

SDL1000X series

Programmable DC Electronic Load

Service Manual

E01B

Copyright and Statement

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General Safety Summary

Please review the following safety precautions carefully to avoid personal injury or damage to this product or any product connected to it. To prevent potential danger, please use the instrument as specified.

Use proper power cord

Only the power cord designed for the instrument and authorized by the local country of which the instrument will be used..

Power supply

AC Input Voltages: 110 V/220 V \pm 10%, 50/60 Hz.

Use proper fuse

The fuse types: 110 V/220 V: T315 mA/250 V.

Make sure to use the correct type of fuse before turning on the instrument.

Do not connect the power cord before replacing the fuse. Investigate the reason why the fuse burned out before replacing the fuse.

Ground the instrument

The instrument is grounded through the protective ground conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to the earth potential. Make certain that the instrument is properly grounded.

Observe all terminal ratings

To avoid fire or electric shock, please observe all ratings and symbols on the instrument. Read this guide carefully to learn more details about the ratings before connection.

Keep proper ventilation

Inadequate ventilation may cause an increase of temperature, which will lead to further damage. Please maintain proper ventilation and check the fan and air-vents regularly when using the instrument.

Operating Conditions

Location: Use this instrument indoors, avoid strong lighting and limit exposure to dirty/dusty environment as much as possible.

Relative humidity: <80%

Altitude: <2000 m

Temperature: 0°C to 40°C

Electrostatic Prevention

Operate in an electrostatic discharge protected area environment to avoid damages induced by static discharges. Always ground both the internal and external conductors of the cable to release static before connecting.

Do not operate in an explosive atmosphere

To avoid personal injury or damage to instrument, please do not operate in an explosive atmosphere.

Keep surface of the product clean and dry

To avoid dust or moisture in the air that may negatively influence the performance of the instrument, please keep surface of the product clean and dry.

Safety Terms and Symbols

Terms may appear on the product:

DANGER: Indicates direct injury or hazard that could occur.

WARNING: Indicates potential injury or hazard that could occur

CAUTION: Indicates potential damage to the instrument or other property that could occur.

Symbols may appear on the product:



**Hazardous
Voltage**



**Protective
Earth Ground**



Warning



**Earth
Ground**



**Power
Switch**

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Chapter 1 General Features and Specifications



SDL1000X/SDL1000X-E series Programmable DC Electronic Load has a 3.5 inch TFT-LCD display, and comes with a simple, user-friendly interface and superb performance specifications. The SDL1020X/ SDL1020X-E comes with an input range of 150 V/30 A @ 200 W. The SDL1030X/ SDL1030X-E comes with an input range of 150 V/30 A @ 300 W. The SDL1000X series leads with measurement resolution of 0.1 mV/0.1 mA while the base SDL1000X-E series resolution is 1 mV/1 mA. Adjustable current slew rate range is 0.001 A/ μ s~2.5 A/ μ s, and it comes with built-in RS232/USB/LAN communication interfaces. Standard SCPI communication protocol is used to establish an intelligent testing platform for applications in various industries, such as the power industry, battery industry, LED lighting, automotive electronics, and aerospace.

Main features of SDL1000X

- SDL1020X (Single channel): DC 150 V/30 A, total power up to 200 W
- SDL1030X (Single channel): DC 150 V/30 A, total power up to 300 W
- 4 Static modes / Dynamic mode: CC/CV/CR/CP
- CC Dynamic modes: continuous, pulsed, toggled
- CC Dynamic mode: 25 kHz, CP Dynamic mode: 12.5 kHz, CV Dynamic mode: 0.5 Hz
- Adjustable current slew rate range 0.001 A/ μ s~2.5 A/ μ s
- Min read-back resolution: 0.1 mV, 0.1 mA

- Measuring speed of voltage and current: up to 500 KHz
- List can edit 100 steps;
- Supports 50 groups of steps in program function
- Over current protection test ,Over power protection test , Battery test, short circuit and CR-LED test functions
- 4-wire SENSE compensation mode function
- External voltage and current control function
- Voltage and Current monitoring output
- 3.5 inch TFT-LCD display, capable of displaying multiple parameters and states simultaneously
- With memory function in case of power lose
- OCP, OVP, OPP, OTP and LRV protection
- Waveform trend chart and easy to store and recall function
- Smart fan control,
- Remote control and measurements via PC

Specifications

Unless otherwise noted, all specifications are guaranteed within the temperature range of 25°C±5°C with warm-up time of 30 minutes.

