

- All-purpose live color TV camera providing low noise, high resolution picture
- Built-in camera cable equalization
- All controls conveniently located — only one master control needed for on-air operation
- Stable, fixed, plug-in gamma corrector units



Color Camera Chain, Type TK-41C

Description

The RCA TK-41C Color Camera Chain provides the television broadcast station with the ideal means of originating beautiful, full-color programs. Live color programming permits maximum realization of the benefits of color—adding a brilliant new dimension to programming techniques and presenting commercial products in thrilling reality. Local color originations of studio programs and commercials, sporting events, community parades and festivals can build station prestige and stimulate sponsor interest. Live color commercial inserts and station breaks between color network and color film features hold and strengthen viewer interest by maintaining color program continuity.

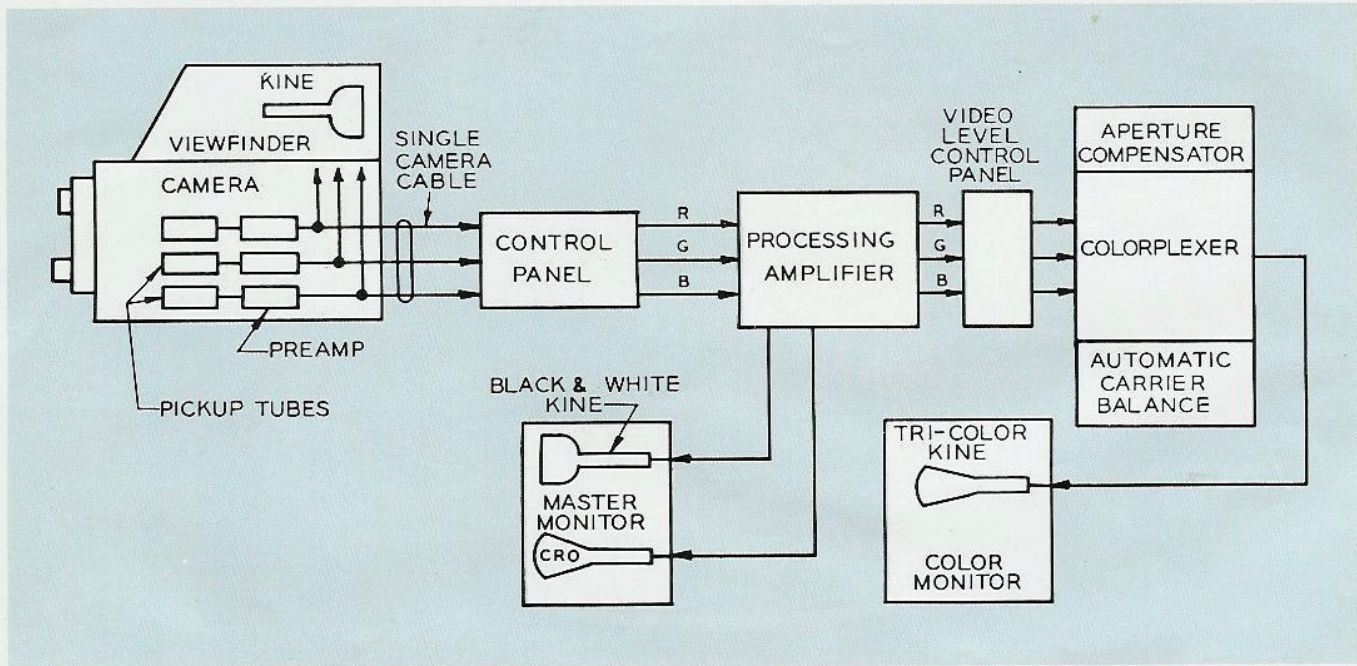
Color mobile units, designed to handle up to five color cameras, are available to extend the use of color cameras to a broad variety of field programming applications.

Dependable and Economical Performance

Designed with the objective of providing an easily operated, space-conserving and economical color television pick-up system, the TK-41 series of cameras have earned wide acceptance throughout the broadcast industry. Their performance and reliability have been thoroughly proven by extensive use under daily operating conditions. The camera is easily handled and is designed for operation by a single cameraman.

A cradle type camera mounting head, which accurately maintains the camera in balance about its own center of gravity, results in maneuverability and convenience of operation comparable to that of monochrome studio camera equipment.

The TK-41C camera employs the same complement of standard lenses as monochrome camera equipment. The camera control equipment includes a processing amplifier which is identical with that used with the RCA Type TK-26C 3-Vidicon Color Film Chain. Centralized controls provide minimum setup time. During "on-air" operation, the camera control operator can control signal processing for



Simplified diagram showing major components of the TK-41C Color Camera Chain. The lineup features considerable space and cost saving advantages over previous color chains.

best picture quality by the use of only one knob. Control operations can be located at a console or rack position as desired.

