The 1117 X-Y BOARD HiTESTER is capable of simultaneous four-arm dual-sided testing, two arms in front and two arms in back. This fixtureless high-speed bare board tester uses a four-terminal resistance measurement function to measure very small resistances with IVH or through holes. It includes both a conductivity detection method and a capacitance measurement method for a range of applications from large general-purpose bare boards to high-density, very fine boards such as BGA, CSP, and MCM. It can also be used to test build-up boards.
A Wide Range of Test Capabilities -- With High Speed and High Precision

The conductivity detection and capacitance measurement methods provide all the features required for dual-sided testing in a wide range of testing capabilities. The 1117 can not only detect build-up board broken connections with IVH, but it can also measure resistance values, making it possible to detect defects such as cracks that are not visible to the eye.

- Detection of short circuits and broken connections with the capacitance measurement method.
- Detection of short circuits and broken connections with the conductivity detection method.
- Resistance measurement with IVH (Inner Via Holes) or through holes.

High-Speed Testing With the Capacitance Measurement Method

Patterns (B through I) on the board exhibit a capacitance between the pattern and the internal ground layer (A) of the board being measured, proportional to the area of the pattern. If there is a broken connection then the detected capacitance value is less than the standard value, and if there is a short circuit then it is larger.

Capacitance Measurement Using an Internal Ground Layer

Patterns (B through I) on the board exhibit a capacitance between the pattern and the internal ground layer (A) of the board being measured, proportional to the area of the pattern. If there is a broken connection then the detected capacitance value is less than the standard value, and if there is a short circuit then it is larger.

Capacitance Measurement Using Vacuum Clamping

With vacuum clamping the capacitance between the pattern on the board and the detection electrode is measured. This can be used in cases such as flexible boards where chucking is not possible because the board is thin.

Example With 100 Nets and a Total of 500 Nodes

<table>
<thead>
<tr>
<th>Testing Method</th>
<th>Conductivity Detection Method Description</th>
<th>Capacitance Measurement Method Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Discontinuity Testing</td>
<td>All nodes within the same net: 500 - 100 = 400</td>
<td>Measure the capacitance of all nodes to detect discontinuities and short circuits: 500</td>
</tr>
</tbody>
</table>
| Short Circuit Testing   | nCr = nC2
100 × (100 - 1) / 2 = 4950                                       |                                                                  |
| Measurement Steps       | 5350                                                             | 500                                                             |
Minimum Measurement Speed of 0.015 Seconds per Step
High speed testing: maximum speed of 0.015 seconds per step with high precision.
(0.15 mm movement, four arms simultaneously, during capacitance measurement)

High Resolution of 5 aF for Capacitance Measurement (1 aF = 10⁻⁶ pF)
The variation in capacitance (ΔC) when there is a defect is extremely small, so capacitance measurement requires high resolution. The 1117 has a high resolution of 5 aF to accurately detect very small variations.

High Accuracy Probing
The positioning return accuracy of ±20 μm can accurately probe delicate fine-pitch pads.

Simple Basic Data Collection
An automatic sequence of operations collects the basic data.

Detection of High Resistance Short Circuits with Capacitance Measurement
Capacitance variations can be accurately measured based on the resistance between neighboring patterns, to detect short circuits that have high resistance. The detection range depends on the frequency. A single measurement detects short circuits between one net and all the other nets.

Four-Edge Chuck Method
All four edges of the board are chucked for stable measurements. The up and down directions are chucked for the entire surface while the left and right directions are automatically chucked for the center portion.

Four-Terminal Resistance Measurement Function
Resistance measurements are done with IVH or through holes by the four-terminal resistance measurement function, which accurately measures very small resistances.

Insulation Measurement
Insulation measurement is possible in the DC 250 V range. Highly efficient measurement is possible by combining a net containing the power supply and the chosen net. Capacitance measurement can be done at the same time.

Wide Measurement Area
The measurement area is 600 (W) × 500 (H) mm, so the 1117 can be used with large boards.

