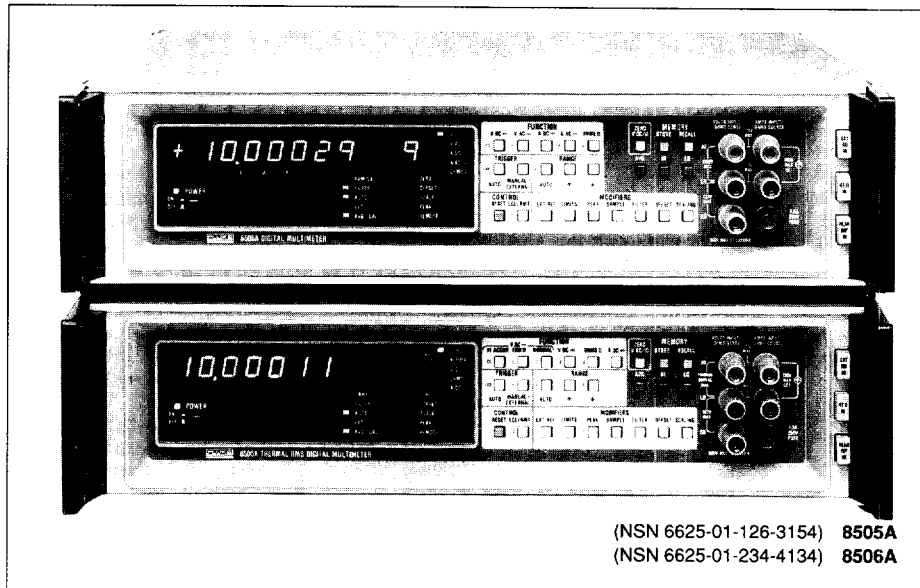


Bench/System Multimeters

8505A & 8506A



(NSN 6625-01-126-3154) **8505A**
(NSN 6625-01-234-4134) **8506A**

8505A Digital Multimeter

- 5 ppm dc accuracy, 100 nV (manovolt) sensitivity
- 500 readings per second with 6 1/2 digit resolution
- AC (8505A only), ohms, current module options
- GPIB/IEEE-488, RS-232C, and parallel interfaces
- Front-rear switchable input standard in basic mainframe
- Software calibration from front panel or remote interface
- Modular construction for application flexibility

8506A Thermal RMS Digital Multimeter

- 8505A features plus
- 120 ppm 24 hour ac accuracy, 40 Hz to 20 kHz
- Full accuracy for crest factors as high as 8:1
- 25 ppm short-term ac stability
- Frequency response specified to 1 MHz
- AC-DC transfer accuracies with DMM speed & convenience

Software Calibration

Both the 8506A and 8505A have a "software calibration" feature that makes it easy to store correction factors for every range of any measurement function. You can update the 24-hour accuracy specifications daily, or whenever the need arises without having to remove the covers. Nor do you need to use a cardinal point standard for a reference. Any reference having a suitably accurate value between 60% of range and full scale will do. This "software calibration" is managed with a few keystrokes on the front panel or even remotely when used as part of a test and measurement system.

Measurement Speed

Most system DMM manufacturers use an integrating technique for A-to-D conversion. That means there must be a compromise between resolution and reading speed. The 8505A and 8506A use a Fluke patented "recirculating remainder" technique for A-to-D conversion that does not compromise 6 1/2 digit resolution at reading speeds up to 500 per second for dc voltage measurements. Front or rear measurement inputs are switch-selectable from the front panel. For system applications the position of the switch can be sensed through the interface. An external trigger input is included to control the timing of measurements remotely. And, to control the switching time of an external scanner, scanner-advance output pulses are available at the rear panel.

Either GPIB/IEEE-488,* RS-232-C, or an 8-bit/16-bit parallel interface option may be used for systems applications. The parallel interfaces will work with DEC computer interfaces DR11C or DRV11.

Math Power

The 8506A and 8505A are controlled by an internal microprocessor and have built in math power to add, subtract, multiply, and divide as well as store and compare numerical information. Each measurement may be made a part of a calculation before being displayed or recorded. Stored HI and/or LO limit values may be repeatedly compared to measured values to determine out-of-tolerance conditions, HI, LO, or PASS indications may appear directly in the display. The highest and lowest values in a series of measurements may be stored and later displayed. And measurements may all be in terms of \pm deviations from a stored "offset" value. In general, any calculation is possible based on the general formula.

$$Y = mx + b$$

- Where m = scaling factor (multiplier),
- x = value measured,
- b = the \pm offset, and
- Y = the numerical result

* The terms GPIB and IEEE-488 may be used interchangeably throughout this catalog.

The 8505A and 8506A Digital Multimeters are Fluke's most advanced bench/system DMMs. Both models excel in dc accuracy, resolution, versatility and speed.

