
Service Manual

SDS1000X+ Series Digital Oscilloscope

2016 SIGLENT TECHNOLOGIES CO., LTD

Guaranty and Declaration

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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.

General Safety Summary

Review the following safety precautions to avoid personal injuries and prevent damages to this product or any products connected to it. To avoid potential hazards, use this product only as specified.

Only qualified personnel should perform service procedures.

To Avoid Fire or Personal Injuries

Use Proper Power Cord. Use only the power cord specified for this product and approved by your local governing agencies.

Avoid Electric Shock. To avoid injuries or potential loss of life, do not connect or disconnect probes or test leads while they are connected to a voltage source.

Ground the Product. This product is grounded through the protective ground conductor of the power line. To avoid electric shock, the grounding conductor must be connected to the earth ground. Make sure the instrument is grounded correctly before connecting its input or output terminals.

Connect the Probe Properly. Do not connect the probe ground lead to a high voltage since it has the isobaric electric potential as ground.

Observe All Terminal Ratings. To avoid fire or shock hazard, observe all ratings and markings on the instrument and check your manual for more information about ratings before connecting.

Use Proper Fuse. Use only the specified fuse.

Do Not Operate Without Covers. Do not operate this instrument with covers or panels removed.

Avoid Circuit or Wire Exposed. Do not touch exposed junctions and components when the unit is powered.

Do Not Operate With Suspected Problems. If you suspect damage has occurred to this instrument, have it inspected by qualified service personnel before further operation. Any maintenance, adjustment or replacement, especially to the circuits or accessories, should be performed by SIGLENT authorized personnel.

Keep Product Surfaces Clean and Dry.

Do Not Operate in Wet/Damp Conditions. To avoid electric shock, do not operate the instrument in wet or damp condition.

Do Not Operate in an Explosive Atmosphere. To avoid injuries or fire hazards, do not operate in an explosive atmosphere.

Safety Terms and Symbols

Terms on the Product. These terms may appear on the product:

DANGER: Indicates an injury or hazard that may immediately happen.

WARNING: Indicates an injury or hazard may be accessible potentially.

CAUTION: Indicates damage to the instrument or other property may occur.

Symbols on the Product. These symbols may appear on the product:



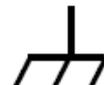
**Hazardous
Voltage**



**Refer to
Instructions**



**Protective
Earth
Terminal**



**Chassis
Ground**



**Test
Ground**

Contents

Guaranty and Declaration	I
General Safety Summary	II
General Features	1
General Features	1
Prepare Information	4
Functional checking	4
Power-on Inspection	4
Probe Compensation	6
Auto Setup	7
Self Calibration	8
Interface Test	10
USB Host Test	10
USB Device Test	11
LANPortTest	12
Pass/Fail out Test	14
Performance Test	16
Verify Test Results	19
Self Test	19
Self Calibration	19
To Verify DC Gain Accuracy	20
To Verify Time Base Accuracy	22
To Verify Trigger Delay	23
To Verify Ext trigger Delay	24
To Verify Noise Floor	25
To Verify Bandwidth	26
To Verify Bandwidth Limit	28
To Verify Trigger Sensitivity	30
Adjusting Procedures	35
WarmingUp	35
Self Calibration	35
Required Equipment	35
Software Installation	35
Assembly Procedures	39
Security Consideration	39
List of Modules	39

Required Tools	40
Disassembly Procedures	40
Removing the Front-Panel Knobs	41
Removing the Rear Panel	42
Removing the Front Panel	43
Removing the Rear Metal Cover	44
Removing the AWG Module	45
Removing the Power Supply Module	46
Removing the Main Board	47
Removing the Keypad and Display Module	48
Troubleshooting	49
General troubles	49
Troubleshooting the Hardware Failures	51
ESD Precautions	51
Required Equipments	51
Main Board Drawing	53
AWG Board Drawing (SDS1000X+)	54
Troubleshooting Flowchart	55
Check the Power Supply	56
Check the Main Board	57
Check the AWG Board(SDS1000X+)	58
Check the Display Module	59
Handling General Hardware Failures	60
Contact SIGLENT	61

General Features

General Features

SDS1000X Series Super Phosphor Oscilloscopes are available in two bandwidths, 100 MHz and 200 MHz, a sample rate of 1 GSa/s, and a standard record length of 14 Mpts. The most commonly used functions can be accessed with its user-friendly one-button design.

The SDS1000X series employs a new generation of SPO technology. With excellent signal fidelity, background noise is lower than similar products in the industry. The SDS1000X has a minimum vertical input range of 500uV/div, an innovative digital trigger system with high sensitivity and low jitter, and a waveform capture rate of 40,000 frames/sec. It also employs not only the common 256-level intensity grading display function but also a color temperature display mode not found in other models in this class. Siglent's new oscilloscope offering supports multiple powerful triggering modes including serial bus triggering and decoding. History waveform recording and sequential triggering allow for extended waveform records to be captured, stored, and analyzed. Add an impressive array of measurement and math capabilities, options for an integrated 25 MHz arbitrary waveform generator, as well as serial decoding, and the features and high-performance of the SDS1000X series oscilloscopes cannot be matched at anywhere at this price.

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Table 1-1 General features

Model	Bandwidth	Sampling Rate	Memory Depth	AWG
SDS1102X	100MHz	1GS/s	14kpts	No
SDS1102X+	100MHz	1GS/s	14kpts	Yes
SDS1202X	200MHz	1GS/s	14kpts	No
SDS1202X+	200MHz	1GS/s	14kpts	Yes

- 200MHz, 100MHz bandwidth models
- Real-time sampling rate up to 1GSa/s
- Record length of 14Mpts
- Waveform capture rate up to 40,000 wfs/s
- New generation of SPO technology
- Supports 256 intensity grading and color temperature display
- Intelligent trigger: Edge, Pulse, Window, Runt, Interval, Time out (Dropout), Pattern
- Serial bus triggering and decode, supports protocols IIC, SPI, UART, RS232,CAN,LIN
- Video trigger, supports HDTV
- Low background noise, supports 500 μ V / div to 10V / div voltage scales
- 10 types of one-button shortcuts; supports Auto Setup, Default Setup, Cursor, Measure, Roll, History, Persist, Clear Sweep, Zoom and Print
- Segmented acquisition (Sequence) mode, the maximum record length can be divided into 1000 segments, according to trigger conditions set by the user, with a very small dead time segments to capture qualifying event
- History waveform record (History) function, the maximum recorded waveform length is 80,000 frames
- 36 automatic measurement function, supports statistics calculations, Gating measurement, Math measurement, History measuring, Ref

measurement

- Waveform math function (FFT, addition, subtraction, multiplication, division, integration, differentiation, square root)
- High Speed hardware based Pass/ Fail function
- 25MHz DDS arbitrary waveform generator, built-in 10 kinds of waveforms (SDS1000X+ Series)
- Large 8 inch TFT-LCD display with 800 * 480 resolution, Multiple interfaces: USB Host, USB Device (USBTMC), LAN (VXI-11), Pass / Fail, Trigger Out
- Support SCPI remote control commands
- Supports Multi-language display and embedded online help

Prepare Information

Before initiating performance verification or any adjustments, it is recommended to follow these procedures. The following topics are discussed in this chapter.

- How to perform functional checks
- How to operate four standard interface tests
- How to use self-calibration routine
- How to recall factory Default settings

For more detailed information about oscilloscope operation, please refer to the Quick Start.

Functional checking

The functional checking details three types of checks used to determine if the oscilloscope is operating properly.

Power-on Inspection

The normal operating voltage for SDS1000X+ series digital oscilloscope is in range of 100-240VRMS, 50Hz/60Hz/440Hz. Connect the power line to the socket on the rear panel of the oscilloscope.

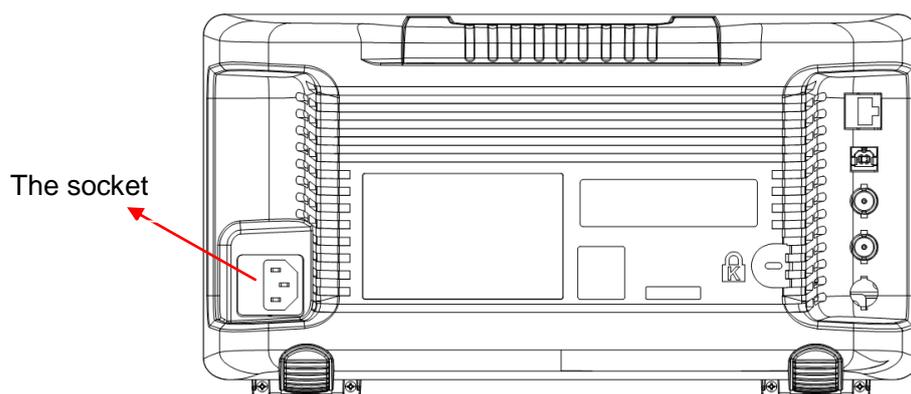


Figure 2-1 Connect power line

Note: to avoid electric shock, make sure that the instrument is correctly grounded to the earth before connecting AC power.

Press the power-on button located at the lower left corner of the front panel and several oscilloscope keys will be lighted for about 6 seconds simultaneously until the boot screen appears. Then the oscilloscope begins to perform its power-on tests automatically, after which the DEFAULT SETUP button can be pressed in order to recall the factory default settings.

Probe Compensation

It is better for you to compensate the probe at first use so as to match to the probe ratio of current input channel. Non-compensated or poorly compensated probes may cause measurement inaccuracies or errors. The probe compensation steps are as follows:

1. Set the attenuation switch on the probe to 10X.

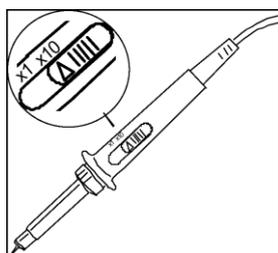
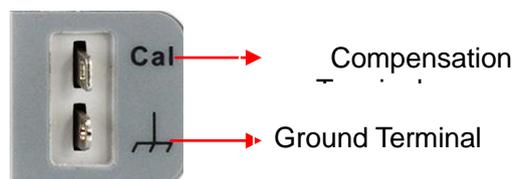
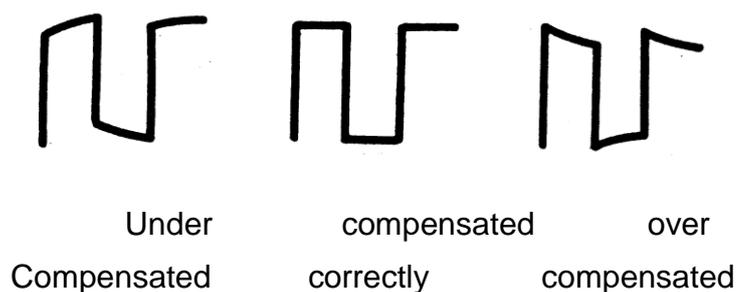


Figure 2-2 Set the attenuation switch

2. Connect the alligator clip of the probe to the Ground Terminal on the front panel firstly, and then use the probe to connect CH1 BNC connector and the Compensation Signal Output Terminal.



3. Press AUTO Setup.
4. Observe waveform on the screen. The displaying should be a square waveform as shown in the figure below in normal condition:



- If the waveform does not show as “compensated correctly”, use a nonmetallic driver to adjust the low-frequency compensation adjustment hole on the probe until the waveform displays correctly.

Auto Setup

Press **Auto Setup** softkey to enable the waveform auto setting function. The oscilloscope will automatically adjust the horizontal time base, vertical scale and trigger mode according to the input signal to obtain an optimum waveform display.

Table2-2 Auto setting menu

Option	Introduction
 (Multi-cycle sine)	Display several waveform cycles
 (Single-cycle sine)	Display single waveform cycles
 (Rising edge)	Display the rising edge of waveform
 (Falling edge)	Display the falling edge of waveform
 (Undo Setup)	Recall the previous setup of oscilloscope

- The input signal frequency must be higher than 20 Hz, with the amplitude higher than 8 mV.
- Selecting channel with the lowest frequency when several channels are connected to signals.

Self Calibration

The self-calibration routine can quickly make the oscilloscope to perform at the optimum state in order to achieve the maximum accuracy. You can perform self-calibration at any time, especially when the change of the environment temperature is up to or more than 5°C or more. Make certain that the oscilloscope has been warmed up or operated for more than 30 minutes before the self-calibration.

