

Pentode— Beam Power Tube

For Combined Limiter, Quadrature-Grid Discriminator, and
Audio Power Output Applications in FM and TV Receivers

DUODECAR TYPE

Electrical:

Heater Characteristics and Ratings:

Voltage (AC or DC)	6.3 ± 0.6 volts
Current at heater volts = 6.3	0.950 amp
Peak heater-cathode voltage:	
Heater negative with respect to cathode	200 max. volts
Heater positive with respect to cathode	200 ^a max. volts

Direct Interelectrode Capacitances:^b

Beam Power Unit:

Grid No.1 to plate.	0.2	pf
Input: $G1_B$ to ($K_B + G3_B, G2_B, H$)	11	pf
Output: P_B to ($K_B + G3_B, G2_B, H$)	7.0	pf

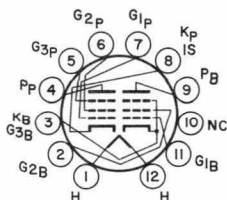
Pentode Unit:

Grid No.1 to plate.	0.01	pf
$G1_P$ to ($K_P + IS, P_P, G3_P, G2_P, H$)	4.0	pf
$G3_P$ to ($K_P + IS, P_P, G2_P, G1_P, H$)	3.2	pf

Mechanical:

Operating Position	Any
Types of Cathodes.	Coated Unipotential
Maximum Overall Length	2.375"
Seated Length.	1.750" to 2.000"
Diameter	1.062" to 1.188"
Dimensional Outline (JEDEC 9-58)	See General Section
Bulb	T9
Base	Small-Button Duodecar 12-Pin (JEDEC E12-70)
Basing Designation for BOTTOM VIEW	12BT

- Pin 1—Heater
- Pin 2—Beam Power Grid No.2
- Pin 3—Beam Power Cathode,
Beam Power Grid No.3
- Pin 4—Pentode Plate
- Pin 5—Pentode Grid No.3
- Pin 6—Pentode Grid No.2
- Pin 7—Pentode Grid No.1
- Pin 8—Pentode Cathode,
Internal Shields
- Pin 9—Beam Power Plate
- Pin 10—No Internal Connection
- Pin 11—Beam Power Grid No.1
- Pin 12—Heater



PENTODE UNIT — LIMITER & DISCRIMINATOR SERVICE

Maximum Ratings, *Design-Maximum Values:*

Plate Supply Voltage.	330	volts
Grid-No.3 (Quadrature-Grid) Voltage.	c	
Grid-No.2 (Accelerator-Grid) Voltage.	110	volts
Grid-No.1 (Limiter-Grid) Voltage:		
Positive-peak value	60	volts
Cathode Current	13	ma

Typical Operation:

Input-Signal

Center Frequency	4.5	10.7	10.7	Mc
Plate Supply Voltage. . .	270	85	285	volts
Plate Voltage	62	121	122	volts
Grid-No.3 Voltage	c	c	c	c
Grid-No.2 Voltage	100	55	100	volts
Cathode-Circuit				
Resistance ^d	200-400	200-400	200-400	ohms
Peak AF Output Voltage. .	16.8	6	16.6	volts
Minimum Grid-No.1				
Signal Voltage (RMS)				
for AM rejection ^d	2	1.25	2	volts
Minimum Grid-No.1				
Signal Voltage (RMS)				
for limiting action ^e	1.25	1.25	1.25	volts
Plate Current	0.44	0.25	0.49	ma
Grid-No.2 Current	10	4.1	9.8	ma
Plate Load Resistor	0.33	0.085	0.33	megohm
Linearity Resistor.	1000	470	1500	ohms
Integrating Capacitor . . .	0.001	0.002	0.001	μf
Coupling Capacitor.	0.25	0.25	0.01	μf
Frequency Deviation	±25	±75	±75	kc
AM Rejection:				
For grid-No.1 signal				
volts (RMS) = 2	25	31	20	db
For grid-No.1 signal				
volts (RMS) = 3	30	30	29	db
Total Harmonic				
Distortion.	1.8	2	1.6	%

