SHA850A
Spectrum & Network Analyzer

SHA860A
Signal Analyzer

Quick Start

EN01A

SIGLENT TECHNOLOGIES CO.,LTD

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Trademark Information

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Declaration

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- SIGLENT will not be responsible for losses caused by either incidental or consequential in connection with the furnishing, use or performance of this manual as well as any information contained.

Product Certification

SIGLENT guarantees this product conforms to the national and industrial standards in China as well as the ISO9001: 2008 standard and the ISO14001: 2004 standard. Other international standard conformance certification is in progress.

Contents

General Safety Summary

Carefully read the following safety precautions to avoid any personal injury or damage to the instrument and any products connected to it.

Only the power cord and adaptor specified for the analyzer and authorized by local country should be used

Look Over All Terminals' Ratings

Do not touch exposed connectors or ports whether the power is on or off

Do not operate in wet/damp conditions

Do not operate in an explosive atmosphere

Keep the surface of the instrument clean and dry

Not to use the instrument for measurements on mains circuits

The responsible body or operator should refer to the instruction manual to preserve the protection afforded by the instrument.

Any parts of the device and its accessories are not allowed to be changed or replaced, other than authorized by the manufacturer or agent.

Safety Terms and Symbols

When the following symbols or terms appear on the front or rear panel of the instrument or in this manual, they indicate special care in terms of safety.

CAUTION	The "CAUTION" symbol indicates a potential hazard. It calls attention to a procedure, practice, or condition which may be dangerous if not followed. Do not proceed until its conditions are fully understood and met.
WARNING	The "WARNING" symbol indicates a potential hazard. It calls attention to a procedure, practice, or condition which, if not followed, could cause bodily injury or death. If a WARNING is indicated, do not proceed until the safety conditions are fully understood and met.

Allgemeine Sicherheitsübersicht

Lesen Sie die folgenden Sicherheitshinweise sorgfältig durch, um Verletzungen oder Schäden am Gerät und an den daran angeschlossenen Produkten zu vermeiden.

Verwenden Sie nur das für das Gerät vorgesehene und im jeweiligen Land zugelassene Netzkabel.

Schließen Sie das Messkabel richtig an

Überprüfen Sie die Nennwerte aller Klemmen

Verwenden Sie einen ordnungsgemäßen Überspannungsschutz

Schutz vor Elektrostatik

Für gute Belüftung sorgen

Betreiben Sie das Gerät nicht bei vermuteten Defekten

Nicht in feuchter Umgebung betreiben

Betreiben Sie das Gerät nicht in explosionsgefährdeten Umgebungen

Halten Sie die Produktoberflächen sauber und trocken

Sicherheit bei der Handhabung

Alle Sondenbaugruppen sollten die Anforderungen von UL 61010-031 und CAN/CSA-C22.2 Nr. 61010-031-07 erfüllen

Sicherheitsbegriffe und Symbole

Begriffe in diesem Handbuch. Diese Begriffe können in diesem Handbuch vorkommen:

WARNUNG

Warnhinweise weisen auf Bedingungen oder Praktiken hin, die zu Verletzungen oder zum Verlust des Lebens führen können.

VORSICHT

Vorsichtshinweise weisen auf Bedingungen oder Praktiken hin, die zu Schäden an diesem Produkt oder anderen Gegenständen führen können.

General Care and Cleaning

Care:

Do not store or leave the instrument in direct sunshine for extended periods.

To avoid damage to the instrument or probes, please do not expose them to fog, liquid, or solvents.

Cleaning:

Please perform the following steps to clean the instrument and probes.

1. Disconnect the instrument from all power sources and then clean it with a soft damp cloth.
2. Clean the loose dust on the outside of the instrument and probe with a soft cloth.

To avoid damage to the surface of the instrument and probe, please do not use any corrosive liquid or chemical cleansers.

Make sure that the instrument is completely dry before restarting it to avoid potential short circuits or personal injury.

