Introduction of Keysight B2900 Precision Instrument Family

Keysight Technologies

B2900A Series of SMU

B2960A Series

B2980A Series

KEYSIGHT TECHNOLOGIES

Agenda

- IV sourcing/measurement
- B2900 Family
- Each Series feature
- Common features
- Summary
- Application example

IV Sourcing/Measurement

Components

Current Source

Current Meter

Voltage Source

Voltage Meter

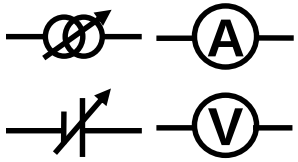
DMM

DC Source

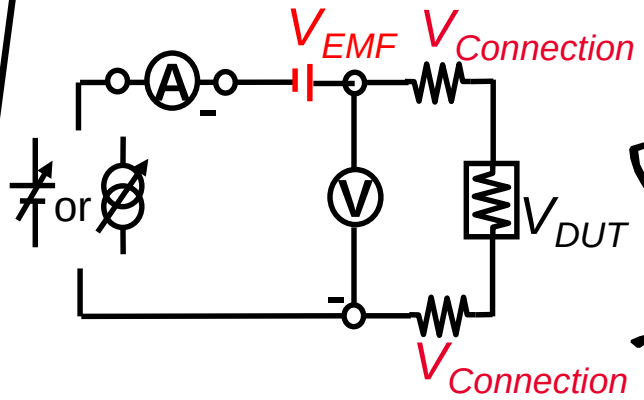
Issues

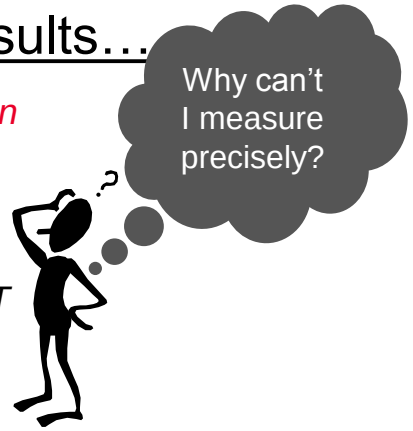
1. Each component doesn't have enough performance…

Current measurement resolution, Voltage source noise, etc…



2. Connections between instruments affect measurement results…





Conventional Instruments compared with B2900 Family

Issues		Conventional Instruments	B2900 Family
Components' Performance	Need more Current Measurement Resolution	10 nA DMM	**0.01 fA** **×10⁹ Precise!**
	Need much less Voltage Noise (20MHz bandwidth)	200 uVrms Linear DC Source	**10 uVrms** **More than ×10 Precise!**
Connections between instruments affect measurement results.		Connections between instruments cause unexpected errors.	**No error due to connection!** All instruments are included in one instrument. **Precise!**

B2900 Family provides

✓ **More precise measurement**

KEYSIGHT TECHNOLOGIES

B2900 Family - PRECISION bench-top instrument -

Each Series is optimized for IV sourcing/measurement.

PRECISION Source	PRECISION Source & Measure	PRECISION Measure
B2960A Series	**B2900A Series of SMU**	**B2980A Series**
		
Low Noise Power Source	Source/Measure Units	Femto/Picoammeter Electrometer/High Resistance Meter

PRECISION Bench-top instrument × Each Specific Function = High Cost-Efficiency

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  - B2960A Series
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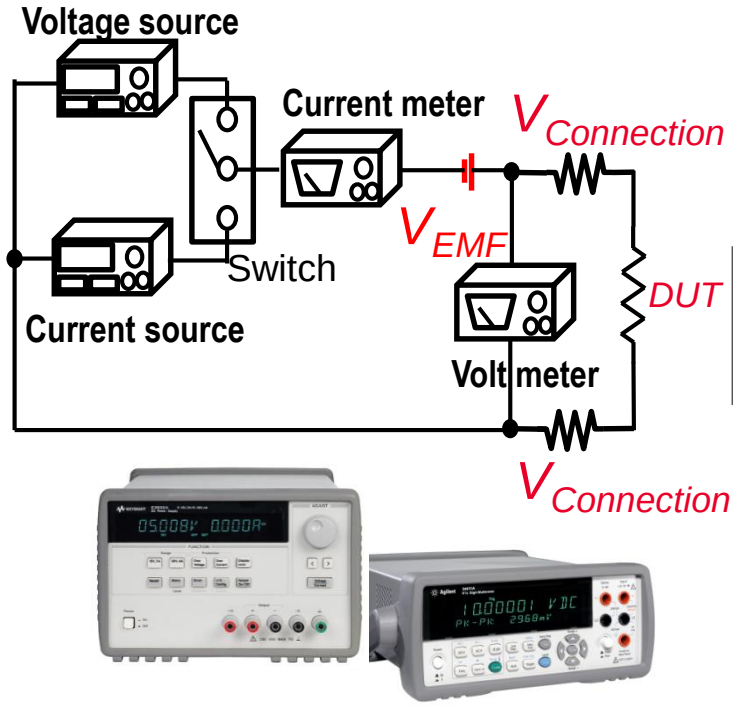
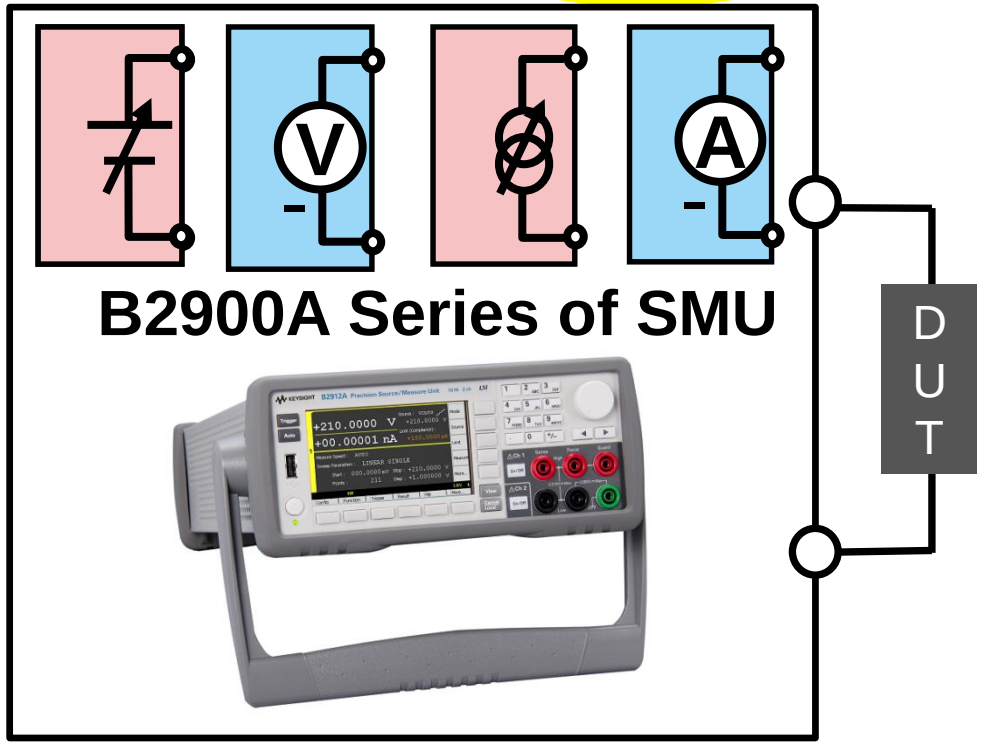
B2900A Series of SMU

Only 1 SMU contains all instruments for IV measurement.

