PRECISION WAVEMETER

TYPE 724-A SERIAL No.

OPERATING INSTRUCTIONS

DESCRIPTION

The Type 724-A Precision Wavemeter is an absorption-type instrument consisting of a coil-and-condenser assembly and a vacuum-tube voltmeter for obtaining resonance indications. The coil can be rotated to give varying degrees of coupling without moving the condenser. Figure 1 is a circuit diagram.

RANGE

The frequency range is from 16 kilocycles to 50 megacycles, covered by means of 7 plug-in coils.

ACCURACY

The accuracy of the wavemeter is ±0.25% between 50 kilocycles and 50 megacycles (Coils B, C, D, E, F and G). Over the low frequency range covered by Coil A (16 kilocycles to 50 kilocycles) the accuracy is ±1%.

EQUIPMENT

The complete wavemeter consists of the following units:

Carrying Case	1 Instruction Chart
Condenser Assembly	1 1G4GT/G type Vacuum Tube
7 Coils	1 Little Six 1.5-volt Battery
2 Calibration Charts	1 Battery Terminal Jack

REPLACEMENTS

To replace the vacuum tube or battery remove the panel of the condenser assembly. The short flexible lead connects to the negative battery terminal, the terminal jack connects to the positive battery terminal and the long flexible lead plugs into the terminal jack.

OPERATION

Throw switch to ON position. The meter should read approximately zero. If it does not, it can be set to zero by adjusting the center-tapped resistor across the filament of the vacuum tube.

Select the coil which covers the desired frequency range and insert it in the coil receptacle on the panel. Couple the coil loosely to the source to be measured and vary the condenser setting until the wavemeter is in resonance.

RESONANCE INDICATION

(1) Absorption Method. Resonance occurs when condenser is set for maximum reading of meter on panel. If too close coupling is required to obtain a readable deflection, "pulling-in" will occur and some other method must be used. Pulling-in is evidenced by an unusually broad maximum or by a discontinuity in the meter deflection after the resonance is passed.

(2) Reaction Method. Where an oscillator has a plate or grid current meter, the reaction on this meter reading as the wavemeter is tuned to resonance may be relied on if coupling is not too close.

(3) Beat Method. This requires a heterodyne detector set to zero beat with the oscillator. As the wavemeter approaches resonance, the audible beat frequency will change as shown in Figure 2. Resonance occurs at zero beat. The beat departs rapidly from zero as the wavemeter setting is varied in either direction away from resonance.

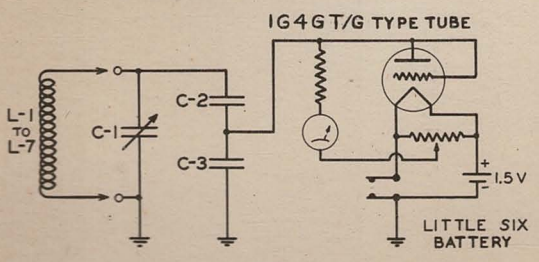

FIG. 1

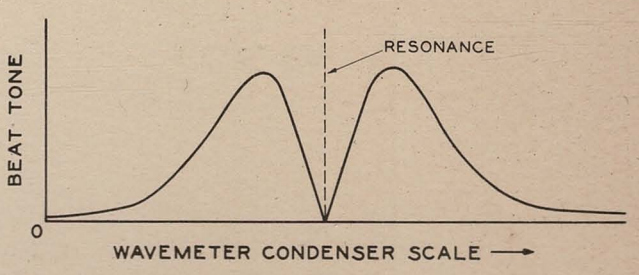

FIG. 2

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CAMBRIDGE, MASSACHUSETTS

FORM 417C

PRECISION WAVEMETER

TYPE 724-A SERIAL No. 1397

DATE 8/14/45 BY

Standardizing Laboratory

FREQUENCY CALIBRATION

COIL A 16 kc to 50 kc Accuracy ± 1.0%

KILOCYCLES	DIVISIONS	DIV / KC	KC / DIV
16	132		
18	558	213	.00469
20	978	210	.00476
22	1378	200	.00500
24	1762	192	.00521
26	2168	203	.00493
30	2954	197	.00508
34	3750	199	.00503
38	4535	196	.00510
42	5275	185	.00541
46	6010	184	.00543
48	6390	190	.00526
50	6765	188	.00532

COIL B 50 kc to 160 kc Accuracy ± 0.25%

KILOCYCLES	DIVISIONS	DIV / KC	KC / DIV
50	134		
55	472	67.6	.01479
60	808	67.2	.01488
65	1130	64.4	.01553
70	1452	64.4	.01553
75	1768	63.2	.01582
80	2082	62.8	.01592
90	2706	62.4	.01603
100	3355	64.9	.01541
110	3980	62.5	.01600
120	4605	62.5	.01600
130	5185	58.0	.01724
140	5770	58.5	.01709
150	6355	58.5	.01709
155	6675	64.0	.01563
160	7005	66.0	.01515

