

# Keysight N774-C & 8162-C Series

N7742C, N7743C, N7744C & N7745C Optical Power Meter  
N7747C & N7748C Optical High Performance Power Meter  
N7749C Optical Head Interface  
81620C, 81623C, 81624C, 81626C & 81628C Optical Power Head

User's Guide

# Notices

© Keysight Technologies 2021

No part of this manual may be reproduced in any form or by any means (including electronic storage and retrieval or translation into a foreign language) without prior agreement and written consent from Keysight Technologies as governed by United States and international copyright laws.

## Manual Part Number

N7740-90B02

## Edition

Edition 2.0, April 2021

Keysight Technologies Deutschland GmbH  
Herrenberger Strasse 130,  
71034 Böblingen, Germany

## Technology Licenses

The hardware and/or software described in this document are furnished under a license and may be used or copied only in accordance with the terms of such license.

## U.S. Government Rights

The Software is “commercial computer software,” as defined by Federal Acquisition Regulation (“FAR”) 2.101. Pursuant to FAR 12.212 and 27.405-3 and Department of Defense FAR Supplement

(“DFARS”) 227.7202, the U.S. government acquires commercial computer software under the same terms by which the software is customarily provided to the public. Accordingly, Keysight provides the Software to U.S. government customers under its standard commercial license, which is embodied in its End User License Agreement (EULA), a copy of which can be found at:

<http://www.keysight.com/find/sweula>.

The license set forth in the EULA represents the exclusive authority by which the U.S.

government may use, modify, distribute, or disclose the Software. The EULA and the license set forth therein, does not require or permit, among other things, that Keysight: (1) Furnish technical information related to commercial computer software or commercial computer software documentation that is not customarily provided to the public; or (2) Relinquish to, or otherwise provide, the government rights in excess of these rights customarily provided to the public to use, modify, reproduce, release, perform, display, or disclose commercial computer software or commercial computer software documentation. No additional government requirements beyond those set forth in the EULA shall apply, except to the extent that those terms, rights, or licenses are explicitly required from all providers of commercial computer software pursuant to the FAR and the DFARS and are set forth specifically in writing elsewhere in the EULA. Keysight shall be under no obligation to update, revise or otherwise modify the Software. With respect to any technical data as defined by FAR 2.101, pursuant to FAR 12.211 and 27.404.2 and DFARS 227.7102, the U.S. government acquires no greater than Limited Rights as defined in FAR 27.401 or DFAR 227.7103-5 (c), as applicable in any technical data.

## Warranty

THE MATERIAL CONTAINED IN THIS DOCUMENT IS PROVIDED “AS IS,” AND IS SUBJECT TO BEING CHANGED, WITHOUT NOTICE, IN FUTURE EDITIONS. FURTHER, TO THE MAXIMUM EXTENT PERMITTED BY APPLICABLE LAW, KEYSIGHT DISCLAIMS ALL WARRANTIES, EITHER EXPRESS OR IMPLIED WITH REGARD TO THIS MANUAL AND ANY INFORMATION CONTAINED HEREIN, INCLUDING BUT NOT LIMITED TO THE IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE. KEYSIGHT SHALL

NOT BE LIABLE FOR ERRORS OR FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES IN CONNECTION WITH THE FURNISHING, USE, OR PERFORMANCE OF THIS DOCUMENT OR ANY INFORMATION CONTAINED HEREIN. SHOULD KEYSIGHT AND THE USER HAVE A SEPARATE WRITTEN AGREEMENT WITH WARRANTY TERMS COVERING THE MATERIAL IN THIS DOCUMENT THAT CONFLICT WITH THESE TERMS, THE WARRANTY TERMS IN THE SEPARATE AGREEMENT WILL CONTROL.

## Safety Notices

### CAUTION

A CAUTION notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in damage to the product or loss of important data. Do not proceed beyond a CAUTION notice until the indicated conditions are fully understood and met.

### WARNING

A WARNING notice denotes a hazard. It calls attention to an operating procedure, practice, or the like that, if not correctly performed or adhered to, could result in personal injury or death. Do not proceed beyond a WARNING notice until the indicated conditions are fully understood and met.

## Safety Summary

The following general safety precautions must be observed during all phases of operation of this instrument. Failure to comply with these precautions or with specific warnings or operating instructions in the product manuals violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements. Product manuals are provided on the Web. Go to [www.keysight.com](http://www.keysight.com) and type in your product number in the Search field at the top of the page.

General	This product is a Protection Class 1 instrument (provided with a protective earth terminal) and has been manufactured and tested according to international safety standards. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.
Environment Conditions	This instrument is intended for indoor use in an Overvoltage Category II, pollution degree 2 environment. It is designed to operate at a maximum relative humidity (RH) of 80%, non-condensing and at altitudes of up to 2000 meters. Refer to the specifications tables for the AC mains voltage requirements and ambient operating temperature range.
Temperature	<p>The instrument should be protected from temperature extremes and changes in temperature that may cause condensation within it.</p> <p>The operating temperature is from:</p> <ul style="list-style-type: none"><li>• +5 °C to +40 °C (N774-C)</li><li>• +0°C to +40°C (81620C/ 81623C/ 81624C)</li><li>• +0°C to +40°C (81623X01C/ 81623X85C/ 81624X01C)</li><li>• +0°C to +35°C (81626C/ 81626X01C, max. 30°C above +20 dBm)</li><li>• +0°C to +40°C (81628C, max. 35°C above +30 dBm)</li></ul> <p>The storage temperature is from -40 °C to +70 °C</p>
Before Applying Power	Verify that all safety precautions are taken. The power cable inlet of the instrument serves as a device to disconnect from the mains in case of hazard. The instrument must be positioned so that the operator can easily access the power cable inlet. When the instrument is rack mounted the rack must be provided with an easily accessible mains switch.
Ground the Instrument	To minimize shock hazard, the instrument chassis and cover must be connected to an electrical protective earth ground. The instrument must be connected to the AC power mains through a grounded power cable, with the ground wire firmly connected to an electrical ground (safety ground) at the power outlet. Any interruption of the protective (grounding) conductor or disconnection of the protective earth terminal will cause a potential shock hazard that could result in personal injury.

Do Not Operate in an  
Explosive Atmosphere










Do not operate the instrument in the presence of flammable gases or fumes.

Do Not Remove the  
Instrument Cover

Operating personnel must not remove instrument covers. Component replacement and internal adjustments must be made only by qualified personnel.

Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel.

# Instrument Markings

Instrument Marking	Description
	<p>The instruction manual symbol. The product is marked with this warning symbol when it is necessary for the user to refer to the instructions in the manual.</p>
	<p>Standby supply. Unit is not completely disconnected from AC mains when switch is off.</p>
	<p>The CE mark is a registered trademark of the European Community. This CE mark shows that the product complies with all the relevant European Legal Directives. ICES/NMB-001 - This ISM device complies with the Canadian ICES-001. Cet appareil ISM est conforme a la norme NMB-001 du Canada. ISM GRP 1-A - This is an Industrial Scientific and Medical (ISM) Group 1 Class A product.</p>
	<p>The CSA mark with the 'c' and 'us' subscript indicates the instrument is certified to the applicable Canadian and United States of America standards respectively.</p>
	<p>The RCM mark is a registered trademark of the Australian Communications and Media Authority</p>
	<p>This symbol is a South Korean Class A EMC Declaration, with the product identification code. R - Identification of authorization prefix. R - Identification of basic certification information. Kst - Identification of applicant's information 3E 18526 - N774-C Product identification. 3E 20724 - 8162-C Product identification. This is a Class A instrument suitable for professional use and in electromagnetic environment outside of the home.</p>
	<p>The recycling symbol indicates the general ease with which the instrument can be recycled.</p>
	<p>China Restricted Substance Product Label. The EPUP (environmental protection use period) number in the center indicates the time period during which no hazardous or toxic substances or elements are expected to leak or deteriorate during normal use and generally reflects the expected useful life of the product.</p>
	<p>The UKCA (UK Conformity Assessed) marking is a new UK product marking that is used for goods being placed on the market in Great Britain (England, Wales and Scotland). It covers most goods which previously required the CE marking.</p>

## South Korean Class A EMC Declaration

Information to the user:

This instrument has been conformity assessed for used in business environments. In a residential environment this equipment may caused radio interference.

This EMC statement applies to the equipment only for use in business environment.



### 사용자 안내문

이 기기는 업무용 환경에서 사용할 목적으로 적합성 평가를 받은 기기로서 가정용 환경에서 사용하는 경우 전파 간섭의 우려가 있습니다.

사용자 안내문은 "업무용 방송통신기자재"에만 적용한다.

## Compliance and Environmental Information

**Table 1 Compliance and Environmental Information**

Safety Symbol	Description
	<p>This product complies with WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.</p> <p>Product Category: With reference to the equipment types in WEEE Directive Annex I, this product is classed as a "Monitoring and Control instrumentation" product.</p> <p>Do not dispose in domestic household waste.</p>
	<p>To return unwanted products, contact your local Keysight office, or see <a href="http://about.keysight.com/en/companyinfo/environment/takeback.shtml">http://about.keysight.com/en/companyinfo/environment/takeback.shtml</a> for more information.</p>

## Declaration of Conformity

Declarations of Conformity for this product and for the Keysight products may be downloaded from the Web. Go to <http://www.keysight.com/go/conformity>.

You can then search by product number to find the latest Declaration of Conformity.

# Contents

Safety Summary	3
Instrument Markings	5
South Korean Class A EMC Declaration	6
Compliance and Environmental Information	6
Declaration of Conformity	6

## 1 General Operating Considerations

<b>General Information</b>	14
<b>Operating Environment</b>	15
<b>Handling the Instrument</b>	17
Storage, Carrying and Shipment	17
Rack Mount the Instrument	17
<b>Obtaining Source Code</b>	19

## 2 Getting Started

<b>N774-C and 8162-C Series Instruments</b>	22
N7742C and N7743C Optical Power Meter	22
N7744C and N7745C Optical Power Meter	23
N7747C and N7748C Optical High Performance Power Meter	24
N7749C Optical Head Interface	24
81620C, 81623C, 81624C, 81626C & 81628C Optical Power Head	25

<b>N774-C Series Instrument's Front and Rear Panels</b>	<b>27</b>
N7742C Power Meter	27
N7743C Power Meter	28
N7744C Power Meter	29
N7745C Power Meter	29
N7747C Power Meter	30
N7748C Power Meter	30
N7749C Optical Head Interface	31
N774-C Series Instrument's Rear Panel	32
<b>Initial Inspection</b>	<b>33</b>
Initial Inspection	33
Claims and Repackaging	33
Return Shipments to Keysight Technologies	33
<b>Power Supply Requirements</b>	<b>35</b>
Line Power Requirements	35
<b>Optical Connections</b>	<b>37</b>
Optical Head Adapters	37
Quad-Adapter Connections	42
8100xXI Optical Module Connector Interfaces	44
Exchangeable connector interface N7742xl	44
<b>Electrical Connectors</b>	<b>45</b>
Rear Panel Trigger BNC Connectors	45
Front Panel Analog Output BNC Connector	45
Optical Head Analog Output	46
<b>Powering Up the Instrument</b>	<b>47</b>
<b>Remote Interface</b>	<b>48</b>
LAN Connection with a DHCP server (Site LAN)	48
LAN Connection without a DHCP server (Private LAN)	49
USB Connection	50
Technical Overview	51
The LAN Status Indicators	51
The LAN Reset button	52



<b>Deleting User Data</b>	53
<b>Connecting the Instrument</b>	54
Connecting over USB	54
Connecting over LAN	55
<b>N774-C User Interface</b>	58

### 3 Definition of Terms

<b>Definition of Terms</b>	61
Specification	61
Typical Value (Characteristics)	61
Operating Conditions	61
Specified Temperature	61
Ambient Temperature Range	61
(Applicable) fiber type	61
Averaging time	62
Constant operating conditions	62
Data logging capability	62
Drift (dark)	62
Dynamic range (logging mode)	63
Frequency Response	63
Linearity	63
Maximum safe (input) power	64
Minimum averaging time	64
Noise pp (dark)	64
Noise 2 sigma (dark)	64
Operating humidity	65
Operating temperature	65
Operating temperature and humidity	65
Polarization dependent responsivity (PDR)	65
Port separation (static)	66
Port separation, dynamic	66

Power range	66
Range settling time (one range step)	67
Relative port to port uncertainty	67
Return loss	67
Specification wavelength range	68
Spectral ripple (power meter; due to interference)	68
Storage conditions	68
Total uncertainty	68
Uncertainty at reference conditions	69
Wavelength range	69
Warm-up time	69

## 4 User Interface Reference

<b>N774-C Series User Interface</b>	72
<b>Controlling N774-C Instruments</b>	74
Control Instrument Tab	74
How to Measure Power	78
How to Set the Wavelength	79
How to Set the Calibration Offset	79
How to Set the Reference Level	80
How to Remove Electrical Offsets (Zero)	82
How to Choose the Range Mode	83
How to Set the Range	84
How to Set the Averaging Time	85
How to Set Automatic Gain for Averaging Modulated Signals	85
How to Choose the MinMax Function	85
How to Use External Triggers	85
<b>How to Use Auxiliary Functions</b>	88
How to Get Current Instrument Settings?	88
How to Identity a Module?	89
How to Capture an Image of the Graph?	89
How to Save/Recall the User Interface Settings?	89

Logging In/Out of the N774-C User Interface	90
How to Create/Change the Password?	91
What If You Forget Your Password?	91
Update Rate and Data Points	91
Reboot Device	92
How to Configure LAN?	93

## 5 Accessories

## 6 Maintenance

<b>Cleaning Instructions</b>	102
Safety Precautions	102
Why is it important to clean optical devices?	102
What materials do I need for proper cleaning?	103
General Cleaning Procedure	105
<b>Additional Cleaning Information</b>	106
<b>Firmware Upgrades</b>	107
Requirements	107
<b>Contact Keysight Technologies</b>	108



Keysight N774-C & 8162-C Series

User's Guide

# 1 General Operating Considerations

General Information / 14

Operating Environment / 15

Handling the Instrument / 17

Obtaining Source Code / 19

## General Information

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability for the customer's failure to comply with these requirements.

### **WARNING**

**Ensure the proper usage for the instrument. The protection provided by the instrument may be impaired. The operator of this instrument is advised to use the equipment in a manner as specified in this document**

---

Before operation, you should review the instrument and manual for safety markings and instructions. You must follow these to ensure safe operation and to maintain the instrument in safe condition.

Some circuits are powered whenever the instrument is connected to the AC power source. To disconnect from the line power, disconnect the power cord either at the rear power inlet or at the AC line power source (receptacle). One of these must always be accessible. If the instrument is in a cabinet, it must be disconnected from the line power by the system's line power switch.

