

# Keysight Technologies

## Making Time Domain Measurement with Continuous Source Using SMU

B2900A Precision Source/Measure Unit

Demo Guide



## Introduction

The Keysight B2900A Series Precision Source/Measure Unit (SMU) is a compact and cost-effective bench-top SMU with the capability to output and measure both voltage and current. The B2900A Series SMU enables you to make a wide range of current versus voltage (IV) measurements more accurately and quickly than ever before. In addition, the B2900A Series SMU comes with an intuitive graphical user interface (GUI) and free PC-based application software that make it easy for you to begin making productive measurements immediately.

This demonstration guide shows how easily you can make a time domain measurement with sourcing continuous current or voltage using the B2900A Series SMU.

### Required Instrument and Accessories

All of the accessories required to perform the demos described in this demonstration guide are provided in a demo kit that is included with Keysight B2902A/12A demo units. The kit includes items such as a Kelvin Probe Set, an LED.



Keysight B2902A/12A  
Precision Source/Measure Unit



LED



11059A Kelvin Probe Set

## Concept

Figure 1 illustrates the connection diagram used in the demo to make a time domain measurement of voltage with sourcing current to an LED using the B2900A Series SMU.

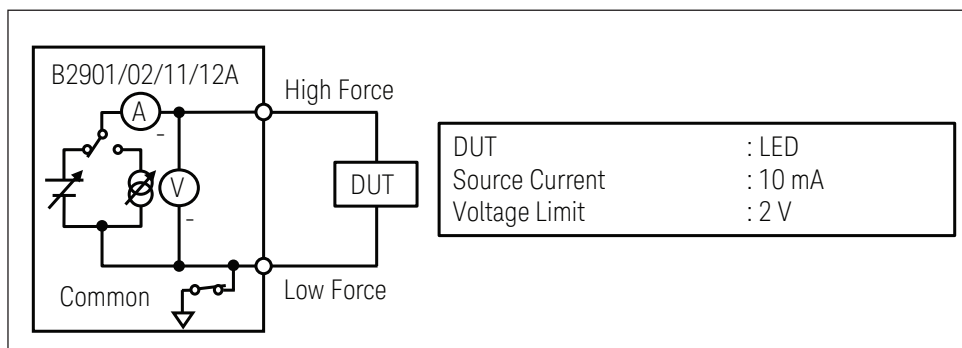


Figure 1. Connection diagram

Figure 2 shows the timing chart for the time domain measurement with continuous source with the front panel operation. In this case, the specified source value is sourced immediately after turning on the channel by pressing **On/Off**. Then, when you press **Trigger**, the instrument will make a time domain measurement. Sweep parameters will be used in the example in order to source the continuous current. Besides, if it is necessary, you can specify any measurement trigger delay time which is the wait time after each internal trigger and before making a measurement. The measurement time consists of Measurement Speed and some overhead time. Measurement Speed is the parameter specified by the user. Overhead time includes the time to change the measurement range, etc.

