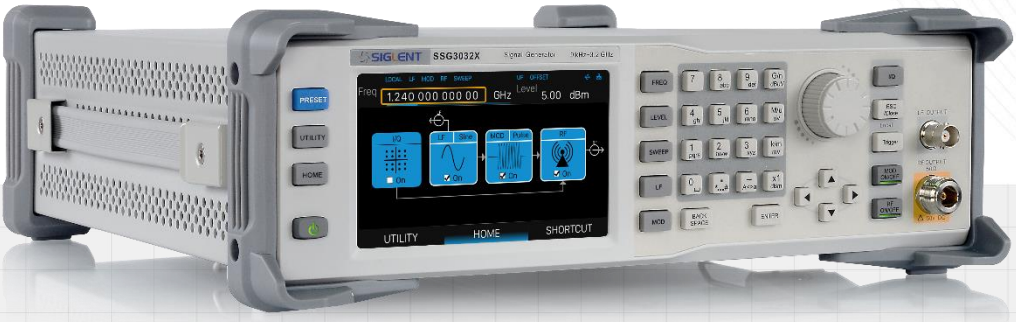
SSG3000X Series

RF Signal Generator

User Manual

EN01B



SIGLENT TECHNOLOGIES CO.,LTD

Contents

1 Introduction

The **SIGLENT** SSG3000X series is a benchtop RF signal source, with an output frequency range of 9 kHz to 3.2 GHz. They provide normal analog modulations such as AM, FM and PM. They also provide pulse modulation and pulse train generators. In addition, when used with a baseband generator such as SDG6000X, they can generate IQ modulated signals. With its high accuracy and pure output, the SSG3000X series is the right choice for R&D, education and manufacturing.

The series includes the following models:

Model	Frequency Range	
	CW MODE	IQ MODE
SSG3021X	9 kHz – 2.1 GHz	None
SSG3032X	9 kHz – 3.2 GHz	None
SSG3021X-IQE	9 kHz – 2.1 GHz	10 MHz – 2.1 GHz
SSG3032X-IQE	9 kHz – 3.2 GHz	10 MHz – 3.2 GHz

Features and Benefits:

- Frequency ranges from 9 kHz to 2.1 GHz/3.2 GHz
- 0.01 Hz frequency resolution
- Level output from -110 dBm to +20 dBm
- 0.01 dB level resolution
- Level accuracy ≤ 0.7 dB(typ.)
- Phase noise < -110 dBc/Hz @1 GHz, offset 20 kHz(typ.)
- Standard AM, FM and PM analog modulation with internal, external and Int+Ext source
- Pulse modulation, on/off ratio ≥ 0.7 dB (typ.)
- Pulse train generator(option)
- External IQ modulation with SDG6000X as the Baseband IQ signal
- USB power meter measurement
- Web remote control is supported, which is convenient for users to control devices remotely
- Equipped with a 5-inch (800x480) display and capacitive touch screen for easy and convenient operation
- Rich communication interfaces. Standard USB-Host, USB Device (USB-TMC), LAN (VXI-11, Socket, Telnet), optional GPIB

2 Important Safety Information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

2.1 General Safety Summary

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

To Avoid Fire or Personal Injury.

Use Proper Power Line.

Only use a local/state approved power cord for connecting the instrument to mains power sources.

Ground the Instrument.

The instrument grounds through the protective terra conductor of the power line. To avoid electric shock, the ground conductor must be connected to the earth. Make sure the instrument is grounded correctly before connect its input or output terminals.

Connect the Signal Wire Correctly.

The potential of the signal wire is equal to the earth, so do not connect the signal wire to a high voltage. Do not touch the exposed contacts or components.

Look over All Terminals' Ratings.

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

Equipment Maintenance and Service.

When the equipment fails, please do not dismantle the machine for maintenance. The equipment contains capacitors, power supply, transformers, and other energy storage devices, which may cause high voltage damage. The internal devices of the equipment are sensitive to static electricity, and direct contact is easy to cause irreparable damage to the equipment. It is necessary to return to the factory or the company's designated maintenance organization for maintenance. Be sure to pull out the power supply when repairing the equipment. Live line operation is strictly prohibited. The equipment can only be powered on when the maintenance is completed and the maintenance is confirmed to be successful.

Not Operate with Suspected Failures.

If you suspect that there is damage to the instrument, please let qualified service personnel check it.

Avoid Circuit or Wire Exposed Components Exposed.

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

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep the surface of the instrument clean and dry.

The responsible body or operator should refer to the instruction manual to preserve the protection afforded by the equipment. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.

Any parts of the device and its accessories are not allowed to be changed or replaced, other than authorized by the manufacturer or agent.

2.2 Safety Terms and Symbols

When the following symbols or terms appear on the front or rear panel of the instrument or in this manual, they indicate special care in terms of safety.

	This symbol is used where caution is required. Refer to the accompanying information or documents to protect against personal injury or damage to the instrument.
	This symbol warns of a potential risk of shock hazard.
	This symbol is used to denote the measurement ground connection.
	This symbol is used to denote a safety ground connection.
	This symbol shows that the switch is an On/Standby switch. When it is pressed, the instrument's state switches between Operation and Standby. This switch does not disconnect the instrument's power supply. To completely power off the instrument, the power cord must be unplugged from the AC socket after the instrument is in the standby state.
CAUTION	The "CAUTION" symbol indicates a potential hazard. It calls attention to a procedure, practice, or condition which may be dangerous if not followed. Do not proceed until its conditions are fully understood and met.
WARNING	The "WARNING" symbol indicates a potential hazard. It calls attention to a procedure, practice, or condition which, if not followed, could cause bodily injury or death. If a WARNING is indicated, do not proceed until the safety conditions are fully understood and met.

2.3 Working Environment

Environment

The instrument is used indoors and should be operated in a clean and dry environment with an ambient temperature range.

NOTE: Direct sunlight, electric heaters, and other heat sources should be considered when evaluating the ambient temperature.

	**WARNING:** Do not operate the instrument in explosive, dusty, or humid environments.

Ambient Temperature

Operating: 0 ℃ to +50 ℃

Non-operation: -20 ℃ to +70 ℃

NOTE: Direct sunlight, radiators, and other heat sources should be taken into account when assessing the ambient temperature.

Humidity

0 ℃ to 30 ℃, ≤ 95 %RH

30 ℃ to 50 ℃, ≤ 75 %RH

Mains supply voltage fluctuations

Please refer to “Power and Grounding Requirements”.

Altitude

Operating: ≤ 3,000 m

Installation (overvoltage) Category

This product is powered by mains conforming to installation (overvoltage) Category II.

NOTE: Installation (overvoltage) category I refers to situations where equipment measurement terminals are connected to the source circuit. In these terminals, precautions are done to limit the transient voltage to a correspondingly low level.
Installation (overvoltage) category II refers to the local power distribution level which applies to equipment connected to the AC line (AC power).

Degree of Pollution

The product may be operated in environments of Pollution Degree II.
NOTE: Degree of Pollution II refers to a working environment that is dry and non-conductive pollution occurs. Occasional temporary conductivity caused by condensation is expected.

IP Rating

IP20 (as defined in IEC 60529).

2.4 Cooling Requirements

This instrument relies on the forced air cooling with internal fans and ventilation openings. Care must be taken to avoid restricting the airflow around the apertures (fan holes) at each side of the instrument. To ensure adequate ventilation it is required to leave a 15 cm (6 inch) minimum gap around the sides

of the instrument.

	**CAUTION:** Do not block the ventilation holes located on both sides of the instrument.

	**CAUTION:** Do not allow any foreign matter to enter the instrument through the ventilation holes, etc.

2.5 Power and Grounding Requirements

The instrument operates on single-phase 100 to 240 Vrms (+/-10%) AC power at 50/60 Hz (+/-5%), or single-phase 100 to 120 Vrms (+/-10%) AC power at 400 Hz (+/-5%).

No manual voltage selection is required because the instrument automatically adapts to line voltage.

Depending on the type and number of options and accessories, the instrument can consume up to 50 W of power.

NOTE: The instrument automatically adapts to the AC line input within the following ranges:

Voltage Range:	90 - 264 Vrms	90 - 132 Vrms
Frequency Range:	47 - 63 Hz	380 - 420 Hz

The instrument includes a grounded cord set containing a molded three-terminal polarized plug and a standard IEC320 (Type C13) connector for making line voltage and safety ground connection. The AC inlet ground terminal is connected directly to the frame of the instrument. For adequate protection against electrical shock hazards, the power cord plug must be inserted into a mating AC outlet containing a safety ground contact. Use only the power cord specified for this instrument and certified for the country of use.

	**WARNING:** Electrical Shock Hazard! Any interruption of the protective conductor inside or outside of the instrument, or disconnection of the safety ground terminal creates a hazardous situation. Intentional interruption is prohibited.

The position of the instrument should allow easy access to the socket. To make the instrument

completely power off, unplug the instrument power cord from the AC socket.

The power cord should be unplugged from the AC outlet if the instrument is not to be used for an extended period.

	**CAUTION:** The outer shells of the front panel terminals (LF OUTPUT, RF OUTPUT) are connected to the instrument's chassis and therefore to the safety ground.

2.6 Cleaning

Clean only the exterior of the instrument, using a damp, soft cloth. Do not use chemicals or abrasive elements. Under no circumstances allow moisture to penetrate the instrument. To avoid electrical shock, unplug the power cord from the AC outlet before cleaning.

	**WARNING:** Electrical Shock Hazard! No operator serviceable parts inside. Do not remove covers. Refer servicing to qualified personnel

2.7 Abnormal Conditions

Do not operate the instrument if there is any visible sign of damage or has been subjected to severe transport stresses.

If you suspect the instrument's protection has been impaired, disconnect the power cord and secure the instrument against any unintended operation.

Proper use of the instrument depends on careful reading of all instructions and labels.

	**WARNING**: Any use of the instrument in a manner not specified by the manufacturer may impair the instrument's safety protection. This instrument should not be directly connected to human subjects or used for patient monitoring.

Informations essentielles sur la sécurité

Ce manuel contient des informations et des avertissements que les utilisateurs doivent suivre pour assurer la sécurité des opérations et maintenir les produits en sécurité.

Exigence de Sécurité

Lisez attentivement les précautions de sécurité ci - après afin d 'éviter les dommages corporels et de prévenir les dommages aux instruments et aux produits associés. Pour éviter les risques potentiels, utilisez les instruments prescrits.

Éviter l 'incendie ou les lésions corporelles.

Utilisez un cordon d'alimentation approprié.

N'utilisez que des cordons d'alimentation spécifiques aux instruments approuvés par les autorités locales.

Mettez l'instrument au sol.

L'instrument est mis à la Terre par un conducteur de mise à la terre de protection du cordon d'alimentation. Pour éviter un choc électrique, le conducteur de mise à la terre doit être mis à la terre. Assurez - vous que l'instrument est correctement mis à la terre avant de connecter les bornes d'entrée ou de sortie de l'instrument.

Connectez correctement le fil de signalisation.

Le potentiel de la ligne de signal est égal au potentiel au sol, donc ne connectez pas la ligne de signal à haute tension. Ne touchez pas les contacts ou les composants exposés.

Voir les cotes de tous les terminaux.

Pour éviter un incendie ou un choc électrique, vérifiez toutes les cotes et signez les instructions de l'instrument. Avant de brancher l'instrument, lisez attentivement ce manuel pour obtenir de plus amples renseignements sur les cotes.

Entretien du matériel.

En cas de défaillance de l'équipement, ne pas démonter et entretenir l'équipement sans autorisation. L'équipement contient des condensateurs, de l'alimentation électrique, des transformateurs et d'autres dispositifs de stockage d'énergie, ce qui peut causer des blessures à haute tension. Les dispositifs internes de l'équipement sont sensibles à l'électricité statique. Le contact direct peut facilement causer des blessures irrécupérables à l'équipement. L'équipement doit être retourné à l'usine ou à l'organisme de maintenance désigné par l'entreprise pour l'entretien. L'alimentation

électrique doit être retirée pendant l'entretienLa ligne ne doit pas être mise sous tension tant que l'entretien de l'équipement n'est pas terminé et que l'entretien n'est pas confirmé.

Ne pas fonctionner en cas de suspicion de défaillance.
Si vous soupçonnez des dommages à l'instrument, demandez à un technicien qualifié de vérifier.

L 'exposition du circuit ou de l' élément d 'exposition du fil est évitée.
Lorsque l 'alimentation est connectée, aucun contact ou élément nu n' est mis en contact.

Ne pas fonctionner dans des conditions humides / humides.

Pas dans un environnement explosif.

Maintenez la surface de l 'instrument propre et sec.

L'organisme ou l'opérateur responsable doit se référer au cahier des charges pour protéger la protection offerte par le matériel.La protection offerte par le matériel peut être compromise si celui - ci est utilisé de manière non spécifiée par le fabricant.

Aucune pièce du matériel et de ses annexes ne peut être remplacée ou remplacée sans l'autorisation de son fabricant.

Termes et symboles de sécurité

Lorsque les symboles ou termes suivants apparaissent sur le panneau avant ou arrière de l'instrument ou dans ce manuel, ils indiquent un soin particulier en termes de sécurité.

	Ce symbole est utilisé lorsque la prudence est requise. Reportez-vous aux informations ou documents joints afin de vous protéger contre les blessures ou les dommages à l'instrument.
	Ce symbole avertit d'un risque potentiel de choc électrique.
	Ce symbole est utilisé pour désigner la connexion de terre de mesure.
	Ce symbole est utilisé pour indiquer une connexion à la terre de sécurité.
	Ce symbole indique que l'interrupteur est un interrupteur marche / veille. Lorsqu'il est enfoncé, l'état de l'instruments bascule entre Fonctionnement et Veille. Ce commutateur ne déconnecte pas l'alimentation de l'appareil. Pour éteindre complètement l'instruments, le cordon d'alimentation doit être débranché de la prise secteur une fois l'instruments en état de veille.

CAUTION	Le symbole " CAUTION" indique un danger potentiel. Il attire l'attention sur une procédure, une pratique ou une condition qui peut être dangereuse si elle n'est pas suivie. Ne continuez pas tant que ses conditions n'ont pas été entièrement comprises et remplies.
WARNING	Le symbole " WARNING" indique un danger potentiel. Il attire l'attention sur une procédure, une pratique ou une condition qui, si elle n'est pas suivie, pourrait entraîner des blessures corporelles ou la mort. Si un AVERTISSEMENT est indiqué, ne continuez pas tant que les conditions de sécurité ne sont pas entièrement comprises et remplies.

Environnement de travail

Environnement

L'instrument doit être utilisé à l'intérieur dans un environnement propre et sec dans la plage de température ambiante.

NOTE: la lumière directe du soleil, les réchauffeurs électriques et d'autres sources de chaleur doivent être pris en considération lors de l'évaluation de la température ambiante.

	**ATTENTION:** ne pas utiliser l'instrument dans l'air explosif, poussiéreux ou humide.

Température ambiante

En fonctionnement: 0 ℃ à +50 ℃

Hors fonctionnement: -20 ℃ à +70 ℃

NOTE: pour évaluer la température de l'environnement, il convient de tenir compte des rayonnements solaires directs, des radiateurs thermiques et d'autres sources de chaleur.

Humidité

0 ℃ à 30 ℃, ≤ 95 % HR

30 ℃ à 50 ℃, ≤ 75 % HR

Fluctuation de la tension d'alimentation

Vérifiez s'il vous plaît "Connexions d'alimentation et de terre".

Altitude

Fonctionnement: ≤ 3000 m

Catégorie d 'installation (surtension)

Ce produit est alimenté par une alimentation électrique conforme à l 'installation (surtension) Catégorie II.

Installation (overvoltage) Category Definitions Définition de catégorie d 'installation (surtension)

La catégorie II d'installation (surtension) est un niveau de signal applicable aux terminaux de mesure d' équipement reliés au circuit source.Dans ces bornes, des mesures préventives sont prises pour limiter la tension transitoire à un niveau inférieur correspondant.

La catégorie II d'installation (surtension) désigne le niveau local de distribution d 'énergie d' un équipement conçu pour accéder à un circuit alternatif (alimentation alternative).

Degré de pollution

Un instruments peut être utilisé dans un environnement Pollution Degree II.

NOTE: Pollution Degree II signifie que le milieu de travail est sec et qu'il y a une pollution non conductrice.Parfois, la condensation produit une conductivité temporaire.

IP Rating

IP20 (as defined in IEC 60529).

Exigences de refroidissement

Cet instrument repose sur un refroidissement à air forcé avec des ventilateurs internes et des ouvertures de ventilation. Des précautions doivent être prises pour éviter de restreindre le flux d'air autour des ouvertures (trous de ventilateur) des deux côtés de la source de signal. Pour assurer une ventilation adéquate, il est nécessaire de laisser un espace minimum de 15 cm (6 pouces) sur les côtés de l'instrument.

	**ATTENTION:** Ne bloquez pas les trous de ventilation de chaque côté de la source de signal.

	**ATTENTION:** Ne laissez pas d'objets étrangers pénétrer dans la source de signal par les trous de ventilation, etc.

Connexions d'alimentation et de terre

L'instrument fonctionne avec une alimentation CA monophasée de 100 à 240 Vrms (+/- 10%) à 50/60 Hz (+/- 5%), ou monophasée 100 - 120 Vrms (+/-10 %) Alimentation CA à 400 Hz (+/-5%).

Aucune sélection manuelle de la tension n'est requise car l'instrument s'adapte automatiquement à la tension de ligne.

Selon le type et le nombre d'options et d'accessoires, l'instrument peut consommer jusqu'à 50 W d'énergie.

Remarque: l'instrument s'adapte automatiquement à l'entrée de ligne CA dans les plages suivantes:

Plage de tension:	90 - 264 Vrms	90 - 132 Vrms
Gamme de fréquences:	47 - 63 Hz	380 - 420 Hz

L'instrument comprend un jeu de cordons mis à la terre contenant une fiche polarisée à trois bornes moulée et un connecteur standard IEC320 (Type C13) pour établir la tension de ligne et la connexion de mise à la terre de sécurité. La borne de mise à la terre de l'entrée CA est directement connectée au châssis de l'instrument. Pour une protection adéquate contre les risques d'électrocution, la fiche du cordon d'alimentation doit être insérée dans une prise secteur correspondante contenant un contact de sécurité avec la terre. Utilisez uniquement le cordon d'alimentation spécifié pour cet instrument et certifié pour le pays d'utilisation.

	**Avertissement:** risque de choc électrique! Toute interruption du conducteur de terre de protection à l'intérieur ou à l'extérieur de la portée ou la déconnexion de la borne de terre de sécurité crée une situation dangereuse. L'interruption intentionnelle est interdite.

La position de l'instruments doit permettre un accès facile à la prise. Pour éteindre complètement l'instruments, débranchez le cordon d'alimentation de l'instrument de la prise secteur.

Si la source n'est pas utilisée pendant une période prolongée, débranchez le cordon d'alimentation de la prise secteur.

	**ATTENTION:** les enveloppes extérieures des bornes du panneau avant (LF OUTPUT, RF OUTPUT) sont connectées au châssis de l'instrument et donc à la terre de sécurité.

Nettoyage

Nettoyez uniquement l'extérieur de l'instrument à l'aide d'un chiffon doux et humide. N'utilisez pas de produits chimiques ou d'éléments abrasifs. Ne laissez en aucun cas l'humidité pénétrer dans l'instrument. Pour éviter les chocs électriques, débranchez le cordon d'alimentation de la prise secteur avant de le nettoyer.

