GA4063 Spectrum Analyzer

User manual Version A.0

(Firmware version: V1.0.0.0)

GRATTEN TECHNOLOGY

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Trademark Acknowledgement

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Convention of the Safety Identification Signs

The following safety signs may appear in this manual. Before operating the instrument, get familiar with these signs and their meanings:

WARNING: It indicates a hazard. It warns the user to pay attention to some operating procedure, practice, or similar aspects. If you can not operate correctly or follow the rules, it may result in casualties. Before fully understanding or satisfying the conditions noted in the warning sign, do not go to the next step.

CAUTION: It indicates a hazard. It warns the user to pay attention to some operating procedure, practice, or similar aspects. If you can not operate correctly or follow the rules, you may cause product damage or data loss. Before fully understanding or satisfying the conditions noted in the caution sign, do not go to the next step.

Note: It indicates there is something that the user needs to pay special attention. It provides the user with the operation information and additional instructions which need the attention.

GA4063 Spectrum Analyzer Introduction

GA4063 is a portable spectrum analyzer with small size, light weight and high performance. It is provided with a keyboard layout which is easy to operate and a high-definition 8.5-inch TFT color LCD. The display interface contains the appropriate settings and prompt messages. The standard configuration or extensible USB, LAN and RS232 communication interfaces are provided and it is possible to display, control and make remote network access through a virtual terminal. The spectrum analyzer can be widely used in many fields such as education, science, enterprise R & D, industrial production and so on.

Main features:

- Frequency range: 9 kHz to 3 GHz
- Displayed average noise level (DANL) -148 dBm
- Phase noise value -95 dBc / Hz (offset 10 kHz)
- Frequency response error <1.0 dB
- Minimum resolution bandwidth (RBW) 1 Hz
- Standard preamplifier
- 3 GHz tracking source (optional)
- Extensive measurement capabilities and a variety of automatic setting functions
- 8.5-inch widescreen, clear and vivid interface, humanized operation
- Variety of connectivity: LAN \ USB Host \ USB Device \ RS232, easy to upgrade and integrate.
- Compact design with the weight less than 7 kg

Contents

Document Overview

This manual contains the following content:

1. Quick Start

This section describes the spectrum analyzer's front and rear panels, user interface, menu operation method, parameter input mode, notes for the first use, and the measurement demonstration to introduce its application method.

2. Function Guideline for the Front panel

This section provides the function descriptions about keys on the front panel according to its order and the detailed menu functions under each key.

3. Measurement Example

This section gives the example to introduce the function and use of the spectrum analyzer.

4. Remote Control

This section describes the remote control method of the spectrum analyzer.

5. Menu Map

This section describes the menu map corresponding to the function keys on the front panel of the spectrum analyzer alphabetically.

6. Performance Index

This section lists the technical indicators and the general technical specifications for the spectrum analyzer.

7. Appendix

This section provides the accessory details of the spectrum analyzer as well as the service and support information.

Relevant User Documentation for This Product:

The user documentation for this product includes the user manual and the programming manual.

1 Quick Start

3.0 GHz Spectrum Analyzer

This section describes the spectrum analyzer's front and rear panels, user interface, notes for the first use and measurement example demonstration.

The content of this section is as follows:

- Preparation before use
- The features of the front panel
- The features of the rear panel
- Menu operation
- Parameter input
- Simple measurement example
- Online help system

1 Quick Start

1-1 Preparation before use

1-1-1 Understand the Safety Precautions

The following safety precautions must be well known before use to prevent injury to personnel and damage to equipment.

- Use the proper power cord

  Only the nationally authorized dedicated power cord for this product can be allowed to use.

- Product grounding

  This product is grounded through the protective grounding wire of the power cable. To avoid electrical shock, before any input or output terminal being connected to the product, make sure the ground terminal of the power cable of this product and the protective ground terminal are reliably connected.

- Check the rated values of all terminals

  Check all the rated values and the marks on the product in order to avoid the impact of fire and excessive current. Please consult the product manual for further rated value information before making connections.

- Use proper overvoltage protection

  Make sure that no overvoltage (such as voltage caused by lightning) can reach the product. Otherwise the operator may have the risk of electric shock.

- No operations with cover open

  Do not run the product when the instrument chassis is open.

- Use proper fuse

  Only the specified fuse for this product can be used.

- Avoid circuit exposure

  After the power is turned on, do not touch the exposed connections and components.

- Do not operate with suspected failures

  If you suspect that there is any failure of this product, please contact the maintenance personnel authorized by Glarun ATTEN to check. Any maintenance, adjustment or parts replacement must be done by the personnel authorized by Glarun ATTEN.

- Keep proper ventilation

  Inadequate ventilation may cause temperature increasing and thereby cause damage to the instrument. Keep good ventilation when the product is in use and periodically check the vents and fans.

- Do not operate in a damp environment

  Do not operate the instrument in a damp environment to avoid the instrument internal short circuit or electric shock.

- Do not operate in an inflammable and explosive environment

  To avoid equipment damage or personal injury, do not operate the instrument in an inflammable and explosive atmosphere.

- Keep the product surface clean and dry

  Keep the product surface clean and dry to avoid the dust or air moisture affecting the instrument performance.

- Anti-static protection

  The static electricity can cause damage to the instrument, therefore try to test in the anti-static area. Before connecting cables to the instrument, make a brief grounding of the inner and outer conductors to discharge the static electricity.

- Protect the RF input port

  Do not bend or strike the DUT (such as filters, attenuators, etc.) connected to the spectrum analyzer; otherwise it will increase the load of the instrument port, which may result in the damage to the instrument. Secondly, do not mix connectors or cables of 50Ω and 75Ω.

- Do not overload the input terminal

  In order to avoid damage to the instrument, DC voltage component for the signals input to the RF input terminal shall not exceed 25V DC, the maximum continuous power for the AC (RF) signal component shall not exceed 30dBm (1W).

- Proper use of the power meter

  If the nature of the measured signal is not well understood, please use the following method to ensure the safe use of the spectrum analyzer: if there is an RF power meter, use it to measure the signal level. If there is not, connect a fixed external attenuator between the signal cable and the input terminal of the spectrum analyzer. In this case, select the maximum RF attenuation, span and reference level for the spectrum analyzer so as to display the signals which may be out of the screen.

- Get familiar with the usage conditions for the spectrum analyzer's technical indicators

  To ensure that all instrument performance indexes can reach the standard, please use the instrument in the specified conditions.

- Pay attention to the transportation safety

  To avoid instrument falling down during the transportation, which may result in damage to the buttons, knobs or interface components on the instrument panel, please pay attention to the transportation safety.

1-1-2 General Inspection

Please check according to the following steps before using the spectrum analyzer.

1. Check whether there is damage caused during transportation

Keep the damaged shipping package or cushioning material until the goods have passed the complete inspection as well as the electrical and mechanical tests. If the instrument is damaged due to the transportation, the shipper should contact with the carrier for compensation. Glarun Atten will not give free repair or replacement.

2. Inspect the complete machine

If there is mechanical damage or loss, or the instrument is not able to pass the electrical and mechanical tests, please contact your Glarun Atten distributor.

3. Check the accessories

For the accessory list provided together with the instrument, please refer to the section Appendix A: Options and accessories in this manual. If there is any content in the package is missing or damaged, please contact your Glarun Atten distributor.

1-1-3 Connection to the Power Supply

The spectrum analyzer can use AC power supply.

Please use the power cord provided in the accessories to connect the spectrum analyzer to AC power supply. For the requirements on the AC power supply voltage and frequency, please see the description in the section *The Features of the Rear Panel*.

 **Caution**	Please make sure that the equipment is properly grounded to avoid electrical shock.

1-1-4 Startup Check

Turn on the rear panel power switch, and then press the power button on the front panel to start the spectrum analyzer. There will be a startup screen and after about ten seconds, the frequency sweep curves will appear on the screen.

1-1-5 Auto-calibration

Press the “System” button on the front panel and select “calibration” on the menu and then select the “auto-calibration”. Use the calibration source within the system for self-correction.

1-1-6 Replace the Fuse

The power connector on the instrument is equipped with a fuse box.
The specifications of the fuse used for the instrument can be: 5 x 20mm, rated value: 1A, 250V.

If the fuse needs to be replaced, please use the fuse with the specified specifications and follow the steps below to replace:

1. Open the cover on the power connector.
2. Remove the fuse holder.
3. Replace the fuse.
4. Reinstall the fuse holder and close the cover.

1-2 The Features of the Front Panel

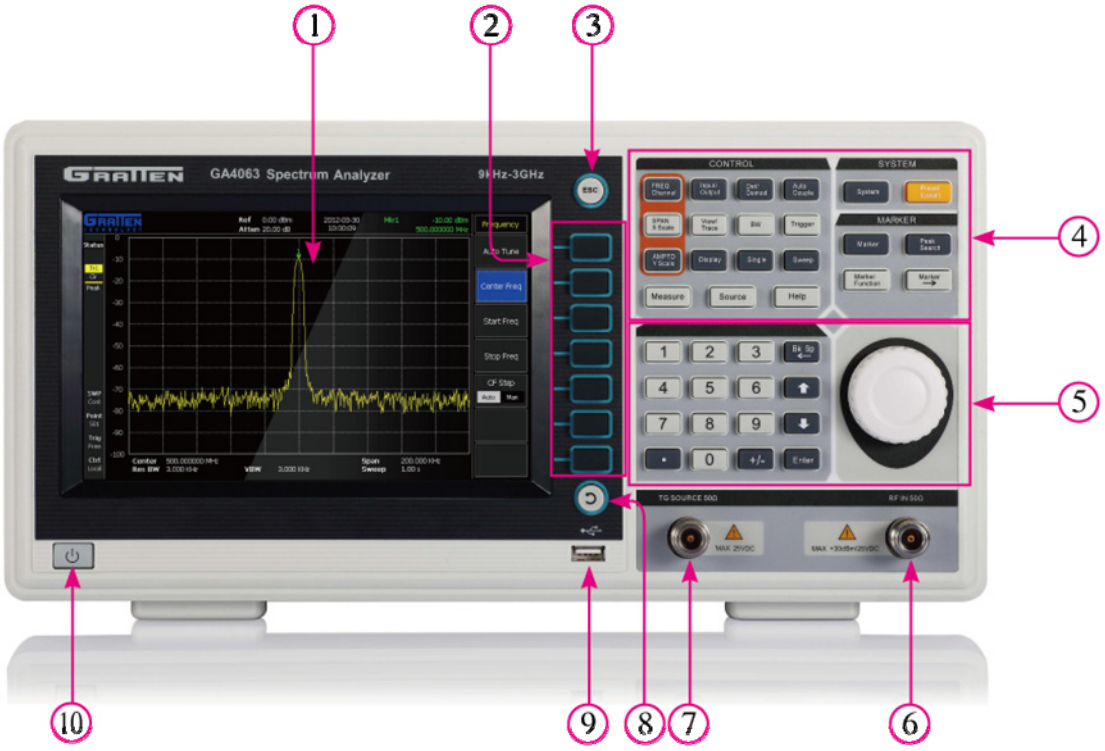


Figure 1-1 The view of the front panel

Table 1-1 Front Panel Description

Items		Description
No.	Name	
1	**LCD**	Display the instrument measurement information, parameters, status and operation tips.

2	**Menu option key**	The menu label is located on the left side of the menu key and it is used to identify the current function of each key. The function displayed is dependent on the currently selected mode and measurement and it is directly related to the recently used keys.
3	**ESC key**	If you have not pressed the unit key or the Enter key, ESC key is to exit the currently selected function without changing its value.
4	**Function keys area**	Set the current mode and the measurement parameters, set the display of the measurement data and control the function of the whole system.
5	**Parameter input / modification key area**	It is the current input or step value. The input is displayed in the measurement information area on the upper left of the screen.
6	**RF signal input interface**	The external signal input terminal. Make sure that the total signal power at the input terminal of the analyzer does not exceed +30 dBm (1W).
7	**Tracking source output interface**	Tracking source output 50Ω: the output of tracking signal source can be connected to the receiving device through the cable of the N male connector.
8	**RETURN key**	Back to the menu page last operated.
9	**USB HOST interface**	Standard USB1.1 port, type A. Connect the peripherals, such as mouse, USB removable memory.
10	**Power standby key**	Turn on the spectrum analyzer. The red backlit indicates the standby while the green backlight indicates that the instrument has been switched

		on. Note The standby key is not the AC power switch (disconnecting device).

1-2-1 Function Keys on the Front Panel

Figure 1-2 Function keys diagram

Table 1-2 Description of the function keys on the front panel

Function keys	Description
FREQ Channel	Set the center frequency, start frequency, stop frequency, etc.
SPAN X Scale	Set the sweep frequency range
AMPT Y Scale	Set the reference level, front-end attenuation and amplification, Y-axis scale type and unit
Measure	Advanced measurement function
Input/Output	Reference frequency selection
View/Trace	Trace setting

Display	Set the display line, grid
Source	Set the tracking source
Det/Demod	Detection setting
BW	Resolution bandwidth and video bandwidth setting
Single	Perform a single sweep and set the current sweep mode as single.
Auto Couple	Parameter automatic coupling
Trig	Trigger function setting
Sweep	Set the sweep type, sweep time and sweep points
Help	Open the help interface
System	System settings, such as interface language, date and time, boot mode, calibration, programmable interface configuration and so on.
Preset	Call the default configuration and revert the system to the default state
Marker	Open / close frequency marker and set frequency marker type.
PeakSearch	Implement the search function and configure the peak parameters.
MarkerFunction	Special measurement functions of the frequency marker, such as frequency count, phase noise
Marker→	Use the frequency or amplitude of the current frequency marker as the values for the other parameter s of the instrument.

1-2-2 Front Panel Interface

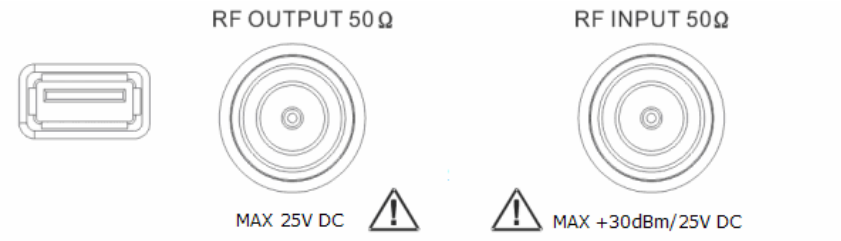


Figure 1-3 Front panel connectors

Table 1-3 Description of the front panel interface

Interface	Description
USB Host	Standard USB1.1 port, type A. Connect to the peripherals, such as mouse, USB removable memory.
RF OUTPUT 50Ω	Tracking source output 50Ω: The output of tracking signal source can be connected to the receiving device through the cable of the N male connector. The tracking source belongs to the options and it can be purchased by the user separately according to actual needs.
RF INPUT 50Ω	RF input 50Ω: RF input can be connected to the receiving device through the cable of the N male connector.

Caution	In order to avoid damage to the instrument, DC voltage component for the signals input to the RF input end shall not exceed 25V DC and the maximum continuous power for the AC (RF) signal component shall not exceed 30dBm (1W).

