

# Signal Generator

GSG-2000

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User Manual

ISO-9001 CERTIFIED MANUFACTURER

**GW INSTEK**

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# S 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.

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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

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### 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.

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### Power Supply



#### WARNING

- AC Input voltage: 100 V to 240 V.
  - Connect the protective grounding conductor of the AC power cord to an earth ground to prevent electric shock.
-

Fuse

Fuse type: 250 V, T 1.0 A (for GSG-2160)  
 250 V, T 0.8 A (for GSG-2060)



**WARNING**

- 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:  $\leq 80\%$ , 0 °C to 40 °C ;  
 $\leq 70\%$ , 35 °C to 40 °C
- Altitude: < 2000 m
- 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 °C to 40 °C;
- Humidity:  
Up to 80 % for ambient temperature up to 40 °C  
Up to 70 % for ambient temperature 35 °C to 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 0.75 mm<sup>2</sup> should be protected by a 3 A or 5 A fuse. Larger conductors would normally require 13 A 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.

# G E T T I N G   S T A R T E D

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

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## Main Features

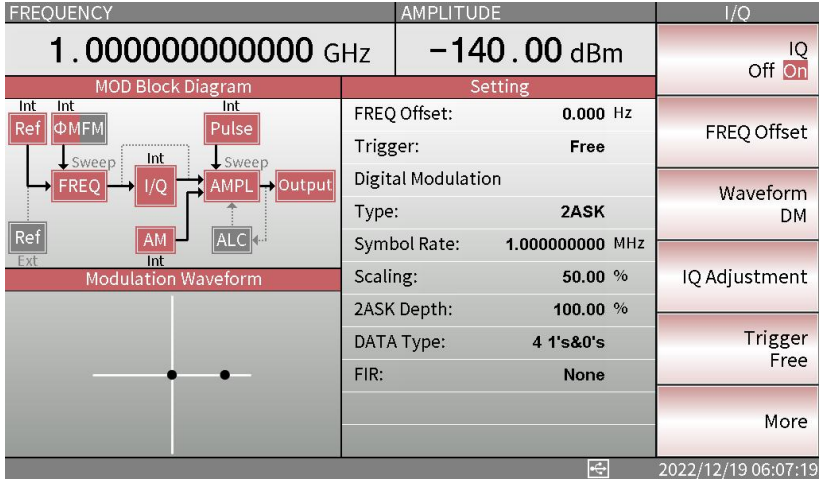
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- Performance
- Highest frequency: 9 kHz to 6 GHz
  - Amplitude accuracy: < 0.8 dB (0 dBm CW signal at 25 °C)
  - Output amplitude range: -140 dBm to 20 dBm (settable)
  - High signal purity, phase noise: -117 dBc/Hz @ 20 kHz offset from 1 GHz carrier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



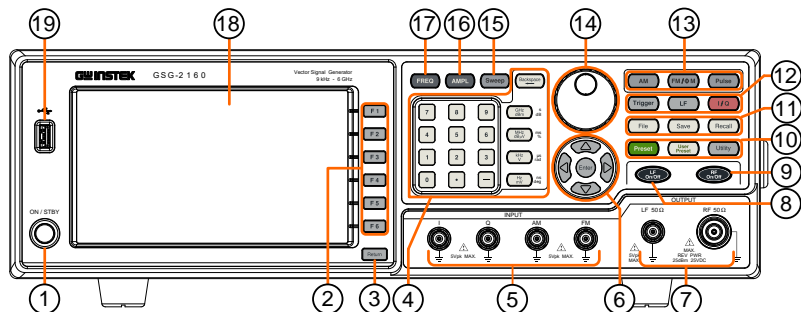
# Panel Overview

## Display

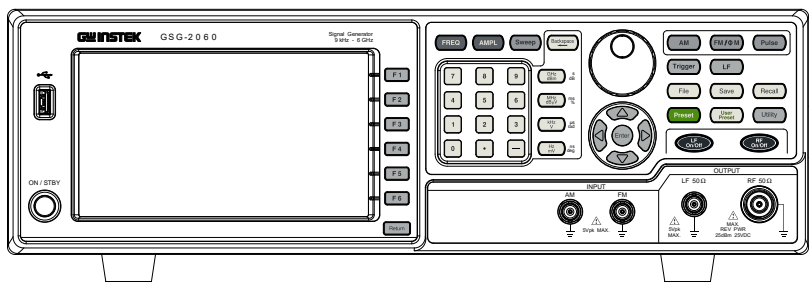


MOD Block Diagram	It is used to display current block diagram.
Setting area	Displays the current setting status.
Soft keys menu	It is used to select modulation function setting.
Modulation Waveform	It is used to display the waveform.
Frequency	It is used to display waveform's frequency.
Amplitude	It 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
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LCD Display	TFT color display, 1024 x 600 resolution.
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
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
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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).
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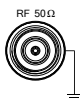
File Key		It is used to access storage memory and ménage files (including copy, delete, and rename files).
Save Key		It is used to save present saving.
Recall Key		It is used to read out the setting value.
Preset Key		It is used to enable preset status.
User preset Key		<p>User preset save: for saving the current GSG-2000 settings.</p> <p>User preset execute: for resetting the GSG-2000 the settings saved in the user preset.</p>
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.

LF 50Ω



It is used for outputting the set LF signal. Set waveform through the LF key.

Input  
Ports



All connectors have full scale from +1 V to -1V. If input exceeds 5 Vpk, the GSG-2000 may damage.

It is used for inputting external FM/ $\Phi$ M modulation. To switch modulation signal source, you need to do setting form FM/ $\Phi$ M > FM ( $\Phi$ M) configuration > FM ( $\Phi$ M) 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.

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USB Host  
port



It is used to connect with USB type-A device.

---

Scroll  
Wheel



It is used to edit values and parameters.

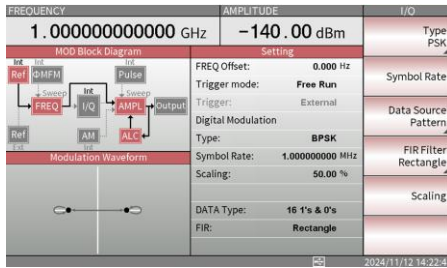


Decrease

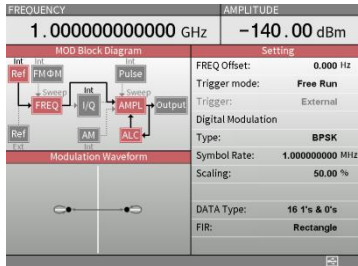
Increase

Editing FIR filter

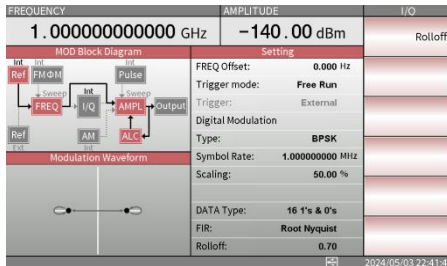
- Panel Operation
1. Once you select an I/Q type, you can edit its FIR filter by pressing the F4 key. F 4



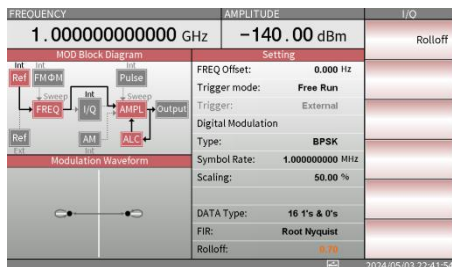
2. Press the F1 key to select Rectangle as the FIR filter of the I/Q type you currently selected. F 1



1. Press the F2 key to select Root Nyquist as the FIR filter of the I/Q type you currently selected. F 2



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.



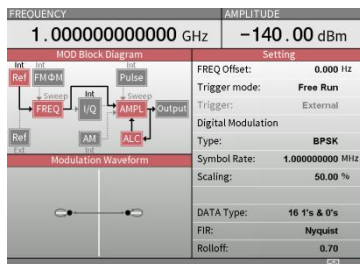
4. You can also use the numeric keyboard to input value you need directly.



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

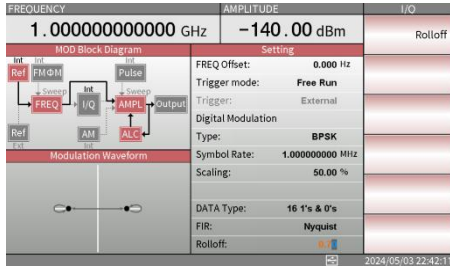


6. Press the F3 key to select Nyquist as the FIR filter of the I/Q type you currently selected.





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.



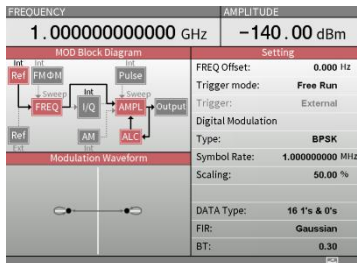
9. You can also use the numeric keyboard to input value you need directly.



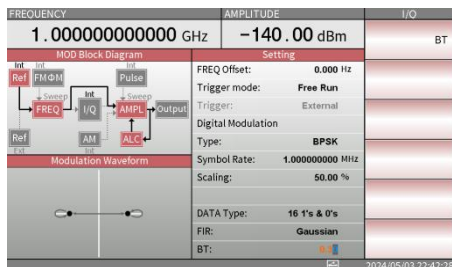
10. Press the Enter key to confirm that value you set.



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.



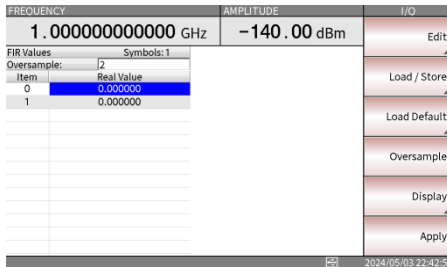
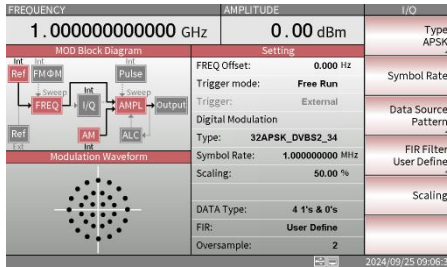
15. Press the Enter key to confirm that value you set.



**Editing User-defined FIR Filter**

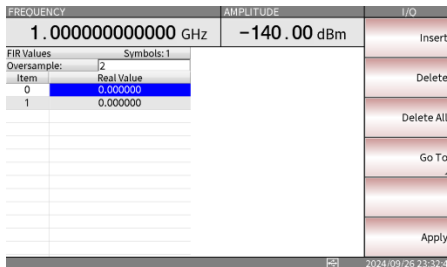
- Panel Operation
1. Press the F5 key under the FIR Filter menu to customize the FIR filter of the I/Q type you currently selected.

**F 5**



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

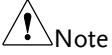
**F 1**



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



FREQUENCY		AMPLITUDE		I/O
1.000000000000 GHz		-140.00 dBm		Load File
FIR Values		Symbols: 1		Save File
Over-sample:	2	Real Value		
Item	0	0.000000		
	1	0.000000		
2024/09/25 22:22:15				



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.

### Illustration

Before setting                  Setting real value                  After setting

Item 0, 1, are mapped to item 3, 2

FREQUENCY		FREQUENCY		FREQUENCY	
1.000000000000 GHz		1.000000000000 GHz		1.000000000000 GHz	
FIR Values		FIR Values		FIR Values	
Symbols: 1		Symbols: 1		Symbols: 1	
Over-sample:	2	Over-sample:	2	Over-sample:	2
Item	Real Value	Item	Real Value	Item	Real Value
0	0.000000	0	0.800000	0	0.800000
1	0.400000	1	0.2	1	0.200000
2	0.400000	2	0.400000	2	0.200000
3	0.800000	3	0.800000	3	0.800000

Identical values

Item 0, 1, 2 are mapped to item 5, 4, 3

FREQUENCY		FREQUENCY		FREQUENCY	
1.000000000000 GHz		1.000000000000 GHz		1.000000000000 GHz	
FIR Values		FIR Values		FIR Values	
Symbols: 1		Symbols: 1		Symbols: 1	
Over-sample:	2	Over-sample:	2	Over-sample:	2
Item	Real Value	Item	Real Value	Item	Real Value
0	0.200000	0	0.8	0	0.200000
1	0.200000	1	0.400000	1	0.400000
2	0.400000	2	0.400000	2	0.400000
3	0.400000	3	0.400000	3	0.400000
4	0.200000	4	0.200000	4	0.200000
5	0.200000	5	0.200000	5	0.100000

Identical values



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.

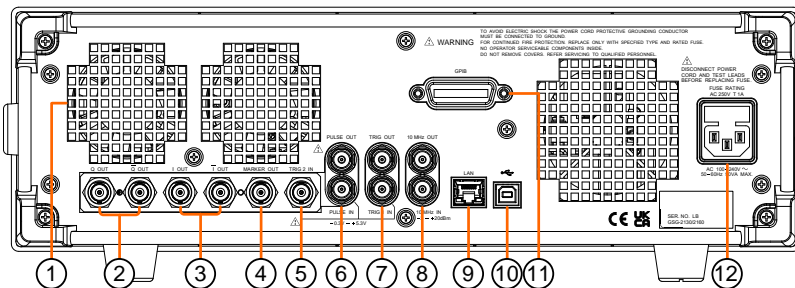


After entering the edit menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the “Exit” (F1) key or the “Save & Exit” (F2) key to exit. Press the F1 key to exit directly, and press the F2 key to save the editing results and exit.

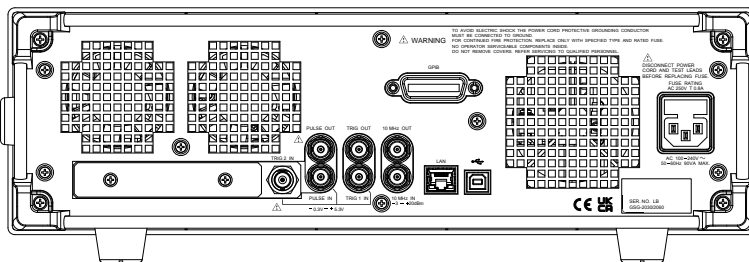
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**GSG-2160 Rear Panel**

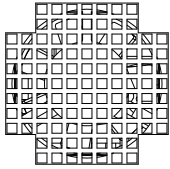



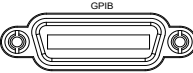
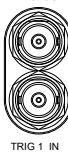


**GSG-2060 Rear Panel**

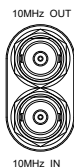


**Item Index Description**

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	10 MHz IN and OUT ports
9	LAN port
10	USB Device Port
11	Power Input Socket
12	GPIB port

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

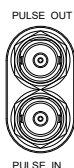
10 MHz IN and Out ports



10 MHz IN:  
It is terminal for external 10 MHz reference frequency input. Input range is from - 3 dBm to 20 dBm. Choose internal or external frequency reference source from the freq>freq ref source menu.

10 MHz OUT:  
It can be used to output 1 Vpp 10 MHz 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



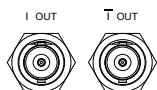
It can be used for external trigger input. The setting methods are the same as that of TRIG IN.

MARKER out port



The default function is IQ trigger output (**Temporarily the Marker feature is unavailable**). It can be modified by BNC output route in the sweep, IQ, and pulse menus (For GSG-2160 only).

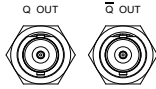
I out ports



It is used to output **in phase waveform** of IQ function and differential is +1 V to -1 V 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 +1 V to -1 V 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.

FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	I/O Config
System Information		
Config Mode: DHCP / AutoIP	Power On: Preset	Power On Preset
IP Address: 169.254.4.15	NTP: On	Software
Subnet Mask: 255.255.0.0	Date: 2024 / 03 / 01	Time/Date
Default Gateway: 0.0.0.0	Time: 23 : 04 : 54	Brightness
1st DNS Server: 0.0.0.0	Time Zone: +08 : 00	More
2nd DNS Server: 0.0.0.0	Brightness: 5	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
2024/03/01 23:05:01		

FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	Error Page
System Information		
Config Mode: DHCP / AutoIP	Power On: Preset	Run Table(CW)
IP Address: 169.254.4.15	NTP: On	Run Table(Q)
Subnet Mask: 255.255.0.0	Date: 2024 / 03 / 01	
Default Gateway: 0.0.0.0	Time: 23 : 04 : 54	
1st DNS Server: 0.0.0.0	Time Zone: +08 : 00	
2nd DNS Server: 0.0.0.0	Brightness: 5	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
2024/03/01 23:05:06		

- I/O configuration ..... 32
  - IP Address setting ..... 33
  - Subnet Mask setting ..... 34
  - Default Gateway setting ..... 34
  - 1st DNS server setting ..... 35
  - 2nd DNS server setting ..... 37
  - Hostname setting ..... 38
  - Socket port setting ..... 39
- Power on setting ..... 40
- Software setting ..... 41
- Time/Date setting ..... 42
- Brightness setting ..... 35

# I/O configuration

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

**F1**  
x2

FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	Config Mode DHCP/AutoIP
System Information		
Config Mode: DHCP / AutoIP	Power On: Preset	Manual Settings Host Name Socket Port Apply Reset
IP Address: 169 . 254 . 4 . 15	NTP: On	
Subnet Mask: 255 . 255 . 0 . 0	Date: 2024 / 03 / 01	
Default Gateway: 0 . 0 . 0 . 0	Time: 23 : 04 : 54	
1st DNS Server: 0 . 0 . 0 . 0	Time Zone: +08 : 00	
2nd DNS Server: 0 . 0 . 0 . 0	Brightness: 5	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01 23:06:14

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

**F1**

FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	DHCP/AutoIP
System Information		
Config Mode: Manual	Power On: Preset	Manual
IP Address: 169 . 254 . 4 . 15	NTP: On	
Subnet Mask: 255 . 255 . 0 . 0	Date: 2024 / 03 / 01	
Default Gateway: 0 . 0 . 0 . 0	Time: 23 : 07 : 11	
1st DNS Server: 0 . 0 . 0 . 0	Time Zone: +08 : 00	
2nd DNS Server: 0 . 0 . 0 . 0	Brightness: 5	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01 23:07:29

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.

Config Mode: **DHCP / AutoIP**

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

Config Mode: **Manual**

- 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.

**F 2**

FREQUENCY		AMPLITUDE		Utility
1.000000000000 GHz		-140.00 dBm		IP Address
System Information				
Config Mode:	Manual	Power On:	Preset	Subnet Mask
IP Address:	169 . 254 . 4 . 15	NTP:	On	
Subnet Mask:	255 . 255 . 0 . 0	Date:	2024 / 03 / 01	Default Gateway
Default Gateway:	0 . 0 . 0 . 0	Time:	23 : 08 : 59	
1st DNS Server:	0 . 0 . 0 . 0	Time Zone:	+08 : 00	1st DNS Server
2nd DNS Server:	0 . 0 . 0 . 0	Brightness:	5	
Socket Port:	5025			2nd DNS Server
MAC:	00:22:24:79:16:02			
Hostname:	GSG-21601g			
mDNS Hostname:	GSG-21601g.local			
				2024.03.01 23:09:15

## IP Address setting

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

**F 1**

FREQUENCY		AMPLITUDE		Utility
1.000000000000 GHz		-140.00 dBm		IP Address
System Information				
Config Mode:	Manual	Power On:	Preset	Subnet Mask
IP Address:	169 . 254 . 4 . 15	NTP:	On	
Subnet Mask:	255 . 255 . 0 . 0	Date:	2024 / 03 / 01	Default Gateway
Default Gateway:	0 . 0 . 0 . 0	Time:	23 : 08 : 59	
1st DNS Server:	0 . 0 . 0 . 0	Time Zone:	+08 : 00	1st DNS Server
2nd DNS Server:	0 . 0 . 0 . 0	Brightness:	5	
Socket Port:	5025			2nd DNS Server
MAC:	00:22:24:79:16:02			
Hostname:	GSG-21601g			
mDNS Hostname:	GSG-21601g.local			
				2024.03.01 23:09:15

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



- 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.

**F 2**

FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	IP Address
System Information		
Config Mode: <b>Manual</b>	Power On: <b>Preset</b>	Subnet Mask
IP Address: 169 . 254 . 4 . 15	NTP: <b>On</b>	Default Gateway
Subnet Mask: <b>255</b> . 255 . 0 . 0	Date: 2024 / 03 / 01	
Default Gateway: 0 . 0 . 0 . 0	Time: 23 : 08 : 59	1st DNS Server
1st DNS Server: 0 . 0 . 0 . 0	Time Zone: +08 : 00	
2nd DNS Server: 0 . 0 . 0 . 0	Brightness: 5	2nd DNS Server
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01 23:09:30

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.

**F 3**

FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	IP Address
System Information		
Config Mode: <b>Manual</b>	Power On: <b>Preset</b>	Subnet Mask
IP Address: 169 . 254 . 4 . 15	NTP: <b>On</b>	Default Gateway
Subnet Mask: 255 . 255 . 0 . 0	Date: 2024 / 03 / 01	
Default Gateway: <b>0</b> . 0 . 0 . 0	Time: 23 : 08 : 59	1st DNS Server
1st DNS Server: 0 . 0 . 0 . 0	Time Zone: +08 : 00	
2nd DNS Server: 0 . 0 . 0 . 0	Brightness: 5	2nd DNS Server
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01 23:10:00

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.



FREQUENCY	AMPLITUDE	Utili
1.000000000000 GHz	-140.00 dBm	I/O
System Information		
Config Mode: Manual	Power On: User	Poi
IP Address: 169.254.4.15	NTP: On	So
Subnet Mask: 255.255.0.0	Date: 2024 / 03 / 01	Tim
Default Gateway: 0.0.0.0	Time: 23 : 20 : 35	Brig
1st DNS Server: 0.0.0.0	Time Zone: +08 : 00	
2nd DNS Server: 0.0.0.0	Brightness:	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01

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.



FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	IP Address
System Information		
Config Mode: <b>Manual</b>	Power On: <b>Preset</b>	Subnet Mask
IP Address: 169 . 254 . 4 . 15	NTP: <b>On</b>	Default Gateway
Subnet Mask: 255 . 255 . 0 . 0	Date: 2024 / 03 / 01	1st DNS Server
Default Gateway: 0 . 0 . 0 . 0	Time: 23 : 08 : 59	2nd DNS Server
1st DNS Server: 0 . 0 . 0 . 0	Time Zone: +08 : 00	
2nd DNS Server: 0 . 0 . 0 . 0	Brightness: 5	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01 23:10:20

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.



FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	IP Address
System Information		
Config Mode: <b>Manual</b>	Power On: <b>Preset</b>	Subnet Mask
IP Address: 168 . 254 . 4 . 15	NTP: <b>On</b>	Date: 2024 / 03 / 01
Subnet Mask: 255 . 255 . 0 . 0	Date: 2024 / 03 / 01	Time: 23 : 08 : 59
Default Gateway: 0 . 0 . 0 . 0	Time Zone: <b>+08 : 00</b>	Brightness: 5
1st DNS Server: 0 . 0 . 0 . 0	Time Zone: <b>+08 : 00</b>	1st DNS Server
2nd DNS Server: <b>0 . 0 . 0 . 0</b>	Brightness: 5	2nd DNS Server
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: <b>GSG-21601g</b>		
mDNS Hostname: <b>GSG-21601g.local</b>		
		2024/03/01 23:10:32

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

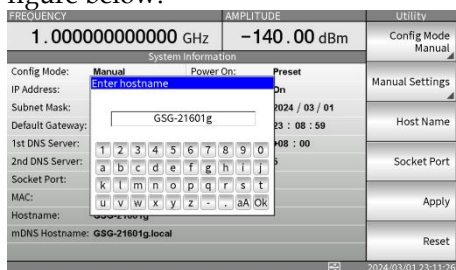


3. Press the Enter key to confirm and move on to the following number of the 2nd DNS server.



## 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.



FREQUENCY	AMPLITUDE	UTILITY
1.000000000000 GHz	-140.00 dBm	Config Mode Manual
System Information		
Config Mode: Manual	Power On: Preset	Manual Settings
IP Address: 169.254.4.15	NTP: On	
Subnet Mask: 255.255.0.0	Date: 2024 / 03 / 01	Host Name
Default Gateway: 0.0.0.0	Time: 23 : 08 : 50	
1st DNS Server: 0.0.0.0	Time Zone: +08 : 00	Socket Port
2nd DNS Server: 0.0.0.0	Brightness: 5	
Socket Port: 507		Apply
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		Reset
mDNS Hostname: GSG-21601g.local		
2024/03/01 23:11:43		

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.



or



# Power on setting

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

**F 2**

FREQUENCY		AMPLITUDE	Utility
1.000000000000 GHz		-140.00 dBm	Last
System Information			
Config Mode:	Manual	Power On:	Preset
IP Address:	169.254.4.15	NTP:	On
Subnet Mask:	255.255.0.0	Date:	2024 / 03 / 01
Default Gateway:	0.0.0.0	Time:	23 : 11 : 52
1st DNS Server:	0.0.0.0	Time Zone:	+08 : 00
2nd DNS Server:	0.0.0.0	Brightness:	5
Socket Port:	5025		
MAC:	00:22:24:79:16:02		
Hostname:	GSG-21601g		
mDNS Hostname:	GSG-21601g.local		
			2024/03/01 23:12:22

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**

AMPLITUDE	Utility
-140.00 dBm	I/O Config
On:	Power On
Last	Last
On	

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

**F 2**

AMPLITUDE	Utility
-140.00 dBm	I/O Config
On:	Power On
Preset	Preset
On	

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

**F 3**

AMPLITUDE	Utility
-140.00 dBm	I/O Config
On:	Power On
User	User
On	

# Software setting

Panel Operation

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



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



FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	System info
System Information		
Config Mode:	Model   GSG-2160	Update
IP Address:	BOOT   18.01	24 / 03 / 01
Subnet Mask:	FW-FPGA   0.09	: 12 : 57
Default Gateway:	REF-FPGA   0.90	: 00
1st DNS Server:	Firmware   0.98.bta	
2nd DNS Server:	Image   1.00	
Socket Port:	MAC:   S/JN   0123456789	
Hostname:	Options   -	
mDNS Hostname:		

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



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.

file browser	Utility
Internal storage 121.00 MB free of 125.77 MB	Select
Internal IQ storage 25.07 MB free of 64.84 MB	
<b>USB storage 7.16 GB free of 7.45 GB</b>	

# 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.



FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	Set Date
System Information		
Config Mode: Manual	Power On: User	Set Time
IP Address: 169.254.4.15	NTP: On	Set Time Zone
Subnet Mask: 255.255.0.0	Date: 2024/03/01	
Default Gateway: 0.0.0.0	Time: 23:12:57	NTP Off <input type="checkbox"/>
1st DNS Server: 0.0.0.0	Time Zone: +08:00	
2nd DNS Server: 0.0.0.0	Brightness: 5	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01 23:14:00

3. Press the F2 key to set time.



FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	Set Date
System Information		
Config Mode: Manual	Power On: User	Set Time
IP Address: 169.254.4.15	NTP: On	Set Time Zone
Subnet Mask: 255.255.0.0	Date: 2024/03/01	
Default Gateway: 0.0.0.0	Time: 23:12:57	NTP Off <input type="checkbox"/>
1st DNS Server: 0.0.0.0	Time Zone: +08:00	
2nd DNS Server: 0.0.0.0	Brightness: 5	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01 23:14:13

4. Press the F3 key to set time zone.



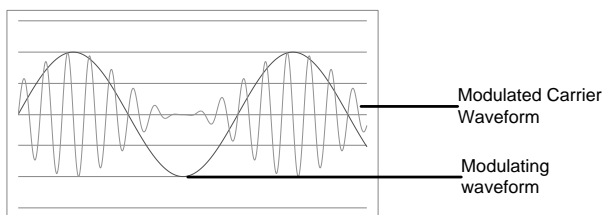
FREQUENCY	AMPLITUDE	Utility
1.000000000000 GHz	-140.00 dBm	Set Date
System Information		
Config Mode: Manual	Power On: User	Set Time
IP Address: 169.254.4.15	NTP: On	Set Time Zone
Subnet Mask: 255.255.0.0	Date: 2024/03/01	
Default Gateway: 0.0.0.0	Time: 23:12:57	NTP Off <input type="checkbox"/>
1st DNS Server: 0.0.0.0	Time Zone: +08:00	
2nd DNS Server: 0.0.0.0	Brightness: 5	
Socket Port: 5025		
MAC: 00:22:24:79:16:02		
Hostname: GSG-21601g		
mDNS Hostname: GSG-21601g.local		
		2024/03/01 23:14:19

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



# AMPLITUDE MODULATION

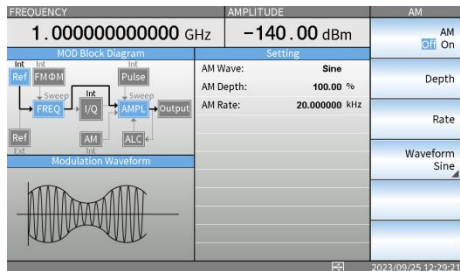
An AM waveform is produced from a carrier waveform and a modulating waveform. The amplitude of the carrier waveform depends on the amplitude of the modulating waveform. The GSG-2000 vector signal generator can set the carrier frequency and amplitude as well as internal or external modulation sources.



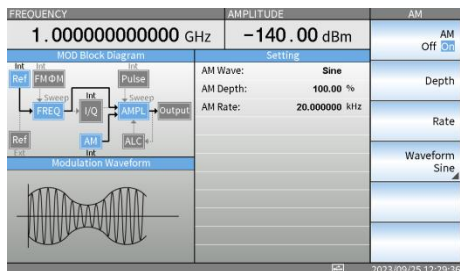
Selecting AM Modulation.....	44
Selecting waveform of AM Modulation .....	45
All waveforms and its setting.....	47
LF waveform.....	47
Sine waveform.....	48
Square waveform .....	50
Triangle waveform .....	51
External waveform.....	52

# 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.





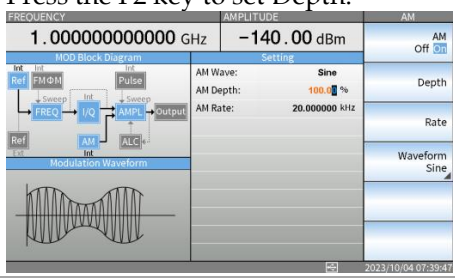
# Selecting waveform of AM Modulation

- 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.

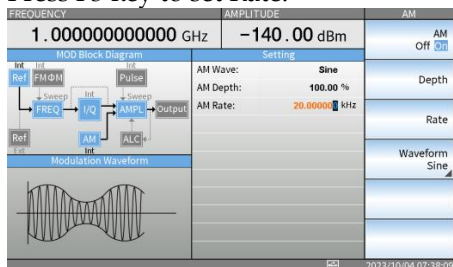


2. Configure the setting of wave form that has been selected. For example, if “Sine” is selected, you need to configure Depth or Rate of “Sine” wave.

3. Press the F2 key to set Depth.



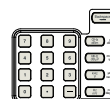
4. Press F3 key to set Rate.



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.

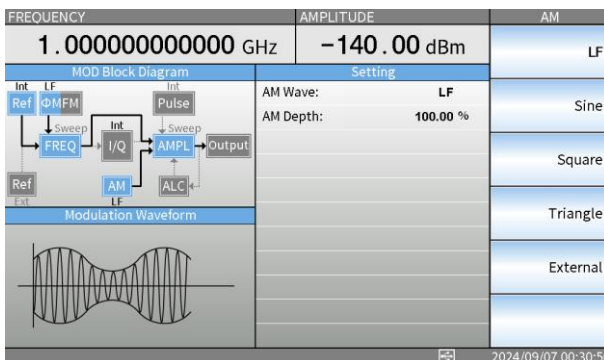


7. Press the Enter key to confirm that value you set.



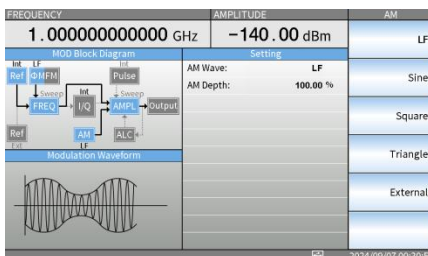
# All waveforms and its setting

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.

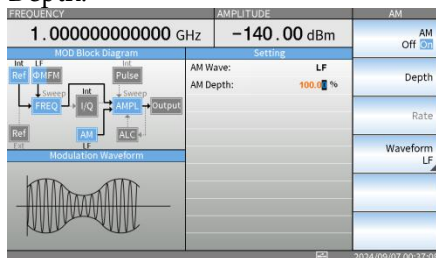


## LF waveform

- Panel Operation
1. Press the F1 soft key to select LF waveform.



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

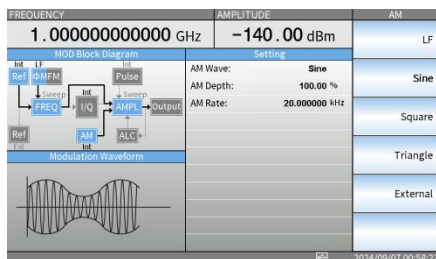


- Set the value of AM Depth.
- Press the Enter key to confirm the value you set. Enter

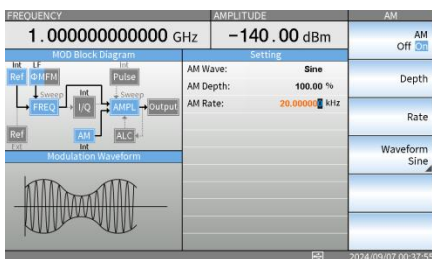
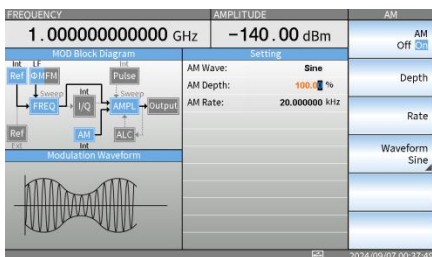
Range of setting item      Depth: 0 % to 100 % (0.01 % resolution)

## Sine waveform

- Press the F2 soft key to select Sine waveform. F 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



- Set the value of AM Depth and AM Rate.
- Press the Enter key to confirm the value you set.

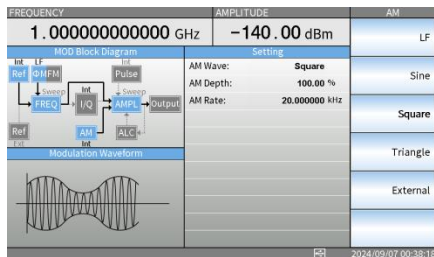


Range of setting item

Depth: 0 % to 100 % (0.01 % resolution)  
 Rate: 0.1 Hz to 20 kHz (1 mHz accuracy)

## Square waveform

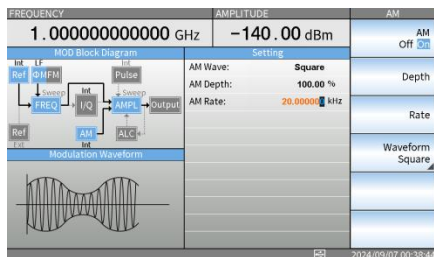
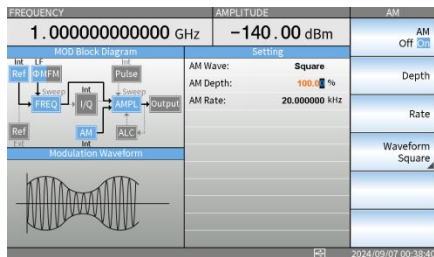
- Panel Operation 1. Press the F3 soft key to select the Square waveform.



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



or



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

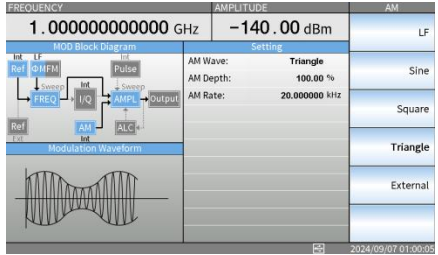


Range of setting item

Depth: 0 % to 100 % (0.01 % resolution)  
 Rate: 0.1 Hz to 20 kHz (1 mHz accuracy)

Triangle waveform

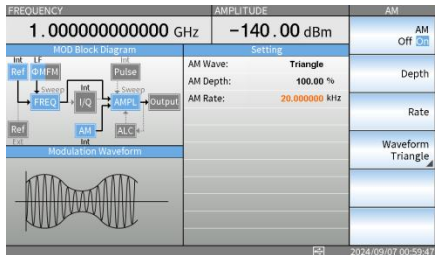
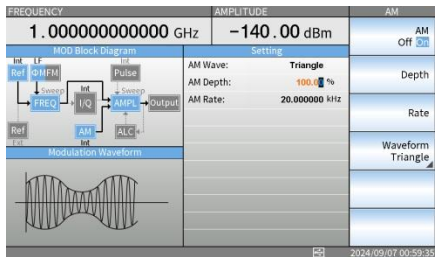
- Panel Operation 1. Press the F4 soft key to select Triangle waveform.



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



or



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



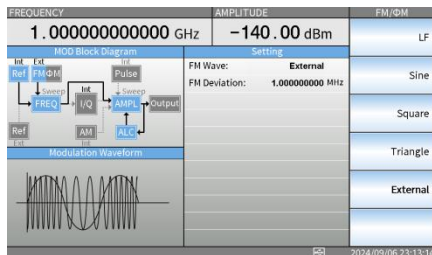
Range of setting item

Depth: 0 % to 100 % (0.01 % resolution)  
 Rate: 0.1 Hz to 20 kHz (1 mHz accuracy)

## External waveform

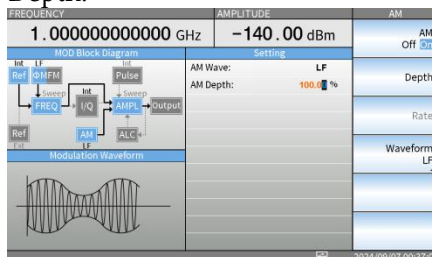
- Panel Operation 1. Press the F5 soft key to select External waveform.

F 5



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

F 2



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



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



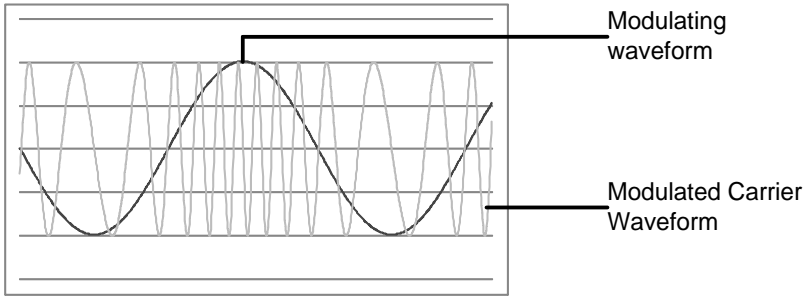
The external waveform is input from the AM connector on the front panel.





# FREQUENCY/PHASE MODULATION

A FM/ $\Phi$ M 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.

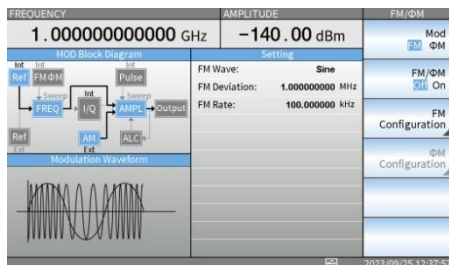



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LF waveform .....	65
Sine waveform .....	66
Square waveform .....	68
Triangle waveform .....	69
External waveform .....	70

# Selecting FM/ $\Phi$ M Modulation

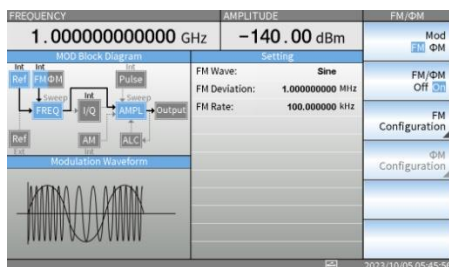
- Panel Operation 1. Press the FM/ $\Phi$ M key on the front panel of the GSG-2000.



2. Press the F1 key to toggle between FM and  $\Phi$ M

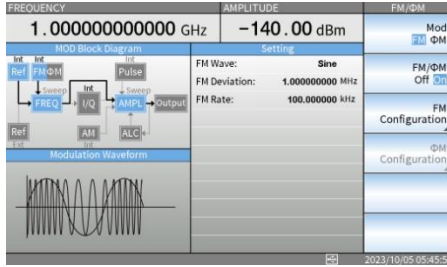


3. Press the F2 key to enable the FM/ $\Phi$ M modulation. Press the F2 key again to disable the FM/ $\Phi$ M modulation. When FM/ $\Phi$ M modulation is activated, the FM/ $\Phi$ M key will light on and you will see the FM/ $\Phi$ M icon in the MOD Block Diagram turning blue as shown in the figure below.

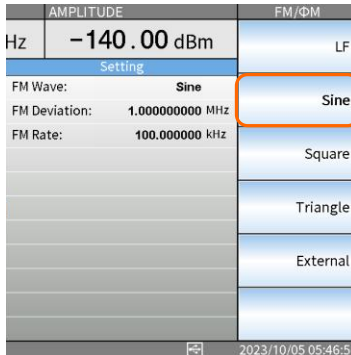


# Waveform of FM/ΦM Modulation



- Panel Operation
1. If FM Modulation is selected, press the **F3** soft key to move on to the FM modulation waveform configuration.

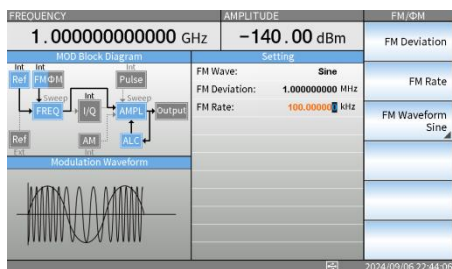
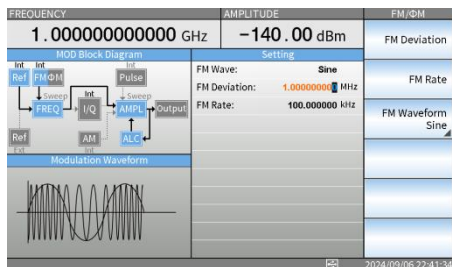


2. To change the FM modulation waveform, press the F3 key and a key next to the waveform it indicates. When a waveform is selected, the waveform name will be highlighted in bold font. For example, when the Sine waveform is selected, the waveform **Sine** will become bold.





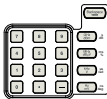
- After selecting the waveform, press the F1 or F2 keys (according to the waveform you selected) for further setting items. For example, if the Sine waveform is selected, press the F1 key to set Deviation and press the F2 key to set Rate.
 


 or  




- 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.
 

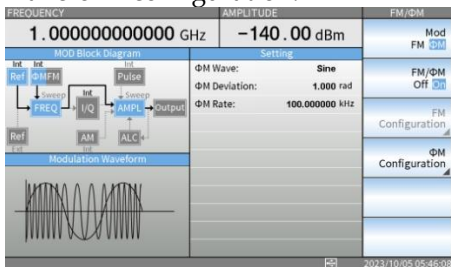
  

- You can also input the values you want by typing the numeric keyboard directly.
 


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



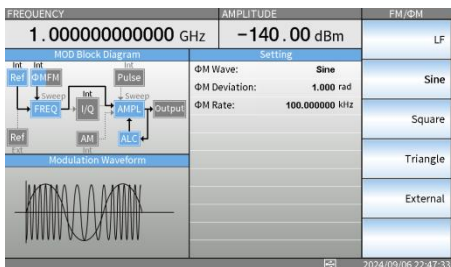
- If  $\Phi$ M Modulation is selected and activated, press the F4 soft key to move to the  $\Phi$ M modulation waveform configuration.

**F 4**



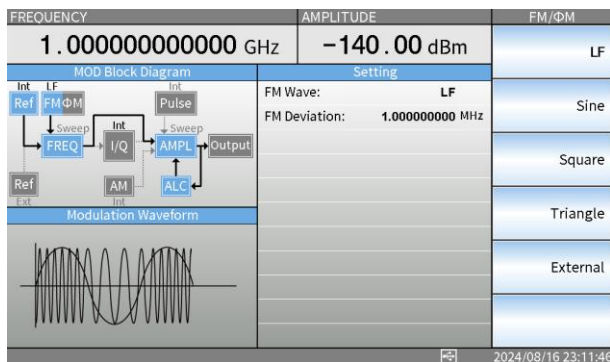
- To change the  $\Phi$ M modulation waveform, press the F3 key and select a wave you need. The following steps for changing waveform is similar to those indicated above in step 2 through step 6.

**F 3**



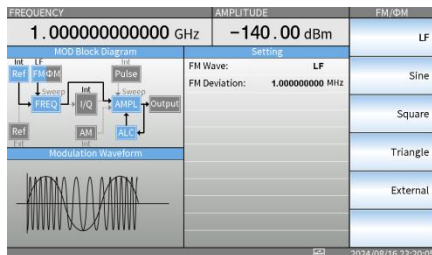
## Waveform type and its setting (FM)

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.



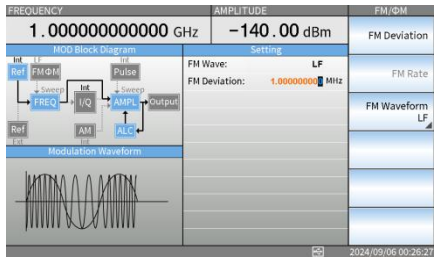
### LF waveform

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



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

**F 1**



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

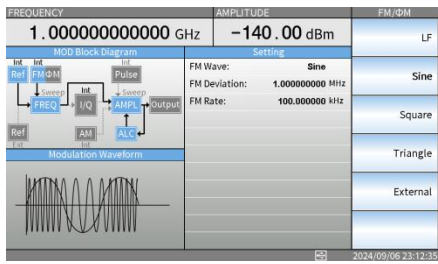
**Enter**

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

**Sine waveform**

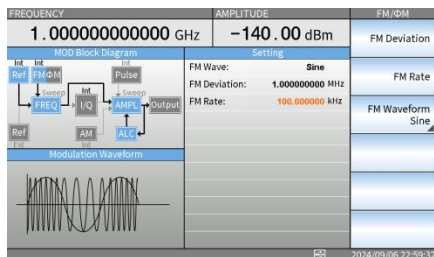
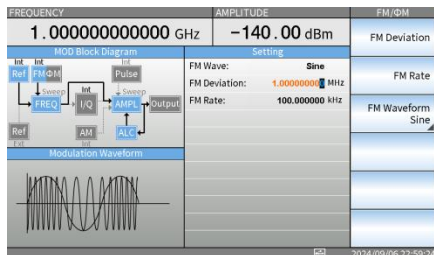
- Panel Operation
1. Press the F2 soft key to select Sine waveform.

**F 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



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

Enter

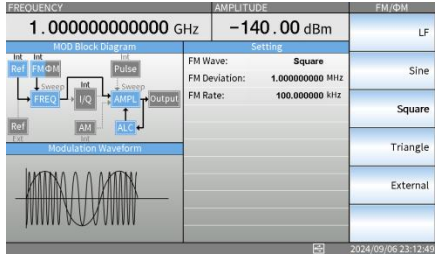
Range of setting item

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



Square waveform

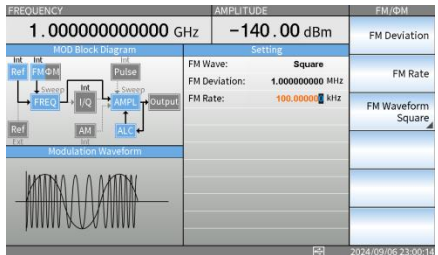
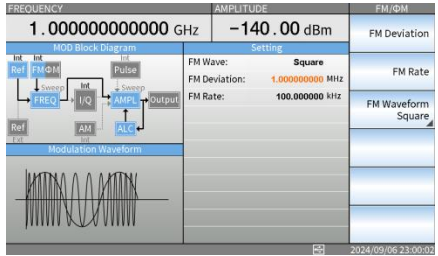
- Panel Operation 1. Press the F3 soft key to select the Square waveform.



