

# Digital Multimeters

## 5 1/2 Digit DMM Series Enabling Dual Input and Display

### R6451A/6452A

- **R6451A: General-Purpose Low-Price DMM with Standard Measurement Functions**
- **R6452A: Full-Functional DMM with Dual-Channel Input and Dual Display**



(Photo is R6452A)

### R6451A/6452A

#### Digital Multimeters

New R6451A/6452A series digital multimeters were designed for diverse applications.

The series is provided with a variety of interfaces for use in R&D sections and production lines, and it ensures battery operation for field applications. With dual-channel input and dual display, the R6452A provides a new measurement environment.

The series includes two models: R6451A low-price basic model and R6452A with full measurement functions including frequency measurement.

- **Dual-Channel Input for New Measurement Environment (R6452A)**
- **Maximum Display of 199999 (with a Sampling Rate of 2.5 Times/Second) and Maximum Sampling Rate of 80 Times/Second (with a Maximum Display of 1999)**
- **AC Voltage and Current (AC + DC) Measurement with True RMS (R6451A/6452A) and Frequency Measurement (R6452A)**
- **Standard RS-232C Interface and Optional GPIB Interface and BCD Data Output Units**
- **Memory Card (SRAM Card Conforming to JEIDA Ver.4) Ensures Data Compatibility with Personal Computers**

- **Various Interfaces Can be Implemented for Automated Measurements**
- **Optional Battery Unit Allows the Use as a High-Performance DMM for Field Measurement**
- **Diverse and Combination Calculation Functions**
- **Memory Function for Panel Settings (Recalls Previous Condition Settings at Power On)**
- **Large Easy-to-Read Electron-Ray Indicator Tube**
- **High-Speed Analog Bar Graph with a Sampling Rate of 80 Times/Second is Available for Instantaneous Trendy Check (R6451A)**
- **Wide Power Range (90 to 250 V)**

### Specifications

**Measurement accuracy:**  $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$ , 85% RH or less (75% or less is guaranteed for 1 year at 20-M and 200-M $\Omega$  ranges.) The display value is  $\pm\%$  of reading  $\pm$  digits.

**Temperature coefficient:**  $0.1 \times (\text{measurement accuracy})/^{\circ}\text{C}$  at  $0^{\circ}\text{C}$  to  $50^{\circ}\text{C}$ . The display value is  $(\pm\%$  of reading  $\pm$  digits)/ $^{\circ}\text{C}$ .

#### DC voltage measurement

d:digit

Range	200 mV	2000 mV	20 V	200 V	1000 V
Maximum display	199999				109999
Resolution	1 $\mu\text{V}$	10 $\mu\text{V}$	100 $\mu\text{V}$	1 mV	10 mV
Measurement accuracy	$\pm 0.018\% \pm 6\text{d}$	$\pm 0.018\% \pm 5\text{d}$	$\pm 0.020\% \pm 5\text{d}$	$\pm 0.020\% \pm 5\text{d}$	$\pm 0.020\% \pm 5\text{d}$
Input impedance	1000 M $\Omega$ or more	11.1 M $\Omega \pm 1\%$	10.1 M $\Omega \pm 1\%$	10.0 M $\Omega \pm 1\%$	
Maximum allowable applied voltage	1100 V (DC or AC peak voltage, continuous)				

#### DC voltage noise rejection ratio

Sampling rate	Effective common mode noise rejection ratio (unbalanced impedance of 1 k $\Omega$ )	Normal mode noise rejection ratio
		AC 50/60 Hz $\pm 0.1\%$ , DC
FAST	Approx. 60 dB	0 dB
MID	Approx. 120 dB	Approx. 60 dB
SLOW		

