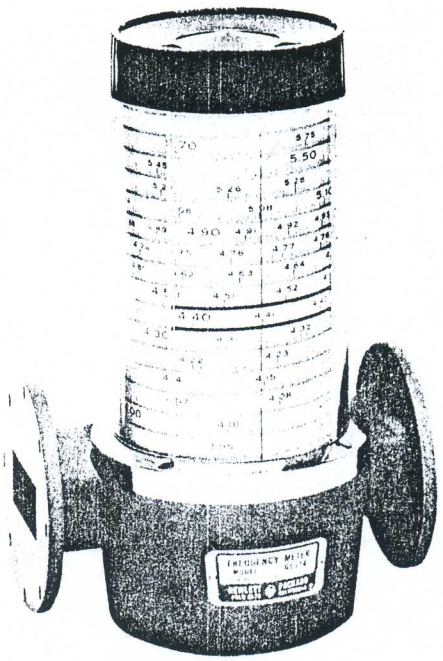
OPERATING NOTE

DIRECT-READING FREQUENCY METERS

532A/B



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HEWLETT hp PACKARD

Table 1. Specifications

Model	G532A	J532A[1]	H532A	X532B	M532A	P532A	K532A[5]	R532A[5]
Frequency Range (GHz)	3.95-5.85	5.3-8.2	7.0-10	8.2-12.4	10-15	12.4-18	18-26.5	26.5-40
Overall Accuracy[2]	0.065%	0.065%	0.075%	0.08%	0.085%	0.10%	0.11%	0.12%
Calibration Increments	1 MHz	2 MHz	2 MHz	5 MHz	5 MHz	5 MHz	10 MHz	10 MHz
Scale Length in. (mm)	155 (3937)	140 (3556)	125 (3145)	77 (1956)	74 (1880)	75 (1905)	72 (1829)	75 (1905)
Dial Accuracy[3]	0.033%	0.033%	0.040%	0.050%	0.053%	0.068%	0.077%	0.083%
Fits Waveguide (in.) (EIA)	2 x 1 WR187	1-1/2 x 3/4 WR137	1-1/4 x 5/8 WR112	1 x 1/2 WR90	.850 x .475 WR75	.702 x .391 WR62	1/2 x 1/4 WR42	.360 x .220 WR28
Equiv Flange	UG-407/U	UG-441/U	UG-138/U	UG-39/U	Cover	UG-419/U	UG-595/U	UG-599/U
Max Temp Coef %/°C	0.0012	0.0012	0.0015	0.0010	0.0012	0.0012	0.0013	0.0017
Size, in., (mm) Length Height Depth	6-1/4 (159) 9-1/2 (241) 5 (127)	6-1/4 (159) 9-1/8 (232) 5-1/2 (114)	6-1/4 (159) 8 (203) 4-3/8 (111)	4-1/2 (114) 6-1/8 (156) 2-7/8 (73)	4-1/2 (114) 6-1/4 (159) 2-3/4 (70)	4-1/2 (114) 6-1/4 (159) 2-3/4 (70)	4-1/2 (114)[4] 5-3/8 (137) 2-7/8 (73)	4-1/2 (114)[4] 5-1/2 (140) 2-3/4 (70)
Net Weight lb, (kg)	9-1/2 (4, 1)	7-1/2 (3, 4)	6 (2, 7)	3-1/2 (1, 6)	3-1/2 (1, 6)	3 (1, 4)	1-1/2 (0, 7)	1-1/2 (0, 7)

FOR ALL MODELS

DIP AT RESONANCE: 1 dB or more
MINIMUM CALIBRATION SPACING: 1/32 inch

[1] Because of the wide frequency range of the J532A, frequencies from 7.6 to 8.2 GHz can excite the TE_{112} mode when the dial is set between 5.3 and 5.6 GHz.

[2] Includes dial accuracy, 20°C temperature variation (23° ±10°C) and 0.02% for 0 to 100% relative humidity.

[3] Includes mechanical tolerances and backlash.

[4] With circular flange adapter, 5-5/16" (135 mm).

[5] Circular flange adapters available: specify HP 11515A (UG-425/U) for "K" band; HP 11516A (UG-381/U) for "R" band.

1. DESCRIPTION.

2. The Model 532A/B direct-reading frequency meters offer good accuracy over an entire waveguide band. The meter consists of a TE_{111} mode resonant cavity coupled to a waveguide section. When tuned to resonance, a fraction of the power is absorbed, and consequently there is a dip of about 1 dB in the transmitted power. The frequency at which this dip occurs may be read directly from the scale.

3. A long spiral scale, with small calibration increments and well-separated marks, provide the high resolution needed for measuring small frequency differences. Even at the high frequency end of each meter, minimum spacing of the calibration marks is 1/32 of an inch. The spiral scale is enclosed in a transparent cylinder so that the entire scale is always visible. The portion of the band that contains the frequency to which the meter is tuned is clearly marked by horizontal red cursor lines.

4. The high-Q resonant cavity is tuned by a choke plunger. Adjustment of the plunger is by means of a precision lead screw which is spring-loaded to prevent backlash. There are no sliding contacts. The base of the 532A/B will accommodate the shaft of a waveguide stand such as the HP Model 11540A.

5. Complete specifications for each Model 532A/B are given in Table 1.

6. UNPACKING AND INSPECTION.

7. Inspect the frequency meter for mechanical damage incurred in transit, and test electrical performance. If there is damage or deficiency, notify the carrier and the nearest Hewlett-Packard office. In the event of mechanical damage, the packing materials and carton should be held for carrier's inspection.

