WAVEMETER
CLASS D No. 2

Working Instructions

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Working Instructions

CHAPTER I . . . GENERAL DESCRIPTION.

1. Purpose and facilities.

The Wavemeter Class D No. 2 is a portable heterodyne wavemeter (Figs. 1 and 2).

It is designed for adjusting senders and receivers to particular frequencies and for checking frequency calibration of these sets.

The instrument can also be used as an absorption wavemeter, utilising a magic eye type valve indicator. This section of the wavemeter can be used for checking roughly the frequencies of a nearby sender.

NOTE—The Wavemeter Class D No. 2 is similar to the Wavemeter Class D No. 1 but the difficulty experienced when using the latter in choosing the right frequency from the large number emitted has been eliminated.

2. Frequency range.

The frequency band covered is 1.2 to 19.2 Mc/s in four ranges :

Range	I.	1.2—2.4 Mc/s (Basic frequency shown on the dials).
„	II.	2.4—4.8 Mc/s (Basic frequency x 2)
„	III.	4.8—9.6 Mc/s („ „ x 4)
„	IV.	9.6—19.2 Mc/s („ „ x 8)

3. Power supply.

The power supply for the wavemeter is obtained from either a 12 volt secondary battery or from 40–60 c/s A.C. mains of a range of voltages between 100 and 250. These are 100, 110, 120, 150, 160, 170, 200, 210, 220, 230, 240 and 250. For battery operation a vibrator is used to energise the mains transformer through an additional winding, the A.C. H.T. output being rectified by full wave rectifier which performs the same function on A.C. mains operation.

The valve heaters are supplied, through individual series resistances direct from the 12 V battery on D.C. operation and from the heater transformer winding on A.C.

The consumption on D.C. and A.C. is approximately 36 watts.

4. Construction.

The wavemeter components, valves, etc., are mounted on a steel chassis which slides into a metal case and is held in position by screws located round the front panel.

Two desiccators are mounted below the front panel. These desiccators turn pink when renewal is required.

Also below the front panel is a drawer which contains the calibration tables for the wavemeter.

In the lid of the wavemeter are two small boxes. One of these contains headphones, A.C. connector, and D.C. connector. The other contains the necessary spare valves, desiccators, vibrator, lamps, fuse wire and carrier.

5. Weight and dimensions.

TABLE I—WEIGHT AND DIMENSIONS

	Weight lb.	Width in.	Height in.	Depth in.
In metal case	61	18¾	12½	12½

CHAPTER II . . . . . OPERATION

6. Preliminary

(1) Remove the power panel cover at left hand side of front panel (Fig. 2) and see that the A.C./D.C. plug is inserted in the correct socket for the type of supply used (Figs. 1 and 3).

(2) For A.C. operation adjust taps to mains voltage used.

Note:—The +10 and +20 V taps are additive to the mains taps, e.g. for a supply of 170 V use 150 and +20 taps.

(3) Replace cover keeping gasket perfectly flat and securely tighten screws.

(4) For A.C. operation remove lead from box in lid of instrument (Fig. 1) and insert socket in A.C. INPUT plug on front panel connecting other end to main supply.

(5) For D.C. operation remove lead from box in lid of instrument (Fig. 1) and insert socket in 12 V D.C. plug on front panel, connecting other end to 12 volt battery with polarity as indicated.

Note:—When A.C. mains supply is not available it is preferable to use a 12 volt battery and not to use A.C. supplies such as are provided by petrol generators. If no other supply is available, however, it should be noted that the fluctuating voltage will adversely affect the accuracy of the wavemeter.

(6) Set the ON/OFF switch to ON.
(7) Plug in headphones.
(8) Set CALIBRATING dial to 0 and SWITCH A to SET ZERO position.
(9) Unlock and adjust SET ZERO control until a whistle is heard, and adjust to zero beat; then re-lock, care being taken in locking not to disturb the setting of the SET ZERO control.
As the frequency may drift slightly during operation this adjustment should be checked at intervals. This is very important during the first 15 minutes of operation.
(10) Rotate the CALIBRATING dial to 100 and check that zero beat is obtained at this setting. If zero beat does not exactly coincide with the 100 mark (providing the error does not exceed 2 kc/s) unlock the SET ZERO control and adjust so that the error is divided equally at both ends of the scale, *e.g.* if the SET ZERO is adjusted accurately at 0 and it is found when the dial is rotated zero beat appears at 99 on the scale re-adjust the SET ZERO control until zero beat is obtained at 99½ and lock.

IMPORTANT NOTE.

After setting the wavemeter with the SWITCH A in the SET ZERO or CALIBRATING OSCILLATOR position always press the PRESS TO CHECK button; this should cause the frequency of the beat note to change slightly, confirming that the latter has been derived from the calibrating section of the wavemeter and not from any other source.

7. To determine the frequency to which the wavemeter has been set.

Note:—It is assumed that the dial has already been checked for "SET ZERO," see Sec. 6 above.

(1) Note the readings of the MAIN and CALIBRATING dials. The MAIN dial reads the whole basic frequency approximately and the CALIBRATING dial reads accurately the last two figures of the basic frequency.

Example (*a*) MAIN dial reading 1.65 ? (*see Fig.* 7A) as the last two figures (5 ?) cannot be read accurately on the main dial, they are read on the CALIBRATING dial which will show, say 51. The *true* MAIN dial reading is then 1.651.

Example (*b*) MAIN dial reading 2.23 ? (*Fig.* 7B) Again the last two figures are read on the CALIBRATING dial, which in this case will show, say 29. The true MAIN dial reading is then 2.229.

Example (*c*) When working at or near frequencies that are multiples of 100 kc/s, slight calibration errors in

the main oscillator may cause ambiguities, *i.e.* CALIBRATING dial reading 98. (*see Fig* 7C). In this case the true MAIN dial reading would be 1.998.
If however the
CALIBRATING dialreading was 8 (*Fig.* 7D (the *true* MAIN dial reading in this example would be 2.008.

(2) On RANGE I the readings given on the MAIN and CALIBRATING dials give the actual frequency in Mc/s (basic frequency).

Example (d) MAIN dial reading 1.71 ? (*Fig.* 7E).
CALIBRATING dial reading 18.
True MAIN dial reading 1.718 Mc s.

Example (e) MAIN dial reading 1.74 ?
CALIBRATING
dial reading 41 41¼ 41½ 41¾
True MAIN
dial reading 1.741 1.74125 1.7415 1.74175 Mc/s
Closer reading of the CALIBRATING dial than to ¼, ½ or ¾
should not be attempted.

(3) For ranges II, III and IV first find in Col. 1 the basic frequency as given on the dials. The method of doing this is as in the above examples. Then read across from this basic frequency to the figure of the RANGE switch and the figure quoted will be the true frequency.

Note :—If it is found that the CALIBRATING dial is set to ¼ more than the nearest figure given in the calibrating tables, add to the frequency so found :—
½ kc/s for range II
1 kc/s for range III.
2 kc/s for range IV.

Example (*f*) MAIN dial reading 1.74 ? (See Fig. 7F)
CALIBRATING dial reading 45
True MAIN dial reading 1.745 (Basic frequency)
RANGE switch set to range III
From tables, required frequency is 6.980 Mc/s

Example (*g*) MAIN dial reading 1.72 ? (Fig. 7G)
CALIBRATING dial reading 29½
True MAIN dial reading 1.7295 (Basic frequency)
RANGE switch set to range IV
From tables, required frequency is 13.836 Mc/s

Example (*h*) MAIN dial reading 1.74 ? (see Fig. 7H)
CALIBRATING dial reading 42¼
True Main dial reading 1.742¼ (Basic frequency)

RANGE switch set to range II
From tables, read across to figure shown opposite 1.742 (Basic frequency) under RANGE II and the frequency shown is 3.484.
To this add 0.5 kc/s and the required frequency is 3.4845 Mc/s.