Use the following steps to perform self calibration:

1. Disconnect all the input channels.
2. Press the **Utility** button on the front panel, and then press the **Do Self Cal** softkey. The oscilloscope will pop-out the message box shown as follows:

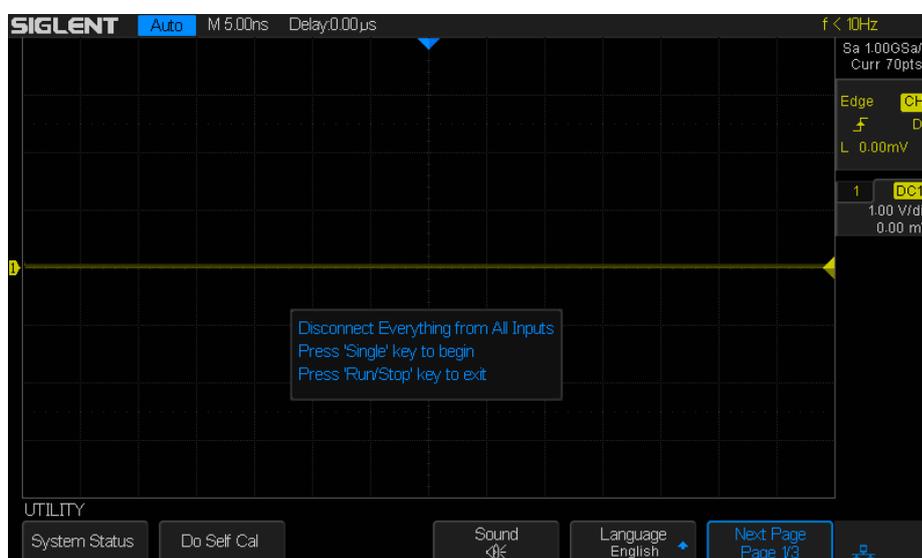


Figure 2-3 Calibration interface

3. Press the **Single** button on the front panel to perform the self calibration program. During the calibration, most of the keys are disabled.
4. When the self calibration program is finished, the following message will

appear: “**press Run/Stop key to exit**”. Press the **Run/Stop** button on the front panel to exit the calibration interface.

Note: Under normal conditions the self-calibration procedure will take approximately 20 seconds. If it does not complete within this period of time or stop on one of the calibration settings then there may be a problem with the instrument.

Interface Test

The SDS1000X/SDS1000X+ series oscilloscope is designed with four standard interfaces: USB Host, USB Device, LAN and Pass/Fail interface. Being connected to other instruments via these interfaces enables the oscilloscope to achieve even more enhanced capabilities. In order to ensure the oscilloscope is operating properly, it is recommended to first test the interfaces.

USB Host Test

To test if the USB Host interface is working normally.

Tools:

- A SDS1000X digital oscilloscope
- An U disk

Steps:

1. Insert a U disc into the USB Host interface on the front panel of the oscilloscope.
2. A prompt message, “USB Flash Drive Plug In!”, appears on the screen, and an icon will be shown in the lower right corner of the screen which suggests the U disk has been successfully recognized.



Figure 2-5 USB drive in interface

USB Device Test

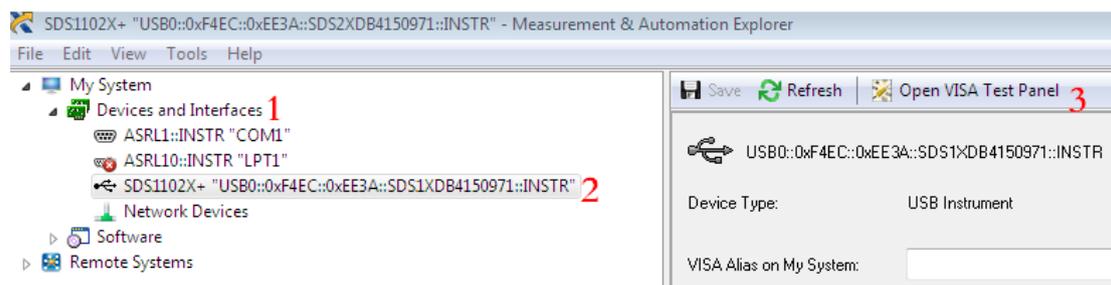
To test if the USB Device interface works normally.

Tools:

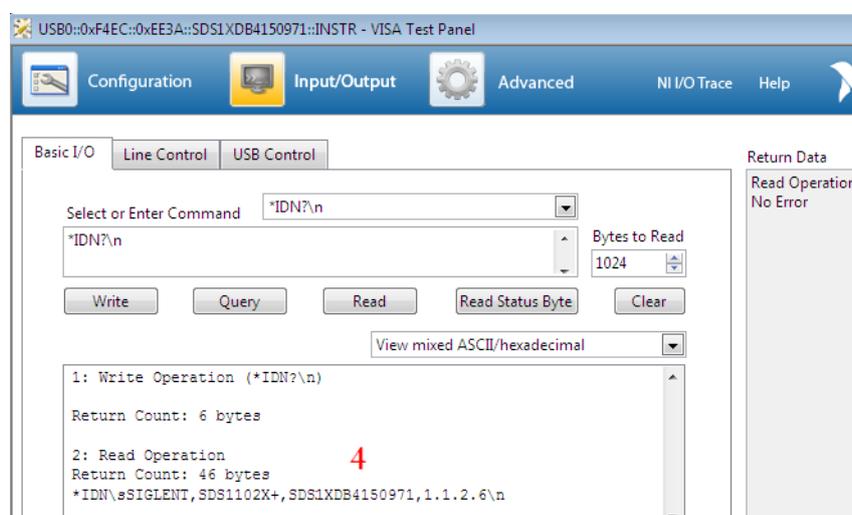
- A computer with USB interface
- A standard USB cable(TypeAB)
- NI Max software

Steps:

1. Set up NI Max software in a computer and install the driver step by step following the instructions.
2. Connect the oscilloscope and the computer using an USB cable.
3. Run NI max software. Click “Device and interface” at the upper left corner of the NI software interface and immediately displays the “USBTMC” device symbol.



4. Click “Open VISA Test Panel” option button, and then the following Interface will appear. Next, click the “Input/Output” option button and click the “Query” option button in order to view the Read operation information.



LANPortTest

Use to test if the LAN interface works normally when connected with NI Visa software.

Tools:

- A computer with LAN interface
- A standard LAN cable
- NI Max software

Steps:

1. Set up NI Max software in a computer and install the driver step by step following the instructions.
2. Press **Utility** → **Page2/3** → **I/O** → **LAN**, input usable IP Address and Subnet Mask.



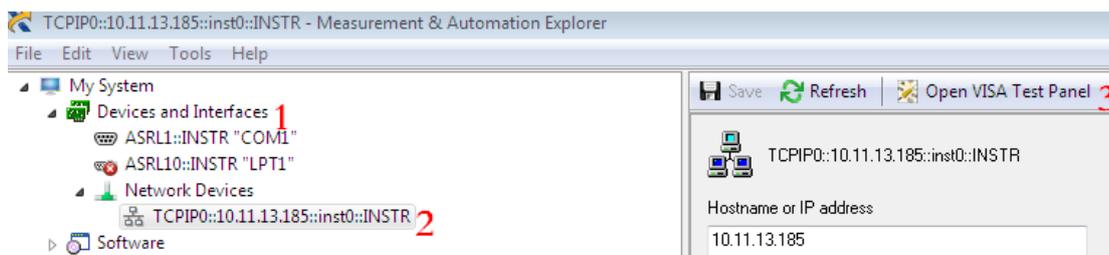
Figure 2-4 IP Setting interface

3. Connect the oscilloscope and the computer using an LAN cable via LAN interface.

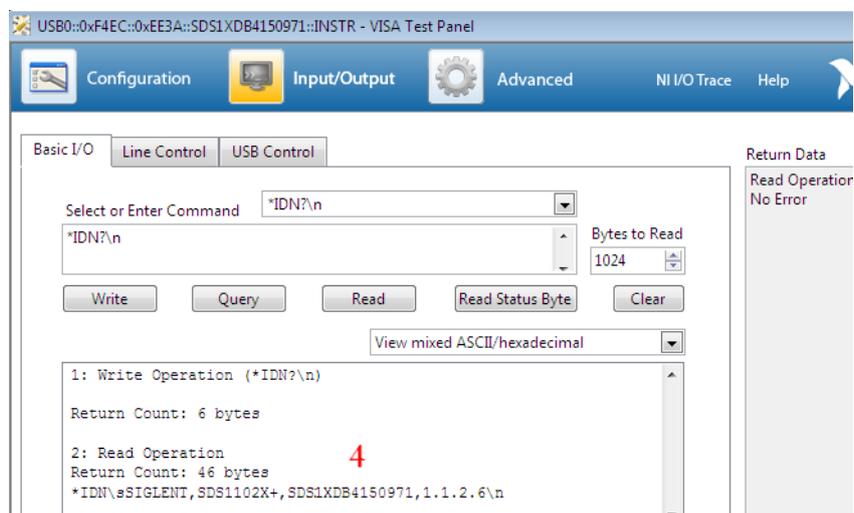


Figure 2-8 LAN interface

- Run NI max software. Click “Device and interface” at the upper left corner of the NI software interface and select the “LAN” device symbol.



- Click “Open VISA Test Panel” option button, which then displays the following interface. Then click “Input/Output” option button and click “Query” option button; you will see the Read operation information.



Pass/Fail out Test

To test the Pass/Fail function and signal output by viewing on a second oscilloscope.

Tools:

- A second oscilloscope
- Two BNC cables

Steps:

1. Turn on the SDS2000X oscilloscope.
2. Enable the channel 1.
3. Press **Utility** → **Page2/3** → **Pass/Fail**, set the submenu items under Pass/Fail menu as below:

Table 2-3 Pass/Fail submenu items

Submenu	Setting
Enable Test	On
Source	CH1
Msg Display	On
Mask setting	
X Mask	0.32 div
Y Mask	0.32 div

Note: Remember to press “Create Mask” to complete Mask setting after x mask setting and y mask setting.

After selecting the corresponding item as table above, the SDS1000X screen will appear as in Figure 2-6



Figure 2-6 Pass/Fail Waveform

If the waveform is within the range that was set under Mask menu setting, the waveform displayed on the screen will Pass. If any part of the trace falls outside the Mask area then it will Fail.

4. Connect the Pass/Fail output signal (on the rear panel) to the input terminal of another oscilloscope.
5. Move the waveform on the screen up, down, or sideways so that any portion of it falls outside of the Pass/Fail mask. If the interface is operating normally then a pulse will appear on the second oscilloscope (Fig. 2-7). Adjust the second oscilloscope's time base and voltage scale as needed. If there is no viewable pulse on the second oscilloscope then there may be a problem with this function.

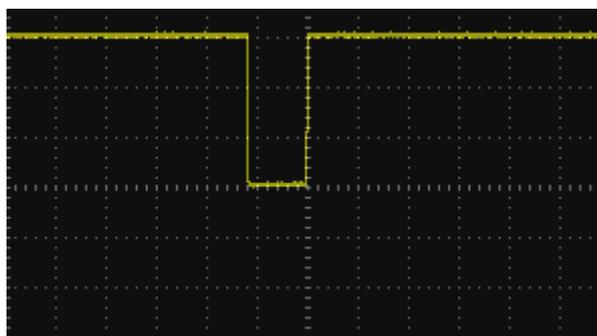


Figure 2-7 Pulse Waveform

Performance Test

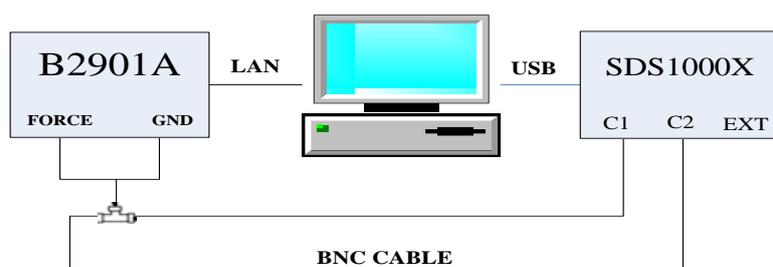
This chapter explains testing the oscilloscope in order to verify performance specifications. For accurate test results, please let the test requirement and the oscilloscope warm up 30 minutes before testing.

