Keysight 8710x Series
Coxial Multiport Switches

KEYSIGHT
TECHNOLOGIES

Operating and
Service Manual

Notices

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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.

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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.

Waste Electrical and Electronic Equipment (WEEE) Directive

This instrument complies with the WEEE Directive 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/switches
(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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Keysight 8710x Operating and Service Manual

1   Introduction

This chapter provides you the overview of Keysight 8710x series coaxial multiport switches.

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General Information

Keysight 87104A/B/C/D SP4T and 87106A/B/C/D SP6T terminated switches provide the life and reliability required for automated test and measurement, signal monitoring and routing applications. These switches can be used in various applications as they are available in multiple frequency ranges, up to 40 GHz.

Figure 1-1   Keysight 87106D and 87104D coaxial multiport switches

Innovative design and careful process control create switches that meet the requirements for highly repeatable switching elements in test instruments and switching interfaces. The switches are designed to operate for more than 10,000,000 cycles.The exceptional 0.03 dB insertion loss repeatability is warranted for 3 million cycles at 25 °C. This reduces sources of random errors in the measurement path and improves measurement uncertainty. Switch life is a critical consideration in production test systems, satellite and antenna monitoring systems, and test instrumentation. The longevity of these switches increases system uptime and lowers the cost of ownership by reducing calibration cycles and switch maintenance.

Table 1-1   List of Keysight 8710x series coaxial multiport switches

Model number	Frequency range	Configuration
87104A	DC to 4 GHz	SP4T
87104B	DC to 20 GHz	SP4T
87104C	DC to 26.5 GHz	SP4T
87104D	DC to 40 GHz	SP4T
87106A	DC to 4 GHz	SP6T
87106B	DC to 20 GHz	SP6T
87106C	DC to 26.5 GHz	SP6T
87106D	DC to 40 GHz	SP6T

Key Features

- – SP4T and SP6T configurations
- – Magnetic latching
- – Operating life of 10 million cycles, typical
- – Guaranteed repeatability of 0.03 dB up to 5 million cycles ensure accurate system measurements and reduces calibration intervals
- – Excellent isolation, typically > 65 dB at 40 GHz
- – Opto-electronic indicators and interrupts
- – Terminated ports
- – TTL/5 V CMOS compatible (optional)

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2   Switch Configuration

This chapter provides you information on how to drive the switches using standard drive and TTL drive. Also included is the configuration to utilize the function of the position indicator.

Driving the Switch

Each RF path can be closed by applying ground (TTL "High" for Option T24) to the corresponding "drive" pin. In general, all other RF paths are simultaneously opened by internal logic. See Figure 2-1 for drive connection diagrams.
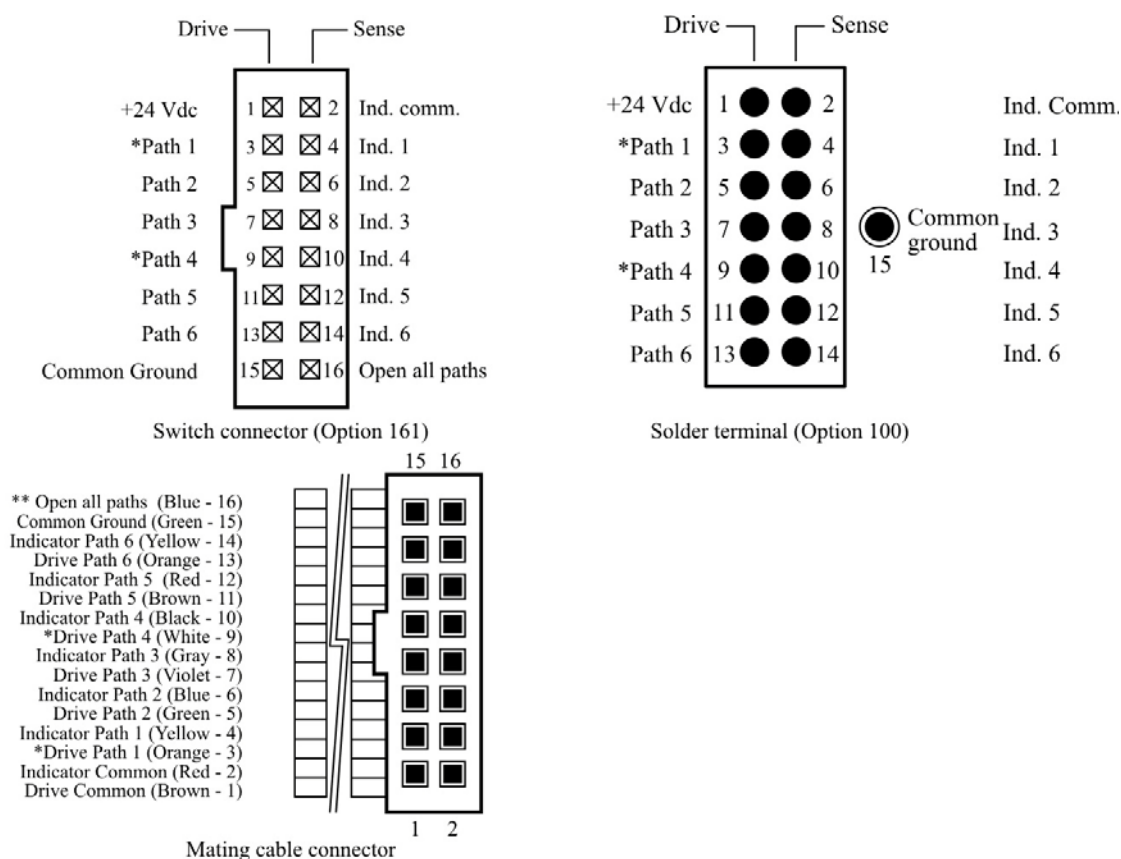
*   Path1 and path 4 are not connected for 87104A/B/0C/D
**   "Open all paths pin is not available for option 100