Example (*j*) MAIN dial reading 1.70? (see Fig. 7J)
CALIBRATING dial reading $9\frac{3}{4}$
True MAIN dial reading $1.709\frac{3}{4}$ (Basic frequency)
RANGE switch set to range IV
From tables read across to figures shown opposite $1.709\frac{1}{2}$ (Basic frequency) under RANGE IV and the frequency shown is 13.676
To this add 2 kc/s, and the required frequency is 13.678 Mc/s

Example (*k*) MAIN dial reading 1.5—? (Fig. 7K)
CALIBRATING dial reading 12
True MAIN dial reading 1.512 (Basic frequency)
RANGE switch set to range IV
From tables read across to figures shown opposite 1.512 (Basic frequency) under RANGE IV and the frequency shown is 12.096 Mc/s.

Example (*l*) MAIN dial reading 1.5—? (Fig. 7L)
CALIBRATING dial reading $11\frac{1}{2}$ plus $\frac{1}{4}$ of a small division.
True MAIN dial reading $1.511\frac{1}{2}$ plus $\frac{1}{4}$ of a small division.
Actual frequency from tables for $1.511\frac{1}{2}$ (Basic frequency) is 12.092 Mc/s.
But for range IV $\frac{1}{4}$ of a division on the CALIBRATING dial is equal to 2 kc/s (see Fig. 7L).
Therefore actual frequency is 12.094 Mc/s.

8. To set the wavemeter to a given frequency.

(1) Set the SWITCH A to CALIBRATING OSCILLATOR position.

(2) Determine in which of the four ranges the required frequency lies and set the RANGE SWITCH accordingly.

(3) From the calibration tables (Fig. 1) find the required frequency under the column corresponding to the setting of the RANGE switch. Read across to Range 1 column where the appropriate basic frequency will be shown.

(4) Set the MAIN dial as closely as possible to the basic frequency so found.

(5) Set the CALIBRATING dial exactly to the basic frequency figures given in heavy type. If the required frequency lies between two tabulated figures then the CALIBRATING dial must be set as accurately as possible between the corresponding figures given in heavy type.

(6) Rock the MAIN dial backwards or forwards until that zero beat note is obtained which occurs at the closest setting to the original. The wavemeter is then set to the required frequency.

The following examples should make this clear:

Example (a) To set wavemeter to 1.934 Mc s (Fig. 7M)

(i) Set the RANGE SWITCH to I (1.2-2.4 Mc s) .034 Mc s (last 2 figures of the basic frequency) = 34 Kc s so

(ii) Set the CALIBRATING dial (marked from 0-100 Kc s) of the wavemeter to 34.

(iii) Set the SWITCH A to CALIBRATING OSCILLATOR.

(iv) Set the MAIN dial to 1.934 (as near as possible to the frequency desired) and using the wavemeter headphones adjust the MAIN control for zero beat.

Note :— The CALIBRATION control must always be set first so that the MAIN control may be accurately set by adjusting for zero beat.

Example (b) To set the wavemeter to 2.005 Mc/s (Fig. 7N) .005 Mc s = 5 Kc/s so

(i) Set the CALIBRATING dial of the wavemeter to 5.

(ii) See that the SWITCH A is at CALIBRATING OSCILLATOR and RANGE SWITCH is at I.

(iii) Set the MAIN dial to 2.005 (as near as possible) and using the wavemeter headphones adjust the MAIN control for zero beat.

For other frequencies higher than range I the calibration tables have to be used as in the following sequence of operations—as in the examples below.

IMPORTANT NOTE :

The MAIN reading is only approximate and the MAIN dial must be readjusted for zero beat in the headphones with the SWITCH A set at CALIBRATION OSCILLATOR after the CALIBRATION dial has been accurately set.

Example (c) To set the wavemeter to 3.415 Mc/s (Fig. 7P)

(i) Select the page with 3.4 on it by means of the thumb index.

(ii) The figures 3.415 will then be found under the range II column, so set the RANGE SWITCH to II which covers 2.4-4.8 Mc/s.

(iii) Opposite the figures 3.415 in the calibration table, under the basic frequency column, the basic frequency is shown as 1.707½ the last two figures being shown in heavy type.

(iv) See that SWITCH A is at CALIBRATING OSCILLATOR.

(v) Set the CALIBRATING dial to 7½.

(vi) Set the MAIN dial as near as possible to 1.707, and when a beat note is heard in the wavemeter headphones, carefully adjust the MAIN dial for zero beat note.

(vii) Press the CHECK button when the frequency of the beat note should change, confirming that it has been derived from the heterodyne section of the wavemeter and not from any other source.

Example (*d*) To set the wavemeter to 7.630 Mc/s (Fig. 7Q)

(i) Select the page with 7.6 on it by means of the thumb index.

(ii) The figures 7.630 will then be found under the range III column, so set the RANGE SWITCH to III which covers 4.8–9.6 Mc/s.

(iii) Opposite the figures 7.630 in the calibration table, under the basic frequency column, the basic frequency is shown as 1.907½ the last two figures being shown in heavy type.

(iv) See that SWITCH A is at CALIBRATING OSCILLATOR.

(v) Set the CALIBRATING dial to 7½.

(vi) Set the MAIN dial as near as possible to 1.907½, and when a beat note is heard in the wavemeter headphones, carefully adjust the the MAIN dial for zero beat note.

(vii) Press the CHECK button when the frequency of the beat note should change, confirming that it has been derived from the heterodyne section of the wavemeter and not from any other source.

Example (*e*) To set the wavemeter to 12.094 Mc/s (Fig. 7R).

(i) Select the page with the figures 12.0 on it by means of the thumb index.

(ii) The exact figures 12.094 will not be found under the range IV column, the nearest figures being 12.096 and 12.092. Set the RANGE SWITCH to IV which covers 9.6–19.2 Mc/s.

(iii) Opposite the figures 12.092 in the calibration table, under the basic frequency column, the basic frequency is shown as 1.511½ the last two figures being shown in heavy type.

(iv) See that SWITCH A is at CALIBRATING OSCILLATOR.

(v) Set the CALIBRATING dial to 11½.

(vi) Set the MAIN dial as near as possible to 1.511½, and when a beat note is heard in the wavemeter headphones, carefully adjust the MAIN dial for zero beat note.

(vii) Press the CHECK button when the frequency of the beat note should change, confirming that it has been derived from the heterodyne section of the wavemeter and not from any other source.

It will be seen from the last example that a slight error has been introduced (the answer is 2 Kc/s less than it should be). To compensate for this the CALIBRATING dial should have been set in (iii) above ¼ of a division more than given in the tables. It must be remembered, however, that if this alteration is made to the CALIBRATING dial the MAIN dial will have to be re-adjusted for zero beat with SWITCH A at CALIBRATING OSCILLATOR.

It is useful when interpolating to know that on :

Range I—the readings are direct

Range II—the readings given in the tables under Range II column are the result of multiplying Range I readings (basic frequency) by 2.

Range III—as for Range II but multiplied by 4.

Range IV—as for Range II but multiplied by 8.

9. To set a sender to a given frequency.

(1) Connect a length of insulated wire to the COUPLING terminal of the wavemeter and place it near to the output terminal of the sender.

(2) Set the wavemeter to the given frequency as in 8 above.

(3) Set the SWITCH A to ABS. W M and adjust the sender frequency until the magic-eye tuning indicator segment is a minimum.

Note :—By using the absorption section of the wavemeter for checking a strong signal, there is more certainty that the signal measured is the fundamental and not a harmonic. In addition to this the setting up of a sender is facilitated by the use of the absorption section, since a definite indication of the relative signal strength is given by the magic-eye. The coupling will require to be tighter for this section of the wavemeter than for the heterodyne section.

(4) To set the sender frequency accurately set SWITCH A to HET. W/M.

(5) Swing the sender frequency slightly each side of its present rough adjustment and when a whistle is heard in the headphones reduce the coupling as much as possible before finally trimming the sender frequency to zero beat.

