SSG5000X Series

RF Signal Generator

Quick Start

EN01C

SIGLENT®

SIGLENT TECHNOLOGIES CO.,LTD

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Contents

General Safety Summary

Carefully read the following safety precautions to avoid any personal injury or damage to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

Use the Proper Power Cord

Only the power cord designed for the instrument and authorized by local government regulations should be used.

Ground the Instrument

The instrument is grounded through the protective earth conductor of the power cord. To avoid electric shock, please make certain the instrument is grounded correctly before connecting its input or output terminals.

Connect the Signal Cable Correctly

The potential of the signal cable ground is equal to the earth ground. Do not connect the signal wire to a high voltage.

Look Over All Terminal Ratings

To avoid fire or electric shock, please look over all ratings and sign instructions of the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Use Proper Overvoltage Protection

Make sure that no overvoltage (such as that caused by a thunderstorm) can reach the product, or else the operator might be exposed to the danger of electrical shock.

Electrostatic Prevention

Operate in an electrostatic-protected area environment to avoid damages induced by static discharge. Always ground both the internal and external conductors of the cable to release a static charge before connecting.

Maintain Adequate Ventilation

Inadequate ventilation may cause an increase in temperature, which may eventually damage the instrument. Maintain suitable ventilation and inspect the fan and intake regularly.

Avoid Exposed Circuits and Components

Do not touch exposed contacts or components when the instrument's power is on.

Use Only the Specified Fuse

Do Not Operate Without Covers

Do not operate the instrument with covers or panels removed.

Safety Terms and Symbols

Terms used in this product. These terms may appear in the product:

DANGER   Indicates direct injury or hazards that may happen.

WARNING   Indicates potential injury or hazards that may happen.

CAUTION   Indicates potential damage to the instrument or other property that may happen.

Symbols used in this product. These symbols may appear on the product:

Hazardous Voltage	Warning	Protective Earth Ground	Earth Ground	Power Switch

Allgemeine Sicherheitsübersicht

Lesen Sie die folgenden Sicherheitshinweise sorgfältig durch, um Verletzungen oder Schäden am Gerät und an den daran angeschlossenen Produkten zu vermeiden. Um mögliche Gefahren zu vermeiden, verwenden Sie das Gerät bitte wie angegeben.

Verwenden Sie ein geeignetes Netzkabel

Verwenden Sie nur das für das Gerät vorgesehene und im jeweiligen Land zugelassene Netzkabel.

Erden Sie das Gerät

Das Gerät ist über den Schutzleiter der Netzleitung geerdet. Um einen elektrischen Schlag zu vermeiden, vergewissern Sie sich bitte, dass das Gerät korrekt geerdet ist, bevor Sie die Eingangs- oder Ausgangsklemmen des Geräts anschließen.

Schließen Sie das Messkabel richtig an

Die Kabelschirmung (Masse) des Messkabels ist gleich dem Potential der Erde, schließen Sie das Messkabel also nicht an eine hohe Spannung an.

Überprüfen Sie die Nennwerte aller Klemmen

Um Feuer oder einen elektrischen Schlag zu vermeiden, beachten Sie bitte alle Angaben und Hinweise auf dem Gerät. Bevor Sie das Gerät anschließen, lesen Sie bitte das Handbuch sorgfältig durch, um weitere Informationen über die Nennwerte zu erhalten.

Verwenden Sie einen ordnungsgemäßen Überspannungsschutz

Stellen Sie sicher, dass keine Überspannung (z. B. durch ein Gewitter) an das Gerät gelangen kann, da sonst die Gefahr eines elektrischen Schlages besteht.

Schutz vor Elektrostatik

Betreiben Sie das Gerät in einer Umgebung, die vor elektrostatischer Entladung geschützt ist, um Schäden durch statische Entladung zu vermeiden. Erden Sie vor dem Anschließen immer sowohl den Innen- als auch den Außenleiter des Kabels, um statische Aufladung abzubauen.

Für gute Belüftung sorgen

Eine unzureichende Belüftung kann zu einem Temperaturanstieg führen, der schließlich das Gerät beschädigt. Sorgen Sie daher für eine gute Belüftung und überprüfen Sie regelmäßig die Ansaugung und den Lüfter.

Vermeiden Sie freiliegende Schaltkreise oder Komponenten

Berühren Sie keine freiliegenden Kontakte oder Bauteile, wenn das Gerät eingeschaltet ist.

Richtige Sicherung verwenden

Verwenden Sie nur die angegebene Sicherung.

Betreiben Sie das Gerät nicht ohne Abdeckungen

Betreiben Sie das Gerät nicht, wenn Abdeckungen oder Verkleidungen entfernt sind.

