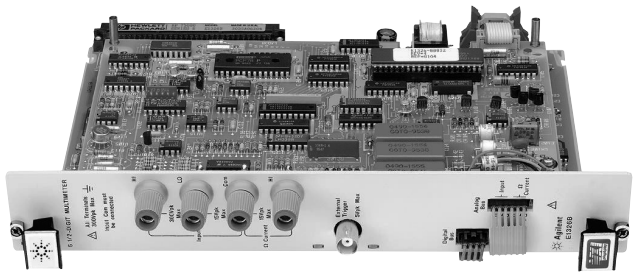
Agilent E1326B

5.5-Digit Multimeter, B-Size

Data Sheet

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



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.

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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

Typical Reading Rates (rdgs/s)

	Aperture						
	320 ms	**267 ms**	**20 ms**	**16.7 ms**	**2.5 ms**	**100 µs**	**10 µs**
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

Resolution (bits/digits)

	Aperture						
	320 ms	**267 ms**	**20 ms**	**16.7 ms**	**2.5 ms**	**100 µs**	**10 µs**
Binary bits:	± 22	± 22	± 20	± 20	± 18	± 15	± 14
Decimal digits:	6.5	6.5	6	6	5.5	4.5	4

Noise rejection (dB):

Noise Rejection Conditions: CMR measured with 1 kΩ 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 ± 0.1%.

		Aperture						
		320 ms	**267 ms**	**20 ms**	**16.7 ms**	**2.5 ms**	**100 µs**	**10 µs**
DC voltage & resistance:								
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
AC voltage:								
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 ± 5 °C of calibration temperature (module calibrated at 18-28 °C).

Range	**Input Resistance**	**Resolution vs Aperture (Ω) (Volts)**		**90-Day Accuracy vs Aperture ± (% of Reading)**	
		20/16.7 ms	**10 µs**	**20/16.7 ms**	**10 µs**
125 mV	>100 MΩ	120 nV	7.6 µV	0.023% + 5 µV	0.115% + 60 µV
1 V	>100 MΩ	1.0 µV	61 µV	0.013% + 15 µV	0.1% + 200 µV
8 V	>100 MΩ	7.6 µV	488 µV	0.01% + 50 µV	0.1% + 1.5 mV
64 V	10 MΩ ± 5%	61 µV	3.9 mV	0.015% + 1 mV	0.1% + 20 mV
300 V	10 MΩ ± 5%	488 µV	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 ±5 °C of calibration temperature (module calibrated at 18-28 °C).

Range	Source Current	Maximum Open Circuit Voltage	Resolution vs Aperture (Ω)		90-Day Accuracy vs Aperture ± (% of Reading)	
			20/16.7 ms	10 µs	20/16.7 ms	10 µs
256 Ω	488 µA	11.5 V	250 µΩ	15 mΩ	0.035% + 10 mΩ	0.12% + 50 mΩ
2 kΩ	488 µA	11.5 V	2 mΩ	125 mΩ	0.025% + 20 mΩ	0.1% + 200 mΩ
16 kΩ	61 µA	11.5 V	15 mΩ	1 Ω	0.025% + 200 mΩ	0.1% + 2 Ω
131 kΩ	61 µA	11.5 V	125 mΩ	8 Ω	0.025% + 1 Ω	0.1% + 16 Ω
1 MΩ	7.6 µA	11.5 V	1 Ω	64 Ω	0.025% + 10 Ω	0.1% + 120 Ω

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 ± 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 ± (% of Reading + Volts)	
			320/267 ms	10 µs	320/267 ms	All other apertures
87.5 mV	>100 MΩ, <100 pF	20-50 Hz	30 nV	7.6 µV	2.175% + 200 µV	2.175% + 1 mV
		50 Hz-1 kHz			0.675% + 200 µV	0.675% + 200 µV
		1-5 kHz			0.675% + 200 µV	0.675% + 200 µV
		5-10 kHz			3.175% + 200 µV	3.175% + 200 µV
700 mV	>100 MΩ, <100 pF	20-50 Hz	0.24 µV	61 µV	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 MΩ, <100 pF	20-50 Hz	2.0 µV	488 µV	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 MΩ ± 5%, <100 pF	20-50 Hz	15 µV	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 MΩ ± 5%, <100 pF	20-50 Hz	122 µV	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

Timer/pacer:
- **Timer range:** 76 µs to 65.5 ms
- **Resolution:** 2 µs

Programmable delay:
- **Delay range:** 40 µs to 16 s
- **Resolution:** 2 µs

External trigger:
- **Minimum pulse width:** 100 ns
- **Maximum trigger rate:** 5 kHz *(Trigger Condition, negative edge; Fixed range, 10 µs 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

Isolation: 450 Vpk between any terminal and chassis.

