RECEIVER G 209-R

The number of radio amateurs actually active on the various frequeney bands allocated for their use is quite considerable. If one wants to maintain contacts with reasonable certainty and to achieve a high percentage of intelligibility, then it becomes necessary to have at one's disposal a receiver offering quite particular features.

In order to satisfy in a better way the requirements of radio amateur communication it is advantageous, therefore, that a recciver destined for this use, instead of having been derived from a project which had to oblige several different requirements, corresponds to it's fInal destination which, after all, is: To receive exclusively the si.gnals of ralio amateurs on those frequeney bands which are set aside for their use.

It is evident, therefore, that equipping such a receiver with other frequeney bands (e.g. the standard broadeasting band or the frequency bands locates between the radio amateur bands) could complicate the constructive solution and lead to the sacrifice of some particular advantage, which in consideration of the purpose of such a receiver does not seem to be justifled.

Derived from previous radio amateur communications recelvers produced by our house. the G 209-R was designed with the intention of offerina to the presently large pubAc of transmittin; amateurs a construction of professional scope, finished and complete, destined. however, to operate exclusively on the frequency bands allocated to their use.

When construetin.a this receíves, certain features of primary importance were kept under particular consideration, as e.g. the stability vs. time and the accuracy of the calibration, the sensítivity and the signal-to-noise ratio, the ability io clip amplitude modulated noise interference (noise limiting), the possibility of choosing the audio (beat) note at will (accomplished by means of a beat frequency oscillator operating at the íntermediate frequency), etc.

In addition to that, this receiver is capable of receiving amplitude modulateci signals and cm. signals as well as single-sicle-bancl-suppressed-carrier (s.s.b.) signals.

In the following chapter all principal technical features are listed (with figures).

TECHNICAL DETAILS

Frequeney Ranges: 10-meter band (28.0-29.8 Me.); 11-meter band (26.4-28.1 Me.); 15meter band (20.6-22.0 Me.); 20-meter band (13-8-14.6 Me.); 40-meter band (6.95-7.5 Me.); 80-meter band (35-4.0 Me.).

Tunin- Control: drive with 46: 1 step-down rati'i.

Accuracy of Frequeney Calibration: ± 10 kc. on the 89-, 40and 20-meter bands; ± 20 ke. on the 15, il- and 10-meter bands.

Frequeney vs. Time Stability: ± 0.5 : 1000 (Le. ± 500 cycles/Me.).

Intermediate Frequeneles: lst. I.f. = 4.6 Me; 2nd. I.f. = 467 ke.

Imagge Rejection: better than 50 db on ali frequeney ranges.

Intermediate Frequeney Rejection: better than 70 db.

Sensitivity: better than 1 μV for 1 watt al. cutput.

Signal-to-Nolse Ratio: at 1 μV better than 6 db.

Selectivity: 5 positions: Normal - Xtal 1 Xtal 2 - Xtal 3 -Xtal 4.

Reception of Amplitude Modulated Signals. Reception of Singie-Side-Band Signals (ss.b.):

amplifier and detector circuit for s.s.b. signals, upper as well as lower side-band, with carrier re-insertion.

Noise Limiter: effective with a.m. cm. or s.s.b. signals. Self-adjusting to various signal levels.

Signal-Strength Indicator: S-meter, calibrated in S-units f rom « S-1 » to « S-9 », « S-9 + 20 db » and « S-9 + 40 db ».

Audio Power Output: 2.5 watts.

Antenna Input: circult for balanced and unbalanced antenna input.

Output Circuit: 3.2 and 500 ohms, receptacle for headphones (any type).

Switches: main (power line) switch and « standby » switch.

Tube Line-Up: 12 tubes, 1 voltage stabilizer, 1 current stabilizer, 2 selentum rectifiers, 4 calibrated crystals of the following types and fuctions:

One 6BA6, r.f. amplifier; one 12AU7. oscillator-buffer: one 6BE6, mixer, 4.6 Mc. output: one 6BE6, mixer. 467 ke. output; one 12AU7. crystal oscillator for crystals at 5067 ke. and 4133 ke.; one 6BA6, il. amplifler; ene 6BA6, il. amplifier; one 6T8,

audio and as.c. detector, b.f.o.; one 6BE6, mixer for «SSB» signals; one 6AL5, noise limiter; one 12AX7, a.f. amplifier, crystal controlled calibration r.f. oscillator; one 6AQ5, final a.f. amplifier; one 0A2, voltage stabilizer; one 6H6, current stabilizer; one sclenium rectifier B300/C130, plate voltage supply; one selenium rectifier 8148, negative bias supply; one crystal 80131 (freq. 5967 kc); one erystal 80132 (freq. 4133 kc); one crystal 80133 (freq. 467 kc); one crystal 80134 (freq. 3500 kc).

Pawer Line Requirements: 110-125-140-160-220 volts a.c., 50 to 60 cycles. Power consumption at 160 volts/50 cycles = 90 watts.

Physical Dimensions: 20 in. wide, 10 in. high, 10 1/4 in. deep.

Frant Panel Dimension: (for rack mounting) 19 by 8 3/4 in.

Shipping Wei,-ht: incl. tubes 12.5 kgs.

DESCRIPTION OF CIRCUIT

Frequency Range

The receiver covers 6 frequeney bands which c,gincide with the frequency ranges allocated to the use of dradio amateurs. A certain margin is added at the ands of each band in order to facilitate easy and safe coverage of the interior of the band as well as achievement of calibration. The dial which shows clearly visible frequency and band indications also provides a 1o3ging scale for referenee purposes. The linearity of the various frequency calibrations displayed on the dial is remarkable; added to this is a smoothly working reduetion drive which provides the necessary and, therefore, important ease of tuning-in the different stations. In addition to that the dial is indireetly illuminated, thus reperesenting another valuable, advantageous feature.

