owon®

# VSA800P Series

# Spectrum Analysis Module

# Quick Guide

- **VSA815P(TG)**
- **VSA836P(TG)**
- **VSA880P(TG)**

**For product support, visit:www.owon.com.hk/download**

※：The illustrations, interface, icons and characters in the user manual may be slightly different from the actual product. Please refer to the actual product.

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**Fujian LILLIPUT Optoelectronics Technology Co., Ltd.**
No. 19, Heming Road
Lantian Industrial Zone, Zhangzhou 363005 P.R. China

**Tel:** +86-596-2130430          **Fax:** +86-596-2109272

**Web:** www.owon.com          **E-mail:** info@owon.com.cn

# General Warranty

We warrant 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 our 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, we 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 our company for warranty work may be new or reconditioned like new. All replaced parts, modules and products become the property of our company.

To obtain service under this warranty, the customer must notify our company of the defect before the expiration of the warranty period. Customer shall be responsible for packaging and shipping the defective product to the designated service centre, a copy of the customer's proof of purchase is also required.

This warranty shall not apply to any defect, failure or damage caused by improper use or improper or inadequate maintenance and care. We shall not be obligated to furnish service under this warranty a) to repair damage resulting from attempts by personnel other than our company representatives to install, repair or service the product; b) to repair damage resulting from improper use or connection to incompatible equipment; c) to repair any damage or malfunction caused by the use of not our supplies; or d) to service a product that has been modified or integrated with other products when the effect of such modification or integration increases the time or difficulty of servicing the product.

Please contact the nearest Sales and Service Offices for services.

**Excepting the after-sales services provided in this summary or the applicable warranty statements, we will not offer any guarantee for maintenance definitely declared or hinted, including but not limited to the implied guarantee for marketability and special-purpose acceptability. We should not take any responsibilities for any indirect, special or consequent damages.**

# Table of Contents

# 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.** The actual current of this product is 1.5A. Please use a power adapter with a rated current of no less than 3A. For the specific power supply interface, please inform us in advance when ordering the product.

- **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 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.

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

# 2.Safety Terms and Symbols

**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.

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

Hazardous Voltage        Chassis Ground        Refer to Manual

**Introduction to the spectrum analysis module:**

The spectrum analysis module offers exceptional performance in a compact form factor, with technical specifications superior to those of mainstream portable spectrum analyzers. It can be connected to a PC for displaying test results, providing a convenient and fast testing experience with just a mouse click. Additionally, it can be integrated into your system to develop spectrum analysis-related functions. The modular design of the spectrum analysis module greatly enhances testing convenience for users while also reducing costs. With the use of standard USB and LAN communication interfaces, it allows for easy measurement and operation. Utilizing the provided complete

SCPI command set, it enables the rapid construction and upgrade of integrated testing systems.

**Features:**

- Provides testing functions of mainstream portable spectrum analysis modules with superior technical specifications.

- Frequency range: 9kHz ~ upper limit

- Resolution bandwidth: 1Hz ~ 1MHz

- +12V single power supply

- Universal USB and LAN interfaces for easy control

- User-friendly PC-based measurement software

- Compact size

**Functions:**

- Phase noise testing

- Signal identification function

- Modulated signal measurement

**Key Technologies:**

The spectrum analysis module employs key technologies such as digital intermediate frequency (IF) technology, RF integration technology, digital filtering technology, high-speed data acquisition technology, electromagnetic compatibility (EMC) technology, graphic processing, embedded system software design technology, and low-power design. These ensure that the product achieves technical specifications superior to similar products.

# 3.General Inspection

## Initial Inspection

1. Check if the package is damaged.
2. Remove the module from the packaging and check if it has been damaged during transportation.
3. Verify that all accessories and documents are included with the instrument by referring to the packing list.

   If the packaging or cushioning materials are damaged, first check if the module and accessories inside the box are complete, then proceed to perform electrical performance tests on the spectrum analysis module.

   If the module is damaged during transportation or accessories are missing, please notify us, and we will arrange repairs or replacements as soon as possible according to your requirements. Please retain the shipping materials for future use in repackaging and shipping. For repair procedures, refer to Chapter 5 "Warranty"

## Safety Precaution Before Operation

## Check Power Supply

The spectrum analysis module power adapter uses a power cord interface and complies with international safety standards. Before powering on the spectrum analysis module, it is essential to ensure that the ground is properly connected. Floating ground or poor grounding may result in module damage and even cause personal injury.