DC Voltage Accuracy with Relay Multiplexers

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

Range	90-Day Accuracy vs Aperture ± (% of Reading + Volts) E1326B & E1345A / 47A		E1326B & E1346A	
	20/16.7 ms	10 µs	20/16.7 ms	10 µs
125 mV	0.023% + 9 µV	0.115% + 64 µV	0.023% + 55 µV	0.115% + 110 µV
1 V	0.013% + 19 µV	0.1% + 204 µV	0.013% + 65 µV	0.1% + 250 µV
8 V	0.01% + 54 µV	0.1% + 1.5 mV	0.01% + 100 µV	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 ± 5 °C of calibration temperature (module calibrated at 18-28 °C).

Range	90-Day Accuracy vs Aperture ± (% of reading + Ω) E1326B & E1345A / 47A 20/16.7 ms	10 µs
256 Ω	0.035% + 18.2 mΩ	0.12% + 58.2 mΩ
2 kΩ	0.025% + 28.2 mΩ	0.1% + 208 mΩ
16 kΩ	0.025% + 266 mΩ	0.1% + 2.1 Ω
131 kΩ	0.025% + 1.1 Ω	0.1% + 16.1 Ω
1 MΩ	0.025% + 10.5 Ω	0.1% + 121 Ω

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
- **Idc:** —
- **Iac:** —
- **Frequency:** —
- **Period:** —
- **Temp.:** 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 neccessary units conversion.*

Thermocouples

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

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

Thermocouples

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

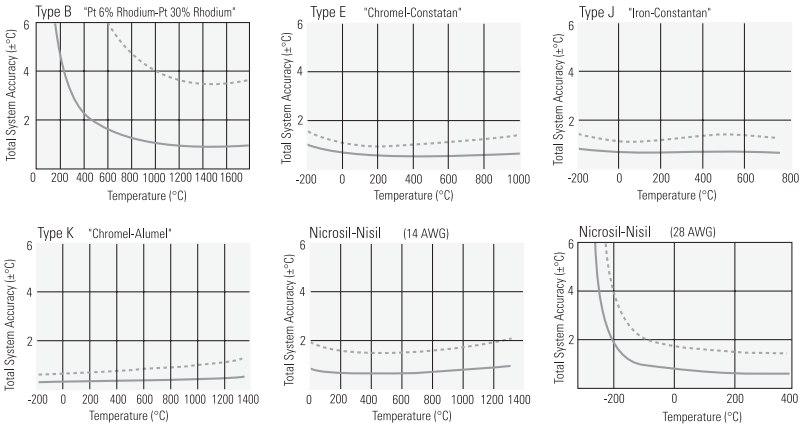
Thermistors

(E1326B Multimeter and E1345A/E1347A/E1476A MUXs):
4-wire Ω:
16 ms aperture (1 PLC):
---
100 µs aperture:
.....

RTDs

(E1326B Multimeter and E1345A/E1476A MUXs):
4-wire Ω:
16 ms aperture (1 PLC):
---
100 µs 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) 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
VXI*plug&play* Win Framework: Yes
VXI*plug&play* Win 95/NT Framework: Yes
VXI*plug&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
ΔP mm H_2O: 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
3 Yr. Retn. to Agilent to 1 Yr. OnSite Warr.	E1326B W01
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

VXI product information
www.agilent.com/find/vxi

Defense Electronics Applications
www.agilent.com/find/defense_ATE

Agilent Technologies VXI Channel Partners
www.agilent.com/find/vxichanpart

Agilent Technologies' HP VEE Application Website
www.agilent.com/find/vee

Agilent Technologies Data Acquisition and Control Website
www.agilent.com/find/data_acq

Agilent Technologies Instrument Driver Downloads
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Phone and fax
United States:
Agilent Technologies
(tel) 1 800 452 4844

Canada:
Agilent Technologies Canada Inc.
(tel) 1 877 894 4414

Europe:
Agilent Technologies
Test & Measurement
European Marketing Organisation
(tel) (31 20) 547 2000

Japan:
Agilent Technologies Japan Ltd.
(tel) (81) 426 56 7832
(fax) (81) 426 56 7840

Latin America:
Agilent Technologies
Latin American Region Headquarters, U.S.A.
(tel) (305) 267 4245
(fax) (305) 267 4286

Australia/New Zealand:
Agilent Technologies Australia Pty Ltd.
(tel) 1 800 629 485 (Australia)
(fax) (61 3) 9272 0749
(tel) 0 800 738 378 (New Zealand)
(fax) (64 4) 802 6881

Asia Pacific:
Agilent Technologies, Hong Kong
(tel) (852) 3197-7777
(fax) (852) 2506-9284

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