

## 8½-digit high-precision and high-accuracy digital multimeter for system calibration

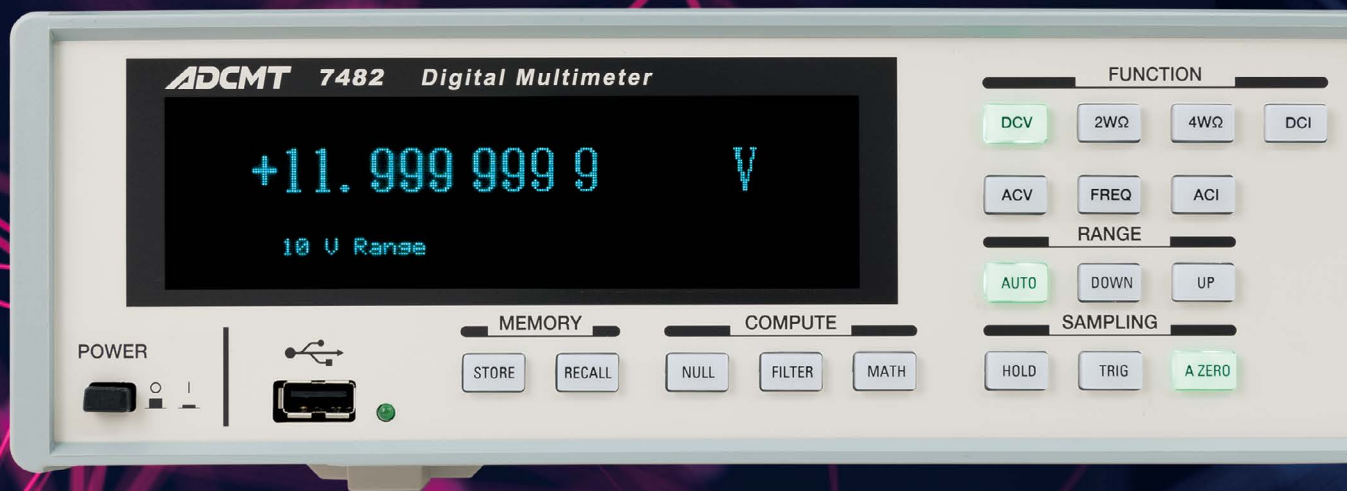
- 8½-digit display (119 999 999), 0.01 ppm resolution  
DC voltage measurement: 100 mV to 1000 V, 10 nV resolution  
DC current measurement: 100 nA to 1000 mA, 100 fA resolution  
Resistance measurement: 10 Ω to 1000 MΩ, 1 μΩ resolution  
AC voltage/current, frequency and period measurements (7482 only)
- High-accuracy measurement by self-calibration function  
5 ppm/year (DC voltage measurement relative accuracy)  
8 ppm/year (resistance measurement relative accuracy)  
Auto-calibration of frequency characteristics for AC voltage measurement (7482 only)
- Internal memory storage up to 50,000 data (or 500,000 data for the Option +06)
- High-speed sampling up to 50,000 readings/s

GPIB

USB

LAN

Factory option



# DMM for System Use with High Accuracy

The 7481/7482 is an 8½-digit digital multimeter with high resolution of 0.01 ppm, equipped with DC voltage, DC current and resistance measurement functions. It is suitable for use in research and development fields or calibration organizations, and calibration of inspection systems for electronic components or semiconductors.

The 7481/7482 achieves high-resolution measurement such as 10 nV for DC voltage measurement, 100 fA for DC current measurement and 1 μΩ for resistance measurement, and also guarantees high relative accuracy 5 ppm per year

for voltage measurement and 8 ppm per year for resistance measurement. The 7482 also has AC measurement capability, and AC voltage measurement can be made from 10 Hz to 2 MHz using the True RMS method.

In addition, the self-calibration function allows high-accuracy measurement at any time, and external calibration can be performed with a smaller number of standards.

The 7481/7482 comes standard with GPIB and USB interfaces for automated systems, and LAN is available as an option. It is designed with rear input terminals for system integration.

## 8½-digit high-performance DMM suitable for high-accuracy measurement

The 7481/7482 is a high-performance digital multimeter with 8½-digit display for DC voltage or resistance measurement (119 999 999) and 7½-digit display for DC current measurement (11 999 999). As high-resolution DC voltage ratio measurement is also possible, this is the best used as standard and for high-accuracy measurement.

	7481/7482				7482		
	DC voltage	Resistance	DC current	DC voltage ratio	AC voltage	AC current	Frequency/Period
Maximum display	119 999 999	119 999 999	11 999 999	999 999 999	1 199 999	1 199 999	9 999 999
Relative accuracy*	0.5 + 0.1	2 + 0.2	5 + 10	1.25 + 0.25	150 + 150	300 + 200	100
(Condition)	10 V range	10 kΩ range	1000 μA range	10 V range	10 V range 1 kHz	1000 μA range 1 kHz	Gate time 1 s

\*Relative accuracy: ±(ppm of reading + ppm of range), Tcal ± 1 °C, 24 hours

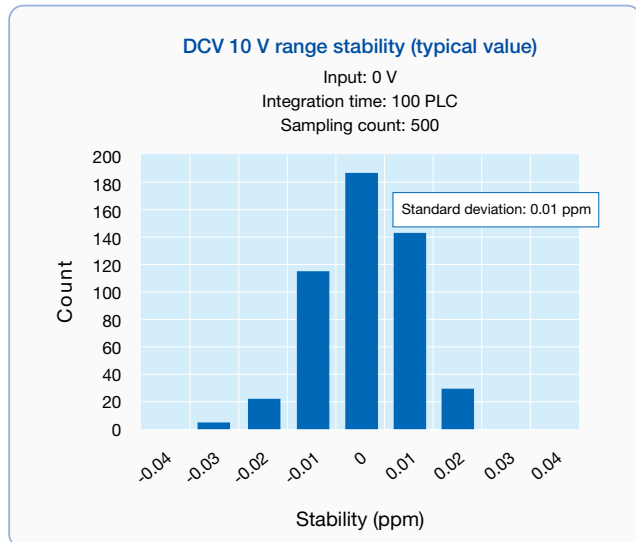
All you need to perform external calibration for the 7481/7482 are two sources: a DC voltage standard (10 V) and a resistance standard (10 kΩ).

