Signal Generator

GSG-2000

User Manual

ISO-9001 CERTIFIED MANUFACTURER

The information in this manual was correct at the time of printing. However, Good Will continues to improve its products and therefore reserves the right to change the specifications, equipment, and maintenance procedures at any time without notice.

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Table of Contents

SAFETY INSTRUCTIONS

This chapter contains important safety instructions that you must follow during operation and storage. Read the following before any operation to ensure your safety and to keep the instrument in the best possible condition.

Safety Symbols

These safety symbols may appear in this manual or on the instrument.

 WARNING	Warning: Identifies conditions or practices that could result in injury or loss of life.
 CAUTION	Caution: Identifies conditions or practices that could result in damage to the GSG-2000 or to other properties.
	DANGER High Voltage
	Attention Refer to the Manual
	Protective Conductor Terminal
	Earth (ground) Terminal
	DANGER Hot Surface
	Double Insulated

Do not dispose electronic equipment as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased.

Safety Guidelines

General Guideline ⚠ CAUTION	• Do not place heavy objects on the instrument. • Do not place flammable objects on the instrument. • Avoid severe impact or rough handling that may damage the function generator. • Avoid discharges of static electricity on or near the function generator. • Use only mating connectors, not bare wires, for the terminals. • The instrument should only be disassembled by a qualified technician. (Measurement categories) EN 61010-1:2010 (Third Edition) specifies the measurement categories and their requirements as follows. The GSG-2000 falls under category II. • Measurement category IV is for measurement performed at the source of a low-voltage installation. • Measurement category III is for measurement performed in a building installation. • Measurement category II is for measurement performed on circuits directly connected to a low voltage installation. • Measurement category I is for measurements performed on circuits not directly connected to Mains.
Power Supply ⚠ WARNING	• AC Input voltage: 100-240V. • Connect the protective grounding conductor of the AC power cord to an earth ground to prevent electric shock.

Fuse ⚠ WARNING	Fuse type: 250V, T1.0A (for GSG-2160) 250V, T0.8A (for GSG-2060) • Only qualified technicians should replace the fuse. • To ensure fire protection, replace the fuse only with the specified type and rating. • Disconnect the power cord and all test leads before replacing the fuse. • Make sure the cause of fuse blowout is fixed before replacing the fuse.
Cleaning the function generator	• Disconnect the power cord before cleaning the function generator. • Use a soft cloth dampened in a solution of mild detergent and water. Do not spray any liquid into the function generator. • Do not use chemicals containing harsh products such as benzene, toluene, xylene, and acetone.
Operation Environment	• Location: Indoor, no direct sunlight, dust free, almost non-conductive pollution (Note below) and avoid strong magnetic fields. • Relative Humidity: ≦80%, 0~40°C ; ≦70%,35~40°C • Altitude: < 2000m • Temperature: 0°C to 40°C

(Pollution Degree) EN 61010-1:2010(Third Edition) specifies pollution degrees and their requirements as follows. The function generator falls under degree 2.

Pollution refers to "addition of foreign matter, solid, liquid, or gaseous (ionized gases), that may produce a reduction of dielectric strength or surface resistivity".

- Pollution degree 1: No pollution or only dry, non-conductive pollution occurs. The pollution has no influence.
- Pollution degree 2: Normally only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation must be expected.
- Pollution degree 3: Conductive pollution occurs, or dry, non-conductive pollution occurs which becomes conductive due to condensation which is expected. In such conditions, equipment is normally protected against exposure to direct sunlight, precipitation, and full wind pressure, but neither temperature nor humidity is controlled.

Storage environment

- Temperature: 0-40 °C;
- Humidity:
  Up to 80 % for ambient temperature up to 40 °C
  Up to 70 % for ambient temperature 35-40 °C
- Altitude: up to 2000 m

Disposal

Do not dispose this instrument as unsorted municipal waste. Please use a separate collection facility or contact the supplier from which this instrument was purchased. Please make sure discarded electrical waste is properly recycled to reduce environmental impact.

Power cord for the United Kingdom

When using the function generator in the United Kingdom, make sure the power cord meets the following safety instructions.

NOTE: This lead/appliance must only be wired by competent persons

WARNING: THIS APPLIANCE MUST BE EARTHED

IMPORTANT: The wires in this lead are coloured in accordance with the following code:

Green/ Yellow:	Earth
Blue:	Neutral
Brown:	Live (Phase)

As the colours of the wires in main leads may not correspond with the coloured marking identified in your plug/appliance, proceed as follows:

The wire which is coloured Green & Yellow must be connected to the Earth terminal marked with either the letter E, the earth symbol ⏚ or coloured Green/Green & Yellow.

The wire which is coloured Blue must be connected to the terminal which is marked with the letter N or coloured Blue or Black.

The wire which is coloured Brown must be connected to the terminal marked with the letter L or P or coloured Brown or Red.

If in doubt, consult the instructions provided with the equipment or contact the supplier.

This cable/appliance should be protected by a suitably rated and approved HBC mains fuse: refer to the rating information on the equipment and/or user instructions for details. As a guide, a cable of 0.75mm² should be protected by a 3A or 5A fuse. Larger conductors would normally require 13A types, depending on the connection method used.

Any exposed wiring from a cable, plug or connection that is engaged in a live socket is extremely hazardous. If a cable or plug is deemed hazardous, turn off the mains power and remove the cable, any fuses and fuse assemblies. All hazardous wiring must be immediately destroyed and replaced in accordance to the above standard.

GETTING STARTED

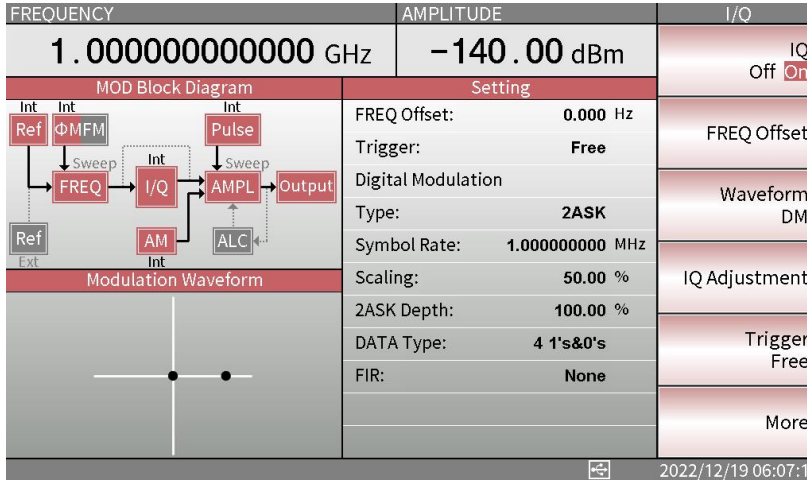
The Getting started chapter introduces the function generator's main features, appearance, set up procedure and power-up.

Main Features

Performance	• Highest frequency: 9kHz to 6GHz • Amplitude accuracy: < 0.8dB (0dBm CW signal at 25C) • Output amplitude range: -140dBm to 20dBm (settable) • High signal purity, phase noise: -117dBc/ Hz@20kHz offset from 1GHz carrier • Standard AM/FM/ΦM analog modulation • Standard pulse modulation; user-defined pulse train generator • I/Q modulation with 120MHz RF bandwidth and 60MHz baseband output. • Up to 180MHz dual baseband ARB generators with 16GB memory. • All modulation schemes support internal and external modulation modes. • Standard USB/LAN/GPIB remote control interfaces. SCPI command set for remote control.

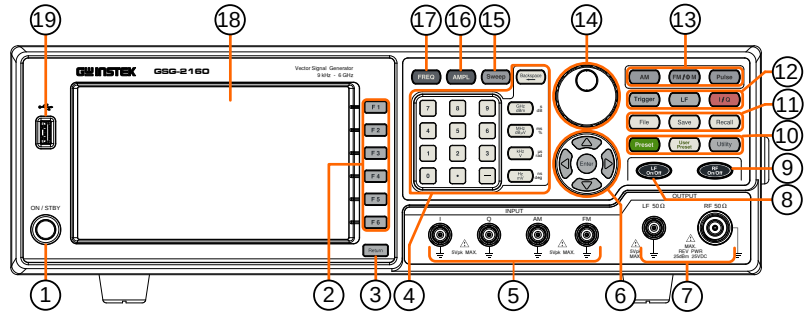
Panel Overview

Display

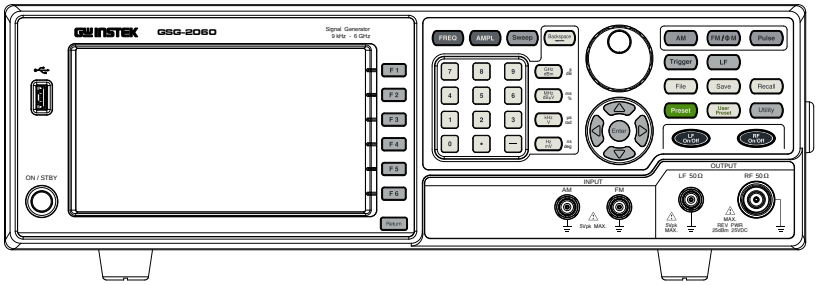


MOD Block Diagram	It is used to display current block diagram.
Setting area	Displays the current setting status.
Soft keys menu	It is used to select modulation function setting.
Modulation Waveform	It is used to display the waveform.
Frequency	It is used to display waveform's frequency.
Amplitude	It is used to display waveform's amplitude.

GSG-2160 Front Panel

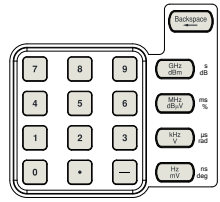


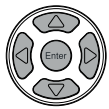
GSG-2060 Front Panel

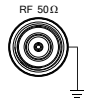


Item	Index	Description
1		Power Button
2		F1~F6 function keys
3		Return key
4		Numeric pad
5		Input Ports
6		Arrow keys and Enter Key
7		Output Ports
8		LF ON/OFF Key
9		RF ON/OFF Key
10		Preset, User preset Key and Utility Keys
11		File Key, Save Key and Recall keys
12		Trigger, LF and I/O keys
13		Waveform Keys

14	Scroll wheel
15	Sweep Key
16	Amplitude Key
17	Frequency Key
18	LCD Display
19	USB Host port

Item	Description
LCD Display	TFT color display, 1024 x 600 resolution.
Waveform Keys	 These three keys are used to set up output modulation waveforms.
Numeric pad	 Numeric pad for inputting variable setting values.
FREQ Key	 It is used to display current waveform's frequency and frequency can to set through this key.
AMPL Key	 It is used to display current waveform's amplitude and amplitude can to set through this key.
Sweep Key	 It is used to sweet current waveform set through this key.
Trigger Key	 It is used to manually trigger for Sweep, pulse modulation and IQ modulation.
LF Key	 It is used to set up LF waveform and output it from LF output. The LF output key on the keypad lights up when outputting

I/Q Key		It is used to set up options related to vector modulation. Modulated waveform will be output from the RF output terminal (For GSG-2160 only).
File Key		It is used to access storage memory and ménage files (including copy, delete, and rename files).
Save Key		It is used to save present saving.
Recall Key		It is used to read out the setting value.
Preset Key		It is used to enable preset status.
User preset Key		User preset save: for saving the current GSG-2000 settings. User preset execute: for resetting the GSG-2000 the settings saved in the user preset.
Utility Key		This key can be used to set up many functions such as IO configuration, brightness setting, display error page and so forth.
F1~F6 functions keys		Assigned to the functions displayed on the right side of the screen
Return key		Press this button to return to the previous menu.
Arrow keys and Enter Key		It is used to select digits when editing parameters.

LF ON/OFF Key		Turn off the present setting LF waveform from BNC connector. When output is turned on, the button lights up.
RF ON/OFF Key		Turn off the present RF output signal or turn on RF output from N-type connector. When output is turned on, the button lights up.
Output Ports		It is used for outputting the set RF signal. Set frequency or amplitude through freq, amp, sweep keys and set modulation through AM, FM/PM, pulse, and IQ keys.
		It is used for outputting the set LF signal. Set waveform through the LF key.
Input Ports		All connectors have full scale from +1V~ to -1V. If input exceeds 5Vpk, the GSG-2000 may damage. It is used for inputting external FM/ΦM modulation. To switch modulation signal source, you need to do setting form FM/ΦM > FM (ΦM) configuration > FM (ΦM) waveform > external setting page.
		It is used for inputting external AM modulation. To switch modulation signal source, you need to do setting form AM > waveform > external setting page.
		It is used for inputting quadrature signal after external digital modulation. To switch modulation signal source, you need to do setting form IQ > waveform > external setting page (For GSG-2160 only).

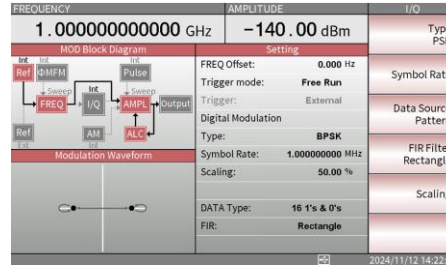
		It is used for inputting in-phase signal after external digital modulation. To switch modulation signal source, you need to do setting form IQ > waveform > external setting page (For GSG-2160 only).
Power Button		It is used to turn on or off the unit.
USB Host port		It is used to connect with USB type-A device.
Scroll Wheel		It is used to edit values and parameters. Decrease  Increase

Editing FIR filter

Panel Operation

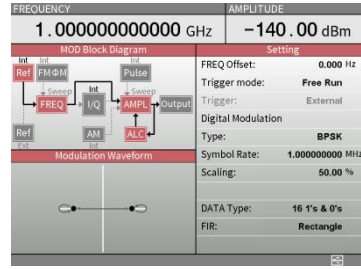
1. Once you select an I/Q type, you can edit its FIR filter by pressing the F4 key.

F4



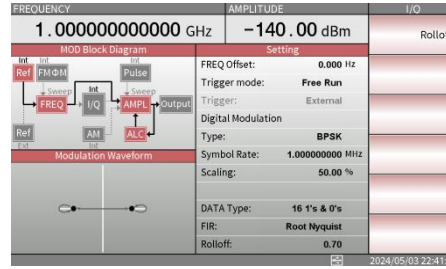
2. Press the F1 key to select Rectangle as the FIR filter of the I/Q type you currently selected.

F1

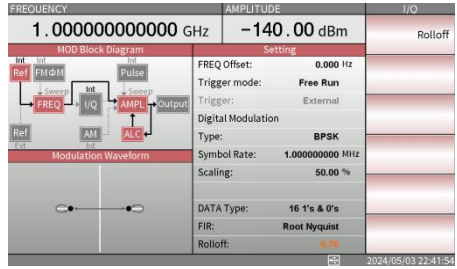


1. Press the F2 key to select Root Nyquist as the FIR filter of the I/Q type you currently selected.

F2



2. Press the F1 key to edit its Rolloff.

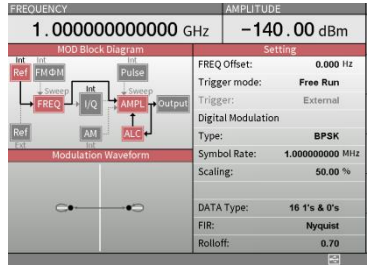


3. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

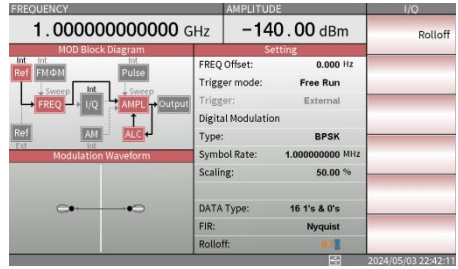
4. You can also use the numeric keyboard to input value you need directly.

5. Press the Enter key to confirm that value you set.

6. Press the F3 key to select Nyquist as the FIR filter of the I/Q type you currently selected.



7. Press the F1 key to edit its Rolloff.

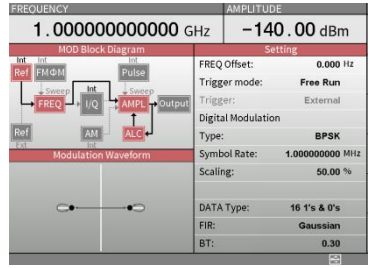


8. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

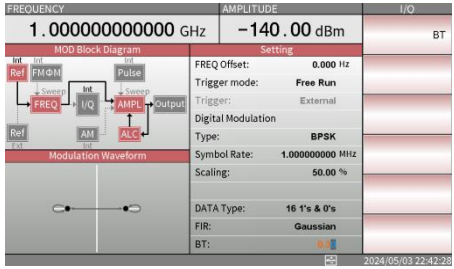
9. You can also use the numeric keyboard to input value you need directly.

10. Press the Enter key to confirm that value you set.

11. Press the F4 key to select Gaussian as the FIR filter of the I/Q type you currently selected.

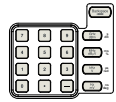


12. Press the F1 key to edit its BT.



13. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

14. You can also use the numeric keyboard to input value you need directly.



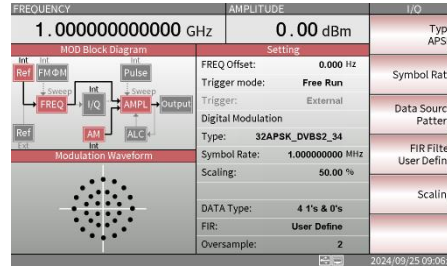
15. Press the Enter key to confirm that value you set.

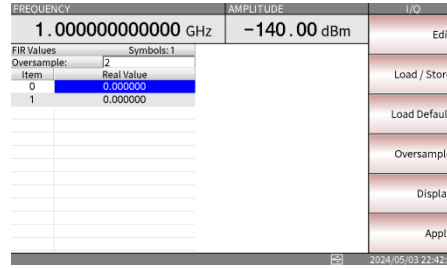
Editing User-defined FIR Filter

Panel Operation

1. Press the F5 key under the FIR Filter menu to customize the FIR filter of the I/Q type you currently selected.

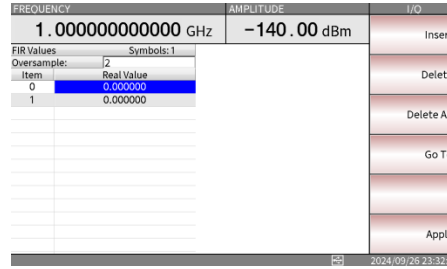
F5





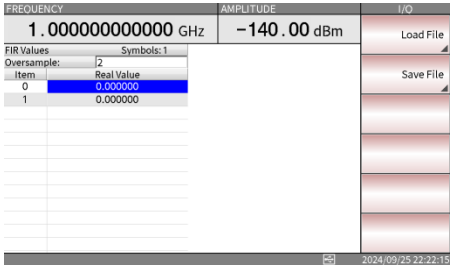
2. Press the F1 key to enter the editing page.

F1



3. Press the F2 key to load a user-defined .iqdr file or save the edited user-defined .iqdr file.

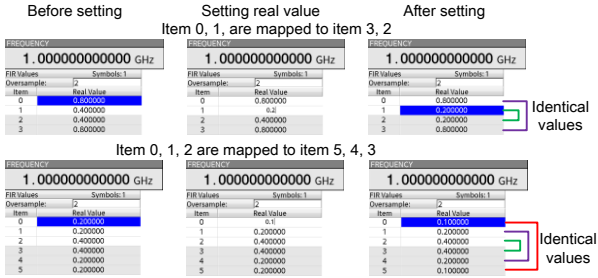
F1



Note

When you set the real value in some items(the range of real value is between -1 and 1), the identical values will automatically copied and mapped into the symmetrically corresponding items. For example, items 0, 1 into items 3, 2, or items 0, 1, 2 into items 5, 4, 3.

Illurtration



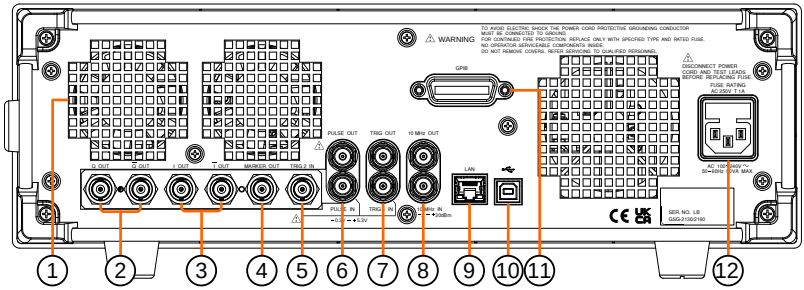
Note

The steps of panel operation in these two menus are similar to that in the pulse train operation's edit menu except for loading and storing file format. Here the format is .iqdr. Please refer to page 77 through page 80 for details of the panel operation of the User Define FIR filter option.

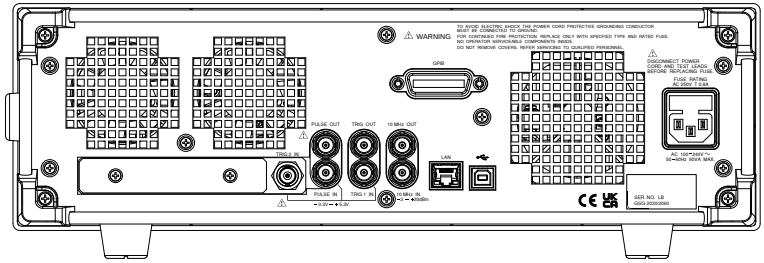
Note

After entering the edit menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the “Exit” (F1) key or the “Save & Exit” (F2) key to exit. Press the F1 key to exit directly, and press the F2 key to save the editing results and exit.

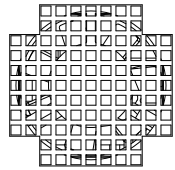
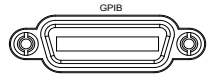
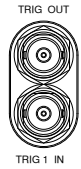
GSG-2160 Rear Panel

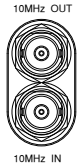
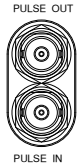
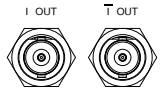


GSG-2060 Rear Panel

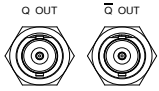


Item Index	Description
1	Fan
2	Q OUT Ports
3	I OUT Ports
4	MARKER OUT port
5	Trigger 2 IN port
6	Pulse IN and OUT ports
7	Trigger 1 IN port and Trigger OUT port
8	10MHz IN and OUT ports
9	LAN port
10	USB Device Port
11	Power Input Socket
12	GPIB port

Item	Description	
Fan		Fan for heat sink.
Power Input Socket		Power input: 100-240V, 50-60Hz
USB Device Port		USB type-B device port is used to connect the function generator to a PC for remote control.
RS232 Port		Ethernet port for controlling the GSG-2000 remotely.
GPIB Port		GPIB connector for units equipped with IEEE programming option. (Factory Installed Options)
Trigger 1 IN port and Trigger Out port		TRIG 1 IN port: It can be used to trigger sweep, IQ and pulse signals. TRIG OUT port: It can be selected from BNC output route in the sweep, IQ and pulse menus.

10MHz IN and Out ports		10MHz IN: It is terminal for external 10MHz reference frequency input. Input range is from – 3 to 20dBm. Choose internal or external frequency reference source from the freq>freq ref source menu. 10MHz OUT: It can be used to output 1Vpp 10MHz with the same frequency as the current reference source.
Pulse IN and Out ports		PULSE IN: It can be used for pulse modulation signal input. Enter setting menu pulse>waveform>external to switch the modulation signal source. It can be can also be used to trigger sweep, IQ, pulse signals as well. The setting method is the same as TRIG IN. PULSE OUT: Default is to output pulse modulation wave for this terminal, which can be modified by entering BNC output route in the sweep, IQ, pulse menu.
Trigger 2 IN port		It can be used for external trigger input. The setting methods are the same as that of TRIG IN.
MARKER out port		The default function is IQ trigger output (Temporarily the Maker feature is unavailable). It can be modified by BNC output route in the sweep, IQ, and pulse menus (For GSG-2160 only).
I out ports		It is used to output **in phase waveform** of IQ function and differential is+1V~-1V for output full scale (For GSG-2160 only).

Q out ports



It is used to output in **quadrature waveform** of IQ function and differential is+1V~- 1V for output full scale (For GSG-2160 only).

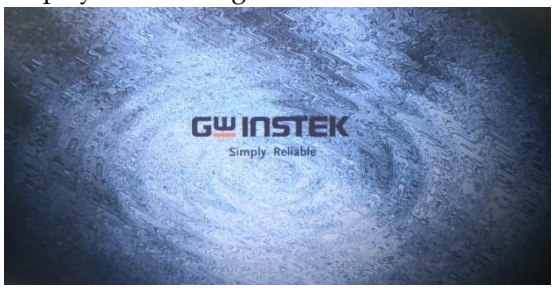
Setting Up the function Generator

Power Up

1. Connect the power cord to the socket on the rear panel.

2. Turn on the power switch on the front panel.

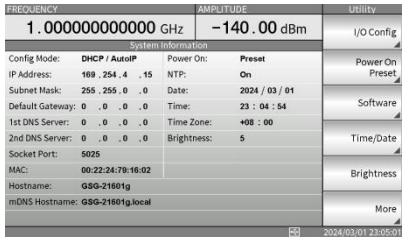
3. When the power switch is turned on the screen displays the loading screen.

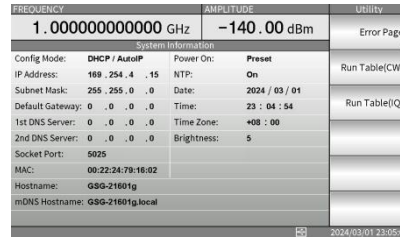


The function generator is now ready to be used.

UTILITY MENU

Press Utility button on the front panel of GSG-2000 series to do the following setting.



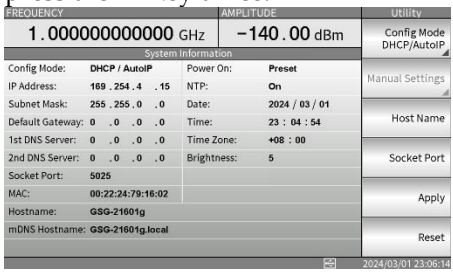


I/O configuration

Panel Operation

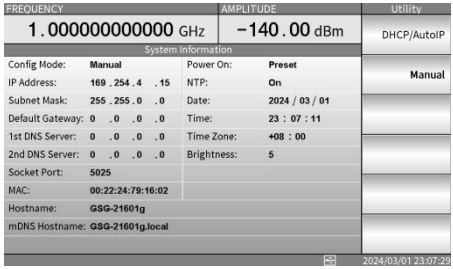
1. To move on to the setting option, press the F1 key twice.

F1 x2



2. To select the configuration mode, press the F1 key again. You can choose between manual and auto modes.

F1



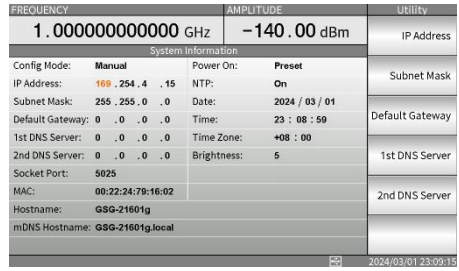
3. For auto mode, simply press the F1 key. And for manual mode, press the F2 key.

F1 or F2

4. If auto mode is selected, you can see the item Config Mode switched to DHCP/AutoIP as shown in the figure below.

5. If auto mode is selected, you can see the item Config Mode switched to Manual as shown in the figure below.

6. If you select Manual as I/O configuration mode, you can press the F2 key to do further settings such as IP Address, Subnet Mask, Default Gateway, 1st DNS Server, and 2nd Server.

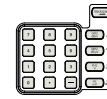


IP Address setting

Panel Operation

1. Press the F1 key to set the IP address. The number of IP address to be set will flash in orange color.

2. Use the number keys on the numeric keyboard and the right and left keys to edit the number of the IP address.

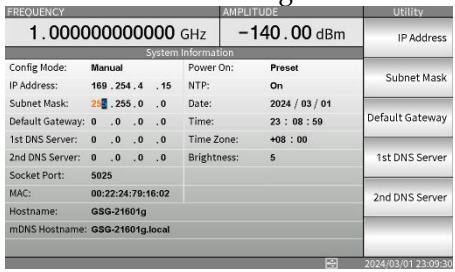


3. Press the Enter key to confirm and move on to the following number of the IP address.

Subnet Mask setting

Panel Operation

1. Press the F2 key to set the subnet mask. The number of subnet mask to be set will flash in orange color.



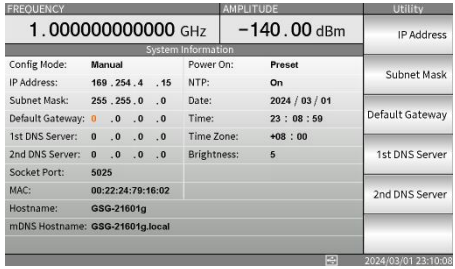
2. Use the number keys on the numeric keyboard and the right and left keys to edit the number of the subnet mask.

3. Press the Enter key to confirm and move on to the following number of the subnet mask.

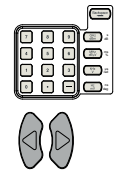
Default Gateway setting

Panel Operation

1. Press the F3 key to set the default gateway. The number of default gateway to be set will flash in orange color.



2. Use the number keys on the numeric keyboard and the right and left keys to edit the number of the default gateway.



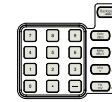
3. Press the Enter key to confirm and move on to the following number of the default gateway.

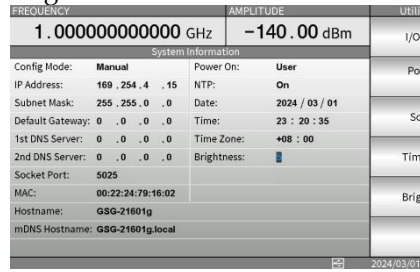
Brightness setting

Panel Operation

To move on to the setting option, press the F5 key.

The brightness blink in orange color. Use the number keys on the numeric keyboard to edit the brightness. There are five level of brightness available.



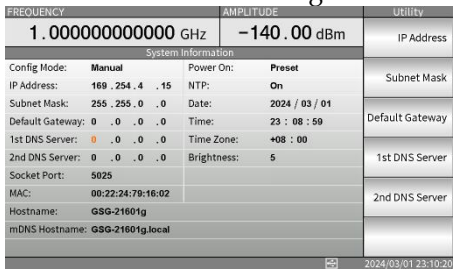


Press the Enter key to confirm.

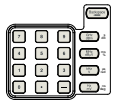
1st DNS server setting

Panel Operation

1. Press the F4 key to set the 1st DNS server. The number of 1st DNS server to be set will flash in orange color.



2. Use the number keys on the numeric keyboard and the right and left keys to edit the number of the 1st DNS server.

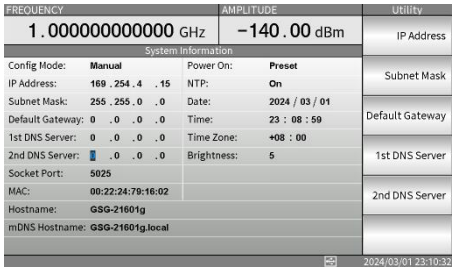


3. Press the Enter key to confirm and move on to the following number of the 1st DNS server.

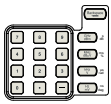
2nd DNS server setting

Panel Operation

1. Press the F5 key to set the 2nd DNS server. The number of 2nd DNS server to be set will flash in orange color.



2. Use the number keys on the numeric keyboard and the right and left keys to edit the number of the 2nd DNS server.

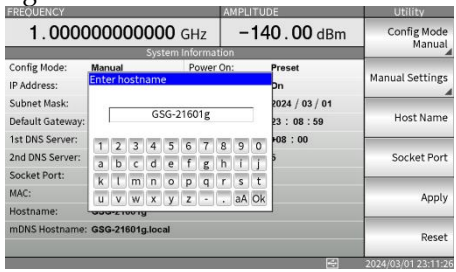


3. Press the Enter key to confirm and move on to the following number of the 2nd DNS server.

Hostname setting

Panel Operation

1. You can press the F3 key to modify the hostname under the menu of the I/O configuration. When the F3 key is pressed, you will see a keypad with numbers and letters in the center of the screen as shown in the figure below.



2. Use the arrow keys and the keys on the keypad to edit the host name and finally press the OK key on the left lower corner to apply the setting.

Socket port setting

Panel Operation

1. You can press the F4 key to modify the hostname under the menu of the I/O configuration. When the F4 key is pressed, you will see an information note about this setting. Press any soft key to continue setting.

2. Use the number keys on the numeric keyboard and the right and left keys to edit the socket port.

3. Press the F5 (Apply) key to apply your setting or Press the F6 (Reset) key to abandon setting.

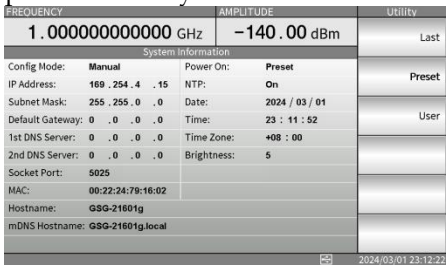
F5 or F6

Power on setting

Panel Operation

1. To move on to the setting option, press the F2 key.

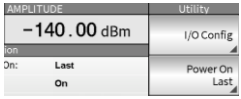
F 2



2. There are three mode of power on available. Select one mode that you need.

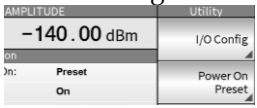
3. Press the F1 key if you prefer to keep the same setting from the last shutdown when turning on this device.

F 1



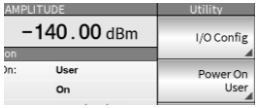
4. Press the F2 key if you prefer to use **Preset** setting.

F 2



5. Press the F3 key if you prefer to use the user's custom setting.

F 3



Software setting

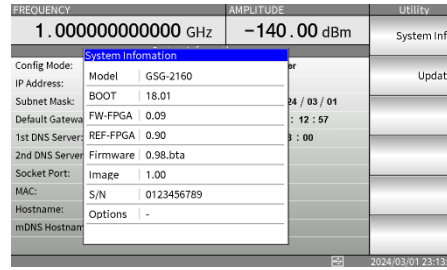
Panel Operation

1. To move on to the setting option, press the F3 key.

F3

2. Press the F1 key to check the system information.

F1

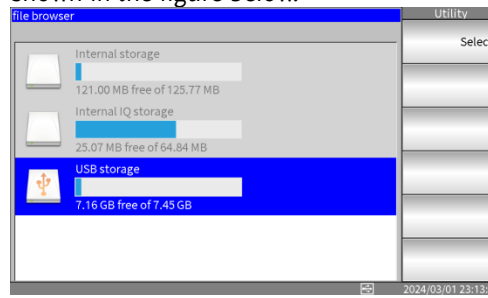


3. Press the F2 key to update the software when there is any new version of software needs to be updated.

F2

Note

Before updating the software, the updated file needs to be saved in the USB flash disk. When you insert the disk, you can see bar USB storage become blue as shown in the figure below.

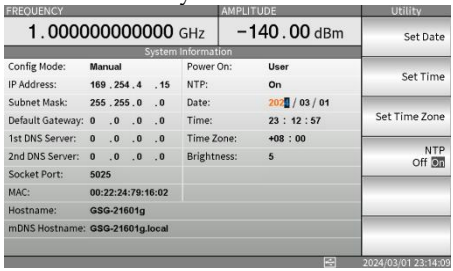


Time/Date setting

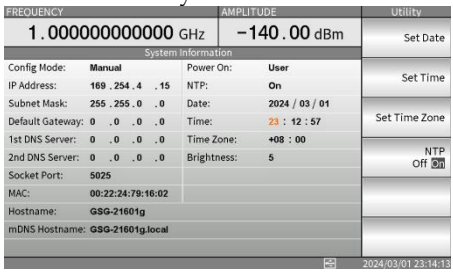
Panel Operation

1. To move on to the setting option, press the F4 key.

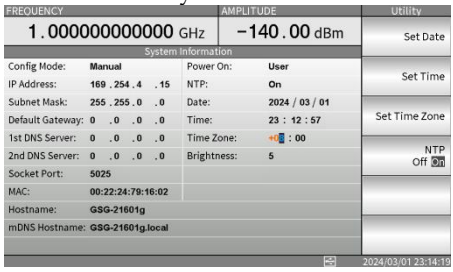
2. Press the F1 key to set date.



