

S8723X Series USB CW Power Sensor

Quick Start Guide



The document applies to the continuous wave USB power sensors of the following models:

- S87230 continuous wave USB power sensor (9kHz - 6GHz).
- S87231 continuous wave USB power sensor (10MHz - 18GHz).
- S87232 continuous wave USB power sensor (50MHz - 26.5GHz).
- S87233 continuous wave USB power sensor (50MHz - 40GHz).

Preface

Thanks for choosing S8723X series USB CW power sensor produced by Saluki Technology Inc. Please read this quick guide carefully for your convenience.

We devote ourselves to meeting your demands, providing you high-quality measuring instrument and the best after-sales service. We persist with “superior quality and considerate service”, and are committed to offering satisfactory products and service for our clients.

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Saluki Technology

Manual Authorization

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Product Quality Certificate

The product meets the indicator requirements of the manual at the time of delivery. Calibration and measurement are completed by the measuring organization with qualifications specified by the state, and relevant data are provided for reference.

Quality/Environment Management

Research, development, manufacturing and testing of the product comply with the requirements of the quality and environmental management system.

Precautions

For the purpose of this manual, the following safety symbols apply, and please be familiar with them and their meanings before operating this instrument!



A “WARNING” sign indicates for an existing danger. It reminds the user to pay attention to a certain operation process, operation method or the similar. Any violation against the indicated rules or incorrect operation may lead to personal injury. It is not allowed to proceed until the warning conditions are fully comprehended and satisfied.

CAUTION

A “CAUTION” sign provides prompt on important information but not dangerous situations. It reminds the user to pay attention to a certain operation process, operation method or the similar. Any violation against the indicated rules or incorrect operation may lead to instrument damage or loss of important data. It is not allowed to proceed until the cautioning conditions are fully comprehended and satisfied.

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Chapter 1 About This Manual

This chapter introduces the functions, compositions, and main content in the User's Manual of the S87230 Series USB CW Power Sensor as well as other related documents provided to the user.

1.1 About This Manual

This manual introduces the basic functions and operation methods of the S87230 series USB CW power sensor. This manual introduces the features, basic usage, measurement configuration guides, remote control, maintenance and specifications of the instrument to help you familiarize yourself with and master the operation methods and essentials as soon as possible. To facilitate your familiarity with the instrument, please read this manual carefully before operating the instrument, and then follow the instructions of manual.

The chapters included in this User's Manual are as follows:

- **Preparation before Use**

This chapter introduces the pre-operation inspection of S87230 series CW power sensor to enable the user to get ready for the correct and safe operation of the instrument.

- **Typical Applications**

This chapter introduces operation methods of all functions of the instrument, including sensor selection, virtual panel introduction, zero and calibration before measurement and continuous wave power measurement, which is intended to make users understand and master some basic operation methods of the S87230 series USB CW power sensor.

- **Getting Help**

This chapter includes basic fault diagnosis, solution, error information description, and repair methods.

1.2 Related Documents

The product document related to S87230 series USB CW power sensor includes:

- Quick Start Guide
- User Manual
- Programming Manual

Quick Start Guide

This manual introduces the settings of the instrument as well as the basic operating methods of measurement with the aim of enabling users to quickly understand the features and basic local and remote control operation of the instrument. Main chapters included in this manual are as follows::

- About This Manual
- Preparation before Use
- Typical Applications
- Getting Help

User Manual

This manual gives a detailed introduction of features and operation methods of the instrument, including information about configuration, measurement, remote control, maintenance, etc. so as to provide users with an all-round understanding of the features of the instrument and aid users in learning the most common test procedures. Main chapters included in this manual are as follows:

- About This Manual
- Overview
- Start Guide
- Operation Guide
- Remote Control
- Fault Diagnosis and Repair
- Technical specifications

Programming Manual

This manual describes the basics of remote control programming, basics of SCPI, SCPIs, examples of programming, and I/O driver library, for the purpose of guiding the user to master the SCPIs and methods of the instrument quickly and comprehensively. Main chapters included in this manual are as follows:

- About This Manual
- Remote Control
- SCPI
- Programming Examples
- Error Description
- Appendixes

Chapter 2 Preparation Before Use

This chapter introduces the precautions and routine maintenance before use of the S87230 series USB CW power sensor to facilitate the user to have a preliminary understanding of the instrument. The content contained in this chapter is consistent with that in relevant chapters of Quick Start Guide.

2.1 Preparation Before Operation

This section describes the precautions before initial use of the S8723X series USB CW power sensor.