By the two-source calibration and the self-calibration function, all ranges of voltage, current and resistance are calibrated and internal errors due to ambient temperature change can be removed. As a result, high-accuracy measurements are guaranteed. Calibration values are stored in the internal memory together with their calibration date, and these data can be read out by the GPIB, USB or optional LAN.

## High-precision A/D converter

The 7481/7482 adopts a self-developed multi-slope integration system for A/D conversion. So, it realizes high-precision linearity and excellent stability as standard, making it possible to perform high-accuracy measurements.

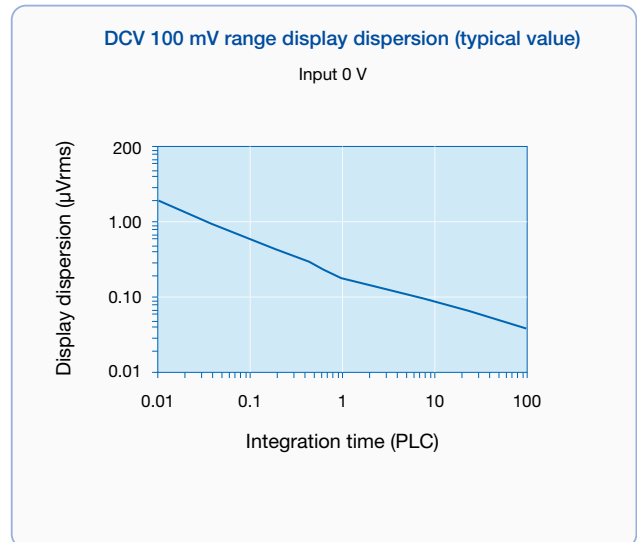
The following figure shows the stability at 0 V input in the 10 V range.



## Low-noise design

The 7481/7482 offers measurement with less dispersion by its low-noise ranging amplifier.

The following figure shows the integration time and effective values (rms) of display dispersion at 0 V input in the 100 mV range.



# Various Functions Convenient for Measurements

## High-precision resistance measurement by thermal EMF cancellation

The 7481/7482 has a high-precision resistance measurement function in which micro thermal electromotive force that causes errors in resistance measurement is cancelled automatically.

## 4-wire contact check function

In 4-wire resistance measurement, contact check on the current source and voltage measurement points are performed. Measurement errors due to wrong connection or contact failure can be judged in advance.

## Auto-calibration of frequency characteristics (7482 only)

In AC voltage measurement, the frequency characteristics of the input section attenuator are automatically calibrated by calibration signals generated from the internal reference voltage, enabling measurement with good frequency characteristics.

## 50,000 data internal memory

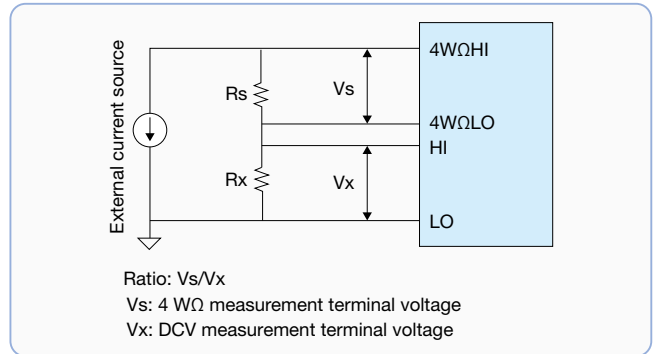
50,000 (or 500,000 data for the Option + 06) measurement data can be stored in the internal memory (RAM) at high speed up to 50,000 samples per second.

## Front/rear input terminal external control

The front and rear input terminals can be controlled externally via the GPIB, USB or optional LAN. It can prevent switching errors between the front and rear input.

## Ratio measurement function

In ratio measurement, the reference DC voltage is measured by using the 4 WΩ measurement terminal in addition to normal DC voltage measurement, and its voltage ratio is gained by calculation. Using this function, it is possible to measure attenuator voltage division ratio and electric power, eliminating error factors of the external supply source in resistance measurement.

