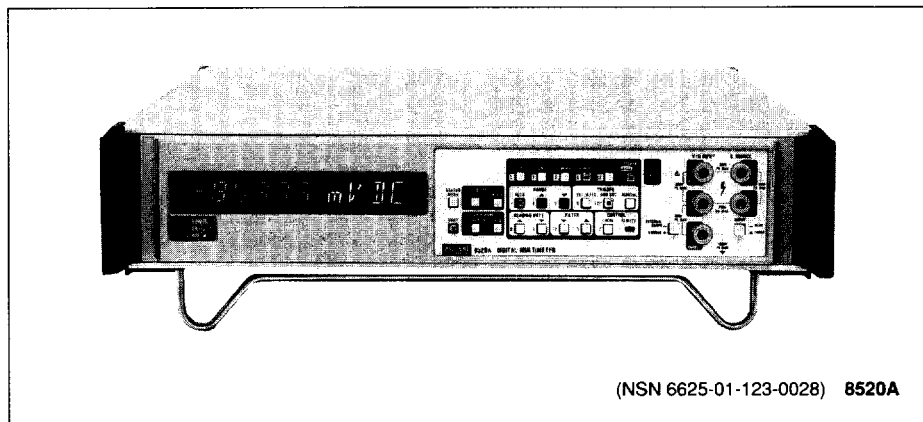


Bench/System Multimeters

8520A, 8522A, 8520A/AS-1 & 8520A/PRT



Intelligent DMMs for Bench or System

DC and ac volts

2 and 4-wire ohms

Conductance

520 readings per second

20 ppm basic dc accuracy

Burst memory and math capabilities

Standard system interfaces: 8520A GPIB/IEEE-488; 8522A: Parallel and BCD

8520A/AS-1 MATE certified DMM

The 8520A and 8522A are designed for system and bench applications and have built-in system interface circuits. The performance specifications of the two instruments are almost identical. The principal difference is that the 8520A has an interface compatible with GPIB/IEEE-488* 1978 and the 8522A has an interface suitable for either BCD or Parallel (binary) applications.

The 8520A/AS-1 and the 8520A/PRT are unique variations of the 8520A. One, the 8520A/AS-1, is compatible with U.S. Government Modular Automatic Test Equipment (MATE) system. And the 8520A/PRT includes a Platinum Resistance Probe for extremely accurate temperature measurements.

Seven standard and seven optional math programs plus a built-in "burst" memory make these multimeters exceptionally intelligent stand-alone units. A choice of dc volts, true-rms ac volts, 2-wire or 4-wire ohms, and the Fluke exclusive conductance function make the instruments very versatile. The conductance function provides a simple way to measure resistance from 10 MΩ to 100,000 MΩ.

The instruments boast 50 ppm basic dc accuracy for 90 days with 5 1/2 digit resolution. A 520 readings-per-second system rate with 4 1/2 digits resolution is standard for high speed measure-

ments. Or make 240 readings per second (with 60 Hz line operation) with 5 1/2 digits resolution. Inputs are switchable from front to rear too.

An unprecedented degree of prompting and operational cues are provided for skilled and unskilled technicians alike. A simple, uncluttered color-coded front panel makes operation easy.

Math Programs

Fourteen pre-programmed functions are available for the 8520A, 8520A/AS-1, 8520A/PRT, and 8522A. The first seven are standard; eight through fourteen are standard on the 8520A/AS-1 but optional on the other models. For systems use, these powerful programs will reduce software overhead greatly. They also simplify and speed testing for ordinary bench applications. Up to three math programs can be chained or stacked for simultaneous use.

The Standard Programs

1 = TEST. Four separate internal test programs do diagnostic checks on analog circuitry, digital hardware and software, and the front panel keys and displays.

2 = ZERO. Eliminates the effect of lead resistance for ohms tests and subtracts low-level dc components in the dc voltage function.

3 = XREF (external reference). Compares an unknown voltage at the front panel to a known rear-panel input. The display is the ratio of the front and rear inputs.

4 = OSR (offset/scale/ratio). Allows you to enter any constant in the formula ($X = \text{measurement} \text{ minus offset} \text{ times scale} \text{ divided by ratio}$) from the keyboard, the memory, or a current reading.

5 = Δ PCT (percent deviation). Compares all subsequent readings with a stored nominal value. The display appears as plus or minus a percentage deviation.