The 8506A uses a fast thermal rms sensing technique for measuring ac which very significantly advances the state-of-the-art for ac measurements using a system DMM. It is several times more accurate than the calculating type of true-rms converter and is unmatched by any

other DMM. Basic ac accuracy uncertainty is reduced to 120 parts per million, 24 hours for frequencies from 40 Hz to 20 kHz. That approximates the accuracy you can expect using traditional thermal transfer techniques that typically take several minutes for each measurement. Short term stability is 25 ppm. Accuracy is specified from 10 Hz to 1 MHz and non-sinusoidal waveforms having crest factors as high as 8 to 1 can be measured with full 90-day accuracy.

8506A & 8505A Differences

The 8505A is Fluke's lowest cost DMM having top dc accuracy, resolution, and speed. Two options for measuring ac voltage are available, either an ac average-sensing, rms-indicating option (-01) for sinewaves or an ac true-rms option (-09A) for either sinewaves or non-sinusoidal waveforms. An option for measuring current (-03) and an option for measuring resistance (-02A) are also available for the 8505A. For measuring ac current, an ac voltage option (-01 or 09A) must also be installed. An 8505A, when fully equipped, will measure dc and ac voltage, dc and ac current, and resistance.

The 8506A and 8505A have identical dc measurement capabilities but the 8506A requires no option for measuring ac voltage. State-of-the-art ac voltage measurement capabilities are built in. An option for measuring dc current may be installed (-03) or an option for measuring resistance may be installed (-02A), but not both at the same time. Any external dc reference voltage up to 40 volts that is applied at the rear panel may be compared and the relative values displayed as a ratio. The same interface options are available for the 8506A as for the 8505A.

8506A Specifications

Technical Specifications

DC Voltage

All dc voltage accuracy and stability specifications apply after a two-hour warm-up unless otherwise noted. The 24-hour specifications are relative to the calibration standards used.

Input Characteristics

| Range | Full Scale 6 ¹ / ₂ Digits | Resolution | | Input Resistance |
|--------|--|--|--------------------------------------|------------------|
| | | 7 ¹ / ₂ * Digits | 6 ¹ / ₂ Digits | |
| 100 mV | 200.0000 mV | — | 100 nV | ≥10,000 MΩ |
| 1V | 2.000000V | — | 1 μV | ≥10,000 MΩ |
| 10V | 20.00000V | 1 μV | 10 μV | ≥10,000 MΩ |
| 100V | 128.0000V | — | 100 μV | 10 MΩ |
| 1000V | 1200.000V | — | 1 mV | 10 MΩ |

*In AVG operating mode

Accuracy, Normal Mode, 6¹/₂ Digits: ±(% of Rdg + Counts)

| Range | 24 Hours* 23°C ±1°C | Long Term 18°C to 28°C | |
|--------|------------------------|------------------------|----------------------------|
| | | Up to 90 Days | Add Per Mo Over 90 Days |
| 100 mV | 0.0018+15 | 0.0025+40 | 0.00017+5.6 |
| 1V | 0.0008+7 | 0.0015+8 | 0.0001+0.1 |
| 10V | 0.0006 or 6** | 0.0010+8 | 0.0001+0.1 |
| 100V | 0.0010+6 | 0.0018+8 | 0.00013+0.1 |
| 1000V | 0.0008+6 | 0.0018+8 | 0.00013+0.1 |

*After 4-hour warm-up & within 1 hour of zeroing dc
**Whichever is greater

Accuracy, AVG Mode, 6¹/₂ Digits: ±(% of Rdg + Counts)

| Range | 24 Hours* 23°C ±1°C | Long Term 18°C to 28°C | |
|--------|------------------------|------------------------|----------------------------|
| | | Up to 90 Days | Add Per Mo Over 90 Days |
| 100 mV | 0.0010+8 | 0.0020+8 | 0.0001+0.1 |
| 1V | 0.0005+4 | 0.0012+6 | 0.0001+1** |
| 10V | 0.0005 or 50*** | 0.0008+60** | 0.00008+1** |
| 100V | 0.0005+5 | 0.0015+6 | 0.0001+0.1 |
| 1000V | 0.0005+5 | 0.0015+6 | 0.0001+0.1 |

*After 4-hour warm-up & within 1 hour of zeroing dc
**7¹/₂ digit mode of operation
***Whichever is greater

Accuracy, Software Calibration

Fully restores above "24-hour" accuracy for 24 hours each time performed within 30 days after hardware calibration is performed. After 30 days add the following number of counts to the 24-hour accuracy specifications.

| Time Since Internal (Hardware) Calibration | Number of Counts to be Added | |
|--|--------------------------------------|--------------------------------------|
| | 6 ¹ / ₂ Digits | 7 ¹ / ₂ Digits |
| Less than 30 Days | 0 | 0 |
| 30 to 90 Days | 1 | 10 |
| 90 Days to 1 Year | 2 | 20 |
| More than 1 Year | 3 | 30 |

Temperature Coefficient: ±(% of Rdg+Counts) /°C

| Range | 0°C to 18°C and 28°C to 50°C |
|--------|------------------------------|
| 100 mV | 0.0003+5 |
| 1V | 0.0003+1 |
| 10V | 0.0002+0.5* |
| 100V | 0.0003+1 |
| 1000V | 0.0003+0.5 |

*With 6¹/₂ digit display. For 7¹/₂ digit display, multiply Number of Counts by 10.

