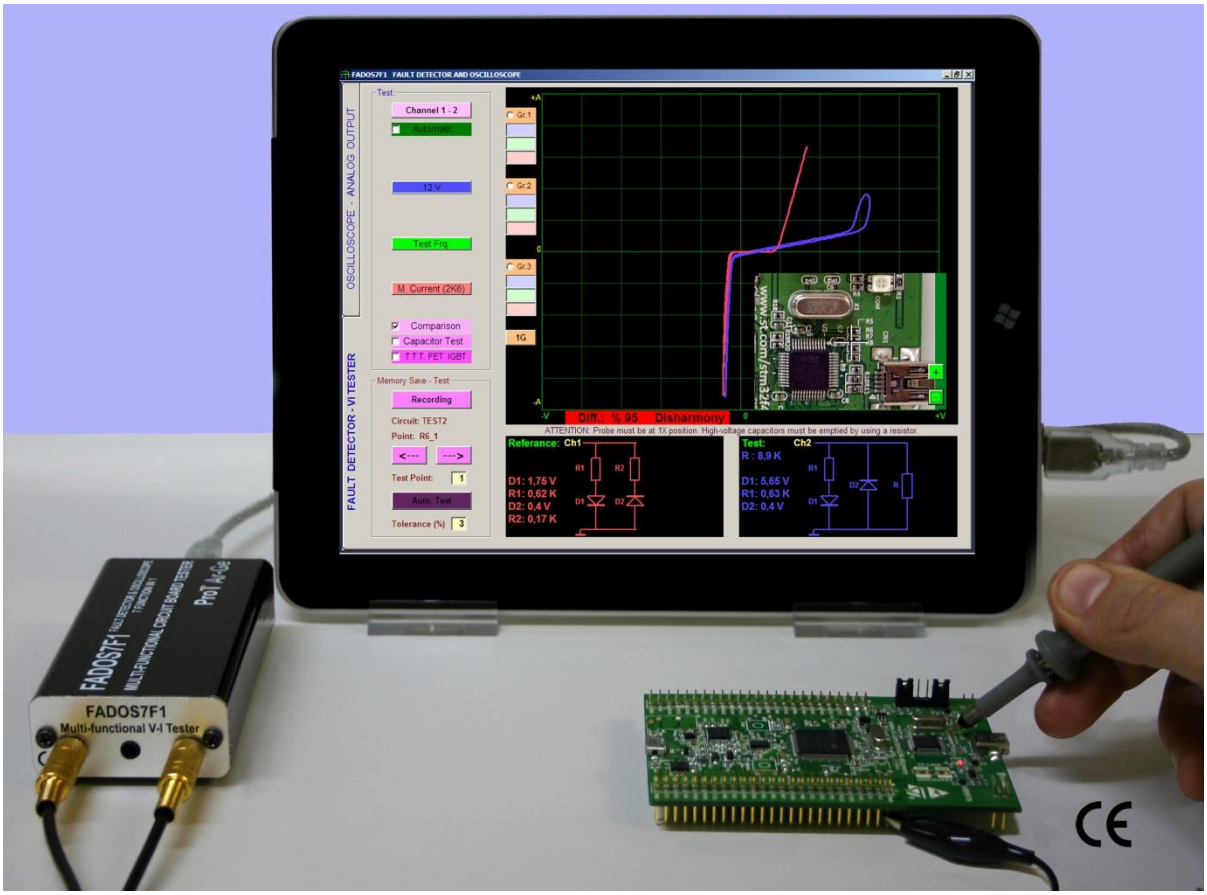
FADOS7F1

FAULT DETECTOR & OSCILLOSCOPE

7 FEATURES IN 1



7 FUNCTIONS:

1. **Dual-Channel Fault Detection by V-I Tester:**

   Fault detection by direct comparison of the current-voltage characteristics (signatures) of a working and a faulty circuit board without applying power to the unit under test.

2. **Equivalent Circuit Diagram** ***

   Display of an equivalent circuit that corresponds to the characteristic on the touched point.

3. **Display Values of Resistor, Capacitor and Diode Threshold** ***

   Display the calculated values of resistance, capacitors and diode threshold voltages corresponding to the conditions at the contacted node.

4. **Fault Detection by Comparison with Stored Signatures**

   Signatures of a functioning board can be saved and used at a later time as a reference for troubleshooting a faulty board. The point to touch can be indicated by a cross hair mark at an image of the board.

5. **Dual-Channel Digital PC Oscilloscope**

   As occasion may require, device can be used as oscilloscope.

6. **0.2... 25KHz Square Wave Output**

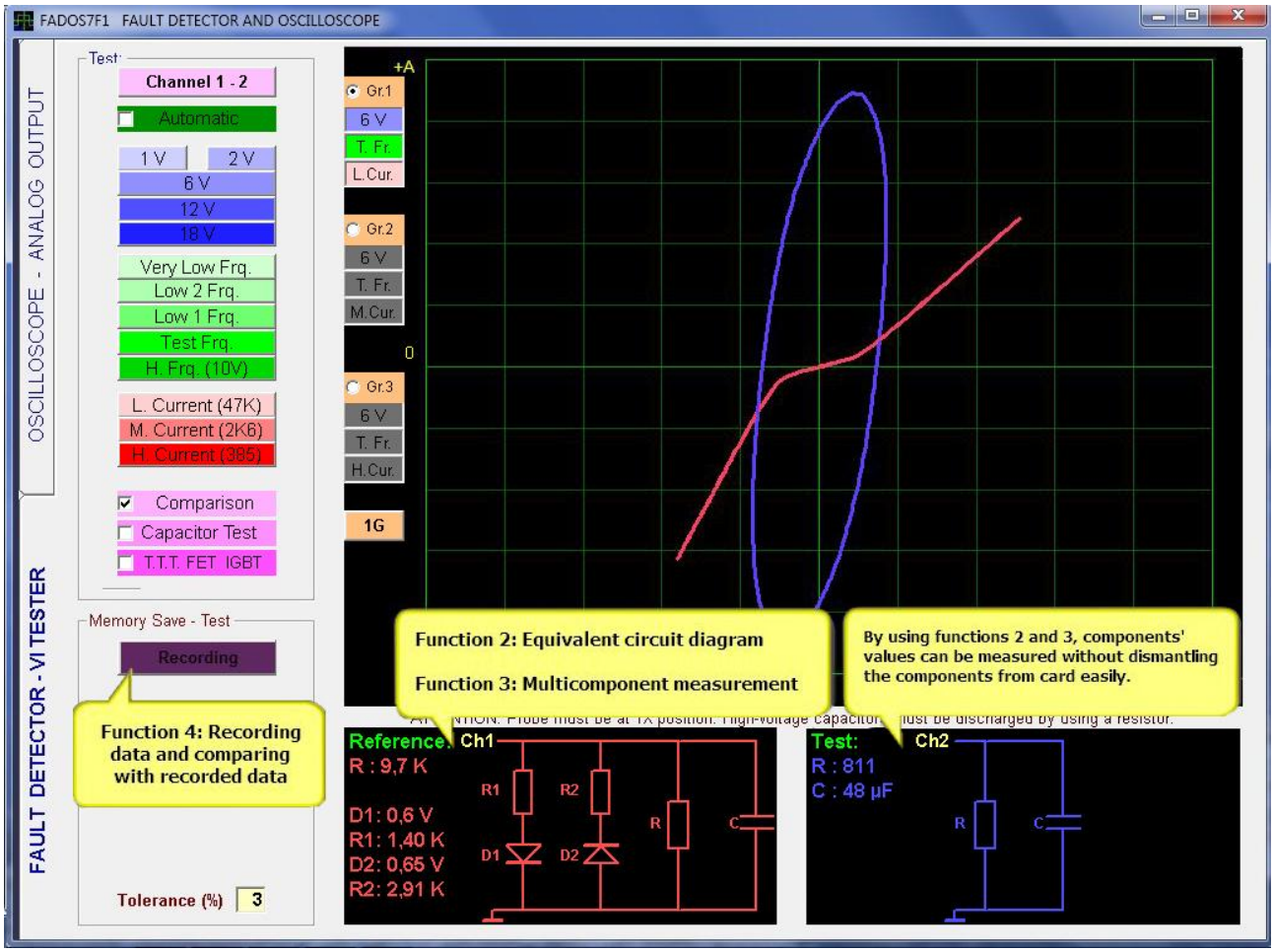
   Channel 2 is used as a square wave generator. Channel 1 can be used as an oscilloscope

