is the range of inputs from zero to 1 μV which is essentially all noise but accounts for the first 30% deflection. Many amateur signals hardly move the pointer, indicating that they are well below 1 μV. These are usually difficult to read. When using this scale almost every amateur appears a little hurt at producing such a weak signal and they often assume that the man on the receiver giving the poor report is "a complete clot and absolutely clueless"! Perhaps they are right—but tuning the receiver to broadcast stations in the 15 mc band will produce many 60% deflections and only a few over 80% which leads one to believe the receiver is all right. Possibly something could be done to improve the scale shape at the lower end. By the way, do not assume the same scale holds on either 21 or 28 mc; more than likely it does not, due to a change in overall sensitivity.

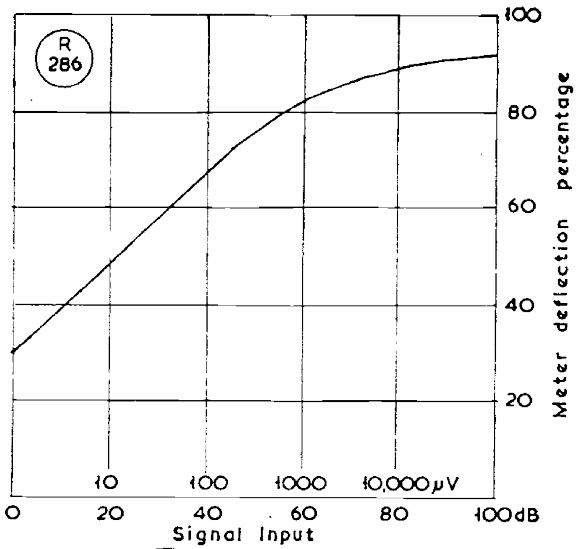

Fig. 14. Plot of the S-meter deflection on the AR88 against actual signal input on the 14 mc band. It should be noted that the shape of the curve will vary from band to band.

New Geloso VFO Unit 4/104

NOTES ON CIRCUIT, APPLICATION AND OPERATION

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RECENTLY, the well-known Italian firm of Geloso introduced a new VFO Unit to their large range of equipment for the radio amateur. This unit, known as the Model 4/104 "Signal Shifter," was designed primarily to replace the Model 4/101. Model 4/102 is still in current production and should be used as described in *Short Wave Magazine* for March 1957. The main difference between these two models is that the 4/102 is designed to drive a pair of 807's (or similar) valves in parallel, whereas the Model 4/104 will drive a single 807 or 6146. Other comparisons and differences are given in these notes, with details for operating this new VFO Unit, which uses more modern valve types than its predecessors.

The Circuit

The Unit consists of a pentode oscillator-buffer-doubler (6CL6) and a tetrode driver (5763 or QVO3-12). The oscillator embodies a Clapp circuit operating on a fundamental frequency in the 80-metre band for output on 80, 40, 20 and 15 metres, and in the 40-metre band for output on 11 and 10 metres. The actual frequency coverage is:

3.5 to 4.0 mc, for the 80-metre band;
3.5 to 3.65 mc, for the 40-, 20- and 15-metre bands;
6.74 to 7.425 mc, for the 11- and 10-metre bands.

Oscillator-tuning is accomplished by means of a three-gang (straight-line capacity variation) variable condenser. One section of it is used for 80 metres, one for 40, 20 and 15 metres, and one for 11 and 10 metre operation. A fixed capacity and a trimmer condenser connected in parallel with each section provide adjustment for exact coverage of each one of the bands. The signal generated by the oscillator section of the 6CL6 is electron-coupled to the amplifier-doubler section of this same valve, which operates as an un-tuned amplifier for 80-metre operation, and as a doubler for output on the other bands.

The 6CL6 is followed by the 5763 which amplifies for 80- and 40-metre operation, doubles for 20 metres, triples for 15 metres and doubles for 11 and 10 metres.

