Keysight Technologies
34945A, L4445A, and L4490A/L4491A

Configuration Guide

KEYSIGHT TECHNOLOGIES

Introduction

RF/Microwave switches are used in a wide variety of applications ranging from DC to over 50 GHz. These applications can include:

- Wireless Communications
- Broadband CATV
- Communication Satellites
- Test and Measurement Equipment
- Electronic Radar and Defense Systems
- Avionics
- Medical Electronics
- Space Programs.

High Frequency measurement systems can be configured to route RF/Microwave signals in a variety of configurations including:

- Selection from multiple signal sources to a single output
- Selection of multiple input signals to a single measurement instrument
- Transfer switching to insert or remove a device in a signal path
- Matrix switching of multiple inputs and outputs

Keysight Technologies, Inc. is a leader in providing RF/Microwave switching solutions. Keysight's solutions include both RF/Microwave switch modules and switch driver instruments that control discreet (external) switches and attenuators physically located at the site of the device under test (DUT) or application.

The purpose of this configuration guide is to introduce you to the features of the Keysight 34945A, L4445A, and L4490A/L4491A family of RF/Microwave switching instruments, and to assist you in the three step process of selecting and configuring your Keysight system:

Step 1: Select the switches/attenuators and their options for your application.

Step 2: Determine the type and number of distribution boards required, and the bracket and cable kits required.

Step 3: Select the switch driver instrument or switch platform you plan to use.

Step 1

Supported Keysight Switches and Attenuators

The Keysight 34945A and L4445A Microwave Switch/Attenuator Drivers and the L4490A/L4491A RF Switch Platform support virtually any RF/Microwave switch or attenuator.

Table 1, shown on the following page, is a list of commonly used and supported Keysight switches and attenuators with their recommended options. Use Table 1 to locate your switch(es)/attenuator(s) and the accessories required. You may find it necessary to refer to the table frequently as you work through this guide.

Note that the switches, attenuators, and accessories shown in Tables 1 and 2 are not included with the instrumentation and must be ordered separately! Use the chart on page 13 to track your selections as you determine your configuration.

Table 1. Common Keysight RF/Microwave Switches and Attenuators

Switch model	Description	Frequency range	Reference document number [1]	Coil voltage option	Position indicator option	DC connector option	Distribution board [number of switches/board]	Bracket kit [3] (Cable kit) [3]
N1810UL N1810TL N1811TL N1812UL	Un-terminated latching 3-port (SPDT) Terminated latching 3-port (SPDT) Terminated latching 4-port (bypass) Un-terminated latching 5-port	DC – 2, 4, 20, or 26.5 GHz	5968-9653E	124	402/403 [2]	201 (DB9F)	Y1150A [8] Y1152A [2] Y1154A [6]	Y1170A: L4491A Y1171A: L4490A (Y1157A)
87104A	SP4T 4-port latching, terminated	DC – 4 GHz	5091-3366E					
87104B	SP4T 4-port latching, terminated	DC – 20 GHz						
87104C	SP4T 4-port latching, terminated	DC – 26.5 GHz						
87106A	SP6T 6-port latching, terminated	DC – 4 GHz						
87106B	SP6T 6-port latching, terminated	DC – 20 GHz						
87106C	SP6T 6-port latching, terminated	DC – 26.5 GHz						
87106P	Low PIM Switch, SP6T 6-port, latching, terminated	DC - 4 GHz	87104-80017	024: 24 VDC T24: TTL/5 V CMOS compatible	Included	161 (16-pin DIP)	Y1151A [2]	Y1172A (Y1159A)
87106Q	Low PIM Switch, SP6T 6-port, latching, terminated	DC - 20 GHz						
87106R	Low PIM Switch, SP6T 6-port, latching, terminated	DC - 26.5 GHz						
	6-port matrix, terminated		5965-7841E 87406-80005					
87406B	Low PIM Switch, 6-port matrix, terminated	DC – 20 GHz						
87406Q		DC – 20 GHz						
87204A	SP4T 4-port latching, terminated	DC – 4 GHz	5965-3309E					
87204B	SP4T 4-port latching, terminated	DC – 20 GHz						
87204C	SP4T 4-port latching, terminated	DC – 26.5 GHz						
87206A	SP6T 6-port latching, terminated	DC – 4 GHz						
87206B	SP6T 6-port latching, terminated	DC – 20 GHz		Included	Included	161 (16-pin DIP)	Y1152A [1]	Y1172A (Y1159A)
87206C	SP6T 6-port latching, terminated	DC – 26.5 GHz						
87606B	6-port matrix, terminated	DC – 20 GHz	5965-7842E					
87606Q	Low PIM Switch, 6-port matrix, terminated	DC – 20 GHz	87606-80005	024: 24 VDC	N/A			
87222C	4-port transfer	DC – 26.5 GHz	5968-2216E					
87222D	4-port transfer	DC – 40 GHz						
87222E	4-port transfer	DC – 50 GHz		Included	Included	161 (16-pin DIP)	Y1154A [2]	Y1173A (Y1158A)
87222R	Low PIM Switch, 4-port transfer	DC- 26.5 GHz	87222-80007	24 VDC				

Table 1. Common Keysight RF/Microwave Switches and Attenuators (continued)

