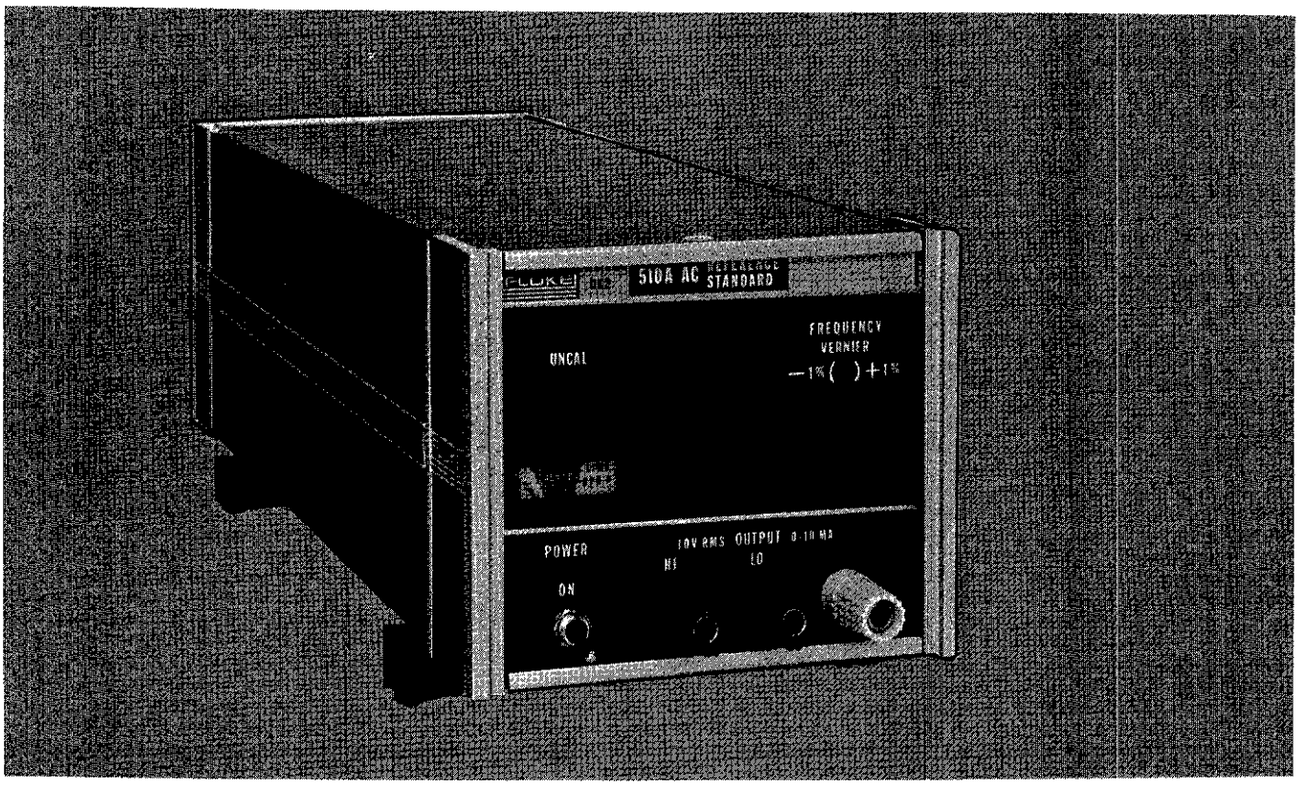
510A

FLUKE

AC REFERENCE STANDARD



Features

- **OUTPUT VOLTAGE: 10 volts RMS**
- **ACCURACY: ±0.01% for 30 days ±0.02% for 90 days**
- **OUTPUT CURRENT: 10 mA RMS, Short Circuit Protected**
- **FIXED FREQUENCY OUTPUT: 50 Hz to 100 kHz**
- **TOTAL HARMONIC DISTORTION: Less than 0.005% to 50 kHz**
- **SHORT TERM STABILITY: 20 ppm pk-pk**
- **DC CALIBRATION**
- **BATTERY OPERATION**

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Thank you for your cooperation, and for your interest in Fluke.

