

Service Manual

SDS1000CFL Series Digital Oscilloscope

Guaranty and Declaration

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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 local state.

Avoid Electric Shock. To avoid injuries or losses 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 terra conductor of the power line. To avoid electric shock, the grounding conductor must be connected to the earth. 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 markers 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 Failures. If you suspect damage occurs 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:



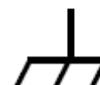
**Hazardous
Voltage**



**Refer to
Instructions**



**Protective
Earth
Terminal**



**Chassis
Ground**



**Test
Ground**

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General Features and Specifications

General Features

SDS1000CFL series oscilloscope is two or four-channel instrument in small, lightweight, benchtop chassis that you can use to take ground-referenced measurements.

Table 1-1 General features

Model	Channels	Bandwidth	Sampling Rate	Memory Depth
SDS1072CFL	2	70MHz	2GS/s	24kpts
SDS1074CFL	4	70MHz	2GS/s	24kpts
SDS1102CFL	2	100MHz	2GS/s	24kpts
SDS1104CFL	4	100MHz	2GS/s	24kpts
SDS1202CFL	2	200MHz	2GS/s	24kpts
SDS1204CFL	4	200MHz	2GS/s	24kpts
SDS1302CFL	2	300MHz	2GS/s	24kpts
SDS1304CFL	4	300MHz	2GS/s	24kpts

- The volume of the oscilloscope is cabinet and it is portable
- 7" Color TFT LCD display
- 2/4 channels, Bandwidth: 70MHz-300 MHz
- Single real-time sampling rate is:2GSa/s, Equivalent sampling rate is 50GSa/s.
- Memory depth is 24Kpts.
- Trigger types: Edge, Pulse, Video, Slope and Alternative
- Unique Digital Filter function and Waveform recorder function
- Auto measure thirty two parameters and support all measurement function.
- Two/Four groups' reference waveforms and twenty groups' capture waveforms and twenty groups' setups internal save/recall function and USB flash drive save/recall function.
- Cursor types: Manual mode, Track mode and Auto mode.
- Channel waveform and its FFT waveform display on split screen.

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- Waveform Intensity and Grid Brightness can be adjusted.
- Menu display in the form of pop-up that in order to convenience users to use it.
- Multiple Language User Interface.
- Support Multilingual online help system
- Standard interface: Double USB Host, USB Device, LAN Port, Pass/Fail Out

Specifications

These specifications apply to SDS1000CFL series Digital Storage Oscilloscope. To verify that an oscilloscope meets specifications, it must first meet the following conditions:

- The oscilloscope must have been operating continuously for thirty minutes within the specified operating temperature.
- You must perform the Do Self Cal operation, accessible through the Utility menu, if the operating temperature changes by more than 5 °C.
- The oscilloscope must be within the factory calibration interval of one year.

All specifications are guaranteed unless noted “typical”.

Table 1-2 Oscilloscope specifications

Inputs	
Input Coupling	AC, DC, GND
Input Impedance	(1MΩ±2%) (18Pf±3Pf) ,50Ω±2%
Maximum input voltage	400Vpk, CAT I
Probe attenuation	1X, 10X
Probe attenuation Factors	1X, 5X, 10X, 50X, 100X, 500X, 1000X

Vertical System	
Volts/Div Range	2mV/div~5V/div(in 1, 2, 5 sequence)
Channel Voltage Offset Range	2mV~100mV: ±800mV 102 mV~5V: ±40V
Vertical Resolution	8 bit
The number of channel	2/4
Analog Bandwidth	70M (SDS1072CFL/SDS1074CFL) 100M (SDS1102CFL/SDS1104CFL) 200M (SDS1202CFL/SDS1204CFL) 300M (SDS1302CFL/SDS1304CFL)
Lower Frequency Limit (AC Coupled)	≤10Hz at BNC

DC Gain Accuracy	$\leq \pm 3.0\%$: 5mv/div to 5V/div $\leq \pm 4.0\%$: typical for 2mv/div
DC Measurement Accuracy	$\pm [3\%(\text{reading} + \text{offset}) + 1\% \text{offset} + 0.2\text{div} + 2\text{mv}]$, $\leq 100\text{mv/div}$
	$\pm [3\%(\text{reading} + \text{offset}) + 1\% \text{offset} + 0.2\text{div} + 100\text{mv}]$, $> 100\text{mv/div}$
Rise Time	$< 5.0\text{ns}$ (SDS1072CFL/1074CFL)
	$< 3.5\text{ns}$ (SDS1102CFL/1104CFL)
	$< 1.7\text{ns}$ (SDS1202CFL/1204CFL)
	$< 1.2\text{ns}$ (SDS1302CFL/1304CFL)
Math Operation	+, -, *, /, FFT
FFT	Window mode: Hanning, Hamming, Blackman, Rectangle
	Sampling points: 1024
Bandwidth Limit	20MHz

Horizontal System

Real Time Sampling Rate	2 channel	2 G for single channel	
		1 G for double channels	
	4 channel	2 G	for single channel
Channel 1 and 3 , Channel 2 and 3 Channel 1 and 4 , Channel 2 and 4			
1 G the other combinations of four channels referring to below			
Equivalent Sampling Rate	50GSa/s		
Sec/Div Range	5ns/div~50s/div (SDS1072CFL/1074CFL)		
	2.5ns/div~50s/div (SDS1102CFL/1104CFL)		
	2.5ns/div~50s/div (SDS1202CFL/1204CFL)		
	1ns/div~50s/div (SDS1302CFL/1304CFL)		
Scan Range	100ms/div~50s/div (in 1,2.5,5 sequence)		
Time base Accuracy	$\pm 50\text{ppm}$		

Trigger System

Trigger Types	Edge, Pulse, Video, Slope, Alternative
Trigger Source	CH1, CH2, CH3, CH4, EXT, EXT/5, AC Line
Trigger Modes	Auto, Normal, Single
Trigger Coupling	DC, allow to pass the whole signal
	AC, prevent DC part of the whole signal and attenuate signal that lower than 50Hz
	HF REJ, attenuate signal that higher than 150KHz
	LF REJ, attenuate signal that lower than 7KHz
Trigger Level Range	CH1/CH2/CH3/CH4: ± 6 divisions from center of screen
	EXT: $\pm 1.2\text{V}$
	EXT/5: $\pm 6\text{V}$

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Trigger Sensitivity	CH1/CH2/CH3/CH4	1division DC~10MHz 1.5divisions 10MHz-BWmax
	EXT	200mv DC~10MHz 300mv 10MHz-BWmax
	EXT/5	1Vpp DC~10MHz 1.5Vpp 10MHz-BWmax
Trigger Level Accuracy	CH1/CH2/CH3/CH4	$\pm 0.4 \text{ div} \times \text{volts/div}$ (within ± 4 divisions from center of screen)
	EXT	$\pm (6\% \text{ of setting} + 40 \text{mv})$
	EXT/5	$\pm (6\% \text{ of setting} + 200 \text{mv})$
Trigger Location	Pre-trigger: (Memory depth/ (2 × sampling rate)) , Delay Trigger: 268.04div	
Holdoff Range	100ns~1.5s	
Edge Trigger	Trigger Mode: Rising slope, Falling slope, Rising and Falling slope	
Pulse Trigger	Trigger Mode	<, >, = (positive pulse width)
		<, >, = (negative pulse width)
	Pulse Width Range: 20ns~10s	
Video Trigger	Support signal Formats: PAL, SECAM, NTSC	
	Trigger condition: Odd Field, Even Field, All Lines, Line Num	
Slope Trigger	Trigger Mode	>, <, = (rising slope)
		>, <, = (falling slope)
	Time: 20ns~10s	
Alternative Trigger	Allow two channels trigger simultaneously, and support four trigger mode: Edge, Pulse, Video, Slope,	

Measure System

Automatic Measurement	Voltage	Vpp, Vmax, Vmin, Vamp, Vtop, Vbase, Vavg, Mean, Vrms, Crms, FOV, FPRE, ROV, RPRE
	Time	Period, Frep, +Wid, -Wid, Rise Time, Fall Time, BWid +Dut, -Dut
	Delay	Phase, FRR, FRF, FFR, FFF, LRR, LRF, LFR, LFF

X-Y Mode

X axis / Y axis input	CH1/CH2/CH3/CH4
Sampling Rate	XY Mode breaks the limit of sampling rate at 1MSa/s of traditional oscilloscope, and supports sampling rate between 25KSa/s~250MSa/s.

Hardware Frequency Counter

Readout Resolution	1Hz
Frequency Range	From 10Hz to rated Bandwidth
Signal Types	Apply to all signals that can correctly trigger except for Pulse signal and Video signal.

Table 1-3 Oscilloscope general specifications

Display System		
Display Type	Color TFT 7in.(178mm) Liquid Crystal Display	
Resolution	480 horizontal by 234 vertical pixels	
Display Color	24 bit	
Display Contrast (Typical state)	150:1	
Backlight Intensity (Typical state)	300nit	
Wave display range	8 x 18 div	
Wave Display Mode	Dot, Vector	
Persist	Off, 1 sec, 2 sec, 5 sec, Infinite	
Menu Display	2 sec, 5 sec, 10 sec, 20 sec, Infinite	
Screen-Saver	Off, 1min, 2min, 5min, 10min, 15min, 30min, 1hour, 2hour, 5hour	
Skin	Classical, Modern, Tradition, Succinct	
Waveform Interpolation	Sin(x)/x	
Screen Display	Normal , Invert	
Language	Simplified Chinese, Traditional Chinese, English, Arabic, French, German, Russian, Portuguese, Japanese, Korean, Italian	
Power Supply		
Input Voltage	100-240 VAC, CAT II	
Frequency	45Hz to 440Hz	
Power	< 50VA	
Environments		
Temperature	Operating:10℃ to +40℃ Not operating: -20℃ to +60℃	
Cooling	The fan forces it cold.	
Humidity	Operating: 85%RH, 40℃, 24 hours Not operating: 85%RH, 65℃, 24 hours	
Height	Operating: 3000m Not operating: 15,266m	
Mechanical		
Dimension	length	336mm
	Width	152mm
	Height	118mm
Weight	4.5 kg for 4 channels / 4.3kg for 2 channels	

Prepare Information

Before doing performance verifying or procedure adjusting, you should master the following operations to make the oscilloscope work in a good state or deal with some simple functional problems. The following contents are included 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

Fore more detailed information about oscilloscope operation, please refer to you Quick Guide for CFL.

Functional checking

This functional checking covers three kinds of checks, by which you can verify whether the oscilloscope is working correctly.

Power-on Inspection

The normal operating voltage for SDS1000CFL series digital oscilloscope is in range of 100-240VRMS with frequency from 45Hz to 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 some 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 that you can press the DEFAULT SETUP button to recall the factory default settings.

Default Setup

When you press DEFAULT SETUP button, the oscilloscope displays waveforms of CH1 and removes waveforms of the other channels.

