



**ELECTRONIC
INNOVATIONS
IN ACTION**

TUBES

—PRODUCT INFORMATION—

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Compactron Beam Triode

6EH4-A

FOR HV SHUNT REGULATOR APPLICATIONS

■ COLOR TV TYPE

■ 27000 VOLTS DC

■ 40 WATTS PLATE DISSIPATION

■ X-RADIATION RATING

The 6EH4-A is a low-current, high-voltage, beam triode intended for use as a shunt regulator in the high-voltage power supply of color television receivers.

The 6EH4-A has a maximum d-c plate-voltage rating of 27000 volts, a maximum d-c plate current rating of 1.5 milliamperes, and a maximum plate-dissipation rating of 40 watts.

Features of the 6EH4-A include built-in X-radiation shielding and additional design and specification controls for the reduction of X-radiation output. The 6EH4-A also features the utilization of a high voltage shield to minimize the effects of a momentary arc within the tube.

GENERAL

ELECTRICAL

Cathode - Coated Unipotential

Heater Characteristics and Ratings

Heater Voltage, AC or DC * 6.3 ± 0.6 Volts

Heater Current • 0.2 Amperes

Direct Interelectrode Capacitances ▲

Grid to Plate: (g to p) 0.036 pf

Input: g to (h+k) 1.9 pf

Output: p to (h+k) 0.63 pf

MECHANICAL

Operating Position - Any

Envelope - T-12, Glass

Base - E12-74, Button 12-Pin

Top Cap - C1-50, Small

Outline Drawing - EIA 12-118

Maximum Diameter 1.563 Inches

Minimum Diameter 1.437 Inches

Maximum Over-all Length 4.625 Inches

Maximum Seated Height 4.250 Inches

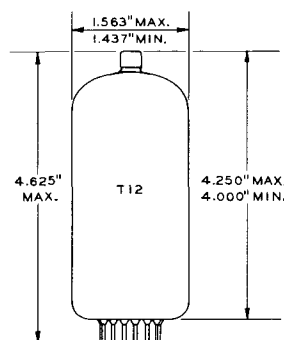
Minimum Seated Height 4.000 Inches

MAXIMUM RATINGS

DESIGN-MAXIMUM VALUES UNLESS OTHERWISE INDICATED

Plate Voltage (Absolute-Maximum Value)	27000	Volts
Negative DC Grid Voltage	135	Volts
Peak Negative Grid Voltage ♦	440	Volts
Plate Dissipation (Absolute-Maximum Value)	40	Watts
DC Plate Current (Absolute-Maximum Value)	1.5	Milliamperes
Heater-Cathode Voltage		
Heater Positive with Respect to Cathode	Not Recommended	
Heater Negative with Respect to Cathode §	450	Volts
Grid-Circuit Resistance ¶	3.0	Megohms

PHYSICAL DIMENSIONS

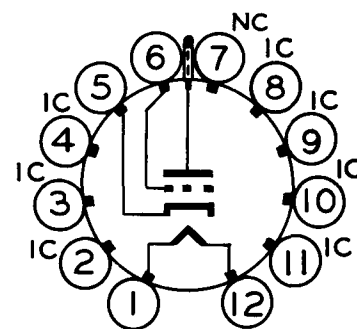


EIA 12-118

TERMINAL CONNECTIONS

- Pin 1 - Heater
- Pin 2 - Internal Connection - Do Not Use
- Pin 3 - Internal Connection - Do Not Use
- Pin 4 - Internal Connection - Do Not Use
- Pin 5 - Cathode and Internal Shield
- Pin 6 - Grid
- Pin 7 - No Connection
- Pin 8 - Internal Connection - Do Not Use
- Pin 9 - Internal Connection - Do Not Use
- Pin 10 - Internal Connection - Do Not Use
- Pin 11 - Internal Connection - Do Not Use
- Pin 12 - Heater
- Cap - Plate

BASING DIAGRAM



EIA 12FA

GENERAL ELECTRIC

MAXIMUM RATINGS (Cont'd)

Design-Maximum ratings are limiting values of operating and environmental conditions applicable to a bogey electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making allowance for the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration.