Here are the required equipments for the test:

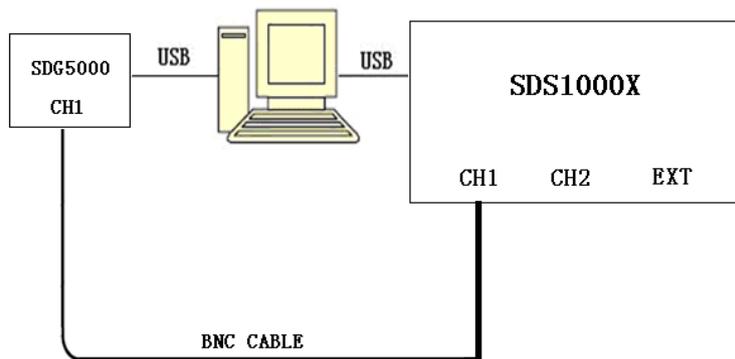
Table 3-1 Test equipments

Equipments	Description	Test item
Keysight B2901A	DC Voltage Source, ±0.1% accuracy	DCG\Offset
Siglent SDG5000	120 MHz , Sine Wave Generator	Ext Trigger delay\Clock accuracy\Trigger delay
R&S SMB100A	1 MHz~6 GHz, Sine Wave Generator	BW\BWL\trigger sensitivity
Siglent SDM3055	Multi-meter	Input impedance\AWG
Agilent U2004A	Power meter	AWG
Attenuator	6 dB	Used with SMB100A
Power divider		Ext Trigger delay
BNC Cable	BNC(m) to BNC(m), About 1m long	
BNC T Connector		Ext Trigger level

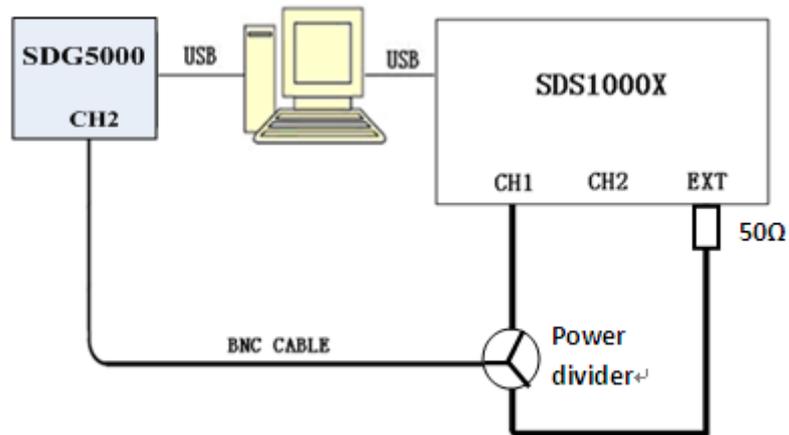
This diagram shows the interconnections between the DC voltage source and PC to the oscilloscope under test (3-1):



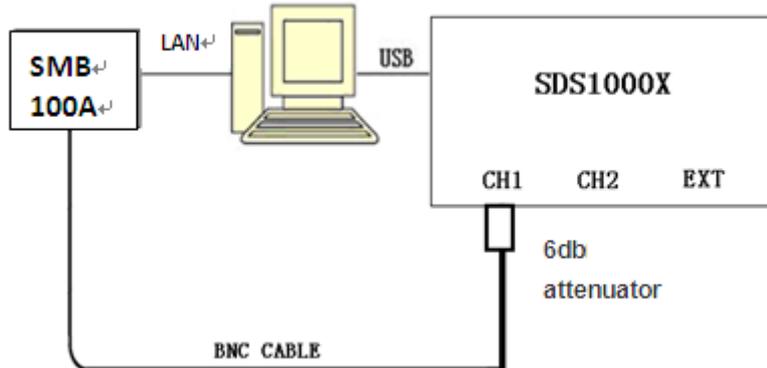
Picture 3-1 Connecting test instruments for DCG\Offset



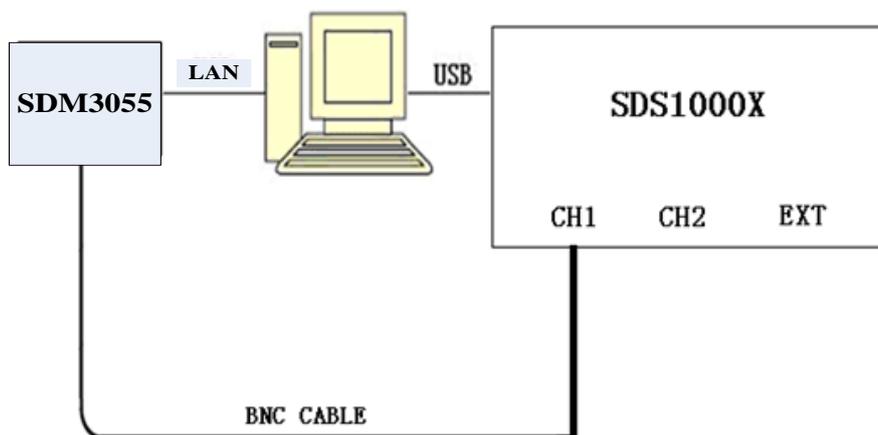
Picture 3-2 Connecting test instruments for Clock /Trigger Delay



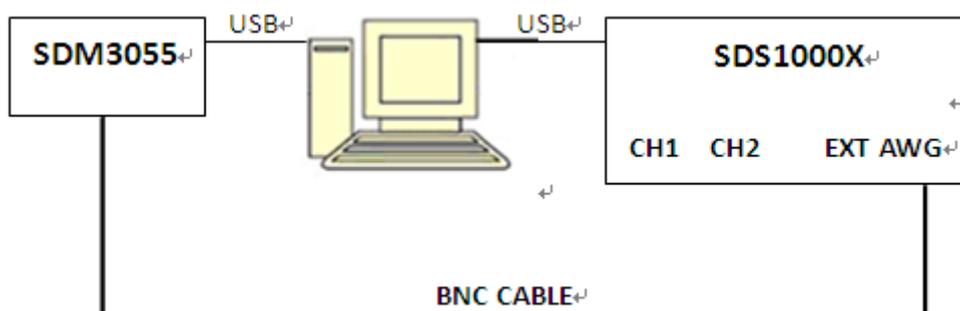
Picture 3-3 Connecting test instruments for Ext Trigger Delay



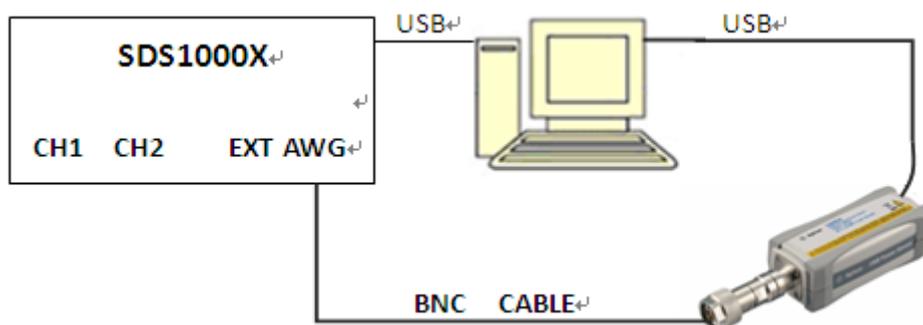
Picture 3-4 Connecting test instruments for BW\BWL\ Trigger Sensitivity



Picture 3-5 Connecting test instruments for Input Impedance



Picture 3-6 Connecting test instruments for AWG Offset Accuracy



Picture 3-7 Connecting test instruments for AWG Frequency Response

Verify Test Results

To verify whether or not a test passes (i.e. whether the readings are within the limits), it is necessary to record the readings in the Performance Test located in the Test Record.

Self Test

This internal procedure is automatically performed every time the oscilloscope is powered on. No test equipments are required. Verify that no error messages are displayed before continuing with the procedure.

Self Calibration

You can perform the Self Calibration operation described in chapter 2. If the environmental temperature changes by more than 5°C, the Self Calibration operation must be performed for achieving the specifications.

To Verify DC Gain Accuracy

DC Gain Accuracy Slope = LINEST($V_{\text{error}1}$: $V_{\text{error}5}$, $V_{\text{Setting}1}$: $V_{\text{Setting}5}$)

Note:“ V_{Setting} ”represents DC voltage output level;

“ V_{error} ”represents the difference between the setting output and the measurement.

This test verifies DC Gain Accuracy of all channels.

Steps:

1. Set the B2901A output to on.
2. Connect all channels of the oscilloscope to B2901A, using the BNC cable with special adapter.
3. Set Volts/Div of the oscilloscope to 2 mV/div. Press **Measure** button on the front panel of the oscilloscope to display mean measurement.
4. Set DC voltage output level of the B2901A according to table 3-2, and record mean value of the oscilloscope as V_{mean} .
5. Calculate V_{error} ($V_{\text{error}}=V_{\text{Setting}}-V_{\text{mean}}$),and set the next output level as step 4.
6. Make linear regression with these 5 data: $V_{\text{Setting}1}\sim V_{\text{Setting}5}$, $V_{\text{error}1}\sim V_{\text{error}5}$. Check if the slope falls within the range shown in the table below.
7. Set the oscilloscope Volts/Div to the other settings in the table below, and repeat steps 4 to 6.
8. Set the B2901A output off.
9. Disconnect the connection to all the channels.

Table 3-2 DC Gain Accuracy

Volt/Div	DC voltage output levels	DC Gain Accuracy
10 V/div	30V,15V,0,-15V,-30V	3%
5 V/div	15V, 7.5V,0,-7.5V,-15V	3%
2 V/div	6V,3V,0,-3V,-6V	3%
1 V/div	3V,1.5V,0,-1.5V,-3V	3%
500 mV/div	1.5V, 0.75V,0,-0.75V,-1.5V	3%
200 mV/div	600mV, 300mV,0,-300mV,-600mV	3%
100 mV/div	300mV,150mV,0,-150mV,-300mV	3%
50 mV/div	150mV,75mV,0,-75mV,-150mV	3%
20 mV/div	60mV,30mV,0,-30mV, -60mV	3%
10 mV/div	30mV,150mV,0,-150mV,-30mV	3%
5 mV/div	15mV,7.5mV,0,-7.5mV-15mV	3%
2 mV/div	6mV, 3mV,0,-3mV, -6mV	4%

To Verify Offset Accuracy

Offset Accuracy Slope = LINEST(Offset_{error1}:Offset_{error5}, Offset₁:Offset₅)

Note: “Offset_{out}” represents DC voltage output level;

“Offset_{error}” represents the difference between the setting output and the measurement.

This test verifies Offset Accuracy of all the channels.

Steps:

1. Set the B2901A output to on.
2. Connect all channels of the oscilloscope to B2901A, using the BNC cable with special probe.
3. Set the Volts/Div of channel to 2 mV/div. Press **Measure** button on the front panel of the oscilloscope to display mean measurement.
4. According to table 3-3, set offset of the channel to -Offset, and set B2901A output level to equals the offset, then record mean value of the oscilloscope as V_{mean} .
5. Calculate Offset_{error} (Offset_{error} = $V_{\text{mean}} - \text{Offset}$), and set B2901A to the output level as step 4.
6. Make linear regression with these 5 data: Offset_{error1}~Offset_{error5}, Offset₁~Offset₅. Check to verify that the slope is within the limits specified below.
7. Set the oscilloscope Volts/Div to the other settings in the table below, and repeat the steps 4 to 6.
8. Set the B2901A output off.
9. Disconnect the connection to all the channels.

Table 3-3 Offset Accuracy

Volt/Div	Offset	error
10 V/div	35V,30V,0,-30V,-35V	1.5%
5 V/div	30V,25V,0,-25V,-30V	1.5%
2 V/div	20V,10V,0,-10V,-20V	1.5%
1 V/div	10V,5V,0,-5V,-10V	1.5%
500 mV/div	5V,2.5V,0,-2.5V,-5V	1.5%
200 mV/div	2V,1V,0,-1V,-2V	1.5%
100 mV/div	1V,0.5V,0,-0.5V,-1V	1.5%
50 mV/div	500mV,250mV,0,-250mV,-500mV	1.5%
20 mV/div	200mV,100mV,0,-100mV,-200mV	1.5%
10 mV/div	100mV, 50mV,0,- 50mV,-100mV	1.5%
5 mV/div	50mV,25mV,0,-25mV-50mV	1.5%
2 mV/div	20mV, 10mV,0,-10mV, -20mV	1.5%

To Verify Time Base Accuracy

This test checks the time base accuracy of one channel. In the test, the impedance of both the SDG5000 and the oscilloscope should be set to 50Ω.

Time Base Accuracy: Frequency Error <250Hz

Steps:

1. Connect selected channel of the oscilloscope to the SDG5000.
2. Set the oscilloscope Volts/Div to 100 mV/div.
3. Set the oscilloscope Sec/Div to 50 ms/div.
4. Set waveform of the generator to sine, amplitude to 600 mv, and frequency to the value which is equal to the sample rate of the oscilloscope.
5. Press **Measure** button on the front panel of the oscilloscope to display Freq measurement.
6. Check if the Freq measurement is within the range of 250 Hz.
7. Disconnect the test connection.

To Verify Trigger Delay

This test checks the delay between the analog channels. In this test, the impedance of both the SDG5000 and the oscilloscope should be set to 50 Ω .

Channel Trigger Delay Limit: Delay <100ps

Steps:

1. Connect selected channel of the oscilloscope to the SDG5000.
2. Set frequency of SDG5000 to 1 KHz, amplitude to 600 mV, and waveform to square.
3. Set the oscilloscope Volts/Div to 100 mV/div.
4. Set the oscilloscope Sec/Div to 2 ns/div.
5. Press **Measure** button on the front panel of the oscilloscope to display delay measurement.
6. Check if the delay is within the limited range above (<100 ps).
7. Disconnect the test connection.
8. Check other channels in the same way as step 1 to step 7.

