

ELECTRONIC TUBE REFERENCE

19AP4A

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION
CONSTRUCTION
CATHODERAY

P4 high-voltage cathode-ray picture-display tube with magnetic focusing and deflection; this 19AP4A variant differs principally in faceplate treatment, with manufacturer documentation warning about X-ray shielding above 16 kV.

GENERAL CHARACTERISTICS

BASE DESIGNATION	12D	BASE PINS	5
NOMINAL HEATER	6.3 V / 600 mA	PARALLEL HEATER	– / –
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION1 Cathode Ray	
MAXIMUM PLATE VOLTAGE	19000 V
MAXIMUM SCREEN VOLTAGE	410 V
CRT specialized anode, grid, optical, and deflection data retained in TUBE_SECTION_PARAMETER.	

19AP4A — Direct-View Metal-Cone Picture Tube

The **19AP4A** is a direct-view cathode-ray picture tube designed for television applications. It features a round, lightweight metal cone construction with a spherical gray glass faceplate, a unipotential cathode, and is designed for magnetic focus and magnetic deflection. The tube requires an external single-field ion-trap magnet for proper operation.

Mechanical and Structural Design

The 19AP4A is constructed with a lightweight metal cone envelope and a spherical, gray glass faceplate. The gray filter faceplate is specifically designed to increase contrast and detail when the screen is viewed

under high ambient light conditions.

The physical dimensions and mechanical features of the tube include:

- **Overall Length:** 21-1/2 ± 1/2 inches
- **Greatest Bulb Diameter:** 18-5/8 ± 1/8 inches
- **Minimum Useful Screen Diameter:** 17-3/8 inches
- **Neck Length:** 7-1/8 inches
- **Approximate Net Weight:** 16 pounds
- **Mounting Position:** Any

The electrical contact for the anode is made via the metal cone/shell lip. The tube uses a small-shell duodecal 5-pin base (JETEC No. B5-57) with a JETEC [12D](#) basing designation. The reference line of the tube is determined by the plane of the upper edge of a reference-line gage (such as RETMA No. 112) when resting on the cone.

Electrical Connections and Heater Ratings

The 19AP4A utilizes a unipotential cathode and a standard heater. The pin connections, viewed from the bottom of the base, are configured as follows:

Pin Number	Connection
Pin 1	Heater
Pin 2	Grid No. 1
Pin 10	Grid No. 2
Pin 11	Cathode
Pin 12	Heater
Metal Cone Lip	Anode / Grid No. 3

The anode and Grid No. 3 are connected internally and are collectively referred to as the anode, which terminates at the metal cone lip.

Heater and Capacitance Characteristics

- **Heater Voltage:** 6.3 V
- **Heater Current:** 0.6 A (with a tolerance of ±10%)
- **Cathode to All Other Electrodes Capacitance:** 5 µpF (approximate)
- **Grid No. 1 to All Other Electrodes Capacitance:** 6 to 7 µpF (approximate)

Optical and Deflection Characteristics

The tube is designed for a nominal deflection angle of approximately 66 degrees. It produces a standard rectangular raster size of 11-3/4 inches by 15-3/4 inches.

- **Phosphor Type:** P4 (Sulfide Type, also designated as No. 4)
- **Fluorescent Color:** White
- **Phosphorescent Color:** White
- **Persistence:** Short to medium
- **Faceplate Light Transmission:** Approximately 66% at the center of the faceplate

Maximum Ratings and Safety Considerations

The following design-center maximum ratings are established for the 19AP4A, with all voltages measured with respect to the cathode:

- **Anode Voltage:** 16,000 to 19,000 V DC (X-ray shielding may be necessary if the tube is operated above 16,000 V)
- **Grid No. 2 Voltage:** 410 V DC
- **Grid No. 1 Voltage:**
 - **Negative-Bias Value:** 125 V DC
 - **Positive-Bias Value:** 0 V DC
 - **Positive-Peak Value:** 2 V
- **Peak Heater-Cathode Voltage:**
 - **Heater Negative with Respect to Cathode (during warm-up $\leq$ 15 seconds):** 410 V
 - **Heater Negative with Respect to Cathode (after warm-up):** 150 V
 - **Heater Positive with Respect to Cathode:** 150 V
- **Grid No. 1 Circuit Resistance:** 1.5 Megohms maximum

Safety Warnings

Because the metal cone operates at high voltage, it must be properly insulated in the receiver cabinet to withstand the maximum applied anode voltage. Additionally, appropriate X-ray shielding precautions must be taken if the operating anode voltage exceeds 16,000 V.