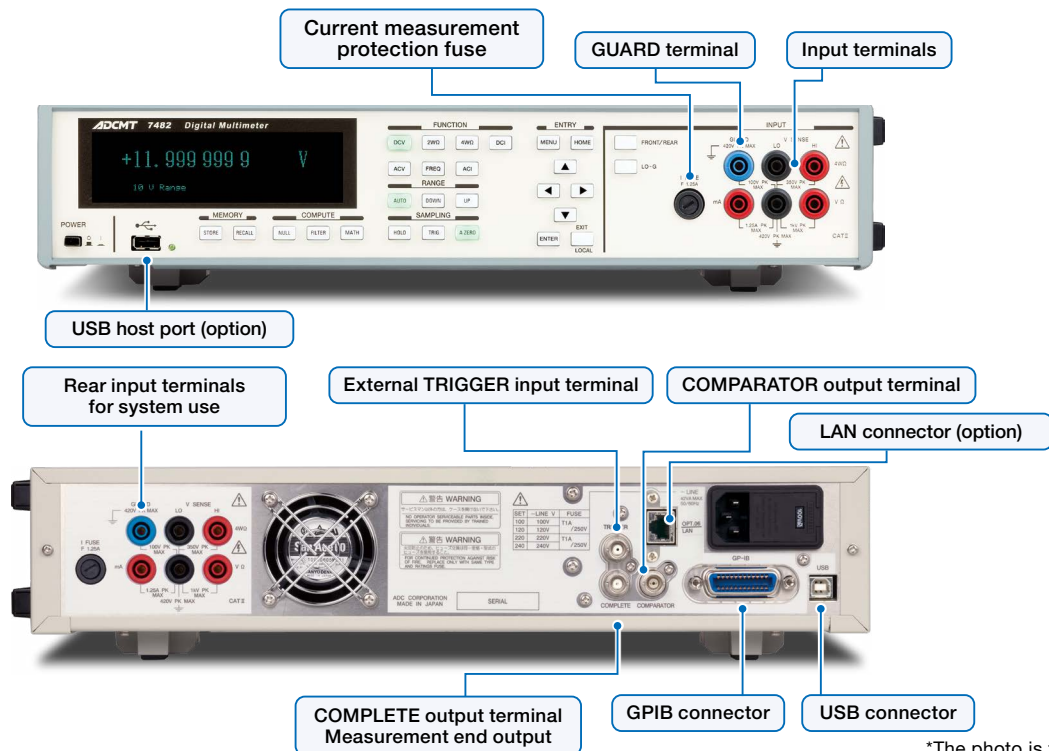


## Comparator function

Efficient PASS/FAIL judgement is available by setting threshold values for inspection of electronic components such as resistors and semiconductors. Judgment results PASS or FAIL are displayed as measurement results on the screen, and also are output to the COMPARATAOR output terminal.

## Statistic operation function

The maximum 50,000 (or 500,000 for the Option +06) samples can be set. Statistic operation results such as maximum value, minimum value, average, dispersion and standard deviation ( $\sigma$ ) are displayed.



\*The photo is the 7482+06.

## 7481/7482 Specifications

### DC Voltage Measurement

Range/maximum display/resolution/input impedance

Range	Maximum display	Resolution					Input impedance
		8 1/2	7 1/2	6 1/2	5 1/2	4 1/2	
100 mV	119.99999 mV	-	10 nV	0.1 μV	1 μV	10 μV	>100 GΩ
1000 mV	1199.99999 mV	10 nV	0.1 μV	1 μV	10 μV	100 μV	>100 GΩ
10 V	11.9999999 V	0.1 μV	1 μV	10 μV	100 μV	1 mV	>100 GΩ
100 V	119.999999 V	1 μV	10 μV	100 μV	1 mV	10 mV	10 MΩ±1 %
1000 V	1099.99999 V	10 μV	100 μV	1 mV	10 mV	100 mV	10 MΩ±1 %

Maximum input voltage: Input HI-LO ±1000 Vpeak  
 GUARD-chassis ±420 Vpeak  
 GUARD-LO terminal ±100 Vpeak

Accuracy: Relative accuracy with the integration time of 100 PLC  
 ± (ppm of reading+ ppm of range)

Range	24 hours <sup>2</sup>	90 days <sup>3</sup>	1 year <sup>3</sup>
	Tcal <sup>1</sup> ± 1 °C	Tcal ± 5 °C	
100 mV	2.5+10	5.0+10	7.0+10
1000 mV	1.5+1	4.0+1	6.0+1
10 V	0.5+0.1	3.0+0.2	5.0+0.2
100 V	2.5+1	5.0+1	7.0+1
1000 V	2.5+0.1	5.0+0.2	7.0+0.2

<sup>1</sup> Tcal = temperature at calibration (23 °C)

<sup>2</sup> 4 minutes or more after range switching (MATH NULL, fixed range), Tcal ± 1 °C

<sup>3</sup> Within 24 hours after last INT CAL, ± 1 °C, Tcal ± 5 °C (MATH NULL, fixed range)

INT CAL: internal calibration (calibration of errors in DMM)

Add 0.9 ppm of reading additional error for ADC traceability to Japan's national standard.

Voltage coefficient: Add 7 ppm (Vin/1000 V)<sup>2</sup> for 100 V or higher input.  
 Temperature coefficient: ± (ppm of reading + ppm of range)/°C

Range	Temperature coefficient	
	Without INT CAL	With INT CAL
100 mV	1.2+1	0.25+1
1000 mV	1+0.1	0.15+0.1
10 V	1+0.01	0.15+0.01
100 V	1.2+0.1	0.25+0.1
1000 V	1.2+0.01	0.25+0.01

Without INT CAL: INT CAL is not performed regardless of the ambient temperature change

With INT CAL: INT CAL is performed according to the ambient temperature change and a measured value right after that is used.

Temperature coefficient additional error with Auto-zero OFF	Range	Additional error ppm of range/°C
	100 mV	50
	1000 mV/100 V	5
	10 V/1000 V	1

Additional error: Add the following additional errors for integration time other than 100 PLC.

Additional errors by integration time <sup>4</sup>

Integration time	Gain error ppm of reading	Range error ppm of range
2 μs to 5 μs	2000	1000
6 μs to 10 μs	1000	500
20 μs to 100 μs	200	100
200 μs to 1 ms	30	20
2 ms to 10 ms	10	10
1 PLC	1	0.6
2 PLC to 3 PLC	0.8	0.5
4 PLC to 5 PLC	0.6	0.4
6 PLC to 10 PLC	0.5	0.3
20 PLC to 30 PLC	0.2	0.2
40 PLC to 50 PLC	0.2	0.1
60 PLC to 90 PLC	0.1	0.05

<sup>4</sup> 1 μs is an unspecified accuracy.