Betreiben Sie das Gerät nicht bei vermuteten Defekten

Wenn Sie vermuten, dass das Gerät beschädigt ist, lassen Sie es vor dem weiteren Betrieb von qualifiziertem Servicepersonal überprüfen. Jegliche Wartung, Einstellung oder Austausch, insbesondere von Schaltkreisen oder Zubehör, muss von SIGLENT autorisiertem Personal durchgeführt werden.

Nicht in feuchter Umgebung betreiben

Um einen Kurzschluss im Geräteinneren oder einen elektrischen Schlag zu vermeiden, betreiben Sie das Gerät nicht in feuchter Umgebung.

Betreiben Sie das Gerät nicht in explosionsgefährdeten Umgebungen

Um Schäden am Gerät oder Personenschäden zu vermeiden, ist es wichtig, das Gerät nicht in explosionsgefährdeter Umgebung zu betreiben.

Halten Sie die Produktoberflächen sauber und trocken

Um den Einfluss von Staub und/oder Feuchtigkeit in der Luft zu vermeiden, halten Sie die Oberfläche des Geräts bitte sauber und trocken.

Sicherheit bei der Handhabung

Bitte behandeln Sie das Gerät während des Transports vorsichtig, um Schäden an Tasten, Drehknopfschnittstellen und anderen Teilen auf den Bedienfeldern zu vermeiden.

Es dürfen nur Tastköpfe verwendet werden, die den Spezifikationen des Herstellers entsprechen

Bei Verwendung von 2X/.../10000X-Sondenbaugruppen müssen die Sondenbaugruppen durch eine doppelte oder verstärkte Isolierung von den gemessenen Stromkreisen isoliert sein.

Alle Sondenbaugruppen sollten die Anforderungen von UL 61010-031 und CAN/CSA-C22.2 Nr. 61010-031-07 erfüllen.

Das Gerät darf nicht so positioniert werden, dass es schwierig ist, die Trennvorrichtung (abnehmbarer Stecker) zu bedienen.

Wenn das Gerät auf eine Weise verwendet wird, die nicht vom Hersteller angegeben ist, kann der Schutz, den das Gerät bietet, beeinträchtigt warden.

Sicherheitsbegriffe und Symbole

Begriffe in diesem Handbuch. Diese Begriffe können in diesem Handbuch vorkommen:

WARNUNG

Warnhinweise weisen auf Bedingungen oder Praktiken hin, die zu Verletzungen oder zum Verlust des Lebens führen können.

VORSICHT

Vorsichtshinweise weisen auf Bedingungen oder Praktiken hin, die zu Schäden an diesem Produkt oder anderen Gegenständen führen können.

Begriffe auf dem Produkt. Diese Begriffe können auf dem Produkt erscheinen:

GEFAHR	Weist auf direkte Verletzungen oder Gefahren hin, die auftreten können.
WARNUNG	Weist auf mögliche Verletzungen oder Gefährdungen hin, die auftreten können.
VORSICHT	Weist auf mögliche Schäden am Gerät oder an anderen Gegenständen hin, die eintreten können.

Symbole auf dem Produkt. Diese Symbole können auf dem Produkt erscheinen:

| Hazardous Voltage | Protective Earth Ground | Warning | Terminal Ground | Power Switch |

Wenn Sie solche Symbole auf dem Produkt finden, ziehen Sie das Handbuch zu Rate, um die Art der potenziellen Gefahr und die zu ergreifenden Maßnahmen zu erfahren

General Care and Cleaning

Care:

Do not store or leave the instrument in direct sunshine for extended periods.

To avoid damage to the instrument or probes, please do not expose them to fog, liquid, or solvents.

Cleaning:

Please perform the following steps to clean the instrument and probes.

1. Disconnect the instrument from all power sources and then clean it with a soft damp cloth.
2. Clean the loose dust on the outside of the instrument and probe with a soft cloth.

To avoid damage to the surface of the instrument and probe, please do not use any corrosive liquid or chemical cleansers.

Make sure that the instrument is completely dry before restarting it to avoid potential short circuits or personal injury.

General Inspection

- **Inspect the shipping container**

Keep the original shipping container and cushioning material until the contents of the shipment have been completely checked and the instrument has passed both electrical and mechanical tests.

The consigner or carrier will be responsible for damages to the instrument resulting from shipment.