General Inspection

- **Inspect the shipping container**

Keep the original shipping container and cushioning material until the contents of the shipment have been completely checked and the instrument has passed both electrical and mechanical tests.

The consigner or carrier will be responsible for damages to the instrument resulting from shipment.

SIGLENT will not provide free maintenance or replacement if the instrument has been damaged in shipment.

- **Inspect the instrument**

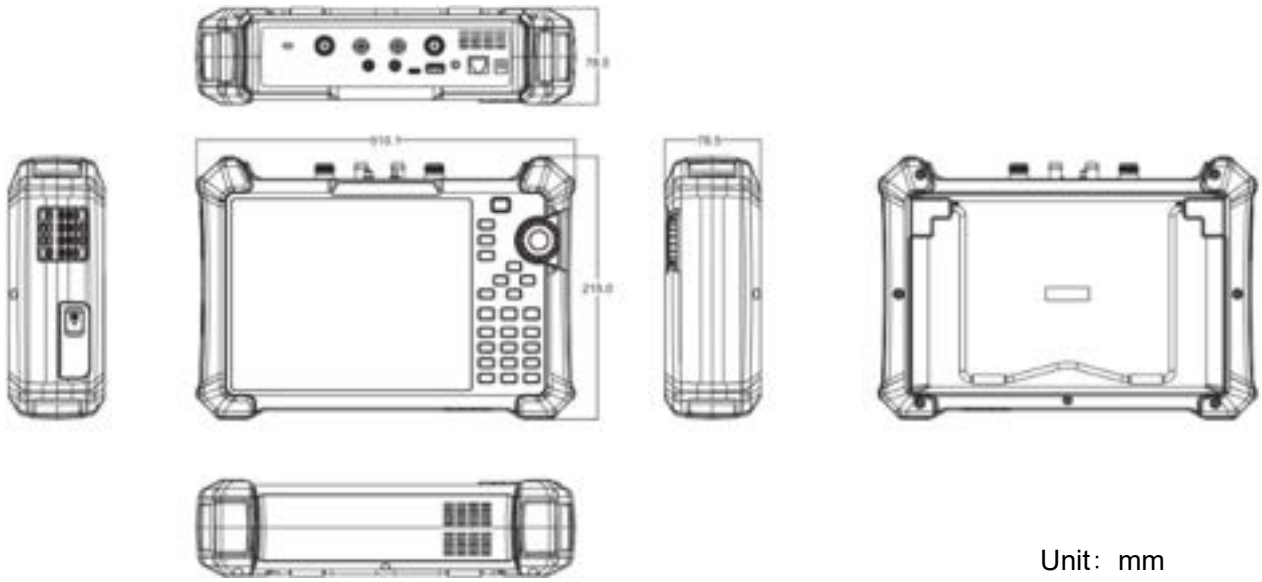
If there are instruments found damaged, defective, or have failed any electrical and / or mechanical tests, please contact SIGLENT.

- **Check the accessories**

Please check the accessories according to the packing list. If the accessories are incomplete or damaged, please contact your SIGLENT sales representative.

Preparing for Use

Appearance and Dimension



Unit：mm

Front and lateral View

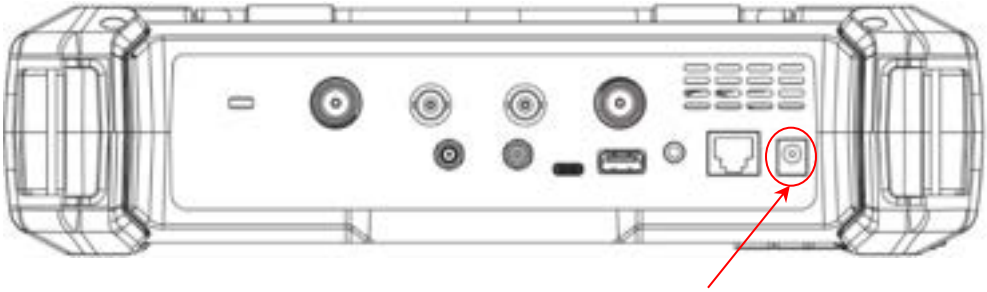
The included tilting stand is available for desktop operation. The tilting bracket provides a backward tilt for improved stability. To deploy the tilt bracket, pull the bottom of the tilt bracket away from the back of the instrument. To retract the tilting bracket, push the bottom of the bracket toward the back of the instrument.