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



or



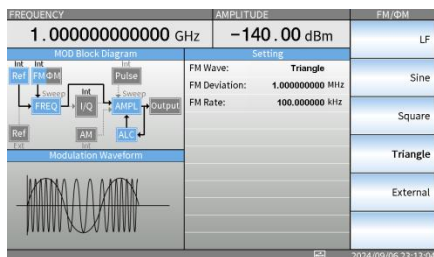
3. Set the value of FM Deviation and FM Rate.  
 4. Press the Enter key to confirm the value you set.



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

### Triangle waveform

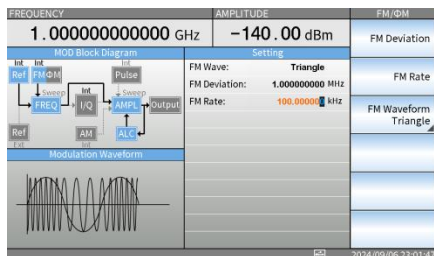
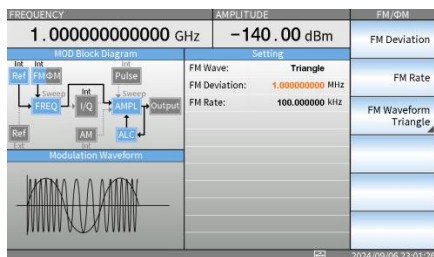
- Panel Operation    1. Press the F4 soft key to select Triangle waveform.



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



or



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

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



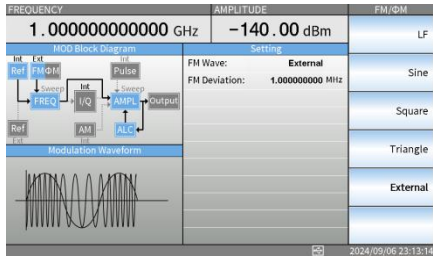
Range of setting item

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

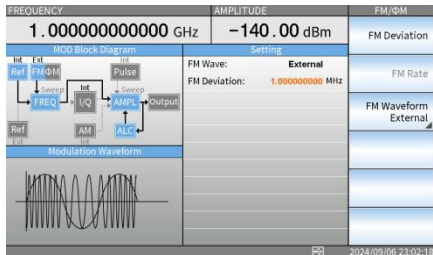
**External waveform**

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 x 1 MHz (1 mHz resolution) (N is determined by frequency band specifications)

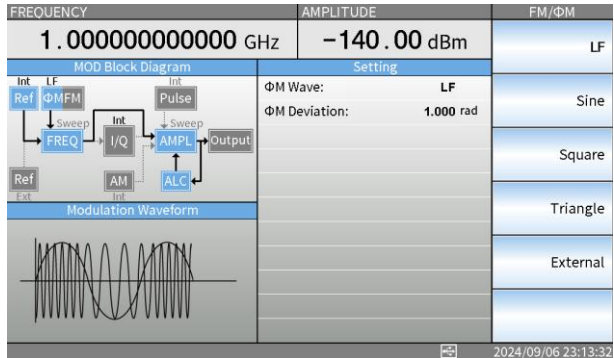


The external waveform is input from the FM connector on the front panel.



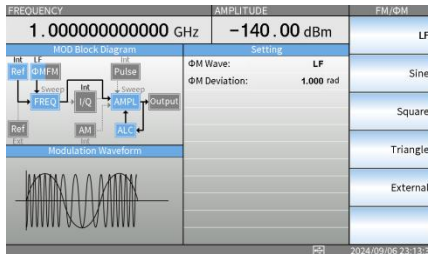
# Waveform type and its setting ( $\Phi$ M)

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



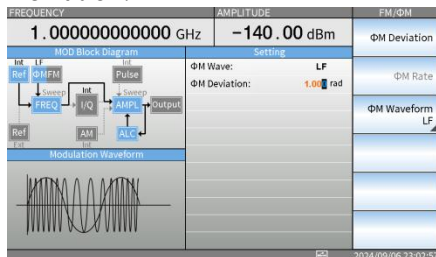
## LF waveform

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



2. Press the F1 soft key to set the  $\Phi$ M Deviation.

**F 1**



3. Set the value of  $\Phi$ M Deviation.
4. Press the Enter key to confirm the value you set.

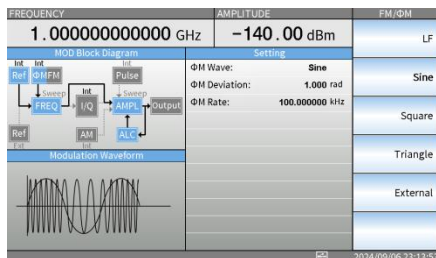
**Enter**

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

## Sine waveform

- Panel Operation
1. Press the F2 soft key to select Sine waveform.

**F 2**

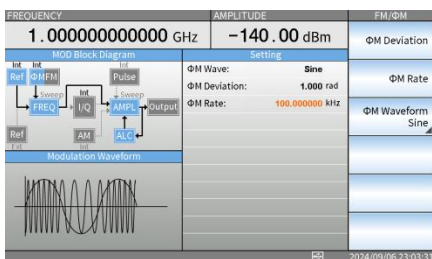
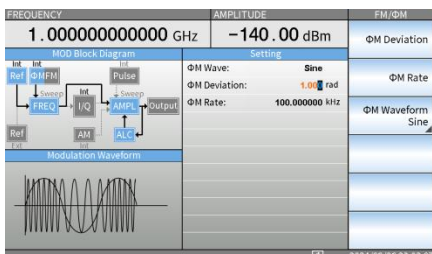


- Press the F1 soft key to set the  $\Phi$ M Deviation and press the F2 soft key to set the  $\Phi$ M Rate. 

F 1

 or 

F 2



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

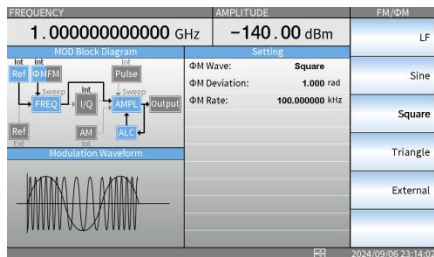
Enter

Range of setting item

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

Square waveform

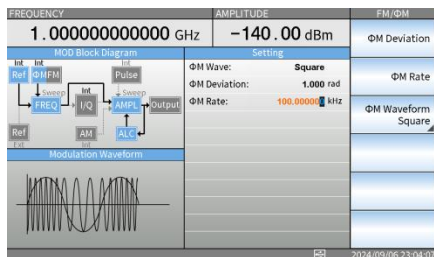
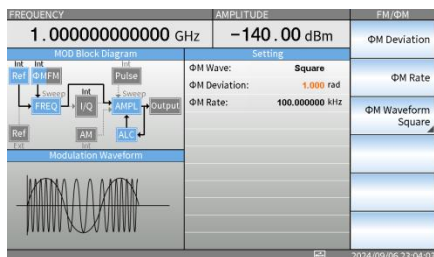
- Panel Operation 1. Press the F3 soft key to select the Square waveform.



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



or



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

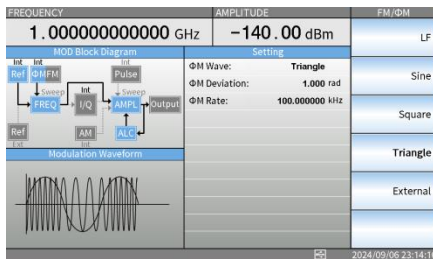




Range of setting item      Deviation: 0 to N x 1 MHz/rate or 5N rad (the smaller value is the upper limit, 0.00 1rad resolution) (N is determined by frequency band specifications)  
 Rate: when frequency  $\geq$  10 MHz, it is 0.1 Hz to 1 MHz, and when frequency  $<$  10 MHz, it is 0.1 Hz to 100 kHz.

**Triangle waveform**

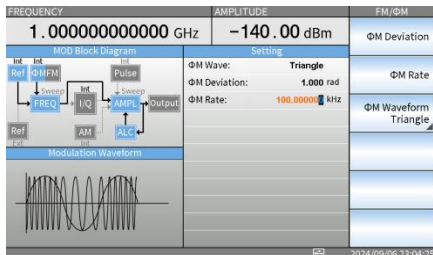
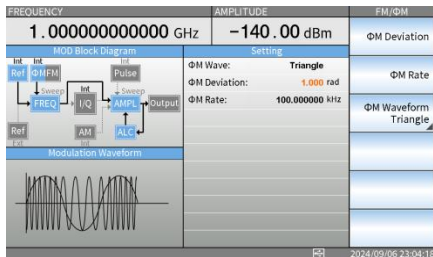
- Panel Operation    1. Press the F4 soft key to select Triangle waveform.



2. Press the F1 soft key to set the  $\Phi$ M Deviation and press the F2 soft key to set the  $\Phi$ M Rate.



or



3. Set the value of  $\Phi$ M Deviation and  $\Phi$ M Rate.
4. Press the Enter key to confirm the value you set.

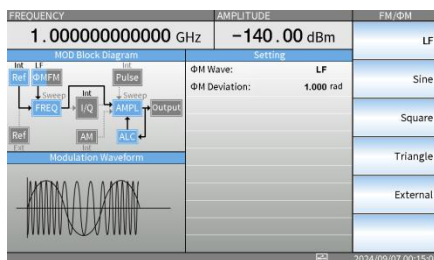


Range of setting item

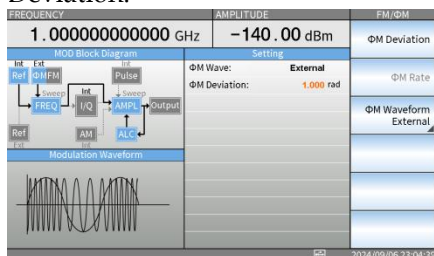
Deviation: 0 to N x 1 MHz/rate or 5N rad (the smaller value is the upper limit, 0.00 1rad resolution) (N is determined by frequency band specifications)  
 Rate: when frequency  $\geq$  10 MHz, it is 0.1 Hz to 1 MHz, and when frequency  $<$  10 MHz, it is 0.1 Hz to 100 kHz

## External waveform

- Panel Operation
1. Press the F5 soft key to select External waveform.



2. Press the F1 soft key to set the  $\Phi$ M Deviation.



3. Set the value of  $\Phi$ M Deviation.
4. Press the Enter key to confirm the value you set.



Range of setting item      Deviation: 0 to  $N \times 1 \text{ MHz/rate}$  or  $5N \text{ rad}$  (the smaller value is the upper limit, 0.001 rad resolution) ( $N$  is determined by frequency band specifications)

---



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



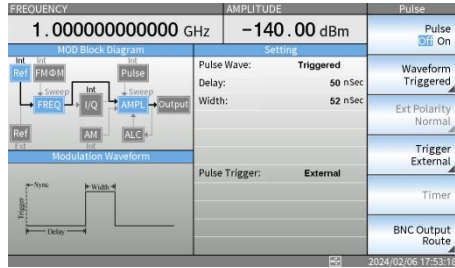
# PULSE MODULATION

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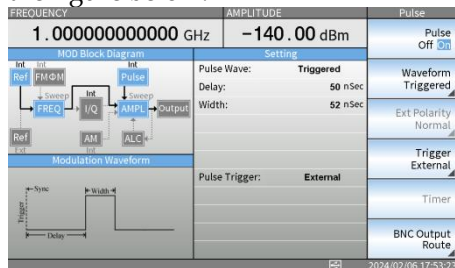
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# Activating Pulse Modulation

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
- 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.



Hz	-140.00 dBm	Square
Setting		
Pulse Wave:	<b>Square</b>	Free Run
Rate:	100.000000 kHz	

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

Pulse Trigger Type

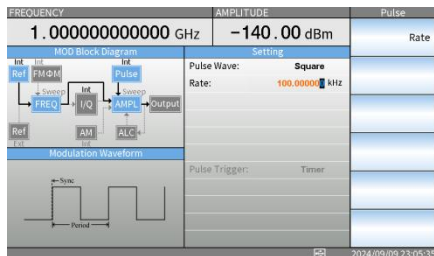
## Square Waveform

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



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

**F 1**



3. Set the value of Rate.
5. Press the Enter key to confirm the value you set.

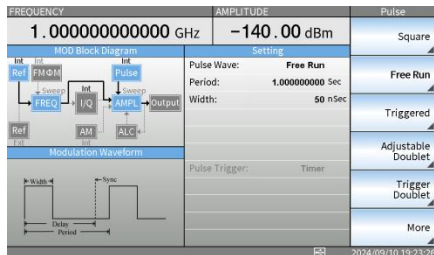
**Enter**

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

### Free Run Waveform

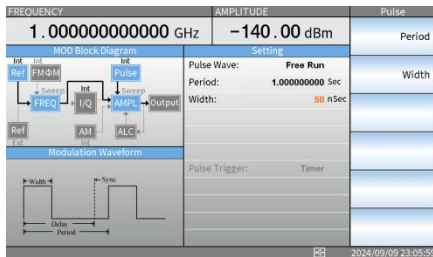
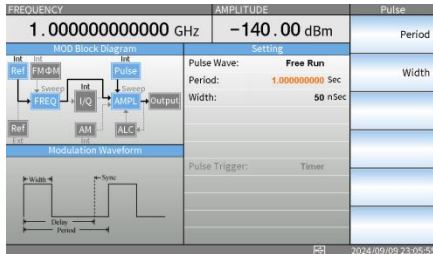
1. Press the F2 soft key to select the Free Run waveform.

**F 2**





- Press the F1 soft key and the F2 soft key to set the Period and Width of the free run waveform respectively. F 1 or F 2



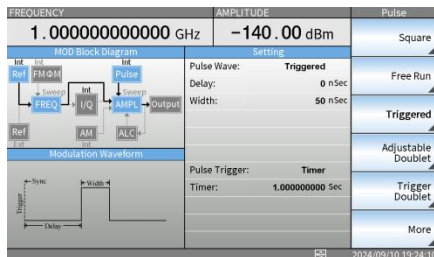
- Set the value of Period and Width.
- Press the Enter key to confirm the value you set. Enter

Setting item and its range

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

## Triggered Waveform

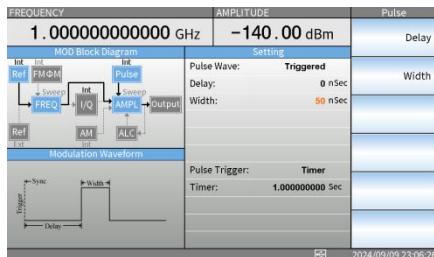
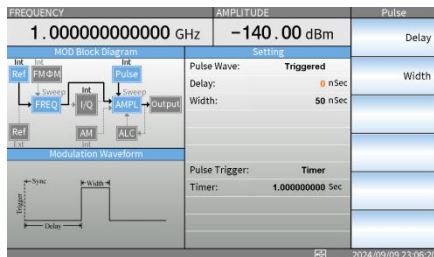
- Panel Operation 1. Press the F3 soft key to select the Triggered waveform.



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



or



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



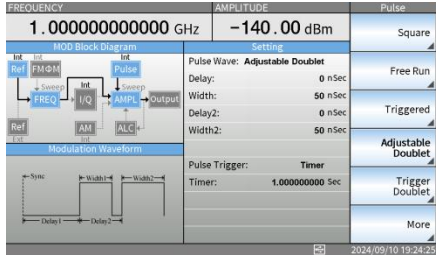
Setting item and its range

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

## Adjustable Doublet Waveform

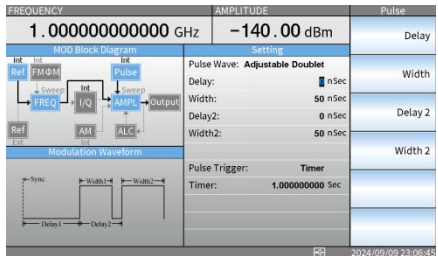
- Panel Operation 1. Press the F4 soft key to select the Adjustable doublet waveform.

**F4**

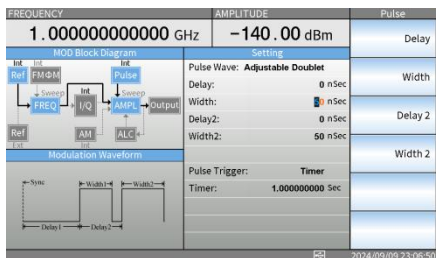


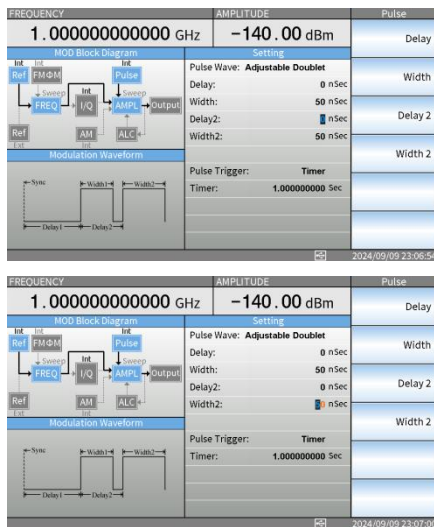
2. Press the F1 soft key, the F2 soft key, the F3 soft key, and the F4 soft key to set the Delay, Width, Delay 2, and Width 2 of the adjustable doublet waveform, respectively.

**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.

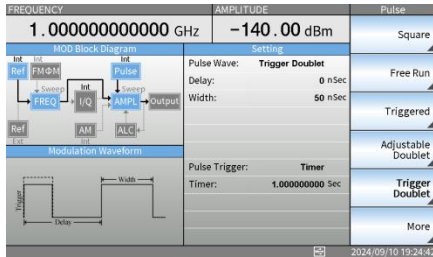


Setting item and its range

Delay and Delay 2: 0 s to 42 s (resolution is 10 ns)  
 Width and Width 2: 50 ns to 4 2s (resolution is 10 ns)

# Trigger Doublet Waveform

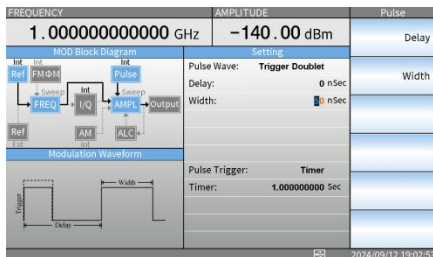
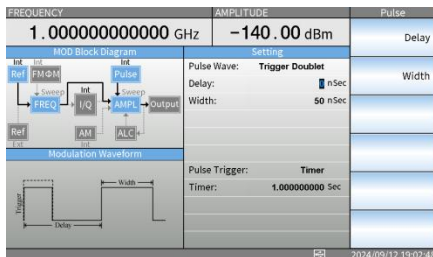
- Panel Operation
1. Press the F5 soft key to select the Trigger doublet waveform.



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



or



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

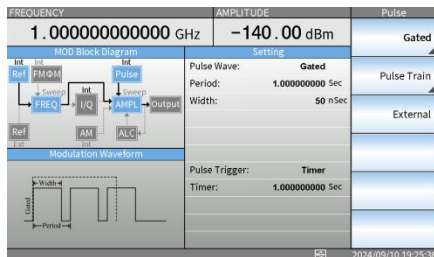


Setting item and its range

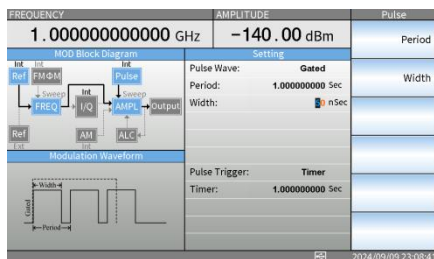
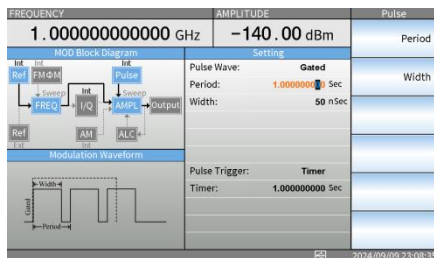
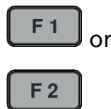
Delay: 0 s to 42 s (resolution is 10 ns)  
 Width: 50 ns to 42 s (resolution is 10 ns)

**Gated Waveform**

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



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.



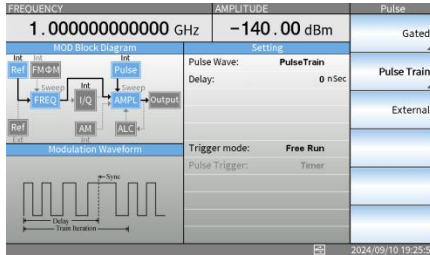
3. Set the value of Period and Width.  
4. Press the Enter key to confirm the value you set.



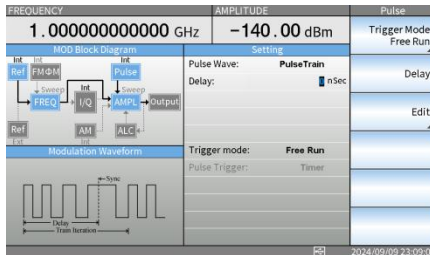
Setting item and its range     Period: 100 ns to 42 s (resolution is 10 ns)  
                             Width: 50 ns to period -10 ns (if there is a period setting, the upper limit is determined by the period)

## Pulse Train Waveform

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



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



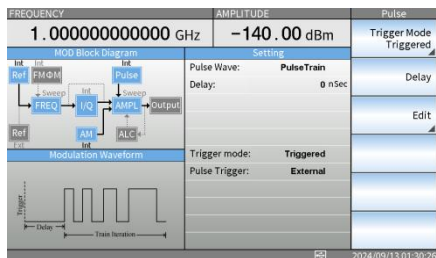
3. Set the value of Delay.  
4. Press the Enter key to confirm the value you set.



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

**Selecting trigger mode of Pulse Train Waveform**

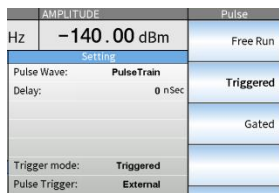
- Panel Operation 1. When the Pulse train waveform is selected, press the F1 key to select its trigger mode you need. F 1



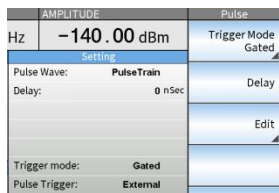
- Free Run 2. Press the F1 key to select free run as trigger mode. F 1



- Triggered 3. Press the F2 key to select triggered as trigger mode. F 2



- Gated 4. Press the F3 key to select gated as trigger mode. F 3





**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.

**F3**

The screenshot shows the main Pulse Modulation menu. At the top, 'FREQUENCY' is 1.00000000000 GHz and 'AMPLITUDE' is -140.00 dBm. The 'Pulse' section shows 'Trigger Mode' as 'Triggered'. The 'MOD Block Diagram' shows a signal path from 'FREQ' through 'IQ', 'AMPL', and 'ALC' to 'Output'. The 'Modulation-Waveform' section shows a pulse train waveform with 'Delay' and 'Train Iteration' markers. The 'Pulse Wave' section shows 'Pulse Train' selected. The 'Delay' is 0 nSec. The 'Trigger mode' is 'Triggered' and 'Pulse Trigger' is 'External'. A 'Pulse' menu is open on the right with 'Triggered' selected. A timestamp '2024/09/13 01:30:26' is at the bottom right.

FREQUENCY		AMPLITUDE		Pulse
1.00000000000 GHz		-140.00 dBm		Insert
	On Time	Off Time	Repeat	
1	50 ns	50 ns	2	
3	260 ns	240 ns	1	Delete
4	50 ns	50 ns	2	
6	250 ns	250 ns	1	
7	50 ns	50 ns	2	Delete All
9	240 ns	260 ns	1	
10	50 ns	50 ns	2	
12	230 ns	270 ns	1	
13	50 ns	50 ns	2	Go To
15	220 ns	280 ns	1	
16	50 ns	50 ns	2	Load / Store
18	210 ns	290 ns	1	
19	50 ns	50 ns	2	
21	200 ns	300 ns	1	Apply
22	50 ns	50 ns	2	

2024/09/20 23:00:03

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



The screenshot shows the same table as above, but now the '50 ns' value in the 'On Time' column of row 1 is highlighted in blue. The 'Pulse' menu on the right now shows 'Load File' selected. A timestamp '2024/09/20 23:50:20' is at the bottom right.



