

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.





MEASUREMENT EVALUATION SYSTEMS

CONDUCTOR RESISTANCE EVALUATION SYSTEM

THROUGH-HOLE CONDUCTOR EVALUATION SYSTEM
SOLDER-JOINT CONTACT EVALUATION SYSTEM
BGA, CSP SOLDER JOINT CONTACT EVALUATION SYSTEM
CONNECTOR CONTACT RESISTANCE EVALUATION SYSTEM
FPC LIFE EVALUATION SYSTEM
OTHER INTERCONNECTION MATERIAL CONTACT EVALUATION SYSTEM

ION MIGRATION EVALUATION SYSTEM

INSULATION RESISTANCE EVALUATION SYSTEM

CAPACITOR INSULATION RESISTANCE EVALUATION SYSTEM
PCB, PWB INSULATION RESISTANCE EVALUATION SYSTEM
INSULATION RESISTANCE EVALUATION SYSTEM FOR OTHER INSULATION MATERIAL

LOW-K INSULATION CHARACTERISTIC EVALUATION SYSTEM

LEAK CURRENT MEASUREMENT SYSTEM

CAPACITOR LEAK CURRENT MEASUREMENT SYSTEM
FET LEAK CURRENT MEASUREMENT SYSTEM
SEMICONDUCTOR REVERSE BIAS LEAK CURRENT MEASUREMENT SYSTEM

CAPACITOR TEMPERATURE PROPERTY EVALUATION SYSTEM

INTERCONNECTION MEASUREMENT EVALUATION SYSTEM

CONNECTOR DISCONNECTION EVALUATION SYSTEM
SOLDER-JOINT DISCONNECTION EVALUATION SYSTEM
HARNESS CONTINUITY EVALUATION SYSTEM

OPTICAL COMPONENT ENVIRONMENTAL TEST SYSTEM

ELECTRO-MIGRATION EVALUATION SYSTEM

LSI ELECTRO-MIGRATION EVALUATION SYSTEM
GMR HEAD ELECTRO-MIGRATION EVALUATION SYSTEM
GMR HEAD ELECTRO-MIGRATION RH EVALUATION SYSTEM
HIGH FREQUENCY ELECTRO-MIGRATION EVALUATION SYSTEM

TDDb EVALUATION SYSTEM

WAFER LEVEL
PACKAGE LEVEL

SEMICONDUCTOR PARAMETER AUTOMATIC EVALUATION SYSTEM

FET(HOT-CARRIER) PROPERTY EVALUATION SYSTEM
TRANSISTOR PROPERTY EVALUATION SYSTEM

● 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 1M Ω , 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 10⁶

Extremely small resistance ranging from 10⁻³ to 10⁶ Ω (AMR-PD) and from 10⁻³ to 10⁴ 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.

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.



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.



Measurement cable inside the chamber

● 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)

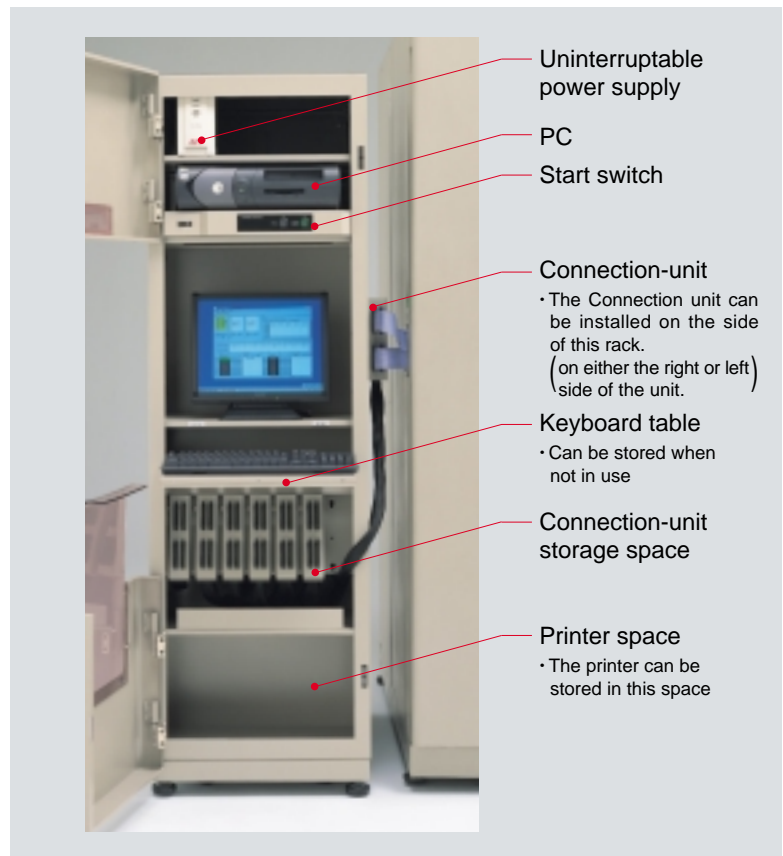
The use of statistical processing software enables the plotting of file probability, logarithmic-normal probability, and normal probability. This software is useful for data analysis.

