Issued 9/3/40

AUDIO MODULATOR OPERATING DATA

Maximum ratings

Plate voltage	600	max. volts
Screen voltage	300	max. volts
Plate current	120	max. ma.
Screen current	15	max. ma.
Plate dissipation	40	max. watts
Screen dissipation	5	max. watts

Typical Operation For Two Tubes Class AB2

Plate voltage	300	400	500	600	600	volts
Screen voltage	250	250	300	300	300	volts
DC grid voltage	-25	-25	-25	-35	-35	volts
Peak AF grid to grid voltage	106	145	120	145	183	volts
Zero signal DC plate current	60	60	65	65	65	ma.
Max. signal DC plate current	150	170	200	100	120	ma.
Max. signal DC Screen current	23	14	23	18	29	ma.
Max. signal DC grid current	4	5	5	5	6	ma.
Load resistance per tube	1000	1000	1250	1250	1175	ohms
Effective plate to plate load	4000	4000	5000	5000	4600	ohms
Max. sig. driving power	.25	.4	.3	.4	.7	watts
Max. signal power output	30	40	65	78	97	watts

The above operating data has been derived through the use of the tubes mentioned in an actual circuit, rather than through use of formulae or calculations from characteristic curves.

CONTINUOUS-DUTY RATINGS
USED IN THIS BULLETIN

Issued 10-39
Type HY69

TENTATIVE SPECIFICATIONS

Engineering Bulletin
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GENERAL CHARACTERISTICS

Filament Voltage (A.C. or D.C.)	6.3 volts
Filament Current	1.5 amp.
Mutual Conductance	3000 umhos.
Average Amp. Factor	140
Bulb	ST - 16
Max. Overall Length	5-3/4"
Max. Diameter	2-1/16"
Net Weight	2½ oz.
Cap	small metal
Base	Med. 5-pin ceramic

INTERELECTRODE CAPACITANCES

Grid to Plate	0.25 uuf
Input Electrodes	7.0 uuf
Output Electrodes	6.0 uuf

BASE PIN CONNECTIONS

1 - Filament
2 - Screen Grid
3 - Control Grid
4 - Beam plates & shield
5 - Filament

~~R.F. AMPLIFIER, OSCILLATOR, CLASS AB2 AUDIO AMPLIFIER~~
FREQUENCY DOUBLER

Hytron HY69 is a filament type transmitting tube of Beam-Tetrode design incorporating efficient inter-electrode shielding and high insulation factor. The HY69 affords extremely high power-sensitivity as an audio-amplifier and very high plate efficiency as an R.F. oscillator, amplifier or frequency doubler. Surprisingly high output is obtainable from a single HY69 as a crystal oscillator due to the high amplification factor and the small transfer of energy from plate to grid. Because of its well suited characteristics, the HY69 operates as a Class "C" doubler at high efficiency with relatively high power output. The internal structure of the HY69 permits operation at maximum ratings at frequencies up to 60 megacycles. The maximum plate dissipation of the HY69 is 40 watts.

The instant heating filament (thoriated tungsten) has been designed so that the tube filament may be controlled by the same switch or relay as the plate supply motor generator, thereby eliminating the need for burning the filament during standby, consequently reducing battery drain. The usual push-to-talk circuit applying plate voltage during transmission should be employed.

When the HY69 is used with an instant operating plate power supply the application of the plate potential must lag the application of the filament power by approximately 1½ seconds.

MAXIMUM RATINGS AND TYPICAL OPERATING CONDITIONS

As push-pull amplifier - Class AB_2 (fixed bias)

D.C. Plate Voltage	600 max. volts
D.C. Screen Voltage (Grid #2)	300 max. volts
Max. Signal D.C. Plate Current*	120 max. ma.#
Max. Signal Plate Input*	72 max. watts
Screen Input*	5.0 max. watts
Plate Dissipation*	40 max. watts

TYPICAL OPERATION FOR CLASS AB_2:

(Unless otherwise specified, values are for two tubes)

Plate Voltage	300	425	600 volts
Screen Voltage	250	250	300 volts
D.C. Grid Voltage (Grid #1)	-26	-25	-35 volts
Peak A.F. grid to grid voltage	70	70	100 volts
Zero Signal D.C. Plate Current	75	75	60 ma.
Max. Signal D.C. Plate Current	170	165	205 ma.
Max. Signal D.C. Screen Current	10.0	10.0	10.0 ma.
Load Resistance per tube	1000	1500	1875 ohms
Load Resistance Plate to Plate	4000	6000	7500 ohms
Max. Signal Driving Power°	0.3	0.5	0.4 watts
Max. Signal Power Output**	27.0	36.0	69.0 watts

AS R.F. POWER AMPLIFIER - CLASS "B" TELEPHONY

D.C. Plate Voltage	600 max. volts
D.C. Screen Voltage (Grid #2)	300 max. volts
D.C. Plate Current	100 max. ma.
Plate Input	60 max. watts
Screen Input	5.0 max. watts
Plate Dissipation	40 max. watts

\# Audio rating only.

