

New!

COLOR

television
tubes
by

Thomas

T. E. I.

type
15GP22

color television direct

FEATURES

FULL-COLOR OR BLACK-AND-WHITE PICTURE
THREE ELECTRON GUNS
195,000 DOT TRIOS OR 585,000 DOTS
ALUMINIZED TRICOLOR PHOSPHOR-DOT PLATE
METAL SHADOW MASK
SPHERICAL FACE
EXTERNAL CONDUCTIVE COATING
ELECTROSTATIC FOCUS AND CONVERGENCE

CHARACTERISTICS — GENERAL DATA

Focusing Method	Electrostatic
Convergence Method	Electrostatic
Deflection Method	Magnetic
Deflection Angles (Approx.)	
Horizontal	45°
Vertical	35°
Phosphor (three separate phosphors, collectively) P22	
Fluorescence and Phosphorescence of separate phosphors, respectively	Blue, green, red
Persistence of group phosphorescence	Medium
Faceplate, spherical	Clear glass
Screen, Ant	
Type	Aluminized, tricolor, phosphor-dot
Plate	Filterglass
Light transmission (approx.)	70%

ELECTRICAL DATA

Heater voltage	6.3 volts
Heater current	1.8 amperes
Direct interelectrode capacitance (approx.)	
Grid No. 1 of any gun to all others	
Electrodes except the No. 1 grids of the other two guns	7.5 uuf
Cathode of blue gun + cathode of red gun + cathode of green gun to all other electrodes	17.5 uuf
Grid No. 3 to all other electrodes	12 uuf
Grid No. 4 to all other electrodes	7 uuf

MECHANICAL DATA

Minimum useful screen dimensions	11 1/2" x 8 1/4"
Picture area	88.5 sq. inches
Base (small-shell bidirect 14-pin)	JETEC B14-103

TUBE DIMENSIONS

Maximum overall length	36 1/4"
Greatest diameter	
of faceplate	14 1/8" ± 5/32"
of metal flange	15 1/4" max.

RATINGS

Maximum Ratings (Design Center values)	
Anode voltage	20,000 max. volts dc
Anode input (Note 1)	15 max. watts
Grid No. 4 voltage (convergence electrode)	11,000 max. volts dc
Grid No. 3 voltage (focusing electrode)	3,000 max. volts dc
Grid No. 2 voltage (each gun)	500 max. volts dc
Grid No. 1 voltage (each gun)	
Negative bias value	200 max. volts dc
Positive bias value	0 max. volts dc
Positive peak value	2 max. volts dc
Heater—Heater—railroad voltage (each gun)	
Heater negative with respect to cathode	
During warm-up period not to exceed 1.5 sec.	410 max. volts dc
After equipment warm up period	180 max. volts dc
Heater positive with respect to cathode	180 max. volts dc
Characteristics Range Values For The Design Of Experimental Receivers: (for anode voltage E_c of 18,000 to 20,000 volts and anode input of 1.5 watts)	
Grid No. 4 voltage (note 2)	42.5% to 51% of E_c volts
Grid No. 3 voltage	12% to 19% of E_c volts
Grid No. 2 voltage (each gun) when circuit design utilizes voltage of fixed value for raster cutoff	2 to 4.5 times E_c volts
Grid No. 1 voltage for visual extinction of focused raster (each gun) when circuit design utilizes grid No. 2 voltage at fixed value	22.5% to 40% of E_c volts
Grid No. 4 current	-5 to -5 u amp
Maximum Grid No. 3 current	300 u amp
Grid No. 2 current	15 to 15 u amp
Beam-current ratio to produce	
Illuminant—C white (6500°K)	
Red gun to green gun	4:1 to 1:1
Blue gun to green gun	1.5:1 to 0.5:1
Maximum raster shift in any direction from screen center (note 3) 1/4"	

EXAMPLES OF USE OF RANGE VALUES

Anode voltage	20,000 volts dc
Grid No. 4 voltage (note 2)	8,500 to 10,200 volts dc
Grid No. 3 voltage	2,400 to 3,800 volts dc
Grid No. 2 voltage (each gun) when circuit design utilizes grid No. 1 voltage of -70 volts (each gun)	140 to 315 volts dc
Grid No. 1 voltage of visual extinction of focused raster (each gun) when circuit design utilizes Grid No. 2 voltage of 300 volts (each gun)	-45 to -100 volts dc

