



ELECTRONIC TUBE REFERENCE

18FW6A

Voltage - Pentode Remote Cutoff (single) electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Controlled-warm-up semi-remote-cutoff pentode for RF/IF stages in 100 mA series-heater receivers, electrically similar to 18FW6.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	7
NOMINAL HEATER	18 V / 100 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
PLATE RESISTANCE	250000 Ω
TRANSCONDUCTANCE	0.0044 S
MAXIMUM PLATE VOLTAGE	150 V
MAXIMUM SCREEN VOLTAGE	150 V
MAXIMUM PLATE DISSIPATION	2.5 W
MAXIMUM SCREEN DISSIPATION	0.6 W
MAXIMUM CATHODE CURRENT	20 mA
<i>Remote-cutoff pentode.</i>	

18FW6A — Semi-Remote Cutoff Pentode

The **18FW6A** is a miniature, semi-remote cutoff pentode designed primarily for use as a radio-frequency (RF) and intermediate-frequency (IF) amplifier in AC/DC radio receivers. It is particularly suited for receivers employing series-connected heater strings operating at a nominal current of 100 mA.

The 18FW6A is identical to the [18FW6](#) except for its heater ratings. It features a controlled heater warm-up time of 20 seconds, making it highly compatible with series-string heater circuits where voltage distribution during start-up must be controlled to prevent heater damage.

Physical Construction and Basing

The 18FW6A is constructed in a miniature T-5 1/2 glass envelope with a small-button miniature 7-pin base (E7-1). The tube features a coated unipotential cathode and can be mounted and operated in any position.

Physical Dimensions

- **Maximum Overall Length:** 2-1/8 inches
- **Maximum Seated Length:** 1-7/8 inches
- **Length (Base Seat to Bulb Top, excluding tip):** 1-1/2" $\pm$ 3/32"
- **Diameter:** 0.650 to 0.750 inches

Pinout and Basing Configurations

The tube utilizes two closely related basing arrangements, JEDEC **7CC** and JEDEC **7BK**. Both configurations share the same primary pin assignments but differ in how the cathode, suppressor grid (Grid No. 3), and internal shield are brought out to the pins.

Pin	JEDEC 7CC Connection	JEDEC 7BK Connection
1	Grid No. 1 (G1)	Grid No. 1 (G1)
2	Grid No. 3 (G3) / Internal Shield	Cathode (K), Grid No. 3 (G3), Internal Shield
3	Heater (H)	Heater (H)
4	Heater (H)	Heater (H)
5	Plate (P)	Plate (P)
6	Grid No. 2 (<u>G2</u>)	Grid No. 2 (<u>G2</u>)
7	Cathode (K)	Cathode (K), Grid No. 3 (G3), Internal Shield

In the 7CC configuration, Grid No. 3 is connected to Pin 2, and the Cathode is connected to Pin 7. In the 7BK configuration, both Pin 2 and Pin 7 are internally tied to the Cathode, Grid No. 3, and the internal shield.

Heater and Filament Ratings

The 18FW6A is designed for series-string heater operation. The heater ratings and characteristics are:

- **Heater Voltage (AC or DC):** 18 V
- **Heater Current:** 0.10 A (100 mA) with a design-maximum tolerance of ± 0.006 A (or $\pm 6\%$).
- **Average Heater Warm-up Time:** 20 seconds.

The heater warm-up time is defined as the time required for the voltage across the heater to reach 80% of its rated voltage when 4 times the rated heater voltage (72 V) is applied to a circuit consisting of the heater in series with a resistance equal to 3 times the nominal heater operating resistance. To ensure reliable operation, heater voltage supply variations must be restricted to maintain the heater current within the specified limits.

Electrical Characteristics and Typical Operating Conditions

Under typical Class A1 amplifier operating conditions, the 18FW6A operates with Grid No. 3 connected directly to the cathode at the socket. The typical operating parameters are:

Parameter	Value
Plate Supply Voltage	100 V
Grid No. 2 (Screen-Grid) Supply Voltage	100 V
Cathode-Bias Resistor	68 Ω
Plate Current	11 mA
Grid No. 2 Current	4.4 mA
Transconductance (g_m)	4400 μmhos
Plate Resistance (Approx.)	0.25 M Ω
Grid No. 1 Voltage for $g_m = 25 \mu\text{mhos}$	-20 V

The remote-cutoff (or semi-remote cutoff) characteristic is demonstrated by the grid-bias voltage required to reduce transconductance. While the transconductance is 4400 μmhos under typical operating conditions, a negative bias of approximately -20 V on Grid No. 1 reduces the transconductance to 25 μmhos , allowing effective automatic volume control (AVC) or automatic gain control (AGC) in RF and IF stages.

Direct Interelectrode Capacitances

The interelectrode capacitances of the 18FW6A are measured with an external shield (JEDEC No. 316) connected to the cathode (or Pin 7):

- **Grid No. 1 to Plate (Max.):** 0.0035 pF
- **Input (Grid No. 1 to Cathode, Heater, Grid No. 2, Grid No. 3):** 5.5 pF
- **Output (Plate to Cathode, Heater, Grid No. 2, Grid No. 3):** 5.0 pF

The extremely low grid-to-plate capacitance (0.0035 pF maximum) is critical for minimizing feedback and ensuring stability in high-gain RF and IF amplifier stages without requiring neutralization.

