

New Ridge



Technologies

Polarization Control Platform

NRT-2500

Versatile Polarization Platform for multiple lab purposes

Scramble & Randomize Polarization

Set Polarization

Very fast, robust & endless Polarization Tracking

Coherent detection

Polarization De-multiplexing of Dual-Polarization signals

Customizable for new applications





Polarization Control Platform

NRT-2500

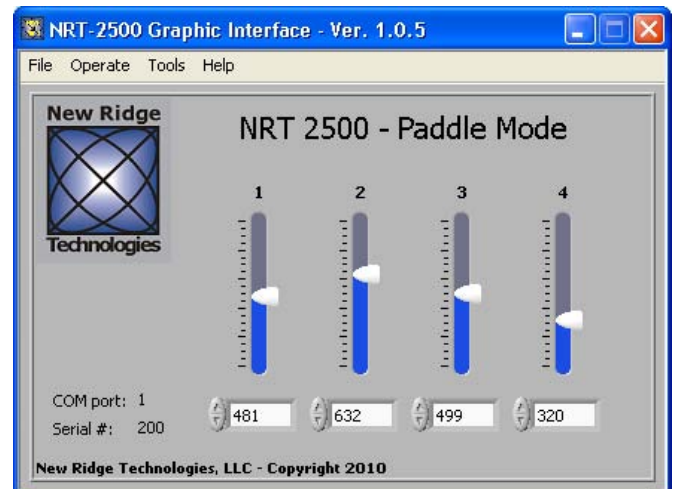
Versatile Polarization Platform for Multiple Lab Applications

NRT's polarization control platform combines an integrated-optic Lithium Niobate (LiNbO_3) waveguide polarization-controller device for super-fast polarization response driven by a customizable DSP/FPGA platform for functional flexibility. Together they enable NRT to provide a wide range of polarization operations in one product. The four functions currently offered are.

1. Set Polarization

Perhaps the most often used polarization operation in the lab. The NRT-2500 provides the electronic equivalent of 4 Lefevre fiber-optic paddles to align the pump to the probe or the signal to the local oscillator, maximize light through a polarization element, or polarization-demultiplex optical communication signals.

Each 'electronic paddle' is controlled through the user interface to set the polarization where you need it. Move the sliders or enter a values from 0 to 1000.

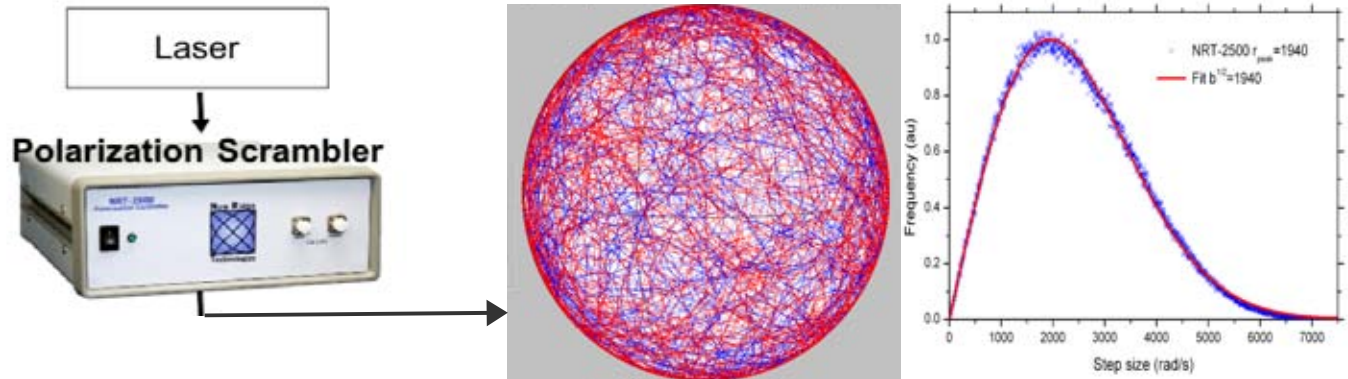


2. Polarization Scrambler

Scrambling the State of Polarization (SOP) is another common fiber optic lab function. Scrambling is invaluable to test the robustness of polarization diversity detection schemes or polarization multiplexed optical communication signals. For these applications it is important that the polarization fully and evenly covers the Poincaré sphere. Such truly random SOP changes obey Rayleigh statistics. The NRT-2500's scrambler repeatably generates this well-known and analytic distribution of SOP statistics. No more guessing about the coverage of the Poincaré sphere or the distribution of SOP change rates. Just enter the desired Rayleigh distribution scrambling rate and you're on your way. The NRT-2500 combines its programmable DSP and the ultrafast speed of the LiNbO_3 polarization controller to generate the fastest, yet truly random, SOP scrambler available (as shown in the diagram on the next page).

