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)**

New Measurement Environment with the Dual Display Function

R6451A

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				109999
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%	10.1MΩ±1%	10.0MΩ±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 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	AC	199999				70999
	AC+DC	19999				7099
Resolution		1 µV	10 µV	100 µV	1 mV	10 mV
Measurement accuracy	20 Hz to 45 Hz	± 0.6%± 350d				
	45 Hz to 20 kHz	± 0.2%± 200d				
	20 kHz to 30 kHz	± 0.5%± 200d				
	30 kHz 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), 10⁷VHz				
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	109999
	AC+DC	19999	10999
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.

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				109999
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 peal voltage, continuous) Between B-channel input terminal and COM terminal: 200 V (DC or AC peal voltage, continuous) Between B-channel input terminal and chassis:450 V (DC or AC peal 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	AC	199999				70999
	AC+DC	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 7 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	109999
	AC+DC	19999	10999
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

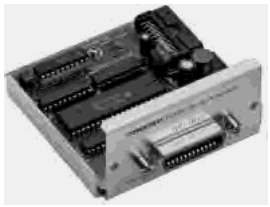
TR1111
Terminal Adaptor

TR1111 Terminal Adaptor

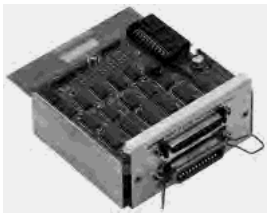
The TR1111 can be used when measurements are performed by connecting leads to the R6441A/51A/52A.

Optional Units for the R6441 Series and R6451/6452 Series

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

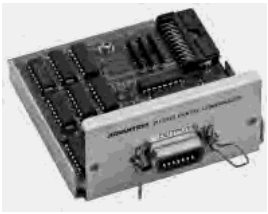


R13220
GPIB Interface Unit



R13015
BCD Data Output Unit

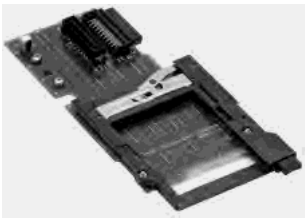
R13223
Printer I/F & Analog Output Unit



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 µs to 10 ms)
B (Remote control input): TTL-level negative logic (with a pulse width of 100 µs to 10 ms), Input impedance of approx. 10 kΩ
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: ±0.2% of the full scale (0˚C to 50˚C), 85% RH or less, for 1 year)
Output impedance: Approx. 180 Ω
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 ≥ Measured data ≥ 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.)