

MEASURING SET, R.I., No. 1

Description, Operation and Maintenance

1. Introduction.—The "Measuring Set, R.I., No. 1" is designed for the measurement of radio-frequency noise voltages and fields generated by electrical equipment in the ranges 150 kc/s. to 400 kc/s. and 0.55 Mc/s. to 30 Mc/s. This Instruction describes the measuring set and its associated equipment, its operation and maintenance.

2. Facilities.—The measuring set can be operated from a 200/250-volt A.C. mains supply or a 6-volt battery, and can be used

- (a) to make quantitative measurements of
 - (i) R.F. noise voltages present at the terminals of electrical apparatus
 - (ii) field strengths of radio transmissions, and of R.F. noise fields produced by electrical apparatus
- (b) as a radio receiver.

DESCRIPTION

3. The complete equipment consists of

- (a) "Measuring Set, R.I., No. 1" (including one rod-aerial, two coaxial connecting-leads and two measuring-heads (see Fig. 1)

- (b) "Power-unit No. 1" (see Fig. 2)
- (c) "Unit, Isolating, R.F., No. 1A"
- (d) "Unit, Isolating, R.F., No. 1B"

- (e) "Receiver, Headgear, No. 10R, Double" with "Plug No. 201" and "Cord, Instrument, 2/35A, Brown, 72 in."

- (f) 6-volt car battery to supply 10 amp.

4. Circuit arrangement.—The circuit shown in Fig. 6 is fundamentally that of a superheterodyne receiver adapted for measurement purposes. The main features of the circuit are:—

- (a) An input selector switch (S1) which provides a choice of three input sockets, two of which are marked LINE 1 and LINE 2 for voltage measurements, and the third marked INSERT AE ROD for field-strength measurements

- (b) An auto-transformer (TR 16) which is inserted after the antenna socket on the two lower-frequency bands (Ranges 1 and 2) to increase the input impedance from 75 ohms and thus improve the gain

- (c) A high-pass filter (C67 to C70 and L12 to L14)

- (d) A 75-ohm switched attenuator (A1) (see par. 5)

- (e) A noise diode (V1) for calibration (see par. 8)

- (f) One R.F. stage (V3)

- (g) A frequency-changer stage consisting of a mixer (V4) and separate oscillator (V5)

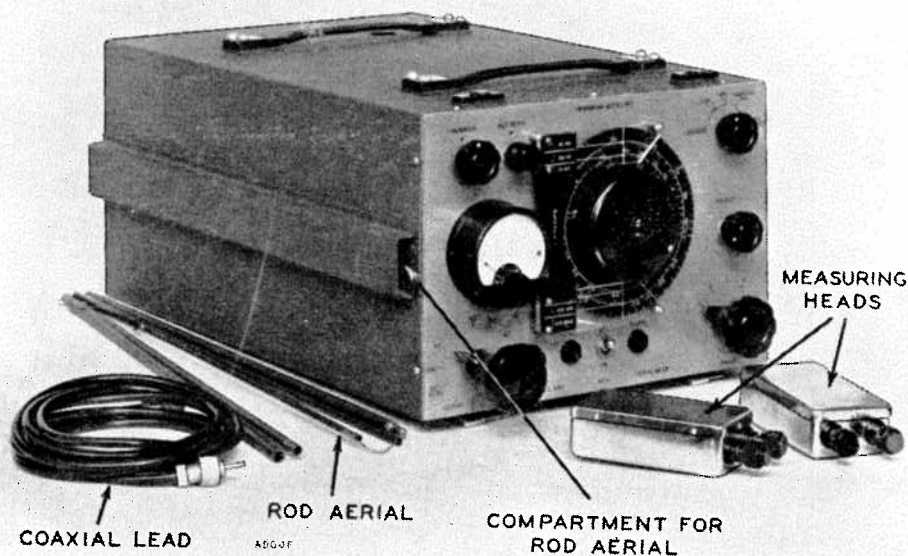


FIG. 1—MEASURING SET, R.I., No. 1

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- (h) A second switched attenuator (A2) (see par. 5)
- (j) Three 465 kc/s. I.F. stages (V6, V7 and V8)
- (k) Metering detector (V9) consisting of two diodes in push-pull

(l) A D.C. amplifier (V10) which forms one arm of a bridge circuit across which is connected the meter when measuring

(m) A double-diode triode (V11), one diode being used to provide an A.F. output to the triode section, where the A.F. is amplified and fed to two phone jacks in parallel

(n) A B.F.O. (V12) for the reception of CW transmission. The B.F.O. switch (S4) disconnects the metering circuit when put in the ON position.

5. The two switched attenuators, one at the input to the R.F. stage and the other at the input to the I.F. stages, each provide 40 db. attenuation in 10-db. steps. The two attenuators are operated by a common control (S3); the first 10-db. attenuation is provided by the I.F. attenuator (A2), the next 40 db. by the R.F. attenuator (A1) and the remaining 30 db. by the I.F. attenuator. This sequence of operation prevents receiver noise detracting from the accuracy of measurements and also prevents overloading occurring in the R.F. stage.

6. Calibration source.—To make measurements, the gain of the measuring set must always be the same as when it was initially calibrated. To ensure this, a calibrating source of constant output is

provided, and it is switched to the receiver input when calibrating. This source is a noise generator consisting of a "saturated" tungsten-filament diode (V1) whose output, which is substantially constant over the whole frequency range, is dependent on the load resistance and the anode current; the former is constant and the latter is set to the same value each time by adjusting the filament voltage of the noise diode.