Input Bias Current

| At Time of Adjustment | 1 Year 23°C ±1°C | Temperature Coefficient |
|--------------------------|---------------------|----------------------------|
| <±5 pA | <±30 pA | <±1 pA/°C |

Zero Stability: Less than 5 μV for 90 days after a four-hour warm-up. Front panel pushbutton zero is provided for permanent storage of a zero correction for each range. Zero may be turned off at any time.

Normal Mode Rejection

| Line Fre- quency | Filter Mode | 4 Samples Per Reading | 32 Samples Per Reading | 128 Samples Per Reading |
|---------------------|----------------|--------------------------------|---------------------------------|----------------------------------|
| 50 Hz | Fast | 60 dB | 70 dB | 75 dB |
| 50 Hz | Slow | 85 dB | 90 dB | 95 dB |
| 60 Hz | Fast | 60 dB | 70 dB | 75 dB |
| 60 Hz | Slow | 90 dB | 95 dB | 100 dB |

Common Mode Rejection: 160 dB at 60 Hz with 1 kΩ in series with either lead, and 4 samples or more per reading. Greater than or equal to 100 dB with less than 4 samples per reading.

Analog Settling Time

| Filter Mode | Filter Command | To 0.01% of Step Change | To 0.001% of Step Change |
|----------------|-------------------|-------------------------------|--------------------------------|
| Fast | F0 or F3 | 40 ms | 50 ms |
| Slow | F or F2 | 400 ms | 500 ms |

Digitizing Time (Line Synchronous): For 2⁰ to 2¹⁷ samples per reading the digitizing time is from 4 ms to 9 minutes 6 seconds using a 60 Hz line. Time increases 20% using 50 Hz ac line. Selectable in 18 binary steps.

Digitizing Time (Line Asynchronous): 2 ms in 3-byte binary mode with dc zero, offset, limits and calibration factors turned off

Maximum Input: ±1200V dc or 1000V rms ac to 60 Hz, or 1400V peak above 60 Hz may be applied continuously to any dc range without permanent damage. Maximum rate of voltage change is 1000V per μs.

Ratio (External DC Reference)

Voltage, resistance, or current may be measured and compared to an external dc voltage and displayed as a ratio. Option -02A or -03 is required when measuring resistance or current. The dc reference voltage (V_{xref}) is applied to terminals on the back panel and is the denominator of the ratio.

Input Resistance: >10,000 MΩ between Ext Ref HI and LO and between either Ext Ref HI or LO and Ohms Guard or Sense LO

Max. Reference Voltage: ±40V between Ext Ref HI and LO terminals providing neither terminal is greater than ±20V relative to the Sense LO or Ohms Guard terminal

Min. Reference Voltage: ≥0.0001V when comparing voltage or current, and ≥0.0001V or 1 billionth of the absolute value of resistance, whichever is greater, when comparing resistance

Maximum Ratio Display: 10⁻⁹ to 10⁹

Source Impedance: Resistive unbalance (Ext Ref HI to LO) <4 kΩ. Total resistance to Sense LO from either Ext Ref HI or LO <20 kΩ

Overload Voltage: ±180V dc or peak ac relative to Ohms Guard or Sense LO. ±360V dc or peak ac (Ext Ref HI to LO)

Normal Mode Noise Rejection: ≥100 dB for line frequency and 2x line frequency

Common Mode Noise Rejection: ≥75 dB for dc, line frequency, and 2x line frequency

Bench/System Multimeters

8505A & 8506A

Ratio Accuracy

| External Reference Voltage | Accuracy |
|----------------------------|------------------------------------|
| $\pm 20V$ to $\pm 40V$ | $\pm(A + B + 0.001\%)$ |
| $\pm V_{min}$ to $\pm 20V$ | $\pm(A + B + (0.02\% V_{xref}))$ |

A = 10V dc range accuracy for the appropriate period of time

B = Input signal function and range accuracy for the appropriate period of time

V_{min} = Minimum allowable external reference voltage

$|V_{xref}|$ = Absolute value of the external reference voltage

Digitizing Time: 196 ms to 9 minutes and 6s for 2^0 to 2^{17} samples per reading using 60 Hz line, increasing 20% using 50 Hz line.

