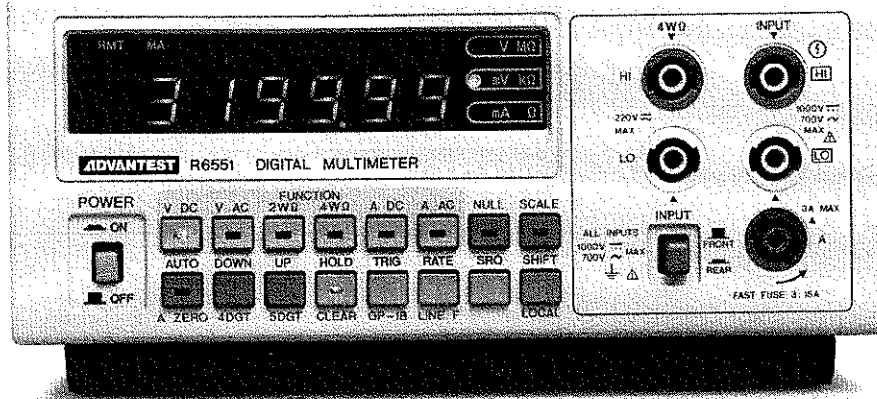


Digital Multimeters

High-Speed, High-Accuracy, True RMS

R6551/6551EMC

- Maximum Display of "319999"
- DC Voltage/Current, AC Voltage/Current and Resistance Measurement with a Single Unit
- High Sampling Rate of 100 Times/Second (with 4 1/2 Digits)
- AC Voltage/Current Measurement with the True RMS Method
- GPIB Interface with Full-Remote-Control Capability and Powerful Front/Rear Input Instrumentation for Usage as a System Component



(Photo is R6551)

R6551/6551EMC

Digital Multimeter

The R6551/6551EMC are low-cost and high-performance digital multimeters with 5 1/2 digit display and a maximum display of 319999, featuring the standard GPIB interface with full-remote-control capability. This single instrument provides the five basic measurement functions for DC voltage/current, AC voltage/current and resistance. In particular, the R6551EMC provides remarkably improved front panel and a variety of countermeasures for noise to achieve the maximum noise immunity. The expertise of ADVANTEST in high-speed integrating-type A/D conversion technology attains three-step integration time (2 ms, 20 ms or 16.667 ms and 100 ms) depending on the measurement precision and speed. This allows the R6551EMC to be used for automated measurement by means of a maximum sampling rate of 100 times/second (with 4 1/2 digits) and the standard GPIB interface.

AC voltage and current are measured by through True RMS (true root mean square) value measurement method and, for AC voltage measurement, the measurement frequency range is 20 Hz to 300 kHz. For DC voltage measurement, the R6551/6551EMC provide an accuracy of $\pm 0.006\%$ of reading ± 3 digits (at 3 V range) over a 90-day period, and 2- and 4-wire resistance measurements, thereby ensuring highly accurate measurement with excellent stability.

Moreover, the R6551/6551EMC are provided with the null function which enables offset value compensation and relative value measurement. Other features including the high-speed autoranging function and the use of clear green LED display make the R6551/6551EMC a high-performance and general-purpose instruments for both bench top and maintenance applications.

- High-Performance Portable DMM with Maximum Display of "319999"
- DC Voltage/Current, AC Voltage/Current, and Resistance Measurement Functions
- Maximum Noise Immunity to Fit Radiation Environment (R6551EMC in Particular)
- High-Speed Sampling of 100 Times/Second (with 4 1/2 Digits)
- High Accuracy of $\pm 0.006\%$ of reading ± 3 digits (at $23 \pm 3^\circ\text{C}$, for 90 Days)
- AC Voltage/Current Measurement with the True Root Mean Square Value Measurement Method (True RMS)
- Standard GPIB Interface with Full Remote Control Capability
- Powerful Front/Rear Input Instrumentation Suitable for Usage as a System Component