To Verify Ext trigger Delay

This test checks the delay between ext trigger channel and analog channels. In the test, the impedance of both the SDG5000 and the oscilloscope should be set to 50 Ω .

CH-Ext Trigger Delay Limit: Delay < 1ns

Steps:

1. Connect selected analog channel and ext trigger channel of the oscilloscope to the SDG5000 with a power divider.
2. Set frequency of the SDG5000 to 1 kHz, amplitude to 600 mV, and waveform to square.
3. Set the oscilloscope Volts/Div to 100 mV/div.
4. Set the oscilloscope Sec/Div to 2 ns/div.
5. Set the oscilloscope trigger source to EXT, the trigger slope to Rising, and the trigger level to 0.
6. Press **Measure** button on the front panel of the oscilloscope to display Delay measurement.
7. Check if the delay is within the limited range above (<1 ns).
8. Disconnect the test connection.
9. Check other analog channels in the same way as step 1 to 9.

To Verify Noise Floor

This test checks the noise of the analog channels. In this test, don't connect any testing devices to the oscilloscope.

Table 3-4 Noise Floor Limited Range

Volt/Div	Limited Range	Volt/Div	Limited Range
500uv	stdev<350uv	100mV	stdev <20mV
1mV	stdev <0.4mV	200mV	stdev <40mV
2mV	stdev <0.4mV	500mV	stdev <100mV
5mV	stdev <1mV	1V	stdev <200mV
10mV	stdev <2mV	2V	stdev <400mV
20mV	stdev <4mV	5V	stdev <1V
50mV	stdev <10mV	10V	stdev <2V

Steps:

1. Set the oscilloscope Sec/Div to 1ms/div.
2. Set the oscilloscope Volts/Div to 500uV/div.
3. Press **Measure** button on the front panel of the oscilloscope to display Stdev measurement.
4. Check if the Stdev is in the limited range above.
5. Check the other analog channel in the same way as steps 1 to 4.
6. Set the oscilloscope Volts/Div to the others in the table above, and repeat the steps from 3 to 5.

To Verify Bandwidth

This test checks the bandwidth of all input channels. In the test, we need to connect the SMB100A with a 6dB attenuator before connecting to the oscilloscope.

The bandwidth should be verified at 2 V/div, 200 mV/div and 100 mV/div.

Steps:

1. Connect channel 1 of the oscilloscope to the SMB100A via a BNC-N cable.
2. Set the oscilloscope Volts/Div to 2 V/div, the Sec/Div to 50 ms/div, the impedance of the channel to 50 Ω.
3. Press the **Measure** button on the front panel of the oscilloscope to display Peak-Peak measurement.
4. Set output power of the SMB100A to 23 dBm.
5. Set frequency of the SMB100A to the frequency in Table 3-6. When testing at 200 mV/div or 100 mV/div, set start frequency at 100 kHz. Set frequency start frequency at 1 MHz when testing at 2 V/div.

Table 3-5 Frequency points in the test

Scope Model	Frequency Point(Hz)
SDS1102X/ SDS1102X+	100K,500K,1M,5M,10M,30M,50M,70M,100M, 110M,120M,150M
SDS1202X/ SDS1202X+	100K,500K,1M,5M,10M, 50M, 100M,140M,180M 200M,220M,250M

6. Every time the frequency is changed, it is recommended to adjust the Sec/Div to a proper value thus to display a perfect waveform.
7. Record the Peak-Peak measurement of the waveform.
8. Check other channels in the same way as steps 1 to 7.
9. Set the oscilloscope Volts/Div to the setting choices (remove comma), and repeat the steps from 2 to 8. Set output power of the SMB100A to 5.54dBm when testing at 100mV/div, and set to 11.56dBm when testing at 200mV/div.
10. Disconnect the test connection.

After the test, calculate the dB value at every frequent point. Check if the value

is in limited range below.

Table 3-6 Limited Range

Scope Model	Frequency Point(Hz)	Range
SDS1102X/ SDS1102X+	$\leq 10\text{M}$	(-1,1) dB
	$\leq 50\text{M}$	(-2,2) dB
	$> 50\text{M}$	(-3,2) dB
SDS1202X/ SDS1202X+	$\leq 20\text{M}$	(-1,1) dB
	$\leq 100\text{M}$	(-2,2) dB
	$> 100\text{M}$	(-3,2) dB

To Verify Bandwidth Limit

This test checks the bandwidth limit of all the analog channels. It performs like testing the bandwidth except for switching the bandwidth limit on. We also need to connect SMB100A with a 6 dB attenuator.

To test the bandwidth at 2 V/div, 200 mV/div and 100 mV/div

Steps:

1. Connect channel 1 of the oscilloscope to SMB100A via aBNC-N cable.
2. Set the oscilloscope Volts/Div to 2 V/div, the Sec/Div to 50 ms/div, the impedance of the channel to 50 Ω, and set BW Limit button to 20 MHz.
3. Press the Measure button on the front panel of the oscilloscope to display Peak-Peak measurement.
4. Set output power of the SMB100A to 23 dB.

Set frequency of the SMB100A to the frequency in Table 3-7. When testing at 200 mV/div or 100 mV/div set start frequency at 100 kHz. When testing at 2 V/div set start frequency to 1 MHz.

Table 3-7 Frequency points in the test

Frequency Point(Hz)
100K,500K,1M,5M,10M,12M,13M,14M,15M,16M,17M,18M,
19M,20M,21M,22M,23M,24M,25M,26M,27M,28M,29M

5. Every time the frequency is changed, it is recommended to adjust the Sec/Div to a proper value thus to display a perfect waveform.
6. Record the Peak-Peak measurement of the waveform.
7. Check the other channels in the same way as steps 1 to 7.
8. Set the oscilloscope Volts/Div to the other settings (remove comma), and repeat the steps from 2 to 8. Set output power of the SMB100A to 5.54 dBm when test at 100 mV/div, and set to 11.56 dBm when at 200 mV/div.
9. Disconnect the test connection.

After the test, calculate the dB value at every frequent point. Check if the value falls within the range below.

Table 3-8 Limited Range

Frequency Point(Hz)	Range
$\leq 19\text{M}$	(-2,2)
$> 19\text{M}$	(-6,2)

To Verify Trigger Sensitivity

This test checks trigger sensitivity at the frequency of 10 MHz and the bandwidth frequency.

A 6 dB attenuator is needed when connecting to the SMB100A

Table 3-9 Trigger sensitivity data

Volts/Div	Frequency	Trigger Range
100 mV/div	10 MHz	9.9~10.1 MHz
100 mV/div	bandwidth	bandwidth \pm 1% bandwidth

Steps:

1. Connect the selected channel of the oscilloscope to the SMB100A.
2. Set the oscilloscope Volts/Div to 100 mV/div, Sec/Div to 50 ns/div, coupling mode to AC, and impedance to 50 Ω .
3. Set output power of the SMB100A to -14.5 dBm, frequency to 10 MHz.
4. Set trigger slope of the oscilloscope to Positive.
5. Press Trigger Level knob to set the level to the center of the waveform.
6. Adjust the trigger Level within the waveform range to reach stable trigger.
7. Record the hardware frequency which is on the top right of the screen, and check if it is in the specified trigger range listed in Table 3-9.
8. Set the oscilloscope trigger slope to Negative, repeat step 6 to step 8.
9. Set the frequency of the SMB100A to the bandwidth frequency. Set the oscilloscope Sec/Div to 5 ns/div if you are testing SDS1052X or SDS1072X or SDS1102X, and set Sec/Div to 2 ns/div if you are testing SDS1202X. Then repeat steps 6 to 8.
10. Check the other channel in the same way as steps 2 to 9.
11. Disconnect the test connection.

The steps above are for testing analog channels. Here are steps below to test the EXT trigger sensitivity.

Steps:

1. Connect the ext trigger channel of the oscilloscope to the SMB100A.
2. Set output power of the SMB100A to -10 dBm, frequency to 10 MHz.

3. Set trigger source of the oscilloscope to EXT, trigger slope to Positive.
4. Press Trigger Level knob to set the level to center of the waveform.
5. Adjust the trigger level within the range of (-100 mV, 100 mV) to make the waveform stable, and then record the frequency value which is on the top right of screen.
6. Check if the frequency is in the specified trigger range listed in Table 3-9.
7. Set trigger slope to Negative, repeat steps 5 to 6.
8. Set frequency of the SMB100A to the bandwidth frequency, output power to -6.5 dBm. Repeat steps 4 to 7. In step 6, the range changes to (-150 mV, 150 mV).
9. Set frequency of the SMB100A to 10 MHz, output power to 4 dBm.
10. Set trigger source of the oscilloscope to EXT/5, trigger slope to Positive.
11. Press Trigger Level knob to set the level to the center of the waveform.
12. Adjust the trigger level within the range of (-500 mV, 500 mV) to make the waveform stable, and then record the frequency value which is on the top right of screen.
13. Check if the frequency is within the specified range listed in Table 3-8.
14. Set trigger slope to Negative, repeat steps 12 to 13.
15. Set frequency of the SMB100A to the bandwidth frequency, output power to 7.5 dBm. Repeat steps 11 to 14. In step 6, the range changes to (-750 mV, 750 mV).
16. Disconnect the test connection.

To Verify Input Impedance

This test checks the input impedance of all analog channels and ext trigger channel with different kinds of coupling and impedance at 100 mV/div, 200 mV/div and 2 V/div.

Table 3-10 Input Impedance data

Channel	Coupling and impedance type	Impedance Range	
CH	AC/1M Ω	0.1V/div	1176000~1224000 Ω
		0.2V/div, 2V/div	980000~1020000 Ω
	DC/1M Ω	980000~1020000 Ω	
	AC/50 Ω	49~51 Ω	
	DC/50 Ω	49~51 Ω	
Ext	50 Ω	49~51 Ω	

Steps:

1. Connect the selected channel of the oscilloscope to the SDM3055.
2. Set the oscilloscope Volts/Div to 100 mV/div.
3. Set coupling mode of the channel to AC, and impedance to 1 M Ω . Record the reading displays on the screen of the SDM3055.
4. Set impedance of the channel to 50 Ω , and then record the reading displays on the screen of the SDM3055.
5. Set coupling mode of the channel to DC, and impedance of the channel to 1 M Ω . Record the reading displays on the screen of the SDM3055.
6. Set impedance of the channel to 50 Ω , and record the reading displays on the screen of the SDM3055.
7. Check if the impedance is within the specified range in Table 3-10
8. Test at 2 V/div and 200 mV/div, perform the same operation as steps 2 to 7.
9. Check the other analog channels in the same way as steps 1 to 9.
10. Disconnect the test connection

When checking the EXT trigger channel, set impedance of the ext trigger channel to 50 Ω . Then record the reading displays on the screen of the SDM3055, and check if it is within the specified range in Table 3-10.

To Verify AWG

This test checks the Wave Generator option of oscilloscope, using A Siglent SDM3055 multi-meter and an Agilent U2004A power sensor.

This test includes three items: Offset Accuracy, Amplitude Accuracy, and Frequency Response.

Table 3-11 Offset Accuracy

DC Volt	Limit Range	DC Volt	Limit Range
3 V	2.9736~3.0264 V	-3 V	-3.0264~-2.9736 V
1 V	0.9896~1.0104 V	-1 V	-1.0104~-0.9896 V
0.1 V	0.0968~0.1032 V	-0.1 V	-0.1032~-0.0968 V
0.01 V	0.00752~0.01248 V	-0.01 V	-0.01248~-0.00752 V
0 V	-0.0024~0.0024 V		

Table 3-12 Amplitude Accuracy

Amplitude	Limit Power Range
80 m V	26.7~29.9 mV
400 m V	136.4~146.4 mV
1 V	342.2~365 mV
4 V	1.371~1.4574 V

Table 3-13 Frequency Response

Amplitude	Frequency	Power Range
2 V	10 K, 100 K, 1 M, 2 M, 3 M, ..., 15 M, 16 M, ..., 24 M, 25 M	3.6794~4.2794 dBm
5 V	10 K, 100 K, 1 M, 2 M, 3 M, ..., 15 M, 16 M, ..., 24 M, 25 M	11.64~12.24 dBm

Steps:

1. Connect the AWG channel of the oscilloscope to the SDM3055.
2. Press **Wave Gen** button on the front panel of the oscilloscope to enable the AWG.
3. Set Output Load of the AWG to High-Z, and Wave Type to DC.

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4. According to table 3-11, set Offset of DC, then record the reading which displays on screen of the SDM3055. Check if it is within the specified range in Table 3-11.
5. Set Wave Type to Sine, frequency to 10 kHz, and offset to 0.
6. According to table 3-12, set amplitude of Sine, then record the reading which displays on the screen of the SDM3055. Check if it is within the specified range in Table 3-12.
7. Connect the AWG channel to the Agilent U2004A.
8. Set Wave Type to sine, frequency to 10 kHz, offset to 0, and amplitude to 2 V.
9. Change the frequency, according to Table 3-13, then record the reading on the U2004A to make certain it is within the specified range in Table 3-13.
10. Set amplitude of the waveform to 5V, repeat step 9.
11. Disconnect the test connection

Adjusting Procedures

This chapter describes how to adjust the SDS2000X series oscilloscopes for optimum performance using a Keysight B2901A and a Siglent SDG5000 for optimum operating performance. Only qualified personnel should perform this procedure.

