is no hazard from falling ice and there is now space for twelve antennas instead of only four. The big discs are now mounted within the actual building area, but there are no walls or supporting structural members except behind the antennas. In front there is nothing but the Plexiglas enclosure between the transmission discs and the open space beyond the building.

The plastic enclosure extends across the full width of one side of the 87th floor and continues around the portion of the two ends which have been included in the micro-wave transmission area (perhaps one-third of the length of each end). This entire area is enclosed, weathertight, with the Plexiglas panels.

The sheet Plexiglas used in the enclosure is formed into a special "flat-bottomed Vee" corrugation pattern. This corrugation serves a dual function; it stiffens the panels to enable them to withstand the high winds, and it eliminates objectionable micro-wave reflections that might occur from an unbroken flat surface. At the same time, the small flat section of the Vee provides a distortion-free, transparent area through which visual sighting is possible as an aid in positioning the antennas. The panels are mounted with the corrugation in a vertical position to help shed moisture and dirt and the entire enclosure is installed with an inward slope from top to bottom to further minimize the problem of moisture and dirt accumulation.

In selecting a material for the enclosure, a basic consideration was low absorption of the TV beam's energy. In addition, a transparent material was desired, as previously explained, to facilitate the initial line-of-sight adjustment of the antenna direction. Also required was full weather resistance, superior strength, shatter resistance and dimensional stability.

Universal Unlimited, Inc., formed the special corrugations in the sheet Plexiglas in its fabricating shop in Glen Cove, N. Y., and this firm also handled the installation of the panels on the building. Practical considerations made it necessary to handle all

the installation from the inside, and the company developed special mountings to facilitate the work. Aluminum castings, shaped to fit the corrugations, were first anchored to the concrete at the top and bottom of the area to be enclosed, and matching castings were then attached after the Plexiglas panels were put in place. Liquid gasket material was forced into the mounting to provide a weatherseal between the Plexiglas and the casting. The panels themselves were made in three different widths—40, 32, and 24 inches—to meet the installation needs, and reinforced plastic strips, attached with nylon belts, provide the weather-tight joints needed between adjacent panels.

New York Telephone Co. operates several relay stations, most of which are located atop telephone buildings in Manhattan. The Empire State Building relay station, however, is the first in which the company has made use of the long, sweeping Plexiglas enclosure.

The greatest distance covered from the Empire State Building relay point is to Crow Nest Mountain at West Point, N. Y., over 40 miles away. For short distances, within a few blocks of the relay station, 2-ft. diameter discs may be used.

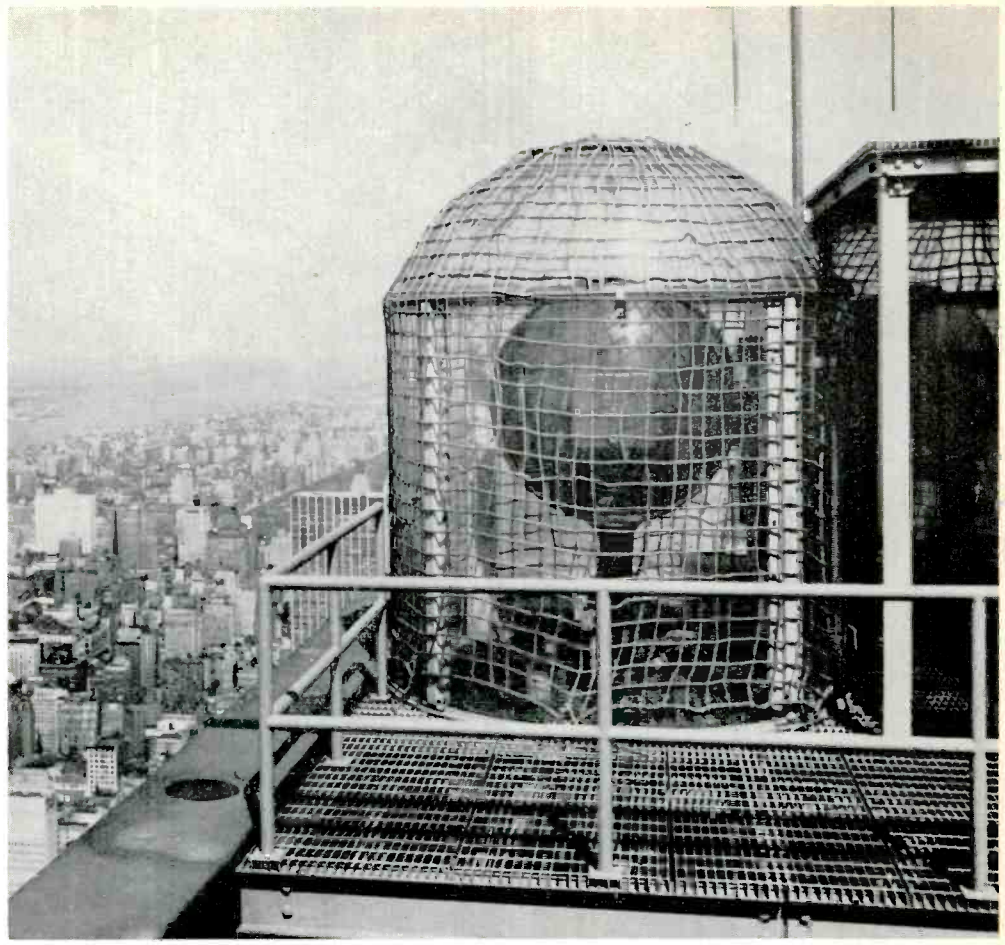


Figure 3—One of four Plexiglas radomes installed on the west side of the relay station to protect the four antennas located there. Manila rope keeps the Plexiglas from blowing off the building in the event the radome is broken up by falling ice.

Figure 4—Close-up shows construction details of the corrugated Plexiglas enclosure. Depth of corrugation is 3 inches; distance from crest to crest, 7 inches.

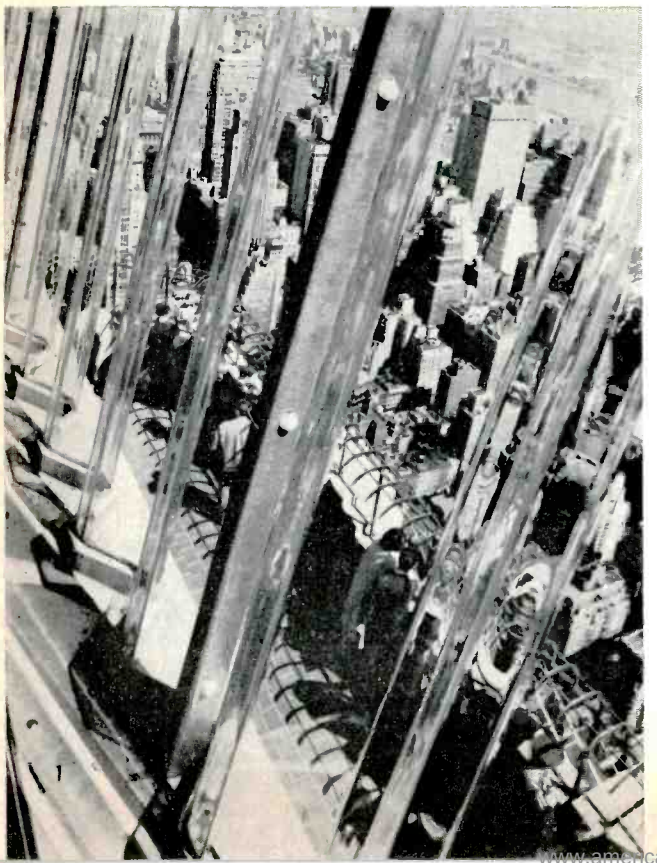


Figure 5—Skyward shot taken from the observation deck of the Empire State Building shows the final installation work on one corner of the east side enclosure.

# PRECISION MULTIPLEX EQUIPMENT
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for **BACKGROUND MUSIC - STORECASTING - DRUGCASTING**
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DMR MULTIPLEX RECEIVER

***CLOSE THE DOOR ON EXPERIMENTATION!***

Electro-Plex brings you the ultimate in multiplex receiver design. A design resulting from a careful study of the background music and allied fields, and an awareness of the problems which the operators have experienced in the past. The DMR is truly an advanced view in multiplex circuitry. A receiver which has been in development for 18 months.

Main Channel circuitry is more reliable because a pulse-counting type detector, utilizing a tube, is used in place of a discriminator-coil/diode combination. This circuitry is original and exclusive with Electro-Plex. Drift is a thing of the past and the receiver will stay on frequency from a cold start!

In the sub-carrier section, heterodyne circuits have been avoided due to the several added adjustments required to keep them in alignment.

The multiplex circuit is furnished on a separate mounting plate which may be easily removed. Other special intermediate and control circuitry may be supplied in this area when desired.

**OTHER MULTIPLEX AND FM RECEIVING EQUIPMENT: STORE CAST TUNERS, MULTIPLEX TUNERS, MLX-10 ECONOMY MULTIPLEX RECEIVER, TRC MULTIPLEX RECEIVER, MULTIPLEX ADAPTERS.**

**ALL MULTIPLEX FUNCTIONS IN A SINGLE COMPACT INSTRUMENT!**

Putting a sub-carrier on the air is greatly facilitated with instruments to accurately check the performance of the transmitter. With the Electro-Plex 8-A Modulation Monitor, injection level of the sub-carrier may be set in seconds as a matter of course. The main channel may be accurately indexed to the new maximum modulation level to avoid over-modulation and cross-talk.

All of this is done by the flick of a switch!

Simultaneous visual monitoring of both main and sub-channels provided by two identical, fast-acting VU meters. No switching necessary. Injection of sub-carrier constantly indicated on separate meter. The VU meters are of new design, having special ballistics for this type of operation.

**IN INSTRUMENTS . . .**

8-A MODULATION MONITOR

Demodulator circuits for both main and sub-channels are included in the monitor whose output may be checked aurally through a separate amplifier and speaker system.

Compact design: 5¼" x 19 engraved relay rack panel. Depth behind the panel 13".
**A MUST IN FM MULTIPLEXING!**

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**WHEN YOU THINK OF MULTIPLEX, THINK OF ELECTRO-PLEX**

**". . . tube coating developed for this specific use . . ."**

WEATHER RADAR starts on page 4

that the radar range and markers may be changed to a new scale without a serious interruption in program continuity.

A new vidicon tube, the GEC 1326, has been developed by the General Electrodynamics Corp. which meets the requirements for weather radar pickup. The photoconductive coating of the tube was developed specifically for this application and provides the proper decay characteristic and sensitivity for radar pickup. The decay characteristic of the tube is shown in Figure 1, where signal highlight current is shown as a function of time after removal of light from the faceplate under one set of conditions of light and signal electrode voltage. For comparison purposes, we have shown the decay characteristics of the 6326A vidicon used for normal film or live pickup purposes. In the 6326A, minimum lag is desirable and the retentivity is minimized to a nominal value of approximately 15 per cent of highlight signal current at the end of three TV fields, or 1/20 of a second under normal operation. The specially developed photoconductive coating of the GEC 1326 has a characteristic which, as can be seen in Figure 1, results in a nominal decay of only 40 per cent in the first second and then decays to the dark current value. It is this characteristic of controlled decay for the first few seconds after removal of light, and then a decay to negligible output without permanent long time storage that makes the GEC 1326 ideally adapatable to radarscope pickup. In actual use, this controlled lag characteristic permits the image of the radar "echos" to remain in the video signal at significant amplitude for a period of time after passage of the radar rotational sweep and yet decay to a very low amplitude before the start of the next rotational sweep.

A study of the GEC 1326 decay curve of Figure 1 will allow us to relate in terms of video signal amplitude what will be achieved in viewing a radar scope. Assume first of all that the radar rotational sweep is 10 cycles per minute or the time between the sweep passing a point on the scope and returning to that point is approximately 6 seconds. If the parameters are adjusted to provide 0.2 microamps of signal highlight current and this represents 1.0 volt peak to peak of composite video output from the camera, the curve shows us that the signal will have decayed to only about 0.3 volt peak to peak at the time the sweep returns to the echo. Looking at it in another way, the decay of the tube is such that the video output signal will remain after the sweep moves, decaying slowly until the sweep comes around to the echo again. However, if it is desirable to change the range of the radar, the signals from the previous range will decay to a negligible value of less than 0.2 volts peak to peak after only two revolutions of the sweep.

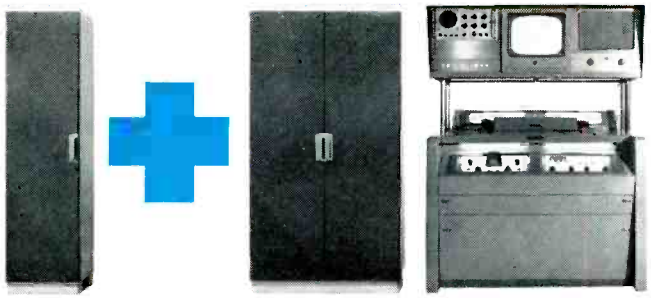
For this reason, it is often possible to change range and markers on the radar unit without the detrimental effect of permanent retentivity of the previous echoes and markers, and eliminates the neces-

# AMPEX COLOR

***NEW IMPROVEMENTS, NEW EXCLUSIVES***

# HOW YOUR COLOR CAMERAS CAN MAKE MORE PROFIT

Color TV's much heralded arrival still holds promise for the station equipped with live color broadcast facilities. But it also holds startling technical problems . . . and expense. Making local live color pay is a challenge of the first order. To the engineer, it is just as much a technical challenge, too, in having all facilities *right* when the second hand in the control room says "go"!



Color Rack — Complete B/W — VR-1000C Console

A **Videotape*** Television Recorder can pay off in both of these areas. How? By permitting you to sell more color commercials . . . safely recorded on tape.

*Plan 1.* Record tape commercials back-to-back with live color telecasting. The time spent in balancing color facilities is done only once . . . before the show. Sell the taped commercials as adjacencies or inserts in your next color show. Profit is high . . . cost is low.

*Plan 2.* Schedule one day — or more — to tape the entire week's color programming. Regular taping sessions permit you to put more color programming and commercials on the air. Reason: more engineering time is spent in profitable production — rather than non-chargeable set-up. And you're sure your programming is fluff-free . . . the tape is *right*.

**NEW AMPEX COLOR** New Ampex color electronic units feature major improvements over all earlier designs to provide improved picture quality — greater stability — and greatly simplified set-up procedures.

**IMPROVED DIFFERENTIAL PHASE PERFORMANCE** An Ampex exclusive, the Differential Phase Compensator, provides new, positive stability of color values on playback . . . *automatically*. Color hues hold steady . . . there's no shifting to green shadows and magenta highlights. Ampex DPC holds differential phase shift within 5 degrees . . . as compared to 20 degrees or more on *any* recorder without DPC.

**BETTER COLOR DETAIL** Color detail of fabrics and skin tones have been significantly improved, too. Costly Bode filters in the color processing circuits bring better clarity and color detail by providing sharp rejection of unwanted carrier with no ringing. Picture edges stay sharp and clean.

**LONG TERM STABILITY** Improved design of the color chassis provides added assurance of entire system stability. New Ampex exclusives in design include thermostatic ovens for precision frequency sources . . . new encoder with *automatic* carrier balance . . . new stable delay lines replacing sensitive tank circuits . . . and new clamped demodulator replacing synchronous detectors.