Switch model	Description	Frequency range	Reference document number [1]	Coil voltage option	Position indicator option	DC connector option	Distribution board [number of switches/board]	Bracket kit [3] (Cable kit) [3]
L7104A	SP4T 4-port latching, terminated	DC – 4 GHz	5989-6030EN					
L7104B	SP4T 4-port latching, terminated	DC – 20 GHz						
L7104C	SP4T 4-port latching, terminated	DC – 26.5 GHz						
L7106A	SP6T 6-port latching, terminated	DC – 4 GHz						
L7106B	SP6T 6-port latching, terminated	DC – 20 GHz						
L7106C	SP6T 6-port latching, terminated	DC – 26.5 GHz		024	Included	161 (16-pin DIP)	Y1151A [2]	Y1172A (Y1159A)
L7204A	SP4T 4-port latching, un-terminated	DC – 4 GHz						
L7204B	SP4T 4-port latching, un-terminated	DC – 20 GHz						
L7204C	SP4T 4-port latching, un-terminated	DC – 26.5 GHz						
L7206A	SP6T 6-port latching, un-terminated	DC – 4 GHz						
L7206B	SP6T 6-port latching, un-terminated	DC – 20 GHz						
L7206C	SP6T 6-port latching, un-terminated	DC – 26.5 GHz						
L7222C	4-port transfer latching, terminated	DC – 26.5 GHz	5989-6084EN	Included	Included	161 (16-pin DIP)	Y1154A [2]	Y1173A (Y1158A)
8762A	Terminated latching 3-port (SPDT)	DC – 4 GHz	5952-1873E					
8762B	Terminated latching 3-port (SPDT)	DC – 18 GHz						
8762C	Terminated latching 3-port (SPDT)	DC – 26.5 GHz						
8763A	Terminated latching 4-port (transfer)	DC – 4 GHz						
8763B	Terminated latching 4-port (transfer)	DC – 18 GHz						
8763C	Terminated latching 4-port (transfer)	DC – 26.5 GHz		024	N/A			
8764A	Terminated latching 5-port	DC – 4 GHz						
8764B	Terminated latching 5-port	DC – 18 GHz						
8764C	Terminated latching 5-port	DC – 26.5 GHz						
8762F	75 ohms Terminated (SPDT)	DC – 4 GHz	5964-3704E					
8765A	Coaxial (SPDT),SMA	DC – 4 GHz	5952-2231E					
8765B	Coaxial (SPDT),SMA	DC – 20 GHz						
8765C	Coaxial (SPDT),3.5 mm	DC – 26.5 GHz		324	n/a			
8765D	Coaxial (SPDT),2.4 mm	DC – 40 GHz						
8765F	Coaxial (SPDT), 75 ohm, SMB	DC – 4 GHz	5091-2679E					
8766K	Coaxial (SP3T)	DC – 26.5 GHz	5959-7831					
8767K	Coaxial (SP4T)	DC – 26.5 GHz		024	n/a	060 (12-pin Viking)	Y1155A [2] Y1155A [1]	Y1175A
8768K	Coaxial (SP5T)	DC – 26.5 GHz						
8769K	Coaxial (SP6T)	DC – 26.5 GHz						
8767M	Coaxial (SP4T)	DC – 50 GHz	5988-2477EN					
8768M	Coaxial (SP5T)	DC – 50 GHz		024	n/a	10-pin DIP	Y1153A [2]	Y1175A (Y1158A)
8769M	Coaxial (SP6T)	DC – 50 GHz						
U9397A	8 GHz Solid State	300 kHz-8 GHz	5989-6088EN					
U9397C	18 GHz Solid State	300 kHz–18 GHz		Included	n/a	Solder terminals	Y1155A [8]	Y1170A: L4491A Y1171A: L4490A

Table 1. Common Keysight RF/Microwave Switches and Attenuators (continued)

Switch model	Description	Frequency range	Reference document number [1]	Coil voltage option	Position indicator option	DC connector option	Distribution board [number of switches/board]	Bracket kit [3] (Cable kit) [3]
84904K 84904L	11 dB max, 1 dB steps, 4 sections	DC – 26.5 GHz DC – 40 GHz	5963-6944					
84906K 84906L	90 dB max, 10 dB steps, 4 sections	DC – 26.5 GHz DC – 40 GHz		24 V (standard)	Included	10-pin DIP (standard)	Y1153A [2]	Y1174A (Y1158A)
84907K 84907L	70 dB max, 10 dB steps, 3 sections	DC – 26.5 GHz DC – 40 GHz						
84904M 84905M 84908M	11 dB max, 1 dB steps, 4 sections 60 dB max, 10 dB steps, 3 sections 65 dB max, 5 dB steps, 4 sections	DC – 50 GHz	5988-2475EN	024	Included	10-pin DIP (standard)	Y1153A [2]	Y1174A (Y1158A)
8494G 8494H	11 dB max, 1 dB steps, 4 sections	DC – 4 GHz DC – 18 GHz						
8495G 8495H	70 dB max, 10 dB steps, 3 sections	DC – 4 GHz DC – 18 GHz						
8496G 8496H	110 dB max, 10 dB steps, 4 sections	DC – 4 GHz DC – 18 GHz	[4]	24 V (standard)	Included	12-pin Viking (standard)	Y1153A [2]	Y1175A
8495K	70 dB max, 10 dB steps, 4 sections	DC – 26.5 GHz						
8497K	90 dB max, 10 dB steps, 4 sections	DC – 26.5 GHz						

1. Product and technical overviews for the switches and attenuators listed can be obtained by document number from the Keysight RF & Microwave Test Accessories web site. Go to **http://www.keysight.com/find/accessories**, select '*RF & Microwave Test Accessories*,' and search for the document number. Additional information can also be found in the '*RF and Microwave Test Accessories Catalog*' accessible from this site. If viewing this document on-line, click on the reference document link.
2. Starting in June 2010, the current interrupt function (formerly Option 403) is a standard feature for these switches. The serial number information below shows which switch units have the current interrupt function included as standard.

