



ELECTRONIC TUBE REFERENCE

12FB5

Power - TV Vertical Output electronic tube

CONSOLIDATED TECHNICAL DATA

1 SECTION

CONSTRUCTION

PENTODE

Output pentode intended for Class-A audio power stages or television frame time-base service, combining receiver audio-output and vertical-sweep applications.

GENERAL CHARACTERISTICS

BASE DESIGNATION	—	BASE PINS	9
NOMINAL HEATER	12.6 V / 300 mA	PARALLEL HEATER	— / —
HEATING	Indirect	SERIES OPERATION	Not specified
CATHODE ARRANGEMENT	Separate cathodes	SECTION CONSTRUCTION	Similar

SECTION RATINGS

SECTION 1 Pentode	
TRANSCONDUCTANCE	0.0083 S
MAXIMUM PLATE VOLTAGE	250 V
MAXIMUM SCREEN VOLTAGE	250 V
<i>Published source ratings and characteristics promoted where applicable; additional data retained as parameters.</i>	

12FB5 — Output Tetrode Vacuum Tube

The **12FB5** (also known by the manufacturer designation **30P12**) is an indirectly heated output tetrode designed for use in the output stage of audio amplifiers or frame time bases (vertical deflection). It is suitable for AC or AC/DC series-heater operation, drawing a nominal heater current of 0.3 A at 12.6 V. The tube is housed in a clear T6 1/2 glass envelope with a 9-pin Noval (B9A) base.

The device was manufactured by Siemens Edison Swan Limited under the Mazda brand. It features high mutual conductance and is capable of delivering useful power output at moderate anode and screen voltages.

Construction, Heater, and Mechanical Specifications

The 12FB5 is constructed with a clear T6 1/2 glass bulb. It utilizes a Noval (B9A) E9-1 base. The physical dimensions and weights are as follows:

- **Maximum Overall Length:** 78.5 mm
- **Maximum Seated Height:** 71.5 mm
- **Maximum Diameter:** 22.2 mm
- **Approximate Net Weight:** 0.5 oz (1/2 oz)
- **Approximate Packed Weight:** 1.25 oz (1 1/4 oz)

The mounting position of the tube is completely unrestricted.

Heater Characteristics

The heater is designed for series or parallel operation, making it highly suitable for AC or AC/DC equipment.

- **Heater Voltage (V_h):** 12.6 V
- **Heater Current (I_h):** 0.3 A
- **Calculated Heater Power:** 3.78 W (calculated as $12.6\text{ V} \times 0.3\text{ A}$)

Pinout and Connections

The tube uses the **9CV** connection diagram, viewed from the free end of the pins:

- **Pin 1:** Internal Connection (IC)
- **Pin 2:** Control Grid (g_1)
- **Pin 3:** Cathode (k)
- **Pin 4:** Heater (h)
- **Pin 5:** Heater (h)
- **Pin 6:** Internal Connection (IC)
- **Pin 7:** Anode (a)
- **Pin 8:** Internal Connection (IC)
- **Pin 9:** Screen Grid (g_2)

Note on Internal Connections: Pins 1, 6, and 8 are designated as "Internal Connection" (IC). These pins are connected internally to electrodes solely to improve the mechanical rigidity of the valve. Because these connections may vary and might not always be made to the same electrode on a given valve specimen, it is essential that the corresponding valve holder sockets be left entirely unconnected in any circuit layout.

Maximum Ratings

The absolute maximum ratings for the 12FB5 must be respected to ensure reliable operation and longevity. These ratings are established for continuous service:

- **Maximum Anode Voltage ($V_a(\text{max})$):** 250 V
- **Maximum Screen Voltage ($V_{[g2]}(/tubes/G2)(\text{max})$):** 250 V
- **Maximum Anode Dissipation ($P_a(\text{max})$):** 6.0 W
- **Maximum Screen Dissipation (continuous) ($P_{[g2]}(/tubes/G2)(\text{max})$):** 1.8 W
- **Maximum Screen Dissipation (Speech and Music) ($P_{[g2]}(/tubes/G2)(\text{max})$):** 2.7 W
- **Maximum Cathode Current ($I_k(\text{max})$):** 50 mA
- **Maximum Heater-to-Cathode Voltage ($V_{h-k}(\text{max})$):** 150 V r.m.s.