8. REPACKAGING FOR SHIPMENT.

9. USING ORIGINAL PACKAGING.

10. The same type containers and materials used in factory packaging can be obtained through the Hewlett-Packard sales and service offices listed at the rear of this manual.

11. If the Model 532A/B is being returned to Hewlett-Packard for servicing, attach a tag indicating the type of service required, return address, model number and full serial number. Also, mark the container FRAGILE to assure careful handling. In any correspondence refer to the instrument by model number and full serial number.

12. USING OTHER PACKAGING.

13. The following general instructions should be used for repackaging with commercially-available materials:

a. Wrap the frequency meter in heavy paper or plastic. (If shipping to a Hewlett-Packard service office or center, attach a tag indicating the type of service required, return address, model number, and full serial number.)

b. Use a strong shipping container. A double-wall carton made of 350 pound test material is adequate.

c. Use enough shock-absorbing material (3- to 4-inch layer) around all sides of the frequency meter to provide firm cushion and prevent movement inside the container. Protect the dial with cardboard.

d. Seal the shipping container securely.

e. Mark the shipping container FRAGILE to assure careful handling.

14. OPERATION.

15. OPERATING PRECAUTIONS.

16. When making initial equipment setup, align the flanges carefully with connecting equipment to reduce reflections due to flange mating. Scoring or burring of the matting surfaces may increase reflections; therefore, keep flange covers on when frequency meter is not in use to protect flanges from damage and to prevent foreign matter from entering the cavity.

17. Maximum power limitations are 0.7 of the power handling capability for equivalent waveguide.

18. OPERATING INSTRUCTIONS.

19. Insert the frequency meter in the equipment setup so that the RF energy passes through the meter. The frequency meter should be isolated from the signal source to prevent frequency pulling when the meter is tuned to resonance. The RF energy must be detected and the detected signal applied to an indicator. When the frequency meter is tuned to the RF input frequency, power is absorbed by the meter and a power dip of about 1 dB will occur in the detected signal.

20. For single frequency measurements the detector meter combination (shown in Figure 1) can be either a thermistor and power meter such as the HP Model 486 Thermistor Mount and 431 Power Meter or detector and high-gain voltmeter such as the HP Model 424 Detector and 415 VSWR Meter. Either a crystal or barretter can be used with the 415. The RF source must be modulated with 1000 Hz square-wave when the 415 is used as the indicator. Tune frequency meter for the point of maximum dip on the indicator, and read frequency meter dial by observing the indication under the black vertical line between the two horizontal red cursor lines.

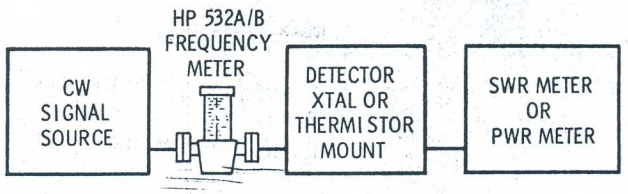

Figure 1. Typical Frequency-Measuring Setup

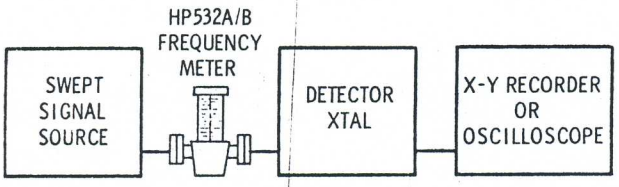

Figure 2. Simplified Swept-Frequency Setup

21. For swept-frequency measurements (see Figure 2) the detector is normally a crystal and the indicator an oscilloscope or X-Y recorder. When the frequency meter is tuned to a frequency included in the swept frequency band displayed on the oscilloscope or X-Y trace. To determine the frequency, adjust the frequency meter to place the dip at any point on the displayed trace. ter to place dip at any point on the displayed trace. Then read the frequency meter dial by observing the indication under the black vertical line between the two horizontal red cursor lines. The frequency axis of the swept display can be calibrated by setting the frequency meter to a given frequency. A dip will then occur in the displayed trace corresponding to the frequency meter setting.

22. MAINTENANCE.

23. The Model 532A/B frequency meters require no maintenance. The frequency meters are not normally field repairable; therefore, if the meter is damaged or does not meet specifications return it to a Hewlett-Packard repair center or contact your nearest Hewlett-Packard office.

24. PERFORMANCE TEST.

25. TEST EQUIPMENT REQUIRED.

26. The test instruments and accessories required to make the performance checks are listed in Table 2. Test instruments other than the ones listed can be used provided their performance equals or exceeds the Critical Specifications listed.

27. PROCEDURES.

28. The procedures in Figure 3 check the Model 532A/B performance for incoming inspection and periodic evaluation. The specifications of Table 1 are the performance standards. Table 3 is a performance test record. This may be used during the test to record the test values obtained. This provides a permanent record of the test values for use at a later time during calibration or periodic evaluation.

Table 2. Test Card

Hewlett-Packard Model 532A/B Date_____

Frequency Meter Tested by_____

OVERALL ACCURACY

Maximum Dial Error_____% Specification_____%

POWER DIP AT RESONANCE

High End of Band_____dB Specifications ≥1 dB

Center of Band_____dB Specifications ≥1 dB

Low End of Band_____dB Specifications ≥1 dB