SIGLENT will not provide free maintenance or replacement if the instrument has been damaged in shipment.
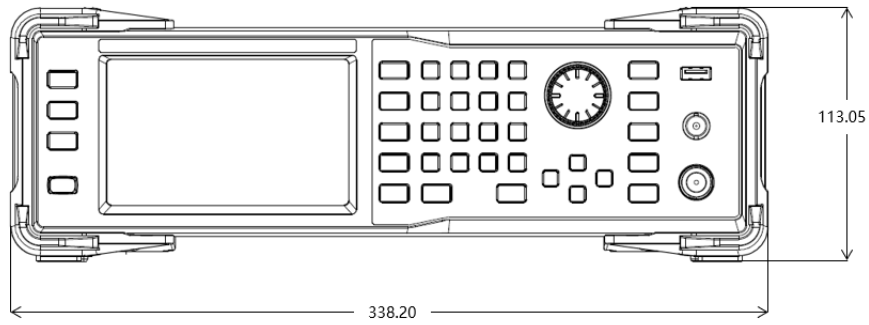
- **Inspect the instrument**

If there are instruments found damaged, defective, or have failed any electrical and / or mechanical tests, please contact SIGLENT.
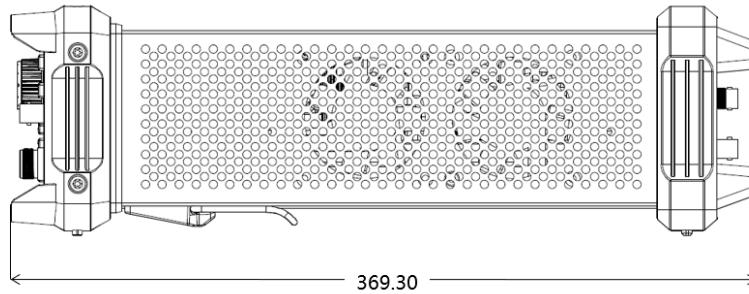
- **Check the accessories**

Please check the accessories according to the packing list. If the accessories are incomplete or damaged, please contact your SIGLENT sales representative.
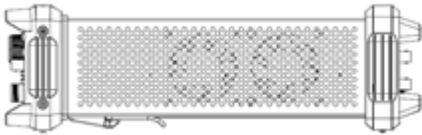
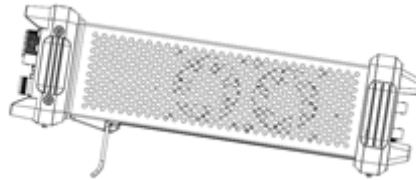# Mechanical Dimensions

Front View

Side View

Preparation Before Use

⎍ Adjust the supporting feet

Adjust the supporting feet appropriately and use it as a bracket to tilt the front of the RF signal generator upwards to stabilize the generator for better operation and observation of the display.
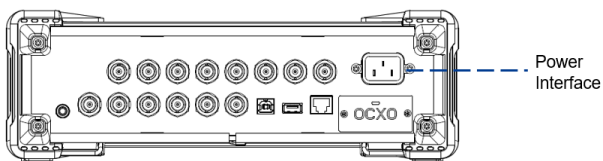

Before adjusting   After adjusting
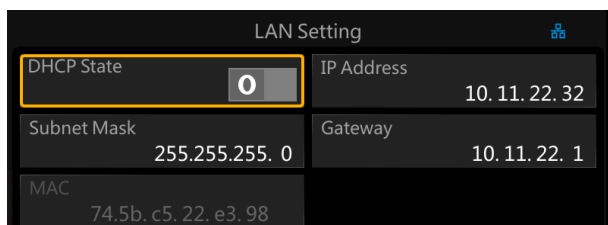
⎍ Connect to AC power supply

The RF signal generator accepts 100-240 V, 50/60 Hz or 100-120 V, 400 Hz AC power supply. Please use the power cord provided in the accessory to connect the instrument to the power interface as shown below.

Power Interface

⎍ Connect to a LAN
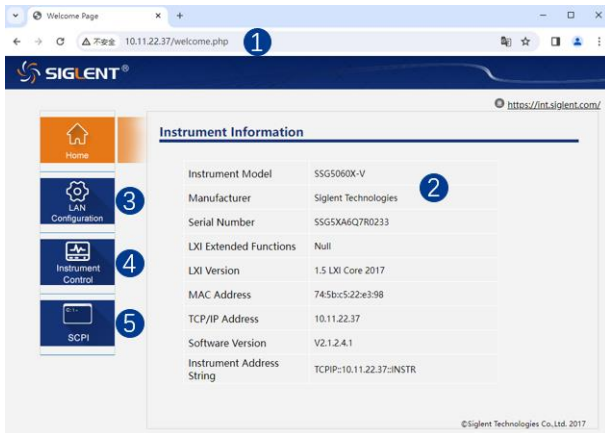
Connect the LAN port to the LAN using a network cable.

Click | UTILITY | > | Interface | > | LAN Setting | to set the LAN. The LAN configuration dialog box is shown below.

