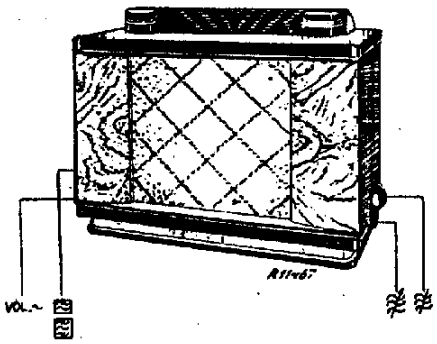
PHILIPS

SERVICE NOTES FOR THE RECEIVER

BX 685 A



FOR A.C. MAINS SUPPLIES

1948

GENERAL

WAVE RANGES

S.W.1 :	11,2 - 13,6 m (	26,8	-	21,27	Mc/s)
	15 m bandspread				
S.W.2 :	15,5 - 20 m (	19,3	-	15	Mc/s)
	20 m bandspread				
S.W.3 :	19 - 25,8 m (	15,79	-	11,6	Mc/s)
	25 m bandspread				
S.W.4 :	24 - 31,8 m (	12,5	-	9,43	Mc/s)
	30 m bandspread				
S.W.5 :	31 - 42,5 m (	9,67	-	7,06	Mc/s)
	40 m bandspread				
S.W.6 :	37 - 50,8 m (	8,1	-	5,9	Mc/s)
	50 m bandspread				
S.W.7 :	50 - 150 m (	6	-	2	Mc/s;
M.W. :	185 - 580 m (1620		-	517	kc/s)

VALVES

B1 : ECH21 : Mixer and oscillator valve
B2 : EF22 : I.F. amplifying valve
B3 : EF22 : L.F. amplifying valve
B4 : EBL21 : Output valve with detector
B5 : EM4 : Tuning valve
B6 : AZ1 : Rectifying valve

L1 and L2 : 2 x 8045 D-00

DIMENSIONS

Height: 40 cm (with the dial turned down)
Length: 57 " (knobs included)
Width : 24,5 "

WEIGHT

11.5 kg. valves included.

LOUDSPEAKER

Type Nr. 9702-05

BANDWIDTH

a. The I.F. bandwidth measured from the control grid of valve B1 amounts to about 10 kc/s with the tone control knob pulled out (position small) and about 18 kc/s with the tone control knob pushed in (position wide).
b. The overall bandwidth measured from the aerial socket at a signal of 1000 kc/s amounts to about 10 kc/s with the tone control knob pulled out (position small) and about 16 kc/s with the tone control knob pushed in (position wide).

INTERMEDIATE FREQUENCY Amounts to 452 kc/s.

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BX685A

CIRCUIT ANALYSIS

GENERAL

The short-wave range of this receiver is divided over 6 bands. The broadcasting short-wave bands, the 50, 40, 30, 25, 20 and 15 m bands are spread. The wave-range switched on is the bottom one that can be read on the dial. When switching over to another wave range, this dial is being shifted up or down. The bandwidth of the receiver can be increased by pushing in the tone control knob. The volume control is such that with the volume control knob in the maximum position no losses in amplification occur by inverse feedback. Physiological tone correction is at the same time applied for the low and the very high tones. With the tone control knob the best reception can be chosen for each station whether it is a local one or a distant weak transmitter with or without side-band splash.

R.F. PART

A simple circuit diagram for the R.F. part of the S.W. range is given in fig. 1. The coils for the various S.W. ranges are given in the table. SK1 is the switch segment No.1. SK2a and SK2b the switch segment No.2, SK3a and SK3b the switch segment No.3 and SK4 the segment No.4.

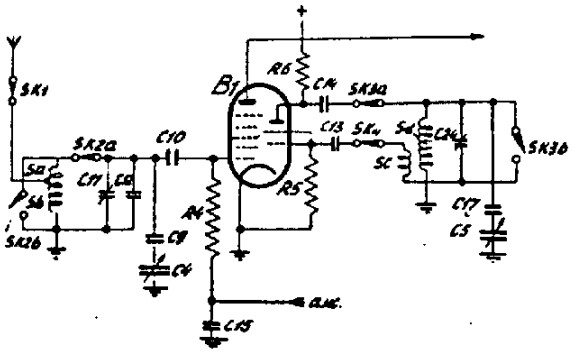

Fig.1. Circuit diagram R.F. part for the S.W. range.