The radio amateur frequeney ranges are covered as follows:

10-meter band	. . . . . 29.8 to 28.0	Me.
11-meter band	. . . . . 28.1 to 26.4	Me.
15 meter band	. . . . . 22.0 to 20,6	Me.
20-meter band	. . . . . 14.6 to 13.8	Me.

40-meter band . . . . .7.5 to 6.95 Me.

80-meter band . . . . . 4.0 to 3.5 Me.

Sensitivity - Selectivity - Stabffity

The sensitivity of the receiver was brought to a very high valu-.: A r.f. signal of 1 pV at the imput Uminals of the receiver (impedance 390 ohms) provides 1 watt of audio output, at a signal-to-noise ratio of better than 6 db. These results were achieved only after intense study of ali problems concerning receiver Input circuits, i.e. the junction of the antenna circuit and the Ist. r.f. amplifier tube. Still higher sensitivity inevitably would have resulted in an increased response to thermal agitation noises particular to the input circuit of the Ist. r.f. arnplifier tube. The image rejection is better than 50 db for all frequency bands covered, whereas the rejection of the Ist. i.f. is better than 70 db. The selectivity of the receiver may be adjusted by means of a selector switch in 5 steps, 4 of which employ a crystal filter circuit; insertion of this crystal filter circuit does not cause any loss in receiver gain, with the exeption of the one position which provides the highest selectivity, but, here, also only to a negligible degree (Pos. No. 4).
The G209-R employs double frequency conversion. The advantage of this system consists of combining superior image rejection quali ties with a very high order of i.f. selectivity.

Utilization of a very high lst. I.f. Increases the differenee between the wanted and the image sígnal frequencies; one stage of r.f. amplification, with the circuits allocated Io this stage, supplies ample attenuation of the image signal, Le. for ali praetical purposes causes it to disappear entirely. The Ist i.f. is in the order of 4,6 Me.

I.F. selectivity is obtained by means of a crystal filter; the circuits employed in conjunetion with this filter use - in comparison with the already mentioned i.f. of 4.6 Me. a frequency of much lower value (467 ke.) which permits higher amplification as well as much better selectivity.

The stability of the receiver ís derived - in addition to the particularly rigid and solid mechanical construction - from the consideratíons devoted to the electrical stability of the circuits concerned, especially those of the two frequency conversion oscillators. It should be pointed out that the second oscillator is stabilized by means of cristal.

The circuit

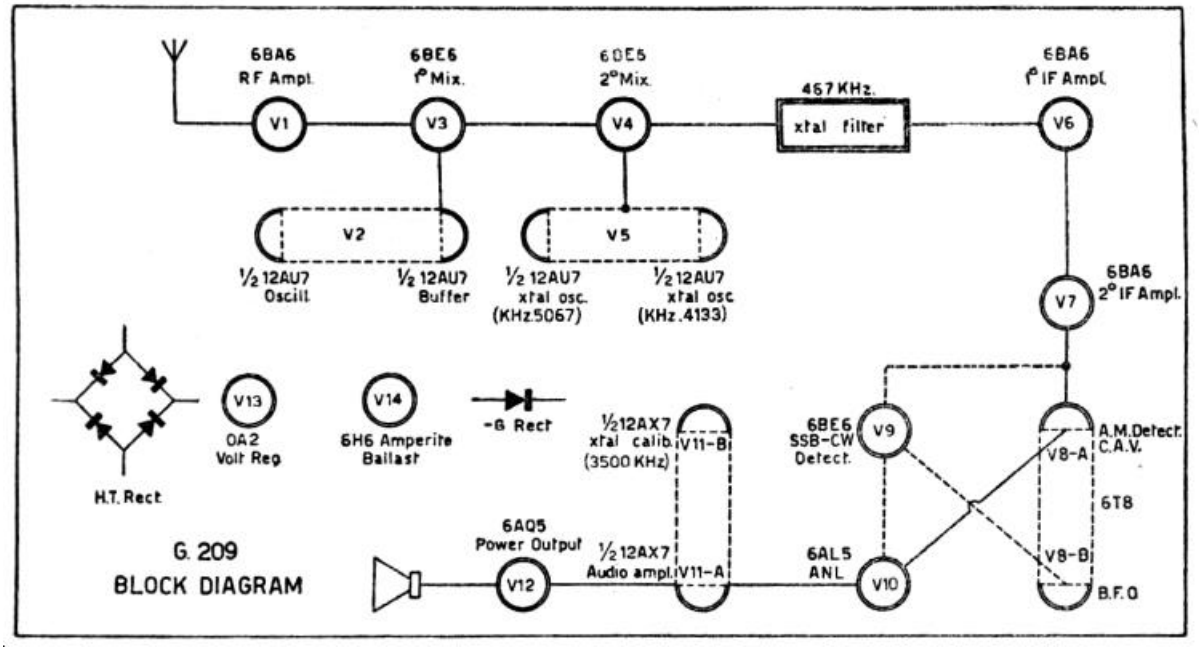
Fig. 1 shows a block diagram of the recciver circuit which may serve to explain the varlous tube funetions.

The first three tubes form a complete unit In itself, combining the Input and local oscillator circuits (first frequency conversion). Mechanically this unit represents one of the r.f. units of our production, incorporating also the tubes. The tuning **condenser and the** reduetion pulley drive of the dial are seperate and may be mounted independently from the unit.

The second converter tube, too, together with an i.f. input transformer (4.6 Me.), the oscillator circuit for the second conversion, and a twin-triode crystal oscillator, is mounted on a small sub-chassis fastened to tre main chassis. The second converter stage Is follo wed by two i.f. amplifier stages (467 ke.); the erystal filter may be inserted at will between the second converter stage mentioned above and the first of these two tubes. A selector switch varies in different de.arees the selectivity derived from the crystal effect; indications marked on the front panel of the set co.rrespond to the various positions of the selector switch.