PRECISION IV Source + **PRECISION** IV Measure = **PRECISION Source/Measure Units**





No error due to connections!

B2900A Series of SMU makes measurement more precise!

B2960A Series

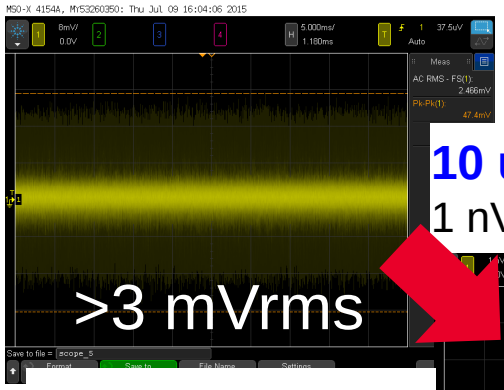
Low Noise Power Source with an external filter

PRECISION IV Source + External Filter = **Low Noise Source**

B2960A Series

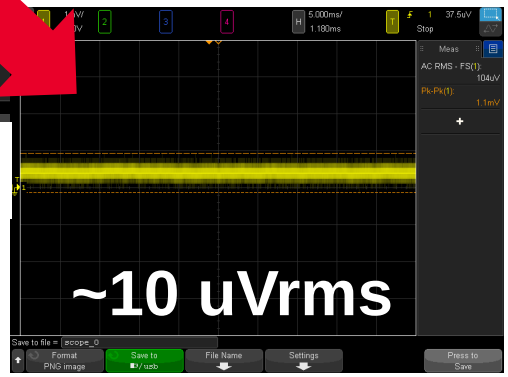
+

with Ultra Low Noise Filter



Without filter

10 uVrms /√Hz (10 Hz-20 MHz)
1 nVrms/√Hz @ 10 kHz



B2960A Series prevents noise from affecting DUT.

B2980A Series

Femto/Picoammeter and Electrometer/High Resistance Meter

PRECISION IV Measure

OR

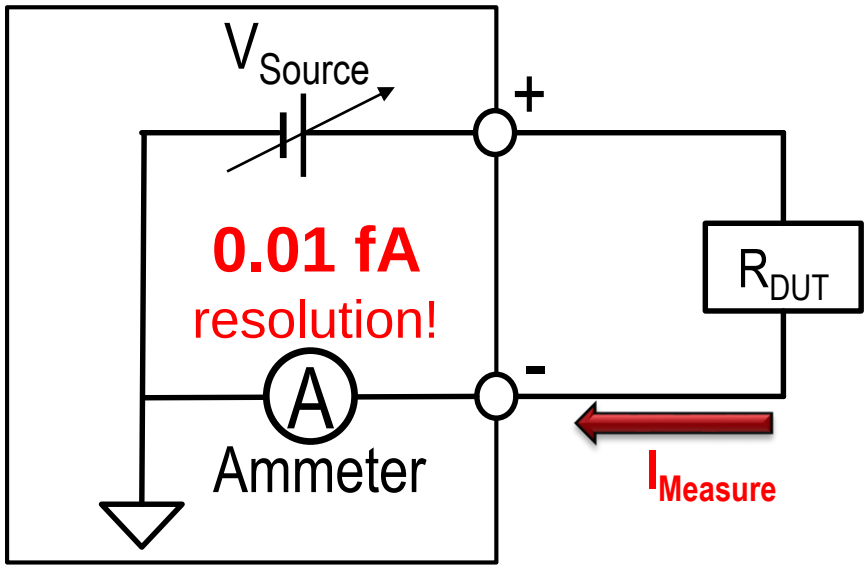
High Resistance Meter

Down to **0.01 fA** resolution!

Up to **10 Pohm!**

$$R_{DUT} = \frac{V_{Source}}{I_{Measure}}$$

B2980A Series



B2980A Series makes high resistance measurement confident.

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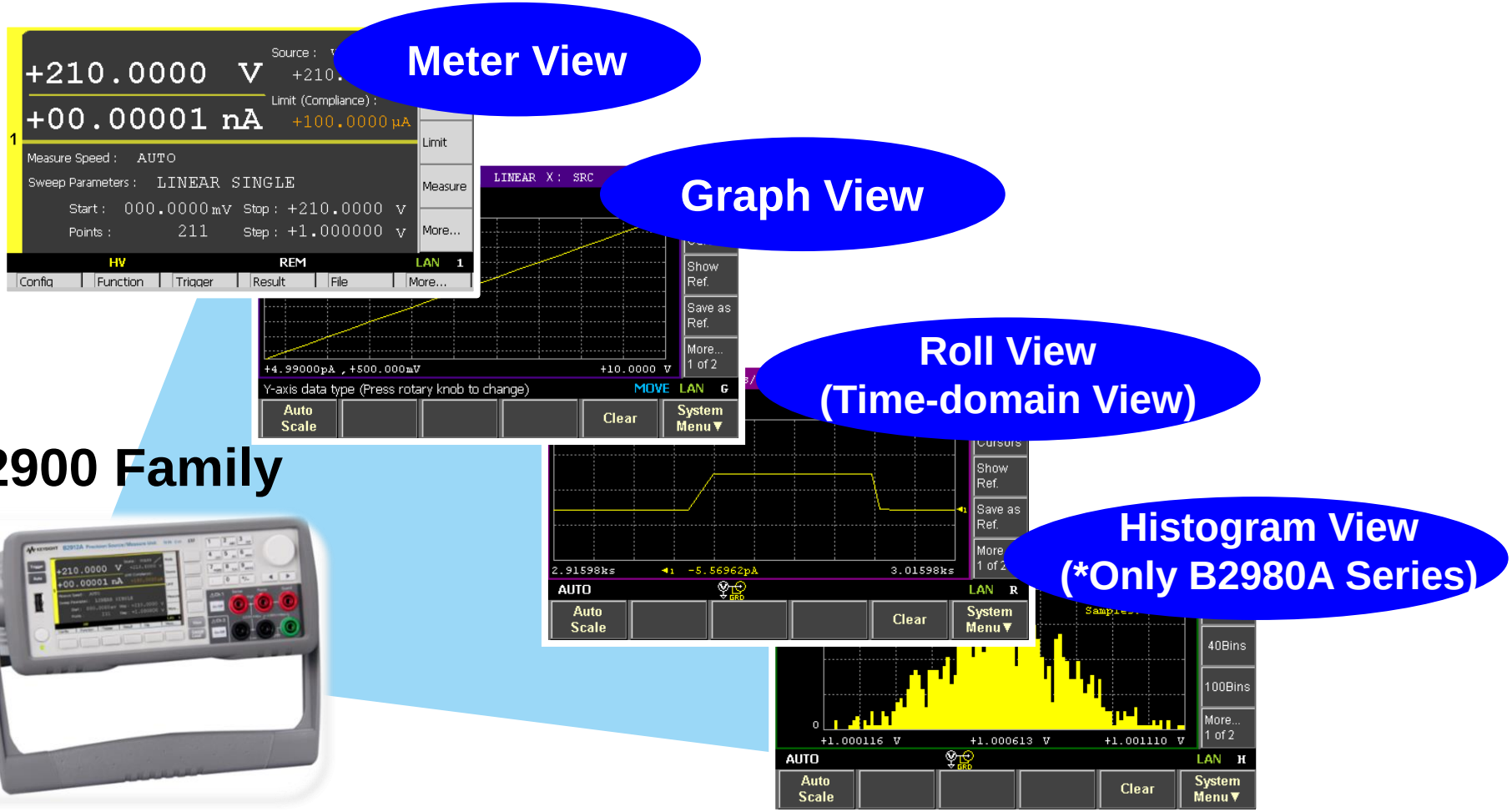
B2900 Family + GUI and LCD

