

Ferranti

VOLTAGE AMPLIFIER PENTODE

A pentode developed for use as an R.C. coupled A.F. voltage amplifier. The low noise characteristic makes it particularly suitable for early stages of high gain audio amplifiers, for tape recorders and microphone pre-amplifiers. It is suitable for series or parallel operation a.c. or d.c.

PHYSICAL DETAILS.

Base	...	...	B9A—Noval.
Max. Overall Length	...	...	56 mm. (2 $\frac{1}{2}$ in.).
Max. Seated Height	...	...	49 mm. (1 $\frac{7}{8}$ in.).
Max. Diameter	...	...	22.2 mm. ($\frac{7}{8}$ in.).
Mounting Position	...	...	Any.

BASE CONNECTIONS.

Pin 1—Screen Grid (g ₂).	Pin 5—Heater.
Pin 2—Shield.	Pin 6—Anode.
Pin 3—Cathode.	Pin 7—Shield.
Pin 4—Heater.	Pin 8—Suppressor Grid (g ₃).
	Pin 9—Control Grid (g ₁).

HEATER.

Heater Voltage	...	...	6.3 volts.
Heater Current	...	...	0.2 amp.

RATINGS.

Max. H.T. Supply Voltage	...	550 volts.
Max. Anode Voltage	...	300 volts.
Max. Screen Voltage	...	200 volts.
Max. Anode Dissipation	...	1.0 watts.
Max. Screen Dissipation	...	0.2 watts.
†Min. Negative Grid Voltage	...	1.3 volts.
Max. Cathode Current	...	6.0 mA.
Max. V _{h-k} (Heater Negative)	...	100 volts.
Max. V _{h-k} (Heater Positive)	...	50 volts.
*Max. R _{g1-k}	...	3 MΩ
Max. R _{g3-k}	...	10 kΩ
†Max. R _{h-k}	...	20 kΩ

CHARACTERISTICS.

Anode Voltage	...	250 volts.
Suppressor Grid Voltage	...	0 volts.
Screen Voltage	...	140 volts.
Anode Current	...	3 mA.
Screen Current	...	0.6 mA.
Control Grid Voltage	...	-2 volts.
Mutual Conductance	...	2.0 A/V.
Inner μ (μ_{g1-g2})	...	38
Anode Impedance	...	2.5 MΩ

Noise :—

With line voltage=250v. and R_a=100kΩ the equivalent noise voltage on the grid of the EF86 is approximately 2 μ V. for the frequency range of 25-10,000 c/s.

Hum :—

In use as a normal voltage amplifier with a line voltage of 250 volts anode load of 100kΩ and grid resistor of 470 kΩ, the maximum hum level of the valve is 5 μ V. The average is approx. 3 μ V. when one side of the heater is earthed.

Microphony :—

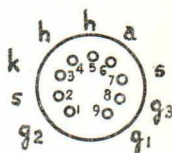
There are no appreciable internal resonances at frequencies below 1000 c/s. and the effect of vibration at frequencies above 1000 c/s. is usually negligible due to the damping provided by the chassis, valve holder, etc.

*With anode dissipation less than 0.2W. the value of R_{g1-k} may be increased up to 10 MΩ

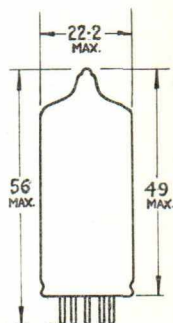
†For use as a phase inverter immediately preceding the output stage, R_{h-k} may be increased up to 120 kΩ

‡For grid current of 0.3 μ A.

EF86



Base
Connections
Underside View
of Base



All dimensions
shown are in
millimetres.

Ferranti

TYPICAL OPERATION as Resistance Coupled A.F. Amplifier.

Pentode Connection.

H.T. Supply Voltage	...	400	400	300	300	200	200	150	150	volts.
Anode Load Resistor	...	100	220	100	220	100	220	100	220	k Ω
Screen Grid Feed Resistor	...	0.39	1.0	0.39	1.0	0.39	1.0	0.47	1.0	M Ω
Anode Current	...	2.6	1.2	1.95	0.9	1.35	0.7	0.8	0.51	mA.
Screen Grid Current	...	550	250	400	190	280	120	180	100	μ A.
Cathode Bias Resistor	...	1.0	2.2	1.0	2.2	1.0	2.2	1.5	2.7	k Ω
Grid Resistor of following valve	...	330	680	330	680	330	680	330	680	k Ω
Stage Gain	...	135	210	120	190	110	180	100	160	
Output Voltage	...	95	77	67	57	38	36	26	25	volts. (r.m.s.)
Total Distortion	...	5	5	5	5	5	5	5	5	%

Triode Connection (g_2 to a ; g_3 to k).