Table 2-1 Default settings

Menu or System	Option	Default setting
CH1/CH2/CH3/CH4	Coupling	DC
	Bandwidth limit	Off
	Volts/Div	Coarse
	Probe	1x
	Invert	Off
	Filter	Off
MATH	Operation	+
	FFT Operation	
	Source	CH1
	Window	Hanning
	FFT Zoom	1X
	Scale	dBVrms
HORIZONTAL	Display	Split
	Delay	Off
	Sec/Div	500us
	Position	0s
CURSOR	Window Zone	50us
	Type	Off
	Source	CH1
	Voltage	+/-3.2 divisions
ACQUIRE	Time	+/-8 divisions
	Acquisition	Sampling
	Sinx/x	Sinx
DISPLAY	Mode	Real Time
	Type	Vectors
	Persistence	Off
	Intensity	60%
	Brightness	40%
	Format	YT
SAVE/RECALL	Menu Display	Infinite
	Type	Setups
	Save to	Device
UTILITY	Setup	No.1
	Counter	On
	Pass/Fail	Off
	Record	Off

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TRIGGER	Type	Edge
Edge TRIGGER	Source	CH1
	Slope	Rising
	Mode	Auto
	Coupling	DC
	Level	0V
Pulse TRIGGER	Source	CH1
	Condition	= at positive pulse
	Set Width	1.00ms
	Mode	Auto
	Coupling	DC
Video TRIGGER	Source	CH1
	Polarity	Negative
	Sync	All lines
	Standard	NTSC
	Mode	Auto
Slope TRIGGER	Source	CH1
	Condition	> at Rising slope
	Time	1.00ms
	Mode	Auto
	Vertical	The higher level
Alternative	Source	CH1
	Mode	Edge
	Coupling	DC
	Slope	Rising

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 probe may cause measurement inaccuracy or error. The probe compensation steps are as follows:

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

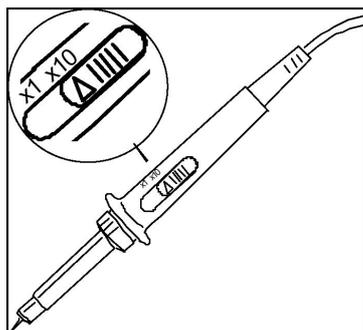
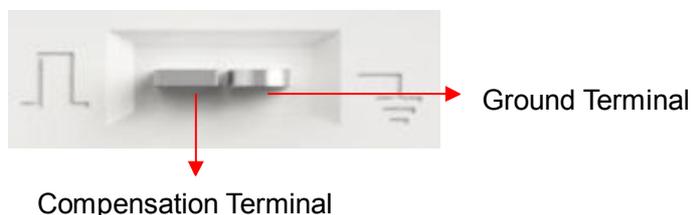
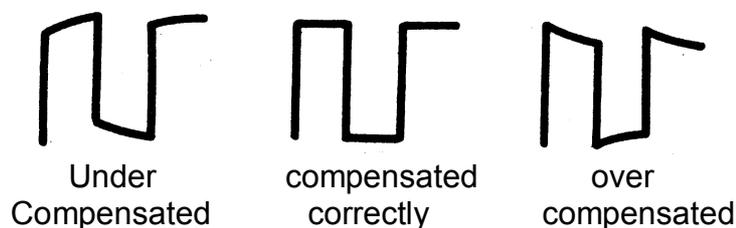


Figure 2-2 Set the attenuation switch

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



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

Auto Setup

Press AUTO 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 periods waveform
 (Single-cycle sine)	Display single period waveform
 (Rising edge)	Display the rising edge of waveform
 (Falling edge)	Display the falling edge of waveform
 (Undo Setup)	Recall the previous setup of oscilloscope

Four parameters will display on the screen after the stability of auto setting. Which channel to select as the trigger source when several channels are on based on the following conditions:

- The input signal frequency must be higher than 10Hz, with the amplitude higher than 8mV.
- Selecting channel with the lowest frequency while several channels are connected with signal.

Self Calibration

The self Calibration procedure can quickly optimize the signal path thus to obtain the best measurement precision. It is essential for you to run the procedure if the environmental temperature changes by 5° or more. Otherwise, please perform self calibration according to your actual conditions.

You can perform the Self Calibration procedure as the following steps:

Steps:

1. Disconnect any probes or cables from all BNC connectors.
2. Press the button UTILITY and then select the Do Self Cal option to enable the Self Calibration function. The oscilloscope will turn to interface below:

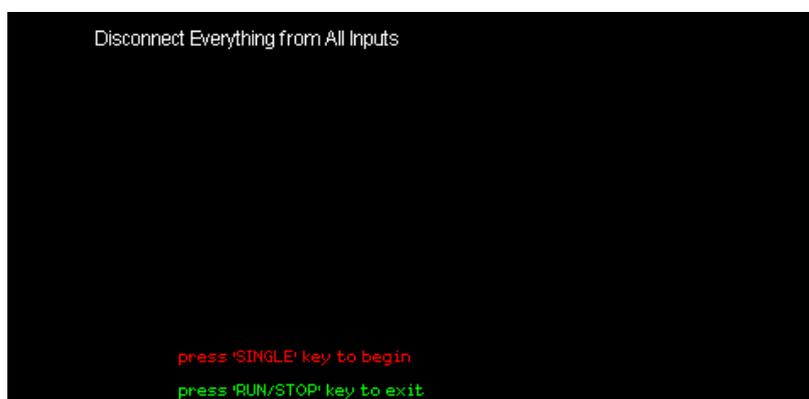


Figure 2-3 Calibration interface

3. Press "SINGLE" to begin.

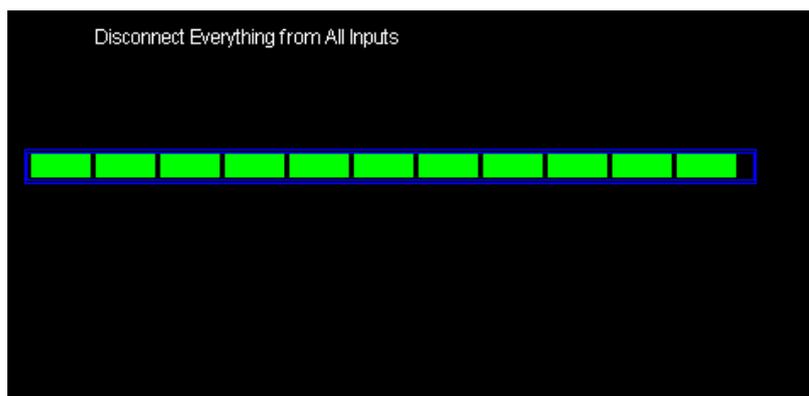


Figure 2-4 Calibration interface

4. After the Self Calibration completed, Press "RUN/STOP" key to exit.

Note: In normal condition, the self calibration will take about 20 seconds, if it do not complete within the period or stop at one of the calibration items, there may be a trouble inside the instrument.

Interface Test

The SDS1000CFL 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 realize some advanced functions. To make sure the oscilloscope can work normally, it is necessary for you to test the interfaces.

USB Host Test

To test if the USB Host interface works normally.

Tools:

- A SDS1000CFL digital oscilloscope
- An U disk

Steps:

1. Insert an U disc into the USB Host interface on the front panel of the oscilloscope.
2. Quickly a prompt message “USB Flash Drive Plug In!” appears on the screen, which suggests the U disc has been recognized successfully.

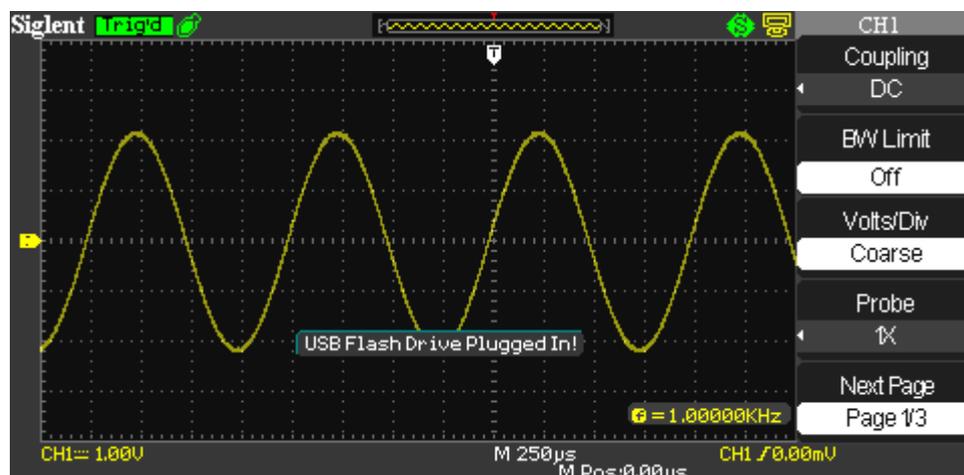


Figure 2-5 USB drive in interface

3. Press Save/Recall button to display Save/Recall menu, then select “File” at the second option “Save To” and select “Save” to enter file save/recall interface.



Figure 2-6 File save interface

4. Remove the U disc and quickly a prompt message “USB Flash Drive Plug Out!” appears.

USB Device Test

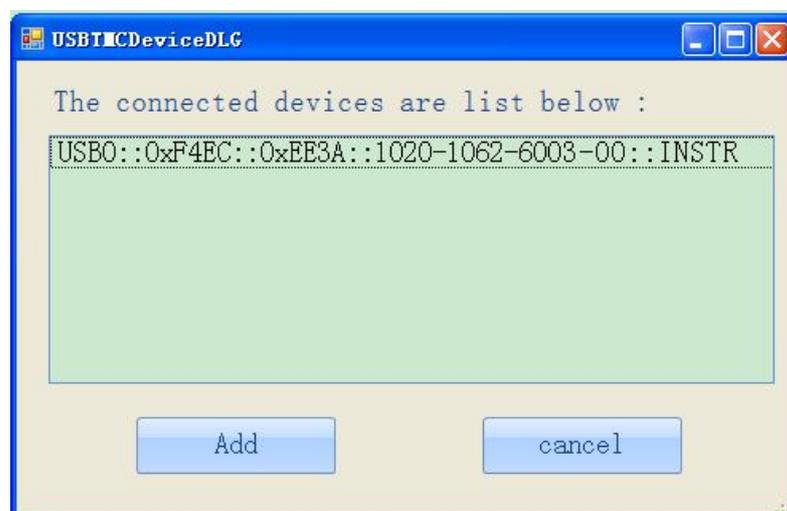
To test if the USB Device interface works normally connected with EasyScope software.

Tools:

- A SDS1000CFL oscilloscope
- A computer with USB interface
- A standard USB cable (Type AB)
- EasyScopeX software for SDS1000CFL

Steps:

1. Set up EasyScopeX 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, and then select “USBTMC” in “Back USB” menu under the UTILITY menu of the oscilloscope.
3. Run EasyScopeX. Click “Add Device” at the upper left corner of the EasyScope interface and immediately displays the “USBTMCDeviceDLG” interface, then click the “Add” on the interface to complete the connection.



LAN Port Test

To test if the LAN interface works normally connected with NI Visa software.

Tools:

- A SDS1000CFL Oscilloscope
- A computer with LAN interface
- A standard LAN cable
- NI Visa software

Steps:

1. Set up NI Visa software in a computer and Install the driver step by step following the instructions.
2. Press UTILITY→Page3/4→ IP Setting, input usable IP Address and Subnet Mask.

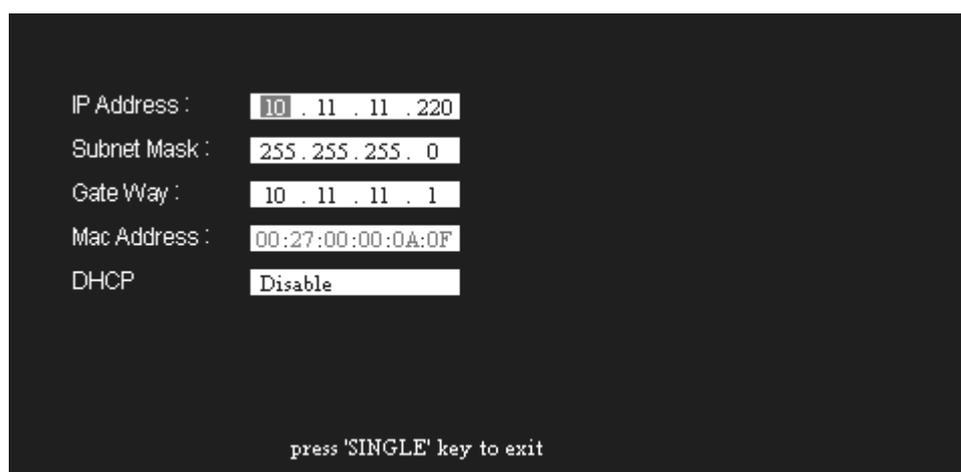


Figure 2-7 IP Setting interface

3. Connect the oscilloscope and the computer using an LAN cable via LAN interface. Open NI Visa and then add the IP above step by step automatically according to its instructions.

