Printed Wiring Board Conductor Resistance Evaluation System
AMR
Continuous measurement of micro resistance in solder joint area and connector contact area. Efficient evaluation of the reliability of connections

The Printed Wiring Board Conductor Resistance Evaluation System enables continuous measurement of resistance changes under high and low temperature cycle. Automatic measurement, data storage and processing are operated systematically with a PC. The system realizes accurate and effective contact reliability evaluation.
High precision measurement

Minute resistance changes in solder joints and connector contact can be measured continuously under a low/high temperature cycle environment.

Measuring instruments available in two types: nanovolt meters and milliohm meters

With the nanovolt-meter type, the maximum measurement value is increased to 1MΩ, making it possible to evaluate specimens of high resistance. The unit measures infinitesimal resistances through the application of a direct current. With the milliohm-meter type, resistance is measured by applying AC, and measurement is therefore not influenced by thermal electromotive force generated by bimetallic contact and temperature differences. This type is effective for the evaluation of contact resistance.

Measurement of a wide range of resistance from $10^{-3}$ to $10^6$ Ω

Extremely small resistance ranging from $10^{-3}$ to $10^0$ Ω (AMR-PD) and from $10^{-3}$ to $10^4$ Ω (AMR-PA) can be measured accurately at the tip of a measuring cable, using a four terminal method.

System integrating environmental testing equipment

By connecting our environmental testing equipment to the system, tests can be started, suspended, or stopped in sync with that equipment.

APPLICATIONS

- Evaluation of lead-free solder joints
- Reliability evaluation of BGA and CSP solder ball connections
- Evaluation of conductive adhesives and anisotropic conductive films
- Evaluation of contact resistance of connectors, etc.
- Evaluation of contact resistance of switches, relays, etc.

Environmental testing equipment can be interconnected

An E-BUS interface port is required.

- Thermal Shock Chambers TSA Series
- Thermal Shock Chamber TSE-11 (monitoring only)
- Temperature & Humidity Chamber Platinous K Series
- Fast Cycle Chamber HC-120

*For connecting to, or monitoring of products other than those listed above, please inquire for further details.
Compact data logging
Cuts down test volume by picking out data from each one point of a stable high/low temperature. This is an effective way to monitor failure while lowering data volume during a long-term test.

Easy determination of trouble
Initial value to determine change rate at high or low temperature can be set separately. The current change rate is displayed on operation status window with the resistance value, and stored in file.

Improved ease of use
The measurement cables can be easily connected through the use of a connection unit. Depending on the installation environment, the connection unit can be attached at a convenient location—either on the front, the right side, or the left side of the rack. Other improvements have also been made, such as operation switches on the front of the rack.

Simultaneous monitoring of specimen measurement and test chamber
Monitors the resistance value of standard 40 channels (max. 280 channels), and temperature (humidity) of the chamber. Test is controlled by a unit of 10 channels.

Specimen temperature monitoring function (optional)
Temperatures of specimens are measured at 16 points, 8 points, or 4 points. Any 4 points may be recorded simultaneously with resistance value data. This specimens temperature can be used as initial value for change rate data and counting cycles, enabling evaluation based on specimens temperature.
Efficient operation using a variety of data-editing and graph functions

With the application software for Windows® 2000, the measurement system, data processing, and testing equipment can be simultaneously controlled, and test reports can be efficiently created through the use of data-editing and graph functions. Through the use of the clipboard function, graphs and calculated results for the determination of initial, maximum, and minimum values can be pasted into other software programs.

LAN application software (optional)

Connection to a LAN allows checking the test status and editing data from a remote distance.

Statistical analysis using failure data (optional)

The use of statistical processing software enables the plotting of file probability, logarithmic-normal probability, and normal probability. This software is useful for data analysis.

Environment friendliness

Components (except for purchased items such as PCs and measuring instruments) are mounted by lead-free soldering. In addition, power consumption is reduced by 28% (in comparison with the previous model) in consideration of global environmental problems.

Smaller installation space (standard model)

Compared to the previous model, the installation space is reduced by 15%.
**System controller**
- **System controller**: PC and LCD monitor for system control. Measurement, data processing, chamber control.
- **Uninterruptable power supply**: Backup power supply for system controller. Automatically interrupts test at time of power cut. When power recovers, test restarts from where it ended. (does not resume automatically)
- **Printer space**: Can be stored inside the system rack (storable dimensions: 450W × 260H × 270D mm)

**Measurement unit**
- **Micro-resistance measurement unit**: Precisely measures resistance by 4-wire (resistance) measurements.
  - PD type: Equipped with 34420A made by Agilent Technologies
  - PA type: Equipped with 4338B made by Agilent Technologies
- **Scanner for minute resistance measurement**: 40 standard channels.
- **Chamber monitor**: Converter for environmental test chamber control, and temperature (humidity) monitoring.
- **Heat-resistant flat cable**: Cable for measuring specimen inside test chamber
Measurement procedures

- Scanning from channel 1 through each channels and measuring minute resistance by 4-wire (resistance) measurements method with a milliohmmeter.

- During AUTO range measurement, each channel is adjusted to an optimum range, therefore obtaining accurate results at each channel.

