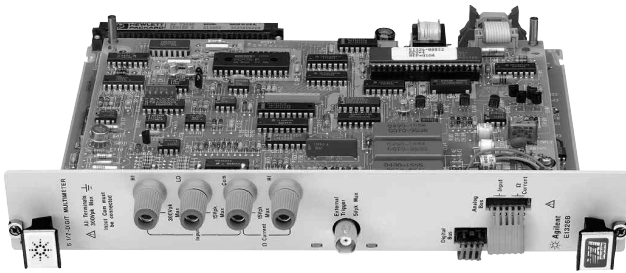


# Agilent E1326B

## 5.5-Digit Multimeter, B-Size

### Data Sheet

- 2-Slot, B-size, register based
- DCV, ACV, 2- & 4-wire  $\Omega$ , temperature
- 5.5-digit low-noise integrating A/D
- 13 kHz high-speed sampling A/D
- Balanced differential isolated inputs
- Software calibration



Agilent E1326B

### Description

The Agilent E1326B autoranging 5.5-Digit Multimeter is a **B-size, 2-slot, register-based VXI module**. It is identical in electrical design to the E1411B, differing only in size. The E1326B can be used in the E1300/01B mainframes. Using the Internal Installation Kit (E1326-80004) or Option 009 when ordering the E1300/01B, the E1326B can be mounted internally in the E1300/01B mainframes (saving two module slots). This instrument is especially well suited for data acquisition and computer-aided test applications.

This module can be used as an integrating A/D to make 5.5-digit, low-noise measurements, or switch to the sampling A/D

to make 14-bit readings at rates up to 13 kHz. When combined with any Agilent VXI relay or FET multiplexer, you can create a multichannel scanning multimeter. By sending just one SCPI command to the E1300/01B mainframe built-in command module, you can program the multimeter and the channels of your multiplexers at one time. The E1326B provides flexible triggering with built-in timer pacer.

Product functions for the E1326B include DCV, ACV Offset-compensated Ohm, Thermocouples, Thermistors, and RTDs.

Refer to the Agilent Technologies Website for instrument driver availability and downloading instructions, as well as for recent product updates, if applicable.



Agilent Technologies

## Product Specifications

### Reading rate:

Auto zero off, fixed range, default trigger delay, offset comp off, Sample Source "TIMER" for rates >15 readings/s.

Max. reading rate: 13 K

### Resolution (bits/digits)

	Aperture						
	320 ms	267 ms	20 ms	16.7 ms	2.5 ms	100 $\mu$ s	10 $\mu$ s
Binary bits:	$\pm 22$	$\pm 22$	$\pm 20$	$\pm 20$	$\pm 18$	$\pm 15$	$\pm 14$
Decimal digits:	6.5	6.5	6	6	5.5	4.5	4

### Typical Reading Rates (rdgs/s)

	Aperture						
	320 ms	267 ms	20 ms	16.7 ms	2.5 ms	100 $\mu$ s	10 $\mu$ s
DC voltage	3	3.5	49	59	365	3125	13000
Four-wire resistance	3	3.5	49	59	365	3125	13000
AC voltage	1.3	1.4	1.9	1.9	1.9	1.9	1.9

### Noise rejection (dB):

Noise Rejection Conditions: CMR measured with 1 k $\Omega$  in both HIGH and LOW leads with a 10% imbalance, LOW connected to COMMON at source, measured with respect to earth ground. NMR is for specified frequencies  $\pm 0.1\%$ .

		Aperture						
		320 ms	267 ms	20 ms	16.7 ms	2.5 ms	100 $\mu$ s	10 $\mu$ s
<b>DC voltage &amp; resistance:</b>								
DC	Common mode rejection	150 dB	150 dB	150 dB	150 dB	150 dB	150 dB	150 dB
50 Hz	Power line cycles (NPLCs)	16	—	1	—	—	—	—
	Normal mode (50 Hz) rejection	84 dB	0 dB	60 dB	0 dB	0 dB	0 dB	0 dB
60 Hz	Power line cycles (NPLCs)	—	16	—	1	—	—	—
	Normal mode (60 Hz) rejection	0 dB	84 dB	0 dB	60 dB	0 dB	0 dB	0 dB
400 Hz	Power line cycles (NPLCs)	128	—	8	—	1	—	—
	Normal mode (400 Hz) rejection	84 dB	0 dB	84 dB	0 dB	60 dB	0 dB	0 dB
<b>AC voltage:</b>								
DC to 400 Hz	Common mode rejection	110 dB	110 dB	110 dB	110 dB	110 dB	110 dB	110 dB

### DC Voltage

Accuracy Conditions: Auto zero on, one hour warmup. Temperature within  $\pm 5^\circ\text{C}$  of calibration temperature (module calibrated at 18-28  $^\circ\text{C}$ ).

