

Agilent N7784B High Speed Polarization Controller Data Sheet



Figure 1. N7784B-001 bench-top mainframe

Introduction

The Agilent N7784B polarization controller contains a high-speed polarization controller plus microcontroller-based driving circuitry. This unit can operate in various modes.

As a **polarization stabilizer**, it provides a stable output state of polarization (SOP) even with fluctuations and drifts of the input SOP as occurring for example through temperature drift and mechanical settling processes. The stabilized output signal is guided in a polarization maintaining fiber (PMF). Alternatively, an external electrical feedback signal can be provided for stabilizing the SOP.

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 N7784B allows switching the internal waveplates to user definable angles with very high speed and repeatability.

As traditional **scrambler** the N7784B 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 N7784B are supported by a PC software package.

- PC-based application software comes with this instrument.
- Other instrument drivers for various software interfaces are available.



Key Benefits

- Comprehensive polarization control and management capabilities
- Covers S-, C- and L-band plus 1.3 μm window (O-band)
- Compact size
- Standalone operation
- Robust, no moving parts
- PC software package included

Applications

- Interferometry: polarization stabilization to maximize contrast ratio
- Recirculating loop experiments: loop-synchronous polarization scrambling
- System test: polarization sensitivity analysis on link/transmission quality

Agilent N7784B Instrument Setup and Application Examples

The instrument setup is shown in Figure 1. If a scrambling or switching operation is desired, only ports I and II are used. If the SOP of the signal is stabilized and the signal is fed in a PMF, then port II and port III have to be connected by an SMF. In this situation, the output signal is available on port IV. If an external feedback signal is available for stabilization, only ports I and II are occupied.

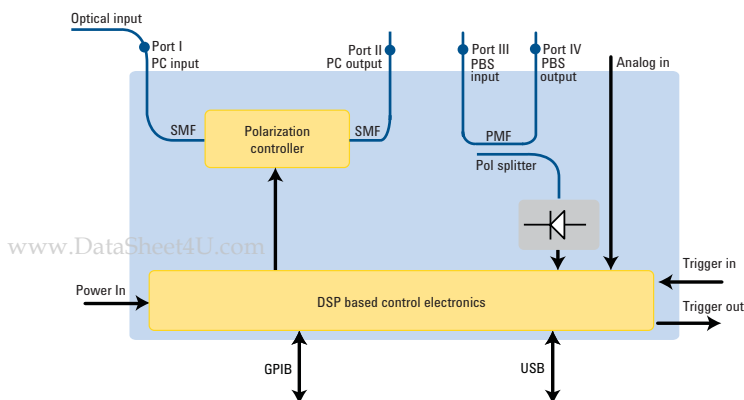


Figure 2. N7784B instrument setup

Application examples

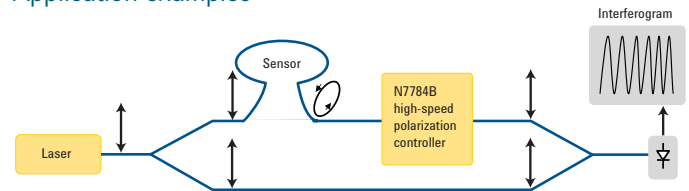


Figure 3. Interferometry/coherent detection

Fiber optic based interferometers or coherent receiver schemes need polarization stabilization in order to avoid fading problems of the interference signal. These fading effects are caused by orthogonally polarized fractions of the light. The N7784B allows elimination of such effects by alignment of the signal polarization.

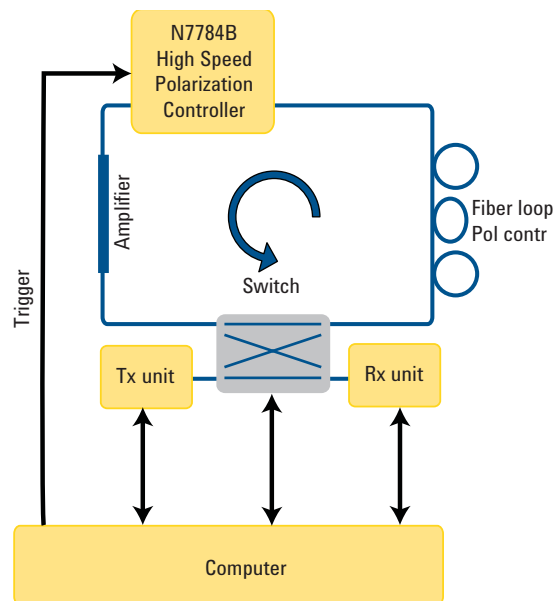


Figure 4. Recirculating loop

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 N7784B is ideally suited to provide the synchronous scrambling capability in such experiments.

In addition, the N7781B polarization analyzer provides the capability of monitoring the SOP evolution on each round trip.

Table 1: Specifications¹⁾ N7784B Polarization Controller

Wavelength	
Operating wavelength range	1260 nm ... 1640 nm
Wavelength range in stabilizer mode ²⁾	1520 nm ... 1580 nm
Polarization Control and Stabilization	
SOP switching time (open-loop)	< 10 μ s
PER at PMF output	> 23 dB
Stabilizer response time ³⁾ (typical)	2 ms
Optical Power	
Insertion loss port I - port II ⁴⁾	< 3.5 dB (< 3.0 dB, typ.)
Insertion loss port III - port IV ⁵⁾	< 1.8 dB (< 1.4 dB, typ.)
PDL port I - port II (typical)	< 0.2 dB
Maximum safe input power	Port I: 20 dBm Port III: 3 dBm
Input power range in stabilizer mode	Port III: -30 dBm ... 0 dBm

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

2) Outside the stabilizer wavelength range, the PER at PMF output may be degraded.

3) Input power > -20 dBm.

4) For SOP scrambling/switching, only ports I/II are used.

5) Valid for optimum input polarization at PBS input (Port III). Add insertion loss of port I/II and obtain total insertion loss for SOP stabilizing mode.

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