■ Excellent Cost Performance

The R6551 provides DC voltage/current, AC voltage/current and resistance measurement functions. DC voltage measurement features five ranges from 300 mV to 1000 V, a maximum resolution of 1 μ V and an accuracy of $\pm 0.006\%$ of reading ± 3 digits (at 3 V range) over a 90-day period. Resistance measurement can be made with four wires, enabling highly accurate measurement without the influence of cable errors. With the True RMS AC voltage and current measurement methods, the R6551 ensures accurate measurement of non-sinusoidal waveforms. In particular, when measuring pulse waveforms, an allowable crest factor of 3:1 enables accurate measurement of the maximum value which is up to three times the full scale value and measurement of signals with a duty cycle of up to 9:1.

■ High Sampling Rate of 100 Times/Second

ADVANTEST's expertise in high-speed integrating-type Δ/Δ conversion is the key to the high-speed sampling of the R6551, enabling 100 samples/second for 4 1/2-digit display or 20 samples/second for 5 1/2-digit display.

■ Null and Scaling Functions for Offset Compensation and Relative Value Measurement

The R6561 is provided with the null function for micro resistance measurement, which measures errors of connection cables, compensates the offset voltage, inputs the offset voltage value and measures the relative value with respect to the input value. It also mounts the scaling function which displays measured values with respect to set values in % format, which is suitable for evaluation of the linearity of a D/A converter.

■ Software Calibration Function Simplifies the Calibration Process

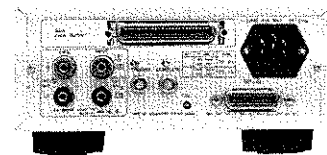
To maintain a high measurement accuracy, calibration must be made in fixed intervals. With the software calibration function which enables calibration from key operation on the front panel or via the GPIB interface, removing of the cover and volume adjustment are no longer necessary. In normal measurements, the calibration data memory is protected by switches.

