

Keysight Technologies B2961A/B2962A Low Noise Power Source

Notices

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COMPLIANCE WITH GERMAN NOISE REQUIREMENTS

This is to declare that this product is in conformance with the German Regulation on Noise Declaration for Machines
(Lärmangabe nach der Maschinenlärminformation-Verordnung -3.GSGV Deutschland).

- **Herstellerbescheinigung**

GERÄUSCHEMISSION

$L_{pa} < 70 \text{ dB}$

am Arbeitsplatz

normaler Betrieb

nach DIN 45635 T. 19

- **Manufacturer's Declaration**

ACOUSTIC NOISE EMISSION

$L_{pa} < 70 \text{ dB}$

operator position

normal operation

per ISO 7779

South Korean Class A EMC declaration

This equipment is Class A suitable for professional use and is for use in electromagnetic environments outside of the home.

A급 기기

(업무용 방송통신기자재)

이 기기는 업무용(A급) 전자파적합기기로서 판매자 또는 사용자는 이 점을 주의하시기 바라며, 가정외의 지역에서 사용하는 것을 목적으로 합니다.

Safety Summary

The following general safety precautions must be observed during all phases of operation, service, and repair of this instrument. Failure to comply with these precautions or with specific warnings elsewhere in this manual may impair the protections provided by the instrument. In addition, it violates safety standards of design, manufacture, and intended use of the instrument. Agilent Technologies, Inc. assumes no liability for customer's failure to comply with these requirements.

Product manuals may be provided on CD-ROM or in printed form. Printed manuals are an option for many products. Manuals may also be available on the Web. Go to www.agilent.com and type the product model number in the Search field at the top of the page.

NOTE

Do not use this instrument in any manner not specified by the manufacturer. The protective features of this instrument may be impaired if it is used in a manner not specified in the operation instructions.

This instrument is an INDOOR USE product.

This instrument complies with INSTALLATION CATEGORY II for mains input and INSTALLATION CATEGORY I for measurement input terminals, and POLLUTION DEGREE 2 defined in IEC 61010-1.

If an instrument is marked CAT I (IEC Measurement Category I), or it is not marked with a measurement category, its inputs must not be connected to line-voltage mains.

- ***DANGEROUS PROCEDURE WARNINGS***

Warnings, such as example below, shall be complied. Procedures throughout in this manual prevent you from potentially hazard. Their instructions contained in the warnings must be followed.

WARNING

Hazardous voltage of up to the instrument's maximum voltage may appear at High Force, Guard, and High Sense terminals if Interlock terminal is closed. Open the Interlock terminal when the High Force, Guard, and High Sense terminals are accessible. Voltage applied to the terminals will be limited up to ± 42 V.

- ***BEFORE APPLYING POWER***

Verify that all safety precautions are taken. Make all connections to the instrument before applying power. Note the instrument's external markings described under "Safety Symbols".

- *GROUND THE INSTRUMENT*

This is Safety Class I instrument. To minimize shock hazard, the instrument chassis and cabinet must be connected to an electrical ground. The power terminal and the power cable must meet International Electrotechnical Commission (IEC) safety standards.

- *DO NOT OPERATE IN AN EXPLOSIVE ATMOSPHERE*

Do not operate the instrument in the presence of flammable gases or fumes. Operation of any electrical instrument in such an environment constitutes a definite safety hazard.

- *DO NOT REMOVE COVERS*

No operator serviceable parts inside. Refer servicing to qualified personnel. To prevent electrical shock do not remove covers.

- *IN CASE OF DAMAGE*


Instruments that appear damaged or defective should be made inoperative and secured against unintended operation until they can be repaired by qualified service personnel. Return the instrument to a Agilent Technologies sales or service office for services and repair to ensure that safety features are maintained.


- *USE ONLY THE SPECIFIC ACCESSORIES*


Specific accessories satisfy the requirements for specific characteristics for using the instrument. Use the specific accessories, cables, adapters, and so on for safety reasons.


Safety Symbols


The general definitions of safety symbols used on equipment or in manuals are listed below.


 Direct current.


 Alternating current.

 Earth ground terminal.


 Protective conductor terminal. For protection against electrical shock in case of a fault. Used with field wiring terminals to indicate the terminal which must be connected to ground before operating equipment.


 Frame or chassis terminal. A connection to the frame (chassis) of the equipment which normally includes all exposed metal structures.


 Grounded terminal which indicates the earth potential.


 On supply.


 Off supply.


 Standby supply. The equipment will be marked with this symbol is not completely disconnected from AC mains when power switch is in the standby position.

 In position of a bi-stable push switch.

 Out position of a bi-stable push switch.

 Hazardous voltage and potential for electrical shock. Do not touch terminals that have this symbol when the equipment is on.

 Hot surface. Avoid contact. Surfaces are hot and may cause personal injury if touched.

 Instruction manual symbol. The equipment will be marked with this symbol when it is necessary for the user to refer to the instruction manual.

WARNING

The warning sign denotes a hazard. It calls attention to a procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in injury or death to personal.

CAUTION

The caution sign denotes a hazard. It calls attention to an operating procedure, practice, condition or the like, which, if not correctly performed or adhered to, could result in damage to or destruction of part or all of the equipment.

CAT I IEC Measurement Category I



The CE mark shows that the product complies with all applicable European Directives.



The CSA mark is a registered trademark of the Canadian Standards Association.



The C-Tick mark is a registered trademark of the Australian Communications Authority. This signifies compliance with the Australian EMC Framework Regulations under the terms of the Radio communications Act.

ICES/NMB-001

This ISM device complies with Canadian ICES-001.
Cet appareil ISM est conforme à la norme NMB-001 du Canada.



This is the symbol for an Industrial, Scientific and Medical, Group 1 Class A product. (CISPR 11)



Korea's safety and EMC mark



China RoHS - Environmentally Green Product Label



China RoHS - Product with Toxic Substance 40 yr EPUP



The Chinese mark for paper-based packaging materials; Paperboard and Corrugated Fiberboard



Plastic Material Coding Identification

Power Supply and Measurement Safety

- Power Supply Safety

This instrument can output high currents and voltages. Make sure that the load or device under test can safely handle the output current and voltage. Also, make sure that the connection leads can safely withstand the expected currents and are insulated for the expected voltages.

The instrument outputs may be connected so as to float relative to earth ground. Isolation or floating voltage ratings are indicated on the instrument, near the output terminal or the Chassis ground terminal.

- Voltage/Current Measurement Safety

Multimeters and other instruments capable of measuring high voltages and currents are subject to specific safety concerns because of the circuits to which they may be connected. To safely use these instruments, you need to understand the markings on the instrument near the input terminals, which include the Protection Limits and the IEC Measurement Category.

- Protection Limits

Agilent multimeters and other voltage measurement instruments provide protection circuitry to prevent damage to the instrument and to protect against the danger of electric shock, provided the Protection Limits are not exceeded. To ensure safe operation of the instrument, do not exceed the Protection Limits shown on the input terminals.

- Source/Measure Terminals

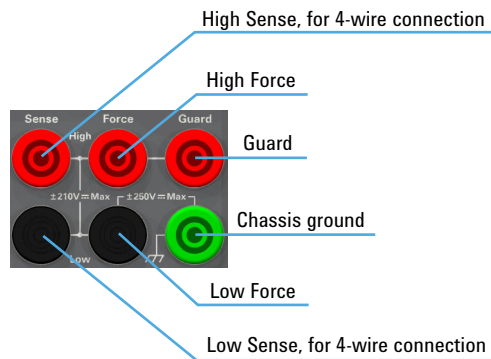
This instrument can simultaneously perform DC voltage or current output and measurement, and has the Force, Sense, and Guard terminals as shown below. Normally the Force, Sense, and Guard are the same potential. Voltage marked around the terminals indicates the Protection Limits.

Force and Sense must be connected to a terminal of a device under test (DUT) for the 4-wire connection (Kelvin connection) which is effective for applying voltage accurately. For the 2-wire connection to ease the connections, connect Force only. Do not connect Sense. It must be opened.

Guard should be connected to the guard shield which covers the DUT high side wiring for reducing leakage current caused by the wire. Or else, the Guard must be opened.

Chassis ground (green terminal) should be connected to the ground shield which covers the DUT including the guard shield to minimize the affect of noise. Or else, the chassis ground should be opened.

The following image is the source and measurement terminals of Agilent B2961A/B2962A. For the B2961A/B2962A, the High Force, High Sense, and Guard are the same potential. And the Low Force and Low Sense are the same potential.



High Voltage Shock Hazard

Agilent B2961A/B2962A can force dangerous voltages (± 210 V) at the High Force, Guard, and High Sense terminals. To prevent electric shock hazard, the following safety precautions must be observed during the use of Agilent B2961A/B2962A.

- Use a three-conductor AC power cable to appliance coupler (inlet) and the instrument to an electric ground (safety ground).
- Prepare shielding box which covers interface to a device under test and equipped with interlock circuit that opens when the door is opened.
- Before performing measurement, connect the interlock circuit to the Interlock terminal of this instrument.
- Confirm periodically that the interlock function works normally.
- Before touching the connections of the High Force, Guard, and High Sense terminals, turn the instrument off and discharge any capacitors of the measurement path. If you do not turn the instrument off, complete “all” of the following items, regardless of any instrument’s settings.
 - Terminate source output by pressing the On/Off switch, confirm that the On/Off switch turns off.
 - Confirm that the High Voltage indicator is not lit.
 - Open the shielding box access door (open the Interlock terminal).
 - Discharge any capacitors if the capacitance is connected to this instrument.
- Warn workers in the vicinity of the instrument about hazardous conditions.

Gefahr durch Hochspannung

Von den Geräten Agilent B2961A/B2962A können Spannungen an den Anschlüssen "High Force", "Guard" und "High Sense" von bis zu 210 V ausgehen. Um elektrischem Schlag vorzubeugen, ist bei der Benützung der Geräte Agilent B2961A/B2962A folgendes zu beachten.

- Verwenden Sie ein dreiphasiges AC-Stromkabel für die Gerätsteckvorrichtung (Eingang) und schließen Sie das Instrument an eine Erdung an (Sicherheitserdung).
- Bereiten Sie das Abschirmungsgehäuse vor, dass die Oberfläche eines zu testenden Geräts abdeckt und mit einem Verriegelungsstromkreis ausgestattet ist, der bei geöffneter Tür unterbrochen wird.
- Vor der Messung verbinden Sie den Verriegelungsstromkreis mit dem Interlock-Anschluss dieses Instruments.
- Prüfen Sie in regelmäßigen Abständen, dass die Verriegelungsfunktion ordnungsgemäß funktioniert.
- Bevor Sie die Verbindungen zu den Anschlüssen "High Force", "Guard" und "High Sense" berühren, schalten Sie das Instrument aus und entladen alle Kondensatoren des Messwegs. Wenn Sie das Instrument nicht ausschalten, führen Sie, unabhängig von den Instrumenteinstellungen, alle folgenden Schritte durch.
 - Beenden Sie die Messung, indem Sie auf die Taste "On/Off" drücken. Stellen Sie sicher, dass die Statusanzeige "On/Off" nicht leuchtet.
 - Stellen Sie sicher, dass die Anzeige "High Voltage" nicht leuchtet.
 - Öffnen Sie die Tür des Abschirmungsgehäuses (öffnen des Interlock-Anschlusses).
 - Entladen Sie alle Kondensatoren, wenn die Kapazität mit das Instrument verbunden ist.
- Warnen Sie Mitarbeiter in der Umgebung des Instruments vor den Gefahren.

Danger de choc dû à une haute tension

Une tension dangereuse (max. \pm pour 210 Vdc) émanant du dispositif Agilent B2961A/B2962A peut être sortie aux bornes High Force, Guard et High Sense, d'appareil de protection ou de détection. Les précautions suivantes doivent être observées contre commotion électrique accidentelle.

- Utilisez un câble d'alimentation CA à trois conducteurs vers le coupleur secteur (entrée) et branchez l'instrument sur une mise électrique à la terre (prise de terre de sécurité).
- Préparez le boîtier de protection qui couvre l'interface avec le dispositif à tester et équipez-le d'un circuit de sécurité qui s'ouvre lors de l'ouverture d'une porte.
- Avant de procéder aux mesures, connectez le circuit de sécurité à la borne Interlock de l'instrument.
- Vérifiez régulièrement le bon fonctionnement de la fonction de sécurité.
- Avant de toucher les connexions des bornes High Force, Guard et High Sense, mettez l'instrument hors tension et déchargez tout condensateur du chemin de mesure. Si vous ne mettez pas l'instrument hors tension, effectuez « toutes » les opérations ci-dessous, quels que soient les paramètres de l'instrument.
 - Terminez les mesures en appuyant sur la touche On/Off ; vérifiez que l'indicateur d'état On/Off est éteint.
 - Vérifiez que le témoin High Voltage est éteint.
 - Ouvrez la trappe d'accès au boîtier de protection (ouvrez la borne Interlock).
 - Déchargez les éventuels condensateurs si la capacité est connectée à l'instrument.
- Informez les personnes travaillant à proximité de l'instrument des conditions.

高電圧感電注意

Agilent B2961A/B2962A の High Force、Guard、High Sense 端子には、危険電圧が出力されることがあります（最大 ± 210 Vdc）。感電事故防止のため、必ず以下の事柄を守ってください。

- 3 極電源ケーブルを使用して本器を接地してください。
- ドアを開くことによって開放されるインターロック回路を装備し、被測定デバイスとのインタフェースを覆うことのできるシールド・ボックスを用意してください。
- 測定を開始する前にはインターロック回路を本器の **Interlock** 端子に接続してください。
- インターロック機能が正常であることを定期的を確認してください。
- **High Force、Guard、High Sense** 端子に繋がる接続部に触れる前には、本器の電源を切断してください。また、測定系のキャパシタを放電してください。電源を切らない場合は、以下の事項を全て実施してください。
 - **On/Off** スイッチを押して **On/Off** スイッチが消灯したことを確認してください。
 - 高電圧警告（**High Voltage**）インジケータが消灯していることを確認してください。
 - シールド・ボックスのドアを開けてください（**Interlock** 端子を開放してください）。
 - 本器にキャパシタが接続されているならば、キャパシタを放電してください。
- 周囲のほかの作業者に対しても、高電圧危険に対する注意を徹底してください。

Product Stewardship



- **Waste Electrical and Electronic Equipment (WEEE) Directive 2002/96/EC**

This product complies with the WEEE Directive (2002/96/EC) marking requirements. The affixed label indicates that you must not discard this electrical/electronic product in domestic household waste.

Product Category: With reference to the equipment types in the WEEE directive Annex 1, this product is classified as a "Monitoring and Control instrumentation" product.

Do not dispose in domestic household waste.

To return unwanted products, contact your local Agilent office or visit the following website for more information.

www.agilent.com/environment/product/

- **LCD Fluorescent Lamp**

Certain products sold by Agilent contain a liquid crystal display (LCD); backlighting for the LCD is provided by a fluorescent lamp which contains mercury, and must be managed, recycled, and/or disposed in accordance with all applicable laws, ordinances and regulations.

For information on how to recycle or dispose of the fluorescent lamp contained in your own product, visit the following website.

<http://www.agilent.com/environment/mercury.shtml>

If you live in the U.S., also visit the following websites.

<http://www.lamprecycle.org>

<http://www.eiae.org>

If you have additional questions, please visit the following website.

<http://www.agilent.com/go/contactus>

- **Perchlorate Information**

Perchlorate Material - special handling may apply. Visit the following website.

<http://www.dtsc.ca.gov/hazardouswaste/perchlorate/>

Equipment's real-time clock battery or coin cell battery may contain perchlorate and may require special handling when recycled or disposed of in California.

In This Manual

This manual describes the front panel operation, installation, and functions of the Agilent Technologies B2961A/B2962A Low Noise Power Source. This manual consists of the following chapters.

- Chapter 1, “Getting Started”

This chapter briefly explains how to use the Agilent B2961A/B2962A by the front panel operation.

- Chapter 2, “Introduction”

This chapter describes overview, specifications, accessories, and options of the Agilent B2961A/B2962A.

- Chapter 3, “Installation”

This chapter explains how to install the Agilent B2961A/B2962A, and how to connect the device under test to a test fixture.

- Chapter 4, “Front Panel Reference”

This chapter provides the reference information of the Agilent B2961A/B2962A front panel keys and graphical user interface.

- Chapter 5, “Front Panel Operations”

This chapter explains how to use the Agilent B2961A/B2962A in the local mode.

- Chapter 6, “Function Details”



This chapter explains the several functions and initial settings of the Agilent B2961A/B2962A.

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1 Getting Started

Getting Started


This chapter describes basic operations for Agilent B2961A/B2962A. Before learning the details of B2961A/B2962A, let us briefly cover the use of the B2961A/B2962A. The operations require only B2961A/B2962A and the power cord. To get started with the operations, open the measurement terminals.

This chapter consists of the following sections.

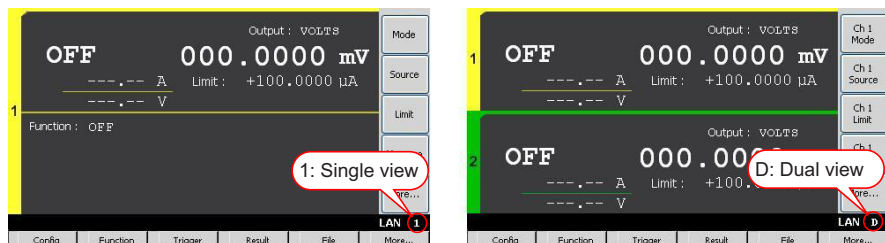
- “Applying DC Output”
- “Applying Waveform Output”
- “Performing Spot Measurement”
- “Performing Sweep Measurement”
- “Operation Tips”
- “Operation Summary”

NOTE

Turning B2961A/B2962A on

1. Connect the power cord from the AC input connector (receptacle) on B2961A/B2962A's rear panel to an AC power outlet at your site.
2. Press the line switch  on the front panel.

B2961A/B2962A boots up and performs a self-test. After B2961A/B2962A boots normally, the front panel LCD displays the following view. It will be the Single view for the 1-channel model or the Dual view for the 2-channel model.



NOTE

Connecting your DUT

If you want to connect your device under test, see “Connecting a DUT” on page 3-11.


Applying DC Output

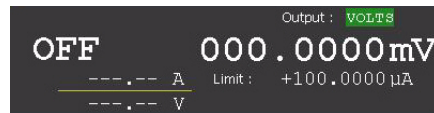
B2961A/B2962A can be used as a DC current or voltage source. The following procedure configures B2961A/B2962A as a voltage source and applies a voltage of +0.5 V.



Step 1. Press the  key to display the Single view or Dual view.

Step 2. Setting the Source mode (voltage output)

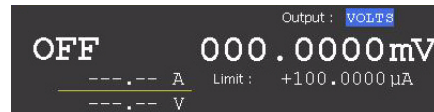
1. Press the **Mode** assist key on a 1-ch model, or the **Ch1 Mode** assist key on a 2-ch model.

The field pointer appears on the Source mode, and the status changes to EDIT (green). The status information will show .



2. Press the **VOLTS (V)** assist key. Or use the rotary knob or arrow keys  and  to specify the mode, and press the knob to fix the setting.

The status changes to MOVE (blue). The status information will show .



Step 3. Setting the Source value (voltage output value)

1. Press the **Source** assist key on a 1-ch model, or the **Ch1 Source** assist key on a 2-ch model. Or, use the rotary knob or arrow keys to move the field pointer onto the Source value and press the knob. The field pointer appears on the Source value, and the status changes to EDIT (green).
2. Turn the rotary knob clockwise to increase the value, or counter clockwise to decrease the value. Set the desired value.

When you press an arrow key, a digit pointer will appear on a digit. Turning the knob will change the value of the digit or move the decimal point if the pointer is on it.

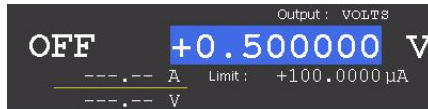
3. Press the rotary knob to fix the value. The status changes to MOVE (blue).

Getting Started

Applying DC Output

The numeric/alpha keys and the unit assist keys are also available for setting the Source value in the same way as for setting the Limit value, shown in the next step.

This example sets the Source value to +0.5 V.



Step 4. Setting the Limit value (current limit value)

1. Press the **Limit** assist key on a 1-ch model, or the **Ch1 Limit** assist key on a 2-ch model. Or, use the rotary knob or arrow keys to move the field pointer onto the Limit value and press the knob. The field pointer appears on the Limit value, and the status changes to EDIT (green).




2. Use the rotary knob, arrow keys, or numeric/alpha keys to set the value.
3. Press one of the unit assist keys to set the unit and fix the value. The status changes to MOVE (blue).



This example sets the Limit value to 100 nA.



Step 5. Enabling the channel


Press the Ch 1  switch to enable channel 1. This turns the switch green. The channel 1 changes status to CV (Constant Voltage) and starts DC output.

The channel 1 also performs output monitor. In this example, the channel 1 measures the channel output voltage and current once.



In this status, changing the setup changes the channel output immediately.

Step 6. Disabling the channel

Press the Ch 1  switch to disable channel 1. This turns off the switch light.

Applying Waveform Output

B2961A/B2962A can be used as a current or voltage waveform generator. The following procedure configures B2961A/B2962A as a voltage waveform generator and applies a sinusoidal wave voltage of 1 V and 1 Hz.

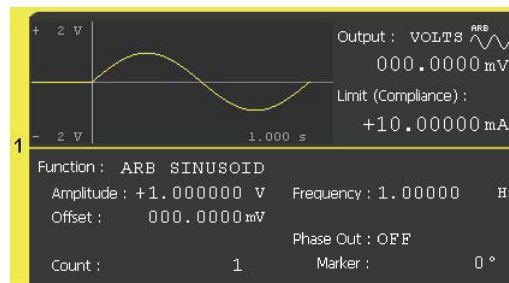
If you want to apply DC output before starting the waveform output, set the DC source. Setup example is described in “Applying DC Output” on page 1-3.

Step 1. Press the  key to display the Single view.


Step 2. Setting the waveform parameters


1. Use the rotary knob or arrow keys to move the field pointer onto the Function field. If the screen does not display the field, press **More** and **Hide xxxx**.
2. Press the rotary knob to change the status to EDIT (green).
3. Press **More** and **ARB SINUSOID** to set the sinusoidal wave mode. The source shape indicator shows the sinusoid icon, and the status changes to MOVE (blue).
4. Use the rotary knob, arrow keys, or numeric/alpha keys to set the Amplitude, Frequency, and Offset. Optionally, press **Show Preview** to display the preview.

This example sets Amplitude/Frequency/Offset to 1 V/1 Hz/0 V.




Step 3. Enabling the channel

Press the Ch 1  switch to enable channel 1. This turns the switch green. The channel 1 changes status to CV (Constant Voltage) and starts DC output.

Step 4. Press the  key to start a waveform output.

Step 5. Disabling the channel


Press the Ch 1  switch to disable channel 1. This turns off the switch light.

Performing Spot Measurement


B2961A/B2962A can be used as a DC current and voltage meter. The following procedure measures current and voltage.

If you want to apply DC output before starting measurement, set the DC source. Setup example is described in “Applying DC Output” on page 1-3.



Step 1. Setting the Measure parameter (current and voltage measurement)

1. Press **Measure** on a 1-ch model or **Ch1 Measure** on a 2-ch model.
2. Press **AMPS (I)**.
3. Press the  key once, and press the rotary knob once.
4. Press **VOLTS (V)**.

Step 2. Enabling the channel

Press the Ch 1  switch to enable channel 1. This turns the switch green. The channel 1 changes status to CV (Constant Voltage) or CC (Constant Current) and starts DC output.


Step 3. Starting measurement

- Press the  key to start a single (one shot) measurement. Spot measurement is performed once.
- Press the  key to start a repeat (continuous) measurement. Spot measurement is performed repeatedly.

The following example shows the measurement results for a 10 M Ω resistor connected between the High Force and Low Force terminals of channel 1.



Step 4. Disabling the channel

Press the Ch 1  switch to disable channel 1. This turns off the switch light.

Performing Sweep Measurement

B2961A/B2962A can be used as a DC current/voltage sweep source and meter. The following example applies a staircase sweep voltage and measures current and voltage at each step voltage.

Step 1. Press the  key to display the Single view.

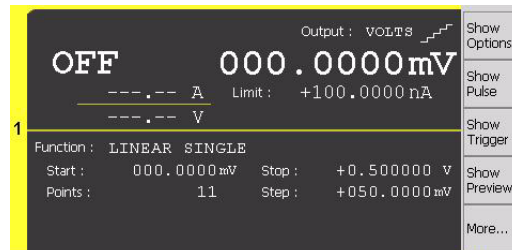
Step 2. Set the Source mode, Limit value, and Measure parameter. Setup example is described in “Applying DC Output” and “Performing Spot Measurement”.

This example sets the voltage output mode, 100 nA limit value, and both current and voltage measurements.

Step 3. Setting the Sweep parameters

1. Use the rotary knob or arrow keys to move the field pointer onto the Function field. If the screen does not display the field, press **More** and **Hide xxxx**.
2. Press the rotary knob to change the status to EDIT (green).
3. Press **LINEAR SINGLE** to set the linear single sweep mode. The source shape indicator shows the staircase icon, and the status changes to MOVE (blue).
4. Use the rotary knob, arrow keys, or numeric/alpha keys to set the Start (sweep start value), Stop (sweep stop value), and Step (sweep step value) or Points (number of sweep steps).

This example sets Start to 0 V, Stop to 0.5 V, and Points to 11.



Step 4. Setting the Trigger parameters

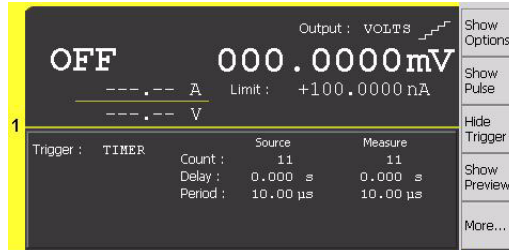
1. Press **More** and **Show Trigger** to display the Trigger setup.
2. Press the rotary knob onto the Trigger field to change the status to EDIT (green).
3. Press **TIMER** to set the timer trigger mode.

Getting Started

Performing Sweep Measurement

- Use the rotary knob, arrow keys, or numeric/alpha keys to set the Count (trigger count) for both Source and Measure.

This example sets Count to 11 for both Source and Measure.



Step 5. Press the **View** key to display the Graph view.

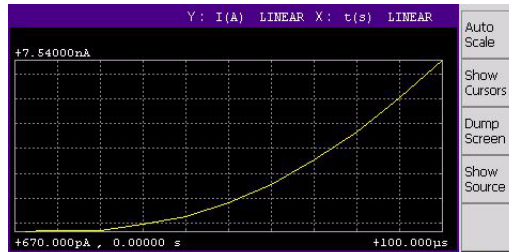
Step 6. Enabling the channel

Press the Ch 1 **On/Off** switch to enable channel 1. This turns the switch green. The channel 1 changes status to CV (Constant Voltage) and starts DC output.

Step 7. Press the **Trigger** key to start a single (one shot) measurement. Sweep measurement is performed once. And the measurement results will be displayed on the I-t graph.

Step 8. Press **Auto Scale** to fit the trace in the graph scale.

The following example shows the measurement results for a 10 MΩ resistor connected between the High Force and Low Force terminals of channel 1.



Step 9. Disabling the channel

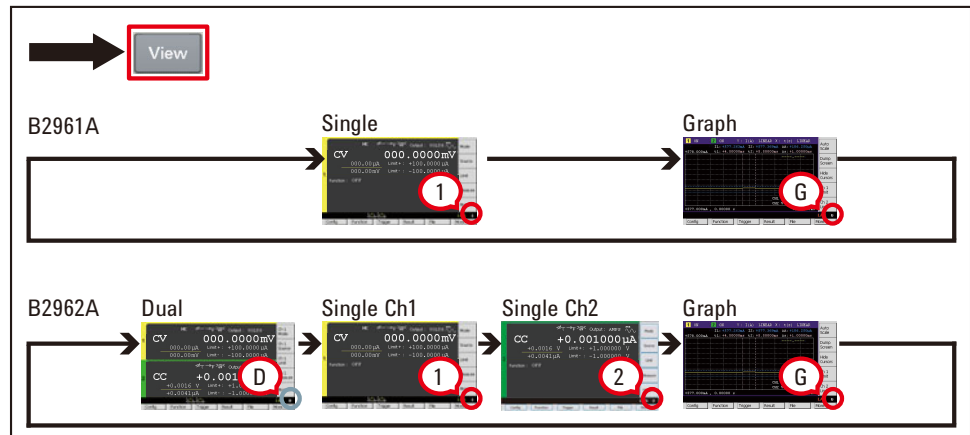
Press the Ch 1 **On/Off** switch to disable channel 1. This turns off the switch light.

Operation Tips

This section introduces key operation and status information on B2961A/B2962A.

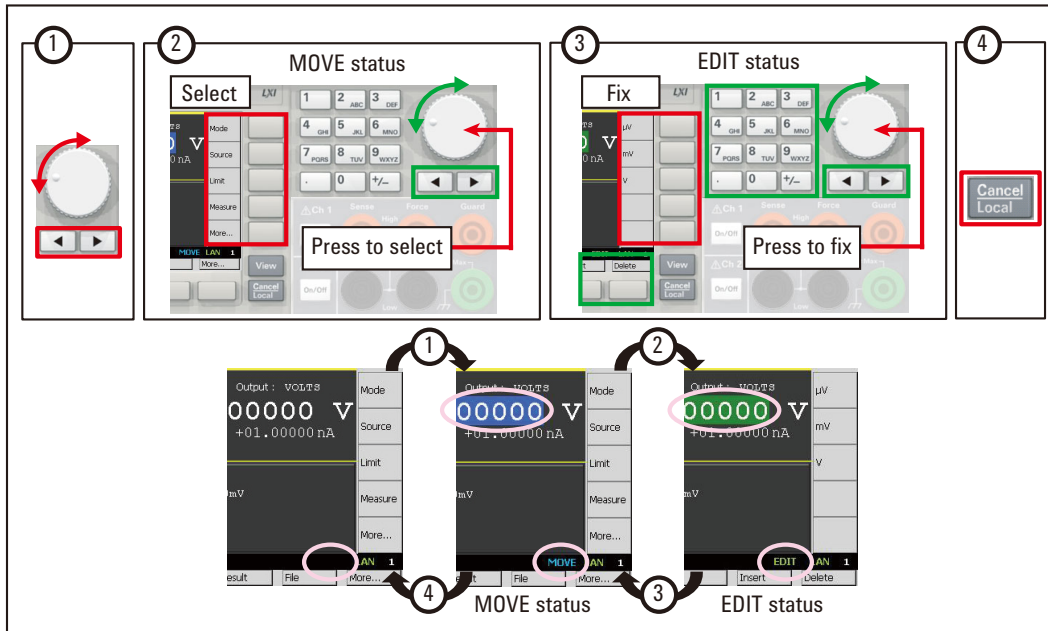
- “Changing the View Mode”
- “Editing the Setup”
- “Status Information”

Figure 1-1 Changing the View Mode



For details about the View mode, see “Display and Assist Keys” on page 4-5.

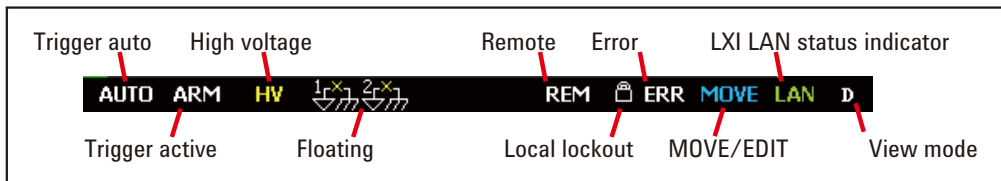
Figure 1-2 Editing the Setup



For more information about the front panel keys, see “Hard Keys and Rotary Knob” on page 4-3.

If the field pointer is in the EDIT (green) status on the Source or Limit field, turning the knob changes the setting value of the source channel in real time.

Figure 1-3 Status Information



For details about the status information, see “Status Information” on page 4-24.

Operation Summary

This section summarizes front panel operations on B2961A/B2962A.

- “Basic Operations”
- “Channel Setup”
- “Source Setup”
- “Measurement Setup”
- “Display Setup”
- “File Operations”
- “Miscellaneous Functions”
- “Interface Setup”
- “System Setup and Operations”

For details about front panel operations, see Chapter 4, “Front Panel Reference.”

Table 1-1 Basic Operations

| Task | Relevant front panel key |
|--|--|
| To turn the B2961A/B2962A on/off | Line switch |
| To change the display mode | View key |
| To enable/disable the specified channel | Ch 1 On/Off switch or Ch 2 On/Off switch |
| To cancel the previous setup operation | Cancel/Local key |
| To return to the upper menu of a function key or softkey | Cancel/Local key |
| To return to the local status from the remote status | Cancel/Local key |
| To start a single (one shot) output/measurement | Trigger key |
| To start a repeat (continuous) measurement | Auto key |
| To move the field pointer | Rotary knob or arrow keys |
| To move the digit pointer | Rotary knob or arrow keys |
| To switch the EDIT/MOVE status | Rotary knob on a setup field |
| To select the setup value | Assist keys, rotary knob, or arrow keys |

Table 1-2 Channel Setup

| Task | Relevant front panel key |
|---|--|
| To enable/disable the specified channel | Ch 1 On/Off switch or Ch 2 On/Off switch |
| To select the sensing type; 2-wire or 4-wire | Config > Source > Connection function keys |
| To select the low terminal status; grounded or floating | Config > Source > Connection function keys |
| To enable/disable high capacitance mode | Config > Source > Connection function keys |
| To enable/disable over voltage/current protection | Config > Source > Connection function keys |
| To enable/disable resistance compensation | Config > Measure > R Compens function keys |
| To enable/disable 2-channel synchronous operation | Config > Common > Group function keys |

Table 1-3 Source Setup

| Task | Relevant front panel key |
|--|---|
| To enable/disable source output | Ch 1 On/Off switch or Ch 2 On/Off switch |
| To select source output mode | Mode, Ch1 Mode, or Ch2 Mode assist key |
| To set source output value | Source, Ch1 Source, or Ch2 Source assist key |
| To set limit value | Limit, Ch1 Limit, or Ch2 Limit assist key |
| To set function OFF, sweep output (linear single, linear double, log single, log double, or list), or arbitrary waveform output (exponent, ramp, square, sinusoid, trapezoid, triangle, or user defined) | Hide Options/Pulse/Trigger assist key on Single view |
| To set constant source ranging mode | Show Options assist key on Single view |
| To set programmable output resistance | Show Options assist key on Single view |
| To set list sweep source | Edit assist key in the EDIT status for the LIST sweep Start/Stop/Points field |
| To set sweep source ranging mode | Config > Source > Sweep function keys |
| To set sweep direction | Config > Source > Sweep function keys |
| To set source output value after sweep | Config > Source > Sweep function keys |
| To set pulse source | Show Pulse assist key on Single view |
| To set source wait time | Config > Common > Wait function keys |
| To set output filter | Config > Source > Filter function keys |
| To use external low noise filter | Config > Source > Ext. Filter function keys |
| To set programmable output resistance using emulation table | Config > Source > Output R function keys |
| To select output-off status | Config > Source > Connection function keys |
| To enable/disable automatic output ON | Config > Source > Connection function keys |
| To enable/disable automatic output OFF | Config > Source > Connection function keys |

Table 1-4 Measurement Setup

| Task | Relevant front panel key |
|---|--|
| To enable/disable the specified channel | Ch 1 On/Off switch or Ch 2 On/Off switch |
| To select measurement mode | Measure, Ch1 Measure, or Ch2 Measure assist key |
| To set measurement speed | Show Options assist key on Single view |
| To set measurement wait time | Config > Common > Wait function keys |

Table 1-5 Display Setup

| Task | Relevant front panel key |
|---|--|
| To change the display mode | View key |
| To change the color set | Display > Color function keys |
| To enable zoom-in | Display > Zoom > ON function keys |
| To disable zoom-in | Zoom Out assist key for the zoom-in display status |
| To enable/disable the front panel display in the remote condition | Display > Remote function keys |

Table 1-6 File Operations

| Task | Relevant front panel key |
|--|---|
| To save a measurement result data to USB memory | File > Save > Measure function keys |
| To save a math result data to USB memory | File > Save > Math function keys |
| To save a trace buffer data to USB memory | File > Save > Trace function keys |
| To save a system setting data to USB memory | File > Save > Config function keys |
| To save a graph screen dump to USB memory | Dump Screen assist key on Graph view |
| To load a system setting data from USB memory | File > Load > Config function keys |
| To load a list sweep data from USB memory | Load assist key in the EDIT status for the LIST sweep Start/Stop/Points field |
| To load a user defined waveform data from USB memory | Load assist key in the EDIT status for the ARB USER Start/Stop/Points field |

Table 1-7 Miscellaneous Functions

| Task | Relevant front panel key |
|--|---|
| To enable V/I Limit for each polarity | Display > Pref. function keys |
| To enable immediate V/I update by knob | Display > Pref. function keys |
| To see measurement result | Result > Measure function keys |
| To use math expression | Function > Math function keys |
| To see math result | Result > Measure function keys |
| To set trace buffer | Function > Trace function keys |
| To see trace statistical result | Result > Trace function keys |
| To select program memory | Program > Catalog function keys |
| To control program memory | Program > Control function keys |
| To set trigger parameters easily | Show Trigger assist key on Single view |
| To set trigger parameters in detail | Function > Trigger > Config function keys |
| To control trigger system | Function > Trigger > Initiate/Abort/Immediate function keys |

Table 1-8 Interface Setup

| Task | Relevant front panel key |
|--|--|
| To specify measurement data elements | I/O > Format > Measure function keys |
| To specify math data elements | I/O > Format > Math function keys |
| To specify trace statistical data elements | I/O > Format > Trace function keys |
| To select data output format | I/O > Format > Data Type function keys |
| To enable/disable byte swap of binary data | I/O > Format > Byte Swap function keys |
| To set LAN configuration | I/O > LAN > Config function keys |
| To see status of LAN interface | I/O > LAN > Status function keys |
| To reset all of LAN connections | I/O > LAN > Reset function keys |

Getting Started
Operation Summary

| Task | Relevant front panel key |
|--|-----------------------------------|
| To sets LAN settings to the default settings | I/O > LAN > Default function keys |
| To see status of USB interface | I/O > USB function keys |
| To set GPIB address | I/O > GPIB function keys |
| To see status of GPIB interface | I/O > GPIB function keys |
| To set configuration of Digital I/O | I/O > DIO > Config function keys |
| To read/write a value set to Digital I/O | I/O > DIO > R/W function keys |

Table 1-9 **System Setup and Operations**

| Task | Relevant front panel key |
|--------------------------------------|---|
| To set power line frequency | System > PLC function keys |
| To initialize B2961A/B2962A | System > Reset function keys |
| To perform self-calibration | System > Cal/Test > Self-Cal function keys |
| To perform self-test | System > Cal/Test > Self-Test function keys |
| To check errors | System > Error > Log function keys |
| To clear errors | System > Error > Clear function keys |
| To clear time stamp | System > Timestamp > Clear function keys |
| To set automatic clear of time stamp | System > Timestamp > Auto CLR function keys |
| To set start-up operation | System > More > Start-up function keys |
| To enable/disable beep and sound | System > More > Sound function keys |
| To set date and time | System > More > Info. > Date/Time function keys |
| To perform firmware update | System > More > Info. > Update > Firmware function keys |
| To perform demonstration | System > More > Info. > Demo. function keys |

Introduction

This chapter describes the basic functions and features of the Agilent B2961A/B2962A, and consists of the following sections.

