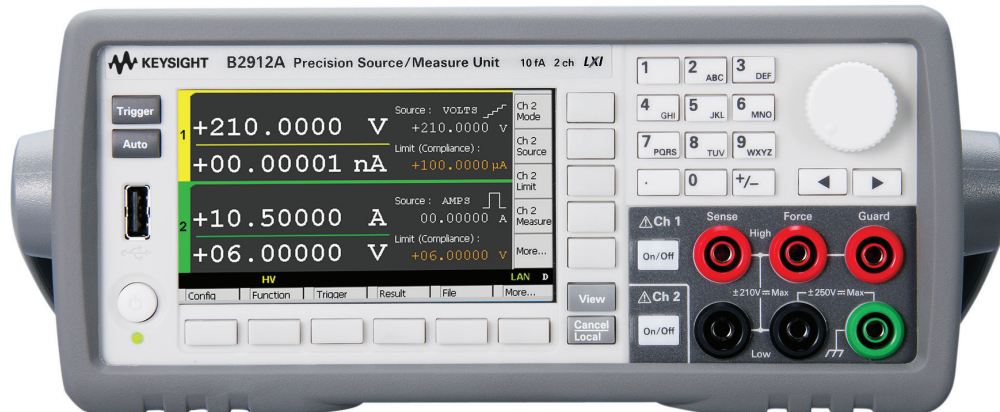# Keysight B2900A Series
Precision Source/Measure Unit

Configuration Guide

Cost-effective source/measurement solutions offer superior performance and a best-in-class graphical user interface.

KEYSIGHT
TECHNOLOGIES

Unlocking Measurement Insights

Configure Your Keysight B2900A Series Precision Source/Measure Unit

The Keysight B2900A Series Source/Measure Unit (SMU) series contains the following four models.

– B2901A Precision Source/Measure Unit, 1ch, 100fA resolution, 210V, 3A DC/10.5A pulse
– B2902A Precision Source/Measure Unit, 2ch, 100fA resolution, 210V, 3A DC/10.5A pulse
– B2911A Precision Source/Measure Unit, 1ch, 10fA resolution, 210V, 3A DC/10.5A pulse
– B2912A Precision Source/Measure Unit, 2ch, 10fA resolution, 210V, 3A DC/10.5A pulse

This configuration guide has step-by-step instructions to help you configure an SMU and its related accessories to meet specific test requirements. For detailed specifications, refer to the **B2900A SMU series data sheet** (publication number 5990-7009EN).

Step 1. Select B2900A Series model

There are two key parameters you need to select up-front: the number of measurement channels (one or two) and the SMU performance level. The B2900A series comes in both standard (B2901A/B2902A) and high-performance (B2911A/B2912A) versions. Note: After purchase it is not possible to upgrade an SMU to have more channels or to the high-performance version (if you currently have the standard version).

Product Number	Number of channels	Max output		Min source resolution	Min measure resolution	Min timing interval	Viewing mode
		DC	Pulse				
B2901A	1	210 V 3.03 A	200 V 10.5 A	1 pA 1 μV	100 fA 100 nV	20 μs	Single, graph
B2902A	2	210 V 3.03 A	200 V 10.5 A	1 pA 1 μV	100 fA 100 nV	20 μs	Single, dual, graph
B2911A	1	210 V 3.03 A	200 V 10.5 A	10 fA 100 nV	10 fA 100 nV	10 μs	Single, graph, roll
B2912A	2	210 V 3.03 A	200 V 10.5 A	10 fA 100 nV	10 fA 100 nV	10 μs	Single, dual, graph, roll

The following items are supplied standard with each B2900A series SMU:

Description	Qty.	Additional Information
1. Product Reference CD	1ea	Contains electronic user manuals files, drivers and software
2. Keysight I/O Libraries CD	1ea	Contains driver and installation software for the Keysight I/O library
3. Quick Reference	1ea	Printed reference for quick startup (English)
4. Certificate of Calibration (without test data)	1ea	Certificate of calibration (without actual test data). If you need the test data, please specify option UK6.
5. USB cable	1ea	USB cable (1.8 m). Orderable parts number is 8121-1696.

