# L4445A Microwave Switch/ Attenuator Driver

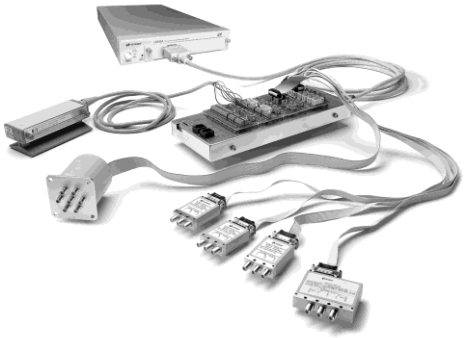
## Microwave switch/attenuator driver offers support of most common microwave switches with distribution boards for easy configuration.

The Keysight Technologies, Inc. L4445A is a LXI Class C compliant instrument that controls external switches and attenuators. With its small size and Ethernet connectivity, the switch/attenuator driver can be placed wherever your application needs it.

The Keysight L4445A provides digital outputs to control switches, attenuators, and other devices that are typically used to route signals in a high frequency system. Many of the most popular microwave switches and attenuators are supported through the distribution boards. The distribution boards enable fast and easy connection to the microwave devices.

Using this LXI instrument, you'll get all the benefits of an Ethernet connection, instrument Web server, standard software drivers and more. The LXI standard is supported by multiple vendors, enabling lower cost of test with accelerated test integration and development.

- LXI compliance includes built-in Ethernet connectivity
- Fully-featured graphical Web interface
- Control of most popular microwave switches and attenuators
- Expandable with 34945EXT
- Distribution boards allow for easy wiring
- Switch read-back capabilities
- External power option for simultaneous switching
- Software drivers for most common programming environments



Note: Keysight will discontinue the L4445A Microwave Switch / Attenuator Driver on June 1st, 2023. The last day to place an order for this product is May 31st, 2023. The closest replacement product for L4445A is a combination of 34980A Multifunction Switch / Measure Unit with 34945A Switch/Attenuator Driver. The programming command of L4445A is compatible with 34945A. Keysight will continue to support these products for the standard period of 5 years.

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## Features

- LXI compliant includes built in Ethernet connectivity
- Control of most popular microwave switches and attenuators
- Expandable with 34945XT
- Distribution boards allow for easy wiring
- Switch read-back capabilities

# Microwave switch driver for easy routing of high frequency signals in your system

The L4445A allows you to control switches, attenuators and other devices close to your device under test. The L4445A combined with the 34945EXT provides the power and control signals to drive up to 64 switch coils—that's 32 standard SPDT switches.

The L4445A can be extended by adding additional 34945EXT extenders. The first 34945EXT is powered by the L4445A. You can add up to seven additional 34945EXT extenders with user supplied power. Multiple switch operations are performed in sequential order, or for faster, simultaneous switching, you can connect an external power supply to the 34945EXT.

The digital outputs can also be used to drive LEDs for indication of the switch position. The L4445A/ 34945EXT also has digital inputs so that you can read back the actual position of the switch or attenuator.

The L4445A comes with a standard 9-pin connector for simple connection to the 34945EXT. The Y1150A-Y1155A distribution boards plug onto the 34945EXT and are used to route the power and control signals from the driver to the switches using user supplied cables. This enables simple connections to the external switches without a lot of complicated wiring.

The following microwave switches and attenuators are supported with the Y1150A-Y1155A distribution boards:

- N181x/U9397x series SPDT switches
- 8762/3/4 series SPDT switches (screw terminals)
- 8765x coaxial switches
- 8766x/8767x/8768x multiport switches
- 87104x/106x/L710xx/L720xx multiport switches
- 87406x series matrix switches
- 87204x/206x series multiport switches
- 87606x series matrix switches
- 87222x/L7222 transfer switches
- 849x series attenuators
- 8490x series attenuators
- Screw terminal connections

# Ethernet connectivity enables simple connection to the network and remote access to measurements

The Ethernet interface offers high-speed connections that allow for remote access and control. You can set up a private network to filter out unwanted LAN traffic and speed up the I/O throughput or take advantage of the remote capabilities and distribute your tests worldwide. Monitor, troubleshoot, or debug your application remotely. Ethernet communication also can be used with the support of LAN sockets connections.

The optional GPIB interface has many years of proven reliability and can be used for easy integration into existing applications.

The L4445A ships with the Keysight E2094 I/O Libraries Suite making it easy for you to configure and integrate instruments into your system — even if your system includes instruments from multiple vendors.

