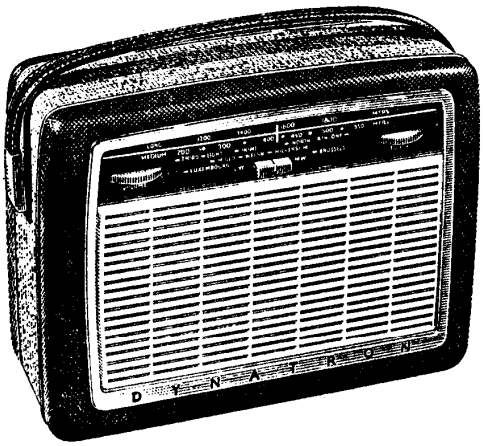
DYNATRON



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DYNATRON RADIO LIMITED
MAIDENHEAD, BERKS.
Telephone : Maidenhead 5150 (10 lines)
General Service Information Ext. 20.
Component Orders Ext. 21.

GENERAL DESCRIPTION

The 'GYPSY' is a six transistor battery operated portable radio receiver covering the Long and Medium wavebands which are selected by push button controls. A socket for a car aerial is incorporated.

TECHNICAL DATA

Batteries :	2 x 6V dry batteries.
Aerial :	8in. Ferrite rod.
Wavebands :	
Medium —	183m-555m 1640kc/s to 540kc/s.
Long —	1090m-1925m 275kc/s to 156kc/s.
Output :	500mW.
Speaker :	5in. diameter 25 ohms. P.M.
Transistors :	TR1 AF117 Self-oscillating Mixer. TR2 AF117 I.F. Amplifier. TR3 AF117 I.F. Amplifier. TR4 OC81D A.F. Driver. TR5 OC81 } Push-pull Output. TR6 OC81 } D1 OA79 A.G.C. D2 OA70 Detector.
Cabinet :	Blue/Grey or Red.
Dimensions :	Height $6\frac{11}{16}$in. Width $9\frac{9}{16}$in. Depth $3\frac{7}{16}$in.
Weight :	$4\frac{1}{2}$lb. (including batteries).

CHASSIS REMOVAL

1. Remove the rear cover. Disconnect the battery and speaker leads.
2. Remove the four nuts and shake proof washers securing chassis to case.
3. Remove chassis carefully from case, ensuring that the Ferrite rod aerial coils are not damaged by being brought into contact with the cover clips located at the top of the case.

REPLACEMENT OF TUNING DRIVE CORD

Refer to Fig. 1 at the rear of the manual.

1. Remove chassis from case as described previously. Remove aerial rod from the retaining clips, also the spring and cleats from old cord. Place the chassis in an upright position with the rear of the dial facing the operator.

2. Select a 22in. length of drive cord, and make a paint spot $6\frac{1}{2}$in. from one end of the cord.
   Fold back each end of drive cord by $\frac{1}{2}$in. and fit cleats allowing for a 1/16in. loop. Fit one end of spring to cord loop. Double cord at paint spot and press to flatten.
3. Pass doubled end of cord, through top hole on tuning spindle, from right to left. Pass loop formed by doubled end back over tuning spindle.
4. Select the longest leg of cord, and pass up through loop. Pull both legs together to tighten loop, ensuring that the paint spot on the cord is positioned over tuning spindle hole when loop is tight. Fit spring to loop.
   Rotate tuning knob by half a turn to close capacitor vanes.
5. Place right-hand nylon pulley on spindle, dress cord round pulley, holding taut. Fully open capacitor vanes, wind on approximately four turns of cord.
6. Remove right-hand pulley from spindle, hold it in the hand and dress half a turn of cord round left-hand spindle and left-hand pulley.
   Place right-hand pulley on right-hand spindle, and clip on press stud.
7. Wind cord both ways to fullest extent of travel to check for correct running. Select mid position, replace pointer on cord. Check travel of pointer and set to datum line.

CIRCUIT DESCRIPTION

M.W. aerial coils L3, L4 and L.W. coils L1 and L2, together with external aerial coupling coil L5 are mounted on a Ferrite rod to form an internal aerial.
On M.W. S1 contacts B and C are closed and L3 is tuned by VC1 and VC1A, the received signal being fed from L4 via S2 contacts B and C and C1 to the base of the mixer transistor TR1.

