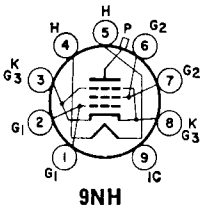
6GB5/ EL500

BEAM POWER TUBE

13GB5/XL500, 18GB5/LL500 27GB5/PL500



9NH

Magnoval type used as horizontal-deflection amplifier in television receivers. **Outlines section,** 35B; requires neonoval 9-contact socket. Typical instantaneous characteristics (measured with recurrent waveform such that maximum ratings are not exceeded): plate volts, 75; grid-No.2 volts, 200; grid-No.1 volts, −10; plate mA, 440; grid-No.2 mA, 37. Types 13GB5/XL500, 18GB5/LL500 and 27GB5/PL500 are identical with type 6GB5/EL500 except for heater ratings.

	6GB5/ EL500	13GB5/ XL500	18GB5/ LL500	27GB5/ PL500	
Heater Voltage (ac/dc)	6.3	13.3	18	27	volts
Heater Current	1.38	0.6	0.45	0.3	amperes
Heater-Cathode Voltage:					
Peak value	±250 max	±250 max	±250 max	±250 max	volts
Average value	125 max	125 max	125 max	125 max	volts

Horizontal-Deflection Amplifier

For operation in a 525-line, 30-frame system

MAXIMUM RATINGS (Design-Maximum Values)

DC Plate Voltage	275	volts
Peak Positive-Pulse Plate Voltage#	7700	volts
DC Grid-No.2 (Screen-Grid) Voltage	275	volts
Average Cathode Current	275	mA
Plate Dissipation▲	17	watts
Grid-No.2 Input▪	5	watts

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:		
Without grid current	0.5	megohm
With grid current (horizontal-output service only)	2.2	megohms

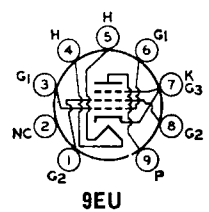
Pulse duration must not exceed 15% of a horizontal scanning cycle (10 microseconds).

▲ A bias resistor or other means is required to protect the tube in absence of excitation.

▪ Grid-No.2 input may reach 6 watts for plate-dissipation values below 11 watts.

For replacement use type 6GW6/6DQ6B. **6GB6**

For replacement use type 6GW6/6DQ6B. **6GB7**



9EU

6GC5

BEAM POWER TUBE

Miniature type used in color and black-and-white television receiver applications and as output tube in audio-amplifier applications. **Outlines section,** 6E, requires miniature 9-contact socket.

Heater Voltage (ac/dc)	6.3	volts
Heater Current	1.2	amperes
Heater-Cathode Voltage:		
Peak value	±200 max	volts
Average value	100 max	volts
Direct Interelectrode Capacitances (Approx.):		
Grid No.1 to Plate	0.9	pF
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3	18	pF
Plate to Cathode, Heater, Grid No.2, and Grid No.3	7	pF

Class A_1 Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	220	volts
Grid-No.2 (Screen-Grid) Voltage	140	volts
Plate Dissipation	12	watts
Grid-No.2 Input	1.4	watts

TYPICAL OPERATION AND CHARACTERISTICS

Plate Voltage	110	200	volts
Grid-No.2 Voltage	110	125	volts
Grid-No.1 Voltage	−7.5	—	volts
Cathode-Bias Resistor	—	180	ohms
Peak AF Grid-No.1 Voltage	7.5	8.5	volts
Zero-Signal Plate Current	49	46	mA
Maximum-Signal Plate Current	50	47	mA
Zero-Signal Grid-No.2 Current	4	2.2	mA
Maximum-Signal Grid-No.2 Current	10	8.5	mA
Plate Resistance (Approx.)	13000	28000	ohms
Transconductance	8000	8000	μmhos
Load Resistance	2000	4000	ohms
Total Harmonic Distortion	10	10	per cent
Maximum-Signal Power Output	2.1	3.8	watts

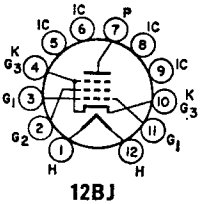
MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.1	megohm
For cathode-bias operation	0.5	megohm

6GE5 BEAM POWER TUBE

12GE5, 17GE5

Duodecar type used as horizontal-deflection-amplifier tube in television receivers. Outlines section, 15A; requires duodecar 12-contact socket. Types 12GE5 and 17GE5 are identical with type 6GE5 except for heater ratings.



