

Portable signal source for  
calibrating electronic equipment  
and machinery monitoring  
systems.

# 1510A PRECISION SIGNAL SIMULATOR

- Voltage Signals
- Charge Signals
- Machinery Speed Signals
- Dual outputs
- Direct Digital Synthesis
- Wide Frequency range
- 40 Built-in memories
- Sweep Generator
- Battery powered



# Achieve the highest accuracy with the most advanced calibrator ever offered

Inspired by the popular 1500CS, the New 1510A Precision Signal Simulator from MTI Instruments combines high precision voltage and charge mode signal generation in a single portable device with new features. Use the 1510A in the laboratory, in test cells, on the flight line, in the calibration shop, on the factory floor or any place that precision signals are required for equipment maintenance or calibration. Initially designed for machinery and gas turbine maintenance, the 1510A produces accurate and precise voltage, charge, and speed signals necessary for system testing and calibration. In addition to being easy to use, the portable 1510A has a large internal memory to store and recall frequently used settings. The 1510A also features a USB interface to allow remote control and programming of the unit.

**DIRECT DIGITAL SYNTHESIS** - The 1510A combines the precision of Direct Digital Synthesis with an effective 20 bit digital-to-analog accuracy to provide state-of-the-art performance.



**PRECISION SIGNALS** - The 1510A provides voltage and charge signals with accuracies to 0.05% - rarely found even in high-cost laboratory instruments.

**DUAL CHANNEL OUTPUT** - The 1510A features two independent signal output channels. Set them for different output levels, wave shapes, frequencies, and phase. For other testing needs you can synchronize the two channels. This unique capability and flexibility makes testing and calibration fast and easy.

**FULL FUNCTIONALITY** - The 1510A produces SINE, SQUARE, TRIANGLE, and PULSE waveforms from 0.1 HZ to 100KHz in 0.1 Hz increments. Output levels can range from 1  $\mu$ volt up to 10 volts peak and can also include programmable DC offsets in 0.1 millivolt steps.

**THERMAL COMPENSATION** - The 1510A features automatic thermal compensation to ensure accuracy in laboratory, control room and factory environments.

**PRECISION CHARGE SIGNALS** are produced by the 1510A. Differential and single-ended signals are produced to simulate accelerometers and other charge mode devices.

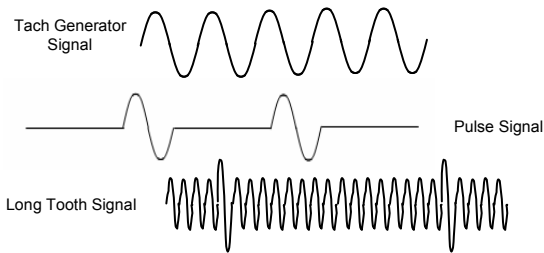


*The 1510A provides unsurpassed features and capabilities for calibration and repair personnel*

# Special functions for machinery and instrumentation systems

Testing and calibrating machinery monitoring and control systems is difficult when vibration, speed and other signals must be simulated simultaneously. The 1510A has two output channels to simplify your testing and calibration processes, and they may be synchronized or run independent of each other. Special tachometer and signal phase functions enable versatile test strategies to check balancing systems, gas turbine engine monitoring systems, and other machinery support equipment.

**SPEED SIGNAL GENERATION** is a snap with the 1510A. Machinery speed signals from tachometer generators, multi-tooth gears and even odd tooth generators are easily produced. The signals can also be generated at a fixed ratio of the other signal channel to produce true machinery vibration and speed signals.

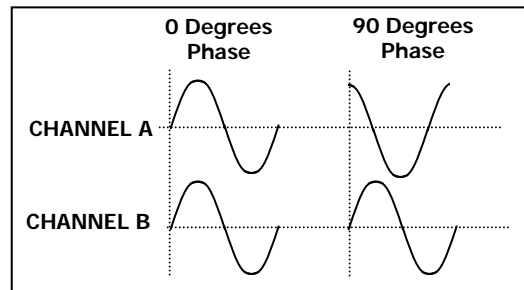


**SYNCHRONIZED SWEEPS** are useful when testing a variety of system performance parameters. Set the START frequency, the STOP frequency, the sweep TIME, and press GO.