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

FREQUENCY		AMPLITUDE		Pulse
1.000000000000 GHz		-140.00 dBm		Load File
1	50 ns	50	2	Save File
3	260 ns	240 ns	1	
4	50 ns	50 ns	2	
6	250 ns	250 ns	1	
7	50 ns	50 ns	2	
9	240 ns	260 ns	1	
10	50 ns	50 ns	2	
12	230 ns	270 ns	1	
13	50 ns	50 ns	2	
15	220 ns	280 ns	1	
16	50 ns	50 ns	2	
18	210 ns	290 ns	1	
19	50 ns	50 ns	2	
21	200 ns	300 ns	1	
22	50 ns	50 ns	2	

**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.



9	240 ns	260 ns	1
10	50 ns	50 ns	2
12	170 ns	330 ns	1
13	90 ns	50 ns	2
15	160 ns	340 ns	1
9	240 ns	260 ns	1
10	50 ns	50 ns	2
12	170 ns	330 ns	1
13	170 ns	330 ns	1
14	90 ns	50 ns	2

Delete

Press the F2 key to delete the editing items of the row.



9	240 ns	260 ns	1
10	50 ns	50 ns	2
12	170 ns	330 ns	1
13	170 ns	330 ns	1
14	90 ns	50 ns	2
9	240 ns	260 ns	1
10	50 ns	50 ns	2
12	170 ns	330 ns	1
13	90 ns	50 ns	2
15	160 ns	340 ns	1

Delete All

Press the F3 key to delete all the editing items of row.



Apply

Press the F6 key to output the editing result.



Go To Page Up

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



FREQUENCY		AMPLITUDE		Pulse
1.000000000000 GHz		-140.00 dBm		Pulse
	On Time	Off Time	Repeat	
1	50 ns	50 ns	2	Page Up
3	260 ns	240 ns	1	
4	50 ns	50 ns	2	Page Down
6	250 ns	250 ns	1	
7	50 ns	50 ns	2	Top Row
9	240 ns	260 ns	1	
10	50 ns	50 ns	2	
12	230 ns	270 ns	1	Middle Row
13	50 ns	50 ns	2	
15	220 ns	280 ns	1	
16	50 ns	50 ns	2	Bottom Row
18	210 ns	290 ns	1	
19	50 ns	50 ns	2	
21	200 ns	300 ns	1	
22	50 ns	50 ns	2	

Go To Page Down

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



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.



FREQUENCY		AMPLITUDE		Pulse
1.000000000000 GHz		-140.00 dBm		Pulse
	On Time	Off Time	Repeat	
1	50 ns	50 ns	2	Insert
3	260 ns	240 ns	1	
4	50 ns	50 ns	2	Delete
6	250 ns	250 ns	1	
7	50 ns	50 ns	2	Delete All
9	240 ns	260 ns	1	
10	50 ns	50 ns	2	
12	230 ns	270 ns	1	Go To
13	50 ns	50 ns	2	
15	220 ns	280 ns	1	
16	50 ns	50 ns	2	Load / Store
18	210 ns	290 ns	1	
19	50 ns	50 ns	2	
21	200 ns	300 ns	1	Apply
22	50 ns	50 ns	2	

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.



FREQUENCY		AMPLITUDE		Pulse
1.000000000000 GHz		-140.00 dBm		Page Up
On Time	Off Time	Repeat		
12 230 ns	270 ns	1		
13 50 ns	50 ns	2		Page Down
15 220 ns	280 ns	1		
16 50 ns	50 ns	2		
18 210 ns	290 ns	1		Top Row
19 50 ns	50 ns	2		
21 200 ns	300 ns	1		
22 50 ns	50 ns	2		Middle Row
24 190 ns	310 ns	1		
25 50 ns	50 ns	2		
27 180 ns	320 ns	1		Bottom Row
28 80 ns	50 ns	2		
30 170 ns	330 ns	1		
31 90 ns	50 ns	2		
33 160 ns	340 ns	1		

Go To Bottom Row

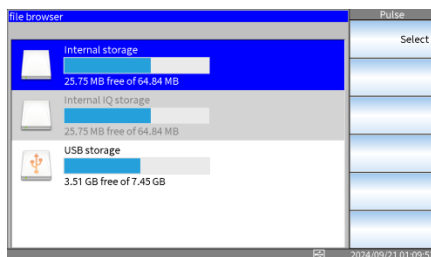
Press the F4 key and then press the F5 key to go to the last row of these items. For example, there are a total of 67 rows of data. The last row will appear.



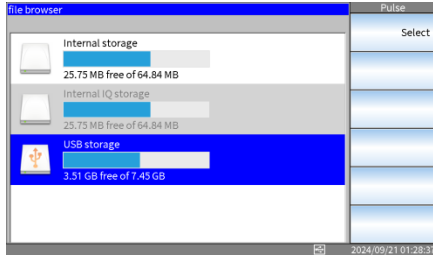
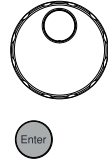
FREQUENCY		AMPLITUDE		Pulse
1.000000000000 GHz		-140.00 dBm		Page Up
On Time	Off Time	Repeat		
46 50 ns	50 ns	2		
48 110 ns	390 ns	1		Page Down
49 50 ns	50 ns	2		
51 100 ns	400 ns	1		
52 50 ns	50 ns	2		Top Row
54 90 ns	410 ns	1		
55 50 ns	50 ns	2		
57 80 ns	420 ns	1		Middle Row
58 50 ns	50 ns	2		
60 70 ns	430 ns	1		
61 50 ns	50 ns	2		Bottom Row
63 60 ns	440 ns	1		
64 50 ns	50 ns	2		
66 50 ns	450 ns	1		
67 nan	nan	nan		

Load File

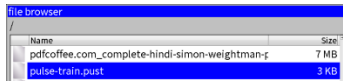
1. Press the F5 key and then press the F1 key to load the .pust file from USB storage for editing.



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



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



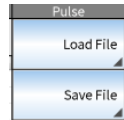
**Save File**

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



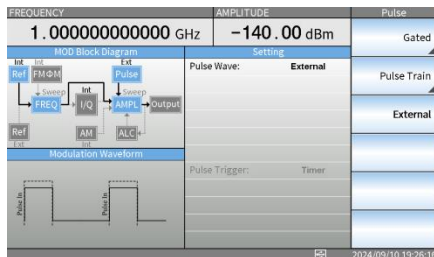
 **Note**

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.

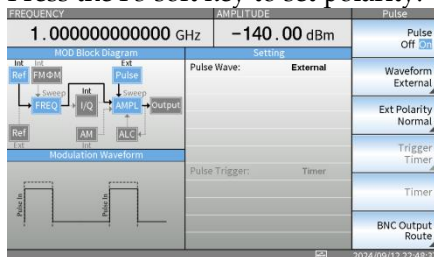


## External Waveform

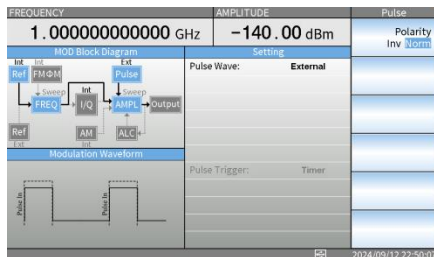
- Panel Operation 1. Press the F6 and then the F3 soft key to select the External waveform.

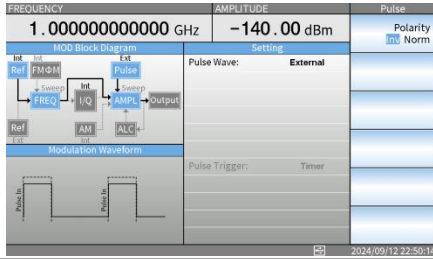


- Set polarity 2. Press the F3 soft key to set polarity.



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





Note

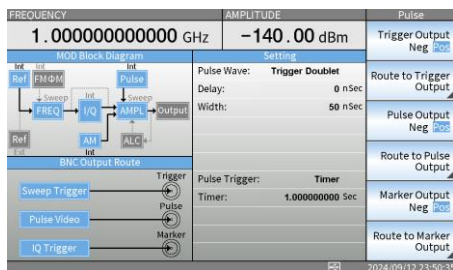
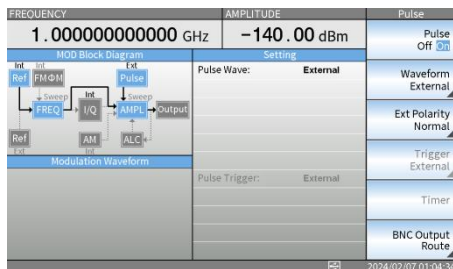
The external waveform is input from the PULSE IN connector on the rear panel.



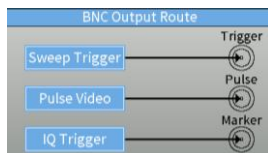
PULSE IN

# 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.

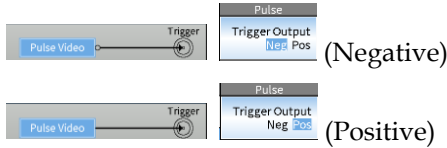


As shown in the diagram below, When the F6 key is pressed, the BNC output route will display on the left lower corner of the Pulse setting page.





- 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.



- 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.



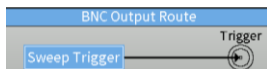
- Select a BNC output route to the trigger output.
  - To select Pulse Video as an output route to trigger, press the F2 key.



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



- To select Sweep Trigger as an output route to trigger, press the F4 key. F 4



- To select Sweep Run as an output route to trigger, press the F5 key. F 5



- To select IQ Generator Trigger as an output route to trigger, press the F6 (More) key and the F1 key. F 6 F 1



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. F 3 F 4



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. F 5 F 6

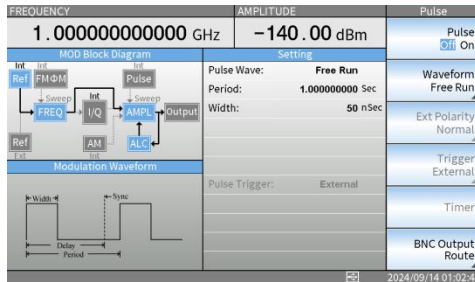


# Setting Pulse trigger and external trigger



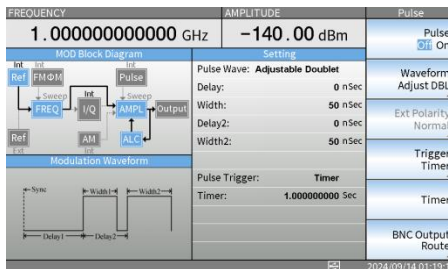
Note

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

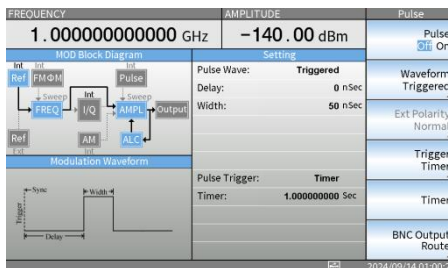


Panel Operation

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



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



3. Set the value of Timer.

**F 5**

FREQUENCY	AMPLITUDE	Pulse
1.000000000000 GHz	-140.00 dBm	Pulse On
MOD Block Diagram		Setting
		Pulse Wave: Triggered Delay: 0 nsec Width: 50 nsec
Modulation Waveform		Waveform Triggered Ext Polarity Normal Trigger Timer Timer BNC Output Route
		Pulse Trigger: Timer Timer: 4.000000000 Sec
2024/09/14 01:00:37		

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

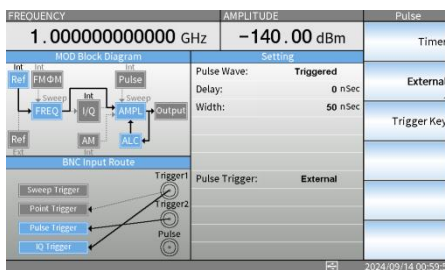
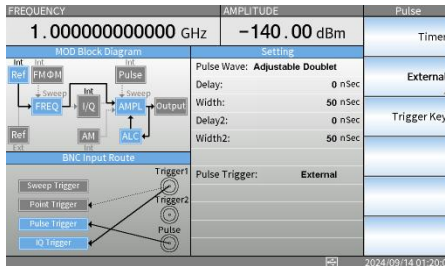
**F 3**

FREQUENCY	AMPLITUDE	Pulse
1.000000000000 GHz	-140.00 dBm	Timer
MOD Block Diagram		Setting
		Pulse Wave: Adjustable Doublet Delay: 0 nsec Width: 50 nsec Delay2: 0 nsec Width2: 50 nsec
Modulation Waveform		External Trigger Key
		Pulse Trigger: Manual
2024/09/14 01:19:43		

FREQUENCY	AMPLITUDE	Pulse
1.000000000000 GHz	-140.00 dBm	Pulse On
MOD Block Diagram		Setting
		Pulse Wave: Triggered Delay: 0 nsec Width: 50 nsec
Modulation Waveform		Trigger Manual Timer BNC Output Route
		Pulse Trigger: Manual
2024/09/14 01:00:53		

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

**F 2**



- 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**

Pulse	Pulse
Polarity Neg <b>Pos</b>	Polarity <b>Neg</b> Pos
Trigger1	Trigger1
Trigger2	Trigger2
Pulse Input	Pulse Input

- 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

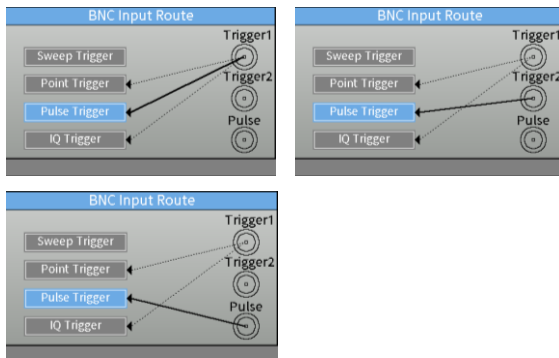
**F 3** or

**F 4**

or

or

or

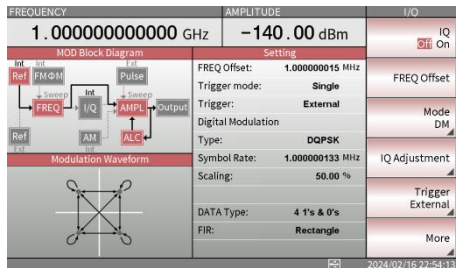


# V VECTOR MODULATION

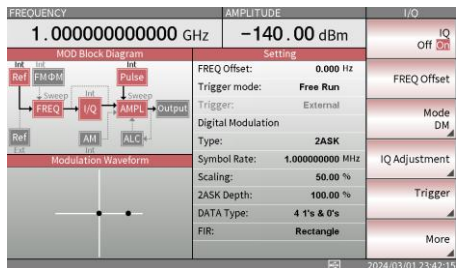
Selecting I/Q Modulation .....	100
Adjusting FREQ Offset .....	101
Selecting Modulation mode.....	103
Regulating I/Q Adjustment .....	106
Setting trigger mode and external trigger .....	113
Setting BNC Output Route .....	117
Other settings of Digital Modulation.....	121
Selecting I/Q Type.....	121
ASK Type.....	121
PSK Type.....	123
APSK Type.....	126
QAM Type.....	127
MSK Type.....	129
FSK Type.....	130
Editing User-defined I/Q Type.....	131
Editing User-defined FSK Modulation .....	133
Editing Symbol Rate .....	135
Editing Scaling.....	136
Editing Data Source .....	137
Editing User-defined Data Source .....	139
Editing FIR filter.....	19
Editing User-defined FIR Filter.....	23
Other settings of ARB Waveform .....	141
Editing Sample Rate .....	141
Editing Waveform .....	142
Editing FIR filter.....	144
Editing scaling .....	146
Display .....	146

# Selecting I/Q Modulation

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



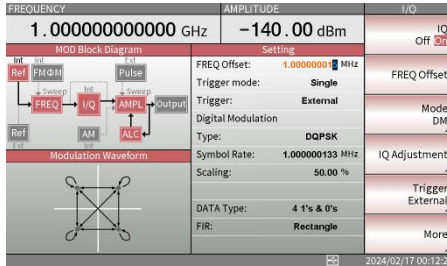
2. Press the F1 key to activate the Vector modulation. Press the F1 key again to disable the Vector modulation. When the Vector modulation is activated, the I/Q key will light on, and you will see the I/Q icon in the MOD Block Diagram turning brown, as shown in the figure below.





# 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.



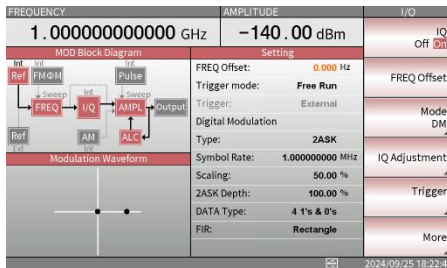
3. You can also use the numeric keyboard to input value you need directly.



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



FREQ Offset in Digital Modulation mode



**FREQ Offset in ARB Waveform mode**

FREQUENCY	AMPLITUDE	I/Q
1.000000000000 GHz	-140.00 dBm	Off On
<b>MOD Block Diagram</b>		
<b>Setting</b> FREQ Offset: 0.000 Hz Trigger mode: Free Run Trigger: External ARB Waveform Sample Rate: 90.000000000 MHz Scaling: 70.00 % FIR: None		
		FREQ Offset
		Mode ARB
		IQ Adjustment
		Trigger
		More
2024/09/25 18:20:00		

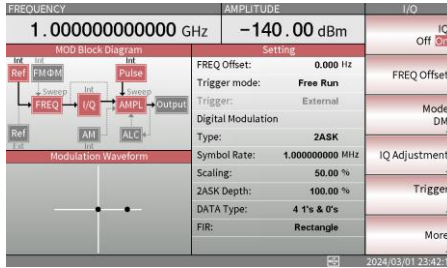
**FREQ Offset in External mode**

FREQUENCY	AMPLITUDE	I/Q
1.000000000000 GHz	-140.00 dBm	Off On
<b>MOD Block Diagram</b>		
<b>Setting</b> FREQ Offset: 0.000 Hz Trigger mode: Free Run Trigger: External		
		FREQ Offset
		Mode External
		IQ Adjustment
		Trigger
		More
2024/09/25 18:19:38		

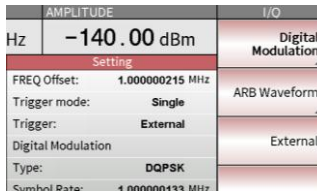
# Selecting Modulation mode

- Panel Operation 5. To change the modulation mode, press the F3 key.

**F 3**

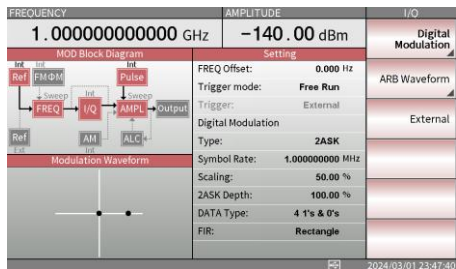


When a modulation mode is selected, the current modulation mode will be indicated in bold font. For example, if Digital Modulation is selected, option **Digital Modulation** will become bold.



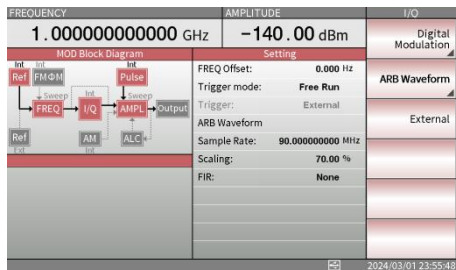
- To select digital modulation, press the F1 key. Then you will see the further option about digital modulation appears as shown in the figure below. For further digital modulation settings, please refer to page 113.

**F 1**



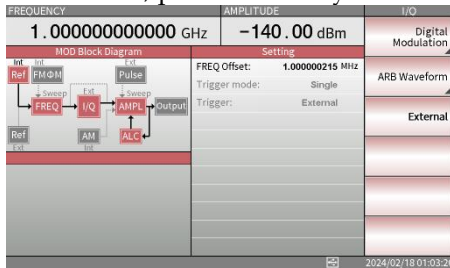
- To select ARB waveform modulation, press the F2 key. Then you will see the further option about ARB waveform appears as shown in the figure below. For further ARB waveform settings, please refer to page 141.

**F 2**



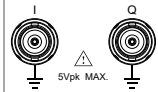
- To select external waveform modulation, press the F3 key.

**F 3**



Note

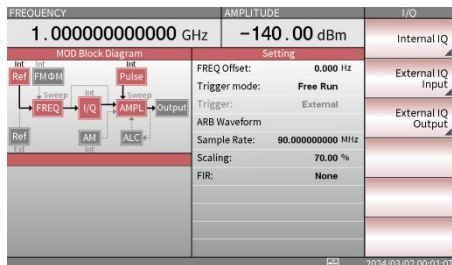
The external waveform is input from the I and Q connectors on the front panel.



## Regulating I/Q Adjustment

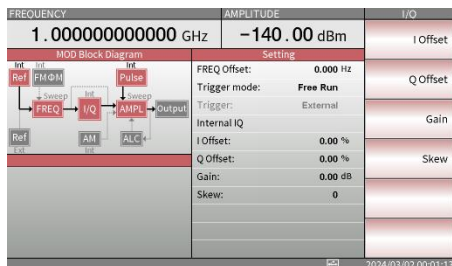
- Panel Operation
1. To change the IQ adjustment, press the F4 key. When the F4 key is pressed, you will see the further option menu appears as shown in the figure below.

**F 4**

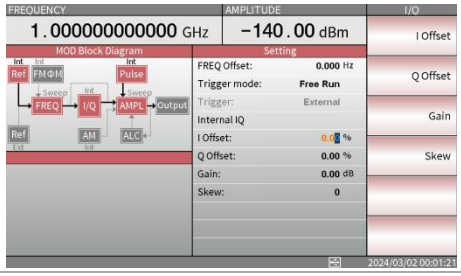


- Internal IQ
2. To select internal IQ modulation, press the F1 key. Then you will see the further option about internal IQ modulation appears as shown in the figure below.

**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.



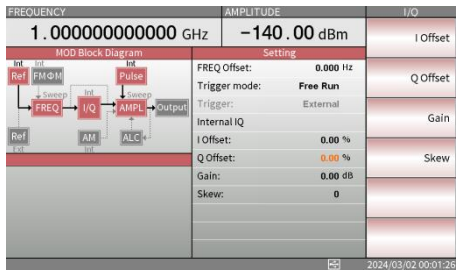
5. You can also use the numeric keyboard to input value you need directly.



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

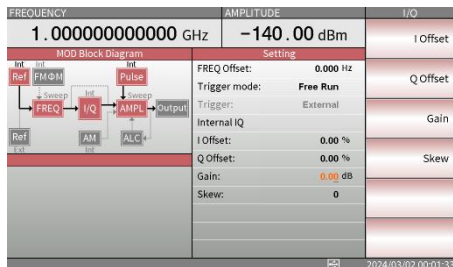


7. Press the F2 key, then you will see item **Q Offset** turns in orange to be edited. Use the same method as describing above to edit Q Offset value.



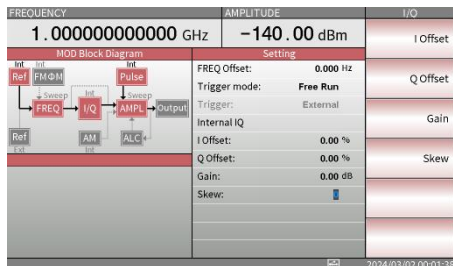
- Press the F3 key, then you will see item **Gain** turns in orange to be edited. Use the same method as describing above to edit **Gain** value.

**F 3**



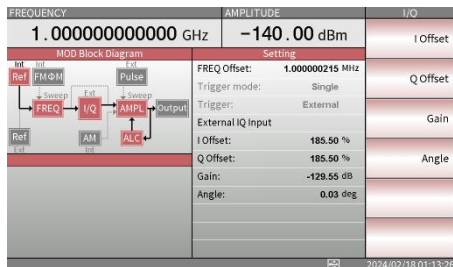
- Press the F4 key, then you will see item **Skew** turns in orange to be edited. Use the same method as describing above to edit **Skew** value.

