116E-0704-16

(Formerly A.P.2550M, Vol. 1)

RECEIVERS RADIO
5820-99-943-2775 and 5820-99-999-9292
(RECEIVERS TYPE S1/1, S1/2, S1/3, S1/4, S2/1, S2/2)
and
MIXER STAGE FREQUENCY
5820-99-943-3464 (TYPE S3/1)

GENERAL AND TECHNICAL INFORMATION
REPAIR AND RECONDITIONING

BY COMMAND OF THE DEFENCE COUNCIL

L T Durrett

Ministry of Defence

FOR USE IN THE

ROYAL AIR FORCE

A.L.16, April 71

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The reference number of this publication was altered from A.P.2550M, Vol. 1 to A.P.116E-0704-1 in November 1969. No general revision of page captions has been undertaken, but the code number appears in place of the earlier A.P. number on new or amended leaves issued subsequent to that date. A further change was made when Topic 6 information was introduced in April 1971.

Each leaf, except the original issue of preliminaries, bears the date of issue and the number of the Amendment List with which it was issued. New or amended technical information on new leaves which are inserted when this publication is amended will be indicated by a vertical line in the margin. This line merely denotes a change and is not a mark of emphasis. When a Part, Section, or Chapter is issued in a completely revised form, the line will not appear.

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LIST OF ASSOCIATED PUBLICATIONS

Receiving set radio 5820-99-993-0813	A.P.116E-0712-1A (A.P.4810A)

MODIFICATION RECORD

This publication is technically up-to-date in respect of the modifications listed below.

Mod. No.	Brief Details
8803	Separate Earth Terminal
9754	Anti-surge Fuse (HT)
0341	Resistor Dissipation
0342	Prevention of Overheating
0403/17	Topic unaffected
0793	Replacement of RF Transformer
1092	Topic unaffected
1572	Resistor Change (R64)
1629	Capacitor Replacements
1667	Replacement of RF Transformer
1778	Capacitor Added, 1MHz Oscillator
1827	Capacitor Change (C25)
1868	Topic unaffected
A.3583	Topic unaffected
A.3584	Topic unaffected
A.3594	Replacement of Obsolete Resistors
A.3595	Replacement of Obsolete Resistors
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PART 1

LEADING PARTICULARS AND GENERAL INFORMATION

LEADING PARTICULARS

RECEIVER ◀ 5820-99-943-2775 ▶

Function ... ... General purpose ground station h.f. communications receiver.

Frequency range ... ... 0·98 – 30 Mc/s. The l.f. converter extends the lower frequency limit to 12·5 kc/s.

Stability ... ... During a warm-up time of three hours, overall drift is less than 1 500 c/s under conditions of constant supply voltage and ambient temperature ; beyond this period, drift will be less than 150 c/s at all frequencies and under normal operating conditions.

Input impedance ... ... 75 ohms unbalanced.

Tuning ... ... Effective scale length of approximately 145 feet, i.e., about 6 inches of actual scale length corresponds to 100 kc/s. (Actual scale length 60 in.). Frequency increments remain substantially constant over the entire band.

Calibration ... ... A 100 kc/s signal derived from a 1 Mc/s crystal oscillator having a stability of 5 parts in 10^6 provides check points at 100 kc/s intervals.

Sensitivity ... ... C.W. reception, bandwidth 3 kc/s ; 1μV for 20dB signal-to-noise ratio.
R/T and M.C.W. reception, 30% modulated, bandwidth 3 kc/s ; 3·5μV for 20dB signal-to-noise ratio.

Cross modulation ... ... By using the aerial attenuator with a tuned input together with a 3 kc/s i.f. bandwidth and a wanted signal of 1mV, an unwanted signal differing by 10 kc/s and modulated by 30% must have a level at least 30dB greater than the wanted signal in order to cause a cross modulation output equivalent to 1% modulation of the wanted signal.

Selectivity ... ... Six alternative i.f. bandwidths are obtained by means of a selector switch. Filter details are :—

Switch position	*– 6dB*	*– 66dB*
100 c/s	80–120 c/s	less than 1·6 kc/s
300 c/s	270–330 c/s	less than 1·8 kc/s
750 c/s	700–800 c/s	less than 2·5 kc/s
1·2 kc/s	950–1200 c/s	less than 8 kc/s
3 kc/s	2·85–3·3 kc/s	less than 12 kc/s
8 kc/s	7·6–8·4 kc/s	less than 20 kc/s.

Bandwidths 100, 300 and 750 c/s are obtained with crystal lattice filters. Differences in centre frequencies of these filters do not exceed 50 c/s.

I.F. output ... ... 100 kc/s at 75-ohms impedance. Two outlets in parallel are provided.

Image and spurious responses With a tuned input, external image signals are at least 58dB down. Internally generated spurious responses are 2dB above noise level in all cases.

Noise factor ... ... 1·5 Mc/s : less than 8dB
3, 6, 12 and 24 Mc/s : less than 6bB

B.F.O. stability ... ... With constant ambient temperature and supply voltage 30 minutes after switching on, drift does not exceed 50 c/s. For input level variations from 10μV to 1mV, b.f.o. drift does not exceed 100 c/s.

Automatic volume control ... An increase in signal level of 20dB above 1μV improves the signal-to-noise ratio by 20dB.

In the WIDEBAND position an increase in signal level of 60dB above a.v.c. threshold increases the a.f. output by less than 6dB.

A.V.C. time constants ...	Short :	charge – 25 milliseconds.	
		discharge – 200 milliseconds.	
	Long :	charge – 200 milliseconds.	
		discharge – 1 second.	

A.F. output ... ...
1. 2½ in. loudspeaker (50mW) on front panel (switched).
2. Two telephone sockets in parallel on front panel.
3. Three independent outputs of 3mW at 600-ohms on rear of chassis.
4. One output of 10mW at 600-ohms. Preset level is independent of A.F. GAIN control setting.
5. ◀5. One output of 50mW at 3 ohms.▶

Note . . .

The two telephone sockets are connected across the output in parallel with the loudspeaker.

A.F. response ... ... With 8 kc/s i.f. bandwidth, response remains within 6dB from 250 c/s to 3500 c/s.

Distortion ... ... Not greater than 5% at 50mW output.

Hum level ... ... 46dB at 1mW (10mW output setting) with I.F. GAIN control at maximum.

Noise limiter... ... ... A series noise limiter circuit can be switched into operation to provide limiting modulation levels exceeding 30%.

Power supply ... ... 100–125 and 200–250 volts, 45–65 c/s. Power consumption 85 watts approx.

Dimensions and Weights	*Dimensions (in.)*			
	Height	*Width*	*Depth*	*Weight*
For rack mounting (fitted dust cover)	10½	19	20⅛	67 lb.
Fitted cabinet	14¼	20½	21⅞	97 lb.

L.F. CONVERTER

Function ... ... To extend the lower frequency limits of the receiver.

Frequency range ... ... 12·5 to 980 kc/s.

Stability ... ... After warm-up time of 1½ hours, overall drift less than 150 c/s under conditions of constant supply voltage and ambient temperature.

Input impedance ... ... 75 ohms unbalanced.

Tuning ... ... Effective scale length approximately 4 ft. 9 in. i.e. about 6 in. of scale length corresponds to 100 kc/s.

Sensitivity ... ... C.W. reception, bandwidth 3 kc/s.
3μV for 20dB signal-to-noise ratio.
R/T and M.C.W. reception, 30% modulated bandwidth 3 kc/s,
3μV for 20dB signal-to-noise ratio.

Image response ... ... With tuned input, external image signals are reduced by at least 50dB.

Power supply ... ... 100–125 and 200–250 volts, 45–65 c/s. Power consumption 11 watts approximately. (H.T. supply from the receiver).

Dimensions and Weight	*Dimensions (in.)*			
	Height	*Width*	*Depth*	*Weight*
For rack mounting ...	1¾	19	13	11 lb.
Cabinet containing receiver and l.f. convertor	14¼	20½	21⅞	110 lb.

◀ LEADING PARTICULARS

RECEIVER 5820-99-999-9292

Function ... ... General purpose ground station h.f. communications receiver (*Chap.* 1, *App*, 1).

Frequency range ... ... 0·98–30 Mc/s. The l.f. converter extends the lower frequency limit to 12·5 kc/s.

Stability ... ... During a warm-up time of 1½ hours, overall drift is less than 50 c/s under conditions of constant supply voltage and ambient temperature.

Input impedance ... ... 75 ohms unbalanced.

Tuning ... ... Effective scale length of approximately 145 feet, i.e. about 6 inches of actual scale length corresponds to 100 kc/s. (Actual scale length 60 in.). Frequency increments remain substantially constant over the entire band.

Calibration ... ... A 100 kc/s signal derived from a 1 Mc/s crystal oscillator having a stability of 5 parts in 10^6 provides check points at 100 kc/s intervals.

Aerial input ... ... (1) Wideband
(2) Double-tuned in six bandwidths.
} 75 ohms impedance.

(a) 0·5–1·0 Mc/s	(d) 4–8 Mc/s
(b) 1–2 Mc/s	(e) 8–16 Mc/s
(c) 2–4 Mc/s	(f) 16–30 Mc/s

Sensitivity ... ... C.W. reception, bandwidth 3 kc/s; 1μV for 18dB signal-to-noise ratio. R/T and M.C.W. reception 30% modulated, bandwidth 3 kc/s; 3μV for 18dB signal to noise ratio.

Intermodulation ... ... More than 100dB for interfering signals at least 10% removed from the wanted signal.

Cross Modulation ... ... With a 3 kc/s i.f. bandwidth and without the aerial attenuator in use, an unwanted signal f2 (modulated 30%) causing interference amounting to 1% modulation of a wanted signal 1mV strength, must exceed the wanted signal f1 by a level higher than the value shown below for the given separations:

off tune	*Reference to 1mV unwanted signal* *dB*	*mV*
10 kc/s	+36	63
25 kc/s	+37	70
5% of f1	+43	140

Blocking ... ... With similar conditions to those for cross-modulation an unwanted signal f2 must be 54dB greater before the audio output of the wanted signal f1 is reduced by 3dB due to blocking.

off tune	*Reference to 1mV unwanted signal* *dB*	*mV*
10 kc/s	+54	500

Selectivity	Six alternative i.f. bandwidths are obtained by means of a selector switch Filter details are:—

Switch position	*—6dB*	*—66dB*
100 c/s	80–120 c/s	
300 c/s	270–330 c/s	
1·2 kc/s	950–1200 c/s	
3 kc/s	2·85 –3·3 kc/s	
6·5 kc/s	6·5 – 7·8 kc/s	
13 kc/s	13·0 – 14·3 kc/s	

Bandwidths 100 c/s and 300 c/s are obtained with crystal lattice filters. Differences in centre frequencies of these filters do not exceed 500 c/s.

I.F. output ... ... 100 kc/s at 75 ohms impedance. Level 0·2 V approximately with a.v.c. in operation. Two outlets in parallel are provided.

Image and spurious responses With wideband or tuned, external image signals are at least 60dB down. Internally generated spurious responses are below noise level in all cases.

Noise factor ... ... Less than 7dB throughout the entire range.

B.F.O. range ... ... ±8 kc/s.

B.F.O. stability ... ... With constant ambient temperature and supply voltage 30 minutes after switching on, drift does not exceed 50 c/s. For input level variations from 10μV to 1mV, b.f.o. drift is negligible.

Automatic volume control ... A.V.C. is applied to the r.f. and the final i.f. stages. An increase in signal level of 20dB above 1μV improves the signal-to-noise ratio of 18dB. An increase in signal level of 100dB above 1μV increases the a.f. output by less than 7dB.

A.V.C. time constants ...

Short: Charge—25 milliseconds
Discharge—200 milliseconds

Long: Charge—200 milliseconds
Discharge—1 second.

A.F. response ... ... With 13 kc/s bandwidth, response remains within ±4dB from 250 c/s to 6000 c/s.

A.F. output ... ...

1. 2½ in. loudspeaker (50mW) on front panel (switched).
2. Two telephone sockets in parallel on front panel.
3. Three independent outputs of 3mW at 600 ohms at rear of chassis.
4. One output of 10mW at 600 ohms. Preset level is independent of A.F. GAIN control setting.
5. One output of 50mW at 3 ohms.

Distortion ... ... Not greater than 5% at 50mW output.

Hum level ... ... —50dB at 1mW (10mW output setting) with A.F. GAIN control at maximum.

Noise limiter ... ... A series noise limiter circuit can be switched into operation to provide limiting at modulation levels exceeding 30%.

Power supply ... ... 100–125 and 200–250 volts, 45–65 c/s. Power consumption 100 watts approx.

Dimensions and Weights

	Dimensions (in.)			
	Height	*Width*	*Depth*	*Weight*
For rack mounting (fitted dust cover)	10½	19	20⅛	67 lb.
Fitted cabinet	14¼	20½	21⅞	97 lb. ▶

Chapter 1

INTRODUCTION AND GENERAL DESCRIPTION

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LIST OF ILLUSTRATIONS

INTRODUCTION

1. Receiver, radio 5820–99–943–2775 is a general purpose ground station communications receiver with a frequency range 980 kc/s to 30 Mc/s. The lower frequency limit can be extended to 12·5 kc/s by the addition of an l.f. converter with the designation mixer stage, frequency 5820–99–943–3464 ; the receiver can be used with or without the l.f. converter as desired.

1A. Receiver, radio 5820-99-999-9292 is a later version of 5820-99-943-2775 and the changes are described in Appendix 1 of this Chapter.

2. The receiver and l.f. converter can be used in rack assemblies or for bench mounting ; the following variant assemblies are available :—

Assembly	*Nomenclature*
(1) Rack mounted receiver	Receiver Type S1/1
(2) Bench mounted receiver	Receiver Type S1/2 (mounted in cabinet 5820–99–972–8566).
(3) Bench mounted receiver and l.f. converter combined	Receiver Type S2/1 (mounted in cabinet 5820–99–972–8567).
◀(4) Rack mounted l.f. converter.	Mixer stage frequency Type S3/1.▶

3. The receiver circuit employs a triple superheterodyne principle with electronic band switching in steps of 1 Mc/s. Fine tuning is accomplished by means of a very stable interpolation receiver covering a spectrum of 1 Mc/s. A 60 in. film scale is provided and this is accurately calibrated in divisions of 1 kc/s. Check signals can be injected at every 100 kc/s.

4. A number of audio and i.f. outputs are provided for flexibility during operation ; a small loudspeaker is fitted for monitoring purposes.

5. The receiver and l.f. converter are designed to operate from power supplies of 100–125V or 200–250V at 45–60 c/s. Power consumption is approximately 85 watts.

CONSTRUCTIONAL LAYOUT

6. As stated in para. 2 the receiver is designed for both bench (table) and rack mounting. The bench mounted receiver and l.f. converter are illustrated in fig. 1. The front panel of the receiver has been carefully designed to minimize operator fatigue. The dimensions of the front panel ($\frac{1}{8}$ in. thick) conform with the requirements for mounting in a standard 19 in. rack.

Fig. 1. Receiver and l.f. converter type S2/1

7. For bench mounting, the receiver is fitted in a robust steel cabinet which has a rear opening to enable the operator to gain easy access to the power input socket, the fuse and the termination strips.

8. A dust cover is provided with the model. This may be removed from cabinet-mounted receivers in conditions of high ambient temperature.

9. Each receiver is supplied with three keys to facilitate removal of the control knobs, a plastic trimming tool and free coaxial terminations for aerial and i.f. connections.

10. The receiver chassis and sub-units are of cast construction thus ensuring maximum rigidity and effective electrical screening. They are referenced as follows :—

Item	*Nomenclature*
Main chassis assembly	Main chassis assembly 5820–99–943–3456
First v.f.o.	Oscillator r.f. sub-assembly 5820–99–943–3458
Second v.f.o.	Oscillator r.f. 5820–99–943–3459
100 kc/s i.f. amplifier	Amplifier i.f. 5820–99–943–3455
Crystal calibrator unit	Calibrator, frequency ◀5820–99–943–3461▶

Controls

11. A brief functional description of the front panel controls of the receiver and l.f. convertor follows.

Receiver

12. The front panel controls are described in the order in which they could be used for setting-up prior to use.

Title	*Function*
MAINS	Makes and breaks the power supplies to mains transformer.
AE. RANGE MC/S	Selects any one of six aerial ranges plus " wideband " position.
AE. ANTENUATOR	Attenuates aerial input in five steps.
MEGACYCLES	Selects frequency in megacycles on scale marked 1 to 29 MC/S.
System switch	Provides facilities for STAND-BY, MANUAL, A.V.C., CALIBRATION and CHECK B.F.O.
BANDWIDTH	Provides selection of six i.f. bandwidths of 100 c/s, 300 c/s, 750 c/s 1·2 kc/s, 3 kc/s and 8 kc/s.
A.F. GAIN	Adjusts the audio output.
KILOCYCLES	Selects the frequency in kilocycles on KC/S scale (divisions 1 kc/s.
B.F.O.	ON/OFF switch for beat frequency oscillator.

375/6 Wt. 68211 D. No. 7658 1,000 91203 20/3/62 C. S. Co.

Appendix 1

Receiver 5820 - 99 - 999 - 9292

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LIST OF ILLUSTRATIONS

INTRODUCTION

1. Receiver, radio 5820-99-999-9292 is a general purpose ground station communications receiver with a frequency range of 980 kc/s to 30 Mc/s. The lower frequency limit can be extended to 12·5 kc/s by the addition of an l.f. converter with the designation mixer stage, frequency 5820-99-943-3464; the receiver can be used with or without the l.f. converter as desired.

2. The receiver and l.f. converter can be used in rack assemblies or for bench mounting; the following variant assemblies are available:—

	Assembly	*Nomenclature*
(1)	Rack mounted receiver.	Receiver Type S1/3
(2)	Bench mounted receiver	Receiver Type S1/4 (mounted in cabinet)
(3)	Bench mounted receiver and l.f. converter combined.	Receiver Type S2/2 (mounted in cabinet)
(4)	Rack mounted l.f. converter	Receiver Type S3/1 (*see Chap.* 1).

3. The receiver circuit employs a triple superheterodyne principle with electronic band switching in steps of 1 Mc/s. Fine tuning is accomplished by means of a very stable interpolation receiver covering a spectrum of 1 Mc/s. A 60 in. film scale is provided and this is accurately calibrated in divisions of 1 kc/s. Check signals can be injected at every 100 kc/s.

4. A number of audio and i.f. outputs are provided for flexibility during operation; a small loudspeaker is fitted for monitoring purposes.

5. The receiver and l.f. converter are designed to operate from power supplies of 100–125V or 200–250V at 45–60 c/s. Power consumption is approximately 100 watts.

CONSTRUCTIONAL LAYOUT

6. With the exception of para. 10 to 12 of the first part of this chapter, the details given are identical for 9292. An illustration of the chassis (top) is shown in fig. 1.

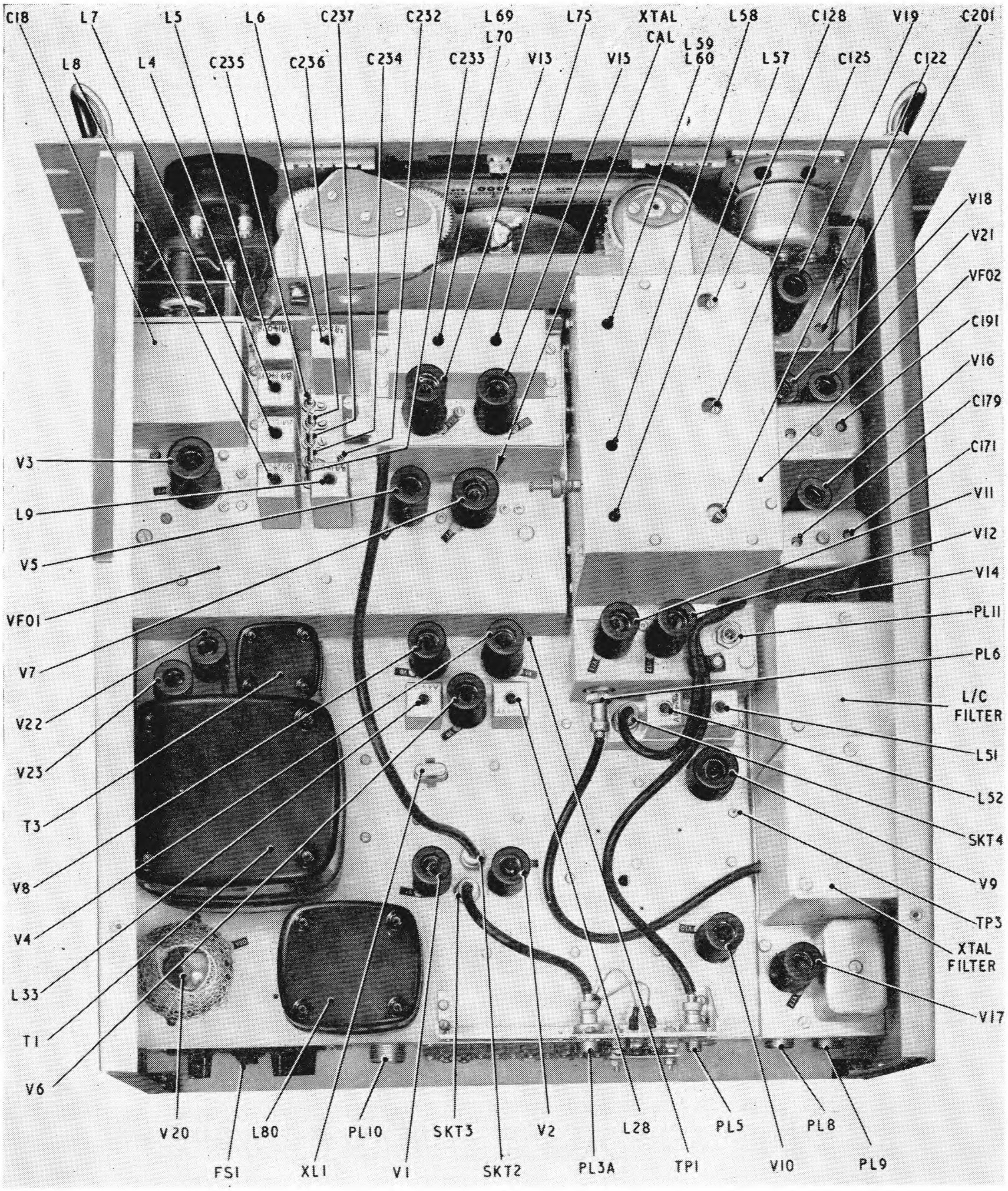


Fig. 1. Top view of receiver radio 5820 - 99 - 999 - 9292 - chassis

7. The receiver chassis and sub-units are of cast construction thus ensuring maximum rigidity and effective electrical screening. They are referenced as follows:

Item	*Nomenclature*
Main chassis assembly	Main chassis assembly 5820-99-943-3456
First v.f.o.	Oscillator r.f. sub-assembly 5820-99-913-1498
Second v.f.o.	Oscillator r.f. 5820-99-943-3459
100 kc/s i.f. amplifier	Amplifier i.f. 5820-99-913-1497
Crystal calibrator unit	Calibrator frequency 5820-99-943-6625

Receiver controls

8. The front panel controls are described in the order in which they could be used for setting-up prior to use.

Title	*Function*
Mains	Makes and breaks the power supplies to mains transformer.
AE. Range Mc/s	Selects any one of six aerial ranges plus "wideband" position.
AE. Attenuator	Attenuates aerial input in five steps.
Megacycles	Selects frequency in megacycles on scale marked 1 to 29 Mc/s.
System switch	Provides facilities for STANDBY, MANUAL, A.V.C., CALIBRATION and CHECK B.F.O.
Bandwidth	Provides selection of six i.f. bandwidths of 100 c/s, 300 c/s, 1·2 kc/s, 3 kc/s, 6·5 kc/s and 13 kc/s.
A.F. Gain	Adjusts the audio output.
Kilocycles	Selects the frequency in kilocycles on KC/s scale (divisions 1 kc/s).
B.F.O.	ON/OFF switch for beat frequency oscillator.
B.F.O. Note KC/S	Adjusts the B.F.O. frequency within fine limits.
AE. Tune	Final tuning of aerial circuit in all positions of AE. RANGE switch except "WIDEBAND".
I.F. Gain	Can be set for optimim signal-to-noise ratio. Should be set to maximum when the system switch is set to A.V.C.
A.V.C.	Should be set to LONG for R/T and SHORT for high-speed W/T (for low -speed W/T system switch should be set to MANUAL).
A.F. Level	Preset control which sets the a.f. level for feeding a 600-ohm 10 mW line. It is unaffected by the main A.F. GAIN control.
Limiter	Limits noise peaks exceeding the level of a 30% modulated signal.
Meter	In the R.F. LEVEL position indicates signal diode current. In the A.F. LEVEL position monitors the 10mW 600-ohm output.
Speaker	The loudspeaker may be switched ON or OFF as required. The two telephone jacks remain in circuit in either position of this switch.

LAYOUT OF SUB-ASSEMBLIES

9. The details given in para. 14 to 17 of this first chapter are similar for receiver radio 9292.

PLUG AND SOCKET INTERCONNECTIONS

10. The details given in para. 18 to 23 of the first part of this chapter are identical for receiver radio 9292.

Receiver back panel facilities

Audio outputs

11. The details given in para. 24 to 26 of the first part of this chapter are identical for receiver radio 9292.

BRIEF TECHNICAL DESCRIPTION

12. The details given in para. 27 to 39 of the first part of this chapter are similar for receiver, radio 9292.

Title	Function
B.F.O. NOTE KC/S	Adjusts the B.F.O. frequency within fine limits.
AE. TUNE	Final tuning of aerial circuit in all positions of AE. RANGE switch except "WIDEBAND."
I.F. GAIN	Can be set for optimum signal-to-noise ratio. Should be set to maximum when the system switch is set to A.V.C.
A.V.C.	Should be set to LONG for R/T and SHORT for high-speed W/T (for low-speed W/T system switch should be set to MANUAL.
A.F. LEVEL	Preset control which sets the a.f. level for feeding a 600-ohm 10mW line. It is unaffected by the main A.F. GAIN control.
LIMITER	Limits noise peaks exceeding the level of a 30% modulated signal.
METER	In the R.F. LEVEL position indicates signal diode current. In the A.F. LEVEL position monitors the 10mW 600-ohm output.
SPEAKER	The loudspeaker may be swit ched ON or OFF as required. The two telephone jacks remain in circuit in either position of this switch.

L.F. Converter

13. The front panel controls are limited mainly to aerial tuning.

Title	Function
MAINS	Makes and breaks the power supplies to the mains transformer.
AE. RANGE	Selects any one of four aerial ranges plus "WIDFBAND" position.
AE. ATTENUATOR	Attenuates aerial input in five steps.
AE. TUNING	Tuning of aerial circuit in all positions of AE. RANGE except WIDEBAND.
OPERATION	H.T. to the converter may be switched ON or OFF by this control. H.T. is applied to the converter from the receiver when the switch is in the "12 kc/s to 980 kc/s" position.
RV1	A preset potentiometer control for balancing gain of balanced mixer valves. This control is covered during operation and should be adjusted only when setting-up.

LAYOUT OF SUB-ASSEMBLIES

First v.f.o.

14. A block diagram of the receiver circuit is given in fig. 2. The first v.f.o. unit comprises, r.f. amplifier (V3), first v.f.o. (V5) and mixer-1 (V7). The low-pass filter is also contained within the unit and is housed in an adjacent screened compartment. Three controls are fitted to the unit, they are the AE. TUNE, AE. RANGE MC/S and MEGACYCLES. The MEGACYCLES control is coupled to the MEGACYCLES dial by means of a 63-link length of chain. The cores of the six aerial coils L4-9 are accessible through the top of the chassis.

Second v.f.o.

15. Two stages are incorporated in this unit, mixer-3 (V11) and second v.f.o. (V12). The two controls on the unit are the KILOCYCLES and FREE/LOCK, the KILOCYCLES control is geared to the KILOCYCLES scale and may be locked as required by use of the FREE/LOCK control. A further gear attached to the ganged capacitor is coupled to the shaft which drives the KILOCYCLES scale, thus both the ganged capacitor and the KILOCYCLES scale, operate simultaneously. Variable inductances L57-60 are accessible through the top of the chassis

100 kc/s i.f. amplifier

16. The unit comprises, first i.f. amplifier (V14), seconf i.f. amplifier (V16), 100 kc/s i.f. output (V17) a.v.c. and t.c. (V18), beat frequency oscillator (V19) and detector and noise limiter (V21). Also incorporated on this unit are the crystal filter and 100 kc/s filter assemblies. Both filters are operated by the BANDWIDTH control; a spur gear is coupled to each of the filter switches and operates them simultaneously. The other two controls on the unit are the B.F.O. NOTE KC/S and the I.F. GAIN. The B.F.O. NOTE KC/S control is an integral part of the b.f.o. unit assembly. The b.f.o. assembly may be removed from the i.f. amplifier chassis if required.

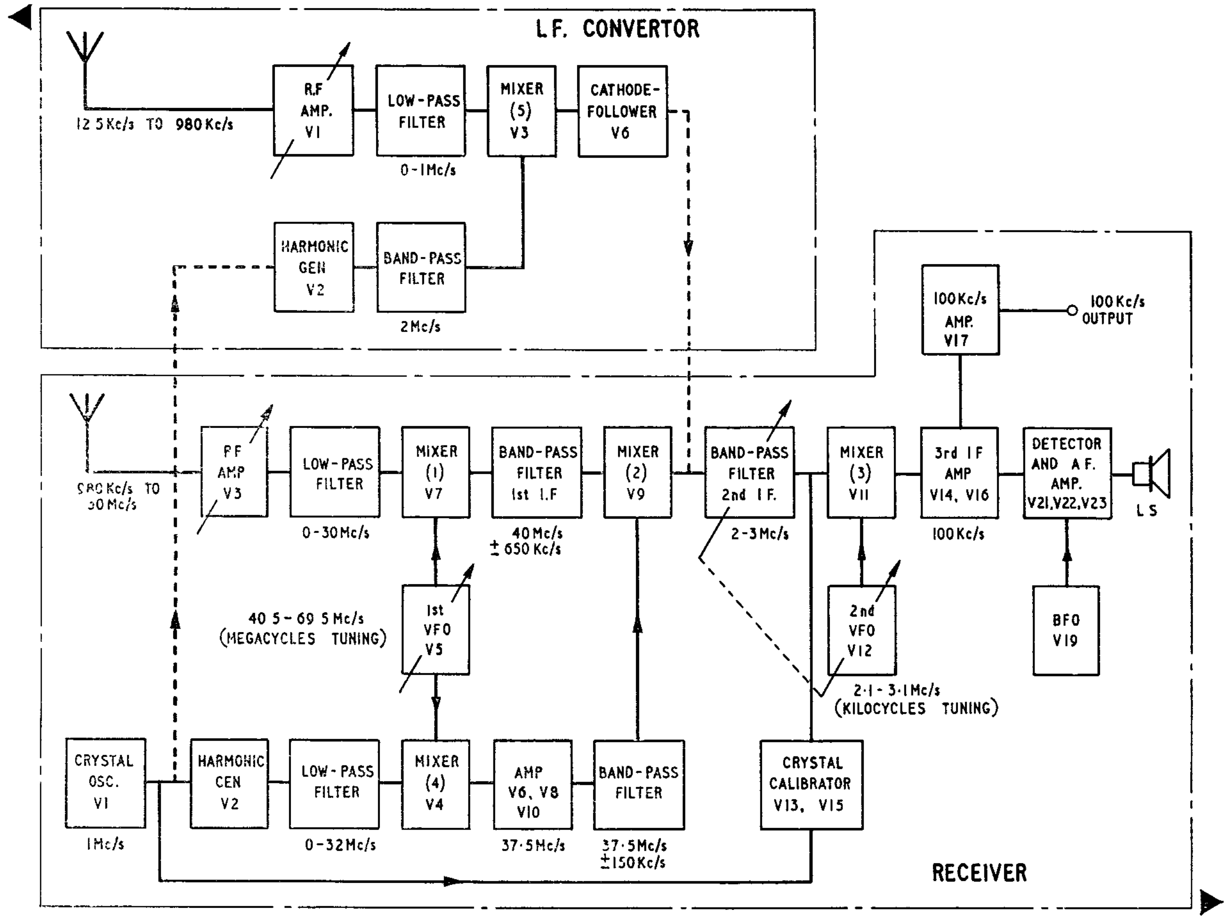


Fig. 2. Block diagram of receiver and l.f. converter

Crystal calibrator

17. The crystal calibrator comprises two stages, a mixer stage (V13) and frequency multiplier (V15). The unit is mounted on the top of the first v.f.o. unit. The cores of the two coils are accessible through the top cover of the unit.

PLUG AND SOCKET INTERCONNECTIONS

18. With the aid of fig. 3 and 4 and the following description, plug and socket interconnections may be easily identified.

19. The short coaxial cable from the second v.f.o. unit is terminated with socket SKT4 and is connected to plug PL4 on the top of the main chassis adjacent to L52.

20. The remaining coaxial cable coming from the second v.f.o. unit is terminated with plug PL5, this plug is mounted on the back panel of the receiver under the engraving R.F.

21. The chassis-mounted plug PL6 on the second v.f.o. unit accepts socket SKT6 from the crystal filter.

22. A flying lead from the crystal calibrator terminated with socket SKT2 is connected to plug PL2 on top of the main chassis adjacent to V1, V2. A 1 Mc/s output from the crystal-oscillator is available at PL3. This is taken via connector SKT3/PL3A to the rear panel to provide an input to the l.f. converter.

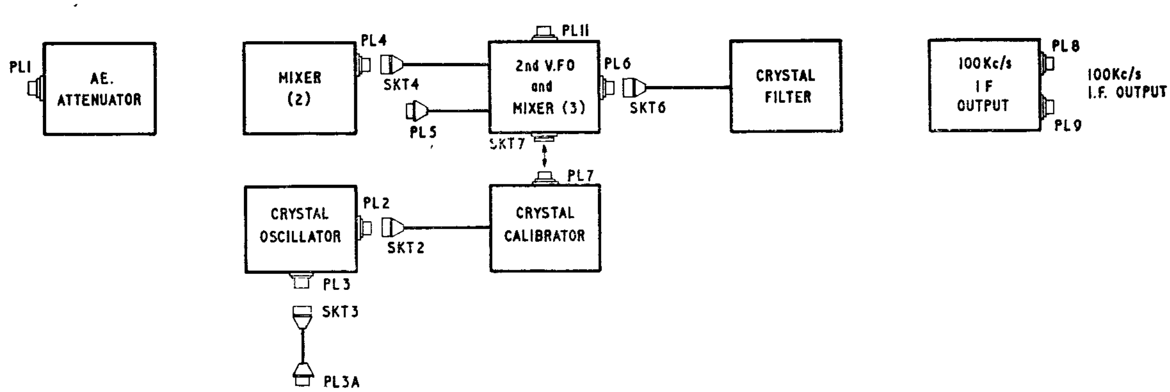


Fig. 3. Plug and socket interconnections

23. The chassis mounted plug PL7, on the crystal calibrator, is plugged direct into the octal base socket SKT7 on the side of the second v.f.o. unit.

Receiver back panel facilities

Audio outputs

24. Five audio outputs are available as follows:—

(1) Three 600-ohm outlets at 3mW.
(2) One 3-ohm outlet at 50mW.
(3) One 600-ohm outlet at 10mW. This output is controlled by the pre-set A.F. LEVEL control on the front panel and is independent of outputs (1) and (2).

100 *kc/s outputs*

25. The connection consists of two coaxial plugs connected in parallel (PL8/PL9—*fig.* 3). The total load should not be less than 70-ohms (e.g. with one outlet loaded by 75-ohms, the other can be used as a high impedance source).

