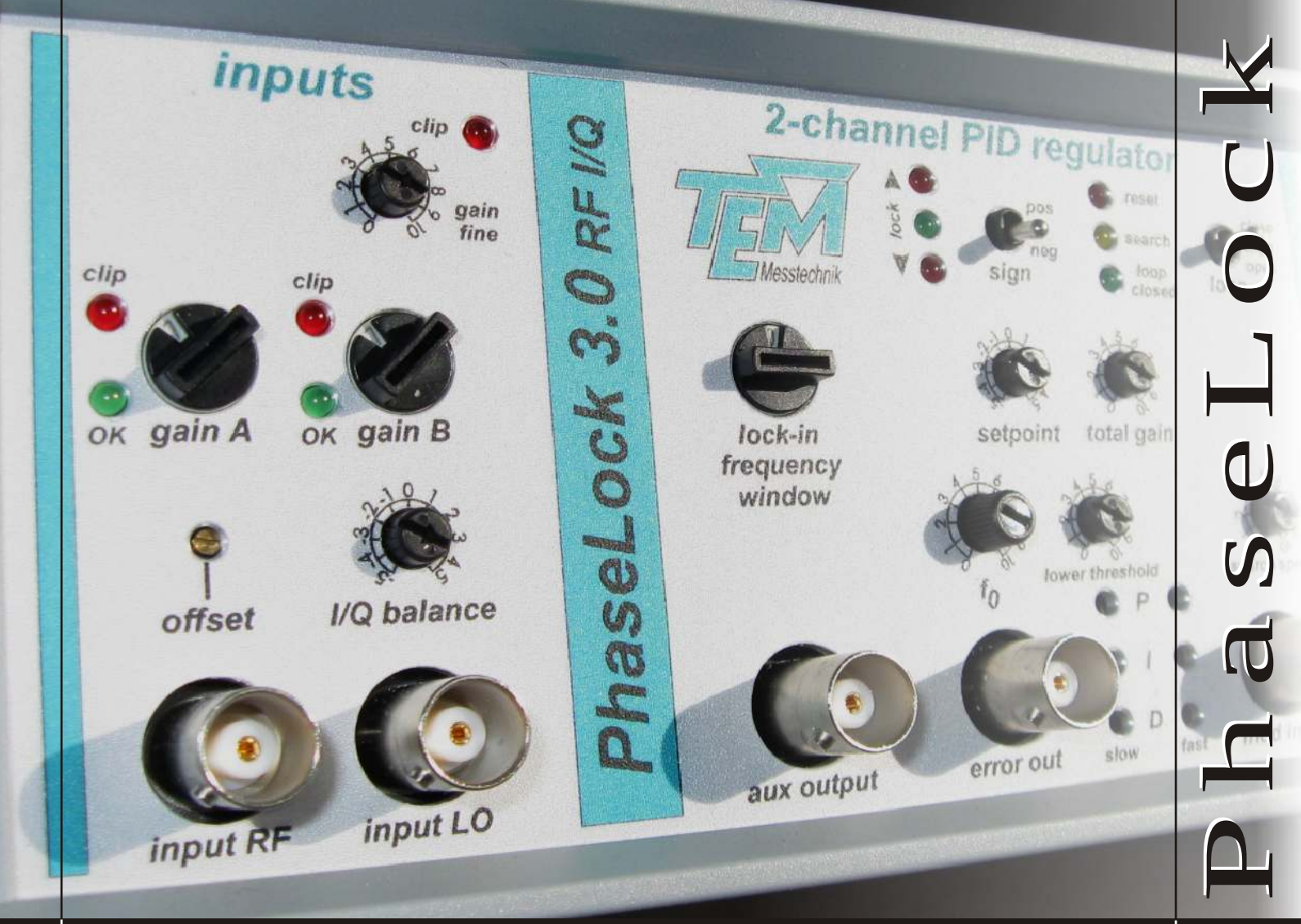


PhaseLock

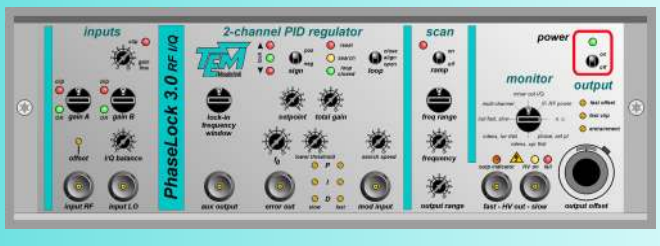
PhaseLock

Universal and compact phase stabilization electronics

- Compact, stand-alone locking electronics for pulsed lasers
- pulse timing stabilization
- 2 independent PID regulators
- High-voltage output for piezo actuators
- Lock point validity detection and automatic "search" function
- Multi-channel monitor for display of regulator signals