7. **Analog Voltage Output**

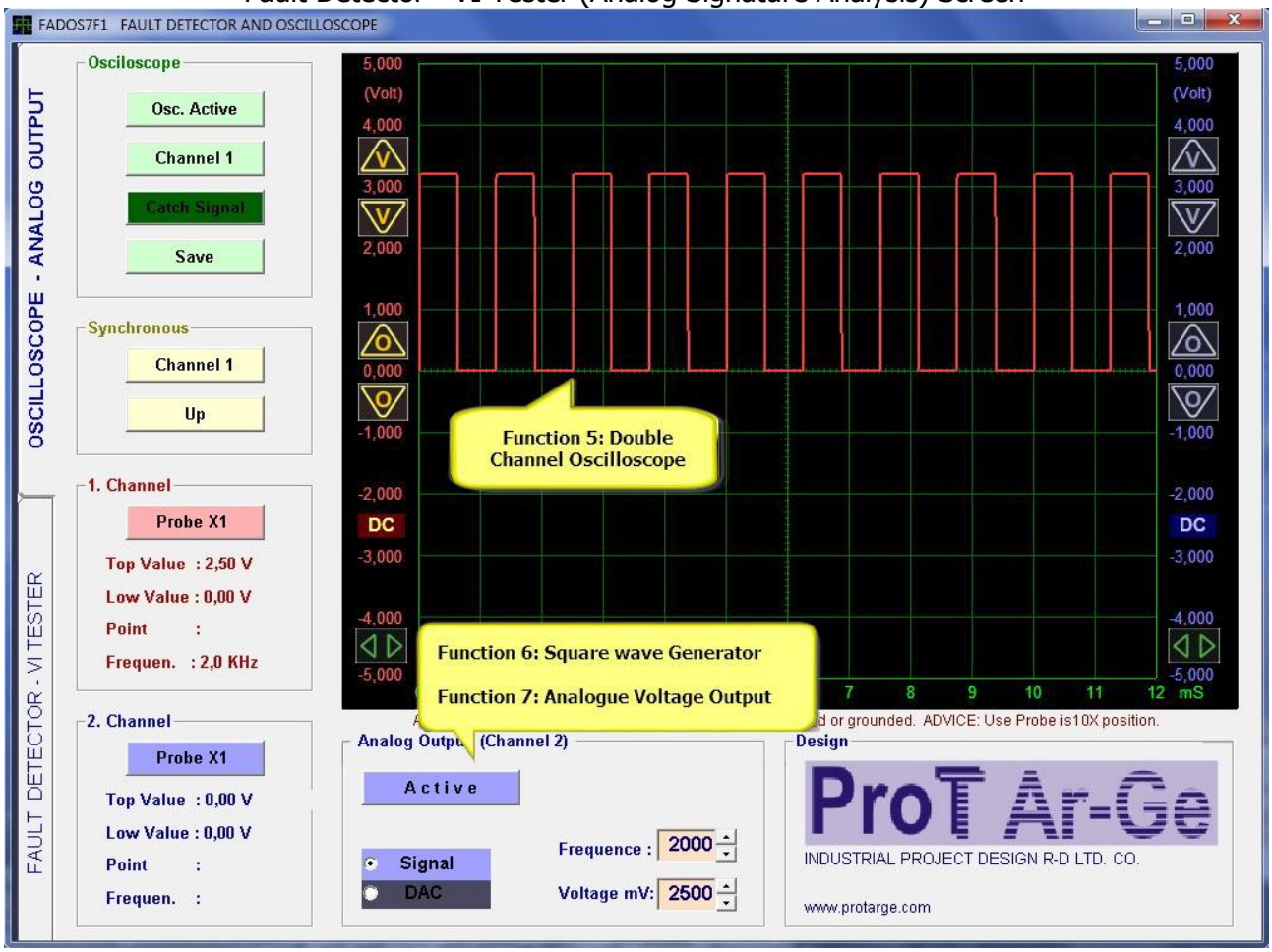
   Channel 2 is used as Analog DC output. Channel 1 can be used as an oscilloscope.

*** **These features are unique.**

FADOS7F1 18V PC Screen



Fault Detector - VI Tester (Analog Signature Analysis) Screen



Oscilloscope – Analog Output Screen

The FADOS7F1 Fault Detector & Oscilloscope Device from the company **Prot Ar-Ge Industrial Project Design Technology R&D Co.** is designed to diagnose the failures in all types of electronic circuit boards. The FADOS7F1 PC is a based **V-I Test Voltage-Current Analysis** device.

Signature Analysis is a power-off test method that is used to troubleshoot circuit boards. FADOS7F1 works by applying a current-limited sine wave through a serial resistor point of touched on circuit and Voltage - Current (Signature) graph is displayed on the computer screen. In addition to these features, the computer software analyzes the Voltage – Current graph and displays the equivalent circuit diagram and the values of the electronic components at the point of contact, which are provided to help the user to diagnose the failure with ease.

Using the **Dual Channel V-I Test** feature, the intact and defective (or suspect) electronic circuit boards can be compared by probing the same points respectively, thus any failures beyond tolerances are diagnosed easily. All the VI graphs are compared by the software with accuracy of **2.5 mV and by analyzing 720 points**. Therefore, the FADOS7F1 is very accurate.

Memory Recording feature; by means of this feature, the characteristics of the intact electronic circuit board (VI graph, equivalent circuit diagram and electronic components values) are written on the computer's hard disk and taking these points as reference, you can compare the defective (or assumed to be defective) electronic circuit boards accurately, easily and rapidly. At the same time, the data can be written on the photograph of the board. Thus, the recorded point can be seen on the photograph while making a comparison from the memory.

The software **produces different sounds** while **comparing** the **matching** and **non-matching** points during the test. Thus, the comparison can be made rapidly by focusing on the sounds without looking at the display constantly. The user can compare the electronic circuit boards from 3 different settings at the same time. (Selected Current-Voltage-Frequency steps)

In addition to the above features, the FADOS7F1 VI Test Device can be used as a **Dual-Channel Oscilloscope, Square Wave Generator** and **Analog Voltage Output**. When the Square Wave Signal Output is used, a signal is applied to the electronic circuit board and the other channels display the output signals on the oscilloscope screen.

The technicians, engineers and the people that repair electronic circuit boards as a hobby consider the VI graphs as an effective and efficient method for diagnosing the failures in the printed circuit boards. This method of comparing the VI signature provides information for the user to identify the defective area and components easily. After gaining some experience of the VI graphs, you will find the FADOS7F1 to be an indispensable troubleshooting tool for diagnosing the electronic circuit boards. It is quite simple to use and the failures can be identified just by looking at the graphs without making any comparisons.