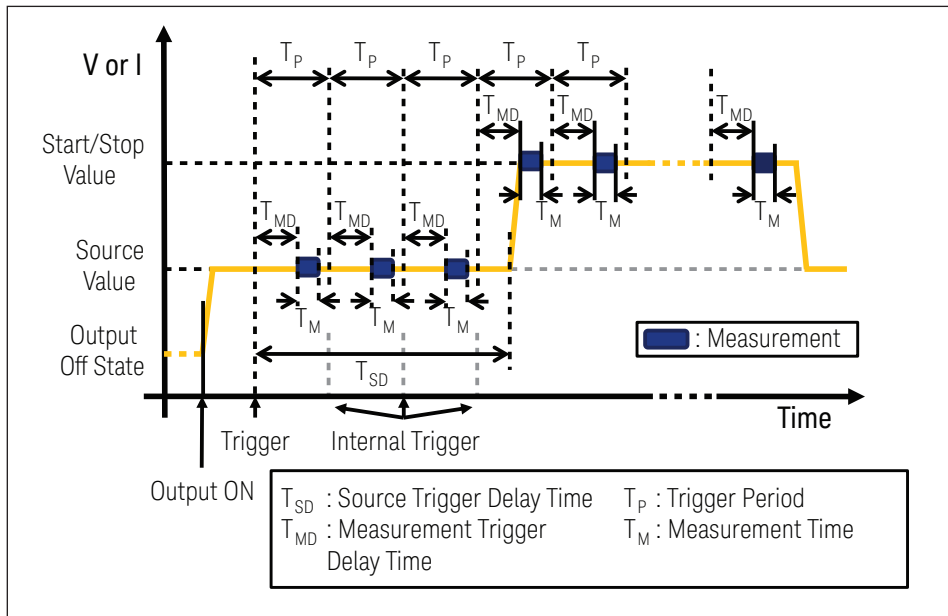
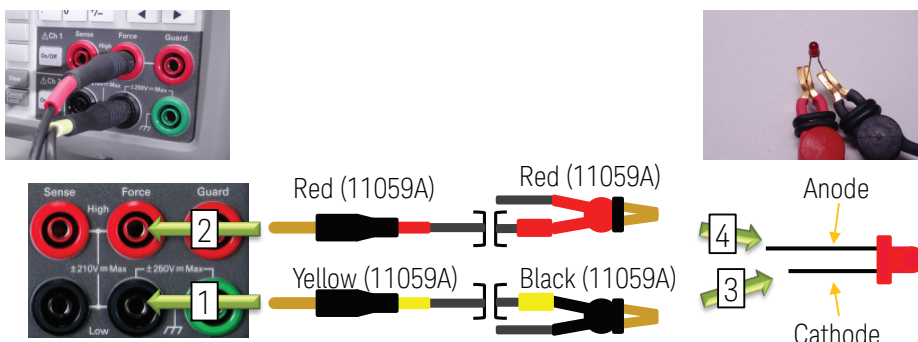


Figure 2. Timing chart for the time domain measurement with continuous source

## Setup

1. Connect the **yellow banana plug** to the **Ch 1 Low Force Terminal**.
2. Connect the **red banana plug** to the **Ch1 High Force Terminal**.
3. Clip the **LED cathode terminal** with the **black gold-plated tweezers**.
4. Clip the **LED anode terminal** with the **red gold-plated tweezers**.



# LAB: Make Time Domain Measurement with Continuous Source Using SMU

## Demonstration

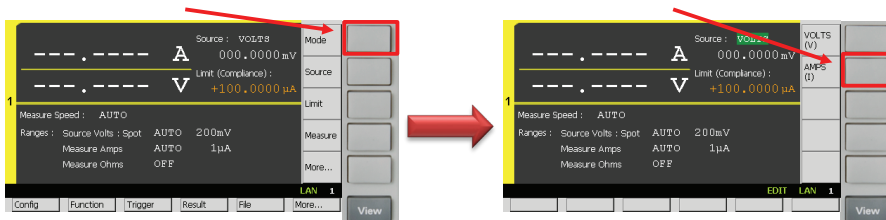
### 1. Change View mode to Channel 1 Single View

1) Press **View** repeatedly until the Channel 1 **Single View** is displayed.

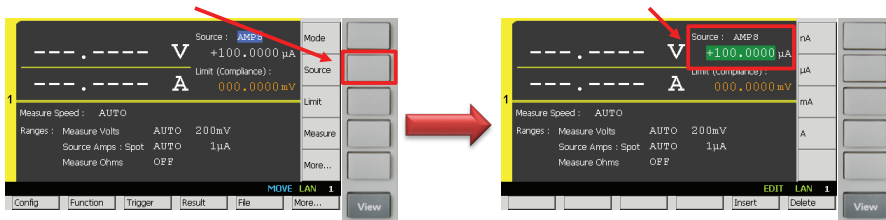


### 2. Configure the condition for Time Domain Measurement

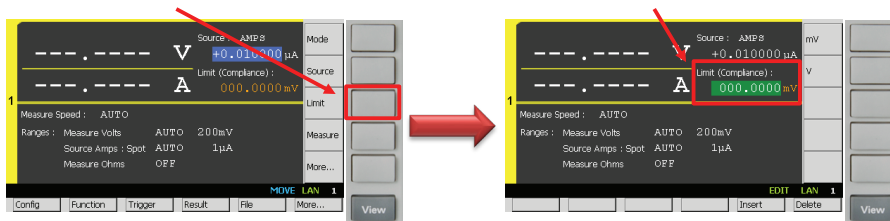
1) Press **Mode** to edit the **Source** function, and then select **AMPS (I)** to set the **Source** function to **Current source**.