On L.W. S1 contacts A and B are closed and L1 is tuned by VC1, VC1A, C15 and VC3 in parallel, the received signal is then fed from L2 via S2 contacts A and B and C1 to the base of TR1. Correct operating bias is provided by R1 and R2. TR1 operates as a self-oscillating mixer, regeneration is obtained by feedback from collector to emitter, provided by the coupling of L6 and L7.

The frequency of operation is determined by the tuned circuit consisting of L8, VC2, VC2A and C22 on M.W. R6 in series with C4. provide frequency dependent damping and helps maintain constant oscillator amplitude over the medium wave band. On L.W. R6 is short circuited by contacts A and B of S3 and L8 is then tuned by VC2, VC2A, C22, VC4 and C4 in parallel.

D.C. stabilization of the emitter current of TR1 is provided by R3, degeneration at R.F. is prevented by decoupling capacitor C2. The intermediate frequency signal generated by TR1 is fed via the double tuned coupling transformer 1FT1 to the base of the first I.F. amplifier TR2. Base bias is provided by R7, R10 and VR1; emitter current stabilization by R7 decoupled by C5. The amplified signal from TR2 is coupled by means of a second double tuned transformer 1FT2 to the base of the second I.F. amplifier TR3. Base bias is provided by R11. R12 and emitter current stabilization by R13 decoupled by C9. The output of TR3 is fed to the diode detector D2 via the single tuned transformer 1FT3.

The audio signal resulting from the rectification of the I.F. signal by D2 is developed across the volume control VR1. C16 prevents the formation of R.F. voltage across VR1. The D.C. component of the rectified signal is fed via R10 and decoupled by C6, to the base of TR2.

This voltage is of positive polarity which reduces the bias on TR2, resulting in a decrease of emitter current and a reduction in gain, thus providing a.g.c. action.

This a.g.c. action is further assisted on strong signals by the action of D1 and R5 as follows :— The cathode of D1 is connected via R5 to the junction of R8, C7 and the 'cold' end of 1FT2 primary. Under no signal condition the potential of the cathode of D1 is about 2 volts less negative than the H.T. line by virtue of the voltage drop due to the collector current of TR2 flowing through R8 (2.2k ohms).

The anode of D1 is connected to the 'hot' end of the primary of 1FT1, and is maintained almost at H.T. potential, since the voltage drop due to the current flowing in R4 (100 ohms) is very small.

The diode D1 is thus reverse biased and presents a high impedance, having a negligible effect on the circuit. When a strong signal is received the collector current of TR2 is reduced by the a.g.c. action described above, this decrease in current causes the voltage dropped across R8 to decrease reducing the reverse bias on D1 and lowering its impedance, thus damping the primary of 1FT1, resulting in a further reduction in gain.

With the reception of a very strong signal, D1 conducts fully and heavily damps 1FT1.

D1 also operates as a 'catching diode' and prevents the collector voltage of TR1 from 'bottoming', as might otherwise occur with strong impulsive interference, causing blocking and other troubles.

The audio signal is fed from the volume control VR1 via R24 and D.C. blocking capacitor C11 to the base of the amplifier/driver TR4.

Base bias is provided by R14, R15, and emitter current stabilization by R17 decoupled at audio frequency by C12. The output of TR4 is coupled by the phase-splitting transformer T1 to the bases of the output transistors TR5, TR6.

The output stage is connected in a single-ended class 'B' push-pull circuit. Base bias is provided by resistor chain R20, R21, R22, R23, and emitter current stabilization for TR5 by R24 and for TR6 by R25.
The output stage directly feeds the 25 ohm impedance loudspeaker.

Negative feedback is provided from the loudspeaker, to the base of TR4 by R19.

C13 and C14 are incorporated to reduce the internal impedance of the batteries and thus reduce cross-over distortion, particularly as the batteries near the end of their useful life.

SPECIFICATION

Test Equipment Required :—

Output Meter
Signal Generator
Avo Model 8
A.F. Generator
Loop Aerial—See Fig. 2 at the rear of the manual for constructional details.

