SDS Series

Smart Digital Storage Oscilloscopes

Service Manual

- **SDS6062**
- **SDS7102**
- **SDS8102**
- **SDS8202**

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Each Owon product is warranted to be free from defects in material and workmanship under normal use and service. The warranty period of oscilloscope is three years and the warranty period of accessories is one year, and begins on the date of shipment. Parts, product repairs and services are warranted for 90 days. This warranty only apply to the original buyer or customers of a Owon authorized dealer, and does not apply to fuses, disposable batteries or to any product which, in Owon's opinion, has been misused, altered, neglected or damaged by accident or abnormal conditions of operation or handling. Owon warrants that software will operate substantially in accordance with its functional specifications for 90 days and that it has been properly recorded on non-defective media. Owon does not warrant that software will be error free or operate without interruption.

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Owon's warranty obligation is limited, at Owon's option, to refund of the purchase price, free of charge repair, or replacement of a defective product which is returned to an Owon authorized service center within the warranty period.

To obtain warranty service, contact your nearest Owon authorized service center or send the product, with a description of the difficulty, postage and insurance prepaid (FOB Destination), to the nearest Owon authorized service center. Owon assumes no risk for damage in transit. Following warranty repair, the product will be returned to Buyer, transportation prepaid (FOB Destination). If Owon determines that the failure was caused by misuse, alteration, accident or abnormal condition of operation or handling, Owon will provide an estimate of repair costs and obtain authorization before commencing the work. Following repair, the product will be returned to the Buyer transportation prepaid and the Buyer will be billed for the repair and return transportation charges (FOB Shipping Point).

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General Safety Summary

Operation security

Read the security information carefully before use.

Safety Terms and Symbols

Specific Warning and Caution Terms that Appear throughout the Manual

Warning: "Warning" identifies conditions and actions that pose hazards to the users.

Caution: "Caution" identifies conditions and actions that may damage the product or other properties.

Terms Used on the Product

The following terms appears possibly on the product:

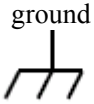
Danger: The term "Danger" is used in this manual to indicate that when you read this mark, personal injury may be caused to you immediately.

Warning: The term "Warning" is used in this manual to indicate that when you read this mark, personal injury may not be caused to you immediately, but you need to be cautionary.

Notice: The term "Notice" is used in this manual to indicate that damages may be caused on this product or other properties.

Symbols Used on the Product

The following symbols appear possibly on the product.

High voltage	Refer to user manual	Protective ground	Measurement ground	Earth (ground) Terminal
				

Safety Requirement

Carefully read the following safety information in order to avoid any personal injury and damage on this product or any products connected with it. This product can only be used in the specified applications to prevent any possible dangers.

- **Only qualified technical personnel are permitted to perform maintenance.**
- **Prevent fires and personal injuries.**
- **Use professional power wire. Only use the special power wire that is applied to the user state.**
- **Connect and cut off in the proper way. Please do not connect or cut off the probe or the tested wires voluntarily when connecting with the power supply.**
- **Grounding. Make sure the product is earthed properly by grounding conductor before connecting with the input or output terminal that is to avoid electric shock.**
- **Use the probe in a proper way. The grounding terminal of the probe is earth potential.**
- **Pay attention to the nominal values of all terminals:** To avoid fire or electric shock, please keep a watchful eye on all nominal values and marks specified for this product. Before any connection performed on this product, carefully read the user's manual of the product for further information of nominal values.
- **No operation is allowed without the instrument cover plate:** If the cover plate or panel has been removed, do not perform any operation on this product.
- **Use the standard fuse conformed to the product with the rating value.**
- **No touch is allowed on bare conductors:** When the product is powered on, do not touch any bare joints or parts of the scope meter.
- **Operation is prohibited in case of any undetermined failure:** When in doubt any damage on this product, consult the qualified personnel for checking on it.
- **Keep ventilation in good condition:** Read the user manual for detail installation instructions in order to fix this product correctly and provide it with good ventilation conditions.
- No operation is allowed under a humid environment.
- No operation is allowed under an explosive environment.
- Keep clean and dry on the product surface.

To avoid body damage and prevent product and connected equipment damage. This product can only be used in the specified applications. Carefully read the following safety information before using the test tool.

⚠ **Warning:**

To avoid fire or electrical shock if a test tool input is connected to more 42V peak (30Vrms) or on circuits of more than 4800VA:

- **Use only insulated voltage probes, test leads and adapter supplied with the test tool, or indicated by OWON as suitable for the Oscilloscope & Multimeter.**
- **Before use, inspect voltage probes, test leads and accessories for mechanical damage and replace when damaged.**
- **Remove all probes, test leads and accessories that are not in use.**
- **Remove all the PC communication connection.**
- **Do not apply input voltages above the rating of the instrument. Please be careful when using 1:1 test leads because the probe tip voltage will be directly transmitted to the Oscilloscope & Multimeter.**
- **Do not use exposed metal BNC or banana plug connectors.**
- **Do not insert metal objects into connectors.**

Section 1: General Information

1.1 Introduction

This service manual contains information on adjusting and servicing the SDS Series Oscilloscope.

Chapter *General Information* simply introduces the specifications of the oscilloscope.
Chapter *Installation* introduces the theory of installing.
Chapter *Test and Calibration* simply introduces some theory and method of tests.
Chapter *Debugging and Calibration* supplies some modules for adjust and some methods.
Chapter *Maintenance* mainly supplies some parts to customers for service
Chapter *Replaceable Parts* mainly introduces theories and methods of servicing.

1.2 Accessories Supplied

Standard Accessories:

- 2 Passive probe: 1.2 m, 1:1 (10:1)
- CD: x 1 (PC link application software)
- Power cord: 1pcs, up to the standards of the country in which it is used.
- USB cable
- User Manual: 1pcs

Options:

- Battery

1.3 Technical Specifications

Unless otherwise specified, the technical specifications applied are applicable to the probe with the attenuation switch setting 10X and the SDS series digital oscilloscope. Only if the oscilloscope fulfill the following two conditions at first, can these specification standards be reached.

- This instrument should run for more than 30 minutes continuously under the specified operating temperature.
- If the change range of the operating temperature is up to or exceeds 5℃, open the system function menu and execute the “Auto-calibration” procedure (see “4.4 Auto-calibration” on P17).

All specification standards can be fulfilled, except one(s) marked with the word “Typical”.

Table 1: Specifications

Performance Characteristics		**Instruction**	
Bandwidth		SDS6062	60MHz
		SDS7102	100MHz
		SDS8102	100MHz
		SDS8202	200MHz
Channel		2 + 1 (External)	
Acquisition	Mode	Normal, Peak detect, Averaging	
	Sample rate (real time)	SDS6062	500MS/s (250MS/s for dual channels)
		SDS7102	1GS/s (500MS/s for dual channels)
		SDS8102	2GS/s (1GS/s for dual channels)
		SDS8202	2GS/s (1GS/s for dual channels)
Input	Input coupling	DC, AC , Ground	
	Input impedance	1MΩ±2%, in parallel with 10pF±5pF	
	Probe attenuation factor	1X, 10X, 100X, 1000X	
	Max. input voltage	400V (PK-PK) (DC + AC PK-PK)	
	Bandwidth limit	20MHz, full bandwidth	
	Channel –channel isolation	50Hz: 100 : 1 10MHz: 40 : 1	
	Time delay between channel(typical)	150ps	
Horizontal System	Sampling rate range	SDS6062	0.5S/s~500MS/s single channel* 0.5S/s~250MS/s dual channel
		SDS7102	0.5S/s~1GS/s single channel* 0.5S/s~500MS/s dual channel
		SDS8102	0.5S/s~2GS/s single channel* 0.5S/s~1GS/s dual channel
		SDS8202	0.5S/s~2GS/s single channel* 0.5S/s~1GS/s dual channel
	Interpolation	(sin x)/x	
	Record length	10M points on each channel	
	Scanning speed (S/div)	SDS6062	5ns/div～100s/div, step by 1～2～5
		SDS7102	2ns/div～100s/div, step by 1～2～5

Table 1: Specifications (cont.)

Performance Characteristics		Instruction	
		SDS8102	2ns/div～100s/div, step by 1～2～5
		SDS8202	1ns/div～100s/div, step by 1～2～5
	Sampling rate / relay time accuracy	±100ppm	
	Interval(△T) accuracy (DC～100MHz)	Single： ±(1 interval time+100ppm×reading+0.6ns); Average>16： ±(1 interval time +100ppm×reading+0.4ns)	
Vertical system	A/D converter	8 bits resolution (2 Channels simultaneously)	
	Sensitivity	2mV/div~10V/div	
	Displacement	SDS6062	±10 div
		SDS7102	±1V(2mV～100mV)； ±10V(200mV～1V)； ±100V(2V～10V)
		SDS8102	
		SDS8202	
	Analog bandwidth	60MHz, 100MHz, 200MHz, 300MHz	
	Single bandwidth	Full bandwidth	
	Low Frequency	≥5Hz (at input, AC coupling, -3dB)	
	Rise time	SDS6062	≤5.8ns (at input, Typical)
		SDS7102	≤3.5ns (at input, Typical)
		SDS8102	≤3.5ns (at input, Typical)
		SDS8202	≤1.7ns (at input, Typical)
	DC accuracy	±3%	
	DC accuracy (average)	Average > 16: ±(3% rdg + 0.05 div) for △V	
Measurement	Cursor	△V and △T between cursors	

Table 1: Specifications (cont.)

Performance Characteristics			**Instruction**
	Automatic		Vpp, Vmax, Vmin, Vtop, Vbase, Vamp, Vavg, Vrms, Overshoot, Preshoot, Freq, Period, Rise Time, Fall Time, Delay A→B, DelayA→B, +Width, -Width, +Duty, -Duty
	Waveform Math		＋, －, *, / ,FFT
	Waveform storage		15 waveforms
	Lissajous figure	Bandwidth	Full bandwidth
		Phase difference	±3 degrees
	Frequency (typical)		1KHz square wave
Communication port	USB2.0, USB for file storage, VGA port or RS-232		

***** Single channel is when only one input channel is working.

Table 1: Specifications (cont.)
Trigger:

Performance Characteristics		Instruction
Trigger level range	Internal	±6 div from the screen center
	EXT	±600mV
	EXT/5	±3V
Trigger level Accuracy (typical)	Internal	±0.3div
	EXT	±(40mV + 6% of Set Value)
	EXT/5	±(200mV +6% of Set Value)
Trigger displacement	According to Record length and time base	
Trigger Holdoff range	100ns~10s	
50% level setting (typical)	Input signal frequency ≥50Hz	
Edge trigger	slope	Rising, Falling
	Sensitivity	0.3div
Pulse trigger	Trigger condition	Positive pulse：＞, ＜, ＝ negative pulse：＞, ＜, ＝
	Pulse Width range	24ns～10s
Video Trigger	Modulation	Support standard NTSC, PAL and SECAM broadcast systems
	Line number range	1-525 (NTSC) and 1-625 (PAL/SECAM)
Slope Trigger	Trigger condition	Positive pulse：＞, ＜, ＝ negative pulse：＞, ＜, ＝
	Time setting	24ns～10s
Alternate Trigger	Trigger on CH1	Edge, Pulse, Video, Slope
	Trigger on CH2	Edge, Pulse, Video, Slope

1.4 General Technical Specifications

Table 2: General specifications

Display

Display Type	8” Colored LCD (Liquid Crystal Display)
Display Resolution	800 (Horizontal) × 600 (Vertical) Pixels
Display Colors	65536 colors, TFT screen

Output of the Probe Compensator

Output Voltage (Typical)	About 5V, with the Peak-to-Peak voltage equal to or greater than 1MΩ of load.
Frequency (Typical)	Square wave of 1KHz

Table 2: General Specifications (cont.)

Power

Mains Voltage	100～240 VAC RMS, 50/60Hz, CAT II
Power Consumption	< 18W
Fuse	1A, T grade, 250V
Battery (optional)	Cell:558792 4000mAh/3.7V Pack:2s2p 7.4V/8000mAh

Mechanical Specifications

Dimension	340mm× 155mm×70mm (L*H*W)
Weight	About 1.82 kilogram

Interval Period of Adjustment:

One year is recommended for the calibration interval period.

1.5 Declaration of Conformity

SDS Series Smart Digital Storage Oscilloscopes
Manufacturer: Fujian Lilliput Optoelectronics Technology Co., Ltd.