**QUICK, SIMPLE SET-UP** New Ampex color equipment alone affords such simplicity and speed in set-up. Daily set-up has been simplified to a quick 7-step check-out which can be completed in 5 minutes or less . . . no specialized sweep generator required. You are invited to write for complete information on color equipment in the new deluxe **Videotape** Television Recorder console (VR-1000C) and the new standard of the uprights (VR-1001A).

**FOR ENGINEERS ONLY:**

Engineers are human too! One significant improvement in the new Ampex color chassis is the simplicity of daily set-up. Attaining this aim is always a design objective, and in this case results were unusually good.

Last summer at the United States Exhibit in Moscow, an Ampex team demonstrated an Ampex color VTR to an estimated 2½ million Russians. The tape recording of the Nixon-Khrushchev debate was exciting enough but it was followed by about two months of 12-hour-plus work days. One of the engineers was a design engineer from the Ampex Video Laboratory. With no time for sightseeing, this man's thoughts turned to work-saving devices.

Result: Simplicity of daily set-up was designed into the new Ampex color chassis. A built-in testing network has a relay system to route signals through various electronic paths. (With mod-demod, without mod-demod, for example.) By using 4 basic test points and test network selector, a series of "Go — No-Go" adjustments can be made quickly. Permanent low-pass filters are built in where needed.

End advantage: 7 step — 5 minute daily set-up procedure.

*Ampex tapes are made and played around the world*

*TM AMPEX CORP

AMPEX

VIDEO PRODUCTS DIVISION - **AMPEX PROFESSIONAL PRODUCTS COMPANY**

934 Charter Street, Redwood City, California

sity of switching away from the radar while it is erased electrically or with external light. The retentivity of the GEC 1326 is a function of light level, exposure, and operating characteristics. Any one of these parameters, if varied, will affect the lag characteristic.

Table I illustrates the effect on retentivity of the 1326 with a change in relative faceplate illumination. As can be seen from the table, as faceplate illumination is increased the decay time decreases as long as the signal highlight current is kept at approximately 0.2 microamperes by readjusting target voltage for each change in illumination.

The change in faceplate illumination may be accomplished in an actual radarscope installation by varying display tube brightness or changing the f stop setting of the lens on the vidicon camera itself. This feature affords a degree of flexibility in operation of the tube in adapting it to radar pickup.

The GEC 1326 is, in all other aspects, a conventional vidicon and will operate interchangeably in any vidicon camera without provision for dynamic focus. There are several small compact vidicon cameras available which are ideally suited for this application. The camera may be of the random interlace type or may be driven by the station's sync generator to allow lap dissolves or superimposition. In any event, this type of radar installation utilizing the vidicon camera and built as a self-contained unit offers the most flexible operation at a minimum investment for the station.

## Typical Installations

The photograph of Figure 2 shows the approach one station has taken in the packaging of a surplus radar unit and the vidicon camera into a compact integral unit. The camera, a Dage 60 Series equipped with a GEC 1326 vidicon, views the radar indicator enclosed by the case with access door to reduce ambient light and reflections. The indicator tube has been removed from the original case and the leads extended to allow the tube to be enclosed with the camera and yet permit the controls for the indicator to be accessible from the operating position. A plate covers the opening in the control unit where the indicator was originally mounted. The control panel on the left contains the vidicon camera operating controls and metering circuits and on the right the monitor and oscilloscope for control of video amplitude and blanking. The installation affords a complete self-contained unit for weather radar telecasting which is completely functional yet involves a minimum of investment.

Figure 3 is a photograph of yet another installation. The unit is located, in this case, in the transmitter master control. The radar indicator, a Collins WP 101, and vidicon camera have been mounted on an unused film camera pedestal which contains all operating controls for the indicator and the camera. The camera, a General Electric industrial unit fitted with a GEC 1326, views the radar display tube directly through a multiplexing prism. The light box, containing a sliding panel with three white on black overlay maps, is multiplexed into the camera through the prism mirror. The prism is passive in the plane from camera to radar and effectively superimposes the overlay map and the radar indicator images. The sliding panel containing the three overlay maps, one for each range of the radar, is ingeniously designed with microswitches at the detents which are wired with suitable relays to change the radar range as the panel slides from one map to another. The front lighting for the overlay maps is controllable in intensity to provide proper balance in the superimposition. The small box next to the indicator permits controllable sector scanning of the radar display when desired. The entire area from the camera to the indicator is enclosed during operation to reduce ambient light.

During a weathercast, the signal from the pickup camera is fed to the control room where it is switched on the air or into a monitor in the studio at the discretion of the director.

These are but two of the vidicon pickup systems being employed in the production of television weathercasts, however, they will serve to acquaint the reader with the method of utilization of the vidicon camera and the GEC 1326 for weather radar telecasting.

# SKELTON MOBILE COLOR TV STUDIOS READY TO ROLL

**The new mobile TV studios of Red Skelton are equipped to produce and record complete color programs and commercials.**

A TRAVELING TV substation and studio will soon be in operation for "Red" Skelton, famous screen and TV star.

The one million dollar, three-bus caravan packed with the latest electronic and video tape recording equipment for both color and black and white TV shows is the latest venture for Red Skelton Enterprises. The traveling studio is designed to produce complete TV shows or commercials on the spot. Live TV broadcasts can also be made at any location that this mobile TV production unit may stop.


Figure 1. View through the windshield of the control room unit. Visible are two Ampex audio tape recorders which will provide special sound effects for Skelton's Red-Eo-Tape television productions.

The most important prerequisite for the TV buses was sturdy steel-framed construction. Crown Coach Corp. at 2500 E. 12th St. in Los Angeles, a pioneer in the construction of custom-designed buses, selected Bethlehem's High Strength Mayari R and cold rolled sheets to form the major structural elements for the buses which they built in their shop. Each bus, 40 ft. long and 8 ft. wide, has 12 shifts forward and two shifts in reverse. This will enable the director to set up in remote areas off the highway and on spots inaccessible to the average automobile.

Exceptional strength has been built into the bus roof to support cameramen and their equipment. Special hoists will be used to lift the heavy cameras to the top of the buses. Each fully loaded bus weighs about 20 tons.

The No. 1 mobile coach houses three color camera chains, a trio of black-and-white cameras, switching

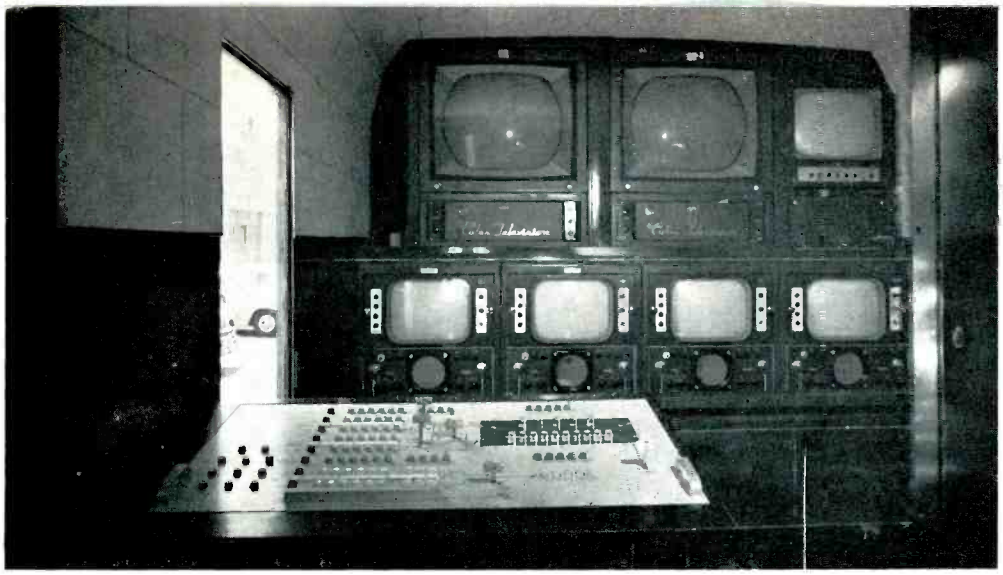


Figure 2. Interior view of executive control bus from which director controls all operations involved in producing a show or commercial on tape or direct telecasting. Both color and black and white telecasts can be made.

control, special effects unit and an audio system. The color cameras are the widely-used RCA TK-41 model with important innovations in the optics system, featuring dichroic mirror plates diagonally encased in glass "ice cubes" to produce the best possible picture quality. Previous color cameras utilized mirror plates sandwiched between thick sheets of glass, an arrangement which occasionally resulted in "ghost" or spurious images.

The transistorized switching equipment selected by Skelton Studios, an RCA TS-40 unit, handles up to 24 input signals and 10 outputs, or any combination. The transfer from one program event to another is made in a matter of micro seconds, eliminating the chance of disturbance to the TV picture. The TS-40 is said to provide the operator with sure-fire push button control of a wide variety of program source material

The Skelton Studios special effects system utilizes 80 or more transition patterns in changing from one picture to another, whether color, black-and-white or a combination of the two.

By means of a pushbutton selection panel and a control lever, the operator can move from one program segment to another with horizontal, vertical, triangular or diamond "wipes." The system's repertoire also includes corner, diamond and rectangular inserts of one picture into another. Lettered inserts, travelling matte and other externally generated signals are handled with equal ease.

A pattern is selected by pushing the proper control panel button. Directly opposite each button is a printed circuit card, bearing a picture of the pattern and with an arrow indicating which direction the pattern will follow across the TV screen when the control lever is moved. Other buttons allow the operator to call on an "out and back" picture transition. A "remote camera" pushbutton activates a film or live camera to produce keyed lettering or a special insert shape.

Three black-and-white cameras and an audio system complete the equipment package in the No. 1 mobile unit. The RCA TK-11 type TK-11 monochrome camera is an all-purpose unit geared for shorter "set-up" time, as well as faster and more accurate focusing—with the emphasis on simplified one-man operation.

Mobile unit No. 2 will contain a complete color film and slide system. In the RCA TK-26 film camera, color fidelity equals the high quality standards of the TK-41 studio color camera, at the same time providing superior black-and-white pictures.

In the control bus the director may operate either three color cameras or up to six black and white cameras from his central control position. The bus contains individual monitors for each camera as well as 21-inch color monitors and previewing monitors to be used in verifying the quality of the outgoing pictures. The audio portion of the equipment contains provisions for individual control of eighteen microphones as well as two tape recorders and record turntable. Communication on location is maintained by means of a radio telephone.

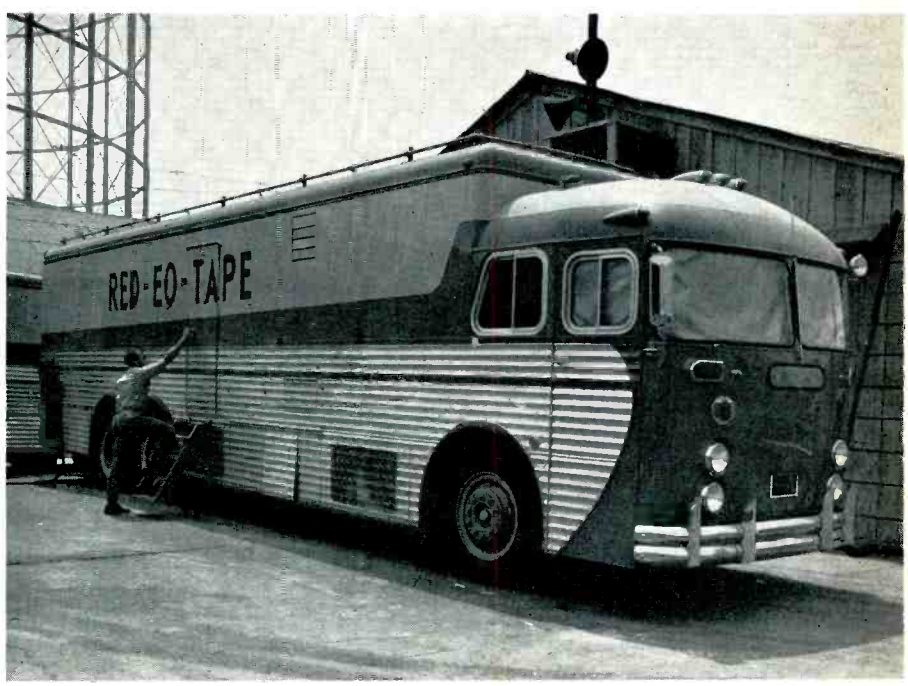



Figure 3. The recording bus, one of three buses which comprise the complete mobile TV studio, built by Crown Coach Corp.

The power bus contains two 85,000 watt generators; storage space for all cameras and associated electronic equipment; a heavy duty lift gate for ease in handling equipment; as well as a repair shop.

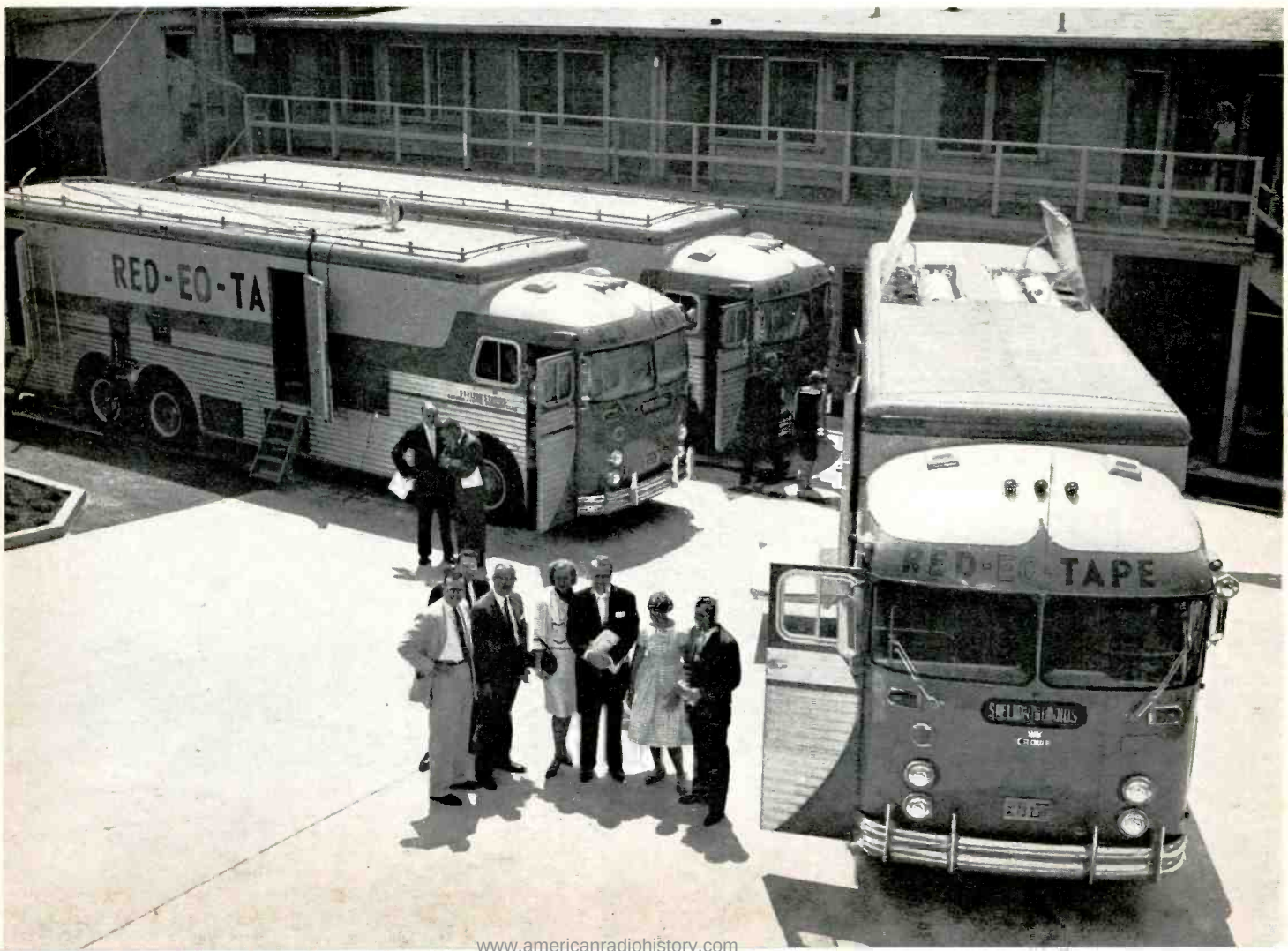
The recording bus contains the latest Ampex Videotape recording equipment. Special emphasis is made on color tape as the Red-Eo-Tape Organization believes the future market lies in an ever increasing use of color TV sets. Besides containing two video tape recorders, the recording bus also contains 16- and 35-mm film facilities whereby filmed commercials can be directly integrated into the video taped shows when the equipment is on location.

