

# HAM TIPS

from



Published by RCA Manufacturing Company, Inc., Camden, N. J., U. S. A.

VOL. 1—No. 2

CAMDEN, N. J.

OCTOBER, 1938

## RAPID BAND CHANGE SIMPLIFIED WITH NEW RCA-814

### NEW RCA-813 BEAM POWER TUBE EXCELLENT FOR HIGH POWER RIGS

Delivers 260-Watts Output With Less Than 1-Watt Driving Power



RCA-813

Announcement of a new and powerful beam power output tube—known as the RCA-813—has just been made by all RCA Power Tube Distributors. This new tube, the largest in the RCA beam power amplifier group, requires no neutralization and makes an excellent final amplifier for a quick-band-change, high-

(Continued on page 2, column 1)

### New Method Used For Presenting Circuits

Helps the Amateur to Choose Proper Tube Line-ups

In HAM TIPS for September, 1938, a number of "unit circuits" on the RCA 809 are shown. In this issue other circuits are shown for the RCA-814. Each individual stage, even in the complete transmitter circuit, has been assigned a "UC" number. Each stage is, insofar as practical, designed as an integral unit, more or less independent of the other units.

As more circuits are published in subsequent issues of HAM TIPS, involving different tube types, the perennial question of selecting a tube line-up will be reduced substantially

(Continued on page 2, column 1)

### LOW DRIVING POWER REDUCES NUMBER OF TUBES REQUIRED IN EXCITER UNIT

Two-Tube Exciter Provides 10-Meter Operation With 80-Meter Crystal

**WIN \$5.00!**

Is your transmitter 100% RCA Tubed?

If so, send us a photograph and a short description of it. Each month, one or more 100% RCA Tubed Transmitter Photos will be published in HAM TIPS. Those published win \$5.00 cash!



RCA-814

The new RCA-814 Beam Power Tetrode is the answer for a band-switching transmitter having real power-output capabilities—130-watts output in class C telegraphy and nearly 90 watts in class C plate-modulated telephony service. Band-switching problems are encountered mainly in

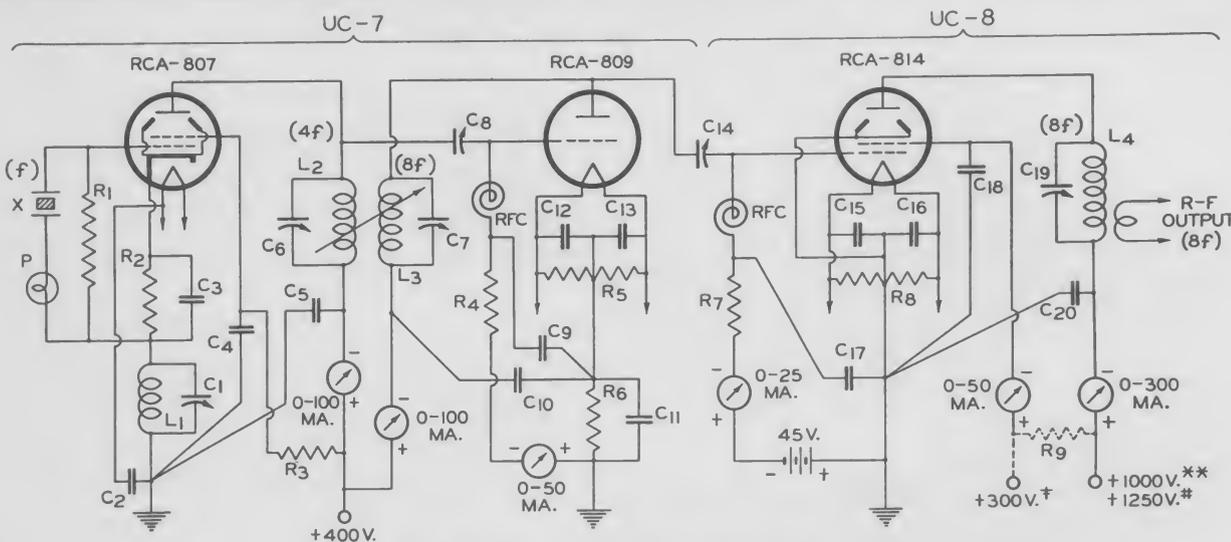
the exciter unit, therefore simplifying the exciter is the first step in their successful solution. Because the 814 requires negligible driving power, it can be driven directly from the crystal oscillator stage on 160, 80 and 40 meters, using crystals operating on the fundamental frequency desired. For 10- and 20-meter operation, a two-tube exciter is adequate, even with an 80-meter crystal.