Automatic volume control

26. The a.v.c. line is brought out on the terminal strip for such applications as diversity reception.

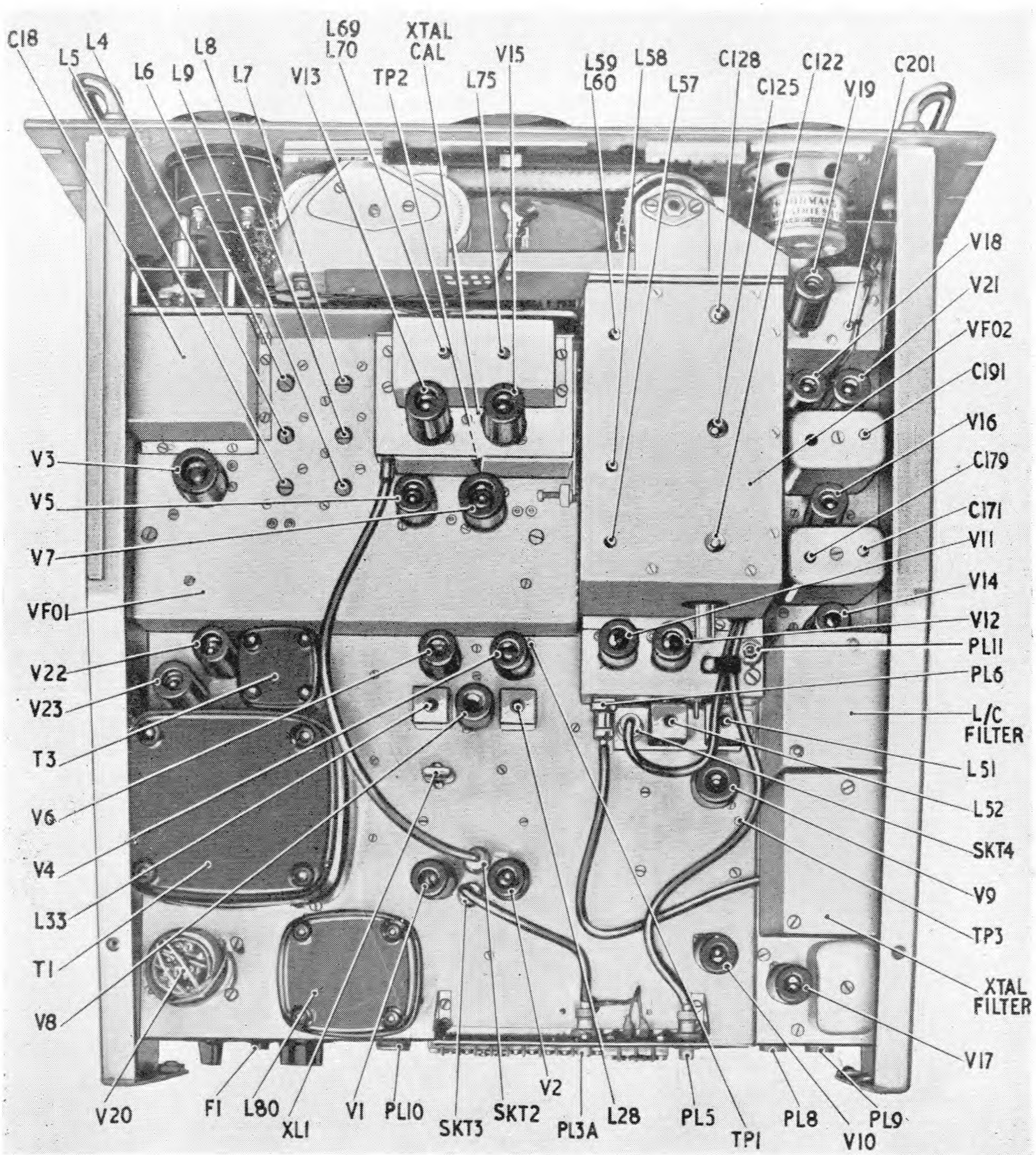


Fig. 4. Top view of receiver chassis

BRIEF TECHNICAL DESCRIPTION

Receiver

27. The receiver circuit is briefly described with the aid of the block diagram in fig. 2. A detailed explanation of the receiver circuit is given in Part 4, Chap. 1.

Signal input

28. The aerial loading (75-ohms unbalanced) is designed for optimum performance when the input circuits are tuned. With the AE. RANGE MC/S switch set to WIDEBAND, the input impedance is high unless the AE. ATTENUATOR is in use.

First mixer

29. Input signals between 0·98 and 30 Mc/s are fed via an r.f. amplifier and a 30 Mc/s low-pass filter to mixer-1 where they are mixed with the output from a variable frequency oscillator (first v.f.o. MEGACYCLES tuning). This oscillator has a frequency range of 40·5 to 69·5 Mc/s. The first i.f. stage is in effect a band-pass filter tuned to 40 Mc/s ± 650 kc/s. Thus, according to the setting of the first v.f.o. any spectrum of signals 1 Mc/s wide and existing in the range 0·98 to 30 Mc/s can be mixed in mixer-1 to produce an output acceptable to the first i.f. band-pass filter.

30. It should be noted at this stage that the exact setting of the first v.f.o. is determined by conditions in the second and fourth mixer circuits ; these restrict the possible settings to positions 1 Mc/s apart (e.g. 40·5, 41·5, 42·5 Mc/s etc.).

Harmonic generator and mixer

31. The output from a 1 Mc/s crystal oscillator is connected to a harmonic generator. The harmonics derived from this stage are passed through a 32 Mc/s low-pass filter and mixed with the output from the first v.f.o. in the fourth mixer. This mixer provides an output at 37·5 Mc/s which is amplified before passing through a band-pass filter tuned to 37·5 Mc/s with a bandwidth of ± 150 kc/s (*fig.* 5).

32. The presence of this filter restricts the setting of the first v.f.o. to an exact number of Mc/s plus 37·5 Mc/s in order to give an output acceptable to the filter and amplifier. As a result, the first v.f.o. must be tuned in 1 Mc/s steps.

Second mixer

33. The 40 Mc/s first i.f. signal is mixed in the second mixer with the 37·5 Mc/s output from mixer-2 in order to produce an output consisting of a 1 Mc/s spectrum in the frequency range 2–3 Mc/s (second i.f.).

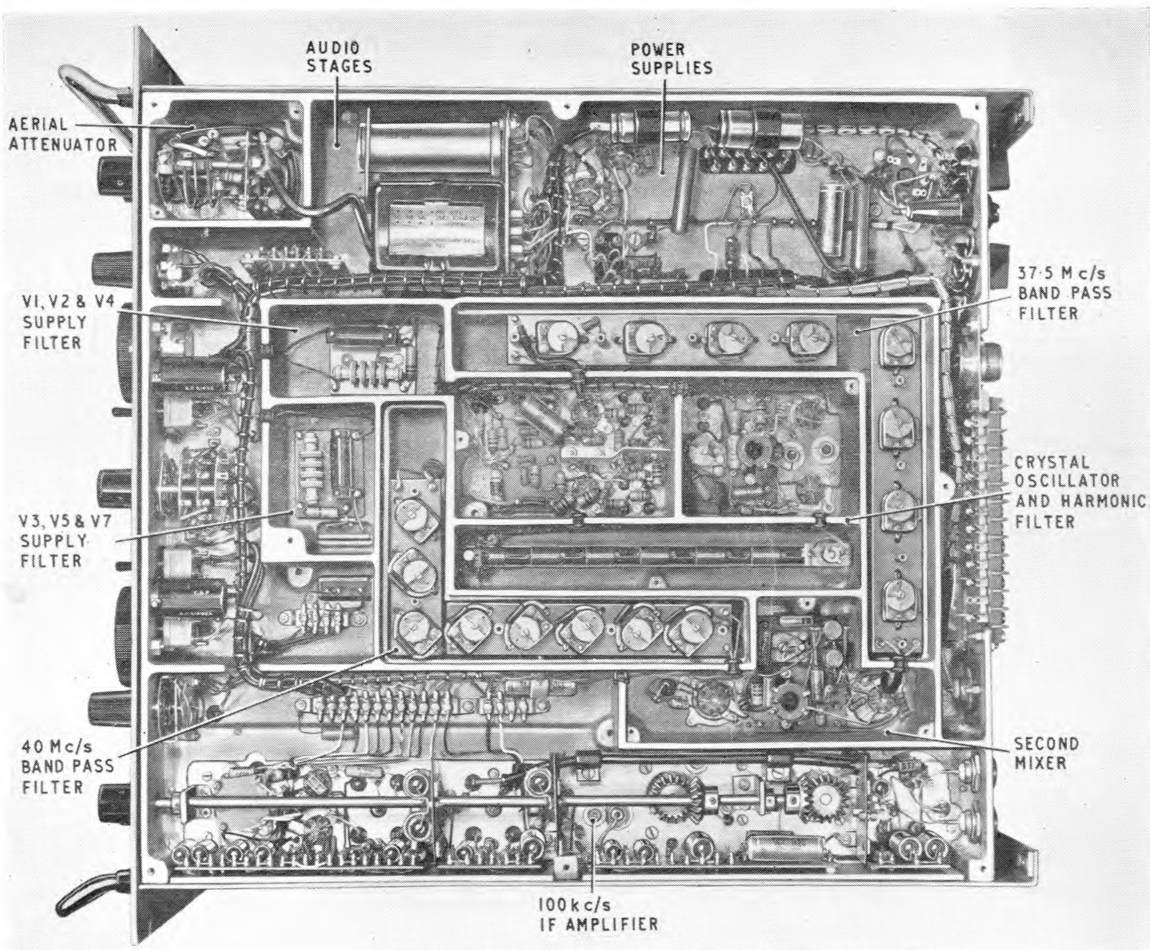


Fig. 5. Underside of receiver chassis

34. To clarify this method of operation, some examples of dial settings and intermediate frequencies corresponding to various incoming signals are tabulated below :—

Dial Settings		*Signal Freq.*	*1st. v.f.o.*	*Xtal Harmonic*	*1st. i.f.*	*Het. Freq.*	*2nd. i.f.*
Mc/s	*kc/s*	f_s *Mc/s*	f_o *Mc/s*	nf_c *Mc/s*	$f_o - f_s$	$f_o - nf_c$ (*M4 output*)	$nf_c - f_s$
4	1000	5·0	44·5	7th	39·5	37·5	2·0
5	0	5·0	45·5	8th	40·5	37·5	3·0
18	600	18·6	58·5	21st	39·9	37·5	2·4

35. Frequency drift of the first v.f.o. within the limits of the 37·5 Mc/s filter bandwidth does not affect the frequency stability of the receiver. A change in this oscillator frequency will alter the first i.f. to the same extent and in the same sense as the nominal 37·5 Mc/s signal from mixer-4. Therefore the difference from mixer-2 will remain constant.

Third mixer

36. The 2–3 Mc/s receiver, which follows M2, is preceded by a tuned three stage band-pass filter ganged to the second variable frequency oscillator 2nd v.f.o. (KILOCYCLES tuning). This oscillator is temperature compensated and the output is mixed in the third mixer with the 2–3 Mc/s output from the band-pass filter to provide the third and final intermediate frequency of 100 kc/s.

Third i.f. stage

37. The final i.f. stages are preceded by crystal lattice and L-C filters which provide six alternative bandwidths. Separate signal and a.v.c. diodes are employed and alternative switched time-constants give the optimum conditions for telegraphy and telephony reception. An additional i.f. amplifier is incorporated to give an independent output at 100 kc/s.

A.F. stages

38. Two independent audio frequency stages are incorporated for either line output or telephone socket and internal loudspeaker ; each stage is provided with a level control.

Crystal calibrator

39. A crystal calibrator unit is incorporated to enable the scale of the second v.f.o. to be checked at 100 kc/s intervals. These check points are obtained from a regenerative divider controlled by the 1 Mc/s crystal oscillator.

L.F. converter

40. The l.f. converter is briefly described with the aid of the block diagram in fig. 2. A detailed explanation of the l.f. converter is given in Part 4, Chap. 2.

R.F. amplifier and filter

41. Input signals from the aerial are applied via the aerial attenuator to the r.f. amplifier. Wideband or tuned (12·5 to 980 kc/s) amplification can be selected according to reception conditions. The output is passed through a 1 Mc/s low-pass filter to eliminate image signals.

Harmonic generator and filter

42. Output from the 1 Mc/s crystal oscillator of the receiver is fed to the harmonic generator. The band-pass filter in the output circuit selects the 2 Mc/s second harmonic.

Mixer

43. The output from the low-pass filter is fed to mixer-5 with the output from the 2 Mc/s band-pass filter. The selected output from the mixer is the sum frequency in the band 2·0125 to 2·98 Mc/s.

Cathode-follower

44. The output from the mixer is applied to a cathode-follower, the low-impedance output of which is applied to the input of the second i.f. amplifier (2–3 Mc/s) stage of the receiver. The required signal is finally selected in the interpolation stage of the receiver by tuning the KILOCYCLES scale.

Chapter 2

INSTALLATION AND OPERATION

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

INSTALLATION

1. After carefully unpacking the receiver, remove the dust cover and make sure that all valves and screening cans are firmly in place and that no packing material remains within the tuning mechanism.

Input power supply

2. Set the receiver and l.f. converter mains transformers to their appropriate voltage tappings to suit the local mains supply. Adjustments are made by plug-in links on the receiver and by ◀soldered▶ joints on the converter.

3. Make up a connector (*if not provided*) from 3-core lead of suitable rating and terminate with the 3-pin socket provided with the receiver. A similar connector of suitable rating should be made up and terminated with the 3-pin socket provided for the l.f. converter. Attach the connections between the mains supply and the receiver and l.f. converter (*fig.* 1). Check that the terminals HT1 and HT2 on the receiver are connected to HT1 and HT2 on the l.f. converter. Should the l.f. converter be removed from the cabinet or disconnected, the receiver may still be used by short circuiting the HT1 and HT2 terminals on the two-way terminal block mounted at the back of receiver.

Fuses

4. Ensure that the rating of the supply fuses is correct.

Receiver	2A.
L.F. converter	250 mA.

Aerial connections

5. Make the aerial connections to both the receiver AE. INPUT plug and the l.f. converter AERIAL plug. The impedance of both inputs is designed to match into a 75-ohm coaxial feeder.

Audio outputs

6. A number of audio outputs are available to give the following facilities :—

(1) Two telephone jacks on the front panel (*fig.* 2) are connected in parallel with the 3-ohm speaker across the 50mW output of the receiver The speaker can be switched OFF as required (S11).

(2) The following outputs are connected to the terminal strip at the rear of the receiver (*fig.* 1)

(*a*) Three 600-ohm outlets at 3mW.

(*b*) One 3-ohm outlet at 50mW.

(*c*) One 600-ohm outlet at 10mW. This output is controlled by a preset A.F. LEVEL control on the front panel and is independent of outputs (*a*) and (*b*).

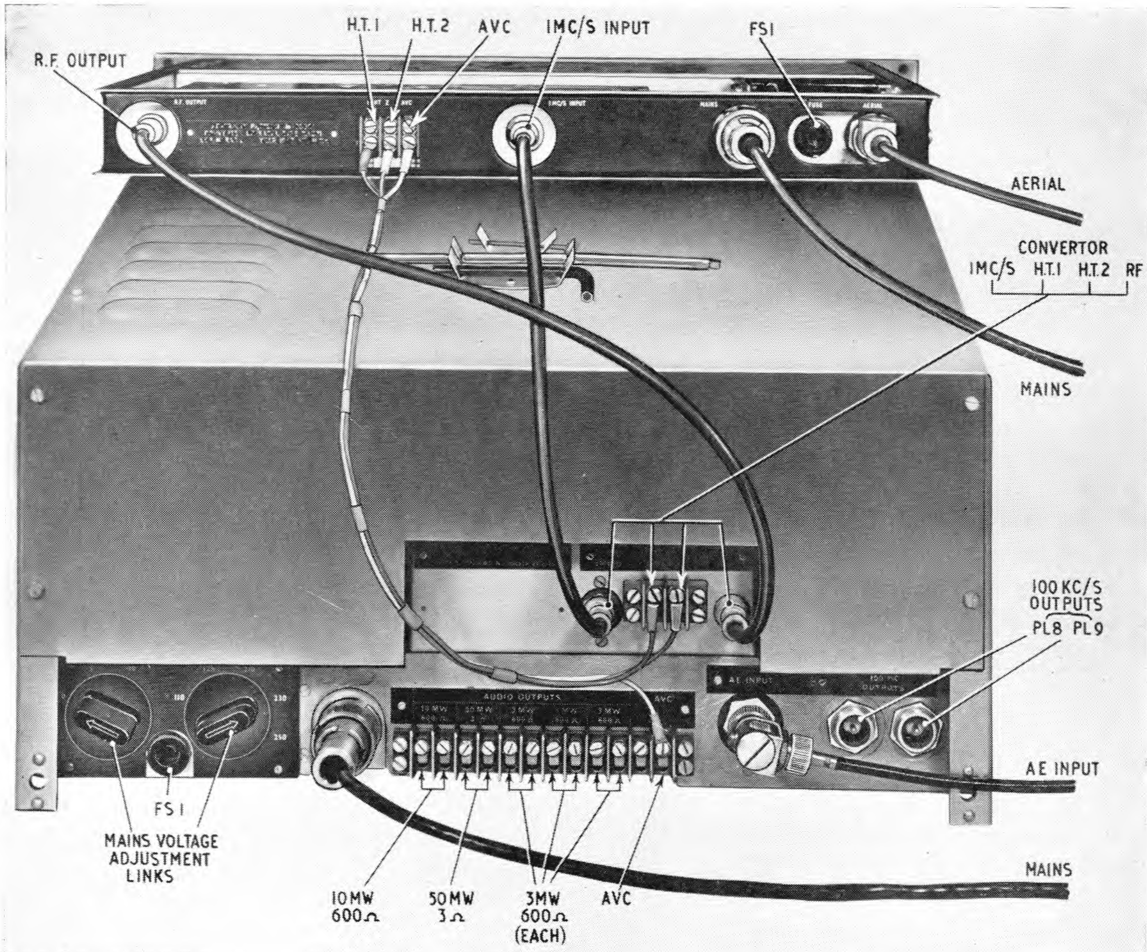


Fig. 1. Interconnection of receiver and l.f. convertor

100 kc/s i.f. output.

7. The connection consists of two coaxial plugs PL8 and PL9 connected in parallel to the 100 kc/s i.f. output (*fig.* 1). The total load should be not less than 70 ohms (e.g. with one outlet loaded by 75 ohms, the other can be used as a high impedance source).

Note. . .

A difference in bandwidth facilities for receiver radio 5820-99-999-9292 *is described in Appendix* 1.

Automatic volume control

8. The a.v.c. line is brought out to the terminal strip on the rear of the chassis for such applications as diversity reception.

Interconnection of receiver and l.f. converter

9. The interconnection of the receiver and the l.f. converter is as follows :—

(1) Coaxial connectors

Receiver	*L.F. converter*
R.F.	R.F. OUTPUT
1 MC/S	1 MC/S INPUT

(2) 3-way connectors

Receiver	*L.F. converter*
HT.1	HT.1
HT.2	HT.2
A.V.C.	A.V.C.

10. The two coaxial connectors are of different length and the correct use of these will be obvious. The 3-way connector consists of two red wires and a white wire coded at either end with coloured sleeves to aid identification. The white wire must be used for the A.V.C. connection (*fig.* 1).

Dust cover

11. Care must be taken when refitting the dust cover to ensure that the front edge of the cover locates the clips correctly. These clips can be damaged if force is used and there will then be an imperfect electrical screen.

OPERATION

Switching on

12. Receiver and l.f. converter

(1) Set both MAINS switches to ON.

(2) Set the OPERATION switch on the l.f. converter to the required frequency range (*fig.* 2).

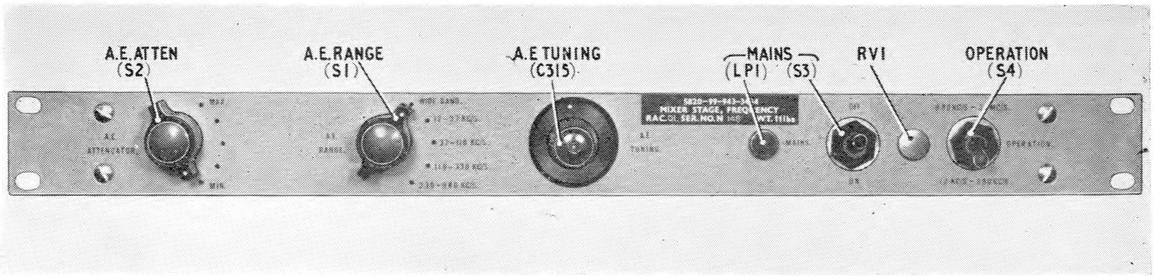


Fig. 2. L.F. converter–front panel

Tuning the receiver

13. Operate the receiver controls (*fig.* 3) in the following sequence :—

(1) AE. RANGE MC/S to the desired frequency band.

(2) AE. ATTENUATOR to MIN.

(3) MEGACYCLES dial to the required integer (1 to 29). The position of maximum receiver noise will indicate the correct setting.

(4) System switch to CAL.

(5) Bandwidth to 3 KC/S.

(6) A.F. GAIN to mid-position.

(7) Adjust KILOCYCLES scale to zero beat at the 100 kc/s point nearest to the desired frequency.

(8) Adjust the milled cursor slide to coincide with this point.

(9) Switch B.F.O. on.

(10) System switch to CHECK B.F.O.

(11) Adjust B.F.O. NOTE KC/S control to zero beat.

(12) Rotate the system switch to MAN.

(13) Set KILOCYCLES scale to the required frequency and critically tune for zero beat in order to centralize the signal within the i.f. pass-band.

(14) Adjust AE. TUNE for maximum signal (or noise). For optimum c.w. reception, " off-tune " the b.f.o. to produce an acceptable beat note.

(15) Set the A.F. GAIN to its maximum clockwise position and adjust the output level with the I.F. GAIN control.

(16) For m.c.w. or voice reception, switch B.F.O. off.

(17) Set the system switch to A.V.C. if required.

(18) Set BANDWIDTH for optimum reception.

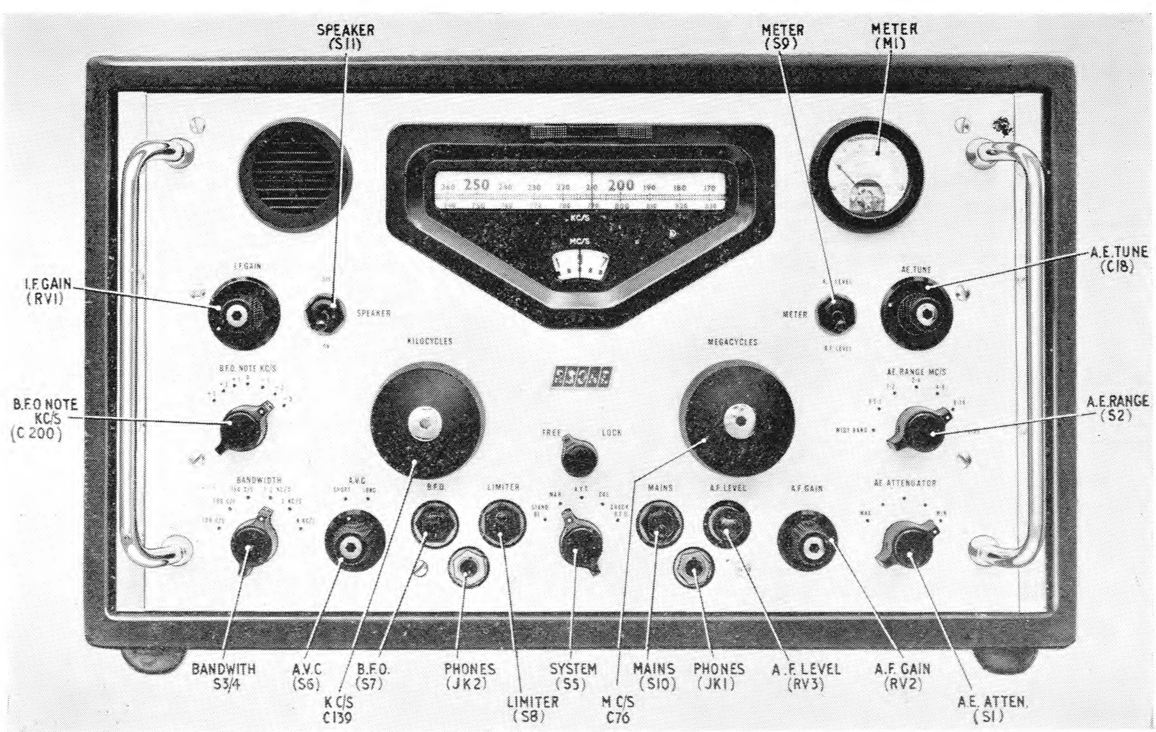


Fig. 3. Receiver–front panel

Tuning the l.f. converter

14. Operate the l.f. converter controls in the following sequence :—

(1) Set the OPERATION switch to the desired frequency range.

(2) Switch AE. RANGE to the desired frequency band and the AE. ATTENUATOR to MIN.

Receiver and l.f. converter

15. (1) Calibrate the receiver as above and adjust the A.F. GAIN and I.F. GAIN controls as necessary.

(2) Set the system switch on the receiver to MAN.

(3) Rotate the KILOCYCLES control to the desired setting on the red scale.

(4) Adjust the l.f. convertor AE. TUNE for maximum signal (or noise).

(5) Set the system switch on the receiver to A.V.C. if required.

FUNCTION OF CONTROLS (RECEIVER)

MAINS

16. Makes and breaks the power supply to the mains transformer.

AE. RANGE MC/S.

17. This control facilitates the selection of any one of six aerial ranges plus WIDEBAND position.

AE. ATTENUATOR

18. This control enables the operator to reduce the level of all incoming signals when strong unwanted signals are present which cannot be rejected sufficiently by tuning the aerial ; the input level can also be reduced if the required signal is causing overloading in the early stages of the receiver.

MEGACYCLES

19. This scale should be checked periodically to ensure that its setting is reasonably central with respect to the band in use. This is indicated by a reduction of signal or noise on either side of the correct setting.

System switch

20. This switch provides facilities for STANDBY, MANUAL, A.V.C., CALIBRATION and CHECK B.F.O.

BANDWIDTH

21. The three crystal filters determining the bandwidth are adjusted to ensure that their centre frequencies are all within 50 c/s, thus any bandwidth can be selected without retuning the receiver. Six bandwidths are provided as follows :—

8 kc/s, 3 kc/s and 1·2 kc/s ; 750 c/s, 300 c/s and 100 c/s (crystal).

A.F. GAIN

22. The A.F. Gain control adjusts the audio output.

KILOCYCLES

23. The calibration of this scale may be checked at 100 kc/s intervals by setting the system switch to the CAL position.

B.F.O.

24. The B.F.O. ON/OFF switch makes or breaks h.t. to the beat frequency oscillator.

B.F.O. NOTE KC/S

25. The b.f.o. is exactly tuned to a central point on the i.f. amplifier response when the B.F.O. NOTE KC/S control is set to zero beat with the calibrator. Having standardized the b.f.o. frequency, the frequency of an incoming signal may be accurately measured by setting the KILOCYCLES control to a zero beat position ; the b.f.o. should be detuned in order to produce an acceptable note for c.w. reception.

AE. TUNE

26. If maximum sensitivity is not required, the aerial need not be tuned unless strong unwanted signals are present. It should be noted that the presence of very strong signals anywhere within the spectrum may cause cross-modulation unless the aerial is tuned. Under these conditions, CARE MUST BE TAKEN TO AVOID TUNING THE INPUT TO THE INTERFERING SIGNALS instead of the signal required. Familiarity with the tuning controls will obviate this.

I.F. GAIN

27. The I.F. GAIN control is operative both in the MAN, and the A.V.C. positions of the system switch. In the MAN. position of the system switch, the setting of the control should always be at a minimum consistent with satisfactory a.f. level. The following should be noted when the system switch is in the A.V.C. position. Reducing the i.f. gain results in a reduction of a.v.c. loop gain together with a degraded a.v.c. characteristic. Therefore when in the A.V.C. position, it is desirable that the I.F. GAIN control be set to maximum. A possible exception to this occurs when receiving interrupted signals in which the carrier is periodically switched off ; in this case, receiver noise could be troublesome during the quiet intervals.

A.V.C.

28. The choice of time-constant depends largely on conditions. The LONG time-constant (1 second) should be employed with voice signals ; the SHORT time-constant may be used with high speed telegraphy or voice. For hand (low) speed telegraphy, the MAN. position of the system switch should be used (*para.* 27).

A.F. LEVEL

29. This preset control sets the a.f. level in a separate a.f. stage for feeding a 600-ohm 10mW line. It is unaffected by the position of the main A.F. GAIN control.

Important Note . . .

It is important that the A.F. LEVEL control is not turned towards its maximum position unless the 10mW 600-ohm winding is suitably terminated with a load.

LIMITER

30. When switched into use, the LIMITER reduces the effects of noise peaks exceeding the level of a 30% modulated signal. It does not introduce noticeable distortion below a 30% modulation level.

METER

31. With the METER switch in the R.F. LEVEL position, the meter indicates the signal diode current. In the A.F. LEVEL position, the 10mW 600-ohm output only is monitored. A calibration mark is provided at 10mW.

SPEAKER

32. The loudspeaker may be switched ON or OFF as required. The two telephone jack sockets remain in circuit in either position of the SPEAKER switch.

FUNCTION OF CONTROLS (L.F. CONVERTER)

MAINS

33. This switch makes and breaks the power supply to the mains transformer.

AE. RANGE

34. This control facilitates the selection of any one of four aerial ranges plus " WIDEBAND " position.

AE. ATTENUATOR

35. This control enables the operator to reduce the level of all incoming signals when strong unwanted signals are present which cannot be rejected sufficiently by tuning the aerial ; the input level can also be reduced if the required signal is causing overloading in the early stages of the receiver.

AE. TUNING

36. If maximum sensitivity is not required, the aerial need not be tuned unless strong unwanted signals are present. It should be noted that the presence of very strong signals anywhere within the spectrum may cause cross-modulation unless the aerial is tuned. Under these conditions, CARE MUST BE TAKEN TO AVOID TUNING THE INPUT TO THE INTERFERING SIGNALS instead of the signal required. Familiarity with the tuning controls will obviate this possibility.

OPERATION

37. The OPERATION switch makes and breaks the h.t. line from the receiver. H.T. is applied to the converter when the switch is in the 12–980 kc/s position.

Appendix 1

Receiver Radio 5820-99-999-9292

LIST OF CONTENTS

INSTALLATION

1. With the exception of para. 4 of the first part of this chapter, the installation (*para.* 1 to 11) of 9292 is identical to that of 2775.

Fuses

2. Ensure that the rating of the h.t. fuse and the supply fuses is correct.

(1) Receiver h.t. 350 mA
(2) Receiver supply 2A
(3) L.F. converter 250 mA

OPERATION

3. The details given in para. 12 to 15 of the first part of this chapter are identical for receiver, radio 9292.

FUNCTION OF CONTROLS (RECEIVER)

4. With the exception of para. 21 of the first part of this chapter the function of the controls (*para.* 16 to 32) for 9292 is identical to that for 2775.

Bandwidth

5. The two crystal filters determining the bandwidth are adjusted to ensure that their centre frequencies are all within 50 c/s, thus any bandwidth can be selected without retuning the receiver. Six bandwidths are provided as follows:

13 kc/s, 6·5 kc/s, 3 kc/s and 1·2 kc/s; 300 c/s and 100 c/s (crystal).

375/6 Wt. No. 57480 D. No. 4884 1.00

PART 2

TECHNICAL INFORMATION (SERVICING)

Chapter 1

TEST EQUIPMENT REQUIREMENTS AND GENERAL SERVICING

CONTENTS

TABLES

ILLUSTRATIONS

INTRODUCTION

1. The general servicing and alignment procedure information in this Par is intended to assist in the repair of the receiver and l.f. converter.

2. This chapter lists the test equipment required for minor and major servicing, dismantling and general servicing of the receiver and l.f. converter.

TEST EQUIPMENT

3. Servicing personnel will require the following test equipment:-

Item	Ref. No.	Nomenclature
1	5QP/1057049	Multimeter CT.498A or
1A	5QP/9491999	Multimeter CT.498 (see Note
2	10S/9008337	Signal generator CT.452A or
2A	10S/9131420	Signal generator CT.452
3	10S/9492964	Signal generator
4	10S/9556255	Multimeter electronic CT.47
5	10S/9149811	Wattmeter absorption A.F.
6	10S/5801668	Noise generator CT.410 or
6A	10S/9491612	Noise generator S4/1
7	10C/0115562	Capacitor 0.1μF
8	10W/0222090	Resistor 4.7 kilohm $\frac{1}{2}$ W
9	10W/0221232	Resistor 600 ohm $\frac{1}{4}$ W (4 off
10	10AS-972-8946-8947	Plates electrical shield (o set) (see Note 2)
11	10AS-972-8949-8950	Plates electrical shield (o set) (see Note 2)
12	5A/9723881	Dryer electric
13	5A/4345664	Adaptor nozzle
14	10S/1076703	Counter electronic frequenc

Note 1...

The use of the alternative items suffixed A above is permissible, where such items are held.

Note 2...

These shields are the screens for the 37.5 and 40 Mc/s filters. I is essential that they are in position during alignment. The acc holes in the shields are normally sealed.

ASSOCIATED AIR PUBLICATIONS

4. Items of test equipment which are used for servicing are briefly described below. Copies of the following Air Publications should be demanded as required.

Item	Air Publication
Multimeter CT.498A	A.P.120M-0105-1
Signal generator CT.452A	A.P.117E-0207-1
Multimeter electronic CT.471C	A.P.117G-0603-1
Wattmeter absorption	A.P.117B-0102-1

DISMANTLING

UNIT BREAKDOWN

5. The receiver may be rapidly dismantled to six sub-units as follows:-

(1) Front panel

(a) Tuning escutcheon

(b) Loudspeaker and escutcheon

(c) Output lever meter

(2) Second variable frequency oscillator

(a) 2-3 Mc/s bandpass filter

(b) Second v.f.o. (V12)

(c) Third-mixer (V11)

(3) First variable frequency oscillator

(a) R.F. amplifier (V3)

(b) First v.f.o. (V5)

(c) First mixer (V7)

(4) 100 kc/s i.f. amplifier

(a) Beat frequency oscillator (V19)

(b) Crystal filter

(c) L-C filter

(d) First and second i.f. amplifiers (V14 and V16)

(e) A.V.C. and T.C. stages (V18)

(f) Detector and noise limiter (V12)

(g) 100 kc/s output (V17)

(5) Crystal calibrator (V13 and V15)

(6) Main chassis

(a) Aerial attenuator

(b) Crystal oscillator (V1)

(c) Harmonic generator (V2)

(d) 30 and 32 Mc/s low-pass filters

(e) 37.5 and 40 Mc/s bandpass filters

(f) Harmonic mixer (V4)

(g) The 37.5 Mc/s amplifiers (V6), (V8) and (V10)

(h) Second mixer (V9)

(j) A.F. output stages (V22) and (V23)

(k) Power supplies (V20)

DISMANTLING AND REASSEMBLY INSTRUCTIONS

Note...

The performance checks (para. 17 to 22) must be carried out on completion of any repair involving dismantling of the receiver.

Front panel

6\. (1) Remove all control knobs.

(2) Unscrew the eight instrument head panel fixing screws.

Note...

The two screws at the bottom of the front panel, adjacent to the jack sockets, are secured to the main chassis with nuts.

(3) Carefully withdraw the front panel and unsolder the connections to the meter and speaker switches. Alternatively, the number of wires to be unsoldered can be minimised (loudspeaker only) by removing the securing nuts on the SPEAKER and METER switches and also the nuts securing the solder tags on the rear of the meter. The panel may now be completely removed.

Note...

When refitting the B.F.O. NOTE control knob, ensure that the identification mark on the shaft is uppermost and that the pointer indicates zero when zero beat is obtained.