Warming Up

Before performing the adjustment procedures, the oscilloscope and other test equipment must warm up for at least 30 minutes in an ambient temperature between 20 °C and 30 °C. Adjustments performed prior to warm-up or outside this temperature range may result in poor performance.

Self Calibration

The Self-Cal performs a routine which uses internally generated signals to optimize circuits that affect channel sensitivity, offset, and trigger parameters, as well as optimizing the signal path in the oscilloscope. Let the oscilloscope warm up before performing this procedure.

Required Equipment

PC: Windows XP operating system, USB interface, NI-VISA.

Calibrating Software: Python 2.7, PyVisa, PyQt4, PyWin32, Adjustment script

Test Instrument:

Keysight B2901A with adapter.

Siglent SDG5000

Siglent SDM3055

Agilent U2004A.

Two USB cables (Type AB)

One network cable

One power divider

Three 10-inch BNC cables

Three BNC T connectors

Software Installation

1. Install the NI-488.2 driver, select custom installation to install NI-VISA.
2. Install the Python 2.7, PyVisa, PyQt4, PyWin32.

Adjusting steps

1. Connect the Keysight B2901A with the PC using a network cable.
2. Connect the oscilloscope with the PC using a USB cable.
3. Connect the SDG5000 with the PC using a USB cable.

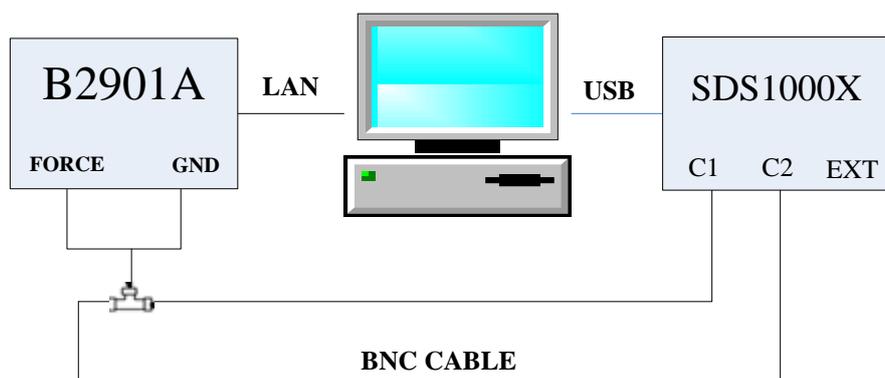


Figure 4-1 DAC adjusting environment

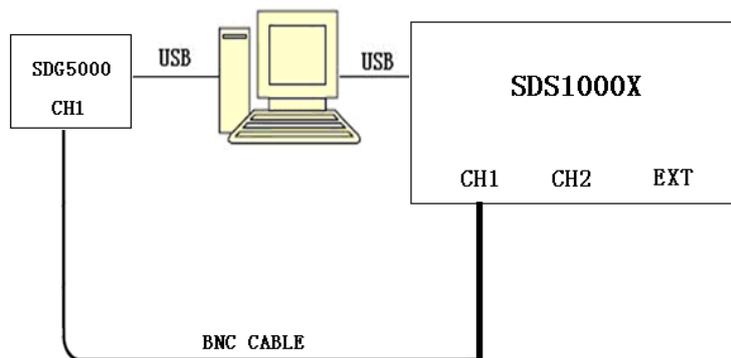


Figure 4-2 Clock Accuracy adjusting environment

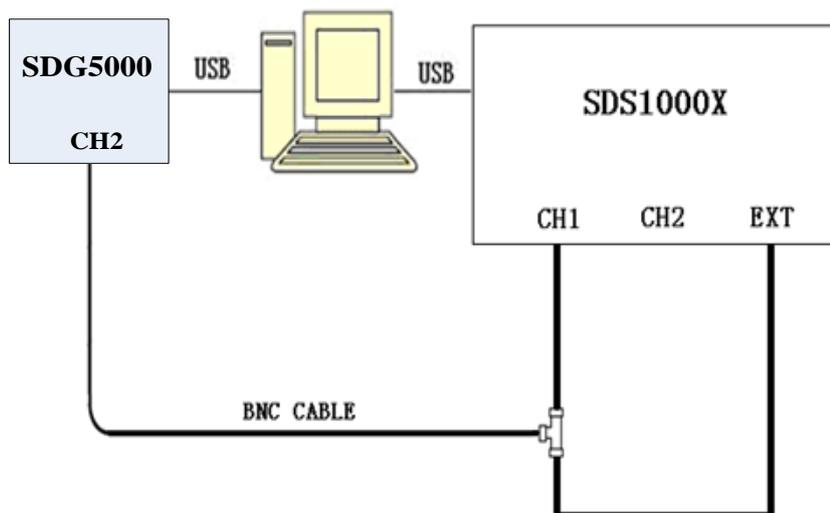


Figure 4-3 EXT Trigger Level adjusting environment

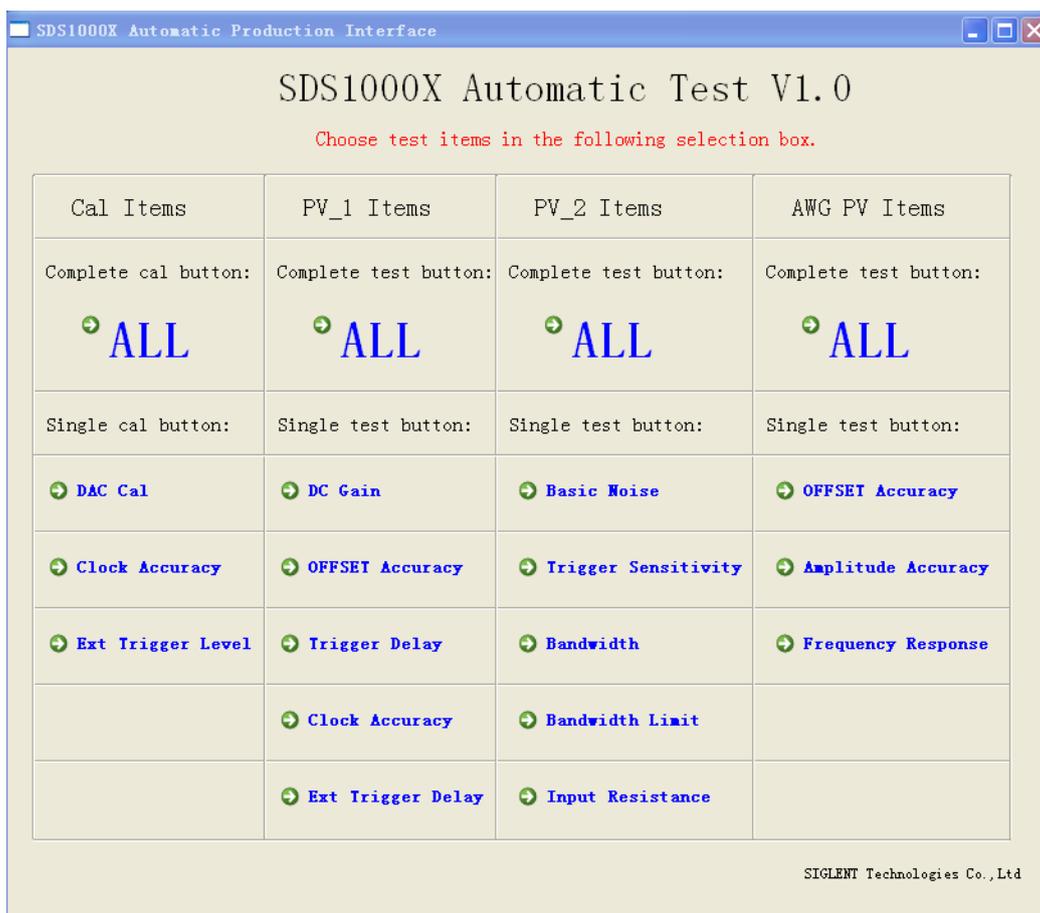


Figure 4-4 SDS1000X PV and Calibrate Interface

3. Refer to the B2901A manual for details about the device IP address setup. The details of the device IP address which we setup are in the script named

devicecon.py in the path of SDS1000X\Lib.

4. Turn on the oscilloscope and operate it for about 30 minutes.
5. Connect the oscilloscope and the adjusting devices as figure above using the BNC T connectors and BNC cables.
6. Open the corresponding python script.
7. Click the “ALL” button in the Cal_Items to perform the adjusting procedures.
8. When the DAC adjust finished, disconnect any probes or cables from the oscilloscope. Press **UTILITY** button and then select “Do Self Cal” to start the Self Calibration.
9. DO next step according to the message box which pops up during the adjusting process.
10. When all items are done, disconnect all devices and close the python script.

Note: The adjusting procedures include four items as the following:

DAC, Self Calibration, Clock Accuracy, Ext trigger delay, Ext trigger level.

Ext trigger delay adjusts before the Ext trigger delay PV test.

Assembly Procedures

This chapter describes how to remove the major modules from the SDS1000X series oscilloscopes. To install the removed modules or replace new modules, please follow corresponding operating steps in reverse order.

The following contents are what mainly included in this chapter:

- **Security Consideration** which describes security information needed to considerate while operating.
- **List of Modules** in which the modules to remove are listed.
- **Required Tools** which describes the tools needed to perform the procedures.
- **Disassembly Procedures** which describes in detail how to remove and install the modules.

Security Consideration

Only qualified personnel should perform the disassembly procedures.

Whenever possible, disconnect the power before you begin to remove or replace the modules. Otherwise, any personal injuries or damages to the components may occur.

Avoid Electrical Shock Hazardous voltages exist on the LCD module and power supply module. To avoid electrical shock, you should firstly disconnect the power cord from the oscilloscope, and then wait at least three minutes for the capacitors in the oscilloscope to discharge before you begin disassembly.

Preventing ESD Electrostatic discharge (ESD) can damage electronic components. When doing any of the procedures in this chapter, use proper ESD precautions. As a minimum, you should place the oscilloscope on a properly grounded ESD mat and wear a properly grounded ESD strap.

List of Modules

The following removable modules are listed in the order of performing disassembly procedures.

Table 5-1 List of modules

Number of Module	Module
1	Front-Panel Knobs
2	Rear Panel
3	Top Metal Cover
4	Rear Metal Cover
5	Power Supply Module
6	Metal Shelf and Interface Module
7	Main Board
8	Fan Module
9	Keypad Module
10	Display Module

Required Tools

Use these tools to remove or replace the modules in the oscilloscope:

- T6, T10 and T20 TORX drivers
- 5/8- inch and 9/32- inch socket drivers
- Flat head screw driver

Disassembly Procedures

This section describes how to remove and install the modules listed above in the oscilloscope in detail. Complete disassembly will be best achieved through the following operating steps.

Removing the Front-Panel Knobs

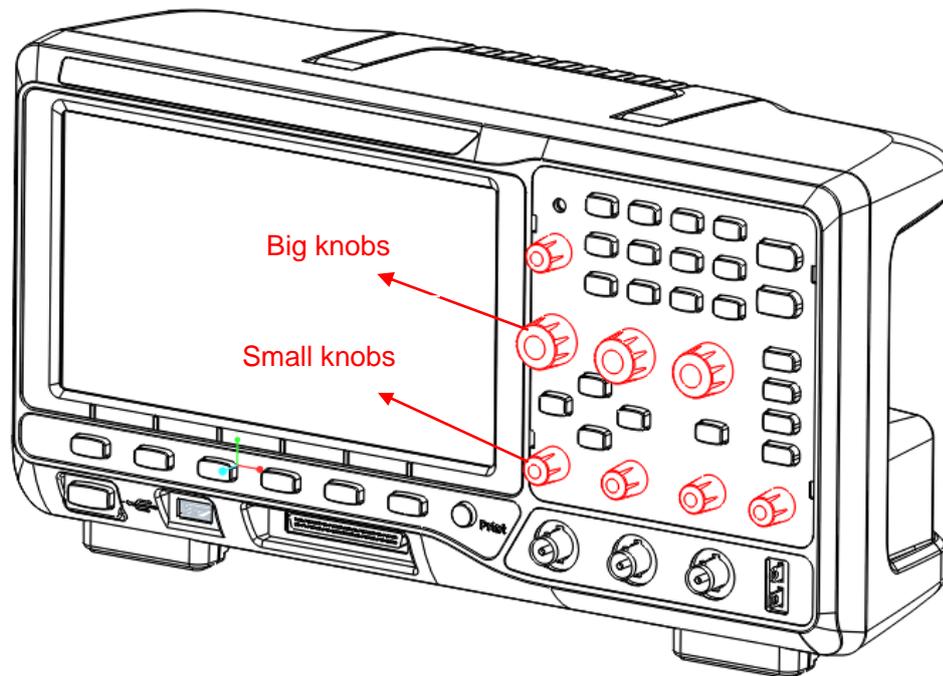


Figure 5-1 Removing the Front -Panel Knobs

Removing steps:

Remove each front-panel knob by firmly grasping the knob (with pliers if necessary) and pulling it away from the front panel.

