

## 5440B & 5442A



RS-232



### 5440B & 5442A Direct Voltage Calibrators

- Full accuracy over extended temperature range of 10°C
- Completely automatic internal calibration, no mechanical adjustments
- Simplified 5-minute external calibration to traceable standards
- Procedure Storage Module for single button test setup (5440B only)
- Completely programmable through the IEEE-488 interface
- Serial printer output for calibration constants and instrument test results

The 5440B and 5442A are equipped with bright vacuum-fluorescent displays for clear visibility at any viewing angle. Even inexperienced operators find the 5440B and 5442A easy to use because the 40-character, alpha-numeric display provided in addition to the numeric output display makes operating instructions and error messages clear and readable in engineering units and English language messages instead of coded numerics. For semi-automated testing, the 5440B allows a complete test sequence of up to 60 steps to be stored in the internal Procedure Storage memory and recorded for later use in the interchangeable, plug-in Procedure Storage Modules. A test sequence is recalled and executed one step at a time with each touch of the NEXT STEP key.

The differences between the 5440B and the 5442A are in the operating features and specifications. The 5440B comes equipped with the Procedure Storage Module capability and boost capability for driving the 5205A Precision Power Amplifier and 5220A Transconductance Amplifier in system applications. The rear output terminals found on the 5440B as a standard feature are available for the 5442A as an option. Both instruments have outstanding accuracy

specifications and the capability for operating at full rated accuracy over a temperature range of  $\pm 5^\circ\text{C}$  from the calibration temperature, making them well-suited for operation in a production environment as well as in a standards lab. Both instruments are completely programmable via the IEEE-488 interface which is included at no extra cost.

The outstanding accuracy specifications for the 5440B and 5442A are easily maintained in any lab by performing the simple, automatic calibration procedures which store the calibration constants in non-volatile EAROM solid-state memory. No hardware adjustments are required. The Fluke 732A Reference Standard combined with the Fluke Direct Volt Maintenance Divider, provide the highest accuracy reference standards available for this periodic calibration.

### Specifications

Specifications apply to both the 5440B and 5442A unless otherwise noted.

**Output Voltage:** 0 to 1100V  
**Output Current:** 0 to 60 mA up to 22V, except divided outputs  
0 to 25 mA up to 1100V

#### 5440B:

**Output Uncertainty Compared to Calibration Standards,  $\pm 5^\circ\text{C}$**

Range	Uncertainty Specification: $\pm(\text{PPM of Output} + \text{Microvolts})$	
	30 Days	90 Days
0V to 11V	$1.5 + 5 \mu\text{V}$	$2.0 + 5 \mu\text{V}$
11V to 22V	$1.5 + 8 \mu\text{V}$	$2.0 + 8 \mu\text{V}$
22V to 275V	$2.5 + 100 \mu\text{V}$	$3.5 + 100 \mu\text{V}$
275V to 1100V	$2.5 + 400 \mu\text{V}$	$3.5 + 400 \mu\text{V}$
<b>Divided Output</b>		
0V to 220 mV	$4 + 0.5 \mu\text{V}$	$5 + 0.5 \mu\text{V}$
0.22V to 2.2V	$3 + 1 \mu\text{V}$	$4.5 + 1.0 \mu\text{V}$
<b>Range</b>		
0V to 11V	$2.5 + 5 \mu\text{V}$	$3.5 + 5 \mu\text{V}$
11V to 22V	$2.5 + 8 \mu\text{V}$	$3.5 + 8 \mu\text{V}$
22V to 275V	$4.5 + 100 \mu\text{V}$	$6.0 + 100 \mu\text{V}$
275V to 1100V	$4.5 + 400 \mu\text{V}$	$6.0 + 400 \mu\text{V}$
<b>Divided Output</b>		
0V to 220 mV	$6.5 + 0.5 \mu\text{V}$	$10 + 0.5 \mu\text{V}$
0.22V to 2.2V	$6 + 1.0 \mu\text{V}$	$8 + 1.0 \mu\text{V}$