The switches SK2b and SK3b are closed for those coils which are not in use; this has been done to avoid undesired damping at a frequency which is equal to the resonance frequency of a coil which is not switched on by mutual coupling of the coils.
The parallel trimmers C24 and C11 are adjusted in the S.W. band 2 (15-20.1 m). The other S.W. bands need only be trimmed at the top of the dial. This trimming is done by the adjustment of copper coil cores which when inserted cause a decrease of self-induction.
Dividing the short-wave range into 6 bands is done by decreasing the capacitance variation of the tuning condenser by connecting a condenser of 82 pF in series with the tuning condenser. This also provides for bandspread at the top of the dial. This can be explained as follows: this condenser of 82 pF in series with the tuning condenser. This also provides for bandspread at the top of the dial. This can be explained as follows: this condenser of 82 pF has little influence upon the small values, 10-30 pF of the tuning condenser (at the bottom of the dial). As soon as the tuning capacity increases, this condenser starts to play a greater part. For values of 250 pF and higher of the tuning condenser the total tuning capacity increases only very little so that bandspread is obtained over this part. The trend of this capacity is given in fig. 2.

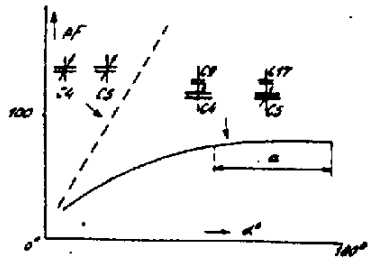

Fig.2. The trend of the total tuning capacity with C4 and C5 respectively in series with C9 and C17. The dotted line indicates the trend without series capacitor. a. is the range of bandspread.

The dividing of the S.W. range is such that the broadcasting S.W. bands fall in the bandspread part. They lie all on top of each other on the dial. This connection has the additional advantage that the switching over from one broadcasting band to the other can be done by merely turning the wave-range switch.

REMARK

For a series of sets a capacitor of 6.8 pF is connected across the coil for the S.W. band 6, S13 + S14. The code number of this coil is replaced by a coil with the code number 43 110 93.1 remove the 6.8 pF. capacitor.

I.F. PART

By pressing in the tone control knob the I.F. bandwidth is increased and one hereby obtains the overall bandwidth with a better reproduction of the high notes. Increasing the bandwidth is done by increasing the coupling of the first I.F. bandfilter with the aid of an additional coupling coil which is switched on by pressing in the tone control knob.
The diodes of valve B4 (EBL21) are used for detection and the A.V.C.
The automatic volume control is delayed by connecting the bottom of the A.V.C. detection resistor R23 to a negative voltage. The negative voltage is obtained from the voltage drop across the resistor R3 through which the total valve current of the receiver flows.

A.F. PART

VOLUME CONTROL. The circuit diagram of the L.F. volume control is given in fig.3.
S49, 350 and S55 are parts of the secondary winding of the output transformer. The negative feedback voltage drawn across S49 and S50 and across S50 alone is applied to the top, point K, of the volume control via R15 and R14 and via R13, R16 and R14 respectively. This negative feedback voltage, however, is practically neutralized by the positive feedback voltage which is drawn across S55 via R9 and R10 and applied to the top, point K, of the volume control, so that with the slider on top (volume control at maximum) there is no feedback. This has the ad-

vantage that for the reception of weak stations with the volume control at maximum the highest sensitivity required is obtained as the amplification does not suffer any losses from negative feedback.

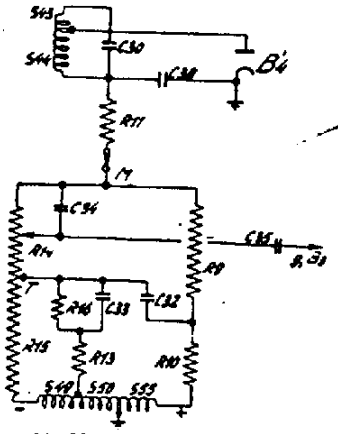

Fig. 3. Circuit diagram of the volume control with coupling and feedback and physiological tone correction.

When the volume control knob is turned to a minimum, the negative feedback increases as the influence of the positive feedback voltage across R14 to R15 is more and more reduced.