1-2-3 LCD user interface

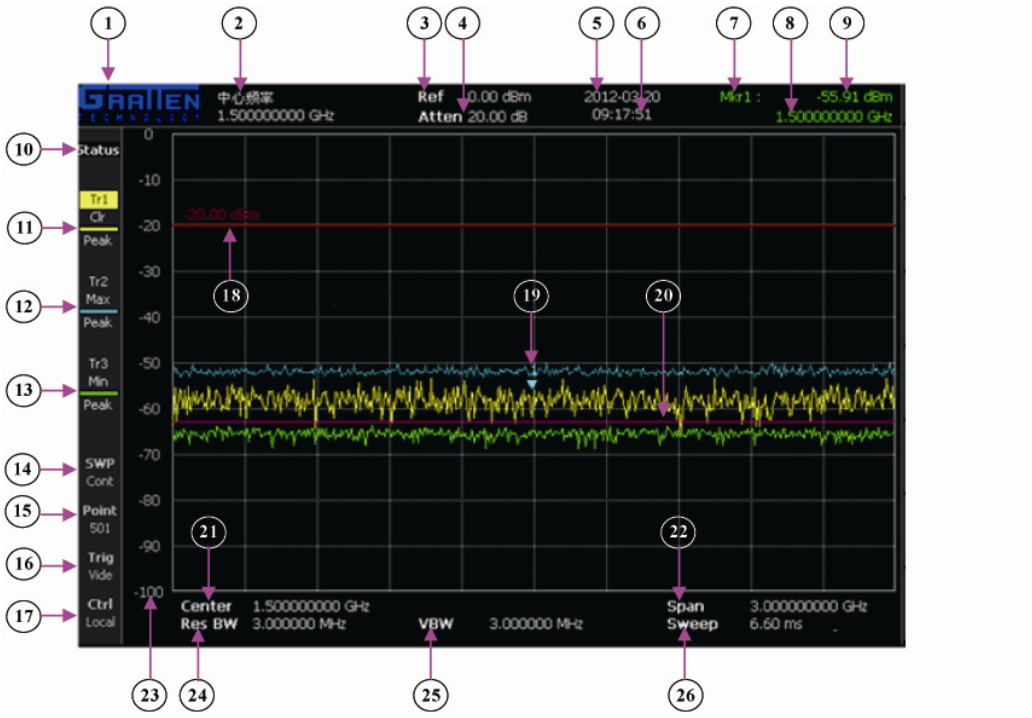


Figure 1-4 LCD user interface

Table 1-4 User Interface Description

No.	Name	Description
1	**LOGO**	Glarun Atten's LOGO
2	**Acvtive function area**	Current operating parameters and values
3	**Reference level**	The value of the reference level
4	**Attenuation**	Attenuation value
5	**System date**	Format: "YYYY-MM-DD"
6	**System time**	24-hour time format: "HH: MM: SS"
7	**Display area for the frequency marker**	Display the name and the number of the frequency marker. If you have more than one

		frequency marker, list them from top to bottom and the frequency marker above all is the current frequency marker.
8	**Frequency marker- Y value**	Amplitude value at the frequency marker
9	**Frequency marker-Y value**	Frequency value at the frequency marker
10	**Parameter status bar**	The parameters status bat on the left side of the status listing the current setting status of some system parameters
11	**The setting of Trace 1**	It indicates the current setting of trace 1, including the trace type, detection method, display color and whether it is the current trace. If the trace 1 is the current trace, it is highlighted. The “Tr1” in the figure above has the yellow background and the highlight means the trace 1 is the current trace.
12	**The setting of Trace 2**	The same as above. The color is cyan.
13	**The setting of Trace 3**	The same as above. The color is green.
14	**Sweep type**	It indicates the current sweep type: Cont-continuous, Sing-single
15	**Sweep points**	It indicates the current sweep points: 501/1001/2001
16	**Trigger type**	It indicates the current trigger type: Free-free trigger, level trigger, external trigger
17	**Programmed state**	It indicates whether the instrument is currently in a programmed state: Local-not programmed, Remote-programmed
18	**Display line**	Reference display line, marked with the corresponding amplitude value.
19	**Frequency marker mark**	It indicates the position of the frequency marker on the trace.
21	**Trigger level**	A horizontal line, indicating the position of the trigger level. It is only displayed in level trigger mode.

22/23	**Frequency range**	It indicates the current frequency sweep range and the form is center frequency / span or start frequency / stop frequency
24	**Scale of the Y axis**	The Y-axis scale, indicating the amplitude value corresponding to each of the Y-axis scale line. The unit is consistent with the reference level unit.
25	**Resolution bandwidth**	It indicates the value of the resolution bandwidth.
26	**Video resolution bandwidth**	It indicates the value of the video resolution bandwidth.
27	**Sweep time**	It indicates the value of the current sweep time. If the sweep time is inappropriate, there is a red dot in the front to prompt. The dot has two colors: red – the sweep time is too short, sweeping stops; yellow – the sweep time is less than the normal, the sweep data may not be accurate.

1-3 The Features of the Rear Panel

Figure 1-5 The view of the rear panel

Table 1-5 The description of the rear panel

No.	Interface	Description
1	**AC power connector (with fuse box)**	AC power type which can be connected: AC: 100 V - 240 V, 50/60/400Hz Fuse specifications: 5 × 20mm, rated value: 1A, 250V
2	**RS232 interface**	The spectrum analyzer can be remotely controlled through this interface.
3	**USB Device interface**	The spectrum analyzer can be used as "slave device" to connect with external USB devices.
4	**LAN interface**	The spectrum analyzer can be connected to the LAN via this interface for remote control. It is possible to quickly build a test system and achieve easy system integration.
5	**TRIGGER IN**	External trigger signal is input to the spectrum analyzer via BNC cable
6	**10MHz IN**	Reference clock input is realized via BNC cable connection.
7	**10MHz OUT**	Reference clock output is realized via BNC cable connection.

1-4 Keys and Menu Operation

1-4-1 The Key Type Overview

- The keys on the front panel are divided into function keys, menu keys and numeric input / adjusting keys. The numeric input keys will not be described in this section.
- There is English text on the function keys for prompt the related information. The menu keys are located at the right side of the LCD and there is no text on them.
- Majority of the front panel function keys can be pressed to have access to the function menu displayed on the right of the display screen.
- The content listed by the menu keys is the last accessed function via the front panel key. It also depends on the selected measurement mode and application currently.
- If the function value of the menu keys can be modified, then it can be considered as the current function. After the function keys are selected, the function menu of the current function will be highlighted and the relevant information will also be displayed in the active function area in the upper left corner.
- For some menu keys, there are multiple choices on their tabs, such as on / off or Auto / Man. Different choices can be made through several time of key selection.

1-4-2 Menu Structure

A menu bar consists of the title and seven menu items and the selection can be made through the menu software key on the right of the screen.

If a menu corresponds to a sub-menu, then the selection of this menu will switch to the next level of sub-menu bar.

1-4-3 Menu Type and Operation Method

The menu items have 6 types with different implementation and operation methods, as shown in the following table

Type	Operation method
Parameter input	Select the corresponding menu item and the parameter values can be changed through the digital input of the keyboard.
Enter the next level of the submenu	Select the corresponding menu item to enter its submenu.
Function switch	Select the corresponding menu item and you can switch to its sub-options. For example, the sub-option is "on / off".
Function Switch + input parameters	Select the corresponding menu item to switch the sub-option of the menu items. When you switch to the specific sub-option, the parameter value can be changed through the digital input of the keyboard. For example, the sub-option is “Auto / Man", usually when it is set to "Man", the parameter can be changed.
Options	The menu item belongs to one of a set of attributes. Select the corresponding menu item and set the corresponding specific attributes. For example, select the menu item “Max Hold” in the Trace menu bar, then the current trace type is set as the maximum hold.
Specific function	Select the corresponding menu item to perform a specific function. For example, select the item Peak in the menu bar, then a peak search will be performed.

1-4-4 The Descriptors for Function Keys and Menu Key as well as the Method

In this manual, the following layout characters are used to describe two kinds of keys:

Function key	***Format:*** key character + text box, corresponding to the hard key on the front panel *For example*， FREQ means the FREQ function key.
Menu	***Format:*** menu text + character shading, corresponding to the menu soft key. *For example*， Center Frequency represents the center frequency menu items of the FREQ function key.

This manual will describe the operation sequence of the keys in the following manner :

FREQ \ Center Frequency	It indicates that fist press the function key “Freq” then the menu soft key “Center Frequency”. If the menu has multiple levels, use "\" for separation.

1-5 Parameter Input

Parameter direct input can be achieved through the numeric keypad.
Parameter adjusting can be done by using the arrow keys and knobs.

1-5-1 Numeric Keypad

- **Numeric keys**

  Numeric keys 0 to 9 are used for direct number input.

- **Decimal point**

  Input a decimal point.

- **Symbolic key**

  It is used to change the plus and minus of the parameter.

- **Enter**

  End the parameter input, and add default units for the parameter.

- **BKSp**

  Delete one character forward. If all the characters are deleted, then it will exit the parameter input state.

1-5-2 Arrow keys

It is used to increase or decrease the parameter according to a certain step during the parameter input.
The up arrow means to increase and the down arrow means to decrease.

1-5-3 Knobs

It is used to increase or decrease the parameter according to a certain step during the parameter input.

The clockwise direction means to increase and counterclockwise direction means to decrease.

1-5-4 Usage distinction between Arrow Keys and Knobs

1. The arrow keys and the knobs are both used to increase and decrease the parameter, but the step value is usually different. Generally the step value for the knobs is less than that for the arrow keys. Therefore, the knobs are generally used for minor adjusting while the arrow keys are used for major adjusting.

2. For the particular parameter, the step value of the knobs is usually fixed. For the arrow keys, the step value is usually different for each time, such as the step"1-2-5", so you can quickly adjust the parameters.

1-6 A Simple Measurement Example

Here a simple measurement example is given to describe the basic measurement methods and steps of GA4063.

Test content: the 1GHz signal amplitude output through the test signal source of the spectrum analyzer.

Instrument: one signal generator (GA1484) and one spectrum analyzer (GA4063).

Preparation: connect the signal output terminal of the signal generator to the RF INPUT terminal on the front panel of GA4063.

Test steps:

1. Press the power button in the lower left corner of the front panel to start the spectrum analyzer (in this case, the power button backlight will turn from red to green), and wait until the system initialization is complete.

2. Press the key **Preset** in the upper right corner of the panel to recover the instrument parameters to the default settings.

3. Set the center frequency :

1) Press **FREQ** to start the frequency setting menu.
2) Press the menu key on the right of the menu item the **Center Frequency** to select the center frequency parameters. At this moment, the menu item **Center Frequency** will be highlighted and the parameter value of the center frequency will be displayed in the active function area in the upper left corner of the screen (see the area 2 in Figure 1-4 LCD user interface).
3) Use the numeric keypad to enter 500 and the menu bar will switch to the frequency unit selection menu. Use the menu key to select the "MHz", then the center frequency is set as 500MHz.

4. Set the span :

1) Press **SPAN** to open the span setting menu
2) Press the menu key on the right of the menu item **Span** to select the span parameters. At this moment, the menu item **Span** will be

highlighted and the parameter value of the span will be displayed in the active function area in the upper left corner of the screen (see the area 2 in Figure 1-4 LCD user interface).

3) Use the numeric keypad to enter 200 and the menu bar will switch to the frequency unit selection menu. Use the menu key to select the "MHz", then the center frequency is set as 200MHz.

5. Set the reference level:

1) Press **AMPT** to open the amplitude setting menu
2) Press the menu key on the right of the menu item **Reference Level** to select the span parameters. At this moment, the menu item **Reference Level** will be highlighted and the parameter value of the reference level be displayed in the active function area in the upper left corner of the screen (see the area 2 in Figure 1-4 LCD user interface).
3) Use the numeric keypad to enter 0 and the menu bar will switch to the amplitude unit selection menu. Use the menu key to select "dBm" and the reference level is set as 0dBm. The reference level corresponds to the value of the first scale line at the top of the grid.

6. Set the resolution bandwidth

1) Press **BW** to open the resolution bandwidth setting menu.
2) Press the menu key on the right of the menu item Resolution Bandwidth to select the resolution bandwidth. At this moment, the menu item of Resolution Bandwidth will be highlighted and the parameter value of the resolution bandwidth will be displayed in the active function area in the upper left corner of the screen (see the area 2 in Figure 1-4 LCD user interface).
3) Use the numeric keypad to enter 3 and the menu bar will switch to the frequency unit selection menu. Use the menu key to select the "MHz", then the resolution bandwidth is set as 3KHz.
4) With reference to the above step (2) and (3), set the video bandwidth as 3KHz.

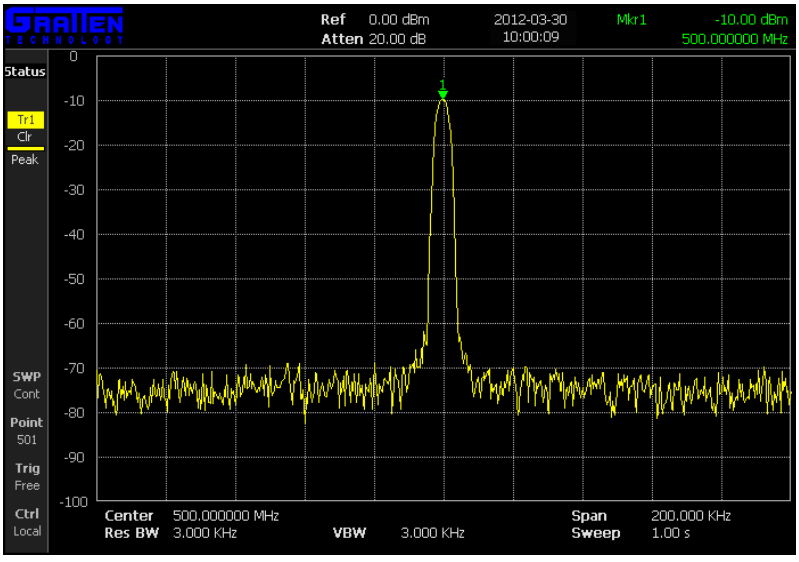
7. Set the frequency marker:

1) Press **Marker** to open the cursor setting menu.
2) Press the menu button on the right of the menu item **Frequency**

Marker 1 to select the frequency marker 1. At this moment, the menu item **Frequency Marker 1** will be highlighted. Then press the menu key again to set the frequency marker 1 as enabled.

3) Use the numeric keypad to enter 500, the menu bar will switch to the frequency unit selection menu. Use the menu key to select the "MHz", then the frequency marker is set as 500MHz.

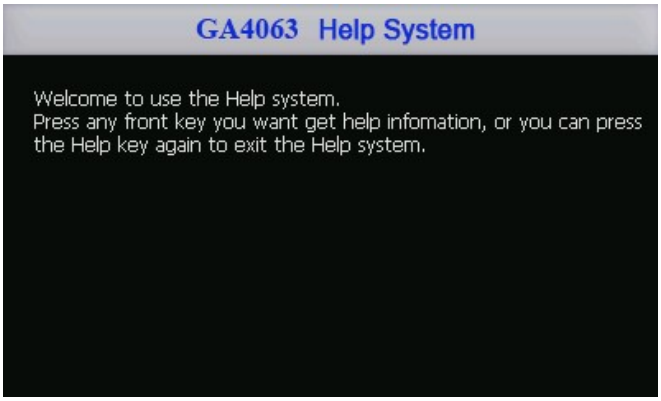
8. Turn on the signal generator, set the output signal frequency as 500MHz, amplitude as -10dBm and switch on the signal output.



After the above steps, on the spectrum analyzer there will be a 500MHz spectrum curve. In the frequency marker display area in the upper left corner, there will be the amplitude value corresponding to the frequency marker 1(see the area 9 in Figure 1-4 LCD user interface).

1-7 Online Help System

The online help system provides the help information about each function key and menu key on the front panel. The user can read the information at any time when operating the instrument. The help system interface is shown as follows:



1. Open the help system

Press down the key **Help** on the front panel and then there will be the help system interface appearing in the center of the screen.

2. Close the help system

In the case the help system is open, press **Help** again to close the help system.

3. Getting help

If the help system is open, press any function key or menu selection key on the front panel, the help system will display the help information about the corresponding function and menu item.

Note: when the help system is open, the digital input function is not available and there will be no response if pressing the digital input on the front panel.

GA4063

2

Function Guide for the Front Panel

3.0 GHz Spectrum Analyzer

This section gives the detailed description about the function keys and the menu functions for the front panel of the GA4063 spectrum analyzer.

The content of this section are as follows:

- Basic Setting
- Sweep Setting
- Frequency marker setting
- Function setting
- Advanced measurement
- System Function

2 Function Guide for the Front Panel

2-1 Basic Setting

2-1-1 FREQ

Set the analyzer frequency parameters. The spectrum analyzer will make the frequency sweep within the set frequency range. Whenever the frequency parameter is changed, the frequency sweep will be re-started.

There are two ways to indicate the frequency range of the current measurement for the spectrum analyzer: start frequency / stop frequency, center frequency / span.

If any of the four parameters is adjusted, the other three parameters should be adjusted correspondingly in order to satisfy the coupling relation between them:

Center frequency **=** (start frequency + stop frequency) / 2

Span **=** stop frequency - start frequency

2-1-1-1 Automatic Capture

Perform the peak search but do not open the frequency marker. Set the frequency corresponding to the peak as the center frequency and set other appropriate parameters (such as the span, reference level, attenuation and resolution bandwidth and so on) as to achieve a better display effect.

Automatic capture function helps to make the convenient signal search and skip the steps in the manual setting of the parameters.

2-1-1-2 Center Frequency

Set the center frequency of the current channel. When this key is pressed down, the representation of the frequency range is changed into center frequency / span. The center frequency and the span will be displayed at the left and right bottom of the grid respectively.

Important notes:

- To modify the center frequency, the start and stop frequencies will be automatically changed while the span will be maintained as the same.
- To modify the center frequency is equivalent to parallelly move the current channel. The adjustable range is limited by the given frequency range.
- In the zero span mode, the start frequency, the stop frequency and the center frequency are of the same value and they will be modified together.
- You can use the number keys, knobs and arrow keys to modify the parameters. For the specific method, please refer to the section Parameter Input.

Parameter	Description
Default value	1.5GHz
Range	0 ~ 3GHz
Unit	GHz、MHz、KHz、Hz
Konb step	Span> 0, step = span / 200; Span = 0, step = resolution bandwidth / 100 Minimum 1Hz
Arrow key step	IF step

2-1-1-3 Start Frequency

Set the start frequency of the current channel. When this key is pressed down, the frequency input mode is: start / stop frequency. The start frequency and the stop frequency will be displayed at the left and right bottom of the grid respectively.

Important notes:

- The modification of the start frequency will cause the change of the span and center frequency, and the change of the span will affect the other system parameters. For more information, please see the section ***Span***.