Statement of Conformity
Base on the result using appropriate standards, the product is in conformity with Electromagnetic Compatibility Directive 2004/108/EC Annex Ⅱ
Low Voltage Directive: 2006/95/EC

Sample tests
Standards used:

EN61010-1：2001
Safety Requirements for Electrical Equipment for Measurement, Control, and Laboratory use-part 1: General Requirements

EN61326-1: 2006
Electrical Equipment for Measurement, Control and Laboratory use-EMC Requirements-part 1. General Requirements

EN61000-3-2: 2006+A2：2009
Electromagnetic Compatibility (EMC)-part 3: Limits-Section 2: Limits for Harmonic Current Emissions (Equipment Input Current less than/equal to 16A per phase)

EN61000-3-3：2008
Electromagnetic Compatibility (EMC)-part 3: Limits-Section 3 Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply systems for Equipment with Rated Current less than or equal to 16A

The tests have been performed in typical configuration.
This conformity is indicated by the symbol CE, i.e."Conformite Europeenne".

Section 2: Installation

2.1 Performing the General Inspection

When you have got a new SDS oscilloscope, it is suggested that you should perform a general inspection on the instrument according to the following steps.

2.1.1 Check whether there is any Damage on it Due to Transportation

If the packing boxes or foam cushions are found in serous damage, keep them in a proper place till the complete instrument and accessories have passed the electrical and mechanical tests.

2.1.2 Make a Check on Accessories

The accessory list has been described in the picture of Digital Oscilloscope Parts of this manual. You can make a check and find whether there is any accessory loss with reference to the Appendix. In case of any accessory loss or damage, consult the OWON dealer responsible for such a business or the local office of OWON.

2.1.3 Make a Check on the Complete Instrument

If the instrument is damaged in its appearance or it fails in normal operation or performance test, consult the OWON dealer responsible for such a business or the local office of OWON. If the instrument is damaged due to transportation, keep the packing in a proper place and consult the transportation department and the OWON dealer responsible for such business, who will provide an instrument replacement or maintenance

2.2 Operating Environment

Table 3: Environment

Temperature	Working temperature: 0 ℃～ 40 ℃ Storage temperature: -20 ℃～ 60 ℃
Relative Humidity	≤ 90%
Height	Operating: 3,000 m Non-operating: 15,000 m
Cooling Method	Natural convection

2.3 Storage and Transport

Do not store or place the instrument in locations where the liquid crystal display (LCD) may be directly exposed to the sunshine for a long time.
Be careful: Do not make spraying agent, liquid and solvent touch with probes to avoid the instrument or probe being damaged.
If the oscilloscope is to be stored for a long time, it is required to charge the lithium battery before storage.
Take and put gently and prevent rain in the process of transportation.

2.4 Packaging

Packaging: default packaging.
Other packaging methods:
A) Wraps with pasteboard or thick plastic.
B) With the intensity big packing case. (Made with such as double-decked cartoon paper)
C) Wraps with 70mm - 100mm sacrificially all around the instrument for quakeproof.
D) Place “the danger” on the packaging.

If the box or blister package has been damaged seriously, please keep it until the instrument and all the accessories are passed your test.

2.5 Tagging for Service

The tagging is the certificate for the customer to require servicing. So please do not arbitrary tears and modifies it.

2.6 Power Supply Requirement

Use only the power cord specified for this product and certified for the country of use. Make sure that the product is properly be grounded.

2.7 Cleaning Requirements

Cleaning

Inspect the instrument and probes as often as operating conditions require.
To clean the instrument exterior, perform the following steps:

1. Wipe the dust from the instrument and probe surface with a soft cloth. Do not make any scuffing on the transparent LCD protection screen when clean the LCD screen.
2. Clean the instrument with a wet soft cloth not dripping water, during the period of which please pay attention to the disconnection of power. It is recommended to scrub with soft detergent or fresh water. To avoid damage to the instrument or probe, do not use any corrosive chemical cleaning agent.

Warning: Before power on again for operation, it is required to confirm that the instrument has already been dried completely, avoiding any electrical short circuit or bodily injury resulting form the moisture.

Section 3: Test and Calibration

3.1 Equipment for Testing

Oscilloscope calibrator, signal generator, oscilloscope, LCR digital electric bridge, multi meter calibrator

3.2 Test Standard

Q/ZLLD03-2005 enterprise standard and technical specification of SDS oscilloscopes by Fujian Lilliput Optoelectronics Technology Co., Ltd

3.3 Inspection Items and Methods

3.3.1 Appearance and functional inspection

A. Appearance inspection

The appearance of the oscilloscope should be clean without obvious row a scar and deformation. The juncture of the front cover and the back cover should be matched, seamless. The screws are all fixed without loose. And the keyboards are flexible and light when pressing.

B. Functional inspection

First, power up the oscilloscope and come into measurement. Second, check all the keys and input 1KHz calibrating signals then press "**Autoset**", the oscilloscope should display waveforms and work for measurement. Third, switch to the multi meter to check whether it could work normally.

3.3.2 Sweep rate and error inspection

A. As shown by Figure 2 connected, the CH1 set as follows:
Coupling: DC Channel: On Probe: 1X Invert: Off

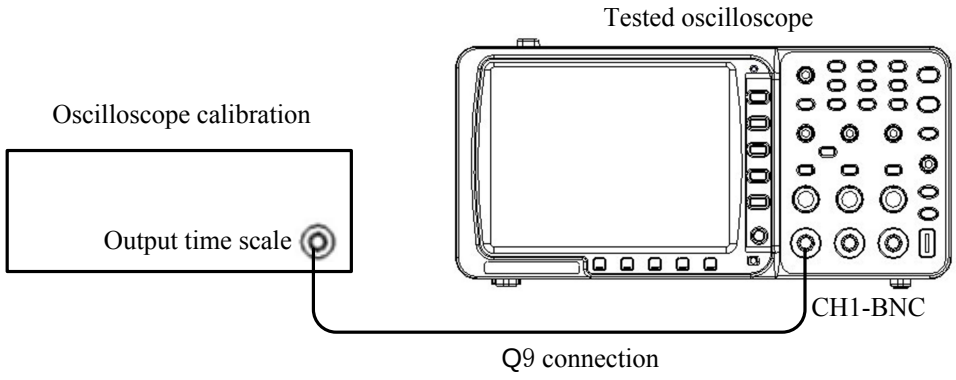


Figure 1: Connection of sweep rate and error inspection

B. Make the time scale of the oscilloscope calibrating in line with sweep rate (time division) and adjust the trigger level to display stable waveforms. And press "T ERROR", turn fine-tuning knob to make the time scale superpose with the level of calibration line(as figure 2),the error is the error value of sweep rate.(S03A calibration is pointer header that the indicated value is the correction to the error of sweep rate and the error should be anti-symbol.)

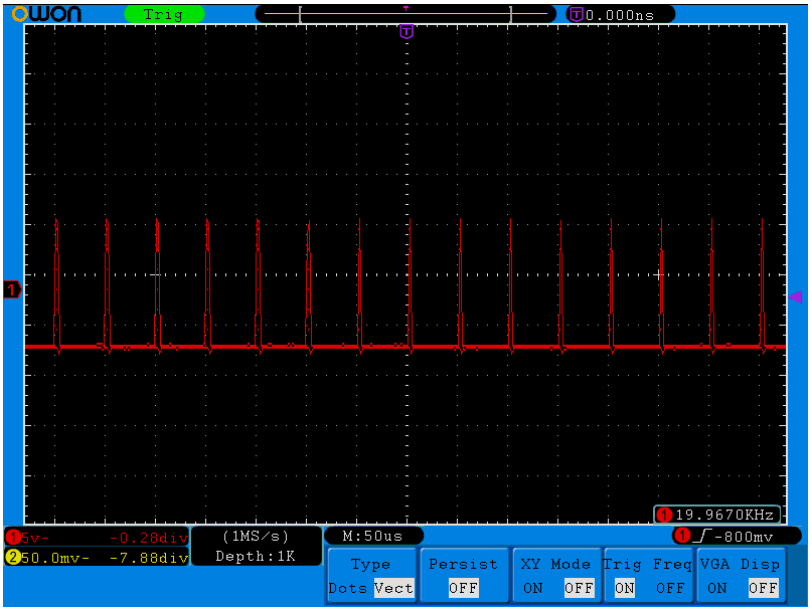


Figure 2: Waveform of sweep rate and error inspection

C. Repeat step B and test sweep rate for other channels.

3.3.3 Time measurement and error inspection

A. As shown by Figure 1 connected

B. Set the output time period of the calibration as A, press "**Autoset**" to display the stable waveform. Then, also set the measured window 1 as the period of CH 1; get the period value B to gain the time error C as follows:

$$C=(B-A)\div A\times 100\%$$

3.3.4 Voltage division and error inspection

A. As shown by Figure 3 connected, CH 1 set as follows:

Coupling: DC Channel: On Probe: 1X Invert: Off

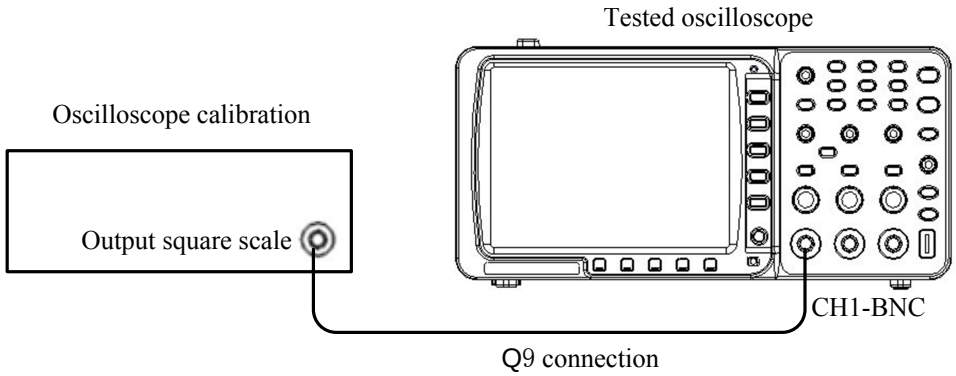


Figure 3: Connection of voltage division and error inspection

B. Make the calibration to output the impulse 1KHz and change base output amplitude and voltage scaling factor, the height of the waveform displayed takes 80% of the checked work spare in the oscilloscope screen (usually 6 grids). Pressing "V ERROR" and adjust the fine-tuning knob until the upper and lower base line and horizontal scale full of coincidence, the error displayed on the calibration is the error of the voltage division. (S03A oscilloscope is pointer header that the indicated value is the correct value of the error of sweep rate, base error is anti-symbol.)

C. Repeat step B and test voltage division for each channel.

3.3.5 Voltage measurement and error inspection

A. As shown by figure 3.connected:

B: Make the calibration to output amplitude A of square wave 1 KHz, press "**Autoset**" and adjust to display the stable waveforms. Set the measured window 1 as the peak-peak value of Channel 1 and read the period value B, then get the voltage measurement error C as follows:

$$C=(B-A)\div A\times 100\%$$

C. Repeat step B and check voltage measurement error for every channel.

3.3.6 Bandwidth inspection

A. As shown by Figure 4 connected:

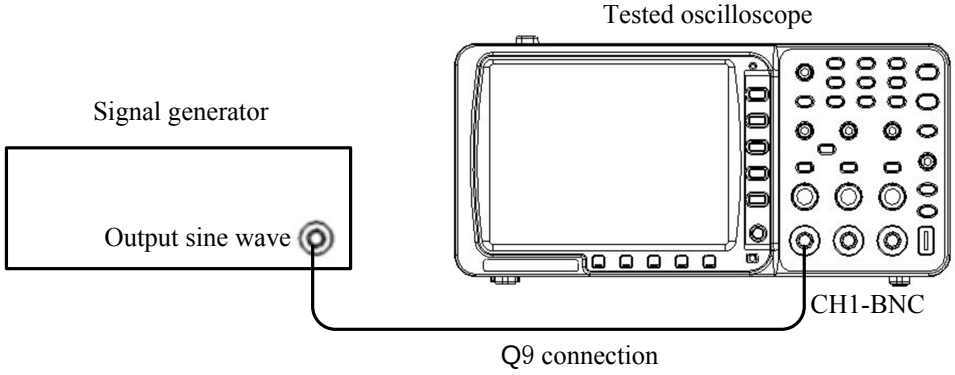


Figure 4: Connection of voltage measurement and error inspection

B. Regulate the signal generator to output continuous sine wave, adjust output voltage and

frequency to make the display amplitude at base standard frequency 80% of the checked spare on the screen (usually 6 grids), and record the peak-peak value, increase the output frequency of signal generator until the peak-peak value to 0.707 HO that the frequency is the actual value of bandwidth.