**THE LOW VOLTAGE BRIDGE** mode is a unique feature of the 1510A that generates accurate low voltages to simulate bridge type sensors. With 24-bit closed loop control, you can easily command MICROvolts for measurement system testing and calibration.



**VARIABLE PHASE** between the two outputs signals is easily adjusted using the 1510A controls. Use this feature to calibrate balancing and other data acquisition systems.



**CHARGE OUTPUT** is used to simulate the signals from piezoelectric accelerometers. Either Single-ended or Differential signals are available to calibrate and test vibration circuits in machinery monitoring systems. A wide range of charge signals may be produced at constant and varying frequencies.

**THE JOG FUNCTION** is a unique feature of the 1500CS that permits small changes to many of the control parameters. Use the JOG feature to slowly vary the signal frequency to determine filter response or vary the signal amplitude in increments to determine system gain.

*Remarkable functionality and accuracy in an easy to use instrument*

# Designed to improve productivity

The 1510A is a tool that improves productivity as well as ensuring equipment and system accuracy. From the high visibility protective boot and the internal signal setting memory to the easy to use keyboard interface, the 1510A has features to make the job easier.



**MEMORY for PRODUCTIVITY** - All signal settings can be saved and retrieved from the 1510A's 40 location memory to reduce programming and test time, and to ensure test repeatability.

**PORTABLE** - The 1510A can be used anywhere. It is small, lightweight, portable, and operates from internal NiMH batteries or the included charger/power supply.

**DESIGNED FOR RUGGED USE** - The 1510A is designed for the factory and shop environment. The spill-proof keypad, the bright protective boot and the back-lighted display all make the 1510A reliable in the toughest working environments.

**EASY TO USE** - The 1510A guides users through the process of programming the instrument. All settings including signal type, amplitude, and frequency are defined using the keypad. "Soft" function keys on the keypad assume different functions depending upon the mode of operation lending added flexibility to the instrument.



## Support Accessories

The 1510A is complimented by a number of accessories designed to ease the task of calibrating and testing your equipment. Included in the list of accessories is a software package specifically developed to help you program and control your 1510A.

**DIGITAL CONTROL INTERFACE** - The 1510A includes a USB interface. Optional software allows setup, operation, maintenance and calibration of the unit via this port.

**CONNECTION CABLES** - Several different cables are available for connecting directly to charge amplifiers, and other machinery monitoring equipment. Consult with your MTI Instruments representative for all available options.



*Bring the calibration lab to the equipment with the 1510A*

# 1510A Specifications, Pg 1 of 2

## Channel A

### Waveform: Sine Wave

Voltage Range	0 to 9.9999 Volts pk
(0.1 Hz to 100 kHz)	
Voltage Accuracy (of setting, 10mV -10V)	
(10Hz-20Hz)	0.15%±0.1mV
(20Hz-30kHz)	0.05%±0.1mV
(30kHz – 50kHz)	0.07%±0.1mV
(50kHz – 80kHz)	0.08%±0.1mV
(80kHz – 100kHz)	0.10%±0.1mV
Charge Range	1 to 9,999.9 pC pk
(10 Hz to 100 kHz)	
Charge Accuracy (of setting)	
(10pC –10,000pC, 10Hz-30kHz)	0.20%±0.1pC
Resolution (voltage & charge)	0.1mV or 0.1 pC
Level Types	RMS, peak or pk-pk units
Frequency Range	0.1 Hz - 99,999.9 Hz
Distortion	
(10 Hz to 50 kHz)	<0.75%
(50 kHz to 100 kHz)	<3.00%
Frequency Accuracy (of setting)	
(3 Hz to 100 kHz)	±0.005%
Variable phase (all waveform types)	0 to 360°

Chan A phase on any waveform type can be synchronized and locked to Chan B phase, at any phase setting 0-360°, Step 1°.

In Sweep mode, Chan A & Chan B can be swept together, preserving phase relationship.