Figure 2-1   Drive connection diagrams for Option 161 and Option 100

The default operation of the switches is break-before-make. Make-before-break switching can be accomplished by simultaneously selecting the "drive" pins for old RF path and new RF path. Once the new RF path is closed (15 ms), de-select the old RF path "drive" pin while leaving the new RF path "drive" pin selected. The switch circuitry will automatically open the old RF path while leaving the new RF path engaged.

Standard Drive

1 Connect pin 1 to supply voltage (+20 Vdc to +32 Vdc) and pin 15 to ground.

NOTE Pin 15 must always be connected to ground to enable the electronic position-indicating circuitry and drive logic circuitry.

CAUTION If pin 15 is not connected to power supply ground, catastrophic failure will occur.

2 Select (close) desired RF path by applying ground to the corresponding "drive" pin; for example ground pin 3 to close RF path 1.

NOTE After the RF path is switched and latched, the drive current is interrupted by the electronic position-sensing circuitry. Pulsed control is not necessary, but if implemented, the pulse width must be 15 ms minimum to ensure the switch is fully latched.

3 To select another RF path, ensure that all unwanted RF path "drive" pins are disconnected from ground (to prevent multiple RF path engagement). Ground the "drive" pin which corresponds to the desired RF path.

4 To open all RF paths, ensure that all RF path "drive" pins are disconnected from ground. Then, connect pin 16 to ground. This feature is not available in option 100.

TTL Drive (Option T24)

1 Connect pin 1 to supply voltage (+20 Vdc to +32 Vdc) and pin 15 to ground.

NOTE	Pin 15 must always be connected to ground to enable the electronic position-indicating circuitry and drive logic circuitry.
	In addition to the quiescent current supplying the electronic position-sensing circuitry, the drive current flows out of pin 15 (during switching) on TTL drive switches (option T24).

CAUTION	If pin 15 is not connected to power supply ground, catastrophic failure will occur.

2 Select (close) desired RF path by applying ground to the corresponding "drive" pin; for example apply TTL "High" to pin 3 to close RF path 1.

NOTE	After the RF path is switched and latched, the drive current is interrupted by the electronic position-sensing circuitry. Pulsed control is not necessary, but if implemented, the pulse width must be 15 ms minimum to ensure the switch is fully latched.

3 To select another RF path, ensure that all unwanted RF path "drive" pins are at TTL "Low" (to prevent multiple RF path engagement). Apply TTL "High" to the "drive" pin which corresponds to the desired RF path.

4 To open all RF paths, ensure that all RF path "drive" pins are at TTL "Low". Then, apply TTL "High" to pin. This feature is not available in option 100.

Electronic Position Indicators

The electronic position indicators consist of optically isolated, solid state relays which are driven by photo-electric sensors coupled to the mechanical position of the RF path's moving elements (see Figure 2-2). The circuitry consists of a common which can be connected to an output corresponding to each RF path. If multiple RF paths are engaged, the position indicator corresponding to each closed RF path will be connected to common. The solid state relays are configured for AC and/or DC operation. The electronic position indicators require that the supply (20 to 32 VDC) be connected to pin 1 and ground connected to pin 15.