PHYSIOLOGICAL TONE CORRECTION

The ear is at small volume sensitive to tones with a frequency of about 3500 c/s, while the ear is at this sound volume insensitive to low and very high tones. To compensate for this physiological tone correction is applied which is put into operation when the volume control knob is turned to a minimum volume.

a. The compensation for the insensitivity for low tones is here obtained by increasing the negative feedback for the higher tones when the volume control is turned to minimum volume. This is done by the capacitor C23 across R16. This capacitor forms a better passage for higher frequency of the negative feedback voltage than via R16 with the result that in point T the negative feedback in the high tones increases.
b. The compensation for the insensitivity to very high tones is obtained by:
   1. The capacitor C32; via this capacitor the positive feedback voltage in the very high tones is applied to point T.
   2. The capacitor C34; via this capacitor the signal for the very high tones finds a better passage to the slider in proportion to the decrease of resistance between point L and the slider. (Volume control turning to minimum position).

TONE CONTROL

The tone control as applied in this receiver is based on three positions of the tone control knob.

1. Position for low tones - for reception of stations with side-band splash.
2. Position for both low and high tones - quality position indicated by the stop.
3. Position for high tones - speech position.

By turning the tone control knob it is now possible to choose the best condition for each reception.
The characteristics of the three positions are indicated in fig. 4 in a space figure.

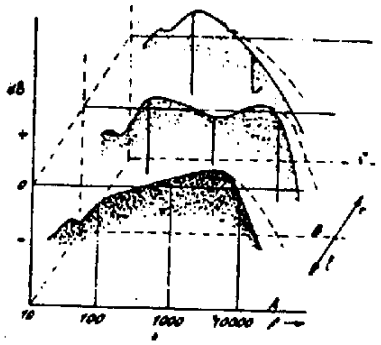

Fig. 4. S = speech position,
B = quality position,
C = position for noise suppression,
r = clockwise and l = anti-clockwise turning of the tone control knob.

The tone control is obtained by adjustable negative feedback in the high and in the low tones. (See fig. 5).

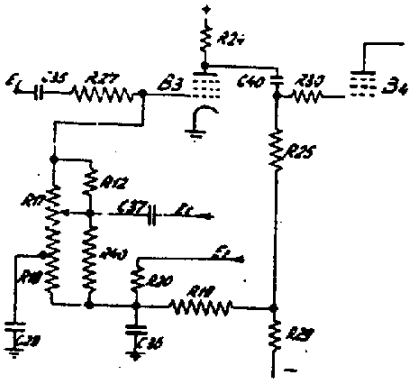

Fig. 5. Tone control with negative feedback.

The capacitor C37 and the potentiometer R17 + R16 with R20 in parallel form a high-pass filter; via this filter the negative feedback for the high tones is applied to the grid of B3. This negative feedback is max. with the slider at the top - position for low tone - and supresses high tones.
Turning the slider downward, this negative feedback decreases as the negative feedback voltage is applied to the grid of B3 via a part of the potentiometer R17 (+R18). The high tones will then come through much better until finally the quality position is reached when the high tone negative feedback voltage is short-circuited by the capacitor C28.
With the slider in the bottom part R18 - of the potentiometer R17 plus R18 - spe ach position negative feedback for the low tones is applied via the low-pass filter R20 and C36, so that these tones are suppressed.

TRIMMING THE RECEIVER

I.F. Bandfilters (fig.6)

1. Wave-range switch on L.W., volume control at maximum, tone control on treble (to the left) and pulled out.
2. Earth the receiver and connect an output meter to the extension loudspeaker sockets via the trimming transformer.
3. Turn out the cores of the I.F. bandfilters as much as possible.
4. Apply a modulated signal of 452 kc/s to the control grid g1 of the valve B1 via a capacitor of 33000 pF.
5. Adjust the cores to maximum output in the sequence S43 ... S44, S41, S42, S37 and S38. Any time the bandfilter circuits are trimmed the trimming must cease after the adjustment of the last circuit of the four.
6. Lacquer the cores.

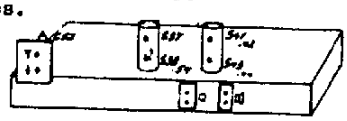

Fig6

I.F. Wave trap (fig.6)

1 and 2 as with I.F. bandfilters. 21:502
3. The variable condenser at maximum capacity.
4. Apply a modulated signal of 452 kc/s to the aerial socket via a dummy aerial.
5. Adjust C52 to minimum output.
6. Lacquer the trimmer.

