Keysight U9422A/B/C, U9424A/B/C and U9428A/B/C FET Solid State Switch Module



KEYSIGHT TECHNOLOGIES

Startup and Service Guide

Notices

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CAUTION

CLEAN WITH SLIGHTLY DAMPENED CLOTH

Clean the outside of the instrument with a soft, lint-free, slightly dampened cloth. Do not use detergent, volatile liquids, or chemical solvents.

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R-R-Kst-WN21767 **R-R-Kst-WN21768** **R-R-Kst-WN21769** **R-R-Kst-WN21770** **R-R-Kst-WN21821** **R-R-Kst-WN21822**	This symbol is a South Korean Class A EMC Declaration. This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home. 이 기기는 업무용 (A 급) 전자파적합기기로서 판 매자 또는 사용자는 이 점을 주 의하시기 바라 며 , 가정외의 지역에서 사용하는 것을 목적으 로 합니다.

South Korean Class A EMC Declaration

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

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Introduction

The scope of this Startup and Service Guide is to detail the processes of receiving and installing the U9422x/U9424x/U9428x FET solid state switch module, installing the required software, and verifying basic switch operations. If you have any inquiries after reviewing this information, contact your local Keysight Technologies representative or contact us through our website at

www.keysight.com/find/USBSwitch.

Product Model Description

Table 1-1 Product Model Description

Model	Description	Connector Type
U9422A	Solid State 1x2 Switch Module, DC - 26.5 GHz	3.5 mm
U9422B	Solid State 1x2 Switch Module, DC - 50 GHz	2.4 mm
U9422C	Solid State 1x2 Switch Module, DC - 54 GHz	1.85 mm
U9424A	Solid State 1x4 Switch Module, DC - 26.5 GHz	3.5 mm
U9424B	Solid State 1x4 Switch Module, DC - 50 GHz	2.4 mm
U9424C	Solid State 1x4 Switch Module, DC - 54 GHz	1.85 mm
U9428A	Solid State 1x8 Switch Module, DC - 26.5 GHz	3.5 mm
U9428B	Solid State 1x8 Switch Module, DC - 50 GHz	2.4 mm
U9428C	Solid State 1x8 Switch Module, DC - 54 GHz	1.85 mm

Step 1: Unpack and Inspect the U9422x/U9424x/U9428x Module

CAUTION The switch module is shipped in a material that prevents it from static damage. The switch module should only be removed from the packaging in an anti-static area ensuring that correct anti-static precautions are taken. Store the switch module in an anti-static envelope when not in use.

ESD

Electrostatic discharge (ESD) can damage or destroy electronic components. All work on electronic assemblies should be performed at a static-safe work station.

Two types of ESD protection are listed below. Purchase acceptable ESD accessories from your local supplier.

- Conductive table-mat and wrist-strap combination
- Conductive floor-mat and heel-strap combination

Both types, when used together, provide a significant level of ESD protection. Of the two, only the table-mat and wrist-strap combination provides adequate ESD protection when used alone. To ensure user safety, static-safe accessories must provide at least 1 MΩ of isolation from ground.

WARNING These techniques for a static-safe work station should not be used when working on circuitry with a voltage potential greater than 500 volts.

Inspect for Damage

After unpacking the switch module, carefully inspect it for any shipping damage. Report any damage to the shipping agent immediately, as such damage is not covered by the warranty (warranty information can be found at the beginning of this manual).

CAUTION To avoid damage when handling a switch module, do not touch the exposed connector pins.

NOTE Information on preventing damage to your Keysight equipment can be found at www.keysight.com/find/tips.

Return for Service

Should it become necessary to return the switch module for repair or service, follow these steps:

1. Review the warranty information shipped with your switch module.
2. Contact Keysight to obtain a Return Material Authorization (RMA) and return address. If you need assistance in finding Keysight contact information, go to www.keysight.com/find/assist (worldwide contact information for repair and service) or refer to the Support information on the product web page at www.keysight.com/find/USBswitch.
3. Write the following information on a tag and attach it to the malfunctioning switch module.
   - Name and address of owner. A P.O. box is not acceptable as a return address.
   - Product model number (for example, U9422A)
   - Product serial number (for example, MYXXXXXXXX). The serial number label is located on the back panel of the switch module. The serial number can also be viewed from the Soft Front Panel interface, but only after the software is installed.
   - Description of failure or service required
4. Carefully pack the switch module in its original ESD bag and packing carton. If the original carton is not available, use bubble wrap or packing peanuts and place the switch module in a sealed container and mark the container as "FRAGILE".
5. On the shipping label, write ATTENTION REPAIR DEPARTMENT and the RMA number.

NOTE If any correspondence is required, refer to the product by serial number and model number.

Verify the U9422x/U9424x/U9428x Shipment Contents

Shipment Content List

Table 1-2 Shipment content list

Quantity	Description	Part Number
1	Quick Startup Poster	U9422-90002
1	Solder wire cable assembly [a]	U9422-60007
1	Solder wire cable assembly [b]	U9424-60007
1	Solder wire cable assembly [c]	U9428-60001
1	USB 3.0 Type-A to Type-C, 1 meter[d]	P9375-60010
1	USB 3.0 Type-A to Type-C, 2 meter[e]	8121-3431
1	Interconnect cable for multi-port configuration with PXIe and USB VNA, 1 meter[f]	M9800-61617
1	Interconnect cable for multi-port configuration with PXIe and USB VNA, 2 meter[g]	M9800-61622

[a] This item is available with Option 101 (for U9422A/B/C).