B2900 Family has intuitive GUI and wide 4.3” LCD.



GUI and LCD helps setup and data management.

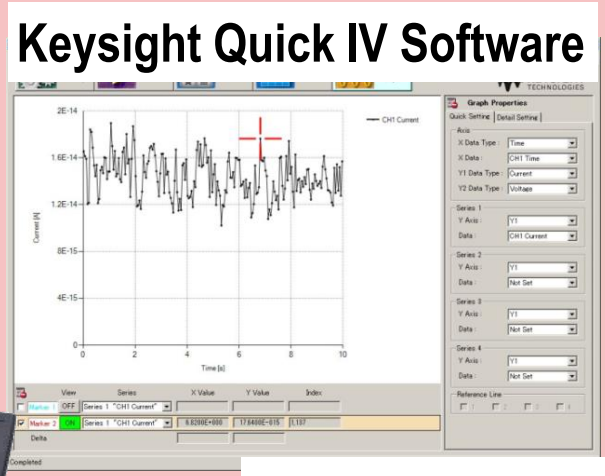
B2900 Family + Software

Control B2900 Family with ready-to-use Software

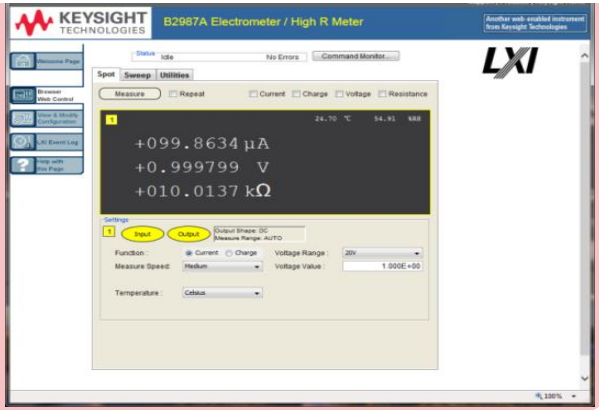
B2900 Family

with PC

Keysight Quick IV Software



Keysight Graphical Web Interface



Keysight software realizes Quick and Easy Measurement!

Agenda

- IV sourcing/measurement
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Summary

B2900 Family
-PRECISION bench-top instrument-

B2900A Series of SMU : Source/Measure units
B2960A Series : Low Noise Power Source
B2980A Series : High Resistance Meter

Each Specific PRECISION Function

+

Improve Usability

GUI and LCD

Meter View Graph View
Roll View Histogram View

Software

Quick IV Software
Graphical Web Interface

B2900 Family is cost-efficient bench-top instrument!

If you are interested in B2900 Family…

Please visit Keysight website or ask our clerks!

Keysight website and sales have all Information you need!

www.keysight.com/find/b2900a

Step1

Check specification & features

- ✓ Brochure
- ✓ Datasheet

Step2

Check how to use in detail

- ✓ Application note
- ✓ Technical overview

Step3

Call our clerks!
Order Demo kits

- ✓Demo Guide
- ✓User's guide

Agenda

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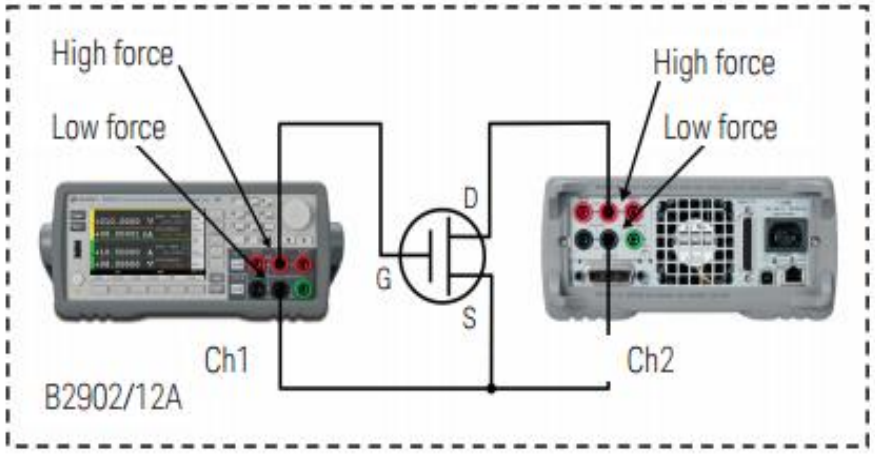
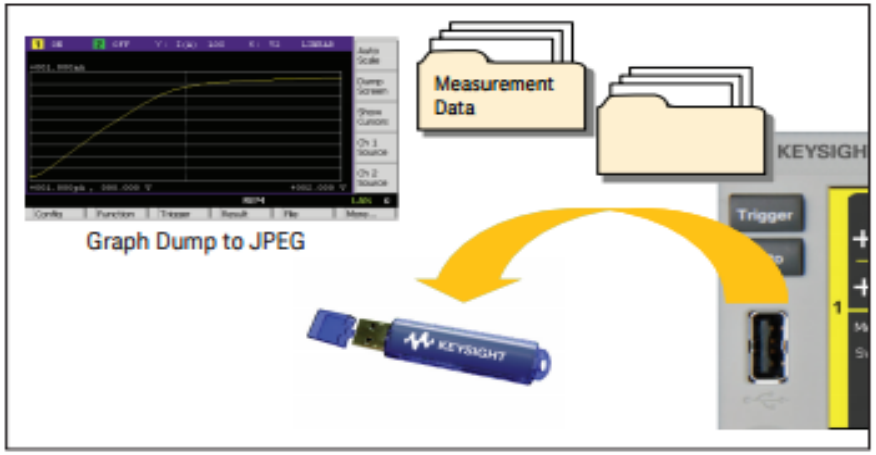
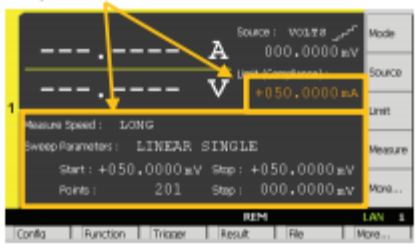
Application example 1 (MOSFET)