To install the Front -Panel Knobs , please operate as the reverse steps.

Removing the Rear Panel

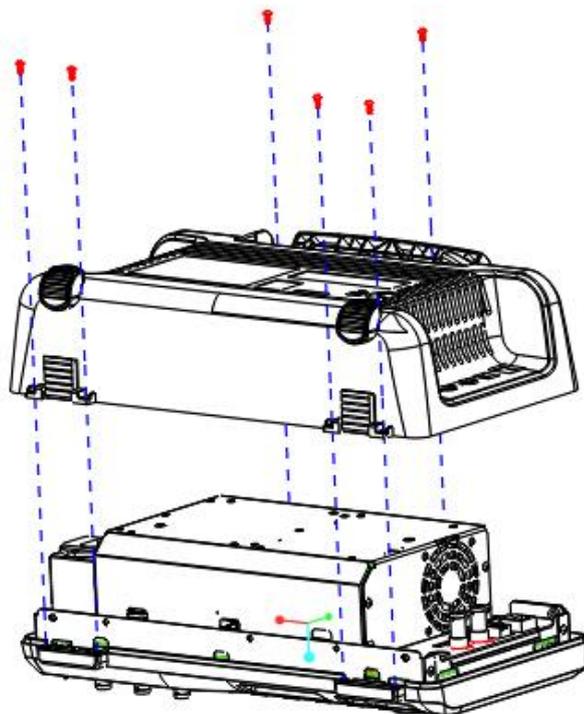


Figure 5-2 Removing the rear panel

Removing steps:

1. Place the oscilloscope face down on a soft surface such as an anti-static mat.
2. Remove the six screws located on the rear panel. Tilt the handle to gain better access to the top two screws.
3. Lift the rear panel up and off carefully.

To install the rear panel, please operate as the reverse steps.

Removing the Front Panel

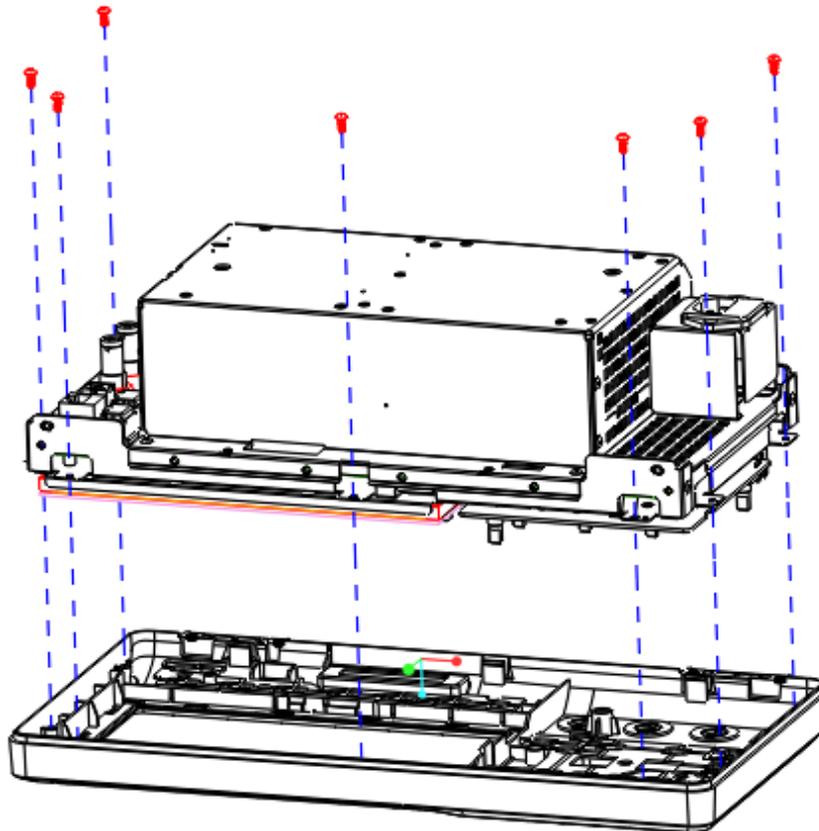


Figure 5-3 Removing the front panel

Removing steps:

1. Place the oscilloscope bottom down on a soft surface such as an anti-static mat.
2. Remove the seven screws located on the metal shelf.

To install the front panel, please operate as the reverse steps.

Removing the Rear Metal Cover

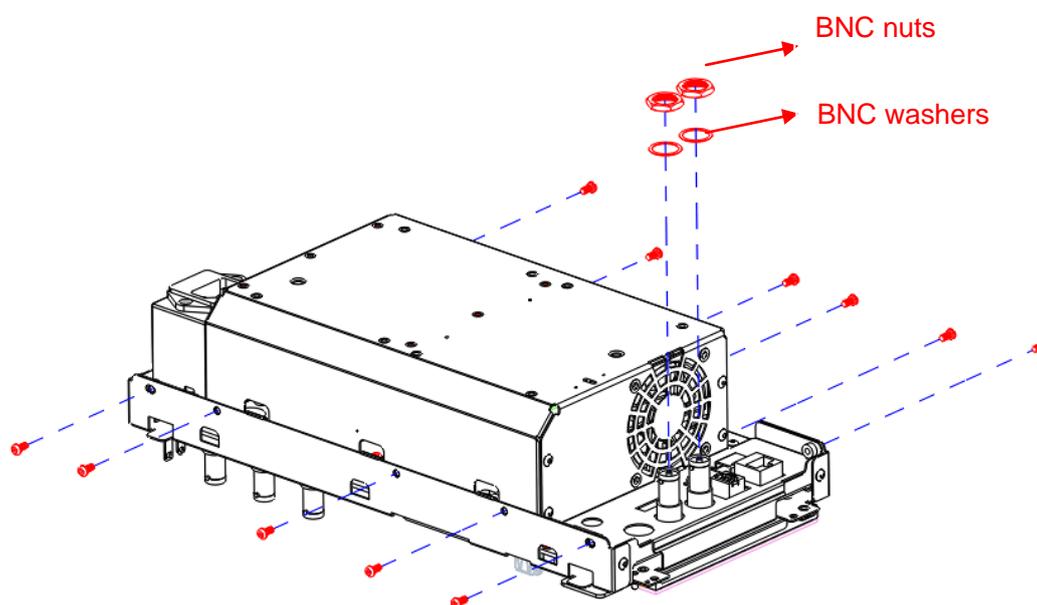


Figure 5-4 Removing the rear metal cover

Removing steps:

1. Place the oscilloscope face down on a soft surface such as an anti-static mat.
2. Remove the eleven screws located on the rear metal cover.
3. Remove two nuts and washers from the Back BNC terminal.
4. Disconnect the power cable connected to main board module from power supply module.
5. Since the edge of the rear metal cover is sharp, you should lift the rear metal cover up and off carefully to avoid personal injury.

To install the rear metal cover, please operate as the reverse steps.

Removing the AWG Module

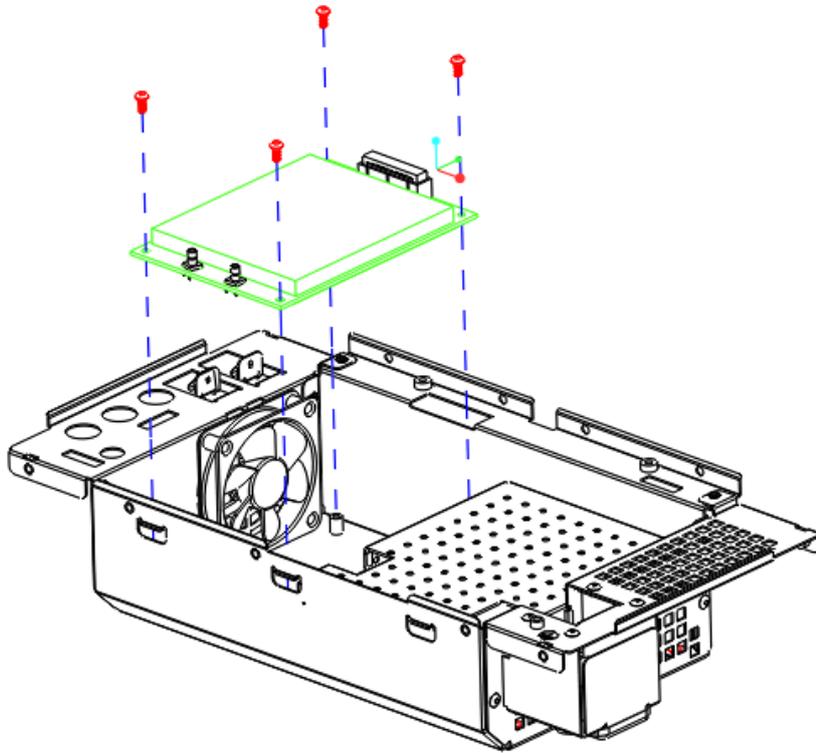


Figure 5-5 Removing the rear metal cover

Removing steps:

1. Remove the four screws located on the AWG PCB.

Removing the Power Supply Module

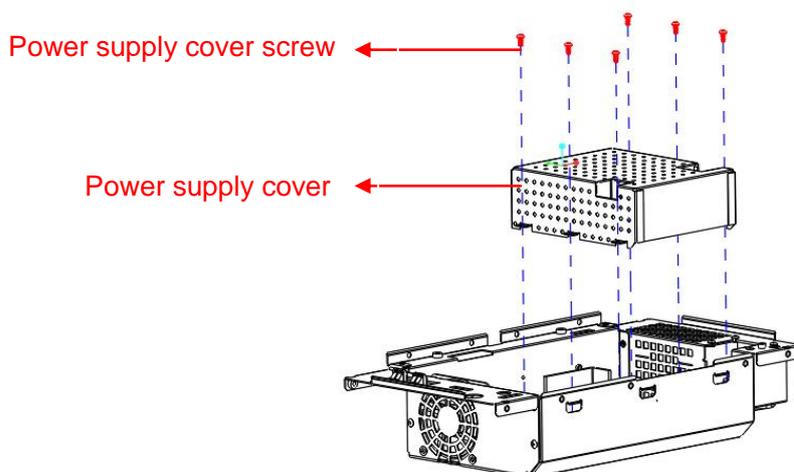


Figure 5-5 Removing the power supply cover

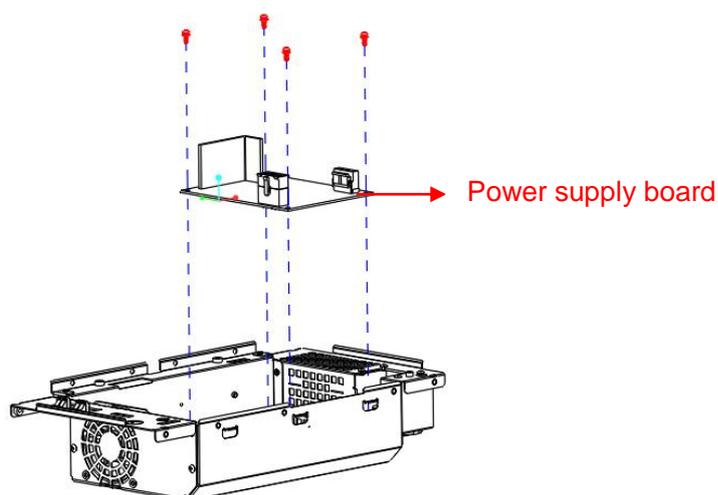


Figure 5-6 Removing the power supply board

Removing steps:

1. Place the rear metal cover on a soft surface such as an anti-static mat.
2. Remove the six screws located on the power supply cover.
3. Lift the cover up and off carefully.
4. Remove the four screws located on the power supply board, and lift up the board.

To install the power supply module, please operate as the reverse steps.