	**Avertissement:** risque de choc électrique! Aucune pièce réparable par l'opérateur à l'intérieur. Ne retirez pas les capots. Confiez l'entretien à un personnel qualifié.

Conditions anormales

Utilisez l'instrument uniquement aux fins spécifiées par le fabricant.
N'utilisez pas l'instrument s'il présente des signes évidents de dommages ou s'il a été soumis à de fortes contraintes de transport.

Si vous pensez que la protection de l'instruments a été altérée, débranchez le cordon d'alimentation et sécurisez l'instrument contre toute opération involontaire.

Une bonne utilisation de l'instrument nécessite la lecture et la compréhension de toutes les instructions et étiquettes.

	**Avertissement:** Toute utilisation de l'instruments d'une manière non spécifiée par le fabricant peut compromettre la protection de sécurité de l'instrument. Cet instrument ne doit pas être directement connecté à des sujets humains ni utilisé pour la surveillance des patients.

3 First Steps

3.1 Delivery Checklist

First, verify that all items listed on the packing list have been delivered. If you note any omissions or damage, please contact your nearest **SIGLENT** customer service center or distributor as soon as possible. If you fail to contact us immediately in case of omission or damage, we will not be responsible for replacement.

3.2 Quality Assurance

The signal generator has a 3-year warranty from the date of shipment, during normal use and operation. **SIGLENT** can repair or replace any product that is returned to the authorized service center during the warranty period. We must first examine the product to make sure that the defect is caused by the process or material, not by abuse, negligence, accident, abnormal conditions, or operation.

SIGLENT shall not be responsible for any defect, damage, or failure caused by any of the following:

a) Attempted repairs or installations by personnel other than **SIGLENT**.

b) Connection to incompatible devices/incorrect connection.

c) For any damage or malfunction caused by the use of non-**SIGLENT** supplies. Furthermore, **SIGLENT** shall not be obligated to service a product that has been modified. Spare, replacement parts and repairs have a 90-day warranty.

The instrument's firmware has been thoroughly tested and is presumed to be functional. Nevertheless, it is supplied without a warranty of any kind covering detailed performance. Products not made by **SIGLENT** are covered solely by the warranty of the original equipment manufacturer.

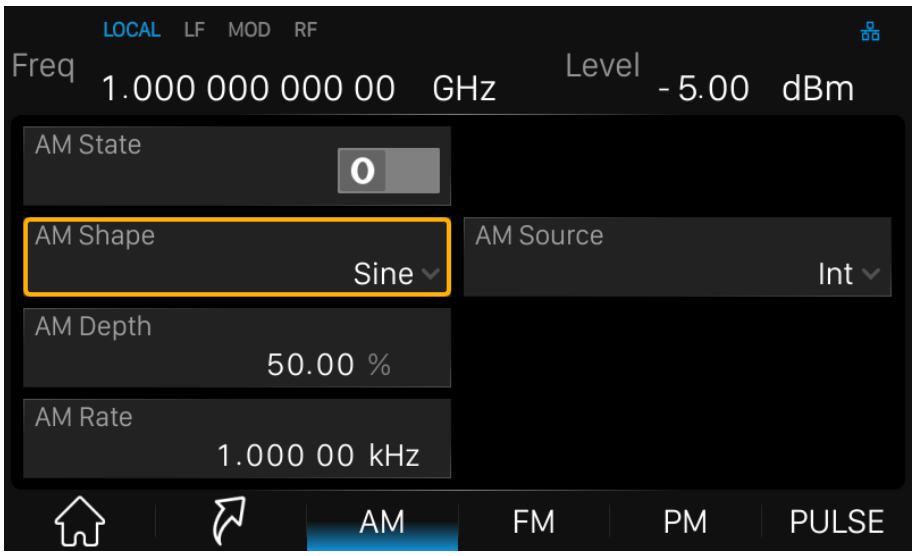
3.3 Maintenance Agreement

We provide various services based on maintenance agreements. We offer extended warranties as well as installation, training, enhancement and on-site maintenance, and other services through specialized supplementary support agreements. For details, please consult your local **SIGLENT** customer service center or distributor.

4 Document Conventions

For convenience of description, this article makes the following conventions:

- Text surrounded by a box border is used to represent the front panel buttons. For example, FREQ represents the "FREQ" button on the front panel.
- Italicized text with shading is used to represent the touchable or clickable menu/button/region on the touch screen. For example, *AM Shape* represents the "AM Shape" setting items on the screen:



- Bold Text with square brackets is used to represent connectors, such as **[RF OUTPUT 50Ω]** indicating the RF output connector on the front panel.
- For the operations that contain multiple steps, the description is in the form of "Step 1 > Step 2 >...". As an example, follow each step in the sequence to enter the upgrade interface:

  UTILITY > *System* > *Update*

  Press the UTILITY button on the front panel as step 1, choose the *System* group on the screen as step 2, and click the *Update* option on the screen as step 3 to enter the upgrade interface.

5 Getting Started

5.1 Power On

The RF signal source provides two power-on methods, namely:

Power On Line

When the "Power On Line" function is enabled, the RF signal source only needs to be connected to the AC power supply through the power cord to power on.

The steps to set the "Power On Line" enable are:

UTILITY > *System* > *Setting* > *Power On Line*

Power On Manually

When the "Power On Line" function is not enabled, after the RF signal source is connected to the AC power supply through the power cord, you need to manually press the power button to turn on the signal source.

5.2 Shut Down

Press the power button for two seconds to turn off the signal source. Or follow the steps below:

UTILITY > *System* > *Shutdown*

NOTE: After pressing the power off button, the RF signal source is still in standby mode. If you no longer want the RF signal source to consume power, completely power down the instrument by unplugging the instrument power cord from the AC outlet.

5.3 System Information

Follow the steps below to examine the software and hardware versions of the signal source.

UTILITY > *System* > *System Info*

See the section "System Info" for details.

5.4 Install Options

A license is necessary to unlock a software option. See the section "Option" for details.

6 Quick Start

6.1 Front Panel Introduction

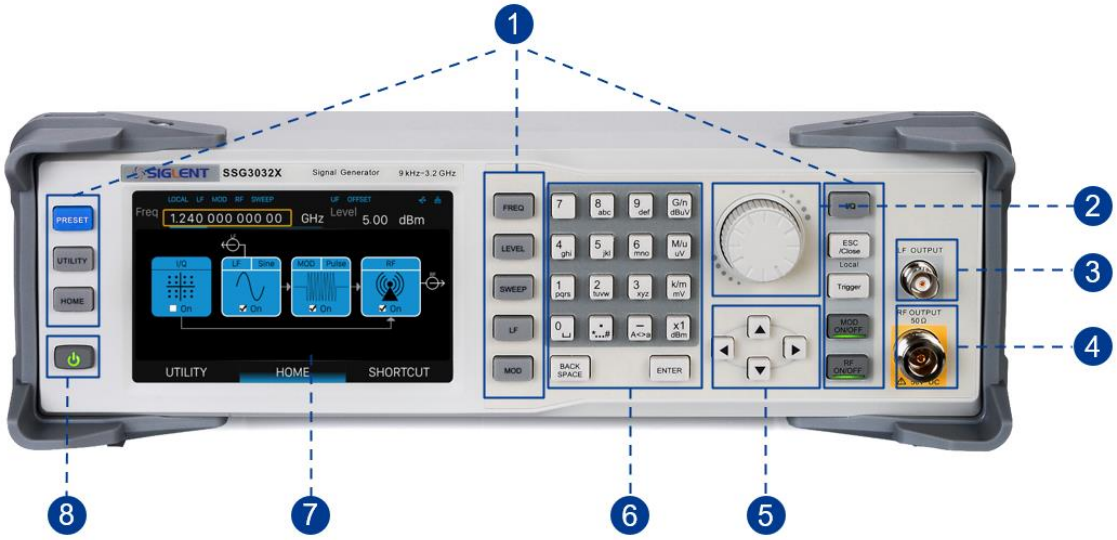


Figure 6-1 the Front Panel

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

6.1.1 Function Keys

Table 6-1 Function keys description

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

6.1.2 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.

6.1.3 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 Settings" section).

Figure 6-2 Digital keyboard

Table 6-2 Digital keys description

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

6.1.4 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.

6.1.5 Connectors

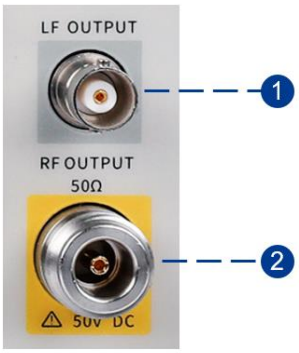


Figure 6-3 Front Panel Connectors

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.

6.2 Rear Panel Introduction

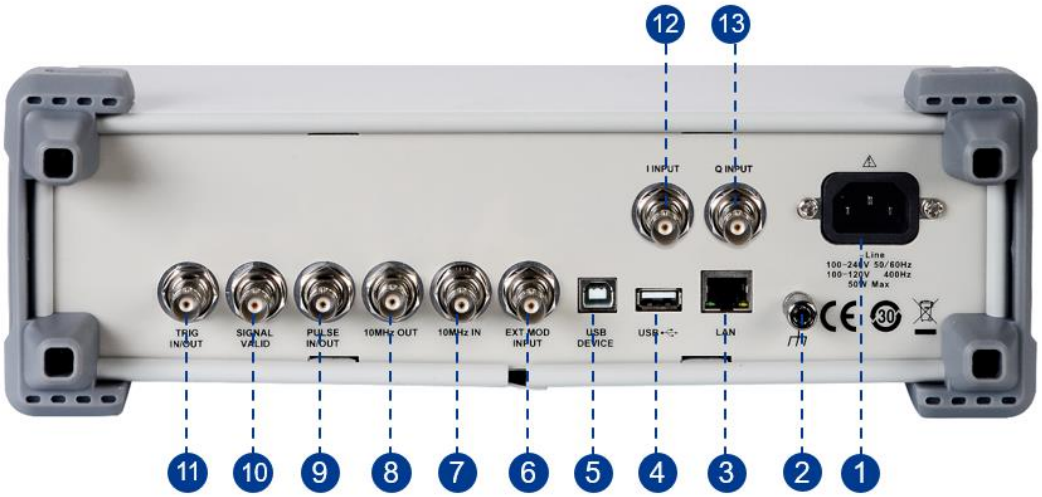


Figure 6-4 the Rear Panel

1. AC power input terminal

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

2. Ground

The system ground terminal.

3. LAN interface

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

4. 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.

5. USB device interface

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

6. EXT MOD INPUT

Input BNC connection for external modulation.

7. 10MHZ IN

The [10MHZ 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 [10MHZ 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".

8. 10MHz OUT

The [10MHz OUT] and [10MHZ 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.

9. 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".

10. 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).

11. 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.

12. I INPUT

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

13. Q INPUT

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

Note: In the SSG3000X series, only the SSG3021X-IQE and SSG3032X-IQE models have the **[I INPUT]** and **[Q INPUT]** connectors.

6.3 User Interface

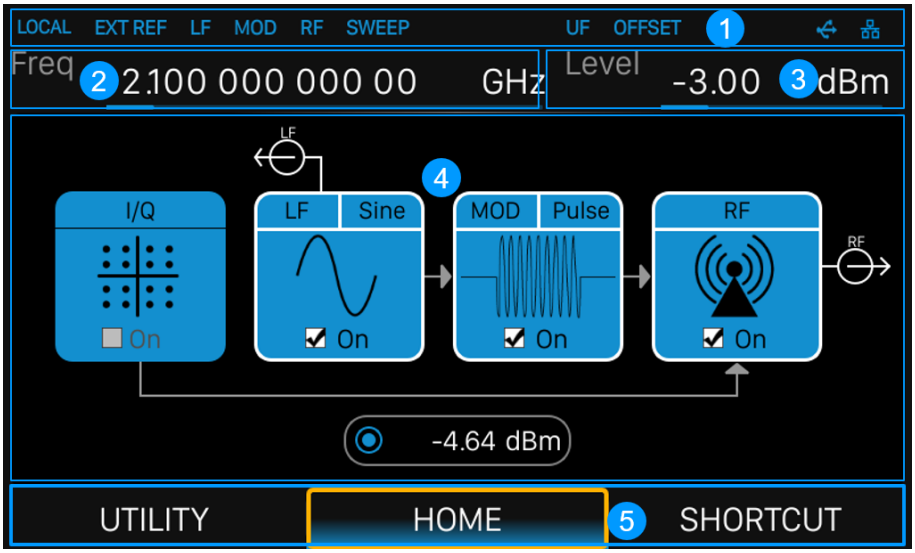


Figure 6-5 the User Interface

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

6.3.1 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 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 RF sweep state.
- UF: Level flatness function enabled.
- OFFSET: Level 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.

6.3.2 RF Frequency

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

6.3.3 RF Level

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

6.3.4 Touch Screen Display Area

Touch screen display area displays the settings under each menu.

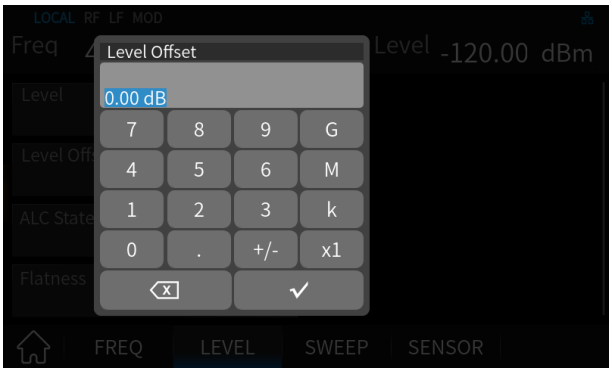
- I/Q: I/Q output state.
- LF: LF output state, LF waveform and LF sweep related parameters can be set. Sine, Square, Sawtooth, Triangle and DC can be set up.
- MOD: Analog modulation state, amplitude modulation, frequency modulation, phase modulation, or pulse can be set.
- RF: RF output state, frequency, level or sweep can be set.
- Power sensor: Display the current reading of the power sensor after accessing the power sensor.

6.3.5 Menu

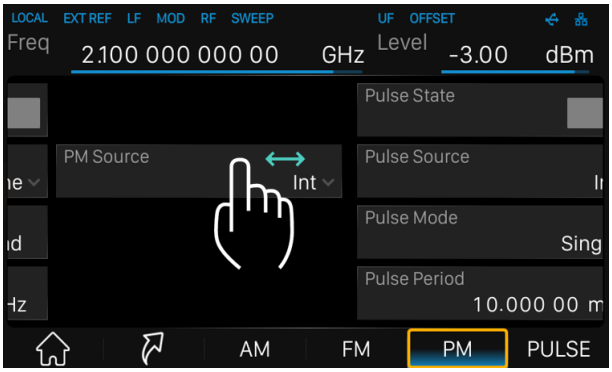
Click the menu to enter the relevant function.

6.4 Touch Operation

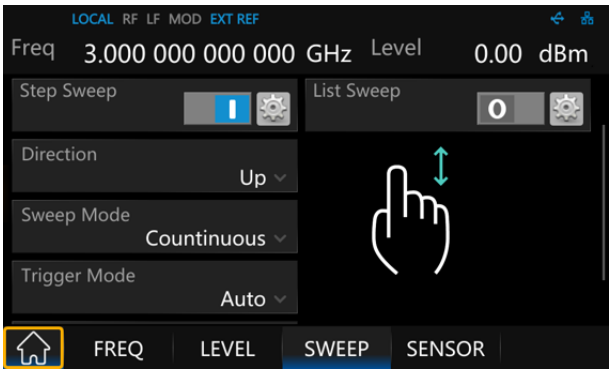
The RF signal source provides a 5-inch capacitive touch screen to support various gesture operations, including:



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.

6.5 Parameter Settings

The parameter settings of the RF signal source include numerical input, drop-down box input and switch settings.

6.5.1 Numerical Input

Numerical input can be done through keys and numeric keyboard, keys and knob/direction keys, or touch screen. The following takes setting the frequency offset to 100 MHz as an example to introduce three numerical input methods.

1. Use keys and numeric keypad
   1) Press the FREQ button on the front panel to enter the frequency parameter setting area.
   2) Rotate the knob or press the direction keys to focus on the *Frequency Offset* parameter in the parameter setting area.
   3) Use the front panel numeric keypad to enter the value "100",
   4) Press the M/u uV button to set the unit to MHz.

2. Using the buttons and knob/directional keys
   1) Press the FREQ button on the front panel to enter the frequency parameter setting area.
   2) Rotate the knob or press the direction keys to focus on the *Frequency Offset* parameter in the parameter setting area.
   3) Press the ENTER button or knob to enter the editing state of the parameters.
   4) Adjust the left and right direction keys to select the number of parameter digits to be adjusted.
   5) Rotate the knob or press the up and down direction keys to change the parameter value until the desired parameter value is obtained.
   6) Press the ENTER button or knob to confirm the parameter value.

3. Use the touch screen
   1) Starting from the main interface, click *RF* Module > *Frequency* > *Frequency Offset*. A virtual keyboard for setting parameters will pop up.
   2) Enter 100 on the virtual keyboard, and then select the unit MHz.

6.5.2 Drop-Down Box Input

The input in the drop-down box can be entered through buttons, knobs/direction keys, or touch screen. The following takes setting the ALC status value as an example to introduce two drop-down box input methods.

1. Using the buttons and knob/directional keys

1) Press the LEVEL button on the front panel to enter the amplitude parameter setting area.
2) Rotate the knob or press the direction keys to focus on the *ALC State* parameter in the parameter setting area.
3) Press the ENTER button or knob to open the drop-down box,
4) Rotate the knob or press the direction keys to select the drop-down box option.
5) Press the ENTER button or knob to confirm the option.

2. Use the touch screen
   1) Starting from the main interface, click *RF* Module > *LEVEL* > *ALC State*, and the drop-down box will open.
   2) Click the option in the drop-down box.

6.5.3 Switch Settings

The switch status can be set through buttons and knobs/direction keys, or the touch screen. When the switch button is on the right and is blue, it is on. When the switch button is on the left and gray, it means off.

The following takes setting the flatness switch as an example to introduce two switch setting methods.

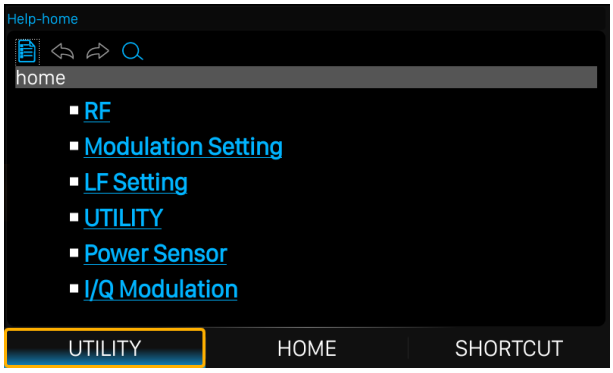
1. Using the buttons and knob/directional keys
   1) Press the LEVEL button on the front panel to enter the level parameter setting area.
   2) Rotate the knob or press the direction keys to focus on the Flatness switch  in the parameter setting area.
   3) Press the ENTER button or knob to switch the switch state.

2. Use the touch screen
   1) Starting from the main interface, click *RF* Module > *LEVEL* > *Flatness*  ,
   2) Click the switch to toggle the switch state.

6.6 Help Information

The RF signal source has a built-in help system that provides help information for each function and menu.

1. Press the UTILITY key and select *Help* to enter help information page.
2. Click to enter the corresponding directory to view.