### **WARNING**

**To avoid hazardous electrical shock, do not perform electrical tests when there are signs of shipping damage to any portion of the outer enclosure (covers, panels, etc.).**

---

### **WARNING**

**Please pay attention to the following laser safety warning:**

**Under no circumstances look into the end of an optical cable attached to the optical output when the instrument is operational. The laser radiation can seriously damage your eyesight. Do not enable the laser when there is no fiber attached to the optical output connector. Refer servicing only to qualified and authorized personnel.**

---

## Operating Environment

### Overview

In order for the instrument to meet specifications, the operating environment must be within these limits. Refer to [Safety Summary](#) on page 3.

### **WARNING**

The instrument is not designed for outdoor use. To prevent potential fire or shock hazard, do not expose the instrument to rain or other excessive moisture.

---

### Instrument Cooling

The instrument has a cooling fan mounted internally.

Mount or position your instrument upright and horizontally, as shown in the following figure so that air can circulate through it freely.

### Operating Position

When operating the instrument choose a location that provides at least 75 mm (3 inches) of clearance at the rear, and at least 25 mm (1 inch) of clearance at each side. Failure to provide adequate air clearance may result in excessive internal temperature, reducing instrument reliability. The instrument should not be operated when resting on its rear or side panels.

[Figure 1](#) shows the correct operating position of Keysight N7744C/5C.

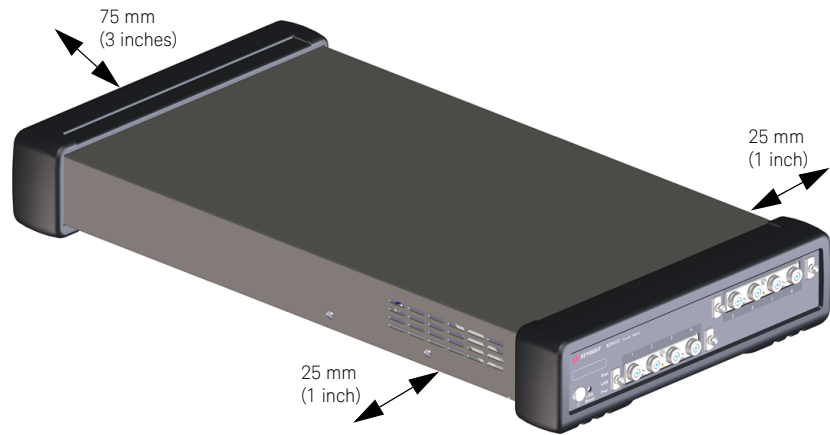


Figure 1 Operating Position of the Instrument



## Handling the Instrument

### Storage, Carrying and Shipment

Keysight N774-C and 8162-C instruments can be stored and shipped at temperatures between  $-40^{\circ}\text{C}$  and  $+70^{\circ}\text{C}$ .

The N774-C instruments must be stored, carried in its operating position, as shown in [Figure 1](#).

### Rack Mount the Instrument

You can mount the instrument in a standard 19-inch rack cabinet using one of two optional kits, each of which includes instructions and mounting hardware.

#### NOTE

**Remove the front and rear rubber bumpers before mounting the instrument on a rack.**

---

Depending on whether one or two N774-C instruments are to be mounted, different mounting kits are required:

- N7799C-1CM Rack Mount Kit 1 HU for 2 instruments - Includes low-profile rails. Requires Filler Kit N7799C-0CM for single device (See [Figure 2](#)).
- N7799C-0CM Filler Kit for N7799C-1CM - Required for single instrument. Includes front panel and base plate.

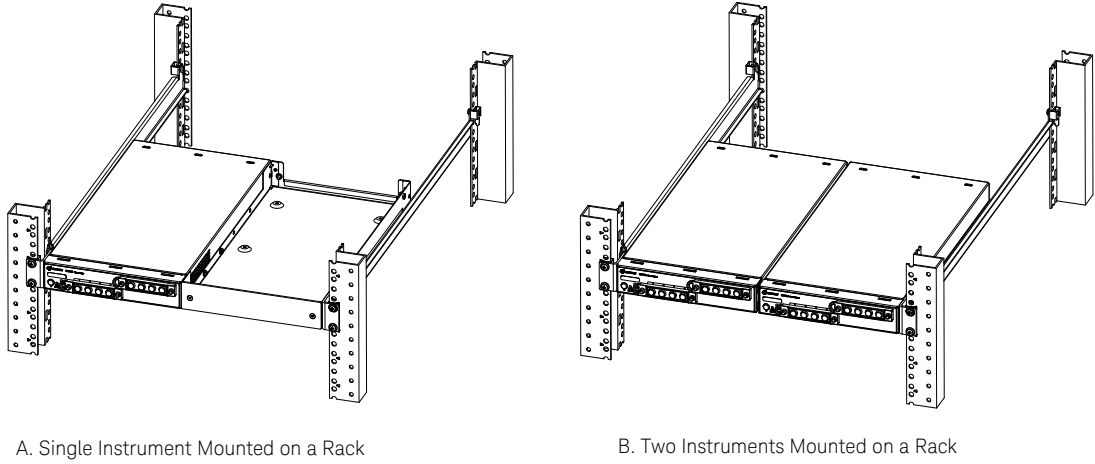


Figure 2 Instrument(s) Mounted on a Rack

## Obtaining Source Code

This product uses open source packages. To the extent required by the applicable open source license(s), Keysight makes source code available upon request. To request source code, please contact **Keysight Support** at [www.keysight.com/main/support.jspx](http://www.keysight.com/main/support.jspx).

Third party software acknowledgments and licenses for the N774-C series with the embedded Linux operating system are located at: [www.keysight.com/find/N7745C](http://www.keysight.com/find/N7745C).



Keysight N774-C & 8162-C Series

User's Guide

# 2 Getting Started

N774-C and 8162-C Series Instruments / 22

N774-C Series Instrument's Front and Rear Panels / 27

Initial Inspection / 33

Power Supply Requirements / 35

Optical Connections / 37

Electrical Connectors / 45

Remote Interface / 48

Remote Interface / 48

Powering Up the Instrument / 47

Connecting the Instrument / 54

N774-C User Interface / 58

## N774-C and 8162-C Series Instruments

This chapter provides overview of the following of N774-C and 8162-C instruments:

- N7742C, N7743C, N7744C and N7745C Optical Power Meter
- N7747C & N7748C Optical High Performance Power Meter
- N7749C Optical Head Interface
- 81620C, 81623C, 81624C, 81626C & 81628C Optical Power Head

### N7742C and N7743C Optical Power Meter

Keysight Technologies new N7742C, N7743C optical power meters with two or four power-sensor channels provide manufacturing users with further increased throughput and operational efficiency to meet today's challenges in multiple-device and multiport testing. A family-wide, common trigger concept, and a modern, browser accessible user interface, make it convenient to configure the instrument's functionality.

N7742C and N7743C optical power meters are ideally suited for automated alignment applications that require an analog feedback signal: the voltage on each channel's analog output port provides a linear or logarithmic representation of the optical power level. Both, N7742C and N7743C are available with two or four power sensor channels. The connector style can be configured individually for each port by choosing from a range of N7742-I connector interfaces.

Successor to Keysight's previous optical power meters, the new series of optical power meters has been further optimized for high measurement throughput when characterizing optical multiport components, for example multiplexers, PON splitters, wavelength selective switches (WSS) and ROADMs, as well as for simultaneous testing of multiple single-port devices.

These power meters achieve a level of space-saving channel density that simplifies fiber handling for many-port device testing. This is complemented by the ease of integrating multiple instruments into a single setup with parallel programming over the LAN or USB connections. A single N7742C/N7743C is only one rack unit high and a half rack unit wide.

These power meters are highly compatible with setups and programs. They are also easy to synchronize with Keysight tunable laser sources, to make spectral measurements. The functionality for time-dependent measurement has been extended with sampling at up to 1 MHz and data logging of up to 1 million samples for each port.

For further details on its application and key features, refer to the product datasheet available on [www.keysight.com](http://www.keysight.com).

## N7744C and N7745C Optical Power Meter

Keysight Technologies new N7744C and N7745C optical power meters with four or eight power-sensor channels provide manufacturing users with further increased throughput and operational efficiency to meet today's challenges in multiple-device and multiport testing. A family-wide, common trigger concept, and a modern, browser accessible user interface, make it convenient to configure the instrument's functionality.

Successor to Keysight's previous optical power meters, the new series of optical power meters has been further optimized for high measurement throughput when characterizing optical multiport components, for example multiplexers, PON splitters, wavelength selective switches (WSS) and ROADMs, as well as for simultaneous testing of multiple single-port devices.

These power meters achieve a level of space-saving channel density that simplifies fiber handling for many-port device testing. This is complemented by the ease of integrating multiple instruments into a single setup with parallel programming over the LAN or USB connections. A single N7744C/N7745C is only one rack unit high and a half rack unit wide.

With this new power meter comes the trusted N7740 fiber connectivity concept, which is a quadruple adapter with a snap-on quick-locking mechanism (see chapter Accessories). The device to be tested can be connected to the quad-adapters in a comfortable ergonomic working position, even while the instrument is measuring another device.

The quad-adapters can be quickly snapped on to the instrument, to provide reliable and repeatable high-precision connections. Use of the quad-adapters simplifies aligning connector keys, especially for rack-mounted instruments and makes it easier to connect ports in the desired order, helping to avoid errors and connector damage.

A bare fiber version of the quad-adapter, N7740BI, can host up to four bare fiber holders. Two types of bare fiber holder kits with four holders each are available for fiber diameters up to 400  $\mu\text{m}$  (81004BM) and between 400  $\mu\text{m}$  and 900  $\mu\text{m}$  (81009BM). The one-click zeroing adapter N7740ZI allows quick and reliable 4-port zeroing of the power meters.

These power meters are highly compatible with setups and programs. They are also easy to synchronize with Keysight tunable laser sources, to make spectral measurements. The functionality for time-dependent measurement has been extended with sampling at up to 1 MHz and data logging of up to 1 million samples for each port.

For further details on its application and key features, refer to the product datasheet available on [www.keysight.com](http://www.keysight.com).

## N7747C and N7748C Optical High Performance Power Meter

The two-port N7747C and 4-port N7748C are the high performance optical power meters in terms of sensitivity, noise and relative accuracy to the compact N774-C instrument platform. These instruments combine the optical performance of the 81634B sensor modules with the large memory, fast data transfer and small footprint of the N774-C series platform. Eight high-sensitivity optical power meters now fit in a single rack unit. Optical connections are made with the interchangeable 81000xl connector interface system.

For further details on its application and key features, refer to the product datasheet available on [www.keysight.com](http://www.keysight.com).

## N7749C Optical Head Interface

The N7749C optical head interface controls the remote heads. Readout is supported over LAN and USB interfaces with a built-in web-browser GUI and the SCPI command set common to Keysight optical power meters. Power values can be logged with dual-1M sample buffers for each head, to sample continuously with internal or external triggering. The heads generally have sample averaging times ranging from 100  $\mu\text{s}$  to 10 s.

### **Analog output port perfect for automated alignment**

Direct feedback for optimization processes like fiber alignment is also provided with analog voltage outputs, both at the remote head itself and now from the N7749C front panel. The front-panel signals can be configured to be either linearly proportional to the optical signal power or logarithmic to provide useful signal over decades of power levels.



### Members of a growing family

The N7749C benefits from the N77-C's family-wide, common trigger concept, and a modern, browser-accessible user interface, that makes it convenient to configure the instrument's functionality. High-speed measurement data acquisition, faster data interfaces, the use of dual-ported RAM for uninterrupted simultaneous measurement and readout, all work to minimize overhead time for repetitive measurements.

### Selection Guide

- 81620C: Si detector, 450 nm to 1020 nm, low noise, best choice for 850 nm
- 81623C: Ge detector, wide 750 nm to 1800 nm range
- 81624C: InGaAs detector, highest accuracy, lowest noise
- 81626C: InGaAs detector, +26 dBm high power
- 81628C: InGaAs detector, integrating sphere, +40 dBm max, highest accuracy at high power

### Compatibility Notice

At this time, the new N7749C optical head interface supports the newly released 81620C, 81623C, 81624C, 81626C and 81628C optical heads and their special calibration variants. An upcoming firmware version will add support for the previous generation optical heads 81620B, 81623B, 81624B, 81626B and 81628B.

Please note that obsolete optical heads, e.g. those of the 8152xA or 8162xA generation, are not supported by the N7749C optical head interface and there are no plans to add support.

Likewise, 8162-C optical heads cannot be used with 81618A or 81619A optical head interface modules or with the 8153A Lightwave Multimeter.

For further details on its application and key features, refer to the product datasheet available on [www.keysight.com](http://www.keysight.com).

## 81620C, 81623C, 81624C, 81626C & 81628C Optical Power Head

The 8162-C family of optical power heads provide accurate power measurements with a large area detector in a remote head for flexible positioning. Functionality includes averaging time settings from 100  $\mu$ s to 10 s, automatic power ranging, monitoring of minimum and maximum values. Fiber adapters are available for common connector types including MT ribbon fiber connectors and bare fiber clamps (for details, see <https://www.keysight.com/in/en/products/accessories.html>).

The D-shaped adapter type are held magnetically for quick adapter change. The heads also include a removable 81624DD adapter ring for use with the threaded type adapters. The heads are connected to the N7749C optical head interface.

Following are the benefits of using 8162-C optical power heads:

- Low relative uncertainty reduces the impact of connectorizing and fiber handling and leads to a robust test setup
- The 5 mm large-area detector is less susceptible for connector misalignment and guarantees highly repeatable measurement results. Lower power per mm<sup>2</sup> makes the optical head more suitable for high power measurements and guarantees better linearity.

See [Optical Head Adapters](#) on page 37.

For further details on its application and key features, refer to the product datasheet available on [www.keysight.com](http://www.keysight.com).

## N774-C Series Instrument's Front and Rear Panels

This section provides information on the front panel of N774-C multiport power meters.

### N7742C Power Meter



Figure 3 Front panel of the N7742C 2-port power meter



Figure 4 Front panel of the N7742C 4-port power meter

## N7743C Power Meter



Figure 5 Front panel of the N7743C 2-port power meter



Figure 6 Front panel of the N7743C 4-port power meter

## N7744C Power Meter



Figure 7 Front panel of the N7744C 4-port power meter

## N7745C Power Meter



Figure 8 Front panel of the N7745C 8-port power meter



## N7747C Power Meter



Figure 9 Front panel of the N7747C 2-port optical power meter

## N7748C Power Meter



Figure 10 Front panel of the N7748C 4-port optical power meter

## N7749C Optical Head Interface



Figure 11 Front panel of the N7749C 2-port optical head interface



Figure 12 Front panel of the N7749C 4-port optical head interface

## N774-C Series Instrument's Rear Panel



Figure 13 Rear panel of the N774-C series instruments



## Initial Inspection

### Initial Inspection

Inspect the shipping container for damage. If there is damage to the container or cushioning, keep them until you have checked the contents of the shipment for completeness and verified the instrument both mechanically and electrically.

