

# HAM TIPS

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## VERSATILE OPERATION BRINGS POPULARITY TO RCA-807

### FREQUENCY EASILY CHECKED WITH RCA XTAL CALIBRATOR

Accuracy better than 0.05%—  
Temperature correction given

By H. J. SCHRADER  
RCA Engineering Department



H. J. SCHRADER

Recent rules of the F.C.C. require that the radio amateur periodically check his operating frequency to insure that it is within one of the assigned bands. This measurement must be made with equipment independent of the frequency control of the transmitter and of sufficient accuracy to always insure that he is operating within the assigned band. This accuracy may be quite readily obtained by employing the RCA Stock No. 9572 Piezo Electric Calibrator to check the accuracy of the amateur bandspread receiver or heterodyne frequency meter.

The Stock No. 9572 Piezo Electric Calibrator has a guaranteed accuracy of 0.05% and will maintain this accuracy over a wide range of temperatures. Still greater accuracy may be obtained by measuring the operating temperature of the unit and applying a temperature correction factor. Each instrument has been individually calibrated at the factory against frequency standard equipment having an accuracy of measurement of better than 1 part in a million.

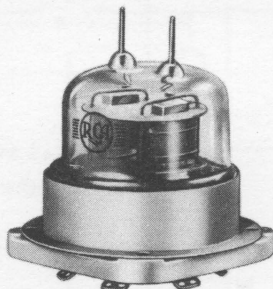
### Has Two Frequency Modes

The instrument has two fundamental modes of operation: one at 100 kcs., and the second at 1000 kcs. Either of the fundamental modes may be selected at will by means of a toggle switch located on the front of the instrument case. Because of the design of the associated tube circuit, an abundance of harmonics of either of these modes of oscillation are contained in the output of the

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### RCA-832 SOCKET



Unusually low dielectric losses, through use of a glazed Steatite Base is an important characteristic of the new RCA-UT-106 Socket, recently announced. This new socket carries the amateur net price of \$1.50 and makes possible the full utilization of the ultra-high frequency performance characteristics of the RCA-832. An aluminum tube shield is included as shown above, which is mounted directly above the metal chassis, while the socket is held below by the same

### BEAM POWER TETRODE IS EXCELLENT FOR MANY AMATEUR APPLICATIONS

Push-pull R-F Amplifier produces output of 75 watts in Class C Service

Few other amateur tubes have received as much publicity in the way of published circuits and suggested applications as the RCA-807. Yet, the popularity of this versatile beam power tube is such that scarcely a day passes when new requests for circuit information are not received. This is not surprising in view of the fact that the 807 can be used in almost every type of amateur service imaginable. Crystal oscillator, doubler, quadrupler, buffer, plate- or grid-modulated r-f amplifier, modulator—the 807 fits them all.

mounting screws or rivets. The UT-106 Socket contacts utilize cadmium-plated wipers with steel spring pressure clamps. They are turn-proof and have short by-pass connections.

See this new socket at your RCA Amateur Equipment Distributor's at \$1.50 net, complete with aluminum shield.

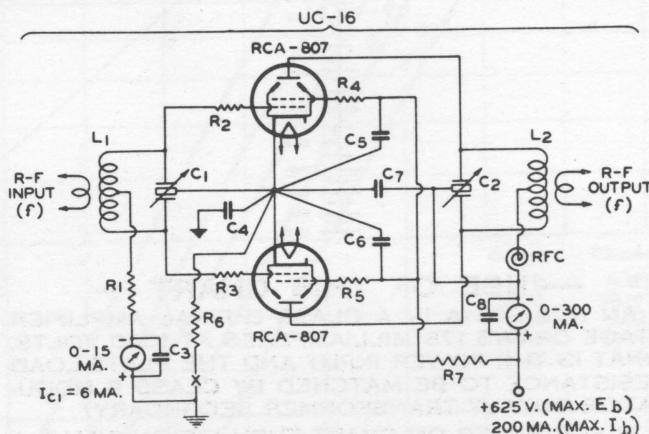
Tritet crystal oscillator and single-ended r-f amplifier circuits for the 807 were shown in the September and October (1938) issues of *Ham Tips*. In this issue, circuit UC-16 shows an r-f amplifier using push-pull 807's and designed for class C telegraph service. This amplifier, producing an output of about 75 watts, is also useful as a buffer to drive a more powerful final amplifier, such as push-pull 808's, 810's, 805's, and similar types. Neutralization at frequencies up to 30 Mc. is not necessary in a properly designed stage.