Model		SDL1020X (Single channel 200 W)	
Input Rating (0~40 °C)	Input voltage	0~150 V	
	Input current	0~5 A	0~30 A
	Input power	200 W	
	Minimum Operating Voltage(DC)	0.13 V at 5 A	0.8 V at 30 A
CV Model	Range	0~36 V	0~150 V
	Resolution	1 mV	1 mV
	Accuracy	±(0.02%+0.025% FS) 50 ppm/°C	
CC Model	Range	0~5 A	0~30 A
	Resolution	0.1 mA	0.1 mA
	Accuracy	±(0.03%+0.05% FS) 100 ppm/°C	
CR Model *1	Range	0.03 Ω~10 KΩ	
	Resolution	16 bit	
	Accuracy	0.01%+0.0008 S [1]	
CP Model *2	Range	200 W	
	Resolution	10 mW	
	Accuracy	0.1%+0.1% FS	
Dynamic model			
CC model			
T1&T2	20 uS~3600 S/Res:1 uS		
Accuracy	20 us~200 ms/Acc:5 us, 200ms~3600s/Acc:5 ms		
Current Slew rate *3	0.0001~0.5 A/us	0.001~2.5 A/us	
Minimum rise time	≈10 uS	≈12 uS	
Measuring range			
Readback Voltage	Range	0~36 V	0~150 V
	Resolution	1 mV	1 mV
	Accuracy	±(0.015%+0.02% FS) 20 ppm/°C	
Readback Current	Range	0~5 A	0~30 A
	Resolution	0.1 mA	0.1 mA
	Accuracy	±(0.03%+0.05% FS) 50 ppm/°C	
Readback Power	Range	200 W	
	Resolution	10 mW	
	Accuracy	±(0.1%+0.1% FS)	
	Range	0.03 Ω~10 KΩ	

Readback Resistance	Resolution	16 bit	
Protection range			
OPP	≈210 W		
OCP	≈5.2 A	≈31 A	
OVP	≈155 V		
OTP	≈85°C		
Battery Measurement	Battery Input:0.5~150 V;Max Measurement: Capacity=999 AH;Resolution=0.1 mA;Time Range=1 S~16 H		
Input Resistance	350 KΩ		
Dimension	W256*H115*D410 (mm)		
Weight	5.8 Kg		

*1 CR Model				
V Range	I Range	R Range	Accuracy	Test condition
5 A	36 V	0.2 Ω~6 Ω	SET*0.01%+0.8S	V>3.6 V OR I>0.5 A
		6 Ω~60 Ω	SET*0.01%+0.008S	
		60 Ω~240 Ω	SET*0.01%+0.0008S	
		240 Ω~2500 Ω	SET*0.01%+0.0005S	I>10 mA
	150 V	1 Ω~30 Ω	SET*0.01%+0.08S	V>15 V OR I>0.5 A
		30 Ω~300 Ω	SET*0.01%+0.0008S	
		300 Ω~1000 Ω		SET*0.01%+0.0002S
		1000 Ω~10 KΩ	I>10 mA	
30 A	36 V	0.03 Ω~1.2 Ω	SET*0.01%+3 S	V>3.6 V OR I>3 A
		1.2 Ω~12 Ω	SET*0.01%+0.08 S	
		12 Ω~40 Ω		SET*0.01%+0.002S
		40 Ω~400 Ω	I>10mA	
	150 V	0.2 Ω~5 Ω	SET*0.01%+0.8 S	V>15 V OR I>3 A
		5 Ω~50 Ω	SET*0.01%+0.008 S	
		50 Ω~150 Ω	SET*0.01%+0.00S	
		150 Ω~1800 Ω		I>10 mA
Resistance Range: [1] (1/(1/R+(1/R)*0.01%+0.0008), 1/(1/R-(1/R)*0.01%-0.0008))				

*2 The input voltage/current value should not be smaller than 10% of the full scale.

*3 Current slew rate: rising slew rate for 10%~90% of the current (0-maximum current).

Prepare Information

Before doing performance verification, you should master the following operations. The following contents are included in this chapter:

- How to perform functional checks
- How to test the interface is operating properly

For more detailed information about the Load's operation, please refer to the Quick Guide for the SDL1000X..

Power-on Inspection

Verify that the electronic load is working by performing a power-on check. The SDL1000X series has a supply voltage of 100 VAC to 240 VAC. Before connect the instrument to a power source, please select the AC voltage selector on the rear panel of your load in order to match it with the external AC power source. Then connect the power line to the socket on the rear panel of the load.

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



Figure 1-1 connect the power cord

Interface test

The SDL1000X series supports four standard interfaces: USB Device, LAN interface, RS232 interface and GPIB interface. Through these interfaces, the electronic load communicates with the outside world and implements various higher-level functions. To ensure that the electronic load is working properly, perform the following interface tests.