Switching of the Clapp oscillator circuits is accomplished by means of a single rotary switch. The plate circuits of the 6CL6 are not tuned continuously but are broad-banded and semi-fixed-tuned to a convenient frequency within the various bands. This simplification is made possible by the high C/L ratio of the circuits (which are tuned only by the inter-electrode capacities of the valves) and the small frequency range which has to be covered. The

various plate circuits of the 5763 driver are tuned to maximum output on the desired frequency by means of a variable 25 $\mu\mu$F trimmer condenser.

The adjustment of the output amplitude of the 5763 valve is by regulation of the screen voltage, the potentiometer R11 in the circuit at Fig. 2.

For CW, keying may be effected in the cathode circuit of the 5763. The key is connected across a resistance which places the cathode at a potential 85-100 volts positive. This blocks the valve in the key-up condition. Under key-down conditions, the valve restores to normal—that is, the cathode is returned to earth potential.

Alignment of the VFO

All units are tested and aligned before leaving the factory, so that only slight touching up should be necessary.

Before attempting alignment of the VFO the position of the pointer must be checked. With the gang condenser vanes fully in mesh, the pointer should be set to the zero mark of the outer logging scale — *see* photograph, where the pointer is at 39. Alignment of the oscillator should be carried out with the aid of frequency meter having 100 and 1000 kc crystal check points or with any other reliable frequency checking apparatus.