The buses are completely air conditioned and sound proofed. They have been designed from the ground up for the specific use as a mobile television station.

With improved color cameras, the very latest switching units and highly-versatile special effects system, plus film and slide equipment, Skelton Studios' mobile crews can produce top quality program material or commercials at home or in the field.

Figure 4. Inside recording van, Red Skelton inspects one of the color Videotape television recorders in his new mobile studio as Larry Weiland (left), manager of video engineering for Ampex, and Hal Salzman, marketing manager of Ampex Professional Products Co., accompany him.

Figure 5. Red Skelton unveils his new Red-Eo-Tape mobile color and monochrome television units at Skelton Studios in Hollywood. Grouped here with Skelton and the million-dollar facility are (left to right) Jerry Cudlipp, Larry Weiland and Hal Salzman of Ampex Professional Products Co.; Mrs. Skelton; the comedian's daughter Valentina, and Charles Luftig, Skelton's business partner and executive producer. The traveling studio incorporates two Videotape television recorders and multi-channel audio tape recording equipment manufactured by Ampex. With the mobile units, a complete color TV production can be recorded at any location without dependence on external equipment or personnel. The completeness extends to such details as editing, sound dubbing, integration of film portions and titles.




# THAT EXTRA KILOWATT COUNTS !

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- cooler operation
- longer life
- lower operating cost

**RF POWER AMPLIFIER & OSCILLATOR, CLASS C**
Typical Operation, Grounded Grid Circuit (Two Tubes)

| Frequency (MC) | 75 | 110 | 110 | 220* | |
|---|---|---|---|---|---|
| DC Plate Voltage | 6000 | 5000 | 4000 | 4000 | volts |
| DC Grid Voltage | 400 | 300 | 200 | 200 | volts |
| Peak RF Grid Voltage | 740 | 640 | 500 | 450 | volts |
| DC Plate Current | 3 | 3 | 2.75 | 2.5 | amps |
| DC Grid Current (approx.) | 0.62 | 0.66 | 0.70 | 0.40 | amps |
| Driving Power | 2240 | 1840 | 1350 | 760 | watts |
| Power Output (approx.) | 15,600 | 12,100 | 8600 | 5600 | watts |

**For operation above 110 mc. in TV applications, please consult our Application Engineering Department.*

**The new Amperex Type 7459,** forced-air cooled triode, was designed for use in many popular TV, FM and Broadcast transmitters operating in the 5, 10 and 25 KW ranges. By virtue of its exceptional ruggedness, reliability and cooler operation, this new 4 KW dissipation tube is becoming a preferred replacement for the conventional 2½ to 3 KW types.

The 7459 incorporates the exclusive Amperex "K" (carbide coated) grid which results in extremely low primary and secondary emission. The "K" grid has been operated at temperatures far above 1000°C with excellent life, thereby assuring reliable operation in *both* communications *and* industrial applications. Where short tube life is your problem in the 2½ to 3 KW dissipation range—the Amperex 7459 is your solution. Application engineering assistance is available.

**ask Amperex®**
for your copy of our latest condensed catalog covering a wide range of broadcasting and power tubes.

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# TV COVERAGE OF OLYMPIC GAMES FROM ROME

THE BIGGEST marathon of the 1960 Olympic Games in Rome (Aug. 25 to Sept. 10) was never witnessed by the spectators. It was a 24-hours-a-day race by the broadcasting personnel charged with televising the various athletic contests to the world.

As was the case with the Winter Olympics at California's Squaw Valley in February, television tape again made it possible for the broadcasters to conquer time and space. For the Rome events, however, the activity and scope was multiplied several times. In fact, the ever-growing use of magnetic tape recording in the television coverage of special events reached a new peak at the Italian capital during the 16-day period.

With the Columbia Broadcasting System holding exclusive TV rights for the Games coverage to the Canadian Broadcasting Corp., hub of the challenging CBS operation lay at Ciampino Airport, just outside Rome.

There, in a converted theater building, CBS sports producer Pete Molnar and chief engineer Art Schoenfuss ran a six-ring circus and provided enough excitement to have delighted Nero, even, had he been around to fiddle while some of the American athletes "burned" over their disappointing performances.

A total of 10 Ampex television recorders operated around the clock at four separate installations in Rome. Another unit worked out of Paris. And CBS often had as many as eight Ampex VTRs in use at New York

Figure 1. CBS Television staffers covering the Olympic Games in Rome are shown at the network's special Videotape recording center set up at Ciampino Airport.

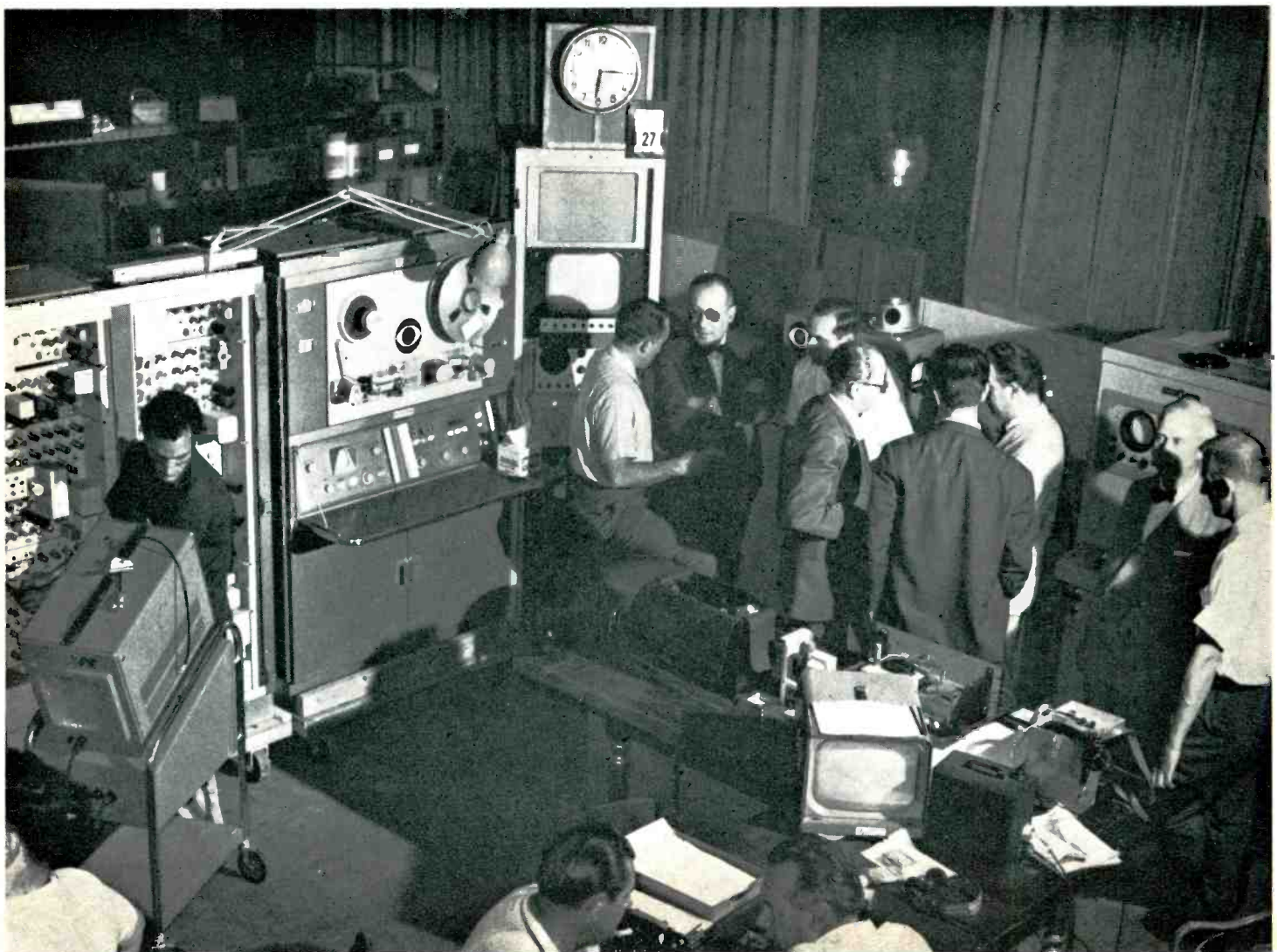


Figure 2. Bob Allison (left), Olympics coverage producer for CBS, and tape editor Ralph Poyntz review tape recording of the women's 400-meter swimming event.


Figure 3. John Triesner (left), utility, and Bill Clade, tape operator, with reel of Olympics tape as it arrives at CBS mobile tape unit parked at International Arrival Building, Idlewild International Airport, New York City.

on the Olympic Games, editing, dubbing and airing.

For its operation in Europe, CBS had three Ampex TV recorders at the Ciampino Airport headquarters, two console machines and one compact upright model, plus another Ampex recorder at Orly Field just outside Paris. The network stationed one of its mobile units at Idlewild International Airport, New York City, to play back tapes as soon as they arrived via jetliner. These playbacks were fed by microwave link to CBS Videotape Center, so that no time was lost in transport.

In addition to the CBS units, the British Broadcasting Corp. had an Ampex-equipped mobile unit in Rome, Japan's NHK had two Ampex recorders at Fiumicino Airport near Rome and Radiotelevisione Italiana, the official Italian Government network, stationed two Ampex recorders in a special Olympic Games control center plus two others in their regular control room. The CBS, BBC and NHK units were sent to Rome specially for the Games and were returned to their regular assignments in New York, London and Tokyo immediately upon the Games' conclusion.

At the center of the involved coverage were RAI's camera crews, working with some 40 cameras in the four main Olympic stadia and special remote locations. They fed signals back to RAI's special Olympics master control, from whence signals were re-routed through a commentators' room where correspondents from many countries added their respective commentary. With audio added, the signals were fed to the following:

*CBS*—through microwave for tape recording.

*BBC*—one signal for recording, another for live transmission through Eurovision.

*NHK*—a 7000 mc. microwave signal for recording.

*Eurovision*—separate signals to Switzerland (French, German and Italian audio), France's RTF, Belgium (French and Flemish audio), East Germany, West Germany, Denmark, Sweden, Finland, Norway.

*Yugoslavia, Czechoslovakia and Poland*—special microwave feed.

*Austria and Monte Carlo*—special feeds.

According to RAI engineers, kinescopes of the signals were made either in Poland or Czechoslovakia for air transport to Russia.

CBS crews, under the direction of Molnar and Schoenfuss, recorded the RAI signal. The incoming 625-line picture was converted to U. S. standard (525-line) by a special optical converter built for the network by Fernseh GMBH of Germany. The Fernseh unit utilizes special circuitry to reduce the 10-cycle flicker between 50 and 60. Schoenfuss reported that the CBS crew had made good dubs from one Ampex TV recorder, through the Fernseh converter, to a second Ampex recorder, playing back 625-line tapes and recording in 525-line standard.

CBS' three Videotape recorders taped those portions of the Games which would be of interest to U. S. viewers. At times this was the stock RAI feed; at other times CBS negotiated for special feeds. On all important events, Schoenfuss' crew made back-up recordings.

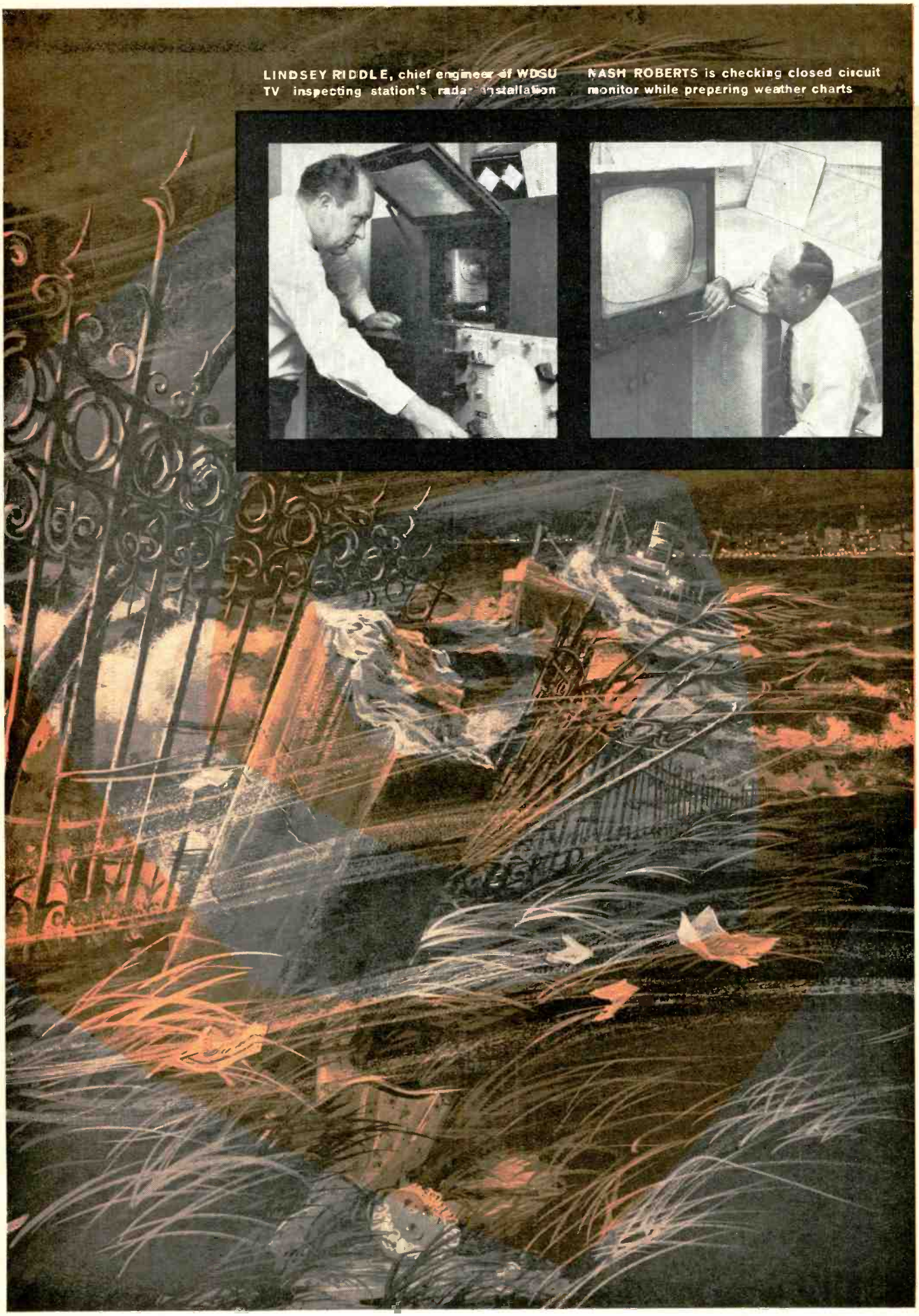
Upon completion, each recording was boxed and placed aboard jetliners bound for the United States. Back-up tapes were sent on different flights so that important segments could get through in the event one plane was delayed.