Note :— Some wireless sets, e.g. Wireless Set No. 12, *have facilities for connecting a wavemeter—these should be used.*

10. To set a receiver to a given frequency.

(1) Connect a length of insulated wire to the COUPLING terminal of the wavemeter and place it near the aerial terminal of the receiver.

(2) Set the wavemeter to the required frequency as in 8 above.

(3) Set the SWITCH A to HET. W/M.

(4) *Using the minimum amount of coupling* adjust the receiver for normal C.W. reception, tuning it to the wavemeter frequency listening on *receiver* headphones or loudspeaker in a similar manner as that used for the reception of a sender.

Note :—The amount of a coupling will vary with different frequencies. With certain superheterodyne receivers a strong and a weak beat note may be heard at two settings of the dial. Use only that setting which gives the strongest signal. With Wireless Set No. 19 *the amount of coupling should not be so great that a "dip" is observed on the meter with the meter switch in position A.V.C.*

11. To determine the frequency of a received signal.

(1) Connect a length of insulated wire to the COUPLING terminal of the wavemeter.

(2) Tune in the signal accurately on the receiver and then if C.W. telegraphy is being received switch off the B.F.O.

(3) Set the SWITCH A to HET. W/M and the RANGE SWITCH to the correct range.

(4) Using a *minimum* of coupling listen on the *receiver headphones* and adjust the MAIN control of the wavemeter to give zero beat with the signal.

(5) Set the SWITCH A to CALIBRATING OSCILLATOR, and while listening on the *wavemeter headphones* adjust the CALIBRATING control for zero beat. Check by operating PRESS TO CHECK button, when the frequency of the note should change slightly.

(6) Having set the MAIN and CALIBRATING dials the readings obtained should be converted to give the true frequency by means of the Calibration tables. (See Sec. 7 above.)

CHAPTER III . . . . . MAINTENANCE

Note :—The wavemeter normally should only be removed from its case by workshop personnel, but see Sec. 16 *below.*

12. To change the magic-eye valve V4 (see Fig. 4).

To change this valve proceed as follows :—

(1) Slacken off the two knurled nuts holding the metal bracket carrying the valve holder.

(2) Slide the metal bracket back towards the rear of the set as far as it will go.

(3) Re-tighten the knurled nuts.

(4) The valve may now be removed from its holder in the normal way. Care should be taken not to lose the large ring into which the glass envelope of the valve fits.

(5) Insert new valve into holder.

(6) Slacken off knurled nuts.

(7) Slide metal bracket towards front of set and simultaneously fit the large ring over glass envelope of valve, making sure that this ring is centrally placed over the rubber ring. Hold the assembly firmly in place and re-tighten the two knurled nuts.

13. Power panel cover.

After changing transformer taps, fuses, or changing from D.C. to A.C. or vice-versa always see that the left hand cover is properly fitted in place, its gasket being perfectly flat, and the six screws fully tightened.

14. Fixing chassis in case.

If valves are changed or chassis removed for any reason, when replaced the screws round the panel should be thoroughly tightened.

15. Daily tasks.

The apparatus should be kept clean, dry and free from dust.

(1) Check all leads for damage, wear and loose connectors.

(2) Check wavemeter controls for tightness, smooth operation. (The SET ZERO control is not intended to have a stop).

(3) Connect and operate the wavemeter as in Chapter II checking the operation of all controls.

(4) When testing the wavemeter strong whistles should be heard at every 0.1 Mc/s. *i.e.* at 1.2, 1.3, 1.4 Mc/s, etc., on the MAIN dial becoming loudest at 1.8 Mc/s then decreasing in strength. The test is taken with the SWITCH A set to CALIBRATING OSCILLATOR and CALIBRATING dial set to 0 or 100.

(5) Using a known good receiver check the wavemeter for correct operation at several frequencies in each band of the wavemeter in accordance with the working instructions.

(6) Using a known good sender check wavemeter for correct operation at several frequencies in each band of the wavemeter using both the absorption and heterodyne sections.

(7) When crystals in either or both desiccators turn from blue to pink the desiccators must be changed for the spares contained in the lid of the wavemeter. The desiccators (with their sealing rings in place) must be securely tightened. The desiccators removed from the wavemeter must have their rubber sealing rings removed and then be dried by heating to a temperature of 120°C-180°C

for not less than 1 hour. After drying the desiccators must be replaced immediately in the metal holders from which the spare desiccators were taken and the cap sealed with P.V.C. tape if available. The holders should then be replaced complete in the spares box.

(8) Note the number of hours worked. When used on D.C. a 75 Ah. battery should last about 20 hours.

16. IMPORTANT.

Operating personnel should not normally open the wavemeter. In an emergency however this may be done. In the following table faults which involve opening the wavemeter are starred thus*

Symptom	Possible Fault		Action
Dials not illuminated.	If used on A.C.	A.C./D.C. plug under cover at left hand side of wavemeter not in A.C. socket.	Insert plug in A.C. socket and push well home.
		A.C. lead not connected to mains.	Make sure A.C. lead is well home in plug on panel. Connect to A.C. mains. Try new lead if available.
		A.C. fuse blown.	Replace fuse (under left hand cover) if fuse blows again report.
		Transformer voltage tapping terminals loose.	Tighten.
	If used on D.C.	A.C./D.C. plug under cover at left hand side of wavemeter not in D.C. socket.	Insert plug in D.C. socket and push well home.
		D.C. lead not connected properly to battery.	Make sure D.C. lead is well home in plug on panel. Connect to battery. Try new lead if available.
		D.C. lead incorrectly connected to battery.	Check that polarity is correct.

Symptom	Possible Fault	Action
	If used on D.C. — D.C. fuse blown.	Replace fuse (under left hand cover) if fuse blows again report.
	ON/OFF switch at OFF.	Switch to ON.
	*One or both dial lamps loose in holders.	Screw up lamps.
	*One or both dial lamps burnt out.	Replace dial lamp(s).
On D.C. only vibrator silent but dial lamps light up.	*Vibrator not plugged in securely or faulty.	Push vibrator right home in socket, if still silent replace vibrator by spare.
If after about 30 seconds absorption tuning indicator remains dark. It should fluoresce.	*Indicator valve V_4 faulty.	Check that valve is correctly inserted in holder, replace if necessary.
	*Valve V_5 faulty.	Check that valve is correctly inserted in holder, replace if necessary.
	Internal fault.	Report.

Symptom	Possible Fault	Action
With SWITCH A set to SET ZERO No whistle at O and 100 on CALIBRATING dial.	Phones not properly plugged in or phones with broken leads.	Check that phones are properly plugged in. Replace with known good pair.
	*V1 faulty.	Replace V1 with spare.
	*V2 faulty.	Replace with spare.
	*Crystal faulty.	Plug in firmly. If still faulty report.
	NOTE :—The hum heard in the phones is different with a faulty crystal to that heard with a functioning crystal. Operators should attempt to differentiate between the two types of hums.	
With SWITCH A set to SET ZERO. Only one strong whistle heard at either 10 or 20 or 75 to 85 mark.	SET ZERO control wrongly set.	Re-set SET ZERO. See Chapter II—Operation.
With SWITCH A set to SET ZERO. No zero beat at either 0 or 100 or at only one.	Internal fault.	Report.

TABLE II—FAULTS WHICH CAN BE TRACED BY OPERATORS.

Symptom	Possible Fault	Action
With SWITCH A at CALIBRATING OSCILLATOR strong whistle on MAIN dial at 1.9 Mc/s with CALIBRATING dial set to 100, and at 1.8 Mc/s when with CALIBRATING dial set at 0.	*Crystal defective.	Plug in firmly. If still faulty report.
With SWITCH A at CALIBRATING OSCILLATOR. Weak whistles every .1 Mc/s (MAIN dial) *only* and alteration of CALIBRATING dial does not alter whistle.	*Valve V1 faulty	Replace with spare.
As above but alteration of CALIBRATING dial affects frequency of whistle, i.e. with CALIBRATING dial at 50 whistle found at 1.85, 1.35 Mc/s, etc.	*Valve V3 faulty	Replace with spare. Examine grid leads for breaks and report.

