The "Geloso" Receiver Front End

HIGH-GAIN AMATEUR-BAND CONVERTER UNIT

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The converter unit discussed here is a pre-fabricated assembly designed for use with almost any receiver, including the "surplus" and older communication types. The article shows how the Geloso Front End can be wired for operation with such a receiver, the advantages it gives being full band-spread through the amateur ranges 3·5 to 28 mc, high gain, good sensitivity, and excellent oscillator stability on the higher frequency bands.—Editor.

MANY readers of *Short Wave Magazine* have, during the past twelve months, built the famous Geloso Signal Shifter into a transmitter and, at reasonable cost, have obtained excellent results with a "professional" finish. Now available in this country is the Geloso Receiver Front-End Unit, which is as used in the G207-DR Double Conversion Superhet.

This unit consists of the following parts: (1) Coil Unit Type 2617; (2) Dial, escutcheon plate, slow motion drive and knob with handle; and (3) Gang condenser, trimmer assembly and dust cover.

The Coil Unit itself is ready-wired with valveholders, resistors, condensers, wavechange switching, and so on, only requiring external connections for HT, LT, gang condenser, IF transformer, AVC and aerial. The IF is at 4·6 mc bringing the unit on to almost any short-wave receiver, and each amateur band is spread to give the following frequency coverage:

10 m-band	...	29.8 to 28.0 mc.	Band F
11 ,,	...	28.1 to 26.4 ,,	,, E
15 ,,	...	22.0 to 20.6 ,,	,, D
20 ,,	...	14.6 to 13.8 ,,	,, C
40 ,,	...	7.6 to 6.95 ,,	,, B
80 ,,	...	4.0 to 3.5 ,,	,, A

A trimming adjustment is provided for every coil in the Unit and is clearly marked with adjustment frequency figure. The Unit can, if desired, be built directly into a receiver using a second mixer to convert to, say, 465 kc, or may be assembled as a converter and fed out at 4·6 mc to a receiver such as an HRO or S640. Two types of 4·6 mc IF transformer are available. The transformer for coupling the unit assembly into a second mixer requires two windings which can be "peaked" at 4·6 mc, but if conversion to the aerial terminal of receiver is contemplated, a 4·6 mc IF transformer with a low impedance output winding should be used.

The dial mechanism provides a 72: 1 reduction from an epicyclic motion with a fibre-glass cord drive. The fine fibre-glass cord is contained within a nylon sleeve and is thus long wearing and very smooth in operation. The cord is spring loaded, giving positive action and preventing backlash. No cut-and-try method of adjusting the drive cord is necessary, as the exact length is supplied, correctly terminated on the loading spring.

The size of the coil unit is approximately 5½in. x 4in. x 3in. deep and is designed for mounting below a chassis. The dial is 8½in. x 5in., and the minimum panel height requirement for the assembly is 8¾in.

The Circuit

This uses modern type valves—6BA6 (RF amplifier), 12AU7 (oscillator and buffer) and 6BE6 mixer. One interesting feature is the employment of a double-triode (12AU7) in the oscillator circuit. The first half is run as the oscillator and the second half as a cathode-follower buffer stage. This prevents any pulling of the oscillator frequency by the aerial and mixer circuits.

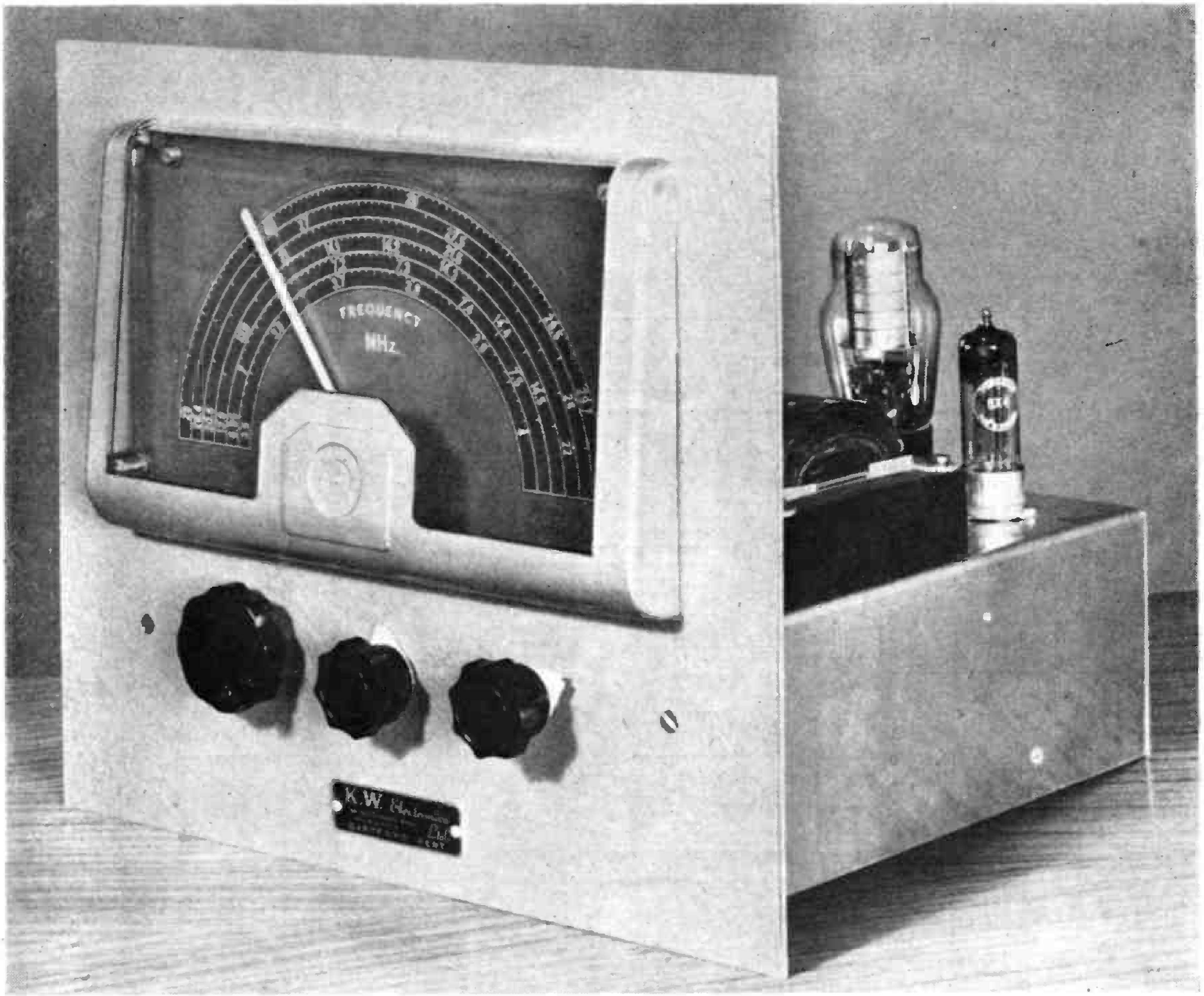
Fig. 1 shows the complete circuit required to build a compact converter which will impart to an old receiver modern performance, with an excellent signal-noise figure of better than 6 dB for 1 microvolt input.