3. Press the F2 key to set time.



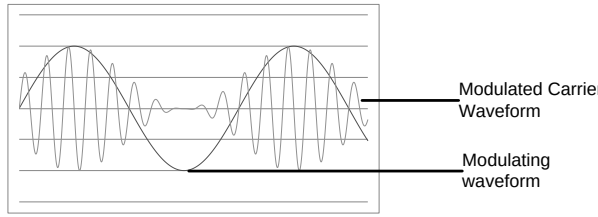
4. Press the F3 key to set time zone.



5. Press the F4 key to enable or disable NTP.

AMPLITUDE MODULATION

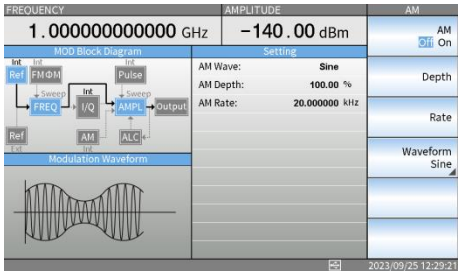
An AM waveform is produced from a carrier waveform and a modulating waveform. The amplitude of the carrier waveform depends on the amplitude of the modulating waveform. The GSG-2000 vector signal generator can set the carrier frequency and amplitude as well as internal or external modulation sources.



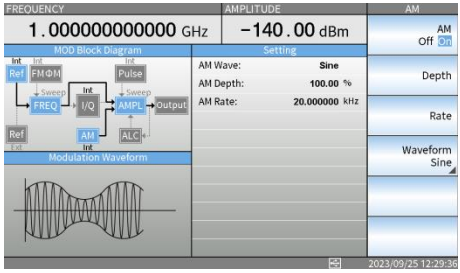
Selecting AM Modulation

Panel Operation

1. Press the AM key on the front panel of the GSG-2000.



2. Press the F1 key to activate the AM modulation. Press the F1 key again to disable it. When AM modulation is activated, the AM key will light on, and you will see the AM icon in the MOD Block Diagram turning blue, as shown in the figure below.

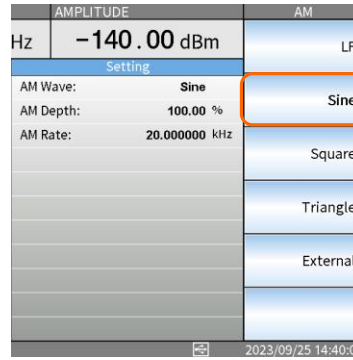


Selecting waveform of AM Modulation

Panel Operation

1. To change the AM modulation waveform, press the F4 key and a key next to the waveform it indicates. When a waveform is selected, the waveform name will be highlighted in bold font. For example, when the Square waveform is selected, the waveform **Sine** will become bold.

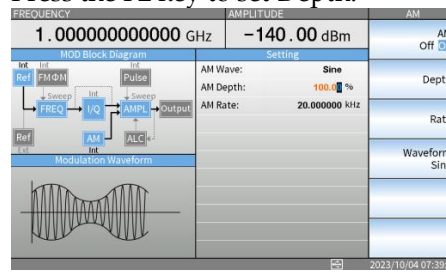
F4



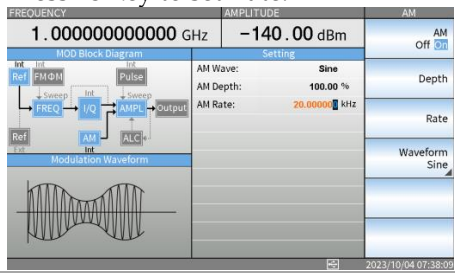
2. Configure the setting of wave form that has been selected. For example, if “Sine” is selected, you need to configure Depth or Rate of “Sine” wave.

3. Press the F2 key to set Depth.

F2

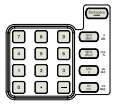


4. Press F3 key to set Rate.



5. Use the left and right arrow keys to select the digit to be changed and then use the up and down arrow keys to increase or decrease the value of the digit to be edited.

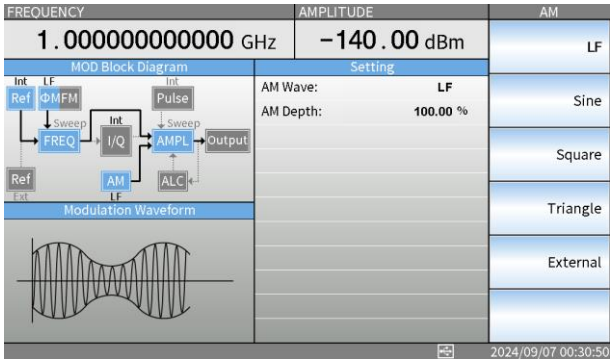
6. You can also input the values you want by typing the numeric keyboard directly.



7. Press the Enter key to confirm that value you set.

All waveforms and its setting

Select the AM waveform you need. There are totally five waveforms available. In the AM waveform configuration menu, you can press the F1 through the F5 soft key to select your desired waveform.

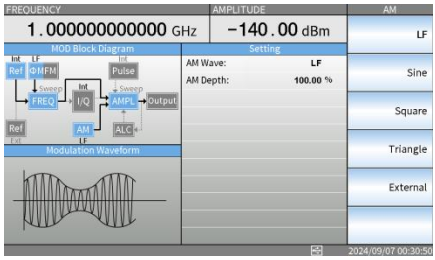


LF waveform

Panel Operation

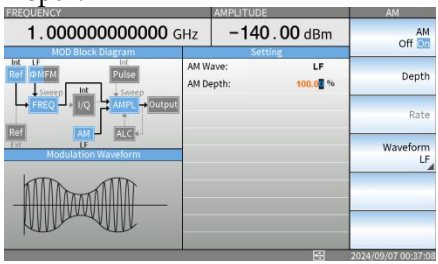
1. Press the F1 soft key to select LF waveform.

F1



2. Press the F2 soft key to set the AM Depth.

F2



3. Set the value of AM Depth.

4. Press the Enter key to confirm the value you set.

Enter

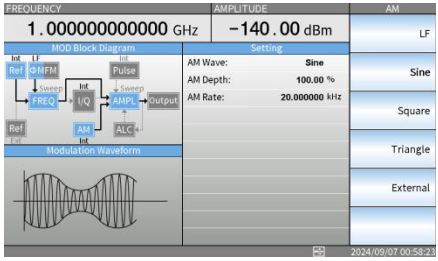
Range of setting item: Depth: 0~100% (0.01% resolution)

Sine waveform

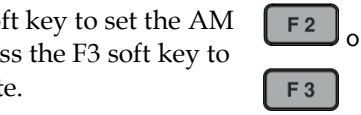
Panel Operation

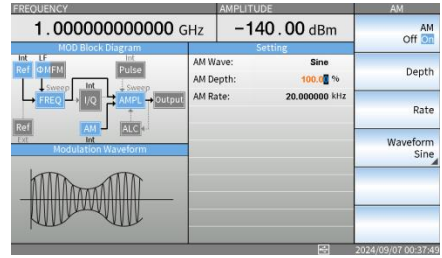
1. Press the F2 soft key to select Sine waveform.

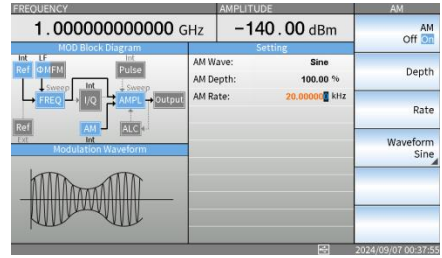
F2



2. Press the F2 soft key to set the AM Depth and press the F3 soft key to set the AM Rate.







3. Set the value of AM Depthe and AM Rate.

4. Press the Enter key to confirm the value you set.

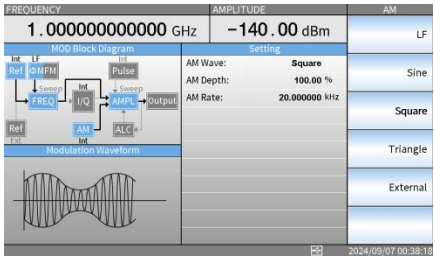
Range of setting item
Depth: 0~100% (0.01% resolution)
Rate: 0.1Hz to 20kHz (1mHz accuracy)

Square waveform

Panel Operation

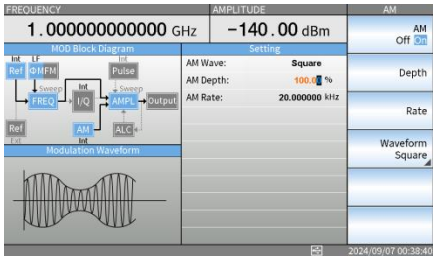
1. Press the F3 soft key to select the Square waveform.

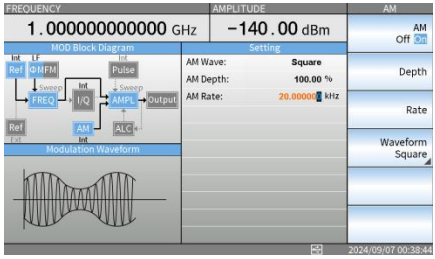
F 3



2. Press the F2 soft key to set the AM Depth and press the F3 soft key to set the AM Rate.

F 2 or F 3





3. Set the value of AM Depthe and AM Rate.

4. Press the Enter key to confirm the value you set.

Enter

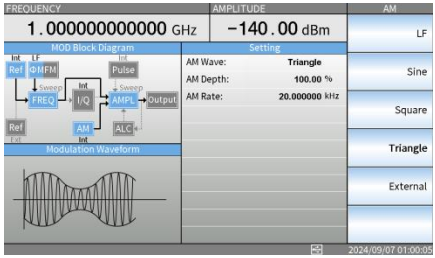
Range of setting item	Depth: 0~100% (0.01% resolution) Rate: 0.1Hz to 20kHz (1mHz accuracy)

Triangle waveform

Panel Operation

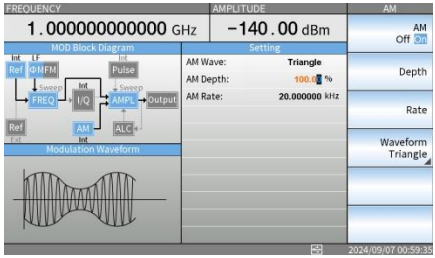
1. Press the F4 soft key to select Triangle waveform.

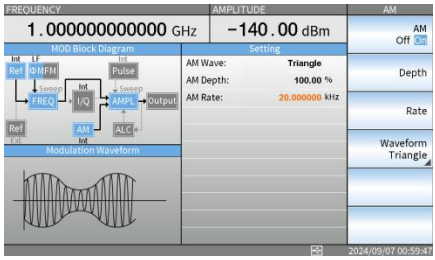
F4



2. Press the F2 soft key to set the AM Depth and press the F3 soft key to set the AM Rate.

F2 or F3





3. Set the value of AM Depthe and AM Rate.

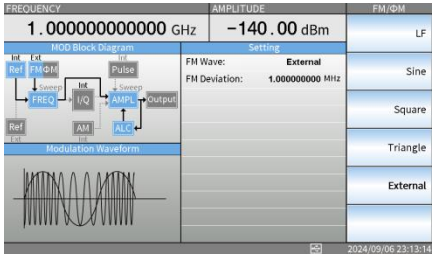
4. Press the Enter key to confirm the value you set.

Range of setting item: Depth: 0~100% (0.01% resolution)
Rate: 0.1Hz to 20kHz (1mHz accuracy)

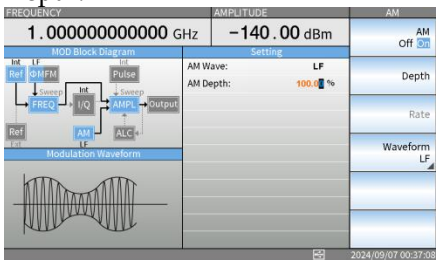
External waveform

Panel Operation

1. Press the F5 soft key to select External waveform.



2. Press the F2 soft key to set the AM Depth.



3. Set the value of AM Depth.

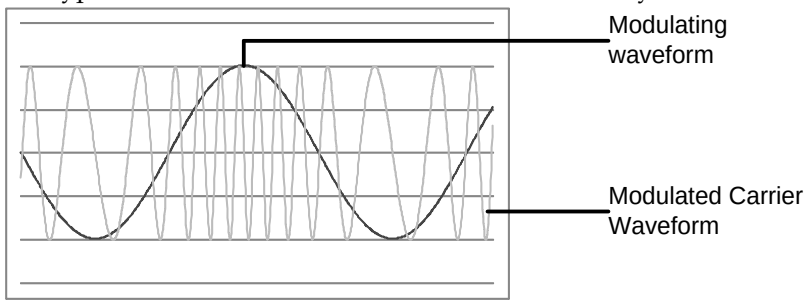
4. Press the Enter key to confirm the value you set.

Range of setting item: Depth: 0~100% (0.01% resolution)

Note: The external waveform is input from the AM connector on the front panel.

FREQUENCY/PHASE MODULATION

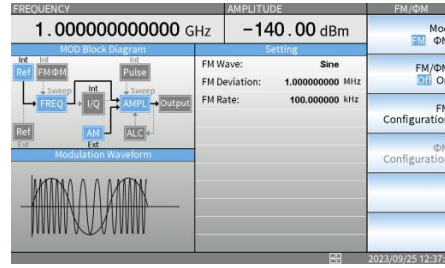
A FM/ΦM waveform is produced from a carrier waveform and a modulating waveform. The instantaneous frequency/phase of the carrier waveform varies with the magnitude of the modulating waveform. When using the GSG-2000 vector signal generator, only one type of modulated waveform can be created at any one time.



Selecting FM/ΦM Modulation

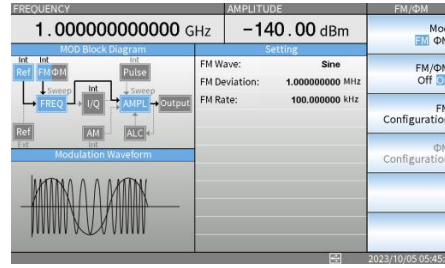
Panel Operation

1. Press the FM/ΦM key on the front panel of the GSG-2000.



2. Press the F1 key to toggle between FM and ΦM

3. Press the F2 key to enable the FM/ΦM modulation. Press the F2 key again to disable the FM/ΦM modulation. When FM/ΦM modulation is activated, the FM/ΦM key will light on and you will see the FM/ΦM icon in the MOD Block Diagram turning blue as shown in the figure below.

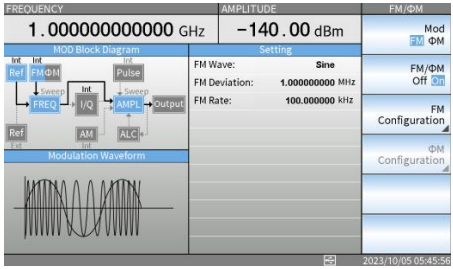


Waveform of FM/ΦM Modulation

Panel Operation

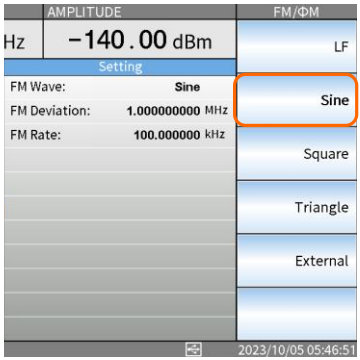
1. If FM Modulation is selcted, press the F3 soft key to move on to the FM modulation waveform configuration.

F 3

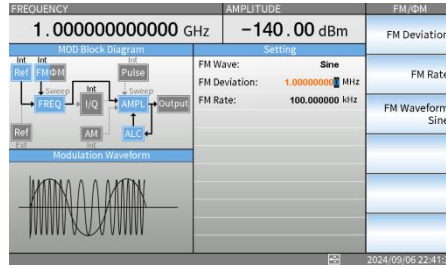


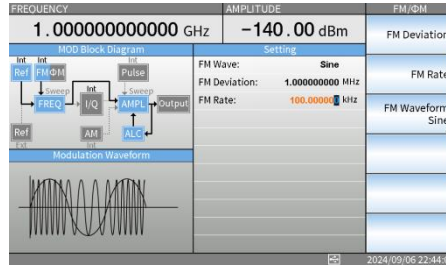
2. To change the FM modulation waveform, press the F3 key and a key next to the waveform it indicates. When a waveform is selected, the waveform name will be highlighted in bold font. For example, when the Sine waveform is selected, the waveform **Sine** will become bold.

F 3



3. After selecting the waveform, press the F1 or F2 keys (according to the waveform you selected) for further setting items. For example, if the Sine waveform is selected, press the F1 key to set Deviation and press the F2 key to set Rate.





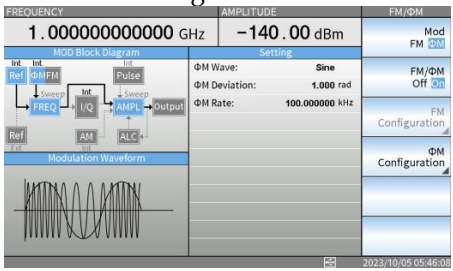
4. Use the left and right arrow keys to select the digit to be changed and then use the up and down arrow keys to increase or decrease the value of the digit to be edited.

5. You can also input the values you want by typing the numeric keyboard directly.

6. Press the Enter key to confirm that value you set.

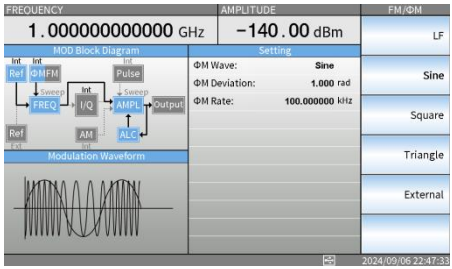
7. If ΦM Modulation is selected and activated, press the F4 soft key to move to the ΦM modulation waveform configuration.

F 4



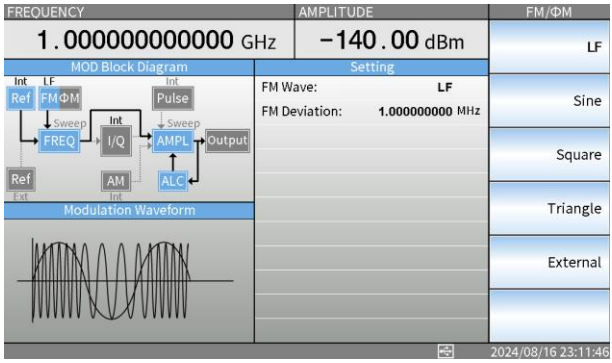
8. To change the ΦM modulation waveform, press the F3 key and select a wave you need. The following steps for changing waveform is similar to those indicated above in step 2 through step 6.

F 3



Waveform type and its setting (FM)

Select the FM waveform you need. There are totally five waveforms available. In the FM waveform configuration menu, you can press the F1 through the F5 soft key to select your desired waveform.

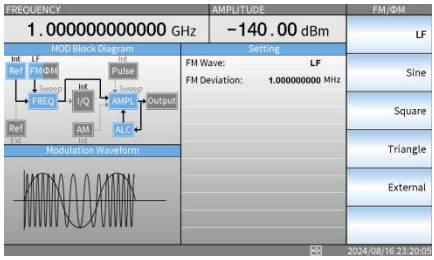


LF waveform

Panel Operation

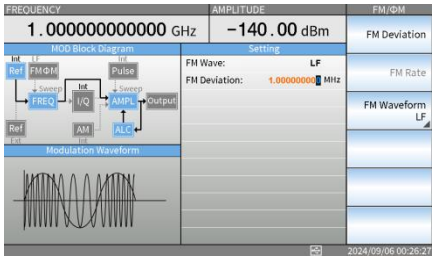
1. Press the F1 soft key to select LF waveform.

F1



2. Press the F1 soft key to set the FM Deviation.

F1



3. Set the value of FM Deviation.

4. Press the Enter key to confirm the value you set.

Enter

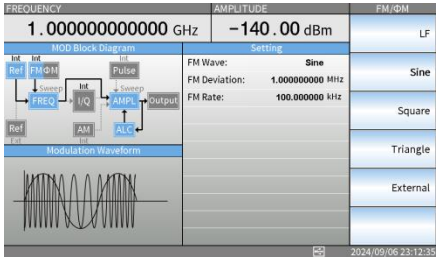
Range of setting item: Deviation: 0 to N*1MHz (1mHz resolution) (N is determined by frequency band specifications)

Sine waveform

Panel Operation

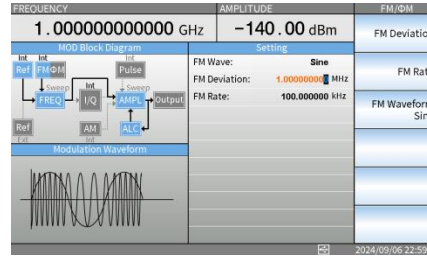
1. Press the F2 soft key to select Sine waveform.

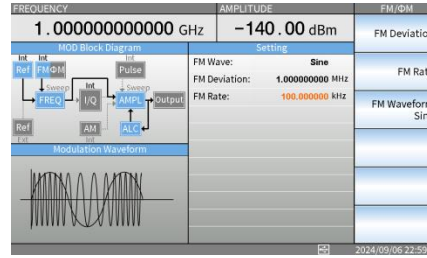
F2



2. Press the F1 soft key to set the FM Deviation and press the F2 soft key to set the FM Rate.

F1 or F2





3. Set the value of FM Deviation and FM Rate.

4. Press the Enter key to confirm the value you set.

Enter

Range of setting item

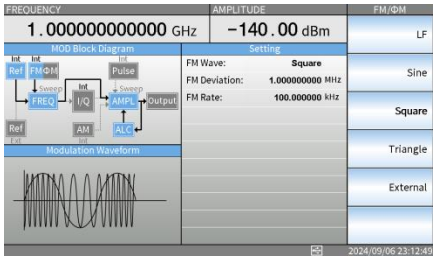
Deviation: 0 to N*1MHz (1mHz resolution) (N is determined by frequency band specifications)
Rate (1mHz accuracy): when frequency ≥ 10MHz, it is 0.1Hz to 1MHz, and when frequency < 10Mhz, it is 0.1Hz to 100kHz

Square waveform

Panel Operation

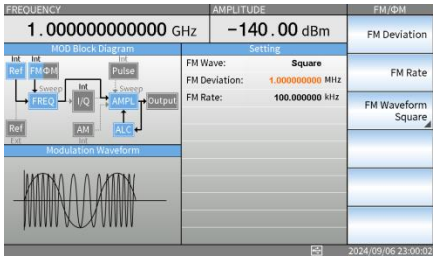
1. Press the F3 soft key to select the Square waveform.

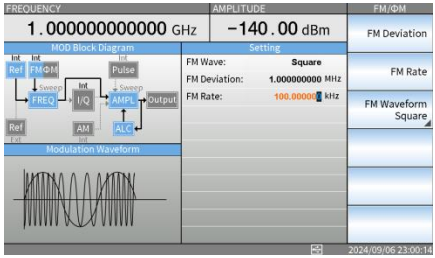
F 3



2. Press the F1 soft key to set the FM Deviation and press the F2 soft key to set the FM Rate.

F 1 or F 2





3. Set the value of FM Deviation and FM Rate.
4. Press the Enter key to confirm the value you set.

Enter

Range of setting item

Deviation: 0 to N*1MHz (1mHz resolution) (N is determined by frequency band specifications)

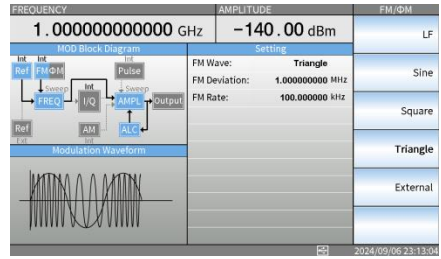
Rate (1mHz accuracy): when frequency ≥ 10MHz, it is 0.1Hz to 1MHz, and when frequency < 10Mhz, it is 0.1Hz to 100kHz

Triangle waveform

Panel Operation

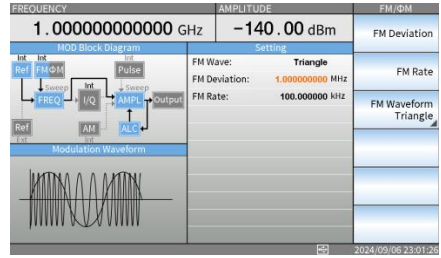
1. Press the F4 soft key to select Triangle waveform.

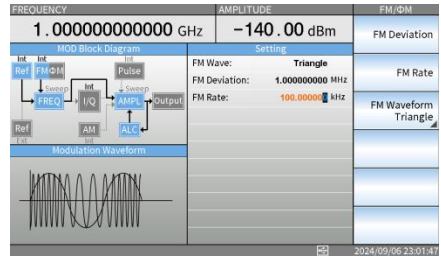
F4



2. Press the F1 soft key to set the FM Deviation and press the F2 soft key to set the FM Rate.

F1 or F2





3. Set the value of FM Deviation and FM Rate.
4. Press the Enter key to confirm the value you set.

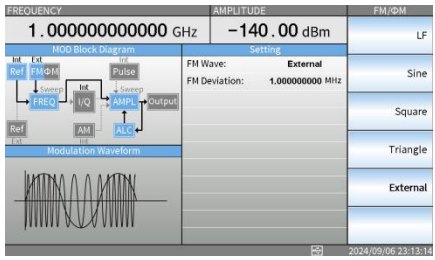
Enter

Range of setting item	Deviation: 0 to N*1MHz (1mHz resolution) (N is determined by frequency band specifications) Rate: when frequency ≥ 10MHz, it is 0.1Hz to 1MHz, and when frequency < 10Mhz, it is 0.1Hz to 100kHz

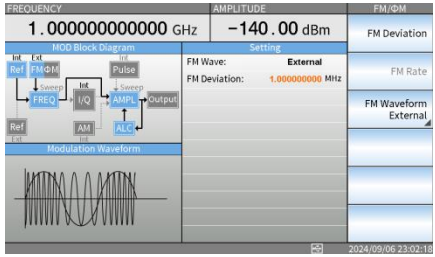
External waveform

Panel Operation

1. Press the F5 soft key to select External waveform.



2. Press the F1 soft key to set the FM Deviation.



3. Set the value of FM Deviation.
4. Press the Enter key to confirm the value you set.

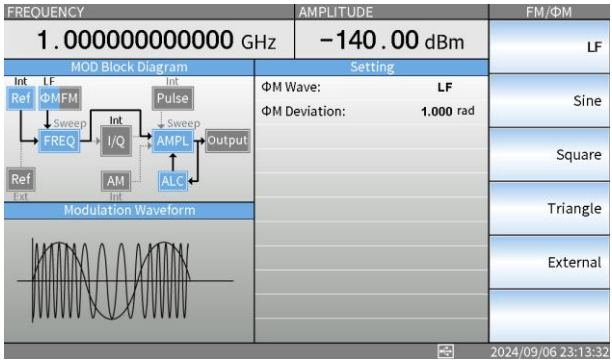
Range of setting item	Deviation: 0 to N*1MHz (1mHz resolution) (N is determined by frequency band specifications)

Note

The external waveform is input from the FM connector on the front panel.

Waveform type and its setting (ΦM)

Select the ΦM waveform you need. There are totally five waveforms available. In the ΦM waveform configuration menu, you can press the F1 through the F5 soft key to select your desired waveform.

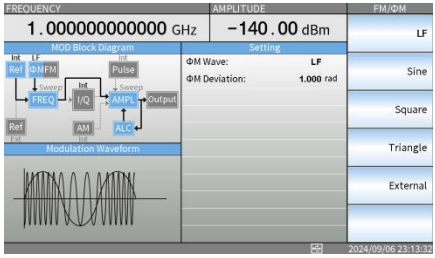


LF waveform

Panel Operation

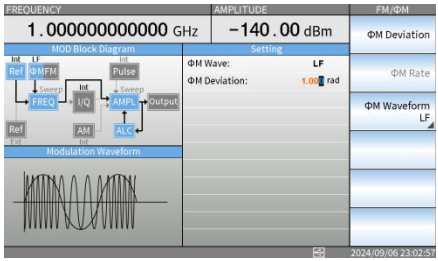
1. Press the F1 soft key to select LF waveform.

F1



2. Press the F1 soft key to set the ΦM Deviation.

F1



3. Set the value of ΦM Deviation.

4. Press the Enter key to confirm the value you set.

Enter

Range of setting item

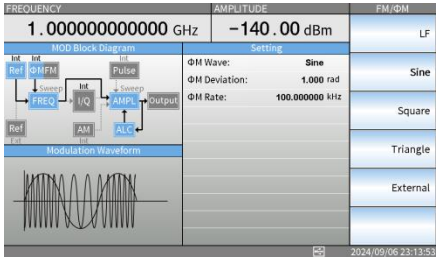
Deviation: 0 to N* 1MHz/rate or 5N rad (the smaller value is the upper limit, 0.001rad resolution) (N is determined by frequency band specifications)

Sine waveform

Panel Operation

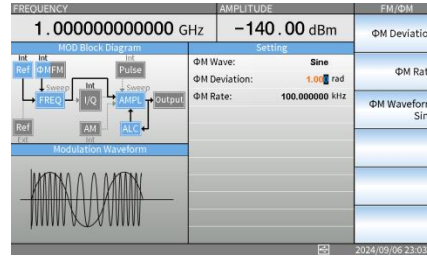
1. Press the F2 soft key to select Sine waveform.

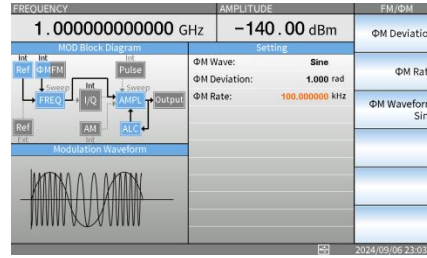
F2



2. Press the F1 soft key to set the ΦM Deviation and press the F2 soft key to set the ΦM Rate.

F1 or F2





3. Set the value of FM Deviation and FM Rate.

4. Press the Enter key to confirm the value you set.

Enter

Range of setting item

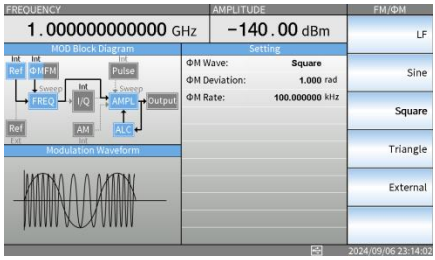
Deviation: 0 to N* 1MHz/rate or 5N rad (the smaller value is the upper limit, 0.001rad resolution) (N is determined by frequency band specifications)
Rate (1mHz accuracy): when frequency ≥ 10MHz, it is 0.1Hz to 1MHz, and when frequency < 10Mhz, it is 0.1Hz to 100kHz

Square waveform

Panel Operation

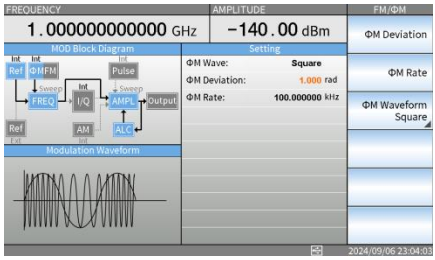
1. Press the F3 soft key to select the Square waveform.

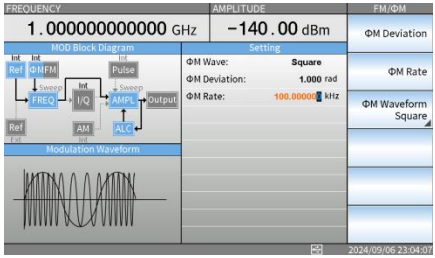
F 3



2. Press the F1 soft key to set the ΦM Deviation and press the F2 soft key to set the ΦM Rate.

F 1 or F 2





3. Set the value of ΦM Deviation and ΦM Rate.

4. Press the Enter key to confirm the value you set.

Enter

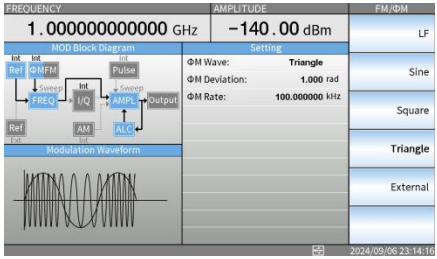
Range of setting item	Deviation: 0 to N* 1MHz/rate or 5N rad (the smaller value is the upper limit, 0.001rad resolution) (N is determined by frequency band specifications) Rate: when frequency ≥ 10MHz, it is 0.1Hz to 1MHz, and when frequency < 10Mhz, it is 0.1Hz to 100kHz

Triangle waveform

Panel Operation

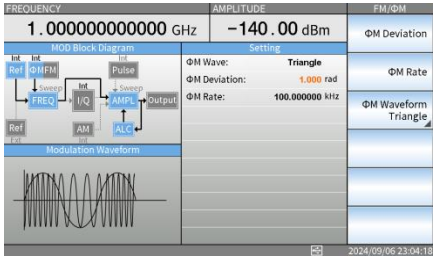
1. Press the F4 soft key to select Triangle waveform.

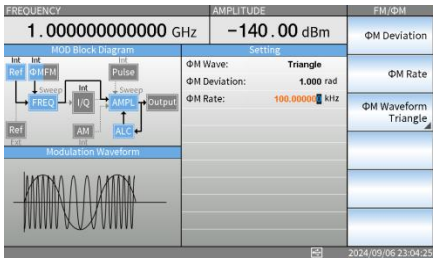
F4



2. Press the F1 soft key to set the ΦM Deviation and press the F2 soft key to set the ΦM Rate.

F1 or F2





3. Set the value of ΦM Deviation and ΦM Rate.

4. Press the Enter key to confirm the value you set.

Enter

Range of setting item

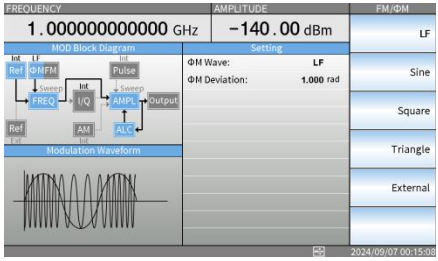
Deviation: 0 to N* 1MHz/rate or 5N rad (the smaller value is the upper limit, 0.001rad resolution) (N is determined by frequency band specifications)
Rate: when frequency ≥ 10MHz, it is 0.1Hz to 1MHz, and when frequency < 10Mhz, it is 0.1Hz to 100kHz

Enternal waveform

Panel Operation

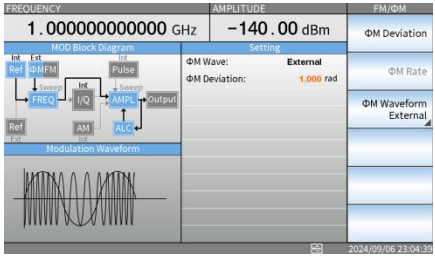
1. Press the F5 soft key to select External waveform.

F5



2. Press the F1 soft key to set the ΦM Deviation.

F1



3. Set the value of ΦM Deviation.

4. Press the Enter key to confirm the value you set.

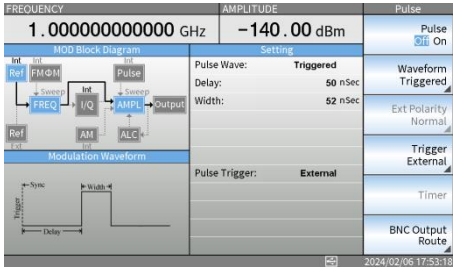
Enter

Range of setting item	Deviation: 0 to N* 1MHz/rate or 5N rad (the smaller value is the upper limit, 0.001rad resolution) (N is determined by frequency band specifications)
Note	The external waveform is input from the FM connector on the front panel.

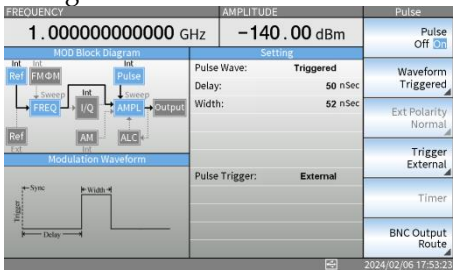
PULSE MODULATION

Activating Pulse Modulation

Panel Operation 5. Press the Pulse key on the front panel of the GSG-2000.