Symptom	Possible Fault	Action
With SWITCH A at CALIBRATING OSCILLATOR. No whistles at all when CALIBRATING dial is rotated. Hum may be very strong.	*Valve V3 faulty.	Replace with spare. Examine grid leads for breaks and report.
	*Valve V2 faulty.	Replace with spare.
	Internal fault.	Report.
With CALIBRATING dial set to either 0 or 100 and SET ZERO control set for zero beat(SWITCH A at SET ZERO). Frequency of beat note does not change slightly when PRESS TO CHECK button is pressed.	Internal fault.	Report.

Circuit reference	Value	Type
CONDENSERS		
C1	212pF	Positive temp. coef. adjusted during manufacture.
C2	58pF	Negative temp. coef. adjusted during manufacture.
C3	3-30pF	Squash plate type
C4	20pF	Variable
C5	39pF	Variable
C6	0.1uF	350V Paper
C7	50uF	12V Electrolytic
C8	33pF	±5% silvered mica
C9	0.1uF	350V Paper
C10	120pF	±5% silvered Mica
C11	27pF	±5% silvered Mica
C12	0.01uF	350V Paper
C13	120pF	±5% silvered Mica
C14	0.001uF	±2% silvered Mica
C15	20pF	Variable
C16	0.01uF	350V Paper
C17	0.1uF	350V Paper
C18	4.7pF	±0.5pF
C19	10 pF	positive temp. coef. adjusted during manufacture.
C20	27pF	negative temp. coef. adjusted during manufacture.
C21	100pF	Variable
C22	353pF	2 gang Variable
C23	353pF	

Circuit reference	Value	Type
C24	39pF	±5% silvered Mica
C25	0.1uF	350V Paper
C26	0.1uF	350V Paper
C27	0.1uF	350V Paper
C28	4.7uF	±0.5pF
C29	100pF	±10% silvered Mica
C31	3-30pF	Variable
C32	47pF	±5% silvered Mica
C33	47pF	±5% silvered Mica
C34	3-30pF	Variable
C35	47pF	±5% silvered Mica
C36	3-30pF	Variable
C37	3-30pF	Variable
C38	47pF	±5% silvered Mica
C39	27pF	±5% silvered Mica
C40	0.005uF	±10% Mica
C41	500uF	12V Electrolytic
C42	8uF	250V Electrolytic
C43	8uF	250V Electrolytic
C44	0.1uF	350V Paper
C45	0.1uF	350V Paper
C46	0.25uF	350V Paper
C47	0.25uF	350V Paper
C48	0.25uF	350V Paper

Circuit reference	Value	Type
C49	0.25uF	350V Paper
C50	0.1uF	350V Paper
C51	0.02uF	600V A.C.
CRYSTAL		
XL 1		100kc/s
FUSES		
F1	5A	
F2	5A	
INDUCTORS		
L1A		
L1B		
L2		Filter
L3		Filter
L4		Filter
L5		
L6		
L6B		
L7		
L8		
L9		
L10		

Circuit reference	Value	Type (Resistor Tolerances ±20% unless otherwise stated)
L11		H.T. Smoothing choke
L12		
L13		Vibrator filter
L14		Vibrator filter
L15		Vibrator filter
L16		Vibrator filter
LAMPS		
LP1	6.5V	Dial lamp
LP2	6.5V	Dial lamp
RESISTORS		
R1	22k ohms	½w
R2	1k ,,	½w
R3	100k ,,	½w
R4	4.7k ,,	½w
R5	470k ,,	½w
R6	470k ,,	½w
R7	100k ,,	½w
R8	2.2M ,,	½w

Circuit reference	Value	Type (Resistor Tolerances ±20% unless otherwise stated)
R9	4.7k ,,	½w
R10	22k ,,	½w
R11	50k ,,	5w
R12	100k ,,	½w
R13	470k ,,	½w
R14	1M ,,	½w
R15	10k ,,	½w
R16	10k ,,	½w
R17	100k ,,	½w
R18	10k ,,	½w
R19	1k ,,	½w
R20	20k ,,	±5% 2w
R21	20k ,,	±5% 2w
R22	330 ,,	½w
R23	330 ,,	½w
R24	17 ,,	Wire wound on common former ±5%
R25	17 ,,	ditto
R26	17 ,,	ditto
R27	17 ,,	ditto
R28	22k ,,	½w
SWITCHES		
S1A and B	System switch	Oak rotary
S2	Range switch	Rotary D.P., 4 way

Circuit reference	Value	Type
S3	ON/OFF switch	Toggle D.P., S.T.
TRANSFORMERS		
T1		Phone transformer
T2		Power transformer
VALVES		
V1		ARTH 2
V2		ARTH 2
V3		ARTH 2
V4		CV 51
V5		6X5G
VIBRATOR		
VBR		4T