Connected to the plate lead of the second i.f. amplifier tube is an measuring instrument (« S-meter ») which suitably calibrated indicates the intensity of the received signal. The circuit employed is a bridge circuit. An increase of intensity of the reccived signal causes a corresponding increase of meter current. Both branches of the bridge circuit are in balance, and there is a potentioineter on the receiver chassis (see page 51) for semifixed adjustment, which permits to set the instrument to read «zero». Normally the «zero» adjustment; is effeeted by means of this potentiorneter, without a signal tuned in.

The tube which follows the second il. amplifier (Le. V-8) consists of two diodes and one triode in one envelope; the first diode serves to detect amplitude modulated signals, and the second one rectifles the signal in order to obtain the control voltage for the automatic-volume-control circuit, -which is of the « delayed » variety. Directly connected to the funetion of the detector diode is another tube (V-10) which provides the noise limiter diGde ls another tube (V-10) which provides the noise limiter action. The latter is effective for « phone » and c.w. reception as well as for signal-side-band (s.s.b.) reception and is at the same time of the self-adjusting type.



This self-adjustment feature enables the limiter to automatically adjust itself to the various signal levels.
The tíme constants of the resistors and capacitors employed in the circuit were selected in such a way as to prevent counteraction to rapid changes o the incoming signal itself; an external threshold control permits adjustment of the elipper aetion from a minimum ment of the clipper action.

After passing the noise limiter circuit, the use of which is optional, the signal is amplified by means of a triode and consecutively a power tetrode. To the circuits of these two amplifier stages - the first one represented by V-11 (a triode section of a twin-triode tube), and the second one by V-12 - are connected in the usual way volume and tone controls.

The remaining section (a triode) of V-8 is employed as an oscillator operating at or close to the the second i.f. (467 ke.). The oscillator circuit of this tube Is coupled by means of a condenser of small. capacity to the grid of the mixer-rectifier for c.w. and s.s.b..

If the oscillation of triode V-8 occurs at exactly the i.f. (467 kc.), no beat-note results («zero-beat») and unmodulated telegraphy signals (c.w.) are not audible In form of a tone, just as if there were no oscillations produced by V-8; it is sufficient, however, to detune the oscillator V-8 by a few hundred cycles in order to produce an audible beatnote, and to make reception of unmodulated signals possible. A control at the front panel permits the variation of the oscillator frequeney and consequently a variation of the beat-note, by which it is possible to obtain an audio selectivity effect permitting the reception of a given signal at the presence of other interfering ones. All constructive measures were taken to keep the preselected beat-note from varying during operation, to confine the oscillations of v-8 to the very circuits where they belong, and, in addition, to ascer~ that their intensity is adequate and dimensioned in such a way as not to attenuate the intensity of a received signal.

In the case of s.s.b. reception the signal produced by V-8 serves to reinsert the carrier of the recelved station, which is suppressed by the action of the transmitter, and to make this type of signals intelligible which otherwise would not be understandable. The b.f.o. may be switched on or off by means of a switch (at the front panel) which serves to apply the plate voltage of the tube at will.

The possibility of receiving also the transmissions of those amateurs - their number is continuously increasing - which apply the system of s.s.b. transmission, renders the G209-R really complete and of most modem conception.

A selenium rectifier supplies the common plate voltage, whereas another rectifier of the same type provides the negative bias voltage.

Another tube, an Amperite 6H6, stabilizes the filament current of V-8 and of the oscillator section of V-2. The power transformer is equipped with a primary winding which permits adaption to all power line voltages (110 to 220 volts), and a 0A2 (V-13) stabilizes the plate voltage of the b.f.o. (V-8), the r.f. oscillator and the mixer-detector (V-9).

The illustrations which we have provided show in a manifold way the nomerous constructive particularities as well as the general aspect of the receiver, built in a typically commercial, practical, sturdy and attractive way.

The development of the G209-R contributed to the necessity of providing certain subassembled section which, precisely, are the tunerunit and the sub-chassis of the second i.f. converter. The tuner-unit will be described in exhaustive details, especially pertaining to its calibration, in the following pages.

