Signal Generator
SG62B
Instruction Manual

ADVANCE ELECTRONICS LIMITED
INSTRUMENT DIVISION
ROEBUCK ROAD, HAINAULT, ILFORD, ESSEX, ENGLAND
TELEPHONE: 01-500 1000 TELEGRAMS: ATTENUATE ILFORD

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Introduction Section 1

The Signal Generator SG62B provides a sine wave output over the range of frequencies between 150k Hz and 220MHz which includes most radio and television bands. A variable frequency Colpitts oscillator provides the basic radio frequency output in six switched bands which cover the complete range of the instrument. The frequency calibration accuracy of this oscillator is within $\pm 1\%$ of scale indication. Facilities are provided for amplitude modulation of the radio frequency signal to a depth of 30% from a fixed frequency audio signal (400Hz) generated by a Hartley type oscillator.

To enable the output level to be set an attenuator is included in the output circuit.

The instrument requires a single phase a.c. power supply of 105V to 125V, 140V to 160V or 210V to 250V at 45Hz to 60Hz.

Specification

Section 2

Frequency Ranges

A 150kHz to 500kH
B 500kHz to 1.8MH
C 1.8MHz to 6MH
D 6MHz to 20MH
E 20MHz to 70MH
F 70MHz to 220MH

Frequency Accuracy

Within 1% of scale indication.

Output Level

Continuously variable up to 100mV by means of the fine (OUTPUT VOLTAGE) and course (OUTPUT VOLTAGE/dB) attenuators. Level is correct to control settings only at 120V and 240V input supply, and varies approximately proportionally with supply fluctuations.
Accuracy of maximum output $\pm$3dB (Ranges A to E),
Accuracy of step attenuator $\pm$(3dB+3μV)

Output Impedance

75 ohms.
Via TP2B pad: 37.5 ohms.

Modulation

The r.f. signal is available as a continuous sine wave, or as an amplitude modulated sine wave with a modulation depth of 30% $\pm$3dB, at 400Hz$\pm$10%.

Audio Frequency

An audio frequency sine wave of 400Hz at 10V (nominal) is available at high impedance when switched to "MOD" operation.

Accessories Supplied

1 75 ohms. Termination Pad, type TP2B.
1 Connector Cable R.F., type PL28.
1 Instruction Manual Part No. 2170J

Power Supply

Single phase 45Hz to 60Hz.
105V to 125V
140V to 160V
210V to 250V

Consumption

Approximately 25W.

Dimensions (excluding handles)

Length 5¾in, (15 cm) Width 11in (23 cm), Depth 7½in (19 cm)

Weight

11 lb (5 kg.)

Finish

Blue case with light grey front panel.

3.1 POWER SUPPLY

The Signal Generator Type SG62B is supplied with the power transformer connected for 210V/250V operation. If the local supply is in the 105/125V or 140V/160V range the connection of the red lead to the power transformer should be altered as follows:—

(*a*) 140V/160V Operation: disconnect the red lead from the 210V/250V terminal on the transformer (T2) and reconnect it to the adjacent terminal.

(b) 105V/125V Operation: disconnect the red lead from the 210V/250V terminal and reconnect it to the next but one terminal i.e. the terminal adjacent to the 140V/160V terminal.

No other alterations should be made to the transformer wiring or damage may be caused to other components in the instrument.

The instrument is switched on by setting the FUNCTION switch to MOD or CW as required and allowing at least two minutes to elapse before attempting to obtain a stable output. The presence of the supply at the primary winding of the power transformer will be indicated by the SUPPLY neon indicator being illuminated.

3.2. FUNCTION SELECTION

When the FUNCTION switch is set to the MOD position the output available at the R.F. socket will be the selected r.f. carrier signal modulated to a depth of 30% by a 400Hz audio signal. The output at the A.F. socket will be the 400Hz sine wave at a nominal amplitude of 10V from a high impedance source.

When the FUNCTION switch is set to the CW position the output at the R.F. socket will be an unmodulated sine wave at the selected radio frequency.

3.3 FREQUENCY SETTING

The required frequency is selected by setting the RANGE switch to the required band and adjusting the slow-motion drive to obtain the frequency indicated on the scale.

3.4 OUTPUT LEVEL

The C.W. output signal level at the R.F. socket is selected by setting the calibrated potentiometer OUTPUT VOLTAGE, and the switch attenuator OUTPUT VOLTAGE/dB, to obtain required output level up to 100mV.

3.5 OUTPUT TERMINATION

The termination pad type TP2B matches the output into any low impedance load and eliminates standing waves in the r.f. connector cable. The pad includes a 75 ohms. resistor, from which the output signal should be routed to the instrument under test via the shortest practicable r.f. connector. The output can also be fed directly to a load of 75 ohms.

3.6 CONNECTIONS TO POINTS OF HIGH POTENTIAL

Since r.f. output from the instrument has a relatively low impedance path to earth a blocking capacitor (e.g. 0.05μF at 400Vwkg)must be connected between the output and the external load if the load is at a high potential. If the chassis of the instrument under test is live (as on an a.c./d.c. type broadcast receiver) capacitors must be connected in series with both the output and earth return leads of the Signal Generator.