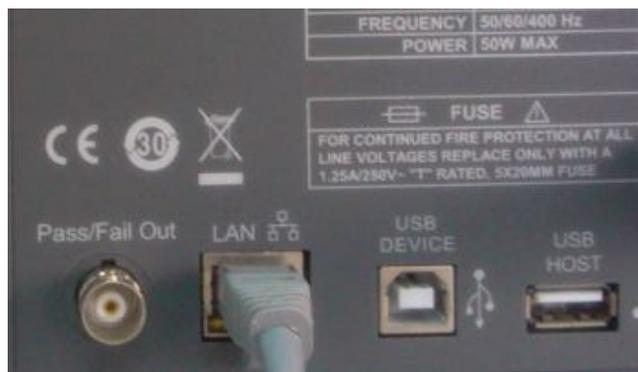


Figure 2-8 LAN interface

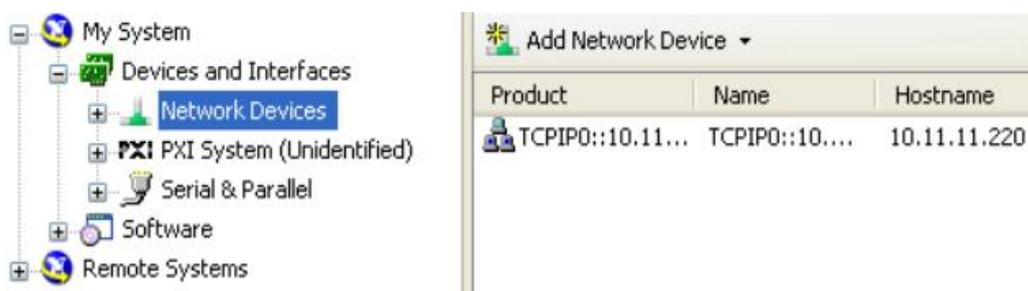


Figure 2-9 NI Visa Interface

4. Double click the TCPIP0 under “Network Device” to turn to the following interface:

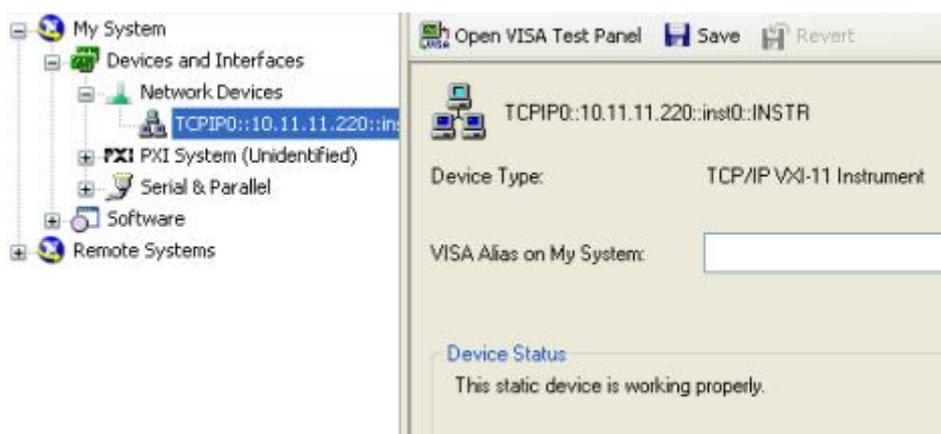


Figure 2-10 NI Visa Interface

5. Click “Open VISA Test Panel” on the above interface, then displays the following interface:

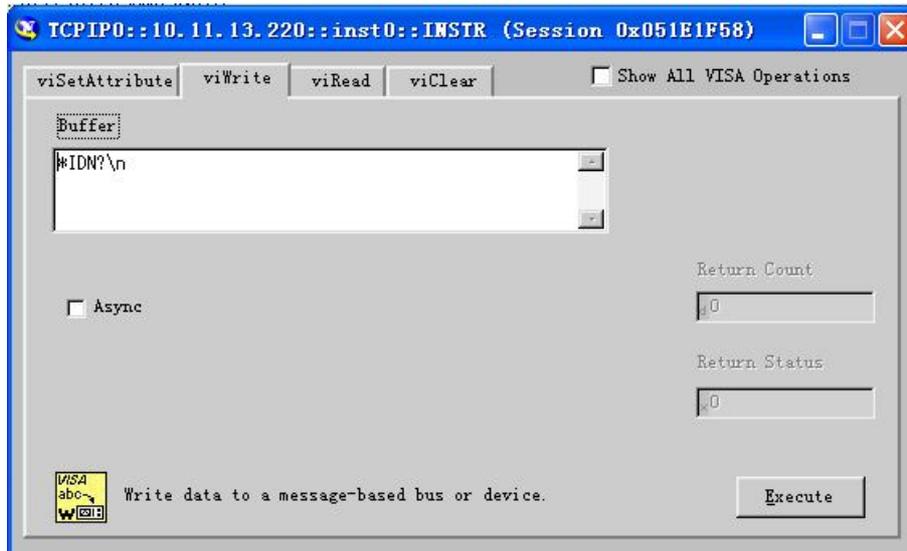


Figure 2-11 viWrite Interface

- Input command like “*IDN?\n” under viWrite interface and click “Execute”, then click viRead to turn to viRead interface, and click “Execute” to read the command.

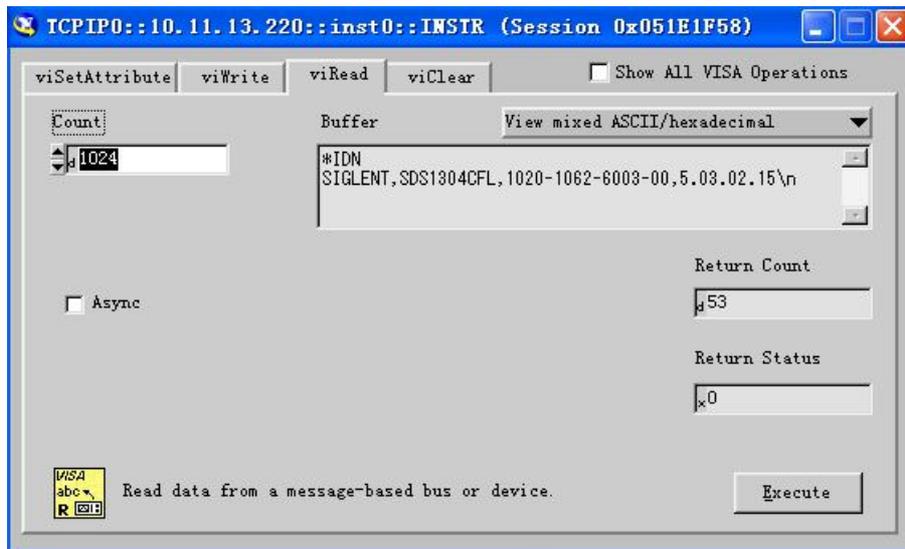


Figure 2-12 viRead Interface

Pass/Fail out Test

To test if the Pass/Fail interface works normally connected with another oscilloscope.

Tools:

- A SDS1000CFL Oscilloscope
- Another Scope
- Two BNC cables
- An arbitrary waveform Generator

Steps:

1. Turn on the SDS1000CFL oscilloscope.
2. Input 1 KHz Sine signal to CH1 using the waveform Generator through a BNC cable, then press AUTO on the front panel of the Oscilloscope.
3. Press “UTILITY” button → page3/4 → 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
Output	Pass
Stop On Output	Off
Mask setting	
X Mask	0.24div (arbitrary)
Y Mask	0.24div (arbitrary)

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, you will see the waveform displays as the following:

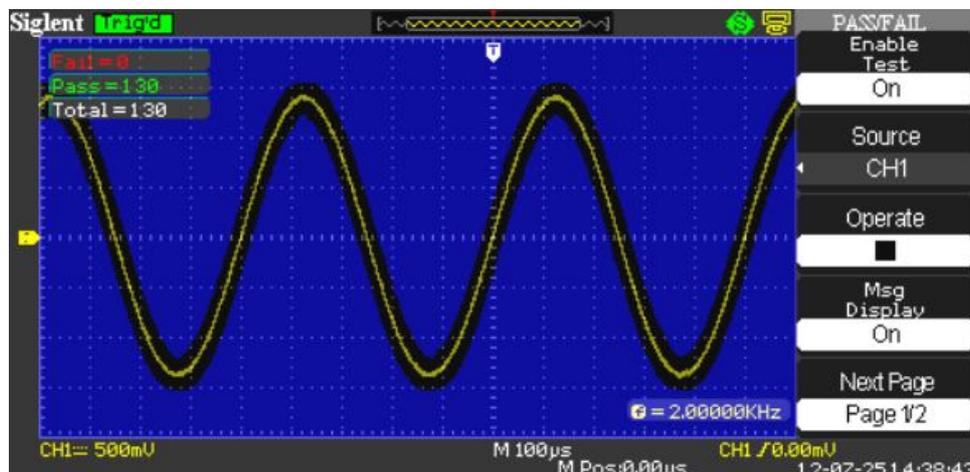


Figure 2-13 Pass/Fail Waveform

If the waveform is in the range that set under menu of Mask setting, it is allowed to pass. Otherwise, it fails to pass.

4. Connect the Pass/Fail BNC terminal of CFL oscilloscope to a channel BNC terminal of another oscilloscope.
5. If the Pass/Fail interface works normally, then you will see a pulse wave as below displays on another oscilloscope by properly adjusting its time base and voltage scale. Otherwise, there might be errors to the interface.

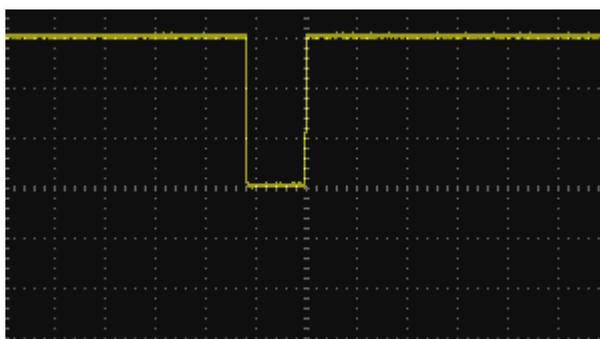


Figure 2-15 Pulse Waveform

Performance Test

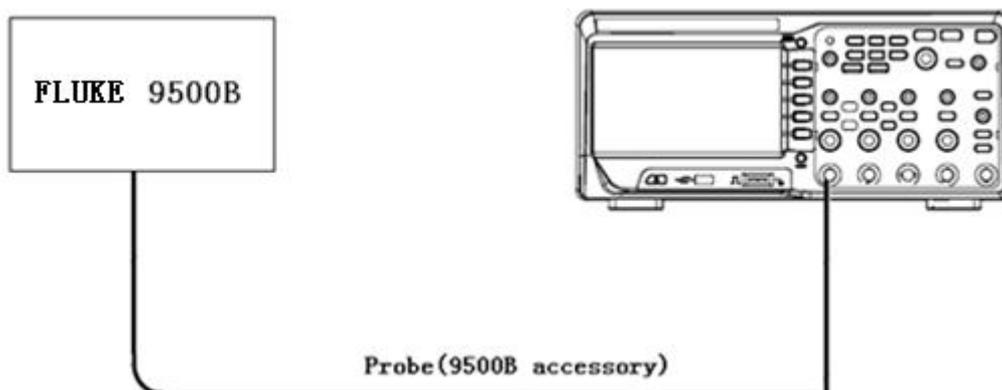
This chapter mainly explains how to perform tests to make sure that the oscilloscope meets the performance specifications. For accurate test results, please let the test requirement and the oscilloscope warm up 30 minutes before testing.