6 = PEAK. Constantly monitors the maximum and minimum readings. These values can be recalled as well as the "peak-to-peak" variation.

7 = LIM (limits). Turns the multimeter into a sorting machine. Inputs are sorted and displayed in three ways "High," "Pass" and "Low," based on previously stored upper and lower limits. You can recall the number of high, low, and pass readings, plus the total number of readings.

The Other Programs (Part of Option -010)

8 = STAT (statistics). Computes the mean, standard deviation, and variance of readings taken or data stored in memory registers.

9 = LFAC. A unique way to accurately measure low frequency ac signals from dc to 10 hertz.

10 = dB. Calculates dB, dBm or dBV of a measured value and displays dB.

11 = RTD. Implements equations which convert the resistance of a resistance temperature detector (RTD) to temperature in °C. Readouts in K or °F are also selectable.

12 = JVC (junction voltage Celsius). Computes °C, °F, or K based on inputs from a Fluke 80T-150C Temperature Probe (calibrated for °C).

13 = JVF (junction voltage Fahrenheit). For use with the Fluke 80T-150F (calibrated for °F). Performs the same operations as Program 12.

14 = THMS (thermistor linearization). Converts the resistance of a thermistor to temperature in °C, °F, or K.

Burst Memory (Reading Storage)

The unique burst memory lets you store up to 50 readings at any reading rate (400 readings with Option -010). In fact, the most recent 50 (or 400) readings are always stored in a shift register and available for recall and analysis whenever measurements cease. In the burst mode the storage operation may be independently triggered to capture a particular group of successive readings that may occur before, after, or both before and after the trigger instant. The storage of readings may be delayed after the trigger, as shown in example D.

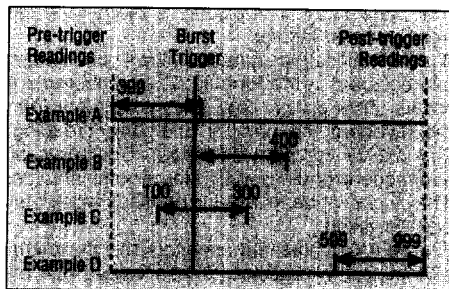
Stored readings can be recalled individually or scanned in sequence for display on the front panel. Or they may be transferred to a controller or computer via the interfaces available in the 8520A or 8522A. Math processing can be applied to readings stored in memory as they are recalled.

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

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Burst memory, (400 readings part of Option -010)



With Option -010, the burst memory may capture any group of 400 successive readings that occur within 399 readings prior to and 999 readings following the burst trigger. In example A, only one reading is taken after the trigger point. In example B, 400 readings immediately following the burst trigger are captured. Example C shows storage of 100 readings prior and 300 readings after the trigger point. The last example shows 400 readings being stored commencing 599 readings after the trigger.

8522A Parallel and BCD Interface

Speed and real-time measurement are key system elements available in the 8522A when the Parallel (binary) interface is selected. That interface offers both a three- and a four-wire handshake (switch-selectable) for use with the most popular parallel computer interfaces. A choice of eight- or sixteen-bit messages are selectable at the rear of the instrument.

The BCD interface emulates BCD remote operation of the Fluke 8375A and 8400A, for the convenience of customers who wish to replace these or any of a large variety of older DMMs in their system. Remote control and data output capabilities are the same as those of the 8375A and 8400A. All but the conductance function may be controlled remotely, plus the range filter and external reference.

Output of readings include five BCD digits, an overrange bit, an overload bit, polarity bit, and three coded range bits. Status output includes function, filter, external reference and remote/local.

8520A/AS-1 – for MATE Systems

The 8520A/AS-1 is equipped with a built-in interface interpreter which makes it compatible with Modular Automatic Test Equipment (MATE) systems. This capability allows a MATE Test Executive to operate the 8520A/AS-1 on the IEEE-488 bus using Control Interface Intermediate Logic (CIIL). It will operate in either the "CIIL Mode," responding only to CIIL commands or in the "native mode," responding to either CIIL commands or IEEE-488 bus commands. Data transmission is increased to 120,000 characters per second for direct memory access using the CIIL mode.

The 8520A/AS-1 was the first candidate model to become MATE certified.