C. Repeat step B and test bandwidth for every channel.

3.3.7 Transient response inspection

A. As shown by Figure 5 connected:

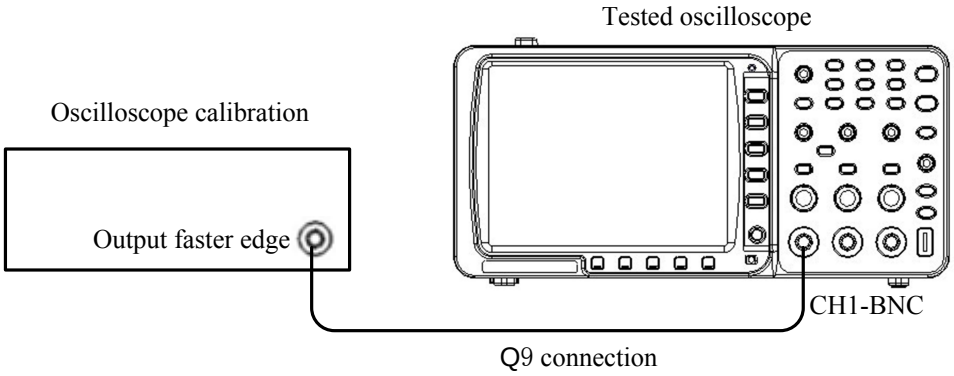


Figure 5: Connection of transient response inspection

B. Set the period of the faster edge pulse as 1uS, adjust its output amplitude to make the waveform take up about 80% spare of the checked working amplitude on the screen (usually 6 grids), and regulate the zero point position to make the 0% of amplitude A and the 100% of amplitude A align with the level of calibration line respectively, then also adjust the time base and trigger level to make the mid-point waveform on the center screen. Shown as Figure 6:

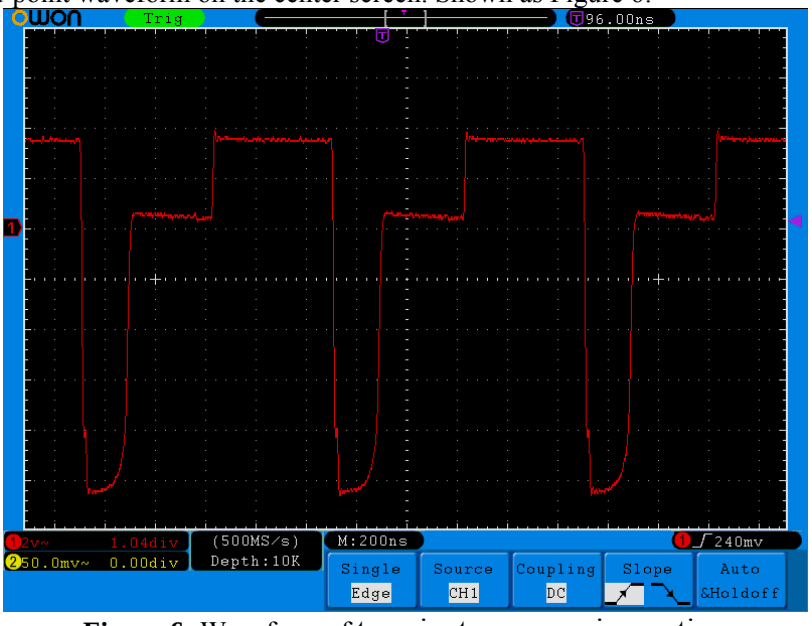


Figure 6: Waveform of transient response inspection

Measure the time t from 10% of amplitude to 90% by cursor time that is rise time and measure the rise-up range B by cursor voltage and get the rise-up value as follows:

Rise-up value S＝B÷A×100%

C. Repeat step B and check the other channel.

3.3.8 Vertical movement range inspection

A. As shown by Figure 7 connected.

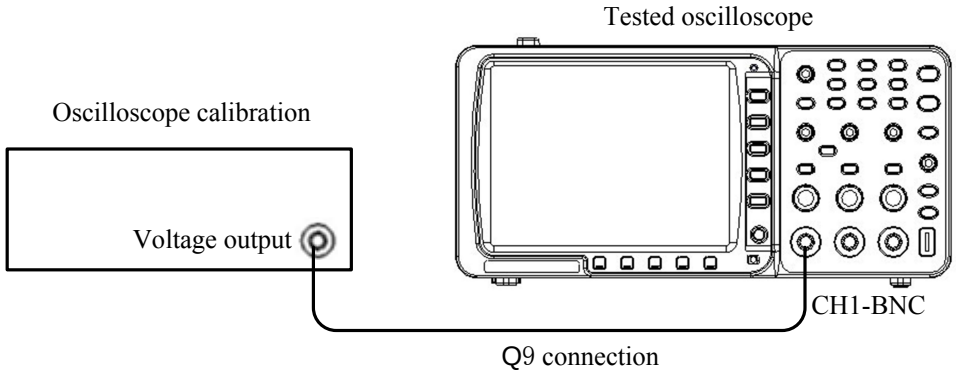


Figure 7: Connection of vertical movement range inspection

B. Regulate the calibration to output some positive voltage and change the lower limit of zero position, the oscilloscope will display a straight line. Regulate the calibration to output negative voltage and change the upper limit of zero position, the oscilloscope will display a straight line. The range between the lower limit and the upper limit is the vertical movement range.

C. Repeat step B and test the vertical movement range of voltage division for every channel.

3.3.9 Linear error inspection for vertical movement

A. As shown by Figure 4 connected. The CH1 is set as follows:
Coupling: AC Channel: On Probe: 1X Invert: Off
Time base division: 1ms Measured window 1: Peak-peak value of CH1

B. Make the signal generator output 1KHz of sine wave and adjust output voltage until the displayed amplitude 50% center of the checked working spare, record the peak-peak value A of measured window 1, then adjust the zero position and record the corresponding peak-peak value B and C of measured window 1 that the top and the bottom of the waveform takes up the upper limit and the lower limit of checked working spare respectively, the linear error are as follows which is the relatively large value:
｜（B－A）÷A｜×100% and｜（C－A）÷A｜×100%

C. Repeat step B and inspect linear error for vertical movement of every channel.

3.3.10 Input impedance inspection

A. As shown by Figure 8 connected:

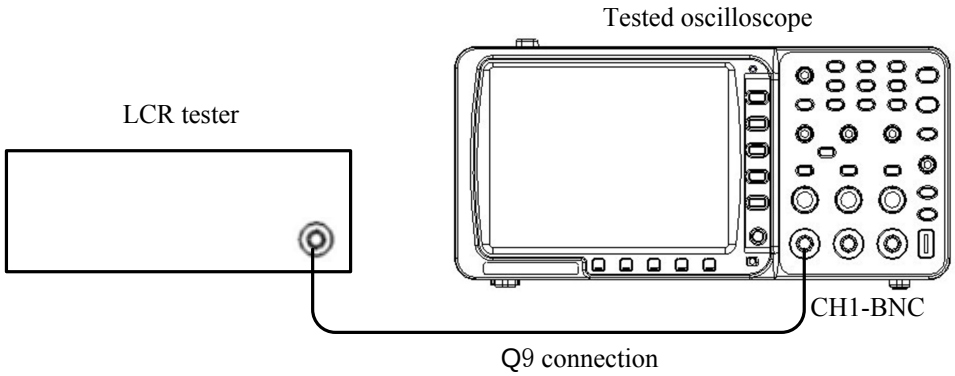


Figure 8: Connection of input impedance inspection

B. The inspected oscilloscope comes into work and record resistance and capacitance of the input end and measure every voltage division separately.

C. Repeat step B and test the other channel.

3.3.11 Drift test

Turn the voltage of CH1 and CH2 at 5mV, time base at 1mS; record the drift value of zero position at the set time.

3.3.12 Noise testing

Turn the voltage of CH1 and CH2 at 5mV, time base at 1mS; record the max displayed amplitude, which is the open-circuit noise.

3.3.13 Maximum input voltage testing

A. As shown by Figure 9 connected:

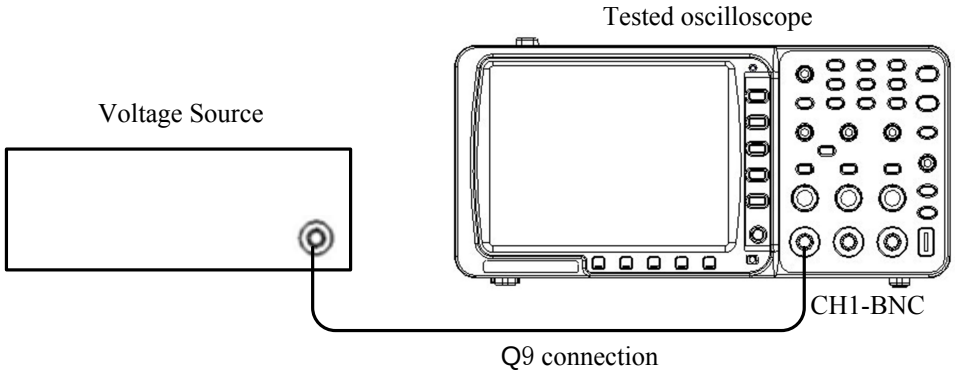


Figure 9: Connection of maximum input voltage testing

B. Turn on the unit, set the input coupling as DC and zero position at the center. Then adjust the output voltage to be in accordance with the set value in product standard. Input voltage and last for one minute and then cut off input voltage, the unit should work normally.

3.3.14 Average function testing

A. As shown by Figure 3 connected.

B. Make the calibration to output 30mV of the square wave and voltage division at 5mV, and the sampling is the average sampling with different average numbers to observe the different

smoothing.

C. Repeat step B and test for CH2.

3.3.15 Peak value –testing inspection

A. As shown by Figure 4 connected.

B. The generator will be set to output 600mV/15nS of the impulse wave and the sampling mode set as peak detection, voltage division at 200mV.Then try the different time base division and observe the impulse wave on the screen.

C. Repeat step B and test the CH2.

3.3.16 Triggering test

A. As shown by Figure 4 connected.

B. Triggering sensitivity test: Turn the voltage division at 200mV and adjust the output frequency of the signal generator as technical requirement until the oscilloscope could locate the waveform stable with stepping up the output amplitude, therefore the voltage amplitude is the triggering sensitivity.

C. Test for the range of triggering level: Adjust the output amplitude of the signal generator as technical requirement and the triggering level position and record the range of triggering position that could locate the waveform. The range is the range of triggering level.

D. Coupling mode test: The coupling mode will be setup as DC, AC, HF reject, LF reject, and adjust the output amplitude of the signal generator and then observe whether the oscilloscope can trigger.

Section 4: Debugging and Calibration

4.1 Brief Introduction

In this part will provide some methods for debugging and calibration.

4.2 Tools and Devices

The instruments for debugging and calibration are in accordance with provided in section three.

4.3 The Interval Time to Calibration.

The recommended time for calibration is one year.

4.4 Auto-calibration

The auto-calibration application can make the oscilloscope reach the optimum condition rapidly to obtain the most accurate measurement value. You can carry out this application program at any time, but when the range of variation of the ambient temperature is up to or over 5℃, this program must be executed.

For the performing of the self-calibration, all probes or wires should be disconnected with the input connector first. Press the **"Utility"** button, then, press **H1** button to call out the **Function** menu; turn the **M** knob to choose **Adjust**. Press **H2** button to choose the option "**Self Cal**"; run the program after everything is ready.

4.5 Attenuation Compensation Capacitance Calibration

The steps are as follows:
1. Connect the calibrator with BNC of CH1 by Q9

2. Make the calibrator to output sine wave with peak-peak value of 30V and 1KHZ

3. Set the coupling of CH1 as DC, voltage division as 5V, time base division as 1ms, zero position as -15v and observe the waveforms on the screen also adjust the attenuation compensation capacitance until the normal waveform display.

4. Repeat step 1 and 3 to turn the attenuation compensation capacitance of CH2 to correct value.

Section 5: Maintenance

5.1 Brief Introduction

In the part, we will provide you the circuit diagram, the replaceable parts, the disassembling method and the maintenance process.

5.2 Preparation and Safety Event

Before disassembling the oscilloscope, please read the safety outline as a warning.

5.3 Circuit Diagram

SDS Series oscilloscope makes up dual channel of digital storage oscilloscope and auto multi-meter which the human machine interface is composed of the keyboard and LCD also with the serial ports and USB interface. The hardware is composed of 5 numbers of modules. The following Figure 10 is the brief diagram.