I.F. Alignment
Switch receiver to the medium waveband, inject a 470kc/s signal, modulated 30% 400c/s, across L4. Set the volume control to maximum. Adjust L13, L12, L11, L10 and L9 in order, reducing the input to maintain an output less than 50mW.

I.F. Sensitivity
Inject a frequency of 470kc/s, modulated 30% at 400c/s across L4. A sensitivity figure of 3.3μV should be obtained for an output of 50mW into a 25 ohms load.

R.F. Alignment
Check that the pointer travels symmetrically within the scale aperture between the limits of the gang travel.
Set up the loop aerial with its axis parallel to the receiver aerial rod with a separation of 24in. between centres.

1. Switch to M.W. and tune the receiver to the L.F. end of the scale. Feed in a signal of 540kc/s. Adjust the core of L8 for maximum output.
2. Tune the receiver to the H.F. end of the scale. Feed in a signal of 1640kc/s. Adjust VC2A for maximum output.
3. Repeat adjustments at 540kc/s and 1640kc/s until no further improvement can be made.

4. Switch to L.W. and tune the receiver to the Light programme as indicated on the scale. Feed in a signal of 200kc/s (or use the Light programme). Adjust VC4 for maximum output.
5. Switch to M.W. Inject a 600kc/s signal, tune in on receiver. Adjust L3 for maximum output by sliding along Ferrite rod.
6. Inject a 1300kc/s signal, tune in on receiver. Adjust VC1A for maximum output.
7. Repeat adjustments at 600kc/s and 1300kc/s until no further improvement can be made.
8. Switch to L.W. Inject a 160kc/s signal, tune in on receiver. Adjust L1 for maximum output.
9. Inject a 260kc/s signal, tune in on receiver. Adjust VC3 for maximum output.
10. Repeat adjustments at 160kc/s and 260kc/s until no further improvement can be made.
11. Check the calibration on M.W. Adjust the pointer on drive cord to minimise any residual errors in calibration.

R.F. Sensitivities

Use the loop aerial with its axis parallel to and spaced 24in. from axis of receiver aerial rod.

Input to Loop Modulated 30% for 50mW output	Frequency
3.5mV	600kc/s.
2.5mV	1.0Mc/s.
2.0mV	1.5Mc/s.
28.0mV	160kc/s.
15.0mV	190kc/s.
13.0mV	250kc/s.

Signal-to-Noise Ratio

With an input of 2.8mV to the Loop aerial, at 1Mc/s the S/N ratio = 10dB.