Damage prevention

To avoid the electric shock, fire and personal injury:

- Do not open the chassis without authorization;
 - Do not attempt to dismantle or modify any part not described in this manual. Improper removal may cause the deterioration of electromagnetic shielding effectiveness, damage of internal parts, etc. and affect the reliability of product. If the product is under warranty, we will no longer provide the unpaid repairs.
 - Please carefully read relevant content of “2.2 Safe Use Guideline” of the User’s Manual and the following precautions for safe operation. In addition, attention shall be paid to relevant specific operating environment requirements specified in the reference data page.
-

CAUTION

During instrument operation, please pay attention to the following aspects:

Improper application site or measurement setting will damage the instrument or the connecting device. Before powering on the instrument, please pay attention to the followings:

- Keep the instrument dry;
 - Place the instrument horizontally and reasonably;
 - Ensure that the surrounding temperature is in accordance with the requirements on the reference data page.
 - Ensure that the power level of the port input signal conforms to the mark range;
 - Ensure that the signal output port is properly connected and isn't overloaded.
-

CAUTION

ESD protection

Pay attention to the ESD protection measures in the workplace to avoid the damage to instrument. For details, please refer to relevant content of “2.2 Safe Use Guideline” of the User’s Manual.

Note: Effect of electromagnetic interference (EMI)

The electromagnetic interference can affect the measurement results, therefore, it is necessary to:

- Select appropriate shielded cables, for example, use RF shielded twisted pair/network connection cable;
- Close the opened and temporarily unused cable connection port or connect the matched load to the connection port in time;
- Refer to the electromagnetic compatibility (EMC) grade in the User Manual.

2.1.1 Unpacking

Step 1: Check if there is any damage in the outer packaging and the anti-vibration packaging of the instrument. If no damage is found, keep the packaging in case of future need and continue the inspection as per the following steps;

Step 2: Unpack the instrument and check for any damage to the main unit and attached items.

Step 3: Verify the items in the packaging box carefully by cross-checking with packing list;

Step 4: If the outer package is broken, the instrument or accessories are damaged or there is any error of the delivery, it is strictly forbidden to switch on the instrument! Please contact us: sales@salukitec.com.

2.1.2 Environment requirements

The operating place of the S87230 series USB CW power sensor shall meet the following environment requirements.

(1) Operating environment

The operating environment should satisfy the following requirements:

Table 2.1 Operating Environment Requirements of the S87230 Series

Temperature	10°C - 40°C
Temperature range during error adjustment	23°C ± 5°C (allowed temperature deviation during error adjustment <1°C)
Humidity	Hygrometer measurement range: 20% - 80% (uncondensed) when the temperature <+29°C
Altitude	0 - 4,600m
Vibration	Maximum: 0.21G, 5Hz - 500Hz

CAUTION

The above environmental requirements are only defined for the operating environment of the instrument and are not within the scope of specifications.

(2) ESD protection

The static electricity is destructive to electronic components and equipment. Generally, we will use two anti-static measures, including combination of conductive table mat and wrist combination as well as combination of conductive floor mat and ankle strap. If these two combinations are used together, a good anti-static protection can be provided. If the combination is used separately, only the former can provide protection. For the safety of users , anti-static components must provide an isolation resistance of at least 1MΩ to the ground.

Please correctly use the following anti-static measures to reduce electrostatic damage:

- Ensure that all instruments are properly grounded to avoid generating static electricity;

-
- Before connecting the coaxial cable to the instrument, contact its inner and outer conductors with the ground temporarily;
 - The staff shall wear anti-static wrist straps or adopt other anti-static measures before contacting joints and core wires or carrying out any assembly operation.
-



Operating voltage range

The above anti-static measures can't be taken in a place where the voltage exceeds 500V.

2.1.3 Power on/off

(1) Host system requirements

The S87230 series USB CW power sensor shall be applied with the standard USB mini-AB socket, and shall be subject to power display or direct remote control on the computer or other test instrument with USB host interface.

Before using the USB CW power sensor, please ensure that the host satisfies the following requirements:

- The computer or any hardware device with a USB host interface;
- Support Windows98SE/ME/XP/2000/2003/Win7/WIN10 or higher version;
- The host is installed with the version above VISA 3.0 and the virtual power test panel provided along with the machine;
- It is also available for programming through the remote programming software including Microsoft® Visual Basics, C++ and LabVIEW.

(2) USB cable selection

The S87230 series USB CW power sensor is equipped with special USB cable, which can be screwed and fixed on the body, as shown in Fig. 2.1. The user can also use his own USB cables, but shall ensure that cables satisfy the international safety standards.



Prevent personal injury and damage to the instrument.

Poor contact or wrong wiring may lead to instrument damage or even personal injury. Therefore, the users are recommended to use the USB cable provided by us. If other non-standard cables shall be used, please contact our technical personnel.