■ Memory Function for Panel Settings

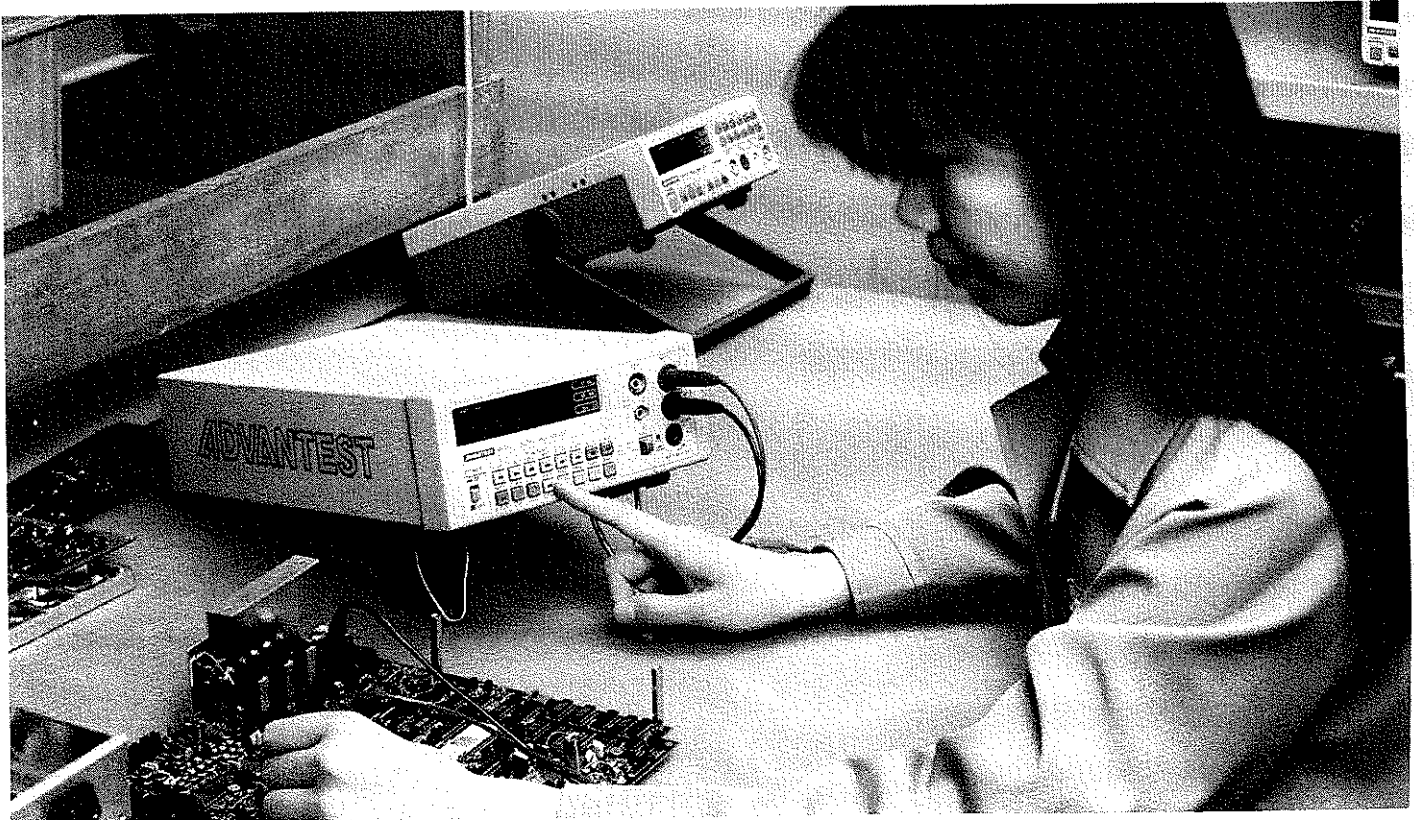
The R6551 mounts the panel setting memory function which eliminates the need to make panel settings at each power-on sequence. The use of non-volatile memory retains previous settings even if the power cord is unplugged from an outlet.

■ Suitable for Use as a System Component

The combination of the standard GPIB interface which enables full remote control including remote activation of the R6551 with its high sampling rate makes it easier to accommodate automated measurement. Input terminals are provided not only on the front panel but also on the rear panel, making rack mounting much easier. Data output is possible using the optional BCD parallel output.



BCD parallel data output (option 01)



Digital Multimeters

Model R6551/6551EMC with 1 1/2 Digit Display

R6551/6551EMC (Continued From Previous Page)

Specifications

DC Voltage Measurement

Ranges, maximum display, resolution and input impedance:

| Range | Maximum readout (5 1/2 digits) | Resolution | | Input impedance |
|---------|-----------------------------------|--------------|--------------|-------------------------|
| | | 5 1/2 digits | 4 1/2 digits | |
| 300 mV | 319.999 mV | 1 μ V | 10 μ V | 1000 M Ω or more |
| 3000 mV | 3199.99 mV | 10 μ V | 100 μ V | |
| 30 V | 31.9999 V | 100 μ V | 1 mV | 10 M Ω \pm 1% |
| 300 V | 319.999 V | 1 mV | 10 mV | |
| 1000 V | 1099.99 V | 10 mV | 100 mV | |

Measurement accuracy: (5 1/2-digit display, with autozero on)
Expressed as \pm (% of reading + digits)

| Range | 24 hours (23°C \pm 1°C) *1 | 90 days (23°C \pm 5°C) | 1 year (23°C \pm 5°C) |
|-----------|------------------------------|--------------------------|-------------------------|
| 300 mV *2 | 0.002+5 | 0.006+7 | 0.014+7 |
| 3000 mV | 0.002+2 | 0.006+3 | 0.012+3 |
| 30 V | 0.002+3 | 0.007+6 | 0.015+6 |
| 300 V | 0.002+2 | 0.006+3 | 0.014+3 |
| 1000 V | 0.002+2 | 0.006+3 | 0.014+3 |

*1: Relative value with respect to calibration reference

*2: 300 mV range measurement accuracy applies when the null function is used.