Step 2. Add optional localized User's Guide

The B2900A manuals (User's Guide, etc.) are included in PDF format on the CD-ROM shipped with the B2900A. If you need printed manuals then they can be ordered using the part numbers shown below.

Description	Product Number	Additional Information
Paper Manual (User's Guide), English	B2901A-ABA B2902A-ABA B2911A-ABA B2912A-ABA	Printed copy
Paper Manual (User's Guide), Japanese	B2901A-ABJ B2902A-ABJ B2911A-ABJ B2912A-ABJ	Printed copy
Paper Manual (User's Guide), Traditional Chinese	B2901A-AB0 B2902A-AB0 B2911A-AB0 B2912A-AB0	Printed copy
Paper Manual (User's Guide), Simplified Chinese	B2901A-AB2 B2902A-AB2 B2911A-AB2 B2912A-AB2	Printed copy
Download the Product Manual from the Keysight website	B2901A-0B0 B2902A-0B0 B2911A-0B0 B2912A-0B0	No printed copy

The EasyEXPERT group+ software manuals (User's Guide) are also included in PDF format on the CD-ROM shipped with the B2900A. If you need printed manuals then they can be ordered using the part numbers shown below.

Description	Product Number	Additional Information
Paper Manual (User's Guide), English	B1540-90007	Printed copy, Volume 1 for EasyEXPERT group+
	B1540-90021	Printed copy, Volume 2 for EasyEXPERT group+
Paper Manual (User's Guide), Japanese	B1540-97007	Printed copy, Volume 1 for EasyEXPERT group+
	B1540-97021	Printed copy, Volume 2 for EasyEXPERT group+

Step 3. Select optional accessories

Step 3-1. Choose a rack mount kit (optional)

| Description	Product Number	Additional Information
Rack Mount Kit	B2901A-1CM B2902A-1CM B2911A-1CM B2912A-1CM	Rack mount kit for the B2900A series. 2U height EIA and 1/2 rack width.

Step 3. Select optional accessories (continued)

Step 3-2. Determine if you need to make 4-wire or guarded measurements

The B2900A SMUs support both 2-wire and 4-wire measurement. The default connection scheme is the simpler 2-wire configuration, which uses only the force terminals. In 2-wire mode the sense terminals are left open.

If you are measuring very small resistances or applying very large currents then you should use the 4-wire measurement method (also known as the Kelvin method). This technique uses both the force and sense terminals, and by making the measurement through the sense terminals (in which no current is flowing) the effects of cable resistance are eliminated.
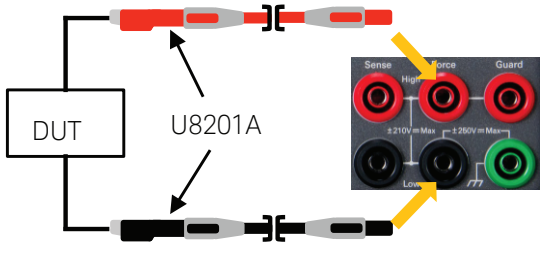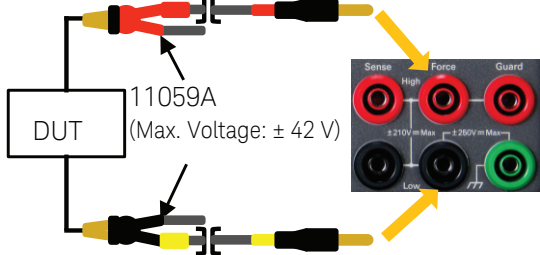

