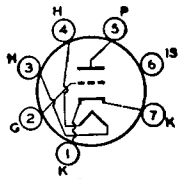
For replacement use type 6GK5/6FQ5A. **6GK5**

6GK5/ 6FQ5A

2GK5/2FQ5A, 3GK5, 4GK5

HIGH-MU TRIODE



7FP

Miniature type with frame grid used as grounded-cathode rf-amplifier tube in vhf tuners of color and black-and-white television receivers. **Outlines section,** 5C; requires miniature 7-contact socket. Types 2GK5/2FQ5A, 3GK5, and 4GK5 are identical with type 6GK5/6FQ5A except for heater ratings.

	2GK5/2FQ5A	3GK5	4GK5	6GK5/6FQ5A	
Heater Voltage (ac/dc)	2.3	2.8	4	6.3	volts
Heater Current	0.6	0.45	0.3	0.18	ampere
Heater Warm-up Time (Average)	11	11	11	—	seconds
Peak Heater-Cathode Voltage	±100 max	±100 max	±100 max	±100 max	volts
Direct Interelectrode Capacitances (Approx.):°					
Grid to Plate				0.52	pF
Grid to Cathode, Heater, and Internal Shield				5	pF
Plate to Cathode, Heater, and Internal Shield				3.5	pF
Heater to Cathode				2.5•	pF

° With external shield connected to cathode, except as noted.

• With external shield and internal shield connected to ground.

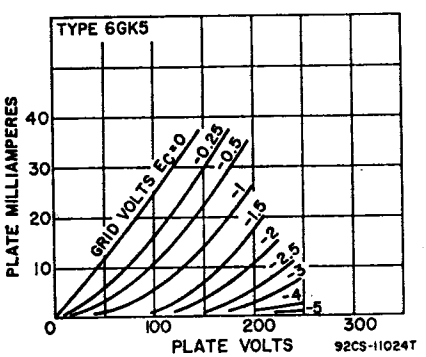
Class A_1 Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	200	volts
Grid Voltage:		
Negative-bias value	50	volts
Positive-bias value	0	volts
Average Cathode Current	22	mA
Plate Dissipation	2.5	watts

CHARACTERISTICS

Plate Voltage	135	volts
Grid Voltage	—1	volts
Amplification Factor	78	
Plate Resistance (Approx.)	5400	ohms
Transconductance	15000	μmhos
Plate Current	11.5	mA
Input Resistance•	275	ohms
Input Capacitance•	11.2	pF
Noise Figure†	4.7	dB
Grid Voltage (Approx.) for transconductance of 150 μmhos	—4.2	volts
Grid Voltage (Approx.) for transconductance of 1500 μmhos	—2.5	volts



MAXIMUM CIRCUIT VALUE

Grid-Circuit Resistance, for cathode-bias operation ..... 1 megohm

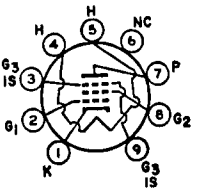
• Measured at 200 MHz with heater volts = 6.3 and plate effectively grounded for rf voltages.

† For a neutralized triode amplifier at a frequency of 200 MHz with signal source impedance adjusted for minimum noise output.

6GK6

10GK6, 16GK6

POWER PENTODE



9GK

Miniature type used in the output stage of audio amplifying equipment and also in the video output stage of color and black-and-white television receivers. **Outlines section,** 6G; requires miniature 9-contact socket. Types 10GK6 and 16GK6 are identical with type 6GK6 except for heater ratings.

