



XSA1000 Series Spectrum Analyzer User Manual

- **XSA1015**
- **XSA1015-TG**
- **XSA1036**
- **XSA1036-TG**

Notice: -TG models are with tracking generator

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General Warranty

OWON warrants that the product will be free from defects in materials and workmanship for a period of 3 years from the date of purchase of the product by the original purchaser from the OWON Company. The warranty period for accessories is 12 months. This warranty only applies to the original purchaser and is not transferable to a third party.

If the product proves defective during the warranty period, OWON will either repair the defective product without charge for parts and labour, or will provide a replacement in exchange for the defective product. Parts, modules and replacement products used by OWON for warranty work may be new or reconditioned like new. All replaced parts, modules and products become the property of OWON.

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1. General Safety Requirements

Before use, please read the following safety precautions to avoid any possible bodily injury and to prevent this product or any other connected products from damage. To avoid any contingent danger, ensure this product is only used within the ranges specified.

- **Use Proper Power Cord.** Use only the power cord supplied with the product and certified to use in your country.
- **Product Grounded.** This instrument is grounded through the power cord grounding conductor. To avoid electric shock, the grounding conductor must be grounded. The product must be grounded properly before any connection with its input or output terminals.
- **Check all Terminal Ratings.** To avoid fire or shock hazard, check all ratings and markings on this product. Refer to the user manual for more information about ratings before connecting to the instrument.
- **Use Proper Overvoltage Protection.** Make sure that no overvoltage (such as that caused by a thunderstorm) can reach the product, or else the operator might expose to danger of electrical shock.
- **Do not operate without covers.** Do not operate the instrument with covers or panels removed.
- **Avoid exposed circuit.** Be careful when working on exposed circuitry to avoid risk of electric shock or other injury.
- **Do not operate if any damage.** If you suspect damage to the instrument, have it inspected by qualified service personnel before further use. Any maintenance, adjustment or replacement especially to circuits or accessories must be performed by qualified service personnel.
- **Use your Oscilloscope in a well-ventilated area.** Make sure the instrument installed with proper ventilation.
- **Do not operate in damp conditions.** In order to avoid short

1. General Safety Requirements

circuiting to the interior of the device or electric shock, please do not operate in a humid environment.

- **Do not operate in an explosive atmosphere.** In order to avoid damages to the device or personal injuries, it is important to operate the device away from an explosive atmosphere.
- **Keep product surfaces clean and dry.** To avoid the influence of dust or moisture in air, please keep the surface of device clean and dry.
- **Electrostatic Prevention.** Operate the instrument in an electrostatic discharge protective environment to avoid damage induced by static discharges. Always ground both the internal and external conductors of cables to release static before making connections.
- **Protect the Input Terminals of Instrument.** Do not bend or hit the input terminals and the connected devices, (such as filter, attenuator, etc.) as such stress may cause damages to devices and the instrument. Do not mix the use of 50Ω and 75Ω connectors and/or cables.
- **Do Not Overload the Input.** To avoid damaging the instrument, the signals at input terminal must be less than 50V DC voltage components and 30 dBm (1 W) AC (RF) components.
- **Appropriate Use of Power Meter.** If you are not sure of the characteristics of signal under measure, follow these recommendations to ensure safe operations: if a RF power meter is available, use it to measure the power level of this signal first; or add a rated external attenuator between signal cable and input terminal of the instrument. Maximum attenuation, reference level and maximum span frequency should be selected, so as to make the signals displayed within the screen.
- **Know About the Specification Conditions of the Instrument.** For maximum performance of the instrument, use the analyzer under specified conditions.

1. General Safety Requirements

- **Handling Safety.** Please handle with care during transportation to avoid damages to buttons, knob, interfaces and other parts on the panels.

2. Safety Terms and Symbols

Safety Terms

Terms in this manual (The following terms may appear in this manual):



WARNING

Warning indicates conditions or practices that could result in injury or loss of life.



CAUTION

Caution indicates the conditions or practices that could result in damage to this product or other property.

Terms on the product (The following terms may appear on this product):

DANGER Indicates an immediate hazard or injury possibility.

WARNING Indicates a possible hazard or injury.

CAUTION Indicates potential damage to the instrument or other property.

Safety Symbols

Symbols on the product (The following symbols may appear on the product):



Hazardous
Voltage



Chassis
Ground



Refer to
Manual

3. Document Overview

- **User Notice**

This chapter states the matters need to attention before first power on, and how to power on at first time.

- **Quick Start**

This chapter introduces spectrum analyzer's front/rear panel and user interface. Demonstrate a test example to help realize how to use.

- **Menu interpration**

This chapter offers spectrum analyzer's front panel menu and button interpration.

- **Specification Parameter**

This chapter lists spectrum analyzer's specification parameter.

- **Trouble Shooting**

This chapter helps to implement the troubleshooting and deal with after sale repair.

- **Appendix**

This chapter introduces accessories of spectrum analyzer and how to maintain device. Interprate related information.

Convention on button and menu key format:

Button: Button character + bold bracket, e.g. **【FREQ】** stands for FREQ button.

Menu key words+bracket, e.g.[Center frequency] stands for **【FREQ】** function's center frequency item, that is common called softkey menu item.

Related document:

Related documents including: Quick guide, User manual, programme guide and etc.

4. User Notice

This chapter helps you in preparing the spectrum analyzer for use and provides the information to start using the spectrum analyzer correctly.

4.1 General Inspection

When you receive your new instrument, it is recommended that you check the instrument following these steps:

1. Check for transportation damage.

If it is found that the packaging carton or the foamed plastic protection cushion has suffered serious damage, do not throw it away until the complete device and its accessories have been electrically and mechanically checked.

2. Check the Accessories

The supplied accessories are described in the "*Appendix A: Enclosure*" of this Manual. Please ensure that all the listed accessories are present and undamaged, if any problems are found please contact your distributor or OWON's local office.

3. Check the Complete Instrument

If there is any physical damage, operational fault, or performance issue please contact your distributor or OWON's local office. If there is any damage to the instrument please ensure you keep the original packaging. Ideally you should always keep the original packaging if the instrument must be returned for repair.

4.2 Safety Precaution before Operation

4.2.1 Check Power Supply

The analyzer is equipped with a three-wire power cord in accordance with international safety standards. The product must be grounded properly before being powered on, as floating or improper ground may cause damage to the instrument or personal injury.

Make sure the grounding conductor of the spectrum analyzer is grounded before turning on the instrument. After which the AC

4. User Notice

power cord can be connected. Do not use a non-ground power cord.

4.2.2 Allowed Variation Range of Supply Power Parameters

XSA1000 series radio frequency spectrum analyzer is compatible with 100V~240V, 50Hz-60Hz AC power, Table 4-1 lists the power requirement to run the spectrum analyzer.

Table 4-1 Working Power Variation Range

Power Supply Parameter	Compatible Range
Voltage	100 - 240 VAC
Frequency	50 - 60 Hz $\pm 10\%$
Power	22 W

To prevent or lower the risk of damage to the spectrum analyzer from power interference between instruments, especially from peak pulses produced by large power consumption instruments, a 220V/110V AC regulated power supply is recommended.

4.2.3 Power Cord Selection

The analyzer is equipped with a three-wire power cord in accordance with international safety standards. This cable grounds the analyzer cabinet when connected to an appropriate power line outlet. The cable must be rated greater than 250Vac and 2A.



WARNING

Improper grounding may cause damage to the instrument, or result in personal injury. Make sure the grounding conductor of the spectrum analyzer is grounded before turning on the instrument.

Always use a well-grounded power source. Do not use an external power cable, power cord or an auto transformer without grounded protection. If this product is to be powered via an external auto transformer for voltage reduction, ensure that its common terminal is connected to a neutral (earthed pole) of the power supply.



WARNING

Make sure the supply power is stable before turning on the analyzer to protect it from damage. Refer to “First Time to Power on” section 3.

4.2.4 Electro-static Discharge (ESD) Protection

ESD is an issue often ignored by users. Damage from ESD on the instrument is unlikely to occur immediately but will significantly reduce the reliability of it. Therefore, ESD precautions should be implemented in the work environment, and applied daily.

Generally, there are two steps to manage ESD protection:

- 1) Conductive table mats to connect hands via wrist bands
- 2) Conductive ground mat to connect feet via ankle straps

Implement both protection methods will provide a good level of anti-static protection. If used alone, the protection will not be as reliable. To ensure user's safety, anti-static components should offer at least 1MΩ isolation resistance.



WARNING

The above ESD protections measures cannot be used when working with over 500V!

Make good use of anti-static technology to protect components from damage:

- 1) Quickly ground the internal and external conductor of the coaxial cable before it is connected with the spectrum analyzer.
- 2) Staff must wear anti-static gloves before touching the connector cord or doing any assemble work.
- 3) Assure all the instruments are grounded properly to avoid static storage.

4.3 First Time to Power on


Connect the three-pin AC power cord into the instrument. Insert the plug into a power socket provided with a protective ground.

4. User Notice



WARNING

Check the power source before turning on the spectrum analyzer, to protect the device from damage.

- 1) Press the power switch  on the bottom left of the front panel.
- 2) Self-initialization takes about 30 seconds, after the boot screen the spectrum analyzer will default to the scanning curve.
- 3) After power on, let the spectrum analyzer warm up for 30 minutes for stabilization to obtain the most accurate results.

5. Quick Start

This chapter introduces the front / rear panel, the user interface and explains how to use the instrument with a measurement example demonstration.

5.1 Front Panel

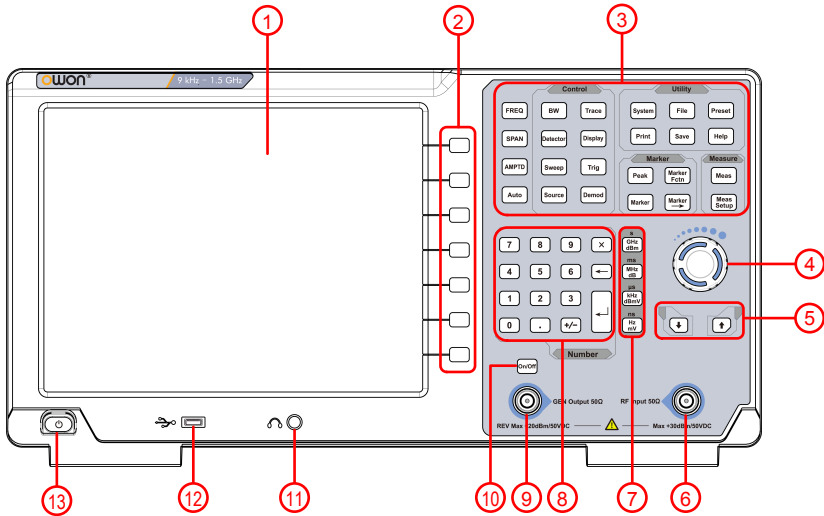


Figure 5-1 Front panel

Table 5-1 Front Panel

NO.	Description	NO.	Description
①	LCD	⑧	Numeric keypad
②	Menu softkeys	⑨	Tracking generator output connector
③	Function keys	⑩	Tracking generator output On/Off button
④	Knob	⑪	Earphone interface
⑤	Arrow keys	⑫	USB Host port
⑥	RF Input connector	⑬	Power key (Push to turn on, long push to turn off)
⑦	Unit keys		

5.1.1 Front Panel Function Key

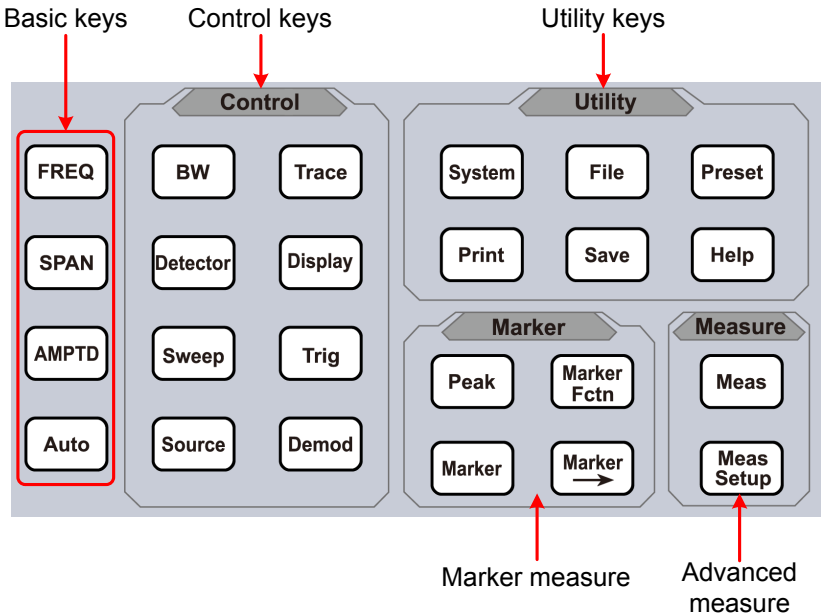







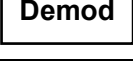





Figure 5-2 Function Keys

Table 5-2 Function Key

Keys	Description
Basic keys	
FREQ	Activates the center-frequency function, and accesses the frequency function menu.
SPAN	Activates the frequency sweep span function, and set Full Span\Zero Span\Last Span.
AMPTD	Activates the reference level function, and accesses the amplitude softkeys, with which you set functions that affect data on the vertical axis.
AUTO	Searches the signal automatically within the full frequency range.