2-wire connections

4-wire connections
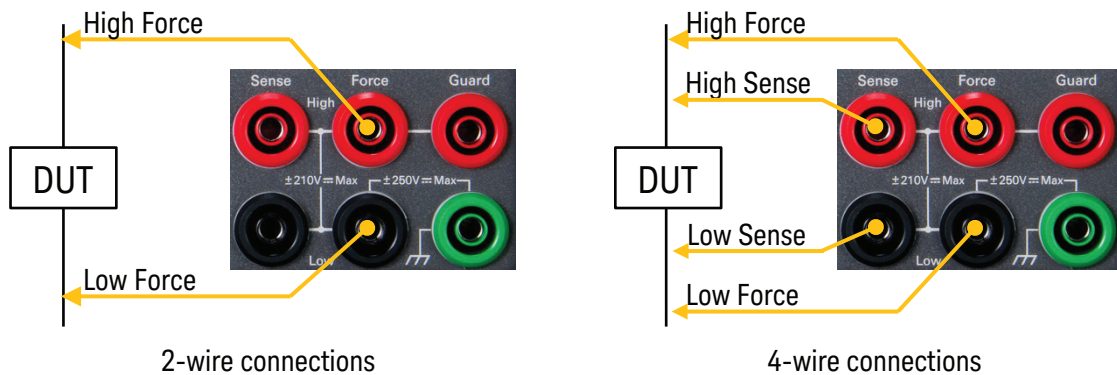
Low current measurements (< 1nA) require guarding to prevent leakage through the measurement cable. The schematic shown below provides a simplified overview of the guarding technique. Guarded measurements require the use of triaxial cables. A follower (x1) buffer amplifier keeps the guard conductor at the same potential as the center conductor. Since there is no voltage difference, no current can flow from the center conductor to the guard. Note: In this example, even the test fixture has a guarded shield to prevent leakage at the test fixture.
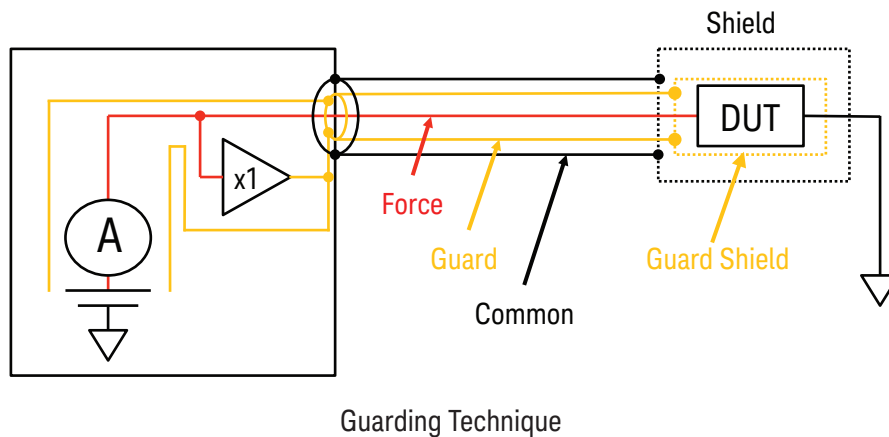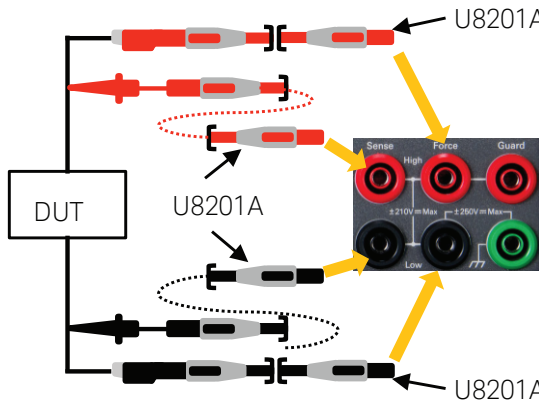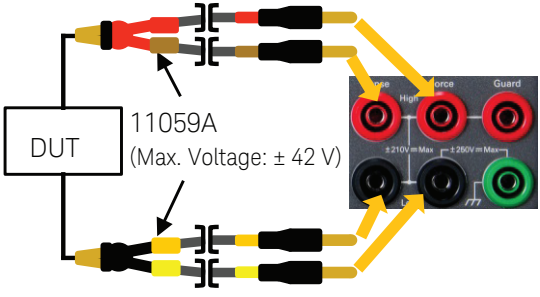

Guarding Technique

Step 3. Select optional accessories (continued)

Step 3-2. Determine if you need to make 4-wire or guarded measurements (continued)

1. Unguarded 2-Wire connection scheme

	Recommended Connection	Easy Connection
Typical connection example		The 11059A simplifies connectivity but does not support voltage magnitudes greater than ± 42 V.
Recommended accessories	U8201A Combo test lead kit	11059A Kelvin probe set