**F 4**



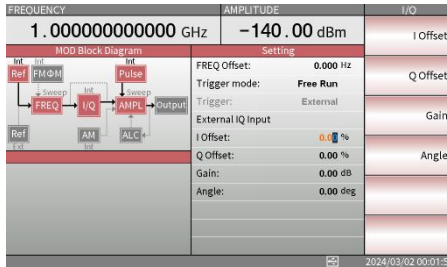
- External IQ input
- To select internal IQ input, press the F2 key. Then you will see the further option about external IQ modulation input appears as shown in the figure below.

**F 2**





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



- 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.



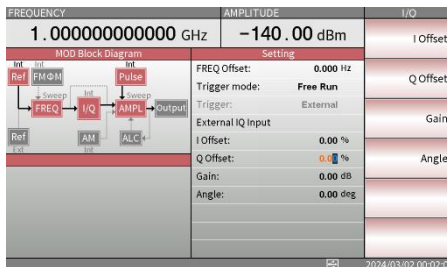
- You can also use the numeric keyboard to input value you need directly.



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

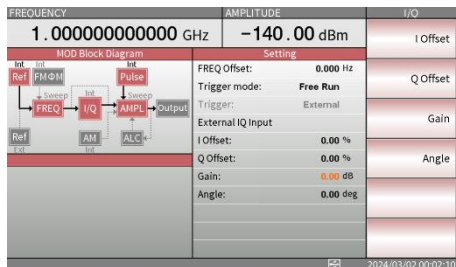


- Press the F2 key, then you will see item **Q Offset** turns in orange to be edited. Use the same method as describing above to edit **Q Offset** value.



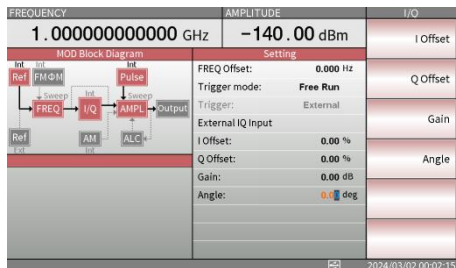
16. Press the F3 key, then you will see item **Gain** turns in orange to be edited. Use the same method as describing above to edit **Gain** value.

**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.

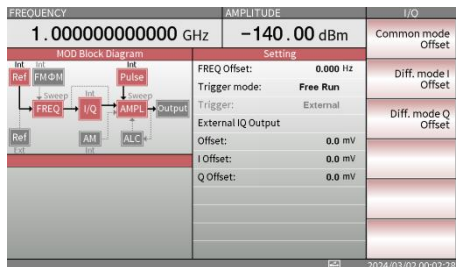
**F 4**



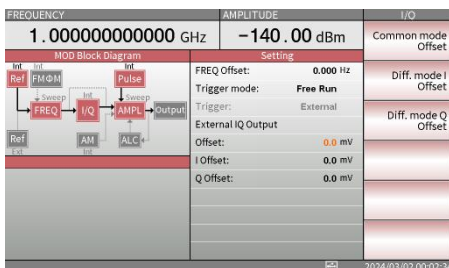
External IQ Output

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**



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



- 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.



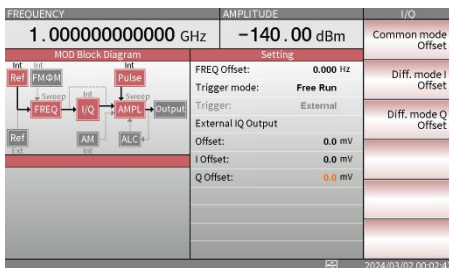
- You can also use the numeric keyboard to input value you need directly.



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

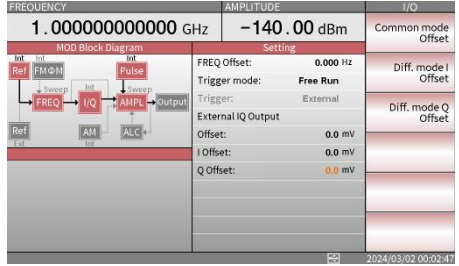


- Press the F2 key, then you will see item **I Offset** turns in orange to be edited. Use the same method as describing above to edit **I Offset** value.



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

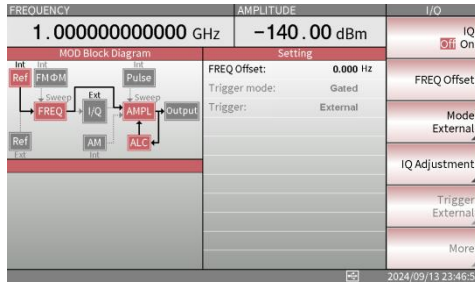


# Setting trigger mode and external trigger



Note

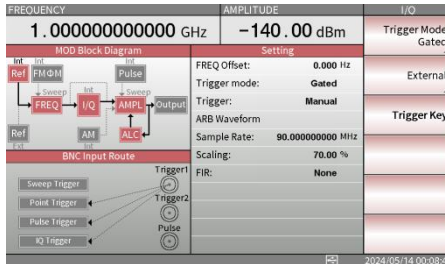
The external trigger won't be activated if the waveform mode is set to External.



Panel Operation

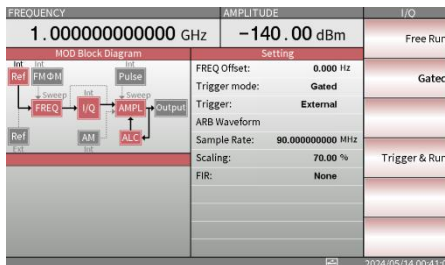
1. Press the F5 key to set or change the present trigger mode when the Digital modulation or ARB mode is selected.

**F 5**



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

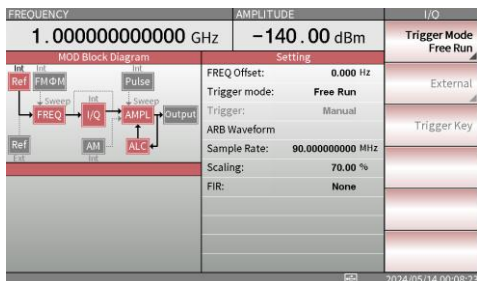
**F 1**





Note

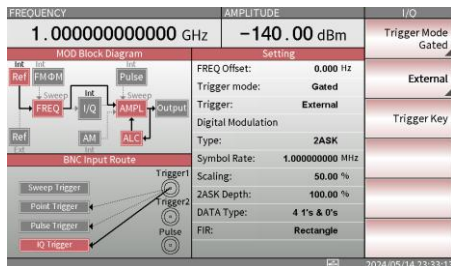
If Trigger mode is selected to Free Run, The External trigger or Manual trigger (Trigger key) won't be activated.



Trigger mode-  
Gated

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

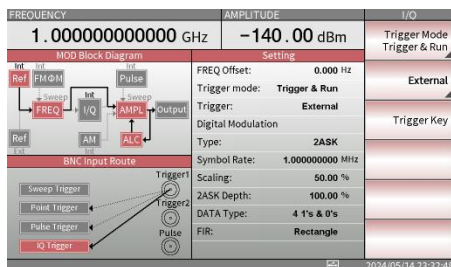
**F 2**



Trigger mode-  
Trigger & Run

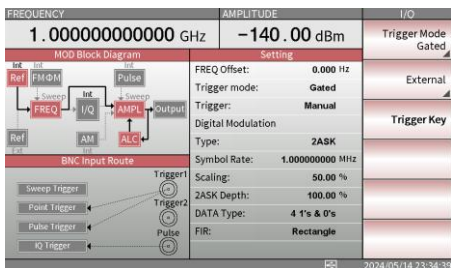
4. If you want to select Trigger & Run as trigger mode, press the F4 key.

**F 4**



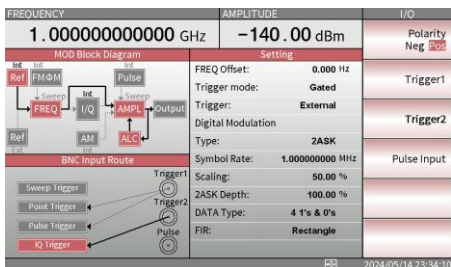
- To select the Manual trigger, press the F3 key.

**F 3**



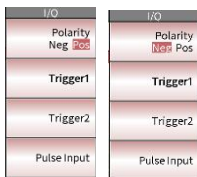
- To select the External trigger, press the F2 key.

**F 2**



- 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**



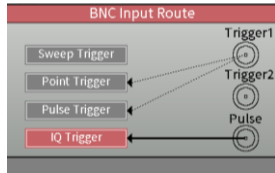
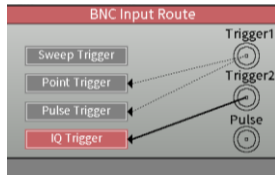
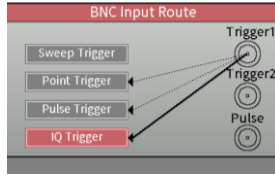
- Press the F2, F3 or F4 key to select a trigger terminal. Select Trigger 1, Trigger2 or Pulse Input. You can observe which trigger terminal is selected from the BNC input route diagram.

**F 2**

**F 3**

or

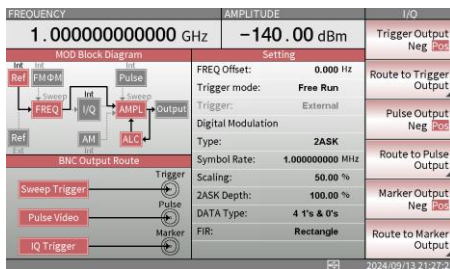
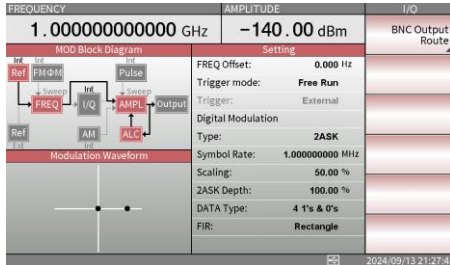
**F 4**



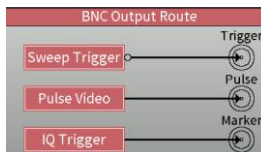


# Setting BNC Output Route

- Panel Operation
- 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.

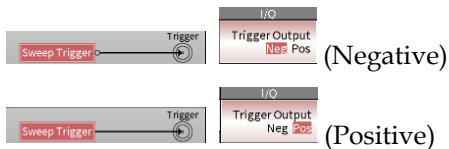


When the F1 key is pressed, the BNC output route will display on the left corner of the I/Q setting page as shown in the diagram below.



- 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.

**F 1**



- 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.

**F 2**



- Select a BNC output route to the trigger output.

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

**F 2**



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

**F 3**



- To select Sweep Trigger as an output route to trigger, press the F4 key. F 4



- To select Sweep Run as an output route to trigger, press the F5 key. F 5



- To select IQ Generator Trigger as an output route to trigger, press the F6 (More) key and the F1 key. F 6 +  
F 1



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. Press the F4 key to select which kind of BNC output route to pulse output. F 3  
F 4



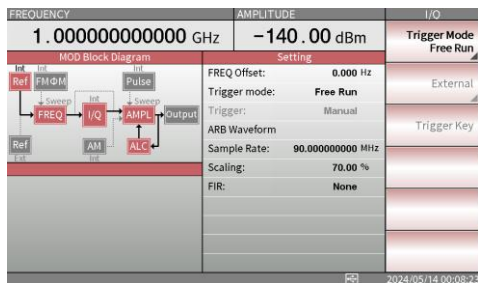
6. Likewise, press the F6 key to select the polarity of the marker output. Press the F6 key to select which kind of BNC output route to marker output. F 5  
F 6





Note

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

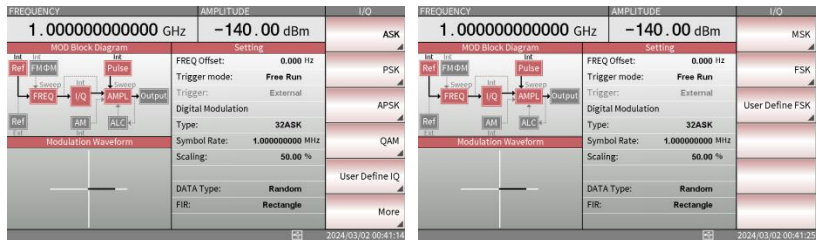


# Other settings of Digital Modulation

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

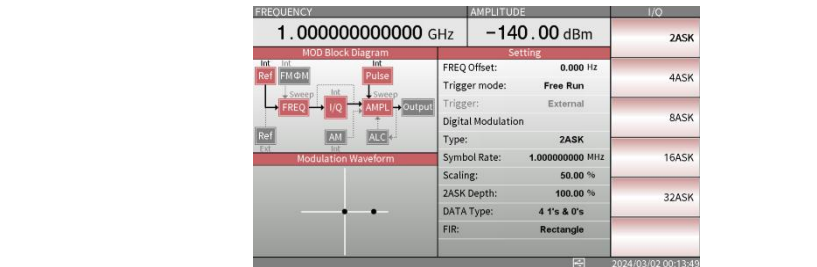
## Selecting I/Q Type

Panel Operation When Digital Modulation is selected, you can press the F1 key twice to change I/Q type. F 1



## ASK Type

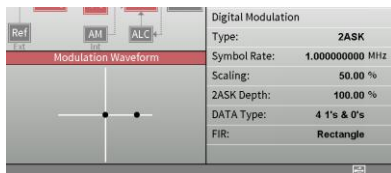
Panel Operation 1. To select ASK type as IQ type, press the F1 key and select a ASK type. F 1  
 Totally there are 5 ASK types available.



2ASK

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

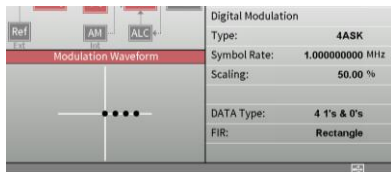
**F 1**



4ASK

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

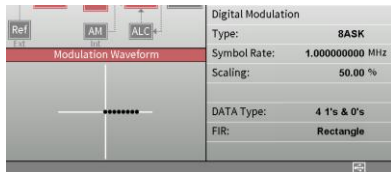
**F 2**



8ASK

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

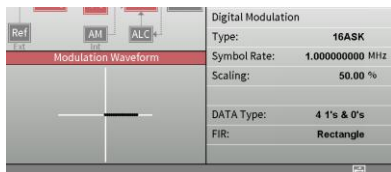
**F 3**



16ASK

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

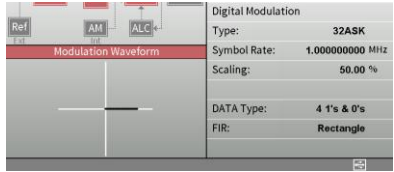
**F 4**



32ASK

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

**F 5**

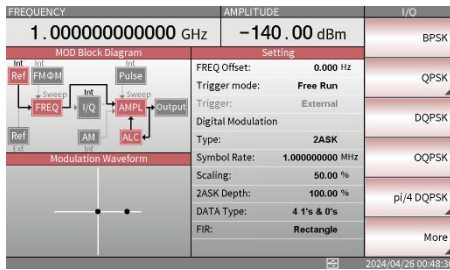


**PSK Type**

Panel Operation

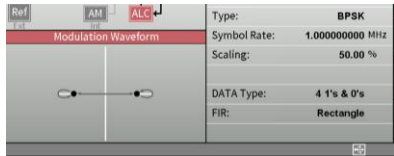
- To select PSK type as IQ type, press the F2 key and select a further PSK Type. There are more PSK types available.

**F 2**



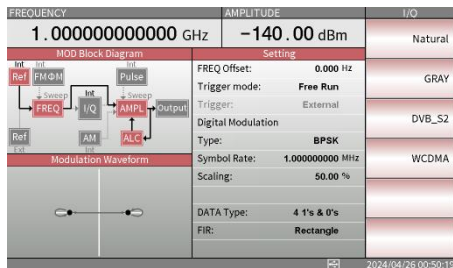
- Press the F1 key to select BPSK as IQ type.

**F 1**



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

**F 2**

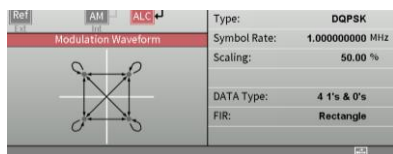


Note

QPSK type is further divided into 4 types of IQ types. Select one among the Natural, Gray, DVB\_S2 and WCDMA.

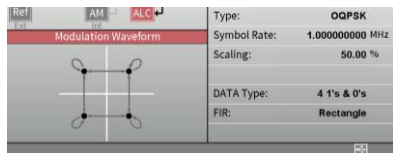
- Press the F3 key to select a DQPSK as IQ type.

**F 3**



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

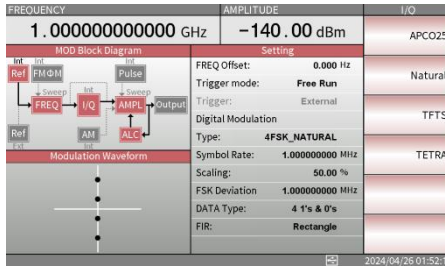
**F 4**





- Press the F5 key to select a  $\pi/4$  DQPSK as IQ type.

**F 5**

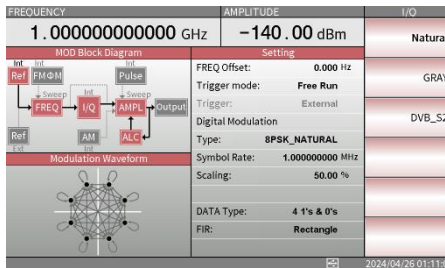


Note

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

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

**F 6** +  
**F 1**

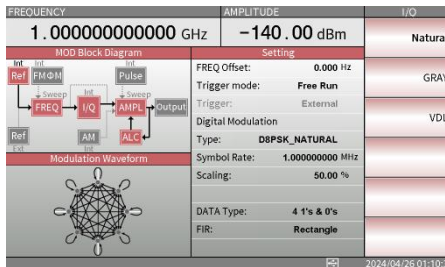


Note

8PSK is further divided into 3 types of IQ types. Select one among the Natural, GRAY, and DVB\_S2 IQ Types.

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

**F 6** +  
**F 2**

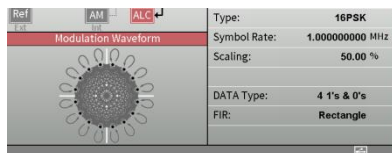




Note

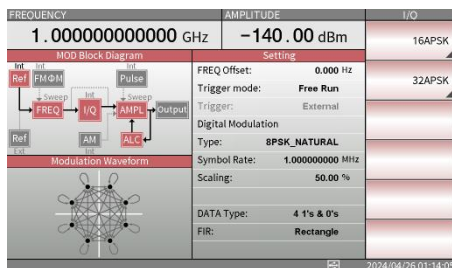
D8PSK is further divided into 3 types of IQ types. Select one among the Natural, GRAY, and VDL IQ Types.

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

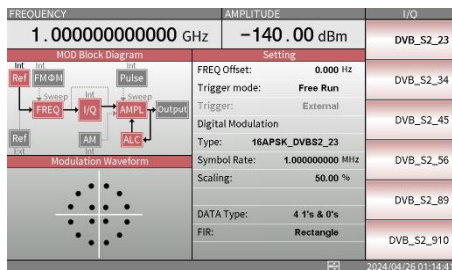


### APSK Type

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



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



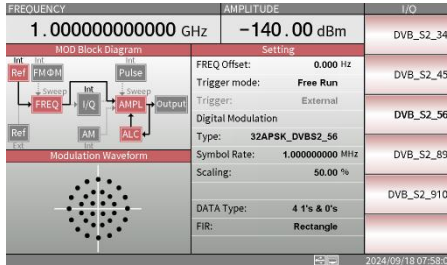


Note

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**



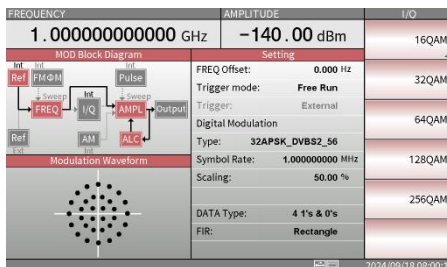
Note

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

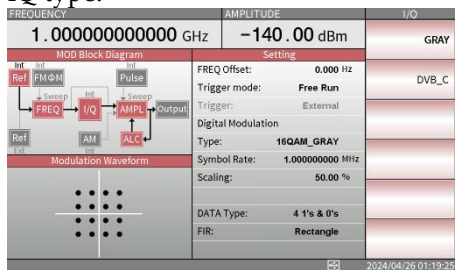
- Panel Operation
1. To select QAM type as IQ type, press the F4 key and then further select a QAM Type.

**F 4**



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

**F 1**

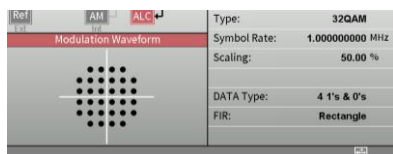


Note

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

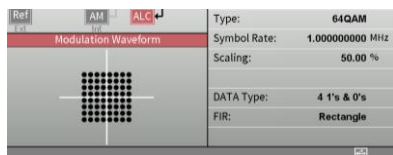
- Press the F2 key to select the 32QAM as IQ type.

**F 2**



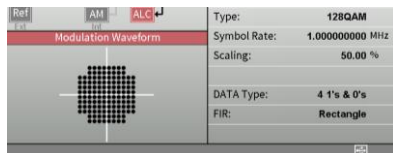
- Press the F3 key to select the 64QAM as IQ type.

**F 3**



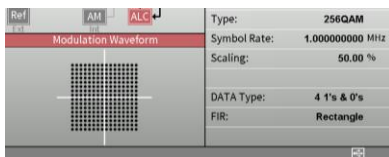
- Press the F4 key to select the 128QAM as IQ type.

**F 4**



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

**F 5**

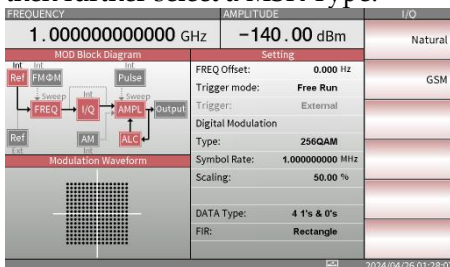


## MSK Type

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

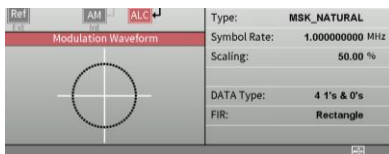
**F 6**  
+

**F 1**



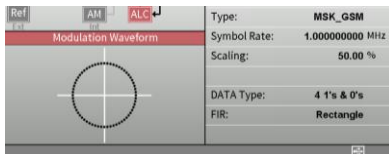
- Press the F1 key to select the Natural IQ type.

**F 1**



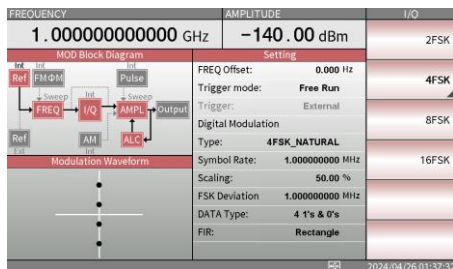
- Press the F2 key to select the GSM IQ type.

**F 2**

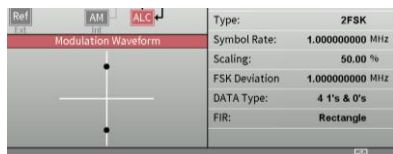


**FSK Type**

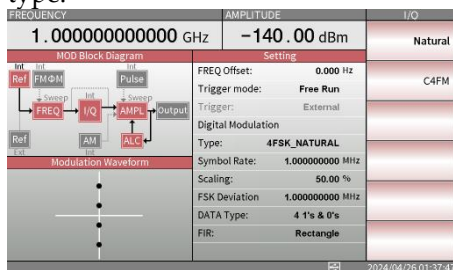
- Panel Operation 1. To select FSK type as IQ type, press the F6 (More) key and the F2 key and then further select a FSK type.



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



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

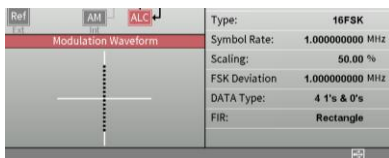


Note 4FSK is further divided into two types. Select one between Natural and C4FM IQ type.

