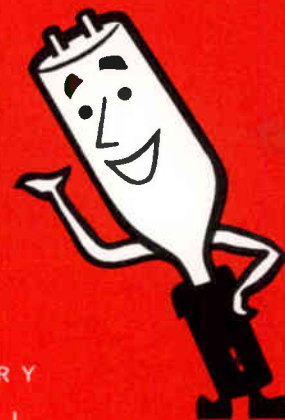




Tube Tips



A NEWSLETTER TO THE BROADCASTING INDUSTRY
RCA ELECTRON TUBE DIVISION, HARRISON, N. J.

Nuvistor Triodes, 4½-Inch Image Orthicon Are Employed in RCA's New TK-12 Camera

A dramatic highlight of the annual show and convention of the National Association of Broadcasters, held in Chicago April 3-6, was RCA's first public showing of its TK-12 Monochrome Studio Camera which employs two outstanding RCA Electron Tube Division developments:

- The RCA-7389-A—a recently announced 4½-inch image orthicon camera tube designed to provide superior black-and-white pictures for either live telecasting or tape recording.
- The thimble-size RCA-7586 nuvistor—a general-purpose medium-mu industrial triode of the heater-cathode type. These nuvistor tubes, used in the video preamplifier and in other TK-12 functions, play a vital role in providing greater camera stability and reliability.

Featuring a distinctive "keystone" styling, and designed for maximum reliability and simplicity of operation, the TK-12 is a stable camera that does not need constant operator attention to maintain picture fidelity.

Although essentially all setup controls have been located in the camera itself rather than relegating some to a separate master-control console, the new TK-12 weighs only 130 pounds. Because the camera's controls are centralized, the TV broadcaster does not have to replace existing studio cable links with more expensive and complex hookups.

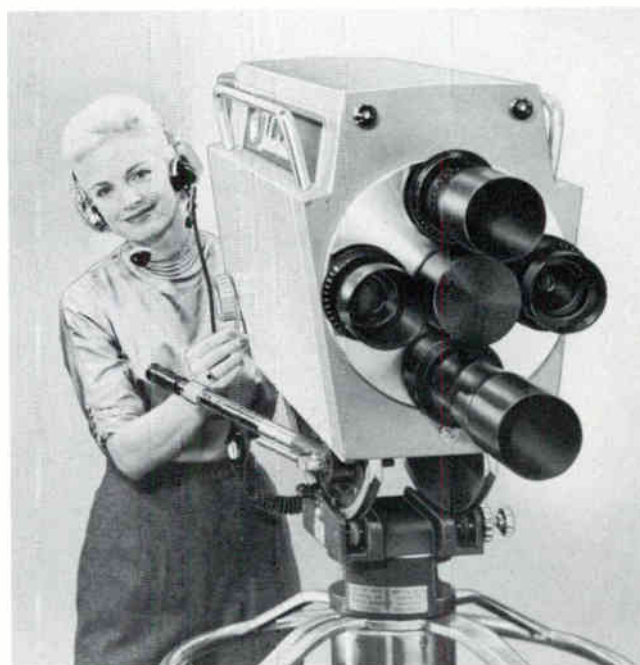
According to the camera's manufacturer, employment of only two main operating controls and the TK-12's stability during operation represent a development as significant in the TV studio equipment field as the introduction of the automatic transmission in the family car. It means in actual practice that a single operator can handle a group of cameras simultaneously.

In regard to RCA's new 4½-inch image orthicon—which is unilaterally interchangeable with the 7389—the 7389-A is instrumental in helping the TK-12 camera produce pictures with unusual clarity, fine detail, and still-photo quality. These TK-12 pictures, says the camera's manufacturer, make possible "fourth generation" tape recordings of high quality.



Actual Size

Compared with the conventional 3-inch camera tube, the 7389-A produces pictures of increased resolution and better gray scale rendition, both vitally important in today's widening use of magnetic-tape recordings. The better the picture with which to



work, the better the initial and subsequent copy tapes. The 7389-A also features a very high signal-to-noise ratio—considerably greater than that of conventional 3-inch types—and a higher-capacitance target. Pictures have more freedom from noise, edge, and redistribution effects, while simultaneously possessing more realistic tonal values, greater sharpness, and wider range of contrast.