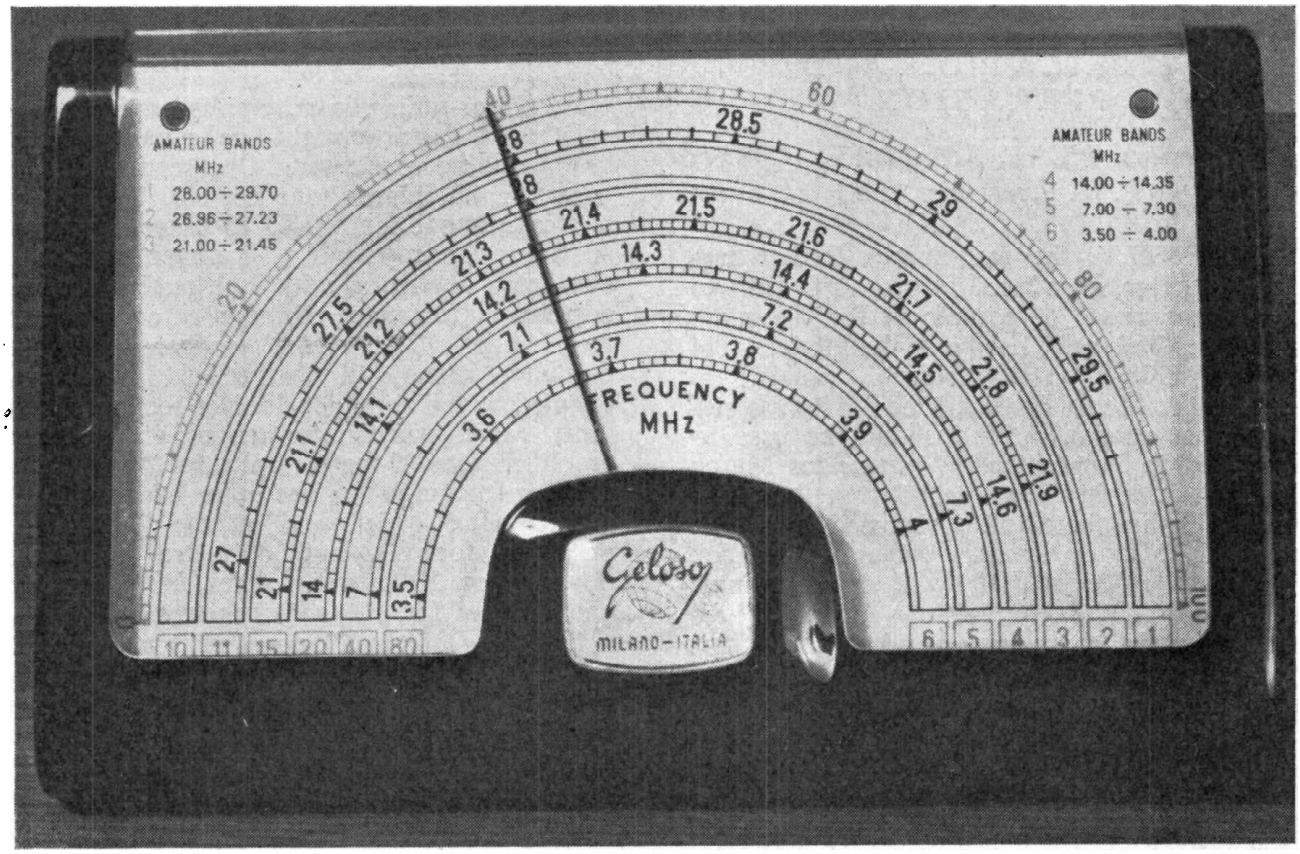
Table 1

OSCILLATOR TUNING POINTS

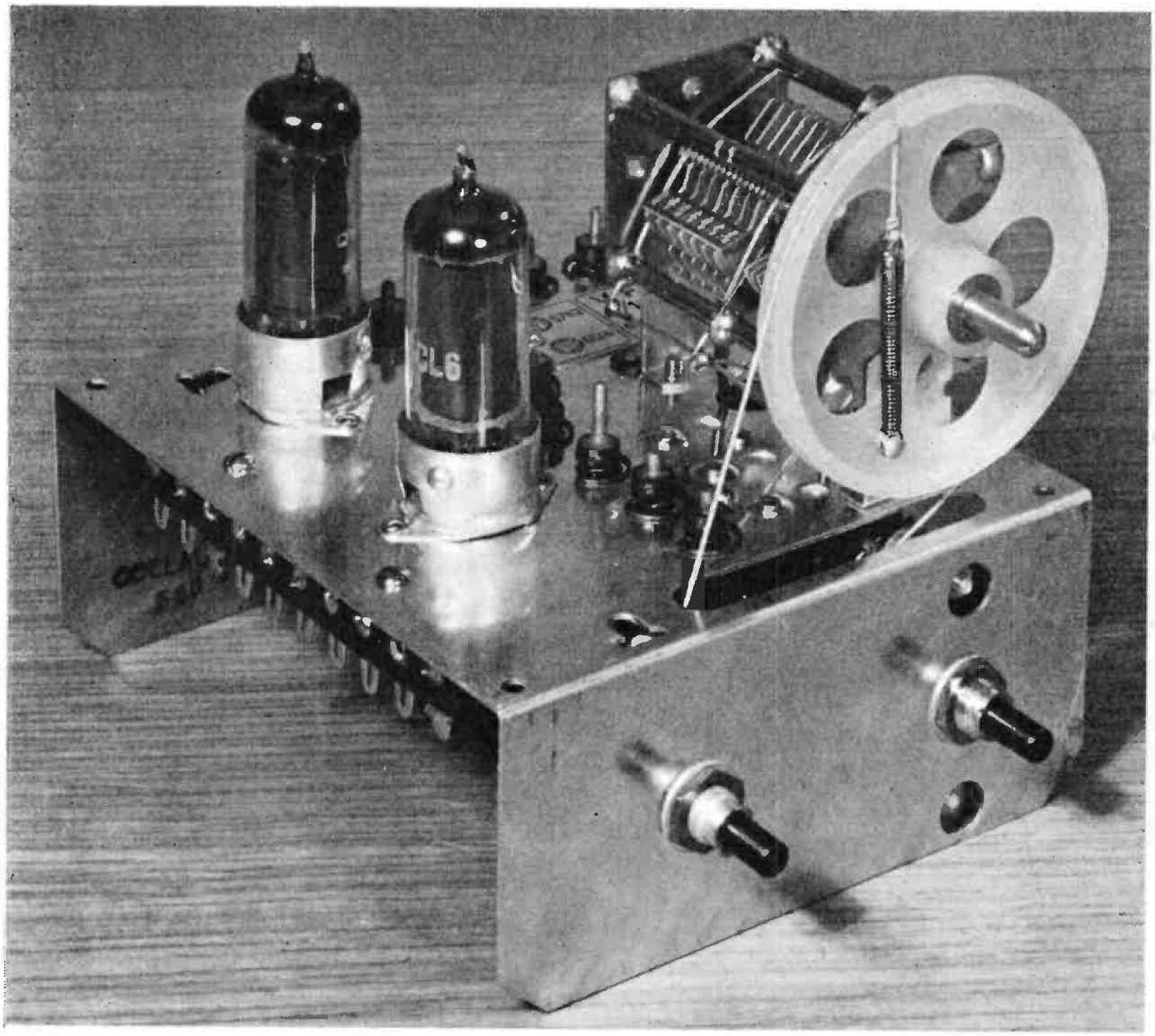
Band	*Coil*	*Trimmer*
80m. (3.5-4 mc)	L2 at 3.5 mc	C2 at 4·00 mc
20m. (14-14.6 mc)	L1 at 14 mc	C1 at 14.5 mc
10m. (28-29.7 mc)	L3 at 28 mc	C3 at 29.7 mc