Side View

Power Supply Information

The battery that comes with the analyzer may need to be recharged before use. The device can use the supplied AC-DC adapter (refer to the product technical data sheet for ordering information). The specifications of the input AC power supply are: 100-240V, 50/60Hz; Or charge through the on-board DC adapter in the accessory.

Specifically, the analyzer can be connected to the adapter according to the power socket shown in the figure below.



Rear View and Power

- Adapter factory configuration is the 12V 4A
- Battery factory installed

	WARNING This instrument can only use Siglent approved batteries, adapters and chargers. When using an onboard DC adapter, always ensure that the power supply is rated at least 75 W @ 15 VDC and that there is no dust or debris on the socket. If the adapter plug becomes hot during operation, discontinue use immediately. Siglent recommends taking out the batteries when devices aren't used for too long.

Panel Introduction

Front Panel

The Front Panel

Front Panel Description

No.	Name	Description
1	LCD	8.4 inch multi-touch screen, resolution 800*600
2	Power Button	Stand by status: Orange; Power on status: White; Short press: Shutting down with current state saved; Long press: Shutting down without current state saved.
3	Function Keys	Function control and parameter input of the analyzer; most operations can be completed by the touch screen. Press **Lock** to turn off the keyboard and touch screen.
4	3D-Knob	Quick adjustment and selection of parameters.
5	Fan	Built-in fan. Please ensure that this vent is unblocked.
6	Battery case	Internal battery protection cover.
7	Hand strap	Convenient hand force, can be installed on both sides.

Shortcut Keys Description

Name	Description
	The menu selection window pops up on the screen, and you can use the touch screen control to directly enter a function menu.
	Shortcut screenshot button to save the current screen display as a picture. Save parameters, such as path, reverse color, and screenshot area, to be set in **System** > File .
	Measurement control, pause or resume the current measurement process. When the button light is on, the measurement is suspended. When the button light is off, the measurement is resumed.
	Key and touch screen lock control. When the button light is on, all key pad buttons and touch screen buttons except the **Lock** button are locked to prevent misoperation.

The function key part of the front panel is the reuse key of menu selection mode and value input mode, which can be switched by **Enter** and **Esc** :

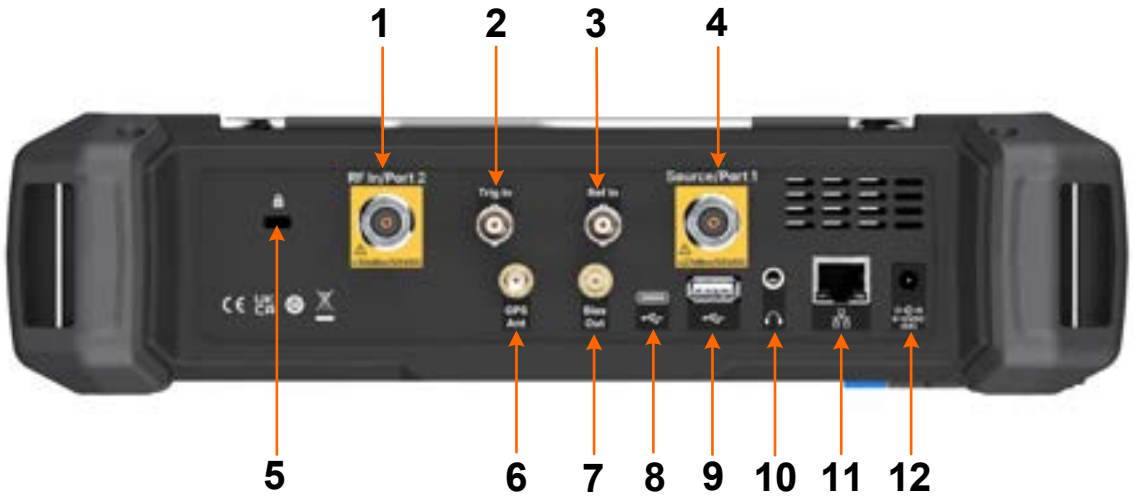
- Under default reset, the operation interface is in menu selection mode, and function keys will be identified as the blue silk screen function identifier on the upper side of the key. Use **Enter** to switch from menu selection mode to value input mode.