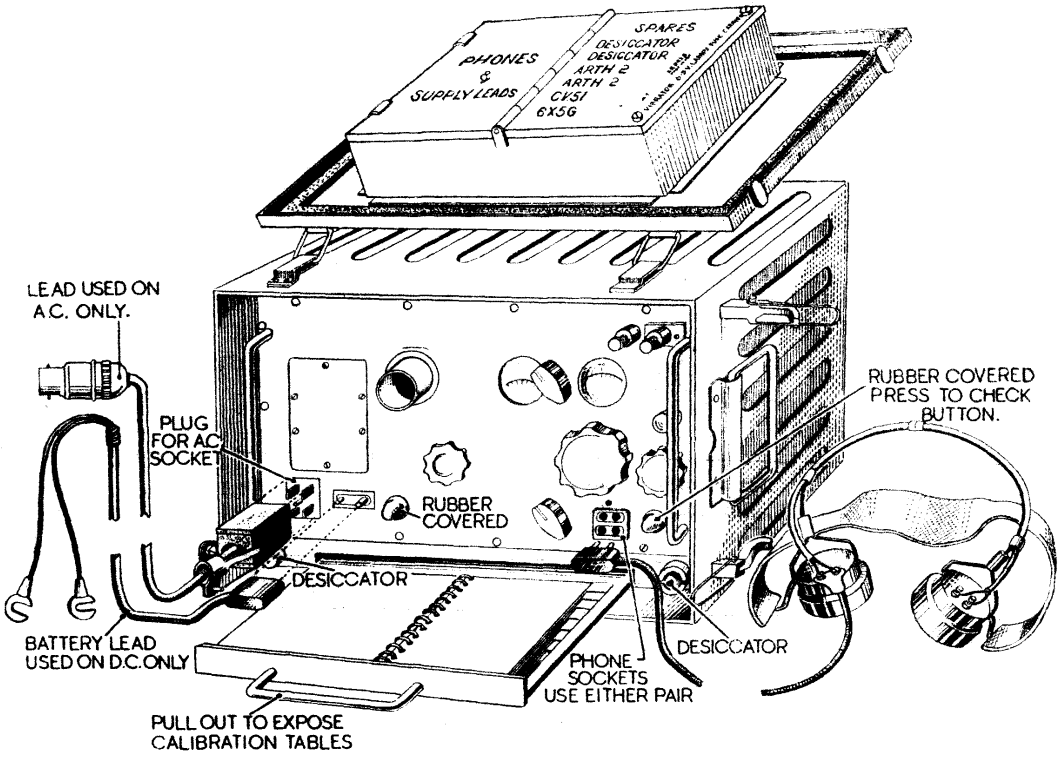


Fig. 1 WAVEMETER CLASS "D" No. 2 AS FOR WORK

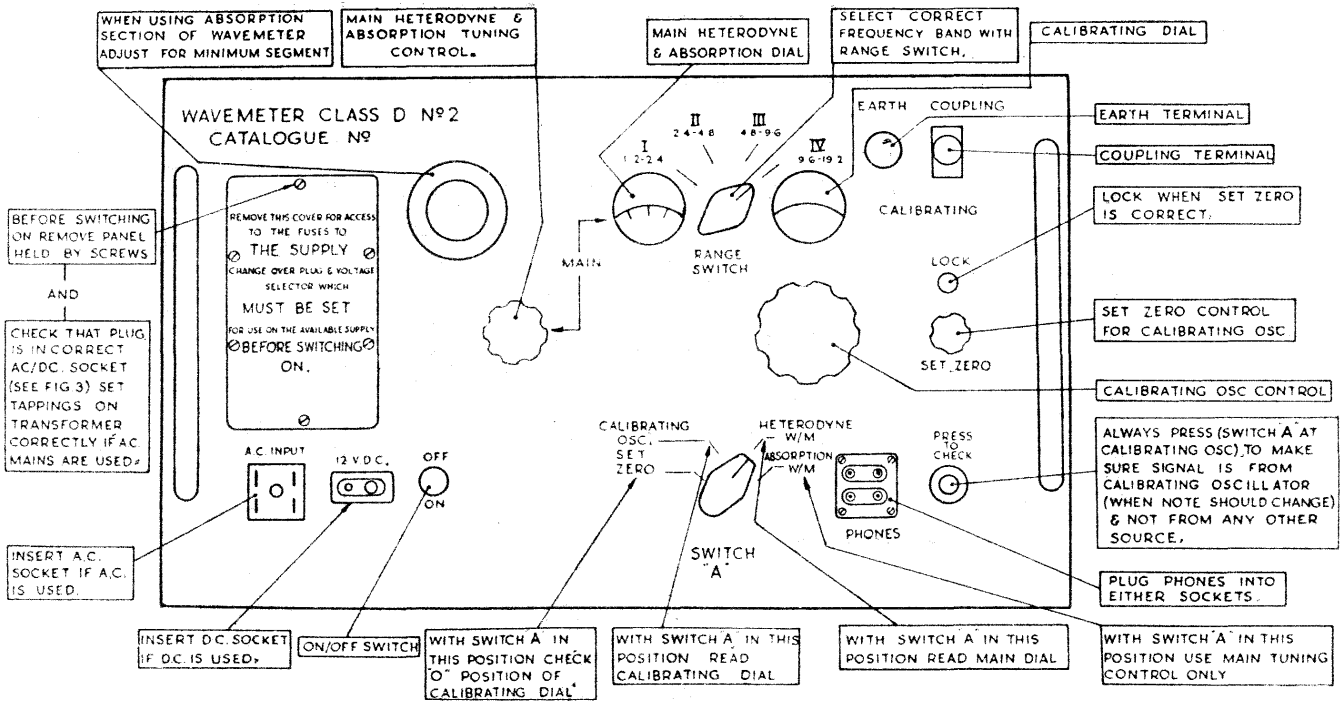


Fig. 2 WAVEMETER CLASS D No. 2 FRONT PANEL

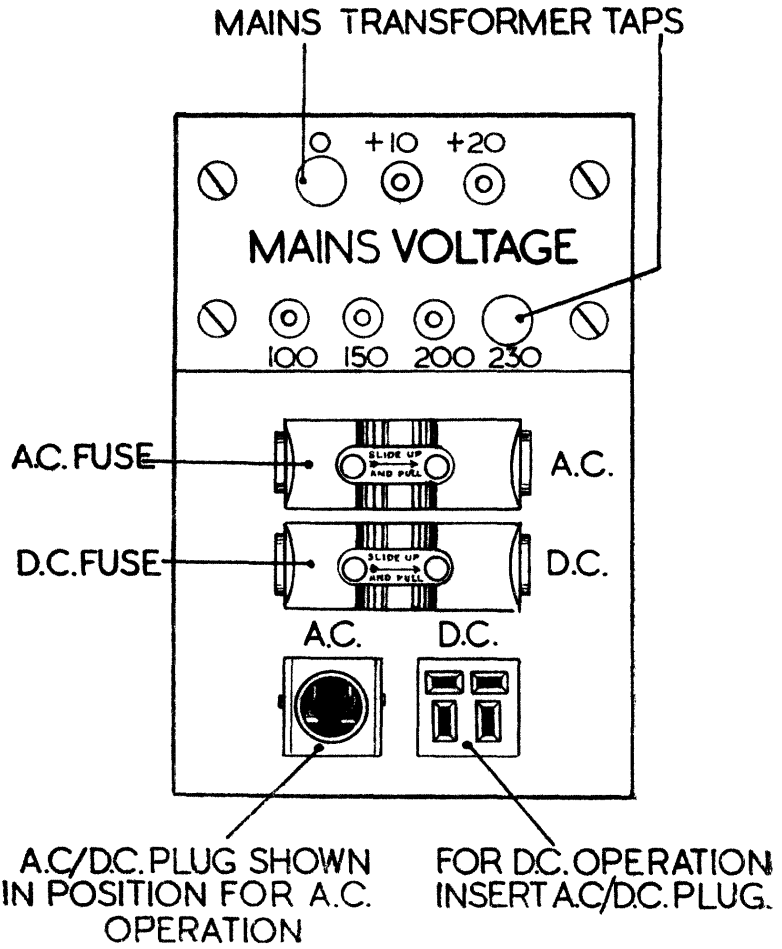


Fig. 3 POWER SUPPLY PANEL

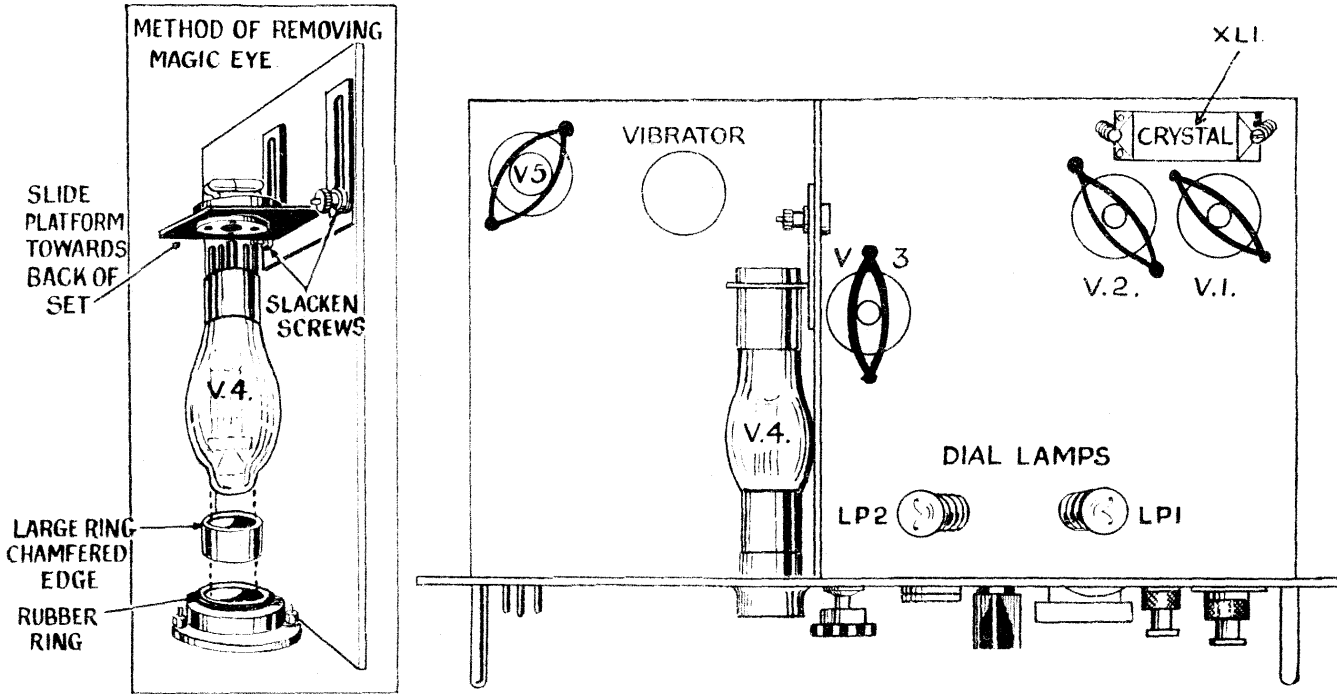


Fig. 4 PLAN OF CHASSIS SHOWING VALVE POSITIONS ONLY

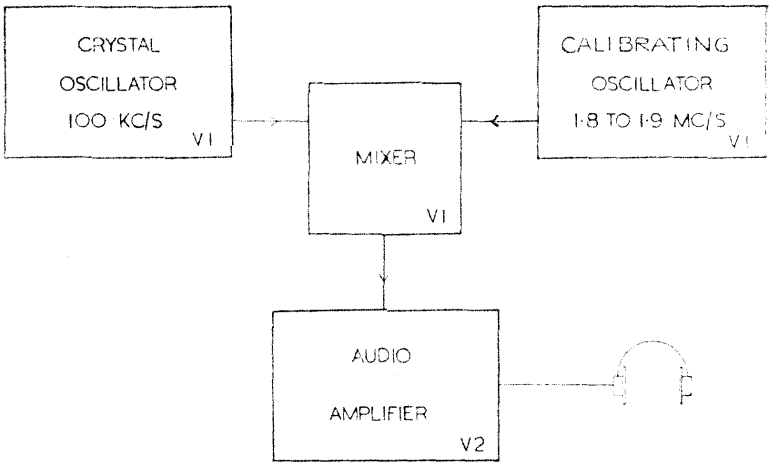


Fig. 5A Block diagram-switch "A" in SET ZERO position