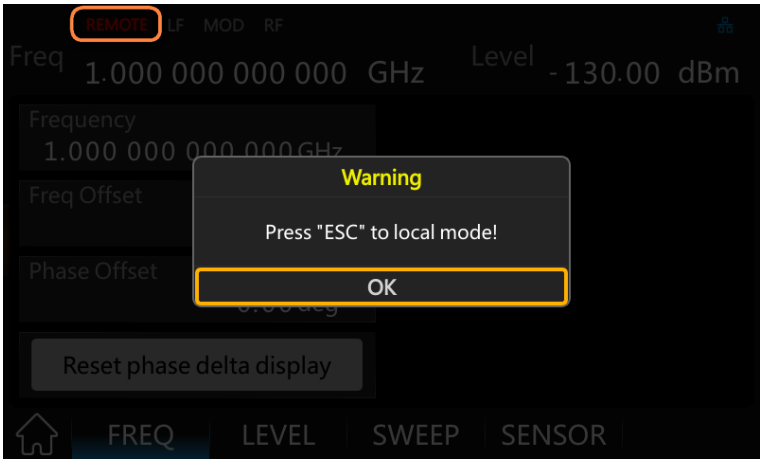


7 Application Examples

7.1 REMOTE and LOCAL Mode

When the signal generator is controlled by a remote computer, the instrument will be in REMOTE mode and the front panel input will be locked.

As shown below, the “REMOTE” icon appears in the status bar, and if you touch the screen or press any key in the font panel, a warning box will appear.



To unlock the front panel, that is, to enter LOCAL mode, press the front panel button ESC/Close. After exiting the REMOTE mode, the “LOCAL” icon will appear in the status bar.

7.2 Output RF Signal

The following takes the output of a radio frequency signal with a frequency of 1 GHz and an amplitude of 0 dBm from the **[RF OUTPUT 50Ω]** connector as an example.

1. Restore factory settings
   1) Press the UTILITY button or click *UTILITY* > *Setting* > *Preset Type* on the touch screen to set the reset type to default;
   2) Press the PRESET button or click *UTILITY* > *Preset* on the touch screen to perform the reset operation.

2. Set the frequency
   Press the FREQ button and use the numeric keyboard to enter 1 GHz, or click the frequency input box on the touch screen to pop up the virtual keyboard and enter 1 GHz on the virtual keyboard.

3. Set the amplitude

Press the LEVEL button and use the numeric keyboard to enter 0 dBm, or click the level input box on the touch screen to pop up the virtual keyboard and enter 0 dBm on the virtual keyboard.

4. Turn on RF output

   Press the RF ON/OFF button to turn on the RF output, or press HOME > *RF* module > *On* to turn on the RF output. After turning on the RF output, the RF ON/OFF button light turns on, and the "RF" icon in the status bar turns blue.

At this time, the **[RF OUTPUT 50Ω]** connector outputs a radio frequency signal with a frequency of 1 GHz and an amplitude of 0 dBm.

7.3 Correcting 10MHz Reference

Using a high-accuracy frequency meter, the RF signal source can correct the accuracy of the 10 MHz reference signal through the reference correction function. The 10 MHz reference signal is generated by the TCXO of the RF signal source and is output from the **[10MHz OUT]** connector. Connect the **[10MHz OUT]** connector to the frequency counter and adjust the reference oscillator codeword until the accuracy of the 10 MHz reference signal reaches the target value.

1. Restore factory settings
   1) Press the UTILITY button or click *UTILITY* > *Setting* > *Preset Type* on the touch screen to set the reset type to default;
   2) Press the PRESET button or click *UTILITY* > *Preset* on the touch screen to perform the reset operation.

2. Set the reference oscillator code
   1) Press UTILITY or click *UTILITY* > *Setting* > *10M Adjustment* >  on the touch screen to enter the " Ref Osc setting " page.
   2) Turn on the *10M Adjustment* switch. At this time, the TCXO will use the value in the *Ref Osc Code* as the TCXO code. If the reference calibration switch is off, the TCXO will use the default code.
   3) Click *Ref Osc Code* to pop up the virtual keyboard and set the code.

3. Correcting 10MHz reference

   The frequency of the TCXO output signal can be modified by the code word. According to the frequency measured by the frequency meter, increase or decrease the reference oscillator codeword, and repeat the operation until the 10MHz reference signal output by the TCXO meets the accuracy requirements.

7.4 Use the Flatness Function to Correct Line Loss

In conjunction with a power meter, RF signal sources can use the flatness function to correct for line loss.

Connect the **[RF OUTPUT 50Ω]** connector of the RF signal source to the cable under test, and connect the end of the cable to the power meter. Plug the power meter into the USB port of the RF signal source and wait for the power meter connection to complete.

1. Restore factory settings
   1) Press the UTILITY button or click *UTILITY* > *Setting* > *Preset Type* on the touch screen to set the reset type to default;
   2) Press the PRESET button or click *UTILITY* > *Preset* on the touch screen to perform the reset operation.

2. Set the frequency and amplitude
   1) Press the FREQ button and use the numeric keyboard to enter 1 GHz, or click the frequency input box on the touch screen to pop up the virtual keyboard and enter 1 GHz on the virtual keyboard.
   2) Press the LEVEL button and use the numeric keyboard to enter 0 dBm, or click the level input box on the touch screen to pop up the virtual keyboard and enter 0 dBm on the virtual keyboard.

3. Set the frequency of flatness calibration
   1) Press LEVEL > *Flatness* >  > *Setting*, and select the *Fill Type* as "Manual Step",
   2) Set *Start Freq* to 2 GHz, *Stop Freq* to 3 GHz, and *Points* to 10.

4. Perform amplitude calibration
   Click *Fill Flatness with Sensor* button and a “Collecting” dialog will pop up.

After the data collection is completed, the user interface will automatically return to the flatness list page and give the amplitude correction value of each frequency.

7.5 Output Analog Modulated Signal

The following takes amplitude modulation as an example to introduce the output of an analog modulation signal: the carrier frequency is 1 GHz, the carrier amplitude is -10 dBm, the AM modulation depth is 80%, the modulation frequency is 10 kHz, and the modulation waveform is a sine wave.

1. Restore factory settings
   1) Press the UTILITY button or click *UTILITY* > *Setting* > *Preset Type* on the touch screen to set the reset type to default;
   2) Press the PRESET button or click *UTILITY* > *Preset* on the touch screen to perform the reset operation.

2. Set carrier frequency and amplitude
   1) Press the FREQ button and use the numeric keyboard to enter 1 GHz, or click the frequency input box on the touch screen to pop up the virtual keyboard and enter 1 GHz on the virtual keyboard.
   2) Press the LEVEL button and use the numeric keyboard to enter -10 dBm, or click the level input box on the touch screen to pop up the virtual keyboard and enter -10 dBm on the virtual keyboard.

3. Set the AM modulation parameters
   Press MOD or click *MOD* > *AM* on the touch screen to enter the amplitude modulation parameter setting interface.
   1) Set *AM Shape* to Sine;
   2) Set *AM Depth* to 80%;
   3) Set *AM Rate* to 10 kHz;
   4) Turn on *AM State*;

4. Turn on the analog modulation function and RF output
   1) Press the MOD ON/OFF button, the button light turns on, and the MOD icon in the status bar of the user interface changes from gray to blue;
   2) Press the RF ON/OFF button, the button light turns on, and the RF icon in the status bar of the user interface changes from gray to blue.

At this time, the **[RF OUTPUT 50Ω]** connector outputs the modulated RF signal in the current configuration.

7.6 Output Pulse Train

The following steps describe how to output a user-defined pulse sequence from the **[PULSE IN/OUT]** connector on the rear panel of the RF signal source. The specific setting parameters of the pulse sequence are shown in the table below.

Serial number	Positive pulse width	Negative pulse width	Repetitions
1	10ms	30ms	1
2	20ms	20ms	2

1. Restore factory settings
   1) Press the UTILITY button or click *UTILITY* > *Setting* > *Preset Type* on the touch screen to set the reset type to default;
   2) Press the PRESET button or click *UTILITY* > *Preset* on the touch screen to perform the reset operation.

2. Install the pulse sequence generator option
   Press UTILITY > *Option* to enter the option installation interface, select "PT" and enter the correct activation code, then click the *Install* button. The RF signal source will automatically install the pulse sequence generator option.

3. Edit pulse list
   Press MOD or click *MOD* > *PULSE* on the touch screen to enter the pulse modulation parameter setting interface.
   1) Set *Pulse Mode* to Train,
   2) Click *Pulse Train* >  to enter the pulse sequence editing interface, set the *On Time* of the first pulse to 10 ms, the *Off Time* to 30 ms, and the *Count* to 1;
   3) Click *Add* to add a row, set the *On Time* to 20 ms, the *Off Time* to 20 ms, and the *Count* to 2.

4. Turn on pulse modulation and pulse output
   Return to pulse modulation setting interface,
   1) Turn on the *Pulse Out* switch,
   2) Turn on the *Pulse State* switch.

5. Turn on the analog modulation
   Press the MOD ON/OFF button, the button light turns on, and the MOD icon in the status bar of the user interface changes from gray to blue.

At this time, the **[PULSE IN/OUT]** connector outputs the pulse train signal configured as above.

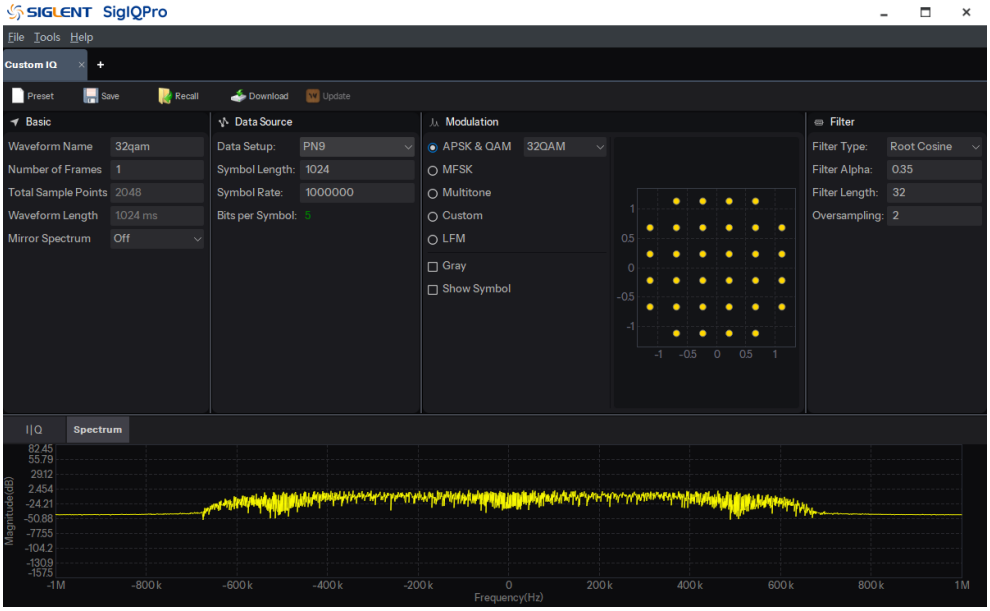
7.7 Output IQ Modulated Signal

The external IQ modulation function of SSG3000X-IQE and SDG6000X series arbitrary waveform generator can be used as the baseband source to generate IQ modulated signals.

The following steps describe how to generate an IQ modulated signal with a modulation mode of 32QAM. Users can modify and configure IQ modulation related parameters according to actual application requirements.

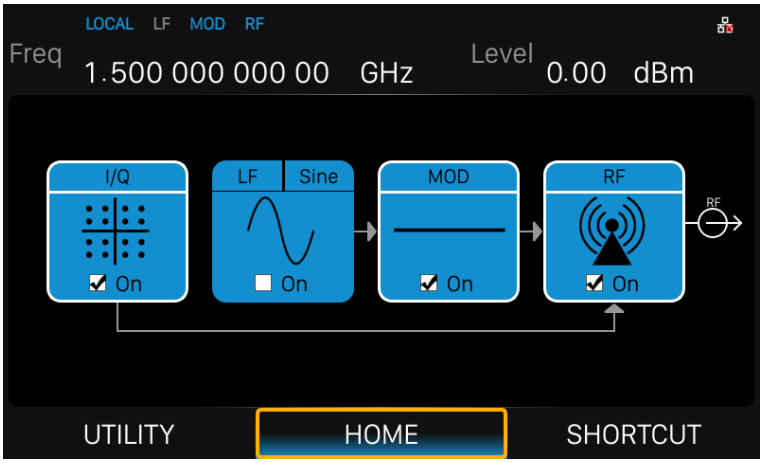
1. Connect the output interfaces of SDG6000X to the external IQ modulation interfaces **[I INPUT]** and **[Q INPUT]** of SSG3000X-IQE.

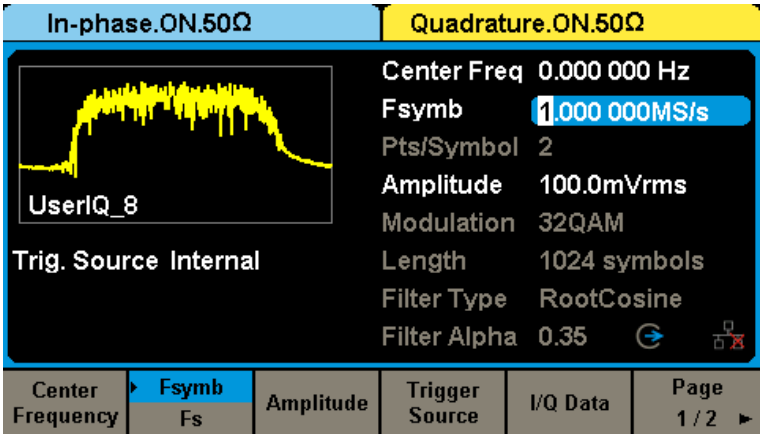
2. Open Siglent SigIQPro software, configure it as shown below, and then download the baseband data to SDG6000X.



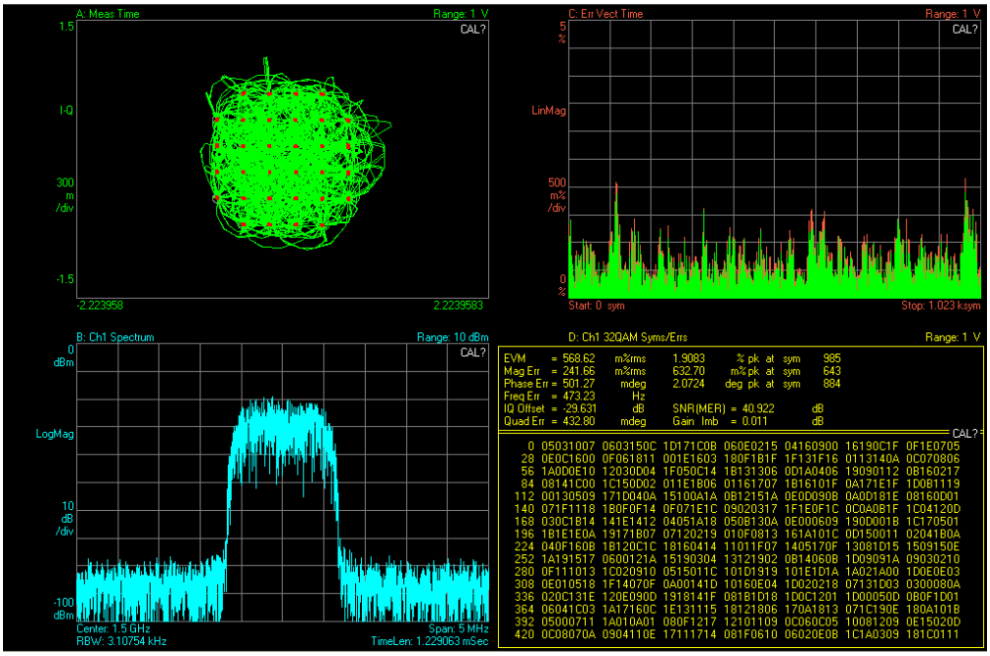
3. As shown in the figures below, configure SSG3000X-IQE and SDG6000X separately, and then

enable the output of SDG6000X, the IQ, MOD and RF output of SSG3000X-IQE.

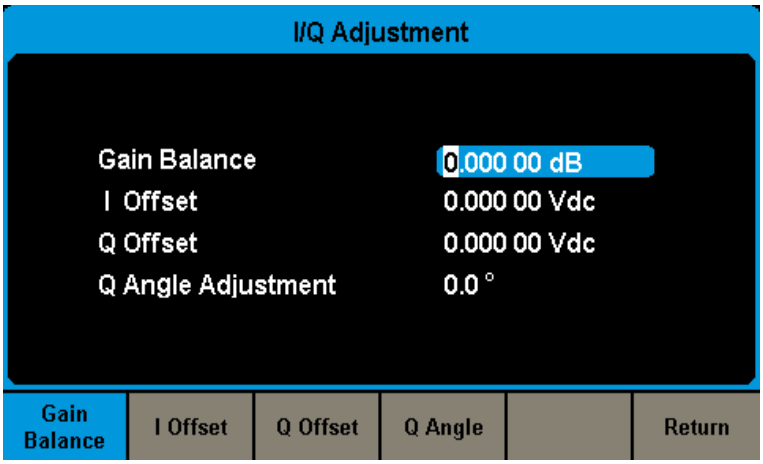




4. At this time, the **[RF OUTPUT]** interface of SSG3000X-IQE outputs an IQ modulation signal with a modulation mode of 32QAM. Connect the IQ modulation signal to an IQ demodulation device to observe the demodulation characteristics of the IQ modulation signal.



Note: IQ compensation can be performed through the I/Q adjustment menu of SDG6000X. For example, when the IQ modulation signal shows a significant local oscillator leakage, it can be solved by alternately adjusting the Offset of I and Q.



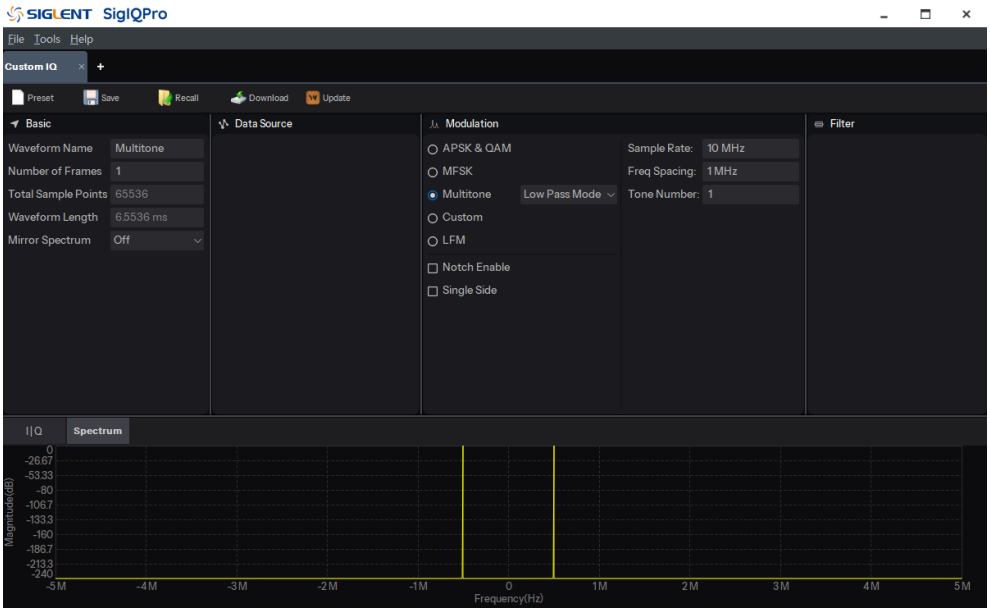
7.8 Test the OIP3 of Active Devices with IQ Function

OIP3 is a key indicator for evaluating the linearity of active devices. This can be tested by SSG3000X-IQE with SDG6000X series arbitrary waveform generator.