- When the operation interface is in value input mode, the multiplex key will be identified as the white silk screen digital identifier inside the key. You can use [Esc] to switch from value input mode to menu selection mode.

Function Keys Description

Name	Description
	Menu selection mode, to select the analyzer operation mode, such as spectrum analysis mode, antenna and cable test mode, network analyzer mode, etc.
	In menu selection mode, control of mode measurement parameters, such as average times, specific test items, etc.
	Confirm key, which is used to move from menu selection mode to numeric input mode, or to confirm that numeric input is valid
	In menu selection mode, frequency parameters are controlled. In time domain analysis, length (distance) parameters are controlled.
	Menu selection mode, bandwidth class parameter control, such as RBW, VBW, IFBW and so on.
	In menu selection mode, control cursor Marker parameters, such as cursor type, cursor positioning, noise cursor, N dB bandwidth, etc.
	Menu selection mode, for amplitude class parameters control, such as scale and unit, as well as preattenuator, preamplifier, amplitude correction, etc.
	In the menu selection mode, control the scanning parameters, such as scanning time and type, scanning number, trigger, gating, etc.
	In the menu selection mode, control the peak parameters, such as peak search, peak rule setting, etc.
	In menu selection mode, trace parameters are controlled, such as trace state, detection, mathematical calculation, normalization, etc.
	In menu selection mode, control the parameters of limit line, such as limit line editing, margin, test state setting, etc.
	In menu selection mode, port calibration of antenna and cable test mode and network analysis mode is carried out, such as selecting the type of mechanical calibration part, user-defined calibration part parameters, loading electronic calibration part, etc.
	In menu selection mode, reset parameters can be controlled, such as reset status definition, power-on status definition, user status definition, etc.
	In the menu selection mode, you can perform file operations, such as saving and invoking files, and viewing file browsers.
	In menu selection mode, the system general information view, version and calibration operation, as well as input and output port Settings, screen display Settings, etc.

Rear Panel



Rear Panel

No.	Name	Description
1	RF In/ Port 2	RF signal input, or used as VNA port 2 receiver input, 50Ω N female connector.
2	Trig In	Trigger input, a BNC female connector. When the analyzer uses an external trigger mode, the connector receives a rising or falling edge of an external trigger signal that is used to establish event synchronization.
3	Ref In	Reference clock input, a BNC female connector. The analyzer can use an internal reference clock or an external reference clock. If the instrument detects a signal from an external 10 MHz reference clock, it automatically uses the signal as the analyzer's reference clock source. At this time the screen status bar frequency reference display external; When the external 10 MHz reference is lost, exceeded, or not connected, the analyzer's reference clock is automatically switched to the internal 10 MHz reference clock. **[Ref In]** is used to establish clock synchronization between multiple instruments.
4	Source/ Port 1	Source output, or VNA port 1 input and output port, a N female connector, 50Ω. In spectrum analysis mode, as an independent signal source. In the network analysis mode, as the excitation and receiving interface, this port built-in coupler, to achieve a single port vector network analysis function.
5	K-groove	Only accept Kensignton® cable locks.
6	GPS Ant	GPS antenna input, a SMA female connector. Provide 3.3V DC feed for an active GPS antenna, to receive GPS satellite signals.

