RCA ANNOUNCES NEW 811-A TRIODE AND HAM RATINGS

Here's tube value that gives you more than your money's worth. Power and performance — huskier construction, greater high-voltage insulation, and a plate structure with radiating fins are just a few of the features that make the new RCA 811-A one of the sweetest power triodes your money can buy. Intended for use as a class B af power amplifier and modulator, it is also well suited for class C telephony and telegraphy. In class B af service and in unmodulated class C service, the 811-A has a maximum plate dissipation of 65 watts (ICAS).

Because of its high perveance, the 811-A operates at high efficiency and with low driving power. For example, a pair of 811-A's in class B af service with a plate input of 470 watts (ICAS) requires a driving power at the tube of only 4.4 watts, and can modulate 100 per cent an rf amplifier having an input of 680 watts.

The RCA 811-A supersedes the 811 and can be used in the same socket without circuit changes. Economy is the keyword in initial cost and operation—Price to amateurs — only $4.05. It's available from local RCA Distributors.

IN YOUR NEXT ISSUE OF RCA HAM TIPS

Don't miss the next issue of RCA HAM TIPS due at your local RCA Distributor November First. In it you'll find a trim little mate for the "Tiny Tran" Mobile Transmitter in the form of a double-conversion, 8-tube, superhet receiver, completely self-contained except for the power supply and speaker. Built in the same small case as the "Tiny Tran", this compact receiver is sure to please the most exacting Ham. It operates on 10 and 11 meters. You'll want to build one like it for your car or shack. Ask your RCA Distributor to reserve your copy of RCA HAM TIPS for you —so you'll be sure to get all the important details.

A SOLID HANDFUL OF POWER

A pair of the new RCA 811-A's in AF or RF, AM or FM, can really deliver the goods. Priced at only $4.05 each, a pair offer you economy and dependability plus.

USING THE RCA-5763 FOR FREQUENCY MULTIPLICATION

By ROBERT M. COHEN, W2LHP
Application Engineer, RCA Tube Department

Amateurs will find many uses for the new miniature transmitting tube, RCA-5763, which operates very efficiently as a doubler, tripler, or quadrupler at frequencies up to 175 Mc. Although intended primarily for mobile service*, its outstanding performance makes it deserving of a place in fixed station equipment where flexible all-band operation is desired.

The basic principles of multiplier operation have been discussed in some detail in previous issues of HAM TIPS**, to say nothing of the reams of technical literature available in the handbooks and elsewhere, so it appears logical to limit our discussion to the particular operating conditions and circuits specifically applicable to the 5763.

Fig. 1A shows the application of the 5763 as a frequency multiplier in the conventional manner. The accompanying photograph (Fig. 1B) shows the lead arrangement and location of parts and is indicative of the generally accepted methods for obtaining short leads and proper circuit bypassing—features necessary for good high-frequency performance.

* "TINY TRAN"—HAM TIPS, May-June, 1949
** "Understanding Frequency Doublers"—HAM TIPS, Jan.-Apr., 1947

Fig. 2 is a family of curves of useful power output versus operating frequency made with this circuit. The term "Useful Power Output" refers to the power which is delivered to the grid of the following tube or the transmission line; it is equal to the total tube power output less circuit and radiation losses. These data, presented in terms of useful power output, are of considerable value to the designer of a transmitter but are not necessarily indicative of tube efficiency, especially at high frequencies where the radiated energy and circuit losses consume a substantial part of the tube output. By way of illustration, the tank circuit power loss including tank circuit radiation is calculated approximately from the unloaded tank-circuit