2. Unguarded 4-Wire connection scheme

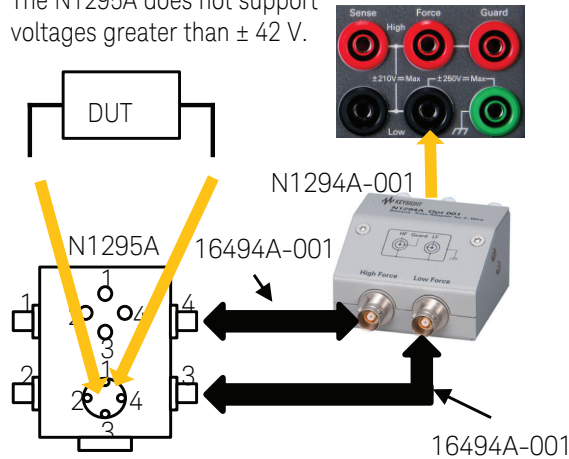|	Recommended Connection	Easy Connection
Typical connection example		The 11059A simplifies connectivity but does not support voltage magnitudes greater than ± 42 V.
Recommended accessories	U8201A Combo test lead kit	11059A Kelvin probe set

Step 3. Select optional accessories (continued)

Step 3-2. Determine if you need to make 4-wire or guarded measurements (continued)
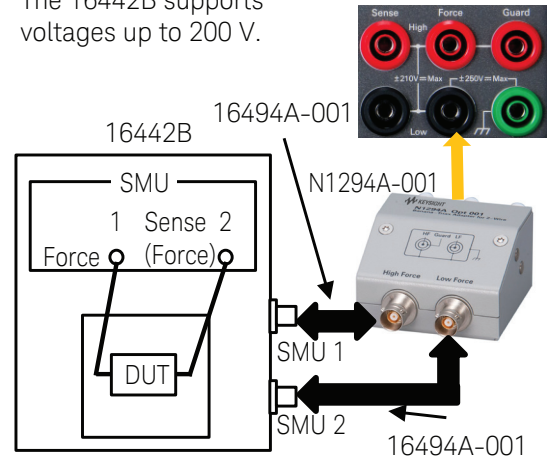
3. Guarded 2-Wire connection scheme

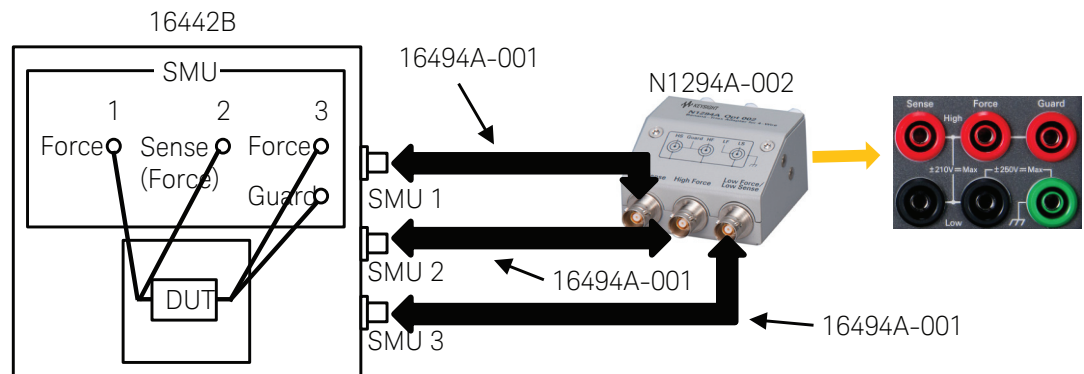|	**Recommended Connection**		
Typical connection example	The N1295A does not support voltages greater than ± 42 V.		The 16442B supports voltages up to 200 V.
Recommended accessories	16494A-001	2ea	Low leakage Triaxial cable (1.5 m)
	N1294A-001	1ea	Banana - Triaxial Adapter for 2-wire (non-Kelvin) connection
	N1295A	1ea	Device/component test fixture

(right side continued)