LAN Setting	
DHCP State O	IP Address 10. 11. 22. 32
Subnet Mask 255.255.255. 0	Gateway 10. 11. 22. 1
MAC 74.5b. c5. 22. e3. 98	

After Connecting to the LAN successfully, the instrument can be remotely controlled by WebServer or by sending SCPI commands via NI-VISA, Telnet, or Socket.
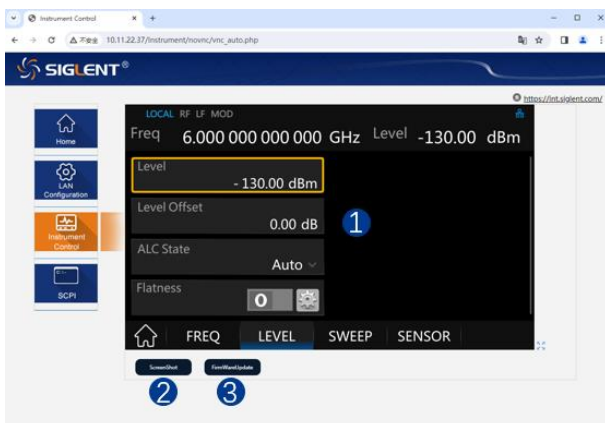
⏚ Use WebServer

A built-in web server provides an approach to interact with the signal generator by a web browser. It doesn't require any additional software to be installed on the computer. Set the IP address of the generator in the browser address bar, and then the user can browse and control the generator on the web.
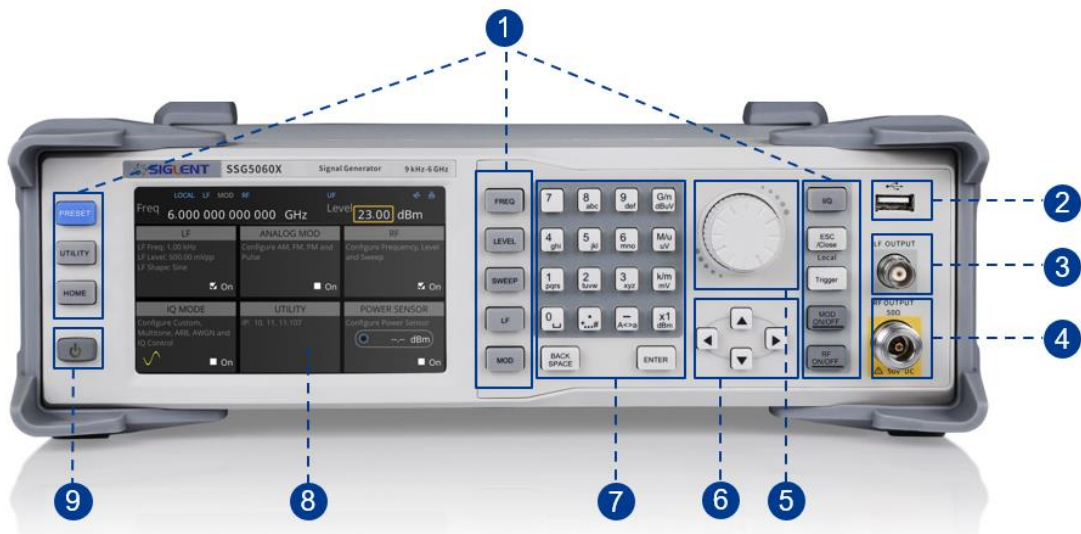

1. Input the IP address of the instrument

2. Instrument information

3. LAN configuration

4. Click here to recall the instrument control interface

5. Click here to send SCPI

Below is the instrument control interface over WebServer:

1. Display and control area of the instrument. The display in this area is a copy of the instrument display. Using the mouse to operate in the area is equivalent to directly operating on the display of the instrument

2. Click here to perform a screenshot

3. Click here to perform a firmware upgrade

Front Panel Introduction

1.	Function keys	6.	Direction key
2.	USB Host	7.	Digital keyboard
3.	LF output	8.	Touch screen display area
4.	RF output	9.	Power button
5.	Knob		

⎍ Function keys

Control Keys	Description
FREQ	Set frequency, frequency offset, phase offset and other related parameters
LEVEL	Set level, level offset, ALC state, flatness and other related parameters
SWEEP	Set sweep state, step sweep, list sweep, sweep direction and other related parameters
LF	Set LF state, LF level, LF frequency and other related parameters
MOD	Set analog modulation parameters (AM, FM, PM and PULSE)
I/Q	Set IQ related parameters

ESC /Close	During the parameter editing process, pressing this key will clear the input of the active function area and exit the parameter input state Press this key to return to local control if previously controlling the instrument remotely
Trigger	When the trigger type is set to Key, press this button to perform one operation
MOD ON/OFF	The main switch of various modulation modes
RF ON/OFF	RF signal output switch
PRESET	Press this button to revert to the default parameters. The default parameters refer to the default parameter table
UTILITY	System and file related operations
HOME	You can get back to the main interface quickly

⚡ Direction knob and keys

1. Direction knob

Rotate left and right to increase or decrease the value of the active parameter, or adjust the focus position in non-parametric input state. Pressing it down is equal to "Enter".

