Featuring newly designed probes and precision control for half the impact mark depth of previous designs[*]

The Z-axis descent speed for gold plating and fine pattern testing can be set higher than with previous models.

*Compared to the C HiTester 1116.

Reduced-impact link probes CP1072-01(option)

By combining newly designed reduced-impact probes and precision soft-landing control, the FA1116-03 makes it possible to approach the maximum speed setting during fine pattern testing.

Precision soft-landing function

Probes are lowered at high speed. Then, just before they come into contact with the pattern, the motor's acceleration is controlled in an optimal manner to lessen the force of impact at contact.
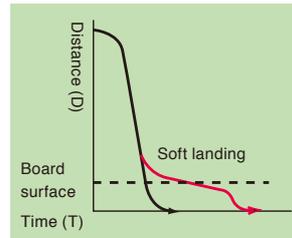
Laser Hight-adjustment unit FA1950-06(option)

The laser board thickness compensation unit checks the height of the testing surface at the start of automatic testing to reduce the effect of differences in board deflection and thickness on probe impact. Probe damage caused by a failure to properly clamp the board can also be prevented.

Reduced fine pattern test times

The FA1116-03 delivers continuous testing of a 15 µm fine pattern at 50 points/sec. (0.03 mm movements, simultaneous use of two arms, capacitance measurement).

Rapid testing, regardless of board type

Easily position the target board and start testing, even for thin-film boards and thick, round boards.

Large testing area

The 610 (W) × 510 (D) mm testing area can accommodate everything from small pieces to large-format boards.
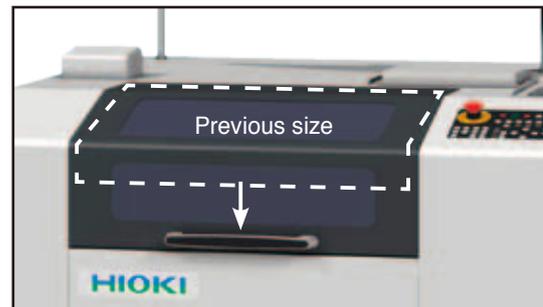
Support for 10 mm probe-up height

Thick ceramic boards and probe cards can be easily positioned in the tester.

Vacuum suction for easy board clamping

A vacuum suction system is used to clamp the board under test. Even thin boards and round boards can be clamped with ease.

Improved front cover for more efficient use

The size of the opening on the front of the tester has been increased by 30%. Increased rigidity and a large handle make it easy to open and close the cover quickly.

Extensive measurement functions and optional units reduce backlogs of untested boards.

High capacitance measurement resolution of 5 aF (1 aF = 10^{-18}F)

Stable, high-resolution measurement ensures that fine pattern defects such as standalone pads are detected. Since capacitance values are displayed directly, differences from the reference board can be easily identified.

Capacitance measurement master creation algorithm

A proprietary algorithm designed by Hioki to keep defective boards from being sent on to the next manufacturing process aids in the creation of capacitance master data, which can be created from a single known-good reference board.

### High-speed image processing system

A new image processing driver (with Windows 7 support) speeds alignment, reducing test time.

Optional functionality for enhanced capability

- **MLCC Measurement Unit 1937-40**
  A dedicated multi-layer ceramic capacitor (MLCC) mode allows JIS-compliant measured value acquisition.

- **Insulation Measurement Feature 1938-10**
  A high-speed insulation test function operates at up to 500 MΩ/250 V. Arc detection support is also available on a special-order basis.

- **Blue Coaxial Downward Illumination Unit 1945-70**
  The FA1116-03's coaxial downward lighting uses blue LEDs to provide effective lighting of ceramic and glass boards.

- **Dot Marking Function FA1941-01**
  The FA1116-03 uses oil-based ink to create marking dots with a diameter of 2 mm. It can also mark CSPs and other small pieces.