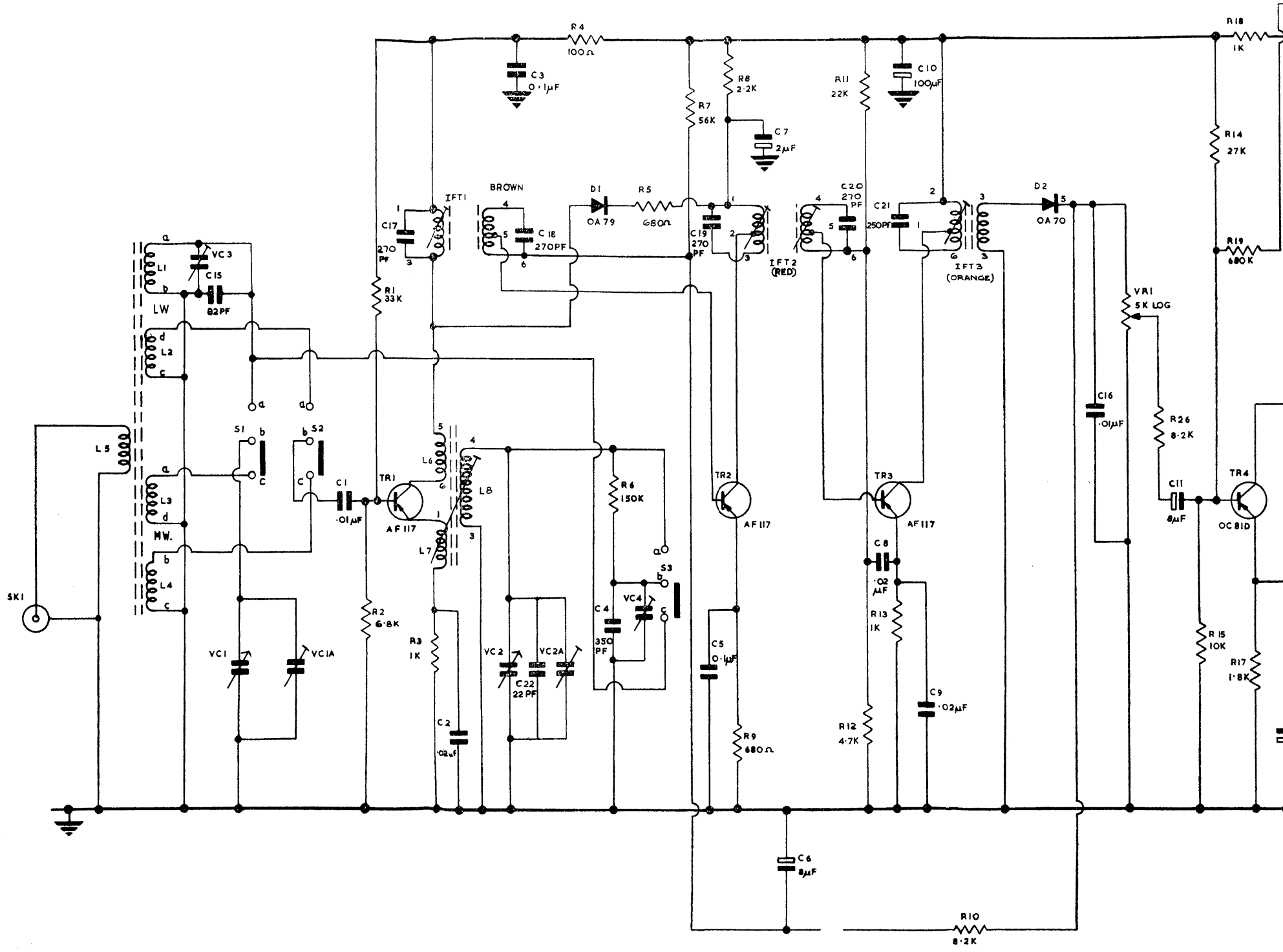
With an input of 14mV to the Loop aerial, at 190kc/s the S/N ratio = 15dB.