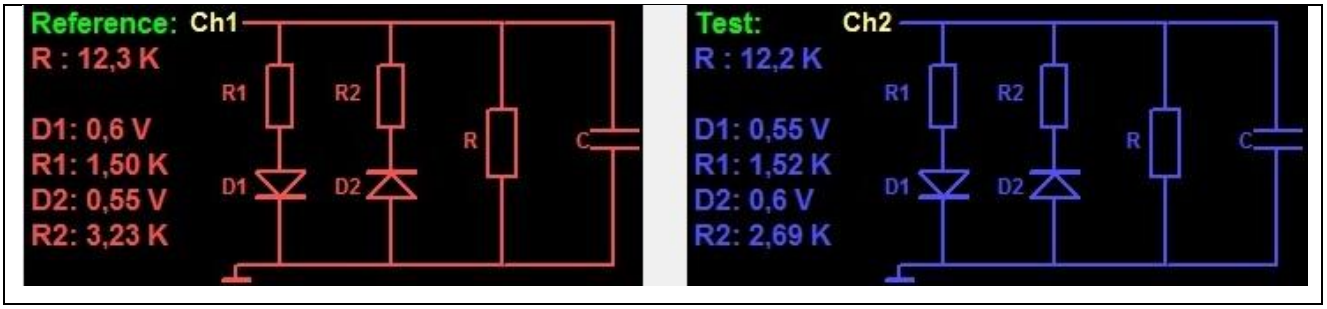
When you test the electronic cards by using the FADOS7F1, do not energize the board and discharge the high voltage capacitors on the board in advance. The FADOS7F1 device does not cause any damages to the electronic circuit boards.

FADOS7F1 is easy to carry since it's small. It can be carried in a laptop briefcase. Including many more features, it is like a Swiss knife of users dealing with electronics.

Usage Areas

ECU Automotive electronic circuit boards, servo-step motor drivers, circuit boards of medical devices, military electronic circuit boards, computer and monitor circuit boards, television-audio-radio circuit boards, circuit boards of textile machines, mobile phone electronic circuit boards etc. (all type electronic circuit boards.)

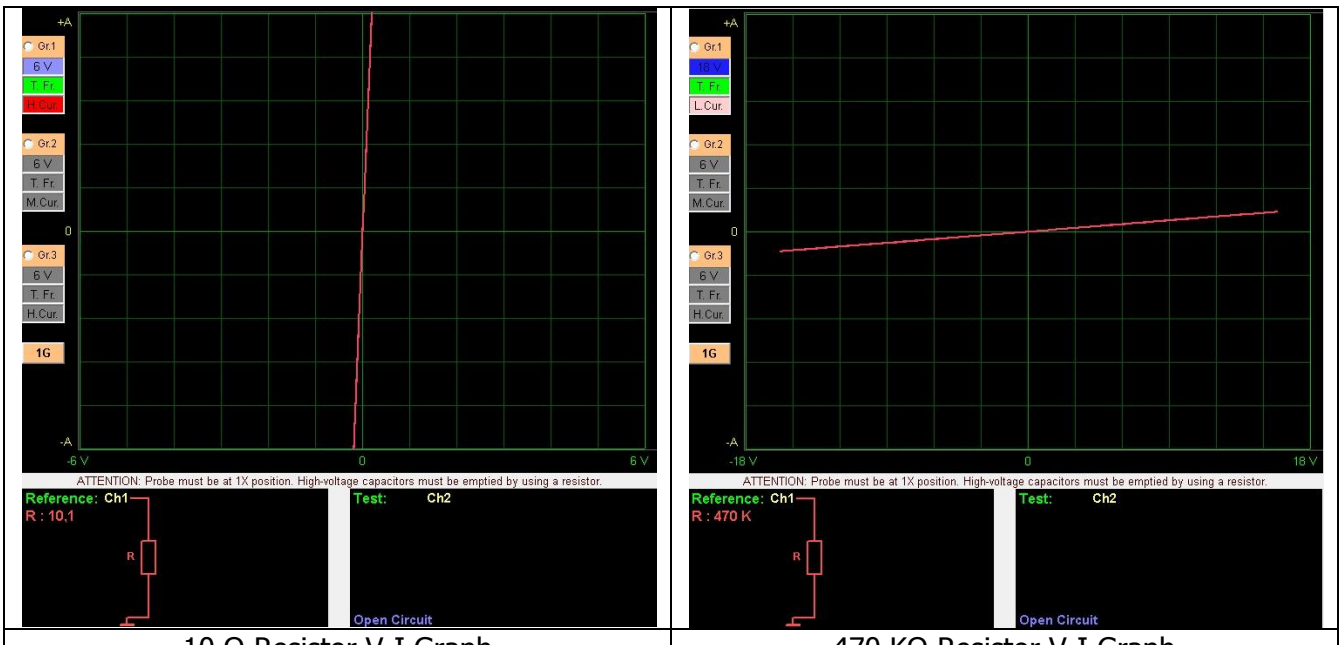
Electronic Component Test: Resistors, Capacitors, Inductors, Diodes (general purpose Diodes, Zener and High Voltage Diodes etc.), Transistors (NPN, PNP, JFET, MOSFET vs.), SCR, Triac, Optocouplers, Integrated Circuits (Digital, Analog) vs. (can test all electronic components).



Equivalent Circuit Diagram and Measuring Values of Electronic Components

Resistor V-I Graph

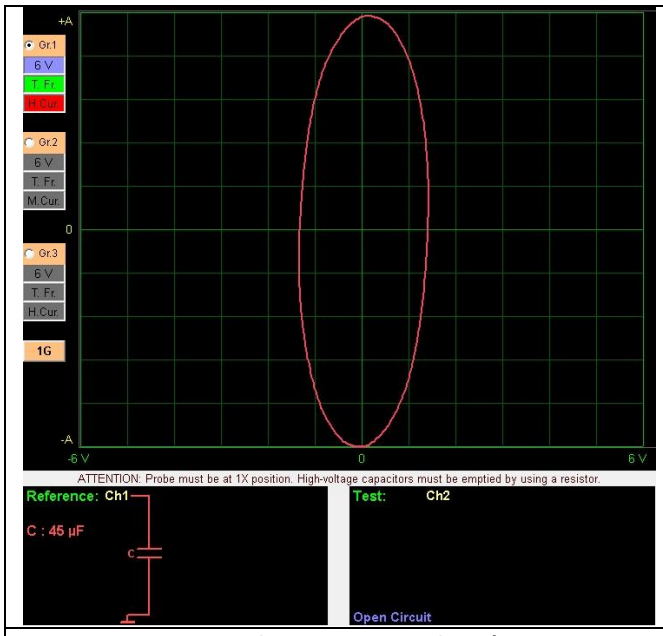
The **Resistor** V-I graph is always a straight line between 0 and 90 degrees to the X axis. Resistor symbol and value are seen at the bottom of the graph.