FREQUENCY CHART AIDS IN COMPUTING HARMONIC RELATIONS

By 'PAT' PATTERSON, W2VBL
RCA Tube Department

How many times have you rummaged through debris on the operating table looking for a pencil to compute the frequency of a crystal or VFO dial?
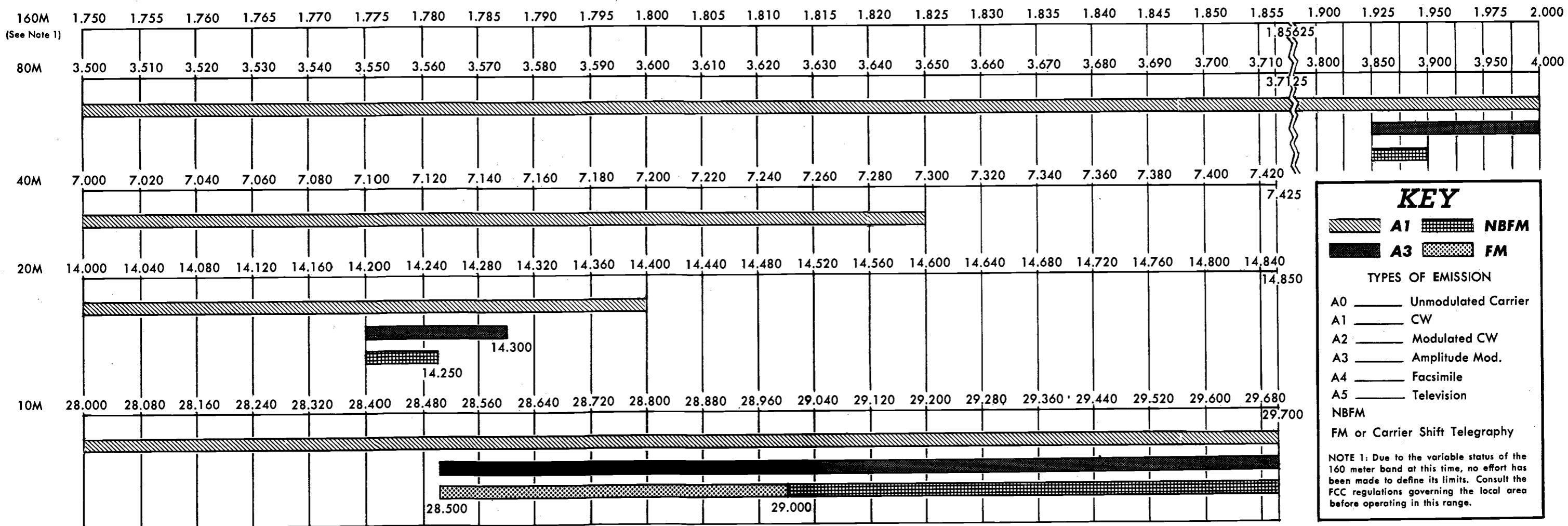
To eliminate the guesswork, we've prepared the handy chart shown on page 2 and 3 of this issue of HAM TIPS. All frequencies are shown in megacycles and have been carried to three decimal places. In many instances, three-place computations do not come out even, hence these figures read low by the quantity of the decimal fraction beyond the third place. Where the figures for the low end of the band do not come out even, the frequencies shown have been extended to the high side of the incomplete decimal fraction in order to show a frequency that is inside the band.

Using the table is a simple matter. For example, a crystal reads 3.645 Mc. After locating this value in the 80 meter column and following it down to 10 meters, it's easy to see the resultant multiplied frequency is 29.160 Mc. Working in the opposite direction: to hit 28.680 Mc, follow the line up to the frequency range of the VFO or crystal, and it shows a setting of 3.585 Mc in the 80 meter band.

The 2, 6, and 11 meter bands do not directly relate to the lower bands, and, therefore, are shown in separate charts. The figures there show the same information, but are computed to several usable sub-multiples. In two meters, for example, if you are using an 8.055 Mc crystal, you must multiply 18 times to reach the band at 145.00 Mc. (Don't forget — the multiplication factors are not added, but multiplied. X 18 may be reached by tripling, tripling, and doubling, (3 x 3 x 2)). Conversely, to hit 146.5 Mc by multiplying 20 times, a crystal halfway between 7.3 and 7.35, or 7.325, is required.