USB Device test

Use EasySDL PC software to test whether the USB Device interface is working properly.

Tools:

- One SDL1000X series electronic load;
- One PC with USB interface;
- Standard USB cable (AB type);
- PC software EasySDL;

step:

1. Install the EasySDL on the PC and follow the prompts to install the driver.
2. Connect the electronic load to the PC with a USB cable.



Figure 1-2 USB Device interface

usb

3. Run the EasySDL software. Double-click to open the software interface, click "Connect" on the top of the interface, then the "Connect Type" window will

pop up, click on the “USBTCM” option on the window, and pop up the information of the connected USB device. Then choose the correct device to complete the connection.

LAN test

Use EasySDL to test whether the LAN interface is working properly.

Tools:

- One SDL1000X series electronic load
- One PC with a network cable interface
- One standard network cable
- EasySDL software loaded on the PC

Step:

1. Install the EasySDL on the PC and follow the prompts to install the driver.
2. Connect the power supply to the PC with a network cable.



Figure 1-3 LAN interface

3. Run the EasySDL software. Double-click to open the software interface, click the “Connect” on the top of the interface, the “Connect Type” window will pop up, then click the “VXI11” option on the window. Finally, input the electronic load IP address in the pop-up window and click “OK” to complete the connection. (See the user manual or quick guide for IP address settings)

Chapter 2 Performance Verification

This chapter main describes how to test and verify whether the main functions of the electronic load meet the specifications. To ensure the accuracy of the measurements, power-on all instruments for 30 minutes.

Below is a list of the equipment needed to perform the test:

Table 2-1 equipment required for test:

description	specification	example
Digital multimeter	6-digit half precision (with sufficient current measurement test range)	SDM3065X
Electronic load	Voltage and current power is greater than the power supply output	
Connection cable	Power supply cable	
DC power supply	Output DC voltage exceed 150 V	

The following is a schematic diagram of the connection between the electronic load and the power supply under test:

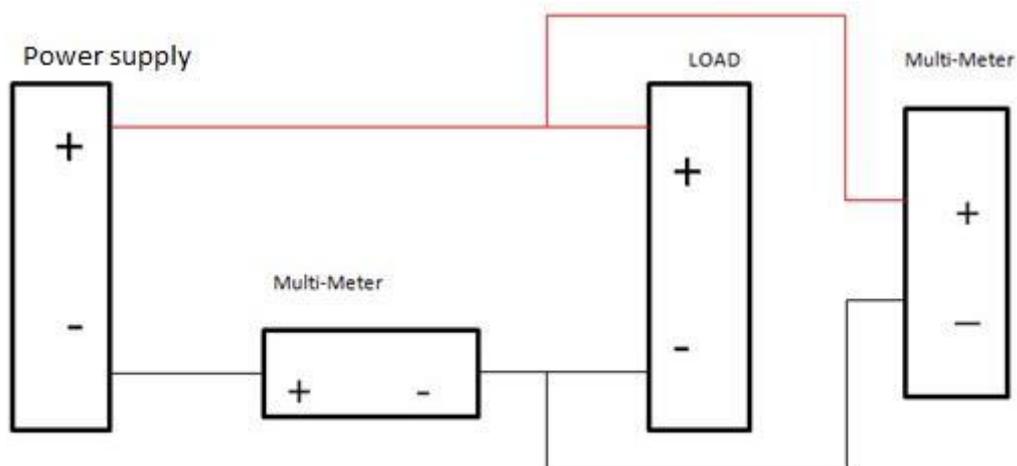


Figure 2-1 Connect the test equipment

Testing report

In order to verify that the test results meet the specifications, please record the test data to below table.

Verify output voltage accuracy

Test overview: In the two-wire or the four-wire mode, and inputting a voltage that is within (under)the rated input voltage, measure and record the actual and readback voltage value relative to the set voltage; reflect the voltage accuracy of the electronic load.

$$\text{Formula: Setting voltage accuracy} = \frac{\Delta V_o}{V_{set}} * 100\% \quad (1)$$

$$\text{Formula: Readback voltage accuracy} = \frac{\Delta V_{back}}{V_{sdm}} * 100\% \quad (2)$$

Voltage control accuracy: $\pm(0.02\%+0.025\% \text{ FS})$

Voltage readback accuracy: $\pm(0.015\%+0.025\%) \text{ FS}$

Preset conditions: room temperature

Test instrument: DC power supply, multimeter

Test methods and steps:

- (a) Using the SDL1020X as an example :The input voltage setting of the SDL1020X is set to 110 V, the output terminal connect to the DC power supply, and the multimeter inputs connected to the positive and negative terminals of the DC power supply output terminal in parallel.
- (b) Turn on the power for each device and set the multimeter to the DCV function and auto range.
- (c) Set the output of the power supply to 150 V/0.1 A. Turn on the output and note the reading of the multimeter and the voltage readback value of the load.
- (d) Set the SDL1020X to 150 V/0.1 A, 75 V/0.1 A, 40 V/0.1 A, 10 V/0.1 A, 1 V/0.1 A, 0.1 V/0.1 A, 0.01 V/0.1 A, 0 V/0.1 A in 30 A/150 V range, In each setting, repeat step (c) for each setting.
- (e) Calculate the corresponding set voltage accuracy by the formula (1) and the readback voltage accuracy by the formula (2) . Take the maximum value of the calculation result to determine whether the SPD1000X meets its published accuracy specification.

Table 2-2

Model	SDL1020X			
Mode	Set Voltage (V)	Measured Voltage (V)	Readback Voltage (V)	Pass / Fail
2 wire	150 V			
	75 V			
	40 V			
	10 V			
	1 V			
	0.1 V			
	0.01 V			
	0 V			
4 wire	150 V			
	75 V			
	40 V			
	10 V			
	1 V			
	0.1 V			
	0.01 V			
	0 V			

Verify output current accuracy

Test overview: While testing below the unit's rated power, test the actual output current and readback current value relative to the set voltage; to determine the current accuracy of the electronic load.

$$\text{Formula: Setting current accuracy} = \frac{\Delta I_o}{I_{set}} * 100\% \quad (3)$$

$$\text{Formula: Readback current accuracy} = \frac{\Delta I_{back}}{I_{sdl}} * 100\% \quad (4)$$

Current control accuracy: $\pm(0.03\%+0.05\% \text{ FS})$

Current readback accuracy: $\pm(0.03\%+0.05\% \text{ FS})$

Preset conditions: room temperature

Test instrument: DC power supply, multimeter, electronic load

Test methods and steps:

- (a) Using the SDL1020X as an example: The input of the SDL1020X is set to 110 V, Turn on the power for each device, and set the electronic load to the constant current mode. Set the multimeter to DCI (or DCA) function using the 30 A range. Then the multimeter pen is connected in series to

the electronic load.

- (b) Set the power supply to 31 A/7 V then turn on the output. Record the reading of the multimeter and the current readback value of the load.
- (c) Set the SDL1020X to 0.0 A/7 V, 0.1 A/7 V, 1 A/7 V, 5 A/7 V, 15 A/7 V, 30 A/7 V in the 30 A/150 V range, in each setting, repeat step (b) for each setting.
- (d) Calculate the corresponding current setting accuracy by the formula (3) and the readback current accuracy by the formula (4). Take the maximum value in the calculation result to determine whether the SDL1020X meets its published specification

Table 2-3

Model	Set Current (A)	Measured Current (A)	Readback Current (A)	Pass / Fail
SDL1020X	0 A			
	0.01 A			
	0.1 A			
	1 A			
	5 A			
	15 A			
	30 A			

Verify output resistor accuracy

Test overview: Test the actual resistor and readback resistor value relative to the set voltage and current. Voltage should be improve when test high resistance to improve accuracy; reflect the resistor accuracy of the electronic load.

Formula: Setting resistor accuracy =

$$\left(\frac{1}{\left(\frac{1}{R_{set}} + \left(\frac{1}{R_{set}} \right) * 0.01\% + 0.0008 \right)}, \frac{1}{\left(\frac{1}{R_{set}} - \left(\frac{1}{R_{set}} \right) * 0.01\% - 0.0008 \right)} \right)$$

(3)

Current control accuracy: 0.01%+0.0008 S

Preset conditions: room temperature

Test instrument: DC power supply, multimeter, electronic load

Test methods and steps:

- (a) Using the SDL1020X as an example :The input of the SDL1020X is set to 110V.turn on the power for each device. Set the electronic load to constant resistance mode and set the multimeter to the suitable range of

the DCI, and the multimeter pen is connect in series to the electronic load.

- (b) Set the power supply to 10 A/15 V, turn on the output. Record the reading of the multimeter and the current readback value of the load.
- (c) Set the SDL1020X to 0.05 Ω , 0.5 Ω , 5 Ω , 100 Ω , 1000 Ω , 10000 Ω in 30 A150 V range, in each setting, repeat step (b) for each setting.
- (d) Calculate the corresponding current setting accuracy by the formula (3) and the readback current accuracy by the formula (4). Take the maximum value in the calculation result to determine whether the SDL1020X meets its published specification.