#### AC voltage measurement (True RMS, AC, AC+DC)

With an input of 5% or more of the full scale

Range	200 mV	2000 mV	20 V	200 V	700 V
Maximum display	199999				70999
display	19999				7099
Resolution	1 $\mu\text{V}$	10 $\mu\text{V}$	100 $\mu\text{V}$	1 mV	10 mV
Measurement accuracy	20 Hz to 45 Hz	$\pm 0.6\% \pm 350\text{d}$			
	45 Hz to 20 kHz	$\pm 0.2\% \pm 200\text{d}$			
	20 kHz to 30 kHz	$\pm 0.5\% \pm 200\text{d}$			
	30 kHz to 100 kHz	$\pm 4\% \pm 500\text{d}$			
Input impedance	1.1 M $\Omega \pm 10\%$ : 100 pF or less				
Input range	5% or more of the full scale				
Crest factor	3:1 at the full scale				
Maximum allowable applied voltage	800 Vrms, 1100 V (peak), $10^{\circ}\text{V}/\text{Hz}$				
Response time	Approx. 1 second (0.1% or less of the final value in the same range)				

#### Resistance measurement

Range	200 $\Omega$	2000 $\Omega$	20 k $\Omega$	200 k $\Omega$	2000 k $\Omega$	20 M $\Omega$	200 M $\Omega$
Maximum display	199999						19999
Resolution	1 m $\Omega$	10 m $\Omega$	100 m $\Omega$	1 $\Omega$	10 $\Omega$	100 $\Omega$	10 k $\Omega$
Measured applied current	3 mA	1 mA	100 $\mu\text{A}$	10 $\mu\text{A}$	1 $\mu\text{A}$	100 nA	10 nA
Measurement accuracy	$\pm 0.04\% \pm 6\text{d}$	$\pm 0.02\% \pm 5\text{d}$	$\pm 0.02\% \pm 5\text{d}$	$\pm 0.02\% \pm 5\text{d}$	$\pm 0.03\% \pm 6\text{d}$	$\pm 0.2\% \pm 10\text{d}$	$\pm 2.0\% \pm 2\text{d}$
Open circuit voltage	7.5 V or less						
Maximum allowable applied voltage	$\pm 500\text{ V}$						

\* When the null function is used

#### DC current measurement

Range	200 mA	10 A
Maximum display	199999	109999
Resolution	1 $\mu\text{A}$	100 $\mu\text{A}$
Measurement accuracy	$\pm 0.1\% \pm 6\text{d}$	$\pm 0.2\% \pm 6\text{d}$
Input terminal resistance	1.5 $\Omega$ or less*	0.04 $\Omega$ or less*
Overcurrent protection	0.5 A/250 V IEC 127 sheet 1 Protected by a quick-blowing fuse	15 A/250 V with 10000-A interrupting capacity Protected by a quick-blowing fuse

\* The resistance of the protection fuse not included.

#### AC current measurement (True RMS, AC, AC+DC)

With an input of 5% or more of the full scale

Range	200 mA	10 A	
Maximum display	AC	199999	109999
	AC+DC	19999	10999
Resolution	1 $\mu\text{A}$	100 $\mu\text{A}$	
Measurement accuracy	20 Hz to 1 kHz	$\pm 0.6\% \pm 200\text{d}$	
	1 kHz to 5 kHz	$\pm 5.0\% \pm 200\text{d}$	
Crest factor	3:1 at the full scale		
Input terminal resistance	1.5 $\Omega$ or less*	0.04 $\Omega$ or less*	
Overcurrent protection	0.5 A/250 V IEC 127 sheet 1		15 A/250 V with 10000-A interrupting capacity
	Protected by a quick-blowing fuse		Protected by a quick-blowing fuse
Response time	Approx. 1 second (0.1% or less of the final value in the same range)		

\* The resistance of the protection fuse not included.

#### 4-20 mA measurement

	Displays the calculation result by assigning (4-20 mA) to (0-100%)
Maximum display	99999
Resolution	0.01%

\* Other specifications are the same as those for 200-mA range for DC current measurement.