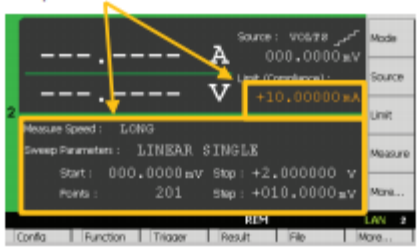


1) Set the measurement condition and the compliance for Ch 1

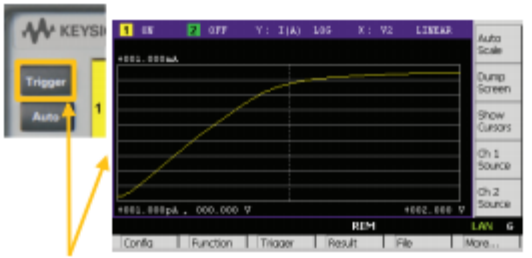


a) Single View for Ch1

2) Set the measurement condition and the compliance for Ch 2



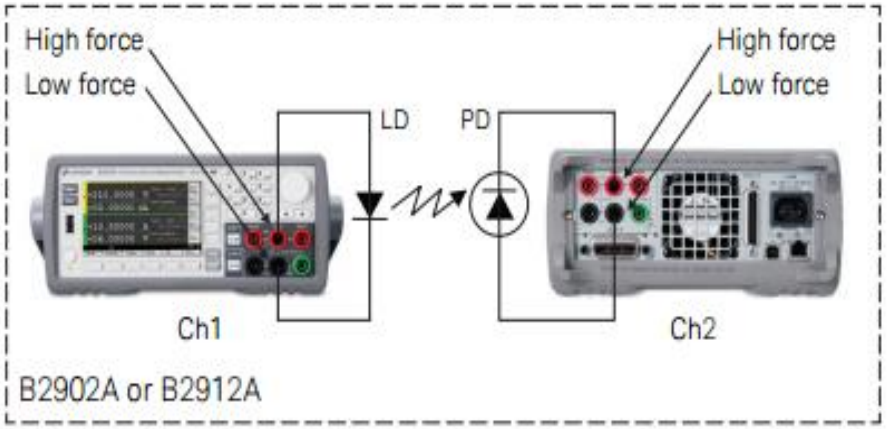
b) Single View for Ch2

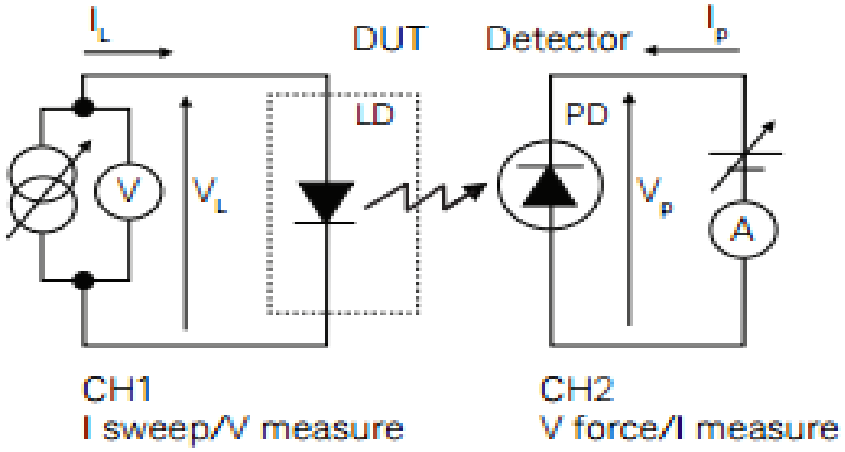


3) Execute and see the result

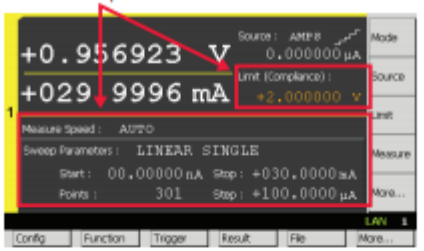
c) Graph View

Application example 2 (LIV)