2. Direction keys

In the non-parametric input state, press the up, down, left and right direction keys to move the focus frame in sequence.

Press the knob in the parameter input area, the cursor will focus to a certain position, then press the left and right direction keys to change the position of the cursor, and use the up and down keys to fine tune the value of the cursor position.

⚡ Digital keyboard

The front panel of the RF signal source provides a numeric keypad, as shown below. The keyboard supports English uppercase and lowercase characters, numbers and common symbols (including decimal point, space, negative sign and ! , @, #, $, %, ^, &, *), mainly for editing the name of files or folders and setting parameters (refer to the "parameter setting" section).

Control Keys	Description
0 ␣	Digit 0 and space bar switch
· *...#	In the English state, enter the special symbol !, @, #, $, %, ^, &, *. In the digital state, enter the decimal point
— A<>a	In the digital state, enter the "-" sign. In the English state input for case switching
G/n dBμV	When setting the amplitude, press this key to set the unit as dBuV. When setting the frequency, press this key to set the unit as GHz. If the input is a time-related parameter, press this key to set the unit as ns
M/u μV	When setting the amplitude, press this key to set the unit as uV. When setting the frequency, press this key to set the unit as MHz. If the input is a time-related parameter, press this key to set the unit as us
K/m mV	When setting the amplitude, press this key to set the unit as MV. When setting the frequency, press this key to set the unit as kHz. If the input is a time-related parameter, press this key to set the unit as ms
x1 dBm	When setting the amplitude, press this key to set the unit as dBm. When setting the frequency, the unit selected will be Hz. If the input is time, the unit will be set to s
BACK SPACE	During the parameter editing process, pressing this key will delete the character to the left of the cursor
ENTER	In the parameter input process, pressing this key will end the parameter input and add the currently set unit for the parameter

〰️ Front panel key backlight

1. Power switch ⏻

Orange light constantly on indicates the instrument is in stand-by state.

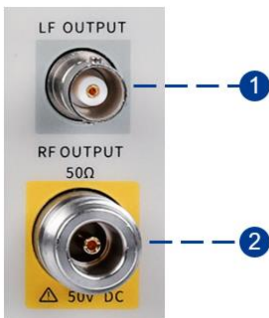Green light constantly on indicates the instrument is in power on state.

2. | MOD |
    | ON/OFF |

When the MOD ON/OFF is set to turn on the modulation, the backlight will illuminate. If modulation is off, the backlight will be dark.

3. | RF |
    | ON/OFF |

When the RF signal is turned on, the backlight is on. If the RF signal output is turned off, the backlight will be dark.
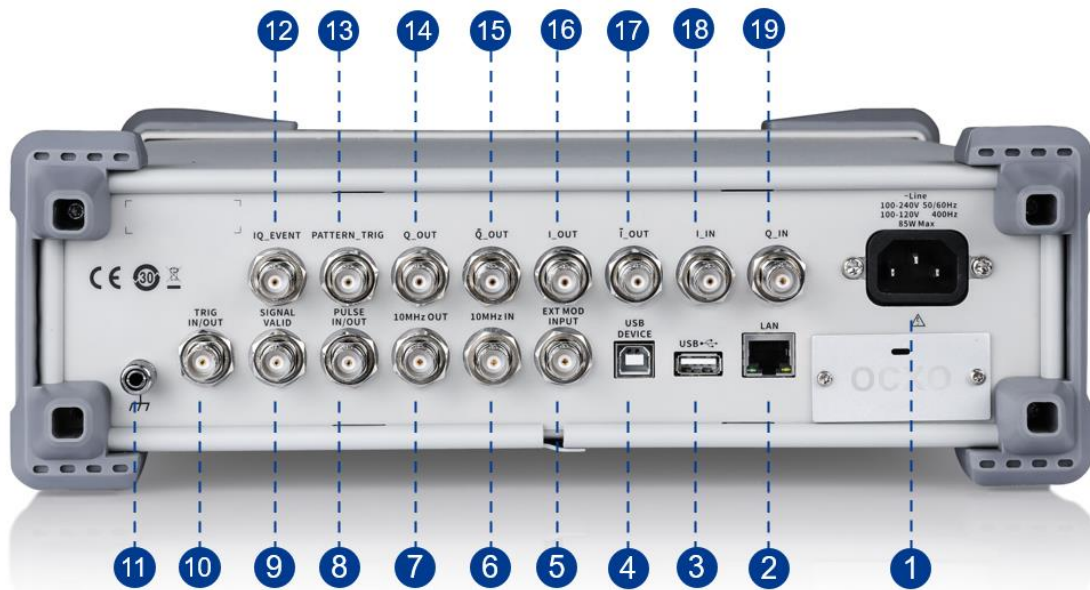
〰️ Front panel connectors

1. LF OUTPUT

    Output the LF (low frequency) signal. The output can also be configured to source the modulation waveform for FM and PM modulation types.