To permit easier camera-tube set-up and operation in cameras designed for high stability, characteristics of the new image orthicon are controlled within close tolerances. Despite the increased size of its image section, the 7389-A uses the same optics and the same optical-image size as are required with the 3-inch tubes. However, the optical image is magnified internally in



the 7389-A so that a larger target can be used for improved performance, resulting in a corresponding increase in picture resolution.

About the tiny RCA-7586 nuvistor triode: Now in commercial production at the Electron Tube Division's Harrison, N. J., plant, this revolutionary new tube is much less susceptible to electronic system "noise," and is cool operating. Only 8/10-inch long and 1/2-inch in diameter, it weighs about 1/15 of an ounce.

Widely acclaimed as representing one of the most dramatic breakthroughs in the history of electron-tube technology, RCA's 7586 nuvistor will stimulate new and compact electronic-equipment designs. With drastic reductions in size, weight, and power consumption, this unique tube offers striking improvements in performance, efficiency, and reliability.

Based on special manufacturing techniques and on a cantilever-supported cylindrical-electrode structure, the 7586 uses only metal and ceramic to provide a structure of extreme ruggedness.

Outstanding features of this nuvistor presage a wide variety of applications where compactness, low heater-current drain, low-voltage operation, and exceptional uniformity of characteristics from tube to tube are primary design requirements. The 7586 triode provides high gain with low noise in amplifier service, and gives excellent performance as an oscillator over a wide range of frequencies. Very high input impedance, high permeance, and very high transconductance at low plate voltage and current are other attributes of RCA's new nuvistor triode.

RCA Iconoscope, Prototype of Camera Tube, Is Scheduled for Retirement in September

The RCA Electron Tube Division recently served notice of plans to discontinue production of the RCA-1850-A iconoscope, the industry's first all-electronic TV-pickup device.

The original patent application on the iconoscope TV camera tube was submitted in 1923—37 years ago—and for a long time the iconoscope enjoyed the distinction of being the only such tube in existence.

For many years it was used for both live and film TV pickup, until the image orthicon replaced it for live pickup shortly after World War II. The 1850-A then remained the only tube for film pickup until the vidicon outmoded it as a superior and less expensive tube.

Despite rapidly approaching obsolescence, the 1850-A was maintained in RCA's product line for several years as a service to a small remaining market. This service was continued in the face of added difficulties in obtaining imported mica of the high quality required by the iconoscope.

In serving advance notice of the 1850-A's discontinuance, RCA is providing users with sufficient time for alternate planning. Those desiring further information should contact their local RCA distributors.

RCA Breakthroughs in Techniques and Materials Improve Performance of Vidicon Camera Tubes

Engineers expressing admiration over the unusually sharp definition achieved by the two television systems in the U. S. TIROS weather satellite may be interested to know that the space-borne "eyes" of those systems consist of two RCA developmental half-inch vidicon tubes—each housed in a camera small enough to hold in the palm of a hand.

This latest and most dramatic employment of vidicons in space-age government service further accentuates the remarkable progress made in the manufacture of vidicons since RCA introduced the 6198 in 1952. Also typifying such progress is the currently popular 7038 one-inch vidicon.

According to an article in the *Journal of the SMPTE* by L. D. Miller and B. H. Vine, RCA Electron Tube Division engineers, the RCA-7038 vidicon is the product of newly developed processing and fabricating techniques. These techniques permit the use of a design with nonmagnetic materials throughout; an extremely flat faceplate free from optical distortion; and a tipless envelope which makes it possible to use deflecting and focusing components producing highly symmetrical fields.

The authors reported that elimination of magnetic materials in the front end of the 7038 helps minimize geometrical distortion of pictures and greatly simplifies the problem of obtaining and maintaining register in color-camera systems.