No.	Name	Description
7	Bias Out	The offset voltage output port is a female SMB connector. Used to provide bias voltage for external signal amplifiers, such as tower amplifiers.
8	USB Device	The main USB port, Type C. The analyzer can be used as a slave device and connected to a PC via USB cable. The PC uses the USB-TMC protocol to remotely control the analyzer.
9	USB Host	The slave USB 3.0 port, Type B. The analyzer can be used as a main device to external USB devices through this port. Such as external extended memory, USB keyboard/mouse, USB-GPIB adapter for remote control, electronic calibration kits for VNA automatic calibration.
10	Audio output	3.5mm headphone jack. The analyzer provides analog audio demodulation listenning. You can turn on or off the headset and adjust the volume of the headset through the menu.
11	LAN	RJ45 ports. The analyzer is connected to the LAN through network cable, and can be viewed and controlled remotely through VXI, socket protocol, or a web browser.
12	Power supply	2.5mm x 5.5mm barrel connector, connected to 12V 4A power adapter charging port, center positive.

WARNING

The analyzer does not support DC input. To avoid damage to the instrument, the DC voltage component of the signal reaching the RF input must not exceed 50 V.

If possible, add an isolated DC component to the RF input of the analyzer before signal measurement.

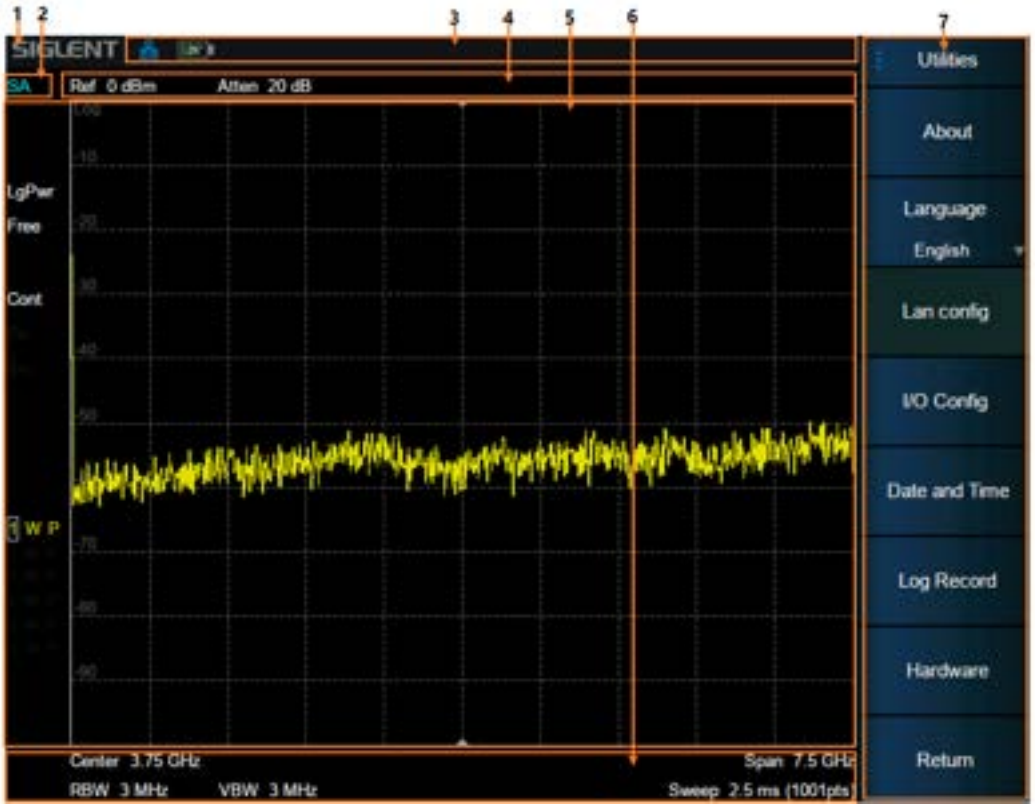
WARNING

When the frequency is less than 10 MHz, the maximum continuous power of the RF signal should not exceed +20 dBm.