	16494A-001	2ea	Low leakage Triaxial cable
	N1294A-001	1ea	Banana - Triaxial Adapter for 2-wire (non-Kelvin) connection
	16442B	1ea	Test Fixture for general use

4. Guarded 4-Wire connection scheme

|	**Recommended Connection**		
Typical connection example			
Recommended accessories	16494A-001	3ea	Low leakage Triaxial cable (1.5 m)
	N1294A-002	1ea	Banana - Triaxial Adapter for 4-wire (Kelvin) connection
	16442B	1ea	Test Fixture for general use

Step 3. Select optional accessories (continued)

Step 3-3. Consider interlock circuit (optional)

To prevent accidental exposure to dangerously high voltages, the B2900A SMUs have a safety interlock. They cannot source voltages greater than ± 42 V unless the interlock circuit is closed. This is achieved using pins 16 and 24 on the rear Digital I/O output. Normally, these pins are routed to a shielding box or test fixture that must be closed to complete the interlock circuit.

If you are using the 16442B test fixture then you can use the N1294A-011 or 012 interlock cables to connect to the interlock circuit. If you are not using the 16442B then you should install an interlock circuit as shown in the figure below. For more detailed information, please refer to "Installing the Interlock Circuit" in the **Keysight B2900A Series User's Guide**.
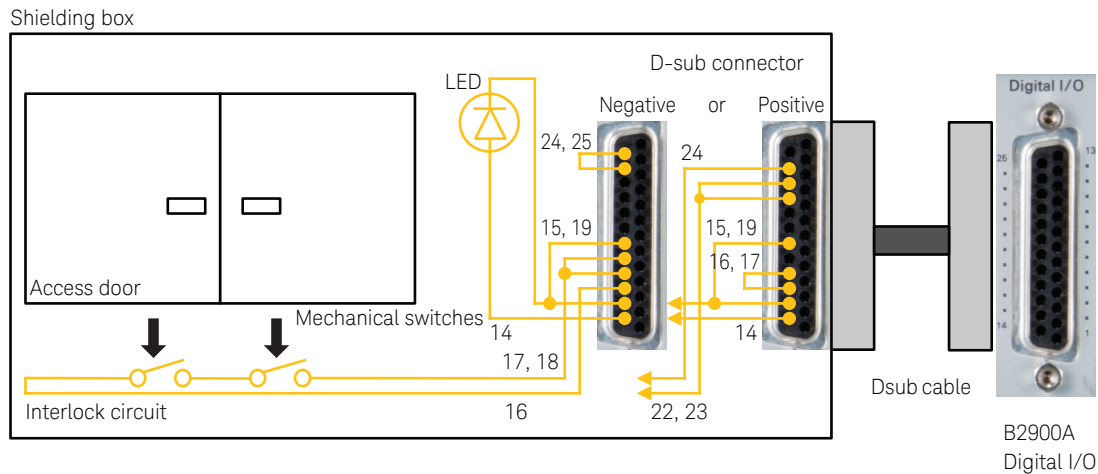
Step 3-4. Determine if you use the B2900A series with multiple free software control options (optional)

The B2900A series has multiple free software control options, allowing you to choose the solution that best fits your particular application.

Description	Product Number	Description
Interlock cable (1.5 m)	N1294A-011	Interlock cable for 16442A/B test fixture (GPIO Dsub25 to 6pin mini plug)
Interlock cable (3.0 m)	N1294A-012	

Software Control Option	Available interface	Description
BenchVue	GPIB, USB, LAN	Source constant voltage or current and control other Keysight instruments
Graphical Web Interface	LAN	Use your web browser to make basic measurements
Quick I/V Measurement Software	GPIB, USB, LAN	A common software solution for the entire B2900 family
EasyEXPERT group+	GPIB	Powerful software for detailed characterization and analysis of devices, circuits and materials

- 82357B GPIB-USB Interface is required for software control through GPIB interface.
- 1.8 m USB cable is furnished with the B2900A series for software control through USB interface.
- LAN cable is required for software control through LAN interface.
- The EasyEXPERT group+ software supports multiple unit control with synchronization. Please see the next page in detail.