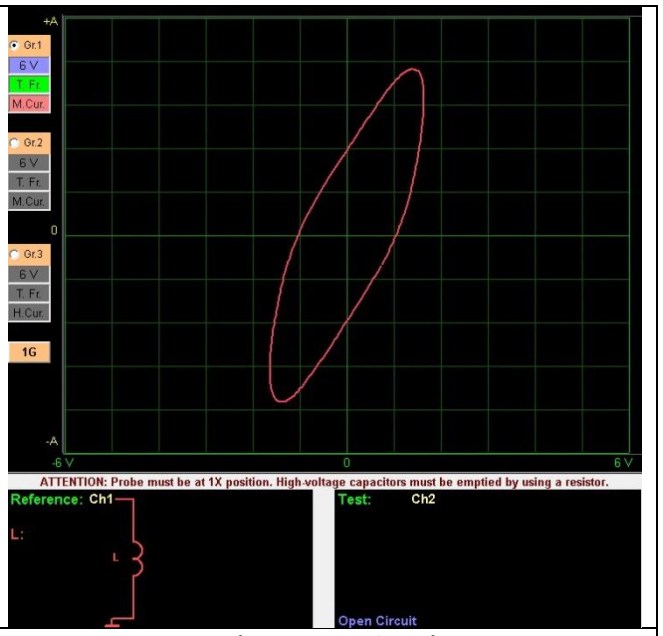
10 Ω Resistor V-I Graph | 470 KΩ Resistor V-I Graph

Capacitor and Inductor V-I Graph

The **Capacitor** graph is an ellipse or a circle. The **Inductor** graph is elliptical or circular; due to the resistance of the wires in the inductor, the effect of the resistors is also observed in the graph.



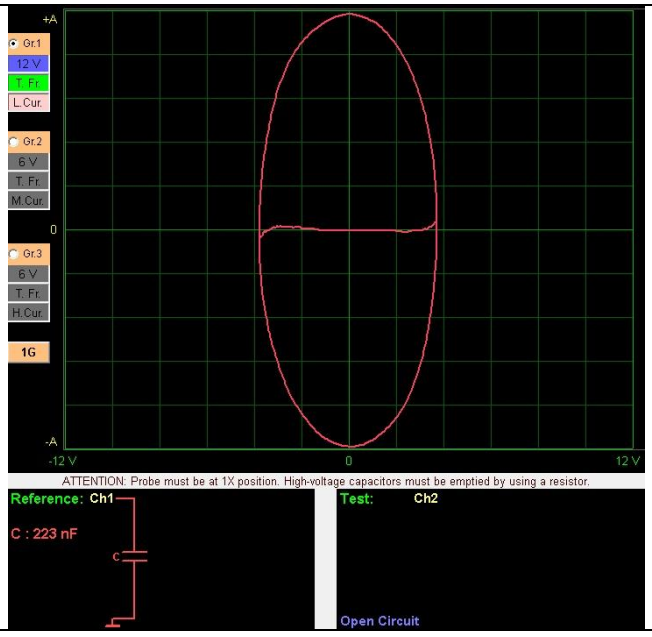
47 µF Capacitor V-I Graph



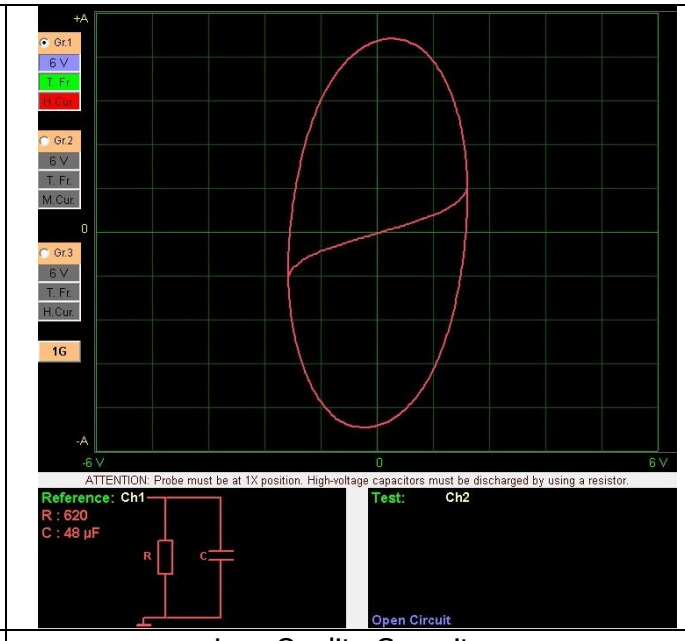
Inductor V-I Graph

Capacity Quality Test

The Capacitor failures caused by leaking in the capacitor in general and as a result, the capacitor acts as if a resistor is connected in parallel. The quality of the leaky capacitors is decreased. The leaky capacitors can be identified easily thanks to the capacity test characteristics of the FADOS7F1. For conducting a capacitor quality and failure test, the active type of the probe is connected to the anode (+) or cathode (-) pole and the chassis probe is connected to the cathode (-) or anode (+) pole of the capacitor, then the "**Capacitor Test"** is clicked from the test characteristics menu and a nearly linear graph appears on the screen. The closer the graph is to the X axis, the higher is the quality of the capacitor. But, if the graph approaches the horizontal too much, it means that the quality of the capacitor is reduced or leaking or defective. The components leaks are very common especially in the electrolytic capacitors.



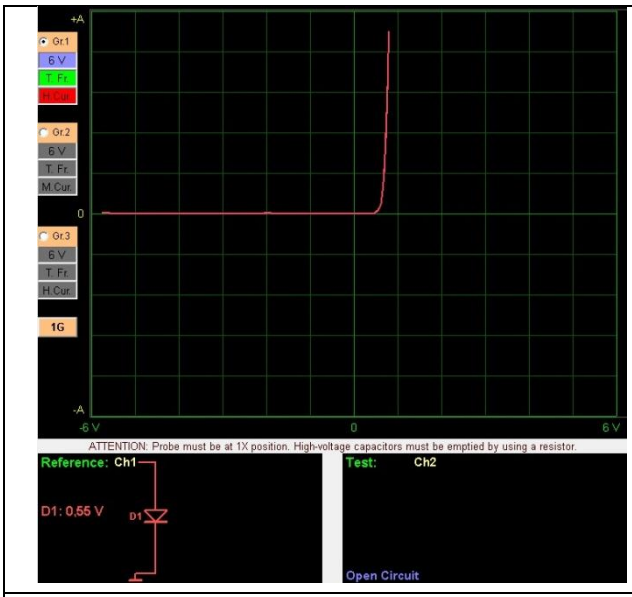
High Quality Capacitor



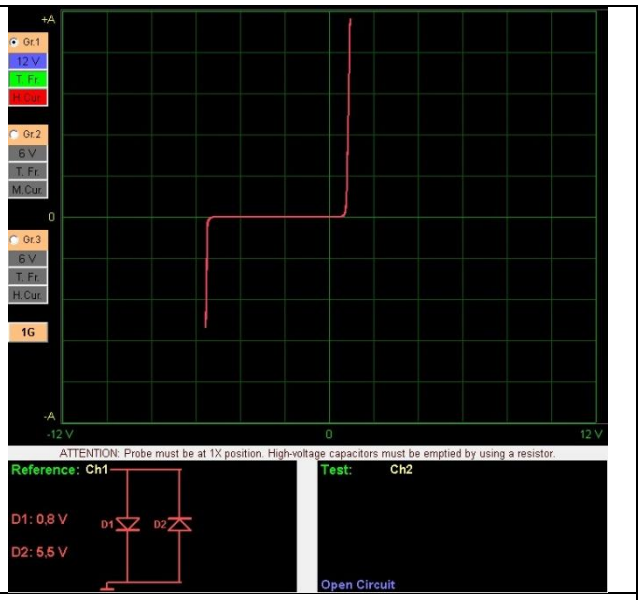
Low Quality Capacitor

Diode – Zener Diode V-I Graph

The semi conductor **Diode** graph appears as one or more straight lines with a 90 degree angle in between.