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Control keys	
	Activates the RBW (resolution bandwidth) function, and accesses the softkeys that control the bandwidth functions and averaging.
	Accesses the softkeys that allow you to store and manipulate trace information.
	Accesses the softkeys that allow you to configure detector functions.
	Accesses the softkeys that allow you to control what is displayed on the analyzer, including the display line, graticule and label.
	Accesses the softkeys that allow you to set the sweep time, select the sweep mode of the analyzer.
	Accesses the softkeys that allow you to select the trigger mode of the analyzer.
	Accesses the softkeys that allow you to set the tracking generator.
	Accesses the softkeys that allow you to set the demodulation.
Marker measure keys	
	Places a marker on the highest peak, and accesses the Peak functions menu.
	Accesses the marker control keys that select the type and number of markers and turns them on and off.
	Accesses the marker function softkeys that allow you to set other system parameters based on the current marker value.

5. Quick Start

Marker Fctn	Accesses the menu of special functions, such as noise marker, N dB bandwidth measure and frequency counting.
Advanced measure keys	
Meas	Accesses the softkeys that let you make transmitter power measurements such as ACPR(adjacent channel power), channel power, and OBW(occupied bandwidth), etc.
Meas Setup	Sets the parameters for the selected measurement function.
Utility keys	
System	Sets the system parameters, and accesses the calibration menu.
File	Accesses the softkeys that allow you to configure the file system of the analyzer.
Preset	Resets the analyzer to the factory settings or user state. This state can be specified in 【System】 → [PowerOn/Preset▶]→ [Preset▶].
Print	Accesses the softkeys that allow you to set the print parameters.
Save	Accesses the softkeys that allow you to save current screen, trace data, or user state.
Help	Press the Help key to activate the help system. Press the Help key again to exit.

5.1.2 Parameter Input

Specific parameter values are able to be entered using the numerical keyboard, knob, and directional keys.

Numeric Keyboard

5.Quick Start

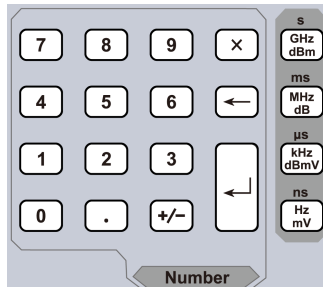






Figure 5-3 Numeric Keyboard

1. Numerical keys
Numbers 0-9 are available to be used.
2.  Decimal point
A decimal point “.” will be inserted at the cursor position when this key is pressed.
3.  Sign key
Sign key “+/-” is to toggle the sign of a parameter. When pressed the first time, a “-” will be inserted and changed into “+” following the second press.
4. Unit keys
Unit keys include GHz/dBm/s, MHz/dB/ms, kHz/dBmV/ μ s and Hz/mV/ns. After entering the desired numbers, choose an appropriate unit to complete the input. The specific meaning of unit is decided by the type of input parameter (“frequency”, “amplitude” or “time”).
5.  Cancel Key
 - (1) During the editing process this key will clear the inputs in the active area and exit editing mode at the same time.
 - (2) Turn off the display in the active area.
 - (3) Exit current test mode while in keyboard test.
6.  Back Key
 - (1) During the process of parameter editing, this key will delete the characters on the left side of the cursor.
 - (2) While in the process of file name editing, pressing this key will delete characters that have been entered.
7. Enter
When pressed, the system will complete the input process and insert a default measurement unit for the parameter automatically.

Knob



Figure 5-4 The knob

The knob function:

During parameter editing, turn the knob clockwise to increase, or counterclockwise to decrease the parameter values at specified steps.

Direction key

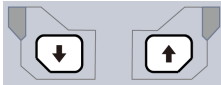


Figure 5-5 Direction keys

The directional keys have following functions:

- 1) Increase or decrease the parameter value at specific steps while editing a parameter.
- 2) Move the cursor through the directory tree in the **【File】** function.

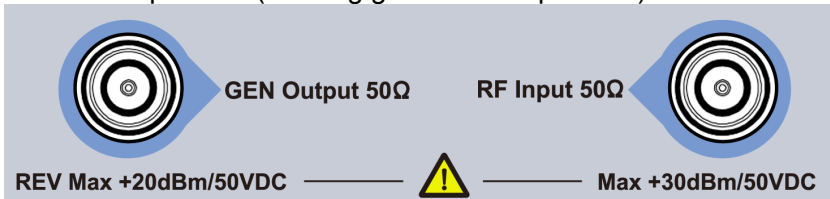
5.1.3 Front Panel Connector

1. USB Host



The analyzer may serve as a “host” device to connect to external USB devices. This interface is available for USB storage devices.

2. GEN Output 50Ω (tracking generator output 50Ω)



The output of the tracking generator can be connected to a receiver through an N type male connector, users can purchase this option if required.

5.Quick Start



CAUTION

Input voltage at RF input port must not be higher than 50 V DC to avoid damage to the attenuator and input mixer tracking generator.

3. RF Input 50Ω

The RF input may be connected to a device via a N type connector



CAUTION

When input attenuator is higher than 10 dB, the RF port input signal must be less than +30 dBm.

5.2 Rear Panel

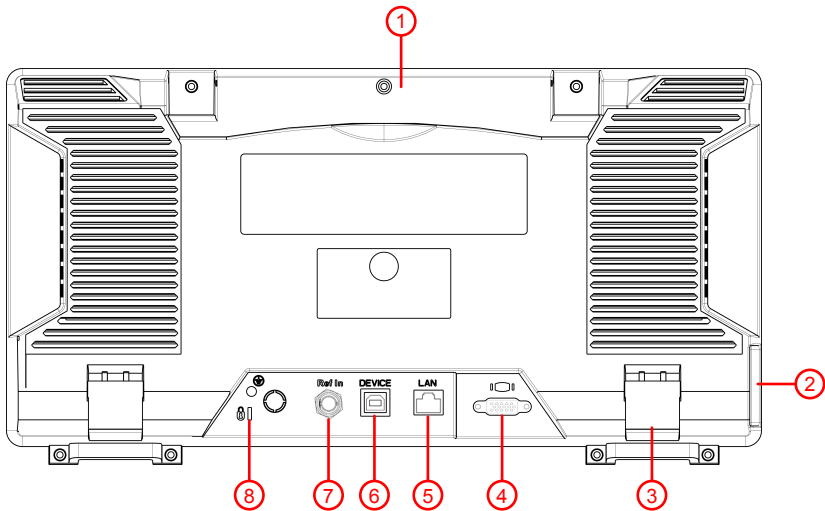


Figure 5-6 Rear Panel

NO.	Name	Description
①	Handle	Stow the handle for mobile use.
②	AC power connector	AC: frequency 50Hz±10%,single-phase alternative 220V±15% or 110V±15%
③	Stool	To adjust the angle of the device

5.Quick Start

④	VGA port	provides a VGA signal output which is used through a VGA cable or with a projector
⑤	LAN interface	Through this interface, the analyzer can be connected to your local network for remote control. An integrated testing system can be built quickly, as the analyzer conforms to the LXI C Device class instrument standards.
⑥	USB Device interface	This configurable USB port permits external USB devices. It supports PictBridge printer and remote-control connection.
⑦	10MHz IN/OUT	The BNC input or output of the 10 MHz reference clock
⑧	Lock hole	You can lock the spectrum analyzer to a fixed location using the security lock (please buy it yourself) to secure the spectrum analyzer.

5.3 User Interface

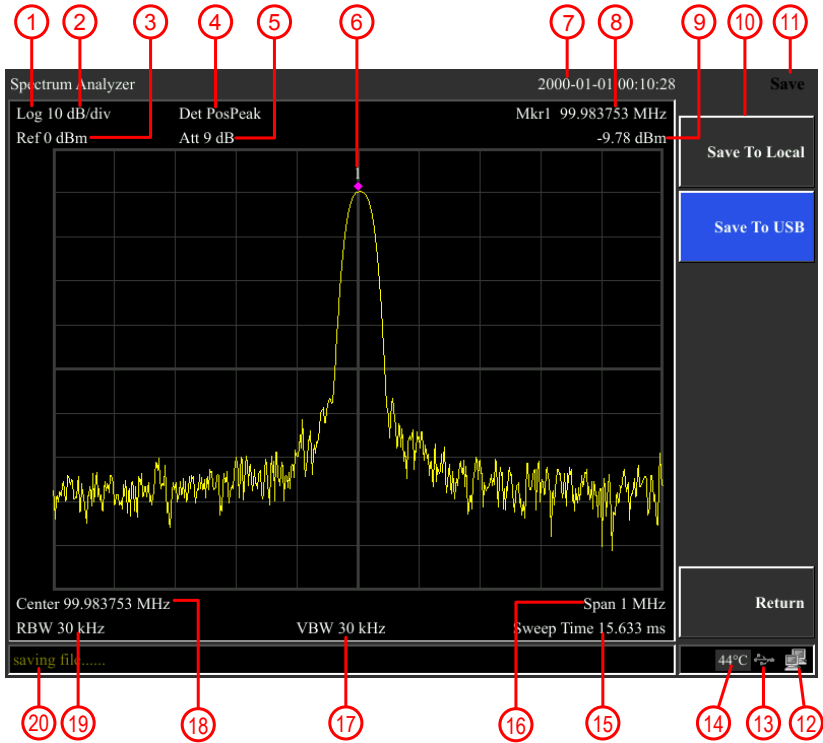


Figure 5-7 User interface

Table 5-3 User interface

NO.	Name	Description	Related Key
①	Amplitude Division Type	Can choose logarithmic or linear	【AMPTD】 → [Scale Type]
②	Amplitude Division	Display division scale	【AMPTD】 → [Scale/Div]
③	Reference level	Reference level	【AMPTD】 → [Ref Level]
④	Detection type	Display detection type	【Detector】
⑤	Attenuation	Display input attenuation setting	【AMPTD】 → [Attenuation]
⑥	Marker	Display current activated marker	【Marker】

5.Quick Start

⑦	Date/time	Display system date and time	【System】 → [Date/Time]
⑧⑨	Marker readout	Display frequency and amplitude of current marker	【Marker】
⑩	Menu item	Menu item of current function	
⑪	Menu title	Function of current menu belongs to.	
⑫	LAN access sign	LAN access sign	
⑬	USB storage device	Show if USB storage device is inserted;	
⑭	Temperature sign	Display device internal temperature	
⑮	Sweep Time	System sweep time	【Sweep】 → [Sweep Time]
⑯	Span	Display span width	【SPAN】 → [Span]
⑰	Video bandwidth	Display video bandwidth	【BW】 → [VBW]
⑱	Center frequency	Display center frequency	【FREQ】 → [Center Freq]
⑲	Resolution bandwidth	Display resolution bandwidth	【BW】 → [RBW]
⑳	System status	Display spectrum analyzer status	

5.4 Build-in Help

The built-in help provides information that refers to every function key and menu key on the front panel. Users can view this help information if required

1.How to acquire built-in help

Press Help; a prompt about how to obtain help information will be shown

2.Page up and down

If there is more than one page of information, you can read the

complete information by using the directional keys.

3.Close the current help information

Press “Help” again to close help.

4.Acquire the menu help

A message about how to obtain help information will be shown, press the menu keys to get the corresponding help.

5.Acquire the help information of any function key

A message about how to obtain help information will be shown, press any function key to get the corresponding help.

5.5 Basic Measurement

Basic measurements include, input signal frequency and amplitude display, marked by a frequency marker. Follow these four simple steps below to implement input signal measurement.

Basic:

1. Set the center frequency;
2. Setup span and resolution bandwidth;
3. Activate the marker;
4. Setup amplitude;

For example, to measure a 100MHz -20dBm signal you must turn on the spectrum analyzer and ensure it is warmed up for 30 minutes to ensure measurement accuracy.