CIRCUIT VALUES VALUES

Grid No. 1 circuit resistance (each gun)	1.5 max. megohms
Dynamic converging voltage (approx. Note 4)	900 volts
Dynamic focusing voltage (approx. Note 4)	250 volts
External conductive coating to anode capacitance	
Maximum	2500 uuf
Minimum	1500 uuf

NOTES

1. This value is the product of anode voltage and average current measured at the anode terminal with a dc ammeter.
2. This range does not include the dc component of the dynamic converging voltage.
3. Centering of the raster on the screen is accomplished by passing direct current of the required value through each pair of deflecting coils to compensate for the raster shift resulting from optimum adjustments for convergence, color purity, and concentricity.
4. Peak-to-peak value. This ac voltage having essentially parabolic waveform is synchronized with scanning and does not include any voltage developed during the blanking time.

Close-up view picture tubes

T. E. I. LAWRENCE EXPERIMENTAL type CH-22

FEATURES

FRINGE-FREE COLOR AND BLACK AND WHITE PICTURES
LARGE PICTURE . . . ONE ELECTRON GUN
SIMPLIFIED CIRCUITING . . . SHORT TUBE
WIDE ANGLE DEFLECTION . . . LOW RASTER SCANNING POWER
LOW COLOR DEFLECTING POWER . . . QUICK SET-UP
STANDARD DEFLECTION COMPONENTS
ALUMINIZED HIGH BRIGHTNESS AND HIGH CONTRAST TRICOLOR SCREEN

GENERAL DATA

Focusing method: Magnetic
Deflecting method: Magnetic
Deflection angle: 72°
Phosphors: Red, green and blue primaries
Envelope: spherical, clear glass
Screen: flat
Type: metal backed, tricolor, phosphor line
Plate: Filterglass

ELECTRICAL DATA

Heater voltage (AC or DC).....6.3 volts
Heater current.....0.6 amperes
DIRECT INTERELECTRODE CAPACITANCES
Grid #1 to all other electrodes.....6 uuf
Cathode to all other electrodes.....5 uuf
Color grid wires to each other.....1400 uuf
Color grid wires to all other electrodes.....0.5 uuf

MECHANICAL DATA

Min. picture size.....10 3/8" x 14 1/4"
Picture area.....153 square inches
Base.....Small-shell duodecal 6 pin
Mounting position.....Any

TUBE DIMENSIONS

Max. bulb diameter.....22 3/4"
Max. length.....22 1/2"

RATINGS

	Max. volts dc
Total accelerating voltage, Ek-p.....	18,000 volts dc
Electron gun voltage.....	5,000 volts dc
Color grid deflection voltage, EG4-G5.....	1,000 volts dc
Seeker voltage, EG3-G4G5 (note #1).....	600 volts dc
Voltage between color grid and phosphor plate, EG4, EG5-p.....	13,000 volts dc
Grid #2 voltage.....	3,000 volts dc
Grid #1 voltage — negative bias value.....	—125 max. volts dc
positive bias value.....	0 max. volts dc
positive peak value.....	2 max. volts dc

Peak heater-cathode voltage:
Heater negative with respect to cathode

- during experiment warm-up period not exceeding 15 seconds.....410 max. volts dc
- after equipment warm up.....180 max. volts dc

Heater positive with respect to cathode.....100 max. volts dc

TYPICAL OPERATION

Total acceleration voltage, Ek-p.....	18,000 volts dc
Electron gun voltage, EK-G3.....	5,500 to 6,000 volts dc
Focus current (plate #7).....	55 ma to 70 ma
Color grid deflection voltage, EG4-G5.....	500 peak volts dc
Seeker voltage, EG3-G4G5.....	300 volts dc
Grid #2 voltage.....	300 to 1,000 volts dc
Grid #1 voltage.....	—33 to —77 volts dc

NOTES:

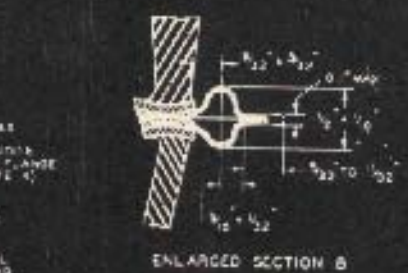
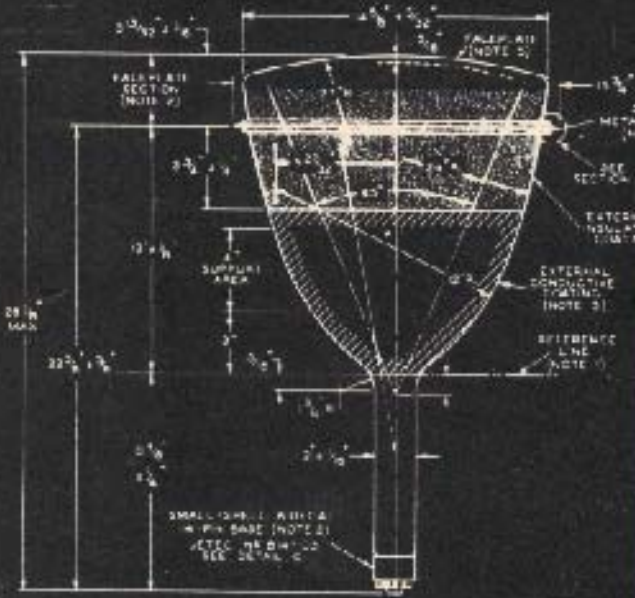
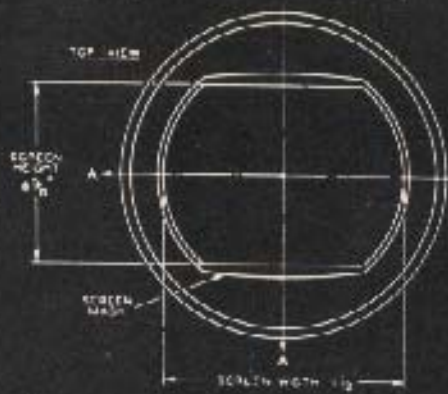
#1 Seeker voltage is defined as the DC potential between color grids and metal case. This voltage is such that the color grids are negative with respect to metal case. This is an installation adjustment.

#2 With RETWA focus coil #109 installed so that the center of focus coil gap is located three inches behind the yoke reference line.

ADVANTAGES OF THE LAWRENCE TUBE — A SINGLE GUN TRI-COLOR TELEVISION TUBE

The type CH-22 single gun tube has **WIDE DEFLECTION ANGLE—72°**, which makes it a **SHORT TUBE**—its overall length for the 22 3/4" picture tube is 22". It gives a **LARGE PICTURE**—over 60% larger than the three-gun shadow mask tube. It provides a **BRIGHT PICTURE**—at an anode voltage of 18 kV, the brightness measured through a 66% efficient filter face plate is about 30 ft. lamberts in the highlights. It requires **LOW RASTER SCANNING POWER**—the inferred beam is only 1/3 the potential of the first acceleration, and **LOW COLOR DEFLECTING POWER**—for 3.58 mc switching with the NTSC system, 25 to 33 watts dc power input. **RESOLUTION**—in the horizontal direction is equivalent to present black and white, in the vertical direction, better than 275 lines. **LESS POWER THAN THREE-GUN TUBE**—overall power is reduced in comparison to a three-gun tube, since there is but one filament, no regulated anode supplies, no dynamic convergence or dynamic focus circuitry, etc. **STANDARD DEFLECTION COMPONENTS**—one standard, low cost lateral-white deflection yoke and focus coil. **QUICK SET-UP**—set-up time is a matter of minutes, since there are no problems of center registry or dynamic convergence. **SIMPLIFIED CIRCUITRY**—is a circuit designed for a single-gun tube. **FRINGE-FREE COLOR PICTURES, FRINGE-FREE STANDARD BROADCAST BLACK-AND-WHITE PICTURES, INEXPENSIVE TO PRODUCE**—low cost single-gun tube type of construction. Color control assembly a practical production item requiring only reasonable production tolerances. **RELIABLE**—Color control assembly not subject to damage even during extended periods of operation and high current density input to small tubes.