Make sure the grounding conductor of the spectrum analysis module is grounded before turning on the instrument. After which the AC power cord can be connected. Do not use a non-ground power cord.

## Allowed Variation Range of Supply Power Parameters

The spectrum analysis module power adapter uses 220V, 50Hz AC power. Table lists the power requirements for the +5V power adapter when the module is operating normally.

| Power Supply Parameter | Compatible Range |
|---|---|
| Voltage | 220V±10% |
| Frequency | 50Hz±5% |
| Max. Power Consumption | 20W |

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

## Selection of +12V Power Adapter

It is recommended to use the dedicated +12V power adapter provided by our company, or a +5V power adapter that is certified and tested in the country of use. The actual current for this product is 1.5A, and a power adapter with a rated current of no less than 4A should be used.

⚠ **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".

## 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.

## First Time to Power On

Simply connect the spectrum analysis module power adapter to a compliant AC power source using a suitable power cord; no additional installation is required.

⚠ **WARNING**

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

⚠ **WARNING**

When the module is placed in a rack for operation, it is essential to ensure proper airflow both inside and outside the module. If the total heat power in the rack exceeds 800 watts, forced ventilation measures must be implemented.
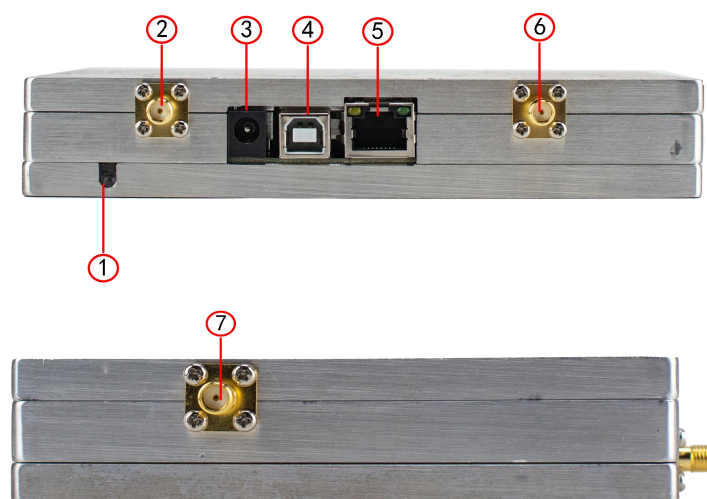
1) Correctly connect the cables and power on the adapter to start the module.

2) The spectrum analysis module will take approximately fifty seconds to execute startup procedures such as configuring hardware parameters. Afterward, the user can connect to and use the module via a PC host.

3) Allow the spectrum analysis module to warm up for 30 minutes.

# 4.Quick Start

## Module Interface Description



| No. | Module | Description |
|---|---|---|
| ① | Power Supply indicator | |
| ② | RF IN (RF input 50Ω) | The RF input is equipped with an SMA straight connector, which is connected to the device under test via a cable. |
| ③ | Power supply input | 9V-12V DC port. |
| ④ | USB Device port | When the intermediate frequency module is connected to an external USB device as a "slave device," data needs to be transmitted through this interface. For example, when connecting to a PC or printer, this interface is used. |
| ⑤ | LAN port | The intermediate frequency module can be connected to the local area network through this interface for remote control. The instrument complies |

| | | with the LXI Class C standard, enabling rapid test system setup and easy system integration. This serial port allows connection to other host devices. |
|---|---|---|
| ⑥ | TG OUT | Tracking source output interface. |
| ⑦ | REF CLK-IN/OUT | Clock source input/output interface. |

⚠ **Attention**

When the input attenuator setting is no less than 10 dB, the maximum input signal power at the RF input port is +23 dBm.