    Type: female BNC.

    Impedance: 50 Ω.

2. RF OUTPUT

    Output the RF signal.

    Type: female N.

    Impedance: 50 Ω.

⚠️	**CAUTION** Damage Levels: 50 Vdc; +30 dBm maximum RF power at frequency greater than 1 MHz.

Rear Panel Introduction

1. AC power input terminal

The RF signal source can operate with AC power from 100-240 V, 50/60 Hz or 100-120 V, 400 Hz. Please connect the RF signal source to the AC power supply with the supplied power cord.

2. LAN interface

The RF signal source can be connected to a network through the interface and remotely controlled.

3. USB host

The RF signal source can be used as the "main device" to connect to an external USB device, like a USB RF power meter. The interface reads the data or state file in the U disk, or stores the current instrument state or data in the U disk.

4. USB device interface

The interface can be connected to a compatible computer and controlled by software on the host computer.

5. EXT MOD INPUT

Input BNC connection for external modulation.

6. REF IN

The [REF IN] and [10MHZ OUT] connectors are commonly used to establish synchronization between multiple instruments.

The RF source can use the internal reference source or an external reference source.

If the instrument detects that there is a valid 10MHz signal at the [REF IN] connector, it will use it as an

external reference source. At this point the user interface status bar shows "Ext Ref". When an external reference is lost, exceeded, or disconnected, the instrument automatically switches to the internal reference, and the screen status bar will no longer display "Ext Ref".

7. 10 MHz OUT

The [10MHz OUT] and [REF IN] connectors are commonly used to establish synchronization between multiple instruments.

The RF source can use the internal or an external reference source.

If the instrument uses the internal reference source, the [10MHz OUT] connector can output a 10 MHz clock signal generated by the instrument and can be used to synchronize other devices.

8. PULSE IN/OUT

The function of the connector is determined by the current mode of pulse modulation.

PULSE IN: When the pulse source is "Ext", it is used to input external pulse signals.

PULSE OUT: When the Pulse modulation source is "Int" and the pulse output switch is turned on, it is used to output the pulse signal generated by the internal generator. The output signal is related to "Pulse Mode", and can be set to "Single", "Double" or "Train".

9. SIGNAL VALID

When the RF output frequency or amplitude is modified, the RF output connector of the front panel outputs the RF signal at the specified frequency and amplitude after a certain response and processing time in the internal circuit of the instrument. In this process, the [SIGNAL VALID] connector outputs an impulse synchronization signal to indicate the validity of the RF output signal:

High level (3.3 V): Indicates that the RF signal is being configured.

Low level (0 V): Indicates that the RF signal is stable (effective).

10. TRIG IN/OUT

When PULSE trigger source is "Int ", the connector can be used to output the trigger signal.

When the RF Sweep, LF Sweep, or PULSE trigger source is "Ext", the connector is used to input the external trigger signal.

11. Ground

The system ground terminal.

12. IQ_EVENT

Output on this connector occurs whenever Marker is on in an Arb–based waveform.

Marker level $\approx$ 3.3 V (positive polarity selected),

Marker level = 0 V (negative polarity selected).

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13. PATTERN_TRIG

When the IQ Arb trigger source is "Ext", the connector is used to input the external trigger signal.

14. Q_OUT

Output the analog, in–phase component of I/Q modulation from the internal baseband generator when the internal IQ modulation mode is on.

15. $\overline{Q\_OUT}$

Used in conjunction with the Q_OUT connector to provide a balanced baseband stimulus.

16. I_OUT

Output the analog, quadrature–phase component of I/Q modulation from the internal baseband generator when the internal IQ modulation mode is on.