The inductances are adjusted at the low frequency end of the band and the trimmer condensers at the HF end, which is normal alignment procedure. It suffices to establish alignment on the 80, 20 and 10 metre bands only, as the 40 and 15 metre bands are found on the same circuits as the 20-metre band, and the 11-metre band adjustment is the same as for 10 metres.

The entire procedure may have to be repeated several times on each band to obtain satisfactory tracking with a maximum tolerance of ½ a degree of the outer logging scale.



Neat appearance of the dial assembly for the new Geloso 4/104 VFO, described in the article. As we in the U.K. are not interested in the 27 mc (11-metre) band, it is probable that this switch position could be adapted to give 160-metre coverage, thus making the instrument into a six-band VFO.



The new Geloso 4/104 VFO covers the five bands 10 to 80 metres and incorporates modern valve types — a 6CL6 on the oscillator side with a 5763 (or Mullard QV03-12) doubler-amplifier. Sufficient output is given for full drive into an 807 or 6146 (QV06-20) on all bands

Alignment should be checked if it be necessary to change the 6CL6 valve at any time.

Inductances L4 to L10 should be adjusted at the frequency given in Table 2, for maximum grid current in the stage following the 5763 valve.

The final *Frequency Ranges* are: 3·5 to 4·0 mc; 7·0 to 7·3 mc; 14·0 to 14·6 mc; 21·0 to 21·9 mc; 26·96 to 28 mc; 28·0 to 29·7 mc.

The *Power Requirements* are: Terminal 4, 150v. 4 mA (approx.); Terminal 6, 275v. 15 to 50 mA; Terminal 10, 275v. 0 to 4 mA.

It is therefore necessary to make available a power supply capable of giving 280v. at 60 mA. HT volts may be increased to 310v. to give more drive. Heater requirement is 6·3 volts at 1·4 amps (*see* note later on Keying).

Connection to Grid of PA following 4/104

This connection must be kept as short as possible and unshielded; a 25 $\mu\mu$F trimmer for resonating each output inductance (L6-L10)

Table 2

BUFFER AND DRIVER TUNING POINTS

Band	*6CL6 anode*	*5763 anode*
80 m.	*Aperiodic*	L10 at 3650 kc
40 m.	——	L9 at 7100 kc
20 m.	L5 at 14200 kc	L8 at 14200 kc
15 m.	——	L7 at 21200 kc
11 m.	——	——
10 m.	L4 at 28600 kc	L6 at 28600 kc