1. Equipment connection:

Connect the signal generator to the spectrum analyzer input terminal and set the parameters as follows:

Frequency	100 MHz
Amplitude	-20 dBm

2. Setup parameters:

- 1) Press “Preset” to reset the spectrum analyzer to factory settings. The Spectrum analyzer will display the spectrum from 9kHz to the maximum span width. The signal generated will display as a vertical line at 100MHz. Refer to Figure 5-8.

5.Quick Start

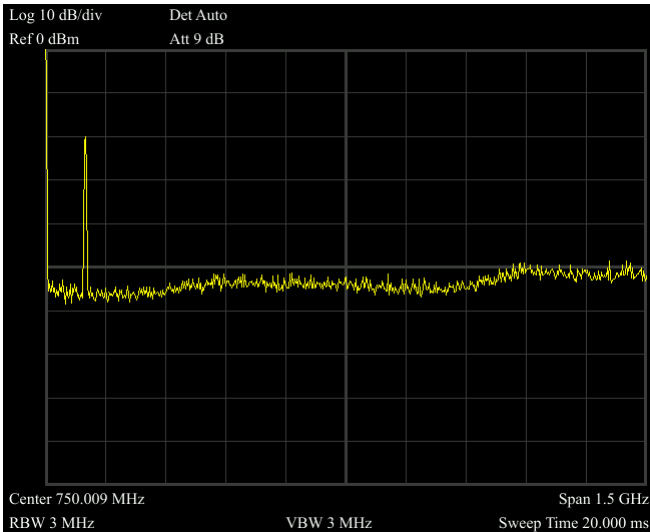


Figure 5-8 Full Span

To clearly observe the signal, reduce the span width to 1 MHz and set the center frequency to 100MHz.

2) Setup the Center Frequency

Press “FREQ”, select [Center frequency] on corresponding pop up menu. Input “100” and select the unit as MHz on the numerical keyboard. The keys can be used to set the exact value but the knob and directional keys can also be used to set the center frequency.

3) Setup span

Press **【SPAN】**, input “1” and select unit MHz on the numerical keyboard. Or Press **【↓】** to decrease to 1MHz

Press **【BW】**, set [resolution bandwidth] to manual, and input “30” on the numerical keyboard and select the unit as kHz or press **【↓】** to decrease to 30kHz

Press **【Detector】**, set the detection type to positive peak.

Figure 5-9 shows the signal at a higher resolution.

Please not that resolution bandwidth, video bandwidth and span are self-adapted. They adjust to certain values according to sweep width. Also, sweep time can be self-adapted.

5.Quick Start

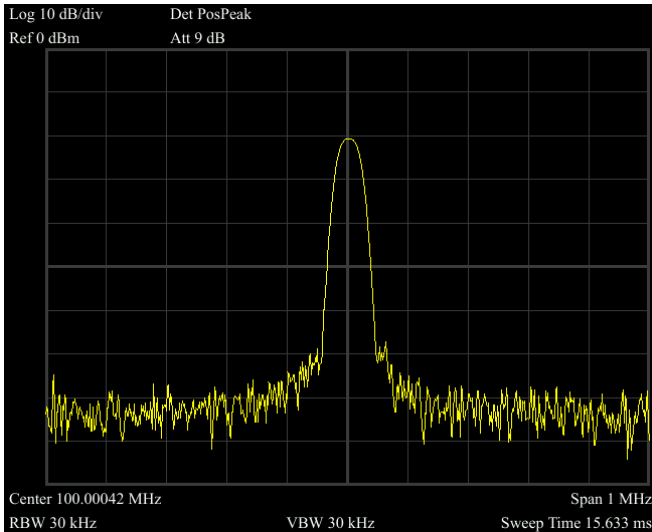


Figure 5-9 Set span

4) Activate Marker

—Press the Marker button in the function area. Press the soft key to select [Marker 1 2 3 4 5], select Marker 1, the marker is located at horizontal center by default, that is the signal peak point or its neighbor.

—Press Peak, and enter the next level menu, select [Max Search]. Frequency and amplitude values are read by the marker and shown on the top right of the display area.

5) Setup amplitude

The reference level will be shown at the top of the display grid. To get a better dynamic range, the real signal peak point should be located at or near the top of display grid (reference level). The reference level is also the maximum value on Y axis. Here we reduce to 20dB reference level to increase the dynamic range.

Press **【AMPTD】** , the amplitude setting menu will pop up, and the [reference level] soft key will be activated. The reference level can be input at the top left of the display grid. Input “-20” using the numerical keyboard and set the unit to dBm. You can also use the **【↓】** key or the knob for adjustment.

The reference level is set at -20dBm, which is the signal peak value near the top of the grid. The balance between the signal

5.Quick Start

peak value and noise is dynamic range.

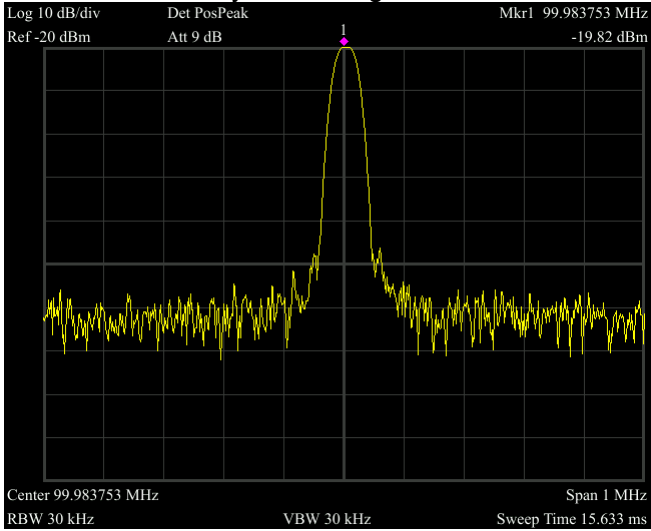


Figure 5-10 Set reference level

6. Menu Interpration

This section provides you with the information on using the front panel of the spectrum analyzer.

6.1 【FREQ】 Frequency

The frequency range of a channel can be expressed by either of two groups of parameters: Start Frequency and Stop Frequency; or Center Frequency and Span. If any such parameter is changed, the others would be adjusted automatically in order to ensure the coupling relationship among them

$$f_{center} = (f_{stop} + f_{start}) / 2 \quad (6-1)$$

$$f_{span} = f_{stop} - f_{start} \quad (6-2)$$

f_{center} , f_{stop} , f_{start} and f_{span} denotes the center frequency, the stop frequency, the start frequency and the span respectively.

6.1.1 [Center Freq]

Sets the center frequency of the sweep. When pressed, the frequency mode is switched to Center Freq and Span in order to enter the desired parameter data.

Key Points:

- The start and stop frequencies vary with the center frequency when the span is constant.
- Changing the center frequency horizontally shifts the current sweep channel and the adjustment is limited by the specified frequency range.
- In Zero Span mode, the start frequency, stop frequency and center frequency are always equal. If one is changed the others are updated to match.
- You can modify this parameter using the numeric keys, knob, or direction keys.

6.1.2 [Start Freq]

Sets the start frequency of the sweep. When pressed, the

frequency mode is switched to Start Freq and Stop Freq in order to enter the desired parameter data.

Key Points:

- The span and center frequency are changed automatically according to the start frequency. The change of the span would have influence on other system parameters. For more details, please refer to “Span”.
- In Zero Span mode, the start frequency, stop frequency and center frequency are always equal. If one is changed the others are updated to match.
- You can modify this parameter using the numeric keys, knob, or direction keys.
- If start freq is larger than stop freq when setting, then stop freq will increase automatically to the same value of start freq.

6.1.3 [Stop Freq]

Sets the stop frequency of the sweep. When pressed, the frequency mode is switched to Start Freq and Stop Freq in order to enter the desired parameter data.

Key Points:

- Modifying the stop frequency changes the span and center frequency, and the change of span influences other system parameters, see “Span”.
- You can modify this parameter using the numeric keys, knob, or direction keys.
- If stop freq is larger than start freq when setting, then start freq will decrease automatically to the same value of stop freq.

6.1.4 [CF Step Auto Manual]

Sets the step of center frequency. Changing the center frequency in a fixed step continuously switches the channel to be measured.

Key Points:

- The frequency step type could be “Manual” or “Auto”. In Auto mode, the CF step is 1/10 of span if it is in Non-zero span mode or equals 25% of RBW while in Zero span mode; in Manual mode, you can set the step using the numeric, step keys or knob.

6.Menu Interpration

Then activate **【Center Frequency】** , press step, center frequency will change as setting step.

- After you set an appropriate frequency step and select center frequency, you can use using up and down direction keys to switch between measurement channels in a specified step in order to sweep the adjacent channels manually.
- You can modify this parameter using the numeric keys, knob, or direction keys.

Frequency step lends itself to detect the harmonic waves and bandwidths that are beyond the current span.

For example, for order of harmonic of a 300 MHz signal, you can use set both the center frequency and frequency step to 300 MHz, and press the up direction key continuously to increase the center frequency to 600MHz, that is secondary harmonic. Press frequency steps to increase center frequency by 300MHz, which reaches 900MHz. [Frequency Step Auto Manual] shows the auto or manual mode to setting the steps. When step is under manual mode, press [Frequency Step Auto Manual] to return to auto mode.

6.1.5 [Freq Offset]

You can set a frequency offset to displayed frequency value, including freq marker value. This movement won't influence sweep frequency range.

While this function activated (frequency offset isn't 0), you can modify this parameter using the numeric keys, knob or direction keys.

6.1.6 [Freq Ref Internal External]

Set the reference frequency as internal or external input, this is regarded as whole device reference.

6.2 【SPAN】

Set the spectrum analyzer to span mode. When press **【SPAN】** ,

[Span],[Full Span],[Zero Span] and [Last Span] will be available to configure. You can modify span using the numeric keys, knob or direction keys. Use numerical key or [Zero Span] to clear span.

6.2.1 [Span]

Sets the frequency range of the sweep. When pressed, the frequency mode is switched to Center Freq/Span.

Key points:

- The start and stop frequencies are changed with the span automatically.
- In manual span mode, the span can be set down to 0 Hz, that is zero span mode. And up to the full span described in “Specification”. When it is set to the maximum span, it enters full span mode.
- Modifying the span in non-zero span mode may cause an automatic change in both CF step and RBW if they were in Auto mode, and the change of RBW may influence VBW (in Auto VBW mode).
- In non-zero span mode, variation in the span, RBW or VBW would cause a change in sweep time.
- You can modify this parameter using the numeric keys, knob, or direction keys.

6.2.2 [Full Span]

Sets the spectrum analyzer to center frequency/sweep mode, and span of the analyzer to the maximum.

6.2.3 [Zero Span]

Sets the span of the analyzer to 0 Hz. Both the start and stop frequencies will equal the center frequency and the horizontal axis will denote time. The analyzer here is measuring the time domain characteristics of amplitude, located at the corresponding frequency point. This will help to observe the signal (especially for modulated signal) at time domain.

6.2.4 [Last Span]

Changes the span to the previous span setting.

6.3 【AMPTD】 Amplitude

Sets the amplitude parameters of the analyzer. Through these parameters, signals under measurement can be displayed at an optimal view with minimum error. The pop out amplitude menu includes [Ref Level], [Attenuation Auto Manual], [Scale/Div], [Scale Type Lin Log], [Ref Offset], [Ref Unit], and [Preamplifier On Off].

6.3.1 [Ref Level]

Activate reference level function and sets the maximum power or voltage for display window.

Key points:

- This value is affected by a combination of maximum mixing level, input attenuation, and preamplifier. When you adjust it, the input attenuation is adjusted under a constant max mixing level, meeting:

$$L_{Ref} - a_{RF} + a_{PA} \leq L_{mix} \quad (6-3)$$

L_{Ref} , a_{RF} , a_{PA} and L_{mix} denotes the reference level, the input attenuation, the preamplifier, and the max mixing level, respectively.

- You can modify this parameter using the numeric keys, knob, or direction keys.

Reference level located at the top of axis grid. Measurement near the reference level would gain better accuracy, but input signal amplitude should not exceed the reference level; if it exceeds, the signal will be compressed and distorted, result in wrong measurement. Analyzer's input attenuation is related with reference level, it can self-adjust to avoid signal compression. Minimum reference level is -80dBm at Log scale under 0dB attenuation.

6.3.2 [Attenuation Auto Manual]

Sets the front attenuator of the RF input in order to permit big signals (or small signals) to pass from the mixer with low distortion (or low noise). It only works under internal mixer mode to adjust input attenuator insider analyzer. In Auto mode, input attenuator is related with reference level.