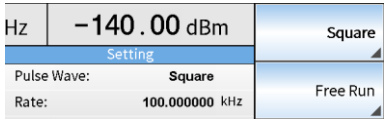
6. Press the F1 key to activate Pulse modulation. Press the F1 key again to disable Pulse modulation. When Pulse modulation is activated, the Pulse key will light on, and you will see the Pulse icon in the MOD Block Diagram turning blue, as shown in the figure below.



Selecting Pulse Modulation

Panel Operation

1. To change the Pulse modulation waveform, press the F2 key and a key next to the waveform it indicates. When a waveform is selected, the waveform name will be highlighted in bold font. For example, when the Square waveform is selected, the waveform **Square** will become bold.



2. Configure the settings of the form that has been selected. For example, if "Square" is selected, you need to configure the Rate of the "Sine" wave. Press the F1 key to set the Rate.

3. Use the left and right arrow keys to select the digit to be changed and then use the up and down arrow keys to increase or decrease the value of the digit to be edited.

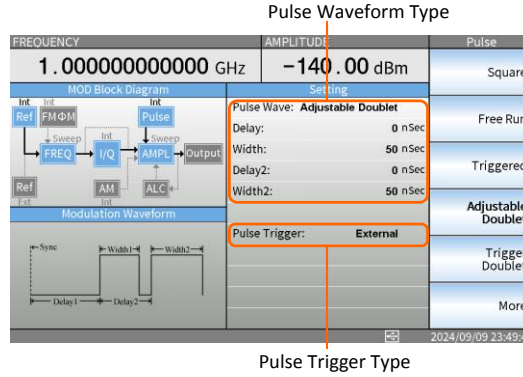
4. You can also input the values you want by typing the numeric keyboard directly.

5. Press the Enter key to confirm that value you set.

Select waveform and configure its setting

Select the Pulse waveform you need. There are several waveforms available. In the pulse waveform configuration menu, you can press the F1 through the F5 soft key and F6 (more) soft key plus the F1 through the F3 key to select your desired waveform.

Pulse configuration menu

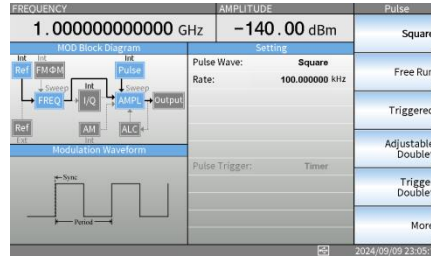


Square Waveform

Panel Operation

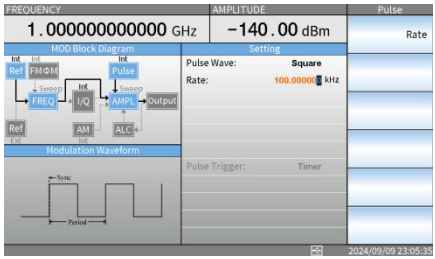
1. Press the F1 soft key to select the Square waveform.

F1



2. Press the F1 soft key to set the Rate of square waveform.

F1



3. Set the value of Rate.

5. Press the Enter key to confirm the value you set.

Enter

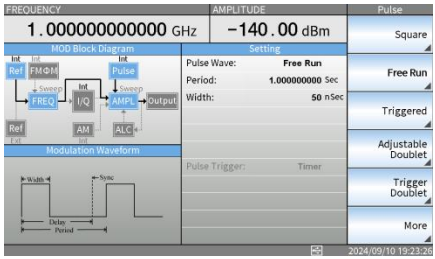
Setting item and its range: Rate: 0.1Hz to 10MH(resolution is 0.001Hz)

Free Run Waveform

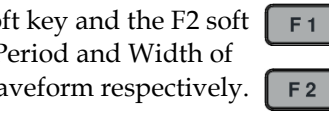
Panel Operation

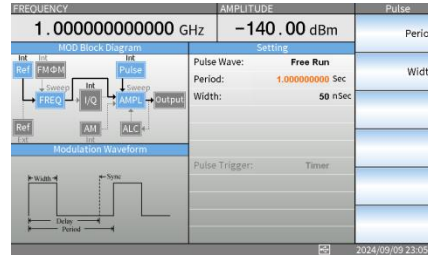
1. Press the F2 soft key to select the Free Run waveform.

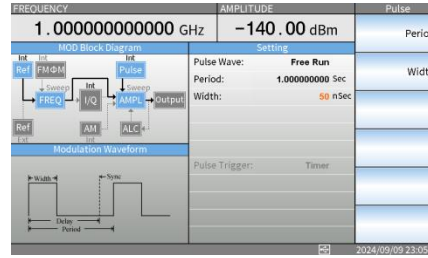
F2



2. Press the F1 soft key and the F2 soft key to set the Period and Width of the free run waveform respectively.







3. Set the value of Period and Width.

4. Press the Enter key to confirm the value you set.

Setting item and its range

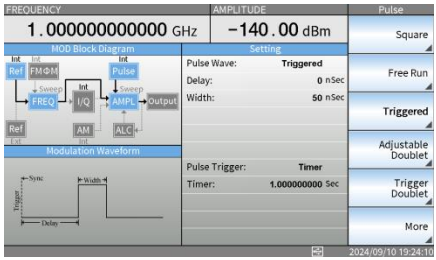
Period: 100ns to 42s(resolution is 10ns)
Width: 50ns to period-10ns (if there is a period setting, the upper limit is determined by the period)

Triggered Waveform

Panel Operation

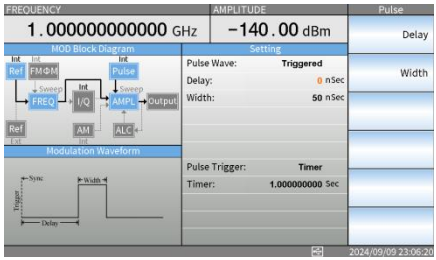
1. Press the F3 soft key to select the Triggered waveform.

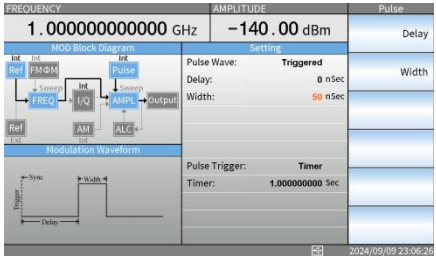
F 3



2. Press the F1 soft key and the F2 soft key to set the triggered waveform's Delay and Width, respectively.

F 1 or F 2





3. Set the value of Delay and Width.

4. Press the Enter key to confirm the value you set.

Enter

Setting item and its range

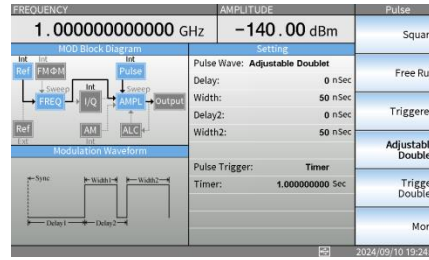
Delay: 0s to 42s(resolution is 10ns)
Width: 50ns to 42s(resolution is 10ns)

Adjustable Doublet Waveform

Panel Operation

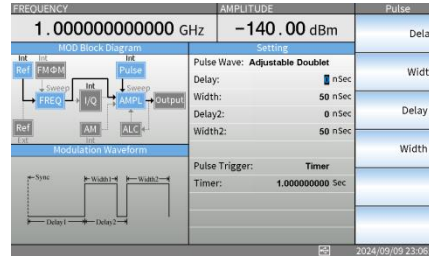
1. Press the F4 soft key to select the Adjustable doublet waveform.

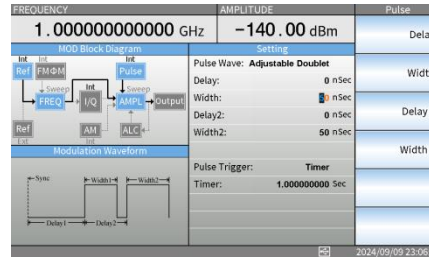
F4

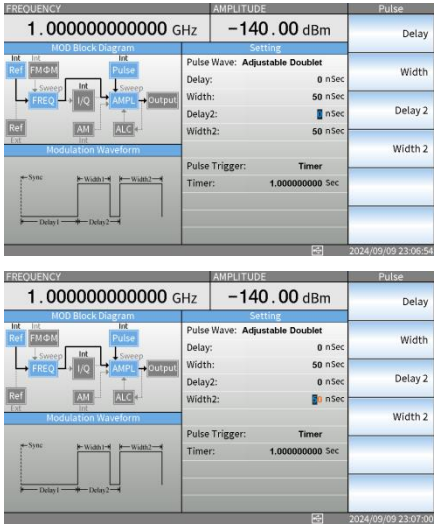


2. Press the F1 soft key, the F2 soft key, the F3 soft key, and the F4 soft key to set the Delay, Width, Delay 2, and Width 2 of the adjustable doublet waveform, respectively.

F1 or F2 or F3 or F4







3. Set the value of Delay, Width, Delay 2 and Width 2.

4. Press the Enter key to confirm the value you set.

Setting item and its range

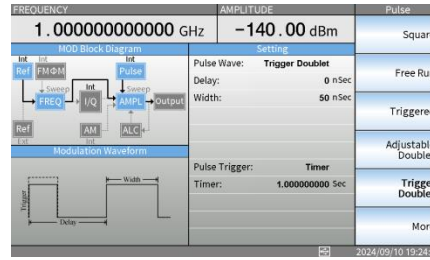
Delay and Delay 2: 0s to 42s(resolution is 10ns)
Width and Width 2: 50ns to 42s (resolution is 10ns)

Trigger Doublet Waveform

Panel Operation

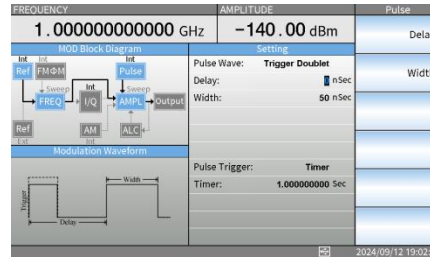
1. Press the F5 soft key to select the Trigger doublet waveform.

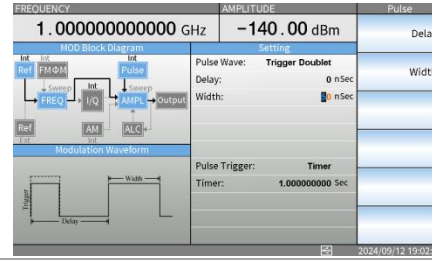
F5



2. Press the F1 soft key and the F2 soft key to set the triggered doublet's Delay and Width, respectively.

F1 or F2





3. Set the value of Delay and Width.

4. Press the Enter key to confirm the value you set.

Enter

Setting item and its range

Delay: 0s to 42s(resolution is 10ns)
Width: 50ns to 42s (resolution is 10ns)

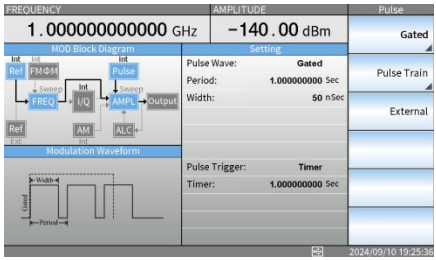
Gated Waveform

Panel Operation

1. Press the F6 and then the F1 soft key to select the Gated waveform.

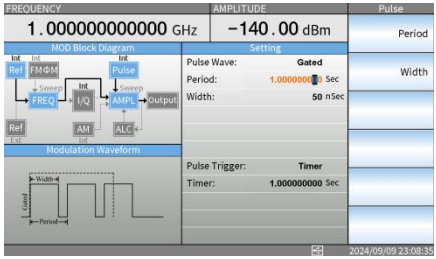
F 6 +

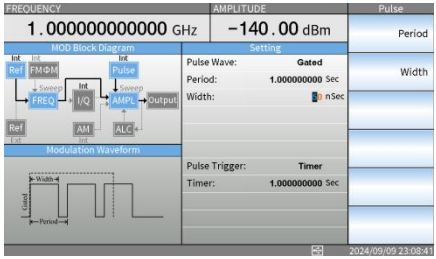
F 1



2. Press the F1 soft key and the F2 soft key to set the Gated's Period and Width of the free run waveform respectively.

F 1 or F 2





3. Set the value of Period and Width.

4. Press the Enter key to confirm the value you set.

Enter

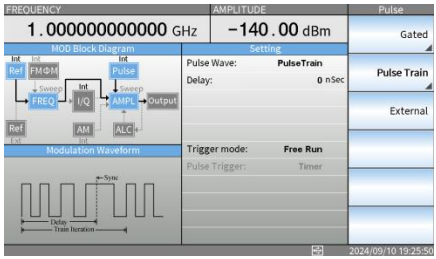
Setting item and its range
Period: 100ns to 42s(resolution is 10ns)
Width: 50ns to period -10ns (if there is a period setting, the upper limit is determined by the period)

Pulse Train Waveform

Panel Operation

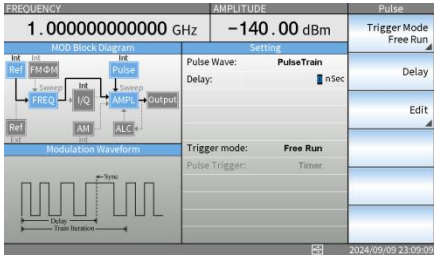
1. Press the F6 and then the F2 soft key to select the Pulse Train waveform.

F6 + F2



2. Press the F2 soft key to set the Delay of pulse train waveform.

F2



3. Set the value of Delay.
4. Press the Enter key to confirm the value you set.

Enter

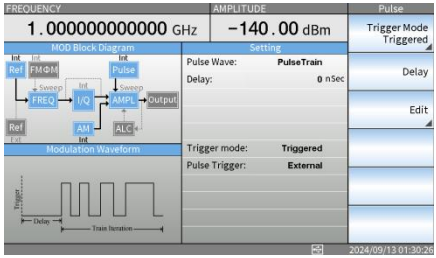
Setting item and its range
Delay: 0s to 42s(resolution is 10ns)
Trigger mode: Gated, Triggered, Free Run

Selecting trigger mode of Pulse Train Waveform

Panel Operation

1. When the Pulse train waveform is selected, press the F1 key to select it's trigger mode you need.

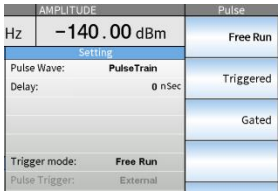
F1



Free Run

2. Press the F1 key to select free run as trigger mode.

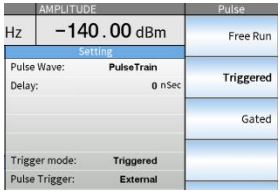
F1



Triggered

3. Press the F2 key to select triggered as trigger mode.

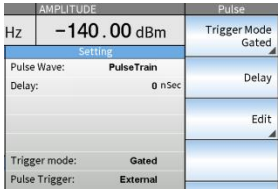
F2



Gated

4. Press the F3 key to select gated as trigger mode.

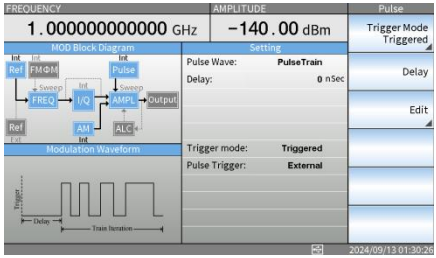
F3

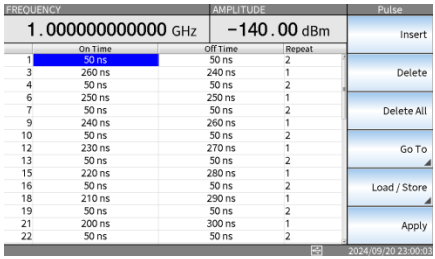


Editing Pulse Train Waveform

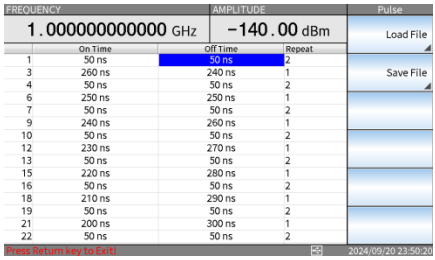
Panel Operation

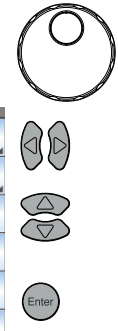
1. When the Pulse train waveform is selected, press the F3 key to enter the Edit page to edit the pulse train waveform.



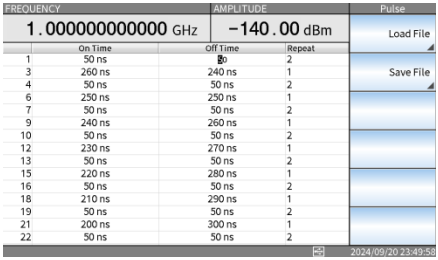


2. Use the scroll knob and arrow keys to select the item to be edited, and then press the enter key to select it.



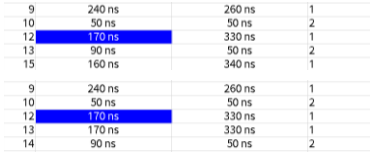


3. When the item selected will become highlighted. Input the values you want by typing the numeric keyboard to change the value.

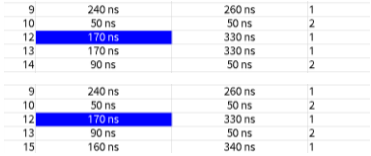


Other edit functions in the edit page

Insert	Press the F1 key to copy the editing items of the row and insert it into the next one.	F 1



Delete	Press the F2 key to delete the editing items of the row.	F 2

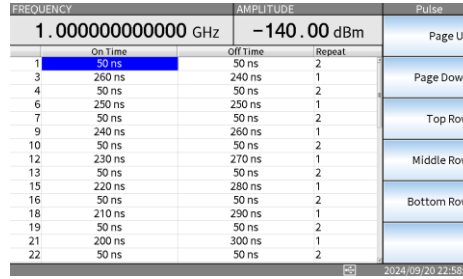


Delete All	Press the F3 key to delete all the editing items of row.	F 3
Apply	Press the F6 key to output the editing result.	F 6

Go To Page Up

Press the F4 key and then press the F1 key to go to the previous page of these items.

F4 + F1



Go To Page Down

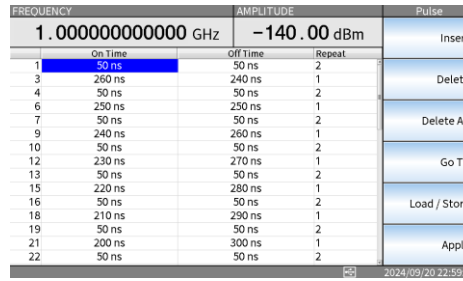
Press the F4 key and then press the F2 key to go to the previous page of these items.

F4 + F2

Go To Top Row

Press the F4 key and then press the F3 key to go to the last row of these items. For example, there are a total of 67 rows of data. The first row will appear.

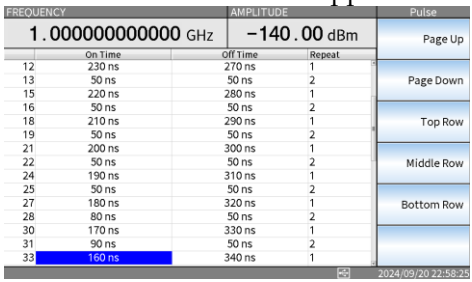
F4 + F3



Go To Middle Row

Press the F4 key and then press the F4 key again to go to the last row of these items. For example, there are 67 rows of data. The 33rd row will appear.

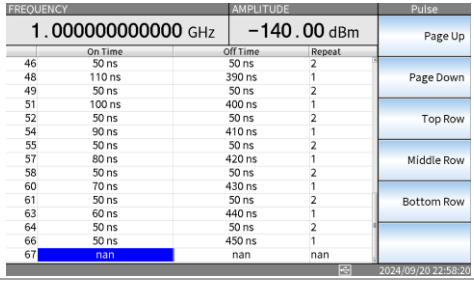
F4 + F4



Go To Bottom Row

Press the F4 key and then press the F5 key to go to the last row of these items. For example, there are a total of 67 rows of data. The last row will appear.

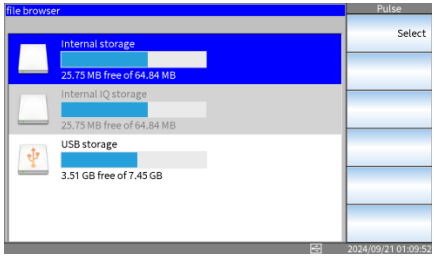
F4 + F5



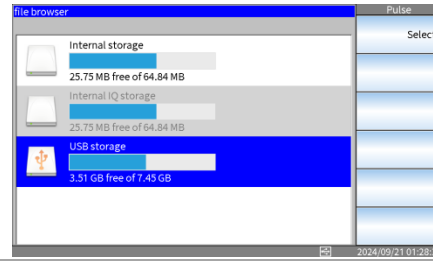
Load File

1. Press the F5 key and then press the F1 key to load the .pust file from USB storage for editing.

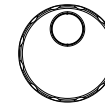
F5 + F1

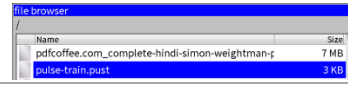


2. Turn the scroll knob to USB storage and then press the enter key.



3. Turn the scroll knob to select the .pust file and press the Select key to open it.



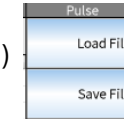


Save File

Press the F5 key and then press the F2 key to save the edited .pust file to USB storage.

Note

After entering the menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the “Exit” (F1) key or the “Save & Exit” (F2) key to exit. Press the F1 key to exit directly, or press the F2 key to save the editing results and exit.

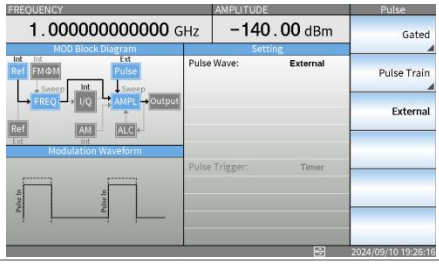


External Waveform

Panel Operation

1. Press the F6 and then the F3 soft key to select the Extenal waveform.

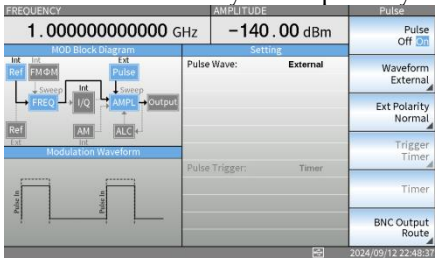
F 6 + F 3



Set polarity

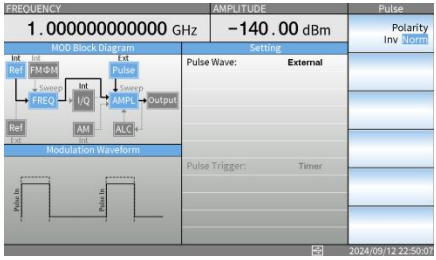
2. Press the F3 soft key to set polarity.

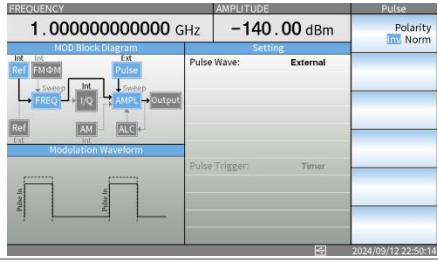
F 3



3. Press the F1 key again to toggle between polarity of Inv and Norm.

F 1





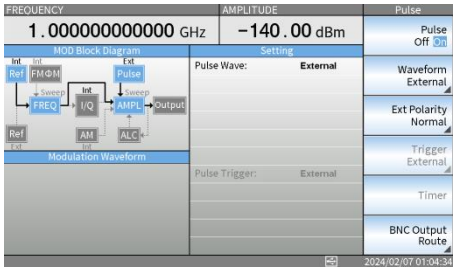
Note

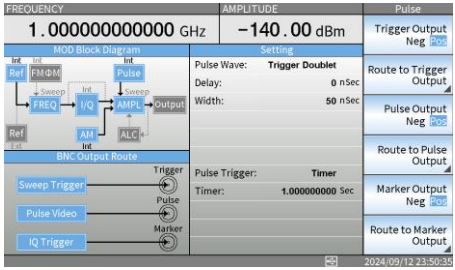
The external waveform is input from the PULSE IN connector on the rear panel.

Setting BNC Output Route

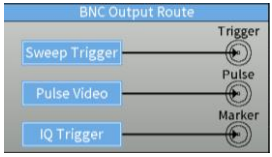
Panel Operation

1. From the Pulse setting page press the F6 key to move on to the BNC output route setting.





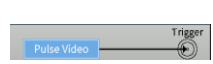
As shown in the diagram below, When the F6 key is pressed, the BNC output route will display on the left lower corner of the Pulse setting page.



2. Press the F1 key to select the polarity of the trigger output and toggle between Pos and Neg polarity. If Neg is selected, you will see a small icon that looks like a small circle at the end of the route to indicate that the present output polarity is Negative.

F1

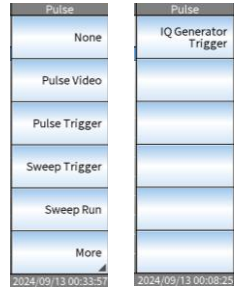
(Negative)



(Positive)

3. Press the F2 key to select which kind of route to trigger output. There are five types of routes available including Pulse Video, Pulse Trigger, Sweep Trigger, Sweep Run, and IQ Generator Trigger.

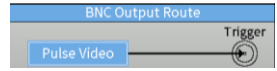
F2



4. Select a BNC output route to the trigger output.

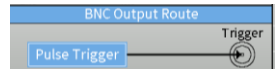
- To select Pulse Video as an output route to trigger, press the F2 key.

F2



- To select Pulse Trigger as an output route to trigger, press the F3 key.

F3

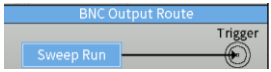


- To select Sweep Trigger as an output route to trigger, press the F4 key.

F4

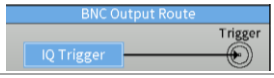
- To select Sweep Run as an output route to trigger, press the F5 key.

F5



- To select IQ Generator Trigger as an output route to trigger, press the F6 (More) key and the F1 key.

F6 + F1



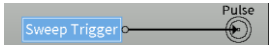
Note

If option **None** is selected as the BNC route to trigger, the icon route to trigger will become grey.

5. Likewise, press the F3 key to select the polarity of the pulse output polarity. Press the F4 key to select which kind of route to pulse output.

F3

F4



6. Likewise, press the F6 key to select the polarity of the marker output. Press the F6 key to select which kind of route to marker output.

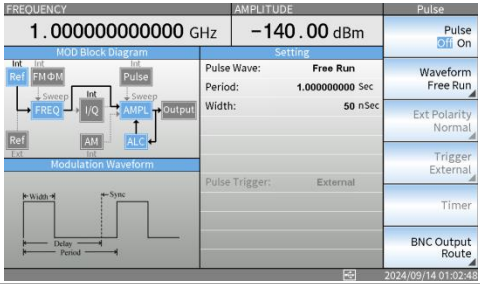
F5

F6

Setting Pulse trigger and external trigger

Note

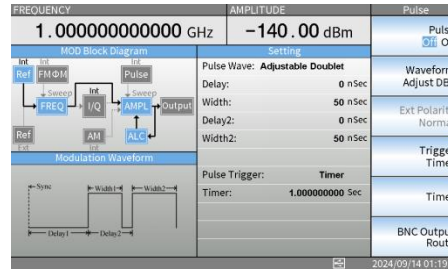
The external trigger won't be activated if the waveform mode is set to Squre, Free Run, Pulse Train, and External.



Panel Operation

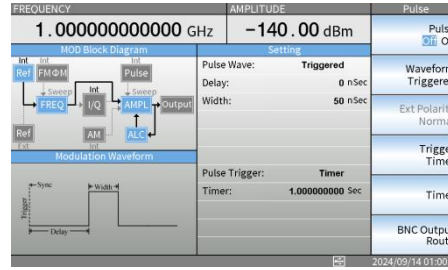
1. Press the F4 key to set or change the present pulse trigger mode.

F4



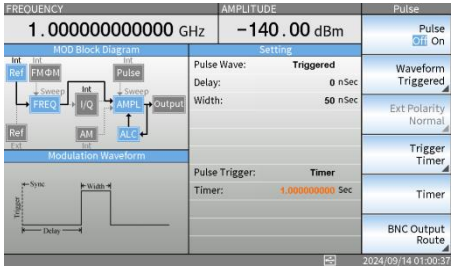
2. To set the pulse trigger to a Timer, Press the F1 key.

F1



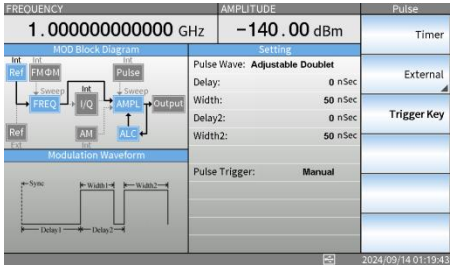
3. Set the value of Timer.

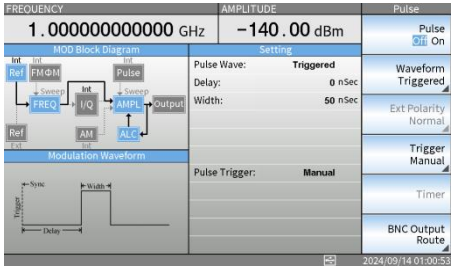
F5



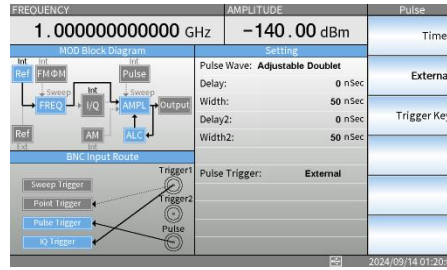
4. To set pulse trigger to Manual trigger, press the F3 key.

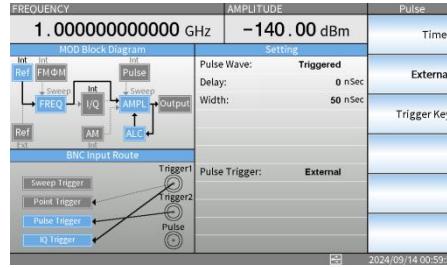
F3



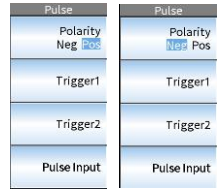


5. To select the External trigger, press the F2 key. F2

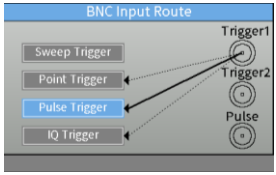


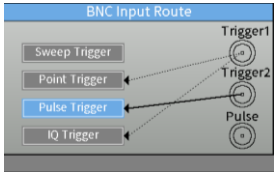


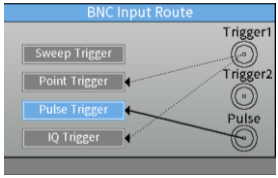
6. Press the F1 key to select polarity. There are polarities positive and negative. You can see the difference from the BNC input route diagram. F1



7. Press the F2, F3 or F4 key to select a trigger terminal. Select Trigger1, Trigger2 or Pulse Input. You can observe which trigger terminal is selected from the BNC input route diagram. F2 or F3 or F4


BNC Input Route
Sweep Trigger
Point Trigger
Pulse Trigger
IQ Trigger
Trigger1
Trigger2
Pulse


BNC Input Route
Sweep Trigger
Point Trigger
Pulse Trigger
IQ Trigger
Trigger1
Trigger2
Pulse

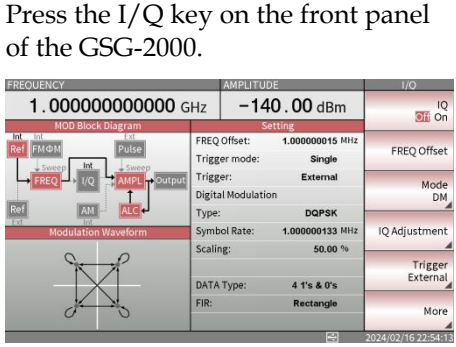

BNC Input Route
Sweep Trigger
Point Trigger
Pulse Trigger
IQ Trigger
Trigger1
Trigger2
Pulse

VECTOR MODULATION

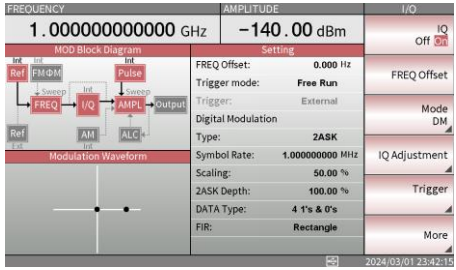
Selecting I/Q Modulation

Panel Operation

1. Press the I/Q key on the front panel of the GSG-2000.

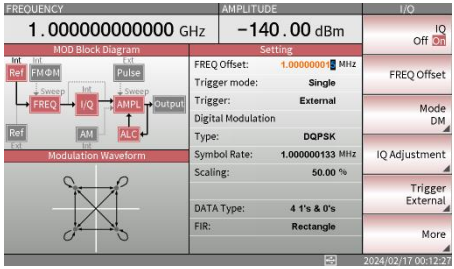


2. Press the F1 key to activate the Vector modulation. Press the F1 key again to disable the Vector modulation. When the Vector modulation is activated, the I/Q key will light on, and you will see the I/Q icon in the MOD Block Diagram turning brown, as shown in the figure below.



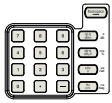
Adjusting FREQ Offset

1. Press the F2 key to adjust frequency offset.



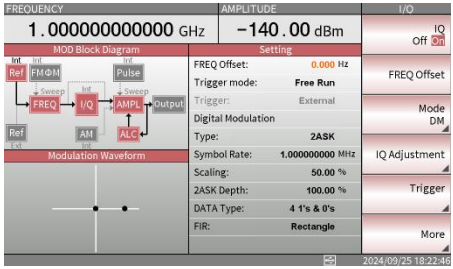
2. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

3. You can also use the numeric keyboard to input value you need directly.

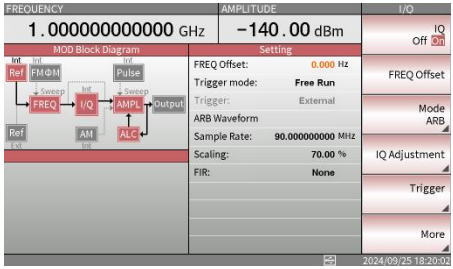


4. Press the Enter key to confirm that value you set.

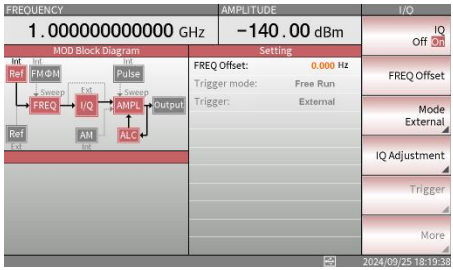
FREQ Offset in Digital Modulation mode



FREQ Offset in ARB Waveform mode



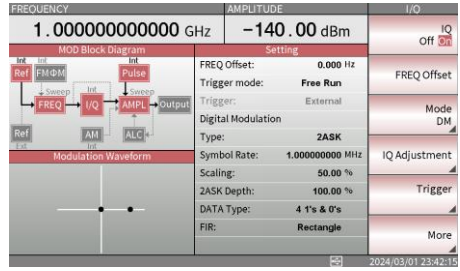
FREQ Offset in External mode



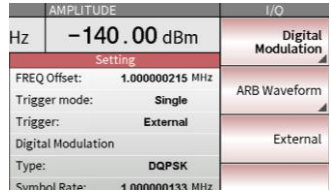
Selecting Modulation mode

Panel Operation

5. To change the modulation mode, press the F3 key.

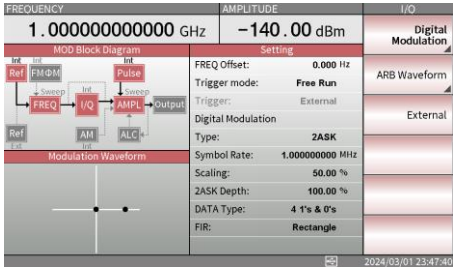


When a modulation mode is selected, the current modulation mode will be indicated in bold font. For example, if Digital Modulation is selected, option **Digital Modulation** will become bold.