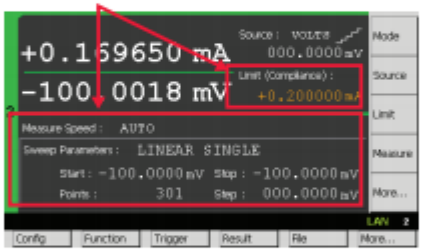


1. Set the measurement condition and the compliance for Ch 1



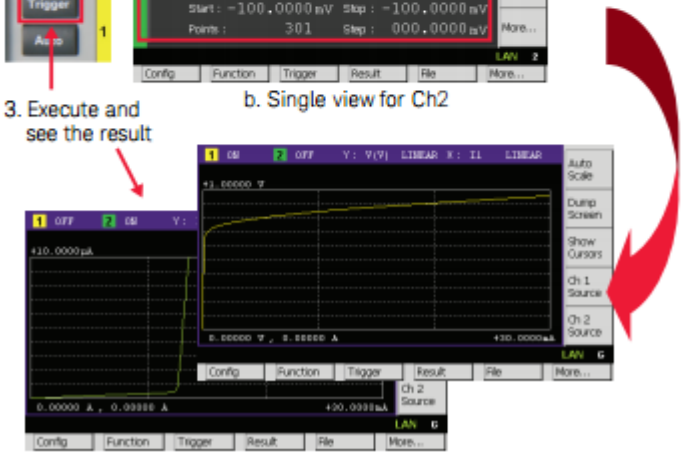
a. Single view for Ch1

2. Set the measurement condition and the compliance for Ch 2



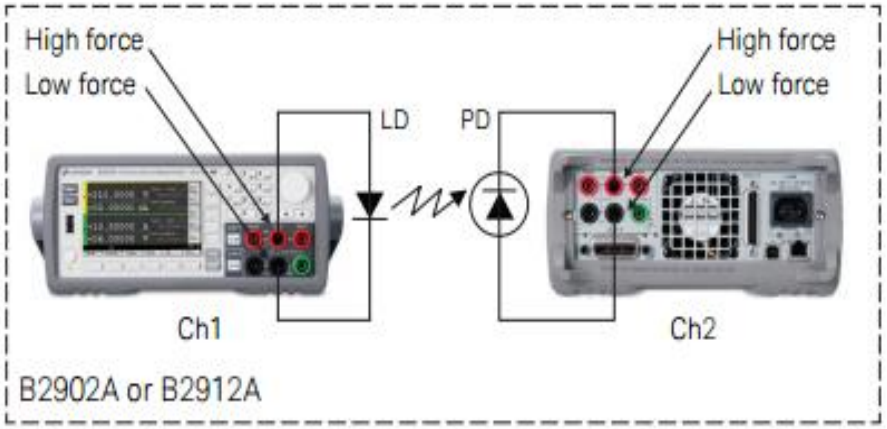
b. Single view for Ch2

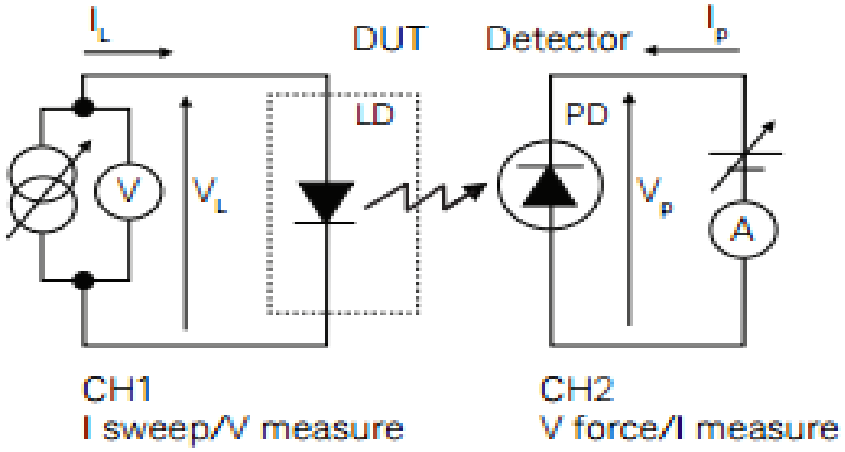
3. Execute and see the result



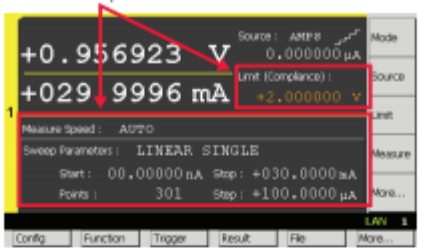
c. Graph view

Application example 3 (LIV)