* Add 2 to the digits term for the medium sampling rate.

* Add 2 to the digits term for a 4 1/2-digit display for the high sampling rate.

Temperature coefficient: (% of reading + digits)/°C

| Range | Autozero on | Autozero off |
|---------|-------------|--------------|
| 300 mV | 0.0005+1.6 | 0.0005+13 |
| 3000 mV | 0.0005+0.2 | 0.0005+1.3 |
| 30 V | 0.0005+1.0 | 0.0005+13 |
| 300 V | 0.0005+0.1 | 0.0005+4 |
| 1000 V | 0.0005+0.1 | 0.0005+1.2 |

* Add 0.0005% to reading term when used at temperatures of 10°C or below.

Maximum allowable applied voltage:

Between Hi and Lo terminals: 300 mV and 3000 mV ranges

400 V (DC or AC peak) ----- continuous

1100 V (DC or AC peak) ----- For 10 seconds

30 V, 300 V and 1000 V ranges

1100 V (DC or AC peak) ----- continuous

Between input Lo terminal and chassis: 1000 V (DC or AC peak)
continuous

Noise rejection ratio:

| Sampling rate | Effective CMR (with a balanced impedance of 1 k Ω) | | NMR |
|----------------------|--|--------|------------------------|
| | AC50/60 Hz \pm 0.09% | DC | AC50/60 Hz \pm 0.09% |
| Low and medium speed | 120 dB | 130 dB | 60 dB |
| High speed | 60 dB | 130 dB | 0 dB |

AC Voltage Measurement

Measurement method: True RMS and AC coupling

Ranges, maximum display, resolution and input impedance:

| Range | Maximum readout (5 1/2 digits) | Resolution | | Input impedance |
|---------|-----------------------------------|--------------|--------------|-----------------------|
| | | 5 1/2 digits | 4 1/2 digits | |
| 300 mV | 319.999 mV | 1 μ V | 10 μ V | 1 M Ω \pm 2% |
| 3000 mV | 3199.99 mV | 10 μ V | 100 μ V | 100 pF max. |
| 30 V | 31.9999 V | 100 μ V | 1 mV | (Front input) |
| 300 V | 319.999 V | 1 mV | 10 mV | 250 pF max |
| 700 V | 709.99 V | 10 mV | 100 mV | (Rear input) |

Measurement accuracy: Expressed as \pm (% of reading plus digits) for
a 5 1/2-digit value over a period of 1 year at the temperature of
23 \pm 5°C.

| Frequency range | 300 mV | 3000 mV | 30 V | 300 V | 700 V |
|--------------------|----------|----------|----------|---------|---------|
| 20 Hz to 45 Hz | 0.8+160 | 0.8+120 | 0.8+120 | 1.1+160 | 1.1+160 |
| 45 Hz to 100 Hz | 0.4+160 | 0.4+120 | 0.4+120 | 0.4+160 | 0.4+160 |
| 100 Hz to 50 kHz | 0.28+160 | 0.28+160 | 0.28+190 | 0.5+160 | 0.5+190 |
| 50 kHz to 100 kHz | 0.5+660 | 0.5+660 | 0.5+660 | 1+660 | - |
| 100 kHz to 300 kHz | 3+1200 | 3+1200 | 5+1200 | - | - |

* Guaranteed for input resulting in a display of at least 15000 (and at above 300 Hz for medium and high sampling rates).

Temperature coefficient: (1/10 of measurement accuracy)/°C within
the frequency range for each range

Maximum allowable applied current: Between Hi and Lo terminals:
300 mV to 700V, 710VDC or 710VAC continuous 1000VAC peak,
10⁷ V Hz or less

Response time: Within 3 seconds (low speed) or within 0.5 seconds
(medium and high speed) to achieve the specified measurement
accuracy with the fixed range.