The maximum heater-to-cathode voltage of 150 V r.m.s. is measured with respect to the higher potential heater pin.

Electrical Characteristics and Typical Class A Audio Operation

At a typical operating point, the 12FB5 exhibits high mutual conductance (g_m), which is rated at **8.3 mA/V** (measured under the conditions: $V_a = 170$ V, $V_{[g2]}(/tubes/G2) = 180$ V, $V_{g1} = -9.4$ V, and $I_a = 35$ mA, with respect to the higher potential heater pin).

Class A Audio Output

For Class A audio amplifier service, the typical operating conditions (measured with fixed DC potentials) are as follows:

- **Anode Supply Voltage ($V_{a(b)}$):** 170 V
- **Screen Supply Voltage ($V_{[g2]}(/tubes/G2)(b)$):** 180 V
- **Grid Bias Voltage (V_{g1}):** -10.3 V
- **Quiescent Anode Current ($I_{a(o)}$):** 31 mA
- **Quiescent Screen Current ($I_{[g2]}(/tubes/G2)(o)$):** 7.3 mA
- **Anode Load Resistance (R_a):** 5,000 Ω
- **Input Signal Swing ($V_{in(\text{r.m.s.})}$):** 3.9 V
- **Power Output (P_{out}):** 2.25 W

The power output of 2.25 W is achieved with a total harmonic distortion where the second harmonic does not exceed 5% and the third harmonic is at 5%.

When designing circuits using cathode self-bias, the grid-to-cathode circuit resistance must not exceed **0.5 M Ω** (500,000 ohms).

Frame Time-Base (Vertical Deflection) Operation

The 12FB5 is also specifically designed for service in television frame output stages (vertical deflection). In these applications, the design must account for valve-to-valve spread, deterioration over the operating life, and component variations.

To assist designers, the available peak-anode current (I_a) is specified at a low anode voltage ($V_a = 50\text{ V}$) and typical screen voltage ($V_{[g2]}(/tubes/G2) = 180\text{ V}$), with the control grid slightly biased ($V_{g1} = -1\text{ V}$):

- **Average New Valve:** $I_a = 110\text{extmA}$
- **Assumed End of Life Condition:** $I_a = 72\text{extmA}$

These figures provide a concrete design envelope, ensuring that even as the tube ages and its emission drops to the assumed end-of-life point, the frame output stage can still deliver sufficient peak current to maintain full vertical deflection.

Characteristic Curves and Behavior

The preliminary characteristic curves for the Mazda 30P12 (12FB5) illustrate the relationship between the control grid voltage (V_{g1}) and the resulting anode and screen currents (I_a and $I_{[g2]}(/tubes/G2)$) across several operating voltages.

The transfer characteristics are plotted for:

- $V_a = V_{[g2]}(/tubes/G2) = 250\text{ V}$
- $V_a = V_{[g2]}(/tubes/G2) = 180\text{ V}$
- $V_a = V_{[g2]}(/tubes/G2) = 100\text{ V}$

These curves demonstrate the sharp cutoff behavior and high transconductance of the tetrode structure. At $V_a = V_{[g2]}(/tubes/G2) = 250\text{extV}$, the anode current rises rapidly as the grid voltage moves from a cutoff near -35 V toward 0 V , exceeding 80 mA at less negative grid bias levels. The corresponding screen current curves (indicated by dashed lines) remain significantly lower than the anode current, reflecting efficient electron collection by the plate. These curves are essential for determining the optimal bias point and load line for both audio and deflection applications.

Technical Summary

The **12FB5** (Mazda 30P12) is a versatile, high-performance Noval-based output tetrode designed for audio power output and television frame time-base applications. Operating with a 12.6 V , 0.3 A heater, it is well-suited for series-string AC/DC chassis designs. With a maximum anode dissipation of 6.0 W and a high mutual conductance of 8.3 mA/V , it can deliver 2.25 W of audio power in Class A service from a modest 170 V supply. For television vertical deflection, it provides a reliable peak anode current of up to 110 mA (dropping to an assumed 72 mA at end-of-life), making it a robust choice for vintage consumer electronics.



SOURCE OPERATING CONDITIONS

[SOURCE PDF](#)

1959 Ediswan

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

1959 EDISWAN

Section 1 · Pentode

APPLICATION		
PARAMETER	PUBLISHED VALUE	CONDITION / NOTE
Application	Class-A audio output / frame time-base	—

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