Minimization of Gouges
Gouges are kept to a minimum by the high speed soft landing feature, which reduces the speed just before reaching the pattern in order to lessen the striking force, and by impact absorbing probes.
### 1117 Specification

**Number of Arms**: 4 (two each, front and back)

**Number of Test Steps**: 40,000 steps (300,000 for continuous testing)

#### Test Ranges
- **DC Measurement Function**
  - Resistance: 400 μΩ to 40 MΩ
  - Capacitance: 4 μF to 400 mF
  - Diodes and Transistors (VF): 0 to 25 V
  - Zener Diodes (VZ): 0 to 25 V
  - Photocouplers: 0 to 25 V
  - Short Circuit: ±40 mΩ ± 40 kΩ
  - Open Circuit: ±4 Ω ± 4 MΩ
  - Voltage: 0 to 25 V

- **AC Measurement Function**
  - Resistance: 100 Ω to 100 MΩ
  - Capacitance: 10 μF to 10 μF
  - Inductance: 10 μH to 100 H

- **AC Voltage Measurement**
  - 800 μV to 25 V f.s. (8 ranges)

- **AC Current Measurement**
  - 10 μA to 1 mA f.s. (3 ranges, for 10 V f.s.)

- **DC Voltage Measurement**
  - 100 mV to 250 mV f.s. (2 ranges)

- **DC Current Measurement**
  - 200 nA to 200 mA f.s. (13 ranges)

- **AC Voltage Measurement**
  - 1 V / 10 V rms (2 ranges)

- **AC Current Measurement**
  - ±160 Hz / ±1 kHz / ±16 kHz / ±160 kHz

- **DC Current Measurement**
  - ±160 Hz / ±1 kHz / ±16 kHz / ±160 kHz

- **AC Measurement Time**
  - Minimum 0.015 seconds / step

- **Probing Position Accuracy**
  - Each arm within ±50 μm (X and Y directions, 20 ± 3°C)

- **Position Return Accuracy**
  - Within ±20 μm (probing position, same temperature)

- **Minimum Movement Resolution**
  - X and Y: ±1.25 μm / pulse, Z: ±6 μm / pulse

- **Minimum Probing Pitch**
  - 0.1 mm between the left and right arms when using a link-type probe

#### Probe Work Area
- 500 (W) x 500 (H) mm

#### Board Fixation: Carrier Height
- 1000 ± 15 mm

#### Board Fixation: Carrier Position
- Board vertical position

#### Fixation Method
- Chuck method on four edges of board (sides are chucked for the center of the board only)
- Vacuum clamp method (optional)

#### Movable Boards
- Thickness: 0.6 to 3.2 mm
- Outer Dimensions: 50 (W) x 70 (H) to 610 (W) x 510 (H) mm
- Board Fixation Up-Down: 3 mm
- There are restrictions on link-type probing with 4 terminal probes.
- Weight: 2 kg maximum

#### Component Mounting Limits
- Front Surface: 25 mm maximum
- Mounting is not possible in the middle 50 mm portion of the board in the Y direction
- Back Surface: 20 mm maximum
- (including board thickness)

#### Positioning Correction
- Automatic positioning correction

#### Safety Devices
- Emergency stop switch, safety cover (anti-static resin), arm interference prevention software

#### Display
- 15-inch liquid crystal display

#### Power Supply
- AC 200 V (single phase), 50/60 Hz
- Power Consumption: 3 kVA

#### Pneumatic System
- Pressure: 0.5 to 0.99 MPa (dry air)

#### Operating Environment
- Temperature: 23 ± 10°C
- Humidity: 75%rh maximum (no condensation)
- Environment: Avoid use in environments subject to dust, vibration, or corrosive gases
- Floor Strength: 500 kg/m² minimum

#### Unit Dimensions
- Approximately 1710 (W) x 1590 (H) x 1080 (D) mm

#### Mass
- Approximately 1200 kg

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### Options

- **1134-02 IMPRESSION SHEETS**
- **1164-02 ONE-WAY CLUTCH**
- **1164-03 PROBE ATTACHMENT**
- **1196 RECORDING PAPER (25m, 10 rolls)**
- **1350-02 OFFSET BOARD**
- **1172-66 LINK PROBE**
- **1172-67 DOUBLE LINK PROBE**
- **1172-68 LINK PROBE WITH BLADE**
- **1172-69 DOUBLE LINK PROBE WITH BLADE**
- **1172-70 SHOCK-ABSORBING SINGLE NEEDLE PROBE (SK)**
- **1172-71 SHOCK-ABSORBING SINGLE NEEDLE PROBE (WC)**
- **1172-72 SHOCK-ABSORBING TRIANGULAR PYRAMID PROBE (SK)**
- **1172-74 PROBE FOR CALIBRATION**
- **1172-76 SHOCK-ABSORBING SINGLE NEEDLE PROBE (HP SR10)**
- **1172-77 SHOCK-ABSORBING SINGLE NEEDLE PROBE (WC SR10)**

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**DISTRIBUTED BY**

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All information correct as of Feb 26, 2001. All specifications are subject to change without notice.