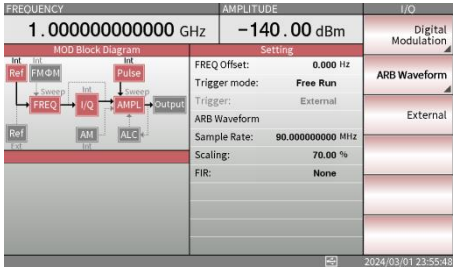
6. To select digital modulation, press the F1 key. Then you will see the further option about digital modulation appears as shown in the figure below. For further digital modulation settings, please refer to page 113.

F1

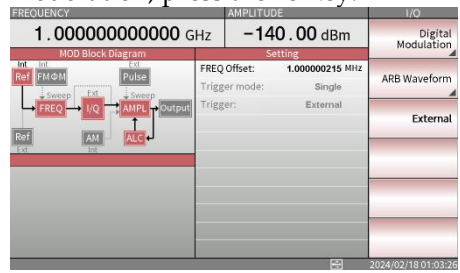


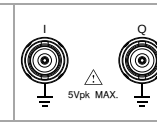
7. To select ARB waveform modulation, press the F2 key. Then you will see the further option about ARB waveform appears as shown in the figure below. For further ARB waveform settings, please refer to page 141.

F2



8. To select external waveform modulation, press the F3 key.



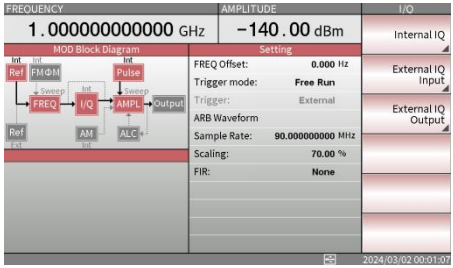
Note	The external waveform is input from the I and Q connectors on the front panel.	

Regulating I/Q Adjustment

Panel Operation

1. To change the IQ adjustment, press the F4 key. When the F4 key is pressed, you will see the further option menu appears as shown in the figure below.

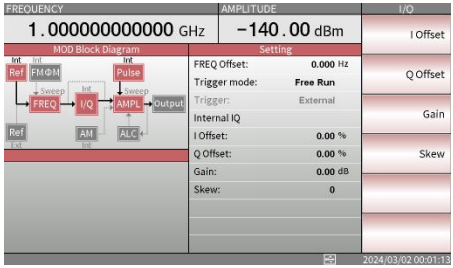
F 4



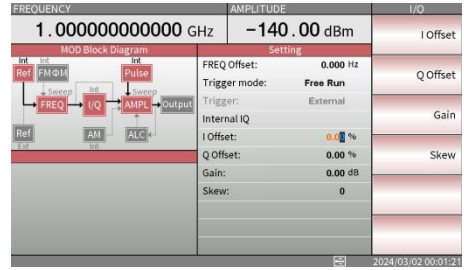
Internal IQ

2. To select internal IQ modulation, press the F1 key. Then you will see the further option about internal IQ modulation appears as shown in the figure below.

F 1

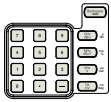


3. Press the F1 key, then you will see item **I Offset** turns in orange to be edited.



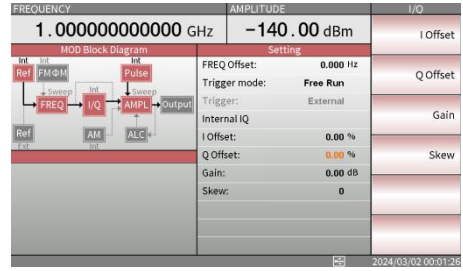
4. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

5. You can also use the numeric keyboard to input value you need directly.



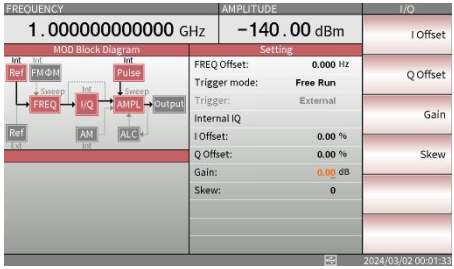
6. Press the Enter key to confirm that value you set.

7. Press the F2 key, then you will see item **Q Offset** turns in orange to be edited. Use the same method as describing above to edit Q Offset value.



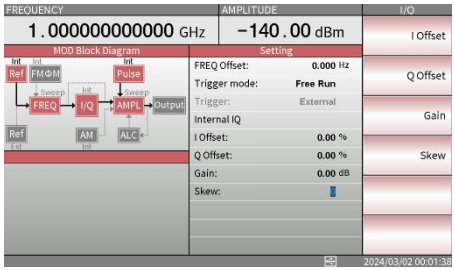
8. Press the F3 key, then you will see item **Gain** turns in orange to be edited. Use the same method as describing above to edit **Gain** value.

F 3



9. Press the F4 key, then you will see item **Skew** turns in orange to be edited. Use the same method as describing above to edit **Skew** value.

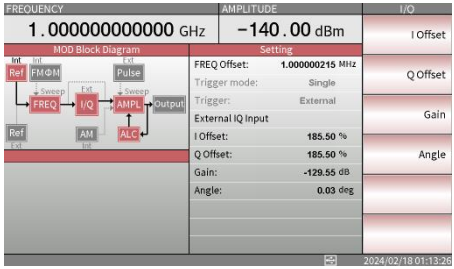
F 4



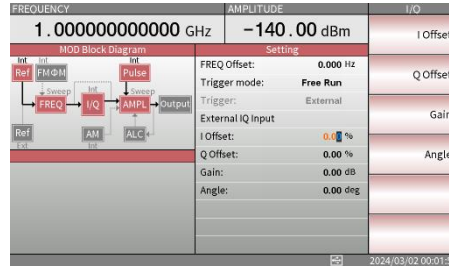
External IQ input

10. To select internal IQ input, press the F2 key. Then you will see the further option about external IQ modulation input appears as shown in the figure below.

F 2

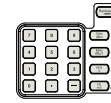


11. Press the F1 key, then you will see item I Offset turns in orange to be edited.



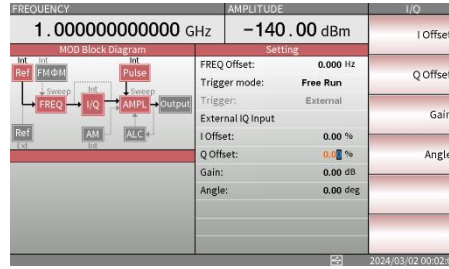
12. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

13. You can also use the numeric keyboard to input value you need directly.



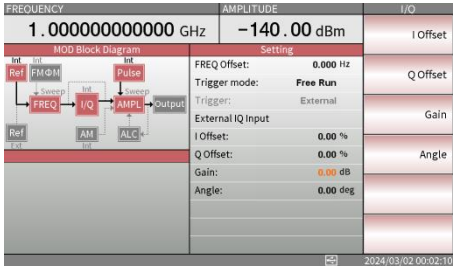
14. Press the Enter key to confirm that value you set.

15. Press the F2 key, then you will see item **Q Offset** turns in orange to be edited. Use the same method as describing above to edit **Q Offset** value.



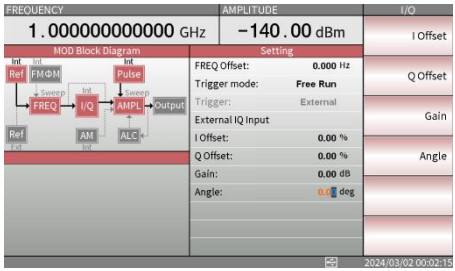
16. Press the F3 key, then you will see item **Gain** turns in orange to be edited. Use the same method as describing above to edit **Gain** value.

F 3



17. Press the F4 key, then you will see item **Angle** turns in orange to be edited. Use the same method as describing above to edit **Angle** value.

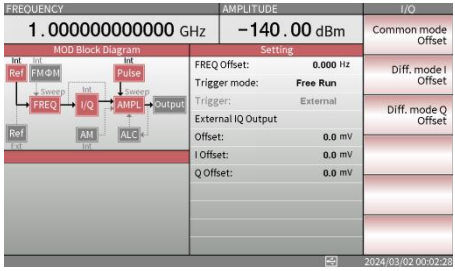
F 4



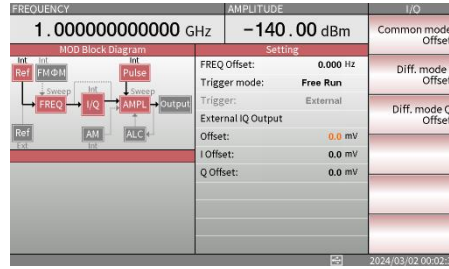
External IQ Output

18. To select external IQ output, press the F3 key. Then you will see the further option about external IQ modulation output appears as shown in the figure below.

F 3

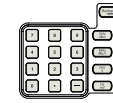


19. Press the F1 key, then you will see item **Offset** turns in orange to be edited.



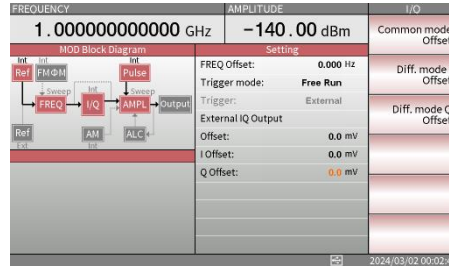
20. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

21. You can also use the numeric keyboard to input value you need directly.



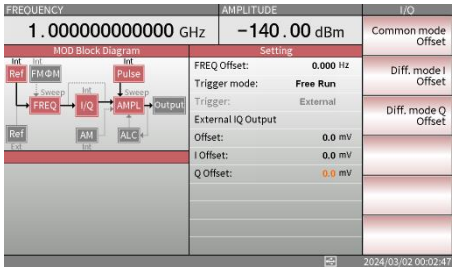
22. Press the Enter key to confirm that value you set.

23. Press the F2 key, then you will see item **I Offset** turns in orange to be edited. Use the same method as describing above to edit **I Offset** value.



24. Press the F3 key, then you will see item **Q Offset** turns in orange to be edited. Use the same method as describing above to edit **Q Offset** value.

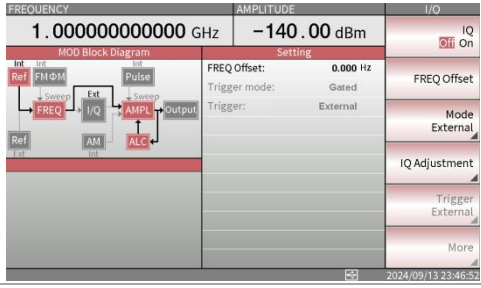
F 3



Setting trigger mode and external trigger

Note

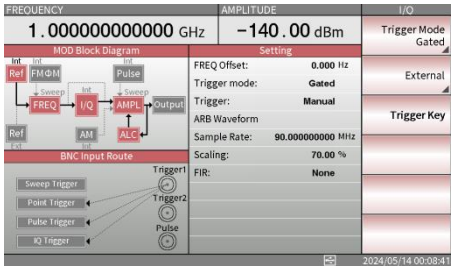
The external trigger won't be activated if the waveform mode is set to External.



Panel Operation

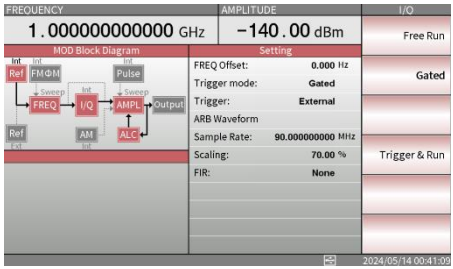
1. Press the F5 key to set or change the present trigger mode when the Digital modulation or ARB mode is selected.

F5



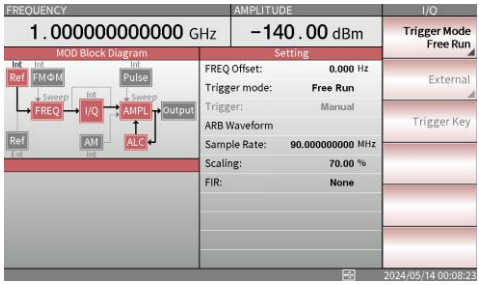
2. Set trigger mode. Press the F1 key to change trigger mode.

F1



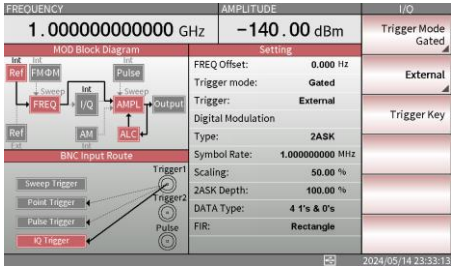
Note

If Trigger mode is selected to Free Run, The External trigger or Manual trigger (Trigger key) won't be activated.



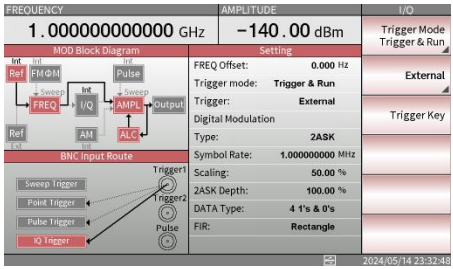
Trigger mode-Gated

3. If you want to select Gated as trigger mode, press the F2 key. **F2**



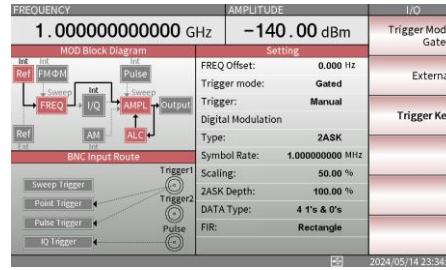
Trigger mode-Trigger & Run

4. If you want to select Trigger & Run as trigger mode, press the F4 key. **F4**



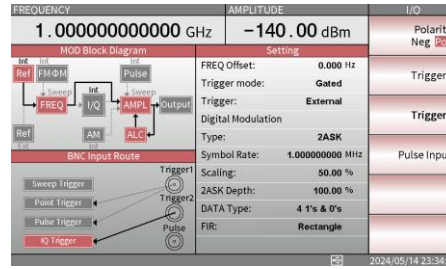
5. To select the Manual trigger, press the F3 key.

F 3



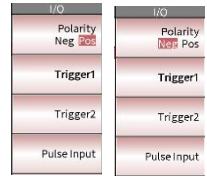
6. To select the External trigger, press the F2 key.

F 2



7. Press the F1 key to select polarity. There are polarities positive and negative. You can see the difference from the BNC input route diagram.

F 1

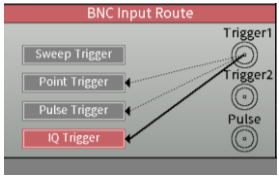


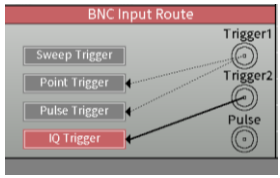
8. Press the F2, F3 or F4 key to select a trigger terminal. Select Trigger 1, Trigger2 or Pulse Input. You can observe which trigger terminal is selected from the BNC input route diagram.

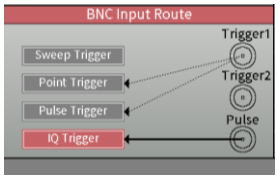
F 2

F 3 or

F 4


BNC Input Route
Sweep Trigger
Point Trigger
Pulse Trigger
IQ Trigger
Trigger1
Trigger2
Pulse


BNC Input Route
Sweep Trigger
Point Trigger
Pulse Trigger
IQ Trigger
Trigger1
Trigger2
Pulse

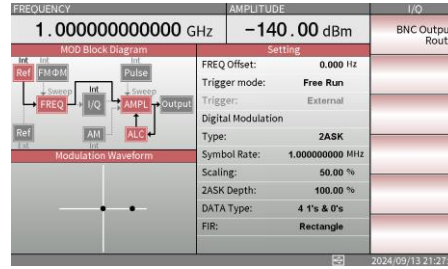

BNC Input Route
Sweep Trigger
Point Trigger
Pulse Trigger
IQ Trigger
Trigger1
Trigger2
Pulse

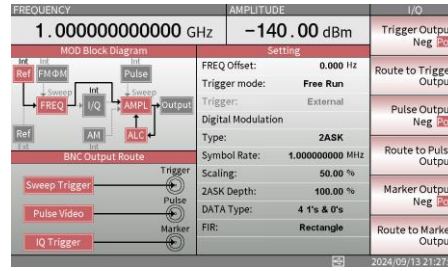
Setting BNC Output Route

Panel Operation

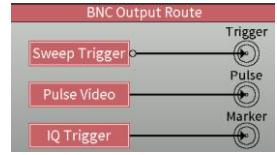
1. From the I/Q setting page press the F6 (more) key and then press the F1 key to move on to the BNC output route setting.

F6 + F1





When the F1 key is pressed, the BNC output route will display on the left lower corner of the I/Q setting page as shown in the diagram below.



2. Press the F1 key to select the polarity of the trigger output and toggle between Pos and Neg polarity. If Neg is selected, you will see a small icon that looks like a small circle at the end of the route to indicate that the present output polarity is Negative.

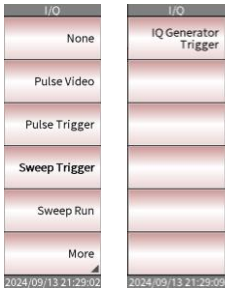
F1

(Negative)

(Positive)

3. Press the F2 key to select which kind of BNC output route to trigger output. There are five types of BNC output routes available including Pulse Video, Pulse Trigger, Sweep Trigger, Sweep Run, and IQ Generator Trigger.

F2



4. Select a BNC output route to the trigger output.

- To select Pulse Video as an output route to trigger, press the F2 key.

F2

- To select Pulse Trigger as an output route to trigger, press the F3 key.

F3

- To select Sweep Trigger as an output route to trigger, press the F4 key.

F4

- To select Sweep Run as an output route to trigger, press the F5 key.

F5

- To select IQ Generator Trigger as an output route to trigger, press the F6 (More) key and the F1 key.

F6 + F1

Note

If option **None** is selected as the BNC route to trigger, the icon route to trigger will become grey.

5. Likewise, press the F3 key to select the polarity of the pulse output polarity. Press the F4 key to select which kind of BNC output route to pulse output.

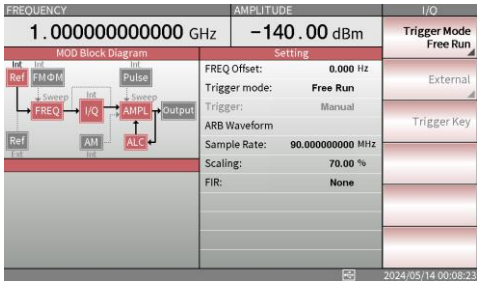
F3
F4

6. Likewise, press the F6 key to select the polarity of the marker output. Press the F6 key to select which kind of BNC output route to marker output.

F5
F6

Note

If trigger mode is selected to Free Run, The External trigger or Manual trigger (Trigger key) won't be activated.



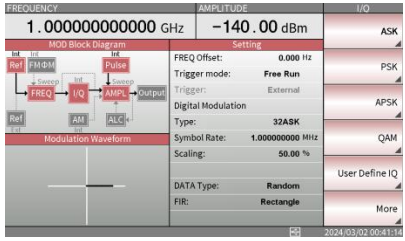
Other settings of Digital Modulation

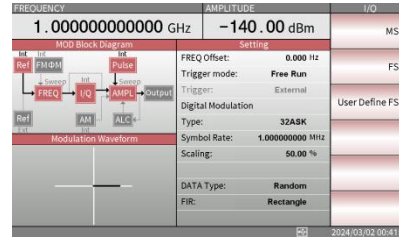
If the I/Q modulation mode is selected to Digital Modulation, other settings can be set as needed.

Selecting I/Q Type

Panel Operation When Digital Modulation is selected, you can press the F1 key twice to change I/Q type.

F1

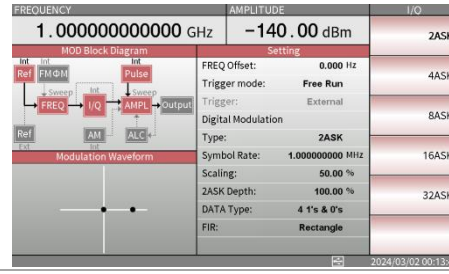




ASK Type

Panel Operation 1. To select ASK type as IQ type, press the F1 key and select a ASK type. Totally there are 5 ASK types available.

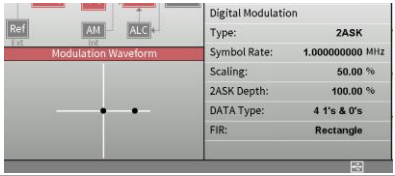
F1



2ASK

2. Press the F1 key to select 2ASK as IQ type.

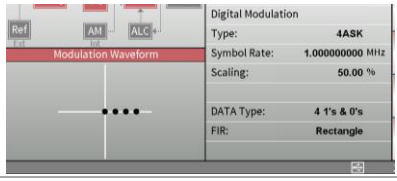
F1



4ASK

3. Press F2 key to select 4ASK as IQ type.

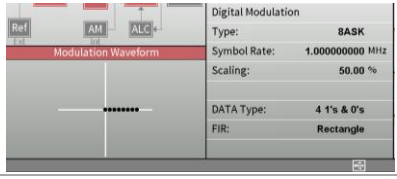
F2



8ASK

4. Press F3 key to select 8ASK as IQ type.

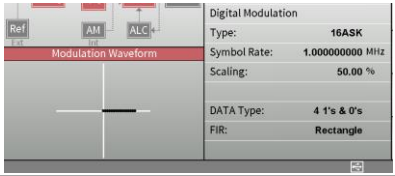
F3



16ASK

5. Press F4 key to select 16ASK as IQ type.

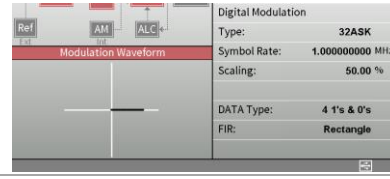
F4



32ASK

6. Press F5 key to select 32ASK as IQ type.

F 5

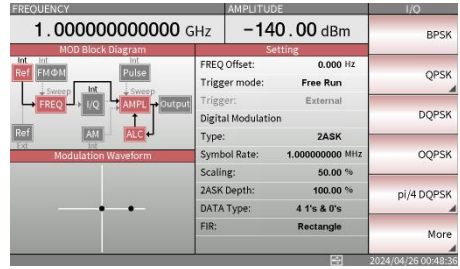


PSK Type

Panel Operation

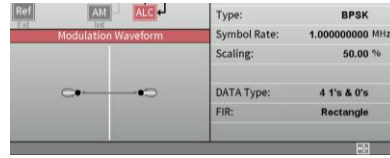
1. To select PSK type as IQ type, press the F2 key and select a further PSK Type. There are more PSK types available.

F 2



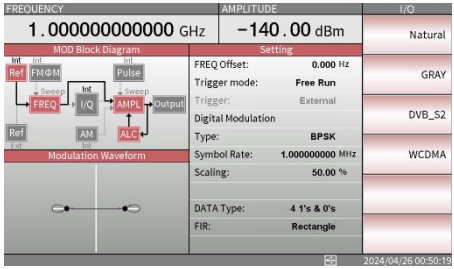
2. Press the F1 key to select BPSK as IQ type.

F 1



3. Press the F2 key to select a QPSK as IQ type.

F 2

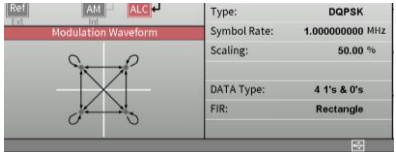


Note

QPSK type is further divided into 4 types of IQ types. Select one among the Natural, Gray, DVB_S2 and WCDMA.

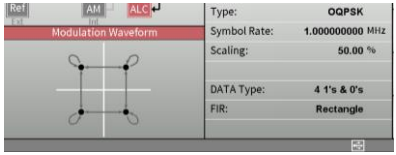
4. Press the F3 key to select a DQPSK as IQ type.

F 3



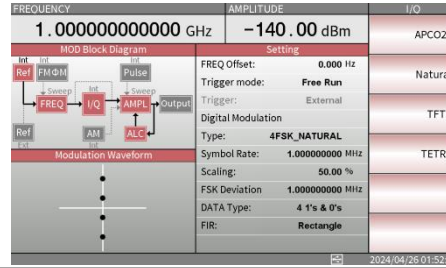
5. Press the F4 key to select an OQPSK as IQ type.

F 4



6. Press the F5 key to select a π/4 DQPSK as IQ type.

F5

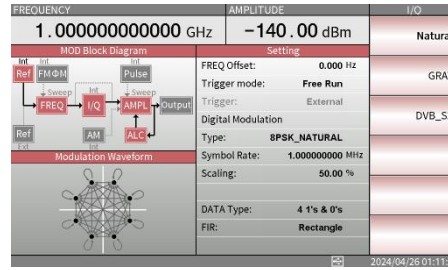


Note

π/4 DQPSK type is further divided into 4 types of IQ types. Select one among the APCO25, Natural, TFTS, and TETR IQ Types.

7. Press the F6 (More) key and the F1 key to select an 8PSK as IQ type.

F6 + F1

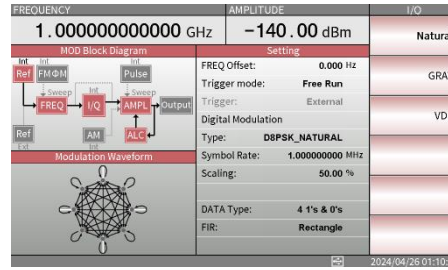


Note

8PSK is further divided into 3 types of IQ types. Select one among the Natural, GRAY, and DVB_S2 IQ Types.

8. Press the F6 (More) key and the F2 key to select a D8PSK as IQ type.

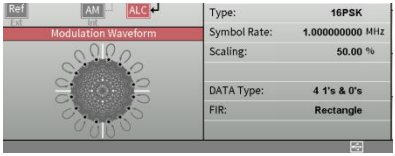
F6 + F2



Note D8PSK is further divided into 3 types of IQ types. Select one among the Natural, GRAY, and VDL IQ Types.

9. Press the F6 (More) key and the F3 key to select the 16PSK as IQ type.

F6 + F3

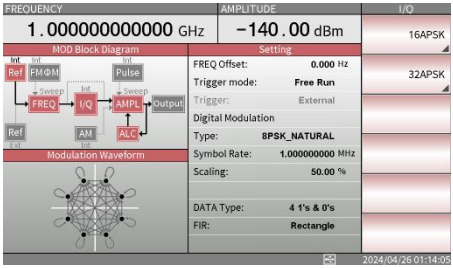


APSK Type

Panel Operation

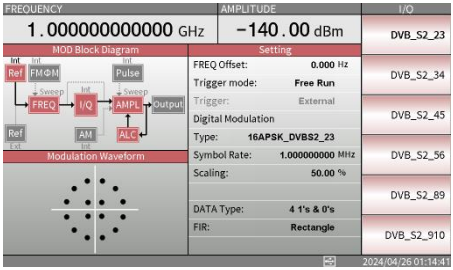
1. To select APSK type as IQ type, press the F3 key and then further select an APSK Type.

F3



2. Press the F1 key to select a 16APSK as IQ type.

F1

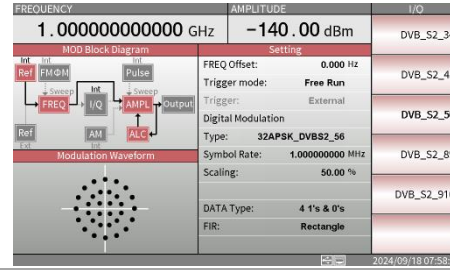


Note

16APSK type is further divided into 6 types of IQ types. Select one among the DVB_S2_23, DVB_S2_34, DVB_S2_45, DVB_S2_56, DVB_S2_89 and DVB_S2_910.

3. Press the F2 key to select a 32APSK as IQ type.

F 2



Note

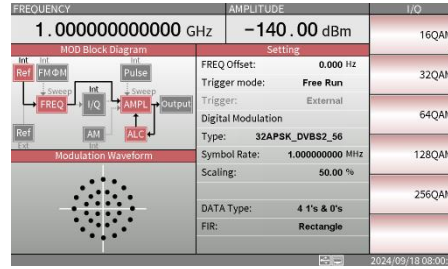
32APSK type is further divided into 5 types of IQ types. Select one among the DVB_S2_34, DVB_S2_45, DVB_S2_56, DVB_S2_89 and DVB_S2_910.

QAM Type

Panel Operation

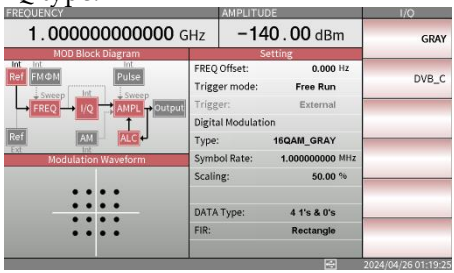
1. To select QAM type as IQ type, press the F4 key and then further select a QAM Type.

F 4



2. Press the F1 key to select a 16QAM IQ type.

F1

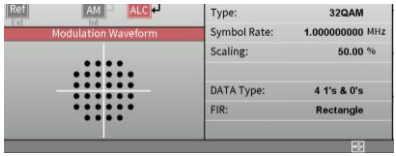


Note

16QAM is further divided into two types. Select one between GRAY and DVB_C IQ type.

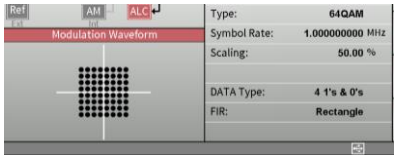
3. Press the F2 key to select the 32QAM as IQ type.

F2



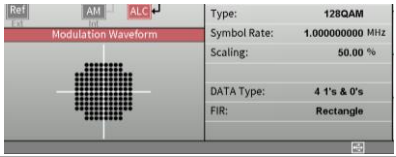
4. Press the F3 key to select the 64QAM as IQ type.

F3



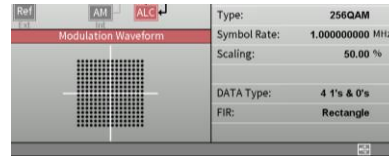
5. Press the F4 key to select the 128QAM as IQ type.

F4



6. Press the F5 key to select the 256QAM as IQ type.

F5

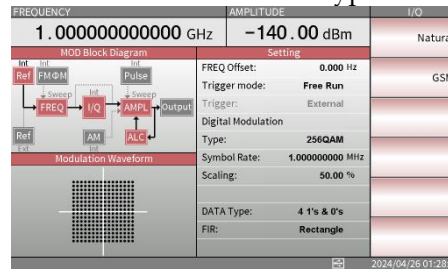


MSK Type

Panel Operation

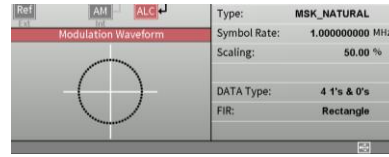
1. To select MSK type as IQ type, press the F6 (More) key and the F1 key and then further select a MSK Type.

F6 + F1



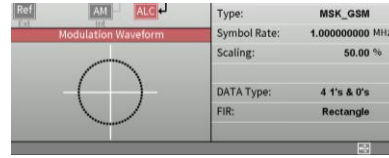
2. Press the F1 key to select the Natural IQ type.

F1



3. Press the F2 key to select the GSM IQ type.

F2

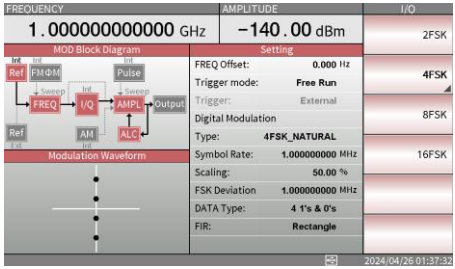


FSK Type

Panel Operation

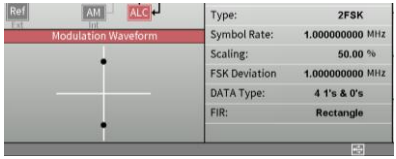
1. To select FSK type as IQ type, press the F6 (More) key and the F2 key and then further select a FSK Type.

F6 + F2



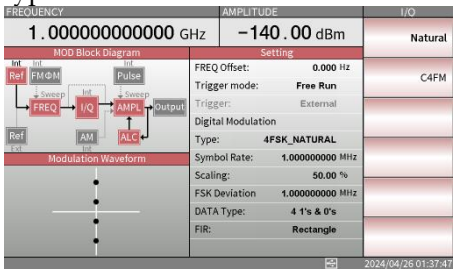
2. Press the F1 key to select the 2FSK IQ type.

F1



3. Press the F2 key to select a 4FSK IQ type.

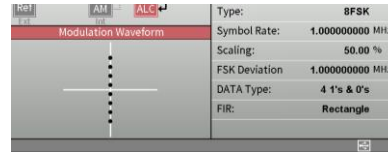
F2



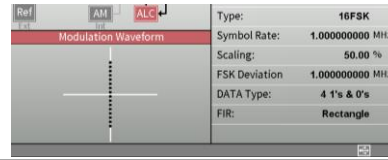
Note

4FSK is further divided into two types. Select one between Natural and C4FM IQ type.

4. Press the F3 key to select the 8FSK IQ type. F3



5. Press the F4 key to select the 16FSK IQ type. F4

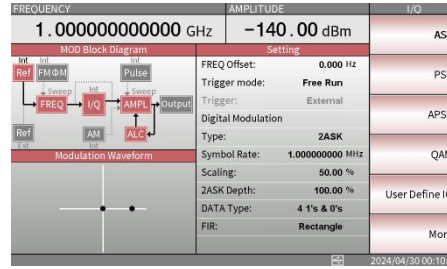


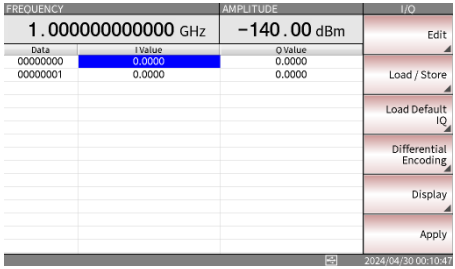
Except for the I/Q types listed above, you can customize user-defined IQ and FSK through panel operation. The procedures are below.

Editing User-defined I/Q Type

Panel Operation

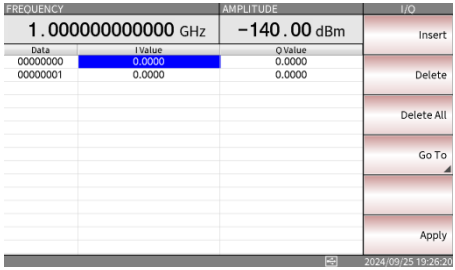
1. Press the F5 key under the I/Q type menu. F5





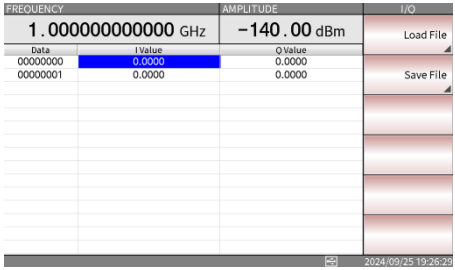
2. Press the F1 key to enter the editing page to edit the user-defined .iqdu file.

F1



3. Press the F2 key to load a .iqdu file or save the edited .iqdu file.

F2



Note

The steps of panel operation in these two menus are similar to that in the pulse train operation's edit menu except for loading and storing file format. Here the format is .iqdu. Please refer to page 77 through page 80 for details of the panel operation of the User Define I/Q option.

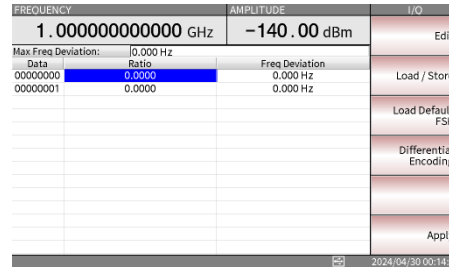
Note

After entering the editing menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the "Exit" (F1) key or the "Save & Exit" (F2) key to exit directly, and press the F2 key to save the editing results and exit.