Sincerely,

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DESCRIPTION

The Fluke 510A is a precision ac voltage source which can be used as a calibration standard or as a fixed frequency source for test applications. In the calibration laboratory, the 510A provides an accurate reference for calibrating both True rms and Average reading ac voltmeters. On the production line, the 510A can be used to rapidly verify ac test instrumentation or to generate a precise ac stimulus for circuit testing.

The output of the 510A is both fixed frequency and fixed amplitude. The frequency may be varied ±1% of center frequency by a front panel screwdriver adjustment. Frequency resolution is ±0.05 per cent. No external adjustments are provided for amplitude control. Variable amplitude levels may be obtained by using ratio transformers or other voltage divider techniques.

The outstanding accuracy and stability of the 510A is achieved by comparing the peak amplitude of each cycle of the ac signal to a dc reference amplifier with precisely known characteristics. AC amplitude errors are fed back as correction signals to the oscillator amplifier circuits to maintain constant amplitude. Calibration of the 510A Reference Standard is accomplished by calibrating the dc reference amplifier and internal resistor divider networks; a procedure easily implemented with standard laboratory instruments.

Total harmonic distortion is less than 50 ppm up to 50kHz, and 150 ppm at 100 kHz, thus assuring a pure output sine wave that can be used to calibrate average, peak, or true rms reading ac to dc converters.

An optional rechargeable battery pack provides up to 16 hours of operation without ac line power. A front panel meter provides a continuous display of battery condition. Whenever the 510A is being operated from an ac line, the battery is maintained at the appropriate charge level and will continue to operate the Reference Standard should ac power failure occur.

The 510A is fully protected from overloads and short circuits. When the load current exceeds the 10 ma output capability, the UNCAL lamp on the front panel illuminates.

Up to four 510A Reference Standards may be bolted together for mounting in a standard EIA 19 inch rack assembly. Output terminals are provided on both the front and rear panels so that the units may be easily connected in either bench or system configurations.

SPECIFICATIONS

OUTPUT VOLTAGE	10V rms
OUTPUT CURRENT	10 mA rms, short circuit protected
SINGLE FIXED FREQUENCY OUTPUT	Any single fixed frequency from 50 Hz to 100 kHz. Standard frequencies are: 50; 60; 400; 1,000; 2,400; 5,000; 19,200 and 100,000 Hertz.

AMPLITUDE ACCURACY USING AC CALIBRATION

	24 Hours	30 Days	90 Days
50 Hz – 20 kHz	±0.01%	±0.015%	±0.02%
20 kHz – 50 kHz	±0.015%	±0.025%	±0.035%
50 kHz – 100 kHz	±0.04%	±0.05%	±0.06%

Above accuracy applies after 10 minutes warmup, operating temperature of 23 ±2°C, and includes worst case deviations of the output caused by line, load, stability, and noise conditions. Assumes calibration against an AC-DC transfer standard with an AC-DC difference of 50 ppm from 50 Hz to 50 kHz and 300 ppm from 50 kHz to 100 kHz.

SPECIFICATIONS

AMPLITUDE ACCURACY USING DC CALIBRATION

Using a DC reference accurate to ±15 ppm and standard laboratory equipment, the 510A may be calibrated to achieve the following accuracies at standard operating temperatures of 23 ±2°C, and worst case deviations caused by line, load, stability and noise conditions.

	30 Days	90 Days
50 Hz – 5 kHz	±0.01%	±0.02%
5 kHz – 10 kHz	±0.02%	±0.03%
10 kHz – 30 kHz	±0.05%	±0.07%
30 kHz – 100 kHz	±0.15%	±0.17%

AMPLITUDE STABILITY	24 Hours	30 Days	90 Days
50 Hz – 20 kHz	±0.002%	±0.005%	±0.01%
20 kHz – 100 kHz	±0.004%	±0.01%	±0.02%