If the contents are incomplete, mechanical damage or defect is apparent, or if an instrument does not pass the operator's checks, notify the nearest Keysight Technologies Sales/Service Office.

#### **WARNING**

**You MUST return malfunctioning instruments to a Keysight Technologies Sales/Service Center for repair and calibration.**

---

### Claims and Repackaging

If physical damage is evident or if the instrument does not meet specification when received, notify the carrier and the nearest Keysight Technologies Sales/Service Office. The Keysight Technologies Sales/Service Office will arrange for repair or replacement of the unit without waiting for settlement of the claim against the carrier.

### Return Shipments to Keysight Technologies

If the instrument is to be shipped to the Keysight Technologies Sales/Service Office, attach a tag showing owner, return address, model number and full serial number and the type of service required.

The original shipping carton and packing material may be reusable, but the Keysight Technologies Sales/Service Office will provide information and recommendations on materials to be used if the original packing is no longer available or reusable. General instructions for repackaging are as follows:

- Wrap instrument in heavy paper or plastic.
- Use strong shipping container. A double wall carton made of 350-pound test material is adequate.
- Use enough shock absorbing material (3 to 4 inch layer) around all sides of the instrument to provide a firm cushion and prevent movement inside container. Protect control panel with cardboard.

- Seal shipping container securely.
- Mark shipping container FRAGILE to encourage careful handling.
- In any correspondence, refer to instrument by model number and serial number.

## Power Supply Requirements

### Line Power Requirements

#### Line Power Requirements

The instrument complies with Overvoltage Category II and can operate from the single-phase AC power source that supplies between 100 V and 240 V at a frequency in the range 50/60 Hz. The maximum voltage fluctuation is 10% of the nominal supply voltage. The maximum power consumption is 60 VA with all options installed.

#### Line Power Cable

In accordance with international safety standards, the instrument has a three-wire power cable. When connected to an appropriate AC power receptacle, this cable earths the instrument cabinet.

### CAUTION

Please note that the switch on the front panel of the instrument does not stop the flow of power to the instrument.

If you need to turn off the power, unplug the instrument at the mains or remove the power cable connector from the appliance coupler at the rear of the instrument. For this reason, the power cable connection should be easily accessible - allowing you to turn off the power quickly. If the instrument is in a cabinet, it must be disconnected from the line power by the system's line power switch.

The power switch allows you to switch between stand-by mode and power-on mode.



Figure 14 Power LED on the Front Panel of the Instrument

When the instrument is in stand-by mode, the Power LED is orange. When the instrument is powered-on, the Power LED is green.

The AC power requirements are summarized on the rear panel of the instrument.



Figure 15 AC Power Requirement Markings

## Optical Connections

### Optical Head Adapters

#### What is an Optical Head?

An optical head measures the power emitted from a connected single-mode or multi-mode fiber or the power applied in an open parallel beam (with max. 5 mm diameter). The wavelength and power range depends on the sensor element.

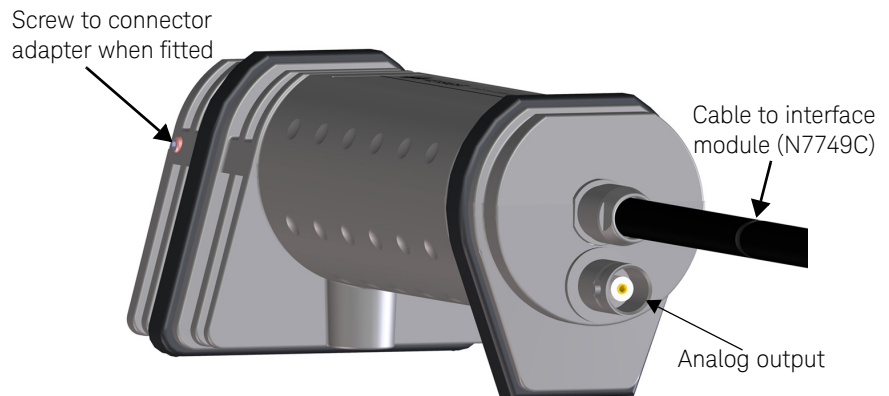


Figure 16 Rear view of an Optical Head with Analog Output

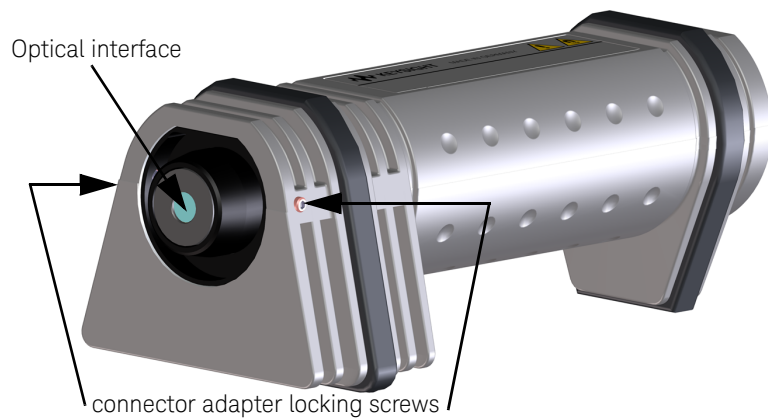


Figure 17 Front View of Optical Head without Adapter

**NOTE**

All optical Heads (except the 81628C) are shipped including a mounted 81624DD adapter ring. To use D-type magnetic connector adapters, this ring should be removed by loosening the locking screws shown in [Figure 17](#) with a 1.5 mm hex key.

For the complete list of adapters, refer to the chapter [Accessories](#) on page 97.

**Analog Output**

The analog output is the BNC connector on the back of the optical head. It outputs a voltage directly proportional to the strength of the optical signal at the optical input in the current range. The analog signal is always in the range between 0 and 2 V, 2 V corresponding to a full power input signal in the current range, 0 V corresponding to no input signal.

During autoranging, the level to which 2 V corresponds changes. You should disable autoranging when using the analog output.

**Applications**

Possible applications for the analog output are:

- to close the feedback loop controlling the current supplied to a laser
- to aid positioning the system for fiber alignment tasks
- to monitor optical power on an oscilloscope

The analog signal reacts instantaneously to the input signal.

**Optical Input**

The optical input to the optical head requires a connector adapter to match the connector type (or bare fiber) to the optical head interface.

The optical head interface can be either threaded or a D-type magnetic interface depending on the model of optical head (81628C is only available with a threaded interface). For the complete list of adapters, refer to the chapter [Accessories](#) on page 97.

When a connector adapter is fitted it should be locked in place by tightening the locking screws located either side of the main optical head housing.

### Heat Sink for 81628C optical Head

The 81628C optical head has a heat sink that allows an extended operating power range. For optical power higher than +34 dBm the attached heat sink MUST be used.

For continuous optical power or average optical power higher than +38 dBm the connector adapters will get warmer than permitted according to the safety standard IEC 61010-1.

The 81628C Optical Head can handle optical power up to +40 dBm, however, operation above +38 dBm is at the operators own risk.

### Attaching the Heat Sink to the 81628C Optical Head

#### NOTE

Always attach the heat sink and rubber ring to the 81628C if operating at an optical power higher than 34 dBm.

---

### Applicable Adapters

Keysight adapters types 81000xx, 81000BT are applicable to the 81628C with the heat sink attached (without the heat sink and up to 34 dBm the 81000BT bare fiber adapter may be attached). Bare fibers are not intended to be used in high power applications.

#### NOTE

If shipping the 81628C high power optical head please detach the heat sink from the optical head to avoid damage during transportation.

---

### Mounting Instructions

- 1 Check that the rubber ring is correctly attached to the integrating sphere and covers the metallic screws as shown in [Figure 18](#) .



Figure 18 Attaching the Rubber Ring

- 2 The heat sink consists of two conical metal parts, the bottom part (smallest diameter at the bottom), and the top part (largest diameter at top). Slide the bottom part of the heat sink over the throat of the integrating sphere with the smallest diameter facing to the sphere. Then screw on the desired adapter (81000xx series) to the sphere as shown in [Figure 19](#) .



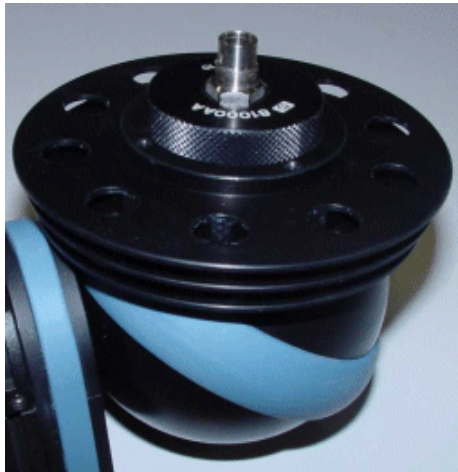


Figure 19 Attaching the Bottom Part of the Heat Sink

- 3 Attach the upper part of the heat sink to the integrating sphere. Slide the upper part over the connector adapter with the largest diameter facing opposite to the sphere. Tighten the screws with the Allen key enclosed in the Heat Sink Kit (see [Figure 20](#)).

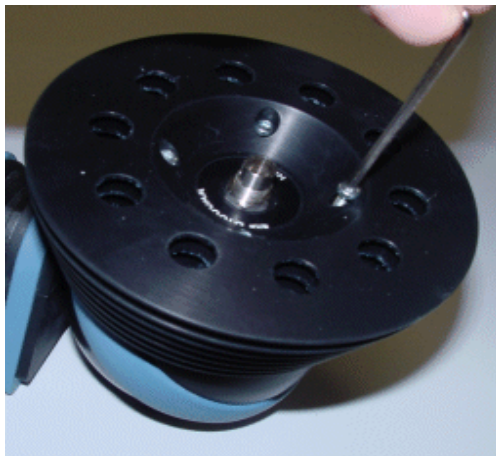


Figure 20 Attaching the Upper Part of the Heat Sink

## Quad-Adapter Connections

The quad-adapter connections can only be made on N7744C and N7745C power meters. The quad-adapter do not make contact to the fiber connector faces and can be used with either angled or straight polished connectors.

### CAUTION

When using bare fiber connections to power meters, the length of fiber extending from the fiber holder must be carefully adjusted to avoid scratching the power meter optics.

### Making Quad-adapter Connections on the Power Meters



Figure 21 Making Quad-Adapter Connection

### NOTE

Before you attach a quad-adapter or fiber, you should make sure they are clean. This is important for accurate measurements. The fibers do not contact the optical inputs (all contact with the optical inputs should be avoided). Usually the only cleaning necessary for the optical inputs is the gentle removal of dust with pressurized, dry air.

For further information, refer to the “Maintenance” section described in this document.

To use a quad-adapter to connect optical fibers to the power meter inputs:

- 1 Select the quad-adapter that suits the optical connector that your optical fiber is terminated with.
- 2 Attach the optical connectors to the quad-adapter. You can attach up to 4 fibers to the quad-adapter at the same time.
- 3 Make sure the number labels on the quad-adapter are at the top.
- 4 Connect the quad-adapter to the optical inputs by pressing it on until it clicks securely into place, without pressing the release levers.

### Removing Quad-adapter Interfaces from the Power Meter

#### NOTE

There are release levers on both sides of the quad-adapter for removing it from the optical inputs.

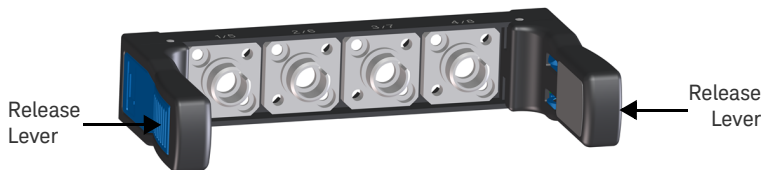


Figure 22 Removing Quad-Adapter Interface

- 1 Press the release levers on both sides of the quad-adapter to release it from the front panel of the power meter.
- 2 You can now remove the optical connectors from the quad-adapter.

#### NOTE

Always place the dust cap on unused connector interfaces.

You can use the quad-adapter dust caps to protect the four power meter inputs and the rear of the quad-adapter, for example, when fibers are attached.

## 8100xXI Optical Module Connector Interfaces

Keysight's universal optical interface allows users to adapt optical test instrumentation to a multitude of optical connector standards.



The new ceramic sleeve has been reinforced to combine robustness with greater precision and less wear. The most popular connector interfaces, used for FC/PC and FC/APC connectors, are now equipped with the new technology.

- A new ceramic sleeve centers the instrument's ferrule to the attached connector's ferrule, ensuring nearly wear-free and abrasion free alignment.
- A groove on the knurled outer ring of the screw-on interface differentiates the new adapter from the current adapters that are equipped with a metal sleeve.
- Metallic sleeves have been considered the most abuse-forgiving alignment solution. However, metal surfaces inside the tube wear and leave contamination at the most critical place, the optical connector plane. Over time, metal sleeves open up enough to degrade the connection alignment.

For the complete list of adapters, refer to the chapter [Accessories](#) on page 97.

## Exchangeable connector interface N7742xl

The new removable/replaceable connector interface N7742xl allows the use the fiber according to connector style preference. These connectors are only available on the N7742C and N7743C instruments. The connector adapters support FC, SC, LC and ST connectors and are individually configurable.

## Electrical Connectors

### Rear Panel Trigger BNC Connectors

There are two BNC connectors on the rear panel of your N774-C instrument. These are the Trigger Out and the Trigger In connectors.



#### CAUTION

The Trigger In is a TTL input. A maximum of 5 V can be applied as an external voltage to this input connector.

The Trigger Output is a TTL output. Do not apply an external voltage to this connector.

### Front Panel Analog Output BNC Connector

The BNC head connectors are available on the front panel of your N774-C instruments (except N7744C and N7745). It provides the possibility to create an linear or logarithmic analog output.

The analog voltage is always in the range between 0 and 2 V. For linear output, 1 V corresponds to the nominal value of the current range (like 100  $\mu$ W in the -10 dBm range) and 0 V corresponds to zero signal.

For logarithmic output, the voltage represents the optical power independent of the current range. For power meters with a maximum range of +10 dBm, 2 V corresponds to +20 dBm, 1.8 V to +10 dBm, 1.6 V to 0 dBm, 1.4 V to -10 dBm,... 0 V to -80 dBm. For power meters with a maximum range of +20 or +30 dBm, the scale is shifted by 10 dB, so 2 V represents +30 dBm and 0 V is -70 dBm. For the 81628C with a +40 dBm maximum range, 2 V is +40 dBm and 0 V is -60 dBm.

Do not apply an external voltage to this connector.



## Optical Head Analog Output

The analog output is the BNC connector on the back of the optical head. It outputs a voltage directly proportional to the strength of the optical signal at the optical input in the current range. The analog voltage is always in the range between 0 and 2 V. For linear output, 1 V corresponds to the nominal value of the current range (like 100  $\mu\text{W}$  in the -10 dBm range) and 0 V corresponds to zero signal. Do not apply an external voltage to this connector.