4.1 GENERAL

As can be seen from the functional diagram, Fig. 1, and the circuit diagram, Fig. 4, the circuit of the instrument is basically two oscillators. These circuits provide the r.f. output and a.f. modulation signals via an attenuator network which permits the required output level to be selected. The description is therefore divided into three main parts viz: the signal generating stages, the ancillary stages and a functional description.

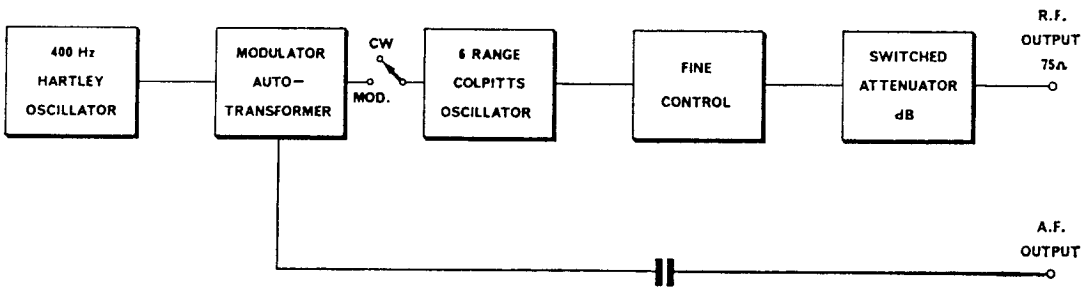


Fig. 1 Functional diagram - overall

4.2 SIGNAL GENERATING STAGES

(*a*) Radio Frequency Signals

As was stated in the introduction the r.f. signals are generated by a Colpitts type oscillator circuit comprising V1b and the associated components C7, C8, R6, etc. Modifications have been made to the basic Colpitts circuit to enable the output signal to sweep the full wide frequency range required from the instrument. The modifications consist of five switched resonant coupling circuits (L1-L5) and the ganged variable tuning capacitor, C7. Initially the frequency sweep of C7 is set by adjustment of the trimming capacitor C6 and the maximum and minimum frequencies in each range selected by adjustment of the trimming capacitor and core in appropriate coupling circuit; thus providing the necessary degree of tuning accuracy.

(*b*) Audio Frequency Signals

The a.f. signals at a fixed frequency of 400Hz are provided from the Hartley type oscillator circuit formed by the triode V1a and its associated components C9, R16, R17, etc. The anode/grid coupling link via the auto-transformer T1 is decoupled to prevent r.f. noise altering its resonant frequency. Since the tolerance of the inductance in T1 and capacitance in C16 is fairly wide the capacitor is selected to provide the 10% tolerance on the 400Hz signal

4.3 ANCILLARY STAGES

(*a*) Power Supply Circuit

The incoming a.c. supply is fed to the power transformer, T2, via a pair of r.f. suppression filters (L14/C24 and L15/C25) and the on/off section of the FUNCTION switch, S2. Three outputs are derived from the power transformer which are utilised as follows:—

(1) The 120V r.m.s. output is half-wave rectified via the diode, MR1, and fed through a smoothing circuit (C23A/B and R20) to produce a negative earthed 140V d.c. supply with low ripple content.

(2) The 6V r.m.s. supply is used as the heater voltage for the double-triode valve, V1. This supply is heavily decoupled to r.f. via L9, L13, and C12, to prevent extraneous signals from being fed back to the power transformer.

(3) The third supply is derived by auto-transformer action from the 105/125V primary winding of T2 to provide the energisation voltage for the neon SUPPLY indicator when S2 is set to any position other than OFF.

(*b*) Attenuation Stages

The attenuation stages are provided in the output circuit of the instrument to enable the operator to control the r.f. output level and, if necessary reset the output level accurately. The attenuation controls consist of a coarse, step-attenuator, OUTPUT VOLTAGE/dB, and a continuously variable fine attenuator, OUTPUT VOLTAGE. Switch S3 and its associated resistors R8 to R15 form the coarse attenuator circuit whilst the fine attenuator is formed by the variable resistor RV1.

4.4 FUNCTIONAL DESCRIPTION

(*a*) C.W. Mode

This mode of operation is selected by setting the FUNCTION switch, S.2, to the C.W. position. In this condition the 140V h.t. supply is fed directly to the anode circuit of the r.f. oscillator, V1b, which functions in the manner indicated in sub-section 4.2. Although the h.t. supply is also applied to the anode circuit of V1a this stage will not oscillate since only part of the auto. transformer T1 is in circuit; thus, the output at the R.F. socket will be unmodulated r.f. and no output will be available at the A.F. socket.

4.4 FUNCTIONAL DESCRIPTION (continued)

(*b*) Modulated Mode

This mode of operation is selected by setting the FUNCTION switch S2 to the MOD position. In this condition the 140V h.t. supply is fed to the anode circuit of V1b via the auto transformer T1; thus, since T1 forms the anode/grid coupling circuit for V1a, the h.t. supply to V1b will vary with the oscillatory action of V1a. The output available at the R.F. socket will be the selected r.f. signal amplitude modulated at 400Hz to a depth of approximately 30%. The 400Hz a.f. signal will also be available at the A.F. socket. When the FUNCTION switch is set to the OFF position after having been set to one of the other positions the supply to the power transformer is isolated. In addition a second section of the FUNCTION switch provides a discharge path for the smoothing capacitors, C23A, and C23B via the triode V1a: the period of thermal run-down of V1a is sufficient to allow the capacitors to discharge completely.