Step 3. Select optional accessories (continued)

Step 3-4. Determine if you use the B2900A series with multiple free software control options (optional)

The EasyEXPERT group+ software is capable to control up to 4 units of the B2900A SMUs at the same time. It is required to make a connection of trigger lines in order to synchronize one unit to the others when you use multiple units of the B2900A SMUs with the EasyEXPERT group+ software. Only GPIB connection is available for the EasyEXPERT group+.
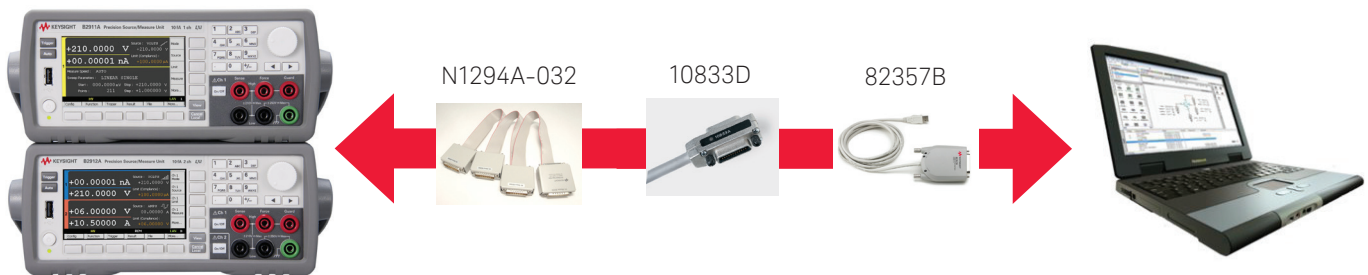
1. Use a single unit of the B2900A SMU

Recommended accessories for synchronization
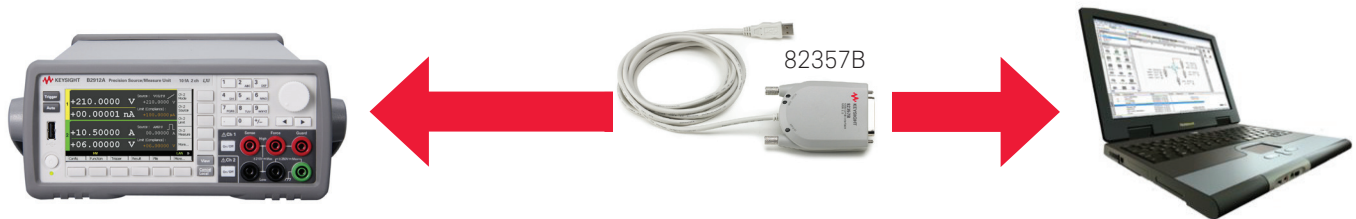
B2900A	1ea	Precision Source/Measure Unit
82357B	1ea	USB/GPIB interface

2. Use two units of the B2900A SMU

Recommended accessories for synchronization

B2900A	2ea	Precision Source/Measure Unit
82357B	1ea	USB/GPIB interface
N1294A-032	1ea	Digital I/O Trigger Cable for Multiple Unit Control
10833D	1ea	GPIB cable (0.5m)