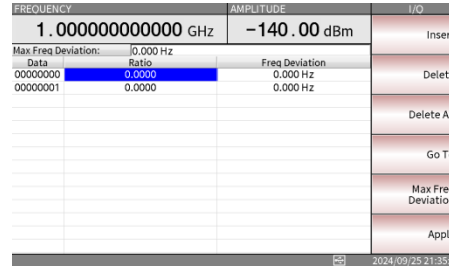
Editing User-defined FSK Modulation

Panel Operation

1. Press the F6 (More) key and the F3 key under the I/Q type menu.

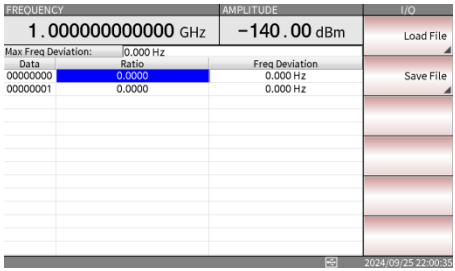


2. Press the F1 key to enter the editing page to edit the user-defined .iqdf file.



3. Press the F2 key to load a .iqdf file or save the edited .iqdf file.

F 2



Note

The steps of panel operation in these two menus are similar to that in the pulse train operation's edit menu except for loading and storing file format. Here the format is .iqdf. Please refer to page 77 through page 80 for details of the panel operation of the User Define FSK option.

Note

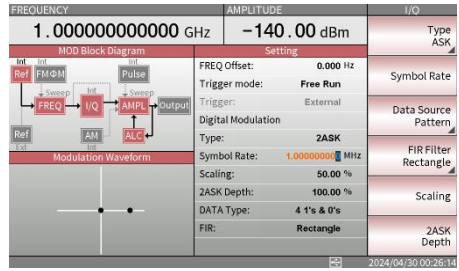
After entering the editing menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the “Exit” (F1) key or the “Save & Exit” (F2) key to exit. Press the F1 key to exit directly, and press the F2 key to save the editing results and exit.

Return

Editing Symbol Rate

Panel Operation

1. Once you select an I/Q type, you can edit its symbol rate by pressing the F2 key.



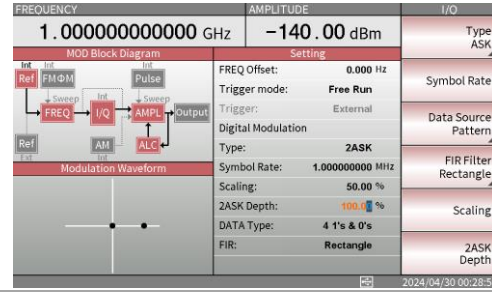
2. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

3. You can also use the numeric keyboard to input value you need directly.

4. Press the Enter key to confirm that value you set.

Note

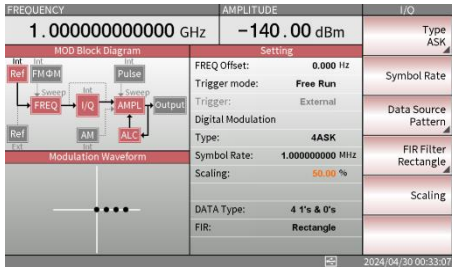
If you select 2ASK as the I/Q type, you can still press the F6 key to edit the depth of the 2ASK I/Q type.



Editing Scaling

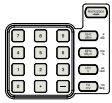
Panel Operation

1. Once you select an I/Q type, you can edit its scaling by pressing the F5 key.



2. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

3. You can also use the numeric keyboard to input value you need directly.



`

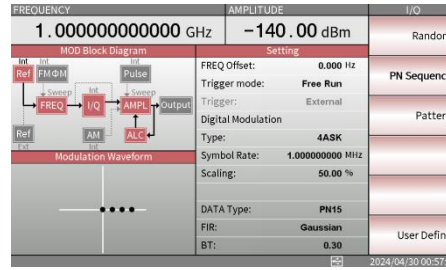
4. Press the Enter key to confirm that value you set.

Editing Data Socurce

Panel Operation

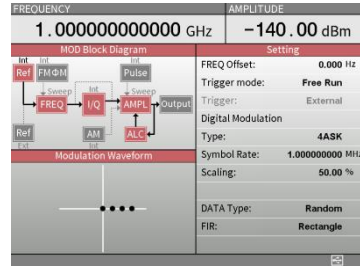
1. Once you select an I/Q type, you can edit its data scource by pressing the F3 key.

F3



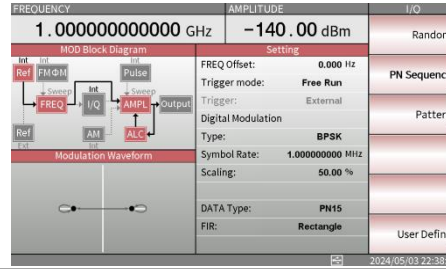
2. Press the F1 key to select Random as the data source of the I/Q type you currently selected.

F1



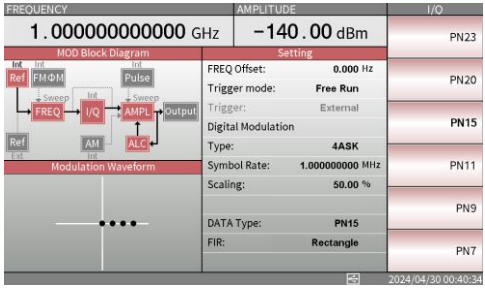
3. Press the F2 key to select PN Sequence as the data source of the I/Q type you currently selected.

F2



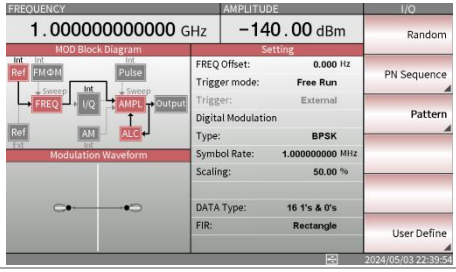
Note

PN Sequence is further divided into six types of source. Select one among PN23, PN20, PN15, PN11, PN9 and PN7 IQ type.



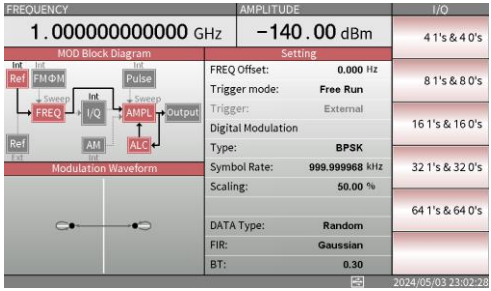
4. Press the F3 key to select Patten as the data source of the I/Q type you currently selected.

F3



Note

Patter is further divided into five types of source. Select one among these IQ type.

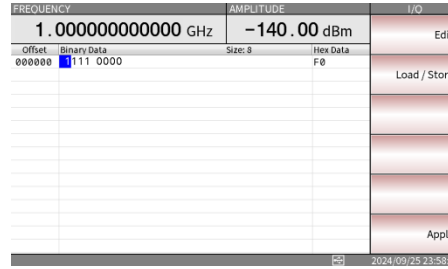


Editing User-defined Data Socurce

Panel Operation

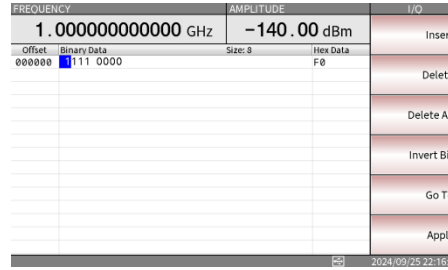
1. Press the F6 key under the Data Source menu.

F6



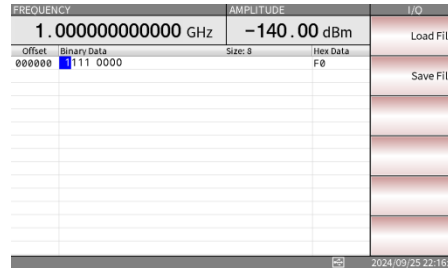
2. Press the F1 key to enter the editing page to edit the user-defined .iqds file.

F1



3. Press the F2 key to load a user-defined .iqds file or save the edited .iqds file.

F2

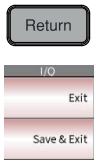


Note

The steps of panel operation in these two menus are similar to that in the pulse train operation's edit menu except for loading and storing file format. Here the format is .iqds. Please refer to page 77 through page 80 for details of the panel operation of the User Define Data Source option.

Note

After entering the editing menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the “Exit” (F1) key or the “Save & Exit” (F2) key to exit. Press the F1 key to exit directly, and press the F2 key to save the editing results and exit.



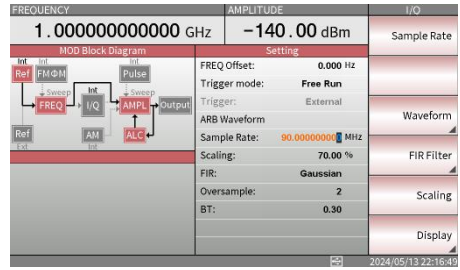
Other settings of ARB Waveform

If the I/Q modulation mode is selected to ARB Waveform, other settings can be set as needed.

Editing Sample Rate

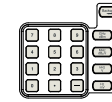
Panel Operation

1. Press the F1 key to edit the sample rate of ARB waveform.



2. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

3. You can also use the numeric keyboard to input value you need directly.



`

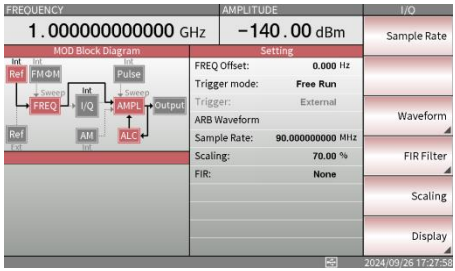
4. Press the Enter key to confirm that value you set.

Editing Waveform

Panel Operation

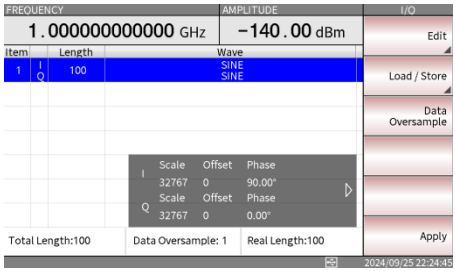
1. Press the F3 key to enter edit the ARB waveform.

F 3



2. Press the F1 key to enter the editing menu for the ARB waveform.

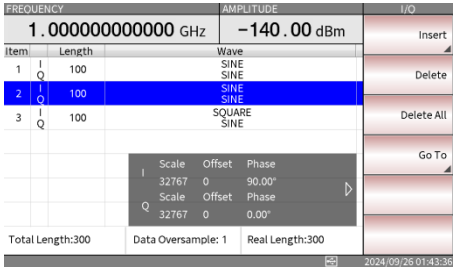
F 1



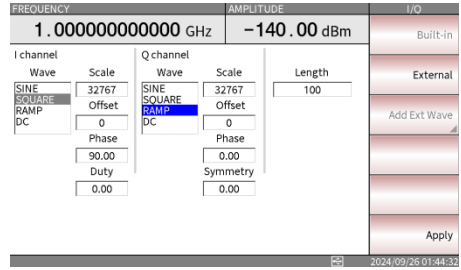
Insert Waveform

3. Press the F1 key to insert a ARB waveform.

F 1



4. Use the scroll knob and arrow keys to select the waveforms for both channels I and channel Q and edit their corresponding parameter (including Scale, Offset, Phase, Duty, Symmetry), and edit Lenth for waveforms. Press the F6 key to apply it.

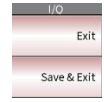


5. Press the F6 key to apply the edited waveform to be inserted.

6. The steps of panel operation for other options in the editing menu are similar to those in the pulse train operation's edit menu except for loading and storing file format. Here the format is .iqdr. Please refer to pages 77 through 80 for details of the panel operation.

Note

After entering the editing menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the "Exit" (F1) key or the "Save & Exit" (F2) key to exit. Press the F1 key to exit directly, and press the F2 key to save the editing results and exit.

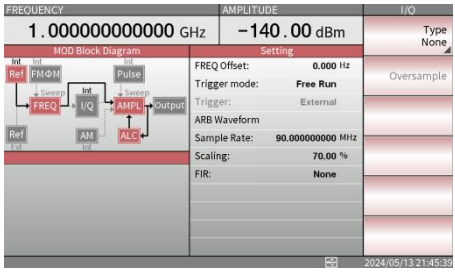


Editing FIR filter

Panel Operation

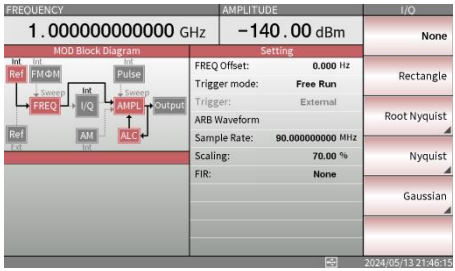
1. Press the F4 key to edit the FIR filter of ARB waveform.

F 4



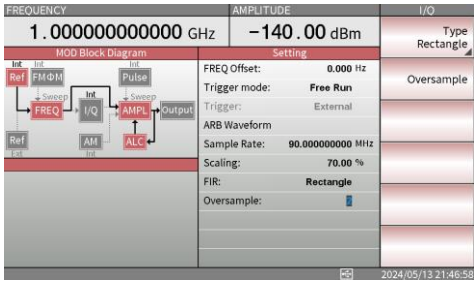
2. Press the F1 key to change the FIR filter.

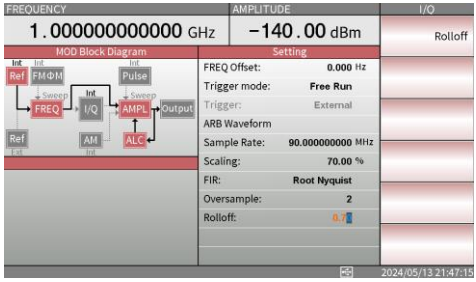
F 1

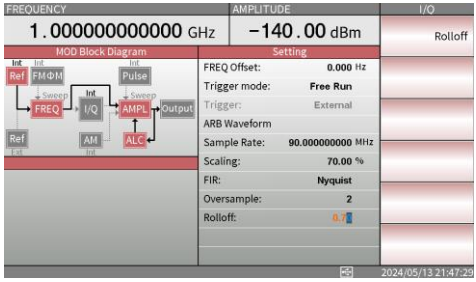


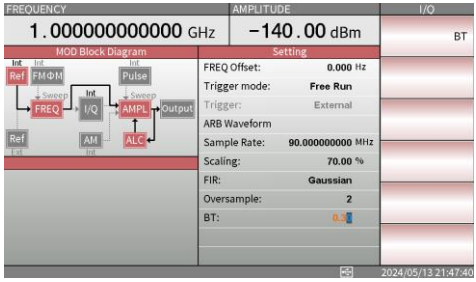
Note

FIR filter type is further divided into four types. Select one among Rectangle, Root Nyquist, Nyquist and Gaussian and then edit its settings such as oversample, Rolloff or BT.





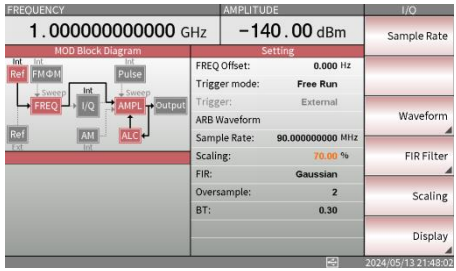




Editing scaling

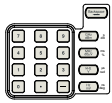
Panel Operation

1. Press the F5 key to edit the scaling of ARB waveform.



2. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

3. You can also use the numeric keyboard to input value you need directly.



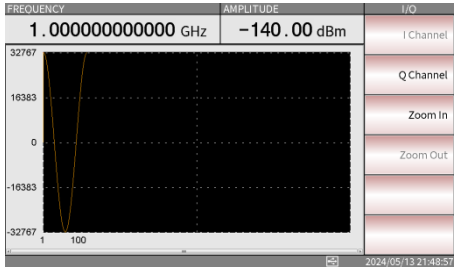
4. Press the Enter key to confirm that value you set.

Display

Panel Operation

1. Press the F6 key to display the follwing options.

I channel



Q channel

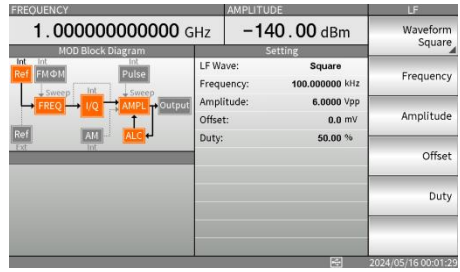

FREQUENCY
1.000000000000 GHz
AMPLITUDE
−140.00 dBm
I/Q
I Channel
Q Channel
Zoom In
Zoom Out
32767
16383
0
-16383
-32767
1
100
2024/05/13 21:48:50

LF SETTING

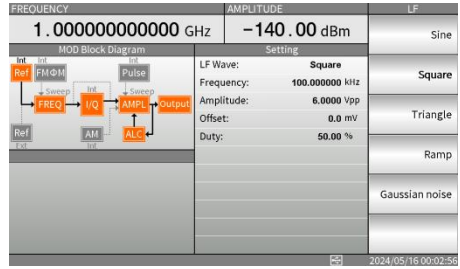
Selecting a waveform for LF output

Panel Operation

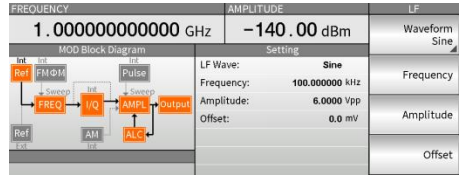
1. Press the LF key on the front panel of the GSG-2000 to enter the menu about the LF setting.



2. Press the F1 key to change the waveform when the LF output is activated.

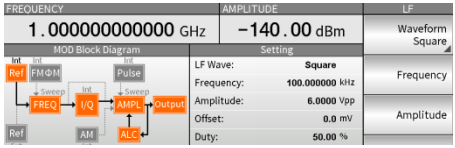


- To select Sine waveform as the LF output waveform, press the F1 key.



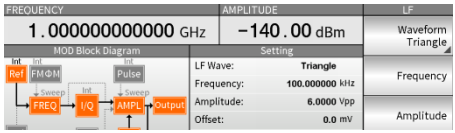
- To select Square waveform as the LF output waveform, press the F2 key.

F 2



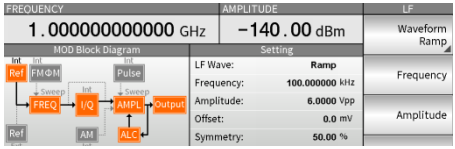
- To select Triangle waveform as the LF output waveform, press the F3 key.

F 3



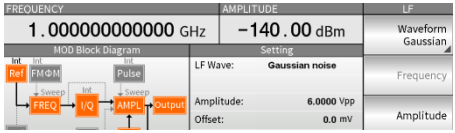
- To select Ramp as the LF output waveform, press the F4 key.

F 4



- To select Gaussian noise as the LF output waveform, press the F5 key.

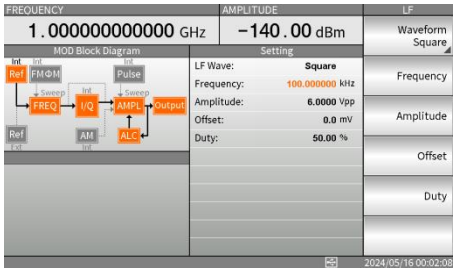
F 5



Other settings for selected waveform

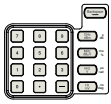
Panel Operation

1. If a waveform (except for Gaussian noise) is selected, please press the F2 key to set the frequency.



2. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

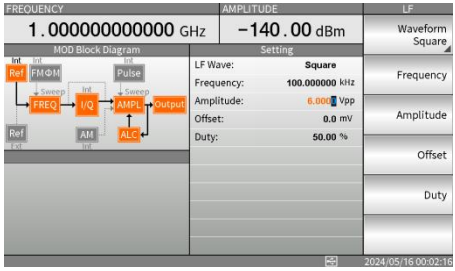
3. You can also use the numeric keyboard to input value you need directly.



4. Press the Enter key to confirm that value you set.

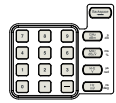
Setting amplitude

5. If a waveform is selected, please press the F3 key to set the amplitude.



6. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

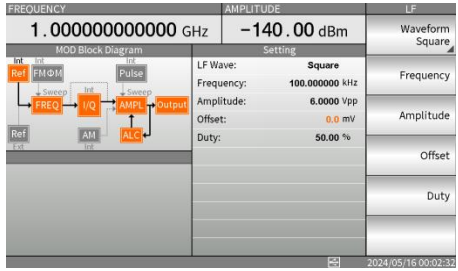
7. You can also use the numeric keyboard to input value you need directly.



8. Press the Enter key to confirm that value you set.

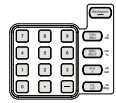
Setting offset

9. If a waveform is selected, please press the F4 key to set the offset.



10. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

11. You can also use the numeric keyboard to input value you need directly.

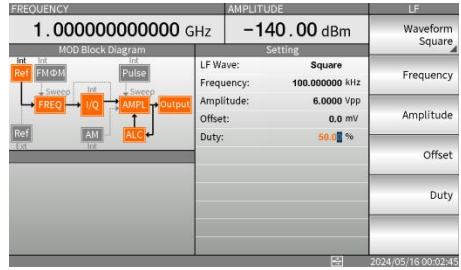


12. Press the Enter key to confirm that value you set.

Setting duty

(for square waveform only)

13. If the square waveform is selected, please press the F5 key to set duty.



14. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

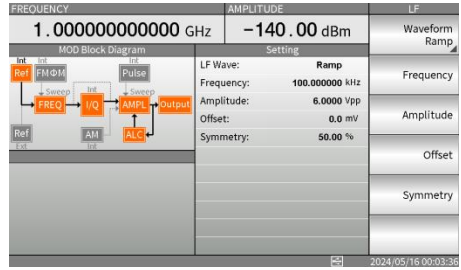
15. You can also use the numeric keyboard to input value you need directly.

16. Press the Enter key to confirm that value you set.

Setting symmetry

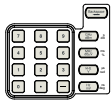
(for ramp only)

17. If the ramp is selected, please press the F5 key to set symmetry.



18. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.

19. You can also use the numeric keyboard to input value you need directly.



20. Press the Enter key to confirm that value you set.

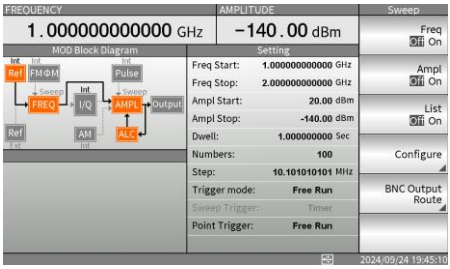
21. After all settings about LF output are done, you can press the LF on/off key on the GSG-2000 front panel to activate LF output. The key constantly lights on when LF output is going.

SWEEP FUNCTION

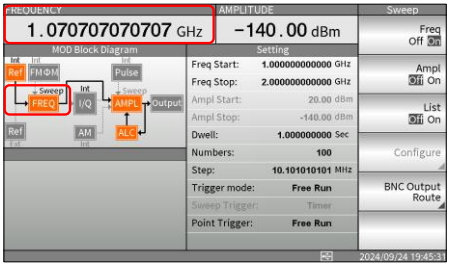
Activating Sweep Function

Panel Operation

1. Press the Sweep key on the front panel of the GSG-2000 to enter sweep configuration menu.

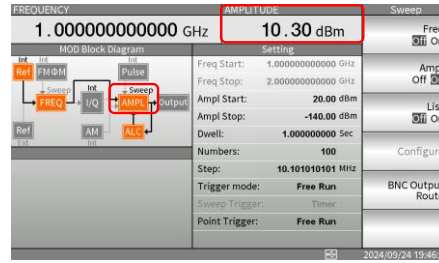


2. Press the F1 key to activate sweep frequency. Then you will see sweep frequency is activated in the MOD Block Diagram and present sweep frequency, as shown in the figure below.



3. Press the F2 key to activate sweep amplitude. Then you will see sweep amplitude is activated in the MOD Block Diagram and present sweep amplitude, as shown in the figure below.

F2



4. Press the F3 key to activate sweep list.

F3

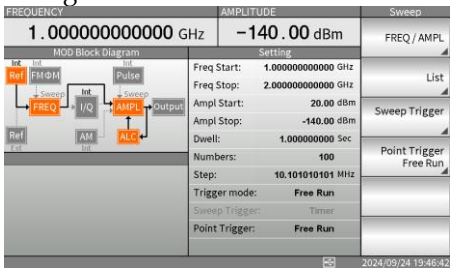
Sweep configuration

Setting sweep frequency and amplitude

Panel Operation

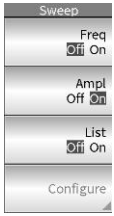
1. Press the F4 key to enter sweep configuration menu.

F4



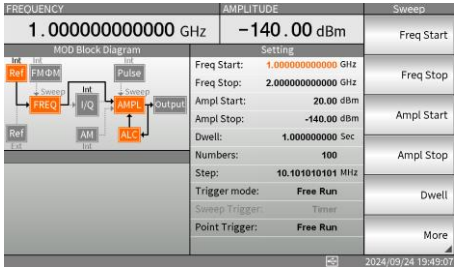
Note

Suppose any of the sweep frequency, sweep amplitude, or sweep list is activated. The configuration is disabled.

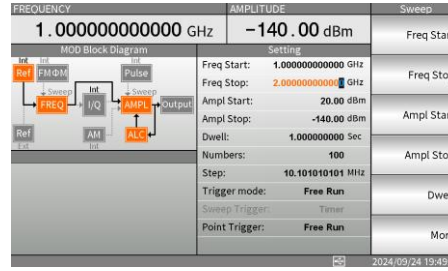


2. Press the F1 to set start frequency.

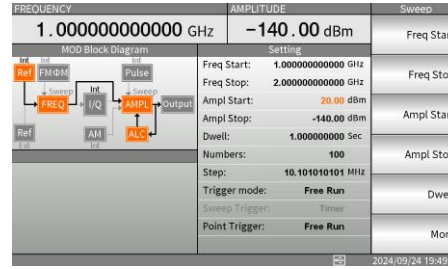
F1



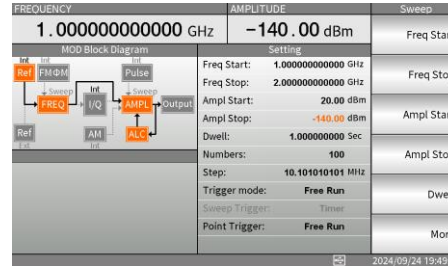
3. Press the F2 key to set end frequency. F2



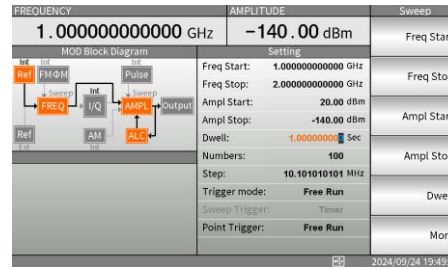
4. Press the F3 to set start amplitude. F3



5. Press the F4 key to set end amplitude. F4

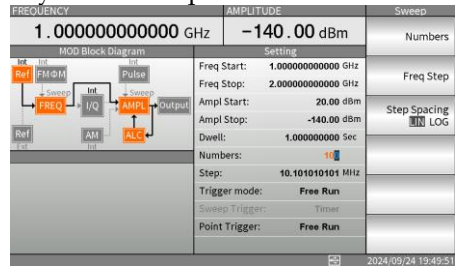


6. Press the F5 key to set sweep dwell. F5



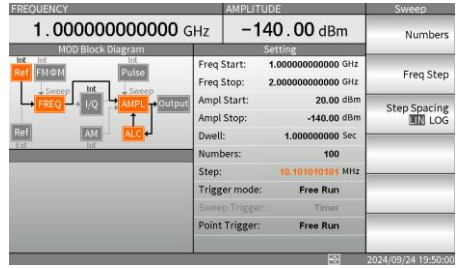
7. Press the F6 (More) key and the F1 key to set sweep numbers.

F6 + F1



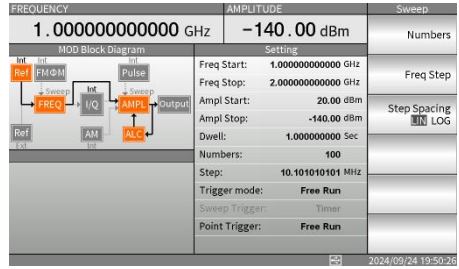
8. Press the F6 (More) key and the F2 key to set sweep step.

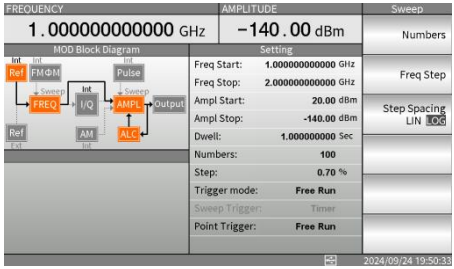
F6 + F2



9. Press the F6 (More) and toggle the F3 keys to select step spacing in MHz or percentage.

F6 + F3



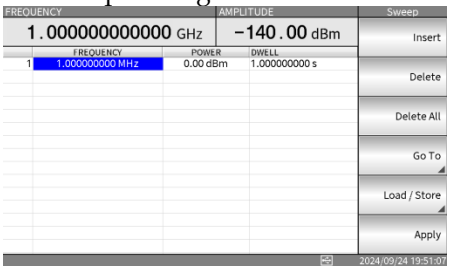


Editing list sweep

Panel Operation

1. Under the sweep configuration menu, press the F2 key to enter the list sweep editing menu.

F2



Note

The steps of panel operation in this menu are similar to that in the pulse train operation's **edit** menu except for loading and storing file format. Here the format is .swel. Please refer to page 77 through page 80 for details of the panel operation of the list option.

Note

After entering the list menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the "Exit" (F1) key or the "Save & Exit" (F2) key to exit. Press the F1 key to exit directly, and press the F2 key to save the editing results and exit.

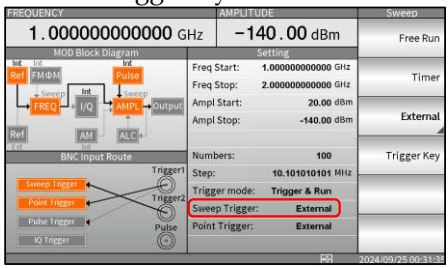
Return

Sweep trigger and point triggers

Panel Operation

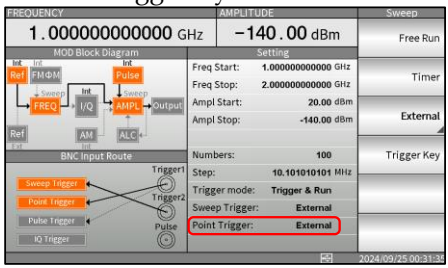
1. Under the sweep configuration menu, press the F3 key to enter the sweep trigger menu and select a trigger style. For example, here External trigger style is selected.

F 3



2. Under the sweep configuration menu, press the F4 key to enter the sweep trigger menu and select a trigger style. For example, here External trigger style is selected.

F 4



Note

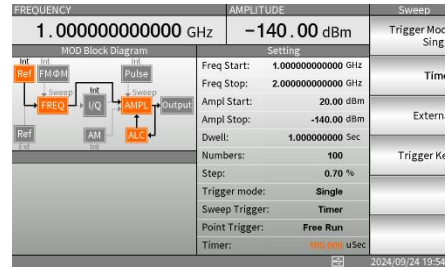
The sweep trigger is used to trigger the sweep process, while the point trigger is used to trigger switching of each setting point in the sweep process.

Note

The panel operation of the sweep trigger and point trigger is similar. Here, we just take the sweep trigger as an example.

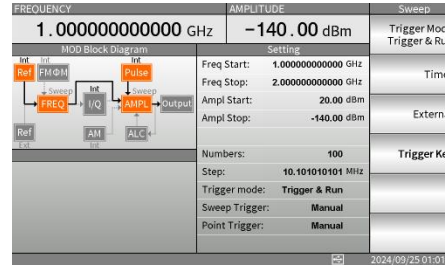
3. To set the sweep trigger to a Timer, Press the F2 key and set the value of Timer.

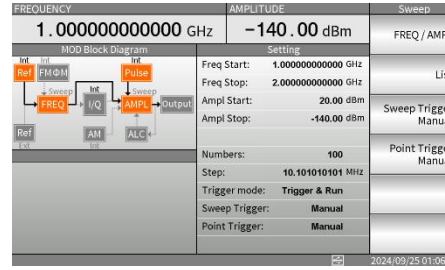
F2



4. To set the sweep trigger to Manual trigger, press the F4 key.

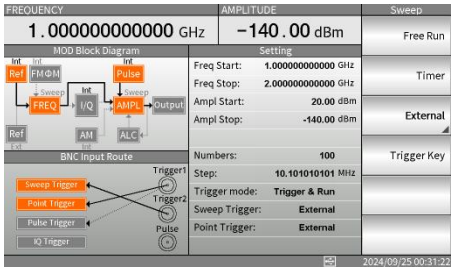
F4





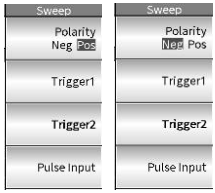
5. To select the External trigger, press the F3 key.

F 3



6. Press the F1 key to select polarity. There are polarities positive and negative. You can see the difference from the BNC input route diagram.

F 1

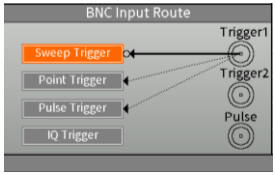


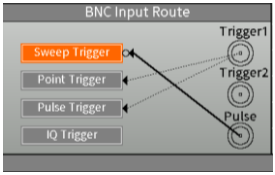
7. Press the F2, F3 or F4 key to select a trigger terminal. Select Trigger1, Trigger2 or Pulse Input. You can observe which trigger terminal is selected from the BNC input route diagram.

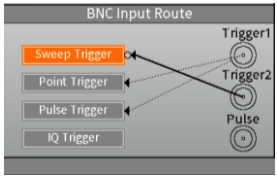
F 2 or

F 3 or

F 4





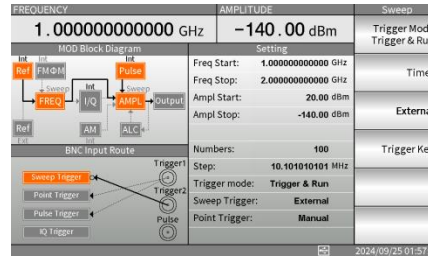


Selecting a trigger mode

Panel Operation

1. Under the sweep trigger menu, press the F1 key to enter the trigger mode menu and select a trigger mode. For example, here Trigger & Run is selected.

F1



Free Run

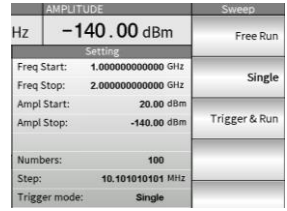
2. Press the F1 key to select free run as trigger mode.

F1

Single

3. Press the F2 key to select triggered as trigger mode.

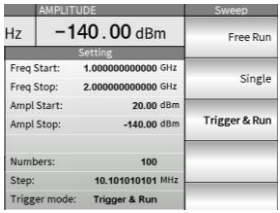
F2



Gated

4. Press the F3 key to select Trigger & Run as trigger mode.

F 3

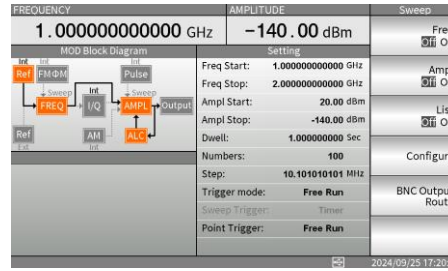


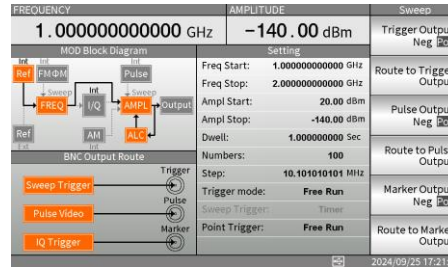
Setting BNC Output Route

Panel Operation

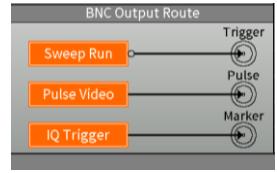
1. From the sweep setting page, press the F5 key to move on to the BNC output route setting.