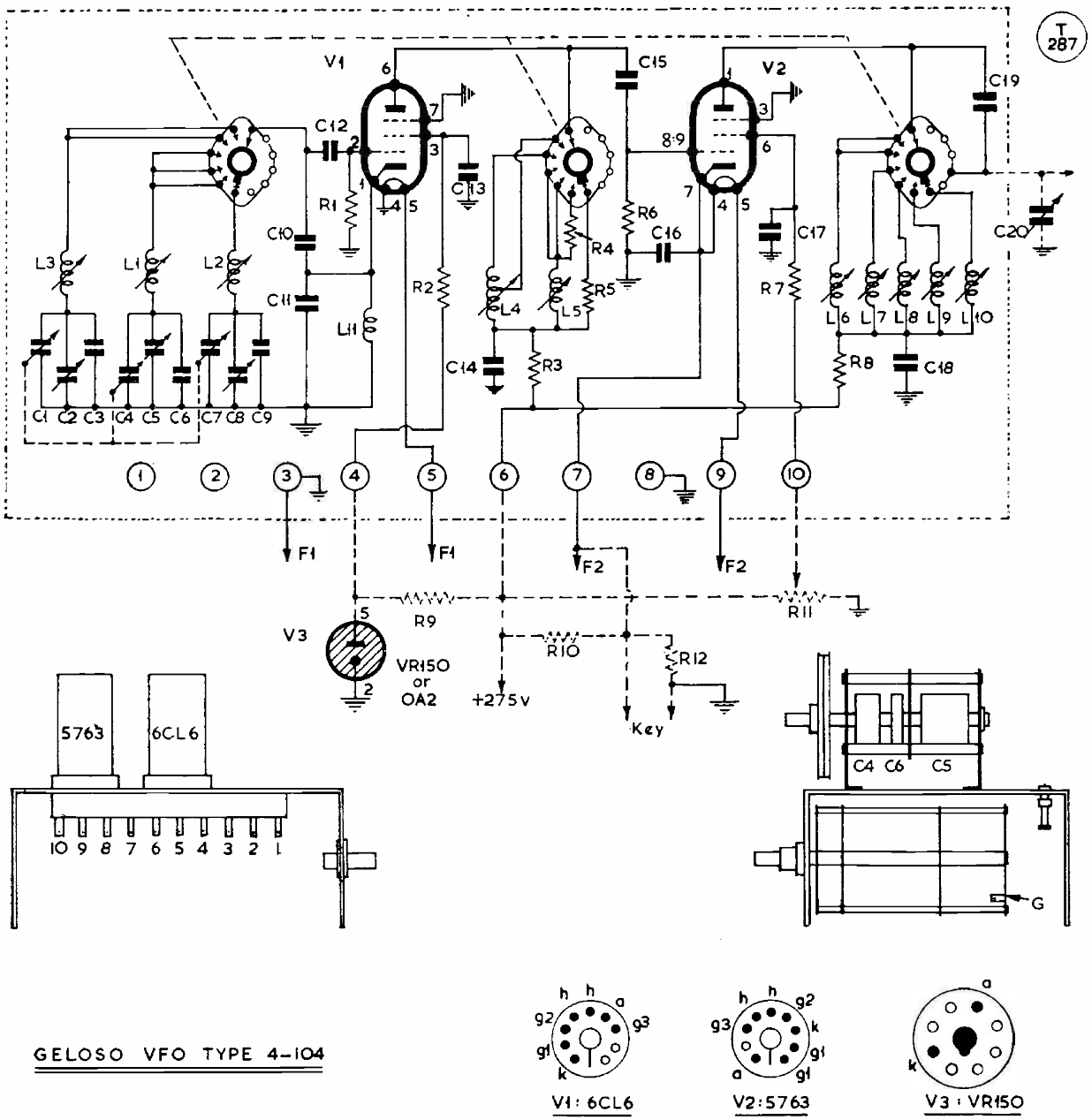


Fig. 1. Circuit complete of the Geloso 4/104 VFO Unit, as shown in the photographs. The output valve, a 5763 or equivalent Mullard QV03-12, operates as an amplifier or doubler-tripler, depending on the drive frequency. As supplied, the 4/104 is pretuned and calibrated and only small adjustments should be necessary for exact band-edging.

should be connected between the grid of the valve following the unit and chassis. This trimmer should have a very low minimum capacity; it is C20 in the circuit above.

