PHILIPS

TELEVISION SERVICE GENERATOR

GM 2891/50 - GM 2891/55
GM 2891/60

(For serial numbers with code letter F)

66 400 61.1-10 15/458

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DIRECTIONS FOR USE

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CONTENTS

In case of correspondence regarding this apparatus, always refer to the type and serial numbers ; these are to be found on the type plate at the back of the apparatus.

Where in these directions for use the properties are expressed in numerical values with statement of tolerances, these are guaranteed values. The data without statement of tolerances are only given for guidance and apply to the properties of an average apparatus.

INTRODUCTION

Owing to its excellent features the television service generator GM 2891 is a particularly practical aid for carrying out all the necessary adjustments, repairs and measurements on a TV receiver, independently of the transmission times of the TV broadcasting stations. The apparatus is especially useful for servicing purposes, since its small dimensions and light weight make it easily transportable. As the apparatus, with its convenient front panel, can be easily operated, all tests on a TV receiver can be carried out quickly and with great accuracy.

The GM 2891 is, moreover, a versatile apparatus since it is suitable for testing the conventional type of split-sound TV receivers as well as the intercarrier-sound type of TV receivers, and can be used both for the low and for the high television band.

The frequency of the H.F. carrier wave is continuously variable in the range 40—80 Mc/s (GM 2891/50), or 45—90 Mc/s (GM 2891/55 and GM 2891/60), and in the range 170—225 Mc/s. For this purpose the apparatus is provided with a tuning knob with rotary dial; this has for each of the two TV bands a scale division which clearly indicates the frequency to which the apparatus is tuned, and, for the versions GM 2891/50 and GM 2891/60, also shows the location of the picture carrier of the various TV channels. For testing the picture channel a choice can be made from five different video signals which effect amplitude modulation of the H.F. carrier wave; for testing the sound channel an A.F. voltage is available for frequency modulation of the H.F. carrier wave.

When switching over from picture to sound, the sound-carrier frequency is automatically obtained at the required distance from the picture-carrier frequency.

A great number of checks can be carried out with this apparatus; the various signals make it possible to test, e.g., the field and line linearity, the synchronization, the frequency-response curve, the location and size of the field, the distance between picture and sound, etc.

Since the GM 2891, apart from having a H.F. output, is also provided with an output for the video signal, it is also possible to test TV receivers behind the video-detector stage.

Various versions of this apparatus can be supplied. The widths of the synchronizing and blanking signals produced by the GM 2891/50 correspond to the standard recommended by the Comité Consultatif International des Radiocommunications, those of the GM 2891/60 conform to the standards laid down by the Federal Communications Committee and those of the GM 2891/55 are according to the Australian television standard.

The apparatus is not suitable for use in extremely warm or humid surroundings.

DESCRIPTION

PRINCIPLE

Fig. 1 shows the block diagram.

The apparatus consists of the following main components :

1. Video generator. This supplies the video signal.
2. F.M. generator. This generates an alternating voltage with a central frequency of 5.5 Mc/s (GM 2891/50 and GM 2891/55) or of 4.5 Mc/s (GM 2891/60).
3. H.F. generator. This supplies a H.F. alternating voltage at a frequency range including the two TV bands.
4. Modulator. This modulates the H.F. voltage with the video signal or with the signal from the F.M. generator.
5. Supply section.

VIDEO GENERATOR

This generator produces a complete video signal, consisting of the lines and field synchronizing pulses, the accompanying blanking pulses and the picture signals.

Synchronizing signal

This signal consists of complex block-shaped voltages.

In accordance with the fixed standards the synchronizing signal for the horizontal scanning (line pulse) has a frequency of 15,625 c/s (C.C.I.R.), or 15,750 c/s (F.C.C.). The synchronizing signal for the vertical scanning (field pulse) has a frequency equal to the mains frequency. In the video signal both synchronizing signals are of equal amplitude. The synchronizing system of the GM