7. Discharge time-constant of the detector.—The discharge time-constant of the metering detector is 500 ms. and can be altered by the insertion of a suitable component in the empty fuseholder on the front panel. *No change in the time-constant value should be made unless special instructions are received from the ~~Eng. Dept. (WP23)~~ THQ (NP 8.1)*

8. Controls.—A front view of the measuring set showing the positions of the controls is shown in Fig. 1. The bottom left-hand switch knob (S3) controls both the R.F. and I.F. attenuators and in addition carries out the switching necessary when setting the gain of the receiver before making a measurement. The knobs marked ADJUST (R5), SET ZERO (R45) and CALIBRATE (R29) correspond to the related positions on the switch (S3) and the marks on the meter scale. The ADJUST knob sets the anode current of the noise diode to a standard value. The SET ZERO position balances the meter bridge-circuit and the CALIBRATE knob, which controls the I.F. amplifier gain, is used with S3 in the

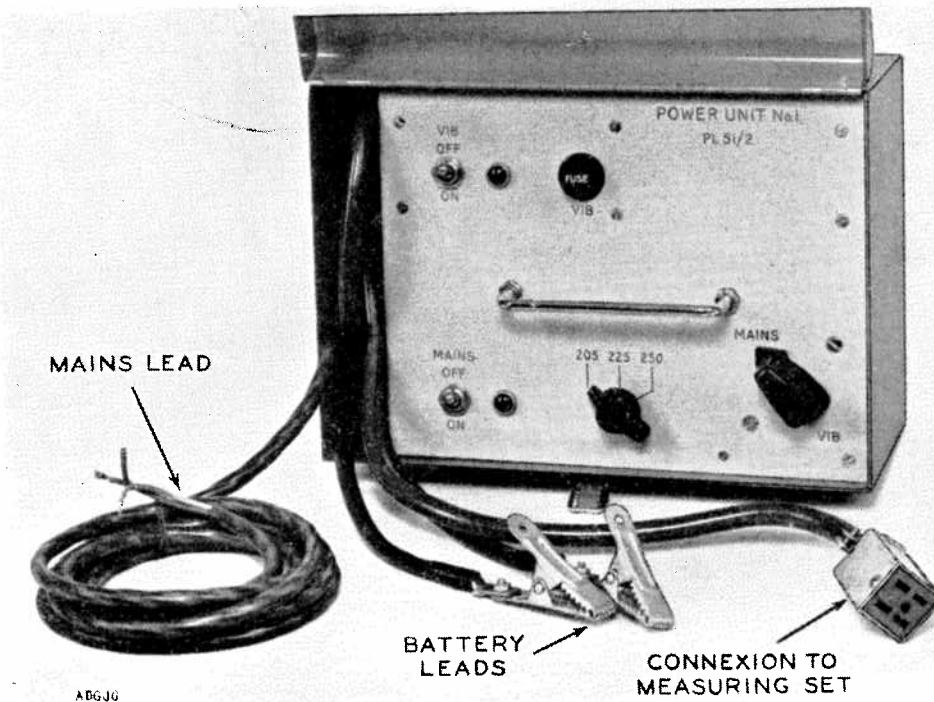


FIG. 2—POWER-UNIT No. 1

third position. Further rotation of the switch puts the set into the measuring condition, at first with full attenuation inserted, and then with progressive reduction of attenuation until, on the last step, the inserted attenuation is zero. The beat-frequency switch (S4), located under the tuning dial, is arranged to disconnect the meter when it is switched to the ON position.

9. Frequency range.—The frequency range covered is 150 kc/s.—30 Mc/s. with a gap from 400 kc/s. to 550 kc/s. about the intermediate frequency of 450 kc/s. The range is covered in five bands as follows:—

Range 1—150 kc/s. to 400 kc/s.

Range 2—550 kc/s. to 1.5 Mc/s.

Range 3—1.5 Mc/s. to 4.0 Mc/s.

Range 4—4.0 Mc/s. to 11.0 Mc/s.

Range 5—11.0 Mc/s. to 30.0 Mc/s.

10. Correction Curves.—Individual voltage and field-strength correction curves are not provided for each measuring set, but all sets are within ± 2 db. of the mean correction curves shown in Fig. 3. The instrument is calibrated on voltage measurements to allow for the 6-db. loss in the measuring head or in the isolating unit caused by the 75-ohm resistor in each being in series with the measuring set input-impedance of 75 ohms.

11. The image rejection is not less than 60 db. on Range 1, falling to 4 db. at 30 Mc/s.

12. Power-unit No. 1.—The power consumption of the measuring set is 4.1 amp. at 6.3 volts and 80 mA. at 215 volts. This power is supplied by the "Power-unit No. 1" which can be operated from 200/250-volt, 50 c/s. A.C. mains or a 6-volt car battery.

13. Measuring heads are used to make measurements of interference on the mains when the current taken by the appliance under test exceeds the rating of the isolating units. The circuit of a measuring head (see Fig. 6) provides a 150-ohm impedance between one line of the mains and earth. The interference voltage on the line is measured across this impedance.

14. Isolating units.—The isolating units

(a) provide a means of connecting the measuring set to the mains terminals of the appliance under test, and block the supply voltage from the measuring set

(b) provide a standard measuring impedance of 150 ohms between each line of the mains and earth

(c) ensure that the standard measuring impedance of 150 ohms is not modified by the impedance looking back into the supply mains

(d) filter out any R.F. voltages coming in on the supply mains.

"Units, Isolating, R.F., No. 1A" have a current rating of 5 amp. and are designed for use when making measurements in the frequency band 150 kc/s. to 8 Mc/s. "Units, Isolating, R.F., No. 1B" are similar except that they cover the frequency band 8 Mc/s. to 30 Mc/s.

15. It should be noted that measurements are made of the two "line voltages" instead of the "symmetrical" and "asymmetrical" voltages which were measured with earlier designs of interference-measuring sets, e.g. "Tester, WL 30487." The two types of measurements are not related in a fixed manner, and the older terms "symmetrical" and "asymmetrical" should no longer be used.

16. Mechanical description.—Details of the size and weight of the measuring set and its associated equipment are given in Table 1.

TABLE 1

Equipment	Dimensions in inches			Weight
	Width	Depth	Height	
Measuring Set, R.I., No. 1	12	20	8½	42 lb. approx.
Power-unit No. 1	12	8	5	23 lb.
Measuring head	2½	5½	1¾	10 oz.
Unit, Isolating, R.F., No. 1A	5½	13½	4	9¾ lb.
Unit, Isolating, R.F., No. 1B	7½	10¼	4½	7 lb.