Camera Chain Components

The TK-41C Color Camera Chain is functionally similar to monochrome camera chains in that it consists of a live pick-up camera in addition to signal processing, control and monitor units. The major equipment units include the color camera, viewfinder, camera control panel, processing amplifier, TM-21D color monitor, TX-1D Colorplexer with aperture compensator and automatic carrier balance, TM-6C master monitor, and power supplies.

The color camera proper contains a light splitting prism optical system, three image orthicon tubes to provide red, blue and green signals, horizontal and vertical deflection circuits for the image orthicons, a target blanking circuit, regulated high voltage and negative voltage circuit, image orthicon protection circuit, and three plug-in video preamplifiers, one for each of the three color channels. The electronic viewfinder includes a 7TP4 kinescope with necessary deflection and video circuits to provide a picture for the camera operator.

The three video signals from the color camera are fed directly to the camera control panel on which both operating and selected set-up controls are located. These signals are in turn fed to the processing amplifier which performs the functions of cable compensation, video amplification, blanking and shading insertion, feedback clamping, linear clipping, gamma correction and output amplification as well as providing auxiliary switching for the master monitor kinescope and CRO.

The processing amplifier feeds a monochrome master monitor, which provides both kinescope and CRO displays of signals at various vital points in the system, selected by push-button. A colorplexer combines the processed video signals into a single FCC standard color signal. The colorplexer feeds a tri-color monitor and the camera switching system. This unit accepts the red, green and blue signals from the image orthicons and transforms them to M, I, and Q signals. These are adjusted with respect to bandwidth and delay and then multiplexed to produce one composite signal from the three input signals. An aperture compensator connects in series with the luminance channel of the colorplexer. The output of

the colorplexer is fed to the studio video switching system. A TM-21D Color Monitor is also included in the chain and is utilized at the camera control position to provide a check on the quality of the final color picture.

TK-41C Color Camera

The RCA Color Camera contains the three image orthicon pick-up tubes with their focus, deflection and beam-alignment coils, complete horizontal and vertical deflection circuits, the video preamplifiers, blowers, light-splitting optical system, turret with four lens positions, and means for adjusting optical focus and remote iris opening.

The camera is entirely self-contained with the exception of the DC power supplies, video processing amplifier and certain electrical controls which are located for operating convenience at the camera control panel. All electrical connections to the camera are made through a single eighty-two conductor camera cable attached by a connector in such manner as to permit the cable to be brought toward the front of the camera, drawn through a special cable clamping bracket, and then draped in a gradual curve to the floor out of way of the cameraman.

Physically the TK-41C Color Camera is 14½ inches high, 44 inches long, and the width tapers from 16 inches at the front to a maximum of 21 inches at the rear edges of the side door covers. On the front end of the camera is the lens turret, and on the rear are the local electrical setup controls and the control handle for rotating the turret. The optical focus handle is located on the right. This focus control and the turret handle are normally the only two controls which require the attention of the cameraman during a television program.

Improved Operational Stability

The TK-41C incorporates a number of design improvements for ease of operation and assurance of highest picture quality. A new focus current regulator holds focus current to within 0.1 percent for accurate and stable registration. A low impedance blanking circuit provides immunity to horizontal deflection crosstalk. The addition of temperature compensation to the vertical deflection coils has reduced the required camera warmup period and assures long term stability of registration. Vernier adjustments are provided for horizontal and vertical size, linearity, skew and centering adjustments. Excellent stability of color balance has resulted from stabilization of the image orthicon multiplier gain. Through "super regulation" techniques the image orthicon electrode voltages are maintained to 0.25 percent, thereby virtually eliminating electrical focus drift. A stabilized beam current supply assures optimum signal-to-noise ratio and proper shading of the picture over long periods without touchup.

Electro-Mechanical Lens Cap

A remote-controlled douser type optical lens cap permits precise adjustment of black level and precision adjustment of color balance for precise matching of cameras. An improved field lens holder maintains precise alignment of the field lenses on the optical axis and avoids vignetting, while a new turret and detent mechanism provides noise-free rotation of the lens turret. Camera test facilities have been centralized with test probe points

and selector switches grouped on a convenient test panel within the camera. New full-length side doors provide substantially improved access to the camera interior.