## Powering Up the Instrument

When you power on the instrument, the LEDs on the front panel show the various stages of the instrument.

	Power	LAN	Status
Yellow	Standby mode	Searching for LAN	Warming Up
Green	ON	Connected with LAN	
Blinking Green			Communicating over LAN / USB
Red		Not connected	

## Remote Interface

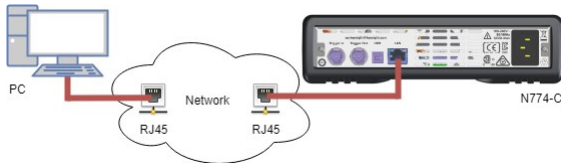
The N774-C supports remote interface communication over a LAN or a USB interface.

### NOTE

It is recommended to use the Keysight IO Libraries Suite to enable instrument communication for a variety of development environments. It is available at: <http://keysight.com/find/iolib>

### LAN Connection with a DHCP server (Site LAN)

A site LAN is a local area network in which LAN-enabled instruments and computers are connected to the network through routers, hubs, and/or switches. They are typically large, centrally-managed networks with services such as DHCP and DNS servers. The following figure illustrates a typical site LAN system.



- Connect the instrument to the site LAN or to your computer using a LAN cable. The as-shipped instrument LAN settings are configured to automatically obtain an IP address from the network using a DHCP server (DHCP is set On). The DHCP server will register the instrument's hostname with the dynamic DNS server. The hostname as well as the IP address can then be used to communicate with the instrument. The front panel LAN indicator will indicate the current LAN state (see [The LAN Status Indicators](#) on page 51).
- Use the Connection Expert utility of the Keysight IO Libraries Suite to add the instrument and verify a connection. To add the instrument, you can request the Connection Expert to discover the instrument. If the instrument cannot be found, add the instrument using its host name or IP address.



- You can now use Interactive IO within the Connection Expert to communicate with your instrument, or you can program your instrument using the various programming environments. You can also use the Web browser on your computer to communicate with the instrument as described under [User Interface Reference](#) on page 71.

## LAN Connection without a DHCP server (Private LAN)

A private LAN is a network in which LAN-enabled instruments and computers are directly connected, and not connected to a site LAN. They are typically small, with no centrally-managed resources. The following figure illustrates a typical private LAN system.



### NOTE

Make sure your computer is configured to obtain its address from DHCP and that NetBIOS over TCP/IP is enabled. Note that if the computer had been connected to a site LAN, it may still retain previous network settings from the site LAN. Wait one minute after disconnecting it from the site LAN before connecting it to the private LAN. This allows the PC to sense that it is on a different network and restart the network configuration.

- The factory-shipped instrument LAN settings are configured to automatically obtain an IP address from a site network using a DHCP server. You can leave these settings as they are. Most Keysight products and most computers will automatically choose an IP address using auto-IP if a DHCP server is not present. Each assigns itself an IP address from the block 169.254.nnn. Note that this may take up to one minute. The front panel LAN indicator will indicate the current LAN state (see [The LAN Status Indicators](#) on page 51).
- Use the Connection Expert utility of the Keysight IO Libraries Suite to add the LAN instrument and verify a connection. To add the instrument, you can request the Connection Expert to discover the LAN instrument. If the instrument cannot be found, add the instrument using its hostname or IP address. You can find additional details here: [Connecting the Instrument](#) on page 54

**NOTE**

If this does not work, refer to “Troubleshooting Guidelines” in the Keysight Technologies USB/LAN/GPIB Interfaces Connectivity Guide included with the Keysight IO Libraries Suite.

- You can now use Interactive IO within the Connection Expert to communicate with your instrument, or you can program your instrument using the various programming environments. You can also use the Web browser on your computer to communicate with the instrument as described under [User Interface Reference](#) on page 71.

## USB Connection

The following figure illustrates a typical USB interface system:



- Connect your instrument to the USB port on your computer using a USB cable.

**NOTE**

Your PC will detect a new USB Mass Storage Device (read-only) and a new virtual Ethernet link over USB. This interface assigns itself an IP address from the block 100.61.nnn.nnn and your PC 100.61.nnn.nnn (n+1).

- Use the Connection Expert utility of the Keysight IO Libraries Suite to add the instrument and verify a connection. To add the instrument, you can request the Connection Expert to discover the instrument. If the instrument cannot be found, add the instrument using its hostname or IP address. You can find additional details here: [Connecting the Instrument](#) on page 54.
- You can now use Interactive IO within the Connection Expert to communicate with your instrument, or you can program your instrument using the various programming environments.

## Technical Overview

User Interface	Keysight N774-C
Ethernet Access: HTTP Telnet VXI-11 SCPI-telnet SCPI-raw	IPv4 and IPv6 Socket connection: http://<ip_address> or http://<host_name> port 23 port 111 (IPv4 only) port 5024 port 5025
USB Access	Remote NDIS (virtual Ethernet link over USB) USB Mass Storage functions (read-only)

## The LAN Status Indicators

When the LAN connection is made, you will see the following LAN status indicators:

No LAN Link



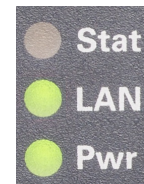
LAN Red

LAN Link  
No IP Address



LAN Yellow

LAN Link



LAN Green

There may be a delay between making the LAN link (yellow status) and getting the IP address (green status). This delay may be longer if there is no DHCP server, for example when the instrument is connected directly to a PC.

## The LAN Reset button

This recessed button has two functions.



- Pressing the button briefly invokes a preset of the instrument and restores default measurement settings. This is equivalent to the programming command:  
`:SYSTEM:PRESet`
- Pressing and holding the button for 5 seconds will reset the LAN parameters to the factory default. This includes removing the password. This is equivalent to the following programming command:  
`:SYSTEM:COMMunicate:ETHernet:RESet`

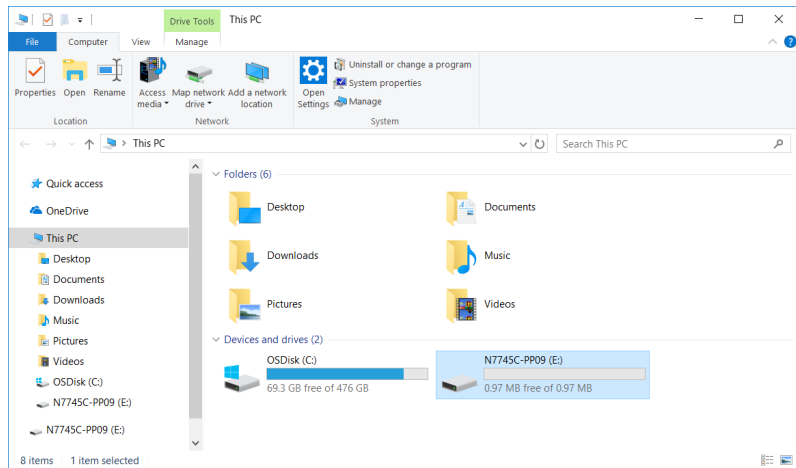
## Deleting User Data

If you need to delete all your logged data and user configurations, press and hold the **LAN Reset** button (approx. 5 sec) to reset the instrument and all your logged data and user configurations will be deleted.

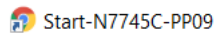
## Connecting the Instrument

### Connecting over USB

- 1 Power on the instrument.
- 2 Connect the PC to the instrument using a USB 2.0 Type A Male to Type B Male cable.
- 3 The operating system will detect and display the new instrument as a new drive and Network Adapter.



- 4 Double-click on this new drive. It will show a shortcut to start the user interface.



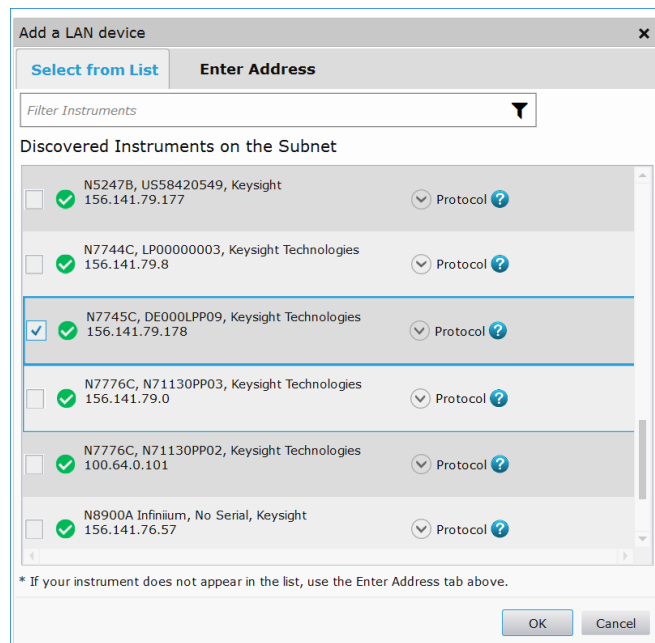
- 5 Double-click on this shortcut. This will open the user interface of the instrument in a browser.

## Connecting over LAN

- 1 Make sure the instrument is connected to the LAN, and that the LAN LED on the front panel is green.
- 2 If it is not already running, start the Keysight Connection Expert software.

The Discovery Service automatically discovers LAN instruments on the same subnet as the PC on which the service is running.

- 3 To add LAN instruments to the Connection Expert My Instruments list:
  - a Click, select LAN Instrument from the context list. This opens the list of discovered LAN instruments.



- b Click the check box for each instrument you want to add to the list.
- c Click OK.

- 4 To manually add LAN instruments outside of the local subnet:
  - a Click, select LAN Instrument from the context list. This opens the list of discovered LAN instruments.
  - b Click the Enter Address tab.
  - c Enter the LAN address or host name and select the protocol used to communicate with the instrument.

**Add a LAN device** [X]

**Select from List    Enter Address**

Set LAN Address:

Hostname or IP Address:

TCPIP Interface ID:

Set Protocol:

Instrument (VXI-11)    Remote Name:

HiSlip    Remote Name:

Socket    Port Number:

Verify Connection:

Allow \*IDN Query

   TCPIP0::169.254.186.97::inst0::INSTR  
Verified

View Web Page:

- d Click OK.



- 5 Linux or macOS can use the zeroconf / mdns discovery service with tools like Avahi (GNU/Linux) or Bonjour (Mac).

```

steffen@keysight [11:04:34 AM] [-]
-> % avahi-browse --all -t |grep N7781
+ en01 IPv4 N7781C DE0000PP03 Polarization Analyzer      _vxi-11._tcp      local
+ en01 IPv4 N7781C DE0000PP03 Polarization Analyzer      _scpi-telnet._tcp local
+ en01 IPv4 N7781C DE0000PP03 Polarization Analyzer      _scpi-raw._tcp    local
+ en01 IPv4 N7781C DE0000PP03 Polarization Analyzer      _lxi._tcp         local
+ en01 IPv4 N7781C DE0000PP03 Polarization Analyzer      Web Site          local
steffen@keysight [11:11:34 AM] [-]
-> % avahi-browse _scpi-raw._tcp --resolve |grep N7781 -A3
+ en01 IPv4 N7781C DE0000PP03 Polarization Analyzer      _scpi-raw._tcp    local
--
= en01 IPv4 N7781C DE0000PP03 Polarization Analyzer      _scpi-raw._tcp    local
hostname = [k-n7781c-0pp03.local]
address = [156.141.78.199]
port = [5025]
txt = ["txtvers=1" "Manufacturer=Keysight Technologies" "Model=N7781C" "SerialNumber=DE0000PP03" "FirmwareVersion=V1.000"]

```

## N774-C User Interface

Figure 23 depicts an example of N7745C multiport power meter user interface that displays the instrument's connection settings. The below figure is also valid for all N774-C instruments.

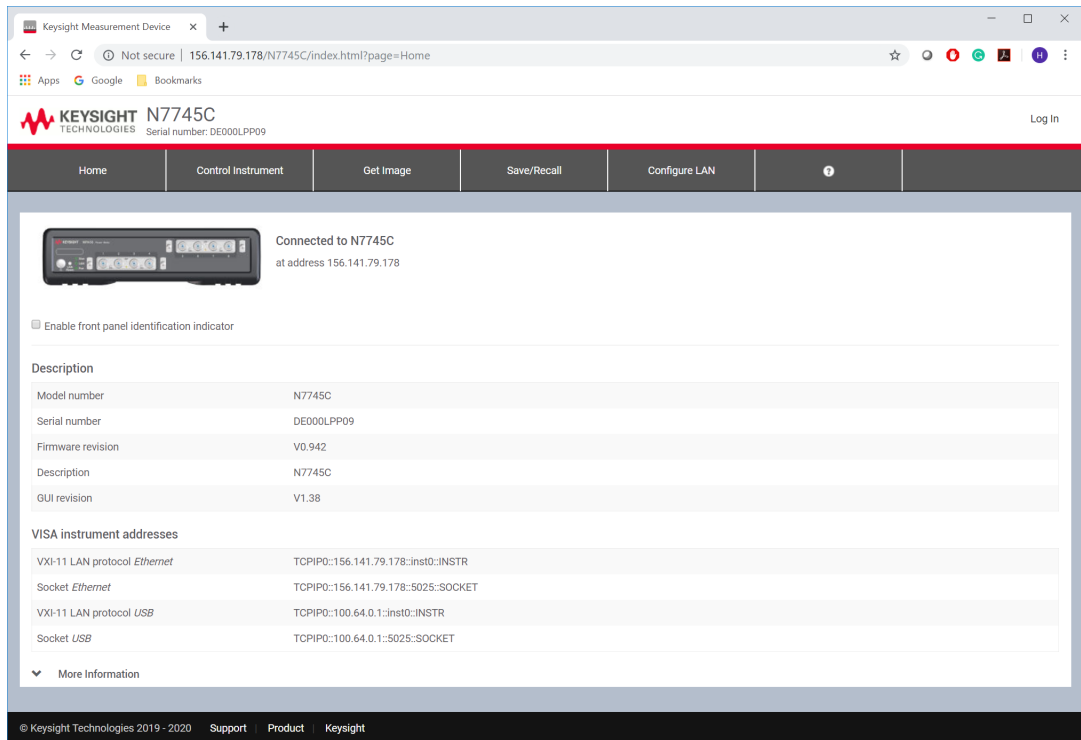


Figure 23 N774-C User Interface

For details on the N774-C user interface and how to use it to control the instrument, refer to [User Interface Reference](#) on page 71.

