

Keysight N773-C Family of Optical Switches

Fast and convenient automation of photonic test solutions

Automate with Ease

The Keysight N773-C family of single-mode fiber-optic switches provides indispensable tools to automate photonic test solutions. Based on optical microelectromechanic systems (MEMS) technology, these switches use tiny mirrors to guide the light to the desired output. MEMS based optical switches offer outstanding durability, repeatability, and fast switching times. The new switch generation sports an on-board graphical user interface for easy control without software installation, accessible via GbE LAN and USB 2.0 connections. It comes in three topologies covering typical applications requiring 1x4 or 1x16 or 2x2 configurations. As new functionality, a switch sequence can be programmed and then executed with external or software triggering.



Compact Stand-Alone Switches

These instruments provide automatic routing of optical signals for testing devices like transceivers, amplifiers, and passive components. Optical switches optimize the investment in automated test equipment by improving repeatability and throughput and supporting parallel measurements of multiport and multiple devices.

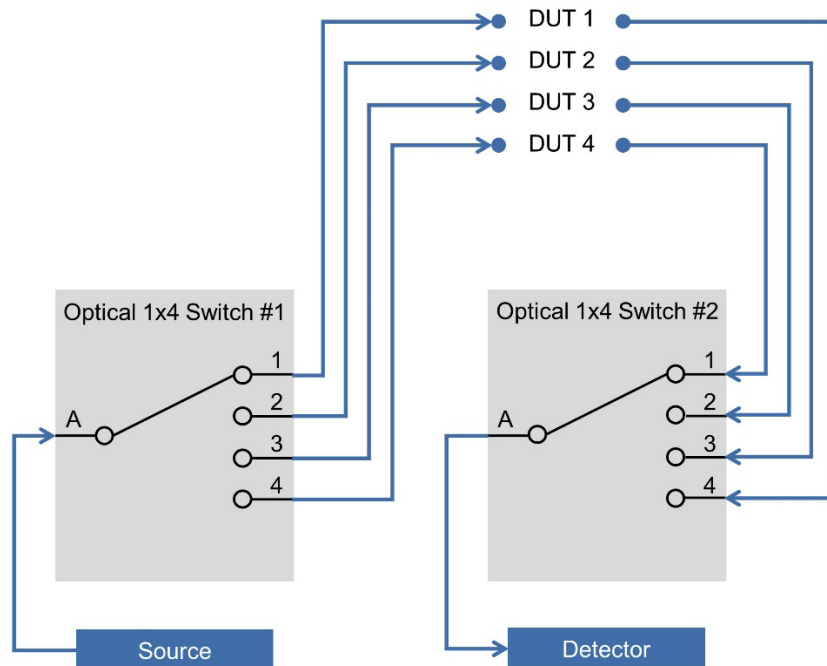


Figure 1. Setup to test multiple devices with one source and one detector

Switching Reduces Uncertainty from Connections and Eases Automation

Test automation

These optical switches can be used to avoid repeated reconnections during your measurements and are critical to automated procedures. The excellent switching repeatability assures that the signal level is constant from cycle to cycle. The low IL and PDL and high repeatability assure minimum impact of the switch on measurement accuracy. A typical setup may use a 1x4 switch to select among several source wavelengths in a test, while avoiding the time delay for power stabilization if each source must be cycled on and off. Or the same digital signal may be switched among several instruments, like a power meter, DCA or BERT.