Typical Operating Conditions

The 19AP4A can be operated under different typical configurations depending on the focusing coil and ion-trap components selected. Under typical conditions, all voltages are measured with respect to the cathode:

- **Anode Voltage:** 12,000 to 14,000 V DC (operating below 12,000 V DC results in a decrease in brightness and focus quality)
- **Grid No. 2 Voltage:** 300 V DC

- **Grid No. 1 Voltage (for visual extinction of focused raster or undeflected focused spot):** -28 V to -72 V DC, or -33 V to -77 V DC

Focusing and Ion-Trap Settings

The focusing and ion-trap requirements can be met using the following typical operating points:

- **Focusing Option A:** A focusing coil current of approximately $140 \pm 20\%$ mA using a standard focus coil No. 106 or equivalent. This is evaluated with the combined Grid No. 1 bias and video signal adjusted for 18 foot-lamberts highlight brightness on an 11-3/4" x 15-3/4" picture, with the focus coil air gap center positioned 3.0 inches from the reference line.
- **Focusing Option B:** A focusing coil current of approximately 107 mA DC using a RETMA focusing coil No. 109, positioned 3-3/8 inches from the yoke-reference-line to the center of the air gap.
- **Ion-Trap Option A:** An ion-trap current of approximately $75 \pm 50\%$ mA using a standard coil No. 111.
- **Ion-Trap Option B:** An ion-trap field intensity of approximately 37 Gauss using a single-field ion-trap magnet adjusted to its optimum position (equivalent to 37 mA through a RETMA ion-trap magnet No. 117).

Technical Summary

The **19AP4A** is a 19-inch class, round metal-cone picture tube featuring magnetic focus and magnetic deflection (66-degree deflection angle). Its gray filter faceplate provides 66% light transmission, enhancing picture contrast under ambient light. Operating with a 6.3 V, 0.6 A heater and a duodecal 5-pin base, the tube typically runs at an anode voltage of 12,000 V to 14,000 V DC. It requires careful insulation of its high-voltage metal cone and utilizes an external single-field ion-trap magnet alongside a magnetic focusing coil to produce a sharp, white-phosphor (P4) television raster.



SOURCE OPERATING CONDITIONS

1961 Tung Sol

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

1961 TUNG SOL

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Anode Voltage	19000 V	—
Typical Anode Voltage	12000 V	—
Maximum Grid2 Voltage	410 V	—
Typical Grid2 Voltage	300 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DeflectionAngleApproximate	66 degree	—
FocusingMethod	Magnetic	—
DeflectingMethod	Magnetic	—
PhosphorNumber	4	—
FluorescentColor	White	—
Persistence	Medium	—
FaceplateVariant	Grey filter faceplate	—



SOURCE OPERATING CONDITIONS

1966 Tung Sol Electronic Tubes 4 of 4

[SOURCE PDF](#)

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

1966 TUNG SOL ELECTRONIC TUBES 4 OF 4

Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
DEFLECTION ANGLE (APPROX.)	66 degrees	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
FACEPLATE LIGHT TRANSMISSION	66 percent	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
HEATER	6.3 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
A IF THIS TUBE IS OPERATED AT VOLTAGES IX E%LESS OF 16,000 VOLTS %RAY RADIATION SHIELD LNG MAY – value 1	16 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
A IF THIS TUBE IS OPERATED AT VOLTAGES IX E%LESS OF 16,000 VOLTS %RAY RADIATION SHIELD LNG MAY – value 2	0 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
DC ANODE	12 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
DC GRID #2 VOLTAGE – value 1	2 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
DC GRID #2 VOLTAGE – value 2	300 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
DC FOCUSING COIL CURRENTC (APPROX.) – value 1	140 mA	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
DC FOCUSING COIL CURRENTC (APPROX.) – value 2	20 mA	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
G FOR STANDARD FOCUS COIL 4106, OR EQUIVALENT S WITH THE COMBINED GRID N1 BIAS VOLTAGE AMD	4106 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
VIDEO SIGNAL VOLTAGE ADJUSTED TO PRODUCE A XiGnL IGnT BRIGHTNESS OF 18 F00T LANBERTS ON A	18 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
11 j/4" % 15 j/R" PICTURE SIZE. DISTANCE FROM REFERENCE LINE TO CENTER OF 41R GAP ON FOCUS – value 1	4	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
11 j/4" % 15 j/R" PICTURE SIZE. DISTANCE FROM REFERENCE LINE TO CENTER OF 41R GAP ON FOCUS – value 2	15	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
11 j/4" % 15 j/R" PICTURE SIZE. DISTANCE FROM REFERENCE LINE TO CENTER OF 41R GAP ON FOCUS – value 3	41	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
MAXIMUM DC ANODE	19000 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
MAXIMUM DC GRID #2 VOLTAGE – value 1	2 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
MAXIMUM DC GRID #2 VOLTAGE – value 2	410 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
MAXIMUM GRID #1 VOLTAGE	1 V	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
MAXIMUM GRID #1 CIRCUIT RESISTANCE – value 1	1 mA	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.
MAXIMUM GRID #1 CIRCUIT RESISTANCE – value 2	1.5 mA	Published CRT datasheet value; multiple values on a row correspond to separate source-table conditions or limits.



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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1968 General Electric Co

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

1968 GENERAL ELECTRIC CO

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Anode Voltage	16000 V	—
Maximum Grid2 Voltage	410 V	—
Maximum Grid1 Negative Bias	125 V	—
Typical Anode Voltage	14000 V	—
Typical Grid2 Voltage	300 V	—
Typical Grid1 Voltage	-72--28 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode To All Other Electrodes Capacitance	5 pF	—
Grid1 To All Other Electrodes Capacitance	6 pF	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Deflection Angle	66 degree	—

TUBE TINKER

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