In addition, CBS had another Ampex recorder at Orly Field near Paris. Here certain portions of the Games were recorded from the RAI feed (with standards conversion), because the jet schedules out of Paris are better than out of Rome, and the Paris-New York flight averages 6½ hours compared to 8 hours for Rome-New York.

At New York's Idlewild International Airport, a fifth CBS Videotape recorder, this one in a mobile unit, was set up to play back incoming tapes direct (by microwave) to CBS master control. On occasion, a tape hit the air within 10 minutes after the plane landed. Usual operation was to dub the Idlewild tape feed onto two Ampex recorders at CBS Videotape Center so that editing could be done while the original tape was brought in from Idlewild.

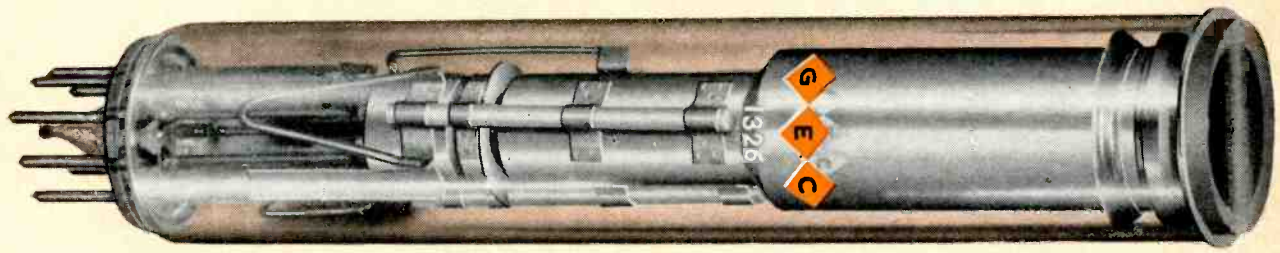
The 18-man CBS crew in Rome arrived about a week before the Olympic Games opened, although Schoenfuss and a part of his en-

(Continued on page 24)



LINDSEY RIDDLE, chief engineer of WDSU TV inspecting station's radar installation

NASH ROBERTS is checking closed circuit monitor while prepering weather charts




the GEC 1326 is especially sensitive to CRTs frequently used in weather radar displays

## *formula for public service:*

# WDSU TV 6 + Nash Roberts + G E C = Hurricane Safety for New Orleans

**weather radar coverage** of the 20 to 30-mile area surrounding New Orleans was impossible with existing radar installations in the area . . . until WDSU TV and Nash Roberts, internationally known meteorologist, got together to solve the problem.
In order to prevent unnecessary evacuation of the city during imminent storms, pinpointing exact locations within the city became the desired objective. The radar scanner was pointed at the best angle to cut ground clutter to a minimum and still be able to use pinpoint accuracy within a 20-mile circumference.

**vidicon pickup** posed the greatest challenge to Lindsey Riddle, Chief Engineer of WDSU TV. Being unable to get the quality pickup he demanded from other sources, he consulted GEC. GEC worked closely with WDSU TV and Mr. Riddle through the experimental stages by furnishing various types of tubes until a satisfactory result was gained in this unique application. GEC 1326 STORAGE vidicon did the trick. Two years after the first radar installation was made, and other make tubes failed, GEC's 1326 storage vidicon is giving the sharpest image possible under CONTINUOUS 'round the clock operation.
Daily live pickup from Nash Robert's meteorological offices five blocks from WDSU TV's studios is accomplished by means of a coaxial cable closed circuit hook-up of the weather radar. He telecasts from his chart room, referring to his monitor where a live camera picks up a clear image of radar weather conditions in the "close-in" area of New Orleans.

**do you have a weather radar** telecast problem? GEC has proved that under conditions where others fail, GEC Vidicons have been the dependable answer. GEC has vidicons for all broadcast requirements . . . live or film pickup in black and white or color, with or without provision for dynamic focus; scan conversion, image conversion, and display tubes. For full information, contact General Electrodynamics Corporation.

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# BIRTH OF A BOTTLE

**The story behind the design and construction of transmitting tubes used in broadcast transmitters.**

By DWIGHT "RED" HARKINS

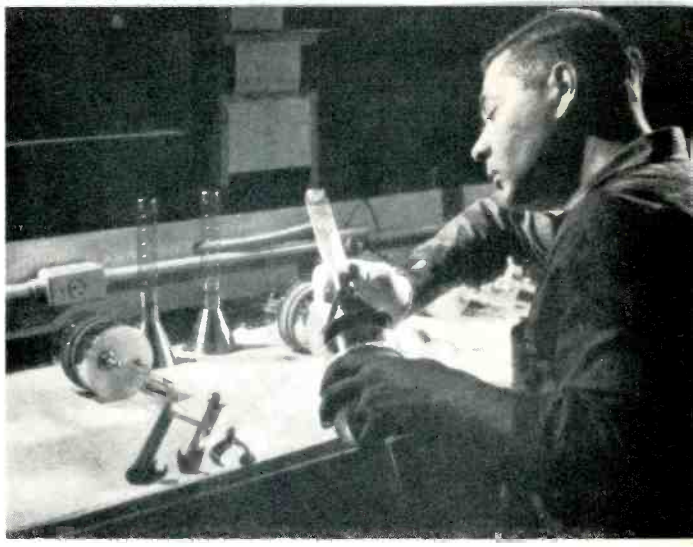
In every transmitting plant, whether it be AM, FM or TV, the signal depends upon large specialized tubes affectionately called "bottles." Of all the things required to make a transmitter run, the tubes are probably the only component which the station engineer couldn't improvise himself.

Very few engineers are aware of the design and production problems that preceded their phone call to the local supplier for immediate delivery of a new tube so they can get back on the air. Although the problem of explaining to the management about (1) high cost of tubes and (2) why they don't run forever will not be solved by this article, it is hoped that some insight to the supply end of transmitting tubes will result.

This report of my recent visit to the Amperex Electronics Corp. plant in Hicksville, N. Y., will show that the production of these transmitting tubes demands the liberal use of skilled craftsmen working to very fine, and often microscopic limits, as well as the carefully planned blending of the craftsman's skill with modern automatic production techniques. I was especially impressed by the blending of personal skill and mechanical technique quickly apparent during my visit. Words couldn't describe the feeling that no battles existed between the human craft and the inhuman machine, but rather a positive co-operation between the two existed that has obviously resulted in not only perfection of the end product, but perfection in large quantities.

Ever since the start of broadcasting, search has constantly been made for better and more efficient transmitting tubes. The transmitter designer can choose between circuitry revolving around existing tube types or by cooperation from the tube manufacturer, receive a new type tube to fit a specific circuit. The latter was the case during the preliminary design of the Standard Electronics television transmitter several years ago. Leading to the birth of the type 5924A was the desire to deliver 5,000 watts of power with minimum possible drive in a grounded grid-wide band type of circuit. One of the tubes already being made by Amperex for the R. F. industrial heating service was the water-cooled type 5923. It was found that this tube could be modified slightly to permit air cooled "tuned cavity" type operation and still retain its high power gain and rugged long life proven features. Thus, through close cooperation between the tube and transmitter manufacturer, the type 5924A has proven itself to be a vital contribution to reliable operation of countless TV and FM transmitters as well as other VHF high power amplifiers.

While visiting the Amperex factory I observed all stages of the manufacture of this particular type of tube. Starting with the raw materials used in the electrodes, all impurities must be removed. A hydrogen atmosphere furnace "burns out"



even deep-rooted oxides from the various types of metals that are used. Cleanliness is much more than a byword here since tube life and reliability depend upon the absolute elimination of even the slightest impurity.

The individual elements are then formed by precision machines especially equipped with optical and other measuring devices to insure absolute accuracy of the dimensions as well as the spacing. An error of only a thousandth of an inch could lead to rejection. After ultrasonic cleaning, the tube elements are then assembled by highly skilled hands under immaculately clean conditions.

Then comes the most dramatic part to watch, which is the forming and joining of the glass portion of the tube. This takes place in a "lathe like" machine where hot gas flames are used instead of cutting tools and the shapeless hunk of glass quickly is formed and joined up to be sealed to the lower portion which contains the previously mounted electrodes.

The completed assembly then proceeds to the department that creates the vacuum inside the tube. This involves not only the removal of gas but also includes the pumping out of gas that is trapped within the tube elements. Toward this end, the filament is lit and kept on during the final stages of evacuation.

The final step then is to "fire it up" and subject the new tube to actual operating conditions where all characteristics are tested to insure that the tube not only meets but exceeds specified ratings. All over the place I noted "bottles" of all sizes running with their plates red hot in actual transmitter circuits. These were random samples taken from regular production and being subjected to "life" tests. In this manner a rigid control is maintained since these samples are run for thousands of hours and then completely examined.

A visit to the engineering department revealed some of the mysteries surrounding tube design. For example, if the number of turns of wire making up the grid were increased by only a small amount, the amplification factor of the tube would increase radically. If the spacing of the grid is made close to the cathode a similar increase in mu would take place. Of course certain limits are reached in the manipulations of elements to arrive at the desired operating characteristic.

I was told that the development of a particular tube type has taken as long as 24 months at a total expense of nearly $200,000 before a single one was ready for sale. From this research, a whole family of tubes then develops, each with individually different characteristics and a slightly different application.

From an operational standpoint, station engineers will be interested in knowing that the correct filament voltage at all times is the most important feature to insure long tube life. The voltage should be measured at the socket terminals with an accurate voltmeter rather than trusting the panel mounted meters. A 10 per cent increase in filament voltage produces double emission and cuts tube life 50 per cent. Another operational hint is always to warm up and cool off the tubes as gradually as possible. Tubes that have seen many hours of service can be extended by this gentle treatment.

According to the Amperex engineers, they have proven that the maintaining of constant operating temperature extends tube life. A change of 10 degrees in the air going through the blower can cause an old tube with a tired-brittle filament to give up its life. The most important thing however is to maintain accurate filament voltage (which is the main source of the tube heat) and to protect the filament from sudden changes in temperature.

I also discussed some of the problems that exist in many of the older FM transmitters in regard to the neutralization of push-pull triode Class C amplifiers. The problem here seems to lie in the area of obtaining matched tubes which, even though well within the manufacturer's tolerances, still are not usable in the transmitter. Transmitters of earlier design did not reckon with these small tube vagaries and, furthermore, in many cases were designed without proper consultation with the tube manufacturers. It was further pointed out that modern grounded grid amplifiers such as the 5924A permit high gain yet preserve bandwidth.

**". . . U. K. viewers saw a 45-minute show every night . . ."**

**OLYMPIC GAMES** starts on page 18

gineering section were on the scene well ahead of that time. The three Ampex recorders were shipped from Chicago at the close of the Republican National Convention.

Viewers in the United Kingdom saw 45 minutes of the Olympics every night on the BBC program, "Sportsview." A three-man BBC crew recorded the in-coming RAI feed on an Ampex recorder housed in their new mobile van. The recorder was the same one used for the Paris summit conference, Princess Margaret's wedding and President Eisenhower's visit to the United Kingdom.

The 625-line pictures were edited in the BBC mobile van and put into segments for a combined tape, live and film presentation sent from RAI's studios over the Eurovision lines. The European picture standard (625-lines) was converted to 405-lines at BBC's conversion station in Dover.

NHK (Nippon Hoso Kyokai), the semi-government operated Japan Broadcasting Corp., used two Ampex TV recorders at its headquarters in Fiumicino Airport. Fiumicino is Rome's newest airport, so new, in fact, that no planes were flying out of it at the time of the Olympics. CBS had been scheduled to locate there but moved to Ciampino when it was learned that the new airport would not open in time. Since time was less of a factor for the Japanese (airline schedules from Rome to Tokyo do not allow rapid transit and the time zone change completely eliminates "same day" coverage), they remained at Fiumicino. NHK relied on the Videotape recorders for bulk coverage. An RAI engineer reported that NHK recorded more tape than anyone else. For rapid, same day coverage, the NHK team used a slow scanning unit similar to the device used by the BBC for trans-Atlantic picture transmission to the United States and Canada. The NHK system involves shooting film at eight frames per second, quick processing the film and then scanning each individual frame for transmission over two 600-cycle bands in the audio spectrum (500-1100 cycles and 200-2600 cycles). Since it requires 30 seconds for the scanning of each frame, four hours of scanning and transmission are necessary for one minute of film.

Continental European viewers saw the Games through Eurovision. By means of RAI's complex but efficient multi-lateral feeds and commentators stationed in a central point, the language problems were solved. In many cases, individual stations or government network centers recorded the RAI-originated signal for delayed broadcast at prime viewing times. Some 40 Ampex TV recorders are now installed in Italy, Germany, France, Sweden, Finland, Denmark and Switzerland.

In Italy, of course, viewers saw complete Olympic coverage on every station. RAI used its four Ampex recorders for Eurovision playback and for local programming.

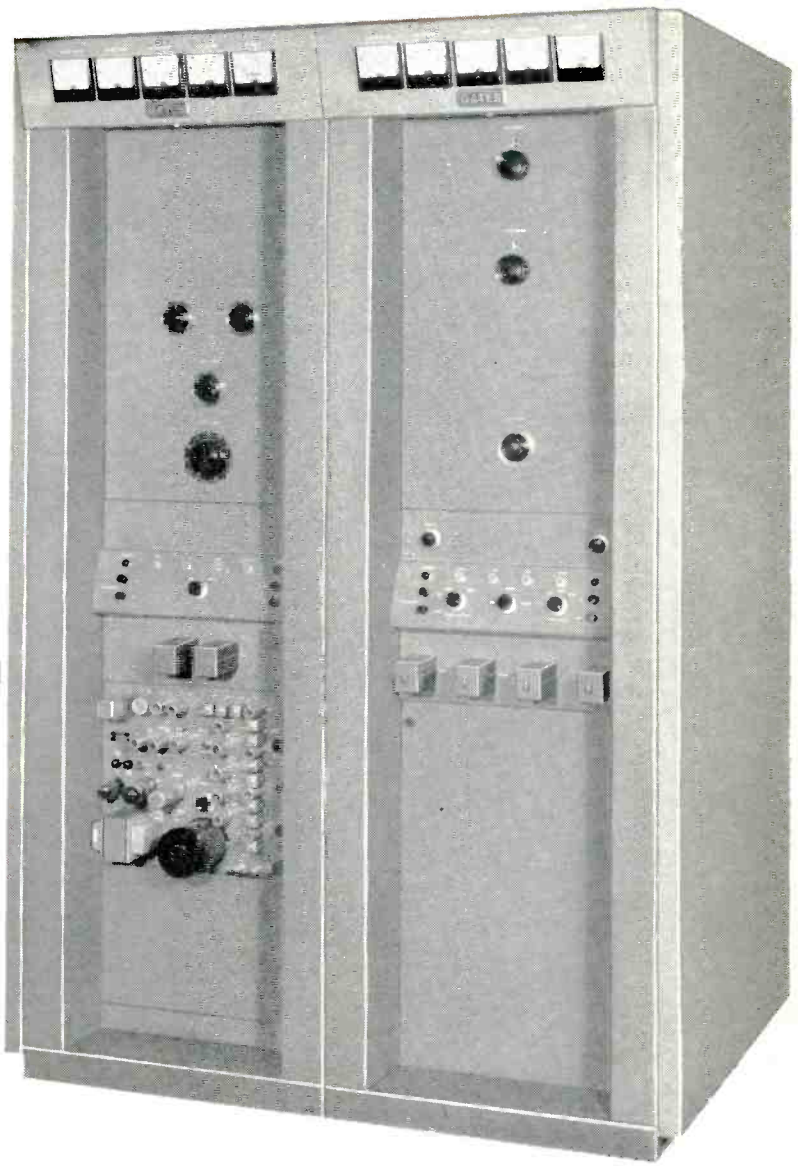
Tape truly has become the world-wide medium for television coverage of special events, be it a summit conference, royal wedding or international athletic contest.