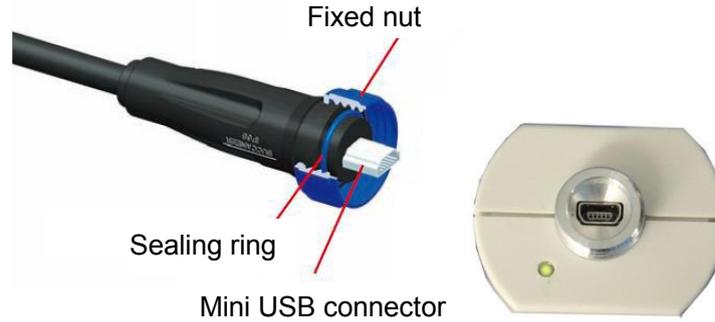


Fig.2.1 Fixable USB cable

(3) Charge of the instrument

The S87230 series USB CW power sensor is applied with the computer standard USB interface. Table 2.2 lists the power supply requirements of the S87230 series USB CW power sensor during normal operation.

Table 2.2

Power Supply Parameter	Applicable Scope
Output voltage	+5 V \pm 5% DC
Rated current	0.5A

The normal power consumption of the S87230 series USB CW power sensor is 1.8 W. When the computer USB interface is inserted with multiple USB devices and it can't guarantee that each interface can provide 0.5 A output current, the computer will prompt that some sensors can't be found. In this case, please use the USB HUB with external power supply.

Connect the sensor with the USB port of the host with the USB cable conforming to the requirements, and observe whether the green indicator lamp of the sensor is lit up.

Step 1: Connect the small port of the USB cable with the S87230 series USB CW power sensor and tighten it, and then connect its large port with the computer or measurement instrument USB host interface, and the power sensor green indicator lamp will light up later;

Step 2: The “Equipment Manager” of the host can find the new “USB Test and Measurement Devices”.



Fig2.2 Connecting the USB CW power sensor to the computer

(4) Power off

Remove the USB cable to turn off the USB CW power sensor. In this case, the green LED indicator lamp will go out.

2.1.4 Connect Use of Connectors

During test of the USB CW power sensor, it shall be connected to the USB cable and then connected to the source to be tested. The 1.85 mm, 2.4 mm and 3.5 mm male connectors shall be used, and even different types of switching adapters shall be used. Even though connectors are designed and manufactured according to the highest standards, their service life is limited. Wear is unavoidable in normal use and can make the connector performance degrade or even unable to meet the measurement requirement, therefore, correct maintenance and measurement connections not only provide accurate and repeatable measurement results but also prolong the useful life, reduce the measurement cost.

Note the following aspects during actual use:

(1) Check of connectors

It is necessary to wear an anti-static wrist strap when checking the connectors. It is recommended to use a magnifier to check:

- 1) the electroplated surface for wear and deep scratches;
- 2) the thread for deformation;
- 3) the thread and joint surface for metallic particles;
- 4) the inner conductor for bending and breakage;
- 5) the screw for improper rotation.

CAUTION

Check the connectors so as not to damage the instrument ports

Any damaged connector may damage the good connector connected to it even for the first time of measurement. To protect the ports of the USB CW power sensor, the connector to be used shall be checked before connection.

(2) Connection

The connectors should be checked and cleaned before measurement and connection to ensure that they are clean and undamaged. It is necessary to wear an anti-static wrist strap during connection. The correct connection methods and procedures are as follows:

Step 1. As shown in Fig.2.3, align the axes of the two interconnected connectors to ensure that the pin of the male connector slides concentrically into the hole of the female connector.



Fig. 2.3 Coaxial alignment of interconnected connectors

Step 2. As shown in Fig. 2.4, move both connectors straight together, so that they can be connected smoothly; rotate the threaded sleeve of connector (rather than the connector itself) until it is tightened; during connection, there can be no relative rotary motion both connectors;

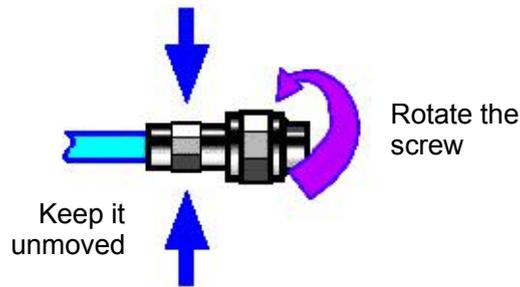


Fig. 2.4 Connection

Step 3. As shown in Fig. 2.5, use a torque wrench to tighten the connectors and finish the connection; the torque wrench shall not exceed the starting break point and an auxiliary wrench can be used to prevent the connector rotating.

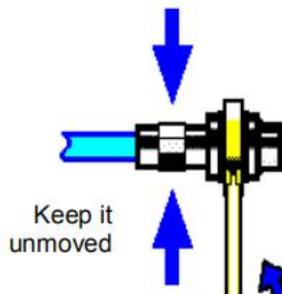


Fig. 2.5 Completion of final connection with a torque wrench

(3) Disconnection

Step 1. Support the connector to prevent any part from being shaken, distorted, or bent;

Step 2. Use an open-end wrench to prevent the main connector from rotating;

Step 3. Use another wrench to loosen the screw on the connector.

Step 4. Loosen the screw by hand until the connection is completely broken.

Step 5. Separate two connectors by pulling them apart in parallel.