#### 5442A:

**Output Uncertainty Compared to Calibration Standards,  $\pm 5^\circ\text{C}$**

Range	Uncertainty Specification: $\pm(\text{PPM of Output} + \text{Microvolts})$	
	30 Days	90 Days
0V to 11V	$2.5 + 5 \mu\text{V}$	$3.0 + 5 \mu\text{V}$
11V to 22V	$2.5 + 8 \mu\text{V}$	$3.0 + 8 \mu\text{V}$
22V to 275V	$3.0 + 100 \mu\text{V}$	$3.5 + 100 \mu\text{V}$
275V to 1100V	$2.5 + 400 \mu\text{V}$	$3.5 + 400 \mu\text{V}$
<b>Divided Output</b>		
0V to 220 mV	$6 + 0.5 \mu\text{V}$	$7 + 0.5 \mu\text{V}$
0.22V to 2.2V	$4 + 1 \mu\text{V}$	$6 + 1.0 \mu\text{V}$
<b>Range</b>		
0V to 11V	$4.5 + 5 \mu\text{V}$	$6.5 + 5 \mu\text{V}$
11V to 22V	$4.5 + 8 \mu\text{V}$	$6.5 + 8 \mu\text{V}$
22V to 275V	$5.0 + 100 \mu\text{V}$	$7.0 + 100 \mu\text{V}$
275V to 1100V	$4.5 + 400 \mu\text{V}$	$6.0 + 400 \mu\text{V}$
<b>Divided Output</b>		
0V to 220 mV	$9 + 0.5 \mu\text{V}$	$12 + 0.5 \mu\text{V}$
0.22V to 2.2V	$8 + 1.0 \mu\text{V}$	$11 + 1.0 \mu\text{V}$

**Uncertainty of Calibration Standards Compared to National Standards**

Range	Uncertainty of Standards
0V to 11V	1.5 ppm
11V to 22V	1.5 ppm
22V to 275V	1.7 ppm
275V to 1100V	2.0 ppm
0V to 220 mV	4.0 ppm
0.22V to 2.2V	2.0 ppm

The output uncertainty compared to national standards for the 5440B and 5442A are defined



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as the algebraic sum for each range of the output uncertainty compared to calibration standards and the uncertainty of the calibration standards compared to national standards. The specifications for uncertainty of calibration standards listed above are those for the Fluke 732A and Fluke 752A. If other standards are used, the uncertainty of those standards must be substituted.

### Output Stability

Specifications apply for initial stabilization of two hours, constant ambient temperature of  $\pm 1^\circ\text{C}$ , constant line voltage, constant load, and measurement bandwidth of 0.1 Hz to 1 Hz.

Range	$\pm(\text{PPM of Output} + \text{Microvolts})$		
	10 Minutes	24 Hours	30 Days*
0V to 11V	0.2 + 2 $\mu\text{V}$	0.3 + 3 $\mu\text{V}$	0.5 + 3 $\mu\text{V}$
11V to 22V	0.2 + 3 $\mu\text{V}$	0.4 + 4 $\mu\text{V}$	0.5 + 4.5 $\mu\text{V}$
22V to 275V	0.3 + 40 $\mu\text{V}$	0.3 + 50 $\mu\text{V}$	1.0 + 60 $\mu\text{V}$
275V to 1100V	0.3 + 200 $\mu\text{V}$	0.3 + 200 $\mu\text{V}$	1.0 + 300 $\mu\text{V}$
<b>Divided Output</b>			
0 mV to 220 mV	0.5 + 0.2 $\mu\text{V}$	0.5 + 0.2 $\mu\text{V}$	2 + 0.3 $\mu\text{V}$
0.22V to 2.2V	0.5 + 0.2 $\mu\text{V}$	0.5 + 0.5 $\mu\text{V}$	2 + 0.7 $\mu\text{V}$

\* For best results, use internal calibration for periods exceeding one day.