Second variable frequency oscillator

7. (1) Remove the bottom cover.

(2) Unsolder the three connections on the 4-way tag strip, adjacent to the jack socket JK1, situated in compartment 6 (fig. 1).

(3) Remove the front panel (para.6).

(4) Withdraw the crystal calibrator unit by slackening the knurled nuts, disconnecting the coaxial cable and unplugging the unit.

(5) Unbolt the cable cleat securing the dial light cable.

(6) Unclip the lampholder.

(7) Disconnect the coaxial cables.

(8) Remove the screws securing the MEGACYCLES dial to the boss and withdraw the dial.

Note...

Do not unscrew the boss from the shaft.

(9) Remove the second v.f.o. cover (15 screws).

(10) Remove the three unit retaining screws and then withdraw the unit vertically.

7a. When servicing the second v.f.o. assembly, clean the worm-wheel and the split gear on the ganged capacitor shaft with Trichloroethane (Inhibisol). Then apply with a brush, to the worm-wheel only, a thin coating of Molybdenum Disulphide grease.

WARNING...

WHEN USING CLEANING OR DEGREASING FLUID:-

(1) ENSURE MAXIMUM VENTILATION.

(2) DO NOT SMOKE.

(3) AVOID CONTACT WITH SKIN.

(4) DO NOT IMMERSE COMPONENTS FOR MORE THAN ONE MINUTE.

(5) DRY COMPONENTS COMPLETELY BEFORE RE-ASSEMBLY. IF VARNISHED, DRY BY OVEN OR WARM AIR.

Ganged capacitor

Note ...

Reference must be made to the second v.f.o. alignment procedure (Part 2, Chap.2) before attempting to refit the ganged capacitor.

8. (1) Remove the second v.f.o. from the receiver in accordance with the instructions in para.7.

(2) Remove the KILOCYCLES scale.

(3) Remove the remaining cover plate and the under chassis screen.

(4) Unsolder the capacitor connections.

(5) Remove the drive gear and collet.

(6) Remove the three screws securing the capacitor to the bracket; ensure that the anti-backlash gears are loaded.

First variable frequency oscillator

9. (1) Remove the front panel, the bottom cover and the right-hand side gusset plate.

(2) Remove the screens from compartments 3, 8 and 13 (fig. 1).

(3) Unsolder the connecting wires from the two turret lugs situated in compartment 3, the leads to the turret lug in compartment 8, the pin connections in compartment 5 and the screened cable in compartment 13.

(4) Unscrew the three fixing screws on the top of the unit.

(a) To fit a new chain:-

(i) Take a 63-link chain (Vol.3).

(ii) Hold the chain tension sprocket down towards the chassis, and fit the new chain round the two chain wheels.

(iii) Release the tension sprocket and check that it holds the chain under tension. See "front panel" instructions regarding refitting of B.F.O. NOTE control knob (para.6).

100 kc/s i.f. amplifier

10. (1) Remove the left-hand gusset plate adjacent to the unit.

(2) Unsolder the leads to the 4 and 12-way tag strips (fig. 2) and the 100 KC/S OUTPUT plugs on the underside of i.f. amplifier.

(3) Disconnect the coaxial lead to the second v.f.o.

(4) Remove the six screws securing this unit to the main chassis.

Note ...

Removal of the I.F. GAIN control (RV1) on the b.f.o. assembly is necessary to obtain access to one of the six securing screws.

(5) Beat frequency oscillator.

(a) Remove the front panel (para.6).

(b) Remove the left-hand gusset plate adjacent to the i.f. amplifier

(c) Disconnect leads from the I.F. GAIN potentiometer (RV1).

(d) Remove the bottom cover.

(e) Remove the screw securing cable cleat situated adjacent to L81 choke assembly on underside of i.f. amplifier.

(f) Disconnect the red-white lead of the b.f.o. cableform from the terminal on adjacent 12-way tag strip.

(g) Withdraw the red-white lead from cable-form.

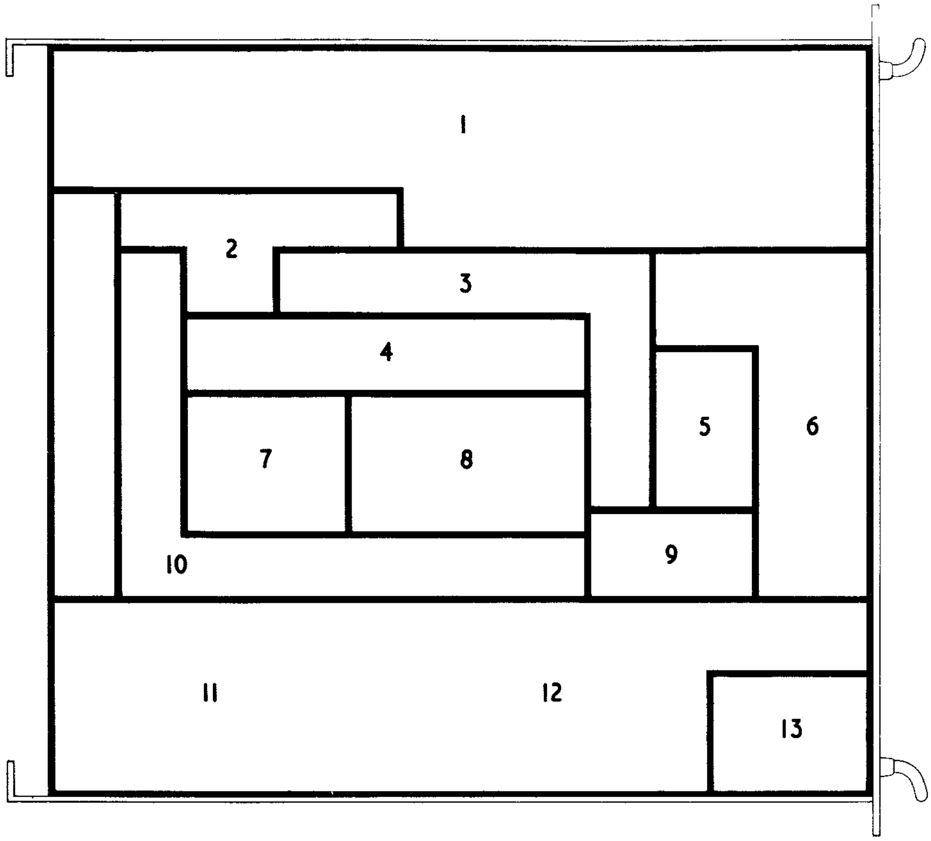
(h) Disconnect the brown leads from pin 4 of V18 socket.

(j) Disconnect the yellow leads from pin 9 of V21 socket.

(k) Remove the remaining three 6 B.A. screws and crinkle washers to release the b.f.o. assembly from the i.f. amplifier chassis.

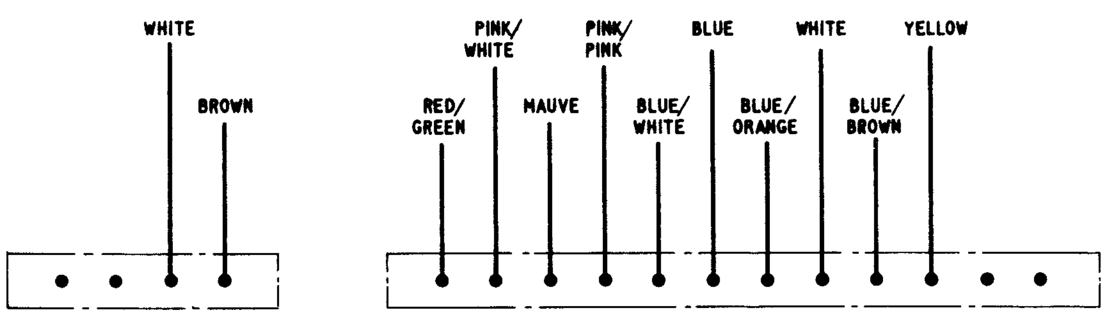
Valve renewal

11. With the exception of V5, fitment of new valves will not affect the receiver alignment.



1 100 kc/s I.F. AMPLIFIER
2 SECOND MIXER
3 40 Mc/s BAND PASS FILTER
4 HARMONIC FILTER
5 FIRST VFO SUPPLY FILTER
6 SYSTEM COMPARTMENT
7 CRYSTAL OSCILLATOR AND HARMONIC GENERATOR
8 HARMONIC MIXER AND 37·5 Mc/s AMPLIFIER
9 SUPPLY FILTER FOR 7 & 8
10 37·5 Mc/s BAND PASS FILTER
11 POWER SUPPLIES
12 AUDIO STAGES
13 AERIAL ATTENUATOR

Fig.1 Key to under-chassis layout



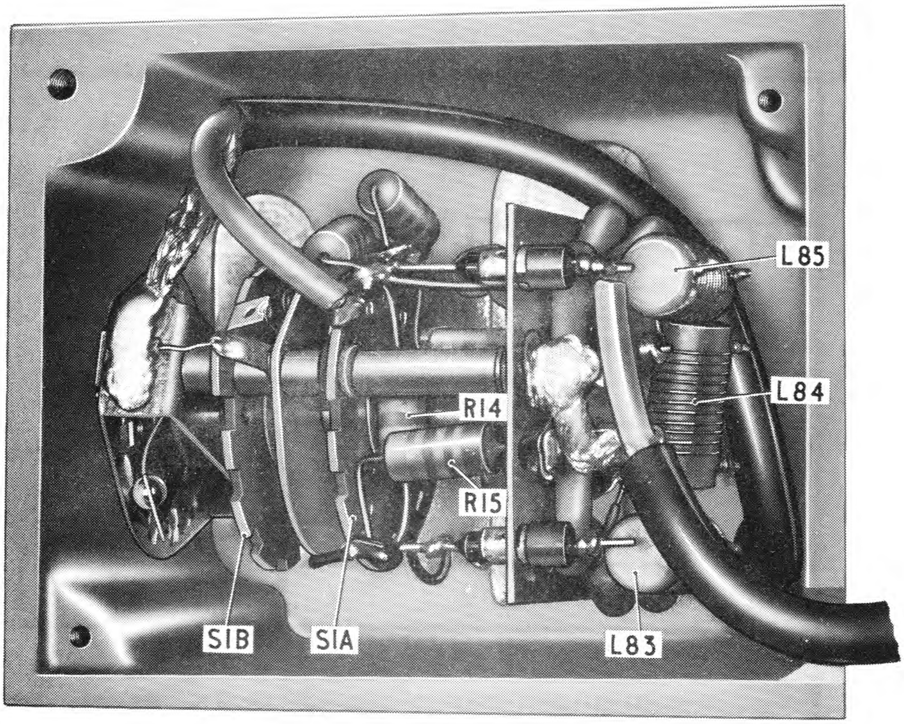


Fig.3   Aerial attenuator

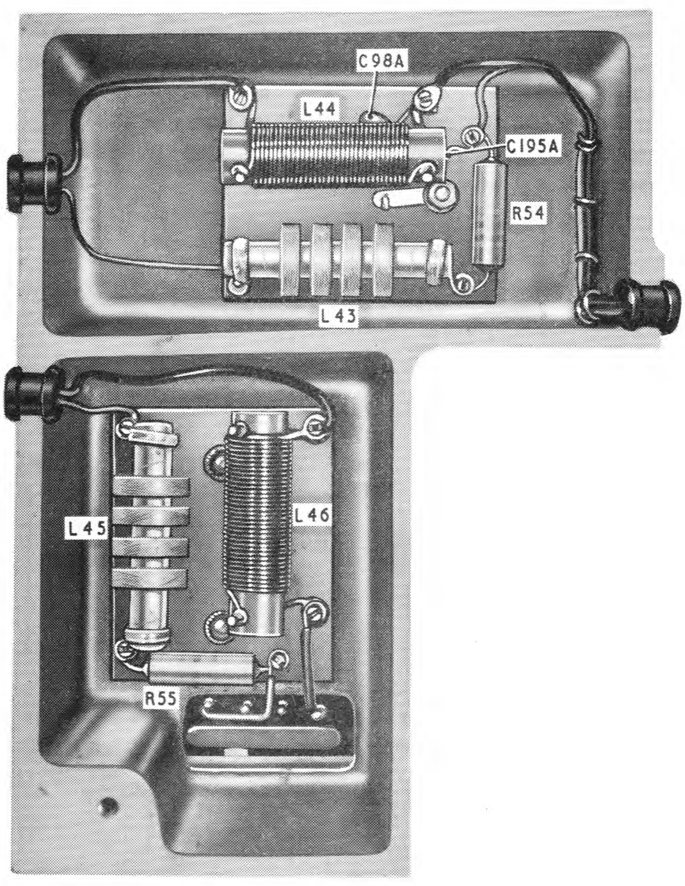


Fig.4   Supply filters

RENEWAL OF FILM TUNING SCALE

Note...

Great care must be taken when feeding a new film into position to avoid twisting or buckling.

Removal

12. (1) Rotate the KILOCYCLES scale to the limit of its travel at the 1000 kc/s end of the scale. Apply the scale lock.

(2) Remove the dial illuminating lamp and its holder.

(3) Hold the two gear wheels at the top of the right-hand film bobbin against the spring tension and remove the two screws securing the idler gear mounting assembly.

(4) Ease the idler gear clear of the film bobbin gear wheels and carefully ease the spring tension from them. The film bobbins are then free to revolve independently.

(5) Carefully lift the film clear of the tuning drive sprocket and withdraw the film via the back of the loudspeaker.

Fitting a new film scale

13. (1) Carefully feed the low frequency end of the film scale via the rear of the loudspeaker, the front of the tuning drive sprocket and the front of the guide roller mounted between the two right-hand film bobbins. Engage the prepared end of the film in the right-hand bobbin. Slowly wind the film, under very light tension, onto the bobbin until the STOP marking is approximately in the centre of the escutcheon window.

(2) Carefully feed the free end of the film via the rear of the loudspeaker and the rear of the tuning drive sprocket. Engage the prepared end of the film in the left-hand film bobbin. Slowly wind the film, under very light tension, on to the bobbin until the sprocket holes in the film engage with the tuning drive sprocket.

(3) Maintain the STOP marking approximately in the centre of the escutcheon window and take up any slack in the film by rotating the bobbins in opposite directions. When all the slack has been taken up, rotate the gear wheels on top of the bobbins a further $\frac{1}{2}$ to $\frac{3}{4}$ turn against the spring tension and hold them in position. Refit the idler gear wheel and mounting plate screws and release the gear wheels.

(4) Check that the STOP marking is still approximately in the centre of the escutcheon window.

(5) Switch on the receiver and allow it to warm up.

(6) Release the tuning LOCK and check the calibration with the internal calibrator at the 100 kc/s point, with the cursor in the centre of the escutcheon window.

(7) If the calibration is not correct, ease the film clear of the tuning drive sprocket and re-position it around the sprocket until the correct position is obtained.

(8) Perform a calibration check using an external signal to ensure that the correct 100 kc/s calibration point was used at sub-para.(6).

(9) Refit the dial illuminating lamp and holder.

GENERAL SERVICING

14. Component layout illustrations, fig. 3 to 8 inclusive, give an overall picture of the chassis underside except for the "crystal oscillator and harmonic generator" section which is incorporated in Part 2, Chap.2, fig. 10.

Note...

On no account should the 37.5 or the 40 Mc/s filter assemblies be touched.

15. Removal of the main base cover will, without removal of further covers, reveal the power and audio stages, and the 100 kc/s amplifier chassis.

16. To gain access to other stages further covers must be removed; they are the second mixer (compartment 2) and the harmonic generator and crystal filter stages (compartments 7 and 8) fig. 1.

RECEIVER TESTS

17. The performance checks given in para. 18 to 22 should be carried out, in the order given, following any fault rectification action. The relevant test equipment is given in para. 3.

Preliminary

18. (1) Set the system switch on the receiver to STANDBY. Set the main supply switch to ON (down) and check that the dial lamp glows.

(2) Set the a.f. wattmeter to the 100mW range and 3-ohm impedance. Connect the wattmeter across the 50mW, 3-ohm output of the receiver.

(3) Terminate each of the remaining audio outputs into 600 ohms.

(4) Connect the signal generator to the antenna input. Set the generator to the CARRIER OFF mode.

(5) Set the front panel controls as follows:-

(a) AE RANGE to WIDEBAND.

(b) MEGACYCLES to 3.

(c) KILOCYCLES to 500.

(d) AE ATTEN to MIN.

(e) BANDWIDTH to 3 kc/s.

(f) BFO switch to OFF (up).

(g) BFO NOTE KC/S to 0 kc/s.

(h) IF GAIN fully clockwise.

(j) SPEAKER switch to OFF (up).

(k) LIMITER switch to OFF (up).

(l) METER switch to RF LEVEL

(m) AF GAIN to mid-travel.

(6) Allow a few minutes warm-up time and then set the system switch to CAL.

(7) Connect the headphones to one of the monitor jacks.

(8) Adjust the KILOC -beat condition in the headphones.

(9) Adjust the milled cursor (located above the Kilocycles scale) to coincide exactly with the calibration point.

(10) Set the System switch to CHECK BFO.

(11) Switch the BFO ON and adjust the BFO control for zero-beat.

(12) Set the system switch to MAN.

(13) Switch the loudspeaker ON and note the level of the noise output.

(14) Set the LIMITER switch to ON and check that the noise output level is reduced.

(15) Re-set the LIMITER and SPEAKER switches to OFF.

(16) Set the AF GAIN control fully clockwise.

Signal-to-noise tests

19. (1) Set the signal generator for the following conditions:-

(a) Signal input frequency: 3.500MHz.

(b) Mode: C.W.

(c) Signal input level to receiver: 1µV.

(2) Tune the receiver for maximum response using both main tuning controls.

(3) Set the BFO switch to ON and adjust for a beat note of about 1kHz.

(4) Set the AE RANGE switch to 2-4 Mc/s and adjust the AE TUNE control for a peak reading on the meter.

(5) Check that an audio output of at least 50mW is obtained. Also check that an audio tone is present at each of the 3mW output points.

(6) Adjust the IF GAIN control to give an indication of 100 µA on the front panel meter.

(7) Set the audio output level to 50mW using the AF GAIN control.

(8) Set the signal generator to the CARRIER OFF mode and check that the audio output level falls to about 0.8mW.

(9) Switch the BFO OFF.

(10) Re-set the IF GAIN and AF GAIN controls fully clockwise.

(11) Set the signal generator for the following conditions:-

(a) Signal input frequency: 3.500MHz.

(b) Mode: 30 percent A.M. at a frequency of 1kHz.

(c) Signal input level to receiver: 3.5µV.

(12) Repeat operations (6) and (7).

(13) Set the signal generator to the C.W. mode and check that the audio output falls to about 0.8mV.

(14) Repeat operations (1) to (13) for each of the following frequencies in turn:-

1.5MHz, 6.5MHz, 12.5MHz and 24.5 MHz.

A.V.C. test

20. (1) Set the controls as follows:-

(a) AE. RANGE to 2-4 Mc/s.

(b) MEGACYCLES to 3.

(c) KILOCYCLES to 500.

(d) I.F. GAIN fully clockwise

(e) AE. ATTEN. to MIN.

(f) System switch to A.V.C.

A.V.C. switch	SHORT
BANDWIDTH	3 kc/s
B.F.O. switch	up position

(2) Set the controls of the output meter for an impedance of 3 ohms and a power range of 200mW. Connect the meter to the 50mW 3-ohm terminals of the receiver.

(3) Set the controls of the signal generator for a 30% modulated signal of 1µV at 3·5 Mc/s and an impedance of 75 ohms. Connect the signal generator output to the receiver aerial input socket.

(4) Tune the receiver to the output frequency of the signal generator and adjust the A.F. GAIN ◀control until the output indicates 10mW.▶

(5) Increase the output of the signal generator to 1·0mV (+60dB) and check that the reading

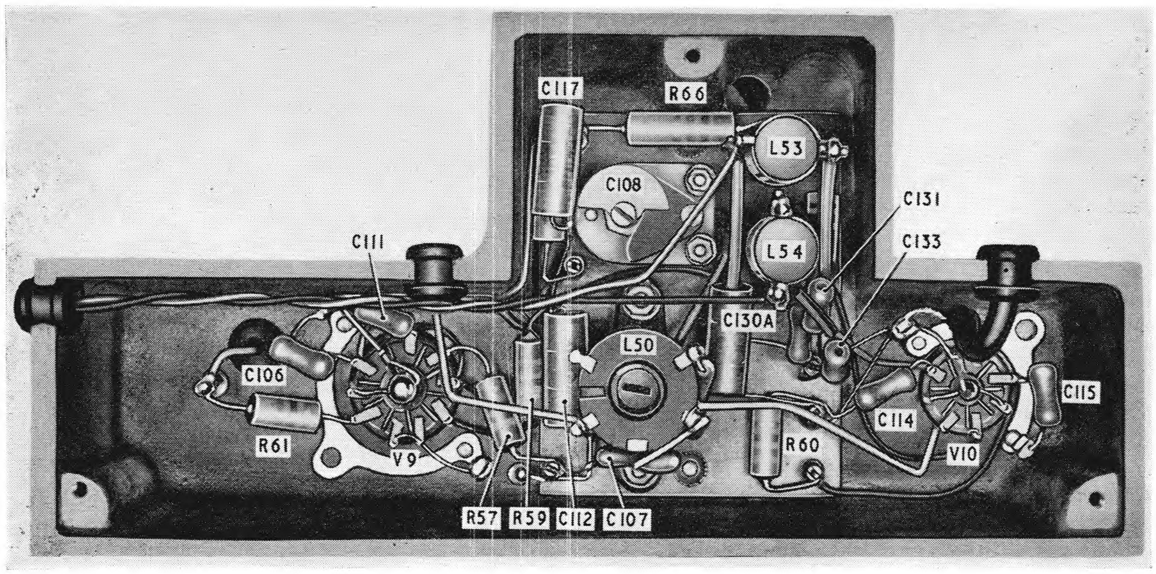


Fig. 5. Second mixer stage

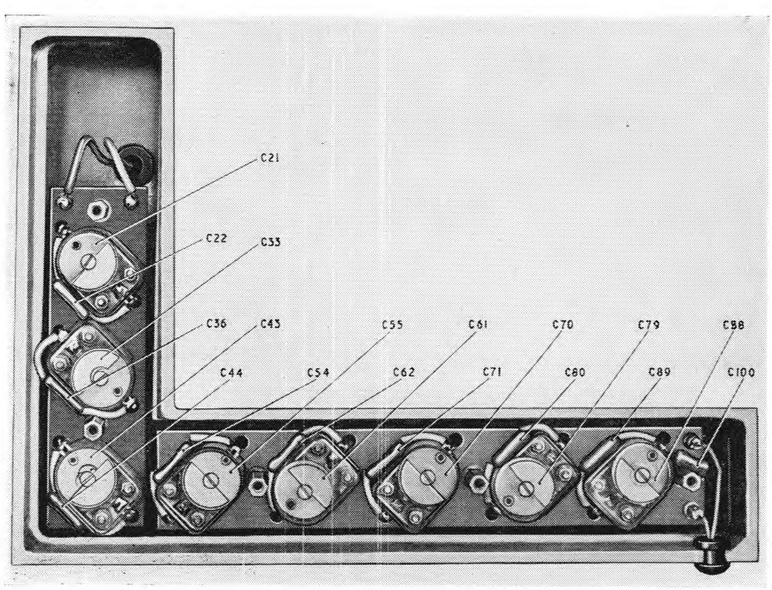


Fig. 6. 40 MC/s i.f. filter

of the output meter does not exceed ◀40mW▶ (+6dB on ◀10mW).▶

A.F. LEVEL *meter test*

21. Perform a test of the A.F. LEVEL meter calibration as follows:—

(1) Set the controls of the output meter for an impedance of 600 ohms and a power range of 120mW. Connect the meter across the 600-ohm 10mW output terminals.

(2) Set the controls of the signal generator for a 30% modulated output of 3·5 Mc/s at an impedance of 75 ohms and a level of 5µV. Connect the signal generator to the aerial input socket of the receiver.

(3) Tune the receiver to the output frequency of the signal generator and adjust the A.F. LEVEL control until the meter reads exactly 10mW. Check that the external output meter reads within 1dB of 10mW.

◀**Important Note . . .**

It is important that the A.F. LEVEL *control is not turned towards its maximum position unless the 10mW 600-ohm winding is suitably terminated with a load.*▶

◀**Noise factor test**

22. Perform a noise factor test as follows:—

(1) Set the receiver controls as detailed below:—

A.E. RANGE	16-30 Mc/s
MEGACYCLES	29
KILOCYCLES	0
System switch	MAN
AE. ATTENUATOR	MIN
BANDWIDTH	3 Kc/s
B.F.O. switch	down position
LIMITER	up position
RF/I.F. GAIN	maximum gain position
B.F.O. NOTE KC/S	±1 Kc/s
SPEAKER	ON

(2) Set the noise generator RANGE switch to OFF.

(3) Switch on the mains supply of the noise generator. Connect the noise generator output to the receiver aerial input socket.

(4) Set the controls of the output meter for an impedance of 3 ohms and a power range of 60 mW and connect it to the 50mW 3-ohm output terminal of the receiver.

(5) Set the A.F. GAIN control for a convenient level and adjust the MEGACYCLES tuning and AE. TUNE controls for maximum noise in the loudspeaker.

(6) Adjust the A.F. GAIN control to obtain a reading of approximately 10 mW on the output meter. Check that the MEGACYCLES and AE. TUNE controls are set for maximum output and then reset the A.F. GAIN control for exactly 10 mW.

(7) Set the noise generator RANGE switch to 0–10.

(8) Adjust the noise generator OUTPUT LEVEL control until a reading of 20 mW is obtained on the output meter.

(9) The noise factor of the receiver is given by the noise generator meter reading for the range in use.

(10) Perform the noise factor test at 28 Mc/s 1000+ kc/s, 24 Mc/s+0 kc/s and 1 Mc/s+ 500 kc/s. The noise factor should not exceed 8 at 1·5 Mc/s and 6 at the other frequencies.

(11) Prepare receiver 5820–99–999–9292 for noise factor test in the manner that receiver 5820–99–943–2775 is prepared for similar test as described in para. (1) to (9) above.

(12) Perform noise factor test at 1·5, 3, 6, 12 and 24 Mc/s, the noise level should not exceed 7dB throughout the entire frequency range.▶

Valve data (receiver)

23. Details of valves used in the receiver are given in Table 2. The location of valves is shown in fig. 4, Part 1, Chap. 1. Voltages were obtained from a B9A or B7G stand-off valve base using a 20 000 ohms/volt meter on the optimum range in each case. Valve pin numbers are indicated in brackets.

24. The receiver was set as follows:—

System switch to MAN.

I.F. and A.F. GAIN to MAX.

No signal i.e. first and second v.f.o. off tune.

LIMITER off.

B.F.O. off except for checking V19.

System switch to CAL in order to check V13 and V15 only.

VALVE DATA (L.F. CONVERTER)

◀ 25. ▶ Details of valves used in the l.f. converter are given below. Voltages were obtained using a 20 000 ohms/ volt meter, the l.f. converter and the receiver being in a quiescent state. Valve pin numbers are indicated in brackets.

◀ 26. ▶ RV1 is set to mid-travel and the I.F. GAIN in the receiver to max.

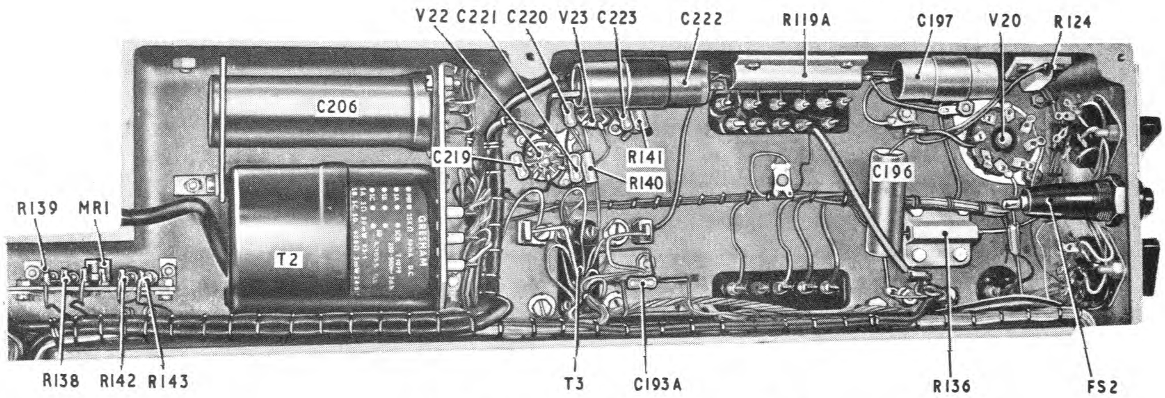


Fig.8 Power supply and audio stages

TABLE 4

Valve connections (l.f. converter)

Pin No.	CV138 EF91	CV454 EF93	CV1832 150C2	CV2209 6F33
1	Grid 1	Grid 1	Anode	Grid 1
2	Cathode	Grid 3	Cathode	Cathode
3	Heater	Heater		Heater
4	Heater	Heater		Heater
5	Anode	Anode	Anode	Anode
6	Grid 3	Grid 2		Grid 3 Diode
7	Grid 2	Cathode	Cathode	Grid 2
Base	B7G	B7G	B7G	B7G

TABLE 5

Valve complement and typical d.c. voltages (l.f. converter)

Cct. Ref.	CV No.	Equivalent	Anode	Screen	Cathode
V1	CV454	EF93	155(5)	95(6)	0.85(7)
V2	CV138	EF91	205(5)	100(7)	-

TABLE 5 (Cont'd)

Cct. Ref.	CV No.	Equivalent	Anode	Screen	Cathode
V3	CV2209	6F33	150(5)	150(7)	2.0(2)
V4	CV2209	6F33	150(5)	150(7)	2.0(2)
V5	CV1832	150C2	150(1)	-	-
V6	CV138	EF91	205(5)	195(7)	1.25(2)

TABLE 6

Representative test data (I.f. converter)

Signal Input to	Frequency	Input	Output	Remarks
Grid V6 (1)	2.0 Mc/s	220μV	100μA r.f. level	3 kc/s bandwidth; System switch to MAN.
	2.5 Mc/s	225μV	100μA r.f. level	I.F.GAIN max; B.F.O. OFF.
	3.0 Mc/s	250μV	100μA r.f. level	1 Mc/s input to PL2 disconnected.
Drive to PL2	1.0 Mc/s	20V	0.5V at V3(6) 0.5V at V4(6)	System switch to MAN; use valve-voltmeter.
Grid V3 (1)	12 kc/s	200μV	100μA r.f. level	3 kc/s bandwidth; System switch to MAN.
	500 kc/s	150μV	100μA r.f. level	I.F.GAIN max; B.F.O. OFF.
	980 kc/s	200μV	100μA r.f. level	1 Mc/s input to PL2.
Aerial socket PL1	12 kc/s	20μV	100μA r.f. level	3 kc/s bandwidth; System switch to MAN.
	500 kc/s	15μV	100μA r.f. level	I.F.GAIN max; B.F.O. OFF.
	980 kc/s	20μV	100μA r.f. level	1 Mc/s input to PL2; I.f. converter AE. RANGE To WIDEBAND; I.f. converter AE. ATTENUATOR to MIN.

Note...

The numerals in brackets indicate the valve pin number.

Appendix 1

RECEIVER, RADIO 5820-99-999-9292

LIST OF CONTENTS

LIST OF TABLES

INTRODUCTION

1. The details given in para. 1 to 4 of the first part of this Chapter are identical for receiver, radio 9292.

DISMANTLING

2. The details given in para. 5 to 13 of the first part of this Chapter are similar for receiver, radio 9292.

GENERAL SERVICING

3. With the exception of para. 19 and 20 of the first part of this Chapter, the general servicing para., 14 to 21 is similar for receiver, radio 9292.

Signal-to-noise test

4. Perform a signal-to-noise ratio test as follows :

(1) Set the receiver controls as follows:—

AE. RANGE	1-2 Mc/s
MEGACYCLES	1
KILOCYCLES	500
AE. ATTENUATOR	MIN
System switch	MAN
BANDWIDTH	3 kc/s
B.F.O. switch	down position
B.F.O. NOTE	1 kc/s
A.F. GAIN	fully clockwise
SPEAKER	OFF

(2) Set the controls of the output meter for an impedance of 3 ohms and a power range of 60mW and connect it to the 50mW 3-ohm output terminals of the receiver.

(3) Set the controls of the signal generator for a c.w. output of 1μV at 1·5 Mc/s and an impedance of 75 ohms. Connect the output of the signal generator to the receiver aerial input socket.

(4) Tune the receiver to the output frequency of the signal generator and adjust the I.F. GAIN control for a reading of 50mW on the output meter.

(5) Switch off the input signal and check that the output meter does not read more than 0·82mW.

(6) Repeat the test with a 30% modulated signal at a level of 3·5μV and the receiver B.F.O. switched off.

(7) Perform signal-to-noise ratio tests at 3·5, 6·5, 12·5 and 24·5 Mc/s.

A.V.C. Test

5. Perform a test of the a.v.c. circuits as follows :

(1) Set the controls of the receiver as follows:—

AE. RANGE	2-4 Mc/s
MEGACYCLES	3
KILOCYCLES	500
I.F. GAIN	fully-clockwise
AE. ATTENUATOR	MIN
System switch	A.V.C.
A.V.C. switch	SHORT
BANDWIDTH	3 kc/s
B.F.O. switch	up position

(2) Set the controls of the output meter for an impedance of 3 ohms and a power range of 200mW. Connect the meter to the 50mW 3-ohm terminals of the receiver.

(3) Set the controls of the signal generator for a 30% modulated signal of 1μV at 3·5 Mc/s and an impedance of 75 ohms. Connect the signal generator output to the receiver aerial input socket.

(4) Tune the receiver to the output frequency of the signal generator and adjust the A.F. GAIN control until the output indicates 10mW.

(5) Increase the output of the signal generator to 100mV (+100dB) and check that the reading of the output meter does not exceed 50mW (+7dB on 10mW).

Valve data (receiver)

6. With the exception of additional valve Types in Table 1, the new voltage figures for V3 in Table 2 and the new input voltage figure in Table 3 of the first part of this Chapter, the valve data is similar to that for 9292.

TABLE 1

Valve connections (receiver)

Pin No.	CV5331 ECC189	CV469 EA76 (Serial No. 3737 onwards)
1	Anode 2	Anode (white)
2	Grid 2	Cathode (blue)
3	Cathode 2	Heater (brown/black)
4	Heater	
5	Heater	
6	Anode 1	
7	Grid 1	
8	Cathode 1	
9	Screen	
Base	B9A	

TABLE 2

Valve complement and typical d.c. voltages (receiver)

Cct. Ref.	Function	CV No.	Equivalent	Anode	Screen	Cathode	Cct. Ref.
V3	R.F. Amplifier	5331	ECC189	185(1) 95(2) 95(6)	—	1·5(8)	V3

TABLE 3

Representative test data (receiver)

Signal input to:	Frequency	Input	Output	Remarks
Aerial input (WIDEBAND)	3·5 Mc/s c.w.	250mV	0·5V at TP3	WIDEBAND INPUT AE. ATTENUATOR min. V5 and V7 removed. Valve voltmeter input shunted to 12pF.
Aerial input (WIDEBAND)	3·5 Mc/s c.w.	250mV	0·5V at TP3	WIDEBAND INPUT AE. ATTENUATOR min. V5 and V7 replaced. V9 and 1 Mc/s crystal removed. Valve voltmeter input shunted to 12pF. MEGACYCLES scale at 3.

Chapter 2

ALIGNMENT OF RECEIVER

(Completely Revised)

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

ALIGNMENT OF THE 100 KC/S IF AMPLIFIER

Warning . . .

Ensure that the mains supply is switched off before removing covers from the receiver.