Range multiplier of range error

Range	Multiplier <sup>5</sup>
100 mV	×20 (×100)
1000 mV	×2 (×10)
10 V	×1 (×1)
100 V	×2 (×10)
1000 V	×1 (×1)

<sup>5</sup> Integration time 200 μs to 10 ms for multipliers in the parentheses

Noise rejection: Between GUARD and LO terminals, at unbalanced impedance of 1 kΩ

Integration time	Effective CMR		NMR
	50/60 Hz±0.07 %	DC	50/60 Hz±0.07 %
10 ms or less	90 dB	140 dB	0 dB
1 PLC or more	150 dB	140 dB	60 dB

### Resistance Measurement

	Range	Maximum display	Resolution					Measurement current	Open circuit voltage
			8 1/2	7 1/2	6 1/2	5 1/2	4 1/2		
High-Power	10 Ω	11.999999 Ω	-	1 μΩ	10 μΩ	100 μΩ	1 mΩ	10 mA	13 V
	100 Ω	119.999999 Ω	1 μΩ	10 μΩ	100 μΩ	1 mΩ	10 mΩ	10 mA	13 V
	1000 Ω	1199.99999 Ω	10 μΩ	100 μΩ	1 mΩ	10 mΩ	100 mΩ	1 mA	13 V
	10 kΩ	11.9999999 kΩ	100 μΩ	1 mΩ	10 mΩ	100 mΩ	1 Ω	1 mA	17 V
	100 kΩ	119.999999 kΩ	1 mΩ	10 mΩ	100 mΩ	1 Ω	10 Ω	100 μA	17 V
	1000 kΩ	1199.99999 kΩ	10 mΩ	100 mΩ	1 Ω	10 Ω	100 Ω	10 μA	17 V
	10 MΩ	11.9999999 MΩ	-	1 Ω	10 Ω	100 Ω	1 kΩ	1 μA	17 V
	100 MΩ	119.999999 MΩ	-	10 Ω	100 Ω	1 kΩ	10 kΩ	100 nA	16 V
	1000 MΩ	1199.99999 MΩ	-	100 Ω	1 kΩ	10 kΩ	100 kΩ	10 nA	16 V
	Low-Power	10 Ω	11.999999 Ω	-	1 μΩ	10 μΩ	100 μΩ	1 mΩ	10 mA
100 Ω		119.99999 Ω	-	10 μΩ	100 μΩ	1 mΩ	10 mΩ	1 mA	5 V
1000 Ω		1199.9999 Ω	-	100 μΩ	1 mΩ	10 mΩ	100 mΩ	1 mA	5 V
10 kΩ		11.9999999 kΩ	-	1 mΩ	10 mΩ	100 mΩ	1 Ω	100 μA	5 V
100 kΩ		119.999999 kΩ	-	10 mΩ	100 mΩ	1 Ω	10 Ω	10 μA	5 V
1000 kΩ		1199.99999 kΩ	-	100 mΩ	1 Ω	10 Ω	100 Ω	1 μA	5 V
10 MΩ		11.9999999 MΩ	-	1 Ω	10 Ω	100 Ω	1 kΩ	100 nA	5 V
100 MΩ		119.999999 MΩ	-	10 Ω	100 Ω	1 kΩ	10 kΩ	10 nA	5 V
1000 MΩ		1199.99999 MΩ	-	100 Ω	1 kΩ	10 kΩ	100 kΩ	10 nA	16 V

Maximum input voltage: Between measurement terminals: ±350 V peak  
 GUARD-chassis ±420 V peak  
 GUARD-LO terminal ±100 V peak

### 4-Wire Resistance Measurement

Accuracy: Relative accuracy with the integration time of 100 PLC  
 ± (ppm of reading + ppm of range)

	Range	24 hours	90 days <sup>6</sup>	1 year <sup>6</sup>
		Tcal ± 1 °C	Tcal ± 5 °C	
High-Power	10 Ω	5+10	12+20	14+20
	100 Ω	5+2	10+5	12+5
	1000 Ω	3+2	8+5	10+5
	10 kΩ	2+0.2	6+0.5	8+0.5
	100 kΩ	2+0.2	6+0.5	8+0.5
	1000 kΩ	10+1	12+1	14+1
	10 MΩ	50+5	50+5	50+5
	100 MΩ	500+10	500+10	500+10
	1000 MΩ	0.5 %+10	0.5 %+10	0.5 %+10
	Low-Power	10 Ω	5+10	12+20
100 Ω		5+10	12+20	14+20
1000 Ω		3+2	8+5	10+5
10 kΩ		3+2	10+5	12+5
100 kΩ		10+2	12+5	14+5
1000 kΩ		50+5	50+5	50+5
10 MΩ		500+50	500+50	500+50
100 MΩ		0.5 %+50	0.5 %+50	0.5 %+50
1000 MΩ		0.5 %+10	0.5 %+10	0.5 %+10

<sup>6</sup> Within 24 hours after last INT CAL, ±1 °C, Tcal ±5 °C (MATH NULL, fixed range)

Add 3.1 ppm of reading additional error for ADC traceability to Japan's national standard.

