



# PE-400 Live Color TV Camera

## TELEVISION



## FEATURES

- "Auto-Trast" system virtually eliminates high lighting contrast problems in both studio and remote programming.
- Masking in all three chroma channels optimizes color fidelity.
- "Matchmaker" system provides fast, precise color matching between cameras.
- Innovative "squash" and clamp circuits provide highly stable black level.
- New FET preamplifiers and switchable gain provide excellent low-light-level capability.
- Scan reduction on all three chroma channels optimizes signal-to-lag performance.
- Extended red pickup tubes in both red and luminance channels enhance color fidelity.
- Extensive use of IC's increases circuit isolation for easier setup.
- Optical prism retardation plate eliminates polarized light effects.
- Plug-in circuit modules, transistors, and IC's for faster maintenance.
- Separate luminance design provides extended tube life.
- Subtractive registration technique speeds setup.

Superb color fidelity and top picture quality—combined with outstanding stability and simplified maintenance—make Gates' PE-400 one of the finest, most versatile live color television cameras available today.

The "Auto-Trast" gain control circuit virtually eliminates the high lighting contrast problems of both studio and remote operations. With this circuit, the PE-400 reproduces lighting contrast ratios of over 160 to 1, more than four times those of earlier live color cameras.

# COLOR TELEVISION CAMERA

Adjustable masking in all three chroma channels, and the use of extended red pickup tubes in the red and luminance channels, further improve the camera's built-in color fidelity.

Correct masking setup is done by matching gray scale reference, without use of a vectorscope or other external test equipment. The system also simplifies and optimizes matching between cameras.

The extensive use of IC's in the camera's completely solid-state circuits, and "squash" and clamp circuits assure black level stability.

With 12 dB of switchable gain, high signal-to-noise

ratio from FET transistor preamplifiers, and excellent signal-to-lag performance from chroma channel scan reduction, the PE-400 provides outstanding all-around low-light-level performance.

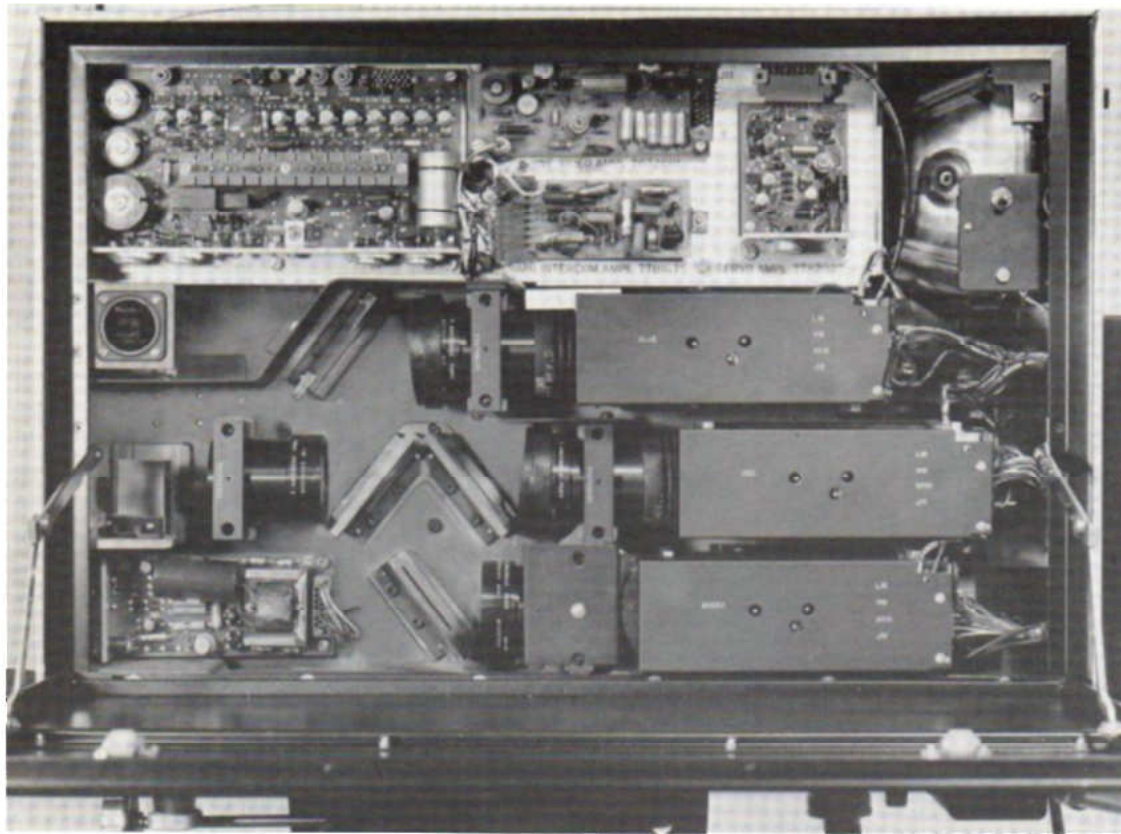
Fast, accurate registration is assured by a proven subtractive registration technique, with a viewfinder brightness compensation feature to assure equal brightness at all steps. Improved yokes maximize uniformity for closer registration and sharper, more distinct pictures.