T. E. I. type 15GP22



Note 1: Reference line is determined by position where a cylindrical gauge 2.400 ± 0.001" I.D. which is held concentric with tube neck axis will rest on funnel.

Note 2: Socket for this base should not be rigidly mounted; it should have flexible leads and be allowed to move freely. Bottom circumference of base shell will fall within a circle concentric with top-plate-assembly axis and having a diameter of 3".

Note 3: External conductive coating must be grounded.

Note 4: Metal flange operates at high voltage. Adequate insulation must be provided between the flange and any grounded element in the receiver to prevent the possibility of electrical leakage including corona.

Note 5: Mask material having on the foreplane must have insulating qualities adequate for use with the applied screen voltage to minimize surface leakage between metal flange and mesh.

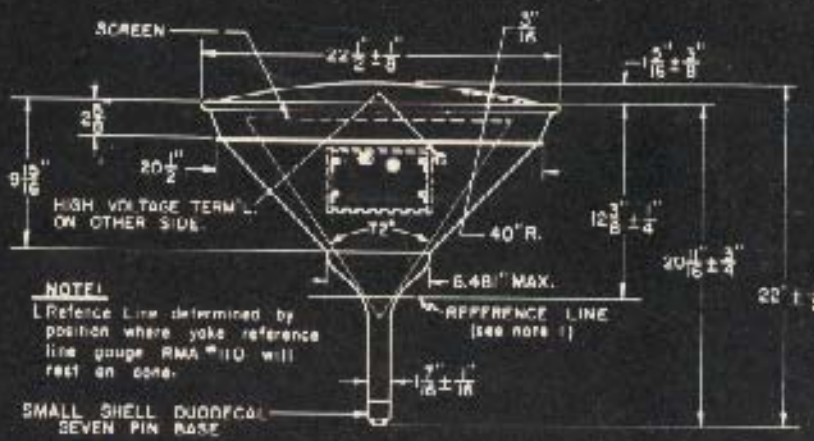
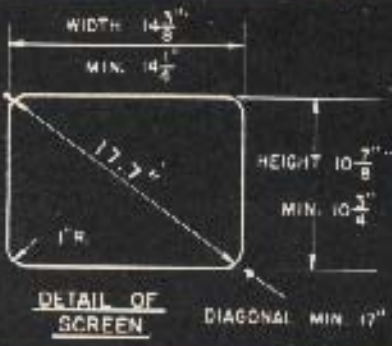
Note 6: Heavy radiation is present at the face of the 15GP22 when it is operated at its normal screen voltage. Simple shielding should prove adequate to provide protection against personal injury from prolonged exposure to this range.

T. E. I. TYPE 15GP-22 SOLDER CONNECTIONS (bottom view)

- PIN 1: Heater
 - PIN 2: Cathode of red gun
 - PIN 3: Grid No. 1 of red gun
 - PIN 4: Grid No. 2 of red gun
 - PIN 5: No connection
 - PIN 6: Grid No. 3
 - PIN 7: Cathode of green gun
 - PIN 8: Grid No. 1 of green gun
 - PIN 9: Grid No. 2 of green gun
 - PIN 10: Grid No. 4
 - PIN 11: Grid No. 2 of blue gun
 - PIN 12: Grid No. 1 of blue gun
 - PIN 13: Cathode of blue gun
 - PIN 20: Heater
- WFT#1 PLIANGE: Anode (Grid No. 5, Grid No. 4, collector)

T. E. I. LAWRENCE type CH-22

developmental number



T. E. I. TYPE LAWRENCE CH-22 SOCKET CONNECTIONS (bottom view)

- PIN 1—Heater
- PIN 2—Grid No. 1, Control Grid
- PIN 3—No connection
- PIN 10—Grid No. 2
- PIN 11—Cathode
- PIN 12—Heater
- SHELL—Metal cage and Grid No. 3
- G4, G5—cath. grid, external connection brought thru shell
- P—Anode, slanted backing of phosphor screen, highest accelerating voltage electrode in tube. External connection brought thru shell