The power requirement of the Unit is 210 volts DC at 35 mA, with 150 volts stabilised, and 6·3 volts AC at 1 amp. From Fig. 1 it will be seen that the 150-volt stabilised supply may be obtained from a VR150/30 valve.

Another interesting feature of the circuit is the provision of an additional wafer at the rear of the wave-change switch for adjusting the screen voltage to the 6BA6 RF amplifier valve. It will be appreciated that the performance of most valves is better at 3·5 mc than at 30 mc and this ensures that the sensitivity of the Unit is the same on every band, and is invaluable for correctly calibrating an S-meter.

Making the Complete Converter

The design using the Geloso Coil Unit and dial assembly shown in the photograph is based upon a 16 swg aluminium chassis 10in.



General appearance of the Geloso Receiver Front End, which makes up as a self-contained unit, the circuit being as shown in Fig. 1. Full spread is given across all amateur bands, including the 27 mc (11-metre) band as a separate range, and the Converter will work into any receiver tunable around 4.6 mc as the IF/AF amplifier. It will improve considerably the HF-band performance of most receivers, and is easy to assemble and instal.

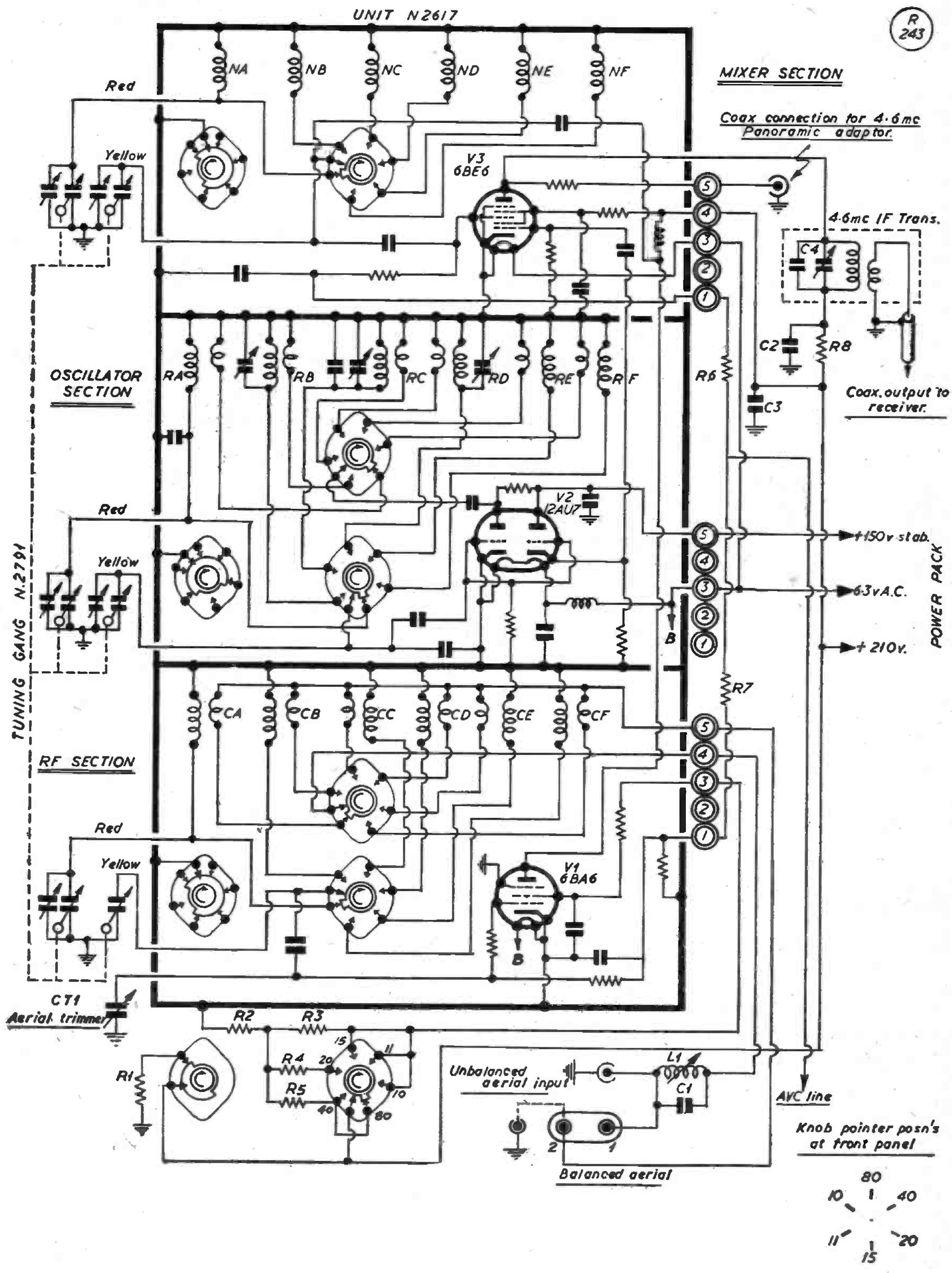
x 8in. x 3in. deep and front panel 11in. x $9\frac{1}{2}$in. The coil unit is mounted below chassis ; cut-outs are made for the valveholder skirts to protrude through the top of the chassis ; $\frac{3}{4}$in. holes are required for the coil unit connections to pass through the chassis to the gang condenser, mounted on top of the chassis. It is important that these wires, detailed in Fig. 2, should be laid clear of the chassis as much as possible, in order to reduce wiring capacity to chassis to an absolute minimum.