Temperature coefficient:  $\pm$  (ppm of reading + ppm of range)/ $^{\circ}$ C

	Range	Temperature coefficient	
		Without INT CAL	With INT CAL
High-Power	10 $\Omega$	3+3	1+3
	100 $\Omega$	3+1	1+1
	1000 $\Omega$	2+1	1+1
	10 k $\Omega$	2+0.1	1+0.1
	100 k $\Omega$	2+0.1	1+0.1
	1000 k $\Omega$	2+0.1	1+0.1
	10 M $\Omega$	20+0.1	5+0.1
	100 M $\Omega$	100+1	50+1
Low-Power	1000 M $\Omega$	1000+1	500+1
	10 $\Omega$	3+3	1+3
	100 $\Omega$	3+3	1+3
	1000 $\Omega$	2+1	1+1
	10 k $\Omega$	2+1	1+1
	100 k $\Omega$	2+1	1+1
	1000 k $\Omega$	10+1	5+1
	10 M $\Omega$	100+10	25+10
100 M $\Omega$	1000+10	250+10	
1000 M $\Omega$	1000+1	500+1	

Additional error: Add the following additional error for integration time other than 100 PLC.\*7

Integration time	Gain error ppm of reading	Range error ppm of range
2 $\mu$ s to 10 $\mu$ s	2000	1500
20 $\mu$ s to 100 $\mu$ s	200	150
200 $\mu$ s to 1 ms	30	30
2 ms to 10 ms	10	10
1 PLC to 10 PLC	1	0.6
20 PLC to 50 PLC	0.2	0.2
60 PLC to 90 PLC	0.1	0.1

\*7 1  $\mu$ s is an unspecified accuracy.

Range multiplier of range error

	Range	Multiplier*8
High-Power	10 $\Omega$	$\times 20$ ( $\times 100$ )
	100 $\Omega$ to 1000 $\Omega$	$\times 5$ ( $\times 10$ )
	10 k $\Omega$ to 1000 M $\Omega$	$\times 1$ ( $\times 1$ )
Low-Power	10 $\Omega$ to 100 $\Omega$	$\times 20$ ( $\times 100$ )
	1000 $\Omega$ to 100 M $\Omega$	$\times 5$ ( $\times 10$ )
	1000 M $\Omega$	$\times 1$ ( $\times 1$ )

\*8 Integration time 200  $\mu$ s to 10 ms for multipliers in the parentheses

4 W $\Omega$  check function ON: Add 5 ppm gain error.

$\Omega$ -COMP function ON: Add 2 ppm gain error for 100 k $\Omega$  and 5 ppm gain error for 1000 k $\Omega$ .

## 2-Wire Resistance Measurement

Accuracy: Add 0.2  $\Omega$  offset error to ppm of range of 4-wire resistance measurement (4 W $\Omega$ ) accuracy.

Temperature coefficient (Auto-zero OFF):

Add the following addition error (ppm of range)/ $^{\circ}$ C to the temperature coefficient of 4-wire resistance measurement (4 W $\Omega$ ).

	Range	Additional error ppm of range/ $^{\circ}$ C
High-Power	10 $\Omega$	50
	100 $\Omega$ to 1000 $\Omega$	5
	10 k $\Omega$ to 1000 M $\Omega$	1
Low-Power	10 $\Omega$ to 100 $\Omega$	50
	1000 $\Omega$ to 100 M $\Omega$	5
	1000 M $\Omega$	1

## DC Current Measurement

Range/maximum display resolution/input impedance/over input protection

Range	Maximum display	Resolution				Input impedance	Over input protection
		7½	6½	5½	4½		
100 nA	119.9999 nA	-	100 fA	1 pA	10 pA	1010 k $\Omega$ or less	1.25 A/250 V fast-blow fuse protection
1000 nA	1199.9999 nA	100 fA	1 pA	10 pA	100 pA	105 k $\Omega$ or less	
10 $\mu$ A	11.999999 $\mu$ A	1 pA	10 pA	100 pA	1 nA	10.1 k $\Omega$ or less	
100 $\mu$ A	119.99999 $\mu$ A	10 pA	100 pA	1 nA	10 nA	1.01 k $\Omega$ or less	
1000 $\mu$ A	1199.9999 $\mu$ A	100 pA	1 nA	10 nA	100 nA	102 $\Omega$ or less	
10 mA	11.999999 mA	1 nA	10 nA	100 nA	1 $\mu$ A	12 $\Omega$ or less	
100 mA	119.99999 mA	10 nA	100 nA	1 $\mu$ A	10 $\mu$ A	3 $\Omega$ or less	
1000 mA	1199.9999 mA	100 nA	1 $\mu$ A	10 $\mu$ A	100 $\mu$ A	2 $\Omega$ or less	

Accuracy: Relative accuracy with the integration time of 100 PLC  $\pm$  (ppm of reading+ ppm of range)

Range	24 hours*9	90 days*9	1 year*9
	Tcal $\pm 1$ $^{\circ}$ C	Tcal $\pm 5$ $^{\circ}$ C	
100 nA	10+400	25+400	25+400
1000 nA	10+40	15+40	20+40
10 $\mu$ A	5+10	15+20	20+20
100 $\mu$ A	5+10	15+20	20+20
1000 $\mu$ A	5+10	15+20	20+20
10 mA	10+10	15+20	20+20
100 mA	20+10	25+20	30+20
1000 mA	100+10	100+20	110+20

\*9 Within 24 hours after last INT CAL,  $\pm 1$   $^{\circ}$ C, Tcal  $\pm 5$   $^{\circ}$ C (MATH NULL, fixed range)

Add 4 ppm of reading additional error for ADC traceability to Japan's national standard.

Temperature coefficient:  $\pm$  (ppm of reading + ppm of range)/ $^{\circ}$ C

Range	Temperature coefficient	
	Without INT CAL	With INT CAL
100 nA	10+200	2+50
1000 nA	10+20	2+5
10 $\mu$ A	2+4	2+1
100 $\mu$ A	5+3	2+1
1000 $\mu$ A	5+2	2+1
10 mA	10+2	5+1
100 mA	20+2	5+1
1000 mA	20+3	10+2

Additional error: Add the following additional errors for integration time other than 100 PLC.\*10

Integration time	Gain error ppm of reading	Range error ppm of range
2 $\mu$ s to 10 $\mu$ s	2000	2000
20 $\mu$ s to 100 $\mu$ s	200	1200
200 $\mu$ s to 1 ms	30	1200
2 ms to 10 ms	10	800
1 PLC to 10 PLC	1	10
20 PLC to 50 PLC	0.2	4
60 PLC to 90 PLC	0.1	2

\*10 1  $\mu$ s is an unspecified accuracy.

