

January 27, 1958

GATED-BEAM DISCRIMINATOR TYPES 3BN6, 4BN6, 6BN6 and 12BN6

The 3BN6, 4BN6, 6BN6 and 12BN6 are 7-pin miniature gated-beam types designed for service as combined limiter, FM detector and audio voltage amplifier in frequency modulation and television receivers. These types may also be used as sync-clipper or limiter.

The 3BN6 and 4BN6 have been designed for use in receivers which employ series connected heaters, especially in television receivers where the picture-tube heater is in series with other heaters. When each is employed in this type of circuit with other tubes similarly designed having the same heater current rating, heater voltage surges across individual tubes are minimized inasmuch as heater warm-up characteristic is controlled.

GENERAL DATA

ELECTRICAL:

Cathode.....	Coated Unipotential			
Heater:	3BN6	4BN6	6BN6	12BN6
Voltage (ac or dc)	3.15	4.2	6.3	12.6
Current	0.60	0.45	0.30	0.15
Warm-up Time ▲	11	11	..	..
Direct Interelectrode Capacitances (Unshielded):				
Grid 1 to All			4.2	uuf
Grid 2 to All			3.3	uuf
Grid 1 to Grid 3 (max.) . .			0.004	uuf

MECHANICAL:

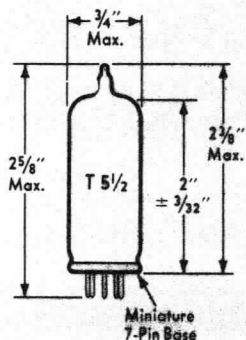
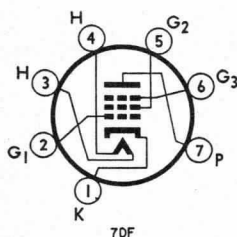
Bulb	T-5-1/2
Base	Miniature 7-Pin (JETEC E7-1)
Basing	7DF
Mounting Position	Any

LIMITER-DISCRIMINATOR SERVICE

MAXIMUM RATINGS:

Design-Center Values

Plate Supply Voltage . . .	300 max. Volts
Accelerator Voltage . . .	100 max. Volts
Peak Positive Limiter - Grid Voltage	55 max. Volts
Total Cathode Current . .	11.5 max. Ma.
Heater-Cathode Voltage:	
Heater Negative with Respect to Cathode	
Total DC + Peak. . . .	200 max. Volts
Heater Positive with Respect to Cathode	
DC Component	100 max. Volts
Total DC + Peak. . . .	200 max. Volts



CHARACTERISTICS AND TYPICAL OPERATION:

Input-Signal Center				
Frequency	10.7	10.7	4.5	Mc
Frequency Deviation	±75	±75	±25	Kc
Plate Supply Voltage	85	285	270	Volts
Plate Voltage	63	122	121	Volts
Accelerator Voltage	55	100	100	Volts
Cathode-Bias Resistor				
(Variable)†	200-400	200-400	200-400	Ohms
Plate Load Resistor	85000	330000	330000	Ohms
Plate Linearity Resistor . . .	470	1500	1000	Ohms
Integrating Capacitor	.002	.001	.001	uf
Coupling Capacitor.	.25	.01	.25	uf
Minimum Signal Voltage for				
Limiting Action (RMS)* . . .	1.25	1.25	1.25	Volts
Average DC Plate Current . .	0.25	0.49	0.44	Ma.
Accelerator Current	4.1	9.8	10.0	Ma.
Input Signal Level for AM				
Rejection Adjustment † . . .	1.25	2.0	2.0	Volts
AM Rejection at Esig. = 2.0.				
Volts (RMS)	31	20	25	db
AM Rejection at Esig. = 3.0				
Volts (RMS)	30	29	30	db
Total Harmonic Distortion . .	2.0	1.6	1.8	Per Cent
Peak Audio Output Voltage . .	6.0	16.6	16.8	Volts

* At signal levels above specified value limiting is within ±2 decibels.