   N1810UL:
   Serial numbers MY07244672 and later
   N1810TL:
   Serial numbers MY07247927 and later
   N1811TL:
   Serial numbers MY07244660 and later
   N1812UL:
   Serial numbers MY07240668 and later
3. Bracket kits apply to the L4490A and L4491A. These kits include pre-assembled control cables and hardware for mounting switches/attenuators to the brackets and the bracket assemblies to the L4490A and L4491A RF Switch Platforms. Each bracket kit supports multiple switches (Table 2). The Cable-only kits are primarily used with the 34945A and L4445A, but can also be used with the L4490A and L4491A. These cables must be assembled and each kit contains material to build multiple cables (Table 2).
4. Information on these attenuators plus additional information on other attenuators can be found in the latest version of the '*RF and Microwave Test Accessories Catalog*.'

Step 2

Distribution Boards, Bracket Kits, and Cable Kits

Switches and attenuators are connected to the Keysight 34945A and L4445A Microwave Switch/Attenuator Drivers and the L4490A/L4491A RF Switch Platform through distribution boards installed on the 34945EXT module (see System Interconnections Defined).

There are five distribution boards (Y1150A – Y1154A) designed to allow Keysight's most popular switches and attenuators to be driven directly. A sixth distribution board, the Y1155A, is designed to drive virtually any switch or attenuator by providing screw terminals to connect to relay coils and position indicators.

The distribution board required for each switch/attenuator model and the number of switches/attenuators supported per board (shown in brackets [ ]) are listed in Table 1.

The Y115x distribution boards are passive; they only provide socket headers or screw terminals that interface external devices to the 34945EXT. The distribution boards do provide access to position feedback signals that can be used to drive LED's to visually represent a signal path, for example.

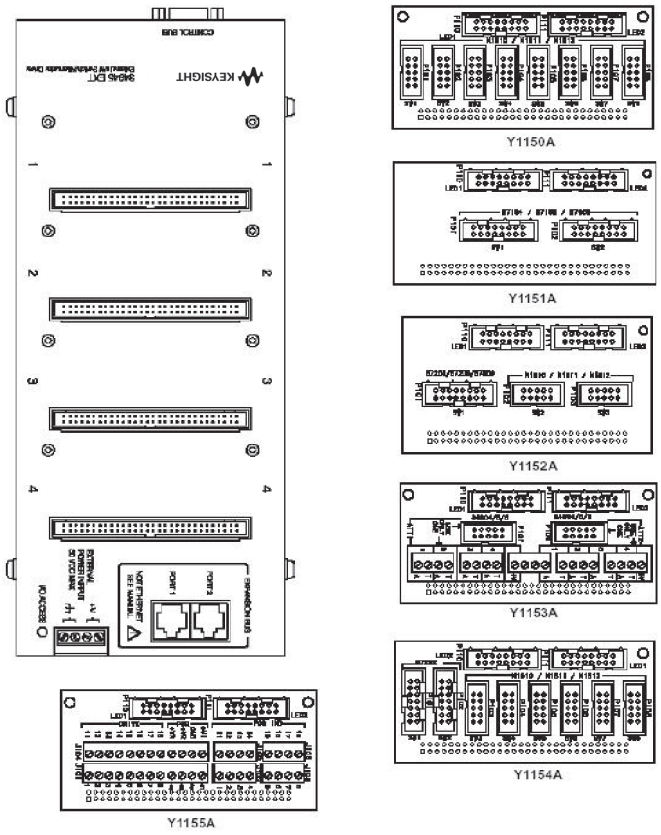


Figure 1. The Y1150A – Y1155A distribution boards

Bracket and Cable Kit Usage

There are six bracket kits and three cable kits available **separately** for switch/attenuator installation and control (Table 1). The number of switches/attenuators supported per kit is summarized in Table 2.

The bracket kits apply to the L4490A and L4491A Each bracket kit contains hardware for mounting the switch to the bracket and for mounting the bracket assembly in the chassis.

The cable-only kits are primarily used with the 34945A and L4445A, but can also be used with the L4490A and L4491A.

Table 2. Bracket and Cable Kit Usage

Kit number	Number of switches supported	Control cable included	Usage	Notes
L4490A/L4491A Bracket Kits				
Y1170A	5	Yes	L4491A	Five brackets per kit. Cable is pre-assembled.
Y1171A	5	Yes	L4490A	Five brackets per kit. Cable is pre-assembled.
Y1172A	5	Yes	L4490A L4491A	Five brackets per kit. Cable is pre-assembled.
Y1173A	6	Yes	L4490A L4491A	Three brackets per kit. Two switches per bracket. Cable is pre-assembled.
Y1174A	5	Yes	L4490A L4491A	Five brackets per kit. Cable is pre-assembled.
Y1175A	5	No	L4490A L4491A	Five brackets per kit. No cable provided.
34945A/L4445A Cable Kits				
Y1157A	4	–	34945A L4445A L4490A L4491A	Cable only – must be assembled. See Table 1 for applicable switches and attenuators.
Y1158A	2	–	34945A L4445A L4490A L4491A	Cable only – must be assembled. See Table 1 for applicable switches and attenuators.
Y1159A	2	–	34945A L4445A L4490A L4491A	Cable only – must be assembled. See Table 1 for applicable switches and attenuators.