Range	Input Resistance	Resolution vs Aperture ( $\Omega$ ) (Volts)		90-Day Accuracy vs Aperture $\pm$ (% of Reading)	
		20/16.7 ms	10 $\mu$ s	20/16.7 ms	10 $\mu$ s
		125 mV	>100 M $\Omega$	120 nV	7.6 $\mu$ V
1 V	>100 M $\Omega$	1.0 $\mu$ V	61 $\mu$ V	0.013% + 15 $\mu$ V	0.1% + 200 $\mu$ V
8 V	>100 M $\Omega$	7.6 $\mu$ V	488 $\mu$ V	0.01% + 50 $\mu$ V	0.1% + 1.5 mV
64 V	10 M $\Omega$ $\pm 5\%$	61 $\mu$ V	3.9 mV	0.015% + 1 mV	0.1% + 20 mV
300 V	10 M $\Omega$ $\pm 5\%$	488 $\mu$ V	31 mV	0.015% + 5 mV	0.1% + 80 mV
DC voltage:	300 V max.				
Voltage accuracy (DC):	0.0145%				

## Four Wire Resistance

Accuracy Conditions: Auto zero on, one hour warmup. Temperature within  $\pm 5$  °C of calibration temperature (module calibrated at 18-28 °C).

Range	Source Current	Maximum Open Circuit Voltage	Resolution vs Aperture ( $\Omega$ )		90-Day Accuracy vs Aperture $\pm$ (% of Reading)	
			20/16.7 ms	10 $\mu$ s	20/16.7 ms	10 $\mu$ s
256 $\Omega$	488 $\mu$ A	11.5 V	250 $\mu\Omega$	15 m $\Omega$	0.035% + 10 m $\Omega$	0.12% + 50 m $\Omega$
2 k $\Omega$	488 $\mu$ A	11.5 V	2 m $\Omega$	125 m $\Omega$	0.025% + 20 m $\Omega$	0.1% + 200 m $\Omega$
16 k $\Omega$	61 $\mu$ A	11.5 V	15 m $\Omega$	1 $\Omega$	0.025% + 200 m $\Omega$	0.1% + 2 $\Omega$
131 k $\Omega$	61 $\mu$ A	11.5 V	125 m $\Omega$	8 $\Omega$	0.025% + 1 $\Omega$	0.1% + 16 $\Omega$
1 M $\Omega$	7.6 $\mu$ A	11.5 V	1 $\Omega$	64 $\Omega$	0.025% + 10 $\Omega$	0.1% + 120 $\Omega$

## True RMS AC Voltage (AC coupled)

Crest Factor: 7 at 10% full scale; 1.5 at full scale. Accuracy Conditions: Sine wave inputs >10% of full scale. DC component <10% of AC component. Auto-zero on, 1 hour warmup. Temperature within  $\pm 5$  °C of calibration temperature (module calibrated at 18-28 °C).