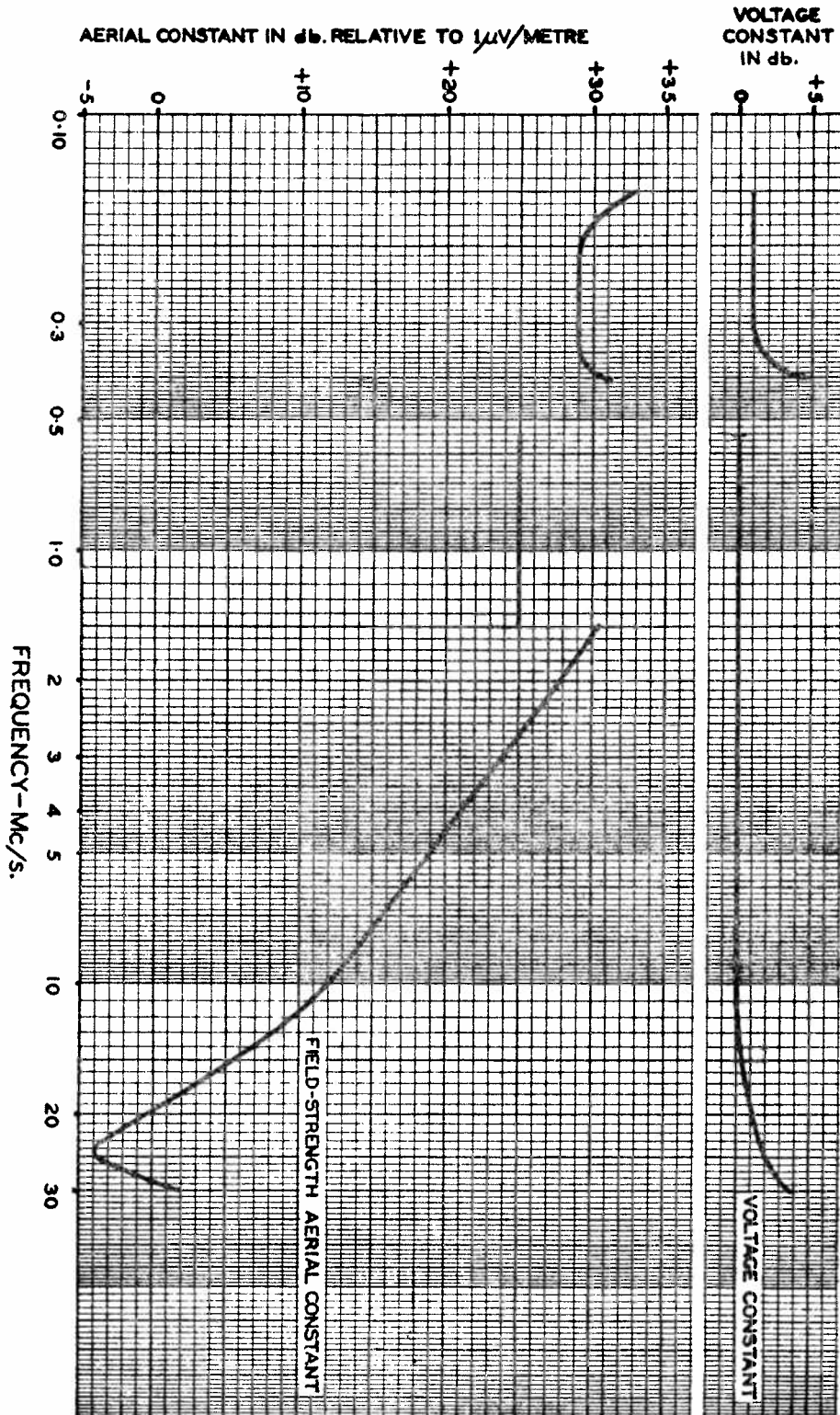


FIG. 3—VOLTAGE AND FIELD-STRENGTH CORRECTIONS
Field-strength correction taken with the battery on ground and with base of receiver 2 ft. 6 in. above ground level. For a receiver height of less than 2 ft. 6 in., the aerial constant should be increased by 2 db. per foot reduction in height.

17. The measuring set is screened to prevent stray pick-up and is contained in a sheet-metal box which provides additional screening. When the set is not in use the front panel is covered by a deep removable lid. The aerial rods are kept in the compartment on the side of the measuring set.

OPERATION

18. **Preparation for use.**—The equipment should be set up as follows:—

- (a) Place the measuring set and power-unit so that they are not touching each other
- (b) Check that
 - (i) the MAINS/VIB switch on the power-unit is in the OFF position
 - (ii) the MAINS ON/OFF switch on the power-unit is at the OFF position
 - (iii) the attenuator switch on the measuring set is to ADJUST
 - (iv) the B.F.O. switch on the measuring set is in the OFF position
- (c) Connect the power-unit to the measuring set with the power-unit lead terminated in a 'Jones' 4-way socket
- (d) Connect the power-unit to the A.C. mains supply or 6-volt battery as required, using the appropriate lead. If a mains supply is to be used adjust the power-unit switch to the correct voltage setting
- (e) For battery operation, switch on the power-unit by turning the rotary switch to VIB. The appropriate pilot light should glow
- (f) For mains operation, turn the power-unit rotary switch to MAINS and switch on the power-unit by operating the toggle-switch. The appropriate pilot light should glow.

NOTE:—No On/Off switch is provided on the measuring set itself, the supply being controlled at the power unit.

(g) Turn the RANGE switch to the frequency range required and the frequency control to the frequency required.

19. The frequencies to be used for routine R.F. "noise" measurement are normally 210 kc/s., 1 Mc/s., 8 Mc/s., 15 Mc/s., and 25 Mc/s. When making field-strength measurements of R.F. noise it may be necessary to vary the frequencies very slightly, to avoid reception of radio transmissions.