### Uses Cathode Keying

Circuit UC-16 is designed for cathode keying. It is not suitable for break-in operation where the r-f excitation (oscillator) is keyed, because grid leak bias is employed. Removal of the grid excitation would, of course, cause the plate current to "soar," with resultant overheating of and damage to the tubes.

If it is desired to key the oscillator, the screen voltage for the 807's should be obtained from a separate, 275-volt source having good regulation, in place of the series resistor, R<sub>7</sub>. Thus, with a partial cathode bias of 25 volts, developed across R<sub>6</sub>, the actual screen voltage (measured between screen and cathode) will be 250 volts. In addition, the grid leak (R<sub>1</sub>) should be replaced by a fixed-bias source of about -30 or -35 volts; this can conveniently be obtained from a battery or from a bias rectifier.

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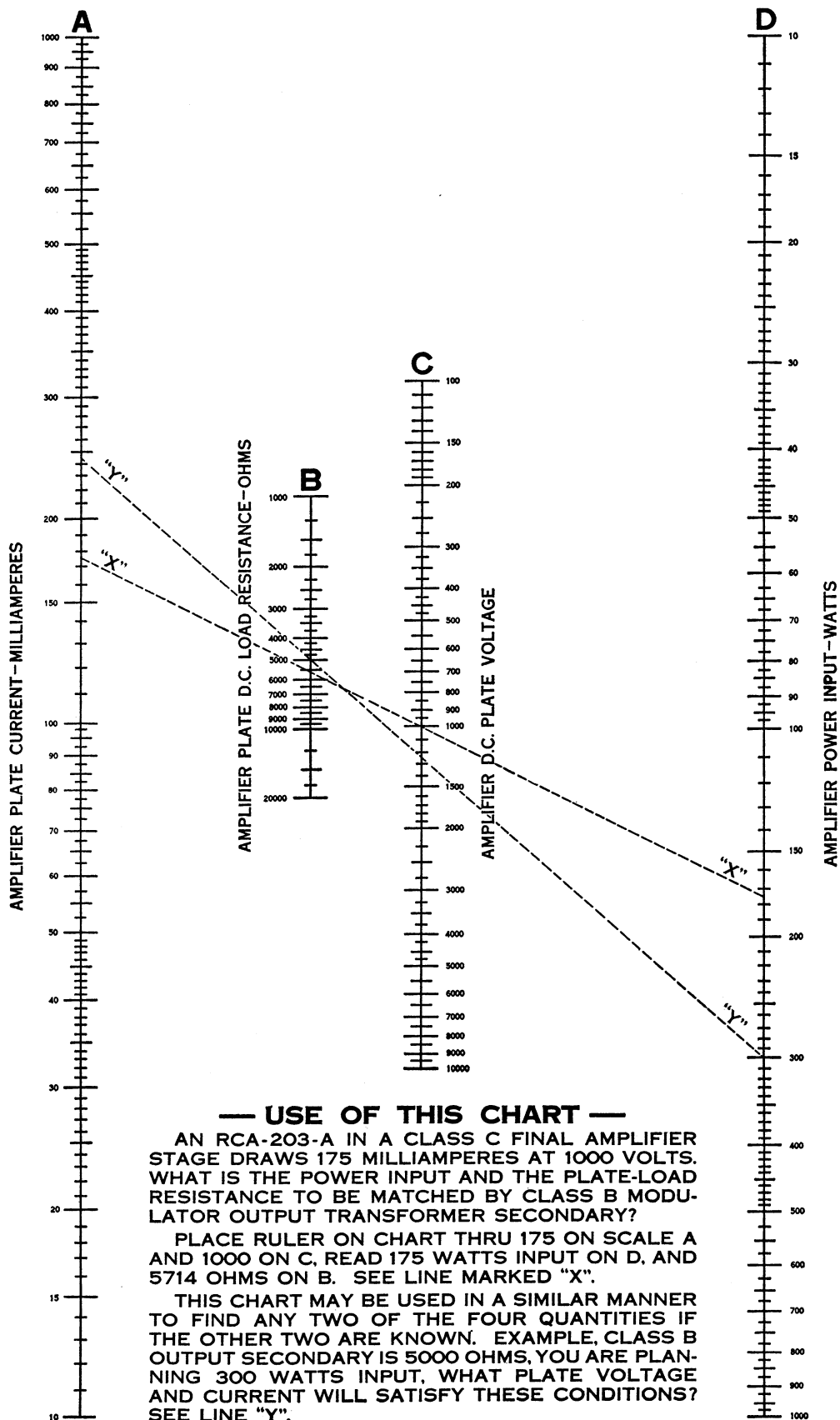
### PUSH-PULL BEAM POWER R-F AMPLIFIER

