

D2-125

Laser Servo Controller

The D2-125 laser servo was designed for low-noise servo control of lasers and other experimental systems. The PI^2D loop filter, with two-stage integral feedback, provides tight locking to cavities and atomic/molecular transitions. The D2-125 provides full user control over the loop-filter parameters, which enables servo-loop optimization for a wide variety of plants, such as current tuning, acousto- and electro-optic modulators, voice coils, piezo actuators, etc.

Lock Guard auto relocking function is included with every D2-125 Laser Servo. Lock Guard detects when the servo loop filter has gone out of lock and automatically tries to recapture lock. Lock Guard control parameters are all user adjustable for maximum flexibility and optimized performance.

The Peak Lock option allows the user to lock a laser to the maximum or minimum of an error without the implementation of an external modulator or lock-in amplifier. The Peak Lock option provides an adjustable-amplitude 4 MHz dither that can directly modulate a diode laser or drive an external modulator. The incoming error signal is then demodulated at the same 4 MHz (with adjustable phase), giving the user a first-derivative error signal suitable for PDH locking.



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D2-125 Front Panel



D2-125 Back Panel

Features

- High-bandwidth Laser Current Feedback
- Auxiliary Feedback to temperature or PZT for long-life locks
- Double Integrators to eliminate drift
- Smooth Lockup
- Frequency Jumping and Integrator Blanking
- Internal Ramp Generator
- Highly adjustable PID corner settings
- Lock Guard lock recapturing
- Ramp Centering
- Optional Peak Locking (-PL)
- Optional AC Power In



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D2-125 Specifications

Parameter	Value
General	
Input and Output Impedance ¹	50 Ω
Output Voltage (main and aux)	± 10 V
Input Voltage Noise ²	< 5 nV/ $\sqrt{\text{Hz}}$
DC Offset Range	± 500 mV
Error Input Max Amplitude	± 500 mV
Bandwidth ³	> 10 MHz
Loop Filter	
Proportional Gain (ref to DC Error)	-66 dB to +6 dB
Proportional Gain (ref to Input Error)	-40 dB to +32 dB
First Integrator	Off 10, 20, 50, 100, 200, 500 (Hz) 1, 2, 5, 10, 20, 50, 100, 200 (kHz)
Second Integrator	Off 100, 200, 500 (Hz) 1, 2, 5, 10, 20, 50, 100, 200, 500 (kHz) 1, 2 (MHz)
Differential	Off 500 (Hz) 1, 2, 5, 10, 20, 50, 100, 200, 500 (kHz) 1, 2, 5, 10 (MHz)
Differential Gain	5 dB to 15 dB
Auxiliary Servo Output Gain ⁴	Integral: 500 μs to 5 s

¹ In Peak Lock mode, the 50 Ω to ground is AC-coupled. A measurement of the DC impedance will yield a higher value.

² Additive noise, referenced to input signal.

³ Oscillation frequency when Laser Servo locked to itself in proportional mode.

⁴ Gain referenced to Primary Servo Output.



D2-125 Specifications Continued...

Parameter	Value
Voltage Ramp	
Ramp Amplitude (Max)	±5 V
Ramp Frequency (on main servo output)	500 Hz
Ramp Frequency (on aux servo output)	50 Hz
Ramp Centering Range	±5 V
Peak Lock Only	
Dither Frequency	4 MHz
RF Output Max Amplitude	±75 mV
RF Output Impedance ⁵	50 Ω
Power Supply	
Voltage Input	+5 VDC, ±15 VDC
Power Supply	D2-005 [Internal Power Option Also Available]
Environmental	
Operating Temperature	>15 °C and <30 °C
Humidity	<60%
Dew Point	<15 °C

⁵ Into a 1 MΩ load.