

# Keysight Technologies N7785B Synchronous Scrambler

Data Sheet



## Introduction

The Keysight Technologies **N7785B** is a high-speed synchronous scrambler. It contains a polarization controller plus microcontroller-based driving circuitry. This unit can operate in various modes:

As a **synchronous scrambler**, the device switches the SOP of the output signal in a random (pseudo) way. Switching of the SOP occurs within a few microseconds.

The SOP is stable for a predefined time until it again switches to a new SOP.

An electrical trigger input can be used to synchronize the scrambler with external events.

As an **SOP switch** the N7785B allows switching the internal waveplates to user definable angles with very high speed and repeatability.

As a traditional **scrambler**, the Keysight **N7785B** varies the output SOP smoothly in a random/pseudo random way.

The unit does not contain any moving parts, and therefore is robust and withstands even rough environmental conditions.

All above-mentioned applications of the N7785B are supported by Keysight's PC software package which comes with this instrument.

### Key benefits

- Comprehensive polarization control and management capabilities.
- Covers S-, C-, and L-band plus 1.3  $\mu\text{m}$  window.
- Compact size.
- Robust, no moving parts.
- PC software package included

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## Applications

- Recirculating loop experiments: loop-synchronous polarization scrambling.
- System test: polarization sensitivity analysis on link/transmission quality.
- Characterization of optical components.

## Keysight N7785B instrument setup and application examples

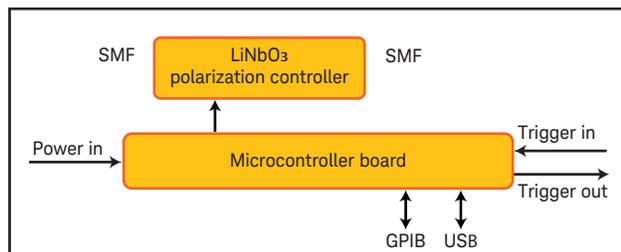


Figure 2. N7785B instrument setup.

The instrument setup is shown in Figure 2. The LiNbO<sub>3</sub> polarization controller is controlled by a signal processor which supplies user-definable sequences to the polarization controller. In this way, the SOP can be controlled in steps but also continuously. The trigger system provides synchronization capabilities to external digital signals.

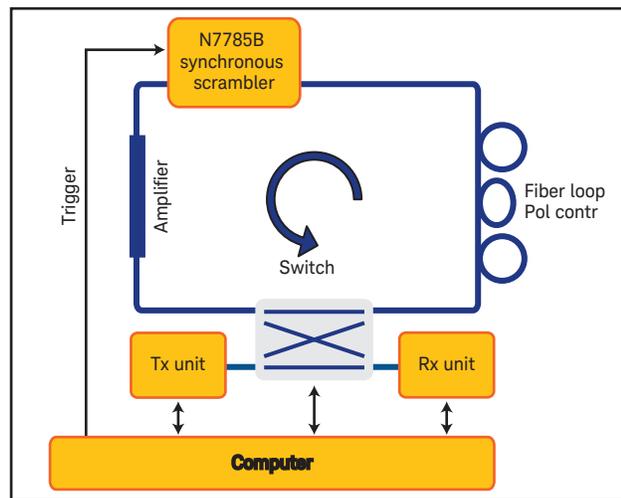


Figure 3. Recirculating loop.

The results obtained in re-circulating loop experiments depend heavily on the PMD and PDL properties of the loop. Loop synchronous polarization scrambling schemes have proven to be necessary for generating results comparable to deployed systems.

The synchronized scrambling feature of the N7785B is a unique enhancement to conventional polarization scramblers. The polarization can be scanned according to a pseudo-random but reproducible path. Instead of a continuously changing SOP, the SOP is switched in discrete steps that are synchronized with an input or output trigger signal. After switching, a stable SOP is quickly reached and held until the next step.

The N7785B is ideally suited to provide the synchronous scrambling capability in such experiments.

This is a key capability for providing realistic change of polarization from cycle to cycle around the loop, while providing a stable SOP during passage of the bit train through the scrambler. This avoids the unrealistic effect rapid change of the polarization during the bit train caused by continuous scramblers.

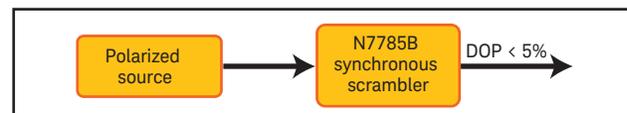


Figure 4. Scrambling/depolarization.

Light emitted by a laser is typically highly polarized. In order to avoid polarization effects it is common in some applications to depolarize light. This can be achieved highly effectively using the N7785B synchronous scrambler unit.

<b>Specifications <sup>1</sup> N7785B Synchronous Scrambler</b>		
<b>Wavelength</b>		
Operating wavelength range	1260 nm to 1640 nm	
<b>Polarization control</b>		
SOP switching time	< 10 $\mu$ s	
<b>Optical power</b>		
PDL (typical)	C/L-Band	< 0.2 dB
	O-Band	< 0.5 dB
Insertion loss	< 3.5 dB (< 3 dB, typical)	
Maximum safe input power	20 dBm	
<b>Ordering instructions</b>		
<b>Optical connector options</b>		
N7785B-021	Straight contact connectors	
N7785B-022	Angled contact connectors	
<b>Connector interface</b>		
The N7785B should usually be ordered with two 81000xl connector interfaces, depending on desired connector type (not included).		
<b>Accessories</b>		
5063-9240	Rack mount kit for 1 unit with filler panel	
5063-9212 + 5061-9694	Rack mount parts for 2 units side-by-side	
<b>Warranty</b>		
<b>Select coverage</b>		
Included	3-year warranty (return to Keysight), standard	
R-51B-001-5Z	5-year warranty assurance plan (return to Keysight): Priority warranty service includes one-time coverage for an EOS/ESD failure.	
<b>Calibration</b>		
<b>Select Keysight calibration plan</b>		
R-50C-011-3	3-year calibration assurance plan (return to Keysight): Priority calibration service covering all calibration costs for 3 years; 15% cheaper than buying stand-alone calibrations.	
R-50C-011-5	5-year calibration assurance plan (return to Keysight): Priority calibration service covering all calibration costs for 5 years; 20% cheaper than buying stand-alone calibrations.	
<b>General characteristics</b>		
Dimensions (D x W x H)	380 mm x 213 mm x 88 mm (excluding front and back rubber cushions and handle)	
Weight	Approx. 4 kg	
Recommended recalibration period	24 months	
Operating temperature	+5 °C to +40 °C	
Operating humidity	0% to 80%, non-condensing	
Altitude	The maximum operating altitude is 2000 m.	
Pollution protection	Pollution degree 2.	
Warm-up time	20 minutes	
Interfaces	The instruments can be controlled via USB or GPIB interfaces	
Power consumption	Line power: AC 100 to 240 V $\pm$ 10%, 50/60 Hz, 60 VA max.	

1. Ambient temperature change max.  $\pm$  0.5 °C since normalization. Specification valid on day of calibration.

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