* Averaged over any audio-frequency of sine-wave form.

° Driver stage should be capable of supplying the grids of the Class AB_2 stage with the specified peak values at low distortion. The effective resistance per grid circuit of the Class AB_2 stage should be kept below 500 ohms and the effective impedance at the highest desired frequency should not exceed 700 ohms.

** With zero-impedance driver and perfect regulation, plate circuit distortion does not exceed 2%. In practice, plate-voltage regulation, screen-voltage regulation, and grid-bias regulation, should not be greater than 5%, 5%, and 3% respectively.

AS FREQUENCY MULTIPLIER

(Carrier conditions per tube for use with a max. modulation factor of 1.0)

	Modulated Power Doubler	Unmodulated Doubler
D.C. Plate Voltage	600	600 max. volts
D.C. Screen Voltage (Grid #2)	300	300 max. volts
D.C. Grid Voltage (Grid #1)	-300	-300 max. volts
D.C. Plate Current	90	100 max. ma.
D.C. Grid Current	7.5	10 max. ma.
Plate Input	54	60 max. watts
Screen Input	4.0	5 max. watts
Plate Dissipation	27	40 max. watts

TYPICAL OPERATION:

D.C. Plate Voltage	600	600 volts
D.C. Screen Voltage	200	200 volts
D.C. Grid Voltage	-300	-300 volts
Peak R.F. Grid Voltage	60	60 volts
D.C. Plate Current	90	100 ma.
D.C. Grid Current (Approx.)	6.0	6.0 ma.
D.C. Screen Current	11.5	11.5 ma.
Screen Resistor (Approx.)	35000	35000 ohms
Grid Resistor	50000	50000 ohms
Driving Power (Approx.)###	2.8	2.8 watts
Power Output (Approx.)	27	30 watts

Adjust excitation for maximum plate efficiency.

AS PLATE - MODULATED R.F. AMPLIFIER - CLASS "C" TELEPHONY

(Carrier conditions per tube for use with a max. modulation factor of 1.0)

D.C. Plate Voltage	600 max. volts
D.C. Screen Voltage (Grid #2)	300 max. volts
D.C. Grid Voltage (Grid #1)	-200 max. volts
D.C. Plate Current	100 max. ma.
D.C. Grid Current	7.5 max. ma.
Plate Input	60 max. watts
Screen Input	5.0 max. watts
Plate Dissipation	27 max. watts

TYPICAL OPERATION:

D.C. Plate Voltage	300	425	600	volts
D.C. Screen Voltage	225	225	225	volts
D.C. Grid Voltage	-60	-60	-60	volts
Peak R.F. Grid Voltage	90	90	90	volts
D.C. Plate Current	80	80	100	ma.
D.C. Screen Current	10.0	10.0	10.0	ma.
D.C. Grid Current (Approx.)	3.0	4.0	4.0	ma.
Screen Resistor (Approx.) ##	10000	10000	30000	ohms
Grid Resistor (Approx.)	7500	20000	35000	ohms
Cathode Resistor (Approx.)	300	300	300	ohms
Driving Power (Approx.)	0.22	0.22	0.25	watts
Power Output (Approx.)	14.0	20.0	36.0	watts