## User Interface

Before accessing the user interface, connect the module to the computer using an Ethernet cable. Then, open a web browser on the computer, enter the spectrum analyzer's IP address in the URL bar, and press "Enter" to access the user interface of the spectrum analyzer.
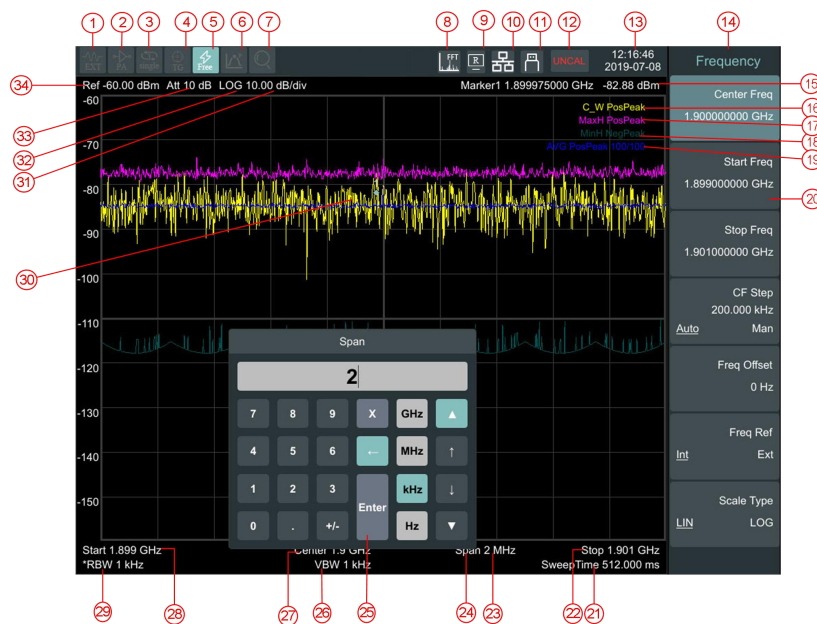


Figure 4- 1 User Interface

Description:

| NO. | Name | Description | Related Key |
|---|---|---|---|
| ① | Reference frequency | Set the reference frequency as **Int** (internal) or **Ext** (external) input | **FREQ** → [Freq Ref] |
| ② | Preamplifier | Turn on/off the preamplifier | **AMPTD**→ [Preamplifier] |
| ③ | Sweep status | Set the sweep status to **Single** or **Cont** (continuous) | [Sweep]→ [Sweep Single] or [Sweep Cont] |
| ④ | Tracking generator | Press to turn on/off the source output | [TG]→ [Track GEN] |
| ⑤ | Trigger type | Set the trigger type to **Auto**, **Video**, **Pos** (external positive edge), **Neg** (external negative edge) | [Trig] |
| ⑥ | Continuous peak search | Enable/Disable continuous peak search | **[Peak]**→ [Cont Peak] |
| ⑦ | Automatic search | Searching automatically | **[Auto]** |
| ⑧ | USB storage device | Show if USB storage device is inserted | |
| ⑨ | Remote control | Turn on remote control | |
| ⑩ | FFT mode | When RBW is set to less than 3kHz, automatically switch to FFT mode | |

| ⑪ | LAN access sign | LAN access sign | |
|---|---|---|---|
| ⑫ | UNCAL sign | Measurement is not calibrated | |
| ⑬ | Date/Time | Display the date/time of system. Click to display the interface of date modification | [System]→[Setting＞] → [Date/Time＞] |
| ⑭ | Menu title | Function of current menu belongs to, Click to call the shortcut menu | |
| ⑮ | Marker readout | Display the frequency value (time during zero scan span) and amplitude value of current frequency standard. Display the frequency standard function of response when the frequency standard function can be enabled | [Marker] |
| ⑯ | Trace 1 | Display the current type of trace 1 is refresh, and peak is detected positive | |
| ⑰ | Trace 2 | Display the current type of trace 2 is refresh, and peak is detected positive | |
| ⑱ | Trace 3 | Display the current type of trace 3 is refresh, and peak is detected positive | |

| | | | |
|---|---|---|---|
| ⑲ | Trace 4 | Display the current type of trace 4 is refresh, and peak is detected positive | |
| ⑳ | Menu item | Menu item of current function | |
| ㉑ | Sweep Time | System sweep time | [<SETUP] →[Sweep]→[Sweep time] |
| ㉒ | Stop frequency | Display stop frequency | [FREQ]→ [Stop Freq] |
| ㉓ | Mouse cursor | Show when using an external mouse | |
| ㉔ | Span | Display span width | [Span]→[Span] |
| ㉕ | Digital input keyboard of touch screen | Call out by clicking the position where the input parameter needs modifying | |
| ㉖ | Video bandwidth | Display video bandwidth | [<SETUP] → [BW] →[VBW] |
| ㉗ | Center frequency | Display center frequency | [FREQ]→ [Center Freq] |
| ㉘ | Start frequency | Display start frequency | [FREQ]→ [Start Freq] |
| ㉙ | Resolution bandwidth | Display resolution bandwidth | [<SETUP]→ [BW]→[RBW] |
| ㉚ | Marker | Display current activated marker | [<Marker]→ [Marker] |
| ㉛ | Amplitude Scale | Display amplitude scale | [AMPTD]→ [Scale/Div] |

| ㉜ | Amplitude Scale Type | **Log** (logarithmic) or **Line** (linear) | [AMPTD]→ [Scale Type] |
|---|---|---|---|
| ㉝ | Attenuation | Display input attenuation setting | [AMPTD]→ [Attenuation] |
| ㉞ | Reference level | Reference level | [AMPTD]→ [Ref Level] |

