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Keysight 34941A–34942A RF Multiplexer Modules

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KEYSIGHT TECHNOLOGIES

User's Guide

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Safety Information

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 Symbols

The following symbols on the instrument and in the documentation indicate precautions which must be taken to maintain safe operation of the instrument.

	Alternating current (AC)		Frame or chassis (ground) terminal
	Standby supply. Unit is not completely disconnected from ac mains when switch is off		Caution, risk of electric shock
	Caution, risk of danger (refer to this manual for specific Warning or Caution information)		

Additional Safety Notices

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 instructions elsewhere in this manual violates safety standards of design, manufacture, and intended use of the instrument. Keysight Technologies assumes no liability of the customer's failure to comply with the requirements.

General

Do not use this products in any manner not specified by the manufacturer. The protective features of this product may be impaired if it is used in a manner not specified in the operation instructions.

Before Applying Power

Verify that all safety precautions are taken. Make all connections to the unit before applying power.

Ground the Instrument

This product is provided with protective earth terminals. To minimize shock hazard, 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

Only qualified, service-trained personal who are aware of the hazards involved should remove instrument covers. Always disconnect the power cable and any external circuits before removing the instrument cover.

Do Not Modify the Instrument

Do not install substitute parts or perform any unauthorized modification to the product. Return the product to an Keysight Sales and Service Office for service and repair to ensure that safety features are maintained.

In Case of Damage

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

Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC

This instrument complies with the WEEE Directive (2002/96/EC) marking requirement. This affixed product label indicates that you must not discard this electrical or electronic product in domestic household waste.

Product category:

With reference to the equipment types in the WEEE directive Annex 1, this instrument is classified as a “Monitoring and Control Instrument” product.

The affixed product label is as shown below.



Do not dispose in domestic household waste.

To return this unwanted instrument, contact your nearest Keysight Service Center, or visit http://about.keysight.com/en/companyinfo/environment/takeback.shtml for more information.

Sales and Technical Support

To contact Keysight for sales and technical support, refer to the support links on the following Keysight websites:

- www.keysight.com/find/xxxxx
  (product-specific information and support, software and documentation updates)
- www.keysight.com/find/assist
  (worldwide contact information for repair and service)

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RF Multiplexer Switch Modules

This User's Guide covers the following two plug-in modules for the Keysight 34980A Multifunction Switch/Measure Unit:

34941A	Quad 1x4 50Ω 3GHz RF multiplexer
34942A	Quad 1x4 75Ω 1.5GHz RF multiplexer

These modules provide high density radio frequency (RF) signal switching, with four independent 1x4 multiplexer banks in each module.

Both modules contain four banks of latching switches. Each bank consists of three Form C relays (see the simplified schematic on page 14). To create a larger switching configuration, you can connect the banks in this module *and* connect to banks in *other* RF MUX modules. For example, you can create up to 1x97 RF MUX in a single 34980A mainframe.

The important differences between the two RF MUX modules lie in their characteristic impedance and their use of connectors (external cables are *not* provided with the module):

– The 34941A – the 50-Ω version – uses SMA connectors.

  When installing SMA cables on the 34941A module, it is recommend that you tighten them to 0.8 - 1.1 Nm (7-10 in-lbs) of torque.

CAUTION **SMA connectors are easily damaged, especially when tightening a neighboring connector with a wrench. To help prevent damage and contamination, do not remove a connector's protective cap until immediately prior to installing a cable on that connector.**

– The 34942A – the 75-Ω variation – uses Mini SMB connectors.

NOTE **For the 34942A, it is recommended that you use gold-plated straight plug connectors (75Ω Miniature SMB). Because of the space constraints between connectors on this module, right-angle plugs and SMB adapters are not recommended.**

Operating Considerations

Electrical Considerations

See the *Introduction to the Plug In Modules* chapter of the 34980A Mainframe User's Guide for detailed environmental operating conditions for the 34980A mainframe and its installed modules. That guidance sets maximum per channel current and power ratings at rated voltage for pollution degree 1 (dry) and pollution degree 2 (possible condensation) conditions, for each of the GP modules.

Signal Connections

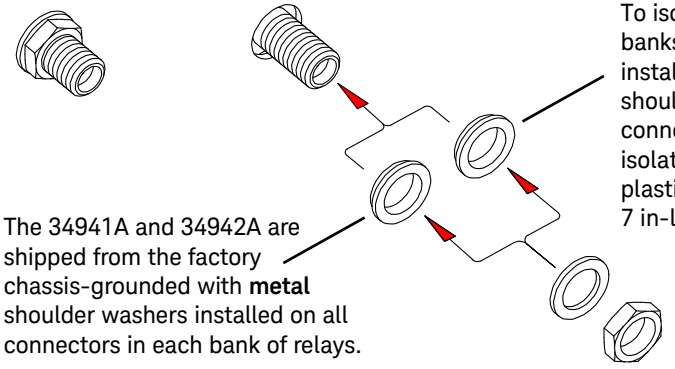
The RF MUX modules do not connect to the analog buses. Instead, all signal connections are made through the visible connectors via external cables. Each visible connector on an RF MUX module is labeled with a number (11 through 44), that represents a channel you can close programmatically from the front panel or with using the Web Browser Interface. When you close a channel on the RF MUX modules you automatically close all relays that create a direct path to the Common of a bank.