H.T. Supply Voltage	...	400	400	400	300	300	200	200	200	volts.
Anode Load Resistor	...	47	100	220	47	220	47	100	220	k Ω
Cathode Bias Resistor	...	1.2	2.2	3.9	1.2	3.9	1.2	2.2	3.9	k Ω
Cathode Current	...	3.5	2.0	1.1	2.7	0.8	1.85	1.0	0.5	mA.
Grid Resistor of following valve	...	150	330	680	150	680	150	330	680	k Ω
Stage Gain	...	27.3	31.5	33	26	33	25.5	30	32	
*Output Voltage	...	68	77	78	46	54	26	31	31	volts. (r.m.s.)
†Distortion	...	5.2	4.8	4.3	4.6	4.2	3.9	4.0	3.7	%

CAPACITANCES†

C_{in}	...	...	...	3.8 pF.
C_{out}	...	...	...	5.3 pF.
C_{a-g_1}	...	...	...	<0.05 pF.
C_{g_1-h}	...	...	...	<0.0025 pF.

NOTES ON OPERATION.

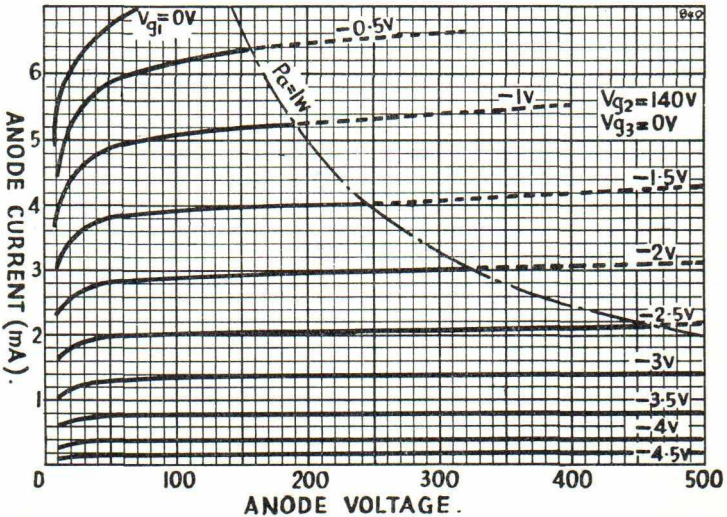
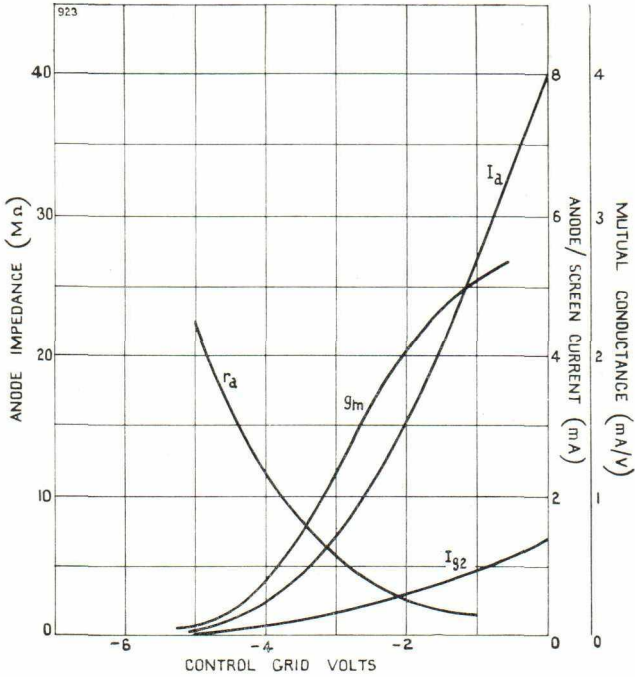
The low hum level attained with this valve, noted under "Characteristics," can be further reduced by the provision of an earthed centre tap to the heater. On the contrary the use of an unsuitable valve holder with excessive leakage and capacitive coupling between the pins can introduce considerable hum.

To avoid microphony at higher frequencies in high gain amplifiers care should be taken in siting the valve to minimise the effect of a loud speaker in the same cabinet. In such cases and also when motors or speakers are mounted on the same chassis, as in tape recorders, it is advisable to provide a flexible mounting for the valve holder or a separate sub-chassis which should be heavy gauge metal.

*Figures quoted are typical figures at the start of positive grid current. For lower output voltages the distortion is approximately proportional to the voltage.

†Measured without external shield.

TYPICAL CHARACTERISTICS



TYPICAL CHARACTERISTICS - CONNECTED AS TRIODE