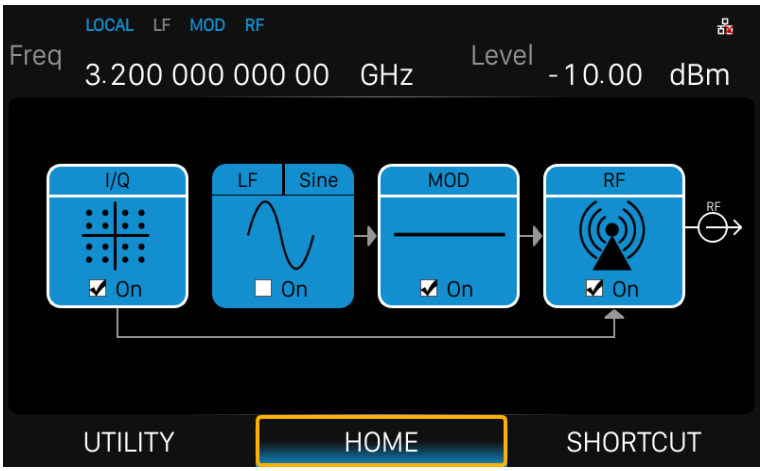
The following steps describe how to generate a two-tone continuous wave signal with carrier frequency of 3.2 GHz and interval frequency of 1 MHz to test the OIP3 of the active device.

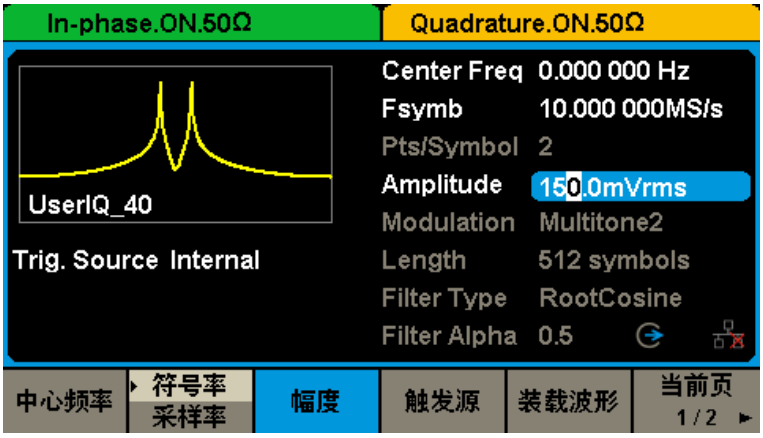
1. Connect the output interfaces of SDG6000X to the external IQ modulation interfaces **[I INPUT]** and **[Q INPUT]** of SSG3000X-IQE.

2. Open Siglent SigIQPro software, configure it as shown below, and download the Multitone data to SDG6000X.



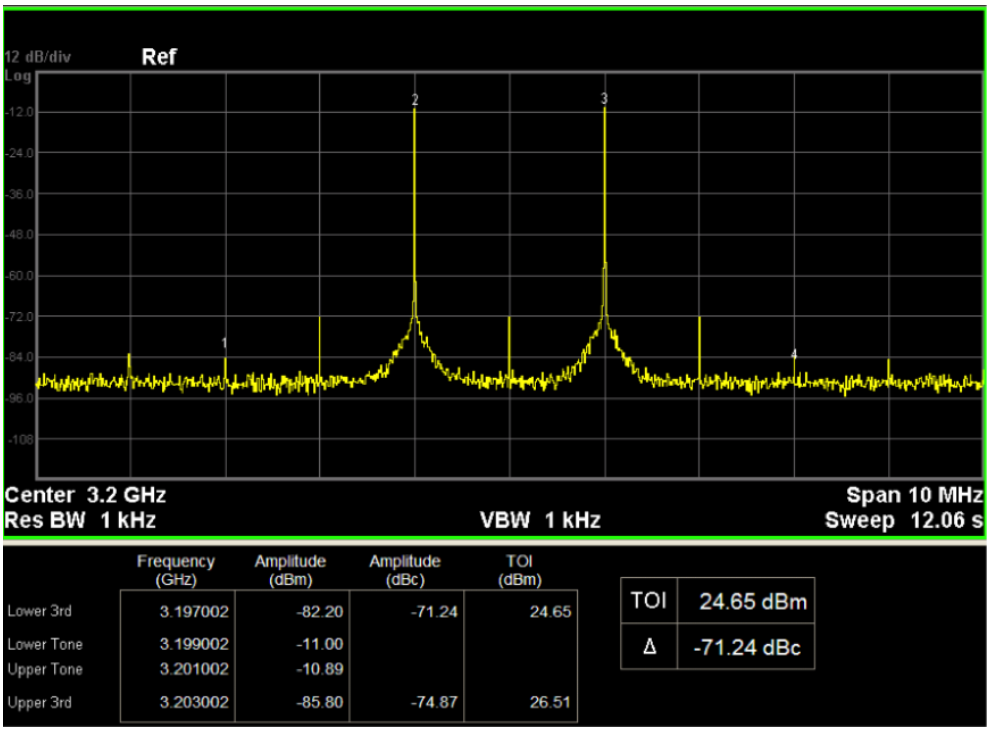
3. Configure SSG3000X-IQE and SDG6000X as shown below, and then open the output of SDG6000X, the IQ, MOD and RF output of SSG3000X-IQE.



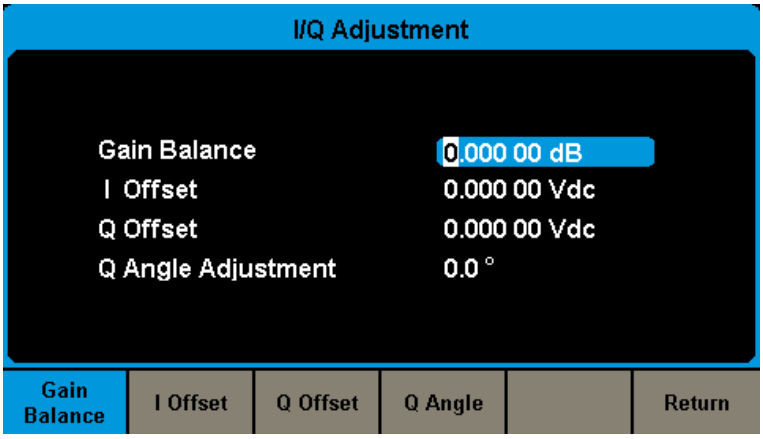


4. At this time, the RF interface of SSG3000X-IQE outputs a two-tone continuous wave signal with

carrier frequency of 3.2 GHz and interval frequency of 1 MHz. The signal is used as the input of the active device, and the output signal is tested to obtain the OIP3 characteristic as shown in the following figure.



Note: IQ compensation can be performed through the I/Q adjustment menu of SDG6000X. For example, when the IQ modulation signal shows a significant local oscillator leakage, it can be solved by alternately adjusting the Offset of I and Q.



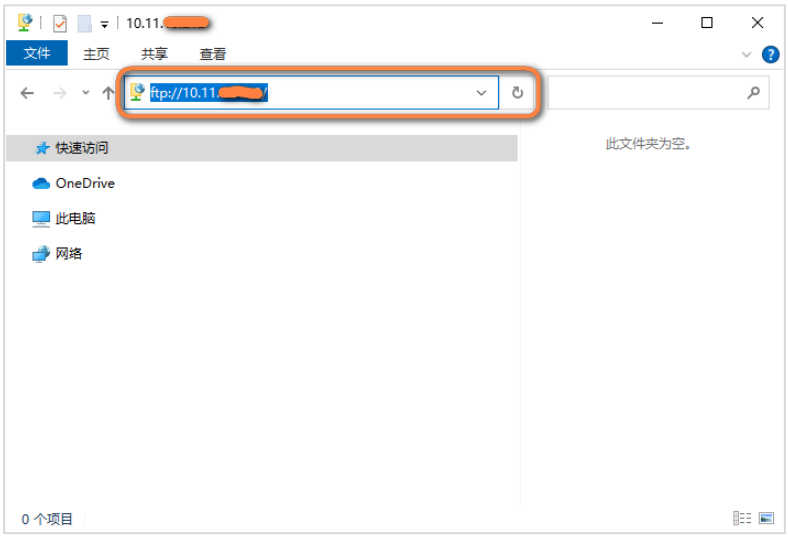
7.9 Download/Upload Files Using FTP (LAN)

SSG3000X users can use the computer's file browser to download files in the signal generator's "Local" folder to the computer via the local area network (LAN), or upload files from the computer to

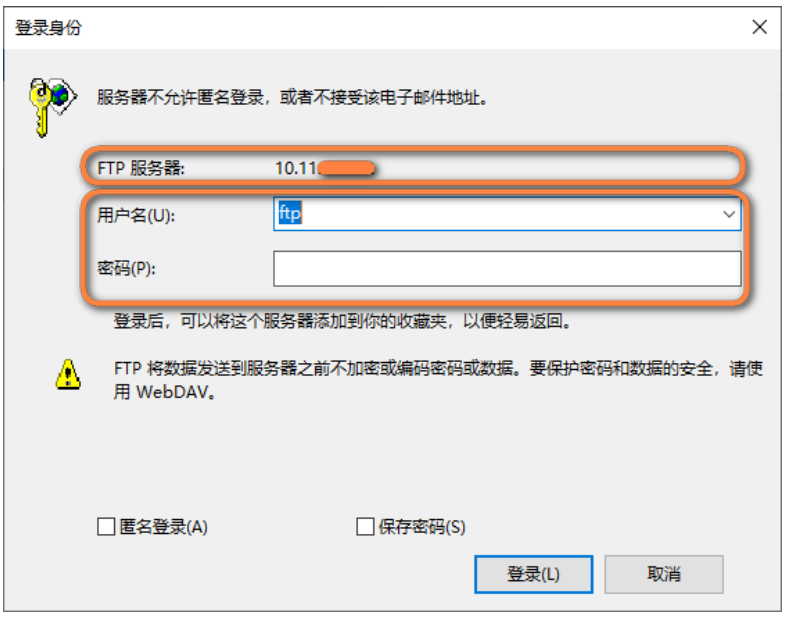
the signal generator.

Here's how to use FTP to download or upload files on a computer connected to the SSG3000X via a LAN:

1. Set LAN parameters of the signal generator. Ensure that the IP address can be pinged through.
2. Open the file browser of the computer. At the address bar of the file browser, enter: ftp://<IP address>, and then press Enter.

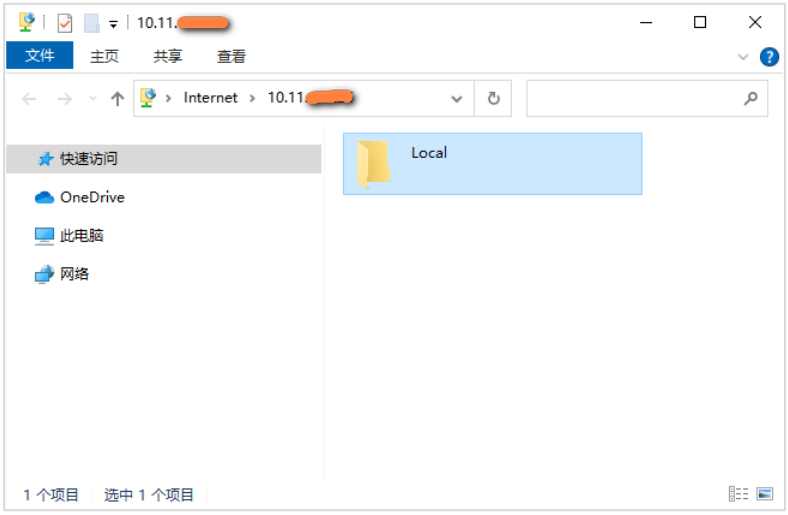


3. A prompt dialog box will pop up in the file browser. You should check the FTP Server address and enter the FTP password.



4. After entered the FTP password, click “Log In” and you can access to the “Local” folder of the signal generator. You can download files from the Local folder to computer, or copy files from

computer to the Local folder of the signal generator.



8 Front Panel Operation

This chapter introduces in detail the function keys on the front panel of SSG3000X and the associated menu functions.

8.1 Frequency

You can set the frequency value in the display frequency input box on the status bar, or you can set the frequency value in the frequency parameter setting area. Note that there is a difference between the frequency displayed on the status bar and the frequency in the parameter setting area. The difference between them will be described in the following chapters.

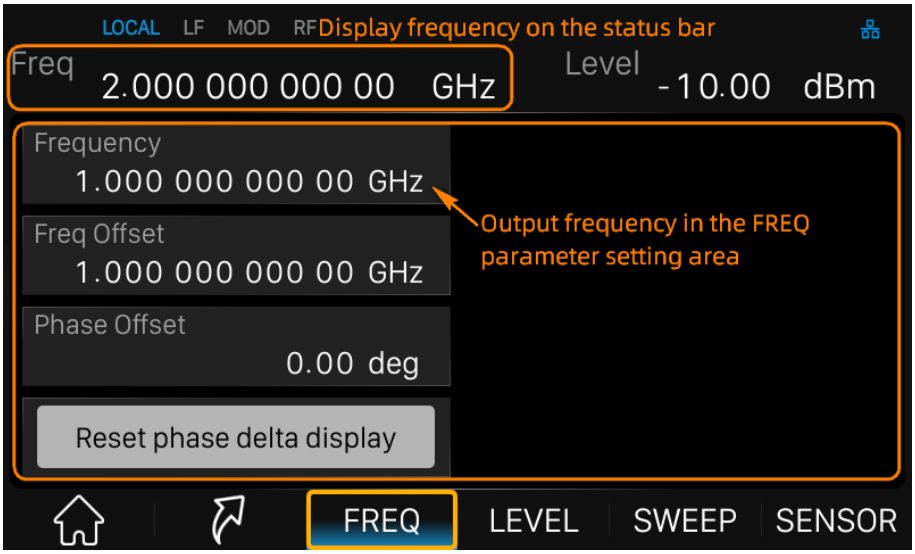


Figure 8-1 Frequency setting

8.1.1 RF Display Frequency and Output Frequency

If the RF output is connected to a downstream instrument, such as a mixer, the frequency offset can be set in the frequency parameter setting area. The relationship between the display frequency of the status bar and the frequency of the parameter setting area is as follows:

1. The relationship between display frequency, output frequency and frequency offset is:
   Display frequency (display frequency in status bar) = output frequency (frequency in parameter setting area) + frequency offset
2. The difference between the displayed frequency and the frequency offset is the RF output frequency.

8.1.2 Frequency Offset

Click *Freq Offset* to set the frequency offset of the RF output signal.

When the RF signal source is connected to an external mixer and other equipment, by setting a reasonable frequency offset, the frequency after passing through the mixer can be directly read and set.

8.1.3 Phase Offset

Click *Phase Offset* to set the phase offset of the RF signal.

When multiple RF sources output signals simultaneously, multiple signals can be output to the same phase or fixed phase offset by adjusting this parameter. At this point you should set multiple RF sources to the same frequency and synchronize their clocks.

Click *Reset Phase delta display* button to reset the currently displayed phase offset value to 0 degrees, but the actual phase offset of the signal does not change.

8.1.4 RF State

Functionally equivalent to the RF ON/OFF button on the front panel.

8.2 Level

You can set the level value in the display level input box on the status bar, or you can set the level value in the level parameter setting area. Note that there is a difference between the display level on the status bar and the level in the parameter setting area. The difference between them will be described in the following chapters.

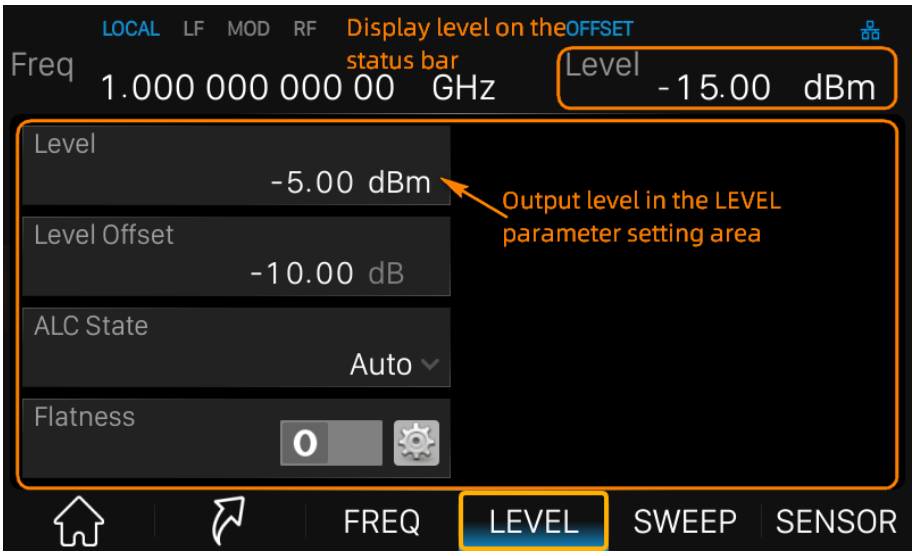


Figure 8-2 Level setting

8.2.1 RF Display Level and Output Level

If the RF signal source works in a system with an attenuator or amplifier, you can set the corresponding level offset parameters in the level parameter setting area. When the signal source and attenuator or amplifier are viewed as a whole, the level value can be viewed directly in the display level area of the status bar.

The relationship between the display level of the status bar and the level of the parameter setting area is as follows:

1. The relationship between the display level, output level and level offset is:
   Display level (display level in status bar) = output level (level in parameter setting area) + level offset
2. The difference between the display level and level offset is the RF output level.

8.2.2 Level Offset

Click *Level Offset* to set the level offset of the RF output signal.

When the RF output is connected to a fixed attenuation or gain, by setting a reasonable level offset, the attenuated or amplified amplitude value can be directly read and set on the RF source.

After setting the level offset to be non-zero, a blue "OFFSET" icon will be displayed on the status bar of the user interface.

8.2.3 ALC State

Click *ALC State* to select the working status of the ALC function.

ALC stands for Automatic Level Control. It is an adaptive control system to stabilize the RF output level.It continuously monitors the current level and adjusts it to keep a steady state over temperature and time.

ALC has three working states: "Off", "On" and "Auto":

- AUTO

  Automatically turn on or off the ALC function according to the equipment state.
- On

  Enable ALC permanently, regardless of the currently selected mode.
- Off (S&H)

  Deactivate ALC. The instrument switches to Sample & Hold (S&H) state, which still allows maintaining a constant output level. In “S&H” mode, the signal generator switches for a short period of time into CW mode and activates ALC. The ALC adjusts the level to the set value and the generator holds the value. Then the generator switches ALC off again and back to the previous operating mode.

8.2.4 Flatness

The flatness correction function can adjust the RF output amplitude corresponding to the frequency point within the frequency range of the instrument to compensate for external losses introduced by cables or other equipment.