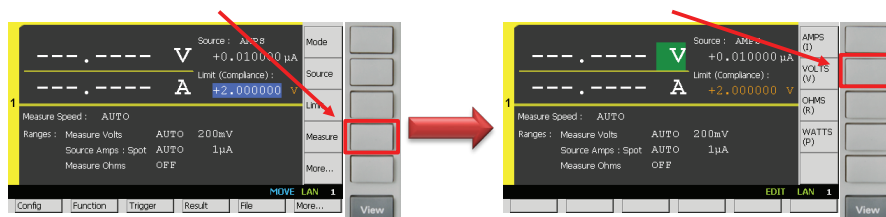
2) Press **Source** to edit the **Source** value, and then enter **10 nA** to set the **Source** value to **10 nA**.



3) Press **Limit** to edit the **Limit** value, and then enter **2 V** to set the **Limit** value to **2 V**.



4) Press **Measure** to configure the **Measurement** parameter, and then select **VOLTS (V)** to set the **Measurement** parameter to **Voltage**.



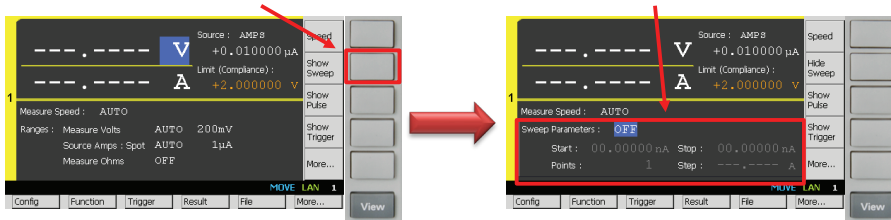
## Objective

This demo illustrates the function to make a time domain measurement of voltage with sourcing current to an LED using a Source/Measure Unit.

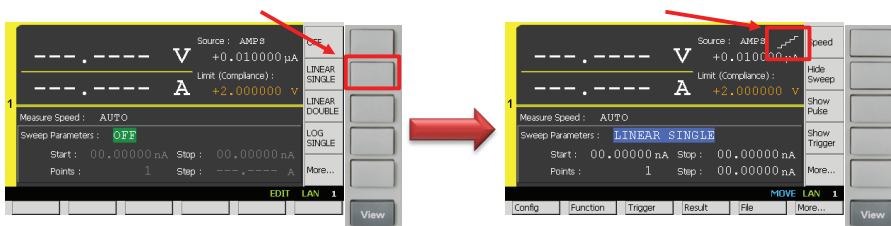
## Procedure

1. Change View mode to Channel 1 Single View
2. Configure the condition for Time Domain Measurement
3. Change View mode to Graph View
4. Perform the measurement
5. View the measurement result graph
6. View the list of measurement results
7. (Optional) Configure the measurement speed
8. (Optional) Configure to use AUTO measurement range operation

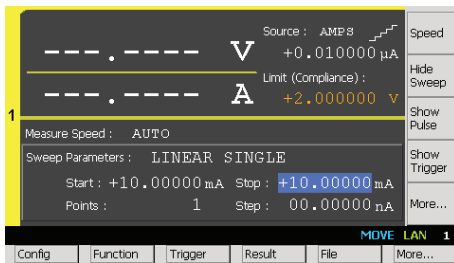
5) Press **More...** to change the keys shown in Assist keys, and then press **Show Sweep** to show Sweep Sub-Panel.