# 3 Definition of Terms

Specification	/ 61
Typical Value (Characteristics)	/ 61
Operating Conditions	/ 61
Specified Temperature	/ 61
Ambient Temperature Range	/ 61
(Applicable) fiber type	/ 61
Averaging time	/ 62
Constant operating conditions	/ 62
Data logging capability	/ 62
Drift (dark)	/ 62
Dynamic range (logging mode)	/ 63
Frequency Response	/ 63
Linearity	/ 63
Maximum safe (input) power	/ 64
Minimum averaging time	/ 64
Noise pp (dark)	/ 64
Noise 2 sigma (dark)	/ 64
Operating humidity	/ 65
Operating temperature	/ 65
Operating temperature and humidity	/ 65
Polarization dependent responsivity (PDR)	/ 65
Port separation (static)	/ 66
Port separation, dynamic	/ 66
Power range	/ 66
Range settling time (one range step)	/ 67
Relative port to port uncertainty	/ 67

Return loss / 67

Specification wavelength range / 68

Spectral ripple (power meter; due to interference) / 68

Storage conditions / 68

Total uncertainty / 68

Uncertainty at reference conditions / 69

Wavelength range / 69

Warm-up time / 69

## Definition of Terms

This section defines terms that are used in this document.

### Specification

Describes warranted product performance that is valid under the specified conditions. Specifications include guard bands to account for the expected statistical performance distribution, measurement uncertainties, changes in performance due to environmental changes and aging of components.

### Typical Value (Characteristics)

Characteristics describe the product performance that is usually met but not guaranteed. Typical values are based on data from a representative set of instruments.

Generally, all specifications are valid within the specified temperature range, after warm-up, at the stated operating conditions and measurement settings.

### Operating Conditions

The environmental conditions for system operation. The system must not be operated outside these conditions.

### Specified Temperature

The temperature range where the specifications apply (if not differently stated).

### Ambient Temperature Range

Temperature range of the ambient environment where specifications apply.

### (Applicable) fiber type

Connection type for which the specifications and characteristics apply (if not differently stated).

## Averaging time

Specifies the period during which the power meter or monitor power meter takes readings from the photo-detector. The displayed power result is the (arithmetical) average of these readings.

## Constant operating conditions

This generally includes constant values of temperature, humidity, wavelength, input power level, polarization state and mode distribution, if the quantity is not explicitly subject to variation.

## Data logging capability

Maximum number of power readings per port that can be captured during a logging operation.

## Drift (dark)

Specifies the maximum deviation from zero of the measured power with no optical input (dark) over time, excluding **Noise pp (dark)** on page 64, power expressed in Watts.

**Measurement:** From the dark measurement result  $P_i$ , a polynomial fit  $F_i$  is calculated. The fit incorporates the least square-sum difference and uses 3rd-order for the N7744C and N7745C. The Drift  $D$  is calculated by

$$D = \max_i\{F_i\} \text{ or } \min_i\{F_i\}, \text{ whichever is worse.}$$

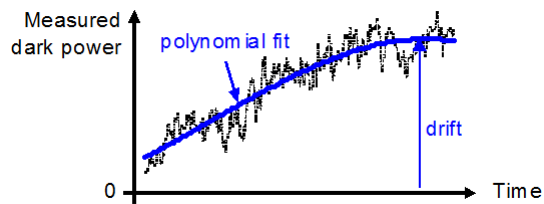


Figure 24 Drift (dark)

**Conditions:** All ports dark. Observation time as specified. Other conditions as specified.

### Dynamic range (logging mode)

For a fixed power meter range, dynamic range  $D$  specifies the difference between the maximum displayable value  $P_{\max}$  in dBm in the corresponding power meter range and the minimum measurable power  $P_{\min}$  in dBm.

**Conditions:** As specified.

**Measurement:**  $P_{\max}$  is based on the nominal power meter range value.  $P_{\max}$  is 3 dB higher than this value (that is, in the +0 dBm power meter range,  $P_{\max}$  is +3 dBm), except that it equals the value for the highest range.  $P_{\min}$  dBm is calculated as the root-sum-square (RSS) of the specified “Noise 2 sigma (dark)” (see, [Noise 2 sigma \(dark\)](#) on page 64 and “Drift (dark)” (see, [Drift \(dark\)](#) on page 62). RSS is calculated in linear units (Watts).

### Frequency Response

Specifies the frequency  $f_{\text{resp}}$  up to which the power meter's transfer function is above a defined cutoff level.

The transfer function is the measured optical amplitude on a modulated sinusoidal optical input divided by the actual amplitude over modulation frequency, expressed in dB.

**Conditions:** Cutoff level as specified. Other conditions as specified.

### Linearity

Specifies the relative difference between the measured (displayed) power ratio  $D_x/D_0$  and the actual (true) power ratio  $P_x/P_0$ , caused by changing the power level from the reference level  $P_0$  to an arbitrary level  $P_x$ .

Powers expressed in Watts.

Excluding “Noise pp (dark)” (see, [Noise pp \(dark\)](#) on page 64 and “Drift (dark)” (see, [Drift \(dark\)](#) on page 62).

$$L_{\%} = \left( \frac{D_x/D_0}{P_x/P_0} - 1 \right) \text{ when expressed in \%}$$

$$L_{\text{dB}} = 10 \log \left( \frac{D_x/D_0}{P_x/P_0} \right) \text{ when expressed in dB}$$

**Conditions:** Reference power level  $P_0 = 0.01$  mW (-20 dBm). Other conditions as specified.

## Maximum safe (input) power

The maximum input power that can be applied to any port of the power meter or attenuator without permanent change to its characteristics.

**Attention:** Applying more than the specified power might damage the power meter or attenuator.

**NOTE**

For input powers > 20 dBm, clean connectors in good condition are vital to avoid thermally induced fiber damage.

---

## Minimum averaging time

The minimum selectable averaging time.

## Noise pp (dark)

Specifies the peak-to-peak (pp) change of displayed power over time with zero input power (dark), excluding "Drift (dark)" (see, [Drift \(dark\)](#) on page 62) for the N7744C and the N7745C only. Powers expressed in Watts.

**Conditions:** All ports dark. Averaging time as specified. Other conditions as specified.

**Measurement:** As for "Drift (dark)". From the measured  $P_i$  and the fitted curve  $F_i$  the noise curve  $N_i = P_i - F_i$  is calculated.

The noise  $N$  is

$$N = \max_i\{N_i\} - \min_i\{N_i\}$$

**NOTE**

The noise pp specification (rather than noise 2 sigma) is given for legacy reasons.

---

## Noise 2 sigma (dark)

Specifies twice the standard deviation of the measured dark power (with zero input power), excluding "Drift (dark)". Power are expressed in Watts.

**Conditions:** All ports dark. Averaging time as specified. Other conditions as specified.



**Measurement:** As for "Drift (dark)" (see, [Drift \(dark\)](#) on page 62).

From the measurement result  $P_i$  and the fitted curve  $F_i$  the noise  $N$  is calculated by

$N = 2 * StDev_i\{P_i - F_i\}$ , where  $StDev_i\{\}$  denotes the standard deviation over indices  $i$ .

#### Operating humidity

Humidity range where the instrument is designed to be operated.

The instrument must not be operated outside this range. If previously stored beyond this range, wait for acclimation before turning on the instrument.

#### Operating temperature

Temperature range for which the specifications apply if not differently stated.

The instrument must not be operated outside this range. If previously stored beyond this range, wait for acclimation before turning on the instrument.

#### Operating temperature and humidity

The ambient temperature range and humidity range of the instrument for which the specifications apply.

### NOTE

**If the instrument is rack-mounted the temperature and humidity within the rack apply.**

#### Polarization dependent responsivity (PDR)

Specifies the dependence of the measured power on the input state of polarization (SOP) as  $\pm$  half the difference between the highest and the lowest measured power over all SOPs, expressed in dB.

Powers expressed in dBm.

**Conditions:** As specified.

## Port separation (static)

Specifies the difference between the power  $P$  applied to one port and the measured power  $D$  on any other port with no applied power (dark).

Excluding "Noise pp (dark)" (see, [Noise pp \(dark\)](#) on page 64) and "Drift (dark)" (see, [Drift \(dark\)](#) on page 62).

Powers expressed in dBm, port separation  $S$  expressed in dB,

$$S = P - D$$

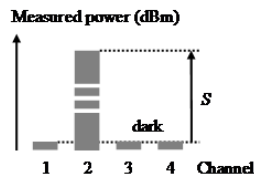


Figure 25 Port separation (static)

**Conditions:** Applied power level as specified.

## Port separation, dynamic

Specifies the difference between step power input  $P_{\text{step}}$  (with positive or negative slope) applied to one port and the maximum measured power change  $D_{\text{chng}}$  (positive or negative) on any other port without applied power (dark). Excluding "Noise pp (dark)" (see, [Noise pp \(dark\)](#) on page 64) and "Drift (dark)" (see, [Drift \(dark\)](#) on page 62).

Powers expressed in dBm, dynamic port separation  $SD$  expressed in dB.

$$SD = P_{\text{step}} - D_{\text{chng}}$$

**Conditions:** Power step height as specified (1 mW).

## Power range

Specifies the range from the smallest input power that causes a significant change of the measured (displayed) power to the highest power for which the specifications apply if not differently stated.

### Range settling time (one range step)

When changing from one power meter range to the next (one range higher or lower), the settling time specifies the time required for the power meter to settle into the new range. Measurements starting after that period are within specifications.

The time starts when the instrument receives the range change command (manual range) or when the instrument detects the requirement for power meter range change (autorange).

**Conditions:** As specified.

### Relative port to port uncertainty

Specifies  $\pm$  half the maximum difference between the measured powers of different ports when applying the same stimulus. Measured powers expressed in dBm, the relative port to port uncertainty  $U$  expressed in  $\pm$ dB.

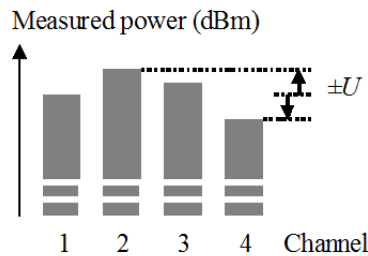


Figure 26 Relative port to port uncertainty

**Conditions:** As specified.

### Return loss

The ratio between the incident power and the power reflected back from the instrument into the input fiber, expressed in dB.

**Conditions:** As specified. (For attenuators: applicable to both ports with fiber cables with high quality connectors in perfect optical condition on both attenuator ports and the respective second port terminated (zero reflectance).)

**Measurement:** With return loss meter and non-coherent source of applicable wavelength.

## Specification wavelength range

The wavelength range for which all specifications and characteristics apply, if not differently stated.

## Spectral ripple (power meter; due to interference)

A coherent input signal causes optical interference<sup>1</sup> between reflective interfaces within the power meter's optical assembly, including the end face of a connected fiber. Optical interference causes a wavelength dependent periodic change of the power meter's responsivity. Spectral ripple is defined as  $\pm$  half the difference between the highest and the lowest power resulting from the periodic change.

**Conditions:** Constant input power, constant state of polarization (SOP).

Connector as specified. Other conditions as specified.

**Measurement:** Using a laser source without spectral ripple or with known (monitored) spectral ripple and linewidth  $< 100$  MHz and stepping the wavelength over the specified range. The periodic part in the measurement result is separated by subtracting the polynomial 2<sup>nd</sup> order fit (low frequency part).

## Storage conditions

Allowed temperature and humidity range for the non-operating instrument. Wait for acclimation to within the "Operating temperature" before turning on the instrument.

## Total uncertainty

The maximum relative difference  $U$  between measured (displayed) power  $M$  and actual (true) power  $P$  for a specified set of operating conditions, expressed in percent. Powers expressed in Watts. Excluding "Noise pp (dark)" (see, [Noise pp \(dark\)](#) on page 64) and "Drift (dark)" (see, [Drift \(dark\)](#) on page 62).

$$U = 100\% * (M/P - 1)$$

**Conditions:** Operating conditions as specified. Other conditions as specified.

#### Uncertainty at reference conditions

The maximum relative difference  $U$  between measured (displayed) power  $M$  and actual (true) power  $P$  for the specified set of reference conditions, including all uncertainties in the calibration chain from the national calibration laboratory to the test meter, expressed in percent.

Powers expressed in Watts.

$$U = 100\% * (M/P - 1)$$

**Conditions:** Reference conditions as specified.

#### Wavelength range

The range of wavelengths for which the power meter is calibrated, or that can be set at the attenuator and for which the specifications apply (if not differently stated).

#### Warm-up time

Time after power-up of the acclimated instrument after which the specifications and characteristics apply.



Keysight N774-C & 8162-C Series

User's Guide

# 4 User Interface Reference

[N774-C Series User Interface](#) / 72

[Controlling N774-C Instruments](#) / 74

[How to Use Auxiliary Functions](#) / 88

## N774-C Series User Interface

Figure 27 shows the N7745C user interface with various tabs highlighted. The same user interface is applicable for all N774-C instruments.

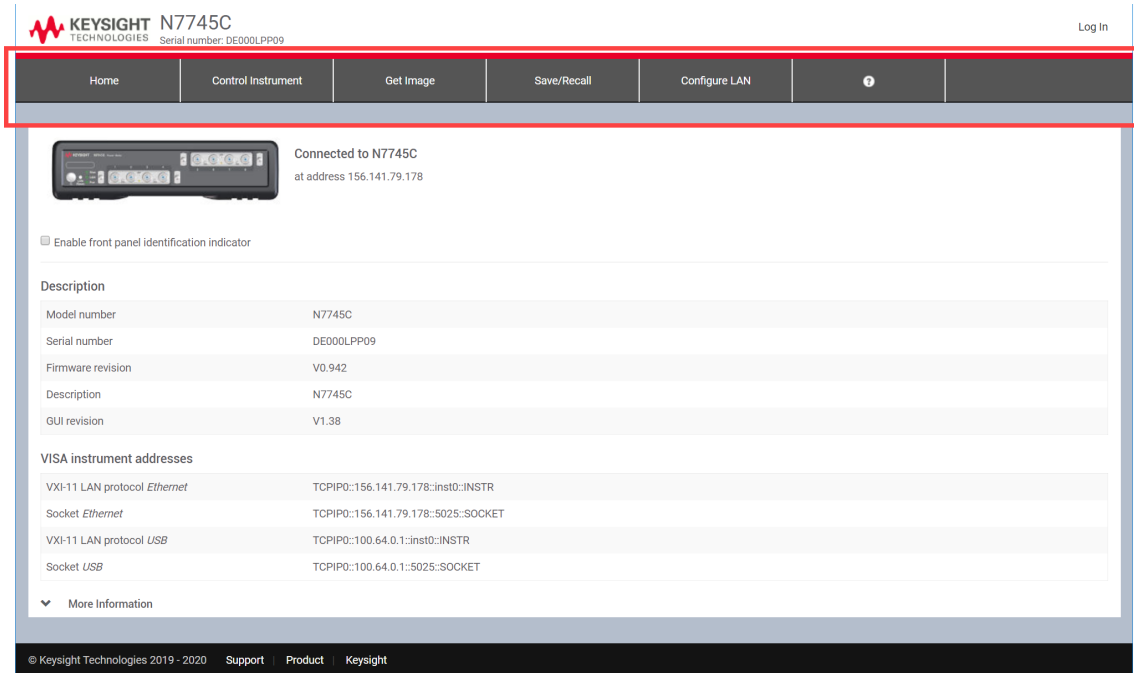


Figure 27 N7745C User Interface

The N774-C series user interface has the various tabs that help the user to control the instrument:

- **Home** – This tab displays the various instrument settings. For details, refer [How to Get Current Instrument Settings?](#) on page 88.
- **Control Instrument** – This tab allows you to set the parameters to control the instrument. For details, refer to [Controlling N774-C Instruments](#) on page 74.
- **Get Image** – This tab allows you to capture a screen of the **Control Instrument** window. The image is saved in PNG format in your PC. For details, see [How to Capture an Image of the Graph?](#) on page 89.