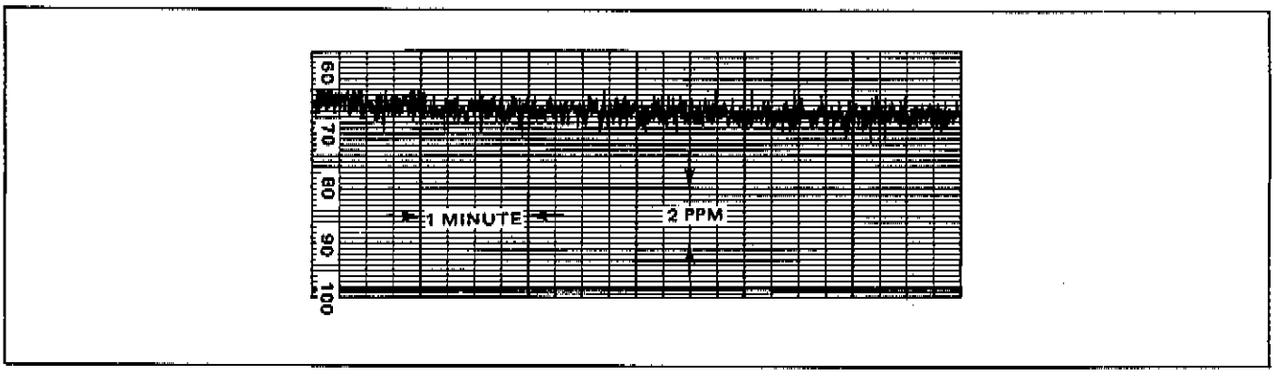


Figure 1-1. TYPICAL SHORT TERM STABILITY

AMPLITUDE NOISE . . . . . Amplitude deviation due to noise is less than 20 ppm peak-to-peak through a 1 Hz bandwidth over a 1 minute interval.

AMPLITUDE TEMPERATURE COEFFICIENT

	15° – 50°C	0° – 15°C
50 Hz – 5 kHz	5 ppm/°C	12 ppm/°C
5 kHz – 10 kHz	7 ppm/°C	15 ppm/°C
10 kHz – 30 kHz	10 ppm/°C	17 ppm/°C
30 kHz – 100 kHz	15 ppm/°C	22 ppm/°C

TOTAL HARMONIC DISTORTION . . . . . (See total harmonic distortion chart in Figure 1-2.)

CENTER FREQUENCY ACCURACY . . . . . ±0.1%

FREQUENCY RESOLUTION . . . . . ±0.05% using front panel vernier

FREQUENCY VERNIER . . . . . Screwdriver adjustment, ±1% of center frequency

FREQUENCY STABILITY . . . . . 500 ppm per month

FREQUENCY TEMPERATURE COEFFICIENT . . . . Less than 150 ppm/°C

COMMON MODE REJECTION . . . . . Greater than 100 db for common mode signals from 1 Hz to 500 Hz, 10V peak-to-peak maximum.

Common Mode Rejection is defined as the affect on the rms or average value of the 10V rms output due to a common mode signal between the low terminal and chassis. This rejection is:

Greater than 70 db for common mode signals from 500 Hz to 1 MHz, 3V peak-to-peak maximum.

Maximum allowable dc potential between output low and chassis ground is 100 volts.

LOAD REGULATION . . . . . (See load regulation chart in Figure 1-3.)