● Environment friendliness

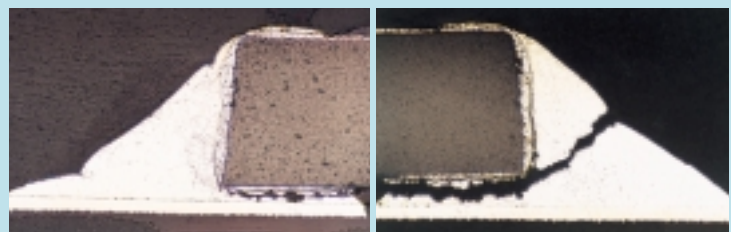
Components (except for purchased items such as PCs and measuring instruments) are mounted by lead-free soldering. In addition, power consumption is reduced by 28% (in comparison with the previous model) in consideration of global environmental problems.

● Smaller installation space (standard model)

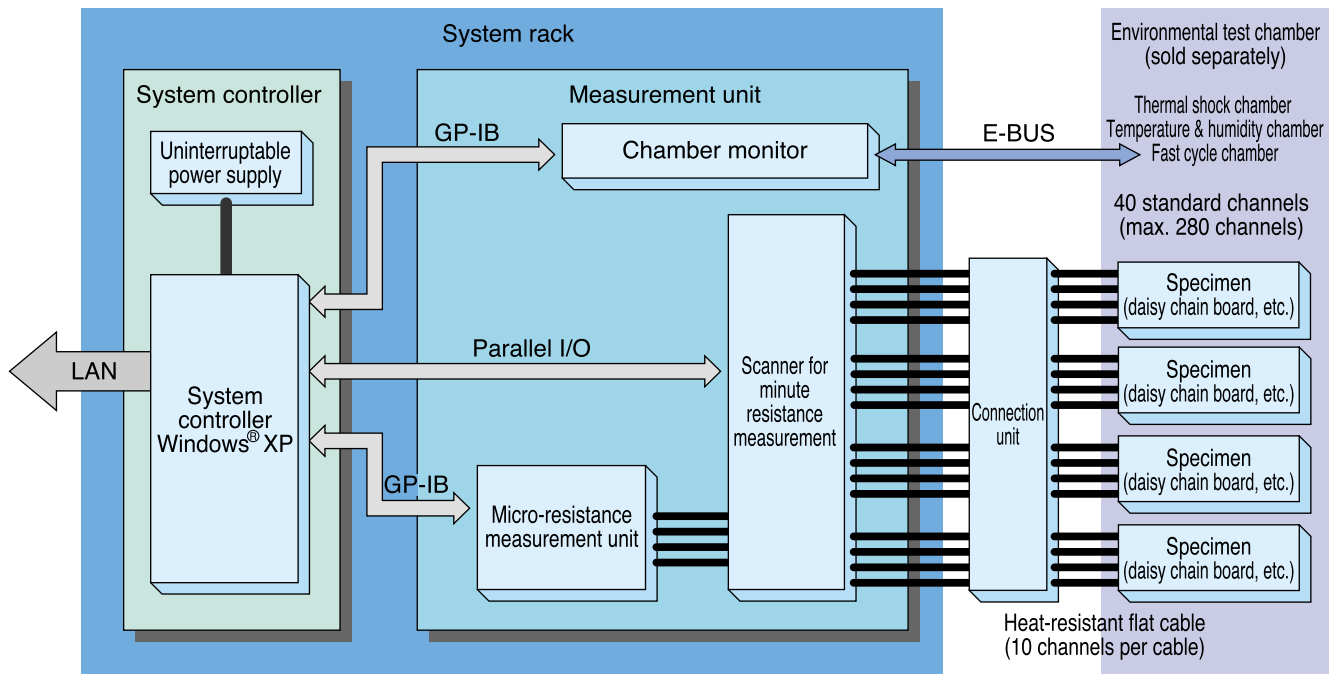
Compared to the previous model, the installation space is reduced by 15%.



