SDG7000A Series Arbitrary Waveform Generator

Service Manual

EN01A

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1 Introduction

Overview of this Document

This document is for the SDG7000A series arbitrary waveform generator, which will be mostly referred to as “the generator” for short in the following text. The main contents described in this manual are:

The SDG7000A Series Generator at a Glance

This section introduces the main technology characteristics for the SDG7000A generator.

The Front Panel at a Glance

This section introduces briefly all of the buttons and the knob on the front panel.

The Rear Panel at a Glance

This section introduces the ports for easy communication on the rear panel.

Specification

Chapter 1 lists the generator’s specifications.

Quick Start

Chapter 2 describes how to prepare the generator for use and helps to familiarize you with a few of its front-panel features.

Calibration

Chapter 3 provides calibration, verification and adjustment procedures for the generator.

Assembly Procedures

Chapter 4 provides disassembly procedures to help in gaining an understanding of the structure of the generator in preparing to install or replace any needed modules or troubleshoot faults that might be encountered during operation.

Troubleshooting

Chapter 5 provides troubleshooting procedures for the internal circuit boards, as well a quick guide for solving general problems. Before any operation, please read the ESD Precautions to avoid personal injuries or damage to the generator.

Maintenance

Chapter 6 provides information on maintenance, daily care and inspection of the instrument. The contact information is included at the end of the chapter in case of some unsolvable problems that might be encountered.

The Different SDG7000A Models Addressed by this Manual

All the description for function and performance in this document are according to the SDG7102A generator, and apply to all generators in this series. The SDG7000A series contains the following types:

The series includes the following models:

Model	Analogy Bandwidth	Maximum Sample Rate	Analog Channel
SDG7102A	1 GHz	5 GSa/s	2
SDG7052A	500 MHz	5 GSa/s	2
SDG7032A	350 MHz	5 GSa/s	2

2 Important Safety Information

This manual contains information and warnings that must be followed by the user for safe operation and to keep the product in a safe condition.

2.1 General Safety Summary

Carefully read the following safety precautions to avoid personal injury and prevent damage to the instrument and any products connected to it. To avoid potential hazards, please use the instrument as specified.

To Avoid Fire or Personal Injure.

Use Proper Power Line.

Use only the special power line approved by the state and local authorities.

Ground the Instrument.

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

Connect the Signal Wire Correctly.

The potential of the signal wire is equal to the earth, so do not connect the signal wire to a high voltage. Do not touch the exposed contacts or components.

Look over All Terminals Ratings.

To avoid fire or electric shock, please look over all ratings and signed instructions of the instrument. Before connecting the instrument, please read the manual carefully to gain more information about the ratings.

Equipment Maintenance and Service.

In the event of an device failure, please do not dismantle the machine for maintenance. The device contains capacitors, power supply, transformers and other energy storage devices which may cause high voltage damage. The internal devices of the device are sensitive to static electricity and direct contact can easily cause irreparable damage to the device. It is necessary to return to the factory or

to the company's designated maintenance organization for maintenance. Be sure to pull out the power cord before repairing the device. Live line operation is strictly prohibited. The device can only be powered on when the maintenance is completed and the maintenance is confirmed to be successful.

Identification of Normal State of Equipment.

After the device is started, there will be no alarm information and error information at the interface under normal conditions. The curve of the interface will scan from left to right freely; if there is a button, alarm or error prompt, the device may be in an abnormal state. You need to view the specific prompt information. You can try to restart the setting. If the fault information is still in place, do not use it for testing. Contact the manufacturer or the maintenance department designated by the manufacturer to carry out maintenance to avoid the wrong test data caused by the use of the fault or endanger the personal safety.

Do Not Operate with Suspected Failures.

If you suspect that there is damage to the instrument, please let only qualified service personnel check it.

Avoid Exposed Circuits, Wire, or Components.

Do not touch exposed contacts or components when the power is on.

Do not operate in wet/damp conditions.

Do not operate in an explosive atmosphere.

Keep the surface of the instrument clean and dry.

Only lithium batteries with the same specification could be used to replace the battery on the main-board.

The responsible body or operator should refer to the instruction manual to preserve the protection afforded by the device. If the device is used in a manner not specified by the manufacturer, the protection provided by the device may be impaired.

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

2.2 Safety Terms and Symbols

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

	This symbol is used where caution is required. Refer to the accompanying information or documents to protect against personal injury or damage to the instrument.
	This symbol warns of a potential risk of shock hazard.
	This symbol is used to denote the measurement ground connection.
	This symbol is used to denote a safety ground connection.
	This symbol shows that the switch is an On/Standby switch. When it is pressed, the instrument's state switches between Operation and Standby. This switch does not disconnect the device's power supply. To completely power off the instrument, the power cord must be unplugged from the AC socket after the instrument is in the standby state.
	This symbol is used to represent alternating current, or "AC".
CAUTION	The "CAUTION" symbol indicates a potential hazard. It calls attention to a procedure, practice, or condition which may be dangerous if not followed. Do not proceed until its conditions are fully understood and met.
WARNING	The "WARNING" symbol indicates a potential hazard. It calls attention to a procedure, practice, or condition which, if not followed, could cause bodily injury or death. If a WARNING is indicated, do not proceed until the safety conditions are fully understood and met.

3 The SDG7000A Series Generator at a Glance

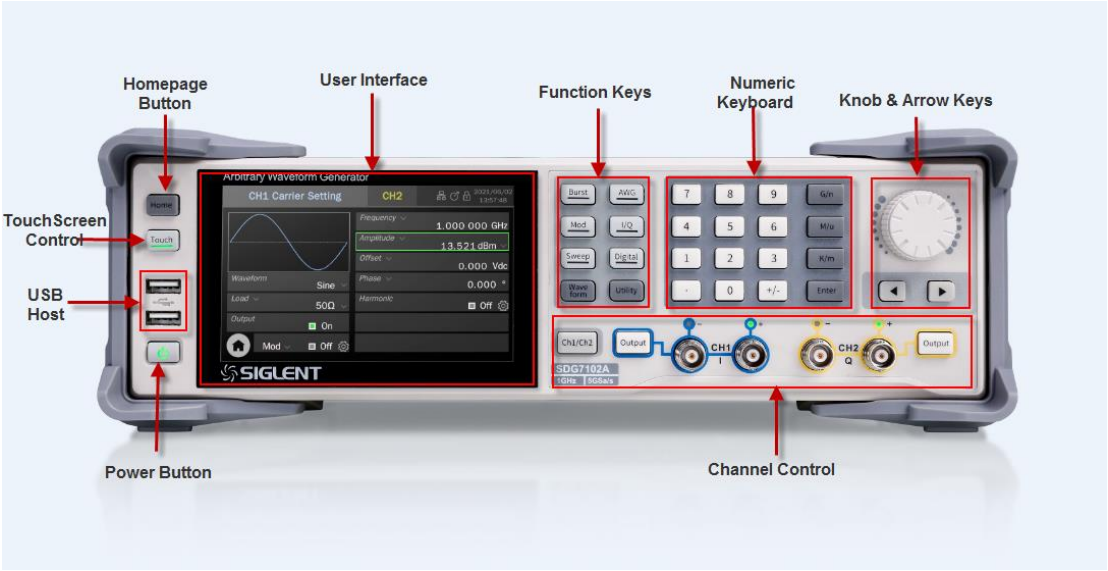
SIGLENT's SDG7000A is a series of dual-channel Arbitrary Waveform Generators that feature up to 1 GHz maximum bandwidth, maximum sample rate of 5 GSa/s and 14-bit vertical resolution. They also include proprietary TrueArb and EasyPulse technology that helps to solve the weaknesses inherent in traditional DDS generators when generating arbitrary, square and pulse waveforms. The SDG7000A can generator Sequence waveform, it supports up to 1024 segments. The SDG7000A is a multi-function device which can generate Noise, IQ signals and PRBS patterns. The IQ modulation bandwidth up to 625 MHz. In addition, The SDG7000A provides a 16bit digital bus output. These features enable the SDG7000A to provide a variety of high fidelity and low jitter signals, meeting the growing requirements of complex waveform synthesis.