AC Voltage (Thermal RMS)

All ac voltage accuracy and stability specifications for $5\frac{1}{2}$ digit displays using at least 25% of full scale after a 2-hour warm-up. Except where noted, ac coupling is used to block dc. The 24-hour specifications are relative to the calibration standards used and within 1 hour of dc zero.

| Range | Full Scale $5\frac{1}{2}$ Digits | Resolution | | Input Impedance |
|--------|-------------------------------------|-------------------------|-----------------------|--|
| | | $6\frac{1}{2}$ * Digits | $5\frac{1}{2}$ Digits | |
| 100 mV | 125.000 mV | — | 1 μV | 1 M Ω $\pm 1\%$ shunted by <180 pF |
| 300 mV | 400.000 mV | — | 1 μV | |
| 1V | 1.25000V | 1 μV | 10 μV | |
| 3V | 4.00000V | 1 μV | 10 μV | |
| 10V | 12.5000V | 10 μV | 100 μV | |
| 30V | 40.0000V | 10 μV | 100 μV | |
| 100V | 125.000V | 100 μV | 1 mV | |
| 500V | 600.000V | 100 μV | 1 mV | |

*In AVG operating mode

Settling Time

High Accuracy Mode: Sample time is 3.5 seconds, hold time is 2.5 seconds. Measurement time is 6 seconds – the sum of sample time and hold time. If the state of the instrument is unknown, two complete measurement cycles will be required to guarantee a correct reading. Use of an external trigger will allow a 6-second measurement cycle.

Enhanced Mode: The first reading requires the same time as the high accuracy mode. Subsequent readings occur every 500 milliseconds. If the input changes 0.1% the analog settling time to 90-day mid-band accuracy is 1.5 seconds.

Normal Mode: Settling time for large changes is non-linear. Zero to full scale changes require 2.0 seconds to settle to 90-day, mid-band specifications. Full scale to 10% of full scale changes require 3.0 seconds to settle to mid-band, 90-day specifications. Small changes (<1%) settle to mid-band specifications in <1.5 seconds.

Autorangeing: Upranges when input is higher than full scale. Downranges when reading is less than approximately 28% of full scale.

Accuracy, High-Accuracy Mode: $\pm(\%$ of Reading)¹ 24 Hours, 23°C $\pm 1^\circ C$ ²

| Ranges | Frequency in Hertz | | | | | | |
|-------------------|--------------------|-----------------|------------------|-------------------|--------------------|--------------------|------------------|
| | 10** to 40 | 40 to 20k | 20k to 50k | 50k to 100k | 100k to 200k | 200k to 500k | 500k to 1M |
| 100 mV | 0.08 | 0.02* | 0.04* | 0.2 | 0.6 | 1.5 | 3.5 |
| 300 mV to 10V | 0.08 | 0.012 | 0.04 | 0.2 | 0.5 | 1.5 | 3.5 |
| 30V | 0.08 | 0.012 | 0.05 | 0.2 | 0.5 | 3.5 | 12 |
| 100V | 0.08 | 0.012 | 0.04 | 0.2 | 1.0 | 3.5 | — |
| 500V ³ | 0.08 | 0.012 | 0.04 | 0.2 | — | — | — |

90 Days, 18°C to 28°C

| | | | | | | | |
|------------------|------|--------|------|-----|-----|-----|-----|
| 100 mV | 0.08 | 0.026* | 0.06 | 0.2 | 0.6 | 1.5 | 3.5 |
| 300 mV to 10V | 0.08 | 0.016 | 0.06 | 0.2 | 0.5 | 1.5 | 3.5 |
| 30V | 0.08 | 0.016 | 0.06 | 0.2 | 0.5 | 3.5 | 12 |
| 100V | 0.08 | 0.016 | 0.06 | 0.2 | 1.0 | 3.5 | — |
| 500V | 0.08 | 0.016 | 0.06 | 0.2 | — | — | — |

>90 Days, 18°C to 28°C, per month. Add to the 90-day specification the following % of reading.

| | | | | | | | |
|-----|-------|-------|--------|-------|-------|------|------|
| All | 0.008 | 0.001 | 0.0025 | 0.012 | 0.021 | 0.06 | 0.11 |
|-----|-------|-------|--------|-------|-------|------|------|

*Add 5 digits (5 μV) to the % of reading

**With Slow filter

Accuracy, Enhanced Mode: Add the following (% of reading + number of digits) to the accuracy specifications of the high accuracy mode –

| Ranges | Time Since First Reading | |
|-----------------|--------------------------|----------------|
| | <5 Min | >5 and <30 Min |
| All except 500V | 0 + 0 | 0.003 + 4 |
| 500V | 0 + 0 | 0.003 + 6 |

Accuracy, Normal Mode: Add the following % of reading to the accuracy mode specification of the high accuracy mode –

| Segment of Scale | 24 Hour 90 Day | <90 Day Add Per Month |
|----------------------------|-------------------|--------------------------|
| 0.25 x to 1 x full scale | 0.4 | 0.044 |
| 0.1 x to 0.25 x full scale | 0.6 | 0.055 |

DC-Coupled (AC+DC) Accuracy: $\pm(1.1$ times the appropriate ac-coupled specifications + a calculated "Adder" from the following table)

| Range | Adder |
|------------|--|
| 100 mV-1V | $\pm(150 \mu V \times (\text{dc volts}/\text{total rms volts}))$ |
| 3V & 10V | $\pm(1 \text{ mV} \times (\text{dc volts}/\text{total rms volts}))$ |
| 30V & 100V | $\pm(10 \text{ mV} \times (\text{dc volts}/\text{total rms volts}))$ |
| 500V | $\pm(50 \text{ mV} \times (\text{dc volts}/\text{total rms volts}))$ |

¹AC coupled, $5\frac{1}{2}$ digits, input level >0.25 x full scale. For $6\frac{1}{2}$ digits multiply Number of Counts by 10. For input levels between 0.1 x and 0.25 x full scale, add 5 counts for the 100 mV, 1V, 10V, and 100V ranges, add 15 counts for the 300 mV, 3V, 30V ranges, and add 25 counts for the 500V range.