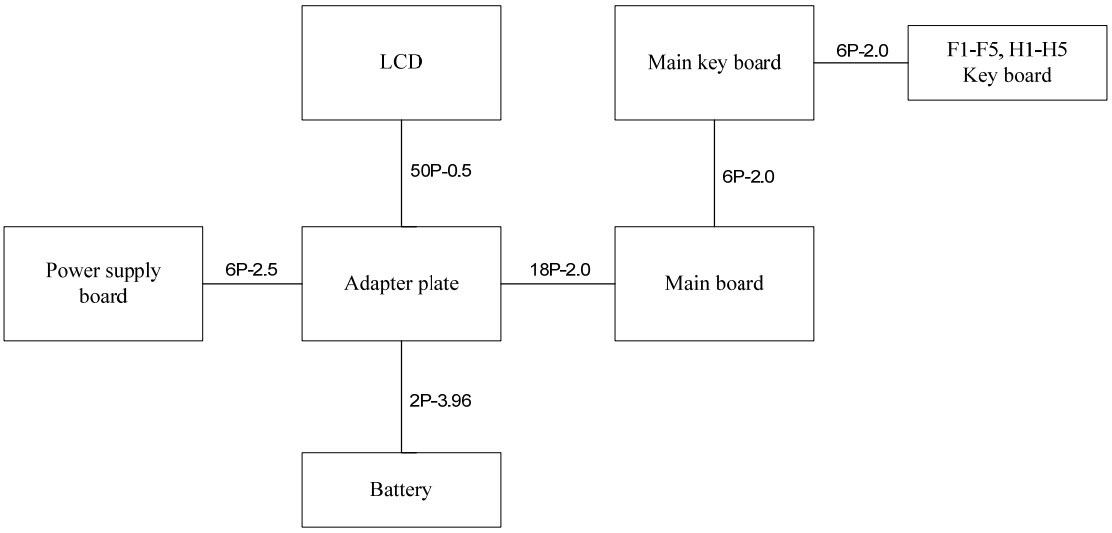


Figure 10: SDS series block diagram

The schematic circuit diagram of the power supply is as follows:

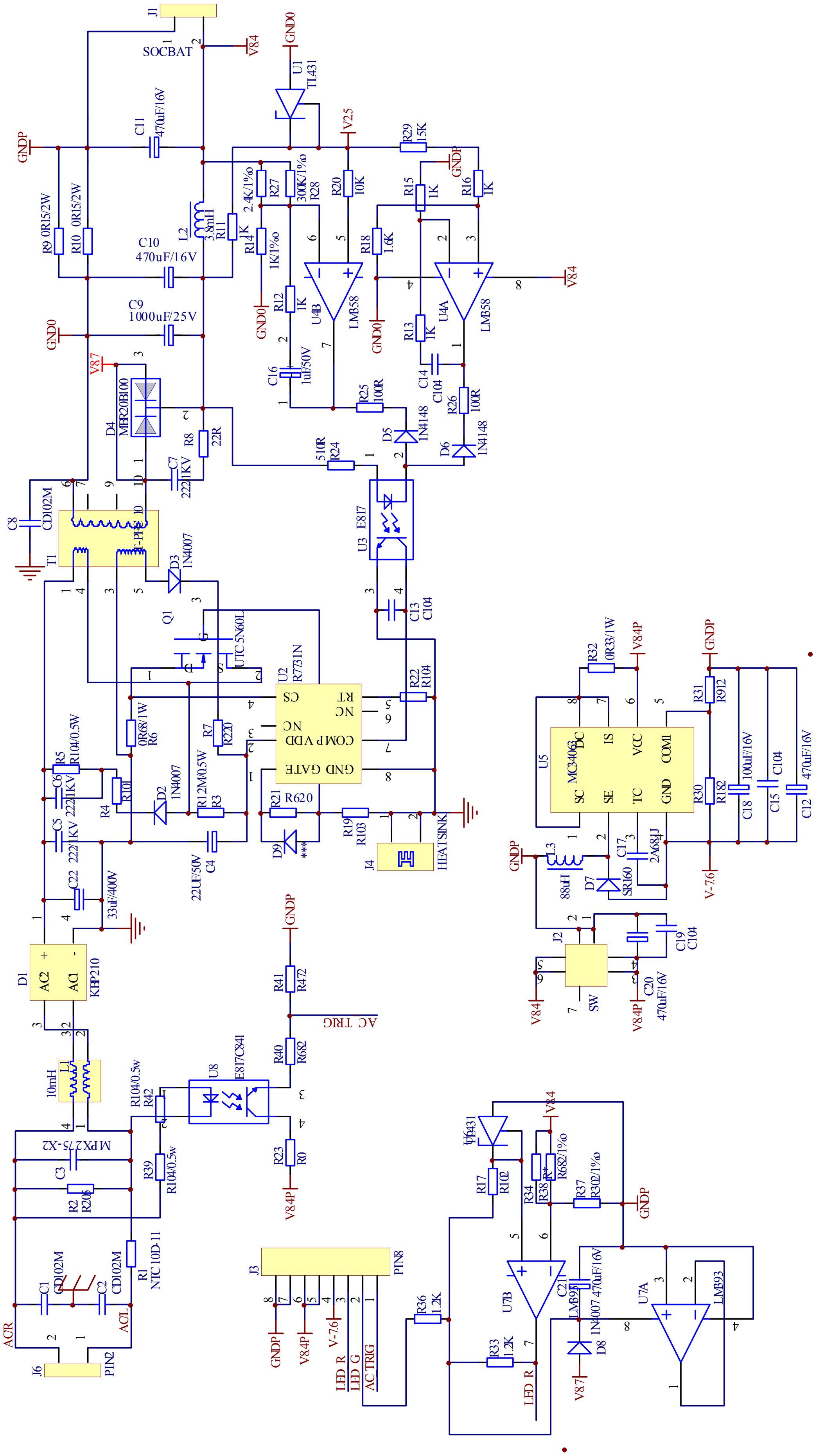

J1
SOCBAT
V84
GND0
U1
TL431
V25
R29
15K
GNDP
C11
470uF/16V
R9 0R15/2W
R10 0R15/2W
C10
470uF/16V
C9
1000uF/25V
L2
R27
R28
R20
10K
R15
1K
R16
1K
R18
1.6K
R12
1K
R13
1K
LM358
U4A
D4
MBR20B100
R8
22R
C7
222/1KV
C16
R25
100R
R26
100R
D5
1N4148
D6
1N4148
R24
510R
U3 E817
C13
C104
T1
D3
1N4007
Q1
UTC 5N60L
U2
R7731N
R22
R104
R5
R104/0.5W
R6
R4
D2
1N4007
R3
R21
R620
R19
R103
J4
HEATSINK
C4
C22
33uF/400V
D1
KBP210
AC1
AC2
L1
10mH
U8
E817C841
R41
R472
R40
R682
AC TRIG
R23
V84P
R42
R104/0.5w
R39
R104/0.5w
R2
C3
MPX275-X2
R1
NTC 10D-11
C1
CD102M
C2
CD102M
ACR
ACL
J6
PIN2
J3
PIN8
GNDP
V84P
V-7.6
LED R
LED G
U5
MC34063
R32
0R33/1W
R31
R912
R30
R182
C18
100uF/16V
C15
C104
C12
470uF/16V
L3
88uH
D7
SR160
C17
J2
C19
C104
C20
470uF/16V
SW
V-7.6
R36
1.2K
R17
R102
R33
1.2K
R34
R38
R37
U7B
U7A
LM393
C21
470uF/16V
D8
1N4007
V87

Figure 11: The schematic circuit diagram of the power supply

5.4 Removal and Installation Procedures

This section describes how to remove and install the major mechanical and electrical modules. Removal procedures are as below. To Install the instrument, you could operate the removal procedure in reverse order. You should pay attention to the "Notice for installation" when installation.

1. **Power switch Button**

   - Use a soft cotton to encase the power switch button (to avoid scratching by pliers), pull out the button with pliers.

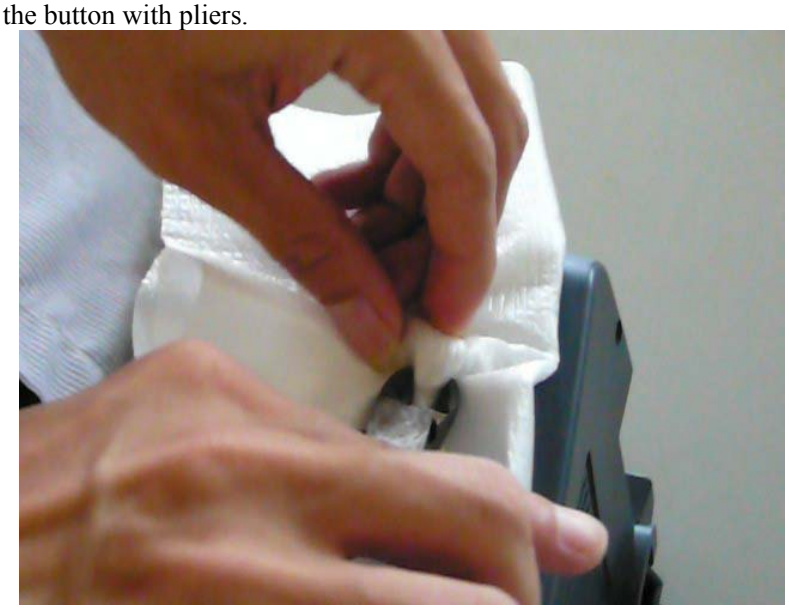


Figure 12: Remove the Power switch button

Notice for installation: Just press the power switch button to its hole.

2. **Ground Connection**

   - Place the oscilloscope face down on soft surface (such as an anti-static mat), with the bottom facing you.
   - Use a flat-bladed screwdriver to remove the Ground Connection.

Figure 13: Remove the Ground Connection

3. Battery Box

- Place the instrument with the bottom facing you. Loosen the two screws that secure the battery box to the rear chassis (do not take it off).

Figure 14：Loosen the screws of battery box

- Take the two screws to pull the battery box out.

Figure 15: Remove the battery box

Notice for installation:
Assemble the battery box as the figure below; insert it into the battery box container.

Figure 16: Assemble the battery box

4. Rear Panel

- Remove the four screws that secure the rear panel with a cross-screwdriver.

Notice for installation:
The shortest screw should be installed in the screw hole marked in red in the third figure below.

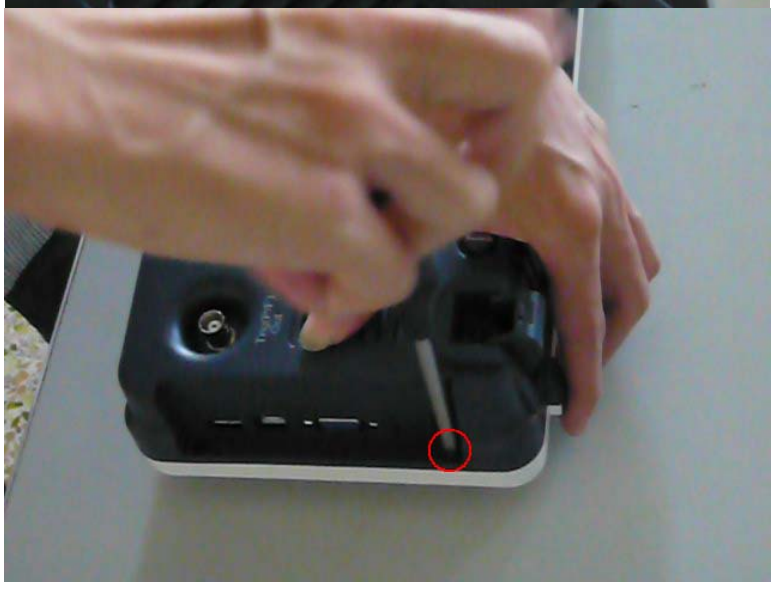


Figure 17: Remove the screws of rear panel

- Place the oscilloscope on its feet on soft surface, with the front facing you.
- Release the snap marked in red in the figure below.

Figure 18: Unsnap the rear panel (1)

- Place the instrument upside down, release the two snaps marked in red in the figure below.

Figure 19: Unsnap the rear panel (2)

- Detach the rear panel carefully, be ware that it still be connected to the font assembly by wires.
- In the figure below, the red and black cable is the AC line power cable; the yellow is the grounding wire. Remove the screw secure the grounding wire to disconnect it. Grasp and pull up on the AC line power cable to disconnect it from power supply board.