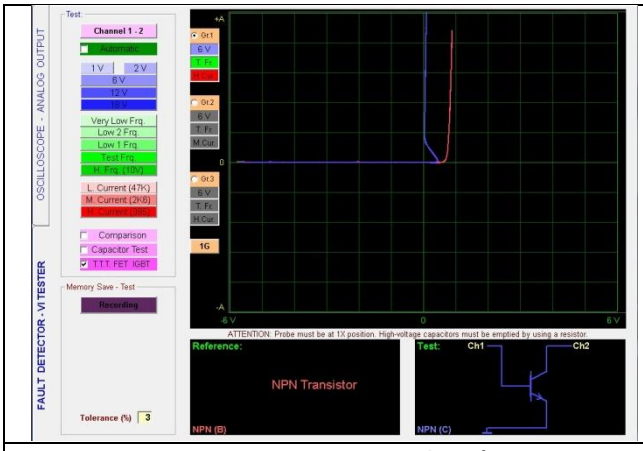


Diode V-I Graph

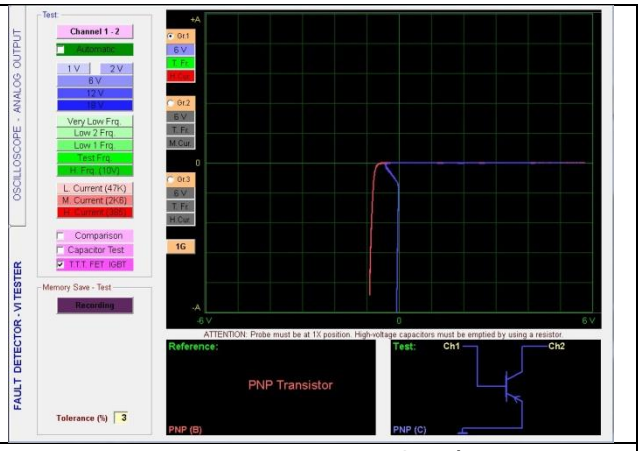


Zener Diode V-I Graph

Transistor – Triac – Thrystor (SCR) – FET – IGBT – Opto-Coupler V-I Graph

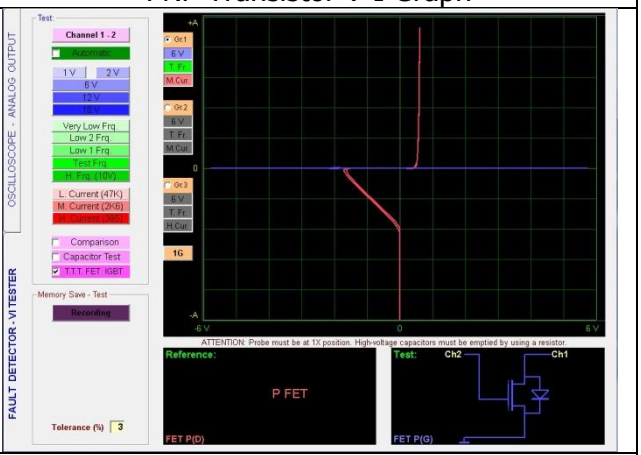


NPN Transistor V-I Graph

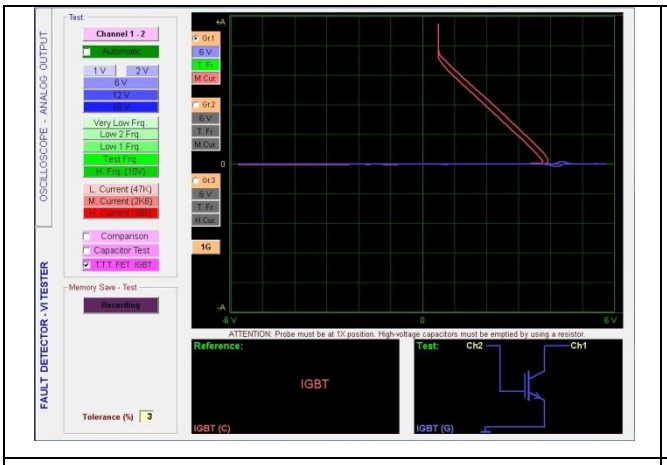


PNP Transistor V-I Graph

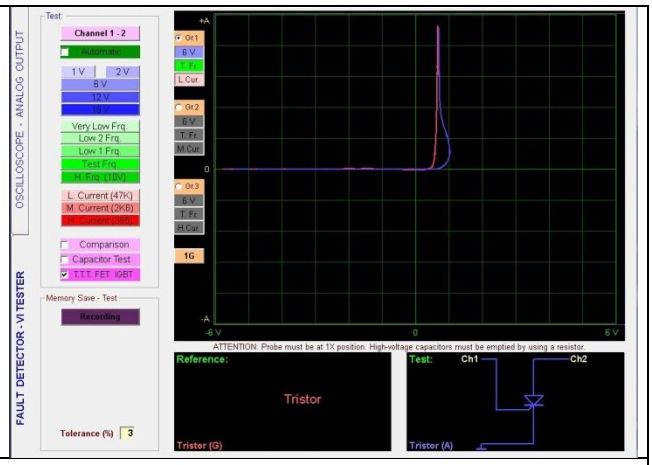
N FET V-I Graph



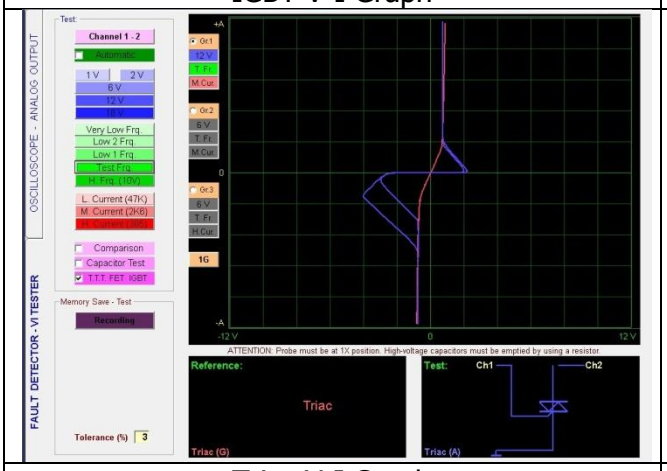
P FET V-I Graph



IGBT V-I Graph



Thrystor (SCR) V-I Graph

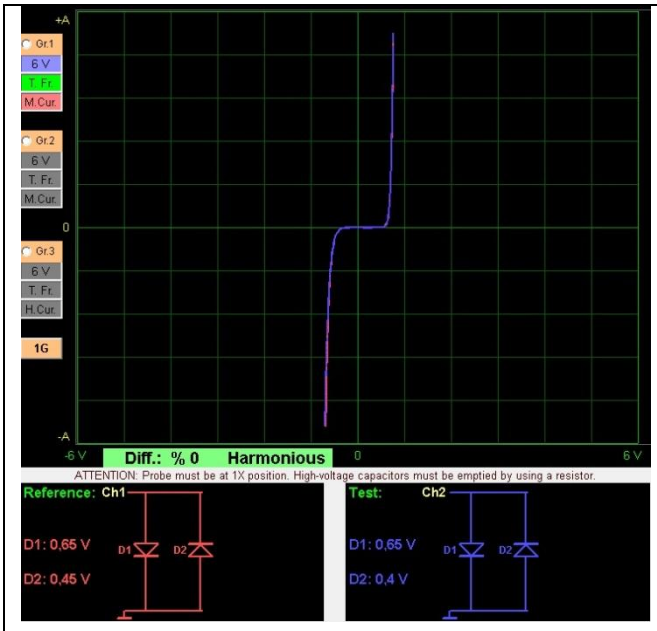


Triac V-I Graph

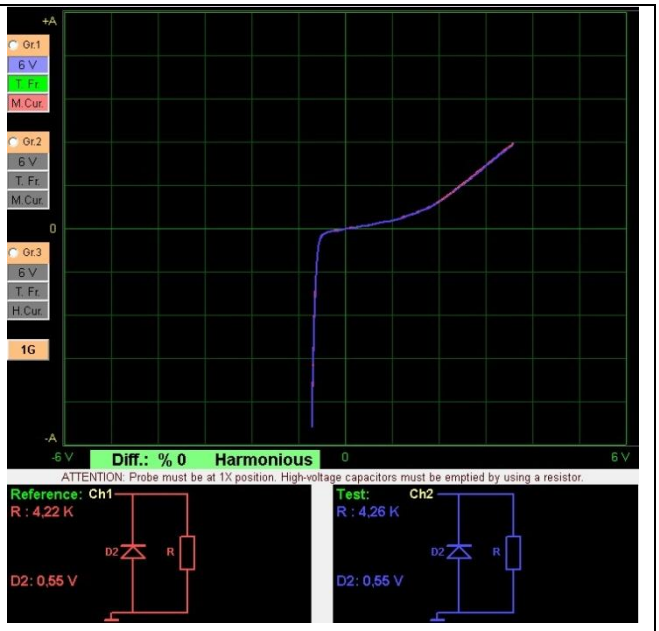
Opto-Coupler V-I Graph

Integrated Circuits (ICs – SMD Integrated Circuit Tests)

The Integrated circuits are composed of the semi conductor components and protective zener diodes and or diodes are connected to all the pins for protection. Therefore, when the integrated circuits are tested, their V-I graphs resemble the zener diodes or normal diodes. The VI graph of the Integrated circuit Vcc pin resembles the graph of a diode and a capacitor connected in parallel. The graph of a short circuit is displayed for the GND pin. The Digital integrated circuits contain more than one components of the same type. Although they may have more than one pins, they may yield several different V-I graphs. The data sheets of the Digital integrated circuits are checked for testing the pins that give the same output or have