5.1 GENERAL

Access to the controls and circuit components, mounted on a front panel and chassis assembly, is gained by removing the wrap-round case after releasing the two securing clips at the rear of the instrument. Side panels may be removed, when necessary, after extracting their four securing screws. Access to the oscillator valve and components is gained by removing the screening can in which they are contained. (see Fig. 3).

5.2 VALVE REPLACEMENT

The oscillator valve V1 is secured in its valveholder by means of a retaining clip. Changing the valve does not normally affect the frequency calibration, but if any frequency scale requires recalibration, the procedure described in sub-section 5.3 should be followed.

5.3 OSCILLATOR RECALIBRATION PROCEDURE

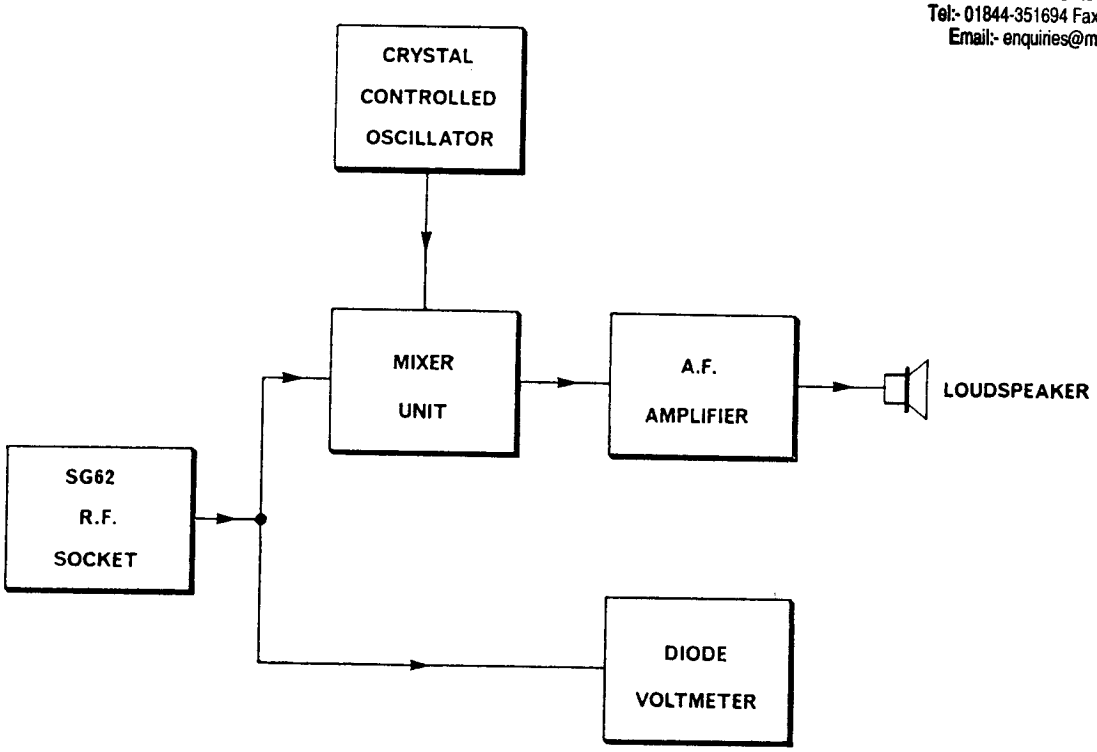


Fig. 2 Functional diagram - recalibration

5.3 OSCILLATOR RECALIBRATION PROCEDURE (continued)

(*a*) Setting Up

(1) Remove the instrument case and the screening can.

(2) Switch the instrument on and allow at least twenty minutes to elapse before commencing recalibration.

(3) Connect the R.F. output socket on the Signal Generator, via a suitably matched coaxial cable, to:—

(*a*) A high input impedance diode voltmeter calibrated in arbitrary units

(*b*) A high input impedance mixer unit with a crystal controlled reference oscillator. The mixer output is then connected to a loudspeaker via an audio amplifier (See Fig. 2).

(4) Set the OUTPUT VOLTAGE and the OUTPUT VOLTAGE/dB controls to their maximum settings.

(*b*) Overall Recalibration

(1) Set the RANGE control to F.

(2) Set the scale cursor at 70MHz.

(3) Set the crystal controlled oscillator to 70MHz. output.

(4) Adjust the F range inductance strip curvature until the loudspeaker gives a null frequency response.

(5) Note the indication given by the diode voltmeter.

(6) Set the scale cursor at 220MHz.

(7) Set the crystal controlled oscillator to 220MHz. output.

(8) Adjust the main trimmer (C6) until the loudspeaker gives a null frequency response.

(9) Note the indication given by the diode voltmeter.

(10) Using a non-conducting tool, adjust the spacing between the vanes of the tuning capacitor C7 in order to achieve good tracking at frequencies intermediate between 70MHz and 220MHz.

(11) Note the indications given by the diode voltmeter at the selected intermediate frequencies. Check that these indications, and the indications noted in steps (5) and (9) are within 3% agreement.

(12) Repeat the procedures of steps (2) to (11) (inclusive) until the required accuracy of calibration and tracking has been achieved.

(13) Set the RANGE control to A.

(14) Set the scale cursor at 150kHz.

(15) Set the crystal controlled oscillator to output 150kHz.