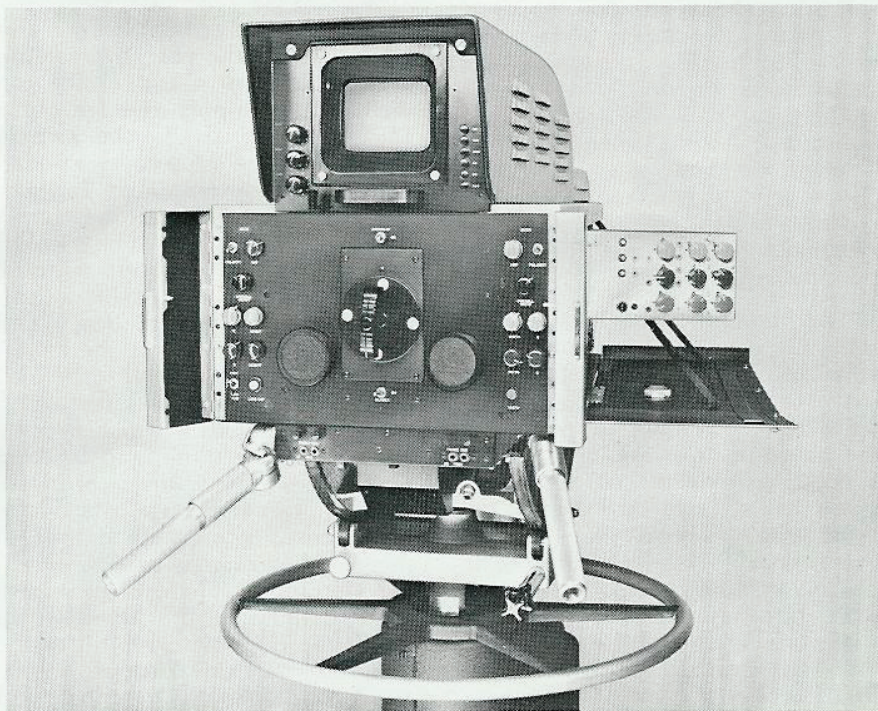
Transistor Intercom System

Two sets of communication and program sound and associated volume controls jacks are mounted on a strip installed below the back operating panel at the rear of the camera. A transistor intercom system provides high level voice communications between the camera operator, the camera control operator, and the program director or other studio personnel. Variable volume controls allow individual adjustment of sound level. Electrical registration controls are also located on the rear plate of the camera behind hinged covers. They include the following independent controls: red and blue skew, with polarity reversing switch, height, width, and vertical and horizontal Q adjustment. An off-on switch operates the blower motors. An overscan switch is also provided. The G-5 controls are located just inside the left side cover near the rear of the camera.

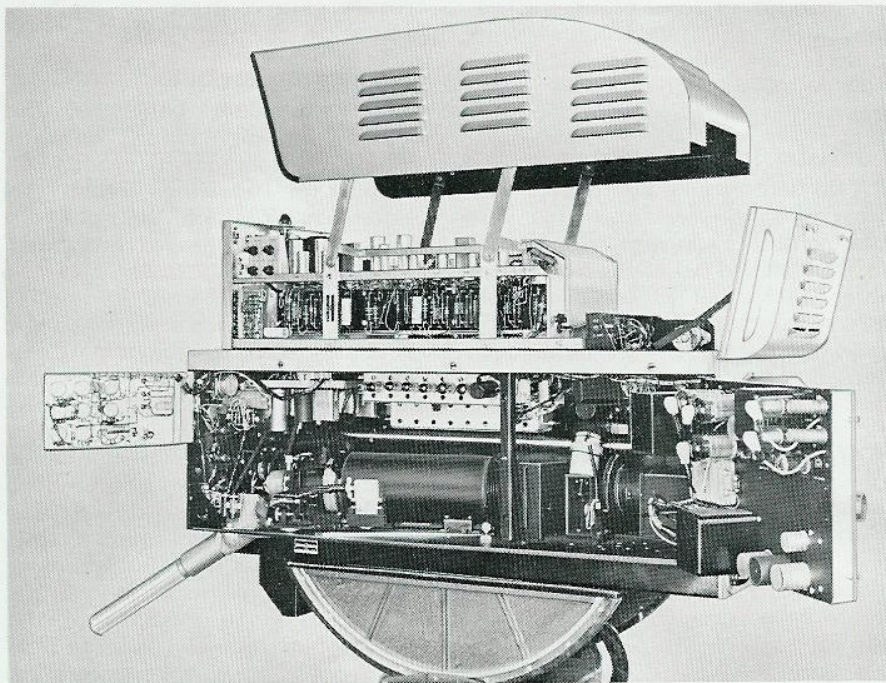
Dynode gain controls are similarly located on the right side.

Complete Accessibility

The side door panels of the camera housing swing outward making all components readily accessible for servicing. From the cameraman's position, the right side door exposes the hinged horizontal deflection chassis, which may be swung 180 degrees from its normal position, permitting replacement of tubes and access to the remote iris synchro motor driving mechanism and other parts of the optical system. The yoke assembly of the red channel and the tube side of the red channel video preamplifier are also exposed. When the left side panel is dropped, the hinged vertical deflection chassis can also be swung outward 180 degrees. It permits further access to elements of the optical plate assembly, and the blue and green channel yoke assemblies. The Type 4415 or 4416 Image Orthicon tubes can be replaced by removing a single holding screw of each yoke assembly and swinging the yoke assembly out the sides of the camera. The yoke assemblies



Set-up controls shown above are all conveniently located behind hinged doors. Only two handle controls are needed for on-air operation of camera.