### Uses Tritet Oscillator

A diagram of a three-tube, 10-meter rig is shown in unit circuits 7 and 8. The exciter unit consists of a combination Tritet crystal oscillator and Reinartz' Harmonic Generator. The 10-meter plate tank of the 809 multiplier is magnetically coupled back to the 20-meter plate tank of the 807 crystal oscillator. When inductances  $L_2$  and  $L_3$  are correctly polarized, a considerable gain in the 10-meter output of the 809 is obtained. Reversing the connections to one of the plate coils (but not both) will provide correct operation, if the connections are incorrect initially.

The ease with which band-changing can be accomplished is apparent from the circuit. The cathode coil of the 807 ( $L_1$ ) does not have to be changed so long as 80-meter crystals are used. With a little experimenting to obtain the proper degree of coupling, coils  $L_2$  and  $L_3$  can be wound on

(Continued on page 2, column 3)



### 30-MEGACYCLE TRANSMITTER

Class C Plate-Modulated Telephony Power Output 87 Watts\*  
Class C Telegraphy Power Output 130 Watts\*

- $C_1 = 75 \mu\text{f}$ , MIDGET
- $C_2$  TO  $C_5 = 0.005 \mu\text{f}$ , MICA
- $C_6 = 25 \mu\text{f}$ , MIDGET†
- $C_7 = 15 \mu\text{f}$ , MIDGET†
- $C_8 = 50 \mu\text{f}$ , MIDGET
- $C_9$  TO  $C_{13} = 0.005 \mu\text{f}$ , MICA
- $C_{14} = 35 \mu\text{f}$ , MIDGET
- $C_{15}$  TO  $C_{17} = 0.002 \mu\text{f}$ , MICA
- $C_{18} = 0.001 \mu\text{f}$ , MICA, 2000 VOLTS\*\*
- $C_{19} = 0.01 \mu\text{f}$ , MICA, 500 VOLTS#
- $C_{20} = 0.002 \mu\text{f}$ , 3000 VOLTS†
- $R_1 = 0.1$  MEGOHM, 0.5 WATT
- $R_2 = 500$  OHMS, 2 WATTS
- $R_3 = 30,000$  OHMS, 2 WATTS (NOTE 2)

- $R_4 = 2000$  OHMS, 2 WATTS
- $R_5 = 40$  OHMS, C.T., WIRE-WOUND
- $R_6 = 200$  OHMS, 5 WATTS
- $R_7 = 10,000$  OHMS, 2 WATTS\*\*
- $R_8 = 3500$  OHMS, 1 WATT#
- $R_9 = 50$  OHMS, C.T., WIRE-WOUND
- $R_0 = 40,000$  OHMS, 25 WATTS†
- $L_1 = 6 \mu\text{h}$ , FOR CRYSTAL FREQ. = f
- $L_2 = 4.8 \mu\text{h}$ , TUNED TO 4f (NOTE 1)
- $L_3 = 3 \mu\text{h}$ , TUNED TO 8f (NOTE 1)
- $L_4 = 1.37 \mu\text{h}$ , TUNED TO 8f
- RFC = R-F CHOKE
- P = 2.0-VOLT, 60-MA. PILOT LAMP
- X = 80-METER CRYSTAL OF FREQUENCY f

- \* Approximate.
- † See text.
- \*\* For plate-modulated telephony.
- # For CW telegraphy.
- † Screen voltage for telegraphy should be obtained from a separate, fixed-voltage source; for telephony, by means of  $R_9$ .
- NOTE 1:  $L_2$  and  $L_3$  must be properly polarized for correct operation.
- NOTE 2: If the 807 is keyed for "break-in" operation, its screen voltage should be obtained from a fixed-voltage source of 200 volts, and not through  $R_9$ .
- NOTE 3: The "Tritet" type of crystal oscillator circuit was originally described by Mr. J. J. Lamb in "QST."