(4) Use of the torque wrench

The torque wrench should be used as indicated in Fig. 2.6. Please pay attention to the following points when using the torque wrench:

- Confirm that the torque of the torque wrench is set correctly before use;
- Ensure that the angle between the torque wrench and the other wrench (used to support the connector or cable) is less than 90° before applying a force;
- Gently grasp the end of the torque wrench handle and apply a force in the direction perpendicular to the handle until the breakout torque of the wrench is reached.

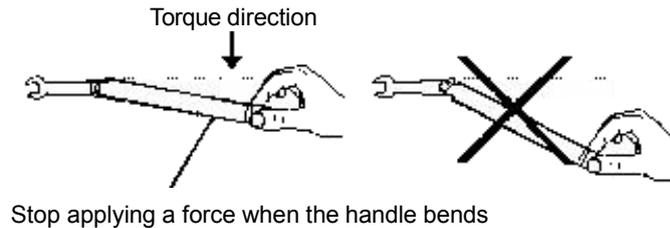


Fig. 2.6 Use of torque wrench

(5) Use and preservation of connectors

- 1) Protect the connectors with a protective sheath when not used;
- 2) Do not place the connectors, tools, etc. in a same box, which is the most common cause leading to connector damage;
- 3) Keep the connector and analyzer at the same temperature. If the connector is held by hand or cleaned with compressed air, the temperature will be significantly changed. The connector can be used for calibration only after its temperature is stabilized;
- 4) Do not touch the joint surface of the connector because it is difficult to remove skin oil and dust particles from the joint surface;
- 5) Do not place the contact surface of the connector downwards onto a hard surface; otherwise, the electroplated layer and joint surface of the connector may be damaged.
- 6) Wear an anti-static wrist strap and work on a grounded conductive workbench mat to protect the analyzer and connector against electrostatic discharge.

(6) Cleaning of connectors

It is necessary to wear an anti-static wrist strap when cleaning the connectors as per the following steps:

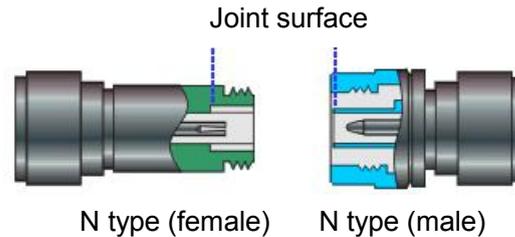
- 1) Use clean low-pressure air to remove the loose particles on the thread and joint surface of the connector and check the connectors thoroughly. If further cleaning is required, proceed as follows;
- 2) Wet (but not soak) a lint-free cotton swab with isopropyl alcohol;
- 3) Use a cotton swab to remove dirt and debris from the joint surface and thread of the connector. When cleaning the inner surface, be careful not to apply an external force to the central inner conductor or leave the cotton swab fibers on the central conductor of the connector;
- 4) Evaporate the alcohol and then blow the surface clean with compressed air;
- 5) Check the connectors to confirm that they are free of particles and residues;
- 6) If the connector still has visible defects after cleaning, it indicates that the connector may be damaged. Never use a damaged connector, and confirm the causes of damage before measurement and connection.

(7) Use of adapter

When the measuring port of analyzer is different from the type of connector used, an adapter must be adopted for measurement connection. In addition, even if the measurement port of the analyzer is the same as the type of connector for the port of tested part, it is also a good idea to use an adapter. Under these two conditions, the measuring port can be protected, thus extending its service life and reducing the maintenance cost. Before connecting the adapter to the measuring port of analyzer, it should be carefully checked and cleaned. A high-quality adapter should be used to reduce the impact of mismatch on the measurement accuracy.

(8) Joint surface of connector

An important concept in microwave measurement is the reference surface for all measurement. In the case of calibration, the reference surface is defined as the surface on which the measuring port and the calibration standard are jointed. Proper connection and calibration depend on whether the connectors can be completely and straightly contact with each other at each point of the joint surface, so as to ensure minimum power standing-wave ratio, achieve the minimum power loss, and ensure the measurement accuracy.



2.2 Routine Maintenance

This section introduces the daily maintenance method of the S87230 series USB CW power sensor.

2.2.1 Cleaning method

Clean the instrument surface as per the following steps:

Step 1. Power it off, and disconnect the power cord;

Step 2. Gently wipe off the surface with a piece of dry or slightly moist soft cloth, and it is not allowed to wipe off its inside;

Step 3. Do not use chemical detergents, such as alcohol, acetone or diluted detergent.

2.2.2 Maintenance of testing port

The S87230 series USB CW power sensor has a USB cable connector and a microwave power signal input port. If the connector is damaged or there is dust inside, the RF wave band test results will be affected; therefore, please observe the following methods for maintenance of such connector:

- Connectors shall be kept clean and away from dust;
- To prevent ESD, do not directly contact the connector surface;
- Do not use damaged connector;
- Clean connectors with a dryer, and do not grind the surface with a tool like abrasive paper.