- Press the F3 key to select the 8FSK IQ type. F 3



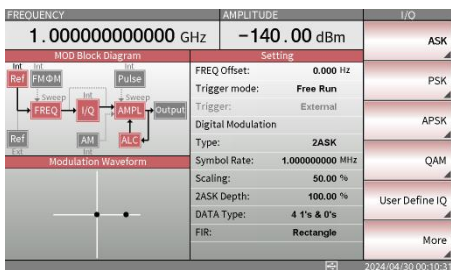
- Press the F4 key to select the 16FSK IQ type. F 4



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
- Press the F5 key under the I/Q type menu. F 5



FREQUENCY		AMPLITUDE		I/O
1.000000000000 GHz		-140.00 dBm		Edit
Data	I Value	O Value		
00000000	0.0000	0.0000		Load / Store
00000001	0.0000	0.0000		Load Default I/Q
				Differential Encoding
				Display
				Apply

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

**F 1**

FREQUENCY		AMPLITUDE		I/O
1.000000000000 GHz		-140.00 dBm		Insert
Data	I Value	O Value		
00000000	0.0000	0.0000		Delete
00000001	0.0000	0.0000		Delete All
				Go To
				Apply

2024/09/25 19:26:30

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

**F 2**

FREQUENCY		AMPLITUDE		I/O
1.000000000000 GHz		-140.00 dBm		Load File
Data	I Value	O Value		
00000000	0.0000	0.0000		Save File
00000001	0.0000	0.0000		

2024/09/25 19:26:30



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. Press the F1 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.



FREQUENCY		AMPLITUDE	I/Q
1.000000000000 GHz		-140.00 dBm	Edit
Max Freq Deviation:	0.000 Hz		
Data	Ratio	Freq Deviation	
00000000	0.0000	0.000 Hz	Load / Store
00000001	0.0000	0.000 Hz	Load Default FSK
			Differential Encoding
			Apply

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



FREQUENCY		AMPLITUDE	I/Q
1.000000000000 GHz		-140.00 dBm	Insert
Max Freq Deviation:	0.000 Hz		
Data	Ratio	Freq Deviation	
00000000	0.0000	0.000 Hz	Delete
00000001	0.0000	0.000 Hz	Delete All
			Go To
			Max Freq Deviation
			Apply

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

FREQUENCY	AMPLITUDE	I/O
1.000000000000 GHz	-140.00 dBm	Load File
Max Freq Deviation: 0.000 Hz		
Data Ratio: 0.0000	Freq Deviation: 0.000 Hz	Save File
00000000	0.0000	
00000001	0.0000	

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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.

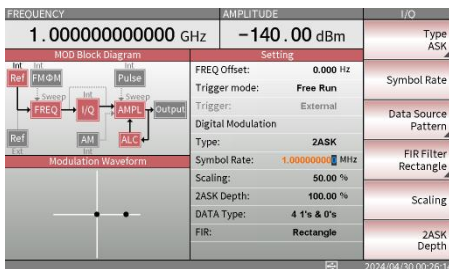
Note





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.



## Editing Symbol Rate

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

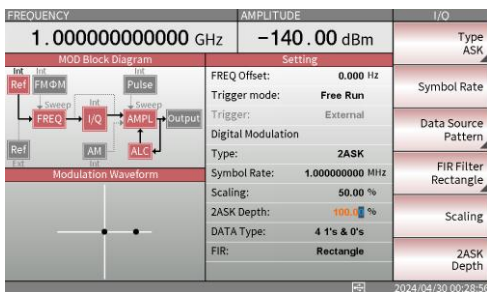


- Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.
 

- You can also use the numeric keyboard to input value you need directly.
 
- Press the Enter key to confirm that value you set.
 



Note

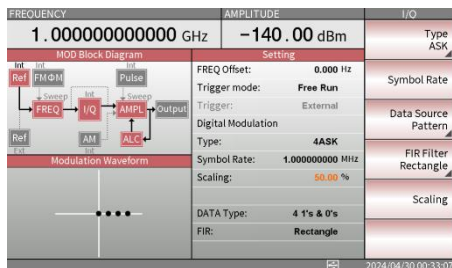
- If you select 2ASK as the I/Q type, you can still press the **F6** key to edit the depth of the 2ASK I/Q type.



## Editing Scaling

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

**F 5**

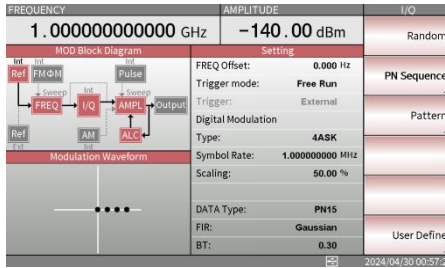


2. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.
3. You can also use the numeric keyboard to input value you need directly.
4. Press the Enter key to confirm that value you set.

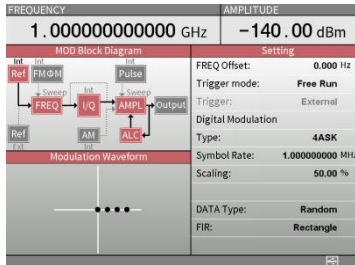


Editing Data Source

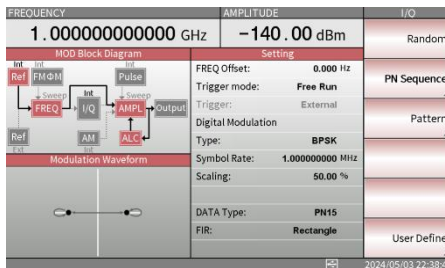
- Panel Operation 1. Once you select an I/Q type, you can edit its data source by pressing the F3 key. F 3



2. Press the F1 key to select Random as the data source of the I/Q type you currently selected. F 1



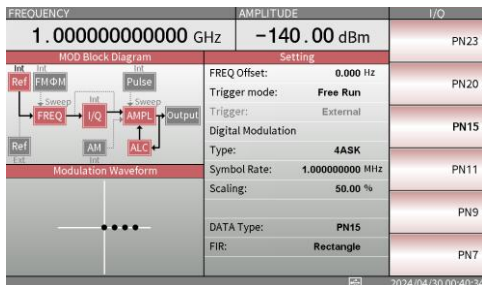
3. Press the F2 key to select PN Sequence as the data source of the I/Q type you currently selected. F 2





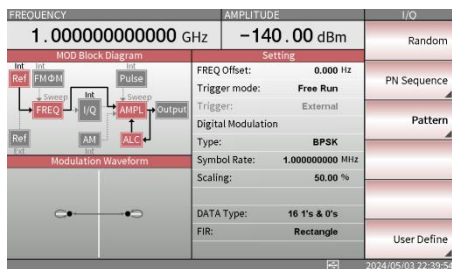
Note

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



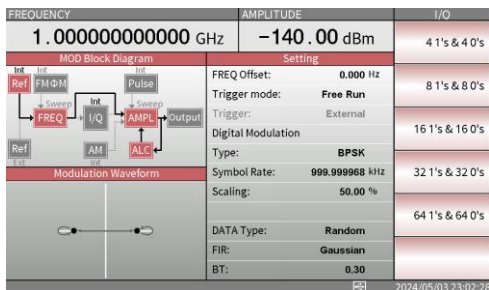
- Press the F3 key to select Patten as the data source of the I/Q type you currently selected.

**F3**



Note

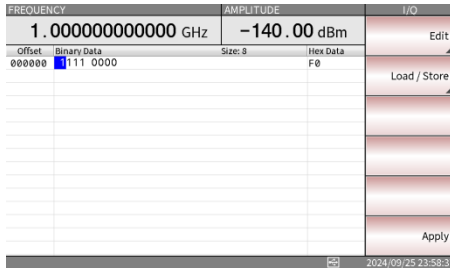
Patter is further divided into five types of source. Select one among these IQ type.



**Editing User-defined Data Source**

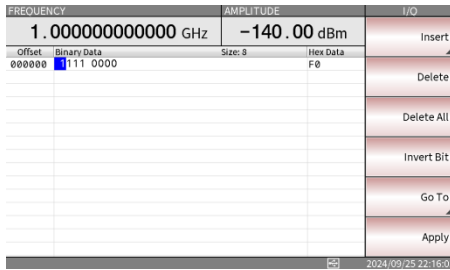
- Panel Operation 1. Press the F6 key under the Data Source menu.

**F 6**



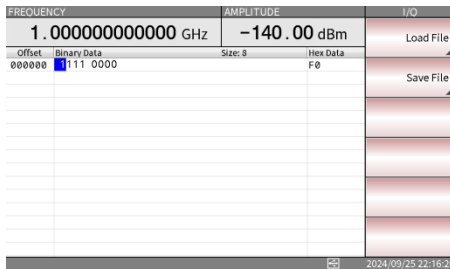
2. Press the F1 key to enter the editing page to edit the user-defined .iqds file.

**F 1**



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

**F 2**

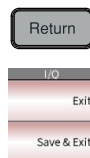




The steps of panel operation in these two menus are similar to that in the pulse train operation's edit menu except for loading and storing file format. Here the format is .iqds. Please refer to page 77 through page 80 for details of the panel operation of the User Define Data Source option.



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.



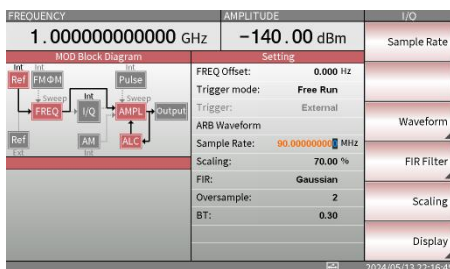


# Other settings of ARB Waveform

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.

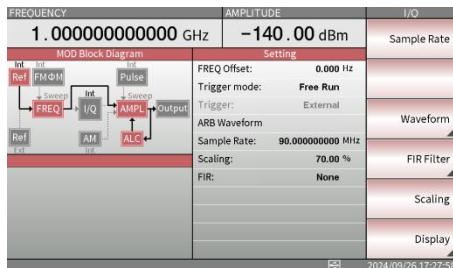


2. Use the left and right arrow keys to select digit to be edited and use up and down arrow keys to increase or decrease the value to be edited.
3. You can also use the numeric keyboard to input value you need directly.
4. Press the Enter key to confirm that value you set.

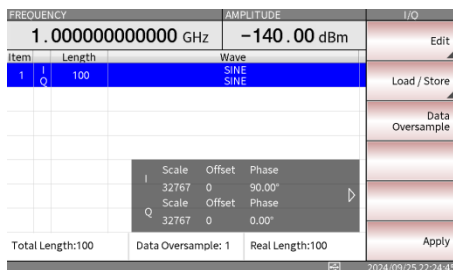


## Editing Waveform

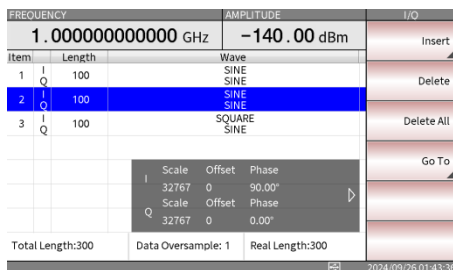
- Panel Operation 1. Press the F3 key to enter edit the ARB waveform. F 3



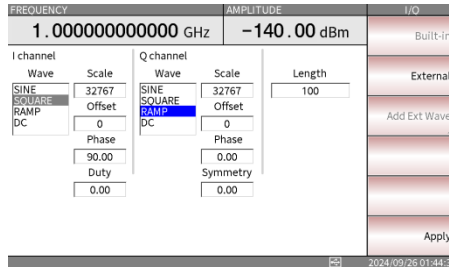
2. Press the F1 key to enter the editing menu for the ARB waveform. F 1



- Insert Waveform 3. Press the F1 key to insert a ARB waveform. F 1



- 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.



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



- 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.



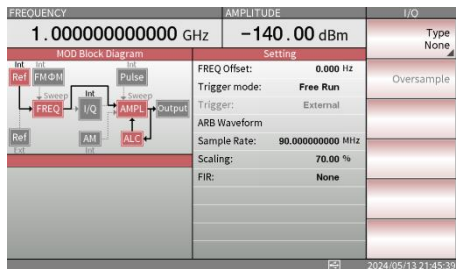
After entering the editing menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the “Exit” (F1) key or the “Save & Exit” (F2) key to exit. Press the F1 key to exit directly, and press the F2 key to save the editing results and exit.



## Editing FIR filter

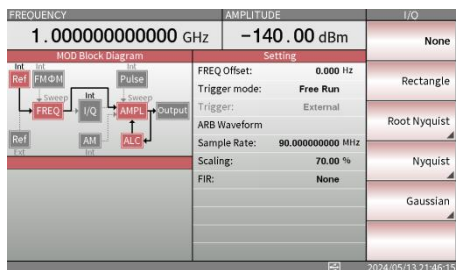
- Panel Operation 1. Press the F4 key to edit the FIR filter of ARB waveform.

**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.

FREQUENCY	AMPLITUDE	I/O
1.000000000000 GHz	-140.00 dBm	Type Rectangle
		Setting
FREQ Offset: 0.000 Hz Trigger mode: Free Run Triggers: External ARB Waveform Sample Rate: 90.000000000 MHz Scaling: 70.00 % FIR: Rectangle Oversample: 1		Oversample
2024/05/13 21:46:58		

FREQUENCY	AMPLITUDE	I/O
1.000000000000 GHz	-140.00 dBm	Rolloff
		Setting
FREQ Offset: 0.000 Hz Trigger mode: Free Run Triggers: External ARB Waveform Sample Rate: 90.000000000 MHz Scaling: 70.00 % FIR: Root Nyquist Oversample: 2 Rolloff: 0.75		
2024/05/13 21:47:15		

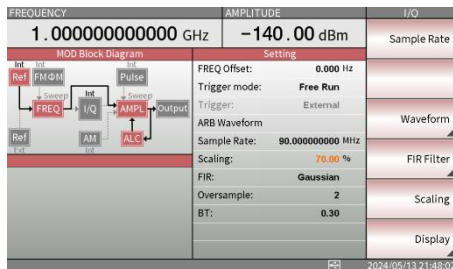
FREQUENCY	AMPLITUDE	I/O
1.000000000000 GHz	-140.00 dBm	Rolloff
		Setting
FREQ Offset: 0.000 Hz Trigger mode: Free Run Triggers: External ARB Waveform Sample Rate: 90.000000000 MHz Scaling: 70.00 % FIR: Nyquist Oversample: 2 Rolloff: 0.75		
2024/05/13 21:47:29		

FREQUENCY	AMPLITUDE	I/O
1.000000000000 GHz	-140.00 dBm	BT
		Setting
FREQ Offset: 0.000 Hz Trigger mode: Free Run Triggers: External ARB Waveform Sample Rate: 90.000000000 MHz Scaling: 70.00 % FIR: Gaussian Oversample: 2 BT: 0.5		
2024/05/13 21:47:40		

## Editing scaling

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

**F 5**



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

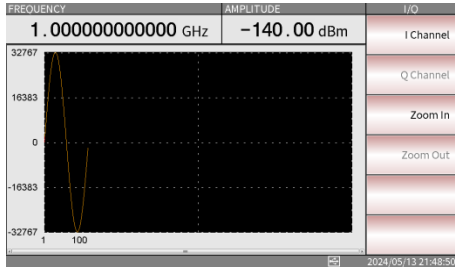
- Panel Operation 1. Press the F6 key to display the following options.

**F 6**

I channel



Q channel



# LF SETTING

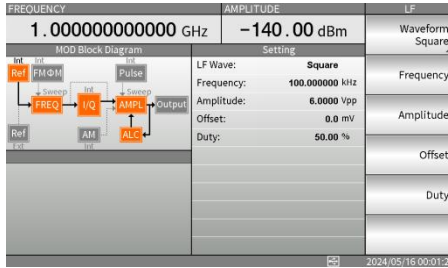
---

Selecting a waveform for LF output.....	149
Other settings for selected waveform.....	151

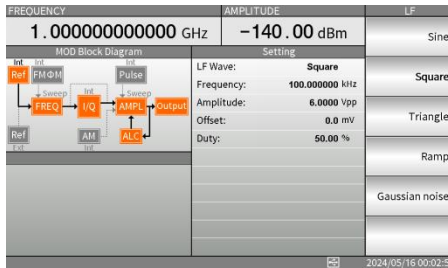


# Selecting a waveform for LF output

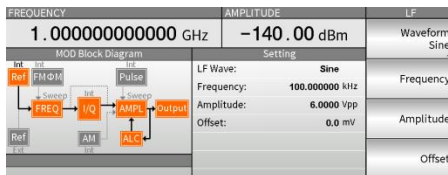
- Panel Operation
1. Press the LF key on the front panel of the GSG-2000 to enter the menu about the LF setting.



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**

FREQUENCY		AMPLITUDE		LF
1.000000000000 GHz		-140.00 dBm		Waveform Square
MOD Block Diagram		Setting		
		LF Wave: <b>Square</b> Frequency: 100.000000 kHz Amplitude: 6.0000 Vpp Offset: 0.0 mV Duty: 50.00 %		
				Frequency
				Amplitude

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

**F 3**

FREQUENCY		AMPLITUDE		LF
1.000000000000 GHz		-140.00 dBm		Waveform Triangle
MOD Block Diagram		Setting		
		LF Wave: <b>Triangle</b> Frequency: 100.000000 kHz Amplitude: 6.0000 Vpp Offset: 0.0 mV		
				Frequency
				Amplitude

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

**F 4**

FREQUENCY		AMPLITUDE		LF
1.000000000000 GHz		-140.00 dBm		Waveform Ramp
MOD Block Diagram		Setting		
		LF Wave: <b>Ramp</b> Frequency: 100.000000 kHz Amplitude: 6.0000 Vpp Offset: 0.0 mV Symmetry: 50.00 %		
				Frequency
				Amplitude

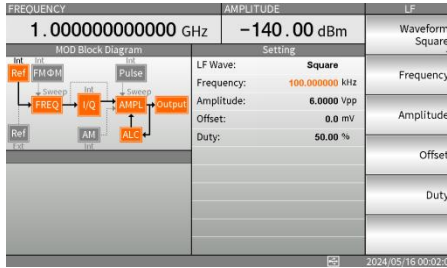
- To select Gaussian noise as the LF output waveform, press the F5 key.

**F 5**

FREQUENCY		AMPLITUDE		LF
1.000000000000 GHz		-140.00 dBm		Waveform Gaussian
MOD Block Diagram		Setting		
		LF Wave: <b>Gaussian noise</b> Amplitude: 6.0000 Vpp Offset: 0.0 mV		
				Frequency
				Amplitude

# Other settings for selected waveform

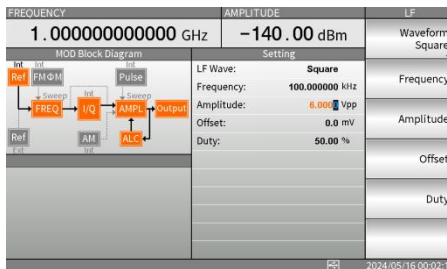
- Panel Operation
1. If a waveform (except for Gaussian noise) is selected, please press the F2 key to set the frequency.



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.



- 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.



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

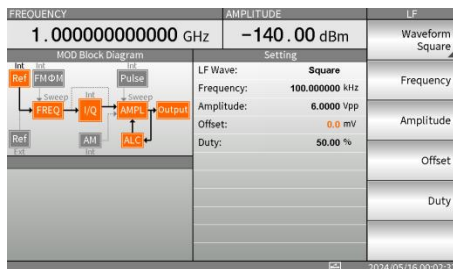


- Press the Enter key to confirm that value you set.



**Setting offset**

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



- 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.



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



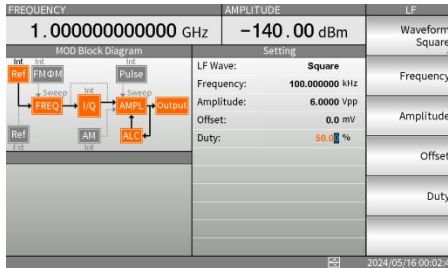
- Press the Enter key to confirm that value you set.



Setting duty  
(for square  
waveform only)

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

**F 5**



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.



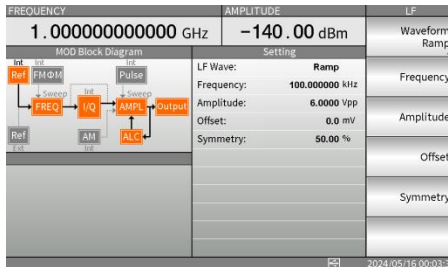
16. Press the Enter key to confirm that value you set.



Setting symmetry  
(for ramp only)

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

**F 5**



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.



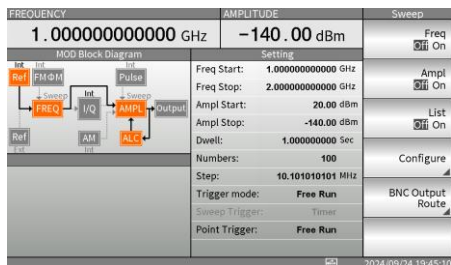
# **S**WEEP FUNCTION

---

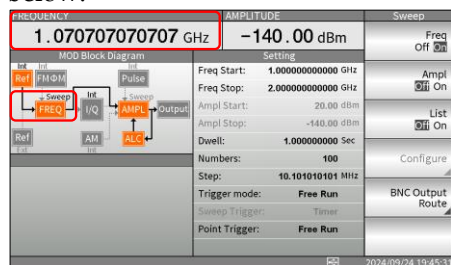
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# Activating Sweep Function

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



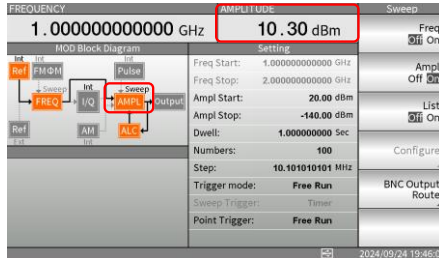
2. Press the F1 key to activate sweep frequency. Then you will see sweep frequency is activated in the MOD Block Diagram and present sweep frequency, as shown in the figure below.





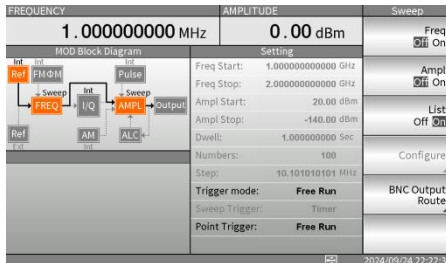
- Press the F2 key to activate sweep amplitude. Then you will see sweep amplitude is activated in the MOD Block Diagram and present sweep amplitude, as shown in the figure below.

**F 2**



- Press the F3 key to activate sweep list.

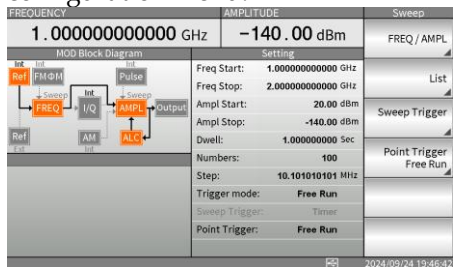
**F 3**



# Sweep configuration

## Setting sweep frequency and amplitude

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

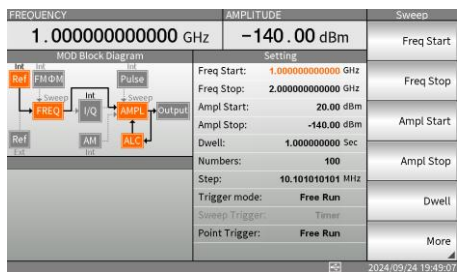


Note

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.



- Press the F2 key to set end frequency.

**F 2**

FREQUENCY	AMPLITUDE	Sweep
1.000000000000 GHz	-140.00 dBm	Freq Start
MOD Block Diagram		
Setting		
Freq Start: 1.000000000000 GHz	Freq Stop: 2.000000000000 GHz	Freq Stop
Ampl Start: 20.00 dBm	Ampl Stop: -140.00 dBm	Ampl Start
Dwell: 1.0000000000 Sec	Numbers: 100	Ampl Stop
Step: 10.101010101 MHz	Trigger mode: Free Run	Dwell
Sweep Trigger: Timer	Point Trigger: Free Run	More

- Press the F3 to set start amplitude.