RF cable and connector suppliers

There are several suppliers for RF cables and connectors for the switches/attenuators used within the L4490A and L4491A RF switch platforms. For convenience, three of these suppliers are listed below:

Pasternack Enterprises, Inc.
http://www.pasternack.com

Micro-Coax
http://www.micro-coax.com

S. M. Electronics L.L.C.
http://www.smelectronics.us

Step 3

Switch/attenuator driver instruments and platforms

For many applications, it is necessary to locate the switching device as close as possible to the DUT. Discrete switches and attenuators are used for this purpose. Optimum use of these devices requires switch/attenuator drivers that are specifically designed to provide the following features:

- Digital Outputs to drive relay coils in either pulsed or continuous drive mode,
- Digital Outputs that can drive switch position feedback LEDs,
- Digital Inputs to sense the position of the switches,
- Power distribution between the power supply, switches, and control logic,
- Report generation that indicates how often switches have been actuated.

These features are standard with the Keysight 34945A and L4445A Microwave Switch/Attenuator Drivers and the L4490A/L4491A RF Switch Platform

The 34945A and L4445A microwave switch/attenuator drivers

For test systems requiring additional functionality, consider the 34945A Microwave Switch/Attenuator Driver module. The 34945A is a one-slot, plug-in module used with the Keysight 34980A Multifunction Switch/Measure Unit. The 34980A offers a 6.5 digit DMM, and supports a host of switching and control modules. LAN, GPIB, and USB interfaces plus a full-feature front panel are standard with the 34980A.

For dedicated or stand-alone RF/Microwave switching applications, there is the L4445A Microwave Switch/Attenuator Driver instrument. The L4445A is a 1U, ½-rack LXI (LAN eXtensions for Instrumentation) version of the 34945A. LXI is an instrumentation standard for devices that use the Ethernet (LAN) as their primary communications interface. The 1U, ½-rack reference refers to the L4445A's physical size relative to standard EIA rack cabinet dimensions.

Understanding what is included when the 34945A or L4445A is ordered and those accessories which must be ordered separately, simplifies the configuration process.

The following items are included with the 34945A and L4445A at shipment:

Item	Description
5061-0701	LAN cross-over cable for direct PC to 34945A/L4445A connection.
8121-1289*	9-pin D-SUB extension cable for supplying +24 V to the 34945EXT module.
34945EXT	Extender module (one is automatically added to each 34945A and L4445A ordered.)
8121-1339	CAT-5E RJ45 cable (included with the 34945EXT for communication between extender modules).

Typical connections of these system components are shown in Figure 2.

The L4490A/L4491A RF switch platforms

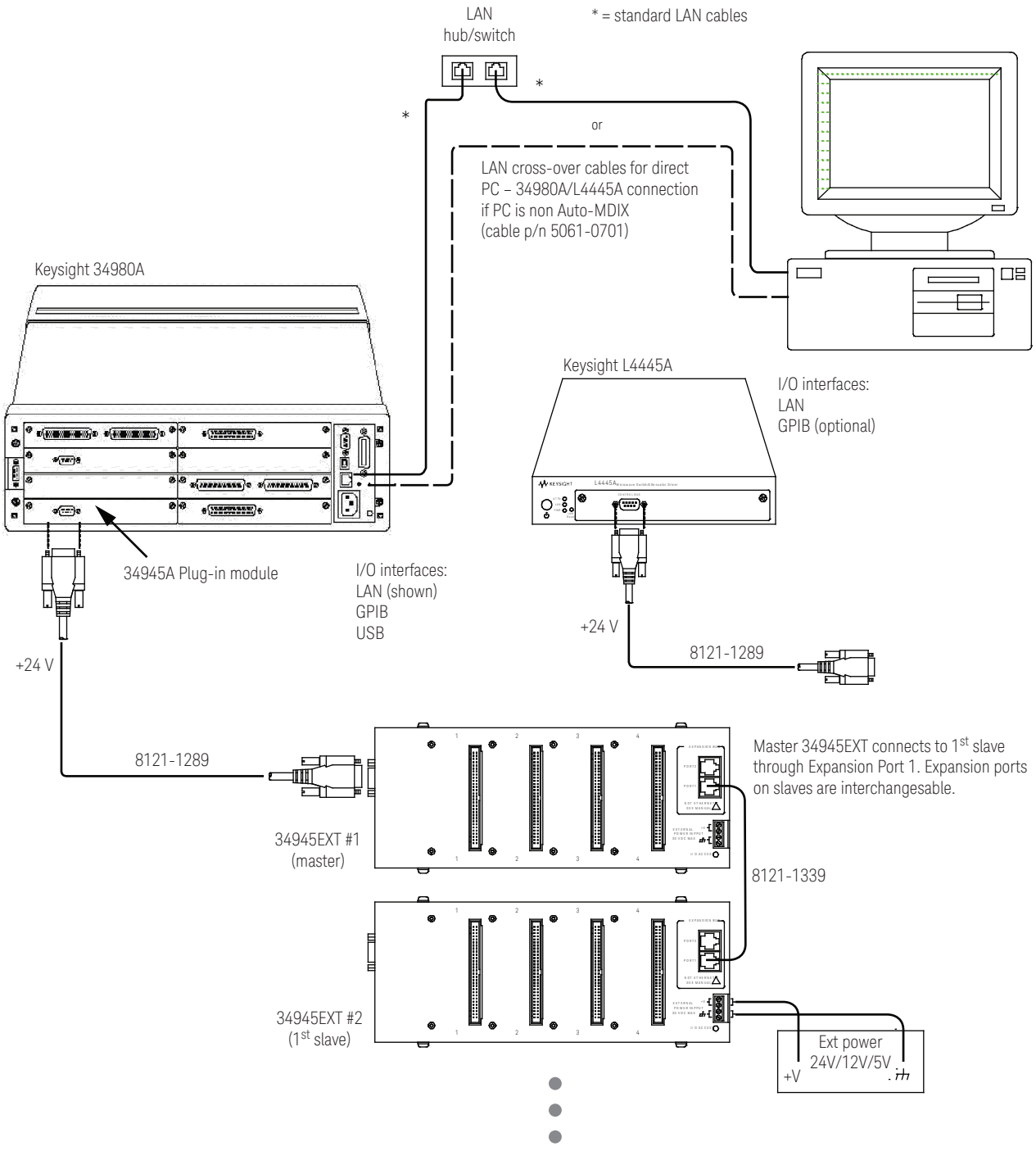
Also for dedicated or stand-alone RF/Microwave switching applications are the Keysight L4490A and L4491A RF Switch Platforms. The 2U L4490A and 4U L4491A allow the mounting of switches and attenuators within a chassis.