Exploded view of TK-41 revealing extreme accessibility of tubes, components and circuits of both camera and viewfinder.

have been designed and are held to very close tolerances so that when used with Precision Image Orthicons very precise registration is obtainable.

Raising the ventilation hood at the front of the camera gives access to the connections of two heater transformers in this area as well as the relay lens. The elapsed time indicator is visible when the hood is raised. Viewfinder component and circuit tests together with tube replacements may be made with the viewfinder cover in the raised position.

The viewfinder may be removed from the camera to provide access to wiring of the hinged shelf type chassis at the rear of the camera. This shelf is used for tie points for the image orthicon sockets, and for filtering components of the deflection circuits. Included here are the three video preamplifier input coupling and filter circuits. The image orthicon protection circuit with its associated tube and relay is also mounted here. Loss of either the vertical or horizontal deflection to the yokes of any of the image orthicons in the camera causes the circuit to bias off the image orthi-

cons. This prevents the beam from being concentrated in a single line or spot which might cause permanent damage.

Plug-In Video Preamplifiers

Removing the viewfinder also gives access to the plug-in preamplifiers located just ahead of the top shelf. These supply the red, blue and green signals to the camera cables and the camera viewfinder. Each of the preamplifiers includes six stages. The first four are simple shunt-peaked stages. The second stage has a screwdriver adjusted cathode peaking circuit for adjusting tilt in the low-frequency end of the response curve of the amplifiers. In the cathode of the third stage there is a similar circuit with a knob type control which may be adjusted to give minimum streaking for the associated image orthicon. The last two stages are a feed-back pair, providing cathode output to the 51-Ohm camera cables and to the viewfinder. There is an adjustable trimmer in this stage which affects the response curve tilt at the high-frequency end. Each of the preamplifiers is shock mounted and bonded to the cross members of the upper camera framing.

Two tally lights are mounted on the front face of the camera. They serve to indicate to the actors when the camera is in actual use. In addition, there is one on top of the viewfinder for directors and one on the kinescope bezel plate for the operator. The latter are operative, however, only when used in conjunction with a camera switching unit. The lights are normally off until a tally relay is actuated by a control voltage (24 Volts DC).

Filtered Forced-Air Ventilation

The individual image orthicon tubes and the area within the camera housing are forced-air cooled. Separate blowers are used to cool the individual image orthicon tubes. Cooling air is brought into the socket end of each yoke assembly by means of flexible hose leading from its associated blower. Replaceable air filters reduce the necessity for frequent cleaning of the optical system. All external areas of the camera and viewfinder have an aluminum finish to further aid in maintaining optimum temperature conditions within the camera. Two utility outlets and a fuse are mounted on the under side at the back end of the camera. They provide facilities for an independent source of AC that may be used for test equipment.

Stabilized Camera Viewfinder

The viewfinder is used by the operator of the color camera to frame the scene, to aid in focusing the camera, and to facilitate in setting up the camera registration. The viewfinder consists of a monochrome kinescope provided with deflection, blanking and video circuits required to provide a picture for the camera operator. A six push-button selector switch at the right of the viewing screen enables the operator to view any channel separately, to view the red or the blue superimposed on the green, or to view all three images superimposed. The focus, brightness, and contrast controls are mounted to the left of the viewing screen.

The ultor and focus voltages of the kinescope are regulated with corona type regulators. This provides a wide range of kinescope brightness change without defocusing of the kinescope image.

The single channel positions are used when making adjustments on individual channels; the red on green and blue on green are useful for registration adjustments. The switching is accomplished by altering the bias on the input amplifier tubes; each of these tubes is kept at cutoff except when it is desired to view the particular signal connected to its input. Blanking pulses of adjustable duration are produced by two multivibrators (triggered by horizontal and vertical drive) and added to the video signal before application to the viewfinder kinescope. A DC restorer is included to maintain optimum contrast and brightness of the viewfinder over a wide range of scene content and compositions.

The viewfinder is designed to slide in guides and lock in position directly above the camera. All signal and operating voltages are fed to the unit through a self-aligning socket connection that automatically engages when the unit slides into place. A pull handle to facilitate the installation and removal of the viewfinder is located on its operating panel just below the viewing screen.

To the left of this handle is a thumb latch to release the unit from a locked position. The viewfinder is covered by a multi-louvered hood which can be raised to facilitate ease in servicing the unit. A detachable viewing hood (MI-40502) is attached to the viewfinder control panel for shielding the viewing screen from extraneous light.

Camera Mounting Equipment

A cradle type tilt head, designed especially for use with the color camera, provides ease of maneuverability in both tilting and panning of the camera and viewfinder, comparable to that of the RCA monochrome camera. The TK-41C is provided with a TD-9C Motor Driven Pedestal for general studio use.

