



TYPES 874-VQ and -VQL VOLTMETER DETECTORS

1 INTRODUCTION.

1.1 PURPOSE. The Type 874-VQ Voltmeter Detector (Figure 1) can be used, in conjunction with a Type 874-VI Voltmeter Indicator, for measuring voltages from 0.1 to 2 volts. When used with a tuned audio amplifier such as the Type 1232-A Tuned Amplifier, the Voltmeter Detector is a sensitive detector (approx 100 μv) of modulated signals, or, with a microammeter, as an rf detector up to 2000 Mc. It can also be used with the Type 1232-A as a video detector up to 7000 Mc, but with reduced sensitivity, especially at the resonant frequency. Full-scale sensitivity of such a system is 200 μv , or approximately -60 dbm in a 50-ohm system.

1.2 DESCRIPTION. The Type 874-VQ Detector consists of a short length of 50-ohm coaxial line, with a Type 1N23B Crystal diode mounted between the inner and outer conductors. Two inductive compensating sections

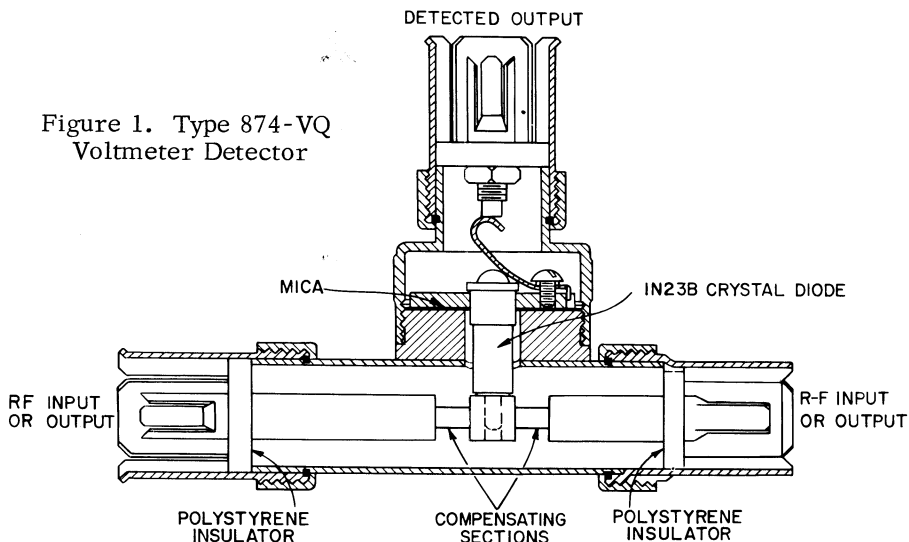


Figure 1. Type 874-VQ
Voltmeter Detector

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(Figures 1 and 2) correct for the discontinuity introduced by the diode. The rf is bypassed through a 300-pf mica disc capacitor, and the detected output is brought out through the shielded connector at the side of the unit. Rf terminals are electrically symmetrical, and all connectors are Type 874.

1.3 TYPE 874-VQL. The Type 874-VQL Voltmeter Detector is identical to the Type 874-VQ except that it employs locking Type 874-BL Coaxial Connectors. These connectors are compatible with both locking and non-locking Type 874 Connectors. When two locking connectors are mated with each other, a firm mechanical coupling is achieved. Also, the shielding is improved significantly over that of the standard connector and, in general, the leakage is reduced by at least 50 db. In terms of VSWR, a locking connector mated with a nonlocking connector is equivalent to two nonlocking connectors mated. The VSWR characteristics of the basic Type 874-BL Locking Connector are similar to those of the basic Type 874-B (nonlocking) Connector, and both are described in the General Radio catalog. The quick-disconnect feature of the standard Type 874 Coaxial Connectors is retained in the locking type if the coupling nut is not engaged. However, in this case, the shielding is less effective.

2 OPERATING CHARACTERISTICS.

2.1 VSWR. Because of the compensating sections, the VSWR of the unit is low at frequencies up to over 2000 Mc. A typical curve, Figure 3, is measured with one r-f end terminated in 50 ohms. If the detected output is fed into an indicator with very low dc resistance and the signal level is high, the VSWR may increase as indicated in Figure 4.