Range multiplier of range error

Range	Multiplier
100 nA	$\times 50$
1000 nA	$\times 5$
10 $\mu$ A to 1000 mA	$\times 1$

## AC Voltage Measurement (7482 only)

Range/maximum display/resolution/input impedance/maximum allowable voltage True RMS

Range	Maximum display	Resolution			Input impedance	Maximum allowable voltage
		6 1/2	5 1/2	4 1/2		
10 mV	11.9999 mV	-	100 nV	1 µV	1 MΩ±10 %	±1000 V peak between input HI and LO terminals
100 mV	119.9999 mV	100 nV	1 µV	10 µV	170 pF or less	
1000 mV	1199.999 mV	1 µV	10 µV	100 µV		
10 V	11.99999 V	10 µV	100 µV	1 mV	1 MΩ±3 %	
100 V	119.9999 V	100 µV	1 mV	10 mV	170 pF or less	
700 V	799.999 V	1 mV	10 mV	100 mV		

Accuracy: ± (% of reading+ % of range) with the integration time of 100 PLC (1 year, Tcal ± 1 °C)  
Specified with sine wave input of 5 % or more of full scale and 1×10<sup>7</sup> VHz or less, and within 24 hours after INT CAL.

For AC

Range	10 Hz to 20 Hz	20 Hz to 40 Hz	40 Hz to 100 Hz	100 Hz to 10 kHz	10 kHz to 50 kHz
10 mV	0.7+0.3	0.2+0.25	0.08+0.25	0.03+0.25	0.15+0.25
100 mV	0.7+0.02	0.2+0.02	0.08+0.02	0.02+0.02	0.15+0.04
1000 mV	0.7+0.02	0.2+0.02	0.08+0.015	0.02+0.015	0.15+0.04
10 V	0.7+0.02	0.2+0.02	0.075+0.015	0.015+0.015	0.15+0.04
100 V	0.7+0.02	0.2+0.02	0.075+0.015	0.015+0.015	0.15+0.04
700 V	0.7+0.03	0.2+0.02	0.08+0.02	0.05+0.02	0.15+0.04
Range	50 kHz to 100 kHz	100 kHz to 250 kHz	250 kHz to 500 kHz	500 kHz to 1 MHz	1 MHz to 2 MHz
10 mV	0.7+0.3	8+0.7	-	-	-
100 mV	0.25+0.08	0.5+0.5	1.5+0.6	5+1	8+3 <sup>††</sup>
1000 mV	0.25+0.08	0.5+0.5	1.5+0.6	2.5+1	8+3 <sup>††</sup>
10 V	0.25+0.08	0.5+0.5	1.5+0.6	2.5+1	8+3 <sup>††</sup>
100 V	0.25+0.08	0.5+0.5 <sup>††</sup>	1.5+0.6 <sup>††</sup>	2.5+1 <sup>††</sup>	-
700 V	0.3+0.2	-	-	-	-

<sup>††</sup> Reference value

For AC + DC

Range	10 Hz to 20 Hz	20 Hz to 40 Hz	40 Hz to 100 Hz	100 Hz to
10 mV	0.4+0.3	0.15+0.25	0.06+0.25	Same as the accuracies of AC
100 mV	0.4+0.02	0.15+0.02	0.06+0.02	
1000 mV	0.4+0.02	0.15+0.02	0.06+0.015	
10 V	0.4+0.02	0.15+0.02	0.055+0.015	
100 V	0.4+0.02	0.15+0.02	0.055+0.015	
700 V	0.4+0.03	0.15+0.02	0.06+0.02	

If the DC component exceeds 10 % of the AC component, the following error is added to each range.

Range	10 mV	100 mV	1000 mV to 700 V
Additional error	0.1+3	0.1+0.2	0.1+0.1

Temperature coefficient: Additional error from Tcal, specified within ± 1 °C after INT CAL execution.  
(1/10 of measurement accuracy including additional error)/°C at each frequency in each range

Crest factor:5 (FILTER SLOW, MID)

Crest factor additional error:±(% of range)

Crest factor	1 to 2	2 to 3	3 to 4	4 to 5
Additional error	0	0.15	0.25	0.40

Settling time: Time to reach 0.1 % of input step  
FAST 25 ms, MID 120 ms, SLOW 1000 ms

Low frequency additional error: ±(% of reading)

FILTER	200 Hz to 500 Hz	500 Hz to 1 kHz	1 kHz to 2 kHz	2 kHz to 5 kHz	5 kHz to 10 kHz
SLOW	0	0	0	0	0
MID	0.15	0.015	0	0	0
FAST	-	-	0.2	0.05	0.01

## AC Current Measurement (7482 only)

Range/maximum display/resolution/input impedance/over input protection True RMS

Range	Maximum display	Resolution			Input impedance	Over input protection
		6 1/2	5 1/2	4 1/2		
100 µA	119.9999 µA	100 pA	1 nA	10 nA	1.01 kΩ or less	1.25 A/250 V fast-blow fuse protection
1000 µA	1199.999 µA	1 nA	10 nA	100 nA	102 Ω or less	
10 mA	11.99999 mA	10 nA	100 nA	1 µA	12 Ω or less	
100 mA	119.9999 mA	100 nA	1 µA	10 µA	3 Ω or less	
1000 mA	1199.999 mA	1 µA	10 µA	100 µA	2 Ω or less	

Accuracy: ± (% of reading+ % of range) with the integration time of 100 PLC (1 year, Tcal ± 1 °C)  
Specified with sine wave input of 5 % or more of full scale and within 24 hours after INT CAL.  
(For the 100 µA range, the accuracy is specified with sine wave input of 10 % or more up to 1 kHz.)

