LIDA-SRS-KIT Lock-In Digital Amplifier System

The LIDA-SRS-KIT Lock-In-Digital Amplifier system is an effective and easy way to measure optical signals. The system includes our TracQ™ Basic software that acquires spectroscopic measurement data quickly and easily, without requiring any programming knowledge.
The chopper wheel and controller included in the system modulate the optical radiation, a requirement for any lock-in system.

Lock-In Digital Amplifier

The Lock-In Digital Amplifier, when used with an optical chopper, removes background signals through phase sensitive detection. This technique extracts very small signals obscured by noise sources many times larger by locking into the specific modulation frequency of a desired signal.

The Lock-In Digital Amplifer provides high performance at a reasonable cost. Features include:

- High resolution frequency control
- Voltage or current input
- Wide range of time constant settings
- Internal or external reference frequency source
- RS232 and GPIB (IEEE 488.2) interfaces
- Automatic settings for gain, phase, reserve and offset

Loading the wavelength spectral responsivity information provided with a calibrated detector into the software will enable optical power measurements.

What Makes Up the LIDA System

- SR810 Lock-In Digital Amplifier
- TracQ Basic Spectroscopy Software
- Optical Chopper Enclosure
- Chopper Controller
- 4 Chopper Wheels

Key Benefits

- Detects signals from UV to IR
- Performs radiometry measurements with TracQ™ Basic software
- Measures small signals by improving signal-to-noise ratio
- Removes background signals
- Acquires, processes, and displays data in real time
- Allows optical chopper frequency selection

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Optical Chopper

The chopper modulates the measured optical radiation. The chopper wheel mounts inside an enclosure, providing control and safety. The beam can be contained by using the Oriel standard 1.5 inch flanges. Containing the beam eliminates scattering and prevents detector saturation from continuous (not chopped) background light. The enclosure keeps fingers away from the spinning blade.

The chopper wheels included with the system operate at user-selectable frequencies of 2 to 100 Hz, wheel dependent. By enabling the user to select a specific chopping frequency, the experiment can be optimized based on particular conditions. The optimal frequency for an experiment is based on the sensitivity of the specific type of detector. A higher chopping frequency allows the system to follow faster changing signals. If necessary, a specific frequency selection removes power line generated noise from the system.

The chopper controller regulates the frequency using an internal reference or an external reference signal. The lock-in digital amplifier acts as a frequency driver for the chopper controller. The reference signal also enables the chopper wheel to be used as a slow speed shutter. The frequency is easily set through the TracQ Basic software. The chopper can be stopped in the fully open or closed position by using the controller's front panel interface or a TTL signal. These control features greatly simplify setup and debugging of a fully enclosed system.

Detectors

A broad selection of detectors are compatible with this system, allowing measurements of optical radiation from UV to IR. Each LIDA detector design includes an integrated amplifier. All models except pyroelectric include selectable gain and time constant switches. The LIDA detectors include all cables necessary to perform measurements. A special cable is included with each LIDA detector, providing power from the system to the built-in detector amplifiers.
The LIDA system also supports other detectors, both amplified and unamplified, with a BNC output connector. The 70710 Preamplifier used with an unamplified detector converts the signal from current to voltage. This option takes advantage of the LIDA system's greater dynamic range for voltage readings.

LIDA Detectors	Usable Wavelength Range
Silicon	200 to 1100 nm
Ge	700 to 1800 nm
Pyroelectric	200 nm to 40 um