Range (RMS)	Input Impedance	Frequency	Resolution vs Aperture (Volts)		90-Day Accuracy vs Aperture $\pm$ (% of Reading + Volts)	
			320/267 ms	10 $\mu$ s	320/267 ms	All other apertures
87.5 mV	>100 M $\Omega$ , <100 pF	20-50 Hz	30 nV	7.6 $\mu$ V	2.175% + 200 $\mu$ V	2.175% + 1 mV
		50 Hz-1 kHz			0.675% + 200 $\mu$ V	0.675% + 200 $\mu$ V
		1-5 kHz			0.675% + 200 $\mu$ V	0.675% + 200 $\mu$ V
		5-10 kHz			3.175% + 200 $\mu$ V	3.175% + 200 $\mu$ V
700 mV	>100 M $\Omega$ , <100 pF	20-50 Hz	0.24 $\mu$ V	61 $\mu$ V	2.125% + 1.5 mV	2.125% + 8 mV
		50 Hz-1 kHz			0.625% + 1.5 mV	0.625% + 1.5 mV
		1-5 kHz			0.625% + 1.5 mV	0.625% + 1.5 mV
		5-10 kHz			3.125% + 1.5 mV	3.125% + 1.5 mV
5.6 V	>100 M $\Omega$ , <100 pF	20-50 Hz	2.0 $\mu$ V	488 $\mu$ V	2.125% + 15 mV	2.125% + 80 mV
		50 Hz-1 kHz			0.625% + 15 mV	0.625% + 15 mV
		1-5 kHz			1.125% + 15 mV	1.125% + 15 mV
		5-10 kHz			10.125% + 15 mV	10.125% + 15 mV
44.8 V	10 M $\Omega$ $\pm$ 5%, <100 pF	20-50 Hz	15 $\mu$ V	3.9 mV	2.125% + 100 mV	2.125% + 500 mV
		50 Hz-1 kHz			0.625% + 100 mV	0.625% + 100 mV
		1-5 kHz			1.125% + 100 mV	1.125% + 100 mV
		5-10 kHz			10.125% + 100 mV	10.125% + 100 mV
300 V	10 M $\Omega$ $\pm$ 5%, <100 pF	20-50 Hz	122 $\mu$ V	31 mV	2.125% + 500 mV	2.125% + 2.5 V
		50 Hz-1 kHz			0.625% + 500 mV	0.625% + 500 mV
		1-5 kHz			1.125% + 500 mV	1.125% + 500 mV
		5-10 kHz			10.125% + 500 mV	10.125% + 500 mV

AC voltage: 300 V max.

Voltage accuracy (AC): 0.84%

### Timing/Synchronization

<b>Timer/pacer:</b>	
<b>Timer range:</b>	76 $\mu$ s to 65.5 ms
<b>Resolution:</b>	2 $\mu$ s
<b>Programmable delay:</b>	
<b>Delay range:</b>	40 $\mu$ s to 16 s
<b>Resolution:</b>	2 $\mu$ s
<b>External trigger:</b>	
<b>Minimum pulse width:</b>	100 ns
<b>Maximum trigger rate:</b>	5 kHz (Trigger Condition, negative edge; Fixed range, 10 $\mu$ s aperture)

### Typical Reading Storage Agilent 75000 Mainframe

	# of Readings
Series B with standard memory	50,000
Series B with 512 KB memory (E1300/01B Opt 11)	100,000
Series B with 1 MB memory (E1300/01B Opt 11)	200,000
<b>Isolation:</b>	450 Vpk between any terminal and chassis.

### DC Voltage Accuracy with Relay Multiplexers

Accuracy Conditions: Auto zero on, one hour warmup. Temperature within  $\pm 5$  °C of calibration temperature (module calibrated at 18-28 °C).

#### 90-Day Accuracy vs Aperture $\pm$ (% of Reading + Volts)

Range	E1326B & E1345A / 47A		E1326B & E1346A	
	20/16.7 ms	10 $\mu$ s	20/16.7 ms	10 $\mu$ s
125 mV	0.023% + 9 $\mu$ V	0.115% + 64 $\mu$ V	0.023% + 55 $\mu$ V	0.115% + 110 $\mu$ V
1 V	0.013% + 19 $\mu$ V	0.1% + 204 $\mu$ V	0.013% + 65 $\mu$ V	0.1% + 250 $\mu$ V
8 V	0.01% + 54 $\mu$ V	0.1% + 1.5 mV	0.01% + 100 $\mu$ V	0.1% + 1.55 mV
64 V	0.015% + 1 mV	0.1% + 20 mV	0.015% + 1.05 mV	0.1% + 20 mV
300 V	0.015% + 5 mV	0.1% + 80 mV	0.015% + 5.05 mV	0.1% + 80 mV

### True RMS AC Voltage (AC coupled) with Relay Multiplexers

1-5 kHz and 5-10 kHz frequencies (all apertures) when using Relay Multiplexers (E1343A, E1345A, E1346A, or E1347A). Add 0.2% to the AC Voltage specifications.