Crest factor: 3:1 at full scale

Resistance Measurement

Measurement method: 4-wire or 2-wire

Ranges, maximum display, resolution, measurement current:

| Range | Maximum readout | Resolution | | Measurement current | Open-circuit voltage |
|-----------------|--------------------|------------------|----------------|------------------------|-------------------------|
| | | 5 1/2 digits | 4 1/2 digits | | |
| 300 Ω | 319.999 Ω | 1 m Ω | 10 m Ω | 1 mA | 6 V max |
| 3000 Ω | 3199.99 Ω | 10 m Ω | 100 m Ω | 1 mA | |
| 30 k Ω | 31.9999 k Ω | 100 m Ω | 1 Ω | 100 μ A | |
| 300 k Ω | 319.999 k Ω | 1 Ω | 10 Ω | 10 μ A | |
| 3000 k Ω | 3199.99 k Ω | 10 Ω | 100 Ω | 1 μ A | |
| 30 M Ω | 31.9999 M Ω | 100 Ω | 1 k Ω | 100 nA | |
| 300 M Ω | 319.99 M Ω | (10 k Ω) | 10 k Ω | 10 nA | |

Measurement accuracy: (5 1/2-digit display, using 4-wire with
autozero on *1)

Expressed as \pm (% of reading + digits)

| Range | 24 hours (23°C \pm 1°C) *2 | 90 days (23°C \pm 5°C) | 1 year (23°C \pm 5°C) |
|-----------------|------------------------------|--------------------------|-------------------------|
| 300 Ω | 0.002+5 | 0.008+11 | 0.015+11 |
| 3000 Ω | 0.002+3 | 0.007+3 | 0.012+3 |
| 30 k Ω | 0.002+3 | 0.007+3 | 0.013+3 |
| 300 k Ω | 0.002+3 | 0.009+3 | 0.014+3 |
| 3000 k Ω | 0.007+14 | 0.03+19 | 0.03+19 |
| 30 M Ω | 0.06+14 | 0.18+19 | 0.2+19 |
| 300 M Ω | 0.6+14 | 1.7+19 | 2+19 |

*1: Using null function

*2: Relative value with respect to calibration reference

* Add 2 to the digits term for the medium sampling rate.

* Add 2 to the digits term for a 4 1/2-digit display for the high sampling rate.

* For 2-wire measurements, add a maximum of 200 m Ω offset for the measurement cable resistance.

Response time for 3000 k Ω and 30 M Ω ranges: Within 0.5 seconds to
reach the measurement accuracy with fixed range

Response time for 300 M Ω range: Within 5 seconds

Temperature coefficient: (4-wire measurements)

Expressed as \pm (% of reading + digits)/°C

| Range | Autozero on | Autozero off |
|-----------------|-------------|--------------|
| 300 Ω | 0.0007+1.6 | 0.0007+13 |
| 3000 Ω | 0.0007+0.2 | 0.0007+1.4 |
| 30 k Ω | 0.0007+0.2 | 0.0007+1.4 |
| 300 k Ω | 0.0009+0.2 | 0.0009+1.4 |
| 3000 k Ω | 0.003+1.3 | 0.003+1.4 |
| 30 M Ω | 0.03+1.3 | 0.03+1.4 |
| 300 M Ω | 0.3+1.3 | 0.3+1.4 |

* For 2-wire measurements, add a maximum offset of 20 m Ω /°C for the measurement
cable resistance.

* Add 0.0005% to the reading term with an operating temperature of 10°C or less.