- In the zero span mode, the start frequency, the center frequency and the stop frequency are of the same value and they will be modified together.
- You can use the number keys, knobs and arrow keys to modify the parameters. For the specific method, please refer to the section ***Parameter Input***.

Parameter	Description
Default value	0GHz
Range	0Hz ~ 3GHz
Unit	GHz、MHz、KHz、Hz
Knob Step	Span> 0, step = span / 200; Span = 0, step = resolution bandwidth / 100 Minimum 1HzSpan> 0, step = span / 200;
Arrow Key Step	IF step

2-1-1-4 Stop Frequency

Set the Stop frequency of the current channel. When this key is pressed down, the frequency input mode is: start / stop frequency. The start frequency and the stop frequency will be displayed at the left and right bottom of the grid respectively.

Important notes:

- The modification of the stop frequency will cause the change of the span and center frequency, and the change of the span will affect the other system parameters. For more information, please see the section ***Span***.
- You can use the number keys, knobs and arrow keys to modify the parameters. For the specific method, please refer to the section ***Parameter Input***.

Parameter	Description
Default value	3GHz
Range	0Hz ~ 3GHz
Unit	GHz、MHz、KHz、Hz
Knob Step	Span> 0, step = span / 200; Span = 0, step = resolution bandwidth / 100 Minimum 1HzSpan> 0, step = span / 200;
Arrow key Step	IF step

2-1-1-5 IF step

It is used to change the step value of the center frequency. Use the fixed step value to modify the center frequency.

Important notes:

- IF step setting is divided into two modes, "manual" and "automatic". When the IF step is in the automatic setting mode and if it is non-zero span, the IF step is 1/10 of the span. If it is zero span, the IF step size is equal to the RBW. When the IF step is in the manual mode, the value can be input via the numeric keys.
- You can use the number keys, knobs and arrow keys to modify the parameters. For the specific method, please refer to the section ***Parameter Input***.

Parameter	Description
Default value	300MHz
Range	1Hz ~ 3GHz
Unit	GHz、MHz、KHz、Hz
Knob Step	Span> 0, step = span / 200; Span = 0, step = resolution bandwidth / 100 Minimum 1Hz
Arrow key Step	1-2-5

2-1-2 SPAN

2-1-2-1 Span

Set the frequency range of the current channel. When this key is pressed down, the frequency input mode is: center frequency / span. The values of the center frequency and the span will be displayed at the left and right bottom of the grid respectively.

Important notes:

- To modify the span, the start and stop frequencies of the spectrum analyzer will be automatically modified.
- When the span is manually set, the minimum can be set to 100 Hz (the only way to enter the zero-span mode is to press down the menu Zero Span). For the maximum settable value, please refer to the specifications in the performance index. When the span is set to the maximum, the spectrum analyzer gets into a full-span mode.
- If the span is modified in the non-zero span mode and if the IF step and the RBW is in the automatic mode, the IF step and the RBW will be automatically modified. The modification of the RBW will cause the change of the VBW (when in automatic mode).
- Any changes on the span, RBW and VBW will cause the change of the sweep time.
- The invalid functions in non-zero span mode: video trigger, setting the cursor readings countdown.
- You can use the number keys, knobs and arrow keys to modify the parameters. For the specific method, please refer to the section ***Parameter Input***.

Parameter	Description
Default value	3GHz
Range	100Hz ~ 3GHz 或 0Hz
Unit	GHz、MHz、KHz、Hz
Knob Step	Step=span/200； The minimum is 1Hz
Arrow key Step	1-2-5

2-1-2-2 Full Span

Set the span of the spectrum analyzer as the maximum.

2-1-2-3 Zero Span

Set the span of the spectrum analyzer as 0 Hz. Here, the start and stop frequencies are equal to the center frequency, and the horizontal axis is the time coordinate. What the spectrum measures are the time domain characteristics of the amplitude at the frequency point corresponding to the input signal.

Important notes:

What the zero span mode displays is the time domain characteristics of the fixed-frequency components of the signal. There are a lot of differences from the non-zero span mode. The following functions are invalid under the zero-span mode:

- The "Narrow" and "Enlarge" in SPAN.
- Frequency marker -> center frequency, Frequency marker -> start frequency, frequency marker -> stop frequency in MarkerTo.

2-1-2-4 Previous Span

Set the span as the one last modified.

2-1-2-5 Span Narrowing

Set the span as twice of the current span.

2-1-2-6 Span Enlarging

Set the span as half of the current span.

2-1-3 AMPT

Set the amplitude parameters of the spectrum analyzer. By adjusting these parameters, the measured signal can be displayed in the current window with easy observation and minimized measurement errors.

2-1-3-1 Reference Level

Set the maximum power or voltage value which can displayed in the current window (corresponding to the scale values of the first horizontal line on the top of the grid) and the value will show in the top middle of the screen.

Parameters	Description
Default value	0dBm
Range	-100dBm ~ 30dBm
Unit	dBm、-dBm、mV、uV
Knob Step	1dBm
Arrow key Step	10dBm

2-1-3-2 Input Attenuation

Set the RF frontend attenuator so that the signal can pass through the mixer with low distortion (small signal can be with low noise).

Parameter	Description
Default value	20dB
Range	0dB ~ 50dB
Unit	dB
Knob Step	10dB
Arrow key Step	10dB

2-1-3-3 Preamplification

Set the switch of the RF frontend amplifier. When the measured signal is small, to open the preamplifier can reduce the average display noise level so that the small signal can be identified from the noise. Note that the preamplifier can only be enabled when the reference level ≤-50dBm.

2-1-3-4 Scale Type

Select the scale type of the vertical axis as the linear scale or the logarithmic scale and the default is the logarithmic scale.

2-1-3-5 Scale / Grid

Select the scale size for each grid of the longitudinal axis. Only 1dB, 2dB, 5 dB, 10dB and 20dB can be selected.

2-1-3-6 Y-axis unit

Set the longitudinal axis unit as dBm, dBmV, dBuV, Volts or Watts, in which DBm, dBmV, dBuV are the logarithmic unit while Volts and Watts are the linear unit. The default value is dBm.

2-2 Frequency Sweep Setting

2-2-1 BW

Set the parameters related to the RBW (resolution bandwidth) and the VBW (video bandwidth) for the spectrum analyzer.

2-2-1-1 Resolution Bandwidth

Set the resolution bandwidth to distinguish between two similar frequency signals.

Important notes:

- When the RBW decreases, higher frequency resolution can be obtained. But it can also lead to prolong the sweep time (when the sweep time is automatic, it is affected by both RBW and VBW).
- When the RBW is in automatic mode, it will decrease with the decreasing of the span non-zero span).

Parameter	Description
Default value	3MHz
Range	1Hz ~ 3MHz
Unit	GHz、MHz、KHz、Hz
Knob Step	1-3-10
Arrow key Step	1-3-10

2-2-1-2 Video Bandwidth

Set the video bandwidth to filter out the video OOB noise.

Important notes:

- If the VBW is decreased, the spectrum will become smoother, which would make the small signals distinguished from the noise. But it can also lead to prolong the sweep time (when the sweep time is automatic, it is affected by both RBW and VBW).

- When the VBW is automatic, it will changes with the RBW while when it is in manual mode, it will not affected by the RBM.

Parameter	Description
Default value	3MHz
Range	1Hz ~ 3MHz
Unit	GHz、MHz、KHz、Hz
Knob Step	1-3-10
Arrow key Step	1-3-10

2-2-1-3 VBW/ RBW

Set the ratio of VBW to RBW.

Important notes:

- Choose the VBW/ RBW ratio according to different kinds of signals.
- When measuring the sinusoidal signal, generally choose 1 ~ 3 (to get faster sweep time).
- When measuring the pulse signal, select 10 (reduce the impact on the amplitude of the transient signal).
- When measuring the noise signal, generally select 0.1 (to get the mean value of the noise).
- You can use the number keys, knobs and arrow keys to modify the parameters. For the specific method, please refer to the section ***Parameter Input.***

Parameter	Description
Default value	0.33
Range	0.000033 ~ 3000000.00
Unit	None
Knob Step	Not supported
Arrow key Step	Not supported

2-2-1-4 Span/ RBW

Set the ratio of Span to RBW

Parameter	Description
Default value	100
Range	0.000033 ~ 3000000000.00
Unit	None
Knob Step	Not supported
Arrow key Step	Not supported

2-2-2 Sweep

Set the sweep-related parameters: sweep time, automatic sweep time, sweep mode, sweep times and sweep points.

2-2-2-1 Sweep Time

Set the time of the spectrum analyzer to finish one sweep within the span. The sweep time can be set in automatic or manual mode. The default is automatic.

Important notes:

- In case of non-zero span, choose the automatic setting. The spectrum analyzer will choose the shortest sweep time according to the current settings of RBW, VBW and so on.
- Reducing the sweep time can improve the measuring speed. But if the sweep time is set less than the shortest sweep time for the automatic coupling, it may lead to measurement error. If the sweep time is set inappropriate, there will be one dot in front of the sweep time parameter prompt at the bottom of the grid. The dot has two colors: red – too short sweep time and the sweep data is not reliable; yellow – short sweep time and the sweep data may be not accurate.
- You can use the number keys, knobs and arrow keys to modify the parameters. For the specific method, please refer to the section ***Parameter Input***.

Parameter	Description
Default value	27ms
Range	2ms~3000s (100us~3000s in case of zero span)
Unit	s、ms
Knob Step	1-2-5
Arrow key Step	1-2-5

2-2-2-2 Continuous Sweep

Set the current sweep mode as continuous sweep mode. Then the SWP property in the parameter status bar on the left side of the screen will change to Cont.

2-2-2-3 Single Sweep

Set the current sweep mode as single sweep mode and trigger one sweep. Then the SWP property in the parameter status bar on the left side of the screen will change to Sing.

Note: The same result can be realized if pressing the key **Single** on the front panel.

2-2-2-4 Sweep Points

Set the number of data obtained by each sweep and there are 3 options, 501/1001/2001. Then the Point property in the parameter status bar on the left side of the screen will change to the set value.

The sweep points will affect the sweep time. More points, more time needed for the sweep.

2-2-3 Trig

Set the trigger type for the spectrum analyzer and other relevant parameters.

2-2-3-1 Free Trigger

The trigger condition is met at any time. That is to say the trigger signal can be

generated continuously. Then the Trig property in the parameter status bar on the left side of the screen will change to Free.

2-2-3-2 Level Trigger

When the detected signal voltage exceeds the set video trigger level, the trigger signal will be generated. In the mode of non-zero span, “effective value averaging” or “voltage averaging”, this trigger method is not usable. Then the Trig property in the parameter status bar on the left side of the screen will change to Vide.

The trigger level value can be set by selecting the menu item of **Trigger Level**.

2-2-3-3 External Trigger

Input an external (TTL signal) through the TRIGGER IN connector on the rear panel and the trigger signal will be generated when this external signal satisfies the set conditions of trigger edge.

2-2-3-4 Trigger Level

When the level trigger mode is selected, you can set the trigger level here. If it is not the level trigger mode, this menu item is not usable.

Parameter	Description
Default value	-20dBm
Range	The current range of the grid vertical axis
Unit	dBm
Knob Step	1dBm
Arrow key Step	Not supported

2-2-3-5 Trigger Edge

Set the trigger edge in the external trigger mode as the rising or falling edge of the pulse.

2-2-3-6 Trigger Delay

Enable or disable the trigger delay function.

2-2-4 Single

Set the current sweep mode as single sweep mode and trigger one sweep. Then the SWP property in the parameter status bar on the left side of the screen will change to Sing. The function is the same as **Sweep** -> **Single Sweep**

2-2-5 Auto Couple

Change all the parameters with “auto / manual” setting mode into the auto mode.

2-3 Frequency Marker setting

2-3-1 Marker

The marker is an inverted triangle mark used to mark the point on the trace. Through the marker, the amplitude and the frequency of the specified trace point can be read.

2-3-1-1 Frequency Marker 1

Open / close frequency marker 1. When the frequency marker is open, there will be an inverted triangle with the number 1 on the trace for marking. At the same time, the current frequency and the amplitude at the position of marker 1 will be displayed in the marker display area on the left top of the grid. The position of the frequency marker (frequency) can be changed through the numeric keypad, arrow keys and the knobs.

2-3-1-2 Frequency Marker 2

Refer to the description about the frequency marker 1.

2-3-1-3 Frequency Marker 3

Refer to the description about the frequency marker 1.

2-3-1-4 Frequency Marker 4

Refer to the description about the frequency marker 1.

2-3-1-5 Normal State

The default type of frequency marker is the normal state, used to measure the frequency and amplitude of some trace point.

2-3-1-6 Difference Value

Difference marker is used to measure the frequency and amplitude difference between two trace points. These two points are marked with a pair of triangle (one

upright and one inverted, with the same number), respectively called as reference frequency marker and difference frequency marker. The frequency and the amplitude values of the difference maker will be displayed in the marker display area on the right top of the grid.

2-3-1-7 Close Frequency Marker

Close all opened frequency markers.

2-3-2 Marker →

2-3-2-1 Frequency Marker Selection

Select a marker as the current frequency marker. The current marker will be displayed at the top of the marker display area in the upper left corner of the grid.

2-3-2-2 Frequency Marker -> Center Frequency

Set the frequency at the current frequency marker as the center frequency.

2-3-2-3 Frequency Marker-> Start frequency

Set the frequency at the current frequency marker as the start frequency.

2-3-2-4 Frequency Marker -> Stop Frequency

Set the frequency at the current frequency marker as the stop frequency.

2-3-2-5 Frequency Marker -> Reference Level

Set the amplitude at the current frequency marker as the value of the reference level.

2-3-3 Peak Search

2-3-3-1 Frequency Marker Selection

Select a marker as the current frequency marker. The current marker will be displayed at the top of the marker display area in the upper left corner of the grid.

2-3-3-2 Peak

Search the trace point with the largest amplitude within the current frequency range and move the current frequency marker here. If there is no marker opened at this moment, the default opened one is the frequency marker 1.

2-3-3-3 Secondary Peak

Search the peak with the amplitude only less than the current peak and it also must meet the search parameter conditions. Mark it with frequency marker.

2-3-3-4 Left Peak

Search the closest peak on the left side of the current peak and it also must meet the search conditions. Mark it with frequency marker.

2-3-3-5 Right peak

Search the closest peak on the right side of the current peak and it also must meet the search conditions. Mark it with the frequency marker.

2-3-3-6 Minimum amplitude

Search the trace point with the minimum amplitude and mark it with the frequency marker.

2-3-3-7 Peak Tracking

Enable or Disable peak tracking and the default is as disabled. When the peak tracking is enabled, after each sweep, the spectrum analyzer will automatically execute a peak search for tracking measurement signal.

2-3-3-8 Search Parameters

Open the peak search parameter setting submenu. Search parameters will define the conditions for the various peak searches. The value which can meet the

conditions of the “Peak offset” and “Peak Limit” simultaneously can be considered as the peak.

Peak Offset

Specify the difference value between the peak and the minimum amplitude value on the left and right sides. Only when the difference value is larger than the set peak offset can it be considered as the peak.

Peak Limit

Specify the minimum amplitude for the peak. Only when it is greater than the peak limit can it be considered as the peak.

2-3-3-9 Peak-peak Search

Perform the peak search and the minimum search at the same time and mark them with the frequency marker pair. The peak search result is marked with the difference frequency marker and the minimum search result is marked with the reference frequency marker.

2-3-4 Marker Function

The special measurement functions of the frequency marker: frequency count and phase noise.

2-3-4-1 Frequency Count

Switch on or off the frequency counter.

If there is no active frequency marker currently, after opening the frequency counter, there will be one marker in “Normal State ” automatically opened.

2-3-4-2 Phase Noise

Phase noise measurement setting.

Phase noise setting includes the enabling / disabling of the phase noise measurement function and the phase noise frequency setting.

2-4 Function Setting

2-4-1 View/Trace

The sweep signal is displayed through the trace on the screen. This menu can be used to set the relevant parameters of the trace. Up to three trace lines can be displayed simultaneously and each trace line has a different color (trace 1 – Yellow; trace 2 – Cyan; trace 3 - green). The current trace setting will be displayed in the parameter status bar on the left side of the screen. For more details, see the items 11-13 in 1.4 User Interface.

2-4-1-1 Trace Selection

Select trace 1, 2, or 3 in order to set the corresponding trace parameters. The selected one by default is trace 1. Open the trace and the trace type is “Clear writing”. The currently selected trace will be highlighted and displayed in the parameter status bar on the left side of the screen and the highlighted background color is the same as the trace color.

2-4-1-2 Clear Writing

Each trace point takes the data after real-time sweep.

2-4-1-3 Minimum Hold

Each trace point keeps displaying the maximum value among the several sweeps and the newly swept maximum date will be updated for displaying.

2-4-1-4 Maximum hold

Each trace point keeps displaying the maximum value among the several sweeps and the newly swept maximum date will be updated for displaying.

2-4-1-5 View

Stop updating the trace data in order to observe and get readings. The default type of the trace loaded into the system from a storage device or remote is view.

2-4-1-6 Close

Close the displaying of the trace as well as all of the trace-based measurement functions.