† The cathode resistor should be adjusted for maximum AM rejection in the output of the limiter-discriminator stage at the specified signal level. AM rejection is measured with an applied signal containing 30% AM and 30% FM.

▲ Heater Warm-up Time is defined as the time required for the voltage across the heater to reach 80% of its rated value after applying four times rated heater voltage to a circuit consisting of the tube heater in series with a resistance equal to three times rated heater voltage divided by rated heater current.

■ ± 6%

Receiving Tube Section

APPLICATION NOTES

Adequate shielding between components of the limiter grid and the quadrature grid must be used to insure proper phasing of the voltage developed on the quadrature grid.

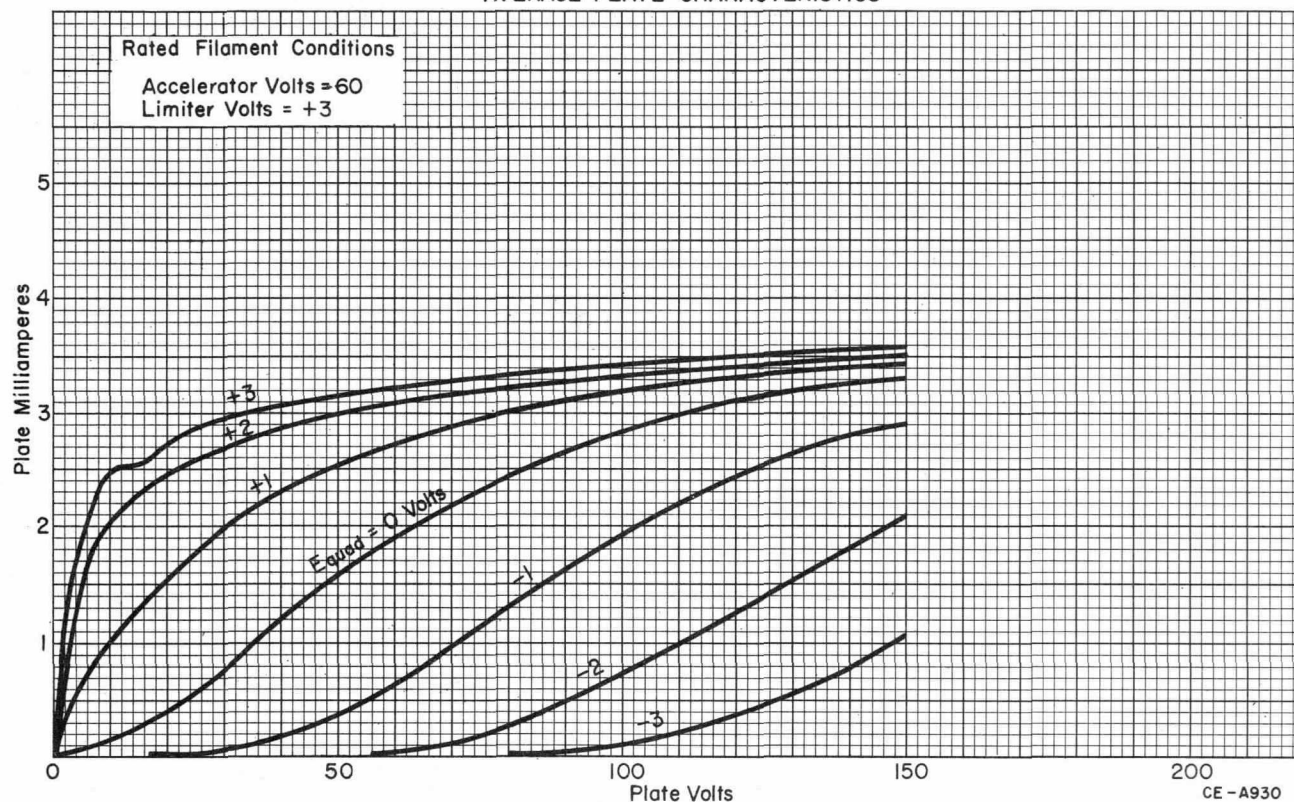
Standard deemphasis requirements for FM are included.