Maximum allowable applied voltage:

Between Hi and Lo terminals: 220 VDC, 310 VAC peak continuous

DC Current Measurement

Ranges, maximum display, resolution, resistance between input terminals:

| Range | Maximum display | Resolution | | Resistance between input terminals |
|---------|-----------------|--------------|--------------|---------------------------------------|
| | | 5 1/2 digits | 4 1/2 digits | |
| 300 mA | 319.999 mA | 1 μ A | 10 μ A | 0.3 Ω or less |
| 3000 mA | 3009.99 mA | 10 μ A | 100 μ A | |

Measurement accuracy: (5 1/2-digit display, autozero on)

Expressed as \pm (% of reading + digits)

| Range | 90 days (23 \pm 5°C) | 1 year (23 \pm 5°C) |
|---------|------------------------|-----------------------|
| 300 mA | 0.06+40 | 0.13+40 |
| 3000 mA | 0.06+6 | 0.13+6 |

* Add 2 to the digits term for the medium sampling rate.

* Add 2 to the digits term for a 4 1/2-digit display for the high sampling rate.

Temperature coefficient: Expressed as (1/10 of measurement accuracy at 23°C ±5°C for 90 days)/°C within the frequency range for each range, with 1 µA/°C added when autozero is off.

Maximum allowable applied current:

- Between Hi and Lo current terminals: 3.15 ADC or 3.15 Arms continuous
- Overcurrent protection using a fuse (changeable from the front panel)

AC Current Measurement

Measurement method: True RMS and AC coupling

Ranges, maximum display, resolution, resistance between input terminals:

| Range | Maximum readout | Resolution | | Resistance between input terminals |
|---------|-----------------|--------------|--------------|------------------------------------|
| | | 5 1/2 digits | 4 1/2 digits | |
| 300 mA | 319.999 mA | 1 µA | 10 µA | 0.3 Ω or less |
| 3000 mA | 3009.99 mA | 10 µA | 100 µA | |

Measurement accuracy: Expressed as ±(% of reading + digits) of a 5 1/2 1/2-digit value for 1 year at a temperature 23±5°C.

| Frequency range | 300 mA | 3000 mA |
|-----------------|---------|---------|
| 20 Hz to 45 Hz | 2+200 | 2+200 |
| 45 Hz to 100 Hz | 0.5+200 | 0.5+200 |
| 100 Hz to 1 kHz | 0.4+200 | 0.4+200 |

* Guaranteed for input resulting in a display of at least 15000 (and at above 300 Hz for medium and high sampling rates).

Temperature coefficient Expressed as (1/10 of measurement accuracy)/°C within the frequency range for each range

Maximum allowable applied current:

- Between Hi and Lo current terminals
- 3.15 ADC or 3.15 Arms continuous, internal fuse protection (changeable from front panel).

Response time: 3 s max. (low speed), or 0.5 s max. (medium and high speed) to reach measurement accuracy with the fixed range

Crest factor: 3:1 at full scale

Number of measured digits, measurement speed, input integration time:

| Measurement function | Sampling rate (number of measured digits) | Measurement speed | | Input integration time |
|---|---|-------------------|---------------|------------------------------------|
| | | Autozero on | Autozero off | |
| DC voltage, DC current, 2-wire resistance | Low speed (5 1/2 digits) | 3 samples/s | 6 samples/s | 100 ms |
| | Medium speed (5 1/2 digits) | 10 samples/s | 20 samples/s | 20 ms (50 Hz) 16.667 ms (60 Hz) |
| | High speed (4 1/2 digits) | 50 samples/s | 100 samples/s | 2 ms |
| 4-wire resistance | Low speed (5 1/2 digits) | 3 samples/s | 3 samples/s | 100 ms |
| | Medium speed (5 1/2 digits) | 10 samples/s | 10 samples/s | 20 ms (50 Hz) 16.667 ms (60 Hz) |
| | High speed (4 1/2 digits) | 50 samples/s | 50 samples/s | 2 ms |
| AC voltage, AC current | Low speed (5 1/2 digits) | 3 samples/s | 6 samples/s | 100 ms |
| | Medium speed (5 1/2 digits) | 10 samples/s | 20 samples/s | 20 ms (50 Hz) |
| | High speed (4 1/2 digits) | 10 samples/s | 20 samples/s | 16.667 ms (60 Hz) |

* For 2-wire and 4-wire resistance measurement in the 300 MΩ range, if the medium or high sampling rate is selected, the measurement speed is 3 samples/s and the input integration time is 100 ms.