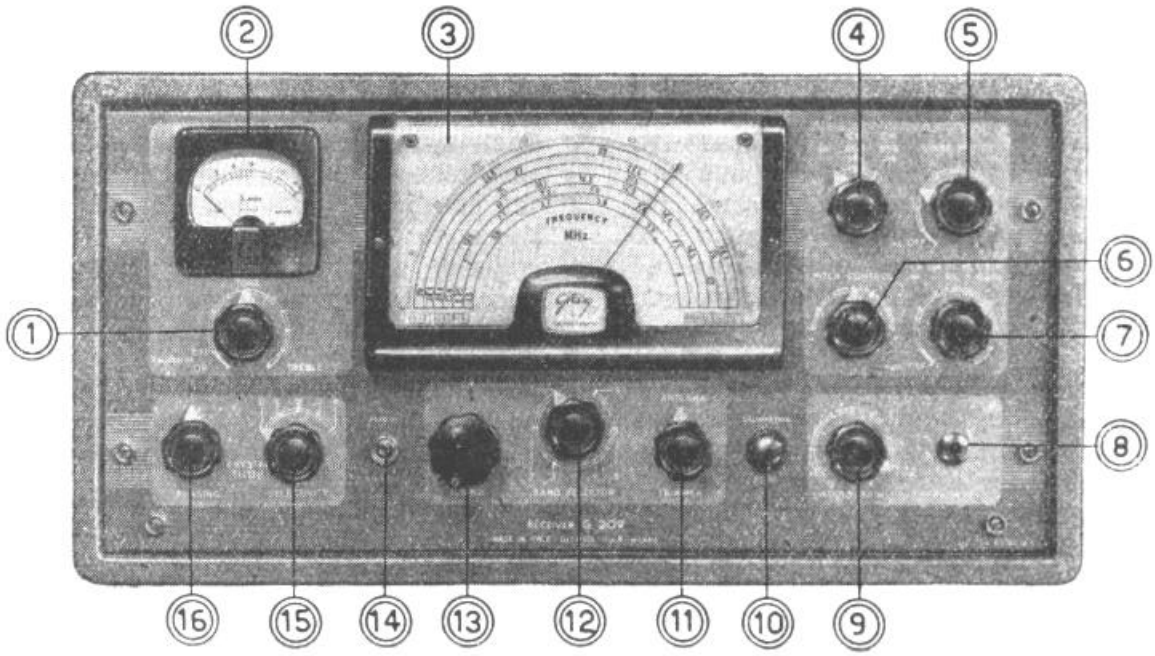
INSTRUCTIONS FOR USE

Installation - The recelver is mounted in a metal cabinet, resting on four rubber feet. This way the receiver is kept above the table surface. allowing for a favorable ar circulation. To avoid detrimental effects of microphonie feed-back, the external speaker must not at all be placed on top of the receiver cabinet.

Power Line Requirements - The recelver must be conneeted to a power line (a.c.) of voltages 110 and 220 volts (50 to 60 cycles). Ascertain, that the voltage indicated at the voltage selector switch corresponds to the voltage of the power line: if this is not the case, adjust the voltage selector switch correspondingly.

Speaker - The speaker is conneeted to terminals *No. 1* and *No.* 2 of the three-terminalstrip at the rear apron of the receiver. The impedance of the moving coil must be appr. 3.2 ohms. Il a speaker with a 500-ohms matching transformer is available, the conneetion is made to terminals *No. 1* and *No.* 3 of the same terminal strip.

Headphones - Headphones are conneeted at the front panel by means of a jack-plug which is inserted into a jack marked « Phones ». Any impedance should give good results; it is suggested, however, to provide an internal impedance of appr. 2000 ohms. Insertion of the plug cuts off the speaker if the latter is conneeted to terminal No. 1 and *No.* 2 of the above mentioned terminal strip.



1 Dial calibration and tone control.
2 Meter instrument of slqnal level (« S.meter
3 Tuning dial.
4 Switch seIector of recePtIon type (AM CW/SSBL -CW/SSBU).
5 Nolse limiter control.
6 Pi!ch and SSB control.
7 Sensitivity control.
8 Plug for headphone conneetton.
9 Volume control.
10 Reset calibrator.
11 Antenna trimmer.
12 Band selector swítch.
13 Tuning control.
14 SwItch « Recelve/Stand-by
15 Selectivity control.
16 Phasing control

Antenna - A connector for coaxial cables is provided as an antenna terminal; a twin-terminal-strip serves to properly connect antennas of the twin-lead variety. If an un-balanced antenna is used, terminaI No. 2 is conneeted to ground. The antenna trimmer control permits adjustment of the input circuits to the various antenny types.

Ground - In most cases a good ground connestion for the recelver, connected to the above mentioned termínal at the rear apron of the receiver, is indispensable.

Remote Controi - At the rear apron of the receiver, above the speaker terminal strip, there is a twin-terminal-strip which is wired in parallel to the « Receive/Stand-By » switch at the front nale. In order to control the receiver remotely, connect to terminals No. 1 and No. 2 a switch or a relay controlled by the transmitter, and push the handIe of the «Receive/Stand-By» switch down into the position « Stand-By ». This way the receivér may be switched from «Stand-By» to «Receive» by remote control.

FUNCTION OF THE RECIVER

Each control of the receiver G209-P. serves a well established purpose. Optimurn results of the equipment may be achieved only after a thorough familiarization with the use of each control, and in perfect knowledge of the changes which each control causes to the characteristics of the receiver.

RECEPTION OF AM SIGNALS

In order to receive amplitude modulated stations (a.m.) with optimum results it is suggested to use the below mentioned controls.

Volume Control - This control, marked at the front panel «Audio Gain» serves to adjust the sound level fed to the headphones or speaker.

«Recelve - Sand-by» Switch - This switch controls the plate voltage of each tube and serves to make the receiver ready for use during transmission or «stand-by» periods. The receiver is made ready for use if the swítch is in the «stand-by» position. The receiver is in funetion if the switch is in the opoosite position: «Receive».

Tone Control - This control permits the attenuation of the higher frequencies of the audio range; in its normal position this control is turned to the right (clockfise). Turning it to the left attenuates the higher frequencies. In the extreme left hand position it trips the switch which actuates one triode section of V-11, which oscillates at 3,5 Me., making it possíble to calibrate the receiver dial in conjunction with the calibration compensator (dial reset) displayed at the front panel.

Sensitivity Control - This control, marked «Power R. F. Gain» at the front panel, cheeks the sensitivtiy of the receiver and affects only the r.f. amplifier stage when in the position . a.m. », whereas it simultaneously affects the two i.f. amplifier stages when in the position « c.w. - s.s.b. ». In this latter position the measuring instrument (S-meter) is cut off, whereas it is in funetion in the posiLion « a.m. ». In order to obtain correct reading3 of the S-meter, it is necesary that the contro'. is adjusted to the position províding maximum sensitivity (turned all the way to the right). Turning this control all the way is tripped hich tums the receiver off.

«A.M. - C.W./S.S.B.» Selector Switch - This switch which serves to select the type of signals to be received, operates as folows:

lst. position «A.M.»: Telephony with amplitude modulation.