H.F. and oscillator circuits (fig.9)

The trimming is done with the trimming point on the dial. These points are indicated in fig. 7 and this facilitates the looking for them on the dial.
The S.W. band 1,13 - 17 m is not trimmed. For the trimming of the other S.W. bands one must first check whether the short-wave band 2 (15.5-20 m) is well trimmed. If this is not the case this has to be done first.
The trimming of the S.W. coils is done with a philite trimming key in which a notch is filed as indicated in fig. 8.

1. Volume control at maximum, tone control on shaft (to the left) and pulled out.
2. Earth the receiver and connect an output meter to the external loudspeaker sockets via the trimming transformer.
3. Turn the variable condenser to minimum capacity and adjust the indicator to the starting point "A" of the dial.

Continue the adjusting as indicated in the table below.

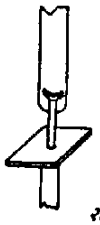

Fig.8 211183

1. Wave range switch on	Wave range to be trimmed						
	SW2	SW3	SW4	SW5	SW6	SW7	HF
2. Adjust the pointer to the trimming point... (see also fig.7)	17,8	↓	↓	↓	↓	15°	15°
3. Apply a modulated signal of... via a ... dummy aerial to the aerial socket	17,8Mc/s SJ	↓	↓	↓	↓	5,8 Mc/s normal	1550 Kc/s normal
4. Trim for maximum output successively ... (see fig.9)	C11 and C24	↓	↓	↓	↓	C22 and C8	C19 and C7
5. Adjust the pointer to the trimmingpoint ... (see also fig.7)	15,2	11,8	9,6	7,2	6,1	1,96	523
6. Apply a modulated signal of... via a ... dummy aerial to the aerial socket	15,2 Mc/s SJ	11,8 Mc/s SJ	9,6 Mc/s SJ	7,2 Mc/s SJ	6,1 Mc/s SJ	1,96 Mc/s normal	523 KC/s normal
7. Trim for maximum output successively ... (see fig.9)	S24 and S7+S8	S26 and S9+S10	S28 and S11+S12	S30 and S13+S14	S32 and S15+S16	C21	C18
8. Repeat points ...	1-7					1-7	1-7
9. Seal ...	C11,C24 S24 and S7+S8	S26 and S9+S10	S28 and S11+S12	S30 and S13+S14	S32 and S15+S16	C22,C8 and C21	C19,C7 and C18

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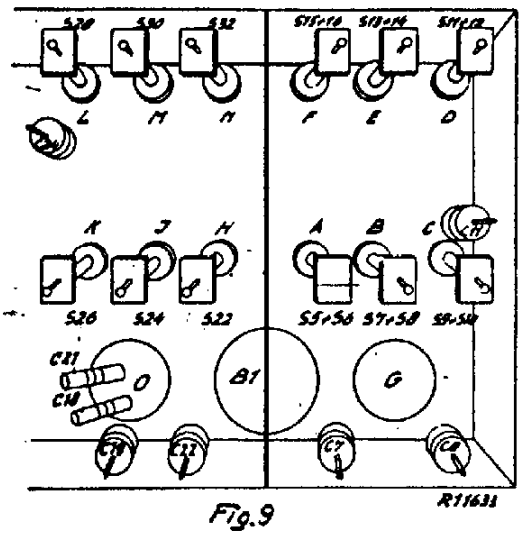

Fig. 9

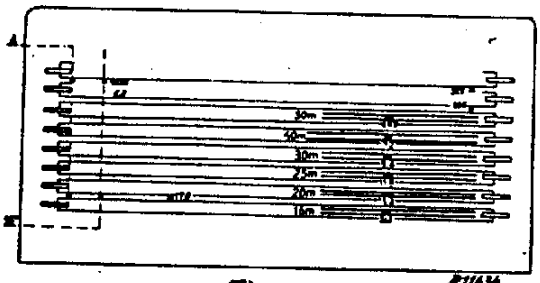

Fig. 7

REPAIRS AND REPLACEMENTS OF PARTS

The removal of the back panel and the bottom panel will be sufficient for doing most repairs. If the chassis has to be taken out of the cabinet one must first remove the back panel and the bottom panel and then do as follows:

1. Loosen the knobs, they can be pulled off the spindles. Unsolder the loudspeaker connections. Loosen the tuning valve.
2. Loosen the wooden screws (2) with which the bracket in the top of the cabinet is mounted.
3. Remove the dial. Loosen the indicator by removing completely the screw for the mounting of the cable. Take the dial out of the cabinet.
4. Loosen the screws (4) with which the chassis is mounted in the cabinet.
5. Take the chassis out of the cabinet.