17. $\overline{I\_OUT}$

Used in conjunction with the I_OUT connector to provide a balanced baseband stimulus.
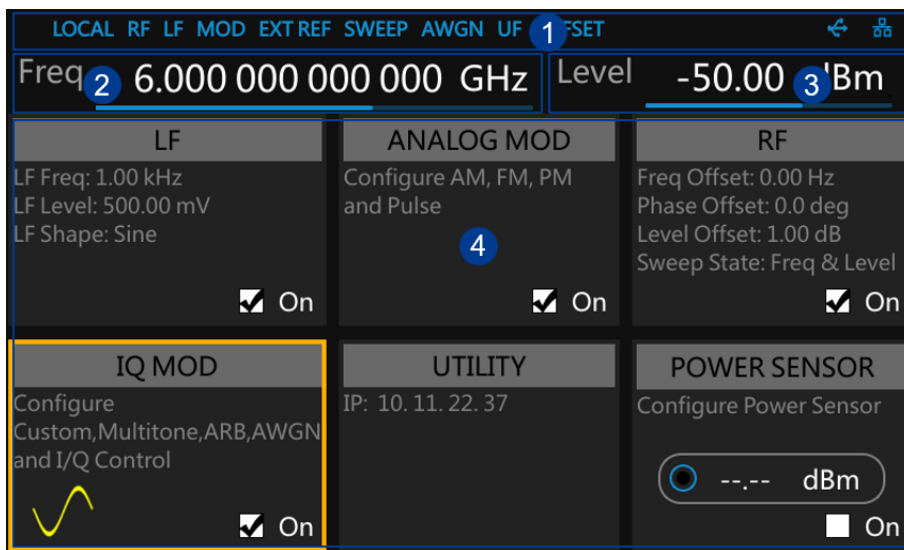
18. I INPUT

Used to input an external modulated I baseband signal when the external IQ modulation mode is on.

19. Q INPUT

Used to input an external modulated Q baseband signal when the external IQ modulation mode is on.

Note: Only models equipped with the IQ modulation function have IQ modulation-related connectors on the rear panel.

User Interface

1. Prompt status bar
2. RF frequency
3. RF level
4. Touch screen display area: Display the settings under each menu

Prompt status bar

- Display LOCAL (local), or REMOTE (remote). When REMOTE is displayed, the instrument is being controlled by a remote computer and the front panel input will be locked. To unlock the front panel (enter LOCAL mode), press ESC /Close or send "SYSTem:REMote 0" to quit.
- RF: The RF output state.
- LF: Low frequency signal generator state.
- MOD: The modulation state.
- EXT REF: EXT REF shows that the SSG is using an external 10 MHz reference.
- SWEEP: The status of the sweep state.
- AWGN: The status of the Additive White Gaussian Noise (AWGN) to a carrier when IQ Modulation.
- UF: Amplitude flatness function enabled.
- OFFSET: Amplitude offset enabled.
- The identification is displayed when a USB disk is inserted.
- LAN: LAN state. Indicates that LAN is successfully connected. Indicates that there is no network connection or network connection failed.

〰 RF frequency

RF output frequency setting. When the sweep type is "Freq" or "Freq & Level", the frequency sweeping progress bar is displayed.

〰 RF level

RF output level setting. When the sweep type is "Level" or "Freq & Level", level sweeping progress bar is displayed.

〰 Touch screen display area: Display the settings under each menu

- LF: LF output state, LF waveform and LF sweep related parameters can be set. Sine, Square, Sawtooth, Triangle and DC can be set up.
- ANALOG MOD: Analog Modulation state. Amplitude modulation, frequency modulation, phase modulation, or pulse can be set.
- RF: RF output state. Frequency, level or RF sweep can be set.
- IQ MOD: I/Q output state. IQ modulation can be set.
- UTILITY: System and file related parameters can be set.
- POWER SENSOR: Power sensor state and power sensor related parameters can be set.

Firmware Operations

⏦ Check System Information

Press | UTILITY | > | System Info | to view the instrument's system information, including:

- Model
- Host ID
- Serial Number
- Software Version
- Uboot-OS Version
- Hardware Version
- Startup Times

⏦ Load Option

1. Press | UTILITY | > | Option | to enter option interface. Click the drop-down box under the Install group box to choose the license type need to be installed. Enter a license in the input box and click | Install | to finish the license installing.

2. If the installations succeed, the prompt message "license was successfully installed" will be pop-up. If not, the prompt message "license was entered incorrectly" will be pop-up.

Note: The SSG comes with trial options that have a finite number of uses. It allows users to evaluate the options without purchasing them. You can find the remaining number of trials at the top of the option interface. When the remaining time of a certain function is zero, the function will be disabled. When a license is successfully installed for a certain function, the remaining times will be shown as "--" and the type of the license will be permanent, which means users have unrestricted access to the function.