AS R.F. POWER AMPLIFIER AND OSCILLATOR - CLASS "C" TELEGRAPHY

(Key down conditions per tube without modulation)oo

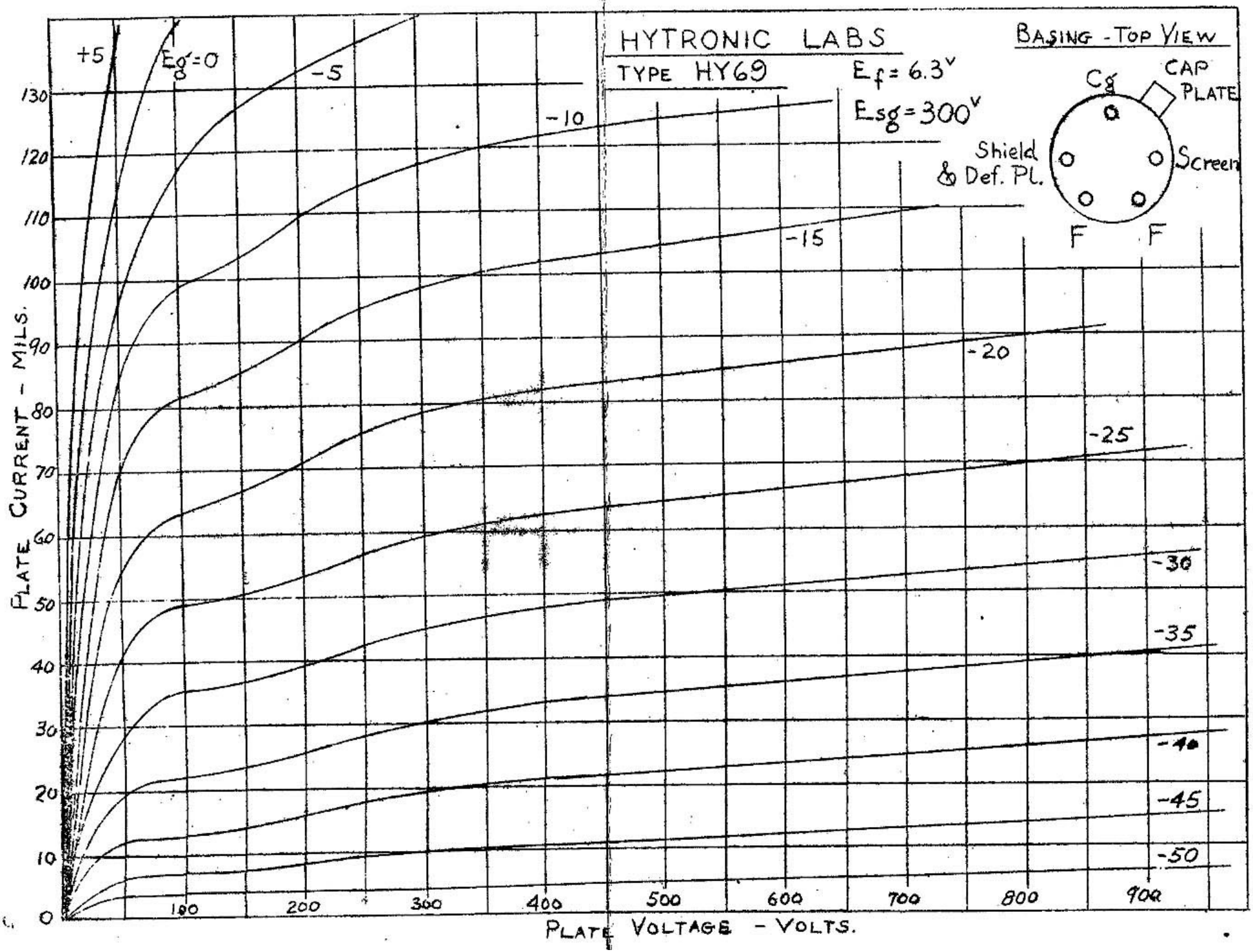
D.C. Plate Voltage	600 max. volts
D.C. Screen Voltage (Grid #2)	300 max. volts
D.C. Grid Voltage (Grid #1)	-200 max. volts
D.C. Plate Current	100 max. ma.
D.C. Grid Current	7.5 max. ma.
Plate Input	72 max. watts
Screen Input	5.0 max. watts
Plate Dissipation	40 max. watts

TYPICAL OPERATION:

D.C. Plate Voltage	300	425	600	volts
D.C. Screen Voltage	250	250	250	volts
D.C. Grid Voltage	-50	-60	-60	volts
Peak R.F. Grid Voltage	90	90	90	volts
D.C. Plate Current	80	90	100	ma.
D.C. Grid Current (Approx.)	2.0	3.0	4.0	ma.
D.C. Screen Current	12.5	12.5	12.5	ma.
Screen Resistor (Approx.)	4000	10000	30000	ohms
Grid Resistor (Approx.)	25000	20000	15000	ohms
Driving Power (Approx.)	0.20	0.22	0.25	watt
Power Output (Approx.)	16.0	26.0	42.0	watts

Connected to modulated plate-voltage supply.

oo Modulation essentially negative may be used if the positive peak of the audio-frequency envelope does not exceed 115% of the carrier conditions.


HYTRONIC LABS
TYPE HY69
$E_f = 6.3^V$
$E_{sg} = 300^V$
BASING - TOP VIEW
Cg
CAP PLATE
Shield & Def. Pl.
Screen
F F
+5
Eg=0
-5
-10
-15
-20
-25
-30
-35
-40
-45
-50
PLATE CURRENT - MILS.
0 10 20 30 40 50 60 70 80 90 100 110 120 130
100 200 300 400 500 600 700 800 900
PLATE VOLTAGE - VOLTS.

TYPE HY69

$E_f = 6.3^V$ $E_{sg} = 250$

HYTRONIC LABS