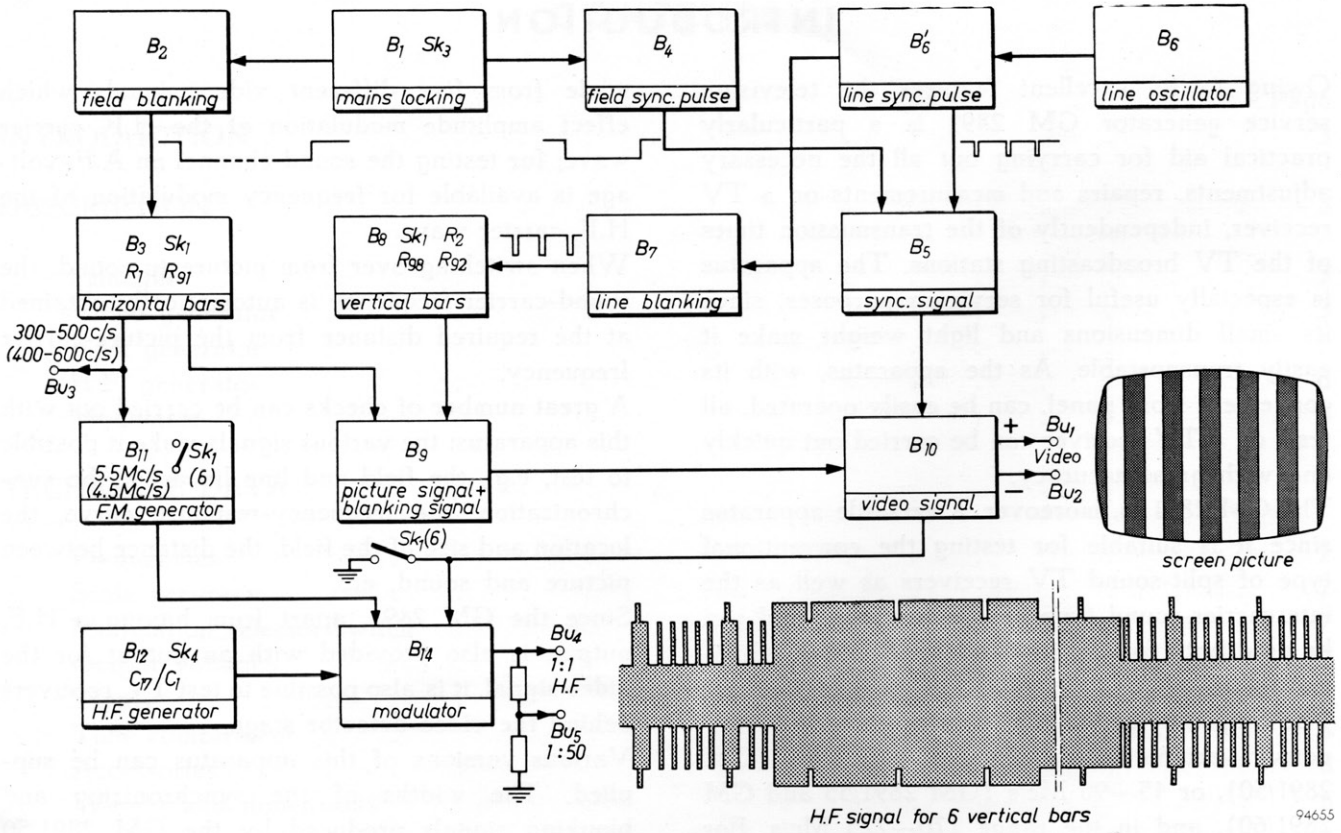


Fig. 1. Block diagram

2891, however, is not completely uniform with the standardized signal, in view of the fact that the working of the apparatus is based on the functioning of two independently operating oscillators. One, a free-running LC oscillator, determines the horizontal frequency from which the line pulses are derived; the other determines the vertical frequency which can be coupled to the mains frequency. There is, therefore, no interlacing effected on the screen of the TV receiver which, however, is no objection for service purposes.

The frequency of the LC oscillator (B_6) has an adjustment which is accurate to 0.5%. The components of the oscillator circuit, owing to their excellent quality, ensure a good frequency stability.

The synchronizing signal, as produced by the GM 2891, is shown in fig. 2.

The line pulses are derived from the tube B_6' and the field pulses from the controlled multivibrator B_4. In B_5 the line and field pulses are added and their sum frequency is applied to the control grid of the triode part of B_{10}.

In order to lock the field pulses to the mains, pulses are used that are generated in tube B_1 which is connected via a resistor to an alternating voltage having the mains frequency. The voltage drop between the ignition voltage and the working voltage of B_1 then produces, via a capacitor, a pulse with the mains frequency.

B_1 can be switched off by means of switch Sk_3. In that case the vertical frequency is no longer synchronous with the mains frequency (free-running system, tolerance 4 c/s).

Blanking signal

The widths of the blanking signal are adjusted to the standardized values.

Fig. 3 shows the horizontal blanking (line blanking) (c), as well as the line pulse (b). The horizontal blanking is supplied by B_7, which is controlled by B_6.

The vertical blanking (field blanking) (e), together with the field pulse (d), are likewise shown in fig. 3. The equalizing pulses available in the standardized signal are not produced by the GM 2891 ; they are unnecessary since no interlacing is applied.

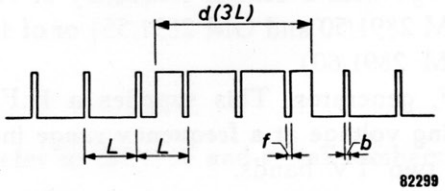


Fig. 2. Synchronizing signal (625 lines)
L = line period d = field impulse
b = line pulse f = inverse pulse
The width of f is equal to that of b

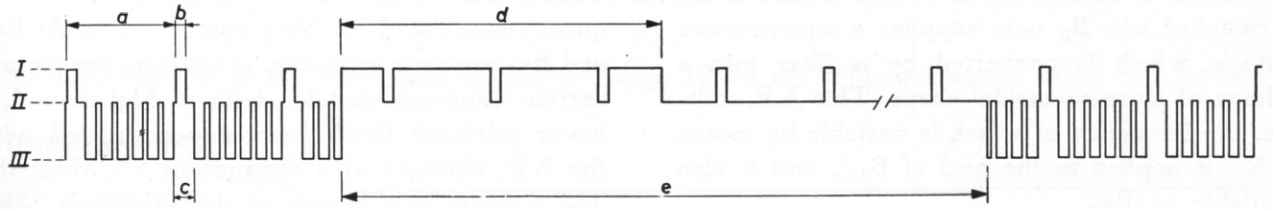


Fig. 3a

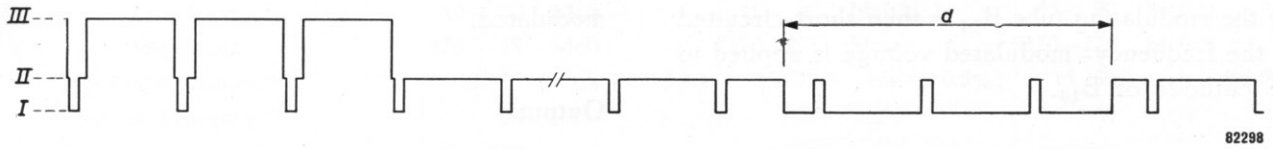


Fig. 3b

Fig. 3. Examples of video voltages

a) Negative video voltage (available at Bu_2) for six vertical bars

b) Positive video voltage (available at Bu_1) for horizontal bars

I = blacker-than-black level, II = black level

III = white level

		GM 2891/50 and GM 2898/55	GM 2891/60
a	line period	L	L
b	line impulse	0.09 L	0.08 L
c	line blanking	0.18 L	0.16 L
d	field pulse	3 L	3 L
e	field blanking	23 L	23 L

For vertical blanking only a back porch is available.
The vertical blanking is effected by B_2.

Picture signal

The picture signals supplied by the GM 2891 are always block-shaped voltages, so that certain patterns are formed in black and white on the screen of the receiver.
The voltages for the horizontal and vertical bars are generated by multivibrators (B_3 and B_8 respectively). The frequency of these multivibrators is adjustable with R_1 and R_2 respectively, by means of which the number of bars on the screen can be varied.
The square-wave generator B_3 is coupled with B_2 and B_8 with B_7.
According to the image required on the screen the generators are switched on or off with the selector switch Sk_1.

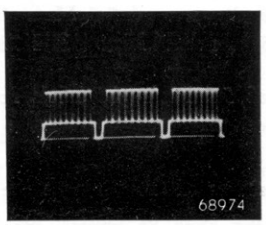


Fig. 4

Video signal

The signals from B_3 and B_8, containing the picture and the blanking signals, are added in B_9 and applied to the pentode section of B_{10}. The grid of B_{10} receives a control voltage of such magnitude that the tube is either completely conducting or completely cut off. Sharply cut-off voltage pulses are thus created at the anode and cathode of this tube. The synchronizing signal is applied to the triode part of B_{10}.
The positive or the negative video signal is thus formed at the common cathode and at the interconnected anodes. These signals are applied, via electrolytic separating capacitors, to the sockets Bu_1 and Bu_2 (cf. fig. 3).
The oscillogram shown in fig. 4, represents the positive video voltage with eight bar pulses for three line periods.

F.M. GENERATOR

The F.M. generator (B_{11}) supplies a frequency-modulated alternating voltage with a central frequency of 5.5 Mc/s *), which, therefore, equals the difference in frequency between the picture- and the sound-carrier wave.
One triode section of B_{11} serves as an oscillator, whereas the other functions as a reactance tube (B_{11}').