### Temperature Coefficient of Output

These specifications apply for ambient temperatures outside the  $\pm 5^\circ\text{C}$  range of the uncertainty specifications listed earlier.

Range	$\pm(\text{PPM of Output}) \text{ Per } ^\circ\text{C}$	
	0-10 $^\circ\text{C}$	10-30 $^\circ\text{C}$
0V to 11V	0.15 ppm	0.1 ppm
11V to 22V	0.15 ppm	0.1 ppm
22V to 275V	0.2 ppm	0.2 ppm
275V to 1100V	0.2 ppm	0.2 ppm
<b>Divided Output</b>		
0V to 220 mV	0.5 ppm	0.5 ppm
0.22V to 2.2V	0.5 ppm	0.5 ppm
<b>Range</b>		
	30-40 $^\circ\text{C}$	40-50 $^\circ\text{C}$
0V to 11V	0.4 ppm	1.0 ppm
11V to 22V	0.4 ppm	1.0 ppm
22V to 275V	0.6 ppm	1.5 ppm
275V to 1100V	1.0 ppm	1.5 ppm
<b>Divided Output</b>		
0V to 220 mV	0.5 ppm	0.5 ppm
0.22V to 2.2V	0.5 ppm	0.5 ppm

### Linearity

These specifications apply for the ambient temperature range of  $15^\circ\text{C}$  to  $30^\circ\text{C}$  within  $\pm 5^\circ\text{C}$  of the external calibration temperature.

Range	$\pm(\text{PPM of Output} + \text{Microvolts})$
0 mV to 220 mV	0.5 ppm + 0.2 $\mu\text{V}$
0.22V to 2.2V	0.7 ppm + 0.3 $\mu\text{V}$
0V to 11V	0.5 ppm + 1.5 $\mu\text{V}$
11V to 22V	0.5 ppm
22V to 275V	0.5 ppm + 40 $\mu\text{V}$
275V to 1100V	1.0 ppm

### Resolution

Range	Resolution	Maximum Load or Output Resistance
0V to 11V	1 $\mu\text{V}$	25 mA
11V to 22V	1 $\mu\text{V}$	25 mA
22V to 275V	10 $\mu\text{V}$	25 mA
275V to 1100V	100 $\mu\text{V}$	25 mA
<b>Divided Output</b>		
0V to 220 mV	0.01 $\mu\text{V}$	495 $\Omega$
0.22V to 2.2V	0.1 $\mu\text{V}$	450 $\Omega$

### Output Noise

Range	Bandwidth	
	0.1 Hz to 10 Hz	10 Hz to 10 kHz
0 mV to 220 mV	0.1 $\mu\text{V}$	5 $\mu\text{V}$
0.22V to 2.2V	0.2 $\mu\text{V}$	15 $\mu\text{V}$
0V to 11V	1.5 $\mu\text{V}$	30 $\mu\text{V}$
11V to 22V	3.0 $\mu\text{V}$	50 $\mu\text{V}$
22V to 275V	35 $\mu\text{V}$	150 $\mu\text{V}$
275V to 1100V	100 $\mu\text{V}$	300 $\mu\text{V}$

### Output Settling Time

Time to settle within a given uncertainty band of final value, for a change in programmed output within a given range.

Range	$\pm$ Parts Per Million of Change*		
	3 seconds	5 seconds	10 seconds
0 mV to 220 mV, 0.22V to 2.2V, 0V to 11V, and 11V to 22V	7 ppm	2 ppm	0.5 ppm
22V to 275V	—	—	3 ppm
275V to 1100V	—	—	—

\* Add 0.5 seconds for any change in range up to 22V, 1.0 second for a change from 22V up, and 0.5 seconds for a change from STBY to OPER.