	6GK6	10GK6	16GK6	
Heater Voltage (ac/dc)	6.3	10	16	volts
Heater Current	0.76	0.45	0.3	ampere
Heater Warm-up Time (Average)	—	11	11	seconds
Peak Heater-Cathode Voltage	±100 max	±100 max	±100 max	volts
Direct Interelectrode Capacitances:				
Grid No.1 to Plate			0.14 max	pF
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield			10	pF
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield			7	pF

Class A_1 Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Supply Voltage	605	volts
Plate Voltage	330	volts
Grid-No.2 Supply Voltage	605	volts
Grid-No.2 (Screen-Grid) Voltage	330	volts
Grid-No.1 (Control-Grid) Voltage, Negative-bias value	100	volts
Cathode Current	65	mA
Plate Dissipation	13.2	watts
Grid-No.2 Input, Peak	4	watts
Grid-No.2 Input, Average	2	watts

CHARACTERISTICS AND TYPICAL OPERATION

Plate Supply Voltage	250	volts
Grid-No.2 Supply Voltage	250	volts
Cathode-Bias Resistor	135	ohms
Mu-Factor, Grid No.2 to Grid No.1	19	
Plate Resistance (Approx.)	38000	ohms
Transconductance	11300	μmhos
Peak AF Grid-No.1 Voltage	7.3	volts
Zero-Signal Plate Current	48	mA
Maximum-Signal Plate Current	50.6	mA
Zero-Signal Grid-No.2 Current	5.5	mA
Maximum-Signal Grid-No.2 Current	10	mA
Effective Load Resistance	5200	ohms
Total Harmonic Distortion	10	per cent
Maximum-Signal Power Output	5.7	watts

Push-Pull Class AB_1 and Class B Amplifier

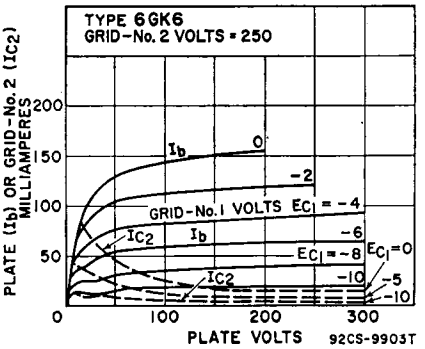
MAXIMUM RATINGS (Same as for Class A_1 Amplifier)

TYPICAL OPERATION (Values are for two tubes)

	Class AB_1		Class B		
Plate Voltage	250	300	250	300	volts
Grid-No.2 Voltage	250	300	250	300	volts
Grid-No.1 Voltage	—	—	−11.6	−14.7	volts
Cathode-Bias Resistor	130	130	—	—	ohms
Peak AF Grid-No.1-to-Grid-No.1 Voltage	22.4	28	22.4	28	volts
Zero-Signal Plate Current	62	72	20	15	mA
Maximum-Signal Plate Current	75	92	75	92	mA
Zero-Signal Grid-No.2 Current	7	8	2.2	1.6	mA
Maximum-Signal Grid-No.2 Current	15	22	15	22	mA
Effective Load Resistance (plate to plate)	8000	8000	8000	8000	ohms
Total Harmonic Distortion	3	4	3	4	per cent
Maximum-Signal Power Output	11	17	11	17	watts

MAXIMUM CIRCUIT VALUES

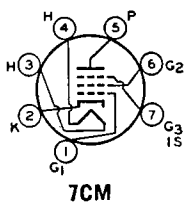
Grid-No.1-Circuit Resistance:		
For fixed-bias operation	0.3	megohm
For cathode-bias operation	1	megohm



For replacement use type 6AU4GTA. **6GK17**

Refer to chart at end of section. **6GL7**

Refer to chart at end of section. **6GM5**



7CM

SEMIREMOTE-CUTOFF PENTODE

6GM6

5GM6

Miniature type used in gain-controlled picture-if stages of color and black-and-white television receivers operating at intermediate frequencies in the order of 40 MHz. **Outlines section,** 5C; requires 7-contact socket. Type 5GM6 is identical with type 6GM6 except for heater ratings.

	5GM6	6GM6	
Heater Voltage (ac/dc)	5.6	6.3	volts
Heater Current	0.45	0.4	ampere
Heater Warm-up Time (Average)	11	—	seconds
Heater-Cathode Voltage:			
Peak value	±200 max	±200 max	volts
Average value	100 max	100 max	volts
Direct Interelectrode Capacitances:	Unshielded	Shielded°	
Grid No.1 to Plate	0.036 max	0.026 max	pF
Grid No.1 to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	10	10	pF
Plate to Cathode, Heater, Grid No.2, Grid No.3, and Internal Shield	2.4	3.4	pF

° With external shield connected to cathode.