# Fully-featured graphical Web interface makes it easy to set-up and troubleshoot your tests from anywhere in the world

The built-in Web browser interface provides remote access and control of the instrument via a Java-enabled browser such as Internet Explorer. Using the Web interface, you can set up, trouble- shoot, and maintain your instrument from remote locations.

- View and modify instrument setup
- Configure switch channels and switch pairs
- Open or close switches
- Send, receive and view SCPI commands
- Define and execute switch sequences
- View error queue
- Get status reports on relay
- Cycle counts, firmware revisions, and more

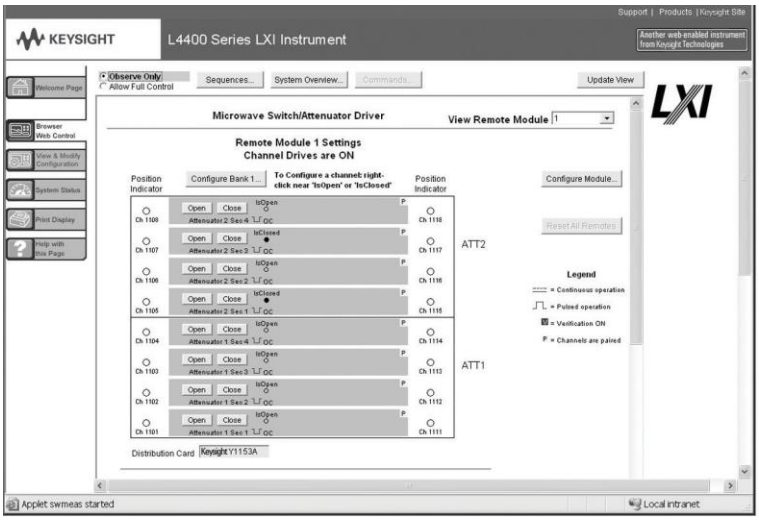


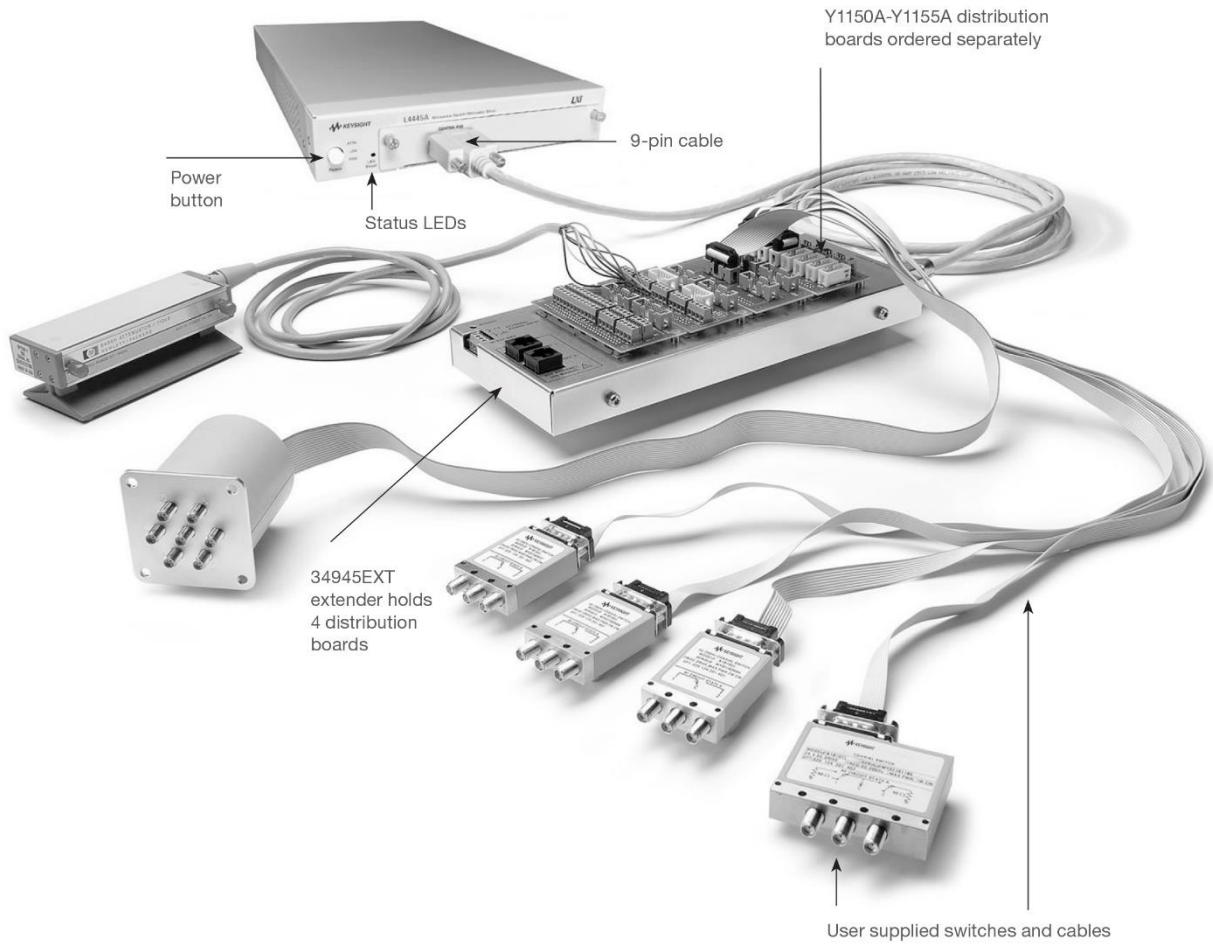

**Figure 1.** The Web interface makes it easy to set up, troubleshoot and maintain your test remotely

Additionally, since the Web server is built into the instrument, you can access it on any operating system that supports the Web browser without having to install any special software. Password protection and LAN lockout are also provided to limit access for additional security.

LabVIEW software drivers that provide compatibility with the most popular development environments:

- Keysight T&M Toolkit for Microsoft Visual Studio.NET and Keysight VEE Pro
- National Instruments LabVIEW, LabWindows/CVI, TestStand, and Switch Manager
- Microsoft C/C++ and Visual Basic

# High-performance switching wherever your application needs it



# Product Specifications

**Specifications and Characteristics**

| | | | |
|---|---|---|---|
| **34945EXT switch drive** | | | |
| | 64 channels, low side drive mode | Driver off voltage (max)<br>Driver off leakage current<br>Driver on current (max)<br>Driver on voltage (max) | 30 V<br>500 uA<br>600 mA<br>0.5 V @ 600 mA |