the same inputs (the pins with the same functions and names) against each other. We can find the defective pin easily by comparing the pins with the same graph against each other. The Analog integrated circuits are called the "op amps" in general. We may see a different V-I graph for each pin. The reason for that is the particular architecture of the IC and the connection of the components used in the IC to each other. Like the Digital integrated circuit tests, the pins with the same names and functions in the analog integrated circuits should be the same V-I graphs.



74HC240 IC Output V-I Graph Comparisons Against Each Other

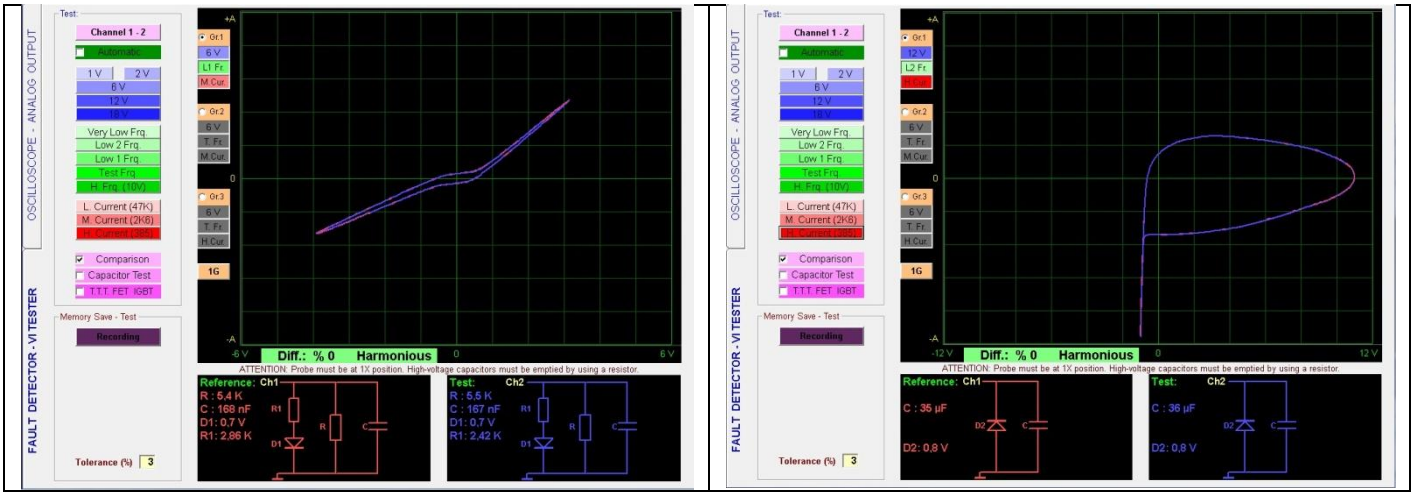


ULN2003 IC Input V-I Graph Comparisons Against Each Other

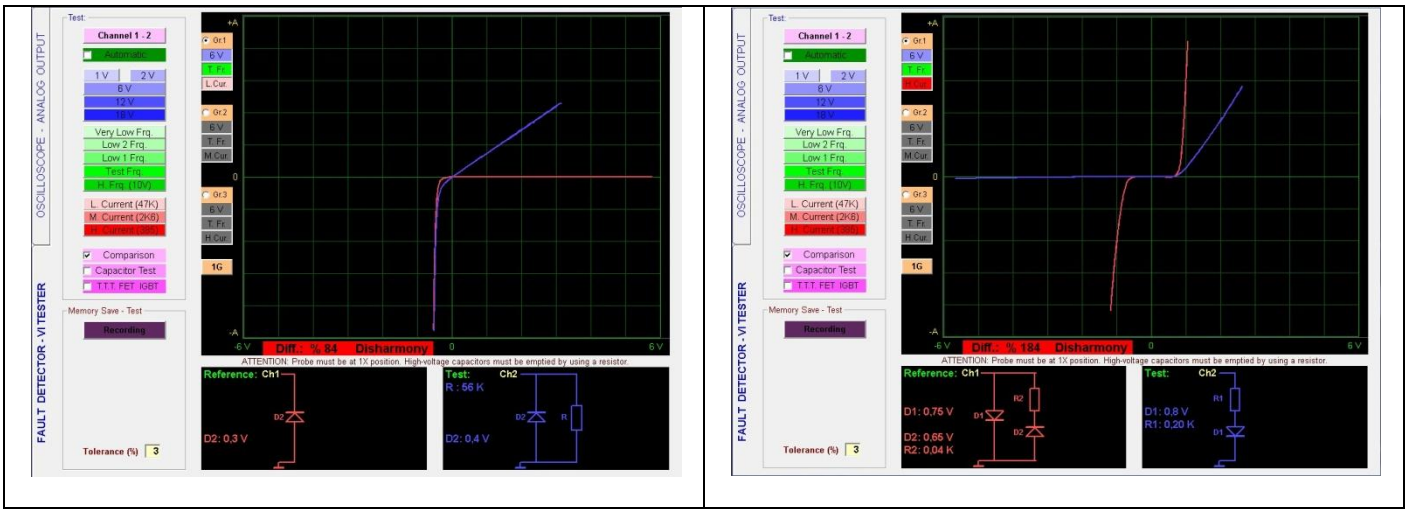
COMPARATIVE TEST OF THE MATERIALS IN THE ELECTRONIC CIRCUITS

When an electronic material is tested in the circuit, it produces a mixed signal due to the parallel or series connections to the other materials in the circuit. The aim in Electronic circuit board repairs is diagnosing the failure without removing the components on the board. Comparing the V-I graphs of the intact and defective electronic circuit boards are determined with the FADOS7F1 allows diagnosing the defective materials in a short time. The comparison is made by touching the pins of the materials on both electronic circuit boards to find the difference between them.