F5





As shown in the diagram below, When the F5 key is pressed, the BNC output route will display on the left lower corner of the Sweep setting page.



2. Press the F1 key to select the polarity of the trigger output and toggle between Pos and Neg polarity. If Neg is selected, you will see a small icon that looks like a small circle at the end of the route to indicate that the present output polarity is Negative.

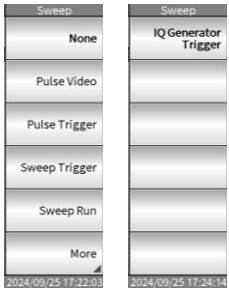
F1

(Negative)

(Positive)

3. Press the F2 key to select which kind of route to trigger output. There are five types of routes available including Pulse Video, Pulse Trigger, Sweep Trigger, Sweep Run, and IQ Generator Trigger.

F2



4. Select a BNC output route to the trigger output.

- To select Pulse Video as an output route to trigger, press the F2 key.

F2

- To select Pulse Trigger as an output route to trigger, press the F3 key.

F3

- To select Sweep Trigger as an output route to trigger, press the F4 key.

F4

- To select Sweep Run as an output route to trigger, press the F5 key.

F5

- To select IQ Generator Trigger as an output route to trigger, press the F6 (More) key and the F1 key.

F6 + F1

Note

If option **None** is selected as the BNC route to trigger, the icon "route to trigger" will become grey.

5. Likewise, press the F3 key to select the polarity of the pulse output polarity. Press the F4 key to select which kind of route to pulse output.

F3

F4

6. Likewise, press the F6 key to select the polarity of the marker output. Press the F6 key to select which kind of route to marker output.

F5

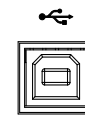
F6

REMOTE INTERFACE

Establishing a Remote Connection

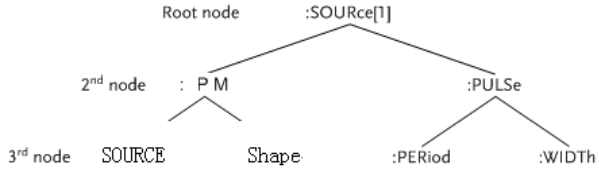
The GSG-2000 supports USB remote connections.

Configure USB interface

Description	The GSG-2000 series can be connected via USB using the USB Test & Measurement (TMC) class (USB 2.0).
Interface	Rear panel USB slave port. 
Installing the Driver	Before connecting the unit to the USB port of the PC, Please use "NI Visa" (National Instruments Corporation). Connect a USB cable to send a command. If the connection is successful, the USB will be shown as the interface type on the lower right corner of the LCD display. The front panel keys are automatically locked when the unit is in remote mode.
Function Check	Perform the following query: *IDN? The unit will return the manufacturer, model, serial number and software version. GW INSTEK, GSG-2000, SN: xxxxxxxx, Vx.xx
Disabling Remote Control Mode	Send a remote command from the PC Long-press the unlock key on the front panel. Unplug the USB cable from the rear panel.

⚠ Note	USB devices are hot-plug devices. You can directly remove the cable and exit.

Command Syntax

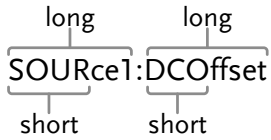
Compatible standard	IEEE488.2, 1992 (fully compatible) SCPI, 1994 (partially compatible)
Command Tree	The SCPI standard is an ASCII based standard that defines the command syntax and structure for programmable instruments. Commands are based on a hierarchical tree structure. Each command keyword is a node on the command tree with the first keyword as the root node. Each sub node is separated with a colon. Shown below is a section of the SOURce[1|2|3|4] root node and the :PM and :PULSe sub nodes. 
Command types	Commands can be separated in to three distinct types, simple commands, compound commands and queries.

Simple	A single command with/without a parameter
Example	*OPC
Compound	Two or more commands separated by a colon (:) with/without a parameter
Example	SOURce1:PULSe:WIDTh

	Query	A query is a simple or compound command followed by a question mark (?). A parameter (data) is returned. The maximum or minimum value for a parameter can also be queried where applicable.
	Example	SOURce1:FREQuency? SOURce1:FREQuency? MIN

Command forms

Commands and queries have two different forms, long and short. The command syntax is written with the short form of the command in capitals and the remainder (long form) in lower case.



The commands can be written in capitals or lower-case, just so long as the short or long forms are complete. An incomplete command will not be recognized.

Below are examples of correctly written commands:

LONG	SOURce1:DCOffset
	SOURCE1:DCOFFSET
	source1:dcoffst
SHORT	SOUR1:DCO
	sour1:dco

Command Format

1: command header
2: single space
3: parameter
4: message terminator

Square Brackets []	Commands that contain squares brackets indicate that the contents are optional. The function of the command is the same with or without the square bracketed items. Brackets are not sent with the command. For example, the frequency query below can use any of the following 3 forms: SOURce1:FREQuency? [MINimum|MAXimum] SOURce1:FREQuency? MAXimum SOURce1:FREQuency? MINimum SOURce1:FREQuency?		
Braces {}	Commands that contain braces indicate one item within the braces must be chosen. Braces are not sent with the command.		
Angled Brackets <>	Angle brackets are used to indicate that a value must be specified for the parameter. See the parameter description below for details. Angled brackets are not sent with the command.		
Bars |	Bars are used to separate multiple parameter choices in the command format.		
Parameters	Type	Description	Example
	<Boolean>	Boolean logic	0, 1/ON,OFF
	<NR1>	integers	0, 1, 2, 3
	<NR2>	decimal numbers	0.1, 3.14, 8.5
	<NR3>	floating point	4.5e-1, 8.25e+1
	<NRf>	any of NR1, 2, 3	1, 1.5, 4.5e-1
	<NRf+><Numeric>	NRf type with a suffix including MINimum, MAXimum or DEFault parameters.	1, 1.5, 4.5e-1 MAX, MIN,

	<aard>	Arbitrary ASCII characters.	
	<discrete>	Discrete ASCII character parameters	IMM, EXT, MAN
	<frequency> <peak deviation in Hz> <rate in Hz>	NRf+ type including frequency unit suffixes.	1 KHZ, 1.0 HZ, MHZ
	<amplitude>	NRf+ type including voltage peak to peak.	VPP
	<offset>	NRf+ type including volt unit suffixes.	V
	<seconds>	NRf+ type including time unit suffixes.	NS, S MS US
	<percent> <depth in percent>	NRf type	N/A
Message terminators	LF CR	Line feed code (new line) and carriage return.	
	LF	line feed code (new line)	
	EOI	IEEE-488 *EOI* (End-Or-Identify)	
Note	∧j or ∧m should be used when using a terminal program.		
Command Separators	Space	A space is used to separate a parameter from a keyword/command header.	
	Colon (:)	A colon is used to separate keywords on each node.	

Semicolon (;)	A semi colon is used to separate subcommands that have the same node level. For example: SOURce[1|2|3|4]:DCOffset? SOURce[1|2|3|4]:OUTPut? →SOURce1:DCOffset?;OUTPut?
Colon + Semicolon (:;)	A colon and semicolon can be used to combine commands from different node levels. For example: SOURce1:PM:SOURce? SOURce:PULSe:WIDTh? →SOURce1:PM:SOURce?:;SOURce:PULSe:WIDTh?
Comma (,)	When a command uses multiple parameters, a comma is used to separate the parameters. For example: SOURce:APPLy:SQUare 10KHZ, 2.0 VPP, -1V

SCPI Commands

*CLS

Set →

Description	The *CLS command clears the Standard Event Status, Operation Status and Questionable Status registers. The corresponding Enable registers in each of the above registers are not cleared. If a <NL> newline code immediately proceeds a *CLS command, the Error Que and the MAV bit in the Status Byte Register is also cleared.
Syntax	*CLS

*ESE

Set →
→ Query

Description	Sets or queries the Standard Event Status Enable register.	
Syntax	*ESE <NR1>	
Query Syntax	*ESE?	
Parameter	<NR1>	0~255
Return parameter	<NR1>	Returns the bit sum of the Standard Event Status Enable register.

*ESR?

→ Query

Description	Queries the Standard Event Status register. The Event Status register is cleared after it is read.	
Query Syntax	*ESR?	
Return parameter	<NR1>	Returns the bit sum of the Standard Event Status register and clears the register.

*IDN? → Query

Description	Queries the manufacturer, model number, serial number, and firmware version of the instrument.	
Query Syntax	*IDN?	
Return parameter	<character data>	Returns the instrument identification as a character data in the following format: GWINSTEK,GSG-2160,XXXXXXXX,T.X.X.X.X Manufacturer: GWINSTEK Model number: GSG-2160 Serial number: XXXXXXXX Firmware version: V3.X.X.X

*OPC → Set / Query

Description	The *OPC command sets the OPC bit (bit0) of the Standard Event Status Register when all current commands have been processed. The *OPC? Query returns 1 when all the outstanding commands have completed.	
Syntax	*OPC	
Query Syntax	*OPC?	
Return parameter	1	Returns 1 when all the outstanding commands have completed.

*OPT? → Query

Description	The *OPT? command query returns a command separated list of all of the instrument options currently installed on the signal generator.
Query Syntax	*OPT?

*RST

Set →

Description	This command resets the unit to its factory default state.
Syntax	*RST

*SRE

Set →
→ Query

Description	Sets or queries the Service Request Enable register. The Service Request Enable register determines which registers of the Status Byte register are able to generate service requests.	
Syntax	*SRE <NR1>	
Query Syntax	*SRE?	
Parameter	<NR1>	0~255
Return parameter	<NR1>	Returns the bit sum of the Service Request Enable register.

*STB?

→ Query

Description	Queries the bit sum of the Status Byte register with MSS (Master summary Status).	
Query Syntax	*STB?	
Return parameter	<NR1>	Returns the bit sum of the Status Byte register with the MSS bit (bit 6).

*TRG

→ Query

Description	The command triggers the device if BUS is the selected trigger source, otherwise, *TRG is ignored.
Syntax	*TRG

*TST?

Query

Description	Returns the result of a self-test.	
Query Syntax	*TST?	
Return parameter	0	This shows that all tests passed.
	1	This shows that one or more tests failed.

*WAI

Set

Description	Prevents any other commands or queries from being executed until all outstanding commands have completed.
Syntax	*WAI

System Commands

:SYSTem:COMMunicate:GPIB:ADDRess

Set → / → Query

Description	This command is to set and return the unit's GPIB address.	
Syntax	:SYSTem:COMMunicate:GPIB:ADDRess<NR1>	
Query Syntax	:SYSTem:COMMunicate:GPIB:ADDRess?	
Parameter/ Return parameter	<NR1>	1~30
Example	:SYST:COMM:GPIB:ADDR 10	

:SYSTem:COMMunicate:LAN:APPLY

Set →

Description	This command is to restart the network to enable changes that have been made to the LAN setup.
Syntax	:SYSTem:COMMunicate:LAN:APPLY

:SYSTem:COMMunicate:LAN:CONFig

Set → / → Query

Description	This command is to set and return the unit's internet protocol (IP) address.	
Syntax	:SYSTem:COMMunicate:LAN:CONFig {DHCP|MANual}	
Query Syntax	:SYSTem:COMMunicate:LAN:CONFig?	
Parameter/ Return parameter	DHCP	The user assigns an IP address to the unit.
	MANual	The network assigns an IP address to the unit with a fall back to Auto IP if DHCP fails. If both DHCP and Auto IP fail, manual configuration will be used.

:SYSTem:COMMunicate:LAN:DNS[1|2]

Set → Query

Description	This command defines the IP address of the signal generator DNS server. This entry defines the DNS server for the signal generator LAN connection. The query returns the current setting, not the saved setting.	
Syntax	:SYSTem:COMMunicate:LAN:DNS[1|2]	
Query Syntax	:SYSTem:COMMunicate:LAN:DNS[1|2]?	
Parameter/ Return parameter	<string>	DNS IP address
Example	:SYST:COMM:LAN:DNS1 "172.16.1.248"	

:SYSTem:COMMunicate:LAN:GATeway

Set → Query

Description	This command is to set and return the gateway for local area network (LAN) access to the signal generator from outside the current sub-network. The query returns the current setting, not the saved setting.	
Syntax	:SYSTem:COMMunicate:LAN:GATeway<ipstring>	
Query Syntax	:SYSTem:COMMunicate:LAN:GATeway?	
Parameter/ Return parameter	<string>	LAN Gateway IP address
Example	:SYST:COMM:LAN:GAT "192.168.39.254"	

:SYSTem:COMMunicate:LAN:HOSTname

Set → Query

Description	Sets or retrun the LAN Hostname.
Syntax	:SYSTem:COMMunicate:LAN:HOSTname<string>
Query Syntax	:SYSTem:COMMunicate:LAN:HOSTname?

Parameter/ Return parameter	<string>	LAN Hostname
Example	:SYSTem:COMMunicate:LAN:HOSTname “GSG-2160”	

:SYSTem:COMMunicate:LAN:IP

Set / Query

Description	This command is to set and return the unit’s local area network (LAN) internet protocol (IP) address for your IP network connection.
Syntax	:SYSTem:COMMunicate:LAN:IP<ipstring>
Query Syntax	:SYSTem:COMMunicate:LAN:IP?

Parameter/ Return parameter	<string>	LAN IP address
Example	:SYSTem:COMMunicate:LAN:IP? “192.168.1.1”	

:SYSTem:COMMunicate:LAN:SUBNet

Set / Query

Description	This command sets the unit’s local area network (LAN) subnet mask address for your internet protocol (IP) network connection.
Syntax	:SYSTem:COMMunicate:LAN:SUBNet<ipstring>
Query Syntax	:SYSTem:COMMunicate:LAN:SUBNet?

Parameter/ Return parameter	<string>	Subnet mask address
Example	:SYST:COMM:LAN:SUBN “255.255.240.0”	

:SYSTem:DATE

Set / Query

Description	Sets the system date.
Syntax	:SYSTem:DATE <year>,<month>,<day>
Query Syntax	:SYSTem:DATE?

Parameter/ Return parameter	<year>	<NR1>
	<month>	<NR1>
	<day>	<NR1>
Example	:SYST:DATE 2011,03,27	

:SYSTem:ERRor[:NEXT]? → Query

Description	Returns the next message from the error queue. Reading the error from the error queue will clear that error from the queue.
Query Syntax	:SYST:ERR?

:SYSTem:PON:TYPE → Set → Query

Description	This command sets the defined conditions for the signal generator at power on.	
Syntax	:SYSTem:PON:TYPE {PRESet|LAST|USER}	
Query Syntax	:SYSTem:PON:TYPE?	
Parameter/ Return parameter	PRESet	This choice sets the conditions to factory or user defined as determined by the choice for the preset type.
	LAST	This choice retains the settings at the time the signal generator was last powered down.
	USER	This choice sets the power on state to be the user preset value.
Example	:SYST:PON:TYPE LAST	

:SYSTem:PRESet → Set

Description	Returns the GSG-2000 to preset settings.
Syntax	:SYST:PRES

:SYSTem:PRESet:USER

Set →

Description	This command presets the unit to the user's saved state.
Syntax	:SYST:PRES:USER

:SYSTem:PRESet:USER:SAVE

Set →

Description	This command saves user defined preset conditions to a state file.
Syntax	:SYST:PRES:USER:SAVE

:SYSTem:STORage:EXTernal:PATH

Set →
→ Query

Description	This command is to set and return USB file directory.
Syntax	:SYSTem:STORage:EXTernal:PATH
Query Syntax	:SYSTem:STORage:EXTernal:PATH?

:SYSTem:TIME

Set →
→ Query

Description	Sets the system time.	
Syntax	:SYSTem:TIME <hour>,<minute>,<second>	
Query Syntax	:SYSTem:TIME?	
Parameter/ Return parameter	<hour>	<NR1>
	<minute>	<NR1>
	<second>	<NR1>
Example	:SYST:TIME 19,26,30	

:SYSTem:TIME:NTP

Set →
→ Query

Description	This command is to set and return Network Time Protocol.

Syntax	:SYSTem:TIME:NTP{ON|OFF}	
Query Syntax	:SYSTem:TIME:NTP{ON|OFF}?	
Parameter/ Return parameter	ON	Turn on the NTP function
	OFF	Turn off the NTP function

:SYSTem:TIME:ZONE

Set → / → Query

Description	This command is to set and return system time zone.
Syntax	:SYSTem:TIME:ZONE
Query Syntax	:SYSTem:TIME:ZONE?

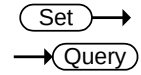
:SYSTem:VERSion

→ Query

Description	This command returns the SCPI version number with which the unit complies.	
Query Syntax	:SYSTem:VERSion?	
Return parameter	<string>	Software version
Example	:SYST:VERS? > "V1.02"	

Display Command

:DISPlay:BRIGhtness



Description	Sets or queries the LCD brightness level.	
Syntax	:DISPlay:BRIGhtness <level>	
Query Syntax	:DISPlay:BRIGhtness?	
Parameter/ Return parameter	<level>	1~5

Source Commands

[:SOURce]:FREQuency:CHANnels:BAND

Set → / → Query

Description	This command sets and returns the frequency of the unit by specifying a frequency channel band. The frequency channel state must be enabled for this command to work.	
Syntax	[:SOURce]:FREQuency:CHANnels:BAND<band>	
Query Syntax	[:SOURce]:FREQuency:CHANnels:BAND?	
Parameter/ Return parameter	<band>	<BG450 | BG480 | BG850 | BPGSm | BEGSm | BRGSm | BDCS | BPCS | MG450 | MG480 | MG850 | MPGSm | MEGSm | MRGSm | MDCS | MPCS | BNADC8 | BNADC19 | MNADC8 | MNADC19 | B8 | B15 | B838 | M8 | M15 | M893 | B390 | B420 | B460 | B915 | M380 | M410 | M450 | M870 | BPHS | MPHS | BDECT | MDECT>

[:SOURce]:FREQuency:CHANnels:NUMBer

Set → / → Query

Description	This command sets and returns the frequency of the signal generator by specifying a channel number of a given frequency band. The channel band and channel state must be enabled for this command to work. Refer to the :FREQuency:CHANnels[:STATe] command.	
Syntax	[:SOURce]:FREQuency:CHANnels:NUMBer<number>	
Query Syntax	[:SOURce]:FREQuency:CHANnels:NUMBer?	
Parameter/ Return parameter	<number>	Please refer to the following table for the corresponding parameters range and channels

Channel Number	GSM450 259~293	GSM480 306~340	GSM850 128~251	P-GSM 1~124
Channel Number	E-GSM 0~124 or 975~1023	ER-GSM 0~124 or 940~1023	DCS 512~885	PCS 512~810
Channel Number	NADC 800M 1~799 or 991~ 1023	NADC 1900M 2~1998	PDC 800M 0~720 or 1080~1680	PDC 1500M 0~960 or 1440~1560
Channel Number	PDC 838/843 320~520	PDC 893/898 320~520	TETRA 380/390 3600~4000	TETRA 390/400 3600~4000
Channel Number	TETRA 410/420 800~1200	TETRA 420/430 800~1200	TETRA 450/460 2400~2800	TETRA 460/ 470 2400~2800
Channel Number	TETRA 870/876 600~840	TETRA 915/921 600~840	PHS 1~82 or 221~255	DECT 0~9

[:SOURce]:FREQuency:CHANnels[:STATe]

Set → / → Query

Description	This command enables/disables and returns the frequency channel and band selection. The signal generator frequency will be set to the channel frequency when the state is on. To set frequency channel bands refer to the :FREQuency:CHANnels:BAND command.	
Syntax	[:SOURce]:FREQuency:CHANnels[:STATe]	
Query Syntax	[:SOURce]:FREQuency:CHANnels[:STATe]?	
Parameter/ Return parameter	ON	Enable the frequency channel
	OFF	Disable the frequency channel

[:SOURce]:FREQuency[:CW]

Set → / → Query

Description	This command enables/disables and returns the frequency channel and band selection. The signal generator frequency will be set to the channel frequency when the state is on. To set frequency channel bands refer to the :FREQuency:CHANnels:BAND command.

Syntax	[:SOURce]:FREQuency[:CW]<[value][unit]>	
Query Syntax	[:SOURce]:FREQuency[:CW]?	
Parameter/ Return parameter	Value	9kHz ~ 6GHz
	Unit	The default unit is Hz.

[:SOURce]:FREQuency:STARt

Set → / → Query

Description	This command sets and returns the first frequency point in a step sweep.
Syntax	[:SOURce]:FREQuency:STARt<[value][unit]>
Query Syntax	[:SOURce]:FREQuency:STARt?

Parameter/ Return parameter	Value	9kHz ~ 6GHz
	Unit	The default unit is Hz.

[:SOURce]:FREQuency:STOP

Set → / → Query

Description	This command sets and returns the last frequency point in a step sweep.
Syntax	[:SOURce]:FREQuency:STOP<[value][unit]>
Query Syntax	[:SOURce]:FREQuency:STOP?

Parameter/ Return parameter	Value	9kHz ~ 6GHz
	Unit	The default unit is Hz.

[:SOURce]:ROSCillator:SOURce

Set → / → Query

Description	This command sets and returns the current reference oscillator source
Syntax	[:SOURce]:ROSCillator:SOURce
Query Syntax	[:SOURce]:ROSCillator:SOURce?

Parameter/ Return parameter	INTernal	Use internal oscillator as reference frequency.
	EXTernal	Use external 10MHz input as reference frequency. If no external signal is detected, maintain the internal setting.
	AUTO	Automatically detects if an external 10MHz signal is connected. If yes, it uses the external signal as the reference frequency. If not, it uses the internal oscillator as the reference frequency.

[:SOURce]:POWer:ALC:LEVel

Set → / → Query

Description	This command sets and returns the automatic leveling control (ALC) level. The ALC is used to maintain the unit's output power level by compensating for power fluctuations due to drift, band changes, or load variations. After you set the ALC level, the unit's output power is monitored and corrected so that the power level setting is maintained.
Syntax	[:SOURce]:POWer:ALC:LEVel<[value][unit]>
Query Syntax	[:SOURce]:POWer:ALC:LEVel?

Parameter/ Return parameter	Value	-12 ~ 12dBm
	Unit	The default unit is dBm.

[:SOURce]:POWer:ALC:SEARch

Set →

Description	This command executes and returns a power search routine that temporarily activates the ALC, calibrates the power of the current RF output, and then disconnects the ALC circuitry. The power search mode is active only when the ALC state is Off, and the RF output is On.
Syntax	[:SOURce]:POWer:ALC:SEARch

[:SOURce]:POWer:ALC[:STATe]

Set → Query

Description	This command enables or disables and returns the automatic leveling control (ALC) circuit. The query returns the current state of the ALC.	
Syntax	[:SOURce]:POWer:ALC[:STATe]	
Query Syntax	[:SOURce]:POWer:ALC[:STATe]?	
Parameter/ Return parameter	ON	Enable ALC
	OFFSample	Enable ALC, set the amplitude, and then turn ALC off.
	OFFTable	Disable ALC and use the built-in table to adjust amplitude.

[:SOURce]:POWer:ATTenuation

Set → Query

Description	This command sets and returns unit's attenuator level.	
Syntax	[:SOURce]:POWer:ATTenuation<[value][unit]>	
Query Syntax	[:SOURce]:POWer:ATTenuation?	
Parameter/ Return parameter	Value	-128 ~ 14dBm
	Unit	The default unit is dBm.

[:SOURce]:POWer:ATTenuation:AUTO

Set → Query

Description	This command sets and returns the state of the attenuator auto mode function.
Syntax	[:SOURce]:POWer:ATTenuation:AUTO
Query Syntax	[:SOURce]:POWer:ATTenuation:AUTO?

Parameter/ Return parameter	ON	This selection allows the unit's automatic level control (ALC) to adjust the attenuator so that a specified RF power level is maintained.
	OFF	This choice allows for a user-selected attenuator setting that is not affected by the unit's ALC circuitry.

[:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]

Set → / → Query

Description	This command sets and returns the RF output power.	
Syntax	[:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]<[value][unit]>	
Query Syntax	[:SOURce]:POWer[:LEVel][:IMMediate][:AMPLitude]?	
Parameter/ Return parameter	Value	-140 ~ 20dBm
	Unit	The default unit is dBm.

[:SOURce]:POWer:STARt

Set → / → Query

Description	This command sets and returns the first amplitude point in a step sweep.	
Syntax	[:SOURce]:POWer:STARt<[value][unit]>	
Query Syntax	[:SOURce]:POWer:STARt?	
Parameter/ Return parameter	Value	-140 ~ 20dBm
	Unit	The default unit is dBm.

[:SOURce]:POWer:STOP

Set → / → Query

Description	This command sets and returns the last amplitude point in a step sweep.
Syntax	[:SOURce]:POWer:STOP<[value][unit]>
Query Syntax	[:SOURce]:POWer:STOP?

Parameter/ Return parameter	Value	-140 ~ 20dBm
	Unit	The default unit is dBm.

[:SOURce]:SWEep:DWELl

Set → Query

Description	This command enables you to set and return the dwell time for a step sweep.
Syntax	[:SOURce]:SWEep:DWELl <[value][unit]>
Query Syntax	[:SOURce]:SWEep:DWELl?

Parameter/ Return parameter	Value	100us ~ 100s
	Unit	The default unit is S

[:SOURce]:SWEep:FREQuency:STATe

Set → Query

Description	This command enables/ disables or returns the sweep in frequency.
Syntax	[:SOURce]:SWEep:FREQuency:STATe{ON|OFF}
Query Syntax	[:SOURce]:SWEep:FREQuency:STATe?

Parameter/ Return parameter	ON	Enables the frequency the sweep in frequency.
	OFF	Disables the frequency the sweep in frequency.

[:SOURce]:SWEep:FREQuency:STEP:LINEar

Set → Query

Description	This command sets and returns the step size for a linear step sweep in frequency (difference between frequency points).
Syntax	[:SOURce]:SWEep:FREQuency:STEP:LINEar<[value][unit]>
Query Syntax	[:SOURce]:SWEep:FREQuency:STEP:LINEar?

Parameter/ Return parameter	Value	0 to 5999991000 (actual upper and lower limits are limited by the start and end frequencies and the number of points 2 to 65535 points)
	Unit	The default unit is Hz

[:SOURce]:SWEep:FREQuency:STEP:LOGarithmic

Set → / → Query

Description	This command sets and returns the step size for a logarithmic step sweep in frequency (ratio between frequency points).	
Syntax	[:SOURce]:SWEep:FREQuency:STEP:LOGarithmic <[value][unit]>	
Query Syntax	[:SOURce]:SWEep:FREQuency:STEP:LOGarithmic?	
Parameter/ Return parameter	Value	0 to 66666566.67(actual upper and lower limits are limited by the start and end frequencies and the number of points 2 to 65535 points)
	Unit	The default unit is %

[:SOURce]:SWEep:TRIGger:EXTernal[:SOURce]

Set → / → Query

Description	This command sets and returns the external trigger source. With external triggering, the selected bi-directional BNC is configured as an input.	
Syntax	[:SOURce]:SWEep:TRIGger:EXTernal[:SOURce] {TRIGger[1]|TRIGger2|PULSe}	
Query Syntax	[:SOURce]:SWEep:TRIGger:EXTernal[:SOURce]?	
Parameter/ Return parameter	TRIGger[1]	This choice selects the TRIG 1 BNC as the external trigger source for triggering sweep, point and function generator sweeps.

	TRIGger2	This choice selects the TRIG 2 BNC as the external trigger source for triggering sweep, point and function generator sweeps.
	PULSe	This choice selects the PULSE BNC as the external trigger source for triggering sweep, point and function generator sweeps.

[:SOURce]:SWEep:TRIGger:SLOPe

Set → Query

Description	This command sets and returns the polarity of an external signal at the Trigger 1, Trigger 2 or Pulse Input.	
Syntax	[:SOURce]:SWEep:TRIGger:EXTernal:SLOPe{POSitive|NEGative}	
Query Syntax	[:SOURce]:SWEep:TRIGger:EXTernal:SLOPe?	
Parameter/ Return parameter	POSitive	Use the external input positive signal as the sweep trigger.
	NEGative	Use the external input inverted signal as the sweep trigger.

[:SOURce]:SWEep:TRIGger:TIMer

Set → Query

Description	Set the interval for generating sweep trigger.	
Syntax	[:SOURce]:SWEep:TRIGger:TIMer <[value][unit]>	
Query Syntax	[:SOURce]:SWEep:TRIGger:TIMer?	
Parameter/ Return parameter	Value	100us ~ 400s
	Unit	The default unit is S

[:SOURce]:SWEep:LIST:POINts

Set → Query

Description	This command sets and queries the unit for the number of dwell points in the current list sweep file.	
Syntax	[:SOURce]:SWEep:LIST:POINts<[value]>	
Query Syntax	[:SOURce]:SWEep:LIST:POINts?	
Parameter/ Return parameter	Valuev	1 ~ 4096

[:SOURce]:SWEep:LIST:STATe

Set → Query

Description	This command enables/ disables and returns the	
Syntax	[:SOURce]:SWEep:LIST:STATe	
Query Syntax	[:SOURce]:SWEep:LIST:STATe?	
Parameter/ Return parameter	ON	Enable the list sweep
	OFF	Disable the list sweep

[:SOURce]:SWEep:POINts

Set → Query

Description	This command defines an returns the number of step sweep points.	
Syntax	[:SOURce]:SWEep:POINts<[value]>	
Query Syntax	[:SOURce]:SWEep:POINts?	
Parameter/ Return parameter	Valuev	2 ~ 65535

[:SOURce]:SWEep:POWer:STATe

Set → Query

Description	This command enables/ disables amplitude sweep
Syntax	[:SOURce]:SWEep:POWer:STATe

Query Syntax	[:SOURce]:SWEep:POWer:STATe?	
Parameter/ Return parameter	ON	Enable the amplitude sweep
	OFF	Disable the amplitude sweep

[:SOURce]:SWEep:PTRIGger

Set → Query

Description	This command sets and returns the point trigger source for a list or step sweep event.	
Syntax	[:SOURce]:SWEep:PTRIGger {IMMediate|TIMer|EXTernal|KEY}	
Query Syntax	[:SOURce]:SWEep:PTRIGger?	
Parameter/ Return parameter	IMMediate	This choice enables immediate triggering of the sweep event.
	TIMer	This choice enables the trigger timer.
	EXTernal	This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.
	KEY	This choice enables triggering by pressing the front-panel Trigger key.

[:SOURce]:SWEep:PTRIGger:EXTernal[:SOURce]

Set → Query

Description	This command sets and returns the external point trigger source. With external triggering, the selected bi-directional BNC is configured as an input.	
Syntax	[:SOURce]:SWEep:PTRIGger:EXTernal[:SOURce] {TRIGger[1]|TRIGger2|PULSe}	
Query Syntax	[:SOURce]:SWEep:PTRIGger:EXTernal[:SOURce]?	
Parameter/ Return parameter	TRIGger[1]	This choice selects the TRIG 1 BNC as the external trigger source for triggering sweep, point and function generator sweeps.

	TRIGger2	This choice selects the TRIG 2 BNC as the external trigger source for triggering sweep, point and function generator sweeps.
	PULSe	This choice selects the PULSE BNC as the external trigger source for triggering sweep, point and function generator sweeps.

[:SOURce]:SWEep:PTRIGger:SLOPe

Set → Query

Description	This command sets and returns the polarity of an external signal at the point Trigger 1, point Trigger 2 or Pulse Input.	
Syntax	[:SOURce]:SWEep:PTRIGger:EXTernal:SLOPe{POSitive |NEGative}	
Query Syntax	[:SOURce]:SWEep:PTRIGger:EXTernal:SLOPe?	
Parameter/ Return parameter	POSitive	Use external input positive signal for point trigger
	NEGative	Use external input inverted signal for point trigger

[:SOURce]:SWEep:PTRIGger:TIMer

Set → Query

Description	Set the time interval for generating point triggers	
Syntax	[:SOURce]:SWEep:PTRIGger:TIMer <[value][unit]>	
Query Syntax	[:SOURce]:SWEep:PTRIGger:TIMer?	
Parameter/ Return parameter	Value	100us ~ 400s
	Unit	The default unit is S

[:SOURce]:SWEep:SPACing

Set → Query

Description	This command enables and returns the unit linear or logarithmic sweep modes. These commands require the unit to be in step mode.	
Syntax	[:SOURce]:SWEep:SPACing {LINear|LOGarithmic}	
Query Syntax	[:SOURce]:SWEep:SPACing?	
Parameter/ Return parameter	LINear	The sweep frequency changes in arithmetic progression
	LOGarithmic	The sweep frequency changes in geometric proportion

[:SOURce]:SWEep:TRIGger

Set → Query

Description	This command sets and returns the trigger source for a list or step sweep event.	
Syntax	[:SOURce]:SWEep:TRIGger{TIMer|EXTernal|KEY}	
Query Syntax	[:SOURce]:SWEep:TRIGger?	
Parameter/ Return parameter	TIMer	This choice enables the trigger timer.
	EXTernal	This choice enables the triggering of a sweep event by an externally applied signal at the TRIGGER IN connector.
	KEY	This choice enables triggering by pressing the front-panel Trigger key.

[:SOURce]:SWEep:PTRIGger:EXTernal[:SOURce]

Set → Query

Description	This command sets and returns the external trigger source. With external triggering, the selected bi-directional BNC is configured as an input.
Syntax	[:SOURce]:SWEep:PTRIGger:EXTernal[:SOURce] {TRIGger[1]|TRIGger2|PULSe}
Query Syntax	[:SOURce]:SWEep:TRIGger:EXTernal[:SOURce]?

Parameter/ Return parameter	TRIGger[1]	This choice selects the TRIG 1 BNC as the external trigger source for triggering sweep, point and function generator sweeps.
	TRIGger2	This choice selects the TRIG 2 BNC as the external trigger source for triggering sweep, point and function generator sweeps.
	PULSe	This choice selects the PULSE BNC as the external trigger source for triggering sweep, point and function generator sweeps.

[:SOURce]:SWEep:TRIGger:TYPE

Set → / → Query

Description	This command sets and returns the trigger type for a list or step sweep event.
Syntax	[:SOURce]:SWEep:TRIGger:TYPE {IMMediate|SINGle|TRIGger }
Query Syntax	[:SOURce]:SWEep:TRIGger:TYPE?