2.2 FREQUENCY CORRECTION. Due to resonance in the diode, the indicated voltage varies with frequency. A correction curve giving the ratio

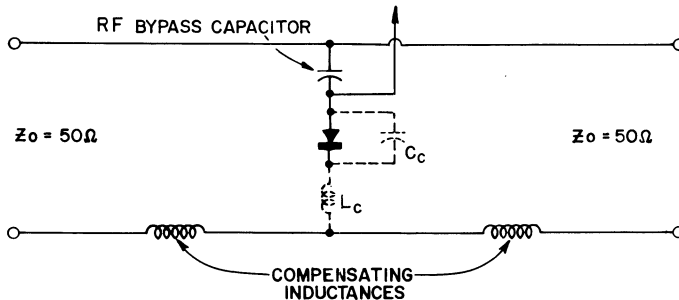


Figure 2.

TYPE 874-VQ VOLTMETER DETECTOR

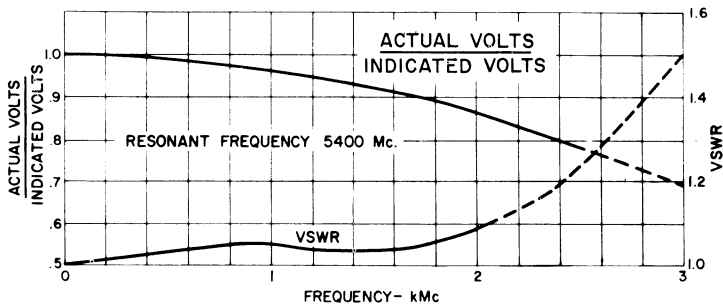


Figure 3.

of actual volts to indicated volts is given in Figure 3. The resonant frequency will increase about 10 percent at the maximum signal level, because of the rectified back voltage.

2.3 VOLTAGE CORRECTION. It should be remembered that the diode characteristic changes from square law at low voltage to linear at higher voltages. To help correct for this characteristic, a typical diode characteristic curve is given in Figure 5.

CAUTION: Voltages higher than 2 volts can permanently damage the diode.

2.4 DC RETURN. An external path for the diode current should be incorporated in the rf circuitry for applications where the detected output is applied to an input resistance less than about 250,000 Ω . The Type 874-W50 or -W50L 50-ohm Terminations are generally suitable for this purpose.

3 APPLICATIONS.

3.1 VOLTAGE MONITOR. The Type 874-VQ can be inserted anywhere in a 50-ohm system to monitor the voltage without introducing any appreciable discontinuities. The Type 874-VI is recommended as a calibrated detector for use with the Type 874-VQ.

3.2 MATCHED DETECTOR. When terminated in 50 ohms (as, for instance, in a Type 874-W50 termination), the Type 874-VQ can be used as a matched detector at frequencies up to 2000 Mc.

3.3 DETECTOR FOR MODULATED SIGNALS. This detector can be used to demodulate a-m signals where the demodulated output appears across the rf bypass capacitor. When it is desired to increase the bandwidth in

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detection of high-frequency a-m signals, it must be remembered that a low resistance may affect the VSWR (see Figure 4). The bandwidth can also be increased by a decrease in the rf bypass capacitance. To do this, insert additional mica spacers (see Figure 1 and paragraph 5.2).

3.4 HETERODYNE MIXER. The Type 874-VQ has proved a useful heterodyne mixer, e.g. in frequency measurements.

3.5 DETECTOR IN SWEEP APPLICATIONS. When the Type 874-VQ is used as a detector for a signal from an oscillator whose output is controlled by a Type 874-VR Voltmeter Rectifier and a Type 1263-B Amplitude-Regulating Power Supply, there is no need to correct for frequency response, since errors in the diodes of the Types 874-VR and 874-VQ tend to cancel each other. However, irregularities of up to 10 percent may occur owing to the output crystal's response to harmonics generated by the input crystal. The measurement of a component with large insertion loss must be corrected for the nonlinearity of the diodes (refer to paragraph 2.3). If the oscillator is swept (e.g. by a Type 1750-A Sweep Drive) and the output from the Type 874-VQ is displayed on an oscilloscope, the display will normally be inverted. If the oscilloscope does not have a reversal switch, the picture can be righted by reversal of the connections to the vertical deflection plates.

Another method of reversal is to replace the diode in the Type 874-VQ with a reversed diode, Type 1N23BR. In this instance, however, much care must be taken to remove harmonic distortion in the oscillator to prevent errors due to the opposite polarity of the diodes in the amplitude-regulating Type 874-VR and the detector Type 874-VQ.