Introduction

1. Unless otherwise stated, the front panel mounted RF LEVEL meter is used as an output meter.

2. Do not align this unit unless it is absolutely necessary, i.e. until all other possible faults have been eliminated.

3. Some of the trimming capacitors are connected to h.t. and it is essential that an insulated trimming tool be used.

Tools and test equipment

4. The following test equipment will be required:-

Signal generator (item 2 of Chap.1, para.3)
Counter electronic frequency (item 15)
0.1uF capacitor (item 8)
4.7 kilohm resistor (item 9)

I.F. alignment

5. Remove the receiver from the rack or cabinet and remove top dust cover which is secured by six screws.

Front panel controls

6. Set the controls on the front panel as follows:-

(1)	System switch	Set to STANDBY.
(2)	IF GAIN control	Set fully clockwise
(3)	METER switch	Set to RF LEVEL
(4)	MAINS switch	Set to downward position.

7. Locate valve V12 on the second v.f.o. sub-unit and remove it from its holder.

8. Set the controls of the signal generator for a c.w. frequency of 100 kc/s.

9. Turn the receiver on its side, remove the main base plate and locate pin 1 of valve V16. Connect the output of the signal generator via a 0.1uF capacitor to this point.

10. Set the system switch to MAN.

11. The output from the signal generator required to produce 100μA deflection on the meter should be approximately 320mV.

12. Locate capacitor C195B (fig.1) and adjust it for a peak reading in the RF LEVEL meter.

13. Set the system switch to STANDBY.

14. Transfer the output of the signal generator from pin 1 of valve V16 to pin 1 of valve 14. Adjust the signal generator output to 6.3mV.

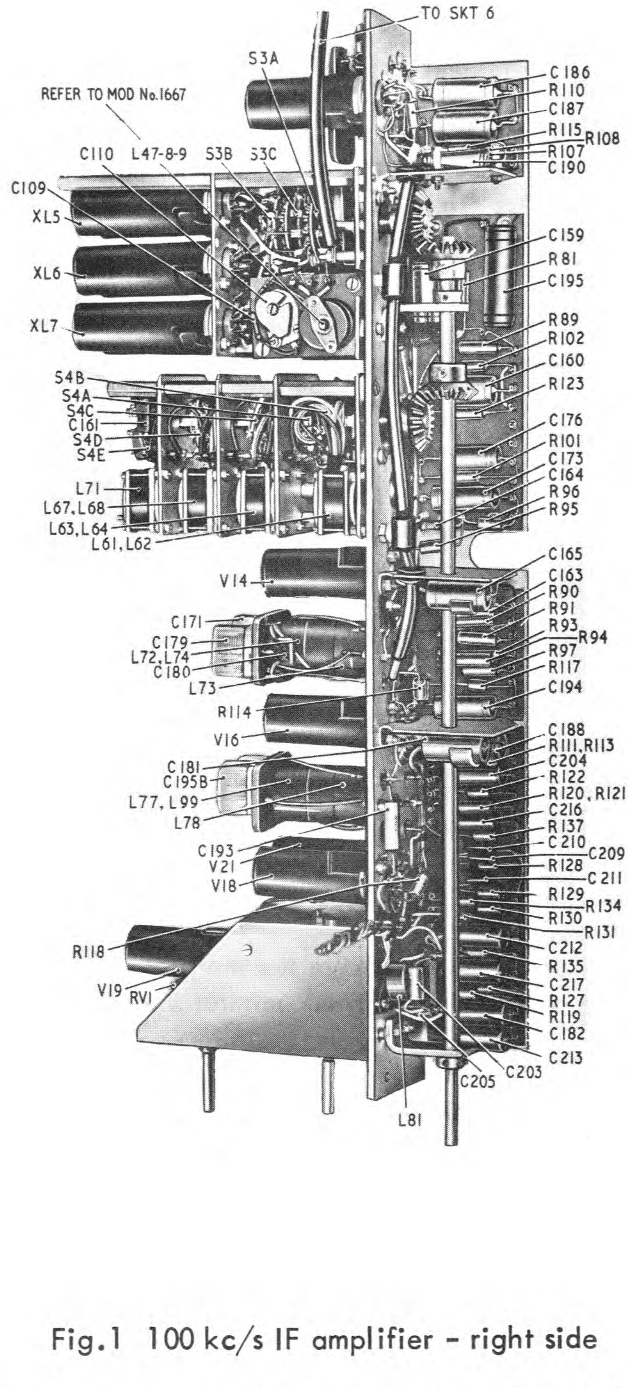


Fig.1 100 kc/s IF amplifier - right side

15. Connect a 4.7 kilohm resistor across L72 (fig.1) pins 3 and 4.

16. Set the system switch to MAN.

17. Locate trimming capacitor C179 (fig. 1) and adjust it for a peak reading in the RF LEVEL.

18. Set the system switch to STANDBY.

19. Remove the 4·7 kilohm resistor from L72 and connect it across L73 pins 1 and 2.

20. Set the system switch to MAN.

21. Locate the trimming capacitor C171 (fig. 1) and adjust it for a peak reading in the RF LEVEL meter.

22. Set the system switch to STANDBY.

23. Remove the 4·7 kilohm resistor connected across L73.

24. Set the system switch to MAN.

25. The signal generator output required to produce a 100 μA deflection should be approximately 800 μV.

26. Tune the signal generator through the passband and note the two frequencies where peaks are obtained. The difference in frequency between the two peak readings should be between 5 and 5·6 kc/s, the mid-point being at 100 kc/s.

27. If the peak amplitudes are not the same then a slight readjustment of capacitor C195B will correct this.

28. The 6dB bandwidth should be approximately 9·5 kc/s.

100 kc/s (L-C) filter

29. Set the controls of the receiver as in para. 6. Remove the receiver side plate adjacent to the 100 kc/s IF strip. (3 front and 6 side securing screws).

30. Remove the second v.f.o. valve V12.

31. Connect the output of the signal generator (100 kc/s) via a 0·1 μF capacitor to pin 5 (anode) of V12.

32. Remove the screening cover from the L-C filter (2 securing screws at top).

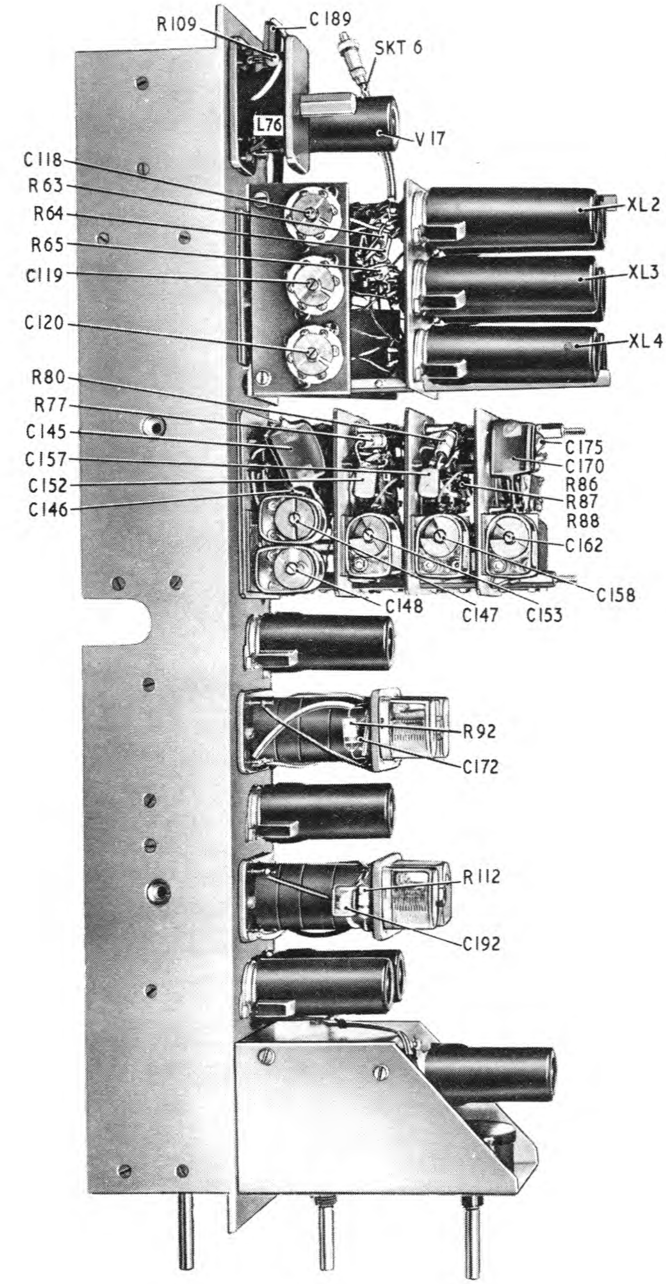


Fig. 2. 100 kc/s IF amplifier—left side

Crystal filter

50. The alignment of the crystal filter involves the measurement of frequencies to far greater accuracies than those normally obtainable from

signal generators. When possible a digital frequency meter should be employed. The equipment should be connected to SKT8 or SKT9. The exact frequency passing through the circuit will be displayed on the indicator panel. Should the level of output at any time during the alignment procedure by insufficient to drive the frequency meter, the signal generator output can be increased to obtain the frequency check but must be restored to the lower value for level measurements. When such increases are made, the meter on the receiver panel should be switched to AF LEVEL to avoid damage.

51. The signal generator and receiver should be connected and set up as for checking the L-C filter. Set the BANDWIDTH switch to 750 c/s and the system switch to MAN.

52. Tune the signal generator slowly through the passband and observe the crystal responses (f1 and f2). Care must be taken as the tuning of these is very sharp.

53. Retune the signal generator to the mean of f1 and f2 and adjust capacitors C110 (fig. 1) and C148 (fig. 2) for maximum output.

54. Tune the signal generator through the passband and ensure that the peak-to-trough ratio does not exceed 3dB (1:1·4) and that the peaks are approximately equal in amplitude.

55. Reset the signal generator frequency to 100 kc/s and adjust the output to produce a reading of 100 μA.

56. Set the signal generator frequency to 101·250 c/s, increase the output by 66dB and adjust the phasing control C120 to obtain minimum output (i.e. the point of rejection occurs).

57. Increase the signal generator frequency slowly and ascertain that the meter reading does not exceed 100 μA.

58. Slowly decrease the signal frequency until 100 μA reading is obtained and check that the frequency is not greater than 101·125 c/s.

59. Tune through the passband, adjusting the signal generator output as necessary to avoid meter damage. Note the highest frequency at which a signal generator output equal to that used at 101·250 c/s gives an output of 100 μA. This frequency should not be less than 98·875 c/s.

60. Slowly decrease the signal frequency and ensure that the output does not rise above 100 μA.

61. Decrease the generator output by 66dB and recheck the frequency response within the passband, readjusting C110 and C148 if necessary.

62. Set the signal generator frequency to 100 kc/s and adjust the output for 100 μA level.

63. Increase the signal generator output by 6dB and check the bandwidth for 100 μA output. The bandwidth should be between 700 and 800 c/s and the mid-position should not deviate from 100 kc/s by more than 25 c/s. The input required for 100 μA level should be less than 350 μV.

64. Switch the BANDWIDTH control to 300 c/s.

65. Repeat the procedure in para. 52 to 63 with signal generator frequency settings of 101·025 kc/s, 100·9 kc/s and 99·1 kc/s respectively. Adjust phasing capacitor C119 only (fig. 2). The 6dB points should be between 270 and 330 c/s apart and deviation of the mean from 100 kc/s should not exceed 25 c/s. The sensitivity should be approximately 200 µV and 100 µA deflection.

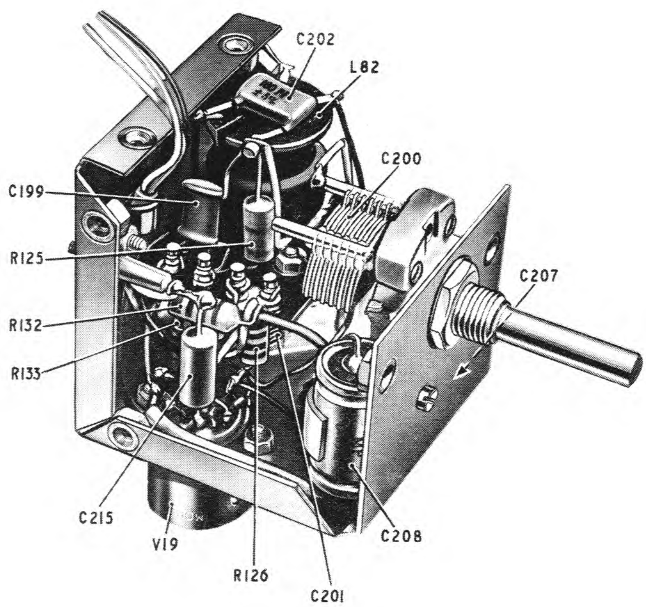


Fig. 3. BFO unit—underside

66. Switch the BANDWIDTH control to 100 c/s.

67. Repeat the procedure in para. 52 to 63 with signal generator settings of 100·925 kc/s, 100·8 kc/s and 99·2 kc/s. Adjust phasing capacitor C118 only (fig. 2). The bandwidth should be between 80 and 120 c/s and the deviation from the mean less than 25 c/s. For 100 µA output the input should be approximately 150 µA.

68. Set the system switch to STANDBY.

69. Disconnect the signal generator and refit V12.

Beat frequency oscillator

70. Set the controls on the front panel as follows:-

(1)	System switch	Set to CHECK BFO.
(2)	Meter switch	Set to RF LEVEL.
(3)	BFO switch	Set to downward position.
(4)	BFO NOTE KC/S	Set to 0.

71. Locate the trimming capacitor C201 (fig. 3) mounted adjacent to V19 at the front of the 100 kc/s i.f. assembly and adjust it for a zero beat note in the headset. The RF LEVEL meter should indicate approximately half full scale deflection.

72. If the b.f.o. frequency control knob has been removed, adjust the frequency control capacitor C201 for a zero beat note with the identification mark on the shaft uppermost. Replace the knob so that the pointer indicates zero.

73. Set the MAINS switch to the upward position.

ALIGNMENT OF SECOND VFO AND THIRD MIXER

Tools and test equipment

74. The following test equipment will be required:-

RF signal generator.
Valve voltmeter.

Second v.f.o. alignment

75. Set the controls on the front panel as follows:-

System switch	Set to CAL.
BFO switch	Set to the upward position.
IF GAIN	Set MAX position.
BANDWIDTH switch	Set to 3 kc/s.
MAINS switch	Set to the upward position.

Note . . .

The pre-set capacitor C136 (fig. 4) is carefully adjusted on initial alignment and should not be readjusted unless it is absolutely necessary, e.g. the capacitor itself has been changed. When adjustment is essential use the following procedure.

Alignment

76. Remove the left-hand gusset plate as viewed from the front of the receiver.

77. Set the KILOCYCLES cursor in line with the MEGACYCLES cursor (i.e. central position).

78. Set the MAINS switch to the downward position.

79. Set the KILOCYCLES scale to zero (0 KC/S) and adjust the capacitor C136 to give zero beat note in the loudspeaker.

80. Set the KILOCYCLES scale to that zero beat which is nearest to the 1000 kc/s position.

81. Lock the drive sprocket.

82. Adjust the position of the film scale to produce correct calibration.

Note . . .

When moving the film scale relative to the sprockets, grip both sides of the film scale in order to create a loop which will allow the film to slide round the drive sprocket, the drive sprocket is on the left when facing the receiver and hence movement of the scale will have to be to the left.

83. Repeat para. 79 and 82 until an adequate degree of accuracy is obtained. Set the system switch to STANDBY.

Important Note . . .

The tuning slug of L55 has been sealed by the manufacturer and must not be touched under any circumstances.

84. Connect a valve voltmeter, set to read at least 3 volts, across the 100 kc/s i.f. output plug PL8 or PL9 at the rear of the 100 kc/s i.f. amplifier. Set the system switch to CAL. Tune the KC/S scale to 1000 kc/s end and obtain a peak reading on the valve voltmeter at the point on the scale which comes nearest to the 1000 kc/s mark. Adjust the film scale carefully until the 1000 kc/s mark is under or as near to the cursor as possible.

85. Adjustments at the upper end of the scale affect the lower end and vice-versa, so that it may be necessary to repeat para. 79 to 83 alternately until both the 0 and the 1000 marks coincide with the signals from the calibrator. When this occurs, all 100 kc/s calibration check points between 0 and 1000 kc/s will be in alignment with the scale and tracking will be achieved

86. Set the system switch to STANDBY.

87. Disconnect the valve voltmeter from the 100 kc/s output and replace the valve V16.

Adjustments after replacing ganged capacitor (C123, C126, C129 and C139)

88. Set the KILOCYCLES scale against the mechanical end stop at the 100 kc/s end and check that the ganged capacitor is set as shown in fig. 5.

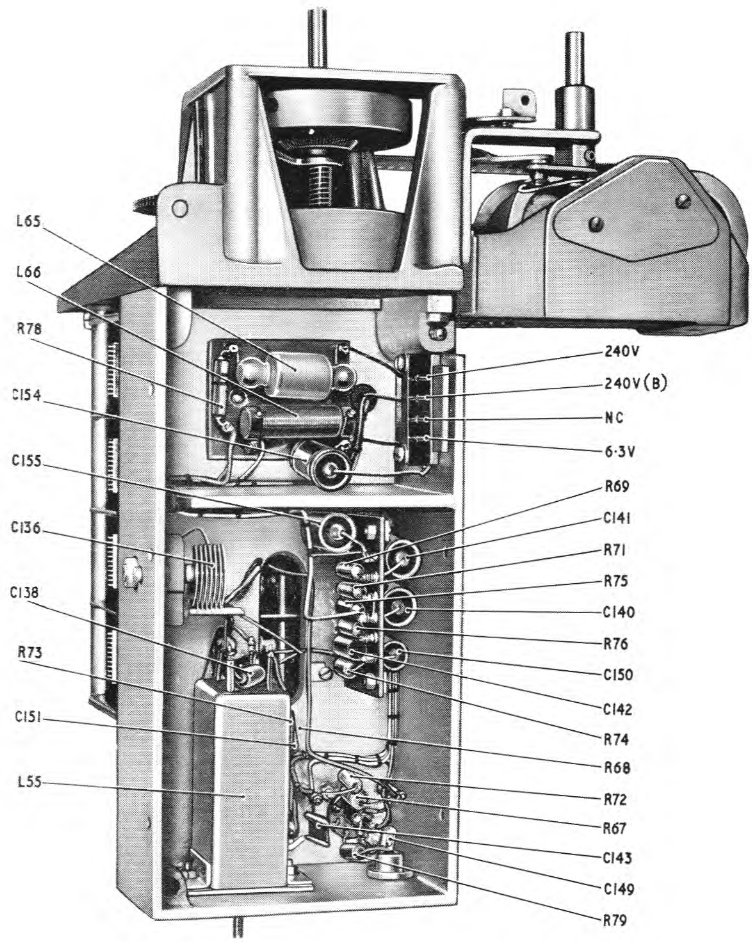


Fig. 4. Second VFO unit—underside

89. Check that the distance from the cursor to the extreme end of the scale, adjacent to the 1000 kc/s point is approximately 0·5 in. If this distance varies appreciably from 0·5 in. carefully lift the scale from the drive and move the scale round to the required position.

Third mixer

90. Set the controls on the front panel as follows:-

(1)	System switch	Set to STANDBY.
(2)	IF GAIN control	Set MAX.
(3)	METER switch	Set to RF LEVEL.
(4)	MAINS switch	Set to the downward position.

91. Locate the 1 Mc/s crystal mounted on the top of the receiver main chassis and remove it from its holder.

92. Set the signal generator to an exact frequency of 2·9 Mc/s and an output level of 5μV.

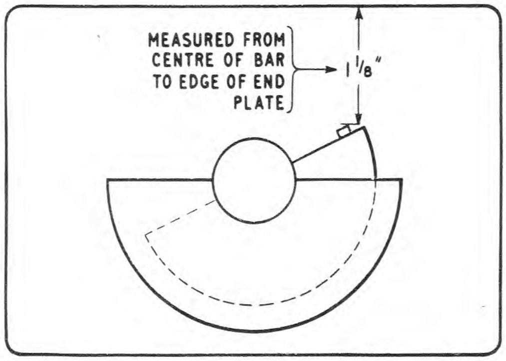


Fig. 5. Ganged capacitor setting

93. Connect the signal generator to the test point TP3 which is located adjacent to V9.

94. Set the KILOCYCLES control to exactly 100 kc/s.

95. Set the system switch to MAN.

96. Locate the trimming capacitors C122, C125 and C128 (fig. 7) mounted on the top second v.f.o. assembly and adjust them in turn for a peak reading in the RF LEVEL meter.

97. Set the KILOCYCLES control to 800 kc/s and the signal generator to a frequency of 2·2 Mc/s.

98. Locate the tuning cores of L57, L58 and L59 (fig. 6) mounted on the top of the second v.f.o. assembly and adjust them in turn for a peak reading in the RF LEVEL meter.

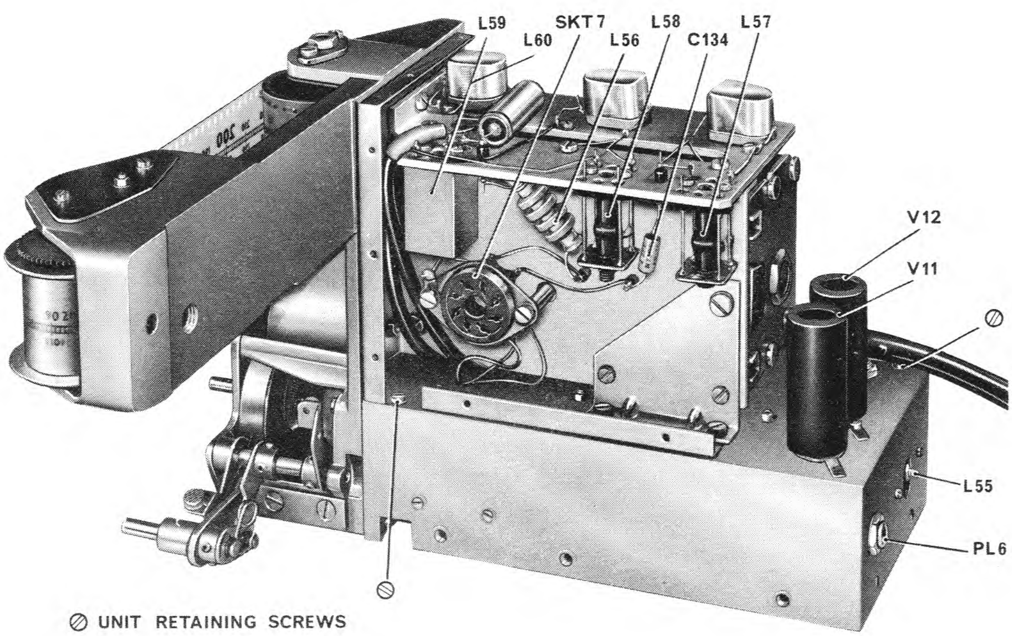


Fig. 6. Second VFO unit—rear

99. Reset the KILOCYCLES control to 100 kc/s and check that a peak reading is obtained in the RF LEVEL meter when the signal generator is set at 2·9 Mc/s. If not, repeat the instruction given in para. 92 to 98 until correct alignment is achieved.

100. Check that an indication of 100 µA in the RF LEVEL meter is obtained with an output level from the signal generator of between 5µV and 10µV.

101. Set the MAINS switch to the upward position.

102. Disconnect the signal generator from TP3 and refit the 1Mc/s crystal.

ALIGNMENT OF CALIBRATOR UNIT, AERIAL CIRCUIT, 1 MC/S OSCILLATOR AND SECOND MIXER DRIVE LEVEL

Note . . .

When receivers are used in conjunction with diversity switch Type 8 the diversity switch unit should be electrically disconnected.

Crystal calibrator unit

103. The calibrator unit should be re-aligned only if the following conditions apply:-

(1) With the system switch set to CAL and the KILOCYCLES scale set to a check point, there is no output, or,

(2) if spurious responses are obtained over the KILOCYCLES range.

104. If either V13 or V15 has been changed minor re-alignment only will be required (para. 106 to 111).

Note . . .

Before carrying out these operations, the alignment tool should be marked with two lines at distances of half an inch and 13/16 ths of an inch from the tip; this will permit the tool to be used as a depth gauge to ascertain the correct position of the inductor cores L70 and L75.

105. If full alignment is required, an external adaptor consisting of an international octal valve base and valve holder connected together pin-to-pin by approximately 18 inches of cable, will be required.

Tools and test equipment

106. The following will be required:-

Signal generator.
Valve voltmeter.
Telephone headset.

Minor alignment

107. Set the controls on the front panel as follows:-

(1)	System switch	Set to STANDBY.
(2)	KILOCYCLES control	Set to any 100 kc/s check point.
(3)	MAINS switch	Set to downward position.

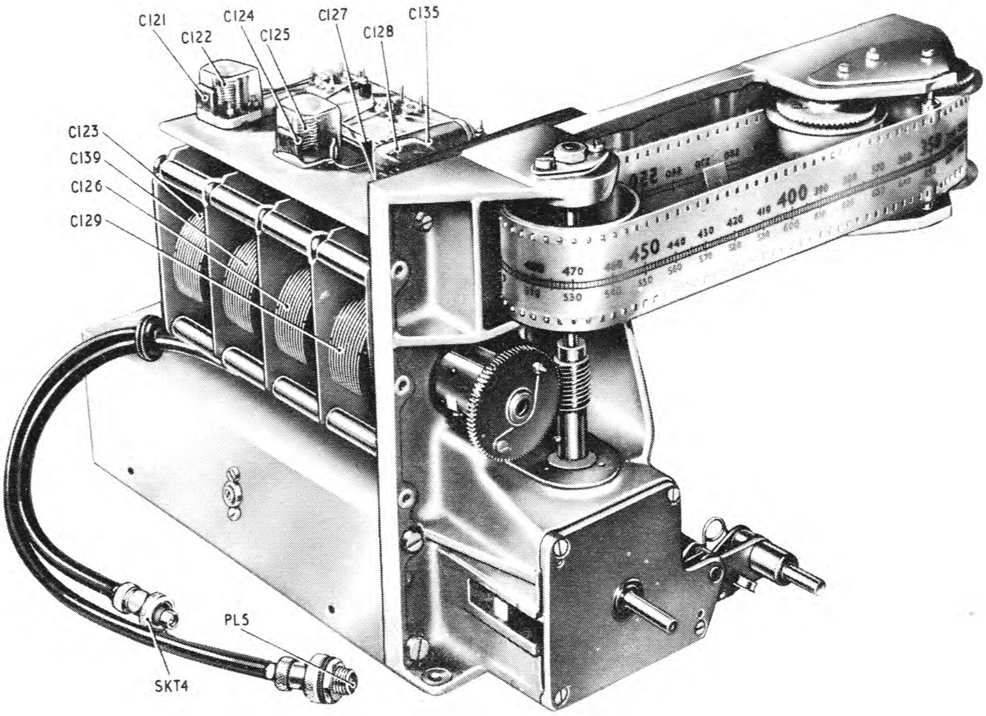


Fig. 7. Second VFO unit—front

108. Remove the coaxial plug PL2 from the socket SKT2 on the main chassis and set the MAINS switch to the downward position.

109. Locate the tuning core of L70, mounted on the top of the calibrator unit (fig. 8). Mark the position to which it is set. Rotate the core half a turn in either direction and note whether a beat note is heard in the telephones or the loudspeaker.

110. If no beat note is heard, restore the core to its original position and repeat the instructions in para. 109 for L75.

Note . . .

If the operations detailed in paras. 109 and 110 do not produce a beat note, use the marked alignment tool to reposition the cores of L70 and L75. The top of the core of L70 should be half an inch below the top of the screen can, while the top of the core of L75 should be 13/16 ths of an inch below the top of the can.

111. When the beat note is heard, adjust the cores of L70 and L75 to the centre of the range of adjustment over which a "clean" note is produced.

112. If a beat note cannot be obtained by the above method, full alignment of the unit will be required (para. 113 to 136).

Full alignment

113. Set the system switch to STANDBY.

114. Remove the calibrator unit from its mounting.

115. Remove the screening cover from around the calibrator unit (6 screws).

116. Connect one end of the extension cable to the calibrator unit and the other end to the receiver.

117. Remove V13 from its holder on the calibrator unit and connect the valve voltmeter to pin 7 of V13 valve holder.

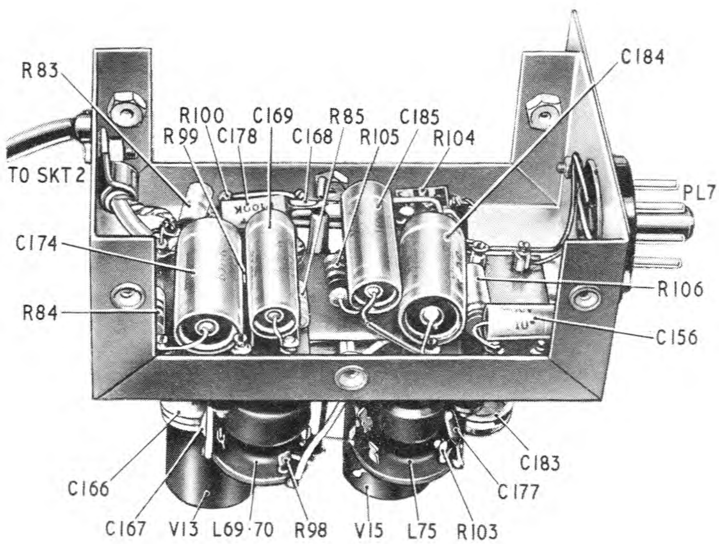


Fig. 8. Crystal calibrator unit—underside

118. Connect the signal generator output to pin 1 of V15. Set the controls for a c.w. output of 900 kc/s at a level of approximately 8 mV (+78 dB rel. 1 μV).

119. Set the system switch to MAN.

120. Locate and adjust the tuning core of L75 for a peak reading in the valve voltmeter (approximately 100 mV).

121. Set the system switch to STANDBY.

122. Refit the V13 and Remove V15.

123. Transfer the signal generator output from V15 to pin 1 of V13.

124. Transfer the valve voltmeter connection from V13 to pin 1 of V15 valve holder.

125. Set the controls of the signal generator for a c.w. output of 100 kc/s at a level of approximately 4mV (+72 dB rel. 1μV).

126. Set the system switch to MAN.

127. Locate and adjust the tuning core of L70 for a peak reading in the valve voltmeter (approximately 85 mV).

128. Set the system switch to STANDBY.

129. Disconnect the valve voltmeter and the signal generator.

130. Refit the valve V15.

131. Refit the screening cover and securing screws.

132. Refit the coaxial connector to the socket SKT2.

133. Set the valve voltmeter range switch to a suitable position to read 15V and connect it to pin 6 of the octal plug on the calibrator unit.

134. Set the system switch to MAN, and check that a reading of approximately 13 to 14 volts is indicated in the valve voltmeter.

Note . . .

Certain early receivers are fitted with "back-to-back" diodes shunting L69. These receivers will give a reading of approximately 0·2V in the valve voltmeter.

135. Set the MAINS switch to the upward position.

136. Disconnect the extension lead and refit the calibrator unit to the receiver.

Aerial circuit alignment

Note . . .

Paras. 137 to 143 do not apply to Receiver, Radio 5820-99-999-9292. See paras. 20 to 36 of Appendix 1 to this chapter.

137. Set the controls of the receiver for R/T reception at 16 Mc/s, with a.v.c. off and the AE. RANGE switch set to WIDEBAND.

138. Set the controls of the signal generator for a 30% modulated MCW frequency of 16 Mc/s at a level of 1μV. Connect the output of the signal generator to the aerial input socket of the receiver.

139. Tune the receiver to the output frequency of the signal generator and adjust the IF GAIN control for a reading of approximately 100 μA in the RF LEVEL meter.

140. Set the AE RANGE switch to 16·30 Mc/s position and the AE TUNE control to approximately 7/8ths of its travel in a clockwise direction.

141. Locate the tuning core of L4, accessible from the top of the first v.f.o. unit (fig. 9), and adjust it for a peak reading in the RF LEVEL meter.

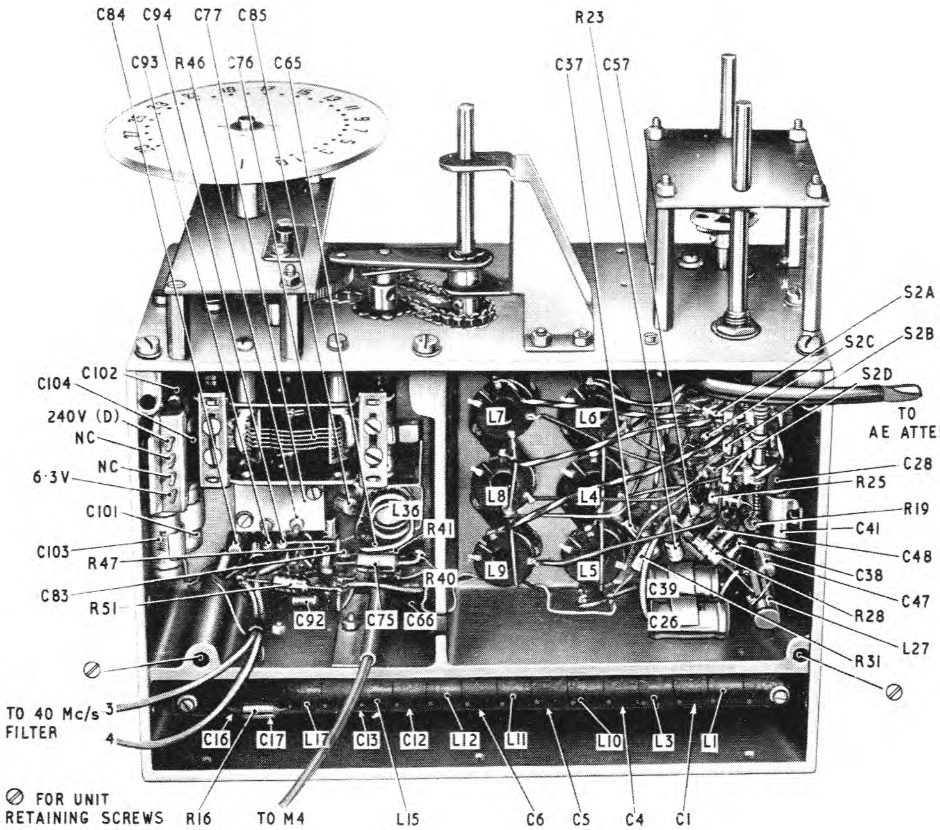


Fig. 9. First VFO unit—underside

142. Set the signal generator frequency to 30 Mc/s and tune the receiver to this frequency. Check that a peak reading can be obtained in the RF LEVEL meter within the travel of the AE TUNE control.

143. Repeat the instructions given in para. 137 to 142 for the AE. RANGE switch settings and frequencies listed below.

AE. RANGE	Alignment frequency	Inductance	Check frequency
8—16	8 Mc/s	L5	16 Mc/s
4—8	4 Mc/s	L6	8 Mc/s
2—4	2 Mc/s	L7	4 Mc/s
1—2	1 Mc/s	L8	2 Mc/s
0·5—1	0·5 Mc/s	L9	1 Mc/s

1 Mc/s crystal oscillator

144. Ensure that the MAINS switch is set to the upward position.

145. Connect a valve voltmeter, set to read approximately 3 volts, across the 1 Mc/s output socket at the rear of the receiver.

146. Set the receiver MAINS switch to the downward position.

147. Locate the inductance L2 (fig. 10) on the underside of the main chassis and tune the core for a peak reading in the valve voltmeter (the reading in the meter should be between 2 and 3 volts).

148. The precise frequency can be set by adjustment of capacitor C2 (fig. 10). This must not be attempted unless a standard frequency signal better than 1 part in 10^7 is available.