You'll find good use for this chart. Tack it up on the shack wall near the rig and it will pay for its space in pencils and tempers saved.

FREQUENCY MULTIPLICATION AND DIVISION CHART

160M (See Note 1): 1.750   1.755   1.760   1.765   1.770   1.775   1.780   1.785   1.790   1.795   1.800   1.805   1.810   1.815   1.820   1.825   1.830   1.835   1.840   1.845   1.850   1.855   1.900   1.925   1.950   1.975   2.000   (1.85625)

80M: 3.500   3.510   3.520   3.530   3.540   3.550   3.560   3.570   3.580   3.590   3.600   3.610   3.620   3.630   3.640   3.650   3.660   3.670   3.680   3.690   3.700   3.710   3.800   3.850   3.900   3.950   4.000   (3.7125)

40M: 7.000   7.020   7.040   7.060   7.080   7.100   7.120   7.140   7.160   7.180   7.200   7.220   7.240   7.260   7.280   7.300   7.320   7.340   7.360   7.380   7.400   7.420   (7.425)

20M: 14.000   14.040   14.080   14.120   14.160   14.200   14.240   14.280   14.320   14.360   14.400   14.440   14.480   14.520   14.560   14.600   14.640   14.680   14.720   14.760   14.800   14.840   (14.850)   14.300   14.250

10M: 28.000   28.080   28.160   28.240   28.320   28.400   28.480   28.560   28.640   28.720   28.800   28.880   28.960   29.040   29.120   29.200   29.280   29.360   29.440   29.520   29.600   29.680   (29.700)   28.500   29.000

KEY

- ▨ **A1**   ▦ **NBFM**
- ▰ **A3**   ▒ **FM**

TYPES OF EMISSION

A0	——	Unmodulated Carrier
A1	——	CW
A2	——	Modulated CW
A3	——	Amplitude Mod.
A4	——	Facsimile
A5	——	Television
NBFM		
FM or Carrier Shift Telegraphy		

NOTE 1: Due to the variable status of the 160 meter band at this time, no effort has been made to define its limits. Consult the FCC regulations governing the local area before operating in this range.

2 METERS

÷	144.000	145.000	146.000	147.000	148.000
2	72.000	72.500	73.000	73.500	74.000
3	48.000	48.333	48.666	49.000	49.333
4	36.000	36.250	36.500	36.750	37.000
5	28.800	29.000	29.200	29.400	29.600
6	24.000	24.166	24.333	24.500	24.666
8	18.000	18.125	18.250	18.375	18.500
9	16.000	16.111	16.222	16.333	16.444
10	14.400	14.500	14.600	14.700	14.800
12	12.000	12.083	12.166	12.250	12.333
15	9.600	9.666	9.733	9.800	9.866
16	9.000	9.062	9.125	9.187	9.250
18	8.000	8.055	8.111	8.166	8.222
20	7.200	7.250	7.300	7.350	7.400

6 METERS

÷	50.000	50.500	51.000	51.500	52.000	52.500	53.000	53.500	54.000
2	25.000	25.250	25.500	25.750	26.000	26.250	26.500	26.750	27.000
3	16.667	16.833	17.000	17.166	17.333	17.500	17.666	17.833	18.000
4	12.500	12.625	12.750	12.875	13.000	13.125	13.250	13.375	13.500
5	10.000	10.100	10.200	10.300	10.400	10.500	10.600	10.700	10.800
6	8.334	8.416	8.500	8.583	8.666	8.750	8.833	8.916	9.000
8	6.250	6.312	6.375	6.437	6.500	6.562	6.625	6.687	6.750
9	5.556	5.611	5.666	5.722	5.777	5.833	5.888	5.944	6.000

