

ELECTRONIC TUBE REFERENCE

19AFP4

Specialized - Cathode Ray electronic tube

CONSOLIDATED TECHNICAL DATA
1 SECTION
CONSTRUCTION
CATHODERAY

Wide-angle P4 monochrome television picture tube designed for high-voltage direct-view service, with magnetic deflection and manufacturer warnings concerning X-ray shielding at elevated anode voltages.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	—
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	20000 V
MAXIMUM SCREEN VOLTAGE	550 V
114-degree P4 picture tube.	

19AFP4 — Rectangular Television Picture Tube

The **19AFP4** is a 19-inch direct-viewed rectangular glass television picture tube designed for black-and-white receiver applications. It features a low-voltage electrostatic focusing system, a 114-degree magnetic deflection system, and an aluminized screen with an integrated protective safety panel. The tube is constructed with a space-saving short neck and does not require an external ion-trap magnet.

Mechanical Construction and Optical Characteristics

The 19AFP4 is built using a bi-panel rectangular glass envelope (bulb designation J149C) with a spherical faceplate. Laminated directly to the front of the tube is a gray filter glass safety plate (type FP159A),

which serves as an integrated protective shield. This safety panel provides a light transmittance of approximately 44%, enhancing picture contrast under ambient lighting conditions.

The screen utilizes an aluminized P4-Sulfide type phosphor that produces white fluorescence with short-to-medium persistence. The tube provides a minimum useful screen area of 172 to 174 square inches, with typical minimum useful dimensions of 12-1/16 inches in height, 15-1/4 inches in width, and a diagonal of 17-1/4 to 17-3/4 inches.

The deflection system is purely magnetic, requiring no ion-trap magnet. The nominal deflection angles are:

- **Diagonal:** 114°
- **Horizontal:** 102°
- **Vertical:** 86°

The physical dimensions and mechanical features of the tube include:

- **Overall Length:** 11-5/8 inches (with a tolerance of $\pm 3/16$ or $\pm 5/16$ inch)
- **Neck Length:** 4-1/8 $\pm$ 1/8 inches
- **Weight:** Approximately 18.5 lbs
- **Bulb Contact:** Recessed Small Cavity Cap (JEDEC No. J1-21)
- **Base:** Small-Button Neoeightar 7-Pin (JEDEC No. B7-208)
- **Operating Position:** Any

An external conductive coating (regular band type) is applied to the envelope. This coating must be grounded to the receiver chassis, with the grounding contact area located near the reference line.

Heater and Basing Configurations

The 19AFP4 is equipped with an indirectly heated cathode. The heater is designed with a controlled warm-up time for use in series-string or parallel-connected receiver designs.

- **Heater Voltage:** 6.3 V
- **Heater Current:** 600 mA $\pm$ 5% (0.60 A $\pm$ 5%)
- **Average Warm-Up Time:** 11 seconds
- **Calculated Nominal Heater Power:** 3.78 W (derived from 6.3 V multiplied by 0.60 A)

The tube utilizes the **8HR** bottom-view basing designation. The electrical connections are documented in two distinct pinout configurations:

Basing Configuration A

- **Pin 1:** Heater
- **Pin 2:** Grid No. 1
- **Pin 3:** Grid No. 2
- **Pin 4:** Grid No. 4 (Focusing Electrode)
- **Pin 6:** Grid No. 1

- **Pin 7:** Cathode
- **Pin 8:** Heater
- **Cap:** Ultor / Anode (Grid No. 3, Grid No. 5, Screen, Collector)

Biasing Configuration B

- **Pin 1:** Heater
- **Pin 2:** Grid No. 2
- **Pin 3:** Grid No. 4 (Focusing Electrode)
- **Pin 4:** No Connection (aligns within 30° of the horizontal centerline)
- **Pin 6:** Grid No. 1
- **Pin 7:** Cathode
- **Pin 8:** Heater
- **Cap:** Anode (J1-21)

Electrical Characteristics and Capacitances

The electrostatic focusing lens (Grid No. 4) operates at low voltages, while the high-voltage ultor/anode accelerates the electron beam. The direct interelectrode capacitances of the tube are:

- **Grid No. 1 to all other electrodes:** 6 pF (approximate)
- **Cathode to all other electrodes:** 5 pF (approximate)
- **External conductive coating to anode/ultor:** 1000 pF minimum, 1500 pF maximum

The external conductive coating forms a capacitor with the internal anode coating, which acts as a high-voltage filter capacitor when the external coating is properly grounded.

Design-Maximum Ratings

The 19AFP4 can be operated under either Grid Drive Service or Cathode Drive Service. The design-maximum ratings represent the limiting values of operating and environmental conditions that should not be exceeded under any circumstances.

Grid Drive Service Ratings

All voltages are positive with respect to the cathode unless otherwise specified.

- **Anode/Ultor Voltage:** 20,000 V dc maximum
- **Grid No. 4 (Focusing Electrode) Voltage:** -550 to +1100 V dc
- **Grid No. 2 Voltage:** 550 V dc maximum
- **Grid No. 1 Voltage:**
 - Negative bias value: 155 V dc maximum
 - Negative peak value: 220 V maximum
 - Positive bias value: 0 V dc maximum

- Positive peak value: 2 V maximum

Cathode Drive Service Ratings

All voltages are positive with respect to Grid No. 1 unless otherwise specified.