### Waveform: Square Wave

Voltage Range	0 to 9.9999 Volts pk
Charge Range	0 to 9,999.9 pC pk
Resolution (voltage & charge)	0.1mV or 0.1 pC
Level Types	RMS, peak or pk-pk units
Frequency Range	0.1 Hz - 20 kHz
Frequency Accuracy (of setting)	
(3 Hz to 100 kHz)	±0.005%
Rise/Fall Time	
(10% - 90%)	≤3.0 μsec.
Asymmetry	Less than 3% at 10 kHz
Overshoot	Less than 2%
Voltage Accuracy (of setting)	0.1% typical, 0.25% max

### Waveform: Triangle Wave

Voltage Range	0 to 9.9999 Volts pk
Charge Range	0 to 9,999.9 pC pk
Resolution (voltage & charge)	0.1mV or 0.1 pC
Level Types	RMS, peak or pk-pk units
Frequency Range	0.1 Hz - 20 kHz
Frequency Accuracy (of setting)	
(3 Hz to 100 kHz)	±0.005%
Voltage Accuracy (of setting)	0.1% typical, 0.25% max

### Waveform: Saw-Tooth Wave

Voltage Range	0 to 9.9999 Volts pk
Charge Range	0 to 9,999.9 pC pk
Resolution (voltage & charge)	0.1mV or 0.1 pC
Level Types	RMS, peak or pk-pk units
Frequency Range	0.1 Hz - 20 kHz
Frequency Accuracy (of setting)	
(3 Hz to 100 kHz)	±0.005%
Voltage Accuracy (of setting)	0.1% typical, 0.25% max

### DC Output (and DC offset)

Voltage Range	±9.9999 VDC
Voltage Accuracy (of setting)	0.05%±0.1mV
Resolution	0.1 mV

DC voltage can be generated alone or simultaneously with AC signal to simulate offsets

### Microvolt DC Output – Bridge Mode

Voltage Range	±1 μvolt to ±99.999 mVDC
Voltage Accuracy (of setting)	0.05% ±5 μvolt
Resolution	0.1 μvolt

Bridge mode operates under 24-bit closed-loop control to ensure accuracy for testing of strain gage and other low-level bridge circuits.

### Output Connectors

Connector Impedance	50 ohms
Voltage	BNC coaxial
Differential Charge (DE)	MS3102A-10SL-3P
Single-ended Charge (SE)	50 Ohm 10-32 MicroDot coaxial

## Channel B

### Standard signal types

(for speed synthesizer signals, see next page)

### Waveform: Sine Wave

Voltage Range	0 to 9.9999 Volts pk
(0.1 Hz to 100 kHz)	
Voltage Accuracy (of setting, 10mV -10V)	
(10Hz-20Hz)	0.15%±0.1mV
(20Hz-30kHz)	0.05%±0.1mV
(30kHz – 50kHz)	0.07%±0.1mV
(50kHz – 80kHz)	0.08%±0.1mV
(80kHz – 100kHz)	0.10%±0.1mV
Resolution	0.1mV
Level Types	RMS, peak or pk-pk units
Frequency Range	0.1 Hz - 99,999.9 Hz

Chan. B frequency can also be set and locked to any ratio of Chan.A.  
Refer to Speed synthesizer specifications.

Distortion	
(10 Hz to 50 kHz)	<0.5%
(50 kHz to 100 kHz)	<3.0%
Frequency Accuracy (of setting)	
(3 Hz to 100 kHz)	±0.005%
Variable phase (all waveform types)	0 to 360°

Chan A phase on any waveform type can be synchronized and locked to Chan B phase, at any phase setting 0-360°, Step 1°.

In Sweep mode, Chan A & Chan B can be swept together, preserving phase relationship.

### Waveform: Square Wave

Voltage Range	0 to 9.9999 Volts pk
Charge Range	0 to 9,999.9 pC pk
Resolution (voltage & charge)	0.1mV or 0.1 pC
Level Types	RMS, peak or pk-pk units
Frequency Range	0.1 Hz - 20 kHz
Frequency Accuracy (of setting)	
(3 Hz to 100 kHz)	±0.005%
Rise/Fall Time	
(10% - 90%)	≤3.0 μsec.
Asymmetry	Less than 3% at 10 kHz
Overshoot	Less than 2%
Voltage Accuracy (of setting)	0.1% typical, 0.25% max

### Waveform: Triangle Wave

Voltage Range	0 to 9.9999 Volts pk
Charge Range	0 to 9,999.9 pC pk
Resolution (voltage & charge)	0.1mV or 0.1 pC
Level Types	RMS, peak or pk-pk units
Frequency Range	0.1 Hz - 20 kHz
Frequency Accuracy (of setting)	
(3 Hz to 100 kHz)	±0.005%
Voltage Accuracy (of setting)	0.1% typical, 0.25% max