### Four Wire Resistance with Relay Multiplexers

Accuracy Conditions: Auto zero on, one hour warmup, temperature within  $\pm 5$  °C of calibration temperature (module calibrated at 18-28 °C).

#### 90-Day Accuracy vs Aperture $\pm$ (% of reading + $\Omega$ ) E1326B & E1345A / 47A

Range	20/16.7 ms	10 $\mu$ s
256 $\Omega$	0.035% + 18.2 m $\Omega$	0.12% + 58.2 m $\Omega$
2 k $\Omega$	0.025% + 28.2 m $\Omega$	0.1% + 208 m $\Omega$
16 k $\Omega$	0.025% + 266 m $\Omega$	0.1% + 2.1 $\Omega$
131 k $\Omega$	0.025% + 1.1 $\Omega$	0.1% + 16.1 $\Omega$
1 M $\Omega$	0.025% + 10.5 $\Omega$	0.1% + 121 $\Omega$

**Note:** With offset compensation on, accuracy is the same as for the voltmeter alone.

**Note:** Accuracy data includes all errors contributed by the multimeter, analog bus ribbon cables, multiplexer, and transducer linearizations (if applicable). The accuracies do not include transducer accuracy errors.

#### Functions

<b>Idc:</b>	—
<b>Iac:</b>	—
<b>Frequency:</b>	—
<b>Period:</b>	—
<b>Temp.:</b>	Tm, Tc, RTD

## Temperature

The temperature accuracy graphs (below) include instrument and firmware linearization errors. The linearization algorithm used is based on the ITS 90 standard transducer curves. Add your transducer accuracy to determine total measurement error.

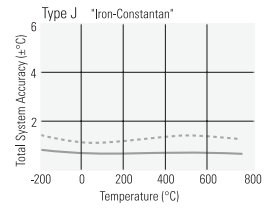
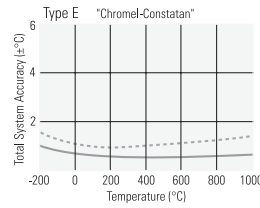
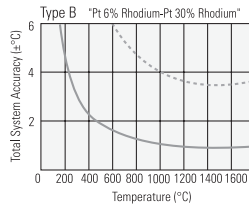
**Note:** The E1300/01B mainframes, E1406A command modules and Agilent embedded VXI controllers provide units conversion; if the E1411B or E1326B is register-programmed, your program must make the necessary units conversion.

### Thermocouples

(E1326B Multimeter and E1347A/E1476A TC MUX):  
16 ms aperture (1 PLC):

100  $\mu$ s aperture:

.....

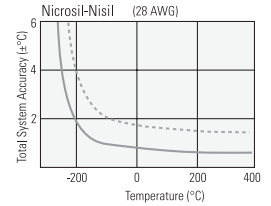
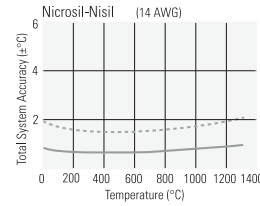
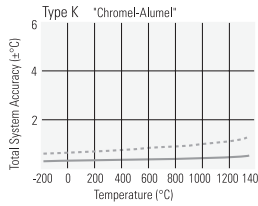


### Thermocouples

(E1326B Multimeter and E1347A/E1476A TC MUX):  
16 ms aperture (1 PLC):

100  $\mu$ s aperture:

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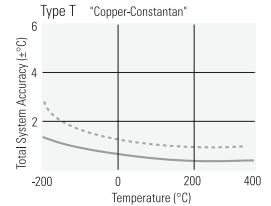
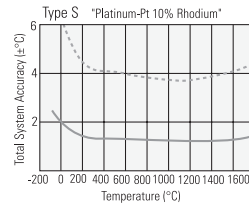
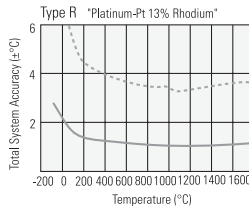


### Thermocouples

(E1326B Multimeter and E1347A/E1476A TC MUX):  
16 ms aperture (1 PLC):

100  $\mu$ s aperture:

.....