| | 64 channels, TTL drive mode | Hi output voltage<br>Lo output voltage<br>Lo input current | 3 V @ Iout = 2 mA<br>0.4 V @ Iin = 20 mA<br>20 mA |
| **34945EXT position indicator sense inputs** | | | |
| | | Channels<br>Lo input voltage (max)<br>Hi input voltage (min)<br>Input resistance<br><br>Maximum input voltage | 64<br>0.8 V<br>2.5 V<br>>100 kΩ @ Vin ≤ 5 V<br>>20 kΩ @ Vin > 5 V<br>30 V |
| **34945EXT switch drive power supply (34945EXT powered by 34945A)** | | | |
| | | Voltage required for switches | 24 V nominal<br>(external power supply needing different voltages) |
| | | Current | 100 mA continuous + 200 mA<br>(15 ms pulse, 25% duty cycle) |
| **34945EXT external power connection** | | | |
| | | Voltage range | 4.75 V to 30 V |
| | | Current limit | 2A |
| **LED indicator (Current mode divers)** | | | |
| | | Channels<br>Supply voltage<br>LED drive current<br>Driver compliance voltage | 64<br>5V nominal<br>5 mA nominal (prog 1-20mA)<br>0.8V |
| **Maximum 8 34945Ext's per L4445A** | | | |
| **Memory** | | | |
| | | States | 5 instrument states with user label in non-volatile memory |

| **General System Specifications** | |
|---|---|
| Power supply | Universal 100 V to 240 V |
| Power line frequency | 50 Hz to 60 Hz automatically sensed |
| Power consumption | 50 VA |
| Operating environment<br>(Indoor use only) | Full accuracy for 0°C to 55 °C<br>Maximum Relative Humidity (non-condensing)[1]: 80%RH up to 40°C, decreases linearly to 37%RH at 55°C.<br>Altitude up to 2,000 meters<br>Installation CAT II, Pollution Degree 1 and 2 |
| Storage environment | -40 °C to 70 °C |
| L4445A Dimensions (H x W x L) | 40.9 x 212.3 x 379.3 mm<br>1.61 x 8.36 x 14.93 in |