An anti-polarization or retardation plate on the optical prism eliminates color differences caused by polarized light from reflected surfaces.

## CONTROL EQUIPMENT

Rack equipment for the PE-400 in a custom console. The color encoder (accessory) may be mounted either with other encoders, or in such a console. Items normally included in the console are: calibration monitor (accessory); processing amplifier; image enhancer; monitor select panel; camera control panel; intercom control; and power supply.





**CAMERA HEAD, LEFT SIDE**—Showing the pre-aligned machined casting which carries the deflection assemblies and the relay optics, to assure alignment and protection from stress in any direction.

**RUGGED, SERVICEABLE CAMERA HEAD:** The camera head has a pre-aligned machined casting which carries the deflection assemblies and the relay optics to protect from stress in any direction. The zoom lens mount fastens directly to this casting. The case is of skin-type construction, providing mounting surfaces for the various boards and the viewfinder. The underside of the main casting mates with the wedge mount for positioning of the camera on the cam head.

**LENSES AND LENS CONTROLS:** Normally an accessory 10:1 or 15:1 zoom lens is used with the PE-400. Control actions for zoom and focus are smoothly transferred to the rear of the camera by splined shafts. The focus control is part of the pan-and-tilt handle mounted on the left rear of the camera, and is removable. The zoom control is mounted on the right rear corner of the camera head. A protective cover is supplied which replaces the zoom lens when the lens is removed. This cover also can be used as a supplemental carrying handle with the zoom lens off.

Immediately behind the lens is an eight-position color temperature correction disk. This is easily and quickly adjusted by the operator from outside the camera, by a knurled, numbered index wheel located on the right front side of the camera head.

A filter guide for different light conditions is provided on the camera's rear panel, for fast reference. The filters compensate for color temperatures from 3200°K

to 8000°K. An ND-1 (transmits 10%) is provided in one position for days when additional light attenuation is required. Position 8 on the disk is a lens cap.

**FINE COLOR TEMPERATURE ADJUSTMENTS:** To ensure optimum color fidelity under varied lighting conditions, fine color temperature adjustments can be made by using the color temperature compensation disk in conjunction with the R B and G color balance controls ("paint pots") on the camera's rack or console-mounted processing amplifier. The "paint pots" also facilitate color matching between scenes.

Four ¼-20 tapped holes are provided in the top of the camera head for attaching such accessories as prompts or spotlights. A 117-volt, 5-ampere AC utility outlet is provided on the head to power such accessories, or service and test equipment.

Especially useful in lining up pre-positioned shots is a built-in focal length meter beside the viewfinder picture tube, to indicate the zoom position of the lens.

**FOUR TALLY LIGHTS:** Four tally lights provide instant recognition of "on-air" status. One light is atop the camera case front, two are beside the lens, and the fourth is for the camera operator, at the left of the viewfinder picture tube.