3.1 Characteristics

- Dual channel differential/single-ended output，16-bit LVDS/LVTTL digital bus output.
- High-performance sampling system with 5GSa/s sample rate and 14 -bit vertical resolution.
- 1 GHz maximum bandwidth.
- Supports arbitrary waveform with sample rate of 0.01 Sa/s ~ 2.5 GSa/s, with maximum memory depth of 512 Mpts, and provides segment editing /playback functions.
- Supports vector signals with up to 500 MS/s symbol rate.
- Supports low jitter pulse with 1 ns minimum pulse width and 500ps minimum edge.
- Up to 1 GHz bandwidth White Gaussian Noise and the bandwidth is adjustable.
- Supports PRBS up to 312.5 Mbps.
- The digital bus can output digital signals up to 1 Gbps.
- Supports analog/digital modulation, sweeping and bursting.
- Enhanced dual channel operation functions: inter channel tracking, coupling and copying; Dual channel superposition function; Supports mutual modulation between channels.
- The 24 Vpp analog output is superimposed with ± 12 Vdc offset to provide a maximum output range of ± 24 V (48 V).
- High precision Frequency Counter
- 5-inch capacitive touch screen with resolution of 800x480; Supports external mouse and keyboard operation; Supports WebServer to remote control the instruments.
- Supports multiple interfaces: 10MHz In, 10MHz Out, Trigger In/Out, Markers etc.
- Supports SCPI command for various automatic integration test systems remote controlling

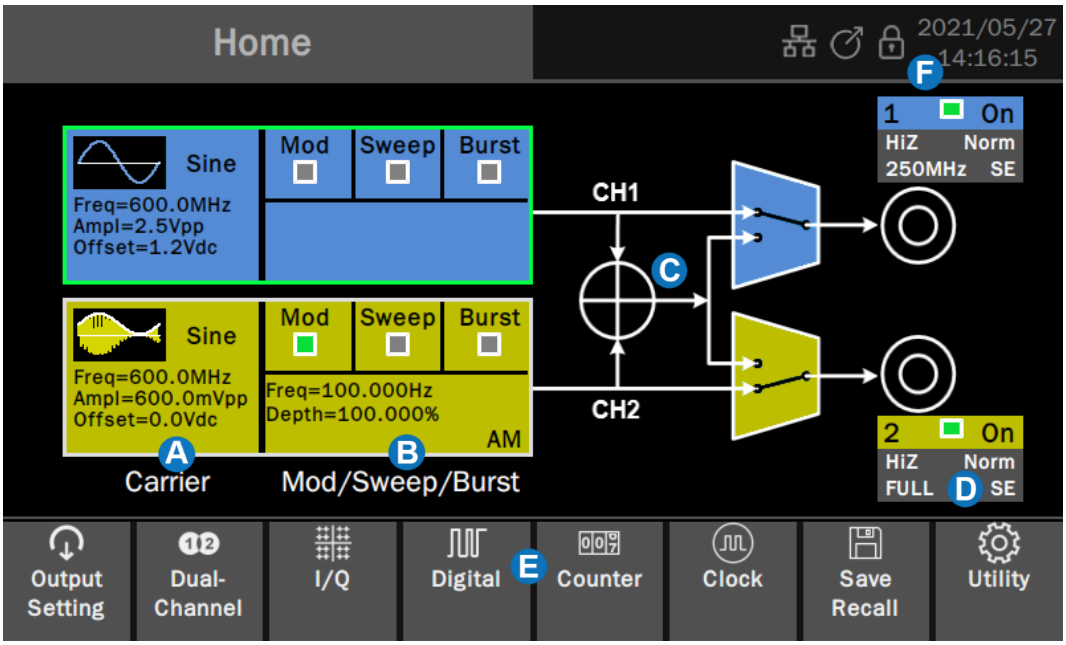
Note: ***All the specifications described in this manual refer to the SDG7102A***.

3.2 The Front Panel at a Glance



3.2.1 Touch Screen Display

Home Page



A **Carrier Setting Boxes** set and display parameters of the carrier. Click to enter the carrier setting page.

B **Modulation/Sweep/Burst Setting Boxes** set and display parameters of modulation/sweep/burst. Click to enter the modulation/sweep/burst setting page.

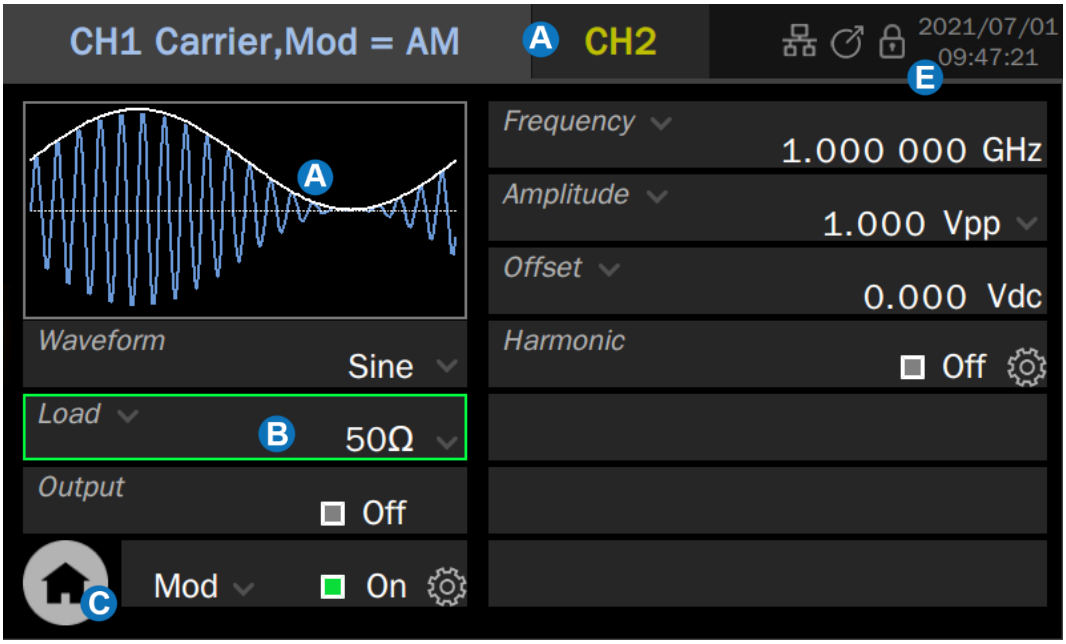
C **Waveform Combine Setting** provides schematic diagram and setting of two channel combine. Click the switches in the area to switch between channel output alone and channel output after combination.

D **Channel Output Setting Boxes** set and display output parameters. Click to switch between On/Off.

E **Toolbar** provides shortcuts to common functions.

F **Status Bar** Displays information such as network connection status, clock status, phase mode and time/date.

Parameter Setting Page



A **Channel Tab** Click the tab corresponding to the channel to switch to the parameter setting page of the channel.

B **Waveform Preview** Displays the preview of waveform.

C **Parameter Setting Box** The parameter name is on the left. If the parameter name is followed by an icon , it indicates that the parameter has alternative parameters, such as "Frequency" can be switched to "Period". Click here to switch the parameter.

The parameter value is on the right. If the value has a unit, the unit will be displayed. Click the parameter value area to set the value through the virtual keyboard or front panel keyboard.

If the parameter value or unit is followed by an icon , it means that there are multiple options (for example, the unit of sine wave amplitude can be set to "Vpp", "Vrms" or "dBm"), click the icon to select.

If the parameter value area is a switch icon , it means that the parameter has only "ON" and "OFF" states. Click the icon to switch.

If the parameter value is followed by an icon , it indicates that there are more detailed parameter settings. Click the icon to enter the corresponding next level page.

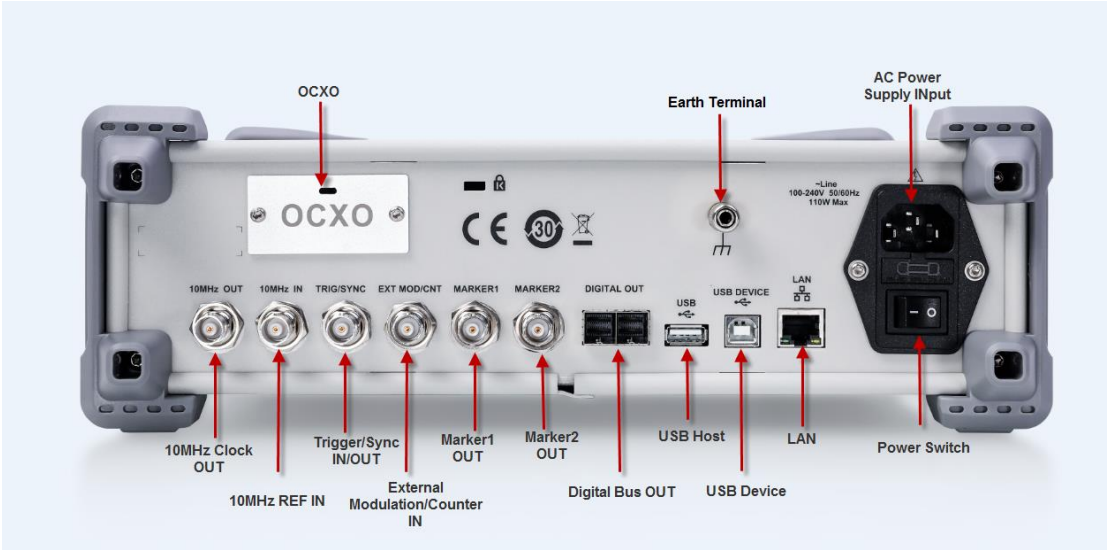
D **Go to the Homepage**

E **Status Bar** Displays information such as network connection status, clock status, phase mode and time/date.

