**Beam-Deflection Tube**

**9-PIN MINIATURE TYPE**

For Use in Balanced-Modulator, Balanced Mixer, and Frequency-Converter Applications in Single- and Double-Sideband, Suppressed-Carrier Communication Equipment Operating at Frequencies up to 100 Mc

**GENERAL DATA**

**Electrical:**

Heater, for Unipotential Cathode:
- Voltage (AC or DC) .................. 6.3 ± 10% volts
- Current ............................. 0.35 amp

Direct Interelectrode Capacitances (Approx.):
- Grid No.1 to all other electrodes except plate .................. 7.5 \( \mu \text{f} \)
- Grid No.1 to deflecting electrode No.1 .................. 0.015 \( \mu \text{f} \)
- Grid No.1 to deflecting electrode No.2 .................. 0.015 \( \mu \text{f} \)
- Grid-No.1 to plate No.1 .................. 0.003 \( \mu \text{f} \)
- Grid No.1 to plate No.2 .................. 0.003 \( \mu \text{f} \)
- Plate No.1 to all other electrodes except deflecting electrode No.1 .................. 0.8 \( \mu \text{f} \)
- Plate No.2 to all other electrodes except deflecting electrode No.2 .................. 0.8 \( \mu \text{f} \)
- Plate No.1 to plate No.2 .................. 0.3 \( \mu \text{f} \)
- Deflecting electrode No.1 to all other electrodes except plate No.1 .................. 4.6 \( \mu \text{f} \)
- Deflecting electrode No.2 to all other electrodes except plate No.2 .................. 4.6 \( \mu \text{f} \)
- Deflecting electrode No.1 to plate No.1 ................. 4 \( \mu \text{f} \)
- Deflecting electrode No.2 to plate No.2 ................. 4 \( \mu \text{f} \)
- Deflecting electrode No.1 to deflecting electrode No.2 ................. 1.4 \( \mu \text{f} \)

**Characteristics, Class A; Amplifier:**

- Plate-No.1 Supply Voltage .................. 150 volts
- Plate-No.2 Supply Voltage .................. 150 volts
- Deflecting-Electrode-No.1 Supply Voltage .................. 25 volts
- Deflecting-Electrode-No.2 Supply Voltage .................. 25 volts
- Grid-No.2 Supply Voltage .................. 175 volts
- Cathode Resistor .................. 150 ohms
- Total Beam Current (Plate-No.1 current plus plate-No.2 current) .................. 8.5 ma
- Grid-No.2 Current .......................... 2.1 ma

\( \Rightarrow \) Indicates a change.
Transconductance:
- Grid No.1 to both plates connected together. .......... $5400 \ \mu$hos
- Deflecting electrode No.1 to plate No.1b. .......... $800 \ \mu$hos
- Deflecting electrode No.2 to plate No.2b. .......... $800 \ \mu$hos
- Switching Voltage. .......... $11 \ \text{volts}$

Mechanical:
- Operating Position. .......... Any
- Maximum Overall Length. .......... 2$\frac{3}{8}$"
- Maximum Seated Length. .......... 2$\frac{3}{8}$" Length, Base Seat to Bulb Top (Excluding tip) .......... 2" ± 0.375"
- Dimensions. .......... See General Section
- Basing Designation for BOTTOM VIEW. .......... 9KS

![Diagram of Pin Connections]

**Pin 1 - Cathode, Internal Shield**
- Pin 2 - Grid No.2
- Pin 3 - Grid No.1
- Pin 4 - Heater
- Pin 5 - Heater

**Pin 6 - Plate No.2**
- Pin 7 - Plate No.1
- Pin 8 - Deflecting Electrode No.2
- Pin 9 - Deflecting Electrode No.1

**BALANCED MODULATOR**

**Maximum Ratings, Absolute-Maximum Values:**
- PLATE-No.1 VOLTAGE. .......... 300 max. volts
- PLATE-No.2 VOLTAGE. .......... 300 max. volts
- DEFLECTING-ELECTRODE-No.1 VOLTAGE. .......... ±100 max. volts
- DEFLECTING-ELECTRODE-No.2 VOLTAGE. .......... ±100 max. volts
- GRID-No.2 (SCREEN-GRID) VOLTAGE. .......... 250 max. volts
- GRID-No.2 INPUT. .......... 0.5 max. watt
- PLATE-No.1 DISSIPATION. .......... 1.5 max. watts
- PLATE-No.2 DISSIPATION. .......... 1.5 max. watts
- PEAK HEATER-CATHODE VOLTAGE:
  - Heater negative with respect to cathode. .......... 180 max. volts
  - Heater positive with respect to cathode. .......... 180 max. volts