Several holes must be made in the rear of the chassis to accommodate the aerial connection, the aerial trimmer, mains lead and fuse-holder, AVC connection and coax output (also 4·6 mc filter adjustment if required). No measurements are given for these items as they can be located to suit the user's requirements.

Assembly

First mount the epicyclic drive on its bracket, and before screwing the bracket under the chassis, slip two turns of drive cord over the drive spindle and locate them around the thick section of the spindle, immediately in front of brass bush. Mount the gang condenser on feet and secure feet to top of chassis by four self-tapping screws. Wire up the switch wafer at rear of the Coil Unit (*see* Fig. 4) and mount the latter under the chassis ; secure by means of 4 nuts and washers (one screw in each top corner of the Unit).

Fit the trimmer assembly bracket to the gang condenser end-plates, and mount all other components ; then wire up in accordance with the circuit diagram. Fit the dial drive drum to the gang condenser spindle and see that it


UNIT N2617
R 243
NA
NB
NC
ND
NE
NF
MIXER SECTION
Coax connection for 4·6mc Panoramic adaptor.
Red
Yellow
V3 6BE6
4·6mc IF Trans.
C4
C2
R8
R6
C3
Coax. output to receiver.
OSCILLATOR SECTION
RA
RB
RC
RD
RE
RF
V2 12AU7
Red
Yellow
+150v stab.
6·3vA.C.
+210v.
POWER PACK
TUNING GANG N.2791
B
R7
CA
CB
CC
CD
CE
CF
RF SECTION
Red
Yellow
V1 6BA6
B
CT1 Aerial trimmer
R2
R3
R4
R5
R1
15
20
11
10
40
80
Unbalanced aerial input
L1
C1
AVC line
2
1
Balanced aerial
Knob pointer posn's at front panel
80
10
40
11
20
15

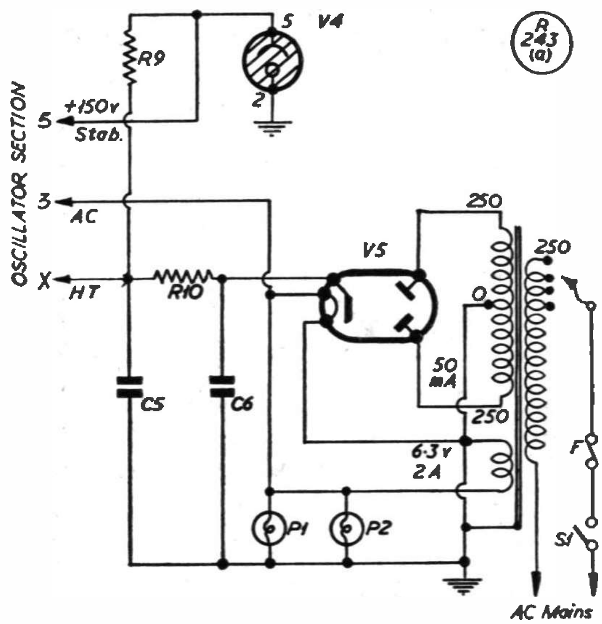


Fig. 1. Circuit complete (left) of the Geloso Receiver Front End Unit type 2617, which makes up as a very satisfactory amateur-band converter with IF output at 4.6 mc. The only connections to be made to the Unit, which is pre-assembled, are as shown outside the heavy line. A suitable power supply circuit is given above, and the appearance of the finished Converter can be seen from the photographs.