20. **Preliminary adjustments.**—The set should be switched on and left for at least ten minutes before the following adjustments are made:—

- (a) With the attenuator switch to ADJUST, turn the ADJUST control to bring the meter needle to the ADJ mark
- (b) With the attenuator switch to SET ZERO, turn the SET ZERO control to bring the meter needle to the ZERO mark
- (c) With the attenuator switch to CAL, adjust the CALIBRATE control to set the meter needle to the CAL mark.

R.F. NOISE VOLTAGE MEASUREMENTS

21. **Connexion of appliance.**—If the measurement is being made to confirm that an appliance complies with a specific regulation, e.g. B.S. 800 "Limits of Radio Interference," the measurement should be made as required by the regulation. Fig. 4 shows the method of connecting the appliance and measuring set as laid down in B.S. 727 : 1954 ; this method is called for in B.S. 800 : 1954. Two methods of connecting an appliance to the isolating unit are shown, one method for appliances whose frame or case is earthed and the other for appliances whose frame or case is not intended to be earthed, e.g. all-insulated or double-insulated appliances. The leads (a), (b) and (c) to an earthed appliance, or (a) and (b) to a non-earthed appliance should be the flexible cable supplied with the appliance. The earth lead (c) to the earth-capacitance plate should be a separate lead not more than 9 in. long. If the appliance is of the fixed or solidly earthed type the leads (a), (b) and (c) should be not more than 9 in. long. A non-earthed appliance should be placed on an earth-capacitance plate, which may have an insulating covering to prevent unwanted short-circuits during

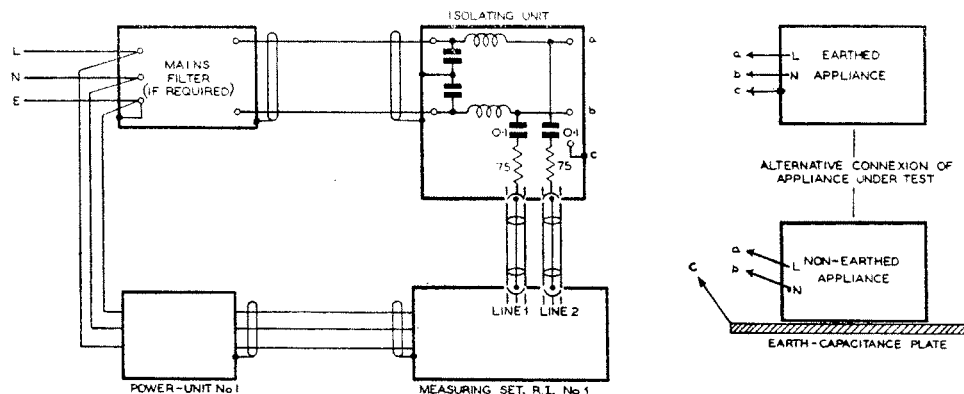


FIG. 4—ARRANGEMENT FOR NOISE-VOLTAGE MEASUREMENT

testing work. The plate should extend at least 12 in. on all sides beyond the projection of the appliance upon it. The mains filter is only required if the mains noise is high in relation to the noise being measured and is insufficiently filtered by the isolating unit. Before the isolating unit, which should be appropriate to the frequency range concerned, is connected to the mains, it should be confirmed that the mains switch on the isolating unit is in the OFF position.

22. The method of making a voltage measurement, after setting up the equipment (par. 18) and making the preliminary adjustments (par. 20), is as follows:—

- (a) Switch on the appliance under test by means of the double-pole switch on the isolating unit
- (b) Turn the VOLTAGE/FIELD STRENGTH switch on the measuring set to LINE 1
- (c) Turn the attenuator control step by step in a clockwise direction, i.e. gradually reduce the amount

TABLE 2—RELATIONSHIP BETWEEN VOLTAGES EXPRESSED IN DECIBELS RELATIVE TO 1 MICROVOLT AND MICROVOLTS

Voltages expressed in db. relative to 1 μ V.		Microvolts		Voltages expressed in db. relative to 1 μ V.		Microvolts		Voltages expressed in db. relative to 1 μ V.		Microvolts	
0	=	1.0		41	=	112		81	=	11,200	
1	=	1.1		42	=	126		82	=	12,600	
2	=	1.3		43	=	141		83	=	14,100	
3	=	1.4		44	=	158		84	=	15,800	
4	=	1.6		45	=	178		85	=	17,800	
5	=	1.8		46	=	200		86	=	20,000	
6	=	2.0		47	=	224		87	=	22,400	
7	=	2.3		48	=	251		88	=	25,100	
8	=	2.5		49	=	282		89	=	28,200	
9	=	2.8		50	=	316		90	=	31,600	
10	=	3.2		51	=	355		91	=	35,500	
11	=	3.6		52	=	398		92	=	39,800	
12	=	4.0		53	=	447		93	=	44,700	
13	=	4.5		54	=	501		94	=	50,100	
14	=	5.0		55	=	562		95	=	56,200	
15	=	5.6		56	=	631		96	=	63,100	
16	=	6.3		57	=	708		97	=	70,800	
17	=	7.1		58	=	794		98	=	79,400	
18	=	7.9		59	=	891		99	=	89,100	
19	=	8.9		60	=	1,000		100	=	100,000	
20	=	10.0		61	=	1,120		101	=	112,000	
21	=	11.2		62	=	1,260		102	=	126,000	
22	=	12.6		63	=	1,410		103	=	141,000	
23	=	14.1		64	=	1,580		104	=	158,000	
24	=	15.8		65	=	1,780		105	=	178,000	
25	=	17.8		66	=	2,000		106	=	200,000	
26	=	20.0		67	=	2,240		107	=	224,000	
27	=	22.4		68	=	2,510		108	=	251,000	
28	=	25.1		69	=	2,820		109	=	282,000	
29	=	28.2		70	=	3,160		110	=	316,000	
30	=	31.6		71	=	3,550		111	=	355,000	
31	=	35.5		72	=	3,980		112	=	398,000	
32	=	39.8		73	=	4,470		113	=	447,000	
33	=	44.7		74	=	5,010		114	=	501,000	
34	=	50.1		75	=	5,620		115	=	562,000	
35	=	56.2		76	=	6,310		116	=	631,000	
36	=	63.1		77	=	7,080		117	=	708,000	
37	=	70.8		78	=	7,940		118	=	794,000	
38	=	79.4		79	=	8,910		119	=	891,000	
39	=	89.1		80	=	10,000		120	=	1,000,000	
40	=	100.0									

