

Zurich
Instruments

HF2LI Lock-in Amplifier

2 Input Channel, 2 Generator,
50 MHz Lock-in Amplifier

Product Specification
Release date: August 2014

Key Features

- 210 MSa/s, 0.7 μ Hz - 50 MHz operation
- 2 independent lock-in units, 2 signal generators
- 1 fundamental and 2 harmonics per lock-in unit
- 4 auxiliary outputs, 2 auxiliary inputs
- USB 2.0 high-speed, 480 Mbit/s
- Frequency response analyzer, FFT spectrum analyzer and oscilloscope
- Graphical user interface and programming interfaces included

Summary

The Zurich Instruments HF2LI (high-frequency, 2 inputs) is a digital lock-in amplifier covering the frequency range between 0.7 μ Hz and 50 MHz. It features 2 physical input channels so that it can replace 2 devices in many measurement setups. The 128-bit digital signal processing delivers superior precision thus boosting both the noise performance and the dynamic reserve. With these unprecedented capabilities, the HF2LI brings lock-in amplification to a new level and enables new applications in a frequency range that was previously tied to analog instrumentation.

The computer is connected by a high-speed USB interface, which allows data acquisition at high rates. The HF2LI is delivered with a fully featured graphical user interface and a choice of programming interfaces that greatly add to the usability of the instrument.

Hardware

The HF2LI combines the latest analog front-end circuits, for signal sampling, and high-performance digital signal processors.

High-Precision Inputs

The 2 input paths of the HF2LI are optimized for very low noise operation. The sampling rate of 210 MSa/s is



4-times the analog bandwidth to ensure full capture of the signal and to avoid aliasing.

Signal Outputs

The HF2LI generates 2 high-frequency outputs as a linear combination of up to 6 sinusoids in the range from DC to 50 MHz. The amplitude, frequency, and the phase shift can be set for each component when the HF2LI-MF Multi-frequency option is enabled.

Demodulators and Filters

The HF2LI provides 6 dual-phase demodulators. Each demodulator can be configured with its own filter properties including time constant from 1 μ s to 500 s (corresponding to signal bandwidths from 80 μ Hz to 200 kHz) and filter order from 1st to 8th. The filters are implemented in advanced 128-bit digital architecture. The advantages over common analog instruments are higher dynamic reserve, zero drift, precise phase shifts, and orthogonality.

Integrated Toolset

An integrated oscilloscope with memory for 2048 samples provides direct signal-vs-time and spectral views of the input signal. Users obtain an overview of the incoming and generated signals at any time to quickly find the right settings. A frequency response analyzer provides precise signal-vs-frequency plots. The FFT spectrum analyzer delivers a high-resolution spectral view of the signals demodulated by the lock-in amplifier.

Specifications

General

dimensions	45 x 35 x 10 cm (19" rack)
weight	6.2 kg
power supply	110-120 V, 220-240 V 50/60 Hz

HF signal inputs

frequency range	0.7 μ Hz - 50 MHz
input impedance	50 Ω or 1 M Ω 20 pF
input noise voltage	5 nV/ \sqrt Hz (> 10 kHz)
dynamic reserve	120 dB
input range	\pm 3.3 V
input AC range	\pm 1.5 V (DC coupling)
input full range sensitivity	1 nV to 1.5 V
A/D conversion	14 bit, 210 MSa/s