²Relative to calibration standards, within 1 hour of dc zero.

³Add $0.02 \times (\text{Input voltage}/600)^2$ % of Reading to the specification.

Stability: 40 Hz to 20 kHz, $<1^\circ C$ Temperature Change

| Range | $\pm(\%$ of Rdg + Counts)* | |
|-----------------------|----------------------------|-----------|
| | 24 Hours | 90 Days |
| 100 mV, 1V, 10V, 100V | 0.0025 + 1 | 0.004 + 1 |
| 300 mV, 3V, 30V | 0.0025 + 3 | 0.004 + 4 |
| 500V | 0.0025 + 5 | 0.004 + 6 |

*For $5\frac{1}{2}$ digit resolution

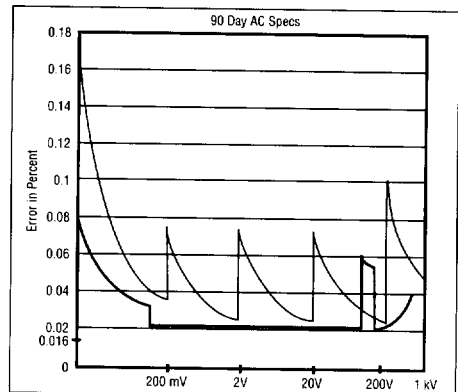
Crest Factor: Up to 8:1, with 90-day or greater accuracy for input signals with peaks less than two times full scale and high frequency components within the 3 dB bandwidth. Up to 4:1 for signals with peaks less than four times full scale, with the addition of 0.03 to the percent-of-reading specification.

3 dB Bandwidth (Typical): 3 MHz for the 100 mV range and 10 MHz for the 300 mV, 1V, 3V and 10V ranges

Maximum Input Voltage: $\pm 600V$ dc or rms ac, 840V peak, or 1×10^7 volt-hertz product

Temperature Coefficient: One tenth of the 90-day accuracy specification per $^\circ C$ from 18°C to 0°C or 28°C to 50°C

Common Mode Rejection: >120 dB from dc to 60 Hz with 100 Ω in series with either lead



This graph compares the total ac uncertainty of the 8506A's thermal rms converter to that of a typical computing rms converter used in other DMMs. The effects of floor error which cause large uncertainties at the beginning of each range are non-existent in the 8506A from 125 mV ac to 125V ac.

8506A Option Specifications

Resistance Option (-02A)

All resistance accuracy and stability specifications apply after a 2-hour warm-up. The 24-hour specifications are relative to the calibration standards used.

Input Characteristics

| Range | Full Scale 5 1/2 Digits | Resolution* | | Current Through Unknown |
|--------|----------------------------|---------------|-------------------|-------------------------|
| | | 6 1/2* Digits | 5 1/2 Digits | |
| 10Ω | 20.0000Ω | 10 μΩ | 100 μΩ | 10 mA |
| 100Ω | 200.0000Ω | 100 μΩ | 6 1/2 Digits Only | 10 mA |
| 1kΩ | 2.000000kΩ | 1 mΩ | | 1 mA |
| 10 kΩ | 25.0000 kΩ | 10 mΩ | | 78 μA |
| 100 kΩ | 250.0000 kΩ | 100 mΩ | | 7.2 μA |
| 1 MΩ | 4.10000 MΩ | 1Ω | 10Ω | 4.5 μA |
| 10 MΩ | 35.0000 MΩ | 10Ω | 100Ω | 0.45 μA |
| 100 MΩ | 265.0000 MΩ | 100Ω | 1 kΩ | 56 nA |

*In normal operating mode, 5 1/2 or 6 1/2 digits depending on range. In AVG operating mode, 6 1/2 digits on all ranges.

Open Circuit Voltage: 7V maximum from 10Ω through 100 kΩ range; 25V maximum from 1 MΩ range through 100 MΩ range

Maximum Input: ±400V dc or peak ac, continuous on any range with no damage

Analog Settling Time: 80 ms with Fast filter or 800 ms with Slow filter, to rated accuracy

Digitizing Time: Depending on sample rate and filter selection the digitizing time will vary from 145 ms to 9 minutes 6 seconds using a 60 Hz ac line. Time increases 20% using a 50 Hz line.