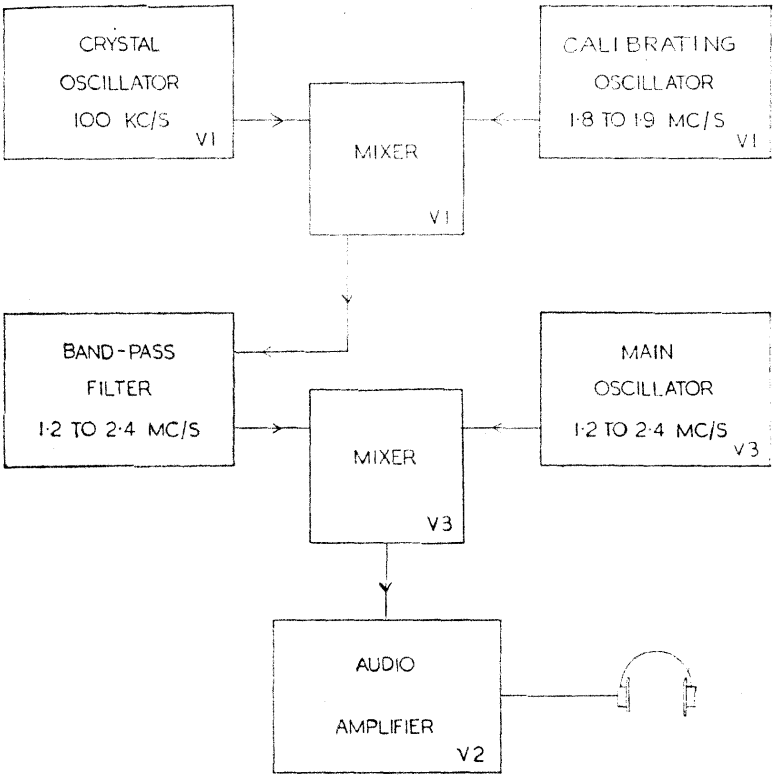


Fig. 5B Block diagram-switch "A" in CALIBRATING OSCILLATOR position

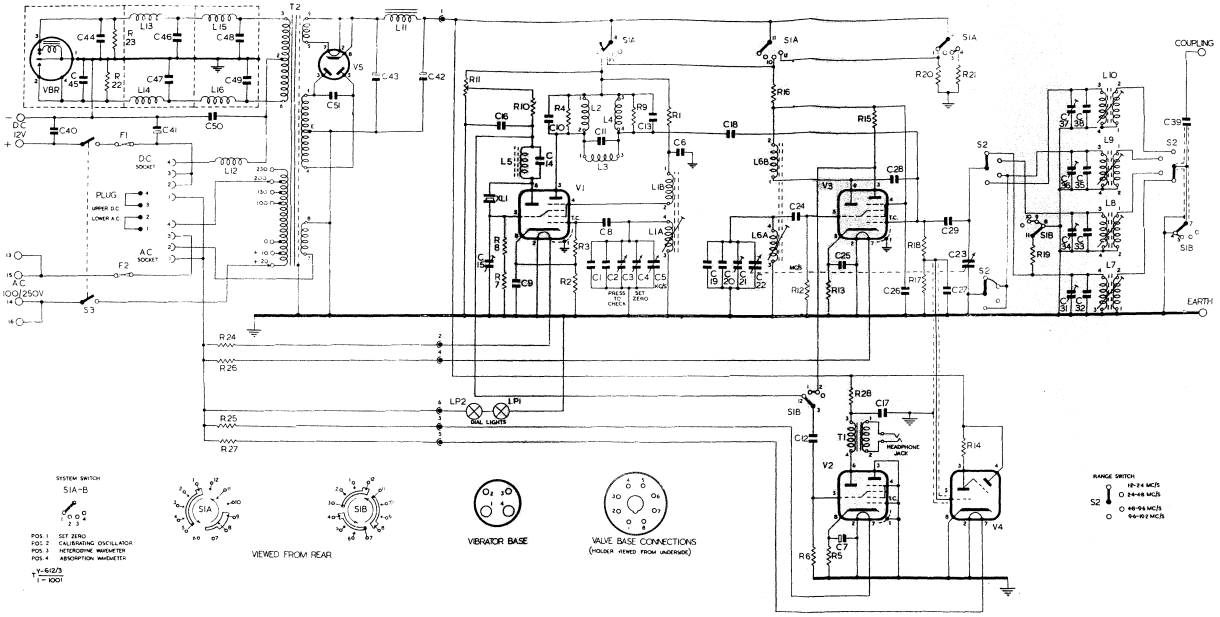
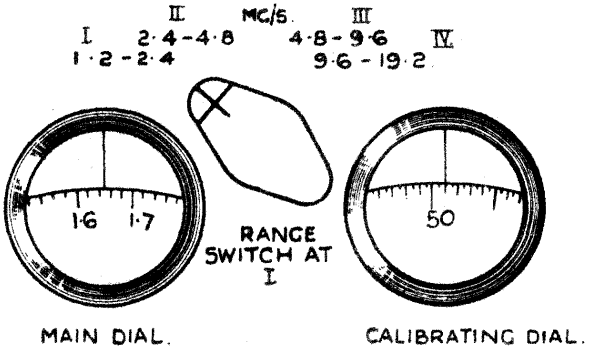


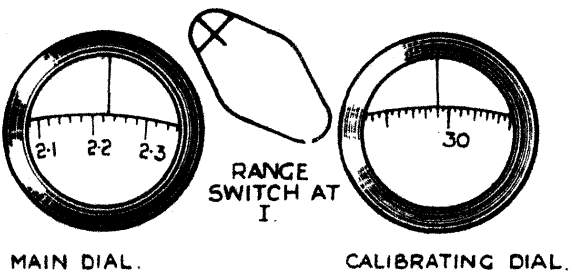
FIG. 6. WAVEMETER CLASS 'D' No.2 MK.I. CIRCUIT DIAGRAM

FIG: 7.A.



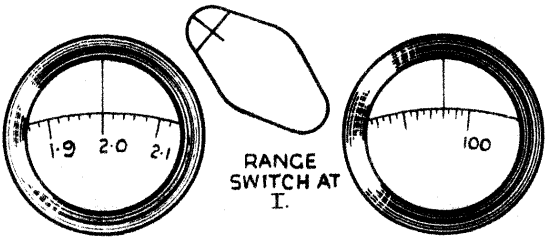
MAIN DIAL READING 1·65 ?
CALIBRATING DIAL READING 51
TRUE MAIN DIAL READING 1·651 MC/S
(BASIC AND ACTUAL FREQUENCY).