Chapter 3 Typical Application

This chapter introduces the selection of the S87230 series USB CW power sensor, and detailed operation methods and measurement procedures for different measurement functions.

3.1 Selection of Power Sensor

The S87230 series USB CW power sensor includes four models including S87230, S87231, S87232 and S87233, as shown in the following Table.

Table 3.1 S87230 Series USB CW Power Sensor

No.	Sensor Model	Power Range	Frequency range	Interface Type
1	S87230	-50 dBm to +20 dBm	9 kHz - 6 GHz	N (m)
2	S87231	-60 dBm to +20 dBm	10 MHz - 18 GHz	N (m)
3	S87232	-60 dBm to +20 dBm	50MHz - 26.5GHz	3.5 mm (m)
4	S87233	-60 dBm to +20 dBm	50MHz - 40GHz	2.4mm (m)



Fig. 3.1 S87230 series USB CW power sensor

The S87230 series USB CW power sensor can realize continuous wave power measurement. As the performance specifications are different by model, the user can select the suitable sensor according to the characteristics and measurement requirements of signals to be tested as well as the specifications of each sensor. The basic functions of the sensor are shown in Table 3.1.

3.2 Virtual Power Measurement Panel

The USB interface of the S87230 series USB CW power sensor conforms to the USBTMC (USB Test and Measurement) protocol, which is a kind of enumerated equipment (namely, it can be found through the viFindRsrc function of the VISA library). The vendor ID and equipment ID (decimal) are 1204 and 4100 respectively, and the serial number are as shown in each sensor.

The user can realize the remote control of the USB sensor through the VISA library; for the specific configuration, please refer to the *Programming Manual of the S87230 Series USB CW Power Sensor*, and the virtual power test panel can also be used for the power test. The user shall install the version above VISA 3.0 and run the virtual power test panel program provided in CD. The open virtual power test panel is as shown in Fig. 3.2.

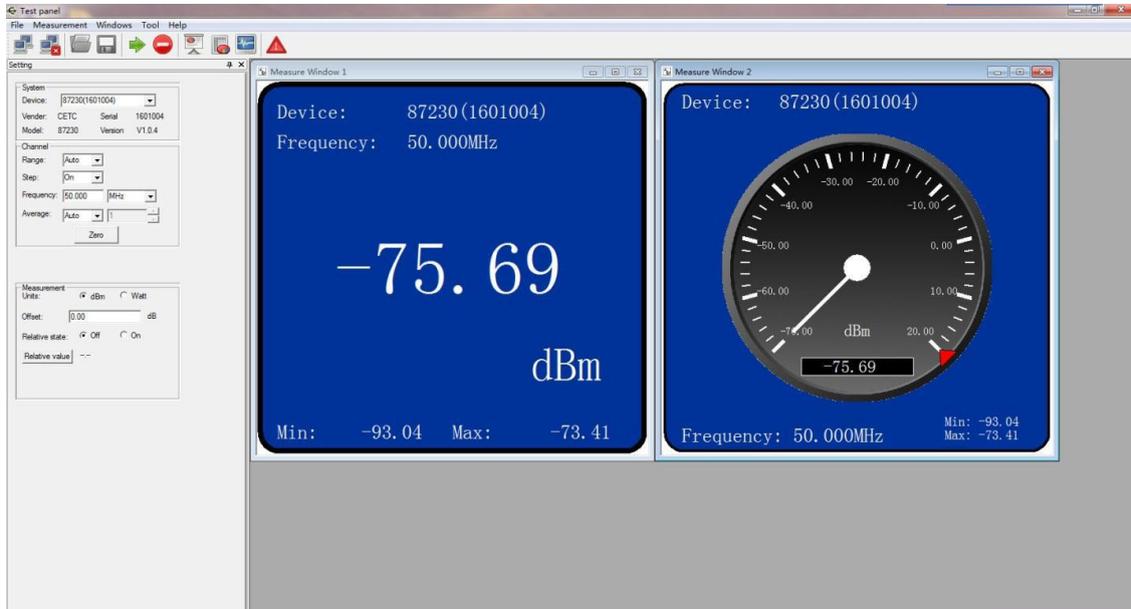


Fig. 3.2 Virtual power test panel

Connection and operation steps of the USB CW power sensor:

Step 1. Connect the USB power sensor with the computer; open the power test panel; select the USB device to be connected in the pop up “Instrument Connection” window in the system, and click “Connection” button. As shown in Fig. 3.3, the measurement process is normal;

Step 2. The user can check the type, serial number and firmware version number of the USB CW power sensor in the “System” label on the left side of the window;

Step 3. Click  or  button of the toolbar, and the system will display the measurement result in the open value window or disable measurement;

Step 4. The user can set the measurement efficiency, average number of times, range selection, etc. in the “Channel” label window;