● Crack in SMD soldered joint (Observation example of cross section under stereomicroscope)



SYSTEM BLOCK DIAGRAM



System controller

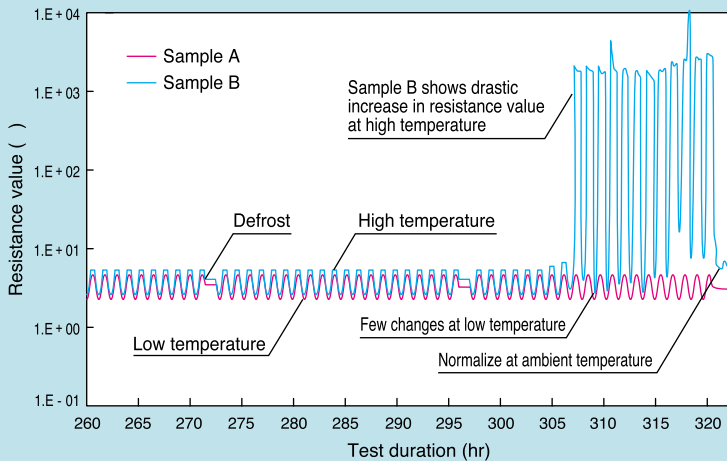
- System controller :
PC and LCD monitor for system control.
Measurement, data processing, chamber control.
- Uninterruptable power supply :
Backup power supply for system controller.
Automatically interrupts test at time of power cut.
When power recovers, test restarts from where it ended. (does not resume automatically)
- Printer space :
Can be stored inside the system rack
(storable dimensions: 450W x 260H x 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 AND EVALUATION EXAMPLE

Conductor resistance variable of solder under temperature cycle



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 + 125 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.

● 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.

Information on the reliability of technology such as lead-free soldering and ion migration is posted in the form of technology reports at the following site:
<http://www.espec.co.jp/english/env-test/tech-report/tech-report.html>

SPECIFICATIONS

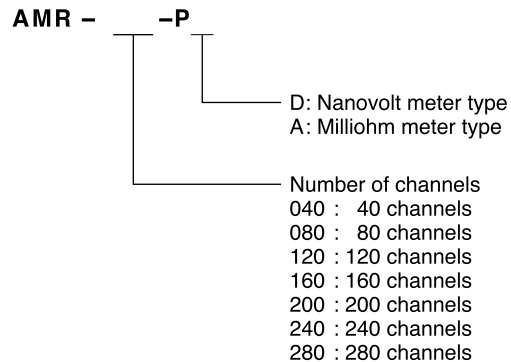
Type	AMR -040 - PD	AMR -040 - PA
No. of measurement channels	Standard 40 channels (max. 280)	
Measuring intervals	Minimum 3 seconds (10 channels), Variable in 3-sec. steps	
Resistance measurement range	1×10^{-3} to 1×10^6	1×10^{-3} to 1×10^4
Minimum resolution	100 μ	10 μ
Measurement accuracy*	10 m Measured value of $\pm 5\%$ or less	
Measuring instruments	34420A (Agilent Technologies)	4338B (Agilent Technologies)
Measurement range	1 , 10 , 100 , 1K , 10K , 100K , 1M , and AUTO	10m , 100m , 1 , 10 , 100 , 1K , 10K , and AUTO
Measurement current	10mA, 1mA, 100 μ A, 10 μ A, 5 μ A	AC 10mA, 1mA, 100 μ A, 10 μ A, 1 μ A (rms) 1kHz Maximum applied voltage 20mV
Measurement cables	4 heat-resistant flat cables, 1.5m from connection unit	
System rack dimensions (Excluding projections)	530W x 1750H x 940D mm [20.87W x 68.9H x 37.01D inch]	
Power supply (within $\pm 10\%$ of the rated voltage)	100VAC 1 50/60Hz 120VAC 1 50/60Hz 220VAC 1 50/60Hz 240VAC 1 50/60Hz	
Maximum current	100VAC	10.0A
	120VAC	8.3A
	220VAC	4.5A
	240VAC	4.2A