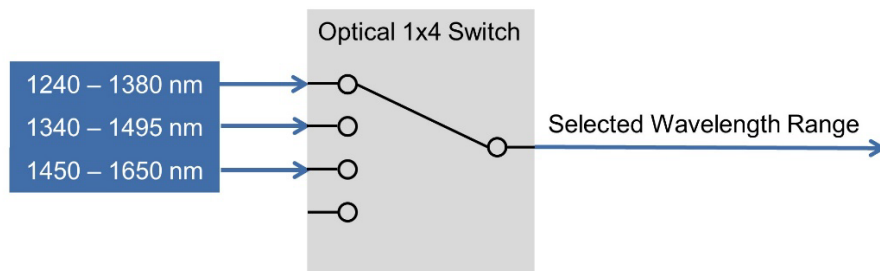


Figure 2. Setup to choose from different tunable laser sources

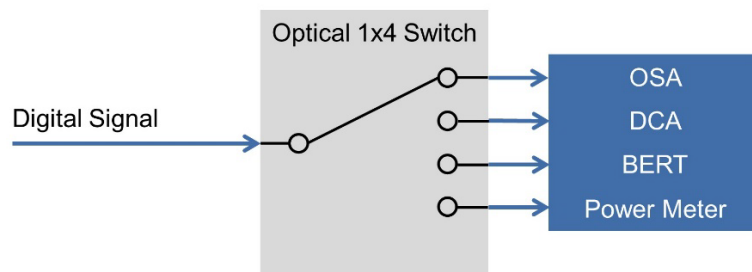


Figure 3. Setup to route signal to different analyzers

Parallel testing for test throughput and efficient use of instrumentation

In many cases, valuable signal source and analysis instrumentation can be used more effectively in a parallel-test configuration. For example, multiple cables or components can be tested together during temperature cycling. On the other hand, an increasing use of inherently parallel components, as for optical interconnections for 40G or 100G using 10 Gb/s components, calls for identical testing in multiple paths. These are well supported by the 1x16 switch configuration covering both, devices with up to 16 ports, as well as the test of 15 devices where the 16th path can be used as a permanent reference path.

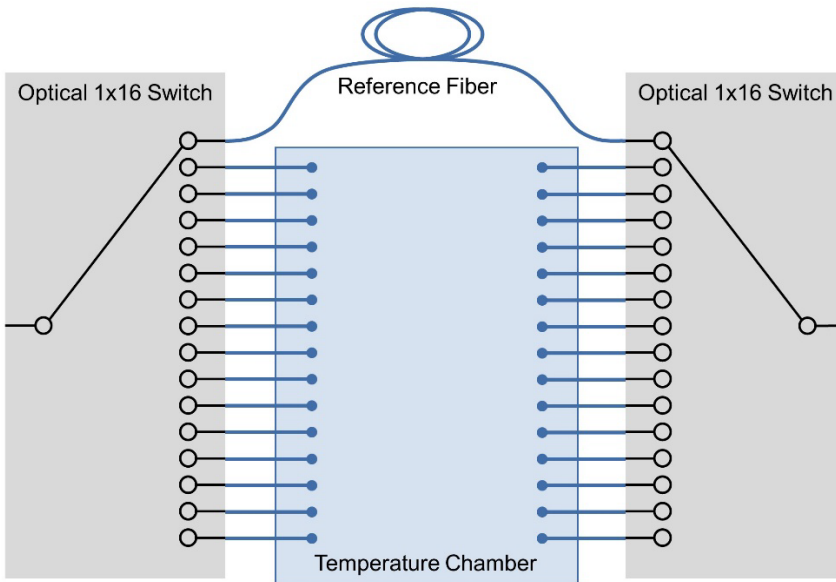


Figure 4. Setup to test multiple devices in a temperature chamber

Bypass device under test for reference measurement

In most stimulus-response tests, such as insertion loss measurements, the signal at the output of the device under test is to be compared to the signal at its input. A 2x2 switch allows bypassing the device under test for the reference measurement and reduces the number of manual reconnections for better repeatability and lower uncertainty.

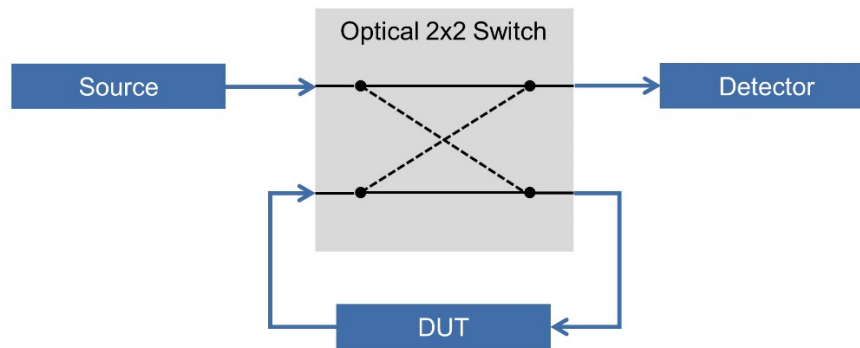


Figure 5. Setup to create a reference path bypassing the device under test

Reversing the signal direction

While most passive optical components are bidirectional, there are some that exhibit different signal conditioning behavior, depending on the direction of the optical signal. Optical isolators and circulators are designed to block or route signals depending on their direction. Other components, such as variable optical attenuators, may exhibit an unwanted directional dependency that needs to be measured. A 2x2 switch allows reversing the signal direction, e.g., to measure an optical isolator in forward direction for insertion loss and in reverse direction for its isolation.