Included with the L4490A and L4491A at shipment are:

Item	Description
5061-0701	LAN cross-over cable for direct PC to L4490A/L4491A connection.
L4490-61603	9-pin D-SUB extension cable for supplying +24 V to the 34945EXT module.
34945EXT	Extender module (included in the L4490A and L4491A chassis).

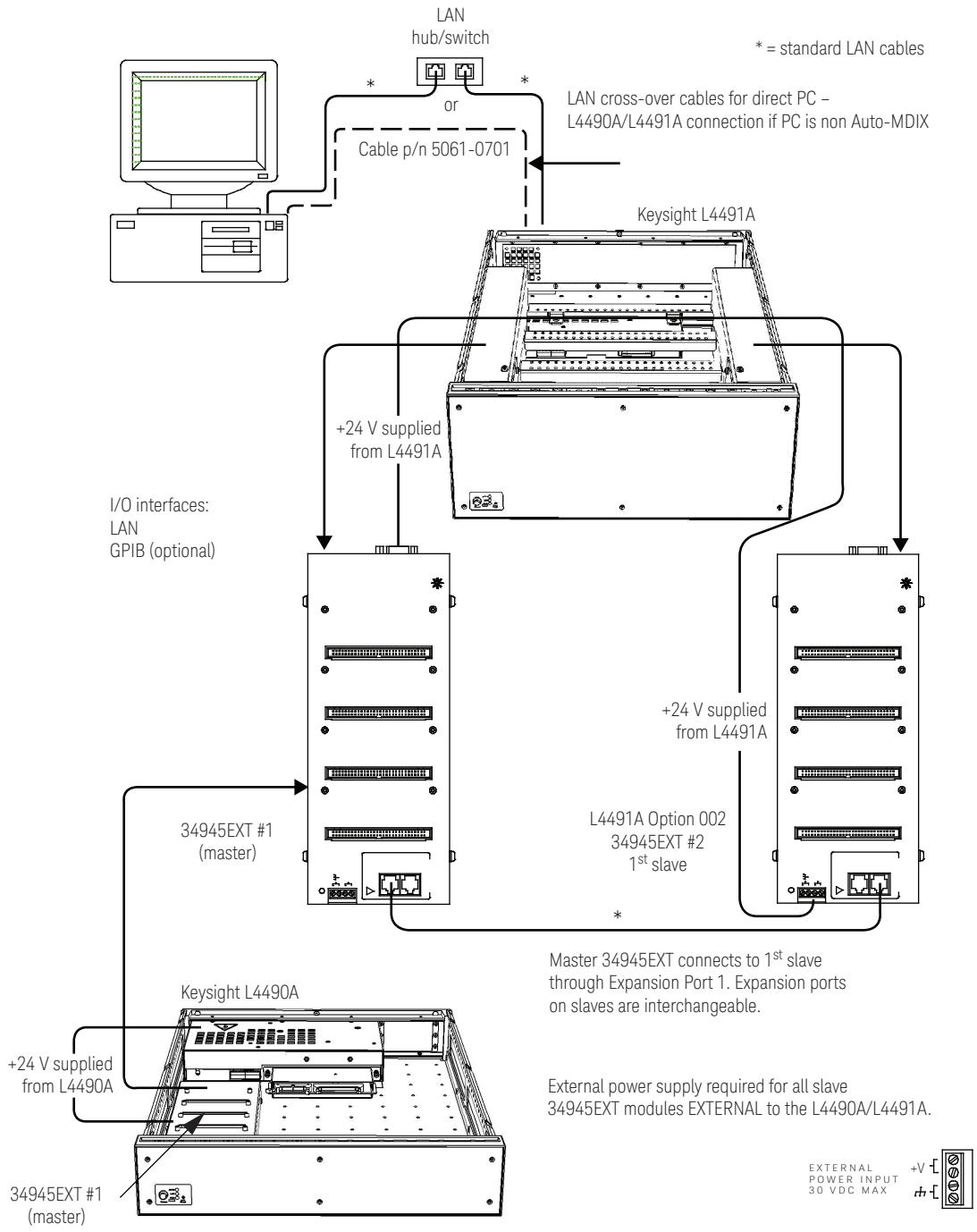
The internal configuration and typical system connections are shown in Figure 3.