#### Measurement time

Sampling mode: Free-run

Function	Measurement time		
	FAST	MID	SLOW
DC voltage measurement	12.5 (80)	100 (10)	400 (2.5)
AC voltage measurement (AC coupling)	12.5 (80)	100 (10)	400 (2.5)
Resistance measurement	12.5 (80)	100 (10)	400 (2.5)
DC current measurement	12.5 (80)	100 (10)	400 (2.5)
AC current measurement (AC coupling)	12.5 (80)	100 (10)	400 (2.5)
AC current measurement (AC + DC coupling)	38 (26.3)	220 (4.5)	820 (1.2)
Diode measurement	12.5 (80)	100 (10)	400 (2.5)
Continuity measurement	12.5 (80)	100 (10)	400 (2.5)
4-20 mA measurement	12.5 (80)	100 (10)	400 (2.5)

Unit [ms] (times/second)

# Digital Multimeters

## 5 1/2 Digit DMM Series Enabling Dual Input and Display

### R6452A

#### Specifications

**Measurement accuracy:** 23°C±5°C, 85% RH or less (75% or less is guaranteed for 1 year at 20-M and 200-MΩ ranges.) The display value is ±% of reading ± digits.

**Temperature coefficient:** 0.1 × (measurement accuracy)/°C at 0°C to 50°C. The display value is (±% of reading ± digits)/°C.

#### DC voltage measurement

d:digit

Range	200 mV	2000 mV	20 V	200 V	1000 V
Maximum display	199999				
Resolution	1 μV	10 μV	100 μV	1 mV	10 mV
Measurement accuracy	±0.018%±6d	±0.018%±5d	±0.020%±5d	±0.020%±5d	±0.020%±5d
Input impedance	1000 MΩ or more	11.1 MΩ±1%	10.1 MΩ±1%	10.0 MΩ±1%	
Maximum allowable applied voltage	1100 V (DC or AC peak voltage, continuous)				

#### DC voltage measurement (B-channel input)

Range	2000 mV	20 V	200 V
Maximum display	19999		
Resolution	100 μV	1 mV	10 mV
Measurement accuracy	±0.025% ± 2d		
Input impedance	Between B-channel input terminals: 10 MΩ ± 5%, Between B-channel input terminal and COM terminal: 5 MΩ ± 5%		
Maximum allowable applied voltage	Between B-channel input terminals: 200 V (DC or AC peak voltage, continuous) Between B-channel input terminal and COM terminal: 200 V (DC or AC peak voltage, continuous) Between B-channel input terminal and chassis: 450 V (DC or AC peak voltage, continuous)		

#### DC voltage noise rejection ratio

Sampling rate	Effective common mode noise rejection ratio (unbalanced impedance of 1 kΩ)	Normal mode noise rejection ratio
	AC 50/60 Hz ± 0.1%, DC	AC 50/60 Hz ± 0.1%
FAST	Approx. 60 dB	0 dB
MID	Approx. 120 dB	Approx. 60 dB
SLOW		

#### AC voltage measurement (True RMS, AC, AC+DC)

With an input of 5% or more of the full scale

Range	200 mV	2000 mV	20 V	200 V	700 V
Maximum display	199999				70999
display	19999				7099
Resolution	1 μV	10 μV	100 μV	1 mV	10 mV
Measurement accuracy	20 to 45 Hz	±0.6%±350d			
	45 to 20 kHz	±0.2%±200d			
	20 to 30 kHz	±0.5%±200d			
	30 to 100 kHz	±4%±500d			
Input impedance	1.1 mΩ ± 10% : 100 pF or less				
Input range	5% or more of the full scale				
Crest factor	3:1 at the full scale				
Maximum allowable applied voltage	800 Vrms, 1100 V (peak), 10 <sup>4</sup> VHz				
Response time	Approx. 1 second (0.1% or less of the final value in the same range)				

