



r-m-s value of the noise. Instantaneous voltages that are still higher must, therefore, occur occasionally to supply the charge for the capacitor. For a normal distribution, the noise voltage is higher than this value only about 0.02% of the time. This direct measurement can, therefore, be a useful indication of the higher voltages existing in the noise; for example, to determine the extent of peak clipping.

A good measure of the r-m-s value can usually be obtained from the reading of a peak voltmeter when it is possible to use a high resistance in series with the diode. The indicated value then depends on a larger sample of the instantaneous voltage. When a 100,000-ohm series resistor is used, the r-m-s value of random noise can be obtained by applying to the meter indication the correction shown in Figure 8 or Figure 9. The one disadvantage of using a series resistor is that it reduces the frequency range over which the voltmeter response is essentially uniform.

FREQUENCY CHARACTERISTIC

One of the important advantages of the peak-type voltmeter with its attached probe is its excellent frequency characteristic, for example, the TYPE 1800-B Vacuum-Tube Voltmeter can be used to hundreds of megacycles. When measurements must be made up

to those frequencies, the probe must be attached at the point where the measurement is desired in order to obtain this good frequency response, and no series resistance should be used. If, however, measurements of audio-frequency noise are being made, high resistances can be inserted in series with the probe terminal without seriously affecting the response to the audio voltage. Thus, for example, if 100,000 ohms is inserted in series with the high terminal right at the probe, the response is down about 10 per cent at 130 kc. If 50,000 ohms is used, the corresponding frequency is raised to 250 kc; or if $\frac{1}{2}$ megohm is used, the 10-per cent point occurs at about 30 kc.

CONCLUSION

The peak-reading voltmeter can be more useful in the measurement of random noise than has heretofore been believed.

The correction curves of Figures 8 and 9 make it possible to relate the meter indications to the true r-m-s amplitude of random noise. These data should prove useful when r-m-s or average meters are not available or where, for some reason, their use is not feasible. In addition, the use of the voltmeter directly, i.e., without a series resistor, yields information about instantaneous peak voltages that cannot be obtained with other types of meters.

— ARNOLD P. G. PETERSON

AUTOMATIC DATA DISPLAY CRO—RECORDER—X-Y PLOTTER

The several automatic dial drives described in recent issues of the *Experimenter*^{1, 2, 3, 4, 5} have greatly simplified the problem of automatic display and recording as a routine laboratory

operation. They attach to existing oscillators and make possible both oscilloscope and graphic display without necessitating the use of specialized sweeping equipment. They combine





the features of economy and simplicity with the ability to produce highly satisfactory results.

To facilitate a selection of the best drive for a given application, the sev-

eral drives and their uses have been tabulated below, together with the General Radio oscillators with which they can be used, listed in the order of increasing frequency range.

GENERAL RADIO SWEEP DRIVES

Frequency Range	Oscillator Type No.	Drive Type No.	CRO ¹⁰	Graphic Recorder	X-Y Plotter
10 c to 100 kc	1302-A	1750-A	x	x	x
20 to 20,000 c 20 kc to 40 kc	1304-B	908-P2 908-P1 908-R12 908-R96 1750-A	x	x x x	x x
20 to 20,000 c 20 kc to 40 kc	1303-A	908-P2 908-P1 1750-A	x ⁶ x	x	
20 to 200μ 0.2 to 2 kc 2 to 20 kc 20 to 200 kc 50 to 500 kc	1210-B	908-P1 908-P2 907-R18 907-R144 1750-A	x ^{6, 7} x	x x x	x x
0.5 to 5 Mc 5 to 50 Mc	1211-B ⁸	908-P2 908-P1 908-R12 908-R96 1750-A	x ⁶ x	x x x	x x
5 to 15 kc 15 to 50 kc 50 to 150 kc 150 to 500 kc 0.5 to 15 Mc 15 to 50 Mc	1330-A	908-P1 907-R18 907-R144		x x x	x x
50 to 250 Mc	1215-B ⁸	908-P2 908-P1 908-R12 908-R96 1750-A	x ⁶ x	x x x	x x
250 to 920 Mc	1209-B ⁸	908-P2 908-P1 907-R18 907-R144 1750-A	x ⁶ x	x x x	x x
900 to 2000 Mc	1218-A ⁸	908-P1 908-R12 908-R96 1750-A	x	x x x	x x
300 to 5000 Mc	Type 874-LB Slotted Line with appropriate oscillator	874-MD	x ⁹		x

¹ H. C. Littlejohn, "Motor Drives for Precision Drives and Beat-Frequency Oscillators", *General Radio Experimenter*, 29, 6; November, 1954, pp. 1-3.