*Not available from Keysight. Can be purchased locally or from the vendor L-COM (**http://www.l-com.com**) as part number CRMN9MF-10.



Up to eight 34945EXT modules including the master per 34945A or L4445A

Figure 2. 34945A and L4445A external connections



Up to seven slave 34945EXT modules per L4490A or L4491A

Figure 3. L4490A and L4491A internal configuration and typical connections

System Interconnections Defined

The following sections describe the interconnections and components of the 34945A, L4445A, and L4490A/L4491A as shown in Figures 2 and 3.

PC to 34945A, L4445A, or L4490A/L4491A

When connecting the PC directly to the 34980A (34945A), L4445A, or L4490A/L4491A, the LAN cross-over cable (p/n 5061-0701) provided with the instruments is used. If your PC supports Auto-MDIX or contains a LAN card with Gigabit data transfer rates, the cross-over cable is not required. A standard LAN cable may be used instead. For network configurations that include a LAN switch or router between the PC and the instruments, standard LAN cables are used.

Connections from the PC to the 34980A (34945A) are also available through the 34980A GPIB and USB ports. Connection via the optional GPIB interface is also available for the L4445A and L4490A/L4491A. However, access to the instrument Web interfaces is only available through the LAN connection (see the product user's guide).

34945A, L4445A, or L4490A/L4491A to 34945EXT

As described in Step 2, Microwave switches/attenuators are connected to the 34945A, L4445A, and L4490A/L4491A through distribution boards (Y1150A – Y1155A) installed on the 34945EXT module. The 34945EXT is divided into four banks (1–4) organized by channel number. Any distribution board may be installed in any bank, and multiple distribution boards of the same type may be installed on the same 34945EXT module.

Each 34945A or L4445A configuration must contain at least one 34945EXT module (a "master") with limits on the configuration as follows:

- Up to eight 34945EXT modules allowed per 34980A mainframe which can consist of eight 34945A modules each with one 34945EXT module, a single 34945A module with up to eight 34945EXT modules, or any combination in between,
- Up to eight 34945EXT modules allowed per L4445A.

The 34945A and L4445A are connected to the master 34945EXT using the 9-pin D-Sub extension cable (8121-1289) through which +24 V is also supplied.

A (master) 34945EXT module is built into the L4490A and L4491A chassis. Up to seven 34945EXT modules (in addition to the master) are allowed per L4490A and L4491A. A second 34945EXT module (the first slave) is available in the L4491A chassis as Option 002.

34945EXT to 34945EXT

Multiple (slave) 34945EXT modules are connected through the expansion bus ports using standard (i.e. non cross-over) LAN cables. A LAN cable (p/n 8121-1339) is included with each 34945EXT for this purpose. The master EXT module must be connected to the first slave module via the (master's) Expansion Bus Port 1, and either Port 1 or Port 2 of the slave EXT module. The expansion ports on the slave modules are interchangeable.

34945EXT to external power supplies

All slave 34945EXT modules and those external to the L4490A or L4491A chassis must use an external power supply or supplies. The 34945EXT can only support one external voltage level (+24 V, +12V, +5 V) at a time which applies to all distribution board banks on the 34945EXT. An external supply can also be used with the master 34945EXT.

Numbering schemes

The channel numbers associated with each bank on the 34945EXT are shown in the following chart. The channel syntax for the 34980A (34945A), L4445A, and L4490A/L4491A is also shown.

Bank	Channels (lower)	Channels (upper)
Bank 1	01 – 08	11 – 18
Bank 2	21 – 28	31 – 38
Bank 3	41 – 48	51 – 58
Bank 4	61 – 68	71 – 78

- 34945A
  <slot #> <ext #> <ch #>
  - slot #: 1-8 (34980A)
  - ext # : 1-8 (34945EXT)
  - ch #: see chart
- L4445A
  <1> <ext #> <ch #>
  - ext # : 1-8 (34945EXT)
  - ch #: see chart
- L4490A/L4491A
  <1> <ext #> <ch #>
  - ext # : 1-8 (34945EXT)
  - ch #: see chart

34945EXT modules are numbered according to their position in the daisy-chain sequence relative to the master 34945EXT which is ext # 1.

System diagnostics

Often the most common problems with switches/attenuators connected to the 34945EXT through distribution boards are related to the switch and attenuator cables. A seventh distribution board, the Y1156A Verification Board, is used to provide visual confirmation of the signal path from the PC to distribution board banks 1–4. Verifying the path from the PC to a selected bank helps isolate suspected problems in the entire path from PC to switch.

Many Keysight switches contain position indicator options that allow for electronic verification of the switch position. The 34945EXT contains circuitry to detect these signals, and the Y1156A diagnostic board can also be used to test the functioning of this circuitry.

L4490A and L4491A RF switch platform product options

There are five product options available for the L4491A and one option available for the L4490A. All options are factory installed and must be specified at the time of order. The product options include:

L4491A

- **Option 001:** multiport front panel. Front panel modification for mounting up to eight multiport switches. Includes mounting hardware. Switch cables must be ordered separately (Y1159A – Table 1).
- **Option 002:** Adds an additional 34945EXT module internal to the L4491A chassis (Figure 3).
- **Option 004:** Adds 16-bit digital IO and 28 bits of relay drive lines.
- **Option 005:** switch mounting – bays (default option)
- **Option 006:** switch mounting – bottom tray

L4490A

- **Option 004:** Adds 16-bit digital IO and 28 bits of relay drive lines.