12BJ

	6GE5	12GE5	17GE5	
Heater Voltage (ac/dc)	6.3	12.6	16.8	volts
Heater Current	1.2	0.6	0.45	amperes
Heater Warm-up Time (Average)	—	11	11	seconds
Heater-Cathode Voltage:				
Peak value	±200 max	±200 max	±200 max	volts
Average value	100 max	100 max	100 max	volts

Class A_1 Amplifier

CHARACTERISTICS	Pentode Connection		Triode* Connection	
Plate Voltage	60	250	150	volts
Grid-No.2 (Screen-Grid) Voltage	150	150	150	volts
Grid-No.1 (Control-Grid) Voltage	0	−22.5	—	volts
Amplification Factor	—	—	4.4	
Plate Resistance (Approx.)	—	18000	—	ohms
Transconductance	—	7300	—	μmhos
Plate Current	345•	65	—	mA
Grid-No.2 Current	27•	1.8	—	mA
Grid-No.1 Voltage (Approx.) for plate current of 1 mA	—	−42	—	volts

* Grid No.2 tied to plate.

• This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

Horizontal-Deflection Amplifier

For operation in a 525-line, 30-frame system

MAXIMUM RATINGS (Design-Maximum Values)

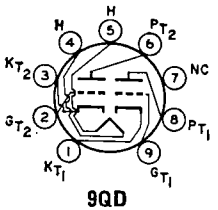
DC Plate Supply Voltage	770	volts
Peak Positive-Pulse Plate Voltage#	6500	volts
Peak Negative-Pulse Plate Voltage	1500	volts
DC Grid-No.2 Voltage	220	volts
Peak Negative-Pulse Grid-No.1 Voltage	330	volts

DC Grid-No.1 Voltage	—55	volts
Peak Cathode Current	550	mA
Average Cathode Current	175	mA
Plate Dissipation†	17.5	watts
Grid-No.2 Input	3.5	watts
Bulb Temperature (At hottest point)	200	°C
MAXIMUM CIRCUIT VALUE		
Grid-No.1 Circuit Resistance	1	megohm

Pulse duration must not exceed 15% of a horizontal scanning cycle (10 microseconds).
† A bias resistor or other means is required to protect the tube in absence of excitation.

Refer to chart at end of section. **6GF5**

Refer to chart at end of section. **6GF7**



9QD

DUAL TRIODE

6GF7A

10GF7A, 13GF7A

Novar types used as combined vertical-deflection oscillator and vertical-deflection amplifiers in color and black-and-white television receivers. **Outlines section, 30A**; requires novar 9-contact socket. Refer to curves of average plate characteristics for Unit No.1 and Unit No.2, refer to types 6DR7 (Unit No.1) and 6EM7, respectively. Types 10GF7A and 13GF7A are identical with type 6GF7A except for heater ratings.

	6GF7A	10GF7A	13GF7A	
Heater Voltage (ac/dc)	6.3	9.7	13	volts
Heater Current	0.985	0.6	0.45	ampere
Heater Warm-up Time (Average)	—	11	11	seconds
Heater-Cathode Voltage:				
Peak value	±200 max	±200 max	±200 max	volts
Average value	100 max	100 max	100 max	volts
Direct Interelectrode Capacitances (Approx.):	Unit No.1	Unit No.2		
Grid to Plate	4.6	9		pF
Grid to Cathode and Heater	2.4	6.5		pF
Plate to Cathode and Heater	0.26	1.4		pF

Class A_1 Amplifier

CHARACTERISTICS	Unit No.1	Unit No.2	
Plate Voltage	250	150	volts
Grid Voltage	—3	—20	volts
Amplification Factor	64	5.4	
Plate Resistance (Approx.)	40000	750	ohms
Transconductance	1600	7200	μmhos
Grid Voltage (Approx.):			
For plate current of 10 μA	—5.5	—	volts
For plate current of 100 μA	—	—45	volts
Plate Current	1.4	50	mA
For plate voltage of 60 volts and zero grid voltage	—	95	mA
For grid voltage of —28 volts	—	10	mA

Vertical-Deflection Oscillator and Amplifier

For operation in a 525-line, 30-frame system

MAXIMUM RATINGS (Design-Maximum Values)	Unit No.1 Oscillator	Unit No.2 Amplifier	
DC Plate Voltage	330	330	volts
Peak Positive-Pulse Plate Voltage (Absolute Maximum)#	—	1500•	volts
Peak Negative-Pulse Grid Voltage	400	250	volts
Peak Cathode Current	77	175	mA
Average Cathode Current	22	50	mA
Plate Dissipation	1.5	11	watts

MAXIMUM CIRCUIT VALUES

Grid-Circuit Resistance:

For grid-resistor-bias or cathode-bias operation	2.2	2.2	megohms

• Under no circumstances should this absolute value be exceeded.

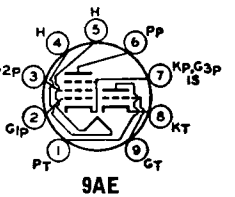
Pulse duration must not exceed 15% of a vertical scanning cycle (2.5 milliseconds).