Removing the Main Board

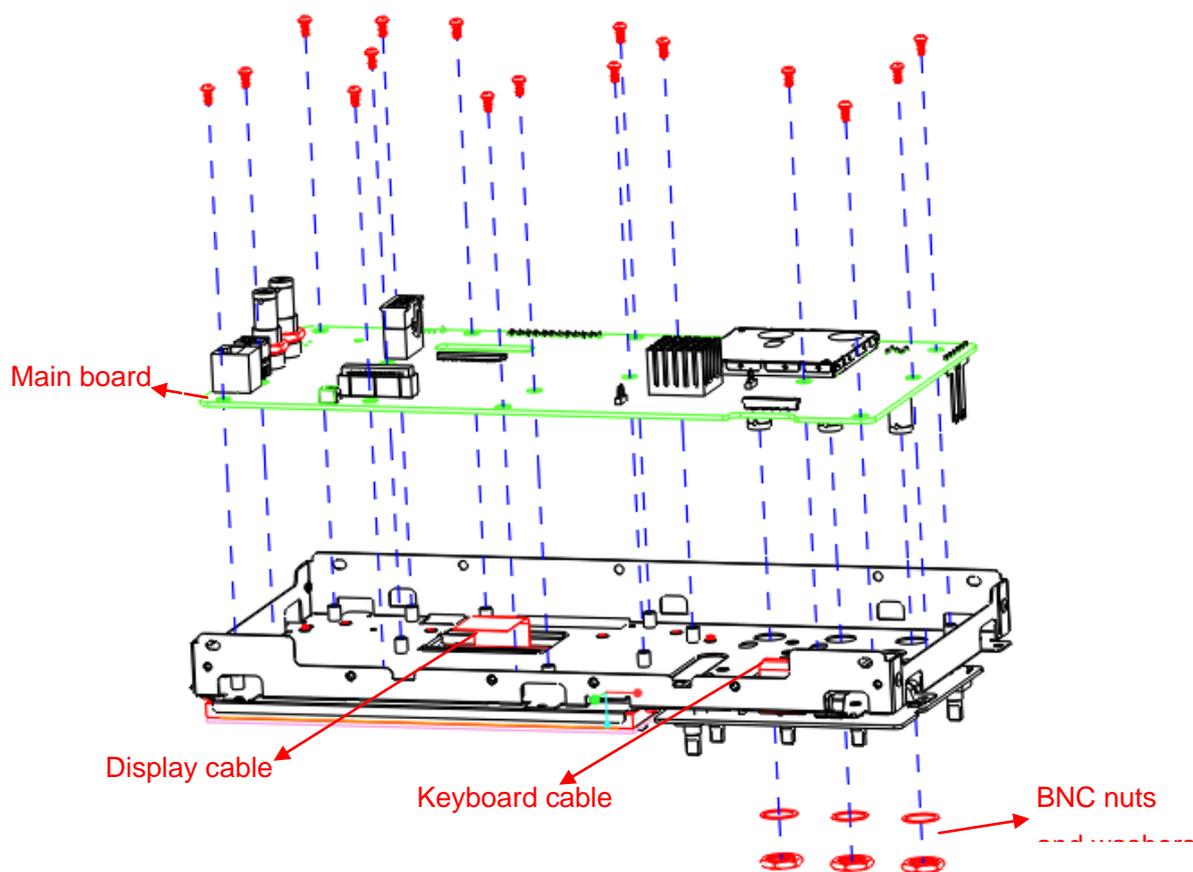


Figure 5-8 Removing the main board

Removing steps:

1. Remove the sixteen screws located on the main board.
2. Remove the nuts and washers located on the channel BNC terminal.
3. Disconnect the display cable and the keyboard cable.
4. Separate the main board from the metal shelf and then lift it up and off carefully to avoid personal injury from the sharp edge of the metal shelf.

To install the main board, please operate as the reverse steps.

Removing the Keypad and Display Module

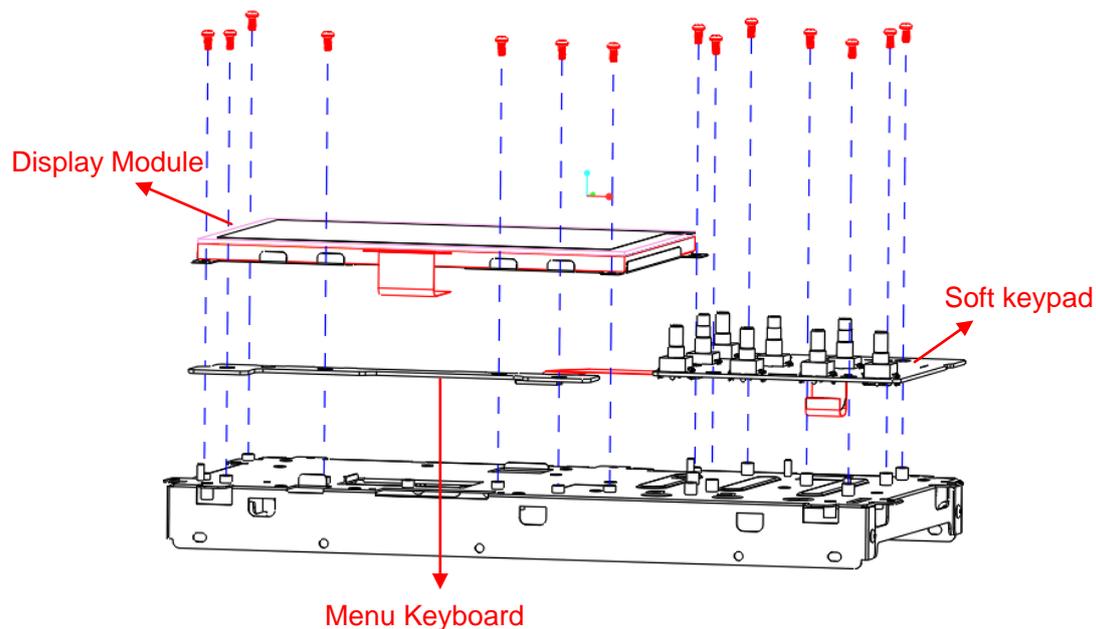


Figure 5-10 Removing the keypad and display Module

Removing steps:

1. Remove the seven screws located on the keypad board.
2. Remove the seven screws located on the edge of the display module.
3. Disconnect the cable that connected keypad with menu keyboard.
4. Separate the keypad and display module carefully.

To install the keypad and display module, please operate as the reverse steps.

Troubleshooting

This chapter explains how to deal with general troubles that you may encounter while operating SDS1000X(+) series oscilloscope.

General troubles

1. The screen remains dark after power on:
 - (1) Check if the power cord is correctly connected.
 - (2) Check whether the fuse is burned out. If the fuse needs to be changed, please contact with SIGLENT as soon as possible and return the instrument to the factory to have it repaired by qualified personnel authorized by SIGLENT.
 - (3) Restart the instrument after completing inspections above.
 - (4) If it still does not work normally, please refer to the Display Troubleshooting or contact SIGLENT.

2. After the signal is sampled, there is no corresponding waveform displaying:
 - (1) Check if the signal connecting cord is correctly connected to BNC connector.
 - (2) Check if the Intensity knob on the front panel is properly adjusted.
 - (3) Check if the probe is correctly connected to the item under test.
 - (4) Check if there are signal generated from the item under test
(You can connect the probe compensation signal to the problematic channel to determine the reason to the problem)
 - (5) Resample the signal.

3. The voltage amplitude measured is higher or lower than the actual value (this error usually occurs in use of probe):
 - (1) Check if the attenuation coefficient of the current channel matches with the attenuation ratio of the probe.
 - (2) Check if the Input impedance(only designed selectable between $1M\Omega$ and 50Ω inside SDS1000X(+)) in CH1 menu is correctly matches with that set inside arbitrary Waveform Generator that connected.

4. There is waveform displaying but not stable:

- (1) Check the trigger source: check whether the “Source” in “Setup” of “Trigger” is the actual operating channel.
- (2) Check if the waveform is wrong: it is easy for us to regard the wrong waveform as the real when a high frequency signal is connected to the instrument. You’d better make sure that the current time base is correct for the frequency of input signal.
- (3) Check the trigger type: “Edge” trigger suits to general signal and “Video” trigger suits to video signal. Only in correct trigger type can make the waveform stably display.
- (4) Change the setting of trigger holdoff.

5. No display after pressing RUN/STOP:

Check whether the trigger Mode is “Normal” or “Single”, and if the trigger level exceeds the waveform range. If yes, set the trigger level to the middle or change the trigger Mode to “Auto”.

Note: press “Auto Setup” could automatically replace the above setting.

6. USB storage can’t be recognized:

- (1) Check if the USB can work normally.
- (2) Make sure that the USB disk being used is of flash type, the instrument does not support USB of hardware type.
- (3) Make sure that the capacity of the USB disk is not too large. It is suggested that the capacity of the USB disk matches to the oscilloscope is no larger than 4 G.
- (4) Restart the instrument and then insert the USB to check it.
- (5) If it is still in abnormal use, please contact with SIGLENT.

7. The signal is not display correctly in the digital mode(SDS1000X+):

- (1) Check whether the connector which between logic probe and the jump wire is connected right.
- (2) Make sure the signal that test target output is correct.
- (3) If the problem is still remain, please contact with SIGLENT.

8. The AWG don’t output signal(SDS1000X+):

- (1) Check if the function of AWG is turn on(the “Wave Gen” key is light on).
- (2) Make sure the output signal is setting right.
- (3) Make sure the connector on which the signal transmission is connected right.
- (4) If output still not have signal,please contact with SIGLENT.

Troubleshooting the Hardware Failures

This section provides information and procedures to help you deal with general hardware failures you encounter while operating the oscilloscope. When troubleshooting these failures, it is essential for you to take into consideration of the following notices:

1. Please disconnect the power if you find a measured voltage value is different with the standard while measuring the voltage value.
2. Before disconnecting the cables connected to main board or FAN module, please turn off the oscilloscope and cut the power cord.
3. While performing any internal testing of the oscilloscope, please take some precautions to avoid damaging internal components or modules results from electrostatic discharge (ESD).

ESD Precautions

While performing any internal testing of the oscilloscope, please refer to the following precautions to avoid damages to internal modules or components result from ESD.

- Touch circuit boards by the edges as possible as you can.
- Reduce handling of static-sensitive modules when necessary .
- Wear a grounded antistatic wrist strap to insulate the static voltage from your body while touching these modules.
- Operate static-sensitive modules only at static-free areas. Avoid handling modules in areas that allow anything capable of generating or holding a static charge.

Required Equipments

The equipments listed in the table are required to troubleshoot the oscilloscope.

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Table 6-1 Required equipments

Equipment	Critical Specifications	Example
Digital Multimeter	Accuracy $\pm 0.05\%$ 1 mV resolution	Agilent 34401A
Oscilloscope	200 MHz BW 1 M Ω /50 M Ω impedance	SDS1202X

Main Board Drawing

Please refer to the following drawing to quickly locate test points on the main board for easy resolution of the failures you encounter.

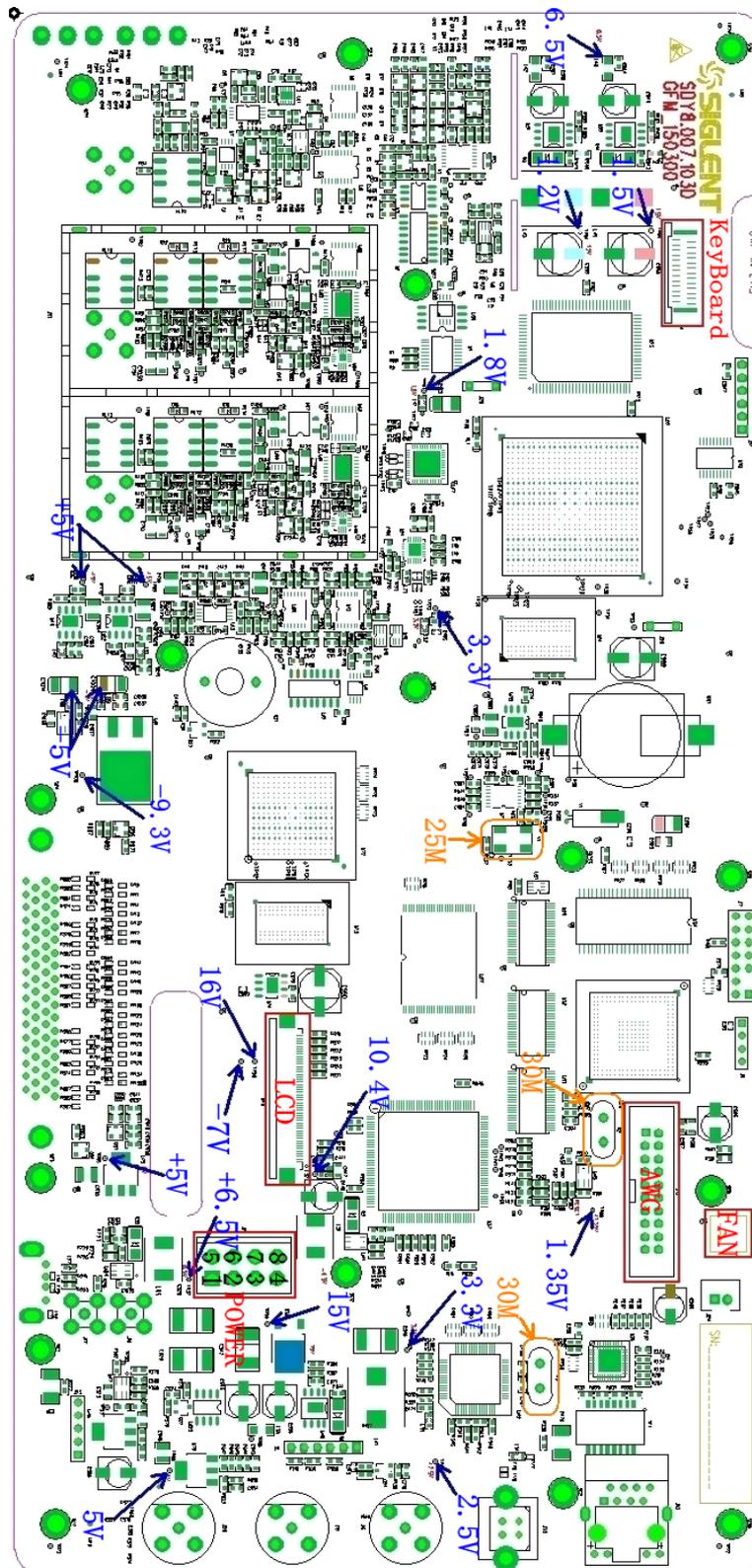


Figure 6-1 Main board module

AWG Board Drawing (SDS1000X+)

Please refer to the following drawing to quickly locate test points on the AWG board for easy resolution of the failures you encounter.