WARNING

Before connecting any signal, short connect the inner core of the test cable to the housing floor to release the static electricity accumulated on the inner core of the test cable.

User Interface

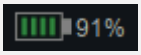
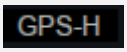


User Interface of spectrum analyzer mode

Spectrum Analyzer Mode User Interface

No.	Name	Description
1	SIGLENT	SIGLENT logo
2	Mode/ Measure	Indicate the current working mode and measurement function of the analyzer, such as Spectrum Analyzer, Cable and Antenna Test, etc.
3	Hardware status bar	Indicates the status of hardware, interfaces, etc.
4	Measurement status bar	Indicates measurement status of reference level, attenuation, cursor, etc.
5	Measurement display	Displaye the measurement results in various forms such as spectral lines, cursors, tables or charts.
6	Scan parameter	Indicates and controls major scan parameters.
7	Menu area	Used to configure measurement settings.

Description of common icons in the hardware status bar of the user interface:

Name	Description
	Power adapter plug-in indication.
	The battery is green, indicating normal discharge working status.
	The battery is red, indicating that the remaining power is low and needs to be charged as soon as possible.
	The battery is marked with a lightning bolt to indicate that it is being charged.
	The battery has a warning mark, indicating that there is a connection or other status problem with the battery.
	GPS (GNSS) satellite lock failed.
	GPS (GNSS) satellite lock is successful.
	The reference clock type is GPS (GNSS), but the clock is not locked or is missing.
	The reference clock type is GPS (GNSS), and the clock is locked successfully.
	The reference clock type is an external 10 MHz reference clock.
	DC bias voltage output on indication*.
	Network connection instructions.
	External USB storage device insertion instructions.

* May cause increased power consumption.

Touch screen and mouse operation

The analyzer provides a 8.4 inch multi-touch screen and supports various gesture operations including:

- Slide the waveform left and right or up and down in the measurement result area to change the X-axis center coordinate or Y-axis reference coordinate Perform two-points scaling in the waveform area to change the X-axis span
- The waveform is scaled horizontally at two points in the measurement result area to change the X-axis display range
- Click the shortcut menu area, working status area, scanning parameter area and menu area for function selection
- Click editable parameters, virtual numeric keyboard or QWERT keyboard will pop up, parameter or text editing
- Open and drag the cursor
- When the mouse is connected, clicking the left mouse button has the same effect as a single touch

You can turn the touch screen function on and off via **Lock** .

Touch Operations

No.	Name	Description
1	Click	Most controls just need to be tapped, touched and released.
2	Double click	Some controls require double clicking. If the second press is not detected within a specific time period, the operation is cancelled or treated as a single press.
3	Press and drag	Some objects can be dragged. This is done by gently holding down the action object and dragging it to a new position while releasing it. For example, you can drag items such as tags, limit line nodes, and center frequencies by dragging tracks left or right.
4	Pinch or release	Some items can be scaled down or expanded. This is done by pressing down with two fingers at the same time and gently holding the item as you pull the fingers closer or further, then releasing. You can pull items in and out, such as frequency spans, by pinching and releasing the trace in two locations, then pulling your finger closer to widen the span or pulling your finger further to narrow it.

Firmware Operation

Check System Information

Users can get the system information by press **System** > **"Utilities"** > **"About"** , including:

- Product Model, Serial and Host ID
- Software Version and hardware Version
- Option Information

Load Option

Refer to the procedures below to activate the options you have purchased.

1. Press **System** > **"Service"** > **"Option"**.
2. Enter the license key in the onscreen window. Press **Enter** to confirm your input and terminate the license key input.
3. Or press "Scan U-disk" from external USB memory.
   Or load the .lic file provided by pressing **File** > "Load" from internal memory

The option will be enabled after rebooting, check in .**System** > **"Utilities"** > **"About".**

Firmware Upgrade

Follow this procedure to update the instrument firmware:

Method 1: Update from USB memory.