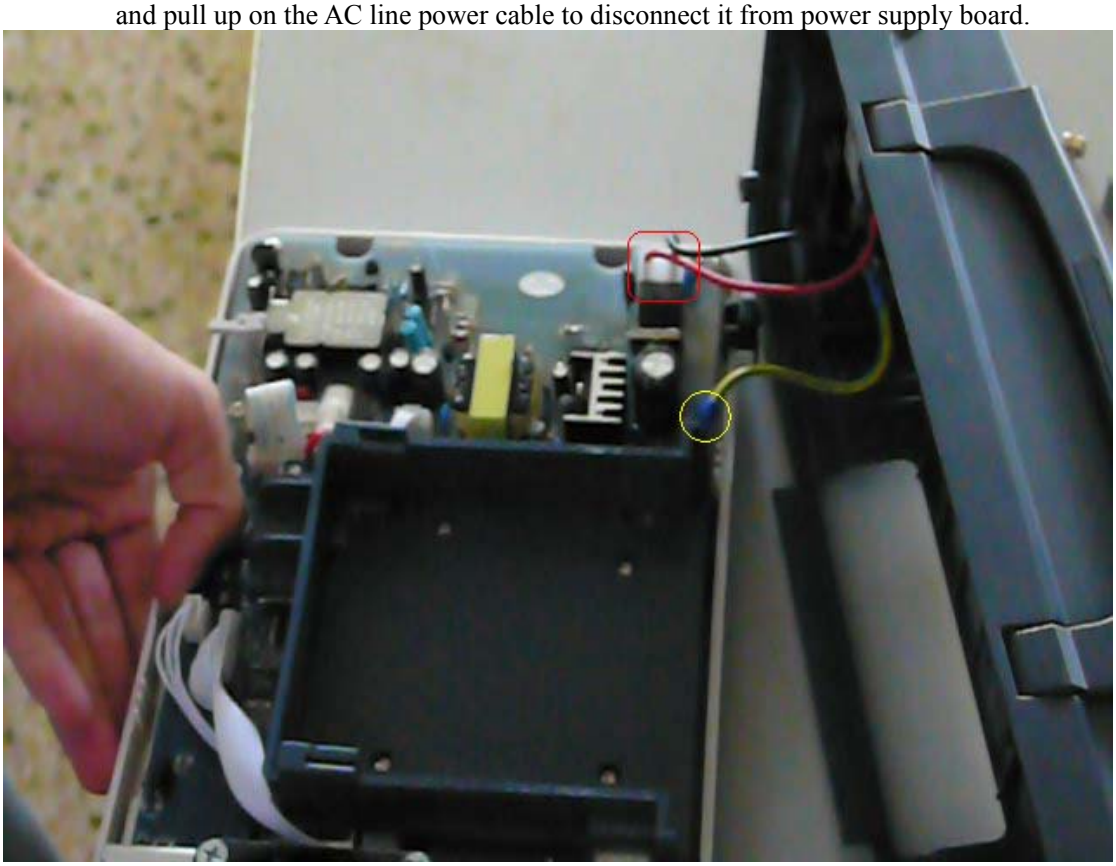


Figure 20: Disconnect the rear panel

5. Battery box Container

- Remove the four screws marked in yellow in the figure below.
- Lift the battery box container a little, be ware that it is still be connected by the battery power cable, which marked in red in the figure below.

- Grasp and pull out the battery power cable.

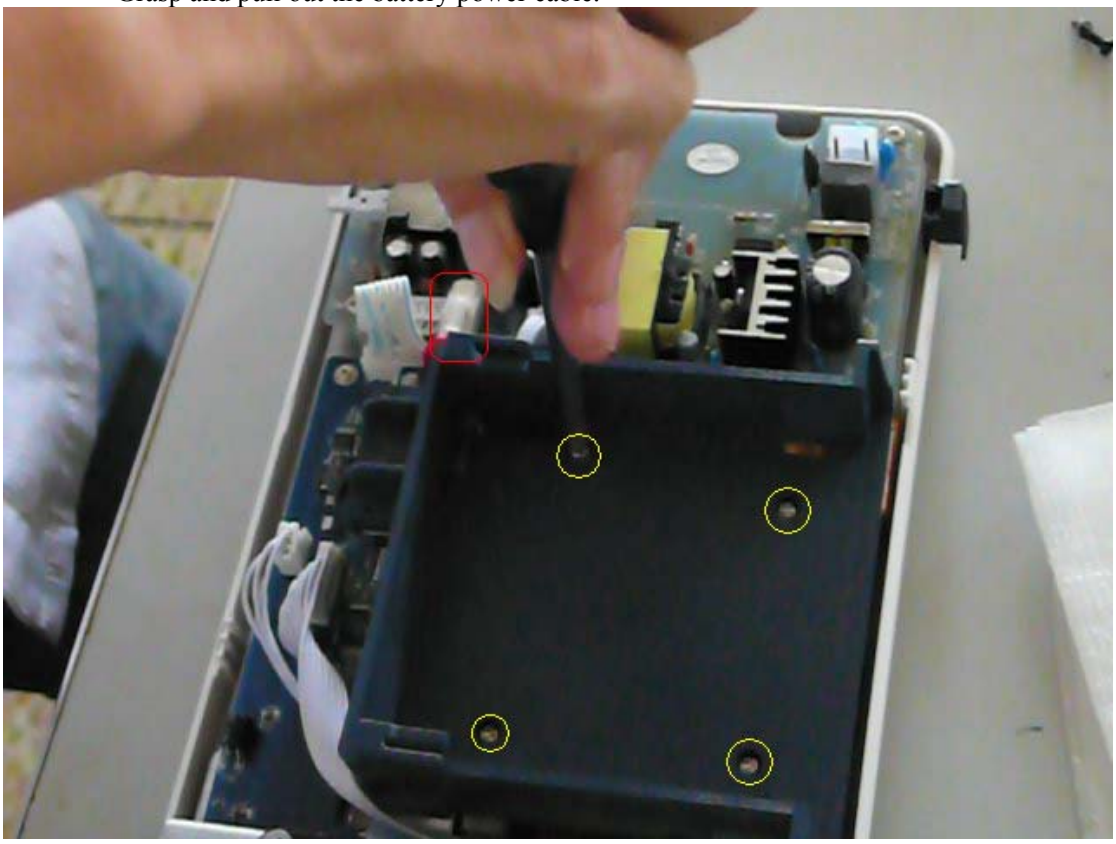


Figure 21: Remove the battery box container

6. Power supply Board

- The cable marked in yellow is the power cable of adapter plate, the red is transfer cable. Disconnect both of them.

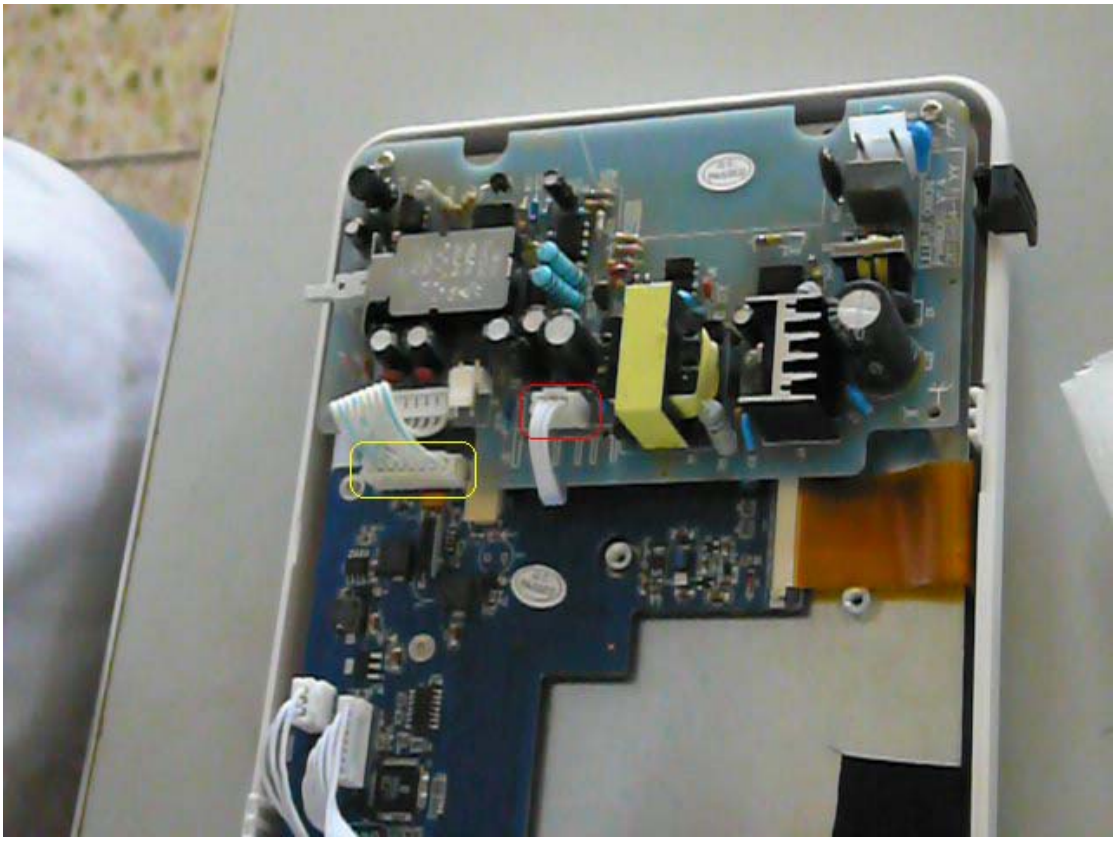


Figure 22: Cables to power supply board

- Remove the three screws marked in yellow, lift off the power supply board.

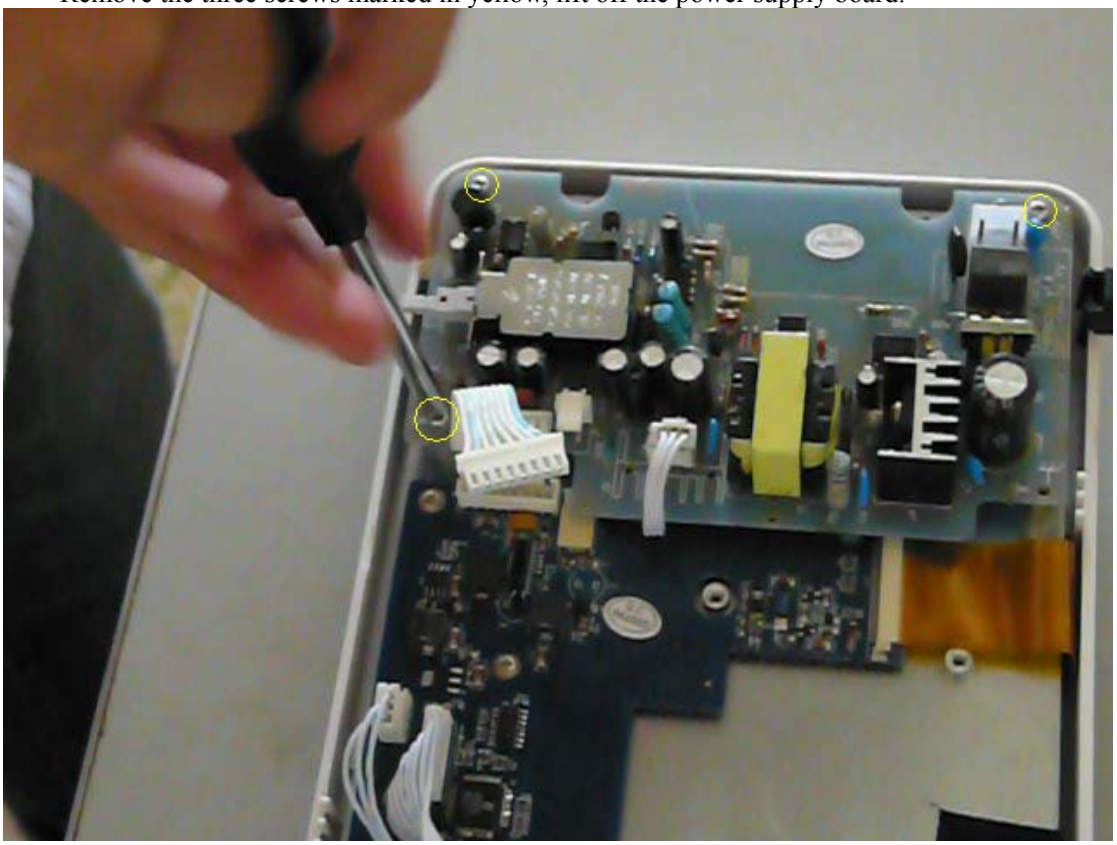


Figure 23: Screws of power supply board

7. Adapter plate

- Unlock the screen data cable, pull it out carefully.