8520A/PRT – Temperature Measurements

The 8520A/PRT is a temperature measurement system consisting of a Rosemount 162N Platinum Resistance Thermometer (PRT) and an 8520A containing a built-in linearization program customized to match the calibration curve of the specific PRT supplied. Temperature is indicated directly in either °C, °F or K with 0.001 degree resolution.

The 8520A/PRT provides a fast, low-cost way of making extremely accurate temperature measurements, or calibrating temperature measurement instruments, in the range of -200°C to +350°C. Systems using four-terminal resistance bridges are much more time-consuming to use, require greater expertise, are limited in their applications, and are far more costly.

Measurements are repeated approximately once per second, making it possible to detect and track fast temperature changes, something impractical to try to do with balance bridges.

Specifications

Technical Specifications

DC Voltage

Range	Full Scale	Resolution	Input Resistance
100 mV	199.999	1 µV	≥10,000 MΩ
1V	1.99999	10 µV	≥10,000 MΩ
10V	16.0100	100 µV	≥10,000 MΩ
100V	130.100	1 mV	10 MΩ
1000V	1024.00	10 mV	10 MΩ

Accuracy: ±(% of Input + Digits)

Range	90 Days		1 Year		Plus Temp Coefficient per °C*
	24 Hours 23°C ±1°C	18°C to 28°C	18°C to 28°C	18°C to 28°C	
100 mV	0.003+5	0.0065+6	0.011+10	0.0005+0.5	
1V	0.003+1	0.006+2	0.011+2	0.0005+0.15	
10V	0.002+1	0.005+1	0.009+1	0.0004+0.10	
100V	0.003+1	0.007+2	0.012+2	0.0005+0.15	
1000V	0.0035+1	0.0065+1	0.011+1	0.0005+0.10	

*From 18°C to 0°C or 28°C to 50°C

High Speed Accuracy: ±(% of Input + LS Bit)*

Range	90 Days 18°C to 28°C	1 Year 18°C to 28°C	Plus Temp Coefficient Per °C
100 mV	0.01 + 1	0.015 + 1	0.001 + 0.1
1V-1000V			0.001 + 0.05

* Typical with 60 Hz line, remote operation, 500 readings per second, 2-byte binary output with 14 bits of data.

Normal Mode Rejection

Line Freq	Filter Setting Time					
	25 ms	50 ms	100 ms	200 ms	500 ms	1 s
50 Hz	65 dB	68 dB	71 dB	80 dB	83 dB	86 dB
60 Hz	65 dB	68 dB	71 dB	85 dB	88 dB	91 dB

Common Mode Rejection: True, 100 dB at 50 Hz and 60 Hz with 1 kΩ unbalance in either lead. Effective CMR is equal to normal mode rejection plus true CMR

Maximum Input: ±1000V peak, High to Low or Guard to chassis terminals, and ±200V peak, Guard to Low terminals, for any range

Bias Current: ≤50 pA

Maximum Reading Rate

Operation	Line	Rate	Resolution
Local	50 Hz	200 rdgs/sec*	5 1/2 digits
	60 Hz	240 rdgs/sec*	
Remote	50 Hz	>500 rdgs/sec	4 1/2 digits
	60 Hz		

*For local operation, 8522A is limited to 1/2 this rate.

AC Voltage (True RMS)

Input Characteristics

Range	Full Scale	Resolution	Input Resistance
1V	1.99999	10 µV	1 MΩ ≤100 pF
10V	16.0100	100 µV	
100V	130.100	1 mV	
1000V	1024.00	10 mV	

Accuracy: ±(% Input + % of Full Scale) ac or ac+dc*

Frequency	90 Days 18°C to 28°C			1 Year 18°C to 28°C		
	% of Input	+% FS AC	+% FS AC+DC	% of Input	+% FS AC	+% FS AC+DC
		10-20 Hz**	3.0		0.6	0.7
20-40 Hz**	0.5	0.5	0.6	0.6	0.6	0.7
40 Hz-20 kHz	0.1	0.03	0.08	0.15	0.05	0.16
20-100 kHz	1.0	0.3	0.4	2.0	0.6	0.8
100-300 kHz	2.4	0.6	0.6	4.0	0.1	0.1
300 kHz-1 MHz	8.0	2.5	2.5	15.0	5.0	5.0