Refer to chart at end of section. **6GH8**

6GH8A

5GH8A, 9GH8A

MEDIUM-MU TRIODE—SHARP-CUTOFF PENTODE



9AE

Miniature type used in multivibrator-type horizontal-deflection circuits and for age-amplifier or sync-separator applications in color and black-and-white television receivers. **Outlines section,** 6B; requires miniature 9-contact socket. Types 5GH8A and 9GH8A are identical with type 6GH8A except for heater ratings.

	5GH8A	6GH8A	9GH8A	
Heater Voltage (ac/dc)	4.7	6.3	9.45	volts
Heater Current	0.6	0.45	0.3	ampere
Heater Warm-up Time (Average)	11	11	—	seconds
Heater-Cathode Voltage:				
Peak value	±200 max	±200 max	±200 max	volts
Average value	100 max	100 max	100 max	volts
Direct Interelectrode Capacitances:		Unshielded	Shielded	
Triode Unit:				
Grid to Plate		1.7	1.7	pF
Grid to Cathode, Heater, Pentode Grid No.3, Pentode Cathode, and Internal Shield		3	3.2	pF
Plate to Cathode, Heater, Pentode Grid No.3, Pentode Cathode, and Internal Shield		1.4	1.9	pF
Heater to Cathode		3	3	pF
Pentode Unit:				
Grid No.1 to Plate		0.02 max	0.01 max	pF
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield		5	5	pF
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield		2.6	3.4	pF
Heater to Cathode, Grid No.3, and Internal Shield		3	3	pF

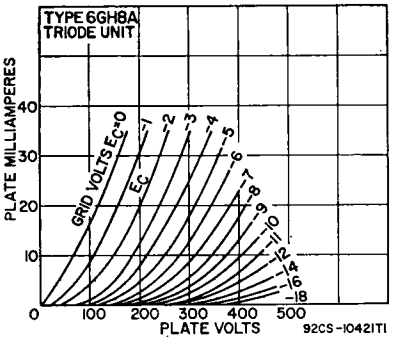
Class A_1 Amplifier

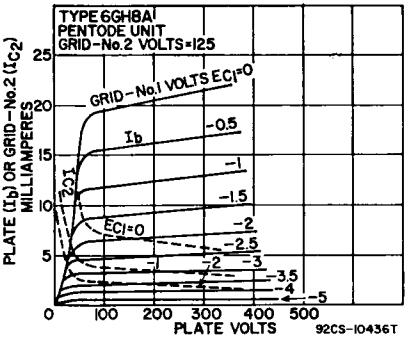
CHARACTERISTICS	Triode Unit	Pentode Unit	
Plate Voltage	125	125	volts
Grid-No.2 Voltage	—	125	volts
Grid-No.1 Voltage	—1	—1	volts
Amplification Factor	46	—	
Plate Resistance (Approx.)	5400	200000	ohms
Transconductance	8500	7500	μmhos
Plate Current	13.5	12	mA
Grid-No.2 Current	—	4	mA
Grid-No.1 Voltage (Approx.) for plate current of 10 μA	—8	—8	volts

Horizontal-Deflection Oscillator

For operation in a 525-line, 30-frame system

MAXIMUM RATINGS (Design-Maximum Values)	Triode Unit	Pentode Unit	
Plate Voltage	330	350	volts
Grid-No.2 (Screen-Grid) Voltage	—	330	volts
Grid-No.1 (Control-Grid) Voltage:			
Positive-bias value	0	0	volts
Peak negative value	—	175	volts
Peak Cathode Current	—	300	mA
Average Cathode Current	—	20	mA
Plate Dissipation	2.5	2.5	watts
Grid-No.2 Input	—	0.55	watt

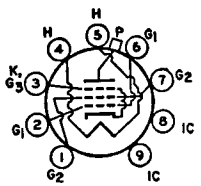




MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	2.2	2.2	megohms
For cathode-bias operation	2.2	2.2	megohms

Refer to chart at end of section. **6GJ5**



9QK

BEAM POWER TUBE

6GJ5A

12GJ5A, 17GJ5A

Novar type used in high-efficiency horizontal-deflection-amplifier circuits of television receivers. **Outlines section, 18A;** requires novar 9-contact socket. For curve of average characteristics see type 6GW6. Types 12GJ5A and 17GJ5A are identical with type 6GJ5A except for heater ratings.