- **Save/Recall** – This tab allows you to save and load the user interface settings. For details, refer to [How to Save/Recall the User Interface Settings?](#) on page 89.
- **Configure LAN** – This tab displays the current LAN configuration of the instrument. In addition, this tab also allows you to edit the current LAN configuration of the instrument. For details, refer to [How to Configure LAN?](#) on page 93.
- **Help** – This tab opens the instrument's help.

## Controlling N774-C Instruments

### Control Instrument Tab

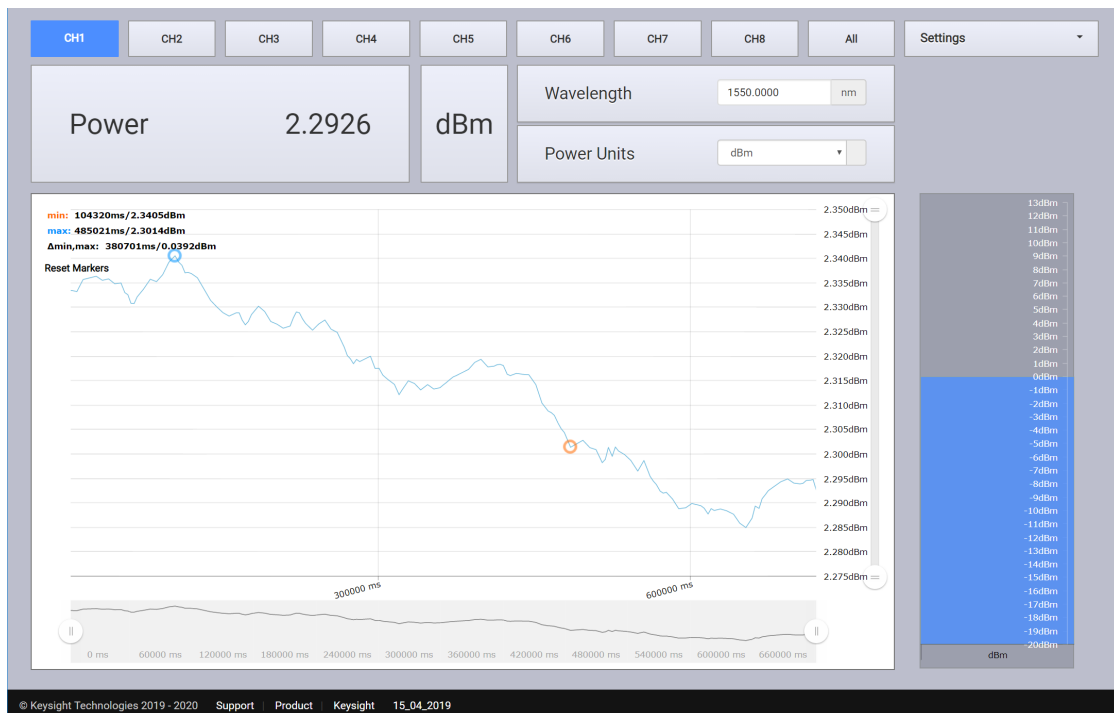
The **Control Instrument** tab displays the measured power of each channel of the N774-C instruments. When you launch the **Control Instrument** tab, by default, **All Channel** button is selected. This means that the user interface will show the measured power of all available (4 or 8) channels, depending upon the N774-C instrument type. The blue highlighted region on the channel scale denotes the measured power level.

The following image shows the N7745C interface displaying measured power of 8 channels:



The **Control Instrument** tab also allows you to configure an individual channel. To do so, click on the channel button, for example **CH1** button for channel 1.

It will show the details of the respective channel as shown in the following figure:



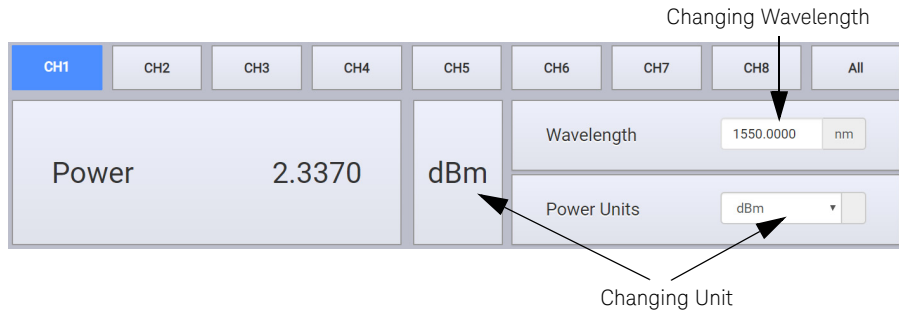
### Display Wavelength and Power

Displays the instrument's current power, wavelength and power unit of the selected channel. For further details on power and its unit, refer to [How to Measure Power](#) on page 78. For further details on wavelength, refer to [How to Set the Wavelength](#) on page 79.



### Changing Wavelength and Power Unit

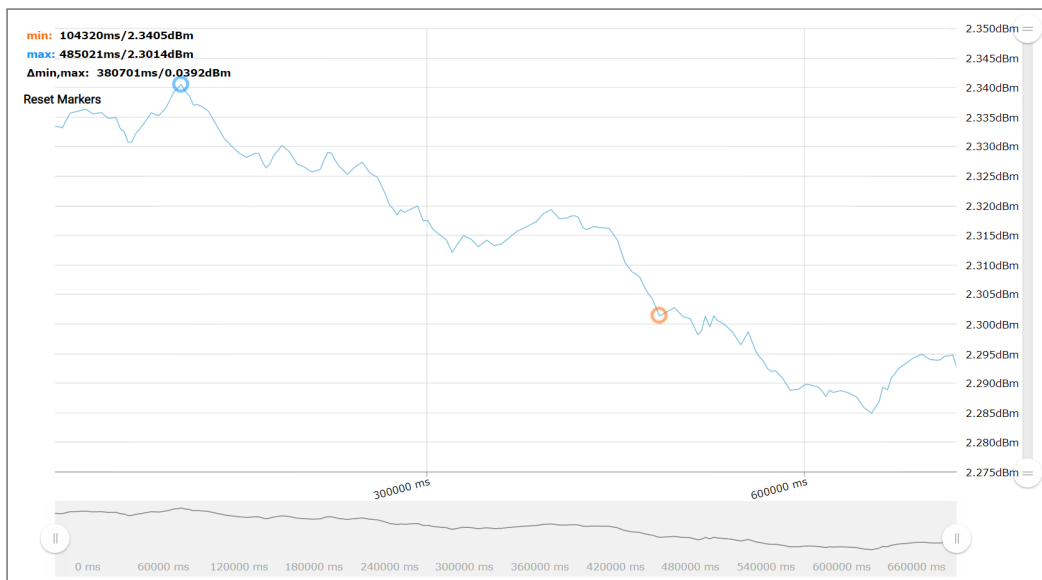
Allows you to change the instrument's current wavelength and the power units. The procedure for changing wavelength and power unit is similar. The following example provides steps to change the wavelength and the power unit.



- 1 Click on the wavelength button.
- 2 Use the left or right arrows to move the position of the cursor pointer to the either left or right.
- 3 Use the up or down arrows to increase or decrease the wavelength.
- 4 Click on the unit button to change the unit. The allowed units for Power are W, dBm or dB.

### Power Vs. Time Graph

The Control Instrument tab displays a graph that shows the relationship between the power and time. The power is represented by Y axis while the X axis represents the time.



### Show/Hide Marker

To show/hide markers on the graph, go to **Settings** and then click **Show/Hide Markers** toggle button. When this button is enabled, the markers appear on the graph. The blue circle on the graph denotes the maximum power while the orange circle on the graph denotes the minimum power measure duration a given time interval.

### Start/Stop Graph Measurement

You can start or stop the graph measurement at any point of time. To do so, go to **Settings** and then click on the **Start/Stop** toggle button. By default this option is enabled. However, once you disable this button, you will notice that the measurements in the graph are stopped until it is enabled.

### Exporting Measurement Results

You can export the numerical measurement results in to a CSV format. To do so, go to **Settings** and then click the **Export CSV** option.

### Reset Markers

At any point of time you can click on the **Reset Markers** button to reset the markers on the graph.

## Big Num

If you are only interested in the measured numbers and not in the graphical view, you may exit the graph by clicking on the **Big Num** option. This option hides the graph and only the big sized measured numbers are displayed on the **Control Instrument** page.

## How to Measure Power

### The Power Value

For each port, the optical power is measured and returned or displayed. The power reading represents the average optical power over the selected averaging time. The power meter can continuously self-trigger new measurements or be configured to wait for external software or hardware triggers.

### How to Set the Power Unit

The Power Unit setting allows you to select either W, dBm or dB as the units in which power is displayed or returned. For returning large amounts of logged data, the fastest data transfer is achieved using W units.

### What are the Power Units?

The SI unit for power measurement is Watt (W).

You can also measure power in dB or dBm. Values returned in these units are derived from measurement in Watts.

By selecting dBm, the following calculation is made:

$$P_{dBm} = 10 \log \frac{P_{input}(W)}{1 \times 10^{-3}(W)}$$

Where,

$P_{dBm}$  is the power value returned in dBm, and

$P_{input}$  is the input signal level in Watts.

Power, in units of dBm, is measured relative to 1 mW. It is an absolute power measurement.

Power, in units of dB, is measured relative to a particular reference power value.

The following calculation is made:

$$P_{dB} = 10 \log \frac{P_{input}(W)}{P_{ref}(W)}$$

Where,

$P_{dB}$  is the power value returned in dB,

$P_{input}$  is the input signal level in Watts, and

$P_{ref}$  is the chosen reference power value in Watts.

#### How to Set the Wavelength

This is the wavelength value of the signal to be measured. The responsivity of the Power Meter varies with wavelength. For accurate absolute power measurement, you need to input the wavelength of the optical input. For relative power measurements, this setting is not critical.

There are two ways to set the wavelength value:

- You can set the wavelength directly on clicking the Wavelength button, see [Display Wavelength and Power](#) on page 75, or
- You go the **Settings > Measurement Settings** and then set the wavelength.

#### How to Set the Calibration Offset

This is a calibration offset that you can enter to compensate for external optical circuitry, for example, an attenuator, switch, or a 3 dB coupler. The calibration offset, [Cal], is automatically subtracted from the input signal, as expressed in dB.

$$P_{measured}(dBm) = P_{input}(dBm) - CAL(dB)$$

where,

$P_{measured}$  is the adjusted value of the signal read in dBm,

$P_{input}$  is the input signal level in dBm, and

CAL is the calibration offset in decibels (dB).

## How to Set the Reference Level

Reference	
Mode	Ref. Value
Reference Channel Offset	0 dB
Reference Value	999.999997 nW

## How to Input a Reference Level

dB results are shown relative to a reference level. Setting, or changing, the reference only affects results that are returned in dB.

You can set the reference level in units of dBm or Watts. Depending on which is selected the following equations are used to calculate the power level in dB:

$$P_{dB} = P_{measured}(dBm) - REF(dBm)$$

or

$$P_{dB} = 10 \log \frac{P_{measured}(W)}{REF(W)}$$

where,

$P_{dB}$  is the returned relative power,

$P_{measured}$  is the absolute power level (see [How to Set the Calibration Offset](#) on page 79), and  $REF$  is the reference level.

## How to Set the Reference Value to the Current Power Value

In addition to entering a new reference value, you can change the reference value to the current power value from the N774-C or by programming.

This takes the input power level and stores it as the reference. Setting the reference only affects results returned in dB.



The power value in dBm or Watts is stored as the reference, that is:

$$REF = P_{measured}$$

where,

$REF$  is the reference, and

$P_{measured}$  is the absolute power level (see [How to Set the Calibration Offset](#) on page 79).

### How to Reference Another Power Measurement Channel

You can use the reference mode to reference to another channel's current power level. If you choose this mode, the reference of the channel continuously updates to the current power value measured by the other channel.

The following equations describe how the power in dB is calculated if you reference another channel:

$$P_{dB} = P_{measuredA}(dBm) - P_{measuredB}(dBm) - REF(dB)$$

or

$$P_{dB} = 10 \log \frac{P_{measuredA}(W)}{P_{measuredB}(W)} - REF(dB)$$

where:

$P_{dB}$  is the relative power,

$P_{measuredA}$  is the absolute power level (see [How to Set the Calibration Offset](#) on page 79) measured by the current port, and

$P_{measuredB}$  is the absolute power level (see [How to Set the Calibration Offset](#) on page 79) measured by the port you choose to reference, and

$REF$  is the reference level in decibels (dB).

### How to Remove Electrical Offsets (Zero)

Optical Power Meters measure optical power by converting optical power to electrical current, and then measuring electrical current. An electrical offset is electrical current that is always present, even if there is no optical power input. If electrical offsets are not removed, they affect the accuracy of power measurement, especially at low optical power levels.

Performing a zero sets the zero power level to the average electrical offset level for the current environmental conditions.

#### NOTE

The environmental conditions and the temperature of the instrument NOTE affect electrical offset.

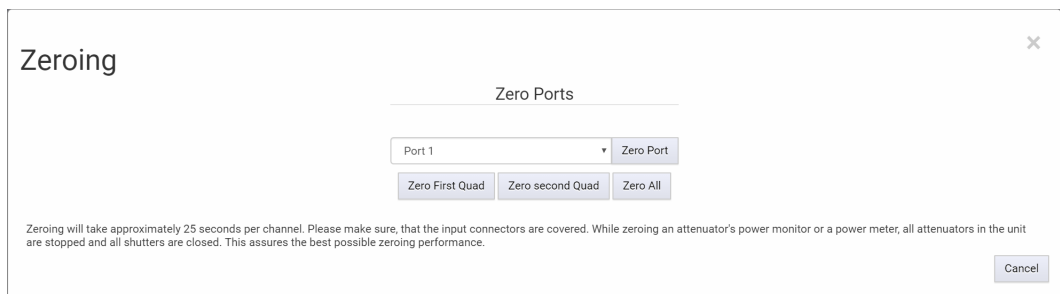
For the best results you must:

- Allow the instrument time to acclimatize (around 24 hours).
- Allow the instrument time to warm up (around 20 minutes).
- Make sure that the optical input is not receiving any light or use the zeroing adapter. If you are using multi-mode fiber optic cable, you must disconnect the cable and cover the input to the Power Meter to perform a zero.

It is good practice to perform a zero before making any sensitive measurements.

