Cunningham
RADIO TUBES

CX-234

SUPER-CONTROL R-F AMPLIFIER PENTODE

The '34 is a super-control pentode recommended for use primarily as a radio-frequency amplifier and intermediate-frequency amplifier in battery-operated receivers employing the '30, '31, '32, and/or '33 where economy of filament current drain is important.

The '34 is very effective in reducing cross-modulation and modulation-distortion over the usual range of signal voltages without the use of antenna potentiometers or auxiliary volume control switches. (See Super-Control amplifier page 15.) This super-control characteristic makes the tube uniquely adaptable to the r-f and i-f stages of receivers employing automatic volume control.

The use of a **suppressor** is an important feature of the '34. In comparison with the usual type of screen grid tube operated under similar conditions, the '34 has a much higher plate resistance and a considerably increased range of voltage swing. Furthermore, a high value of mutual conductance is maintained.

The suppressor is connected inside the tube to the filament. During operation of the tube, the suppressor eliminates the secondary emission effects which limit the voltage swing permissible in the usual screen grid tube at low plate voltage, that is, at a plate voltage approximately equal to the screen voltage. The suppressor in the '34, therefore, makes possible efficient operation of this tube at a relatively low plate voltage. This may be greater than, equal to, or slightly less than the recommended screen voltage.

CHARACTERISTICS

Filament Voltage (D. C.)			2.0	Volts
Filament Current			0.060	Ampere
Plate Voltage	67.5**	135	180 *max.*	Volts
Screen Voltage (Max.*)	67.5	67.5	67.5	Volts
Grid Voltage, Variable (Minimum)	−3	−3	−3	Volts
Plate Current	2.7	2.8	2.8	Milliamperes
Screen Current	1.1	1.0	1.0	Milliamperes
Plate Resistance	400000	600000	1000000	Ohms
Amplification Factor	224	360	620	
Mutual Conductance	560	600	620	Micromhos
Mutual Conductance, at −22.5 volts bias	15	15	15	Micromhos
Effective Grid-Plate Capacitance			0.020 *maximum*	μμf.
Input Capacitance			6.4	μμf.
Output Capacitance			12.8	μμf.
Overall Length				4 25/32" to 5 1/32"
Maximum Diameter				1 13/16"
Bulb (See page 42, Fig. 11)				S-14
Cap				Small Metal
Base				Medium 4-Pin

* Under conditions of maximum plate current.
** Recommended values for use in portable receivers.

INSTALLATION

The **base** pins of the '34 fit the standard four-contact socket. Although this tube is quite free from microphonic disturbances, cushioning of its socket may sometimes be desirable. For socket connections, see page 39, Fig. 4.

For **filament** operation, refer to Installation for type '32.

The **screen voltage** may be obtained from a tap on the B-supply battery or from a bleeder circuit across the battery, as a whole or in part. Due to the screen current characteristics of the '34, a resistor in series with the B-supply may be employed, if desired, for obtaining the screen voltage, providing the maximum voltage between screen and filament does not exceed 100 volts under conditions of reduced plate current.

Stage **shielding** enclosing all the components of each stage is, in general, necessary for multi-stage amplifier circuits.

APPLICATION

As an **r-f** or **i-f amplifier,** the '34 is applicable in receivers designed for it. Plate, screen, and minimum grid voltages are given under CHARACTERISTICS for a number of operating conditions.

Volume control of the receiver is accomplished effectively by variation of the negative voltage applied to the grid. In order to obtain adequate volume control, an available grid bias voltage of approximately −22.5 volts will be required. The exact value will depend upon the circuit design and operating conditions. This voltage may be obtained from a potentiometer, a bleeder circuit, or a separate source, depending on receiver requirements.

Owing to the fact that the super-control feature of the '34 requires a comparatively large grid bias change, the screen and plate voltage may vary considerably for various volume settings depending on receiver design. It is recommended therefore, that design features be incorporated in the receiver so that the screen voltage will not exceed 67.5 volts under conditions of minimum grid bias and maximum plate current. With a design arrangement of this kind, the screen voltage at decreased values of plate current may reach a value higher than 67.5 volts but should not exceed 100 volts. It should be recognized that under the condition of screen voltage above 67.5 volts at low plate current, an increase in the grid bias voltage supply must be provided for adequate volume control.

As the **first detector** in superheterodyne circuits, the '34 may be utilized to advantage. In such service, the grid bias may or may not be made variable. With variable bias in the first detector, the peak oscillator voltage should be preferably about one volt less than the lowest operating grid bias. This practice will eliminate the possibility of cross-modulation caused by the first detector drawing grid current. Without variable bias on the first detector, the oscillator peak voltage should be considerably less than the grid bias to prevent grid current on very strong signal swings. It should be noted that by varying the grid bias on the first detector in conjunction with that on the radio-frequency and/or the intermediate-frequency stages, additional control of volume may be accomplished.

AVERAGE PLATE CHARACTERISTICS