Table of Values

Fig. 1. External circuitry of Geloso Receiver Unit

CT1 =	15 μμF air trimmer	R6 =	1 megohm, ¼-w.
C1 =	300 μμF	R7 =	2.2 megohms, ¼-w.
C1, L1 =	4.6 mc wave-trap (*see text*)	R8 =	2,200 ohms, 1-w.
C2, C3 =	.0047 μF	R9 =	3,000 ohms, 3-w.
C4 =	50 μμF	R10 =	1,500 ohms, 10-w.
C5, C6 =	32 μF	V4 =	VR150/30
R1 =	22,000 ohms, 2-w.	V5 =	6X4, or 6X5GT
R2 =	22,000 ohms, ½-w.	P1, P2 =	Dial lamps, 6.5v. 0.3 amp.
R3 =	330,000 ohms, ½-w.	S1 =	Mains switch, toggle on-off
R4 =	33,000 ohms, ½-w.	F =	1 amp. fuse
R5 =	100,000 ohms, ½-w.		

turns centrally within the cut-out at the front edge of the chassis. The drive cord should then be placed around the outer of the drive drum and the spring located.

After the drive has been put on, the front panel can be secured in position and the dial mounted. Before fitting the escutcheon to the dial, push the pointer into position on the gang condenser spindle. Should it be a slack fit, gently pinch together the ends of the tubular section. A dab of paint on the spindle will help to secure the pointer. Make sure that the pointer is horizontal at just below 28·0 mc with the condenser vanes fully in mesh. Check that the dial drum is correctly located on the condenser spindle and that the pointer will turn 180°.

Testing Out

Check all wiring, then fit the valves. Connect the output of the converter to the aerial input of the receiver and tune it to 4·6 mc. Connect the converter AVC line to the receiver AVC—if this is not conveniently accessible, take the AVC line to chassis. (In Eddystone receivers the AVC line can easily be picked up at the BFO switch.) Join converter and receiver chassis together by a short length of braiding or heavy wire. Connect the converter to mains and switch on.

At this stage it would be advisable to check voltage points in the converter—HT + 210 v., stabilised HT, screen 6BA6 network, and heaters.