A digital elapsed time filament meter, to record pickup tube operating hours, is included in the camera head.



**CAMERA HEAD, RIGHT SIDE**—Zoom lens control is at lower left. Swing-out local control panel, with 20-position switchable test meter, is at left in retracted position.

**VIEWFINDER DISPLAY VERSATILITY:** The PE-400's viewfinder can display separate W, R, G, B, difference signals (for example, G-R) for registration, or system video. The system video display facilitates shot centering for special effects, or following scenes where the picture quality of system video provides greater contrast.

Advanced preamplifier design uses low noise FET transistors in a feedback configuration; preamplifiers are smear-proof due to nearly perfect low-end frequency response.

All pickup tube yokes are temperature-compensated for added registration stability, and employ special focus winding for improved beam landing for disturbance-free pictures. All yokes are mounted parallel to minimize effects of external magnetic fields.

Flare compensation circuits maintain blacks even under extremes of contrast as duty cycle changes.

**CAMERA CABLE:** Two different types of camera cable may be used with the PE-400, the standard 1 1/8" O.D. cable, or the newer 0.65" "minicable" which weighs 1/4-pound per foot. Standard fittings are available which mate cable assemblies directly to the existing connectors. Compensation is provided in the camera control unit for both types of cable, which can be used separately or mixed.



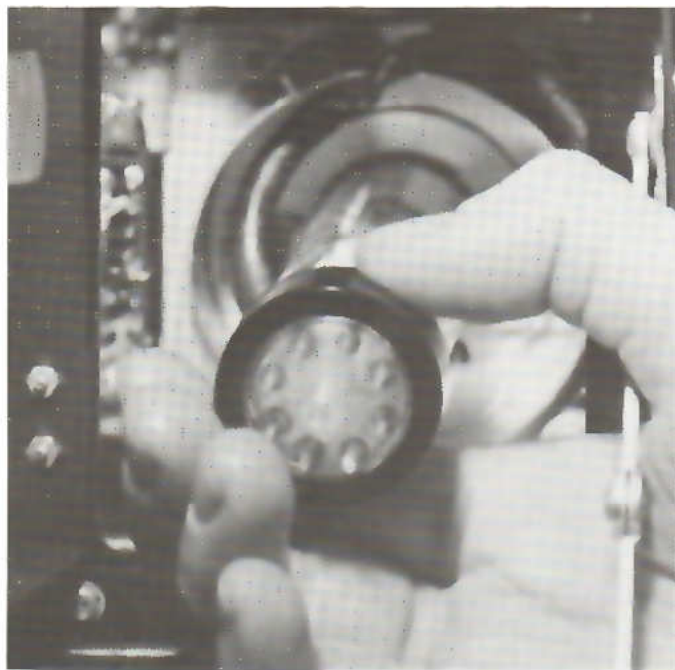
**CAMERA HEAD, FROM REAR**—Quick access is provided to rear controls by hinged panel. The swing-out local control panel, with 20-position switchable test meter, is extended at right.

**IMPROVED COLOR TRACKING:** Gamma circuitry is continuously variable, in all channels, from 0.35 to 1.0. Absence of discontinuities or step-breaks in the gamma curve provides improved color tracking. A unique noise-reduction filter is also employed for clean blacks.

A calibrated sawtooth test signal is provided, for injection into the pre-amplifiers. This enables very accurate system setup, maintains accurate balance between the parameters of iris setting and amplifier gains, and facilitates maintenance.

**EFFICIENT COOLING:** A camera head cooling fan is provided, for efficient ventilation with minimal noise. Conventional blowers cool the rack equipment, and a special blower more effectively ventilates the monitoring equipment and the processing amplifier.

For added convenience in setup and maintenance, the local control panel in the right side of the camera head swings out for easy access. The panel also includes the 20-position switchable test meter, which facilitates setup and maintenance.



**FAST PICKUP TUBE CHANGE**—All four pickup tubes in the PE-400 may be changed through the rear of the yoke in minutes, without disturbing registration.