L4490A/L4491A bracket layout guidelines

Switches installed in the L4490A platform or in the L4491A platform with Option 006 can be mounted in any orientation that optimizes or simplifies switch or attenuator wiring.

For the L4491A with default Option 005, switches and attenuators may be mounted in any of the "bays" and in any combination. Figure 5 shows the typical number of given brackets (Y1170A – Y1175A) that can be installed in a bay.

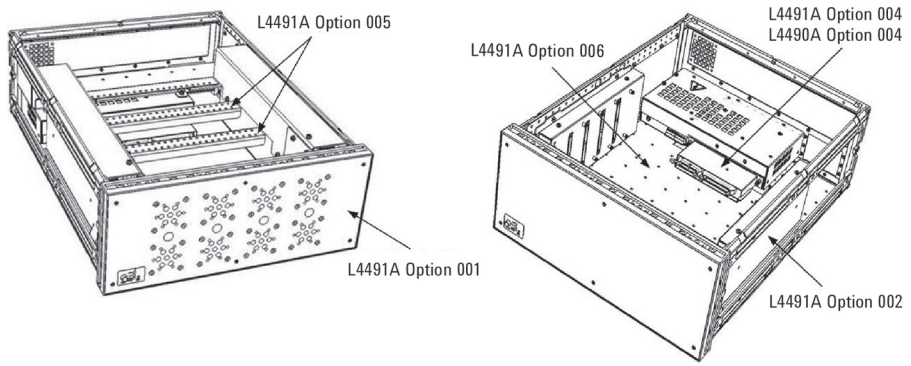


Figure 4. L4490A/L4491A product option locations

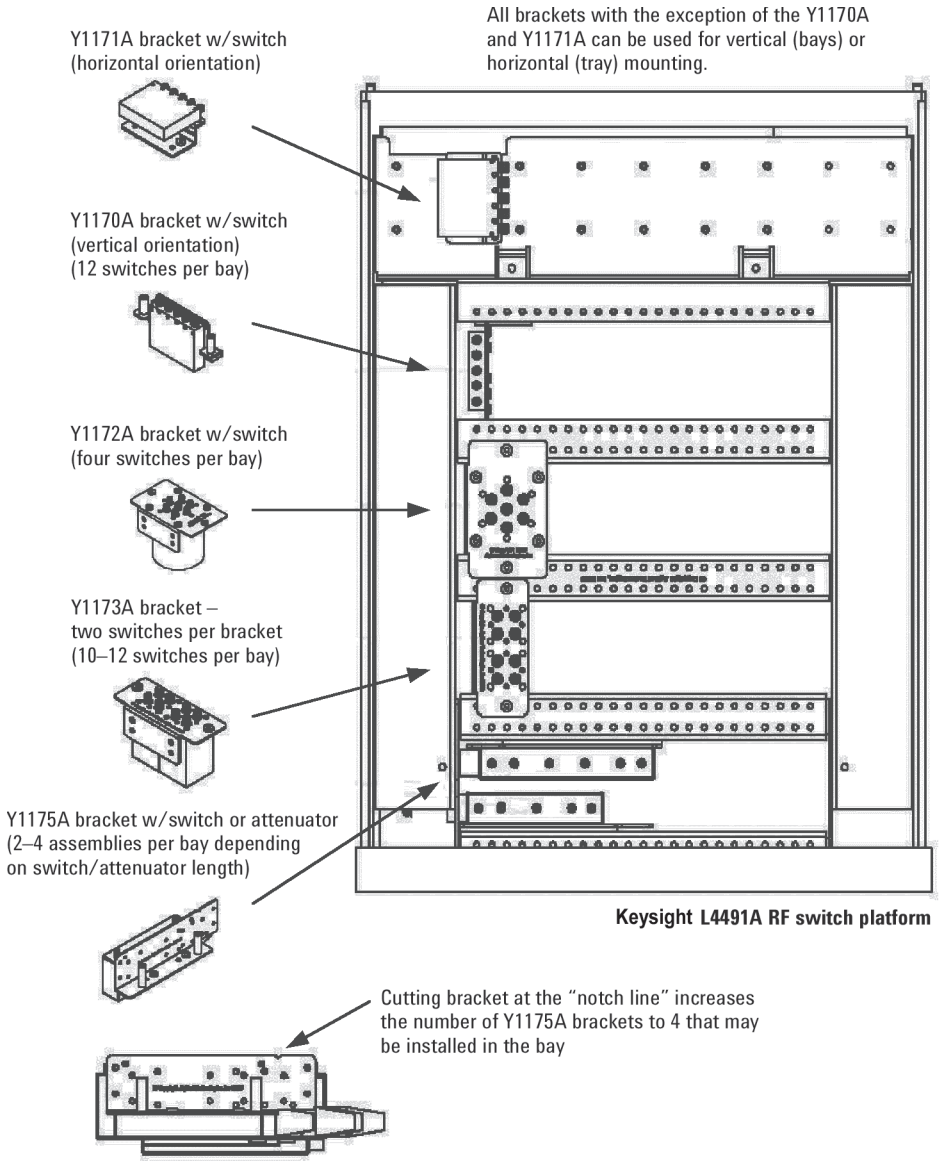


Figure 5. L4491A mounting brackets per bay

Internal/External Power Supply Considerations

As shown in Figures 2 and 3, the channel drive source for the master 34945EXT is provided through the internal +24 V power supply of the 34945A, L4445A, and L4490A/L4491A. If necessary, external supplies can be used. For either case, the supply must meet the quiescent (continuous) and switching current requirements of the switches in your application.