# STABILITY

*is why!*

# GATES FM-5B

*largest selling 5KW FM Transmitter manufactured today!*



**Stability is what station engineers look for in FM transmitters, and stability was the engineering objective during research and design of the Gates FM-5B 5000 watt FM broadcast transmitter.**

The left cabinet of the FM-5B is a complete 250 watt FM transmitter, including exciter, provision for multiplex, 250 watt amplifier, control circuits and power supplies. The 5000 watt power amplifier is totally isolated in the right cabinet, with separate power supplies, relay equipment and metering. From exciter output at 10 watts through 5000 watts, there are only 2 radio frequency stages. This is *stability* for ease in tune-up and then staying that way.

Provision for single or dual channel multiplex eliminates adaptor arrangements when multiplex is added. The new Gates multiplex system is widely acclaimed for its new approach in simplicity and effective operation.

RF harmonics are handled from within, and an external coaxial style notch filter is standard equipment to protect the TV band. And, the twin 6076 tubes in the 5 kilowatt PA have a big conservative factor, very important in operating cost consideration through long tube life.

*Stability* spells *reliability* . . . that's one reason why the Gates FM-5B is the largest selling 5000 watt FM transmitter manufactured today. *Stability* is what engineers demand *and get* when they specify the Gates FM-5B for 5000 watts.

For additional technical information, write for the Gates FM Fact File, which includes price lists and engineering bulletins on all Gates FM transmitters, from 10 watts to 10,000 watts. Yours for the asking.

GATES

**GATES RADIO COMPANY**

*Subsidiary of Harris-Intertype Corporation*

**QUINCY, ILLINOIS**

HARRIS INTERTYPE CORPORATION

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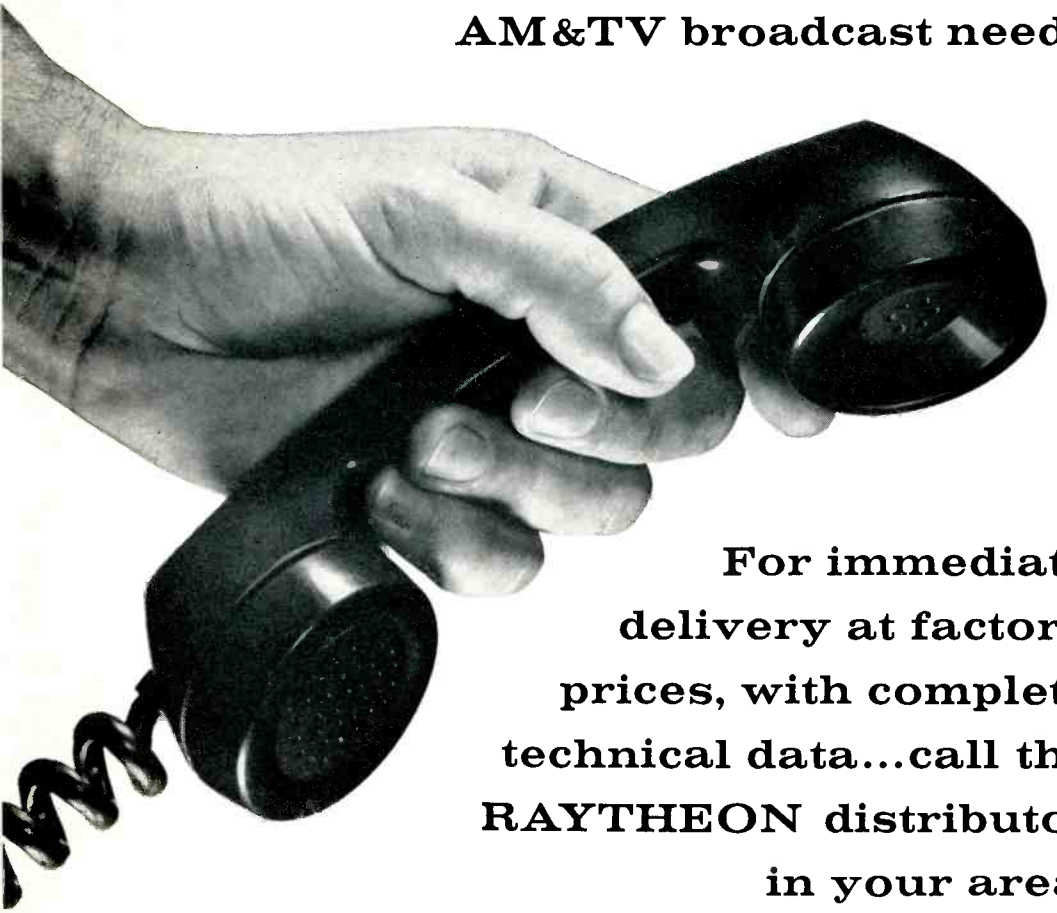
## Raytheon/Machlett tubes mean highest quality for all your FM AM&TV broadcast needs



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# AMENDMENTS AND PROPOSED CHANGES OF F.C.C. REGULATIONS

## INTERIM POLICY ON VHF TELEVISION CHANNEL ASSIGNMENTS; AND TELEVISION ENGINEERING STANDARDS

### Order Extending Time for Filing Comments

At a session of the Federal Communications Commission held at its offices in Washington, D. C., on the 26th day of August, 1960;

The Commission has before it for consideration a petition filed in this proceeding on August 24, 1960, by the Association of Federal Communications Consulting Engineers requesting that the time for filing comments herein be extended for a period of 30 days from September 1, 1960 (to Saturday, October 1, 1960) and that the time for filing reply comments be extended for a similar period from September 16, 1960 (to Sunday, October 16, 1960).

In support of its petition, the Association states that its computations based on the propagation curves, dated June 20, 1960, included with the Commission's further notice of proposed rule making (FCC 60-766), released July 1, 1960, have disclosed discrepancies in the order of 7.5 db in the permissible Effective Radiated Power to protect an existing station (considering a change in separation of about 25 miles) with those obtained using the high band VHF curves released with the original Notice in this proceeding. This difference in computed ERP is of such magnitude that a substantial part of the work done by the Association at an earlier stage will have to be completely revised; and that such revision will require considerable time to complete. The Association believes that it is important to give further consideration to revising the high band propagation curves, in view of its findings, to more accurately depict the field intensities to be expected within the service range of a television station. For other cogent reasons, it urges that its request for an extension of time be granted to enable it to perfect its comments on this subject.

Although it is desirable to avoid unnecessary delay in concluding this proceeding, it appears, on the basis of the representations of the Association, that it would serve the public interest to extend the time for filing comments and reply comments to September 30, 1960, and to October 14, 1960, respectively;

*Accordingly, it is ordered,* That the Petition for Further Expansion of Time for Filing Comments, filed herein on August 24, 1960, by the Association of Federal Communications Consulting Engineers, is granted, and that the time for filing comments and reply comments is extended to September 30, 1960, and October 14, 1960, respectively.

### Station Identification by Television Broadcast Translator Stations

On July 27, 1960, the Commission adopted a Report and Order in Docket No. 12116, amending Part 4, Subpart G of the Commission rules to provide for the licensing of television broadcast translator stations on VHF television channels 2-13.

Section 4.783 of the rules which relates to station identification, contains a paragraph (c) which describes the manner in which call signs will be formed. Briefly, the call sign would be formed with an initial letter, K or W, followed by the channel number assigned to the translator and a two-letter suffix. This is the procedure which has been followed for UHF translator call signs.

It has been brought to the attention of the Commission that the call signs assigned to television broadcast translators operating on Channels 2 through 9 would be similar to call signs assigned to Amateur Radio Stations and would, in fact, duplicate such call signs.

In order to avoid such duplication of call signs, the call signs assigned to television broadcast translator stations will in all cases consist of an initial letter, K or W, followed by two digits designating the channel assigned to the translator and followed by a two-letter suffix. The channel designator portion of the call sign for television broadcast translator stations operating on Channels 2 through 9 will use a zero before the channel number as one of the digits. For example, the first VHF translator authorized to operate on Channel 2 and located east of the Mississippi River will be assigned the call sign W02AA.

Therefore, § 4.783 of the rules should be appropriately amended to set forth clearly the procedure for the formation of call signs for television broadcast translator stations.

The amendment adopted herein pertains to the administrative function of the Commission in the assignment of call signs to radio stations and may be accomplished and made effective without compliance with the public notice, procedural, and effective date require-

ments of section 4 of the Administrative Procedure Act.

Authority for the amendment herein is contained in sections 4 (i) and 303 (o) of the Communications Act of 1934, as amended, and section 0.341 (a) of the Commission's Statement of Organization, Delegations of Authority and Other Information.

*Accordingly, it is ordered,* Effective September 7, 1960, That § 4.783 (c) of the Commission rules and regulations is amended by adding a new sentence. The paragraph as amended will read as follows:

**§ 4.783 Station identification.**

* * * * *

(c) Call signs for television broadcast translator stations will be made up of the initial letter K or W followed by the channel number assigned to the translator and two letters. The use of the initial letter will generally follow the pattern used in the broadcast service, i.e., stations west of the Mississippi River will be assigned an initial letter K and those east of the Mississippi River the letter W. The two letter combinations following the channel number will be assigned in order and requests for the assignment of particular combinations of letters will not be considered. The channel number designator for Channels 2 through 9 will be incorporated in the call sign as a two-digit number, i.e., 02, 03, 04, 05, 06, 07, 08, or 09, to avoid similarities with call signs assigned to Amateur Radio Stations.

**Subpart G—Television Broadcast Translator Stations**

DEFINITIONS AND ALLOCATION OF FREQUENCIES

**§ 4.701 Definitions.**

(a) *Television broadcast translator station.* A station in the broadcasting service operated for the purpose of retransmitting the signals of a television broadcast station or another television broadcast translator station, by means of direct frequency conversion and amplification of the incoming signals without significantly altering any characteristic of the incoming signal other than its frequency and amplitude, for the purpose of providing television reception to the general public.

(b) *Primary station.* The television broadcasting station radiating the signals which are retransmitted by a television broadcast translator station.

(c) *VHF translator.* A television broadcast translator station operating on a VHF television broadcast channel.

(d) *UHF translator.* A television broadcast translator station operating on a UHF television broadcast channel.

**§ 4.702 Frequency assignment.**

(a) An applicant for a new television broadcast translator station or for changes in the facilities of an author-

# Plug-in reliability with ALTEC professional audio equipment

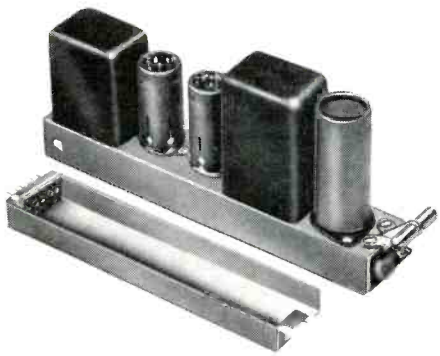
**250 SU CONSOLE** Combining compact simplicity with maximum flexibility through Altec advanced design, the new 250 SU Altec has proven to be the ultimate in control consoles for TV, AM, FM, recording studio or sound system use. Newly designed miniature plug-in preamplifiers, and utility input devices of uniform size and interchangeability permit free range in number and type of amplifiers used per console.

Characterized by single unit construction for simplicity (amplifiers and controls within same housing) and economical installation, Altec's 250 SU features an externally mounted power supply for cool operation and isolation of strong magnetic fields.

Providing complete circuitry for all stereo or universal operating functions, there is no finer, more reliable control console serving the audio industry. Individual components are available complete with plug-in trays for custom and rack installation.

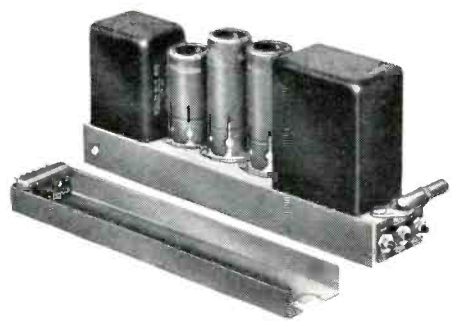
**THE 250 SU FEATURES:**

- Meets NAB, EIA, and recording requirements
- "Plug-in" units completely interchangeable
- Low impedance mixing
- Speech-music filter
- D.C. heater supply
- Utility input devices for tape-disc-line-networks, etc.
- Tube testing provisions
- Expandable to jack fields, equalizers, etc.
- Up to 10 mixing channels
- Single channel operation
- Two channel operation
- Two channel/three channel operation
- "Stereo" operation
- Illuminated meters
- Color coded controls
- 16 connected inputs
- Microphone level or "high level" on any input



**458A "PLUG-IN" PREAMPLIFIER** An extemely simple, highly reliable, low noise preamplifier, the 458A incorporates a single stage push-pull cross-neutralized vacuum tube circuit, transformer coupled to source and load. Maximum reliability with unfailing performance are achieved through simplified design featuring fewer components, extremely accurate balance of input and output transformers, and premium quality pre-aged, shielded tubes. The failure of either tube will not cause loss of program.

**SPECIFICATIONS GAIN:** 40db unterminated input, 34 db terminated. **POWER OUTPUT:** +20 dbm at less than .5% THD 50 to 15,000 cps. +25 dbm at less than 1% THD at 1 KC. **FREQUENCY RESPONSE:** ± 1 db 20 to 20,000 cps. **SOURCE IMPEDANCE:** 150 or 600 ohms (centertap for 600 ohms). **LOAD IMPEDANCE:** 150 to 600 ohms (centertap for 600 ohms). **OUTPUT IMPEDANCE:** Equal to load impedance. **NOISE LEVEL:** Equivalent input noise: −126 dbm. **POWER SUPPLY:** 15ma at 275vdc and .7a at 6.3vdc. **TUBES:** 2−6072/12AY7. **DIMENSIONS:** 1 3/4" W x 3 15/16" H and 9 11/16" L. **COLOR:** Cad plate, dichromate dip. **WEIGHT:** 3 1/2 lbs. (including tray). **SPECIAL FEATURES:** Push buttons for individual tube test. 40ma dc can be applied to center taps for simplexing. **ACCESSORIES:** 13225 Rack Mounting Assembly (for 9 units). 13401 Mounting Tray Assembly. 5981 Tube Test Meter. 535A Power Supply.