Accuracy, 5 1/2 Digits: ±(% of Rdg + Counts)**

| Range | 24 Hours 23°C ±1°C | Long Term 18°C-28°C | | Plus Temp Coefficient Per °C* |
|--------|--------------------------|---------------------|------------------------------------|-------------------------------|
| | | Up to 90 Days | >90 Day, Add to % of Rdg Per Month | |
| 10Ω | 0.003+20 | 0.005+20 | 0.00056 | 0.0008+15 |
| 100Ω | 0.002+1.4 | 0.003+1.4 | 0.00033 | 0.0007+0.2 |
| 1 kΩ | 0.002+0.8 | 0.003+0.8 | 0.00033 | 0.0007+0.2 |
| 10 kΩ | 0.002+0.8 | 0.003+0.8 | 0.00033 | 0.0007+0.2 |
| 100 kΩ | 0.002+0.8 | 0.003+0.8 | 0.00033 | 0.0007+0.5 |
| 1 MΩ | 0.002+0.8 | 0.003+0.8 | 0.00033 | 0.001+0.5 |
| 10 MΩ | 0.0075+0.8 | 0.02+0.8 | 0.0022 | 0.005+0.5 |
| 100 MΩ | 0.026+0.8 | 0.05+1 | 0.0056 | 0.02+0.5 |

*From 18°C to 0°C or 28°C to 50°C

**For 6 1/2 digit display, multiply number of counts by 10

Measurement Configuration: Two-wire and four-wire available on all ranges

Four-Wire Lead Resistance: Source leads should not exceed 10Ω for the 10Ω and 100Ω ranges, 100Ω for the 1 kΩ range, or 1 kΩ for the 10 kΩ or higher ranges

DC Current Option (-03)

All current accuracy and stability specifications apply after a 2-hour warm-up. The 24-hour specifications are relative to the calibration standards used. No ac current option is available for the 8506A.

Input Characteristics

| Range | Full Scale 5 1/2 Digits | Resolution | | Voltage Burden |
|--------|----------------------------|---------------|--------------|----------------|
| | | 6 1/2* Digits | 5 1/2 Digits | |
| 100 μA | 250.0000 μA | 0.1 nA | 1 nA | ≤100 mV |
| 1 mA | 2.000000 mA | 1 nA | 10 nA | ≤100 mV |
| 10 mA | 16.000000 mA | 10 nA | 100 nA | ≤200 mV |
| 100 mA | 128.000000 mA | 100 nA | 1 μA | ≤200 mV |
| 1A | 1.28000000 A | 1 μA | 10 μA | ≤500 mV |

*In AVG operating mode 100 μA ac range is 5 1/2 digits only

Accuracy, 5 1/2 Digits: ±(% of Rdg + Counts)**

| Range | 24 Hours 23°C ±1°C | Long Term 18°C-28°C | | Plus Temp Coefficient Per °C* |
|--------|--------------------------|---------------------|------------------------------------|-------------------------------|
| | | Up to 90 Days | >90 Day, Add to % of Rdg Per Month | |
| 100 μA | 0.02+10 | 0.03+10 | 0.0022 | 0.0025+0.6 |
| 1 mA | 0.02+10 | 0.03+10 | 0.0022 | 0.0025+0.6 |
| 10 mA | 0.02+10 | 0.03+10 | 0.0022 | 0.0025+0.6 |
| 100 mA | 0.03+20 | 0.05+20 | 0.0056 | 0.0035+0.6 |
| 1A | 0.03+20 | 0.05+20 | 0.0056 | 0.0035+0.6 |

*From 18°C to 0°C or 28°C to 50°C

**For 6 1/2 digit display, multiply number of counts by 10

Overload: 1.5A maximum, ±140V dc or peak ac to 60 Hz, or 200V peak ac above 60 Hz on any range with no damage. Protected by a 1.5A fuse.

Settling and Digitizing Time: Same as for dc volts

IEEE-488 Interface Option (-05)

This interface incorporates the following subset of the IEEE Standard 488-1978; SH1, AH1, T5, L4, SR1, RL2, DC1, DT1, and E1. The interface allows full control of all instrument functions and the transfer of ASCII or binary data. In the binary mode the instrument is capable of 500 readings per second.

RS-232 Interface Option (-06)

This interface is a bit serial asynchronous interface providing either voltage or 20 mA current loop level signals. The interface allows selection of baud rate from 50 to 9600, either one or two stop bits, and odd or even parity. Up to 40 ASCII character readings per second are possible with Option -06. No handshakes are provided.

Bit-Parallel Interface Option (-07A)

Permits you to connect the instrument to DEC PDP11 minicomputer interfaces (DR11C and DRV11). The interface permits either 8- or 16-bit parallel ASCII transfers or 8- or 16-bit parallel binary transfers. In the binary mode the instrument is capable of up to 500 readings per second.

8505A Specifications

Technical Specifications

DC Voltage

Same specifications as for 8506A

Ratio (External DC Reference)

Same specifications as for 8506A for dc ratio. AC/AC ratio available upon special request

8505A Option Specifications

True-RMS AC Voltage Option (-09A)

All true-rms ac voltage accuracy and stability specifications apply to readings between 0.1% of range to full scale after a 2-hour warm-up. Options -09A and -01 may not be installed at the same time.