The equipment manufacturer should design so that initially and throughout life no design-maximum value for the intended service is exceeded with a bogey tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of all other electron devices in the equipment.

Absolute-Maximum ratings are limiting values of operating and environmental conditions applicable to any electron tube of a specified type as defined by its published data and should not be exceeded under the worst probable conditions.

The tube manufacturer chooses these values to provide acceptable serviceability of the tube, making no allowance for equipment variations, environmental variations, and the effects of changes in operating conditions due to variations in the characteristics of the tube under consideration and of

all other electron devices in the equipment.

The equipment manufacturer should design so that initially and throughout life no absolute-maximum value for the intended service is exceeded with any tube under the worst probable operating conditions with respect to supply-voltage variation, equipment component variation, equipment control adjustment, load variation, signal variation, environmental conditions, and variations in the characteristics of the tube under consideration and of all other electron devices in the equipment.

CHARACTERISTICS AND TYPICAL OPERATION**AVERAGE CHARACTERISTICS**

Unregulated DC Supply Voltage	36000	Volts
Equivalent Resistance of Unregulated Supply	11	Megohms
DC Reference Voltage	200	Volts
Equivalent Resistance of Reference Supply	1000	Ohms
Effective Grid-Plate Transconductance	200	Micromhos
DC Plate Current for Zero Load Current	1000	Microamperes
DC Plate Current for Load Current of 1 Milliampere	45	Microamperes
Regulated DC Output Voltage at Zero Load Current	25000	Volts
Regulated DC Output Voltage at Load Current of 1 Milliampere	24500	Volts

X-RADIATION RATING

X-radiation, maximum 0.5 mR/hr

Based on accumulated sample test data taken initially and during life test, tubes do not exceed the maximum rating limit of 0.5 mR/hr at any time throughout their useful life, when operated within the maximum ratings, including heater voltage, specified on this data sheet.

This X-radiation maximum rating is based on the use of the Victoreen 440 RF/C survey meter as the standard instrument for X-radiation measurement. X-radiation is measured with the plastic spacer of the 440 RF/C survey meter at a distance of four (4) inches from the external surface of the tube under test. This rating information is not necessarily applicable when a different radiation measuring instrument is used.

Operation of the 6EH4-A outside of the Absolute-Maximum Ratings indicated may damage the tube and/or result in either temporary or permanent changes in the X-radiation characteristics of the tube. Equipment design must be such that these Absolute-Maximum Ratings are not exceeded.

The above X-radiation characteristics are measured in accordance with JEDEC Publication No. 67A, "Recommended Practice for Measurement of X-radiation from Receiving Tubes," and controlled in accordance with JEDEC Publication No. 73A, "Recommended Practice for Quality Control of X-radiation from High Voltage Rectifier and Shunt Regulator Receiving Tubes."

The General Electric Company makes no representation concerning the X-radiation output from these tubes when operated beyond the maximum ratings set forth herein.

The tubes and arrangements disclosed herein may be covered by patents of General Electric Company or others. Neither the disclosure of any information herein nor the sale of tubes by General Electric Company conveys any license under patent claims covering combinations of tubes with other devices or elements. In the absence of an

express written agreement to the contrary, General Electric Company assumes no liability for patent infringement arising out of any use of the tubes with other devices or elements by any purchaser of tubes or others.

WARNING**X-RADIATION**

Operation of the 6EH4-A outside of the Absolute-Maximum Ratings indicated may produce soft X-rays above 0.5 milliroentgens per hour which may constitute a health hazard on prolonged exposure at close range unless the tube is adequately shielded. Equipment design must provide required shielding.