**459A "PLUG-IN" PROGRAM AMPLIFIER** A highly reliable, low noise program amplifier with exceptionally large power capability, the 459A consists of a 2-stage push-pull circuit with a balanced negative feedback loop. Push-pull operation of all stages provides reliability, interchangeability with preamplifiers for added gain and power. Superior overall performance results from special input and output transformer design of ultrafine balance combined with premium quality pre-aged shielded tubes. Program transmission is not interrupted by failure of either output tube.

**SPECIFICATIONS GAIN:** 56 db unterminated input, 50 db terminated. **POWER OUTPUT:** +30 dbm at less than .5% THD 30 to 20,000 cps. +35 dbm at less than 1% THD at 1 KC. **FREQUENCY RESPONSE:** ±1 db. 20 to 20,000 cps. **SOURCE IMPEDANCE:** 150 or 600 ohms (centertap for 600 ohms). **LOAD IMPEDANCE:** 150 or 600 ohms (centertap for 600 ohms). **NOISE LEVEL:** Equivalent input noise: −126 dbm. **POWER SUPPLY:** 40ma at 275 vdc and 1.6a at 6.3vdc. **TUBES:** 1−6072/12AY7, 2−12BH7. **DIMENSIONS:** 1 3/4" W x 3 15/16" H x 9 11/16" L. **COLOR:** Cad plate, dichromate dip. **WEIGHT:** 3 1/2 lbs. (including tray). **SPECIAL FEATURES:** Push buttons for individual tube test. 40ma dc can be applied to center taps for simplexing. **ACCESSDRIES:** 13225 Rack Mounting Assembly (for 9 units). 13401 Mounting Tray Assembly. 5981 Tube Test Meter. 535A Power Supply.

**535A POWER SUPPLY** Compact, highly reliable, the 535A is the DC power supply for furnishing the operating voltages to the Altec 458A and 459A amplifiers used together with the Altec 250 SU Console. Externally mounted to preclude hum, the 535A employs silicon rectifiers in both the filament and "B" supplies. The 535A connects to the 250 SU by means of a 4-foot multiple conductor cable terminated in a type P306CCT Jones plug which "mates" with a Jones receptacle in the 250 SU Console. A single screw frees the power supply unit from its mounting bracket for inspection.

**SPECIFICATIONS POWER OUTPUT:** 275vdc at 275ma. At 275ma ripple is .02v peak to peak max. 6.3vdc at 13a. At 13a evc ripple is 1.5v peak to peak max. **POWER INPUT:** 117v 50-60 cps 245 watts at full load. **RECTIFIERS:** Silicon. **CONTROLS:** 1. Power Switch. 2. Circuit Breaker (Push to reset). 3. 4 Position tap switch (provides adjustment of voltage by autoformer action to accommodate 2 to 1 range of loads). **COLOR:** Dark Green. **WEIGHT:** 16 pounds. **SIZE AND MOUNTING:** 7 3/16" W x 9 5/8" H x 7" D overall.

**ALTEC LANSING CORPORATION**

Dept. BEB-1D

*A subsidiary of Ling-Temco Electronics, Inc.*

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ALTEC LANSING CORPORATION

ized station shall endeavor to select a channel on which its operation is not likely to cause interference to the reception of other stations. The application must be specific with regard to the frequency requested. Only one channel will be assigned to each station.

(b) Any one of the 12 standard VHF television channels (2-13 inclusive) may be assigned to a VHF translator on condition that no interference is caused to the direct reception of any television broadcast station operating on the same or an adjacent channel.

(c) Any one of the upper 14 standard UHF channels (70-83 inclusive) may be assigned to a UHF translator provided that the proposed translator site is not located:

(1) Within 20 miles of a television broadcast station or city which is assigned the second, third, fourth, fifth, or eighth channel above or below the requested channel.

(2) Within 55 miles of a television broadcast station or city which is assigned an adjacent channel.

(3) Within 60 miles of a television broadcast station or city which is assigned the seventh channel above or the seventh or fourteenth channel below the requested channel.

(4) Within 75 miles of a television broadcast station or city which is assigned the fifteenth channel below the requested channel.

(5) Within 155 miles of a television broadcast station or city which is assigned the same channel as the requested channel unless the requested channel is assigned in the Table of Assignments appearing in § 3.606 (b) of this chapter, to the city in which the proposed translator is to be operated and has not been assigned to a television broadcast station in that city.

(d) The distances specified in paragraph (c) of this section are to be determined between the proposed site of the television broadcast translator station and the main Post Office location in any city listed in § 3.606 (b) of this chapter unless the channel shown therein has been assigned to a television broadcast station, in which case the distance shall be determined between the proposed site of the translator and the transmitter site of the television broadcast station. Changes in the Table of Assignments of § 3.606 (b) of this chapter may be made without regard to existing or proposed television broadcast translator stations and, where such changes result in minimum separations less than those specified above, the licensee of an affected UHF television broadcast translator station shall file an application for a change in channel assignment to comply with the required separations. In the case of changes in the Table of Assignments affecting VHF channels, existing VHF television broadcast translator stations causing interference to reception of VHF broadcast channels shall eliminate the interference or file an application for a change in channel assignment.

(e) No minimum distance separation between TV translators operating on the same channel is specified. However, assignments which will obviously result in mutual interference between translators will not be made.

(f) Adjacent channel assignments will not be made to television broadcast translator stations intended to serve all or a part of the same area.

**§ 4.703 Interference.**

(a) An application for a new television broadcast translator station or for changes in the facilities of an authorized station will not be granted where it is apparent that interference will be caused. In general, the licensee of a new UHF translator shall protect existing UHF translators from interference resulting from its operation. If interference develops between VHF translators, the problem shall be resolved by mutual agreement among the licensees involved.

(b) It shall be the responsibility of the licensee of a VHF translator to correct at its expense any condition of interference to the direct reception of the signals of a television broadcast station operating on the same channel as that used by the VHF translator or on an adjacent channel, which occurs as the result of the operation of the translator. Interference will be considered to occur whenever reception of a regularly used signal is impaired by the signals radiated by the translator, regardless of the quality of such reception or the strength of the signal so used. If the interference cannot be promptly eliminated by the application of suitable techniques, operation of the offending translator shall be suspended and shall not be resumed until the interference has been eliminated. If the complainant refuses to permit the translator licensee to apply remedial techniques which demonstrably will eliminate the interference without impairment of the original reception, the licensee of the translator is absolved of further responsibility.

(c) It shall be the responsibility of the licensee of a television broadcast translator station to correct any condition of interference which results from the radiation of radio frequency energy by its equipment on any frequency outside the assigned channel. Upon notice by the Commission to the station licensee or operator that such interference is being caused, the operation of the television broadcast translator station shall be suspended immediately and shall not be resumed until the interference has

MODEL 642
List $390.00

# Here's what some of the top TV audio engineers told us this dramatic new microphone can do:

***reach**** two to six times the distance of cardioid types

***reach*** with ambient noise and reverberation pickup reduced to one third that of cardioid types

***reach*** that greatly improves audio "Presence"

***reach*** that allows the use of wider-angle camera shots

***reach*** that frequently eliminates the necessity of pre-recording

***separation*** of vocalist and band, controlled to a degree never before possible

***reduction*** of critical audio feedback problems

***substitution*** of the 642 for bulky parabolic microphones, with better band pickup on football remotes

***improved*** signal-to-noise ratio due to extremely high level output

*Microphone Working Distance

For the first time extreme directivity, and wide range and highest output have been combined in one microphone. Unlike any other microphone available, the new E-V Model 642 allows new camera and sound techniques to improve production quality and lower production costs.

The 642 is so different we urge you to try it yourself in *your* studio. If you have problems with sound, this new working tool may well provide the answer. Your franchised E-V Broadcast distributor will soon be stocking this amazing new microphone. Why not arrange *TODAY* for your own test of the new Electro-Voice 642?

Write Dept. 100-V, Buchanan, Michigan, for complete literature.

*better products for better sound*

Electro-Voice®

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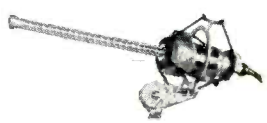


been eliminated or it can be demonstrated that the interference is not due to spurious emissions by the television broadcast translator station: *Provided, however,* That short test transmissions may be made during the period of suspended operation to check the efficacy of remedial measures.

(d) In each instance where suspension of operation is required, the licensee shall submit a full report to the Commission after operation is resumed, containing details of the nature of the interference, the source of the interfering signals, and the remedial steps taken to eliminate the interference.

ADMINISTRATIVE PROCEDURE

**§ 4.711 Cross reference.**

See § § 4.11 to 4.16.

LICENSING POLICIES

**§ 4.731 Purpose and permissable service.**

(a) Television broadcast translator stations provide a means whereby the signals of television broadcast stations may be retransmitted to areas in which direct reception of such television broadcast stations is unsatisfactory due to distance or intervening terrain barriers.

(b) A television broadcast translator station may be used only for the purpose of retransmitting the signals of a television broadcast station or another television broadcast translator station which have been received directly through space, converted to a different channel by simple heterodyne frequency conversion, and suitably amplified.

(c) The transmissions of each television broadcast translator station shall be intended for direct reception by the general public and any other use shall be incidental thereto. A television broadcast translator station shall not be operated solely for the purpose of relaying signals to one or more fixed receiving points for retransmission, distribution, or further relaying.

(d) The technical characteristics of the retransmitted signals shall not be deliberately altered so as to hinder reception on conventional television broadcast receivers.

(e) A television broadcast translator station shall not deliberately retransmit the signals of any station other than the station it is authorized by license to retransmit. Precautions shall be taken to avoid unintentional retransmission of such other signals.

**§ 4.732 Eligibility and licensing requirements.**

(a) A license for a television broadcast translator station may be issued to any qualified individual, organized group of individuals, broadcast station licensee, or local civil governmental body, upon an appropriate showing that plans for financing the installation and operation of the station are sufficiently sound to insure prompt construction of the station and dependable service for the duration of the license period.

(b) More than one television broadcast translator station may be licensed to the same applicant, whether or not such stations serve substantially the same area, upon an appropriate showing of need for such additional stations. TV translators operated by TV broadcast station licensees are not counted as TV stations for purposes of § 3.636 concerning multiple ownership.

(c) Only one channel will be assigned to each television broadcast translator station. Additional television broadcast translator stations may be authorized to provide additional reception. A separate application is required for each television broadcast translator station and each application shall be complete in all respects.

(d) A VHF translator will not be authorized to serve an area which is receiving satisfactory service from one or more UHF television broadcast stations or UHF translators unless, upon consideration of all applicable public interest factors, it is determined that, exceptionally, such intermixture of VHF and UHF service is justified.

(e) The Commission will not act on applications for new television broadcast translator stations or for changes in the facilities of an existing station where such changes will result in an increase in signal range in any horizontal direction until 30 days have elapsed since the date on which "Public Notice" is given by the Commission of acceptance for filing of such application, in order to afford licensees of existing television broadcast stations an opportunity to comment with respect to the effect of the proposed translator on their operation.

**§ 4.733 [Reserved]**

**§ 4.734 Unattended operation.**

(a) A television broadcast translator station may be operated without a licensed radio operator in attendance if the following requirements are met:

(1) If the transmitter site cannot be reached promptly at all hours and in all seasons, means shall be provided so that the transmitting apparatus can be turned on and off at will from a point which is readily accessible at all hours and in all seasons.

(2) The transmitter shall also be equipped with suitable automatic circuits which will place it in a non-radiating condition in the absence of a signal on the input channel.

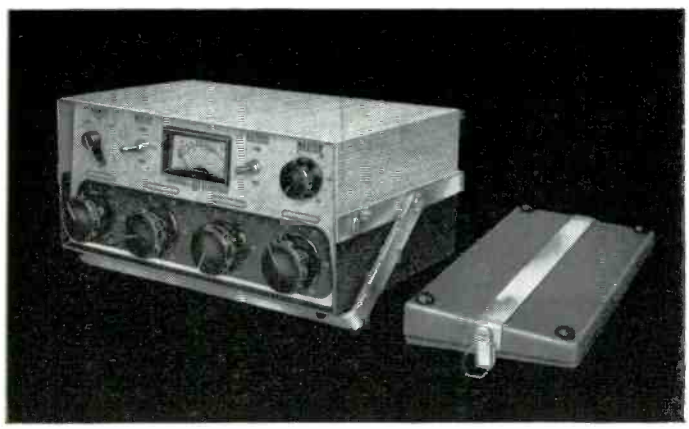
(3) The transmitting apparatus and the on-and-off control, if at a location other than the transmitter site, shall be adequately protected against tampering by unauthorized persons.

(4) The Commission shall be supplied with the name, address, and telephone number of a person or persons who may be contacted to secure prompt suspension of operation of the translator should such action be deemed necessary by the Commission.

(5) In cases where the antenna and supporting structure are considered to be a hazard to air navigation and are required to be painted and lighted under the provisions of Part 17 of this chapter, the licensee shall make suitable arrangements for the daily inspection and logging of the hazard markings required by § § 17.37 and 17.38 of this chapter.

(b) An application for authority to construct a new television broadcast translator station or to make changes in the facilities of an authorized station, and which proposes unattended operation, shall include an adequate showing

# New portable audio amplifier—only 19½ lbs!



Carrying handle functions as base to position unit for most convenient operating angle.

***Completely transistorized — not a tube in the circuit.***

The first time you lift it you'll be thankful for transistors — because it is 100% transistorization that makes this lightweight reliable design possible.

General Electric's new Type BA-26-A has built-in studio quality. Designed for AM-FM-TV and recording use, this portable amplifier provides console quality for remote broadcasts such as sports events, concerts and spot news. Besides the customary microphone inputs, this portable amplifier features a high-level input for tape or transcription.

Here is the first portable audio amplifier containing its own regulated self-contained power supply with a range of 95 to 135 volts a-c. Provision for battery operation is also included. A laminated plastic front panel preserves permanent markings and allows space for other information to be added and erased without damaging the surface.

For complete specifications on the latest in General Electric's new line of Transistorized Audio equipment, write Technical Products Operation, Communication Products Department, Section 49100, General Electric Company, Lynchburg, Virginia.

GENERAL ELECTRIC

as to the manner of compliance with this section.

(c) Unless the applicant specifically requests unattended operation and makes the showing required by paragraph (b) of this section, a licensed radio operator meeting the requirements of § 4.766 shall be on duty at the transmitter site whenever the station is operated.

**§ 4.735 Power limitations.**

(a) The transmitter power output of a VHF translator shall be limited to a maximum of 1 watt peak visual power. In no event shall the transmitting apparatus be operated with power output in excess of the manufacturer's rating.

(b) The transmitter power output of a UHF translator shall be limited to a maximum of 100 watts peak visual power. In no event shall the transmitting apparatus be operated with power output in excess of the manufacturer's rating.

(c) No limit is placed upon the effective radiated power which may be obtained by the use of horizontally or vertically directive transmitting antennas.

**§ 4.736 Emissions and bandwidth.**

(a) The license of a television broadcast translator station authorizes the transmission of the visual signal by amplitude modulation (A5) and the accompanying aural signal by frequency modulation (F3).

(b) Standard width television channels will be assigned and the transmitting apparatus shall be operated so as to limit spurious emissions to the lowest practicable value. Any emissions including intermodulation products and radio frequency harmonics which are not essential for the transmission of the desired picture and sound information shall be considered to be spurious emissions.

(c) Any emissions appearing on frequencies more than 3 megacycles above or below the upper and lower edges respectively of the assigned channel shall be attenuated no less than 30 decibels below the peak power of the visual signal.