For Class C Telegraph Service  
Power Output 75 Watts\*

- C<sub>1</sub> = 1.5 μf/meter/section\*
- C<sub>2</sub> = 2 μf/meter/section † (see Note 2)
- C<sub>3</sub>, C<sub>4</sub> = 0.002 μf mica
- C<sub>5</sub>, C<sub>6</sub>, C<sub>7</sub> = 0.005 μf mica, 1000 V.
- R<sub>1</sub> = 4200 ohms, 1 watt
- R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub> = 50-ohm carbon, 0.5 watt †
- R<sub>6</sub> = 110 ohms, 20 watts
- R<sub>7</sub> = 19,500 ohms, 20 watts
- L<sub>1</sub>, L<sub>2</sub> = For desired frequency

- RFC = R-f choke
- X = Keying relay
- \* Approximate.
- † Capacitance in actual use.
- # Parasitic suppressors.
- NOTES.—(1) This circuit is not suitable for keying in the oscillator stage—see text.
- (2) Rotor shaft of C<sub>2</sub> is at d-c plate potential; an insulated coupling must be used between rotor shaft and control dial.

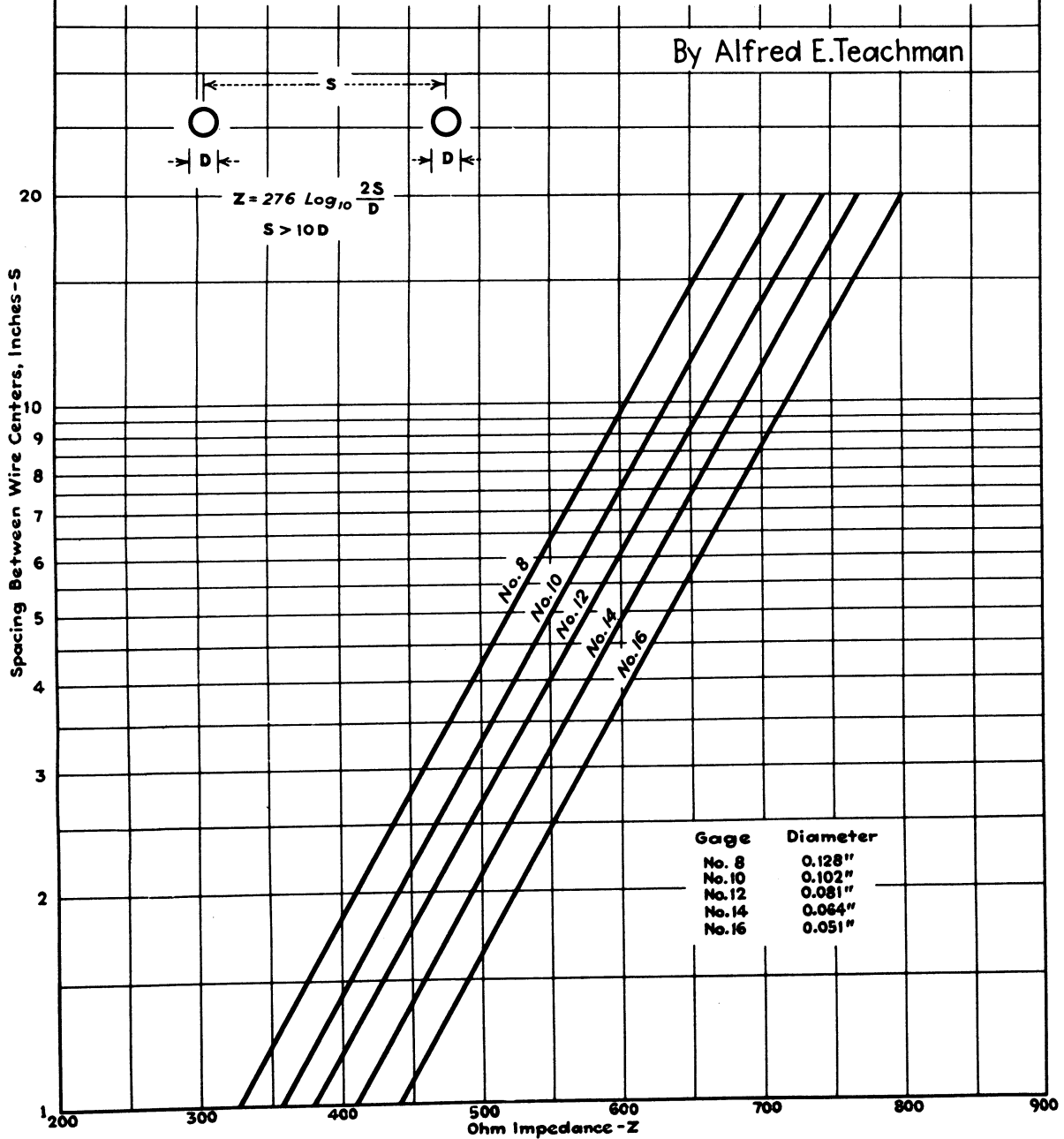
# HAM TIPS from RCA



# Impedance Chart for R-f Lines

The surge impedance of parallel-wire lines in terms of wire diameter and spacing, when the spacing is greater than ten times the wire diameter

By Alfred E. Teachman



Courtesy of "Electronics"



# HAM TIPS from RCA

## QUESTIONS AND ANSWERS

by RCA's Engineering Department

(Q) Why is a series screen resistor not recommended for the 814 in class C telegraph service?

A. Because, under key-up conditions where the space current is reduced to zero or to a low value, there is not enough IR drop across the screen resistor to limit the screen potential to a safe value. For example, where the tube is keyed in the filament-ground circuit, the screen current is zero when the key is up and the screen voltage therefore rises to the plate potential. The screen voltage should be obtained from a separate, low-voltage fixed source, or from a tap on a voltage divider. With the type of keying circuit mentioned above, the voltage regulation of the screen supply need not be especially good. It is permissible for the screen voltage to rise, under key-up conditions, to a value equal to twice the maximum rated screen voltage. In the