

# 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.

### A-F Power Amplifier and Modulator — Class A<sub>1</sub>

#### 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 $\phi$       | 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   |
| (a)                                 | -20  | -20  | -20   | -25  | -25  | volts   |
| D-c control grid bias $\phi$ #      | (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 |

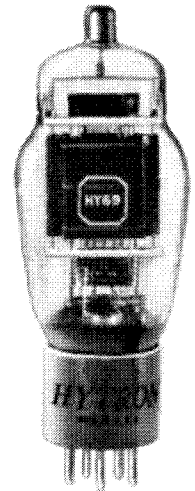
#### Typical Operation — Push-Pull Amplifier

Unless otherwise specified, the values are for two tubes

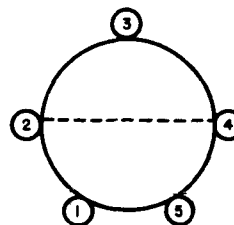
|                                                 |       |       |       |      |       |       |       |
|-------------------------------------------------|-------|-------|-------|------|-------|-------|-------|
| A-c filament potential $\phi$                   | 6.0   | 6.0   | 6.0   | 6.0  | 6.0   | 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 |
| (a                                              | -20   | -20   | -20   | -25  | -25   | -27.5 | volts |
| D-c control grid bias $\phi$ #                  | (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     |       |

### General Characteristics

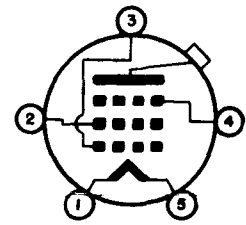
|                                                                                           |                                 |
|-------------------------------------------------------------------------------------------|---------------------------------|
| Filament                                                                                  | thoriated tungsten              |
| Potential a-c or d-c                                                                      | 6.0 $\pm$ 5% volts              |
| Current                                                                                   | 1.6 amperes                     |
| Heating time (approx.) *                                                                  | 1/4 second                      |
| Transconductance (for $E_b = 600V$ , $E_{c2} = 250V$ , $E_f = 6.0V$ a-c, $E_{c1} = -21$ ) | 2900 $\mu$ mhos                 |
| Average amplification factor (G1 to G2)                                                   | 6.5                             |
| Direct Interelectrode Capacitances                                                        |                                 |
| Grid to plate (max)                                                                       | 0.3 $\mu$ fd                    |
| Input                                                                                     | 17 $\mu$ fd                     |
| Output                                                                                    | 8.5 $\mu$ fd                    |
| 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 AB<sub>2</sub>

#### 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 $\phi$                   | 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 $\phi$ #                  | (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 $\phi$         | 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.) $\Delta$ | 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 $\dagger$          | 60 max   | watts |
| D-c screen grid input power $\dagger$    | 3.3 max  | watts |
| Plate dissipation $\dagger$              | 25 max   | watts |

#### Typical Operation — Average Characteristics

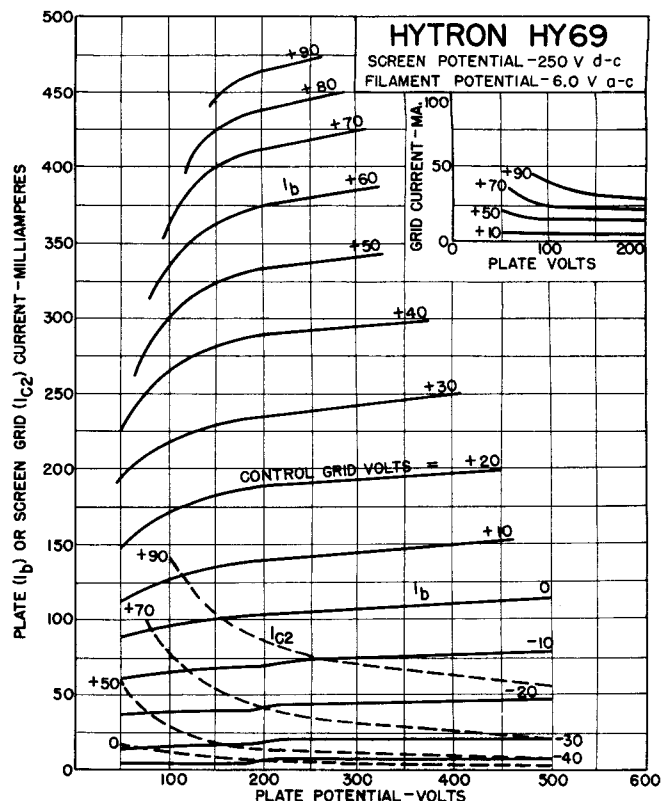
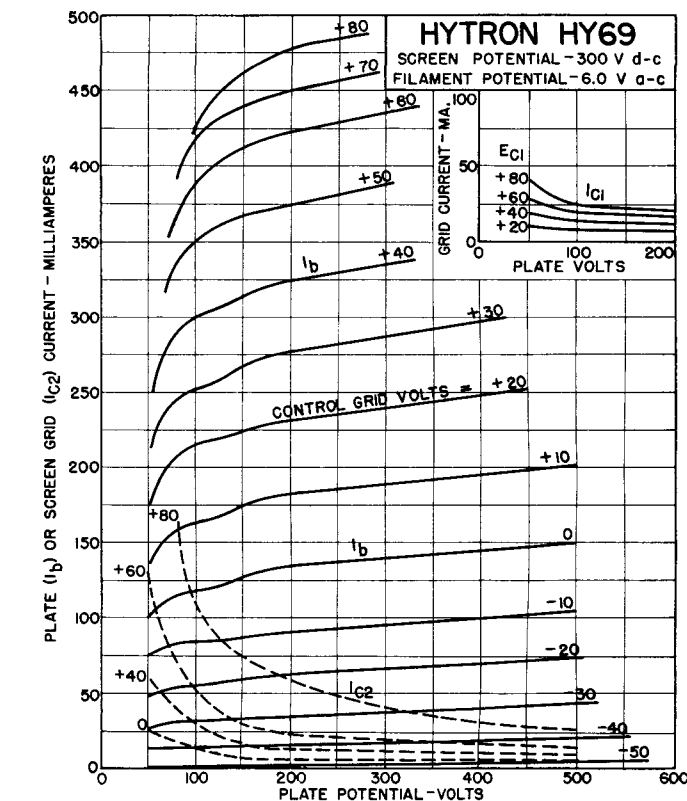
|                                       |           |       |       |
|---------------------------------------|-----------|-------|-------|
| A-c filament potential $\phi$         | 6.0       | 6.0   | volts |
| D-c plate potential                   | 400       | 500   | volts |
| D-c screen grid potential             | 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.) $\Delta$ | 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.



$\phi$  When d-c is used on the filament, the bias should be reduced approximately  $3\frac{1}{2}$  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.

$\psi$  Averaged over any a-f cycle of sine wave form.

$\dagger$  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%.

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