The nonmagnetic metal collar used in sealing the faceplate to the tube envelope has the further advantage of possessing a melting point lower than that of glass, thus permitting—in effect—a "cold seal." Possibilities of heat damage to signal electrode, photoconductor, and glass are virtually eliminated, and high-quality, camera-type optical glass can be used for the faceplate.

Photoconductive material is applied to the signal electrode on the faceplate prior to sealing the faceplate to the tube envelope. This method replaced the old process of evaporation of photoconductive material through the side of the envelope and, consequently, has eliminated the side tip that characterized this operation.

Direct application of the photoconductive layer has resulted in a surface of uniform thickness. This uniformity assures a substantially constant voltage gradient and uniform dark current across the scanned area. This feature also permits the 7038 to produce a signal current great enough to provide a high signal-to-noise ratio even when used at low light levels. The dark current, although high, is substantially uniform and, therefore, provides a substantially constant signal which can be clipped off to establish proper black level.

Because of the uniform thickness of its photoconductive surface, the 7038 also produces a signal of substantially constant amplitude over the entire scanned area when subjected to uniform illumination. In addition to high effective sensitivity over the entire scanned area, the 7038 exhibits high uniformity of characteristics from tube to tube. This feature plays a vital part in obtaining the excellent color registration and balance in three-vidicon camera work for which RCA types are noted.

In terms of tube performance, elimination of the side tip permits use of a longer deflecting yoke. The longer

yoke offers advantages of less deflecting power, and a narrower deflecting angle which effectively reduces deflection distortion and improves center-to-edge focus of the beam.

Resolution capability of the RCA-7038 one-inch vidicon is 600 lines. Because of its high effective sensitivity, the 7038 has new-camera-design capability for producing pictures of broadcast quality with as little as one footcandle of highlight illumination on its faceplate. Spectral response covers the entire visible spectrum.

RCA's New Ceramic-Metal Beam Power Tube Offers Broadcasters Numerous Advantages

The RCA-6166-A beam power tube exhibited at the April 3-6 NAB Convention features ceramic-metal construction and is designed for use in television and cw applications.

Unilaterally interchangeable with the 6166, the ceramic-metal 6166-A has somewhat higher maximum plate-voltage ratings than the former, and can be operated with full plate voltage and full plate input at frequencies up to 220 Mc.

The coaxial-structured 6166-A is intended for use with circuits of the coaxial-cylinder type. Its structural design provides low-inductance, large-area rf electrode terminals for insertion into the cylinders. An efficient external radiator permits plate cooling by means of forced air.

Station engineers in the market for a beam power tube having inherent characteristics of basic stability, outstanding performance, and long service should be especially interested in the following features of the new RCA-6166-A:

- High-strength, thick-walled, high-alumina ceramics
- Effective gettering action over a wide temperature range
- Wide, screen-terminal contact surface
- Precision ceramic spacer for locking filament rods in place
- High-strength, ceramic-to-metal seals employing RCA's exclusive metallizing process
- Thick, precision-drawn Kovar filament header
- Silver plating for superior rf conductivity

Use of metal shims to correct grid and screen perpendicularity is unnecessary with the 6166-A. Absence of these shims reduces rf and thermal losses. Filament strands are uniformly held by molybdenum clamps rather than arc-welded joints, thus avoiding stresses normally causing strands to bow. Use of small-diameter filament-support rods in the 6166-A reduces heat-conduction loss, thereby insuring more uniform temperature distribution in the active filament area.



Continuous Improvement Earmarks RCA-5820 For Added Popularity Among Image Orthicons

Broadcasters will be quick to agree that RCA's 5820 image orthicon is consistently setting new records in performance and low operating cost. The reason for this excellent showing is the continual improvement of this best known of all black-and-white camera tubes since its introduction to the broadcast industry in 1949.