Here are the required equipments for the test:

Table 3-1 Test equipments

Description	Critical Specifications	Example
DC Voltage Source	-6mv~30v, $\pm 0.1\%$ accuracy	FLUKE 9500B Calibrator
Sine Wave Generator	10Hz~300MHz, $\pm 0.1\%$ amplitude accuracy	
BNC Cable	BNC(m) to BNC(m), About 1m long	
50 Ω Feedthrough Termination	50 Ω BNC(f) to BNC(m)	

Here is the connecting between FLUKE 9500B and the oscilloscope under test:



Picture 3-1 Connecting test instruments

Verify Test Results

To verify whether a test passes, whether the readings are within the limits, it is necessary for you to record the readings in the Performance Test on 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 must perform the Self Calibration operation described in chapter 2. If the environmental temperature changes by more than 5° , you must perform the Self Calibration operation again.

To verify DC Gain Accuracy

$$\text{DC Gain Accuracy error} = |1 - \{(V_{\text{pos}} - V_{\text{neg}}) / (V_{\text{Setting}(+)} - V_{\text{Setting}(-)})\}| < 3\%$$

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

This test verifies DC Gain Accuracy of all channels.

- Steps:
1. Set the DC voltage source output level to **0v**.
 2. Connect channel 1 of the oscilloscope to the DC voltage source of FLUKE 9500B using the BNC cable specified.
 3. Set the Volts/Div of channel 1 to 5v/div.
 4. Set the DC voltage output level to the positive voltage listed below and then record the reading as V_{pos} .
 5. Reverse the polarity of the DC voltage source and then record the reading as V_{neg} .
 6. $V_{\text{sub}} = V_{\text{pos}} - V_{\text{neg}}$, calculate V_{sub} and then check to see if it is in the accuracy limits range below.
 7. Set the Volts/Div of channel 1 from 2v/div to 2mv/div, and then record the reading in the same way as step 4 to 6.
 8. Set DC voltage source output level to 0v.
 9. Disconnect the connection of channel 1.
 10. Check the other channels in the same way as step 1 to 9.

Table 3-2 DC Gain Accuracy

Volt/Div	DC voltage output levels	Accuracy limits range for V_{sub}
5v/div	+15V, -15V	29.1 V~30.9 V
2v/div	+6V, -6V	11.64 V~12.36 V
1v/div	+3V, -3V	5.82 V~6.18 V
500mv/div	+1.5V, -1.5V	2.91 V~3.09 V
200mv/div	+600mV, -600mV	1.164 V~1.236 V
100mv/div	+300mV, -300mV	582 mV~618 mV
50mv/div	+150mV, -150mV	291 mV~309 mV
20mv/div	+60mV, -60mV	116.4 mV~123.6 mV
10mv/div	+30mV, -30mV	58.2 mV~61.8 mV
5mv/div	+15mV, -15mV	29.1 mV~30.9 mV
2mv/div	+6mV, -6mV	11.52 mV~12.48 mV

To verify Bandwidth

This test checks the bandwidth of all input channels. In the test, both the impedance of FLUKE and the oscilloscope are required to set to 50Ω , we could complete that for FLUKE by easy operation on the front panel. But for the oscilloscope, it proves to be a little different. As described in chapter 1, the SDS1000CFL series oscilloscope has four different Bandwidths, and only two kinds of them are designed with 50Ω impedance selectable.

Table 3-3 Input Impedance for SDS1000CFL

Model	Channels	Bandwidth	Input Impedance
SDS1072CFL	2	70MHz	Not set
SDS1074CFL	4	70MHz	Not set
SDS1102CFL	2	100MHz	Not set
SDS1104CFL	4	100MHz	Not set
SDS1202CFL	2	200MHz	$50\Omega / 1M\Omega$
SDS1204CFL	4	200MHz	$50\Omega / 1M\Omega$
SDS1302CFL	2	300MHz	$50\Omega / 1M\Omega$
SDS1304CFL	4	300MHz	$50\Omega / 1M\Omega$

For oscilloscope with 70MHz or 100MHz bandwidth, the 50Ω feedthrough terminator need to be added to the end of BNC cable connected to FLUKE 9500B. In addition, for oscilloscope with 200MHz or 300MHz bandwidth, you could also add the 50Ω feedthrough terminator by setting the Input Impedance to $1M\Omega$.

To test the bandwidth at 200mV/div and 100mV/div

- Steps:**
1. Connect channel 1 of the oscilloscope to Sine Wave Generator of FLUKE 9500B via the BNC cable and probe specified for it.
 2. Set the oscilloscope Volt/Div to 200mV/div, the Sec/Div to 50mS/div.
 3. Set the frequency of 9500B to 10Hz.
 4. Set the amplitude of 9500B to 3v.
 5. Press the MEASURE button on the front panel of the oscilloscope to display V_{pp} measurement.
 6. Set the frequency of 9500B to:
 - 70MHz if you are testing a SDS1072/1074CFL
 - 100MHz if you are testing a SDS1102/1104CFL
 - 200MHz if you are testing a SDS1202/1204CFL

- 300MHz if you are testing a SDS1302/1304CFL

Table 3-4 Bandwidth test data

Volts/Div	Input frequency	Vpp measured
200mV/div	10Hz	1.2V
	100Hz	
	1KHz	
	10KHz	
	100KHz	
	1MHz	
	10MHz	
	20MHz	
	...	
	bandwidth	
100mV/div	10Hz	600mV
	100Hz	
	1KHz	
	10KHz	
	100KHz	
	1MHz	
	10MHz	
	20MHz	
	...	
	bandwidth	

7. Every time you set to a frequency, it is better for you to adjust the Sec/Div to a proper value thus to display a perfect waveform.
8. The V_{pp} measurement of the waveform will decrease as the frequency increases, check the frequency, which is defined as the bandwidth, until the V_{pp} measurement is closest to 0.848v.
9. Disconnect the test connection.
10. Check the other channels in the same way as step 1 to 9.

For test at 100mV/div, please perform the same operation as that at 500mV/div, except for the initial amplitude and amplitude at bandwidth listed below.

Table 3-4 Amplitude at bandwidth

Volts/Div	Initial amplitude	Amplitude at bandwidth	Initial frequency
200mV/div	1.2V	$0.707 \times 1.2V = 0.848v$	10 Hz
100mV/div	600mV	$0.707 \times 600mV = 424mV$	10 Hz

To verify Time Base Accuracy

This test checks the time base accuracy of one channel. In the test, both the impedance of FLUKE and the oscilloscope are required to set to 50Ω. For detailed information about adding 50Ω feedthrough terminator with different types of CFL oscilloscope at the end of BNC cable connected to FLUKE 9500B, please refer to corresponding information in bandwidth verification above.

Time Base Accuracy: Freq/10M < 50ppm

- Steps:**
1. Connect selected channel of the oscilloscope to the Sine Wave Generator of FLUKE 9500B.
 2. Set the frequency of 9500B to 10MHz.
 3. Set the oscilloscope Volts/Div to 500mv/div.
 4. Set the oscilloscope Sec/Div to 1ms/div.
 5. Press MEASURE button on the front panel of the oscilloscope to display Freq measurement.
 6. Calculate Freq/10M to see if the value is within the range of 50ppm, which means correct time base accuracy.
 7. Disconnect the test connection.

To verify Trigger Sensitivity

To test trigger sensitivity at the frequency of 100KHz, 10MHz and bandwidth.

Table 3-5 Trigger sensitivity data

Volts/Div	Frequency	Trigger Range
500mv/div	100KHz	500mVpp
500mv/div	10MHz	500mVpp
500mv/div	bandwidth	750mVpp

- Steps:**
1. connect the selected channel of the oscilloscope to the Sine Wave Generator of FLUKE 9500B.
 2. Set the oscilloscope Volts/Div to 500mv/div.
 3. Set the oscilloscope Sec/Div to 5us/div.
 4. Set the frequency of the Sine Wave Generator to 100KHz.
 5. Set the amplitude of the Sine Wave Generator to 500mVpp, so that the Vpp measurement of the oscilloscope is approximately 500mv.
 6. Press Trigger LEVEL button to move the waveform to the screen center.
 7. Adjust the Trigger LEVEL within the waveform range to check if there is stable trigger.
 8. Set the oscilloscope Sec/Div to 50ns/div.
 9. Set the frequency of the Sine Wave Generator to 10MHz.
 10. Set the amplitude of the Sine Wave Generator to 500mVpp, so that the Vpp measurement of the oscilloscope is approximately 500mv.
 11. Press Trigger LEVEL button to move the waveform to the screen center.
 12. Adjust the Trigger LEVEL within the waveform range to check if there is stable trigger.
 13. Set the oscilloscope Sec/Div to 5ns/div.
 14. Set the frequency of the Sine Wave Generator to:
 - 70MHz if you are testing a SDS1072/1074DFL
 - 100MHz if you are testing a SDS1102/1104DFL
 - 200MHz if you are testing a SDS1202/1204DFL
 - 300MHz if you are testing a SDS1302/1304DFL
 15. Set the amplitude of the Sine Wave Generator to 750mVpp, so that

the Vpp measurement of the oscilloscope is approximately 750mv.

16. Press Trigger LEVEL button to move the waveform to the screen center.
17. Adjust the Trigger LEVEL within the waveform range to check if there is stable trigger.
18. Disconnect the test connection.
19. Check the other channels in the same way as step 1 to 18.

Adjusting Procedures

This chapter explains how to adjust the SDS1000CFL series oscilloscopes with FLUKE9500B for optimum operating performance. Only qualified personnel should perform this procedure.

Warming up

Before performing the adjustment procedures, you must let the oscilloscope and other test equipments 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 an internal routine which uses internally generated signals to optimize circuits that affect channel sensitivity, offset, and trigger parameters, to optimize the signal path in the oscilloscope. Let the oscilloscope warm up before performing this procedure.

Required Equipments

PC: Inter Pentium processor, Windows XP operating system, USB interface, Microsoft Office Excel 2003, NI-GPIB Card and corresponding NI-488.2 driver

Calibrating Software: EasyTest, Adjustment script

Test Instrument: FLUKE 9500B with active head

An USB cable (Type AB)

A GPIB cable

Six 10-inch BNC cable

Three BNC T connectors(50 Ω)

Software Installation

1. Install the NI-488.2 driver, select custom installation to install NI-VISA.
2. Install the EasyTest software.
3. Decompress **production. zip** file to E disk directory.