**FAST PICKUP TUBE CHANGE:** All four pickup tubes are easily removable through the rear of the yokes without disturbing mechanical registration. Not only may a tube be changed in minutes, but registration remains constant. The tubes are supported in the yoke assemblies by a clamp-on knob which grasps the rear of the tube firmly.



**PLUG-IN MODULES, COMPONENTS:** For fast, easy maintenance, all circuit modules, transistors, and integrated circuits are plug-in.

**TOP COVER ACCESS:** The camera head's water-resistant top cover is removable for access to the top center section of the head. Accessory 2X and 3X lens extenders may be stored by clamps to the bottom of the camera top cover. The extenders can be mounted on the lens without removing the lens from the camera head.

Fittings are provided on the outside of the relay optics cover for readily accessible storage of maintenance and adjustment tools. The cover also provides storage for two rubber stoppers for securing the zoom and focus drive shafts when the lens is removed from the camera.

Retractable, slide-out carrying handles are provided under the camera head. These have two locking positions: directly outboard to allow raising the camera to cam head height, and pivoted upward closer to the center of gravity for carrying.

**WAVEFORM MONITOR SWITCHER:** The PE-400 includes a versatile waveform monitor switcher. The switcher offers sequential W, R, G, B display for setting shading, gamma tracking, level, iris, etc. It also presents waveforms before and after the masker and encoder. A four input test signal switcher is included for injecting test signals such as multiburst and  $\sin^2$  window into the preamplifiers for system checking.

**PICTURE MONITOR SWITCHER:** The PE-400 also includes a video monitor switcher which displays many points in the video flow, including separate W, R, G, B; W, R, B, B superimposed, subtractive (negative) registration, and an external video input. The availability of these test displays further contributes to system versatility, stability, and accuracy of setup and maintenance.

**"AUTO-TRAST" OPERATION:** Broad new production capabilities are made possible by the "Auto-Trast" feature's added picture detail under high-contrast lighting situations in both studio and field. Picture detail formerly lost in the clippers is now preserved. For example, in late afternoon sports where the picture includes both sunlight and stadium shadow, the iris can be opened up for the shadow area and "Auto-Trast" will preserve detail in the sunlight portion. In the studio, the exposure can be set high enough for good skin tone without white clipping reflective costumes.

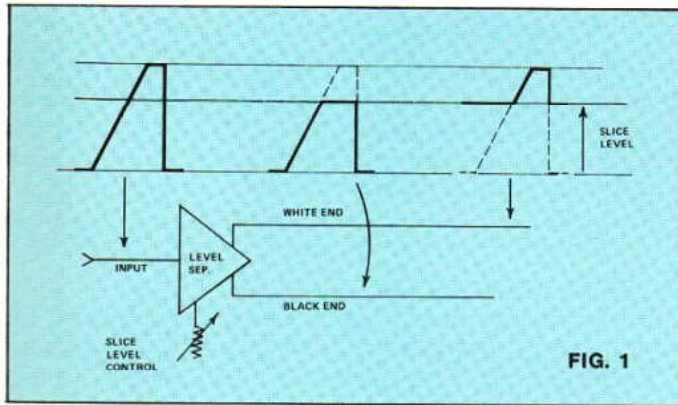


FIG. 1

Fig. 1. In a level separator, input video is divided into two components, the white-end signal and the black-end signal. Separation occurs at the "slice level", which can be set by a control at any point between 20 and 100 IRE units.

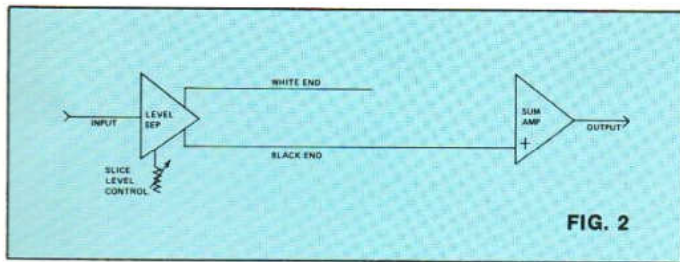


FIG. 2

Fig. 2. If the slice level control is set at 75 IRE units, only that portion of the input signal above 75 units will come out of white-end output. The remainder of the signal, all that below 75 IRE units, will come out of black-end output.

