Using Component Test on the Fluke 867B Graphical MultiMeters

Introduction

The Fluke 867B provides you with the unique ability to test electrical/electronic components in an unpowered circuit. The GMM™ supplies a sinewave of voltage to the component under test and then plots the voltage vs current relationship on the display. Component test allows you to select one of the following five test frequencies: 2 Hz, 20 Hz, 200 Hz, 2 kHz, and 18.75 kHz. This broad range of test frequencies gives the user the ability to test circuits with a wide range of capacitive characteristics.

The GMM displays to the right show the characteristics of some basic components.

Testing components in-circuit will create troubleshooting patterns that are combinations of these basic patterns.

While it is possible to recognize individual component patterns, it is likely that you will need to have a good circuit board available for comparison purposes. This will allow the most efficient use of the component test mode where there are multiple components influencing the pattern.

Another capability that can enhance the efficiency of testing circuit boards in the field is the ability to store three test patterns in the GMM's waveform storage memory. Once stored you can recall a pattern to the screen for comparison. The FlukeView 860 software allows you to upload component test patterns (signatures) to your IBM® compatible personal computer for long term storage and circuit documentation. You can overcome the three pattern storage limit in the field by using a printout of the patterns or
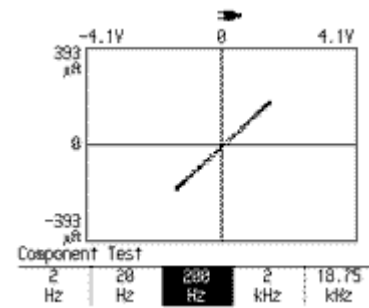
Resistor / Diode/Transistor Junction
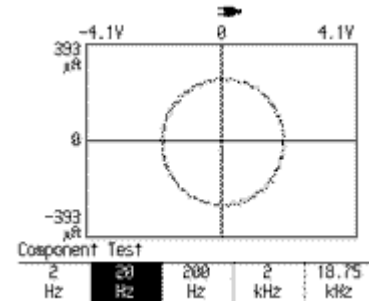
Capacitor / Zener Diode
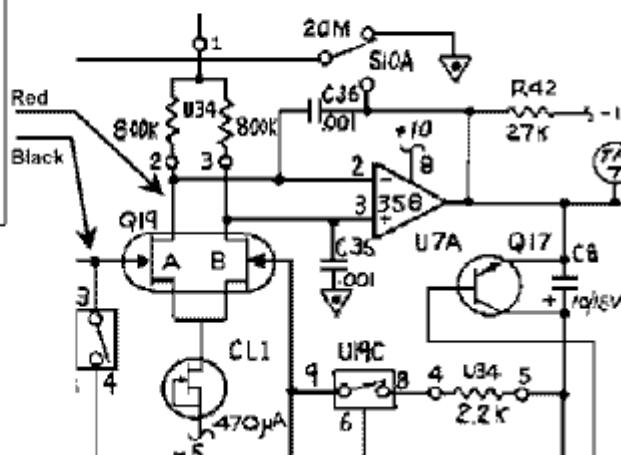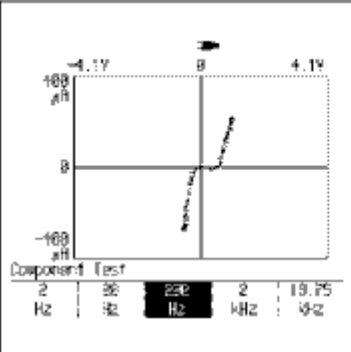
downloading the pc data itself to make comparisons. When the need arises, up to three of these patterns at a time can be downloaded from the computer to the GMM. The computer makes it possible to make a large number of comparisons without having a known good board on site.

While the Fluke 860 Series component test feature shortens troubleshooting time you should also be aware of its limitations. The GMM's 3V peak test voltage will not forward bias multiple pn junctions in series. The display will remain a flat horizontal line indicating an open circuit. While this is not a severe limitation in most troubleshooting situations, it can present a problem when testing high power devices.
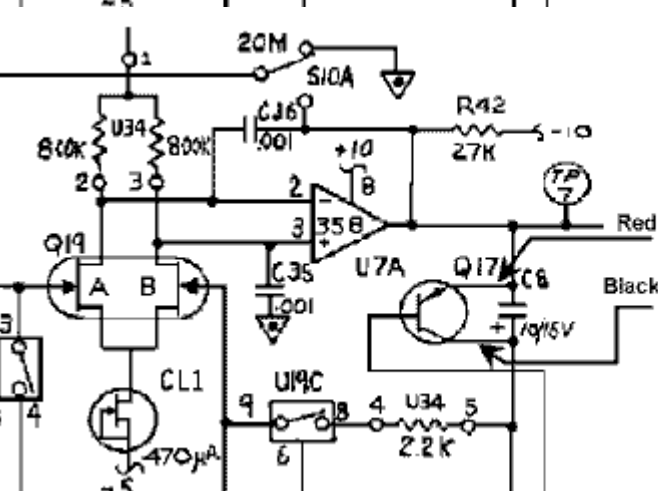
Real World Examples

One of the real advantages of using a component tester occurs through pattern recognition. Through the patterns presented on the screen it is possible, by using a known good circuit board or by having troubleshooting experience with the board, to quickly determine if a circuit component is bad. What follows are some real circuits with their signatures. Each signature has an explanation of why we see what we see and some considerations to take into account while interpreting the display.