Table 2-3

Model	Set Resistance (Ω)	Measured Resistance (Ω)	Readback Resistance (Ω)	Pass / Fail
SDL1020X	0.05 Ω			
	0.5 Ω			
	5 Ω			
	100 Ω			
	1000 Ω			
	10000 Ω			

Chapter 3 Disassembly and assembly

This chapter mainly describes how to disassemble and assemble the module units of the SDL1000X series electronic load. Please refer to the given procedure to remove or replace the corresponding load unit.

The following are the main contents of this chapter:

- **Safety considerations** include safety factors to be considered when performing disassembly operations
- **Module unit** contains all detachable modular units of the power supply
- **Preparation tool** Contains the tools to be used during the disassembly process
- **Removal procedure** Contains specific removal steps

Safety prevention

Only professional technicians can perform this disassembly step. Be sure to disconnect all the power connections before operation, otherwise damage to the instrument components or personal injury may result.

Avoiding electric shocks

Because there is a dangerous voltage in the electronic load, be sure to disconnect the power supply before disassembling and wait for about three minutes until the internal capacitor of the electronic load is discharged.

ESD Prevention

Electrostatic discharge (ESD) can cause damage to the electronics inside the electronic load. Therefore, please use anti-static measures appropriately during the disassembly process. It is best to place the electronic load on an antistatic mat and wear antistatic gloves.

Module list

All the module units of the electronic load are listed in the order of disassembly as follows:

Table 4-1 list of power modules

Module serial number	Module name
1	handle components
2	the metal plate
3	the front shell component
4	the hardware components
5	back hardware components
6	hardware main component

Equipped with tools:

1. Anti-static gloves;
2. The multifunctional screwdriver or electric group;
3. The screwdriver or long nose pliers.

Teardown steps:

This chapter mainly introduces how to remove and install the load of each module unit, please follow the steps given in below the right operation.

3.1 Open handle components

Remove the two plastic handle of the electronic load.

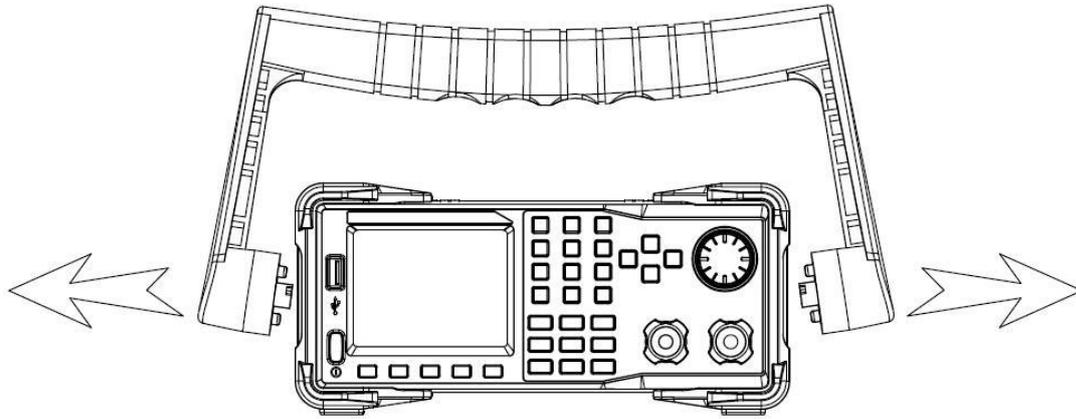


Figure 3-1

3.2 Remove the foot pad and metal shell

Remove 8 pcs M4 screw of foot pad, then remove foot pad and pull the metal shell in the direction of the red arrow.