BEAM POWER UNIT — AMPLIFIER — Class A₁Maximum Ratings, *Design-Maximum Values:*

Plate Voltage	275	volts
Grid-No.2 (Screen-Grid) Voltage.	275	volts
Plate Dissipation.	10	watts
Grid-No.2 Input.	2	watts

Typical Operation and Characteristics:

Plate Voltage.	250	volts
Grid-No.2 Voltage.	250	volts
Grid-No.1 (Control-Grid) Voltage	-8	volts
Peak AF Grid-No.1 Voltage.	8	volts

Zero-Signal Plate Current.	35	ma
Max.-Signal Plate Current.	39	ma
Zero-Signal Grid No.2 Current.	2.5	ma
Max.-Signal Grid No.2 Current.	7	ma
Plate Resistance (Approx.)	0.1	megohm
Transconductance	6500	μ mhos
Load Resistance.	5000	ohms
Total Harmonic Distortion.	10	%
Max.-Signal Power Output	4.2	watts

Maximum Circuit Values:

Grid-No.1-Circuit Resistance:

For fixed-bias operation	0.25	megohm
For cathode-bias operation	0.5	megohm

- ^a The dc component must not exceed 100 volts.
- ^b Without external shield.
- ^c For proper operation of the pentode unit of the type shown in the accompanying Typical Quadrature-Grid-FM Detector Circuit, the Q of the tuned circuit (L_1 , C_6) should be sufficiently high to develop a 4-volt rms signal at the quadrature grid when a 2-volt rms signal at the center frequency is applied to grid No.1.
- It is recommended that L_1 be shunted by a capacitance of at least 10 μ mf. This capacitance may be composed of tube capacitance, stray capacitance, the distributed capacitance of L_1 , and a fixed capacitor.
- ^d The cathode-circuit resistance should be adjusted for maximum AM rejection at the AF output of the circuit at the specified grid-No.1 signal voltage. AM rejection is measured with an applied signal containing 30 per cent amplitude modulation and 30 per cent frequency modulation.
- ^e At signal levels above specified value, limiting is within ± 3 decibels.

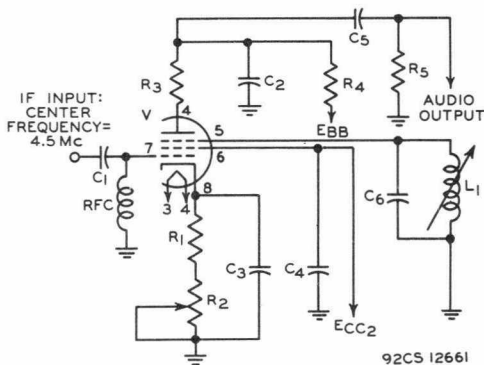
OPERATING CONSIDERATIONS FOR PENTODE UNIT

To insure proper phasing of the signal voltage developed at the quadrature grid, the components of the quadrature-grid circuit should be shielded from those of the control-grid circuit.

To obtain a symmetrical discriminator-response curve, the plate currents for no input signal and for unmodulated input signal should be equal. To assure this equality, it is necessary that the plate voltage and grid-No.2 voltage have the proper values.

The proper plate voltage for any grid-No.2 voltage may be determined from the accompanying *Operating Characteristics, Pentode Unit* curve. This curve may also be used to determine the average dynamic plate current for any combination of grid-No.2 voltage and plate voltage.