[b] This item is available with Option 101 (for U9424A/B/C).

[c] This item is available with Option 101 (for U9428A/B/C).

[d] This item is available with Option 201.

[e] This item is available with Option 202.

[f] This item is available with Option 301.

[g] This item is available with Option 302.

Step 2: Install the Software (for USB Connection Only)

System Requirements

Prior to any installation or configuration, ensure that the following system requirements are met:

Table 1-3 System Requirements

Operating System	Windows 7 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional, Ultimate, Enterprise Windows 10 (32-bit and 64-bit) Starter, Home Basic, Home Premium, Professional
Available Hard-Disk Space[a]	5 GB, includes: – 4.5 GB for Microsoft .NET Framework 4.5.2[b] – 100 MB for Keysight IO Libraries Suite[c]
Browser	Microsoft Internet Explorer, Opera and Google Chrome

[a] Because of the installation procedure, less memory may be required for operation than is required for installation.

[b] .NET Framework Runtime Components are installed by default with Windows 7 and Windows 10. Therefore, you may not need this amount of available disk space.

[c] Version 2020 (or later) of the Keysight IO Libraries Suite is required.

Power Up the Host PC

Power up the host PC to install the U9422x/U9424x/U9428x software.

Install the Software

The U9422x/U9424x/U9428x software is available for download at www.keysight.com/find/USBswitch.

NOTE **The latest version of Keysight IO Libraries Suite (which includes the Keysight Connection Expert) can be downloaded from**

www.keysight.com/find/iosuitedownload. The Keysight Instrument Control DVD, with the above software, is no longer shipped with Keysight instruments. If you require a Keysight Instrument Control DVD, it can be ordered by contacting your local Keysight Customer Contact Center.

The software installation includes the following items:

- Keysight IO Libraries Suite
- Soft front panel (SFP) software and related user documentation for the switch module.

Step 3: Connect and Verify the U9422x/U9424x/U9428x Operation

The following procedures helps you to verify that the newly installed U9422x/ U9424x/U9428x switch module is operating correctly.

Using USB Connection

1. Connect the switch module to the PC using the USB Cable (PN: P9375-60010/ 8121-3431).
2. Run Keysight Connection Expert (from the desktop icon, or from **Start > All Programs > Keysight Connection Expert**). It displays the installed switch module (U9428C as shown below).

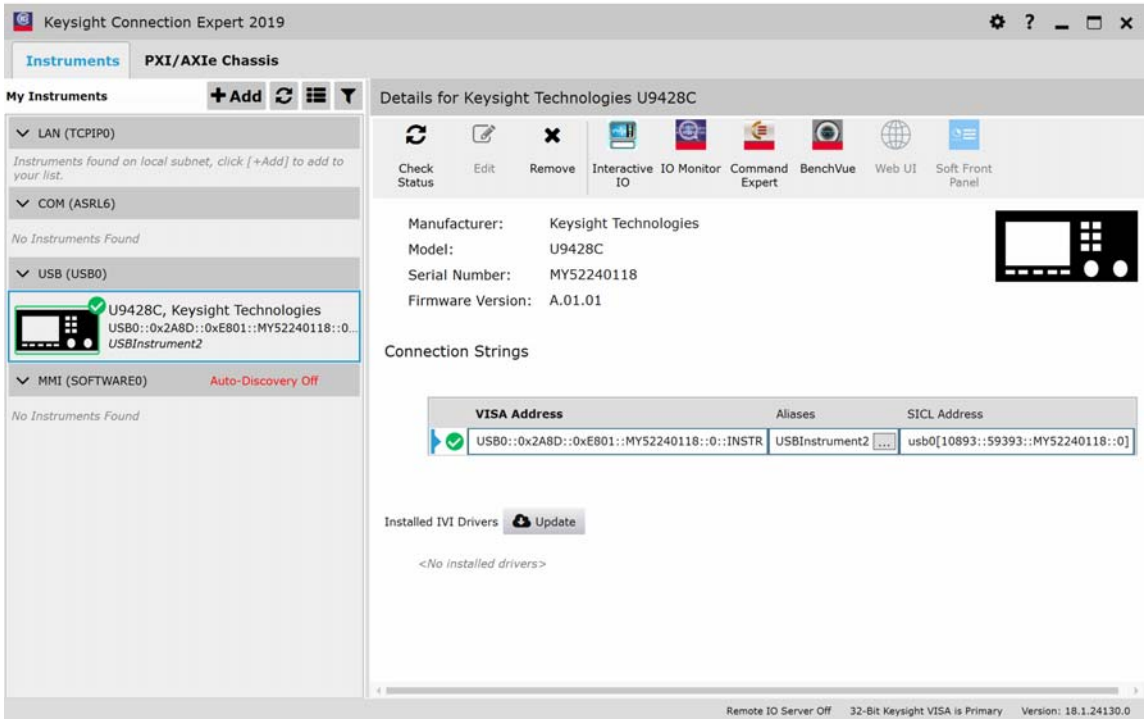


Figure 1-1 Keysight Connection Expert interface

3 Launch the soft front panel (SFP) software from **Start > All Programs > Keysight > U942x USB Switch > U942x USB Switch SFP**.

4 On the Connect to Instrument dialog shown in Figure 1-2, click to select a connected switch for use. The selected switch is highlighted once you select it. You can view the model numbers and serial numbers of the connected switches in the Connect to Instrument dialog.