2nd. position « C.W. /S.S.B. (U.S.B.) »: Telegraphy with unmodulated continuous waves and s.s,b. signals with carríer re-insertion for upper-side-band operation.

3rd. position « C.W./S.S.B. (L.S.B.) »: Telegra' phy with unmodulated continuous waves and s.s.b. signals with carríer re-insertion for lower-side-band operation.

Noise Limiter - In the position « NL-Off » thís circuits is cut off, whereas it, is in funetion and varies its efficieney from minimum to maxirnum after the switch has elosed, during its entìre rotatìon in a clockwise sense. It may be aetivated for whatever kind of signal is being received, and the circuit of the tube used for this purpose, a 6AL5, is automatically ad iusted to correspond to the position of the tube used for this purpose. a 6AL5, is automatically adjusted to correspond to the position of the « A.M.-C.W./S.S.B. » selector switch.

Band Selector Switch - This selector switch, marked « Band Selector », switches the r.f. tuning unlts to the desired frequeney range. Its 6 positions correspond to the 6 frequency ranges marked on the receiver diaL

Tuning Control - This control, marked « Tuning », serves so select the desired recelving frequeney within the frequency range predetermined by the « Band Selector » switch. To facilitate accurate tuning it employs a high step-down ratio pulley drive. For large frequeney changes the handle on the knob may be utilized.

Dial Reset - This knob controls a small trimmer condenser which is wired in parallel to the oscillator section of the main tuning condenser. It permits the re-calibration of the lower band ends on the frequency ranges 1-3-4-5-6. On frequeney range 2 the calibration takes place at 28.0 Me.

Te calibrate the dial, it is necessary to adjust the receiver for cm. receptìon, to turn the pítch control of the b.f.o. to its center position, and to turn the tone control ali the way to'the left, in order to close its switch. This starts the crystal calibrator. Now, swing the dial pointer to the lower end of the band coneerned (i.e. to 28.0, 21.0, 14.0, 7.0 or 3.5 Mc.) and slowly turn the knob marked «Dial Reset » until « zero-beat » is obtained. This way the lower end of the selected frequeney band is re-calibrated.

Crystal Filter - It is equipped with two controls, one marked «Phasing» and the other one «Selectivity». The latter consists of a 5-position selector switch with the markings « 0 » to « 4 ». In position « 0 » the filter is cut off, and the receiver has its largest band width; in the position « 1-2-3-4 » the crystal filter is switched on and provides four different steps of selectivity from very broad (position «l») to very small (position «4»). Position «1» and «2» are preferably used f or the reception of « phone » signals, whereas position «3» is used for s.s.b. signals, and « 4 » be used to advantage i or the reception of c.w. signals.

Use of the Phasing Control - This control permits discriminatìon of interfering sìgnals even in elose proximíty of wanted sígnals. For single-signal reception put the crystal filter into action by settíng the selectivity selector swìtch to one of the positions « 2 » to « 4 »; tune in a strong signal, preferably one of a commercial station. Swinging the dial slowly across the received signal, two closely adjacent point of reception will be noticéd, one stronger than the other.

Aj ust the « phasing » control until the weaker signal disappears or becomes almost inaudible. Once adjusted, the « phasing » control does not require any additional adijustment, excluding the case that suppression of an interf ering beat note of diff erent pitch is desired.

C.W. RECEPTION

For perfect c.w. reception the following controls of the receiver must be adjusted: Volume control, Tone control, noise limiter and selector switch; their operation is identical to the one described f or « phone » reception. The selector switch controlling the mode of reception is brought into one of the two positions marked « CM. ».

The sensitivity control (« Power R.P. Gain ») remains in action. The signal strength indicator (« S-meter ») is cut off.

Sensitivity Control - This control serves to adjust the sensitivity by varying the bìas voltage applied to the single r.f. amplifier stage in case of a.m. reception, and of the r.f. and the i.f. amplifier stages in case of c.w. and s.s.b. reception. It must be adjusted in such a way that the incoming signal does not cause any overloading of the receiver.

C.W. Pitch Controi - This control varies the frequency of **the b.f.o. and thus the beat note** of the received signal. After tuning the recelver to the desìred signal, it should beadjusted to give the beat note which is most convenient to the operator and yields the best performance.

RECEPTION OF S.S.B. STATIONS

In order to receive amplitude modulated stations with one side band suppressed (s.s.b.), it is necessary at first to tune the receiver accurately to the station, keeping the selector switch controllin.g the mode of reception in the a.m. position. This way the modulation of the station being received will be unintelligible, and the signal strenght indicator («Smeter») will flicker repeatedly following the rhythm ci the modulation. After the station is tuned in, the- switch is advanced to the position s.s.b.(U.s.b.), the volume control (« Audio Gain ») is turned almost all the way to the maxiinum position, and the intensity of the signal is adjusted by means of the sensitivíty control (« Power R.R Gain ») in such a way as to render the reception fairly weak and well under the saturation level. In this positíon, adjusting the «Pitch Control » very slowly and with utrnost care, a point will be reached where the modulation becimes clearly undestandable.

The majority of radio amateurs emits singleside-band signals with suppressed upper side band, and in this case the rnodulation will be understandable with the control set to the position « U.S.B. ». In some cases, there may also be transmissions with the lower side band suppressed, and in this case understandability will be achieved with the control in the position «L.S.B.». Especially novices should take particular notice of this kind of reception which in order to achieve good results at first requires much patience and the achievement of a certain experience in this mode of reception. In order to achíeve better understandability it is necessary to adjust the chystal filter to position «3» or «4».

Por transmissions on the 4- and 7-Me. band amateurs usually employ the lower band, whereas they use the upper band in the 14-, 21- and 28-Mc. band.