The flatness function mathematically adjusts the output by applying a user-defined list of level corrections, thereby adjusting the amplitude at specific frequencies. Correction is performed by adding the correction value from the flatness correction list to the output level of the corresponding RF frequency. For frequencies not included in the list, the level correction is determined by linear interpolation of the nearest correction value.

After the flatness correction function is turned on, a blue "UF" icon will be displayed on the status bar of the user interface.

8.2.4.1 Create Flatness List

Press LEVEL > *Flatness*, or click *RF* module on the home page > *LEVEL* > *Flatness*, and then click  to enter the flatness list editing page.

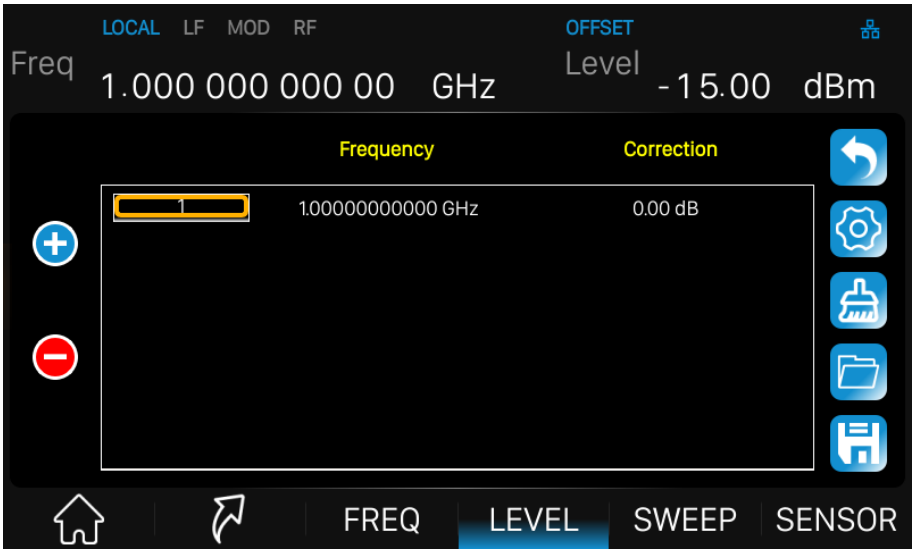


Figure 8-3 Flatness list editing page

The flatness list consists of index, correction frequency and level correction value, and is an empty list by default.

1) Insert

   Press  to insert a new row after the last row.

2) Delete

   Press  to delete the selected row.

3) Empty

   Press  to empty all the rows.

4) Load

   Press  to enter the “Store/Recall” page, select and load flatness correction file (*.UFLT).

5) Save

   Press  to enter the “Store/Recall” page, save the flatness list in UFLT file.

6) Return

   Press  to return to the previous menu.

7) Set

   Press  to enter the flatness list automatic filling page. For details, please see "Auto Fill Flatness List".

Users need to pay attention to the following when editing the flatness list:

1. When there is a frequency offset, the frequency offset value needs to be added to the correction frequency.
2. The flatness list is automatically sorted from small to large according to the correction frequency.

8.2.4.2 Auto Fill Flatness List

After entering the flatness list setting page, you can choose one of the following three methods to automatically fill the flatness list with the power sensor.

1. Flatness List
   1) Firstly, set the correction frequency points in the flatness list editing page.
   2) Secondly, click the *Setting* button to enter the automatic filling flatness list page.
   3) Thirdly, select *Fill Type* as "Flatness List".
   4) Finally, click the *Fill Flatness With Sensor* button.

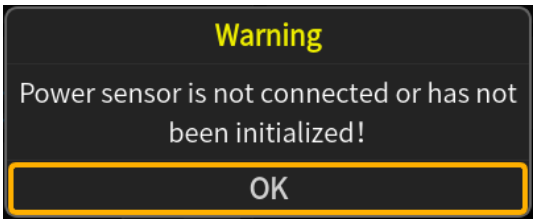
2. Manual Step
   1) Firstly, click the *Setting* button to enter the automatic filling flatness list page.
   2) Secondly, select *Fill Type* as "Manual Step".
   3) Thirdly, in the pop-up edit box, set the start frequency, stop frequency, frequency space mode and frequency step or number of points that need to be corrected.
   4) Finally, click the *Fill Flatness With Sensor* button.

3. Sweep List
   1) Firstly, set the sweep frequency in SWEEP > *List Sweep*,
   2) Secondly, select the flatness list *Fill Type* as "Sweep List",
   3) Finally, click the *Fill Flatness With Sensor* button.

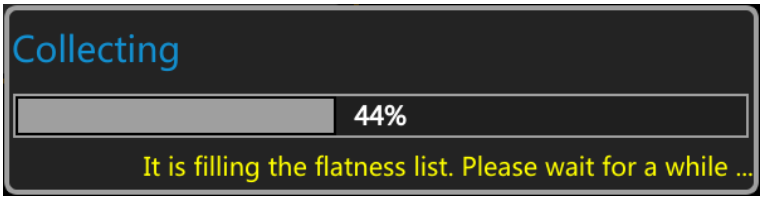
After clicking the *Fill Flatness With Sensor* button, the RF signal source will automatically generate the amplitude correction values of the flatness list.

NOTE:

- When use sweep list to populate the flatness list, the correction frequencies of the flatness list is consistent with the sweeping frequencies of the sweep list, and the correction frequencies of the flatness list will be automatically sorted from small to large.
- When using the auto-fill flatness list function, please connect the power meter correctly to the RF signal source. If a power meter is not connected or is not recognized, the flatness list will not automatically populate. Please pay attention to the pop-up message.



- When automatically filling the flatness list, there's no need for you to turn on the RF state or sensor state. Before or after "Fill Flatness With Sensor" executed, the RF state and sensor state will be turned on or turned off automatically.
- During the process of automatically filling the flatness list, the user interface will pop up the following prompt message. Do not move the power meter during this process.



8.3 Sweep

When the RF sweep function is enabled, the sweep signal will be output from the **[RF OUTPUT 50Ω]** connector on the front panel.

Please note that the RF sweep signal will be output only when the RF switch RF ON/OFF is on.

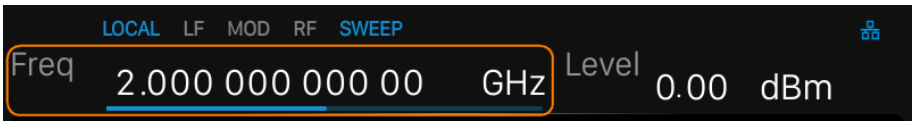
You can press the SWEEP button on the front panel to enter the RF sweep setting interface.

8.3.1 Sweep State

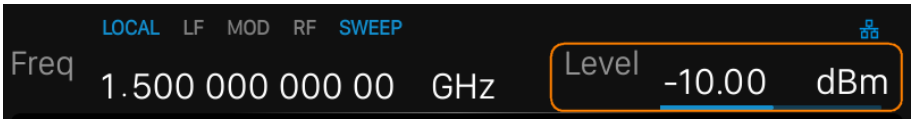
The sweep state is off by default. The RF signal generator offers three sweep types: Freq, Level, and Freq & Level. Select any one of the sweep types to enable RF sweeping. After the sweep function is enabled, a blue "SWEEP" icon will be displayed on the status bar of the user interface.

Clicking the drop-down box of the *Sweep State* to choose a sweep type:

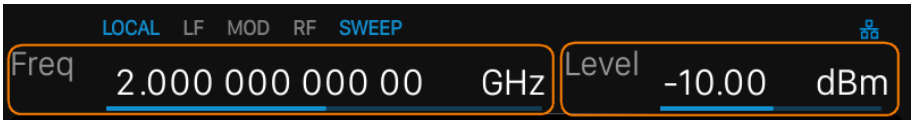
- Off: Default state. Turn off the sweep function.
- Freq: Enable frequency sweep. At this time, the display frequency refreshes the current sweeping frequency value in real time, and the current sweep progress can be observed on the frequency sweep progress bar.



- Level: Enable level sweep. At this time, the display level refreshes the current sweeping level value in real time, and the current sweep progress can be observed on the level sweep progress bar.



- Freq& Level: Enable both frequency and level sweep. At this time, the display frequency and display level refresh the current sweeping frequency and level values in real time, and the current sweep progress can be observed on the frequency and level sweep progress bar.



NOTE: Turning on RF sweep turns off the power control function of the power meter. If an RF

sweeping is in progress, the power meter's power control function cannot be turned on.

8.3.2 Step Sweep

The step sweep is on by default. Click the slide  to switch the on-off state. Click  to enter the parameter setting menu of step sweep.

NOTE: The step sweep and list sweep are mutually exclusive. One will shut off automatically when the other is on.

Step sweep settings include the following parameters:

1) Start Freq: Initial frequency of the sweep.
2) Stop Freq: Final frequency of the sweep.
3) Start Level: Initial amplitude level of the sweep.
4) Stop Level: Final amplitude level of the sweep.
5) Dwell Time: The interval time between two adjacent sweep points.
6) Sweep Points: The number of points in a sweep. The frequency and level values of each sweep point are interpolated from the start and stop parameters.
7) Sweep Shape: The cycle mode of sweep, there are two types: "Sawtooth" and "Triangle", which can be selected by clicking the drop-down box.
   - Sawtooth: Sweep period is always from the start frequency or start level to the stop frequency or stop level. The sweep sequence is similar to a "sawtooth wave".
   - Triangle: Sweep period is always from the start frequency or start level to the stop frequency or stop level, and then return back to the start frequency or start level. The sweep sequence is similar to a "triangle wave".
8) Sweep Space: the change from one frequency to another within a frequency sweep step. Frequency sweep has two step types: linear and logarithmic, which can be selected by clicking the drop-down box.

   NOTE: Level sweep only supports linear steps and does not need setting.

8.3.3 List Sweep

The list sweep is off by default. Click the slide  to switch the on-off state. Click  to enter the editing page of list sweep.

NOTE: The list sweep and step sweep are mutually exclusive. One will shut off automatically when the other is on.

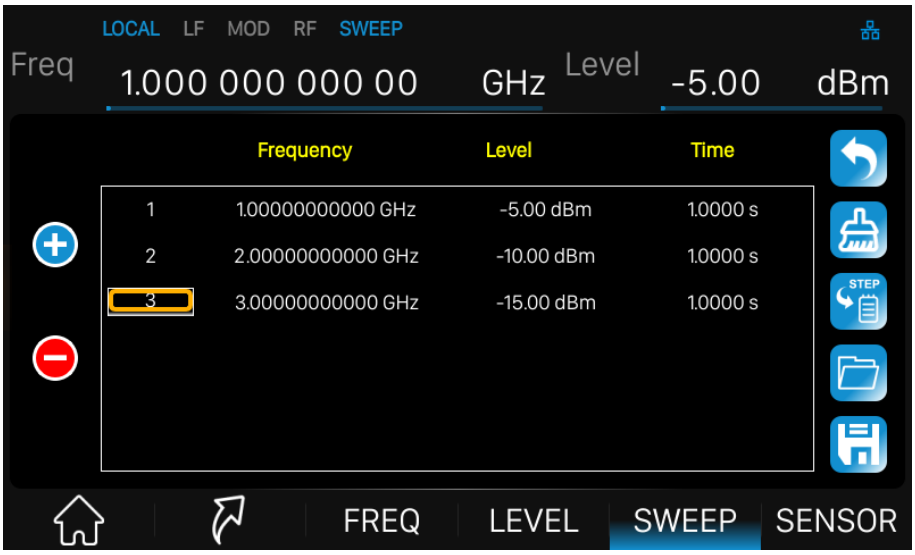


Figure 8-4 List sweep editing page

As show in the figure, the table edit page consists of the operating buttons on the left of page, the table on the middle of the page and the menu buttons on the right side. The sweep list includes index number, sweep frequency, sweep level and dwell time. The default value is "1,1.5 GHz,-110 dBm,50 ms".

1) Inset

   Click  to inset a new line under the current cursor.

2) Delete

   Click  to delete the line under the current cursor.

3) Parameter edit

   Click each parameter in the table to set it through the touch screen keyboard or the keypad of the front panel.

4) Return

   Click  to return to the previous menu.

5) Clear

   Click  to clear and preset current list.

6) Step to list

   Click  to generate a new list according to the step sweep setting.

7) Load

   Click  to select and load the sweep list file (*.LSW).

8) Save

   Click  to save the current sweep list to a LSW file.

Users need to pay attention when editing the sweep list: when there is a frequency offset/level offset, the offset value needs to be added to the sweep frequency/sweep level.

8.3.4 Sweep Direction

The sweep direction defaults to “Up”. The signal source provides two types: “Up” Or “Down”. Click the drop-down box of *Direction* to enable the corresponding sweep direction.

- Up: The signal source sweeps from the start frequency or start level to the stop frequency or stop level. The progress bar displayed in the parameter bar sweeps from left to right.
- Down: The signal source sweeps from the stop frequency or stop level to the start frequency or start level. The progress bar displayed in the parameter bar sweeps from right to left.

8.3.5 Sweep Mode

The sweep mode defaults to “Continuous”. The signal source provides two sweep modes: “Continuous” or “Single”. Click the drop-down box of *Sweep Mode* to enable the desired mode.

- Continuous: When the trigger conditions are met, the signal source sweeps continuously according to the current settings.
- Single: When the trigger conditions are met, each time you click the *Execute single sweep* button, the signal source will sweep for a cycle with the current settings, and then stop.

Please note that the *Execute single sweep* button will only be displayed when the sweep mode is "Single" and hidden otherwise.

8.3.6 Trigger Mode

The trigger mode defaults to “Auto”. The signal source provides four types of trigger mode: “Auto”, “Key”, “Bus” and “Ext”.

Click the drop-down box of *Trigger Mode* to select the desired type:

- Auto
  - If the sweep mode is "Continuous", after selecting any sweep state, the signal source starts sweeping continuously.
  - If the sweep mode is "Single", after selecting any sweep state, you need to click the *Execute single sweep* button to start sweeping. The sweep stops after completing one cycle.
- Key
  - If the sweep mode is “Continuous”, the device will start a one-time sweep after you pressed the Trigger button on the front panel or click the *Click to trigger* button on the touch screen.

- If the sweep mode is “Single”, first click the *Execute single sweep* button, and then a one-time sweep will be started after you pressed the Trigger button on the front panel or click the *Click to trigger* button on the touch screen.

- Bus
  - If the sweep mode is “Continuous”, the device will start a one-time sweep after receiving a “*TRG” command from the control computer via the communication bus (USB, LAN or GPIB).
  - If the sweep mode is “Single”, first click the *Execute single sweep* button, and then a one-time sweep will be started after the device received a “*TRG” command.
- Ext

  The device receives the external trigger signal input from the **[TRIG IN/OUT]** connector on the rear panel.
  - If the sweep mode is “Continuous”, the device will start a one-time sweep every time it receives a TTL pulse of specified polarity.
  - If the sweep mode is “Single”, first click the *Execute single sweep* button, and then the device will start a one-time sweep every time it receives a TTL pulse of specified polarity.

Please note that the above description of the sweep trigger mode is based on the point trigger mode being "Auto" mode.

8.3.7 Point Trigger

The point trigger mode defaults to “Auto”. The signal source provides four types of point trigger mode: “Auto”, “Key”, “Bus” and “Ext”.

Click the drop-down box of *Point Trigger* to select the desired type:

- Auto
  - If the sweep mode is “Continuous”, just select one sweep state to start sweeping each point continuously within one sweep cycle.
  - If the sweep mode is “Single”, click *Execute single sweep* button to start sweeping each point within one sweep cycle.
- Key
  - If the sweep mode is “Continuous”, the device will sweep one point each time the Trigger button on the front panel is pressed or the *Click to trigger* button on the touch screen is clicked.
  - If the sweep mode is “Single”, first click the *Execute single sweep* button, then each time you press the Trigger button or click the *Click to trigger* button the device will sweep one point. The sweep stops after completing one cycle.
- Bus

- If the sweep mode is “Continuous”, the device will sweep one point each time it receives a “*TRG” command.
- If the sweep mode is “Single”, first click the *Execute single sweep* button, then the device will sweep one point each time it receives a “*TRG” command. The sweep stops after completing one cycle.

- Ext

  The device receives the external trigger signal input from the **[TRIG IN/OUT]** connector on the rear panel.
  - If the sweep mode is “Continuous”, the device will sweep one point each time it receives a TTL pulse of specified polarity.
  - If the sweep mode is “Single”, first click the *Execute single sweep* button, then the device will sweep one point each time it receives a TTL pulse of specified polarity. The sweep stops after completing one cycle.

Please note that the above description of the point trigger mode is based on the sweep trigger mode being "Auto" mode.

8.3.8 Trigger Slope

When the trigger mode or point trigger mode is “Ext”, you can select “Positive” or “Negative” as the external trigger slope. The default trigger slope is “Positive”.

Click the drop-down box to select the desired trigger slope:

- Positive: The sweep is triggered when the rising edge of the external trigger signal arrives.
- Negative: The sweep is triggered when the falling edge of the external trigger signal arrives.

Please note that the *Trigger Slope* button will be displayed only when the trigger mode or point trigger mode is “Ext”, and will be hidden in other cases.

8.3.9 About Sweep Conditions

When performing a sweep operation, the priorities that need to satisfy the sweep conditions from high to low are:

Sweep mode > Trigger mode > Point trigger mode.

For example, when "Key" is selected for both trigger mode and point trigger mode:

- In "Continuous" sweep mode, press the Trigger button first to meet the trigger condition, and then press the Trigger button again to meet the point trigger condition. At this time the signal source will start sweeping.

- In "Single" sweep mode, press the *Execute single sweep* button first to meet the single sweep condition. Then press the Trigger button two times to meet the trigger condition and point trigger condition. At this time the signal source will start sweeping. The sweep stops after completing one cycle.

8.4 Analog Modulation

Analog modulation includes amplitude modulation, frequency modulation, phase modulation and pulse modulation.

You need to turn on the analog modulation master switch to enable the analog modulation function. You can turn it on by pressing the MOD ON/OFF button on the front panel, or through the *MOD* module switch on the home page, as shown in the figure below. After turning on the analog modulation master switch, a blue "MOD" icon will be displayed on the status bar of the user interface.

Figure 8-5 Analog modulation master switch

8.4.1 Amplitude Modulation (AM)

Amplitude Modulation (AM) is a technique that modulates the original signal by changing the amplitude of the carrier signal. When the amplitude of the original signal changes, the amplitude of the carrier signal also changes linearly, thus superimposing the characteristics of the original signal on the carrier signal.

You can click *MOD* module > *AM* on the homepage to enter the AM page, or you can press the MOD button several times until you switch to the AM page.

8.4.1.1 AM State

Press *AM State* to turn on or off the amplitude modulation.

8.4.1.2 AM Source

Internal and/or external source can be selected for amplitude modulation. Press *AM Source* to set the amplitude modulation source to “Int”, “Ext” or “Int + Ext”. The default is “Int”.

1. Int

   The internal modulation source is generated inside the instrument and is shared with the low frequency generator (LF). When internal source modulation is on, the LF output will be off. When the LF output is on, internal source modulation will be off.

2. Ext

   External modulation source is the external modulation signal input by the **[EXT MOD INPUT]** connector on the rear panel of the RF signal source. The modulated signal can be an arbitrary waveform. At this time, the modulation depth is controlled by the level of the external modulation signal.

3. Int + Ext

   After selecting "Int + Ext", the modulation signal is synthesized from internal and external modulation sources, which can realize two-tone amplitude modulation.