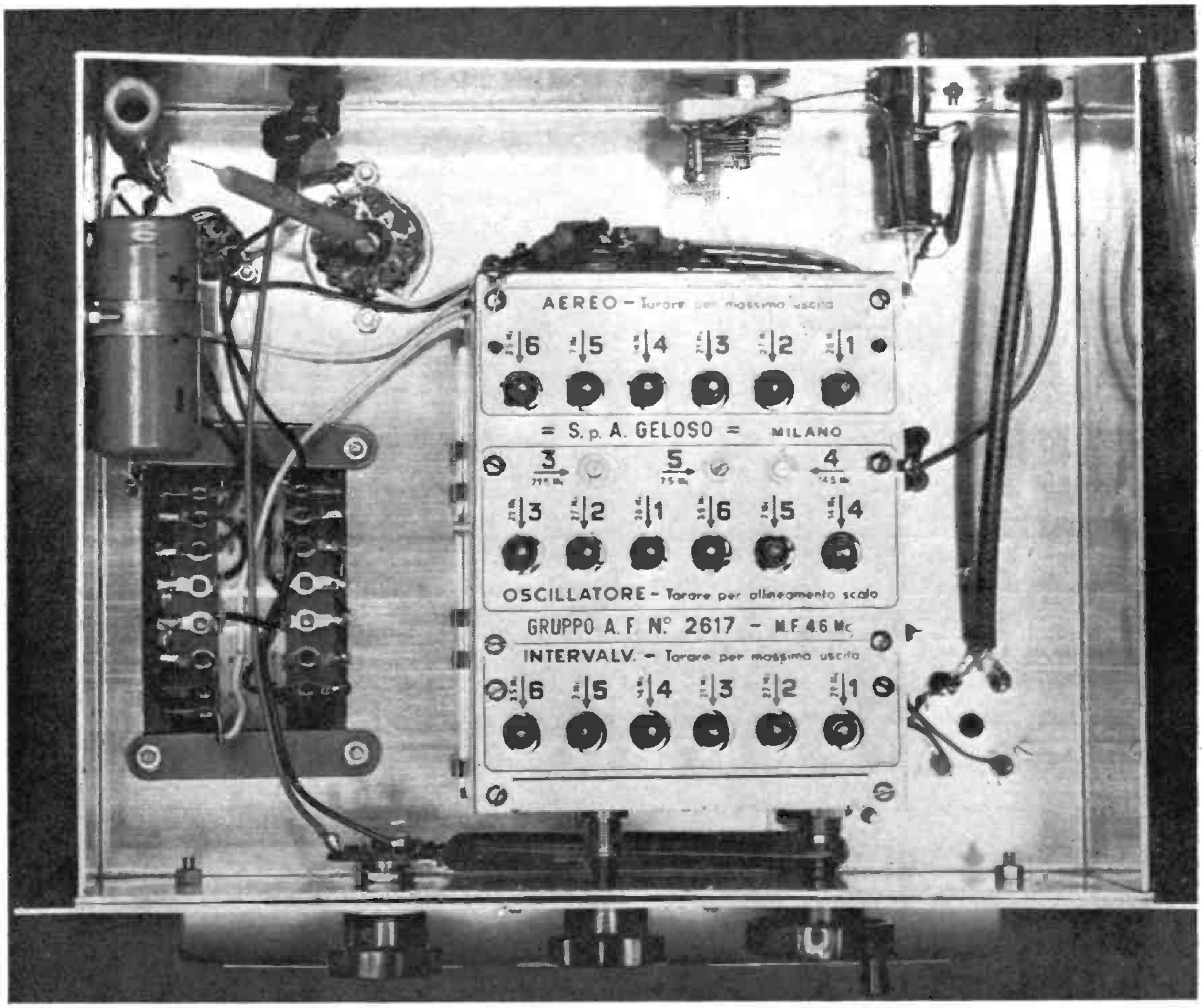
Manual Volume Control

As an alternative to feeding AVC to the RF stage in the converter, or to having no control on this stage, a manual RF gain control can be included. This may be achieved by incorporating a 1,000-ohm potentiometer across a negative 20-volt supply, with positive connected to chassis and the slider of the potentiometer taken to the AVC line in the converter. This 20-volt bias supply may be obtained from the converter power supply unit by including a 500-ohm 5-watt resistor between centre-tap of the HT transformer and chassis. The resistor should be by-passed with a 25 μF 25 v. electrolytic condenser. The positive side of the electrolytic should go to chassis. The 1000-ohm potentiometer is wired between centre-tap and chassis, with the slider going to the Converter AVC control line. If this bias arrangement is installed it may leave the HT volts slightly on the low side. In order to increase the HT rail (HT plus to chassis) to approximately 210 volts, the resistor R10 in the power supply unit (*see* Fig. 1) should be replaced by a small 10 Henry 50 mA LF choke.

A manual RF gain control will give improved signal-to-noise ratio for CW operation and can be associated with a switch which will enable manual or AVC control to be selected.

Alignment

All Coil Units are checked by the manufacturer before despatch and are usually not very far off. Do *not*, at this stage, touch any iron dust-core or trimmer in the Coil Unit. Alignment can best be accomplished by using a signal generator, but this is by no means an absolute necessity if a local transmitter can give a few "spot" frequencies on different bands—or a good station frequency meter is available. In the latter case, an aerial should



Construction under-chassis of the Geloso Amateur Band Converter, the central assembly being the pre-fabricated Coil Unit type 2617, showing the points at which alignment adjustments are carried out, as explained in the text. The values of the external items to complete the Converter are given with Fig. 1.

be connected to the aerial socket in place of a signal generator. It is important that alignment should commence on the 10-metre band, as the setting of CT3 will affect all other bands except 80 metres. If a signal generator is used, feed it at about the 100 microvolt level into the converter aerial socket. Set the wave-change switch at the 10-metre position. Tune the converter to 29·7 mc and set the signal generator to this frequency ; adjust CT3 on the gang condenser. If the signal cannot be located, set CT3 (*see* Fig. 6) at approximately half-capacity and adjust the dust-iron core "28 mc oscillator" (under coil unit). Remember that the oscillator dust-iron cores are adjusted for correcting calibration at the *low* frequency end of each band and oscillator trimmers correct the calibration at the *high* frequency end of the band.

It may be necessary to re-adjust the 28 mc core and CT3 several times in order to obtain correct frequency tracking over the entire band. Once this has been achieved, do not touch again. Oscillator alignment should be obtained on all bands by this method, before adjusting inter-valve and aerial circuits. The oscillator iron dust cores are adjusted on each appropriate band at 28, 27, 21, 14, 7, 3·5 mc and the trimmers at 29·7 (on gang), 21·5, 14·5 and 7·5 mc (under coil unit), and 4·0 mc (on gang). There is no oscillator trimmer for the 11-metre band—only an iron-dust core. Each iron-dust core and trimmer in the coil unit is clearly marked with adjustment frequency. To align inter-valve circuits, first adjust CT5 (on gang), for maximum signal output on 29·7 mc—then

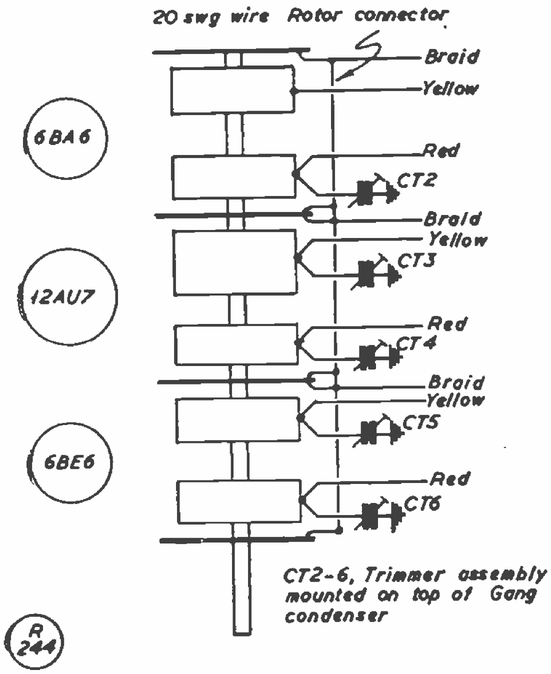


Fig. 2. Connections to the gang condenser and trimmers in the Geloso Rx Unit. The three braided unsleeved wires are taken to the three rotor leads on the condenser gang; all the individual rotor wires should be connected together by a 20 swg lead cut to the length of the gang. Mount the condenser assembly on the two feet provided, so that the ceramic insulating rod is "looking at" the spindle end.

set the iron-dust core marked "Intervalve—28 mc" for maximum signal output at 28 mc.