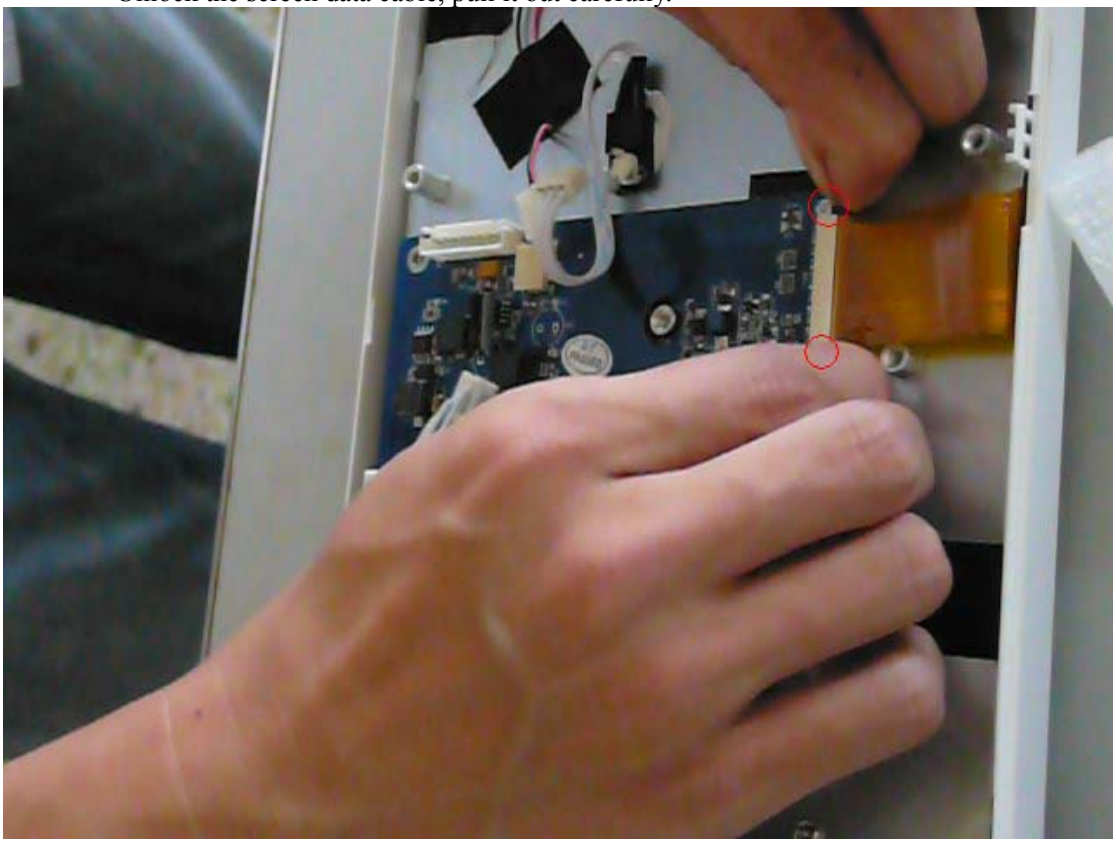


Figure 24: Disconnect the screen data cable

- The cable marked in blue in the figure below is the high-tension cable, green is the indicator light cable, and red is VGA cable. Pull out the three cables.
- Remove the four screws marked in yellow in the figure below.

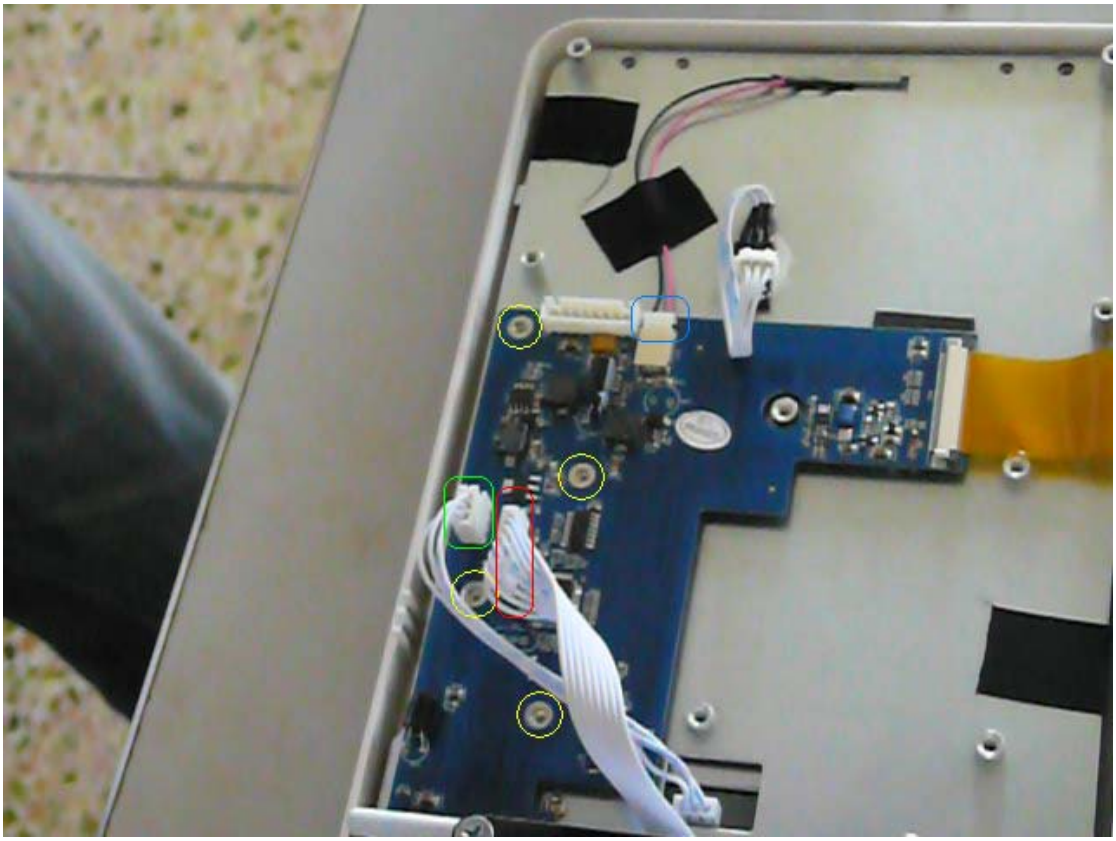


Figure 25: Screws and cables of the adapter plate

- Pull out the adapter plate carefully.

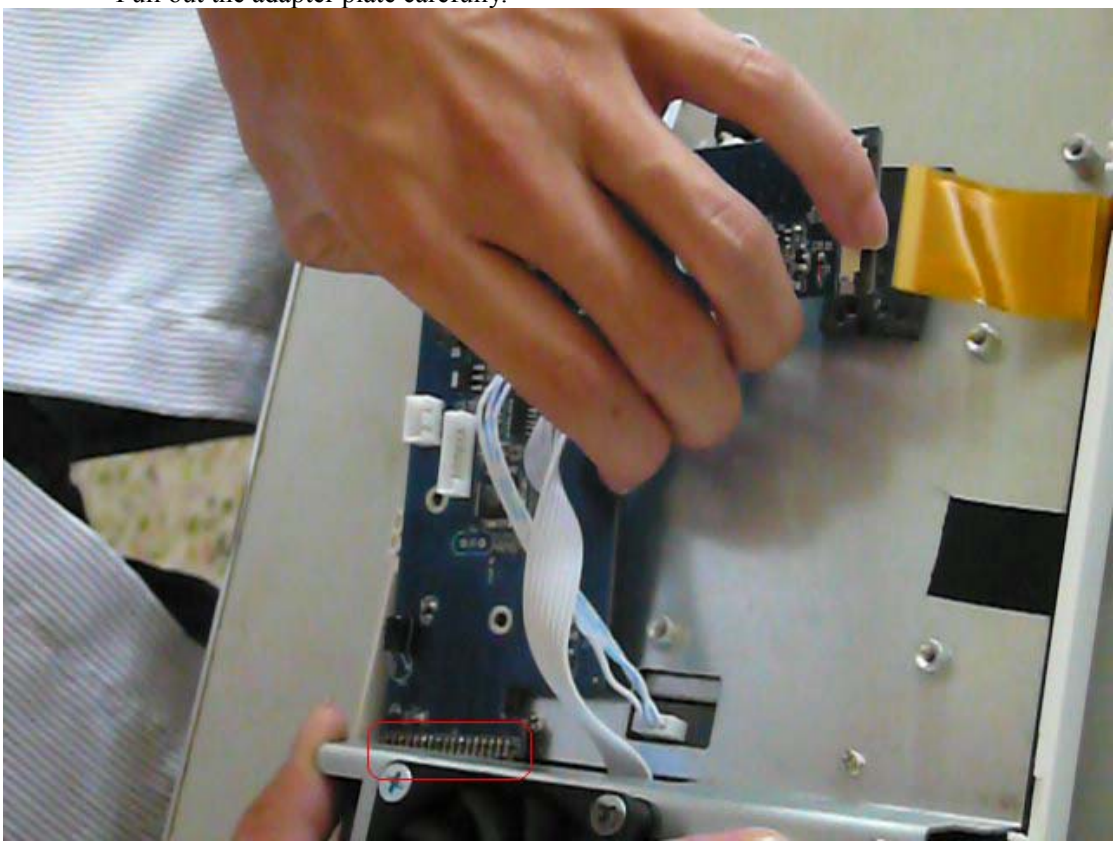


Figure 26: Remove the adapter plate

8. Chassis (including Fan and LCD)

- Remove the plastic cushion marked in the figure below.

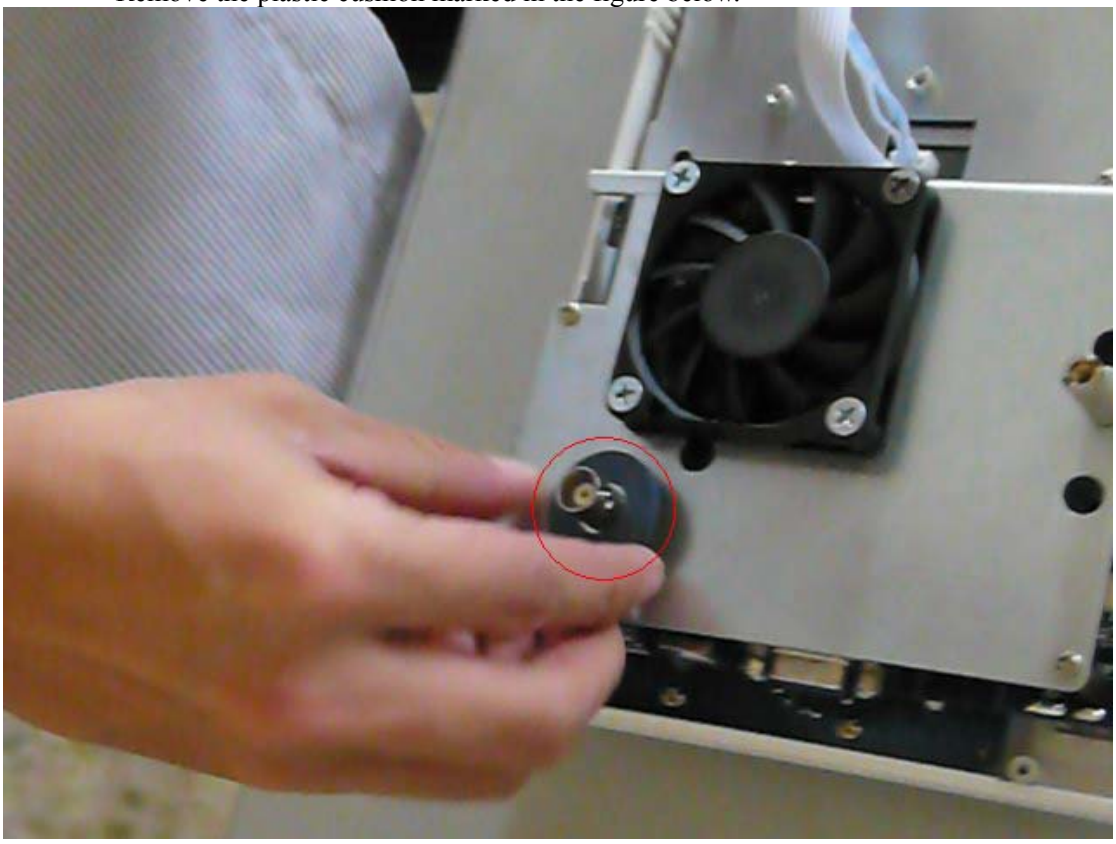


Figure 27: Remove plastic cushion

- Remove the six screws marked in the figure below. Lift the chassis a little, be aware that it is still connected to the main board by a cable.

