FLYING-SPOT CATHODE-RAY TUBE

HIGH RESOLUTION CAPABILITY  ALUMINIZED SCREEN
ELECTROSTATIC FOCUS  MAGNETIC DEFOCUSTION

For use as scanner in high-quality flying-spot video-signal generators

**DATA**

**General:**
Heater, for Unipotential Cathode:
- Voltage: 6.3 ac or dc volts
- Current: 0.6 ± 10% amp

Direct Interelectrode Capacitances:
- Grid No.1 to all other electrodes: 8 μf
- Cathode to all other electrodes: 5 μf
- External conductive neck coating to ultor: 500 max. μf
  - 100 min. μf

Faceplate, Flat: Clear Glass
Phosphor (for curves, see front of this section): Aluminized P16

Fluorescence—
- Visible radiation: Violet
- Invisible radiation: Near Ultraviolet

Phosphorescence—
- Persistence of visible radiation: Very Short
- Persistence of invisible radiation: Very Short

Focusing Method: Electrostatic
Deflection Method: Magnetic
Deflection Angle (Approx.): 40°

Tube Dimensions:
- Overall length: 14–3/8" ± 3/8"
- Greatest diameter of bulb: 5" ± 1/8"

Minimum Useful Screen Diameter: 4–1/4" in.

Weight (Approx.): 1–1/2 lbs
Operating Position: Any

Cap.: Recessed Small Cavity (JETEC No.11-21)
Socket: Small-Shell Duodecal 7-Pin (JETEC No.87-51)

Basing Designation for BOTTOM VIEW: 12C

**Pin 1—Heater**
Pin 2—Grid No.1
Pin 6—Grid No.3
Pin 7—Internal Connection—Do Not Use
Pin 10—Grid No.2
Pin 11—Cathode

**Pin 12—Heater Cap—Ultor**
(Grid No.4, Collector)
C—External Conductive Neck Coating

**Maximum Ratings, Design-Center Values:**
- **ULTOR VOLTAGE**: 27000 max. volts
- **GRID—No.3 VOLTAGE**: 7000 max. volts
- **GRID—No.2 VOLTAGE**: 350 max. volts

*Indicates a change.*
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| **GRID-No.1 VOLTAGE:** |  |
|------------------------|--|---|
| Negative bias value    | 150 max. volts |
| Positive bias value    | 0 max. volts   |
| Positive peak value    | 2 max. volts   |

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<thead>
<tr>
<th><strong>PEAKER HEATER–CATHODE VOLTAGE:</strong></th>
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<tbody>
<tr>
<td>Heater negative with respect to cathode:</td>
</tr>
<tr>
<td>During equipment warm-up period not exceeding 15 seconds</td>
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<tr>
<td>After equipment warm-up period</td>
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<tr>
<td>Heater positive with respect to cathode.</td>
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<tr>
<th><strong>Equipment Design Ranges:</strong></th>
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<tr>
<td>For any utior voltage ($E_{Cu}$) between 20000* and 27000 volts</td>
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| Grid-No. 3 Voltage for focus with utior current of 25 µA or less. | 20.5% to 26.5% of $E_{Cu}$ volts |
| Grid-No. 2 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.1 voltage | 2 to 5 times $E_{Cu}$ volts |
| Grid-No. 1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.2 voltage | -20% to -50% of $E_{Cu}$ volts |
| Grid-No. 2 Current | -15 to +15 µA |

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<tr>
<th><strong>Examples of Use of Design Ranges:</strong></th>
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<tbody>
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<td>For utior voltage of 20000 27000 volts</td>
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| Grid-No. 3 Voltage for focus with utior current as indicated | 4100 to 5300 5500 to 7100 volts |
| Grid-No. 2 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.1 voltage of -70 volts | 140 to 350 140 to 350 volts |
| Grid-No. 1 Voltage for visual extinction of undeflected focused spot when circuit design utilizes fixed grid-No.2 voltage of 200 volts | -40 to -100 -40 to -100 volts |
| Utior Current | 25 15 µA |

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<tr>
<th><strong>Maximum Circuit Values:</strong></th>
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<tr>
<td>Grid-No.1–Circuit Resistance</td>
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</table>

* Brillian and definition decrease with decreasing utior voltage. In general, the utior voltage should not be less than 20,000 volts.