Note:

1~7 can be switched by clicking with the mouse;

1~19 can be called up to modify the current trace interface by clicking with the mouse;

22, 26, 29, 33: If there is a "*" before the display, it indicates that the item is in manual setting mode;

26~29: Clicking will bring up the digital input keyboard interface.

## 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], and a prompt on how to receive help will pop up in the center of the screen.

2. **Page up and down**

   When the help information is displayed across multiple pages, click and drag the scroll bar to view more help information.

3. **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.

4. **Close the current help information**

   Press [Help] again to close help.

## Web Keyboard Control

In web control, keyboard control and input can be used, with the corresponding keys as follows:

[F] Frequency

[S] Span

[A] Amplitude

[R] Automatic research


[B] Bandwidth

[D] Detector

[W] Sweep

[O] Tracking source


[T] Trace

[V] Display

[I] Trigger

[M] Mode


[Y] System

[Q] Quick Save

[P] Peak

[K] Marker


[X] File

[L] Save/Recall

[E] Marker Function

[C] Marker→

[N] Preset

[H] Help

[J] Measurement

[U] Measurement Setting

[F1~F7] F1~F7

[F9] GHz/dBm     [F10] MHz/dB

[F11] kHz/dBmV   [F12] Hz/mv

[0~9] 0~9

[Backspace] <-

[Esc] X

[Enter] enter

## 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. Setting center frequency；

2. Setting span and resolution bandwidth；

3. Activate marker；

4. Setting amplitude；

For example, to measure a 100MHz -10dBm 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 output terminal of signal generator to the **RF Input 50Ω** terminal of spectrum analysis module. Set the parameters as follows:
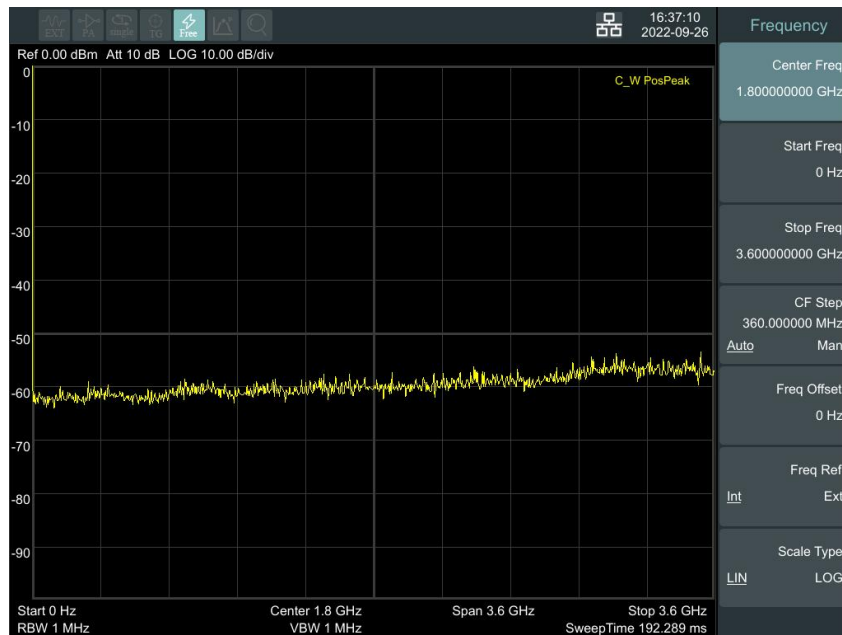
            Frequency       100 MHz

Amplitude        -10 dBm

2. Setting parameters

Press [Preset] to restore the analyzer to its factory-defined state. The spectrum analysis module will display the spectrum from 9kHz to the maximum span width. The signal generated will display as a vertical line at 100MHz. Refer to the follow figure.



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

1) Setting Center Frequency

Press "FREQ", select [Center frequency] on corresponding pop up menu. Input "100" and select the unit as MHz on the numeric keypad.

2) Setting Frequency Span

Press [SPAN], input "**1**" and select **MHz** as its unit using the numeric keypad; or press [↓] to decrease to 1MHz.