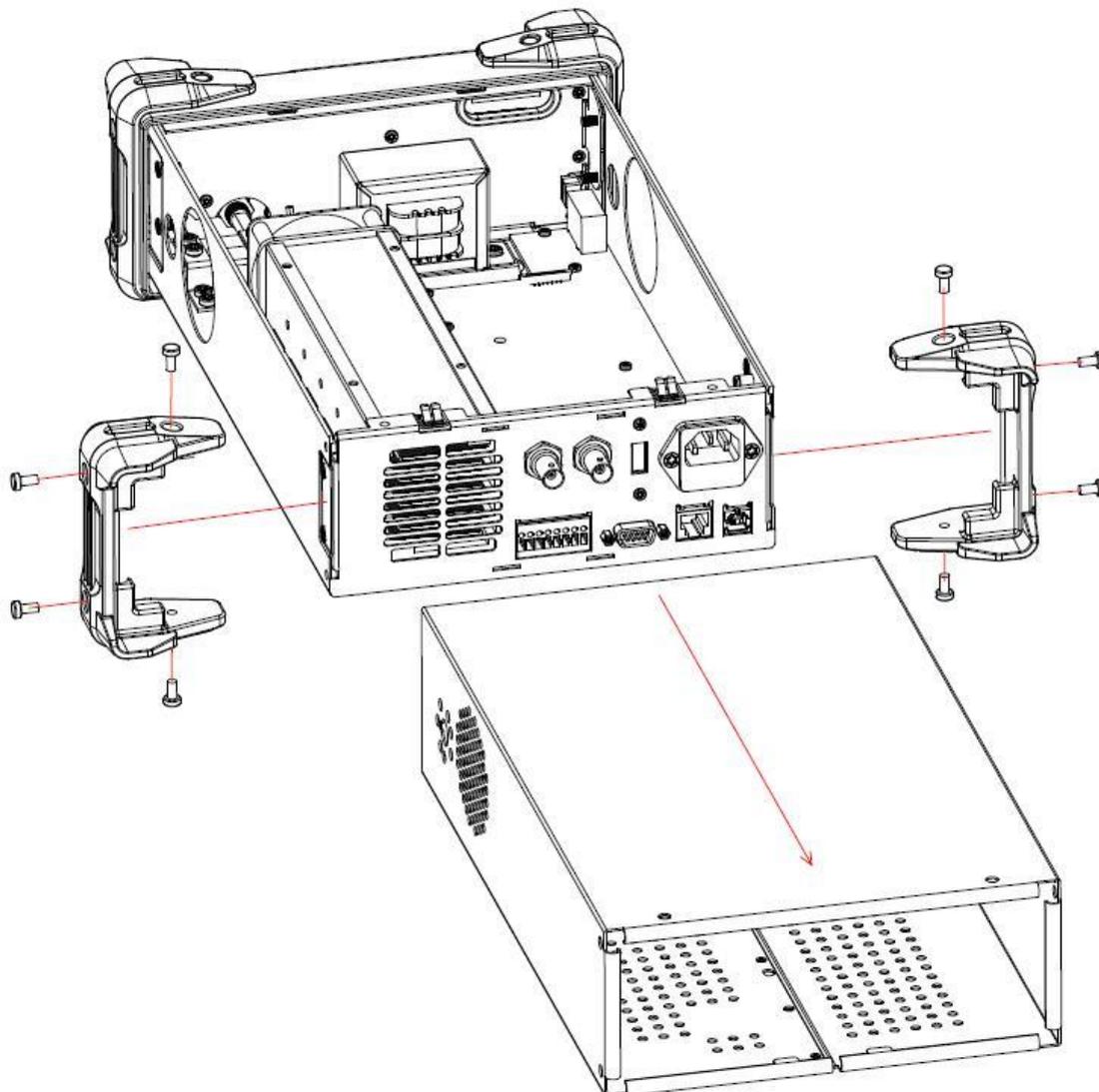


Figure 3-2

3.3: remove the metal rear plate

Take the metal cover plate to remove

Remove the 2 pcs hex screw on the RS232 interface. Remove the 4 pcs M4 screw on both sides of main frame and the 1pcs M3 screw on the power supply grounding cable. At the same time remove the power carrier, the DIP switch and the cable of rear interface. At last pull the metal cover plate in the direction of the red arrow.