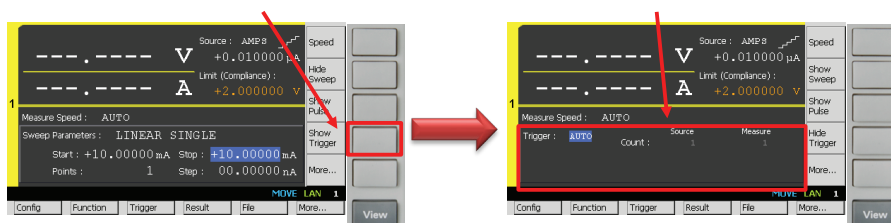
6) Press **LINEAR SINGLE**, then press **LINEAR SINGLE** to turn on Single Linear Sweep Mode. After turning on Single Linear Sweep Mode, you can see Source Shape which shows the single linear sweep mode.



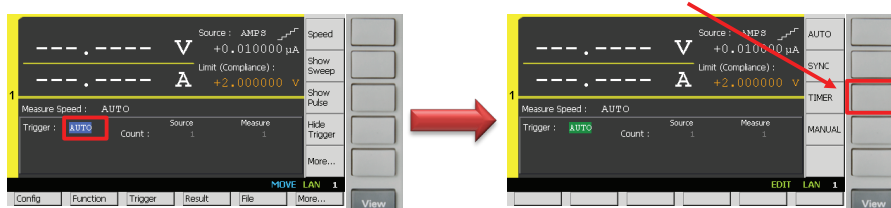
7) Rotate **EDIT LANE 1** to select Channel 1 Sweep Parameters and set them up as below. Start and Stop values should be the same, which define the continuous source value. (Start: 10 mA, Stop: 10 mA, Points: 1, Step: 0 A)




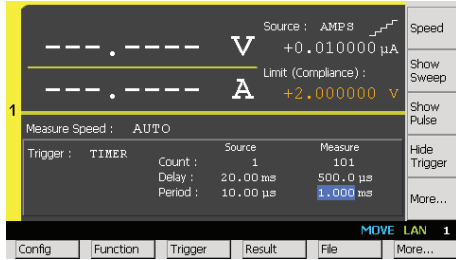
8) Press **Show Trigger** to show Trigger Sub-Panel.



8) Press **TIMER** to edit the Trigger type, and then select **TIMER** to set the Trigger type to TIMER.



10) Rotate  to select Channel 1 Trigger Parameters and set them up as below. Measurement Trigger Count defines the number of sampling and Measurement Trigger Period defines the interval of sampling. (Source Trigger Count: 1, Measurement Trigger Count: 101, Source Trigger Delay: 20 ms, Measurement Trigger Delay Time: 500 us, Measurement Trigger Period: 1 ms)





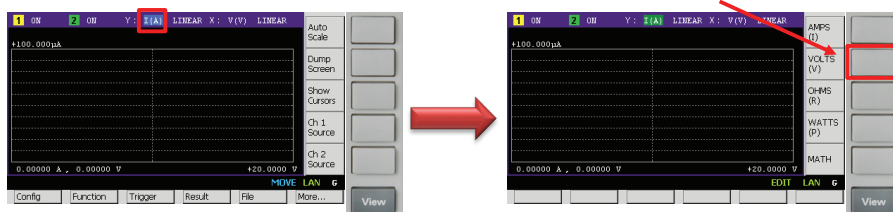
Now you've configured a 1 ms measurement trigger period for a time domain measurement. The measurement will be performed every 1 ms periodically. However, please note that a FIXED voltage measurement range operation will be used to control the trigger period, in other words the measurement interval, strictly. The measurement range is selected by Limit value. In this example, a 2 V measurement range will be used. If using AUTO measurement range operation is prior to controlling the trigger period strictly, you may specify MANUAL trigger type with AUTO source and measurement trigger source by the steps shown later.