Key points:

- When the preamplifier is On, the input attenuation could be set up to 39 dB. You can adjust the reference level to ensure that the specified parameters meet the requirement.
- Modifying the reference level may cause an automatic change in attenuation value; But the change of attenuation value won't influence reference level.
- You can modify this parameter using the numeric keys, knob, or direction keys.

Attenuator adjustment is to make the maximum signal amplitude pass from mixer less than or equal to -10dBm. E.g. if the reference level is +12dBm, the attenuator value is 22dB, then the input level in mixer is -18dBm ($12-22-8=-18$), its mainly purpose is to avoid signal compression. Switch [Input Atten Auto Manual] to manual mode, adjust the attenuator manually. The highlight under auto or manual stands for auto coupling and manual coupling. When attenuator is under manual mode, press [Input Atten Auto Manual] will match the attenuator and reference level again.

Note: Maximum input signal amplitude of input attenuator (10dB input attenuation at least) is +27dBm, higher power signal will damage input attenuator or mixer.

6.3.3 [Scale/Div]

Sets the logarithmic units per vertical grid division on the display. Select 1,2,4 or 10dB log amplitude scale. It's 10dB/div by default. Every activated marker is with dB as unit, difference between two markers is treated as marker difference under dB unit.

Key points:

- By changing the scale, the displayed amplitude range is

adjusted.

- The amplitude that can be displayed is from reference level minus 10 times the current scale value to the reference level.
- You can modify this parameter using the numeric keys, knob, or direction keys.

6.3.4 [Scale Type Lin Log]

Sets the Scale Type of Y-axis to Lin or Log, the default is Log. It only works under internal mixer mode. In general, select mV as Lin amplitude scale unit. Of course there would be other units for select.

Key points:

- In Log scale type: the Y-axis denotes the logarithmic coordinates, the value shown at top of the grid is the reference level and the grid size is equal to the scale value. The unit of Y-axis will be automatically switched into the default “dBm” when the scale type is changed from Lin to Log.
- In Lin scale type: the Y-axis denotes the linear coordinates, the value shown at the top of the grid is the reference level and the bottom of the grid shows 0 V. The grid size is 10% of the Reference level and the Scale/Div is invalid. The unit of Y-axis will be automatically switched into the default “mV” when the scale type is changed from Log to Lin.
- Other than as mentioned above, the unit of Y-axis is independent of the Scale Type.

6.3.5 [Ref Offset]

Assigns an offset to the reference level to attempt to compensate for gains or losses generated between the device under measurement and the analyzer.

Key points:

- The changing of this value changes both the readout of the reference level and the amplitude readout of the marker, but will not impact the position of the curve on the screen.
- You can modify this parameter using the numeric keys.
- This offset use dB as absolute unit, will not change with selected scale and unit.

6.3.6 [Ref Unit▶]

Sets the unit of the Y-axis to[dBm], [dBmV], [dBuV], [V] or [W]

Key points:

- 1) [dBm]
Choose decibel equals to 1mW as amplitude unit.
- 2) [dBμW]
Choose decibel equals to 1μW as amplitude unit.
- 3) [dBpW]
Choose decibel equals to 1pW as amplitude unit.
- 4) [dBmV]
Choose decibel equals to 1mV as amplitude unit.
- 5) [dBμV]
Choose decibel equals to 1μV as amplitude unit.
- 6) [W]
Choose Watts as amplitude unit.
- 7) [V]
Choose Voltage as amplitude unit.

6.3.7 [Preamplicator On Off]

Sets the status of preamplicator located at the front of the RF signal path. Turning on the preamplicator reduces the displayed average noise level in order to distinguish small signals from the noise when working with small signals.

6.4 【Auto】 Auto Tune

Searches for signals automatically throughout the full frequency range, adjusts the frequency and amplitude to their optimum and realizes one-key signal search and auto setting of parameters.

Key points: some parameters such as reference level, scale, and input attenuation may be changed during the auto tune.

6.5 【BW】 Bandwidth

Sets the RBW (Resolution Bandwidth) and VBW (Video Bandwidth) parameters of the analyzer. Pop out the setting menu includes

[RBW Auto Manual], [RBW Mode Default Continuous],[VBW Auto Manual], [Average On Off], [EMI BW▶].

6.5.1 [RBW Auto Manual]

Adjust the resolution bandwidth ranging from 10Hz-3MHz. Use numerical key, step key or knob to switch resolution bandwidth. The underline under Auto or Manual means Auto mode or Manual mode. Press [Resolution Bandwidth Auto Manual] and hold it until underline under Auto has been highlighted. Then the resolution bandwidth is under auto coupling mode.

Key points:

- Reducing the value of RBW will increase the frequency resolution, but may also cause sweeps to take longer (Sweep Time is effected by a combination of RBW and VBW when it is in Auto mode).
- RBW decreases with the span (non-zero span) in Auto RBW mode.

6.5.2 [RBW Mode Default Continuous]

Adjust resolution step mode, resolution mode can be set to 1-3-5, Default or Continuous mode.

6.5.3 [VBW Auto Manual]

Sets the desired video bandwidth in order to remove the band noise. Set the video resolution displays in function area, ranging from 10Hz to 30MHz by sequence step. You can modify this parameter by numeric key, step key or knob. The underline under Auto or Manual means Auto mode or Manual mode. Press [VBW Auto Manual] and hold it in manual until the underline highlighted under Auto to return auto mode.

Key points:

- Reducing the VBW to smooth the spectrum line and differentiate small signals from the noise. However, this may cause a longer sweep time. (Sweep Time is effected by a combination of RBW and VBW when it is in Auto mode).
- VBW varies with RBW when it is set to Auto.

6.5.4 [Average On Off]

Trace average function. It doesn't need narrow VBW to implement smooth trace. This function set the wave detector to acquisition mode, continuously get average of the trace to smooth it.

6.5.5 [EMI BW▶]

Pop out the menu for EMI measurement bandwidth.

1) [EMI bandwidth On Off]

Turn on or off EMI measurement resolution bandwidth.

2) [1MHz]

Set EMI measurement resolution to 1MHz.

3) [120kHz]

Set EMI measurement resolution to 120kHz.

4) [30kHz]

Set EMI measurement resolution to 30kHz.

5) [9kHz]

Set EMI measurement resolution to 9kHz.

6) [200Hz]

Set EMI measurement resolution to 200Hz.

6.6 【Trace】

As the sweep signal is displayed as a trace on the screen, you can set parameters about the trace using this key. The analyzer allows for up to five traces to be displayed at one time, and press this key to check the menu for trace. It includes [Trace 1 2 3 4 5], [Clear Write], [Max Hold], [Min Hold], [Blank], [Check], [1 ↔ 2], [2 - DL → 2], [2 ↔ 3], [1 → 3] and [2 → 3].

6.6.1 [Trace 1 2 3 4 5]

Select trace, the analyzer offers 1,2,3,4,5 trace. The selected trace and corresponding status menu will be underlined.

6.6.2 [Clear Write]

Refresh current curve and display the analyzer trace.

6.6.3 [Max Hold]

Maintains the maximum for each point of the trace. It continuously receive scan data and select positive peak value detect mode.

6.6.4 [Min Hold]

Maintains the minimum for each point of the trace. It continuously receive scan data and select negative peak value detect mode.

6.6.5 [Blank]

Clear the trace on screen. But the trace stock will keep still without refreshing.

6.6.6 [View]

Stops updating trace data and display current trace for observation..

6.6.7 [Operations▶]

Enter trace math related sub menu.

1) [1 ↔ 2]

Exchange the trace stock 1 data with trace stock 2 and place them in display mode.

2) [2-DL → 2]

Deduct display line value in trace stock 2. This function execute once when activated. Press [2 - DL → 2] again to execute it the second time. When this function activated, display line will also be activated.

3) [2 ↔ 3]

Exchange the trace stock 2 data with trace stock 3 and place them in display mode.

4) [1→3]

Exchange the trace stock 1 data with trace stock 3 and place them in display mode.

5) [2→3]

Exchange the trace stock 2 data with trace stock 3 and place them in display mode.

6.7 【Detector】

While displaying a wider span, each pixel contains spectrum information associated with a larger subrange. That is, several samples may fall on one pixel. Which of the samples will be represented by the pixel depends on the selected detector type. Press this key to pop out the relevant menu includes [Auto],[Normal],[Pos Peak],[Neg Peak],[Sample].

Key points:

- Selects an appropriate type according to the application in order to ensure the accuracy of the measurement for your application.
- The available types are: Pos Peak, Neg Peak, Sample.
- Every selected type is shown with a parameter icon on the left status bar of screen.

Table 6-1 Detector type comparison

Detector Type	Measurement
Auto	Normal wave detect is the most common way to detect waveform. It can observe the signal and base noise at the same time without loosing any signal.
Normal	Display pos peak and neg peak alternately when noise is detected, or it only display pos peak.
Pos Peak	Positive peak detection ensures that no peak signal is missed, which is useful for measuring signals that are very close to the base noise.
Neg Peak	Negative peak detection is used in most cases with the self-test of the spectrum analyzer and is rarely used in the measurement. It is able to restore the modulation envelope of the AM signal well.

6.Menu Interpration

Sample	Sampling detector is conducive to measurement noise signal. Compared with the standard detection method, it can measure noise better.
--------	---------------------------------------------------------------------------------------------------------------------------------------

6.7.1 [Auto]

Set the detector to auto detection mode (default mode). In this mode, when the span is greater than 1MHz, the detection method is set as Normal. When the span is less than or equal to 1MHz, the detection method is set as Positive Peak.

6.7.2 [Normal]

When noise is detected, the positive and negative peaks are alternately displayed, otherwise only positive peaks are displayed.

6.7.3 [Pos Peak]

Searches the maximum from the sampling data segment and displays it at the corresponding pixel. Positive peak detector will be selected when [Max Hold] pressed.

6.7.4 [Neg Peak]

Searches the minimum from the sampling data segment and displays it at the corresponding pixel.

6.7.5 [Sample]

Set the detector to the sampling detector mode. This mode is usually used for video averaging and noise frequency Maker.

6.8 【Display】

Controls the screen display of the analyzer, such as setting the on or off for window zoom, display line, amplitude scale, grid, label, and display style.

6.8.1 [Full Screen]

Set to full-screen display graphical interface, press any key to exit.

6.8.2 [Zoom On Off]

In multi-window display mode, press this button to zoom in on the selected window. Press the key for the first time to enlarge the selected window to the entire graphic display area. Press this button again to exit the entire graphic display area and restore the multi-window display mode.

6.8.3 [Display Line On Off]

When this menu is on, an adjustable horizontal reference line is activated on the screen.

6.8.4 [Ampt Graticule On Off]

Turn on or Off amplitude scale function.

6.8.5 [Grid On Off]

It's the grid lines displaying and hiding menu. When the grid display line is on, pressing [Grid On Off] again will turn it off.

6.8.6 [Style▶]

Set the spectrum analyzer display style as default or WinXP.

6.8.7 [Label On Off]

Defines the content displayed or hidden in the comments that appear in the display grid area.

6.9 【Sweep】

Sets parameters about the Sweep time and mode including [Sweep Time Auto Manual], [Sweep Single], [Sweep Cont]].

6.9.1 [Sweep Time Auto Manual]

Sets the time interval for the analyzer to complete a sweep.

- In non-zero span, the analyzer uses the shortest sweep time on the basis of the current RBW and VBW settings if Auto is selected.
- You can modify this parameter using the numeric keys, knob, or direction keys.

6.9.2 [Sweep Single]

Press [Single Sweep] to set the sweep mode to Single. Press [Single Scan] to restart the scan when the next trigger signal arrives. Allows you to set continuous scan mode.

6.9.3 [Sweep Cont]

Press [Continuous Scan] to activate the sweep scan mode.

6.9.4 [Sweep Points]

Sets the desired points for every sweep. That is the number of points of the current trace.

Key Points:

- Changing the points may influence the sweep time which is limited by the sample rate of the ADC (Analog to Digital Converter). That is, the more points used, the longer the sweep will be.
- Changing the points would also influence other system parameters, thus the instrument restarts the sweep and measurement cycle.
- You can modify this parameter using the numeric keys, knob or direction keys.

6.10 【Trig】

Sets the trigger type and other associated parameters, menu includes [Auto Run] and [Video].

6.10.1 [Auto Run]

Set the trigger mode to the free trigger mode so that the scan trigger is as fast as possible with the spectrum analyzer. It meets the trigger conditions at any time, that is, continue to generate a trigger signal.