### Thermistors

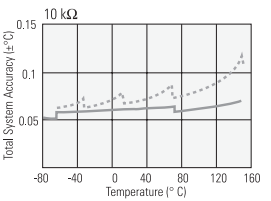
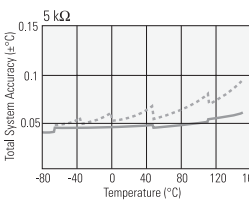
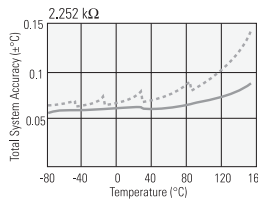
(E1326B Multimeter and E1345A/E1347A/E1476A MUXs):

**4-wire  $\Omega$ :**

16 ms aperture (1 PLC):

100  $\mu$ s aperture:

.....



### RTDs

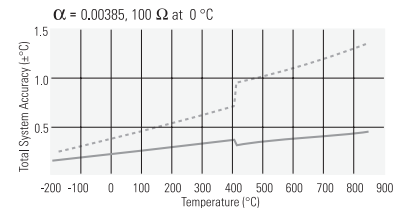
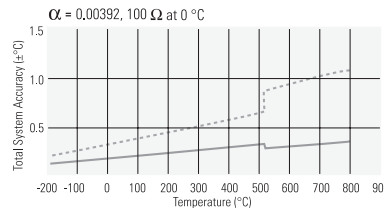
(E1326B Multimeter and E1345A/E1476A MUXs):

**4-wire  $\Omega$ :**

16 ms aperture (1 PLC):

100  $\mu$ s aperture:

.....



Note: The E1344A High-Voltage MUX also does TC measurements, but with slightly less accuracy.

## General Specifications

### VXI Characteristics

VXI device type:	Register based
Data transfer bus:	
Size:	B
Slots:	2
Connectors:	P1
Shared memory:	Yes (available with E1406A/E1300B/E1301B SCPI driver)
VXI busses:	n/a
C-size compatibility:	Yes

### Instrument Drivers

See the *Agilent Technologies Website* ([http://www.agilent.com/find/inst\\_drivers](http://www.agilent.com/find/inst_drivers)) for driver availability and downloading.

Command module firmware:	Downloadable
Command module firmware rev:	A.01
I-SCPI Win 3.1:	Yes
I-SCPI Series 700:	Yes
C-SCPI LynxOS:	Yes
C-SCPI Series 700:	Yes
Panel Drivers:	Yes
VXIplug&play Win Framework:	Yes
VXIplug&play Win 95/NT Framework:	Yes
VXIplug&play HP-UX Framework:	No

### Module Current

	$I_{PM}$	$I_{DM}$
+5 V:	0.2	0.1
+12 V:	0.55	0.01
-12 V:	0	0
+24 V:	0	0
-24 V:	0	0
-5.2 V:	0	0
-2 V:	0	0

### Cooling/Slot

Watts/slot:	4.20
$\Delta P$ mm H <sub>2</sub> O:	0.07
Air Flow liter/s:	0.35

### Ordering Information

Description	Product No.
5.5 Digit, Multimeter B-Size	E1326B
Service Manual	E1326B 0B3
Mil Std 45662A Calibration w/Test Data	E1326B 1BP
Japan - Japanese Localization	E1326B ABJ
Internal Installation Kit for E1326B DVM	E1326-80004
Kit-Binding Post	E1326-80005

## Related Literature

*2000 Test System and VXI Catalog CD-ROM,*  
Agilent Pub. No. 5980-0308E (detailed specifications for VXI products)

*2000 Test System and VXI Catalog,*  
Agilent Pub. No. 5980-0307E (overview of VXI products )

*1998 Test System and VXI Products Data Book,*  
Agilent Pub. No. 5966-2812E

## Online

Internet access for Agilent product information, services and support  
[www.agilent.com/find/tmdir](http://www.agilent.com/find/tmdir)

VXI product information  
[www.agilent.com/find/vxi](http://www.agilent.com/find/vxi)

Defense Electronics Applications  
[www.agilent.com/find/defense\\_ATE](http://www.agilent.com/find/defense_ATE)

Agilent Technologies VXI Channel Partners  
[www.agilent.com/find/vxichanpart](http://www.agilent.com/find/vxichanpart)

Agilent Technologies' HP VEE Application Website  
[www.agilent.com/find/vee](http://www.agilent.com/find/vee)

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[www.agilent.com/find/data\\_acq](http://www.agilent.com/find/data_acq)

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