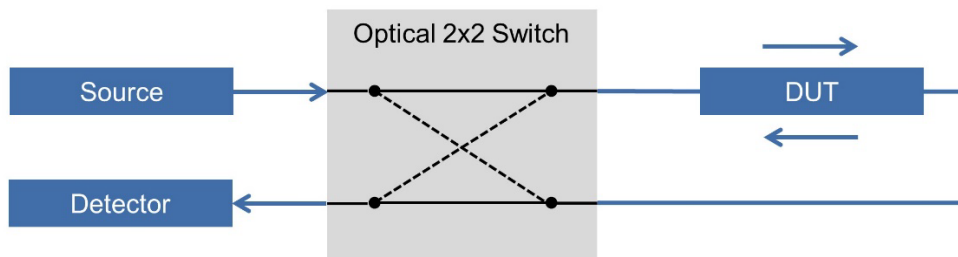


Figure 6. Setup to reverse the direction of the optical path

Technical Specifications

The Keysight N773-C optical switches come in three different topologies to enable typical use cases. By cascading and combining optical switches, a wide range of applications can be covered.

Switch types

Model	Switch topology	Typical use case
N7731C 	Two independent 1 x 4 switches	Connect four devices to stimulus (source) and response (detector) instruments
N7733C 	One 1 x 16 switch	- Measure a device with up to 16 ports - Measure up to 15 devices and use 16th port as a reference path
N7736C 	Four independent 2 x 2 switches	- Bypass device under test with a reference path - Reverse signal direction in stimulus-response setups

Technical details

	N7731C-009	N7733C-009	N7736C-009
Switch topology	Two independent 1 x 4 switches	One 1 x 16 switch	Four independent 2 x 2 switches
Fiber type	9/125 μ m Single Mode Fiber	9/125 μ m Single Mode Fiber	9/125 μ m Single Mode Fiber
Connectivity	FC/APC – angled, narrow key	FC/APC – angled, narrow key	FC/APC – angled, narrow key
Wavelength range	1250 nm to 1650 nm	1250 nm to 1650 nm	1250 nm to 1650 nm
Repeatability ^{1,2}	< $\pm$ 0.007 dB, typical < $\pm$ 0.005 dB	< $\pm$ 0.013 dB (1310 nm) ³ < $\pm$ 0.012 dB (1550 nm) ³ typical < $\pm$ 0.01 dB ³	< $\pm$ 0.004 dB, typical < $\pm$ 0.002 dB
Insertion loss ¹	< 2.0 dB typical < 1.7 dB	< 2.4 dB (1310 nm) ³ < 2.3 dB (1550 nm) ³ typical < 2.0 dB ³	< 1.8 dB typical < 1.5 dB
Polarization dependent loss ¹	Typical < 0.07 dB peak-peak	Typical < 0.12 dB peak-peak	Typical < 0.07 dB peak-peak
Return loss	Typical > 50 dB	Typical > 50 dB	Typical > 50 dB
Crosstalk ¹	Typical < -70 dB	Typical < -50 dB	Typical < -60 dB
Lifetime	> 1 billion cycles	> 1 billion cycles	> 1 billion cycles
Switching time incl. transitions and settling ⁴	4 ms ⁵	85 ms ⁵	5 ms
Max. input power	+23 dBm	+23 dBm	+23 dBm

1. At 1310 nm $\pm$ 15 nm and at 1550 nm $\pm$ 15 nm.

2. Worst case measurement deviation over 10,000 random switching cycles.

3. If operating wavelength set accordingly.

4. Time from receiving switching command to sending output trigger, includes transitions and settling. Specifications apply after switching time.

5. Transient crosstalk occurs for some switch transitions, during which the signal is briefly present on an unselected port.

General specifications

N7731C, N7733C, N7736C

Line power	AC 100 V to 240 V $\pm$ 10%, 50/60 Hz, 60 VA max.
Operating temperature	+5 °C to +40 °C
Operating humidity	$\leq$ 80%, non-condensing
Storage temperature	–40 °C to +70 °C
Max. operating altitude	2000 m
Recommended recalibration period	2 years
Dimensions	420 mm $\times$ 212 mm $\times$ 43 mm (excluding front and back rubber cushions and connectors)
Weight	3 kg (6 lbs)
Trigger	BNC input port, BNC output port
User interface	N7731C, N7733C, N7736C
LAN Access (1 Gbit/s): HTTP Telnet VXI-11 SCPI-telnet SCPI-raw HISLIP	IPv4 and IPv6 Socket connection: http://<ip_address> or http://<host_name> port 23 port 111 (IPv4 only) port 5024 port 5025 port 4880
USB Access (USB 2.0)	Remote NDIS (virtual Ethernet link over USB); USB Mass Storage functions (read-only) USBTMC