- Test condition setting, start-up, and measurement control can be applied to a unit of 10 channels at minimum.

- Tests with different conditions can be performed side by side.

Exception: when measurement interval is short and test channels are many.

This evaluation example shows continuous solder joint resistance variation under temperature cycle environment. Result shows increase of resistance value at high temperature with sample B ( ).

- Test conditions:
  - Temperature cycle: -55°C 30 minutes each
  - Measurement cycle: every 10 minutes
  - Measurement range: AUTO range

Data measured by AMR is converted to text file and processed by Commercial spreadsheet software.
**SPECIFICATIONS**

<table>
<thead>
<tr>
<th>Type</th>
<th>AMR-040-PD</th>
<th>AMR-040-PA</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of measurement channels</td>
<td>Standard 40 channels (max. 280)</td>
<td></td>
</tr>
<tr>
<td>Measuring intervals</td>
<td>Minimum 3 seconds (10 channels), Variable in 3-sec. steps</td>
<td></td>
</tr>
<tr>
<td>Resistance measurement range</td>
<td>1 \times 10^3 to 1 \times 10^6 \Omega</td>
<td>1 \times 10^3 to 1 \times 10^4 \Omega</td>
</tr>
<tr>
<td>Minimum resolution</td>
<td>100 \Omega</td>
<td>10 \Omega</td>
</tr>
<tr>
<td>Measurement accuracy*</td>
<td>10 mΩ Measured value of 5% or less</td>
<td></td>
</tr>
<tr>
<td>Measuring instruments</td>
<td>34420A (Agilent Technologies)</td>
<td>4338B (Agilent Technologies)</td>
</tr>
<tr>
<td>Measurement range</td>
<td>1 Ω, 10 Ω, 100 Ω, 1KΩ, 10KΩ, 100KΩ, 1MΩ, and AUTO</td>
<td>10mΩ, 100mΩ, 1 Ω, 10 Ω, 100 Ω, 1KΩ, 10KΩ, and AUTO</td>
</tr>
<tr>
<td>Measurement current</td>
<td>10mA, 1mA, 100μA, 10μA, 5μA</td>
<td>AC 10mA, 1mA, 100μA, 10μA, 1μA (rms)</td>
</tr>
<tr>
<td>Measurement cables</td>
<td>4 heat-resistant flat cables, 1.5m from connection unit</td>
<td>1kHz Maximum applied voltage 20mV</td>
</tr>
<tr>
<td>System rack dimensions</td>
<td>530W x 1750H x 940D mm [20.87W x 68.9H x 37.01D inch]</td>
<td></td>
</tr>
<tr>
<td>Power supply</td>
<td>100VAC 50/60Hz</td>
<td>100VAC 50/60Hz</td>
</tr>
<tr>
<td>Within 10% of the rated voltage</td>
<td>120VAC 50/60Hz</td>
<td>120VAC 50/60Hz</td>
</tr>
<tr>
<td>Maximum current</td>
<td>220VAC 50/60Hz</td>
<td>220VAC 50/60Hz</td>
</tr>
<tr>
<td>Maximum current</td>
<td>240VAC 50/60Hz</td>
<td>240VAC 50/60Hz</td>
</tr>
</tbody>
</table>

*Value guaranteed at end of measurement cable of a standard system.

**OPTIONS**

- 40-channel extension
- LAN application software
- Data-processing software (with a statistical analysis function)
- Specimen temperature monitor function
- 4 or 8 or 16 measurement points
- Non heat-resistant measurement extension cable
- Heat-resistant measurement extension cable (3m)

**MODEL**

- AMR - P
  - D: Nanovolt meter type
  - A: Millivolt meter type
  - Number of channels
    - 040: 40 channels
    - 080: 80 channels
    - 120: 120 channels
    - 160: 160 channels
    - 200: 200 channels
    - 240: 240 channels
    - 280: 280 channels
SOFTWARE

**Main window**
- Display of the current resistant value, chamber temperature, channel error, and other status.
- Switch to graphic/data display window with a click.
- To start, stop, interrupt, restart the test.

Example shows 2 unit, 80 channel configuration.

**Test condition registration**
- Set the test cycle or duration, measurement interval, limit value, status, and register them in a file.

**Test setting**
- Select the test module, input name of data file, interlock with chamber, command output of test data and data storage during defrost, and taking memorandums.

**Data display**
- Data during testing and stored data are displayed.

**Test start**
- Click “Start” to start test.

**Test setting**
- Select test channel and status (choose from registered test condition file). Specify temperature samples to be saved (optional).

**Graphic display**
- Graph can be arranged by choosing channel display, display setting, and cursor display.
- Graphs can be copied on a clipboard to be applied onto another software.

The sample graph displays resistance value with temperature on thermal shock chamber at the same time.

**Cursor function**
- Quick confirmation of measurement data and channel number by cursor function on graphic display.

**Weibull Analysis (Optional)**
- Data-processing software (with a statistical processing function) enables Weibull analysis of test data, as well as the plotting of normal probability and logarithmic-normal probability.

Some photographs listed in this catalog contain Japanese display.