HY69

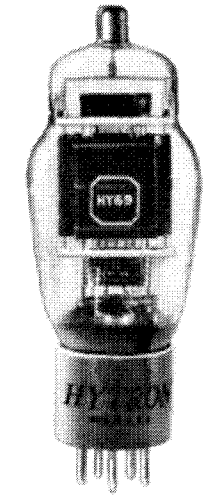
R-F OSCILLATOR–AMPLIFIER FREQUENCY MULTIPLIER, A-F AMPLIFIER AND MODULATOR

HY69
30-WATT BEAM PENTODE INSTANT-HEATING FILAMENT

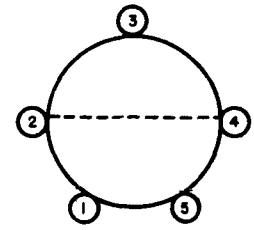
The HY69 is an instant-heating filamentary type 30-watt beam pentode for use in r-f and a-f service. Its versatility permits its use in all stages — r-f and a-f of an entire transmitter. In portable and mobile applications, its instant-heating filament can be turned off during standby periods. Thus a tremendous saving in battery drain (over that possible with cathode-type tubes) can be gained when transmitting time is a small percentage of total time. Because the HY69 requires no neutralization in properly designed adaptable in band switching transmitters and exciters. Maximum ratings apply up to 60 megacycles.

General Characteristics

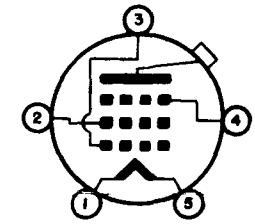
Filament	thoriated tungsten	
Potential a-c or d-c	6.0 ± 5%	volts
Current	1.6	amperes
Heating time (approx.)*	¼	second
Transconductance (for Eb = 600V, Ec2 = 250V, Ef = 6.0V a-c, Ec1 = –21)	2900	μmhos
Average amplification factor (G1 to G2)	6.5	
Direct Interelectrode Capacitances		
Grid to plate (max)	0.3	μμfd
Input	17	μμfd
Output	8.5	μμfd
Bulb		ST-16
Maximum overall length	5-3/4	inches
Maximum diameter	2-1/16	inches
Base	5 pin medium low loss phenolic	
Cap	small metal	
Mounting position	filament plane must be vertical	



Filament Plane



Terminal Layout



bottom view of socket

Terminal Connections

1 — Filament	4 — Beam plates
2 — Screen grid	5 — Filament
3 — Control grid	Cap — Plate

A-F Power Amplifier and Modulator — Class A_1

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
D-c plate input power	30 max	watts
D-c screen grid input power	5 max	watts
Plate dissipation	30 max	watts

Typical Operation — Average Characteristics

A-c filament potential ø		6.0	6.0	6.0	6.0	6.0	volts
D-c plate potential		300	400	500	300	400	volts
D-c screen grid potential		250	250	250	300	300	volts
D-c control grid bias ø ‡	(a	–20	–20	–20	–25	–25	volts
	(b	...	...	...	...	...	
	(c	375	360	360	410	410	ohms
Peak a-f control grid potential		20	20	20	25	25	volts
Zero signal d-c plate current		46	49	51	54	56	ma
Max signal d-c plate current		47	50	53	56	58	ma
Zero signal d-c screen grid current		3	2.5	2	3.5	3	ma
Max signal d-c screen grid current		7	5.5	4.5	9	8.5	ma
Effective load resistance		6500	8500	10000	4700	7000	ohms
Max signal plate power output		6.2	8.4	10.2	7.9	10.6	watts
Total harmonic distortion		7	7	6	8	7	percent

Typical Operation — Push-Pull Amplifier

Unless otherwise specified, the values are for two tubes

A-c filament potential ø		6.0	6.0	6.0	6.0	6.0	6.0	volts
D-c plate potential		300	400	500	300	400	500	volts
D-c screen grid potential		250	250	250	300	300	300	volts
D-c control grid bias ø ‡	(a	–20	–20	–20	–25	–25	–27.5	volts
	(b	...	...	...	...	...	...	
	(c	200	195	190	220	210	250	ohms
Peak a-f control grid to control grid potential		40	40	40	50	50	55	volts
Zero signal d-c plate current		92	98	102	108	112	106	ma
Max signal d-c plate current		96	102	106	116	118	114	ma
Zero signal d-c screen grid current		5	5	4	7	6	4	ma
Max signal d-c screen grid current		14	12	9	18	17	15	ma
Effective load resistance (plate to plate)		13000	17000	20000	9400	14000	17000	ohms
Max signal plate power output		13.3	17.4	20.5	15.8	21.2	28.5	watts
Total harmonic distortion		5	5	3	5	5	5	