6.10.2 [Video]

This indicates a trigger signal will be generated when the system detects a video signal in which the voltage exceeds the specified video trigger level.

6.11 【Source】

When the Source is On, a signal with the same frequency of the current sweep signal will be output from the GEN OUTPUT 50Ω terminal on the front panel. Press the key will pop out related menu includes [Tracking Source▶], [Tracking Source On Off], [Output Power], [Network Measure▶]. The tracking source is turned off in the power-on and reset states.

6.11.1 [Track Gen▶]

To configure tracking source.

6.11.2 [Track Gen On Off]

RF output and spectrum reception are fully synchronized on the frequency sweep, and the tracking source frequency can not be set individually.

6.11.3 [Output Level]

Tracking Source power output range from 0dBm to -30dBm.

6.11.4 [Network Meas▶]

Tracking source network measurement function, mainly for amplitude and frequency characteristics measurement; RF output and spectrum measurement is fully synchronized, can be used as a scalar network analyzer. When the network measurement function is "on", the measurement results show relative values after "normalized", expressed in "dB". When the network measurement function is "off", the measurement shows the spectrum measurement result, expressed in "dBm".

1) [Network Meas On Off]

Turn on or off the tracking source network measurement function. Tracking source network measurement function, mainly for amplitude and frequency characteristics measurement; RF output and spectrum measurement is fully synchronized, can be used as a scalar network analyzer. When the network measurement function is "on", the measurement results show relative values after "normalized", expressed in "dB". When the network measurement function is "off", the measurement shows the spectrum measurement result, expressed in "dBm".

2) [Output Level]

Used to set the output power of the trace source.

3) [Ref Level]

This soft menu is used to track the source network measurement of the user to adjust the measurement results display location.

4) [Sweep Points]

Used to set the number of scanning points for network measurements.

5) [Sweep Time]

Used to set the scan time for network measurements.

6) [Normalize]

This soft menu is used to track the user's field calibration of the source network measurements. After connecting the instrument's RF output to the RF input, press the "normalized" soft menu and the display shows a straight line on the 0dB scale.

6.12 【Demod】 Demodulation

Enter the demodulation settings, the spectrum analyzer supports audio demodulation and AM, FM digital demodulation.

6.12.1 [DEMODO▶]

Enter Audio Demod soft menu.

6.12.2 [Demod On Off]

Turn audio demodulation on or off.

6.12.3 [Demod Mode▶]

Enter the demodulation mode soft menu. Including FMW, FM, AM, USB, LSB.

6.12.4 [Sound]

When the audio demodulation is on, adjust the speaker output volume.

6.12.5 [RadioSet▶]

Quick access to the common broadcast band.

6.12.6 [Digital Demod▶]

Enter the digital demodulation soft menu.

6.12.7 [AM▶]

Enter AM demodulation soft menu.

6.12.8 [AM On Off]

Turn AM demodulation On or Off.

6.12.9 [Carrier Freq]

Set the carrier frequency of the AM modulation signal.

6.12.10 [IF BW Auto Manual]

Set the demodulation bandwidth to auto or manual mode.

6.12.11 [FM▶]

Enter FM demodulation soft menu.

6.12.12 [FM On Off]

Turn FM demodulation On or Off.

6.12.13 [Carrier Freq]

Set the carrier frequency of the FM modulation signal.

6.12.14 [IF BW Auto Manual]

Set the demodulation bandwidth to auto or manual mode.

6.13 【Peak】

Executes peak searching immediately and opens the Peak setting menu.

Key Points:

- If Max is selected from the Peak Search option, it will search and mark the maximum on the trace.
- The peak search of Next Peak, Peak Right, Peak Left or peaks in the peak table must meet the specified parameter condition.
- The spurious signal at the zero frequency caused by LO feed through is ignored.

6.13.1 [Max Search]

Place a frequency scale at the highest point of the trace and display the frequency and amplitude of the frequency scale in the upper right corner of the screen. [Max search] does not change the activated function.

6.13.2 [Next Peak]

Searches the peak whose amplitude is the closest to that of the current peak. The peak is then identified with a marker. When this key is pressed repeatedly, you can quickly find a lower peak.

6.13.3 [Left Peak]

Searches the nearest peak located to the left side of the current peak and meets the current peak and peak thresholds condition. The peak is then identified with a marker.

6.13.4 [Right Peak]

Searches the nearest peak located to the right side of the current peak and meets the current peak and peak thresholds condition. The peak is then identified with a marker.

6.13.5 [Min Search]

Searches the peak with the minimum amplitude on the trace and identifies it with a marker.

6.13.6 [Mkr→CF]

Used to move the peak point to the center frequency point.

6.13.7 [Cont Max On Off]

Set the peak search form, off by default. On mode will automatically search for the peak.

6.14 【Marker】

The marker appears as a rhombic sign (shown below) for identifying the point on the trace. We can easily readout the parameters of the marked point on the trace, such as the amplitude,

frequency and sweep time.

Key points:

- The analyzer allows for up to three groups of markers to be displayed at one time, but only one pair or one single marker is active every time.
- You can use the numeric keys, knob or direction keys to enter the desired frequency or time when any marker type menu is active, so as to view the readouts of different points on the trace.

6.14.1 [Marker 1 2 3 4 5]

Selects one marker, the default is Marker1. And place the frequency scale at the center of the trace. If the frequency difference is activated, this softkey changes to the menu under the [Difference] function.

If there is already a marker, this command will not produce any operation. If there are already two markers (e.g. in [Difference] mode), [Marker] changes the active frequency scale to a new single frequency scale. Amplitude and frequency information can be obtained from the frequency scale (time information when the sweep width is 0Hz), and these values are displayed in the upper right corner of the active function area and the screen. You can use the numeric keys, the step key, or the knob to move the active frequency scale.

The marker reads data from the current active track (this track may be track A or track B). If both tracks are active or both tracks are in static display mode, the frequency scale will read data from track A.

6.14.2 [Trace 1 2 3 4 5]

In the trace measurement, the frequency scale used to activate the traces.

6.14.3 [Normal]

One of the marker types, which is used to measure the values of

X (Frequency or Time) or Y (Amplitude) at certain point of the trace. When selected, a marker will appear with its own digital ID such as “1” on the trace.

Key points:

- If no active marker exists currently, a one will be enabled automatically at the center frequency of current trace.
- You can use the knob, direction keys or numeric keys to move the marker. The readouts of the marker will be displayed on the upper right of the screen.
- The readout resolution of the X-axis corresponds to the span and sweep points. For higher resolution, add sweep points or reduce the span.

6.14.4 [Delta]

One of the marker types, which is used to measure the delta values of X (Frequency or Time) and Y (Amplitude) between the Reference point and certain point on the trace. When selected, a pair of markers appears on the trace, which are the Reference Marker and the Delta Marker. Will be in the active area and the display area of the upper right corner, showing the amplitude delta value between the two markers and frequency difference. If a single marker already exists, [Delta] will place a static marker and an active marker to the original position and a single marker position. Use the knob, step key, or number keys to move the marker. If there are two markers, press [Delta] directly. However, if [Delta] has been activated, press [Delta] to place the still frequency scale to the active marker. The displayed amplitude difference is expressed in dB, or is the linear unit in terms of the corresponding scale.

Key points:

- The Reference Marker will be activated at the position of current marker, or else both the reference marker and Delta Marker will be simultaneously activated at the center frequency location if no marker is active at the present.
- The location of the Reference Marker is always fixed (both in the X-axis and the Y-axis), while the Delta Marker is active. You can use the numeric keys, knob or direction keys to change the location of Delta Marker.

- The delta of both the Frequency/Time and the amplitude between the two markers are displayed at the upper right of the screen.
- Two ways to enable a certain point as the reference:
 - a) Open a “Normal” marker and locate it onto a point and then switch the marker type into “Delta”, creating a new reference, then you can modify the location of the delta point to achieve the delta measurement.
 - b) Open a Delta Marker and place it onto a point, then reselect the Delta menu to locate the marker you opened onto this points, then you can modify the location of the delta point to achieve the delta measurement.

6.14.5 [Off]

The marker information displayed on the screen and functions based on the marker will be turned off and won't show up again.

6.14.6 [All Off]

Turns off all the opened markers and the related functions. The marker won't show again.

6.14.7 [Marker Table On Off]

Turns on or off the display of all marker table.

6.15 【Marker→】

A soft menu associated with the marker function is popped out for setting the other system parameters (such as Center frequency, Reference level) by current marker readings. These menus relate to the frequency of the spectrum analyzer, whether the sweep width and marker are in normal or delta marker mode.

6.15.1 [Mkr->CF]

Sets the center frequency of the analyzer based on the frequency of the current marker. This feature quickly moves the signal to the center of the screen.

- If Normal is selected, the center frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, the center frequency will be set to the frequency at which the Delta Marker is located.
- The function is invalid in Zero span mode.

6.15.2 [Mkr->CF Step]

Sets the center frequency step of the analyzer based on the frequency of the current marker.

- If Normal is selected, the center frequency step will be set to the frequency of current marker.
- If Delta Marker is selected, the center frequency step will be set to the frequency at which the Delta Marker is located.
- The function is invalid in Zero span mode.

6.15.3 [Mkr->Start]

Sets the start frequency of the analyzer based on the frequency of the current marker.

- If Normal is selected, the start frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, the start frequency will be set to the frequency at which the Delta Marker is located.
- The function is invalid in Zero span mode.

6.15.4 [Mkr->Stop]

Sets the stop frequency of the analyzer based on the frequency of the current marker.

- If Normal is selected, the stop frequency will be set to the frequency of the current marker.
- If Delta Marker is selected, the stop frequency will be set to the frequency at which the Delta Marker is located.
- The function is invalid in Zero span mode.

6.15.5 [Mkr->Ref Level]

Sets the reference level of the analyzer based on the amplitude of the current marker.

- If Normal is selected, the reference level will be set to the amplitude of the current marker.
- If Delta Marker is selected, the reference level will be set to the amplitude at which the Delta Marker is located.

6.15.6 [Mkr Δ ->Span]

Changes the span of the analyzer to the frequency difference between the two markers.

6.15.7 [Mkr Δ ->CF]

Changes the center frequency of the analyzer to the frequency difference between the two markers.

6.16 【Marker Fctn】 Marker Function

Executes specific marker soft menu.

6.16.1 [Function Off]

Turn off marker measurement function.

6.16.2 [NdB On Off]

Enables the N dB BW measurement or sets the value of N. The N dB BW denotes the frequency difference between points that are located on both sides of the current marker while the amplitude falls off ($N < 0$) or rises ($N > 0$) N dB separately,

Key points:

- When the measurement starts, the analyzer will search the two points which are located at both sides of the current point and are N dB amplitudes smaller or greater than the current point, and display the frequency difference between the two

points.

- You can use the numeric keys, knob or direction keys to modify the value of N, 3 at default.

6.16.3 [Marker Noise On Off]

Turn on or off the frequency noise function. The function of marking noise is applied to the selected cursor, and then the noise Power Spectral Density at the cursor is read. When turned on, the average noise level read at the frequency scale is normalized to 1 Hz bandwidth for noise power.

6.16.4 [Freq Count▶]

Activate the frequency counter function and display the count results in the upper right corner of the screen. The counter counts only the signals that are displayed on the screen. The frequency count also pops up an additional counter function for the soft menu, including [Freq Count On Off].

1) [Freq On Off]

Turn on or off the frequency counter mode. This function is invalid when the trace signal generator is activated. The count value is displayed in the upper right corner of the screen.

2) [Resolution]

Counter resolution is divided into 1 kHz, 100 Hz, 10 Hz, 1Hz. Changing the counter resolution can change the counter accuracy. The higher the resolution, the higher the counting accuracy.

6.17 【Meas】 Measurement

Provide a variety of advanced measurement functions, pop-up spectrum analyzer built-in and user-defined measurement function soft menu, turn on or off the time spectrum, adjacent channel power measurement, channel power measurement, occupied bandwidth, Pass-Fail measurement menu.

6.17.1 [Measure off]

You can directly close the currently running measurement function, you can also choose to close the measurement menu.

6.17.2 [Time Spec On Off]

Turn on time spectrum measure mode.

6.17.3 [ACPR On Off]

Turn on or off the adjacent channel power measurement. Press **【Meas Setup】** to pop up the parameters of the adjacent channel power measurement soft menu. The adjacent channel power is used to measure the ratio of the adjacent channel power of the transmitter. The absolute value of the main channel power and the absolute value of the adjacent channel power are obtained by the linear power integration method, so that the adjacent channel power ratio is gained.