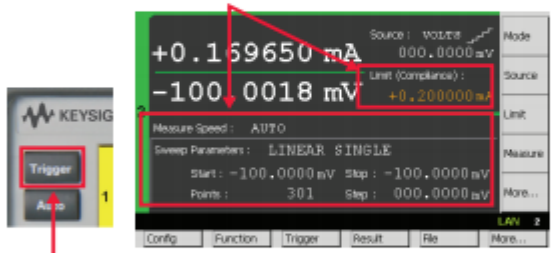


1. Set the measurement condition and the compliance for Ch 1



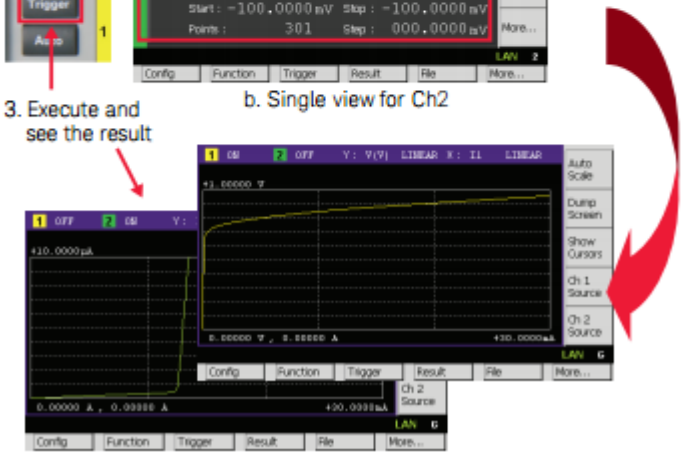
a. Single view for Ch1

2. Set the measurement condition and the compliance for Ch 2



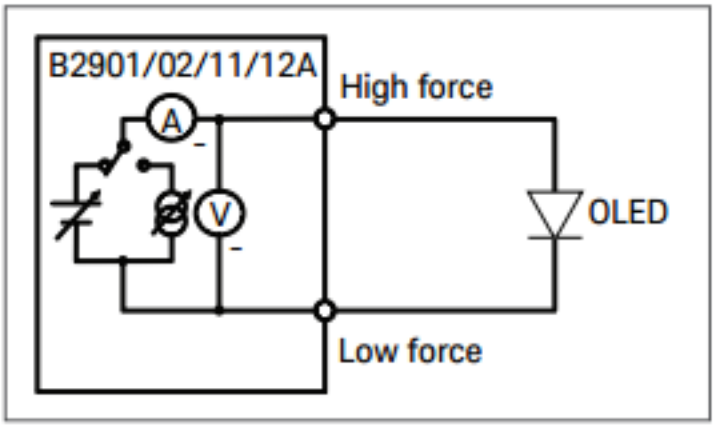
b. Single view for Ch2

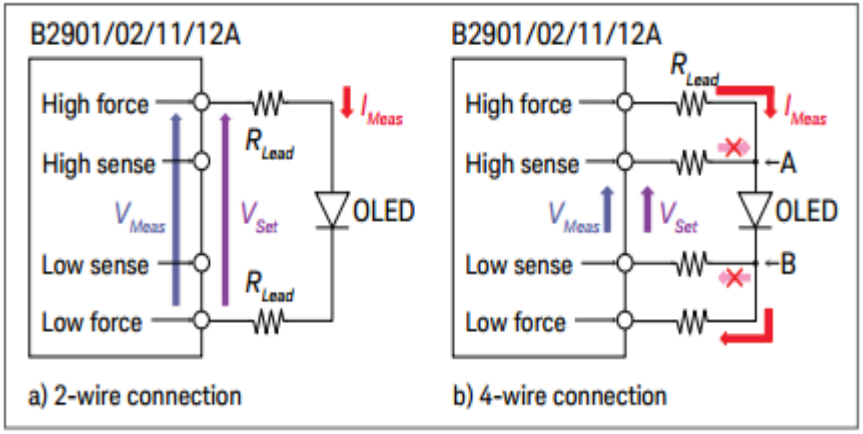
3. Execute and see the result

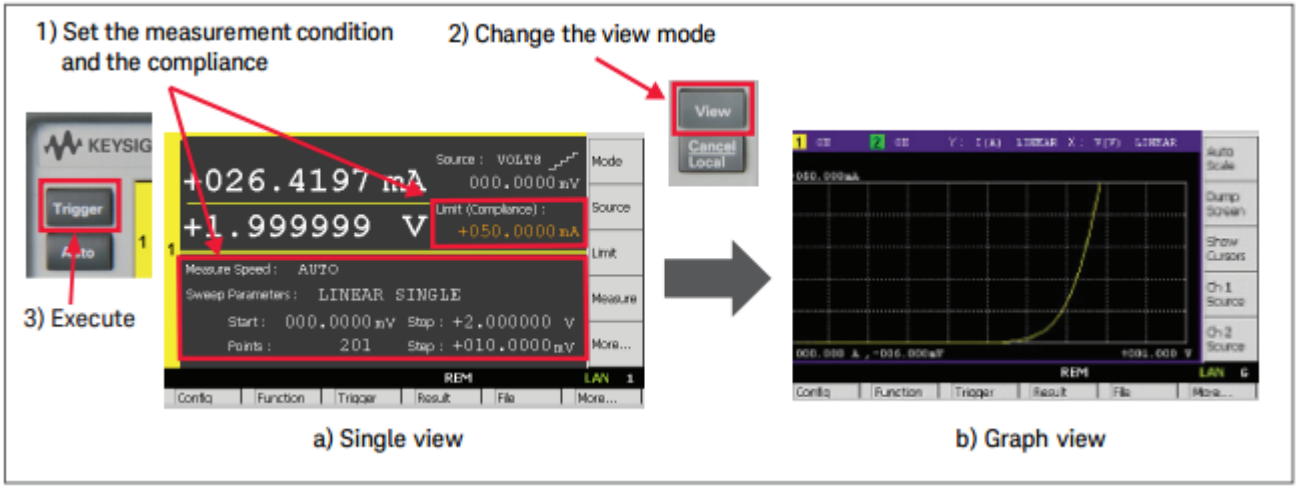


c. Graph view

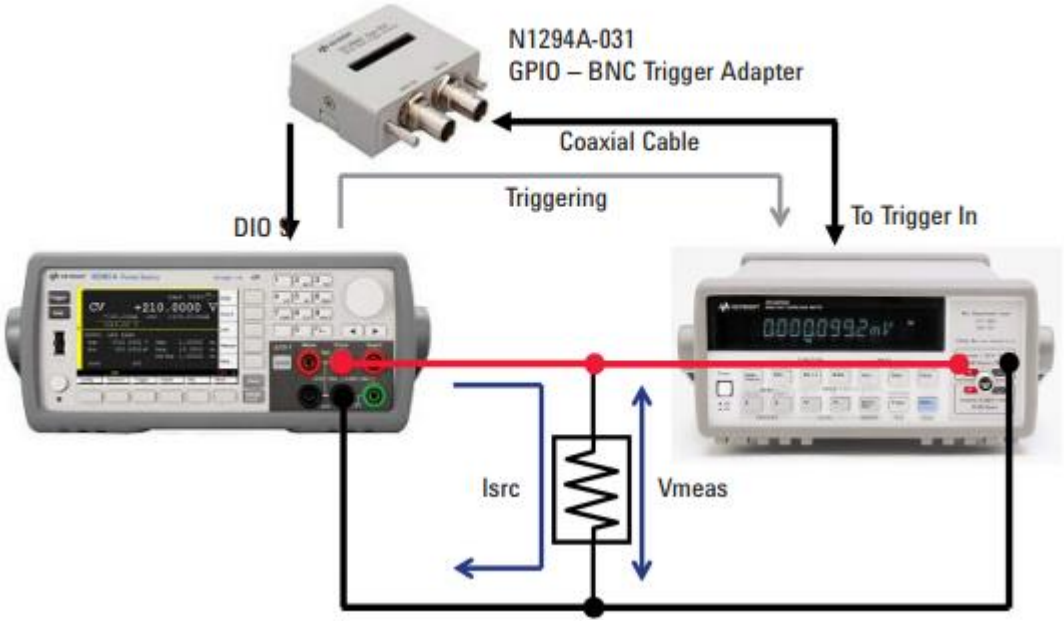
Application example 4 (IV characterization of OLEDs)

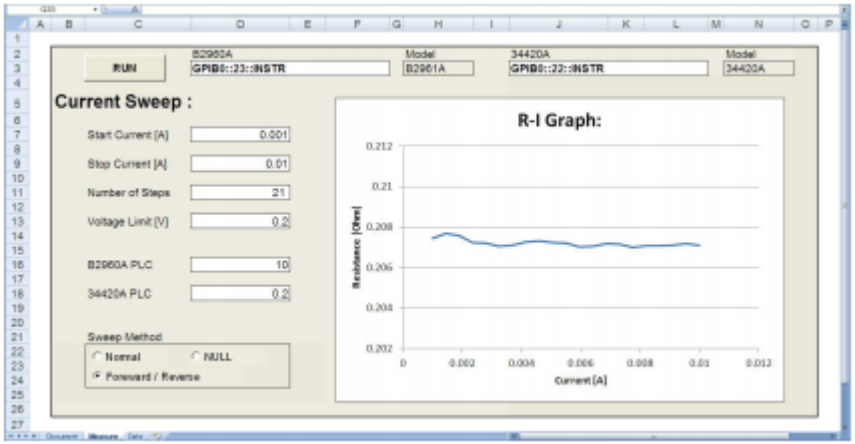


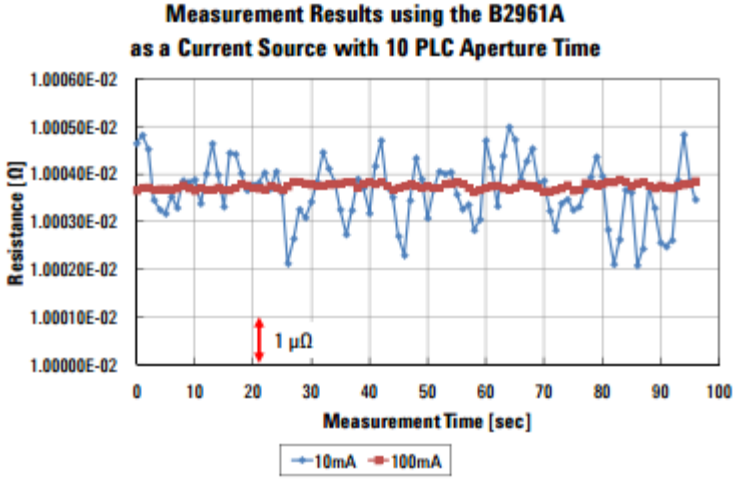




Application example 5 (Precise low resistance measurement)







KEYSIGHT TECHNOLOGIES

Thank you for your attention!

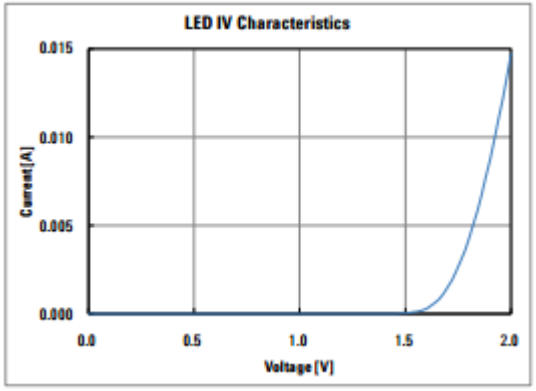
Lab1 Performing IV Characterization of LED

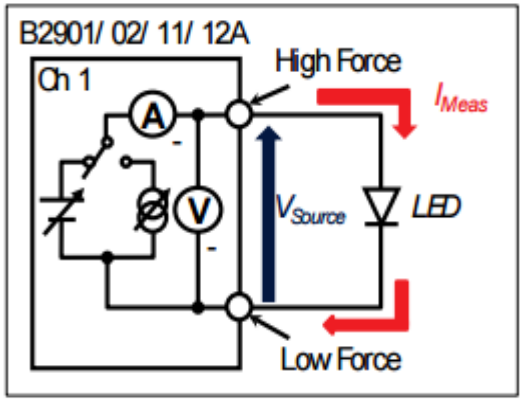
Key Points

- IV characterization capability
- Intuitiveness of GUI (Single View, Graph View)
- X-Y graph display
- Graph dump capability