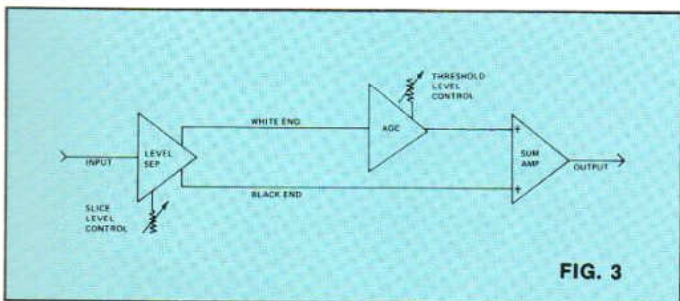


FIG. 3

Fig. 3. After separation, the black-end signal goes to a summing amplifier where the white-end signal will be added

ed after processing. The white-end signal goes to an automatic gain control circuit. As long as the input signal to the AGC is below threshold level, the AGC has a gain of one and the signal is unaltered. If the input signal increases above the threshold level, the gain of the circuit is reduced, proportionate to the increase, and the peak of the output signal is held to the threshold level. The threshold is adjustable to any value between 90 and 130 IRE units. The AGC circuit feeds the summing amplifier, where the two signals are re-combined.

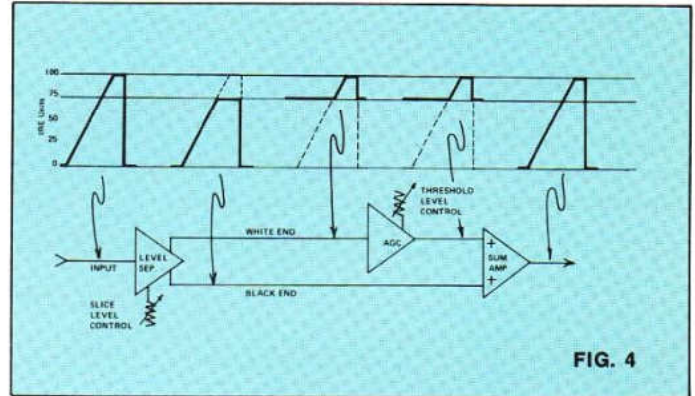


FIG. 4

Fig. 4. Circuit operation, with slice level at 75 IRE units, threshold setting at 105 IRE units, and an input signal at 100 IRE units. The AGC output is equal to its input since the signal does not reach the 105 IRE unit threshold level and no gain reduction is required. The summing amplifier output is therefore the same as the input signal since only separation and re-combination have taken place.

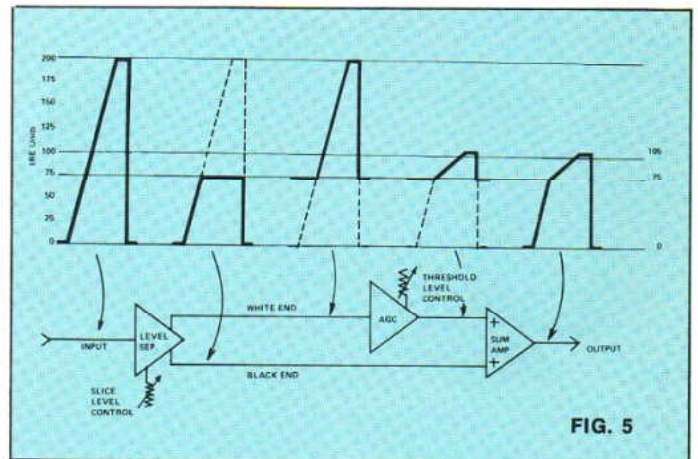


FIG. 5

Fig. 5. If the input signal goes to 200 IRE units, for example, the AGC output is different. Since the input (white-end) signal is well above the 105 IRE unit threshold level, the AGC has reduced the signal level at its output so the peak is at 105 IRE units. This reduced signal is re-combined with the black-end signal in the summing amplifier to form the output signal. The input and output signals are identical below 75 IRE units; only the portion above 75 IRE units is affected.

