



ELECTRONIC TUBE REFERENCE

14Q7

Voltage - Radio Detector Converter electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

HEPTODE

Heptode oscillator-converter for superheterodyne receiving equipment. Its multi-grid structure combines local oscillation and mixing in one valve, translating incoming radio-frequency signals to intermediate frequency while maintaining useful isolation between converter circuits.

GENERAL CHARACTERISTICS

BASE DESIGNATION	8ALT	BASE PINS	8
NOMINAL HEATER	14 V / 160 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Heptode	
PLATE RESISTANCE	1000000 Ω
MAXIMUM PLATE VOLTAGE	200 V
MAXIMUM SCREEN VOLTAGE	100 V
MAXIMUM PLATE DISSIPATION	1 W
MAXIMUM SCREEN DISSIPATION	1 W
MAXIMUM CATHODE CURRENT	14 mA
<i>Promoted from clearly identified printed ratings/characteristics; additional published operating points and capacitances retained in TUBE_SECTION_PARAMETER.</i>	

14Q7 Pentagrid Converter

The **14Q7** is a multi-electrode pentagrid converter designed primarily for frequency conversion and mixer service in radio receivers. It features an indirectly heated unipotential cathode and is constructed with a

locking-in eight-pin base. The tube's design integrates the functions of an oscillator and a mixer within a single T-9 glass envelope, allowing for efficient superheterodyne receiver designs.

Physical Construction and Pin Configuration

The 14Q7 utilizes a T-9 glass bulb with a locking-in 8-pin base. The physical dimensions of the tube are characterized by a maximum outer diameter of 1 3/16 inches, a maximum overall length of 2 25/32 inches, and a maximum seated height of 2 1/4 inches. The device does not feature a top cap, meaning all electrode connections are routed through the base pins.

The 8ALT basing arrangement provides the following pin connections, viewed from the bottom of the tube:

Pin Number	Electrode Connection
Pin 1	Heater
Pin 2	Plate
Pin 3	Grids #2 and #4 (Screen Grids)
Pin 4	Grid #1 (Oscillator Grid)
Pin 5	Grid #5 (Suppressor Grid)
Pin 6	Grid #3 (Control Grid / Signal Input Grid)
Pin 7	Cathode
Pin 8	Heater

In this configuration, Grid #3 serves as the signal-input grid, while Grids #2 and #4 are tied together internally to function as the screen grid. Grid #5 acts as the suppressor grid, and Grid #1 serves as the oscillator grid.

Electrical Ratings and Heater Characteristics

The heater of the 14Q7 is designed for AC or DC operation. The nominal heater specifications vary depending on the operating context:

- Under nominal rating conditions, the heater voltage is rated at **14.0 V** with a nominal current of **0.16 A**.
- Under typical converter operating conditions, the heater is operated at **12.6 V** with a current of **0.15 A**.

The maximum electrical ratings established for the 14Q7 must be strictly observed to prevent damage and ensure reliable operation:

Parameter	Absolute Maximum Rating
Maximum Plate Voltage	300 V
Maximum Screen Voltage (Grids #2 & #4)	100 V
Maximum Screen Supply Voltage	300 V
Maximum Screen Dissipation	1.0 W
Maximum Total Plate and Screen Dissipation	2.0 W
Maximum Total Cathode Current	14 mA
Minimum External Signal Grid Bias Voltage (Grid #3)*	0 V

* This minimum bias limit applies when operating with a self-excited oscillator.

Typical Operating Conditions and Converter Performance

The 14Q7 is typically operated as a converter with an oscillator-grid resistor of 20,000 ohms. The performance of the tube is documented at two distinct plate voltage operating points:

Parameter	Operating Point A	Operating Point B
Heater Voltage	12.6 V	12.6 V
Heater Current	0.15 A	0.15 A
Plate Voltage	100 V	250 V
Screen Voltage	100 V	100 V
Control Grid Voltage (Grid #3)	-2 V	-2 V
Suppressor Grid Voltage (Grid #5)	0 V	0 V
Plate Current	3.3 mA	3.5 mA
Screen Current	8.5 mA	8.5 mA
Oscillator-Grid Current	0.5 mA	0.5 mA
Total Cathode Current (Calculated)	12.3 mA	12.5 mA
Plate Resistance (Approximate)	0.5 MΩ	1.0 MΩ

Total Cathode Current Calculation

The total cathode current is the sum of the individual currents flowing through the active electrodes: the plate current, the screen current, and the oscillator-grid current.