2-4-1-7 Video Averaging

The averaging result of the data displayed by the trace after several times of sweep. This kind of trace is smoother than others.

2-4-1-8 Averaging Times

Set the averaging computing times in the video averaging mode.

2-4-1-9 Trace Computing

It is allowed to select one or two traces for arithmetic operations and the operation result will be displayed on the specified trace.

2-4-2 Det/Demond

The detection function setting.

2-4-2-1 Detection Method

When a large span is displayed, one pixel point contains the spectrum information of the relatively large sub-segment, that is more than one sampling point will fall on own pixel point. By setting the detection method of the detector, you can decide what sampling value the pixel point contains.

The spectrum analyzer supports the following four detection methods:

- **Positive peak**

  The detector selects the maximum value in the sampling data segment to display at the corresponding pixel point.

- **Negative peak**

The detector selects the minimum value in the sampling data segment to display at the corresponding pixel point.

- **Sampling detection**

  The detector selects the arbitrary value in the sampling data segment to display at the corresponding pixel point.

- **Normal detection**

  The detector selects the minimum and the maximum values in the sampling data segment to display at the corresponding pixel point. The normal detection can help to visually observe the signal amplitude range.

2-4-3 Input/Output

Signal input and output setting.

2-4-3-1 Reference Frequency

Select the internal or external reference clock and the default is internal clock. The reference clock is used to synchronize all the clocks within the test system so as to reduce the frequency error.

- **The internal**

  Use the internal clock source as the reference clock. At the same time, output the 10MHz clock signal from the “10MHz OUT” interface on the rear panel of the instrument to synchronize the other devices.

- **The external**

  Use the external 10MHz reference clock as the reference clock. The external 10MHz reference clock can be output from the “10MHz OUT” interface on the rear panel of the instrument.

2-4-4 Source

Tracking source related setting.

2-4-4-1 Tracking Source

Enable or disable the tracking source output.

Note: When the span is small (less than 10KHz) or the RBW is small (less than 100Hz), the tracking source will not make sweep frequency output but only output a point frequency.

2-4-4-2 Tracking Source Amplitude

Set the output amplitude of the tracking source with the range from -25dBm to 0dBm.

2-4-5 Display

Screen display-related setting.

2-4-5-1 Display Line

Enable and disable the display line function.

Display line function is used to display a horizontal reference line in the grid to assist the user for measurement. When the display line is opened, its position can be set through the numeric keypad.

2-4-5-2 Grid

Enable or Disable the grid display.

2-5 Advanced measurement

2-5-1 Measure

The supported measurement types of the spectrum analyzer: channel power, adjacent channel power, occupied bandwidth and harmonic distortion.

2-5-1-1 Measurement Setting

Measurement setting is used to set the parameters of different measurement types. It can also be used to select the measurement type. When getting into the setting menu of some type of measurement, it means to switch this measurement type as the current measurement type.

1. Channel power

It is used to measure the power and power density of the specified channel bandwidth. There are the following parameters:

- *Averaging times:* the times to average the measurement result
- *Averaging mode:* “Index” or “repeat”. The former is to do index averaging and the latter is to do arithmetic averaging
- *Integral bandwidth:* channel width to be measured
- *Channel span:* it equals to the span under the Span menu

2. Adjacent channel power

It is used to measure the power of the main channel, the power of the adjacent channels as well as the power difference between the adjacent channel and the main channel. There are the following parameters:

- *Averaging times*
- *Averaging mode*
- *Main channel bandwidth:* the width of the main channel
- *Adjacent channel bandwidth:* the width of the adjacent channel

- *Channel spacing:* the difference between the center frequency of the main channel and that of the adjacent channel

Note: the center frequency of the main channel is the same as the center frequency under the Freq menu.

3. Occupied bandwidth

Get the occupied bandwidth within the span of the power according to the specified power ratio. The channel center frequency corresponding to the bandwidth is the same as the center frequency of the spectrum analyzer. There are the following parameters:

- *Averaging times*
- *Averaging mode*
- *Maximum Hold*
- *Span:* the same span as that of the spectrum analyzer
- *Power ratio: The percentage of the set channel power in the entire span power*

X dB: This function is used to measure the XDB bandwidth of the signal. XdB bandwidth refers to the frequency difference between the two points where the current cursor frequency point falls or rises for about XdB amplitude on the left and right.

4. Harmonic distortion

Measure the harmonic power of the carrier signal and the total harmonic distortion.

- *Averaging times*
- *Averaging mode*
- *Harmonic quantity:* Set the harmonic number of the carrier. The maximum is 10.
- *Sweep time:* it is the same as that of the spectrum analyzer.
- *Fundamental frequency:* when the fundamental frequency is automatic, the instrument will automatically take the signal with the maximum amplitude as the fundamental wave. When it is set as manual, take the manually set value

as the fundamental frequency.

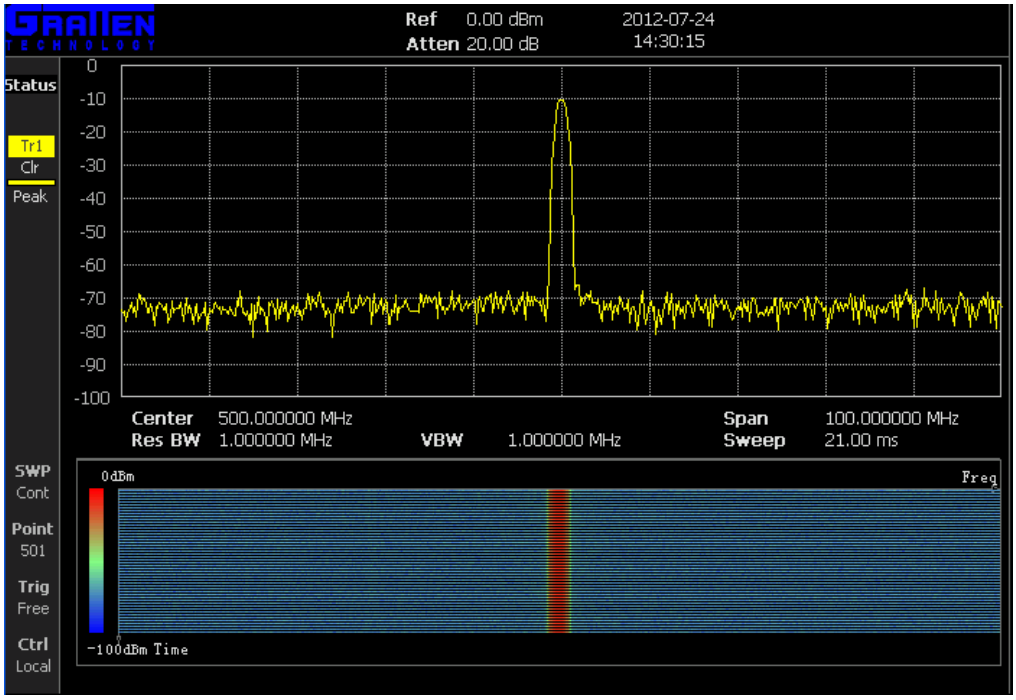
5. Third-order intermodulation distortion

It is used to measure the frequency, amplitude and magnitude difference of four kinds of signals, high fundamental frequency, low fundamental frequency, low third-order intermodulation and high third-order intermodulation, as well as the cut-off point of third-order intermodulation.There are the following parameters:

- *Average times*
- *Average mode*
- *Center frequency:* equivalent to the center frequency of the FREQ menu
- *Span:* equivalent to the span of the SPAN menu

6. Waterfall curve

Display the amplitude changes of each frequency point in the waterfall manner. The amplitude depth is indicated with a different color to distinguish.The display interface is as follows:



2-5-1-2 Close Measurement

Close the current ongoing measurement.

2-5-1-3 Restart

If the measuring does not start, start it according to the measurement type selected in the measurement setting.

If the measuring is in the process, interrupt the current measuring and restart the measurement.

2-5-1-4 Suspend Measurement

Suspend the currently ongoing measurement.

2-5-1-5 Measurement Mode

There are two options: single and continuous. Single means to measure for only once and continuous means to measure continuously.

2-5-1-6 Averaging Type

The averaging types divided into video averaging and power averaging. This setting is valid for channel power, adjacent channel power, occupied bandwidth and harmonic distortion.

- *Video averaging:* The logarithmic averaging result of the multiple sweep values of each trace point.
- *Power averaging:* The averaging result of the multiple sweep values of each trace point.

2-6 System Function

2-6-1 System

2-6-1-1 Language

Select the language types displayed on the user interface of spectrum analyzer. The simplified Chinese and English are available and the simplified Chinese is the default language.

2-6-1-2 Options for Power on

Provide settings of spectrum analyzer after it is switched on.

1. Preset type

The preset type includes default settings and user settings, which means as follows:

- *Default setting:* corresponding to the factory settings of the instrument.
- *User settings:* corresponding to the user's last saved settings.

When the Presset key on the front panel is pressed down, the corresponding configuration values will be loaded according to the options above, as follows:

If the preset type is the default setting, press down the Preset key on the front panel to revert to the factory default parameters. If it is the user setting, after the Preset key is pressed down, a dialog box will pop up to let the user choose a saved configuration file.

2. Save the user setting

Take the current system configuration as user defined configuration and save it into the interior storage which can support power-fail storage.

2-6-1-3 Time / Date

1. Time and date

Turn on or turn off the display of time and date.

2. Set the time

Set the time display for the spectrum analyzer. The time display is in 24-hour format and the input format is HHMMSS.

For example, 23:12:11 will be displayed as 231211.

3. Set the date

Set the date display for the spectrum analyzer. The date input format is YYYYMMDD.

For example, Oct. 1, 2009 will be displayed as 20091001.

2-6-1-4 Calibration

Calibrate the system automatically.

1. Immediate calibration

perform a calibration immediately.

2. Automatic calibration

automatic calibration will be done once after the instrument is powered on and it will be also done at intervals during instrument operation.

2-6-1-5 Communication Interface

Configure the communication interface used for remote control.

1. LAN

Configure various parameters for LAN communication.

- **DHCP:** Enable/disable DHCP function. DHCP function is mainly used to obtain IP address automatically. The IP address can be obtained only when the host computer enables DHCP server function. The default DHCP is disabled.
- **IP address:** set the instrument IP address. The default value is "192.168.1.63."
- **Port address:** Set the port address for instrument on communication. The default value is 5025. The port number is not available for modification but only for display so that it is convenient for user's programming.
- **Gateway address:** Set the communication gateway address which is

usually the same as that of host computer. The default value is "192.168.1.1".

- **Restart the network card:** the modification to the above mentioned network parameter is only valid after restarting the network card.

2. RS232

RS232 communication baud rate is displayed.

The baud rate represents the number of binary bits that can be transmitted on the communication line per second, it is in bps.

For this product, the communication baud rate of RS232 is fixed at 115200bps.

In addition to the baud rate, the other parameters are fixed as "8-N-1", that is 8 data bit, no parity, 1 stop bit.

2-6-1-6 File

Operate the file on the internal and external memory of spectrum analyzer. Use the file dialog with Windows style and provide soft keyboard to set the file name.

1. Save

It is supported to save three types of files: "trace", "state" and "image".

2. Open

It is supported to open the "trace" and "state" file

3. File Management

It supports the operation on the common file, including "open", "create", "delete", "re-name", "copy" and "paste"

Instructions on the use of file dialog box and soft keyboard:

1. File dialog box

the options can be switched by the arrows keys and the knobs and then confirm

it by “Enter” key.

2. Soft keyboard

It is mainly used to enter a file name.

1) *Open the soft keyboard:* when the focus is on the file name input box, press down “Enter” key on the front panel to open the soft keyboard.

2) *Select characters:* select characters through the arrow keys and the knobs and then confirm it by “Enter” key.

3) *Close the soft keyboard:* select "EXIT" on the soft keyboard and press “Enter” key on the front panel to confirm.

2-6-1-7 Software Upgrade

The software upgrade function supports software upgrade via USB removable memory.

The steps are as follows:

1. Format the USB portable memory into FAT32 file system.
2. Copy the upgrade files obtained from the official website of GLARUN ATTEN TECHNOLOGY CO., LTD or from its After-sale Services to the USB portable memory.
3. Insert the USB mobile memory into the front USB interface of spectrum analyzer and wait about 10 seconds until the instrument identifies the USB portable memory.
4. Use the Menu key to activate Software Upgrade menu.
5. Wait for the completion of software upgrade which is done automatically.
6. Unplug the USB portable memory.

2-6-1-8 System Information

Display related system information, such as product serial number and software version.

2-6-2 Preset

Call the preset settings and recover the system settings to a specified state. The operation modifies all sweep parameters, measure functions and the settings of system parameter.

The second function of “Preset” key is “Local”. If the instrument is in programmed state, to press down the “Preset (Local)” key will make the instrument exit from programmed state. The indicative mark of instrument programmed state is located in state column on the left of LCD interface. See the “Programmed State” column in the 18th item of “Table 1-4 User interface description” in the section 1.2.3 LCD User Interface.

2-6-3 Help

Open or close help system.

See section 1.7 for the details about how to use Help system.

3

Measurement Example

3.0 GHz Spectrum Analyzer

This section introduces the functions and the use method of spectrum analyzer through examples.

The contents of the chapter are as follows:

- Measure the sinusoidal signal
- Measure the channel power
- Measure the adjacent channel power
- Measure the occupied bandwidth
- Measure the harmonic distortion
- Measure signal frequency through the frequency count function.
- Measure the phase noise
- Measure the third order intermodulation distortion

3 Measurement Example

3-1 Measure the Sinusoidal Signal

The most frequently used function of the spectrum analyzer is to measure the signal frequency and amplitude. In the following examples, the sinusoidal signal with signal generator output frequency as 500MHz and amplitude as -10dBm is used for the measured signal.

Operation Steps：

1. Equipment connection

Connect the signal output terminal of the signal generator to the **RF INPUT** terminal on the front panel of the spectrum analyzer front panel.

2. Set the spectrum analyzer

(1) Reset

Press **Preset** .

(2) Set parameters

Press **FREQ** .

Press the menu key of **Center Frequency** and enter 500MHz.

Press **SPAN** and set the span as 50MHz.

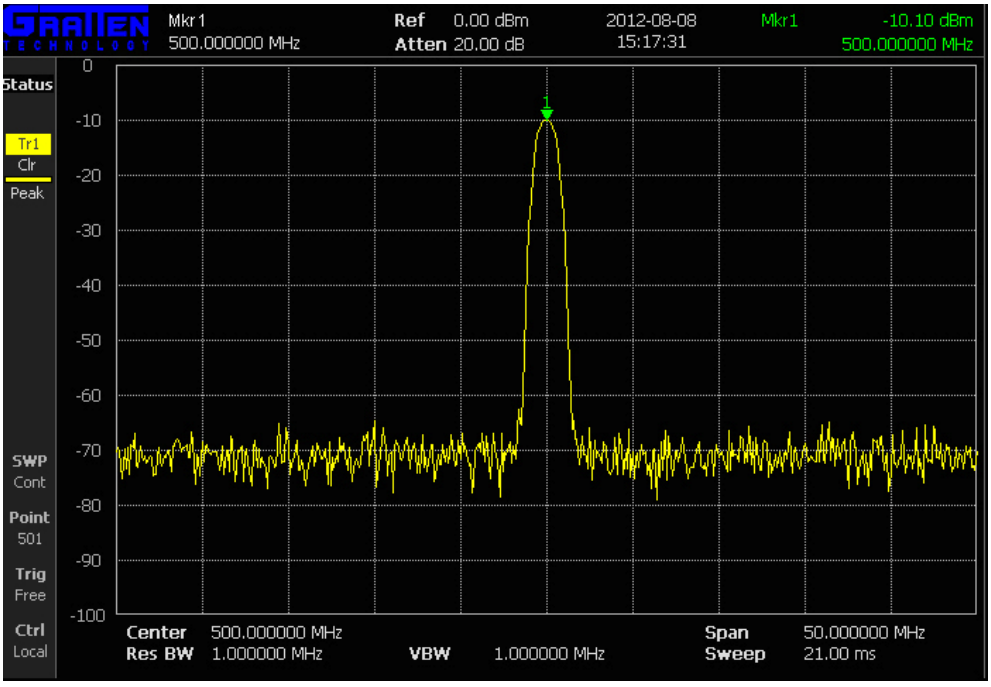
(3) Use frequency marker to measure the frequency and amplitude

Press **Peak Search** .

Press the menu key of **Peak** and activate frequency marker 1. The frequency marker 1 will be positioned at the peak. The corresponding frequency and the amplitude values can be read from the upper left corner of the screen.

3. Read the measurement results

The measured input signal is 500MHz and the amplitude is -10.10dBm, as shown in the following figure:



3-2 Measure the Channel Power

The sinusoidal signal with signal generator output frequency as 500MHz and amplitude as -10dBm is used for the measured signal.

Operation Steps：

1. Equipment connection

Connect the signal output terminal of the signal generator to the **RF INPUT** terminal on the front panel of the spectrum analyzer front panel.

2. Set the spectrum analyzer

(1) Reset

Press **Preset** .