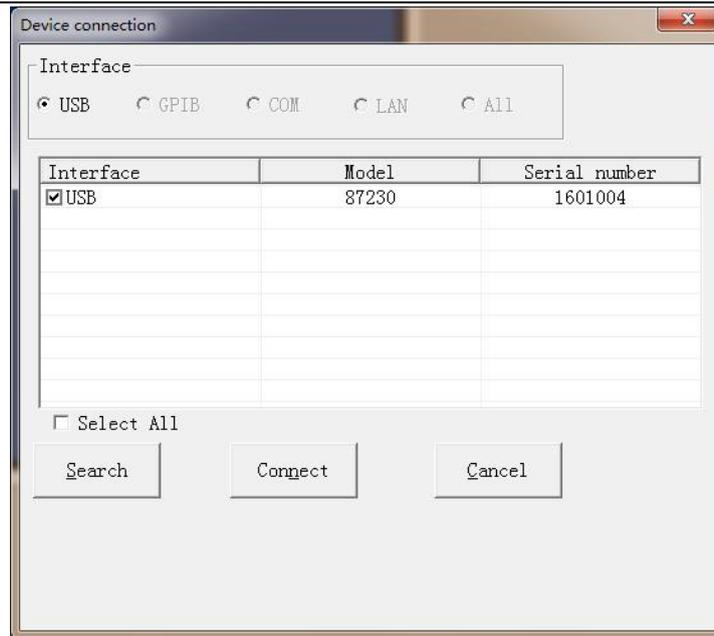


Fig. 3.3 Equipment Connection Window

Step 5. The settings including unit selection, offset and relative measurement can be carried out in the “Measurement” label window;

Step 6. Click  and  buttons of the toolbar to create the value display window and analog display window;

Step 7. Click  button of the toolbar to research and connect the new USB power sensor.

3.3 Zeroing and Calibration Before Measurement

In order to improve the measurement accuracy of the S87230 series USB CW power sensor, it is necessary to zero it before small signal power measurement.

The S87230 series USB CW power sensor has been calibrated before delivery with the calibration source traceable to the national standard, and thus calibration is not recommended to the users.

3.3.1 Zeroing

Zeroing refers to measurement and storage of noise of the whole measurement channel. In the process of measurement, the zeroed value shall be deducted from the actually measured value, namely deducting the channel noise, and this reading is the real channel input signal level.

If the sensor is connected to other equipment, firstly disable the signal output of the equipment, and then zero it.

The specific steps are as follows:

Step 1. Connect the sensor to the output port of the source to be tested, and disable the output of the source;

Step 2. Carry out external zero with the SCPI or [Zero] button on the power test panel. The green LED lamp will flash during zero.

It is recommended to zero the S87230 series USB CW power sensor in following conditions:

- When the temperature change is larger than 5°C;

- After 24 h;
- Before measuring the low power continuous wave signal. For example, when measuring the small signal with a maximum power 10 dB higher than the minimum detectable power of the applied power sensor.

CAUTION

For the S87230 series USB CW power sensor with a frequency band covering 9 kHz - 6 GHz, as DC couple is used as detection component, some signal sources may lead to DC or low frequency leakage when the RF output is "OFF", thus resulting in too high level of the measured signal and zero failure.

3.3.2 Internal zero

The internal zero means that a switch is equipped in front of the measurement channel. The user can measure and save the noise of the channel without disconnecting the sensor from the DUT. During internal zero, the RF signal is always applied to the power sensor, which can reduce the wear of the sensor connector and shorten the test time, and thus is especially suitable for the occasions when it is inconvenient to disable the power signal output.

Generally speaking, the conventional zero usually has a better zero effect, and the internal zero and the conventional zero functions shall be selected according to the actual measurement demands. During programming, the user can recall CALibration[1]:ZERO:TYPE command to select the internal zero or conventional zero function. For specific operation, please refer to the *Programming Manual of the S87230 Series USB CW Power Sensor*.

CAUTION

During measurement of low level signal, automatic zero shall be carried out before measurement, so as to ensure the measurement accuracy.

Set the step detection to "Off" status when the measurement of low power signal with amplitude lower than -40 dBm is carried out to obtain more accurate measurement results, but the measurement speed is lower.

3.3.3 Calibraiton

The calibration means that the power sensor is connected to the known standard calibration source output port for power tracing under the current measurement conditions (current temperature, current power reference, etc.). As the S87230 series USB CW power sensor has been calibrated before delivery, the calibration is not recommended to the users. However, the advanced users can automatically calibrate the sensor in the following conditions:

- When the user uses a customized 0 dBm power standard for measurement and comparison;
- When it is beyond 1-year calibration period, and the user thinks that it has measurement errors and it is unavailable for returning and calibration.

3.4 CW Power Measurement

The S87230 series USB CW power sensor can realize the average power measurement of the continuous wave signal. The dynamic range of power measurement is -60 dBm to +20 dBm, and the frequency range is 9 kHz - 40 GHz.

