

MOTOR DRIVES FOR PRECISION DIALS AND BEAT-FREQUENCY OSCILLATORS

● **GENERAL RADIO** beat-frequency oscillators, as well as a number of other General Radio instruments developed in the past few years, use as frequency controls the TYPE 908 or TYPE 907 Gear-Drive Precision Dials. These dials are so designed that a motor drive can be easily attached in place of the knob.

Shown in Figure 1 is a simple, low-cost motor drive unit for use on the dials. Available in two models with different speeds, the TYPE 908-P1 and TYPE 908-P2 Dial Drives have been designed particularly for use on the TYPES

1304-A and 1304-B Beat-Frequency Audio Generators and the TYPE 1303-A Two-Signal Audio Generator, but they can also be used on General Radio Unit Oscillators and Standard-Signal Generators, as well as on other instruments equipped with the TYPE 908 or TYPE 907 Gear-Drive Precision Dials.

The motor drives make possible the use of these instruments with recording systems as, for example, in recording the response of a network as a function of frequency. They can also be used as sweep drives and for producing warble

Figure 1. View of the Type 908-P2 Synchronous Dial Drive installed on a Type 1304-B Beat-Frequency Oscillator. The adjustable stops, which attach to the oscillator dial, are not shown.



Also

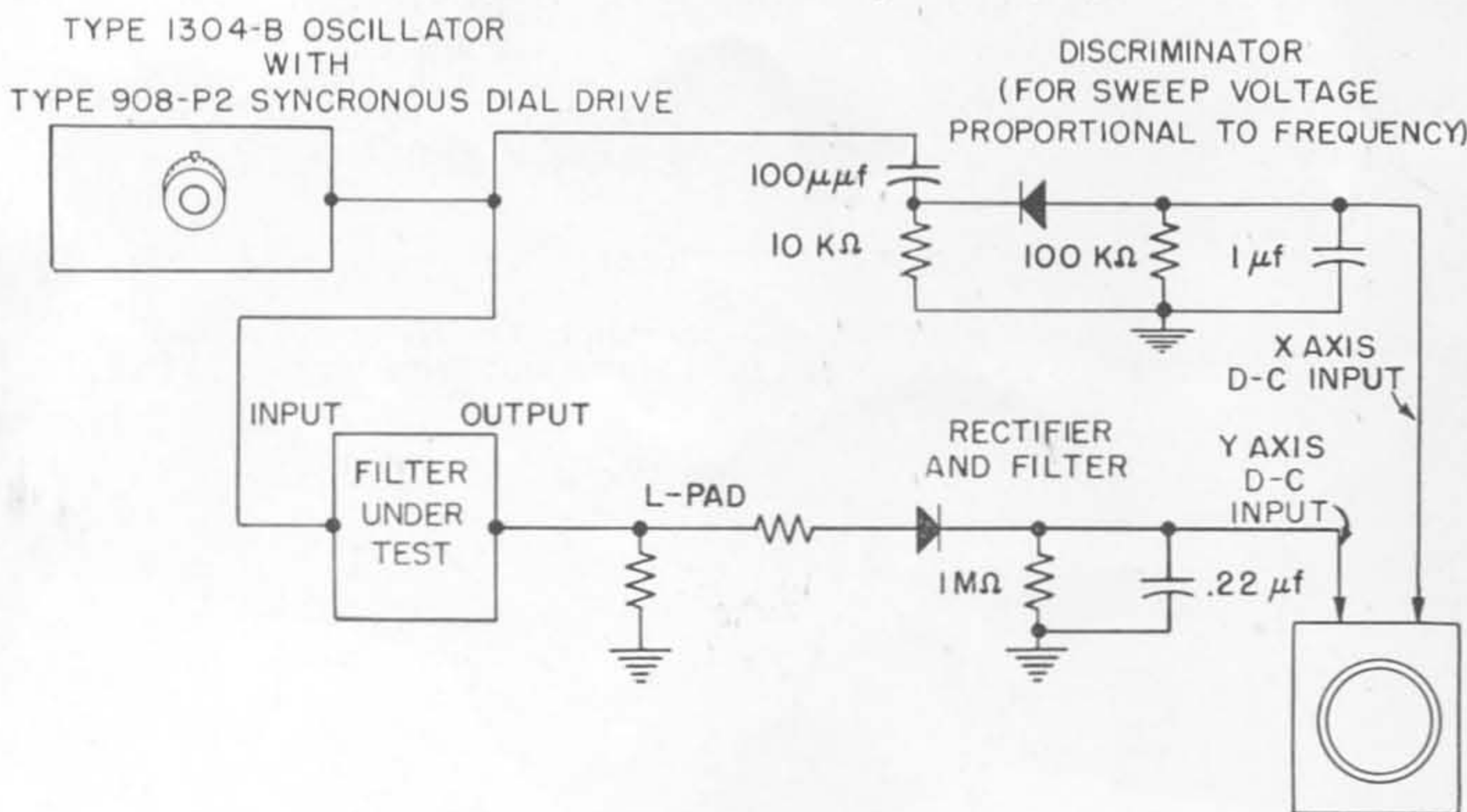
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tones. When installed on a TYPE 1304 Beat-Frequency Audio Generator, as shown in Figure 1, this type of drive can sweep the oscillator automatically back and forth over a range of frequencies. This technique has applications in many kinds of measurements. For example, with a cathode-ray oscillograph as a visual indicator, the study and adjustment of audio-frequency networks is accomplished rapidly and conveniently. Another example, in the field of mechanics, rather than electronics, occurs in vibration testing. When the beat-frequency oscillator is used to drive a shake table, the automatic sweep is helpful in spotting resonances.

