

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

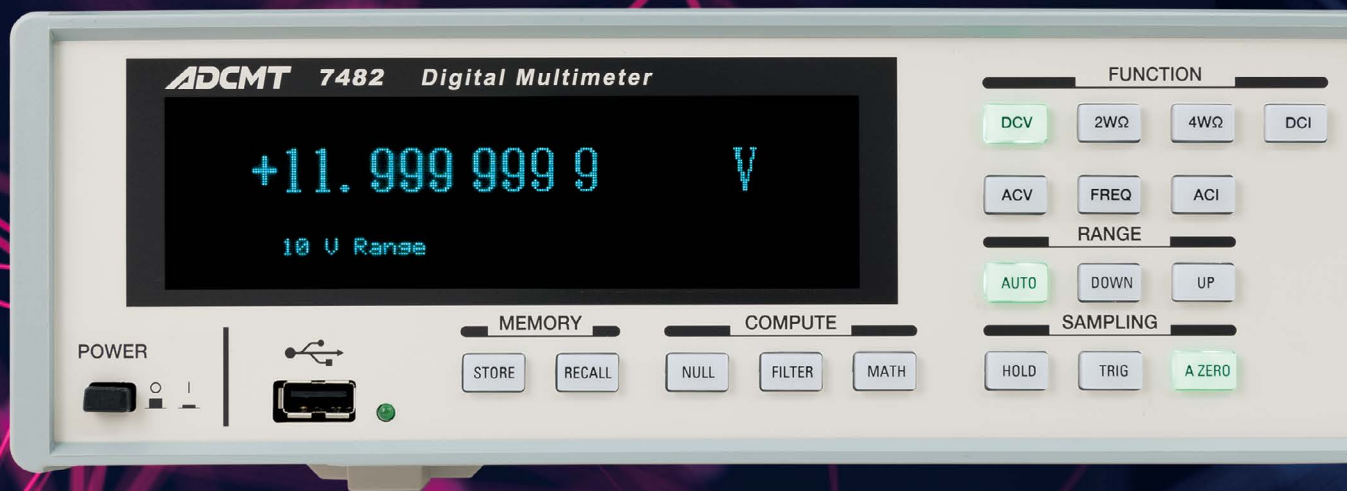
- 8½-digit display (119 999 999), 0.01 ppm resolution
DC voltage measurement: 100 mV to 1000 V, 10 nV resolution
DC current measurement: 100 nA to 1000 mA, 100 fA resolution
Resistance measurement: 10 Ω to 1000 MΩ, 1 μΩ resolution
AC voltage/current, frequency and period measurements (7482 only)
- High-accuracy 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

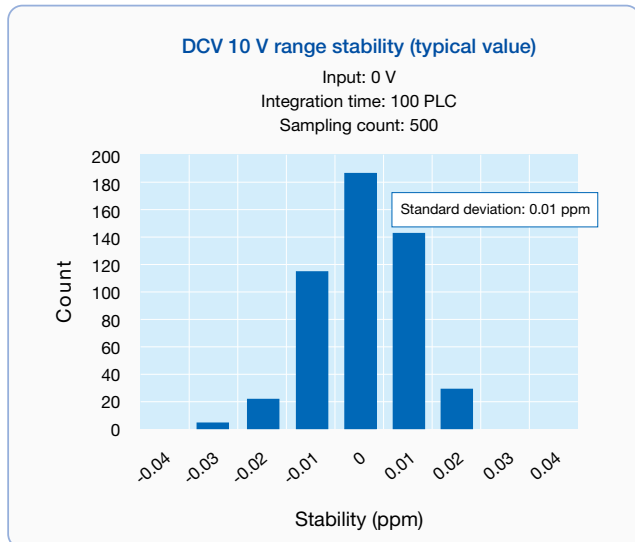
All you need to perform external calibration for the 7481/7482 are two sources: a DC voltage standard (10 V) and a resistance standard (10 kΩ).

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.

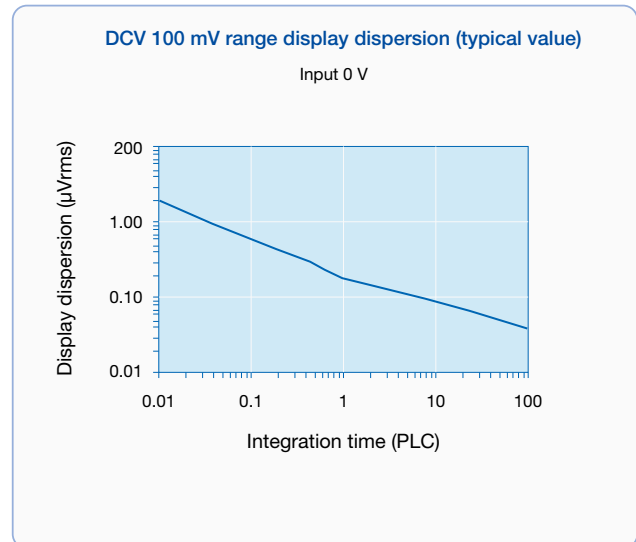
The following figure shows the stability at 0 V input in the 10 V range.