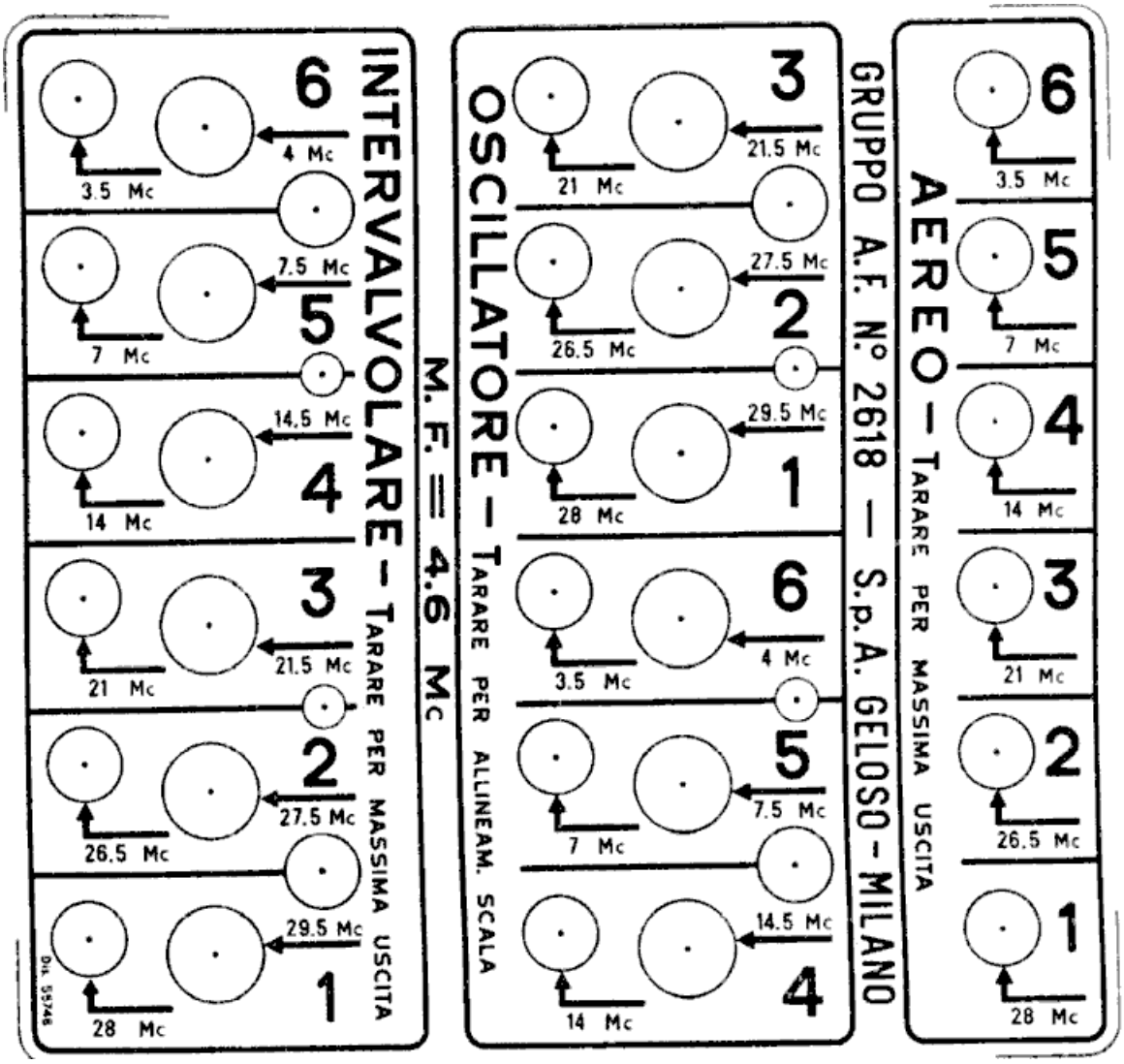
ADIUSTMENT OF THE RECEIVER

The initial adjustment of the receiver G-209 may be subdivided into two distinct operations.

The fìrst operation concerns the adjustment of the two i.f. channels, the oscillator of the 2nd. conterter stage (467 ke.), and the adjustment of the beat note for the reception of unniodulated c.w.

The second operation **regards the adjustment** of the r.f. tuning unit, for which it is necessary to achieve exact alignment of the circuits tuned to the various frequency bands In conjunction with an exact correspondence to the indications of the dial.

Adjustment must not be performed before a warming-up period of at least 15 minutes In order that the components of the receiver may assume their normal operating temperature. Por all operations the following order of proceding must be observed.



First Phase of Adiustment

1. **467 ke. I.F. Channel** - Connect the signal generator (modulated 30 %) between the control grid of the 6BE6 (VA = second converter) and ground. Connect and output voltmeter in parallel to the speaker or to terminals « 1 » and « 3 » of the output terminal strip. Vary the frequeney of the signal generator, keeping ali controls in their maximum position: The « phasing » control in its starting position. and the selectivity control in position « 4 », in order to find a clean resonance on a frequeney in the vicinity of 467 kc. The frequency thus determined is the frequency of the crystal, and the i.f. channel must be aligned to this frequeney, first adjusting the selectivity control to its «zero» position, and then adjusting the trimmers of PI 467 kC transformers for maximum output. This done, adjust the signal generator to a frequeney 4 ke. higher than the crystal frequeney, and adjust the trimmer « b » in such a way as to obtain maximum output, after turning the selectivity control to its position « 1 ».
2. **Adjustment of the B.F.O.** - Prepare the signal generator as outlined for step 1 (above). Turn the switch concerned to the position « QW. », eliminate the modulatìon of the signal generator, place the « C.W. Pitch Control » into its center position, and adjust trimmer « N » in order to obtaìn « zero-beat ».