3. Polarization Randomizer

Need more speed? The NRT-2500 Polarization Randomizer mode allows you to set the slew time between polarization states and dwell time at a state. At each cycle the NRT-2500 sends each waveplate to a unique random position at the predetermined slew speed, and then holds it there till the next cycle. Slew speeds up to $1 \mu\text{s}$ enable changes in the SOP up to about 1,500,000 radians/second (or >9 million Hz)!



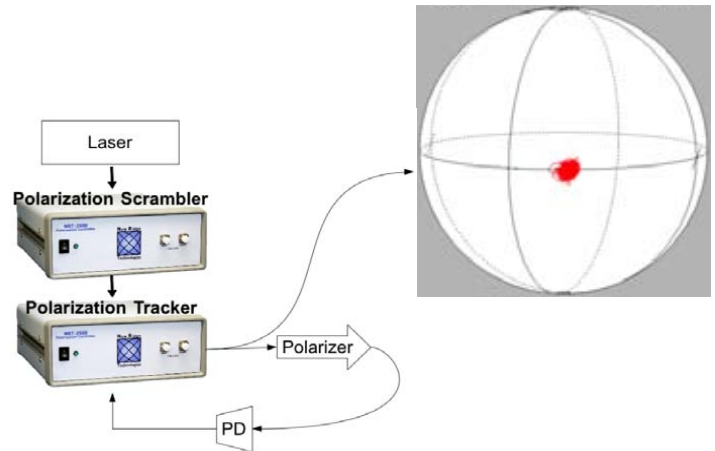
Polarization Scrambler setup yielding even SOP coverage on the Poincaré sphere. At the right is a histogram of the SOP scrambling fit to a Rayleigh distribution with the peak at $b^{0.5} = 12,189$ Hz, and a tail that extends past 46,000 Hz.

4. Fast Robust and Endless Polarization Tracker

NRT's unique tracking algorithm enables virtually perfect SOP tracking with no dropouts or 'glitches' for your new applications and prototypes. The NRT-2500's open architecture allows you to optimize the performance for your specific application:

- Create a unique error signal from four A/D converter inputs
- Optimize algorithm parameters with tracker optimization program

New Ridge has leveraged >4 years of time and effort in the tracker, and has packaged it all together for you. This tracking technology is so robust it was qualified for network deployment at multiple carriers around the world after proving its 'five-9s' tracking capabilities.



NRT-2500 in Polarization Tracker mode stabilizing a scrambled SOP input using the light passing through a polarizer as the feedback.

Examples of NRT-2500 Applications

1. Optical Polarization Demultiplexing
2. PMD tolerance testing of transponders
3. Optical polarization demuxing
4. Testing electronic pol-demultiplexing
5. Optical PMD compensation
6. Coherent detection

Key specifications¹

Insertion Loss	< 3 dB
PDL	< 0.3 dB
Optical return Loss	> 50 dB
Optical Power Handling	< 20 dBm
Operating Wavelength	1.55 microns (C- and L-bands)
Optical Connectors	FC/UPC, FC/APC, SC
Speed distribution parameters ² (in scrambling mode)	$r_{\text{peak}} \equiv b^{0.5}$: up to 2,000 radians/second = 12,500 Hz, $\langle r \rangle \equiv 1.25r_{\text{peak}}$: up to 15,600 radians/second = 15,600 Hz, $r_{\text{max}} \sim 3.76r_{\text{peak}}$: up to 7,300 radians/second = 45,600 Hz
Slew speed (for SOP-to-SOP transition in randomizer mode)	≥ 1 microseconds (up to 1,500,000 radians/second) ³
Tracking Speed (closed loop in tracking mode)	~ 20 microseconds ⁴
Power Supply	12 VDC from 100-240 VAC, 50 – 60 Hz wall AC-DC converter
Communication Interfaces	Ethernet, RS-232 (monitor points)
Dimensions	H=4.04" (102.6 mm), W=10.12" (257 mm), D=12.32" (313mm)

1. Subject to change at any time by New Ridge Technologies, LLC.

2. For a Rayleigh distribution: r_{peak} is the peak value, $\langle r \rangle$ is the mean SOP change, and 99.9% of all SOP changes occur by $r_{\text{max}} = 3\langle r \rangle \sim 3.76r_{\text{peak}}$

3. For $\pi/2$ radian SOP transitions in 1 μs .

4. This speed is feedback/update algorithm loop time based on reading A/DCs and DSP speed and updating polarization controller voltages. The feedback signal level and customization of the algorithm may slow system response.

Do you have a polarization control problem or function the NRT-2500 can solve? Then please contact us to discuss implementation.

New Ridge also welcomes licensing of the NRT-2500's design and tracking algorithm for OEM solutions.

For more information about the NRT-2500

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