**F 3**

FREQUENCY	AMPLITUDE	Sweep
1.000000000000 GHz	-140.00 dBm	Freq Start
MOD Block Diagram		
Setting		
Freq Start: 1.000000000000 GHz	Freq Stop: 2.000000000000 GHz	Freq Stop
Ampl Start: 20.00 dBm	Ampl Stop: -140.00 dBm	Ampl Start
Dwell: 1.0000000000 Sec	Numbers: 100	Ampl Stop
Step: 10.101010101 MHz	Trigger mode: Free Run	Dwell
Sweep Trigger: Timer	Point Trigger: Free Run	More

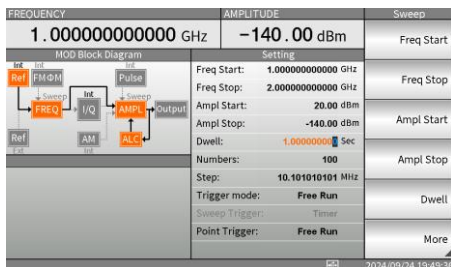
- Press the F4 key to set end amplitude.

**F 4**

FREQUENCY	AMPLITUDE	Sweep
1.000000000000 GHz	-140.00 dBm	Freq Start
MOD Block Diagram		
Setting		
Freq Start: 1.000000000000 GHz	Freq Stop: 2.000000000000 GHz	Freq Stop
Ampl Start: 20.00 dBm	Ampl Stop: -140.00 dBm	Ampl Start
Dwell: 1.0000000000 Sec	Numbers: 100	Ampl Stop
Step: 10.101010101 MHz	Trigger mode: Free Run	Dwell
Sweep Trigger: Timer	Point Trigger: Free Run	More

6. Press the F5 key to set sweep dwell.

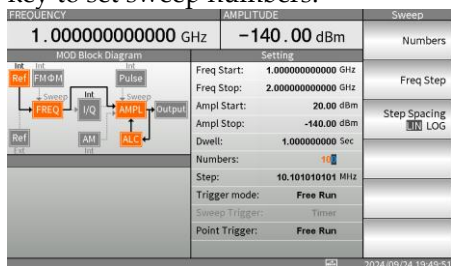
**F 5**



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

**F 6**

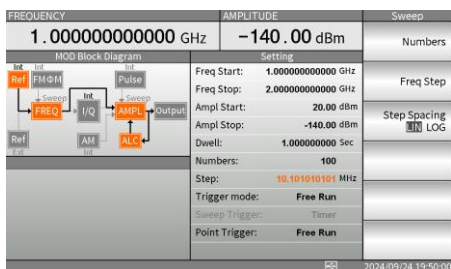
**F 1**



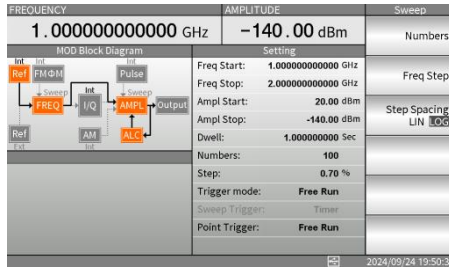
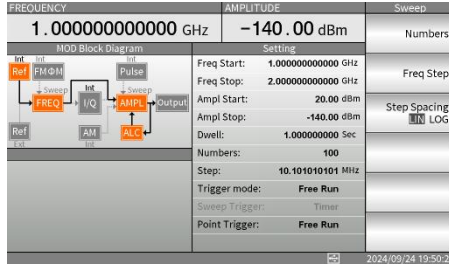
8. Press the F6 (More) key and the F2 key to set sweep step.

**F 6**

**F 2**

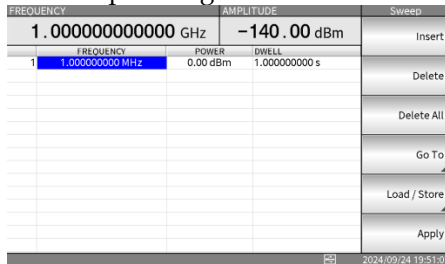


9. Press the F6 (More) and toggle the F3 keys to select step spacing in MHz or percentage.



## Editing list sweep

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





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

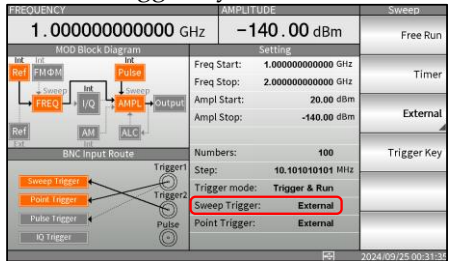
After entering the list menu, you can only use the return key to exit. If you have edited any item in the content, you need to select the "Exit" (F1) key or the "Save & Exit" (F2) key to exit. Press the F1 key to exit directly, and press the F2 key to save the editing results and exit.



Sweep trigger and point triggers

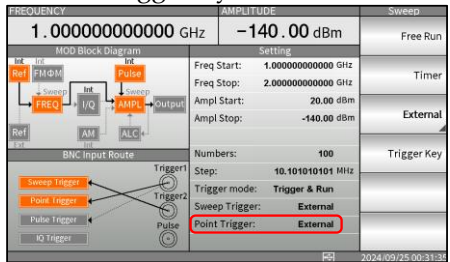
- Panel Operation
- Under the sweep configuration menu, press the F3 key to enter the sweep trigger menu and select a trigger style. For example, here External trigger style is selected.

**F 3**



- 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

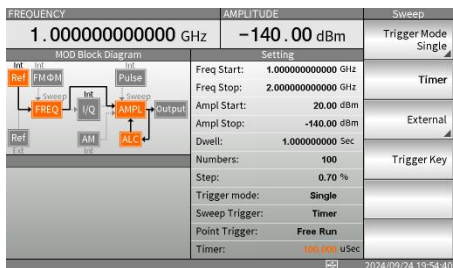
The sweep trigger is used to trigger the sweep process, while the point trigger is used to trigger switching of each setting point in the sweep process.

Note

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

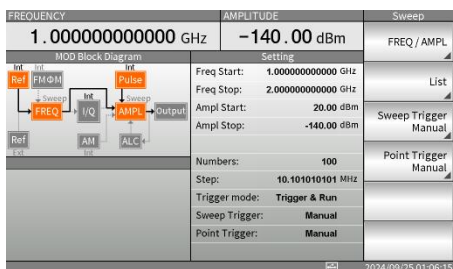
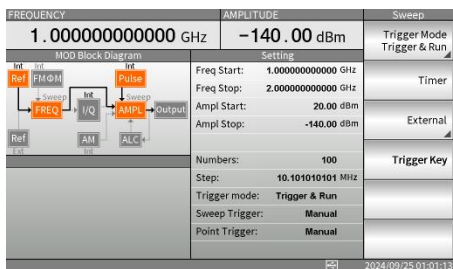
- To set the sweep trigger to a Timer, Press the F2 key and set the value of Timer.

**F 2**



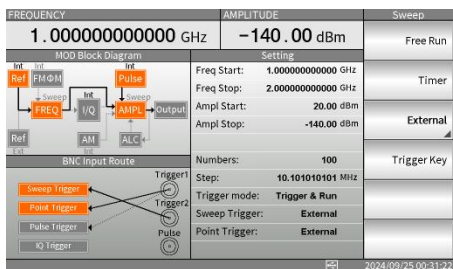
4. To set the sweep trigger to Manual trigger, press the F4 key.

**F 4**



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

**F 3**





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

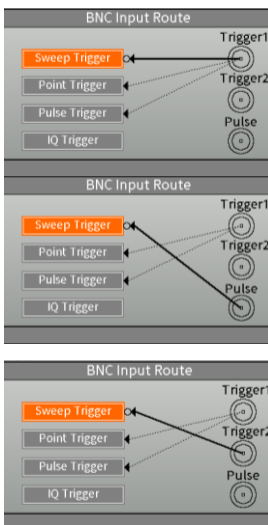


Sweep	Sweep
Polarity Neg <b>Pos</b>	Polarity Neg <b>Pos</b>
Trigger1	Trigger1
Trigger2	Trigger2
Pulse Input	Pulse Input

- 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.



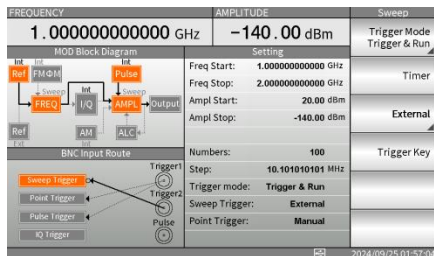
or



**Selecting a trigger mode**

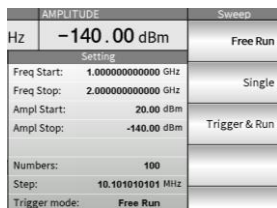
- Panel Operation 1. Under the sweep trigger menu, press the F1 key to enter the trigger mode menu and select a trigger mode. For example, here Trigger & Run is selected.

**F 1**



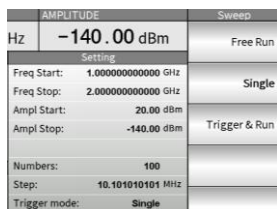
- Free Run 2. Press the F1 key to select free run as trigger mode.

**F 1**



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

**F 2**



Gated

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

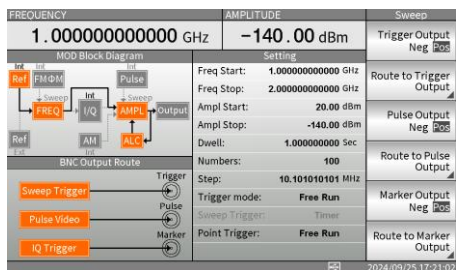
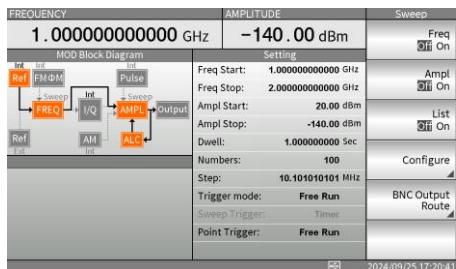
**F3**

	AMPLITUDE	Sweep
Hz	-140.00 dBm	Free Run
Setting		
Freq Start:	1.000000000000 GHz	Single
Freq Stop:	2.000000000000 GHz	
Ampl Start:	20.00 dBm	Trigger & Run
Ampl Stop:	-140.00 dBm	
Numbers:	100	
Step:	10.101010101 MHz	
Trigger mode:	Trigger & Run	

# 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.

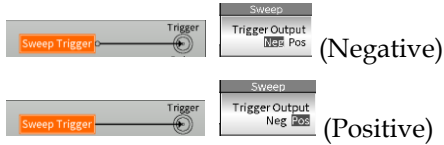
**F 5**



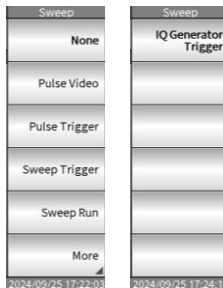
As shown in the diagram below, When the F5 key is pressed, the BNC output route will display on the left lower corner of the Sweep setting page.



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. F 1



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. F 2



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

- To select Pulse Video as an output route to trigger, press the F2 key. F 2



- To select Pulse Trigger as an output route to trigger, press the F3 key. F 3



- To select Sweep Trigger as an output route to trigger, press the F4 key. F 4



- To select Sweep Run as an output route to trigger, press the F5 key. F 5



- To select IQ Generator Trigger as an output route to trigger, press the F6 (More) key and the F1 key. F 6 + F 1



 **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 F 3  
 polarity. Press the F4 key to select F 4  
 which kind of route to pulse output.



6. Likewise, press the F6 key to select the polarity of the marker output. F 5  
 Press the F6 key to select which kind F 6  
 of route to marker output.



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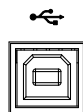
## Establishing a Remote Connection

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	<p>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.</p>
-----------------------	---

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	<p>Send a remote command from the PC</p> <p>Long-press the unlock key on the front panel.</p> <p>Unplug the USB cable from the rear panel.</p>
-------------------------------	--



Note

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

## Remote control terminal connection

---

Terminal application	<p>Invoke the terminal application such as MTTY (Multi-Threaded TTY). For USB, set the COM port, baud rate, stop bit, data bit, and parity accordingly.</p> <p>To check the COM port No, see the Device Manager in the PC. For WinXP, Control panel → System → Hardware tab.</p>
Functionality check	<p>Run this query command via the terminal.</p> <pre>*idn?</pre> <p>This should return the Manufacturer, Model number, Serial number, and Firmware version in the following format.</p> <pre>GW INSTEK, GSG-2000, SN:XXXXXXXX, Vm.mm</pre> <p>Note: ^j or ^m can be used as the terminal character when using a terminal program.</p>
Display	<p>When a remote connection is established all panel keys are locked.</p>

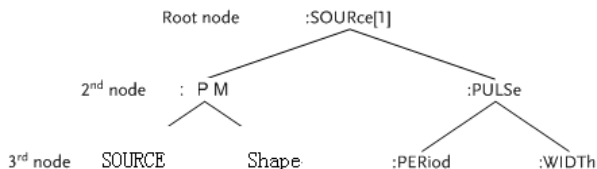
## Command Syntax

---

Compatible standard	<p>IEEE 488.2, 1992 (fully compatible)</p> <p>SCPI, 1994 (partially compatible)</p>
Command Tree	<p>The SCPI standard is an ASCII based standard that defines the command syntax and structure for programmable instruments.</p>

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.

long            long  
┌───┬───┐    ┌───┬───┐  
SOURce1:DCOffset  
└───┘    └───┘  
short    short

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	$\overbrace{\text{SOURce1:DCOffset}}^1 \underbrace{\langle \text{offset} \rangle}_{2} \text{LF}_{4}$	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	λj or λm 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: <pre>SOURce[1 2 3 4]:DCOffset? SOURce[1 2 3 4]:OUTPut? →SOURce1:DCOffset?;OUTPut?</pre>
	Colon + Semicolon (;:)	A colon and semicolon can be used to combine commands from different node levels.  For example: <pre>SOURce1:PM:SOURce? SOURce:PULSe:WIDTh? →SOURce1:PM:SOURce?::SOURce: PULSe:WIDTh?</pre>
	Comma (,)	When a command uses multiple parameters, a comma is used to separate the parameters.  For example: <pre>SOURce:APPLy:SQUare 10KHZ, 2.0 VPP, -1V</pre>

## 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 to 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 to 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**



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

**Syntax** \*WAI

## System Commands

**:SYSTem:COMMunicate:GPIB:ADDRess**  

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 to 30
Example	:SYST:COMM:GPIB:ADDR 10	

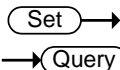
**:SYSTem:COMMunicate:LAN:APPLY** 

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**  

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 MANual	The user assigns an IP address to the unit. 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]**



**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.

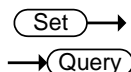
**Syntax** :SYSTem:COMMunicate:LAN:DNS[1|2]

**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**



**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.

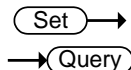
**Syntax** :SYSTem:COMMunicate:LAN:GATeway<ipstring>

**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**



**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/	<year>	<NR1>
Return parameter	<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/	PRESet	This choice sets the conditions to factory or user defined as determined by the choice for the preset type.
Return parameter	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/	<hour>	<NR1>
Return parameter	<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/	ON	Turn on the NTP function
Return parameter	OFF	Turn off the NTP function

:SYSTem:TIME:ZONE 


Description This command is to set and return system time zone.

Syntax :SYSTem:TIME:ZONE

Query Syntax :SYSTem:TIME:ZONE?

:SYSTem:VERSion 

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

Set →

→ Query

---

Description      Sets or queries the LCD brightness level.

---

Syntax            :DISPlay:BRIGhtness <level>

Query Syntax     :DISPlay:BRIGhtness?

---

Parameter/  
Return parameter   <level>      1 to 5

## Source Commands

`[:SOURce]:FREQuency:CHANnels:BAND`  

**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?`

<b>Parameter/ Return parameter</b>	<code>&lt;band&gt;</code>	<code>&lt;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&gt;</code>
--	---------------------------	--

`[:SOURce]:FREQuency:CHANnels:NUMBer`  

**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.

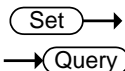
**Syntax** `[:SOURce]:FREQuency:CHANnels:NUMBer<number>`

**Query Syntax** `[:SOURce]:FREQuency:CHANnels:NUMBer?`

<b>Parameter/ Return parameter</b>	<code>&lt;number&gt;</code>	Please refer to the following table for the corresponding parameters range and channels
--	-----------------------------	---

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

**[[:SOURce]:FREQuency:CHANnels[:STATE]**



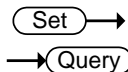
**Description** This command enables/disables and returns the frequency channel and band selection.  
The signal generator frequency will be set to the channel frequency when the state is on. To set frequency channel bands refer to the :FREQuency:CHANnels:BAND command.

**Syntax** [:SOURce]:FREQuency:CHANnels[:STATE]

**Query Syntax** [:SOURce]:FREQuency:CHANnels[:STATE]?

<b>Parameter/Return parameter</b>	<b>ON</b>	Enable the frequency channel
	<b>OFF</b>	Disable the frequency channel

**[[:SOURce]:FREQuency[:CW]**



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	9 kHz to 6 GHz
	Unit	The default unit is Hz.

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	9 kHz to 6 GHz
	Unit	The default unit is Hz.

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	9 kHz to 6 GHz
	Unit	The default unit is Hz.

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 10 MHz 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 
 →  
 →

Description	<p>This command sets and returns the automatic leveling control (ALC) level.</p> <p>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.</p>	
Syntax	[:SOURce]:POWER:ALC:LEVel<[value][unit]>	
Query Syntax	[:SOURce]:POWER:ALC:LEVel?	
Parameter/ Return parameter	Value	-12 dBm to 12dBm
	Unit	The default unit is dBm.

[:SOURce]:POWER:ALC:SEARCh  →

**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]?

<b>Parameter/ Return parameter</b>	<b>ON</b>	Enable ALC
	<b>OFFSample</b>	Enable ALC, set the amplitude, and then turn ALC off.
	<b>OFFTable</b>	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?

<b>Parameter/ Return parameter</b>	<b>Value</b>	-128 dBm to 14 dBm
	<b>Unit</b>	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.

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 dBm to 20 dBm
	Unit	The default unit is dBm.

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 dBm to 20 dBm
	Unit	The default unit is dBm.


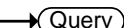
Set →  
 → Query

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 dBm to 20 dBm
	Unit	The default unit is dBm.


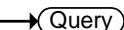
[:SOURce]:SWEep:DWELL 


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	100 us to 100 s
	Unit	The default unit is s.


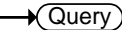
[:SOURce]:SWEep:FREQuency:STATe 

  


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.


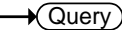
[:SOURce]:SWEep:FREQuency:STEP:LINEar 

  


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 

  


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] 

  


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` 
 →  
 →

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` 
 →  
 →

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	100 us to 400 s
	Unit	The default unit is s.

`[:SOURce]:SWEep:LIST:POINts` 


**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 to 4096
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`[:SOURce]:SWEep:LIST:STATe` 


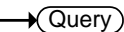
  


**Description** This command enables/ disables and returns the

**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` 

  


**Description** This command defines an returns the number of step sweep points.

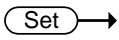
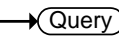
**Syntax** `[:SOURce]:SWEep:POINts<[value]>`

**Query Syntax** `[:SOURce]:SWEep:POINts?`

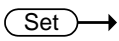
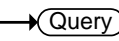
Parameter/ Return parameter	Valuev	2 to 65535
--------------------------------	--------	------------

`[:SOURce]:SWEep:POWER:STATe` 

  


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 



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.

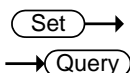
[:SOURce]:SWEep:PTRIGger:EXTErnal[:SOURce] 



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]?	



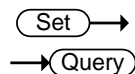
Parameter/ Return parameter	TRIGger[1]	This choice selects the TRIG 1 BNC as the external trigger source for triggering sweep, point and function generator sweeps.
	TRIGger2	This choice selects the TRIG 2 BNC as the external trigger source for triggering sweep, point and function generator sweeps.
	PULSe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

**[[:SOURce]:SWEep:PTRIGger:SLOPe**



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**



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	100 us to 400 s
	Unit	The default unit is s.

`[:SOURce]:SWEep:SPACing` 


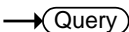
  


Description	This command enables and returns the unit linear or logarithmic sweep modes. These commands require the unit to be in step mode.	
Syntax	[:SOURce]:SWEep:SPACing {LINear LOGarithmic}	
Query Syntax	[:SOURce]:SWEep:SPACing?	
Parameter/ Return parameter	LINear	The sweep frequency changes in arithmetic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

`[:SOURce]:SWEep:TRIGger` 


  


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]` 

  


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` 

  


Description	This command sets and returns the trigger type for a list or step sweep event.	
Syntax	<code>[:SOURce]:SWEep:TRIGger:TYPE {IMMediate SINGLE TRIGger }</code>	
Query Syntax	<code>[:SOURce]:SWEep:TRIGger:TYPE?</code>	
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` 

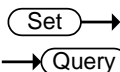

Description	This command sets and returns the amplitude for the signal at the LF OUTPUT connector.
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Syntax [:SOURce]:LFOuTput:AMPLitude<[value][unit]>

Query Syntax [:SOURce]:LFOuTput:AMPLitude?

Parameter/ Return parameter	Value	2 mVpp to 6 Vpp
	Unit	The default unit is Vpp

[:SOURce]:LFOuTput:FREQUency



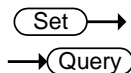
Description This command sets and returns the frequency for the signal at the LF OUTPUT connector.

Syntax [:SOURce]:FREQUency <[value][unit]>

Query Syntax [:SOURce]:FREQUency?

Parameter/ Return parameter	Value	100 mHz to 1 MHz or 10 MHz
	Unit	The default unit is Hz

[:SOURce]:LFOuTput:FUNCTion:DCYCLE



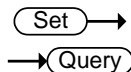
Description Set the duty cycle of LF output

Syntax [:SOURce]:FUNCTion:DCYCLE<[value][unit]>

Query Syntax [:SOURce]:FUNCTion:DCYCLE?

Parameter/ Return parameter	Value	0.00 % to 100.00 %
	Unit	The default unit is %

[:SOURce]:LFOuTput:FUNCTion:SHAPE



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` 
 →  
 →

**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 % to 100.00 %
	Unit	The default unit is %

`[:SOURce]:LFOutput:OFFSet` 
 →  
 →

**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	-2.999 V to 2.999 V, the upper and lower limits are limited by the LF output amplitude setting value
	Unit	The default unit is Volt

`[:SOURce]:LFOutput:STATe` 
 →  
 →

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] 


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 % to 100.00 %
	Unit	The default unit is %

[:SOURce]:AM:INTernal:FREQUENCY 


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	100 mHz to 20 kHz
	Unit	The default unit is Hz

[:SOURce]:AM:INTernal:SHAPE 


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 



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 



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] 



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	0 Hz to 4 MHz
	Unit	The default unit is Hz

[:SOURce]:FM:INTernal:FREQuency 


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	100 Hz to 1 MHz
	Unit	The default unit is Hz

[:SOURce]:FM:INTernal:SHAPE 


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 


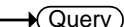



Description	This command sets and returns the source to generate the frequency modulation.	
Syntax	[:SOURce]:FM:SOURce{LF INTernal EXTernal}	
Query Syntax	[:SOURce]:FM:SOURce?	
Parameter/ Return parameter	LF	Use LF waveform for modulation
	INTernal	Use internal waveform modulation
	EXTernal	Use BNC to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


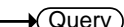
[:SOURce]:FM:STATe 


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] 

  


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	0.000 rad to 20.000 rad
	Unit	The default unit is rad

[:SOURce]:PM:DEVIation:UNIT 

  


Description	This command sets and returns the unit of deviation of the phase modulation.	
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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	100 kHz to 1 MHz
	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.


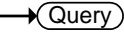
[:SOURce]:PM:SOURce (Set) →  
→ (Query)

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


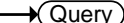
[:SOURce]:PM:STATe 


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 

  


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


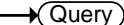
`[:SOURce]:PULM:INTernal:DELay[1]]2`  

**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?`

<b>Parameter/ Return parameter</b>	<b>Value</b>	0 s to 42 s
	<b>Unit</b>	The default unit is s.