of attenuation, until the meter needle moves on to the working part of its scale. The measuring set will now indicate the r.f. voltage developed across 150 ohms between the line concerned and 'earth'. This voltage will be given, in db relative to 1 μ V, by the sum of the attenuator and meter readings, e.g. if the attenuator setting is 50 db and the meter reading 4 db then the voltage is + 54 db relative to 1 μ V (i.e. 500 μ V). For convenience, the relationship between voltages expressed in db relative to 1 microvolt and microvolts is given in Table 2.

(d) Note the r.f. voltage determined according to (c).

(e) Insert maximum attenuation.

(f) Turn the VOLTAGE/FIELD STRENGTH switch to LINE 2.

(g) Repeat for Line 2 the procedure given in (c) and (d).

(h) Insert maximum attenuation and switch off appliance under test at the isolating unit.

(j) Repeat the preliminary adjustments and the above procedure for each other frequency at which voltage measurements are required, having suitably adjusted the frequency-range switch and the tuning dial and having changed the isolating unit when necessary.

NOTE:—It is important to remember that the preliminary adjustments (par. 20) must be repeated for each frequency at which measurements are required.

23. Use of measuring heads.—The two measuring heads supplied with the Measuring Set, R.I., No. 1 are not required except when the appliance under test takes more than 5 amp, which is the maximum

current rating of Units, Isolating, R.F., No. 1A and 1B. If this is the case, a suitable filter should be built up, using inductors having the required current rating, for insertion in the supply to the appliance under test. The measuring heads should then be connected between each line and earth on the appliance side of the filter. This arrangement is in effect an isolating unit and should be treated as such when making measurements. The measuring heads can be used without a filter, if it is not possible to insert a filter in the supply.

FIELD-STRENGTH MEASUREMENTS

24. When field-strength measurements are made with the rod-aerial, the battery must be placed directly on the ground, the set being raised to a height of 2 ft. 6 in. by means of any convenient support (which may be conducting or otherwise). It should be noted that the calibration supplied (Fig. 3) is only applicable if the battery is placed directly on the ground. Incorrect results will be obtained if, for example, the battery is placed on a wooden floor. No earthing conductor should be used and the nature of the 'ground', e.g. dry concrete or wet soil, on which the battery is placed makes little difference to the result. Quantitative measurements of field strength cannot be made inside the average dwelling house which has a wooden floor.

25. If the tests are being made to confirm that the appliance complies with a specific regulation, e.g. B.S. 800, the measurement should be made as required by the regulation concerned. Fig. 5 shows the method of connecting the apparatus under test laid down in B.S. 727 : 1954; this method is called for in B.S. 800 : 1954. The conditions applying to the two methods of connecting the appliance to the isolating unit, length of leads and the need for a mains filter are the same as those given in par. 21.

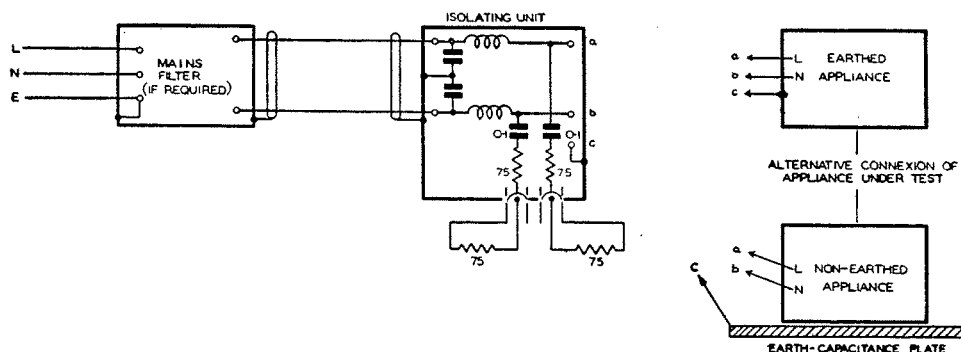


FIG. 5. ARRANGEMENT FOR NOISE-FIELD MEASUREMENT

26. After setting up the equipment (par. 18) and making the preliminary adjustments (par. 20), the method of making field-strength measurements is as follows:—

(a) Turn the VOLTAGE/FIELD STRENGTH switch to INSERT AE ROD.

(b) Insert the rod-aerial.

(c) Turn the attenuator control step by step in a clockwise direction (i.e. gradually reduce the amount of attenuation) until a reading is observed on the meter.

(d) If it is desired to measure the field strength of a radio transmission, or a fundamental or harmonic of a radiation from, say, valve diathermy equipment, the measuring set must be tuned accurately to the frequency concerned. As this is being done it will be necessary to increase the attenuation to keep the meter needle on its scale. If the field strength of radiated 'noise' is to be measured, care must be taken that the measuring set is tuned to a frequency clear of radio transmissions.

(e) When the measuring set has been correctly tuned and the attenuator has been adjusted to give a satisfactory meter reading, the field strength, in db relative to $1 \mu\text{V}/\text{metre}$, will be given by the sum of the attenuator and meter readings plus the field-strength correction factor indicated in Fig. 3. For example, if the attenuator setting is 40 db, the meter reading 4 db, and the correction factor 10 db, then the field strength is $40 + 4 + 10 = +54$ db relative to $1 \mu\text{V}/\text{metre}$ (i.e. $500 \mu\text{V}/\text{metre}$). *The headphones should not be worn or connected while field-strength measurements are being made.*

(f) Insert maximum attenuation and remove the rod-aerial. The rod-aerial should always be removed before adjusting the CALIBRATE control. When making measurements of high field strengths on the higher frequency ranges the input selector switch should be switched to the LINE 1 or LINE 2 position, in addition to removing the rod-aerial, while preliminary adjustments are being made.