Application

- Stabilization of the repetition rate and pulse timing of pulsed lasers
- Phase locking of the optical frequency of continuous lasers
- Control of the pulse envelope phase (carrier offset frequency) of femtosecond lasers
- Stabilization of frequency or phase of electronic oscillators



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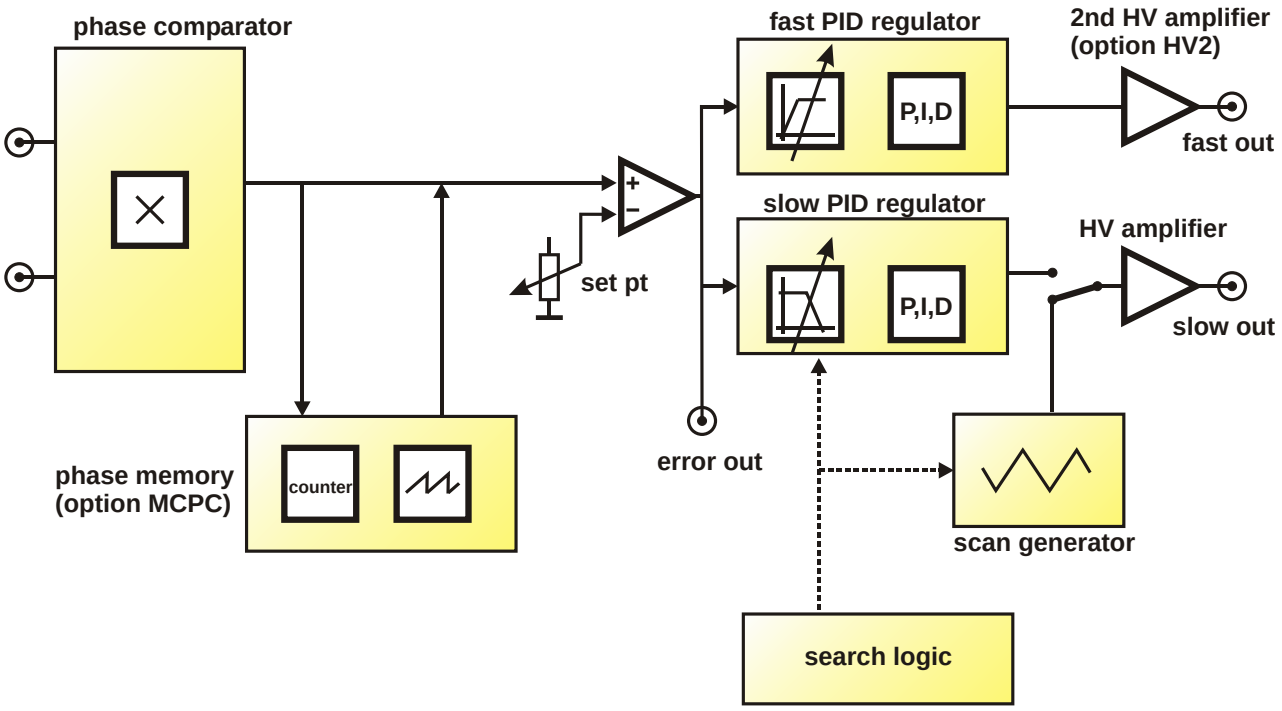
Block diagram