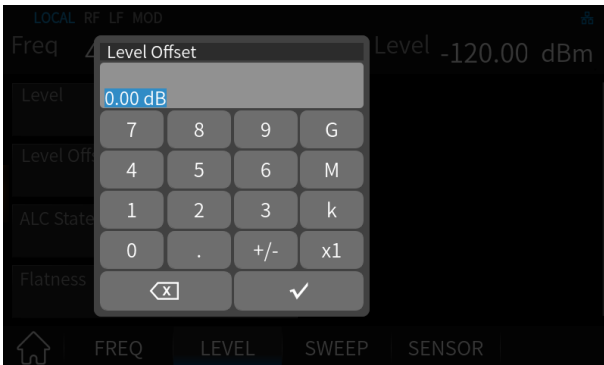| Option Name	License Type	Remaining Times
SSG5000X_F60	Permanent	--
SSG5000XV_B150	Permanent	--
SSG5000X-PT	Temporary	0
SSG5000XV-IOT	Temporary	30
10M_OCXO_L	Permanent	--
SigIQPro-OFDM	Temporary	30
SigIQPro-BT	Temporary	30
SigIQPro-IOT	Temporary	30

⏚ Firmware Upgrade

Follow this procedure to update the instrument firmware:

1. Download the firmware package from an official SIGLENT website

    www.siglentamerica.com

    http://www.siglent.com/ens

    https://www.siglenteu.com

2. Extract and copy the .ADS file into the root directory of a USB disk.

3. Press ⸢UTILITY⸣ > ⸢Update⸣ , and select the update file.

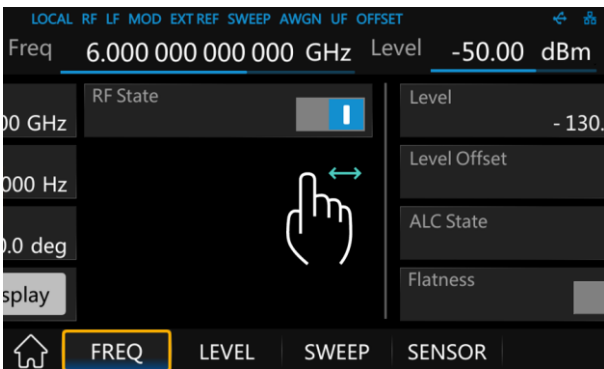4. Click ⸢Recall⸣ to update the system software.

The progress bar will appear on the screen while updating. The instrument will restart automatically if updates succeed or display a pop-up prompt box if updates fail.
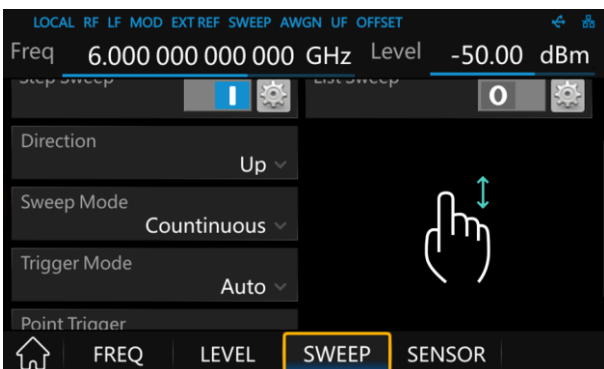
Touch Operation

The RF signal source provides a 5-inch capacitive touch screen to support various gesture operations, including:

Click on the screen parameters or menu to pop up a virtual keyboard where you can edit the parameters.
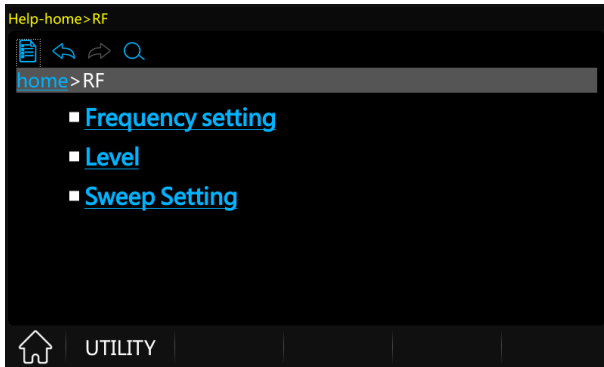

Left or right slide switches menus.

Up or down slides the display menu.

Help Information

The built-in help system provides help information for each function and menu option on the front panel.

1. Press UTILITY button and select Help . The center of the screen will pop up to help.

2. Click to enter the corresponding directory.

Remote Control

The generator supports communication with compatible computers via USB, LAN or GPIB-USB interface. By using these interfaces, in combination with programming languages and/or NI-VISA software, users can remotely control the signal generator. More information can be found in the SSG5000X Programming Guide available on the SIGLENT website.

More Information

You can obtain the instrument information and installation status of all options through UTILITY menu.

For more information of this product, please refer to the following manuals (you can also download them from the SIGLENT web site):

- **SSG5000X user manual:**

Provides detailed introductions of the functions of this instrument.

- **SSG5000X data sheet**：

Provides the main characteristics and specifications of this instrument.

- **SSG5000X programming manual**：

Provides detailed introductions of the SCPI commands and programming of this instrument.

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