PIN NUMBER	FUNCTION
2	COMMON
4	*PATH 1
6	PATH 2
8	PATH 3
10	*PATH 4
12	PATH 5
14	PATH 6
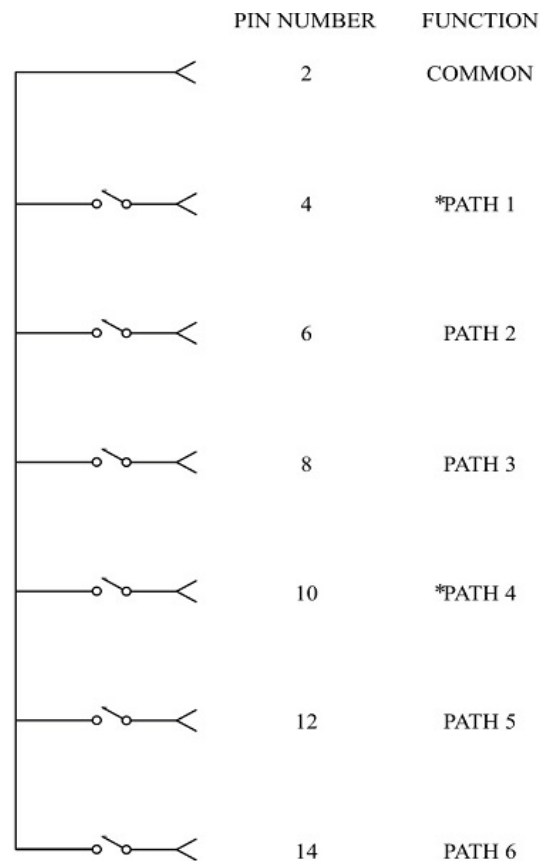
*Paths 1 and 4 are not connected for 87104A/B/C/D

Figure 2-2   Pin configuration for indicator function

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3 Installation and Verification

This chapter provides you installation information and simple verification steps of the switches.

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Installation

Initial inspection

1   Inspect the shipping container for damage. If the shipping container or cushioning material is damaged, it should be kept until the contents of the shipment have been checked for completeness and the instrument has been checked both mechanically and electrically.

–   Check for mechanical damage such as scratches or dents.

–   Procedures for checking electrical performance are given under "Operator's check" on page 23 or "Performance test" on page 24.

2   If the contents are incomplete, there is mechanical damage or defect, or the instrument does not pass the electrical performance test, contact the nearest Keysight Sales and Service office (refer to "Sales and Technical Support" on page 3). Keysight will arrange for repair or replacement of the damaged or defective equipment. Keep the shipping materials for the carrier's inspection.

3   If you are returning the instrument under warranty or for service, repackaging the instrument requires original shipping containers and materials or their equivalents. Keysight can provide packaging materials identical to the original materials. Refer to "Sales and Technical Support" on page 3 for the Keysight office nearest to you. Attach a tag indicating the type of service required, return address, model number, and serial number. Mark the container *FRAGILE* to insure careful handling. In any correspondence, refer to the instrument by its model number and serial number.

Operating and Service Instructions

Operator's check

The operator's check is supplied to allow the operator to make a quick check on the coaxial multiport switches prior to use or if a failure is suspected.

Description

The coaxial multiport switch is connected to a network analyzer configured for the S-parameter measurement. The network analyzer may be set to sweep over the whole or selected frequency range of the switch to be verified. The S-parameter measurement is the best way to determine if the switch is working properly.
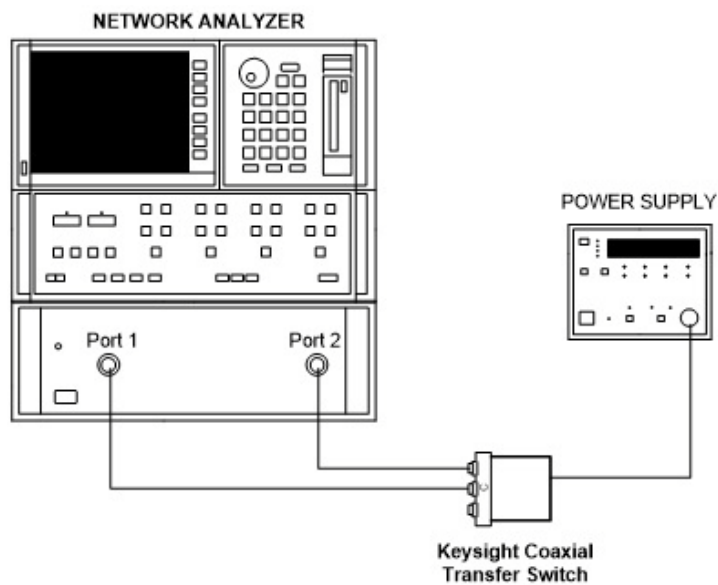

Figure 3-1   Connection to perform quick check

Quick check procedure

1 Connect the common port of the switch to Port 1 of the network analyzer and one of the outer RF ports to Port 2 of the network analyzer as illustrated in Figure 3-1.

2 For standard drive, apply ground to the corresponding "drive" pin to close the selected path. Refer to "Standard Drive" on page 17.

3 For TTL drive (option T24), apply "High" to the corresponding "drive" pin to close the selected path. Refer to "TTL Drive (Option T24)" on page 18.

4 Perform the S-parameter measurement and verify against supplemental specifications (cold switching).

5 Repeat steps 1 to 4 until all paths are measured and verified.

Performance test

The coaxial multiport switches can be tested to the accuracy of the specifications with a network analyzer or equivalent equipment of suitable accuracy. If a network analyzer is available, test the instrument using the procedure in the analyzer's operating manual.

Service instructions

Adjustment and repair

Keysight 8710x series coaxial multiport switches do not require internal adjustments and are not recommended for repair.

Maintenance

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

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