A-F Power Amplifier and Modulator — Class AB_2

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
Peak positive a-f control grid potential	100 max	volts
Max signal d-c plate current	120 max	ma
Max signal plate input power	72 max	watts
Max signal screen grid input power	5 max	watts
Plate dissipation	30 max	watts

Typical Operation — Average Characteristics
Unless otherwise specified, the values are for two tubes

A-c filament potential ø		6.0	6.0	6.0	volts
D-c plate potential		400	500	600	volts
D-c screen grid potential		250	250	250	volts
D-c control grid bias ø ‡	(a	–22.5	–22.5	–30	volts
Peak a-f control grid to control grid potential		167	170	193	volts
Zero signal d-c plate current		80	84	54	ma
Max signal d-c plate current		240	240	240	ma
Zero signal d-c screen grid current		3	3	2	ma
Max signal d-c screen grid current		15	16	20	ma
Max signal d-c control grid current		12	12	13	ma
Effective load resistance (plate to plate)		2800	4300	5500	ohms
Max signal control grid driving power		1	1	1.12	watts
Max signal plate power output		50	75	100	watts
Total harmonic distortion		4	4	3	percent

PREPARED BY COMMERCIAL ENGINEERING DEPT.
HYTRON RADIO & ELECTRONICS CORP.
MAIN OFFICE: SALEM, MASSACHUSETTS

HYTRON HY69

R-F Power Amplifier and Oscillator
Class C Telegraphy and Frequency Modulation

Key-down Conditions per Tube without Amplitude Modulation

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
D-c control grid bias	-200 max	volts
D-c plate current	100 max	ma
D-c control grid current	7 max	ma
Peak positive r-f control grid potential	100 max	volts
D-c plate input power	60 max	watts
D-c screen grid input power	5 max	watts
Plate dissipation	30 max	watts

Typical Operation — Average Characteristics

A-c filament potential ø		6.0	6.0	6.0	volts
D-c plate potential		400	500	600	volts
D-c screen grid potential		250	250	250	volts
D-c control grid bias #	(a	-100	-100	-100	volts
	(b	17000	17000	17000	ohms
	(c	850	850	850	ohms
Peak r-f control grid potential		170	170	170	volts
D-c plate current		100	100	100	ma
D-c screen grid current		15	12.5	12.5	ma
D-c control grid current		6	6	6	ma
Control grid driving power (approx.)		1	1	1	watt
Plate power output (approx.) Δ		24	33	42	watts

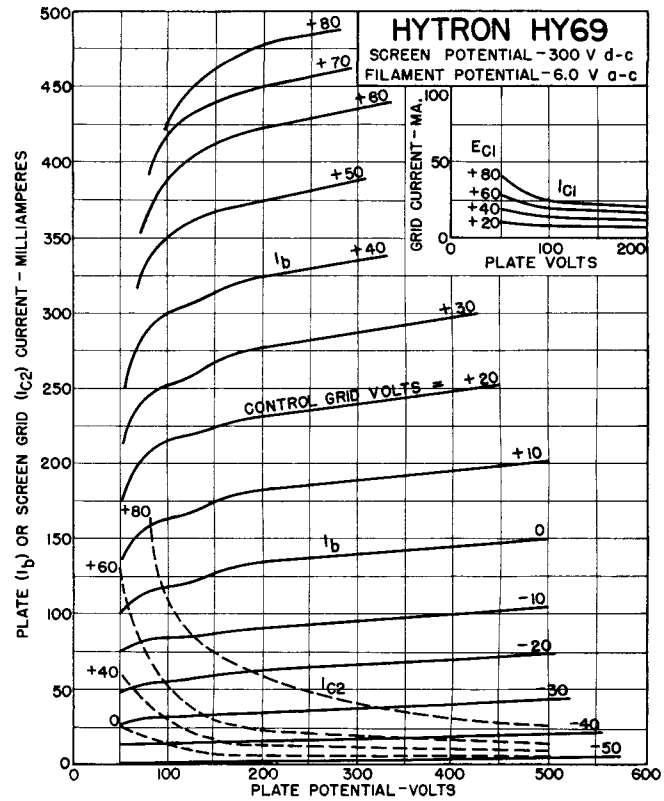


Plate and Screen Grid Amplitude Modulated
R. F. Power Amplifier — Class C Telephony