COIL C 160 kc to 500 kc Accuracy ± 0.25%

KILOCYCLES	DIVISIONS	DIV / KC	KC / DIV
160	178		
180	602	21.2	.0472
200	1014	20.6	.0485
220	1416	20.1	.0498
240	1816	20.0	.0500
260	2206	19.5	.0513
300	2982	19.4	.0515
340	3755	19.3	.0518
380	4510	18.9	.0529
420	5210	17.5	.0571
460	5905	17.4	.0575
480	6240	16.8	.0595
500	6580	17.0	.0588

COIL D 0.5 Mc to 1.6 Mc 500 kc to 1600 kc Accuracy ± 0.25%

KILOCYCLES	DIVISIONS	DIV / KC	KC / DIV
500	176		
550	516	6.80	.1471
600	850	6.68	.1497
650	1176	6.52	.1534
700	1494	6.36	.1572
750	1810	6.32	.1582
800	2120	6.20	.1613
900	2740	6.20	.1613
1000	3360	6.20	.1613
1100	3970	6.10	.1639
1200	4555	5.85	.1709
1300	5125	5.70	.1754
1400	5660	5.35	.1869
1500	6205	5.45	.1835
1550	6475	5.40	.1852
1600	6755	5.60	.1786

USE OF CALIBRATION TABLES

TO DETERMINE THE FREQUENCY CORRESPONDING TO A GIVEN WAVEMETER SETTING:

1. Note the condenser scale reading at resonance in divisions.
2. Locate the next lower number in the DIVISIONS column for the coil used and note the corresponding frequency in the first column.
3. Multiply the difference in divisions by KC/DIV or MC/DIV as given in the last column and add this product to the frequency noted in "2" above to obtain the resonant frequency.

TO SET THE WAVEMETER TO A PREDETERMINED FREQUENCY:

1. Locate the next lower frequency on the calibration chart for the coil used and note the corresponding "divisions" in the second column.
2. Multiply the difference in frequency by DIV/KC or DIV/MC as given in the third column and add this product to "divisions" noted in "1" above to obtain the setting of the wavemeter.

TO DETERMINE WAVELENGTH:

To convert to wavelength in meters, divide the conversion factor 299,820 by the frequency in kilocycles.

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CAMBRIDGE, MASSACHUSETTS

FORM 417D

PRECISION WAVEMETER

TYPE 724-A SERIAL No. 1397

DATE 8-14-45 BY [signature] Standardizing Laboratory

FREQUENCY CALIBRATION

COIL E 1.6 Mc to 5 Mc (1600 kc to 5000 kc) Accuracy ± 0.25%

KILOCYCLES	DIVISIONS	DIV / KC	KC / DIV
1600	120	2.22	.450
1800	564	2.09	.478
2000	982	2.00	.500
2200	1382	1.89	.529
2400	1760	1.96	.510
2600	2152	1.87	.535
3000	2898	1.97	.508
3400	3685	1.86	.538
3800	4430	1.76	.568
4200	5135	1.64	.610
4600	5790	1.70	.588
4800	6130	1.70	.588
5000	6470		

COIL F 5 Mc to 16 Mc Accuracy ± 0.25%

MEGACYCLES	DIVISIONS	DIV / MC	MC / DIV
5.0	140	672	.001488
5.5	476	656	.001524
6.0	804	640	.001563
6.5	1124	628	.001592
7.0	1438	616	.001623
7.5	1746	612	.001634
8.0	2052	612	.001634
9.0	2664	596	.001678
10.0	3260	590	.001695
11.0	3850	585	.001709
12.0	4435	545	.001835
13.0	4980	520	.001923
14.0	5500	485	.002062
15.0	5985	510	.001961
15.5	6240	520	.001923
16.0	6500		

COIL G 16 Mc to 50 Mc Accuracy ± 0.25%

MEGACYCLES	DIVISIONS	DIV / MC	MC / DIV
16	210	225	.00444
18	660	202	.00495
20	1064	192	.00521
22	1448	191	.00524
24	1830	181	.00552
26	2192	184	.00543
30	2928	176	.00568
34	3630	168	.00595
38	4300	154	.00649
42	4915	145	.00690
46	5495	133	.00752
48	5760	138	.00725
50	6035		

USE OF CALIBRATION TABLES

TO DETERMINE THE FREQUENCY CORRESPONDING TO A GIVEN WAVEMETER SETTING:

1. Note the condenser scale reading at resonance in divisions.

2. Locate the next lower number in the DIVISIONS column for the coil used and note the corresponding frequency in the first column.

3. Multiply the difference in divisions by KC/DIV or MC/DIV as given in the last column and add this product to the frequency noted in "2" above to obtain the resonant frequency.

TO SET THE WAVEMETER TO A PREDETERMINED FREQUENCY:

1. Locate the next lower frequency on the calibration chart for the coil used and note the corresponding "divisions" in the second column.

2. Multiply the difference in frequency by DIV/KC or DIV/MC as given in the third column and add this product to "divisions" noted in "1" above to obtain the setting of the wavemeter.

TO DETERMINE WAVELENGTH:

To convert to wavelength in meters, divide the conversion factor 299,820 by the frequency in kilocycles.

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CAMBRIDGE, MASSACHUSETTS

DRM 417E