Device

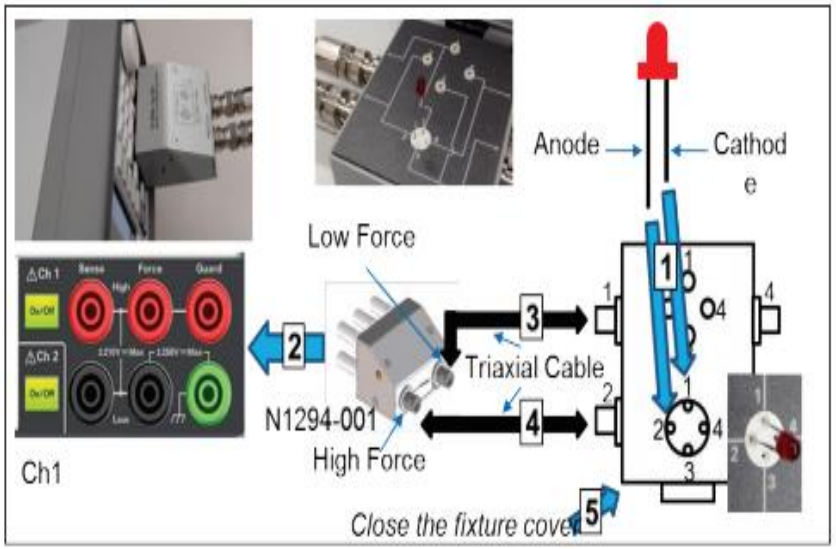
Diffused LED Lamp





Outlines

- Making an IV characteristics measurement of LED by
  - Setting the sweep source parameters for voltage (Start voltage : 0 V Stop voltage : 2 V Voltage step : 20 mV)
  - Setting the current limit value to 100 mA
  - Setting the measurement parameter to Current
  - Setting the current minimum measurement range to 10 nA
  - Sourcing voltage and measuring current
  - Seeing the IV characteristics result