(g) Repeat the preliminary adjustments (par. 20) and the above procedure for each frequency at which measurement is to be made.

27. *Comparative field-strength checks* (at the same frequency) may be made using any convenient aerial system, and may be undertaken in the R.I. Car (M).

28. **Method of measuring interference voltages or field strengths of a discontinuous nature.**—Discontinuous interference, i.e. interference of the 'impulse' type, is usually caused by the operation of thermostats and switching contacts.

29. When measuring the voltage or field strength of discontinuous interference, it is essential for each recorded result to be the mean of (say) a dozen peak readings of successive clicks. If tests are being made to determine whether interference exceeds the limits specified in, for example, B.S. 800 'Limits of Radio Interference,' the method laid down in that standard for assessing the test results should of course be observed.

30. Provided the meter reading does not exceed full-scale deflexion, the set cannot be overloaded and false readings will not be obtained. A practice should always be made of inserting more attenuation than is necessary, and then reducing the attenuation until a suitable reading is obtained.

31. Measurements logged should be the final answer, i.e. the calibration constant should be added to the sum of attenuator and meter readings, and only the overall total should be recorded. When making 'line' voltage measurements it is normally only necessary to record the higher of the two readings obtained at each frequency. All measurements should be recorded and the results of measurements made for outside bodies or firms should be forwarded to the Eng. Dept. (WT2/3) before the information is passed to the outside bodies concerned.
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32. **Use as a radio receiver.**—The measuring set may be used for the reception of radio signals, though it is not designed for this purpose, and in fact some of its characteristics, e.g. the wide band-width necessary for measuring r.f. 'noise', are not ideal for this purpose. The measuring set should be roughly adjusted as described in par. 20 in order that it shall be used in a stable condition. The attenuator control should be used as a gain control. To enable c.w. signals to be received a beat-frequency oscillator has been provided, and may be brought into use by operating the B.F.O. toggle switch.

MAINTENANCE

★33. **Repairs.**—Local arrangements should be made for the prompt repair of minor faults and the replacement of faulty valves. Whenever possible, simple faults in the measuring sets (i.e. those not entailing replacements of main components) should be rectified by the investigation officer. No attempt should be made to re-align the measuring set or alter the adjustment of the i.f. transformers. If a complete overhaul is considered necessary, the measuring set complete with valves, measuring heads, coaxial leads and rod aerial should be returned under maintenance exchange procedure.

34. Access to components.—The chassis should be removed from its case as follows:—Remove lid, undo screws at the sides of the front panel, and pull off the cover. The valves now exposed are those of the i.f. and later stages. The r.f. local oscillator and frequency-changer valves are situated beneath the front right-hand cover which should be removed as follows:—Remove the VOLTAGE/FIELD-STRENGTH switch rod by unscrewing the fixing screws in the rod connector, undo the four screws which hold the cover and keep in position the coaxial lead connected to the ADJUST control, then remove the cover. Access to the underside of the chassis is obtained by undoing the screws and removing the screening cover. The noise-generator valve which is situated in the compartment behind the r.f. stage can then be reached.

35. Voltage readings.—It can be seen from Fig. 6 that test points are provided in the cathode circuits of most of the valves in the measuring set. These test points are brought out on the top side of the chassis beside the valve concerned, access being obtained as described in par. 34. Table 3 gives the voltages between these test points (positive) and chassis (negative) which should be obtained with a Meter, Multi-range, No. 3 if the valves are operating correctly.

made to have the calibration checked as early as possible and a similar method should be followed for repairs when M.E. procedure is not considered necessary.

★37. Form A 343 should be completed in triplicate using a separate set of forms for each item to be checked and the requisition references should be serialized as laid down in STORES, General, B 0011. The delivery address should be that at which the equipment can be collected and to which it should be returned after attention. The lines referring to coaxial line links, cable pairs and manufacturers are not applicable to radio interference equipment. After completion of the forms, the C copy should be retained and the A and B copies sent to Birmingham Test Section (Group 72), Fordrough Lane, Birmingham, 9 (Tele. No. Birmingham VICToria 2361, Extn. 158).

Collection and delivery will then as far as possible be arranged by the Test Section, which has at its disposal vehicles suitable for the transport of test equipment without the need for special packing.

The A copy will be retained by the Test Section and a

TABLE 3. TEST VOLTAGE READINGS

Test point	Voltage range on meter	Test voltage	Remarks
V3	10	1.8	
V4	10	1.45	
V6	100	6	CALIBRATE control at max. gain
V6	100	14.5	„ „ „ min. „
V7	100	14	„ „ „ max. „
V7	100	19	„ „ „ min. „
V8	10	1.5	
V10	10	0.84	Attenuator switch set to 80 db
V11	10	0.2	

★36. **Calibration check.**—It is advisable that the calibration of the measuring set should be checked at intervals. The officer holding the equipment is responsible for initiating the request for calibration on form A 343, at intervals not exceeding 18 months. If any doubt exists as to the accuracy of calibration between successive checks, arrangements should be

receipt for the set will be given by the driver on the back of the C copy when the set is collected.

★38. Where no attention other than the calibration check is found to be necessary, the set will, in normal circumstances, be returned within 14 days of its collection; more urgent attention should be arranged by telephone in an emergency.