The dial drive consists essentially of a small, synchronous, 115-volt, 60-cycle motor with a pinion gear on the output shaft. This motor drive is readily fastened in place of the knob drive of the precision dial so that the pinion gear on the motor shaft engages the dial ring gear.

Figure 2. Simple discriminator circuit for supplying the horizontal axis signal to a cathode-ray oscillograph.



A disengage lever, as well as a power switch, is provided. The lever can be used to lift the pinion off the ring gear and thus disengage the drive.

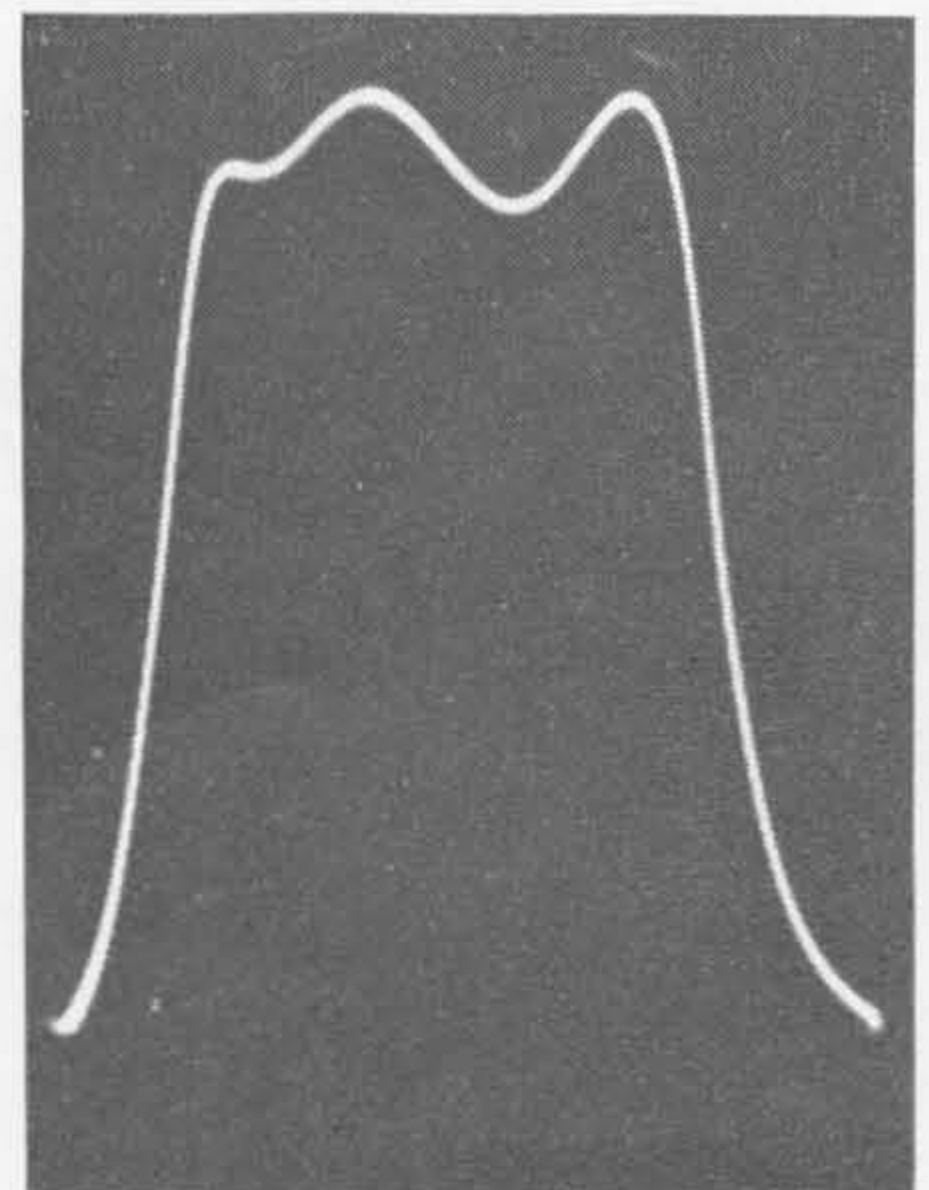
The drives reverse the direction of rotation whenever a stop is encountered. It is this feature that makes possible their use as sweep drives and their use to produce warble tones. Stops, which are provided, can be readily attached to the dial to limit the sweep to the desired part of the range.