- **Anode/Ultor Voltage:** 20,000 V dc maximum
- **Grid No. 4 (Focusing Electrode) Voltage:** -400 to +1250 V dc
- **Grid No. 2 Voltage:** 700 V dc maximum
- **Cathode Voltage:**
 - Positive bias value: 155 V dc maximum
 - Positive peak value: 220 V maximum
 - Negative bias value: 0 V dc maximum
 - Negative peak value: 2 V maximum

Peak Heater-Cathode Voltage (Both Services)

- **Heater negative with respect to cathode:**
 - During equipment warm-up (first 15 seconds): 450 V maximum
 - After equipment warm-up: 200 V maximum
- **Heater positive with respect to cathode:** 200 V maximum

Typical Operating Conditions and Circuit Values

Typical operating parameters are established for both drive configurations at an anode voltage of 16,000 V dc.

Grid Drive Operation

- **Anode Voltage:** 16,000 V dc
- **Grid No. 2 Voltage:** 300 V dc or 400 V dc
- **Grid No. 4 Voltage for Focus:** 0 to 400 V dc
- **Grid No. 1 Voltage for Visual Extinction of Focused Raster:** -35 to -72 V dc (at 300 V on Grid No. 2)
- **Grid No. 1 Voltage Required for Cutoff:** -46 to -94 V dc (at 400 V on Grid No. 2)

Cathode Drive Operation

- **Anode Voltage:** 16,000 V dc
- **Grid No. 2 Voltage:** 400 V dc
- **Grid No. 4 Voltage for Focus:** 0 to 400 V dc
- **Cathode Voltage Required for Cutoff:** 42 to 78 V dc

Circuit Constraints

- **Grid No. 1 Circuit Resistance:** 1.5 MΩ maximum

Raster Cutoff Dynamics

For complete cutoff of the undeflected focused spot, the absolute value of the bias voltage between the cathode and Grid No. 1 must be increased by approximately 5 V compared to the voltage required for the visual extinction of a focused raster.

Safety and X-ray Shielding

When operating the 19AFP4, safety precautions regarding potential X-ray radiation must be observed. If the tube is operated at anode voltages exceeding 16,000 V, or at the maximum rated anode voltage of 20,000 V (whichever is less), appropriate shielding may be required to protect users from exposure to X-rays.

Technical Summary

The **19AFP4** is a **19-inch rectangular glass picture tube** featuring **114° magnetic deflection**, **low-voltage electrostatic focus**, and an **integrated FP159A safety panel** with ~44% light transmittance. Operating with a **6.3 V, 600 mA heater** that has an **11-second controlled warm-up time**, it is highly suited for both series and parallel television receiver designs. The tube supports both **Grid Drive** and **Cathode Drive** configurations, with an absolute maximum anode rating of **20,000 V** and typical operation at **16,000 V**. It requires no ion-trap magnet and relies on a grounded external conductive coating to complete its high-voltage filtering system.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1950 Sylvania

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

1950 SYLVANIA

Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum Plate Voltage	20000 V	—
Anode Voltage	16000 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Phosphor	P4	Aluminized



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1965 Sylvania Electronic Tubes Vol3

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

1965 SYLVANIA ELECTRONIC TUBES VOL3

Section 1 · Cathode Ray

CHARACTERISTICS		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focusing method	Electrostatic	—
Deflection method	Magnetic	—
Horizontal deflection angle	102 deg	—
Diagonal deflection angle	114 deg	—
Vertical deflection angle	86 deg	—
Fluorescence	White	—
Persistence	Short to medium	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	6.3 V	—
Heater current	600 mA	—

CONSTRUCTION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Phosphor	Aluminized P4	—

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum anode voltage	20000 V	—
Typical anode voltage	16000 V	—
Typical focus-electrode voltage maximum	400 V	—
Typical grid2 voltage	400 V	—
Cutoff voltage range	-46 to -94 V	—
Grid1 circuit resistance maximum	1.5 Mohm	—
Focus-electrode voltage minimum	-550 V	—
Focus-electrode voltage maximum	1100 V	—
Grid2 voltage maximum	550 V	—

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid1-to-all capacitance	6 pF	—
External conductive coating to anode capacitance maximum	1500 pF	—

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Monochrome television picture display	—



SOURCE DATA APPENDIX

1971 RCA HB3 Binder 1 of 7

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

1971 RCA HB3 BINDER 1 OF 7
Section 1 · Cathode Ray

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	6.3 V	—
Heater current	600 mA	—
Heater warm-up time	11 s	—
Maximum anode/ultor voltage	20000 V	—
Typical anode/ultor voltage	20000 V	PictureTubeService
Maximum grid No.2 voltage	550 V	—
Typical grid No.2 voltage	300 V	PictureTubeService
Focus-voltage range minimum	0 V	OptimumFocus
Focus-voltage range maximum	400 V	OptimumFocus
Visual-extinction voltage range minimum	-72 V	FocusedRasterExtinction
Visual-extinction voltage range maximum	-35 V	FocusedRasterExtinction
Maximum grid No.1 circuit resistance	1.5 megohm	—
X-ray shielding warning	Present	HighAnodeVoltage
Maximum negative grid No.1 peak voltage	220 V	—
Maximum negative grid No.1 bias magnitude	155 V	—
Maximum positive grid No.1 peak voltage	2 V	—
Peak heater-cathode voltage during warm-up	450 V	HeaterNegative;Warmup<=15s
Peak heater-cathode voltage after warm-up	200 V	HeaterNegative
Peak heater-cathode voltage heater positive	200 V	HeaterPositive

CONSTRUCTION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Focusing method	LowVoltageElectrostatic	—
Deflection method	Magnetic	—
Phosphor	P4	—
Screen type	White	P4

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Deflection angle	114 deg	Approximate

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Cathode to all other electrodes capacitance	5 pF	Approximate