* Autozero is a function which automatically eliminates the offset error introduced by the R6551's internal analog circuitry.

Calculation Functions

Null function: The measured value at the time the function is recalled is taken as the null setting value (MNULL), after which the null setting value is subtracted from the measured value (MIN) before output (i.e., $R = MIN - MNULL$)

Scaling function: The measured value at the time the function is recalled is set to the set scaling value (MSCALE : 100%), after which the ratio of the measured value (MIN) is output (i.e., $R = MIN / MSCALE \times 100$).

Input/Output Functions

Trigger signal input: A measurement-start signal can be input at a rear-panel BNC connector.
TTL level, negative pulse, triggering on the falling edge of a pulse of width with 5 µs min.

Complete signal output: A completion signal is output to a rear-panel BNC connector upon completion of a measurement and sampling sequence.

TTL level, negative pulse, pulse width: approx. 5 µs

GPIO Interface: Standard

Standard: IEEE 488-1978

Interface functions: SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, E2
Output data format: ASCII format

Remote programming: All operating parameters (with the exception of POWER, INPUT (FRONT/REAR) switching, rear panel CAL ON/OFF switching, and GPIB address number and mode can be controlled.

SRQ signal: Output when measurement ends, when the SRQ key on the front panel is pressed, or if an error occurs. Can be masked if necessary.

General Specifications

Measurement method: Integration

Input configuration: Floating

Range switching: Auto and manual

Autoranging (up-ranging at 320000 and down-ranging at 29999)

Data display: 6-digit decimal green LED display, "-" displayed for negative values

Overload display: "OL" displayed for input exceeding the measurement range

Units and function display: Green LEDs

Warm-up time: Approx. 1 hour

Operating environment: Temperature 0 to +50°C, Humidity 85% RH or less

(In the 30 MΩ and 300 MΩ ranges, 0 to +35°C and 75% RH or less)

Storage environment: Temperature -25 to +70°C,

Humidity 85% RH or less

(Measurement parameters and calibration data memory contents are held for approximately 10 years at -25 to +60°C.)

Power requirements: Specified at the time of ordering.

| Option No. | Standard | 32 | 42 | 44 |
|------------------|-----------|------------|------------|------------|
| Line voltage (V) | 90 to 110 | 108 to 132 | 198 to 242 | 216 to 250 |

Power frequency: 48 to 66 Hz

Power consumption: 13 VA max.

Dimensions: Approx. 210(W) × 86(H) × 350(D) mm

Mass: 2.9 kg max. (R6551) / 3.0 kg max. (R6551EMC)

Standard Accessories

| Product name | Model | Remarks |
|--------------|--------|---------|
| Power cord | A01402 | |
| Input cable | A01001 | |

Options

Option 01: BCD Parallel Data Output (Only for R6551)

Data output format: BCD parallel output

Output data contents: Measured data, decimal point, polarity, unit and OVER

Print command signal output: TTL level, positive logic, pulse width of approx. 400 µs

External start signal input: TTL level, positive logic, pulse width of 100 µs to 10 ms

Connector: Amphenol (57-40500 or equivalent)

Accessories (Optional)

| | |
|--------|---|
| A01006 | Input Cable (for 4-wire resistance measurement) |
| TR1111 | Terminal Adaptor |
| A02237 | Rack Mount Set (JIS Standard) |
| A02238 | Rack Mount Set (JIS Standard, Twin) |
| A02435 | Rack Mount Set (EIA Standard) |
| A02436 | Rack Mount Set (EIA Standard, Twin) |
| A02028 | Panel Mount Set |
| A02029 | Panel Mount Set (Twin) |
| R16213 | Carrying Case |