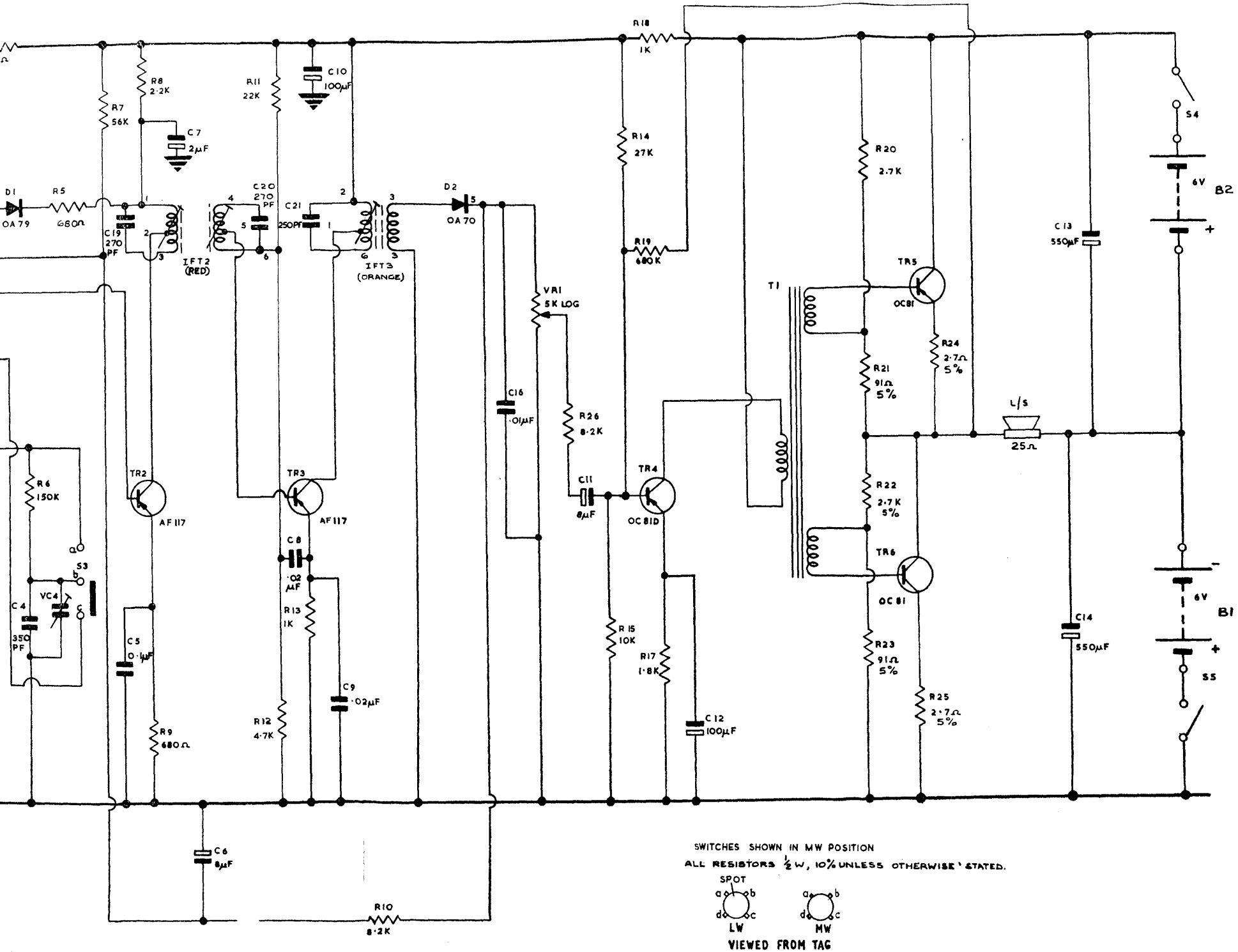
Audio Frequency Sensitivity

Feed Audio generator (600 ohms) output across volume control.

Sensitivity : 400c/s input for an output of 50mW = 14mV.

MODIFICATIONS RECORD


R4
100Ω
C3
0·1μF
R8
2·2K
R7
56K
C7
2μF
R11
22K
C10
100μF
R18
1K
R14
27K
R19
680K
IFT1
BROWN
D1
OA79
R5
680Ω
C17
270 PF
C18
270PF
C19
270 PF
IFT2
(RED)
C20
270 PF
C21
250PF
IFT3
(ORANGE)
D2
OA70
VR1
5K LOG
C16
·01μF
R26
8·2K
C11
8μF
TR4
OC81D
R15
10K
R17
1·8K
R1
33K
VC3
C15
82PF
LW
L1
L2
MW.
L3
L4
L5
SK1
S1
S2
C1
·01μF
TR1
AF117
L6
L7
L8
R2
6·8K
R3
1K
C2
·02μF
VC1
VC1A
VC2
VC2A
C22
22PF
R6
150K
C4
350 PF
VC4
S3
TR2
AF117
C5
0·1μF
R9
680Ω
TR3
AF117
C8
·02 μF
R13
1K
C9
·02μF
R12
4·7K
C6
8μF
R10
8·2K