*) For the version GM 2891/60 the central frequency is 4.5 Mc/s.

In position 6 of Sk_1 B_{11} is switched on and B_2 is switched off. B_3 now supplies a square-wave voltage, which is converted by a filter into a voltage of more sinusoidal shape. This A.F. voltage, the frequency of which is variable by means of R_1, is applied to the grid of B_{11}', and is also available at Bu_3.
The frequency of B_{11} is adjusted to 5.5 Mc/s to within an accuracy of 0.5%.
With Sk_1 in the sixth position — the video signal for the modulating tube B_{14} is then short-circuited — the frequency- modulated voltage is applied to the cathode of B_{14}.

H.F. GENERATOR

The H.F. carrier wave is generated by means of a double-triode B_{12}. Both triode systems are incorporated in a Colpitts circuit. Feedback takes place via the internal tube capacitances.
With the aid of Sk_4, by which the frequency band is selected, one of the triode systems is fed with the required supply voltage. The H.F. voltage is then applied to the cathode of B_{14}.

MODULATOR

The modulator (B_{14}) modulates the carrier wave generated in the H.F. generator with the video signal or mixes the carrier wave with the voltage derived from the F.M. generator.

Video modulation

With Sk_1 in the positions 1—5 the complete video signal is applied to the grid of B_{14}. The modulated H.F. signal then has a shape as shown in e.g. fig. 7a. The synchronizing signal is thus positively, and the picture signal negatively, directed (negative modulation). The modulation depth corresponds to the standard of the TV transmitters.
The modulated signal is available at the output sockets Bu_4 and Bu_5 (see fig. 5a).
If Bu_2 is short-circuited by the short-circuiting plug, then the video voltage is attenuated to such an extent that the voltage at Bu_4 and Bu_5 becomes a practically non-modulated H.F. voltage.

Audio modulation

With Sk_1 in position 6 the video signal is short-circuited, and the F.M. generator is now connected to the supply voltage. The H.F. carrier wave is then amplitude-modulated with the frequency-modulated 5.5 Mc/s carrier wave. At Bu_4 and Bu_5 are now available, apart from the picture carrier (non-modulated), both a higher and a lower sideband (both frequency-modulated with the A.F. voltage) at a distance of 5.5 Mc/s; the TV receiver selects one of the sidebands. Also available at Bu_4 and Bu_5 is the voltage of the F.M. generator (5.5 Mc/s) (see fig. 5b).
If Bu_3 is short-circuited, the sidebands are not modulated.

Output

The ratio of the voltage at Bu_4 to that at Bu_5 is 50 : 1. The value of the voltage at Bu_4 corresponds to the signal strength brought about by a local transmitter, whereas the voltage at Bu_5 corresponds to the signal strength when receiving a distant transmitter.
The voltage from Bu_4 and Bu_5 can be taken up by means of the screened coaxial cable.

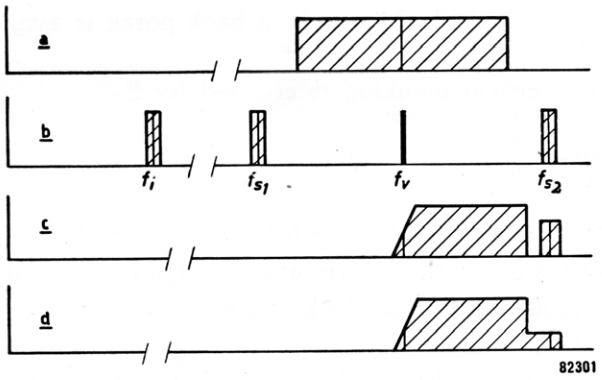


Fig. 5a. Frequency spectrum at video modulation

Fig. 5b. Frequency spectrum at audio modulation

Fig. 5c. Band-pass curve of a split-sound TV receiver

Fig. 5d. Band-pass curve of an intercarrier-system receiver

f_v = picture carrier frequency; adjustable between 40 and 80 Mc/s (GM 2891/50), 45 and 90 Mc/s (GM 2891/55 and GM 2891/60) resp., and between 170 and 225 Mc/s

f_s = sound carrier frequency; f_s lies at a distance of 5.5 Mc/s (GM 2891/50 and GM 2891/55), or 4.5 Mc/s (GM 2891/60) from f_v

f_i = frequency of 5.5 Mc/s, 4.5 Mc/s resp., derived from the F.M. generator

The proportions of the diagram are not according to scale; for the sake of clarity the sound bands are shown exaggerated in width.

TECHNICAL DATA

The nomenclature of the controls is indicated in fig. 17 on the folding sheet.

FREQUENCIES

Version	GM 2891/50	GM 2891/55	GM 2891/60
Picture carrier frequency			
Low band	40— 80 Mc/s	45— 90 Mc/s*)	45— 90 Mc/s*)
High band	170—225 Mc/s	170—225 Mc/s	170—225 Mc/s
Horizontal frequency	15,625 c/s (±0.5%)	15,625 c/s (±0.5%)	15,750 c/s (±0.5%)
Vertical frequency	50 c/s	50 c/s	60 c/s
Picture modulation	negative	negative	negative
Distance picture-sound	5.5 Mc/s (±0.5%)	5.5 Mc/s (±0.5%)	4.5 Mc/s (±0.5%)
Sound modulation	F.M.	F.M.	F.M.

SCALE ACCURACY

GM 2891/50 and GM 2891/60: The tuning to the TV channels is always within the sections indicated on the rotatable dial. For the low band each section represents a width of 2 Mc/s and for the high band 3 Mc/s.
GM 2891/55: The max. frequency deviation is 3%.

MODULATION SELECTOR SWITCH

By means of Sk_1 the following pictures may be obtained:

Position 1 — Blank field, the modulating voltage consisting of synchronizing and blanking pulses.

Position 2 — Horizontal bars **), the number of which is variable between 6 and 9 with R_1.

Position 3 — Vertical bars, the number of which is variable between 6 and 9 with R_2.

Position 4 — Blocks, the number of which can be varied with R_1 and R_2.

Position 5 — Fixedly adjusted block pattern, consisting of 8 blocks in horizontal and 6 in vertical direction.

Position 6 — Sound test. The video signal is now switched off, the F.M. generator switched on.

OUTPUT VOLTAGES

Video signal

Bu_1 — Positive video voltage (1 V_{p-p}). The direction of the picture modulation is positive and that of the synchronization negative.

Bu_1 is connected via a semi-bipolar electrolytic capacitor of 14 μF to a resistor (R_{53}) of 150 Ω.

Bu_2 — Negative video voltage (1 V_{p-p}). Here the direction of the picture modulation is negative and that of the synchronisation positive.