149. Set the MAINS switch to the upward position.

150. Disconnect the valve voltmeter.

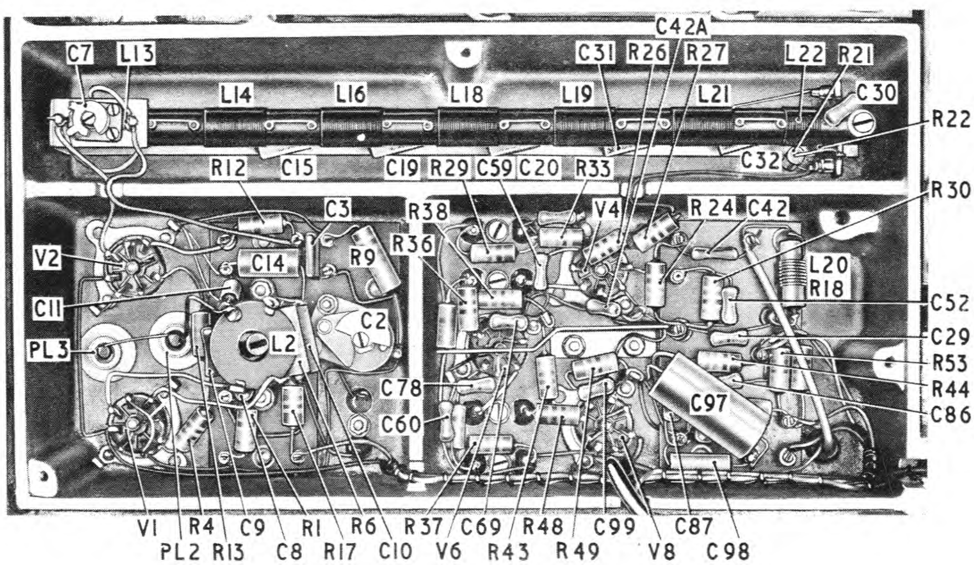


Fig. 10. Crystal oscillator and harmonic filter system—underside

Second mixer drive level

151. Ensure that the MAINS switch is set in the upward position.

152. Locate the second mixer valve V9 on the main chassis behind second v.f.o. assembly and remove it from its holder.

153. Connect the valve voltmeter, shunted to 12 pF, to test point TP3.

154. Set the MAINS switch to the downward position.

155. Tune the MEGACYCLES control through each calibration point and check that the reading in the valve voltmeter lies between 1·8 and 10 volts.

156. If necessary, equalise the drive at 28 and 29 Mc/s by carefully adjusting C7.

157. Set the MAINS switch to the upward position.

158. Disconnect the valve voltmeter from TP3 and replace the valve V9.

CALIBRATION OF FIRST VFO UNIT

Warning . . .

Ensure that the mains supply is switched off before removing covers from the receiver.

Tools and test equipment

159. The following test equipment will be required:-

Signal generator CT452A (Set) 10S/9008337
Counter electronic frequency 10S/1076703
Headset 10AH/9
Capacitor 2 pF

Mechanical calibration of C76

160. Slacken off the mechanical end-stop until it is inoperative.

161. Set C76, fig. 9, to maximum capacity and ensure that the calibration mark at the zero end of the MEGACYCLES dial coincides with the cursor.

162. Tighten the end-stop after moving the dial free from the stop.

163. Check that the mechanical stops operate before the capacitor end-stops become effective at both ends of the band.

First v.f.o.

164. To gain access to the core of L36 and capacitor C77 on the first v.f.o. unit, the crystal calibrator unit must be removed. Proceed as follows:-

(1) Disconnect socket SKT2 adjacent to V1/V2.

(2) Remove the knurled screw from the paxolin block at the side of the unit.

(3) Unscrew the knurled lock-nut to its fullest extent adjacent to the second v.f.o. unit.

(4) The unit may now be unplugged from the second v.f.o. unit.

165. Remove the 1 Mc/s crystal and valve V12.

166. Connect the signal generator to TP2 via a 2 pF capacitor and set its output to 40·5 Mc/s.

167. Set the MAINS switch to the downward position.

168. Set the MEGACYCLES dial to zero and adjust L36 for zero beat.

169. Reset the signal generator to 69·5 Mc/s, the MEGACYCLES dial to 29 and adjust C77 for zero beat.

170. Repeat the above adjustments as necessary.

171. Check the frequency calibration at 1 Mc/s intervals and ensure that the megacyle positions are reasonably central on the scale markings.

172. Set the system switch to STANDBY.

173. Remove the first mixer valve V7.

174. Connect the valve voltmeter, shunted to 12 pF, between TP2 and chassis.

175. Set the system switch to MAN.

176. Check that the valve voltmeter indicates at least 1·5 V over the range of the v.f.o.

177. Set the MAINS switch to the upward position.

178. Replace the crystal calibrator unit, the 1 Mc/s crystal V12 and V7. Connect socket SKT2.

Note 1 . . .

The receiver will, under normal conditions, maintain the factory alignment over an extremely long period of time. Consequently all possibility of other causes of trouble should be eliminated before re-alignment is considered.

Note 2 . . .

If it becomes necessary to re-align any part of the receiver, only a very small angular adjustment of any trimmer should be necessary.

WARNING . . .

Ensure that the mains supply is switched OFF before removing any covers from the receiver and before making any connections.

37·5 MC/S FILTER

Tools and test equipment

179. The following test equipment will be required:-

Signal generator CT452A
Multimeter electronic CT471C
Headphones

Adapter consisting of:-
Clips crocodile
Jack Tip

Alignment

180. Locate and remove the 1 Mc/s crystal, second mixer valve V9 and first VFO valve V5.

181. Ensure that all screening covers are in place.

182. Connect the Multimeter CT471C to TP3, using the shortest possible leads.

183. Connect the signal generator output to TP1 using the shortest possible leads. Set the control for a CW input of 37·5 Mc/s at a level of 2·5 mV.

184. Locate the 37·5 Mc/s filter and remove the small warning plates which normally conceal the trimming capacitor holes.

185. Locate and adjust the tuning core of L50 for a peak reading in the multimeter (approximately 1V).

Note . . .

C24 is connected to HT.

186. In the 37·5 Mc/s filter, adjust C90, C81, C72, C63, C45, C35 and C24 in that order for a peak reading in the multimeter.

187. Locate and adjust the tuning cores of L28 and L33 in that order for peak reading in the multimeter.

188. Repeat the procedure in para. 185 to 187 for a peak reading in the multimeter.

189. Adjust the level of the signal generator until the reading in the multimeter is 1V.

190. Increase the frequency of the signal generator until the reading in the multimeter drops to 0·5V. Note the frequency.

191. Decrease the frequency of the signal generator until the reading in the multimeter again drops to 0·5V. Note the frequency. The difference between these two frequencies, i.e. the bandwidth, should lie between 229 and 300 kc/s. The mean of the frequencies should not deviate from 37·5 Mc/s by more than 20 kc/s.

192. Carry out the procedure outlined in para. 191 for the 40 dB points i.e. until the reading in the multimeter drops to 0·01V. The difference between the two frequencies should not exceed 750 kc/s, and the mean of the frequencies should not deviate from 37·5 Mc/s by more than 25 kc/s.

Note . . .

C108 is adjusted to avoid interaction between the 37·5 Mc/s and 40 Mc/s filters and should not normally require further adjustment. If this is necessary remove the 1 Mc/s crystal, V5 and V9 and the 40 Mc/s protection cover. Fit the 40 Mc/s test cover and proceed as outlined in paras. 209 to 213 inclusive.

193. Replace the 1 Mc/s crystal, the second mixer and 1st VFO valves.

40 MC/S FILTER

Note 1 . . .

This filter consists of eight over-coupled tuned stages and is virtually impossible to align without special equipment. No attempt is to be made to reset any of the eight stages without suitable equipment.

Note 2 . . .

It is essential that the alignment of the 37·5 Mc/s filter is correct before any attempt is made to align the 40 Mc/s filter. In cases where the 40 Mc/s filter falls below specification 37·5 Mc/s filter is to be checked for correct output.

Note 3 . . .

The receiver will, under normal conditions, maintain the factory alignment over an extremely long period of time. Consequently, all possibility of other causes of trouble should be eliminated before re-alignment is considered.

Note 4 . . .

Do not attempt alignment unless the filter protection covers are securely in position.

Tools and test equipment

194. The following will be required:-

Oscillator frequency swept CT501
Multimeter electronic CT471C
40 Mc/s filter protection test covers
(plates electrical shield)

Signal generator CT452A (Set)
Counter electronic frequency

WARNING 1 . . .

The separate earth connection must be made before connecting to mains supply.

WARNING 2 . . .

Ensure that the mains supply is switched OFF before removing any covers from the receiver and before making any connections.

Alignment

195. Remove the 1 Mc/s crystal, V5 and V9 from their valve holders.

196. Remove the 40 Mc/s protection cover plates and insert test covers.

197. Connect the CT501 output to TP2 and connect TP3 to the CT501 input

198. Set the CT501 LIN/LOG to LIN.

199. Set the receiver MAINS switch to the downward position and the CT501 to ON.

200. Adjust the CT501 front panel controls for an oscilloscope display of satisfactory brilliance, position and amplitude.

201. Commencing with C21 slightly adjust each trimmer in the filter in turn in the order C21, C33, C43, C53, C61, C70, C79 and C88 to obtain a waveshape similar to that shown in fig. 11.

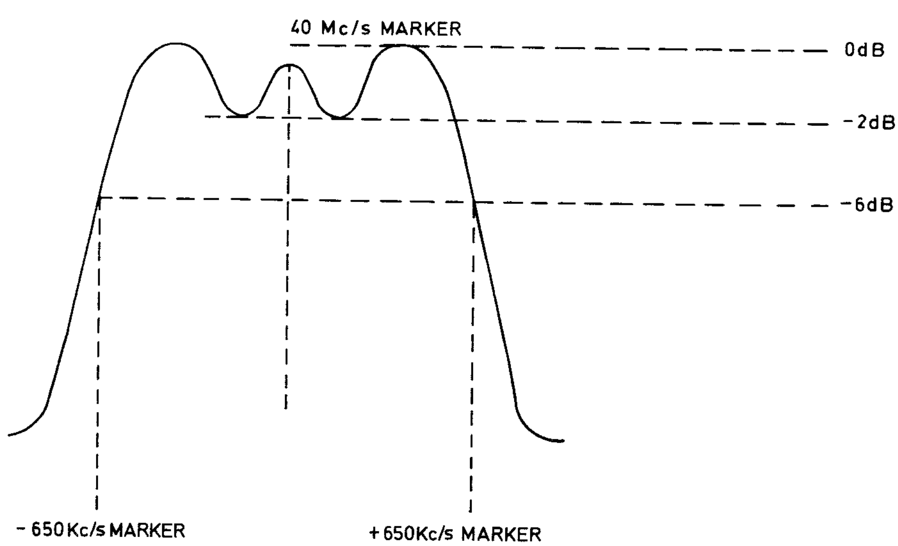


Fig. 11. Typical 40 Mc/s filter response (lin)

Note . . .

As adjustments are made, experience will indicate which portions of the curve react to particular trimmer adjustment. Where the waveshape is extremely distorted, an attempt should be made to keep the left hand slope of the curve as steep as possible whilst maintaining the 40 Mc/s marker in the centre of the curve.

202. When an approximate waveshape to that shown in fig. 11 has been obtained each trimmer should be checked in turn to improve the symmetry of the curve.

203. Set the LIN/LOG switch to LOG.

204. Adjust the trimmers to correct the waveshape to that shown in fig. 12.

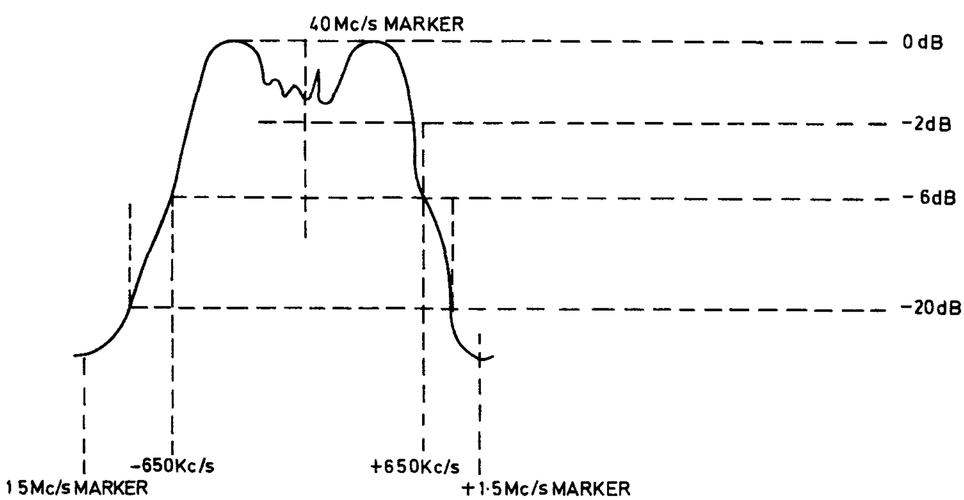


Fig. 12. Typical 40 Mc/s filter response (log)

205. Ensure that all markers are within the specification tolerance.

206. Set the receiver System switch to STANDBY.

207. Remove the test rig leads from TP2 and TP3.

208. Set the multimeter to the 1·5V AC range. Connect the instrument to TP3 and set the receiver system switch to MAN.

209. Set the output of the signal generator CT452A to exactly 37·5 Mc/s CW and connect it to TP1. Adjust the output level controls to obtain a multimeter reading of 1 Volt.

210. Adjust L50 for a maximum reading in the multimeter, and readjust the signal generator controls to obtain a multimeter reading of 1 Volt.

211. Carefully note the setting of C88. Rotate C88 through 360° and ensure that the reading of the multimeter does not vary by more than 10%. If the variations exceed 10%, a fractional adjustment of C108 must be made followed by a readjustment of L50 for peak reading. C88 should again be rotated through 360°. Adjustment of C108 and L50 must be repeated until the required results are obtained.

212. Reset C88 to the position noted in para. 211.

213. Set the receiver mains switch to OFF, disconnect the test equipment, and remove the test cover. Refit the 40 Mc/s protection cover.

214. Refit the 1 Mc/s crystal, V5 and V9.

Specification

215. With the 1 Mc/s crystal V5 and V9 removed and the receiver normal in all other respects, system switch to MAN, Mc/s dial between 1 and 30, the 40 Mc/s filter response should be such that:-

(1) At the -6dB points, the bandwidth should not be less than ±600 kc/s, (±kc/s nominal).

(2) At the -20 dB points, the bandwidth should not be greater than ±1·3 Mc/s.

(3) Peak-to-trough undulation in the passband shall not exceed 3dB.

Appendix 1

RECEIVER, RADIO 5820-99-999-9292

(Completely Revised)

CONTENTS

ILLUSTRATIONS

1. With the exception of para. 46 to 69 and 138 to 144 of the first part of this chapter, the alignment of the receiver para. 1 to 45, 70 to 136 and 144 to 178 is similar for 9292.

100 kc/s (L-C) filter

2. Increase the signal generator frequency to 100.6 kc/s and its output by 6dB and check that the RF LEVEL meter again indicates 100μA.

3. Decrease the frequency of the signal generator to 99.4 kc/s and check that the RF LEVEL meter again indicates 100μA.

4. Set the BANDWIDTH switch to 3 kc/s and repeat paras. 2 and 3 above using the frequencies 101.5 kc/s and 98.5 kc/s.

5. Set the BANDWIDTH switch to 6.5 kc/s and repeat paras. 2 and 3 using the frequencies 103.25 kc/s and 90.75 kc/s.

6. Set the BANDWIDTH switch to 13 kc/s and repeat paras. 2 and 3 using the frequencies 106.5 kc/s and 93.5 kc/s.

Crystal filter

7. The alignment of the crystal filter involves the measurement of frequencies to far greater accuracies than those normally obtainable from signal generators. When possible a digital frequency meter should be employed. The equipment should be

connected to SKT8 or SKT9. The exact frequency passing through the circuit will be displayed on the indicator panel. Should the level of output at any time during the alignment procedure be insufficient to drive the frequency meter, the signal generator output can be increased to obtain the frequency check but must be restored to the lower value for level measurements. When such increases are made, the meter on the receiver panel should be switched to AF LEVEL to avoid damage.

8. The signal generator and receiver should be connected and set up as for checking the L-C filter. Set the BANDWIDTH switch to 300 c/s and the MAINS switch to the downward position.

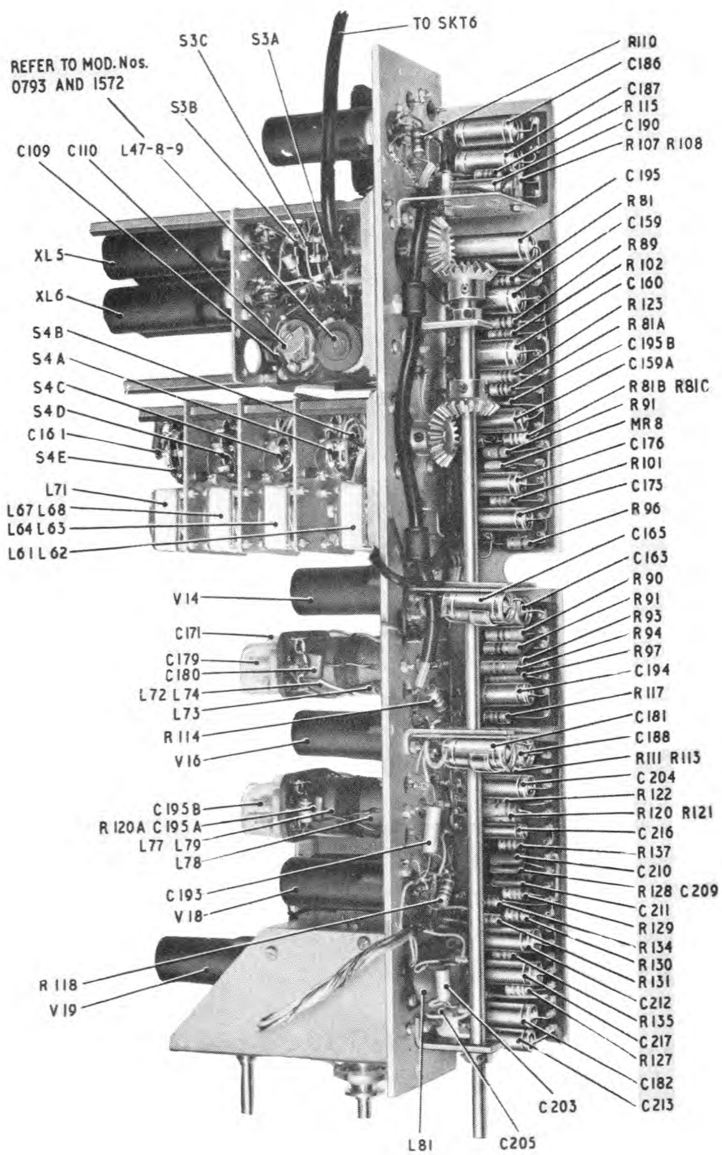


Fig.1 100 kc/s i.f. amplifier - right side

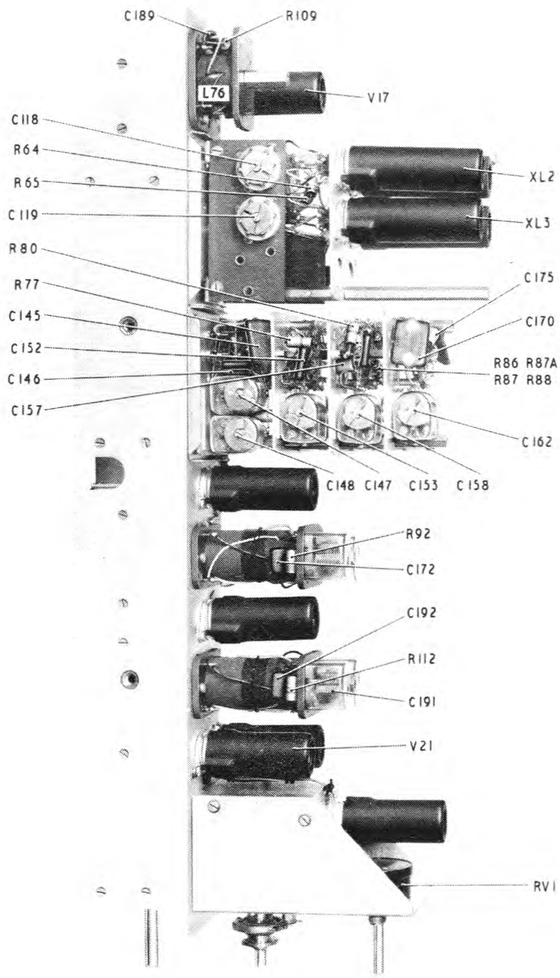


Fig. 2. 100 kc/s i.f. amplifier—left side

9. Tune the signal generator slowly through the passband and observe the crystal responses (f1 and f2). Care must be taken as the tuning of these is very sharp.

10. Retune the signal generator to the mean of f1 and f2 and adjust capacitors C110 (fig. 1) and C148 (fig. 2) for maximum output.

11. Reset the signal generator to 100 kc/s and adjust the output to produce a reading 100 μA.

12. Set the signal generator frequency to 101025 c/s, increase the output by 66 dB and adjust the phasing control C119 to obtain minimum output (i.e. the point of rejection occurs).

13. Increase the signal generator frequency slowly and ascertain that the meter reading does not exceed 100 μA.

14. Slowly decrease the signal frequency until 100 μA reading is obtained and check that the frequency is not greater than 100900 c/s.

15. Tune through the passband, adjusting the signal generator output as necessary to avoid meter damage. Note the highest frequency at which a signal generator output equal to that used at 101025 c/s gives an output of 100 μA. This frequency should not be less than 99100 c/s.

16. Slowly decrease the signal frequency and ensure that the output does not rise above 100 μA.

17. Decrease the generator output by 66 dB and recheck the frequency response within the passband, re-adjusting C110 and C148 if necessary.

18. Set the signal generator frequency to 100 kc/s and adjust the output for 100 μA level.

19. Increase the signal generator output by 6dB and check the bandwidth for 100 μA output. The bandwidth should be between 270 and 330 c/s and the mid-position should not deviate from 100 kc/s by more than 25 c/s. The sensitivity should be approximately 200 μV for 100 μA deflection.

20. Switch the BANDWIDTH control to 100 c/s.

21. Repeat the procedure in para. 9 to 19 with signal generator frequency settings of 100925 c/s, 100800 c/s and 99200 c/s respectively. Adjust phasing capacitor C118 only (fig. 2). The 6dB bandwidth should be between 80 and 120 c/s, and the deviation from the mean less than 25 c/s. For 100 μA output, the input should be approximately 150 μV.

22. Set the MAINS switch to upward position.

23. Disconnect the signal generator and refit V12.

Aerial circuit alignment

24. Remove the first v.f.o. valve V5 and the first mixer valve V7 and set the receiver controls as follows:-

AE. ATTENUATOR to MIN.
AE. RANGE MC/S to 0·5 Mc/s.
System switch to MAN.
IF GAIN to MAX.

25. Set the AE. TUNE control to approximately 7/8ths of its travel in a clockwise direction.

26. Connect the valve voltmeter, shunted to 12 pF, between TP2 and chass Connect the output of the signal generator to the aerial input socket. Set the generator for a frequency of 0·5 Mc/s.

27. Remove the top core from the transformer L9 (fig. 3).

28. Set MAINS switch to the downward position.

29. Adjust the primary core for a maximum deflection in the valve voltmeter. (The position of this core should be such that it tunes at a point nearest the bottom of the transformer).

30. Adjust the secondary core for a maximum deflection in the valve voltmeter.

31. Reset the signal generator frequency to 1 Mc/s.

32. Adjust the AE. TUNE control C18 for maximum output in the valve voltmeter then adjust the trimmer capacitor C232 for a maximum deflection in the valve voltmeter also check for symmetrical response.

33. Repeat the above procedure para. 26 to 32 for the AE. RANGE switch settings and frequencies listed as follows:-

AE. RANGE	Alignment Frequency		Inductance
	Primary	Secondary	
1-2	1 Mc/s	2 Mc/s	L8
2-4	2 Mc/s	4 Mc/s	L7
4-8	4 Mc/s	8 Mc/s	L6
8-16	8 Mc/s	16 Mc/s	L5
16-30	13 Mc/s (C18 at max.)	30 Mc/s	L4

Maximum voltage input for 0·5 volt output.

AE. RANGE	LF	HF
0·5-1 Mc/s	6 mV	6 mV
1-2 Mc/s	7 mV	7 mV
2-4 Mc/s	10 mV	10 mV
4-8 Mc/s	12 mV	16 mV
8-16 Mc/s	22 mV	26 mV
16-30 Mc/s	22 mV	30 mV

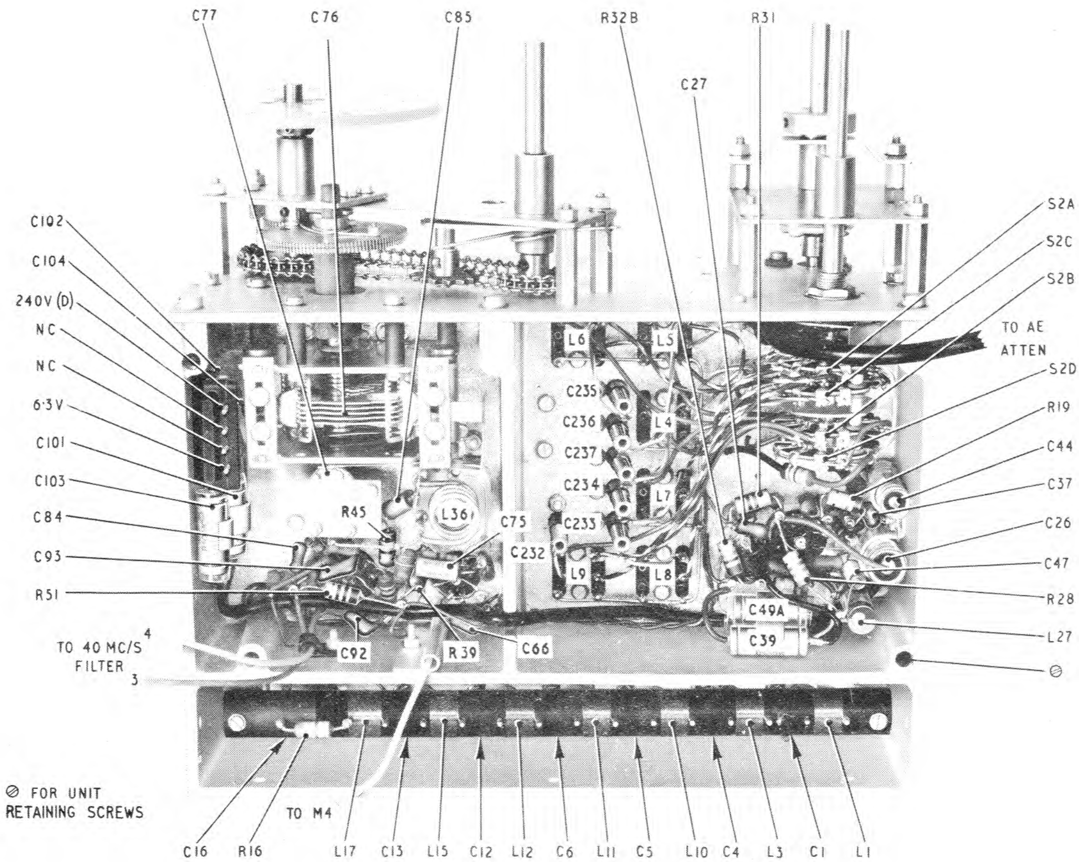


Fig. 3. First v.f.o. unit—underside

Appendix 2

RECEIVERS RADIO 5820-99-999-2775 and 5820-99-999-9292

LIST OF CONTENTS

Notes . . .

1. The tests detailed in this appendix are given to ascertain whether an equipment is up to standard after 3rd line servicing or repair.

2. All valves should have been proved serviceable in a valve tester before performing these tests.

3. The receiver should be removed from its cabinet for testing, but all screening covers must be secured in position.

4. The tests should be performed in the order given and will thereby localize any section which is not up to standard.

5. The receiver must be switched on and allowed to warm-up for at least 30 minutes before testing.

WARNING . . .

The separate earth connection must be made before connecting to mains supply.

TOOLS, TEST EQUIPMENT AND MATERIALS

10S/9008337	Signal generator CT452A (Set)
10S/9149811	Wattmeter absorption AF
10S/5801668	Generator noise CT410
	or
10S/9491612	Generator noise Type S4/1
10AH/9	Headset telephone low impedance
10S/9492964	Signal generator Type 9428
10S/9556255	Multimeter electronic CT471C
10W/0221232	Resistor 600 ohm
	Signal generator CT433A
	Resistor 3-ohm

AF tests

1. Perform a test of the a.f. section of the receiver as follows:-

(1) Connect an a.f. wattmeter set for 600 ohms impedance and a power range of 100 mW across the 10 mW 600 ohms terminals of the receiver. Load the other output terminals with resistors equivalent to the engraved impedance.

(2) Set the controls of the signal generator CT433A for a frequency of 1000 cycles at high impedance and a level of 350 mV. Connect the output of the oscillator to the outer input tag of the AF GAIN control.

(3) Set the preset AF LEVEL control for maximum output and ensure that the a.f. wattmeter indicates at least 10 mW.

(4) Set the level switch to AF LEVEL and adjust the AF LEVEL control for an AF LEVEL meter indication of exactly 10 mW. Ensure that the external a.f. wattmeter indicates 10 mW ±1dB.

(5) Adjust the a.f. wattmeter impedance range to 3 ohms, and transfer the connections to the 3-ohm 50 mW output terminals.

(6) Set the AF GAIN control for maximum output and ensure that the a.f. wattmeter indicates at least 50 mW.

(7) Repeat the test for each of the output terminals in turn, adjusting the a.f. wattmeter power and impedance controls as appropriate. The output should be at least that engraved on the terminals.

IF tests

2. Perform a test of the IF sensitivity as follows:-

(1) Set the System switch on the receiver to MAN, the BFO to OFF, the IF GAIN control fully counter-clockwise, the METER switch to RF LEVEL and the BANDWIDTH switch to 3 kc/s. Set the MAINS switch in the upwards position.

(2) Set the controls of the signal generator Type 9428 for an output of 100 kc/s at a level of 200 μV (+46 dB relative to 1μV).

(3) Remove V12 from the receiver and connect the output of the signal generator Type 9428 through a 0·1 μF capacitor to pin 5 (anode) of V12 holder.

(4) Set the receiver MAINS switch to the downward position, allow receiver to warm-up.

(5) Turn the IF GAIN clockwise to obtain a maximum reading without over running the scale.

(6) Ensure that the output indicated in the RF LEVEL meter is at least 100 μA.

(7) Reset the IF GAIN control to give an exact reading of 100 μA in the RF LEVEL meter.

(8) Set the BANDWIDTH switch to each position in turn and ensure that the output level at each position is not less than 30 μA.

3. Perform a test of the BFO zero beat as follows:-

(1) Set the System switch on the receiver to MAN, the BANDWIDTH switch to 8 kc/s (receiver 2775), or 6·5 kc/s (receiver 9292), and the BFO switch to the upwards position.

(2) Set the controls on the signal generator Type 9428 to exactly 100 kc/s at a level to produce a reading of 50 μA in the receiver RF LEVEL meter.

(3) Set the BFO and SPEAKER switches to ON and ensure that zero beat is obtained when the BFO NOTE control is approximately at zero.

(4) Disconnect the test equipment and refit V12.

AVC tests

4. Perform a test of the overall AVC control as follows:-

(1) Set the controls on the receiver as follows:-

AE RANGE	2-4 Mc/s
MEGACYCLES	3
KILOCYCLES	500
AE ATTENUATOR	MIN
System Switch	AVC
AVC Switch	SHORT
BANDWIDTH	3 kc/s

BFO switch	upward
LIMITER switch	upward
IF GAIN	fully clockwise

(2) Set the controls of the a.f. wattmeter for an impedance of 3 ohms and a power range of 100 mW. Connect the wattmeter to the 50 mW 3-ohm terminals at the rear of the receiver.

(3) Set the controls of the multimeter CT471C to 12V d.c. range and connect it to the AVC output terminals at the rear of the receiver.

(4) Set the signal generator Type 9428 controls for a 30% modulated signal at 3·5 Mc/s. Connect the 20 dB attenuator in series with the signal generator output, and set the output level to 24·5 dB. Connect the signal generator output to the receiver aerial input.

(5) Tune the receiver accurately to the signal generator frequency and adjust the AF GAIN control for a reading in the a.f. wattmeter of 30 mW. Note the reading in the multimeter CT471C. Set the a.f. wattmeter power range to 1W.

(6) Increase the signal generator Type 9428 output level to 84·5 dB (+60 dB). The reading in the a.f. wattmeter should not rise above 120 mW (+6 dB on 30 mW).

(7) Confirm the presence of the a.g.c. voltage by observing the reading on the multimeter CT471C.

(8) Disconnect the signal generator Type 9428 zero and ensure that a zero reading is obtained in the multimeter CT471C.

(9) Switch on the receiver b.f.o. and ensure that there is still no reading in the multimeter CT471C.

5. Perform a test of the AVC time constant as follows:-

(1) Remove the 1 Mc/s crystal XL1 (mounted on the upper side of the main chassis).

(2) Re-connect the signal generator Type 9428 (set up as in paragraph 4 (4)) and adjust the output level to +124·5 dB.

(3) With the SPEAKER switch set to ON, rotate the RF GAIN control from minimum to maximum sharply and evenly. Note the audible signal level increases instantly with no apparent overloading or distortion.

(4) Set the AVC switch to LONG and repeat sub-para. (3). No overloading or distortion should be apparent, but a perceptable time (approximately 1 second) should elapse before the signal level increase.

Interpolation receiver sensitivity

6. Perform a test of the interpolation receiver sensitivity as follows:-

(1) Set the receiver System switch to MAN and all other controls as detailed in para. 4 (1).

(2) Set the signal generator Type 9428 to a frequency of 2·5 Mc/s, and connect the output to TP3.

(3) With the receiver KILOCYCLES scale set to 500 kc/s, check for an audible note in the loudspeaker.

(4) Adjust the output level of the signal generator Type 9428 for an indication of 100 μA in the receiver RF LEVEL meter. Ensure that the signal generator Type 9428 output does not exceed 8μV.

(5) Repeat the test with the signal generator Type 9428 set to 2·2 and 2·9 Mc/s, and the receiver KILOCYCLES scale tuned to 800 and 100 kc/s respectively, at the same time ensuring that the difference in signal generator output does not exceed 3dB.

(6) Refit the 1 Mc/s crystal.

Separate IF output

7. Check the separate IF outputs as follows:-

(1) Set the receiver controls as in para. 4 (1), and connect the signal generator CT 452A to the receiver aerial input.

(2) Set the signal generator controls for a 30% modulated signal at 3·5 Mc/s. Connect the 20 dB attenuator in series with the signal generator output and set the output level to 24·5 dB.

(3) Terminate one of the i.f. output leads with the 75-ohm terminated probe of the multimeter CT471C. Set the multimeter CT471C to the 0.4V RF RANGE.

(4) Tune the receiver to the signal generator frequency and ensure that the output indicated on the multimeter CT471C is not less than 100 mV.

(5) Increase the signal generator output to 84·5 dB, and ensure that the output indicated on the multimeter CT471C is not greater than twice the value noted in para. (4).

(6) Disconnect the test equipment.

Kilocycles dial calibration

8. Check the KILOCYCLES dial calibration and resetting accuracy as follows:-

(1) Set the controls of the receiver as in para. 4 (1) and then set the System switch to CAL.

(2) Adjust the KILOCYCLES tuning control to any calibration point for a zero beat note in the loudspeaker, first from one direction, and then from the opposite direction. Check that the difference in dial settings for zero beat does not exceed 250 c/s ($\frac{1}{4}$ scale division).