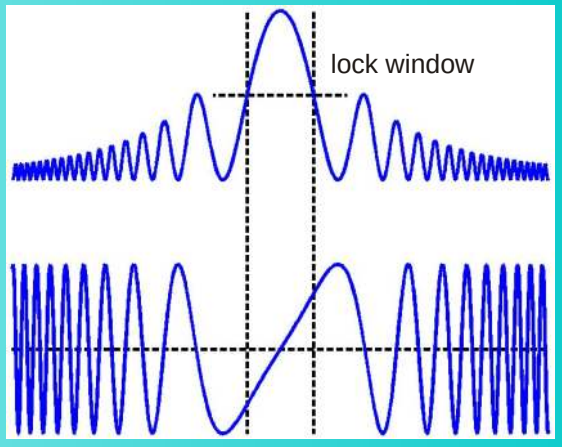


PhaseLock combines all components required or beneficial for this purpose in a user-friendly compact device:

- fast input amplifiers
- phase comparator
- 2 independent PID regulators, adapted especially to resonant systems like piezo-driven optical components
- scan generator, for adjustment or supervision of the physical system
- output amplifier, user-selectable as high-voltage amplifier for piezo actuators, or as low-voltage amplifier generating a control signal for external amplifier sections
- logic section for automatic recognition of successful locking

Signal Diagram

If the frequency difference of the input signals is too large, a simple PID controller would not be able to accomplish the equality of the frequency within one cycle of the intermediate signal. Thus, the control loop would fail to lock then. In order to avoid this problem, the *PhaseLock* is equipped with a discriminator logic: As long as the frequency difference is higher then a preset value, the output voltage ramps through its full range. As soon as the frequency difference is lower than the preset value (“frequency lock window”), the PID loop is closed.



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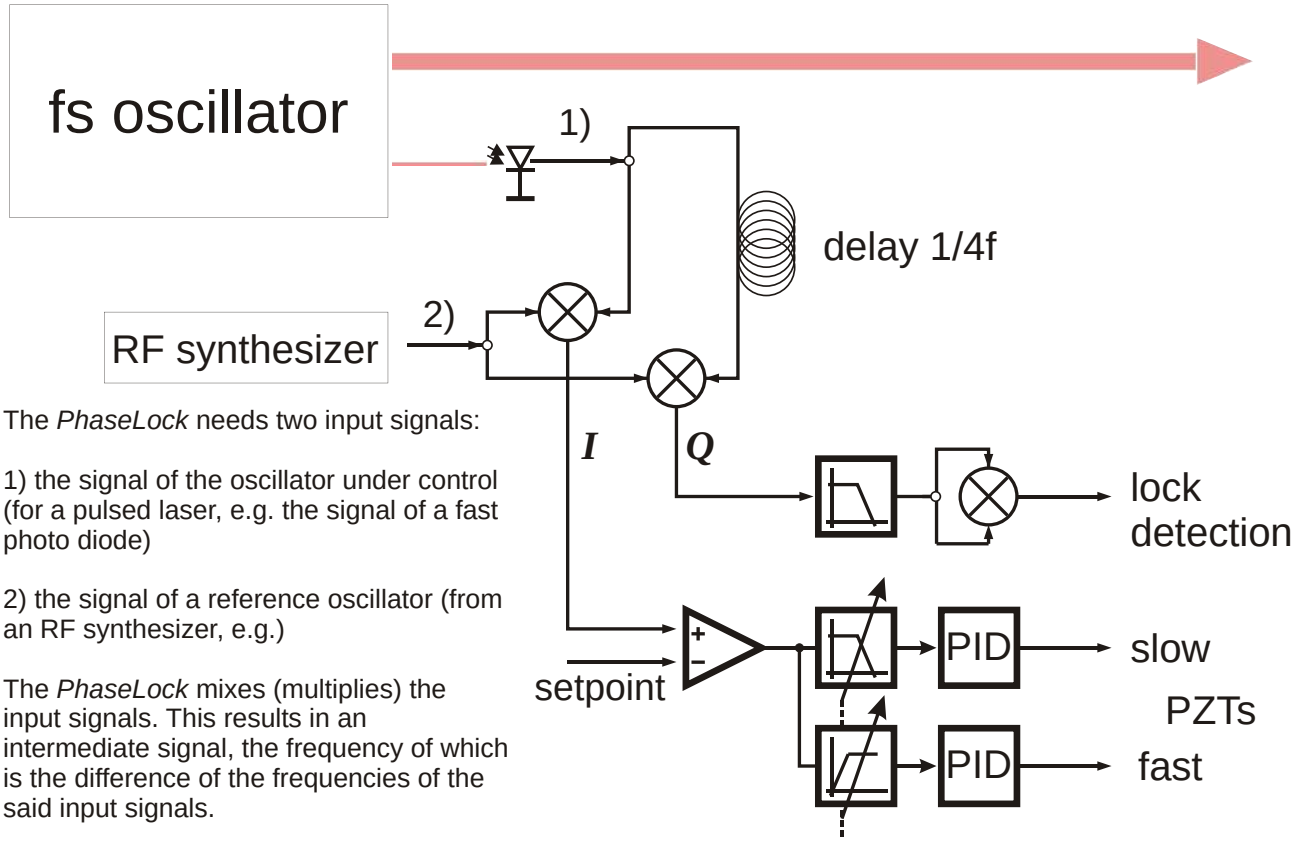
Application Example