8.4.1.3 AM Shape

The internal source of amplitude modulation supports two modulation waveforms: sine and square. After setting the AM source to "Int" or "Int + Ext", you can press *AM Shape* to choose the AM waveform of internal source to be "Sine" or "Square".

8.4.1.4 AM Rate

After setting the AM modulation source to "Int" or "Int + Ext", you can press *AM Rate* to set the modulation frequency of the internal source.

- The modulation frequency range of sine wave is 0.01 Hz~100 kHz,
- The modulation frequency range of square wave is 0.01 Hz~20 kHz.

8.4.1.5 AM Depth

Modulation depth represents the degree to which the carrier amplitude changes, expressed as a percentage.

- When selecting internal modulation source, the setting range of AM modulation depth is 0.10%~100%. The relationship between the modulation depth *m* and the carrier sideband amplitude difference *ΔP* satisfies the relationship:

$$\Delta P = 6.02 - 20*lgm$$

- When selecting external modulation source, the actual modulation depth is related to the amplitude of the external input modulation signal, that is:

  Modulation depth = amplitude of the external input signal × external modulation sensitivity

  For example, if the modulation depth is set to 100%, then the actual modulation depth is 100% when the external modulation signal is 2 Vpp (0 V offset), and when the external modulation signal is 1 Vpp (0 V offset), the actual modulation depth is 50%.
- When selecting internal + external modulation source, the setting value is the total modulation depth, with the internal source accounting for 50% and the external source accounting for 50%. The modulation depth of the external source is related to the amplitude of the external input modulation signal, that is:

  Modulation depth = setting value × 0.5 + amplitude of external input signal × external modulation sensitivity

  For example, if the modulation depth is set to 100%, the modulation depth allocated to the internal source and the external source will be 50% each. Since the external modulation sensitivity is 25%/V, the actual modulation depth is 100% when the external modulation signal is 2 Vpp (0 V offset), and the actual modulation depth is 75% when the external modulation signal is 1 Vpp (0 V offset).

8.4.1.6 AM Sensitivity

It displays the unit depth quantified by the amplitude of the external modulation signal.

8.4.2 Frequency Modulation (FM)

Frequency Modulation (FM) is a technology that modulates the original signal by changing the frequency of the carrier signal. The frequency changes of the original signal are converted into frequency changes of the carrier signal, thereby carrying the characteristics of the original signal on the carrier signal.

You can click *MOD* module > *FM* on the homepage to enter the FM page, or you can press the MOD button several times until you switch to the FM page.

8.4.2.1 FM State

Press *FM State* to turn on or off the frequency modulation.

8.4.2.2 FM Source

Internal and/or external source can be selected for frequency modulation. Press *FM Source* to set the frequency modulation source to “Int”, “Ext” or “Int + Ext”. The default is “Int”.

1. Int
   Internal modulation source is generated within the instrument. Parameters such as waveform, frequency deviation and modulation rate can be set.
2. Ext
   External modulation source is the external modulation signal input by the **[EXT MOD INPUT]** connector on the rear panel of the RF signal source. The modulated signal can be an arbitrary waveform.
3. Int + Ext
   After selecting "Int + Ext", the modulation signal is superposed by internal source and external source. In this way, two-tone modulation or more complex modulation can be achieved.

8.4.2.3 FM Shape

The internal source of frequency modulation supports two modulation waveforms: “Sine” or “Square”.

8.4.2.4 FM Rate

After setting the FM source to internal or internal + external, you can set the modulation frequency of internal source through *FM Rate*.

- The modulation frequency range of sine wave is 0.01 Hz~100 kHz.
- The modulation frequency range of square wave is 0.01 Hz~20 kHz.

8.4.2.5 FM Deviation

Corresponding to different carrier frequencies, the frequency deviation range may be different. The setting range is 0.01 Hz~N×1 MHz. The value of N is related to the carrier frequency. Please refer to the data sheet for details.

- When the modulation source is set to “Int”, the setting value is the frequency deviation of the RF output.
- When the modulation source is set to “Ext”, the actual frequency deviation is related to the amplitude of the external input modulation signal, that is:

Frequency deviation of RF output = amplitude of external input signal ×

external modulation sensitivity

For example, if the maximum frequency deviation is set to 100 kHz, then the actual frequency deviation is 100 kHz when the external modulation signal is 2 Vpp (0 V offset), and when the external modulation signal is 1 Vpp (0 V offset), the actual frequency offset is 50 kHz.

- When the modulation source is set to "Int+Ext", the setting value is the maximum value of the total frequency deviation, with the internal source accounting for 50% and the external source accounting for 50%. The external source modulation frequency deviation is related to the amplitude of the external input modulation signal, that is:

  Frequency deviation of RF output = setting value × 0.5 + external input signal amplitude × external modulation sensitivity

  For example, if the maximum frequency deviation is set to 100 kHz, the frequency deviation allocated to the internal source and the external source is 50% each. Since the external modulation sensitivity is 25 kHz/V, when the external modulation signal is a full-scale 2 Vpp (0 V offset), the actual modulation frequency offset is 100 kHz, and when the external modulation signal is 1 Vpp (0 V offset), the actual modulation frequency offset is 75 kHz.

8.4.2.6 FM Sensitivity

External modulation sensitivity displays the unit frequency deviation quantized by the amplitude of the external modulation signal.

8.4.3 Phase Modulation (PM)

Phase Modulation (PM) is a technology that modulates the original signal by changing the phase of the carrier signal. The phase change of the original signal is converted into the phase change of the carrier signal, thereby transmitting the information of the original signal on the carrier signal.

You can click *MOD* module > *PM* on the homepage to enter the PM page, or you can press the MOD button several times until you switch to the PM page.

8.4.3.1 PM State

Press *PM State* to turn on or off the phase modulation.

8.4.3.2 PM Source

Internal and/or external source can be selected for phase modulation. Press *PM Source* to set the phase modulation source to “Int”, “Ext” or “Int + Ext”. The default is “Int”.

1. Int

The internal modulation source is generated inside the instrument, and the modulation frequency can be set and the modulation waveform can be selected.

2. Ext

   External modulation source is the external modulation signal input by the **[EXT MOD INPUT]** connector on the rear panel of the RF signal source. The modulated signal can be an arbitrary waveform.

3. Int + Ext

   After selecting "Int + Ext", the modulation signal is synthesized from internal and external modulation sources, which can realize two-tone phase modulation.

8.4.3.3 PM Shape

The internal source of PM supports two modulation waveforms: sine and square. After setting the PM source to "Int" or "Int + Ext", you can press *PM Shape* to choose the PM waveform of internal source to be "Sine" or "Square".

8.4.3.4 PM Rate

After setting the PM modulation source to "Int" or "Int + Ext", you can press *PM Rate* to set the modulation frequency of the internal source.

- The modulation frequency range of sine wave is 0.01 Hz~100 kHz,
- The modulation frequency range of square wave is 0.01 Hz~20 kHz.

8.4.3.5 PM Deviation

Different carrier frequencies have different phase deviation ranges. The setting range is 0.0 rad~N×5 rad. The value of N is related to the carrier frequency. Please refer to the data sheet for details.

- When the modulation source is internal, the setting value is the maximum phase deviation of the RF output.
- When the modulation source is external, the actual maximum phase deviation is related to the amplitude of the external input modulation signal, that is:

  Phase deviation of RF output = amplitude of external input signal × external modulation sensitivity

  For example, if the maximum phase deviation is set to 1 rad, then the actual maximum phase deviation is 1 rad when the external modulation signal is 2 Vpp (0 V offset), and when the external modulation signal is 1 Vpp (0 V offset), the actual maximum phase deviation is 0.5 rad.
- When the modulation source is external + internal, the setting value is the maximum value of the total phase deviation, with the internal source accounting for 50% and the external source

accounting for 50%. The external source modulation phase deviation is related to the amplitude of the external input modulation signal, that is:

Phase deviation of RF output = setting value × 0.5 + amplitude of external input signal × external modulation sensitivity

For example, if the maximum phase deviation is set to 1 rad, the phase deviation allocated to the internal source and the external source is 50% each. Since the external modulation sensitivity is 0.25 rad/V, the actual maximum phase offset is 1 rad when the external modulation signal is 2 Vpp (0 V offset), and the actual maximum phase offset is 0.75 rad when the external modulation signal is 1 Vpp (0 V offset).

8.4.3.6 PM Sensitivity

It shows the unit phase deviation quantified by the amplitude of the external modulation signal.

8.4.4 Pulse Modulation (PULSE)

Pulse Modulation refers to the process of using pulse signals as modulation signals to modulate radio frequency carrier signals.

You can click *MOD* module > *PULSE* on the homepage to enter the pulse modulation page, or you can press the MOD button several times until you switch to the pulse modulation page.

8.4.4.1 Pulse State

Press *Pulse State* to turn pulse modulation on or off.

8.4.4.2 Pulse Source

Press *Pulse Source* to select “Int” or “Ext” modulation source. The default is “Int”.

- Int

  The internal pulse generator of the RF signal source provides the modulation source. You can set the pulse mode, pulse period, pulse width and other parameters of the modulation source.
- Ext

  The RF signal source receives the external pulse signal input from the **[PULSE IN/OUT]** connector on the rear panel as the modulation source. At this time, the setting items such as pulse mode, pulse period, pulse width, trigger mode and pulse output are hidden.

8.4.4.3 Ext Polarity

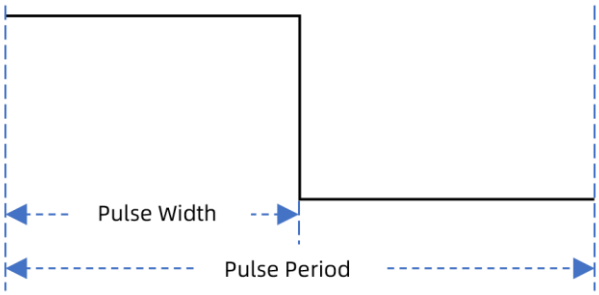
When the pulse source is external, click *Ext Polarity* to switch the trigger polarity of the external modulation source. The default is "Normal".

- Normal: Pulse modulation is performed when the external modulation signal is high level.
- Inverse: Pulse modulation is performed when the external modulation signal is low level.

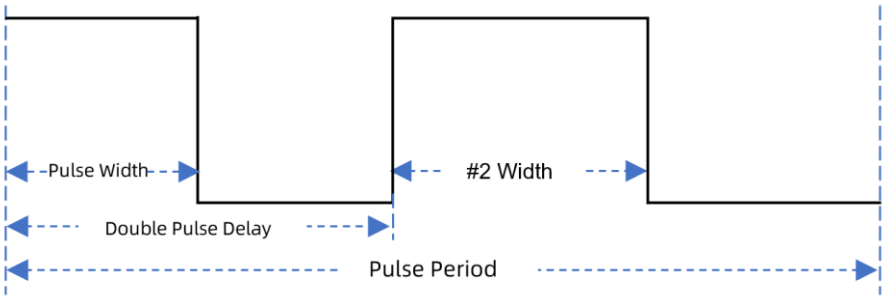
8.4.4.4 Pulse Mode

When the modulation source is “Int”, the RF signal source provides three pulse modes: “Single”, “Double” and “Train”. The default is “Single”. Click the drop-down box to select the pulse mode.

- Single: Generate one pulse signal in one pulse period. At this time, the two settings “Double Pulse Delay” and “#2 Width” are hidden.



- Double: Generate two pulse signals in one pulse period. At this time, the two settings “Double Pulse Delay” and “#2 Width” are shown.



- Train: Generate multiple pulse signals in one pulse period. At this time, the *Pulse Train* setting item appears, and the settings “Pulse Period”, “Pulse Width”, “Double Pulse Delay” and “#2 Width” are hidden. For a detailed introduction to pulse train, please see the "Pulse Train" chapter.

8.4.4.5 Pulse Period

Pulse period represents the time interval between two adjacent periodic pulses. When the pulse mode

is single pulse or double pulse, the pulse period needs to be set.

8.4.4.6 Pulse Width

Pulse width represents the high-level duration of a single-pulse modulation signal, or the high-level duration of the first pulse of a double-pulse modulation signal.

8.4.4.7 Double Pulse Delay

Double-pulse delay represents the delay from the start of the first pulse to the start of the second pulse in a single cycle of a double-pulse modulation signal.

8.4.4.8 #2 Width

#2 Pulse Width represents the high duration of the second pulse within a single cycle in a double pulse modulation signal.

8.4.4.9 Pulse Train

When the *Pulse Mode* is set to Train, the *Pulse Train* setting item appears, and the settings "Pulse Period", "Pulse Width", "Double Pulse Delay" and "#2 Width" are hidden.

8.4.4.9.1 The Setting of Pulse Train

Click the setting button  of *Pulse Train* to enter the pulse train editing interface.

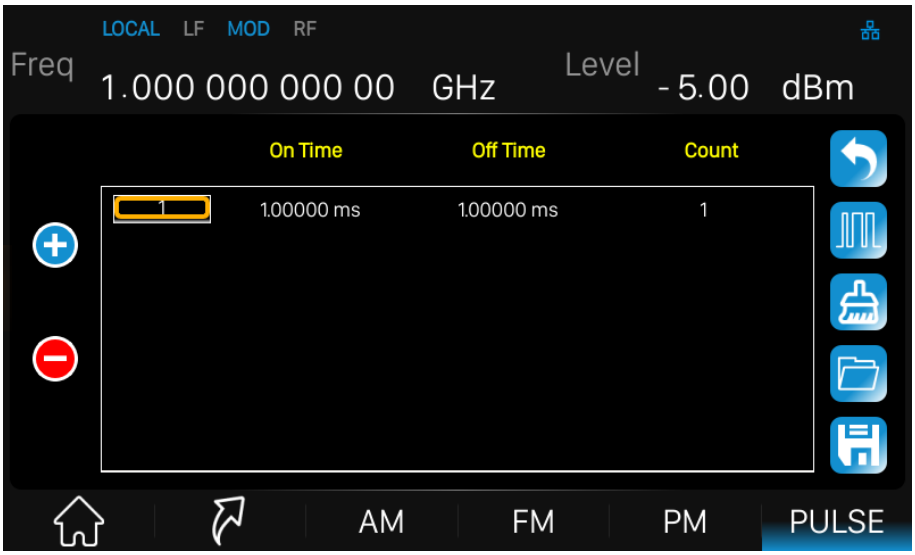


Figure 8-6 Pulse train editing page

As shown above, the pulse train editing page consists of the left action buttons, the middle table area, and the right menu buttons:

1) Insert

   Click  to inset a new line under the current cursor.

2) Delete

   Click  to delete the line under the current cursor.

3) Parameter editing

   Click each parameter in the table and set it through the touch screen keyboard or the front panel keypad.

4) Return

   Click  to return to the previous menu.

5) Clear

   Click  to clear and reset the pulse train.

6) Diagram

   Click  to enter the pulse train diagram page.

7) Load

   Click  to select and load a pluse train file (*.PULSTRN).

8) Save

   Click  to save the pluse train to a PULSTRN file.

Each row of parameters of the pulse train represents the settings of each pulse signal within a single pulse period:

- Index indicates the sequence number of the pulse signal corresponding to the row,
- On time indicates the duration of the high level of the pulse signal,
- Off time indicates the duration of the low level of the pulse signal,
- Count indicates the number of repetitions of the pulse signal.

The default value is "1,1 ms,1 ms,1".

8.4.4.9.2 Pulse Train Diagram

Click the *Diagram* button in the pulse train editing interface to to view the diagram of the current pulse train.

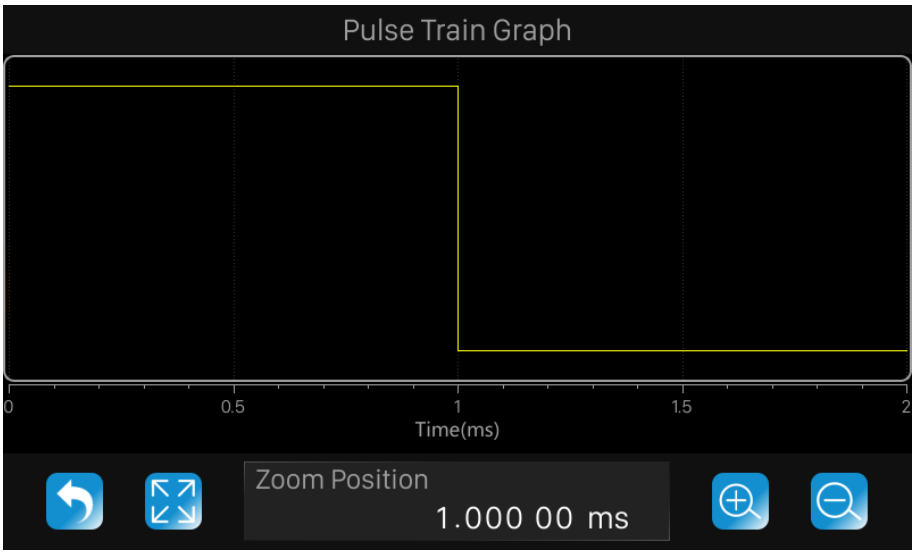


Figure 8-7 Pulse train graph page

As shown in the figure above, the page consists of the upper drawing area and the lower control area:

- Drawing area

  A schematic diagram of the waveform generated based on the current pulse train. The vertical direction represents the high and low level changes of each pulse signal in the pulse train, and the position of the high and low levels in this direction remains unchanged; the horizontal direction represents the high and low level duration of each pulse signal in the pulse train, which can be enlarged or reduced for easy observation and comparison.

- Control area
  - Click  to return to the pulse train editting page.
  - Click  to restore the waveform to the initial state.
  - The “Zoom Position” parameter control displays the center position of the current waveform, and the operations of zoom in, zoom out and restore buttons are based on this position. It can be set through the touch screen keyboard or the front panel keypad to make the current waveform translate to the corresponding position.
  - Click  to zoom in the center position of the current waveform.
  - Click  to zoom out the center position of the current waveform.

The zoom operation of the drawing area can be achieved in the following ways:

1) Zoom, pan and restore through the Control Area’s  ,  ,  button, and “Zoom Position” parameter.
2) You can also use your finger or stylus to zoom in or zoom out directly on the touch screen.
3) On the touch screen, use the mouse wheel. Pull the wheel down to zoom in and up to zoom out.

The zoom position of the wheel is consistent with the "zoom position" of the control area.

8.4.4.10 Pulse Out

The default state is off. Click the sliding switch to switch the pulse output state.

When the pulse output is turned on, the RF signal source will output the pulse signal generated by the internal pulse generator from the **[PULSE IN/OUT]** connector on the rear panel.

Note: When the pulse source is External, the pulse output state will be automatically turned off.

8.4.4.11 Pulse Out Polarity

Click *Pulse Out Polarity* to switch the polarity of the pulse signal output from the **[PULSE IN/OUT]** connector on the rear panel. The default is "Normal".

- Normal: Output positive polarity pulse signal.
- Inverse: Output negative polarity pulse signal.

8.4.4.12 Trigger Out

The default state is off. Click the sliding switch to switch the trigger output status.

When the trigger output is turned on, the RF signal source will output the trigger signal generated by the internal pulse generator from the **[TRIG IN/OUT]** connector on the rear panel.

Note: When the trigger mode is "Ext Trig" or "Ext Gate", the trigger output function will be automatically turned off. When the trigger mode of RF SWEEP or LF SWEEP is set to external, the trigger output function will also be automatically turned off.

8.4.4.13 Pulse Trigger

The trigger mode defaults to "Auto". The RF signal source offers five pulse trigger types: "Auto", "Key", "Bus", "Ext Trig" and "Ext Gate".