**Typical Operation:**

*In accompanying balanced-modulator circuit utilizing separate excitation*

- Plate Voltage (Each plate). .......... 150 volts
- Deflecting-Electrode Voltage (Approx., each electrode). .......... 25 volts
- Grid-No.2 Voltage. .......... 175 volts

*Indicates a change.*
Cathode Resistor.................................. 1200 ohms
Peak-to-Peak AF Deflecting-
   Electrode Voltage................................ 2.8 volts
Peak-to-Peak RF Grid-No.1 Voltage.............. 10 volts
Plate Current (Each plate).......................... 1.5 ma
Grid-No.2 Current.................................. 0.75 ma
Plate-to-Plate Load Impedance
   (Approx.)...................................... 5000 ohms
Push-Pull, Peak-to-Peak Double-
   Sideband Output Voltage......................... 4 volts
Carrier Suppression.............................. 60 db
Third-Order Distortion.......................... -47 db
Fourth-Order Distortion......................... -45 db

Maximum Circuit Values:
Grid-No.1-Circuit Resistance:
   For fixed-bias operation.......................... 0.5 max. megohm
   For cathode-bias operation....................... 2.2 max. megohms
Deflecting-Electrode-Circuit
   Resistance (Per deflecting
   electrode).................................... 0.05 max. megohm

BALANCED MIXER

Maximum Ratings, Absolute-Maximum Values:

PLATE-No.1 VOLTAGE................................ 300 max. volts
PLATE-No.2 VOLTAGE................................ 300 max. volts
DEFLECTING-ELECTRODE-No.1 VOLTAGE.............. ±100 max. volts
DEFLECTING-ELECTRODE-No.2 VOLTAGE.............. ±100 max. volts
GRID-No.2 (SCREEN-GRID) VOLTAGE................. 250 max. volts
GRID-No.2 INPUT.................................. 0.5 max. watt
PLATE-No.1 DISSIPATION........................... 1.5 max. watts
PLATE-No.2 DISSIPATION........................... 1.5 max. watts
PEAK HEATER-CATHODE VOLTAGE:
   Heater negative with respect to cathode........ 180 max. volts
   Heater positive with respect to cathode........ 180d max. volts

Typical Operation:

   In accompanying balanced-mixer circuit utilizing separate excitation

Plate Voltage (Each plate)........................ 150 volts
Deflecting-Electrode Voltage
   (Approx., each electrode)......................... 25 volts
Grid-No.2 Voltage................................. 175 volts
Cathode Resistor................................ 1200 ohms
Peak-to-Peak Single-Sideband
   Deflecting-Electrode Voltage........................ 8 volts
   Peak-to-Peak RF Grid-No.1 Voltage............... 10 volts
   Plate Current (Each plate)........................ 1.5 ma
   Grid-No.2 Current................................ 0.75 ma

*Indicates a change.
Plate-to-Plate Load Impedance
(Approx.) .......................... 10000 ohms

Push-Pull, Peak-to-Peak Single-
Sideband Output Voltage .......... 40 volts
Oscillator Rejection 9° .......... −40 db
Third-Order Distortion 9° ......... −40 db
Fourth-Order Distortion 9° ........ −39 db

**Maximum Circuit Values:**

<table>
<thead>
<tr>
<th>Grid-No.1-Circuit Resistance:</th>
<th></th>
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<tbody>
<tr>
<td>For fixed-bias operation ......</td>
<td>0.5 max. megohm</td>
</tr>
<tr>
<td>For cathode-bias operation ......</td>
<td>2.2 max. megohms</td>
</tr>
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**Deflecting-Electrode-Circuit Resistance (Per deflecting electrode):**

|  | 0.05 max. megohm |

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a. Without external shield.
b. Defined as the partial derivative of the plate current with respect to the difference between the deflecting-electrode voltages, evaluated about the point of equal plate currents.
c. Defined as the sum of (a) the absolute value of the difference between the deflecting-electrode voltages when the current to one plate is equal to 90% of the total beam current and (b) the absolute value of the difference between the deflecting-electrode voltages when the current to the same plate is equal to 10% of the total beam current. This sum, expressed in terms of signal voltage, corresponds to the peak-to-peak value of signal voltage that is required between the deflecting electrodes in order to produce peak-to-peak signal current at each plate equal to 80% of the total beam current.
d. The dc component must not exceed 100 volts.
e. Operation with self-excitation and cathode resistor of 300 ohms is similar to operation with separate excitation.
f. To either deflecting electrode. The other deflecting electrode is bypassed.
g. Referred to single-sideband output voltage.

**OPERATING CONSIDERATIONS**

Deflecting-electrode-circuit resistance should be kept below 0.05 megohm to prevent nonlinear tube operation. The resistances of the two deflecting-electrode circuits should be approximately equal to minimize unbalance. The current drawn by each deflecting-electrode is in the order of 40 microamperes.