11 METERS

÷	26.960	27.000	27.040	27.080	27.120	27.160	27.200	27.230
2	13.480	13.500	13.520	13.540	13.560	13.580	13.600	13.615
3	8.987	9.000	9.013	9.026	9.040	9.053	9.066	9.076
4	6.740	6.750	6.760	6.770	6.780	6.790	6.800	6.807
6	4.494	4.500	4.506	4.513	4.520	4.526	4.533	4.538

RCA   RCA

FREQUENCY MULTIPLICATION

(Continued from Page 1)

parameters by means of the following relation:

$$\text{Total Tank Circuit Loss} = \frac{E^2 2\pi fC}{Q}$$

f = frequency in megacycles

Q = Q of unloaded tank circuit with tube out and circuit restored to resonance

E = RMS value of tank circuit voltage in volts with tank circuit unloaded

C = Total value of tank circuit capacitance including tube, wiring, etc. in microfarads

For the doubler circuit given in Fig. 1 when used in a typical compact mobile transmitter, the total tank circuit loss at 150 Mc is:

$$\frac{(150)^2 \times 6.28 \times 150 \times 15 \times 10^{-6}}{110}$$

= 2.86 watts

This value, approximately equal to the useful power output, is large but is typical of the normal condition in the 150-Mc region when "lumped circuits" are employed. The tank circuit Q of 110 is reasonably good and the total capacitance of 15 uuf is difficult to reduce.

Fig. 3 is a chart giving the recommended operating conditions for the multiplier circuit. Both doubler and tripler operating conditions are given, since the same circuit is used with a change in grid-No. 1 resistance. It is well to remember that when the tube is operated at lower B supply voltage than indicated, best multiplier operation occurs, in general, with high driving voltage, high developed bias, and with tank circuits having very low capacitance. In order to obtain maximum power output at high frequencies, the value of the grid-No. 2 resistor should be adjusted so that the full rated value of 250 volts is applied to grid No. 2.

The plate circuit efficiency of this tube is sufficiently good to allow application of full power in-

Figure 2. Useful power output of the RCA-5763 as a function of operating frequency in the circuit of Fig. 1A (dotted lines). The solid lines indicate the useful power output of RCA-5763's as a function of operating frequency in the push-push circuit of figure 3.

BASE CONNECTIONS AND TYPICAL OPERATION:
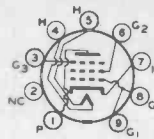
RCA-5763

Figure 3.

	Doubler to 175 Mc	Tripler to 175 Mc	
DC Plate Voltage	300	300	volts
Grid No. 3	Tied to cathode at socket		
DC Grid-No. 2 Voltage	*	*	volts
DC Grid-No. 1 Voltage	−75	−100	volts
From a Grid-No. 1 resistor of	75000	100000	ohms
Peak RF Grid-No. 1 Voltage	95	120	volts
DC Plate Current	40	35	ma
DC Grid-No. 2 Current	4.0	5.0	ma
DC Grid-No. 1 Current (Approx.)	1.0	1.0	ma
Driving Power (Approx.)	0.6	0.6	watt
Power Output (Approx.) #	3.6	2.8	watts

* Obtained from plate supply voltage of 300 volts through a series resistor of 12500 ohms.

\# Useful power output is approximately 2.1 watts for doubler service and 1.3 watts for tripler service.