- “Agilent B2961A/B2962A”
- “Front View”
- “Rear View”
- “Power Source”
- “Specifications”
- “Operation and Functions”
- “Software and Drivers”
- “Accessories”
- “Options”

Agilent B2961A/B2962A

Agilent B2961A/B2962A is 6½ digit low noise power source. B2961A/B2962A provides the LCD, front panel keys, and rotary knob for applying voltage/current or measuring voltage/current/resistance. B2961A/B2962A also supports several functions, such as arbitrary waveform generation, pulse output, sweep output, trace buffer, math expressions, and graph plot. Hence, B2961A/B2962A can be used as a DC (constant) voltage/current source, sweep voltage/current source, pulse generator, arbitrary waveform generator, and multimeter.

Table 2-1

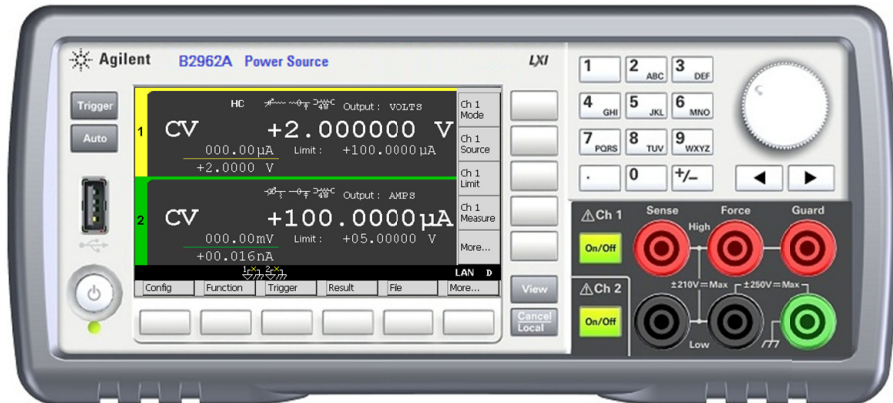
Agilent B2961A/B2962A 6½ Digit Low Noise Power Source

| Model No. | Number of channels | Effective set and measure value | | | |
|-----------|--------------------|---------------------------------|----------------|---------------------------------|-----------------|
| | | Minimum resolution | | Maximum current | Maximum voltage |
| | | Set | Measure | | |
| B2961A | 1 | 0.01 pA, 0.1 μV | 1 pA, 10 μV | DC: ± 3.03 A Pulse: ± 10.5 A | ± 210 V |
| B2962A | 2 | | | | |

B2961A/B2962A is a LAN eXtended Interface Core compliant instrument.

Front View

This section describes the front view of the Agilent B2961A/B2962A.



- **Line switch**
Turns the instrument on or off.
- **Display**
Displays the source setup, measurement result, status information, etc. For details, see Chapter 4, “Front Panel Reference.”
- **Trigger key**
Starts a single (one shot) output/measurement or initiates trigger system. If a repeat measurement is in progress, stops it.

The single measurement is performed with the DC bias output, pulsed bias output, arbitrary waveform output, staircase sweep output, or pulsed sweep output set to the channel. One single measurement can contain the maximum of 100000 measurement points.

Once a single measurement starts, the data buffer (maximum 100000 data) is cleared, and the last single measurement result is stored in the buffer. The measurement result is displayed on the Single view, Dual view, or Graph view.

NOTE

If measurement is not performed properly, check the trigger setting. The trigger type must be set to AUTO, or the trigger count (Count) must be set properly. See “Trigger Parameters” on page 4-19.

- Auto key

Starts a repeat (continuous) measurement. If a repeat measurement is in progress, stops it.

The repeat measurement is performed with the DC bias output of the Source value. And the measurement result is displayed on the Single view or Dual view. The repeat measurement result is not stored in the buffer.

- USB-A connector

Used to connect a USB memory. After disconnecting the USB memory, wait 10 seconds before connecting it again or new one.

CAUTION

Turning the instrument off while the USB memory is being accessed may damage the device.

- Function keys

Six function keys are available below the display. They are assigned to the softkeys, Config, Function, Trigger, Result, File, Program, I/O, Display, System, and More. For details, see Chapter 4, “Front Panel Reference.”

- Assist keys

Five assist keys are available to the right of the display. They are assigned to several softkeys, such as Mode, Source, Limit, Measure, and More. The softkey assignment depends on the display mode (Single, Graph, or Dual). For details, see Chapter 4, “Front Panel Reference.”

- View key

Changes the display mode. Pressing the key changes the mode as shown below.

On B2961A Single → Graph → (return to Single)

On B2962A Dual → Single for channel 1 → Single for channel 2 →
Graph → (return to Dual)

- Cancel / Local key

Cancels the setup operation if the instrument is in the local status. Returns the instrument to the local status if it is in the remote status.

Introduction

Front View

- Numeric/alpha keys

Used to enter the value of setup parameters such as the source output value, limit value, and message, specified by the field pointer.

- Rotary knob

If the field pointer is in the MOVE (blue) status, turning the knob moves the pointer. Pressing the knob fixes the pointer position and changes the pointer status to EDIT (green).

If the field pointer is in the EDIT (green) status, turning the knob changes the value of the setup parameter specified by the pointer. Pressing the knob fixes the value and changes the pointer status to MOVE (blue).

- Left and right keys

If the field pointer is in the MOVE (blue) status, pressing the key moves the pointer.

If the field pointer is in the EDIT (green) status, pressing the key changes the value of the setup parameter specified by the pointer.

If the field pointer is in the EDIT (green) status on a numeric value entry field, pressing the key changes the pointer to a digit pointer.



- On/Off switch(es)

Used to enable or disable the channel. Turns the channel off if it is in the output status even if it is in the remote status. One switch on 1-channel models, and two switches on 2-channel models.

The switch turns green if the channel is enabled.

The switch turns red if the channel is in the high voltage state.



- Channel 1 source/measure terminals

Terminals for channel 1. High Force, Low Force, High Sense, Low Sense, Guard, and chassis ground. For details, see “Connecting a DUT” on page 3-11

CAUTION

Never connect the Guard terminal to any output, including circuit common, chassis ground, or any other guard terminal. Doing so will damage the B2961A/B2962A.

CAUTION

Do not apply current to the chassis ground terminal. Doing so will damage the B2961A/B2962A.

Rear View

This section describes the rear view of the Agilent B2961A/B2962A.



- Channel 2 source/measure terminals

Only on 2-channel models. Terminals for channel 2. High Force, Low Force, High Sense, Low Sense, Guard, and chassis ground. For details, see “Connecting a DUT” on page 3-11

CAUTION

Never connect the Guard terminal to any output, including circuit common, chassis ground, or any other guard terminal. Doing so will damage the B2961A/B2962A.

CAUTION

Do not apply current to the chassis ground terminal. Doing so will damage the B2961A/B2962A.

- GPIB interface connector

Use an Agilent 82357A/B USB/GPIB interface or Agilent 10833A/B/C/D GPIB cable to connect to an external computer or equipment.

- Cooling fan
- AC input connector

AC power cord is connected to this receptacle.

- LAN interface connector

Connects to 10/100 Base-T interface. Left LED indicates activity. Right LED indicates link integrity.

- USB-B connector

Connects to USB interface.

- Digital I/O connector

D-sub 25 pin female connector for general purpose I/O (GPIO). Can be used as trigger input/output terminals or as an interface to a handler or the likes. For details, see “Using Digital I/O” on page 3-33

Pins 16 and 24 and pins 17 and 25 are reserved for the interlock function. If the terminals are open, the instrument output is limited to ± 42 V. Be sure to connect the terminals to the Agilent 16442B test fixture or another DUT interface before performing measurements. If you do not use 16442B, you need to install an interlock circuit. For details on how to install the interlock circuit, see “Installing the Interlock Circuit” on page 3-23.

WARNING

Dangerous voltage of up to the maximum voltage of channel may be present at the High Force, High Sense, and Guard terminals if the Interlock terminal is closed.

NOTE

Serial Number

You will need the instrument’s *serial number* when using the Agilent Technologies telephone assistance program. The serial number label is attached to the bottom of the instrument.

Power Source

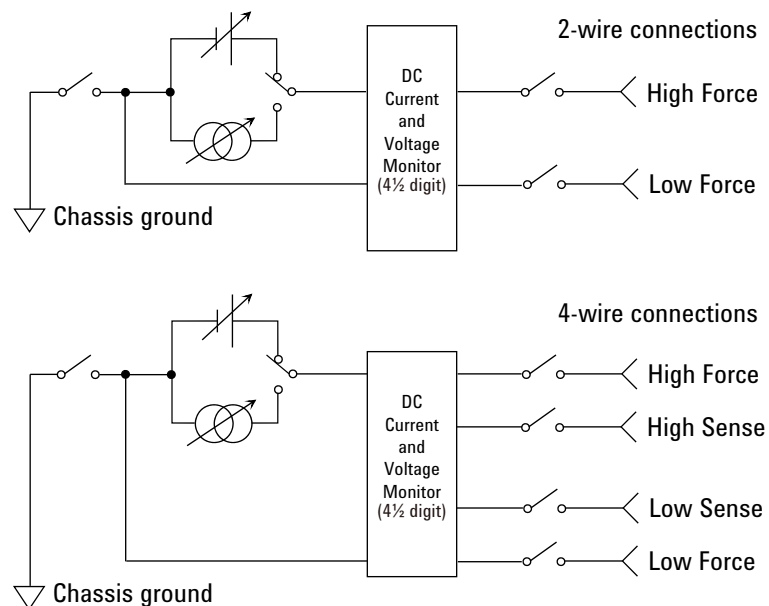
The power source can apply voltage or current, and can measure current or voltage.

Figure 2-1 shows a simplified power source circuit diagrams. The power source can perform the following operations.

- Applies voltage and measures current
- Applies current and measures voltage
- Applies voltage and measures voltage
- Applies current and measures current

Figure 2-1

Simplified Power Source Circuit Diagram



Measurement Parameters

B2961A/B2962A supports the following measurement parameters.

- Current
- Voltage
- Resistance
- Power
- Percent-to-Limit (= measured value / Limit value × 100 %)

Resistance data is given by $\text{Resistance} = V_{\text{meas}} / I_{\text{meas}}$.

Power data is given by $\text{Power} = V_{\text{meas}} \times I_{\text{meas}}$.

In the above formula, V_{meas} is the voltage measurement data, and I_{meas} is the current measurement data.

For using the resistance compensation, see “Resistance Compensation” on page 6-18.

NOTE

Measurement Range

Voltage source uses the present output range to measure voltage and/or the minimum range which covers the Limit value to measure current.

Current source uses the present output range to measure current and/or the minimum range which covers the Limit value to measure voltage.

Limit

B2961A/B2962A has a compliance feature that limits the output voltage or current to prevent damage to the device under test. When the channel applies voltage, you can specify the current limit. When the channel applies current, you can specify the voltage limit. For details, see “Limit/Compliance” on page 6-3.

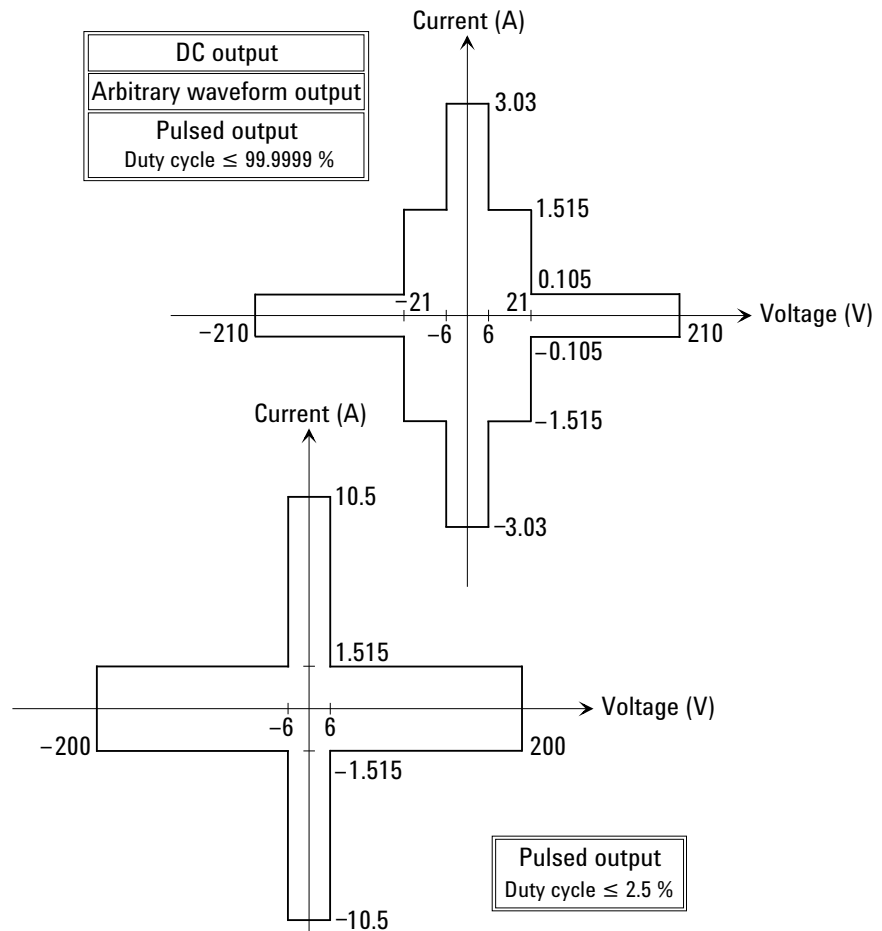
Output and Measurement Ranges

This section describes typical specifications of the Agilent B2961A/B2962A.

- Maximum voltage and current: see Figure 2-2.
- Maximum power: 31.8 W
- Output/measurement value and resolution: see Table 2-2 to Table 2-6.

Figure 2-2

Maximum Voltage and Current



NOTE

For using the arbitrary waveform output function or an external filter (N1294A-021/022 low noise filter), the range of DC output is applied.

Table 2-2 Current Output Range

| Range value | Setting resolution | DC output current or pulse peak/base current ^{a b} | Maximum voltage | | Pulse width t ^c | |
|-------------|--------------------|---|-----------------|---------------|------------------------------|--------------------|
| | | | DC output | Pulsed output | | |
| 10 nA | 10 fA | 0 ≤ I ≤ 10.5 nA | ±210 V | ±210 V | 50 μs ≤ t ≤ t _{max} | |
| 100 nA | 100 fA | 0 ≤ I ≤ 105 nA | | | | |
| 1 μA | 1 pA | 0 ≤ I ≤ 1.05 μA | | | | |
| 10 μA | 10 pA | 0 ≤ I ≤ 10.5 μA | | | | |
| 100 μA | 100 pA | 0 ≤ I ≤ 105 μA | | | | |
| 1 mA | 1 nA | 0 ≤ I ≤ 1.05 mA | | | | |
| 10 mA | 10 nA | 0 ≤ I ≤ 10.5 mA | | | | |
| 100 mA | 100 nA | 0 ≤ I ≤ 105 mA | | | | |
| 1 A | 1 μA | 0 ≤ I ≤ 105 mA | ±21 V | ±21 V | | |
| | | 105 mA < I ≤ 1.05 A | | | | |
| | | 0 ≤ I ≤ 1.05 A | — | ±200 V | | 50 μs ≤ t ≤ 2.5 ms |
| | | | — | ±180 V | | 50 μs ≤ t ≤ 10 ms |
| 1.5 A | | 0 ≤ I ≤ 105 mA | ±210 V | ±210 V | 50 μs ≤ t ≤ t _{max} | |
| | | 105 mA < I ≤ 1.515 A | ±21 V | ±21 V | | |
| | | 0 ≤ I ≤ 1.515 A | — | ±200 V | 50 μs ≤ t ≤ 2.5 ms | |
| | | 0 ≤ I ≤ 1.05 A | — | ±180 V | 50 μs ≤ t ≤ 10 ms | |
| 3 A | 10 μA | 0 ≤ I ≤ 105 mA | ±210 V | ±210 V | 50 μs ≤ t ≤ t _{max} | |
| | | 105 mA < I ≤ 1.515 A | ±21 V | ±21 V | | |
| | | 1.515 A < I ≤ 3.03 A | ±6 V | ±6 V | | |
| 10 A | | 0 ≤ I ≤ 10.5 A | — | ±6 V | 50 μs ≤ t ≤ 1 ms | |
| | | 0 ≤ I ≤ 1.515 A | — | ±200 V | 50 μs ≤ t ≤ 2.5 ms | |
| | | 0 ≤ I ≤ 1.05 A | — | ±180 V | 50 μs ≤ t ≤ 10 ms | |

- Table 2-4 shows the limitations when using Channels 1 and 2 for DC output or Pulsed output with $50 \mu\text{s} \leq t \leq t_{\text{max}}$ ($=99.9999 \text{ ks}$).
- Maximum base current is 500 mA for the pulse with $50 \mu\text{s} \leq t \leq 1 \text{ ms}$, and 50 mA for the pulse with $50 \mu\text{s} \leq t \leq 2.5 \text{ ms}$ or $50 \mu\text{s} \leq t \leq 10 \text{ ms}$.
- Maximum duty cycle is 99.9999 % for the pulse with $50 \mu\text{s} \leq t \leq t_{\text{max}}$, and 2.5 % for the pulse with $50 \mu\text{s} \leq t \leq 1 \text{ ms}$, $50 \mu\text{s} \leq t \leq 2.5 \text{ ms}$, or $50 \mu\text{s} \leq t \leq 10 \text{ ms}$.

Table 2-3 Voltage Output Range

| Range value | Setting resolution | DC output voltage or pulse peak/base voltage | Maximum current ^a | | Pulse width t ^b | |
|-------------|--------------------|--|------------------------------|--|------------------------------|--|
| | | | DC output | Pulsed output | | |
| 0.2 V | 0.1 μV | 0 ≤ V ≤ 0.21 V | ±3.03 A | ±3.03 A with 50 μs ≤ t ≤ t _{max} ±10.5 A with 50 μs ≤ t ≤ 1 ms | | |
| 2 V | 1 μV | 0 ≤ V ≤ 2.1 V | | | | |
| 20 V | 10 μV | 0 ≤ V ≤ 6 V | | | | |
| | | 6 V < V ≤ 21 V | ±1.515 A | ±1.515 A with 50 μs ≤ t ≤ t _{max} | | |
| 200 V | 100 μV | 0 ≤ V ≤ 6 V | ±3.03 A | ±3.03 A with 50 μs ≤ t ≤ t _{max} ±10.5 A with 50 μs ≤ t ≤ 1 ms | | |
| | | 6 V < V ≤ 21 V | ±1.515 A | ±1.515 A | 50 μs ≤ t ≤ t _{max} | |
| | | 21 V < V ≤ 210 V | ±105 mA | ±105 mA | | |
| | | 0 ≤ V ≤ 180 V | — | ±1.05 A | 50 μs ≤ t ≤ 10 ms | |
| | | 0 ≤ V ≤ 200 V | — | ±1.515 A | 50 μs ≤ t ≤ 2.5 ms | |

- Table 2-4 shows the limitations when using Channels 1 and 2 for DC output or Pulsed output with $50 \mu\text{s} \leq t \leq t_{\text{max}}$ ($=99.9999 \text{ ks}$).
- Maximum duty cycle is 99.9999 % for the pulse with $50 \mu\text{s} \leq t \leq t_{\text{max}}$, and 2.5 % for the pulse with $50 \mu\text{s} \leq t \leq 1 \text{ ms}$, $50 \mu\text{s} \leq t \leq 2.5 \text{ ms}$, or $50 \mu\text{s} \leq t \leq 10 \text{ ms}$.

Table 2-4 **Limitations for using Channels 1 and 2**

| Channel 1 voltage V1 | Channel 2 voltage V2 | Current limit ^a |
|--|--|---|
| $0 < V1 \leq 6 \text{ V}$ | $0 < V2 \leq 6 \text{ V}$ | $I1 + I2 \leq 4 \text{ A}$ |
| | $6 \text{ V} < V2 \leq 21 \text{ V}$ | $I1 + I2 \times 1.6 \leq 4 \text{ A}$ |
| $6 \text{ V} < V1 \leq 21 \text{ V}$ | $0 < V2 \leq 6 \text{ V}$ | $I1 + I2 \times 0.625 \leq 2.5 \text{ A}$ |
| | $6 \text{ V} < V2 \leq 21 \text{ V}$ | $I1 + I2 \leq 2.5 \text{ A}$ |

a. I1: Channel 1 current, I2: Channel 2 current

Table 2-5 **Current Measurement Range**

| Range value | Current measurement value | Resolution |
|-------------------|------------------------------------|-------------------|
| 10 nA | $0 \leq I \leq 10.6 \text{ nA}$ | 1 pA |
| 100 nA | $0 \leq I \leq 106 \text{ nA}$ | 10 pA |
| 1 μA | $0 \leq I \leq 1.06 \mu\text{A}$ | 100 pA |
| 10 μA | $0 \leq I \leq 10.6 \mu\text{A}$ | 1 nA |
| 100 μA | $0 \leq I \leq 106 \mu\text{A}$ | 10 nA |
| 1 mA | $0 \leq I \leq 1.06 \text{ mA}$ | 100 nA |
| 10 mA | $0 \leq I \leq 10.6 \text{ mA}$ | 1 μA |
| 100 mA | $0 \leq I \leq 106 \text{ mA}$ | 10 μA |
| 1 A | $0 \leq I \leq 1.06 \text{ A}$ | 100 μA |
| 1.5 A | $0 \leq I \leq 1.53 \text{ A}$ | |
| 3 A | $0 \leq I \leq 3.06 \text{ A}$ | 1 mA |
| 10 A ^a | $0 \leq I \leq 10.6 \text{ A}$ | |

a. Available for pulse mode. Not available for DC mode.

Table 2-6 **Voltage Measurement Range**

| Range value | Voltage measurement value | Resolution |
|-------------|-----------------------------------|-------------------|
| 0.2 V | $0 \leq V \leq 0.212 \text{ V}$ | 10 μV |
| 2 V | $0 \leq V \leq 2.12 \text{ V}$ | 100 μV |
| 20 V | $0 \leq V \leq 21.2 \text{ V}$ | 1 mV |
| 200 V | $0 \leq V \leq 212 \text{ V}$ | 10 mV |

Specifications

This chapter lists specifications and supplemental information for the Agilent B2961A/B2962A. The specifications are the standards against which the B2961A/B2962A is tested. When the B2961A/B2962A is shipped from the factory, it meets the specifications.

Specification Conditions

The source and measurement accuracy are specified under the conditions listed below.

1. Temperature: $23\text{ }^{\circ}\text{C} \pm 5\text{ }^{\circ}\text{C}$
2. Humidity: 30 % to 80 % RH
3. After 60 minutes warm-up
4. Ambient temperature change less than $\pm 3\text{ }^{\circ}\text{C}$ after self-calibration execution
5. Calibration period: 1 year
6. Measurement speed: 1 PLC (Power Line Cycle)

Maximum Voltage and Current

- Voltage output range: See Figure 2-2, Table 2-3, and Table 2-4.
- Current output range: See Figure 2-2, Table 2-2, and Table 2-4.

Source Specifications

- Voltage source specifications: See Table 2-7.
- Current source specifications: See Table 2-8.

Table 2-7 Voltage Source Specifications

| Range | Programming resolution | Accuracy (gain error (% of reading) + offset error) | Noise ^a (peak-peak) 0.1 Hz to 10 Hz | Maximum voltage (over range) |
|---------|------------------------|--|--|------------------------------------|
| ±200 mV | 100 nV | ±(0.015 % + 225 µV) | ≤ 5 µV | ±210 mV |
| ±2 V | 1 µV | ±(0.02 % + 350 µV) | ≤ 15 µV | ±2.1 V |
| ±20 V | 10 µV | ±(0.015 % + 5 mV) | ≤ 150 µV | ±21 V |
| ±200 V | 100 µV | ±(0.015 % + 50 mV) | ≤ 1.5 mV | ±210 V |

a. Supplemental characteristics

Table 2-8 Current Source Specifications

| Range | Programming resolution | Accuracy (gain error (% of reading) + offset error) | Noise ^a (peak-peak) 0.1 Hz to 10 Hz | Maximum current (over range) |
|--------------------|------------------------|--|--|------------------------------------|
| ±10 nA | 10 fA | ±(0.10 % + 50 pA) | ≤ 1 pA | ±10.5 nA |
| ±100 nA | 100 fA | ±(0.06 % + 100 pA) | ≤ 2 pA | ±105 nA |
| ±1 µA | 1 pA | ±(0.025 % + 500 pA) | ≤ 20 pA | ±1.05 µA |
| ±10 µA | 10 pA | ±(0.025 % + 1.5 nA) | ≤ 60 pA | ±10.5 µA |
| ±100 µA | 100 pA | ±(0.02 % + 25 nA) | ≤ 1 nA | ±105 µA |
| ±1 mA | 1 nA | ±(0.02 % + 200 nA) | ≤ 6 nA | ±1.05 mA |
| ±10 mA | 10 nA | ±(0.02 % + 2.5 µV) | ≤ 100 nA | ±10.5 mA |
| ±100 mA | 100 nA | ±(0.02 % + 20 µV) | ≤ 600 nA | ±105 mA |
| ±1 A | 1 µA | ±(0.03 % + 1.5 mA) | ≤ 20 µA | ±1.05 A |
| ±1.5 A | 1 µA | ±(0.05 % + 3.5 mA) | ≤ 20 µA | ±1.515 A |
| ±3 A | 10 µA | ±(0.4 % + 7 mA) | ≤ 60 µA | ±3.03 A |
| ±10 A ^b | 10 µA | ±(0.4 % + 25 mA) ^c | — | ±10.5 A |

a. Supplemental characteristics

b. 10 A range is available only for pulse mode, not available for DC mode.

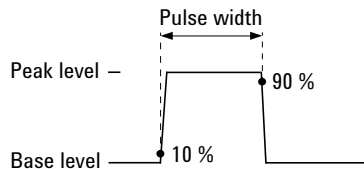
c. Measurement speed: 0.01 PLC

Source Supplemental Characteristics

Pulsing Capabilities

- Minimum programmable pulse width: 50 μ s
- Pulse width programming resolution: 1 μ s
- Pulse width definition:

The time from 10 % leading to 90 % trailing edge as follows.



- Maximum duty cycle and pulse width: See Table 2-9.
- Minimum pulse width at the given voltage, current, and settling conditions: See Table 2-10.

Sweep Capabilities

- Sweep mode: linear, logarithmic (log), or list
- Sweep direction: single or double
- Type: DC or pulse
- Number of steps: 1 to 100,000
- Minimum programmable value to create list sweep waveform: Minimum 10 μ s with 1 μ s resolution

Arbitrary Waveform Generation Capabilities

Pre-defined waveforms and user-defined waveforms are supported.

- Pre-defined Waveforms:
 - Supported waveforms: sine, square, ramp, triangle, trapezoid and exponential
 - Frequency: 1 mHz to 10 kHz
 - Programmable frequency/timing resolution: 1 μ Hz nominal (sine), 250 ns (waveforms other than sine)

- Frequency accuracy of time base: ± 50 ppm
- User-defined waveform:
 - Waveform length: 1 to 100,000 points
 - Sample rate: 0.001 to 100,000 Sa/s, 250 ns resolution
 - Storage: Non-volatile memory and USB memory are both available. Non-volatile memory can store one waveform with a length of up to 2500 points. USB memory can store waveforms of up to 100,000 points.

Table 2-9 Maximum Duty Cycle and Pulse Width

| Maximum duty cycle | Pulse width | Maximum voltage | Maximum peak current | Maximum base current |
|--------------------|-------------------------|-----------------|----------------------|----------------------|
| 99.9999 % | 50 μ s to 99999.9 s | 6 V | 3.03 A ^a | 3.03 A ^a |
| | | 21 V | 1.515 A ^a | 1.515 A ^a |
| | | 210 V | 0.105 A | 0.105 A |
| 2.5 % | 50 μ s to 1 ms | 6 V | 10.5 A | 500 mA |
| | 50 μ s to 10 ms | 180 V | 1.05 A | 50 mA |
| | 50 μ s to 2.5 ms | 200 V | 1.515 A | 50 mA |

a. Maximum current limitation: For 21 V/1.515 A and 6 V/3.03 A ranges, total maximum current is limited as shown in Table 2-4 for using 2 channels. Maximum current is not limited for using 1 channel only.

Table 2-10 Minimum Pulse Width at the Given Voltage, Current, and Settling Conditions

| Source value | Limit value | Load | Source settling (% of range) | Minimum pulse width |
|--------------|-------------|--------------|------------------------------|---------------------|
| 200 V | 1.5 A | 200 Ω | 0.1 % | 1 ms |
| 6 V | 10.5 A | 0.6 Ω | 0.1 % | 0.2 ms |
| 1.5 A | 200 V | 65 Ω | 0.1 % | 2.5 ms |
| 10.5 A | 6 V | 0.5 Ω | 0.1 % | 0.2 ms |

Output Characteristics

- Temperature coefficient (0 °C to 18 °C and 28 °C to 50 °C):
 $\pm(0.1 \times \text{accuracy specification}) / ^\circ\text{C}$
- Maximum output power and source/sink limits: 31.8 W, $\pm 6 \text{ V}$ @ $\pm 3.03 \text{ A}$, $\pm 21 \text{ V}$ @ $\pm 1.515 \text{ A}$, $\pm 210 \text{ V}$ @ $\pm 105 \text{ mA}$, four quadrant source or sink operation
- Output location: Channel 1 at front and channel 2 at rear
- Output connectors: Banana jack. Triaxial connections are recommended for sourcing less than 1 nA. A banana jack to triaxial adapter is available for low current source.
- Low terminal connection: Chassis grounded or floating
- Sensing modes: 2-wire or 4-wire (remote-sensing) connections
- Maximum load: 0.01 μF in normal mode, 50 μF in high capacitance mode
- DC floating voltage: Maximum $\pm 250 \text{ V}$ DC between low force and chassis ground
- Guard offset voltage (V source): $< 4 \text{ mV}$
- Remote sense operation range:
Maximum voltage between High Force and High Sense: 3 V
Maximum voltage between Low Force and Low Sense: 3 V
- Common mode isolation: $> 1 \text{ G}\Omega$, $< 4500 \text{ pF}$
- Maximum sense lead resistance: 1 $\text{k}\Omega$ for rated accuracy
- Sense input impedance: $> 10 \text{ G}\Omega$
- Current limit/compliance: Accuracy is same as current source. Minimum value is 1 % of range, or 1 nA in 10 nA range.
- Voltage limit/compliance: Accuracy is same as voltage source. Minimum value is 1 % of range, or 20 mV in 200 mV range.
- Over range: 101 % of source range for 1.5 A and 3 A ranges. 105 % of source range other than 1.5 A and 3 A ranges. No over range for 200 V range with current exceeding 105 mA pulse only condition.
- Over temperature protection: Output turns off then resets at over temperature sensed internally.

Voltage Source.

- Settling time:
Time required to reach within 0.1 % of final value at open load condition. Step is +10 % to +90 % range.
200 mV and 2 V ranges: < 50 μ s
20 V range: < 110 μ s
200 V range: < 700 μ s
- Slew rate and small signal bandwidth: See Table 2-11. Slew rate and small signal bandwidth can be down to -20 % in maximum.
- Noise 10 Hz to 20 MHz: ≤ 3 mVrms, 20 V range, without external filter
- Overshoot:
< $\pm(0.1 \% + 10 \text{ mV})$, step is +10 % to +90 % range, resistive load.
- Range change overshoot:
 ≤ 250 mV, 100 k Ω load, 20 MHz bandwidth
- Line regulation/load regulation: Included in voltage source specifications.
- Load transient recovery time: Time to recover to within the settling band following a load change. See Table 2-12.

Current Source.

- Settling time:
Time required to reach within 0.1 % (0.3 % for 3 A range) of final value at short condition. Step is +10 % to +90 % range.
10 nA and 100 nA ranges: < 10 ms
1 μ A range: < 500 μ s
10 μ A and 100 μ A ranges: < 250 μ s
1 mA to 3 A ranges: < 80 μ s
- Slew rate and small signal bandwidth: See Table 2-13. Slew rate and small signal bandwidth can be down to -20 % in maximum.
- Overshoot:
< $\pm 0.1 \%$ (< $\pm 0.3 \%$ for 3 A range), step is +10 % to +90 % range, resistive load.

- Range change overshoot:
≤ 250 mV/R load, 20 MHz bandwidth
- Line regulation/load regulation: Included in current source specifications.

Table 2-11

Slew Rate and Small Signal Bandwidth for Voltage Source

| Current range | Voltage range | | | | Load resistance |
|---------------|------------------|-------------------|-------------------|-------------------|-----------------|
| | 200 mV | 2 V | 20 V | 200 V | |
| 1 mA | 44 mV/μs, 28 kHz | 57 mV/μs, 18 kHz | 57 mV/μs, 28 kHz | 57 mV/μs, 28 kHz | 10 MΩ |
| 10 mA | 44 mV/μs, 28 kHz | 360 mV/μs, 20 kHz | 360 mV/μs, 17 kHz | 360 mV/μs, 28 kHz | 10 MΩ |
| 100 mA | 28 mV/μs, 28 kHz | 28 mV/μs, 20 kHz | 28 mV/μs, 28 kHz | 57 mV/μs, 28 kHz | 10 MΩ |
| 1 A | 25 mV/μs, 28 kHz | 25 mV/μs, 28 kHz | 25 mV/μs, 28 kHz | — | 10 MΩ |
| 1.5 A | 36 mV/μs, 28 kHz | 36 mV/μs, 18 kHz | 36 mV/μs, 28 kHz | — | 10 MΩ |
| 3 A | 27 mV/μs, 28 kHz | 27 mV/μs, 28 kHz | 27 mV/μs, 28 kHz | — | 10 MΩ |

Table 2-12

Load Transient Recovery Time

| | 100 mA current change ^a | 800 mA current change ^b |
|---------------|------------------------------------|------------------------------------|
| Settling band | ±20 mV | ±20 mV |
| Time | 10 μs | 30 μs |

a. At a load change to change the flowing current from +50 mA to +150 mA, 10 V voltage force, 20 V range, 1 A limit.

b. At a load change to change the flowing current from +100 mA to +900 mA, 10 V voltage force, 20 V range, 1.5 A limit.

Table 2-13

Slew Rate and Small Signal Bandwidth for Current Source

| Current range | Voltage range | | | | Load resistance |
|---------------|--|---|---|---|-----------------|
| | 200 mV | 2 V | 20 V | 200 V | |
| 1 mA | 94 $\mu\text{V}/\mu\text{s}$, 21 kHz | 160 $\mu\text{V}/\mu\text{s}$, 21 kHz | 160 $\mu\text{V}/\mu\text{s}$, 21 kHz | 150 $\mu\text{V}/\mu\text{s}$, 21 kHz | 100 Ω |
| 10 mA | 94 $\mu\text{V}/\mu\text{s}$, 21 kHz | 670 $\mu\text{V}/\mu\text{s}$, 21 kHz | 900 $\mu\text{V}/\mu\text{s}$, 21 kHz | 900 $\mu\text{V}/\mu\text{s}$, 21 kHz | 100 Ω |
| 100 mA | 8 mV/ μs , 10 kHz | 8 mV/ μs , 10 kHz | 8 mV/ μs , 10 kHz | 12 mV/ μs , 21 kHz | 1 Ω |
| 1 A | 78 mV/ μs , 12 kHz | 94 mV/ μs , 12 kHz | 92 mV/ μs , 12 kHz | — | 0.1 Ω |
| 1.5 A | 125 mV/ μs , 12 kHz | 135 mV/ μs , 12 kHz | 140 mV/ μs , 12 kHz | — | 0.1 Ω |
| 3 A | 250 mV/ μs , 13 kHz | 270 mV/ μs , 13 kHz | 260 mV/ μs , 13 kHz | — | 0.041 Ω |

High Capacitance Mode

The high capacitance mode supports measurements when the load capacitance is greater than 0.01 μF . In the high capacitance mode, the maximum allowed load capacitance value is 50 μF .