(2) Set parameters

Press **FREQ** .

Press the menu key of **Center Frequency** and enter 500MHz.

Press **SPAN** and set the span as 50MHz.

Press **Measure** .

Press the menu key of **Measurement Setting** .

(3) Measure

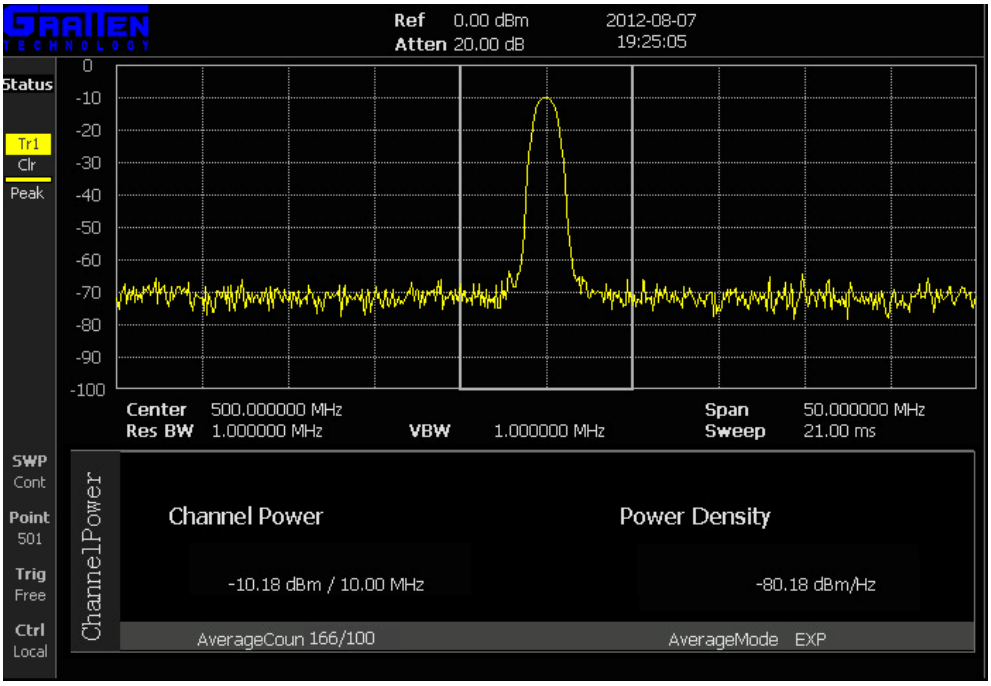
Press **Measure** .

Press the menu key of **Restart** to start the measurement.

3. Read the measurement results

Obtain the measured results from the window at the bottom of the interface, as shown in the figure below ：

The channel power is -10.18dBm and the power spectrum density is -80.18dBm/Hz.



3-3 Measure the Adjacent Channel Power

The sinusoidal signal with signal generator output frequency as 500MHz and amplitude as -10dBm is used for the measured signal.

Operation Steps：

1. Equipment connection

Connect the signal output terminal of the signal generator to the **RF INPUT** terminal on the front panel of the spectrum analyzer front panel.

2. Set the spectrum analyzer

(1) Reset

Press **Preset** .

(2) Set parameters

Press **FREQ** .

Press the menu key of **Center Frequency** and enter 500MHz.

Press **SPAN** and set the span as 50MHz.

Press **Measure** .

Press the menu key of **Measurement Setting** .

Press the menu key of **Adjacent Channel Power** .

Press the menu key of **Main channel Bandwidth** and enter 10MHz.

Press the menu key of **Adjacent channel Bandwidth** and enter 10MHz

Press the menu key of **Channel Space** and enter 15MHz

(3) Measure

Press **Measure** .

Press the menu key of **Restart** to start the measurement.

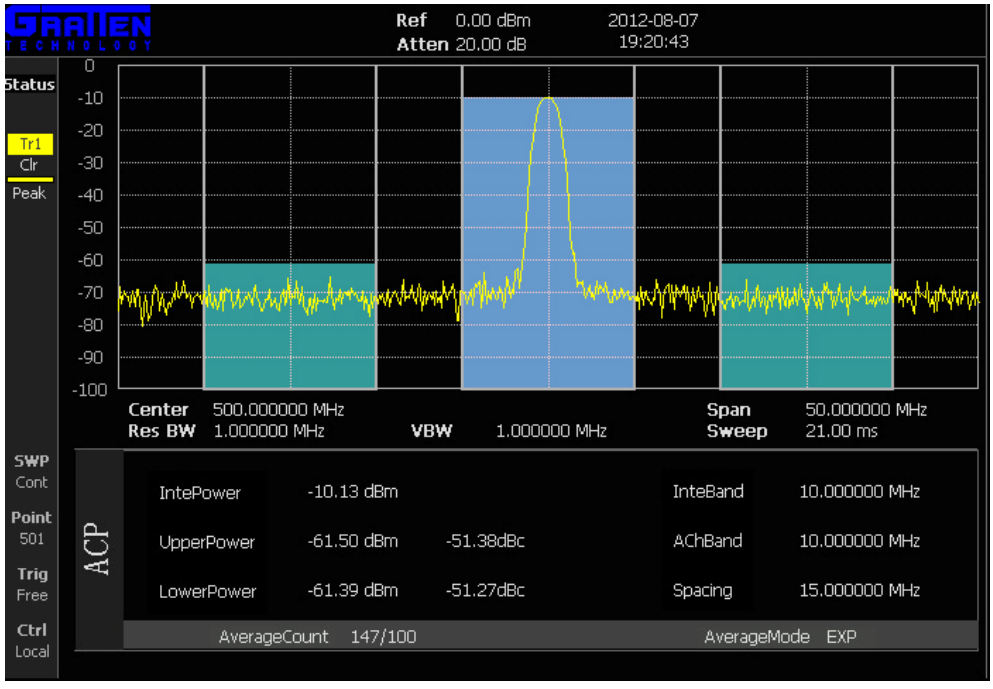
3. Read the measurement results

Obtain the measured results from the window at the bottom of the interface, as shown in the figure below.

The power of the main channel is -10.13dBm.

The power of the previous channel is -61.50dBm, the power difference from the main channel is -51.38dBm.

The power of the next channel is -61.39dBm, the power difference from the main channel is -51.27dBm.



3-4 Measure the Occupied Bandwidth

The sinusoidal signal with signal generator output frequency as 500MHz and amplitude as -10dBm is used for the measured signal.

Operation Steps：

1. Equipment connection

Connect the signal output terminal of the signal generator to the **RF INPUT** terminal on the front panel of the spectrum analyzer front panel.

2. Set the spectrum analyzer

(1) Reset

Press **Preset** .

(2) Set parameters

Press **FREQ** .

Press the menu key of **Center Frequency** and enter 500MHz.

Press **SPAN** and set the span as 50MHz.

Press **Measure** .

Press the menu key of **Measurement setting** .

Press the menu key of **Occupied Bandwidth** .

Press the menu key of **Power Ratio** and enter 0.99.

(3) Measure

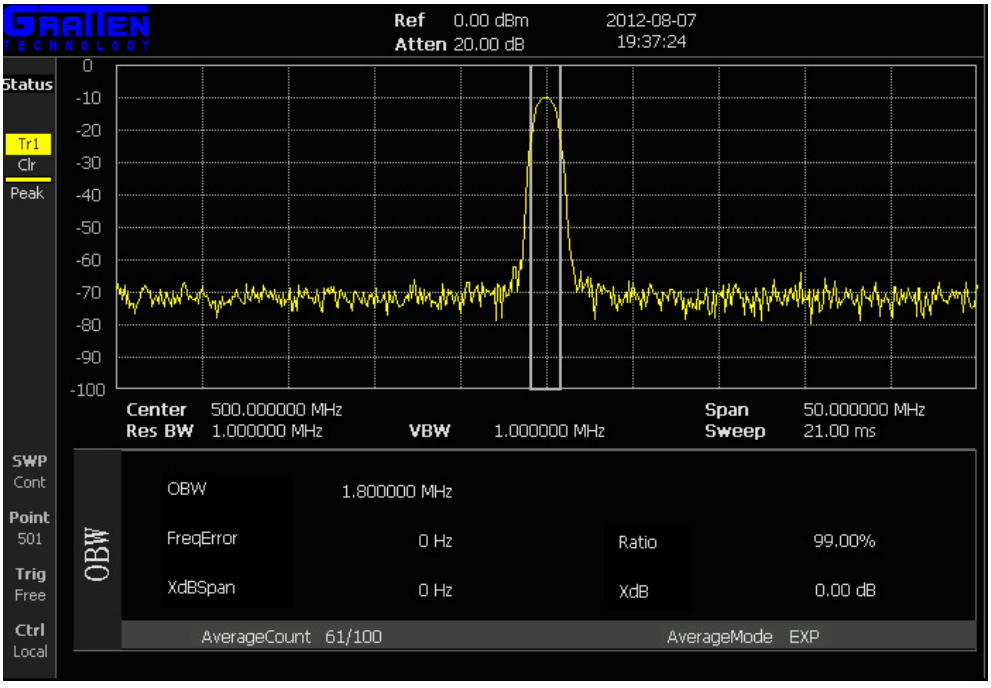
Press **Measure** .

Press the menu key of **Restart** to start the measurement.

3. Read the measurement results

Obtain the measured results from the window at the bottom of the interface, as shown in the figure below.

The occupied bandwidth is 1.8MHz and the transmission frequency error is 0Hz.



3-5 Measure the Harmonic Distortion

The sinusoidal signal with signal generator output frequency as 500MHz and amplitude as -10dBm is used for the measured signal.

Operation Steps：

1. Equipment connection

Connect the signal output terminal of signal generator to the **RF INPUT** terminal on the front panel of the spectrum analyzer.

2. Set the spectrum analyzer

(1) Reset

Press **Preset** .

(2) Set parameters

Press **FREQ** .

Press the menu key of **Center Frequency** and enter 500MHz.

Press **SPAN** and set the span as 50MHz.

Press **Measure** .

Press the menu key of **Measurement setting** .

Press the menu key of **Harmonic Distortion** .

Press the menu key of **Harmonic Number** and enter 3.

Press the menu key of **Fundamental Frequency** , switch it to “Manual” and enter 500MHz.

(3) Measure

Press **Measure** .

Press the menu key of **Restart** to start the measurement.

3. Read the measurement results

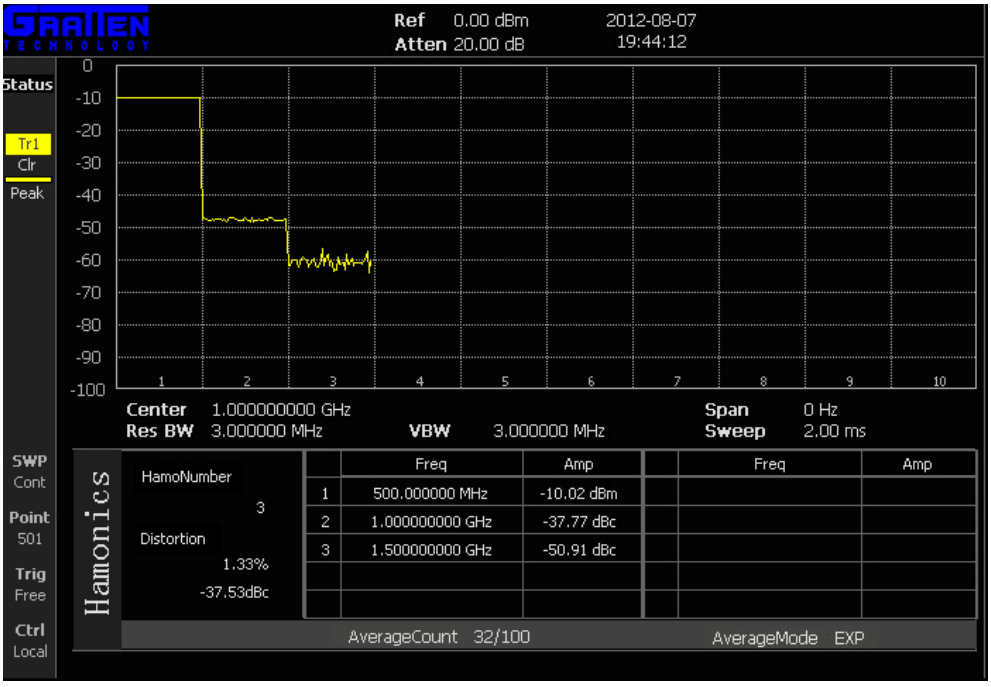
Obtain the measured results from the window at the bottom of the interface, as shown in the figure below.

The fundamental frequency is 500MHz and its amplitude is -10.02dBm.

The first harmonic frequency is 1GHz, and the amplitude difference from the fundamental wave is -37.77dBc.

The second harmonic frequency is 1.5GHz and the amplitude difference from the fundamental wave is -50.91.

The total harmonic distortion is 1.33%. The difference between the total harmonic energy and the fundamental wave is -37.53dBc.



3-6 Measure Signal Frequency through Frequency Count Function

The sinusoidal signal with signal generator output frequency as 500MHz and amplitude as -10dBm is used for the measured signal.

Operation Steps：

1. Equipment connection

Connect the signal output terminal of signal generator to the **RF INPUT** terminal on the front panel of the spectrum analyzer.

2. Set the spectrum analyzer

(1) Reset

Press **Preset** .

(2) Set parameters

Press **FREQ** .

Press the menu key of **Center Frequency** and enter 500MHz.

Press **SPAN** and set the span as 50MHz.

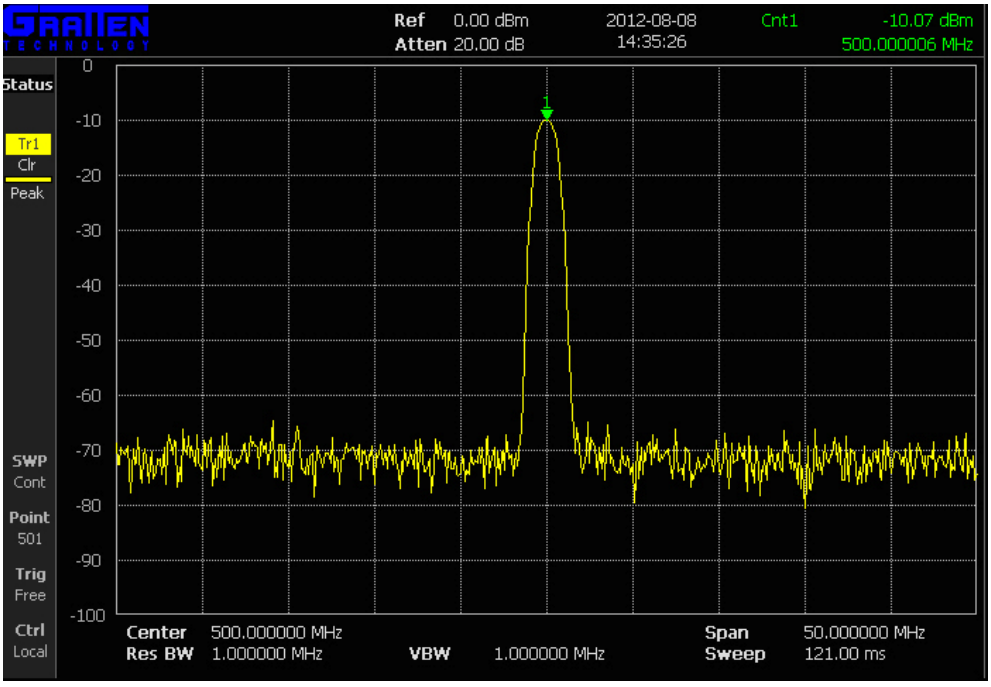
(3) Measure

Press **Marker Function** .

Press the menu key of **Frequency Count** , switch to “On” and start to measure. The frequency and the amplitude values corresponding to the frequency marker 1 can be read in the upper left corner of the screen.

3. Read the measurement results

The Measured input signal is 500.000006MHz and its amplitude is -10.07dBm, as shown in figure below:



3-7 Measure the Phase Noise

The most frequently used function of the spectrum analyzer is to measure the signal frequency and amplitude. In the following examples, the sinusoidal signal with signal generator output frequency as 500MHz and amplitude as -10dBm is used for the measured signal.

Operation Steps：

1. Equipment connection

Connect the signal output terminal of signal generator to the **RF INPUT** terminal on the front panel of the spectrum analyzer.

2. Set the spectrum analyzer

(1) Reset

Press **Preset** .

(2) Set parameters

Press **FREQ** .

Press the menu key of **Center Frequency** and enter 500MHz.

Press **SPAN** and set the span as 50MHz.

Press **BW** .

Press the menu key of **Resolution Bandwidth** and enter 1KHz.

Press the menu key of **Video Bandwidth** and enter 100Hz.