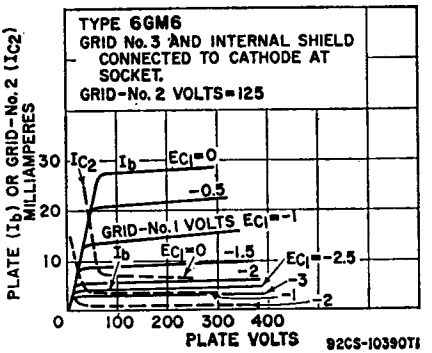
Class A_1 Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	330	volts
Grid-No.3 (Suppressor-Grid) Voltage, Positive value	0	volts
Grid-No.2 (Screen-Grid) Supply Voltage	330	volts
Grid-No.2 Voltage	See curve page 300	
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0	volts
Plate Dissipation	3.1	watts
Grid-No.2 Input:		
For grid-No.2 voltages up to 165 volts	0.65	watt
For grid-No.2 voltages between 165 and 330 volts	See curve page 300	

CHARACTERISTICS

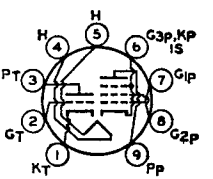
Plate Supply Voltage	125	volts
Grid No.3	Connected to cathode at socket	
Grid-No.2 Supply Voltage	125	volts
Cathode-Bias Resistor	56	ohms
Plate Resistance (Approx.)	0.2	megohm
Transconductance	13000	μmhos
Plate Current	14	mA
Grid-No.2 Current	3.4	mA
Grid-No.1 Voltage (Approx.) for transconductance of 60 μmhos	−15	volts



6GN8

8GN8/8EB8
10GN8

HIGH-MU TRIODE—SHARP-CUTOFF PENTODE



9DX

Miniature type used in color and black-and-white television receiver applications. Triode unit is used as sync-separator, sync-clipper, phase inverter, or sound-if amplifier. Pentode unit is used in output stage of video amplifier. **Outlines section,** 6E; requires miniature 9-contact socket. For direct interelectrode capacitances, refer to type 6EB8; curve for average plate characteristics of triode unit is same as for type 6EB8. Types 8GN8/8EB8, and 10GN8 are identical with type 6GN8 except for heater ratings.

	6GN8	8GN8/8EB8	10GN8	
Heater Voltage (ac/dc)	6.3	8	10.5	volts
Heater Current	0.75	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

Class A_1 Amplifier

MAXIMUM RATINGS (Design-Maximum Values)	Triode Unit	Pentode Unit	
Plate Voltage	330	330	volts
Grid-No.2 (Screen-Grid) Supply Voltage	—	330	volts
Grid-No.2 Voltage	—	See curve page 300	
Grid-No.1 (Control-Grid) Voltage, Positive-bias value	0	0	volt
Plate Dissipation	1	5	watts
Grid-No.2 Input:			
For grid-No.2 voltages up to 165 volts	—	1.1	watts
For grid-No.2 voltages between 165 and 330 volts	—	See curve page 300	

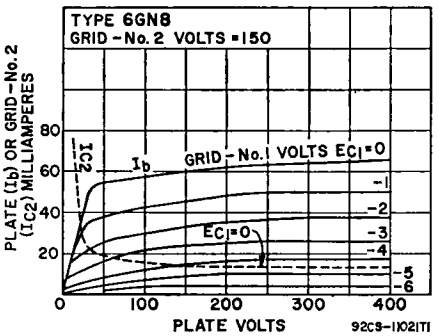
CHARACTERISTICS	Triode Unit	Pentode Unit		
Plate Supply Voltage	250	60	200	volts
Grid-No.2 Supply Voltage	—	150	150	volts
Grid-No.1 Voltage	−2	0	—	volts
Cathode-Bias Resistor	—	—	100	ohms
Amplification Factor	100	—	—	
Plate Resistance (Approx.)	37000	—	60000	ohms