Few 5820's of that year, however, would meet even the minimum performance and quality requirements of RCA's 1960 version. Today, the RCA-5820 is subjected to rigid control tests on resolution, signal-to-noise ratio, and signal uniformity. Measurable electrical characteristics are checked out "hot" in special test equipment. Tubes are further tested by actual operation in cameras. As added guarantee of stability, all 5820's are stored for seven days, then rechecked before shipment.

What has advanced this popular camera tube to new achievement is RCA's comprehensive research program to seek out higher levels of tube performance. In 1952, for example, a major improvement in resolution was accomplished by developing a new wall that helped reduce target leakage. This notable step eliminated degradation in resolution as a "life" problem.

Not long afterward, adoption of new production methods led to better control over spots and blemishes.

In 1956, RCA announced the 750-line Micro-Mesh screen—another RCA "first." This delicate mesh structure, with 750 lines in each linear inch, eliminated mesh pattern and moiré effect without need for defocusing, and permitted improved picture-detail contrast.

With the development of Super-Dynode design in 1957, the 5820 took a great forward stride. Super-Dynode design solved the earlier problem of "dynode burn"—a condition contributing to excessive "dark shading." The solution of the problem was made possible by a new material not subject to objectionable changes in secondary-emission ratio. The improvement led to more uniform picture background with a minimum of undesirable background texture in lowlight areas. With this design, the 5820 requires only a minimum of dark-shading adjustment time and, for color operation, gives cleaner colors in the dark areas through minimum color shift. In addition, decelerator-grid voltage can now be set at the best value for high-light uniformity throughout the useful life of the tube, thus eliminating the interdependence of dark shading and highlight uniformity.

New RCA-4401 Low-Light-Level Image Orthicon A Boon to Night-Event Coverage by Color TV

RCA has just announced its newest-type, color-TV camera tube that is expected to prove of tremendous value for mobile-equipment coverage of night events.

A popular attraction at the 1960 NAB Convention, this low-light-level image orthicon has been designated the RCA-4401. Designed for use in color-TV cameras, it features a high output signal and high sensitivity, and is especially suited for applications where light level on the scene is below 200 footcandles.

The 4401 has a maximum photocathode image diagonal of 1.8 inches. The illumination on tube face needed to reach "knee" of light transfer characteristic is 0.006 footcandles. This new type has a typical amplitude response of 35% at 400 TV lines, and a limiting resolution capability of 700 TV lines.

Precision-Constructed
Image Orthicon
Provides
BETTER
'PHOTOGRAPHIC'
QUALITY
In Black-and-White
And Color
TV



RCA-7513 Television Camera Tube Offers 'Field Mesh' as Design Feature

Broadcasters at the recently held NAB show and convention expressed considerable interest in the RCA-7513, a remarkable precision image orthicon. This camera tube features a design element known as "Field Mesh," which helps to assure that the scanning beam will strike the target perpendicularly at all points, thus improving corner resolution and reducing glaring "halo" and edge effects. The field mesh, moreover, defocuses the return beam and hence eliminates dynode texture from the picture.

One of the newer additions to RCA's line, the 7513 provides high-quality performance in color cameras utilizing the simultaneous method of pickup, and gives equally fine performance in black-and-white cameras.

In addition to field-mesh design, the 7513 incorporates several precision-construction features. They include accurate alignment of all sections of the tube and high accuracy in location of electrodes. As a result, the three images produced within a three-image-orthicon-type

color camera can be practically identical in geometry. However, to take full advantage of the 7513's precision capabilities, the color camera should employ deflecting yokes and focusing coils having precision construction, and precision axial alignment with respect to each 7513.

High-capacitance target assembly enables the 7513 to produce a signal having an unusually wide dynamic-contrast range and to develop a high-signal-to-noise ratio.

A suppressor-grid helps reshape the main electrostatic focusing field in the scanning section. The reshaped field prevents secondary electrons from the field mesh from lowering the beam modulation and increasing the noise in the return beam. Consequently, the 7513 has a signal current of good purity and low noise.

Because of these numerous features, the RCA-7513 is a superior camera tube that will serve the broadcast industry in providing pictures of "photographic" quality and realism, both in color and black-and-white TV.

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