(d) Greater attenuation than that specified in paragraph (c) of this section may be required if interference results from emissions outside the assigned channel.

**§ 4.737 Antenna location.**

(a) An applicant for a new television broadcast translator station or for a change in the facilities of an authorized station shall endeavor to select a site which will provide a line-of-sight transmission path to the entire area intended to be served and at which there is available a suitable signal from the primary station. The transmitting antenna should be placed above growing vegetation and trees lying in the direction of the area intended to be served to minimize the possibility of signal absorption by foliage.

(b) A site within 5 miles of the area intended to be served is to be preferred if the conditions in paragraph (a) of this section can be met.

(c) Consideration should be given to accessibility of the site at all seasons of the year aand to the availability of facilities for the maintenance and operation of the television broadcast translator station.

(d) The transmitting antenna should be located as near as is practicable to the transmitter to avoid the use of long transmission lines and the associated power losses.

(e) Consideration should be given to the existence of strong radio frequency fields from other transmitters at the translator site and the possibility that such fields may result in the retransmission of signals originating on frequencies other than that of the primary station.

EQUIPMENT

**§ 4.750 Equipment and installation.**

(a) The transmitting apparatus employed at a television broadcast translator station must meet the requirements for type acceptance by the Commission. These requirements are set forth in paragraph (c) of this section.

(b) Transmitting antennas, antennas used to receive the signals to be rebroadcast, and transmission lines do not have to be type accepted. External preamplifiers may also be used provided that they do not cause improper operation of the translator and compliance with specifications in paragraph (c) of this section does not depend upon the use of such preamplifiers.

(c) The following requirements must be met before translator equipment will be type accepted by the Commission:

(1) The frequency converter and associated amplifiers shall be so designated that the electrical characteristics of a standard television signal introduced into the input terminals will not be significantly altered by passage through the apparatus except as to frequency and amplitude. The overall response of the apparatus within its assigned channel when operating at its rated power output and measured at the output terminals, shall provide a smooth curve, varying within limits separated by no more than 4 decibels: *Provided, however*, That means may be provided to reduce the amplitude of the aural carrier below those limits, if necessary to prevent intermodulation which would mar the quality of the retransmitted picture or result in emissions outside of the assigned channel.

(2) Radio frequency harmonics of the visual and aural carriers, measured at the output terminals of the transmitter, shall be attenuated no less than 60 decibels below the peak visual output power

within the assigned channel. All other emissions appearing on frequencies more than 3 megacycles above or below the upper and lower edges, respectively, of the assigned channel shall be attenuated no less than:

(i) 30 decibels for transmitters rated at less than 10 watts power output.

(ii) 40 decibels for transmitters rated at 10 watts or more power output.

(3) The local oscillator employed in the frequency converter shall maintain its operating frequency within 0.02 percent of its rated frequency when subjected to variations in ambient temperature between minus 30 degrees and plus 50 degrees Centigrade and variations in power main voltage between 85 per cent and 115 per cent of the rated supply voltage.

(4) The apparatus shall contain automatic circuits which will maintain the peak visual power output constant within 2 decibels when the strength of the input signal is varied over a range of 30 decibels and which will not permit the peak visual power output to exceed the maximum rated power output under any condition. If a manual adjustment is provided to compensate for different average signal intensities, provision shall be made for determining the proper setting for the control and if improper adjustment of the control could result in improper operation, a label shall be affixed at the adjustment control bearing a suitable warning.

(5) The apparatus shall be equipped with automatic controls which will place it in a non-radiating condition when no signal is being received on the input channel, either due to absence of a transmitted signal or failure of the receiving portion of the translator. The automatic control may include a time delay feature to prevent interruptions in the translator operation caused by fading or other momentary failures of the incoming signal.

(6) The tube or tubes employed in the final radio frequency amplifier shall be of the appropriate power rating to provide the rated power output of the translator. The normal operating constants for operation at the rated power output shall be specified. The apparatus shall be equipped with suitable meters or meter jacks so that appropriate voltage and current measurements may be made while the apparatus is in operation.

(7) The transmitter shall be equipped with an automatic keying device which will transmit the call sign assigned to the station, in international Morse Code, within 5 minutes of the hour and half-hour. Transmission of the call sign shall be accomplished either by interrupting the radiated signals in the proper code sequence or by amplitude modulating the radiated signals with

an audio frequency tone containing the telegraphic identification. The modulating signal may be inserted at any suitable stage in the apparatus but shall result in at least 30 per cent amplitude modulation of the aural carrier. If an audio frequency tone is used it shall not be within 200 cycles of the 1,000 cycle tone used for CONELRAD alerting.

(8) Wiring, shielding, and construction shall be in accordance with accepted principles of good engineering practice.

(d) Type acceptance will be granted only upon a satisfactory showing that the apparatus is capable of meeting the requirements of paragraph (c) of this section. The following procedures shall apply:

(1) Any manufacturer of apparatus intended for use at television broadcast translator stations, may request type acceptance by following the procedures set forth in Part 2, Subpart F, of this chapter. Equipment found to be acceptable by the Commission will be listed in the "Radio Equipment List, Part A, Television Broadcast Equipment," published by the Commission. These lists are available for inspection at any Field Office of the Commission and at the Washington, D.C. offices of the Commission.

(2) Television broadcast translator apparatus which has been type accepted by the Commission will normally be authorized without additional measurements by the applicant.

(3) Construction permits may be granted for the installation of custom-built apparatus which has not been type accepted by the Commission. In such cases, the permittee shall submit the information required by Part 2, Subpart F, of this chapter, together with sufficient measurements and data to show that the apparatus meets the requirements of paragraph (c) of this section. The measurements shall be made by a qualified electronic engineer with instruments of sufficient accuracy to insure the reliability of the data.

(4) Other rules concerning type acceptance, including information regarding withdrawal of type acceptance, modification of type accepted equipment and limitations on the findings upon which type acceptance is based, are set forth in Part 2, Subpart F, of this chapter.

(e) The installation of a television broadcast translator station employing custom-built apparatus or apparatus which has not been type accepted by the Commission, shall be made by or under the direct supervision of a person having the technical skill and engineering knowledge required to make a proper installation.

(f) The installation of a television broadcast translator station employing type accepted apparatus may be made by a person with sufficient technical knowledge and skill to correctly follow the manufacturer's instructions.

(g) Simple repairs such as the replacement of tubes, fuses, or other plug-in components and the adjustment of non-critical circuits which require no particular technical skill may be made by an unskilled person. Repairs which require the replacement of attached components, adjustment of critical circuits, or technical measurements shall be made only by a person with the knowledge and skill to perform such tasks.

(h) Any tests or adjustments which require the radiation of signals for their completion and which could result in improper operation of the apparatus, shall be made by or under the immediate supervision of a licensed first or second class radiotelephone operator.

(i) The transmitting antenna may be designed to produce either horizontal, vertical, or circular polarization.

**§ 4.751 Equipment changes.**

(a) No change, either mechanical or electrical, may be made in apparatus which has been type accepted by the Commission without prior authority of the Commission. If such prior authority has been given to the manufacturer of type accepted equipment, the manufacturer may issue instructions for such changes citing its authority. In such cases, individual licensees are not required to secure prior Commission approval but shall notify the Commission when such changes are completed.

(b) Formal application (FCC Form 346) is required for any of the following changes:

(1) Replacement of the transmitter as a whole, except by one of an identical type.

(2) A change in the transmitting antenna system, including the direction of radiation, directive antenna pattern, or transmission line.

(3) An change in the antenna which will increase the overall height above ground by more than 20 feet or will result in an overall height of more than 170 feet above ground.

(4) Any change in the location of the transmitter except a move within the same building or upon the same pole or tower.

(5) Any horizontal change in the location of the transmitting antenna of more than 500 feet.

(6) A change of frequency assignment.

(7) A change of the primary TV station being retransmitted.

(8) A change of authorized operating power.

(c) Other equipment changes not specifically referred to above may be made at the discretion of the licensee, provided that the Engineer in Charge of the radio district in which the television broadcast translator station is located and the Commission's Washington, D. C., office are notifed in writing upon completion of such changes, and provided further that the changes are appropriately reflected in the next application for renewal of license of the television broadcast translator station.

TECHNICAL OPERATION

**§ 4.761 Frequency tolerance.**

The licensee of a television broadcast translator station shall maintain the visual carrier frequency and the aural center frequency at the output of the translator within 0.02 per cent of its assigned frequencies when the primary station is operating exactly on its assigned frequency. This tolerance shall not be exceeded, at times when the primary station is not exactly on its assigned frequencies, by more than the amount of departure by the primary station.

**§ 4.762 Frequency monitors and measurements.**

(a) The licensee of a television broadcast translator station is not required to provide means for measuring the operating frequencies of the transmitter. However, only equipment having the required stability will be approved for use at a television broadcast translator station.

(b) In the event that a television broadcast translator station is found to be operating beyond the frequency tolerance prescribed in § 4.761, the licensee shall promptly suspend operation of the translator and shall not resume operation until the translator has been restored to its assigned frequencies. Adjustment of the frequency determining circuits of a television broadcast translator station shall be made only by a qualified person in accordance with § 4.750 (g).

**§ 4.763 Time of operation**

(a) A television broadcast translator station is not required to adhere to any regular schedule of operation. However, the licensee of a television translator station is expected to provide a dependable service to the extent that such is within its control and to avoid unwarranted interruptions to the service provided.

(b) If causes beyond the control of the licensee require that a television broadcast translator station remain inoperative for a period in excess of 10 days, the Engineer in Charge of the radio district in which the station is located shall be notified promptly in writing, describing the cause of failure and the steps taken to place the station in operation again, and shall be notified promptly when the operation is resumed.

(c) Failure of a television broadcast translator station to operate for a period of 30 days or more, except for causes beyond the control of the licensee, shall be deemed evidence of discontinuance of operation and the license of the station will be cancelled.

(d) A television broadcast translator station shall not be permitted to radiate during extended periods when signals of the primary station are not being retransmitted.

**§ 4.764 Station inspection**

The licensee of a television broadcast translator station shall make the station and the records required to be kept by the rules in this subpart, available for inspection by representatives of the Commission.

**§ 4.765 Posting of station license.**

(a) The station license and any other instrument of authorization or individual order concerning the construction of the station or the manner of operation shall be kept in the station record file maintained by the licensee so as to be available for inspection upon request to any authorized representative of the Commission.

(b) The call sign of the translator together with the name, address, and telephone number of the licensee or local representative of the licensee if the licensee does not reside in the community served by the translator, shall be displayed at the translator site on the structure supporting the transmitting antenna, so as to be visible to a person standing on the ground at the transmitter site. The display shall be prepared so as to withstand normal weathering for a reasonable period of time and shall be maintained in a legible condition by the licensee.

**§ 4.766 Operator requirements.**

(a) No licensed radio operator is required for the routine operation of a television broadcast translator station provided that the requirements of § 4.734 are met. Otherwise, an operator holding a valid restricted radiotelephone operator permit or a first or second class radiotelephone operator license shall be on duty at the place where the transmitting apparatus is located at all times when the apparatus is being operated.

(b) A licensed operator employed to operate a TV translator may, at the discretion of the licensee, be employed for other duties or for the operation of another class of station or stations in accordance with the class of license which he holds and the rules and regulations governing such other stations. However, such duties shall in nowise interfere with the operation of the TV translator station.

**§ 4.767 Marking and lighting of antenna structures.**

The marking and lighting of antenna structures employed at a television broadcast translator station, where required, will be specified in the authorization issued by the Commission. Part 17 of this chapter sets forth the conditions under which such marking and lighting will be required and the responsibility of the licensee with regard thereto.

**§ 4.768 Additional orders.**

In cases where the rules contained in this part do not cover all phases of operation or experimentation with respect to external effects, the Commission may make supplemental or additional orders in each case as may be deemed necessary.

**§ 4.769 Copies of rules.**

The licensee of a television broadcast translator station shall have current copies of Part 3, Part 4, and in cases where antenna marking is required, Part 17 of this chapter available for use by the operator in charge and is expected to be familiar with those rules relating to the operation of a television broadcast translator station. Copies of the Commission's rules may be obtained from the Superintendent of Documents, Government Printing Office, Washington 25, D.C., at nominal cost.

OPERATION

**§ 4.781 Station records.**

(a) The licensee of a television broadcast translator station shall maintain adequate station records, including the current instrument of authorization, official correspondence with the Commission, maintenance records, contracts, permission for rebroadcasts, and other pertinent documents.

(b) Where an antenna structure is required to be painted or illuminated, see § 17.38 of this chapter.

(c) The station records shall be made available upon request to any authorized representative of the Commission.

(d) Station records shall be retained for a period of two years.

**§ 4.782 [Reserved]**

**§ 4.783 Station identification.**

(a) The call sign of a television broadcast translator station shall be transmitted in international Morse Code, by means of an automatic keying device, at the beginning of each period of operation and, during operation, within 5 minutes of the hour and half hour. This transmission may be accomplished either by turning the visual and aural carriers of the translator on and off in the proper sequence or by superimposing an audio frequency tone containing the telegraphic identification, on the visual and aural carriers radiated by the translator. The modulation level of the identifying signal shall not be less than 30 per cent of the aural signal.

(b) The Commission may, in its discretion, specify other methods of identification.

(c) Call signs for television broadcast translator stations will be made up of the initial letter K or W followed by the channel number assigned to the translator and two letters. The use of the initial letter will generally follow the pattern used in the broadcast service, i.e., stations west of the Mississippi River will be assigned an initial letter K and those east of the Mississippi River the letter W. The two letter combinations following the channel number will be assigned in order and requests for the assignment of particular combinations of letters will not be considered.

**§ 4.784 Rebroadcasts.**

(a) The term "rebroadcast" means the reception by radio of the programs or other signals of a radio or television station and the simultaneous or subsequent retransmission of such programs or signals for direct reception by the general public.

(b) The licensee of a television broadcast translator station shall not rebroadcast the programs of any television broadcast station or other television broadcast translator station without obtaining prior consent of the station whose signals or programs are proposed to be retransmitted. The Commission shall be notified of the call letters of each station rebroadcast and the licensee of the television broadcast translator station shall certify that written consent has been received from the licensee of the station whose programs are retransmitted.

(c) A television broadcast translator station is not authorized to rebroadcast the transmissions of any class of station other than a television broadcast station or another television broadcast translator station.

PRE-EXISTING REPEATERS

**§ 4.790 Special requirements for pre-existing VHF repeaters.**

(a) Until October 31, 1961, the provisions of this section shall apply to repeater stations which are rebroadcasting TV signals on VHF Channels 2-13, and which were constructed on or before July 7, 1960. The term "repeater station" is used in this section of the rules to refer to low power devices for the reception, amplification and retransmission of television signals, irrespective of whether the output channel is the same as the input channel, or is a different channel as in the case of VHF translators.

(b) On or before October 31, 1960, the operators of all devices covered in paragraph (a) of this section shall file with the Commission at its Washington offices an application for temporary authorization to continue operation. Such application shall be filed on FCC Form 347-A in accordance with instructions accompanying that Form.

(c) Applicants must comply with requirements imposed by law, including those found in the following sections of the Communications Act of 1934:

(1) Section 308(b) which requires that the application be signed by the applicant under oath or affirmation.

(2) Section 310 which, among other things, prohibits the issuance of a license to an alien or an organization of which any officer or director is an alien.

(3) Section 325 which prohibits rebroadcasting of the programs of another broadcasting station without the express authority of the other station. Applicants must certify that such consent has been obtained in writing and is available for inspection by the Commission.