Description of Icons in the Status Bar

	The network is connected. Click this icon to quickly set the LAN.
	No network connection. Click this icon to quickly set the LAN.
	USB storage device detected.
	The clock source is internal. Click this icon to quickly set the clock source.
	The clock source is external. Click this icon to quickly set the clock source.
	The clock source is external, but no valid external clock was detected. Click this icon to quickly set the clock source.
	The phase mode is "Locked". Click this icon to quickly set the phase mode.
	The phase mode is "Independent". Click this icon to quickly set the phase mode.
2021/04/16 08:26:56	Time/date. Click this area to quickly set the time/date.

3.3 The Rear Panel at a Glance



WARNING: *For protection from electric shock, the grounding power cord must not be defeated. If only a two-contact electrical outlet is available, connect the instrument's chassis ground screw (see above) to a good earth ground.*

4 Performance Verification

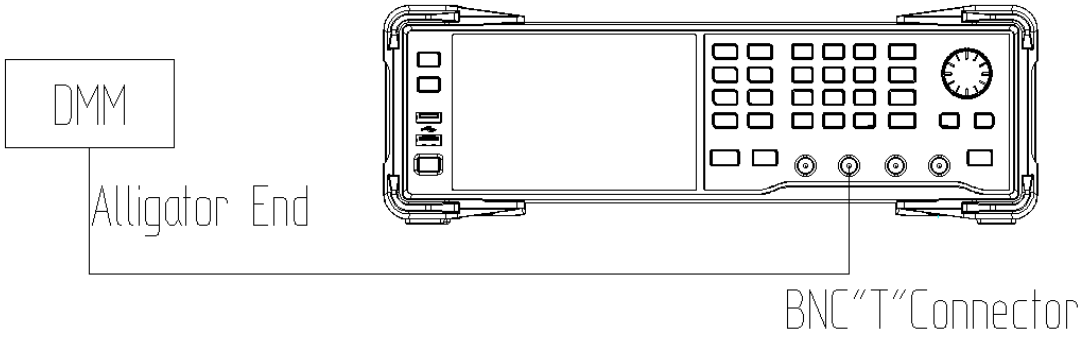
The performance verification tests are recommended as acceptance tests upon receipt of the instrument. The acceptance test results should be compared to the specifications given in datasheet. After acceptance, repeat the performance verification tests within every calibration interval.

If the instrument fails performance verification, adjustment or repair is required.

4.1 DC Output Verification

This test checks if the DC offset listed in the table below is within the spec range using a DMM.

1. Set the DMM to measure DC voltage. Connect the DMM to the CH1 output of the generator as shown below.



2. Set CH1 format to single-ended and set the Load to HiZ.
3. Turn on CH1 and select the DC waveform.
4. Set the instrument to each output value described in the table below and measure the output voltage with the DMM. Be sure the generator output load is set to High–Z and the output is enabled.

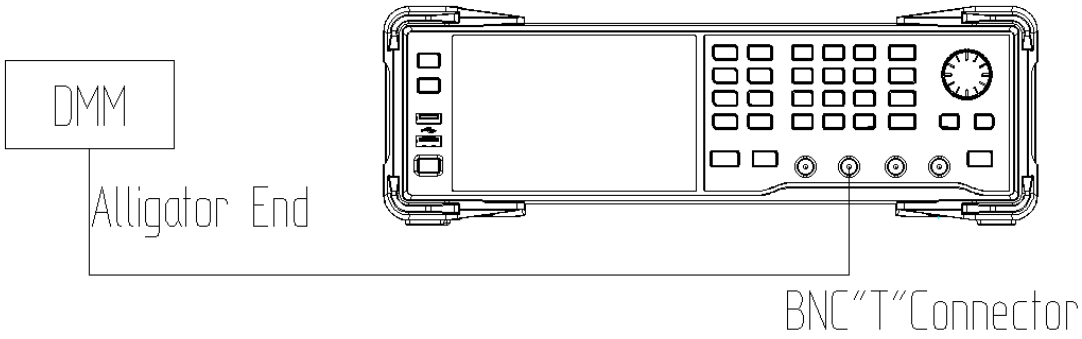
DC Offset	CH1	CH2	Spec Range ± (1%+2 mV)
0 mV			-2 mV ~ 2 mV
10 mV			7.9 mV ~ 12.1 mV
100 mV			97 mV ~ 103 mV
1 V			0.988 V ~ 1.012 V
3 V			2.968 V ~ 3.032 V
10 V			9.898 V ~ 10.102 V
-10 mV			-12.1 mV ~ - 7.9 mV
-100 mV			-103 mV ~ -97 mV
-1 V			-1.012 V ~ -0.988 V
-3 V			-3.032 V ~ -2.968 V
-10 V			10.102 V ~ -9.898 V

5. Remove the BNC cable and connect it to the output of CH2, then perform the same verification as CH1.
6. Compare the measured voltage to the spec range shown in the table above.

4.2 AC Amplitude Verification

This test checks the ac amplitude output accuracy at the frequency of 10 kHz using a DMM.

1. Turn on the generator and choose CH1 as the operating channel.
2. Connect the DMM and generator as shown below.



3. Set CH1 format to single-ended and set the Load to HiZ.
4. Select a 10 kHz Sine waveform of the generator and set offset to 0V.
5. Set the amplitude to the values listed below in sequence.

Amplitude (Vpp)	CH1 (Vpp)	CH2 (Vpp)	Spec Range ± (1% +2 mVpp)
9			8.908~9.902
6.5			6.433~6.567
4			3.958~4.042
1.3			1.285~1.315
0.4			0.394~0.406
0.13			0.1267~0.1333
0.04			0.0376~0.0424
0.013			0.01087~0.01513

6. Set offset to 3.5V and Set the amplitude to the values listed below in sequence.

Amplitude (Vpp)	CH1 (Vpp)	CH2 (Vpp)	Spec Range ± (1% +2 mVpp)
9			8.908~9.902
4			3.958~4.042
1			0.988~1.012
0.4			0.394~0.406
0.13			0.1267~0.1333
0.04			0.0376~0.0424

7. Set CH1 format to differential set the Load to HiZ.
8. Set offset to 0V and set the amplitude to the values listed below in sequence.

Amplitude (Vpp)	CH1 (Vpp)	CH2 (Vpp)	Spec Range ± (1% +2 mVpp)
1			0.988~1.012
0.45			0.4435~0.4565
0.15			0.1465~0.1535
0.1			0.097~0.103
0.032			0.02968~0.03432

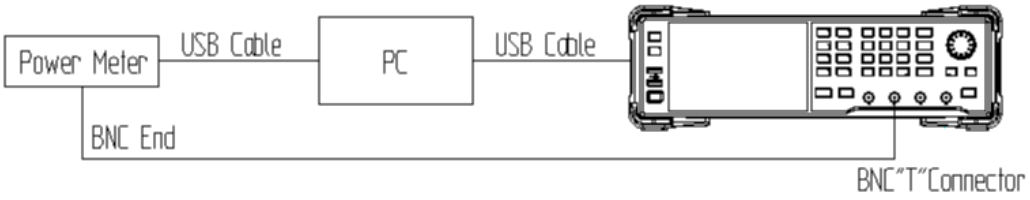
***Note**: the value measured from the DMM need to be multiplied by 2.*

9. Remove the BNC cable and connect it to the output of CH2, then perform the same verification as CH1.
10. Compare the value measured from the DMM to the spec range shown in the table above.

4.3 Frequency Response Verification

This test checks if the amplitude flatness is within the spec range using a Power Meter.

1. Turn on the generator and choose CH1 as the operating channel. Set the Load to 50 Ω.
2. Connect the Power Meter, PC and generator as shown below.