3. Use three units of the B2900A SMU

Recommended accessories for synchronization
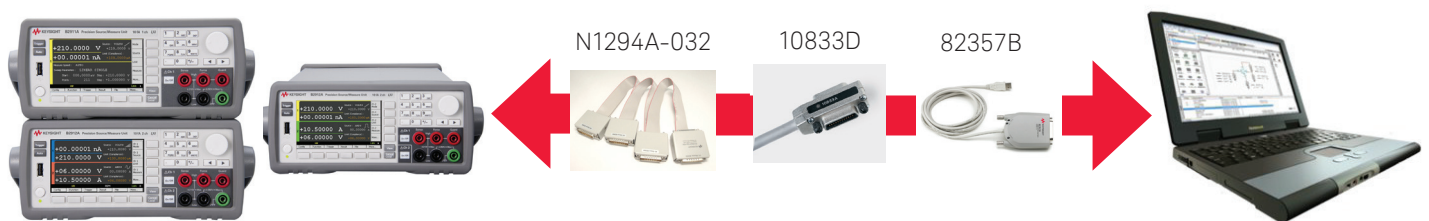
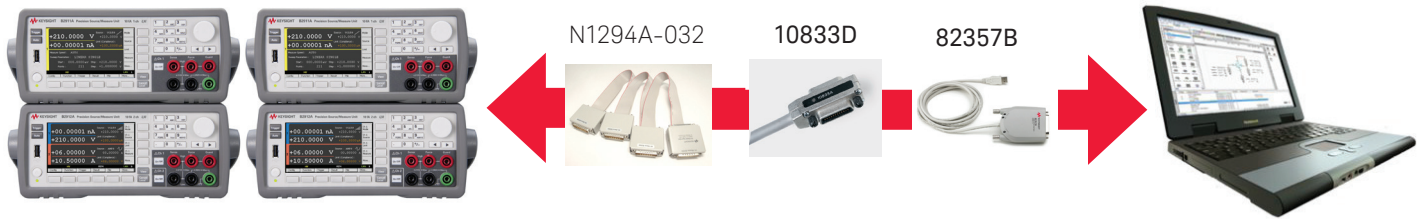| B2900A	3ea	Precision Source/Measure Unit
82357B	1ea	USB/GPIB interface
N1294A-032	1ea	Digital I/O Trigger Cable for Multiple Unit Control
10833D	2ea	GPIB cable (0.5m)

Step 3. Select optional accessories (continued)

Step 3-4. Determine if you use the B2900A SMUs with EasyEXPERT group+ software (continued)

The EasyEXPERT group+ software is capable to control up to 4 units of the B2900A SMUs at the same time. It is required to make a connection of trigger lines in order to synchronize one unit to the others when you use multiple units of the B2900A SMUs with the EasyEXPERT group+ software. Only GPIB connection is available for the EasyEXPERT group+.

4. Use 4 units of the B2900A SMUs

Recommended accessories for synchronization

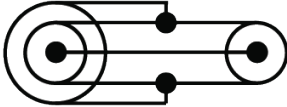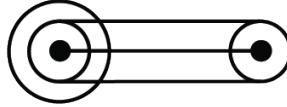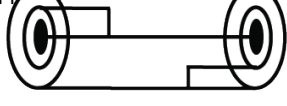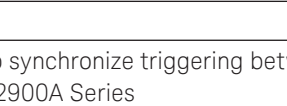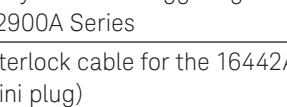| B2900A	4ea	Precision Source/Measure Unit
82357B	1ea	USB/GPIB interface
N1294A-032	1ea	Digital I/O Trigger Cable for Multiple Unit Control
10833D	3ea	GPIB cable (0.5m)
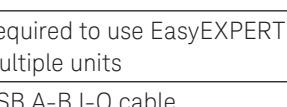
Step 3-5. Select additional accessories (optional)

The following optional accessories are available for specialized requirements.

Description	Product Number	Additional Information
Low leakage Triaxial cable (1.5 m)	16494A-001	16494A triaxial cable supports up to 200 V and 1 A.
Low leakage Triaxial cable (3.0 m)	16494A-002	
Low leakage Triaxial cable (0.8 m)	16494A-003	
Low leakage Triaxial cable (0.4 m)	16494A-004	
Low leakage Triaxial cable (4.0 m)	16494A-005	
High Current Triaxial cable (1.5m)	16493L-001	16493L triaxial cable supports current higher than 1 A.
High Current Triaxial cable (3.0m)	16493L-002	
Coax cable (1.5 m)	16493B-001	16493B coax cable supports up to 40 V and 200 mA.
Coax cable (3.0 m)	16493B-002	
High Current BNC Coax cable (1.5 m)	16493U-001	16493U coax cable supports up to 40 V and 20 A pulse.
High Current BNC Coax cable (3.0 m)	16493U-002	
Coaxial BNC cable (1.2 m)	U2921A-100	
Combo test lead kit	U8201A	
Kelvin probe set	11059A	

Step 3. Select optional accessories (continued)

Step 3-5. Select additional accessories (continued)