(16) Adjust the core of the A range inductor (L1) until the loudspeaker gives a null frequency response.

(17) Note the indication given by the diode voltmeter.
(18) Set the scale cursor at 500kHz.
(19) Set the crystal controlled oscillator to output 500kHz.
(20) Adjust the A range trimmers (C1 and C26) until the loudspeaker gives a null frequency response.
(21) Note the indication given by the diode voltmeter. Check that this indication agrees with the indication noted in step (17) within 3%.
(22) Repeat the procedures of steps (13) to (21) (inclusive) for the remaining ranges B, C, D and E in turn, adjusting the appropriate inductor core (L2 to L5) and trimmer (C2 to C5)in each case.
(23) Finally, with the screening can in place, repeat step (22) making final adjustments.

(*c*) Setting Up for Optimum Tracking Over Any One Range

Repeat the test procedures of 5.3 (*b*) steps (1) to (11) (inclusive) for the required range, adjusting the inductor core and trimmer appropriate to that range.

(*d*) Adjustment of A.F. Modulating Depth

The resistor R16 can be specially selected to obtain a modulation depth of 30% ± 3dB, at 400Hz ± 10%. The selected value of R16 should lie within the range 4.7kΩ to 9.1kΩ.

(*e*) Checking Output Level.

The output level on all bands should be checked to be within ±3dB. This may be accomplished by using the Advance Millivoltmeter VM79, coaxial "T" probe PL60A and a 75Ω load.

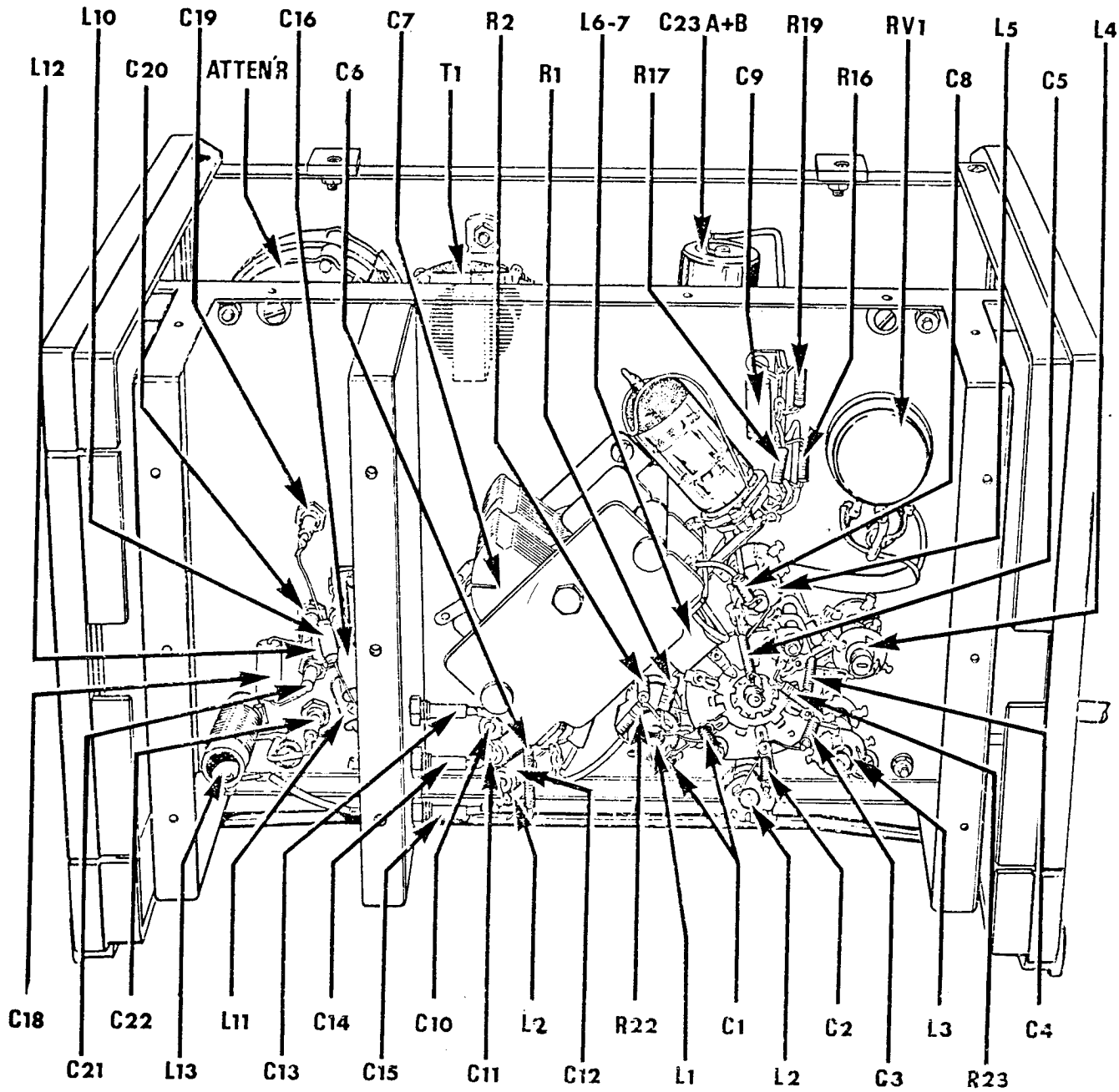


Fig. 3 Component Location Diagram

For Service Manuals Contact
MAURITRON TECHNICAL SERVICES
8 Cherry Tree Rd, Chinnor
Oxon OX9 4QY
Tel:- 01844-351694 Fax:- 01844-352554
Email:- enquiries@mauritron.co.uk