# PE-400

## Specifications

### VISUAL PERFORMANCE

**System Standards:** NTSC, PAL and SECAM standards with appropriate encoder.

**Scanning Standards:** 525 lines, 60 fields, or 625 lines, 50 fields.

**Signal Outputs:** Luminance, red, blue, green, each 0.7 volts into 75 ohms. Separate chroma keying outputs available at processor.

**Signal Inputs:** Bridging; H drive, V drive, blanking and sync: 4 Volts  $\pm 0.5$  Volts.

**Test Signal Inputs:** Three switchable external inputs.

**Geometric Distortion:** No point will depart more than 2% from its true position on the face of the pickup tubes.

**Sensitivity:** 50 foot-candles (500 lux) for 100% video, @ 46 dB signal-to-noise ratio, with 60% reflectance white with lens at f/2.2 and typical tubes. 2X and 4X gain switches provide extended sensitivity.

**Lag Performance:** Scanned area of chrominance tubes reduced for lag suppression.

**Horizontal Resolution:** 600 lines.

**Masker:** In chroma channels, adjustable.

**Gamma Correction:** Continuously variable, 0.35 to 1.

**Signal-to-noise Ratio:** 46 dB, with 4.2 MHz bandwidth.

**Aperture Correction:** Low noise, horizontal and two line vertical with comb filter and noise clipping.

**Square Wave Response:** Less than 2% tilt of a 50 Hz square wave.

**Shading Correction:** Adjustable, vertical and horizontal, modulated in.

**Viewfinder:** 8" (203 mm) diagonal dimension, highlight brightness in excess of 150 foot-lamberts. Controls for contrast, brightness, video peaking and focus.

**Camera Cable:** (1 1/8" diameter): Up to 2,000 ft. with adjustable compensation. Will operate at greater lengths at slightly reduced performance. (0.65" diameter): Up to 500 ft. with adjustable compensation. Will operate at greater lengths at slightly reduced performance. Interchangeable.

### SERVICE CONDITIONS

**Ambient Temperature:** Minimum camera ambient for continuous operation:  $-20^{\circ}\text{C}$  ( $-4^{\circ}\text{F}$ ). Maximum room ambient for continuous operation:  $+45^{\circ}\text{C}$  ( $+113^{\circ}\text{F}$ ). Maximum inside rack or console ambient for continuous operation:  $+55^{\circ}\text{C}$  ( $+131^{\circ}\text{F}$ ).

**Ambient Humidity Range:** 0 to 95% relative humidity.

**Altitude:** Sea level to 10,000 ft.

### ELECTRICAL

**AC Power Input:** 105 to 130 volts, 50/60 Hz. Channel (less encoder and monitoring) 375 Watts.

## Ordering Information

PE-400 basic color camera, including camera head (less lens but including tubes and wedge plate and adapter), camera control panel (including intercom amplifier), processing amplifier, monitor selector panel, 28 Volt DC power supply, rack interconnection harness, blower and panel, and image enhancer .....	994-7351
Angenieux zoom 10:1 lens, 18-180 mm, f/2.2, plus interfacing hardware .....	992-3760
Angenieux 15:1 zoom lens, 18-270 mm, f/2.0 18-180 mm increasing linearly to f/3.0 at 270 mm, 2 ft. minimum focus distance, plus interfacing hardware .....	992-3761
Angenieux 18:1 zoom lens, f/2.2, 27.5 mm to 300 mm, increasing linearly to f/3.2 at 500 mm, 10 ft. minimum focus distance .....	727-0185
TV-115 NTSC encoder, with built-in color bar generator .....	994-7210
Extender board for TV-115 .....	952-7240
Encoder cable, 50' .....	928-1098
Camera cable, 100' .....	938-7636
Single headset .....	721-0077
Dual headset .....	721-0078
Service engineering checkout available.	

GATES DIVISION

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