(3) Adjust the KILOCYCLES tuning control to each of the 100 kc/s check points in turn and ensure that the dial error between any two adjacent check points does not exceed 1 kc/s.

Megacycles dial calibration

9. Check the MEGACYCLES dial calibration as follows:-

(1) Set the controls of the receiver as in para. 4 (1), with the AE RANGE switch set to WIDEBAND.

(2) Set the MEGACYCLES control midway between any two megacycles calibration points and adjust the gain of the receiver for a convenient noise level in the loudspeaker or headset.

(3) Set the MEGACYCLES control to each calibration point in turn and ensure that there is an appreciable increase in the noise level and a decrease between them.

Aerial attenuator

10. Check the aerial attenuator as follows:-

(1) Set the controls of the receiver as in para. 4 (1) with AVC switched off.

(2) Set the controls of the signal generator CT452A for a 30% modulated MCW output, 20 dB attenuator in position, output level to 35·5 dB, at a frequency of 3·5 Mc/s. Connect the signal generator output to the receiver aerial input.

(3) Tune the receiver to the signal generator frequency and adjust the IF GAIN control for a reading of 100 μA in the RF LEVEL meter.

(4) Set the AE ATTENUATOR to position 1 and increase the output level of the signal generator to restore a reading of 100 μA in the RF LEVEL meter. Note the increase in signal level.

(3) Set the controls of the signal generator CT452A to give a 1.5 Mc/s c.w. output. With the 20 dB attenuator in position, set the signal generator output attenuator to 25 dB.

(4) Tune the receiver to the signal generator frequency and adjust the RF/IF GAIN control for a reading of 50 μA on the RF LEVEL meter (METER switch set to RF). Switch on the BFO and adjust the AF GAIN control for an output of 50 mW in the a.f. wattmeter.

(5) On the signal generator depress the CARR INT switch and ensure that the a.f. wattmeter does not read more than 0·8 mW (18 dB down on 50 mW).

(6) Set the signal generator to give a 30% modulated signal, (1 kc/s modulation) set the output attenuator to 36 dB and leave the 20 dB attenuator in circuit. Switch off the BFO and adjust the RF/IF GAIN control for a reading of 50 μA in the RF LEVEL meter. Adjust the AF GAIN control for a reading of 50 mW in the a.f. wattmeter.

(7) Switch the signal generator to c.w. and ensure that the a.f. wattmeter reads not more than 0·8 mW. (18 dB down on 50 mW).

(8) Repeat the above procedure at 3005 kc/s, 6005 kc/s, 12005 kc/s and 24005 kc/s. (Break-through from the 1 Mc/s crystal may occur if exact multiples of 1 Mc/s are used).

Noise factor test

Note . . .

Due to ambient noise, the following test is normally performed in a wire cage at 3rd line.

14. (1) Set the receiver controls as follows:-

AE RANGE	16 - 30
MEGACYCLES	24
KILOCYCLES	0
System Switch	MAN
AE ATTENUATOR	MIN
BANDWIDTH	3 kc/s
BFO Switch	downward position
LIMITER	upward position
RF/IF	MAXIMUM GAIN
BFO NOTE kc/s	±1 kc/s
SPEAKER	ON

(2) Set the noise generator RANGE switch to OFF.

(3) Switch on the noise generator CT410 and connect its output to the receiver aerial input socket.

(4) Set the controls of the a.f. wattmeter for an impedance of 3 ohms, a power range of 100 mW, and connect it to the 50 mW 3-ohm output terminal of the receiver.

(5) Set the AF GAIN control for a convenient level and adjust the MEGACYCLES tuning and AE TUNING controls for maximum noise in the loudspeaker.

(6) Adjust the AF GAIN control to obtain a reading of approximately 10 mW in the a.f. wattmeter. Check that the MEGACYCLES and AE TUNING controls are set for maximum output and then reset the AF GAIN control for exactly 10 mW.

(7) Set the noise generator RANGE switch to 0-10.

(8) Adjust the noise generator OUTPUT LEVEL control until a reading of 20 mW is obtained in the a.f. wattmeter.

(9) The noise factor of the receiver is given by the noise generator meter reading for the range in use.

(10) Carry out a noise factor test at 24, 12, 6, 3 and 1·5 Mc/s. The noise factor should not exceed 5 at all frequencies for the receiver 9292, and 24 to 3 Mc/s for the receiver 2775. At 1·5 Mc/s the receiver 2775 noise factor should not exceed 6·3.

Spurious response

15. With no input to the receiver aerial socket, check spurious responses to internally generated signals as follows:-

(1)

AE RANGE	WIDEBAND
MEGACYCLES	1
KILOCYCLES	0
BANDWIDTH	3 kc/s
BFO Switch	downwards
SPEAKER	ON
System Switch	MAN

(2) Tune the KILOCYCLES control until a spurious signal is indicated by a beat note in the loudspeaker. When a beat note is detected, detune the receiver until the beat note is inaudible.

(3) Connect the a.f. wattmeter, set to 3 ohms impedance and a power range of 10 mW to the 3-ohm 50 mW output terminals of the receiver.

(4) Adjust the Mc/s dial and RF/IF GAIN control until a noise level of 1 mW is indicated on the a.f. wattmeter.

(5) Repeat the tests detailed at (4) for each position of the AE ATTENUATOR switch and ensure that the increase in signal generator output required to restore the level in the RF LEVEL meter falls within ±2dB of the figures listed below:-

Ae attenuator Position	Total signal Increase
MIN	0 dB
1	13 dB
2	22 dB
3	31 dB
MAX	39 dB

(6) Disconnect the signal generator.

Aerial circuit noise test

11. (1) Set the IF GAIN control fully clockwise.

(2) Set the controls of the a.f. wattmeter for 3 ohms impedance and a range of 10 mW. Connect the a.f. wattmeter to the 50 mW 3-ohm terminals of the receiver.

(3) Set the RF TUNE control off tune and adjust the AF GAIN control until the noise level indicated on the a.f. wattmeter is 1 mW.

(4) Set the RF RANGE switch in turn to the positions listed below, tune the Mc/s dial to the frequencies listed below, and adjust the RF TUNE control for maximum indication on the a.f. wattmeter. Ensure that the increase in noise level is not less than the figure listed below:-

RF RANGE	Mc/s Dial	Noise Increase
1 - 2	1	7 dB
1 - 2	2	7 dB
2 - 4	2	5 dB
2 - 4	4	5 dB
4 - 8	4	3 dB
4 - 8	8	3 dB
8 - 16	8	2 dB
8 - 16	16	2 dB
16 - 30	16	1 dB
16 - 30	30	1 dB

Receiver overall gain test

12. Perform a sensitivity test as follows:-

(1) Set the controls on the receiver as follows:-

AE RANGE	2 - 4 Mc/s
MEGACYLES	3
KILOCYCLES	500
AE ATTENUATOR	MIN
System Switch	MAN
BANDWIDTH	3 kc/s
BFO switch	downward position
BFO NOTE kc/s	+1 kc/s
IF GAIN	fully clockwise

(2) Set the controls of the a.f. wattmeter for 3 ohms impedance and a range of 100 mW. Connect the a.f. wattmeter across one of the 3-ohm 50 mW outputs and terminate the other outputs with resistors to match their engraved impedance.

(3) Set the signal generator CT452A controls for a CW signal of 3·5 Mc/s. With the 20 dB attenuator in position, set the output attenuator to 25 dB, and connect the signal generator output to the receiver aerial input.

(4) Tune the receiver to the frequency of the signal generator and ensure that a reading of 50 mW can be obtained within the range of the AF GAIN control.

(5) Repeat the tests with the BFO switched off and a 30% modulated signal with the output attenuator set to 36 dB, the 20 dB attenuator remaining in position.

Signal-to-noise ratio test

13. (1) Set the receiver controls as follows:-

AE RANGE	1 - 2 Mc/s
MEGACYCLES	1
KILOCYCLES	500
AE ATTENUATOR	MIN
System Switch	MAN
BANDWIDTH	3 kc/s
BFO Switch	upwards position
BFO NOTE kc/s	±1 kc/s
AF GAIN	fully clockwise
SPEAKER	OFF

(2) Set the controls of the a.f. wattmeter for an impedance of 3 ohms and a power range of 100 mW.

(5) Retune the receiver for a maximum indication on the a.f. watt-meter and note the increase in level above the 1 mW reference. The increase should not exceed 2dB.

(6) Repeat test for each Mc/s position from 1 to 29 in turn.

(7) Set the kc/s dial to 1000 and repeat sub. para. (6).

Chapter 3

ALIGNMENT OF L.F. CONVERTER

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

ALIGNMENT OF L.F. CONVERTER

1. The l.f. converter must be removed from the main cabinet before commencing alignment.

2. Before carrying out the following alignment instructions, the sensitivity at 2·0, 2·5 and 3·0 Mc/s (0, 500 and 1000 on the KILOCYCLES scale) of the associated receiver must be known. The procedure for obtaining this data is given in para. 15 to 19.

3. Ensure that the dust cover is in position on the harmonic generator.

Tools and test equipment

4. The following test equipment will be required—

Signal generator
Valve voltmeter
0·1μF capacitor
330-ohm resistor

Receiver sensitivity determination

5. Set the controls on the front panel of the receiver as follows:—

(1)	I.F. GAIN control	Set fully clockwise
(2)	BANDWIDTH switch	Set to 3 kc/s
(3)	System switch	Set to MAN
(4)	METER switch	Set to R.F. LEVEL
(5)	KILOCYCLES tuning control	Set to 0 on the red scale

6. Ensure that the MAINS supply is switched off.

7. Disconnect the r.f. output connector from between the receiver and the converter.

8. Set the controls of the signal generator for a frequency of 2 Mc/s at a level of 2μV and ensure that the output impedance of the signal generator is 75 ohms.

9. Connect the output of the signal generator via a 0·1μF capacitor to the r.f. socket on the rear of the receiver.

10. Set the MAINS switch to the downward position.

11. Increase the output voltage level of the signal generator until a reading of 100μA is obtained in the R.F. LEVEL meter. Note the signal generator output voltage level.

12. Reset the KILOCYCLES tuning control to 600 kc/s on the red scale.

13. Reset the frequency of the signal generator to 2·5 Mc/s.

14. Adjust the output voltage level of the signal generator until a reading of 100μA is obtained in the R.F. LEVEL meter. Note the signal generator output voltage level .

15. Reset the KILOCYCLES tuning control to 1000 kc/s on the red scale.

16. Reset the frequency of the signal generator to 3 Mc/s.

17. Adjust the output voltage level of the signal generator until a reading of 100μA is obtained in the R.F. LEVEL meter. Note the signal generator output voltage level.

18. Set the MAINS switch to the upward position.

19. Disconnect the signal generator from the r.f. socket and reconnect the connector from the l.f. converter to it. Ensure that all other connections from the converter are correctly connected to the receiver.

Harmonic generator.

Note. . .

The screening cover must be secured in position before alignment.

20. Ensure that the converter and receiver MAINS switches are set to the upward position.

21. Set the converter OPERATION switch to the 12 kc/s-980 kc/s position.

22. Locate the preset capacitor C28 (*fig.* 1) (mounted on top of the balanced mixer sub-unit) and set it to its mid-position.

23. Locate pin 6 of the valve V3 (*fig.* 2) (mounted adjacent to the balanced mixer sub-unit) and connect a valve voltmeter between it and a suitable earth.

24. Set mains supply switches on both units to ON.

25. Locate the inductor L16, L17 and the capacitor C27 (*fig.* 1) (mounted on top of the harmonic generator sub-unit) and tune each in turn for maximum reading in the valve voltmeter. Note the reading, which should not be less than 0·5 volts.

26. Set both mains supply switches to OFF.

27. Disconnect the valve voltmeter from V3 and connect it to pin 6 of the valve V4.

28. Set both mains supply switches to on.

29. The reading in the valve voltmeter should be within 0·05 volts of that recorded in para. 25.

30. Set both mains supply switches to OFF.

31. Disconnect the valve voltmeter from pin 6 of V4.

Balanced mixer anode circuit.

32. Ensure that both mains supply switches are set to OFF.

33. Disconnect the coaxial connector between the R.F. OUTPUT socket on the converter and the r.f. socket on the receiver.

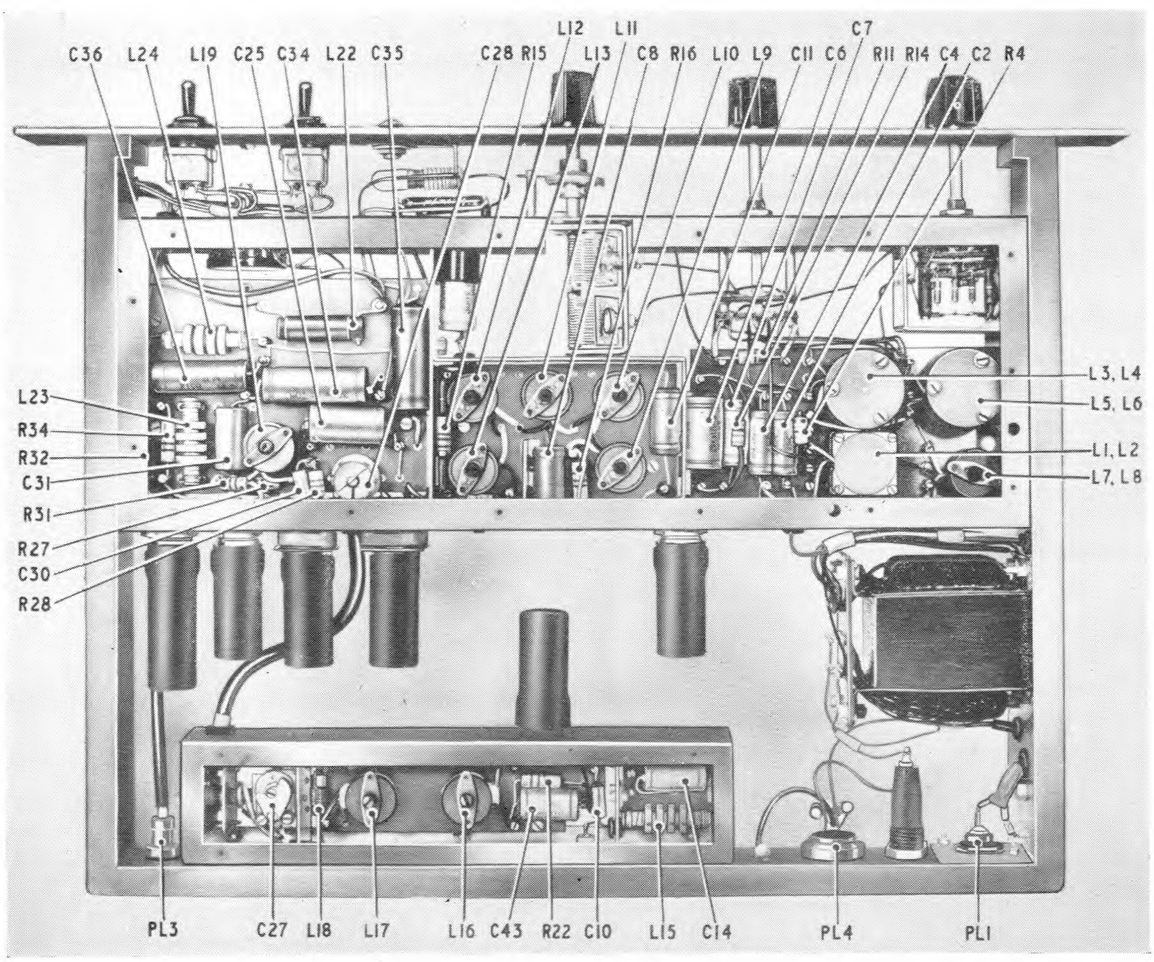


Fig. 1. Top of chassis

34. Set the valve voltmeter to the 1·5-volt range and connect it in parallel with a 330-ohm resistor across the R.F. OUTPUT socket.

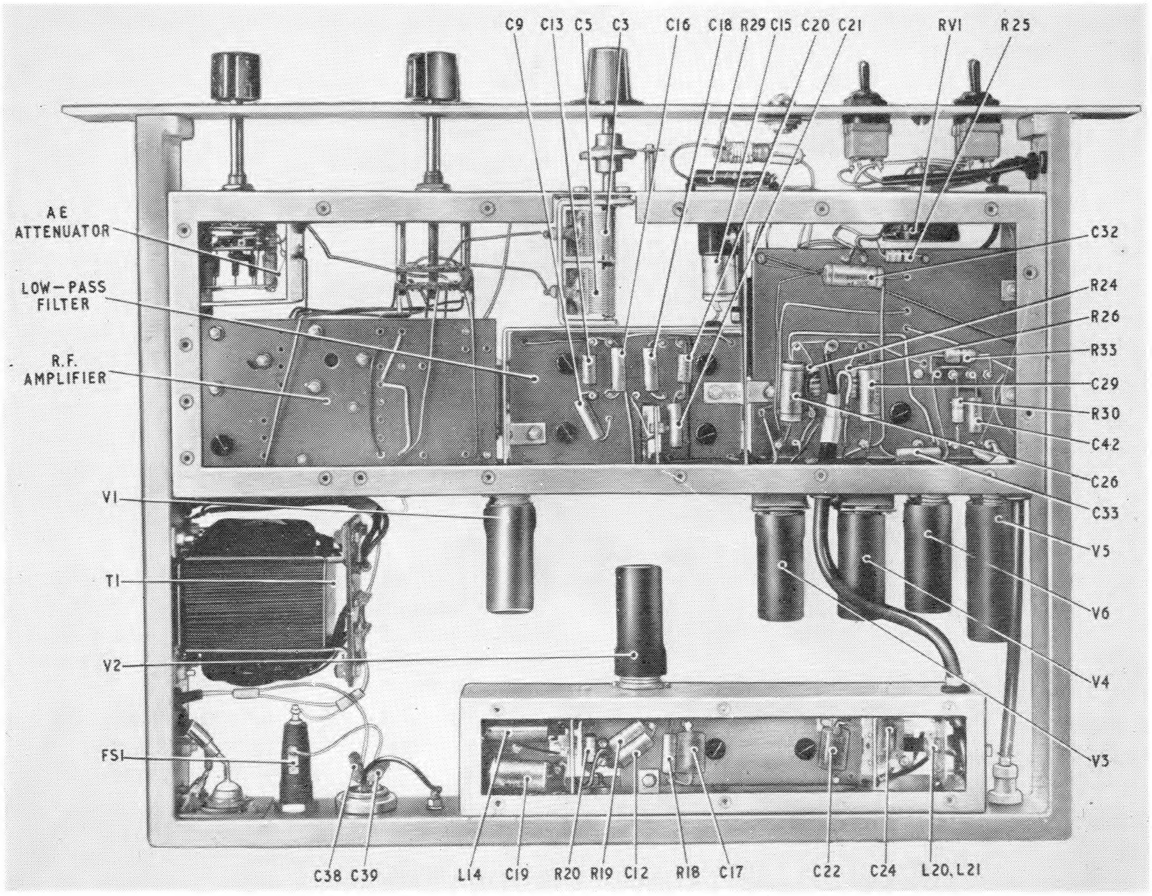


Fig. 2. Underside of ehassis

35. Locate pin 1 on the valve V3 and connect the output of the signal generator via a 0·1μF capacitor to it.

36. Set the controls of the signal generator for a c.w. frequency of 2·7 Mc/s.

37. Set both mains supply switches to ON.

38. Adjust the output level of the signal generator to produce a convenient reading in the valve voltmeter.

39. Locate the inductor L19 (*fig.* 1) (mounted on the balanced mixer sub-unit) and tune it for a peak reading in the valve voltmeter.

40. Vary the frequency of the signal generator between 2 and 3 Mc/s and check that the valve voltmeter reading remains fairly constant.

41. Set both mains supply switches to OFF.

42. Disconnect the valve voltmeter from V3 and refit the coaxial connector between the converter R.F. OUTPUT socket and receiver r.f. socket.

43. Ensure that the meter switch is set to R.F. LEVEL.

44. Set the signal generator controls for a c.w. frequency of 2·012 Mc/s and an output voltage of 200μV.

45. Set the KILOCYCLES red scale to 12 kc/s.

46, Set both mains supply switches to ON.

47. Check that the reading in the R.F. LEVEL meter is approximately 100μA.

48. Reset the signal generator frequency of 2·5 Mc/s and its output voltage to 150μV.

49. Set the KILOCYCLES red scale to 500 kc/s and check that the reading in the R.F. LEVEL meter is approximately 100μA.

50. Reset the signal generator frequency to 2·980 kc/s and its output to 200μV.

51. Set the KILOCYCLES red scale to 980 kc/s and check that the reading in the R.F. LEVEL meter is approximately 100μA.

52. Set both mains supply switches to OFF.

53. Disconnect the signal generator from V3.

Balanced mixer adjustment

54. Set the controls on the front panel of the receiver as follows:—

Red KILOCYCLES scale	Set to 0
I.F. GAIN control	Set to minimum
Meter switch	Set to R.F. LEVEL

55. Set both mains supply switches to ON.

56. Ensure that there is no signal input to the receiver and adjust the variable resistor RV1 and the capacitor C28 for minimum reading in the R.F. LEVEL meter, adjusting the I.F. GAIN as necessary to maintain a convenient reading.

Low pass filter

57. Set the controls on the front panel of the receiver as follows:—

I.F. GAIN control	Set fully clockwise
System switch	Set to MAN
Mains switch	Set to the upward position.

58. Set the controls on the front panel of the converter as follows:—

AE. ATTENUATOR switch	Set to MIN
AE. RANGE switch	Set to WIDEBAND
OPERATION switch	Set to 12 kc/s—980 kc/s
Mains switch	Set to the upward position

59. Remove the valves V3, V4 and V5 on the converter unit and connect a valve voltmeter between pin 1 of the valve V3 and earth.

60. Set the controls of the signal generator for a c.w. frequency of exactly 1030 kc/s (use a frequency meter such as the SCR211 to check the frequency) and an impedance of 75 ohms. Connect the output to the aerial input plug.

61. Set both mains supply switches to ON and allow the receiver and converter to warm up for a few minutes.

62. Adjust the output level of the signal generator to give a reading of 2 volts in the valve voltmeter.

63. Locate the inductor L13 (*fig.* 1), mounted on the low-pass filter sub-unit, and tune it for a dip in the valve voltmeter, increasing the output voltage of the signal generator as necessary up to a maximum of 800mV.

64. Reset the signal generator frequency to 1080 kc/s exactly.

65. Locate the inductor L9 on the low-pass filter sub-unit and tune it for a dip in the valve voltmeter, increasing the output voltage of the signal generator as necessary to a maximum of 800mV.

66. Check that the reading in the valve voltmeter does not vary beyond the limits of 1·12 and 0·7 volts (1 to 3dB) at any frequency between 12 kc/s and 980 kc/s. If the response in the region 900 to 980 kc/s is not within the limits given, correction may be obtained by adjusting L10, L11 and L12.

67. Set the signal generator to a frequency of 1030 kc/s and an output level of 800mV.

68. Set the range of the valve voltmeter to 1·5 volts and check that there is no appreciable reading in the meter.

69. Set both mains supply switches to off.

70. Disconnect the signal generator.

71. Disconnect the valve voltmeter from V3 and refit the valves V3, V4 and V5.

Aerial circuit alignment

72. Set the controls of the converter and receiver for R/T reception at 330 kc/s, with A.V.C. off and the A.E. RANGE switch set to WIDEBAND.

73. Set the controls of the signal generator for a 30% modulated MCW frequency of 330 kc/s at a level of 1μV. Connect the output of the signal generator to the aerial input socket of the converter.

74. Tune the equipment to the output frequency of the signal generator and adjust the I.F. GAIN control for a reading of approximately 100μA in the R.F. LEVEL meter.

75. Set the AE. RANGE switch of the converter to the 330-980 kc/s position and the AE. TUNING control to approximately ⅛th of its travel in a clockwise direction.

76. Locate L8 (mounted on the r.f. amplifier sub-unit) and adjust the tuning core for a peak reading in the R.F. LEVEL meter.

77. Set the signal generator frequency to 980 kc/s and tune the equipment to this frequency. Check that a peak reading can be obtained in the R.F. LEVEL meter within the travel of the AE. TUNE control.

78. Repeat the instructions given in para. 72 to 77 for the A.E. RANGE switch settings and frequencies listed below.

AE. RANGE	*Frequency*	*Inductor*	*Check frequency*
110—330 kc/s	110 kc/s	L6 (fixed)	330 kc/s
37—110 kc/s	37 kc/s	L4	110 kc/s
12— 37 kc/s	12 kc/s	L2 (fixed)	37 kc/s

Note . . .

L6 and L2 are fixed inductors and no adjustment can *hem*

PART 3

FAULT DIAGNOSIS

Chapter 1

FAULT DIAGNOSIS ON RECEIVER AND L.F. CONVERTER

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FAULT DIAGNOSIS ON RECEIVER

Introduction

1. The following notes and test procedures enable the faulty section of the receiver to be determined with the minimum of delay. Unless otherwise stated the meter on the front panel is used for measuring purposes. This is set to R.F. LEVEL and the reference figure is 100μA for all sensitivity tests.

2. Since the audio stages of the receiver are conventional and accessible normal practice will serve to trace any fault which may occur in this section.

Test equipment requirements

3. The following test equipment will be required:

(1) Valve voltmeter Type CT54 (10S/16374).

(2) Capacitor, variable (12pF) Type 6383-(10C/0115562).

(3) Signal generator Type 70 (10S/16392).

Note . . .

The input capacitance of the valve voltmeter must be padded to 12pF by the trimmer or alternatively by a fixed capacitor. Before the value of the trimmer or the fixed capacitor can be selected, the input capacitance of the valve voltmeter must be known. If the trimmer is used, this should be connected across a capacitance bridge and set to the required value.

Fault diagnosis

4. Set the controls on the front panel as follows:

R.F. GAIN set to MAX.
I.F. GAIN set to MAX.
B.F.O. switch set to OFF.
LIMITER switch set to OFF.
SYSTEM switch set to MAN.
MAINS switch set to OFF.

5. Remove the valve V12 and crystal XL1 and connect the output of the signal generator via a 0·1μ F capacitor to pin 5 (anode) of the valve holder V12.

6. Set the MAINS switch to the downward position.

7. Set the BANDWIDTH control to 100 c/s and tune the signal generator for maximum indication in the R.F. LEVEL meter at 100 kc/s. Sensitivities should be approximately as follows:

100 c/s	less than 130μV.
300 c/s	less than 265μV.
750 c/s	less than 300μV.
1·2 kc/s	less than 210μV.
3·0 kc/s	less than 160μV.
8·0 kc/s	less than 210μV.

8. In the event of the figures in para. 7 not being realized the renewal of one or more of the following valves will probably effect an improvement:

V11	mixer-3
V14	first i.f. amplifier.
V16	second i.f. amplifier.

9. Set the MAINS switch to the upward position.

10. Refit the valve V12, remove the crystal XL1 and connect the output of the signal generator to test point TP3. Set the BANDWIDTH control to 3 kc/s.

11. Set the MAINS switch to the downward position.

12. Tune the generator for maximum at each setting.

Receiver kc/s scale	*Signal generator*
100	2·9 Mc/s: less than 10μV.
500	2·5 Mc/s: less than 10μV.
800	2·2 Mc/s: less than 10μV.

13. The maximum diff
points should not exceed 3dB. The renewal of V11 or V9 will probably effect an improvement if this figure is not met, providing that the conditions outlined in previous paragraphs have been achieved. If the figures vary by more than 3dB between check points, the 2–3 Mc/s bandpass filter C122, C125, C128, L57, L58 and L59/60 should be carefully realigned as detailed under "Alignment of second v.f.o. and third mixer" (*Part* 2, *Chap*. 2).

14. Refit the crystal XL1.

15. Check the 1 Mc/s output (PL3A at the rear of the receiver) with the valve voltmeter to ensure that there is at least 2V output.

16. Set MAINS switch to the upward position.

17. Remove the valve V9 and connect the valve voltmeter to test point TP3.

18. Set the MAINS switch to the downward position.

19. Tune the MEGACYCLES dial slowly through each Mc/s point when at least 2V should be indicated on the voltmeter at each point. Absence of drive at this point or a low reading indicates a possible fault in any one of the following valves or the associated circuitry:
V2, V4, V6, V8, V10 or V5.

20. With V9 and the crystal XL1 removed and the valve voltmeter connected to TP3 as in para. 17 connect the output of the signal generator to the aerial socket at a frequency of 3·5 Mc/s. With the AE. RANGE switch set to WIDEBAND and the AE. ATTENUATOR set to MIN, peak the MEGACYCLES tuning at 3 Mc/s for maximum on the valve voltmeter. The input required for 0·5V should be less than 250mV.

21. If this figure cannot be achieved V1 and V7 may have low emission or a fault may exist in the associated circuits.

22. Low r.f. channel gain may be caused by a failure in the 40 Mc/s bandpass filter. This, however, is extremely unlikely and no attempt should be made to touch this section unless a wobbulator is available on third-line.

23. The aerial, r.f. circuits and low pass filter may be by-passed by feeding in a signal to test point TP2 on the first v.f.o. chassis.

24. Should the fault be traced to a section where alignment will be affected by servicing, reference should be made to the relevant chapter in Part 2.

25. Voltages on valves where the bases are inaccessible are measured by the use of short "stand offs".

'URIOUS RESPONSES

26. In a highly sensitive receiver, precautions against internally generated spurious responses are essential. To this end, the various sections of the receiver have been carefully screened and the power supplies filtered.

27. Any reduction in the screening efficiency or the failure of any filtering component may result in spurious signals being generated. It is therefore essential to ensure that the bonding surfaces are clean and that all securing screws are tight. Spurious responses in the receiver may occur from the following main causes:

(1) 37·5 Mc/s break-through from the second mixer V9 to the third-mixer V11.

(2) Break-through of 1 Mc/s harmonics.

(3) Break-through of b.f.o. harmonics.

(4) Responses at 2·550 and 3·050 Mc/s due to second v.f.o. break-through.

Checks for spurious responses

28. Spurious responses are measured relative to receiver noise with the following standard conditions of test:

(1) No connection to aerial socket

(2) System switch to MAN

(3) I.F. GAIN at MAX

(4) B.F.O. on

(5) 3 kc/s bandwidth

(6) AE. ATTENUATOR at MIN.

29. When the response is located, the receiver is de-tuned from it just sufficiently to render the beat note inaudible. The i.f. gain is then adjusted to provide a convenient noise reference output (1mW) and the receiver re-tuned to the spurious signal for maximum output. The dB rise in audio output is a measure of the spurious signal level relative to the receiver noise.

37·5 Mc/s break-through to mixer-3

30. Switch AE. RANGE to WIDEBAND. This response will be indicated as a beat note which varies rapidly in frequency with respect to the KILOCYCLES scale i.e. a change of 1 Kc/s on the scale results in a much larger change in the note. It will also move along the KILOCYCLES scale if the MEGACYCLES dial is adjusted slightly. This response may be eliminated by adjusting the 37·5 trap (L52 at second mixer anode).

1 Mc/s harmonic break-through

31. Switch AE. RANGE to WIDEBAND. 1 Mc/s break-through responses appear at 0 and 1000 on the KILOCYCLES scale at each setting of the MEGACYCLES dial and are generally more prominent with wideband input. If the response is dependent upon the setting of the MEGACYCLES dial, the 1 Mc/s spectrum is probably breaking through to the first mixer stage. If the response is independent of the MEGACYCLES dial setting, it is due either to break-through of the second and/or third harmonic to the second or third mixer stage. If the response is independent of the MEGACYCLES dial setting, it is due either to break-through of the second and/or third harmonic to the second or third mixer stage. Remove the second mixer valve (V9) to eliminate this stage and so determine in which stage the break-through occurs.

First v.f.o. harmonics

32. Spurious responses may occur at 4·5, 5·5 and/or 17·5 Mc/s, if C42A and/or C194A are open-circuit. These responses are caused by the harmonics of the first v.f.o. breaking through to the second mixer stage and beating with the harmonics of the 37·5 Mc/s heterodyne voltage.

33. If the screening covers of the 40 Mc/s bandpass filter are removed, the fingering strips should be cleaned. When refitting the covers it is essential that perfect contact is made with the main casting.

B.F.O. harmonics

34. These responses may be detected at 100 kc/s intervals between 1 and 1·5 Mc/s when the b.f.o. frequency is 100 kc/s and the receiver aerial input is tuned. Should these responses occur, the bonding between the b.f.o. and the i.f. amplifier chassis should be checked.

Second v.f.o. break-through

35. Responses may occur at 2·550 and 3·050 Mc/s with tuned aerial input. Ascertain that the first and second v.f.o. are not in contact, that the first v.f.o. chassis is well bonded to the main chassis and the fixing screws are tight. Should this occur, check the coaxial lead braiding from the crystal filter.

Note . . .

A failure in any one of the following capacitors C66, C92, C96, C97, C98, C103 or C104 may result in increased "end of band" responses. These responses will disappear when the MEGACYCLES *dial is de-tuned. The failure of C117, C154, C155, C207, C208 or C214 can result in increased "end of band" responses, or b.f.o. harmonic break-through. De-tuning the* MEGACYCLES *dial will have no effect.*

FAULT LOCATION ON RECEIVER

36. Table 1 lists a series of faults which may be diagnosed with no external test equipment. Where the probable fault is listed as being a valve, this also includes the associated circuitry.

TABLE 1.

Fault location on receiver.

Symptoms	*Probable fault*	*Action*
No. output from loudspeaker. No output from 10mW 600 ohm terminals. Dial lamp not lit.	(*a*) Fuse FS1 faulty. (*b*) Voltage tapping plugs faulty. (*c*) Mains plug or connector faulty. (*d*) External mains source faulty.	Renew fuse (2 amp.) Check plugs. Check plug connections and cable. Check mains supply.
No output from loudspeaker. No output from 10mW 600 ohm terminals. Dial lamp lit.	Rectifier valve V20 faulty.	Renew valve (CV378).
No output from loudspeaker. Normal output from 10mW 600 ohm terminals.	Output valve V22 faulty.	Renew valve (CV138).
No output from 10mW 600 ohm terminals. Normal output from loudspeaker.	Output valve V23 faulty.	Renew valve (CV138).
Receiver operates normally on MAN but no a.v.c. when in A.V.C. position of system switch.	A.V.C. valve V18 faulty.	Renew valve (CV140).

[*continued.*

TABLE 1 (*continued*)

Fault location on receiver.

Symptoms	*Probable fault*	*Action*
Background noise does not vary when MEGACYCLES control is rotated through each megacycle calibration.	(*a*) V1, V2 and V5 faulty or (*b*) 1 Mc/s crystal faulty.	Renew valves (CV138). Renewal crystal XL1.
Receiver operates normally on MCW. No beat note with B.F.O. on.	B.F.O. valve V19 faulty.	Renew valve (CV138).
No signals from receiver. Reduced background noise. Slight increase in background noise as MEGACYCLES control is rotated through each megacycle calibration.	First v.f.o. valve faulty.	Renew valve (CV138).
No beat note at check points when system switch is at CAL.	Calibration valves V13 or V15 faulty.	Renew valves V13-CV453 V15-CV454.

FAULT DIAGNOSIS ON L.F. CONVERTER

Signal input circuits

37. If the r.f. stage is functioning correctly, an increase in noise will occur when the input circuit is tuned through the frequency to which the KILOCYCLES scale is set. Should this not occur, check the aerial input and the attenuator circuits.

R.F. stage

38. Should no signal be received, switch on the b.f.o. and set the red KILOCYCLES scale to zero. A strong 2 Mc/s carrier from the harmonic generator should be heard. If this signal is received, adjust the balanced mixer in accordance with Part 2, Chap. 2. If the mixer can be balanced, the fault is in the r.f. stage or low-pass filter.