² Eduard Karplus, "A New System for Automatic Data Display", *General Radio Experimenter*, 29, 11; April, 1955, pp. 1-6.

³ R. A. Soderman, "Automatic Sweep Drive for the Slotted Line", *General Radio Experimenter*, 29, 11; April, 1955, pp. 10-15.

⁴ G. A. Clemow, "Synchronous Dial Drives for Automatic Plotting", *General Radio Experimenter*, 31, 3; August, 1956, pp. 5-9.

⁵ W. F. Byers, "The Type 1263-A Amplitude-Regulating Power Supply", *General Radio Experimenter*, 29, 11; April, 1955, pp. 6-10.

⁶ Horizontal deflection voltage not provided; synchronous drive.

⁷ Horizontal deflection voltage can be furnished with the Type 1210-P1 Detector and Discriminator.

⁸ Oscillator must be powered by the Type 1263-A Amplitude Regulating Power Supply.

⁹ Displays VSWR directly on CRO.

¹⁰ Oscilloscope should have long-persistence screen.

THE TYPE 1750-A SWEEP DRIVE

(see cover)

Of all the drives, the TYPE 1750-A is the most flexible in application, because it fits any knob or dial and is easily adjustable, while operating, both in sweep arc and sweep rate.

Speed range is 0.5 to 5 cps over arcs from 30° to 300°. This drive is fully described in the *Experimenter* for April, 1955.

Type	Code Word	Price
1750-A	Sweep Drive (115 volts, 50-60 cycles).....	STUDY \$440.00

AMPLITUDE-REGULATING POWER SUPPLY

Where indicated in the table (with TYPES 1211-B, 1215-B, 1209-B, and TYPE 1218-A Unit Oscillators) the TYPE 1263-A Amplitude-

Regulating Power Supply is necessary to hold the oscillator output constant. This, with other accessories, is listed below.

Type	Code Word	Price
1263-A	Amplitude Regulating Power Supply.....	SALON \$280.00
874-VR	Voltmeter Rectifier.....	COAXRECTOR 30.00
874-VQ	Voltmeter Detector.....	COAXVOQUER 30.00
274-NF	Patch Cord.....	STANPARGAG 1.50
874-Q6	Adaptor.....	COAXCLOSER 2.25
874-WM	50-ohm Termination.....	COAXMEETER 12.50

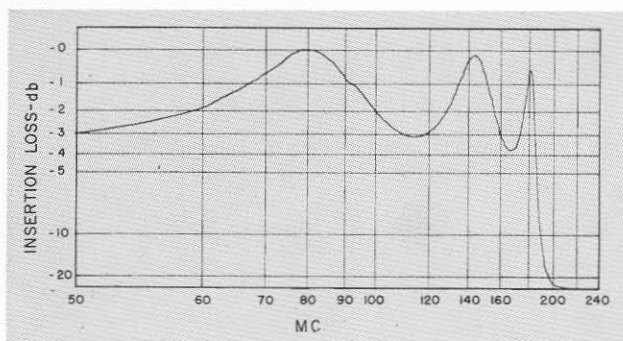


THE TYPE 907-R and TYPE 908-R X-Y DIAL DRIVES

These drives are designed to fit the General Radio TYPE 907-WA (4-inch) and TYPE 908-WA (6-inch) Gear Drive Precision Dials for front-of-panel mounting. Oscillators using these dials are listed in the table for the R-type drives. The drive replaces the knob on the front of the dial and is easily installed. Its synchronous motor rotates the dial at a uniform rate. A potentiometer is rotated simultaneously, providing an output voltage proportional to dial position, which can be used to drive the X-axis of a plotter. A complete description and specifications will be found in the *Experimenter* for August, 1956. Two speeds are available in each size.

(Above) View of Type 907-R-144 X-Y Dial Drive, installed on a u-h-f Unit Oscillator.

(Right) Plot of the frequency characteristic of a Type 874-F185 Filter obtained on an X-Y plotter with the X-Y Dial Drive shown above.