Also Bu_2 is connected via a semi-bipolar electrolytic capacitor of 14 μF to a resistor with a value between 120 and 270 Ω (R_{49}), by means of which the modulation depth is adjusted.
The load resistance of both sockets should be at least 10 kΩ, whilst the maximum permissible voltage at both sockets is + 300 V⎓ plus 10 V~ or — 30 V⎓ plus 10 V~.

A.F. signal

Bu_3 — A.F. alternating voltage (1 $V_{r.m.s.}$), the frequency of which can be varied by means of R_1 between 300 and 500 c/s (with the GM 2891/60 between 400 and 600 c/s).

This output socket may only be used when Sk_1 is in position 6. The internal impedance amounts to 30 kΩ. In case of external A.F. modulation the load resistance should be less than 300 ohms, in which case the internal modulation is sufficiently suppressed.
At Bu_3 an external alternating voltage of 1.5 V is permissible, whereas a direct voltage is not.

*) For the sake of simplicity the relevant switch is indicated for all versions by: "40—80 MHz".

**) To avoid misunderstanding it should be pointed out that in this manual by "bars" are meant the lighting parts of the screen.

H.F. signal

Bu_4 — H.F. voltage.
Bu_5 — $^1/_{50}$ × H.F. voltage.
With Sk_1 in the positions 1—5 the carrier wave modulated with the video signal is available at Bu_4 and Bu_5. If the short-circuiting plug is inserted in the socket for the negative video voltage (Bu_2), the modulation is almost completely suppressed *).
With Sk_1 in position 6 the H.F. carrier with two side bands (frequency distance 5.5 Mc/s) is available at Bu_4 and Bu_5; the side bands are frequency-modulated (frequency sweep > 25 kc/s).
If the A.F. output (Bu_3) is short-circuited by means of the plug, the 5.5 Mc/s oscillator is not modulated; there are then available at the output, apart from the H.F. carrier wave, two non-modulated side bands.
The H.F. voltage available at Bu_4 and Bu_5 can be taken up by means of the H.F. cable (wave resistance 75 Ω). The cable has been provided with a matching network for semi-symmetrical connection (output impedance 300 Ω). At a load of 300 Ω the H.F. voltage between the terminals "⏚ 1" and "⏚ 2" is higher than 10 mV (cable connected to Bu_4).
No external direct or alternating voltage must be applied to Bu_4 and Bu_5.

SUPPLY

The apparatus can be supplied from mains of 110, 125, 145, 200, 220 or 245 V; mains frequency 50 c/s (GM 2891/50 and GM 2891/55) or 60 c/s (GM 2891/60). Power consumption 50 W.
The supply transformer is provided with a thermal fuse, code number 08 100 97 (Vl_1 in fig. 6).

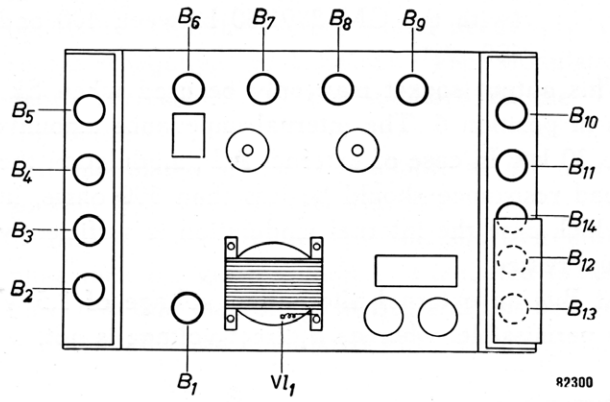


Fig. 6. Location of the tubes

*) When using the practically non-modulated H.F. voltage, Sk_1 should preferably be set to position 1.

TUBE COMPLEMENT

No.	Type	Function
B_1	Z 1 M	neon tube for synchronization with the mains
B_2	ECL 80	multivibrator for field blanking
B_3	ECL 80	multivibrator for horizontal bars
B_4	ECL 80	multivibrator for field synchronization
B_5	ECL 80	mixer for field and line synchronization
B_6	ECL 80	oscillator tube for line frequency
B_7	ECL 80	multivibrator for line blanking
B_8	ECL 80	multivibrator for vertical bars
B_9	ECL 80	mixer for horizontal and vertical bars
B_{10}	ECL 80	mixer for synchronization and bars
B_{11}	ECC 85	oscillator and frequency-modulating tube
B_{12}	ECC 85	H.F. oscillator tube
B_{13}	EZ 80	rectifying tube
B_{14}	EC 80	modulator tube
Gr_1	OA 81	detector
La_1	7181 N	pilot lamp 8-10 V 0.05 A

ACCESSORIES

Together with the apparatus are supplied:

1. A screened coaxial H.F. cable provided at one end with a connecting plug for Bu_4 and Bu_5 and at the other end with a junction box for the semi-symmetrical matching (300 ohms).
2. A screened cable, which can be connected to Bu_1, Bu_2 or Bu_3.
3. A mains flex.
4. A short-circuiting plug, by means of which a video voltage or the A.F. voltage can be switched off (Bu_2, or Bu_3 respectively) **).

WEIGHT AND DIMENSIONS

Weight 20 lbs (9 kg).

Length 13¼" (33.5 cm). Height 8¾" (22 cm).

Depth 6½" (16.5 cm).

**) When the short-circuiting plug is not in use it can always be placed in Bu_1, in order to prevent its getting lost.

INSTALLATION

SETTING VOLTAGE ADAPTOR

The mains voltage to which the apparatus has been adapted can be read through the round aperture in the rear panel. If this does not correspond to the local mains voltage, remove the cover plate (loosen four crews), pull the voltage adaptor a little forward and turn it until the required voltage is read on top. Then depress the voltage adaptor again and refit the cover plate.

CONNECTION TO THE MAINS

Before the apparatus is connected to the A.C. mains, the earth terminal at the rear of the apparatus should be connected to earth. It is recommended to set knob Sk_2/R_2 in the extreme anticlockwise position before the apparatus is connected to the mains.

CONNECTION TO THE TV RECEIVER

Most receivers are provided with a symmetrical 300 Ω matching. In that case connect the screws on the junction box of the H.F. cable marked "⅄ 1" and "⅄ 2", by means of the shortest possible wires (only about an inch long) to the aerial terminals of the receiver. If the receiver has an earth connection, this is to be connected to the earth contact on the junction box.
If the receiver has an asymmetrical 75 Ω matching, the aerial terminals are connected directly to the H.F. output of the GM 2891.
For supplying the H.F. voltage it is recommended to choose the output Bu_5 (low voltage) *).
If several receivers are to be tested at the same time, a wire of approx. two feet in length can be suspended from the output socket Bu_4. Its radiation is then sufficiently great to apply the necessary aerial power to the receivers.
If the receiver is of the type suitable for D.C./A.C. supply, it might occur that the chassis carries the fully mains voltage with respect to earth. This must be prevented by connecting a separating transformer between the receiver and the mains. After all the necessary precautions have been taken the receiver can be connected to the mains.