Adjusting steps

1. Connect the FLUKE 9500B with PC using a GPIB cable.
2. Connect the oscilloscope with PC using an USB cable.

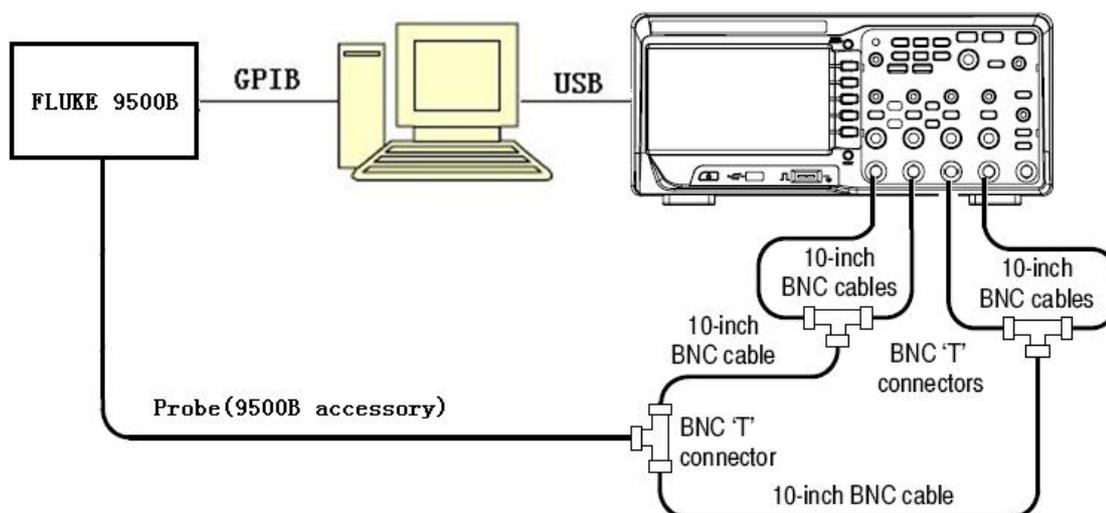


Figure 4-1 Connecting the adjusting devices

3. Turn on FLUKE 9500B, and then set its GPIB address to 22.
4. Turn on the oscilloscope and operate it for about 30 minutes, then perform the Self-Cal routine.
5. Connect the oscilloscope and FLUKE as figure above using the specified probe provided as accessory, BNC T connectors and BNC cables.
6. Open the EasyTest software.
7. Click “open” under the “file” menu, and then select the corresponding Tcl script.
8. Click the “test” button to perform the adjusting procedures.

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

Debugvolt.tcl : indicates adjusting voltage

Debugtrig.tcl : indicates adjusting trigger

Debughori.tcl : indicates adjusting horizon

Debugtrigpre.tcl : indicates adjusting trigger accuracy

Assembly Procedures

This chapter describes how to remove the major modules from the SDS1000CFL 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

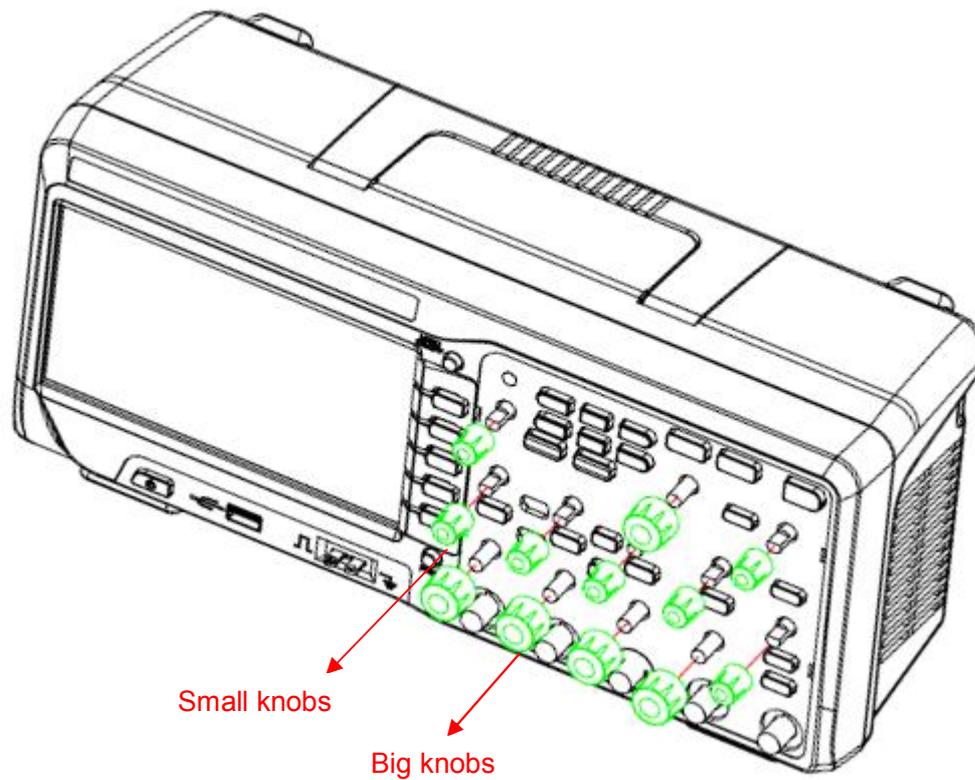


Figure 5-1 Removing the Front -Panel Knobs

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

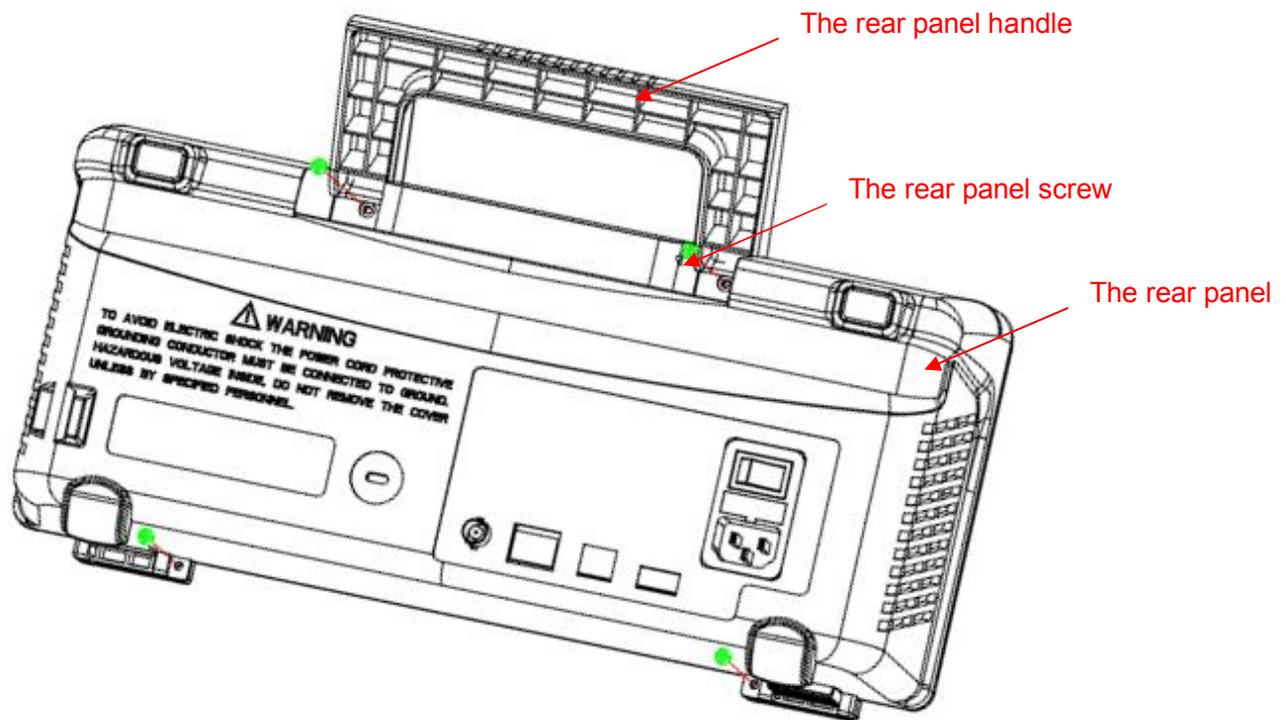


Figure 5-2 Removing the rear panel

Removing steps:

1. Place the oscilloscope face down on a soft surface such as an anti-static mat.
2. Remove the four 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 Top Metal Cover

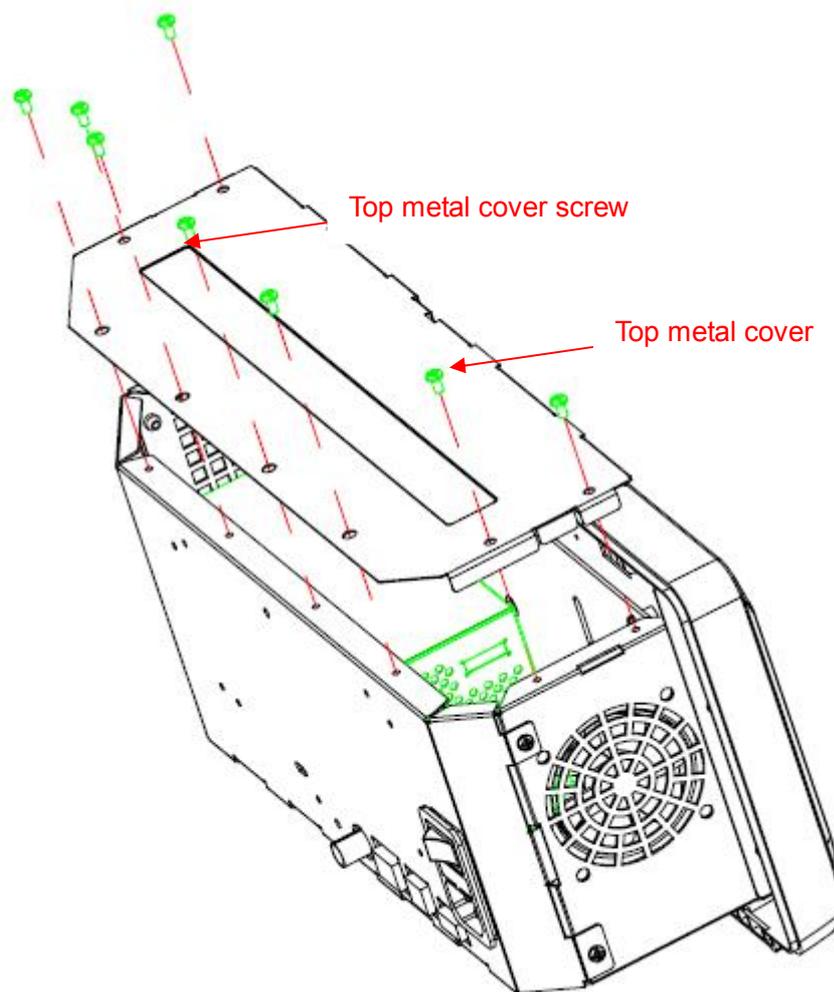


Figure 5-3 Removing the top metal cover

Removing steps:

1. Place the oscilloscope bottom down on a soft surface such as an anti-static mat.
2. Remove the eight screws located on the top metal cover.
3. Since the edge of the top metal cover is sharp, you should lift the top metal cover up and off carefully to avoid personal injury.