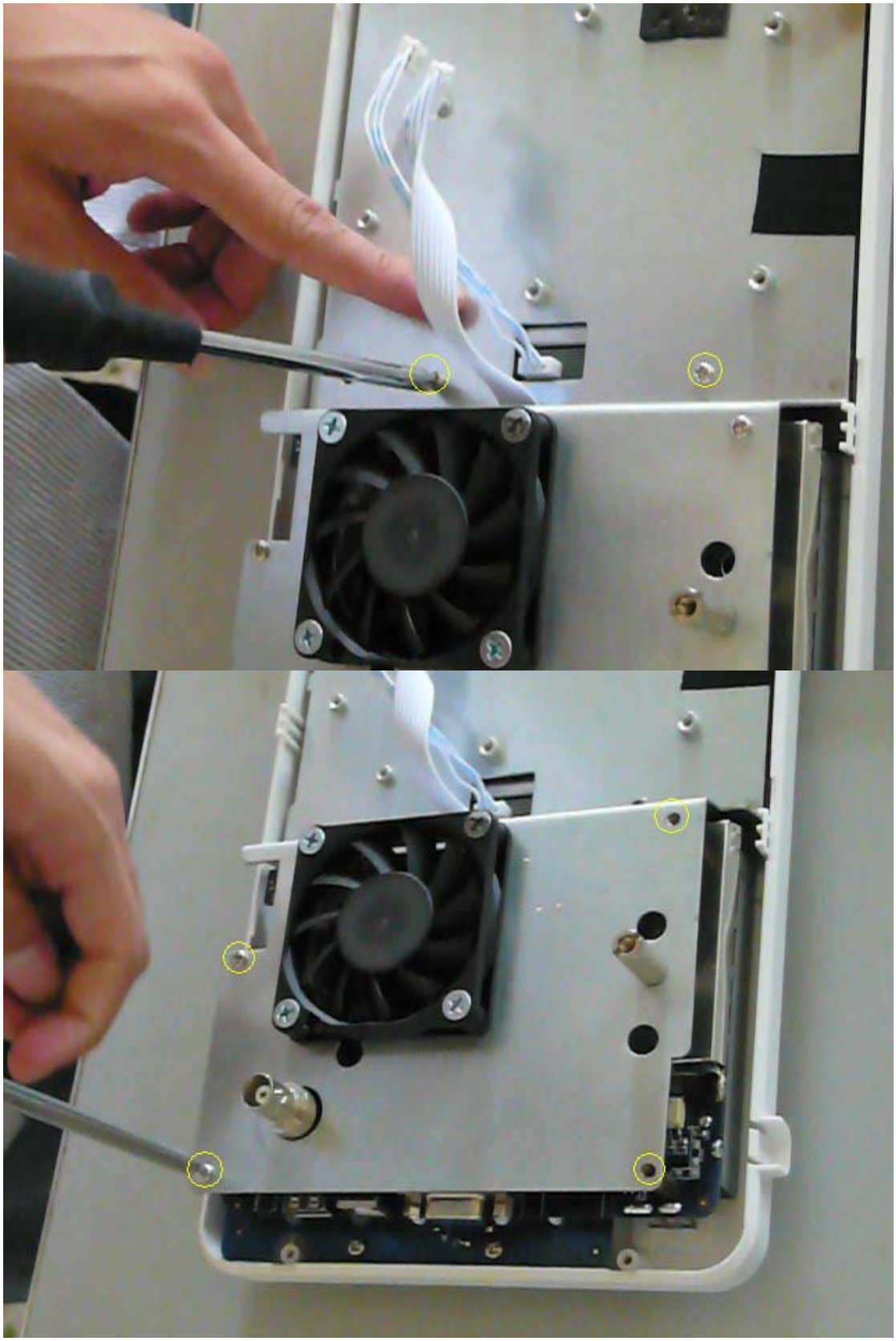


Figure 28: Screws of the chassis

- Grasp and pull up on the fan power cable marked in the figure below.

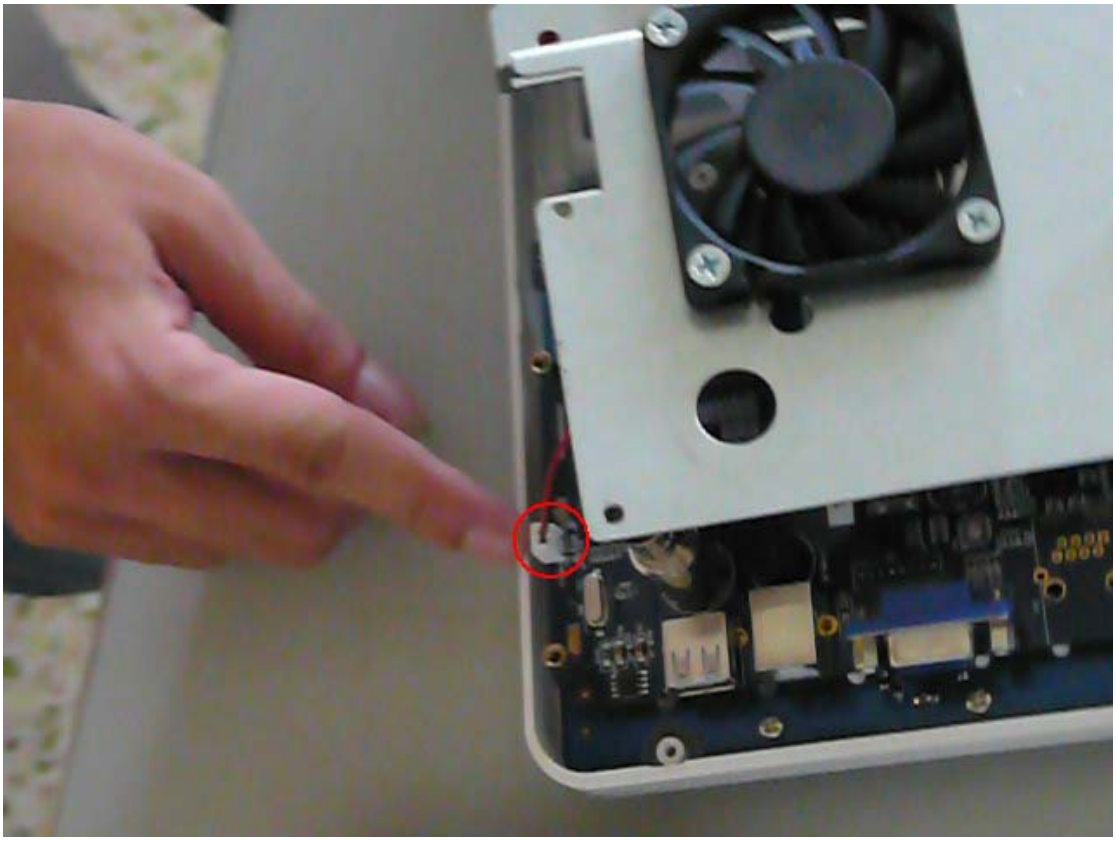


Figure 29: Fan power cable of the chassis

Notice for installation:
Make sure that the label of the LCD protection do not be covered by the front panel.

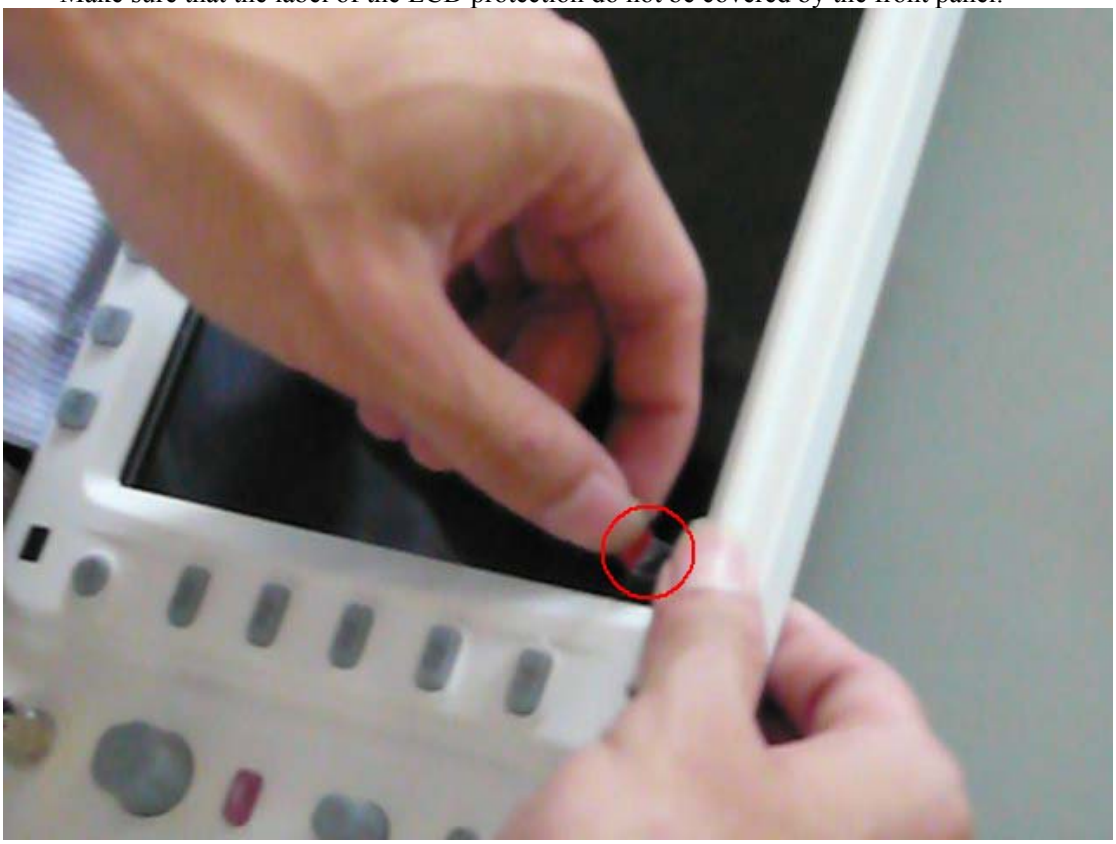


Figure 30: Install the chassis (1)

- Pull the indicator light cable and VGA cable through the holes in the chassis as the figure below.

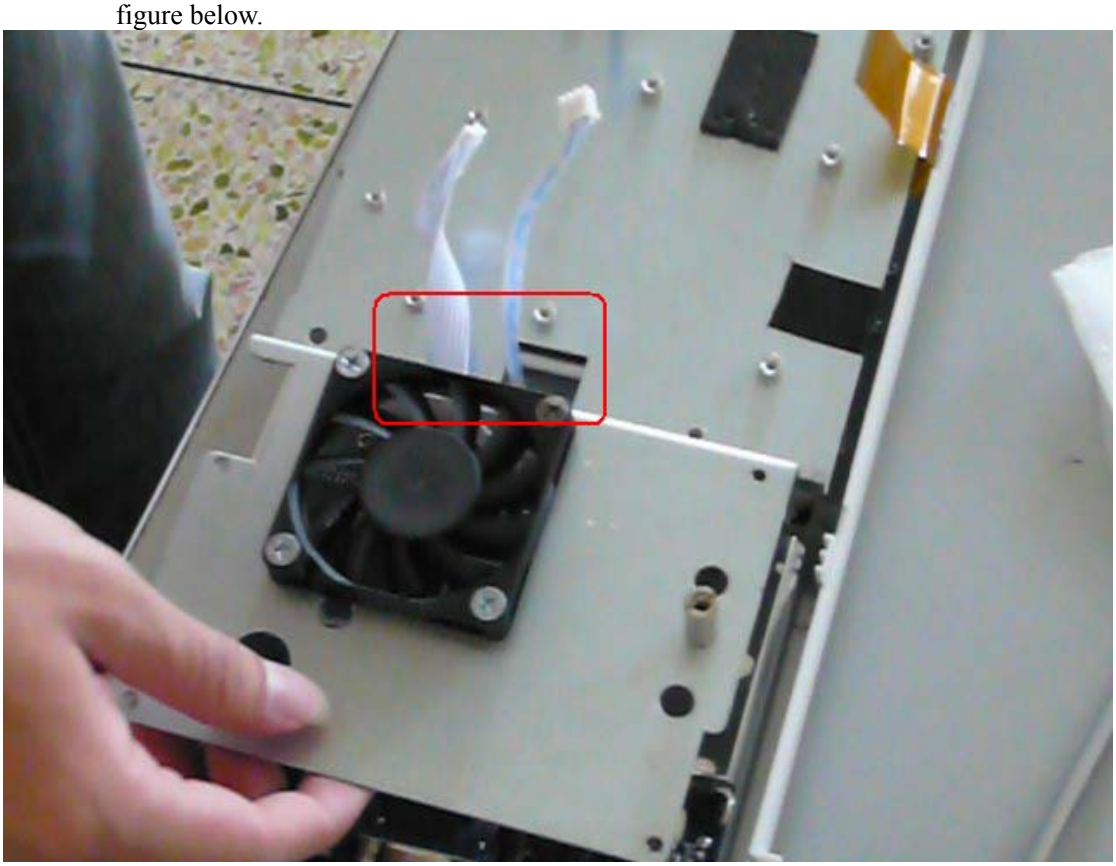


Figure 31: Install the chassis (2)

9. Main Board

- Remove the three screws marked in the figure below, lift off the main board.

Figure 32: Screws secure the main board

Notice for installation:

The 2×6-Pin interface of main board should be matched to the one marked in the Figure 34.