Precautions must be exercised during the servicing of the equipment employing the 6EH4-A to assure that the high voltage is adjusted to the recommended value and that any shielding components are replaced to their intended positions before the equipment is operated.

SHOCK HAZARD

The high voltages at which the 6EH4-A is operated can be extremely dangerous to the user or serviceman. Extreme care should be taken in the use of and for the servicing and adjustment of any high voltage circuit.

Precautions must be exercised during the replacement or servicing of the 6EH4-A in equipment to assure that the high voltage output terminal is properly grounded while inserting or removing the tube from its socket or while connecting or disconnecting the top cap connector.

THE EQUIPMENT MANUFACTURER SHOULD PROVIDE A WARNING LABEL IN AN APPROPRIATE POSITION ON THE EQUIPMENT TO ADVISE THE SERVICEMAN OF ALL PRECAUTIONS HEREIN.

NOTES

* The equipment designer should design the equipment so that heater voltage is centered at the specified bogey value, with heater supply variations restricted to maintain heater voltage within the specified tolerance.

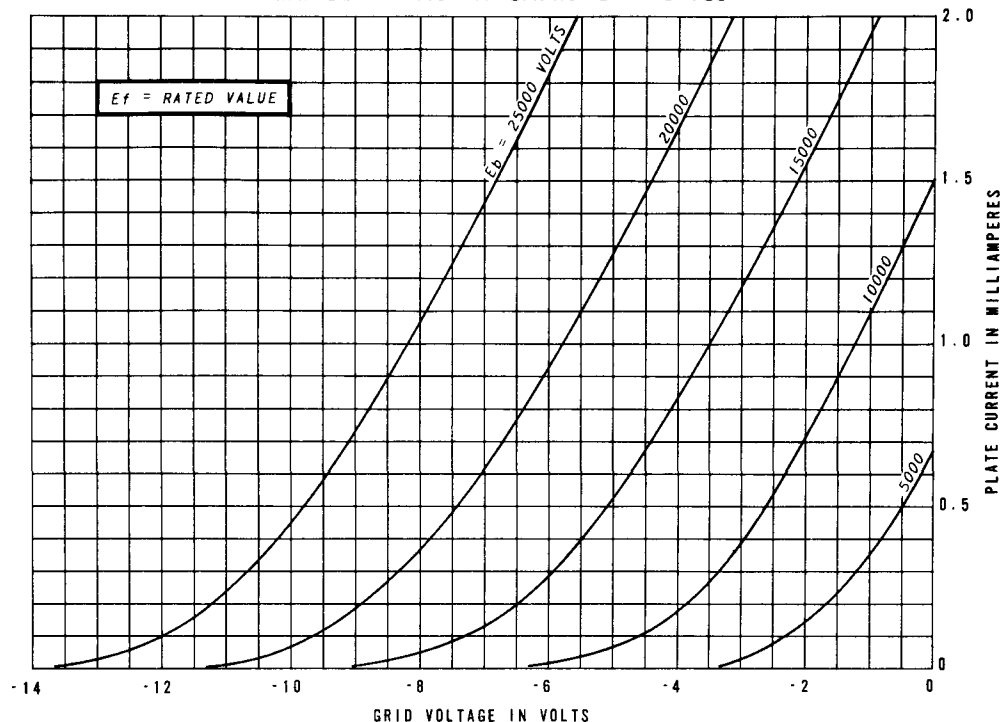
• Heater current of a bogey tube at $E_f = 6.3$ volts.

▲ Without external shield.