# HAM TIPS from RCA

## New RCA-813 Beam Power Tube Excellent For High Power Rigs

(Continued from page 1, column 1)

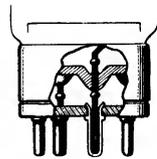
powered amateur transmitter. It has outstanding performance and is characterized by unusually rugged mechanical construction.

The new 813 is among the finest transmitting tubes RCA has ever developed, employs a new stem structure which makes practical a compact tube—only 7½" long—having very short heavy leads and low lead inductance. Because of its design, this new high-power beam tube can be operated at full ratings up to 30 megacycles without neutralization.

Other noteworthy features of this new tube are: Heavy-duty thoriated-tungsten filament, oversized graphite plate, dome-top bulb with cushion mount supports, low screen current, and a new Giant 7-pin base having short shell and wide pin spacings. The a amateur net price is \$28.50.

### Typical Operation (Class "C" Telegraphy)

Filament Voltage... 10 volts (AC or DC)  
 Filament Current... .5 amperes  
 DC Plate Voltage... 2000 volts  
 DC Screen Voltage... 400 volts  
 DC Grid Voltage... -90 volts  
 DC Plate Current... 180 milliamperes  
 DC Screen Current... 15 milliamperes  
 Driving Power... .05 watt  
 Power Output... 260 watts



Moulded glass stem assembly showing individual lead seals.

## New Method Used For Presenting Circuits

(Continued from page 1, column 2)

to the mere selection of a suitable combination of unit circuits. In those border-line cases where the amateur may be in doubt as to whether one UC stage will deliver sufficient power to drive another UC stage, he can readily obtain additional information by writing to RCA Manufacturing Co., Commercial Engineering Section, Harrison, New Jersey.

The circuits, in general, are designed for the maximum power output consistent with reliable performance and true tube economy—which means that all tubes are operated within their maximum ratings. Designed by radio engineers who are also active amateurs, the circuits will be found to give those uniformly fine results of which RCA transmitting tubes are capable.

A complete file of HAM TIPS in every station will be found of considerable value. See your distributor each month to insure that you get each new issue as it appears.

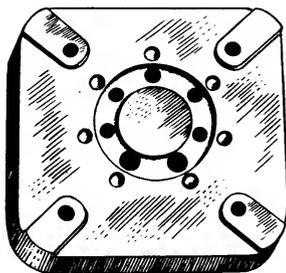
### DO YOU KNOW THAT—

—more than 80 different chemical elements and compounds are used in making RCA tubes, and that —these materials are bought from every continent on earth—from the Malay States to Africa, from Bolivia to Canada?

## LOW-LOSS SOCKET DESIGNED TO FIT NEW RCA-813 TUBE

### Has Steatite Base and Positive Spring Contacts

Announcement of a new high-quality low-loss socket, especially designed for the RCA-813 beam power tube, has just been made by the RCA Amateur Equipment Division. This socket, which has such features as two-point



RCA UT-104 SOCKET

wiping contacts, positive spring tension and newly designed mounting bosses, has an attractive amateur net price of \$1.25. It is known as Type UT-104 and may be procured through all RCA Amateur Equipment Distributors on or about Nov. 15, 1938

The design of the Model UT-104 socket is such that it insures the highly efficient operation of the RCA-813 tube at its maximum frequency ratings without adding appreciable losses. This is very important when the RCA-813 is used at frequencies of 30 megacycles and above.

Other important features include glazing the top and wax-treating the bottom of the ceramic base to prevent losses due to climatic conditions and a finder ring to facilitate locating the tube pins.

## Rapid Band Change Simplified With New RCA-814

(Continued from page 1, column 4)

the same plug-in form. Thus, including L<sub>4</sub>, only two plug-in coil forms are needed to change bands.