RESISTORS (Carbon 10% ¼W unless specified)

Ref.	Value	Description	Part No.
R1	560		9236
R2	100K		1270
R3	27K		868
R4	33K		3434
R5	22K		3433
R6	22K		3433
R7	39	½W	978
R8	750	5% ¼W	3442
R9	91	5% ¼W	3441
R10	750	5% ¼W	3442
R11	91	5% ¼W	3441
R12	750	5% ¼W	3442
R13	91	5% ¼W	3441
R14	750	5% ¼W	3442
R15	82	5% ¼W	3440
R16	6.8K	Selected on Test	6319
R17	470	5% ¼W	1606
R18	1K	5% ¼W	10263
R19	56K		3435
R20	1K		3424
R21		Not used	
R22	120K		4407
R23	47	½W	1818
R24	22	½W	4419
RV1	100	Plessey type E	10374

CAPACITORS (Mullard 20% 150V unless specified)

C1-6		Wire Trimmer	10681
C7	532+532pF	Variable ganged	11589
C8	50pF	20% Lemco 350V	1562
C9	0.04µF		792
C10	0.04µF		792
C11	0.04µF		792
C12	0.04µF		792
C13-15	300pF	TCC LT/3 Feed thro'	7099
C16-18	0.04µF	20% 400V WIMA M	3398
C19-22	300pF	TCC LT/3 Feed thro'	7099

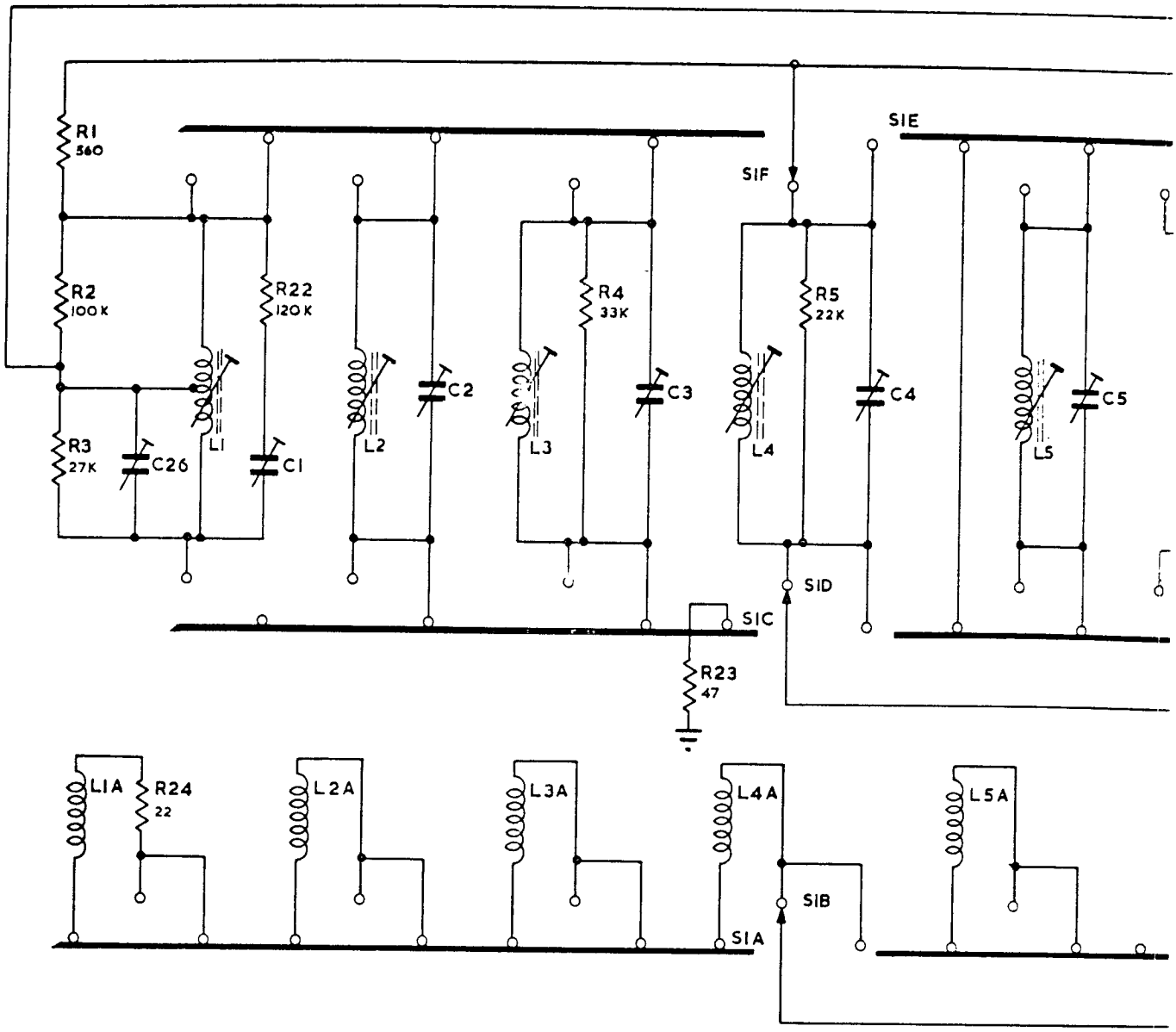
Ref.	Value	Description	Part No
C23	16+16µF	350V Electrolytic Hunts JF413K	7014
C24) C25)	5000pF	3KV Erie K 3500 11/CD8	1514
C26		Wire Trimmer	10681