TYPICAL QUADRATURE-GRID-
FM-DETECTOR CIRCUIT

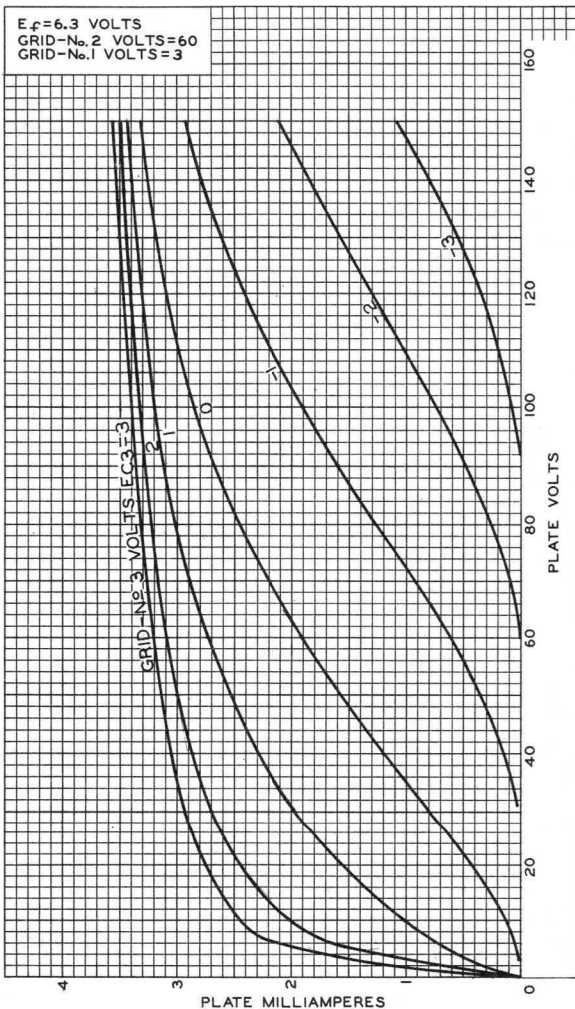
C_1 : 100 μf
 C_2 : Integrating capacitor,
 0.001 μf
 C_3, C_4 : 0.01 μf
 C_5 : 0.25 μf
 C_6 : 10 μf ^c
 L_1 : c
 R_1 : 200 ohms
 R_2 : Cathode-bias
 potentiometer, 200 ohms

R_3 : Linearity resistor,
 1000 ohms
 R_4 : Plate-load resistor,
 0.33 megohm
 R_5 : 0.47 megohm
 V : Pentode Unit of
 Electron-tube-type
 6J10

^c For footnote see end of data.

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AVERAGE PLATE CHARACTERISTICS Pentode Unit



92CM-10319



AVERAGE CHARACTERISTICS
Pentode Unit

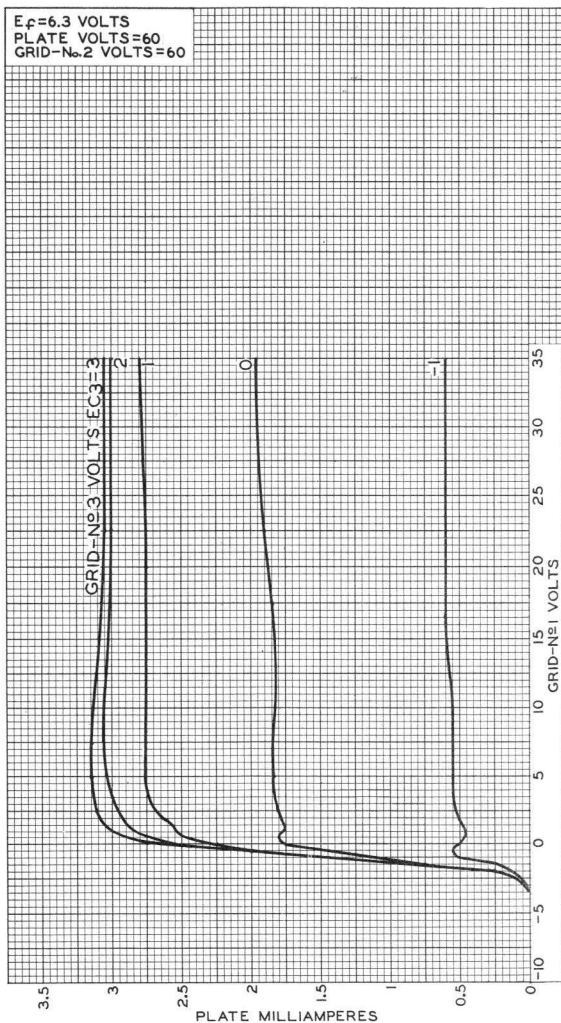
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AVERAGE CHARACTERISTICS