The TK-41C camera control units may be conveniently mounted in the Control Console. This control position includes: (1) a TM-6C Master Monitor mounted in its Console Housing with the Video Level Control Panel, and (2) a Master Console Housing in which the Camera Control Panel and the Processing Amplifier may be mounted. This

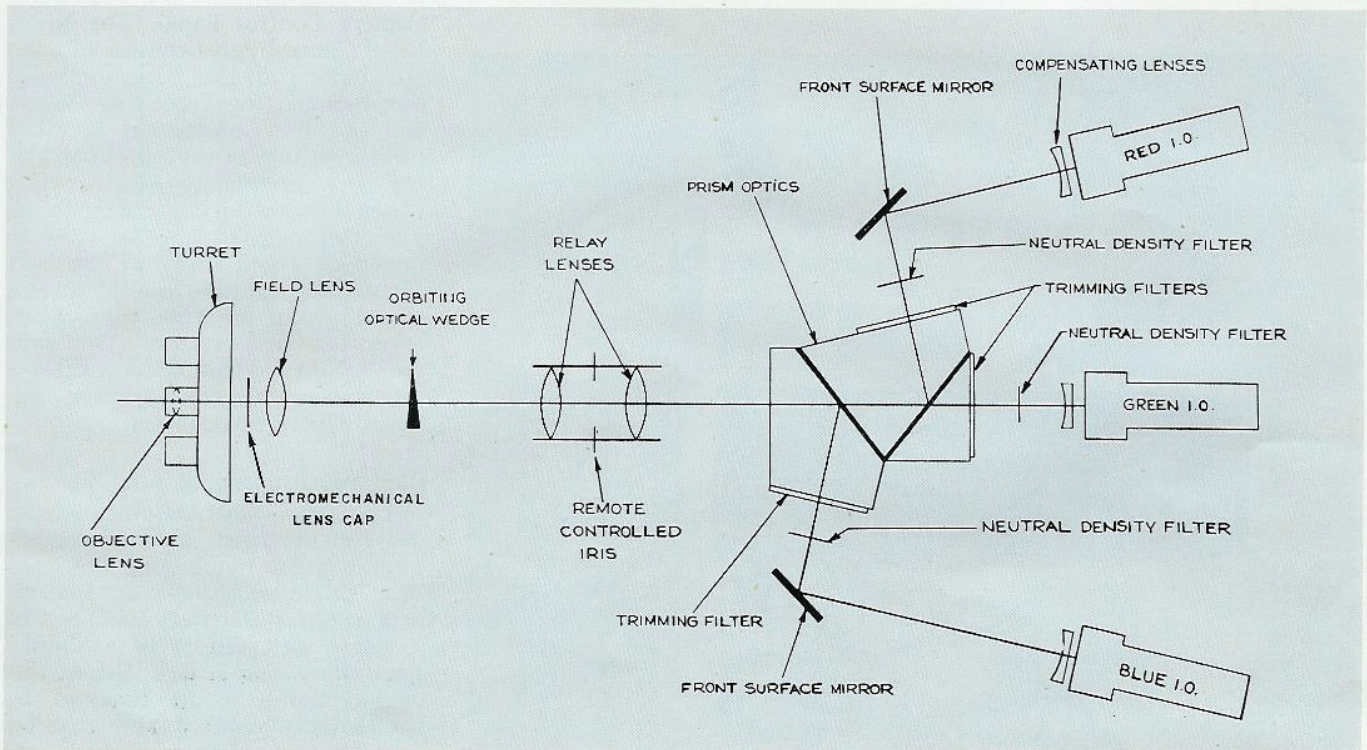
Master Console Housing is designed to mount the 19-inch Camera Control Panel in the indented section of the console desk and the Processing Amplifier in the top sloping portion of the console. The camera control equipment also includes a TM-21D Color Monitor. This may be suspended from the wall or ceiling or set upon a stand.