Figure 1 shows the characteristics of an 'N' channel JFET with its drain connected to an operational amplifier. The negative portion of the component test pattern is the JFET junction while the positive portion is a transistor pn junction inside the bipolar op amp. If this pattern were to change shape in either the positive or negative portions, it could be indicative of problems in the JFET or op amp.

Figure 2 Transistor Emitter/Collector is a look at the emitter/collector junction of an npn transistor. As you look at the component test pattern the transistor appears shorted (the pattern appears as a vertical bar). However, as we examine the schematic we find a large value electrolytic capacitor across the transistor. At the 200 Hz test frequency this is a very low impedance and, therefore, appears as a short. Fortunately, the 860 Series component tester has multiple frequencies and allows lower frequency testing.
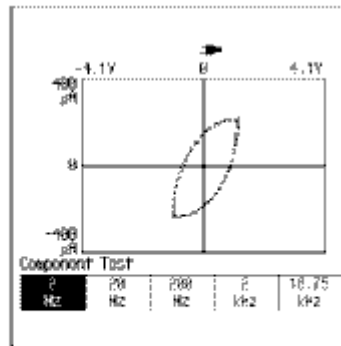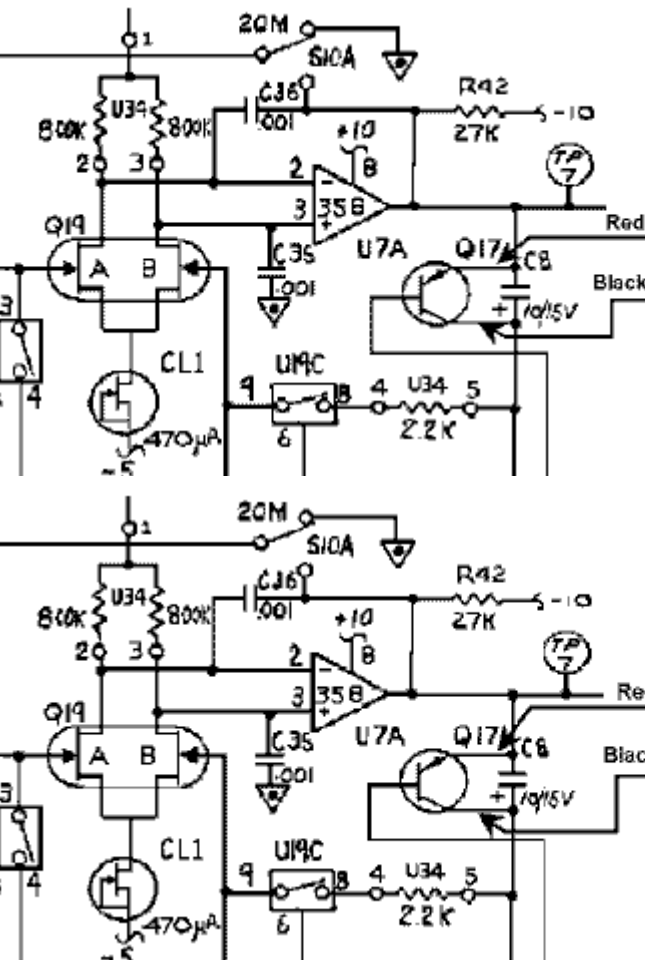
Figure 3 shows the same component tested at 2 Hz. Notice the oval showing the capacitance in the circuit. A shorted transistor would have continued to show a thin vertical line.

Figure 4 shows the effect of having several components influencing the circuit. In this circuit we see a pattern showing the pn junction at the input of op amp U7B, the pn junction

at the output of U7B, the large filter capacitor on the output of the-5V supply through the 15 k½ resistor and the circuit consisting of C9, R44, U9A pin 2 and C37. The high value resistors in the circuit will effectively isolate the rest of the components from the test.

Summary

By using component test with its multiple test frequencies, you can troubleshoot many types of analog and digital circuits. With a little experience, you will recognize the characteristics of many component types. Using a known good pc board for comparison, it will be easy to determine the circuit and area causing the problem. In situations where you are unable to take a good board with you, you can store component patterns for later recall and comparison. All of this will help you to decrease your troubleshooting and repair time.

Storing Test Patterns

To store any pattern you see on screen follow these steps.

1. Press the "SAVE/PRINT" button
2. Press "SAVE SCREEN" (softkey 1)
3. Use the arrow keys (softkey 1 or softkey 2) to select a memory location
4. Press "SAVE" (softkey 3) to store the pattern
5. Press "EXIT" (softkey 5) to go back to the component test screen

Recalling Test Patterns

To recall component test patterns follow these steps.

1. Press the "SAVE/PRINT" button
2. Press "RECALL" (softkey 2)
3. Use the arrow keys (softkey 1 or softkey 2) to select a "SCREENS" memory location
4. Press "VIEW MEMORY" (softkey 3) to look at the pattern or press "LOAD SCREEN" (softkey 4) to load the pattern for comparison purposes