- Voltage output settling time:

Time required to reach within 0.1 % of final value with 4.7 μF capacitive load on a fixed range at specified current limit value.

200 mV and 2 V ranges: 600 μs , at 1 A limit

20 V range: 1.5 ms, at 1 A limit

200 V range: 20 ms, at 100 mA limit

- Current measurement settling time:

Time required to reach within 0.1 % of final value after voltage source is stabilized on fixed range. Vout is 5 V unless noted.

1 μA range: 230 ms

10 μA and 100 μA ranges: 23 ms

1 mA and 10 mA ranges: 0.23 ms

100 mA to 3 A ranges: 100 μ s

- Mode change delay:
 - Delay into high capacitance mode:
 - 1 μ A range: 230 ms
 - 10 μ A and 100 μ A ranges: 23 ms
 - 1 mA to 3 A ranges: 1 ms
 - Delay out of high capacitance mode:
 - All ranges: 10 ms
- Noise 10 Hz to 20 MHz (20 V range): 4.5 mVrms
- Voltage source range change overshoot (20 V range or below):
< 250 mV, 20 MHz bandwidth
- High capacitance mode working conditions:
 - V/I mode: Voltage source mode only
 - Range: Current measurement range is limited to fixed range only. 10 nA and 100 nA ranges are not available.
 - Current limit: $\geq 1 \mu$ A

Programmable Output Resistance

In its default state the Agilent B2961A/B2962A behaves like either an ideal voltage source with a negligibly small source resistance or an ideal current source with a huge source resistance. The programmable output resistance feature allows you to specify either a particular output resistance or a specific voltage vs. current source characteristic. This feature is ideal for emulating a wide variety of devices (such as batteries, photovoltaic cells, sensors, transducers, etc.) that are otherwise difficult to simulate.

- Mode: Constant or V/I Emulation
- Programmable resistance range:
 - Series resistance (R_s) at voltage source:
– Load resistance/2 $\leq R_s \leq$ Load resistance, for resistive load

$R_s \leq 25 \Omega$ at 3 A range, $\leq 100 \Omega$ at 1 A and 1.5 A ranges, $\leq 1 \text{ k}\Omega$ at 100 mA range, or $\leq 10 \text{ k}\Omega$ at other ranges, R_s can be limited by capacitive load.

- Shunt resistance (R_{sh}) at current source:

Load resistance $\leq R_{sh} \leq 2 \text{ G}\Omega$, for resistive load

$R_{sh} \geq 10 \text{ M}\Omega$ at 10 nA and 100 nA ranges, $\geq 1 \text{ M}\Omega$ at other ranges, R_{sh} can be limited by capacitive load.

- Emulation mode:

Emulation mode allows you to program a non-linear resistance. You specify the desired voltage/current characteristic using a tabular format.

Maximum number of points: 16 (piecewise linear interpolation between points)

* Programmable Output Resistance is only available for DC output.

External Low Noise Filter Supplemental Characteristics

The Agilent B2961A/B2962A supports dedicated external low-noise filters; they are available as an option or as an accessory. They connect to the banana jack outputs of each Agilent B2961A/B2962A channel.

Ultra Low Noise Filter (N1294A-021)

- Maximum output range: 42 V / 105 mA (DC)
- Output connector: BNC
- Output/residual resistance: 50 Ω nominal (2-wire), 0.3 Ω nominal (4-wire. 4-wire connected inside of filter)
- Small signal bandwidth: 23 Hz nominal (2-wire), 8 Hz nominal (4-wire)
- Voltage noise (20 V / 100 mA range, 50 Ω load, 10 Hz to 20 MHz): 10 μVrms , 1 nVrms/Hz^{1/2} at 10 kHz. Also see Figure 2-3. Source specification is applied for less than 10 Hz.
- Current noise (20 V / 100 mA range, 10 Ω load, 10 Hz to 1 MHz): 300 nArms. Source specification is applied for less than 10 Hz.
- Settling time: See Table 2-14.
- Load transient recovery time: Time to recover to within the settling band following a load change. See Table 2-15.
- Supported ranges:

Voltage: 200 mV to 200 V ranges, 42 V maximum

Current: 10 μ A to 100 mA ranges, 105 mA maximum

- Maximum capacitive load: 50 μ F for 4-wire
- Dimensions: 41 mm (H) \times 58.2 mm (W) \times 141.5 mm (D)

When the filter is inserted to the output connector of B2961A/B2962A, the depth is 126.5 mm.

- Weight: 0.3 kg

The 10 A pulse range and programmable output resistance capability are not supported by external filters.

Figure 2-3

Noise Density

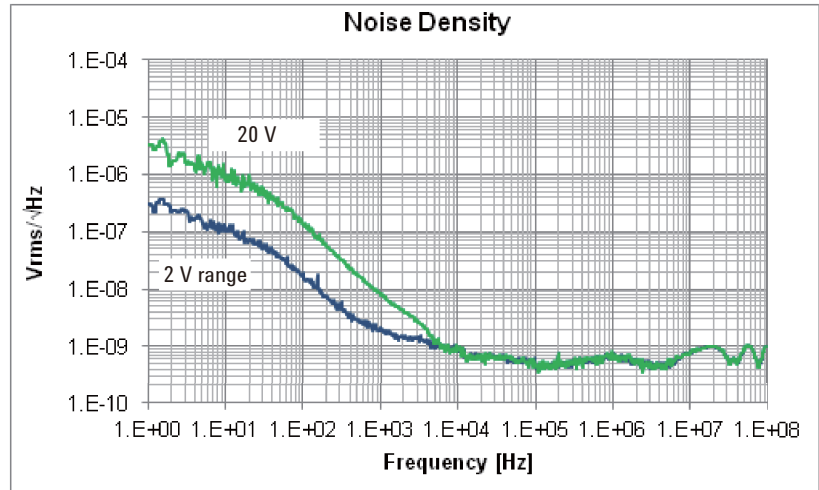


Table 2-14

Settling Time

| | 2-wire | 4-wire |
|-----------------------------|--------|--------|
| Voltage source ^a | 80 ms | 140 ms |
| Current source ^b | 11 ms | 150 ms |

- a. Time required to reach within 0.1 % of final value at open load condition. Step is +10 % to +90 % range. At 20 V range, 100 mA limit, 100 mA range.

- b. Time required to reach within 0.1 % of final value at short condition.
Step is +10 % to +90 % range. At 100 mA range, 20 V limit, 20V range.

Table 2-15

Load Transient Recovery Time

| | 50 mA current change^a |
|---------------|---|
| Settling band | ±20 mV |
| Time | 50 ms for 2-wire, 85 ms for 4-wire |

- a. At a load change to change the flowing current from +10 mA to +60 mA, 10 V voltage force, 20 V range, 100 mA limit.

Low Noise Filter (N1294A-022)

- Maximum output range: 210 V / 3 A (DC)
- Output connector and connection: Banana, 2-wire/4-wire
- Output/residual resistance: 0.3 Ω nominal (2-wire)
- Small signal bandwidth: 2 kHz nominal (1 A and 3 A ranges), 800 Hz nominal (100 mA range)
- Voltage noise (20 V / 1.5 A range, 50 Ω load, 10 Hz to 20 MHz): 350 μ Vrms
Source specification is applied for less than 10 Hz.
- Current noise (20 V / 1.5 A range, 0.67 Ω load, 10 Hz to 1 MHz): 450 μ Arms
Source specification is applied for less than 10 Hz.
- Settling time: See Table 2-16.
- Load transient recovery time: Time to recover to within the settling band following a load change. See Table 2-17.
- Supported ranges:
Voltage: 200 mV to 200 V ranges, 210 V maximum
Current: 10 μ A to 3 A ranges, 3 A maximum
- Maximum capacitive load: 1 mF
- Dimensions: 41.5 mm (H) \times 58.2 mm (W) \times 127.5 mm (D)
When the filter is inserted to the output connector of B2961A/B2962A, the depth is 112.5 mm.
- Weight: 0.25 kg

The 10 A pulse range and programmable output resistance capability are not supported by external filters.

Table 2-16

Settling Time

| | 2-wire / 4-wire |
|-----------------------------|------------------------|
| Voltage source ^a | 640 μ s |
| Current source ^b | 1.2 ms |

- a. Time required to reach within 0.1 % of final value at open load condition.
Step is +10 % to +90 % range. At 20 V range, 1.5 A limit, 1.5 A range.
- b. Time required to reach within 0.1 % of final value at short condition.
Step is +10 % to +90 % range. At 1.5 A range, 20 V limit, 20V range.

Table 2-17

Load Transient Recovery Time

| | 800 mA current change^a |
|---------------|--|
| Settling band | ± 20 mV |
| Time | 450 μ s for 2-wire, 650 μ s for 4-wire |

- a. At a load change to change the flowing current from +100 mA to +900 mA, 10 V voltage force, 20 V range, 1.5 A limit.

Built-in Voltage/Current Monitor Specifications

- Voltage measurement specifications: See Table 2-18.
- Current measurement specifications: See Table 2-19.

Table 2-18

Voltage Measurement Specifications

| Range | Measurement resolution | Accuracy (gain error (% of reading) + offset error) |
|---------|------------------------|--|
| ±200 mV | 10 µV | ±(0.015 % + 225 µV) |
| ±2 V | 100 µV | ±(0.02 % + 350 µV) |
| ±20 V | 1 mV | ±(0.015 % + 5 mV) |
| ±200 V | 10 mV | ±(0.015 % + 50 mV) |

Table 2-19

Current Measurement Specifications

| Range | Measurement resolution | Accuracy (gain error (% of reading) + offset error) |
|--------------------|------------------------|--|
| ±10 nA | 1 pA | ±(0.10 % + 50 pA) |
| ±100 nA | 10 pA | ±(0.06 % + 100 pA) |
| ±1 µA | 100 pA | ±(0.025 % + 500 pA) |
| ±10 µA | 1 nA | ±(0.025 % + 1.5 nA) |
| ±100 µA | 10 nA | ±(0.02 % + 25 nA) |
| ±1 mA | 100 nA | ±(0.02 % + 200 nA) |
| ±10 mA | 1 µA | ±(0.02 % + 2.5 µV) |
| ±100 mA | 10 µA | ±(0.02 % + 20 µV) |
| ±1 A | 100 µA | ±(0.03 % + 1.5 mA) |
| ±1.5 A | 100 µA | ±(0.05 % + 3.5 mA) |
| ±3 A | 1 mA | ±(0.4 % + 7 mA) |
| ±10 A ^a | 1 mA | ±(0.4 % + 25 mA) ^b |

a. 10 A range is available only for pulse mode, not available for DC mode.

b. Measurement speed: 0.01 PLC

Built-in Voltage/Current Monitor Supplemental Characteristics

- Temperature coefficient (0 °C to 18 °C and 28 °C to 50 °C):
 $\pm(0.1 \times \text{accuracy specification}) / ^\circ\text{C}$
- Over range:
102 % of measurement range for 1.5 A and 3 A ranges. 106 % of measurement range other than 1.5 A and 3 A ranges.
- Voltage measurement range change overshoot:
< 250 mV, 100 k Ω load, 20 MHz bandwidth
- Current measurement range change overshoot:
< 250 mV/R load, 20 MHz bandwidth
- Derating accuracy for measurement speed less than 1 PLC:
Add % of range shown in Table 2-20 for measurement with PLC < 1.

Table 2-20 Derating Accuracy with PLC Setting < 1 PLC

| PLC setting | Voltage range | | Current range | | | |
|-------------|---------------|--------------|---------------|--------|---------------------------|------------|
| | 0.2 V | 2 V to 200 V | 10 nA | 100 nA | 1 μA to 100 mA | 1 A to 3 A |
| 0.1 PLC | 0.01 % | 0.01 % | 0.1 % | 0.01 % | 0.01 % | 0.01 % |
| 0.01 PLC | 0.05 % | 0.02 % | 1 % | 0.1 % | 0.05 % | 0.02 % |
| 0.001 PLC | 0.5 % | 0.2 % | 5 % | 1 % | 0.5 % | 0.2 % |

Data Buffer

A data buffer is an array of measurement elements. Each element holds the following values.

- Source setting
- Time stamp
- Measurement value
- Status

Maximum buffer size: 100,000 points/channel

Triggering and Timing Specifications

Triggering

- Digital I/O trigger in to trigger out¹: $\leq 5 \mu\text{s}$
- Digital I/O trigger in to source change¹: $\leq 5 \mu\text{s}$
- LXI Trigger in to source change¹: Minimum 100 μs , Typical 200 μs , Maximum Unknown
- LXI Trigger in to measurement¹: Minimum 100 μs , Typical 200 μs , Maximum Unknown
- Internal event to external LXI trigger output¹: Minimum 100 μs , Typical 200 μs , Maximum Unknown
- LAN[0-7] Event Receiving Latency¹: Unknown
- LAN[0-7] Event Sending Latency¹: Unknown
- Minimum trigger interval: 10 μs

Timer

- Trigger timing resolution: 1 μs to 100 ms
- Timer accuracy: ± 50 ppm
- Arm/trigger delay: 0 to 100,000 s
- Arm/trigger interval: 10 μs to 100,000 s
- Arm/trigger event: 1 to 100,000
- Time stamp: TIMER value automatically saved when each measurement is triggered.

1. Supplemental characteristics

General Specifications

- Environment: For use in indoor facilities
- Temperature range
 - Operating** 0 °C to +55 °C
 - Storage** -30 °C to +70 °C
- Humidity range
 - Operating** 30 % to 80 % RH, non-condensing
 - Storage** 10 % to 90 % RH, non-condensing
- Altitude
 - Operating** 0 m to 2,000 m (6,561 ft.)
 - Storage** 0 m to 4,600 m (15,092 ft.)
- Power requirement: 100-240 V (± 10 %), 50/60 Hz
- Maximum volt-amps (VA): 250 VA
- Cooling: Forced air. Side intake and rear exhaust.
- EMC
 - IEC 61326-1 / EN 61326-1
 - ICES/NMB-001
 - AS/NZS CISPR 11
 - KC: RRA Notification amending Radio Waves Act Article 58-2
- Safety
 - IEC 61010-1 / EN 61010-1
 - CAN/CSA-C22.2 No. 61010-1
- Dimensions
 - Without handle and feet: 88 mm (H) \times 213 mm (W) \times 450 mm (D)
 - Bench configuration (with handle and feet): 180 mm (H) \times 260 mm (W) \times 480 mm (D)
- Weight
 - B2961A: 5.0 kg, B2962A: 6.4 kg

Operation and Functions

Front Panel Interface

4.3” color TFT WQVGA (480×272, with LED backlight) provides a graphical user interface (GUI) with the following features.

- Single, Dual view, and time domain view (voltage vs time or current vs time) on Graph view
- Preview of output waveform
- Easy-to-use key operations
- Easy access to basic and advanced source/measurement capabilities

Single view

Single view provides basic and advanced settings and display capabilities for a selected channel from the front panel of the instrument. The DC, pulse and integrated arbitrary waveform generation capabilities do not require any additional controller or software. The GUI has a feature that allows you to preview an arbitrary waveform before application. It also displays the measured voltage and current for the selected channel with 4.5 digits of resolution.

Dual view

Dual view allows you to view both channels simultaneously and provides basic setting and display capabilities. It also displays the measured voltage and current for both channels 1 and 2 with 4.5 digits of resolution. This mode is available only for the B2962A.

Graph View

Graph View displays measurement results in the time-domain (V-t or I-t curves) for up to 2 channels. This is useful for quick checking and debug of the output waveform(s).

Easy-to-use Key Operations

- Numeric/alpha keys, assist keys, and rotary knob for easy operation
- Numeric/alpha keys enable direct input of alphanumeric values.
- Assist key guides operation on the front panel.

Easy Access to Source/Measurement Capabilities

- Settings:
 - V/I source mode
 - Source value
 - Limit value
 - Sweep parameters
 - Pulse parameters
 - Parameters for built-in waveform
 - Measure speed
 - Range setting
 - Trigger setting
- Displays:
 - Numeric display in 6 1/2 digits for sourcing
 - Numeric display in 4 1/2 digits for monitoring
 - V-t / I-t curve in Graph view
- Advanced Capabilities:
 - Trace memory for accumulating measurement (or math) result and collecting their statistics
- File Operations (USB memory):
 - Save:
 - System configuration
 - Measurement/math result
 - Trace data
 - Graph screen dump
 - Load:
 - System configuration
 - List sweep data
 - User-defined arbitrary waveform data

Program and Interface Capabilities

Programming Language

The B2961A/B2962A supports SCPI (Standard Commands for Programmable Instruments).

Program Memory

Program memory allows you to store long strings of SCPI command lines once into the B2961A/B2962A's volatile memory and then recall those strings multiple times while the program is executing using a single SCPI command. By storing the command strings in memory, the time that would have been spent sending those same commands over a communication bus is eliminated. For tests that utilize lots of repeated code (such as subroutines), program memory can dramatically reduce test times.

- Maximum number of characters of program name: 32 with alphabets, numbers, hyphens, and underscores
- Maximum memory size: 100 KB (2500 lines typical)

LXI

LXI core conformant. The B2961A/B2962A follows specified LAN protocols and adhere to LXI requirements such as a built-in Web control server and IVI-COM driver.

- Ethernet: 10/100Base-T
- USB2.0: USB-TMC488 protocol (rear × 1)
- GPIB: IEEE-488.2 compliant

USB File System

USB 2.0 high-speed mass storage (MSC) class device (front × 1)

Digital I/O Interface

- Connector: 25-pin female D
- Input/output pins: 14 open drain I/O bits
- Absolute maximum input voltage: 5.25 V
- Absolute minimum input voltage: -0.25 V
- Logic low maximum input voltage: 0.8 V
- Logic high minimum input voltage: 2.0 V
- Maximum source current: 1 mA, $V_{out} = 0$ V
- Maximum sink current: 50 mA, $V_{out} = 5$ V
- 5 V power supply pin:
Limited to 600 mA, solid state fuse protected
- Safety interlock pin:
One active high pin and one active low pin. Activation of both pin enables output voltage > 42 V.

Software and Drivers

- Agilent B2900A Quick I/V Measurement Software

The B2961A/B2962A includes PC-based Agilent B2900A Quick I/V Measurement Software. This powerful software makes it easy to quickly setup and perform I/V measurements and to display the measurement data in a table or graph without the need to perform any programming. The software allows you to control up to four channels over a GPIB or LAN connection, or one B2900 via a USB connection.

System requirements:

- Windows 7 (64 bit/32 bit), XP SP3 (32 bit)
- Microsoft .NET framework 4.0 or later
- Agilent IO Libraries 16.0 or later

- Graphical Web Interface

The Graphical Web Interface is a web browser based instrument control panel. It enables you to set up and perform a measurement easily and quickly from a web browser using the built-in web server. This allows you to control one B2900 over a LAN connection.

- IVI-C or IVI-COM drivers

Compatible with Windows 7 (64 bit/32 bit), XP SP3 (32 bit) IO Libraries 16.0 or later. Supports Agilent VEE, Microsoft Visual Studio (Visual Basic, Visual C++, Visual C#), National Instruments LabWindows and LabVIEW.

- LabVIEW driver (VI)

National Instruments LabVIEW 7.0 or later. LabView drivers are available at NI.COM.

NOTE

For the latest system requirements, go to www.agilent.com and type in B2961A or B2962A in the Search field at the top of the page.

Accessories

Furnished Accessories

The Agilent B2961A/B2962A is furnished with the following accessories.

- Quick Reference, 1 ea.
- Product Reference CD-ROM, 1ea.
- Agilent IO Libraries CD-ROM, 1ea.
- Power cord, 1 ea.
- USB cable, 1 ea.

The Product Reference CD-ROM stores Agilent B2900A Quick I/V Measurement Software, sample programs, and user manuals.

Available Accessories

Table 2-21 lists the available accessories for the Agilent B2961A/B2962A.

Table 2-21 **Available Accessories**

| Model Number | Option Item | Description |
|--------------|-------------|---|
| N1294A | | Accessories |
| | N1294A-001 | Banana to triaxial adapter for 2-wire connections |
| | N1294A-002 | Banana to triaxial adapter for 4-wire connections |
| | N1294A-011 | Interlock cable for 16442B, 1.5 m |
| | N1294A-012 | Interlock cable for 16442B, 3.0 m |
| | N1294A-021 | Ultra Low Noise Filter for B2961A/B2962A |
| | N1294A-022 | Low Noise Filter for B2961A/B2962A |
| | N1294A-031 | GPIO-BNC Trigger Adapter |
| N1295A | | Device/Component Test Fixture |

| Model Number | Option Item | Description |
|--------------|-------------|---|
| 16442B | | Test Fixture |
| | 16442B-010 | Add triaxial cables, 1.5 m, 4 ea. |
| | 16442B-011 | Add triaxial cables, 3 m, 4 ea. |
| | 16442B-800 | Extra blank PTFE board |
| | 16442B-801 | Universal socket module, 0.1 inch pitch, with 10 pins |
| | 16442B-802 | Universal socket module, 0.075 inch pitch, with 10 pins |
| | 16442B-803 | Universal socket module, 0.05 inch pitch, with 10 pins |
| | 16442B-810 | Extra pin set (for universal socket module, 10 pins.) |
| | 16442B-811 | Extra wire set (mini banana to pin plug, 6 ea.) |
| | 16442B-812 | Extra wire set (pin plug to pin plug, 6 ea.) |
| | 16442B-813 | Extra wire set (mini banana to mini clip, 6 ea.) |
| | 16442B-814 | Extra wire set (mini banana to mini banana, 6 ea.) |
| | 16442B-821 | Socket module, 4-pin TO package |
| | 16442B-822 | Socket module, 18-pin DIP package |
| | 16442B-823 | Extra socket module, 28-pin DIP package |
| | 16442B-890 | Extra accessory case |
| 16493G | | Digital I/O Connection Cable |
| | 16493G-001 | 1.5 m length |
| | 16493G-002 | 3.0 m length |
| 16494A | | Triaxial Cable |
| | 16494A-001 | 1.5 m length |
| | 16494A-002 | 3 m length |
| | 16494A-003 | 80 cm length |

Options

Table 2-22 lists the options for the Agilent B2961A/B2962A.

Table 2-22

Options

| Option | Description |
|-------------------------------|---|
| External Low Noise Filter | |
| LN1 | Ultra low noise filter, 42V/105mA, 50 Ω (N1294A-021) |
| LN2 | Low noise filter, 210V/3A (N1294A-022) |
| Calibration | |
| A6J | ANSI Z540 compliant calibration |
| UK6 | Commercial calibration certificate with test data |
| Printed Manual (User's Guide) | |
| ABA | English |
| ABJ | Japanese |
| Rack Mount Kit | |
| 1CM | Rack mount kit |

This chapter describes how to install Agilent B2961A/B2962A and accessories and consists of the following sections.

- “Inspecting the Shipment”
- “Installing the Agilent B2961A/B2962A”
- “Maintenance”
- “Connecting a DUT”
- “Installing the Interlock Circuit”
- “Connecting to the Interfaces”
- “Communicating Over the LAN”
- “Using Digital I/O”

WARNING

To avoid electrical shock and instrument damage, turn the instrument off before connecting or disconnecting measurement cable.

WARNING



There are potentially hazardous voltages (± 210 V) present at the High Force, High Sense, and Guard terminals of this instrument. To prevent electrical shock, the following safety precautions must be observed during the use of the instrument.

- Use a three-conductor AC power cord to connect the cabinet (if used) and the instrument to an electrical ground (safety ground).
- If you do *not* use the Agilent 16442B test fixture, you must install and connect an interlock circuit that opens the interlock terminal when the shielding box access door is opened.
- Confirm periodically that the interlock function works normally.
- Before touching the connections on the High Force, High Sense, and Guard terminals, turn the instrument off and discharge any capacitors. If you do *not* turn the instrument off, complete *all* of the following items, regardless of the instrument settings.
 - Press the On/Off switch, and confirm that the switch turns off.
 - Confirm that the On/Off switch does not turn red.
 - Open the shielding box access door (open the interlock terminal).
 - Discharge any capacitors connected to a channel.
- Warn persons working around the instrument about dangerous conditions.

Inspecting the Shipment

Perform the following inspections when the Agilent B2961A/B2962A and accessories arrive at your site.

1. Before unpacking any component, inspect all boxes for any signs of damage that might have occurred during shipment, such as:
 - dents
 - scratches
 - cuts
 - water marks

If you suspect any damage, contact your nearest Agilent Sales and Support Office.

2. When you open the boxes that contain the B2961A/B2962A and accessories, check the components against the contents lists attached to the boxes.
If anything is missing, contact your nearest Agilent Sales and Support Office.
3. Verify the operation of B2961A/B2962A as described in “Checking the Operation of Agilent B2961A/B2962A”.

If any problem occurs, contact your nearest Agilent Sales and Support Office.

Checking the Operation of Agilent B2961A/B2962A

1. Make sure that the line switch is set to off.
2. Connect the power cord from the B2961A/B2962A's rear panel AC input connector (receptacle) to an AC power outlet at your site.
3. Press the line switch to turn on the instrument.

The initialization screen will appear on the B2961A/B2962A's front panel display, and the power-on self-test is automatically executed.

If the B2961A/B2962A is operating normally, the front panel LCD displays as shown in Figure 3-1 or 3-2.

Figure 3-1

Display Example for 1-ch Model

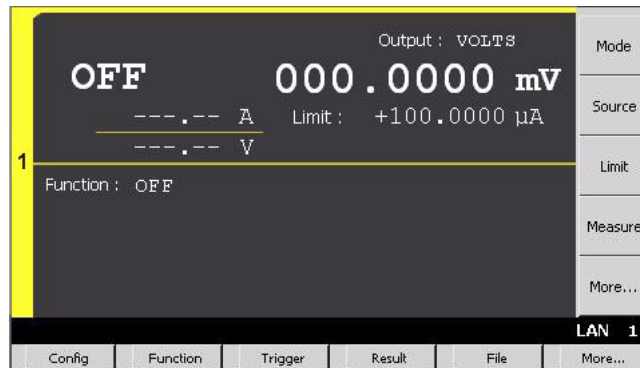
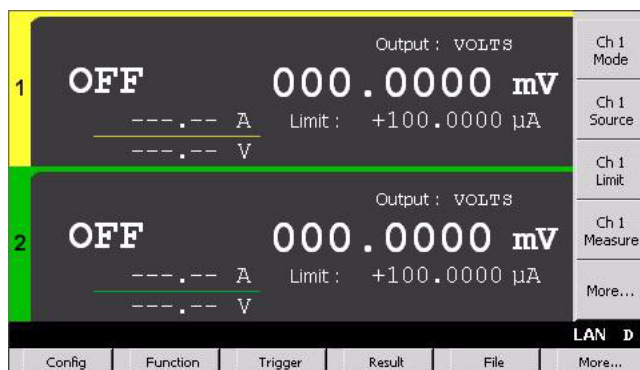


Figure 3-2

Display Example for 2-ch Model



Checking for Errors

Errors can be checked as described below.

1. Press the More > System > Error > Log function keys. This opens the Error Log dialog box.
2. Check the errors displayed on the dialog box.
If no error is detected, "0, No Error" is displayed.
3. Press the OK softkey to close the dialog box.

Installing the Agilent B2961A/B2962A

This section describes information you must pay attention to when installing the Agilent B2961A/B2962A.

- “Safety Considerations”
- “Environment”
- “Connecting the Power Cord”
- “Setting the Power Line Frequency”
- “Bench Installation”
- “Rack Installation”

Safety Considerations

Refer to the Safety Summary page at the beginning of this guide for general safety information. Before installation or operation, check the B2961A/B2962A and review this guide for safety warnings and instructions. Safety warnings for specific procedures are located at appropriate places throughout this guide.

Environment

WARNING

Do not operate the instrument in the presence of flammable gasses or fumes

Environmental conditions for B2961A/B2962A are documented in “General Specifications” on page 2-32. In principle, B2961A/B2962A should only be operated indoors in a controlled environment.

The dimensions of B2961A/B2962A are also given in “General Specifications”. Fan cools the instrument by drawing air through the sides and exhausting it out the back. The instrument must be installed in a location that allows sufficient space at the sides and back of the instrument for adequate air circulation.

Connecting the Power Cord

WARNING

FIRE HAZARD: Use only the power cord supplied with your instrument. Using other types of power cord may cause overheating of the power cord, resulting in fire.

SHOCK HAZARD: The power cord provides the chassis ground through a third conductor. Be sure to connect to a three-conductor type power outlet with the correct pin grounded.

NOTE

The detachable power cord may be used as an emergency disconnecting device. Removing the power cord will disconnect AC input power to the instrument.

Connect the power cord to the IEC 320 connector on the rear of the instrument. If the wrong power cord was shipped with your instrument, contact your nearest Agilent Sales and Support Office.

The AC input on the back of your instrument is a universal AC input. It accepts nominal line voltages in the range of 100 to 240 VAC.

Setting the Power Line Frequency

The power line frequency must be set properly for the AC power at your site. Press the following function keys to set the frequency to 50 Hz or 60 Hz.

- For setting to 50 Hz: More > System > PLC > 50 Hz
- For setting to 60 Hz: More > System > PLC > 60 Hz

Bench Installation

Do not block the air intake at the sides and the exhaust at the rear of the B2961A/B2962A. Minimum clearances for bench operation are 5 mm along the sides and 100 mm along the back.

For easier display viewing and measurement terminal access, you can tilt up the front of the instrument by turning the handle. To adjust the handle, grab the handle by the sides and pull outward. Then, rotate the handle to the desired position.



Rack Installation

NOTE

Use the Rack Mount kit (Option 1CM) to rack mount the Agilent B2961A/B2962A.

Agilent B2961A/B2962A can be mounted in a 19-inch EIA rack cabinet. It is designed to fit in two rack-units (2U) of space.

Remove the front and rear rubber bumpers and the handle before rack mounting the B2961A/B2962A.

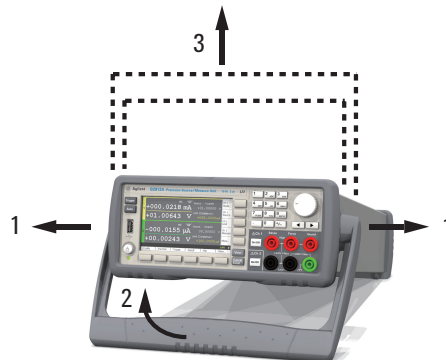
Do not block the air intake at the sides and the exhaust at the rear of the B2961A/B2962A.

Removing the Bumper

Stretch a corner of the rubber bumper and slide it off.

Removing the Handle

1. Grab the handle by the sides and pull outward. This will allow you to rotate the handle.
2. Rotate the handle to a vertical position. Then, position the instrument horizontally.
3. Pull outward and then lift the handle upward.




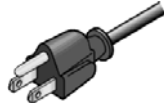




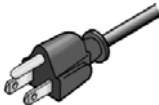
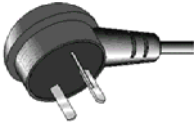




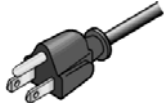

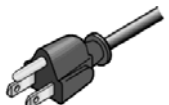



CAUTION

When reattaching the handle, pay attention to its direction. Incorrect attachment may damage the hardware.

Installation

Installing the Agilent B2961A/B2962A

| | | | |
|--|--|---|---|
| <p>Option 900</p>  <ul style="list-style-type: none"> • Plug: BS 1363/A, 250 V, 10 A • PN: 8120-4420 | <p>Option 901</p>  <ul style="list-style-type: none"> • Plug: AS/NZS 3112, 250 V, 10 A • PN: 8120-4419 | <p>Option 902</p>  <ul style="list-style-type: none"> • Plug: IEC 60277-1, 250 V, 10 A • PN: 8121-1226 | <p>Option 903</p>  <ul style="list-style-type: none"> • Plug: NEMA 5-15P, 125 V, 10 A • PN: 8120-6825 |
| <p>Option 904</p>  <ul style="list-style-type: none"> • Plug: NEMA 6-15P, 250 V, 10 A • PN: 8120-3996 | <p>Option 906</p>  <ul style="list-style-type: none"> • Plug: SEV 1011, 250 V, 10 A • PN: 8120-4416 | <p>Option 912</p>  <ul style="list-style-type: none"> • Plug: SB 107-2-D1, 250 V, 10 A • PN: 8121-1655 | <p>Option 917</p>  <ul style="list-style-type: none"> • Plug: IS 1293 and IS 6538, 250 V, 10 A • PN: 8121-1690 |
| <p>Option 918</p>  <ul style="list-style-type: none"> • Plug: JIS C 8303, 125 V, 12 A • PN: 8121-0743 | <p>Option 919</p>  <ul style="list-style-type: none"> • Plug: Israel SI 32, 250 V, 10 A • PN: 8121-0724 | <p>Option 920</p>  <ul style="list-style-type: none"> • Plug: IRAM 2073, 250 V, 10 A • PN: 8121-0725 | <p>Option 921</p>  <ul style="list-style-type: none"> • Plug: CEI 23-16, 250 V, 10 A • PN: 8121-0722 |
| <p>Option 922</p>  <ul style="list-style-type: none"> • Plug: GB 1002 figure 3, 250 V, 10 A • PN: 8120-8376 | <p>Option 923</p>  <ul style="list-style-type: none"> • Plug: SANS 164-1, 250 V, 10 A • PN: 8121-0564 | <p>Option 927</p>  <ul style="list-style-type: none"> • Plug: NEMA WD-6, 250 V, 10 A • PN: 8120-0674 | <p>Option 930</p>  <ul style="list-style-type: none"> • Plug: NBR 14136, 250 V, 10 A • PN: 8121-1809 |
| <p>Option 931</p>  <ul style="list-style-type: none"> • Plug: CNS 10917-2, 125 V, 10 A • PN: 8121-1635 | <p>Option 932</p>  <ul style="list-style-type: none"> • Plug: CS 0017, 250 V, 10 A • PN: 8121-1638 | | |

Maintenance

Maintenance should be performed periodically to keep the Agilent B2961A/B2962A in good condition. If problems arise, contact your nearest Agilent Sales and Support Office.

- “Cleaning”
- “Self-test”
- “Self-calibration”
- “Calibration”

Cleaning

WARNING

SHOCK HAZARD: To prevent electric shock, unplug the B2961A/B2962A before cleaning.

Use a dry cloth or a cloth slightly dampened with water to clean the external case parts. Do not use detergents or chemical solvents. Do not attempt to clean internally.

Self-test

Agilent B2961A/B2962A provides the self-test function to check the operation. The self-test is automatically performed when the instrument is turned on. It is recommended to perform the self-test for the following condition or purpose. Before performing the self-test, turn the channel output off and disconnect test leads and cables from the terminals.

- If a channel is in the lock condition due to over temperature

In this condition, the Emergency dialog box is displayed on the gray background screen, however this is not shown in the remote status if the remote display is set to OFF. And the ERR indicator turns on and the On/Off switch is not effective.

Perform the self-test to unlock the channel. The channel can be used soon if the self-test does not report any problem.

- If you feel that the instrument may be defective
- For preventive maintenance

To perform self-test

The following procedure shows how to perform the self-test.

1. If it is in the remote state, press the Cancel / Local key.
2. Press the On/Off switch and confirm that the switch turns off.
3. Disconnect test leads and cables from the channel terminals.
4. Press the following function keys.

More > System > Cal/Test > Self-Test

Confirmation dialog box is opened.

5. Press the OK key. This starts the self-test.

Self-calibration

Agilent B2961A/B2962A provides the self-calibration function to maintain the measurement performance. If the environmental temperature changes ± 3 °C or more, perform the self-calibration. This is effective for the accurate measurements by minimizing the effect of thermal drift. The self-calibration must be performed after warming-up of 60 minutes. Before performing the self-calibration, turn the channel output off and disconnect test leads and cables from the terminals.

To perform self-calibration

The following procedure shows how to perform the self-calibration.

1. If it is in the remote state, press the Cancel / Local key.
2. Press the On/Off switch and confirm that the switch turns off.
3. Disconnect test leads and cables from the channel terminals.
4. Press the following function keys.

More > System > Cal/Test > Self-Cal

Confirmation dialog box is opened.

5. Press the OK key. This starts the self-calibration.

Calibration

Calibration and adjustments must be performed periodically so that the instruments satisfy the specifications, and keep a good condition. It is recommended to perform the calibration once a year at least. For the calibration and adjustments, contact your nearest Agilent Sales and Support Office. Trained service personnel will perform the calibration and adjustments.

Connecting a DUT

This section describes how to connect a device under test (DUT) to the Agilent B2961A/B2962A source/measure terminals.

NOTE

Set the channel output off when changing the connections. If not, the DUT may be damaged.

To set the channel output off, press the **On/Off** switch and confirm that the switch LED turns off.

This section includes the following descriptions.