Parameter/ Return parameter	IMMediate	This choice enables immediate triggering of the sweep event.
	SINGle	Single trigger. Sweep is performed only once after triggering, and no output is performed after the sweep is completed.
	TRIGger	Trigger and run. Sweep after triggering, no need to trigger again after sweeping. Sweeping will be repeated automatically

[:SOURce]:LFOutput:AMPLitude

Set → Query

Description	This command sets and returns the amplitude for the signal at the LF OUTPUT connector.	
Syntax	[:SOURce]:LFOutput:AMPLitude<[value][unit]>	
Query Syntax	[:SOURce]:LFOutput:AMPLitude?	
Parameter/ Return parameter	Value	2mVpp ~ 6Vpp
	Unit	The default unit is Vpp

[:SOURce]:LFOutput:FREQuency

Set → Query

Description	This command sets and returns the frequency for the signal at the LF OUTPUT connector.	
Syntax	[:SOURce]:FREQuency <[value][unit]>	
Query Syntax	[:SOURce]:FREQuency?	
Parameter/ Return parameter	Value	100mHz ~ 1 or 10MHz
	Unit	The default unit is Hz

[:SOURce]:LFOutput:FUNCtion:DCYCle

Set → Query

Description	Set the duty cycle of LF output	
Syntax	[:SOURce]:FUNCtion:DCYCle<[value][unit]>	
Query Syntax	[:SOURce]:FUNCtion:DCYCle?	
Parameter/ Return parameter	Value	0.00 ~ 100.00%
	Unit	The default unit is %

[:SOURce]:LFOutput:FUNCtion:SHAPe

Set → Query

Description	Set the output waveform of LF output
Syntax	[:SOURce]:LFOutput:FUNCtion:SHAPe {SINE|TRIangle|SQUare|RAMP|NOISe}

Query Syntax	[:SOURce]:LFOutput:FUNCtion:SHAPe?	
Parameter/ Return parameter	SINE	Set the LF waveform to sine wave
	TRIangle	Set the LF waveform to triangle wave
	SQUare	Set the LF waveform to square wave
	RAMP	Set the LF waveform to triangle wave, symmetry is adjustable
	NOISe	Set the LF waveform to Gaussian noise

[:SOURce]:LFOutput:FUNCtion:SYMMetry

Set → Query

Description	Set the symmetry of the Ramp waveform of LF. 0% means that the Ramp waveform is at its highest point at phase 0 degrees, and 100% means that the Ramp waveform is at its highest point at phase 360 degrees.	
Syntax	[:SOURce]:FUNCtion:SYMMetry <[value][unit]>	
Query Syntax	[:SOURce]:FUNCtion:SYMMetry?	
Parameter/ Return parameter	Value	0.00 ~ 100.00%
	Unit	The default unit is %

[:SOURce]:LFOutput:OFFSet

Set → Query

Description	This command sets and returns the offset of the low frequency output.	
Syntax	[:SOURce]:LFOutput:OFFSet <[value][unit]>	
Query Syntax	[:SOURce]:LFOutput:OFFSet?	
Parameter/ Return parameter	Value	-2.999V~2.999V, the upper and lower limits are limited by the LF output amplitude setting value
	Unit	The default unit is Volt

[:SOURce]:LFOutput:STATe

Set → / → Query

Description	This command enables/ disables and returns the low frequency output.	
Syntax	[:SOURce]:LFOutput:STATe{ON|OFF}	
Query Syntax	[:SOURce]:LFOutput:STATe?	
Parameter/ Return parameter	ON	Enables the low frequency output.
	OFF	Disables the low frequency output.

[:SOURce]:AM[:DEPTh]

Set → / → Query

Description	This commands sets and returns the amplitude modulation depth in percent.	
Syntax	[:SOURce]:AM[:DEPTh] <[value][unit]>	
Query Syntax	[:SOURce]:AM[:DEPTh]?	
Parameter/ Return parameter	Value	0.00 ~ 100.00%
	Unit	The default unit is %

[:SOURce]:AM:INTernal:FREQuency

Set → / → Query

Description	This command sets and returns the internal amplitude modulation rate.	
Syntax	[:SOURce]:AM:INTernal:FREQuency <[value][unit]>	
Query Syntax	[:SOURce]:AM:INTernal:FREQuency?	
Parameter/ Return parameter	Value	100mHz ~ 20kHz
	Unit	The default unit is Hz

[:SOURce]:AM:INTernal:SHAPe

Set → / → Query

Description	This command sets and returns the AM waveform type.

Syntax	[:SOURce]:AM:INTernal:SHAPe{SINE|SQUare|TRIangle}	
Query Syntax	[:SOURce]:AM:INTernal: SHAPe?	
Parameter/ Return parameter	SINE	Set the internal modulation signal to a sine wave
	SQUare	Set the internal modulation signal to a square wave
	TRIangle	Set the internal modulation signal to a triangle wave

[:SOURce]:AM:SOURce

Set
Query

Description	This command sets and returns the source to generate the amplitude modulation.	
Syntax	[:SOURce]:AM:SOURce{LF|INTernal|EXTernal}	
Query Syntax	[:SOURce]:AM:SOURce?	
Parameter/ Return parameter	LF	Use LF waveform for modulation
	INTernal	Use internal waveform modulation
	EXTernal	Use BNC to input modulation signal

[:SOURce]:AM:STATe

Set
Query

Description	This command enables/ disables or returns the amplitude modulation for the selected path.	
Syntax	[:SOURce]:AM:STATe{ON|OFF}	
Query Syntax	[:SOURce]:AM:STATe?	
Parameter/ Return parameter	ON	Enables the frequency modulation for the selected path.
	OFF	Disables the frequency modulation for the selected path.

[:SOURce]:FM[:DEViation]

Set → / → Query

Description	This command sets and returns the deviation of the frequency modulation.	
Syntax	[:SOURce]:FM[:DEViation]<[value][unit]>	
Query Syntax	[:SOURce]:FM[:DEViation]?	
Parameter/ Return parameter	Value	0Hz ~ 4MHz
	Unit	The default unit is Hz

[:SOURce]:FM:INTernal:FREQuency

Set → / → Query

Description	This command sets and returns the internal frequency modulation rate.	
Syntax	[:SOURce]:FM:INTernal:FREQuency <[value][unit]>	
Query Syntax	[:SOURce]:FM:INTernal:FREQuency?	
Parameter/ Return parameter	Value	100Hz ~ 1MHz
	Unit	The default unit is Hz

[:SOURce]:FM:INTernal:SHAPe

Set → / → Query

Description	This command sets and returns the FM waveform type.	
Syntax	[:SOURce]:FM:INTernal:SHAPe{SINE|SQUare|TRIangle}	
Query Syntax	[:SOURce]:FM:INTernal: SHAPe?	
Parameter/ Return parameter	SINE	Set the internal modulation signal to a sine wave.
	SQUare	Set the internal modulation signal to a square wave.
	TRIangle	Set the internal modulation signal to a triangle wave.

[:SOURce]:FM:SOURce

Set → / → Query

Description	This command sets and returns the source to generate the frequency modulation.	
Syntax	[:SOURce]:FM:SOURce{LF|INTernal|EXTernal}	
Query Syntax	[:SOURce]:FM:SOURce?	
Parameter/ Return parameter	LF	Use LF waveform for modulation
	INTernal	Use internal waveform modulation
	EXTernal	Use BNC to input modulation signal

[:SOURce]:FM:STATe

Set → / → Query

Description	This command enables/ disables or returns the frequency modulation for the selected path.	
Syntax	[:SOURce]:FM:STATe{ON|OFF}	
Query Syntax	[:SOURce]:FM:STATe?	
Parameter/ Return parameter	ON	Enables the frequency modulation for the selected path.
	OFF	Disables the frequency modulation for the selected path.

[:SOURce]:PM[:DEViation]

Set → / → Query

Description	This command sets and returns the deviation of the phase modulation.	
Syntax	[:SOURce]:PM[:DEViation]<[value][unit]>	
Query Syntax	[:SOURce]:PM[:DEViation]?	
Parameter/ Return parameter	Value	0.000rad ~ 20.000rad
	Unit	The default unit is rad

[:SOURce]:PM:DEViation:UNIT

Set → Query

Description	This command sets and returns the unit of deviation of the phase modulation.	
Syntax	[:SOURce]:DEViation:UNIT{RADian|DEGree}	
Query Syntax	[:SOURce]:DEViation:UNIT?	
Parameter/ Return parameter	RADian	Radian is used as the deviation setting unit of phase modulation.
	DEGree	Degree is used as the deviation setting unit of phase modulation.

[:SOURce]:PM:INTernal:FREQuency

Set → Query

Description	This command sets and returns the internal frequency modulation rate.	
Syntax	[:SOURce]:PM:INTernal:FREQuency <[value][unit]>	
Query Syntax	[:SOURce]:PM:INTernal:FREQuency?	
Parameter/ Return parameter	Value	100kHz ~ 1MHz
	Unit	The default unit is Hz

[:SOURce]:PM:INTernal:SHAPe

Set → Query

Description	This command sets and returns the PM waveform type.	
Syntax	[:SOURce]:PM:INTernal:SHAPe{SINE|SQUare|TRIangle}	
Query Syntax	[:SOURce]:PM:INTernal: SHAPe?	
Parameter/ Return parameter	SINE	Set the internal modulation signal to a sine wave.
	SQUare	Set the internal modulation signal to a square wave.

	TRIangle	Set the internal modulation signal to a triangle wave.

[:SOURce]:PM:SOURce

Set → / → Query

Description	This command sets and returns the source to generate the phase modulation.	
Syntax	[:SOURce]:PM:SOURce{LF|INTernal|EXTernal}	
Query Syntax	[:SOURce]:PM:SOURce?	
Parameter/ Return parameter	LF	Use LF waveform for modulation
	INTernal	Use internal waveform modulation
	EXTernal	Use BNC to input modulation signal

[:SOURce]:PM:STATe

Set → / → Query

Description	This command enables/ disables or returns the phase modulation for the selected path.	
Syntax	[:SOURce]:PM:STATe{ON|OFF}	
Query Syntax	[:SOURce]:PM:STATe?	
Parameter/ Return parameter	ON	Enables the frequency modulation for the selected path.
	OFF	Disables the frequency modulation for the selected path.

[:SOURce]:PULM:EXTernal:POLarity

Set → / → Query

Description	This command sets and returns the polarity of the TTL input signal at the TRIG IN rear panel connector. The unit can respond to either a normal (a TTL high) or an inverted (TTL low) signal.
Syntax	[:SOURce]:PULM:EXTernal:POLarity{NORMal|INVerted}
Query Syntax	[:SOURce]: PULM:EXTernal:POLarity?

Parameter/ Return parameter	NORMal	Use external input positive signal for pulse modulation
	INVerted	Use external input inverted signal for pulse modulation

[:SOURce]:PULM:INTernal:DELay[1]|2

Set → / → Query

Description	This command sets and returns the pulse delay for the internally-generated pulse modulation using the variable <value><unit>.
Syntax	[:SOURce]:PULM:INTernal:DELay<[value][unit]>
Query Syntax	[:SOURce]:PULM:INTernal:DELay?

Parameter/ Return parameter	Value	0 ~ 42s
	Unit	The default unit is S

[:SOURce]:PULM:INTernal:FREQuency

Set → / → Query

Description	This command sets and returns the pulse rate for the internally-generated square wave using the variable <frequency>.
Syntax	[:SOURce]:PULM:INTernal:FREQuency<[value][unit]>
Query Syntax	[:SOURce]:PULM:INTernal:FREQuency?

Parameter/ Return parameter	Value	100mHz ~ 10MHz
	Unit	The default unit is Hz

[:SOURce]:PULM:INTernal:PERiod

Set → / → Query

Description	This command sets and returns the pulse period for the internally generated pulse modulation using the variables <value><units>.
Syntax	[:SOURce]:PULM:INTernal:PERiod <[value][unit]>
Query Syntax	[:SOURce]:PULM:INTernal:PERiod?

Parameter/ Return parameter	Value	100ns ~ 42s
	Unit	The default unit is S

[:SOURce]:PULM:INTernal:PWIDth[1]|2

Set → / → Query

Description	This command sets and returns the pulse width for the internally-generated pulse modulation using the variables <value><unit>.
Syntax	[:SOURce]:PULM:INTernal:PWIDth[1]|2<[value][unit]>
Query Syntax	[:SOURce]:PULM:INTernal:PWIDth[1]|2?

Parameter/ Return parameter	Value	50ns ~ 42s
	Unit	The default unit is S

[:SOURce]:PULM:INTernal:TRAin:OFFTime

Set → / → Query

Description	This command sets the pulse off values for the current list of pulse train off times (where the RF will be off). If this list is shorter than the other lists, then the last element will be repeated as necessary to match the length of the On Time or the Repetition list.	
Syntax	[:SOURce]:PULM:INTernal:TRAin:OFFTime <index>,<[value][unit]>,<[value][unit]>,<[value][unit]>...	
Parameter	Index	Set the starting sequence number of pulse.
	Value	Set the pulse to time at low.
	Unit	The time unit corresponding to the value.
Example	<index>, <[value][unit]>, <[value][unit]> is 2, 1us, 2us, then the setting starts from the second pulse. The second pulse with 1μs as low, and the third pulse with 2μs as low.	

[:SOURce]:PULM:INTernal:TRAin:ONTime

Set / Query

Description	This command sets the pulse on values for the current list of pulse train on times. If this list is shorter than the other lists, then the last element will be repeated as necessary to match the length of the Off Time or the Repetition list. The query returns the count of pulse cycle elements in the list of on times.
Syntax	[:SOURce]:PULM:INTernal:TRAin:ONTime <index>,<[value][unit]>,<[value][unit]>,<[value][unit]>...
Parameter	Index: Set the starting sequence number of pulse. Value: Set the pulse to time at high. Unit: The time unit corresponding to the value.
Example	<index>, <[value][unit]>, <[value][unit]> is 2, 1us, 2us, then the setting starts from the second pulse. The second pulse with 1µs as high, and the third pulse with 2µs as high.

[:SOURce]:PULM:INTernal:TRAin:POINts

Set / Query

Description	This query sets and returns the count of elements in the list of on times.	
Syntax	[:SOURce]:PULM:INTernal:TRAin:POINts <[value][unit]>	
Query Syntax	[:SOURce]:PULM:INTernal:TRAin:POINts?	
Parameter/ Return parameter	Value	1 ~ 2047

[:SOURce]:PULM:INTernal:TRAin:REPetition

Set / Query

Description	This query sets and returns the count of elements in the list of on times.

Syntax	[:SOURce]:PULM:INTernal:TRAin: REPetition <index>,<value>,<value>,<value>...	
Parameter	Index	Set the starting sequence number of pulse.
	Value, Value, Value,	The number of times each pulse is repeated.
Example	<index>, <value>, <value>…. is 5,1,2,3, then start setting from the 5th pulse, the 5th pulse is repeated once, the 6th pulse is repeated twice, and the 7th pulse is repeated 3 times	

[:SOURce]:PULM:INTernal:TRAin:TRIGger

Set → / → Query

Description	This command sets and returns the triggering mode for the Pulse Train feature.	
Syntax	[:SOURce]:PULM:INTernal:TRAin:TRIGger	
Query Syntax	[:SOURce]:PULM:INTernal:TRAin:TRIGger?	
Parameter/ Return parameter	FRUN	Free Run triggering continuously plays the pulse train.
	TRIGgered	Trigger runs the pulse train (after waiting the Pulse Delay) each time an external trigger is supplied (edge triggered) to the PULSE BNC.
	GATEd	Gated triggering runs the pulse train while an external trigger is supplied (level triggered) to the PULSE BNC.

[:SOURce]:PULM:SOURce

Set → / → Query

Description	The INTernal selection accesses one of the six internally generated modulation inputs while EXTernal selects an external pulse (rear panel connector) input. To select an internally generated modulation input, refer to :PULM:SOURce:INTernal command.

Syntax	[:SOURce]:PULM:SOURce{INTernal |EXTernal}
Query Syntax	[:SOURce]:PULM:SOURce?
Parameter/ Return parameter	INTernal EXTernal

[:SOURce]:PULM:SOURce:INTernal

Set → / → Query

Description	This command selects and returns one of the seven internally generated modulation inputs. There is one external source: Ext Pulse selected by :PULM:SOURce command.	
Syntax	[:SOURce]:PULM:SOURce:INTernal{SQUare|FRUN|TRIGgered|ADOublet|DOUBlet|GATEd|PTRain}	
Query Syntax	[:SOURce]:PULM:SOURce:INTernal?	
Parameter/ Return parameter	SQUare	This command sets Square as the pulse modulation source. This is an internal free-run pulse with a 50% duty cycle. The period is determined by the rate.
	FRUN	This command sets Free Run as the pulse modulation source. You can define the period, width, and delay.
	TRIGgered	This command sets Triggered as the pulse modulation source. This selection produces an RF pulse with a user-defined width and delay at the RF OUTPUT connector when a valid trigger signal occurs at the PULSE connector.

ADOublet	This command sets Adjustable Doublet as the pulse modulation source. This selection produces two pulses at the RF OUTPUT connector for each trigger event at the PULSE connector. The first pulse has a user-defined width and delay (from the rising edge of the Pulse Sync Out signal). The second pulse has a user-defined width and delay (from the rising edge of the first pulse).
DOUBlet	This command sets Trigger Doublet as the pulse modulation source. This produces two pulses at the RF OUTPUT connector for each trigger event at the PULSE connector. The first pulse follows the external trigger signal. The second pulse has user-defined width and delay parameters.
GATEd	This command sets Gated as the pulse modulation source. A pulse train with user-defined period and width parameters occurs at the RF OUTPUT connector when a valid gate signal is applied to the PULSE connector.
PTRain	This selection produces an RF pulse train (up to 2047 distinct cycles) with user-defined widths and delays at the RF OUTPUT connector when a valid trigger signal occurs at the PULSE connector. The Pulse Train Trigger mode selection determines when the pulse train is output.

[:SOURce]:PULM:STATe

Set → Query

Description	This command enables or disables pulse modulation for the selected path. When pulse modulation is enabled, the PULSE annunciator appears on the unit's front-panel display.	
Syntax	[:SOURce]:PULM:STATe	
Query Syntax	[:SOURce]:PULM:STATe?	
Parameter/ Return parameter	ON	Enable the pulse modulation
	OFF	Disable the pulse modulation

[:SOURce]:PULM:TRIGger

Set → Query

Description	Trigger input setting of pulse modulation	
Syntax	[:SOURce]:PULM:TRIGger	
Query Syntax	[:SOURce]:PULM:TRIGger?	
Parameter/ Return parameter	TIMer	Generate internal triggers every fixed time.
	EXTernal	Input trigger from BNC
	KEY	Input from trigger key

[:SOURce]:PULM:TRIGger:SOURce

Set → Query

Description	This command sets and returns trigger source of Pulse wavefome.	
Syntax	[:SOURce]:PULM:TRIGger:SOURce {TRIGger[1]|TRIGger2|PULSe }	
Query Syntax	[:SOURce]:PULM:TRIGger:SOURce?	
Parameter/ Return parameter	TRIGger[1]	Input from trig1
	TRIGger2	Input from trig2
	PULSe	Input from pulse input

[:SOURce]:PULM:TRIGger:TIMer

Set → / → Query

Description	This command sets and returns trigger time of Pulse wavefome.	
Syntax	[:SOURce]:PULM:TRIGger:TIMer	
Query Syntax	[:SOURce]:PULM:TRIGger:TIMer?	
Parameter/ Return parameter	Value	100ns ~ 42s
	Unit	The default unit is S

[:SOURce]:IQ:ADJustment:EXTernal:ANGLe

Set → / → Query

Description	This command set and returns angle of the external IQ input.	
Syntax	[:SOURce]:IQ:ADJustment:EXTernal:ANGLe <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:EXTernal:ANGLe?	
Parameter/ Return parameter	Value	-10.00deg ~ 10.00deg
	Unit	The default unit is deg

[:SOURce]:IQ:ADJustment:EXTernal:COFFset

Set → / → Query

Description	This command set and returns common mode offset of the external IQ output.	
Syntax	[:SOURce]:IQ:ADJustment:EXTernal:COFFset <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:EXTernal:COFFset?	
Parameter/ Return parameter	Value	-1.25Volt ~ 1.25Volt
	Unit	The default unit is Volt

[:SOURce]:IQ:ADJustment:EXTernal:DIOFfset

Set → / → Query

Description	This command set and returns Diff. mode I offset of the external IQ output.	
Syntax	[:SOURce]:IQ:ADJustment:EXTernal:DIOFfset <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:EXTernal:DIOFfset?	
Parameter/ Return parameter	Value	-50.0mVolt ~ 50mVolt
	Unit	The default unit is Volt

[:SOURce]:IQ:ADJustment:EXTernal:DQOFfset

Set → / → Query

Description	This command set and returns Diff. mode Q offset of the external IQ output.	
Syntax	[:SOURce]:IQ:ADJustment:EXTernal:DQOFfset <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:EXTernal:DQOFfset?	
Parameter/ Return parameter	Value	-50.0mVolt ~ 50mVolt
	Unit	The default unit is Volt

[:SOURce]:IQ:ADJustment:EXTernal:GAIN

Set → / → Query

Description	This command set and returns gain of the external IQ input.	
Syntax	[:SOURce]:IQ:ADJustment:EXTernal:GAIN <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:EXTernal:GAIN?	
Parameter/ Return parameter	Value	-6.00dBm ~ 6.00dBm
	Unit	The default unit is dB

[:SOURce]:IQ:ADJustment:EXTernal:IOFFset

Set → Query

Description	This command set and returns I offset of the external IQ input.	
Syntax	[:SOURce]:IQ:ADJustment:EXTernal:IOFFset <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:EXTernal:IOFFset?	
Parameter/ Return parameter	Value	-5.00% ~ 5.00%
	Unit	The default unit is %

[:SOURce]:IQ:ADJustment:EXTernal:QOFFset

Set → Query

Description	This command set and returns Q offset of the external IQ input.	
Syntax	[:SOURce]:IQ:ADJustment:EXTernal:QOFFset <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:EXTernal:QOFFset?	
Parameter/ Return parameter	Value	-5.00% ~ 5.00%
	Unit	The default unit is %

[:SOURce]:IQ:ADJustment:GAIN

Set → Query

Description	This command set and returns gain of the internal IQ.	
Syntax	[:SOURce]:IQ:ADJustment:GAIN<[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:GAIN?	
Parameter/ Return parameter	Value	-6.00dBm ~ 6.00dBm
	Unit	The default unit is dB

[:SOURce]:IQ:ADJustment:IOFFset

Set → / → Query

Description	This command set and returns I offset of the internal IQ.	
Syntax	[:SOURce]:IQ:ADJustment:IOFFset<[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:IOFFset?	
Parameter/ Return parameter	Value	-10.00% ~ 10.00%
	Unit	The default unit is %

[:SOURce]:IQ:ADJustment:QOFFset

Set → / → Query

Description	This command set and returns Q offset of the internal IQ.	
Syntax	[:SOURce]:IQ:ADJustment:QOFFset<[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:QOFFset?	
Parameter/ Return parameter	Value	-10.00% ~ 10.00%
	Unit	The default unit is %

[:SOURce]:IQ:ADJustment:SKEW

Set → / → Query

Description	This command set and returns Skew of the external IQ input.	
Syntax	[:SOURce]:IQ:ADJustment:SKEW <[value]>	
Query Syntax	[:SOURce]:IQ:ADJustment:SKEW?	
Parameter/ Return parameter	Value	-255 ~ 255

[:SOURce]:IQ:ARBitrary

Set → / → Query

Description	This command is to edit file name of ARB waveform.
Syntax	[:SOURce]:IQ:ARBitrary<"file_name">

[:SOURce]:IQ:ARBitrary:FILTer

Set → / → Query

Description	This command specifies and retrurns filter type of ARB waveform.	
Syntax	[:SOURce]:IQ:ARBitrary:FILTer{OFF| RECTangle |RNYQuist|NYQuist|GAUSsian}	
Query Syntax	[:SOURce]:IQ:ARBitrary:FILTer?	
Parameter/ Return parameter	OFF	Disable filter
	RECTangle	Enable the rectangle filter
	RNYQuist	Enable the root Nyquist filter
	NYQuist	Enable the Nyquist filter
	GAUSsian	Eanble the Gaussian filter

[:SOURce]:IQ:ARBitrary:FILTer:GAUSsian

Set → / → Query

Description	This command sets and returns Gaussian filter value of ARB waveform.	
Syntax	[:SOURce]:IQ:ARBitrary:FILTer:GAUSsian<[value]>	
Query Syntax	[:SOURce]:IQ:ARBitrary:FILTer:GAUSsian?	
Parameter/ Return parameter	Value	0.01 ~ 10.00

[:SOURce]:IQ:ARBitrary:FILTer:NYQuist

Set → Query

Description	This command sets and returns NYQuist filter rolloff value of ARB waveform.	
Syntax	[:SOURce]:IQ:ARBitrary:FILTer:NYQuist<[value]>	
Query Syntax	[:SOURce]:IQ:ARBitrary:FILTer:NYQuist?	
Parameter/ Return parameter	Value	0.00 ~ 1.00

[:SOURce]:IQ:ARBitrary:FILTer:RYQuist

Set → Query

Description	This command sets and returns RYQuist filter rolloff value of ARB waveform.	
Syntax	[:SOURce]:IQ:ARBitrary:FILTer:RYQuist<[value]>	
Query Syntax	[:SOURce]:IQ:ARBitrary:FILTer:RYQuist?	
Parameter/ Return parameter	Value	0.00 ~ 1.00

[:SOURce]:IQ:ARBitrary:SCALing

Set → Query

Description	This command sets and returns scaling of ARB waveform.	
Syntax	[:SOURce]:IQ:ARBitrary:SCALing <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ARBitrary:SCALing?	
Parameter/ Return parameter	Value	0.00 ~ 100.00%
	Unit	The default unit is %

[:SOURce]:IQ:ARBitrary:SCLock:RATE

Set → Query

Description	This command sets and returns Sample Rate of ARB waveform.
Syntax	[:SOURce]:IQ:ARBitrary:SCLock:RATE <[value][unit]>

Query Syntax	[:SOURce]:IQ:ARBitrary:SCLock:RATE?	
Parameter/ Return parameter	Value	0.00 ~ 100.00%
	Unit	The default unit is %

[:SOURce]:IQ:DMODulation:DATA

Set → / → Query

Description	This command sets and returns the data pattern for unframed transmission..	
Syntax	[:SOURce]:IQ:DMODulation:DATA {PN7|PN9|PN11|PN15|PN20|PN23|P4|P8|P16|P32|P64 |RANDom|UDEFine}	
Query Syntax	[:SOURce]:IQ:DMODulation:DATA?	
Parameter/ Return parameter	PN7	Using pseudo random m-sequences as data, m = 7
	PN9	Using pseudo random m-sequences as data, m = 9
	PN11	Using pseudo random m-sequences as data, m = 11
	PN15	Using pseudo random m-sequences as data, m = 15
	PN20	Using pseudo random m-sequences as data, m = 20
	PN23	Using pseudo random m-sequences as data, m = 23
	P4	Using fixed pattern for data, P4 = 00001111
	P8	Using fixed pattern for data, P8 = 0000000011111111
	P16	Using fixed pattern for data, P16 = 0000000000000000111111111111111
	P32	Using fixed pattern for data
	P64	Using fixed pattern for data
	RANDom	Using random data as data
	UDEFine	Data is compiled by the user.

[:SOURce]:IQ:DMODulation:DATA:UDEFine

Set / Query

Description	This command is to define file name for digital modulation waveform.
Syntax	[:SOURce]:IQ:DMODulation:DATA:UDEFine <"file_name">

[:SOURce]:IQ:DMODulation:FILTer

Set / Query

Description	This command specifies and returns filter type of digital modulation waveform.	
Syntax	[:SOURce]:IQ:DMODulation:FILTer{OFF| RECTangle |RNYQuist|NYQuist|GAUSsian}	
Query Syntax	[:SOURce]:IQ:DMODulation:FILTer?	
Parameter/ Return parameter	RECTangle	Enable the rectangle filter
	RNYQuist	Enable the root Nyquist filter
	NYQuist	Enable the Nyquist filter
	GAUSsian	Enable the Gaussian filter
	UDEFine	Enable the user define filter

[:SOURce]:IQ:DMODulation:FILTer:GAUSsian

Set / Query

Description	This command sets and returns Gaussian filter value of digital modulation waveform.	
Syntax	[:SOURce]:IQ:DMODulation:FILTer:GAUSsian <[value]>	
Query Syntax	[:SOURce]:IQ:DMODulation:FILTer:GAUSsian?	
Parameter/ Return parameter	Value	0.01 ~ 10.00

[:SOURce]:IQ:DMODulation:FILTer:NYQuist

Set → Query

Description	This command sets and returns NYQuist filter roll off value of digital modulation waveform.	
Syntax	[:SOURce]:IQ:DMODulation:FILTer:NYQuist<[value]>	
Query Syntax	[:SOURce]:IQ:DMODulation:FILTer:NYQuist?	
Parameter/ Return parameter	Value	0.00 ~ 1.00

[:SOURce]:IQ:DMODulation:FILTer:RYQuist

Set → Query

Description	This command sets and returns RYQuist filter roll off value of digital modulation waveform.	
Syntax	[:SOURce]:IQ:DMODulation:FILTer:RYQuist<[value]>	
Query Syntax	[:SOURce]:IQ:DMODulation:FILTer:RYQuist?	
Parameter/ Return parameter	Value	0.00 ~ 1.00

[:SOURce]:IQ:DMODulation:FILTer:UDEFine

Set → Query

Description	This command specifies file name user defined for digital modulation waveform.
Syntax	[:SOURce]:IQ:DMODulation:FILTer:UDEFine <"file_name">

[:SOURce]:IQ:DMODulation:MODulation :APSK:MAPPing

Set → Query

Description	This command sets and returns mapping type for APSK mapping.
Syntax	[:SOURce]:IQ:DMODulation:MODulation:APSK :MAPPing {16 | 32>,<DVB_S2_23|DVB_S2_34|DVB_S2_45|

	DVB_S2_56|DVB_S2_89|DVB_S2_910}	
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation:APSK :MAPPing?	
Parameter/ Return parameter	16	16APSK modulation
	32	32APSK modulation
	<DVB_S2_23|DVB_S2_34| DVB_S2_45|DVB_S2_56| DVB_S2_89|DVB_S2_910>	APSK Mapping settings, where DVB_S2_23 is the mapping for DVB-S2 code rate 2/3

[:SOURce]:IQ:DMODulation:MODulation :ASK[:DEPTh]

Set → / → Query

Description	This command changes and returns the depth for the amplitude shift keying (ASK) modulation. Depth is set as a percentage of the full power on level.	
Syntax	[:SOURce]:IQ:DMODulation:MODulation:ASK [:DEPTh]<[value][unit]>	
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation:ASK [:DEPTh]?	
Parameter/ Return parameter	Value	0.00 ~ 100.00%
	Unit	The default unit is %

[:SOURce]:IQ:DMODulation:MODulation :FSK[:DEViation]

Set → / → Query

Description	This command sets and returns the symmetric FSK frequency deviation value.	
Syntax	[:SOURce]:IQ:DMODulation:MODulation:FSK [:DEViation]<[value][unit]>	
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation:FSK [:DEViation]?	
Parameter/ Return parameter	Value	0 ~ 60MHz
	Unit	The default unit is Hz

[:SOURce]:IQ:DMODulation:MODulation :FSK:MAPPing

Set → / → Query

Description	FSK modulation mapping settings	
Syntax	[:SOURce]:IQ:DMODulation:MODulation:FSK MAPPing {NATURAL|C4FM>	
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation:FSK MAPPing?	
Parameter/ Return parameter	NATURAL	Natural mapping
	C4FM	C4FM mapping

[:SOURce]:IQ:DMODulation:MODulation :MSK:MAPPing

Set → / → Query

Description	MSK modulation mapping settings	
Syntax	[:SOURce]:IQ:DMODulation:MODulation:MSK MAPPing {NATURAL|GSM>	
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation:MSK MAPPing?	
Parameter/ Return parameter	NATURAL	Natural mapping
	C4FM	C4FM mapping

[:SOURce]:IQ:DMODulation:MODulation :PSK:MAPPing

Set → / → Query

Description	PSK modulation mapping settings
Syntax	[:SOURce]:IQ:DMODulation:MODulation:PMSK MAPPing <NORMal|DIFFerential>,<NATURAL|GRAY|DVB_S2|VDL>
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation:PSK MAPPing?

Parameter/ Return parameter	NORMal	Normal coding
	DIFFerential	Differential coding
	NATURAL	Natural mapping
	GRAY	Gray mapping
	DVB_S2	DVB_S2 mapping
	VDL	VDL mapping

[:SOURce]:IQ:DMODulation:MODulation :QAM:MAPPing

Set → / → Query

Description	QAM modulation mapping settings	
Syntax	[:SOURce]:IQ:DMODulation:MODulation:QAM MAPPing {GRAY|DVB_C}	
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation:QAM MAPPing?	
Parameter/ Return parameter	GRAY	Gray mapping
	DVB_C	DVB_C mapping

[:SOURce]:IQ:DMODulation:MODulation :QPSK:MAPPing

Set → / → Query

Description	QSPK modulation mapping settings	
Syntax	[:SOURce]:IQ:DMODulation:MODulation:QPSK MAPPing {NORMal|DPI4>,<NATURAL|GRAY|DVB_S2 |WCDMA|APCO25|TFTS |TETRA}	
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation:QPSK MAPPing?	
Parameter/ Return parameter	NORMal	QPSK mapping
	DPI4	$\pi/4$ DQPSK mapping
	<NATURAL|GRAY|DVB_S2| WCDMA|APCO25|TFTS |TETRA>	Mapping setting, the setting value is the same as the parameter name

[:SOURce]:IQ:DMODulation:MODulation[:TYPE]

Set / Query

Description	This command sets and returns the modulation type for the digital modulation personality. Please refer to the following tables for parameter 1 (Modulation type) and parameter 2 (Mapping corresponding to the modulation)
Syntax	[:SOURce]:IQ:DMODulation:MODulation[:TYPE]
Query Syntax	[:SOURce]:IQ:DMODulation:MODulation[:TYPE]

Parameter/Return parameter 1 as below indicates the modulation type.

<ASK2 |ASK4 | ASK8 | ASK16 | ASK32 | BPSK | QPSK | DQPSK | OQPSK | NPI4DQPSK |PSK8 | DPSK8 | PSK16 |APSK16 | APSK32 | QAM16 | QAM32 | QAM64 | QAM128 | QAM256 | UIQ | MSK | FSK2 | FSK4 | FSK8 | FSK16 | UFSK>

Parameter	ASK2	ASK4	ASK8	ASK16	ASK32
Modulation type	2ASK	4ASK	8ASK	16ASK	32ASK
Parameter	BPSK	QPSK	DQPSK	OQPSK	NPI4DQPSK
Modulation type	BPSK	QPSK	DQPSK	OQPSK	π /4 DQPSK
Parameter	PSK8	DPSK8	PSK16		
Modulation type	8PSK	D8PSK	16PSK		
Parameter	APSK16	APSK32			
Modulation type	16APSK	32APSK			
Parameter	QAM16	QAM32	QAM64	QAM128	QAM256
Modulation type	16QAM	32QAM	64QAM	128QAM	256QAM
Parameter	FSK2	FSK4	FSK8	FSK16	MSK
Modulation type	2FSK	4FSK	8FSK	16FSK	MSK
Parameter	UIQ	UFSK			
Modulation type	User define IQ	User define FSK			
Parameter	FSK2	FSK4	FSK8	FSK16	MSK
Modulation type	2FSK	4FSK	8FSK	16FSK	MSK

Parameter/Return parameter 2 as below indicates the mapping corresponding to the modulation.

<NATURAL | GRAY | DVB_S2 | WCDMA | APCO25 | TFTS | TETRA | VDL | DVB_S2_23 | DVB_S2_34 | DVB_S2_45 | DVB_S2_56 | DVB_S2_89 |DVB_S2_910 | GRAY | DVB_C | GSM | C4FM>

The parameters and settings are the same, for example, NATURAL corresponds to NATURAL mapping.

[:SOURce]:IQ:DMODulation:MODulation :UFSK:UDEFine

Set → / → Query

Description	Select the file of user define FSK modulation
Syntax	[:SOURce]:IQ:DMODulation:MODulation:UFSK :UDEFine<"file_name">

[:SOURce]:IQ:DMODulation:MODulation :UIQ:UDEFine

Set → / → Query

Description	Select the file of user define IQ modulation
Syntax	[:SOURce]:IQ:DMODulation:MODulation:UIQ :UDEFine <"file_name">

[:SOURce]:IQ:DMODulation:SCALing

Set → / → Query

Description	This command sets and returns scaling of Digital Modulation waveform.	
Syntax	[:SOURce]:IQ:DMODulation:SCALing <[value][unit]>	
Query Syntax	[:SOURce]:IQ:DMODulation:SCALing?	
Parameter/ Return parameter	Value	0.00 ~ 50.00%
	Unit	The default unit is %

[:SOURce]:IQ:DMODulation:SRATe

Set / Query

Description	This command sets and returns symbol rate of Digital Modulation waveform.	
Syntax	[:SOURce]:IQ:DMODulation:SRATe <[value][unit]>	
Query Syntax	[:SOURce]:IQ:DMODulation:SRATe?	
Parameter/ Return parameter	Value	625Hz ~ 90MHz
	Unit	The default unit is Hz

[:SOURce]:IQ:DMODulation:SRATe

Set / Query

Description	This command sets and returns frequency offset.	
Syntax	[:SOURce]:IQ:FREQuency:OFFSet <[value][unit]>	
Query Syntax	[:SOURce]:IQ:FREQuency:OFFSet?	
Parameter/ Return parameter	Value	-60MHz ~ 60MHz
	Unit	The default unit is Hz

[:SOURce]:IQ:SOURce

Set / Query

Description	This command sets and returns the source to generate the digital modulation.	
Syntax	[:SOURce]:IQ:SOURce{MODulation|ARB|EXTernal}	
Query Syntax	[:SOURce]:IQ:SOURce?	
Parameter/ Return parameter	MODulation	Select internal digital modulation as IQ signal
	ARB	Select ARB waveform as IQ signal
	EXTernal	Select BNC waveform as IQ signal

[:SOURce]:IQ:STATe

Set → / → Query

Description	This command enables/ disables or returns the digital modulation for the selected path.	
Syntax	[:SOURce]:IQ:STATe{ON|OFF}	
Query Syntax	[:SOURce]:IQ:STATe?	
Parameter/ Return parameter	ON	Enables the digital modulation for the selected path.
	OFF	Disables the digital modulation for the selected path.