The *Connections to the Unit* are: 1, no connection; 2, no connection; 3, chassis (HT-); 4, screen of 6CL6; 5, heater oscillator (6·3 v.); 6, HT to 6CL6 and 5763; 7, heater of 5763 (6·3 v.); 8, chassis (HT-); 9, heater of 5763 (6·3 v.); 10, screen of 5763.

The chassis of the 4/104 is 5⅜in. x 4¼in. x 2 3/16in. deep, which is same as the 4/101 and 4/102; also the positioning of the spindles is the same as in these latter units, thus making them interchangeable.

The dial and escutcheon assembly (Cat. No. 1646) is also the same size as others; that is, approximately 8¼in. x 5in.

Keying

The main advantage with the 4/104 over the 4/101 is that the new Unit has facilities for being keyed. This is done in the cathode of the 5763 driver valve, which means that certain

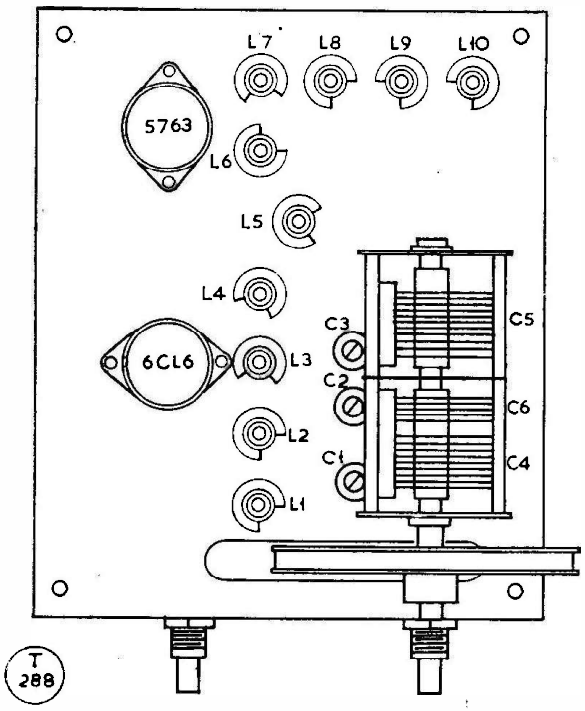


Fig. 2. Plan view of the Geloso 4/104 VFO, showing adjustment points. As explained in the text, the units are sent out pre-tuned and only slight adjustment should be necessary.

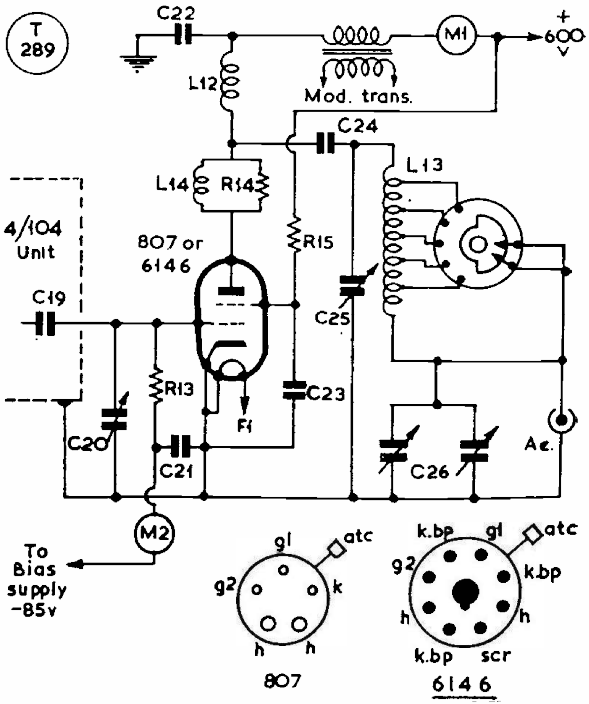


Fig. 3. A suggested PA circuit to work with the Geloso 4/104, using an 807 or 6146 (QVO6-20) for driving direct from the VFO unit. Inputs up to 50-60 watts are possible, on five bands. All values are given in the table herewith.

requirements have to be met which did not exist with the earlier model.