INDUCTORS

L1	Band "A" Tuning	RF594
L1A	Band "A" Coupling	RF594
L2	Band "B" Tuning	RF595
L2A	Band "B" Coupling	RF595
L3	Band "C" Tuning	RF596
L3A	Band "C" Coupling	RF596
L4	Band "D" Tuning	RF597
L4A	Band "D" Coupling	RF597
L5	Band "E" Tuning	RF598
L5A	Band "E" Coupling	RF598
L6-7	Band "F" Tuning Silver Plated Strip	
L8	Band "F" Coupling Part of Wiring	
L9-10	R.F. Choke Dubilier 666	11212
L11	R.F. Choke	C173
L12	R.F Choke Dubilier 666	11212
L13	Supply Filter choke	C95
L14-15	R.F. Choke Dubilier 666	11212

MISCELLANEOUS

N1	Indicator Neon 125V	1165
MR1	Rectifier	3560
S1	Range Switch	10364
S2	Function Switch	10364
S3	Attenuator Switch	A78
T1	Transformer (Modulator)	MT348
T2	Transformer (Supply)	MT345/B
V1	Valve 12AT7 (ECC81)	7106



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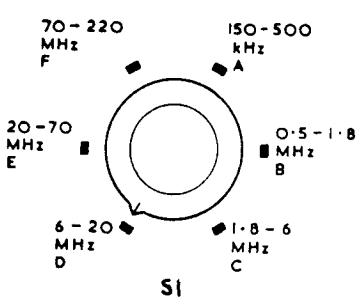
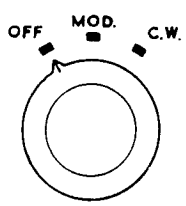
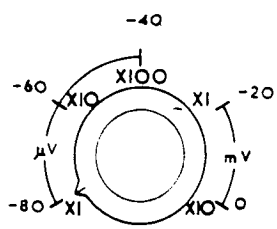


S1



S2



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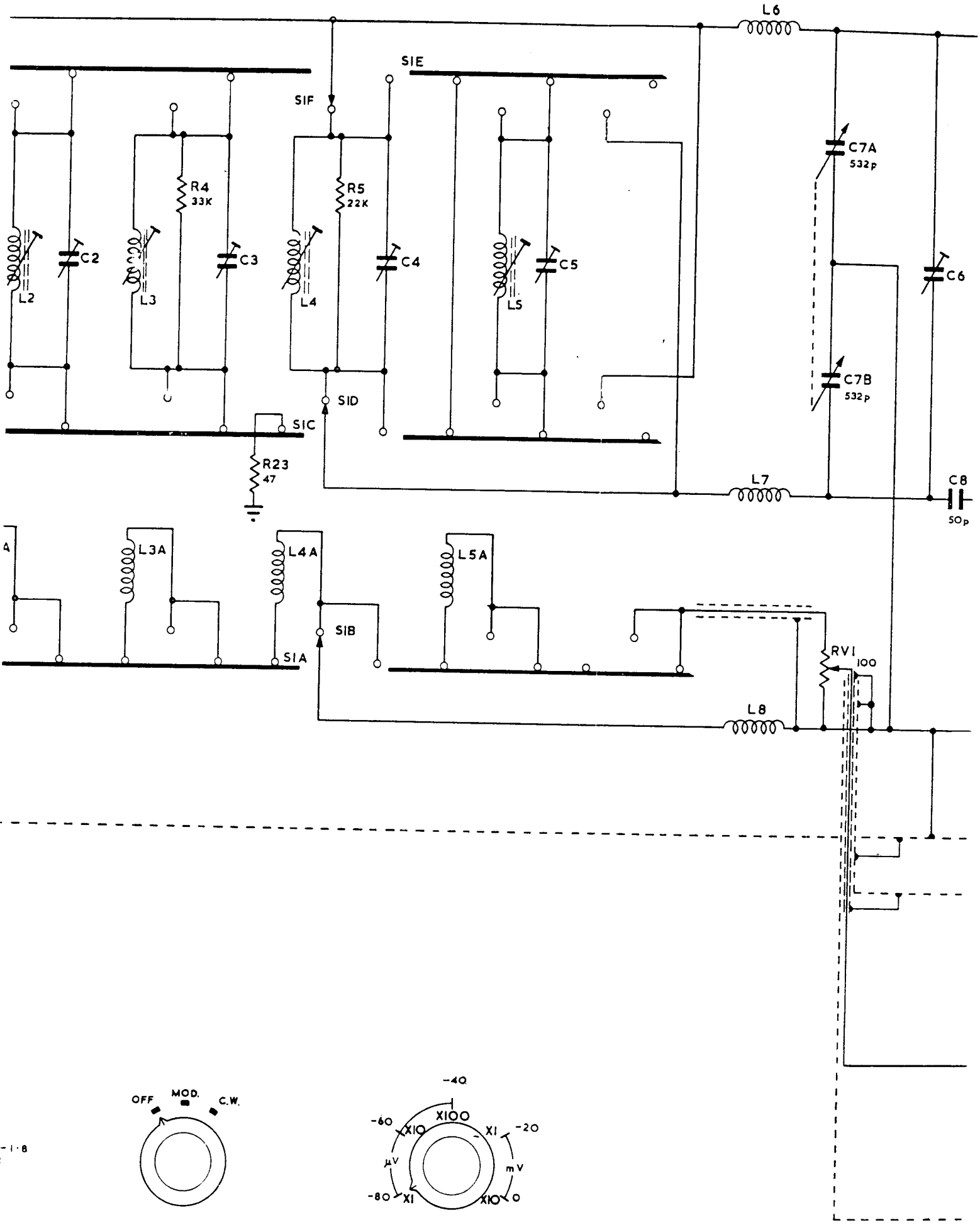
L6
SIE
SIF
R4
33K
R5
22K
C7A
532p
C2
C3
C4
C5
C6
L2
L3
L4
L5
C7B
532p
SID
SIC
R23
47
L7
C8
50p
L3A
L4A
L5A
SIB
SIA
RV1
100
L8