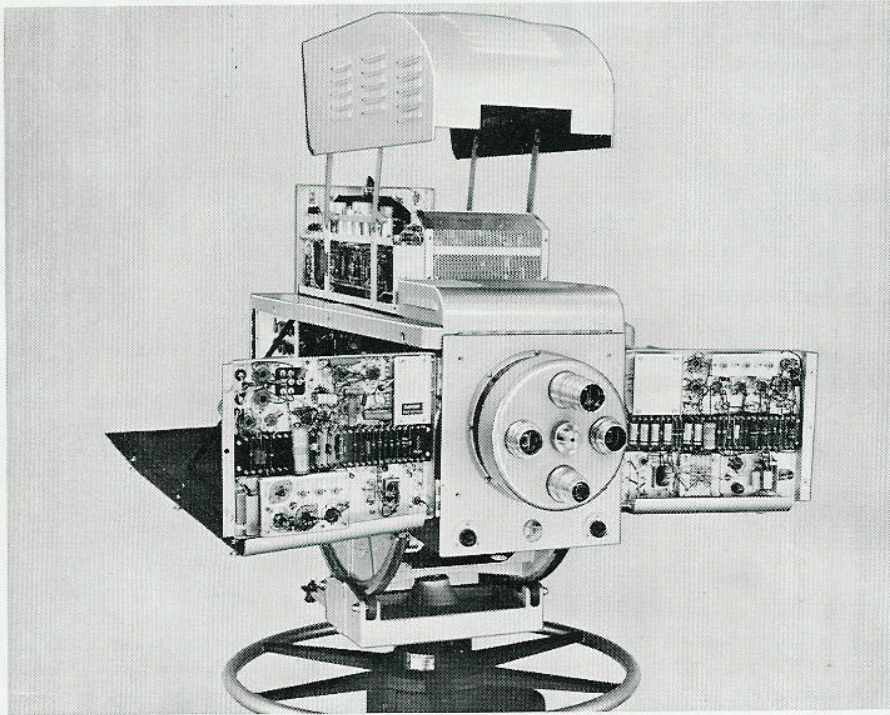
If preferred, all of the TK-41C control equipment may be rack mounted with the exception of the color monitor. In this case a Rack Mounted Control Desk and Accessory Kit, MI-40415, is available to provide desk space at the rack location.

Simplified Control Panel

The Camera Control Panel, on which the remote control adjustments of the color camera are mounted, is located in the sloping portion of the desk section of the 19-inch console which houses the processing amplifier. It lies below and in front of the processing amplifier front panel, and has a cover plate through which only two controls protrude. These are the Pedestal and Iris Control knobs. The

Optical system diagram for MI-40534 Color Camera.





Complete accessibility to all circuits and controls makes maintenance and servicing of RCA color camera a pleasure for both operators and technicians.

latter operates the remote iris selsyn motor in the optical system, and is the only control required during program origination. Mounted directly above this control, in the processing amplifier panel, is the iris f-stop indicator meter. In normal operation, the remote iris control performs the function of overall gain control for the complete color camera chain. The master pedestal control provides simultaneous adjustment of the pedestal voltage in the three channels. Set-up controls for each of the three image orthicons may be reached by lifting the cover plate.

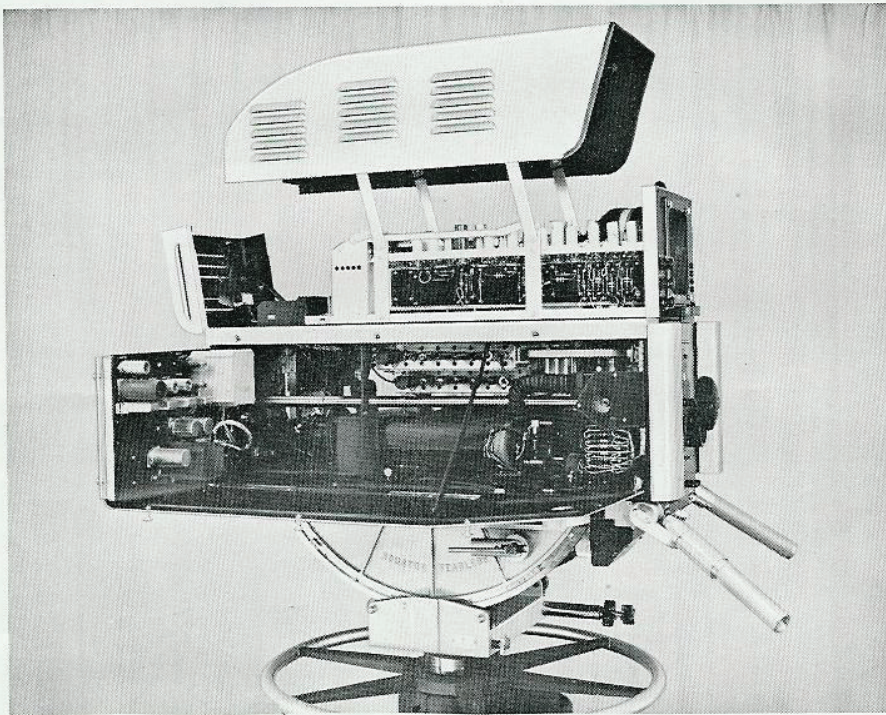
Colored knobs identify the three video channels. The individual channel controls include horizontal and vertical centering, alignment, orthicon focus, multiplier focus, image focus, image accelerator voltage and target voltage. Also provided is a target test knob to aid in setting target voltage accurately and rapidly, as well as a selector switch which permits the metering of: target, orth focus, image focus and multiplier focus voltage settings in each color channel.

Video Level Control Panel

The Video Level Control Panel is mounted adjacent to the MI-40535 Camera Control Panel. The Video Level Control Panel consists of three attenuator pads located in the video line between the Processing Amplifier and the Colorplexer to allow precise settings of the white balance, thereby completely eliminating pedestal-riding during programming. The control may also be used to introduce color shifts of precisely controlled amplitude into the picture to compensate for minor color differences between cameras. The pads are thus used as trimmer adjustments to achieve true color picture uniformity between cameras.