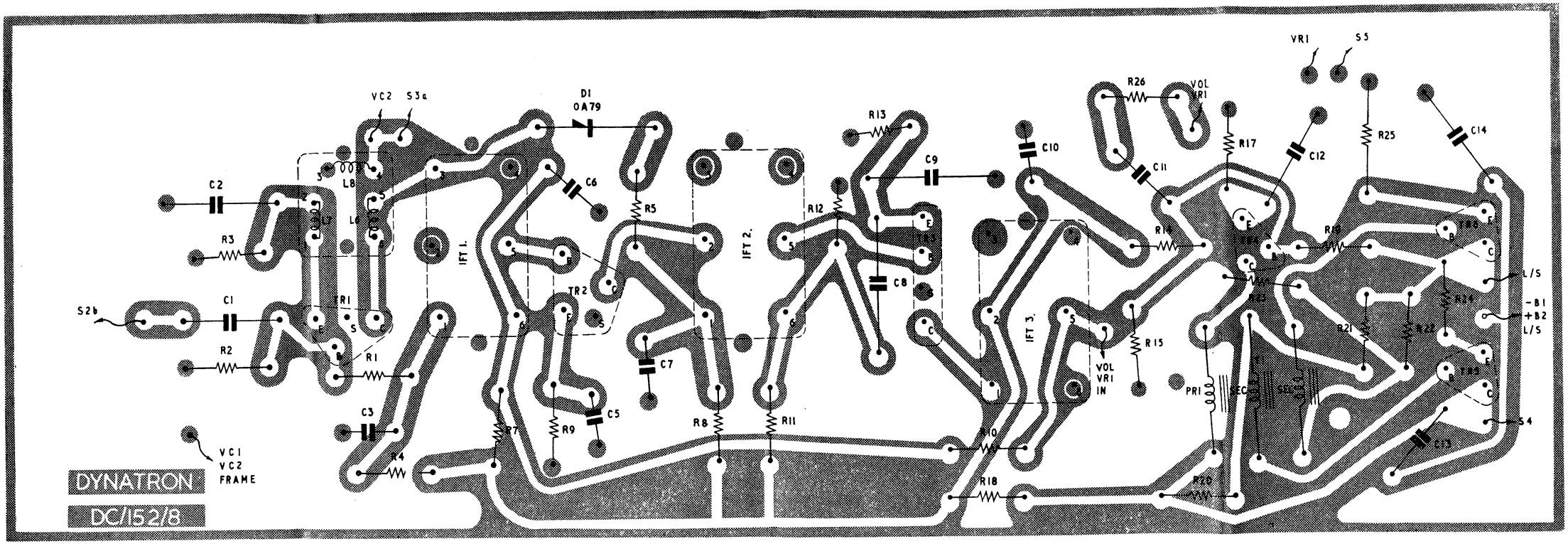


SWITCHES SHOWN IN MW POSITION

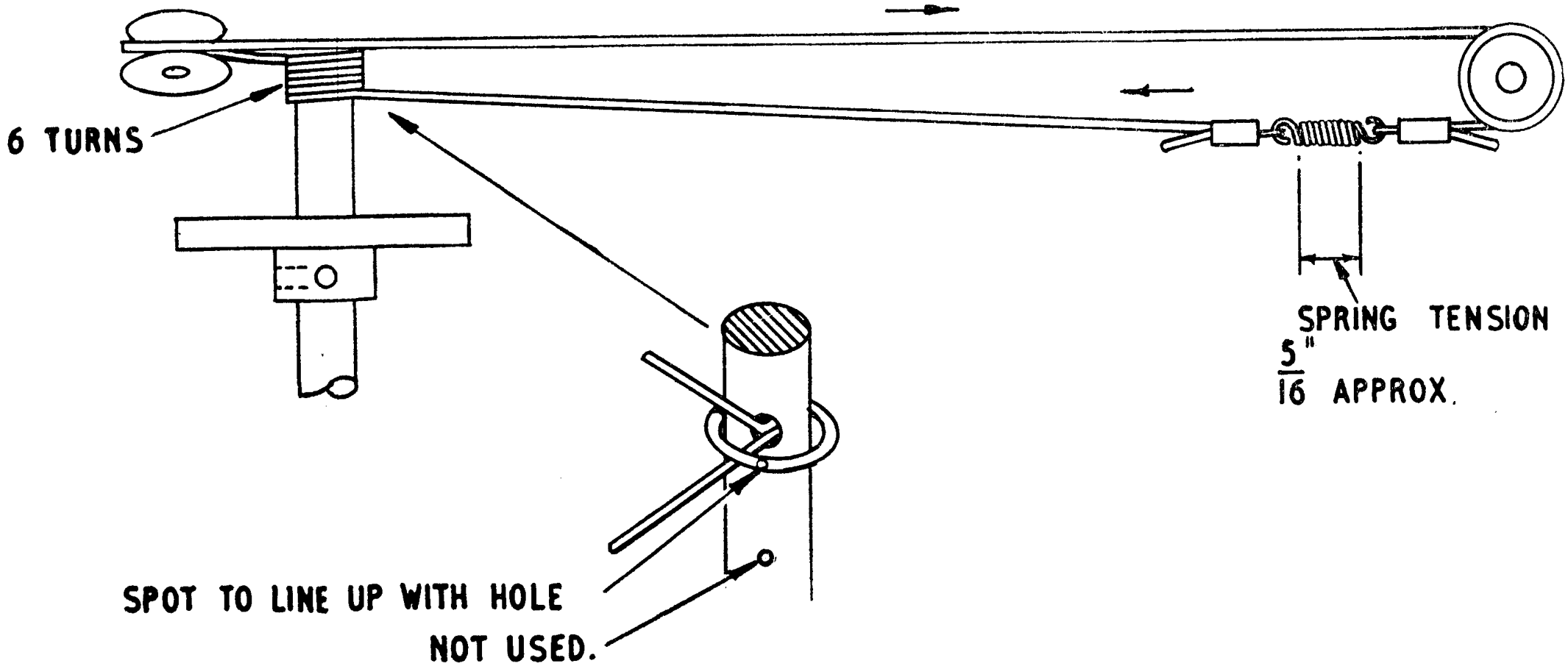
ALL RESISTORS ½ W, 10% UNLESS OTHERWISE STATED.