The *PhaseLock* compares the phase of an RF input signal with a local oscillator (LO).

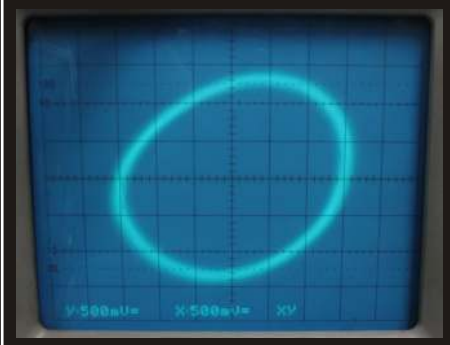


The *PhaseLock* needs two input signals:

1) the signal of the oscillator under control (for a pulsed laser, e.g. the signal of a fast photo diode)

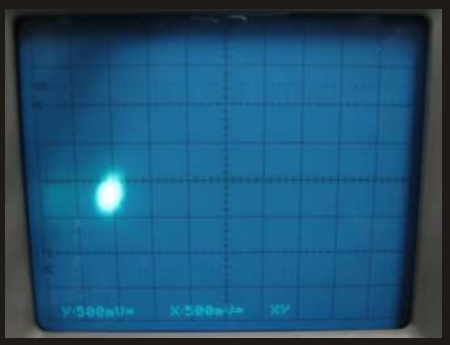
2) the signal of a reference oscillator (from an RF synthesizer, e.g.)

The *PhaseLock* mixes (multiplies) the input signals. This results in an intermediate signal, the frequency of which is the difference of the frequencies of the said input signals.



a) IQ (quadrature) mixer output (while unlocked)

b) Phase memory analog output (while unlocked). The amplitude of 10Vpp corresponds to full 8192 cycles!



c) IQ (quadrature) mixer output when locked

Option MCPC

If phase excursions exceed of +/-π, a conventional RF mixer looses cycles. This results in phase slip, which is sometimes not acceptable. In order to avoid this problem, the *PhaseLock* can be equipped with a phase counter, which acts as a "memory" for lost cycles (option MCPC). The output of this add-on circuit is an analog voltage proportional to the phase difference within a range as large as +/- 8192π. This provides a long time for the PID servo loop to settle, thus enabling phase locks even in diffcult situations in which standard locking schemes would fail.

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PhaseLock

Technical Data

Signal inputs	Impedance: RF Bandwidth	50 Ohm 1GHz
Option MCPC	Phase memory (cycles)	+/-4096·2π
Outputs	HV outputs Scan trigger output Scan monitor output Multichannel monitor	150V, 150mA, BNC TTL +/-10V@1kOhm +/-10V@1kOhm, +/-5V@50Ohm
Lock Detection	Frequency window	switchable +/-33Hz..+/-100kHz
Twin PID regulator	cross-over frequency slow/fast regulator	adjustable from 150 to 8kHz (range is user selectable)
Scan generator	Output frequency	10mHz..10kHz (triangular shape)
Supply	Voltage range	100..120V / 220..240V AC, 50..60Hz
Housing	Dimensions HxWxD	88mmx260mmx373mm

Costumer specific values on request. Subject to change without notice.

Development, Manufacturing and Distribution

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12/2010

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