R** 75,000 Ω, 1W FOR DOUBLER; 100,000 Ω, 1W FOR TRIPLER

RFC* RF CHOKE, #24 ENAMEL-COVERED WIRE CLOSE WOUND ON RESISTORS

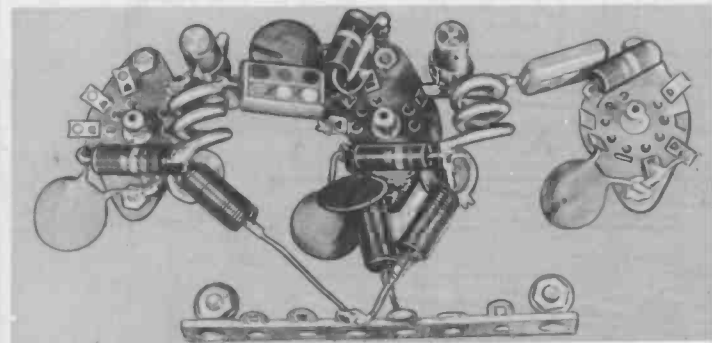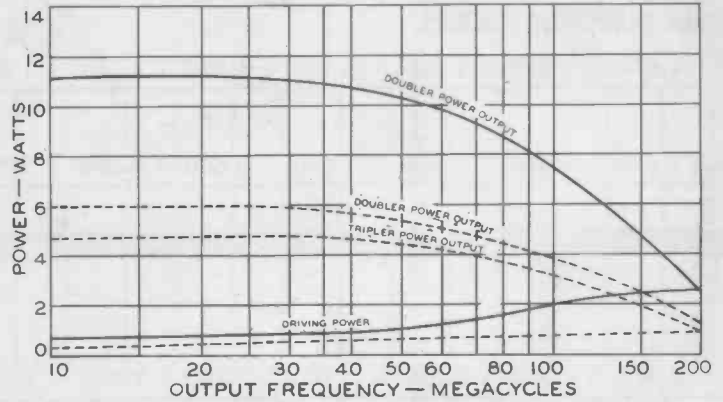**Fig. 1A.** Frequency multiplier circuit diagram using the RCA-5763.

Fig. 1B. Photograph showing an actual model of a frequency multiplier constructed from the above diagram. Note that the placement of parts follows closely the position indicated in the diagram for the purpose of keeping leads as short as possible.

put at frequencies up to 175 Mc. It is important to note that above 125 Mc, greater power gain is obtained when the tube is used as a doubler than as a straight-through neutralized amplifier because loading of the driving stage due to the input resistance of the 5763 is less severe at the lower frequency.

Because of its low value of output capacitance, two 5763's may be used to advantage in the "push-push" doubler circuit shown in Fig. 4. A single 5763 used as a tripler will provide more than adequate driving power, making a combination which is especially suitable for a low-power transmitter. Fig. 2 also shows a chart of measured power output as a function of operating frequency (solid lines) similar to that shown for the single multiplier (dotted lines).

Because the grid-No. 2 dissipation of this beam pentode will increase rapidly when the excitation is increased, especially with an unloaded amplifier, the maximum allowable grid No. 2 input of 2.0 watts must not be exceeded. Tubes can be quickly ruined if this rating is not adhered to.

Because of the high amplification factor of the 5763, a small cathode resistance of 62 ohms can furnish sufficient voltage to protect the tube in the event of temporary excitation failure and resultant loss in bias developed across the grid resistor. The cathode bias of 5.0 volts required for protection is sufficiently small to make the loss in dc plate voltage negligible.
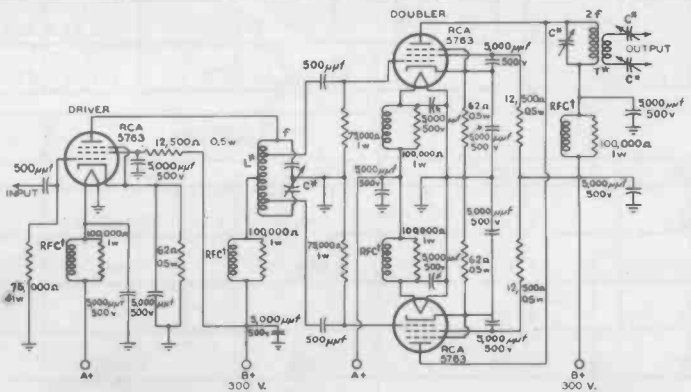
* VALUES DEPENDENT ON OPERATING FREQUENCIES

RFC† RF CHOKE, #24 ENAMEL-COVERED WIRE CLOSE WOUND ON RESISTORS

Figure 4. Circuit diagram of the Push-Push Doubler using a pair of RCA-5763's.