*) If a receiver is not functioning properly, the input signal may be too weak, so that no image is formed or the picture contains too much noise. In that case the H.F. voltage should be taken up from output Bu_4.

SWITCHING ON

The apparatus is switched on by turning knob Sk_2/R_2 clockwise, upon which the pilot lamp La_1 lights up. After approx. 1 minute the tubes have reached their working temperature and the apparatus is ready for use.
Next Sk_3/R_1 is turned beyond its extreme anticlockwise position ; the field synchronization is then coupled to the mains frequency.

H.F. TUNING

Receivers of the intercarrier-sound type

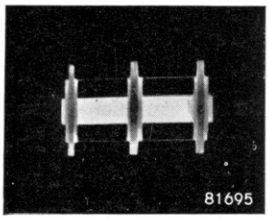
1. Set generator to fixedly adjusted block pattern (Sk_1 in position 5).
2. Adjust brightness control of the receiver so that the screen just lights up.
3. Select desired TV band by means of Sk_4.
4. Adjust generator by means of C_1/C_{17} to the desired channel, so as to obtain the best possible picture on the screen.
5. With Sk_1 in position 6 the sound corresponding to this tuning will be heard.

The H.F. tuning is thus obtained by adjusting to the best possible **picture** and not by adjusting to the optimum sound volume.

Receivers with separate channels

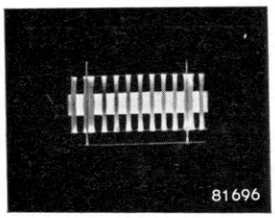
With receivers having separate channels for image and sound the H.T. tuning is obtained by adjusting to optimum **sound** volume.

1. Set generator to fixedly adjusted block pattern (Sk_1 in position 5).
2. Adjust brightness control of the receiver so that the screen just lights up.
3. Select desired TV band by means of Sk_4.
4. Adjust generator approximately to the desired channel by means of C_1/C_{17}. The block pattern will now become visible on the screen.
5. Set Sk_1 of generator to position 6.
6. Readjust generator with C_1/C_{17} so as to obtain optimum sound volume.
7. When Sk_1 is set to position 5 again, the image corresponding to this tuning will become visible on the screen.



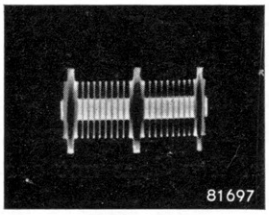
$\leftarrow T_l \rightarrow$

Fig. 7a



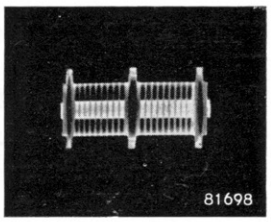
$\leftarrow T_f \rightarrow$

Fig. 7b



$\leftarrow T_l \rightarrow$

Fig. 7c



$\leftarrow T_l \rightarrow$

Fig. 7d

Oscillograms of the H.F. output voltage
a) Blank field, b) horizontal bars, c) vertical bars, d) horizontal and vertical bars
T_l = line period, T_f = field period

PICTURE ADJUSTMENT

If Sk_1 is set to position 1, the output voltage at Bu_4 and Bu_5 has a shape as shown in fig. 7a. The block-shaped peaks are the line-synchronizing signals. On either side of these the signal is for a moment at the black level: the prescribed front and back porches. The H.F. voltage, between the line-synchronizing signals, has a small amplitude corresponding to the white level. The field-synchronizing signal is produced with the mains frequency (not visible in fig. 7a); this signal is accompanied by a back porch.

If the signal shown in fig. 7a is applied to the receiver, then the horizontal and the vertical deflection of the receiver are synchronized by the service generator, so that the fly-back should be invisible and the screen should be uniformly white. The surface of the picture should cover the whole screen. If this is not the case, the vertical and/or horizontal size controls must be adjusted. It may also occur that one side of the screen remains partly dark. The reason for this may be faulty adjustment of the ion-trap magnet.

If the picture is obliquely on the screen, then the set of deflection coils on the neck of the kinescope may have shifted and they have to be turned to the correct position.

The two last faults are particularly liable to occur after replacement of the kinescope.

SYNCHRONIZATION

If switch Sk_1 is set to position 2, then the picture signal has such a shape (see fig. 7b) that at certain intervals series of white lines are traced, which are visible as horizontal white bars on the screen of the TV receiver (fig. 8). During the intervals, the electron beam is suppressed.

If the field synchronization of the receiver is not adjusted correctly, the bars will bounce in a vertical direction over the screen. This can be improved by adjusting the field time-base of the receiver.

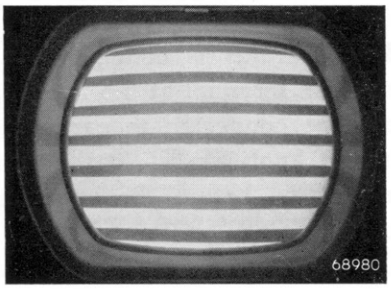


Fig. 8. Sk_1 in position 2

In position 3 of Sk_1 the output signal has the shape shown in fig. 7c. Each line consists of white and black parts, which forms vertical bars on the screen (fig. 9). If the line synchronization does not function properly, no stationary picture can be obtained and the line time-base of the receiver has to be adjusted.

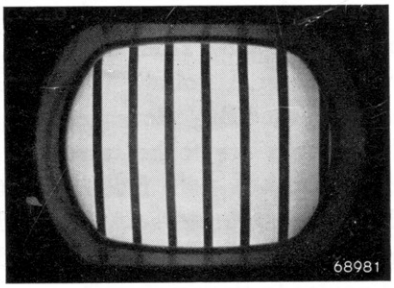


Fig. 9. Sk_1 in position 3

LINEARITY OF THE DEFLECTIONS

Once a stationary picture has been obtained, testing the linearity of the deflections can be proceeded with Sk_1 set to position 3. Any difference in the width of the vertical bars indicates a non-linear horizontal deflection (line time-base). If Sk_1 is returned to position 2 and the horizontal bars are not equally wide, this is an indication that the vertical deflection (field time-base) does not function linearly, and thus requires re-adjustment.

These two checks can be combined by producing a number of blocks on the screen (Sk_1 in position 4 or 5, see also fig. 10).
The output signal of the GM 2891 then has the shape shown in fig. 7d.