(d) An applicant for a temporary authorization under this section shall certify in his application that on or before February 1, 1961 he will file an application on FCC Form 346 for authority to replace or modify the facility for which temporary authorization is sought, so as to conform to all the requirements set out in §§ 4.701 through 4.784 of this Subpart G of the Commission's rules with respect to television broadcast translators.

(e) Existing repeaters may not be modified, and no new translator may be constructed, prior to the issuance of Commission approval of an application filed on FCC Form 346 for authorization to make a desired modification or to construct a new translator.

(f) Temporary authorizations issued under this section of the rules will be valid only until October 31, 1961. On or before that date persons responsible for the operation of all repeaters must complete all the steps required to comply with all the requirements of §§ 4.701 through 4.784 of this Subpart G of the Commission's rules.

# Industry News

### Foto-Video Appoints Dines As West Coast Manager

Foto - Video Electronics, Inc., has announced the appointment of Jess E. Dines as manager of its new West Coast engineering office, located in Los Angeles.

Mr. Dines, one of the most widely-known engineering consultants in the East, was born in New York and spent most of his life there. In 1949 he was graduated from the RCA Institute, where he majored in advanced technology. For several years he taught radio and basic and advanced radar techniques as a civilian at the Fort Monmouth Signal Corps school. Thereafter Mr. Dines taught radio-TV at Gotham Trade Schools in New York, and traveled widely and lectured as educational director in those fields.

He was employed at Bell Laboratories as a senior technical writer on missiles, and as a project engineer with Aerovox. He also is the author of numerous other technical literature.

The address of the new West Coast office of Foto-Video is 1317 West 214 St., Torrance, Calif.

### New F.C.C. Problem—Is Multiplexing for the Birds?

Many uses for the FM multiplex subchannels have been proposed but none so unique as one recently developed by Dwight Harkins, president of Harkins Radio Co. Having become aware of the serious damage caused to farms and orchard groves by infestations of starlings, Mr. Harkins plans to utilize FM multiplex to transmit the distress calls of starlings which will be picked up and fed to sound systems in the affected areas.

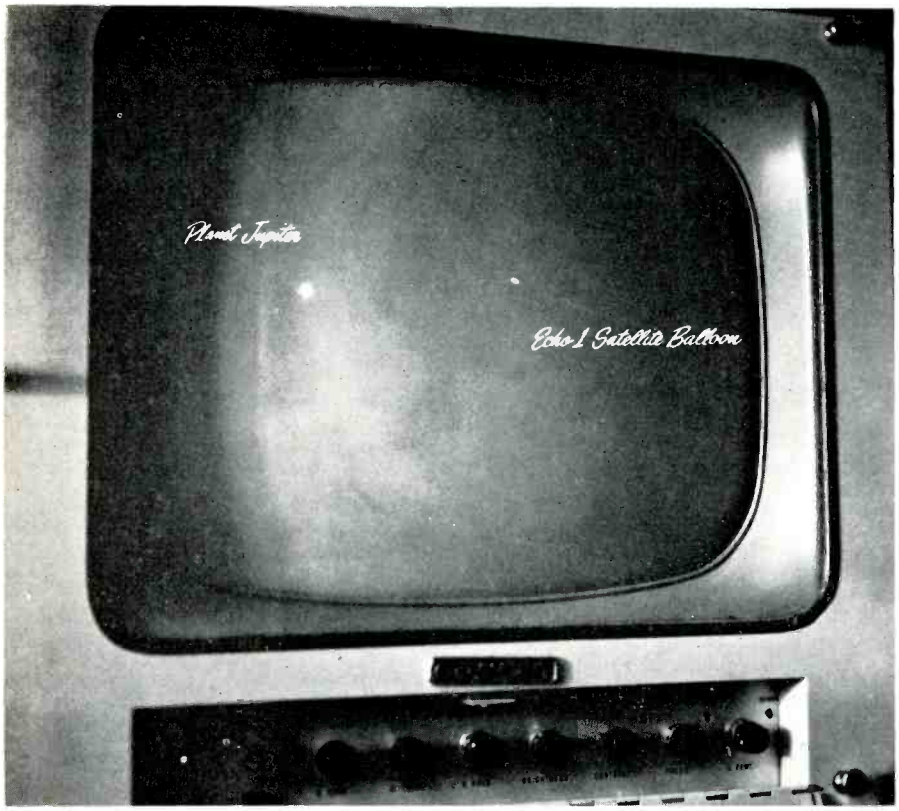
These calls have been used successfully in the past to drive away the birds but the use has been limited to a localized area. The plan calls for the signal from the multiplex receiver to be retransmitted over a low power transmitter operating in one of the industrial services. Since the speakers would be installed in areas of great size making physical connection by wire impractical, each speaker location would receive the signal from the transmitter by a transistorized receiver. Because crop damage by starlings causes millions of dollars of losses annually, a commercial need for the service exists.

Mr. Harkins has discussed the service and the necessary amendments to the regulations with the F. C. C. Mr. Harkins, who is former owner of KTYL-TV, KTYL, and KTYL-FM, has pioneered in the development and application of FM multiplex techniques.

### Dale Buzan to Sarkes Tarzian

Dale Buzan has been appointed manager, production engineering, for the Broadcast Equipment Division of Sarkes Tarzian, Inc., it is announced by Biagio Presti, manager of the division.

## WROC-TV ROCHESTER TELEVISES ECHO I




On the night of Aug. 15, technicians set up a RCA field camera equipped with the new RCA 4401 super-sensitive image orthicon camera tube. They recorded the path of Echo I Satellite Balloon over Rochester at 10 p.m. on videotape, for transmission to area viewers on its 11th Hour News. The videotape was also fed to the NBC-TV Network during the Huntley-Brinkley News.

Because of perfect weather, technicians were able to get an excellent picture and the videotape sequence shows the satellite approaching horizon-right and passing closely to the planet Jupiter.

This photograph was taken by polaroid from the videotape monitor.

### Adler Names Two Field Engineers

Joseph E. Baker and Kenneth L. Blum have been appointed field sales engineers by Adler Electronics, Inc., New Rochelle, N. Y. Mr. Baker will cover New England, New York and Pennsylvania. Mr. Blum will cover the East Coast, from Delaware through South Carolina. Adler manufactures TV transmitting and repeating equipment.

## Classified

**Advertising rates in the Classified Section are ten cents per word. Minimum charge is $2.00. Blind box number is 50 cents extra. Check or money order must be enclosed with ad.**

### EQUIPMENT FOR SALE

**TV VIDEO MONITORS**—8Mc., Metal cabinets starting at $189.00. Never before so much monitor for so little cost. 30 different models, 8" thru 24". Miratel, Inc., 1083 Dionne St., St. Paul, Minn. 2-60 11t

**Combination Recording Studio** and home for sale. Business is good. Repeat clientele. I want to retire—you take over. No junk equipment. Cook Recorders, 3905 W. Slauson Ave., Los Angeles 43, Calif. 7-60 tf

**Commercial Crystals** and new or replacement crystals for RCA, Gates, W. E. Bliley and J-K holders; regrinding, repair, etc. BC-604 crystals. Also A. M. monitor service. Nationwide unsolicited testimonials praise our products and fast service. Eidson Electronic Company, Box 31, Temple, Texas. 10-60 tf

**Ampex 400** single case portable with manual controls. Very good condition. $400. Jon Monsen, 1350 N. Harding, Pasadena, California. 10-60 1t

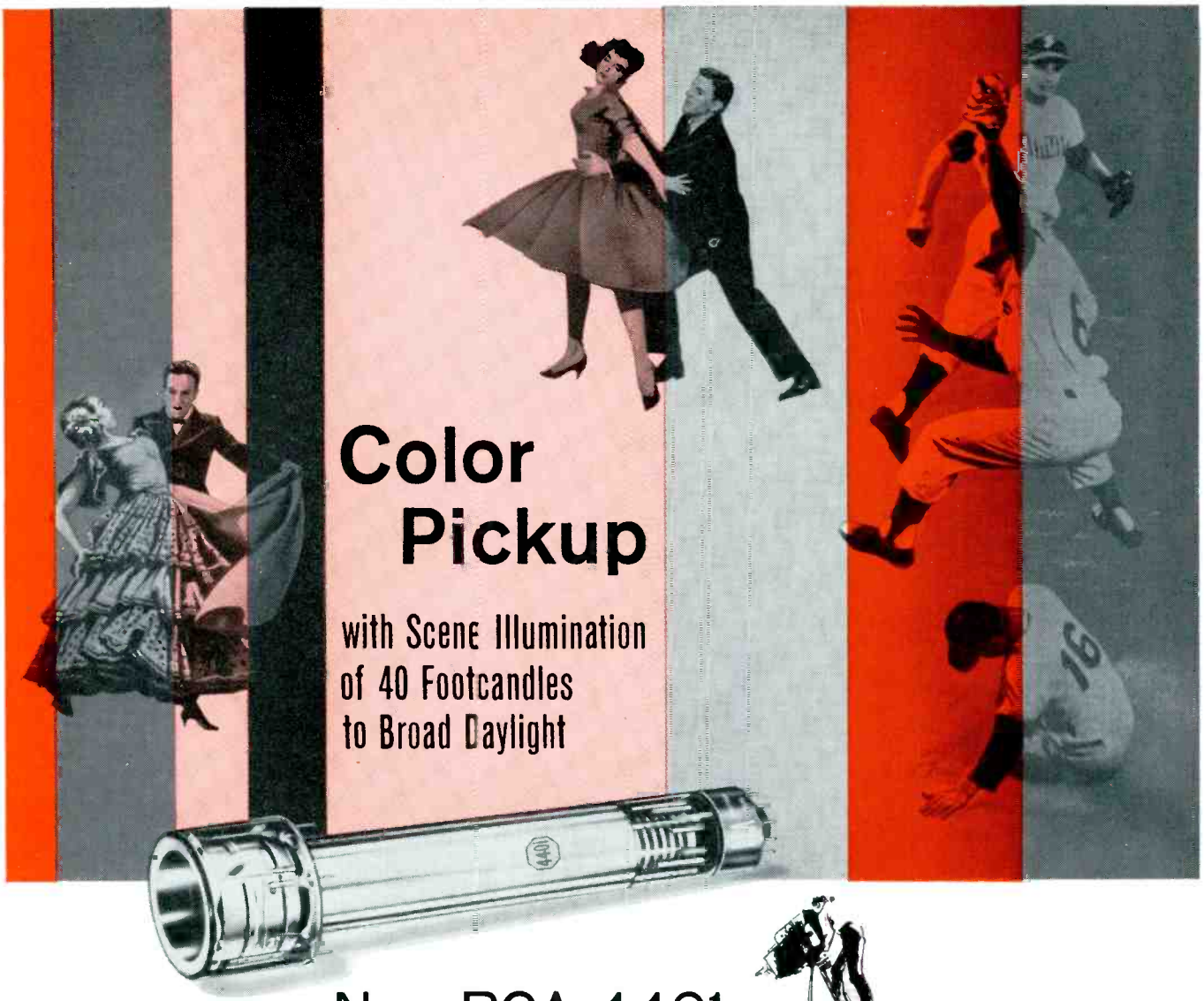
### SERVICES

**Cambridge Crystals Precision Frequency Measuring Service.** Specialists for AM-FM-TV. 445 Concord Ave., Cambridge 38, Mass. Phone: TRowbridge 6-2810. 3-60 12t

## Advertisers' Index



## Professional Services




# New RCA-4401 Image Orthicon

**High sensitivity and high signal output of RCA-4401 make possible quality color pictures at black-and-white light levels.**

Now every TV studio can be made into a color studio. RCA-4401 eliminates the need for extra lighting and air conditioning. It produces high-quality color pictures with a scene illumination of 150 footcandles. Satisfactory color pictures can be obtained with a lens opening of f/5.6 at scene illumination as low as 40 footcandles.

A single color camera equipped with RCA-4401's can put you in business. It can be used in the studio or taken to remote locations and operated as light levels change from daylight through dusk to artificial lighting. These versatile tubes have been successfully used to colorcast night sports events at light levels once adequate for black-and-white pickup only.

Designed to fit color cameras using 3-inch image orthicons, the 4401 is unilaterally interchangeable with RCA types 6474 or 7513. RCA-4401's are provided in factory-matched sets of three, including one tube preselected for the blue channel. Availability is no problem; the RCA-4401 is in full production.

Get in touch with your RCA Broadcast Tube Distributor today for more details on how RCA-4401 can broaden your colorcasting capability—and cut costs at the same time. *RCA Electron Tube Division, Harrison, N. J.*

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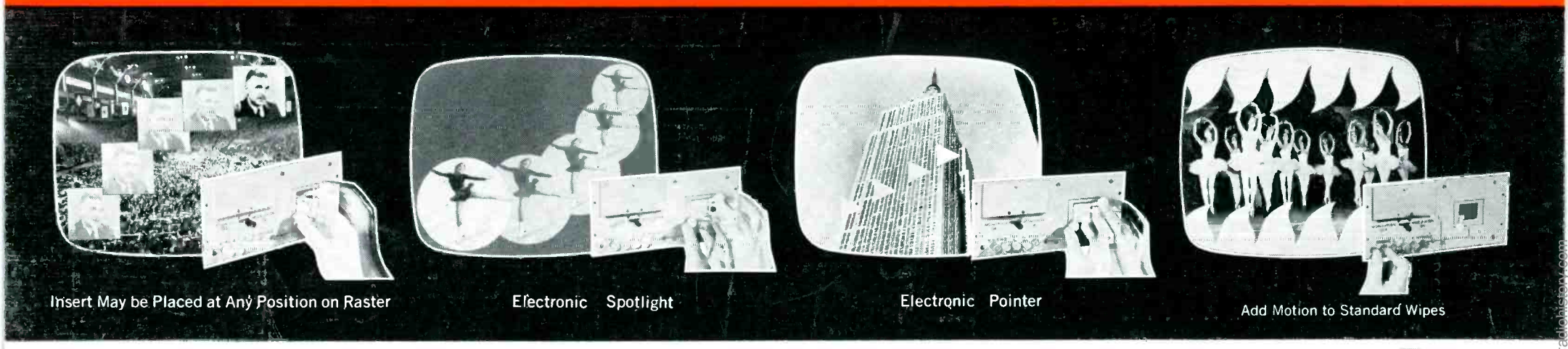
# THE SPECIAL EFFECTS GENERATOR that MATCHES YOUR CREATIVE SKILL



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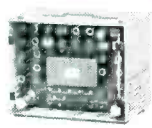
**Now, You Can Offer Your Advertisers the Newest Facilities and Your Viewers the Most Varied Programming.**

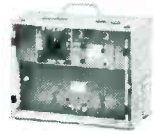
First, Telechrome provided broadcasters with a vastly improved system for producing a wider variety of dramatic wipes, inserts, keying and other special effects. Now, Telechrome engineering introduces the "Joy Stick" Positioner. This makes it possible to create many hundreds more effects and to move wipes, inserts, keying or other special effects to any place on the TV screen. The effects are startling! A new era in program creativity begins now! Ask to see the "Joy Stick" Positioner demonstrated, today!

**Full Specifications & Details or Demonstration Available on Request**



490WA1 Waveform generator. Generates keying signals for the 72 different wipes.

490SA1 Switching Amplifier. Combines two picture signals in accordance with applied keying waveform.



490RA1 Remote Control Unit. Selects and controls desired effect. Designed for console or desk mounting. Easily modified for integration into existing studio facilities. Complete with power supply— Model 512C1

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