Magnetic fields adversely affect the intrinsic operating plate-current balance of the 7360. Although this tube is internally shielded to minimize this effect, the tube should be mounted as far as possible from all devices producing extraneous magnetic fields such as transformers, chokes, motors, or similar components. It is recommended that an external shield be used in those applications critical for balance.

Chassis layout should be such that all components and wiring associated with the plates and deflecting electrodes is symmetrical. This consideration is particularly important in rf applications where very small differences in stray capacitance can result in unbalance. Chassis layouts which permit heat or vibration to affect the components associated with one deflecting-electrode circuit or plate circuit more than the other, should be avoided. All components should be rigidly mounted.
BALANCED-MODULATOR CIRCUIT
With Separate Excitation

C1: 0.001 µf
C2: 0.22 µf
C3: 0.001 µf
C4: 0.01 µf
C5: 0.0033 µf
C6: 0.1 µf
C8, C9: Sufficient to resonate with input of SSB filter
C10: 0.22 µf
C11: 0.47 µf
R1: 0.47 megohm
R2: 1200 ohms
R3, R4: 68000 ohms
R5: 47000 ohms
R6: 12000 ohms
R7: 47000 ohms
R8: 0.1 megohm
R9: 2700 ohms
R10: Carrier-Balance Potentiometer, 5000 ohms
R11: 2700 ohms
R12: Quadrature-Balance Potentiometer, 2500 ohms
R13, R14: 2700 ohms
R15: 0.1 megohm

NOTE: All resistors 1/2 watt, ±10% unless specified.
All capacitors 400 volts.

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BALANCED-MIXER CIRCUIT
With Separate Excitation

C1: 0.001 μf
C2: 0.04 μf
C3, C4: 0.001 μf
C5: 0.04 μf
C6: Split-Stator Tuning Capacitor to Resonate with L1
C7, C8: 0.04 μf
L1: Inductor
R1: 0.47 megohm
R2: 1200 ohms
R3, R4: 68000 ohms
R5: 0.1 megohm
R6: 12000 ohms
R7: Oscillator-Rejection Potentiometer, 5000 ohms
R8: 0.1 megohm
R9, R10: 2700 ohms
T1: Tuned Input Transformer

NOTE: All resistors 1/2 watt, ± 10%, unless specified.
All capacitors 400 volts.
AVERAGE CHARACTERISTICS

E_f = 6.3 VOLTS
PLATES CONNECTED TOGETHER.
DEFLECTING-ELECTRODE VOLTS = 25
(DEFLECTING ELECTRODES
CONNECTED TOGETHER)
GRID-Nº 2 VOLTS = 175

RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.
DATA 4
3-61

92CM-10253RI
AVERAGE CHARACTERISTICS

\[ E_g = 6.3 \text{ VOLTS} \]
PLATE VOLTS = 150
(PLATES CONNECTED TOGETHER)
DEFLECTING-ELECTRODE VOLTS = 25
(DEFLECTING ELECTRODES CONNECTED TOGETHER)

\[ \text{GRID-NR1 VOLTS} \]
\[ \text{GRID-NR2 VOLTS} \]

92CS-10250R2

\[ E_g = 6.3 \text{ VOLTS} \]
PLATE-NR1 VOLTS = 150
PLATE-NR2 VOLTS = 150
DEFLECTING-ELECTRODE-NR1 VOLTS = 25
DEFLECTING-ELECTRODE-NR2 VOLTS ADJUSTED TO GIVE EQUAL PLATE CURRENTS.

\[ \text{GRID-NR1 VOLTS} \]
\[ \text{GRID-NR2 VOLTS} \]

92CS-10249R1
AVERAGE CHARACTERISTICS

$E_F = 6.3$ VOLTS
PLATE-$N^2$ VOLTS=$150$
PLATE-$N^2$ VOLTS=$150$
DEFLECTING-ELECTRODE-
$N^2$ VOLTS=$25$
GRID-$N^2$ VOLTS=$175$
$I_{b1} =$ DC PLATE-$N^1$ CURRENT
$I_{b2} =$ DC PLATE-$N^2$ CURRENT
OPERATION CHARACTERISTICS

$E_p = 6.3 \text{ VOLTS}$

$\text{PLATE-N1 VOLTS} = 150$

$\text{PLATE-N2 VOLTS} = 150$

$\text{DEFLECTING-ELECTRODE-N2 VOLTS} = 25$

$\text{GRID-N2 VOLTS} = 175$

$i_{b1} = \text{AC PLATE-N1 CURRENT}$

$i_{b2} = \text{AC PLATE-N2 CURRENT}$