The Q of the quadrature grid circuit should be high enough to develop a minimum of 4 volts (RMS) signal with 2 volts (RMS) of the center-frequency signal applied to the limiter grid. It is recommended that the coil be shunted by a minimum of 10 uuf. The capacitance may be composed of tube input capacitance,

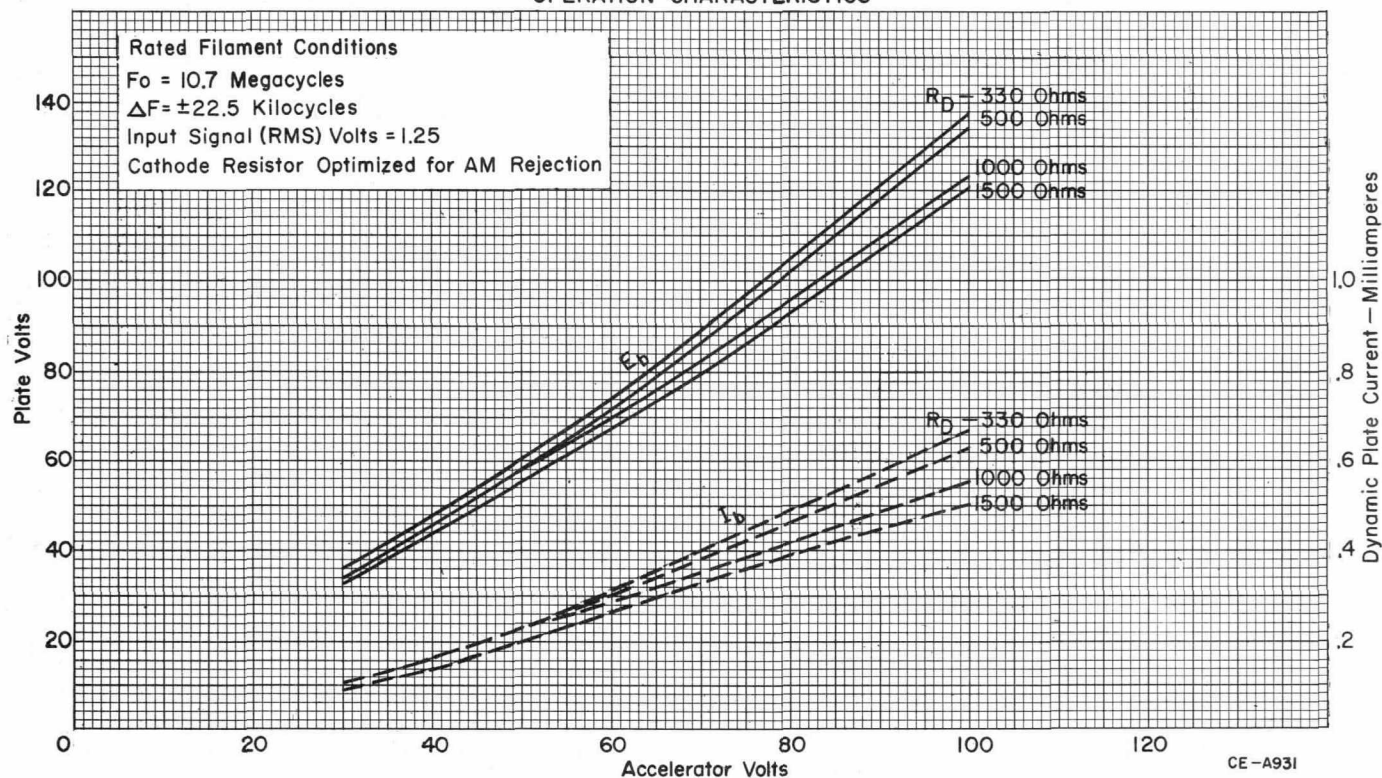
stray capacitance, and distributed capacitance, as well as physical capacitance.