6.17.4 [Chanel Power On Off]

Turn on or off channel power measurements. Press **【Meas Setup】** to pop up the channel power measurement parameter settings soft menu. The channel power is used to measure the transmitter channel power, according to the user set the channel bandwidth, through the linear power integration method to obtain the absolute value of the main channel power.

6.17.5 [OBW On Off]

Turn on or off the occupied bandwidth measurement. Press **【Meas Setup】** to pop up the parameter setting soft menu for occupying the bandwidth measurement. Occupied Bandwidth is a measure of the bandwidth occupied by the transmitter signal can

be measured from the total power ratio within the in-band power span, with a default value of 99% (the user can set this value).

6.17.6 [Pass-Fail▶]

Enter the pass / fail measurement function soft menu. Pass / fail measurement has two modes of window measurement and area measurement.

6.17.7 [Window Meas▶]

Enter Window measurement soft menu.

6.17.8 [Window Meas On Off]

Turn on or off window measurement mode.

6.17.9 [Amplitude Line On Off]

Turns the amplitude line on or off, and the amplitude line turns on when the window measurement is on.

6.17.10 [Frequency Line On Off]

Turns the frequency line on or off, and the frequency line turns on when the window measurement is on.

6.17.11 [Amplitude Upper limit Lower limit]

Used to edit the upper and lower limit on the amplitude line.

6.17.12 [Freq Start Stop]

Start and stop frequencies for scanning line for editing.

6.17.13 [Window Scan On Off]

Turns window scan on or off. When the window scan is on, only the window formed by the intersection of the amplitude line and the frequency line is scanned. The peripheral stops scanning; the full frequency is scanned when it is closed.

6.17.14 [Limit Meas▶]

Enter the soft menu of the area measurement mode.

6.17.15 [Limit Meas On Off]

Turn On or Off area measurement mode.

6.17.16 [Line Up On Off]

When the upper limit line is turned on or off, the upper limit line is opened by default when the area measurement is on.

6.17.17 [Line Low On Off]

When the lower limit line is turned on or off, the lower limit line is opened by default when the area measurement is on.

6.17.18 [Shift X/Y Frequency Amplitude]

Frequency: For the actual measurement, the edited area as a whole superimposed on a frequency, so that it can implement left or right shift, easy to measure. Does not affect the frequency and marker of the spectrum analyzer settings.

Amplitude: The region has been edited on the whole superimposed on a degree, so that it can move up or down, easy to measure. Does not affect the amplitude setting of the spectrum analyzer.

6.17.19 [UpLine Edit▶]

Upper line editing is used to edit the control line above the trace, depending on the trace.

6.17.20 [LowLine Edit▶]

Lower line editing is used to edit the control line above the trace, depending on the trace.

6.18 【Meas Setup】

Measurement setting menu for the corresponding measurement parameter settings when adjacent channel power, channel power, occupied bandwidth measurement mode is turned on.

6.18.1 [Channel BW]

Set the bandwidth of the channel power measurement, and set the total display power percentage of bandwidth.

6.18.2 [Channel Interval]

Set the center frequency difference of the primary channel to the adjacent channel.

6.18.3 [Channel Num]

Set the number of upper and lower adjacent channels measured by adjacent channel power.

6.18.4 [Power Percent]

Set the power ratio of occupied bandwidth.

6.19 【System】

A soft menu for system parameter settings pops up. Including [System Info ▶], [Configure I / O ▶], [Power On / Reset ▶], [Local Language ▶], [Date / Time ▶], [User Calibration ▶], [System Service ▶]. For first time you use the spectrum analyzer, set the date and time, the system will store the settings, restart the machine after power off won't change the settings.

6.19.1 [System▶]

Pop up system information and system log soft menu.

- 1) [System Information]
- 2) [System Log]

6.19.2 [Config I/O▶]

A soft menu for setting the interface address of the spectrum analyzer, including [Network ▶]. The spectrum analyzer supports VGA, LAN and USB interface communication.

1. [LAN▶]

Pop out the relative menu for network configuring.

1.1 [IP]

Used to set the IP address of the LAN port.

1.2 [Mask]

Set the subnet mask parameter.

1.3 [Gate]

Set default gateway address.

1.4 [Reset Lan]

To reset the LAN.

6.19.3 [PowerOn/PreSet▶]

6.Menu Interpration

Used to set the analyzer power on parameters or reset parameters.

1. [Power Set▶]

Power-on parameter settings include [Factory] and [User].

2. [Preset▶]

Power-on parameter settings include [Factory] and [User].

Note: To save the current system configuration as a user-defined configuration, press the [Save] panel key and select the [User Status] menu item.

[Factory] Settings are as follow:

Parameter	Value
Frequency	
Center Frequency	750.009000MHz
Start Frequency	9.000kHz
Stop Frequency	1.500009000GHz
Frequency Step	150.000000MHz
Frequency Offset	0Hz
Frequency Reference	Internal
SPAN	
Sweep	1.500000000GHz
AMPTD	
Reference Level	0.00dBm
Attenuator	Auto 9 dB
Scale/div	10.00dB
Scale Type	Log
Reference Offset	0.00dB
Unit	dBm
Preamp	Off
BW	
Resolution Bandwidth	Auto 3MHz
Resolution Step	Default
Video Bandwidth	Auto 3MHz
Trace Average	Off
Detector	

6.Menu Interpration

Detect Type	Auto
Sweep	
Sweep Time	Auto 20.000ms
Sweep Term	Continuous Sweep
Source	
Tracking Source	Off
Network Measurement	Off
Trace	
Trace	1
Trace Type	Clear Write
Trace 1 Math	1<- ->2
Display	
Full Display	Off
Window Zoom	Off
Display Line	Off
Amplitude Scale	Off
Grid	Off
Display Style	Default
Label	On
Trig	
Trigger Type	Auto
Demod	
Audio Demod	
Digital Demod	
Peak	
Peak Search	Off
Marker Fctn	
NdB	Off
Marker Noise	Off
Frequency Count	Off
Marker	
Marker	1
Trace	1
Marker List	Off

6.Menu Interpration

Meas	
Time Spectrum	Off
Adjacent Power	Off
Channel Power	Off
Occupied Bandwidth	Off
pass-fail	Off
Meas Setup	
Channel Bandwidth	1.000000MHz
Channel Gap	2.000000MHz
Adjacent Number	3
Occupied Bandwidth	0.99
System	
Interface	LAN
IP Address	192.168.1.168
Subnet Mask	255.255.255.0
Gateway	192.168.1.1
Local Language	English
Date/Time	On
Print	
Paper Size	A4
Print Language	PCL
Print Type	黑白
Direction	Horizontal
Copy	1

6.19.4 [Language▶▶]

To set the system language, in Chinese by default.

6.19.5 [Date/Time▶▶]

Used to set the device date, time, and their format.

- [Date/Time On Off]
Turn on or off Date/Time display.

- [Format▶]
Time format can be displayed as [Year,Month,Day,Hour,Minute,Second] or [Hour,Minute,Second,Year,Month,Day].
- [Date Set]
Set the display date for spectrum analyzer. Format is YYYYMMDD. E.g. June 22th,2012 should display as 20120622.
- [Time Set]
Set the display time for spectrum analyzer. Format is HHMMSS. E.g. 16:55:30 should display as 165530.

6.19.6 [Calibration▶]

Pop up user calibration soft menu including [Start Calibration] and [Restore Factory].

[Calibration]: Set the signal generator frequency as 440MHz, power as -20dBm, access to RF instrument RF input, press the [Start Calibration] softkey, start the implementation of user calibration.

[Factory]: If you do not need the user calibration compensation data, press the [Restore Factory] key to clear the data and return to the factory status.

6.19.7 [Service▶]

For spectrum analyzer debugging.

6.20 【File】

Pop up file management soft menu.

6.20.1 [Refresh]

In the directory state, view the latest stored files.

6.20.2 [Type▶]

To check file type under directory, includes screen image, trace data and display all.

6.20.3 [First Page]

Display first page of current directory.

6.20.4 [Prev Page]

Display Previous page.

6.20.5 [Next Page]

Display next page.

6.20.6 [Last Page]

Display last page of current directory.

6.20.7 [Operations▶]

Pop out the soft menu for file operation, includes sorting order, delete, export and import.

6.21 【Print】

Pop out the relative soft menu for printing.

6.21.1 [Paper Size]

Used to select the size of the paper to be printed, including A4, A3, B5, C5, Letter.

6.21.2 [Language Pcl Esc]

Used to select the printer language, optional for Pcl and Esc.

6.21.3 [Printer Type Black/White Color]

Use to switch from Black/White print to Color print.

6.21.4 [Orientation Horizontal Vertical]

For the horizontal and vertical placement switch.

6.21.5 [Number]

To set the print copies.

6.21.6 [Print Trace]

Prints the current trace.

6.21.7 [Print Screen]

Print the full screen content.

6.22 【Save】

It's available to save screenshot, trace data, or user status.

6.22.1 [Screen Pixmap▶]

Enter screenshot save soft menu, you can choose to save screenshots to local or flash memory, the image file format is png, the lower left corner of the screen status display bar will display the saved screenshots information.

6.22.2 [Trace Data▶]

Enter the trace data save soft menu, you can choose to save the trace data to the local or flash memory, trace data file format is csv, the bottom left corner of the screen status display trace data saving information.

6.22.3 [User State]

Save the current system configuration as a user self-defined configuration. Save it in local. The information on saving the user status will display in the status bar of the bottom left corner of the screen.

7. Specification

This chapter lists the technical specifications and general technical specifications of the spectrum analyzer. Unless otherwise stated, the technical specifications apply to the following conditions:

- The instrument has been preheated for 30 minutes before use.
- The instrument is in the calibration cycle and has been self-calibrated.

"Typical" and "nominal" for this product are defined as follows

- Typical: Refers to the performance of the product under certain conditions.
- Nominal: Refers to the approximate value under product application process.

7.1 Frequency

Frequency		
Frequency Range	XSA1015 XSA1015-TG	9 kHz to 1.5 GHz
	XSA1036 XSA1036-TG	9 kHz to 3.6 GHz
Frequency Resolution	1 Hz	

Frequency Span	
Span Range	0 Hz, 100 Hz to max frequency of instrument
Span Uncertainty	$\pm \text{span} / (\text{sweep points}-1)$

Internal Frequency Reference	
Reference Frequency	10.000000 MHz
Reference Frequency Accuracy	$\pm [(\text{days from last calibrate} \times \text{freq aging rate}) + \text{temperature stability} + \text{initial accuracy}]$

7. Specification

Temperature stability	<2.5ppm (15°C to 35°C)
Aging rate	<1ppm/year

SSB Phase Noise (20°C to 30°C, fc=1 GHz)		
Carrier Offset	30 kHz	< -90 dBc/Hz
	100 kHz	< -100 dBc/Hz
	1 MHz	< -110 dBc/Hz

Bandwidth	
Resolution Bandwidth (less than 1Hz version for option)	10Hz to 500kHz(1-10 steps by sequence), 1MHz, 3MHz
RBW Uncertainty	< 5%, typical
Resolution Filter Shape Factor (60 dB : 3 dB)	<5: 1 typical (digital and close to Gaussian shape)
Video Bandwidth (VBW)	10Hz to 3MHz

7.2 Amplitude

Amplitude and level	
Amplitude measurement range	DANL to +10 dBm, 100 kHz to 1 MHz, Preamp Off DANL to +20 dBm, 1 MHz to 1.5 GHz, Preamp Off
Reference Level	-80 dBm to +30 dBm, 3dB by step
Preamp	20 dB, nominal, 9 kHz to 1.5 GHz
Input Attenuation	0 to 39 dB, 3 dB by step
Max Input DC Current	50 VDC

7. Specification

Max continuous power	+27dBm, average continuous power
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Display Average Noise Level (Input Attenuation= 0 dB, RBW=1Hz and RBW normalizes to 1Hz)		
Preamp Off	1 MHz to 10 MHz	-130 dBm (Typical)
	10 MHz to 1 GHz	-130 dBm (Typical)
	1 GHz to 1.5 GHz	-128 dBm (Typical)
Preamp On	1 MHz to 10 MHz	-150 dBm (Typical)
	10 MHz to 1 GHz	-150 dBm (Typical)
	1 GHz to 1.5 GHz	-148 dBm (Typical)

Frequency response (20°C to 30°C, 30% to 70% relative humidity, input attenuation=20 dB, reference frequency=50 MHz)	
Preamp Off	±0.8 dB; ±0.4 dB, Typical
Preamp On	±0.9 dB; ±0.5 dB, Typical