Pentode Unit

$E_p = 6.3$ VOLTS
PLATE VOLTS = 60
GRID-No.2 VOLTS = 60



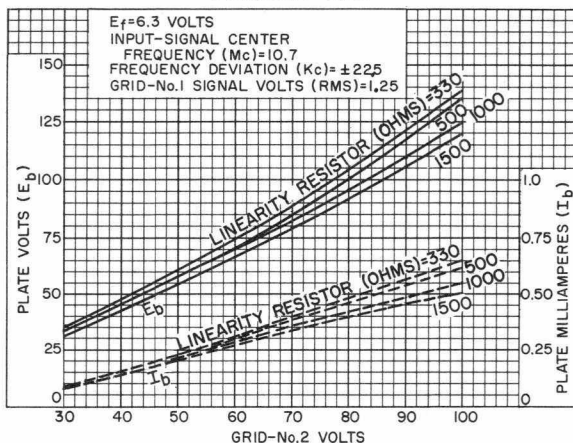
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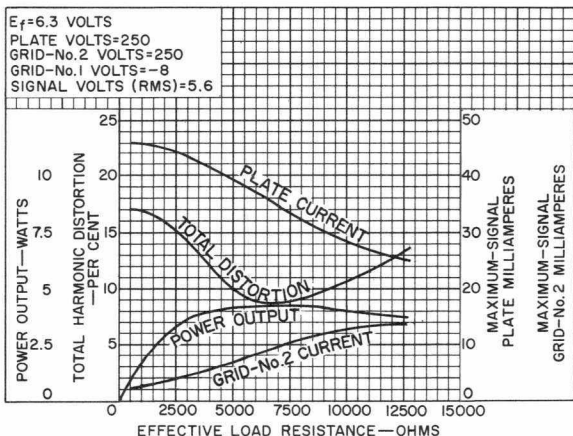
DATA 4
2-65

OPERATION CHARACTERISTICS Pentode Unit



92CS-12662

OPERATION CHARACTERISTICS Beam Power Unit

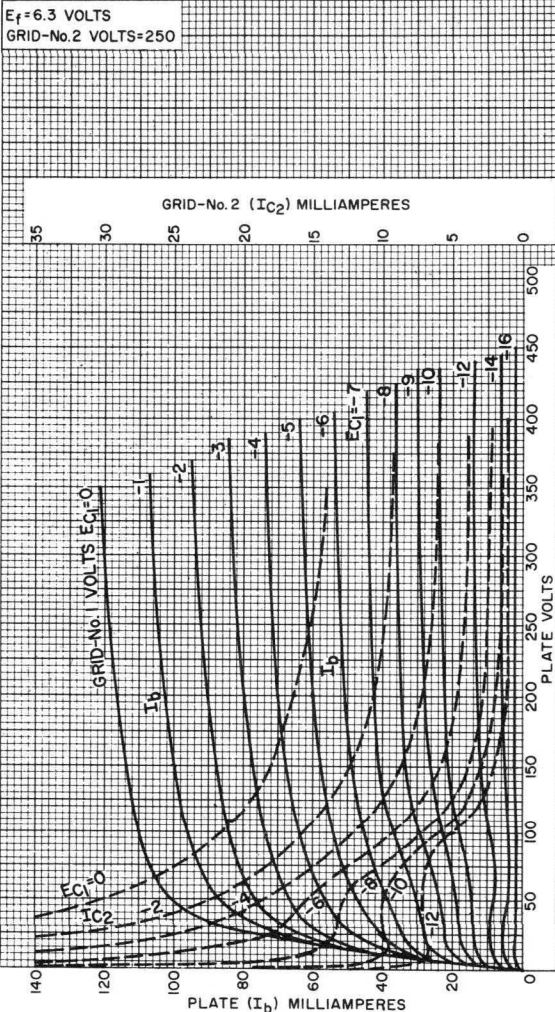


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AVERAGE CHARACTERISTICS

Beam Power Unit



92CM-12669