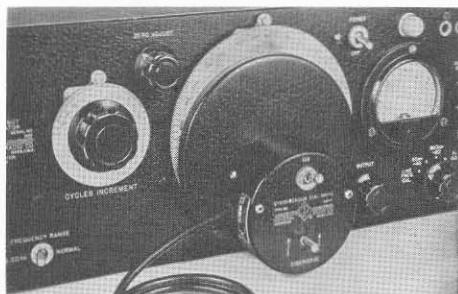
Type	Dial	Speed	Rotation	Potentiometer	Max Pot. Current	Resolution
907-R18	907	18°/min	CCW	20 kΩ	10 ma	0.4°
907-R144	907	144°/min	Self-reversing	20 kΩ	10 ma	0.4°
908-R12	908	12°/min	CCW	50 kΩ	10 ma	0.2°
908-R96	908	96°/min	Self-reversing	50 kΩ	10 ma	0.2°



Type		Code Word	Price
907-R18	X-Y Dial Drive.....	EARLY	\$55.00
907-R144	X-Y Dial Drive.....	EDUCE	55.00
908-R12	X-Y Dial Drive.....	EGRET	55.00
908-R96	X-Y Dial Drive.....	EJECT	55.00

THE TYPE 908-P1 and TYPE 908-P2 SYNCHRONOUS DIAL DRIVES

Simplest and least expensive of the dial drives, these synchronous units will fit both the TYPE 907-WA and the TYPE 908-WA Gear-Drive Precision Dials. They do not include the potentiometer for supplying a horizontal deflection voltage. Adjustable stops are provided for limiting travel. Drives are self reversing. The faster model, TYPE 908-P2, can be used for oscilloscope display if a simple discriminator is provided to supply the X-axis original. The TYPE 908-P1 is recommended for use with a graphic recorder. A complete description with specifications was published in the *Experimenter* for November, 1954.

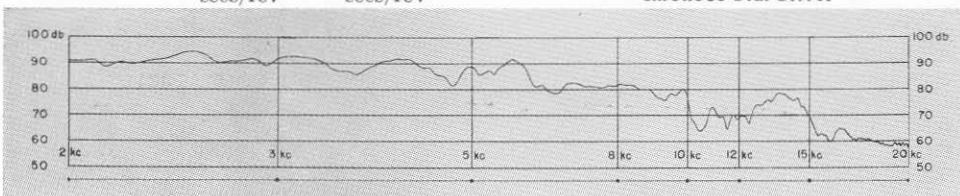


(Above) View of the Type 908-P1 Synchronous Dial Drive installed on a Type 1304-B Beat-Frequency Audio Generator.

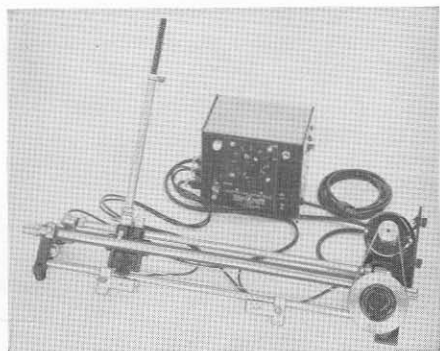
(Below) Record of the frequency response of a small loudspeaker in an anechoic chamber. Oscillator was driven by the Type 908-P1 Synchronous Dial Drive.

Speed:

Type	Pinion	908 Dial	907 Dial
908-P1	4 RPM	4/15 RPM or 225 secs/rev	4/10 RPM or 150 secs/rev
908-P2	30 RPM	2 RPM or 30 secs/rev	3 RPM or 20 secs/rev



Type		Code Word	Price
908-P1	Synchronous Dial Drive.....	SYNDO	\$27.50
908-P2	Synchronous Dial Drive.....	SYNKA	27.50

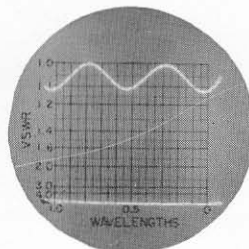


View of the Type 874-LBA Slotted Line with the Type 874-MD Motor Drive.

SLOTTED LINE MOTOR DRIVE

The slotted-line motor drive, designed to drive the probe carriage of the General Radio TYPE 874-LBA Slotted Line, makes possible the display of VSWR directly on an oscilloscope. Its use greatly speeds up slotted line measurements. See the *Experimenter* for April, 1955, for complete details.

VSWR pattern, as displayed on scope, obtained with the motor-driven slotted line.



Type		Code Word	Price
874-MD	Slotted-Line Motor Drive..	STORY	\$290.00