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

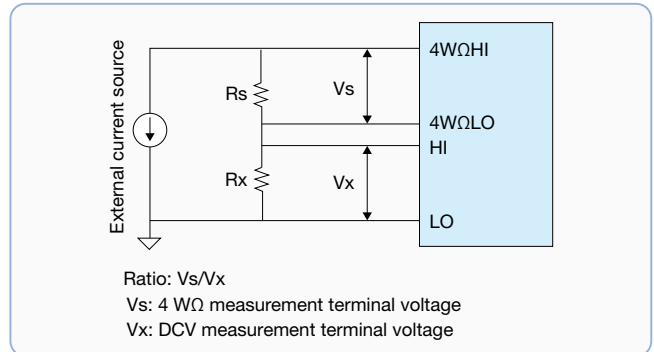
50,000 (or 500,000 data for the Option + 06) measurement data can be stored in the internal memory (RAM) at high speed up to 50,000 samples per second.

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.

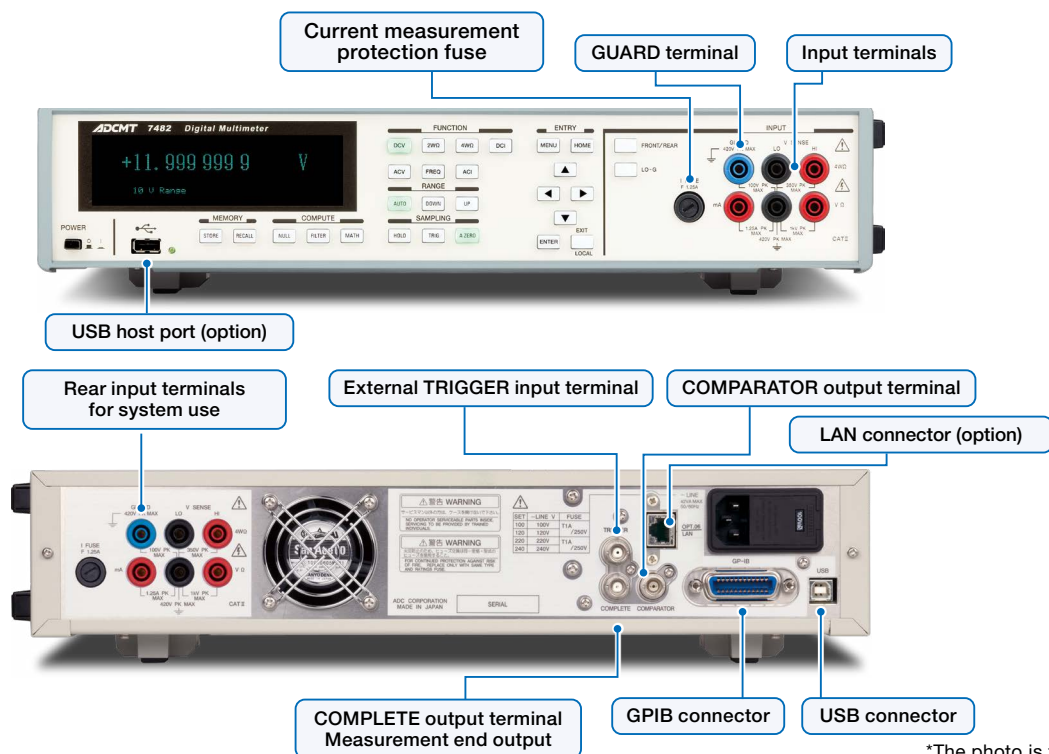


Comparator function

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 (σ) 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 ±500 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 ² | 90 days ³ | 1 year ³ |
|---------|--------------------------|----------------------|---------------------|
| | Tcal ¹ ± 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 |

¹ Tcal = temperature at calibration (23 °C)

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

³ 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)² 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 time⁴

| 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 |

⁴ 1 μs is an unspecified accuracy.

| Range multiplier of range error | Range | Multiplier ⁵ |
|---------------------------------|---------|-------------------------|
| | 100 mV | ×20 (×100) |
| | 1000 mV | ×2 (×10) |
| | 10 V | ×1 (×1) |
| | 100 V | ×2 (×10) |
| | 1000 V | ×1 (×1) |

⁵ 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 ±500 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 ⁶ | 1 year ⁶ |
|------------|-----------|-------------|----------------------|---------------------|
| | | 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 |