Click the drop-down box corresponding to the trigger mode to select the desired type.

- Auto: The signal source satisfies the trigger condition at any time.
- Key: When the trigger mode is selected as "key", the user interface will display the *Click to trigger* button. Each time you press the Trigger key or the *Click to trigger* button on the user interface, the RF signal source will start a pulse modulation.
- Bus: Each time the SCPI command "*TRG" is received, the RF signal source will start a pulse modulation.
- Ext Trig: When the trigger mode is selected as "Ext Trig", the user interface will display the "Trig Slope" button. At this time, the RF signal source receives the trigger signal input from the **[PULSE**

IN/OUT] connector on the rear panel. Each time a TTL pulse signal of specified polarity is received, the RF signal source starts a pulse modulation.

- Ext Gate: When the trigger mode is selected as "Ext Gate", the user interface will display the “Trig Polarity” button. At this time, the RF signal source receives the trigger signal input from the **[PULSE IN/OUT]** connector on the rear panel. Each time a TTL pulse signal of specified polarity is received, the RF signal source starts pulse modulation within its effective level.

8.4.4.14 Trigger Delay

The trigger delay represents the delay of the pulse modulated signal from the reception of the external trigger signal to the start of the first pulse modulation. When the trigger mode is "Ext Trig", the user interface will display the *Trigger Delay* setting item.

8.4.4.15 Trigger Slope

The default is “Positive”. Click the drop-down box to switch the trigger slope.

- Positive: Trigger a pulse when the positive slope of the external trigger signal arrives.
- Negative: Trigger a pulse when the negative slope of the external trigger signal arrives.

When the trigger mode is "Ext Trig", the user interface will display the *Trigger Slope* setting item.

8.4.4.16 Trigger Polarity

The default is “Normal”. Click the drop-down box to switch the trigger polarity.

- Normal: Trigger pulse modulation during the high-level effective time of the external gate signal.
- Inverse: Trigger pulse modulation during the low-level effective time of the external gate signal.

When the trigger mode is "Ext Gate", the user interface will display the *Trigger Polarity* setting item.

8.5 LF

8.5.1 LF Source

The RF signal source has a built-in low-frequency signal generator, which can be used as a low-frequency signal output or an internal source for analog modulation. When used as a low-frequency signal output, LF supports several commonly used waveforms, and the frequency and amplitude of the low-frequency signal can be set.

Press the LF key on the front panel, select *LF Source* in the menu, or click *LF* Module > *LF Source* on the home page to enter the LF parameter setting interface.

8.5.1.1 LF State

Press *LF State* to turn LF output on or off.

8.5.1.2 LF Shape

Press *LF Shape* to select the waveform of the LF output signal. The supported waveforms are "Sine", "Square", "Sawtooth", "Triangle" and "DC". The default is "Sine".

8.5.1.3 LF Frequency

Press *LF Frequency* to set the frequency of the LF output signal.

- When the waveform is "Sine", the LF frequency setting range is 0.01 Hz~1 MHz.
- When the waveform is "Square", "Sawtooth" or "Triangle", the LF frequency setting range is 0.01 Hz~20 kHz.

8.5.1.4 LF Level

Press *LF Level* to set the LF output amplitude. The setting range is 1 mVpp~3 Vpp. Multiple unit format settings are supported.

8.5.1.5 LF Level Offset

Press *LF Level Offset* to set the amplitude offset of the LF output. The setting range is

$$|LF\ Level\ Offset| \leq \min\left(2.5 - \frac{1}{2}LEVEL, 2\ V\right)$$

8.5.1.6 LF Phase

Press *LF Phase* to set the LF phase. The setting range is -360° ~ 360°, and it supports setting in degrees or radians.

8.5.2 LF Sweep

The RF signal source supports outputting LF waveforms that gradually change from the start frequency to the end frequency within a specified time, that is, LF output supports frequency sweeping. Press the LF key on the front panel, select *LF Sweep* in the menu, or click *LF* Module > *LF Sweep* on the home page to enter the LF Sweep parameter setting interface.

8.5.2.1 Sweep State

Press *Sweep State* to activate the LF frequency sweep signal generation.

8.5.2.2 Start Freq

Press *Start Freq* to set the start frequency of LF frequency sweep.

8.5.2.3 Stop Freq

Press *Stop Freq* to set the stop frequency of LF frequency sweep.

8.5.2.4 Center Freq

Press *Center Freq* to set the center frequency of LF frequency sweep.

8.5.2.5 Freq Span

Press *Freq Span* to set the frequency Span of LF frequency sweep.

8.5.2.6 Sweep Time

Press *Sweep Time* to set the duration of one LF sweep.

8.5.2.7 Direction

Press *Direction* to set the frequency direction of LF sweep to up or down.

- Up: Scan from the start frequency to the end frequency.
- Down: Scan from the end frequency to the start frequency.

8.5.2.8 Trigger Mode

The default LF trigger mode is "Auto". The RF signal generator provides four trigger types: "Auto", "Key", "Bus" and "Ext".

Click the drop-down box of *Trigger Mode* to select the desired type.

- Auto

  Generate a continuously repeating sweep signal immediately after activating the sweep mode.
- Key

  Each time the Trigger key on the front panel is pressed or the *Click to Trigger* button on the touch screen is clicked, the signal generator starts a sweep.
- Bus

  Each time the "*TRG" command is sent, the signal generator starts a sweep.
- Ext

  The signal generator receives the external trigger signal input from the **[TRIG IN/OUT]** connector on the rear panel of the instrument. Each time a TTL pulse signal of a specified polarity is received, the signal generator starts a sweep.

Note: If the trigger mode is changed during the LF sweep, the signal generator will stop sweeping and return to the initial state until the next trigger event starts.

8.5.2.9 Trigger Slope

When the trigger mode is external, you can select the type of *Trigger Slope* to determine whether the sweep is triggered by the "Positive" or "Negative" of the external trigger signal. The default trigger edge is "Positive".

Click the drop-down box to start the corresponding trigger edge setting:

- Positive: When the rising edge of the external trigger signal arrives, the sweep is triggered.
- Negative: When the falling edge of the external trigger signal arrives, the sweep is triggered.

Please note that the *Trigger Slope* button will only be displayed when the trigger mode is "Ext", and it is hidden in other cases.

8.5.2.10 Sweep Shape

Press *Sweep Shape* to select the cyclic mode of LF sweep. There are two types: "Sawtooth" and

"Triangle", and the default value is "Sawtooth".

- Sawtooth: Sweep period is always from the start frequency or start level to the stop frequency or stop level. The sweep sequence is similar to a "sawtooth wave".
- Triangle: Sweep period is always from the start frequency or start level to the stop frequency or stop level, and then return back to the start frequency or start level. The sweep sequence is similar to a "triangle wave".

8.5.2.11 Sweep Space

Press *Sweep Space* to select the mode for the calculation of the frequency sweep intervals.

- Linear

  Take the frequency value entered as an absolute value in Hz.
- Log

  Takes the value entered as a logarithmic value that means as a constant fraction of current frequency in %.

8.6 Power Sensor

The RF signal source can be connected to a USB power sensor through the USB Host interface. The power meter models currently supported by the RF signal source are shown in the following table:

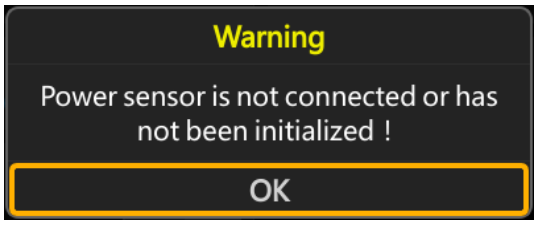
Table 8-1 Power sensor model supported

Manufacturer	Model
R&S	NRP6A, NRP18A
	NRP8S, NRP18S, NRP33S, NRP40S, NRP50S, NRP67S
	NRP40T
Keysight	U2000A, U2001A, U2002A, U2004A
	U2000B, U2001B
	U2000H, U2001H, U2002H

8.6.1 Parameter Settings

On the home page, click *SHORTCUT* > *RF* > *SENSOR* to enter the power meter parameter setting interface.

Please note that when the power sensor is not connected or initialized, you cannot set any parameters for the power sensor measurement. At this time, the user interface will pop up the following prompt:



8.6.1.1 Sensor Info

Displays the model information of the connected power sensor. If the power sensor is not connected or initialized, the power sensor information is blank.

8.6.1.2 Sensor State

Turn on or off the level measurement by the power sensor. The default is "off".

After turning on the power sensor measurement function, the measurement control refreshes the power sensor measurement value in real time.

8.6.1.3 Measurement

Display the current reading of the sensor.
You can select the unit used for result display: dBm, dBμV, uV, mV, V, nW, uW, mW, W.

8.6.1.4 Level Control

With the Level Control function, you can achieve very stable and accurate RF power your DUT. With the aid of a downstream control circuit, a CLPC (Closed Loop Power Control), you can detect frequency response characteristics of the components: such as losses due to cables, modules or components and compensate these effects accordingly.
For details, please refer to the introduction of the "Level Control" section.

8.6.1.5 Statistics

The Statistics function is disabled by default. When enabled, the statistics of the power sensor measurements will be displayed.

- On: Turn on the statistics function. The statistical parameters will be displayed next to the statistics switch. The statistical parameters include the average value, minimum value, maximum value and statistical times. Click the  button to clear all current statistical values and start a new round of statistics.
- Off: Turn off the statistics function. The statistical parameters will be automatically hidden.

8.6.1.6 Auto Zero

The power sensor zero adjustment function can reduce the impact of noise and zero deviation on the measurement results and improve the accuracy of RF power measurement.
Zero adjustment is disabled by default. Click the drop-down box to switch the zero adjustment type.

- Disabled: The zero buttons will be hidden.
- INT: Zero button is displayed.
- EXT: Zero button is displayed.

Click the “Click to perform zeroing” button and the power sensor will start the zero adjustment operation. At this time, the button name will change to "Zero Adjustment...". After the zero adjustment is completed, the button name will return to " Click to perform zeroing".

Please note when performing zeroing of the power sensor:

1) Generally, all measurement signals should be turned off before the power sensor performs zeroing. For specific operations, please refer to the user manual of the power sensor.

2) If the power sensor does not have the option of internal or external zeroing, the "INT" and "EXT" options in the drop-down box will be replaced by the "Enabled" option.

To reduce the impact of noise and zero deviation on the measurement results, it is recommended to zero the power sensor in the following situations:

- Warm-up phase just after connecting to the signal source
- Temperature change exceeds 5 ℃
- Connect the power sensor to the RF output port at high temperature
- The power sensor has not been zeroed in the past 24 hours
- Before measuring low-power signals, such as signals with expected measured power more than 10 dB below the lower limit of the measurement range

8.6.1.7 Frequency

The measured frequency mode is “Auto” by default. Click the drop-down box to switch the mode.

- Auto: Automatically configure the power sensor 's measurement frequency value based on the output frequency of the RF.
- Manual: The power sensor's measurement frequency value can be customized.

8.6.1.8 Level Offset

The level offset is set to "off" by default. Click the slide switch to turn the level offset on or off.

- On: The level offset value can be set at this time. The displayed reading value of the power sensor will be the actual measured value plus the level offset value. This function makes measurement easier when there are amplifiers and attenuators in the middle of the signal chain.
- Off: The level offset value setting will be automatically hidden. At this time the displayed reading value of the power sensor is consistent with the actual measured value.

8.6.1.9 Averaging

The averaging mode is “Auto” by default. Click the drop-down box to switch the averaging mode.

- Auto: Automatically configure the average times according to the current measurement. The average times are only displayed and cannot be modified.
- Manual: Manually set the average times of the power sensor measurement.

8.6.1.10 Logging

The log function is disabled by default. Click the slide switch to turn on or off the function. When the log function is turned on, the signal generator will record the measurement values and save them in

a log file in TXT format.

The log file is saved in the path: Local:/power_sensor/.

8.6.2 Level Control

Figure 8-8 Power control

As shown above, the sensor measures a proportional power in defined time intervals, derived from a coupler. It considers optionally the given S-parameters and returns the results to the generator. The signal generator compares the measured level with the set value and adjusts its output level accordingly. This allows you to control the external signal level continuously and reliably reach a constant input level at the DUT in real time.

In practice, an RF splitter is needed to split the RF signal. One of them is connected to the DUT and the other is connected to the power meter. The signal source is for acquisition and compensation. Power compensation can be used to minimize cable losses, the attenuation of passive networks, and the amplification of the signal by a power amplifier and the frequency response of each device in the link as the frequency changes.

Note: When the RF sweep function is turned on, the level control function cannot be turned on. The RF sweep function must be turned off before turning on the level control function, and vice versa.

8.6.2.1 Level Control State

The default setting is "off". Click the slide switch to switch the on/off state.

This setting item is the same as the "Level Control" function in the upper menu.

8.6.2.2 Measurement

Display the current power sensor reading. You can click the drop-down box to change the current power display unit.

This setting item is consistent with the "Measurement" function in the upper menu.

8.6.2.3 Target Level

Specify the nominal level expected at the input of the sensor. The signal generator adjusts the output power accordingly, in order to meet the target value at the sensor input, thus meeting the power required by the DUT.

8.6.2.4 Level Limit

Set an upper limit for RF output power to protect your DUT from damage due to high input power. If the input RF signal power exceeds the limit, the set value will not take effect and the source will pop up a warning message.

8.6.2.5 Catch Range

The capture range means that if the power sensor reading is within the effective capture range, it is a valid reading and the RF signal is adjusted and compensated. Set the capture range of the control system. If the power sensor reading exceeds this range, the reading will be ignored.
Effective Capture Range = Target Level +/- Catch Range

8.7 IQ Modulation

I/Q modulation, i.e. two orthogonal signals (carriers with the same frequency and phase difference of 90°, generally expressed by Sin and Cos) and I (In-Phase, in-phase component) and Q (Quadrature Phase, quadrature component) signals are respectively modulated by carrier and transmitted together, thereby improving spectrum utilization.

Note: Only some models of the SSG3000X series have the IQ modulation function, including SSG3021X-IQE and SSG3032X-IQE.

The I/Q modulation setup menu can be accessed by one of the following three ways:

- Click *I/Q* button on the shortcut menu.
- Click *I/Q* module on the home page.
- Press I/Q button on the front panel.

8.7.1 Turning on I/Q modulation

In the I/Q modulation interface, open *I/Q State*, and then press MOD ON/OFF to turn on the modulation master switch to enable I/Q modulation output.

Note: The modulation function must be activated to modulate the output signal. You can turn it on by pressing the MOD ON/OFF button or you can open it by checking the *MOD* module on the home page.

8.7.2 I/Q Source

The I/Q modulation uses an external modulation source that receives the I/Q in-phase baseband signal and quadrature phase modulation signal input from the **[I INPUT]** and **[Q INPUT]** connectors on the rear panel.

Note: SSG3000X-IQE can use any IQ baseband generator as the external modulation source, such as Keysight 3352B, SDG6000X, etc. For how to use SDG6000X to output I/Q modulation signals, please refer to the section "Output IQ Modulated Signal".

8.8 UTILITY

The UTILITY settings of the RF signal source include system settings and file management.

8.8.1 System

8.8.1.1 Setting

1. Language

   Set the display language of the RF signal source. The signal source supports Chinese and English menu, help and interface display.

   Press UTILITY > *Setting* > *Language* to expand drop down list, and then select the desired language.

2. Screen Saver

   Set the state of screen saver. When screen saver is switched on, screen saver will be enabled if no action is taken within the specified time. Click the touch screen or press any key to resume.

   Press UTILITY > *Setting* > *Screen Saver* to expand drop down list, and then select “off”, “10 s”, “1 min”, “5 min”, “15 min”, “30 min”, “1 hour” or “2 hour”.

3. Setup Type

   Set the type of parameter configuration to be loaded when the instrument startup.

   Press UTILITY > *Setting* > *Power On* to expand drop down list, and then select “Default” or “Last”.

   - Default: The factory defined default settings will be loaded at power-on. For more details, please refer to “Table 8-5 Default Settings”.
   - Last: The system setting before the last power-off will be loaded automatically at power-on.

4. Preset Type

   Set the parameters for the Preset configuration of the instrument.

   Press UTILITY > *Setting* > *Preset Type* to expand drop down list, and then select “Default” or “User”.

   - Default: The default settings will be loaded when PRESET is pressed. For more details, please refer to “Table 8-5 Default Settings”.
   - User: The user specified configuration will be loaded when PRESET is pressed.

     Note: After selecting the preset type as “User”, the file management interface will automatically open to allow the user to load the configuration file. You can also click  to change the configuration file.

5. Factory Reset

Restore the instrument configuration to factory settings.

Press UTILITY > *Setting* > *Factory Reset*, set the instrument parameters and status to factory defaults.

To restore factory settings, in addition to loading the default settings, the following functions and parameters will also be configured.

Table 8-2 Factory Default

Parameters	Default Value
Setting	
Language	Chinese/English (depend on factory configuration)
Screen Saver	Off
Setup Type	Default
Preset Type	Default
Beeper	On
Power On Line	Off
10M Adjustment	Off
Interface	
DHCP State	Off
IP Address	10.11.13.220
Subnet Mask	255.255.255.0
Gateway	10.11.13.1
VNC Operable	On
GPIB Address	18
Level	
Flatness	Empty list
Sweep	
List sweep	Keep only one default sweep point “1,1.5 GHz,-110 dBm,50 ms”
Pulse	
Pulse Train	Keep only one default pulse “1,1 ms,1 ms,1”

6. Reset & Clear

"Reset & Clear" will restore the instrument configuration to factory settings, as well as clean up files stored by users in "Local" folder.

Press UTILITY > *Setting* > *Reset & Clear* to set the instrument parameters and status to factory defaults and clean up local files.

7. Beeper

Set whether the beeper make a sound when clicking any button, input box or check box.

Press UTILITY > *Setting* > *Beeper* to switch the beeper state.

8. Power On Line

Set the instrument power on sequence. In some situations, you may want the instrument to automatically restart if the line power is restored.

- Off: If line power is available, you need to manually press the power key on the front panel to start the instrument.
- On: If line power is available, the instrument starts automatically. This is an idea feature for automatic or remote tests that may be difficult to physically reach.

Press UTILITY > *Setting* > *Power On Line* to switch the state.

9. 10M Adjustment

Modifying the Reference Oscillator Code will change the reference frequency. You can externally connect a frequency counter from the 10MHz OUT connector on the rear panel and adjust the 10MHz reference by modifying the code.

- Press  to save "*.dac" file to store the Ref Oscillator Code you currently set.
- Press *Recall Ref Osc Setting* to recall the Ref Oscillator Code you have stored.
- Press *Reset to default* to set the Ref Oscillator Code to default value, and the reference frequency will reset to the original value, too.
- Press UTILITY > *Setting* > *10M Adjustment* to switch the state.

10. Time Setting

Set the display time of the instrument.

Press UTILITY > *Setting* > *Time Setting*, then move the cursor to specified location and change the time by inputting the value.

8.8.1.2 System Info

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

- Model
- Host ID

- Serial Number
- Software Version
- Hardware Version
- Startup Times

8.8.1.3 Interface

Press UTILITY > *Interface* to view the instrument's remote control interface information, including:

1. LAN Setting

IP addresses can be assigned dynamically or statically. Open the *DHCP state* to set a dynamic IP. At this time, the DHCP server will automatically configure the IP address, subnet mask and gateway according to the current network conditions, and the user does not need to set it. Turn off the DHCP state and set a static IP. Users need to customize the IP address, subnet mask and gateway.