The heater of the 5763 must be run off a separate heater winding—6·3v. at 0·75 A is required. The 6CL6 can take its LT from a heater winding supplying other valves in the transmitter.

It will be observed from the circuit diagram that when the key is in the "up" position, the positive volts applied to the cathode of the 5763 could cause stress on the cathode-heater insulation, and eventual breakdown. The heater supply for this valve may be taken from a separate 6·3v. transformer, or from an individual 6·3v. winding on a transformer supplying other voltage requirements in the transmitter. Should a heavy amperage winding only be available, *e.g.*, 3 or 4 amps at 6·3v., it may be necessary to include a small resistance in series with the heater line in order that the volts at the valve base will not rise above 6·3v. Actually the 5763 (QVO3-12) heater is rated at 6·0v. at 0·75 amps., so that 6·3v. should be the absolute maximum.

If the user is not proposing to use CW, but phone only, these precautions need not be observed.

Negative bias must be provided for the stage following the 4/104 Signal Shifter Unit. As no arrangement was made in the earlier model for keying any of the valves, the method usually adopted was cathode keying of the stage *following* the Unit. This meant that the use of automatic bias voltage developed across a resistor in the grid of the valve (by means of drive from the Unit), was permissible for Class-C operation. With the driver stage keyed, however, fixed negative bias must be provided,

Table of Values

Fig. 1. Circuit of the Geloso 4/104

L1-L11	= Standard Geloso coil pack	C13, C14, C16, C17, C18	= .0047 μF, ceramic
C1, C4, C7	= 28-18-51 μμF, ganged	C19	= 470 μμF, silver-mica
C2, C5, C8	= 20 μμF, trimmer	C20	= 25 μμF, low min. cap.
C3	= 75 μμF, silver-mica	R1	= 100,000 ohms, ½-w.
C6	= 120 μμF, silver-mica	R2	= 1,000 ohms, ½-w.
C9	= 91 μμF, silver-mica	R3, R4, R8	= 470 ohms, ½-w.
C10, C11	= .001 μμF, silver-mica	R5, R7	= 4,700 ohms, ½-w.
C12, C15	= 100 μμF, silver-mica	R6	= 33,000 ohms, ½-w.
		R9	= 5,600 ohms, 2w.
		R10	= 100,000 ohms, 2w.
		R11	= 35,000-ohm pot'meter, 4w.
		R12	= 50,000 ohms, 1w.
		Valves	= 6CL6, 5763

Table of Values

Fig. 3. Suggested PA stage for the 4/104 VFO

C19	= 470 μμF (*part of* 4/104)	C26	= To total .0013 μF
C20	= 25 μμF, low min. (*see text*)	R13	= 10,000 ohms, 1w.
C21	= .001 μF, 350v.	R14	= 33 ohms, 2w.
C22	= .0033 μF, 1500v.	R15	= 50,000 ohms, 3w.
C23	= .0033 μF, 1000v.	L12	= RF choke
C24	= .001 μF, 2500v.	L13	= Geloso type 4/112 tank assembly
C25	= 186 μμF, low min.	L14	= 5t. 18g. ¼-in. dia.

as shown in Fig. 3. Using an 807 PA, for example, with 600 volts on the anode and 260v. on the screen, a negative voltage of -85 volts, in addition to a 10,000 ohm grid resistor producing extra automatic bias, should be used. A grid current figure of about 4 mA can be expected on all bands.