5 Click **Connect** to connect to the selected switch module.

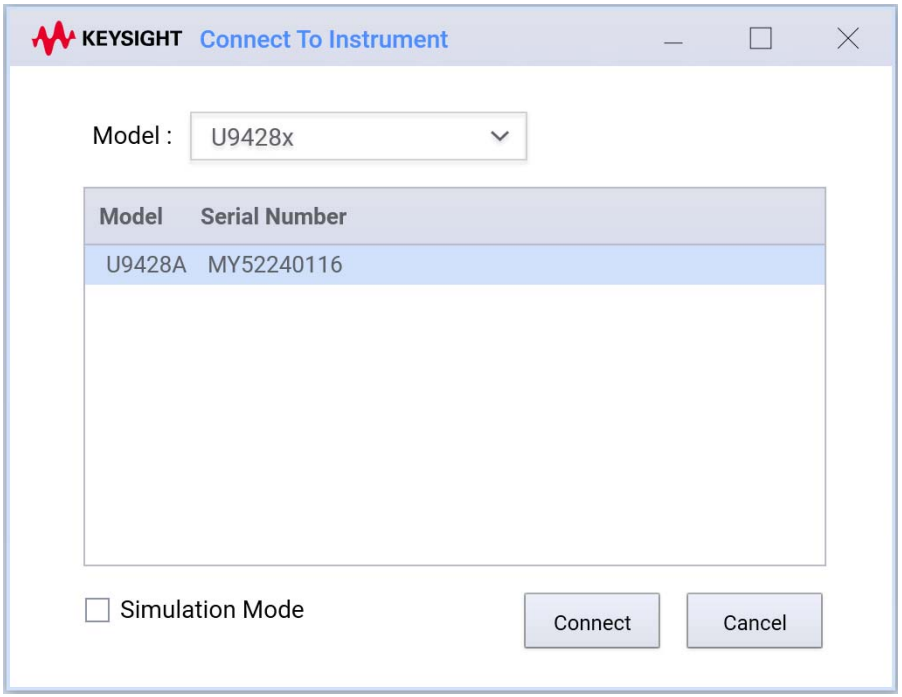


Figure 1-2 Connect to Instrument Dialog

To verify that the U9422x/U9424x/U9428x switch module is working properly, click the desired port as shown in Figure 1-3.

NOTE It is also possible to change the ports of the switch module using the :ROUTe:CLOSe SCPI command.

You can further verify the U9422x/U9424x/U9428x switch module to check if a port is connected using a network analyzer to perform RF measurement.

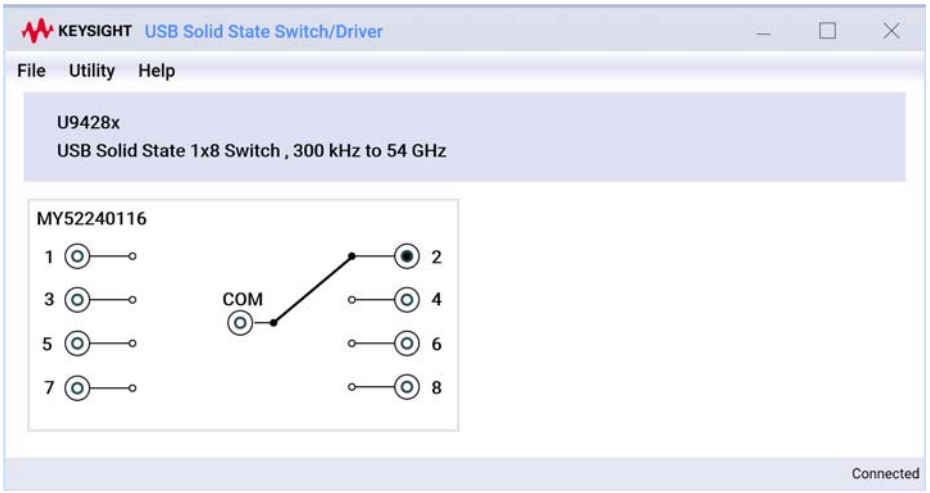


Figure 1-3 SFP Verification

Using Solder Wire Connection

1 Connect V_{CC} and GND wires of the solder wire cable assembly (PN: U9422-60007/U9424-60007/U9428-60001) to the supply voltage (5V) and ground respectively.

NOTE GND wire must always be connected to ground to enable the electronic position-indicating circuitry and drive logic circuitry.

CAUTION If GND wire is not connected to power supply ground, catastrophic failure will occur.

2 Select the desired RF port by applying either 3.3V or 5V voltage (to use the control logic) to the CTRL (1/2/3) wires of the of the solder wire cable assembly as described in Table 1-4, Table 1-5 and Table 1-6 for U9422A/B/C, U9424A/B/C and U9428A/B/C FET solid state switch modules respectively.



Figure 1-4 U9422A Solder Wire Connection

Table 1-4 U9422A Logic States

CTRL Logic	RF Port
0	1
1	2



Figure 1-5 U9424B Solder Wire Connection

Table 1-5 U9424B Logic States

CTRL1 Logic	CTRL2 Logic	RF Port
0	0	1
1	0	2
0	1	3
1	1	4



Figure 1-6 U9428C Solder Wire Connection

Table 1-6 U9428C Logic States

CTRL1 Logic	CTRL2 Logic	CTRL3 Logic	RF Port
0	0	0	1
1	0	0	2
0	1	0	3
1	1	0	4
0	0	1	5
1	0	1	6
0	1	1	7
1	1	1	8

Using Multi-port Configuration Port Connection

1 Connect Ctrl S and Ctrl M ports of the U9422x/U9424x/U9428x switch module to Ctrl M and Ctrl S ports of the PXIe/USB VNA respectively using the Interconnect cable for multi-port configuration (PN: M9800-61617/ M9800-61622).