To obtain a symmetrical discriminator response curve in FM applications, the ratio of no signal plate current to plate current with an unmodulated signal must equal unity. When the value of accelerator voltage is chosen, the plate voltage applied to the tube may be found from drawing CE-A931. This will insure unity ratio of plate current. CE-A931 also shows the average dynamic plate current that flows with the specified plate and accelerator voltages. The plate load resistor should drop the plate supply voltage to the specified plate voltage.

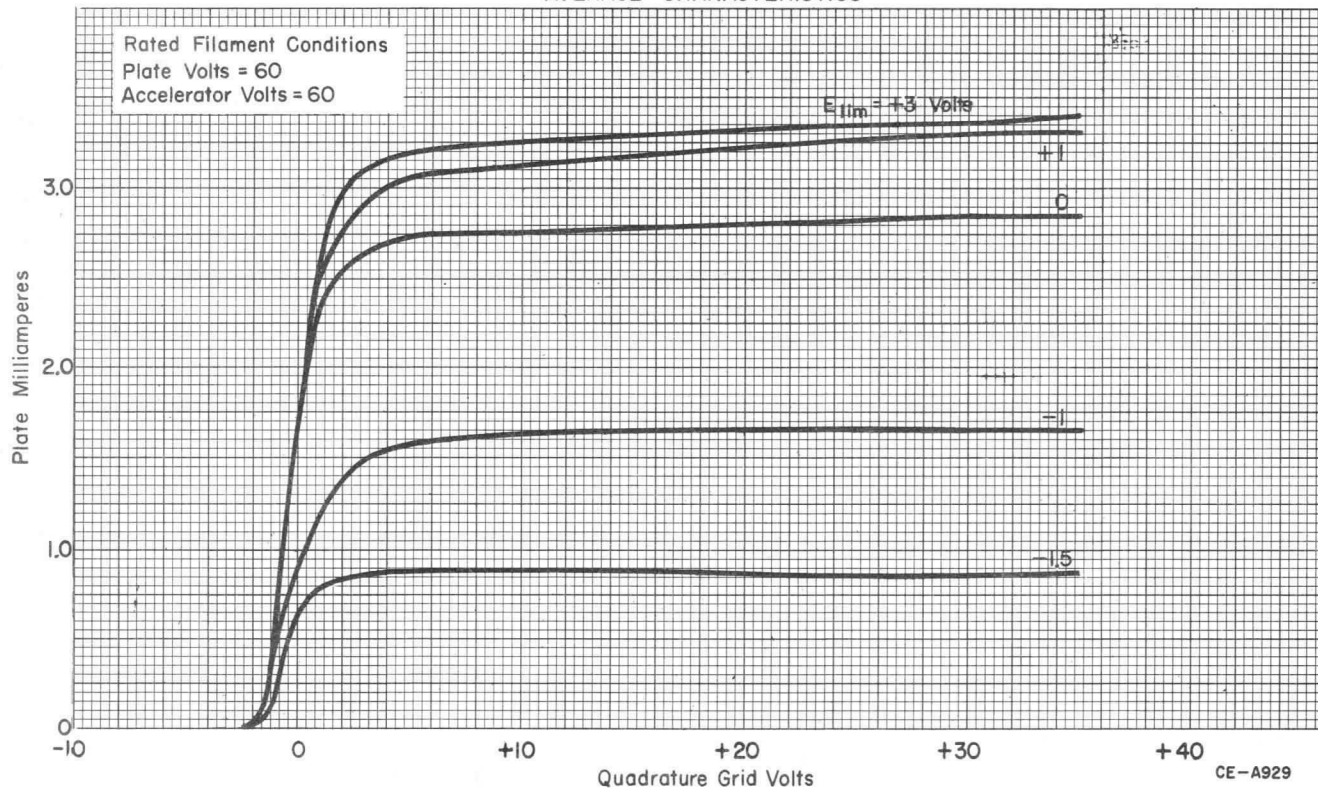
AVERAGE PLATE CHARACTERISTICS



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