	6GJ5A	12GJ5A	17GJ5A	
Heater Voltage (ac/dc)	6.3	12.6	16.8	volts
Heater Current	1.2	0.6	0.45	amperes
Heater Warm-up Time (Average)	—	11	11	seconds
Heater-Cathode Voltage:				
Peak value	±200 max	±200 max	±200 max	volts
Average value	100 max	100 max	100 max	volts
Direct Interelectrode Capacitances (Approx.):				
Grid No.1 to Plate			0.26	pF
Grid No.1 to Cathode, Heater, Grid No.2, and Grid No.3			15	pF
Plate to Cathode, Heater, Grid No.2, and Grid No.3			6.5	pF

Class A_1 Amplifier

CHARACTERISTICS	Triode Connection	Pentode Connection		
Plate Voltage	150	60	250	volts
Grid-No.2 Voltage	150	150	150	volts
Grid-No.1 Voltage	—22.5	0	—22.5	volts
Mu-Factor, Grid No.2 to Grid No.1	4.4	—	—	
Plate Resistance (Approx.)	—	—	15000	ohms
Transconductance	—	—	7100	μmhos
Plate Current	—	390▪	70	mA
Grid-No.2 Current	—	32▪	2.1	mA
Grid-No.1 Voltage for plate current of 1 mA	—	—	—42	volts

▪ This value can be measured by a method involving a recurrent waveform such that the maximum ratings of the tube will not be exceeded.

Horizontal-Deflection Amplifier

For operation in a 525-line, 30-frame system

MAXIMUM RATINGS (Design-Maximum Values)

DC Plate Supply Voltage	770	volts
Peak Positive-Pulse Plate Voltage#	6500	volts
Peak Negative-Pulse Plate Voltage	1500	volts

DC Grid-No.2 Voltage	220	volts
DC Grid-No.1 Voltage	—55	volts
Peak Negative-Pulse Grid-No.1 Voltage	330	volts
Peak Cathode Current	550	mA
Average Cathode Current	175	mA
Plate Dissipation•	17.5	watts
Grid-No.2 Input	3.5	watts
Bulb Temperature (at hottest point)	240	°C

MAXIMUM CIRCUIT VALUE

Grid-No.1-Circuit Resistance:		
For grid-resistor-bias operation•	1	megohm

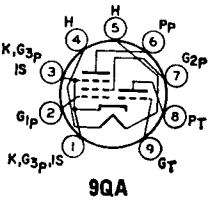
Pulse duration must not exceed 15% of a horizontal scanning cycle (10 microseconds).
• A bias resistor or other means is required to protect the tube in absence of excitation.

6GJ7 Refer to chart at end of section.

6GJ7/ ECF801

4GJ7/XCF801
5GJ7/LCF801
8GJ7/PCF801

MEDIUM-MU TRIODE— SHARP-CUTOFF PENTODE



9QA

Miniature types used as combined oscillator and mixer tubes in color and black-and-white television receivers utilizing an intermediate frequency in the order of 40 MHZ. **Outlines section, 6J;** requires miniature 9-contact socket. Types 4GJ7/XCF801, 5GJ7/LCF801, and 8GJ7/PCF801 are identical with type 6GJ7/ECF801 except for heater ratings.

	4GJ7/ XCF801	5GJ7/ LCF801	6GJ7/ ECF801	8GJ7/ PCF801	
Heater Voltage (ac/dc)					
Heater Current	4.1	5.6	6.3	8	volts
Peak Heater-Cathode Voltage▲	0.6	0.45	0.41	0.3	ampere
	±110 max	±110 max	±100 max	±110 max	volts

Class A_1 Amplifier

MAXIMUM RATINGS (Design-Maximum Values)	Triode Unit	Pentode Unit	
Plate-Supply Voltage	600	600	volts
DC Plate Voltage	140	275	volts
Grid-No.2 (Screen-Grid) Supply Voltage	—	600	volts
DC Grid-No.2 Voltage	—	275	volts
DC Grid-No.1 (Control-Grid) Voltage	—	—50	volts
Cathode Current	22	20	mA
Plate Dissipation	1.8	2.4	watts
Grid-No.2 Input•	—	0.55	watt
CHARACTERISTICS			
DC Plate Voltage	100	170	volts
DC Grid-No.2 Voltage	—	120	volts
DC Grid-No.1 Voltage	—3	—1.2	volts
Amplification Factor	20	55*	
Plate Resistance (Approx.)	—	0.35	megohm
Transconductance	9000	11000	μmhos
Plate Current	15	10	mA
Grid-No.2 Current	—	3	mA
Grid-No.1 Voltage for grid-No.1 current of 0.3 μA	—1.3 max	—1.3 max	volts
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	1	megohm
For cathode-bias operation	0.5	2.2	megohms

▲ The hum should be minimized in intercarrier applications by limiting the heater-cathode voltage to 100 volts rms, and in AM receivers to 50 volts rms.
* Grid No.2 to grid No.1, approximate value.
• When control-grid bias is between —1.5 and —2 volts, screen-grid dissipation is limited to 0.50 watt. When this bias is greater than —2 volts, maximum screen-grid dissipation is 0.36 watt.

6GJ8 Refer to chart at end of section.