⁶ 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 Ω | 3+3 | 1+3 |
| | 100 Ω | 3+1 | 1+1 |
| | 1000 Ω | 2+1 | 1+1 |
| | 10 k Ω | 2+0.1 | 1+0.1 |
| | 100 k Ω | 2+0.1 | 1+0.1 |
| | 1000 k Ω | 2+0.1 | 1+0.1 |
| | 10 M Ω | 20+0.1 | 5+0.1 |
| | 100 M Ω | 100+1 | 50+1 |
| Low-Power | 1000 M Ω | 1000+1 | 500+1 |
| | 10 Ω | 3+3 | 1+3 |
| | 100 Ω | 3+3 | 1+3 |
| | 1000 Ω | 2+1 | 1+1 |
| | 10 k Ω | 2+1 | 1+1 |
| | 100 k Ω | 2+1 | 1+1 |
| | 1000 k Ω | 10+1 | 5+1 |
| | 10 M Ω | 100+10 | 25+10 |
| 100 M Ω | 1000+10 | 250+10 | |
| 1000 M Ω | 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 μ s to 10 μ s | 2000 | 1500 |
| 20 μ s to 100 μ s | 200 | 150 |
| 200 μ 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 μ s is an unspecified accuracy.

Range multiplier of range error

| | Range | Multiplier ^{*8} |
|------------|----------------------------------|------------------------------|
| High-Power | 10 Ω | $\times 20$ ($\times 100$) |
| | 100 Ω to 1000 Ω | $\times 5$ ($\times 10$) |
| | 10 k Ω to 1000 M Ω | $\times 1$ ($\times 1$) |
| Low-Power | 10 Ω to 100 Ω | $\times 20$ ($\times 100$) |
| | 1000 Ω to 100 M Ω | $\times 5$ ($\times 10$) |
| | 1000 M Ω | $\times 1$ ($\times 1$) |

*8 Integration time 200 μ s to 10 ms for multipliers in the parentheses

4 W Ω check function ON: Add 5 ppm gain error.

Ω -COMP function ON: Add 5 ppm gain error for 100 k Ω .

2-Wire Resistance Measurement

Accuracy: Add 0.2 Ω offset error to ppm of range of 4-wire resistance measurement (4 W Ω) 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 Ω).

| | Range | Additional error ppm of range/ $^{\circ}$ C |
|------------|----------------------------------|---|
| High-Power | 10 Ω | 50 |
| | 100 Ω to 1000 Ω | 5 |
| | 10 k Ω to 1000 M Ω | 1 |
| Low-Power | 10 Ω to 100 Ω | 50 |
| | 1000 Ω to 100 M Ω | 5 |
| | 1000 M Ω | 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 Ω 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 Ω or less | |
| 10 μ A | 11.999999 μ A | 1 pA | 10 pA | 100 pA | 1 nA | 10.1 k Ω or less | |
| 100 μ A | 119.99999 μ A | 10 pA | 100 pA | 1 nA | 10 nA | 1.01 k Ω or less | |
| 1000 μ A | 1199.9999 μ A | 100 pA | 1 nA | 10 nA | 100 nA | 102 Ω or less | |
| 10 mA | 11.999999 mA | 1 nA | 10 nA | 100 nA | 1 μ A | 12 Ω or less | |
| 100 mA | 119.99999 mA | 10 nA | 100 nA | 1 μ A | 10 μ A | 3 Ω or less | |
| 1000 mA | 1199.9999 mA | 100 nA | 1 μ A | 10 μ A | 100 μ A | 2 Ω 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 ± 1 $^{\circ}$ C | Tcal ± 5 $^{\circ}$ C | |
| 100 nA | 10+400 | 25+400 | 25+400 |
| 1000 nA | 10+40 | 15+40 | 20+40 |
| 10 μ A | 5+10 | 15+20 | 20+20 |
| 100 μ A | 5+10 | 15+20 | 20+20 |
| 1000 μ 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, ± 1 $^{\circ}$ C, Tcal ± 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 μ A | 2+4 | 2+1 |
| 100 μ A | 5+3 | 2+1 |
| 1000 μ 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 μ s to 10 μ s | 2000 | 2000 |
| 20 μ s to 100 μ s | 200 | 1200 |
| 200 μ 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 μ s is an unspecified accuracy.

Range multiplier of range error

| Range | Multiplier |
|-----------------------|-------------|
| 100 nA | $\times 50$ |
| 1000 nA | $\times 5$ |
| 10 μ 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 1×10⁷ 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 ^{††} |
| 1000 mV | 0.25+0.08 | 0.5+0.5 | 1.5+0.6 | 2.5+1 | 8+3 ^{††} |
| 10 V | 0.25+0.08 | 0.5+0.5 | 1.5+0.6 | 2.5+1 | 8+3 ^{††} |
| 100 V | 0.25+0.08 | 0.5+0.5 ^{††} | 1.5+0.6 ^{††} | 2.5+1 ^{††} | - |
| 700 V | 0.3+0.2 | - | - | - | - |

^{††} 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 ^{†2} | 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. | |

^{†2} 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 | 500 V | 500 V | 850 V | 1000 V | 850 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 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