- **Calculation for Operating Point A:** $3.3 \text{ mA} + 8.5 \text{ mA} + 0.5 \text{ mA} = 12.3 \text{ mA}$
- **Calculation for Operating Point B:** $3.5 \text{ mA} + 8.5 \text{ mA} + 0.5 \text{ mA} = 12.5 \text{ mA}$

These calculated values align precisely with the documented total cathode current specifications of 12.3 mA and 12.5 mA, respectively.

Conversion Transconductance

The conversion transconductance of the 14Q7 is highly dependent on the bias voltage applied to the control grid (Grid #3). This characteristic allows for effective automatic volume control (AVC) or gain control in receiver circuits:

- At a control grid voltage of **-2 V**, the conversion transconductance is **525 μmhos** (at 100 V plate) or **550 μmhos** (at 250 V plate).
- At a control grid voltage of **-6 V**, the conversion transconductance drops to **275 μmhos** (at 100 V plate) or **300 μmhos** (at 250 V plate).
- At a control grid voltage of **-35 V**, the conversion transconductance is reduced to an approximate minimum of **2 μmhos** under both plate voltage conditions.

Interelectrode Capacitances

The interelectrode capacitances of the 14Q7 are measured with an external shield connected to the base shell. These values determine the high-frequency performance and stability of the oscillator and mixer stages:

Capacitance Parameter	Value
Signal Grid to Mixer Plate (Grid #3 to Plate)	0.20 pF (Max)
Signal Grid to Oscillator Grid (Grid #3 to Grid #1)	0.20 pF (Max)
Signal Input (Grid #3 to all other electrodes)	9.0 pF
Oscillator Grid to Cathode (Grid #1 to Cathode)	2.2 pF
Oscillator Grid to Plate (Grid #1 to Plate)	0.15 pF (Max)
Oscillator Input (Grid #1 to all other electrodes)	7.0 pF
Oscillator Grid to all other electrodes except Cathode	5.0 pF
Mixer Output (Plate to all other electrodes)	9.0 pF

Capacitance Parameter	Value
Cathode to all other electrodes except Grid #1	6.0 pF

These low coupling capacitances (such as the 0.20 pF maximum between the signal grid and the plate or oscillator grid) help minimize unwanted feedback and oscillator radiation into the antenna circuit.

Technical Summary

The **14Q7** is a locking-in, 8-pin pentagrid converter designed for frequency conversion service. It features an indirectly heated unipotential cathode with a heater rated at 12.6 V (0.15 A) under typical operating conditions or 14.0 V (0.16 A) under nominal ratings. The tube combines an oscillator and mixer in a single T-9 bulb, operating with a maximum plate voltage of 300 V and a maximum screen voltage of 100 V. It delivers a conversion transconductance of up to 550 μmhos at a plate voltage of 250 V, which can be varied down to approximately 2 μmhos with control grid bias for effective gain control.

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

195X General Electric Essential Characteristics

Published test conditions and operating points. Values on this page are preserved as reported by this source.

195X GENERAL ELECTRIC ESSENTIAL CHARACTERISTICS

Section 1 · Heptode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Oscillator-grid current	0.5 mA	Converter
Oscillator-grid resistor	20000 Ω	Converter
Plate voltage	250 V	Converter
Screen voltage	100 V	Converter
Control-grid voltage	-2 V	Converter
Plate current	3.5 mA	Converter
Screen current	8.5 mA	Converter

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	1000000 Ω	Converter
Conversion transconductance	550 μS	Converter

SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1961 Tung Sol

Published test conditions and operating points. Values on this page are preserved as reported by this source.

1961 TUNG SOL

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
SignalInputCapacitance	9 pF	—
Oscillator Input Capacitance	7 pF	—

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