Design-Maximum Ratings

The maximum ratings of the 18FW6A are established under the Design-Maximum System. Operating the tube beyond these limits may impair its performance and lifetime.

- **Maximum Plate Voltage:** 150 V
- **Maximum Grid No. 2 (Screen-Grid) Supply Voltage:** 150 V
- **Maximum Grid No. 2 Voltage:** Subject to the Grid No. 2 Input Rating Chart
- **Maximum Grid No. 1 (Control-Grid) Positive-Bias Voltage:** 0 V
- **Maximum Plate Dissipation:** 2.5 W
- **Maximum Grid No. 2 Input (Dissipation):**
 - For Grid No. 2 voltages up to 75 V: 0.6 W
 - For Grid No. 2 voltages between 75 V and 150 V: Subject to the Grid No. 2 Input Rating Chart
- **Maximum Heater-Cathode Voltage (Total DC and Peak):**
 - Heater negative with respect to cathode: 100 V
 - Heater positive with respect to cathode: 100 V

Qualitative Curve Observations

The electrical behavior of the 18FW6A is illustrated by its characteristic curves:

- **Plate Characteristics:** The curves plotting plate current (I_b) and Grid No. 2 current (I_{c2}) against plate voltage (from 0 to 300 V) for Grid No. 1 voltages ranging from 0 to -20 V exhibit typical pentode behavior. Below a plate voltage of approximately 50 V, the curves show a sharp knee. Above 50 V, the plate current saturates and remains relatively flat, indicating high plate resistance.
- **Transfer Characteristics:** The curves plotting transconductance (g_m), plate current (I_b), and Grid No. 2 current (I_{c2}) against Grid No. 1 voltage (from -9 V to 0 V) at plate and Grid No. 2 voltages of 100 V show a smooth, continuous drop in transconductance. The transconductance decreases from 4400 μmhos at 0 V bias to approximately 200 μmhos at -9 V bias, confirming the remote-cutoff design which prevents cross-modulation and allows smooth gain control.

Technical Summary

The **18FW6A** is a high-performance, 7-pin miniature semi-remote cutoff pentode designed for RF and IF amplification in series-string AC/DC radio receivers. Operating with an 18 V, 100 mA heater, it features a controlled 20-second warm-up time to ensure reliable series-string operation. With a high transconductance of 4400 μmhos , low grid-to-plate capacitance of 0.0035 pF, and a smooth remote-cutoff characteristic, the 18FW6A provides stable, high-gain amplification with effective automatic gain control capabilities.



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

Section 1 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
TransconductancePublished	4400 μ S	—



SOURCE OPERATING CONDITIONS

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1966 Tung Sol Electronic Tubes 3 of 4

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

1966 TUNG SOL ELECTRONIC TUBES 3 OF 4

Section 1 · Pentode

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid 1-to-plate capacitance	0.0035 pF	WholeTube
Input capacitance	5.5 pF	WholeTube
Output capacitance	5 pF	WholeTube
Grid 1 voltage for 25 μ S transconductance	-20 V	WholeTube

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum plate voltage	150 V	WholeTube
Maximum screen supply voltage	150 V	WholeTube
Maximum plate dissipation	2.5 W	WholeTube

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Maximum screen dissipation	0.6 W	WholeTube
Plate voltage	200 V	TypicalOperation
Screen voltage	100 V	TypicalOperation
Plate current	11 mA	TypicalOperation
Screen current	4.4 mA	TypicalOperation
Transconductance	4400 μ S	TypicalOperation
Plate resistance	250000 ohm	TypicalOperation



SOURCE DATA APPENDIX

SOURCE OPERATING CONDITIONS

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1971 RCA HB3 Binder 5 of 7

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

1971 RCA HB3 BINDER 5 OF 7

Section 1 · Pentode

OTHER		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Heater voltage	18 V	—
Heater current	100 mA	—
Heater warm-up time	20 s	ControlledWarmup
Plate supply voltage	100 V	ClassA
Screen supply voltage	100 V	ClassA
Cathode resistor	68 ohm	ClassA
Plate current	11 mA	ClassA
Screen current	4.4 mA	ClassA
Maximum plate voltage	150 V	—
Maximum screen supply voltage	150 V	—
Screen input at ≤ 75 V	0.6 W	—
Plate dissipation	2.5 W	—
Peak heater-cathode voltage heater negative	100 V	—

PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Peak heater-cathode voltage heater positive	100 V	—

CHARACTERISTIC		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Plate resistance	250000 ohm	ClassA
Transconductance	4400 uS	ClassA
Grid voltage for transconductance 25 uS	-20 V	RemoteCutoff

CAPACITANCE		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Grid-to-plate capacitance	0.0035 pF	—
Input capacitance	5.5 pF	—
Output capacitance	5 pF	—

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