Keysight Technologies
Compatibility and Differences: 34461A and 34401A Digital Multimeters

Migration Guide

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Unlocking Measurement Insights

Introduction

The 34401A digital multimeter (DMM) is the industry standard. Its accuracy, ease of use, and flexibility have attracted users for more than two decades and its low cost of ownership and high quality have helped it to be one of the most successful products in the history of Keysight Technologies, Inc. Many engineers do not even evaluate other DMMs when they want to order one; they know the 34401A will work for them. It is an essential meter for bench and automated test applications.

The 34461A DMM is the next-generation 34401A. This new DMM was designed by the same group as the 34401A, with many of the same R&D engineers participating. With this continuity of experience and expertise, Keysight has made a DMM that is a virtual drop-in replacement for the 34401A and offers improved usability and measurement technology. The True*volt* Series DMM's graphic capabilities such as trend and histogram charts offer more insights quickly.

Compatibility

There are many factors to keep in mind when you want to replace reliable instruments such as the 34401A. Here are just some of the areas where the 34461A is equivalent to the 34401A.

– Functions and ranges: The 34461A is a superset of the 34401A capability.
  Differences are listed below.
– Measurement accuracy and resolution: The 34461A's specifications and typical characteristics are as accurate or better than those of the 34401A. See Table 1. All specifications are ISO17025 compliant.
– SCPI compatibility: We have taken extra care to ensure that the 34461A will work with SCPI programs that were written for the Keysight 34401A. Programming considerations and differences are listed below.
– Mechanical size: Height and width dimensions are the same.
– Accessories: Rack mount kits and probe accessories are compatible with both products.
– Manufacturing: Both DMMs are produced to the same rigorous quality standards and manufacturing process controls.
– Service and support from Keysight: Our international team is available to help you calibrate your DMM or answer any questions about either instrument.
– Warranty: Both the 34401A and 34461A offer the same outstanding 3-year standard warranty.

Table 1. Key features and model comparison

	34461A	34401A
Resolution	6½ digits	6½ digits
Input terminals	Front and rear	Front and rear
1-year DCV accuracy ± (% of reading + % of range)	0.0035 + 0.0005	0.0035 + 0.0005
Measurement speed @ 4½ digits	1000 readings/s	1000 readings/s
Measurements		
DCV, ACV, Resistance, Frequency, Period, Continuity	Same	
Diode	5 V	1 V
AC and DC current	100 µA – 10 A	10 mA – 3 A
Temperature	RTD/ PT100, thermistor	N/A
Reading memory	10,000 readings	512 readings
Display	Number, histogram, bar meter, trend chart	Number
Connectivity	USB, LAN Optional: GPIB	GPIB, RS-232

Measurement Tip

Use SCPI compatibility mode
By default, the 34461A *IDN? query returns:
Keysight Technologies,3446xA,
‹Serial Number›,ff.ff-pp.pp-mm.mm-gg.gg-bb-pp

For compatibility purposes, use SYSTem:IDENtify HP34401A to return:
HEWLETT-PACKARD,34401A,‹Serial Number›,ff.ff-pp.pp-mm.mm-gg.gg-bb-pp

You can also configure this from the front panel:
[Utility] > System Setup > User Settings > SCPI ID

Differences

The few differences between the 34461A and 34401A that might affect migration are listed below. Many of these differences improve the performance of the 34461A relative to the 34401A.

Physical differences

– The 34461A is not as long as the 34401A, and the connectors are in different positions.
– The 34461A does not support RS-232, and GPIB is optional on the 34461A.
– The 34461A does not support hardware limit test outputs.

Key measurement differences

- The 34461A and 34401A use different calibration procedures, with different default passwords.

- Some specifications vary between the 34461A and the 34401A. In general, the 34461A specifications equal or exceed those of the 34401A. One exception: the 34401A's 3-A range is slightly better than the 34461A. For best current measurement results above 1 A, use the 34461A's 10-A input terminal.

- The 34461A has additional current ranges: 100 µA, 1 mA, and 10 A. Therefore, the MIN and MAX parameters produce different results. In addition, autorange on the 34461A may use different ranges than on the 34401A, and autoranging may take longer.

- Burden voltage is generally lower on the 34461A than the 34401A.

- 34461A uses a digital AC measurement technique. This produces better linearity and a sharper bandwidth roll off for AC measurements.

Key programming differences

- The 34461A does not support the older 3478A or Fluke 8840A programming languages.

- The INIT command on the 34401A is non-overlapped, except when bus triggering (*TRG) is selected. This means that CONF:VOLT:DC;:INIT;:CONF:CURR:DC;:INIT makes two measurements. The INIT command on the 34461A is overlapped, and the above sequence generates an error message.

- By default, the 34461A *IDN? query returns:

- Keysight Technologies,3446xA,<Serial Number>,ff.ff-pp.pp-mm.mm-gg.gg-bb-pp

- The 34461A parses and executes commands faster than the 34401A. The 34461A also supports overlapped command processing between INIT and measurement completion. Proper synchronization with *WAI and *OPC? minimizes the impact. Existing systems that depend (intentionally or unintentionally) on 34401A command execution speed for timing may experience subtle timing issues.

- The 34461A requires less settling time than the 34401A, yielding shorter default trigger delays. Therefore, if you use default trigger delays, these delays may start a measurement before your DUT has settled, which means that a signal that was fully settled when measured on the 34401A will still be settling on the 34461A.

- The 34461A and the 34401A may generate different error messages. This is usually not a problem, because existing programs normally do not generate SCPI errors.

- The 34461A can store up to 10,000 readings, which is more than the 512 that the 34401A allows. This is unlikely to affect existing programs.

- The 34461A defines bits in the questionable data and status byte registers that were unused by the 34401A. Programs that properly mask unused bits will minimize issues associated with querying these registers.

- Under certain conditions, the 34461A may return and display negative resistance values. For details, see [Help] > Negative Resistance Values from the front panel.

- The 34461A always puts readings into memory. When the READ? query finishes, a subsequent FETCh? returns those same readings. In a similar situation, the 34401A shows memory as empty. Also, if the computer is not taking readings fast enough, the 34401A slows down to avoid losing readings. The 34461A does not allow the computer to pace its reading rate.

- To support testing a wider range of diodes, the compliance voltage has been increased from 1.2 V to 5.05 V. The range for the 34461A is fixed at 10 V, as opposed to 1 V on the 34401A. The current source remains fixed at 1 mA.

- The dBm reference on the 34461A is a volatile value. It was non-volatile on the 34401A.

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34461A True*volt* Digital Multimeters

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- – Patented analog-to-digital converter enables metrology grade architecture
- – Measure your real-world signals, not instrument error: minimized measurement error, digital AC measurements and expanded measurement functionality
- – All specifications tested, compliant and guaranteed according to ISO/IEC 17025

Everything you depend on with the 34401A and more
- – Industry's only 100% drop-in, SCPI compatible replacement for the 34401A DMM
- – Designed by the same team of engineers as the 34401A
- – 3-year standard warranty

Conclusion

The 34461A DMM is the next generation 34401A. When you migrate from the 33401A to the 33461A DMM, you do not need to rewrite your programs or spend hours learning a brand-new, complicated interface.

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