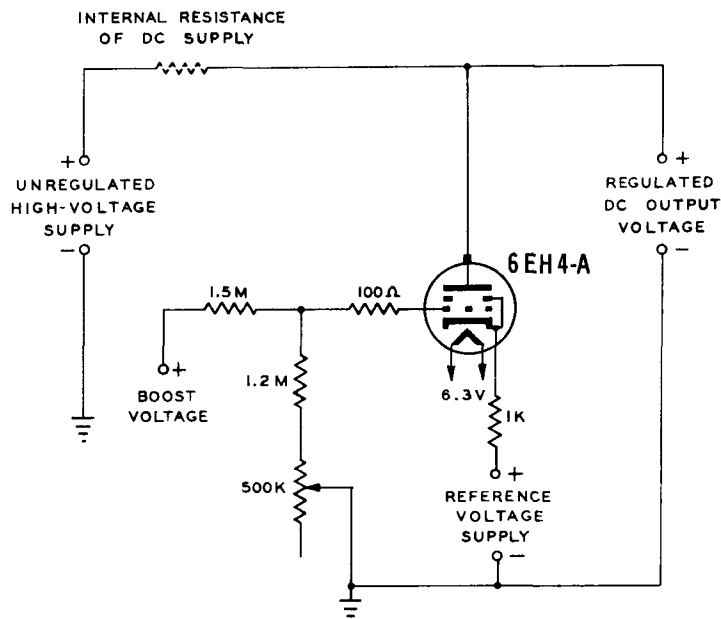
♦ Peak value for duration of 20 seconds maximum during equipment warmup.

§ Sufficient impedance (1000 ohms is recommended) should be in series with the cathode to limit the cathode current under prolonged heater-cathode short-circuit conditions to 450 ma. This protective impedance will minimize the danger of heater burnout in case of a momentary heater-cathode arc within the tube.

⊕ With flyback transformer high-voltage supply.

AVERAGE TRANSFER CHARACTERISTICS

TYPICAL SHUNT REGULATOR CIRCUIT



APPLICATION CONSIDERATIONS

The base pins of the 6EH4-A fit the standard compactron socket. Socket terminals for pins 2, 3, 4, 8, 9, 10 and 11 should not be used for tie points. Tube performance may be adversely affected should this precaution not be followed.

Sufficient impedance (1000 ohms is suggested) should be in series with the cathode to limit the cathode current under prolonged heater-cathode short circuit conditions to 450 ma. This protection impedance will minimize the danger of heater burnout in case of a momentary heater-cathode arc within the tube.

A unique design feature of the 6EH4-A is the utilization of a high voltage shield to minimize the effects of a momentary arc within the tube. This shield is brought out to a separate pin so that it can be tied directly to ground, whereas it has been customary in the more conventional tubes of this type to tie the shield directly to the cathode. When the shield is tied to the cathode, any arcing can cause failure of the cathode-resistor and/or breakdown of the heater cathode insulation, failures which the 6EH4-A has been designed to prevent.

The high voltages at which the 6EH4-A is operated may be very hazardous. Extreme caution should be used while making any circuit adjustments. The 6EH4-A and all of its associated hardware should be housed in a protective enclosure. It is particularly important that all parts which may be at a high potential with respect to ground be housed in this protective enclosure. The protective enclosure should be constructed with a system of interlocks to prevent anyone

from coming in contact with any high potential point in the electrical system. The interlocks should break the primary circuit of the high-voltage supply when any part of the protective enclosure is open, and should prevent the closing of the primary circuit until the protective enclosure is closed and locked.

High voltages may appear at points in the circuit which are normally at low potentials as a result of improper circuit connection or of capacitor breakdown. Therefore, before touching any part of the circuit, the power supply switch should be turned off and both terminals of any capacitor should be grounded.

The bulb of the 6EH4-A becomes hot during operation. Therefore, it is essential that provision be made for free circulation of air around the tube in order to insure sufficient cooling.

The plate of the 6EH4-A exhibits a dull red color when the tube is operated at maximum plate dissipation. In addition it may exhibit a bluish glow on the upper half of the bulb inner wall surface during normal operation. This bluish glow is a result of fluorescence and it should not be mistaken for gas.

To prevent any strain from being exerted on the seal of the plate cap, it is important that connection to the plate cap be made by an appropriate connector which has a flexible lead.

TUBE PRODUCTS DEPARTMENT

GENERAL  ELECTRIC

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