3. Set CH1 format to single-ended.
4. Set offset to 0V and the output load to 50 Ω.
5. Select Sine waveform of the generator and set the amplitude to 0.45 Vpp and frequency to the values listed below in sequence.

Frequency	CH1 (dBm)	CH1 Spec Range (dBm)	CH2 (dBm)	CH2 Spec Range (dBm)
1 MHz	P_{CH1_1M}	-3.2564~-2.6564	P_{CH2_1M}	-3.2564~-2.6564
5 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
10 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
50 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
100 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
150 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
200 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
250 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
300 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
350 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$
400 MHz		$P_{CH1\_1M} \pm 0.3$		$P_{CH2\_1M} \pm 0.3$

450 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
500 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
550 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
600 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
650 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
700 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
750 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
800 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
850 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
900 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
950 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3
1000 MHz		P_{CH1_1M} ± 0.3		P_{CH2_1M} ± 0.3

6. Set CH1 format to differential and terminate the "-" port with 50 Ω load. Be sure the generator output load is set to 100 Ω.
7. Set the amplitude to 0.45 Vpp and frequency to the values listed below in sequence.

Frequency	CH1 (dBm)	CH1 Spec Range (dBm)	CH2 (dBm)	CH2 Spec Range (dBm)
1 MHz	$P_{CH1\_1M\_dif}$	-6.2667~-5.6667	$P_{CH2\_1M\_dif}$	-6.2667~-5.6667
5 MHz		$P_{CH1\_1M\_dif}$ ± 0.3		$P_{CH2\_1M\_dif}$ ± 0.3
10 MHz		$P_{CH1\_1M\_dif}$ ± 0.3		$P_{CH2\_1M\_dif}$ ± 0.3
50 MHz		$P_{CH1\_1M\_dif}$ ± 0.3		$P_{CH2\_1M\_dif}$ ± 0.3
100 MHz		$P_{CH1\_1M\_dif}$ ± 0.3		$P_{CH2\_1M\_dif}$ ± 0.3
150 MHz		$P_{CH1\_1M\_dif}$ ± 0.3		$P_{CH2\_1M\_dif}$ ± 0.3
200 MHz		$P_{CH1\_1M\_dif}$ ± 0.3		$P_{CH2\_1M\_dif}$ ± 0.3
250 MHz		$P_{CH1\_1M\_dif}$ ± 0.3		$P_{CH2\_1M\_dif}$ ± 0.3

300 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
350 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
400 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
450 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
500 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
550 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
600 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
650 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
700 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
750 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
800 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
850 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
900 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
950 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$
1000 MHz		$P_{CH1\_1M\_dif} \pm 0.3$		$P_{CH2\_1M\_dif} \pm 0.3$

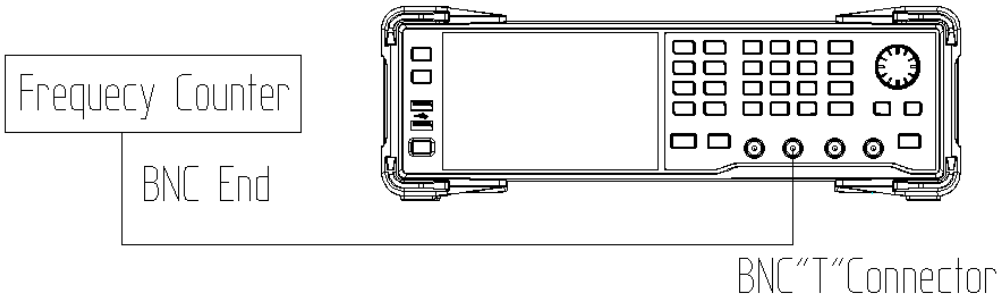
Note: *the value measured from the Power Meter need to be added by 3.0103dBm.*

8. Remove the BNC cable and connect it to the output of CH2, then perform the same verification as CH1.
9. Compare the value measured from Power Meter to the spec range shown in the table above.

4.4 Frequency Accuracy Verification

This test checks if the frequency accuracy is within the spec range using a frequency counter.

1. Set the Frequency Counter to measure frequency. Connect the Counter to the CH1 output of the generator as shown below.



2. Power up the frequency counter and the generator for 30 minutes.
3. Set CH1 format to single-ended and set the Load to HiZ.
4. Select Sine waveform of the generator and set the amplitude to 3 Vpp.
5. Set the frequency to 10 MHz and turn on CH1.
6. Compare the value measured from the counter to the spec range shown in the table below.

Time Base Type	Frequency (Hz)	Spec Range (Hz)
Standard time base		9999990 ~ 10000010, if 18 ℃≤the ambient temperature ≤ 28 ℃; else 9999980 ~ 10000020
OCXO option		9999999 ~ 10000001

5 Assembly Procedures

This chapter describes how to remove the major modules from the SDG7000A series generator. To install the removed modules or replace new modules, please follow corresponding operating steps in reverse order.

The following subjects are addressed in this chapter:

- **Security Consideration** which describes security information needed to consider 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.

5.1 Security Consideration

Only qualified personnel should perform the disassembly procedures. Whenever possible, disconnect the power supply before removing or replacing modules. Otherwise, personal injuries or damages to the components may occur.

Avoid Electric Shock Hazardous voltages exist on the LCD module and power supply module. To avoid electrical shock, disconnect the power cord from the generator, and then wait at least three minutes for the capacitors in the generator to discharge before beginning the disassembly.

Preventing ESD Almost all electrical components can be damaged by electrostatic discharge (ESD) during handling. Component damages can occur at electrostatic discharge voltages as low as 50 volts. The following guidelines will help preventing ESD damage when servicing the instrument or any electronic device.

- Disassemble instruments only in a static-free work area.
- Use a conductive work area to reduce static charges.
- Use a conductive wrist strap to reduce static charge accumulation.
- Minimize handling.
- Keep replacement parts in original static-free packaging.
- Remove all plastic, foam, vinyl, paper and other static-generating materials from the immediate work area.
- Use only anti-static solder suckers.

5.2 List of Modules

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

Number of Module	Module
1	Metal Shell
2	Channel Board
3	Main Board
4	Front Cabinet

5.3 Required Tools

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

- Antistatic gloves
- T10 and T15 Torx socket head screwdriver, pointed nose pliers

5.4 Disassembly Procedures

This section describes in detail how to disassemble the generator's modules listed above. If you need to install or replace the part module, follow the reverse steps.

5.4.1 Disassemble the Metal Shell

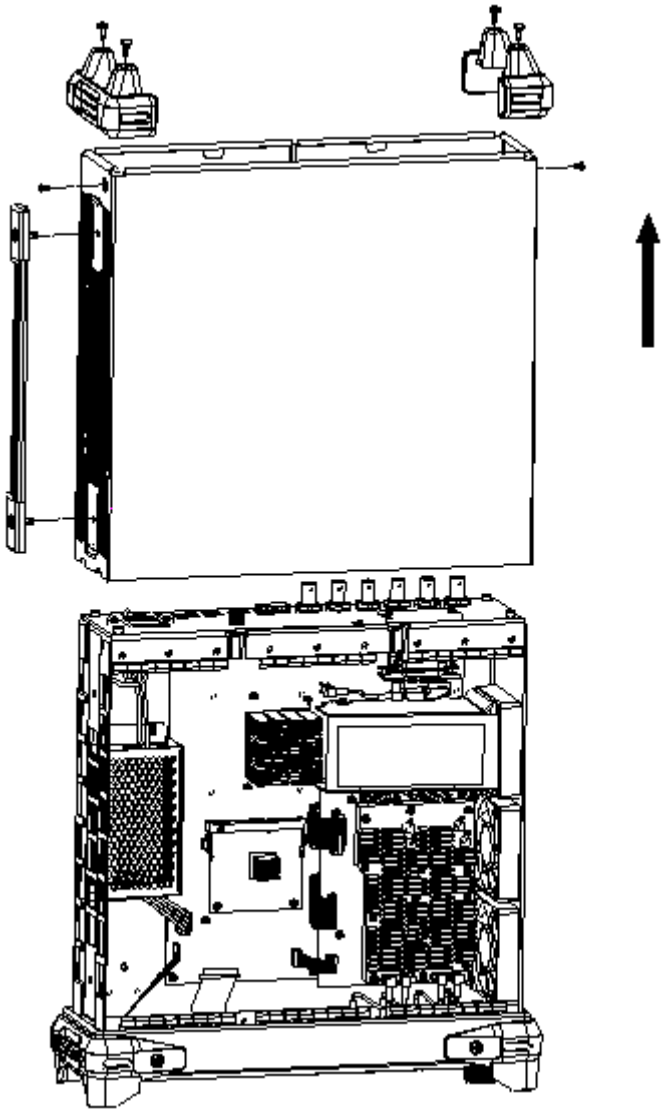


Figure 5-1 Disassemble the Metal Shell

Disassemble according to the following steps:

1. Remove 4 PCS PM4 * 8 screws from the rear foot pad and remove the rear foot pad.
2. Remove 2 PCS KM4 * 16 screws of the handle and remove the handle.
3. Remove 2 PCS KM3 * 6 screws of the shell and remove the shell upward.