- “2-Wire Connections or 4-Wire Connections”
- “Floating”
- “Using Test Leads”
- “Using the N1294A-021/022 Low Noise Filter”
- “Using the N1295A Test Fixture”
- “Using the 16442B Test Fixture”
- “Guarding”

NOTE

Connecting the interlock circuit

B2961A/B2962A provides an interlock function to prevent the user from receiving an electrical shock from high voltages over ± 42 V. If the Digital I/O interlock terminal is open, B2961A/B2962A *cannot* apply a high voltage.

For high voltage measurement, connect the interlock terminal to the interlock circuit as described in “Installing the Interlock Circuit”.

WARNING

Handling device under test (DUT) and terminal area

To prevent electrical shock caused by touching the end of the extension cable or the terminal area with the DUT, cover over the conductors with insulator. Also, protect the cable end and the DUT by using the grounded shield cover and such.

DUT may have a temperature by performing measurement. Pay attention to not only residual charge but temperature when handling the DUT.

2-Wire Connections or 4-Wire Connections

When connecting a DUT, you can choose the connection type either 2-wire connections or 4-wire connections.

If you want to simplify the connections, use 2-wire connections by connecting the Force terminals only and opening the Sense terminals. The Force terminals can be used to apply and measure voltage or current.

To apply voltage accurately, use 4-wire connections, remote sensing, well known as Kelvin connections. Connecting the Force and Sense lines together at the device end eliminates the voltage drop caused by the residual resistance of the test leads or cables.

To specify the connection type (Sensing Type), perform the following procedure.

1. Press the Config > Source > Connection function keys. This opens the Output Connection dialog box.
2. Set the Sensing Type on this dialog box. Choose 2-WIRE for 2-wire connections, or 4-WIRE for 4-wire connections.
3. Press the OK softkey. For 4-wire connections, the following indicator appears on the Single view or the Dual view.


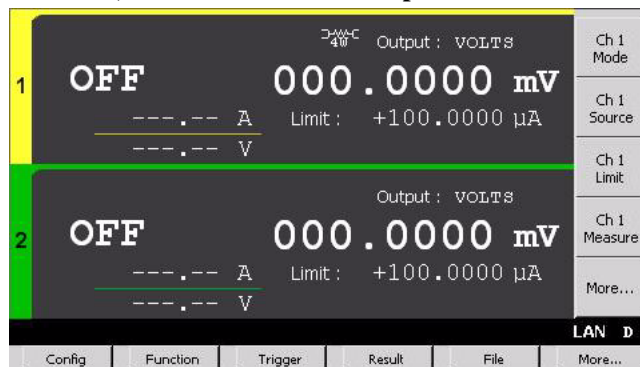
4-wire connection indicator: 

Figure 3-3

Dual View, 4-Wire Connection Setup for Channel 1






Floating

With the default setting, Low Force terminal is connected to the chassis ground. However, it can be internally disconnected from the ground for making the floating condition. This setup is used for connecting the source channels in series.

To specify the low terminal status, perform the following procedure. Setting is not saved. Turning off the instrument sets the status to the grounded.

1. Press the Config > Source > Connection function keys. This opens the Output Connection dialog box.
2. Set the Low Terminal State on this dialog box. It must be FLOATING for the floating status, or GROUNDED for the grounded status.
3. Press the OK softkey.

For the floating status, the following indicator appears on the status information area. And then the Low Force and Low Sense terminals can be connected to the maximum of ± 250 V.

Channel 1 floating status indicator: 


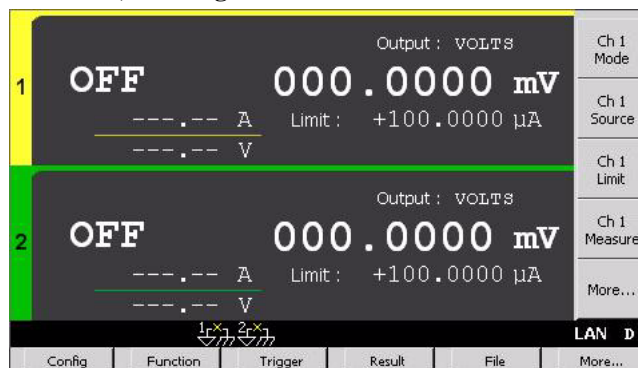
Channel 2 floating status indicator: 

Figure 3-4

Dual View, Floating Status for Channels 1 and 2



CAUTION

Do not apply current to the chassis ground. Doing so will damage the instrument.

WARNING

Potentially hazardous voltages of up to ± 250 V may be present at the Low Force and Low Sense terminals. To prevent electrical shock, use accessories that comply with IEC 61010-2-031. All terminals and the extended conductors must be isolated by using insulation caps, sleeves, etc.

Using Test Leads

B2961A/B2962A source/measure terminals use banana jacks. For connecting a DUT, the following test leads are available. Figure 3-5 shows the connections for two-terminal device measurements.

- Agilent U8201A Combo Test Lead Kit

Couple of test leads, test probes, alligator clips, SMT grabbers, fine-tips test probes, and banana plugs, CAT III 1000 V, 15 A maximum

Two kits are required for 4-wire connections.



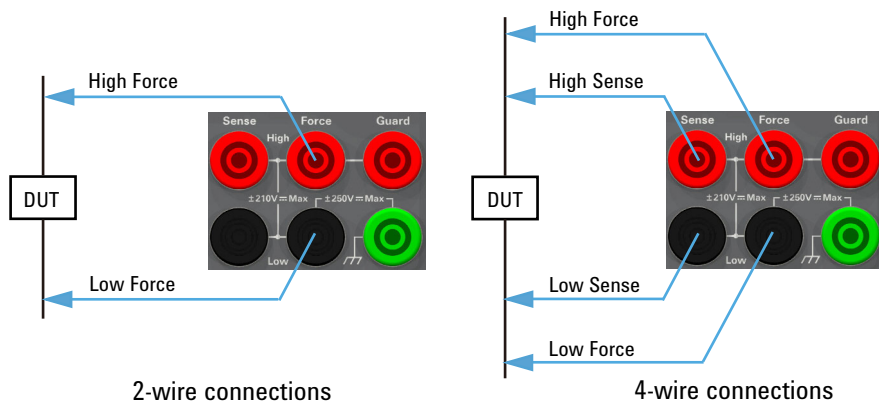
- Agilent 11059A Kelvin Probe Set

Test leads for 4-wire connections, 42 V maximum



Figure 3-5

Connecting a Two-Terminal Device



Using the N1294A-021/022 Low Noise Filter

The following filters are available for the B2961A/B2962A to reduce undesirable noise and to obtain clean output signal. See Figure 3-6 for their top and connector panels. Also see “Output Filter and External Filter” on page 6-12 for more information.

- Agilent N1294A-021 Ultra Low Noise Filter
 - Noise level (20 V range, 10 Hz to 20 MHz): 10 μ Vrms
 - Noise level (100 mA range, 10 Hz to 1 MHz): 300 nArms
 - Maximum voltage/current: 42 V / 105 mA (DC)
 - Output: BNC
- Agilent N1294A-022 Low Noise Filter
 - Noise level (20 V range, 10 Hz to 20 MHz): 350 μ Vrms
 - Noise level (1.5 A range, 10 Hz to 1 MHz): 450 μ Arms
 - Maximum voltage/current: 210 V / 3 A (DC)
 - Output: Banana


Preparation

To use the low noise filter, perform the following procedure. This setting is saved to the non-volatile memory.

1. Press the Config > Source > Ext. Filter function keys. This opens the External Output Filter dialog box.
2. Set the External Filter State on this dialog box to ON.
3. Set the External Filter Type on this dialog box to ULNF for using the ultra low noise filter (N1294A-021) or LNF for using the low noise filter (N1294A-022).
4. Press the OK softkey.

The following indicator appears on the Single view or the Dual view. And then the filter can be connected to the output terminal.

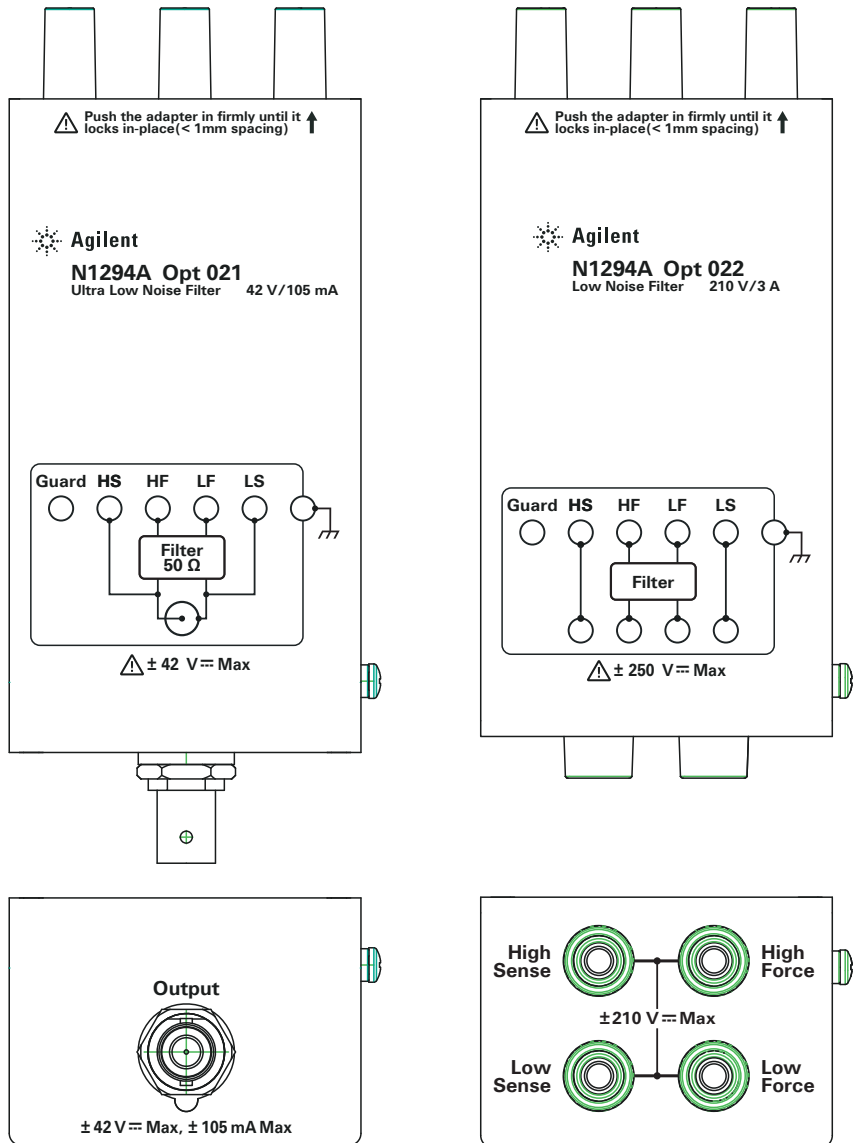
Ultra low noise filter indicator: 

Low noise filter indicator: 

Installation
Connecting a DUT

Figure 3-6

N1294A-021/022 Low Noise Filter



Connections



1. Attach the filter tightly to the B2961A/B2962A source/measure terminals. Note that the contact is not enough if the connection looks like “Bad connection” shown in Figure 3-7.
2. Use appropriate cable or test leads to connect the output of the filter.

CAUTION

Connecting N1294A-021 Ultra Low Noise Filter

If the External Filter Type is set to LNF or the External Filter State is set to OFF, *never* connect the N1294A-021 to the B2961A/B2962A. Doing so, the B2961A/B2962A can apply its maximum voltage/current, and may damage the N1294A-021.

If the External Filter Type is set to ULNF and the External Filter State is set to ON, the B2961A/B2962A output is limited to the N1294A-021's maximum voltage/current (42 V / 105 mA).

WARNING

For using the floating condition, see “Floating” on page 3-13.

If the N1294A-021 ultra low noise filter is used, you can touch the outer conductor of the output connector (BNC). To prevent electrical shock, cover over the outer conductor with insulator.

Using the N1295A Test Fixture

Agilent N1295A is a test fixture which has four triaxial connectors and which supports two 2-wire connections.

Requirements

- Agilent N1295A test fixture furnished with pin clip wire 4 ea. and pin plug wire 2 ea.
- Agilent N1294A-001 banana to triaxial adapter for 2-wire connections
- Triaxial cable, 2 ea. for one 2-wire connection

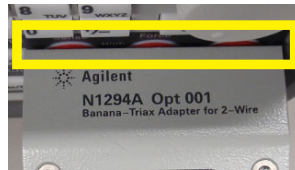
Connections



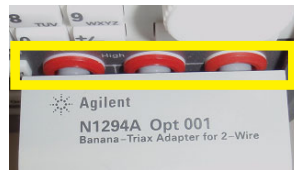
1. Attach the banana to triaxial adapter to the B2961A/B2962A source/measure terminals. See Figure 3-7. If there is some space as “Bad connection”, the contact is not enough.
2. Connect the triaxial cables between the adapter and N1295A as shown in Figure 3-8.
3. Connect the DUT between terminals 1 and 2 for the example in Figure 3-8.

Figure 3-7

Attaching Banana to Triaxial Adapter



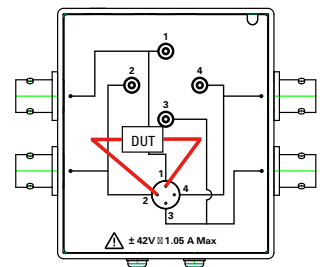
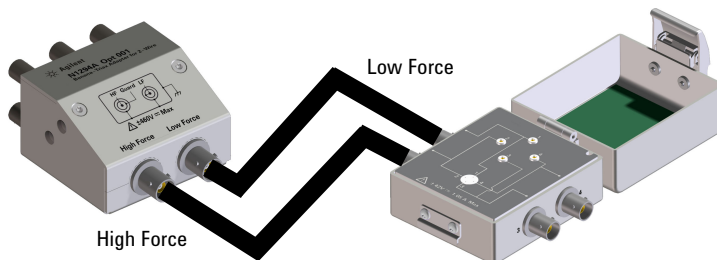
Good connection (no space)



Bad connection

Figure 3-8

Agilent N1295A Connection Example



NOTE

Shielding

N1295A is equipped with a lid. To minimize the effect of ambient noise, close the lid when performing measurements.

CAUTION**Maximum voltage and current**

The test fixture and adapters must be used under the following limitations to prevent damage.

Agilent N1294A-001: ± 250 V maximum, ± 42 V maximum for connecting N1295A

Agilent N1294A-002: ± 250 V maximum, ± 42 V maximum for connecting N1295A

Agilent N1295A: ± 42 V, 1.05 A maximum

Using the 16442B Test Fixture

Agilent 16442B is a test fixture which has six triaxial connectors for source/measure unit (SMU), the GNDU connector for the ground unit of a parameter/device analyzer, the Intlk connector for the interlock control, and six coaxial connectors for other instruments. See *Agilent 16442B User's Guide* for details and accessories of the 16442B.

Requirements

- Agilent 16442B test fixture furnished with pin clip wire, pin plug wire, etc.
- Agilent N1294A-001 banana to triaxial adapter for 2-wire connections
- Agilent N1294A-002 banana to triaxial adapter for 4-wire connections
- Triaxial cable, 2 ea. for 2-wire connections, and 3 ea. for 4-wire connections

NOTE**Shielding**

16442B is equipped with a lid. To minimize the effect of ambient noise, close the lid when performing measurements.

CAUTION**Maximum voltage and current**

The test fixture and adapters must be used under the following limitations to prevent damage.

Agilent N1294A-001: ± 250 V maximum, ± 200 V maximum for connecting 16442B

Agilent N1294A-002: ± 250 V maximum, ± 200 V maximum for connecting 16442B

Agilent 16442B: ± 200 V, 1 A maximum for SMU input

Installation

Connecting a DUT

Connections



1. Attach the banana to triaxial adapter to the B2961A/B2962A source/measure terminals. See Figure 3-7. If there is some space as “Bad connection”, the contact is not enough.
2. Connect the triaxial cables between the adapter and the 16442B. Figure 3-9 shows a connection example.
3. Connect the DUT on the 16442B wiring panel by using the 16442B’s furnished accessories, socket module, blank board, and wire suitable for the DUT.

Figure 3-10 shows the connection example for the connections of Figure 3-9.

For 2-wire connections, connect the SMU 1 Force terminal to a DUT terminal, and connect the SMU 2 Force terminal to the other DUT terminal.

For 4-wire connections, connect the SMU 1 Force and Sense terminals to a DUT terminal. And connect the SMU 3 Sense and Guard terminals to the other DUT terminal if the adapter’s Low Force/Low Sense connector is connected to the SMU 3 Sense connector. The Low Force signal appears on the Guard terminal.

Figure 3-9

Connection Example between N1294A and 16442B

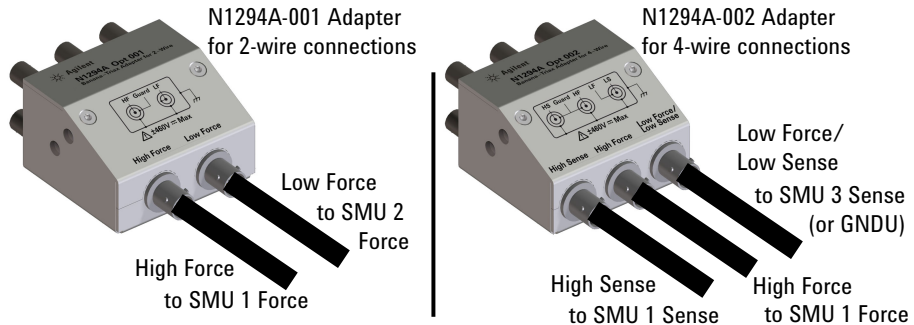
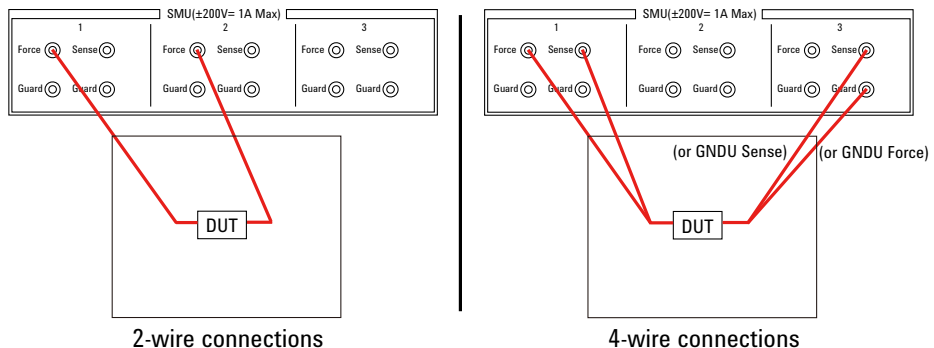


Figure 3-10

Connection Example of 16442B Wiring Panel



NOTE**Performing high voltage measurement**

When the Digital I/O interlock terminal is open, B2961A/B2962A cannot apply high voltage over ± 42 V. To perform high voltage measurements, B2961A/B2962A must be connected to the interlock circuit installed in 16442B.

Prepare the N1294A-011 or 012 interlock cable, and connect it between the B2961A/B2962A Digital I/O connector and the 16442B Intlk connector. B2961A/B2962A can apply a high voltage when the test fixture lid is closed.

WARNING

Potentially hazardous voltages of up to ± 210 V may be present at the High Force, High Sense, and Guard terminals when the 16442B test fixture lid is closed. To prevent electrical shock, do *not* expose these lines.

Guarding

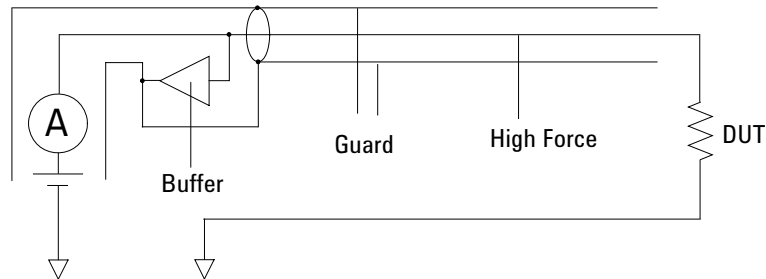
Guarding reduces the leakage current between the instrument and a DUT. This is important when you measure a low current.

Figure 3-11 shows the theory of guarding. The buffer amplifier ($\times 1$) keeps the potential of the Guard conductor at the same potential as the High Force conductor, so that the current does not flow between the High Force and Guard conductors. Therefore, the current measured by the instrument is the same as the current at the DUT terminal because no current is leaked.

For the connection examples shown in Figures 3-8 and 3-9, the guard is extended to the test fixture input connectors with triaxial cables.

Figure 3-11

Guarding



CAUTION

Never connect the Guard terminal to any output, including circuit common, chassis ground, or any other guard terminal. Doing so will damage the B2961A/B2962A.



Installing the Interlock Circuit

The interlock circuit is a simple electric circuit, as shown in Figure 3-12. The circuit electrically opens when an access door is opened, and closes when the door is closed.

B2961A/B2962A cannot apply high voltages over ± 42 V when the Digital I/O interlock terminal is open. To perform high voltage measurements, the B2961A/B2962A interlock terminal must be connected to the interlock circuit installed in the measurement environment such as the shielding box. The interlock circuit is important and necessary to prevent electrical shock when the user touches the measurement terminals.

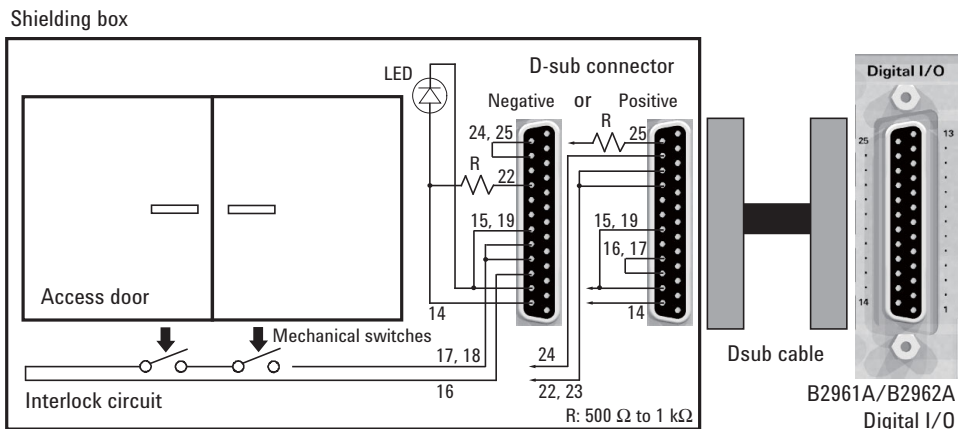
WARNING

Potentially hazardous voltages of up to ± 210 V may be present at the High Force, High Sense, and Guard terminals when the interlock circuit is closed. To prevent electrical shock, do *not* expose these lines.

Requirements

- LED (Agilent part number 1450-0641), 1 ea.
- Mechanical switch (Agilent part number 3101-0302 or 3101-3241), 2 ea.
- Resistor, 500 Ω to 1 k Ω (choose lower one to get higher output of LED), 1 ea.
- 25-pin D-sub connector (for wiring, mounted on the shielding box), 1 ea.
- Connection wire
- 25-pin D-sub cable, 1 ea.

Figure 3-12 Interlock Circuit



Installation
Installing the Interlock Circuit

Procedure

1. Mount two mechanical switches onto your shielding box, so that the switches close when the access door is closed, and open when the door is opened. See Figure 3-14 and Figure 3-15 for the switch dimensions.

2. Mount an LED onto your shielding box. See Figure 3-13 for the LED dimensions.

The LED is used as a high voltage indicator which is lit when B2961A/B2962A is in the high voltage output status.

3. Mount a D-sub connector onto your shielding box.
4. Use a wire and short the following pins of the D-sub connector. See Figure 3-12 for a connection example.

For the negative logic: Pins 24 and 25

For the positive logic: Pins 16 and 17

5. Use a wire and connect the two switches in series between the following pins of the D-sub connector. See Table 3-1 for the Digital I/O pin assignment.

For the negative logic: Pins 16 and some ground pins

The ground pins are pin numbers 15 and 17 to 21.

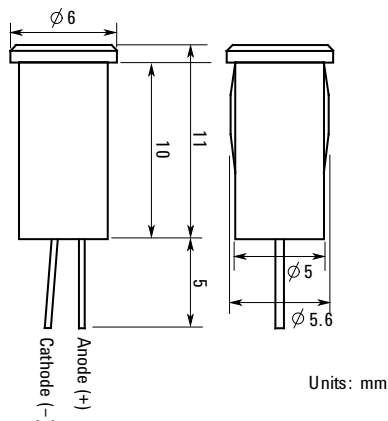
For the positive logic: Pins 24 and some +5 V pins

The +5 V pins are pin numbers 22, 23, and 25.

6. Use a wire and connect the LED between the pin 14 and some ground pins of the D-sub connector. Then set the pin 14 to HIGH VOLTAGE LAMP. See “DIO Configuration dialog box” on page 4-43.

Figure 3-13

Dimensions of the LED (Agilent part number 1450-0641)



7. Connect a resistor between the pin 14 and an unused +5 V pin.

Figure 3-14

Dimensions of the Interlock Switch (Agilent part number 3101-0302)

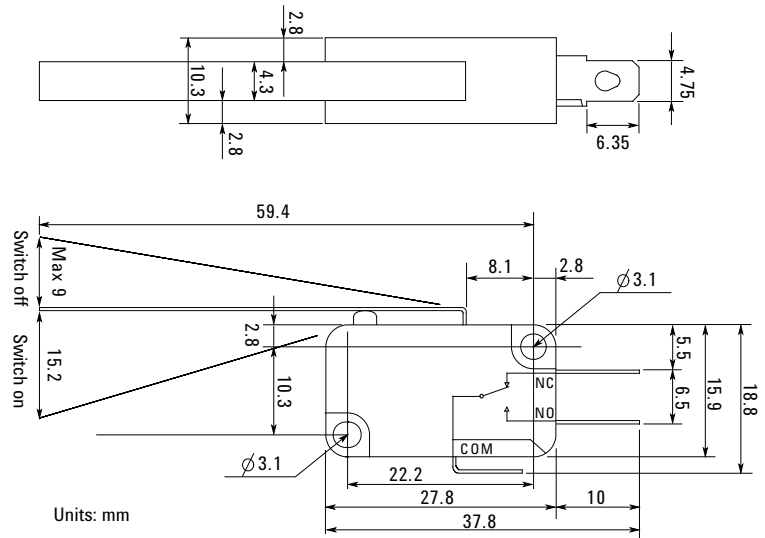
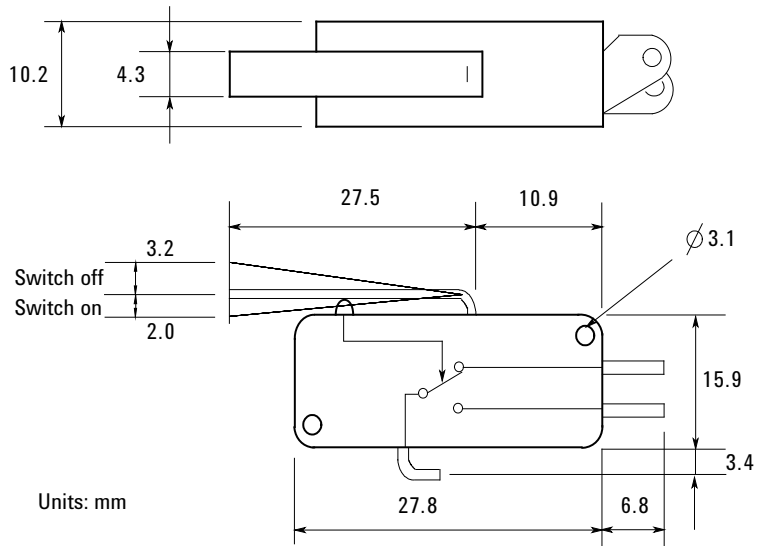


Figure 3-15

Dimensions of the Interlock Switch (Agilent part number 3101-3241)



Connecting to the Interfaces

CAUTION

Electrostatic discharges greater than 1 kV near the interface connectors may cause the unit to reset and require operator intervention.

B2961A/B2962A supports GPIB, LAN, and USB interfaces. All three interfaces are live at power-on. Connect your interface cable to the appropriate interface connector. Information on configuring the interfaces can be found later in this section.

The front panel display's LAN indicator is lit when the LAN port is connected and configured.

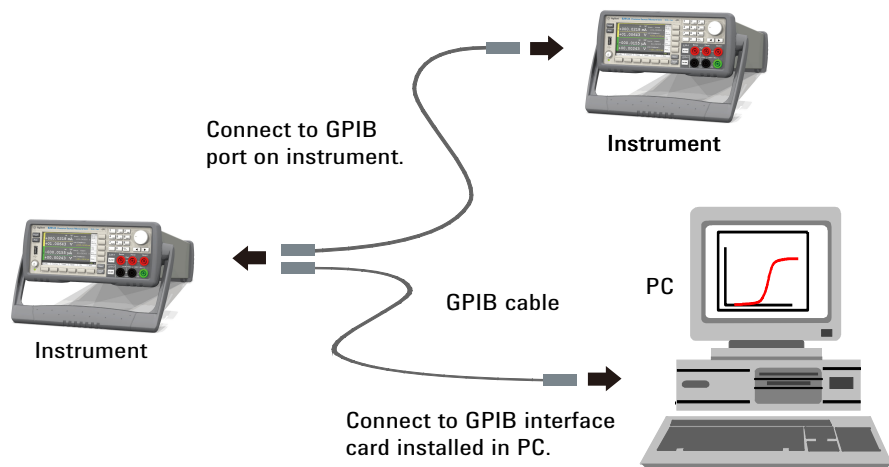
B2961A/B2962A provides Ethernet connection monitoring. With Ethernet connection monitoring, the instrument's LAN port is continually monitored and automatically reconfigured.

GPIB/USB Interfaces

NOTE

For detailed information about GPIB and USB interface connections, refer to *Connectivity Guide* installed with the Agilent IO Libraries.

The following steps will help you quickly get started connecting your instrument to the GPIB (General Purpose Interface Bus). The following figure illustrates a typical GPIB interface system.

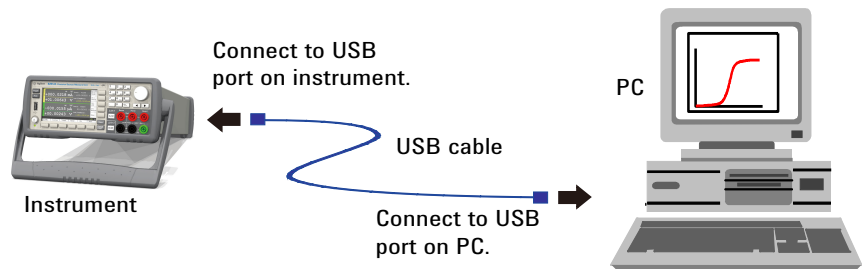


1. If you have not already done so, install the Agilent IO Libraries Suite from the CD shipped with your product.
2. If you do not have a GPIB interface card installed on your computer, turn off your computer and install the GPIB card.
3. Connect your instrument to the GPIB interface card using a GPIB interface cable.
4. Use the Connection Expert utility from the Agilent IO Libraries Suite to configure the installed GPIB interface card's parameters.
5. B2961A/B2962A is shipped with its GPIB address set to 23. To view or change the GPIB address, press the More function key, then the I/O > GPIB softkeys. The GPIB Configuration dialog box appears.

To change the GPIB address, use the rotary knob or the arrow keys, and press OK to set the value.

6. You can now use the Interactive IO within Connection Expert to communicate with your instrument, or program your instrument using various programming environments.

The following steps will help you quickly get started with connecting your USB-enabled instrument to the USB (Universal Serial Bus). The following figure illustrates a typical USB interface system.



1. If you have not already done so, install the Agilent IO Libraries Suite from the CD shipped with your product.
2. Connect the USB device port located on the back of your instrument to the USB port on your computer.
3. With the Connection Expert utility from the Agilent IO Libraries Suite running, the computer will automatically recognize the instrument. This may take several seconds. When the instrument is recognized, your computer will display the VISA alias, IDN string, and VISA address. This information is located in the USB folder.

Installation

Connecting to the Interfaces

You can also view the instrument's VISA address from the front panel. Press the More function key, then the I/O > USB softkeys. The VISA address is shown in the USB Status dialog box.

4. You can now use the Interactive IO within Connection Expert to communicate with your instrument, or program your instrument using various programming environments.

LAN Interface

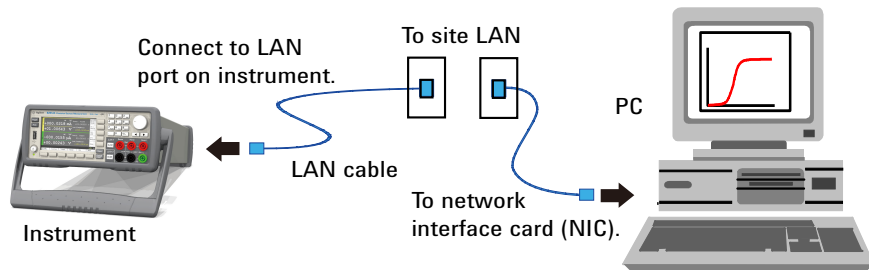
NOTE

For detailed information about LAN interface connections, refer to *Connectivity Guide* installed with the Agilent IO Libraries.

The following steps will help you quickly get started with connecting and configuring your instrument on a local area network.

Connecting to a Site LAN

A site LAN is a local area network in which LAN-enabled instruments and computers are connected to the network via routers, hubs, and/or switches. They are typically large, centrally-managed networks with services such as DHCP and DNS.



1. If you have not already done so, install the Agilent IO Libraries Suite from the CD shipped with your product.
2. Connect the instrument to the site LAN. The factory-shipped instrument LAN settings are configured to automatically obtain an IP address from the network using DHCP (DHCP is enabled). Note that this may take up to one minute. The DHCP server will register the instrument's hostname with the dynamic DNS server. The hostname as well as the IP address can then be used to communicate with the instrument. The front panel display's LAN indicator will turn green when the LAN port has been configured successfully, or turn red if the configuration fails.

NOTE

If you need to manually configure any instrument LAN settings, see “LAN Configuration dialog box” on page 4-43 for information about configuring the LAN settings from the front panel of the instrument.

3. Use the Connection Expert utility from the Agilent IO Libraries Suite to add the B2961A/B2962A and verify the connection. To add the instrument, you can request Connection Expert to discover the instrument. If the instrument cannot be found, add the instrument using the instrument’s hostname or IP address.

NOTE

If this does not work, refer to the troubleshooting section in the Agilent Technologies *USB/LAN/GPIB Interfaces Connectivity Guide*.

4. You can now use the Interactive IO within Connection Expert to communicate with your instrument, or program your instrument using various programming environments. You can also use the Web browser on your computer to connect to the instrument as described under “Using the Graphical Web Interface”.

Viewing the Active LAN Status

To view the currently active LAN settings, press the More function key, then the I/O > LAN > Status softkeys. The LAN status dialog box appears.

Note that the currently active LAN settings for the IP Address, Subnet Mask, and Default Gateway may be different from the settings specified in the LAN Configuration dialog box, depending on the configuration of the network. If the settings are different, it is because the network has automatically assigned its own settings.

Modifying the LAN Settings

As shipped from the factory, B2961A/B2962A’s pre-configured settings should work in most LAN environments. If you need to manually configure these settings, press the More function key, then the I/O > LAN > Config softkeys. The LAN Configuration dialog box appears.

NOTE

B2961A/B2962A must be rebooted if the host name is changed.

For the LAN setup parameters, see “LAN Configuration dialog box” on page 4-43.

Communicating Over the LAN

Using the Graphical Web Interface

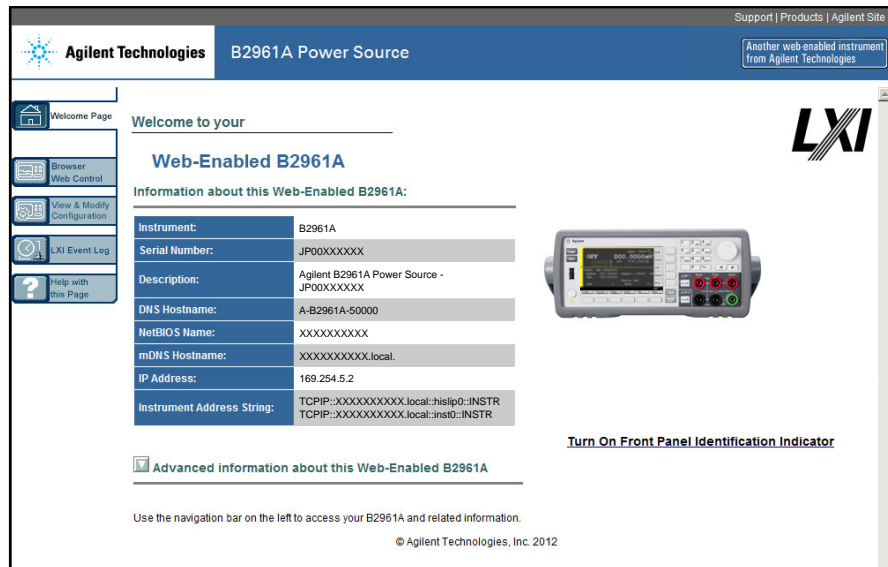
Your Agilent B2961A/B2962A has a built-in graphical web interface that lets you control it directly from an Web browser on your computer. Multiple simultaneous connections are allowed, but only from one computer. With additional connections, performance will be reduced. Multiple connections from multiple computers are not allowed.