Description	Product Number	Additional Information
Triaxial(m) to BNC (f) adaptor	N1254A-101	
Triaxial(f) to BNC (m) adaptor	N1254A-102	
Triaxial(m) to BNC (f) adaptor	N1254A-103	
Triaxial (f) to BNC (m) adaptor	N1254A-104	
Triaxial (f) to BNC (m) adaptor	N1254A-105	
Triaxial (m) to BNC (f) adaptor	N1254A-106	
Triaxial (m) to Triaxial (f) adaptor	N1254A-107	
Coax Tee Adapter (m-f-f)	1250-2405	
Triaxial Tee Adapter (f-m-f)	1250-1551	
Digital I/O cable (1.5 m)	16493G-001	To synchronize triggering between member of the B2900A Series
Digital I/O cable (3.0 m)	16493G-002	
Digital I/O T-cable	N1253A-100	To synchronize triggering between member of the B2900A Series
Interlock cable (1.5 m)	N1294A-011	Interlock cable for the 16442A/B test fixture (GPIO Dsub-25 to 6-pin mini plug)
Interlock cable (3.0 m)	N1294A-012	
GPIO - BNC Trigger Adapter	N1294A-031	
Digital I/O Trigger Cable for Multiple Unit Control	N1294A-032	Required to use EasyEXPERT group+ software with multiple units
USB A-BI-O Cable (2.0 m)	8121-1696	USB A-B I-O cable
USB/GPIB interface	82357B	
Banana - Triaxial Adapter for 2-wire (non Kelvin) connection	N1294A-001	
Banana - Triaxial Adapter for 4-wire (Kelvin) connection	N1294A-002	
Device/component test fixture	N1295A	
Test Fixture for E5270 and general use	16442B	
GPIB cable (1.0 m)	10833A	
GPIB cable (2.0 m)	10833B	
GPIB cable (4.0 m)	10833C	
GPIB cable (0.5 m)	10833D	

Step 4. Select warranty length and calibration plan

Step 4-1. Select extended warranty (optional)

A 3-year warranty is included at no additional charge.

Description	Product Number	Additional Information
Warranty Assurance Plan – Return to Service Center – 5 years	R-51B-001-5F	

Step 4-2. Select calibration services (optional)

Keysight factory calibration is provided as standard and free of additional charges.

Description	Product Number	Additional Information
ANSI Z540-1-1994 Calibration	B2901A-A6J B2902A-A6J B2911A-A6J B2912A-A6J	Calibration certificate with measurement results available only at time of purchase
Commercial Calibration Certificate with Test Data	B2901A-UK6 B2902A-UK6 B2911A-UK6 B2912A-UK6	Calibration certificate with measurement results available only at time of purchase
Calibration Assurance Plan – Return to Service Center - 3 years	R-50C-011-3	
Calibration Assurance Plan - Return to Service Center - 5 years	R-50C-011-5	

Software Upgrade Package for B2900A Series

If you'd like to use the EasyEXPERT group+ or latest functions on GUI with your existing B2900A Series, a product update may be required. Please contact Keysight in detail.

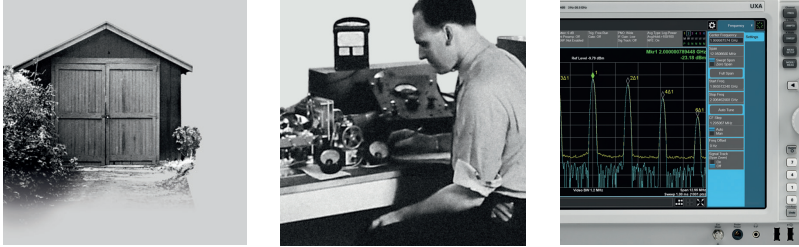| Description	Product Number	Additional Information
B2901A Software Upgrade Package	B2901AU	Extension Support and Subscription
B2902A Software Upgrade Package	B2902AU	Extension Support and Subscription
B2911A Software Upgrade Package	B2911AU	Extension Support and Subscription
B2912A Software Upgrade Package	B2912AU	Extension Support and Subscription

Related Literature

Publication Number	Publication Title
5990-7009EN	Keysight B2900A Series Precision Source/Measure Unit, datasheet
5991-3878EN	Accessories for the B2900 Precision Instrument Family
5991-3542EN	GPIO-BNC trigger Adapter Simplifies Triggering Connections

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