SPECIFICATIONS

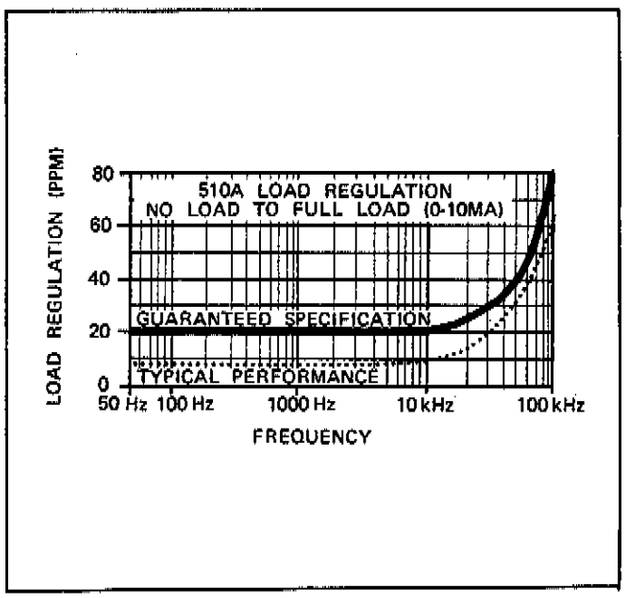


Figure 1-2. TOTAL HARMONIC DISTORTION

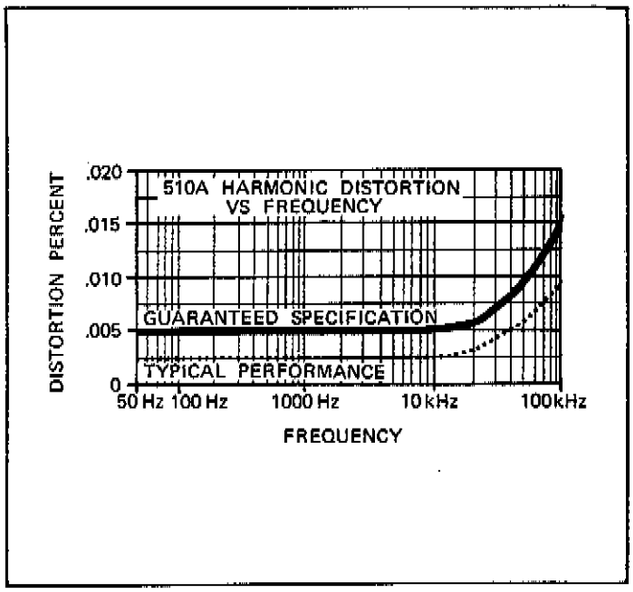
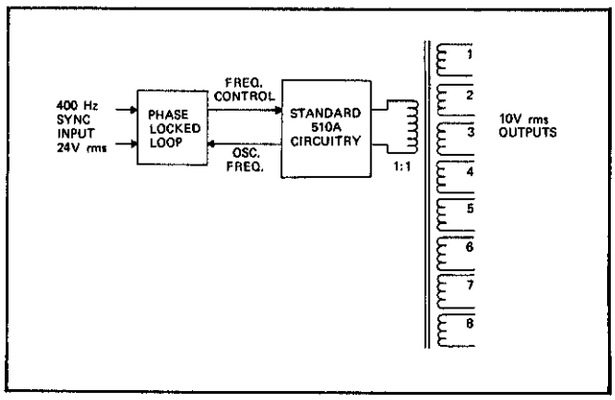


Figure 1-3. LOAD REGULATION

LINE REGULATION	< 10 ppm, ±10% line change
OUTPUT CONNECTIONS	High, Low and Chassis binding posts on front and rear panels.
UNCALIBRATED INDICATION	Front panel display labeled "UNCAL" indicates when load exceeds 10 mA.
ENVIRONMENTAL	
Operating Temperature Range	0°C to 50°C
Storage Temperature	–40°C to +75°C; –40°C to +60°C with batteries
Humidity Range	Up to 80% relative humidity, 0°C to 35°C Up to 70% relative humidity, 35°C to 50°C
Shock	20g, 11 millisec half-sine wave
Vibration	4.5g, 10 Hz – 55 Hz
Altitude	0 to 10,000 feet – Operating 50,000 feet – Non-Operating
INPUT POWER 115/230V ac ±10%, 50 – 500 Hz, Single Phase	An optional rechargeable battery pack will power the AC Reference Standard for 16 hours. The battery pack is field installable.
SIZE	3–1/2" high x 4–1/4" wide x 12" deep (8.8 x 10.7 x 30.4 CM) (2.26 kg)
MOUNTING	Up to four 510A's can be mounted side by side and installed in a standard 19" EIA rack with optional accessory ears.