### 3. Change View mode to Graph View

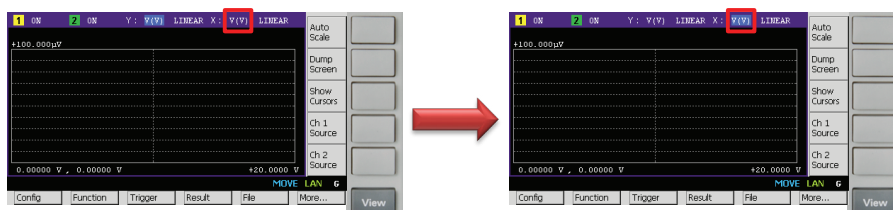
1) Press  repeatedly until Graph View is displayed.



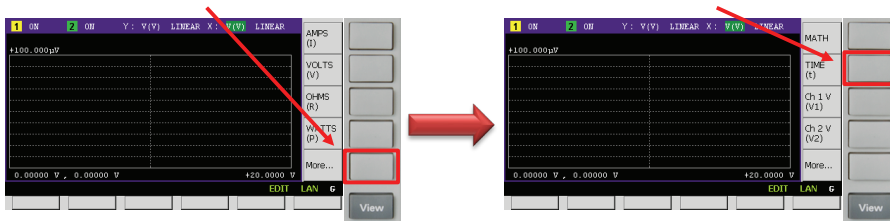
2) Rotate and press  to edit the Y-axis data type, and then select  to set the Y-axis data type to Voltage.



3) Rotate and press  to edit the X-axis data type.



4) Press **More...**, and then select **TIME (t)** to set the X-axis data type to Time.



#### 4. Perform the measurement

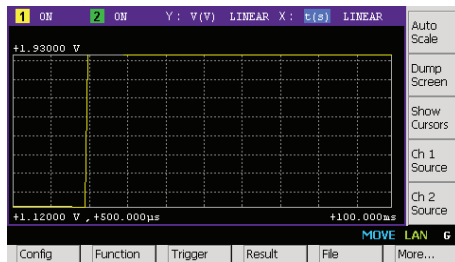
1) Press **On/Off** to source the current specified by the Source value, and then press **Trigger** to perform a measurement.

(The status information will show **ARM** during the measurement.)

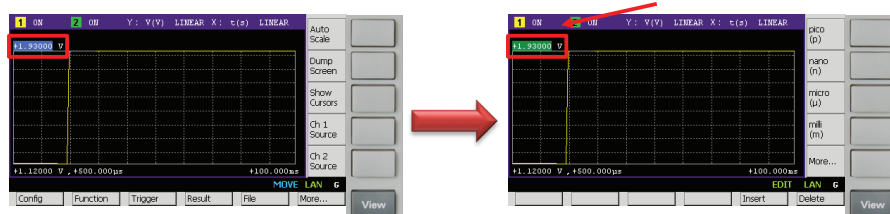


#### 5. View the measurement result graph

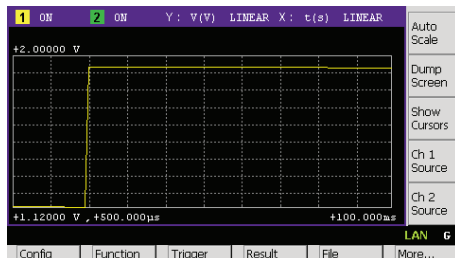
1) Press **Auto Scale** to adjust the scale of the graph after finishing the measurement.



2) Rotate and press **Auto Scale** to edit the Y-axis scaling, and then enter **2 V** to adjust the graph scale.



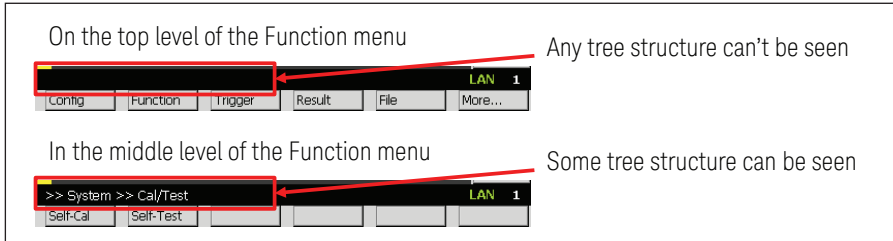
Now you can see the measurement result on the GUI of the B2900A series SMU as below.