← Indicates a change.
OPERATING CONSIDERATIONS

X-Ray Warning. X-ray radiation is produced at the face of the 5ZP16 when it is operated at its normal ultor voltage. These rays can constitute a health hazard unless the tube is adequately shielded for X-ray radiation. Although relatively simple shielding should prove adequate, make sure that it provides the required protection against personal injury.

The base pins of the 5ZP16 fit the Duodecal 12-contact socket. The socket contacts corresponding to the vacant pin positions (pin positions 3, 4, 5, 8, and 9) should be removed in order to provide the maximum insulation for the high-voltage pins 6 and 7. The socket should be made of high-grade, arc-resistant, insulating material and should preferably be designed with baffles.

Resolution of better than 1000 lines at the center of the reproduced picture can be produced by the 5ZP16 when it is operated with 27,000 volts on the ultor. At lower ultor voltages, the resolution capability decreases. To obtain high resolution in the horizontal direction, it is necessary to use a video amplifier having a bandwidth of about 20 megacycles.

The ultraviolet output of the 5ZP16 is a linear function of the ultor current. For any particular value of ultor current, the ultraviolet output is approximately 50 per cent higher when the 5ZP16 is operated with 27,000 volts on the ultor than when operated with 20,000 volts.

Underscanning over a protracted period should be avoided because an underscanned area of the screen will be burned and thus give diminished radiation when the raster is again scanned to full size and be slightly noticeable in the reproduced picture. Furthermore, it is inadvisable to permit a modulated stationary pattern to remain more than a few minutes on the face of the tube. If it remains for a longer time, the phosphor will be burned unevenly over the pattern area.

Never allow the beam to remain stationary, even momentarily, because the high peak energy in the beam will seriously damage the screen. Provision should be made to prevent such a possibility. Provision should also be made in equipment design to insure that the ultor voltage will drop as fast as the scanning current when the equipment is turned off; or to bias grid No. 1 to beam-current cutoff when the equipment is turned off.
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BLOCK DIAGRAM OF FLYING-SPOT VIDEO-SIGNAL GENERATOR SYSTEM FOR SLIDE TRANSPARENCIES

VERTICAL & HORIZONTAL SAWTOOTH GENERATORS & VERTICAL OUTPUT AMPLIFIER

HORIZONTAL OUTPUT AMPLIFIER

HIGH-VOLTAGE POWER SUPPLY

MULTIPLIER PHOTOTUBE POWER SUPPLY

TO GRID NO. 1

VERTICAL SCANNING

HORIZONTAL SCANNING

HIGH VOLTAGE ULTORS

DEFLECTING YOKE

OBJECTIVE LENS TYPE IP21 PLAN SLIDE

CONDENSER LENSES

SYNCHRONIZING SIGNAL GENERATOR

MIXED BLANKING SIGNAL

BLANKING AMPLIFIER

TO LINE AMPLIFIER

Devices and arrangements shown or described herein may use patents of RCA or others. Information contained herein is furnished without responsibility by RCA for its use and without prejudice to RCA's patent rights.

NOTE 2: WITH TUBE NECK INSERTED THROUGH FLARED END OF REFERENCE-LINE GAUGE JETEC NO. 110 (SHOWN AT FRONT OF THIS SECTION) AND WITH TUBE SEATED IN GAUGE, THE REFERENCE LINE IS DETERMINED BY INTERSECTION ON PLANE CC' OF THE GAUGE WITH THE GLASS FUNNEL.

NOTE 3: EXTERNAL CONDUCTIVE NECK COATING MUST BE GROUNDED.

NOTE 4: Ø OF BULB WILL NOT DEVIATE MORE THAN 2° IN ANY DIRECTION FROM THE PERPENDICULAR ERECTED AT THE CENTER OF THE BOTTOM OF THE BASE.
$E_f = 6.3$ VOLTS
ULTOR VOLTS = 20000
GRID-N° 3 VOLTS ADJUSTED TO GIVE FOCUS.
GRID-N° 2 VOLTS = 200
$E_f = 6.3\ \text{VOLTS}$

ULTOR VOLTS = 27000

GRID-N° 3 VOLTS ADJUSTED TO GIVE FOCUS.

GRID-N° 2 VOLTS = 200