5.4.2 Disassemble the Channel Board

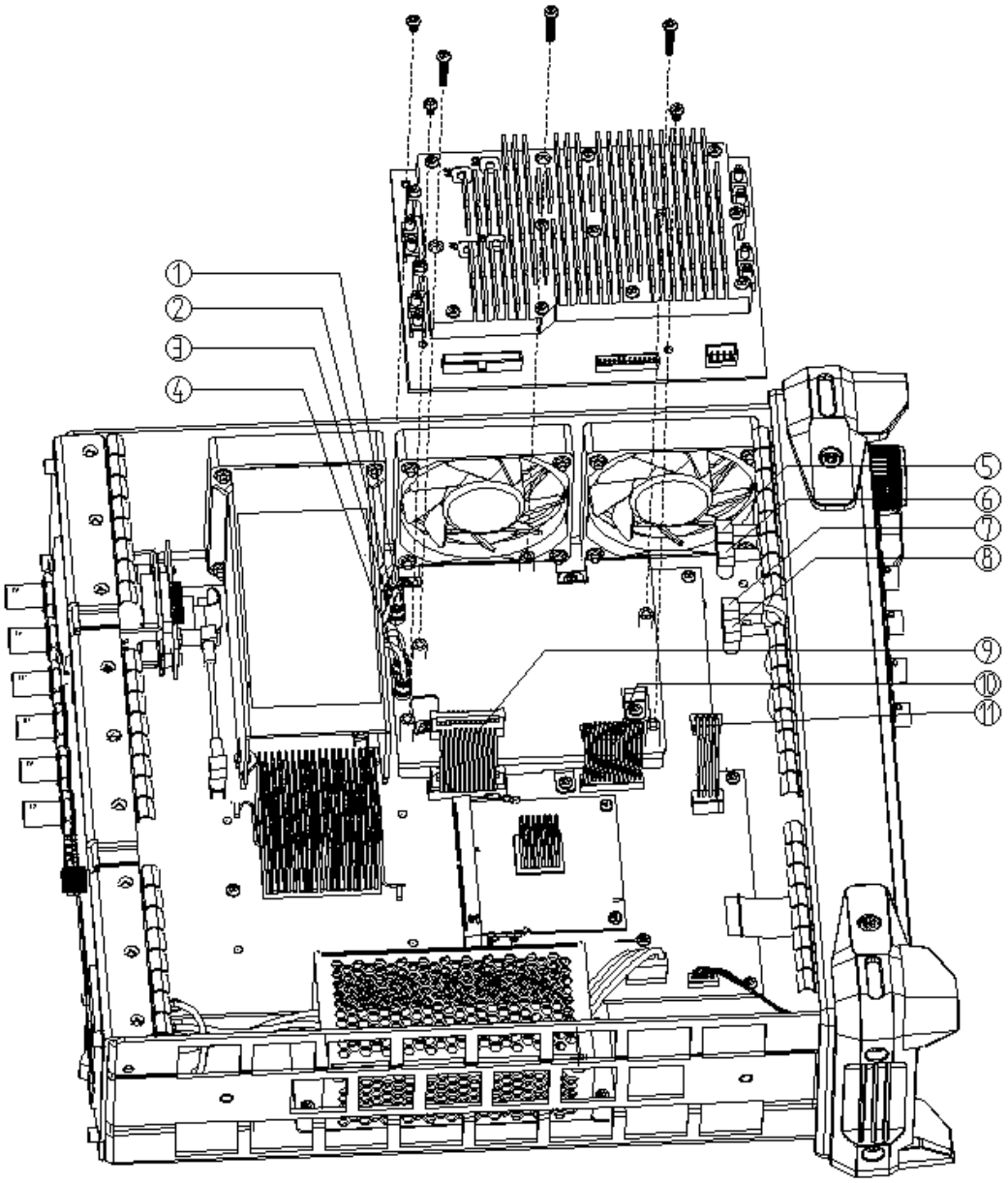


Figure 5-2 Disassemble the Channel Board

Disassemble according to the following steps:

1. Pull out the cable plug from ① to ⑪ as shown in the figure above.
2. Remove 6 PCS screws fixing the channel board.
3. Remove the channel board.

5.4.3 Disassemble the Main Board

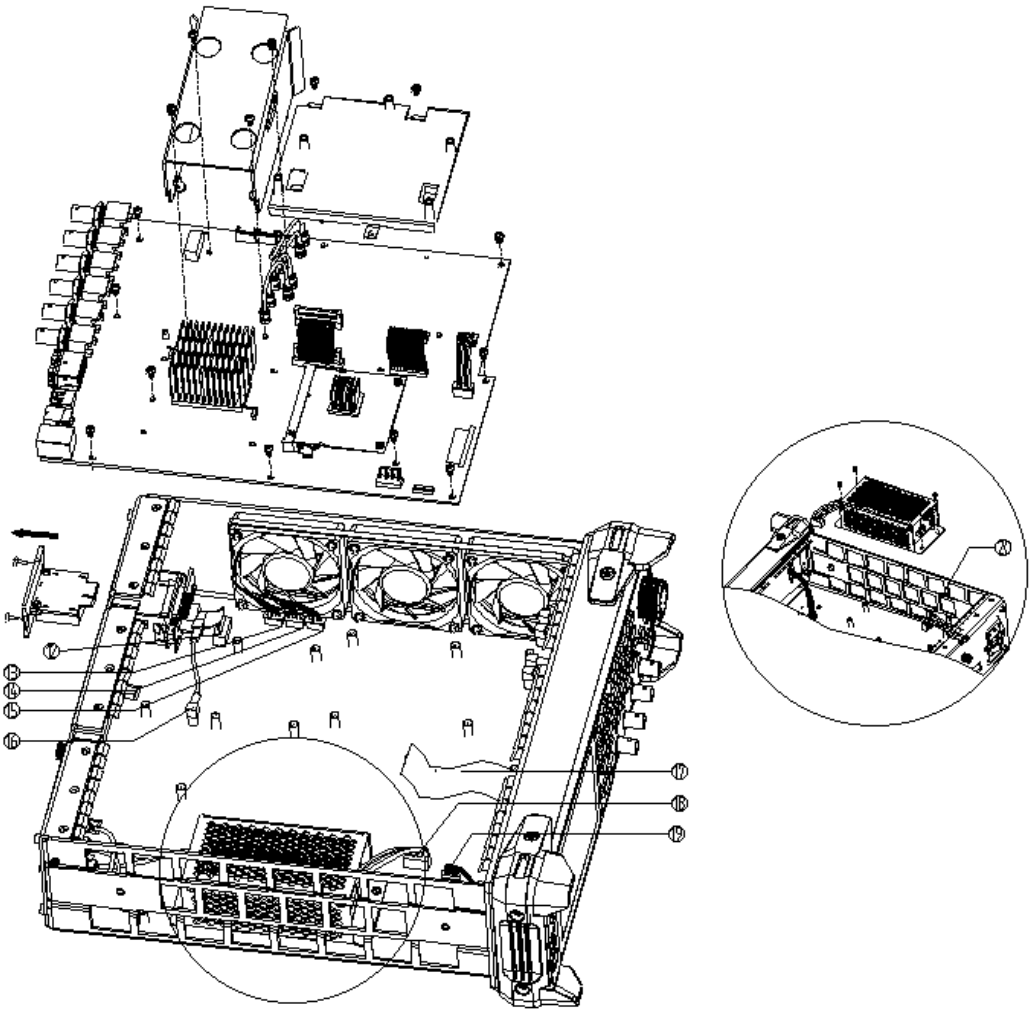


Figure 5-3 Disassemble the Main Board

Disassemble according to the following steps:

1. Pull out the cable plug from ⑫ to ⑳ as shown in the figure above.
2. Remove 18 PCS PM3 * 6 screws and take out the cooling air duct, support frame and PCBA in turn.
3. Remove 4 PCS PM3 * 6 screws of the power module and take out the power module.
4. Remove 2 PCS PM3 * 6 screws fixing OCXO module and pull out the OCXO module backward.
5. Remove the main board