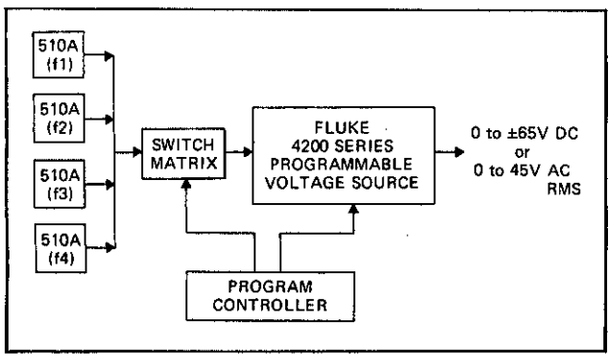
APPLICATIONS



PHASE LOCKED AC REFERENCE STANDARD

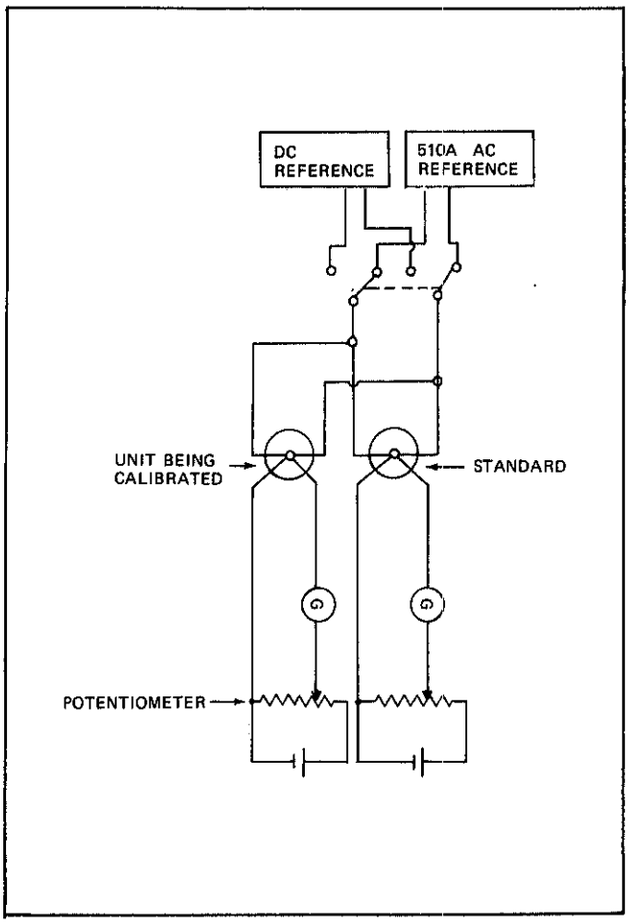
For accurate frequency synchronization and multiple outputs, a standard 510A can be modified to phase lock to an external signal source. The block diagram above shows the Model 510A/AA, designed to synchronize with an external 400 Hz signal and provide eight transformer coupled outputs. Programmable phase reversal at each of the eight outputs is also provided. Typical specifications for the 510A/AA are as follows:

Frequency:	400 Hz ±5% (other frequencies can be specified)
Output Voltage:	10V rms (eight outputs, transformer coupled)
Output Accuracy:	±0.1%
Output Phase Relationship:	0° ±1° or 180° ±1° (programmable)
Total Harmonic Distortion:	0.2%
Phase Lock Capture Range:	±5% about center frequency
Sync Input Voltage:	24V rms
Voltage:	



PRECISION AC SOURCE FOR AUTOMATIC TEST SYSTEMS

The Model 510A may be used as a reference standard for self calibration and verification of the ac measuring components within an automatic test system. When used as an external reference for any of the Fluke 4200 Series programmable voltage sources, precise ac voltages from 0 to 45 volts rms and current levels up to 0.7 amps rms can be supplied to the unit under test. Overall system accuracies of ±0.02% can be achieved for frequencies up to 5 kHz. Send for the 4200 Series data sheets or contact your Fluke representative for further information.



THERMAL CONVERTER CALIBRATION

The excellent short term stability of the Model 510A allows easy comparison and calibration of ac/dc thermal converters without the need of complex bridge comparators. With the 510A and a stable dc source, the above schematic approach may be used to achieve high sensitivity at the galvanometer for fast and accurate thermal converter calibration.