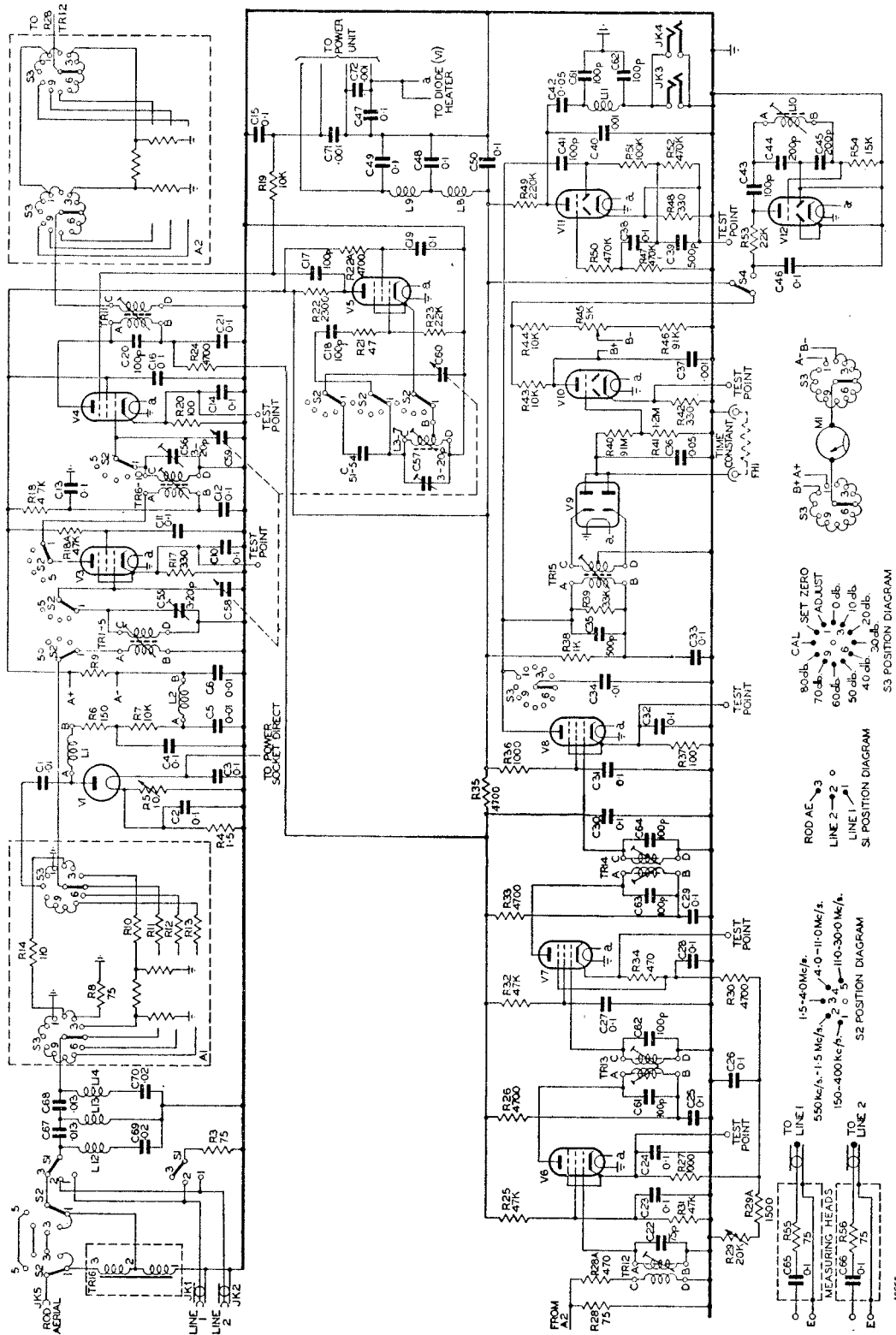


FIG. 6. MEASURING SET, R.I., No. 1

TABLE 4—LIST OF COMPONENTS (see Fig. 6)

<i>Cct. Ref.</i>	<i>Description</i>
R3	Resistor $75 \Omega \pm 2\%$, $\frac{1}{4}$ W.
R4	„ $1.5 \Omega \pm 10\%$, 4W.
R5	Potentiometer 10 Ω
R6	Resistor $150 \Omega \pm 2\%$, 1W.
R7	„ $10K \Omega \pm 10\%$, 2W.
R8	„ $75 \Omega \pm 2\%$, $\frac{1}{4}$ W.
R9	„ wound to suit meter
R10-14	„ $110 \Omega \pm 5\%$, $\frac{1}{4}$ W.
R17	„ $330 \Omega \pm 10\%$, $\frac{1}{4}$ W.
R18	„ $4.7K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R18A	„ $47K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R19	„ $10K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R20	„ $100 \Omega \pm 10\%$, $\frac{1}{4}$ W.
R21	„ $47 \Omega \pm 10\%$, $\frac{1}{4}$ W.
R22	„ $2.3K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R22A	„ $4.7K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R23	„ $22K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R24	„ $4.7K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R25	„ $47 K \Omega \pm 5\%$, $\frac{1}{2}$ W.
R26	„ $4.7K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R27	„ $1K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R28	„ $75 \Omega \pm 2\%$, $\frac{1}{4}$ W.
R28A	„ $470 \Omega \pm 10\%$, $\frac{1}{4}$ W.
R29	Potentiometer 20K Ω
R29A	Resistor $1.5K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R30	„ $4.7K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R31	„ $47K \Omega \pm 5\%$, $\frac{1}{2}$ W.
R32	„ $47K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R33	„ $4.7K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R34	„ $470 \Omega \pm 10\%$, $\frac{1}{4}$ W.
R35	„ $4.7K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R36	„ $1K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R37	„ $100 \Omega \pm 10\%$, $\frac{1}{4}$ W.
R38	„ $1K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R39	„ $33K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R40	„ $9.1M \Omega \pm 5\%$, $\frac{1}{4}$ W.
R41	„ $1.2M \Omega \pm 5\%$, $\frac{1}{4}$ W.
R42	„ $330 \Omega \pm 10\%$, $\frac{1}{4}$ W.
R43	„ $10K \Omega \pm 10\%$, 1W.
R44	„ $10K \Omega \pm 10\%$, 1W.
R45	Potentiometer 5K Ω , 3012/15 Colvern
R46	Resistor $91K \Omega \pm 5\%$, 1 W.
R47	„ $470K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R48	„ $330 \Omega \pm 10\%$, $\frac{1}{4}$ W.
R49	„ $220K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R50	„ $470K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R51	„ $100K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R52	„ $470K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R53	„ $22K \Omega \pm 10\%$, $\frac{1}{2}$ W.
R54	„ $15K \Omega \pm 10\%$, $\frac{1}{4}$ W.
R55	„ $75 \Omega \pm 2\%$, $\frac{1}{4}$ W.
R56	„ $75 \Omega \pm 2\%$, $\frac{1}{4}$ W.
C1	Capacitor $0.01 \mu F. \pm 15\%$, 350-V. working.
C2	„ $0.1 \mu F. \pm 25\%$, 150-V. „
C3	„ $0.1 \mu F. \pm 25\%$, 150-V. „
C4	„ $0.1 \mu F. \pm 25\%$, 250-V. „
C5	„ $0.01 \mu F. \pm 15\%$, 350-V.] „