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

OPTIONS

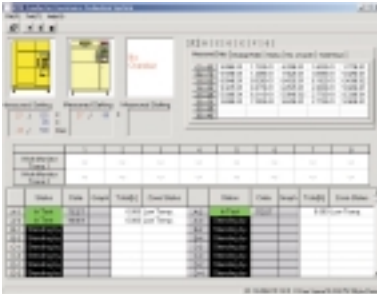
- 40-channel extension
- LAN application software
- Data-processing software (with a statistical analysis function)
- Specimen temperature monitor function
- 4 or 8 or 16 measurement points
- Non heat-resistant measurement extension cable
- Heat-resistant measurement extension cable (3m)

MODEL



SOFTWARE

Main window



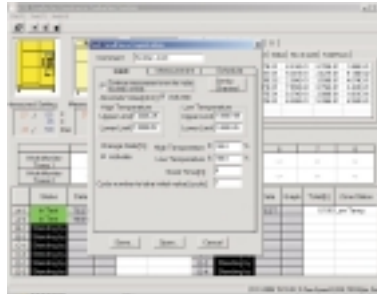
Display of the current resistant value, chamber temperature, channel error, and other status.

Switch to graphic/ data display window with a click.

To start, stop, interrupt, restart the test.

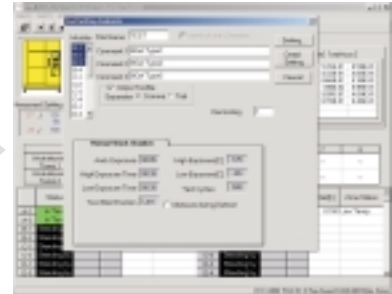
(Example shows 2 unit, 80 channel configuration.)

Test condition registration



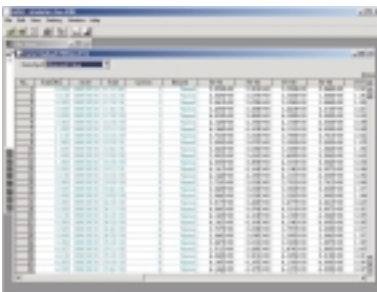
Set the test cycle or duration, measurement interval, limit value, status, and register them in a file.

Test setting



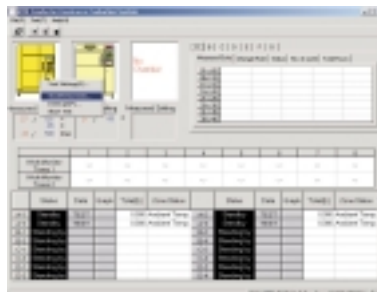
Select the test module, input name of data file, interlock with chamber, command output of text data and data storage during defrost, and taking memorandums.

Data display



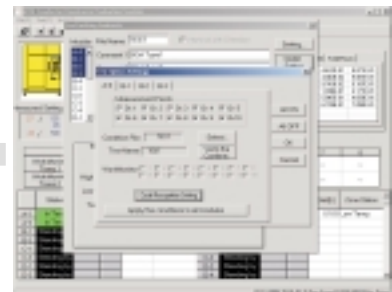
Data during testing and stored data are displayed.

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).

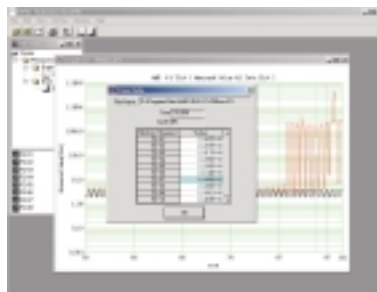
Graphic display



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.

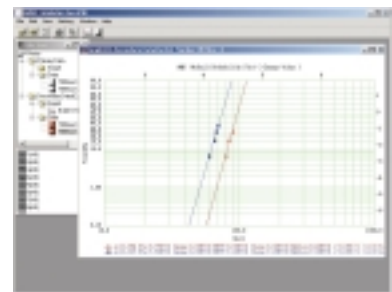
(The sample graph displays resistance value with temperature on thermal shock chamber at the same time.)

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.

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ISO 9001/JIS Q 9001

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ISO 14001 (JIS Q 14001)

Environmental Management System Assessed and Registered

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