case of the 814, this would be 600 volts under key-up conditions. The same statements apply to the big beam power tube, type RCA-813. They do not apply to the 807, which may be keyed in the cathode circuit with the screen voltage taken from the plate supply through a suitable series resistor (see circuit UC-16).

(Q) When the oscillator stage is to be keyed for break-in operation, how should the screen voltage for the 813 be obtained?

A. From a separate, low-voltage fixed source having good regulation, if it is desired to use the minimum amount of fixed grid bias to cut off space current when the key is up. It is mainly the screen voltage of a beam power tetrode which determines the cut-off bias required, the plate voltage being relatively unimportant. The screen voltage can also be obtained from a tap on a voltage divider across the high-voltage supply; however, if the voltage divider has poor regulation (too small a value of bleeder current), a larger amount of fixed grid bias will be required to obtain cut-off when the key is up. The proper cut-off bias for rated screen voltage can be obtained readily from the plate-family curves. These statements also apply to the 807 and 814.

### RCA-807 Excellent For Variety of Amateur Uses

(Continued from page 1, column 4)

The use of fixed grid bias without a fixed screen voltage would be unsatisfactory, because plate current cut-off could not be obtained with a reasonable value of grid bias. A good r-f choke, by-passed on the

## HAS RANGE FROM 30 TO 15,000 CYCLES



For running fidelity curves or tone modulating your rig, the RCA Beat Frequency Oscillator is FB. At all RCA Test Equipment Distributors for \$49.95 amateur net. Stock No. 154.

"ground" end, should be inserted between the center tap of  $L_1$  and the bias supply, in order to avoid double r-f grounds in the grid circuit.

The 50-ohm carbon resistors in the grid and screen circuits ( $R_2$ ,  $R_3$ ,  $R_4$ , and  $R_5$ ) may be helpful in preventing parasitic oscillations. If no parasitics are encountered, these resistors should be omitted.