#### Resistance measurement

Range	200 Ω	2000 Ω	20 kΩ	200 kΩ	2000 kΩ	20 MΩ	200 MΩ
Maximum display	199999						19999
Resolution	1 mΩ	10 mΩ	100 mΩ	1 Ω	10 Ω	100 Ω	10 kΩ
Measured applied current	3 mA	1 mA	100 μA	10 μA	1 μA	100 nA	10 nA
Measurement accuracy	±0.04%±6d	±0.02%±5d	±0.02%±5d	±0.02%±5d	±0.03%±6d	±0.2%±10d	±2.0%±2d
Open circuit voltage	7.5 V or less						
Maximum allowable applied voltage	± 500 V						

\* When the null function is used

#### DC current measurement

Range	200 mA	10 A
Maximum display	199999	109999
Resolution	1 μA	100 μA
Measurement accuracy	±0.1% ± 6d	±0.2% ± 6d
Input terminal resistance	1.5 Ω or less*	0.04 Ω or less*
Overcurrent protection	0.5 A/250 V IEC 127 sheet 1 Protected by a quick-blowing fuse	15 A/250 V with 10000-A interrupting capacity Protected by a quick-blowing fuse

\* The resistance of the protection fuse not included.

#### AC current measurement (True RMS, AC, AC+DC)

With an input of 5% or more of the full scale

Range	200 mA	10 A
Maximum display	AC	199999
	AC+DC	19999
Resolution	1 μA	100 μA
Measurement accuracy	20 Hz to 1 kHz	±0.6%±200d
	1 kHz to 5 kHz	±5.0%±200d
Crest factor	3:1 at the full scale	
Input terminal resistance	1.5 Ω or less*	0.04 Ω or less*
Overcurrent protection	0.5 A/250 V IEC 127 sheet 1 Protected by a quick-blowing fuse	15 A/250 V with 10000-A interrupting capacity Protected by a quick-blowing fuse
	Response time: Approx. 1 second (0.1% or less of the final value in the same range)	

\* The resistance of the protection fuse not included.

#### Temperature measurement (Rear panel)

Range	-50 to 1370°C
Maximum display	13700
Resolution	0.1°C
Measurement accuracy	±0.15%±2.0°C
Corresponding thermocouple	K(CA)

#### Frequency measurement

Range	20 Hz to 200 kHz
Maximum display	19999
Measurement accuracy	±0.02%±2d

\* Waveform: Sine wave and square wave

Duty ratio: 3 or less

Other specifications are the same as those for AC voltage/current measurement.

#### Measurement time

Sampling mode: Free-run

Function	Measurement time		
	FAST	MID	SLOW
DC voltage measurement	12.5 (80)	100 (10)	400 (2.5)
AC voltage measurement (AC coupling)	12.5 (80)	100 (10)	400 (2.5)
Resistance measurement	12.5 (80)	100 (10)	400 (2.5)
DC current measurement	12.5 (80)	100 (10)	400 (2.5)
AC current measurement (AC coupling)	12.5 (80)	100 (10)	400 (2.5)
AC current measurement (AC + DC coupling)	38 (26.3)	220 (4.5)	820 (1.2)
Diode measurement	12.5 (80)	100 (10)	400 (2.5)
Continuity measurement	12.5 (80)	100 (10)	400 (2.5)
Temperature measurement	12.5 (80)	100 (10)	400 (2.5)
Frequency measurement	210 (4.7)	300 (3.3)	600 (1.6)

Unit [ms] (times/second)

### R6451A/6452A, TR1111

#### Common specifications (R6451A/6452A)

**Continuity measurement:** Measurement range of 200 Ω and continuity judgment value of 20 Ω

Other specifications are the same as those for the 200Ω range for resistance measurement.

**Diode measurement:** Measurement range of 2000 mV

Other specifications are the same as those for the 2000 Ω range for resistance measurement.