High-speed pattern testing using capacitance measurement

Any given pattern on the board under test will have a certain capacitance relative to the electrically isolated test electrode, and that capacitance is proportional to the area of the pattern. Any short or break in the pattern will cause a corresponding change in the area of the pattern, with a resulting change in its capacitance value. By comparing the measured value to data for a known-good reference board, it is possible to detect pattern shorts and breaks. Since capacitance values can be read directly, judgments can be made based even on minuscule changes in the capacitance. Furthermore, the FA1116-03's master extraction algorithm allows the same approach to be used without regard to board type, from single-sided glass boards to multi-layer and high-density boards.
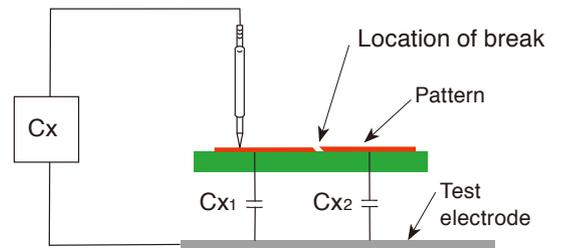
Capacitance value with no break: $Cx = Cx_1 + Cx_2$
Capacitance value with break: $Cx = Cx_1$
With a break, the detected capacitance value is less than the corresponding value for the known-good reference board. With a short, the capacitance value increases by the capacitance of the other pattern.

Methods for calculating the number of test steps

In continuity testing, testing for breaks in pattern A require three test steps: (1)-(2), (1)-(3), and (1)-(4). Similar tests are required for patterns B and C. Furthermore, when testing for shorts between patterns A, B, and C, it is necessary to test A-B, A-C, and B-C. As the complexity of the circuits increases, an enormous number of test steps become necessary. In testing using capacitance measurement, it is possible to test for both breaks and shorts with the minimum number of test points and arm movements since only the endpoints of each pattern need to be tested.
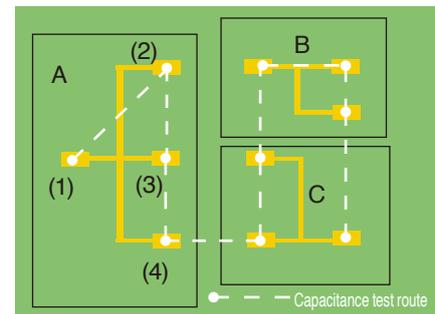
Comparison of test steps
For 100 nets and 500 total endpoints

|	Resistance measurement	Capacitance measurement
Testing for breaks	All nodes on same net 500 - 100 = 400	Detection of breaks and shorts using capacitance measurements for all endpoints 500
Testing for shorts	$nCr = {}_{100}C_2$ $100 \times (100 - 1) / 2 = 4,950$	
Total steps	5,350	500

If there is a break near the end of a pattern as shown below, the capacitance at point B will vary significantly, even though the capacitance at point A varies only slightly. In this way, the break can be reliably detected.

Fail Visualizer UA1782 for repair work

The FA1116-03 can be used in conjunction with the UA1782, which supports boards with embedded passive and active devices, to facilitate repair work. Support for not only the FA1116-03, but also all Hioki electrical testing systems, including the FA1282, C HiTester 1116, and 1230 series (designed for mass-production testing), makes it easy to build a bare board testing system.

UA1782 Fail Visualizer
Simultaneous display of components and patterns
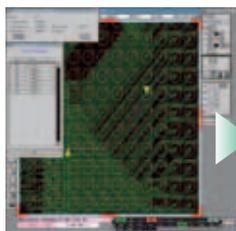
Importing of display databases

EPA-LINE
FLY-LINE
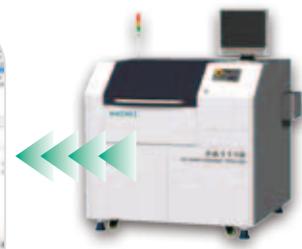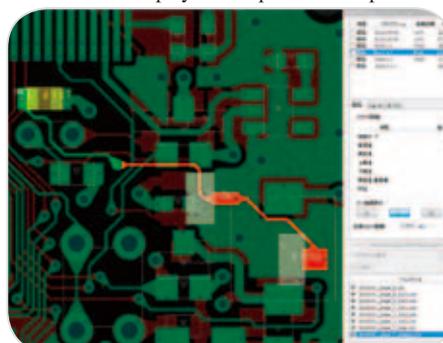
Importing of fail results

Barcode scanning
Real-time monitoring