

ELECTRONIC TUBE REFERENCE

19AQ5

Power - Beam (NOT sweep) electronic tube

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
BEAMPOWER

19-volt-heater miniature output beam tetrode documented for Class-A power amplification, with operating points providing approximately two to 4.5 watts output.

GENERAL CHARACTERISTICS

BASE DESIGNATION	7BZ	BASE PINS	7
NOMINAL HEATER	18.9 V / 150 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

7BZ - TERMINAL PINOUT

TERMINAL	SECTION	ELEMENT	STATUS
PIN1 – Pin 1	A	G1 – Control Grid	CONNECTED • verified
PIN2 – Pin 2	A	G3 – Suppressor Grid	CONNECTED • verified
PIN2 – Pin 2	A	K – Cathode	CONNECTED • verified
PIN3 – Pin 3	–	H – Heater	CONNECTED • verified
PIN4 – Pin 4	–	H – Heater	CONNECTED • verified
PIN5 – Pin 5	A	P – Plate (Anode)	CONNECTED • verified
PIN6 – Pin 6	A	G2 – Screen Grid	CONNECTED • verified
PIN7 – Pin 7	A	G1 – Control Grid	CONNECTED • verified

SECTION1 Beam Power	
PLATE RESISTANCE	52000 Ω
TRANSCONDUCTANCE	0.0041 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	200 V
MAXIMUM PLATE DISSIPATION	12 W
MAXIMUM SCREEN DISSIPATION	2 W
Published source values promoted where applicable.	

19AQ5 — Miniature Beam Power Pentode

The **19AQ5** is a miniature beam power amplifier designed for use in medium-power audio-frequency applications and television vertical deflection circuits. It is particularly suited for A.C./D.C. receivers and color television systems where series-string heater operation is utilized.

Overview and Similar Types

The 19AQ5 is a beam power pentode featuring a compact construction. It is electrically similar to the [6AQ5](#) but is distinguished by its specific heater ratings designed for series-string heater chains. The tube is housed in a T-5 1/2 glass envelope and utilizes a standard 7-pin miniature button base. It is capable of delivering up to 4.5 Watts of audio power in Class A1 amplifier service.

Physical Construction, Base, and Pinout

The 19AQ5 is constructed in a miniature T-5 1/2 bulb with an E7-1 miniature button 7-pin base. The physical dimensions of the tube are as follows:

- **Maximum Diameter:** 3/4 inch (0.750 in.)
- **Maximum Overall Length:** 2-5/8 inches (2.625 in.)
- **Maximum Seated Height:** 2-3/8 inches (2.375 in.)

The tube can be mounted in any position. It utilizes the **7BZ** basing arrangement, which provides the following pin connections (viewed from the bottom of the base):

Pin	Connection
Pin 1	Grid No. 1 (<i>g</i> ₁)
Pin 2	Cathode & Grid No. 3 (<i>k</i> , <i>g</i> ₃)

Pin	Connection
Pin 3	Heater (<i>h</i>)
Pin 4	Heater (<i>h</i>)
Pin 5	Plate (<i>p</i>)
Pin 6	Grid No. 2 (<i>g</i> ₂ / Screen Grid)
Pin 7	Grid No. 1 (<i>g</i> ₁)

Grid No. 1 is internally connected to both Pin 1 and Pin 7, providing flexibility in circuit layout and wiring.

Heater Ratings and Interelectrode Capacitances

The 19AQ5 features a coated unipotential cathode. The heater is designed for series-string operation with the following nominal ratings:

- **Heater Voltage (AC or DC):** 18.9 V (also referred to as 19 V nominal)
- **Heater Current:** 150 mA (0.15 A)

Heater-Cathode Voltage Limits

The maximum allowable voltage between the heater and the cathode depends on the rating system applied:

- **RTMA Standard (Release #899):** 90 V maximum.
- **Design Maximum Rating System:**
 - **Heater Negative with Respect to Cathode:** 200 V maximum (Total DC and Peak).
 - **Heater Positive with Respect to Cathode:** 100 V DC maximum, or 200 V maximum (Total DC and Peak).

Direct Interelectrode Capacitances

The direct interelectrode capacitances of the 19AQ5, measured without an external shield, are:

- **Grid No. 1 to Plate:** 0.4 pF
- **Input (*g*₁ to *h* + *k* + *g*₂ + *g*₃):** 8.0 pF
- **Output (*p* to *h* + *k* + *g*₂ + *g*₃):** 8.5 pF

Maximum Ratings

The maximum ratings of the 19AQ5 vary depending on the operating mode and the rating system applied. These limits must be strictly observed to ensure reliable operation and prevent premature tube failure.