Second Phase of Adiustinent

1. 4,6 Mc. I.F. Channel - For this phase of the operation it is necessary before all to adjust the oscillation amplitude of the crystals on 5067 kc. and 4133 kc. Connect a vacuum tube voltrneter with a r.f. probe to pin No. 1 of the second mixer (6BE6, VA), set the selector switch to a.m. and adjust the top core of transformer 708 until a reading of 3 volts r.f. is obtained.

This adjustment is made on the flank of the curve which is not steep. If a vacuum tube voltmeter with a r.f. probe is not available, connect the meter terminals of the vacuum tube voltmeter to pin No. 1 of V-4, and read the d.c. voltage which must be in the order of-3.5 volts in reference to ground. Turn the selector switch to be positíon S.S.B./L.S.B. and, after stopping the b.f.o. by connecting pin No. 8 of V-8 to ground, adjust the lower core of the transformer 708 in order to obtain a r.f. reading of 3 volts or a d.c. reading of - 3.5 volts. During this and for all the following operations the volume and the sensitivity control are kept in their maximum position; the noise limiter must be switched off.

G 209-R - TABELLA DELLE TENSIONI - VOLTAGE MEASUREMENTS

in Volt CC (salvo indicazione diversa) misurate con voltmetro 20.000 Ω/V

VALVOLA TUBE	PIEDINI - PINS									
	1	2	3	4	5	6	7	8	9	NOTE
6BA6	– 0,8*	—	—	5,9 CA	245	85 (1)	0,8	—	—	
12AU7	150	– 4*	3,2	5,9 CA	5,9 CA	75	– 4* (2)	—	—	
6BE6	– 0,2*	1,6	—	5,9 CA	245	90	– 1*	—	—	
6BE6	– 2*	—	5,9 CA	—	240	70	– 1,3*	—	—	
12AU7	32,5	– 11,8*	—	—	—	35	– 12,4*	—	5,9	
6BA6	– 1,3*	—	5,9 CA	—	215	70	—	—	—	
6BA6	– 1,3*	—	5,9 CA	—	232	80	—	—	—	
6T8	– 0,75*	– 1,4*	—	5,9 CA	—	—	—	– 1	—	(3)
6BE6	– 0,6	—	5,9 CA	—	—	—	—	—	—	(4)
6AL5	50	50	—	—	50	—	50	—	—	(5)
12AX7	170	– 13,5*	—	3,1	3,1	125	—	1,35	3,1	(6)
6AQ5	—	9,8	5,9 CA	—	225	235	—	—	—	
OA2	150	—	—	—	—	150	—	—	—	
6H6	—	—	13, CA	—	—	5,9 CA	245	245	—	

1° Condensatore elettrol.: 260 V CC.

2° Condensatore elettrol.: 245 V CC.

3° Condensatore elettrolit.: 195 V CC.

Polarizzazione negativa max.: — 40 V CC (1° Cond. elettrol.); — 38 V CC (2° Cond. elettrol.).

Polarizzazione negativa base: — 1,75 V CC.

(1) Per la gamma 20 m = 30 V; per la gamma 40 m = 20 V; per la gamma 80 m = 15 V.

(2) Varia a seconda della gamma.

(3) Valori in tabella per « beat » escluso. Col « beat » incluso si ha: pied. 9 = 105 V; pied. 8 = 3,4* V.

(4) Valori in tabella per il « beat » escluso. Col « beat » incluso si ha: pied. 1 = 1 V; pied. 2 = —; pied. 3 = 5,9 V CA; pied. 4 = —; pied. 5 = 60 V; pied. 6 = 40 V; pied. 7 = — 0,8* V.

(5) Valori in tabella per il « Noise Limiter » escluso. Col N.L. incluso: tutti i piedini assumono valore nullo di tensione.

(6) Le tensioni ai piedini 6 - 7 - 8 sono presenti col « calibrator » incluso.

* Tutti i valori accompagnati da asterisco sono misurati con voltmetro a valvola.

Connect the signal generator between the control grid of the first converter tube (6BE6, V-2) and ground. The signal generator is adjusted to give audible output when tuned to appr. 4.6 Me. Turn the adjustment screws of transformer 701-A te obtain maximum output.

Now, connect the output of the sìgnal generator to the antenna terminal, increase the signal level until an appreciable reading of the output voltmeter is obtained; adjust the screwdriver control of the 4.6-Mc. wave trap, which is accessible at the rear apron of the chassis, immediately above the ground terminal, in order to achieve the lowest possible output. The pointer of the antenna trimmer control must point te the referenee point of the scale (vertical position).

ASSENILING THE RECEIVER

The assembly of the receiver 0-209, as, a matter of fact, is a somewhat tedíous job. It is quite evident that the construction of a piece of equipment of such complex circuitry and parts arrangement cannot be casily achieved.