Internal supply

When using the internal +24 V supply of the 34945A or L4445A, the quiescent current draw must not exceed 100 mA, with a switching pulse current that does not exceed 200 mA. The duration of the switching pulse must be < 15 ms with a 25% duty cycle. The remainder of the duty cycle (75%) allows recovery time for the supply to provide the next pulse.

For the L4490A/L4491A, the quiescent and switching currents from the supply must not exceed the supply's specification of 600 mA continuous.

When current limits are exceeded, overcurrent conditions can occur which shuts down the internal supply. When this happens, you must remove the device/condition causing the overcurrent and reset or cycle power on the instrument.

The quiescent current requirement of the 34945EXTs themselves is accounted for by the internal supply rating and is not included in quiescent current and switching current calculations. Only the specified currents (quiescent, switching) of the switch must be considered.

As an example, the Keysight 87104/87106A, B, C coaxial switches specify the following:

Supply current (switching: pulse width = 15 ms:Vcc = 24 VDC): 200 mA Nom

Supply current (quiescent): 50 mA Max

Using the internal +24 V supply, the current required for actuating a 87104/87106 switch is:

[87104/87106 quiescent current] + [87104/87106 switching current]
[50 mA] + [200 mA]
= 250 mA (15 ms pulse, 50 mA quiescent)

The number of switches available and their varying power requirements often make it difficult to determine if the capacity of the 34945A, L4445A, or L4490A/L4491A internal +24 V supply will be exceeded. If overcurrent conditions occur repeatedly the use of an external power supply may be required. Refer to the product user manuals for more information.

External supply

Each 34945EXT module is limited to 2 A continuous current from an externally connected power supply (4.75 V to 30 V). The actual amount of power required by each EXT module depends on the types of switches used.

When using an external power supply with either the master 34945EXT module or slave 34945EXT modules (required), the supply must be able to provide the quiescent current requirement of the EXT modules, plus the quiescent and switching currents of the switches themselves.

The power requirement of the 34945EXT is 1.2 W. For supported external supply voltages of 24 V, 12 V, and 5 V, the current required for a single EXT module is as follows:

current = power / voltage
24 V: 1.2 W / 24 V = 50 mA
12 V: 1.2 W / 12 V = 100 mA
5 V: 1.2 W / 5 V = 240 mA

If multiple 34945EXT modules are driven by a single external supply, the power required from the supply increases by 1.2 W for each EXT module present. Thus, if two EXT modules are driven by a single supply, the power value in the equations becomes 2.4 W – doubling the current requirement.

Remember that the external supply must also meet the quiescent and switching current requirements of the switch. Using the Keysight 87104/87106A, B, C coaxial switches from the internal supply example, the switch specifications again are:

Supply current (switching: pulse width =15 ms:Vcc = 24 VDC): 200 mA Nom
Supply current (quiescent): 50 mA Max

The quiescent current required for the 34945EXT module is:

[34945EXT quiescent current from 24 V]
[24 V: 1.2 W / 24 V = 50 mA]

Therefore, the current required from an external supply for actuating a single 87104/87106 switch on a single 34945EXT module is:

[34945EXT quiescent current from 24 V] + [switch quiescent current] + [switching current]
[24 V: 1.2 W / 24 V = 50 mA] + [50 mA] + [200 mA]
= 300 mA (15 ms pulse, 100 mA quiescent)

In summary, when using an external supply, the current calculations must include the quiescent current requirement of the 34945EXT and the quiescent current requirement of each switch. These quantities are then added to the switching (pulse) current requirement of the device.

Related Keysight Literature

Data sheets

Keysight 34980A Multifunction Switch/ Measure Unit
5989-1437EN
http://cp.literature.keysight.com/litweb/pdf/5989-1437EN.pdf

Keysight L4445A Microwave/Attenuator Switch Driver
5989-4828EN
http://cp.literature.keysight.com/litweb/pdf/5989-4828EN.pdf

Keysight L4490A/L4491A RF Switch Platform
5989-7857EN
http://cp.literature.Keysight.com/ litweb/pdf/5989-7857EN.pdf

Application notes

Test System Signal Switching
5988-8627EN
http://cp.literature.keysight.com/litweb/pdf/5988-8627EN.pdf

Benefits of a Switch/Measure Unit for Data Acquisition and Electronic Functional Test
5989-1481EN
http://cp.literature.keysight.com/litweb/pdf/5989-1481EN.pdf

34980A Multifunction Switch/Measure-System Modules Applications that benefit from specific module features/functions
5989-2371EN
http://cp.literature.Keysight.com/ litweb/pdf/5989-2371EN.pdf

For additional information please visit:

http://www.keysight.com/find/34980A

http://www.keysight.com/find/L4445A

http://www.keysight.com/find/L449xA

http://www.keysight.com/find/L4490A

http://www.keysight.com/find/L4491A

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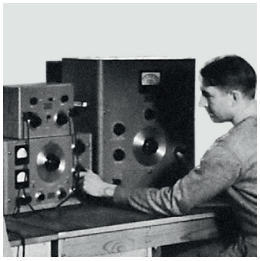

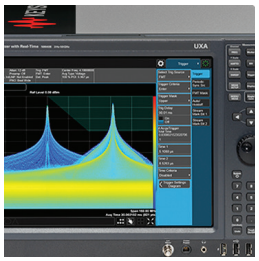

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