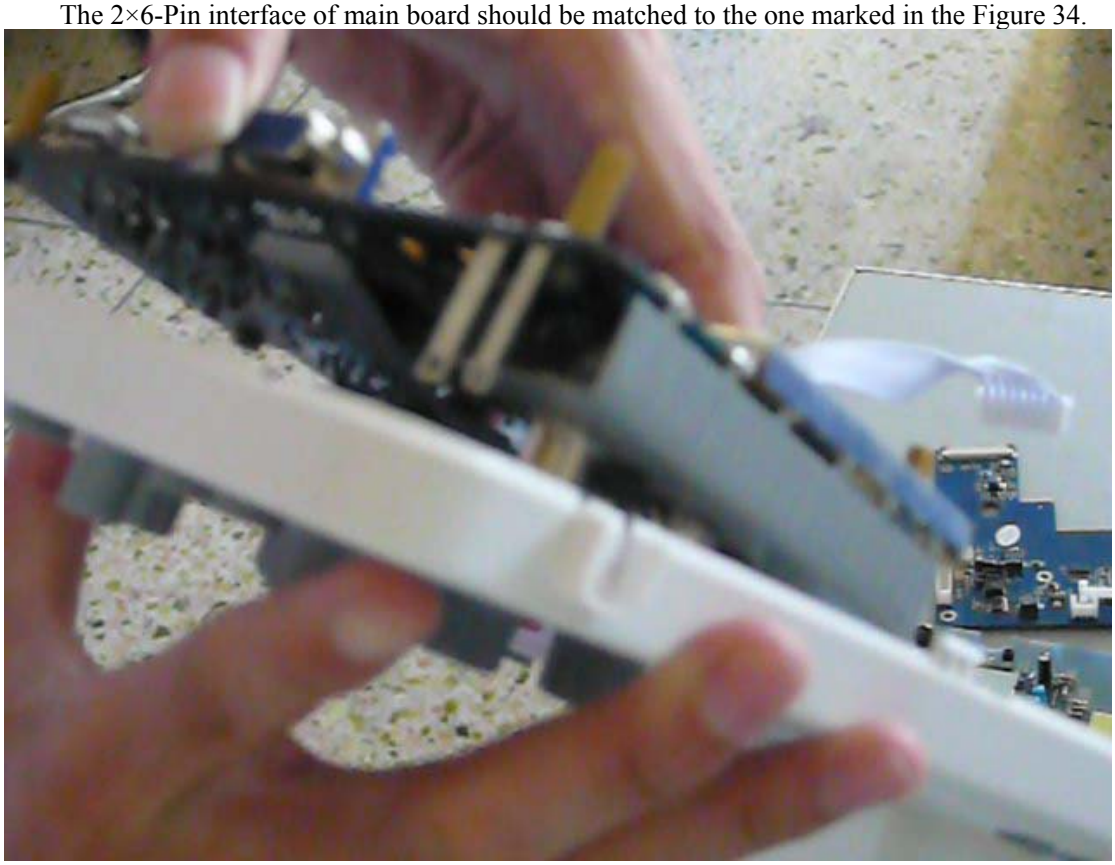


Figure 33: Install the main board

10. **Done.** The left assembly include key board and front panel.

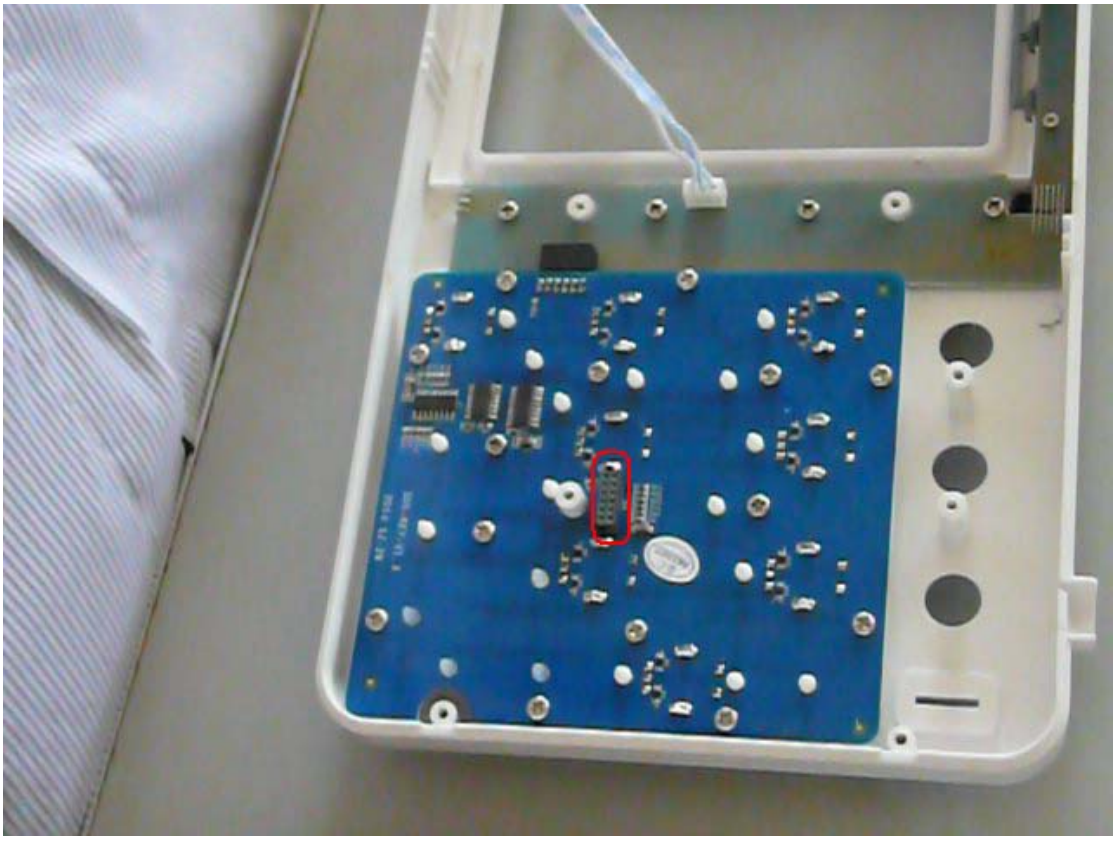


Figure 34: Key board and front panel

5.6 Examination and Maintenance

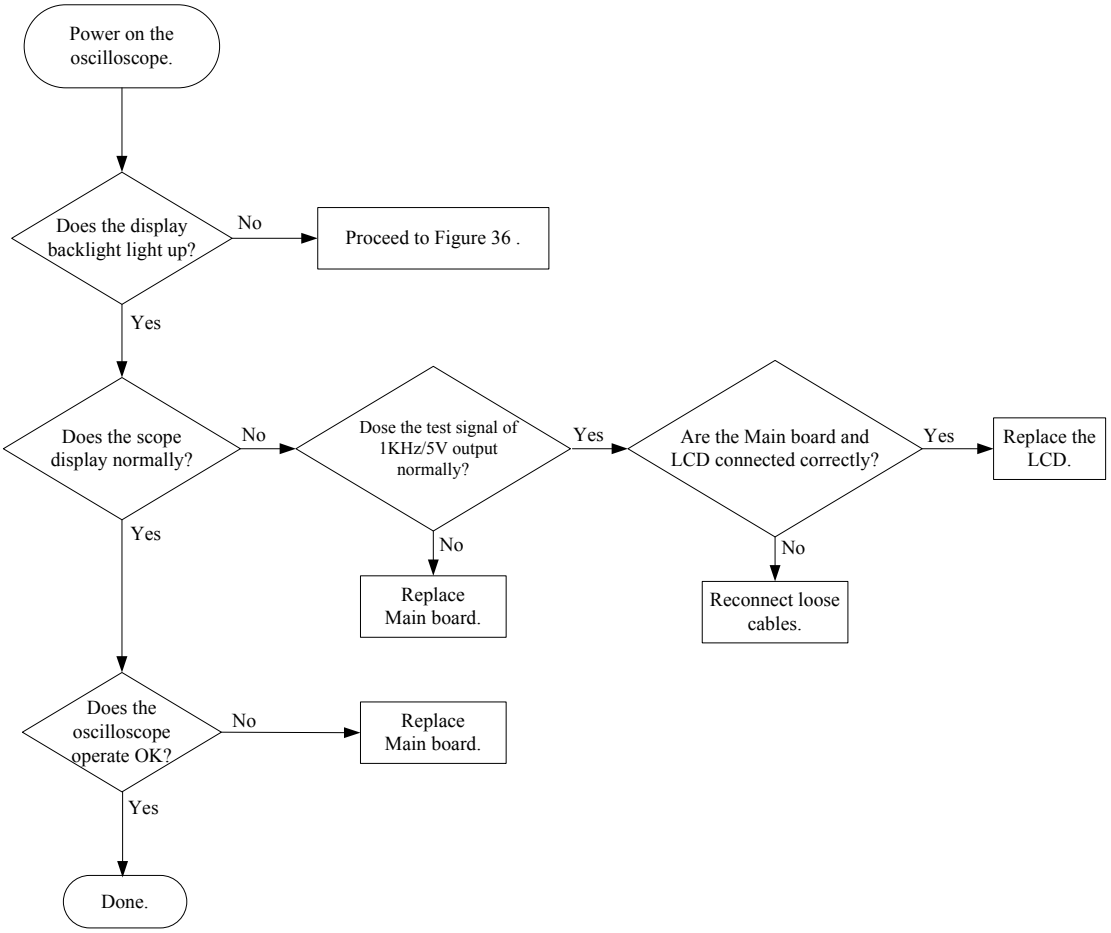


Figure 35: Troubleshooting procedure (1)

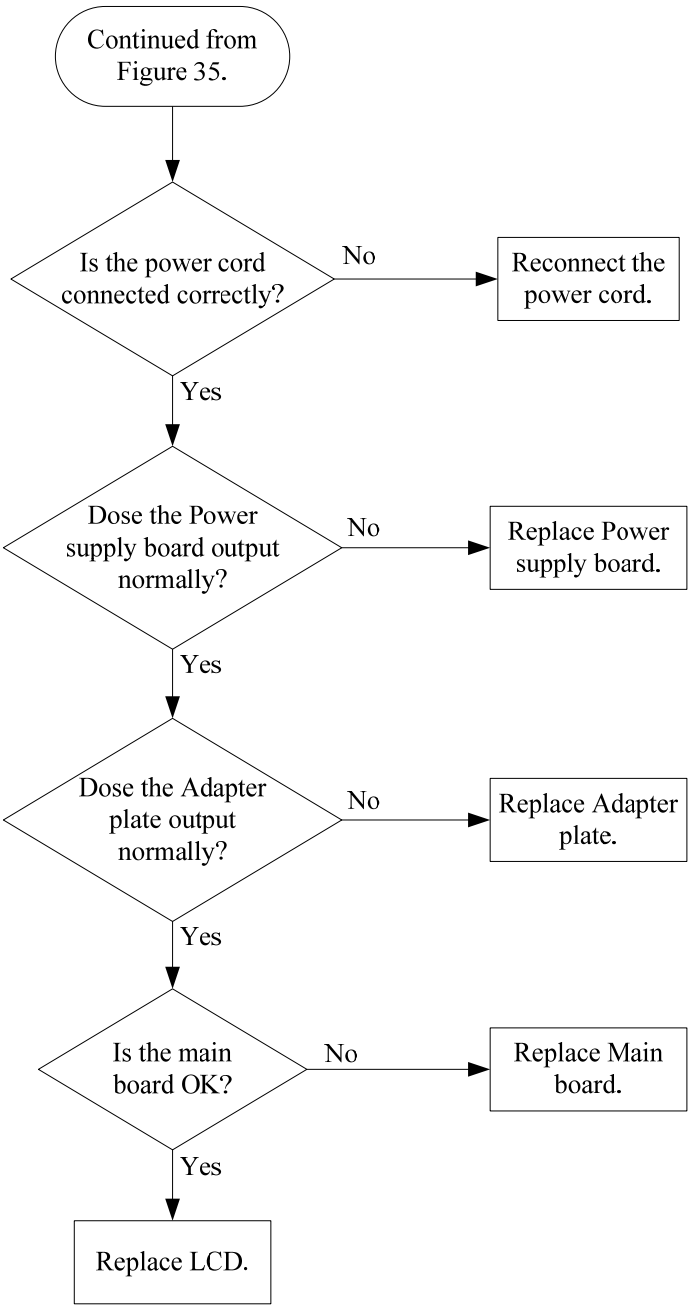


Figure 36: Troubleshooting procedure (2)

Section 6: Replaceable Parts

6.1 Replaceable Parts List

Table 4: Replaceable parts list

Name	**Model**	
Power supply board	PWR6062 V1.5	
Adapter plate	SDS-CONNECT-VGA-V2.1	
Main board	SDS6062	SDS6062-V1.4
	SDS7102	SDS7102-V1.1
	SDS8102	SDS8102-V1.1
	SDS8202	SDS8202-V1.1
Fan	JD-6010S1MO	
Main key board	SDS-KEY-V1.3	
F1-F5, H1-H5 Key board	SDS-KEY2-V1.4	
LCD	AT080TN52	
Battery	WMDC 2XPL509092×2	

6.2 Order Information

Please record the names, models and quantity of the accessories you want to order and contact with the nearest OWON service center. If the accessories are not in the above list, please kindly record the serial number and describe the accessories (includes functions) and the quantity and contact with the nearest OWON service center.