*From 0.1% of range to full scale

**With statistics program

Temp. Coefficient: 18°C to 0°C or 28°C to 50°C, to 20 kHz

AC Mode: ±(0.007% of input + 0.007% FS)/°C

AC+DC Mode: ±(0.007% of input + 0.14% FS)/°C

Maximum Input: ±1000V peak High to Low or Guard to Chassis terminals, and ±200V peak Guard to Low terminals

Crest Factor: ≥4:1 at full scale, increasing down scale

Maximum Reading Rate: 10 readings per second (rated accuracy, ≥400 Hz)

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Maximum Slew Rate: 177V per μ s
Maximum Volt-Hertz Product: 2×10^7

Resistance

Input Characteristics

Range	Full Scale	Resolution	Current Through Unknown	Open Circuit Voltage
10 Ω	19.9999	100 $\mu\Omega$	10 mA	7V
100 Ω	199.999	1 m Ω	10 mA	
1000 Ω	1999.99	10 m Ω	1.0 mA	
10 k Ω	19.9999	100 m Ω	0.1 mA	
100 k Ω	199.999	1 Ω	14.5 μ A (max)	
1 M Ω	1.99999	10 Ω	1.5 μ A (max)	
10 M Ω	19.999	1 k Ω	1.5 μ A (max)	

Maximum Reading Rate

Operation	Line	Rate	Resolution
Local Remote	50 Hz	200 rdgs/sec*	5 1/2 digits
	60 Hz	240 rdgs/sec*	
Remote	50 Hz	>500 rdgs/sec	4 1/2 digits
	60 Hz		

*For local operation, 8522A is limited to 1/2 this rate.

Accuracy: \pm (% of Input + Digits)

Range	24 Hrs 23°C $\pm 1^\circ$ C	90 Days 18°C to 28°C	1 Year 18°C to 28°C	Plus Temp Coefficient Per °C*
10 Ω	0.0045+6	0.0080+7	0.0140+12	0.0007+2.0
100 Ω	0.0035+2	0.0070+2	0.0125+3	0.0007+0.2
1000 Ω	0.0035+2	0.0070+2	0.0125+3	0.0007+0.2
10 k Ω	0.0035+2	0.0070+2	0.0125+3	0.0007+0.2
100 k Ω	0.0040+2	0.0090+2	0.0140+3	0.0012+0.2
1 M Ω	0.0090+2	0.0160+2	0.0200+3	0.0020+0.2
10 M Ω	0.0300+1	0.0440+1	0.0450+3	0.0030+0.2

*From 18°C to 0°C or 28°C to 50°C

Conductance

Range: 100 nS (10 M Ω)⁻¹
Full Scale: 199.99
Resolution: 0.01 nS (100,000 M Ω)⁻¹
Accuracy: \pm (% of Input + Digits)

24 Hours 23°C $\pm 1^\circ$ C	90 Days 18°C to 28°C	1 Year 18°C to 28°C	Plus Temp Coefficient Per °C*
0.4+5	0.05+5	0.06+5	0.004+1

*From 18°C to 0°C or 28°C to 50°C

Maximum Input: ± 400 V peak
Maximum Reading Rate: 10 readings per second

External Reference

Operating Range: ± 0.5 V dc to ± 33 V dc as long as external reference Low terminal is within ± 16.5 V of input Low terminal
Input Impedance: 10,000 M Ω between external reference High or Low terminals and input Low terminal

Ratio Accuracy

X-Ref Voltage	Accuracy
16.5V to 33V	$\pm(A + B + 20 \text{ ppm})$
0.5V to 16.5V	$\pm[A + B + (400 \text{ ppm} + V_{\text{ref}})]$

Note: A = DC 10 volt range accuracy
 B = Input voltage or resistance range accuracy

Maximum Input: ± 180 V peak between external reference High or Low and input Low; ± 360 V peak between external reference High and Low

Transfer Accuracy

The following accuracy specifications apply when:

- Reading rate is 2 readings per second
- Filter settling time is 500 ms
- Warm-up is at least 2 hours
- Quantity measured has same nominal value and frequency as transfer standard
- Measurements are made in one range
- Standard is checked at least every hour
- Ambient temperature remains within $\pm 1^\circ$ C

DC Voltage

Range	\pm (% of Input + Digits)
100 mV	0.0020 + 4
1V	0.0020 + 1
10V	0.0010 + 1
100V	0.0020 + 1
1000V	0.0020 + 1