The exciter unit UC-7 is shown for 10-meter operation. For 20 meters, design L<sub>2</sub> for 40 and L<sub>3</sub>L<sub>4</sub> for 20 meters. For 40 meters, switch C<sub>14</sub> from the plate of the 809 to the plate of the 807, disconnect C<sub>8</sub> from the 807 plate, and tune L<sub>2</sub>L<sub>4</sub> to 40 meters. For 80 meters, repeat the 40-meter procedure, but tune L<sub>2</sub>L<sub>4</sub> to 80 meters and short-circuit L<sub>1</sub>. For 160 meters, change the crystal to that band, short-circuit L<sub>1</sub>, and tune L<sub>2</sub>L<sub>4</sub> to 160 meters; the other connections are the same as for 40 and 80 meters. Whenever L<sub>3</sub> is in use, it will always be tuned to twice the frequency of L<sub>2</sub>, because the 809 is not intended for use as a straight r-f amplifier in this circuit. Because the various tuned circuits show actual operating capacitance values for 10 meters only, the values of C<sub>6</sub>, C<sub>7</sub>, and C<sub>19</sub> should be increased for operation on 160, 80, 40, and 20 meters. The increase should be about in direct proportion to the wavelength. Thus, for 20 meters, C<sub>19</sub> should have an operating value of 30 μf, instead of 15 μf as shown in the legend. Multiple-section variable condensers are advisable if three or more bands are to be covered.

The 814 stage (UC-8) can be used to drive a much more powerful r-f amplifier, if desired. Even with another power stage added, only three plug-in forms will be needed.

Diagram UC-6 shows a circuit for two 814's in push-pull, designed for either plate-modulated telephony or for CW telegraphy. A single 809 operated as a frequency doubler will easily drive this push-pull stage. As shown, the 814 circuit can be used

## VOLTAGE REGULATOR TUBES OPERATE OVER WIDE LOAD CHANGES

### New Types RCA-VR105-30 and RCA-VR150-30 Added to Line

The new voltage regulator tubes, designed for a wide variety of applications, have recently been announced to radio amateurs by RCA Power Tube Distributors. Both tubes are identical, except that the VR105-30 is designed for 105-volt circuits while the VR150-30 is designed for 150-volt circuits. Each carries an amateur net price of \$1.25.

These tubes are of the cold cathode, glow discharge type, intended for applications where a constant DC output voltage is required for varying values of DC load current. They also may be used as an oscillator in relaxation circuits and for spark-over protection.

### Ratings and Characteristics

**RCA-VR150-30**  
 Starting Supply Voltage (DC).....180 min. Volts  
 Operating Voltage (DC).....150 approx. Volts  
 Operating Current (DC)\* { 5 min. Milliamperes  
 { 30 max. Milliamperes

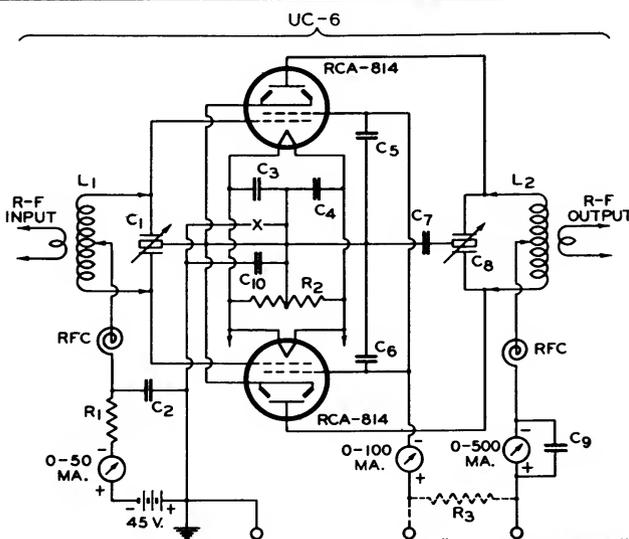
**RCA-VR105-30**  
 Starting Supply Voltage (DC).....137 min. Volts  
 Operating Voltage (DC).....105 approx. Volts  
 Operating Current (DC)\* { 5 min. Milliamperes  
 { 30 max. Milliamperes

\* Sufficient resistance must always be used in series with this tube to limit the current through it to 30 ma.

The standard ST-12 small shell octal 6-pin base is used on both tubes. The overall dimensions are 4½" high and 1¾" maximum diameter.

for "break-in" telegraph operation, where the oscillator stage is keyed.

Circuit UC-9 shows a grid-modulated 814 stage. Due to the high power sensitivity of this tube, very little a-f modulating power is needed to provide a well-modulated 'phone signal.