**Line Regulation:** Changes less than  $\pm 0.1$  ppm of range for  $\pm 10\%$  change from nominal line voltage

**Load Regulation:** Less than  $\pm 0.1$  ppm change of output for change from no-load to full-load or from full-load to no-load for output load impedances greater than 80 ohms

**Common Mode Rejection:** Greater than 140 dB for frequencies from dc to 400 Hz

**Temperature:**  $0^\circ\text{C}$  to  $50^\circ\text{C}$ , operating, except accuracy is degraded above  $40^\circ\text{C}$  due to loss of oven regulation;  $-40^\circ\text{C}$  to  $+75^\circ\text{C}$  non-operating

**Relative Humidity:**  $\leq 90\%$  to  $30^\circ\text{C}$  except accuracy is degraded above 80%,  $\leq 70\%$  to  $40^\circ\text{C}$ ,  $\leq 40\%$  to  $50^\circ\text{C}$

### Vibration

Frequency	Force	Double Amplitude
5 Hz to 15 Hz	0.7G at 15 Hz	0.06 inches
15 Hz to 25 Hz	1.3G at 25 Hz	0.04 inches
25 Hz to 55 Hz	3G at 55 Hz	0.02 inches

**Shock:** Eighteen 20G  $\frac{1}{2}$ -sinewave shocks

**Compliance With External Standards:** ANSI C39.5 Dec 1980 and IEC 348 Second Edition 1978

**EMI/RFI Review Standards:** FCC Rules Part 15, Subpart J; European Standard VDE 0871; MIL STD 461B

**EMI/RFI Conducted Emissions:** FCC Rules Part 15 Class J; European Standard VDE 0871; CISPR.11

**Radiated EMI/RFI Emissions:** Meets or exceeds all FCC and VDE requirements

**Power:** 100V, 110V, 115V, 120V ac  $\pm 10\%$  or 200V, 220V, 230V, 240V ac  $\pm 10\%$ , 50 to 60 Hz, 84W Standby, 145W nominal

**Size:** 61 cm L x 43 cm W x 24 cm H (24 in x 17 in x 9.4 in)

**Weight:** 30.2 kg (66.4 lb)

**Mounting:** Standard 19" EIA relay rack, tapped for attachment of slides; resilient feet provided for bench use

**Included:** Operator's and Service Manual, serialized and dated Calibration Certificate

**5440B:** Procedure Storage Module, IEEE-488 Interface, RS-232-C Printer Interface, Boost Interface, Rear Output

**5442A:** IEEE-488 Interface, RS-232-C Printer Interface

## Ordering Information

### Models

January 1988 prices

**5440B** Direct Voltage Calibrator ..... \$12,950  
**5442A** Direct Voltage Calibrator ..... 10,950  
NSN 6625-01-224-9270

### Accessories (Also see page 468)

**5440A-7001** Spare Procedure Storage Module ..... 220  
**5440A-7002** Low Thermal Copper EMF Plug-In Cables ..... 325  
**732A** DC Reference Standard ..... 3300  
**732A-000** w/Special Calibration, shipped hot ..... 3540  
**732A-100** w/Special Calibration and Drift Certification, shipped hot ..... 3795  
**752A** Reference Divider ..... 4900  
**M08-205-600** 8 $\frac{3}{4}$ " Rack Mount Kit .... 105  
**M00-280-610** 24" Rack Slide Kit (Requires M08-205-600) ..... 125  
**5442A-01** Rear Output Option ..... 345

## Service & Support

### Warranty

One-year product warranty. See page 453 for further information on warranty terms and conditions.

### Extended Warranty

**SC1-5440B/42A** Repair (w/calibration) .. 231  
**SC1-5440B/42A** Repair (cal w/in or out data) ..... 306  
**SC1-5440B/42A** Repair (cal w/in and out data) ..... 381  
**SC2-5440B/42A** Cal (4 yr rec) ..... 252  
**SC2-5440B/42A** Cal (4 yr w/in or out data) ..... 402  
**SC2-5440B/42A** Cal (4 yr w/in and out data) ..... 552