(3) Measure

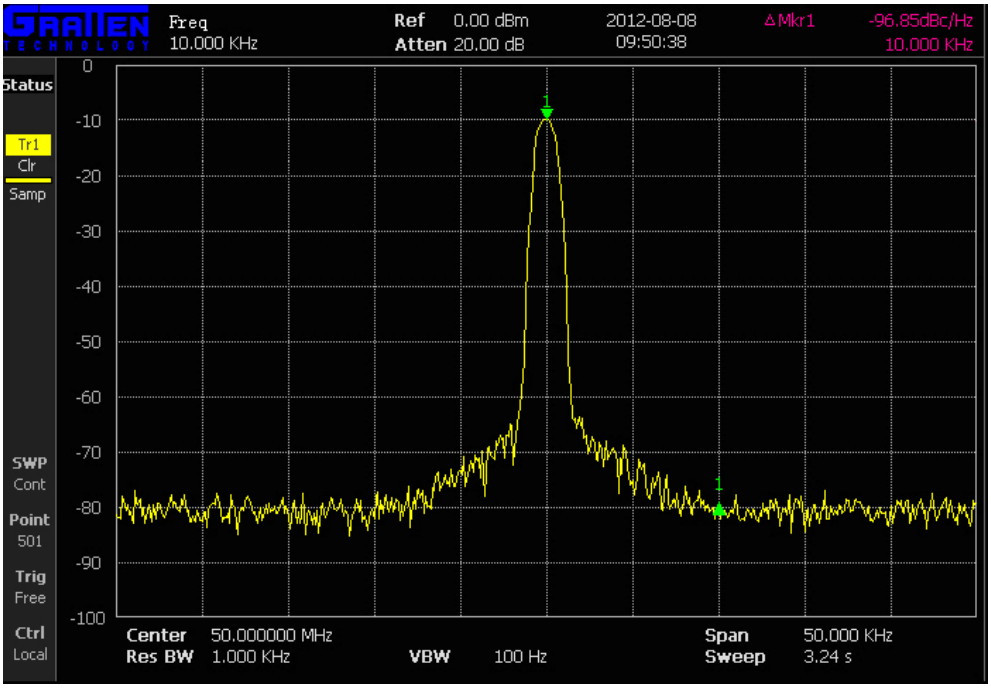
Press **Marker Function** .

Press the menu key of **Phase Noise Frequency** and enter 10KHz.

Press the menu key of **Phase Noise** switch to “On” and start to measure. The measured result will be displayed on the frequency marker area in the upper left corner of the interface.

3. Read the measurement results

The measured phase noise deviated 10KHz from the signal is -96.85dBc/Hz, as shown below:



3-8 Measure the Third-order Intermodulation Distortion

Use the sinusoidal signal output from signal generator 1 with the frequency of 500MHz and amplitude of -10dBm. Use the sinusoidal signal output from signal generator 2 with the frequency of 100.2MHz and amplitude of 15dBm.

Operation Steps:

1. Equipment connection

Connect the output signal of signal generator 1 and signal generator 2 to the **RF INPUT** terminal on the front panel of the spectrum analyzer through a power combiner.

2. Set the spectrum analyzer

(1) Reset

Press **Preset** .

(2) Set parameters

Press **FREQ** .

Press the menu key of **Center Frequency** and enter 500MHz.

Press **SPAN** and set the span as 50MHz.

Press **AMPT** .

Press the menu key of **Reference Level** and enter 30dBm.

Press **Measure** .

Press the menu key of **Measurement setting**

Press the menu key of **Third-order Intermodulation Distortion**

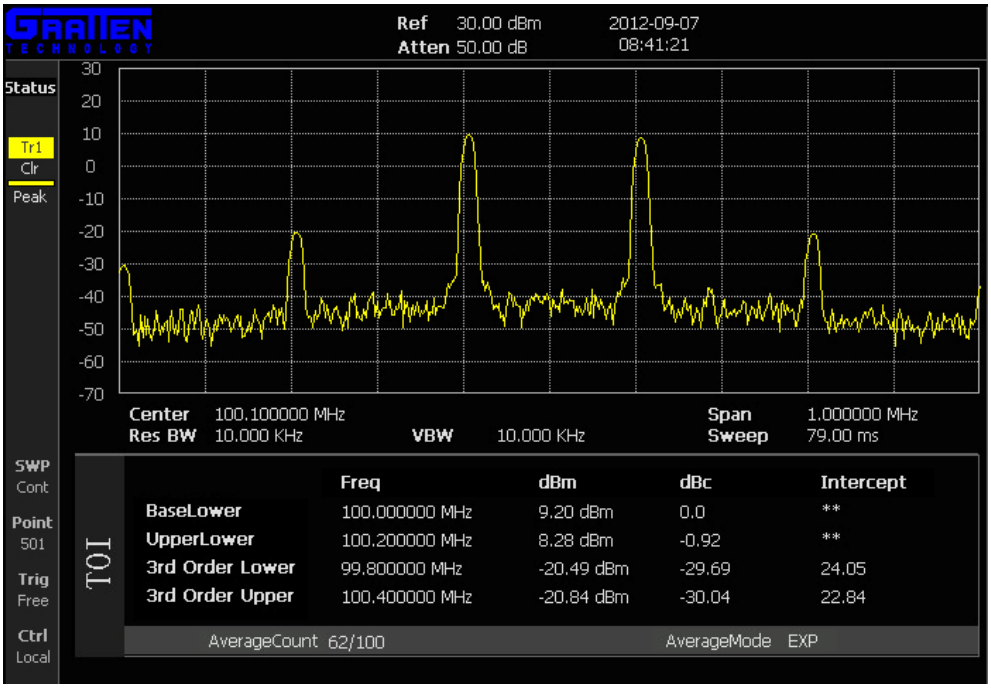
(3) Measure

Press **Measure**

Press the menu key of **restart** to start the measurement.

3. Read the measurement results

From the sub-screen in the bottom of the screen, the frequency, amplitude and magnitude difference of high fundamental frequency, low fundamental frequency, low third-order intermodulation and high third-order intermodulation as well as the cut-off point of third-order intermodulation can be read. It is shown as below:



4 Remote Control

3.0 GHz Spectrum Analyzer

This section describes the remote control method of the spectrum analyzer.

4 Remote Control

Communication Mode and Command

The spectrum analyzer can communicate with PC via LAN, RS232, etc. The upper computer software of PC end can control and program the instrument by using SCPI (Standard Commands for Programmable Instruments) command.

Upper computer software

The users can write their own upper computer software and send commands to control the spectrum analyzer remotely. In addition, the users can use "Measurement & Automation Explorer" of NI (National Instruments Corporation) or “Agilent IO Libraries Suite" of Agilent (Agilent Technologies, Inc.) to control it.

Programming details

For more details about the command and programming, please refer to the product *Programming Manual*.

5

Menu Map

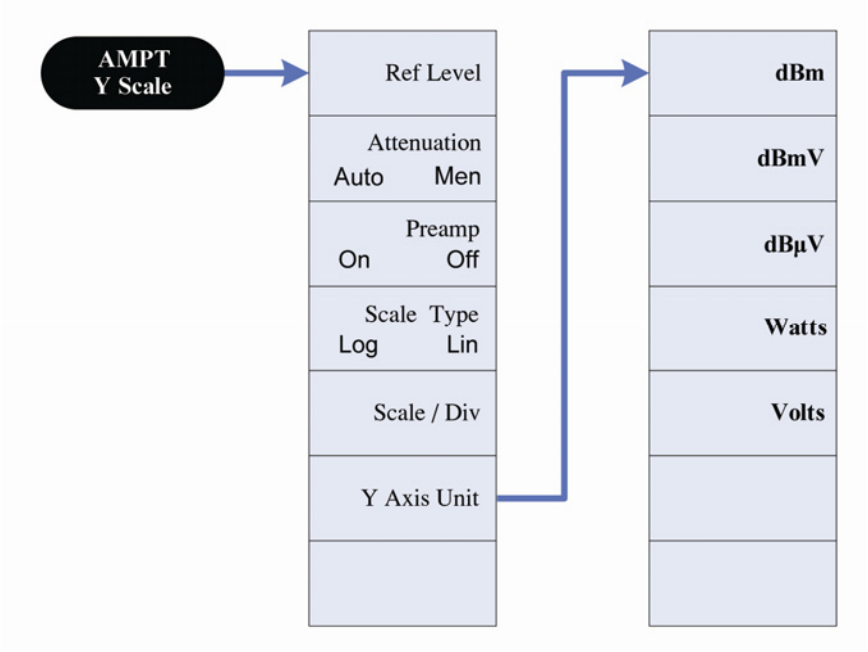
3.0 GHz Spectrum Analyzer

This section describes the menu map corresponding to the function keys on the front panel of the spectrum analyzer alphabetically.

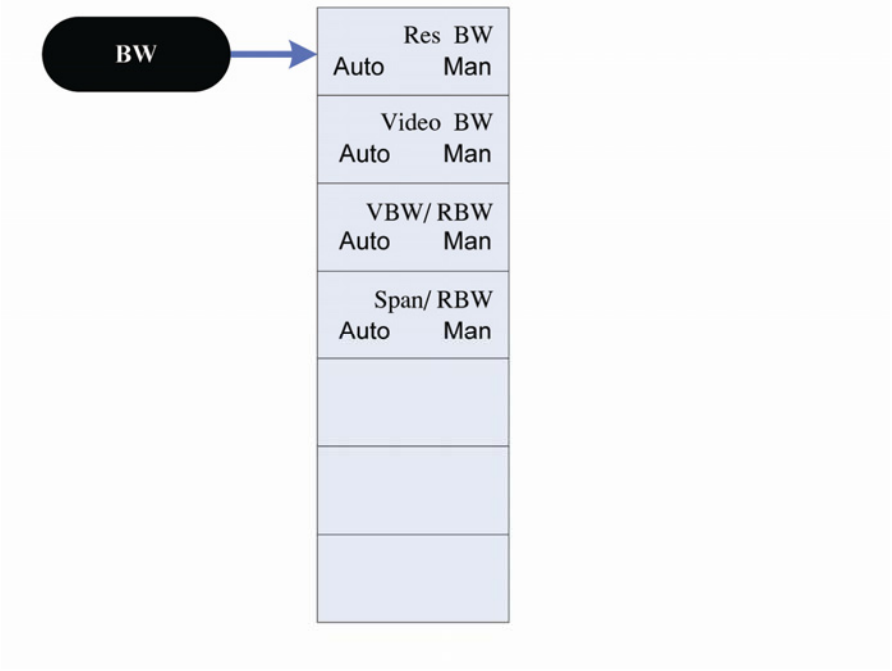
5 Menu Map

This section provides function map with related menu keys on the front panel of the spectrum analyzer in alphabetical order from A to Z. Refer to the section 2 “Function guide for the Front Panel” for the specific information of each menu.