Class A1 Amplifier Service

Under the Design Maximum Rating System (with older RTMA limits in parentheses where they differ):

- **Plate Voltage:** 275 V maximum (250 V under RTMA)
- **Grid No. 2 (Screen Grid) Voltage:** 275 V maximum (250 V under RTMA)
- **Plate Dissipation:** 12 W maximum
- **Grid No. 2 Dissipation:** 2 W maximum
- **Bulb Temperature (at any point):** 250 °C maximum
- **Grid No. 1 Circuit Resistance:**
 - **Fixed Bias:** 0.1 Megohm maximum
 - **Cathode (Self) Bias:** 0.5 Megohm maximum

Vertical Deflection Amplifier Service (Triode Connected)

When the 19AQ5 is triode-connected (with Grid No. 2 connected directly to the plate) for vertical deflection service in television receivers, the following absolute maximum ratings apply:

- **Plate Voltage:** 275 V maximum
- **Peak Positive Plate Voltage:** 1100 V absolute maximum (restricted to a duty cycle where the voltage pulse does not exceed 15% of one horizontal scanning cycle in a 525-line, 30-frame television system)
- **Plate Dissipation:** 10 W maximum (adequate cathode bias resistance or other protective measures are required in stages operating with grid leak bias)
- **Peak Negative Grid No. 1 Voltage:** 275 V maximum
- **Average Cathode Current:** 40 mA maximum
- **Peak Cathode Current:** 115 mA maximum
- **Grid No. 1 Circuit Resistance (Cathode Bias):** 2.2 Megohms maximum

Typical Operating Conditions and Characteristics

The 19AQ5 can be operated either as a pentode or as a triode-connected amplifier. The typical operating parameters for both configurations are detailed below.

Pentode Connection (Class A1 Amplifier)

Two typical operating points are established for pentode operation:

Parameter	Condition I	Condition II
Plate Voltage	180 V	250 V
Grid No. 2 Voltage	180 V	250 V
Grid No. 1 Voltage	-8.5 V	-12.5 V
Peak A-F Grid No. 1 Voltage	8.5 V	12.5 V

Parameter	Condition I	Condition II
Zero-Signal Plate Current	29 mA	45 mA
Maximum Signal Plate Current	30 mA	47 mA
Zero-Signal Grid No. 2 Current	3.0 mA	4.5 mA
Maximum Signal Grid No. 2 Current	4.0 mA	7.0 mA
Plate Resistance (Approximate)	58,000 Ohms	52,000 Ohms
Transconductance (g_m)	3700 μ mhos	4100 μ mhos
Load Resistance	5500 Ohms	5000 Ohms
Total Harmonic Distortion (Approximate)	8%	8%
Power Output	2.0 W	4.5 W

Triode Connection (Class A1 Amplifier)

When Grid No. 2 is connected directly to the plate, the typical operating characteristics are:

- **Plate Voltage:** 250 V
- **Grid No. 1 Voltage:** -12.5 V
- **Zero-Signal Plate Current:** 49.5 mA
- **Plate Resistance (Approximate):** 1970 Ohms
- **Transconductance:** 4800 μ mhos
- **Grid No. 1 Voltage for $I_b = 0.5$ mA (Approximate Cutoff):** -37 V

Qualitative Curve Observations

The average plate characteristics for the triode-connected 19AQ5 show the relationship between plate current and plate voltage across a range of grid No. 1 voltages ($E_{c1}(/tubes/C1)$). At the rated heater voltage, the plate current (plotted from 0 to 40 mA) is shown against plate voltages from 0 to 500 V. The grid bias curves are plotted from 0 V down to -24 V in steps of 2 V, demonstrating the triode-connected tube's linearity and control characteristics.

Technical Summary

The **19AQ5** is a versatile, miniature beam power pentode designed for series-string heater applications in audio and television receivers. With its 18.9 V, 150 mA heater, it integrates easily into standard series chains. It offers robust performance as a Class A1 audio amplifier, delivering up to 4.5 Watts of output power with 8% total harmonic distortion under typical pentode operating conditions. Additionally, its high

peak voltage ratings and triode-connected characteristics make it highly suitable for vertical deflection amplifier service in television scanning systems.

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 · Beam Power

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate voltage	250 V	ClassA
Screen voltage	250 V	ClassA
Control-grid voltage	-12.5 V	ClassA
Plate current	45 mA	ClassA
Screen current	4.5 mA	ClassA
Load resistance	5000 Ω	ClassA
Power output	4.5 W	ClassA
Plate voltage	180 V	ClassA
Screen voltage	180 V	ClassA
Control-grid voltage	-8.5 V	ClassA
Plate current	29 mA	ClassA
Screen current	3 mA	ClassA
Load resistance	5500 Ω	ClassA
Power output	2 W	ClassA

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	52000 Ω	ClassA
Transconductance	4100 μS	ClassA
Plate resistance	58000 Ω	ClassA
Transconductance	3700 μS	ClassA

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