Cycle

ESYNC

Electronic Synchronization Unit

Versatile & precise phase and frequency locking electronics

APPLICATIONS

- Synchronization between ultrafast lasers and microwave signals
- Synchronization for pump-probe experiments
- Electronically controlled optical sampling (ECOPS)
- Asynchronous electronic sampling (ASOPS)

BENEFITS

- Less than 100 fs RMS timing jitter
- Advanced fundamental and harmonic frequency lock functionality
- User adjustable delay between locked oscillators
- Automated search and lock mechanism via GUI

DESCRIPTION

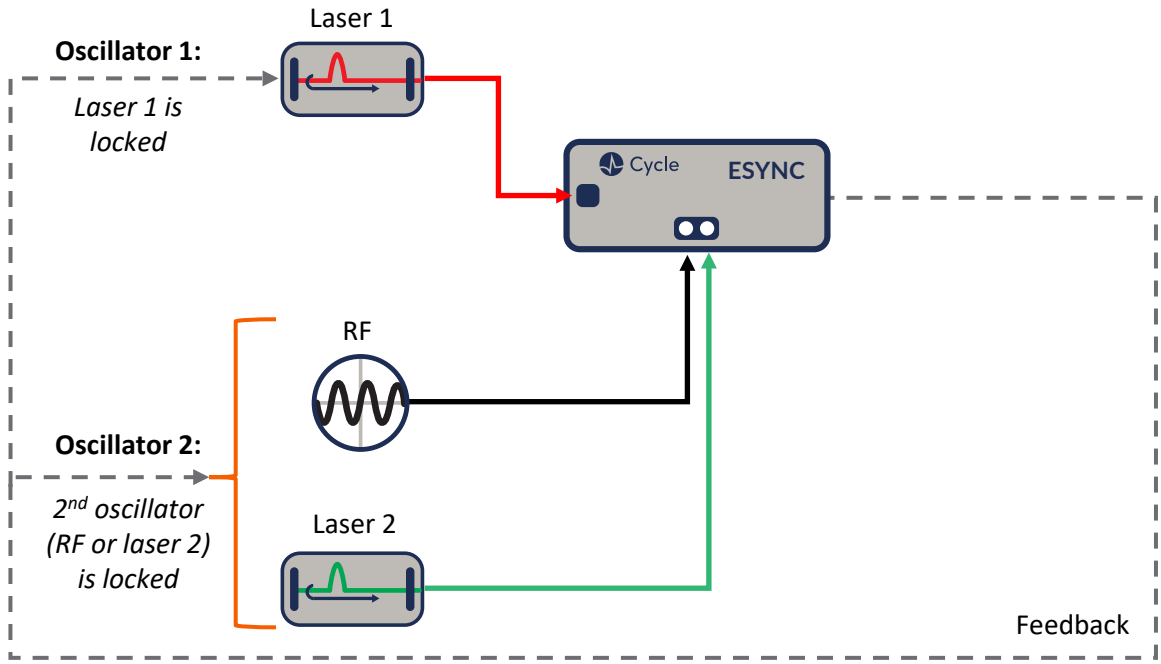
ESYNC features versatile & precise locking electronics to synchronize ultrafast lasers and/or microwave sources with femtosecond precision.

Output signal is a baseband signal that is proportional to the timing error between the two inputs, which in turn can be used in a phase-locked loop configuration to synchronize:

- a laser to a microwave source,
- a microwave source to a laser, or
- two lasers with each other.

ESYNC features a wide range of options including precise harmonic lock, laser stepper control, RF regeneration, external reference inputs (10 MHz / 100 MHz / 1 GHz), ECOPS, ASOPS etc.

SETUP EXAMPLE



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Contact us to discuss your timing and synchronization requirements

SPECIFICATIONS

Parameter	Specification	Comment
Standard device		
Timing jitter	< 500 fs RMS	integrated residual noise [0.1 Hz - 100 kHz][1]
Fund. input frequency	10 MHz – 1.3 GHz	shall be equal to pulse repetition rate in case of a laser
Output PZT voltage range	[0 – 100 V]	dual PZT amplifier outputs (i.e., for fast and slow PZTs)
Adjustable delay range	90% fundamental wave period	e.g., 9-ns range for 100-MHz pulse repetition rate
Dimensions	3 U	19" rack module
Control system interface	EPICS	via TCP/IP
Integrated feedback	Included	applied to a slave laser's actuators
Auto lock	included	via graphical user interface on a computer
Option A: harmonic lock		
Timing jitter	< 100 fs RMS	integrated residual noise [0.1 Hz - 100 kHz][1]
Harm. input frequency	40 MHz – 2.8 GHz	shall be a harmonic (4^{th} to 10^{th}) of the fund. frequency
Adjustable delay range	Full fundamental wave period	e.g., 10-ns range for 100-MHz pulse repetition rate
Option B: laser stepper		
Standard controllers: SMC100, Picomotor, PI C-663. Contact Cycle for other controller interfaces.		
Option C: RF regeneration		
Synchronized RF output	800 MHz – 12 GHz	any frequency output possible in this range
Option D: External reference inputs		
External RF input	10 MHz, 100 MHz, 1 GHz	contact Cycle for other external RF inputs.
Option E: Electronically controlled optical sampling (ECOPS)		
Specifications vary with scan range and resolution, please consult Cycle with your requirements.		
Option F: Asynchronous electronic sampling (ASOPS)		
Specifications vary with scan range and resolution, please consult Cycle with your requirements.		
Option G: Fundamental locking		
Fund. RF lock function to ensure same phase/delay bucket upon resynchronization & automatize an optical lock.		

[1] with appropriate input sources with > 200-MHz frequency, in a thermally controlled environment (temperature +18 to +24°C, with slope < 0.4°C/h and variation < 1°C pk-pk; humidity < 60 %RH with variation < 10 %RH pk-pk).

MEASUREMENT DATA

Out-of-loop timing jitter and drift a laser locked to a RF master oscillator at 2856 MHz.