With the graphical web interface, you can access the front panel control functions including the LAN configuration parameters. This is a convenient way to communicate with the B2961A/B2962A without using I/O libraries or drivers.

NOTE

The built-in graphical web interface only operates over the LAN interface. It requires Internet Explorer 6+ or Firefox 2+. You will also need the Java Plug-in. This is included in the Java Runtime Environment. Refer to Sun Microsystem's website. If you are using Internet Explorer 7, open a separate browser window for each connection.

The graphical web interface is enabled when shipped.



To launch the graphical web interface:

1. Open a Web browser on your computer.
2. Enter the instrument's hostname or IP address into the browser's Address field to launch the graphical web interface. The B2961A/B2962A home page will appear.
3. Click on the Browser Web Control button in the navigation bar on the left to begin controlling your instrument.
4. For additional help about any page, click "Help with this Page".

If desired, you can control the access to the graphical web interface using password protection. As shipped from the factory, the password is set to *agilent*. To change the password, click on the View & Modify Configuration button. Refer to the online help for additional information about setting the password.

Using Telnet

The Telnet utility (as well as sockets), is another way to communicate with B2961A/B2962A without using I/O libraries or drivers. In all cases, you must first establish a LAN connection from your computer to the B2961A/B2962A as previously described.

In an MS-DOS Command Prompt box, type "telnet *hostname* 5024" where *hostname* is the B2961A/B2962A's hostname or IP address, and 5024 is the instrument's telnet port. You should get a Telnet session box with a title indicating that you are connected to the B2961A/B2962A. Type the SCPI commands at the prompt.

Using Sockets

NOTE

Agilent B2961A/B2962A allows any combination of up to four simultaneous data socket, control socket, or telnet connections to be made.

Agilent instruments are standardized on using port 5025 for SCPI socket services. A data socket on this port can be used to send and receive ASCII/SCPI commands, queries, and query responses. All commands must be terminated with a newline for the message to be parsed. All query responses will also be terminated with a newline.

Installation

Communicating Over the LAN

The socket programming interface also allows control socket connections. The control socket can be used by a client to send device clear and to receive service requests. Unlike the data socket, which uses a fixed port number, the port number for a control socket varies and must be obtained by sending the following SCPI query to the data socket: `SYSTem:COMMunicate:TCPIp:CONTRol?`

Once the port number is obtained, a control socket connection can be opened. As with the data socket, all commands to the control socket must be terminated with a newline, and all query responses returned on the control socket will be terminated with a newline.

To send a device clear, send the string “DCL” to the control socket. When the B2961A/B2962A has finished performing the device clear, it will echo the string “DCL” back to the control socket.

Service requests are enabled for control sockets using the Service Request Enable register. Once service requests have been enabled, the client program listens on the control connection. When SRQ becomes true, the instrument will send the string “SRQ +nn” to the client. The “nn” is the status byte value, which the client can use to determine the source of the service request.

Using Digital I/O

B2961A/B2962A has a Digital I/O connector, D-sub 25 pin female, for general purpose input/output (GPIO). It can be used for:

- Trigger input
- Trigger output
- Digital signal input/output
- Digital signal input
- Interlock control
- High voltage status output (shared with the digital signal input/output DIO 14)

The pin assignment of the Digital I/O connector is shown in Table 3-1. Pins DIO 1 to DIO 14 can be assigned to one of the above functions, except for interlock control. To set the DIO functions, press the More function key, then the I/O > DIO > Config softkeys. For details, see “DIO Configuration dialog box” on page 4-43.

Figure 3-16 shows the input/output circuits internally connected to each pin of the Digital I/O connector.

For the available accessory, see “Accessory for Digital I/O Connector” on page 3-35.

Figure 3-16

Digital I/O Internal Circuit

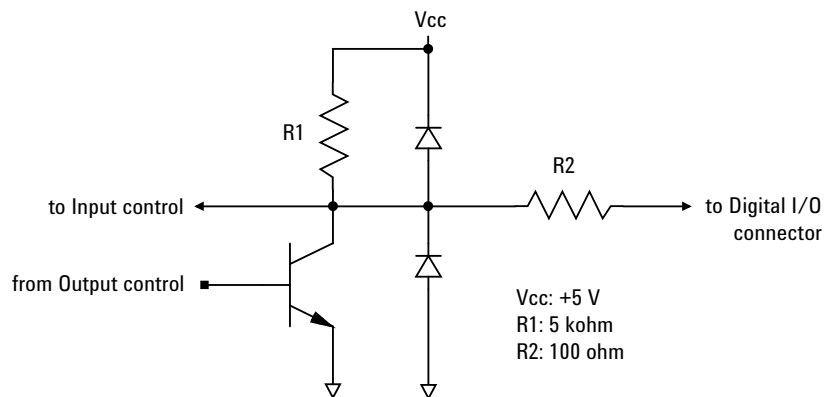


Table 3-1

Digital I/O Pin Assignment

| Description | Pin Number | | Description |
|---|------------|----|-----------------|
| +5 V ^a | 25 | 13 | DIO 13 (bit 13) |
| Interlock control ^b | 24 | 12 | DIO 12 (bit 12) |
| +5 V ^a | 23 | 11 | DIO 11 (bit 11) |
| +5 V ^a | 22 | 10 | DIO 10 (bit 10) |
| GND | 21 | 9 | DIO 9 (bit 9) |
| GND | 20 | 8 | DIO 8 (bit 8) |
| GND | 19 | 7 | DIO 7 (bit 7) |
| GND | 18 | 6 | DIO 6 (bit 6) |
| GND | 17 | 5 | DIO 5 (bit 5) |
| Interlock control ^c | 16 | 4 | DIO 4 (bit 4) |
| GND | 15 | 3 | DIO 3 (bit 3) |
| DIO 14 (bit 14) or High voltage status | 14 | 2 | DIO 2 (bit 2) |
| | | 1 | DIO 1 (bit 1) |

- a. Current limit: 600 mA (total current to the pins 22, 23, and 25)
- b. Used for the positive logic. Connected to the pin 25 for the negative logic.
- c. Used for the negative logic. Connected to the pin 17 for the positive logic.

Accessory for Digital I/O Connector

The following accessory is available for the Digital I/O connector.

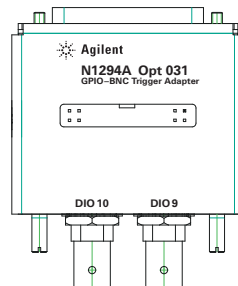
- Agilent N1294A-031 GPIO-BNC Trigger Adapter

This adapter is used to change the Digital I/O connector to the trigger input/output BNC connectors. The BNC connectors are internally connected to the DIO pins 9 and 10.

This adapter can be connected directly to the Digital I/O connector.

Figure 3-17

N1294A-031 GPIO-BNC Trigger Adapter



NOTE

Interlock terminals

If the N1294A-031 adapter is connected to the Digital I/O connector, the Interlock terminals are opened. Then the B2961A/B2962A output voltage is limited to ± 42 V.

To use the interlock function, see “Installing the Interlock Circuit” on page 3-23 and extend the Interlock terminals. They can be extended from the adapter internal board through the opening of the adapter top cover.

Front Panel Reference

This chapter provides the reference information of the Agilent B2961A/B2962A front panel keys and display.

- “Hard Keys and Rotary Knob”
- “Display and Assist Keys”
- “Function Keys”
- “Config key group”
- “Function key group”
- “Trigger key group”
- “Result key group”
- “File key group”
- “Program key group”
- “I/O key group”
- “Display key group”
- “System key group”



NOTE

If measurement is not performed properly, check the trigger setting. The trigger type must be set to AUTO, or the trigger count (Count) must be set properly. See “Trigger Parameters” on page 4-19.

Hard Keys and Rotary Knob

Line switch

Turns the instrument on or off.

Trigger

Starts a single (one shot) output/measurement or initiates trigger system. If a repeat measurement is in progress, stops it.

The single measurement is performed with the DC bias output, pulsed bias output, arbitrary waveform output, staircase sweep output, or pulsed sweep output set to the channel. One single measurement can contain the maximum of 100000 measurement points.

Once a single measurement starts, the data buffer (maximum 100000 data) is cleared, and the last single measurement result is stored in the buffer. The measurement result is displayed on the Single view, Dual view, or Graph view. Also the last single measurement result can be listed and displayed on the Measure Result dialog box.

Auto

Starts a repeat (continuous) measurement. If a repeat measurement is in progress, stops it.

The repeat measurement is performed with the DC bias output of the Source value. And the measurement result is displayed on the Single view or Dual view. The repeat measurement result is not stored in the buffer.

The repeat measurement is performed with the following trigger setup. Settings of “Trigger Parameters” are ignored.

- Acquire trigger (measurement trigger): Initiate
- ARM acquire count: Infinite
- ARM acquire source: AUTO (automatic internal)
- TRIGger acquire count (Measure Count) 100
- TRIGger acquire source (Measure Trigger): AUTO (automatic internal)
- TRIGger acquire timer period (Measure Period): 10 ms (this is automatically extended if the measurement is not completed.)
- Trigger delay (Source Delay=Measure Delay): 0 s
- Trigger output: Disable

View

Changes the display mode. See “Display and Assist Keys” on page 4-5.

Front Panel Reference

Hard Keys and Rotary Knob

| | |
|----------------------------|---|
| Cancel / Local | <p>Cancels the setup operation if the instrument is in the local status. Returns the instrument to the local status if it is in the remote status.</p> |
| On/Off | <p>Used to enable or disable the channel. Turns the channel off if it is in the output status even if it is in the remote status. One switch on 1-channel models, and two switches on 2-channel models.</p> <p>The switch turns green if the channel is enabled.</p> <p>The switch turns red if the channel is in the high voltage state.</p> |
| Numeric/alpha keys | <p>Used to enter the value for setup parameters such as the source output value, limit value, and message, specified by the field pointer. The value can be changed if the field pointer is in the EDIT (green) status.</p> |
| Rotary knob | <p>If the field pointer is in the MOVE (blue) status, turning the knob moves the pointer. Pressing the knob fixes the pointer position and changes the pointer status to EDIT (green).</p> <p>If the field pointer is in the EDIT (green) status, turning the knob changes the value of the setup parameter specified by the pointer. Pressing the knob fixes the value and changes the pointer status to MOVE (blue).</p> <p>If the field pointer is in the EDIT (green) status on a setup field other than the Source field and the Limit field, turning the knob changes the setting value. The value is applied by pressing the knob.</p> <p>If the field pointer is in the EDIT (green) status on the Source or Limit field, turning the knob changes the setting value of the source channel in real time.</p> <p>If the digit pointer is on a digit of a numeric value entry field, turning the knob changes the value of the digit. Note that changing the value from 9 to 0 or from 0 to 9 changes the value of the next digit.</p> <p>If the digit pointer is on the decimal point of a numeric value entry field, turning the knob moves the decimal point if the Immediate V/I Update by Knob setup is OFF.</p> |
| Left and right keys | <p>If the field pointer is in the MOVE (blue) status, pressing the key moves the pointer.</p> <p>If the field pointer is in the EDIT (green) status, pressing the key changes the value of the setup parameter specified by the pointer.</p> <p>If the field pointer is in the EDIT (green) status on a numeric value entry field, pressing the key changes the pointer to the digit pointer.</p> <p>If the digit pointer is on a digit of a numeric value entry field, pressing the key moves the pointer on the digits.</p> |

Display and Assist Keys

Agilent B2961A/B2962A provides several display modes which depend on the model as shown below. The display mode is changed by the View key. Pressing the key changes the mode as shown below.

On B2961A Single → Graph → (return to Single)

On B2962A Dual → Single for channel 1 → Single for channel 2 → Graph
→ (return to Dual)

For each display mode, five assist keys are available on the right side of the display. They are assigned to several softkeys such as Mode, Source, Limit, Measure, and More. The softkey assignment depends on the display mode.

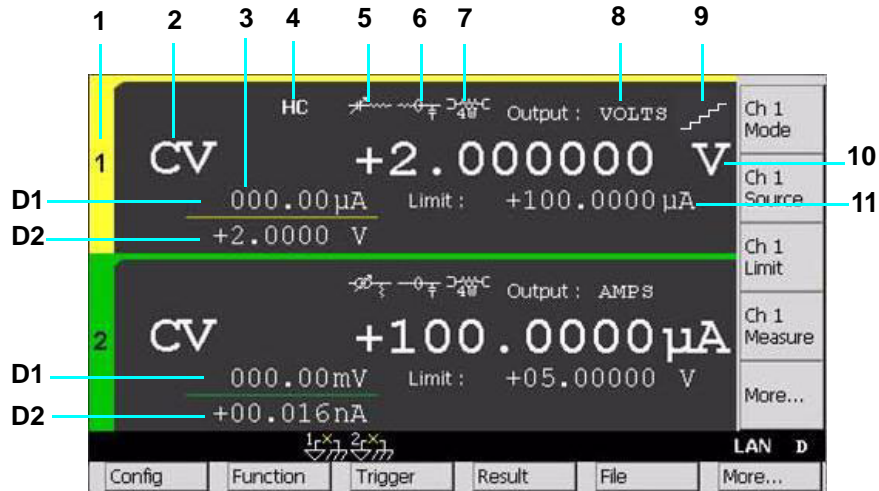
For details of each display mode and assist keys, see the following sections.

- “Dual View”
- “Single View”
- “Graph View”
- “Status Information”

The status information is common for all display modes. It is displayed above the bottom softkeys associated with the function keys. This display area is also used to display system messages and error messages.

Dual View

Available on B2962A. The upper half is for channel 1. The lower half is for channel 2. Each area displays the measurement results, source and measurement settings, and channel status. Most setup parameters can be edited on this display.



Display area

1. Channel number. 1 or 2.
2. Output status (OFF, CV, CC, or EMUL)
CV: Constant Voltage
CC: Constant Current
EMUL: Emulation Table (this is displayed when programmable output resistance is set using the emulation table.)
3. Latest measurement data (4½ digit resolution)
4. High capacitance (HC) mode indicator
5. Programmable output resistance indicator
6. External filter indicator
7. Remote sensing (4-wire connection) status indicator
8. Source function. VOLTS or AMPS.
9. Source shape indicator. DC, waveform, pulse, sweep, or pulsed sweep. DC does not show the indicator.
10. Source output value (6½ digit resolution)

11. Limit value

To set the V/I Limit for Each Polarity, see “Display Preference dialog box” on page 4-46.

D1. Primary measurement data. Turns orange if the data exceeds the Limit value.

D2. Secondary measurement data. Turns orange if the data exceeds the Limit value.

NOTE

Measurement Range

Voltage source uses the present output range to measure voltage and/or the minimum range which covers the Limit value to measure current.

Current source uses the present output range to measure current and/or the minimum range which covers the Limit value to measure voltage.

Assist keys

In the following descriptions, *Ch n* indicates *Ch 1* or *Ch 2*.

***Ch n* Mode** Changes the assist keys to VOLTS (V) and AMPS (I) used to select the source function.

VOLTS (V) sets the voltage source.

AMPS (I) sets the current source.

***Ch n* Source** Changes the assist keys to the unit keys shown below.

μV, mV, and V for the voltage source

pA, nA, μA, mA, and A for the current source

First, enter or set the output value by using the numeric/alpha keys, rotary knob, and arrow keys. Then press one of the unit keys to apply the value.

***Ch n* Limit** Changes the assist keys to the unit keys shown below.

pA, nA, μA, mA, and A for the current limit

μV, mV, and V for the voltage limit

First, enter or set the limit value by using the numeric/alpha keys, rotary knob, and arrow keys. Then press one of the unit keys to apply the value.

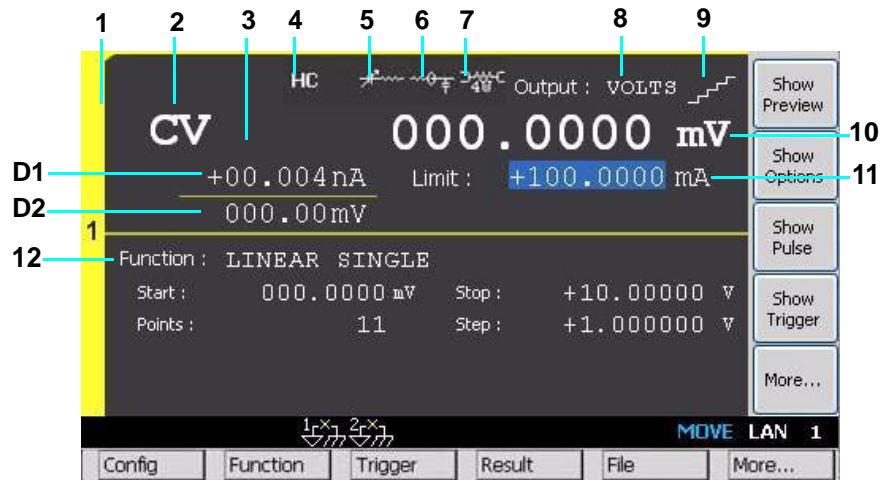
Front Panel Reference

Display and Assist Keys

| | |
|----------------------------|--|
| <i>Ch n Measure</i> | <p>Changes the assist keys to AMPS (I), VOLTS (V), OHMS (R), WATTS (P), and %LIMIT (%) used to select the measurement function.</p> <p>AMPS (I) sets the current measurement.</p> <p>VOLTS (V) sets the voltage measurement.</p> <p>OHMS (R) sets the resistance measurement.</p> <p>WATTS (P) sets the power measurement.</p> <p>%LIMIT (%) sets the percent-to-Limit measurement.</p> <p>Resistance data is given by $\text{Resistance} = \text{Vmeas} / \text{Imeas}$.</p> <p>Power data is given by $\text{Power} = \text{Vmeas} \times \text{Imeas}$.</p> <p>In the above formula, Vmeas is the voltage measurement data, and Imeas is the current measurement data.</p> <p>For details on using resistance compensation, see “Resistance Compensation” on page 6-18.</p> |
| More... | <p>Changes the assist keys to <i>Ch 1</i> assist keys or <i>Ch 2</i> assist keys. <i>Ch 1</i> assist keys are effective for channel 1. <i>Ch 2</i> assist keys are effective for channel 2.</p> |

Single View

Displays the measurement results, source and measurement settings, and channel status. Most setup parameters can be edited on this display. The lower half displays the setup parameters selected by Assist keys 2.



Display area

1. Channel number. 1 or 2.
2. Output status (OFF, CV, CC, or EMUL)
CV: Constant Voltage
CC: Constant Current
EMUL: Emulation Table (this is displayed when programmable output resistance is set using the emulation table.)
3. Latest measurement data (4½ digit resolution)
4. High capacitance (HC) mode indicator
5. Programmable output resistance indicator
6. External filter indicator
7. Remote sensing (4-wire connection) status indicator
8. Source function. VOLTS or AMPS.
9. Source shape indicator. DC, waveform, pulse, sweep, or pulsed sweep. DC does not show the indicator.
10. Source output value (6½ digit resolution)

Front Panel Reference
Display and Assist Keys

11. Limit value

To set the V/I Limit for Each Polarity, see “Display Preference dialog box” on page 4-46.

12. Output function (sweep and arbitrary waveform) parameters.

D1. Primary measurement data. Turns orange if the data exceeds the Limit value.

D2. Secondary measurement data. Turns orange if the data exceeds the Limit value.

NOTE

Measurement Range

Voltage source uses the present output range to measure voltage and/or the minimum range which covers the Limit value to measure current.

Current source uses the present output range to measure current and/or the minimum range which covers the Limit value to measure voltage.

Assist keys 1

| | |
|----------------|---|
| Mode | Changes the assist keys to VOLTS (V) and AMPS (I) used to select the source function. VOLTS (V) sets the voltage source. AMPS (I) sets the current source. |
| Source | Changes the assist keys to the unit keys shown below. μ V, mV, and V for the voltage source pA, nA, μ A, mA, and A for the current source First, enter or set the output value by using the numeric/alpha keys, rotary knob, and arrow keys. Then press one of the unit keys to apply the value. |
| Limit | Changes the assist keys to the unit keys shown below. pA, nA, μ A, mA, and A for the current limit μ V, mV, and V for the voltage limit First, enter or set the limit value by using the numeric/alpha keys, rotary knob, and arrow keys. Then press one of the unit keys to apply the value. |
| Measure | Changes the assist keys to AMPS (I), VOLTS (V), OHMS (R), WATTS (P), and %LIMIT (%) used to select the measurement function. AMPS (I) sets the current measurement. |

VOLTS (V) sets the voltage measurement.

OHMS (R) sets the resistance measurement.

WATTS (P) sets the power measurement.

%LIMIT (%) sets the percent-to-Limit measurement.

Resistance data is given by $\text{Resistance} = V_{\text{meas}} / I_{\text{meas}}$.

Power data is given by $\text{Power} = V_{\text{meas}} \times I_{\text{meas}}$.

In the above formula, V_{meas} is the voltage measurement data, and I_{meas} is the current measurement data.

For details on using resistance compensation, see “Resistance Compensation” on page 6-18.

More... Changes the assist keys to Assist keys 2.

Assist keys 2

Show Preview Changes display from channel setup to waveform preview.

Hide Preview Changes display from waveform preview to channel setup.

Show Options Displays the optional parameters shown in “Optional Parameters” on page 4-17, and changes the softkey label to *Hide Options*.

Hide Options Displays the function setup parameters shown in “Function Parameters” on page 4-12, and changes the softkey label to *Show Options*.

Show Pulse Displays the pulse setup parameters shown in “Pulse Parameters” on page 4-18, and changes the softkey label to *Hide Pulse*.

Hide Pulse Displays the function setup parameters shown in “Function Parameters” on page 4-12, and changes the softkey label to *Show Pulse*.

Show Trigger Displays the trigger setup parameters shown in “Trigger Parameters” on page 4-19, and changes the softkey label to *Hide Trigger*.

Hide Trigger Displays the function setup parameters shown in “Function Parameters” on page 4-12, and changes the softkey label to *Show Trigger*.

More... Changes the assist keys to Assist keys 1.

Softkey labels *Show XXXX* and *Hide XXXX* are switched by pressing the key.

Function Parameters

```
Function : LINEAR SINGLE
Start :    000.0000 mV   Stop :    +10.00000 V
Points :         11     Step :    +1.000000 V
```

The following setup parameters are available.

| | |
|------------------|---|
| Function: | Output function. The following parameters are available. OFF: DC output LINEAR SINGLE: Linear single sweep output LINEAR DOUBLE: Linear double sweep output LOG SINGLE: Log single sweep output LOG DOUBLE: Log double sweep output LIST: List sweep output ARB EXPONENT: Exponential waveform output ARB RAMP: Ramp waveform output ARB SINUSOID: Sinusoidal waveform output ARB SQUARE: Square waveform output ARB TRAPEZOID: Trapezoidal waveform output ARB TRIANGLE: Triangle waveform output ARB USER: User defined arbitrary waveform output For details, see “Sweep Output” on page 6-9, “List Sweep” on page 6-10, and “Arbitrary Waveform Output” on page 6-11. |
| Start: | Start value of sweep source or arbitrary waveform. |
| Stop: | Stop value of sweep source. |
| Points: | Number of sweep source steps. |
| Step: | Step value of sweep source. |
| End: | End value of arbitrary waveform. |
| Delay: | Delay time of arbitrary waveform. |

| | |
|-------------------|---|
| Rise Time: | Rise time of arbitrary waveform. |
| Peak Time: | Peak time of arbitrary waveform. |
| Fall Time: | Fall time of arbitrary waveform. |
| End Time: | End time of arbitrary waveform. |
| Count: | Number of waveforms to be generated in one device action. |
| Time: | Time of exponential waveform. |
| T(tau): | Time constant of exponential waveform. |
| Ramp: | Ramp (rise) time of ramp waveform. |
| Amplitude: | Amplitude value of sinusoidal waveform. |
| Offset: | Offset value of sinusoidal waveform. |
| Frequency: | Frequency of sinusoidal waveform. |
| Phase Out: | Phase marker output status, ON or OFF, for sinusoidal waveform. ON enables trigger output at phase marker position. |
| Marker: | Phase marker value, 0 to 360, in degree. |

NOTE

To use the trigger output, set trigger output condition by using SCPI commands. See Agilent B2961A/B2962A *SCPI Command Reference*.

List Sweep Setup

When the field pointer is in the EDIT (green) status on the LIST sweep Start/Stop/Points field, the following assist keys are available for setting the list sweep source.

| | |
|-------------|--|
| Edit | Opens the List Sweep dialog box used to set the list sweep source. |
| Load | Opens the Load List Sweep Data dialog box used to load a list sweep data from a USB memory connected to the front panel USB-A connector. |

- List Sweep dialog box

This dialog box provides the following GUI for setting the list sweep source.

| | |
|---------------------|---|
| (data graph) | Displays the shape of the list sweep output |
| Source | Source function (VOLTS or AMPS) |

Front Panel Reference

Display and Assist Keys

| | |
|--------------------|---|
| CH | Channel number 1 or 2, only on 2-channel models |
| Points | Number of data points |
| Max | Maximum value |
| Min | Minimum value |
| (data list) | Lists the data index and the output value |

When the field pointer is in the EDIT (green) status on the data index field, the following assist keys are available for adding/deleting an entry and scrolling the list: Append, Insert, Delete, Scroll +100, and Scroll -100.

When the field pointer is in the EDIT (green) status on the output value field, the following assist keys are available for specifying the unit: μ V, mV, and V (for VOLTS) or pA, nA, μ A, mA, and A (for AMPS).

- Load List Sweep Data dialog box

This dialog box provides the following GUI for loading a list sweep data from a file stored on a USB memory.

| | |
|---------------------|---|
| (data graph) | Displays the shape of the list sweep data selected by the file list |
| Path | Folder into which the list sweep data file is saved |
| Points | Number of data points |
| Max | Maximum value |
| Min | Minimum value |
| (file list) | List of the list sweep data file |

The following data can be loaded as the list sweep data.

- Comma separated value format, file extension csv
- Carriage return or line feed separated value format, file extension txt
- Space separated value format in a line, file extension prn

User Defined Waveform Setup

When the field pointer is in the EDIT (green) status on the ARB USER defined waveform Start/Stop/Points field, the following assist keys are available for setting the user defined waveform output.

| | |
|-------------|--|
| Edit | Opens the User Defined Waveform dialog box used to set the user defined waveform. |
| Load | Opens the Load User Defined Waveform dialog box used to load a waveform data from a USB memory connected to the front panel USB-A connector. |

- User Defined Waveform dialog box

This dialog box provides the following GUI for setting the user defined waveform output.

| | |
|---------------------|--|
| (data graph) | Displays the shape of the waveform output |
| Source | Source function (VOLTS or AMPS) |
| CH | Channel number 1 or 2, only on 2-channel models |
| Points | Number of data points |
| Max | Maximum value |
| Min | Minimum value |
| (data list) | Lists the data index, the output value, and trigger output on/off flag |

When the field pointer is in the EDIT (green) status on the data index field, the following assist keys are available for adding/deleting an entry and scrolling the list: Append, Insert, Delete, Scroll +100, and Scroll -100.

When the field pointer is in the EDIT (green) status on the output value field, the following assist keys are available for specifying the unit: μV , mV, and V (for VOLTS) or pA, nA, μA , mA, and A (for AMPS).

When the field pointer is in the EDIT (green) status on the Trigger field, the following assist keys are available for switching the trigger output flag setting: ON and OFF.

NOTE

To use the trigger output, set trigger output condition by using SCPI commands. See Agilent B2961A/B2962A *SCPI Command Reference*.

Front Panel Reference

Display and Assist Keys

- Load User Defined Waveform dialog box

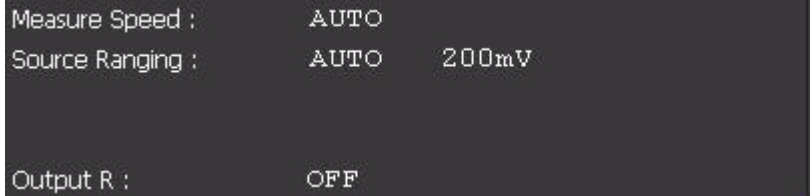
This dialog box provides the following GUI for loading a waveform data from a file stored on a USB memory.

| | |
|---------------------|---|
| (data graph) | Displays the shape of the waveform data selected by the file list |
| Path | Folder into which the waveform data file is saved |
| Points | Number of data points |
| Max | Maximum value |
| Min | Minimum value |
| (file list) | List of the waveform data file |

The following data can be loaded as the waveform data.

- Comma separated value format, file extension csv
- Carriage return or line feed separated value format, file extension txt
- Space separated value format in a line, file extension prn

Optional Parameters



```
Measure Speed :      AUTO
Source Ranging :      AUTO    200mV

Output R :           OFF
```

Measure Speed: Measurement speed. AUTO (1 PLC for 10 nA and 100 nA ranges, 0.01 PLC for other ranges), SHORT (0.01 PLC), MEDIUM (0.1 PLC), NORMAL (1 PLC), LONG (10 PLC), or MANUAL. The aperture time is automatically set to the above values in parentheses. For the aperture time, see “Measurement Time” on page 6-5.

For the MANUAL speed, the aperture time must be set to the right field in seconds or PLC (power line cycle, number of power line cycles per measurement). Move the field pointer to the one by using the arrow keys or rotary knob and press the knob to set the pointer to the EDIT mode. Enter or set the value by using the numeric/alpha keys, knob, or arrow keys, then press the knob or one of the unit keys to apply the value. For setting the seconds value, the following unit keys are available as assist keys.

μs, ms, and s

Source Ranging: Selects the ranging mode AUTO or FIXED used for the DC (constant) source operation.

The right field is used to set the range value for the FIXED range operation, or the minimum range value for the AUTO range operation. For the available range values, see “Output and Measurement Ranges” on page 2-11.

Output R: Selects the operation mode OFF, CONST (constant), or EMUL (emulation) of the programmable output resistance function.

See “Programmable Output Resistance” on page 6-13 for more information.

Pulse Parameters

```
Pulse :  ON      Peak : +05.00000 V
          Delay : 001.2000 ms
          Width : 025.0000 ms
```

B2961A/B2962A can be used as a pulse source, and supports pulsed output and measurement. Pulse ON or OFF can be selected by using the assist keys displayed when the field pointer is in the EDIT (green) status on the Pulse field.

The following setup parameters are available.

| | |
|--------------|--|
| Peak | Sets the pulse peak value. Not available for the sweep source which sets the sweep output value to the pulse peak. The pulse base value is set to the source output value in the upper half of the display area. See “Single View” on page 4-9. |
| Delay | Sets the pulse delay time. The pulse source changes the output level from the base value to the peak value when the delay time elapsed after trigger delay. |
| Width | Sets the pulse width. |

When the field pointer is in the EDIT (green) status on an entry field, the assist keys are changed to the unit keys as shown below.

pA, nA, μ A, mA, and A for the peak current

μ V, mV and V for the peak voltage

μ s, ms, s, and ks for the delay and width

Trigger Parameters

| | | | |
|-----------|-----------|---------------|---------------|
| Trigger : | MANUAL | Source | Measure |
| | Count : | 1 | 1 |
| | Delay : | 0.000 μ s | 0.000 μ s |
| | Period : | 0.000 μ s | 0.000 μ s |
| | Trigger : | AUTO | AUTO |

The B2961A/B2962A supports the following trigger types for triggering source output and measurement. They are effective for setting triggers easily.

The trigger type can be selected by using the assist keys displayed when the field pointer is in the EDIT (green) status on the Trigger field. See Table 4-1 for the trigger types and the setup parameters.

| | |
|---------------|--------------------------|
| AUTO | Automatic trigger type |
| SYNC | Synchronize trigger type |
| TIMER | Timer trigger type |
| MANUAL | Manual trigger type |

The following setup parameters are available for setting the source output trigger (transient action) by using the Source column, and the measurement trigger (acquire action) by using the Measure column.

| | |
|----------------|---|
| Count | Trigger count (number of triggers), 1 to 100000 or INF. (infinity). This value is automatically set for the AUTO trigger type. For the other trigger type, set the number of triggers required for each source output and measurement properly. For example, set Source Count = Measure Count = 10 for the sweep measurement with 10 steps. |
| Delay | Sets the trigger delay time. |
| Period | Sets the trigger period. |
| Trigger | Selects the trigger source by using the assist key AUTO, BUS, TIMER, INT m (only for 2-channel model), LAN, or EXT n , where m is the integer 1 or 2, and n is an integer from between 1 and 14. See Table 4-1 for the trigger sources. |

When the field pointer is in the EDIT (green) status on the Delay or Period field, the assist keys are changed to the unit keys as shown below.

μ s, ms, s, and ks

Table 4-1

Trigger Types and Setup Parameters

| Type | Count | Delay | Period | Trigger |
|--------|-------------------|---------------|---------------|----------------|
| AUTO | set automatically | 0 second | N.A. | AUTO |
| SYNC | entered value | entered value | N.A. | AUTO |
| TIMER | entered value | entered value | entered value | TIMER |
| MANUAL | entered value | entered value | entered value | selected value |

Trigger=AUTO automatically selects the trigger source best suited for the present operating mode by using internal algorithms.

Trigger=BUS uses the remote interface trigger command such as GET, TRIGger, and *TRG.

Trigger=TIMER uses a signal internally generated every interval set by the *Period* parameter.

Trigger=INT1 or INT2 uses a signal from the internal bus 1 or 2, respectively.

Trigger=LAN uses the LXI trigger.

Trigger=EXT n uses a signal from the DIO pin n which is an output port of the Digital I/O D-sub connector on the rear panel. n =1 to 14.

NOTE

Setting trigger parameters in detail

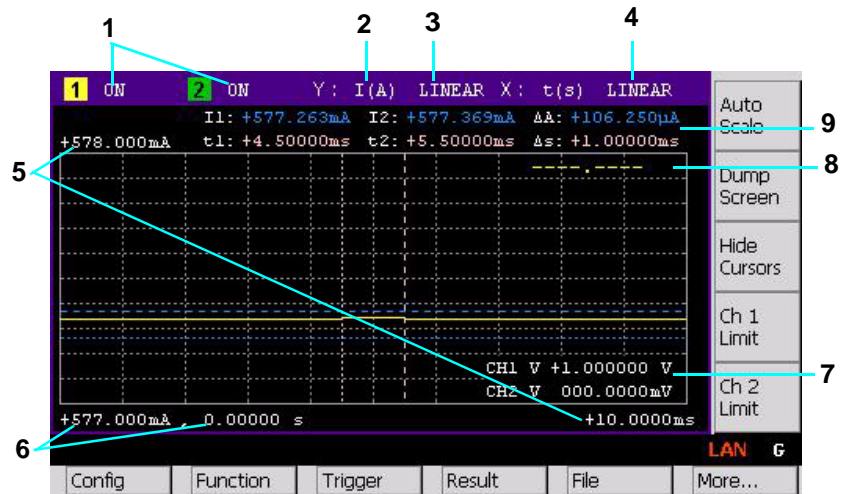
For details of the trigger system, see Figure 6-7 on page 6-27.

The Single view provides the trigger types and parameters effective for setting triggers easily. If you want to set the trigger parameters in detail, select the MANUAL trigger type and use the Trigger Configuration dialog box opened by pressing the Trigger > Config function keys. See “Trigger key group” on page 4-33.

The Single view does not contain the setup parameters for the arm layer, but contains the setup parameters for the trigger layer. The Single view setup is given priority over the trigger layer setup on the Trigger Configuration dialog box. Hence, the overlapped parameter values on the dialog box are ignored.

Graph View

Displays the graph for plotting the channel 1 and/or 2 measurement or math result. The Graph view can plot up to 5000 data.



Display area

1. Graph display status ON or OFF. Only on 2-channel models. [n] is for channel *n*.
2. Y-axis data type I (A), V (V), R (Ω), P (W), or MATH (see Table 4-2)
3. Y-axis scale LINEAR or LOG
4. X-axis scale LINEAR or LOG. X-axis data type is always time *t* (s).
5. Graph maximum value
6. Graph minimum value
7. Channel 1 and/or 2 source output value, limit value, or none (controlled by the Ch *n* Source, Ch *n* Limit, or Hide Ch *n* assist key)
8. Channel 1 and/or 2 Y-axis data at the active X-cursor position. ----,---- is displayed for the *no-data* position.
9. Cursor data (controlled by the Show Cursors or Hide Cursors assist key)

| | |
|--------------------|--|
| First line | Positions and distance (e.g. I1, I2, ΔA) of Y-cursors 1 and 2 |
| Second line | Positions and distance (t1, t2, Δt) of X-cursors 1 and 2 |

Table 4-2 Y Axes Data Types for Graph View

| Data type | Assist key | Description |
|----------------|------------|------------------|
| I (A) | AMPS (I) | Current data |
| V (V) | VOLTS (V) | Voltage data |
| R (Ω) | OHMS (R) | Resistance data |
| P (W) | WATTS (P) | Power data |
| MATH | MATH | Math result data |

Assist keys

| | |
|---------------------------|---|
| Auto Scale | Changes graph scale to fit the trace in the graph automatically. |
| Dump Screen | <p>Opens the File Selection (Dump Screen) dialog box which is used to save the screen dump as a JPEG file.</p> <p>The file can be saved onto a USB memory connected to the front panel USB-A connector. The file is saved with the specified name. If the file extension is not specified, “.jpg” is added automatically.</p> |
| Show Cursors | Displays the cursors (Y-cursors 1 and 2, X-cursors 1 and 2, and cursor data) and changes the softkey label to <i>Hide Cursors</i> . |
| Hide Cursors | Hides the cursors and changes the softkey label to <i>Show Cursors</i> . |
| Ch <i>n</i> Source | Displays the channel <i>n</i> source output value and changes the softkey label to <i>Ch <i>n</i> Limit</i> . |
| Ch <i>n</i> Limit | Hides the channel <i>n</i> source output value and displays the limit value. Also changes the softkey label to <i>Hide Ch <i>n</i></i> . |
| Hide Ch <i>n</i> | Hides the channel <i>n</i> limit value and changes the softkey label to <i>Ch <i>n</i> Source</i> . |

In the above descriptions, *Ch *n** indicates *Ch 1* or *Ch 2*.

