

have somewhere around 200-250 volts on the screen. Now with the Rothman system, it is necessary that the d.c. plate voltage be equal to the sum of the d.c. and a.c. components utilised in normal plate modulation and this quantity, as previously explained, is twice the usual d.c. plate voltage, although in practice it is found that an increase of 50 per cent. of the plate voltage will give excellent results. For example—

**High Level:**

$$600 \text{ v. (Ep)} \times 100 \text{ Ma. (Ip)} = 30 \text{ watts}$$

**Rothman:**

$$1200 \text{ v. (Ep)} \times 50 \text{ Ma. (Ip)} = 60 \text{ watts}$$

At this point it is well to bear in mind that the only source of d.c. screen voltage supply to the Class C amplifier tube is by means of voltage supplied by the rectified r.f. taken from VI of Fig. 1.

**MOBILE EQUIPMENT**

Fig. 2 shows a Rothman modulator for 100 watts plate power input which although shown as a complete mobile unit due to the fact that it is d.c. operated, can easily be changed over for a.c. operation to meet the requirements for the standard 100 watt transmitter license as applied to Australian Amateurs. The circuit is straight forward and it works well. The writer has used this modulator, which only measures 4 inches by 4 inches by 2 inches deep, with great success to modulate his 100 watt Class C stage. Here again Australian type tubes can be used, the principal requirement being low plate resistance characteristics.

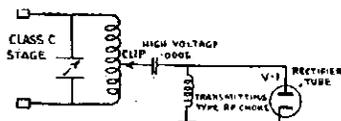


Fig. 3.—Alternative Method of Coupling R.F. to Modulator.

**ADJUSTMENTS**

1. Disconnect your screen supply altogether from the screen grid electrode.
2. See that your plate voltage to the Class C final tube is at least half as great again as that used with high level modulation for the same plate power input.
3. Back out your aerial coupling link to minimum.
4. Tune the final tank for resonance and you will notice that the resonance point will be indicated by the maximum plate current reading and not the usual

dip, this being because the screen grid voltage has been removed.

5. Couple the r.f. pick-up coil (attached to the de-modulator of the twin triode) to the cold end of the Class C stage and adjust same until the screen grid voltmeter reading shows half the voltage stated by the manufacturer's chart in respect of the plate voltage applied and this voltage must be obtained by application of modulation, i.e. whistle into the microphone at a constant level and adjust the pick-up coil until you obtain the required screen grid voltage.

6. Now couple your antenna coil to get a rise in plate current and when the plate current starts to fall off, this is the point at which the coupling to the antenna is correctly adjusted.

7. Don't be misled by small plate current readings because that shown on the meter is only the average value, the peak being twice that shown. However, if you have an aerial ammeter or pea lamp, you will see the energy that is being transferred to the aerial and when you apply modulation (speech), you will see the terrific increase in this energy due to the audio voltage adding to the de-modulated screen grid voltage and thereby varying the r.f. output of the transmitter.

The adjustments might seem complicated, but they are really quite simple and no difficulty should be experienced and once you get the correct settings, it is all plain sailing.

Unlike plate high level modulation, the plate current will kick about frantically, due to the modulation in this system appearing as variations of plate current.

**LIMITATIONS AND SPECIAL REQUIREMENTS OF THE SYSTEM**

The degree to which Rothman modulation can approach 100 per cent. is affected by the screen characteristics of the Class C amplifier tube used. With tubes possessing a reasonably high screen to plate transconductance, modulation or percentages between 90 and 95 per cent. are readily obtained. The plate power supply for the r.f. stage must be designed for twice the voltage normally used and must be capable of an output equal to the sum of the carrier and side-band components of the plate power input to the modulated Class C stage.

Care must be exercised in adjusting the feedback link to insure that the screen voltage at the peak of the modulation cycle does not approach screen

saturation. This is necessary in order to prevent excessive screen dissipation and efficiency modulation with resultant decrease in plate efficiency.

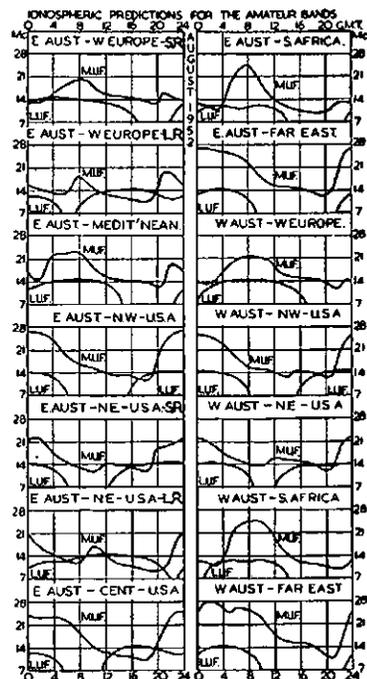
Since the degree of output coupling to the r.f. load affects the amount of energy in the plate tank and therefore the screen feedback link, adjustment of output coupling and feedback coupling are interdependent.

Plate resistance of the control and rectifier tubes should be low, about 500 ohms being ideal.

**ADVANTAGES OF THE ROTHMAN SYSTEM**

1. Elimination of bulky and heavy high level modulation components including Class B modulators, drivers, and modulation transformers.
2. Consolidation of plate power requirements into a single power supply at twice the normal impedance, thereby enabling a saving in space and weight.
3. Capable of linear modulation at extremely high modulation frequencies with all the flat response characteristics of resistance coupled operation.
4. Elimination of separate screen power supply or power wasting voltage dropping or dividing resistors.
5. Since screen power is generated only under conditions of resonance, protective fixed bias is unnecessary and superfluous.
6. Controlled carrier operation is readily obtainable with extremely simple circuitry.
7. Negative feedback of the de-modulated intelligence is easily accomplished by merely connecting a suitable network between the plate and grid electrodes of the control tube as shown in Fig. 2.

**PREDICTION CHART FOR AUG., 1952**



**ANNOUNCEMENT**

The exclusive manufacturing and distributing rights for Australia and the Australian Patent Application for . . .

**The Rothman System of Modulation**

is held by the undersigned, who will shortly be manufacturing a modulator, type A1, suitable for 100 watt transmitter, and Australian conditions.

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