A key click filter can be included in the transmitter if required. This should consist of a 3 Hy. choke rated at 60 mA or more, a resistor and condenser. The DC resistance of the choke should not exceed 50 ohms; the condenser of 0·1-0·5 μF and resistor of 10-100 ohms, in series, are placed across the key socket and should be adjusted in values for the keying waveform required. The choke is inserted in the cathode lead between pin 7 of the 5763 and tag No. 7 on the Unit. It will be necessary to disconnect the heater pin 4 from pin 7 and reconnect pin 4 direct to the heater supply. This type of filter is suitable for most cathode keying circuits but it should be remembered that if PA cathode keying is used a choke of appropriate current carrying capacity is necessary. In the "Vanguard" transmitter, for instance, a choke of 120 mA rating must be used.

Conclusion

This Unit upholds the tradition that the Geloso people have established—to provide equipment of good technical and mechanical standards at a reasonable price. The introduction of nylon rotor sections in the wavechange switch, improved L/C ratio in the oscillator section and the attractive dial, will help the amateur of today to build a transmitter of high reliability with an appearance which may even appeal to the XYL.

The writer has noted with interest the possibility of modifying the new 4/104 Unit for Top Band operation, by adapting the 11-metre band (not wanted in the U.K.) position of the wavechange switch for this purpose. Tests are being carried out which, if successful, may form the subject of a later article.

LICENCE EXAMINATIONS — OCTOBER

We are informed that the Post Office will be arranging for a Radio Amateur Examination on October 4, to be held at centres in London, Edinburgh and Cardiff. The fee for taking the examination is 25s. Applications to sit, naming centre desired, with the fee, should be made to: Wireless Telegraphy Section, Radio Services Dept., Post Office Headquarters, London, E.C.1, by not later than *September* 6; time and place for the examination will be notified to applicants.

There is also a comprehensive programme of Morse Tests, arranged for the first week in September, at centres in Birmingham, Cambridge, Cardiff, Derby, Edinburgh, Leeds, London and Manchester. Applications to take this Test should be made forthwith (and in any event not later than *August* 20) to: Radio Services Dept. (Radio Branch), Post Office Headquarters, London, E.C.1. The sitting fee is 10s., to be paid when the completed application form is returned. Candidates will be notified of date, place and time.

SATELLITE VII IN ORBIT

On July 26, the Americans launched their Explorer IV from Cape Canaveral, Florida—a new space vehicle in the shape of a cylinder 6½ft. long, weighing 38½ lbs. This makes the third U.S. satellite maintained in orbit. The main task of Explorer IV is said to be the "investigation of an area of intense radiation lying 600 miles out in space, and disclosed by earlier exploration." From the amateur point of view, Satellite VII is of particular interest for another reason—it has been launched in a north-easterly direction, on the same sort of heading as the Russian Satellite VI. This puts Explorer IV on a polar orbit and means that it will be regularly audible in the U.K. The perigee (nearest approach) is about 170 miles and the apogee (furtherest departure) 1,400 miles. The transmitting frequency is 108·30 mc (in the Band II region) and it is said that the batteries carried by the new American satellite should keep the signal going for about two months. There is also a signal on 108·00 mc, which comes from a very much lower-powered transmitter run from solar batteries.

We shall be most interested to have reports from readers on the reception of Explorer IV, on either 108·00 or 108·30 mc.

THE "NEW QTH" PAGE

Readers who become licensed, or change their address, are reminded that they should notify us immediately for appearance in the "New QTH" page, which has been a regular *Magazine* feature for many years. In any event, as U.K. agents for the *Radio Amatur Call Book* — listing all known amateur stations of the world — we are responsible for keeping the G sections of the *Call Book* up-to-date. All new callsign/addresses received by us are passed automatically to the American publishers of the *Radio Amateur Call Book*, which appears quarterly and is circulated throughout the world. So you need to be sure your own callsign is in it—there is no charge of any sort for this service.

CHANGE OF ADDRESS — Tiger Radio, Ltd.

We are asked to announce that the new registered office address of Tiger Radio, Ltd., is 136 River Way, Christchurch, Hants., to which all correspondence should now be directed. Anyone who may not have received a reply to a letter sent to the old address (15 Verona Avenue, Southbourne) is asked to write again, to the new address.