Specifications

Signal Channel	
Number of channels	1
Voltage inputs	Single-ended or differential
Sensitivity	2 nV to 1 V
Current input	10^6 or 10^8 V/A
Input impedance	
Voltage input	10 MΩ + 25 pF, AC or DC coupled
Current input	1 kΩ to virtual ground
Gain accuracy	±1 % (±0.2 % typ.)
Noise	6 nV/√Hz at 1 kHz, 0.13 pA/√Hz at 1 kHz (10^6 V/A), 0.013 pA/√Hz at 100 Hz (10^8 V/A)
Line filters	50/60 Hz and 100/120 Hz (Q=4)
CMRR	100 dB at 10 kHz, decreasing by 6 dB/oct above 10 kHz
Dynamic reserve	>100 dB (without prefilters)
Stability	<5 ppm/°C
Reference Channel	
Frequency range	0.001 Hz to 102.4 kHz (2 to 100 Hz with included chopper wheels)
Reference input	TTL or sine (400 mVpp min.)
Input impedance	1 MΩ, 25 pF
Sensitivity	LSB on A/D
Phase resolution	0.01° front panel, 0.008° through computer interfaces
Absolute phase error	<1°
Relative phase error	<0.001°
Orthogonality	90° ± 0.001°
Phase noise	
Int. reference	Synthesized, <0.0001° rms at 1 kHz
Ext. reference	0.005° rms at 1 kHz, 100 ms, 12 dB/oct
Phase drift	<0.01°/°C below 10 kHz, <0.1°/°C, 10 kHz to 100 kHz
Harmonic detection	2F, 3F, ... nF to 102 kHz (n < 19,999)
Acquisition time	(2 cycles + 5 ms) or 40 ms, whichever is greater
Demodulator	
Stability	Digital outputs and display: no drift. Analog outputs: <5 ppm/°C for all dynamic reserve settings.
Harmonic rejection	-90 dB
Time constants	10 µ s to 30 ks (6, 12, 18, 24 dB/oct rolloff). Synchronous filters available below 200 Hz.
Internal Oscillator	
Range	1 mHz to 102 kHz
Accuracy	25 ppm + 30 µ Hz
Frequency resolution	4½ digits or 0.1 mHz, whichever is greater
Distortion	-80 dBc (f <10 kHz), -70 dBc (f >10 kHz) @ 1 Vrms amplitude
Amplitude	0.004 to 5 Vrms into 10 kΩ (2 mV resolution), 50 Ω output impedance, 50 mA maximum current into 50 Ω
Amplitude accuracy	1%
Amplitude stability	50 ppm/°C
Outputs	Sine, TTL (When using an external reference, both outputs are phase locked to the external reference.)
Displays	
Channel	4½-digit LED display with 40-segment LED bar graph. X, R, X-noise, Aux 1 or Aux 2. The display can also be any of these quantities divided by Aux 1 or Aux 2.
Offset	X, Y, R can be offset up to ±105 % of full scale.
Expand	X, Y, R can be expanded by 10× or 100×.
Reference	4½-digit LED display

Specifications (continued)

Inputs and Outputs	
CH1 output	±10 V output of X, R, X-noise, Aux 1 or Aux 2. Updated at 512 Hz.
X, Y outputs	In-phase and quadrature components (rear panel)
Aux. A/D inputs	4 BNC inputs, ±10 V, 1 mV resolution, sampled at 512 Hz
Aux. D/A outputs	4 BNC outputs, ±10 V, 1 mV resolution
Sine Out	Internal oscillator analog output
TTL Out	Internal oscillator TTL output
Data buffer	The SR810 has an 8k point buffer. Data is recorded at rates to 512 Hz and read through the computer interfaces.
Trigger In (TTL)	Trigger synchronizes data recording
Remote pre-amp	Provides power to the preamplifier integrated inside LIDA detectors, using cable Model CBL-70054-LIDA
Interfaces	IEEE-488.2 and RS-232 interfaces standard.
Power Requirements	
Lock-In Digital Amplifer	100/120, 220/240 VAC, 50/60 Hz
Chopper Controller	100/120, 200/240 VAC, 50/60 Hz
Dimensions*	
Lock-In Digital Amplifer	17”W x 5.25”H x 19.5”D [431mm x 133mm x 495mm]
Chopper Controller	8”W x 3.75”H x 12.5”D [203mm x 95mm x 318mm]
Chopper Enclosure	5.5”W x 5.75”H x 3.25”D [140mm x 146mm x 83mm]
Weight*	
Lock-In Digital Amplifer	30 lbs [13.6 kg]
Chopper Controller	7 lbs [3.2 kg]
Cables, CD, manuals	1.5 lbs [0.7 kg]

*Weights and dimensions do not include packing material.

Order Information

Model	Description
LIDA-SRS-KIT-120V	LOCK-IN DIGITAL AMPLIFIER KIT 120VAC
LIDA-SRS-KIT-220V	LOCK-IN DIGITAL AMPLIFIER KIT 220VAC
Detectors	
DET-L-GE-R-C	Germanium, Calibrated
DET-L-GE-T-C	Germanium, Calibrated, Temperature Controlled
DET-L-SIUV-R-C	Silicon, Calibrated
DET-L-SIUV-T-C	Silicon, Calibrated, Temperature Controlled
DET-L-PYC5-R-P	Pyroelectric, 0.45 - 9 um
DET-L-PYK5-R-P	Pyroelectric, 0.6 - 50 um
DET-L-PBS-R-U	Lead Sulfide, 0.7 - 3 um

Model	Description
Cables	
CBL-70054-LIDA	Cable, SR810 Lock-In to Detector
70016	Cable, BNC 2m length
70063	Cable, PBS Detector to Power Supply
Accessories	
70710	Current Preamplifier (standalone)
70703	Lab Power Supply 120VAC (standalone)
70709	Lab Power Supply 220VAC (standalone)

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