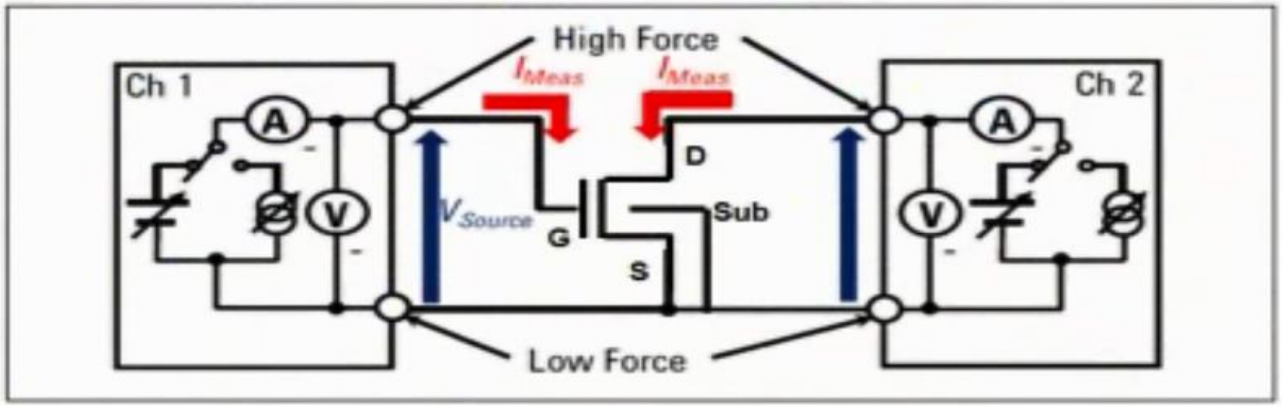


Lab2 IV Characteristic(curve) of MOSFET

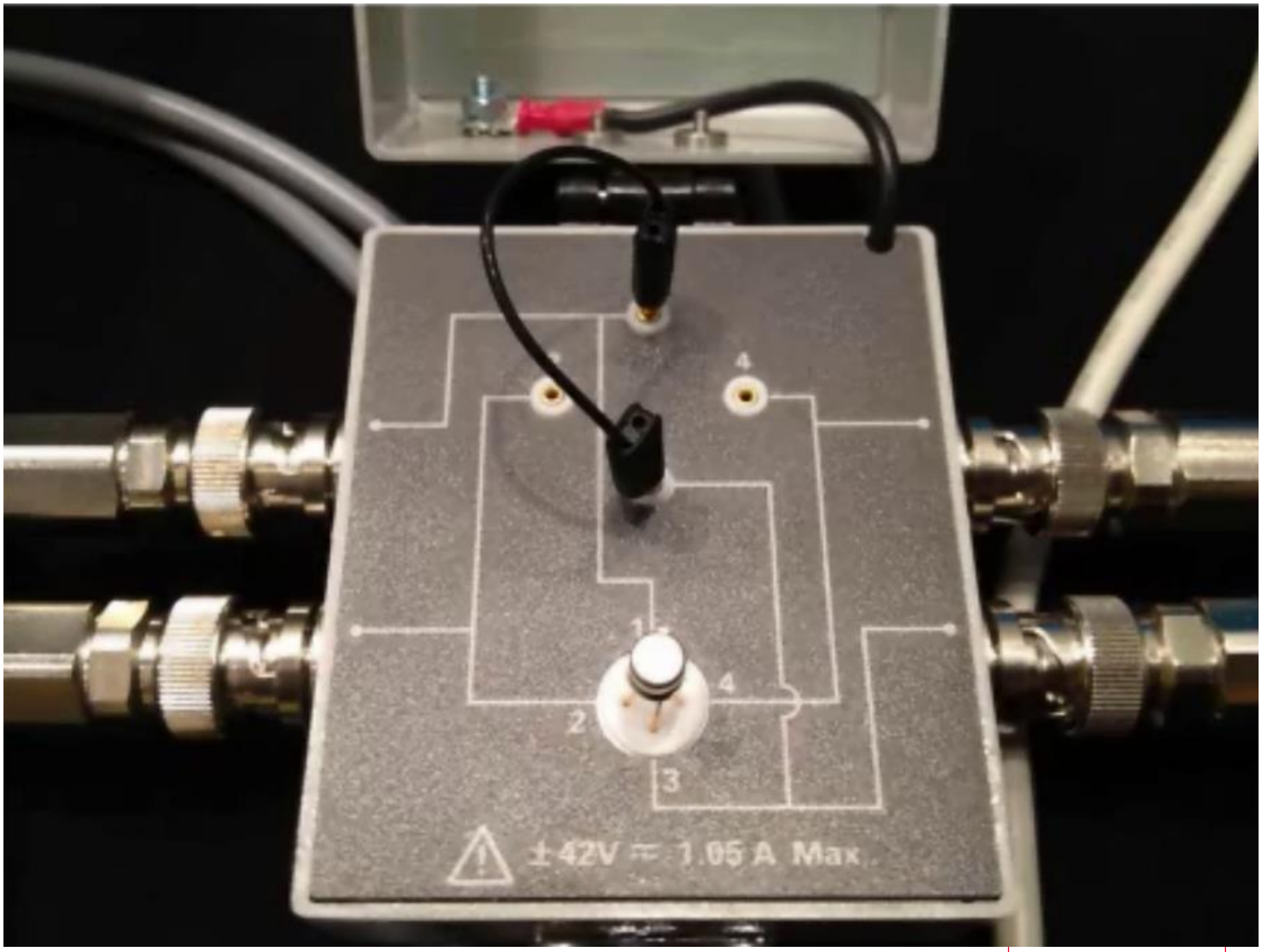
Outlines

- Making an IV characteristics measurement of **FET**
  - Setting Channel 1 sweep source parameters for voltage
    (Start voltage : **0.5V** Stop voltage : **2 V** Voltage step : **0.5V**)
  - Setting Channel 1 current limit value to 100 mA
  - Setting Channel 1 measurement parameter to Current
  - Setting Channel 1 current minimum measurement range to 10 nA
  - Setting Channel 2 sweep source parameters for voltage
    (Start voltage : **0V** Stop voltage : **2** V Voltage step : **0.05 V**
  - Setting Channel 2 current limit value to **100mA**
  - Setting Channel 2 measurement parameter to Current
  - Setting Channel 2 current minimum measurement range to 10 nA
  - Sourcing voltage and measuring current

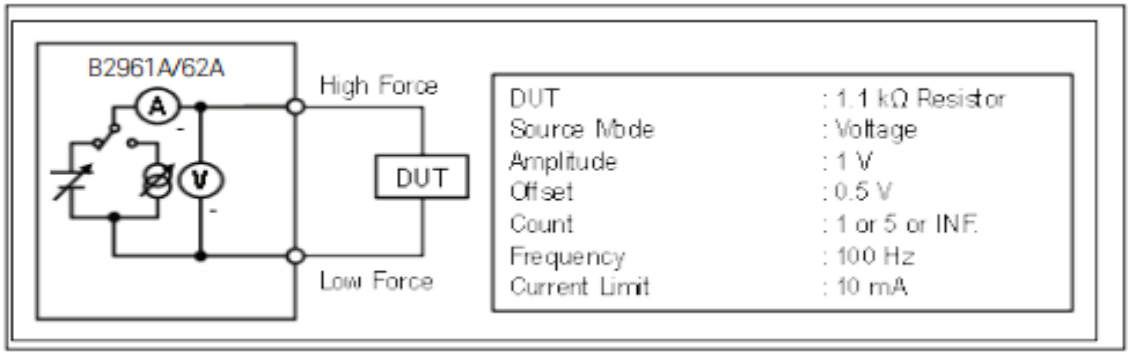
Under this condition, both channels sweep the voltage synchronously with making measurements simultaneously.



Lab2 IV Characteristic(curve) of MOSFET



Lab3 Source finite current/voltage sinusoid waveform

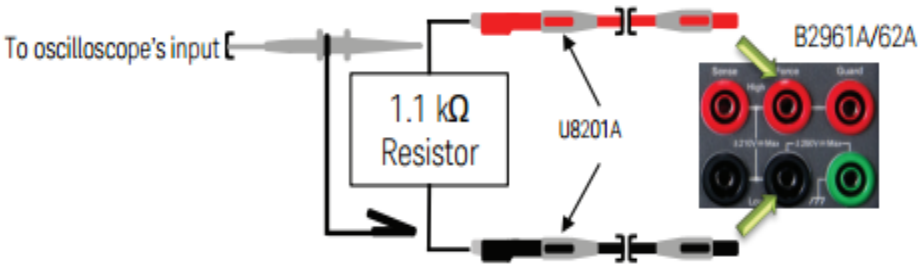


Oscilloscope Setup

1. Set Ch1 vertical scale to **500 mV/div** and horizontal scale to **5 ms/div**.
2. Set Ch1 Input Impedance to **1M Ohm**.

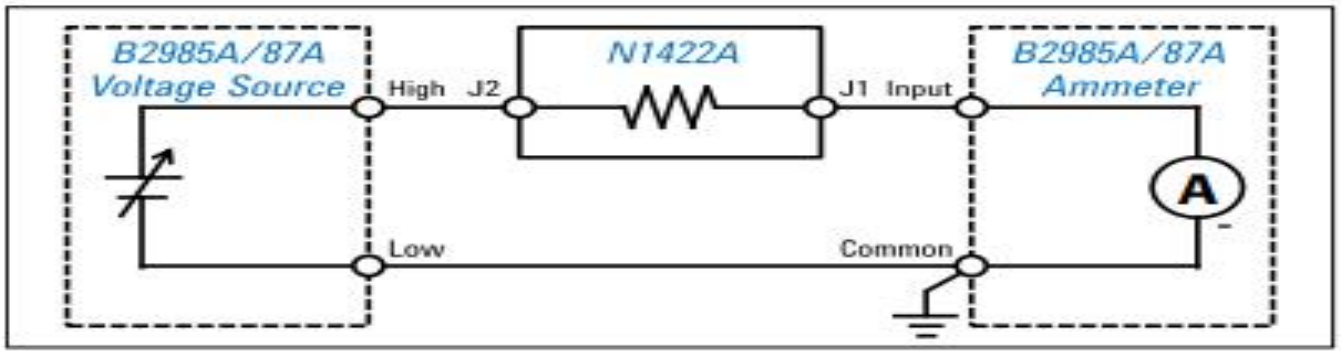
B2961A/62A Setup

1. Connect the banana cables to the B2961A/62A's Ch1 High/Low Force Terminals
2. Connect the alligator clips to the ends of the 1.1 kΩ resistor.
3. Probe across the 1.1 kΩ resistor to monitor the output using the oscilloscope.



Lab4 Perform Current Measurement

1. Connect the **Common terminal** to the **Earth terminal** of the B2985A/87A **with a banana to screw-lug cable**.
2. Connect the **Voltage Source Low terminal** to the **Common terminal** of the B2985A/87A **with a black banana test lead**.
3. Connect the **Ammeter Input terminal** of the B2985A/87A to the **J1 terminal** of the N1422A **with a triaxial cable**.
4. Connect the **Voltage Source High terminal** of the B2985A/87A to the **J2 terminal** of the N1422A **with a red banana test lead**.



Lab5 Perform Resistance Measurement

1. Connect the **Common terminal** to the **Earth terminal** of the B2985A/87A **with a banana to screw-lug cable**.
2. Connect the **Voltage Source Low terminal** to the **Common terminal** of the B2985A/87A **with a black banana test lead**.
3. Connect the **Ammeter Input terminal** of the B2985A/87A to the **J1 terminal** of the N1422A **with a triaxial cable**.
4. Connect the **Voltage Source High terminal** of the B2985A/87A to the **J2 terminal** of the N1422A **with a red banana test lead**.