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

Removing the Rear Metal Cover

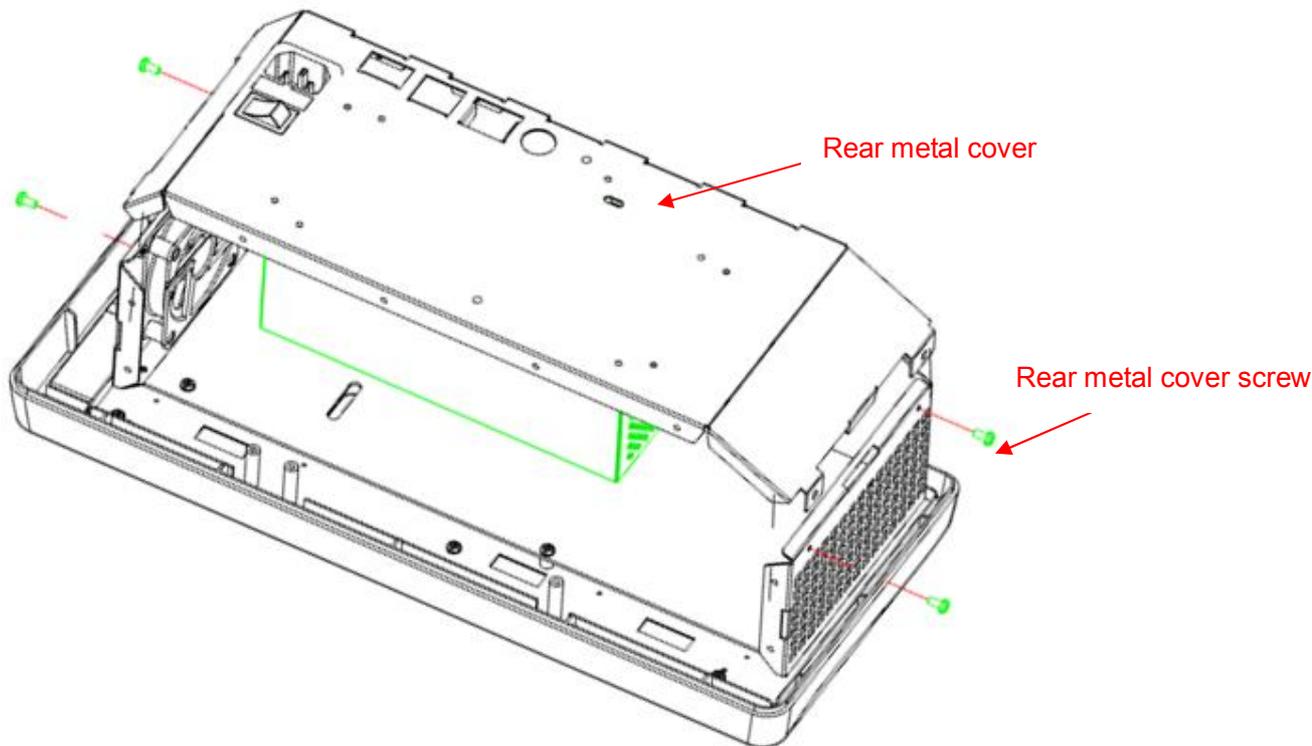


Figure 5-4 Removing the rear metal cover

Removing steps:

1. Place the oscilloscope face down on a soft surface such as an anti-static mat.
2. Remove the four screws located on the rear metal cover.
3. Disconnect the display cable connected to display module and the power cable connected to main board module from power supply module.
4. 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 Power Supply Module

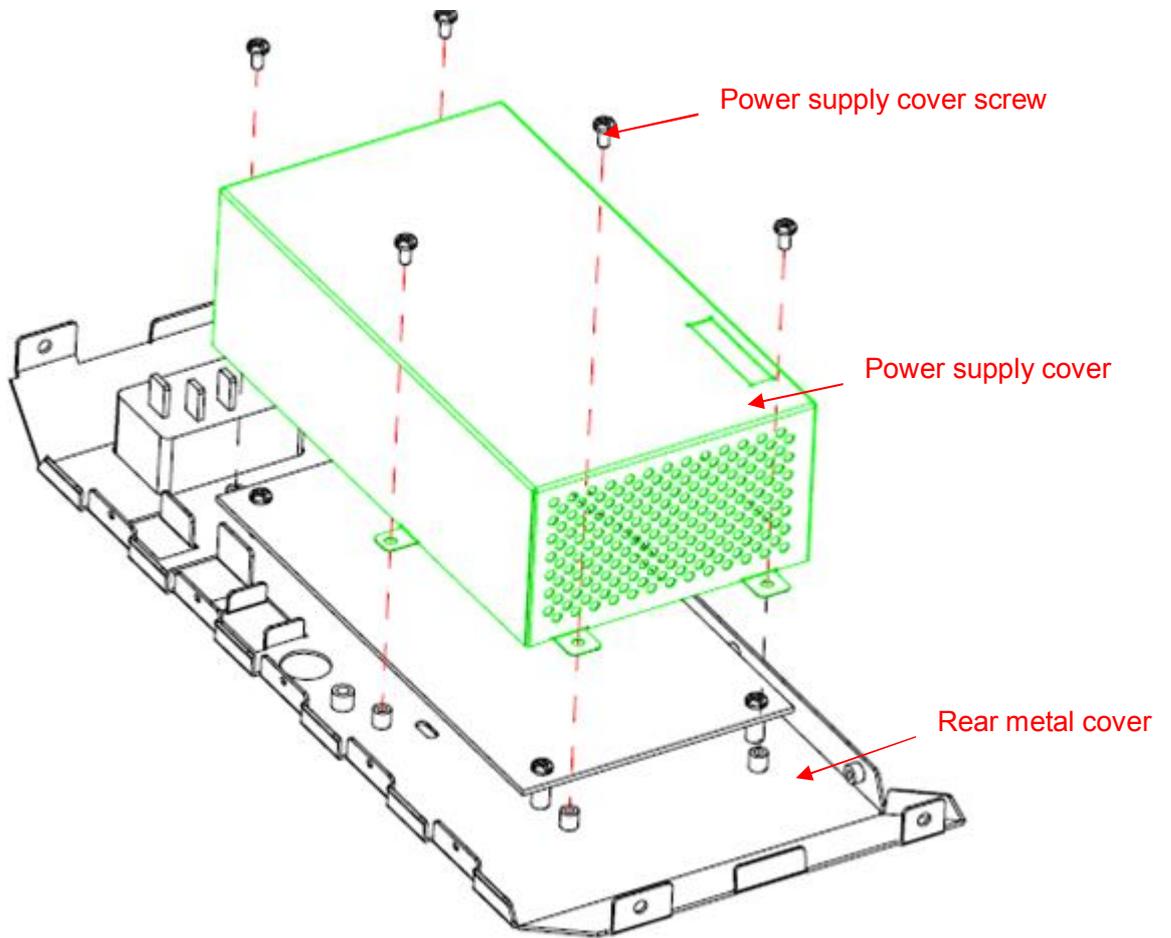


Figure 5-5 Removing the power supply cover

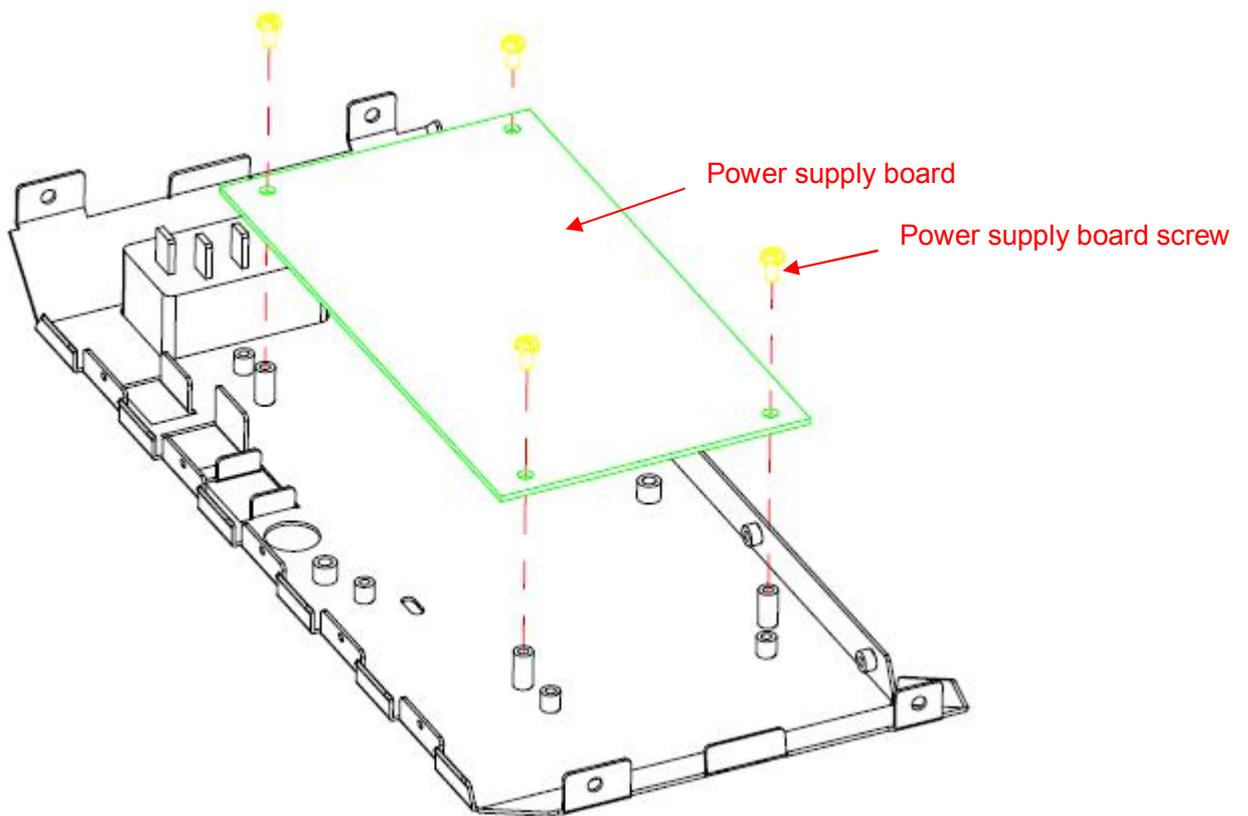


Figure 5-6 Removing the power supply board

Removing steps:

1. Place the rear metal cover on a soft surface such as an anti-static mat.
2. Remove the five screws located on the edge of the rear metal cover.
3. Lift the power supply shield up and off carefully.

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

Removing the Metal Shelf and Interface Module

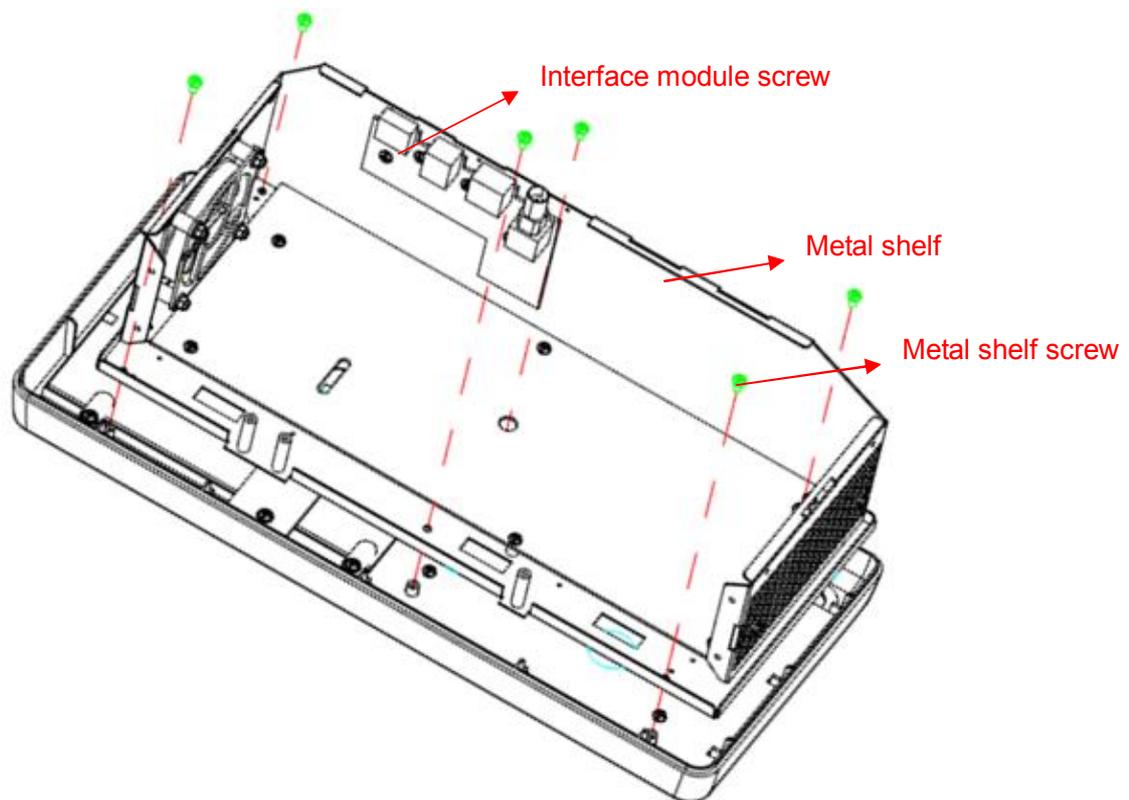


Figure 5-7 Removing the Metal Shelf and Interface module

Removing steps:

1. Place the oscilloscope face down on a soft surface such as an anti-static mat.
2. Disconnect the interface cable from the main board module.
3. Remove the four screws located on the interface module.
4. Remove the six screws located on the edge of the metal shelf.
5. Separate the interface module from the bottom of the oscilloscope and the metal shelf from the front panel, then lift it up and off carefully to avoid personal injury from the sharp edge of the metal shelf.