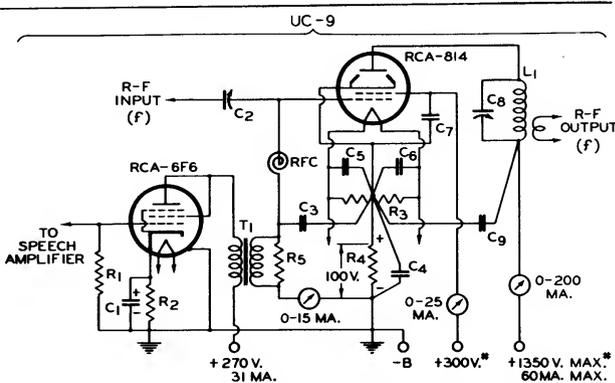


C<sub>1</sub> = 1.5 μf/METER/SECTION  
 C<sub>2</sub>, C<sub>3</sub>, C<sub>4</sub>, C<sub>9</sub> = 0.002 μf, MICA  
 C<sub>5</sub>, C<sub>6</sub>, C<sub>10</sub> = 0.001 μf, MICA,  
 2000 VOLTS  
 C<sub>7</sub> = 0.002 μf, MICA, 3000  
 VOLTS  
 C<sub>8</sub> = 1.5 μf/METER/SECTION  
 R<sub>1</sub> = 5000 OHMS, 5 WATTS\*\*  
 R<sub>2</sub> = 1750 OHMS, 2 watts#  
 R<sub>2</sub> = 50 OHMS, C.T., WIRE-  
 WOUND  
 R<sub>3</sub> = 20,000 OHMS, 50 WATTS  
 \*\*†  
 L<sub>1</sub>, L<sub>2</sub> = SELECT FOR BAND  
 DESIRED  
 RFC = R-F CHOKE

X = INSERT KEYING RELAY  
 HERE

\* Approximate.  
 \*\* For plate-modulated telephony.  
 # For CW telegraphy.  
 † In telegraph service, omit R<sub>3</sub>  
 and use a separate, fixed-  
 voltage source for the screen  
 voltage.  
 NOTE: With partial fixed bias, as  
 shown, the oscillator stage may be  
 keyed for "break-in" operation, if  
 desired. When no fixed bias is  
 used, R<sub>1</sub> should be changed to  
 7500 ohms\*\* or to 4000 ohms#.

LEFT, PUSH-PULL 814 R-F AMPLIFIER  
 Class C Plate-Modulated Telegraphy Power Output 175 Watts\*  
 Class C Telegraphy Power Output 260 Watts\*



GRID-MODULATED R-F AMPLIFIER  
 Power Output 29 Watts\*

C<sub>1</sub> = 25 μf, ELEC., 50 VOLTS  
 C<sub>2</sub> = 35 μf, MIDGET  
 C<sub>3</sub> = 0.002 μf, MICA  
 C<sub>4</sub>, C<sub>5</sub>, C<sub>6</sub>, C<sub>7</sub> = 0.005 μf, MICA  
 C<sub>8</sub> = 0.6 μf/METER  
 C<sub>9</sub> = 0.002 μf, MICA, 2000  
 VOLTS  
 R<sub>1</sub> = 0.5 MEGOHM, 0.5 WATT  
 R<sub>2</sub> = 645 OHMS, 2 WATTS  
 R<sub>3</sub> = 50 OHMS, C.T., WIRE-  
 WOUND  
 R<sub>4</sub> = 1560 OHMS, 20 WATTS  
 R<sub>5</sub> = 8000 OHMS, 1 WATT  
 RFC = R-F CHOKE  
 L<sub>1</sub> = TUNE TO FREQUENCY f  
 T<sub>1</sub> = MODULATION TRANS-  
 FORMER,

URNS RATIO, P/S =  
 1.3;  
 PRIMARY LOAD IM-  
 PEDANCE = 4000  
 OHMS

\* Approximate.  
 # The extra 100 volts is to com-  
 pensate for the voltage drop  
 across cathode resistor R<sub>4</sub>;  
 grid, screen, and plate volt-  
 ages are measured to the fila-  
 ment. The screen voltage  
 should be obtained from a  
 separate, fixed-voltage source,  
 or from a voltage divider hav-  
 ing good regulation—not from  
 a series resistor.