Channel Relay Operation

With RF MUX switches, you cannot open switches programmatically. You can only close a channel. When you close one channel, another channel automatically opens. Therefore, only one channel relay in each bank is closed at any time.

Electrical Isolation

You can configure each bank on the RF MUX modules to be either isolated or chassis-grounded. The modules come with chassis-grounded metal shoulder washers installed on all connectors in each bank of relays. If you want to isolate a bank from the other banks and from chassis-ground, you must remove the five metal washers in that bank and replace them with the provided plastic shoulder washers.



To isolate a bank from other banks and chassis-ground, install the provided **plastic** shoulder washers on the connectors in the bank to be isolated. When installing the plastic shoulder washers, use 7 in-lbs of torque.

The 34941A and 34942A are shipped from the factory chassis-grounded with **metal** shoulder washers installed on all connectors in each bank of relays.

34941A and 34942A SCPI Programming Examples

The programming examples below provide you with SCPI command examples to use for actions specific to the RF MUX switch modules.

The slot and channel addressing scheme used in these examples follow the form **sccc** where **s** is the mainframe slot number (1 through 8) and **ccc** is the channel number. For information on specific configurations, refer to the simplified schematic on page 14.

For complete information on the SCPI commands used to program the 34980A, refer to the *Keysight 34980A Programmer's Reference* which can be downloaded from www.keysight.com/find/34980A.

Example: Closing channels You can only *close* channels on the RF MUX modules. When you close a channel, any already-closed channels open automatically. The relays switch in sequence to avoid momentary connection of the wrong input to the multiplexer output. The following command closes channel 03 on Bank 1 of an RF MUX module in slot 5.

```
ROUTe:CLOSe (@5103)
```

Example: Querying channels for open or close state The following commands returns the close or open state of channel 33 of a module in slot 5.

```
ROUT:CLOSe? (@5033)
ROUT:OPEN? (@5033)
```

Example: Querying the system for module identify The following command returns the identify of the module installed in slot 7.

```
SYSTem:CTYPe? 7
```

Example: Reading the cycle count for a relay On these modules, each bank consists of two *leaf* relays and one *tree* relay (see the simplified schematic on page 14). The module stores the cycle count for each of the three relays on all four banks. The cycle count is the greater of the three values on the specified bank (i.e., reflecting the cycle count for the entire bank). Therefore, the count for Channels 101, 102, 103, and 104 will *always* be equal. The following statement reads back the number of completed cycles for the channels 101 and 202 on a module installed in slot 6.

```
DIAGnostic:RELay:CYCLes? (@6101,6202)
```

Example: Clearing the cycle count for a relay The following command resets the cycle count on the channels 103 and 201 for a module in slot 1.
Note that clearing the cycle count on a specific channel will clear the count on *all* three relays in the corresponding bank.

```
DIAGnostic:RELay:CYCLes:CLEar (@1103,1201)
```

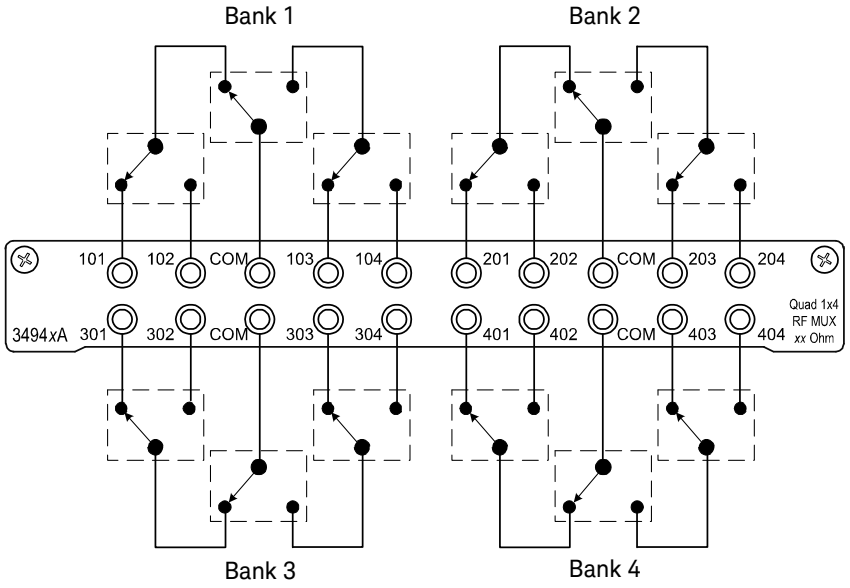
Example: Resetting module to power-on state The following command resets a module in slot 4 to its power-on state.

```
SYSTem:CPON 4
```

34941A and 34942A Simplified Schematic

Both the 34941A and 34942A modules are configured alike. Each contains four banks of latching switches. Each bank consists of three Form C relays.

The front panel of the two RF MUX modules are similar with channel labels in the same positions, the unique product number on the left, and the product description on the right.



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