CAUTION Do not connect Ctrl M port of the PXIe/USB VNA to Ctrl M port of the switch module or Ctrl S port of the PXIe/USB VNA to Ctrl S port of the switch module.

NOTE Default RF path is based on Ctrl S input. Use either Ctrl S (preferred) or Ctrl M to control the U9422x/U9424x/U9428x switch module. If you use Ctrl M to control the switch module, make sure you toggle the switch to 2 different paths before using it so that firmware of the switch module knows where the control logic is applied.

2 The switch module reads the control logic (edge trigger) from the VNA ports and toggles RF path on the U9422A/B/C, U9424A/B/C and U9428A/B/C switch modules accordingly. For information on how to select the desired RF path using VNA SCPI commands and logic controls, refer to U9422x/U9424x/ U9428x Logic States described in Table 1-7, Table 1-8, Table 1-9, Table 1-10, Table 1-11 and Table 1-12.



Figure 1-7 U942xA/B/C Multi-port Configuration Port Connection

Table 1-7 U9422A Logic States (Ctrl M of VNA to Ctrl S of switch module)

Ctrl S			
Control Logic 1	**Control Logic 2**	**RF Port**	**VNA SCPI Command**
0	x	1	CONT:SIGN:KDMI:MAIN3:FUNC LOW
1	x	2	CONT:SIGN:KDMI:MAIN3:FUNC HIGH

Table 1-8 U9422A Logic States (Ctrl S of VNA to Ctrl M of switch module)

Ctrl M			
Control Logic 1	**Control Logic 2**	**RF Port**	**VNA SCPI Command**
0	x	1	CONT:SIGN:KDMI:SUB3:FUNC LOW
1	x	2	CONT:SIGN:KDMI:SUB3:FUNC HIGH

Table 1-9 U9424B Logic States (Ctrl M of VNA to Ctrl S of switch module)

Ctrl S			
Control Logic 1	**Control Logic 2**	**RF Port**	**VNA SCPI Command**
0	0	1	CONT:SIGN:KDMI:MAIN3:FUNC LOW CONT:SIGN:KDMI:MAIN4:FUNC LOW
1	0	2	CONT:SIGN:KDMI:MAIN3:FUNC HIGH CONT:SIGN:KDMI:MAIN4:FUNC LOW
0	1	3	CONT:SIGN:KDMI:MAIN3:FUNC LOW CONT:SIGN:KDMI:MAIN4:FUNC HIGH
1	1	4	CONT:SIGN:KDMI:MAIN3:FUNC HIGH CONT:SIGN:KDMI:MAIN4:FUNC HIGH

Table 1-10 U9424B Logic States (Ctrl S of VNA to Ctrl M of switch module)

Ctrl M			
Control Logic 1	**Control Logic 2**	**RF Port**	**VNA SCPI Command**
0	0	1	CONT:SIGN:KDMI:SUB3:FUNC LOW CONT:SIGN:KDMI:SUB4:FUNC LOW
1	0	2	CONT:SIGN:KDMI:SUB3:FUNC HIGH CONT:SIGN:KDMI:SUB4:FUNC LOW
0	1	3	CONT:SIGN:KDMI:SUB3:FUNC LOW CONT:SIGN:KDMI:SUB4:FUNC HIGH
1	1	4	CONT:SIGN:KDMI:SUB3:FUNC HIGH CONT:SIGN:KDMI:SUB4:FUNC HIGH

Table 1-11 U9428C Logic States (Ctrl M of VNA to Ctrl S of switch module)

Ctrl S				
Control Logic 1	**Control Logic 2**	**Control Logic 3**	**RF Port**	**VNA SCPI Command**
0	0	0	1	CONT:SIGN:KDMI:MAIN2:FUNC LOW CONT:SIGN:KDMI:MAIN3:FUNC LOW CONT:SIGN:KDMI:MAIN4:FUNC LOW
1	0	0	2	CONT:SIGN:KDMI:MAIN2:FUNC LOW CONT:SIGN:KDMI:MAIN3:FUNC HIGH CONT:SIGN:KDMI:MAIN4:FUNC LOW
0	1	0	3	CONT:SIGN:KDMI:MAIN2:FUNC LOW CONT:SIGN:KDMI:MAIN3:FUNC LOW CONT:SIGN:KDMI:MAIN4:FUNC HIGH
1	1	0	4	CONT:SIGN:KDMI:MAIN2:FUNC LOW CONT:SIGN:KDMI:MAIN3:FUNC HIGH CONT:SIGN:KDMI:MAIN4:FUNC HIGH
0	0	1	5	CONT:SIGN:KDMI:MAIN2:FUNC HIGH CONT:SIGN:KDMI:MAIN3:FUNC LOW CONT:SIGN:KDMI:MAIN4:FUNC LOW
1	0	1	6	CONT:SIGN:KDMI:MAIN2:FUNC HIGH CONT:SIGN:KDMI:MAIN3:FUNC HIGH CONT:SIGN:KDMI:MAIN4:FUNC LOW
0	1	1	7	CONT:SIGN:KDMI:MAIN2:FUNC HIGH CONT:SIGN:KDMI:MAIN3:FUNC LOW CONT:SIGN:KDMI:MAIN4:FUNC HIGH
1	1	1	8	CONT:SIGN:KDMI:MAIN2:FUNC HIGH CONT:SIGN:KDMI:MAIN3:FUNC HIGH CONT:SIGN:KDMI:MAIN4:FUNC HIGH