SPOT

VIEWED FROM TAG RING END.



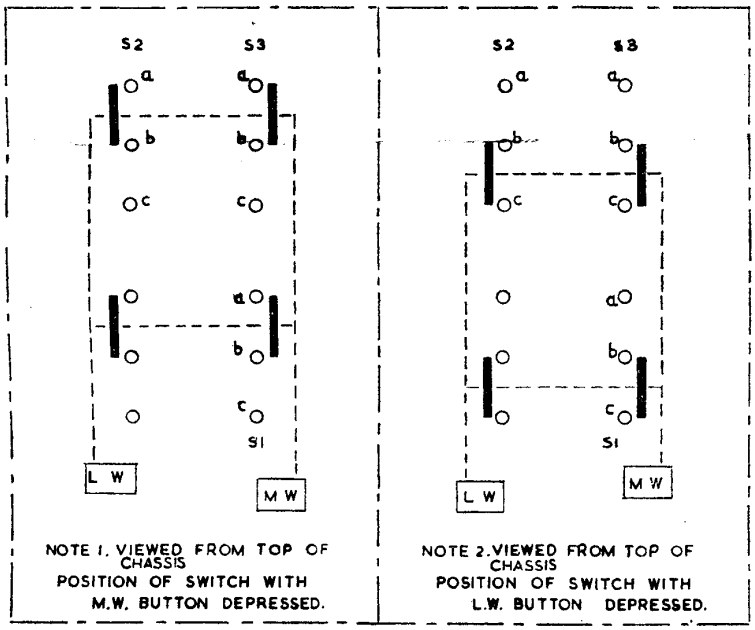
COMPONENT LAYOUT

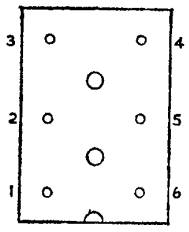


CORD ANCHORAGE

TUNING DRIVE CORD ASSEMBLY

Fig. 1.





COLOUR CODE
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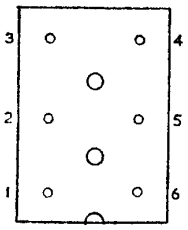

COLOUR CODE
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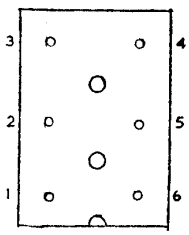

COLOUR CODE
ORANGE
IFT.3.

STATIC VOLTAGES (measured with Avo Model 8)

Transistor	Emitter	Base	Collector
TR1	1·22	1·26	8·0
TR2	·75	·93	5·6
TR3	·70	·92	8·2
TR4	2·15	2·30	11·5
TR5	6·02	6·20	12·0
TR6	0·02	0·20	6.0

Current drain under no signal conditions = 10mA.