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

Removing the Main Board

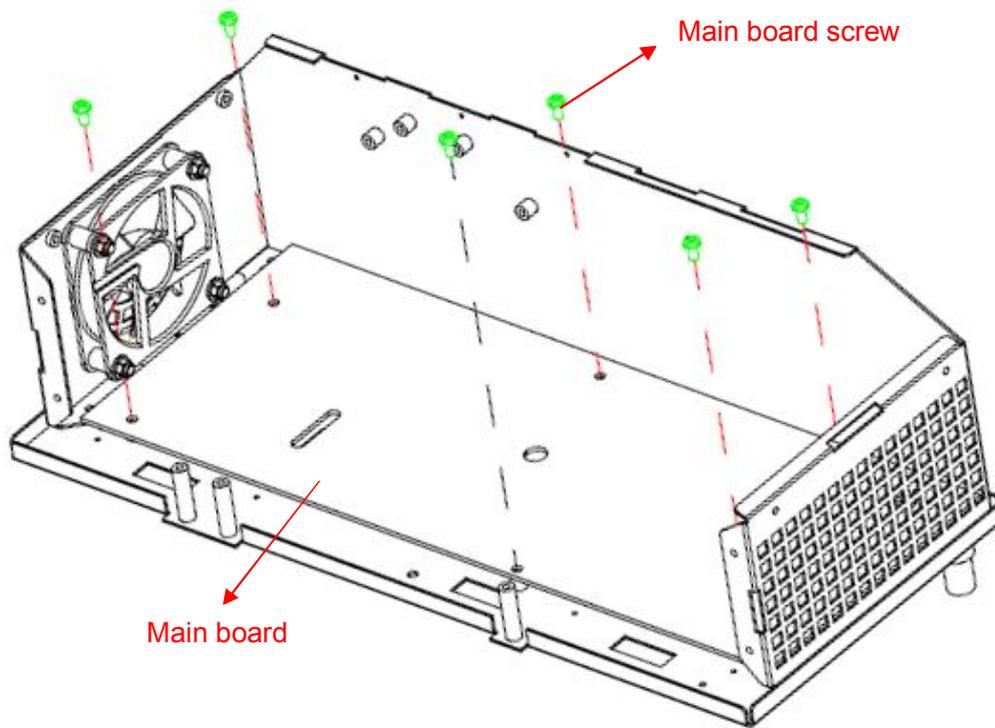


Figure 5-8 Removing the main board

Removing steps:

1. Place the oscilloscope face down on a soft surface such as an anti-static mat.
3. Remove the six screws located on the edge of the main board.
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 Fan Module

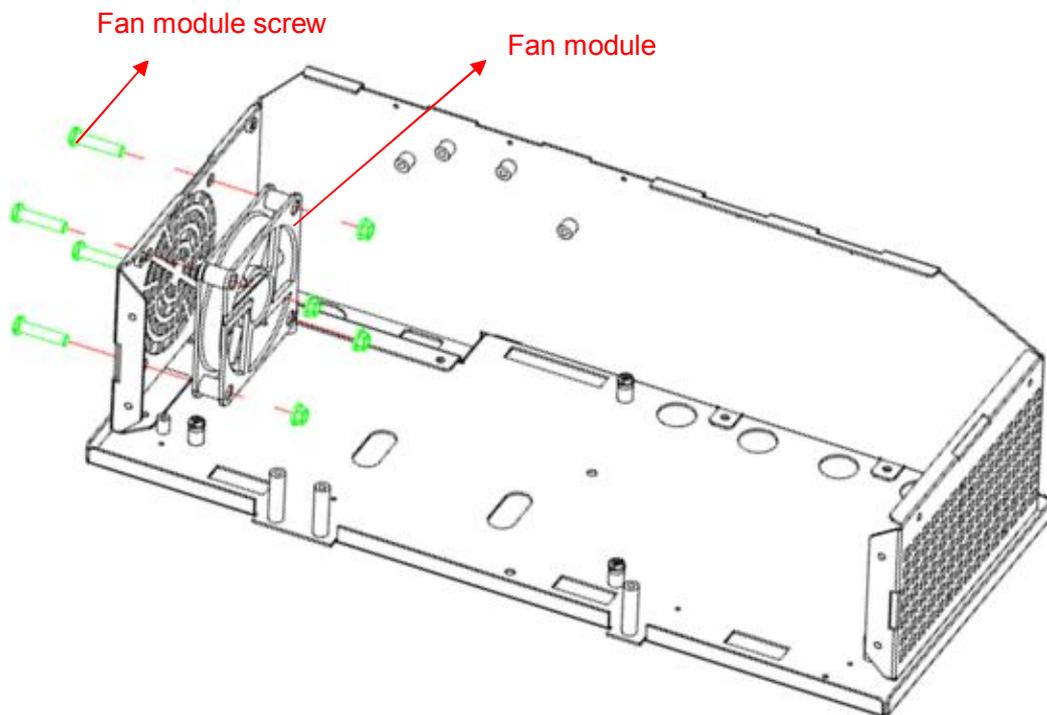


Figure 5-9 Removing the fan module

Removing steps:

1. Place the oscilloscope face down on a soft surface such as an anti-static mat.
2. Disconnect the fan power cable from the main board module.
3. Remove the four screws located on the fan module.
4. Separate the fan from the metal shelf and then remove it away carefully.

To install the fan module, please operate as the reverse steps.

Removing the Keypad Module

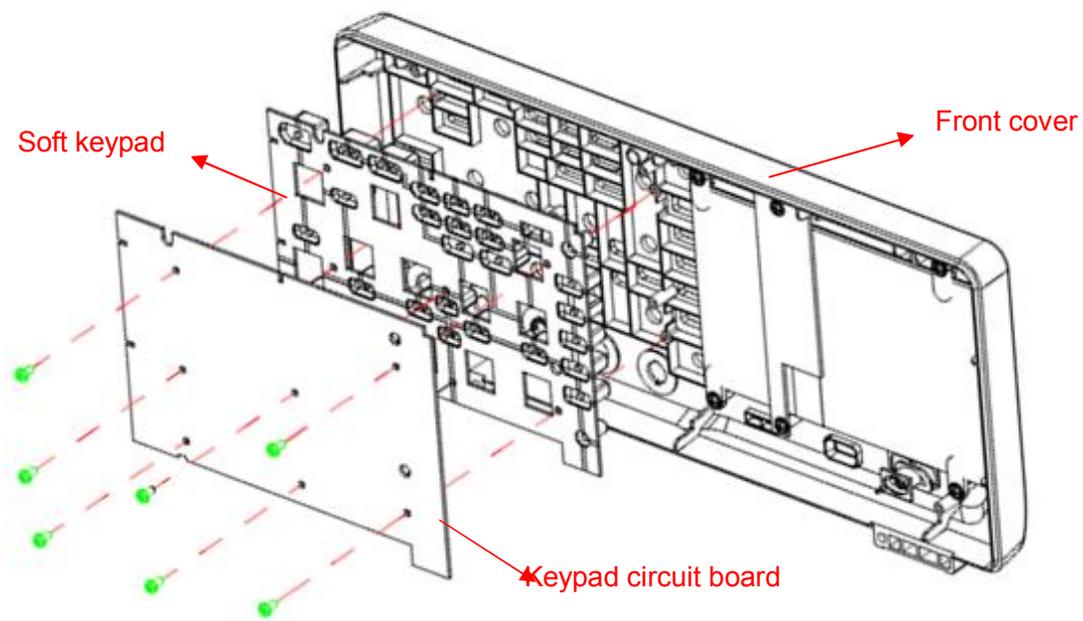


Figure 5-10 Removing the Front Panel Module

Removing steps:

1. Place the oscilloscope down on a soft surface such as an anti-static mat.
2. Remove the front panel module from the keypad, which is made of plastic material to avoid touching the electrical contacts.
3. Separate the keypad from the front cover and then remove it carefully.

To install the keypad, please operate as the reverse steps.

Removing the Display Module

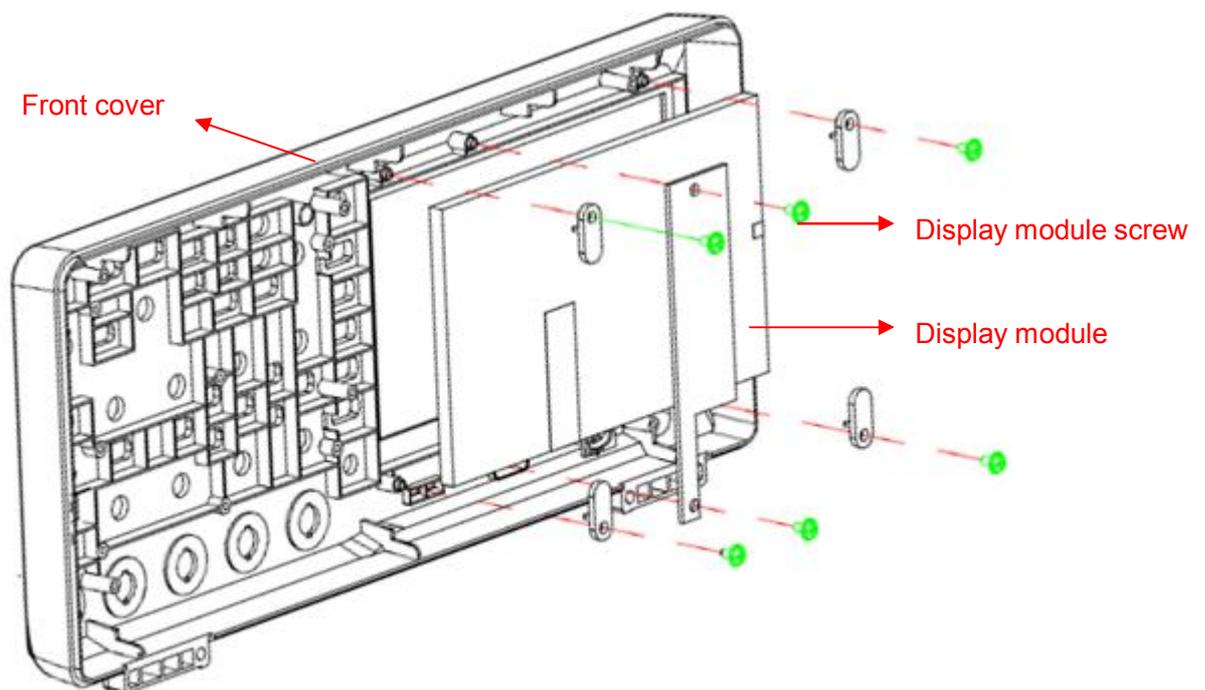


Figure 5-11 Removing the Display Module

Removing steps:

1. Place the oscilloscope down on a soft surface such as an anti-static mat.
2. Remove the six screws located on the edge of the display module.
3. Disconnect the display cable from the main board module.
4. Separate the display module from the front cover and then lift it up and off carefully to avoid damage to the LCD screen.