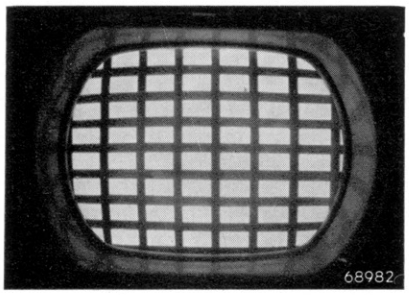


Fig. 10. Sk_1 in position 4

In position 5 of Sk_1 a fixedly adjusted block-pattern appears on the screen (8 blocks in horizontal and 6 in vertical direction). If the apparatus is warmed up and if an incorrect number of blocks should appear on the screen (e.g. $7\frac{1}{2} \times 5\frac{1}{2}$), this deviation can be corrected by means of the potentiometers on the rear (see fig. 11). Naturally, the receiver used for this check

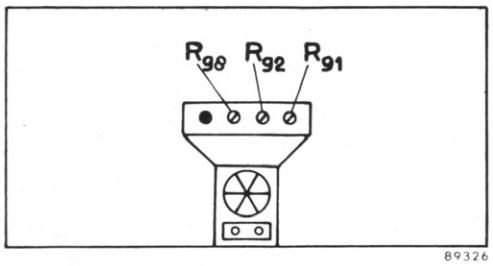


Fig. 11

must function properly. The correct number of blocks in vertical direction (6) can be adjusted by R_{91}, while R_{92} is provided for adjustment of the correct number (8) in horizontal direction. Furthermore it is possible to equalize the width of the black interstices between the blocks in horizontal and vertical direction by means of R_{98}.

CONNECTION OF THE DEFLECTION COILS

In accordance with all current TV standards, the picture tracing takes place, for each line from left to right, and for each field from top to bottom.
During repairs there is risk that the connections of the deflection coils are reversed, which would cause a reversed picture on the screen (upside down, laterally reversed, or both). Owing to the symmetry of the bar pictures such a reversal is not directly visible. This fault can, however, be traced by varying the number of bars by means of the controls Sk_3/R_1 (horizontal bars) and Sk_2/R_2 (vertical bars).
If the number of **horizontal** bars is enlarged, the additional bars should enter the screen from **below;** if the number of **vertical** bars is enlarged, the same should happen from the **right-hand** side of the screen.

UNIT-FUNCTION RESPONSE

The bars should have a uniform brightness over their whole width. By means of a test picture of horizontal bars the brightness distribution of the bars can be checked. To do this, Sk_1 is set to position 2. It should be kept in mind that the receiver must not be overmodulated (low input voltage).
If the reproduction of the low frequencies is not satisfactory, the brightness of these bars will not be uniform over the whole width. Fig. 12 shows

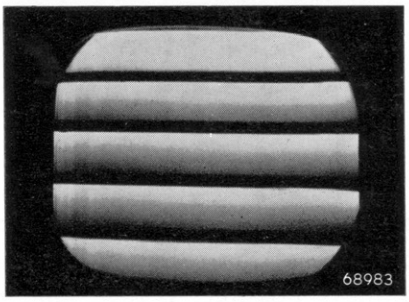


Fig. 12

such a faulty pattern on the screen of the TV receiver and fig. 13 shows the distorted video signal on the screen of an oscilloscope. The block-shaped pulses of the video signal are distorted in the receiver as a consequence of the attenuation of the low-frequency components.

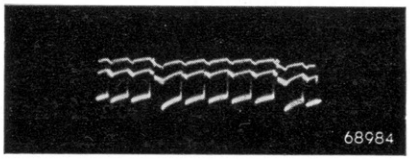


Fig. 13

FREQUENCY RESPONSE CURVE

A pattern of vertical bars can be used to check whether the frequency response curve is correct; the bars should then have a uniform brightness over the whole width. Sk_1 is, therefore, set to position 3, whilst it should again be kept in mind that the receiver must not be overmodulated (low input voltage).

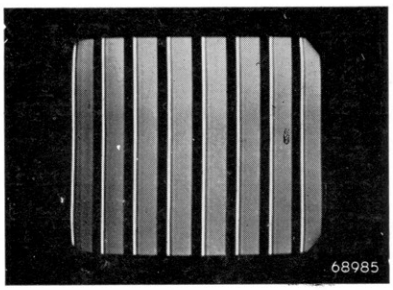


Fig. 14

Fig. 14 shows that in case of a poor reproduction of the high frequencies bright white lines are formed at the left side of the bars, followed by a number of light and dark lines of less contrast. Fig. 15 shows the oscillogram of the distorted video signal.
Even without a defect in the receiver, brightness drift of the vertical bars may occur, viz. if the generator is not properly tuned to the receiver.

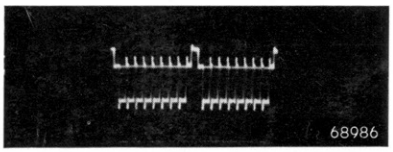


Fig. 15

It is thus necessary to adjust the tuning dial of the generator or of the receiver to the most uniform brightness possible, before jumping to the conclusion that the receiver is defective.

RIPPLE

In order to test the ripple in the receiver, knob Sk_3/R_1 is set to the extreme anti-clockwise position. The field locking is now switched off. The field-synchronizing pulses are then applied to the receiver at a frequency not synchronous with the mains frequency.

Sk_1 is set to position 3. The vertical bars will show a clearly visible undulation if the smoothing of the supply of the receiver is not satisfactory. The presence of ripple can also be established if Sk_1 is set to position 1. The white picture will then show brightness variations.

KINESCOPE

In position 1 of Sk_1 the kinescope can be checked for, e.g., damage or less sensitive spots on the screen. This check can obviously also be carried out with the aid of a bar pattern. If then the number of bars is gradually altered, any faults of the screen are clearly apparent.

VIDEO AMPLIFIER

The video signal of the generator, which is available at a potential of 1 V_{p-p} at the terminals Bu_1 (positive modulation) and Bu_2 (negative modulation), can be applied directly to the video amplifier, so that this part can be tested separately.
These sockets can also be used to check the functioning of the generator itself, by connecting an oscilloscope. In order to produce a true reproduction of the video signal, the oscilloscope must be capable of properly reproducing pulses with a transition time of $\frac{1}{4}$ μsec *).

SOUND CHANNEL

For checking the sound channel Sk_1 is set to position 6.
At Bu_3 an A.F. generator, e.g. the PHILIPS GM 2308 or GM 2317, can be connected. The 5.5 Mc/s oscillator **) is then frequency-modulated with the output voltage of the A.F. generator. By altering the frequency the frequency-response curve of the sound channel can be established. It is, of course, also possible to apply voltages from other sources, e.g. the A.F. voltage from the output of a loudspeaker transformer of a radio receiver. The internal resistance should be smaller than 300 Ω (see also "A.F. Signal", page 7).
Thanks to the fact that the non-modulated H.F. carrier wave and the frequency-modulated sideband are simultaneously available, also the sound channel of receivers using the intercarrier system can be checked.
If the part before the discriminator is defective, then the sound channel of these receivers can be tested by connecting the input of the 5.5 Mc/s channel directly to the H.F. output of the GM 2891. The 5.5 Mc/s voltage can then be derived from the terminals "⋎ 2" and "⏚" on the junction box ***).