ORDERING INFORMATION: The 510A can provide only one fixed frequency. Eight standard frequencies are identified by option numbers –02 through –09. Any other single frequency can be provided on special order for an additional charge of $50. The 510A with the rechargeable battery pack is identified as 510A-01. When ordering battery pack separately for field installation, suffix the –01 with a "K," e.g. 510A-01K.

To order a standard frequency with no battery pack, specify the model and option, e.g. "510A-04, 400 Hz AC Reference Standard." To order a standard frequency with the battery pack option, drop the leading zero on the frequency option number and suffix the second number to the –01, e.g. "510A-014" identifies a 400 Hz frequency model with rechargeable battery pack. A special frequency should be identified with specific nomenclature, e.g. "Model 510A (or 510A-01 if a battery is required) with a special frequency of 24.8 kHz."

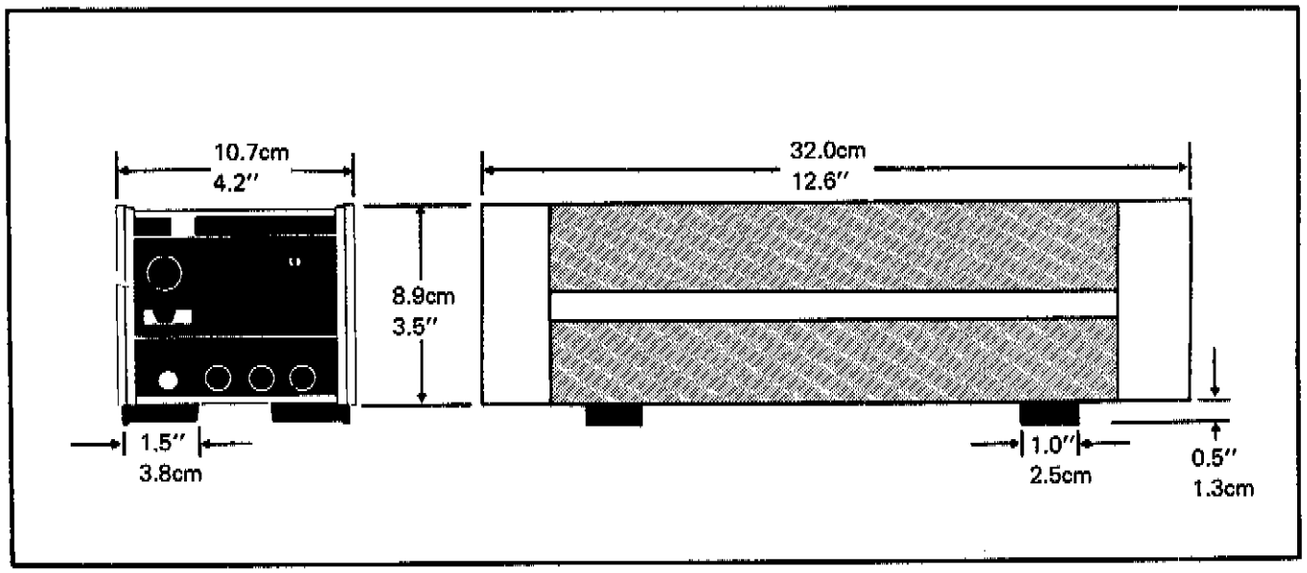
PRICE:

510A	AC Reference Standard	$ 495.00
510A–01	AC Reference Standard with Rechargeable Battery Pack . .	$ 595.00
Option –01K	Field Installable Battery Pack Kit	$ 100.00

One of the following standard frequency options are provided at no charge. Special frequencies may be ordered for an additional charge of $ 50.00.

Option –02	50 Hz	Option –06	2,400 Hz
Option –03	60 Hz	Option –07	5,000 Hz
Option –04	400 Hz	Option –08	19,200 Hz
Option –05	1,000 Hz	Option –09	100,000 Hz

Rack Mounting Accessory Kit for one 510A; M03-201-601	$ 40.00
Rack Mounting Accessory Kit for two 510A's; M03-201-603	$ 40.00
Rack Mounting Accessory Kit for three 510A's; M03-206-604	$ 40.00
Rack Mounting Accessory Kit for four 510A's; M03-205-605	$ 40.00



OUTLINE DRAWING