Input Characteristics (-09A and -01)

| Range | Full Scale 5 1/2 Digits | Resolution | | Input Impedance |
|-------|----------------------------|---------------|--------------|-----------------|
| | | 6 1/2* Digits | 5 1/2 Digits | |
| 1V | 2.50000V | 1 μV | 10 μV | MΩ |
| 10V | 20.0000V | 10 μV | 100 μV | shunted |
| 100V | 160.000V | 100 μV | 1 mV | by |
| 100V | 1000.00V | 1 mV | 10 mV | <100 pF |

*In AVG operating mode

Accuracy: ±(% of Rdg + % of Full Scale)*

| Frequency | 90 Days, 19°C to 28°C | | |
|-----------------|-----------------------|-------------|------------------|
| | % of Input | + % FS (AC) | + % FS (AC + DC) |
| DC | 0.1 | - | 0.03 |
| 10 Hz-20 Hz | 1.0 | 0.04 | 0.06 |
| 20 Hz-50 Hz | 0.5 | 0.012 | 0.03 |
| 50 Hz-10 kHz | 0.1 | 0.012 | 0.03 |
| 10 kHz-30 kHz | 0.2 | 0.04 | 0.06 |
| 30 kHz-50 kHz | 0.3 | 0.1 | 0.12 |
| 50 kHz-100 kHz | 1.0 | 0.3 | 0.3 |
| 100 kHz-300 kHz | 2.0 | 0.5 | 0.5 |
| 300 kHz-1 MHz | 3.3 | 1.8 | 1.8 |

*Slow filter must be used below 400 Hz. For inputs greater than 500V multiply the accuracy specification by: (200 + reading) + 2000

Common Mode Rejection: >120 dB, dc to 60 Hz, with 100Ω unbalance in either lead

Crest Factor: >7 at full scale, increasing down scale by

$$7 \times \sqrt{V_{\text{Range}} + V_{\text{Reading}}}$$

Voltage & Frequency Limits: 1x10⁷ volt-hertz product for the 1V and 10V ranges and 2x10⁷ for the 100V and 1000V ranges

Analog Settling Time: 100 ms with Fast filter and 500 ms with Slow filter to within 0.1% of a step change within a range

Digitizing Time: Same as for dc voltage. See 8506A specifications

Bench/System Multimeters

8505A & 8506A

Averaging-Sensing AC Voltage Option (-01)

All average-sensing ac voltage accuracy and stability specifications apply to a 5 1/2 digit display with readings between 0.1% of range to full scale after a 2-hour warm-up. Option -01 and -09A may not be installed at the same time. (See Input Characteristics -09A)

Accuracy: ±(% of Rdg + Counts)*

| Frequency | 90 Days, 18°C to 28°C | |
|-----------------|-----------------------|------------|
| | 1 mV to 500V** | Above 500V |
| 30 to 50 Hz | 0.5 + 5 | 0.55 + 5 |
| 50 Hz to 10 kHz | 0.05 + 5 | 0.1 + 5 |
| 10 to 40 kHz | - | 0.15 + 5 |
| 10 to 50 kHz** | 0.1 + 5 | - |
| 50 to 100 kHz** | 0.5 + 5 | - |

*Slow filter must be used below 400 Hz. For 6 1/2 digit display, multiply number of counts by 10

**On 1-volt range add 7 counts above 10 kHz or 35 counts above 50 kHz

Common Mode Rejection: >120 dB, dc to 60 Hz with 100Ω inbalance in either lead

Voltage & Frequency Limits: 1000V rms (1400V peak) or 2x10⁷ volt-hertz product, whichever is less

Analog Settling Time: 100 ms with Fast filter and 500 ms with Slow filter to within 0.05% of a step change within a range

Digitizing Time: Same as for dc voltage. See 8506A specifications

DC and AC Current Option (-03)

All accuracy and stability specifications apply after a 2-hour warm-up

Input Characteristics: Same as for 8506A

DC Current Accuracy: Same as for 8506A

AC Current Accuracy, 8505A only: ±(% of Rdg + Counts)*

| Range | Frequency | 90 Days, 23°C ±5°C | |
|----------------------|------------------|--------------------|-----------|
| | | Opt -01 | Opt -09A |
| 100 μA | 10 Hz - 20 Hz | - | 1.0 + 110 |
| | 20 Hz - 50 Hz | 0.8 + 9 | 0.8 + 35 |
| | 50 Hz - 10 kHz | 0.4 + 9 | 0.4 + 35 |
| | 10 kHz - 20 kHz | 0.7 + 9 | 1.0 + 110 |
| | 20 kHz - 50 kHz | 1.5 + 9 | 1.5 + 260 |
| | 50 kHz - 100 kHz | 3.0 + 9 | 4.0 + 760 |
| 1 mA and 10 mA | 10 Hz - 20 Hz | - | 1.0 + 110 |
| | 20 Hz - 50 Hz | 0.5 + 9 | 0.5 + 35 |
| | 50 Hz - 10 kHz | 0.06 + 9 | 0.11 + 35 |
| | 10 kHz - 20 kHz | 0.11 + 9 | 0.2 + 110 |
| | 20 kHz - 50 kHz | 0.12 + 9 | 0.3 + 260 |
| | 50 kHz - 100 kHz | 0.51 + 9 | 1.0 + 760 |
| 100 mA | 10 Hz - 20 Hz | - | 1.0 + 150 |
| | 20 Hz - 50 Hz | 0.5 + 55 | 0.5 + 80 |
| | 50 Hz - 10 kHz | - | 0.26 + 80 |
| | 50 Hz - 100 kHz | 0.24 + 55 | - |
| 1A | 10 Hz - 20 Hz | - | 1.0 + 160 |
| | 20 Hz - 50 kHz | 0.5 + 65 | 0.5 + 90 |
| | 50 Hz - 10 kHz | 0.24 + 65 | 0.26 + 90 |