For AC

Range	10 Hz to 20 Hz	20 Hz to 45 Hz	45 Hz to 100 Hz	100 Hz to 5 kHz
100 µA to 100 mA	0.7+0.02	0.2+0.02	0.08+0.02	0.03+0.02
1000 mA	0.7+0.02	0.2+0.02	0.08+0.02	0.1+0.02

For AC + DC

Range	10 Hz to 20 Hz	20 Hz to 45 Hz	45 Hz to 100 Hz	100 Hz to 5 kHz
100 µA to 100 mA	0.4+0.02	0.15+0.02	0.06+0.02	0.03+0.02
1000 mA	0.4+0.02	0.15+0.02	0.08+0.02	0.1+0.02

If the DC component exceeds 10 % of the AC component, "0.1 % of reading+ 0.2 % of range" is added to each range as additional error.

Temperature coefficient: Additional error from Tcal, specified within ± 1 °C after INT CAL execution.  
(1/10 of measurement accuracy including additional error)/°C at each frequency in each range

Crest factor:5 (FILTER SLOW, MID)

Crest factor additional error:±(% of range)

Crest factor	1 to 2	2 to 3	3 to 4	4 to 5
Additional error	0	0.15	0.25	0.40

Settling time: Time to reach 0.1 % of input step  
FAST 25 ms, MID 120 ms, SLOW 1000 ms

Low frequency additional error: ±(% of reading)

FILTER	200 Hz to 500 Hz	500 Hz to 1 kHz	1 kHz to 2 kHz	2 kHz to 5 kHz
SLOW	0	0	0	0
MID	0.15	0.015	0	0
FAST	-	-	0.2	0.05

## Frequency/Period Measurement (7482 only)

Measurement range/input signal range/input impedance

	AC voltage input <sup>†2</sup>	AC current input
Frequency measurement range	1 Hz to 10 MHz	1 Hz to 10 kHz
Period measurement range	1 s to 100 ns	1 s to 100 µs
Input signal range	5 mVrms to 700 Vrms	10 µArms to 1 Arms
Input impedance	Refer to the input impedance described in AC voltage measurement and AC current measurement sections.	

<sup>†2</sup> The input signal range is from 50 mVrms when the frequency is 1 MHz or higher.

Accuracy

Measurement range		± (% of reading)	
Frequency	Period	Square wave	Sine wave
1 Hz to 10 Hz	1 s to 100 ms	0.05	1
10 Hz to 100 Hz	100 ms to 10 ms	0.02	0.1
100 Hz to 10 MHz	10 ms to 100 ns	0.01	

Gate time/display digits/maximum display

Gate time	Display digits	Maximum display
100 µs	3 digits	999
1 ms	4 digits	999 9
10 ms	5 digits	999 99
100 ms	6 digits	999 999
1 s	7 digits	999 999 9

Trigger level: Can be set to ±500 % of range (in 20 % steps).  
However, for the 700 VAC range, the trigger level is set to ±100 % of 1000 V (in 20 % steps).  
The trigger level setting is valid for frequency below 1 MHz.

## Ratio Measurement

Ratio	Input voltage/reference voltage
Input voltage	Between DCV HI and LO terminals
Reference voltage	(Between 4WΩHI and LO terminals) - (Between 4WΩLO and LO terminals)
Reference measurement range	DCV 100 mV to 10 V (auto range only)

Accuracy:

Ratio measurement accuracy	± (Input measurement error + Reference measurement error)
Input measurement error	Total range error of DCV input signal measurement × 1
Reference measurement error	Total range error of DCV reference signal measurement × 1.5

## Integration Time

The integration time can be set as follows:

1 μs to 10 μs:	1 μs step
20 μs to 100 μs:	10 μs step
200 μs to 1 ms:	100 μs step
2 ms to 10 ms:	1 ms step
1 PLC to 10 PLC:	1 PLC step
10 PLC to 100 PLC:	10 PLC step

4½-digit display	1 μs to 100 PLC
5½-digit display	100 μs to 100 PLC
6½-digit display	1 ms to 100 PLC
7½-digit display	1 PLC to 100 PLC
8½-digit display	10 PLC to 100 PLC

PLC: Power Line Cycle

10 PLC is repeated in case of 20 PLC or longer.

## Computing Operations

Digital filter:

Smoothing	Obtains the moving average of measurement data of a specified smoothing count. Smoothing count: 2 to 100
Averaging	Obtains the average of measurement data of a specified averaging count. Averaging count: 2 to 100

Format:

Scaling

$$R = \frac{D - Y}{X} \times Z \quad (X, Y, Z: \text{constant})$$

% deviation

$$R = \frac{D - X}{|X|} \times 100 \quad (\%)$$

Delta

$$R = D_t - D_{t-1} \quad (\text{difference from the previous measured value})$$

dB conversion

$$R = 20 \log_{10} |D/X| \quad (\text{dB})$$

RMS

$$R = \sqrt{\frac{1}{N} \sum_{K=1}^N D_K^2}$$

dBm conversion

$$R = 10 \log_{10} \frac{D^2/X}{10^{-3}} \quad (\text{dBm})$$

R: dBm conversion value based on 1 mW (= 0 dBm)

D: voltage measured value (V)

X: reference resistance value (Ω)

Resistance value temperature compensation

$$R_{20} = \frac{R_x}{1 + 0.00393(T - 20)} \times \frac{1000}{L} \quad (\Omega/\text{km})$$

$R_{20}$ : Converted resistance value of copper wire at 20 °C (Ω/km)

$R_x$ : Measured resistance value at temperature of X °C (Ω)

T: Room temperature at measurement(°C), L: Wire length(m)

Pt sensor temperature measurement: JIS C1604-1997 (ITS90)

Comparator:	Operation	UP area	UPPER < D
		MID area	LOWER ≤ D ≤ UPPER
		LOW area	D < LOWER

Constant setting range

UPPER -9.99999999 E+51 to +9.99999999 E+51

LOWER -9.99999999 E+51 to +9.99999999 E+51

Operation result display

PASS or FAIL is displayed as result.