1. Download the firmware package from official **SIGLENT** website.
2. Extract the .ADS file into the root directory of an USB memory.
3. Plug the USB memory into the USB Host connector. Press **System** > **"Service"** > **"Update"**, find the .ADS file in USB memory.
4. Press the **"Load"**, the analyzer will perform the update process automatically.

Method 2: Update from web browser

1. Download the firmware package from official **SIGLENT** website.
2. Extract the .ADS file to a user-defined directory.
3. Connect the analyzer to the LAN.
4. Obtain the IP address of the analyzer and log in to the analyzer using a web browser.
5. Click "Firmware Update" on the Instrument Control page, select the .ADS file and confirm, the analyzer will enter the update status.

	**CAUTION:** The upgrade process will take several minutes then reboot. Any interruption during the update process will result in update failure and system data loss. This is **not covered under the warranty** and the user will bear repair costs and shipping. Do not remove the USB storage device until the update is finished.

Remote Control

The analyzer supports communication with computers via USB, LAN, and GPIB-USB interfaces. By using these interfaces, in combination with programming languages and/or NI-VISA software, users can remotely control the analyzer based on a SCPI (Standard Commands for Programmable Instruments) compliant command set, LabVIEW and IVI (Inter-changeable Virtual Instrument), to interoperate with other programmable instruments.

You can also remotely monitor and control the analyzer in Web Browser.

For more details, refer to the “User Manual” or contact your nearest SIGLENT office.

Service and Support

SIGLENT warrants that the products that it manufactures and sells will be free from defects in materials and workmanship for a period of three years (accessories for a period of one year) from the date of shipment from an authorized Siglent distributor.

If the product proves defective within the respective period, SIGLENT will provide repair or replacement as described in the complete warranty statement. To arrange for service or obtain a copy of the complete warranty statement, please contact your nearest SIGLENT sales and service office. Except as provided in this summary or the applicable warranty statement, SIGLENT makes no warranty of any kind, express or implied, including without limitation the implied warranties of merchantability and fitness for a particular purpose. In no event shall SIGLENT be liable for indirect, special, or consequential damages.

Troubleshooting

Before calling SIGLENT, or returning an analyzer for service, perform the quick checks listed below. These checks may eliminate the problem.

If the problem remains still, please contact SIGLENT and provide your device information in the back of the analyzer.

1. **The Power Switch is still dark after power on:**
   (1) Check that the power is connected / working.
   (2) Check the power cord has been connected correctly.
   (3) Check the power fuse. If a new fuse needs to be installed, please use a specified fuse.

2. **The analyzer's screen is still dark (no display) after power on:**
   (1) Check whether the fan is running while the screen is dark, maybe the LCD cable is loose.
   (2) Check whether the fan is not running while screen is dark, maybe it has failed to start up.
   Do not disassemble the instrument by yourself and contact **SIGLENT**.

3. **The control panel is unresponsive or gives a wrong response:**
   (1) Press all the keys at the front panel to check if all of them are normal after power on.
   (2) Press **System** > **"Self Test"** > **"Key Test"** to check if all the keys are working properly.
   (3) If all the keys are not working, the numeric keyboard connection might be loose or the numeric keyboard is broken.
   (4) If the touch screen is not working, check if the Touch is ON in **Display** > Touch Settings menu.
   (5) Check whether the analyzer is locked in a remote control; if so, press **Esc** to unlock it.
   Do not disassemble the instrument by yourself and contact **SIGLENT**.

4. **The traces on the screen do not update for a long period of time:**
   (1) Check whether the traces are in View or other status; if so, change to Clear&Write to activate it.
   (2) Verify whether all the trigger conditions have been met and whether there is a valid trigger signal inputting.
   (3) Check whether the analyzer is in a Limit test.
   (4) Check whether the analyzer is in a single sweep.
   (5) Check whether the current sweep time is too long.
   (6) Check whether the analyzer is in a Demod listening and the Demod time is too long.
   (7) Check whether the analyzer is in an EMI measurement mode, and the Sequence is not in a Scan status.

