

STANFORD RESEARCH SYSTEMS

SR510

The Stanford Research Systems SR510 is a single-phase analog lock-in amplifier designed for phase-sensitive detection of weak AC signals in high-noise environments. It features a broad operating frequency range from 0.5 Hz to 100 kHz, high dynamic reserve up to 80 dB, integrated tracking band-pass and line filters, and digital control with standard RS-232 and GPIB interfaces.

SPECIFICATIONS

General

Interfaces	GPIB (IEEE-488), RS-232
Display	Analog meter and 4-digit LED display

Physical

Power Supply	100 / 120 / 220 / 240 VAC (selectable), 50/60 Hz, 35 W
Operating Temperature	0°C to 50°C °C
Dimensions (W×H×D)	432 mm × 133 mm × 368 mm mm
Weight	7.3 kg kg

Signal Channel

Input Configuration	Single-ended (A) or differential (A-B)
Voltage Input Impedance	100 M Ω in parallel with 45 pF
Voltage Input Full-Scale Sensitivity Range	100 nV to 500 mV in 1-2-5 sequence
Current Input Full-Scale Sensitivity Range	1 fA to 500 nA
Frequency Range	0.5 Hz to 100 kHz
Voltage Input Noise	7 nV/ $\sqrt{\text{Hz}}$ at 997 Hz (typical)
Current Input Noise	0.13 pA/ $\sqrt{\text{Hz}}$ at 997 Hz (with 10 ⁶ V/A setting), 13 fA/ $\sqrt{\text{Hz}}$ at 997 Hz (with 10 ⁸ V/A setting)
Common Mode Rejection Ratio (CMRR)	100 dB at 100 Hz, decreasing by 6 dB/octave
Dynamic Reserve	Up to 60 dB
Maximum Input Voltage	100 VDC, 10 VAC
Gain Accuracy	$\pm 1\%$ (excluding band-pass filter)
Gain Stability	± 200 ppm/ $^{\circ}\text{C}$
Input Coupling	AC or DC
Input Shield Grounding Options	Float (10 k Ω to chassis) or Ground
Line Notch Filters	50/60 Hz and 100/120 Hz (attenuation > 30 dB)
Tracking Band-Pass Filter	Q = 5, center frequency tracks the reference frequency from 10 Hz to 100 kHz
Dynamic Reserve Modes	Low Noise, Normal, High Reserve
Line Notch Filter Rejection	>30 dB

Reference Channel

Reference Frequency Range	0.5 Hz to 100 kHz
Reference Input Voltage Range	Sine: 100 mV minimum; TTL: 1.6 V threshold
Reference Waveform Requirements	Sine wave or square wave (TTL)
Phase Resolution	0.1 $^{\circ}$
Phase Accuracy	2 $^{\circ}$
Phase Range	360 $^{\circ}$ (with 90 $^{\circ}$ shifts and 0.1 $^{\circ}$ fine steps)
Phase Drift	0.1 $^{\circ}/^{\circ}\text{C}$
Reference Acquisition Time	25 s (at 1 Hz), 2 s (at 10 Hz), 1 s (at 100 Hz to 100 kHz)
Harmonic Detection Capabilities	1f (fundamental) or 2f (second harmonic)
Reference Minimum Input Pulse Width	1 μs
Phase Resolution (Remote Interface)	0.025 $^{\circ}$
Phase Resolution (Front Panel)	0.1 $^{\circ}$

Internal Oscillator

Oscillator Frequency Range	1 Hz to 100 kHz
Oscillator Frequency Resolution	5-decade range selector and continuous dial control
Oscillator Frequency Accuracy	±5%
Oscillator Output Amplitude Range	1 mV to 1 V rms
Oscillator Output Amplitude Resolution	Adjusted via continuous dial control
Oscillator Distortion (THD)	1% THD
Oscillator Output Impedance	600 Ω
Oscillator Output Waveform	Sine
VCO Frequency Drift	150 ppm/°C
VCO Amplitude Drift	500 ppm/°C

Demodulator and Filtering

Time Constant Range	1 ms to 100 s (1-3-10 sequence)
Low-Pass Filter Roll-off Slopes	6 dB/octave or 12 dB/octave
Output DC Drift	<5 ppm/°C (high stability), <50 ppm/°C (normal), <500 ppm/°C (high reserve)

Auxiliary Inputs and Outputs

Auxiliary ADC Inputs	4 channels
Auxiliary ADC Input Voltage Range	±10.24 V
Auxiliary ADC Resolution	13-bit (2.5 mV)
Auxiliary ADC Conversion Time	60 ms
Auxiliary DAC Outputs	2 channels
Auxiliary DAC Output Voltage Range	±10.24 V
Auxiliary DAC Resolution	13-bit (2.5 mV)
Auxiliary DAC Max Output Current	10 mA
Analog Output (Rear Panel)	X analog output (Front Panel, BNC, ±10 V)
Preamplifier Power Port Voltage	±15 VDC
Preamplifier Power Port Current	100 mA

Display and Front Panel

Display Type	Analog meter and 4-digit LED display
Status Indicators	LEDs for overload, reference lock, offset, and scale
Output Offset Range	Up to ±10 V (1000% of full scale)
Output Offset Resolution	0.1% of full scale

Physical and Environmental

Operating Temperature Range	0°C to 50°C
Rack Mounting	19" rack mountable with optional rack ears

Power Specifications

AC Line Voltage Requirements	100, 120, 220, or 240 VAC (selectable)
AC Line Frequency Range	50/60 Hz
Power Consumption	35 W
AC Fuse Rating	0.5 A (100/120 V) or 0.25 A (220/240 V)

Interfaces and External Control

GPIO Interface Support	Standard (IEEE-488)
RS-232 Interface Support	Standard, up to 19.2 kbaud

Signal Input

Current Input Impedance	1 k Ω to virtual ground (100 nA to 500 A), 100 k Ω to virtual ground (100 pA to 50 nA)
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Data Storage

Data Buffer Capacity	2000 points
Data Buffer Sample Rate	1/8 Hz to 512 Hz

Interfaces

RS-232 Baud Rates	300, 1200, 2400, 4800, 9600, 19200 baud
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Outputs

Analog Outputs Output Impedance	<1 Ω
Demodulator Monitor Output Voltage Range	± 10 V
Demodulator Monitor Output Impedance	10 k Ω
CH 1 Output Voltage Range	± 10 V

Auxiliary D/A Outputs

Auxiliary DAC Accuracy	0.1% + 5 mV
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Auxiliary A/D Inputs

Auxiliary ADC Accuracy	0.1% + 5 mV
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TECHNOLOGY

Single-Phase Analog Lock-In Amplifier

APPLICATIONS

Phase-sensitive detection of weak AC signals in high-noise environments

Generated by SpecAtlasHub (specatlashub.com). Specifications are compiled from available sources and are subject to change — verify critical values against the manufacturer before purchase.