Difference and Accuracy				
RBW Switch Difference	RBW=10kHz Log resolution=±0.2 dB, Lin resolution=±0.01. Nominal			
Input Attenuation Difference	20°C ~30°C, fc=50 MHz, Preamplifier Off, 20dB RF attenuation, input signal 0~39 dB ±0.5 dB			
Absolute Amplitude Uncertainty	20°C to 30°C, fc=50 MHz, RBW=1 kHz, VBW=1 kHz, peak detector, 20 dB RF attenuation			
	<table border="1" style="width: 100%;"> <tr> <td style="width: 30%;">Preamp Off</td> <td>±0.4 dB, input signal level -20 dBm</td> </tr> <tr> <td>Preamp On</td> <td>±0.5 dB, input signal level -40 dBm</td> </tr> </table>	Preamp Off	±0.4 dB, input signal level -20 dBm	Preamp On
Preamp Off	±0.4 dB, input signal level -20 dBm			
Preamp On	±0.5 dB, input signal level -40 dBm			
Uncertainty	Input signal range 0 dBm 至 -50 dBm			
	±1.5 dB			

7.Specification

VSWR	Input 10 dB RF attenuation, 1 MHz to 3.6
	<1.5, Nominal

Distortion and spurious response	
Second harmonic distortion	fc ≥ 50 MHz, Preamp off, signal input -30 dBm, 0 dB RF attenuation, 20 °C to 30 °C
	-65 dBc
Third-order intermodulation	fc ≥ 50 MHz, Input double tone level -20 dBm, frequency interval 100 kHz, input attenuation 0 dB, preamplifier off, 20 °C to 30 °C
	+10 dBm
1 dB Gain Compression	fc ≥ 50 MHz, 0 dB RF attenuation, Preamp off, 20 °C to 30 °C
	>-5 dBm, Nominal
Residual response	connect 50 Ω load at input port, 0 dB input attenuation, 20 °C to 30 °C
	<-90 dBm, Typical
Input related spurious	-30 dBm signal at input mixer, 20 °C to 30 °C
	<-65 dBc

7.3 Sweep

Sweep		
Sweep Time	None-zero Span	10 ms to 3000 s
	Zero Span	1 ms to 3000 s
Span Mode	Continue, Single	

7.4 Tracking Generator (Only apply to –TG model)

Tracking Source Output	
Frequency Range	100 kHz to 1.5GHz
Output power level range	-30 dBm to 0 dBm
Output power level resolution	0.5 dB
Output flatness	± 3 dB

7.Specification

Maximum safe reverse level	Average total power: 30 dBm, DC : ± 50 VDC
----------------------------	------------------------------------------------

7.5 Frequency Count

Frequency Counter	
Counter Resolution	1Hz, 10Hz, 100Hz, 1kHz
Uncertainty	frequency indication \times frequency reference uncertainty + counter resolution

7.6 Inputs and Outputs

RF Input	
Impedance	50 Ω , Typical
Connector	N Type Female

Tracking Generator Output	
Impedance	50 Ω , Typical
Connector	N Type Female

10MHz Reference Input	
Connector	BNC Female
10MHz Reference Amplitude	0 dBm 至 +10 dBm

USB	
USB Host	
Connector	B Plug
Protocol	USB 1.1 (Host End)
USB Device	
Connector	A Plug
Protocol	2.0 Version

VGA

7.Specification

Connector	15-pins D-SUB(female)
Resolution	800*600, 60 Hz

7.7 General Specification

Display	
Type	TFT LCD
Resolution	800*600
Size	10.4 inches
Color	65536

Remote Control	
USB	USB TMC
LAN	10/100Base, RJ-45

Mass Memory		
Mass Memory	Internal Storage	128M Bytes

Temperature	
Operating Temperature Range	0 °C to 40 °C
Storage Temperature Range	-20 °C to 70 °C

Appearance	
Dimensions	421 mm (Width)×221 mm (Height)×115 mm (Depth)
Weight	Approx. 4.96 kg (without package)

8. Warranty for Spectrum Analyzer

8.1 Troubleshooting

Typical issues that may occur when using your spectrum analyzer:

- Power on malfunction
- No signal display
- Wrong measurement results or poor frequency or amplitude precision.

1. Power on malfunction

Power on malfunction can include a situation where the screen is still dark (no display) after switch on.

If the screen is still dark after power on, please check:

- 1) If the power supply has been connected correctly and it the power supply voltage range is within the specification.
- 2) If the power switch has been turned on.
- 3) If the fan is running, please contact OWON for service.

2. No signal display

If there is no signal display at any wave band. Please try the following: set a signal generator at 30 MHz frequency and -20 dBm power and connect it to the spectrum analyzer RF input connector. If there is still no signal display, there may be a problem with the spectrum analyzer hardware circuit. Please contact OWON for service.

3. Wrong measurement results or poor signal frequency precision

If the display contents shakes a lot or the frequency readout exceeds the error range during measurements, check if the signal source is stable. If so, check if spectrum analyzer reference is precise. Select internal or external frequency reference according to measurement conditions: press **【FREQ】**→[frequency reference Internal External]. If the frequency is still not precise, then the spectrum analyzer LO has lost its phase lock, please contact OWON for service.

4. Wrong measurement results or poor readout amplitude precision

If signal amplitude readout is not precise, perform a calibration. If amplitude readout is still not precise, then it may be a problem with internal circuit, please contact OWON for service.

8.2 Spectrum Analyzer Repair

When it is difficult to solve your spectrum analyzer's problem, you can contact us by phone or fax. When it's confirmed that the instrument is damaged and need return to repair, you need to wrap the spectrum with the original packaging material and the packing box, follow the steps below to package:

- 1) Write a detailed description of the malfunction of the spectrum analyzer, put it in the box together with the spectrum analyzer.
- 2) Put the instrument in a dustproof / antistatic plastic bag to reduce possible damage.
- 3) Place pads in four corners of mother packaging carton, then put the instrument into the mother carton.
- 4) Seal the carton with tape and tighten it with nylon tape.
- 5) Mark the carton with words of "Fragile! Do not touch! Carefully".
- 6) Ship by type of precise instruments.
- 7) Keep all the copies of shipping sheets.



CAUTION

The use of other materials to package the spectrum analyzer may damage the instrument. Do not use polystyrene pellets as packaging materials, they can not adequately fit the instrument, and can be sucked into fan by the generated electrostatic, causing the spectrum analyzer damage.

9. Appendix

Appendix A: Enclosure

Standard Accessories (subject to final delivery):



Power Cord



CD Rom



Quick Guide



USB Cable

Appendix B: General Care and Cleaning

General Care

Do not store or leave the instrument where the liquid crystal display could be exposed to direct sunlight for long periods of time.

Caution: To avoid any damage to the instrument or probes, do not exposed it to any sprays, liquids, or solvents.

Cleaning

Inspect the instrument and probes as often as operating conditions require.

To clean the instrument exterior, perform the following steps:

Wipe the dust from the instrument surface with a soft cloth. Take care not to scratch the transparent LCD protection screen when cleaning.



WARNING

Before re applying power, ensure that the instrument is completely dry, avoiding any electric shock or electrical short circuit resulting from moisture.

Appendix C: USB Disk Requirements

USB disk requirements:

Max capacity 4G, NTFS file system is not supported.

If the USB disk doesn't work properly, format your USB disk and then try again.

Appendix D: Glossary

Envelope Detector

The detection circuit, which is output with the envelope (rather than the instantaneous variable of its input signal), is sometimes referred to as a peak detector.

In the superheterodyne spectrum analyzer, the envelope detector input from the last IF, then output video signal. When the sweep of the analyzer is set to 0Hz, the envelope detector will demodulate the input signal. At this point, we can observe the modulation signal as a function of time on the display.

LO

Abbreviation for Local Oscillator. Superheterodyne receiver IF system is received with the local oscillator signal and generating frequency or difference frequency.

When the vibrator is tuned to 0Hz, that is, when the local oscillator is tuned to the same size as the first IF, the response on the display. The local feedthrough can be used as a 0Hz frequency marker.

Standard detection method

Also known as Rosenfell detection method, for a digital display of a detection method, in which the value of each point is based on whether video signal is rising or falling. If the video signal only rises or falls, the maximum value is displayed. If the video signal both rises and falls, the maximum value is displayed at the odd point and the minimum value is displayed at the even value. In order to prevent the signal loss in the even number, the maximum value is retained during this period, and then the larger value of the stored value is displayed at the next odd point.

Step volume

Press the front panel step key or through the program command to control the corresponding activity parameter changes.

Unit of Measurement

Spectrum Analyzer commonly used measurement units are as shown in Schedule 1:

Schedule 1 Unit of Measurement

9. Appendix

Measurement Item	Unit	Unit Abbreviate
Frequency	Hertz	Hz
Power Level	Decibel-milliwatts	dBm
Power ratio	Decibel	dB
Voltage	Volt	V
Time	Second	s
Current	Ampere	A
Impedance	Resistance	Ω

Menu

The function of the spectrum analyzer displayed on the screen, by pressing the corresponding front panel soft key to activate the function, these menu items may pop up other related function options.

Reference Level

The calibrated vertical scale position on the display is used as a reference for amplitude measurement, and the reference level usually occupy the top of scale line.

Measuring range

The power ratio (dB) of the maximum signal (usually the maximum safe input level) and the minimum signal (average noise level) that can be measured at the mixer input at a given accuracy range. This ratio is almost always much larger than the dynamic range that may be achieved in a single measurement.

Impact Bandwidth

According to the principle of voltage equivalent, the area of the voltage response curve of the actual analyzer filter is equivalent to the voltage response curve of an ideal rectangular filter of the same area, and the height of the two curves is equal. The rectangular filter width is called the equivalent impact bandwidth. It is different from the signal bandwidth and noise bandwidth. In the spectrum analyzer, the impact bandwidth of the synchronous tuning Gaussian filter is about 1.5 times the bandwidth of 3dB.

Bandwidth Selectivity

This is an indicator of the ability of the spectrum analyzer to distinguish unequal signal capability. It is the ratio of the 60dB

bandwidth to the 3dB bandwidth of the given filter. The bandwidth selectivity tells us the steepness of the edge of the filter, and the bandwidth selectivity is also called the rectangular coefficient. When the single span mode meets a trigger condition, the analyzer sweeps only implement once span mode. Press the front panel button or enter the program command to sweep the analyzer.

Scale factor

The unit of vertical grid.

Dynamic Range

Under the condition of a given uncertainty, the spectrum analyzer can measure the ratio of the maximum signal to the minimum signal that is present at the input, and is expressed in dB. It characterizes the ability to measure the difference in amplitude of the two signals at the same time. Factors that affect the dynamic range are noise level, internal distortion, and noise sidebands.

Logarithmic display

The vertical deflection on the display changes in logarithmic mode with the input signal voltage. The calibration of the display is implemented by selecting the value of the top grid (reference level) and scale factor (dB / div). In this case, the bottom grid is not calibrated. We can select dBm, dBmV, V or W to indicate the unit of the reference level or marker.

Multiple Response

When a single frequency input signal (CW) causes more than one response on the display, it is responsive to two or more local oscillator frequencies. The local frequency of the multi-response is twice as high as the intermediate frequency.

FFT

Abbreviation of Fast Fourier Transform. It carries on the specific mathematical analysis to the time domain signal and gives the frequency domain analysis result.

Resolution

The resolution represents the ability of the spectrum analyzer to clearly separate the two input signals in response. It is affected by the IF filter bandwidth and its rectangular coefficient, the local oscillator residual frequency and phase noise and scanning time and other factors. Most of the spectrum analyzer is the use of LC filters, crystal filters, active filters, digital filters and other methods

to achieve different resolution bandwidth.

Amplitude Accuracy

Spectrum analyzer amplitude (relative or absolute) Uncertainty of measurement.

Negative peak mode

A method of detection for digital display. Wherein each of the displayed dots corresponds to a minimum value of a video signal in a portion of a frequency span or a time interval indicated by that point.

Firmware

A set of hardware and machine code that forms a complete, functional device that will not be changed in normal operation. The machine code is permanently installed in the ROM (read only memory) of the instrument. The firmware determines the operating characteristics of the instrument or device. Each firmware version has a code number or date code that can be corrected.

Active function area

Spectrum analyzer activity function and its status display screen area. The active function is the last time the key is pressed by the spectrum analyzer or by the last program command to activate the function.

Marker

A marker located on a trace and can be moved directly by the front panel control key or program command.

Trace

A trace consists of a series of data points that contain information about frequency and amplitude, which is usually treated as a collection. Traces A and B are the trace names that are frequently used by the spectrum analyzer.

