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CBS SPECIFICATIONS FOR SEQUENTIAL COLOR CAMERA UNIT
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CBS SPECIFICATIONS FOR SEQUENTIAL COLOR CAMERA CHAIN

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CBS SPECIFICATIONS FOR SEQUENTIAL COLOR CAMERA CHAIN

I. Scope.

A. It is the intent of these specifications to describe a field-sequential color-television image-orthicon camera chain suitable for both field and studio applications built in accordance with:

1. RETMA standards and proposed standards, where applicable.
2. FCC standards, where applicable.
3. The latest technical developments.
4. Good engineering practice.

II. System Standards.

A. Scanning Standards.

1. Number of scanning lines - 525
2. Interlacing - 2 to 1
3. Frame frequency - 90 cps
4. Field frequency - 180 cps
5. Color frame frequency - 30 cps
6. Color field frequency - 60 cps
7. Line frequency - 47,250 cps
8. Color field sequence - red-blue-green
9. Aspect ratio - 4 units horizontally
3 units vertically
10. Scanning direction (viewing transmitted scene) - Vertical lines,
scanning from top to bottom and progressing from right to left.

B. Synchronizing Signal.

1. Field rate blanking shall be 0.07V, +0.03V, -0.
2. Line rate blanking shall be 0.21H, +0.02H, -0.01H.
3. All pulse rise times shall be .006H maximum.
4. Front porch shall be 0.04H minimum.
5. Back porch plus sync pulse shall be 0.16H minimum.
6. No color synchronizing pulse is required initially.
7. Other characteristics in accordance with applicable FCC and RETMA Standards.

III. Synchronizing Generator.

1. Required Output Signals.

1. Line Rate Drive.
 - a. Variable in width from 0.1H to 0.2H.
2. Field Rate Drive.
 - a. Variable in width from 0.03V to 0.08V.
3. Color Field Rate Drive.
 - a. Repetition rate - 60 cps.
 - b. Leading edge to coincide with leading edge of field rate drive.
 - c. Precedes red field.
 - d. Width 0.02V to 0.04V (non-adjustable).
4. Blanking.
 - a. Leading edge of line rate pulses to occur nominally 3 microseconds after leading edge of line rate drive pulses.
 - b. Delay adjustable ± 0.5 microseconds.
5. Synchronizing signal.
 - a. Timing adjustable so that leading edges of synchronizing pulses may occur from 0.5 microseconds in advance to 3.5 microseconds after leading edges of line rate blanking pulses.

B. Desired Output Signals.

1. Geometric linearity test signal.
 - a. Basic pattern - 15 horizontal bars and 20 vertical bars.
 - b. Output combinations desired:
 - i. Vertical bars only.
 - ii. Horizontal bars only.
 - iii. Vertical and horizontal bars.
 - iv. Dots.
 - c. All patterns to be available in either polarity with negative blanking.
2. Amplitude linearity test signal.
 - a. Linear stair step signal of 1 volt peak-to-peak amplitude.
 - b. Total of ten steps.
 - c. Repetition rate equal to field rate (to produce vertical bars).

C. Master Oscillator Synchronization.

1. 60 cps power line.
2. Internal crystal.
3. External 60 cps.
4. External from "sync-lock".
5. Off (free-running).

D. General.

1. All other specifications shall be in accordance with applicable RETM standards and proposed standards.

IV. Camera Chain.

A. Camera.

1. Image orthicon scanning circuits.
 - a. Line rate flyback time - 3.5 microseconds maximum.

- b. Linearity - within $\pm 1\%$ of picture height.
 - c. Scanning transient suppression:
 - i. Geometric - no distortion equivalent in amplitude to greater than 1% of picture width.
 - ii. Brightness variation - no spurious signal introduced into video signal with peak-to-peak amplitude greater than 1% of full video signal peak-to-peak amplitude.
 - d. Color field registration:
 - i. The three color field rasters shall register within 0.1% of picture width over the entire raster.
2. Color filter disc.
- a. Filter material shall be on 10 mil acetate base and of following types:
 - i. Red - E.K. Co. Wratten #25
 - ii. Blue - E. K. Co. Wratten #47, half density
 - iii. Green - E. K. Co. Wratten #58
 - b. Individual filter segments of the same color shall be matched for equal transmission within 1% .
 - c. Transmission in the three primaries for each color disc shall be equalized by means of neutral density filters so that target saturation in a standard type 5820 image orthicon takes place at the same light level on a standard white card Munsell N-2 with incandescent illumination of 2900 °K. This match shall be achieved as accurately as is possible using neutral density filters in density increments of 0.05. (This specification applies only to cameras used for studio operations.)
 - d. Construction of color disc shall be such that individual filter segments are floating within their mountings and not clamped at any point.
3. Color disc drive.
- a. The color disc shall be driven by a single phase synchronous motor of not greater than 1/100 hp rating or 50 watts power consumption.
 - b. The phase position of the disc shall be manually adjustable through a complete color field cycle from the camera control position. An external multi-phase power source shall not be required for this circuit.