DRIVE

The drive is given in fig. 10; this also gives the lengths of the various cables. The capacitor is in position for maximum capacity. The wave-range switch stands on M.W.

DRIVING STRIP

The exchange of the driving strip is done as follows:

1. Take the chassis out of the cabinet. Wave-range switch on M.W. (turn fully anti-clockwise).

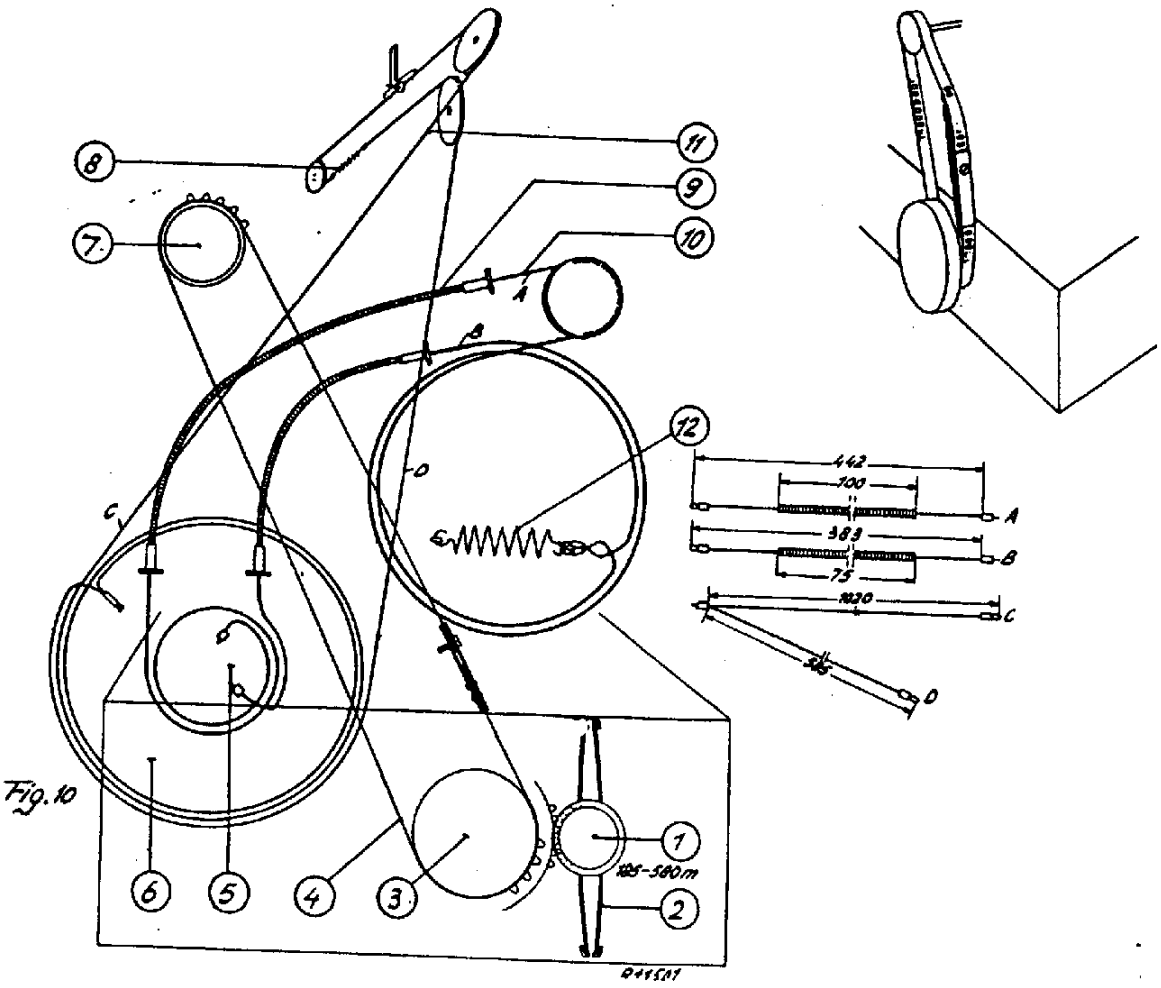

Fig. 10