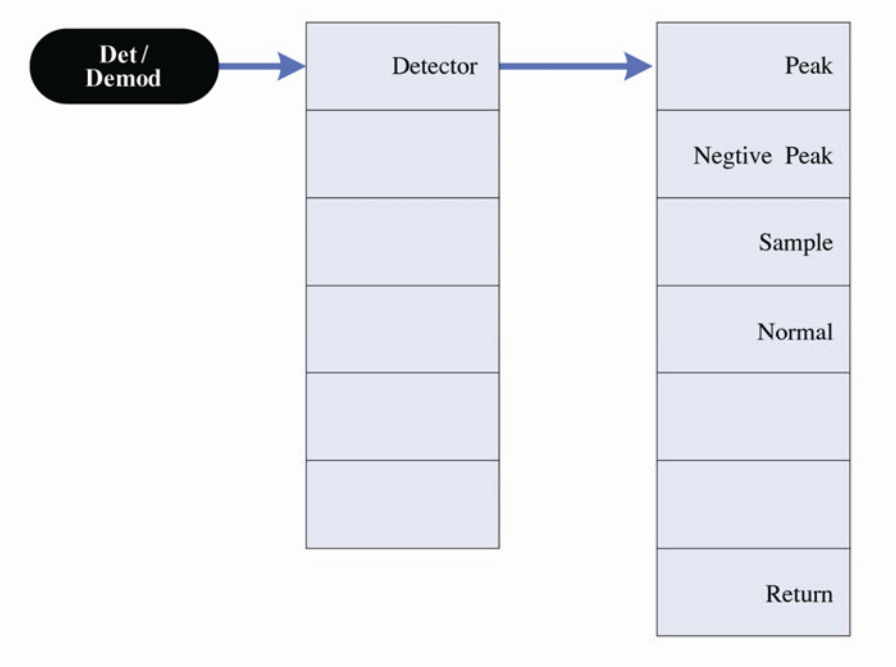
5-1 AMPT



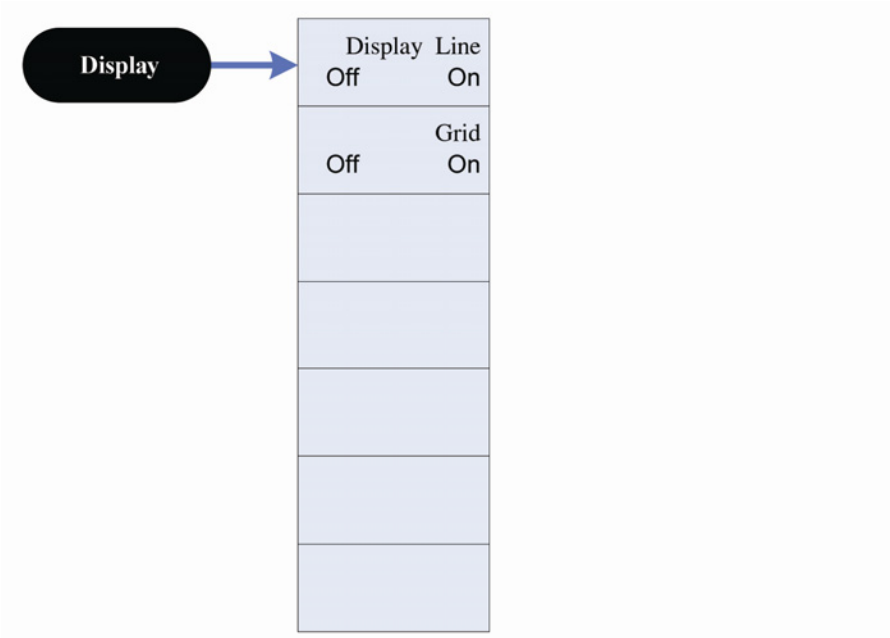
5-2 BW



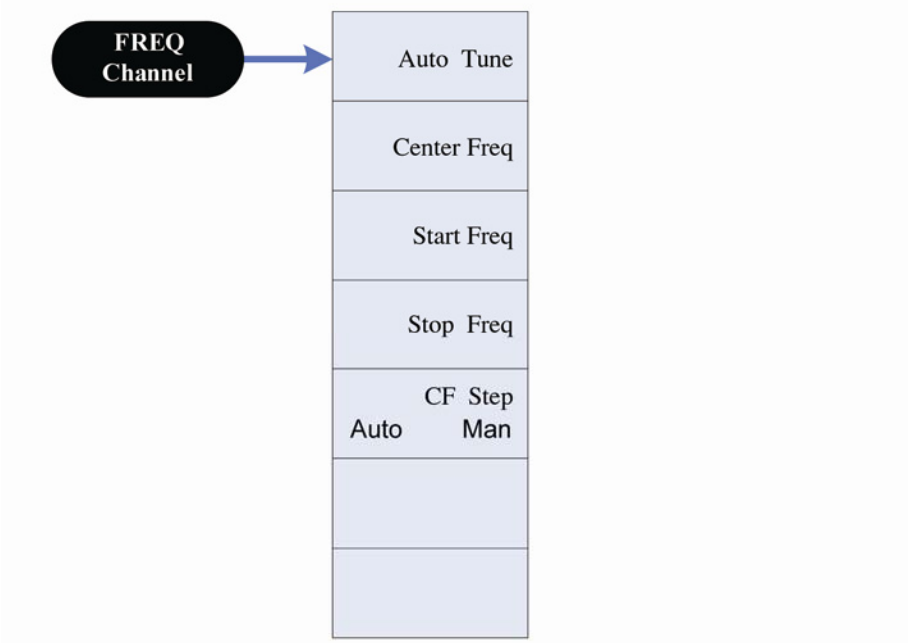
5-3 Det/Demond



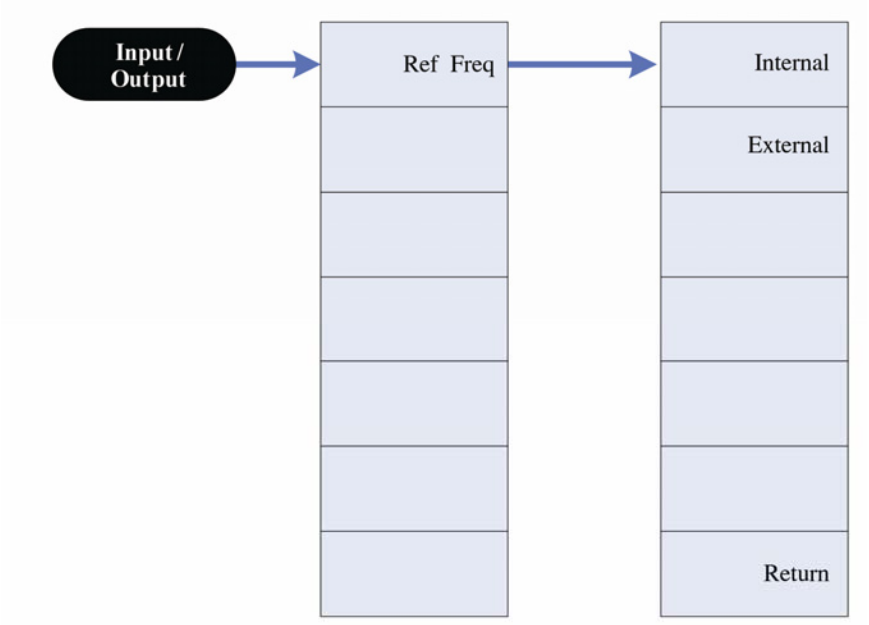
5-4 Display



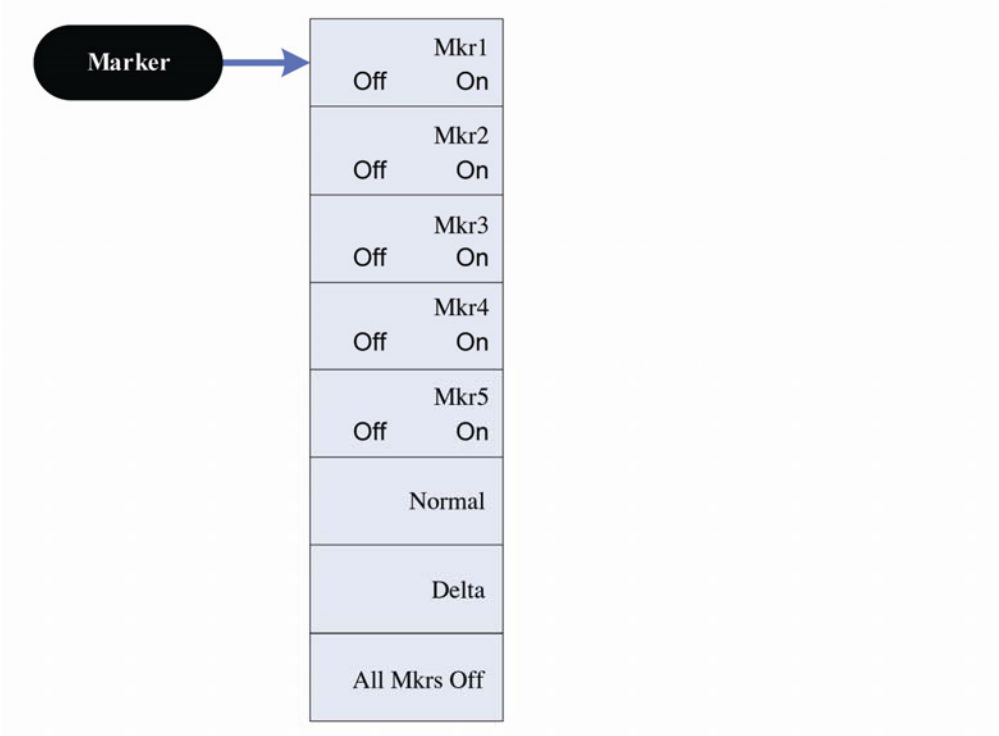
5-5 FREQ



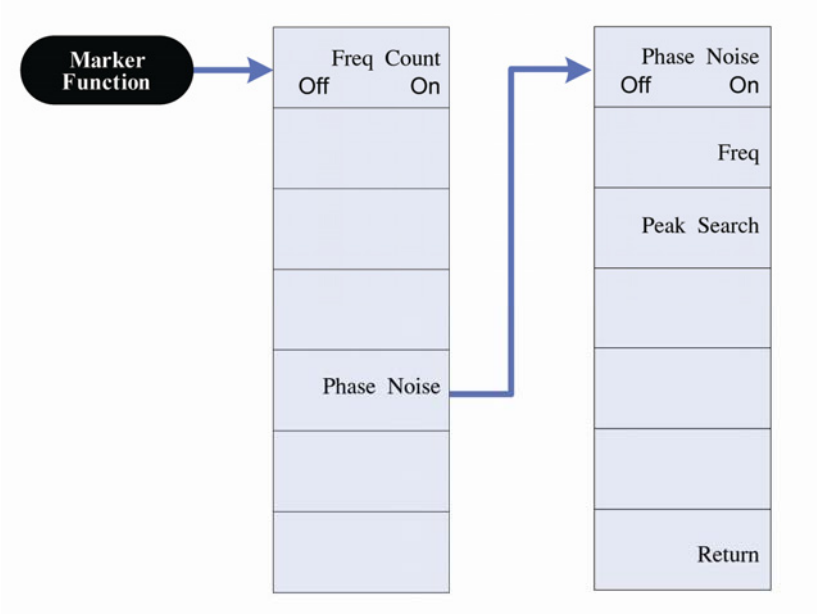
5-6 Input/Output



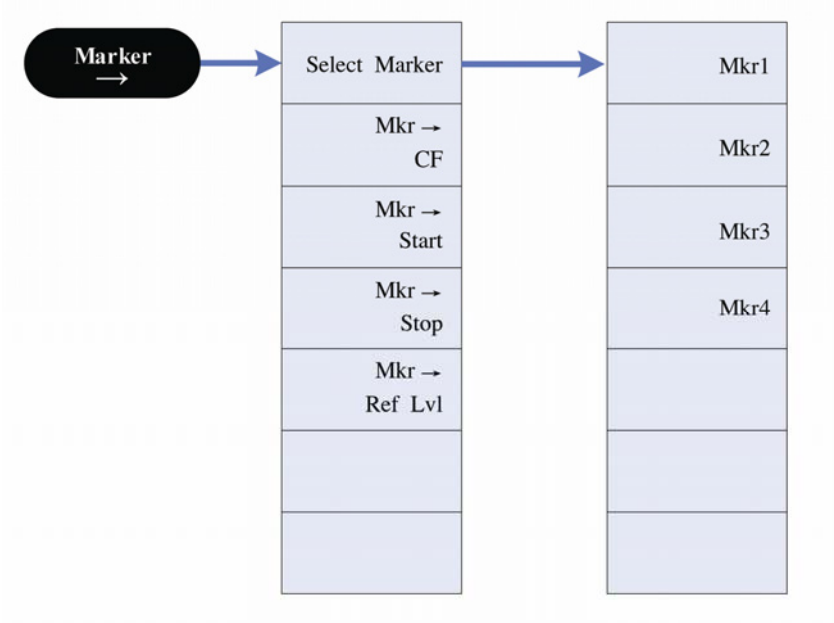
5-7 Marker



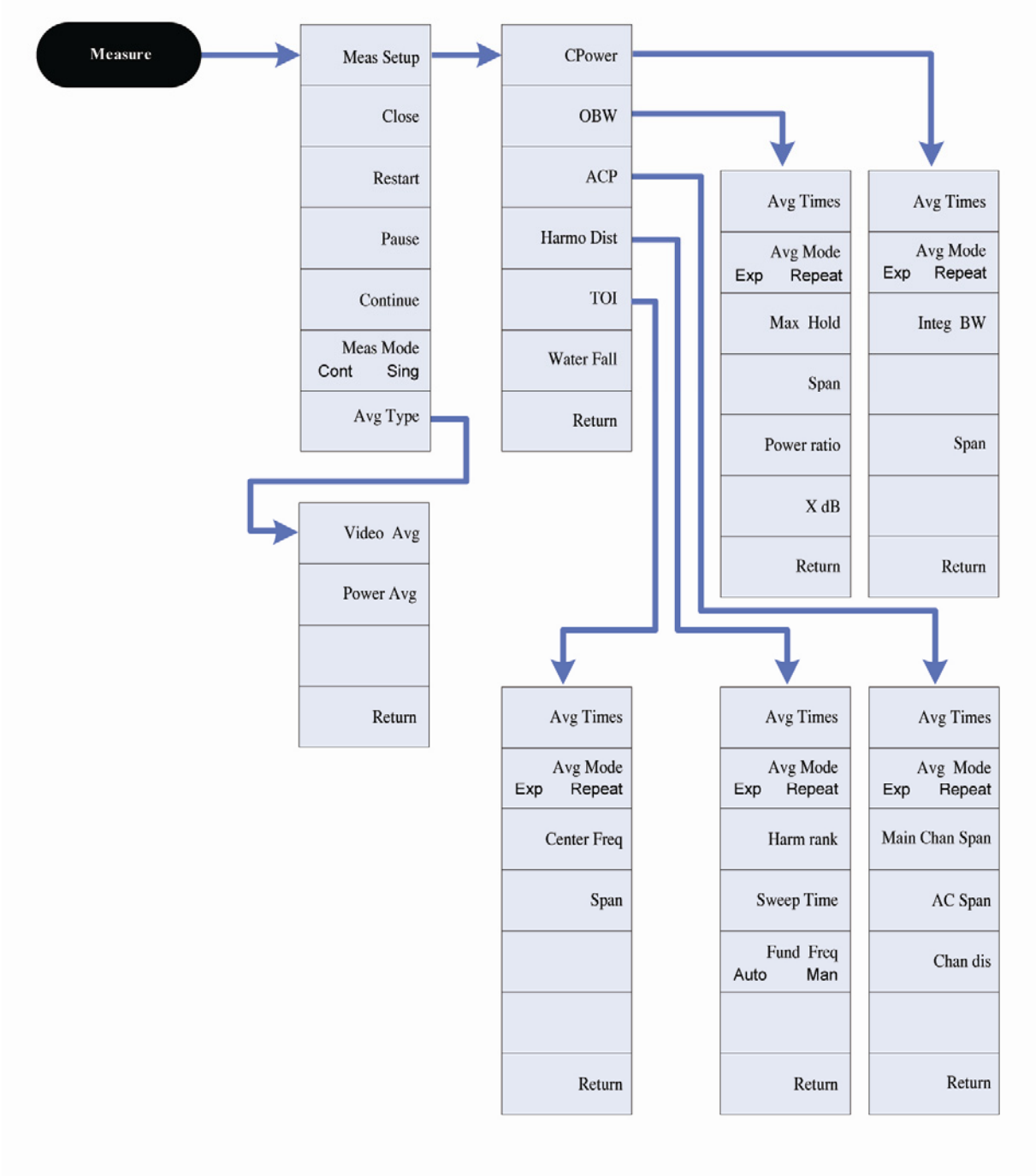
5-8 Marker Function



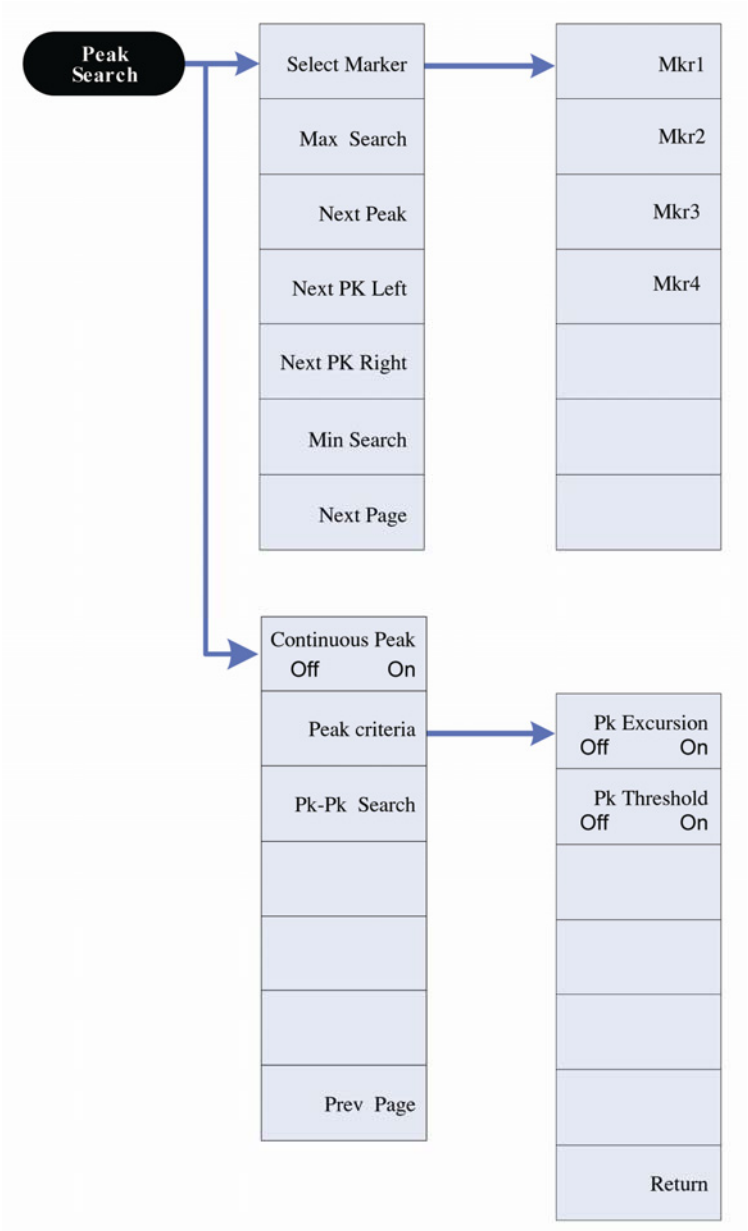
5-9 Marker→



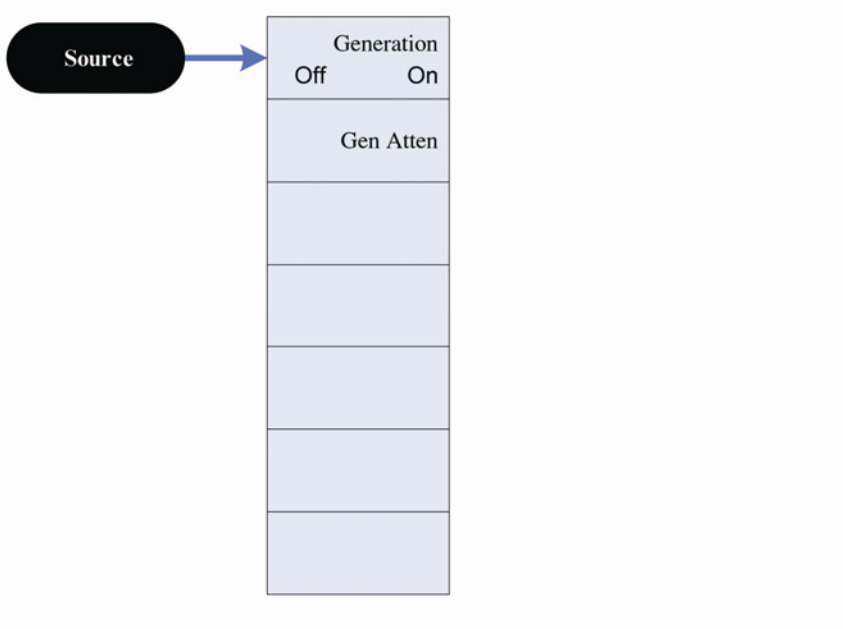
5-10 Measure


Measure
Meas Setup
Close
Restart
Pause
Continue
Meas Mode
Cont Sing
Avg Type
Video Avg
Power Avg
Return
CPower
OBW
ACP
Harmo Dist
TOI
Water Fall
Return
Avg Times
Avg Mode
Exp Repeat
Max Hold
Span
Power ratio
X dB
Return
Avg Times
Avg Mode
Exp Repeat
Integ BW
Span
Return
Avg Times
Avg Mode
Exp Repeat
Center Freq
Span
Return
Avg Times
Avg Mode
Exp Repeat
Harm rank
Sweep Time
Fund Freq
Auto Man
Return
Avg Times
Avg Mode
Exp Repeat
Main Chan Span
AC Span
Chan dis
Return