NOTE**If the number of data exceeds 5000**

If the number of measurement data exceeds 5000, the Graph view plots the following data. where, n is integer, 1 to 5000.

Number of data is 5001 to 10000: $[2*(n-1)+1]$ th data

Number of data is 10001 to 25000: $[5*(n-1)+1]$ th data

Number of data is 25001 to 50000: $[10*(n-1)+1]$ th data

Number of data is 50001 to 100000: $[20*(n-1)+1]$ th data




Status Information

The status information is common for all display modes. It is displayed above the bottom softkeys associated with the function keys.



Table 4-3

Status Indicator

| Label | Color | Description |
|---|--------------|--|
| AUTO | white | Trigger auto. Automatic trigger is enabled now. |
| ARM | white | Trigger active. Trigger system is active now. |
| HV | yellow | High voltage. Output voltage setting is over ± 42 V. |
|   | | Channel 1 floating status. Channel 1 is not grounded. |
| | | Channel 2 floating status. Channel 2 is not grounded. |
| REM | white | Remote. Instrument is in the remote state. |
|  | | Local lockout. Instrument is in the local lockout (LLO) status. |
| ERR | white | Error. At least one error is detected. |
| EDIT | green | Edit mode. The field specified by the pointer can be edited. Not in the move mode. |
| MOVE | blue | Move mode. The field pointer can be moved. Not in the edit mode. |
| LAN | green or red | LXI LAN status indicator. Green indicates normal LAN status. Red indicates abnormal condition. Blinking indicates the LAN identification status. |
| D | white | Display mode: Dual view |
| 1 | white | Display mode: Single view for channel 1 |
| 2 | white | Display mode: Single view for channel 2 |
| G | white | Display mode: Graph view |

Function Keys

Agilent B2961A/B2962A has six function keys below the front panel display, and provides the following nine softkeys.

| | | |
|------------------------|-----------------|--|
| Function keys 1 | Config | Channel configuration setup. Displays the softkeys for setting several functions of the channel. See “Config key group” on page 4-26. |
| | Function | Math and trace function setup. Displays the softkeys for setting these functions. See “Function key group” on page 4-31. |
| | Trigger | Trigger configuration and control. Displays the softkeys for setting and controlling the trigger system. See “Trigger key group” on page 4-33. |
| | Result | Measurement and trace result display. Displays the softkeys for displaying these results. See “Result key group” on page 4-36. |
| | File | File operation. Displays the softkeys for saving and loading a file. See “File key group” on page 4-38. |
| | More... | Changes the function keys to Function keys 2. |
| Function keys 2 | Program | Program configuration and control. Displays the softkeys for setting and controlling the program memory. See “Program key group” on page 4-39. |
| | I/O | I/O setup. Displays the softkeys for setting the I/O interfaces. See “I/O key group” on page 4-40. |
| | Display | Display setup. Displays the softkeys for setting the display functions. See “Display key group” on page 4-45. |
| | System | System setup. Displays the softkeys used for several system setups. See “System key group” on page 4-47. |
| | More... | Changes the function keys to Function keys 1. |

Config key group

Pressing the Config key displays the following three softkeys for setting several functions of the channel.

Source

Displays the following five softkeys for setting the source operation.

| | |
|--------------------|---|
| Connection | Channel operation and connection setup. See “Output Connection dialog box” on page 4-27. |
| Filter | Output filter setup. See “Output Filter dialog box” on page 4-28. |
| Ext. Filter | External filter setup. See “External Filter dialog box” on page 4-28. |
| Sweep | Sweep source detail setup. See “Sweep dialog box” on page 4-29. |
| Output R | Programmable output resistance (using Emulation Table) setup. See “Output R (Emulation) dialog box” on page 4-30. |

Measure

Displays the following softkey for setting the measurement operation.

| | |
|-----------------|--|
| R Compen | Resistance compensation ON or OFF. See “Resistance Compensation” on page 6-18. On a 1-channel model, pressing this key displays the ON and OFF keys used to set the resistance compensation on or off. On a 2-channel model, pressing this key displays the ALL, Ch 1, and Ch 2 keys. They are used to specify the channel for setting the resistance compensation on or off. ALL specifies channels 1 and 2. Ch 1 specifies channel 1 only. Ch 2 specifies channel 2 only. |
|-----------------|--|

Common

Displays the following two softkeys for setting the miscellaneous function.

| | |
|-------------|---|
| Wait | Source and measurement wait time setup. See “Wait Control dialog box” on page 4-30. |
|-------------|---|

| | |
|--------------|---|
| Group | Only on 2-channel models. Channel grouping ON or OFF. If this function is ON, the channels perform synchronous channel operation. The present setting is indicated by an asterisk on the softkey label. |
|--------------|---|

Output Connection dialog box

This dialog box provides the following parameters for setting the channel operation and connection.

| | |
|--|--|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. |
| Sensing Type | Sensing type, 2-wire connection (2-WIRE) or 4-wire connection (4-WIRE). Set 4-WIRE for remote sensing. |
| Low Terminal State | Low sense terminal connection, grounded (GROUND) or floating (FLOAT) |
| High Capacitance Mode | High capacitance mode, ON or OFF Set the mode to ON to perform high capacitive load measurements. See “High Capacitance Mode” on page 6-17. |
| Over Voltage/Current Protection | Over voltage or current protection, ON or OFF Set the function ON to turn off the channel output automatically and immediately when it reaches its limit. |
| Output-Off State | Output-off state, high impedance (HIGH Z), normal (NORMAL), or zero volt (ZERO) This is the source setup condition after output off. See Table 6-1 on page 6-15. |
| Auto Output-On | Automatic output on function, ON or OFF Set the function ON to turn on the channel output automatically just before the trigger system is initiated by the SCPI command (not by front panel operation). |

Auto Output-Off

Automatic output off function, ON or OFF

Set the function ON to turn off the channel output automatically and immediately when all trigger system changes the status from busy to idle.

Output Filter dialog box

This dialog box provides the following parameters for setting the output filter.

| | |
|-------------------------|---|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. |
| Filter State | Output filter, ON or OFF Set the filter ON to obtain clean source output without spikes and overshooting. Note, however, that using a filter may increase the channel settling time. |
| Automatic Filter | Automatic filter, ON or OFF Set the function ON to automatically set the output filter which provides the best filter characteristics and cutoff frequency. |
| Time Constant | Filter time constant, 5 μ s to 50 ms |

External Filter dialog box

This dialog box provides the following parameters for using the N1294A-021/022 low noise filter. The filter cannot be detected automatically.

The following settings are saved to the non-volatile memory.

| | |
|------------------------------|--|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. |
| External Filter State | Use of the filter, ON for use or OFF for non-use |
| External Filter Type | Filter type, ULNF or LNF. ULNF: Agilent N1294A-021 ultra low noise filter LNF: Agilent N1294A-022 low noise filter |

Sweep dialog box

This dialog box provides the following parameters for setting details of the sweep source operation.

| | |
|---------------------------|---|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. |
| Sweep Ranging | Ranging mode used for the sweep source operation, BEST, AUTO, or FIXED. See Table 4-4 on page 4-29. |
| Sweep Direction | Sweep direction, UP (start to stop direction) or DOWN (stop to start direction) |
| Output after Sweep | The value the source channel applies after it completes the sweep output START VALUE (START): The value applied when the source channel starts the sweep END VALUE (END): The value applied when the source channel completes the sweep |

Table 4-4

Ranging Mode used for Sweep Source Operation

| | Description |
|-------|---|
| BEST | In the linear sweep mode, the sweep source channel automatically uses the minimum range which covers the whole sweep output. In the log sweep mode, the sweep source channel automatically uses the range which provides the best resolution for each sweep step output. |
| AUTO | The sweep source channel automatically changes and sets the range which provides the best resolution to apply the source output for each sweep step. |
| FIXED | The sweep source channel sets the range specified by the range parameter <i>Source Ranging: FIXED</i> . See “Optional Parameters” on page 4-17. |

Output R (Emulation) dialog box

This dialog box provides the following parameters to set up the emulation table for programmable output resistance setting.

| | |
|--------------------|--|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. |
| # | List index. |
| Voltage (V) | Voltage value. |
| Current (A) | Current value. |
| Mode | Source mode: VOLTS or AMPS. |

Wait Control dialog box

This dialog box provides the following parameters for setting the source and measurement wait time.

The source wait time is defined as the time the source channel cannot change the output after the start of a DC output or the trailing edge of a pulse.

The measurement wait time is defined as the time the measurement channel cannot start measurement after the start of a DC output or the trailing edge of a pulse.

| | |
|------------------------|--|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. |
| State | Wait time, ON or OFF |
| Automatic | Automatic wait time, ON or OFF |
| Gain and Offset | Parameters for calculating the wait time. See the following formula. |

- If State=ON and Automatic=ON:
$$\text{wait time} = \text{Gain} \times \text{initial wait time} + \text{Offset}$$
- If State=ON and Automatic=OFF:
$$\text{wait time} = \text{Offset}$$
- If State=OFF:
$$\text{wait time} = 0$$

The initial wait time is automatically set by the instrument, and cannot be changed.

Function key group

Pressing the Function key displays the following two softkeys for setting the math and trace functions.

Math

Math function setup. See “Math Expression dialog box” on page 4-31.

Trace

Trace function setup. See “Trace Buffer Setup dialog box” on page 4-32.

Math Expression dialog box

This dialog box provides the following parameters for setting the math function. If the math function is ON, the measurement data can be calculated by using the specified math expression.

Ch Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2)

This field specifies the channel set by this dialog box.

Status Math function, ON or OFF

Unit String Unit for the calculation result of the math expression

The available math expressions are listed in the area below the Unit String field. This area can be used to select the math expression for data calculation. To select a math expression, highlight the name in this area.

The data calculation is effective for data measured after the math function is set by this dialog box. The calculation result can be displayed on the dialog box opened by using the Result key group. See “Result key group” on page 4-36.

Math expressions can be defined by using the SCPI commands while the B2961A/B2962A is in the remote mode.

For the predefined math expressions, see “Predefined Math Expressions” on page 6-19.

Trace Buffer Setup dialog box

This dialog box provides the following parameters for setting the trace function. The data specified by the Feed Data parameter can be stored in the trace buffer if the Buffer Control parameter is NEXT. The maximum data size is specified by the Buffer Size parameter. See Figure 6-6 on page 6-23 for the trace buffer.

| | |
|-----------------------|---|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. |
| Feed Data | Type of data placed in the trace buffer, SENSE or MATH SENSE: Measurement result data MATH: Calculation result data of math expression The data contains the voltage measurement data, current measurement data, resistance measurement data, source output setting data, calculation result data, time data, or status data selected by using the Format keys of the I/O key group. See “I/O key group” on page 4-40. |
| Buffer Control | Trace buffer control mode, NEVER or NEXT NEVER: Disables the write operation to the trace buffer. NEXT: Enables the write operation until buffer full. Buffer full will change the mode to NEVER. |
| Buffer Size | Size of the trace buffer, 1 to 100000 data |

Trigger key group

Pressing the Trigger key displays the following four softkeys for setting the trigger parameters in detail and controlling the trigger system. See Figure 6-7 on page 6-27.

| | |
|------------------|--|
| Config | Opens a dialog box. See “Trigger Configuration dialog box” on page 4-34. |
| Initiate | Displays the softkeys for selecting the device action to initiate (to go to the arm layer of the trigger system). See Table 4-5. |
| Abort | Displays the softkeys for selecting the device action to abort (to return to the idle state of the trigger system). See Table 4-5. |
| Immediate | Displays the following two softkeys for selecting the arm layer or trigger layer for sending the immediate trigger. |
| Trigger | Selects the trigger layer. |
| Arm | Selects the arm layer. |
| | Selecting the layer displays the softkeys for selecting the device action to send the immediate trigger. See Table 4-5. |

Table 4-5 Softkeys to Select Device Action and Channel

| Softkey label | Description |
|---|---|
| ALL | Selects the transient and acquire device actions. |
| Trans. | Selects the transient (source output) device action only. |
| Acq. | Selects the acquire (measurement) device action only. |
| On a 1-channel model, selecting the device action executes Initiate, Abort, or Immediate for the specified device action. | |
| On a 2-channel model, selecting the device action displays the following three softkeys for selecting the channel. | |
| ALL | Selects channels 1 and 2. |
| Ch 1 | Selects channel 1 only. |
| Ch 2 | Selects channel 2 only. |
| Selecting the channel executes Initiate, Abort, or Immediate for the specified device action of the specified channel. | |

Trigger Configuration dialog box

This dialog box is used to set the trigger parameters in detail. Note that the overlapped parameter values are ignored and replaced with the settings made on the Single view. See “Trigger Parameters” on page 4-19.

| | |
|-----------------------|--|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. |
| Layer | Specifies the layer or device action set by this dialog box. ARM: Arm layer TRIGGER: Trigger layer ACTION: Device action For ACTION, the available parameters are Ch, Layer, Action, and Trigger Output. |
| Action | Specifies the device action type set by this dialog box. TRANS.: Transient (source output) device action ACQ.: Acquire (measurement) device action |
| Count | Count, 1 to 100000 or INF. (infinity), for the action specified by the Ch, Layer, and Action parameters |
| Bypass | Bypass, ON or OFF Bypass=ON enables the bypass only for the first passage to the event detector for the action specified by the Ch, Layer, and Action parameters. Bypass=OFF disables the bypass. |
| Trigger Source | Event for the action specified by the Ch, Layer, and Action parameters. AUTO, BUS, TIMER, INT1, INT2, LAN, EXT1, EXT2, EXT3, EXT4, EXT5, EXT6, EXT7, EXT8, EXT9, EXT10, EXT11, EXT12, EXT13, or EXT14. See Table 4-6. |
| Period | Only for the TIMER event. Interval of the TIMER event for the action specified by the Ch, Layer, and Action parameters, 10 μ s to 100000 s |
| Trigger Delay | Delay time for the action specified by the Ch, Layer, and Action parameters, 0 to 100000 s |

Trigger Output Trigger output, ON or OFF

Trigger output terminal, an internal bus (INT1, INT2), LAN port (LAN), or a digital I/O pin EXT n ($n=1$ to 14)

If this parameter is ON, B2961A/B2962A sends an output trigger when it changes the trigger state for the action specified by the Ch, Layer, and Action parameters. See Figure 6-7 on page 6-27.

For using a digital I/O pin, it is necessary to set function of the pin, output trigger polarity, type, pulse width, and so on. See “DIO Configuration dialog box” on page 4-43 and “Using Digital I/O” on page 3-33.

Table 4-6

Trigger Source

| Trigger Source | Description |
|----------------|--|
| AUTO | Trigger source best suited for the present operating mode is automatically selected by the internal algorithms. |
| BUS | Remote interface trigger command such as GET, TRIGger, and *TRG |
| TIMER | Signal internally generated every interval set by the Period field |
| INT1 or INT2 | Signal from the internal bus 1 or 2 |
| LAN | LXI trigger specified by the :ARM[:ACQ]:TRAN]:SOUR:LAN and :TRIG[:ACQ]:TRAN]:SOUR:LAN commands |
| EXT n | Signal from the DIO pin n , which is an I/O port of the Digital I/O D-sub connector on the rear panel. $n=1$ to 14 |

Result key group

Pressing the Result key displays the following two softkeys for displaying the measurement and trace results.

Measure

Displays the measurement result. See “Measure Result dialog box” on page 4-36.

Trace

Displays the trace result. See “Trace Statistical Result dialog box” on page 4-37.

Measure Result dialog box

This dialog box is used to display the last single (one shot) measurement result (maximum 100000 data) stored in the data buffer.

This dialog box provides the following GUI for displaying the measurement result. The result data is shown in the index and data table below the Type field. Also, the data is plotted in the graph area above the Points fields.

| | |
|---------------|--|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel of the data to display. |
| Type | Type of data to display, AMPS, VOLTS, OHMS, WATTS, MATH, or TIME AMPS: Current measurement data VOLTS: Voltage measurement data OHMS: Resistance data given by $\text{Resistance} = V_{\text{meas}} / I_{\text{meas}}$ WATTS: Power data given by $\text{Power} = V_{\text{meas}} \times I_{\text{meas}}$ MATH: Calculation result data of math expression TIME: Time data In the above formula, V_{meas} is the voltage measurement data, and I_{meas} is the current measurement data. For details on using resistance compensation, see “Resistance Compensation” on page 6-18. |
| Points | Number of data points. |
| Max. | Y-axis maximum value of the graph. |
| Min. | Y-axis minimum value of the graph. |

Trace Statistical Result dialog box

This dialog box provides the following GUI for displaying the trace statistical result. The result data is displayed in the Mean, Std. Dev., Min., and Max. fields.

| | |
|------------------|--|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel of the data to display. |
| Feed | Always SENSE |
| Element | Type of data to display, AMPS, VOLTS, or OHMS AMPS: Current measurement data VOLTS: Voltage measurement data OHMS: Resistance data given by $\text{Resistance} = V_{\text{meas}} / I_{\text{meas}}$ In the above formula, V_{meas} is the voltage measurement data, and I_{meas} is the current measurement data. For details on using resistance compensation, see “Resistance Compensation” on page 6-18. |
| Length | Data length |
| Mean | Mean value |
| Std. Dev. | Standard deviation |
| Min. | Minimum value |
| Max. | Maximum value |

File key group

Pressing the File key displays the following two softkeys for saving a file on and loading a file from a USB memory connected to the front panel USB-A connector.

Save

Displays the following five softkeys for saving a file. Pressing a softkey displays the File Selection dialog box. See “File Selection dialog box” on page 4-38.

| | |
|----------------|-----------------------------------|
| Measure | Saves a measurement data file. |
| Math | Saves a math result data file. |
| Trace | Saves a trace buffer data file. |
| Config | Saves a system setting data file. |

Load

Displays the following softkey for loading a file. Pressing the softkey displays the File Selection dialog box. See “File Selection dialog box” on page 4-38.

| | |
|---------------|-----------------------------------|
| Config | Loads a system setting data file. |
|---------------|-----------------------------------|

File Selection dialog box

This dialog box provides the following GUI for saving or loading a file.

| | |
|------------------|---|
| Path | Folder name for saving or loading a file. |
| File Name | File name to save or load. |

The files and folders saved in the specified folder are listed in the area between the Path field and the File Name field. This area can be used for selecting a file to save or overwrite. To select a file, highlight its name in this area.

For saving a system setting file, if the file extension is not specified, “.sta” is added automatically. For saving the other data file, “.csv” is added automatically.

Program key group

Pressing the Program key displays the following four softkeys for setting and controlling the program memory.

The program memory can be defined by using the SCPI commands while the B2961A/B2962A is in the remote mode.

| | | | | | | | | | | | |
|-----------------|---|------------|--------------------------------------|--------------|---|-------------|--|-------------|--|-----------------|---|
| Catalog | Displays the Program Catalog dialog box which lists the programs saved in the program memory. This dialog box is also used to specify the memory program to use. To select a memory program, highlight its name in this list. | | | | | | | | | | |
| View | Displays the Program View dialog box which shows the program code of the specified program. | | | | | | | | | | |
| Variable | Displays the Variable dialog box which lists the variables used in the memory programs. Available index is 1 to 100. | | | | | | | | | | |
| Control | Displays the following five softkeys for controlling the operation of the program memory. <table><tr><td>Run</td><td>Starts the specified memory program.</td></tr><tr><td>Pause</td><td>Pauses the execution of the memory program.</td></tr><tr><td>Step</td><td>Starts the step execution of the specified memory program.</td></tr><tr><td>Stop</td><td>Stops the execution of the memory program.</td></tr><tr><td>Continue</td><td>Continues the execution of the memory program presently paused.</td></tr></table> | Run | Starts the specified memory program. | Pause | Pauses the execution of the memory program. | Step | Starts the step execution of the specified memory program. | Stop | Stops the execution of the memory program. | Continue | Continues the execution of the memory program presently paused. |
| Run | Starts the specified memory program. | | | | | | | | | | |
| Pause | Pauses the execution of the memory program. | | | | | | | | | | |
| Step | Starts the step execution of the specified memory program. | | | | | | | | | | |
| Stop | Stops the execution of the memory program. | | | | | | | | | | |
| Continue | Continues the execution of the memory program presently paused. | | | | | | | | | | |

I/O key group

Pressing the I/O key displays the following five softkeys for setting the I/O interfaces.

Format

Displays the five softkeys for setting the data output format. See “Data Output Format” on page 4-41.

LAN

Displays the following four softkeys for managing the LAN interface.

- | | |
|-----------------|--|
| Config | Displays the LAN Configuration dialog box used to set the configuration of the LAN interface. See “LAN Configuration dialog box” on page 4-43. |
| Status | Displays the LAN Status dialog box which displays the status of the LAN interface. |
| Reset | Resets all of the LAN connections. |
| Defaults | Sets the LAN settings to the factory default settings. |

Pressing the Reset softkey or the Defaults softkey displays a confirmation dialog box. Press the OK softkey to confirm the specified action, or press the Cancel/Local key to cancel the action.

USB

Displays the USB Status dialog box which displays the VISA USB connect string.

Example: USB0::2391::36376::MY12345678::0::INSTR

GPIB

Displays the GPIB Configuration dialog box used to set the GPIB address of the B2961A/B2962A. This dialog also displays the VISA GPIB connect string.

Example: GPIB0::23::INSTR

DIO

Displays the following two softkeys for managing the Digital I/O interface.

- | | |
|---------------|--|
| Config | Displays the DIO Configuration dialog box used to set the configuration of the Digital I/O interface. See “DIO Configuration dialog box” on page 4-43. |
| R/W | Displays the DIO Read/Write dialog box used to read or write a value set to the Digital I/O interface. See “DIO Read/Write dialog box” on page 4-44. |

Data Output Format

Pressing the Format softkey displays the following five softkeys for setting the format and elements of the output data.

| | | |
|------------------|--|--|
| Measure | Displays the Format (Measure) dialog box used to set the elements of the measurement data output. See “Format (Measure) dialog box” on page 4-41. | |
| Math | Displays the Format (Math) dialog box used to set the elements of the math result data output. See “Format (Math) dialog box” on page 4-42. | |
| Trace | Displays the Format (Trace) dialog box used to set the elements of the trace data output. See “Format (Trace) dialog box” on page 4-42. | |
| Data Type | Displays the following three softkeys for specifying the data output format. The present setting is indicated by an asterisk on the softkey label. | |
| | ASCII | ASCII format |
| | REAL32 | IEEE-754 single precision format, 4-byte |
| | REAL64 | IEEE-754 double precision format, 8-byte |
| Data Swap | Displays the following two softkeys for enabling or disabling the byte swap for the IEEE-754 precision format data output. The present setting is indicated by an asterisk on the softkey label. | |
| | OFF | Disables the byte swap. Normal byte order. |
| | ON | Enables the byte swap. Reverse byte order. |

If Data Swap=ON, the byte order is reversed. Byte 1 to byte 4 are sent in the order of byte 4 to byte 1 for the IEEE-754 single precision format, and byte 1 to byte 8 are sent in the order of byte 8 to byte 1 for the IEEE-754 double precision format.

Format (Measure) dialog box

This dialog box provides the following parameters for setting the elements of the measurement data output.

| | |
|----------------|--------------------------------|
| Voltage | Voltage data output, ON or OFF |
| Current | Current data output, ON or OFF |

| | |
|-------------------|-----------------------------------|
| Resistance | Resistance data output, ON or OFF |
| Source | Source data output, ON or OFF |
| Time | Time data output, ON or OFF |
| Status | Status data output, ON or OFF |

Format (Math) dialog box

This dialog box provides the following parameters for setting the elements of the math result data output.

| | |
|---------------|-------------------------------|
| Data | Result data output, ON or OFF |
| Time | Time data output, ON or OFF |
| Status | Status data output, ON or OFF |

Format (Trace) dialog box

This dialog box provides the following parameters for setting the elements of the trace statistical data output.

| | | |
|------------------|--|---|
| Ch | Only on 2-channel models. Channel 1 (Ch 1) or 2 (Ch 2) This field specifies the channel set by this dialog box. | |
| Data | Trace data. Selects one from the following data elements. | |
| | MEAN | Mean value |
| | STD.DEV. | Standard deviation |
| | MIN. | Minimum value |
| | MAX. | Maximum value |
| | PK-PK | Peak to peak value |
| Timestamp | Timestamp data format. Selects one from the following selections. | |
| | ABSOLUTE | Absolute value (ABS.). Returns the incremental value for the first timestamp data. |
| | DELTA | Delta value (DELTA). Returns the incremental value for the previous timestamp data. |

LAN Configuration dialog box

This dialog box provides the following parameters for setting the configuration of the LAN interface.

| | |
|---------------------------|---|
| mDNS | mDNS (multicast DNS) status, ON or OFF |
| IP Address Config. | IP address configuration, AUTO or MANUAL AUTO configuration uses the DHCP server. |
| IP Address | IP address of this instrument, used for the MANUAL IP address configuration |
| Subnet | Subnet mask, used for the MANUAL IP address configuration |
| Gateway | IP address of gateway, used for the MANUAL IP address configuration |
| DNS Server Config. | DNS server configuration, AUTO or MANUAL |
| DNS Server | IP address of DNS server, primary and secondary, used for the MANUAL DNS server configuration |
| Hostname | Host name of this instrument |
| WINS Server | IP address of WINS server, primary and secondary |

DIO Configuration dialog box

This dialog box provides the following parameters for setting the configuration of the Digital I/O interface.

| | |
|-----------------|--|
| Pin # | Digital I/O pin number, 1 to 14 This field specifies the pin set by this dialog box. |
| Function | Function of the specified pin of the Digital I/O interface, digital signal input/output (DIGITAL I/O), digital signal input (DIGITAL IN), trigger output (TRIGGER OUT), trigger input (TRIGGER IN), or high voltage state (HIGH VOLTAGE LAMP, HI-VOLT LAMP, only for pin 14) If Function is set to HIGH VOLTAGE LAMP, other setup parameters on this dialog box is ignored. |
| Polarity | Polarity of the input/output function, positive (POSITIVE, POS.) or negative (NEGATIVE, NEG.) |

Output Trigger Type Type of output trigger, edge (EDGE) or level (LEVEL)

Output Trigger Timing Timing of the output trigger, after action (arm, trigger, and device action) (AFTER), before action (BEFORE), or both (BOTH)

Output Pulse Width Pulse width of the output trigger, 10 μ s to 10 ms

For more information about the trigger function, see “Trigger key group” on page 4-33.

DIO Read/Write dialog box

This dialog box provides the following parameters for reading or writing a value set to the Digital I/O interface.

Format Format of the value set to the Mask Value field and the Value field, binary (BIN), decimal (DEC), or hexadecimal (HEX)

Mask Value Mask value which indicates the pattern of the un-used bits of the Digital I/O interface

The READ assist key is used to read the mask value presently set to the Digital I/O interface.

The WRITE assist key is used to set the specified mask value to the Digital I/O interface.

Value Value set to the Digital I/O interface

The READ assist key is used to read the value presently set to the Digital I/O interface.

The WRITE assist key is used to write the specified value to the Digital I/O interface.

Display key group

Pressing the Display key displays the following four softkeys for setting the display functions. The present setting is indicated by an asterisk on the softkey label.

Remote

Displays the following two softkeys for enabling or disabling the front panel display when the B2961A/B2962A is in the remote mode.

- | | |
|------------|---|
| OFF | Disables the front panel display. Effective for fast operation. |
| ON | Enables the front panel display. |

Color

Displays the following two softkeys for specifying the display color set.

- | | |
|--------------|-----------------------|
| Set 1 | Sets the color set 1. |
| Set 2 | Sets the color set 2. |

Zoom

Displays the following two softkeys for enabling or disabling the display zoom.

- | | |
|------------|---|
| OFF | Disables the zoom. Normal display. |
| ON | Enables the zoom. Only the measured data is displayed. Zoom-in can be cancelled by pressing the Zoom Out assist key. |

In the zoom-in state, setup information is not displayed, and the measurement result is zoomed. Then,

- the Dual view displays the primary measurement data with a large font, and the secondary measurement data for each channel with a small font.
- the Single view displays the primary and secondary measurement data with a large font.

Pref.

Displays the Display Preference dialog box used to set the preference for front panel operation. See “Display Preference dialog box” on page 4-46.

Display Preference dialog box

This dialog box provides the following parameters for the front panel operation.

The following settings are saved to the non-volatile memory.

- **V/I Limit for Each Polarity**

Selects the Limit setup operation.

ON Individual setup ON

Limit+ and Limit– fields are available. Positive and negative limits can be set individually.

OFF Individual setup OFF

Limit field is available. \pm (Limit value) is set to the limit.

- **Immediate V/I Update by Knob**

Selects the channel operation when the Source value or the Limit value is changed by using the digit pointer and the rotary knob.

ON Real time update ON

Setting value is applied to the channel immediately.

OFF Real time update OFF

Setting value is not applied immediately. It is applied to the channel by pressing the knob.

System key group

Pressing the System key displays the following eight softkeys used for several system setups.

Error

Displays the following two softkeys to view or clear errors.

| | |
|--------------|---|
| Log | Displays the Error Log dialog box which displays the SCPI errors. |
| Clear | Clears the error buffer immediately. |

Reset

Initializes the B2961A/B2962A.

Pressing the Reset softkey displays a confirmation dialog box. Press the OK softkey to start initialization, or the Cancel/Local key to cancel.

Cal/Test

Displays the following two softkeys for performing self-calibration or self-test.

| | |
|------------------|----------------------------|
| Self-Cal | Performs self-calibration. |
| Self-Test | Performs self-test. |

Pressing the softkey displays a confirmation dialog box. Press the OK softkey to start self-calibration or self-test, or the Cancel/Local key to cancel.

PLC

Displays the following two softkeys to specify the power line frequency. The present setting is indicated by an asterisk on the softkey label.

| | |
|--------------|---|
| 50 Hz | Specifies the power line frequency 50 Hz. |
| 60 Hz | Specifies the power line frequency 60 Hz. |

Timestamp

Displays the following two softkeys to clear timestamp.

| | |
|-----------------|---|
| Clear | Clears the timestamp. Pressing this softkey displays a confirmation dialog box. Press the OK softkey to clear the timestamp, or the Cancel/Local key to cancel. |
| Auto CLR | Displays the following two softkeys for setting the automatic clear of the timestamp. The present setting is indicated by an asterisk on the softkey label. |
| OFF | Disables the automatic clear of the timestamp. |

| | | |
|-----------------|--|--|
| | ON | Enables the automatic clear of the timestamp. |
| Start-up | Displays the System Start-up dialog box which provides the following setup parameters. | |
| | Power-on State | Power-on state, RST, RCL0, RCL1, RCL2, RCL3, or RCL4 The power-on state can be selected from the factory default reset condition (RST) and user conditions RCL0, RCL1, RCL2, RCL3, and RCL4 which can be defined by using the *SAV 0, *SAV 1, *SAV 2, *SAV 3, and *SAV 4 commands, respectively, while the B2961A/B2962A is in the remote mode. |
| | Power-on Program | Power-on program execution ON or OFF If this parameter is ON, the power-on program is automatically executed when the B2961A/B2962A is turned on. The power-on program can be defined by using the :PROG:PON:COPY command while the B2961A/B2962A is in the remote mode. |
| Sound | Displays the following two softkeys to enable or disable the beep and sound. The present setting is indicated by an asterisk on the softkey label. | |
| | OFF | Disables the beep and sound. |
| | ON | Enables the beep and sound. |
| Info. | Displays the following four softkeys. | |
| | Revision | Displays the Revision dialog box which displays the model number, serial number, and firmware revision of the B2961A/B2962A. |
| | Date/Time | Displays the Date and Time dialog box which is used to view or set the date and time. |
| | Update | Used for firmware update. |
| | Demo. | Performs demonstration. Pressing this softkey displays a confirmation dialog box. Press the OK softkey to start demonstration, or the Cancel/Local key to cancel. |

Front Panel Operations

This chapter explains how to use the Agilent B2961A/B2962A.

- “Basic Operations”
- “To Use Miscellaneous Functions”
- “To Set Source Output”
- “To Execute Measurement”
- “To Use Math Function”
- “To Use Trace Buffer”
- “To Use Program Memory”

NOTE

Turning the instrument on or off

Press the line switch. When the power is on, the LED below the switch is turned green.

NOTE

Setting the instrument to local mode

Press the Cancel/Local key.

The front panel keys are available when the instrument is in local mode.

NOTE

Enabling or disabling the channel

Press the On/Off switch.

The channel status is indicated by the lighting status of the switch as follows.

Off: The channel is disabled.

Green: The channel is enabled.

Red: The channel is in the high voltage state.

NOTE

Starting measurement

Press the Trigger key. According to the setting conditions, the single (one shot) measurement is performed with the DC bias output, pulsed bias output, arbitrary waveform output, staircase sweep output, or pulsed sweep output.

Press the Auto key. The repeat (continuous) measurement is performed with the DC bias output (of the Source value).

Basic Operations

Use the field pointer to specify a setup field in the setup screen. The field pointer can take the following states. Change the status as needed during the setup of B2961A/B2962A.

| | |
|--------------------|--|
| MOVE status | Highlighted in blue. You can move the pointer from field to field. |
| EDIT status | Highlighted in green. You can change the value of the current field. |

To Change the Setting in a Field

1. If the field pointer is in the EDIT status, press the rotary knob. The pointer status is changed to MOVE.
2. Turn the rotary knob or press the arrow keys to move the field pointer.
3. Move the field pointer to the item to be changed and press the rotary knob. The pointer status is changed to EDIT.
4. Enter a value or character by pressing the numeric/alpha keys, turning the rotary knob, or pressing the arrow keys. Press the rotary knob to fix the setting value. The pointer status is changed to MOVE.

Or press the assist key corresponding to the setting value to fix the setting value. The pointer status is changed to MOVE.

NOTE

Digit pointer

In numeric value entry fields such as the Source and Limit fields, you can specify only one digit to change its value.

When the field pointer is in the EDIT status (i.e., all digits in the entry field are highlighted in green), pressing the arrow keys changes the pointer to the digit pointer, which points only one digit in the entry field. In this status, the following operations are allowed.

The arrow keys are used to move the pointer.

The numeric/alpha keys and rotary knob are used to change the value of the digit indicated by the pointer.

When the pointer is on the decimal point, turning the knob moves the decimal point if the real time update (Immediate V/I Update by Knob) is OFF.

NOTE

Channel operation when using the rotary knob

If the field pointer is in the EDIT (green) status on the Source or Limit field, turning the knob changes/updates the setting value of the source channel in real time.

Channel operation when using the knob and the digit pointer depends on the setting of the real time update (Immediate V/I Update by Knob).

- Real time update ON
Setting value is applied to the channel immediately.
- Real time update OFF
Setting value is not applied immediately. It is applied to the channel by pressing the knob.

To Change the Settings on a Dialog Box

1. Set the items on the dialog box in the same way as described in “To Change the Setting in a Field” on page 5-3.
2. To apply the settings, press Apply.
To apply all settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key instead of pressing Apply.

To Use Miscellaneous Functions

This section describes the following miscellaneous operations other than the source output and measurement functions.

- “To Set Power Frequency”
- “To Apply Initial Settings”
- “To Set Beeper”
- “To Set Date and Time”
- “To Perform Self-Test”
- “To Perform Self-Calibration”
- “To Set Operations at Power On”
- “To Display Error Message”
- “To Clear Error Buffer”
- “To Clear Timestamp”
- “To Set Automatic Clear of Timestamp”
- “To Display Firmware Revision”
- “To Set GPIB Address”
- “To Set Remote Display Mode”

To Set Power Frequency

1. Press the More > System > PLC function keys.
2. Press 50 Hz or 60 Hz. To cancel the setting change, press the Cancel/Local key.

To Apply Initial Settings

1. Press the More > System > Reset function keys.
The Confirmation dialog box opens.
2. Press OK to reset. To cancel the operation, press the Cancel/Local key.

To Set Beeper

1. Press the More > System > More > Sound function keys.
2. To enable the beeper, press ON. To disable it, press OFF. To cancel the setting change, press the Cancel/Local key.

To Set Date and Time

1. Press the More > System > More > Info. function keys.
2. Press Date/Time.
The Date and Time dialog box opens.
3. Set the date and time.
4. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Perform Self-Test

1. Press the On/Off switch and confirm that the switch is turned off.
2. Disconnect test leads and cables from the channel terminals.
3. Press the More > System > Cal/Test > Self-Test function keys.
The Confirmation dialog box opens.
4. Press OK to perform the self-test. To cancel the operation, press the Cancel/Local key.

To Perform Self-Calibration

The self-calibration must be performed after warming-up of 60 minutes.

1. Press the On/Off switch and confirm that the switch is turned off.
2. Disconnect test leads and cables from the channel terminals.
3. Press the More > System > Cal/Test > Self-Cal function keys.
The Confirmation dialog box opens.

4. Press OK to perform the self-calibration. To cancel the operation, press the Cancel/Local key.

To Set Operations at Power On

1. Press the More > System > More > Start-up function keys.
The System Start-up dialog box opens.
2. See “Start-up” on page 4-48 to set each parameter.