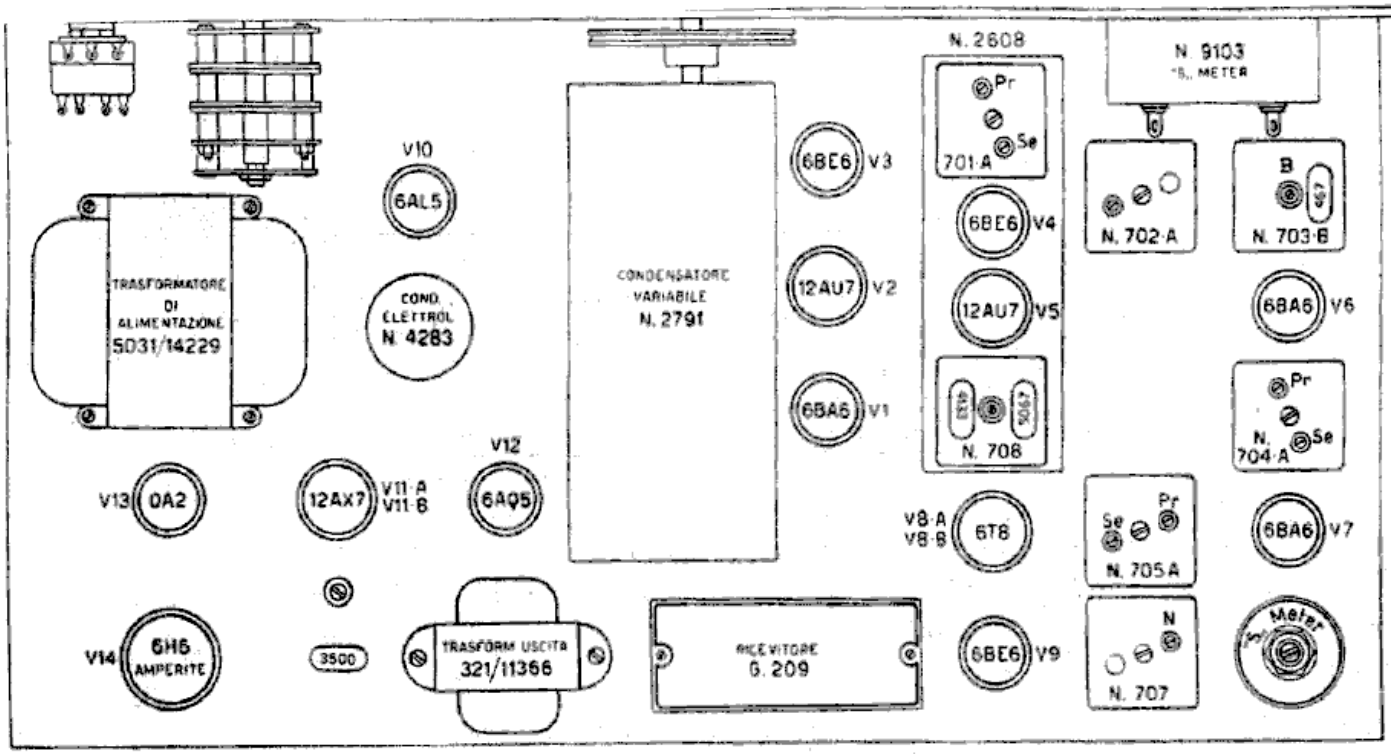
We consider it te be our duty, therefore, to mention before-hand that a constructive task of this nature should be attempted only by persons which successfully have constructed and assembled other recéivers, the more complicated the better,

While emphasizìng the delicacy and the comparative intricacy of the assembly, it seems well worthwile to call te the attention of whoever may approach this problem, that these very circumstances require the utmost of caution, intense study of the circuits as well as considerable patienee and leisure. It is a good idea te divide the whole procedure into several well separated phases, tackling one at a time. All steps **must be taked** in order to ascertain the progress of the assembly, free from all mistakes.

The understandable difficulties just mentioned are alleviated, however, by following a technique which GELOSO applies to all her kits: Chassis and front panel are factory drilled with maximum precision (thereby eliminating losses of time and other Inconveniences of the assembling procedure); Prealigned and pre-calibrated sub~emblies for stages of special intricacy C.e. r.f. tuning unit, i.f. transformers and in this case a second converter chassis); and finally numerous illustrations and photographs. Here, now, is the pattern which should be followed in order to simplif y the task and to insure a good job well done.

Sort out all the material, subdiving it Into various groups of similar items: Resistors, condensers, hardware, transformers etc. This facilitates easy access and control of the material and simplifles the search of components during the assembly.

As with all assembly jobs it is a matter of convenienee to fasten to the chassis those parts first which weigh the least, exempting the tuning condenser and the r.f. tuning unit. Following this pattern, mount all tube sockets, plugs, fuse holder, voltage selector switch, drive shaft and antenna filter as well as all grounds lugs, the position of which is indicated in the contruetion drawingS. Following that, in an order which must. not be striettly followed, the soldering lug strips, the selfinductance 321/2,5 the electrolytie condensers, the various il. transformers, the second converter chassis, and finally the potentiometer for the signal strength indicator « zeri » adj ustment find their places.



Besides that, before or after the operations just mentioned, the front panel must be pre
assembled by fastening to it all parts and controls, aft6r which the front panel itself is secured to the receiver chassis; tlùs last step is performed only after all connections within the chassis itself are in place and it becomes necessary to connect those ending at controls fastened to the front paneL At the same time, the r.f. tuning unit and the variable condenser must be mounted.

When wiring the receiver, the longest and most cumbersome leads are put in place flrst, i.e. all power transformer leads or the main «cable tree», ramifications of which are clearly indicated in the illustrations, etc.

It seems hardly necessary to mention the trick of chalking off in the circuit or the construction diagram all connections by means of colored pencil marks as soon as they are performed. This makes it possible to recognize at one glance all whìch still has to be done and, when cheeking, what otherwise night have been forgotten. In the same way all the parts Indicated in the parts list should be checked off as soon as they are mounted.

As was previously mentioned, the number of connections to be made is qulte large, causing a considerable complexity and, thereby, an increased probability of errors. This makes it imperative that a thorough examination be carried out before any attempt ls made to cheek the equipment under voltage.

These final checks must be carried out in a logical sequence: First without tubes (a.c. circuits only), then with ali tubes and, preferably, to begin with, slightly reduced voltages which result, if the voltage selector switch is adjusted to the next higher voltage than actually presented by the power line.

Before the alignment is attempted (see notes in preceding chapter) all voltages must be checked and ascertained to equal the values indicated in the table « within a 15 % limit). The anomalies showing up durin this examination are the best guides to those sections of the receiver, which evidently contain an error of assembly or another source of trouble.