HF signal outputs

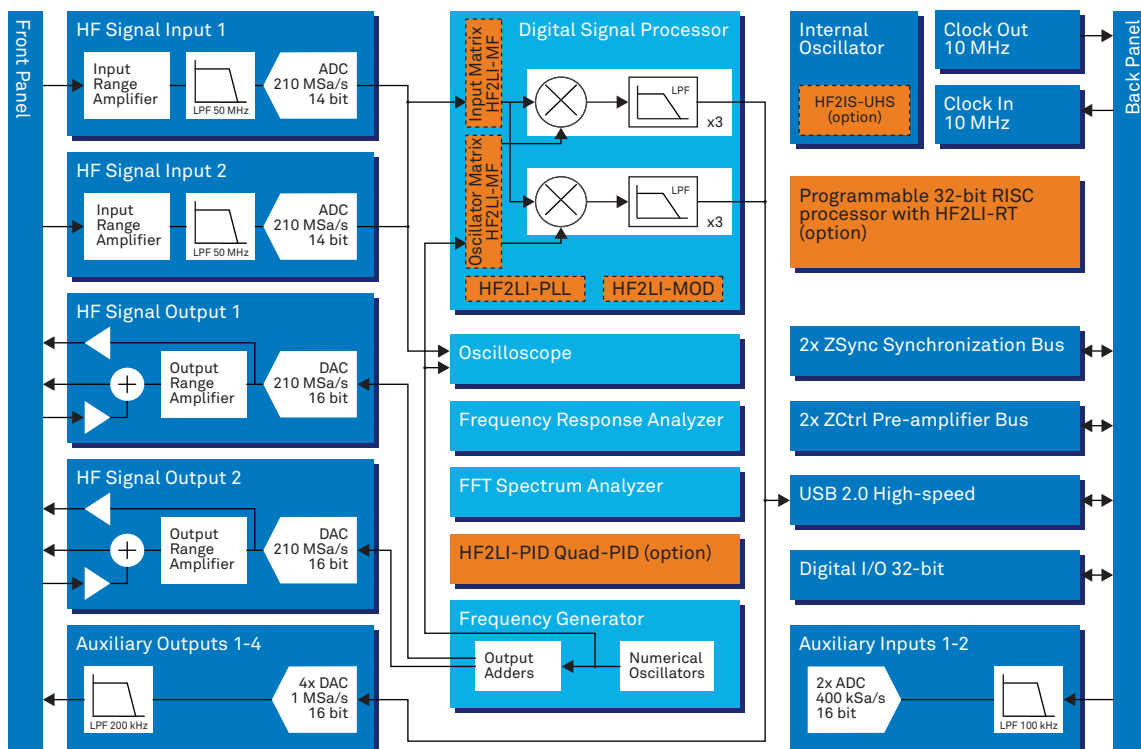
frequency range	DC - 50 MHz
output ranges	\pm 10 mV, \pm 100 mV, \pm 1 V, \pm 10 V
signal adder	\pm 10 V, DC to 50 MHz
D/A conversion	16 bit, 210 MSa/s

Demodulators and reference

number of demodulators	6 dual-phase
output sample rate	USB: up to 460 kSa/s Aux outputs: 1 MSa/s
time constant	1 μ s to 500 s
measurement bandwidth	80 μ Hz to 200 kHz
filter slope (dB/Oct)	6, 12, 18, 24, 30, 36, 42, 48
X, Y, R, θ samples	64-bit full range
reference frequency res.	0.7 μ Hz
reference phase res.	1.0 μ°

Auxiliary and others

high-speed outputs	4 channels, \pm 10V, amplitude, phase, frequency, X/Y, value
D/A converter	16 bit, 1 MSa/s
D/A analog bandwidth	200 kHz
high-speed inputs	2 channels, \pm 10 V
A/D converter	16 bit, 400 kSa/s
A/D analog bandwidth	100 kHz
digital I/O	16 bit input, 16 bit bidirectional, 50 MHz
other interfaces	clock input, USB 2.0, 2x ZCtrl, 2x ZSync



Zurich Instruments
 Technoparkstrasse 1
 CH-8005 Zurich
 Switzerland

Phone +41-44-5150410
 Email info@zhinst.com
 Web www.zhinst.com

About Zurich Instruments
 Zurich Instruments makes lock-in amplifiers, phase-locked loops, and impedance spectroscopes that have revolutionized instrumentation in the high-frequency (HF) and ultra-high-frequency (UHF) ranges by combining frequency-domain tools and time-domain tools within each product. This reduces the complexity of laboratory setups, removes sources of problems and provides new measurement approaches that support the progress of research.

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