Compact Processing Amplifier

The Processing Amplifier of the TK-41C has been designed to perform a great number of functions in a single versatile unit. Integration of these electrical functions in a single unit results in a simple, space-conserving system. Use of this design allows set-up time to be substantially reduced and requires fewer video operators and control



room engineers for programming. Hence considerable savings in operating costs can be realized. A large reduction in power required as well as increased tube life due to extremely conservative operation of tubes further reduce costs, at the same time improving performance and overall quality.

The basic circuit elements in the processing amplifier are three plug-in video amplifiers which perform accurately and with extreme stability the following functions: cable compensation, video amplification, blanking insertion, shading insertion, feedback clamping, linear clipping, gamma correction, and output amplification. Pulse circuitry needed for the camera and shading generators, is obtained from stabilized multi-vibrators. These multi-vibrators provide pulses of constant amplitude and width independent of the incoming pulse. These circuits require no tube selection and are completely stable. Shading signals are provided for insertion of either horizontal or vertical shading. A fourth plug-in unit serves as the video section of an electronic switcher which is an integral part of the main chassis. The switcher,

used with Master Monitor, TM-6C, provides an individual or combined presentation of red, blue and green video.

The entire chassis of the processing amplifier is drawer-slide mounted for easy pull-out for servicing. The front panel is hinged, thus permitting it to be opened to facilitate removal of tubes and servicing of other components behind the panel.

An edge-lighted translucent plastic escutcheon is mounted on the outside surface of the panel to provide illumination of the nomenclature for the various controls when the unit is operated in semi-darkness. All controls are conveniently mounted on the panel. Thirteen lucite pushbuttons at the top of the panel control the switching arrangement which permits separate Master Monitor Kinescope or CRO observation of important test points, including individual channels, various channels superimposed, and colorplexer output. A staircase signal for the CRO circuit is provided for a sequential display of red, blue, and green channels.

Precision Color Monitor

The Color Control Monitor, Type

TM-21D, provides an accurate, stabilized color picture display at high brightness level and is extremely useful in pinpointing parts of the color chain requiring adjustment. The equipment affords the control operator precision checks on camera registration, color balance, shading, deflection and transmission system transients, and effects of pedestal adjustments, as well as camera deflection linearity, chroma level and phase of hue adjustments. It greatly simplifies camera matching and provides a standard against which color performance can be evaluated. Long term stability of the monitor is assured by liberal use of feedback. Time devoted to monitor adjustments is negligible.

Optional Rack Mounting of Camera Controls

All the units normally housed in the consoles — Master Monitor, Control Panel and Processing Amplifier may be rack mounted. To complete the camera chain, a Colorplexer, aperture compensator, automatic carrier balance, focus current regulator and a set of two WP-16B power supplies also mount in standard 84-inch cabinet racks.

**Television Color Camera Chain
Power, Space, Tube and Weight Information**

Equipment	MI	Tubes	DC mA	AC Watts	Total Heat	Rack Space	Weight
Color Camera—Defl.	40534	40	225 + (210 at 360 V)	132	277	—	250
—Preamp.			330				
Viewfinder	40501-A	22	125 + (65 at 360 V)	58	117	—	45
Processing Amplifier	40520-A	55	360	175	200	10½"	50½
Focus Current Regulator	40524-B	4	12	85	90	5¼"	22
Focus Voltage Regulator	40541	6	34+	17	5	3½"	7½
Colorplexer	40209-C	29	280	90	180	21"	34
Automatic Carrier Balance	40416-A	5	20	15	—	3½"	10
Aperture Compensator	40414	2	33	10	15	1¾"	3
TM-21D Color Monitor	40226-D	61	—	900	900	—	213
WP-16B Power Supply (2 Units)	26084-B	—	*1600 each	700 ea.	—	7" ea.	50 ea.
WP-16B Centering Current Unit	26083-A	—	1000	—	—	—	2
WP-16B Unregulated High Voltage Unit	26082-A	—	250	—	—	—	3

* 1600 mA with no unregulated current—1350 mA with 250 mA unregulated current.

