

Audio continuity tester indicates resistance values

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A continuity tester built around a 555 timer audibly and visually indicates a wide range of resistance values. The unit, which can be assembled for less than \$10, is especially handy for testing devices without having to glance from test probe to meter and back again. However, by merely changing the value of one resistor, the tester can function as a multivibrator.

The meter can indicate by tones over a loudspeaker or a headset forward and reverse continuity conditions from 0 to more than 30 megohms for such devices as resistors, diodes, transistors, capacitors, and light-emitting diodes. In addition to the audio output, a LED serves as a pilot light and flashes when the output frequency falls below 10 to 12 pulses per second. The output is a square wave, and an audio pulse sounds each time the LED is turned on or off.

The tester can also determine the charges stored in mercury and nickel-cadmium battery cells. A full charge of 1.2 to 1.4 volts will either not sound at all or sound in only one direction, depending on the probe's polarity. However, a partially discharged cell with a potential of 0.9 v or less will create a sound in either direction because the audio frequency depends on the resistance of the cell in either direction. For the value of

Sounding off. Low-current audio continuity tester indicates unknown resistance value by the frequency of audio tone. A high tone indicates a low resistance, and a tone of a few pulses per second indicates a resistance as high as 30 megohms.

resistors used an on-to-off duty cycle of about 60% is obtained. The circuit draws about 7 milliamperes from a standard 9-v battery.

The schematic shows where unknown resistor R_x is connected into the multivibrator circuit. The unknown can have any resistance value from zero ohms to more than 30 megohms. At 0 ohm, which is a short circuit across the test probes, the audio output frequency is about 7,000 pulses per second. This frequency sounds like a tone (sine wave) to the ear. At 30 megohms, the frequency from the speaker is about 1 pulse per second.

Very low current flows through the test probes. When R_x is 0 ohm, the current level through the probes is about 270 microamperes, and when R_x is 1 megohm, the current is about 9 μ A.

The 555 timer is operated in the astable-oscillator mode. The free-running frequency and duty cycle are both accurately controlled with three external resistors and one capacitor. The external capacitor, C, charges through R_1 , R_2 , and R_x , but it discharges only through R_2 and R_x . R_2 limits the upper frequency of oscillation to about 7,000 pulses per second when R_x is 0 ohm; otherwise, the frequency would be out of the upper range of hearing (higher than 18,000 pulses per second). The lower frequency limit of approximately 1 pulse per second is set by the value of R_x when it is above 20 megohms.

Resistor R_3 limits the current drawn through the output circuit. A value of 1 kilohm provides adequate audio volume. □

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