



# Wayne Kerr CORPORATION

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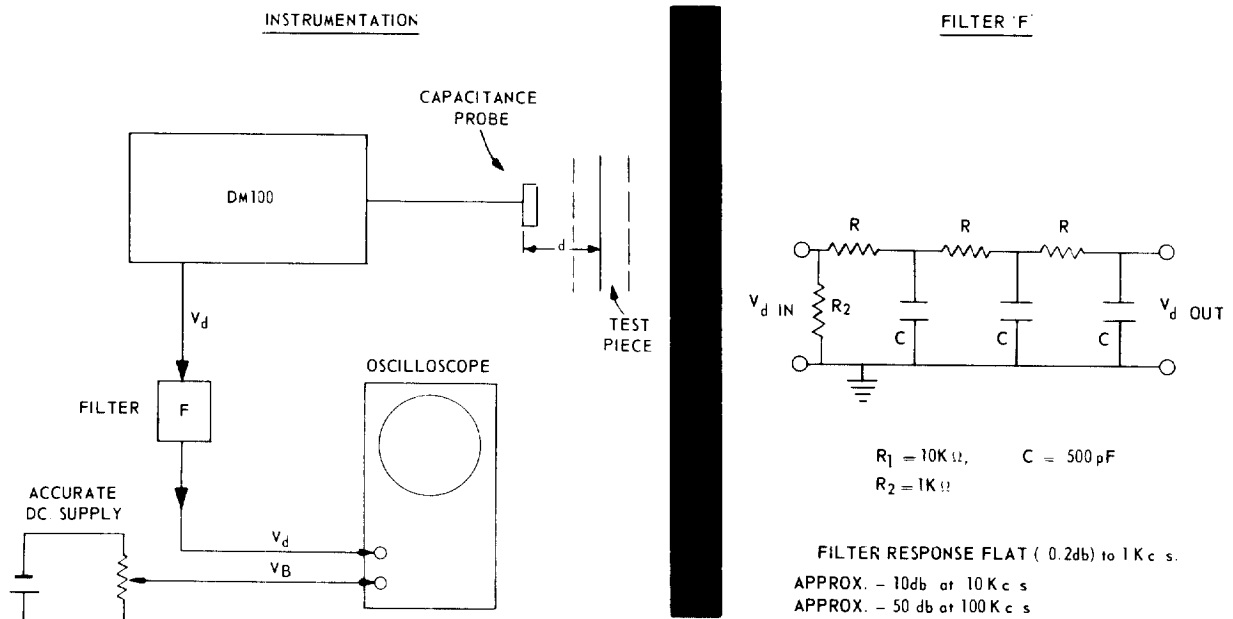
Innovations in Instrumentation ■ Measurement ■ Analysis ■ Synthesis ■ Control

## APPLICATION OF DM100 DISTANCE METER FOR LOW AMPLITUDE VIBRATION MEASUREMENTS

The Wayne Kerr DM100 is an extremely linear capacitance transducer whose output voltage varies directly with the capacitance probe from the test specimen. The system is sensitive enough to measure variations in distance (or vibration amplitudes) of the order of microinches. The frequency range of the DM100 is from DC to 10 KC.

### MEASUREMENT PROCEDURE

A Wayne Kerr capacitance probe is placed a distance "d" (see diagram) from the static test specimen. The output voltage, " $V_d$ ", from the DM100 recorder outlet will be in the form of a 50 KC full-wave rectifier signal. The 100 KC ripple voltage is filtered out by the filter "F", and the filter output is now a low-noise DC voltage whose magnitude will depend directly on the distance of the probe from the test piece. For probe A, "d" varies from 0 to 1 mil, and " $V_d$ " varies from 0 to 1 volt, so that the spot will be on the screen for the most sensitive range required.



When the test specimen is vibrated, the spot will follow the excursion of the specimen; a typical sensitivity would be 4 micro-inches vibration amplitude (peak to peak) for 1 cm oscilloscope deflection on an oscilloscope range of 4 mv/cm range.

### **ACCURACY**

The sensitivity of Probe, DM100 filter, and oscilloscope may be calibrated statically by adjusting " $V_d$ " to various accurately known distances which are fixed by means of gauge blocks or a micrometer. A determination of microinches " $d$ " per millivolt " $V_d$ " is made by nulling the DC voltage " $V_d$ " against the 0.01% accurate DC supply " $V_b$ " (Normal accuracy DC potentiometer).

The accuracy will then depend chiefly on the accuracy of the calibration gauge blocks or micrometer—normally  $\pm 4$  micro-inches. The oscilloscope gain is checked by returning the deflected spot to a datum line by an accurate voltage  $V_B$  derived from the DC potentiometer.

### **TWO DEGREES OF FREEDOM OF A ROTATING SHAFT**

Extremely small movements of rotating machinery, e.g., Air Bearings, can be studied by using two probes at right angles to each other to measure the object's movement simultaneously along the X and Y axes. The outputs of the two DM100's are connected to the X and Y amplifiers of the oscilloscope. The pattern of the resulting display gives complete information on the motion of the rotating shaft.

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