5.4.4 Disassemble the Front Cabinet

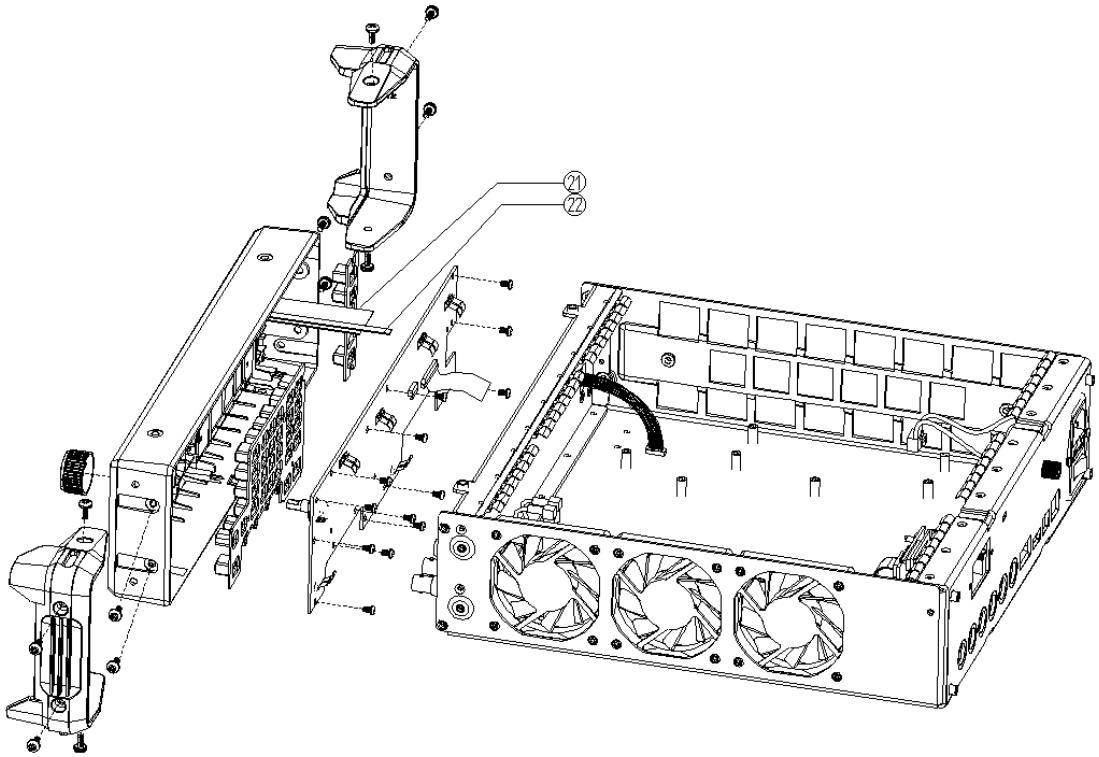


Figure 5-4 Disassemble the Front Cabinet

Disassemble according to the following steps:

1. Remove the 8 PCS PM4 * 8 screws of the front foot pad and take out the front foot pad.
2. Remove 4 PCS PM4 * 8 screws from the front cabinet and separate the front cabinet assembly from the frame.
3. Remove the connecting cable 21 and 22, and remove plastic knob;
4. Remove 13 PCS PM3 * 8 screws of key board.
5. Take out the key board and silicone keys in turn.

6 Troubleshooting

The internal structure of the generator consists of the CPU card, main board, channel board, key and LCD board, USB interface board, power module, OCXO module, and fans. They are linked through cables or connectors. This chapter explains the main troubleshooting procedures for these boards (mainly main board, channel board, and CPU card) by measuring the corresponding test points and checking the signals of connectors on them, thus to help in determining the cause of the failure that has been encountered while operating the SDG7000A.

6.1 ESD Precautions

While performing any internal test of the generator, please refer to the following precautions to avoid damages to its internal modules or components resulting from ESD.

- Handle circuit boards by their edges as much as possible.
- Avoid handling of static-sensitive modules if not necessary.
- Wear a grounded antistatic wrist strap to drain the static voltage from your body while touching these modules.
- Operate static-sensitive modules only in static-free areas. Avoid handling modules in areas that allow anything capable of generating or holding a static charge.

6.2 Required Equipments

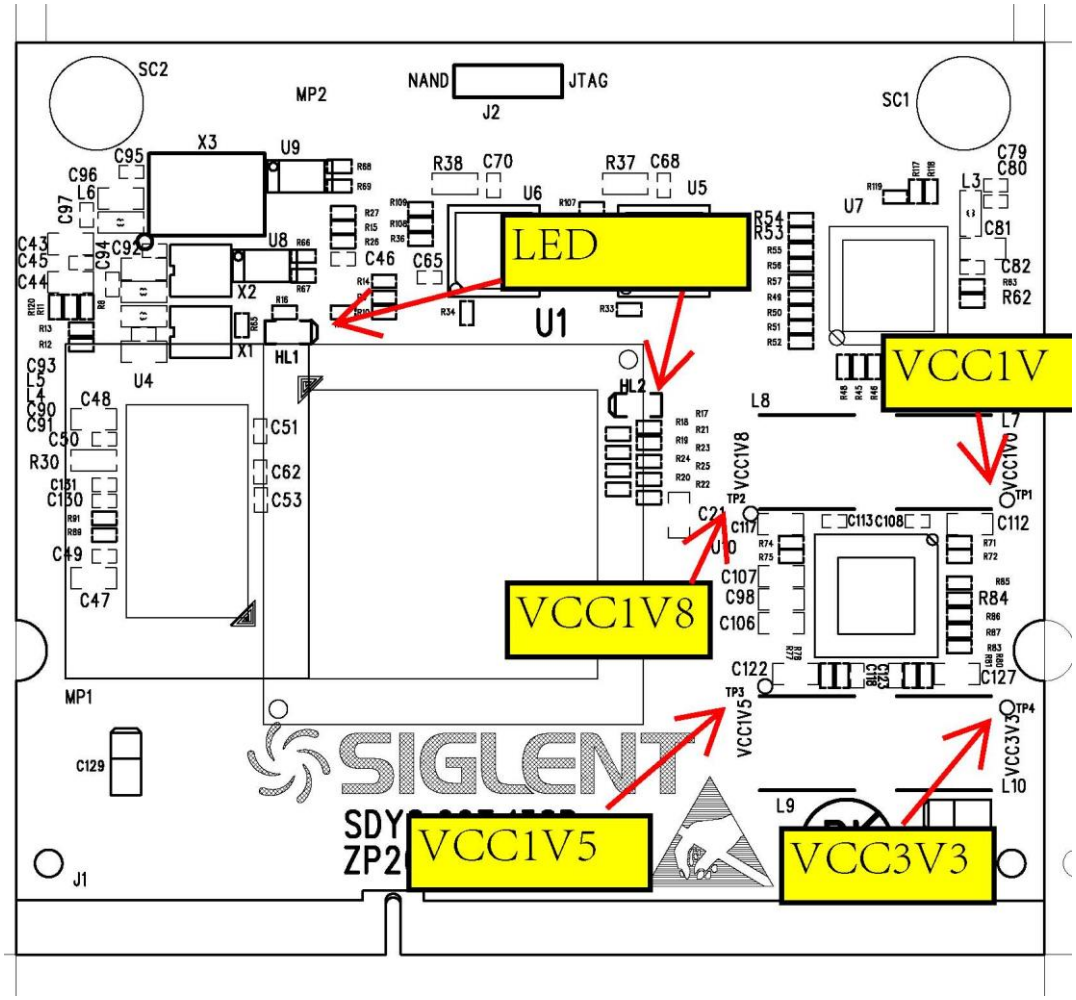
The equipment listed in the table below is required to troubleshoot the generator.