Logging data over a wide dynamic range is a typical case that requires a valid zero setting.

- 1 In the **Settings** option, select **Zero**.



Select the channel you want to zero from the drop down list and click on the **Zero Port** button. While the zero is running, the screen shows a 'busy' display.

OR

Click on the **Zero First Quad** button if you want to zero all channels from first quad. Similarly, click **Zero Second Quad** to zero all channels from first quad.

OR

Click on the **Zero All** button to zero all channels.

If you receive a zero error, the zeroing operation has failed because the Power Meter received light. The most common reason for zeroing to fail is if:

- a source is connected to the Power Meter's input connector,
- the fiber connected to the Power Meter's input connector is collecting light, or
- the Power Meter receives ambient light because the input connector is uncovered.

When zeroing is finished, the 'busy' display stops. You can now proceed with your measurements.

When environmental conditions are stable, the zero setting will remain valid over long times and the same settings will be active after rebooting the instrument.

## NOTE

Zeroing will take approximately 25 seconds per channel. Please make sure, that the input connectors are covered. While zeroing an attenuator's power monitor or a power meter, all attenuators in the unit are stopped and all shutters are closed. This assures the best possible zeroing performance.

---

### How to Choose the Range Mode

You can choose either of two ranging modes:

- **Auto** - the auto-ranging mode, ensures that the result has a returned value between 9% and 100% of full scale. The default state is for automatic ranging to be enabled.
- **Manual** - the manual mode allows you to set a user-defined range.

## How to Set the Range

The range setting determines the power levels that can be measured. The setting should be high enough for the applied power, but lower settings will provide a lower noise level for weak signals.

If you choose auto-ranging mode, this parameter can not be set. The **Range** parameter returns the automatically-determined range.

If the measured power is more than 3 dB greater than the range setting, the power cannot be measured and an overflow is indicated by the returned power value. This means that the measured power is greater than the **Maximum Power Readback Value**. You must increase the **Range** value.

For more details, see the following table.

### Upper Power Limit

The following table shows the upper power limit at the available power ranges. The lowest measurable power in each range is determined by the noise level, which depends on the range setting and the averaging time.

Range	Maximum Power Readback Value	
40 dBm	19.999 W	43.000 dBm
30 dBm	1.9999 W	33.000 dBm
20 dBm	199.99 mW	23.000 dBm
10 dBm	19.999 mW	13.000 dBm
0 dBm	1.9999 mW	3.000 dBm
-10 dBm	199.99 $\mu$ W	-7.000 dBm
-20 dBm	19.999 $\mu$ W	-17.000 dBm
-30 dBm	1.9999 $\mu$ W	-27.000 dBm
-40 dBm	199.99 nW	-37.000 dBm
-50 dBm	19.999 nW	-47.000 dBm
-60 dBm	1.9999 nW	-57.000 dBm

### How to Set the Averaging Time

This is the length of time over which a signal is averaged to produce a measured value. Longer averaging times increase the accuracy and improve the noise rejection.

The averaging time of the N774-C instruments can be set over a wide range from 1  $\mu$ s to 10s. Up to 2 ms, the setting can be varied with a typical resolution of 2  $\mu$ s, and for higher averaging times the setting resolution is about 0.1%. This flexible setting time supports optimal synchronization with the time scale of the signals. The high sampling rate with short averaging times is supported by the high cutoff frequency, as shown in the specifications. These bandwidths are reduced in steps, when longer averaging times are used to improve the noise performance while maintaining signal fidelity.

### How to Set Automatic Gain for Averaging Modulated Signals

A fast **Auto Gain** switching is used to achieve the high dynamic range in the N7744C and N7745C. In some applications, like determining the average power of signals modulated with periods shorter than the averaging time, this switching produces irregular readings. In such cases, the **Auto Gain** should be turned off, as described in the *N774-C Programming Guide*. This setting takes effect after setting the averaging time on the port directly or via function parameters.

### How to Choose the MinMax Function

**MinMax** function measures the incoming power and returns the minimum value measured and the maximum value measured of the selected channel. Note that this measurement is independent from the graphical plot. The difference between these values, delta P, is returned in place of P, the power value.

This mode is intended principally for polarization dependent measurements, but can be used for other types of measurement.

**Reset MinMax** - Use this option to reset the minimum value measured, and the maximum value measured.

### How to Use External Triggers

The Optical Multiport Power Meter allows you trigger the instrument to perform tasks and to output trigger signals to external measurement instruments using the rear panel BNC connectors.

- 1 Go to **Settings** -> **Measurement Settings**
- 2 Set the **Trigger** configuration

By default, the trigger level at the external trigger connector is active high. This means when a trigger rises above the high TTL level (rising edge), a trigger is accepted.

You can select three modes of triggering from the trigger configuration menu:

- **Disabled** - to disable the trigger connectors.
- **Default** - to enable the trigger connectors.
- **Pass Through** - an input trigger will generate an output trigger. This lets you trigger another instrument almost simultaneously.

- 3 Set the input trigger functions

The power meter ports can be configured individually to respond to an input trigger by:

- **Ignore (IGN)** - The trigger is ignored.
- **Single Measurement (SME)** - The trigger causes a single power measurement to be made.
- **Complete Measurement (CME)** - The trigger will cause an active measurement function like logging to begin and continue until completed.
- **Multiple Measurement (MME)** - Similar to Complete Measurement, the first hardware trigger starts the function and if LOOP is not 1, then multiple functions will be performed without waiting for further triggers.
- **Threshold (THR)** - The input trigger allows to specify the minimum, maximum threshold values along with the threshold units and pre-trigger value.

- 4 Set the output trigger functions

The power meter ports can be configured individually to generate output triggers for the following events:

- **Disabled (DIS)** - No triggers are generated.
- **Meas. Started (MEAS)** - An output trigger is generated when a power measurement begins.
- **Avg Time Over (AVG)** - An inverted trigger is generated for each measurement sample.

Trigger configuration can also be done using the commands. For information on trigger commands, refer to the *Keysight N774-C Series Programming Guide*.

## How to Use Auxiliary Functions

### How to Get Current Instrument Settings?

The **Home** tab on the N774-C user interface displays the current instrument settings.

KEYSIGHT N7745C  
TECHNOLOGIES Serial number: DE000LPP09 Log In

Home Control Instrument Get Image Save/Recall Configure LAN ⓘ

Connected to N7745C  
at address 156.141.79.178

Enable front panel identification indicator

**Description**

Model number	N7745C
Serial number	DE000LPP09
Firmware revision	V0.942
Description	N7745C
GUI revision	V1.38

**VISA instrument addresses**

VXI-11 LAN protocol <i>Ethernet</i>	TCPIP0::156.141.79.178::inst0::INSTR
Socket <i>Ethernet</i>	TCPIP0::156.141.79.178::5025::SOCKET
VXI-11 LAN protocol <i>USB</i>	TCPIP0::100.64.0.1::inst0::INSTR
Socket <i>USB</i>	TCPIP0::100.64.0.1::5025::SOCKET

▼ More Information

© Keysight Technologies 2019 - 2020 Support Product Keysight

This tab displays the following settings:

- **Description** – Displays the instrument description such as instrument’s model no., serial no., firmware version and description of the current instrument.
- **VISA Instrument Address** – Displays VISA instrument addresses of the current instrument.
- **LAN Details** – Displays LAN configuration details of the current instrument.

### NOTE

Please note that the **Home** tab does not allow the user to change the displayed instrument settings.



### How to Identify a Module?

Sometimes, you have many modules mounted on the rack. In this situation, it becomes difficult to identify a particular module which are currently connected.

To identify a particular module, select the check-box **Enable front panel identification indicator** available on the N774-C **Home** tab. The **Status** LED on the front panel of the connected module will start flashing.

**Enable front panel identification indicator**

### How to Capture an Image of the Graph?

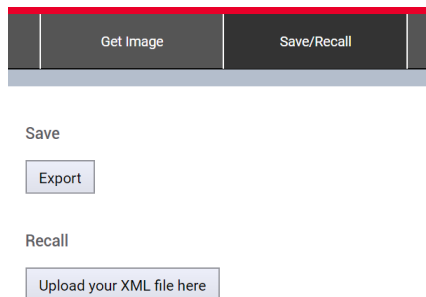
The **Get Image** tab on the N774-C user interface allows you to capture the current screen of the **Control Instrument** tab and save it as a PNG image.

## NOTE

You can only capture the screen if you are in the **Control Instrument** tab.

### How to Save/Recall the User Interface Settings?

The **Save/Recall** tab on the N774-C user interface allows you to save and recall the user interface settings.

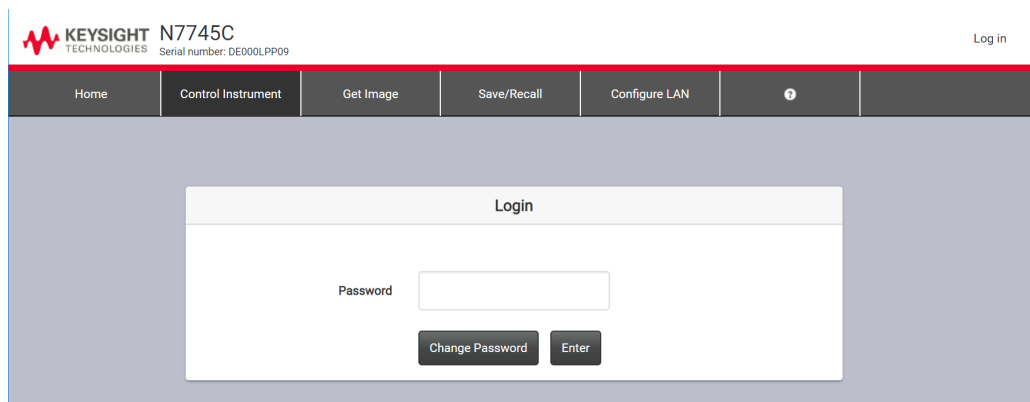


To perform the save/recall operation:

- 1 Click on the **Save/Recall** tab.
- 2 To save a file, click on **Export** button. The user interface settings will be saved as an XML file in your PC.
- 3 To recall a previously saved file, click on **Upload your XML file here** button. A Windows **Open** dialog will appear. Locate the target file and click **Open**. The settings will be loaded in the instrument.


### Logging In/Out of the N774-C User Interface

The login screen allows the authorized users to control the N774-C instruments. When the users type in their password and click **Enter**, their credentials are validated and if correct they are logged in.




If you want to create a new password or change an existing password, click on **Change Password** button. For details, see [How to Create/Change the Password?](#) on page 91.

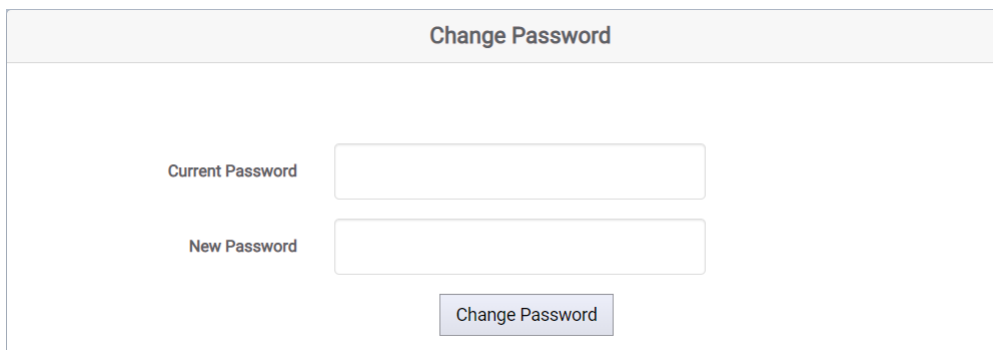
To log out the N774-C user interface, click on **Log out** icon available on the top right of the user interface.

Log out 

### How to Create/Change the Password?

The password is used for logging in to the web page to control the N774-C instruments. To create or change a password;

- 1 Click the **Password Options** icon  available on the top right of the N774-C user interface. You see a **Change Password** box requesting you to enter the password.



The screenshot shows a dialog box titled "Change Password". It contains two text input fields: "Current Password" and "New Password". Below these fields is a button labeled "Change Password".

- 2 Enter the current password (the default password is blank).
- 3 Enter the new password.
- 4 Click the **Change Password** button. The password will be changed. Use the new password for logging in to the N774-C web page.

### What If You Forget Your Password?

If you forget your password, please follow the instructions to reset the LAN button. See The [The LAN Reset button](#) on page 52.

### Update Rate and Data Points

You can use the **Update Rate and Data Points** feature to set the refresh rates in milliseconds for the graph and instrument settings.

To perform an update rate:

- 1 Go to **Settings** and click **Update Rate**.  
A **Update Rate and Number of Data Points** dialog appears:

**Update rate and number of data points** ✕

Please note, it will only affect current session

Number Of data points on graph:

Graph Refresh rate:  ms

Settings rate:  ms

- 2 Enter the following details:
  - number of data points required on the graph,
  - refresh rates in milliseconds for the graph, and
  - refresh rates for the instrument settings.
- 3 Click on **Save** button.

## NOTE

The new refresh rates will only be effective for the current session.

### Reboot Device

A firmware reboot is required if it becomes unresponsive or returns errors. To perform a reboot:

- 1 Go to Settings and click **Reboot**. A **Reboot Device** dialog will appear:

**Do you really want to Restart the System?** ✕

This action will restart instrument...

Please wait atleast 30seconds...

- 2 Click on the **Reboot System** button. This action will restart the firmware and take at least 30 seconds. Please wait until the reboot process is completed.

## How to Configure LAN?

### Show the Current LAN Settings

The **Configure LAN** tab on the N774-C user interface displays the currently used LAN settings. It displays the following networking parameters:

- IP address configuration
- IP address
- Subnet mask
- Default gateway
- DNS server(s)
- Hostname
- Domain

### Edit LAN Settings

The **Configure LAN** tab also allows you to edit the currently used LAN settings. To do so,

- 1 Click on the **Edit** button. The **Edit Network Configuration** page will appear as shown in the figure below:

Configure LAN > Edit Network Configuration

Warning: Your connection to the instrument may be broken after executing either of the operations below. If so, reconnect to the instrument using the new hostname or IP address.

**Instrument identification**

Desired hostname

Description

**IP address configuration**

Use automatic configuration

IP address

Subnet mask

Default gateway

**DNS server address configuration**

Use automatic configuration

Preferred DNS server

**WARNING**

Your connection to the instrument may be broken after executing either of the operations below. If so, reconnect to the instrument using the new hostname or IP address.

---

- 2 Enter the descriptions for the following LAN configuration parameters:
  - Instrument identification
  - IP address configuration
  - DNS server address configuration

**NOTE**

For IP address and DNS server configuration, you can select the Use Automatic Configuration check-box to automatically select the IP address and DNS server.

---

Once, the changes are done, click on **Apply Changes** button.