Table 1-12 U9428C Logic States (Ctrl S of VNA to Ctrl M of switch module)

Ctrl S				
Control Logic 1	**Control Logic 2**	**Control Logic 3**	**RF Port**	**VNA SCPI Command**
0	0	0	1	CONT:SIGN:KDMI:SUB3:FUNC LOW CONT:SIGN:KDMI:SUB4:FUNC LOW CONT:SIGN:KDMI:SUB6:FUNC LOW
1	0	0	2	CONT:SIGN:KDMI:SUB3:FUNC HIGH CONT:SIGN:KDMI:SUB4:FUNC LOW CONT:SIGN:KDMI:SUB6:FUNC LOW
0	1	0	3	CONT:SIGN:KDMI:SUB3:FUNC LOW CONT:SIGN:KDMI:SUB4:FUNC HIGH CONT:SIGN:KDMI:SUB6:FUNC LOW
1	1	0	4	CONT:SIGN:KDMI:SUB3:FUNC HIGH CONT:SIGN:KDMI:SUB4:FUNC HIGH CONT:SIGN:KDMI:SUB6:FUNC LOW
0	0	1	5	CONT:SIGN:KDMI:SUB3:FUNC LOW CONT:SIGN:KDMI:SUB4:FUNC LOW CONT:SIGN:KDMI:SUB6:FUNC HIGH
1	0	1	6	CONT:SIGN:KDMI:SUB3:FUNC HIGH CONT:SIGN:KDMI:SUB4:FUNC LOW CONT:SIGN:KDMI:SUB6:FUNC HIGH
0	1	1	7	CONT:SIGN:KDMI:SUB3:FUNC LOW CONT:SIGN:KDMI:SUB4:FUNC HIGH CONT:SIGN:KDMI:SUB6:FUNC HIGH
1	1	1	8	CONT:SIGN:KDMI:SUB3:FUNC HIGH CONT:SIGN:KDMI:SUB4:FUNC HIGH CONT:SIGN:KDMI:SUB6:FUNC HIGH

U9422x, U9424x and U9428x LED Indication



Figure 1-8 U9422x, U9424x and U9428x overview

Table 1-13 LED color and instrument state

LED color	Instrument state
Green	Indicates that the switch module is turned ON and functioning properly.
Red	Indicates that an error has occurred.

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2 Specifications

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Physical Specifications 35

This chapter provides you the environmental specifications of the U9422x/ U9424x/U9428x FET solid state switch module.

Environmental Specifications

Keysight U9422x/U9424x/U9428x FET solid state switch module is designed to fully comply with Keysight Technologies' product operating environmental specifications as shown in the table below.

NOTE

Samples of this product have been type tested in accordance with the Keysight Environmental Test Manual and verified to be robust against the Environmental stresses of Storage, Transportation and End-use; those stresses include, but are not limited to temperature, humidity, shock, vibration and altitude conditions. The primary source of Keysight Environmental Test standards is the International Electro-technical Commission (IEC) standards.

Table 2-1 U9422x, U9424x and U9428x Environmental Specifications

Temperature	
– Operating	0°C to +55°C
– Storage	–40°C to +70°C
Humidity	95% RH up to 40 °C (non-condensing)
– Operating	From 40°C to 55°C, the maximum Relative Humidity follows the line of constant dew point
Shock	
– End-user handling	Delta-V: 1.6 m/s (60 in/s) ±5%, Duration <3ms
– Transportation	50G , Delta-V: 8m/s ±10% at 6 faces
Vibration	
– Operating (Random)	5 Hz-500 Hz, 0.21 Grms
– Survival (Random)	5 Hz-500 Hz, 2.41 Grms
Altitude	
– Operating	<4,600 meters (15,000 feet)
– Non-operating	<4,600 meters (15,000 feet)
ESD Immunity	
– Contact Discharge	4 kV per IEC 61000-4-2
– Air Discharge	8 kV per IEC 61000-4-2

Physical Specifications

Table 2-2 and Table 2-3 list the weight and physical dimensions of the Keysight U9422x, U9424x and U9428x FET solid state switch modules.

Table 2-2 U9422x, U9424x and U9428x Weight

Model number	Weight
U9422A (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	107.4 gms (0.236 lbs)
U9422A (Solder connector)	72.0 gms (0.158 lbs)
U9422B (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	110 gms (0.242 lbs)
U9422B (Solder connector)	74.4 gms (0.164 lbs)
U9422C (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	110.4 gms (0.243 lbs)
U9422C (Solder connector)	74.9 gms (0.165 lbs)
U9424A (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	123.8 gms (0.272 lbs)
U9424A (Solder connector)	92.8 gms (0.204 lbs)
U9424B (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	129.2 gms (0.284 lbs)
U9424B (Solder connector)	97.3 gms (0.214 lbs)
U9424C (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	130 gms (0.286 lbs)
U9424C (Solder connector)	97.8 gms (0.215 lbs)
U9428A (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	157.2 gms (0.346 lbs)
U9428A (Solder connector)	155.3 gms (0.342 lbs)
U9428B (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	162.3 gms (0.357 lbs)
U9428B (Solder connector)	160.6 gms (0.354 lbs)