### Layout Important

The mechanical layout of the r-f amplifier is almost as important as the circuit itself. The tuned grid circuit (both  $L_1$  and  $C_1$ ) should be carefully shielded from the output circuit. Tube shields extending from the chassis to about  $\frac{2}{3}$  the height of the 807's should be employed. Some of the early receiving-tube shield cans will be found suitable.

When "tuning up" the 807 stage the first time, it is very advisable to insert a protective resistor of 3000 to 5000 ohms in series with the common positive high-voltage lead. This resistor will reduce the plate current and voltage to a safe value while the plate tank is out of resonance.

### Changes Necessary for Plate Modulation

If it is desired to use plate modulation with circuit UC-16, the following changes should be made:  $R_6 = 130$  ohms, 20 watts;  $R_7 = 14,000$  ohms, 20 watts;  $E_b = 500$  volts, maximum;  $I_b = 166$  ma., maximum; and a 0.01- $\mu$ f, 600-volt paper condenser should be shunted directly across  $R_7$ , in order to compensate for the audio-frequency by-passing of the screen condensers,  $C_5$  and  $C_6$ . With these changes, the carrier power output will be approximately 50 watts. The secondary impedance of the modulation transformer should be about 2600 ohms, allowing for modulation of both screen and plate circuits. 100% modulation with excellent linearity can be obtained with a modulator having an a-f power output of about 40 watts.

### Frequency Easily Checked With RCA XTAL Calibrator

(Continued from page 1, column 1)

instrument. With a normal receiver and operating on the 100 kc. mode, harmonics up to 18 mc. may be readily detected. The 1000 kc. connection provides harmonics well above 40 mc.

The measurement of the transmitter operating frequency is made by first calibrating the dial on the receiver or heterodyne frequency meter against the piezo electric calibrator at 100 kc. intervals and then using the receiver or frequency meter to measure the transmitter frequency. The receiver or frequency meter should, of course, have either a



RCA Piezo-Electric Calibrator

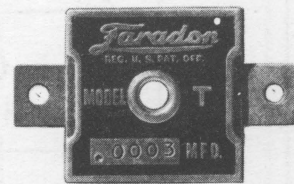
straight-line frequency tuning condenser or a dial calibrated in frequency which compensates for the plate shapes. Also, it must have sufficient bandspread to read frequency to the required accuracy.

### Recommends Frequent Checks

The majority of receivers and heterodyne frequency meters do not have sufficient stability with respect to changes in humidity and temperature to maintain accurate calibration

## Faradon Facts

An oscillatory circuit has three fundamental physical components, namely: inductance, resistance and capacitance. These basic elements are employed in a number of ways to acquire circuit functions. Each element contributes in its own manner to the overall circuit efficiency. To achieve the ultimate in efficient circuit performance each of these three basic elements should exist as individual qualities to the exclusion of characteristics of the other two



Faradon Model T Condenser. Made of clear mica, sealed to prevent climatic changes. Sixteen sizes available from .00005 mfd. to .01 mfd., priced from 40 to 85 cents. See your RCA Amateur Equipment Distributor.

elements. For example, an inductance should be free of the resistive and capacitive elements; a resistor should have no inductive or capacitive qualities; a condenser should have no inductance or resistance. Man's skill has not been able to achieve the ultimate in design because of limitations in usable materials.

However, for all practical purposes, it behooves one, when buying a by-pass, blocking or coupling condenser for radio frequency currents to seek a brand that uses the finest of materials and employs the greatest degree of skill in its construction. Such a condenser is a FARADON—manufactured by RCA. Many years of usage in commercial radio equipment where exacting requirements are met is conclusive evidence of its superior design.

Your RCA Amateur Equipment dealer will be glad to show you many types of FARADONS that will improve that new transmitter you are building.

over long intervals of time so the calibration should be made at frequent intervals, preferably before each measurement of the transmitter frequency. The calibration is readily accomplished by simply coupling the piezo electric calibrator to the antenna input of the receiver and tuning the receiver to the harmonic outputs of the unit. The variation between the marked frequency and the actual tuning point should be noted and a dial correction curve plotted. Having done this, the amateur has available a frequency meter of greater accuracy than most commercial instruments.