FIG: 7. B.



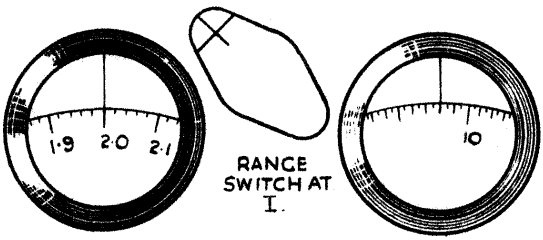
MAIN DIAL READING 2·23 ?
CALIBRATING DIAL READING 29.
TRUE MAIN DIAL READING 2·229 MC/S
(BASIC & ACTUAL FREQUENCY)

FIG 7.C



MAIN DIAL READING 2·0 __ MORE ? OR LESS ?
CALIBRATING DIAL READING 98.
TRUE MAIN DIAL READING 1·998 MC/S. (ACTUAL FREQUENCY) BASIC AND
NOTE :- IT CANNOT BE 2·098 OTHERWISE THE
MAIN DIAL WOULD READ AROUND THE 2·1 MARK.

FIG: 7. D.



MAIN DIAL READING 2·0 __ MORE ? OR LESS ?
CALIBRATING DIAL READING 8.
TRUE MAIN DIAL READING 2·008 (BASIC & ACTUAL FREQUENCY).
NOTE:- IT CANNOT BE 1·998 BECAUSE THE
CALIBRATING DIAL WOULD THEN READ 98 AS
IN THE ABOVE EXAMPLE.

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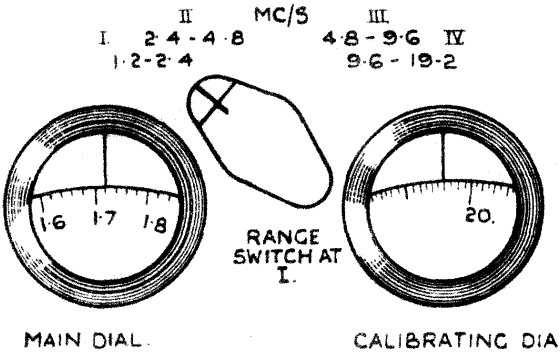
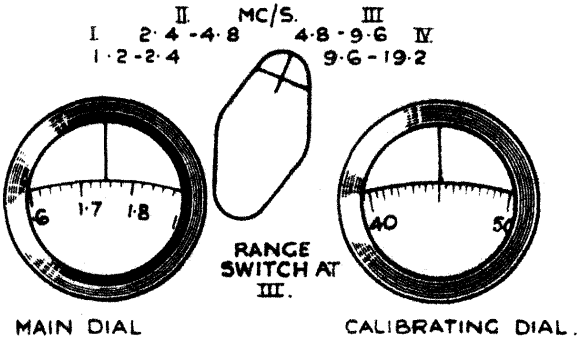
FIG 7.E.



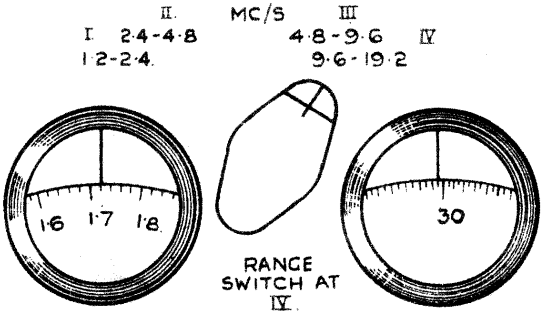
MAIN DIAL READING 1·71 ?
CALIBRATING DIAL READING 18
TRUE MAIN DIAL READING 1·718 MC/S
(BASIC AND ACTUAL FREQUENCY).

FIG:7.F.



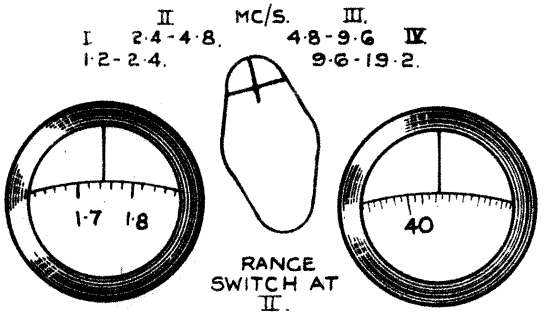
MAIN DIAL READING 1·74 ?
CALIBRATING DIAL READING 45.
TRUE MAIN DIAL READING 1·745 (BASIC FREQUENCY)
ACTUAL FREQUENCY FROM TABLES 6·980 MC/S.

FIG. 7.G.



MAIN DIAL READING 1·72?
CALIBRATING DIAL READING 29½
TRUE MAIN DIAL READING 1·7295 (BASIC FREQUENCY).
TRUE FREQUENCY 13·836 MC/S. (FROM TABLES).

FIG. 7.H.



MAIN DIAL READING 1·74?
CALIBRATING DIAL READING 42¼.
TRUE MAIN DIAL READING 1·742¼ (BASIC FREQUENCY)
TRUE FREQUENCY 3·4845 MC/S. (FROM TABLES).

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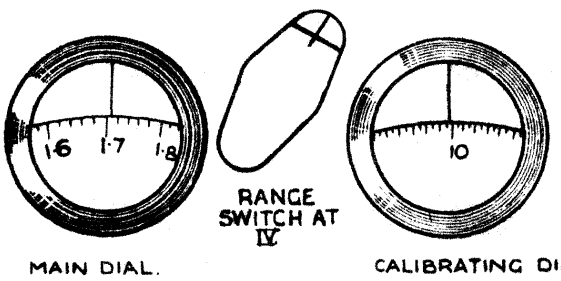
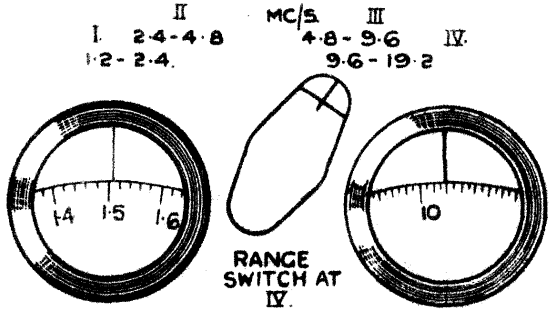
FIG. 7.J.



MAIN DIAL READING 1·70?
CALIBRATING DIAL READING $9\frac{3}{4}$.
TRUE MAIN DIAL READING 1·709$\frac{3}{4}$. (BASIC FREQUENCY)
TRUE FREQUENCY 13·678. (FROM TABLES).

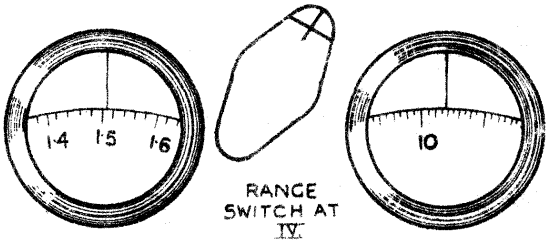
FIG. 7.K.



MAIN DIAL READING 1·51?
CALIBRATING DIAL READING 12.
TRUE MAIN DIAL READING 1·512 (BASIC FREQUENCY).
ACTUAL FREQUENCY FROM TABLES 12·096 MC/S.

FIG: 7. L.

II MC/S. III
I 2·4 - 4·8 4·8 - 9·6 IV.
1·2 - 2·4 9·6 - 19·2

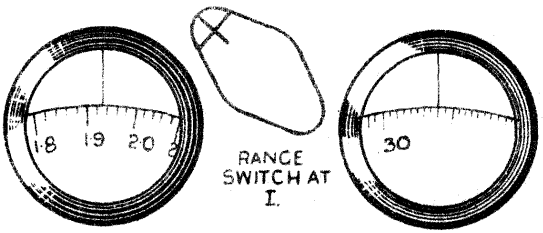


MAIN DIAL. CALIBRATING DIAL.