Model number	Weight
U9428C (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	165.5 gms (0.364 lbs)
U9428C (Solder connector)	163.8 gms (0.361 lbs)

Table 2-3 U9422x, U9424x and U9428x Dimensions

Model number	Dimensions
U9422x (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	82.2 mm H x 64.5 mm W x 23.0 mm D (except U9422A: 85.0 mm H x 70.2 mm W x 23.0 mm D)
U9422x (Solder connector)	67.7 mm H x 64.5 mm W x 23.0 mm D (except U9422A: 70.5 mm H x 70.2 mm W x 23.0 mm D)
U9424x (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	105.4 mm H x 64.5 mm W x 22.5 mm D (except U9424A: 108.3 mm H x 69.9 mm W x 22.5 mm D)
U9424x (Solder connector)	91.0 mm H x 64.5 mm W x 18.0 mm D (except U9424A: 93.8 mm H x 69.9 mm W x 18.0 mm D)
U9428x (USB/Interconnect for multi-port configuration with PXIe and USB VNA)	110.9 mm H x 66.9 mm W x 21.8 mm D (except U9428A: 113.9 mm H x 73.0 mm W x 21.8 mm D)
U9428x (Solder connector)	110.9 mm H x 66.9 mm W x 21.8 mm D (except U9428A: 113.9 mm H x 73.0 mm W x 21.8 mm D)

Figure 2-1, Figure 2-2 and Figure 2-3 show the dimensions of the Keysight U9422x, U9424x and U9428x FET solid state switch modules respectively.