Mixer stage

39. If the 2 Mc/s signal is not received, carry out the following check: Ensure that the stabilizer V5 has ignited. Check with the valve-voltmeter that at least 2 volts of 1 Mc/s drive is present at SKT2. Remove V3, V4 and V5 and check that 0·5 volts at 2 Mc/s appears at pin 6 of the valve holders of both V3 and V4.

40. Should this drive be present the fault lies in the balanced mixer, the cathode-follower, or the connection between the R.F. OUTPUT socket and the 2–3 Mc/s band-pass filter in the receiver.

Voltage stabilizer

41. Should V5 fail to function then the balance will drift rapidly.

Appendix 1

RECEIVER, RADIO 5820-99-999-9292

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LIST OF TABLES

Fault diagnosis

1. With the exception of para. 7 and Table 1 of the first part of this Chapter, the fault diagnosis on receiver (para. 1 to 25) 9292 is similar to that of 2775.

2. Set the BANDWIDTH control to 100 c/s and tune the signal generator for maximum indication in the R.F. LEVEL meter at 100 kc/s. The sensitivity should be approximately as follows :—

3 kc/s	Less than 200μV
100 c/s 300 c/s 1·2 kc/s 6·5 kc/s 13·0 kc/s	To be within 10dB of sensitivity measured on 3 kc/s position.

TABLE 1

Fault location on receiver

Symptoms	Probable fault	Action
No output from loudspeaker No output from 10mW 600—ohm terminals Dial lamp not lit	(a) Fuse FS1 faulty (b) Voltage tapping plugs faulty (c) Mains plug or connector faulty (d) External mains source faulty	Renew fuse (2A) Check plugs Check plug connections and cable Check mains supply
No output from loudspeaker No output from 10mW 600—ohm terminals. Dial lamp lit	Rectifier valve V20 faulty	Renew valve (CV1377)
No output from loudspeaker. Normal output from 10mW 600—ohm terminals	Output valve V22 faulty	Renew valve (CV138)
No output from 10mW 600—ohm terminals. Normal output from loudspeaker	Output valve V23 faulty	Renew valve (CV138)
Receiver operates normally on MAN but no a.v.c. when in A.V.C. position of system switch	A.V.C. valve V18 faulty	Renew valve (CV140)
Background noise does not vary when MEGACYCLES control is rotated through each megacycle calibration	(a) V1, V2 and V5 faulty or (b) 1 Mc/s crystal faulty	Renew valves V1—CV5331, V2 and V5—CV138. Renew crystal XL1
Receiver operates normally on MCW. No beat note with B.F.O. ON	B.F.O. valve V19 faulty	Renew valve (CV138)
No signals from receiver. Reduced background noise. Slight increase in background noise as MEGACYCLES control is rotated through each megacycle calibration	First v.f.o. valve faulty	Renew valve (CV138)
No beat note at check points when system switch is at CAL	Calibration valves V13 or V15 faulty	Renew valves V13, (CV 4012), V15 (CV454).

ON134444 D5697 Wt40864 EGE 7/61

PART 4

CIRCUIT THEORY

Chapter 1

CIRCUIT DESCRIPTION OF RECEIVER

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LIST OF ILLUSTRATIONS

Note:

Of the above circuits the following are also available as Miniature Air Diagrams:

Fig.	*Min./A.D.*
2	6722B/MIN
3	6722A/MIN
5	6722C/MIN
6	6722E/MIN
9	6722D/MIN
10	6722F/MIN

INTRODUCTION

1. The circuit description given in this chapter is broken down into sub-units and main chassis. A circuit diagram is incorporated for each individual sub-unit and the main chassis and one overall circuit diagram appears at the end of this chapter (*fig.* 10).

◀ **1A.** Circuit changes for receiver radio 5820–99–999–9292 are described in Appendix 1 of this chapter. ▶

Aerial attenuator

2. The signal input is connected at plug PL1 and fed via a three-section 30 Mc/s low-pass filter to the AE. ATTENUATOR switch S1A (*fig.* 1). The switch provides five steps of attenuation covering a range of 0 to 40dB. The signal is then fed to the AE. RANGE MC/S switch S2 on the first v.f.o. unit.

R.F. amplifier, first v.f.o. and first mixer

3. The AE. RANGE MC/S switch S2 selects wideband operation or any one of the six aerial coils L4 to L9 for tuned operation (*fig.* 2). These aerial coils may be aligned by means of iron dust cores. The aerial is tuned by capacitor C18 which is switched out of circuit in the WIDEBAND position.

4. The incoming signal is fed via C28 and R25 to the control grid of the r.f. amplifier (V3) which employs a high-gain low-noise pentode so that sufficient gain is obtained over the whole frequency range. C40, C41, C49, R32 and C57 ensure that the cathode is adequately decoupled over the wide frequency range.

5. The output from the r.f. amplifier is d.c. coupled to a 30 Mc/s low-pass filter which has a substantially flat response over the frequency range. L27, C47 and R28 constitute the first "L half-section" of the filter. The signal is then fed at low impedance (680 ohms) via the coupling capacitor C74 and grid stopper R45 to the control grid of the first mixer stage (V7). The input capacitance of V7 forms the capacitance to chassis between L15 and L17 required to complete the filter network.

Note. . .
This capacitance is not critical, therefore no adjustment will be necessary should V7 be changed.

6. The first v.f.o. stage consists of a cathode-coupled Hartley oscillator (V5) which may be continuously tuned over the frequency range of 40·5 to 69·5 Mc/s. The frequency determining components are an inductor L36 and a variable capacitor C76. Alignment is accomplished by adjusting the core of L36 and the trimming capacitor C77. The variable capacitor C76 is mechanically coupled to the Mc/s dial which is calibrated from 0 to 29 Mc/s. The anode load consists of L20, a compensating inductance, which is wound on a 470 ohm resistor R.18. The oscillator is coupled via C85 to the signal grid of the first mixer stage V7 and also via C42 (*fig.* 3) to the control grid of the harmonic mixer (V4).

Note. . .
The Mc/s dial calibration may be affected if V5 is changed. The necessary correction may be made by adjusting C77 with the Mc/s dial set to 29 Mc/s.

7. The outputs from the 30 Mc/s low-pass filter and the first v.f.o. are mixed in the first mixer stage (V7) which produces a signal frequency of 40 Mc/s at the anode. The output of V7 is then fed to a 40 Mc/s band-pass filter which forms the anode load of V7. The cathode is decoupled by R47 and C94.

Crystal oscillator, harmonic generator, 37·5 Mc/s amplifiers V6, V8 and V10 and second mixer

8. The frequency of the crystal oscillator V1 which is a cathode-coupled Colpitts circuit, may be set precisely to 1 Mc/s by adjusting the trimming capacitor C2 (*fig.* 3). The anode coil L2 is adjusted to resonate at 1 Mc/s, by means of a dust iron core, which is electron coupled to the oscillator. The fixed capacitors C9, C10 and C11 complete the tuned circuit. The ouput from V1 is capacity-coupled to the harmonic generator (V2), coaxial plug PL3A, for feeding a 1 Mc/s input into the l.f. converter, and also to the first grid of the mixer valve V13 via PL2/SKT2.

9. Megacycle harmonics are produced in the harmonic generator stage by operating the valve in

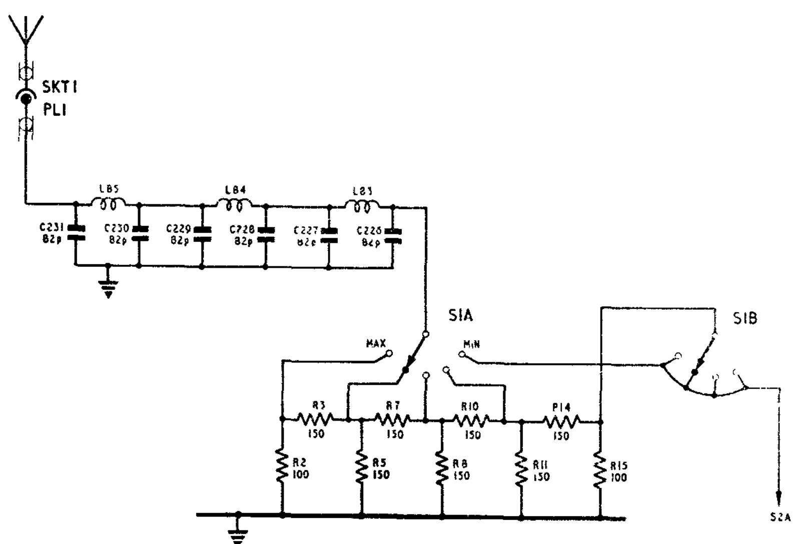


Fig. 1 Main chassis assembly 5820-99-943-3456 (Ae. attenuator): circuit

a non-linear state. A suitable bias potential is produced due to the time-constant of C8 and R13. The megacycle harmonics are fed via a 32 Mc/s low-pass filter circuit to prevent harmonics other than those required from passing to the harmonic mixer (V4). Limited control over the cut-off frequency is provided by C7 which is adjusted to equalize the output from the filter at the harmonic frequencies corresponding to 28 and 29 Mc/s on the MEGACYCLES dial.

10. The outputs from the 32 Mc/s low-pass filter and first v.f.o. are mixed in the harmonic mixer (V4) by applying the filtered megacycle harmonics to the suppressor grid and the output from the first v.f.o. to the control grid. The 37·5 Mc/s output is produced by the tuned anode load, consisting of a fixed capacitor C50 and an inductor L28 and is R-C coupled to the control grid of the 37·5 Mc/s amplifier V6.

11. V6 and V8 constitute a two stage R-C coupled 37·5 Mc/s amplifier. The anode load of V6 is a tuned circuit consisting of a fixed capacitor C67 and an inductor L33 which is adjusted to resonate at 37·5 Mc/s by means of a dust iron core. The anode load of V8 is provided by L24 in the 37·5 Mc/s band-pass filter. The amplified output of the second stage (V8) is fed via the 37·5 Mc/s band-pass filter to the control grid of V10. The 37·5 Mc/s band-pass filter consists of eight under-coupled tuned circuits arranged in cascade. These filter sections may be tuned by C24, C35, C45, C55, C63, C72, C81 and C90 respectively. This filter, which has a passband of 300 c/s, allows for possible drift in the first v.f.o. The narrow pass-band and high rejection to frequencies outside the passband prevent spurious signals from reaching the second mixer stage (V9).

12. Further amplification of the 37·5 Mc/s signal is provided by V10. To prevent interaction between the 40 Mc/s band-pass filter and the 37·5 Mc/s tuned circuit (L50 and C113) in the anode of V10, a balancing circuit is included which is shown in a simplified form in fig. 4. The 40 Mc/s signal is introduced into the 37·5 Mc/s tuned circuit at a point of zero r.f. potential since L50 is centre tapped and C108 is adjusted to be equal to the total of the capacitances of V10 anode to chassis, C107 and the input capacitance of V9.

Note. . .
The balancing circuit will not be affected if V9 or V10 is changed.

13. The output of V10 is *R-C* coupled to the control grid of the second mixer V9 which produces the second intermediate frequency of 2-3 Mc/s by mixing the 40 Mc/s i.f. and the 37·5 Mc/s signal. The anode choke L51 and the tuned circuit formed by C116 and L52 remove the 37·5 Mc/s frequency and other h.f. components, so that only the second i.f. is fed to the 2-3 Mc/s band-pass filter preceding

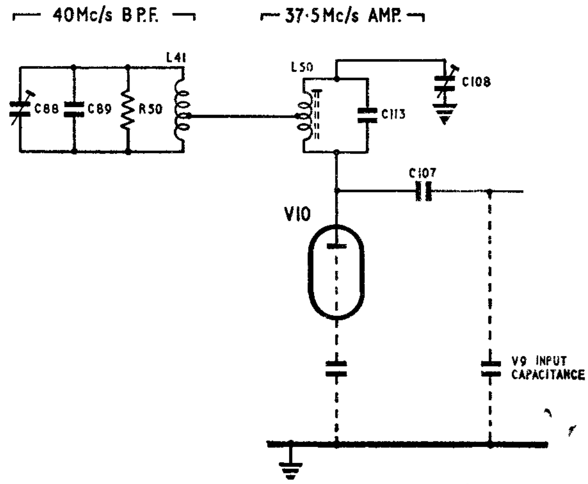


Fig. 4 Simplified balancing circuit

the third mixer stage. The series tuned circuit is adjusted to resonate at 37·5 Mc/s by means of the dust iron core in L52.

Second v.f.o. and third mixer

14. Input to the 2-3 Mc/s tuned band-pass filter is via SKT4 (*fig.* 5) the filter, which is ganged to the second v.f.o., consists of three tuned band-pass filter section as follows:–

(1) An inductor L59 and a variable capacitor C129. A fixed capacitor C127 and a trimmer C128 complete this section. L59 is tapped to provide an input connection via the coaxial plug PL5 so that the 2-3 Mc/s low impedance output of the l.f. converter may be connected.

(2) A variable inductor L58 is connected in series with a coupling coil L60 and a variable capacitor C126. A fixed capacitor C124 and a trimmer C125 are connected in parallel with C126.

(3) An inductor L57 and a variable capacitor C123 in parallel with a fixed capacitor C121 and a trimmer C122 form the final section.

15. The correct bandwidth is obtained by adjusting the dust iron cores and the trimming capacitors C128, C125 and C122 respectively.

16. The output from the 2-3 Mc/s bandpass filter, together with a signal at 100 kc/s intervals from the tuned anode load of V13 (via SKT7/6), is fed to the signal grid of the third mixer stage V11 (fig. 5.)

17. The second v.f.o. stage is an electron-coupled Hartley circuit. The oscillator frequency is determined by a variable inductance, a fixed capacitor C137, a trimming capacitor C136 and a variable capacitor C139 which is ganged to the tuned bandpass filter. The KILOCYCLES scale which is calibrated between 0 and 1000 kc/s is coupled to this ganged capacitor. Output from this stage (2·1 to 3·1 Mc/s) is *R-C* coupled to the oscillator grid of the third mixer V11.

18. An additional output is fed to a coaxial plug PL11 via C143A for feeding auxiliary units at a frequency of 2·1 to 3·1 Mc/s.

Note. . .
The output at P11 is not required in the present application.

19. The 100 kc/s output obtained from the third mixer stage is fed via PL6 to the crystal filter unit.

100 kc/s i.f. amplifier

20. Input to the crystal filter is via socket SKT6. The crystal filter and the 100 kc/s L-C filter provide six alternative switched i.f. bandwidths as follows:–

1.	100 c/s	crystal	4.	1·2 kc/s	L-C
2.	300 c/s		5.	3·0 kc/s	
3.	750 c/s		6.	8·0 kc/s	

21. In the crystal positions (1, 2 and 3) the third mixer anode is connected, via S3A, to L48 in the crystal filter (*fig*. 6). L47 and L49 provide a balanced output which is tuned by capacitors C109 and C110. In the 100 c/s position, the balanced output is connected via crystals XL2 and XL5 to the first tuned section of the 100 kc/s L-C filter. The differential trimmer C118 is the phasing control for this bandwidth. Crystals XL3, XL6, C119 and XL4, XL7 and C120 form similar circuits for the 300 and 750 c/s respectively. Damping resistors R63, R64 and R65 are connected across the tuned circuits to obtain the required bandwidth. In the three L-C bandwidth positions the crystal filter is by-passed.

22. In the L-C bandwidth positions (4, 5 and 6) the third mixer anode is connected, via S3A/C and S4A, to L61 in the 100 kc/s *L-C* filter.

23. The 100 kc/s L-C filter consists of four tuned circuits arranged in cascade. In the L-C bandwidth positions, the signal is fed to the tuned circuit formed by L61 and the combination of the capacitors C145, C146, C146A and C147. The second section consists of L62 and L63 in series with C152, C152A and C153. The third section is identical to the preceding section and consists of L64 and L67 in series with C157, C157A and C158. The final section, consisting of L68 and L71 in series with C161, C161A and C162, is damped by the series resistors R86, R87 or R88 according to the bandwidth.

24. In the *L-C* positions the output is taken from a capacitive divider formed by C161 and C161A with C170 to equalize the gains in the *L-C* and crystal bandwidth positions.

25. The L-C bandwidths are obtained by varying the degree of coupling between each section of the filter in addition to the damping resistors in the final stage. The capacitor C175 is included to compensate for the effective reduction of the input capacitance of V14, appearing across the tuned circuit, when switching from crystal to *L-C* position.

26. To maintain the input capacitance of the *L-C* filter, in the crystal positions, a trimming 48 is switched into circuit. This trimmer is adjusted to be equal to the output capacitance of V11 and the screened cable. In the crystal bandwidth positions, the *L-C* filter is operating in its narrow bandwidth position, i.e. 1·2 kc/s.

Note. . .
The 470-kilohm damping resistors R77 and R80 are disconnected except during filter alignment as indicated by the dotted lines (fig. 6).

27. The output from the *L-C* filter is fed via the coupling capacitor C164 to the control grid of the first i.f. amplifier valve V14. This grid is returned to the a.v.c. line which is filtered at this point by R102 and C173. The screen potential is derived from a potential divider formed by R93, R94, and R97. Output from this stage is coupled to the 100 kc/s i.f. output stage and the second i.f. amplifier by a double tuned transformer having an over-coupled characteristic.

28. The control grid of V17 is fed with the a.v.c. potential as well as the signal frequency of 100 kc/s. The screen resistor R108 and the cathode bias resistor R115 are of the same values as used in the second i.f. amplifier, hence the a.v.c. characteristic of this stage is similar to that of the main receiver. Output from V17 is fed via capacitor C189 and auto-transformer L76 to the 100 kc/s i.f. output plugs PL8 and PL9 for external applications.

Note. . .
PL8 and PL9 are connected in parallel, therefore only one 100 kc/s output is available at 75 ohms and to avoid a mis-match the other connection should be made at high impedance.

29. The control grid of the second i.f. amplifier V16 is also returned to the a.v.c. line via L73 and L74. H.T. is supplied to the screen via dropping resistor R113 and is de-coupled by C181. The anode load is a tuned circuit consisting of L77, C192 and C191 and is heavily damped by R112. The secondary winding is tuned by C195A, C195B with R120A as a damping resistor. The output of this stage is fed via the coupling capacitor C193 to the anode of the a.v.c. diode V18A.

30. The diode load is formed by R116. A positive potential derived from R120, R121 and R122 supplies the required a.v.c. delay voltage to the cathode of this diode. When the A.V.C. switch is in the SHORT position and the system switch set to a position in which the a.v.c. is operative, i.e. A.V.C., CAL or CHECK B.F.O., the anode of the diode is connected to the a.v.c. line via L81 and R127. The choke L81 is tuned by C203 to a frequency slightly below 100 kc/s so that it presents a small capacitance at 100 kc/s, thus R127 is prevented from shunting the diode load. When the A.V.C. switch is in the LONG position, the a.v.c. de-coupling capacitors C182 and C173 are charged through R127, the time-constant diode V18B and R119. When the signal level falls, the capacitors C182 and C173 are discharged through R119, R118, R127, L81 and the diode load resistor R116. The a.v.c. potential is brought out via R123 to the terminal tag strip at the rear of the receiver for external use if required. With the system switch set to the MAN postion, the a.v.c. line is connected to the I.F. GAIN control RV1, thus the gain of the 100 kc/s amplifiers may be varied by adjusting the negative potential applied to the a.v.c. line.

31. The low potential end of L79 is connected via the r.f. filter network C209, R128, C210, R129 and C211 to the detector diode load R130. With the meter switched to R.F. LEVEL, the meter indicates the detector diode (V21A) current. The resistor R131 is included to complete the diode detector circuit when the meter is switched out of circuit.

32. The noise limiter diode (V21B) is connected in a series circuit to operate at approximately 30% modulation. Its operation is explained as follows with reference to fig. 7.

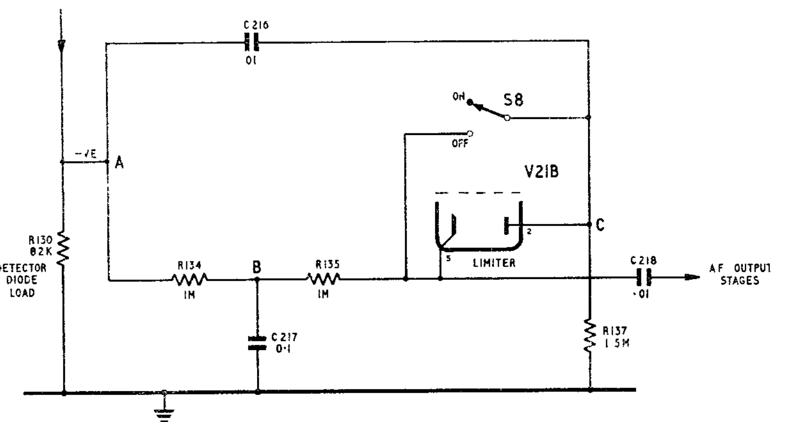


Fig. 7 Noise limiter diode circuit

33. The d.c. path from point A is via R134, R135 the diode and R137. The a.f. signal path from the detector diode load R130 is via C216, the diode and C218 when S8 is open. In the presence of a signal, a negative potential varying with the depth of modulation will be developed at point A, thus causing the diode to conduct.

34. The negative point at B, will be lower than that of A and will be maintained at a constant level due to the long time constant of R134 and C217. R135 allows the cathode potential to vary in sympathy with the modulation provided the modulation depth does not exceed 30%.

35. The potential appearing at the cathode of the noise limiter diode therefore consists of a steady negative potential with the modulation superimposed.

36. When noise impulses corresponding to high modulation peaks appear at point A and via C216 at point C, the voltage across the diode changes sign thereby causing the diode to stop conducting and open circuit the a.f. signal path. With S8 in the OFF position the limiter is inoperative.

Crystal calibrator

37. A 1 Mc/s signal from the output of the crystal oscillator V1 is fed to the control grid of the calibrator mixer valve V13 via SKT2 (*fig.* 8). The anode load consists of a 100 kc/s tuned circuit (L70, C167), the output of this anode is fed via C168 to the control grid of V15.

38. V15 is heavily biased by R105 so that it functions as a frequency multiplier. The anode load is tuned to 900 kc/s and is fed back to grid 3 of V13 thereby producing a difference frequency of 100 kc/s relative to the 1 Mc/s input.

39. This crystal-controlled circuit is thus self-maintaining. The 100 kc/s output is produced by the coil L69 and fed via PL7 pin 6 to the signal grid of the third mixer stage V11.

Audio output

40. The audio frequencies are applied to the control grid of V22 via RV2 the A.F. GAIN control (*fig.* 9). The output of V22 is coupled to the audio output transformer T2 which provides four separate outputs as follows:–50mW into 3 ohms and three windings supplying 3mW into 600 ohms. The telephone jack sockets JK1 and JK2 and the internal loudspeaker, which may be switched out of circuit by operating S11, are connected across the 3 ohm winding.

A.F. line output

41. The audio frequencies are also applied to the grid of V23 via RV3 the A.F. LEVEL preset control. This control sets the level of output from the transformer T3. The control must not, however, be turned towards its maximum position unless the 10mW 600-ohm winding is suitably terminated with a load.

42. A bridge rectifier MR1 is connected across the output via R142 and R143. The meter may be switched across the rectifier circuit so that the operator can monitor the a.f. output.

Note. . .

The red line on the meter scale corresponds to 10mW output into 600 ohms.

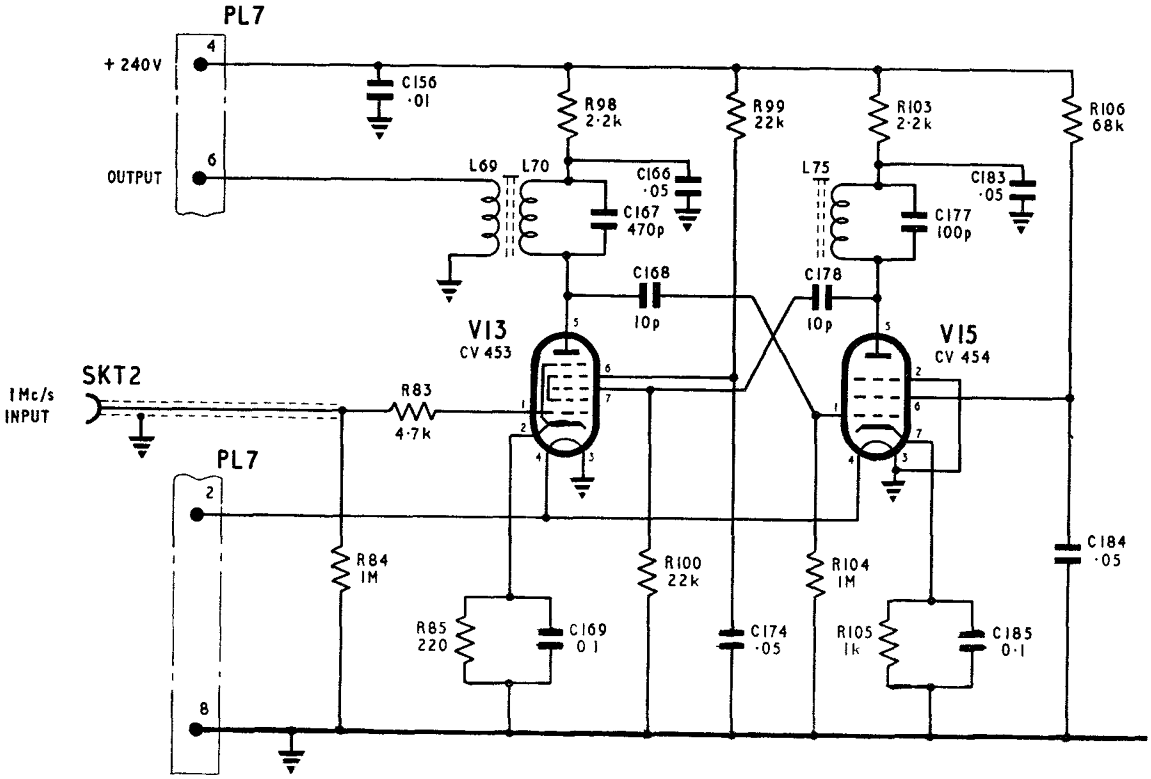


Fig. 8 Calibrator, frequency 5820-99-943-6625 (crystal calibrator): circuit

Power supplies

43. The conventional full-wave rectifier circuit, employing choke-capacity smoothing L80, C198 and C206, provides a 240 volts h.t. supply. Resistor R124 is connected between the negative line and earth to provide a —25V d.c. supply for gain control purposes. Resistor R136 is incorporated to limit the peak current of V20 to a safe value.

44. All valve heaters and the scale illuminating lamp are supplied from the 6·3V 7A winding.

45. The primary of the mains transformer T1 is tapped to provide for inputs at 0, —5, —10, 110, 125, 210, 230 and 250 volts and is connected to the mains supply via the fuse FS1 (2A). MAINS switch S10 and 3-pin plug PL10.

46. To remove mains-borne interference the capacitors C224 and C225 have been incorporated from each side of the mains input to earth.

Note. . .

From serial number 2666 *onwards a* 350*mA fuse is inserted between the secondary centre tap of T*1 *and R*136.

System switch

47. The following conditions exist for each setting of the system switch (S5) (*fig.* 10). The link on the h.t. terminals should be in position (LK1—*fig.* 9 *and* 10).

(1) STANDBY S5A disconnects the h.t. from all stages and connects R119A across the h.t. as a compensating load.

(2) MANUAL (a) The h.t. is fed via S5A, S5B and S5C to all stages except the calibrator unit.

(b) S5F connects h.t. to the b.f.o. when S7 is switched on.

(c) The a.v.c. line is connected from the a.v.c. diode by S5D and connected to the I.F. GAIN control RV1 by S5E.

(3) A.V.C. (a) As for MANUAL (a) and (b).

(b) S5E renders the I.F. GAIN control inoperative.

(c) S5D connects the a.v.c. line to the a.v.c. diode.

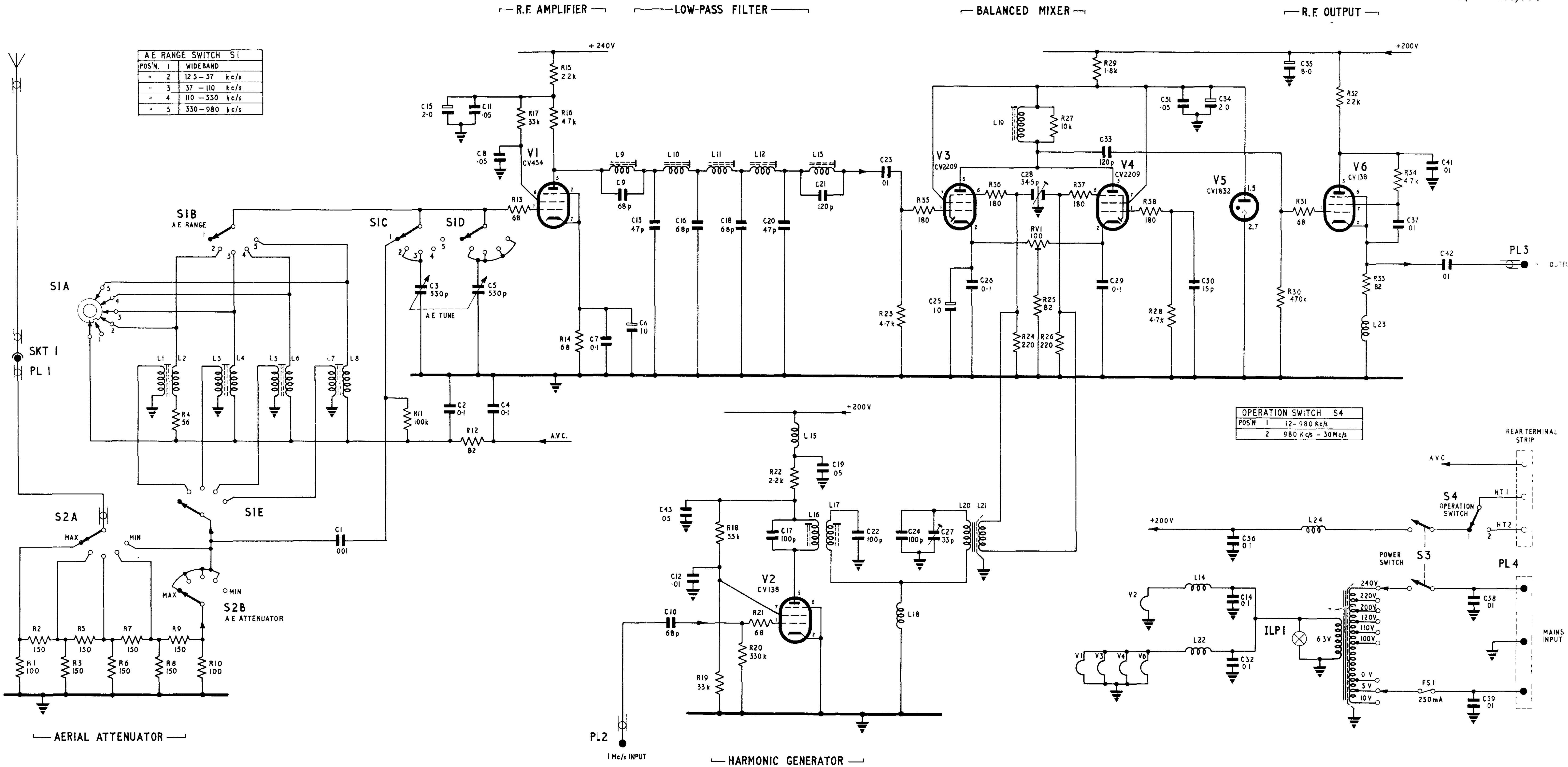
◀(4) CAL. (a) H.T. is applied via S5A, S5B and S5F to all stages except: -

The amplifier (V3)
The first v.f.o. (V5)
The first mixer (V7)
The second mixer (V9)
The final 37·5 Mc/s amplifier (V10)
The b.f.o.

(*b*) As for A.V.C. (b) and (c).

(5) CHECK BFO (a) As for CAL (a) except that h.t. is also applied to the b.f.o.

(b) As for A.V.C. (b) and (c).▶



AE RANGE SWITCH S1	
POS'N. 1	WIDEBAND
" 2	12.5 – 37 kc/s
" 3	37 – 110 kc/s
" 4	110 – 330 kc/s
" 5	330 – 980 kc/s

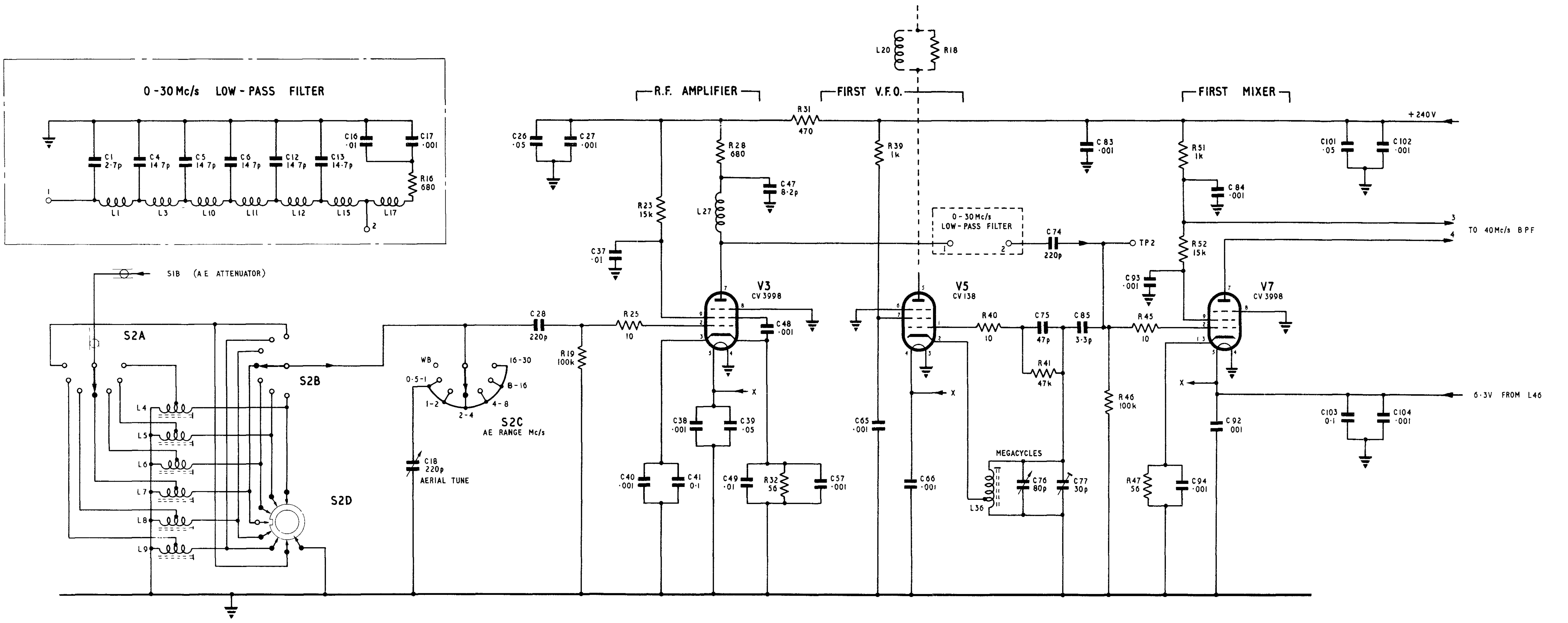
OPERATION SWITCH S4	
POS'N 1	12 – 980 Kc/s
2	980 Kc/s – 30Mc/s

L.F. converter 5820-99-943-3464: circuit

Fig. 1

AIR DIAGRAM
6722G / MIN.