PASS setting is available independently for each of UP, MID and LOW areas.

Statistic operation:	RN	Number of samples,	Rave	Average value
	Rmax	Maximum value,	Rp-p	Dispersion range
	Rmin	Minimum value,	Rσ	Standard deviation
	Rucl	Upper Control Line	Rave+3Rσ	
	Rlcl	Lower Control Line	Rave-3Rσ	

Null operation:

Sets a certain measured value as null value, and subtracts the null value from the following measured values. Null correction is available in the full range of each measurement range.

Memory function:

Memory contents Measured data (50,000 data or 500,000 data for the Option +06)

Condition setting memory 4 files (USER0 to USER3)  
RTC (real time clock)

Trigger function:

Trigger source IMMEDIATE, MANUAL, EXTERNAL, BUS, LEVEL, TIMER, LINE

## Interface Function

GPIB interface:

Command system	Compliant to IEEE 488.2-1987
Connector	Amphenol 24 pin
Interface function	SH1, AH1, T5, L4, SR1, RL1, PP0, DC1, DT1, C0, E2

USB interface:

Standard	Compliant to USB 2.0 Full-Speed
Connector	Type B

LAN interface (Option +06)

Standard	Compliant to IEEE 802.3
Transmission	10Base-T, 100Base-TX
Connector	RJ-45

Front panel USB host port (Option +06)

Supporting mass storage class devices	
Measurement memory data export	
Standard	Compliant to USB 2.0 Full-Speed
Connector	Type A

Input terminals:

Switchable between front input and rear input by remote control

External control signals:

Connector	BNC connector
Trigger input signal	TTL level, positive/negative pulse selectable
Complete output signal	TLL level, negative pulse
Comparator output signal	Open collector/pull-up selectable PASS/FAIL output selectable

## General Specifications

Operating environment: Temperature: 0 °C to +50 °C (7481)  
 0 °C to +45 °C (7482)  
 (Performance guaranteed between 0 °C and +40 °C)  
 Relative humidity: 85 % or less, no condensation  
 (65 % or less no condensation for resistance  
 measurement ranges: 1 MΩ, 10 MΩ, 100 MΩ,  
 1000 MΩ, current measurement 100 nA range)

Storage environment: Temperature: -25 °C to +70 °C  
 Relative humidity: 85 % or less, no condensation

Warm-up time: 4 hours or more to meet the specifications  
 Display 256 × 64 dot-matrix VFD  
 Range switching Automatic and manual  
 Input method Floating and guarded

### Maximum allowable applied voltage

				4WΩHI	
				HI	350 V
		4WΩLO		350 V	350 V
		LO	350 V	1000 V	350 V
GUARD	100 V	450 V	1000 V	450 V	
Chassis	420 V	420 V	770 V	1000 V	770 V

\* Do not apply more than 1000 V between the same terminals on the front and the rear.

Measurement method: Integration

Power supply: AC power supply 100 V/120 V/220 V/240 V (User selectable)

Option number	Standard	OPT. 32	OPT. 42	OPT. 44
Power voltage	100 V	120 V	220 V	240 V

Use a power cable and a fuse that are compliant with the safety standard when changing the power supply voltage.

Line frequency: 50 Hz/60 Hz  
 Power consumption: 42 VA or less  
 Dimensions: Approx. 424 (W) × 88 (H) × 450 (D) mm  
 Mass: 7481 9 kg or less  
 7482 10 kg or less  
 Safety: Compliant with IEC61010-1 Ed.3 Measurement CAT II  
 EMC: EN61326-1 class A

### Supplied accessories

Name	Model	Quantity
Power cable (JIS 2 m)	A01402	1
Input cable (test probe 1 m)	CC010001	1
Alligator clip adapter (for CC010001)	CC015001	1
Current terminal protection fuse	DFS-AN1R25A-1	1
Power fuse	DFT-AA1A-1	1
EMI clamp	DEE-100345-1	1

### Optional accessories

Name	Model
Input cable (for 4-wire measurement, with guard)	A01005
Input cable (for 4-wire measurement)	A01006
Input cable (banana- alligator)	A01035
Input cable (test probe 1 m)	CC010001
Alligator clip adapter (for CC010001)	CC015001
Front handle set 2U	CC028002
Rack mount set EIA 2U	CC024002
Rack mount set JIS 2U	CC022002

(The front handle set and the rack mount set can be used in combination.)

### Option

Function	Model
LAN interface	7481+06 (Factory option)
Front panel USB host port	7482+06 (Factory option)
Internal memory 500,000 data	

- Please read through the operation manual carefully before using the product.
- All specifications are subject to change without notice.



E-mail : [kcc@adcmt.com](mailto:kcc@adcmt.com) URL : <http://www.adcmt.com>

#### Head Office (R&D Center)

77-1, Miyako Namegawa-machi, Hiki-gun,  
 Saitama 355-0812, Japan  
 Phone: +81-493-56-4433 Fax: +81-493-57-1092

#### East Branch (Sales Dept.)

Okabe-building, 3-515, Onari-cho, Omiya-ku, Saitama-shi,  
 Saitama 330-0852, Japan  
 Phone: +81-48-651-4433 Fax: +81-48-651-4432