The user can carry out power measurement of the continuous wave through our power test panel or SCPI. For details, please refer to the *Programming Manual of the S87230 Series USB CW Power Sensor* in the accompanied CD. It is classified into three steps generally:

- Step 1.** Zero the USB CW power sensor;
- Step 2.** Set the frequency of the signal to be tested;
- Step 3.** Carry out power measurement of the continuous wave with the sensor.

When multi-channel measurement shall be carried out, the user can directly insert several USB CW power sensors into the computer or build a multi-channel power test system with USB HUB, as shown in Fig. 3.4.



Fig. 3.4 Multi-channel power test with USB HUB

The specific operation steps are as follows:

Step 1. Open the virtual power test panel, and the system will automatically find the connected USB CW power sensors, and then select all connected power sensors, and click “Connection” button. As shown in Fig. 3.5, the system will automatically display the USB CW power sensor found first and display the measurement results;

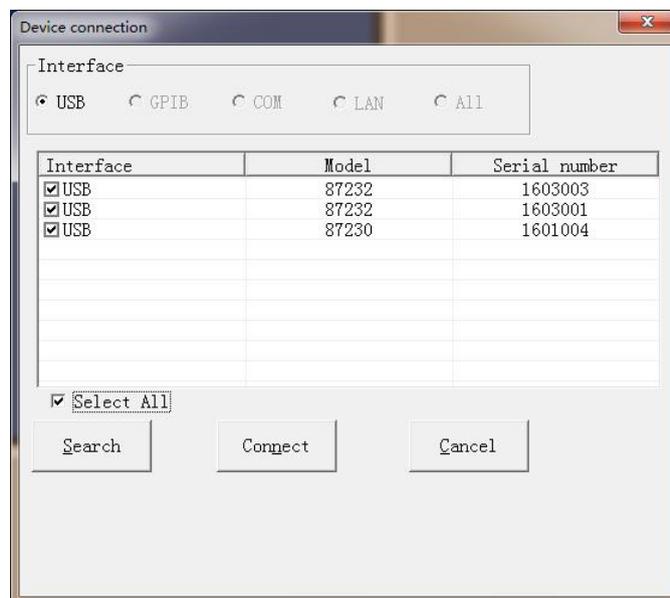


Fig. 3.5 Equipment when several USB CW power sensors are connected

Step 2. Click  or  button of the toolbar, and open the measurement result of other power sensor in form of value display or analog display, as shown in Fig. 3.6;

Step 3. Click one measurement window, and the system will indicate the currently selected measurement window with yellow border, and then select the “Equipment” drop-down menu under the “System” label to assign the window to other equipment;

Step 4. Click one measurement window, and the system will indicate the currently selected measurement window with yellow border, and then the channel can be zeroed and the measurement frequency and offset can be set;

Step 5. When several USB CW power sensors are connected, the open measurement window can be automatically arranged with the window/tile or cascade command.

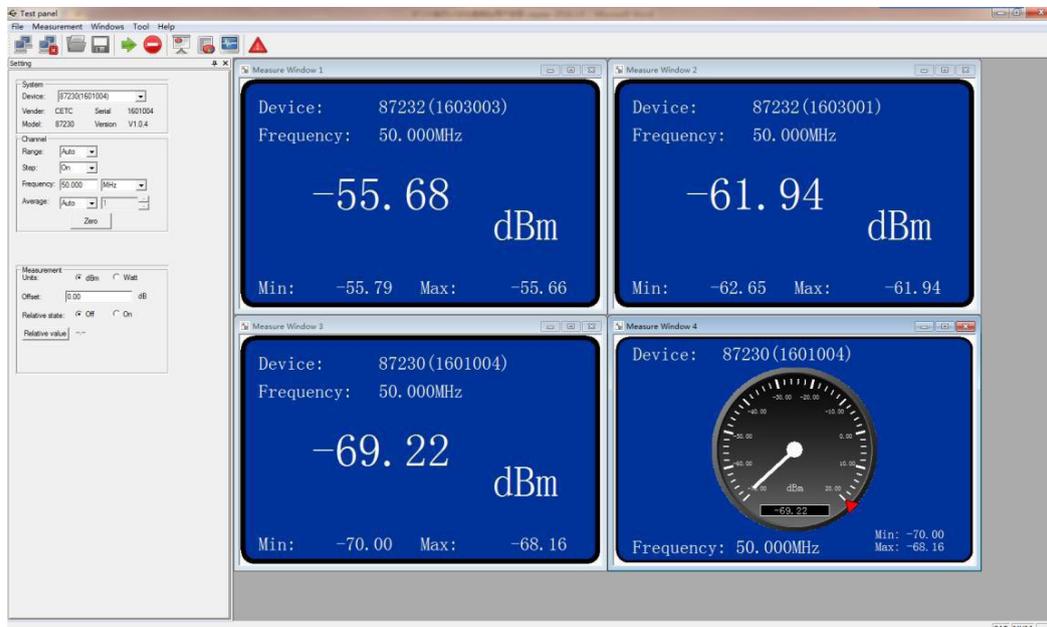


Fig. 3.6 Measurement window connected with multiple USB CW power sensors

The S 87230 series USB CW power sensor can be connected with a computer for microwave power measurement with a virtual panel or user programming or be connected with some electronic measurement instruments of our company for microwave power measurement with its power options.