It may be necessary gradually to reduce the output from the signal generator and to repeat these last two adjustments several times to obtain linear sensitivity over the whole band. All other inter-valve iron-dust cores are peaked on each band at 27, 21, 14, 7 and 3·5 mc, also trimmer CT6 at 4·0 mc.

At this stage, with a low signal input, the 4·6 mc IF transformer should be peaked for maximum output from the receiver. To align the aerial circuits, set the aerial trimmer at about half-capacity and adjust iron-dust cores at 28, 27, 21, 14, 7 and 3·5 mc for maximum output in the receiver.

4·6 mc Break-Through

With some receivers, due to insufficient screening, break-through may occur from powerful commercial stations on or around 4·6 mc. This can be very much reduced, if not completely eliminated, by screening the input to the receiver. The fitting of a co-axial connector in place of terminals will usually make an improvement. The converter end of the co-axial connecting cable should have the minimum length of centre conductor unscreened where it is connected to the IF transformer.

It has been found from experience that most of any 4·6 mc break-through occurs around the receiver front-end and is not reduced when the aerial is removed from the converter, *i.e.*, it is due to direct pick up. Should the break-through be reduced when the aerial is removed, a 4·6 mc trap in the aerial feed will help. This can be made up on an iron-dust cored former, of 5/16th dia., close wound with 30 turns of 36 swg enamelled copper, in parallel with a 300 $\mu\mu$F condenser (shown in circuit diagram Fig. 1). The core should be adjusted for resonance of the tuned circuit (L1 and C1) at 4·6 mc.

Alternatively, the receiver can be tuned just off 4·6 mc to clear the interfering station, but

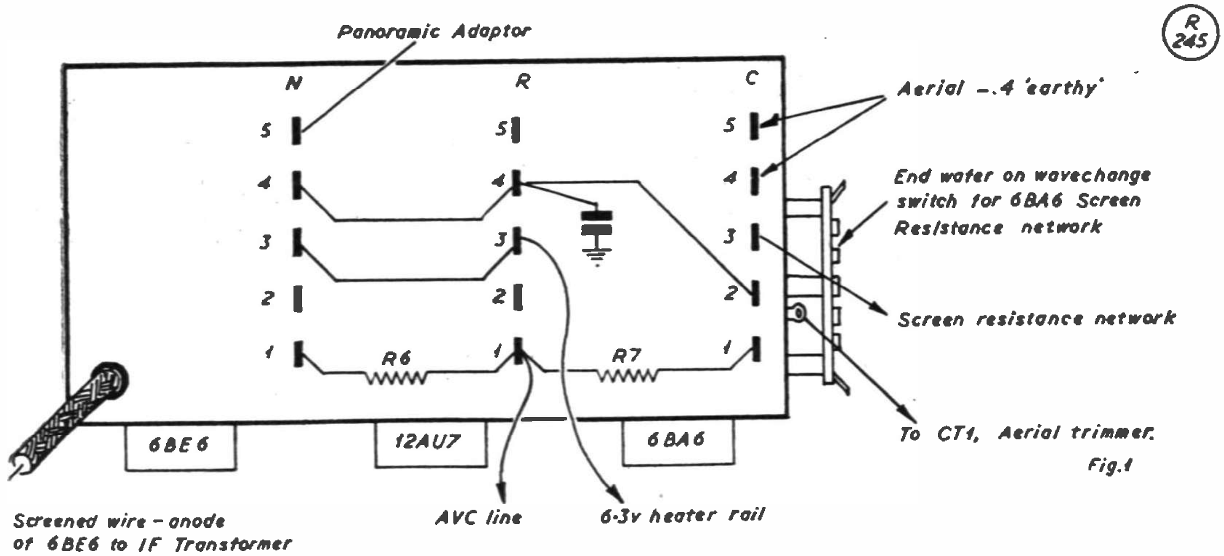


Fig. 3. Connections to the Geloso coil unit, which is pre-fabricated to the circuit shown in Fig. 1. All necessary information is given in the text, and inspection of the unit itself will make the assembly procedure clear.

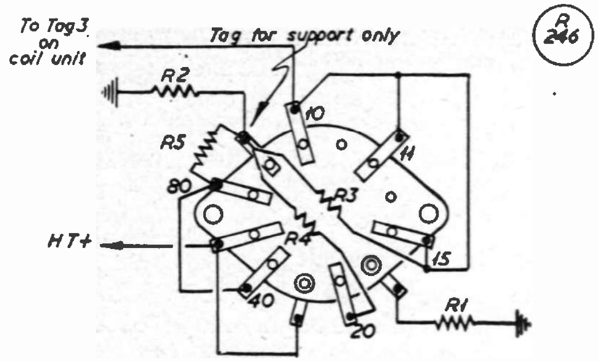


Fig. 4. Connections to the rear wafer of the wave-change switch. This is used to adjust the voltage on the screen of the 6BA6 RF amplifier so as to obtain sensitivity equal on all bands ; the highest voltage is taken on 28 mc.

this operation will cause the converter alignment to change. It may, however, be necessary only to re-align CT3 at 29·7 mc. If all bands are seriously affected, the alignment of the oscillator circuits as detailed must be carried out again. The IF transformer should also be peaked up at the new frequency.