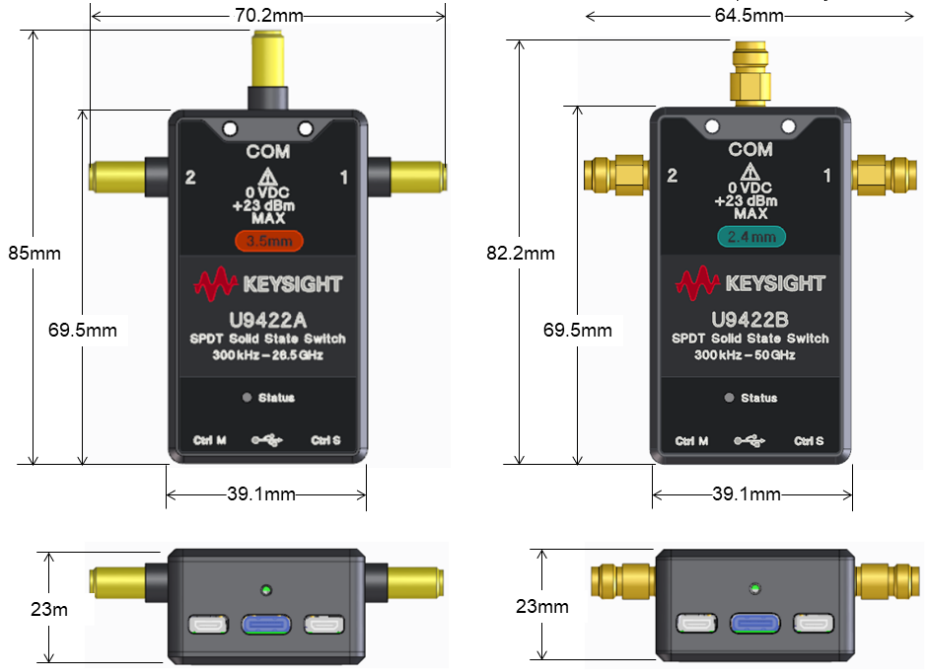


Figure 2-1 U9422x Switch Module

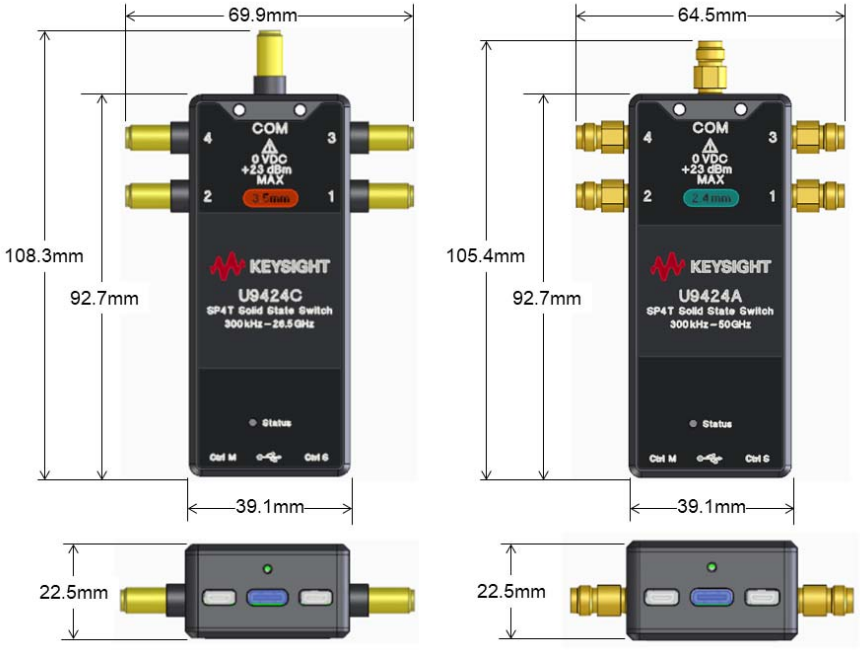


Figure 2-2 U9424x Switch Module

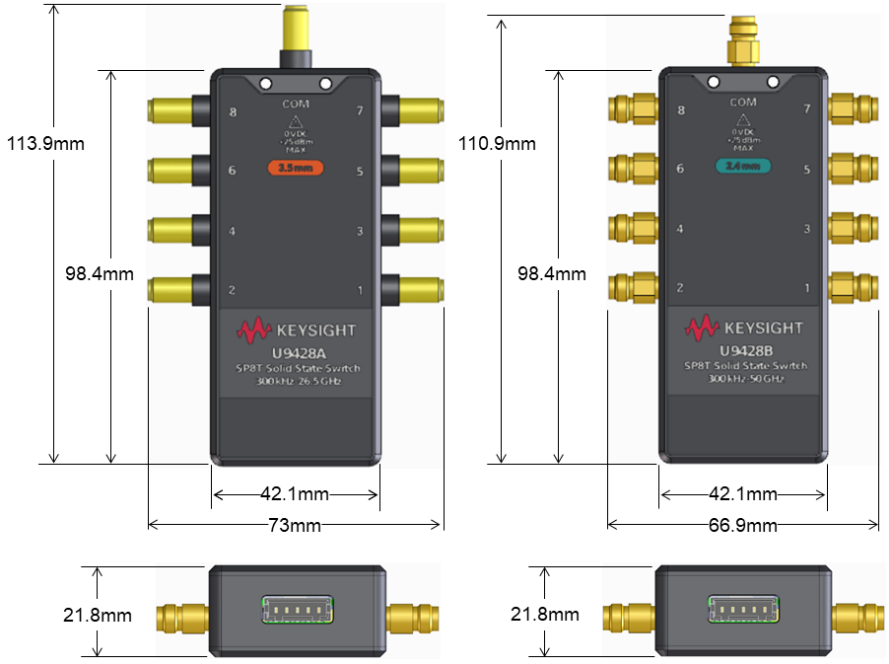


Figure 2-3 U9428x Switch Module

NOTE For the detailed characteristics and specifications of the Keysight U9422x, U9424x and U9428x switch modules, refer to the Technical Overview document at

www.keysight.com/my/en/assets/3121-1500/technical-overviews/FET-Solid-State-Switches.pdf

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3 Service and Maintenance

Service 42
Maintenance 42

Service

The U9422x/U9424x/U9428x switch module does not have internal adjustments and should only be repaired by service-trained personnel. Should it become necessary to return the U9422x, U9424x and U9428x for repair or service, contact your nearest Keysight Service Center.

Maintenance

The connectors, particularly the connector faces, must be kept clean. Keysight recommends that the connectors be periodically inspected and cleaned if necessary. For instructions on connecting and care of your connectors, refer to the Microwave Connector Care Quick Reference Card (08510-90360).

Clean the Connectors

Clean connectors are essential for ensuring the integrity of RF and microwave coaxial connectors.

1 Use compressed air or nitrogen.

WARNING **Always use protective eye-wear when using compressed air or nitrogen.**

Use compressed air (or nitrogen) to loosen particles on the connector mating plane surfaces.

You can use any source of clean, dry, low-pressure compressed air or nitrogen that has an effective oil-vapor filter and liquid condensation trap placed just before the outlet hose.

Ground the hose nozzle to prevent electrostatic discharge, and set the air pressure to less than 414 kPa (60 psi) to control the velocity of the air stream. High-velocity streams of compressed air can cause electrostatic effects when directed into a connector. These electrostatic effects can damage the device.

2 Clean the connector threads.

WARNING Keep isopropyl alcohol away from heat, sparks, and flame. Store it in a tightly closed container. It is extremely flammable. In case of fire, use alcohol foam, dry chemicals, or carbon dioxide; water may be ineffective.

Use isopropyl alcohol with adequate ventilation and avoid contact with eyes, skin, and clothing. It causes skin irritation, may cause eye damage, and is harmful if swallowed or inhaled. It may be harmful to the skin. Wash thoroughly after handling. In case of spill, soak up with sand or earth. Flush spill with water.

Dispose of isopropyl alcohol in accordance with all applicable federal, state, and local environmental regulations.

Use a lint-free swab or cleaning cloth moistened with isopropyl alcohol to remove any dirt or stubborn contaminants on a connector that cannot be removed with compressed air or nitrogen.

a Apply a small amount of isopropyl alcohol to a lint-free swab.

b Clean the connector threads.

c Let the alcohol evaporate, and then blow the threads dry with a gentle stream of clean, low-pressure compressed air or nitrogen. Always dry a connector completely before you re-assemble or use it.

3 Clean the mating plane surfaces.

a Apply a small amount of isopropyl alcohol to a lint-free swab.

b Clean the center and outer conductor mating plane surfaces.

c Let the alcohol evaporate, then blow the connector dry with a gentle stream of clean, low-pressure compressed air or nitrogen. Always dry a connector completely before you re-assemble or use it.

4 Re-inspect

Inspect the connector again to make sure that no particles or residue are present.

Make Good Connections

Good connections require a skilled operator. The most common cause of measurement error is bad connections. The following procedures explain how to make good connections.