	Triode Unit	Pentode Unit		
Transconductance	2700	—	11500	μmhos
Plate Current	2	55▪	25	mA
Grid-No.2 Current	—	18▪	5.5	mA
Grid Voltage (Approx.) for plate current of 20 μA	−5	—	—	volts
Grid-No.1 Voltage (Approx.) for plate current of 100 μA	—	—	−10	volts

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance:			
For fixed-bias operation	0.5	0.25	megohm
For cathode-bias operation	1	1	megohm

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



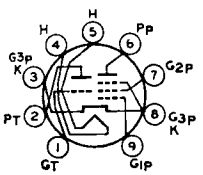
Refer to chart at end of section.

6GQ7

MEDIUM-MU TRIODE—SHARP-CUTOFF PENTODE

6GS7

5GS7, 7GS7



9GF

Miniature type used as a frequency changer in vhf television tuners. **Outlines section,** 6B; requires 9-contact socket. Types 5GS7 and 7GS7 are identical with type 6GS7 except for heater ratings. **Heater:** volts, 7.6; ampere, 0.3; maximum heater-cathode volts, ±100 peak, 100 average.

	5GS7	6GS7	7GS7	
Heater Voltage	5.4	6.3	7.6	volts
Heater Current	0.45	0.375	0.3	ampere
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

MAXIMUM RATINGS (Design-Center Values)	Triode Unit	Pentode Unit	
Plate Voltage	125	250	volts
Grid-No.2 (Screen-Grid) Voltage	—	150	volts
Plate Dissipation	1.5	2	watts
Grid-No.2 Input	—	0.5	watt
Cathode Current	15	18	mA
CHARACTERISTICS			
Plate Voltage	100	170	volts
Grid-No.2 Voltage	—	150	volts
Grid-No.1 (Control-Grid) Voltage	−3	−1.2	volts
Plate Current	14	10	mA
Grid-No.2 Current	—	3.3	mA
Transconductance	5500	12000	μmhos
Plate Resistance	—	0.35 min	megohm
Amplification Factor	17	—	

MAXIMUM CIRCUIT VALUES

Grid-No.1-Circuit Resistance	0.5	—	megohm
Grid-No.1-Circuit Resistance:			
For fixed-bias operation	—	0.25	megohm
For cathode-bias operation	—	0.5	megohm

Pentode Unit as Frequency Changer

CHARACTERISTICS

Plate Voltage	190	volts
Grid-No.2 Supply Voltage	190	volts
Oscillator Voltage	2.3	volts (rms)
Grid-No.2 Circuit Resistance	0.018	megohm
Grid-No.1 Circuit Resistance	0.1	megohm
Plate Current	8.5	mA
Grid-No.2 Current	2.7	mA
Grid-No.1 Current	30	μA
Plate Resistance	0.6	megohm
Conversion Transconductance	4500	μmhos

Triode Unit as Oscillator

CHARACTERISTICS

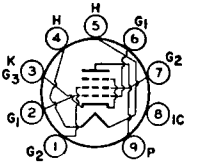
Plate Supply Voltage	190	volts
Plate Circuit Resistance	8200	ohms
Grid Circuit Resistance	10000	ohms
Oscillator Voltage	4.5	volts (rms)
Plate Current	12	mA
Transconductance	3500	μmhos

6GT5 Refer to chart at end of section.

6GT5A

17GT5A

BEAM POWER TUBE



9NZ

Novar type used as horizontal-deflection amplifier in television receivers. **Outlines section,** 31A; requires novar 9-contact socket. For curve of average characteristics, refer to type 6GW6. Type 17GT5A is identical with type 6GT5A except for heater ratings.

	6GT5A	17GT5A	
Heater Voltage (ac/dc)	6.3	16.8	volts
Heater Current	1.2	0.45	ampere
Heater Warm-up Time (Average)	—	11	seconds
Heater-Cathode Voltage:			
Peak value	±200 max	±200 max	volts
Average value	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 (Screen-Grid) Voltage	150	150	150	volts
Grid-No.1 (Control-Grid) 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 (Approx.) 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

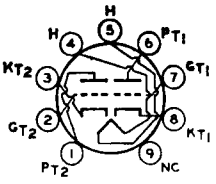
MAXIMUM CIRCUIT VALUE

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.