DISTANCE PICTURE—SOUND

The distance between the picture and the sound carrier frequencies can also be checked. For the conventional split-sound TV receivers the test is

*) This requirement is met by, e.g., the Philips' oscilloscope GM 5662. A test sufficient for ordinary service purposes can be carried out with the GM 5650.
**) For the versions GM 2891/60 the central frequency is 4.5 Mc/s.
***) In view of the fact at these points also the picture carrier wave with the two sound sidebands is available, it is recommended to interconnect them by a 100 pF capacitor.

based on a proper sound adjustment (max. sound volume), after which the quality of the picture determines whether the receiver has the correct band-pass curve, as is already indicated under "H.F. tuning" (page 9).

If, therefore, Sk_1 is returned to position 5, a picture of good quality should appear. An accurate check is now possible by slightly varying the tuning of the receiver. The picture should now deteriorate. If, on the other hand, it is found that the picture quality can be somehow improved by altering the tuning, then the picture—sound distance is not correct.

REPLACEMENT OF TUBES

If tubes or the pilot lamp have to be replaced, the three screws and the earth terminal must be removed from the rear panel. The apparatus can then be taken out of its case.

The location of the tubes is shown in fig. 6 (see page 8).
After replacement of the tubes a new adjustment of the apparatus is as a rule not necessary.

LIST OF COMPONENT PARTS

(subject to modifications)

RESISTORS

R_1	0.2	MΩ	(lin.)
R_2	0.2	MΩ	(lin.)
R_3	470	kΩ	
R_4	1	MΩ	
R_5	10	kΩ	
R_6	10	kΩ	
R_7	22	kΩ	
R_8	820	kΩ*	
R_9	150	kΩ	
R_{10}	68	kΩ	
R_{11}	15	kΩ	
R_{12}	22	kΩ	
R_{13}	1.5	kΩ	
R_{14}	1	MΩ*	
R_{15}	220	kΩ	
R_{16}	1	MΩ	
R_{17}	4.7	kΩ	
R_{18}	220	Ω	
R_{19}	15	kΩ	
R_{20}	220	Ω	
R_{21}	82	Ω	
R_{22}	3.9	kΩ	
R_{23}	82	Ω	
R_{24}	100	Ω	
R_{25}	150	Ω	
R_{26}	100	kΩ	
R_{27}	270	kΩ	
R_{28}	220	Ω	
R_{29}	150	Ω	
R_{30}	82	Ω	
R_{31}	120	Ω	
R_{32}**	750	kΩ*	
R_{32}***	470	kΩ*	
R_{33}	10	kΩ	
R_{34}	22	kΩ	
R_{35}**	560	kΩ	
R_{35}***	390	kΩ	
R_{36}	1	MΩ	
R_{37}	6.8	kΩ	
R_{38}	56	kΩ	
R_{39}	10	kΩ	
R_{40}	1	MΩ	
R_{41}	10	kΩ	
R_{42}	6.8	kΩ	
R_{43}	47	kΩ	
R_{44}**	120	kΩ*	
R_{44}***	150	kΩ*	
R_{45}	10	kΩ	
R_{46}	68	kΩ	
R_{47}	3.3	kΩ	
R_{48}	2.2	MΩ	
R_{49}	150	Ω*	
R_{50}	1	MΩ	
R_{51}	22	kΩ	
R_{52}	3.3	kΩ	
R_{53}	150	Ω	
R_{54}	3.3	kΩ	
R_{55}	5.6/2 = 2.8	kΩ	
R_{56}	56	kΩ	
R_{57}	2.2	kΩ	
R_{58}	22	kΩ	
R_{59}	150	kΩ*	
R_{60}	1	MΩ	
R_{61}	2.2	MΩ	
R_{62}	1,2	kΩ	
R_{63}	2.2	MΩ	
R_{65}	1	kΩ	
R_{66}	120	kΩ	
R_{67}	470	kΩ	
R_{68}	470	kΩ	
R_{69}	22	kΩ	
R_{70}	2.2	kΩ*	
R_{71}	220	kΩ*	
R_{72}	120	kΩ	
R_{73}	4.7	kΩ	
R_{74}	560	Ω	
R_{75}	10	kΩ	
R_{77}	100	Ω	
R_{79}	22	kΩ	
R_{80}	56	kΩ	
R_{83}	10	kΩ	
R_{85}	390	kΩ	
R_{86}	120	kΩ*	
R_{88}	4.7	kΩ	
R_{89}	15	Ω	
R_{91}	50	kΩ	(lin.)
R_{92}	50	kΩ	(lin.)
R_{94}	120	kΩ*	
R_{96}	10	kΩ	
R_{98}	50	kΩ	(lin.)
R_{99}	15	kΩ	
R_{100}	10	Ω	
R_{102}	10	kΩ	

CAPACITORS

C_1	10	pF
C_2	1,500	pF
C_3	150	pF
C_4	10,000	pF
C_5	10,000	pF
C_6	390	pF
C_7	2,200	pF
C_8	10,000	pF
C_9	25	μF
C_{10}	2,200	pF
C_{11}	2,200	pF
C_{12}	1,000	pF
C_{13}	390	pF
C_{14}	1,500	pF
C_{15}	1,500	pF
C_{16}	22	pF
C_{17}	64	pF
C_{18}	4.7	pF
C_{19}	1,500	pF
C_{20}	1,500	pF
C_{21}	22	pF
C_{22}	5	pF
C_{23}	1,500	pF
C_{24}	22	pF
C_{25}	3.9	pF
C_{26}	2,700	pF
C_{27}	2,700	pF
C_{28}	5	pF
C_{29}	22,000	pF
C_{30}	10,000	pF
C_{31}	100	pF
C_{32}	150	pF
C_{33}	68	pF
C_{34}	180,000	pF
C_{35}	180,000	pF
C_{36}	180,000	pF
C_{37}	50	μF
C_{38}	50	μF
C_{39}	50	μF
C_{40}	50	μF
C_{41}	68	pF
C_{42}	47	pF
C_{43}	6,800	pF
C_{44}	180,000	pF
C_{45}	1,500	pF
C_{46} **	220	pF
C_{46} ***	330	pF
C_{47}	18	pF
C_{48}	1,500	pF
C_{49}	82	pF
C_{50}	22,000	pF
C_{51}	68	pF
C_{52}	6,800	pF
C_{53}	14	μF
C_{54}	14	μF
C_{55}	1,500	pF
C_{56} ****	27—68	pF*
C_{57}	6,800	pF
C_{58}	6.8	pF*
C_{62} ***	8	μF
C_{63}	10	pF
C_{64}	22	pF
C_{65}	250	μF
C_{66}	1500	pF

*) The proper value is selected when the apparatus is being manufactured.