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

Troubleshooting

This chapter explains how to deal with general troubles that you may encounter while operating SDS1000CFL 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 CFL) 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 menu of "TRIG" 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 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 could automatically replace the above setting.
6. The waveform displays like ladder:
 - (1) The horizontal time base may be too low, you could increase it to improve the horizontal resolution so as to obtain a good waveform displaying.
 - (2) The lines between the sample points may also cause ladder-like displaying if the “Type” in menu of “DISPLAY” is “Vectors”. Please turn the “Type” to “Dots” to solve the problem.
7. USB storage can't be recognized:
 - (1) Check if the USB can work normally.
 - (2) Check if the USB Device interface can work normally.
 - (3) Make sure that the USB disk being used is of flash type, the instrument does not support USB of hardware type.
 - (4) 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.
 - (5) Restart the instrument and then insert the USB to check it.
 - (6) If it is still in abnormal use, 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 display 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.

Table 6-1 Required equipments

Equipment	Critical Specifications	Example
Digital Multimeter	Accuracy $\pm 0.05\%$ 1 mV resolution	Agilent 34401A
Oscilloscope	300MHz BW 1M Ω /50 M Ω impedance	SDS1304CFL

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.

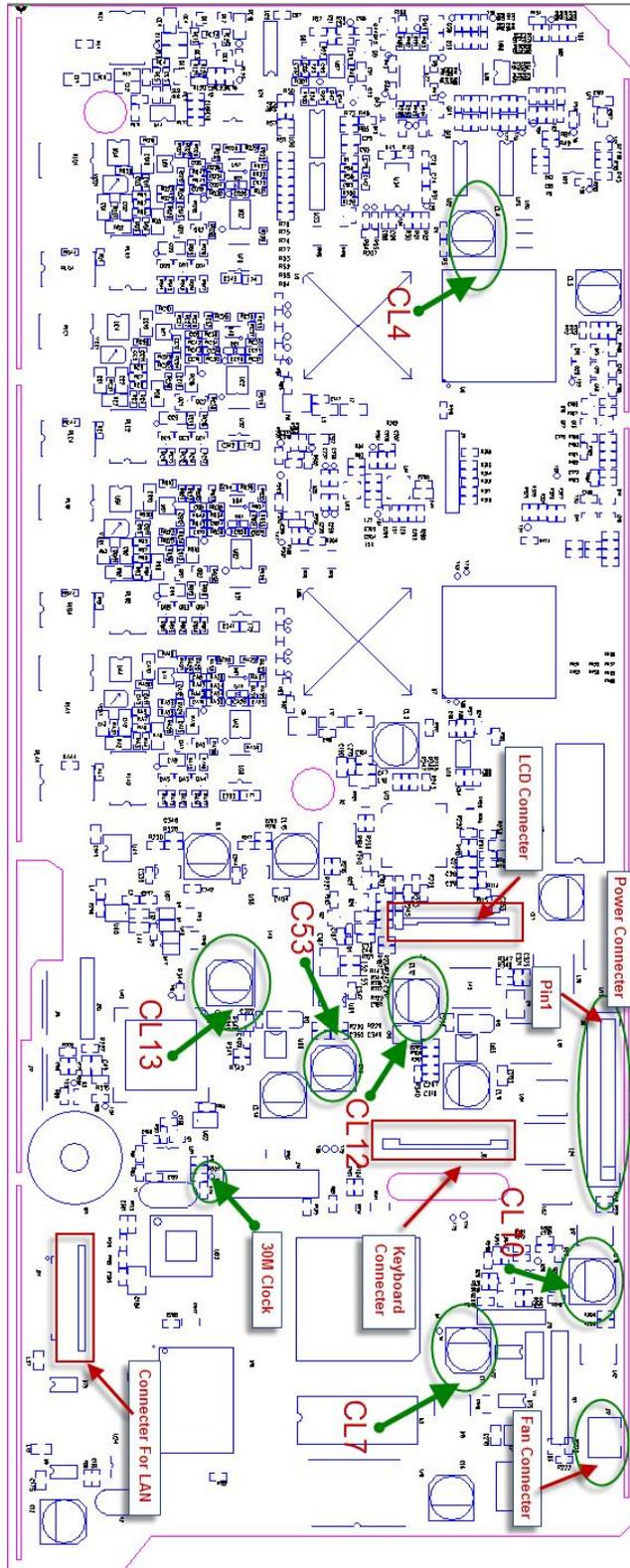


Figure 6-1 Main board module

Troubleshooting Flowchart

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

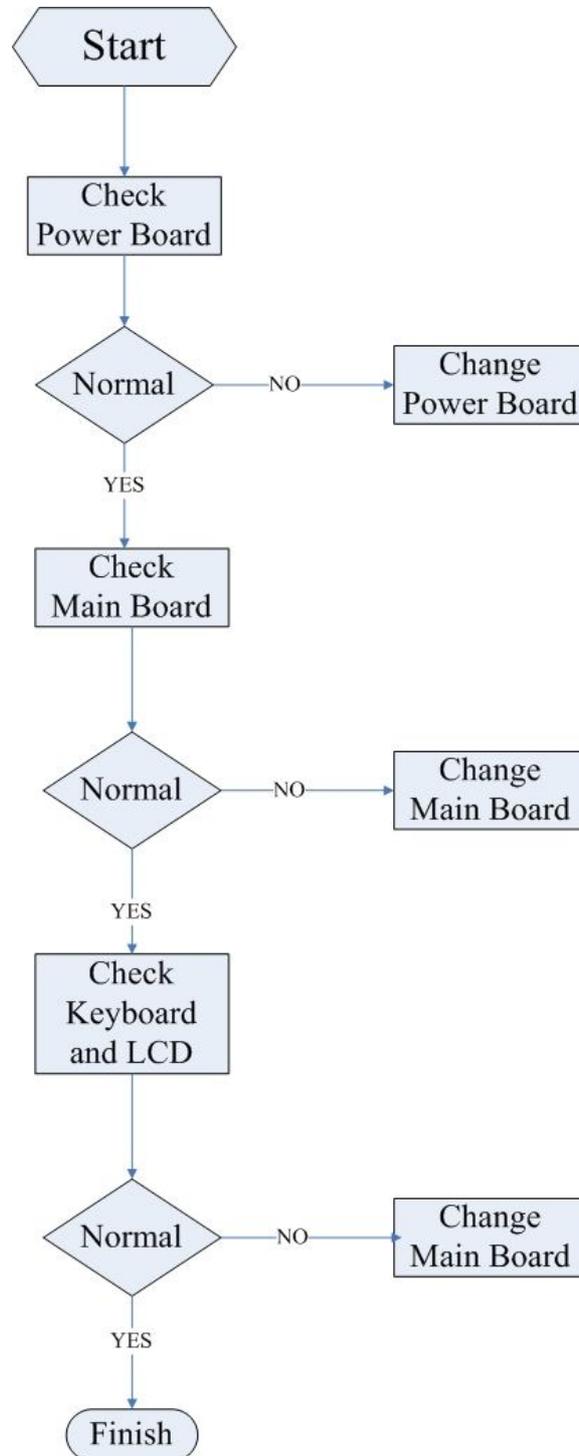


Figure 6-2 Troubleshooting flowchart

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 12 pins from Pin1 to Pin12 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	Error
0V	Pin1, Pin5, Pin8, Pin12	NULL
-10V	Pin4	20%
6.5V	Pin6, Pin7, Pin9, Pin10	10%
15V	Pin11	5%

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, back USB Connector and Connector for LAN 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

Components tested	Voltage (V)	Error (V)
CL4	-5	±0.1
CL12	3.3	±0.1
CL7	1.25	±0.1
CL10	5	±0.1
CL13	1.9	±0.1
C53	1.25	±0.1

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 "30M Clock" on the main board drawing.

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

If the clock measurement is 30M with abnormal working of the main 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 and the backlight inverter 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 inverter cable.

If the measurement is within the range of $-11V \sim -9V$, please reconnect the backlight inverter cable 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 of $-11V \sim -9V$, 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 Clock tested is 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 if the power cord is correctly connected, if the power button is ok and if the fuse is damaged.
No displaying after power on	Check if the backlight inverter cable is correctly connected.
No response after pressing any button in condition that the other parts work normally	Check if the keypad cable is correctly connected to the main board.
Every time the oscilloscope is turned on, the Time displays at the lower right corner restores to its initial value.	Check and replace the button battery on the main board.
The USB interface works abnormally	Check if the back USB cable is correctly connected.
The LAN interface works abnormally	Restore the internet access to its initial setting.

Maintenance

Maintain summary

SIGLENT warrants that the products it manufactures and sells are free from defects in materials and workmanship for a period of three years from the date of shipment from an authorized **SIGLENT** distributor. If a product or CRT 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 that 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 case shall **SIGLENT** be liable for indirect, special or consequential damages

Inspecting and Care

This section explains how to inspect the oscilloscope and shipping container as well as general care and cleaning of the oscilloscope. Here are detailed information about this.

General Inspecting

1. Inspect the shipping container.

Keep the damaged shipping container or 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 would not provide free maintenance or replacement.

2. Inspect the instrument.

If there are instruments found damaged, defective or failure in electrical and mechanical tests, please contact SIGLENT.

3. 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.

Standard Accessories:

- Two pieces 1:1,(10:1) Passive Probes
- An User Manual
- A Certification
- A Guaranty Card
- An CD(including EasyScope3.0 computer software system)
- A Power Cord that fits the standard of destination country
- An USB Cable

General Care and Cleaning**Care:**

Do not store or leave the instrument in direct sunshine for long periods of time.

Notice:

- To avoid damages to the instrument or probe, please do not leave them in fog, liquid, or solvent.

Cleaning:

Please perform the following steps to clean the instrument and probe regularly according to its operating conditions.

1. Disconnect the instrument from all power sources, and then clean it with a soft wet cloth.
2. Clean the loose dust on the outside of the instrument and probe with a soft cloth. When cleaning the LCD, take care to avoid scarifying it.

Notice:

- To avoid damages to the surface of the instrument and probe, please do not use any corrosive liquid or chemical cleanser.
- Make sure that the instrument is completely dry before restarting it to avoid short circuits or personal injuries.

Replaceable Parts

SIGLENT provides a list of replaceable parts for SDS1000CFL oscilloscopes. Within the list, you could exchange or purchase wanted modules for new manufactured. Please see the following table for detailed information.

Table 7-1 Updating Parts Item

No.	Module Name	Specification
1	On-Off button	
2	Back Rind	
3	Big knobs	
4	Small knobs	
5	Bolts	PM2.5*10
6	Bolts	PA3*8
7	Bolts	PA3*10
8	Back cover board	
9	Bolts	KM3*8
10	Top cover board	
11	Bolts	KM3*30
12	Fan	
13	Bolts	BM3*8
14	Bolts	PA3*8
15	Metal shelf	
16	Silica gel key	
17	Bolts	BM3*8
18	Main board	
19	BNC nuts	
20	LCD	
21	Bolts	KM3*8
22	Keyboard	
23	Front panel	

All the replaceable parts above are available through contacting your local **SIGLENT** office or representative. For more information about the module exchange, please refer to “Contact **SIGLENT**”.

Contact SIGLENT

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