AC Voltage (all ranges)

Frequency	\pm (% of Input + % of Full Scale)
10 Hz to 20 Hz	1.0 + 0.2
20 Hz to 40 Hz	0.1 + 0.1
40 Hz to 20 kHz	0.005 + 0.009
20 kHz to 100 kHz	0.100 + 0.030
100 kHz to 1 MHz	0.500 + 0.60

Resistance

Range	\pm (% of Input + Digits)
10 Ω	0.0030 + 5
100 Ω	0.0020 + 2
1000 Ω	0.0020 + 2
10 k Ω	0.0020 + 2
100 k Ω	0.0020 + 2
1 M Ω	0.0050 + 2
10 M Ω	0.0100 + 1

Conductance (100 nS Range): $\pm(0.02\%$ of input + 0.02 nS)

General Specifications

IEEE-488 Interface: Standard in the 8520A, 8520A/AS-1 and 8520A/PRT

Parallel (Binary) and BCD Interface: Standard in 8522A

BCD Data Output: Standard 0V and +5V TTL levels positive true, 8-4-2-1 code. Five BCD digits with an overrange bit, overload, polarity, and three coded range bits. The output also includes the state of the instrument (function, filter, external reference, and remote or local).

BCD Remote Control: Standard TTL levels – Logic 1 equals +5V or open, Logic 0 equals 0V or contact closure. Controls all functions (except conductance), range, filter (fast, slow), and external reference. Continuous-command entry and triggered-command entry.

Parallel: In bit parallel operation all features and functions can be accessed through the remote interface. Maximum speed in this mode is 520 readings per second

Format: Select 8- or 16-bit message format with a rear panel switch

Handshake: Handshake configuration is also switch selectable 3- or 4-wire for compatibility with computers, mini-computers, and instrument controllers

Temperature: 0°C to 50°C, operating; -25°C to +75°C non-operating; for 8520A/AS-1, non-operating temperature range is -40°C to +75°C
Altitude: 10,000 feet operating, 40,000 feet non-operating

Relative Humidity: $\leq 95\%$ to 25°C, $\leq 75\%$ to 40°C, $\leq 40\%$ to 50°C

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

Power: 100, 120, 220, or 240V ac, $\pm 10\%$, 50 to 60 Hz, ≤ 50 W

Size: 8.9 cm H x 45.7 cm L x 43.2 cm W (3 1/2 in H x 18 in L x 17 in W)

Weight: 9.56 kg (21 lb)

Included with Instrument: Manual, power cord, rear panel mating connector for analog input, serialized and dated calibration certification sheet

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8520A, 8522A, 8520A/AS-1 & 8520A/PRT

Ordering Information

Models	January 1990 prices
8520A DMM w/IEEE-488 Interface	\$ 3450
8522A DMM w/BCD and Parallel Interface	5350
8520A/AS-1 DMM for MATE	4850
8520A/PRT Temperature Measurement System	7595

Option (for 8520A & 8520A/PRT)*

-010 Extended Software Package \$ 620

* Included with 8520A/AS-1 and 8522A. Factory or Service Center installation only.

Accessories (Also see Section 5)

Y9111 Trigger Cable, 0.93m (3 ft)	\$ 20
Y9112 Trigger Cable, 1.85m (6 ft)	20
Y8133 Universal Test Lead Set	24
Y2037 100Ω RTD Temperature Probe ..	260
Y8021 IEEE-488 Shielded Cable, 1m ...	130
Y8022 IEEE-488 Shielded Cable, 2m ...	145
Y8023 IEEE-488 Shielded Cable, 4m ...	155
Y8597 Interface Adapter for 8375A, 8400A	250
Y8598 3 1/2" Rackmount Kit w/22" slides	130
Y8599 3 1/2" Rackmount Kit only	70

Conversion of 8520A/AS

Conversion of 8520A/AS to 8520A/AS-1 is available from your Fluke Service Center. Order 8520A/AS/AS1. The price of the conversion is \$950.

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.

SC1-8520A Repair	\$ 242
SC2-8520A Calibration	126
SC3-8520A Full Service	341
SC4-8520A Performance Verification-Plus	76
SC1-8522A Repair	264
SC2-8522A Calibration	126
SC3-8522A Full Service	361
SC4-8522A Performance Verification-Plus	76
SC2-8520A/PRT Calibration	540

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