Table of Values

Fig. 5. Circuit of the 6BE6 2nd Mixer

C1, C6 = .005 μF	R1, R6 = 2,200 ohms, ½-w.
C2, C3.	R2 = 22,000 ohms, ½-w.
C4 = .001 μF	R3 = 10,000 ohms, ½-w.
C5 = .0047 μF	R4 = 100 ohms
C7 = .01 μF	R5 = 330 ohms

OSCILLATOR COIL DATA

Grid —28 turns 28 swg enam. close-wound on 3/8-in. former, with 275 μμF silver-mica fixed capacity and 40 μμF air-spaced trimmer in parallel.

Feed-Back- 12 turns on earthy end of grid coil former, spaced 1/8-in. away; reverse connections if oscillation is not obtained.

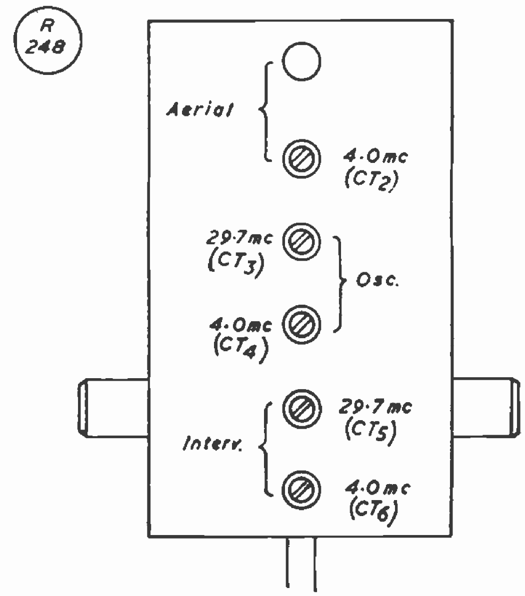


Fig. 6. Trimmer positions on the gang condenser, showing the frequencies at which alignment adjustments should be made.

Unit With Second Mixer

The unit may also be built directly into a complete receiver having a low second IF channel. The Geloso G207-DR uses 467 kc with a crystal-gate, but the choice of frequency can be left to the individual's requirements. It is, however, necessary to convert from 4·6 mc to the second IF desired. Fig. 5 gives a circuit which has proved quite satisfactory. The oscillator is injecting to the mixer at 5065 kc to produce a second IF of 465 kc—that is, 4600 kc + second IF. Instead of using a self-excited oscillator for the mixer it may be

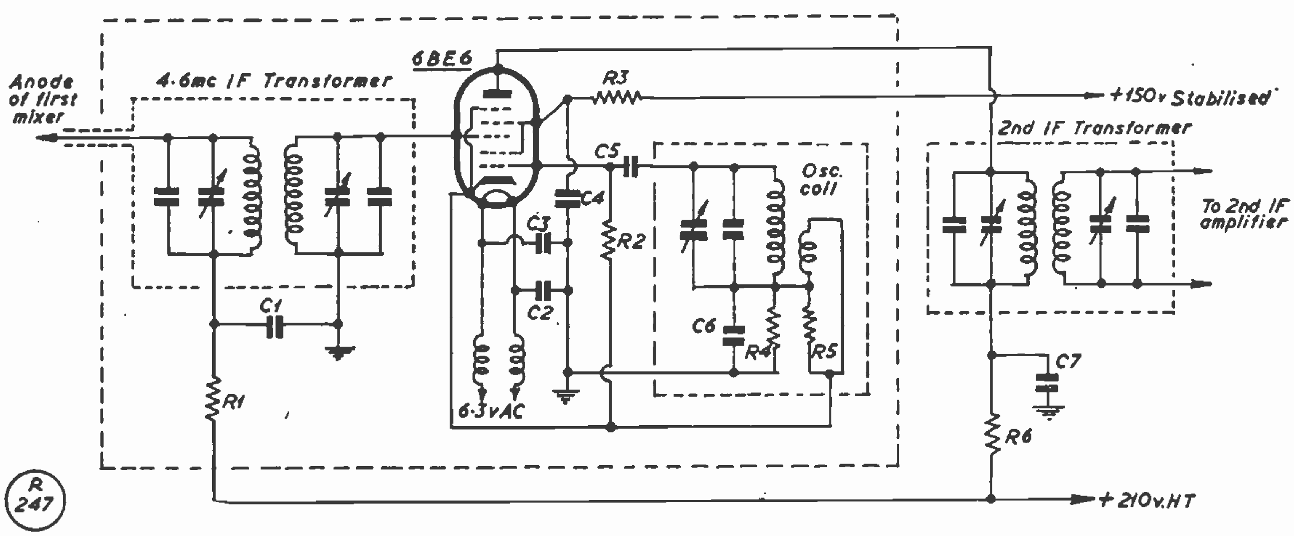
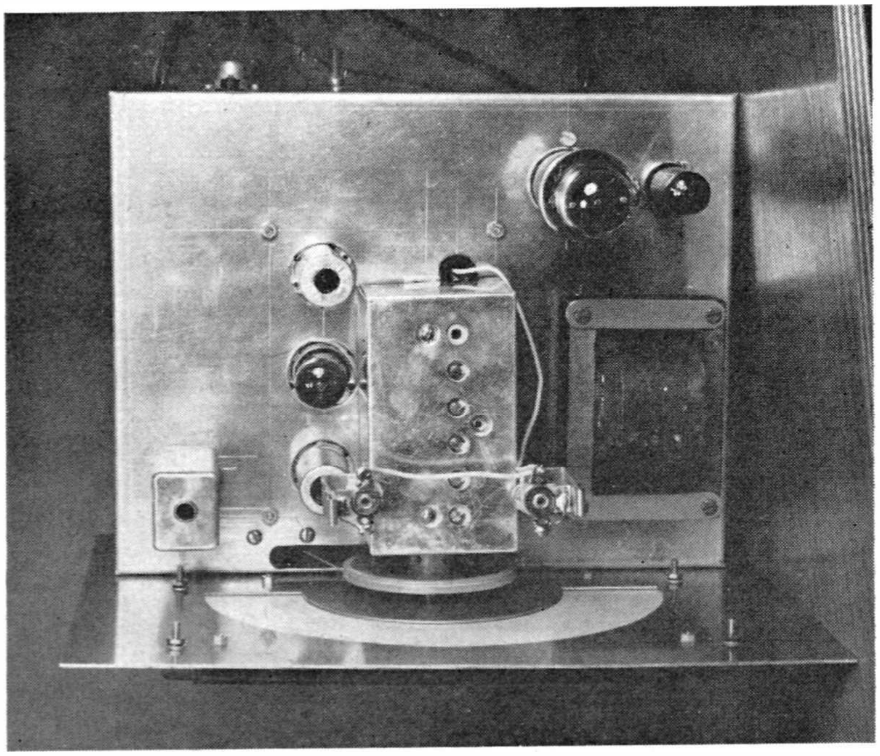