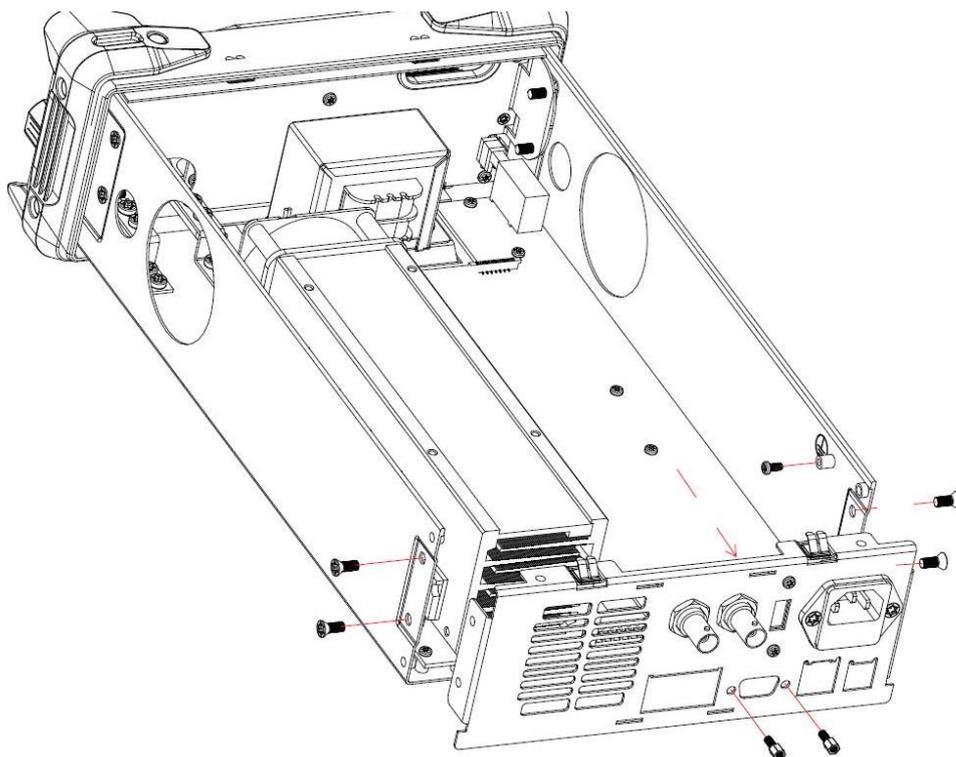


Figure 3-3

3.4 Remove the front shell component and the metal components

Remove between the front shell components and metal backplane 4 pcs M4 screws and keyboard cable, at the same time remove the 4pcs M4 screws that connect the front shell component to the shrapnel, then separating the front shell components and metal component.

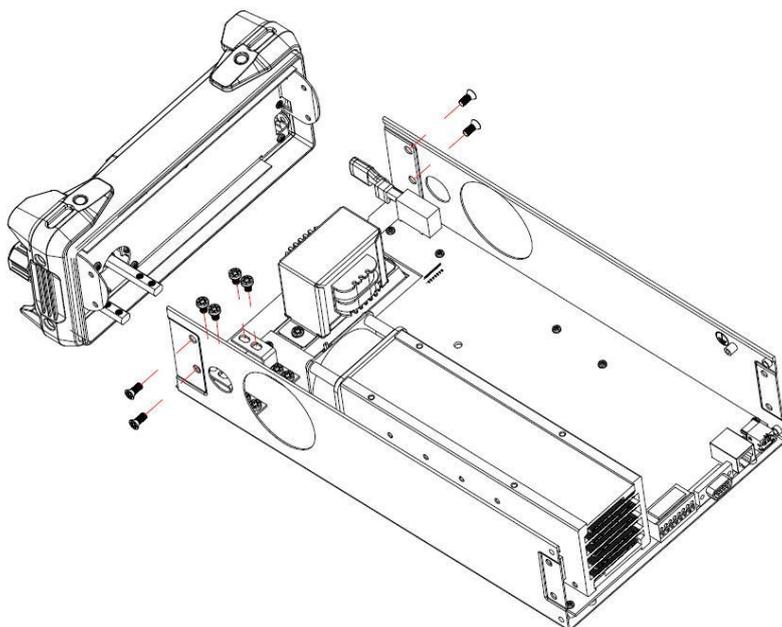


Figure 3-4

3.5 Open the front shell component.

3.5.1 Remove the 7 pcs M3 screws then remove the front cover of the metal.

Figure 3-5

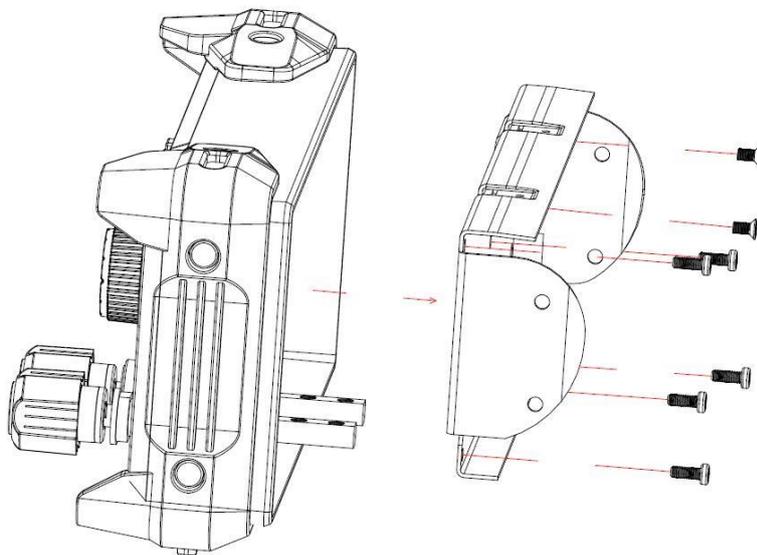


Figure 3-5

3.5.2 Remove the 5pcs M3 screws and 2pcs M3 copper posts that hold the keypad and at the same time need to remove the screen cable. Then remove the 2pcs M10 hex nut , at last separating the front shell and metal component.