Ordering Information

Product/option	Description
N7731C	Optical Switch, 1x4 (2 Channel)
N7731C-009	Single Mode Fiber Interface
N7733C	Optical Switch, 1x16
N7733C-009	Single Mode Fiber Interface
N7736C	Optical Switch, 2x2 (4 Channel)
N7736C-009	Single Mode Fiber Interface
Product/option	Recommended accessories
N7799C-1CM	Rack Mount Kit for 2 half-width instruments, 1 Rack Height Unit. Includes low profile rails, fitted to Keysight System II racks with 24-inch-spaced mounts. Requires Filler Kit N7799C-0CM for mounting single instrument
N7799C-0CM	Filler Kit for N7799C-1CM. Required for single half-width instrument; includes front panel and base plate
N7799C-DOC	Documentation of N77-C Platform, Physical Medium

User interface screen captures

The N773-C switches' graphical user interface provides an unambiguous view of the current switch status. Operators can change port labels to better differentiate optical paths and modify address settings. Switching sequences can be uploaded and progressed by time interval or by trigger signals, a convenient feature to spare time and effort to write control software.



Figure 7. Web GUI of N7731C: two 1 x 4 switches

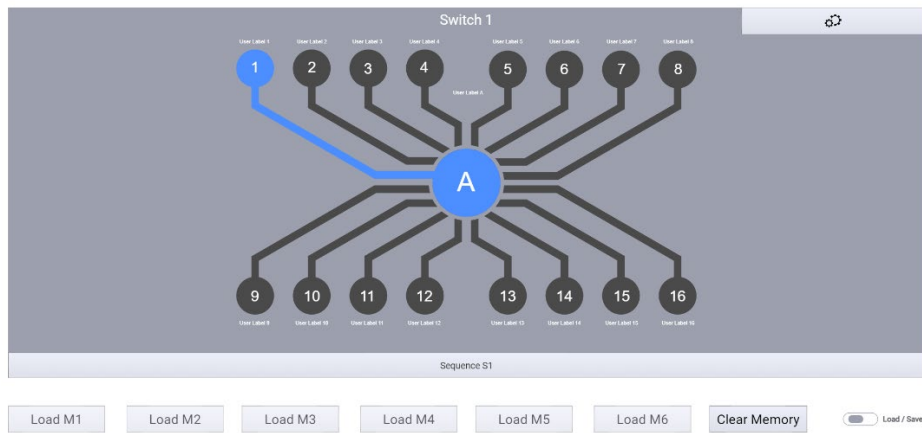


Figure 8. Web GUI of N7733C: 1 x 16 switch

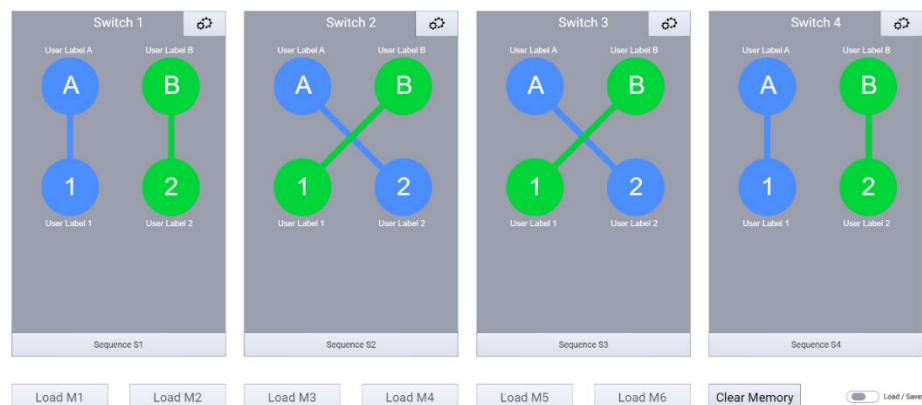


Figure 9. Web GUI of N7736C: four 2 x 2 switches

For more information

To find more optical test instruments, check the following links:

Optical test instruments: www.keysight.com/find/oct

Optical signal conditioning instruments: www.keysight.com/find/voa

Optical multiport power meters: www.keysight.com/find/MPPM

Polarization solutions: www.keysight.com/find/pol

Tunable laser sources: www.keysight.com/find/tls

Keysight photonic discussion forum: community.keysight.com