Fig. 5. With some receivers, it may be necessary to convert to a low-order IF. This is a suitable circuit for a second mixer, converting from 4.6 mc (the IF output of the Geloso Unit) to 465 kc ; the SEO could be replaced by a crystal, and the circuit sections should be screened as indicated. The 330-ohm resistor across the feed-back coil is there to damp this winding and can be varied in value to ensure optimum conversion. The correct operating condition for the 6BE6 is when 0.5 mA flows in the grid resistor R2 ; this should be checked when setting up the oscillator.

more convenient to utilise a crystal oscillator circuit with 5065 kc crystal (readily obtainable as "surplus"). It is advisable to have the oscillator on the high frequency side of the first IF channel. One IF transformer at 4·6 mc is sufficient—any additional gain should be obtained in the second IF amplifier. The selectivity of the complete receiver will depend entirely upon the characteristic of the second IF amplifier section.



How the Geloso Amateur Band Converter can be laid out behind the panel. Power supply components are at right, the 4.6 mc IF transformer lower left, and the tuning heart, as shown in Fig. 1, at the centre. The latter is factory-assembled, and needs only adjusting for correct frequency coverage. The chassis is 10 ins. by 8 ins. by 3 ins. deep.

Conclusion

This new Receiver Front End will improve the performance of any existing receiver. It combines the advantage of a double-conversion circuit with improved signal/noise figures and increased sensitivity. The band-spread facilities and smooth operation of the dial make it a pleasure to use.

The writer has been running the converter as described here with an HRO which has itself already undergone several modifications to improve performance on 10 metres. An S3 signal on the HRO, as indicated on the S-meter, becomes an S9 when fed through the converter, with a very noticeable improvement in signal-to-noise ratio and oscillator stability. At 4·6 mc, the HRO oscillator is very stable and produces a clean T9 beat on all transmissions which are PDC, but these qualities are not present on all receivers at 28 mc!

Already many operators with "surplus" receivers of one sort or another have taken advantage of the availability of this Front End Unit to give them performance at least equivalent to, if not better than, many modern communications receivers.

THE NEW "CALL BOOK"

The latest (Winter) issue of the international *Radio Amateur Call Book*, which we can supply from stock, is selling fast. The Full Edition, which runs to more than 600 pages and lists the call-sign/addresses of more than 200,000 licensed radio amateurs throughout the world, costs 37s. 6d., post free. Now in its 35th year of publication, the international *Call Book* remains an essential buy for everyone interested in DX operating, and the accumulation of QSL cards. As it sells throughout the world, and most people buy at least one edition every year (it is published quarterly, to keep up-to-date) you can be sure your contact will have your address if you can say "QTHR in C.B." And you can be sure of that if your own call-sign/address has been published in any issue of SHORT WAVE MAGAZINE up to and including October 1957, as we are U.K. agents for the *Call Book* and keep the G sections up-to-date as new call-signs or changes of address are notified to us. This is, of course, a free-of-charge service.

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As this issue concludes Vol. XV of SHORT WAVE MAGAZINE, each copy of the March issue, with which we commence our 16th year of publication, will have in it, as a free loose supplement, a complete Index to the current volume. Any reader who may not find an Index in his March issue copy can have one on request, with an s.a.e.