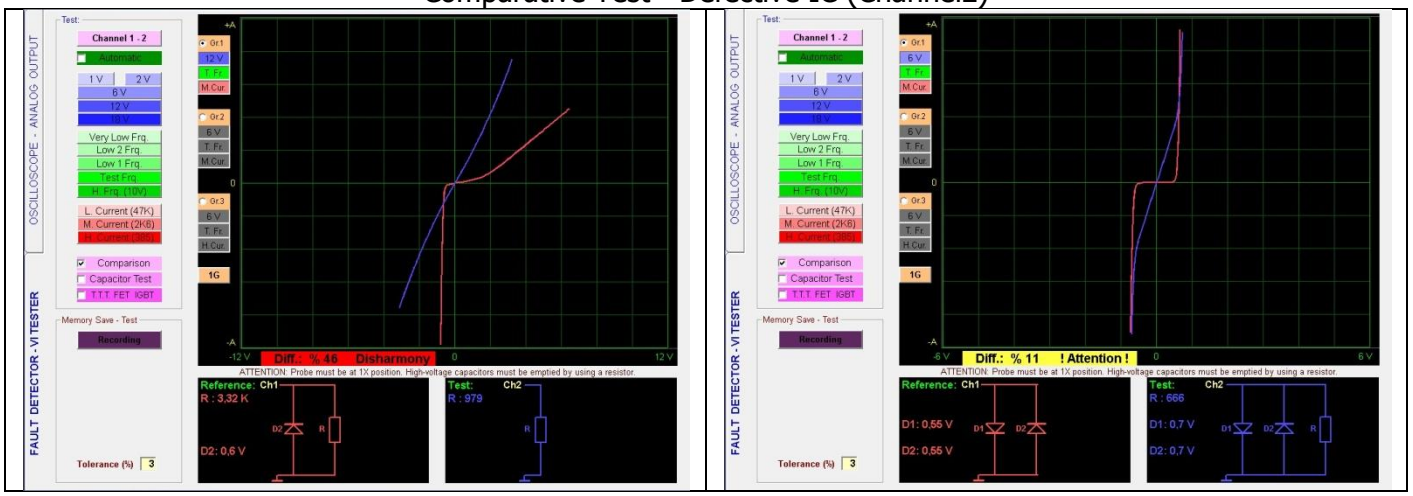
While making a comparison with the FADOS7F1 device, start comparing from the power supply lines and progress towards the inputs and outputs and any other places suspected. The comparison can be made rapidly by focusing on the sounds without looking at the display constantly. First the supply circuit of the electronic circuit board (the regulator) is checked, if the regulator circuit is defective, the signals from all the components may show differences while comparing. The other components are tested after eliminating the regulator circuit failure. Sometimes an un-matching sound may be heard due to the charging and discharging of some capacitors, but the graph curve will eventually become compatible once the capacitor is charged after waiting for a short while. The V-I graphs of the Electronic materials are different from each other. With adequate experience on the V-I graphs, a defective component on a single defective board can also be diagnosed.



Simultaneous Comparison of Two Electronic Circuit Boards

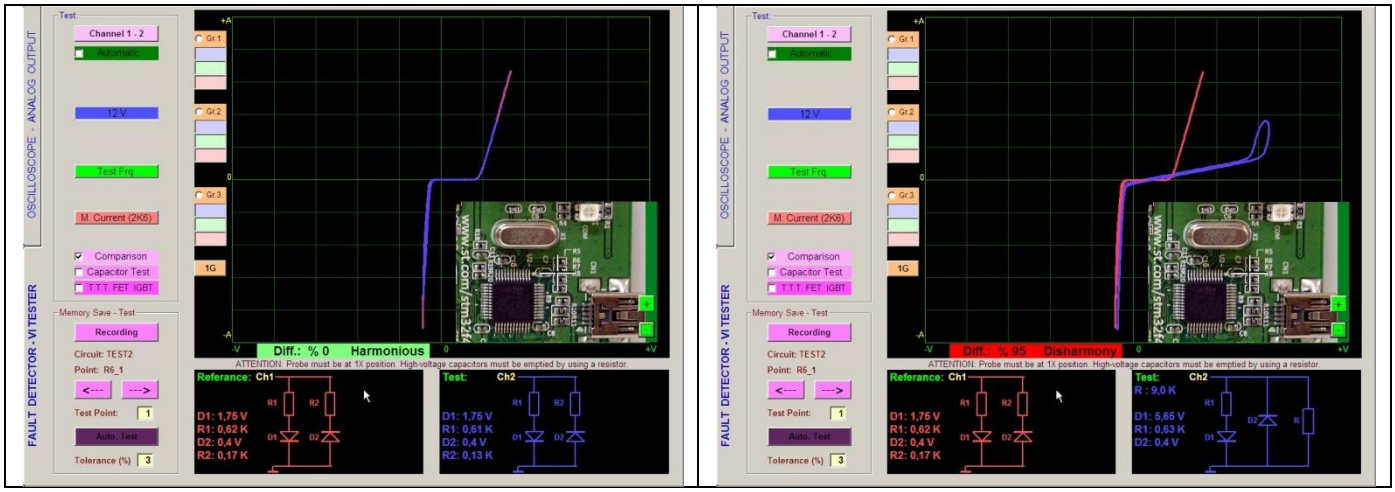


Comparative Test - Defective IC (Channel2)



Comparative Test - Defective IC (Channel2)

Comparison Testing Component of Circuit Boards with Picture from Memory



Circuit node is displayed in the display with crosshairs cursor

Memory Recording feature; by means of this feature, the characteristics of the intact electronic circuit board (VI graph, equivalent circuit diagram and electronic components values) are written on the computer's hard disk and taking these points as reference, you can compare the defective (or assumed to be defective) electronic circuit boards accurately, easily and rapidly. At the same time, the data can be written on the photograph of the board. Thus, the recorded point can be seen on the photograph while making a comparison from the memory.