Refer to chart at end of section. **6GU5**



9LP

MEDIUM-MU TWIN TRIODE

6GU7

8GU7

Miniature type used in the matrixing circuits of color and black-and-white television receivers and in phase-inverter, multivibrator, and general-purpose amplifier applications. **Outlines section,** 6E; requires miniature 9-contact socket. Type 8GU7 is identical with type 6GU7 except for heater ratings.

	6GU7	8GU7	
Heater Voltage (ac/dc)	6.3	8.4	volts
Heater Current	0.6	0.45	ampere
Heater Warm-up Time (Average)	11	11	seconds
Heater-Cathode Voltage:			
Peak value	±200 max	±200 max	volts
Average value	100 max	100 max	volts
Direct Interelectrode Capacitances (Approx.):	Unit No.1	Unit No.2	
Grid to Plate	3	3	pF
Grid to Cathode and Heater	3.4	3.6	pF
Plate to Cathode and Heater	0.44	0.34	pF
Plate of Unit No.1 to Plate of Unit No.2	1		pF

Class A_1 Amplifier

MAXIMUM RATINGS (Design-Maximum Values)

Plate Voltage	330	volts
Grid Voltage, Positive-bias value	0	volts
Plate Dissipation	3	watts

CHARACTERISTICS

Plate Voltage	250	volts
Grid Voltage	—10.5	volts
Amplification Factor	17	
Plate Resistance (Approx.)	5500	ohms
Transconductance	3100	μmhos

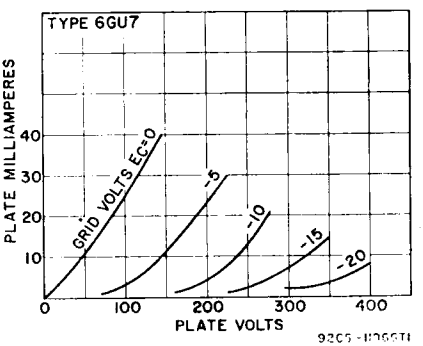
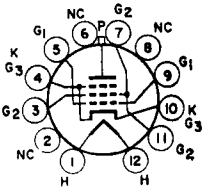


Plate Current	11.5	mA
Grid Voltage (Approx.) for plate current of 50 μA	—23	volts
Plate Current for grid voltage of —14 volts	4	mA
MAXIMUM CIRCUIT VALUE		
Grid-Circuit Resistance, for fixed-bias operation	1	megohm

6GV5
17GV5

BEAM POWER TUBE



12DR

Duodecar type used as horizontal-deflection amplifier in television receivers. **Outlines section,** 39A; requires duodecar 12-contact socket. Type 17GV5 is identical with type 6GV5 except for heater ratings.

	6GV5	17GV5	
Heater Voltage (ac/dc)	6.3	16.8	volts
Heater Current	1.2	0.45	amperes
Heater Warm-up Time (Average)	—	11	seconds
Heater-Cathode Voltage:			
Peak value	±200 max	±200 max	volts
Average value	100 max	100 max	volts

Class A_1 Amplifier

CHARACTERISTICS	Pentode Connection			Triode* Connection	
Plate Voltage	5000	60	250	150	volts
Grid-No.2 (Screen-Grid) Voltage	150	150	150	150	volts
Grid-No.1 (Control-Grid) Voltage	—	0	—22.5	—22.5	volts
Plate Resistance (Approx.)	—	—	18000	—	ohms
Transconductance	—	—	7300	—	μmhos
Amplification Factor	—	—	—	4.4	
Plate Current	—	345▪	65	—	mA
Grid-No.2 Current	—	27▪	1.8	—	mA
Grid-No.1 Voltage (Approx.) for plate current of 1 mA	—100	—	—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)	220	°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.

6GV8 Refer to chart at end of section.