Table 6-1 Required Equipments

Equipment	Critical Specifications	Example
Digital Multimeter	DC Accuracy ±0.015%	SDM3055
Oscilloscope	300 MHz Bandwidth	SDS2304X

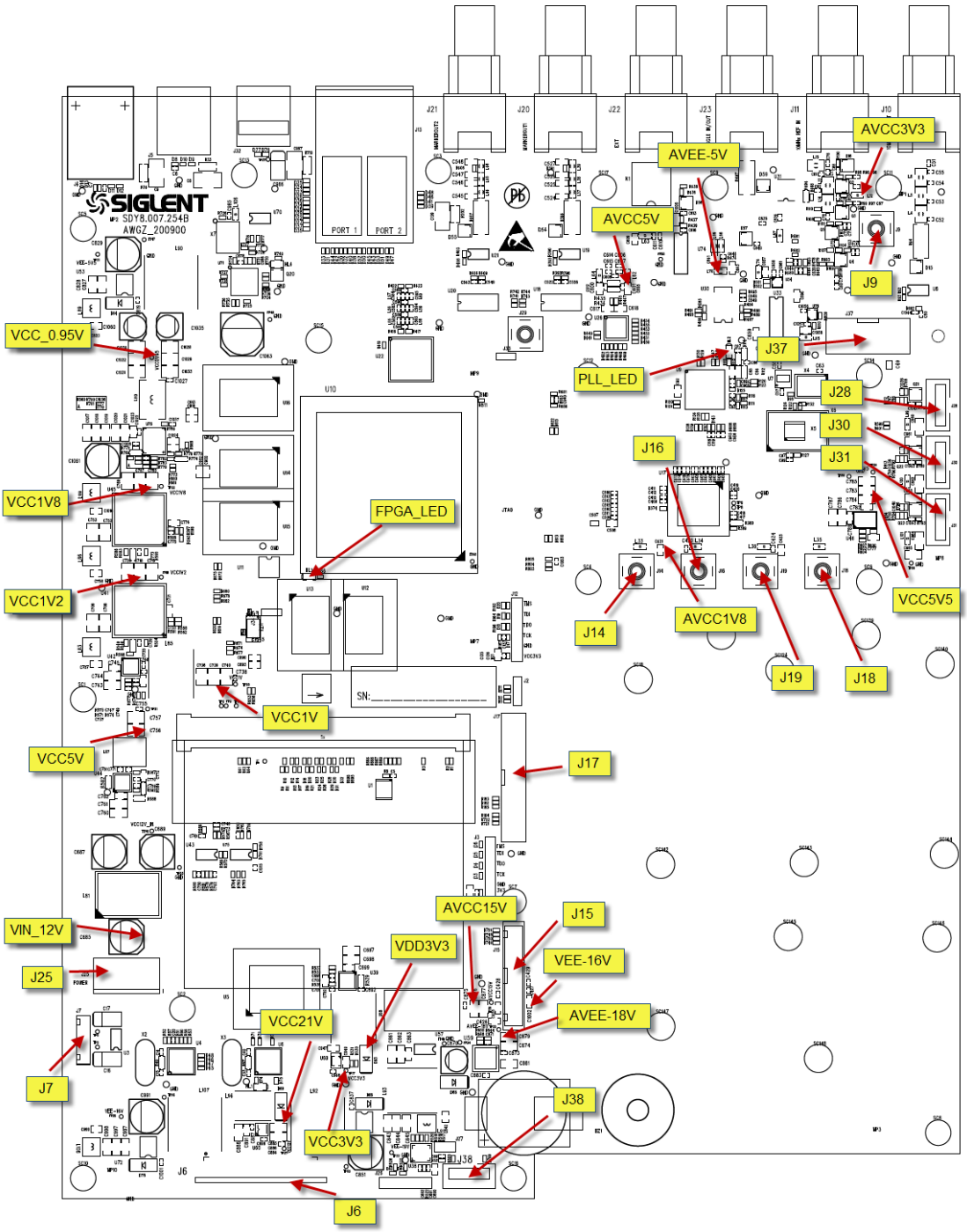
6.3 CPU Card Drawing

The CPU card is the control center of the generator that contains an ARM CPU system. It completes the GUI function, controlling and configuration function of the main board and the channel board as well as the user interface. It is plugged into the SODIMM socket of the main board. Please refer to the following drawing to quickly locate the test points on the main board for easy resolution of any problems encountered.



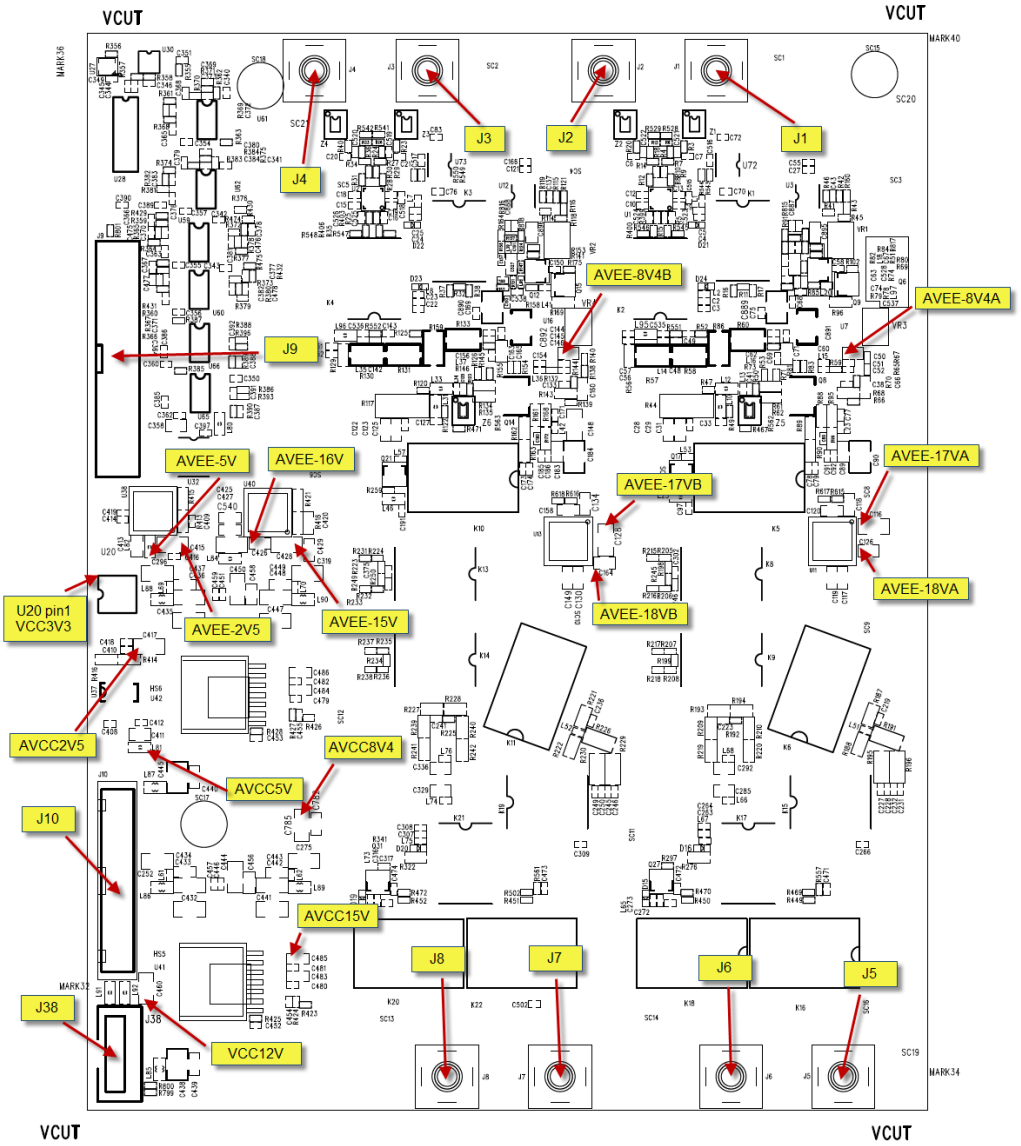
6.4 Main Board Drawing

The main board is responsible for signal processing. It is mainly responsible for generating analog signal, clock, input and output interface signal and other functions. Please refer to the following drawing to quickly locate the test points on the main board for easy resolution of any problems encountered.



6.5 Channel Board Drawing

The channel board is a signal conditioning board. It mainly deals with the adjusting of signal parameters such as amplitude, offset, and so on. Please refer to the following drawing to quickly locate the test points on the channel board for easy resolution of any problems encountered.



6.6 Check the Power Supply

Before performing the power supply testing procedure, please make sure that the generator is grounded correctly through the protective lead of the power cord. Take care not to touch or even disassemble the power supply module without any safety precautions to avoid electric shock. Here are procedures for testing the power supply:

1. Disconnect the power cord of the generator and then check whether the fuse is good. The fuse is under the AC inlet.
2. Connect the power cord and then turn on the generator. Focus on the Power Connector (J25) on main board, which contains 4 pins, from Pin 1 to Pin 4. Pin 1 and Pin 2 are +12V, and connected to red wires. Pin 3 and Pin 4 are ground, and connected to black wires. Check whether the voltage value is within the corresponding specified range by digital multimeter. The voltage range is 12V±10%.
3. If the voltage value is within the specified range, then the power module is working normally. Otherwise, please go to step 4.
4. Disconnect the power connector and re-check the voltage on the wires side. Some abnormality of the load is most likely causing the power supply problem. Continuous checking or even replacing the channel/main board is required for further test.