To Display Error Message

1. Press the More > System > Error function keys.
2. Press Log.
The error message is displayed in the Error Log dialog box.
3. Press OK to close the dialog box.

To Clear Error Buffer

1. Press the More > System > Error function keys.
2. To clear the error buffer, press Clear. To cancel the operation, press the Cancel/Local key.

To Clear Timestamp

1. Press the More > System > Timestamp function keys.
2. Press Clear. The Confirmation dialog box opens.
3. To perform the operation, press OK. To cancel the operation, press the Cancel/Local key.

To Set Automatic Clear of Timestamp

1. Press the More > System > Timestamp function keys.
2. Press Auto CLR.
3. To enable the automatic clear, press ON. To disable it, press OFF. To cancel the setting change, press the Cancel/Local key.

To Display Firmware Revision

1. Press the More > System > More > Info. function keys.
2. Press Revision.
The revision information is displayed in the Revision dialog box.
3. Press OK to close the dialog box.

To Set GPIB Address

1. Press the More > I/O function keys.
2. Press GPIB.
The GPIB Configuration dialog box opens.
3. Set the GPIB address.
4. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Set Remote Display Mode

1. Press the More > Display function keys.
2. Press Remote.
3. To enable the screen display in remote mode, press ON. To disable it, press OFF.
To cancel the setting change, press the Cancel/Local key.

To Set Source Output

This section describes the following source output operations.

- “To Set Source Output Mode”
- “To Apply DC Voltage/Current”
- “To Stop Source Output”
- “To Set Limit Value”
- “To Set Output Function”
- “To Set Output Range”
- “To Set Programmable Output Resistance”
- “To Set Pulse Output”
- “To Set List Sweep Output”
- “To Set Source Output Trigger Parameters”
- “To Set Source Wait Time”
- “To Set Output Filter”
- “To Set Connection Type”
- “To Set Low Terminal State”
- “To Enable or Disable High Capacitance Mode”
- “To Enable or Disable Over Voltage/Current Protection”
- “To Specify Output-Off Status”
- “To Enable or Disable Automatic Output-On Function”
- “To Enable or Disable Automatic Output-Off Function”
- “To Set Ranging Mode of the Sweep Source”
- “To Set Sweep Direction”
- “To Set Source Output Value after Sweep”

To Set Source Output Mode

1. For the Single view, press the Mode assist key. For the Dual view, press the Ch1 Mode or Ch2 Mode assist key.
The field pointer moves to the Source mode setup field.
2. Press VOLTS (V) for the voltage output or AMPS (I) for the current output.

To Apply DC Voltage/Current

1. For the Single view, press the Source assist key. For the Dual view, press the Ch1 Source or Ch2 Source assist key.
The field pointer moves to the Source value setup field.
2. Enter the output value by using the numeric/alpha keys, rotary knob, and arrow keys.
3. Press the rotary knob or assist key to fix the setting value.
4. Press the On/Off switch for channel 1 or 2 (Ch 1 or Ch 2).

The channel starts the specified voltage/current output. While the switch is turned green, the channel continues the output and changes the value immediately if it is changed.

To Stop Source Output

1. Press the On/Off switch for channel 1 or 2 (Ch 1 or Ch 2).
The output and measurement are stopped and the switch turns off.

To Set Limit Value

For details on this function, see “Limit/Compliance” on page 6-3.

1. For the Single view, press the Limit assist key. For the Dual view, press the Ch1 Limit or Ch2 Limit assist key.
The field pointer moves to the Limit field.
2. Enter the limit value by using the numeric/alpha keys, rotary knob, and arrow keys.
3. Press the rotary knob or assist key to fix the setting value.

To Set Output Function

For details on the output functions, see “Function Parameters” on page 4-12, “Sweep Output” on page 6-9, “List Sweep” on page 6-10, and “Arbitrary Waveform Output” on page 6-11.

The following procedure sets the staircase sweep output.

To set the pulsed sweep output, it is necessary to set the staircase sweep output and the pulse output. For details on setting the pulse output, see “To Set Pulse Output” on page 5-13.

1. Press the View key to display the Single view.
2. If Function parameters are not shown, press the Hide XXXX assist key.
3. Move the field pointer to the Function field.
4. Press the rotary knob to change the pointer status to EDIT.
5. Press the LINEAR SINGLE, LINEAR DOUBLE, LOG SINGLE, or LOG DOUBLE assist key to select the relevant sweep operation. The pointer status is changed to MOVE.
6. Move the field pointer to the sweep parameter setup field (Start, Stop, Points, or Step).
7. Press the rotary knob to change the pointer status to EDIT.
8. Enter the sweep start value (Start), sweep stop value (Stop), number of sweep steps (Points), or sweep step value (Step).
9. Press the rotary knob or assist key to fix the setting value.
10. Repeat steps 6 to 9 for all parameters.

NOTE

Applying the sweep voltage/current

Press the On/Off switch to start the Source value output.

Press the Trigger key to perform the specified sweep output and measurement.

To Set Output Range

For details on this function, see “Ranging Mode” on page 6-4 and “Optional Parameters” on page 4-17.

1. Press the View key to display the Single view.

Front Panel Operations

To Set Source Output

2. Press the Show Options assist key.
3. Move the field pointer to the Source Ranging field.
4. Press the rotary knob to change the pointer status to EDIT.
5. Press AUTO to set the auto range operation or FIXED to set the fixed range operation. The pointer status is changed to MOVE.
6. Move the field pointer to the range value setup field (on the right side of the Source Ranging field).
7. Press the rotary knob to change the pointer status to EDIT.
8. Press an assist key to set the following value.

For the auto range operation: Minimum range of the range operation

For the fixed range operation: Range used for source output

To Set Programmable Output Resistance

For details on this function, see “Programmable Output Resistance” on page 6-13.

1. Press the View key to display the Single view.
2. Press the Show Options assist key.
3. Move the field pointer to the Output R field.
4. Press the rotary knob to change the pointer status to EDIT.
5. Press OFF to disable this function, CONST to set the constant mode, or EMUL to set the emulation mode. The pointer status is changed to MOVE.
6. For the constant mode:
 - a. Move the field pointer to the resistance value setup field which is right of the Output R field.
 - b. Press the rotary knob to change the pointer status to EDIT.
 - c. Enter a resistance value. The channel works as a voltage source with built-in series resistor or a current source with a built-in shunt resistor.
7. For the emulation mode, the emulation table must be set. See “Output R (Emulation) dialog box” on page 4-30 and set up the emulation table.

To Set Pulse Output

For details on this function, see “Pulse Output” on page 6-7.

1. Press the View key to display the Single view.
2. Press the Show Pulse assist key to display the Pulse parameters. For details on the parameters, see “Pulse Parameters” on page 4-18.
3. Move the field pointer to the Pulse field.
4. Press the rotary knob to change the pointer status to EDIT.
5. Press the ON assist key. The pointer status is changed to MOVE.
6. Move the field pointer to the pulse parameter setup field (Peak, Delay, or Width).
7. Press the rotary knob to change the pointer status to EDIT.
8. Enter the pulse peak value (Peak), delay time (Delay), or pulse width (Width).
9. Press the rotary knob or assist key to fix the setting value.
10. Repeat steps 6 to 9 for all parameters.

NOTE

Applying the pulse voltage/current

Press the On/Off switch to start the Source value output. The Source value is used as the pulse base value.

Press the Trigger key to perform the specified pulse output and measurement.

To Set List Sweep Output

For details on this function, see “List Sweep” on page 6-10.

1. Press the View key to display the Single view.
2. If Function parameters are not shown, press the Hide XXXX assist key.
3. Move the field pointer to the Function field.
4. Press the rotary knob to change the pointer status to EDIT.
5. Press the LIST assist key. The pointer status is changed to MOVE.
6. Move the field pointer to the sweep parameter setup field (Start, Stop, or Points).
7. Press the rotary knob to change the pointer status to EDIT.

Front Panel Operations

To Set Source Output

8. Press the Edit assist key. The List Sweep dialog box opens.
9. Set the list sweep source using the List Sweep dialog box. For details, see “List Sweep Setup” on page 4-13.
10. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

NOTE

Load assist key

If you press the Load assist key instead of the Edit assist key in step 8, the Load List Sweep Data dialog box opens to allow you to load list sweep data from a USB memory.

For details, see “List Sweep Setup” on page 4-13.

NOTE

Applying the list sweep voltage/current

Press the On/Off switch to start the Source value output.

Press the Trigger key to perform the specified list sweep output and measurement.

To Set Source Output Trigger Parameters

For details on this function, see “Trigger System” on page 6-26 and “Trigger Parameters” on page 4-19.

1. Press the View key to display the Single view.
2. Press the Show Trigger assist key to display the Trigger parameters.
3. Move the field pointer to the Trigger field.
4. Press the rotary knob to change the pointer status to EDIT.
5. Press the AUTO, SYNC, TIMER, or MANUAL assist key to set the trigger type. The pointer status is changed to MOVE.
6. Move the field pointer to the trigger parameter setup field (Count, Delay, Period, or Trigger in the Source column).
7. Press the rotary knob to change the pointer status to EDIT.
8. Enter the trigger count (Count), trigger delay time (Delay), trigger period (Period), or trigger source (Trigger).

9. Press the rotary knob or assist key to fix the setting value.
10. Repeat steps 6 to 9 for all parameters.

NOTE

If you want to set the trigger parameters in detail, select the MANUAL trigger type and use the Trigger Configuration dialog box opened by pressing the Trigger > Config function keys. See “Trigger key group” on page 4-33.

To Set Source Wait Time

For details on this function, see “Measurement Time” on page 6-5 and “Wait Control dialog box” on page 4-30.

1. Press the Config > Common > Wait function keys.
The Wait Control dialog box opens.
2. Set each parameter in the Source column.
3. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Set Output Filter

For details on this function, see “Output Filter and External Filter” on page 6-12 and “Output Filter dialog box” on page 4-28.

1. Press the Config > Source > Filter function keys.
The Output Filter dialog box opens.
2. Set each parameter.
3. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Set Connection Type

For details on this function, see “2-Wire Connections or 4-Wire Connections” on page 3-12.

1. Press the Config > Source > Connection function keys.

Front Panel Operations

To Set Source Output

The Output Connection dialog box opens.

2. In the Ch field, set the channel to which the setting change is applied.
3. Set 2-WIRE or 4-WIRE in the Sensing Type field.
4. To apply the settings, press Apply.

To apply the settings and close the dialog box, press OK.

To cancel the setting change, press the Cancel/Local key.

To Set Low Terminal State

For details on this function, see “Floating” on page 3-13.

1. Press the Config > Source > Connection function keys.

The Output Connection dialog box opens.

2. In the Ch field, set the channel to which the setting change is applied.
3. Set GROUNDED or FLOATING in the Low Terminal State field.
4. To apply the settings, press Apply.

To apply the settings and close the dialog box, press OK.

To cancel the setting change, press the Cancel/Local key.

To Enable or Disable High Capacitance Mode

For details on this function, see “High Capacitance Mode” on page 6-17.

1. Press the Config > Source > Connection function keys.

The Output Connection dialog box opens.

2. In the Ch field, set the channel to which the setting change is applied.
3. Set ON (enable) or OFF (disable) in the High Capacitance Mode field.
4. To apply the settings, press Apply.

To apply the settings and close the dialog box, press OK.

To cancel the setting change, press the Cancel/Local key.

To Enable or Disable Over Voltage/Current Protection

For details on this function, see “Over Voltage/Current Protection” on page 6-14.

1. Press the Config > Source > Connection function keys.
The Output Connection dialog box opens.
2. In the Ch field, set the channel to which the setting change is applied.
3. Set ON (enable) or OFF (disable) in the Over Voltage/Current Protection field.
4. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Specify Output-Off Status

For details on this function, see “Output-Off Status” on page 6-15.

1. Press the Config > Source > Connection function keys.
The Output Connection dialog box opens.
2. In the Ch field, set the channel to which the setting change is applied.
3. Set HIGH Z (high impedance), NORMAL (normal), or ZERO (zero volt) in the Output-Off State field.
4. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Enable or Disable Automatic Output-On Function

For details on this function, see “Automatic Output-ON/OFF Function” on page 6-16.

1. Press the Config > Source > Connection function keys.
The Output Connection dialog box opens.
2. In the Ch field, set the channel to which the setting change is applied.
3. Set ON (enable) or OFF (disable) in the Auto Output-On field.
4. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Enable or Disable Automatic Output-Off Function

For details on this function, see “Automatic Output-ON/OFF Function” on page 6-16.

1. Press the Config > Source > Connection function keys.
The Output Connection dialog box opens.
2. In the Ch field, set the channel to which the setting change is applied.
3. Set ON (enable) or OFF (disable) in the Auto Output-Off field.
4. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Set Ranging Mode of the Sweep Source

For details on this function, see “Ranging Mode” on page 6-4.

1. Press the Config > Source > Sweep function keys.
The Sweep dialog box opens.
2. In the Ch field, set the channel to which the setting change is applied.
3. Set BEST, AUTO, or FIXED in the Sweep Ranging field. For details, see “Sweep dialog box” on page 4-29.
4. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

To Set Sweep Direction

1. Press the Config > Source > Sweep function keys.
The Sweep dialog box opens.
2. In the Ch field, set the channel to which the setting change is applied.
3. Set UP or DOWN in the Sweep Direction field. For details, see “Sweep dialog box” on page 4-29.
4. To apply the settings, press Apply.

To apply the settings and close the dialog box, press OK.

To cancel the setting change, press the Cancel/Local key.

To Set Source Output Value after Sweep

1. Press the Config > Source > Sweep function keys.
The Sweep dialog box opens.
2. In the Ch field, set the channel to which the setting change is applied.
3. Set START VALUE or END VALUE in the Output after Sweep field. For details, see “Sweep dialog box” on page 4-29.
4. To apply the settings, press Apply.

To apply the settings and close the dialog box, press OK.

To cancel the setting change, press the Cancel/Local key.

To Execute Measurement

This section describes the following measurement operations.

- “To Set Measurement Mode”
- “To Perform Spot Measurement”
- “To Stop Measurement”
- “To Set Measurement Time”
- “To Perform Sweep Measurement”
- “To Set Measurement Trigger Parameters”
- “To Set Measurement Wait Time”
- “To Enable or Disable Resistance Compensation”

To Set Measurement Mode

1. For the Single view, press the Measure assist key. For the Dual view, press the Ch1 Measure or Ch2 Measure assist key.
2. Press AMPS (I) for the current measurement, VOLTS (V) for the voltage measurement, OHMS (R) for the resistance measurement, WATTS (P) for the power measurement, or %LIMIT (%) for the percent-to-Limit measurement.

To Perform Spot Measurement

1. Set the measurement mode (see “To Set Measurement Mode” on page 5-20).
2. Set the output voltage or current (see “To Apply DC Voltage/Current” on page 5-10).
3. Press the On/Off switch for channel 1 or 2 (Ch1 or Ch2).

The channel starts the specified voltage/current output. While the switch is turned green, the channel continues the output and changes the value immediately if it is changed.

4. Press the Trigger key.

The spot measurement is performed.

NOTE

To change the Limit value, see “To Set Limit Value” on page 5-10.

To Stop Measurement

1. Press the On/Off switch for channel 1 or 2 (Ch1 or Ch2) to turn the switch off.
The channel stops source output and measurement.

To Set Measurement Time

For details on this function, see “Measurement Time” on page 6-5 and “Measure Speed:” on page 4-17.

1. Press the View key to display the Single view.
2. Press the Show Options assist key to display the optional parameters.
3. Move the field pointer to the Measure Speed field.
4. Press the rotary knob to change the pointer status to EDIT.
5. Press the AUTO, SHORT, MEDIUM, NORMAL, LONG, or MANUAL assist key to set the measurement time.
6. When MANUAL is specified, the aperture time setup field and PLC setup field are displayed. Enter and fix a value in either of the fields to set the measurement time.

To Perform Sweep Measurement

For details on this function, see “Sweep Output” on page 6-9.

1. Press the View key to display the Single view.
2. Set the source function (see “To Set Source Output Mode” on page 5-10).
3. Set the Source value and Limit value (see “To Apply DC Voltage/Current” on page 5-10 and “To Set Limit Value” on page 5-10).
4. Set the measurement mode (see “To Set Measurement Mode” on page 5-20).
5. Set the sweep source (see “To Set Output Function” on page 5-11).
6. Press the View key to display the Graph view.
7. Press the On/Off switch for channel 1 or 2 (Ch1 or Ch2).

Front Panel Operations

To Execute Measurement

The channel starts the specified voltage/current output. While the switch is turned green, the channel continues the output and changes the value immediately if it is changed.

8. Press the Trigger key.

The sweep measurement is performed and the measurement result is displayed in a graph.

To Set Measurement Trigger Parameters

For details on this function, see “Trigger System” on page 6-26 and “Trigger Parameters” on page 4-19.

1. Press the View key to display the Single view.
2. Press the Show Trigger assist key to display the Trigger parameters.
3. Move the field pointer to the Trigger field.
4. Press the rotary knob to change the pointer status to EDIT.
5. Press the AUTO, SYNC, TIMER, or MANUAL assist key to set the trigger type. The pointer status is changed to MOVE.
6. Move the field pointer to the trigger parameter setup field (Count, Delay, Period, or Trigger in the Measure column).
7. Press the rotary knob to change the pointer status to EDIT.
8. Enter the trigger count (Count), trigger delay time (Delay), trigger period (Period), or trigger source (Trigger).
9. Press the rotary knob or assist key to fix the setting value.
10. Repeat steps 6 to 9 for all parameters.

NOTE

If you want to set the trigger parameters in detail, select the MANUAL trigger type and use the Trigger Configuration dialog box opened by pressing the Trigger > Config function keys. See “Trigger key group” on page 4-33.

To Set Measurement Wait Time

For details on this function, see “Measurement Time” on page 6-5 and “Wait Control dialog box” on page 4-30.

1. Press the Config > Common > Wait function keys.

The Wait Control dialog box opens.

2. Set each parameter in the Measure column.

3. To apply the settings, press Apply.

To apply the settings and close the dialog box, press OK.

To cancel the setting change, press the Cancel/Local key.

To Enable or Disable Resistance Compensation

1. Press the Config > Measure > R Compen function keys.

2. For the 2-channel models, specify the channel to which the setting change is applied by using the following function keys.

ALL: Channels 1 and 2 (Ch 1 and Ch 2)

Ch 1: Channel 1 (Ch 1) only

Ch 2: Channel 2 (Ch 2) only

3. To enable the resistance compensation, press ON.

To disable it, press OFF.

To cancel the setting change, press the Cancel/Local key.

To Use Math Function

This section describes how to use the math function. For details on this function, see “Math Expression” on page 6-19. Also, for details on the setup parameters, see “Math Expression dialog box” on page 4-31.

1. Press the Function > Math function keys.

The Math Expression dialog box opens.

2. In the Ch field, set the channel to which the setting change is applied.
3. In the Status field, set the math function ON (enable) or OFF (disable).
4. In the Unit String field, enter the unit for the calculation result data.

To enter alphabets, press the ABC assist key and then use the numeric/alpha keys.

To enter numbers, press the 123 assist key and then use the numeric/alpha keys.

To delete a character, highlight the character to be deleted and then press the Delete function key.

To insert a character, highlight the character at the position where to insert the character and then press the Insert function key.

5. Select a math expression to use.

To select a math expression, highlight the name of the math expression in the list area below the Unit String field.

6. To apply the settings, press Apply.

To apply the settings and close the dialog box, press OK.

To cancel the setting change, press the Cancel/Local key.

To Use Trace Buffer

This section describes how to set the trace buffer and how to display the statistical data. For details on this function, see “Trace Buffer” on page 6-22.

To use the trace buffer, set the trace buffer and source output and measurement conditions, and then press the Trigger key.

- “To Set Trace Buffer”
- “To Display Statistical Data”

To Set Trace Buffer

For details on the setup parameters, see “Trace Buffer Setup dialog box” on page 4-32.

1. Press the Function > Trace function keys.
The Trace Buffer Setup dialog box opens.
2. In the Ch field, set the channel to which the setting change is applied.
3. In the Feed Data field, set SENSE (for collecting the measurement result data) or MATH (for collecting the calculation result data).
4. In the Buffer Control field, set NEXT (for enabling the write operation to the trace buffer) or NEVER (for disabling it).
5. In the Buffer Size field, set the size of the trace buffer (1 to 100000).
6. To apply the settings, press Apply.
To apply the settings and close the dialog box, press OK.
To cancel the setting change, press the Cancel/Local key.

NOTE

To specify the measurement result data (SENSE) to be collected, use “Format (Measure) dialog box” on page 4-41.

To specify the calculation result data (MATH) to be collected, use “Format (Math) dialog box” on page 4-42.

To change the statistical data to be saved in the trace buffer, use “Format (Trace) dialog box” on page 4-42.

To Display Statistical Data

For details on the setup parameters, see “Trace Statistical Result dialog box” on page 4-37.

1. Press the Result > Trace function keys.
The Trace Statistical Result dialog box opens.
2. In the Ch field, set the channel for the data to be displayed.
3. In the Element field, set the data type SOURCE (source output data), VOLTS (voltage measurement data), AMPS (current measurement data), OHMS (resistance measurement data) for the statistical calculation.
The statistical data for the data specified here is displayed in the area below the Length field.
4. Press OK to close the dialog box.

The Length field displays the number of data.

The statistical data is displayed in the following fields:

Mean: Mean value

Std. Dev.: Standard deviation

Min.: Minimum value

Max.: Maximum value

To Use Program Memory

This section describes how to select and run a memory program. For details on this function, see “Program Memory” on page 6-24.

See also “Program key group” on page 4-39.

- “To Select a Program”
- “To Control Program Operation”

To Select a Program

1. Press the More > Program > Catalog function keys.
The Program Catalog dialog box opens.
2. Highlight the name of the memory program to run.
3. Press OK.

NOTE

To set a value for a variable used in the memory program, use the Variable dialog box. For details, see “Program key group” on page 4-39.

To Control Program Operation

1. Press the More > Program > Control function keys.
2. Use the following keys to control the operation of a memory program.

| | |
|-----------------|---|
| Run | Starts the execution of the specified memory program. |
| Pause | Pauses the execution of the memory program. |
| Step | Starts the step execution of the specified memory program. |
| Stop | Stops the execution of the memory program. |
| Continue | Continues the execution of the memory program presently paused. |

Front Panel Operations
To Use Program Memory

6 **Function Details**

Function Details

This chapter describes the following functions of the Agilent B2961A/B2962A.

- “Limit/Compliance”
- “Ranging Mode”
- “Measurement Time”
- “Pulse Output”
- “Sweep Output”
- “List Sweep”
- “Arbitrary Waveform Output”
- “Output Filter and External Filter”
- “Programmable Output Resistance”
- “Over Voltage/Current Protection”
- “Output-Off Status”
- “Automatic Output-ON/OFF Function”
- “High Capacitance Mode”
- “Resistance Measurement”
- “Math Expression”
- “Trace Buffer”
- “Program Memory”
- “Channel Grouping”
- “Trigger System”
- “Interlock Function”
- “Over Temperature Protection”
- “Initial Settings”

Limit/Compliance

Limit/compliance is the output limiter for preventing damage to the test device from overcurrent or overvoltage. Voltage limit is for current output channels, and current limit is for voltage output channels.

When a channel reaches limit, the channel acts as a constant voltage source or a constant current source. The channel keeps the output value once limit has been reached.

Limit can be set with the same resolution and accuracy as output current or output voltage.

To Set Limit

The following points must be noted when setting the limit.

- The minimum limit value is limited as follows.
 - Current limit
 - 1 % of the range (at 100 nA Range)
 - 1 nA (at 10 nA Range)
 - Voltage limit
 - 20 mV (at 0.2 V range)
- If the current limit value is too low, the channel will require a long settling time.
- The limit value can be specified asynchronously to positive and negative.

Ranging Mode

The following ranging modes are available for the source output.

- **FIXED** (fixed range)

The channel uses the specified range only.

- **AUTO** (auto range)

The channel automatically uses the range which provides the best resolution for the source output value. It is possible to specify the minimum range effective for the auto range operation.

- **BEST** (best, only for the sweep source)

In the linear sweep mode, the channel automatically uses the minimum range which covers the whole sweep output.

In the log sweep mode, the channel automatically uses the range which provides the best resolution for each sweep step output.

Setting the Ranging Mode

The following points must be noted when setting the ranging mode.

- The pulsed source channel always uses the fixed range.
- To set the ranging mode used for the DC (constant) source operation, see “Optional Parameters” on page 4-17.
- To set the ranging mode used for the sweep source operation, see “Sweep dialog box” on page 4-29.

Measurement Time

Measurement time depends on aperture time, measurement range, and other measurement conditions, and can be expressed by the following formula:

$$\text{Measurement time} = \text{Aperture time} + \text{Overhead time}$$

Aperture time is the time required for measurement, and does not include such factors as range change or data compensation, which would be the overhead time.

Aperture Time

Aperture time is the time required to acquire the measurement data. For accurate and reliable measurement, the aperture time should be increased.

The aperture time is set by using the Measure Speed parameter on the Single view. See “Measure Speed:” on page 4-17.

Overhead Time

Overhead time is the time required for range change, etc. This time depends on the measurement condition, and cannot be specified. Major elements of the overhead time are:

- Range change time during measurement (when measurement ranging mode is set to AUTO)
- Range change time at the start of a measurement (when the measurement range is less than the limit value)

To Control Source/Measure Timing

The source output and measurement timing can be controlled by the following parameters. See Figure 6-1. This figure shows an example of sweep output. For a bias output, focus the shape of a sweep step only.

1. Source delay

The source delay time is defined as the time from trigger to start of a source output.

Function Details

Measurement Time

2. Measure delay

The measurement delay time is defined as the time from trigger to start of a measurement.

3. Source wait

The source wait time is defined as the time the source channel cannot change the output value after starting an output.

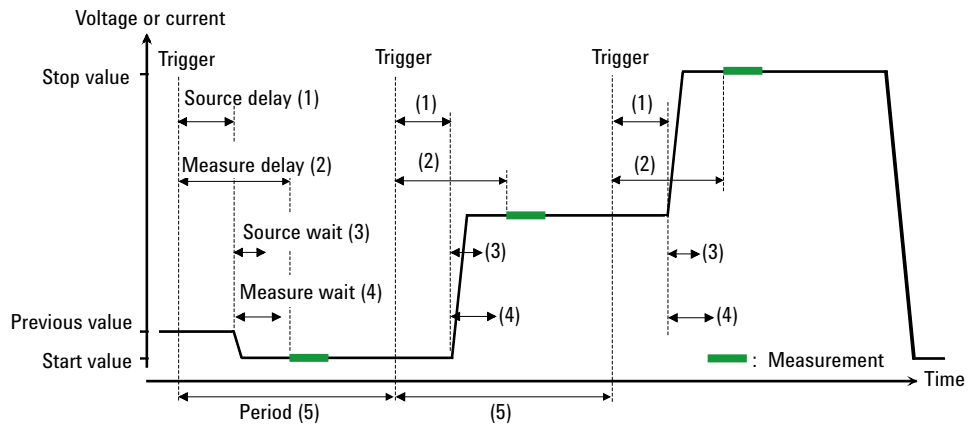
4. Measure wait

The measurement wait time is defined as the time the measurement channel cannot start measurement after starting an output.

5. Period

The period is the trigger interval. It can be defined for the TIMER or MANUAL trigger type (trigger source) and for the source output and measurement actions individually.

Figure 6-1 Source Output and Measurement Timing, Sweep Output Example



To set the delay time and the period, see “Trigger Parameters” on page 4-19.

To set the wait time, see “Wait Control dialog box” on page 4-30.

For more information about the trigger setup, see “Trigger key group” on page 4-33.

Pulse Output

The channel can apply the pulsed voltage or current. Figure 6-2 shows a pulsed sweep output example. For a pulsed bias output, focus the shape of a pulse only.

To Control Pulse Output/Measure Timing

The pulse output and measurement timing can be controlled by the following parameters. See Figure 6-2.

1. Source delay

The source delay time is defined as the time from trigger to start of a source output.

2. Measure delay

The measurement delay time is defined as the time from trigger to start of a measurement.

3. Pulse delay

The pulse delay time is defined as the time from the start of a source output to the start of a pulse (peak) output.

4. Source wait

The source wait time is defined as the time the source channel cannot change the output value after the trailing edge of a pulse.

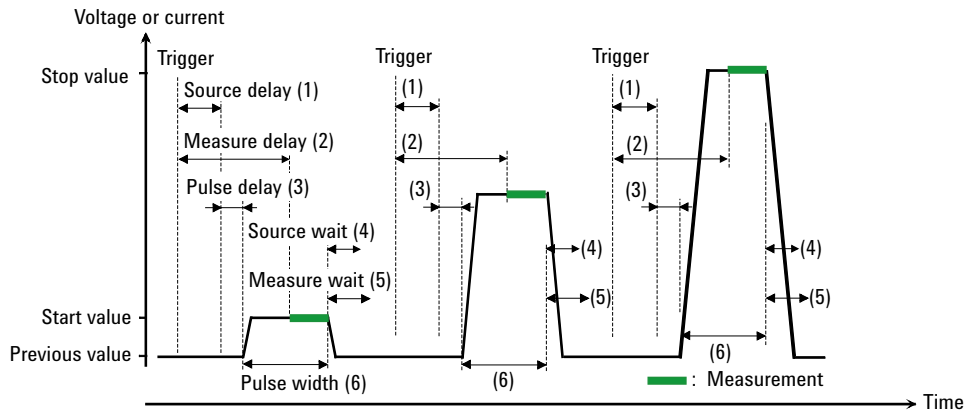
5. Measure wait

The measurement wait time is defined as the time the measurement channel cannot start measurement after the trailing edge of a pulse.

6. Pulse width

The pulse width is the time from the start of a pulse output to the end of a pulse (peak) output. However, it is strictly defined as the time from 10 % of peak level at the leading edge to 90 % of peak level at the trailing edge. The available values are 50 μ s to 100000 s.

Figure 6-2 Pulse Output and Measurement Timing, Sweep Output Example



To set the delay time, see “Trigger Parameters” on page 4-19.

To set the pulse delay time and the pulse width, see “Pulse Parameters” on page 4-18.

To set the wait time, see “Wait Control dialog box” on page 4-30.

For more information about the trigger setup, see “Trigger key group” on page 4-33.

To Set Pulse Output

The following points must be noted when setting the pulse output.

- Pulse base value is set by the Source value on the Single or Dual view.
- Pulse peak value is set by the Single view.

Set the Peak value of “Pulse Parameters” on page 4-18 for the pulsed bias output.

Or set the Start, Stop, and Points values of “Function Parameters” on page 4-12 for the pulsed sweep output.

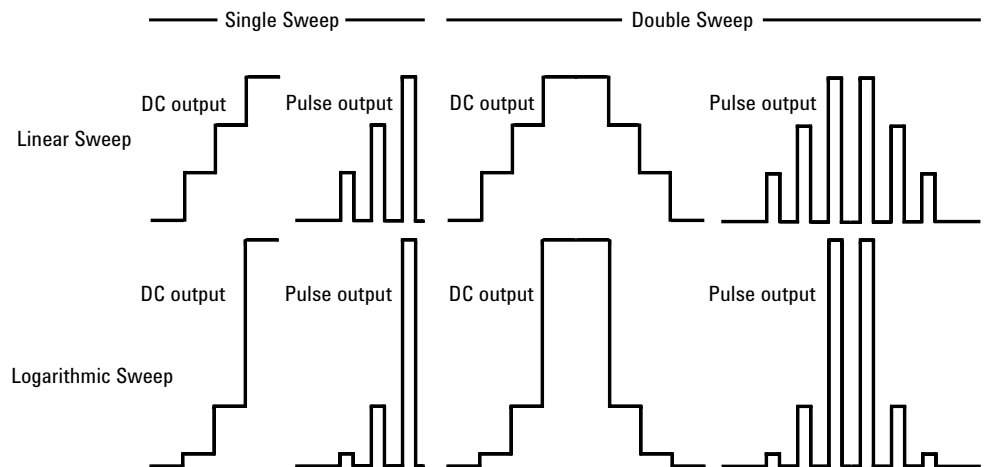
Sweep Output

The channel can apply a sweep voltage/current. It supports several sweep output functions, as shown in Figure 6-3. The channel not only performs the sweep output but performs the measurement for each sweep step as shown in Figures 6-1 and 6-2.

The channel can also perform an arbitrary waveform output as the sweep source and perform the measurement for each step of the waveform. It is called as list sweep. For details, see “List Sweep” on page 6-10.

Figure 6-3

Variety of Sweep Outputs



To Set Sweep Output

The following points must be noted when setting the sweep output.

- To set the function parameters, see “Function Parameters” on page 4-12.
- To set the ranging mode of the sweep source, see “Sweep dialog box” on page 4-29.
- To set the sweep direction, see “Sweep dialog box” on page 4-29.
- To set the output condition after sweep, see “Sweep dialog box” on page 4-29.
- To set the pulse delay time and the pulse width, see “Pulse Parameters” on page 4-18.

List Sweep

By using the list sweep function, the channel can apply your desired waveform, for example as shown in Figure 6-4, and measure voltage or current at each output value.

This function can be used in both the DC voltage/current output range and the pulse voltage/current output range.

The source output and measurement timing is controlled by the trigger system. And the interval can be set to a constant value if the trigger type is set to TIMER.

The source output and measurement can be performed in 10 μ s minimum interval.

To set these trigger parameters, see “Trigger Parameters” on page 4-19. The interval can be set by the Period parameter. The number of output values can be set by the Count parameter.

To set the source output values, use the List Sweep dialog box. See “List Sweep Setup” on page 4-13.

Figure 6-4 shows an example setup of the List Sweep dialog box with an image of the output waveform.

Figure 6-4

List Sweep Dialog Box



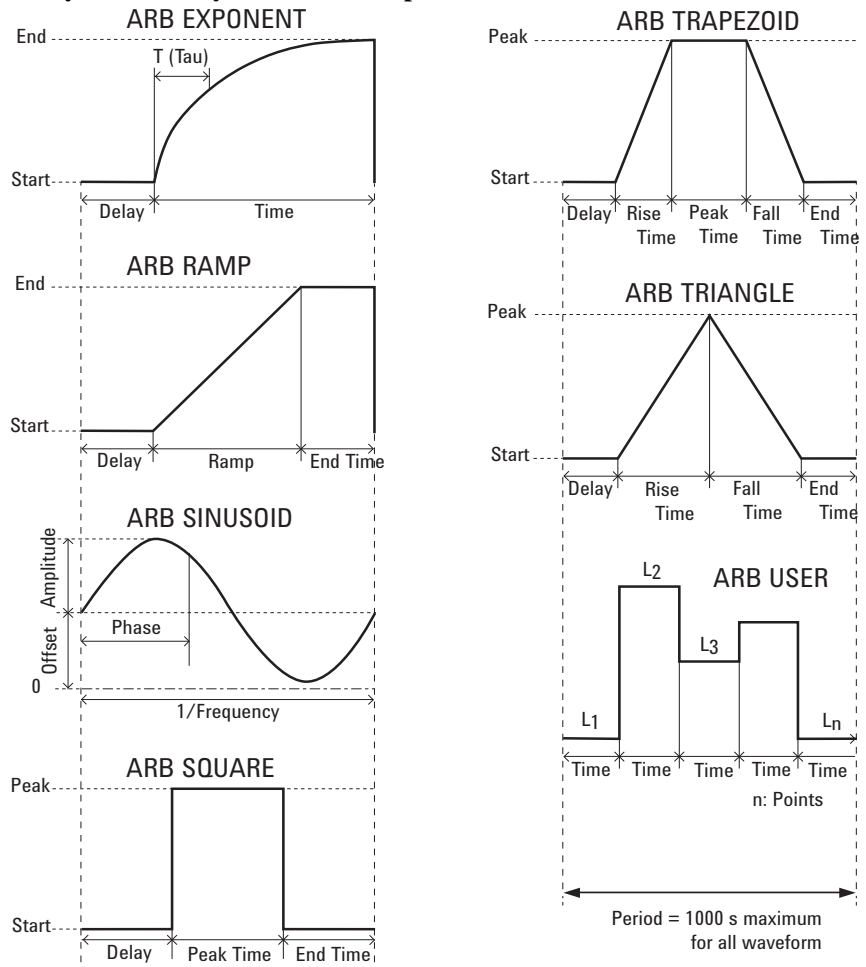
Arbitrary Waveform Output

The channel can also apply an arbitrary voltage/current waveform. It supports several waveform output functions, as shown in Figure 6-5. This function can be used in the DC voltage/current output range.

To set an arbitrary waveform output parameters, see “Function Parameters” on page 4-12. To set the user defined waveform data values, use the User Defined Waveform dialog box. See “User Defined Waveform Setup” on page 4-15.

Figure 6-5

Variety of Arbitrary Waveform Outputs



Output Filter and External Filter

The channel has a built-in output filter to obtain clean source output without spikes, noise, and overshooting. To set the filter, see “Output Filter dialog box” on page 4-28. Note, however, that using a filter may increase the channel settling time.

Also the channel can be equipped with a N1294A-021 ultra low noise filter (ULNF) or a N1294A-022 low noise filter (LNF). By attaching the filter to the output terminal, the B2961A/B2962A can be used as a high resolution and high speed DC power supply or a DC bias source for high frequency measurement instrument.