MAIN DIAL READING 1·51?
CALIBRATING DIAL READING 11½ PLUS ¼ OF A SMALL DIVISION.
TRUE MAIN DIAL READING 1·511½ PLUS ¼ OF A SMALL DIVISION.
ACTUAL FREQUENCY FROM TABLES, FOR 1·511½ (BASIC FREQUENCY) IS 12·092 MC/S.
BUT FOR RANGE IV ¼ OF A DIVISION ON THE CALIBRATING DIAL IS EQUAL TO 2 KC/S THEREFORE ACTUAL FREQUENCY IS 12·094 MC/S.

FIG: 7. M.

II MC/S. III.
I 2·4 - 4·8 4·8 - 9·6 IV.
1·2 - 2·4. 9·6 - 19·2



MAIN DIAL. CALIBRATING DIAL.

REQUIRED FREQUENCY 1·934 MC/S.
CALIBRATING DIAL READING 34.
MAIN DIAL READING 1·93?
ADJUST MAIN DIAL FOR ZERO BEAT 1·934 MC/S (SWITCH A AT CALIBRATING OSCILLATOR)
SWITCH TO HETERODYNE WHEN WAVEMETER WILL EMIT A FREQUENCY OF 1·934 MC/S.

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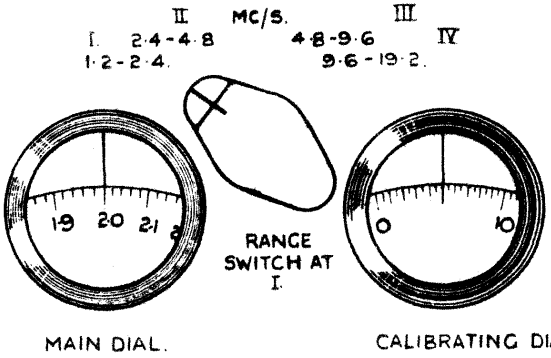
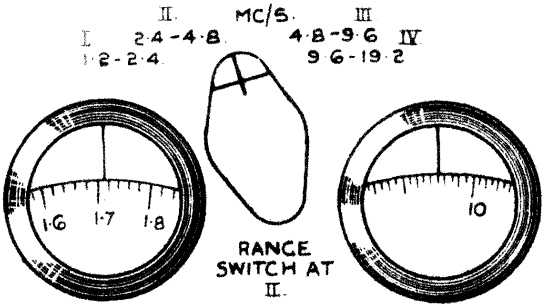
FIG: 7N.



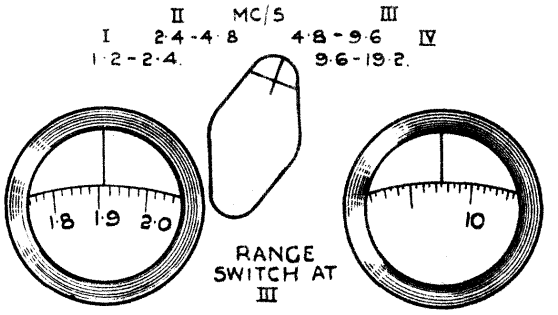
REQUIRED FREQUENCY 2·005 MC/S.
CALIBRATING DIAL 5.
MAIN DIAL 2·00 ?
ADJUST MAIN DIAL FOR ZERO BEAT 2·005 MC/S
(SWITCH A AT CALIBRATING OSCILLATOR)
SWITCH TO HETERODYNE WHEN WAVEMETER WILL
EMIT A FREQUENCY OF 2·005 MC/S.

FIG: 7P.



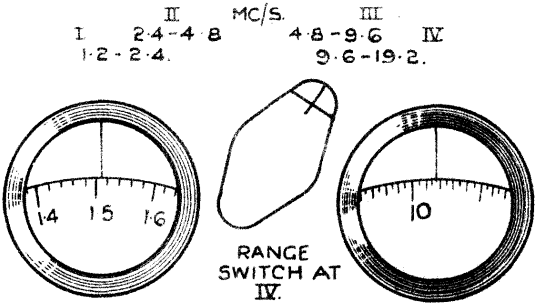
REQUIRED FREQUENCY 3·415 MC/S.
FROM TABLES BASIC FREQUENCY IS 1·707½.
CALIBRATING DIAL 7½
MAIN DIAL 1·70 ?
ADJUST MAIN DIAL FOR ZERO BEAT 3·415 MC/S
(SWITCH A AT CALIBRATING OSCILLATOR)
SWITCH TO HETERODYNE WHEN WAVEMETER WILL
EMIT A FREQUENCY OF 3·415 MC/S.

FIG: 7. Q.



REQUIRED FREQUENCY 7·630 MC/S.
FROM TABLES BASIC FREQUENCY 1·907 1/2.
CALIBRATING DIAL 7 1/2.
MAIN DIAL 1·90 ?
ADJUST THE MAIN DIAL FOR ZERO BEAT 7·630 MC/S
(SWITCH A AT CALIBRATING OSCILLATOR).
SWITCH TO HETERODYNE WHEN WAVEMETER WILL
EMIT A FREQUENCY OF 7·630 MC/S

FIG: 7. R.



REQUIRED FREQUENCY 12·094.
FROM TABLES BASIC FREQUENCY 1·511 3/4.
CALIBRATING DIAL 11 3/4.
MAIN DIAL 1·51 ?
ADJUST THE MAIN DIAL FOR ZERO BEAT 12·094 MC/S
(SWITCH A AT CALIBRATING OSCILLATOR).
SWITCH TO HETERODYNE WHEN WAVEMETER WILL
EMIT A FREQUENCY OF 12·094 MC/S.

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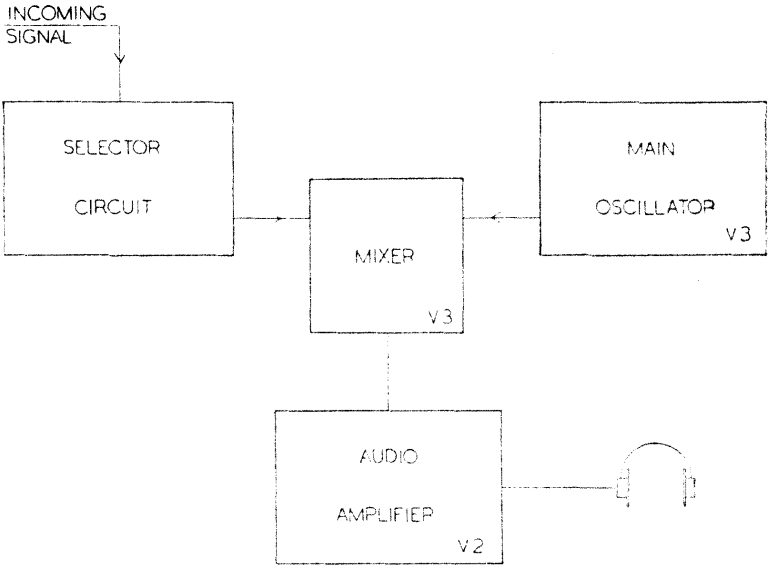

Fig. 5C Block diagram-switch "A" in HETERODYNE WAVEMETER position

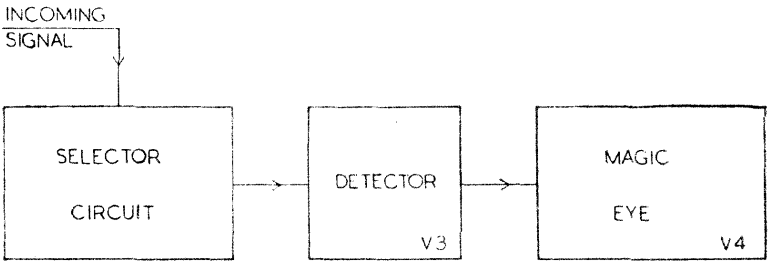

Fig. 5D Block diagram-switch "A" in ABSORPTION WAVEMETER position