2. Web Setting

Web Setting includes the settings of VNC Operable state and Web password. Press UTILITY > *Interface* and scroll the scroll bar on the right side of the window to see the entire Web Setting content.

1) VNC Operable

Turn the Web control function on or off by turning the *VNC Operable* button on or off. When the VNC operation is enabled, users can control the instrument through a Web browser. Enter the IP address of the signal generator in a Web browser, and you can log in to the VNC.

If you want to control the instrument or send SCPI in the VNC, a dialog box will pop up where you need to enter your login password. You can set the log in password in *Web Password Setting*.

2) Web Password

Press *Web Password Setting* to enter the Web Password Setting interface. You can change the password by entering the Current password, New Password and Confirm password. You can also set the password to the default value "siglent" by clicking the "Reset to default" button.

3. GPIB Setting

Set the GPIB address from 1 to 30. A SIGLENT USB-GPIB adapter should be connected to the USB Host port of the RF signal source to expand the instrument's USB interface into a GPIB

interface.

8.8.1.4 Self Test

Press UTILITY > *Self Test* to enter the system's self-test interface.

1. **LCD Test**

   Press *LCD Test* to enter the screen detection.

   The RF signal source cycles through the red, green and blue pixels of the display to verify whether there are dot defects on the screen.

   Press 7 to change the color and press 8 to exit.

2. **Key Test**

   Press *Key Test* to enter the keyboard test interface. Press the function keys at the front panel one by one and observe whether the corresponding key is checked. If not, an error may have occurred in the key. To exit the test, press 8 three times or click the screen.

3. **LED Test**

   Press *LED Test* to enter the LED test interface. Press 7 to light or extinguish the key light of the button MOD ON/OFF and RF ON/OFF and press 8 to exit the test.

4. **Board Test**

   Press *Board Test* to enter the board test interface. Test whether writing and reading are normal for CPLD and FPGA.

5. **Touch Test**

   Press *Touch Test* to enter the touch screen test interface. Click the marks on the interface to test the touch screen and press 8 to exit the test.

8.8.1.5 Shutdown

Press UTILITY > *Shutdown* to power off the instrument according to operating hints on the interface.

8.8.1.6 Preset

Reset parameter settings according to the type of preset.

Press UTILITY > *Preset* to reset the parameters.

8.8.1.7 Update

Press UTILITY > *Update*, and select the update file. Then click *Recall* to update the system software. The progress bar will appear on the screen while updating and the instrument will restart automatically if updates succeed or pop-up prompt box if updates fail.

8.8.1.8 Option

Press UTILITY > *Option*, to enter the 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.

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 Time
IQE-21BW32	Permanent	--
PT	Temporary	30

Please refer to the data sheet for the option types of SSG3000X.

8.8.1.9 Help

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* to enter the help interface.
2. Click to enter the corresponding directory.

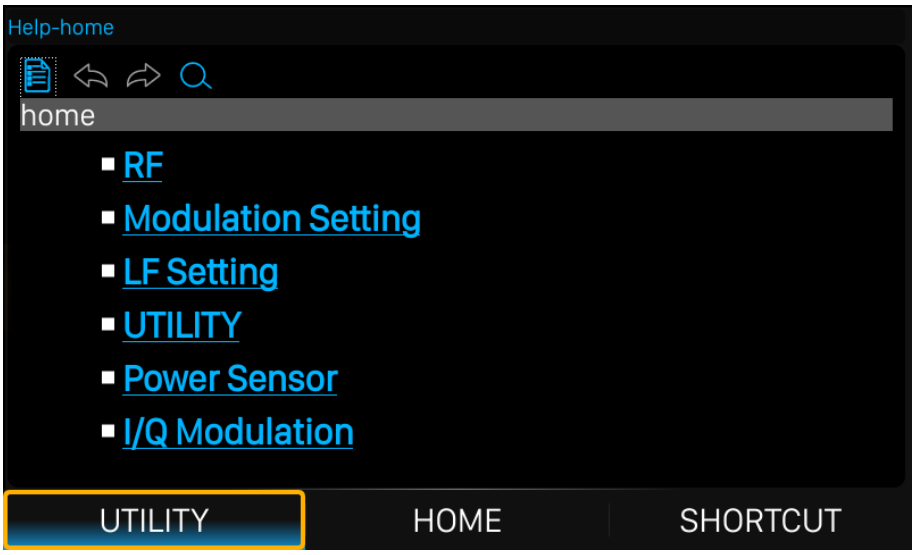


Figure 8-9 Help interface

8.8.1.10 Contact Us

Press UTILITY > *Contact Us* to view the contact information for SIGLENT. You can contact us to solve the problems meet in practical use. You can also write info@siglent.com or call your local SIGLENT sales office for support.

8.8.2 File

Press UTILITY > *Store/Recall* to enter file management page.

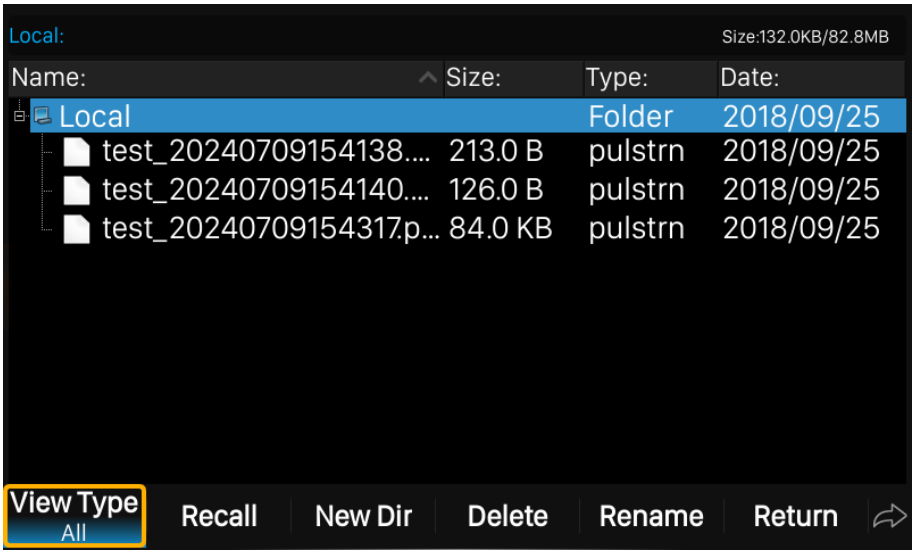


Figure 8-10 File management page

In the file management page, the top bar displays the currently selected path, folder or file, as well as

the size of the used memory and available memory in the Local path or USB flash drive. A file list is displayed in the middle of the interface. You can select files and fold or expand folders by tapping the touch screen. You can also use the up and down keys to select files and the left and right keys to collapse or expand folders. The bottom bar of the interface displays operation buttons. The specific operations are as follows.

1. View Type

Click *View Type* to change the type of files to show, including “All”, “Data”, “State” and “Update”.

Table 8-3 File Type

File Type		File Extension	Description
All	Data	LSW	Sweep list file
		UFLT	Flatness correction file
		PULSTRN	Pulse train file
		DAC	Reference oscillator code file
		TXT	Power sensor log file
	State	XML	System state file
	Update	CFG	Configuration update file
		ADS	System update file

2. Recall

Click *Recall* to load the selected file.

3. Save

Click *Save* to save the file with corresponding type according to the type of data.

4. Delete

Click *Delete* to delete the selected file or folder.

5. New Dir

Click *New Dir* to create new folders.

6. Rename

Click *Rename* to rename a file or folder.

7. Copy

Click *Copy* to copy the selected file or folder.

8. Paste

Click *Paste* to paste the copied file or folder to specified location.

8.9 Shortcut Keys

There are some shortcut keys on the front panel of the RF signal source to quickly perform specific functions. These shortcut keys include:

Table 8-4 Shortcut Keys

Shortcut Keys	Function
PRESET	Quick preset
HOME	Quick return to home page
ESC/Close	Exit remote mode or edit mode
Trigger	Execute key trigger
MOD ON/OFF	Modulation master switch
RF ON/OFF	RF output switch

8.9.1 PRESET

Recall the preset settings and restore the signal generator to a specified state.

- Press UTILITY > *Setting* > *Preset Type* to select "Default" or "User". When selecting the preset type as "User", you need to select the preset state file.
- Press PRESET, and the instrument will recall the default settings or user settings. The default settings are shown in the table below.

Table 8-5 Default Settings

Parameter	Default Value
RF	
RF State	Off
Frequency	
Frequency	3.2 GHz
Freq Offset	0 Hz
Phase Offset	0 deg
Level	
Level	-110 dBm
Level Offset	0 dB
ALC State	Auto
Flatness	Off

Sweep	
Sweep State	Off
Sweep Mode	Continuous
Direction	Up
Trigger Mode	Auto
Point Trigger	Auto
Trigger Slope	Positive
Step Sweep	
Step Sweep State	On
Start Freq	3.2 GHz
Stop Freq	3.2 GHz
Start Level	-110 dBm
Stop Level	-110 dBm
Sweep Points	11
Dwell Time	30 ms
Sweep Space	Linear
Sweep Shape	Sawtooth
List Sweep	
List Sweep State	Off
MOD	
MOD State	Off
AM	
AM State	Off
AM Source	Int
AM Shape	Sine
AM Rate	1 kHz
AM Depth	50 %
FM	
FM State	Off
FM Source	Int
FM Shape	Sine
FM Deviation	100 kHz
FM Rate	10 kHz

PM	
PM State	Off
PM Source	Int
PM Shape	Sine
PM Rate	10 kHz
PM Deviation	1 rad
Pulse	
Pulse State	Off
Pulse Source	Int
Pulse Mode	Single
Pulse Period	10 ms
Pulse Width	2 ms
Double Pulse Delay	4 ms
#2 Width	2 ms
Pulse Trigger	Auto
Trig Delay	140 ns
Trigger Slope	Positive
Trig Polarity	Normal
Pulse Train	Off
Trigger Out	On
Pulse Out	Off
Pulse Out Polarity	Normal
LF	
LF Source	
LF State	Off
LF Shape	Sine
LF Frequency	1 kHz
LF Level	500 mVpp
LF Offset	0 uV
LF Phase	0 deg
LF Sweep	
Sweep State	Off
Start Freq	500 Hz

Stop Freq	1.5 kHz
Center Freq	1 kHz
Freq Span	1 kHz
Sweep Time	1 s
Trigger Mode	Auto
Sweep Shape	Sawtooth
Trigger Mode	Linear
Direction	Up

8.9.2 HOME

Press the HOME button in any menu to quickly return to the main interface.

8.9.3 ESC/Close

This shortcut key has the following functions:

- Press this key to switch the instrument from remote control to manual control.
- During parameter editing, press this key to clear the input and exit parameter editing mode.
- In a dialog box containing an "ESC" button, press this key to close the dialog box.
- Exit the current menu and return to the previous menu.

8.9.4 Trigger

This shortcut key has the following functions:

- When the trigger mode of RF sweep is Key, press this key once to trigger a sweep.
- When the point trigger mode of RF sweep is Key, press this key once to trigger a point sweep.
- When the trigger mode of pulse modulation is Key, press this key once to start a pulse modulation.
- When the trigger mode of LF sweep is Key, press this key once to trigger a LF sweep.

8.9.5 MOD ON/OFF

Press this key to turn on the RF modulation, the key backlight turns on, and the MOD icon in the user interface status bar changes from gray to blue. Press this key again to turn off all the modulations, the key backlight turns off, and the MOD icon in the user interface status bar changes from blue to gray.

8.9.6 RF ON/OFF

Press this key to turn on the RF output, the key backlight turns on, and the RF icon in the user interface status bar changes from gray to blue. Press this key again to turn off the RF output, the key backlight turns off, and the RF icon in the user interface status bar changes from blue to gray.

9 Remote Control

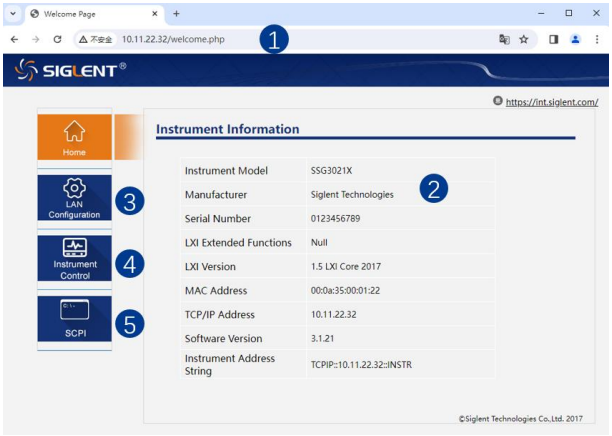
The RF signal source has USB, LAN and USB-GPIB interfaces. Based on these three interfaces, users can achieve remote control of RF signal source in a variety of ways.

9.1 Remote Control via SCPI

Based on the above mentioned interfaces, the RF signal source supports remote control by sending SCPI commands to the instrument through NI-VISA, Telnet or Socket connection. For details, please refer to the programming manual of this product.

9.2 Web Control

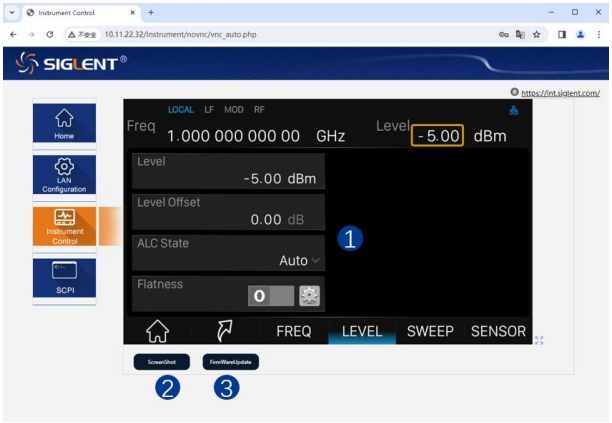
The RF signal source also supports user access and control through a web browser. Users can access the RF signal source by entering the instrument IP address in the browser address bar.



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

Note: For details on the settings of the web page control switch, web page access password and IP address, please refer to the "Interface" section.

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

10 Troubleshooting

The following lists the possible faults and troubleshooting methods that may occur during the use of the RF signal source. When you encounter these faults, please follow the corresponding steps to handle them. If the problem remains, please contact **SIGLENT** as soon as possible.

1. The screen is still black with no display after power on:
   1) Check the power supply:
      — Check that the power connector is connected correctly,
      — Check that the power switch is turned on.
   2) Check whether the fan rotates normally:
      — If the fan rotates and the screen does not light up, the screen connection cable may be loose.
      — If the fan does not rotate, it means the instrument has not been successfully powered on. Please refer to step 2.
   3) Check whether the fuse is burned out. If the fuse needs to be changed, please contact **SIGLENT** timely and return the instrument to the factory for replacement by **SIGLENT** authorized maintenance personnel.
   4) After completing the above checks, please restart the instrument. If you still cannot start the product normally, please contact **SIGLENT**.

2. No response when pressing keys or key strings:
   1) After powering on, confirm whether all buttons are unresponsive.
   2) Press UTILITY > *Self Test* > *Key Test* to confirm whether there is any unresponsive button or key string phenomenon.
   3) If the above fault exists, it may be that the keyboard connection cable is loose or the keyboard is damaged. Please do not disassemble the instrument yourself and contact **SIGLENT** in time.

3. The settings are correct but the waveform output is incorrect:
   1) No RF output
      — Check whether the signal cable is firmly connected to the **[RF OUTPUT 50Ω]** port.
      — Check the connecting cable for damage.
      — Check whether the RF ON/OFF button light is on. If it is not lit, press the key to light it, and the RF icon in the status bar of the user interface turns blue. At this point the RF ON/OFF output is turned on correctly.
      — Check whether the signal output amplitude is too small and adjust the output amplitude appropriately.

2) No modulation on RF output

— Check whether the signal cable is firmly connected to the **[RF OUTPUT 50Ω]** port.

— Check the connecting cable for damage.

— Check whether the MOD ON/OFF and RF ON/OFF button lights are on, and check whether the modulation switch is turned on.

— Check whether the modulation parameters are appropriate and adjust the modulation parameters appropriately.

— If using an external modulation source, make sure the external source is connected correctly and has an output, and it should work within the specified range of the signal source.

4. Sweep function abnormality

1) Sweeping stalled

The user interface displays a sweeping progress bar in the frequency/level area, indicating that the sweeping operation is in progress. If stagnation occurs, there are a few things you should check:

— Turn on at least one sweep type: Press SWEEP > *Sweep State* and select "Freq", "Level" or "Freq & Level".

— If it is single sweep mode, click *Execute single sweep* and when the trigger conditions are met, a sweep will be started.

— If the sweep trigger mode is not automatic trigger, set the sweep trigger mode to "Auto" to determine whether the sweep trigger loss is blocking the sweep.

— If the point trigger mode is not automatic, set the point trigger mode of the sweep to "Auto" to determine whether point trigger loss is blocking the sweep.

— Determine whether the dwell time is too large or too small, resulting in no visible sweeps.

2) There is no change in amplitude in list or step sweep

— Make sure the sweep type is set to Level or Freq & Level.

— If the current sweep type is set to frequency, the amplitude value does not change.

5. The USB storage device cannot be recognized:

1) Check whether the USB storage device can work normally.

2) Make sure the USB interface can work normally.

3) Make sure that the USB storage device being used is a flash storage type. This signal source does not support hardware storage type.

4) Restart the instrument and then insert the USB storage device to check it.

5) If the USB storage device still cannot be used normally, please contact **SIGLENT**.

6. Inaccurate measurement results or insufficient accuracy:

   Users can obtain detailed descriptions of technical indicators from the data sheet to calculate system errors and check measurement results and accuracy issues. To achieve the performance specifications listed in this manual, you need to:

   1) Check if the RF signal source is within the calibration period (1 year).
   2) Verify that the RF signal source has been warmed up for at least 30 minutes before testing.
   3) Check that the performance of the test equipment used meets the requirements.
   4) Ensure that the test equipment used is within the calibration cycle.
   5) Check if the test equipment used is under the working conditions required by its manual.
   6) Check if all connections are tightened.

7. Pop-up Message:

   The instrument may display prompt messages, error messages or status messages according to the current working status. These messages can help you to use the instrument correctly and are not instrument failures.

About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, RF/MW signal generators, spectrum analyzers, vector network analyzers, digital multimeters, DC power supplies, electronic loads and other general purpose test instrumentation. Since its first oscilloscope was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

Headquarters:

SIGLENT Technologies Co., Ltd
Add: Bldg No.4 & No.5, Antongda Industrial Zone, 3rd Liuxian Road, Bao'an District, Shenzhen, 518101, China
Tel: + 86 755 3688 7876
Fax: + 86 755 3359 1582
Email: sales@siglent.com
Website: int.siglent.com

North America:

SIGLENT Technologies America, Inc
6557 Cochran Rd Solon, Ohio 44139
Tel: 440-398-5800
Toll Free: 877-515-5551
Fax: 440-399-1211
Email: info@siglentna.com
Website: www.siglentna.com

Europe:

SIGLENT Technologies Germany GmbH
Add: Staetzlinger Str. 70
86165 Augsburg, Germany
Tel: +49(0)-821-666 0 111 0
Fax: +49(0)-821-666 0 111 22
Email: info-eu@siglent.com
Website: www.siglenteu.com

Follow us on
Facebook: SiglentTech