

Section 1

Introduction & Specifications

1-1. INTRODUCTION

1-2. The Fluke Model 515A enables the field checking and/or calibration of the dc voltage, ac voltage and resistance ranges of high-accuracy voltmeters and multimeters. The Model 515A provides standards for dc voltage, ac voltage and resistance which maintain the basic accuracy over the temperature range of $23^{\circ}\text{C} \pm 5^{\circ}\text{C}$. Self-contained batteries permit operation at sites remote from ac power, and also permit operating temperature of the unit to be maintained while in transit. Up to eight hours of battery operation is available from a single charge. The batteries are charged within the calibrator when connected to the ac line. A front-panel meter indicates the state of battery charge when in the battery-operated mode.

1-3. All instrument outputs are provided at a single set of terminals located on the front panel. Generally, connections to the instrument under test may be made one time for a complete series of tests. In addition, terminals are provided to allow guarding and shielding of test leads. Guarded connections reduce the effects of common mode voltages, while shielding reduces the effects of electrical noise. The

front panel also contains all operating controls which are color-coded to simplify output voltage and resistance selection.

1-4. DC voltage outputs are selectable in the ranges of 0 - 999 microvolts (continuous), 100 millivolts to 1 volt in 100-millivolt steps, 1 volt to 10 volts in 1-volt steps, and 100 volts. AC voltages are selectable 1, 10 and 100V rms at 400 Hz, 10V rms at 4 kHz, and 10V rms at 50 kHz. Resistance is selectable at zero, 10, 100, 1K, 10K, 100K, 1M and 10M ohms. All pushbutton selection switches are mechanically interlocked so that only a single function can be selected.

1-5. Power source switching within the calibrator permits the unit to operate on 100V, 115V, 200V or 230V at 50 Hz to 440 Hz. The HI & LO front panel terminals are of solid copper to reduce the effects of thermal emf. In addition, the voltage outputs are fully protected against short circuit, and the resistance output will provide for the application of up to 200 milliwatts or 100V (dc or rms), whichever is less.

1-6. SPECIFICATIONS

DC Voltage -

Range:

uV:	0 to 999 uV continuous (0.2 uV resolution)
1V:	0.0 to 1.0V in 0.1V steps
10V:	0 to 10V in 1V steps
100V:	100V cardinal point

Accuracy:

(@ 23°C $\pm 5^\circ\text{C}$ for 1 year; 30-minute warmup)

uV Range:

 ± 2 uV, referred to zero setting

1V, 10V and 100V Ranges:

 $\pm (0.003\%$ of setting or 30 uV, whichever is greater)

Ripple:

uV Range:

< 10 uV rms

1V, 10V, 100V Ranges:

< 0.01% of range rms

Load Regulation:

Load R

Output Change
(% of setting)

uV, 1V, 10V Ranges:

> $10^5 \Omega$

-0.000%

10M Ω

-0.003%

1M Ω

-0.03%

100V Range:

 ± 5 ppm (0.0 to 0.5 mA)

Output Current:

Function of source resistance to limits noted.

No damage to instrument with short circuit on output.

Source Resistance:

uV, 1V, 10V Ranges:

300 ohms (up to 10 mA load)

100V Range:

< 1 ohm (up to 0.5 mA load)

Line Regulation:

($\pm 10\%$ line voltage change)

uV Range:

< 1 uV

1V, 10V Ranges:

< 1ppm of range

100V Range:

< 10 ppm of range

Temperature Coefficient:

(0°C to 18°C, 28°C to 50°C)

uV Range:

 ± 0.1 uV/°C, referred to zero setting

1V, 10V Ranges:

 ± 5 ppm/°C

100V Range:

 ± 8 ppm/°C

AC Voltage

Voltage Range: 1V, 10V, 100V cardinal points

Output Frequencies:

10V: 400 Hz, 4 kHz, 50 kHz

1V, 100V: 400 Hz

Accuracy: (@ 23°C $\pm$ 5°C for 1 year; 30 minute warmup)

Voltage:

1V: $\pm 0.05\%$

10V: $\pm 0.04\%$ — 400 Hz and 4 kHz

$\pm 0.1\%$ — 50 kHz

100V: $\pm 0.06\%$

Frequency: $\pm 1\%$ except @ 50 kHz; $\pm 5\%$

Total Harmonic Distortion and Noise:

400 Hz and 4 kHz: $< 0.03\%$

50 kHz: $< 0.05\%$

Load Regulation:

10V output (0 to 10 mA) $\pm 0.004\%$ except @ 50 kHz; $\pm 0.008\%$

1V output ($< 1\Omega$ Source Z) -0.005% (20 k Ω); -0.01% (10 k Ω)

100V output ($< 30\Omega$ Source Z) -0.006% (500 k Ω); -0.015% (200 k Ω)

Output Current: (For load Regulation as stated above)

1V, 10V output 0 to 10 mA rms

100V output 0 to 0.5 mA rms

NOTE: Current limiting protects the 515A output from damage due to short circuit on output.

Line Regulation: ($\pm 10\%$ line voltage change)

All Voltages at All Frequencies: $< \pm 10$ ppm

Temperature Coefficient: (0°C to 18°C, 28°C to 50°C)

All Voltages at All Frequencies: $< \pm 25$ ppm/°C

515A

Resistance

Range:	10 Ω through 10 M Ω in decade steps plus zero setting
Accuracy:	(@23°C $\pm$ 5°C for 1 year; referred to zero ohms setting)
0 Ω :	Residual Resistance; < 0.15 Ω
10 Ω – 100 Ω :	$\pm$ 0.06%
1 k Ω – 1 M Ω :	$\pm$ 0.015%
10 M Ω :	$\pm$ 0.075%
Power Rating:	0.2 Watt or 100V (DC or RMS), whichever is less
Temperature Coefficient:	(0°C to 18°C, 28°C to 50°C); referred to residual resistance
0 Ω :	< + 0.4%/°C
10 Ω – 100 Ω :	< $\pm$ 10 ppm
1 k Ω – 1 M Ω :	< $\pm$ 5 ppm
10 M Ω :	< $\pm$ 10 ppm

General

Size:	3½" H x 8½" W x 16" D
Weight:	13 lbs.
Operating Temperature:	0°C to 50°C
Storage Temperature:	–40°C to +50°C; to +60°C with batteries removed
Relative Humidity:	< 70%, 0°C to 45°C
Input Power:	100/115/200/230V ac, $\pm$ 10%, < 10 Watts, 50 - 440 single phase or internal batteries. Eight hours operation from batteries when fully charged. Charging is automatic during line operation. Front panel meter indicates condition of charge and battery/line operation.
Output Connectors:	4 binding posts for HI, LO, GUARD and CHASSIS HI & LO terminals are solid copper
Shock:	15g., 11 msec half-sine wave
Vibration:	MIL-T-21200L Class 2 or Class 3
Altitude:	0 to 10,000 feet operating 50,000 feet non-operating