[:SOURce]:IQ:TRIGger

Set → / → Query

Description	This command sets and returns trigger mode to generate the digital modulation.	
Syntax	[:SOURce]:IQ:TRIGger{EXTernal|KEY}	
Query Syntax	[:SOURce]:IQ:TRIGger?	
Parameter/ Return parameter	EXTernal	Choose to use BNC input for triggering
	KEY	Choose to use trigger key for triggering

[:SOURce]:IQ:TRIGger:EXTernal:SLOPe

Set → / → Query

Description	This command sets and returns the polarity of external trigger mode to generate the digital modulation.	
Syntax	[:SOURce]:IQ:TRIGger:EXTernal:SLOPe {POSitive|NEGative}	
Query Syntax	[:SOURce]:IQ:TRIGger:EXTernal:SLOPe?	
Parameter/ Return parameter	POSitive	Use external input positive signal for IQ trigger
	NEGative	Use external input inverted signal for IQ trigger

[:SOURce]:IQ:TRIGger:EXTernal:SOURce

Set → / → Query

Description	This command sets and returns the source of external trigger to generate the digital modulation.	
Syntax	[:SOURce]:IQ:TRIGger:EXTernal:SOURce {TRIGger[1]|TRIGger2|PULSe}	
Query Syntax	[:SOURce]:IQ:TRIGger:EXTernal:SOURce?	
Parameter/ Return parameter	TRIGger[1]	Input from trig1
	TRIGger2	Input from trig2
	PULSe	Input from pulse input

[:SOURce]:IQ:TRIGger:TYPE

Set → / → Query

Description	This command sets and returns the trigger type to generate the digital modulation.	
Syntax	[:SOURce]:IQ:TRIGger:TYPE{IMMediate|TRIGger|SINGle|GATE }	
Query Syntax	[:SOURce]:IQ:TRIGger:TYPE?	
Parameter/ Return parameter	IMMediate	It run free. Automatic output after turning on IQ modulation. No need to trigger.
	TRIGger	Trigger and run. It start output after receiving trigger.
	GATE	Use trigger signal as gate for IQ output

Route Commands

:ROUTe[:CONNectors]:MARKer[:OUTPut]

Set → Query

Description	This command sets returns the route to output.	
Syntax	:ROUTe[:CONNectors]:MARKer[:OUTPut]{NONE|PVIDeo|PTRG|STRG|SRUN|IQTRG}	
Query Syntax	:ROUTe[:CONNectors]:MARKer [:OUTPut]?	
Parameter/ Return parameter	NONE	No output
	PVIDeo	Output pulse video signal
	PTRG	Output pulse trigger signal
	STRG	Output sweep trigger signal
	SRUN	Output pulse sweep run signal
	QTRG	Output pulse IQ trigger signal

:ROUTe[:CONNectors]:MARKer:POLarity

Set → Query

Description	This command sets and returns the polarity of route to output	
Syntax	:ROUTe[:CONNectors]:MARKer:POLarity {POSitive|NEGative}	
Query Syntax	:ROUTe[:CONNectors]:MARKer:POLarity?	
Parameter/ Return parameter	POSitive	Set the marker BNC to positive phase output
	NEGative	Set the marker BNC to negative phase output

:ROUTe[:CONNectors]:PULSe[:OUTPut]

Set → Query

Description	This command sets returns the route to pulse output.

Syntax	:ROUTe[:CONNectors]:PULSe[:OUTPut]{NONE|PVIDeo|PTRG|STRG|SRUN|IQTRG}	
Query Syntax	:ROUTe[:CONNectors]:PULSe[:OUTPut]?	
Parameter/ Return parameter	NONE	No output
	PVIDeo	Output pulse video signal
	PTRG	Output pulse trigger signal
	STRG	Output sweep trigger signal
	SRUN	Output pulse sweep run signal
	QTRG	Output pulse IQ trigger signal

:ROUTe[:CONNectors]:PULSe:POLarity

Set → Query

Description	This command sets and returns the polarity of route to pulse output	
Syntax	:ROUTe[:CONNectors]:PULSe:POLarity {POSitive|NEGative}	
Query Syntax	:ROUTe[:CONNectors]:PULSe:POLarity?	
Parameter/ Return parameter	POSitive	Set the marker BNC to positive phase output
	NEGative	Set the marker BNC to negative phase output

:ROUTe[:CONNectors]:TRIGger[:OUTPut]

Set → Query

Description	This command sets returns the route to trigger output.	
Syntax	:ROUTe[:CONNectors]:TRIGger[:OUTPut]{NONE|PVIDeo|PTRG|STRG|SRUN|IQTRG}	
Query Syntax	:ROUTe[:CONNectors]:TRIGger[:OUTPut]?	
Parameter/ Return parameter	NONE	No output
	PVIDeo	Output pulse video signal

	PTRG	Output pulse trigger signal
	STRG	Output sweep trigger signal
	SRUN	Output pulse sweep run signal
	QTRG	Output pulse IQ trigger signal

:ROUTe[:CONNectors]:TRIGger:POLarity

Set → / → Query

Description	This command sets and returns the polarity of route to trigger output	
Syntax	:ROUTe[:CONNectors]:TRIGger:POLarity {POSitive|NEGative}	
Query Syntax	:ROUTe[:CONNectors]:TRIGger:POLarity?	
Parameter/ Return parameter	POSitive	Set the marker BNC to positive phase output
	NEGative	Set the marker BNC to negative phase output

Output Command

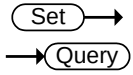
:OUTPut:STATe

Set
Query

Description	This command enables/disables and returns the RF output.	
Syntax	:OUTPut:STATe{ON|OFF}	
Query Syntax	:OUTPut:STATe?	
Parameter/ Return parameter	ON	Enable the RF output
	OFF	Disable the RF output

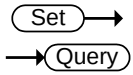
Memory Commands

:MEMory:CATalog:ARBitrary



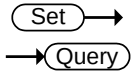
Description	This command returns a list of the arbitrary waveform digital modulation files.
Query Syntax	:MEMory:CATalog:ARBitrary?

:MEMory:CATalog:ARBitrary:EXTernal



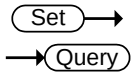
Description	This command returns a list of the arbitrary waveform digital modulation files.
Query Syntax	:MEMory:CATalog:ARBitrary:EXTernal?

:MEMory:CATalog:DATA



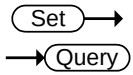
Description	This command returns a list of the arbitrary waveform digital modulation files.
Query Syntax	:MEMory:CATalog:DATA?

:MEMory:CATalog:FILTer



Description	This command returns a list of the finite impulse response filter files.
Query Syntax	:MEMory:CATalog:FILTer?

:MEMory:CATalog:LIST



Description	This command returns a list of the list sweep files.
Query Syntax	:MEMory:CATalog:LIST?

:MEMory:CATalog:PTRain

Set → Query

Description	This command returns all files of the pulse train files stored in the non-volatile storage.
Query Syntax	:MEMory:CATalog:PTRain?

:MEMory:CATalog:UFSK

Set → Query

Description	This command returns a list of the frequency shift keying files.
Query Syntax	:MEMory:CATalog:UFSK?

:MEMory:CATalog:UIQ

Set → Query

Description	This command returns a list of the Inphase and Quadrature (I/Q) files.
Query Syntax	:MEMory:CATalog:UIQ?

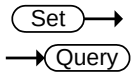
:MEMory:DATA:IQ:ARBitrary

Set → Query

Description	This command edits IQ ARB waveforms by reading external file or by using built-in waveforms. Two sets of pararmeters can be sued.	
Syntax	:MEMory:DATA:IQ:ARBitrary<“filename”>,<oversample>,<number>,<“ext file 1”>[,...,< “ext file n">] or :MEMory:DATA:IQ:ARBitrary<“filename”>,<oversample>,<number>,<wave length>,<SINE|SQUare|RAMP|DC>,<scale>,<offset>,<phase>,<conf>[,...,<SINE|SQUare|RAMP|DC>,<scale>,<offset>,<phase>,<conf>]	
Parameter1/ Return parameter1	<“filename”>	File name
	<oversample>	Do multiples of oversample on the input data

	<number>	Number of set of waveforms to be edited
	<“ext file 1”> ... <“ext file n”>	The name of the external file to read
Parameter2/ Return parameter2	<“filename”>	File name
	<oversample>	Do multiples of oversample on the input data
	<number>	Number of set of waveforms to be edited
	<wave length>	Number of points in the built-in waveform
	<SINE|SQUare| RAMP|DC>	Built-in sine wave, square wave, triangle wave, DC waveform
	<scale>	Built-in waveform peak value, range 0~32767
	<offset>	Built-in waveform offset, range 0~32767
	<phase>	Built-in waveform starting phase, range +180~-180, unit degree
	<conf>	When the built-in waveform is set to square wave, it is duty, when it is triangular wave, it is symmetry. There is no need to write this parameter when sine wave and DC wave are used.

:MEMory:DATA:IQ:ARBitrary:EXTernal



Description	This command reads external file as IQ ARB waveform.	
Syntax	:MEMory:DATA:IQ:ARBitrary:EXTernal<“filename”>,<length>,<#ABC>	
Parameter/ Return parameter	<“filename”>	File name
	<length>	Number of points in the waveform

	<#ABC>	#: initialization character; A: Digit length (in ASCII) of the number of bytes B: Number of bytes C: Edit the Binary data of Waveforms

:MEMory:DATA:IQ:DMODulation:DATA

Set → / → Query

Description	Edit user define data pattern for been using in IQ digital modulation	
Syntax	:MEMory:DATA:IQ:DMODulation:DATA <"filename">, <length>,<#ABC>	
Parameter/ Return parameter	<"filename">	File name
	<length>	Number of points in the waveform
	<#ABC>	#: initialization character; A: Digit length (in ASCII) of the number of bytes B: Number of bytes C: Edit the Binary data of Waveforms

:MEMory:DATA:IQ:DMODulation:FIR

Set → / → Query

Description	This command loads user–defined finite impulse response coefficient data, with a given oversample ratio, into a file in the unit's non–volatile memory.	
Syntax	:MEMory:DATA:IQ:DMODulation:FIR<"filename">, ,<OSR>,<length>,<value 0 >[,...,<value n>]	
Parameter/ Return parameter	<"filename">	File name
	<OSR>	Oversample number of FIR
	<length>	(FIR taps) /2
	<ratio n>	FIR value

Note	The created FIR filter will be automatically symmetrical. For example, if the input parameters filename, 4, 3, 0.1, 0.3, 0.5 are entered, an FIR filter with an oversample of 4 times, 0.1, 0.3, 0.5, 0.5, 0.3, 0.1 will be created.

:MEMory:DATA:IQ:DMODulation:UFSK

Set / Query

Description	This command loads custom frequency shift keying data into a file in the unit's non-volatile memory.	
Syntax	:MEMory:DATA:IQ:DMODulation:UFSK<"filename">,<FSK Dev>,<ratio length>,<ratio 0>[,...,<ratio n>],<diff encoding>,<diff length>[,<diff 0>,...,<diff n>]	
Parameter/ Return parameter	<"filename">	File name
	<FSK Dev>	Maximum frequency deviation, unit is Hz.
	<length>	Edit ratio quantity
	<ratio n>	Edit ratio quantity. frequency deviation/max deviation value, ranging from -1~1
	<diff encoding>	0: Disable differential encoding; 1: Enable differential encoding.
	<diff length>	The mapping length of differential coding
	<diff n>	Data = n corresponds to differential coding value
Example	Input parameter filename,1000000,4, 1, 0.5, -0.5,-1,1,4,1,3,-1,-3, the following table FSK mapping and differential coding will be created	

Data	00	01	10	11
Frequency deviation	1MHz	0.5MHz	-0.5MHz	-1MHz

Differential coding

Data	00	01	10	11
O	+1	+3	-1	-3

:MEMory:DATA:IQ:DMODulation:UIQ

Set / Query

Description	This command loads custom I/Q data into a file in the unit's non-volatile memory.	
Syntax	:MEMory:DATA:IQ:DMODulation:UIQ<"filename">, <IQ symbol length>,<I0,Q0>[,...,<In,Qn>],<diff encoding>, <diff length>[,<diff0,...,diffn>]	
Parameter/ Return parameter	<"filename">	File name
	<IQ symbol length>	Edit coordinate number
	<In,Qn>	Correspond to the IQ constellation coordinates, ranging from -1 to 1.
	<diff encoding>	0: Disable the differential encoding; 1: Enable the differential encoding
	<diff length>	The mapping length of differential coding
	<diff n>	Data = n corresponds to differential coding value

:MEMory:LOAD:LIST

Set / Query

Description	This command loads a list sweep file.
Syntax	:MEMory:LOAD:LIST<"filename">

:MEMory:LOAD:PTRain

Set / Query

Description	This command reads the pulse train file specified.
Syntax	:MEMory:LOAD:PTRain <"filename">

:MEMory:STORe:LIST

Set → / → Query

Description	This command stores the current list sweep data to a file.
Syntax	:MEMory:STORe:LIST<“filename”>

:MEMory:STORe:PTRain

Set → / → Query

Description	This command stores the current pulse train list to the PTRAIN file specified.
Syntax	:MEMory:STORe:PTRain <“filename”>

Error Messages

The GSG-2000 has a number of specific error codes. Use the SYSTem:ERRor command to recall the error codes. For more information regarding the error queue.

Command Error Codes

-101 Invalid character

An invalid character was used in the command string. Example: #, $, %.

SOURce1:AM:DEPTh MIN%

-102 Syntax error

Invalid syntax was used in the command string. Example: An unexpected character may have been encountered, like an unexpected space.

SOURce1:APPL:SQUare,1

-103 Invalid separator

An invalid separator was used in the command string. Example: a space, comma or colon was incorrectly used.

APPL:SIN 11000 OR SOURce1:APPL:SQUare

-104 Data type error

The parser recognized a data element different than one allowed. For example, numeric or string data was expected but block data was encountered.

-108 Parameter not allowed

The command received more parameters than were expected.Example: An extra (not needed) parameter was added to a command

SOURce1:APPL? 10

-109 Missing parameter

The command received less parameters than expected. Example: A required parameter was omitted.

SOURce1:APPL:SQUare

-112 Program mnemonic too long

A command header contains more than 12 characters:

OUTP:SYNCHRONIZATION ON

-113 Undefined header

An undefined header was encountered. The header is syntactically correct. Example: the header contains a character mistake.

SOUR1:AMM:DEPT MIN

-123 Exponent too large

Numeric exponent exceeds 32,000. Example:

SOURce[1|2]:BURSt:NCYCles 1E34000

-124 Too many digits

The mantissa (excluding leading 0's) contains more than 255 digits.

-128 Numeric data not allowed

An unexpected numeric character was received in the command. Example: a numeric parameter is used instead of a character string.

SOURce1:BURSt:MODE 123

-131 Invalid suffix

An invalid suffix was used. Example: An unknown or incorrect suffix may have been used with a parameter.

SOURce1:SWEep:TIME 0.5 SECS

-138 Suffix not allowed

A suffix was used where none were expected. Example: Using a suffix when not allowed.

SOURce1:BURSt:NCYCles 12 CYC

-148 Character data not allowed

A parameter was used in the command where not allowed. Example: A discrete parameter was used where a numeric parameter was expected.

SOUR1:MARK:FREQ ON

-158 String data not allowed

An unexpected character string was used where none were expected. Example: A character string is used instead of a valid parameter.

SOURce1:SWEep:SPACing'TEN'

-161 Invalid block data

Invalid block data was received. Example: The number of bytes sent with the DATA:DAC command doesn't correlate to the number of bytes specified in the block header.

-168 Block data not allowed

Block data was received where block data is not allowed. Example:

SOURce1:BURSt:NCYCles #10

-170~178 expression errors

Example: The mathematical expression used was not valid.

Execution Errors

-211 Trigger ignored

A trigger was received but ignored. Example: Triggers will be ignored until the function that can use a trigger is enabled (burst, sweep, etc.).

-223 Too much data

Data was received that contained too much data. Example: An arbitrary waveform with over 16384 points cannot be used.

-221 Settings conflict; burst period increased to fit entire burst

Example: The function generator automatically increases the burst period to allow for the burst count or frequency.

-221 Settings conflict; burst count reduced

Example: The burst count is reduced to allow for the waveform frequency if the burst period is at its maximum.

-221 Settings conflict; trigger delay reduced to fit entire burst

Example: The trigger delay is reduced to allow the current period and burst count.

-221 Settings conflict; triggered burst not available for noise

Example: Triggered burst cannot be used with noise.

-221 Settings conflict; amplitude units changed to Vpp due to high-Z load

Example: If a high impedance load is used, dBm units cannot be used. The units are automatically set to Vpp.

-221 Settings conflict; trigger output disabled by trigger external

Example: The trigger output terminal is disabled when an external trigger source is selected.

-221 Settings conflict; trigger output connector used by FSK

Example: The trigger output terminal cannot be used in FSK mode.

-221 Settings conflict; trigger output connector used by burst gate

Example: The trigger output terminal cannot be used in gated burst mode.

-221 Settings conflict; trigger output connector used by trigger external

Example: The trigger output connector is disabled when the trigger source is set to external.

-221 Settings conflict; frequency reduced for pulse function

Example: When the function is changed to pulse, the output frequency is automatically reduced if over range.

-221 Settings conflict; frequency reduced for ramp function

Example: When the function is changed to ramp, the output frequency is automatically reduced if over range.

-221 Settings conflict; frequency made compatible with burst mode

Example: When the function is changed to burst, the output frequency is automatically adjusted if over range.

-221 Settings conflict; frequency made compatible with FM

Example: When the function is changed to FM, the frequency is automatically adjusted to suit the FM settings.

-221 Settings conflict; burst turned off by selection of other mode or modulation

Example: Burst mode is disabled when sweep or a modulation mode is enabled.

-221 Settings conflict; FSK turned off by selection of other mode or modulation

Example: FSK mode is disabled when burst, sweep or a modulation mode is enabled.

-221 Settings conflict; FM turned off by selection of other mode or modulation

Example: FM mode is disabled when burst, sweep or a modulation mode is enabled.

-221 Settings conflict; AM turned off by selection of other mode or modulation

Example: AM mode is disabled when burst, sweep or a modulation mode is enabled.

-221 Settings conflict; sweep turned off by selection of other mode or modulation

Example: Sweep mode is disabled when burst or a modulation mode is enabled.

-221 Settings conflict; not able to modulate this function

Example: A modulated waveform cannot be generated with dc voltage, noise or pulse waveforms.

-221 Settings conflict; not able to sweep this function

Example: A swept waveform cannot be generated with dc voltage, noise or pulse waveforms.

-221 Settings conflict; not able to burst this function

Example: A burst waveform cannot be generated with the dc voltage function.

-221 Settings conflict; not able to modulate noise, modulation turned off

Example: A waveform cannot be modulated using the noise function.

-221 Settings conflict; not able to sweep pulse, sweep turned off

Example: A waveform cannot be swept using the pulse function.

-221 Settings conflict; not able to modulate dc, modulation turned off

Example: A waveform cannot be modulated using the dc voltage function.

-221 Settings conflict; not able to sweep dc, modulation turned off

Example: A waveform cannot be swept using the dc voltage function.

-221 Settings conflict; not able to burst dc, burst turned off

Example: The burst function cannot be used with the dc voltage function.

-221 Settings conflict; not able to sweep noise, sweep turned off

Example: A waveform cannot be swept using the noise function.

-221 Settings conflict; pulse width decreased due to period

Example: The pulse width has been adjusted to suit the period settings.

-221 Settings conflict; amplitude changed due to function

Example: The amplitude (VRM / dBm) has been adjusted to suit the selected function. For the GSG-2000, a typical square wave has a much higher amplitude (5V Vrms) compared to a sine wave (~3.54) due to crest factor.

-221 Settings conflict; offset changed on exit from dc function

Example: The offset level is adjusted on exit from a DC function.

-221 Settings conflict; FM deviation cannot exceed carrier

Example: The deviation cannot be set higher than the carrier frequency

-221 Settings conflict; FM deviation exceeds max frequency

Example: If the FM deviation and carrier frequency combined exceeds the maximum frequency plus 100 kHz, the deviation is automatically adjusted.

-221 Settings conflict; frequency forced duty cycle change

Example: If the frequency is changed and the current duty cannot be supported at the new frequency, the duty will be automatically adjusted.

-221 Settings conflict; offset changed due to amplitude

Example: The offset is not a valid offset value, it is automatically adjusted, considering the amplitude.

|offset| ≤ max amplitude – Vpp/2

-221 Settings conflict; amplitude changed due to offset

Example: The amplitude is not a valid value, it is automatically adjusted, considering the offset.

Vpp ≤ 2X (max amplitude -|offset|)

-221 Settings conflict; low level changed due to high level

Example: The low level value was set too high. The low level is set 1 mV less than the high level.

-221 Settings conflict; high level changed due to low level

Example: The high level value was set too low. The high level is set 1 mV greater than the low level.

-222 Data out of range; value clipped to upper limit

Example: The parameter was set out of range. The parameter is automatically set to the maximum value allowed.

SOURce[1|2]:FREQuency 80.1MHz.

-222 Data out of range; value clipped to lower limit

Example: The parameter was set out of range. The parameter is automatically set to the minimum value allowed.

SOURce[1|2]:FREQuency 0.1μHz.

-222 Data out of range; period; value clipped to ...

Example: If the period was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range; frequency; value clipped to ...

Example: If the frequency was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range; user frequency; value clipped to upper limit

Example: If the frequency is set to a value out of range for an arbitrary waveform using, SOURce[1|2]: APPL: USER or SOURce[1|2]: FUNC:USER, it is automatically set to the upper limit.

-222 Data out of range; ramp frequency; value clipped to upper limit

Example: If the frequency is set to a value out of range for a ramp waveform using, SOURce[1|2]: APPL: RAMP or SOURce[1|2]:FUNC:RAMP, it is automatically set to the upper limit.

-222 Data out of range; pulse frequency; value clipped to upper limit

Example: If the frequency is set to a value out of range for a pulse waveform using, SOURce[1|2]: APPL:PULS or SOURce[1|2]:FUNC:PULS, it is automatically set to the upper limit.

-222 Data out of range; burst period; value clipped to ...

Example: If the burst period was set to a value out of range, it is automatically set to an upper or lower limit.

222 Data out of range; burst count; value clipped to ...

Example: If the burst count was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range; burst period limited by length of burst; value clipped to upper limit

Example: The burst period must be greater than burst count divided by the frequency + 200 ns. The burst period is adjusted to satisfy these conditions.

burst period > 200 ns + (burst count/burst frequency).

-222 Data out of range; burst count limited by length of burst; value clipped to lower limit

Example: The burst count must be less than burst period * the waveform frequency when the trigger source is set to immediate (SOURce[1|2]:TRIG:SOUR IMM). The burst count is automatically set to the lower limit.

-222 Data out of range; amplitude; value clipped to ...

Example: If the amplitude was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range; offset; value clipped to ...

Example: If the offset was set to a value out of range, it is automatically set to an upper or lower limit.

-222 Data out of range; frequency in burst mode; value clipped to ...

Example: If the frequency was set to a value out of range in burst mode. The burst frequency is automatically set to an upper or lower limit, taking the burst period into account.

-222 Data out of range; frequency in FM; value clipped to ...

Example: The carrier frequency is limited by the frequency deviation (SOURce[1|2]: FM:DEV). The carrier frequency is automatically adjusted to be less than or equal to the frequency deviation.

-222 Data out of range; marker confined to sweep span; value clipped to ...

Example: The marker frequency is set to a value outside the start or stop frequencies. The marker frequency is automatically adjusted to either the start or stop frequency (whichever is closer to the set value).

-222 Data out of range; FM deviation; value clipped to ...

Example: The frequency deviation is outside of range. The deviation is automatically adjusted to an upper or lower limit, depending on the frequency.

-222 Data out of range; trigger delay; value clipped to upper limit

Example: The trigger delay was set to a value out of range. The trigger delay has been adjusted to the maximum (85 seconds).

-222 Data out of range; trigger delay limited by length of burst; value clipped to upper limit

Example: The trigger delay and the burst cycle time combined must be less than the burst period.

-222 Data out of range; duty cycle; value clipped to ...

Example: The duty cycle is limited depending on the frequency.

Duty Cycle	Frequency
50%	> 50MHz
40%~60%	25 MHz ~ 50MHz
20%~80%	< 25 MHz

-222 Data out of range; duty cycle limited by frequency; value clipped to upper limit

Example: The duty cycle is limited depending on the frequency. When the frequency is greater than 50 MHz, the duty cycle is automatically limited to 50%.

-313 Calibration memory lost; memory corruption detected

Indicates that a fault (check sum error) has occurred with the non-volatile memory that stores the calibration data.

-314 Save/recall memory lost; memory corruption detected

Indicates that a fault (check sum error) has occurred with the non-volatile memory that stores the save/recall files.

-315 Configuration memory lost; memory corruption detected

Indicates that a fault (check sum error) has occurred with the non-volatile memory that stores the configuration settings.

-350 Queue overflow

Indicates that the error queue is full (over 20 messages generated, and not yet read). No more messages will be stored until the queue is empty. The queue can be cleared by reading each message, using the *CLS command or restarting the function generator.

Query Errors

-410 Query INTERRUPTED

Indicates that a command was received but the data in the output buffer from a previous command was lost.

-420 Query UNTERMINATED

The function generator is ready to return data, however there was no data in the output buffer. For example: Using the APPLy command.

-430 Query DEADLOCKED

Indicates that a command generates more data than the output buffer can receive and the input buffer is full. The command will finish execution, though all the data won't be kept.

Arbitrary Waveform Errors

-770 Nonvolatile arb waveform memory corruption detected

Indicates that a fault (check sum error) has occurred with the non-volatile memory that stores the arbitrary waveform data.

-781 Not enough memory to store new arb waveform; bad sectors

Indicates that a fault (bad sectors) has occurred with the non-volatile memory that stores the arbitrary waveform data. Resulting in not enough memory to store arbitrary data.

-787 Not able to delete the currently selected active arb waveform

Example: The currently selected waveform is being output and cannot be deleted.

800 Block length must be even

Example: As block data (DATA:DAC VOLATILE) uses two bytes to store each data point, there must be an even number or bytes for a data block.

APPENDIX

GSG-2000 Specification

The specifications apply when the GSG-2000 is powered on for 30 minutes to warm-up to a temperature of +20℃ to +30℃, unless specified otherwise.

Frequency Specifications				
Frequency Range				
Frequency Range	9kHz to 6GHz	GSG-2160, GSG-2060		
Frequency Resolution		1mHz		
Frequency Bands		**Band**	**Frequency Range**	**N**
		1	9kHz to 5MHz	digital synthesis
		1	<5MHz to 187.5MHz	1
		2	<187.5MHz to 375MHz	0.25
		3	<375MHz to 750MHz	0.5
		4	<750MHz to 1500MHz	1
		5	<1500MHz to 3000MHz	2
		6	<3000MHz to 6000MHz	4
Frequency Switching		≤5ms		
Phase Noise @ 20kHz offset				
SSB phase noise CW at 20kHz offset (dBc/Hz)	Frequency (MHz)	ALC on	ALC off	
	5	-	-122	
	100	-112	-115	
	250	-112	-117	
	1000	-112	-117	
	2000	-108	-112	
	3000	-107	-110	
	6000	-102	-105	
Residual FM (0.3kHz to 3kHz)(1GHz CW)		<2Hz		

Non Harmonics			
Non Harmonics	Level>-10dBm, offset>10kHz	<-65dBc	1M ≤ freq ≤ 5M
		<-66dBc,-70dBc(typ)	5M < freq ≤ 187.5M
		<-75dBc	187.5M < freq < 750M
		<-70dBc,-74dBc(typ)	750M ≤ freq < 1500M
		<-62dBc,-66dBc(typ)	1500M ≤ freq < 3000M
		<-56dBc,-60dBc(typ)	3000M ≤ freq ≤ 6000M
Harmonics			
Range	Level < 4dBm		
9k ≤ Freq < 6000M	<-35dBc		
Frequency Reference			
Frequency Reference	10MHz		
Temperature Stability	<10ppm, Standard	<10ppb, OCXO Option	
Aging	2ppm/year, Standard	0.1ppm/year, OCXO Option	
Output	1Vpp, 50 Ohm Load		
Input	-3 ~ 20dBm, 50 Ohm Load		
Input Deviation	Standard: 3ppm, OCXO Option: 0.5ppm		

Amplitude Specifications				
Amplitude				
Setting Range	20dBm to -140dBm			
Resolution	0.01dB			
Amplitude Unit	dBm, dBuV, Vrms			
Amplitude Accuracy				
Absolute level accuracy in CW mode (ALC On)		14 to -60dBm	-60 to -90dBm	-90 to -110dBm
	9k < freq < 3GHz	±0.6dB	±0.8dB (0.6dB typical)	±1dB (0.7dB typical)
	3GHz ≦ freq < 6GHz	±0.8dB	±1dB(0.6dB typical)	±1.2dB(0.7dB typical)
Addition level error		<0.15dB, at ALC Off, Power search run		
VSWR (5M ~ 3GHz)		<1.8 (output ≤ -66dBm)		
Amplitude Switching (ALC on, CW)		≤5ms		

Note

When measuring amplitude accuracy, it is recommended that

- maintain the measured SNR (signal to noise ratio) above 20dB
- use test instrument with measurement bandwidth ≤ 1MHz when test condition is -30dBm ≥ amp> -30dBm ≥ amp>-80dBm, and use test instrument with measurement bandwidth ≤ 1kHz when test condition is -80dBm ≥ amp> -110dBm.

Sweep Specifications		
Sweep		
Mode		frequency, amplitude, list
Dwell time		100us to 100s
Number of points(step)		2 to 65,535
Number of points(list)		1 to 4,096
Triggering		free, trigger key, external, timer
Analog Modulation Specifications		
FM		
Source		internal, external
Max. Deviation		N*1MHz
Rate	freq ≥ 10MHz	0.1Hz to 1MHz
	freq < 10MHz	0.1Hz to 100kHz
Resolution		1mHz
Accuracy (1kHz rate)		2% setting +20Hz
Distortion(1kHz rate, N*50kHz deviation)		0.40%
PM		
Source		internal, external
Max. Deviation		N* 1MHz/rate or 5N rad
Rate	freq ≥ 10MHz	0.1Hz to 1MHz
	freq < 10MHz	0.1Hz to 100kHz
Resolution		0.001rad
Accuracy (1kHz rate)		1% of setting+0.1rad
Distortion (1kHz rate, max deviation)		0.20%
Response		0.1Hz to 1MHz
AM		
Source		internal, external
Resolution		0.01%
Depth		0 to 100%
Accuracy (1kHz, 0dBm)	<5MHz	1.5% setting +1%
	5M ~ 4GHz	3% of setting+1%
	4GHz ~ 6GHz	5% of setting + 1%
Distortion (1kHz, 80%, <8dBm)	<5MHz	1.50%
	5M ~ 4GHz	2%
	4GHz ~ 6GHz	3%
Response		0.1Hz to 20kHz

Pulse Specifications	
Pulse	
Mode	Free-run, square, triggered, adjustable doublet, trigger doublet, gated, external pulse, and pulse train
Source	internal, external

Pulse Input	-0.5V to 5V, V_{IL}=V_{IH}=1.5V (typ)
Edge Time	<20ns
On/Off Ratio	70dB, 5M ~ 3GHz
	45dB, 3G ~ 6GHz
Repetition Rate	0.1Hz to 10MHz
Pulse Period	100ns ~ 42s
Resolution	10ns
Width	50ns ~ period-10ns
Resolution	10ns
Pulse Train Number of Patterns	2047

LF Specifications		
LF		
Waveform		sine, square, triangle, ramp, Gaussian noise
Frequency Range	Sine	0.1Hz to 10MHz
	Square, Triangle, Ramp	0.1Hz to 1MHz
	Gaussian Noise	10MHz BW
Resolution		1mHz
Output		2mVpp to 6Vpp
Impedance		50 Ohm

Vector Modulation Specifications		
Vector Modulation (GSG-2160 only)		
Source		internal, external
Bandwidth (baseband)		60MHz
Bandwidth (RF)		120MHz
Carrier Frequency		<5MHz to 6,000MHz
Carrier Suppression	25±5℃	>50dBc
Sideband Suppression	25±5℃	>50dBc
Modulation Mode		ASK, PSK, APSK, QAM, FSK, MSK, user define IQ, user define FSK, trigger and run
ASK		2ASK(0 to 100%), 4ASK, 8ASK, 16ASK, 32ASK
PSK		BPSK, QPSK, DQPSK, OQPSK, π/4 DQPSK, 8PSK, D8PSK, 16PSK
APSK		16APSK, 32APSK
QAM		16QAM, 32QAM, 64QAM, 128QAM, 256QAM
FSK		2FSK, 4FSK, 8FSK, 16FSK
Internal Modulation EVM (16QAM, RRC filter,α=0.25, 4Msps, level≦4dBm,ALC off)		0.8%, <3GHz
		1.2%, 3GHz < freq < 5GHz
IQ Generator		
Resolution		16bit
Sample Rate		10kHz to 180MHz

Baseband Bandwidth		60MHz
ARB Memory	Waveform Length	16Msa
	Storage Capacity	16GB
Trigger Type		free, single, gated
Trigger Source		external, trigger key
Internal IQ Adjustment		
IQ Offset		±10%
IQ Gain		±6dB
IQ Skew		max 30ps ~ 100ps
External IQ Output		
Impedance		50Ohm per output
Maximum per Output		0.5Vpk
Bandwidth		60MHz
Common Mode Offset		±1.25V
Differential Mode Offset		±50mV
External IQ Input		
Bandwidth		60MHz
Full Scale		±1V into 50Ohm
IQ Offset		±10% full scale
IQ Gain		±6dB
Simultaneous Modulation		
All modulation types (I/Q, FM, AM, ΦM, and pulse modulation) may be simultaneously enabled except: FM and phase modulation.		
General Specifications		
General Specification		
Power Source		AC 100-240V, 50 to 60Hz
Power Consumption		90VA Maximum
Display		7 inch TFT LCD, 1024(RGB)*600
Operating Temperature		0 to 50°C
Storage Temperature		-10 to 70°C
Humidity		85% at 40°C
Altitude		Up to 2000m
Dimensions (W x H x D)		430(W) x 140(H) x 540(D)mm
Weight		Approx. 11.5 kg

Certificate Of Compliance

We

GOOD WILL INSTRUMENT CO., LTD.

declare that the CE marking mentioned product

satisfies all the technical relations application to the product within the scope of council:

Directive: EMC; LVD; WEEE; RoHS

The product is in conformity with the following standards or other normative documents:

◎ **EMC**	
EN 61326-1	Electrical equipment for measurement, control and laboratory use –– EMC requirements
Conducted & Radiated Emission EN 55011 / EN 55032	Electrical Fast Transients EN 61000-4-4
Current Harmonics EN 61000-3-2 / EN 61000-3-12	Surge Immunity EN 61000-4-5
Voltage Fluctuations EN 61000-3-3 / EN 61000-3-11	Conducted Susceptibility EN 61000-4-6
Electrostatic Discharge EN 61000-4-2	Power Frequency Magnetic Field EN 61000-4-8
Radiated Immunity EN 61000-4-3	Voltage Dip/ Interruption EN 61000-4-11 / EN 61000-4-34
◎ Safety	
EN 61010-1 :	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements

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