With these adjustable stops the maximum angle of dial rotation is limited to 80° for the TYPE 908 Dial and 65° for the TYPE 907 Dial. The full range of dial rotation can be obtained when these stops are not used. Other types of stops to give intermediate angles of rotation can be devised by the user.

USE WITH RECORDERS

Because the drives are synchronous, they are readily used with recording systems. For example, the response of a network as a function of frequency can often be recorded very easily by applying to the network the output of a TYPE 1304-B Beat-Frequency Generator driven by a TYPE 908-P1 Dial Drive. The output of the network is then recorded as a function of time. Since the oscillator frequency and time are di-

Figure 3. Oscillogram of the response characteristic of a filter as displayed by means of the arrangement of Figure 2.





rectly related by the dial drive, the response as a function of frequency is readily obtained. To facilitate the use of recorders in such applications, the speed of TYPE 908-P1 Drive has been selected to cover in 15 seconds a frequency interval of an octave on the TYPE 1304-B Generator. This rate is widely accepted as a standard. The TYPE 908-P2 Drive is particularly suitable for limited-sweep applications, with observations of the response on a cathode-ray oscillograph with a long persistence-screen. As a natural consequence of the higher speed, however, the torque available from the TYPE 908-P2 is small. Therefore, in order to avoid erratic operation, the driven part should generally use ball-bearing supports, as in the TYPES 1304-A, 1304-B, and 1303-A Oscillators.

For some recording applications, an output voltage is desired that is proportional to the angle of rotation of the dial. To do this, a linear potentiometer having low torque requirements can also be driven by the shaft on which the dial is mounted. Naturally, this arrangement is usable only if the complete system can be arranged so that the required torque does not exceed the torque that can be delivered by the drive. The linear potentiometer can then be energized by a con-

stant d-c voltage, and the voltage between the tap and one end will be proportional to the dial rotation.

When a limited sweep is used to vary the frequency of an oscillator, a discriminator system can often be used to give a signal proportional to the instantaneous frequency. The output of the discriminator can then supply the voltage for one axis of an oscillographic display, for example. The circuit of a very simple type of discriminator, suitable for use with the TYPE 1304-B Generator, is shown in Figure 2. The output of this discriminator is used to supply the X-axis signal of a cathode-ray oscillograph having a d-c amplifier and a long persistence-screen.

The oscillogram of Figure 3 shows the response characteristic of a filter as displayed on an oscillograph screen by means of the arrangement of Figure 2.

In experimental work on audio-frequency circuits, sweep methods will save much valuable engineering time as compared to point-by-point methods. The availability of this economical motor drive for General Radio beat-frequency generators makes possible the application of sweep methods to existing laboratory equipment.

—H. C. LITTLEJOHN

SPECIFICATIONS

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

On logarithmic frequency dials used on TYPES 1304-A, 1303-A Oscillators, the sweep times are as follows:

908-P1	50 sec/frequency decade or 15 sec/octave
908-P2	6 $\frac{2}{3}$ sec/frequency decade or 2 sec/octave

Pinion on Output Shaft: 48 D.P., full involute, 20° pressure angle, 10 teeth.

Torque at Pinion: 908-P1 5 inch-ounces
908-P2 $\frac{2}{3}$ inch-ounce

Power Supply: 105 to 125 volts, 50-60 cycles, 3 watts.

Dimensions: 3 $\frac{5}{8}$ -inch diameter x 3 inches deep, overall, but excluding power line connecting cord.

Weight: 1 pound, 3 ounces.

*Data are for 60-cycle operation. On 50 cycles, speeds will be 5/6 of those given above and drive times will be 6/5 of those listed.

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