**NOTE**

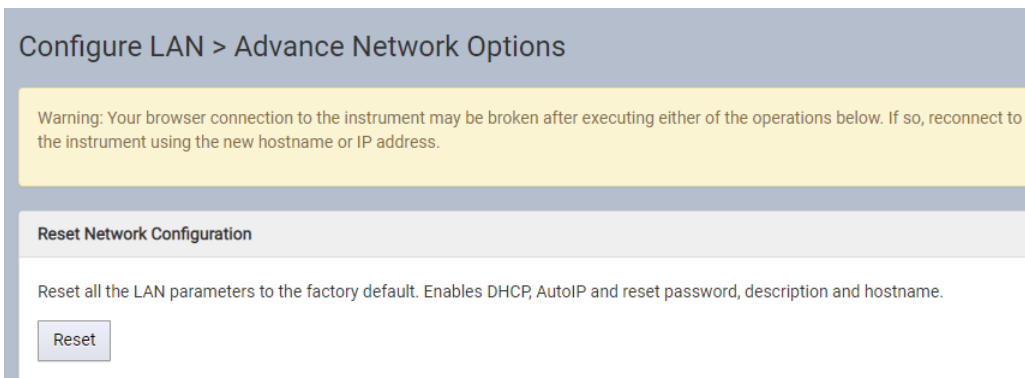
It can take up to 30 seconds for changes to these settings to take effect. You may need to refresh the Configure LAN page after 30 seconds to see the updated settings. Changes in hostname and description require reboot or LAN restart to take effect.

---

## Reset Network Configuration

The **Configure LAN** tab also allows you to reset all LAN parameters to the factory default. To do so;

- 1 Click the **Advance Options** button available on **Configure LAN** tab. The **Advance Network Options** page will appear.



- 2 Click on the **Reset** button to reset all LAN parameters to the factory default.

### WARNING

Your browser connection to the instrument may be broken after executing the reset network configuration operation. If so, reconnect to the instrument using the new hostname or IP address.





Keysight N774-C & 8162-C Series

User's Guide

# 5 Accessories

**Threaded head adapter**

(Threaded adapter for 8152x Optical Heads, 8162x Optical Heads with 81624DD and 81628C Optical Heads)



81000FA 81000KA 81000PA 81000VA 81003LA  
 FC/PC SC E-2000 ST LC/F3000  
 FC/APC

**Optical head adapter**

These adapters are to be used with Keysight optical heads only. The connector adapters are needed to attach connectorized fibers.

Optical head adapters – with integral D-shape attachment for 8162xx optical head (except 81628C – see threaded version)



81001FA 81001KA 81001PA 81001LA 81001MA  
 FC/PC SC E-2000 LC/F3000 MU

**81003TD - MPO/MTP connector adapter**

Optical head adapter with integral D-shape attachment for 8162xx optical head (except 81628C) for connection of ribbon cables with MT/MPO connectors. The adapter has connector guide pins and should be used with female cable connectors.



**81001ZA - Blank adapter**

Plug-in D-shape adapter for 8162x Optical Heads To be customized by customer. Doesn't match to 8152x and High Power Optical Heads



**81624DD - D-shape adapter**

To connect threaded adapters to 8162x D-shape receptable. Included with new heads except 81628C. Remove for using head with D-shaped adapters.



**Bare fiber adapters and interfaces**

The Keysight Bare Fiber Connectivity Solutions enable the easy and repeatable adaptation of optical components to Keysight's standard optical heads (all 8152x and 8162x series) and sensor modules 81630B, 81634B.



- 81000BC** Bare fiber connectivity set for 81623C, 81624C and 81626C (1x head adapter, 1 x 0-400 um holder, 1 x 400-900 um holder, 1 x gauge)
- 81000BI** Bare fiber connectivity Set for 81630B and 81634B (1 x sensor adapter, 1 x 0-400 um holder, 1 x 400-900 um holder, 1 x gauge)
- 81000BT** Bare FC set for 8152x and 8162x optical heads and threaded interface
- 81004BH** Bare fiber holder Set (10 x 0-400 um holder)
- 81009BH** Bare fiber holder Set (10 x 400-900 um holder)
- 81004BM / 9BM** Bare fiber holder Set (4 x 0-400 um or 0-900 um holder, 1 x gauge)

**N7740KI - SC**  
 4-port SC connector for the multiport power meter series N7744C and N7745C.



**N7740FI - FC**  
 4-port FC connector for the multiport power meter series N7744C and N7745C.



**N7740BI - Bare fiber adapter**  
 Fiber holders not included; please add 81004BM or 81009BM



**N7740ZI - Zeroing adapter**

**N7740LI - LC**  
 4-port LC connector for the multiport power meter series N7744C and N7745C.



**N7740MI - MU**  
 4-port MU connector for the multiport power meter series N7744C and N7745C.

**81000HI - E-2000 Connector interface**

For **physical** contact connections

Recommended for angled and straight connector interfaces. Use with sources. Not for sensors.



**81000PI - E-2000 Connector interface**

For **non-physical** contact connections

Recommended for angled and straight connector interfaces. Use with sensors.



**81000LI - LC/F3000 Connector interface**

For **physical** contact connections

Recommended for angled and straight connector interfaces. Use with sources.A



**81002LI - LC/F3000 Connector interface**

For **non-physical** contact connections

Recommended for angled and straight connector interfaces. Use with sensors.



**81000FI - FC/PC Connector interface**

N-keying (key slot = 2.20 mm nominal)

For physical and non-physical contact connections

Recommended for angled and straight connector interfaces



**81000NI - FC/APC Connector interface**

R-keying (key slot = 2.00 mm nominal)

For physical and non-physical contact connections

Recommended for angled and straight connector interfaces



**81000MI - MU Connector interface**

For **physical** contact connections

Recommended for angled and straight connector interfaces. Use with sources.



**81002MI - MU Connector interface**

For **non-physical** contact connections

Recommended for angled and straight connector interfaces. Use with sensors.



**81000KI - SC Connector interface**

For physical and non-physical contact connections

Recommended for angled and straight connector interfaces



**81000VI - ST Connector interface**

For physical and non-physical contact connections

Recommended for angled and straight connector interfaces



**81000SI - DIN 4108/47256 Connector interface**

For physical and non-physical contact connections

Recommended for angled and straight connector interfaces



**81000UM - Universal feedthrough adapter**

To adapt 81000BR or HMS-10 connectors to any other appropriate connector. In combination with a Keysight 81000xI connector interface, this adapter allows you to mate an HMS-10 connector to another HMS-10, FC/PC/SPC, APC, DIN, ST, E-2000, or SC connector. It can also be used to mate a Keysight 81000BR reference reflector to a connector under test. The Keysight 81000UM is a through adapter only. It can not be used at the fiber interfaces of the modules.



**81000BR - HMS-10 Reference reflector**

- Return loss = 0.18 dB ± 0.1 dB (96% ± 2%) typ.
- Wavelength range: 1200 to 1600 nm

A gold-plated HMS-10 connector for use in measuring return loss of optical connectors. It allows you to establish a precise reference for reflection measurements. Return loss is 0.18 dB ± 0.1 dB (96% ± 2%)





Keysight N774-C & 8162-C Series

User's Guide

# 6 Maintenance

[Cleaning Instructions](#) / 102

[Additional Cleaning Information](#) / 106

[Firmware Upgrades](#) / 107

[Contact Keysight Technologies](#) / 108

## Cleaning Instructions

The following Cleaning Instructions contain some general safety precautions, which must be observed during all phases of cleaning. Consult your specific optical device manuals or guides for full information on safety matters.

Please try, whenever possible, to use physically contacting connectors, and dry connections. Clean the connectors, interfaces, and bushings carefully after use.

If you are unsure of the correct cleaning procedure for your optical device, we recommend that you first try cleaning a dummy or test device.

Keysight Technologies assume no liability for the customer's failure to comply with these requirements.

## Safety Precautions

Please follow the following safety rules:

- Do not remove instrument covers when operating.
- Ensure that the instrument is switched off throughout the cleaning procedures.
- To prevent electrical shock, disconnect the instrument from the mains before cleaning. Use a dry cloth, or one slightly dampened with water, to clean the external case parts. Do not attempt to clean internally.
- After cleaning, do not switch on the instrument when there is no termination to the optical output connector, to the optical fiber or to the attached device. The laser radiation is not visible to the human eye, but it can seriously damage your eyesight.

## Why is it important to clean optical devices?

In transmission links optical fiber cores are about 9 mm (0.00035") in diameter. Dust and other particles, however, can range from tenths to hundredths of microns in diameter. Their comparative size means that they can cover a part of the end of a fiber core, and as a result will reduce the performance of your system.

Furthermore, the power density may burn dust into the fiber and cause additional damage (for example, 0 dBm optical power in a single mode fiber causes a power density of approximately 16 million W/m<sup>2</sup>). If this happens, measurements become inaccurate and non-repeatable.

Before you make any connection you must ensure that all cables and connectors are clean. If they are dirty, use the appropriate cleaning procedure.

When inserting the ferrule of a patchcord into a connector or an adapter, make sure that the fiber end does not touch the outside of the mating connector or adapter. Otherwise you will rub the fiber end against an unsuitable surface, producing scratches and dirt deposits on the surface of your fiber.

## What materials do I need for proper cleaning?

Following are some standard cleaning equipment necessary for cleaning your instrument:

### Standard Cleaning Equipment

Before you can start your cleaning procedure you need the following standard equipment:

- Dust and shutter caps
- Isopropyl alcohol
- Cotton swabs
- Soft tissues
- Compressed air

### Dust and shutter caps

All of Keysight Technologies' lightwave instruments are delivered with either laser shutter caps or dust caps on the lightwave adapter. All cables come with covers to protect the cable ends from damage or contamination.

We suggest these protected coverings should be kept on the equipment at all times, except when your optical device is in use. Be careful when reattaching dust caps after use. Do not press the bottom of the cap onto the fiber too hard, as any dust in the cap can scratch or pollute your fiber surface.

### Isopropyl alcohol

This solvent is usually available from any local pharmaceutical supplier or chemist's shop.

If possible avoid using denatured alcohol containing additives. Instead, apply alcohol used for medical purposes.

Never try to drink this alcohol, as it may seriously damage to your health.

Do not use any other solvents, as some may damage plastic materials and claddings. Acetone, for example, will dissolve the epoxy used with fiber optic connectors. To avoid damage, only use isopropyl alcohol.

If you use isopropyl alcohol to clean your optical device, do not immediately dry the surface with compressed air. This is because the dust and the dirt is solved and will leave behind filmy deposits after the alcohol is evaporated. You should therefore first remove the alcohol and the dust with a soft tissue, and then use compressed air to blow away any remaining filaments.

### **Cotton swabs**

We recommend that you use cotton swabs available from local distributors of medical and hygiene products.

Ensure that you use natural cotton swabs. Foam swabs will often leave behind filmy deposits after cleaning.

Use care when cleaning, and avoid pressing too hard onto your optical device with the swab. Too much pressure may scratch the surface, and could cause your device to become misaligned. It is advisable to rub gently over the surface using only a small circular movement.

Swabs should be used straight out of the packet, and never used twice. This is because dust and dirt in the atmosphere, or from a first cleaning, may collect on your swab and scratch the surface of your optical device.

### **Soft tissues**

These are available from most stores and distributors of medical and hygiene products.

We recommend that you do not use normal cotton tissues, but multi-layered soft tissues made from non-recycled cellulose. Cellulose tissues are very absorbent and softer. Consequently, they will not scratch the surface of your device over time.

Use care when cleaning, and avoid pressing on your optical device with the tissue. Pressing too hard may lead to scratches on the surface or misalignment of your device. Just rub gently over the surface using a small circular movement.

Use only clean, fresh soft tissues and never apply them twice. Any dust and dirt from the air which collects on your tissue, or which has gathered after initial cleaning, may scratch and pollute your optical device.



### **Compressed air**

Compressed air can be purchased from any laboratory supplier.

It is essential that your compressed air is free of dust, water and oil. Only use clean, dry air. If not, this can lead to filmy deposits or scratches on the surface of your connector. This will reduce the performance of your transmission system.

When spraying compressed air, hold the can upright. If the can is held at a slant, propellant could escape and dirty your optical device. First spray into the air, as the initial stream of compressed air could contain some condensation or propellant. Such condensation leaves behind a filmy deposit.

### **Cleaning Instrument Housings**

Use a dry and very soft cotton tissue to clean the instrument housing. Do not open the instruments as there is a danger of electric shock, or electrostatic discharge. Opening the instrument can cause damage to sensitive components, and in addition your warranty will be voided.

## General Cleaning Procedure

### **Light dirt**

If you just want to clean away light dirt, observe the following procedure for all devices:

- Use compressed air to blow away large particles.
- Clean the device with a dry cotton swab.
- Use compressed air to blow away any remaining filament left by the swab.

### **Heavy Dirt**

Use this procedure particularly when there is greasy dirt on the connector:

- 1 Moisten a new cotton-swab with isopropyl alcohol.
- 2 Clean the connector by rubbing the cotton-swab over the surface using a small circular movement.
- 3 Take a new, dry soft-tissue and remove the alcohol, dissolved sediment and dust, by rubbing gently over the surface using a small circular movement.
- 4 Blow away any remaining lint with compressed air.

## Additional Cleaning Information

For additional information on cleaning and safety matters for optical devices, refer the following document:

<https://literature.cdn.keysight.com/litweb/pdf/5989-4473EN.pdf>

## Firmware Upgrades

This section provides information about the firmware upgrade process for the N774-C multiport power meters instruments.

You may need to upgrade firmware to enhance the usability and functionality of your instrument. New features may be available with new firmware revisions.

Firmware updates can be done by installing the firmware updates installation file, which can be downloaded from [www.keysight.com](http://www.keysight.com).

### CAUTION

Ensure to execute the firmware update procedure only under conditions of reliable power and I/O connectivity to the instrument. For example, do not update firmware with an intermittent LAN connection, a loose power cord, or during a thunderstorm that may interrupt power. Loss of power or connectivity may cause the firmware update fail, possibly making instrument non-operational.

---

### NOTE

Updating the firmware will not affect your annual instrument calibration.

---

## Requirements

To upgrade firmware for the N774-C multiport power meters instruments, you require a PC, running Windows 10 on it.

To update the firmware you need to download the current firmware which consist of two components:

- Firmware Upload Utility
- The latest firmware version (\*.bin file)

**NOTE**

This process could take a couple of minutes (5-10 minutes depending on your network speed).

---

Once you have copied both items to your computer, proceed as follows:

- 1 Run the **Firmware Update Utility** and select the device you want to update.
- 2 Browse to the location of the firmware that you just downloaded and open the file.
- 3 Press **Start**.

The update utility will copy the firmware update file on your local PC.

After the firmware has been updated, the instrument will automatically restart itself with the new software

During the update process the **Status** and the **Active LED** will flash periodically.

- 4 Check the firmware version. Go to instrument's user interface Home tab and check for the firmware version.

## Contact Keysight Technologies

To locate a sales or service office near you, go to [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus).