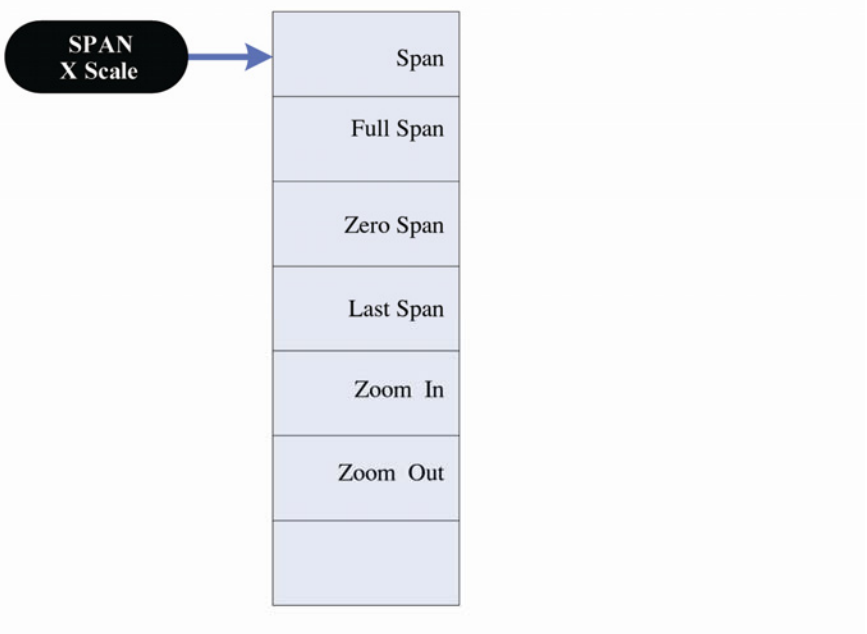
5-11 Peak Search



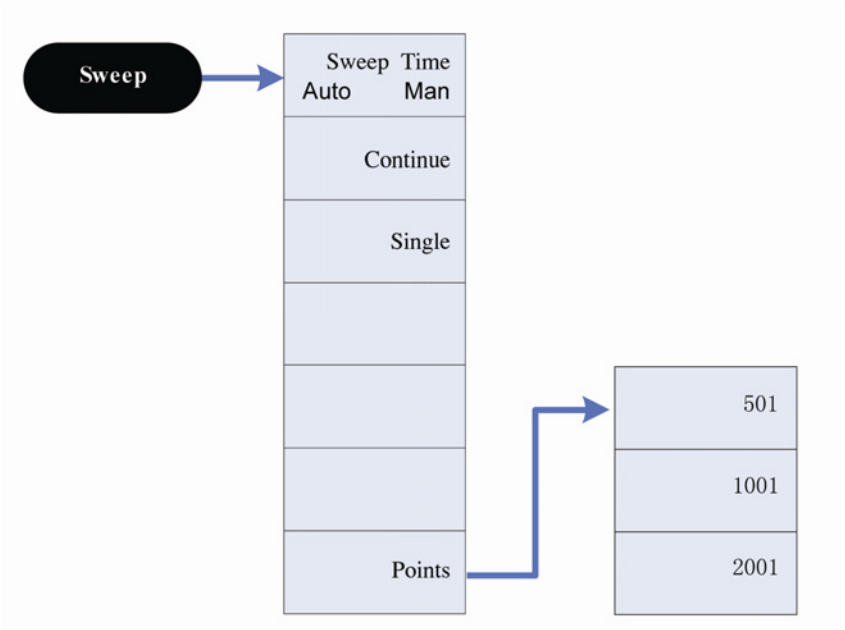
5-12 Source



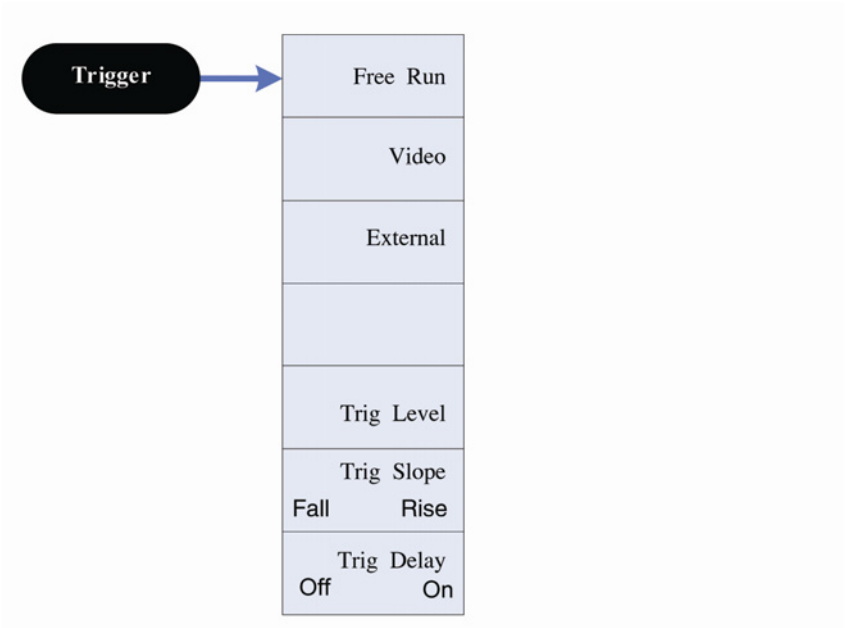
5-13 SPAN



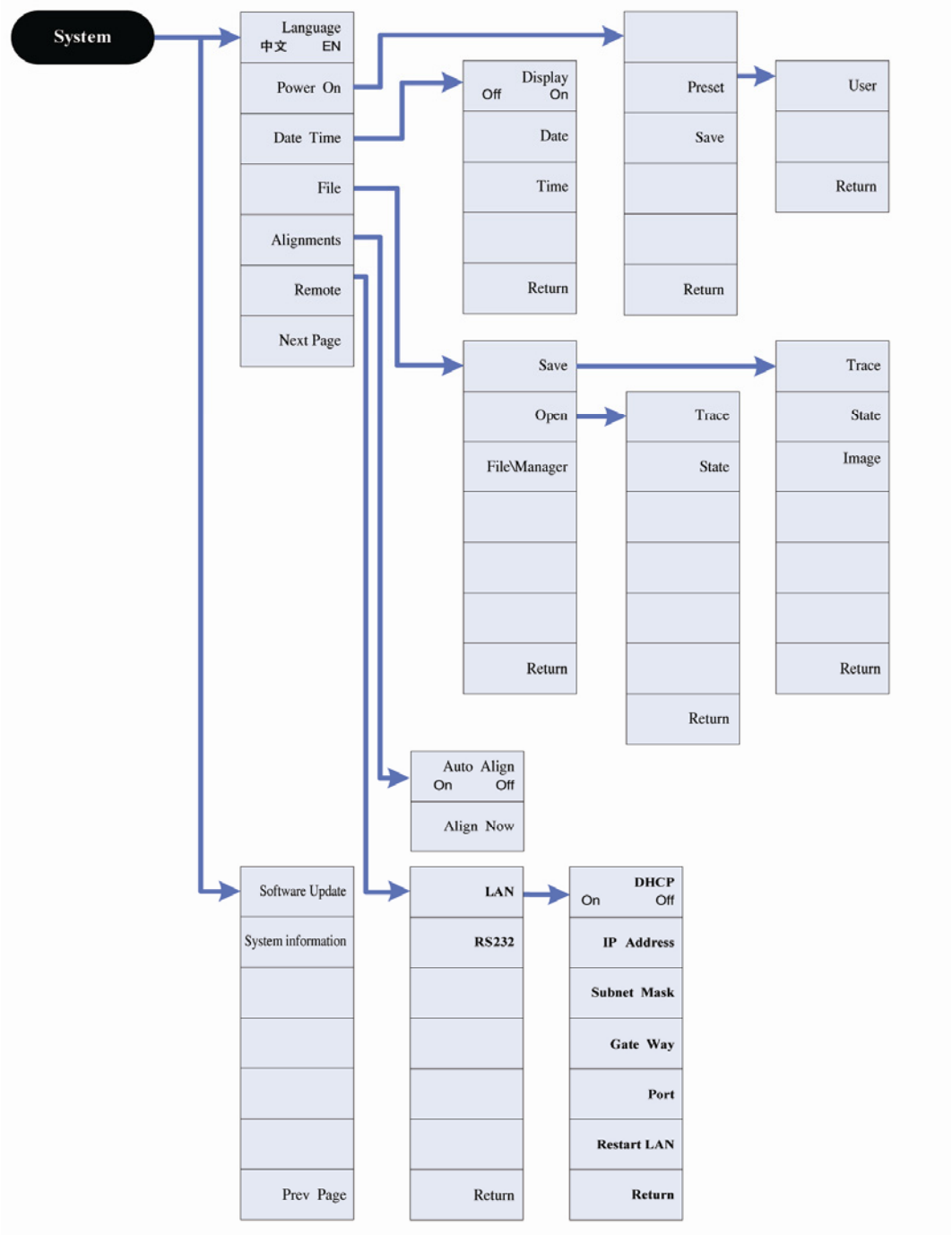
5-14 Sweep



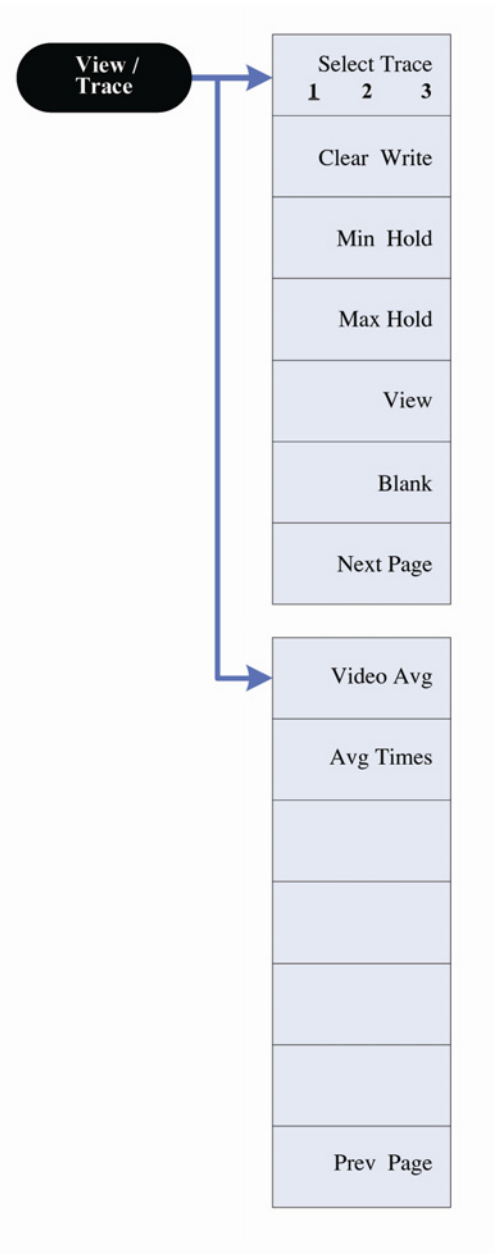
5-15 Trig



5-16 System


System
Language
中文 EN
Power On
Date Time
File
Alignments
Remote
Next Page
Display
Off On
Date
Time
Return
Preset
Save
Return
User
Return
Save
Open
File\Manager
Return
Trace
State
Return
Trace
State
Image
Return
Auto Align
On Off
Align Now
Software Update
System information
Prev Page
LAN
RS232
Return
DHCP
On Off
IP Address
Subnet Mask
Gate Way
Port
Restart LAN
Return

5-17 View/Trace



6

Performance Index

3.0 GHz Spectrum Analyzer

This section lists the technical indicators and the general technical specifications for the spectrum analyzer.

6 Performance Index

The technical index is applicable for the following conditions:

- 30 minutes' warm-up and be stored at least two hours at working temperature.
- It is within the effective calibration period and the automatic calibration has been done.
- The data without given deviation is only a typical value. The data marked with "typical value" is not included in the product guarantee.

1 Frequency

Frequency

Frequency range: 9 kHz ~ 3 GHz

The internal reference accuracy of 10MHz

Initial calibration accuracy: $\pm 1 \times 10^{-7}$

Aging rate: $\pm 1 \times 10^{-7}$ / year

Temperature characteristics: $\pm 5 \times 10^{-8}$ 0 ~ 50℃

Cursor frequency accuracy (start, stop, center, cursor)

The cursor resolution: (frequency span) / (sweep points-1)

Uncertainty: ± (frequency indication × frequency reference uncertainty +1% × span +10% × resolution bandwidth + cursor resolution)

Minimum resolution: 1Hz

Marker counter

Resolution: 1Hz

Accuracy: ± (cursor frequency × frequency reference uncertainty + counter resolution ± 1Hz)

Sweep frequency range	
Range: 0 Hz (zero span), 100Hz ~ 3GHz	
Minimum resolution: 1 Hz	
Accuracy: ± span / (sweep points -1)	

SSB phase noise	
Carrier offset:	fc=500MHz, equivalent resolution bandwidth
10kHz: < -95 dBc/Hz；	RBW = 1Hz
1MHz: < -110 dBc/Hz	
(RBW) Resolution bandwidth (RBW)	
-3dB bandwidth: 1 Hz ~ 3 MHz	1-3-10
Accuracy: ± 5% (1Hz ~~ 1MHz), ± 20% (3MHz)	Nominal value
Resolution filter shape factor: <5: 1	bandwidth ratio of 60 dB to 3 dB, approximate to Gaussian type

2 Amplitude

Measure range	
+30 DBm to average display noise level (DANL) Input attenuator range: 0 ~ 50 dB, 10 dB steps	
The maximum safe input level	
+30 dBm (1 W)	Input attenuator setting ≥ 20 dB, preamplifier off
+10 dBm (10 mW)	Input attenuator setting ≥ 20 dB, preamplifier on
Average display noise	
≤-130dBm, typicalvalues:-140dBm	Preamplifier off, RBW: 1Hz; ATT 0dB; frequency: 10MHz ~ 2.5GHz Other bands plus 10dB;
≤-148dBm, typicalvalues:-160dBm	Preamplifier, RBW: 1Hz; ATT 0dB; frequency: 10MHz ~ 2.5GHz Other bands plus 10dB;
Level display range	

Logarithmic scale and unit:
10 to 100 dB; display 10 grids; 1, 2, 5, 10 dB for each grid; dBm, dBmV, dBμV.

Linear scale:
0-100%; show 10 grids; μV, mV, V, mW, W.

Readout resolution of marker level :
logarithmic scale 0.01dB, linear scale refers to 0.01% of level
Detector: standard, positive peak, negative peak, sample, the RMS.

Trace: 3

Trace function:

Clear / write, maximum hold, minimum hold, averaging

Level measurement error:

± 0.4dB, 50MHz;
±(0.6dB + frequency response), all frequencies

Frequency response: ± 1dB

Reference level

Setting range:-100dBm to +30 dBm, 1dB step

RF Input VSWR (at tuning frequency)

VSWR ≤1.8	RF ATT10dB;frequency ≥ 10MHz

Spurious response

Second harmonic distortion: <-70 dB	Mixer level-40dBm,frequency 1MHz-1500MHz).
Third-order inter-modulation distortion: ≤ 70dBc	Dual-band signal frequency interval is greater than 1MHz; the level of the mixer-30dBm
Input parasitic: ≤ -60 dBc	Maximum mixer level -40dBm, offset from the carrier ≥ 1MHz
The inherent residual response: ≤ -80 dBm	Connect 50Ω load to input end , ATT: 0dB typical value

3 Sweep

Sweep time

Range: 2 ms ~ 3000 s (SPAN> 100Hz)
100us ~ 100s (SPAN = 0)

Sweep mode: continuous, single

Trigger source: free-running, video trigger, external trigger

trigger slope: positive or negative edge available

4 Front and rear panel input / output

RF input

Connector and impedance: N-type female head; 50Ω	Nominal value

10MHz reference / external trigger input

Reference input, output frequency: 10 MHz	
Reference input, output amplitude: 0 ~ +10 dBm	
Trigger voltage: 5 V TTL level	Nominal value
Connector and output impedance: BNC female head; 50Ω	Nominal value

USB interface

The primary end connector and protocol: A plug; Version 1.1
Equipment end of the connector and protocol: B plug; 1.1

LAN interface

The spectrum analyzer can be connected through the interface to the LAN for remote control, quick establishment of testing system and easy system integration.

RS232 interface

Available for virtual terminal display, control and remote access

5 Options

Tracking signal generator

Frequency range: 5MHz ~ 3GHz	
Output level: 0 ~-25dBm,	1dB stepping
Output flatness: ± 3dB;	Take 50MHz, 0dBm as reference
VSWR: ≤ 2.0:1;	Nominal value
Connector and impedance: N-type female head; 50Ω	Nominal value

6 Common indicators

Monitor
Resolution: 800 × 480 pixels
Monitor size and type: 8.5 inches TFT LCD (LED backlight)
Languages
Screen interface: English, Simplified Chinese,
Power requirement and calibration
Power supply voltage: 100V ~ 240V.
Power frequency: Rated 50/60/400Hz,
Power consumption: less than 35W.
Warm-up time: 30 minutes
Calibration cycle: one year
Environment and dimensions
Operating temperature range: 0 ° C ~ +40 ° C
Storage temperature range: -40 ° C ~ +70 ° C
Relative humidity: <95%
Weight: less than 7 kg
Dimensions: 410mm × 210mm × 136mm

7

Appendix

3.0 GHz Spectrum Analyzer

This section provides the accessory details of the spectrum analyzer as well as the service and support information.

7 Apendix

Appendix A: Options and Accessories

Type	Name	Description
Standard options	Advanced measurement function	
Options to be Purchased	RS232 Interfaces	Select either RS232 interface or VGA interface
	VGA Interfaces	
	Tracking signal generator	Frequency range: 5 MHZ ~ 3 GHZ Output level: 0 ~ - 25 DBM, Output flatness: ± 3 db, VSWR: ≤2.0:1； Connector and impedance: N-type female connector; 50 Ω
Standard Accessories	Power cord	1
	User Manual	1
	Programming Manual	1
	Tool Box	1
	CD	1

Note: For information about more options and accessories, please contact with the salesman of GLARUN-ATTEN TECHNOLOGY CO., LTD or the local distributor.

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