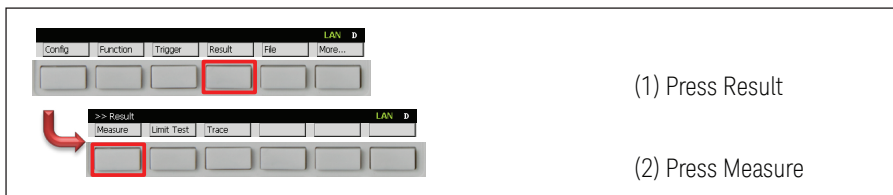
## 6. View the list of measurement results

The measurement results including the measurement time stamp can be referred by the following steps.

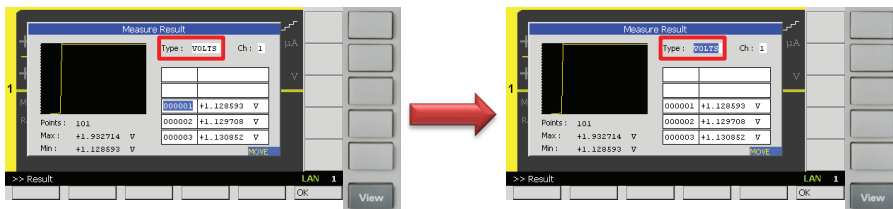
- 1) If you aren't on the top of the Function menu, press **Cancel Local** repeatedly to return to the top level.



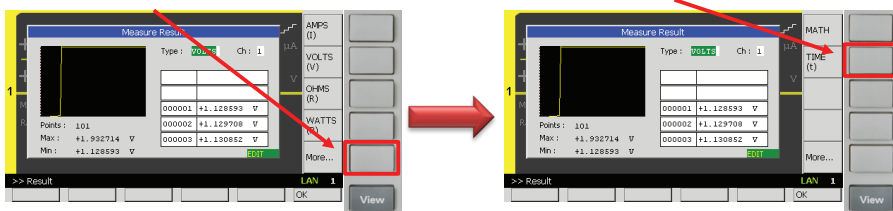
- 2) If you'd like to see the list of the measurement result, press **Result**, then press **Measure** to open Measure Result dialogue.



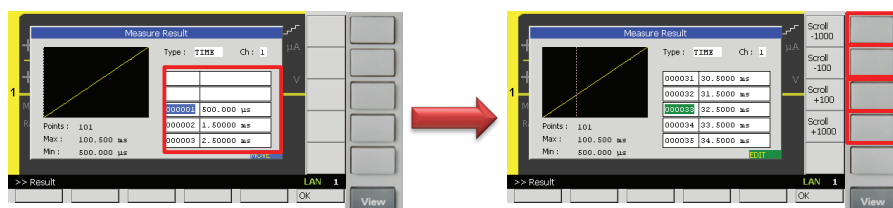
- 3) Rotate and press **View** to select the Data Type field.



- 4) Press **More...** to change the keys shown in Assist keys, and then press **TIME (t)** to select Time as the Data type.



- 5) Rotate and press **View** to select the Data field. Then rotate **View** to scroll the data list.





## 7. (Optional) Configure the measurement speed

In the default setting, the instrument selects the appropriate measurement speed and range automatically to get the fine accuracy. However, you can also specify these parameters on the GUI of the B2900A series SMU to meet a variety of the requirement to the measurement conditions.

For example, let's try to change the measurement speed to SHORT to make a measurement more quickly. If you select SHORT, the aperture time is set to 0.01 PLC. Here, PLC stands for power line cycle and the specified number of power line cycles is used per a measurement.

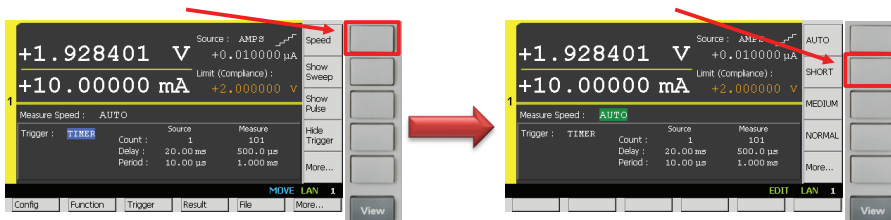
1) Press **View** repeatedly until the Channel 1

Single View is displayed.