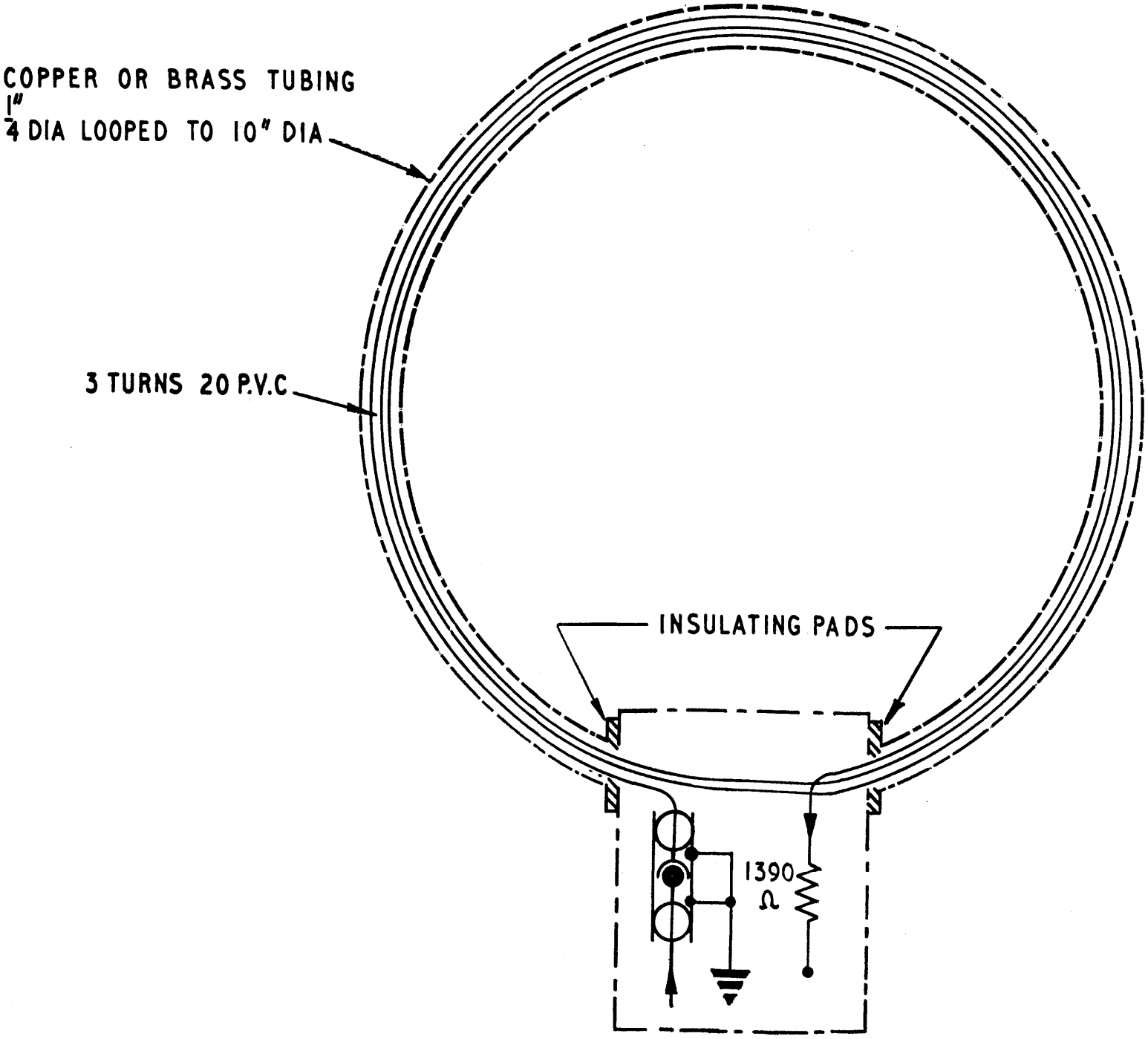

Fig. 2. STANDARD LOOP AERIAL — DETAILS OF CONSTRUCTION