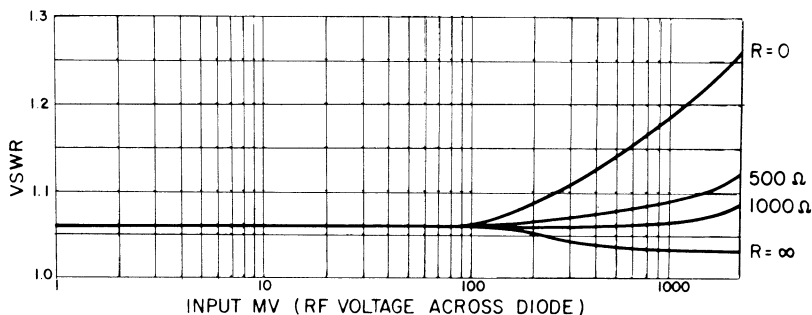


Figure 4.

TYPE 874-VQ VOLTMETER DETECTOR

4 OTHER TYPE 874 COMPONENTS.

General Radio manufactures an extensive line of coaxial connectors, adaptors, and components. Adaptors are available in both locking and nonlocking versions to most popular connectors, including Types BNC, C, HN, LC, LT, N, SC, UHF, and TNC. Components available include terminations, low-pass filters, tees, ells, air lines, balun, tuning stubs, attenuators, and patch cords. For further information, consult the latest General Radio Catalog.

5 SERVICE AND MAINTENANCE.

5.1 DIODE REPLACEMENT. To replace the diode in the Type 874-VQ, unscrew the knurled head on the detected-output connector, loosen the

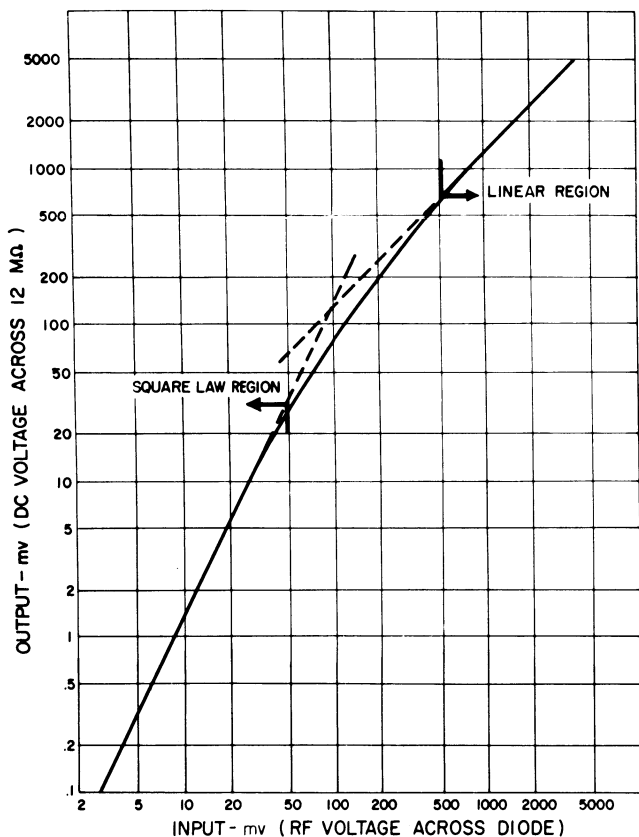


Figure 5.

spring clip with a screw driver, and remove the diode. The diode should have a back resistance of at least 20,000 ohms at 1 volt dc.

5.2 CAPACITOR REPLACEMENT. To replace the coupling capacitor, unscrew the knurled head and remove the two diametrically positioned screws. The capacitor then comes apart. To decrease capacitance, insert additional mica spacers.

SPECIFICATIONS

Maximum Voltage: 2 volts.

Resonant Frequency: Approximately 5400 Mc; correction curve supplied.

VSWR Introduced in a Matched 50-ohm Line: Less than 1.1 at 1000 Mc. less than 1.2 at 2000 Mc.

Bypass Capacitance: Approximately 300 pf.

Frequency Range: 500 kc to 2000 Mc. Can be used at frequencies up to 5000 Mc (see VSWR curve), in limited application up to 7000 Mc, and down to 60 cps (with external bypass capacitor).

Crystal: Type 1N23B.

Dimensions: 3-3/4 x 2-1/2 inches (96 x 64 mm).

Net Weight: 5 ounces (140 g).

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