Specifications

Electrical

CAMERA:

Input:

Horizontal Drive
from Processing Amp-51 OhmMin. 2 Volts (neg.)
peak-to-peak

Vertical Drive
from Processing Amp-51 OhmMin. 2 Volts, (neg.)
peak-to-peak

DC Power (from power supplies):

Regulated
Camera280 Volts, 245 mA
Preamplifiers280 Volts, (3x110) mA

Unregulated
Camera and Deflection360 Volts, 210 mA
Focus Coil Current78 mA
Tally Lights (Relay Controls)24 Volts DC

AC Power:

Heaters, Blowers117 V., 50/60 Hz, 1 phase, 132 Watts

Output:

Video ResponseFlat to 6 MHz
Video Signals (black negative) 51 Ohm0.3 Volt
peak-to-peak

Video Signals to Viewfinder0.6 Volt, peak-to-peak
Video Gain15 dB

VIEWFINDER:

Input:

Video Signals (negative)0.6 Volt, peak-to-peak
Horizontal Drive (negative—Hi-impedance)2 Volts
peak-to-peak

Vertical Drive (negative—Hi-impedance)2 Volts
peak-to-peak

DC Power (from power supply):

Regulated280 Volts, 125 mA
Unregulated360 Volts, 65 mA
Tally Lights (Relay Controls)24 Volts, DC

AC Power50/60 Hz, single phase, 117 Volts, 58 Watts

PROCESSING AMPLIFIER:

Input:

Video (red, blue, green and test)0.3 Volt peak-to-peak
Impedance (red, blue, green and test)75 Ohm $\pm 5\%$

Horizontal Drive (high impedance)1.5 to 5 Volts
peak-to-peak

Vertical Drive (high impedance)1.5 to 5 Volts
peak-to-peak

Blanking Pulse (high impedance)1.5 to 5 Volts
peak-to-peak

Calibration Pulse (high impedance)15 kHz sq. wave
0.7 Volt peak-to-peak

Output:

Video to Colorplexer (red, blue and green)0.7 Volt
peak-to-peak
Impedance75 Ohms

Video to Monitor CRO0.7 Volt peak-to-peak
Impedance(Sending end 75 Ohms,
receiving end unterminated)

Video to Monitor Kinescope0.7 Volt peak-to-peak
Impedance75 Ohms

Horizontal Drive:
Width8.5 microseconds $\pm 5\%$
Amplitude3.5 Volts peak-to-peak
Impedance75 Ohms

Vertical Drive:

Width800 microseconds $\pm 20\%$
Amplitude3.5 Volts peak-to-peak
Impedance75 Ohms

Blanking Pulse:

WidthEqual to input pulse width $\pm 1\%$
Amplitude2 Volts peak-to-peak
Impedance75 Ohms

Calibration Pulse:

WidthEqual to input pulse width
Amplitude0.7 Volt peak-to-peak $\pm 1\%$
ImpedanceLow

Twenty Cycle Staircase Voltage to Master Monitor:

Amplitude (maximum)22 Volts peak-to-peak
ImpedanceHigh

Regulated DC Supply Voltage280 Volts
DC Current360 mA
AC Power Input175 Watts

Dimensions10 15/32" high x 17 5/8" wide x 20 3/8" long
Weight50 1/2 lbs.

NOTE: For specifications on Master Monitor, Color Monitor, Colorplexer and Power Supply see separate catalog description of these items.

Overall Mechanical

	Camera	Viewfinder	Camera Control Panel
Length	44"	34 1/8"	18"
Width	21"	13 3/8"	13 1/8"
Height	14 1/2"	11 1/8"	8"
Weight	265 lbs.*	45 lbs.	18 lbs.

* Camera weight less objective lenses, panning and focus handles.

Accessories

Neutral Density Slide Mechanism for TK-41C	MI-40528
Spare Video Preamplifier for TK-41	MI-40800-A
Pulse Delay Line	MI-26886
TA-4A Pulse Distribution Amplifier	MI-26158
Interphone Connection Unit (Transistorized)	MI-11784
Interphone Retardation Coil	MI-11737
Mounting Plate for Interphone Connection Unit	MI-11735
Mounting Panel for Retardation Coil	MI-11736-A
Gamma Corrector (0.5)	MI-40833-3
Field Lens Test Pattern Jig	MI-40873
100 Ft. Camera Cable	MI-40868-3
200 Ft. Camera Cable	MI-40868-4
EIA Linearity Test Chart	MI-26822-1
EIA Resolution Test Chart	MI-26822-2
EIA Registration Test Chart	MI-26822-3
EIA Linear Gray Scale	MI-26822-4
EIA Logarithmic Gray Scale Chart	MI-26822-5
Type BR-84D Cabinet Rack	MI-30951-D84
WA-7C Linearity Checker	MI-34017-B
Viewfinder (including Kinescope)	MI-40501-A
Viewfinder Hood	MI-40502
TX-1D Colorplexer	MI-40209-C
TM-21D Color Monitor	MI-40226-D
Image Orthicon Tube, Type 4415	MI-40890
Image Orthicon Tube, Type 4416	MI-40891

NOTE: The TK-41C Camera equipment is also available for operation on 625 line, 50-field standards and from 50 Hz, 115-Volt or 230-Volt power source.

Ordering Information

TK-41C Color Camera less Image Orthicons	MI-40534
TK-41C Color Camera Chain, Console-Mounted Control	Order per Schedule RA
TK-41C Color Camera Chain, Rack-Mounted Control	Order per Schedule RB



RADIO CORPORATION OF AMERICA

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