2) Press **Speed** to edit the Measurement speed, and then select **SHORT** to set the

Measurement speed to SHORT. (If you can't see **Speed** in Assist keys, press **More...** to change the keys shown in Assist keys.)



## 8. (Optional) Configure to use AUTO measurement range operation

If you'd like to use AUTO measurement range operation during the time domain measurement, take the following steps.

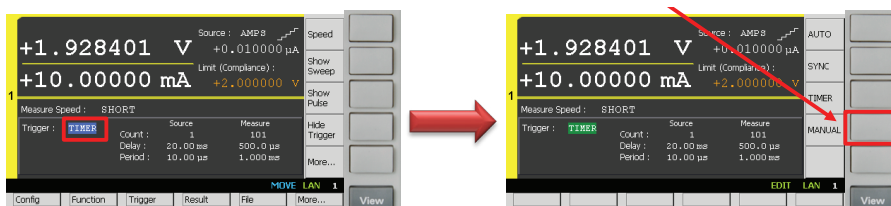
1) Press **View** repeatedly until the Channel 1


Single View is displayed.

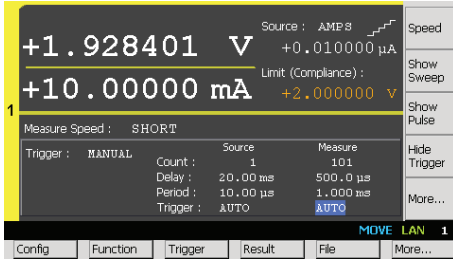


2) Rotate and press **MANUAL** to edit the Trigger type, and then select **MANUAL** to set the

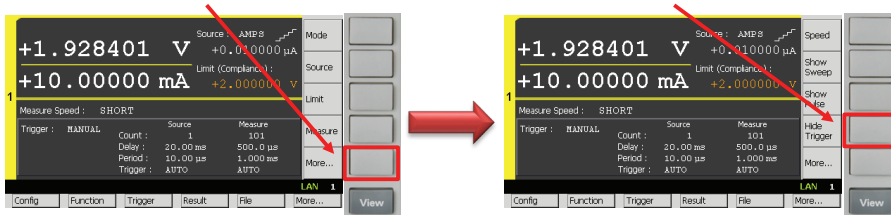
Trigger type to MANUAL.





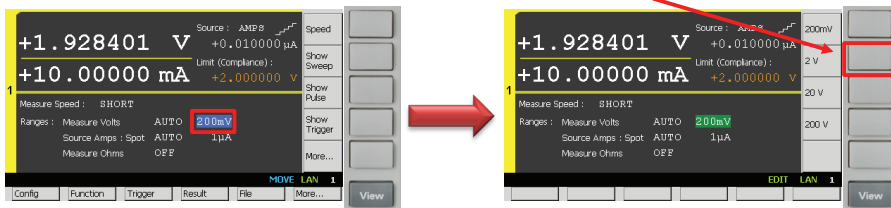
3) Rotate  to select Channel 1 Trigger Parameters and set them up as below.  
 (Source Trigger Source: AUTO, Measurement Trigger Source: AUTO)



4) Press  to show Range Sub-Panel. (If you can't see  in Assist keys, press  to change the keys shown in Assist keys.)



5) Rotate and press  to edit the Voltage minimum measurement range, and then select  to set it to 2 V for example.



## Conclusion

The Keysight B2900A Series Precision Source/Measure Unit (SMU) is a compact and cost-effective bench-top SMU with the capability to output and measure both voltage and current. Configuring the B2900A series SMU properly enables you not only to make a simple current versus voltage (IV) measurement, but also to make a time domain measurement with sourcing continuous current or voltage as if it were an oscilloscope.