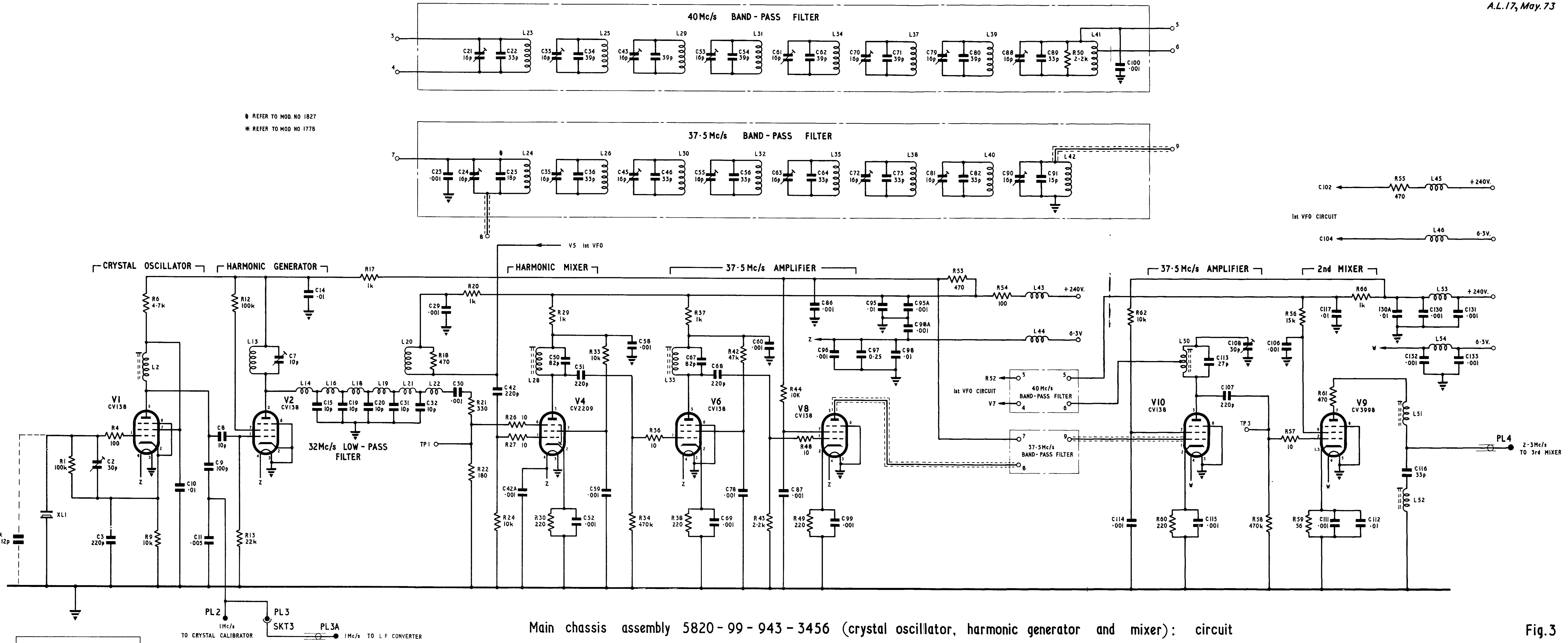
ISSUE 1 — PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY AIR MINISTRY



Oscillator r.f. 5820-99-943-3458 (first v.f.o.): circuit

Fig. 2

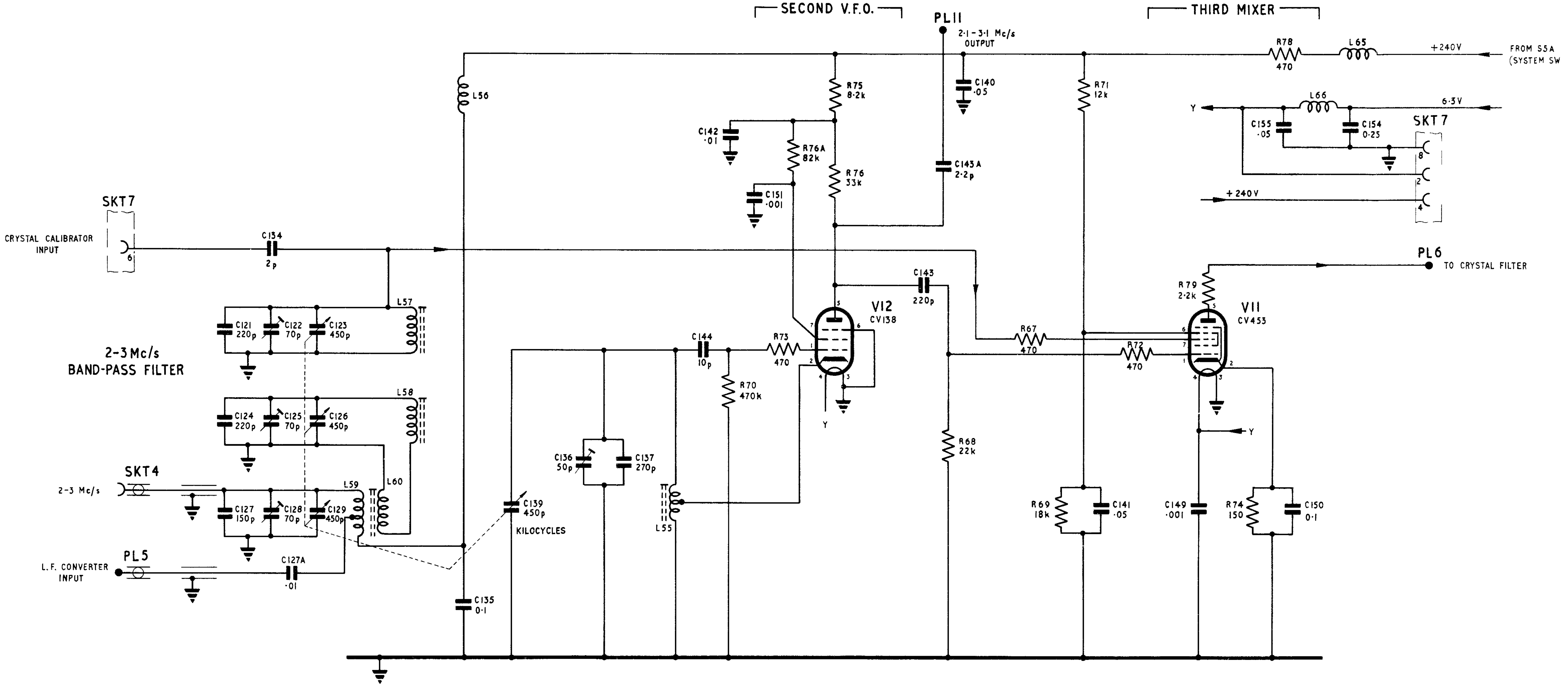
AIR DIAGRAM
6722 B / MIN
ISSUE 1
PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY AIR MINISTRY



Main chassis assembly 5820-99-943-3456 (crystal oscillator, harmonic generator and mixer): circuit

Fig.3

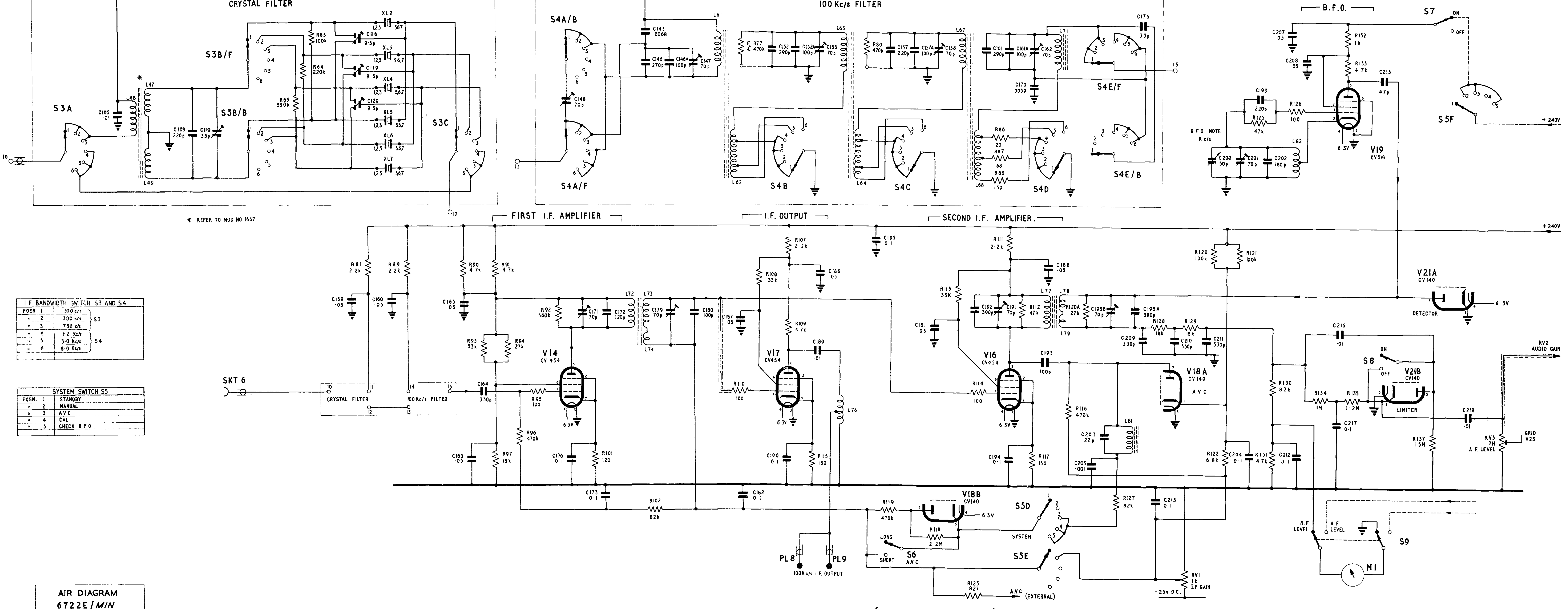
AIR DIAGRAM 6722A/M/N	
ISSUE 2	PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY AIR MINISTRY



Oscillator r.f. 5820-99-943-3459 (second v.f.o.): circuit

Fig.5

AIR DIAGRAM 6722C/MIN	
ISSUE 1	PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY AIR MINISTRY



I F BANDWIDTH SWITCH S3 AND S4		
POSN 1	100 c/s	S3
" 2	300 c/s	S3
" 3	750 c/s	S3
" 4	1·2 Kc/s	S4
" 5	3·0 Kc/s	S4
" 6	8·0 Kc/s	S4

SYSTEM SWITCH S5	
POSN. 1	STANDBY
" 2	MANUAL
" 3	A V C
" 4	CAL
" 5	CHECK B F O

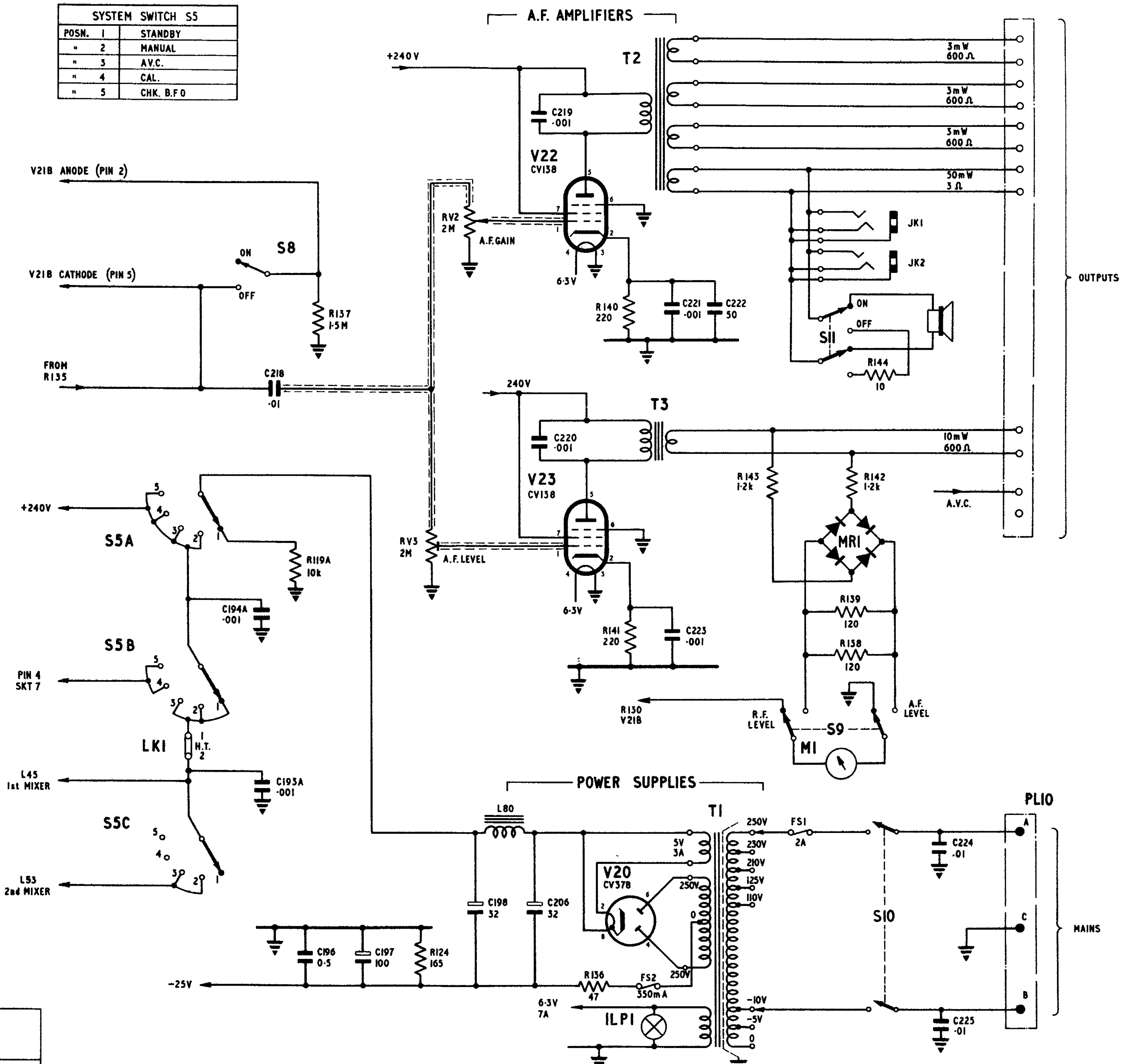
AIR DIAGRAM
6722E/M/N

ISSUE 4 — PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY AIR MINISTRY

Amplifier i.f. 5820-99-943-3455 (100kc/s i.f. amplifier): circuit

Fig.6

SYSTEM SWITCH S5		
POSN.	1	STANDBY
"	2	MANUAL
"	3	A.V.C.
"	4	CAL.
"	5	CHK. B.F.O



AIR DIAGRAM 6722D/*MIN*	
ISSUE 2	PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY AIR MINISTRY

Main chassis assembly 5820-99-943-3456 (audio output and power supplies): circuit. Fig. 9

Receiver radio 5820-99-943-2775 : circuit

Fig.10

Appendix 1

RECEIVER RADIO, 5820–99–999–9292

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Introduction

1. With the exception of para. 3, 4, 18, 20 to 23 and 28 to 30 of the first part of this chapter, the circuit description para. 1 to 47 is similar for receiver radio 9292.

R.F. amplifier, first v.f.o. and first mixer

2. The AE. RANGE MC/S switch S2 selects wideband operation or any one of six double-tuned aerial coils L4 to L9 for tuned operation (*fig.* 1). These aerial coils may be aligned by means of iron dust cores. The aerial is tuned by capacitor C18A/B which is switched out of circuit in the WIDEBAND position.

3. The incoming signal is fed via C28 and grid stopper R25 to the grid of V3B; the r.f. stage (V3) employs a variable-mu, low-noise double-triode, the valve is connected in cascode so as to utilize the low-noise high-gain properties of the valve. A delayed a.v.c. voltage, derived from a shunt diode network, is applied to the grid of V3B when the signal level is approximately 10μV. The capacitors C40 and C41 ensure that the cathode is adequately decoupled over the wide frequency range. Ferrite beads have been fitted to the heater lead, connected to pin 4, the anode of V3A and the cathode of V3B adjacent to C41, to prevent parasitic oscillations occurring.

4. An additional output from the cathode of the second v.f.o. is fed directly to a coaxial plug PL11 for feeding auxiliary units at a frequency of 2·1–3·1 Mc/s. Reference should be made to fig. 3 of this Appendix and *not* to fig. 5 of the first part of this chapter.

100 kc/s i.f. amplified

5. Input to the crystal filter is via socket SKT6. The crystal filter and the 100 kc/s L-C filter provide six alternative switched i.f. bandwidths as follows:—

1. 100 c/s } crystal
2. 300 c/s } crystal
3. 1·2 kc/s } L-C
4. 3·0 kc/s } L-C
5. 6·5 kc/s } L-C
6. 13·0 kc/s } L-C

6. In the crystal positions (1 or 2) the third mixer anode is connected via S3A to L48 in the crystal filter (*fig.* 2). L47 and L49 provide a balanced output which is tuned by capacitors C109 and C110. In the 100 c/s position, the balanced output is connected via crystals XL2 and XL5 to the first tuned section of the 100 kc/s L-C filter. The differential trimmer C118 is the phasing control for this bandwidth. Crystals XL3, XL6 and capacitor C119 form a similar circuit for the 300 c/s position. Damping resistors R64 and R65 are connected across the tuned circuits to obtain the required bandwidth. In the four L-C bandwidth positions the crystal filter is by-passed.

7. In the L-C bandwidth positions (3, 4, 5 or 6) the third mixer anode is connected via S3A/C and S4A, to L61 in the 100 kc/s filter.

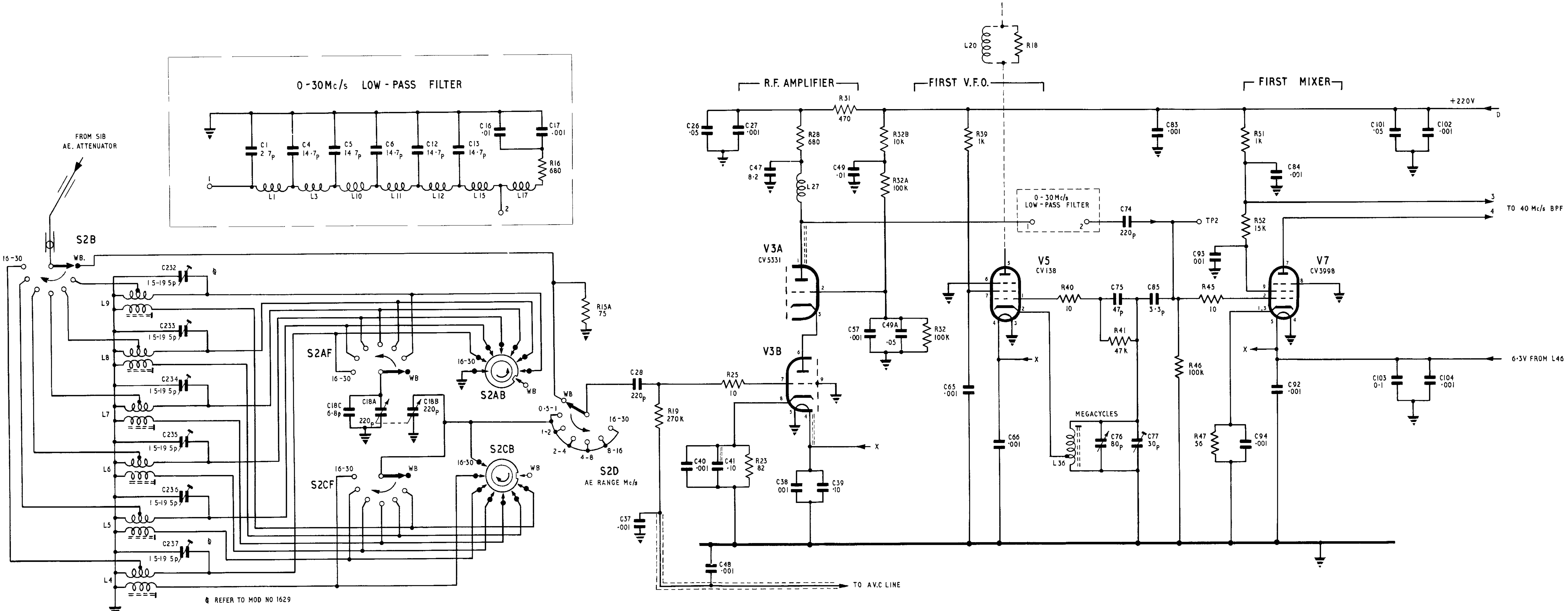
8. The 100 kc/s L-C filter consists of four tuned circuits arranged in cascade. In the L-C bandwidth positions, the signal is fed to the tuned circuit formed by L61 and the combination of the capacitors C145, C146, C146A and C147. The second section consists of L62 and L63 in series with C152, C152A and C153. The third section is identical to the preceding section and consists of L64 and L67 in series with C157, C157A and C158. The final section consists of L68 and L71 in series with C161, C161A and C162 and is damped by the series resistors R86, R87, R87A or R88 according to the bandwidth selected.

9. The control grid of V17 is fed with the signal frequency of 100 kc/s from the secondary winding of the first 100 kc/s i.f. transformer. The screen resistor R108 and the cathode bias resistor R115 are of the same values as used in the second i.f. amplifier, hence the a.v.c. characteristic of this stage is identical to that of the main receiver. Output from V17 is fed via capacitor C189 and auto-transformer L76 to the 100 kc/s i.f. output plugs PL8 and PL9 for external applications.

10. The control grid of V16 is also fed with the signal frequency of 100 kc/s from the first i.f. transformer. H.T. is supplied to the screen via dropping resistor R113 and decoupled by C181. The anode load is a tuned circuit consisting of L77, C192 and C191 and is heavily damped by R112. The secondary winding is tuned by C195A, C195B with R120A as a damping resistor. The output of this stage is fed via the coupling capacitor C193 to the anode of the a.v.c. diode V18A.

11. The diode load is formed by R116. A positive potential derived from R120, R121 and R122, supplies the required a.v.c. delay voltage to the cathode of this diode. When the A.V.C. switch is in the SHORT position and the System switch set a position in which the a.v.c. is operative, i.e. A.V.C., FAL or CHECK B.F.O., the anode of the a.v.c. diode is connected to the a.v.c. line via L81 and R127. The choke L81 is tuned by C203 to a frequency slightly below 100 kc/s so that it presents a small capacitance at 100 kc/s, thus R127 is prevented from shunting the diode load. When the A.V.C. switch is in the LONG position the a.v.c. de-coupling capacitors C182 and C173 are charged through R127 and the time constant diode. When the signal level falls, the capacitors C182 and C173 discharge through R118, R127, L81 and the diode load resistor R116. The a.v.c. potential is brought out via R123 to the terminal tag strip at the rear of the receiver, for external use if required. With the System switch set to the MAN position, the a.v.c. line is connected to the I.F. GAIN control RV1, thus the gain of the 100 kc/s amplifiers may be varied by adjusting the negative potential applied to the a.v.c. line.

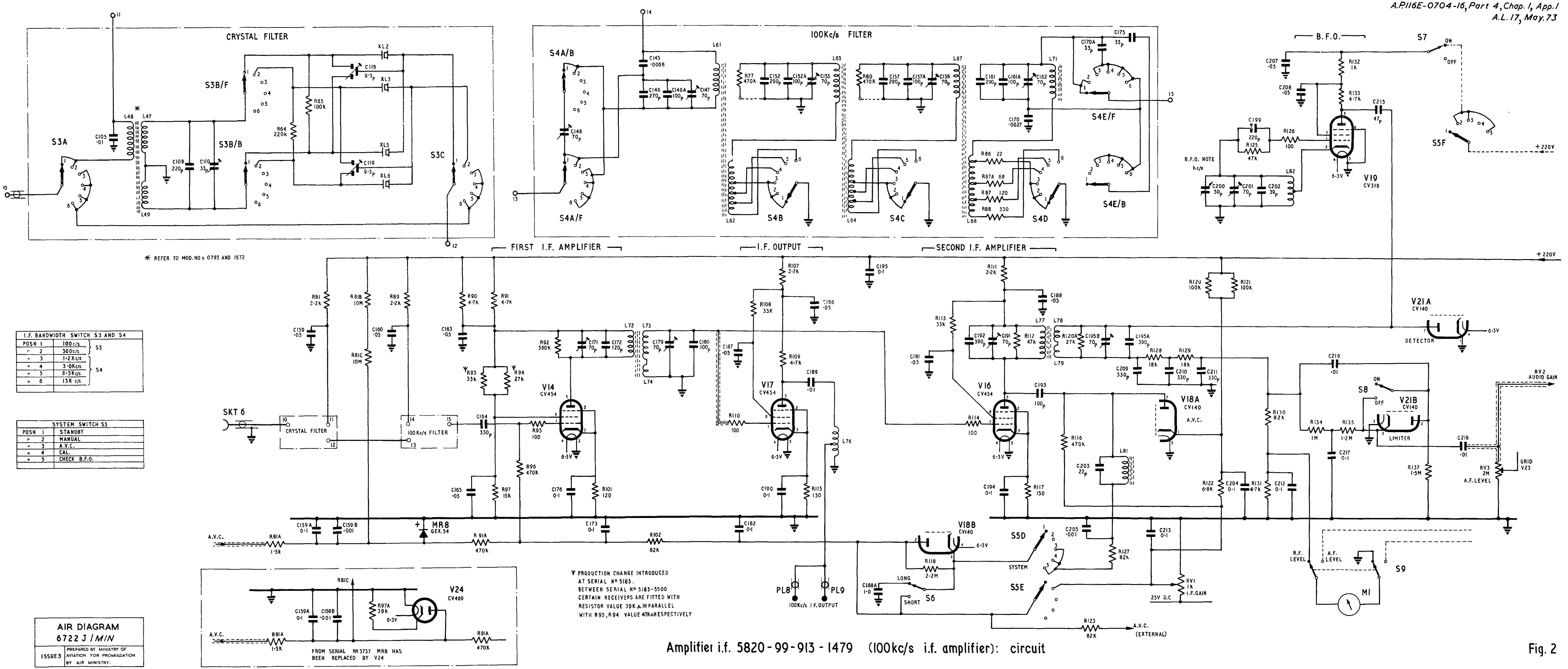
375/6 Wt. No. 41394 D. No. 5722 1,000



AIR DIAGRAM 6722H/MIN	
ISSUE 2	PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY AIR MINISTRY

Oscillator r.f. 5820-99-913-1498 (first v.f.o.): circuit

Fig.1



I.F. BANDWIDTH SWITCH S3 AND S4		
POSN 1	100c/s	S3
" 2	300c/s	S3
" 3	1·2Kc/s	S4
" 4	3·0Kc/s	S4
" 5	6·5Kc/s	S4
" 6	13K c/s	S4

SYSTEM SWITCH S5	
POSN 1	STANDBY
" 2	MANUAL
" 3	A.V.C.
" 4	CAL.
" 5	CHECK B.F.O.

Ψ PRODUCTION CHANGE INTRODUCED AT SERIAL No 5183.
BETWEEN SERIAL No 5183-5500 CERTAIN RECEIVERS ARE FITTED WITH RESISTOR VALUE 39KΩ IN PARALLEL WITH R93, R94 VALUE 47KΩ RESPECTIVELY

AIR DIAGRAM
6722 J / M/N
ISSUE 3 PREPARED BY MINISTRY OF AVIATION FOR PROMULGATION BY AIR MINISTRY.

Amplifier i.f. 5820-99-913-1479 (100kc/s i.f. amplifier): circuit

Fig. 2

Receiver radio 5820-99-999-9292: circuit

RESTRICTED

Fig.3

Chapter 2

CIRCUIT DESCRIPTION OF L.F. CONVERTER

LIST OF CONTENTS

LIST OF ILLUSTRATIONS

Note. . .
Fig. 1 *is also available as a Miniature Air Diagram* 6722G/MIN.

Aerial attenuator

1. The signal input is connected at plug PL1 and is fed to the AE. ATTENUATOR switch S2. This switch provides five steps of attenuation covering an attenuation range of 0 to 40dB. Switch S1 selects wideband amplification or any one of four aerial coils L2, L4, L6 and L8 for tuned operation fig. 1.

2. The aerial coils are tuned by C5 for the ranges 100-330 kc/s and 330-980 kc/s. For the 12·5-37 kc/s and 37-110 kc/s ranges, C3 and C5 in parallel make up the tuning capacitor. The resistor R4 is included in the 12·5-37 kc/s tuned circuit (L2) to provide an adequate bandwidth.

R.F. amplifier

3. In the WIDEBAND position, the signal from the aerial attenuator is fed via C1 and grid stopper R13 to the control grid of the r.f. amplifier V1. This grid is returned to the a.v.c. line via S1C and R11. When tuned input is employed, one end of the selected tuned circuit is connected via S1B to the control grid and the other end is returned to the a.v.c. line. There are two stages of filtering in the a.v.c. line, they are C2, R12, and C4, R123; R123 is situated in the receiver (*Chap.* 1). The anode load resistor R16 matches the output impedance of the amplifier to the characteristic impedance of the filter. R17 allows the screen potential of V1 to rise when a.v.c. is applied. thereby controlling the effective a.v.c. action.

4. The amplifier is fed to a low-pass filter consisting of three constant-K sections preceded and terminated by m-derived end-sections. Cut-off takes place at 980 kc/s. The output from the filter is fed via C23 to the control grid of V3.

Harmonic generator and 2 Mc/s band-pass filter

5. The 1 Mc/s crystal-controlled output from the receiver is fed via C10 to the control grid of the harmonic generator V2. R20, decoupled by C10. provides bias for this valve which operates in a non-linear condition. The anode load consists of a tuned circuit L16, C17 which is also the first stage of a 2 Mc/s band-pass filter. The second tuned circuit of the filter is formed by L17, L18, and C22 and is coupled by L18 to the third tuned circuit L18, L20, C24 and C27. Inductive coupling is provided to the balanced output winding L21. This filter has a passband of 50 kc/s, ensuring that only the 2 Mc/s harmonic is fed to the mixer.

Balanced mixer

6. The CV2209 pentodes V3 and V4 form a balanced mixer in which the incoming signal is mixed with the output of the 2 Mc/s band-pass filter to produce an output lying between 2 and 3 Mc/s. The 2 Mc/s voltage is applied to grid 3 of valves V3 and V4 in anti-phase. The resistors R24 and R26 provide a correctly balanced load for the harmonic generator output.

7. The 2 Mc/s component produced in the mixer balances out in the common anode load of V3 and V4. This anode consists of L19 and R27. L19 is tuned by stray capacitance to 2·7 Mc/s and is heavily damped by R27 to provide wideband tuning covering the frequency range 2-3 Mc/s.

8. The preset potentiometer RV1 equalizes the gains of V3 and V4 and the differential capacitor C28 equalizes the phase shifts in these two valves to enable a precise balance to be achieved. The 2-3 Mc/s output from the mixer is fed via C33 and the grid stopper R31 to the control grid of the cathode follower.

Cathode follower

9. The cathode follower stage V6 enables the signal to be fed to the low-impedance tapping in the 2-3 Mc/s band-pass filter in the receiver via C42. and the r.f. output plug PL3. The cathode load is formed by L23 and the input impedance of the band-pass filter. Resistor R33 is included to bias the valve to the correct operating conditions.

Power supplies

10. The h.t. supply is obtained from the receiver by setting the OPERATION switch to 12·5 -980 kc/s. When the switch is in this position, h.t is disconnected from the first v.f.o. unit and second mixer in the receiver and is applied to the l.f. converter. The h.t. supply for the valves V3 and V4 of the balanced mixer is stabilized by the voltage regulator V5 (CV.1832).

11. The heater supply of 6·3V is obtained from the secondary of the mains transformer T1 contained within the l.f. converter.

12. The mains input switch is interlocked with the h.t. circuit, to prevent h.t. being fed to the l.f. converter when heater voltage is not applied to the valves.

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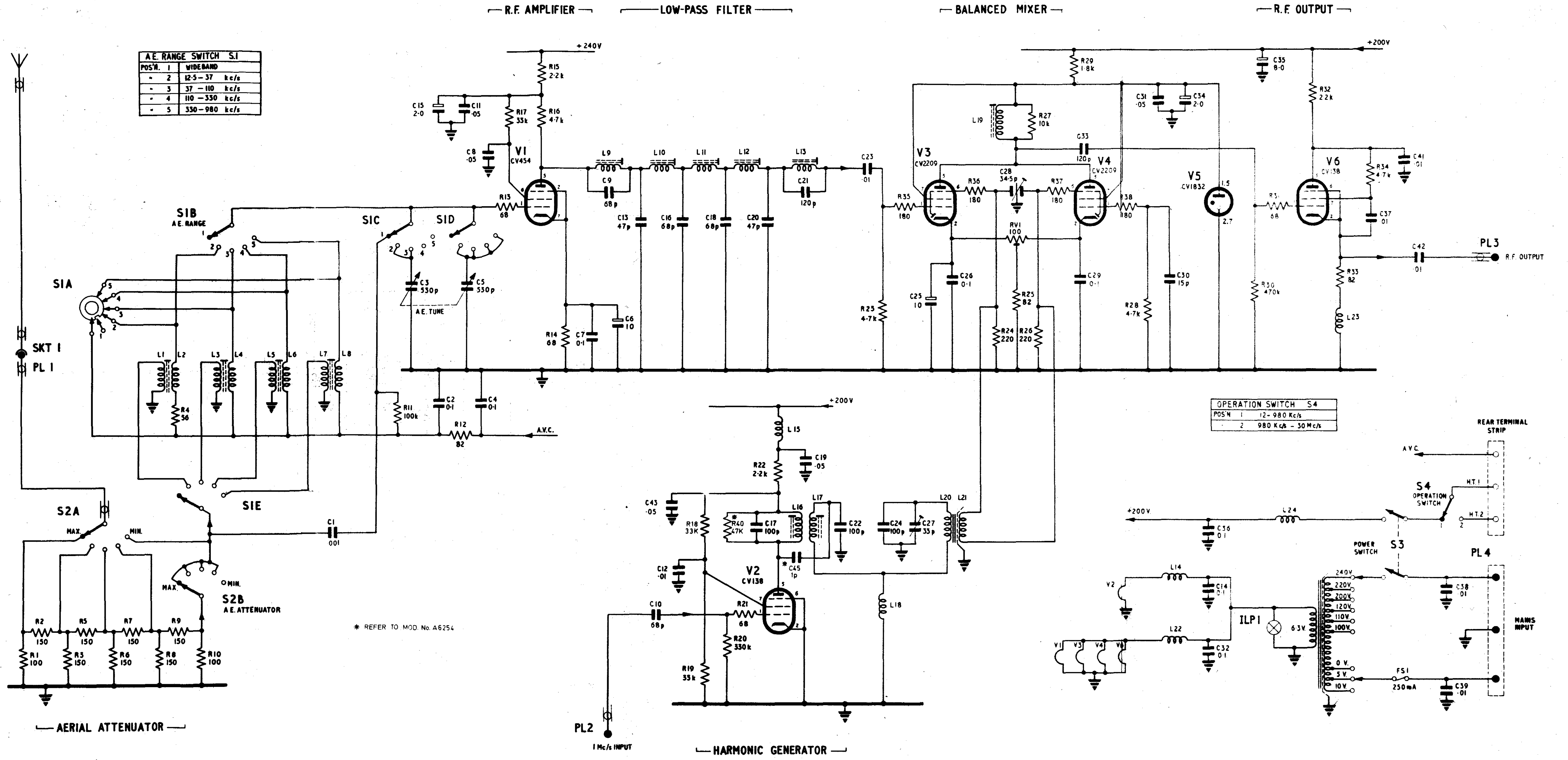

AE. RANGE SWITCH S.1	
POS'N. 1	WIDEBAND
" 2	12.5 – 37 kc/s
" 3	37 – 110 kc/s
" 4	110 – 330 kc/s
" 5	330 – 980 kc/s

OPERATION SWITCH S4	
POS'N 1	12 – 980 Kc/s
" 2	980 Kc/s – 30 Mc/s

L.F. converter 5820-99-943-3464: circuit

Fig. 1