Make a Preliminary Connection

1. Ground yourself and all devices. Wear a grounded wrist strap and work on a grounded, conductive table mat. Wear a heel strap when working in an area with conductive floor. If you are uncertain about the conductivity of your floor, wear a heel strap.
2. Visually inspect the connectors.
3. If necessary, clean the connectors.
4. Carefully align the connectors.
5. Push the connectors straight together.

CAUTION **Do not turn the device body. Only turn the connector nut. Damage to the center conductor and outer conductor can occur if the device body is twisted.**

6. The preliminary connection is tight enough when the mating plane surfaces make uniform, light contact. Do not over-tighten the connection. A connection in which the outer conductors make gentle contact at all points on both mating surfaces is sufficient. Very light finger pressure is enough to accomplish this.
7. Ensure that the connectors are properly supported. Relieve any side pressure on the connection from long or heavy devices or cables.

Make the Final Connection Using a Torque Wrench

1 Use a torque wrench to make the final connection. The table below provides information about the torque wrench. Using the torque wrench guarantees that the connection is not too tight, preventing possible connector damage. It also ensures that all connections are equally tight each time.

Connector Type	Torque Setting	Keysight Torque Wrench Part Number
3.5 mm	90 N-cm (8 in-lb)	8710-1765
2.4 mm		
1.85 mm		

2 Prevent the rotation of anything other than the connector nut that you are tightening. It may be possible to do this by hand if one of the connectors is fixed (as on a test port). In all situations, however, it is recommended that you use an open-end wrench to keep the body of the device from turning.

3 Position both wrenches within 90 degrees of each other before applying force. Refer to Figure 3-1. Wrenches opposing each other (greater than 90 degrees apart) will cause a lifting action which can misalign and stress the connections of the devices involved. This is especially true when several devices are connected together.

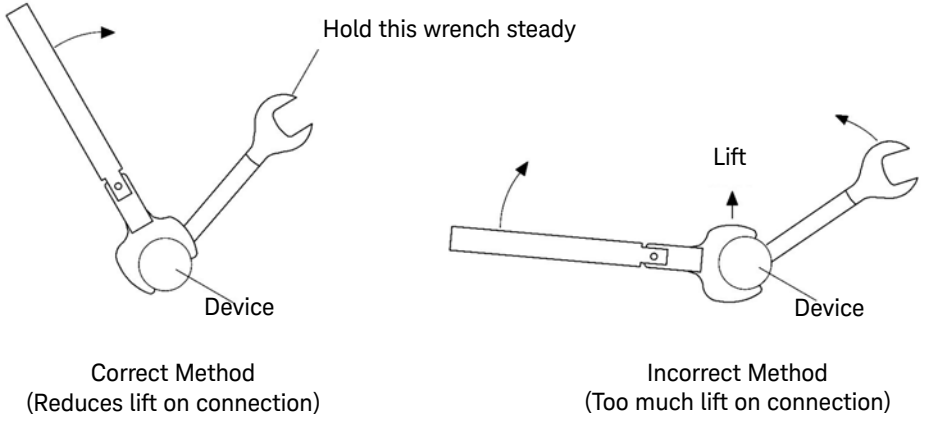


Figure 3-1 Wrench Positions

4 Hold the torque wrench lightly, at the end of the handle only (beyond the groove). Refer to Figure 3-2.

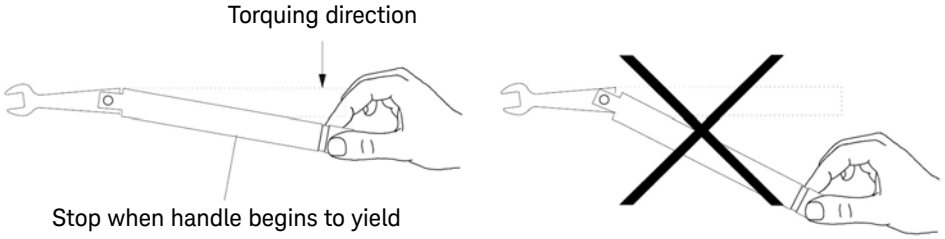


Figure 3-2 Using the Torque Wrench

5 Apply downward force perpendicular to the wrench handle. Refer to Figure 3-2. This applies torque to the connection through the wrench.

Do not hold the wrench so tightly that you push the handle straight down along its length rather than pivoting it, otherwise you apply an unknown amount of torque.

6 Tighten the connection just to the torque wrench break point. The wrench handle gives way at its internal pivot point. Refer to Figure 3-2. Do not tighten the connection further.

CAUTION **You do not need to fully break the handle of the torque wrench to reach the specified torque; doing so can cause the handle to kick back and loosen the connection. Any give at all in the handle is sufficient torque.**

Do not pivot the wrench handle on your thumb or other fingers, otherwise you apply an unknown amount of torque to the connection when the wrench reaches its break point.

Do not twist the head of the wrench relative to the outer conductor mating plane. If you do, you apply more than the recommended torque.

Separate a Connection

To avoid lateral (bending) force on the connector mating plane surface, always support the devices and connections.

CAUTION **Turn the connector nut, not the device body. Major damage to the center conductor can occur if the device is twisted.**

1. Use an open-end wrench to prevent the device body from turning.
2. Use another open-end wrench to loosen the connector nut.
3. Complete the separation by hand, turning only the connector nut.
4. Pull the connectors straight apart without twisting, rocking, or bending either of the connectors.

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This information is subject to change without notice. Always refer to the English version at the Keysight website for the latest revision.

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