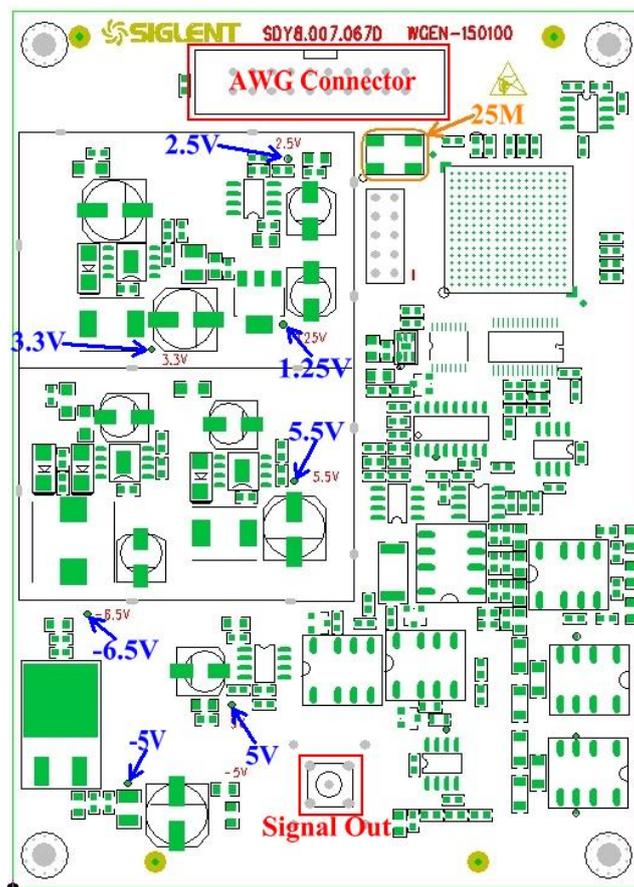


Figure 6-2 AWG board module

Troubleshooting Flowchart

The following flowchart describes how to troubleshoot the oscilloscope, making it easy for you to understand the troubleshooting procedures at first view.

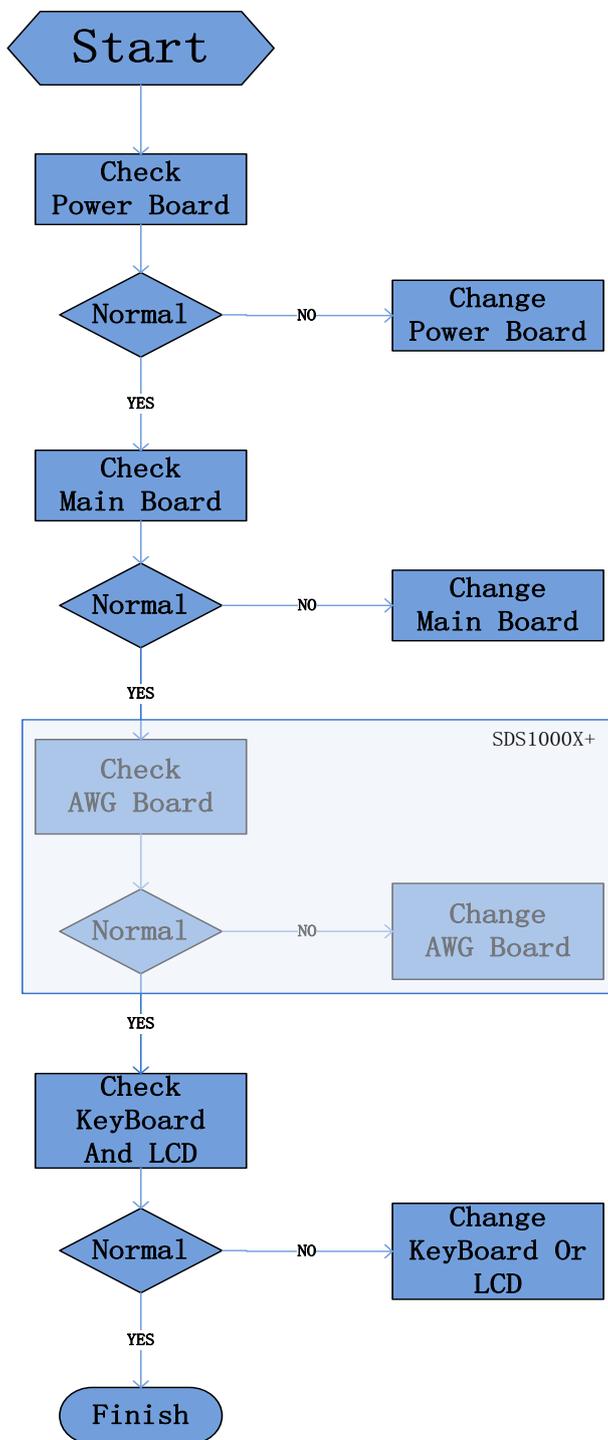


Figure 6-3 Troubleshooting flowchart

Check the Power Supply

Before performing the power supply testing procedure, please make sure that the oscilloscope is grounded through the protective lead of the power cord. take care not to touch or even disassemble the power supply module without any safety precautions, or you may probably suffer from electric shock or burn. Here are procedures for testing the power supply:

1. Disconnect the power cord of the oscilloscope and then check whether the fuse has been burnt out.
2. Remove metallic cover of the power supply module using a driver, and then connect the power cord.
3. Focus at the Power Connector which contains 8 pins from Pin1 to Pin8 on the main board. You can test voltages provided by power supply at these points to check whether they are within the specified range using a digital multimeter. The corresponding voltage parameters to be tested are listed in table below:

Table 6-2 Voltage parameters of the power supply module

Voltage value	Pin	Normal Range
0V	Pin4, Pin5, Pin6	NULL
-9.3V	Pin3	-9.1V~-9.5V
6.5V	Pin1, Pin2	6.3V~6.6V
15V	Pin8	14.8V~15.2V

If each tested voltage value is within the spec range referring to the table above, then the power supply works normally. Otherwise, go to the next step.

4. Disconnect the cable connected to the main board, and then perform the testing procedures as above again:

If each tested voltage value is within the spec range referring to the table above, then it is the abnormal of the load that leads to problematic power supply. Continuous checking or even replacing the main board is required for further test.

If there is at least one voltage value beyond the spec range, then the power supply module proves problematic, you need replace a new one. For safety, please do not disassemble the power supply module by yourself.

Check the Main Board

If you want to remove the main board from the metal shelf inside the oscilloscope, you'd better place it on a clean, insulated mat after removing. In addition, to avoid some chips or components on the main board being damaged for overheating, please cool the main board whenever possible using a fan. Here are procedures for testing the main board:

1. Several kinds of connectors including Fan Connector, LCD Connector, Keyboard Connector and AWG Connector(SDS1000X+ used) are located on the main board. Check if they are connected properly.
2. Make sure that the connectors on the main board are connected properly firstly, then connect the power supply module cable to appointed place on the main board, lastly connect the oscilloscope power cord. Turn on the oscilloscope to check whether the voltage values at test points are within spec range using a digital multimeter. The voltage parameters to be tested are listed in table below:

Table 6-3 Voltage parameters of the main board

TP Voltage (V)	Normal Range (V)
-5	-5.2 ~ -4.8
5	4.9 ~ 5.1
3.3	3.15 ~ 3.45
2.5	2.25 ~ 2.75
1.8	1.7 ~ 2.0
1.5	1.425 ~ 1.575
1.35	1.235 ~ 1.47
1.2	1.14 ~ 1.26
10.4	10.2 ~ 10.6

If there is at least one voltage value tested beyond the spec range, please turn off the oscilloscope and cut the power immediately to avoid damage to the chips or even the main board due to abnormal working. As a result, you need to replace a new main board.

If each voltage value tested is within the spec range, please go to the next step.

3. Check if the clock of the main board can work normally using an oscilloscope. Focus at the test point marked with “30MHz” and “25MHz” on the main board drawing.

If the clock measurement is not 30M and 25M, then the failure may come from the main board, a new one is required necessary.

If the clock measurement is 30M and 25M with abnormal working of the main board, you need to return the oscilloscope to manufacturer to have it repaired by qualified personnel.

Check the AWG Board(SDS1000X+)

If you want to remove the AWG board from the metal shelf inside the oscilloscope, you need to read notice that wrote in the first paragraph of

previous section. Here are procedures for testing the AWG board:

1. There is “AWG Connector” and “Signal Out” connector are located on the AWG board. Check if they are connected properly.
2. Make sure that the connectors on the main board and AWG board are connected properly firstly, then connect the power supply module cable to appointed place on the main board, lastly connect the oscilloscope power cord. Turn on the oscilloscope to check whether the voltage values at test points are within spec range using a digital multimeter. The voltage parameters to be tested are listed in table below:

Table 6-4 Voltage parameters of the AWG board

TP Voltage (V)	Normal Range (V)
-6.5	-6.6~-6.4
5.5	5.4~5.6
-5	-5.2 ~ -4.8
5	4.9 ~ 5.1
3.3	3.15 ~ 3.45
2.5	2.25 ~ 2.75
1.25	1.135 ~ 1.37

If there is at least one voltage value tested beyond the spec range, please turn off the oscilloscope and cut the power immediately to avoid damage to the chips or even the AWG board due to abnormal working. As a result, you need to replace a new AWG board.

If each voltage value tested is within the spec range, please go to the next step.

3. Check if the clock of the AWG board can work normally using an oscilloscope. Focus at the test point marked with “25M” on the AWG board drawing.

If the clock measurement is not 25M, then the failure may come from the AWG board, a new one is required necessary.

If the clock measurement is 25M with abnormal working of the AWG board, you need to return the oscilloscope to manufacturer to have it repaired by qualified personnel.

Check the Display Module

Here are procedures for testing the Display Module:

1. Disconnect the power cord to make sure the display module cable are correctly connected.
2. Connect the power cord and turn on the oscilloscope. If the screen remains dark, then go to test the voltage value of the backlight where “16V” and “-7V” on the board.

If the measurement of “16V”(TP99) is within the range of 15.3V ~ 16.7V, and “-7V”(TP48) is within the range of -7.7V ~ -6.3V, also the 10.4V is within the range of 10.2V ~ 10.6V. please reconnect the LCD connector to make sure its correct connecting. However, if the screen remains dark in this consequence, a new LCD is required.

If the measurement is beyond the range, you need to replace a new power supply module.

3. If the screen gets bright displaying abnormal, then go to test the Clock located on the main board.

If the clocks frequency that tested respectively are 25M and 30M, then the failure may come from the main board, a new one is required necessary.

Otherwise, the failure may come from the display module, you need to return the oscilloscope to manufacturer to have it repaired by qualified personnel.

Handling General Hardware Failures

The general hardware failures are listed in the table below. Reading the following information can help you quickly handle some easy hardware failures with more convenience©

Table 6-3 Troubleshooting general failures

General hardware failures	Method to deal with
No start-up after pressing the ON/OFF button	Check the power cord connection. Also check the power button and power line fuse.
No displaying after power on	Check that the the LCD FPC cable is correctly connected.
No response after pressing any button Even though the scope display appears normal.	Check if the keypad cable is correctly connected to the main board.
Every time the oscilloscope is turned on, the Time displayed at the lower right corner restores to its initial value.	Check and replace the button battery on the main board.
The USB interface not working correctly	Check if the rear USB cable is correctly connected.
The LAN interface not working correctly	Check the LAN setting in the I/O set menus, reboot the scope and try again.

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