Sampling rate	FAST	MID	SLOW
Number of measurements (times/second)	80	10	2.5

**Calculation function:** Null, smoothing, dB/dBm, scaling, MAX/MIN, comparator

#### General specifications

**Measurement method:** Integrating type

**Input method:** Floating type

**Range switching:** Auto and manual

**Data display:** 6-digit decimal, 7-segment electron ray indicator tube (Dual display for the **R6452A**)

**Overinput indication:** "OL" is displayed for inputs out of the rated measurement range.

**Low-battery indication:** If the battery power voltage drops to below the rated voltage, a low-battery mark is displayed in the display section.

**Dielectric strength:** Withstands 450 V continuously applied between the COM terminal and chassis and AC power line.

#### Operating environment:

Operating temperature: 0 to 50°C (0 to 40°C when the battery is mounted)

Operating humidity: 85% RH or less

**Storage temperature:** -25 to 70°C (-20 to 50°C when the battery is mounted)

**Power consumption:** 15 VA or less

**AC power:** Specified at the time of ordering.

Option No.	Standard	32	42	44
Power voltage (V)	90 to 100	103 to 132	198 to 242	207 to 250

**DC power supply:** 6-hour continuous operation is possible by means of the **R15807(optional)** battery unit.

**Dimensions:** Approx. 212 (W) × 88 (H) × 310 (D) mm

**Mass:** 2.2 kg maximum (main unit), 3.5 kg maximum (with options)

#### Accessories:

Product name	A01402	A01034
Model	Power cable	Input cable x1

**STANDARD ACCESSORIES:** RS-232C, BAUD RATE OF 9600, 4800, 2400, 1200, 600 AND 300

#### OPTIONAL ACCESSORIES

- A01034** INPUT CABLE
- A08316** ALLIGATOR CLIP ADAPTER
- A08317** MINIATURE CLIP ADAPTER
- TR1116** DC HIGH-VOLTAGE PROBE
- TR1101-130** SHEATHED TYPE THERMOCOUPLE
- TR1111** TERMINAL ADAPTER
- A02464** EIA RACK MOUNT KIT (TWIN)
- A02463** EIA RACK MOUNT KIT
- A02264** JIS RACK MOUNT KIT (TWIN)
- A02263** JIS RACK MOUNT KIT
- A01001** INPUT CABLE
- A01265** RS-232C CABLE (FOR 1 M, 250- AND 9-PIN (DMM))
- A09507** SRAM CARD (64 KBYTES)
- R16215** CARRYING BAG
- R15807** BATTERY UNIT

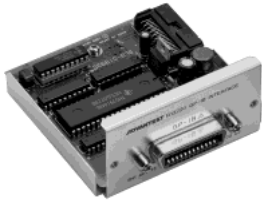


TR1111  
Terminal Adaptor

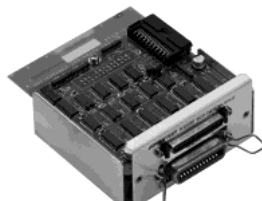
### TR1111 Terminal Adaptor

The TR1111 can be used when measurements are performed by connecting leads to the R6441A/51A/52A.

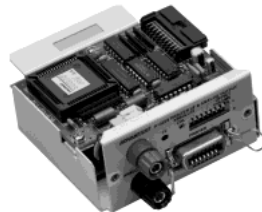
### R13220, R13015, R13223, R13016, R13221, R15807, R13222



**R13220**  
GPIB Interface Unit



**R13015**  
BCD Data Output Unit



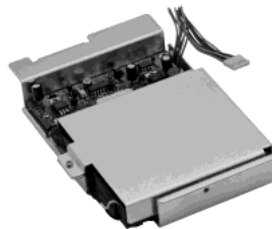
**R13223**  
Printer I/F & Analog Output Unit