- c. The disc shall be operable with the camera in any position and shall not be caused to malfunction by the acceleration resulting from rapid manual panning of the camera.
 - d. The audible noise resulting from operation of the disc shall not exceed 40 db with "A" weighting at a distance of 5 feet in any direction from the camera.
 - e. The power input to the drive motor shall be brought out as a separate circuit isolated from the camera power circuits.
4. Optical system.
- a. Design shall permit use of a 35mm focal length lens set to infinity focus.
 - b. A remotely-controlled iris with independent adjustment of each lens and operable from the camera control position, shall be provided.
5. It is desirable that the camera image orthicon scanning circuits be alignable from the camera control position.
6. General.
- a. The ventilation system shall be adequate to compensate for any increased heat dissipation resulting from modifications to standard monochrome equipment and shall maintain correct image orthicon operating temperature for ambients ranging from 0° to 110°F.
- B. View Finder.
- 1. A monochrome picture may be provided.
 - 2. Linearity shall be within $\pm 2\%$ with no foldover.
 - 3. Picture highlight brightness shall be at least 100 foot lamberts.
 - 4. Color field registration shall be within 0.1% of picture width.
 - 5. Resolution capability shall be at least 400 lines horizontally and 350 lines vertically, initially.
- C. Camera Control.
- 1. Picture display.
 - a. A monochrome picture may be provided.
 - b. Linearity shall be within $\pm 2\%$ with no foldover.

- c. Picture highlight brightness shall be at least 50 foot lamberts.
 - d. Color field registration shall be within 0.1% of picture width.
 - e. Resolution capability shall be at least 400 lines horizontally and 350 lines vertically, initially.
2. Waveform monitor display.
- a. Sweep rates available shall include:
 - i. 60 cps - triggered so that red field appears on left
 - ii. 23,625 cps
 - b. Internal amplitude calibrator with accuracy $\pm 2\%$ shall be provided.
3. Target voltage calibrator shall be provided with manual switch-button to insert 2 volt (nominal) negative increment on target potential. Screwdriver adjustment of calibration voltage shall be provided over range of 2 ± 0.5 volts.
4. Fixed pedestal insertion with black clipping shall be provided.
- D. Color Mixer (Gated amplifier for independent color field control)
- 1. Shall provide operational control of gain in three color fields.
 - 2. Shall provide operational control of pedestal in three color fields.
 - 3. Desirable to provide some simple form of over-all gamma adjustment.
 - 4. Pedestals shall hold within $\pm 2\%$ over range of peak video signal amplitude from zero to $1\frac{1}{2}$ times standard video signal level.

E. General

- 1. Video amplifier performance (applies to both over-all picture channel response and monitoring circuits including view finder).
 - a. High-frequency amplitude response to 9 mc ± 0.5 db, initially.

- b. High-frequency transient response shall be such that the peak-to-peak value of any transient resulting from the application of a step voltage function having a 0.02 microsecond rise time shall be less than 5% of the amplitude of the step function.
 - c. Low-frequency transient response shall be adequate to pass a 60 cps square wave with less than 5% tilt.
 - d. Hum level (peak-to-peak) shall be less than 40 db below peak-to-peak video signal level.
2. Pulse delay system.
- a. A fixed delay of 3 microseconds shall be provided for all line rate drive pulses used in the camera control and color mixer.
 - b. A variable delay (with knob adjustment) from zero to 3 microseconds in 0.2 microsecond increments shall be provided for all line rate drive pulses fed to the camera control.
 - c. Delay lines shall be located in the camera control or color mixer.
3. The equipment shall be operable from 105 to 125 volt, 60 cps, single phase power.