Figure  shows the signal at a higher resolution.Please note that resolution bandwidth, video bandwidth and frequency span are self-adapted. They adjust to certain values according to frequency span. Sweep time can be self-adapted too.

3) Activate Marker

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.
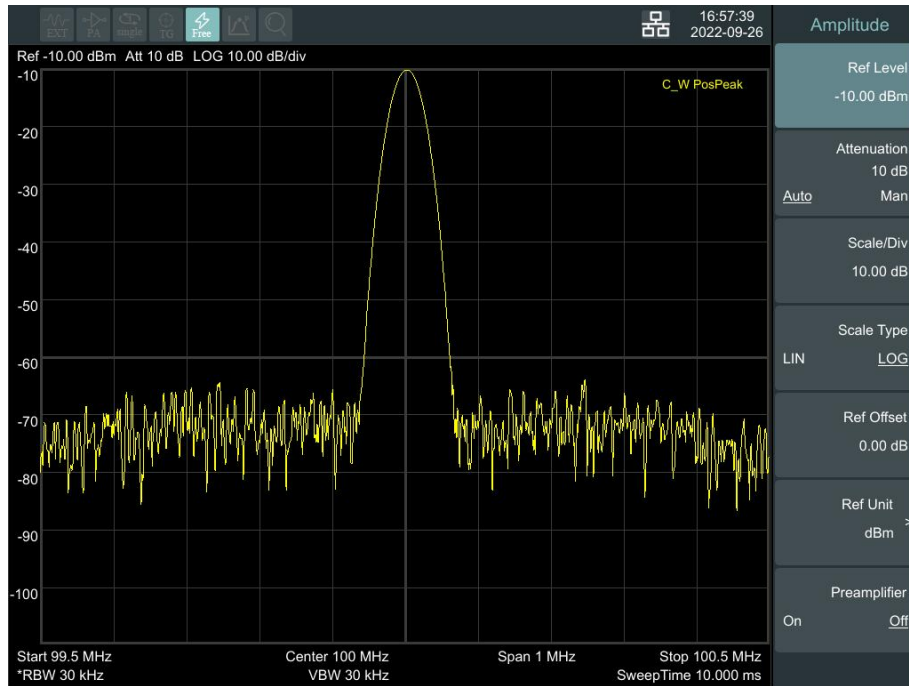
4) Setting amplitude

The amplitude of the top horizontal line in the measurement chart displayed on the host computer is generally referred to as the reference level.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 numeric keypad and set the unit to dBm. You can also use the [↓]key 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 peak value and noise is dynamic range.

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# 5.Warranty

## Troubleshooting

Typical issues that may occur when using your spectrum analysis module:

■ The host computer cannot connect.

■ No signal display.

■ Signal loss of lock.

■ Wrong measurement results or poor frequency or amplitude precision.

1. **The host computer cannot connect**

   The spectrum analysis module cannot connect to the computer, and the host software is not functioning properly.

   1) First, check if the network cable and USB cable are functioning correctly.

   2) Check the computer to ensure the port address and settings are correct.

   3) If the cables and parameters are fine, it can be determined that the issue is with the module. Please contact the manufacturer.

2. **No signal display**

   If there is no signal display at any wave band. Please try the following: set a signal generator at 20 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 us 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 analysis module reference is precise. Select internal or external frequency reference according to measurement conditions:

press [FREQ]→[Frequency reference <u>Internal</u> External].If the frequency is still not precise, then the spectrum analyzer LO has lost its phase lock, please contact us 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 us for service.

## Spectrum Analyzer Repair

When it is difficult to solve your spectrum analysis module'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 analysis module with the original packaging material and the packing box, follow the steps below to package:

1) 1) Write a detailed description of the malfunction of the spectrum analysis module, put it in the box together with the spectrum analysis module.

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.

# 6.Appendix

## Appendix A: Enclosure

(The accessories subject to final delivery.)

**Standard Accessories：**

| | | |
|---|---|---|
| **Power Cord** | **Adaptor** | **USB Cable** |

**Optional Accessories:**

| | | | | |
|---|---|---|---|---|
| **N-N Cable** | **N-SMA Cable** | **SMA-SMA Cable** | **SMA Adaptor** | **N-SMA Adaptor** |

**Near Field Probe includes: Four near-field probes, N-SMA adapter, SMA-SMA cable ( Frequency range: 30 MHz – 3 GHz)**

## 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

To clean the instrument exterior, perform the following steps:

Wipe the dust from the instrument surface with a soft cloth.

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