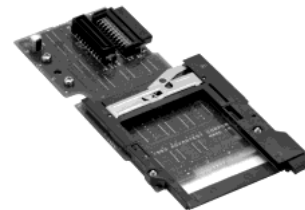
**R13016**  
Digital Comparator Unit



**R13221**  
Printer Interface Unit



**R15807**  
Battery Unit



**R13222**  
Memory Card Interface Unit

#### R13220 GPIB Interface Unit

**Electrical specifications:** Conforms to IEEE488-1978 and IEC625-1.

**Mechanical specifications:** Conforms to IEEE488-1978.

**Connector:** 24-pin Amphenol

**Interface specifications:** SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, and E2

**Code system:** ASCII code

**Address designation:** 31 talker/listener addresses can be set from the front panel of the main unit.

#### R13015 BCD Data Output Unit

**Output data:** BCD parallel code

**Output data contents:** Measured data, decimal point, polarity and unit (output only at first display unit)

**Print command signal output:** TTL-level positive logic (with a pulse width of approx. 1 ms)

**External start signal:**

A (Data output): TTL-level positive logic (with a pulse width of 100  $\mu$ s to 10 ms)

B (Remote control input): TTL-level negative logic (with a pulse width of 100  $\mu$ s to 10 ms), Input impedance of approx. 10 k $\Omega$

**External control:** Function, range, buzzer on/off, sampling mode, sampling rate, null calculation and comparator calculation

**Connector:** Data output DHA-RC50 DDK  
Remote input 57-40240 DDK

#### R13223 Printer I/F & Analog Output Unit

**Printer I/F section:** Same as the R13221.

**Analog output section**

**Output voltage:** 0 V to +0.999 V (+1 V output at the time of IVFS calibration)

**Number of conversion digits:** 8 to 9 types of digits can be selected by means of the DIP switch on the accessory panel (rear panel of the main unit)

**Conversion output:** Can be selected from NORMAL, OFFSET NORMAL, ABSOLUTE, or OFFSET ABSOLUTE.

**Conversion accuracy:**  $\pm 0.2\%$  of the full scale (0°C to 50°C), 85% RH or less, for 1 year)

**Output impedance:** Approx. 180  $\Omega$

**Output terminal:** Binding post

#### R13016 Digital Comparator Unit

**Comparison level:** Upper and lower limits (HIGH LIMIT/LOW LIMIT)

**Determination condition:**

HIGH Measured data > HIGH LIMIT

PASS HIGH LIMIT  $\geq$  Measured data  $\geq$  LOW LIMIT

LOW Measured data < LOW LIMIT

**Level setting:** Set from the front panel of the main unit.

**END signal:** TTL-level, negative logic (with a pulse width of approx. 1 ms)

**Contact output:** Optical MOS relay HI, PASS, LO

**Contact capacity:** Allowable switching voltage of 50 V and allowable switching current of 0.1 A

**Dielectric strength:** 200 V (between input/output signal and chassis)

**Transistor output:** Open-collector output

Maximum collector voltage/current of 50 V/0.3A

**Buzzer output:** Generated when the comparison result is HIGH, PASS, LOW or HIGH/LOW.

**Connector:** 57-40140 DDK

#### R13221 Printer Interface Unit

**Output code:** Centronics

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

**Printing interval:** Continuous, 5 seconds to 4 hours

**Setting:** Set from the main unit panel.

**Connector:** 57-40140 DDK

#### R15807 Battery Unit

**Built-in battery :** 12 V lead storage battery

**Capacity :** 1.8 Ah

**Charging method :** Fully charged for approx. 12 hours with the main unit power turned off and power supply connected.

**Low-battery indication :** Displayed on the front panel of the main unit. Goes on for a remaining time of 2 hours. Does not affect main unit specifications.

**Weight :** 1 kg maximum

#### R13222 Memory Card Interface Unit

**Available card :** A09507 (64 kbytes): SRAM card conforming to JEIDA ver.4 (with attribute information)

**Memory contents :** Measured data and panel settings are stored with DOS format. (Up to 128 files and up to 4000 data items are stored.)