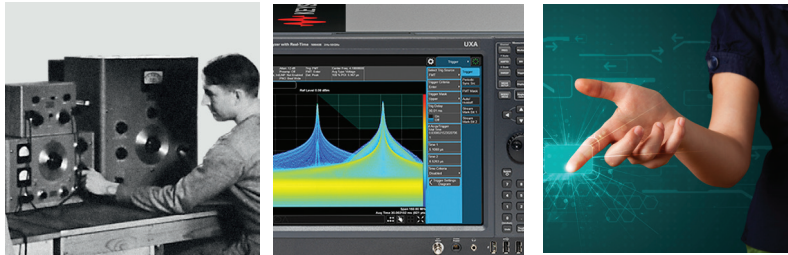
### B2900 Precision Instrument Family

The B2900 family contains products that perform both precision sourcing and precision measurement. [www.keysight.com/find/b2900a](http://www.keysight.com/find/b2900a)



## Evolving

Our unique combination of hardware, software, support, and people can help you reach your next breakthrough. **We are unlocking the future of technology.**



From Hewlett-Packard to Agilent to Keysight

### myKeysight

#### myKeysight

[www.keysight.com/find/mykeysight](http://www.keysight.com/find/mykeysight)

A personalized view into the information most relevant to you.

#### Keysight Infoline

### Keysight Infoline

[www.keysight.com/find/Infoline](http://www.keysight.com/find/Infoline)

Keysight's insight to best in class information management. Free access to your Keysight equipment company reports and e-library.

## KEYSIGHT SERVICES

#### Keysight Services

[www.keysight.com/find/service](http://www.keysight.com/find/service)

Our deep offering in design, test, and measurement services deploys an industry-leading array of people, processes, and tools. The result? We help you implement new technologies and engineer improved processes that lower costs.



#### Three-Year Warranty

[www.keysight.com/find/ThreeYearWarranty](http://www.keysight.com/find/ThreeYearWarranty)

Keysight's committed to superior product quality and lower total cost of ownership. Keysight is the only test and measurement company with three-year warranty standard on all instruments, worldwide. And, we provide a one-year warranty on many accessories, calibration devices, systems and custom products.



#### Keysight Assurance Plans

[www.keysight.com/find/AssurancePlans](http://www.keysight.com/find/AssurancePlans)

Up to ten years of protection and no budgetary surprises to ensure your instruments are operating to specification, so you can rely on accurate measurements.

#### Keysight Channel Partners

[www.keysight.com/find/channelpartners](http://www.keysight.com/find/channelpartners)

Get the best of both worlds: Keysight's measurement expertise and product breadth, combined with channel partner convenience.

[www.keysight.com/find/b2900a](http://www.keysight.com/find/b2900a)

For more information on Keysight Technologies' products, applications or services, please contact your local Keysight office. The complete list is available at: [www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)

### Americas

Canada	(877) 894 4414
Brazil	55 11 3351 7010
Mexico	001 800 254 2440
United States	(800) 829 4444

### Asia Pacific

Australia	1 800 629 485
China	800 810 0189
Hong Kong	800 938 693
India	1 800 11 2626
Japan	0120 (421) 345
Korea	080 769 0800
Malaysia	1 800 888 848
Singapore	1 800 375 8100
Taiwan	0800 047 866
Other AP Countries	(65) 6375 8100

### Europe & Middle East

Austria	0800 001122
Belgium	0800 58580
Finland	0800 523252
France	0805 980333
Germany	0800 6270999
Ireland	1800 832700
Israel	1 809 343051
Italy	800 599100
Luxembourg	+32 800 58580
Netherlands	0800 0233200
Russia	8800 5009286
Spain	800 000154
Sweden	0200 882255
Switzerland	0800 805353
	Opt. 1 (DE)
	Opt. 2 (FR)
	Opt. 3 (IT)
United Kingdom	0800 0260637

For other unlisted countries:  
[www.keysight.com/find/contactus](http://www.keysight.com/find/contactus)  
(BP-06-08-16)



[www.keysight.com/go/quality](http://www.keysight.com/go/quality)  
Keysight Technologies, Inc.  
DEKRA Certified ISO 9001:2015  
Quality Management System