TABLE 4—(continued)

Cct. Ref.	Description
C6	Capacitor 0.01 μ F. \pm 15%, 350-V. working
† { C10	0.1 μ F. \pm 20% } 350-V. "
C11	
C12	
C13	0.1 μ F. \pm 20%, 350-V. "
‡ C14	0.1 μ F. \pm 20%, 350-V. "
§ C15	0.1 μ F. \pm 20%, 350-V. "
§ C16	0.1 μ F. \pm 20%, 350-V. "
C17	100 ρ F. \pm 10%, 500-V. "
C18	100 ρ F. \pm 10%, 500-V. "
§ C19	0.1 μ F. \pm 20%, 350-V. "
C20	100 ρ F. \pm 10%, 500-V. "
‡ C21	0.1 μ F. \pm 20%, 350-V. "
C22	75 ρ F. \pm 10%, 500-V. "
† { C23	0.1 μ F. \pm 20% } 350-V. "
C24	
C25	
C26	0.1 μ F. \pm 20%, 350-V. "
† { C27	0.1 μ F. \pm 20% } 350-V. "
C28	
C29	
C30	0.1 μ F. \pm 20%, 250-V. "
† { C31	0.1 μ F. \pm 20% } 350V. "
C32	
C33	
C34	0.01 μ F. \pm 15%, 350-V. "
C35	500 ρ F. \pm 10%, 350-V. "
C36	0.05 μ F. \pm 10%, 250-V. "
C37	0.001 μ F. \pm 15%, 350-V. "
C38	0.1 μ F. \pm 20%, 150-V. "
C39	500 ρ F. \pm 10%, 350-V. "
C40	0.001 μ F. \pm 10%, 350-V. "
C41	100 ρ F. \pm 10%, 500-V. "
C42	0.05 μ F. \pm 20%, 350-V. "
C43	100 ρ F. \pm 10%, 500-V. "
C44	200 ρ F. \pm 15%, 350-V. "
C45	200 ρ F. \pm 15%, 350-V. "
† { C46	0.1 μ F. \pm 20% } 350-V. "
C47	
C48	
C49	0.1 μ F. \pm 20%, 350-V. "
C50	0.1 μ F. \pm 20%, 350-V. "
C51	150 ρ F. \pm 2%
C52	470 ρ F. \pm 2%
C53	1500 ρ F. \pm 2%
C54	3400 ρ F. \pm 2%
C55	3-20 ρ F.
C56	3-20 ρ F.
C57	3-20 ρ F.
C58	10-365 ρ F. } 3-gang
C59	10-365 ρ F. }
C60	10-365 ρ F. }

† in one container
‡ C14, C21 in one container
§ C15, C16, C19 in one container

TABLE 4—(continued)

<i>Cct. Ref.</i>	<i>Description</i>
ϕ C61	Capacitor 100 μ F. \pm 10%, 500-V. working
ϕ C62	„ 100 μ F. \pm 10%, 500-V. „
C63	„ 100 μ F. \pm 10%, 500-V. „
C64	„ 100 μ F. \pm 10%, 500-V. „
C65	„ 0.1 μ F. 750-V. working, 2250-V. test
C66	„ 0.1 μ F. 750-V. working, 2250-V. test
C67, 68	„ 0.013 μ F. \pm 10%
C69, 70	„ 0.02 μ F. \pm 10%
C71, 72	„ 0.001 μ F. \pm 15%, 350-V. working
V1	Valve CV 172
V3-5	„ CV 1091
V6-7	„ CV 1053
V8	„ CV 1065
V9	„ CV 1054
V10-12	„ CV 587
TR1-15	Transformer (see Dgm. WL 22532 for details)
TR16	Aerial transformer assembly, Type EX 42200/14
L1-10	Inductance
ϕ L11	Choke 18 mH. } See Dgm. WL 22532
L12	Inductance 200 μ H. \pm 5% } for details
L13	„ 60 μ H. \pm 5%
L14	„ 200 μ H. \pm 5%
M1	Decibelmeter No. 13
S1	Input selector switch 3-posn., 4-pole, 1-bank
S2	Frequency range switch { 5-posn., 1-pole, 7-bank
S3	Attenuator switch 12-posn., 1-pole, 7-bank
S4	B.F.O. switch
JK1	Coaxial socket JS/1/PF
JK2	„ „ JS/1/PF
JK3	Jack Igranic P73
JK4	„ „
JK5	Aerial socket
A1	Attenuator R.F. } See Dgm. WL 22533
A2	„ I.F. } for details
FH1	Fuse-holder, L356/MF., Belling-Lee (see par. 7)

ϕ Fitted on sets with serial number 81 and upwards

NOTE:—There is no V2. It was removed during development, together with certain other components.

References:—None
(WP2/3) (N.P. 8.1.)

END

MEASURING SET, R.I., NO. 1

Description, Operation and Maintenance

[Amendment to pars. 7, 31 and Author Branch]

Par. 7, *last line* "Eng. Dept. (WP2/3)" *is replaced by* "THQ (NP8.1)"

Par. 31, *penultimate line* "Eng. Dept. (WI2/3)" *is replaced by* "Ministry of Posts and Telecommunications (TRRD/TU)"

Author Branch "WP2/3" *is replaced by* "NP8.1"

[The main Instruction should be suitably annotated]