*With 5 1/2 digit display. For 6 1/2 digit display, multiply number of counts by 10. AC Voltage Option -01 or -09A must also be installed to measure ac current

Crest Factor: (Using Option -09A) >4.5 at full scale, increasing down scale by

$$4.5 \times \sqrt{\frac{I_{\text{Range}} - I_{\text{Reading}}}{I_{\text{Reading}}}}$$

Maximum Overload: 1.5A maximum, ±140V dc or peak ac to 60 Hz, or 200V peak ac above 60 Hz on any range with no damage. Protected by a 1.5 fuse

Settling and Digitizing Time: Same as dc volts

Resistance Option (-02A)

Same specifications as for 8506A

IEEE-488 Interface Option (-05)

Same specifications as for 8506A

RS-232 Interface Option (-06)

Same specifications as for 8506A

Bit-Parallel Interface Option (-07A)

Same specifications as for 8506A

General Specifications

Maximum Terminal Voltage:

LO to Guard, 127V rms

Guard to Chassis, 500V rms

HI Sense to HI Source, 127V rms

LO Sense to LO Source, 127V rms

HI Sense to LO Sense, 1000V rms or 1200V dc

HI Source to LO Source, 280V rms

Trigger Input: TTL level, ±30V maximum, factory wired for falling edge; may be rewired for rising edge. Pulse width ≥10 μs

Scanner Advance Pulse: TTL level, ≥3 μs width

Shock & Vibration: Meets requirements of MIL-T-28800C for Type III, Class 5, Style E equipment

Temperature: 0°C to 50°C, operating; -40°C to 70°C, non-operating

Relative Humidity: ≤80% to 18°C, ≤75% to 40°C, ≤45% to 50°C

Size: 10.8 cm H x 43.2 cm W x 42.5 cm D (4.25 in H x 17 in W x 16.75 in D)

Weight: 10 kg (22 lb) basic, 12 kg (26 lb) fully loaded

Power: 100, 120, 220 or 240 volt, 47-63 Hz, switch selectable

Included with Instrument: Manual, power cord, serialized and dated calibration certification sheet

Ordering Information

Models

January 1990 prices

8506A Thermal RMS Digital Multimeter \$7270
8505A Digital Multimeter 3495

Options

-02A* Ohms Converter \$ 550
-03* Current Converter 570
-05** IEEE-488 Interface 570
-06*** RS-232-C Interface 570
-07A*** Parallel Interface
 (for DEC PDP11, DR11C, DRV11) 570
-07D*** Duplex parallel interface for
 all others (user configured) 570

* Cannot install both -02A and -03 in 8506A at the same time

** Provides only dc current when installed in 8506A

*** Only one interface may be installed

Options (for 8505A only)

-01* AC Converter (Average) \$ 675
-09A* AC Converter (True-RMS) 765

* Cannot install both -01 and -09A at the same time

Accessories (Also see Section 5)

MIS-7011K Extender Card \$ 175
MIS-7013K Bus Interconnect & Monitor 85
MIS-7190K Static Test Controller 375
MIS-7191K Test Module 485
M04-205-600 5 1/2" Rackmount Kit 95
M00-260-610* 18" Rack Slide Kit 130
M00-270-610* 20" Rack Slide Kit 130
M00-280-610* 24" Rack Slide Kit 130
Y8021 IEEE-488 Shielded Cable, 1m 130
Y8022 IEEE-488 Shielded Cable, 2m 145
Y8023 IEEE-488 Shielded Cable, 4m 155
Y8077 Four Terminal Short 35
Y8133 Universal Test Leads 24

*Needs M04-205-600 Rackmount Kit

Customer Support Services

Warranty

One-year product warranty. See Section 16 for further information on warranty terms and conditions.

Extended Warranty

A 10% discount is available when you order the following at the time of the instrument purchase or when ordered within the factory warranty period.

SC1-8506A Repair \$ 562
SC2-8506A Calibration 495
SC3-8506A Full Service 991
SC4-8506A Performance Verification-Plus 297
SC1-8505A Repair 352
SC2-8505A Calibration 157
SC3-8505A Full Service 471
SC4-8505A Performance Verification-Plus 94

Note: Incoming and/or outgoing calibration readings are available as an option.