OFF
MOD.
C.W.

S2

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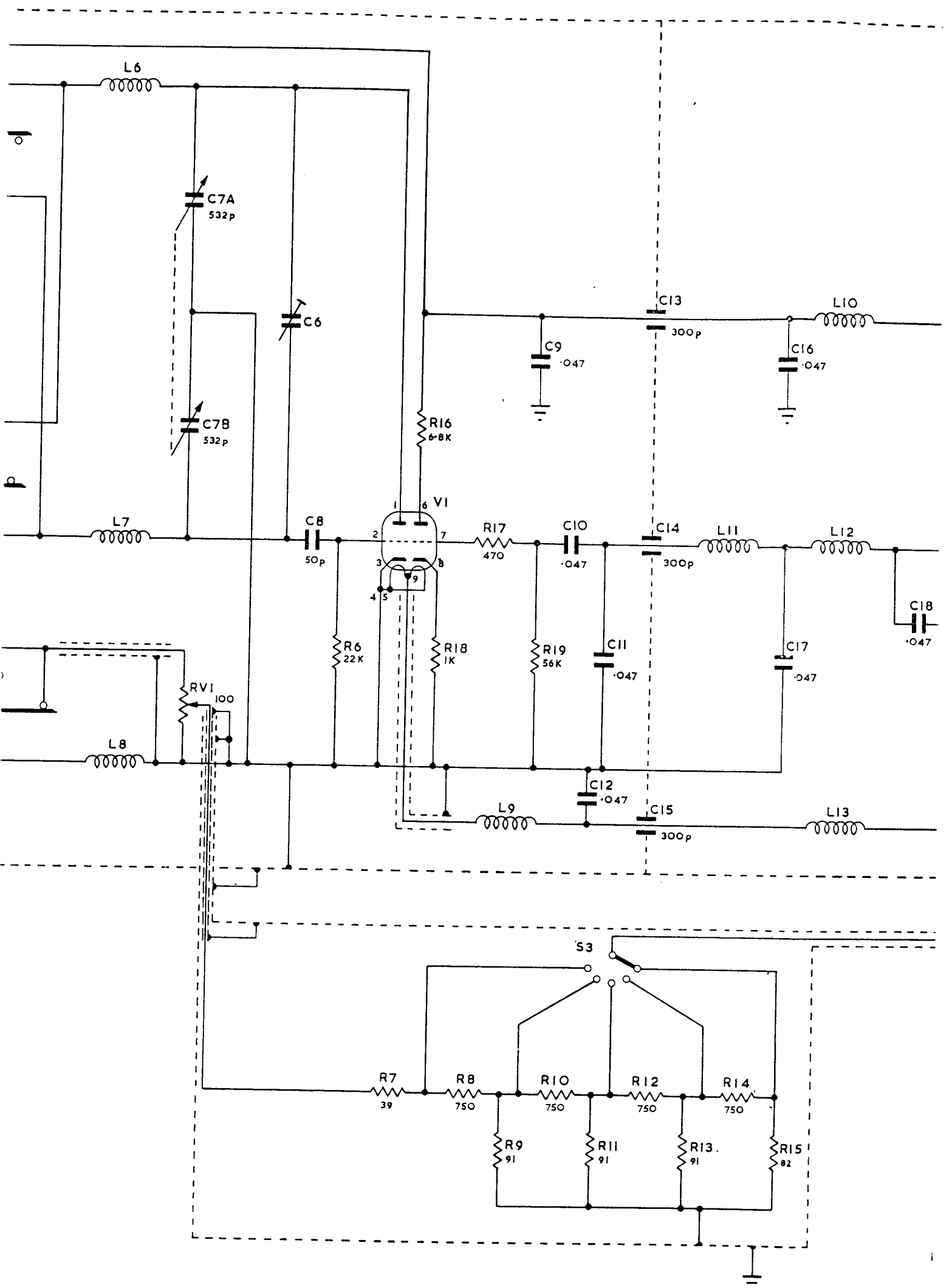
X100
-60
X10
X1
-20
μV
mV
-80
X1
X10
0