`[:SOURce]:PULM:INTernal:FREQuency`  

**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?`

<b>Parameter/ Return parameter</b>	<b>Value</b>	100 mHz to 10 MHz
	<b>Unit</b>	The default unit is Hz

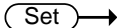

`[:SOURce]:PULM:INTernal:PERiod`  

**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?`

<b>Parameter/ Return parameter</b>	<b>Value</b>	100 ns to 42 s
	<b>Unit</b>	The default unit is s.

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

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	50 ns to 42 s
	Unit	The default unit is s.

[:SOURce]:PULM:INTernal:TRAI:n: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:TRAI:n: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 2 μs as low.	

**[:SOURce]:PULM:INTernal:TRAI:n: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:TRAI:n: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 2 μs as high.	

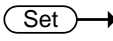
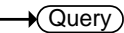
**[:SOURce]:PULM:INTernal:TRAI:n:POINts** (Set) →  
→ (Query)

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

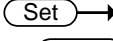
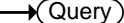
**[:SOURce]:PULM:INTernal:TRAI:n:REPetition** (Set) →  
→ (Query)

Description	This query sets and returns the count of elements in the list of on times.
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Syntax	[:SOURce]:PULM:INTernal:TRAI: REPetition <index>,<value>,<value>,<value>...	
Parameter	Index	Set the starting sequence number of pulse.
	Value,	The number of times each pulse is repeated.
	Value,	
	Value,	
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	


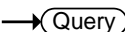
[:SOURce]:PULM:INTernal:TRAI:TRIGger  

Description	This command sets and returns the triggering mode for the Pulse Train feature.	
Syntax	[:SOURce]:PULM:INTernal:TRAI:TRIGger	
Query Syntax	[:SOURce]:PULM:INTernal:TRAI: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  

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

[:SOURce]:PULM:SOURce:INTernal 

  


**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.



ADouplet	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).
DOUplet	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)

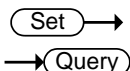
Description	This command enables or disables pulse modulation for the selected path.  When pulse modulation is enabled, the PULSE annunciator appears on the unit's front-panel display.	
Syntax	[:SOURce]:PULM:STATe	
Query Syntax	[:SOURce]:PULM:STATe?	
Parameter/ Return parameter	ON	Enable the pulse modulation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

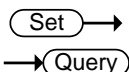
`[:SOURce]:PULM:TRIGger:TIMER` 

**Description** This command sets and returns trigger time of Pulse wavefome.

**Syntax** `[:SOURce]:PULM:TRIGger:TIMER`

**Query Syntax** `[:SOURce]:PULM:TRIGger:TIMER?`

<b>Parameter/ Return parameter</b>	<b>Value</b>	100 ns to 42 s
	<b>Unit</b>	The default unit is s.

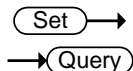
`[:SOURce]:IQ:ADJustment:EXTernal:ANGLE` 

**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?`

<b>Parameter/ Return parameter</b>	<b>Value</b>	-10.00 deg to 10.00 deg
	<b>Unit</b>	The default unit is deg


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

**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?`


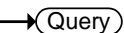
<b>Parameter/ Return parameter</b>	<b>Value</b>	-1.25 Volt to 1.25 Volt
	<b>Unit</b>	The default unit is Volt

`[:SOURce]:IQ:ADJustment:EXTernal:DIOFFset`  

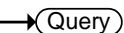
Description	This command set and returns Diff. mode I offset of the external IQ output.	
Syntax	[:SOURce]:IQ:ADJustment:EXTernal:DIOFFset <[value][unit]>	
Query Syntax	[:SOURce]:IQ:ADJustment:EXTernal:DIOFFset?	
Parameter/ Return parameter	Value	-50.0 mVolt to 50 mVolt
	Unit	The default unit is Volt

`[:SOURce]:IQ:ADJustment:EXTernal:DQOFFset`  

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	-50.0 mVolt to 50 mVolt
	Unit	The default unit is Volt

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

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	-6.00 dBm to 6.00 dBm
	Unit	The default unit is dB


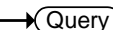
`[:SOURce]:IQ:ADJustment:EXTernal:IOFFset`  

Description This command set and returns I offset of the external IQ input.

Syntax `[[:SOURce]:IQ:AD]ustment:EXTErnal:IOFFset <[value][unit]>`

Query Syntax `[[:SOURce]:IQ:AD]ustment:EXTErnal:IOFFset?`

Parameter/ Return parameter	Value	-5.00 % to 5.00 %
	Unit	The default unit is %

`[[:SOURce]:IQ:AD]ustment:EXTErnal:QOFFset`  

Description This command set and returns Q offset of the external IQ input.

Syntax `[[:SOURce]:IQ:AD]ustment:EXTErnal:QOFFset <[value][unit]>`

Query Syntax `[[:SOURce]:IQ:AD]ustment:EXTErnal:QOFFset?`

Parameter/ Return parameter	Value	-5.00 % to 5.00 %
	Unit	The default unit is %

`[[:SOURce]:IQ:AD]ustment:GAIN`  

Description This command set and returns gain of the internal IQ.

Syntax `[[:SOURce]:IQ:AD]ustment:GAIN<[value][unit]>`

Query Syntax `[[:SOURce]:IQ:AD]ustment:GAIN?`

Parameter/ Return parameter	Value	-6.00 dBm to 6.00 dBm
	Unit	The default unit is dB

`[[:SOURce]:IQ:AD]ustment:IOFFset`  

Description This command set and returns I offset of the internal IQ.

Syntax `[[:SOURce]:IQ:AD]ustment:IOFFset<[value][unit]>`

Query Syntax	[:SOURce]:IQ:ADJustment:IOffset?	
Parameter/ Return parameter	Value	-10.00 % to 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 % to 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 to 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 returns 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	Enable 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 to 10.00
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**[[: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 to 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 to 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 % to 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 % to 100.00%
	Unit	The default unit is %


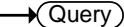
[:SOURce]:IQ:DMODulation:DATA 
 →  
 →

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 = 00000000000000001111111111111111
	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` 


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

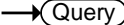
`[:SOURce]:IQ:DMODulation:FILTer` 

  


Description	This command specifies and returns filter type of digital modulation waveform.	
Syntax	<code>[:SOURce]:IQ:DMODulation:FILTer{OFF  RECTangle  RNYQuist  NYQuist  GAUSSian}</code>	
Query Syntax	<code>[:SOURce]:IQ:DMODulation:FILTer?</code>	
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` 

  


Description	This command sets and returns Gaussian filter value of digital modulation waveform.	
Syntax	<code>[:SOURce]:IQ:DMODulation:FILTer:GAUSSian &lt;[value]&gt;</code>	
Query Syntax	<code>[:SOURce]:IQ:DMODulation:FILTer:GAUSSian?</code>	
Parameter/ Return parameter	Value	0.01 to 10.00

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

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 to 1.00


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

Description This command sets and returns RYQuist filter roll off value of digital modulation waveform.

Syntax [:SOURce]:IQ:DMODulation:FILTer:RYQuist<[value]>


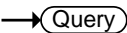
Query Syntax [:SOURce]:IQ:DMODulation:FILTer:RYQuist?

Parameter/ Return parameter Value 0.00 to 1.00

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

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  

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/	16	16APSK modulation
Return parameter	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/	Value	0.00 % to 100.00 %
Return parameter	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/	Value	0 to 60 MHz
Return parameter	Unit	The default unit is Hz

`[:SOURce]:IQ:DMODulation:MODulation` (Set) →  
`:FSK:MAPPING` → (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 C4FM	Natural mapping C4FM mapping

`[:SOURce]:IQ:DMODulation:MODulation` (Set) →  
`:MSK:MAPPING` → (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 C4FM	Natural mapping C4FM mapping

`[:SOURce]:IQ:DMODulation:MODulation` (Set) →  
`:PSK:MAPPING` → (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?	


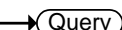
Parameter/	NORMAL	Normal coding
Return parameter	DIFFerential	Differential coding
	NATURAL	Natural mapping
	GRAY	Gray mapping
	DVB_S2	DVB_S2 mapping
	VDL	VDL mapping

[:SOURce]:IQ:DMODulation:MODulation Set →  
 :QAM:MAPPING → 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/	GRAY	Gray mapping
Return parameter	DVB_C	DVB_C mapping

[:SOURce]:IQ:DMODulation:MODulation Set →  
 :QPSK:MAPPING → 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/	NORMAL	QPSK mapping
Return parameter	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]  

**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.


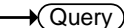
<ASK2 | ASK4 | ASK8 | ASK16 | ASK32 | BPSK | QPSK | DQPSK | OQPSK | NPI4DQPSK | PSK8 | DPSK8 | PSK16 | APSK16 | APSK32 | QAM16 | QAM32 | QAM64 | QAM128 | QAM256 | UIQ | MSK | FSK2 | FSK4 | FSK8 | FSK16 | UFSK>

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	$\pi/4$ 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`      

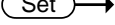

Description      Select the file of user define FSK modulation

Syntax      `[:SOURce]:IQ:DMODulation:MODulation:UFSK :UDEFine<"file_name">`

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

Description      Select the file of user define IQ modulation

Syntax      `[:SOURce]:IQ:DMODulation:MODulation:UIQ :UDEFine <"file_name">`

`[:SOURce]:IQ:DMODulation:SCALing`        


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 % to 50.00 %
	Unit	The default unit is %

`[:SOURce]:IQ:DMODulation:SRATe`        




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	625 Hz to 90 MHz
	Unit	The default unit is Hz

`[:SOURce]:IQ:DMODulation:SRATe` 


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	-60 MHz to 60 MHz
	Unit	The default unit is Hz

`[:SOURce]:IQ:SOURce` 


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?`

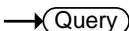
Parameter/ Return parameter	MODulation	Select internal digital modulation as IQ signal
	ARB	Select ARB waveform as IQ signal
	EXTernal	Select BNC waveform as IQ signal

**[[:SOURce]:]IQ:STATe** 


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** 

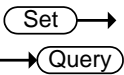
  


Description	This command sets and returns trigger mode to generate the digital modulation.	
Syntax	[:SOURce]:IQ:TRIGger{EXTernal KEY}	
Query Syntax	[:SOURce]:IQ:TRIGger?	
Parameter/ Return parameter	EXTernal	Choose to use BNC input for triggering
	KEY	Choose to use trigger key for triggering

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


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` 


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` 


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]  

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  

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]  

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  

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]  

Description This command sets returns the route to trigger output.

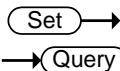
Syntax :ROUTe[:CONNectors]:TRIGger[:OUTPut]{NONE|PVIDeo|PTRG|STRG|SRUN|IQTRG}

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

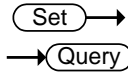
:ROUTe[:CONNectors]:TRIGger:POLarity



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



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 Set →  
→ Query

Description This command returns a list of the arbitrary waveform digital modulation files.

Query Syntax :MEMory:CATalog:ARBitrary?

:MEMory:CATalog:ARBitrary:EXTernal Set →  
→ Query

Description This command returns a list of the arbitrary waveform digital modulation files.

Query Syntax :MEMory:CATalog:ARBitrary:EXTernal?

:MEMory:CATalog:DATA Set →  
→ Query

Description This command returns a list of the arbitrary waveform digital modulation files.

Query Syntax :MEMory:CATalog:DATA?

:MEMory:CATalog:FILTer Set →  
→ Query

Description This command returns a list of the finite impulse response filter files.

Query Syntax :MEMory:CATalog:FILTer?

:MEMory:CATalog:LIST Set →  
→ Query

Description This command returns a list of the list sweep files.

Query Syntax :MEMory:CATalog:LIST?

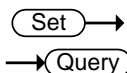
:MEMory:CATalog:PTRain Set →  
→ Query



Description This command returns all files of the pulse train files stored in the non-volatile storage.

Query Syntax :MEMory:CATalog:PTRain?

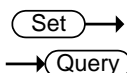
:MEMory:CATalog:UFSK



Description This command returns a list of the frequency shift keying files.

Query Syntax :MEMory:CATalog:UFSK?

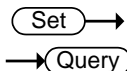
:MEMory:CATalog:UIQ



Description This command returns a list of the Inphase and Quadrature (I/Q) files.

Query Syntax :MEMory:CATalog:UIQ?

:MEMory:DATA:IQ:ARbitrary



Description This command edits IQ ARB waveforms by reading external file or by using built-in waveforms. Two sets of parameters 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 to 32767
	<offset>	Built-in waveform offset, range 0 to 32767
	<phase>	Built-in waveform starting phase, range +180 to -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 Set →  
 → Query

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

<code>&lt;#ABC&gt;</code>	#: 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` 
 →  
 →

Description	Edit user define data pattern for been using in IQ digital modulation
-------------	---

Syntax	<code>:MEMory:DATA:IQ:DMODulation:DATA &lt;"filename"&gt;, &lt;length&gt;,&lt;#ABC&gt;</code>
--------	---

Parameter/ Return parameter	<code>&lt;"filename"&gt;</code>	File name
	<code>&lt;length&gt;</code>	Number of points in the waveform
	<code>&lt;#ABC&gt;</code>	#: 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` 
 →  
 →

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	<code>:MEMory:DATA:IQ:DMODulation:FIR&lt;"filename"&gt;, &lt;OSR&gt;,&lt;length&gt;,&lt;value 0 &gt;[,...,&lt;value n&gt;]</code>
--------	---

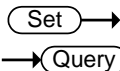
Parameter/ Return parameter	<code>&lt;"filename"&gt;</code>	File name
	<code>&lt;OSR&gt;</code>	Oversample number of FIR
	<code>&lt;length&gt;</code>	(FIR taps) / 2
	<code>&lt;ratio n&gt;</code>	FIR value



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



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 to 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	1 MHz	0.5 MHz	-0.5 MHz	-1 MHz

Differential coding

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

:MEMory:DATA:IQ:DMODulation:UIQ 
 →  
 →

**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>]

<b>Parameter/ Return parameter</b>	<"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 
 →  
 →

**Description** This command loads a list sweep file.

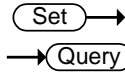
**Syntax** :MEMory:LOAD:LIST<"filename">

:MEMory:LOAD:PTRain 
 →  
 →

**Description** This command reads the pulse train file specified.

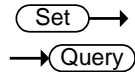
**Syntax** :MEMory:LOAD:PTRain <"filename">

:MEMory:STORe:LIST



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

:MEMory:STORe:PTRain



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 (5 Vrms) compared to a sine wave (to 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.

$$|\text{offset}| \leq \text{max amplitude} - V_{pp}/2$$

---

**-221 Settings conflict; amplitude changed due to offset**

---

Example: The amplitude is not a valid value, it is automatically adjusted, considering the offset.

$$V_{pp} \leq 2X (\text{max amplitude} - |\text{offset}|)$$

---

**-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.

$\text{burst period} > 200 \text{ ns} + (\text{burst count} / \text{burst frequency})$ .

---

**-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%	> 50 MHz
40%~60%	25 MHz to 50 MHz
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 of bytes for a data block.



# A PPENDIX

## GSG-2000 Specification

The specifications apply when the GSG-2000 is powered on for 30 minutes to warm-up to a temperature of +20°C to +30°C, unless specified otherwise.

<b>Frequency Specifications</b>			
<b>Frequency Range</b>			
Frequency Range		9 kHz to 6 GHz	GSG-2160, GSG-2060
Frequency Resolution	1mHz		
Frequency Bands	<b>Band</b>	<b>Frequency Range</b>	<b>N</b>
	1	9 kHz to 5 MHz	digital synthesis
	1	< 5 MHz to 187.5 MHz	1
	2	< 187.5 MHz to 375 MHz	0.25
	3	< 375 MHz to 750 MHz	0.5
	4	< 750 MHz to 1500 MHz	1
	5	< 1500 MHz to 3000 MHz	2
	6	< 3000 MHz to 6000 MHz	4
Frequency Switching	≤ 5 ms		
<b>Phase Noise @ 20 kHz offset</b>			
SSB phase noise	Frequency (MHz)	ALC on	ALC off
CW at 20 kHz offset (dBc/Hz)	5	-	-122
	100	-112	-115
	250	-112	-117
	1000	-112	-117
	2000	-108	-112
	3000	-107	-110
	6000	-102	-105
Residual FM (0.3 kHz to 3 kHz) CW)	(1 GHz)	< 2 Hz	

<b>Non Harmonics</b>			
Non Harmonics	Level > -10 dBm, offset > 10 kHz	< -65 dBc	1 MHz ≤ freq ≤ 5 MHz
		< -66 dBc, -70 dBc (typ)	5 MHz < freq ≤ 187.5 MHz
		< -75 dBc	187.5 MHz < freq < 750 MHz
		< -70 dBc, -74 dBc (typ)	750 MHz ≤ freq < 1500 MHz
		< -62 dBc, -66 dBc (typ)	1500 MHz ≤ freq < 3000 MHz
		< -56 dBc, -60 dBc (typ)	3000 MHz ≤ freq ≤ 6000 MHz

**Harmonics**

Range	Level < 4 dBm
9 kHz ≤ Freq < 6000 MHz	< -35 dBc

**RMS JITTER**

Frequency	Bandwidth	Seconds (meas.)
1 GHz	1 Hz to 10 MHz	0.23 ps
155 MHz	100 Hz to 1 MHz	1.38 ps
622 MHz	1 kHz to 3 MHz	0.17 ps
2.488 GHz	5 kHz to 10 MHz	0.12 ps

\*Calculated from phase noise performance in CW mode at 0 dBm, ALC off (sample) mode.

**Frequency Reference**

Frequency Reference	10 MHz	
Temperature Stability	< 10 ppm, Standard	< 10 ppb, OCXO Option
Aging	2 ppm/year, Standard	0.1 ppm/year, OCXO Option
Output	1 Vpp, 50 Ohm Load	
Input	-3 dBm to 20 dBm, 50 Ohm Load	
Input Deviation	Standard: 3 ppm, OCXO Option: 0.5 ppm	


**Amplitude Specifications**

**Amplitude**

Setting Range	20 dBm to -140 dBm
Resolution	0.01 dB
Amplitude Unit	dBm, dBuV, Vrms

**Amplitude Accuracy**

Absolute level accuracy in CW mode (ALC On)	14 dBm to -60 dBm	-60 dBm to -90 dBm	-90 dBm to -110 dBm
9 kHz < freq < 3 GHz	± 0.6 dB	± 0.8 dB (0.6 dB typical)	± 1 dB (0.7 dB typical)
	3 GHz ≤ freq < 6 GHz	± 0.8 dB	± 1 dB (0.6 dB typical)
Addition level error		< 0.15 dB, at ALC Off, Power search run	
VSWR (5 MHz to 3 GHz)	< 1.8 (output ≤ -66 dBm)		

Amplitude Switching (ALC on, CW)	$\leq 5$ ms
 Note	<p>When measuring amplitude accuracy, it is recommended that</p> <ul style="list-style-type: none"> <li>• maintain the measured SNR (signal to noise ratio) above 20 dB.</li> <li>• use test instrument with measurement bandwidth <math>\leq 1</math> MHz when test condition is <math>-30</math> dBm <math>\geq</math> amp <math>&gt; -30</math> dBm <math>\geq</math> amp <math>&gt; -80</math> dBm, and use test instrument with measurement bandwidth <math>\leq 1</math> kHz when test condition is <math>-80</math> dBm <math>\geq</math> amp <math>&gt; -110</math> dBm.</li> </ul>

<b>Sweep Specifications</b>		
<b>Sweep</b>		
Mode	frequency, amplitude, list	
Dwell time	100 us to 100 s	
Number of points(step)	2 to 65,535	
Number of points(list)	1 to 4,096	
Triggering	free, trigger key, external, timer	
<b>Analog Modulation Specifications</b>		
<b>FM</b>		
Source	internal, external	
Max. Deviation	N x 1 MHz	
Rate	freq ≥ 10 MHz	0.1 Hz to 1 MHz
	freq < 10 MHz	0.1 Hz to 100 kHz
Resolution	1 mHz	
Accuracy (1 kHz rate)	2 % setting + 20 Hz	
Distortion(1 kHz rate, N x 50 kHz deviation)	0.40 %	
<b>PM</b>		
Source	internal, external	
Max. Deviation	N x 1 MHz/rate or 5N rad	
Rate	freq ≥ 10 MHz	0.1 Hz to 1 MHz
	freq < 10 MHz	0.1 Hz to 100 kHz
Resolution	0.001 rad	
Accuracy (1 kHz rate)	1 % of setting + 0.1 rad	
Distortion (1 kHz rate, max deviation)	0.20 %	
Response	0.1 Hz to 1 MHz	
<b>AM</b>		
Source	internal, external	
Resolution	0.01 %	
Depth	0 % to 100 %	
Accuracy (1 kHz, 0 dBm)	< 5 MHz	1.5 % setting +1 %
	5 MHz to 4 GHz	3 % of setting+1 %
	4 GHz to 6 GHz	5 % of setting + 1 %
Distortion (1 kHz, 80 %, < 8 dBm)	< 5 MHz	1.50 %
	5 MHz to 4 GHz	2 %
	4 GHz to 6 GHz	3 %
Response	0.1 Hz to 20 kHz	
<b>Pulse Specifications</b>		
<b>Pulse</b>		
Mode	Free-run, square, triggered, adjustable doublet, trigger doublet, gated, external pulse, and pulse train	
Source	internal, external	
Pulse Input	-0.5 V to 5 V, V <sub>IL</sub> =V <sub>IH</sub> =1.5 V (typ)	



Edge Time		< 20 ns
On/Off Ratio		70 dB, 5 MHz to 3 GHz
		45 dB, 3 GHz to 6 GHz
Repetition Rate		0.1 Hz to 10 MHz
Pulse Period		100 ns to 42 s
Resolution		10 ns
Width		50 ns to period-10 ns
Resolution		10 ns
Pulse Train Number of Patterns		2047
<b>LF Specifications</b>		
<b>LF</b>		
Waveform		sine, square, triangle, ramp, Gaussian noise
Frequency Range	Sine	0.1 Hz to 10 MHz
	Square, Triangle, Ramp	0.1 Hz to 1 MHz
	Gaussian Noise	10 MHz BW
Resolution		1 mHz
Output		2 mVpp to 6 Vpp
Impedance		50 Ohm
<b>Vector Modulation Specifications</b>		
<b>Vector Modulation (GSG-2160 only)</b>		
Source		internal, external
Bandwidth (baseband)		60 MHz
Bandwidth (RF)		120 MHz
Carrier Frequency		< 5 MHz to 6000 MHz
Carrier Suppression	25 ± 5 °C	> 50 dBc
Sideband Suppression	25 ± 5 °C	> 50 dBc
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, 4 Msps, level ≤ 4 dBm, ALC off)		0.8 %, < 3GHz
		1.2 %, 3 GHz < freq < 5 GHz
<b>IQ Generator</b>		
Resolution		16 bit
Sample Rate		10 kHz to 180 MHz
Baseband Bandwidth		60 MHz
ARB Memory	Waveform Length	16 Msa
	Storage Capacity	16 GB

Trigger Type	free, single, gated
Trigger Source	external, trigger key
<b>Internal IQ Adjustment</b>	
IQ Offset	± 10 %
IQ Gain	± 6 dB
IQ Skew	max 30 ps to 100 ps
<b>External IQ Output</b>	
Impedance	50 Ohm per output
Maximum per Output	0.5 Vpk
Bandwidth	60 MHz
Common Mode Offset	± 1.25 V
Differential Mode Offset	± 50 mV
<b>External IQ Input</b>	
Bandwidth	60 MHz
Full Scale	±1 V into 50 Ohm
IQ Offset	± 10 % full scale
IQ Gain	± 6 dB
<b>Simultaneous Modulation</b>	
All modulation types (I/Q, FM, AM, ΦM, and pulse modulation) may be simultaneously enabled except: FM and phase modulation.	
<b>General Specifications</b>	
<b>General Specification</b>	
Power Source	AC 100 V to 240 V, 50 to 60Hz
Power Consumption	90 VA Maximum
Display	7-inch TFT LCD, 1024(RGB) x 600
Operating Temperature	0 °C to 50 °C
Storage Temperature	-10 °C to 70 °C
Humidity	85 % at 40 °C
Altitude	Up to 2000 m
Dimensions (W x H x D)	430 mm x 140 mm x 540 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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