5. **Wrong measurement results or poor precision:**
   (1) Check whether all the external devices are successfully connected and are working normally.
   (2) Get some knowledge of the signal under measurement and set appropriate instrument parameters.
   (3) Make measurements under proper conditions, for example:

- Warm-up the instrument appropriately;
- Operate the instrument under the specified environment temperature;
- Check if the AMPTD -> “Correction” is ON in SA or VNA mode.

(4) Calibrate the instrument regularly to reduce or avoid errors that might occur over time.

If you need a specific calibration after the stated calibration period, contact SIGLENT or get paid service from authorized measurement agencies.

6. System Message:

The instrument may display prompt messages, error messages or state messages according to the current working status. These messages are displayed to help you to use the instrument correctly and are not instrument failures.

Table 1 Operation Messages

User system message	Message on screen
System message description (1~199)	
SWT_OOR (1)	Sweep time out of range
RBW_OOR (2)	RBW out of range
SWT_CCOFM (3)	Can't change the sweep time in FFT mode
MRKT_UNDEF (4)	Undefined marker type
MRKFT_UNDEF (5)	Undefined marker function type
MRKDT_UNDEF (6)	Undefined marker delta pair type
MRKRT_UNDEF (7)	Undefined marker read out type
TRCT_UNDEF (8)	Undefined trace type
DETT_UNDEF (9)	Undefined detect type
SCA_CSWL (10)	Can't set the Scale/Div with linear
MRKT_IOFF (11)	The marker type is OFF, please open the current marker
MRK_NDELT (12)	The marker type is not Delta
MRKRT_MBST (13)	The marker read out type must be set time
MATHT_UNDEF (14)	Undefined math type
XML_ANIE (15)	XML attribute node import error
XSCA_MBSLIZS (16)	X Scale must be set liner in zero span
TG_AXIS_XSCA (17)	The Scale type must be logarithm when normalize
SCALE_TG_AXIS (18)	Scale type cannot be changed to linear while nomalize on
PEAK_UNFOUND (19)	No peak found. Please change the search setting
IMD_FREQ_OOR (20)	Frequency of intermodulation products out of range

User system message	Message on screen
AUTO_FAIL (21)	Auto tune process failed
EXT_REF_PLUG_IN (22)	EXT ref plug in
EXT_REF_PLUG_OUT (23)	EXT ref plug out
REF_PLL_UNLOCK (24)	Ref pll unlock
SIG_NOT_STB (25)	Signal is not stable enough to track
QP_RBW_OOR (26)	RBW out of range when do quasi peak scan
LAN_PLUG_IN (150)	Ethernet cable plug in
LAN_PLUG_OUT (151)	Ethernet cable plug out
IP_CONFLICT (152)	IP address conflict
IP_INVALID (153)	IP address invalid
NETM_INVALID (154)	Netmask address invalid
GWAY_INVALID (155)	Gateway address invalid
S21_NORMALIZE_DONE (183)	Normalization of S21 done
VNA_AUTO_CAL_DONE (184)	Auto calibration of VNA done
Execution error (400~599)	
LCF_DTFERR (400)	Load configurations failed, due to file error
Device error (600~799)	
FUF_DTVERR (600)	Firmware upgrade failed, due to the version error
FUF_DTRERR (601)	Firmware upgrade failed, due to the ram error
FUF_DTFERR (602)	Firmware upgrade failed, due to the file error
FUF_DTFVERR (603)	Firmware upgrade failed, due to verify the file error
FUF_DTUZFERR (604)	Firmware upgrade failed, due to unzip the file error
LIC_INVALID (605)	License is invalid!
ADC_ERROR (606)	Warning, ADC Overload!

More Product Information

For more information, refer to the following manuals by logging in to the official website of **SIGLENT** (www.siglent.com) to download them.

Data Sheet: Provides the main features and technical specifications.

User Manual: Introduces the detailed description of the instrument.

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