| | |
|---|---|
| 34945EXT dimensions (H x W x L) | 38.1 x 114.3 x 284.5 mm<br>1.5 x 4.5 x 11.2 in<br>with distribution boards installed |
| Weight | 3.6 kg, 8.0 lbs |
| Safety and EMC | Refer to Declaration of Conformity for the latest revisions of regulatory compliance at: www.keysight.com/go/conformity |
| **Software** | |
| Keysight connectivity | Keysight I/O Libraries Suite 14 or greater (E2094N) software included |
| **Computer interfaces** | |
| | Standard LAN 10BaseT/100BaseTx |
| | Optional IEEE 488.2 GPIB |
| **Software driver support for programming languages** | |
| Software drivers | IVI-C and IVI-COM for Windows NT/2000/XP |
| | LabVIEW |
| **Compatible with programming tools and environments** | |
| Keysight | VEE Pro |
| | T&M Toolkit<br>(reqs Visual Studio.NET) |
| National Instruments | TestStand |
| | Measurement Studio |
| | LabWindows/CVI |
| | LabVIEW |
| | Switch Executive |
| Microsoft | Visual Studio.NET |
| | C/C++ |
| | Visual Basic 6 |

1. From 40°C to 55°C, the maximum % Relative Humidity follows the line of constant dew point.

# Ordering Information

## Example configuration:

A test system is being built that requires the following Microwave Switching:

- (qty 2) Keysight 87206B SP6T Switches
- (qty 8) Keysight N1810UL SPDT Switches

Select the quantity of distribution boards for the required switches using the ordering info below:

- Qty 2 Y1152A Distribution boards to control qty 2 87206B switches
- Qty 1 Y1150A Distribution board to control qty 8 N1810UL switches.

Notice that each Y1152A can also drive two N181x switches. Therefore, if you only needed to drive 4 N1810 switches, then you could have controlled those switches via the Y1152A distribution boards already selected.

Here is the final recommended configuration:

- (qty 2) 87206B DC-20 GHz SP6T Switches
- (qty 8) N1810UL DC-20 GHz SPDT Switches
- (qty 1) L4445A Switch/Attenuator Driver (when ordering the L4445A, the 34945EXT is automatically added for controlling switches)
- (qty 2) Y1152A Distribution Boards
- (qty1) Y1150A Distribution Board
- Either build own cables using off-the-shelf parts, or order qty 1 Y1159A 16-to-16 pin connect kit (supplies for 2 cables) and qty 2 Y1157A 9-to-10 pin cable kit (supplies for 4 cables)

We recommend that the switch be ordered with options for 24 V coils, position indicators, and socket connectors. Since 24 V latching relays are specified, there is no need for an external power supply. The L4445A instrument can provide power for a single 34945EXT. Easy-to-build ribbon cables can be built to interface each of the switches to the Y1150A and Y1152A distribution boards.

See the Application note: Configuring an RF/ Microwave Switch System (5989-2272EN) for additional configuration details.

| Product model | Description |
|---|---|
| L4445A | Microwave Switch/ Attenuator driver |
| Option - GPIB | Adds GPIB interface |
| L4445A Accessories | Distribution boards are required for control of external switches. One 34945EXT external driver required for each 64 coils – holds 4 distribution boards per 34945EXT extender |
| Y1150A | 34945EXT distribution board for 8 N181x SPDT switches |
| Y1151A | 34945EXT distribution board for two 87104x/106x multiport or 87406B matrix switches |
| Y1152A | 34945EXT distribution board for one 87204x/206x or 87606B switch and two N181x switches |
| Y1153A | 34945EXT distribution board for two 84904/5/6/7/8 or 8494/5/6 step attenuators |
| Y1154A | 34945EXT distribution board for two 87222 transfer switches and six N181x SPDT switches |
| Y1155A | 34945A distribution board w/ generic screw terminals for driving 16 switch coils |
| Y1157A | 9-to-10 pin cable kit for Y1150A, Y1152A, Y1154A - supplies to build 4 cables |
| Y1158A | 10-to-10/10-to-14 pin cable kit for Y1153A, Y1154A - supplies to build 2 cables |
| Y1159A | 16-to-16 pin cable kit for 1150A/51A/52A/53A/54A/55A - supplies to build 2 cables |

# Other Accessories

| Options | Description |
|---|---|
| Y1160A | Rack mount kit for L4400 series instruments racks 2 instruments side-by-side on sliding tray |