   If the voltage value is out of the specified range, then the power module appears to be problematic and a replacement will be required. For safety, please use qualified technical personnel to disassemble the power module.

Note: *The fuse under AC inlet provides protect against the danger of fire in the event of a failure of the power supply circuitry. However, this fuse will not fail ("open" or "blow") in normal power supply operation except when a significant overload occurs.*

6.7 Check the CPU Card

The CPU card is the control center of the generator where an Arm CPU is located. Please refer to chapter 8 if you wish to separate it from the main board.

6.7.1 Voltage Checking

Test the voltage test points on the CPU card and compare to the table below. If each tested voltage value is within the corresponding specified range, then the CPU card is working normally. If the voltages are out of the specified range, please return it to the factory for repair or contact **SIGLENT**.

Table 6-2 Test Voltages of the CPU card

Test point	Voltage value	Error limit
VCC1V	1 V	±5%
VCC1V8	1.8 V	±5%
VCC1V5	1.5 V	±5%
VCC3V3	3.3 V	±5%

6.7.2 ARM CPU System Checking

Observe the LED lights on the CPU card, which indicate the working state of the ARM CPU system. If the LED lights blink at a regular rate, then the corresponding codes have been loaded successfully and the chip is in an operating state. Otherwise, there may be a problem.

6.8 Check the Main Board

If it is desired to remove the main board from the metal shelf inside the generator, please place it on a clean, insulated mat. Here are the procedures for testing the main board:

1. Several types of connectors are used on the main board. make certain that all of these connectors are connected properly.
2. After checking these connectors, then connect the generator to AC power and power it on. Check if the voltage values at all test points are within the specified range using a digital multimeter. The voltage parameters to be tested are listed in "Table 6-3".

6.8.1 Voltage Checking

Test the voltage points on the main board in the table below. To locate the test points, please refer to the drawing of the main board. If each tested voltage value is not within the corresponding spec range referring to "Table 6-3", the main board is defective. Please return it to the factory for repair or contact SIGLENT.

Table 6-3 Test Voltages of the Main Board

Test point	Voltage value	Error limit
VIN_12V	12 V	±10%
VCC21V	21.7 V	±10%
AVCC15V	15 V	±5%
AVEE-16V	-16 V	±5%
AVEE-18V	-18 V	±5%
AVEE-5V	-5 V	±5%
VCC5V	5 V	±5%
VCC3V3	3.3 V	±5%
VDD3V3	3.3 V	±5%
VCC1V	1 V	±5%
AVCC1V8	1.8 V	±5%
VCC1V8	1.8 V	±5%
VCC1V2	1.2 V	±5%
VCC5V5	5.5 V	±5%
AVCC5V	5 V	±5%
AVCC3V3	3.3 V	±5%
VCC_0.95V	0.95 V	±5%

6.8.2 10 MHz Clock Source and PLL Lock Status Checking

There is a TXCO/OCXO generating a 10 MHz clock source to the PLL. The PLL lock to the clock source and generate all clock for the entire main board. Please check whether the PLL LED is on. If it is on, it is locked.

6.8.3 FPGA Checking

To check if the FPGA is working properly, please observe the test point marked with FPGA_LED on the main board drawing. The LED light blinks at a 1 Hz rate in normal operation. If it does not light, or blinks at an incorrect frequency, then the FPGA may be fault.

6.8.4 Connector Checking

Table 6-4 Connectors of the Channel Board

Connector	Function
J15, J17	Communication between the main board and the channel board.
J9, J37	Communication between the main board and the OCXO module.
J25	Power supply of the main board.
J7	USB HOST interface of the front panel.
J6	Communication between the main board and the Key and LCD board.
J14, J16, J18,J19	Analog out to the channel board.
J38	Communication between the main board and the channel board.
J28, J30, J31	Power supply of the fans.

Table 9-4 explains the function of all the connectors on the main board. It is important to ensure that all the connections are tight.

6.9 Check the Channel Board

If it is desired to remove the channel board from the metal shelf inside the generator, please place it on a clean, insulated mat. Here are the procedures for testing the channel board:

1. Several types of connectors are used on the channel board. Make certain that all of these connectors are connected properly.
2. After checking these connectors, then connect the generator to AC power and power it on. Check if the voltage values at all test points are within the specified range using a digital multimeter. It may be necessary to open the shielding cover of the channel board when testing the voltage. The voltage parameters to be tested are listed in "Table 6-5":

6.9.1 Voltage Checking

Test the voltage points on the channel board in the table below. To locate the test points, please refer to the drawing of the channel board. If each tested voltage value is not within the corresponding spec range referring to "Table 6-5", the channel board is defective. Please return it to the factory for repair or contact **SIGLENT**.

Table 6-5 Test Voltages of the Channel Board

Test point	Voltage value	Error limit
AVEE-15V	-15 V	±5%
AVCC15V	15 V	±5%
AVEE-16V	-16 V	±5%
VCC12V	12 V	±10%
AVEE-5V	-5 V	±5%
AVCC5V	5 V	±5%
AVCC2V5	2.5 V	±5%
AVEE-2V5	-2.5 V	±5%
AVCC8V4	8.4 V	±5%
AVEE-8V4A	-8.4 V	±5%
AVEE-8V4B	-8.4 V	±5%
AVEE-17VA	-17 V	±5%
AVEE-17VB	-17 V	±5%
AVEE-18VA	-18 V	±5%
AVEE-18VB	-18 V	±5%
VCC3V3	3 V	±5%

6.9.2 Connector Checking

Table 6-6 Connectors of the Channel Board

Connector	Function
J9, J38	Communication between the main board and the channel board.
J10	Power supply of the channel board.
J1, J2, J3, J4	Analog input from the main board.
J5, J6, J7, J8	Analog output to BNC connector of the front panel.

Table 9-6 explains the function of all the connectors on the channel board. It is important to ensure that all the connections are tight.

6.10 Quick Guide for General Failures

The general hardware failures are described in the following. This information may help in determining the cause of some general hardware failures:

1. No start-up after pressing the power button:

(1) Check if the power cord is correctly connected.
(2) Check if the power switch under the AC inlet is turn on.
(3) Check if the power button is operating correctly.
(4) Check whether the fuse has burned out. If the fuse is blown, please replace with a fuse of the same rating.
(5) Check if the connection between the power module and the main board is tight.
(6) If the instrument still does not work normally, please contact **SIGLENT.**

2. Starts up with a dark screen:

(1) Check the connection between the power module and the main board.
(2) Check the connection between the keypad circuit board and the main board.
(3) If the instrument still does not work normally, please contact **SIGLENT**.

3. No response after pressing any button, or abnormal display of the screen:

(1) Check the connection between the keypad circuit board and the main board.
(2) If the instrument still does not work normally, please contact **SIGLENT.**

4. The output voltage amplitude measured is higher or lower than expected:

(1) Check the connection between the generator and the load.
(2) Check if the impedance set in generator matches the input impedance of the load.
(3) If the instrument still does not work normally, please contact **SIGLENT**.

7 Maintenance

7.1 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 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.

7.2 Repackaging for Shipment

If the unit must be returned to **SIGLENT** for service or repair, be sure to:

1. Attach a tag to the unit identifying the owner and indicating the required service or repair.
2. Place the unit in its original container with appropriate packaging material for shipping.
3. Secure the container with strong tape or metal bands.

If the original shipping container is not available, place your unit in a container which will ensure at least 4 inches of compressible packaging material around all sides for the instrument. Use static-free packaging materials to avoid additional damage to your unit.

About SIGLENT

SIGLENT is an international high-tech company, concentrating on R&D, sales, production and services of electronic test & measurement instruments.

SIGLENT first began developing digital oscilloscopes independently in 2002. After more than a decade of continuous development, SIGLENT has extended its product line to include digital oscilloscopes, isolated handheld oscilloscopes, function/arbitrary waveform generators, RF/MW signal generators, spectrum analyzers, vector network analyzers, digital multimeters, DC power supplies, electronic loads and other general purpose test instrumentation. Since its first oscilloscope was launched in 2005, SIGLENT has become the fastest growing manufacturer of digital oscilloscopes. We firmly believe that today SIGLENT is the best value in electronic test & measurement.

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