### Waveform: Saw-Tooth Wave

Voltage Range	0 to 9.9999 Volts pk
Charge Range	0 to 9,999.9 pC pk
Resolution (voltage & charge)	0.1mV or 0.1 pC
Level Types	RMS, peak or pk-pk units
Frequency Range	0.1 Hz - 20 kHz
Frequency Accuracy (of setting)	
(3 Hz to 100 kHz)	±0.005%
Voltage Accuracy (of setting)	0.1% typical, 0.25% max

### Output Connectors

Impedance	50 ohms
Connector	BNC coaxial

Operating range temperature is 0-50°C.

Specifications are stated at 25°C under open load conditions, after minimum 30 minute warm-up.

**Accuracy specifications** are expressed in terms of ranges, which leads to points of discontinuity in the specified performance. At such points of discontinuity, the wider tolerance applies.

**Performance** is verified with measurement instrumentation that is traceable to N.I.S.T., having a TAR (Test Accuracy Ratio) of at least 4:1, although that is not guaranteed for all settings.

**Bridge Mode Microvolt DC Signal:** accuracy is based on use of RG58/U coaxial cable, 2 ft long, non-RoHS composition. **NOTE:** Connector metallic dissimilarity can cause false readings at low microvolt signal levels.

**Specifications are subject to change without notice.**

## Channel B Speed Synthesizer Signals

### Ratio Speed Signal Function

Signal Type	Sine, Square, Single pulse, Odd Pulse
Signal Range	0 to 9.9999 Volts Pk
Resolution	0.1 mV
Frequency Range (ratio)	0.1 to 100X Chan A frequency, Step 0.1
Units	RMS, peak, or pk-pk

### Single Pulse Signal Function

Signal Type	1-cycle sine or ½ cycle square (TTL)
Signal Range	0 to 9.9999 Volts Pk
Resolution	0.1 mV
Pulse Duty Cycle	3% to 100%
Frequency Range (ratio)	0.1x to 100x Ch. A frequency, Step 0.1
Frequency Range (fixed)	1Hz to 100kHz
Units	RMS, peak, or pk-pk

### Odd Pulse Signal Function

Odd Pulse Type	Long or Short
Odd Pulse Size	0 to 99% of Base Pulse
Number of Base Pulses between Odd Pulse	1 - 100
Frequency Range (ratio)	0.1x to 100x Ch. A frequency, Step 0.1
Frequency Range (fixed)	1 Hz to 99,999.9 Hz
Range	0 to 9.9999 Volts Pk
Resolution	0.1 mV
Voltage Units	RMS, peak, or pk-pk
Waveform	Sine wave

### Sweep Function (Channels A & B)

Sweep time	1 to 999 sec (16.67 min)
Sweep time Step	1 Second

#### User Controls:

- Set START Frequency
- Set STOP Frequency
- Set SWEEP time (seconds)
- GO
- PAUSE
- CANCEL

Channels A alone or A & B together

*Chan B can be swept synchronously with Chan A, if Chan B frequency is set to any Ratio of Chan A frequency.*

*Phase between Chan A and Chan B is preserved during sweep.*

## Other Features

### Controls and features

User Display	Graphical, 128x64 pixel, B&W transfective LCD white backlight
Computer Port	USB 1.0 for remote control, programming, and calibration
Battery Charger Port	USB-A Connector For battery charging and operation. 115/230VAC power

### Key Pad Functions

Numbers	0 through 9
Function Keys (soft keys)	4 (functions change depending upon operating mode)
On/Off	Momentary Hold "soft" button
Set-Up Memory	40 locations to save settings for all outputs and functions
Memories (non-volatile)	Save program setups (any combination of instrument settings)

### Dimensions Power

7.5"H x 4.25W x 2.25"D (19cm x 11cm x 5.7cm)
External charger operates from 115/230VAC, 50-60Hz Approx 5 watts.
Battery Pack – NiMH, size AA (qty 4), 2500mAH

Operating range temperature is 0-50°C.

Specifications are stated at 25°C under open load conditions, after minimum 30 minute warm-up.

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