S3


L6
C7A
532p
C6
C7B
532p
C13
300p
L10
C9
·047
C16
·047
R16
6·8K
V1
L7
C8
50p
R17
470
C10
·047
C14
300p
L11
L12
C18
·047
R6
22K
R18
1K
R19
56K
C11
·047
C17
·047
RV1
100
L8
C12
·047
L9
C15
300p
L13
S3
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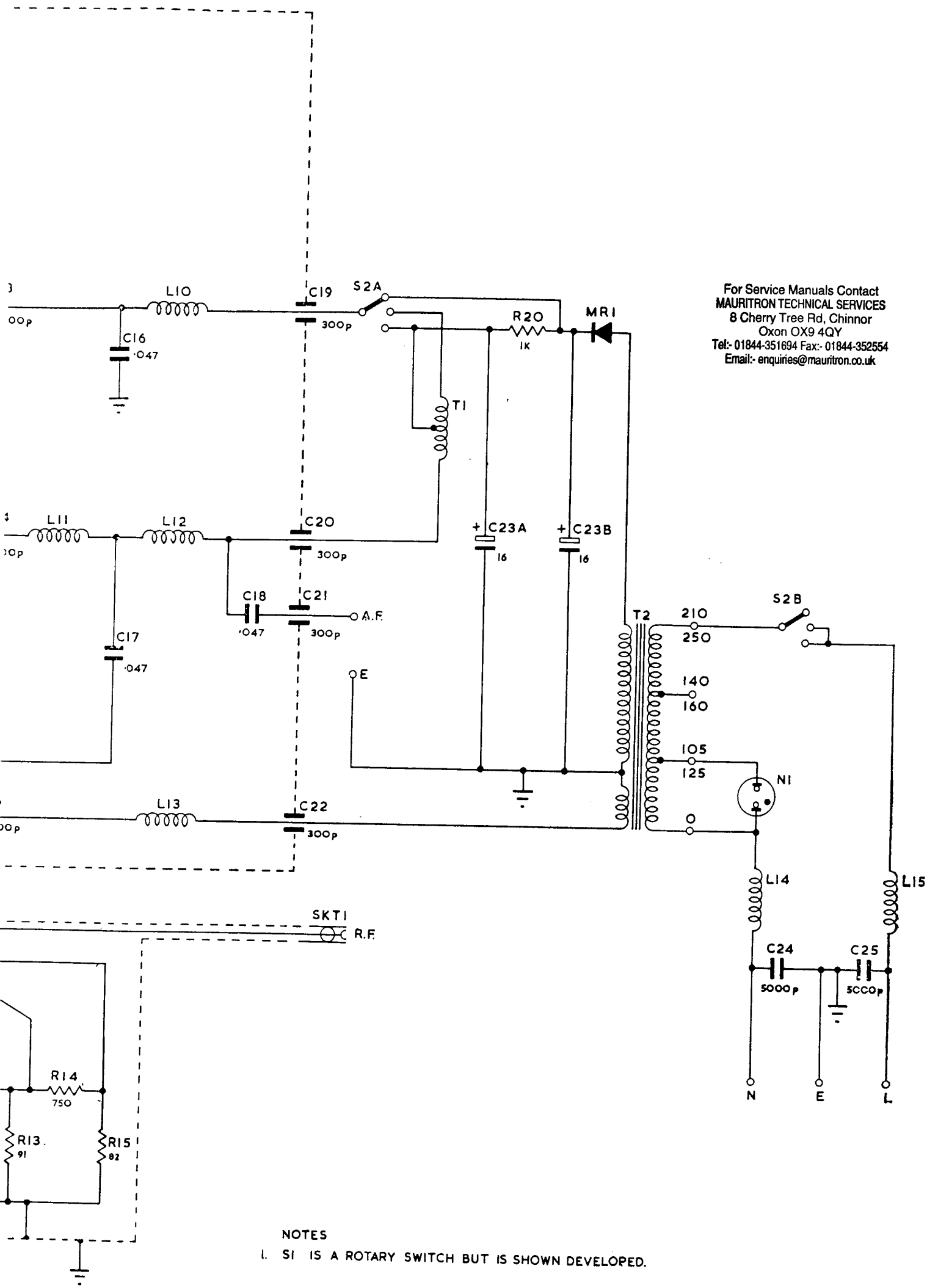

NOTES

1. S1 IS A ROTARY SWITCH BUT IS SHOWN DEVELOPED.

Fig 4 circuit Diagram

Guarantee and Service Facilities

Section 7

This instrument is guaranteed for a period of one year from its delivery to the purchaser, for the replacement of defective parts other than valves, semiconductors and fuses. Valves and semiconductors are subject to the manufacturers guarantee.

We maintain comprehensive after sales facilities and the instrument can, if necessary, be returned to our factory for servicing. The type and serial number of the instrument should always be quoted, together with full details of any fault and the service required. The Service Department can also provide maintenance and repair information by telephone or letter.

Equipment returned to us for servicing must be adequately packed, preferably in the special box supplied, and shipped with transportation charges prepaid. We can accept no responsibility for instruments arriving damaged. Should the cause of failure during the guarantee period be due to misuse or abuse of the instrument, or if the guarantee has expired, the repair will be put in hand without delay and charged unless other instructions are received.

OUR SALES, SERVICE AND ENGINEERING DEPARTMENTS ARE READY TO ASSIST YOU AT ALL TIMES.