False Response

An unwanted signal that appears on the monitor display. The internally generated distortion thing, like mirroring and multiple responses, is a false response. These may be harmonic responses, and may be not. Harmonic response is the input signal of the second, third, four and other harmonics. The non-harmonic

response is the intermodulation and residual response.

Detection method

The analog information is digitized and stored in memory before processing. Including "positive peak", "negative peak", "standard" and "sampling".

Correction Factor

Due to the hardware structure of the spectrum analyzer, the measurement results tend to cause errors, and the calibration factor is used to correct the measurement results.

The mirror response. The mirror is a signal of a different frequency at the same point of the display as that at the same local frequency. Mirror is twice the midrange. For each of the local oscillator harmonics, there is a mirror, a low frequency than the local oscillator, one higher than the local oscillator. Mirroring is usually only present on a spectrum analyzer without preselector.

Intermodulation Distortion

The unwanted frequency components formed by the interaction of two or more spectral components with non-linear characteristic devices such as mixers, amplifiers, and the like. The unwanted components are generated by the sum of the fundamental waves and the harmonics. For example: $f_1 \pm f_2$, $2f_1 \pm f_2$, $2f_2 \pm f_1$.

Adjacent power

The power is measured due to the leakage of the signal power to the adjacent channel. The measured value is usually expressed as the adjacent channel to channel power ratio.

Zero Span

Means that the local oscillator of the spectrum analyzer is fixed at a given frequency, so that the spectrum analyzer becomes a fixed tuned receiver whose bandwidth is the resolution bandwidth.

Defaults

The factory setting indicates the reset status, options or instrument parameters.

Drift

The local oscillator frequency is subject to a change in the scan voltage resulting in a slow change in the signal position on the

display. When drifting occurs, it may be necessary to readjusted, but will not weaken the frequency resolution.

Frequency Marker

You can place a visible indicator on any of the screen traces. Data can be used to show the frequency and amplitude absolute at the frequency scale on the trace.

Marker Difference

An operating mode of the analyzer. Including a fixed reference frequency scale and an active frequency scale that can be moved freely on the trace. The resulting reading is the frequency, amplitude, or time difference between the two frequency scales.

Frequency Range

The frequency range that spectrum analyzer can measure. The maximum frequency range of many microwave spectrum analyzers can be extended by using an external mixer.

Frequency accuracy

An indication of the signal frequency or spectral component uncertainty.

Frequency stability

Refers to the extent to which the frequency of the signal remains constant in the short or long term, usually including short and long term local oscillator instability.

The sweep slope of the tuned local oscillator determines the position of the signal on the display. Any long-term variation (drift) of the local oscillator frequency relative to the scan ramp voltage will cause the signal to move slowly. Short-term local oscillator instability in the original stable signal may be expressed as FM or phase noise.

Flatness

The amount of change in the display amplitude corresponding to the tuning frequency range of the spectrum analyzer indicates the correspondence between the displayed signal amplitude variation and the frequency. The flatness of ± 1 dB indicates that the difference between the maximum and minimum values of the frequency response of the spectrum analyzer is less than 2dB.

Preamp

An external low-noise amplifier used to improve system sensitivity to exceed the sensitivity of the analyzer itself.

Sampling terms

A method of detection for digital display. Wherein the value displayed at each point is the instantaneous value of the video signal at the frequency interval or the time interval indicated by the point.

Third-order intermodulation distortion

Third-order intermodulation distortion occurs in systems where there are two signals. The distortion product comes from the mixing of a signal with another signal of the second harmonic. If the two main signals are equal, then the two third-order distortion products will also be equal to the power. As the power of the two main signals increases, the power of the distortion product will increase in triplicate. In theory, there is a level at which the power of each distortion product is equal to the power of the main signal.

Span

The difference between the starting frequency and the stop frequency. The span setting determines the scale of the horizontal axis of the spectrum analyzer display.

Sweep Accuracy. The uncertainty of the frequency interval specified between any two signals on the display.

Span Time

The time required to tune the vibrations through the selected frequency interval. The scan time directly affects the time taken to complete a test, which does not include the time between the completion of a scan and the start of the next scan. Under zero sweep width, the horizontal axis is only calibrated for time. At non-zero sweep width, the horizontal axis is calibrated for both the frequency and the time. The scan time usually varies with the width of the sweep, the resolution bandwidth, and the video bandwidth.

Video

The output signal of the envelope detector. The frequency range extends from 0 Hz far beyond the frequency of the widest

resolution bandwidth provided by the analyzer, and the final bandwidth of the video path is determined by the set video filter. Video amplifier. A DC-coupled amplifier next to the detector.

Video filter

It is designed as a low-pass filter with variable cutoff frequency after the envelope detector. When the video bandwidth is equal to or less than the resolution bandwidth, the video circuit can not respond adequately to the rapid fluctuation of the detector output. The result is that the trace is smoothed, or the peak-to-peak shift of the noise and pulsed RF is observed in the broadband mode of operation. This average or smooth degree is related to the ratio of video bandwidth and resolution bandwidth.

Video Average

It is averaged over time during multiple scans. At each point, the newly obtained data and the old data are averaged, and the display will gradually focus on the average of several measurements. Only in the digital display of the analyzer, the average calculation is determined by the number of scanning selected by users. The average algorithm uses the weighting factor $(1 / n, n$ for the current number of scans) for the current scan of the given point, and the other weighting factor $[(n-1) / n]$ for the previously stored average Merge the two into the current average. After the specified number of scans is completed, the weighting factor remains unchanged and the display becomes dynamic averaging.

In most measurement situations, video filtering and video averaging are essentially the same. But the difference between the two is that video filtering is a real-time average, and when measuring a time-drift signal, the difference between the two approaches becomes significant and may result in completely different results. When scanning with video, each scan may give a different average. With video averaging, since it is multiplied by multiple scans to achieve a full average, therefore, is a very close to the true average of the results.

RF Attenuator

A step attenuator between the input connector of the spectrum analyzer and the first mixer. The RF attenuator is used to adjust the signal level input to the first mixer, to prevent gain compression

caused by high or wideband signals, and to set the dynamic range by controlling the distortion. In some analyzers, changing the setting of the input attenuator shows that the vertical position of the display signal also changes. In a microprocessor-controlled analyzer, the input attenuator is compensated for by changing the IF gain. Therefore, the signal can be stable on the screen, the reference level is also unchanged.

Input Impedance

The analyzer displays the terminal impedance of the signal source. The impedance of the RF and microwave analyzers is typically 50Ω . The standard impedance for some systems (such as cable) is 75Ω . The degree of mismatch between the rated impedance and the actual impedance is represented by the voltage standing wave ratio (VSWR).

Clear Write Mode

Used to clear the screen traces, re-scan when meeting trigger conditions. When the trigger condition is met, the new input signal data is displayed.

Residual FM

It indicates that the oscillator's inherent short-term frequency instability when there is no other modulation.

Residual Response

The discrete response seen on the spectrum analyzer display when there is no input signal.

Warning Information

A message displayed on the screen that indicates a hardware failure, a user operation error, or other situations that require attention.

Normally, the error message on the screen won't disappear until these conditions are resolved.

AM%

Measure the amplitude of the signal. The measured value is the ratio of the modulate signal power to the modulated signal power. The modulation degree can be calculated by the following equation, where dB is the ratio of the signal power to the amplitude modulated sideband power:

$$\text{AM\%} = 200 \times 10^{-(\text{dB}/20)} \%$$

Not Calibrated

Indicating the presence of non-calibrated measurement conditions. This message will appear on the screen when the instrument settings affect measurement accuracy.

Show Fidelity

The uncertainty of the relative difference in amplitude is measured on the spectrum analyzer. The analyzer with a digital display has a marker difference, and the difference can be extracted from the stored data, which eliminates the uncertainty caused by the screen display from the measurement.

Display Range

The difference between the maximum signal and the minimum signal can be observed simultaneously on the display. For a spectrum analyzer with the largest logarithmic display of 10dB / div, the actual dynamic range may be larger than the range shown.

Displays Average Noise Level

At the minimum resolution bandwidth and minimum input attenuation, the noise level observed on the spectrum analyzer displays after sufficiently reducing the video bandwidth to reduce peak-to-peak noise fluctuations. The final noise display is essentially a straight line. The average noise level equivalent of the spectrum analyzer is usually referred to as sensitivity and is expressed in dBm. A signal equal to the display noise level will show a convex hull approximately 3dB higher than the display noise level, which is generally considered to be the smallest measurable signal level. According to the receiver theory, the relationship between sensitivity and resolution bandwidth is as follows:

$$P_{in} = -174\text{dBm} + F_{dB} + 10\text{Log}B$$

In formula:

FdB is the receiver noise figure

B is the receiver 3dB bandwidth (in Hz)

The best sensitivity can be obtained at the narrowest resolution bandwidth, minimum input attenuation and full video filtering of the instrument state. But the best sensitivity may conflict with other measurement requirements, for example: using a smaller

resolution bandwidth will increase the span time, 0dB input attenuation will increase the input port standing wave ratio (VSWR).

Linear display

The vertical deflection on the display is proportional to the input signal voltage. The display bottom grid line represents 0V and the top grid represents the reference level (depending on a non-zero value of a particular spectrum analyzer). The scale factor is equal to the reference level divided by the number of divisions. Although shown as linear, the spectrum analyzer still allows dBm, dBmV, dBuV, W and V to indicate the reference level and frequency scale values.

Relative Amplitude Accuracy

Uncertainty of amplitude measurement. Where the amplitude of one signal is compared with the amplitude of the other signal, regardless of the absolute amplitude of any of the two. Factors that affect uncertainty include frequency response, display fidelity, changes in input attenuation, IF gain, scale factor, and resolution bandwidth.

Harmonic Mixing

Using the harmonic of the local oscillator to participate in the mixing, to expand the spectrum of the tuning range.

Harmonic Distortion

The unwanted frequency components attached to the signal due to the non-linear nature of the device (such as a mixer, amplifier, etc.). These unwanted frequency components are related to the original signal harmonics.

Channel Power

The total average power contained in the specified bandwidth.

Hard Copy

The information or data is output to the paper instead of being stored in the instrument memory.

Noise frequency marker

It is used to represent the noise power within the 1 Hz noise bandwidth. When the noise frequency is selected, the sampling mode is activated, averaging the number of points around the frequency scale (the number of points depends on the analyzer). This average is normalized to the equivalent value within the 1 Hz noise power bandwidth. The normalization takes into account the effects of the detector and the logarithmic amplifier.

Noise Sideband

It indicates the short-term frequency instability of the local oscillator of the spectrum analyzer. Since the sidebands are noise, they vary with the resolution bandwidth relative to the spectral component. The noise sideband is commonly expressed in dBc / Hz (relative to the carrier frequency within 1Hz bandwidth), and the carrier frequency is the spectral component observed on the display. The noise sideband is also called phase noise.

Gain Compression

When the mixer of the spectrum analyzer is close to the saturation operating point, the signal level displayed by the spectrum analyzer is low, which is caused by gain compression. Usually at 1dB or 0.5dB compression point, the signal level is generally between -3dBm and -10dBm.

Occupy Bandwidth

The frequency bandwidth occupied by the transmitter carrier is measured. The carrier power in the occupied bandwidth is typically 99% of the total carrier power, so it is equal to "99% power bandwidth". Its measurement is determined by low-end and high-end frequency limits.

Positive Peak Mode

A method of detection for digital display. Wherein each of the displayed dots corresponds to a maximum of the frequency interval and the portion of the video signal in a portion of the time interval indicated by that point.

IF gain / IF attenuation

A controller that adjusts the vertical position of the signal on the display without affecting the signal level on the input mixer. When

the controller is changed, the reference level also changes accordingly.

IF feedthrough

As the IF input signal through the input mixer to make the display of the baseline rise. Typically, this is only a potential problem with no preselected spectrum analyzer. Since the signal is always on the intermediate frequency, it is not necessary to mix with the local oscillator, so the whole trace rises.

Status Register

Used to store the measurement results and the associated register settings for the user.

Quasi - peak detector

The objective effect of impulsive disturbances on people's auditory effects increases with increasing repetition frequency, and the output characteristics of quasi-peak detectors with specific time constants can approximate this effect. Since the quasi-peak value is to reflect the amplitude of the interfering signal and reflect its time distribution, its charge time constant is larger than the peak detector and the discharge time constant is smaller than the peak detector.

Maximum Input Level

The maximum safe power input to the analyzer input port is usually 1W (+ 30dBm) continuous wave.