For using the external filter, see “Using the N1294A-021/022 Low Noise Filter” on page 3-15 and “External Filter dialog box” on page 4-28. And set the dialog box properly.

Conditions for using the external filter is shown below.

- Supported source mode: DC voltage source or DC current source
- Built-in output filter:
Filter State: ON
Automatic Filter: ON
- Programmable output resistance function: Unsupported
- Maximum output voltage/current for using ULNF: $\pm 42\text{ V}$ / $\pm 105\text{ mA}$
- Current ranges effective for using ULNF:
In the current source mode: 10 nA to 100 mA ranges
In the voltage source mode: 10 μA to 100 mA ranges
- Current ranges effective for using LNF:
In the current source mode: 10 nA to 3 A ranges
In the voltage source mode, high capacitance mode ON: 10 μA to 3 A ranges
In the voltage source mode, high capacitance mode OFF: 100 mA to 3 A ranges

Programmable Output Resistance

If the programmable output resistance function is enabled, the channel operates like an electric load.

This function provides two operation mode, constant and emulation.

For the constant mode, the channel works as a voltage source with built-in constant series resistor or a current source with a built-in constant shunt resistor. For easy understanding, when the High and Low terminals are shorted, the channel tries to apply 0.1 A with the setting of 0.1 V output and 1 Ω output resistance.

For the emulation mode, the channel emulates user defined V/I curve set to the emulation table. Then the output status on the Single or Dual view is changed to “EMUL”.

To set the programmable output resistance, see “Optional Parameters” on page 4-17.

To set up the emulation table, see “Output R (Emulation) dialog box” on page 4-30.

NOTE

For examples using this function, see the following documents.

- Programmable Output Resistance, Using Constant Mode
- Programmable Output Resistance, Using VI Emulation Mode

They are stored in the B2961A/62A Power Source Product Reference CD-ROM.

Over Voltage/Current Protection

The over voltage/current protection is effective for preventing damage to the test device from overcurrent or overvoltage. If this function is enabled, the channel sets the output to 0 V and sets the output switch to off automatically and immediately when it reaches the limit status.

To set the over voltage/current protection, see “Output Connection dialog box” on page 4-27.

Output-Off Status

The output-off status is the condition which is set on the channel automatically, immediately after its output is turned off. The status must be specified before enabling the source output. The available conditions are shown in Table 6-1

To set the output-off status, see “Output Connection dialog box” on page 4-27.

Table 6-1

Output-Off State

| Name | Conditions after output-off |
|------------------------------|---|
| HIGH Z, high impedance | <ul style="list-style-type: none"> • Output relay: off (open or break) • Voltage source setup is not changed if the source applies 40 V or less. • Current source setup is not changed if the source uses the 100 mA range or lower. |
| NORMAL | <ul style="list-style-type: none"> • Source function: Voltage source • Output voltage: 0 V • Current limit: 100 μA at the 100 μA range • Output relay: off (open or break) |
| ZERO | <ul style="list-style-type: none"> • Source function: Voltage source • Output voltage: 0 V • Current limit: 100 μA at the 100 μA range |

NOTE

This setting is not applied to the output-off process triggered by the emergency condition such as the over voltage/current protection, interlock open, and over temperature protection. Then the output voltage is immediately set to 0 V and the output switch is set to off.

Automatic Output-ON/OFF Function

The automatic output-ON/OFF function defines the source channel's output ON/OFF operation when the trigger system changes the status.

- Automatic-ON function

If this function is enabled, the channel automatically turns the output ON just before the trigger system is initiated by an SCPI command, not by a front panel operation.

- Automatic-OFF function

If this function is enabled, the channel automatically turns the output OFF immediately when all trigger system changes the status from busy to idle.

To set the automatic output ON/OFF function, see “Output Connection dialog box” on page 4-27.

High Capacitance Mode

High capacitance mode is effective for the measurement of a capacitive load greater than 0.01 μF .

If the measurement result data is not stable, set this function ON. The measurement data may come stable. This function is effective for measurements of capacitive devices up to 50 μF .

High capacitance mode is available for the following source/measure condition.

- Operation mode: voltage source and current measurement
- Current measurement range: 1 μA to 10 A

To set the high capacitance mode, see “Output Connection dialog box” on page 4-27.

Resistance Measurement

B2961A/B2962A supports resistance measurement. If the measurement parameter is set to resistance OHMS (R), B2961A/B2962A automatically calculates resistance value from measured voltage and current.

For performing accurate measurement, B2961A/B2962A provides the compensation function.

Resistance Compensation

Resistance compensation (R Compen) is effective for performing low resistance measurements accurately. If R Compen is set to ON, the channel performs measurement twice and returns the compensated measurement result given by the following formula. This technique is effective for reducing the thermal EMF.

$$R_{\text{compen}} = (V_2 - V_1) / (I_2 - I_1)$$

where, V_1 is the measurement results at the 0 A source condition, and I_1 is the measurement results at the 0 V source condition.

To enable resistance compensation, press the Config > Measure > R Compen > ON function key on a 1-channel model, or the Config > Measure > R Compen > ALL or Ch 1 or Ch2 > ON function key on a 2-channel model.

To disable resistance compensation, press the Config > Measure > R Compen > OFF function key on a 1-channel model, or the Config > Measure > R Compen > ALL or Ch 1 or Ch2 > OFF function key on a 2-channel model.

Math Expression

B2961A/B2962A provides a math function for performing calculations using the measurement result data. The calculation result can be displayed and used for the trace statistics.

For the predefined math expressions, see “Predefined Math Expressions”.

To define a math expression, see Agilent B2961A/B2962A *SCPI Command Reference*. Math expressions can be defined by using the :CALC:MATH commands. For resources effective for the expression, see “Resources Used in the Expressions”.

To use the math function, see “Math Expression dialog box” on page 4-31.

To display the calculation result, see “Graph View” on page 4-21 and “Measure Result dialog box” on page 4-36.

Predefined Math Expressions

The following math expressions have already been defined in B2961A/B2962A. The predefined math expressions are not cleared by the power off and on operations.

- Power (POWER)
- Offset Compensated Ohms (OFFCOMPOHM)
- Varistor Alpha (VARALPHA)
- Voltage Coefficient (VOLTCOEF)

In the following formula, [c] specifies the channel (1 or 2) used for the measurement.

POWER

Calculates power using the following formula.

$$\text{POWER} = \text{VOLT}[c] * \text{CURR}[c]$$

OFFCOMPOHM

Calculates offset compensated ohms (resistance) using the following formula.

$$\text{OFFCOMPOHM} = (\text{VOLT}[c][1] - \text{VOLT}[c][0]) / (\text{CURR}[c][1] - \text{CURR}[c][0])$$

where, VOLT[c][0] and CURR[c][0] are the data measured with a current output level, and VOLT[c][1] and CURR[c][1] are the data measured with a different current output level or zero output.

Function Details

Math Expression

This function is effective for reducing measurement errors in low resistance measurements.

VARALPHA

Calculates varistor alpha using the following formula.

$$\text{VARALPHA} = \log(\text{CURR}[c][1] / \text{CURR}[c][0]) / \log(\text{VOLT}[c][1] / \text{VOLT}[c][0])$$

where, $\text{CURR}[c][0]$ and $\text{VOLT}[c][0]$ are the measurement data at a point on a varistor's non-linear I-V characteristics curve, and $\text{CURR}[c][1]$ and $\text{VOLT}[c][1]$ are the data at the another point.

VOLTCOEFF

Calculates voltage coefficient using the following formula.

$$\text{VOLTCOEFF} = (\text{RES}[c][1] - \text{RES}[c][0]) / (\text{RES}[c][1] * (\text{VOLT}[c][1] - \text{VOLT}[c][0])) * 100 \%$$

where, $\text{RES}[c][0]$ and $\text{RES}[c][1]$ are the resistance measurement data at the first and second measurement points, respectively, and $\text{VOLT}[c][0]$ and $\text{VOLT}[c][1]$ are the voltage measurement data at the first and second measurement points, respectively.

The voltage coefficient is known as the ratio of the fractional change for a resistor whose resistance varies with voltage.

Resources Used in the Expressions

The following resources can be used in user-defined math expressions.

- Reserved variables

The variables listed in Table 6-2 are reserved for reading the channel output or measurement data.

Scalar variable is used for spot measurement data.

Vector (array) variable is used for sweep measurement data.

- Math operators

The following operators are available.

- Arithmetic operators: +, -, *, /, ^, see Table 6-3
- Elementary functions: ln, log, sin, cos, tan, exp

The functions log and ln perform the operation after calculating the absolute value. So if a negative value is specified, they do not cause an error but calculate as a positive value. For example, $\log(-10)$ results in $\log(10)=1$.

Table 6-2

Reserved Variables

| Reserved variable ^a | | Description |
|--------------------------------|-----------|-----------------------------|
| Scalar | Vector | |
| SOUR[c] | SOUR[c][] | Source output setting data |
| VOLT[c] | VOLT[c][] | Voltage measurement data |
| CURR[c] | CURR[c][] | Current measurement data |
| RES[c] | RES[c][] | Resistance measurement data |
| TIME[c] | TIME[c][] | Time (timestamp) data |

- a. The numeric suffix [c] is effective for specifying the channel. For example, use CURR2 to read the current spot measurement data of the channel 2.

Table 6-3

Arithmetic and Unary Operators

| Priority of task | Operator | Description |
|------------------|----------|---|
| High | () | Parentheses |
| : | + and - | Unary plus operator and unary minus operator |
| : | ^ | Exponentiation operator |
| : | * and / | Multiplication operator and division operator |
| Low | + and - | Additive operator and subtraction operator |

Trace Buffer

The trace buffer collects the test result data until a buffer full is detected. The maximum data size is 100,000 blocks for each channel. The data flow is shown in Figure 6-6. One data block may contain multiple data, such as voltage measurement data, current measurement data, resistance measurement data, source output data, calculation result data, time data, and status data. They are selected by using the Format keys of the I/O key group. See “I/O key group” on page 4-40.

For setting the trace buffer, see “Trace Buffer Setup dialog box” on page 4-32.

In Figure 6-6, the variables indicate the following data.

- VOLT: Voltage measurement data
- CURR: Current measurement data
- RES: Resistance measurement data
- TIME: Time data (timestamp of the measurement start trigger)
- STAT: Status data
- SOUR: Source output data
- CALC: Math (calculation) result data

If data is stored in the trace buffer, its statistical data can be calculated. Calculable statistical data is as follows.

- MEAN: Mean value
- SDEV: Standard deviation
- MIN: Minimum value
- MAX: Maximum value
- PKPK: Peak to peak value

The statistical data (except for PKPK) of VOLT, CURR, or RES data can be displayed on the Trace Statistical Result dialog box. See “Trace Statistical Result dialog box” on page 4-37 for displaying the data.

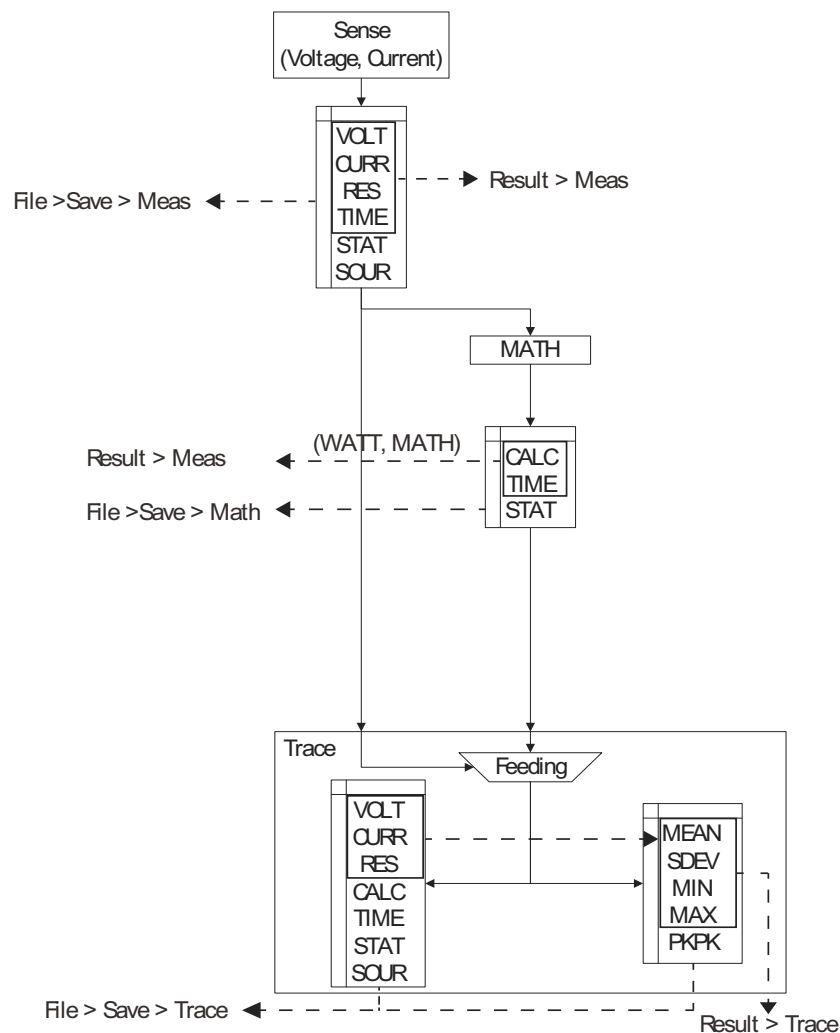
Use an external computer to display the data which cannot be displayed on the B2961A/B2962A screen. The data can be saved in a USB memory connected to the front panel USB-A connector or can be read by using SCPI commands.

NOTE

Do not forget to save or read the data before turning the B2961A/B2962A off. The trace buffer is cleared by turning the instrument off.

Figure 6-6

Data Flow to Trace Buffer for Each Channel



Program Memory

The program memory stores command strings temporarily. The stored program can be executed by using the front panel keys, or automatically when B2961A/B2962A is turned on. See “Program key group” on page 4-39 and “Start-up” on page 4-48. The keys used for controlling the program memory are shown in Table 6-4. This table also shows the status changed by pressing the program control keys.

The program memory can eliminate several processes in the program execution, such as transferring commands, checking command syntax, and converting commands to the internal codes. Thus, using the program memory speeds up program execution. If frequently used command strings are stored in the program memory, interface/computer activity is minimized.

The program memory can be defined by using SCPI commands while B2961A/B2962A is in the remote mode. See Agilent B2961A/B2962A *SCPI Command Reference*.

- Number of programs saved in the memory: 100
- Number of programs used for start-up automatic execution: 1
- Total memory size: 100 KB
- Maximum length for a line: 256 bytes
- Maximum number of characters of program name: 32 with alphabets, numbers, hyphens, and underscores

Table 6-4

Program Control Keys (Function Keys) and Status Changes

| Control key | Present execution status | | |
|-------------|--------------------------|----------------------|----------------------|
| | Running | Paused | Stopped |
| Run | Error | to Running | to Running |
| Pause | to Paused | Paused | Stopped |
| Step | Error | to Running to Paused | to Running to Paused |
| Stop | to Stopped | to Stopped | Stopped |
| Continue | Error | to Running | Error |

Channel Grouping

This section applies only to 2-channel models. This function is used to control the channel output timing automatically so that the channel keeps the output while the other channel performs measurement.

The grouped channels start the source output in the order of channel number, then start the measurement at the same time, and keep the output until the measurement is completed. If delay time and wait time are set, this is adjusted by these values.

If the grouping is released, the channels work independently regardless of the condition of the other channel.

To enable the channel grouping, press the Config > Common > Group > ON function keys.

To disable the channel grouping, press the Config > Common > Group > OFF function keys.

Conditions for the channels to group:

- Trigger source (Trigger value) must be the same.
- If the trigger source is set to TIMER, the trigger period (Period value) of the source output trigger (transient action) must be the same. This is not applicable if the trigger count (Count value) is set to 1.

NOTE

About Wait Time

If wait time is set, channels cannot start measurement or source output change until the wait time elapses. See “Wait Control dialog box” on page 4-30 for setting the wait time.

For the grouped channels, the wait time starts at the timing of the last output change (DC output change or pulse level transition from peak to base) by the last source output channel.

Trigger System

B2961A/B2962A supports the ARM-TRIGGER model described in *1999 SCPI Command Reference*. Operation summary of this trigger model is described below. Also see Figure 6-7.

The trigger system can be initiated by pressing the Trigger key on the front panel.

For the trigger setup parameters, see “Trigger Parameters” on page 4-19 and “Trigger Configuration dialog box” on page 4-34.

1. Moves to the ARM layer if the trigger system was initiated.
2. Waits for the ARM event which is a signal from the ARM trigger source.
3. Moves to the TRIGGER layer if the ARM event was detected and the ARM delay time elapsed.
4. Waits for the TRIGGER event which is a signal from the TRIGGER trigger source.
5. Executes the device action if the TRIGGER event was detected and the TRIGGER delay time elapsed.
6. Repeats 4 and 5 until the TRIGGER count reaches the specified count. And then moves to the ARM layer.
7. Repeats 2 to 6 until the ARM count reaches the specified count. And then moves to the Idle layer.

This trigger model is applied to two device actions, Transient (source output) and Acquire (measurement) independently. Two actions can start simultaneously or separately.

Also for the 2-channel models, two channels can perform synchronous operation or asynchronous operation.

NOTE

Auto key

The Auto key sets the operation of the trigger system to AUTO or off.

In the AUTO status, the channel in the DC output status (On/Off switch is ON) repeats measurement (Acquire device action) under the predefined trigger conditions. The Transient device action is not performed.

For the predefined trigger conditions, see “Auto” on page 4-3.

Trigger Source

B2961A/B2962A supports the following trigger sources. The trigger source must be set to the ARM event and the TRIGGER event individually.

- AUTO (automatic internal, AINT): Trigger source best suited for the present operating mode is automatically selected by the internal algorithms.
- BUS: Remote interface trigger command such as GET, TRIGger, and *TRG
- TIMER (timer, TIMer): Signal internally generated every interval set by the Period field
- INT1 or INT2 (internal): Signal from the internal bus 1 or 2
- EXT1, EXT2, EXT3, EXT4, EXT5, EXT6, EXT7, EXT8, EXT9, EXT10, EXT11, EXT12, EXT13, or EXT14 (external): Signal from the DIO pin n , which is an I/O port of the Digital I/O D-sub connector on the rear panel. $n=1$ to 14
- LAN: LXI trigger

Device Actions

B2961A/B2962A supports the following device actions. Also see Figure 6-8.

- Transient device action (source output)
Source channel starts source output for applying one output value if the TRIGGER event was detected and the Source delay time elapsed.
- Acquire device action (measurement)
Measurement channel starts measurement for obtaining one measurement data if the TRIGGER event was detected and the Measure delay time elapsed.

NOTE

To synchronize the channel operation, for the 2-channel models

If channels are set as shown below, the device actions start simultaneously.

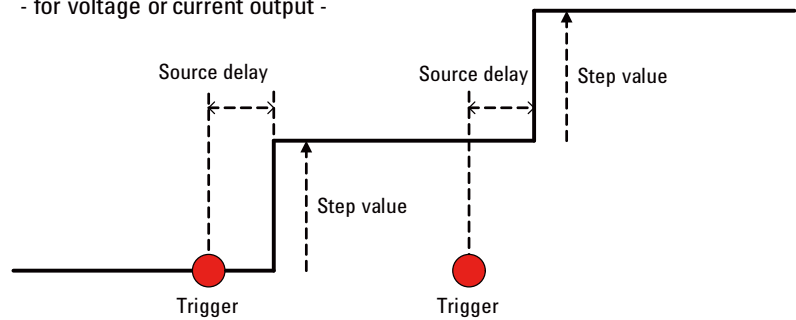
- To synchronize source output:
 - Trigger source is set to the same mode.
 - Delay time is set to the same value.
 - Source output ranging mode is set to the fixed mode.
 - Source wait time control is set to OFF.

- Measurement wait time control is set to OFF.
- To synchronize measurement:
 - Trigger source is set to the same mode.
 - Delay time is set to the same value.
 - Measurement wait time control is set to OFF.

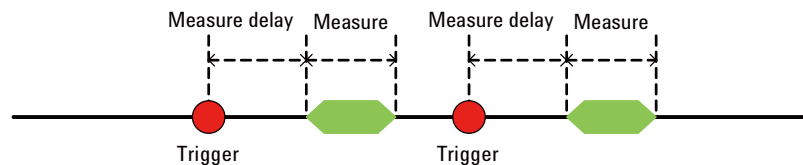
Figure 6-8

Transient and Acquire Device Actions

Transient device action
- for voltage or current output -



Acquire device action
- for voltage or current measurement -



Trigger Output

B2961A/B2962A can output trigger at the timing of *Trigger output* shown in Figure 6-7. The trigger output terminal can be selected from the following terminals.

- Internal bus, INT1, INT2
- LAN port
- Digital I/O pin, EXT1, EXT2, EXT3, EXT4, EXT5, EXT6, EXT7, EXT8, EXT9, EXT10, EXT11, EXT12, EXT13, EXT14

The trigger output can be set by using “Trigger Configuration dialog box” on page 4-34. The trigger output timing and the setup parameters are shown in Table 6-5.

Table 6-5

Trigger Output Timing and Setup Parameters

| Trigger output timing | Layer | Action | Trigger Output | Output Trigger Timing |
|----------------------------------|---------|--|----------------|-----------------------|
| Starting ARM loop | ARM | TRANS. for transient action or ACQ. for acquire action | ON | BEFORE |
| Ending ARM loop | ARM | | ON | AFTER |
| Starting TRIGGER loop | TRIGGER | | ON | BEFORE |
| Ending TRIGGER loop | TRIGGER | | ON | AFTER |
| Starting Transient device action | ACTION | TRANS. | ON | BEFORE |
| Ending Transient device action | ACTION | TRANS. | ON | AFTER |
| Starting Acquire device action | ACTION | ACQ. | ON | BEFORE |
| Ending Acquire device action | ACTION | ACQ. | ON | AFTER |

For using a digital I/O pin, it is necessary to set function of the pin, output trigger polarity, type, pulse width, and the Output Trigger Timing parameter. See “DIO Configuration dialog box” on page 4-43 and “Using Digital I/O” on page 3-33.

NOTE

In addition, the trigger outputs are also available for *Phase marker of sinusoidal wave* and *Trigger points of user defined wave* by using the terminals which are not assigned to the above trigger outputs. For setting these trigger outputs, see “Function Parameters” on page 4-12.

Interlock Function

The interlock function is designed to prevent electrical shock when a user touches the measurement terminals. If the interlock terminal is open, maximum output is limited to ± 42 V.

To perform high voltage measurement greater than ± 42 V, connect the interlock terminal to an interlock circuit of a test fixture or a shielding box. The interlock circuit must have one LED and two mechanical switches that are connected together and placed near the shielding box opening doors. For details on installing the interlock circuit, see “Installing the Interlock Circuit” on page 3-23.

The interlock function works as shown below.

- When the interlock terminal is open, maximum output is limited to ± 42 V.
- When the interlock terminal is shorted, source channel can apply its maximum output value.
- When the interlock terminal is opened in a high voltage condition greater than ± 42 V, the output voltage is immediately set to 0 V and the output switch is set to off.

WARNING

Open the interlock terminal so that the channel cannot apply dangerous voltage when the source/measure terminal is touchable or opened.

Over Temperature Protection

The over temperature protection is effective for preventing damage to a channel from over temperature. If B2961A/B2962A is used in an environment over 30 °C, channel outputs are limited to the value less than the maximum value. If a channel output reaches the limit, all channels automatically and immediately set the output to 0 V and set the output switch to off. And the causal channel is locked automatically.

To unlock the channel, the self-test must be performed. If the self-test does not report any problem, you can use the channel soon. For performing the self-test, see “Self-test” on page 3-9.

The maximum output for the condition over 30 °C is less than the maximum output for the specification condition of 23 °C ± 5 °C. The channel output limit is given by the following formula.

$$DC_{MAX} \leq ([(P_{CS} + 30 - T_{AMB}) - |V_{OAB} \times I_B|] / |V_{OAP} \times I_P|)^2 \times 100$$

The parameters are described below.

- DC_{MAX} : Allowable maximum duty ratio in %, or 0 for DC bias output
- P_{CS} : Maximum power, 64 W
- T_{AMB} : Ambient temperature, in °C
- $V_{OAB} = 250$ V, for $|I_B| \leq 105$ mA
 $V_{OAB} = 39$ V, for $|I_B| > 105$ mA and $|V_B| > 6$ V
 $V_{OAB} = 21$ V, for $|I_B| > 105$ mA and $|V_B| \leq 6$ V
 V_B : Pulse base voltage setting value or DC bias voltage setting value, in V
- I_B : Current at pulse base or DC current, in A
- $V_{OAP} = 250$ V, for $|I_P| \leq 105$ mA
 $V_{OAP} = 39$ V, for $|I_P| > 105$ mA and $|V_P| > 6$ V
 $V_{OAP} = 21$ V, for $|I_P| > 105$ mA and $|V_P| \leq 6$ V
 V_P : Pulse peak voltage setting value, in V
- I_P : Current at pulse peak, in A

Initial Settings

The B2961A/B2962A is initialized by turning the B2961A/B2962A on, the *RST command, or the device clear. Initial settings are shown in this section.

Table 6-6

System Initial Settings

| Setup item | Power on | Reset |
|----------------------------------|-------------------------|-------------|
| GPIO function | Digital In | → |
| GPIO function (D14) | High Voltage | → |
| GPIO polarity | Negative | → |
| GPIO output trigger type | Edge | → |
| GPIO output trigger timing | Both | → |
| GPIO output trigger pulse width | 100 μs | → |
| Zoomed display | OFF | Not changed |
| Display image format | JPG | → |
| User message enable | Disabled | → |
| User message | “” | → |
| Byte order (measurement data) | Normal | → |
| Data format (measurement data) | ASCII | → |
| Data format (GPIO data) | ASCII | → |
| Data format (status register) | ASCII | → |
| Data elements (measurement data) | All (V/I/R/S/T/Stat) | → |
| Data elements (calculate) | CALC | → |
| Automatic timestamp reset | ON | → |
| Mass storage directory | (Root) | → |

Function Details

Initial Settings

| Setup item | Power on | Reset |
|-------------------|----------|-------------|
| Program variables | None | Not changed |
| Program selection | None | → |
| Program status | Idle | → |

Table 6-7

Channel Initial Settings

| Setup item | Power on | Reset |
|--|----------------|-------------|
| Low terminal state | Grounded | Not changed |
| Output state | OFF | → |
| Output auto filter enable | ON | → |
| Output filter enable | ON | → |
| Output filter time constant | 5 μ s | → |
| Output filter frequency | 31.8309886 kHz | → |
| Output OFF state | Normal | → |
| Output protection | OFF | → |
| Programmable output resistance current list | -1E-4,1E-4 | → |
| Programmable output resistance fixed level | 0 Ω | → |
| Programmable output resistance mode | Fixed | → |
| Programmable output resistance state | OFF | → |
| Programmable output resistance voltage list | 0.0,0.0 | → |
| Programmable output resistance (series resistance) | 0 | → |
| Programmable output resistance (shunt resistance) | 2 G Ω | → |
| Programmable output resistance mode list | VOLT | → |
| External output filter state | OFF | Not changed |
| External output filter type | ULNF | Not changed |

| Setup item | Power on | Reset |
|----------------------------------|-------------|-------|
| Source mode | Voltage | → |
| Source shape | DC | → |
| Automatic output-on | ON | → |
| Automatic output-off | OFF | → |
| Voltage source | 0 V | → |
| Voltage protection level | 2 V | → |
| Voltage source auto ranging | ON | → |
| Voltage source range | 2 V | → |
| Voltage source range lower limit | 0.2 V | → |
| Voltage source mode | Fixed | → |
| Voltage sweep points | 1 | → |
| Voltage sweep start | 0 V | → |
| Voltage sweep stop | 0 V | → |
| Voltage list points | 1 | → |
| Voltage list values | 0 V | → |
| Current source | 100 μ A | → |
| Current protection level | 100 μ A | → |
| Current source auto ranging | ON | → |
| Current source range | 100 μ A | → |
| Current source range lower limit | 1 μ A | → |
| Current source mode | Fixed | → |
| Current sweep points | 1 | → |
| Current sweep start | 0 A | → |
| Current sweep stop | 0 A | → |

Function Details
Initial Settings

| Setup item | Power on | Reset |
|---------------------------------------|------------|-------|
| Current list points | 1 | → |
| Current list values | 0 A | → |
| Sweep direction | UP | → |
| Double sweep | OFF | → |
| Sweep ranging | BEST | → |
| Continuous triggered source | ON | → |
| Pulse delay | 0 s | → |
| Pulse width | 50 μ s | → |
| Auto settling time | ON | → |
| Settling time | 0 s | → |
| Measure function | Current | → |
| Auto aperture | ON | → |
| Aperture time | 0.1 PLC | → |
| Resistance measure compensation | OFF | → |
| Remote sensing | OFF | → |
| ARB waveform shape | Square | → |
| ARB waveform count | 1 | → |
| ARB exponential current end level | 0 A | → |
| ARB exponential current start level | 0 A | → |
| ARB exponential current start time | 0 s | → |
| ARB exponential current time constant | 0 s | → |
| ARB exponential current total time | 0 s | → |
| ARB ramp current end level | 0 A | → |
| ARB ramp current end time | 0 s | → |

| Setup item | Power on | Reset |
|--|----------|-------|
| ARB ramp current rise time | 0 s | → |
| ARB ramp current start level | 0 A | → |
| ARB ramp current start time | 0 s | → |
| ARB sinusoidal current amplitude | 0 A | → |
| ARB sinusoidal current frequency | 1 mHz | → |
| ARB sinusoidal current offset | 0 A | → |
| ARB sinusoidal current phase marker output | EXT1 | → |
| ARB sinusoidal current phase marker phase | 0 degree | → |
| ARB sinusoidal current phase marker state | OFF | → |
| ARB square current end time | 0 s | → |
| ARB square current peak level | 0 A | → |
| ARB square current peak time | 0 s | → |
| ARB square current start level | 0 A | → |
| ARB square current start time | 0 s | → |
| ARB trapezoidal current end time | 0 s | → |
| ARB trapezoidal current fall time | 0 s | → |
| ARB trapezoidal current peak level | 0 A | → |
| ARB trapezoidal current peak time | 0 s | → |
| ARB trapezoidal current rise time | 0 s | → |
| ARB trapezoidal current start level | 0 A | → |
| ARB trapezoidal current start time | 0 s | → |
| ARB triangle current end time | 0 s | → |
| ARB triangle current fall time | 0 s | → |
| ARB triangle current peak level | 0 A | → |

Function Details

Initial Settings

| Setup item | Power on | Reset |
|--|----------|-------|
| ARB triangle current rise time | 0 s | → |
| ARB triangle current start level | 0 A | → |
| ARB triangle current start time | 0 s | → |
| ARB user defined current BOS points | 1 | → |
| ARB user defined current BOS signal | EXT1 | → |
| ARB user defined current BOS state | OFF | → |
| ARB user defined current BOS value | OFF | → |
| ARB user defined current level | 0 A | → |
| ARB user defined current points | 1 | → |
| ARB user defined current step time | 0 s | → |
| ARB exponential voltage end level | 0 V | → |
| ARB exponential voltage start level | 0 V | → |
| ARB exponential voltage start time | 0 s | → |
| ARB exponential voltage time constant | 0 s | → |
| ARB exponential voltage total time | 0 s | → |
| ARB ramp voltage end level | 0 V | → |
| ARB ramp voltage end time | 0 s | → |
| ARB ramp voltage rise time | 0 s | → |
| ARB ramp voltage start level | 0 V | → |
| ARB ramp voltage start time | 0 s | → |
| ARB sinusoidal voltage amplitude | 0 V | → |
| ARB sinusoidal voltage frequency | 1 mHz | → |
| ARB sinusoidal voltage offset | 0 V | → |
| ARB sinusoidal voltage phase marker output | EXT1 | → |

| Setup item | Power on | Reset |
|---|----------|-------|
| ARB sinusoidal voltage phase marker phase | 0 degree | → |
| ARB sinusoidal voltage phase marker state | OFF | → |
| ARB square voltage end time | 0 s | → |
| ARB square voltage peak level | 0 V | → |
| ARB square voltage peak time | 0 s | → |
| ARB square voltage start level | 0 V | → |
| ARB square voltage start time | 0 s | → |
| ARB trapezoidal voltage end time | 0 s | → |
| ARB trapezoidal voltage fall time | 0 s | → |
| ARB trapezoidal voltage peak level | 0 V | → |
| ARB trapezoidal voltage peak time | 0 s | → |
| ARB trapezoidal voltage rise time | 0 s | → |
| ARB trapezoidal voltage start level | 0 V | → |
| ARB trapezoidal voltage start time | 0 s | → |
| ARB triangle voltage end time | 0 s | → |
| ARB triangle voltage fall time | 0 s | → |
| ARB triangle voltage peak level | 0 V | → |
| ARB triangle voltage rise time | 0 s | → |
| ARB triangle voltage start level | 0 V | → |
| ARB triangle voltage start time | 0 s | → |
| ARB user defined voltage BOS points | 1 | → |
| ARB user defined voltage BOS signal | EXT1 | → |
| ARB user defined voltage BOS state | OFF | → |
| ARB user defined voltage BOS value | OFF | → |

| Setup item | Power on | Reset |
|------------------------------------|----------|-------|
| ARB user defined voltage level | 0 V | → |
| ARB user defined voltage points | 1 | → |
| ARB user defined voltage step time | 0 s | → |

Table 6-8

Trigger System Initial Settings

| Setup item | Power on | Reset |
|--------------------------------|--------------|-------|
| ARM count | 1 | → |
| ARM source | AINT | → |
| ARM timer | 100 μ s | → |
| ARM delay time | 0 s | → |
| ARM bypass | OFF | → |
| Trigger count | 1 | → |
| Trigger source | AINT | → |
| Trigger timer | 10 μ s | → |
| Trigger delay time | 0 s | → |
| Trigger bypass | OFF | → |
| External trigger output | EXT1 | → |
| External trigger output (LAN) | LAN0-7 (all) | → |
| External trigger output enable | OFF | → |

Table 6-9 LXI Trigger Events Initial Settings

| Setup item | Power on | Reset |
|----------------------------|--|-------|
| Event domain | 0 | → |
| LAN event | “WaitingForAcquireArm1”, “WaitingForTransitionArm1”, “WaitingForAcquireTrigger1”, “WaitingForTransitionTrigger1”, “Measuring1”, “Settling1” “WaitingForAcquireArm2”, “WaitingForTransitionArm2”, “WaitingForAcquireTrigger2”, “WaitingForTransitionTrigger2”, “Measuring2”, “Settling2” | → |
| Delay time | 0 | → |
| Input/output filter string | “ALL:5044” | → |
| Input/output status | OFF | → |
| Input detection | RISE | → |
| Output drive | OFF | → |
| Output slope | Positive | → |
| Output source | “” | → |
| Output timestamp delta | 0 | → |
| Event logging | ON | → |
| Circular event logging | ON | → |
| Event log size | 100 | → |

Table 6-10 Calculate Functions Initial Settings

| Setup item | Power on | Reset |
|-------------------------------|--|-------|
| Math function enable | OFF | → |
| Math function expression | (VOLT*CURREN) | → |
| Math function expression name | “POWER” | → |
| Math function catalog | “POWER”, “OFFCOMPOHM”, “VOLTCOEFF”, “VARALPHA” | → |
| Math function unit name | “W” | → |
| Trace feed source | SENSe | → |
| Trace control | NEVer | → |
| Trace points | 100000 | → |
| Trace statistics format | MEAN | → |
| Trace timestamp format | ABS | → |

Table 6-11 Non-volatile Communication Settings

| Setup item | Factory default setting |
|-----------------------------|-------------------------|
| DHCP | Enabled |
| IP address | 169.254.5.2 |
| Subnet mask | 255.255.0.0 |
| Default gateway | 0.0.0.0 |
| Obtain DNS server from DHCP | Enabled |
| DNS server | 0.0.0.0 |
| WINS server | 0.0.0.0 |

| Setup item | Factory default setting |
|--------------------------------------|---|
| Hostname | A-B29xxA- <i>nnnnnn</i> B29xxA: model number <i>nnnnnn</i> : suffix of serial number. |
| Desired hostname | |
| Desired service name | |
| mDNS | Enabled |
| Use DNS naming service | Enabled |
| Use NetBIOS naming service | Enabled |
| Domain name | Not set |
| GPIB address | 23 |
| LXI identify | Disabled |
| GPIB command interface | Enabled |
| USB command interface | Enabled |
| VXI-11 command interface | Enabled |
| SCPI telnet command interface | Enabled |
| SCPI socket command interface | Enabled |
| SCPI HiSLIP command interface | Enabled |
| Web interface | Enabled |
| Command prompt for a Telnet session | B2900A> |
| Welcome message for a Telnet session | Welcome to Agilent B2900A Series |

Table 6-12
Other Non-volatile Settings

| Setup item | Factory default setting |
|--------------------------------------|--|
| Channel grouping | “1” for 1-ch models “1,2” for 2-ch models |
| Remote display | Enabled |
| Display color set | 1 |
| Beeper | Enabled |
| Graphical web interface (web server) | Enabled |
| Power-on program | Not set |
| Line frequency | 50 Hz |
| Fan control mode | Normal |
| V/I Limit for each polarity | OFF |
| Immediate V/I update by knob | OFF |
| External output filter state | OFF |
| External output filter type | ULNF (ultra low noise filter) |

This information is subject to change without notice.
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