) GM 2891/50 and GM 2891/55. *) GM 2891/60. ****) Short-circuited in some generators

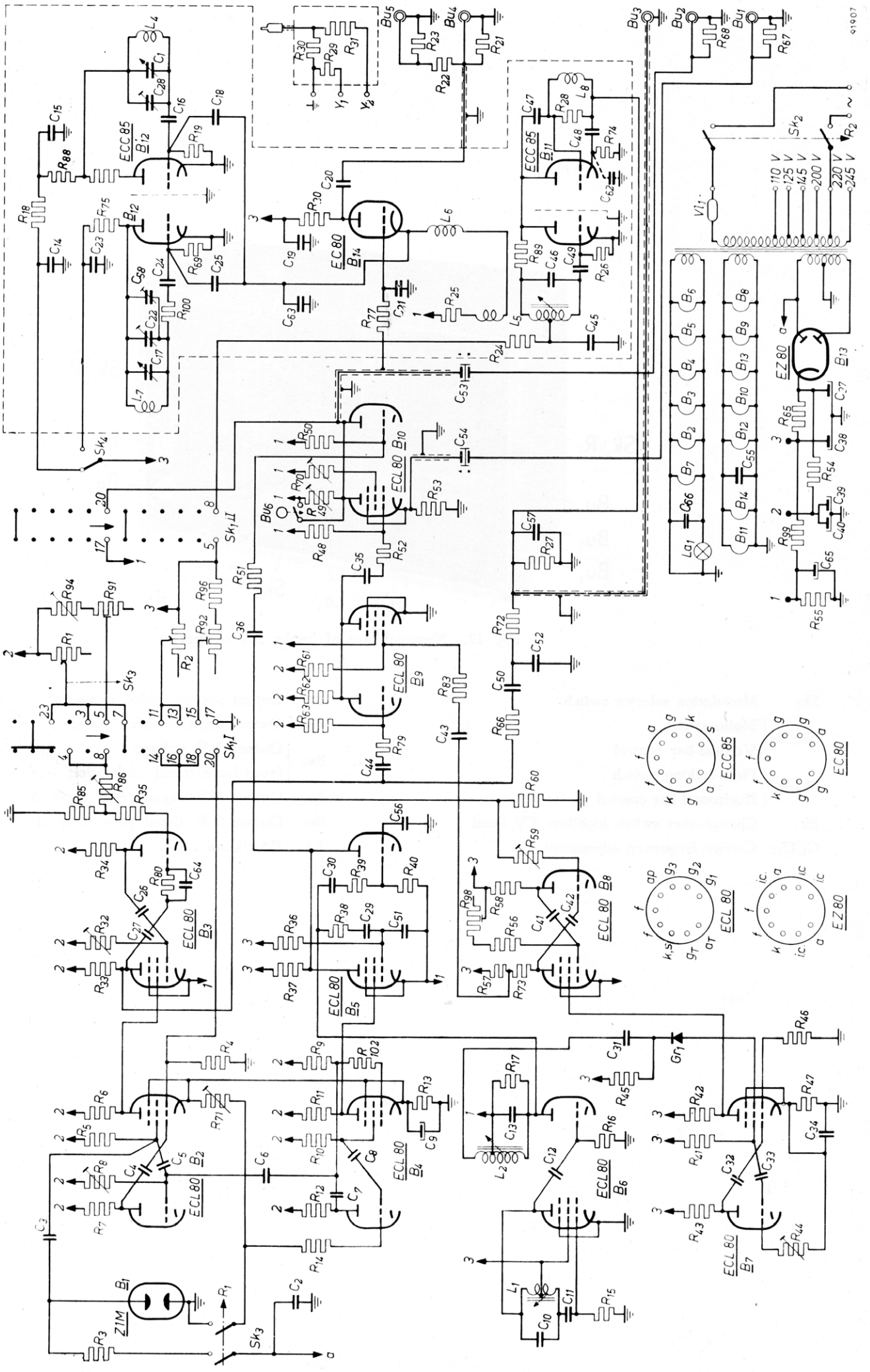


Fig. 16. Circuit diagram of the television service generators GM 2891/50, GM 2891/55 and GM 2891/60 (subject to modifications). At several places the circuit is connected to the housing

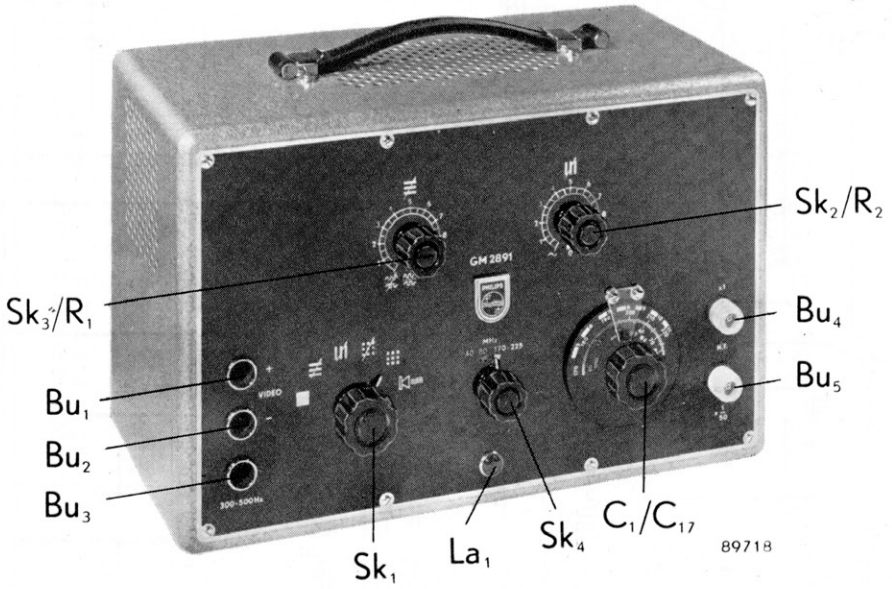


Fig. 17. Nomenclature of knobs and sockets

Sk_1	Modulation selector switch
Sk_2/R_2	Mains switch / Vertical-bar control
Sk_3/R_1	Field-locking switch / Horizontal-bar control
Sk_4	Change-over switch high/low TV band
C_1/C_{17}	Carrier frequency adjustment
Bu_1	Output positive video signal
Bu_2	Output negative video signal
Bu_3	Output A.F. voltage / Input for external modulation
Bu_4	Output H.F. signal (high tension)
Bu_5	Output H.F. signal (low tension)
La_1	Pilot lamp

Scanned from an original 'Directions for Use' manual in June 2020
This manual covers models GM 2891/50, GM 2891/55, GM 2891/60
The GM 2891/55 having RF frequencies extended to 90MHz for the Australian Band
The waveform photos have been scanned to provide as much detail as possible
This is the last page with text from the original, and this scan is provided free of chagre