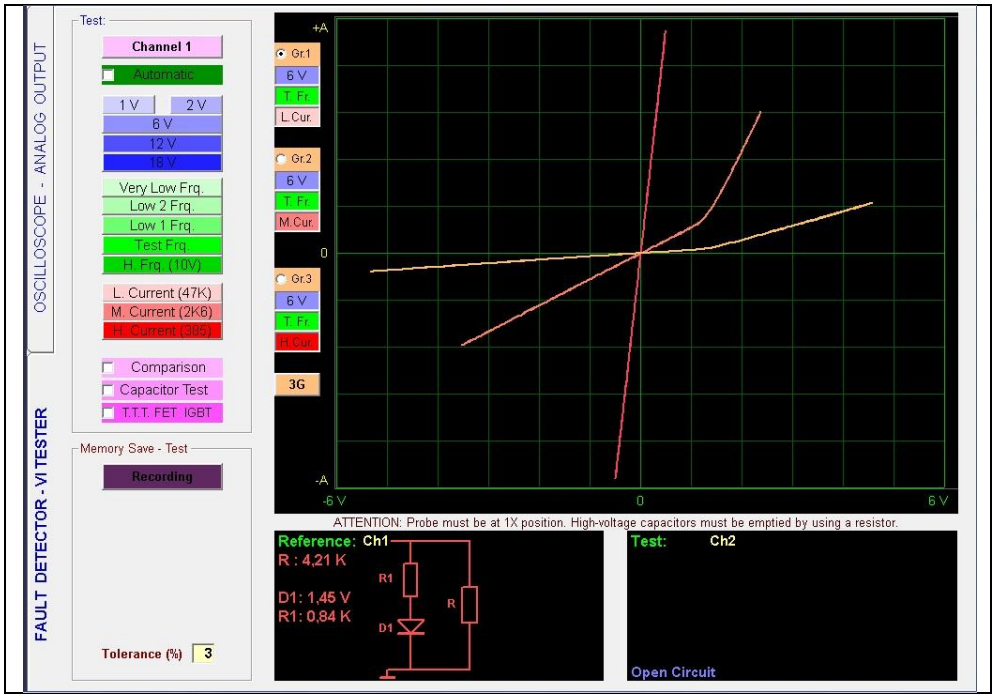
The software **produces different sounds** while **comparing** the **matching** and **non-matching** points during the test. Thus, the comparison can be made rapidly by focusing on the sounds without looking at the display constantly.

3G – Display of The Graphs For 3 Different Settings

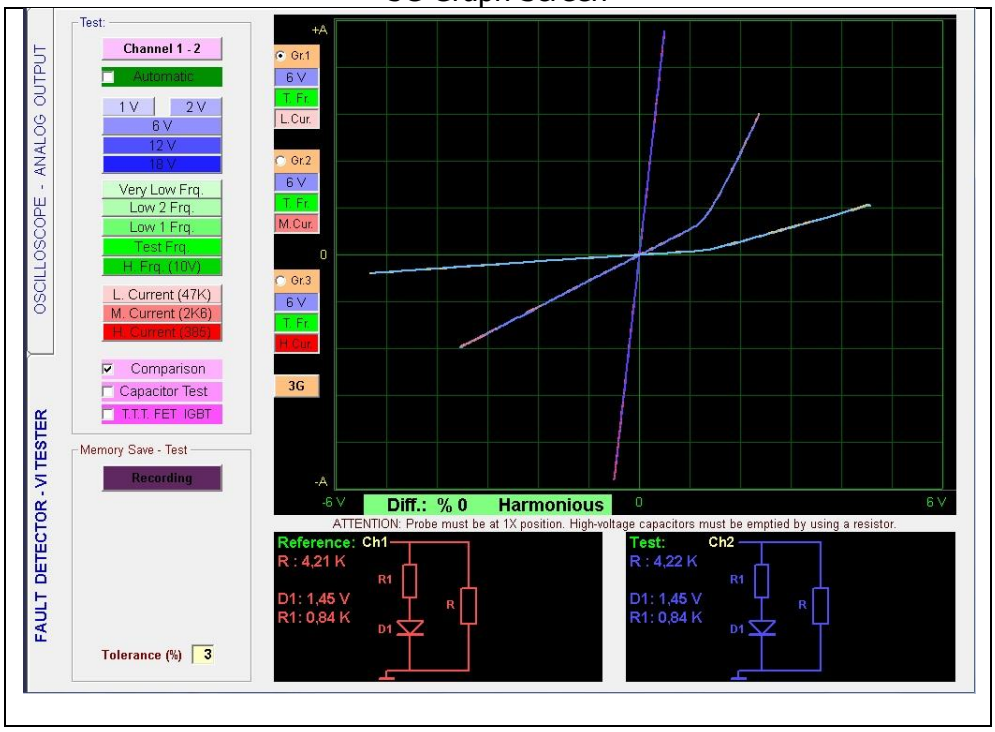
The FADOS7F1 can make comparisons on the electronic circuit boards at 3 different settings simultaneously.

By clicking the 1G button, the failure diagnostics screen 2G, that is Gr.1 and Gr.2 active graph, and in 3G the Gr.1, Gr.2 and Gr.3 can be displayed by selecting different voltage, frequency and current stages.

Using this method, the response of the electronic component against different voltage, frequency and current stages can be observed. E.g. while some electronic material's graph may appear intact under low current, it may prove to be defective under high current.



3G Graph Screen

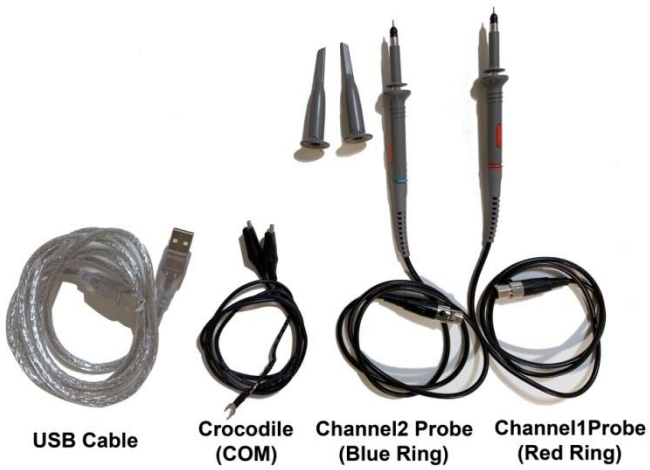


3G Comparison – As seen in the example, the material, which shows a perfect match at each steps

Product Overview and Content

- 1 FADOS7F1 Product
- 1 Software CD
- 2 Oscilloscope Probe
- 2 Crocodiles (Com Probe)
- 1 USB Cable
- 1 FADOS7F1 Handbag

FADOS7F1 Product



Accessories of FADOS7F1

FADOS7F1 Handbag and Software CD

FADOS7F1 18V Technical Specifications

A- FAULT DETECTION SPECIFICATIONS :

Test Voltages	**:** ±1V, ±2V, ±6V, ±12V, ±18V
Test Resistance	**:** Current Level: Low 47 KΩ, Medium 2,6 KΩ, High 385 Ω
Test Frequencies	**:** Very Low Frequency, Low2 Frequency, Low1 Frequency, Test Frequency, High Frequency
Number of Channels	**:** 2 (Channel 1 and Channel 2)
Scan Mode	**:** Manual or Automatic. Automatic selection steps of voltage, current, frequency.
Other Feature	**: 1:** Equivalent circuit diagram. **2:** Resistor, capacitors, diodes etc measurement. **3:** Recording data and comparing with recorded data. **4:** 3 graphs at different adjustments can be screened simultaneously.

B- PC OSCILLOSCOPE FEATURES :

Sampling Rate	**:** 400 K/S
Input Voltage	**:** Probe 1X: ±9 V Probe10X: ±50 V
Channel / ADC	**:** 2 Channel / 12 Bit
Sensitivity	**:** 2.5 mV
Image Rate	**:** 0.02 mS/div….100 mS/div
Instant Memory	**:** 64 Kbyte

C- DIGITAL AND ANALOG OUTPUT :

Output	**:** Channel 2
Output Voltage	**:** -5V….+5V (Adjustable)
Frequency (Digital)	**:** From 0.2KHz to 25KHz
Connections	**:** Probes can be connected each socket. Red ring probe is always Channel 1; Blue ring probe is always Channel 2. Crocodile probe is always COM. USB cable for using communications between PC and FADOS7F1.
Dimensions	**:** 105mm L x 54mm W x 24mm H
Weight	**:** 450 gram with all accessories
Warranty	**:** 1 year

FADOS7F1 Technical Features