Chapter 4 Getting Help

4.1 Fault Diagnosis and Guides

This part provides general guidance on how to carry out simple judgment and handling when the S87230 series USB CW power sensor has any fault. If necessary, please feed back the problem to the manufacturer as accurately as possible, so that we can solve it as soon as possible.

If the error information is displayed in the indication area of the USB CW power sensor, please check the menu “[Tool]->[Error]” to know the specific error information description.

Under normal conditions, problems may arise due to inappropriate use and setting or hardware or software errors. When a problem is encountered, first observe and save the error information, analyze the possible causes of the problem and do troubleshooting in advance by referring to the troubleshooting steps in this chapter. Alternatively, you can contact our customer service center and provide the collected error information, and we will help you solve the problems as quickly as possible. For more details, please refer to the contact information provided in this manual or visit our web site: www.salukitec.com to find the contact information of the technical support center nearest to you.

This chapter is mainly intended to help users to judge faults of the S87230 series USB CW power sensor, and determine whether the after-sales service is needed. It also includes the explanation on the internal error information of the instrument.

Generally, problems come from hardware and software errors and inappropriate use. The S87230 series USB CW power sensor may have the following types of faults:

- The USB device can't be found.
- The LED green indicator lamp has no display.
- Unexpected phenomena, such as misoperation and obvious errors of the measurement result.

4.1.1 Failure to find the USB device

If the USB device can't be found in the computer equipment manager after power on, please check it with the following steps:

Step 1. Please confirm whether the USB cable is connected normally, and whether the USB power supply is normal;

Step 2. Please confirm whether several USB devices are connected, and please use USB HUB with external power supply when necessary;

Step 3. Please confirm whether the host is installed with the VISA library and driver correctly.

4.1.2 Lighting failure LED green indicator lamp

If the LED green indicator lamp of the sensor keeps off after power on, please check it with the following steps:

Step 1. Confirm whether the USB cable is connected normally;

Step 2. Confirm whether the host is powered on, and whether the USB host interface is normal.

4.1.3 Accidental phenomena

Many factors may result in unexpected phenomena during use. Determine cause of faults of the instrument by referring to the following inspection procedures through which the problems can be solved or the causes of problems can be judged clearly.

- Check whether the mechanical connection of the USB cable is correct, and whether the electric characteristics are compatible;
- When the problems appears after some settings are made, check the operation and confirm that all settings are correct. If the test is completed, please check whether the measurement result is consistent with the tested signal, and whether the performance indicator of the sensor is satisfied.
- If the result provided by the instrument is out of expectation and it is hard to determine whether the settings of the instrument are correct, unplug and plug it again, and then set it up according to the tested signal and test requirements.

4.2 Error Information

If the operation is improper or the configuration is incorrect during actual use, the system will automatically provide error information. The user can roughly judge the type of problem based on the error prompt and take corresponding measures for troubleshooting or get the instrument repaired.

Click  in the user power test panel to check the recent error information.

For detailed description of the error information, please refer to the *Programming Manual of the S87230 Series USB CW Power Sensor*.

4.3 Repair Methods

4.3.1 Contact us

When the S87230 series USB CW power sensor incurs a problem, observe and save error information, analyze the possible causes and eliminate and solve the problems according to the methods provided in the section “4.1. Fault diagnosis and troubleshooting”. If the fault is not solved, please contact our service center according to the following contact information and provide the collected error information, and we will help you solve the problem as soon as possible.

Contact information:

Service Tel:	886.909 602 109
Website:	www.salukitec.com
Email:	sales@salukitec.com
Address:	No. 367 Fuxing N Road, Taipei 105, Taiwan (R.O.C.)

4.3.2 Packing and mailing

When your S87230 series USB CW power sensor incurs a problem that is difficult to solve, please contact us by phone or fax. If it is decided that the S87230 USB CW power sensor needs to be returned for repair, please package it using the original packaging material and box, and follow these steps:

- 1) Please include a detailed explanation of the problem that you've encountered when using the USB power sensor along with the apparatus in the packaging box.
- 2) Pack the USB CW power sensor with the original packaging material to reduce possible damage.
- 3) Put the linings at four corners of the outer packaging box, and put the instrument in the outer packaging box;
- 4) Seal the packaging box with tapes, and reinforce it with nylon tape;
- 5) Mark "Fragile! No Touch! Handle with Care!" words;
- 6) Please arrange the consignment as required for the precise instrument.
- 7) Keep copies of all the shipping documents.

CAUTION

Pay attention to followings when packaging the S87230 series USB CW power sensor
Packaging of the USB CW power sensor with other materials may cause damage to it.

- End of Document -