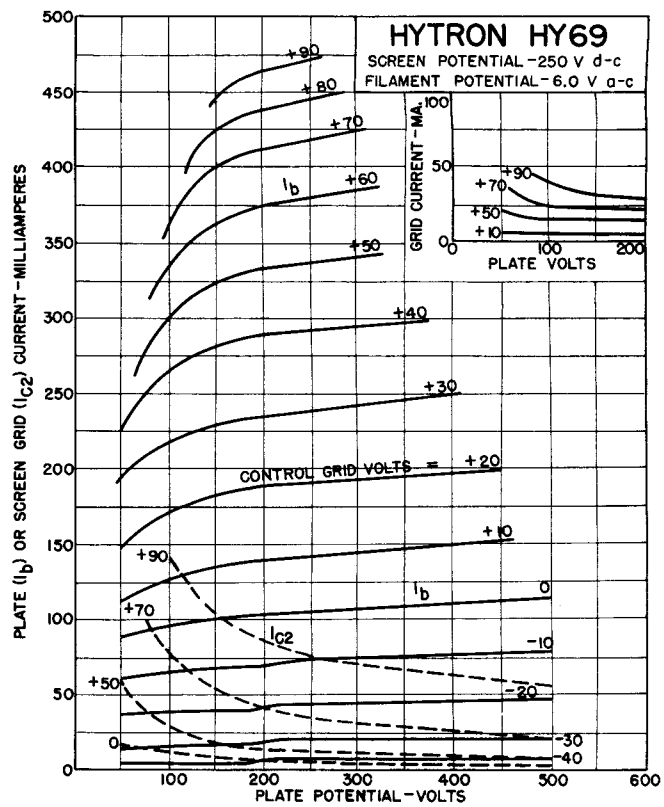
Carrier conditions for use with a maximum modulation percentage of 100

Maximum Ratings, Absolute Values

D-c plate potential	600 max	volts
D-c screen grid potential	300 max	volts
D-c control grid bias	-200 max	volts
D-c plate current	100 max	ma
D-c control grid current	7 max	ma
Peak positive r-f control grid potential	100 max	volts
D-c plate input power †	60 max	watts
D-c screen grid input power †	3.3 max	watts
Plate dissipation †	25 max	watts

Typical Operation — Average Characteristics

A-c filament potential ø		6.0	6.0	volts
D-c plate potential		400	500	volts
D-c screen grid potential		250	250	volts
D-c control grid bias #	(a	-100	-100	volts
	(b	18000	18000	ohms
	(c	1000	1000	ohms
Peak r-f control grid potential		163	163	volts
D-c plate current		80	83	ma
D-c screen grid current		12.5	12.5	ma
Screen grid dropping resistor		12000	20000	ohms
D-c control grid current		5.5	5.5	ma
Control grid driving power (approx.)		0.9	0.9	watts
Plate power output (approx.) Δ		22.5	29	watts



NOTES

* The plate supply must be switched off before or simultaneously with the filament in all applications. When the HY69 is driven in r-f service by a tube with a slower heating filament, provision must be made so that plate and screen voltages are not applied without a protective bias on the tube until the driver tube gets to operating temperature.

When the filament is heated from a transformer with a nominal 6.3 volt output, the filament connections may be made with small wire to introduce the necessary drop of 0.3 volts.

Tube conservation. When the standby period is generally less than 15 minutes, additional tube life can be obtained by reducing the filament potential to 80% of the nominal operating voltage. For longer periods of time, the filament should be turned off.

ø When d-c is used on the filament, the bias should be reduced approximately 3½ volts and the grid return made to the negative leg of the filament.

Obtained from (a) fixed supply (b) control grid resistor (c) cathode resistor, or by combination of methods.

ψ Averaged over any a-f cycle of sine wave form.

† When modulated 100% with a sine wave, the average power increases by 50%. With a complex wave form, such as is produced by speech or music, the average power increases approximately 20% to 25%.

Δ "Plate power output" includes circuit losses and r-f radiation losses as well as useful power delivered to the load.

Bulletin E-125, Issued January 1, 1947
Supersedes issue of December 25, 1940