Figure 3-6

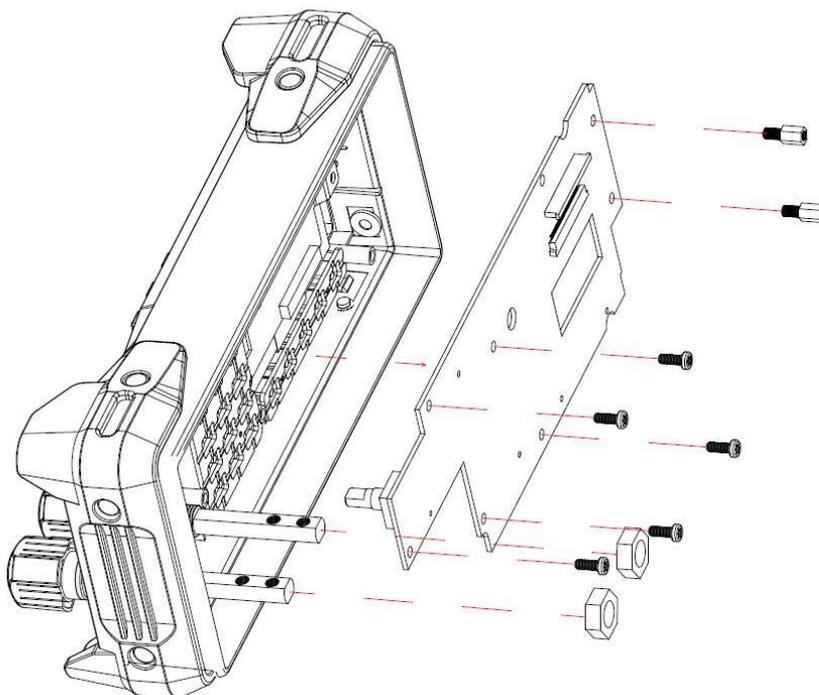


Figure 3-6

3.5.3 Remove the 2pcs M3 screws from metal near the LCD display, then remove the LCD display and metal. Figure 3-7

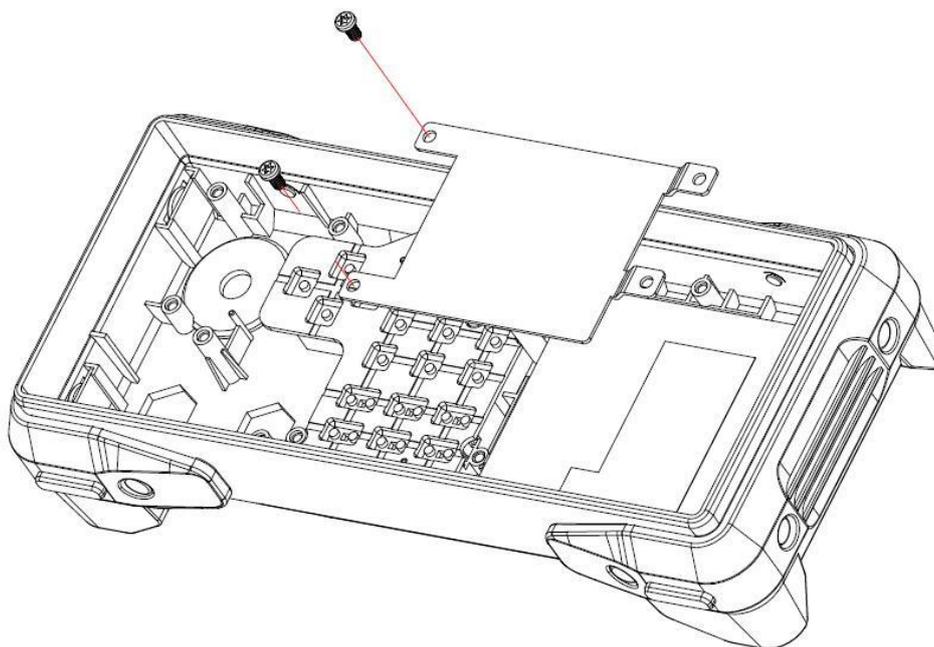


Figure 3-7

3.6 Open the metal rack components

3.6.1 Remove the power button (pull up);

Remove the 2pcs M4 screw of the transformer, at the same time remove the cable from the transformer. Figure 3-8.

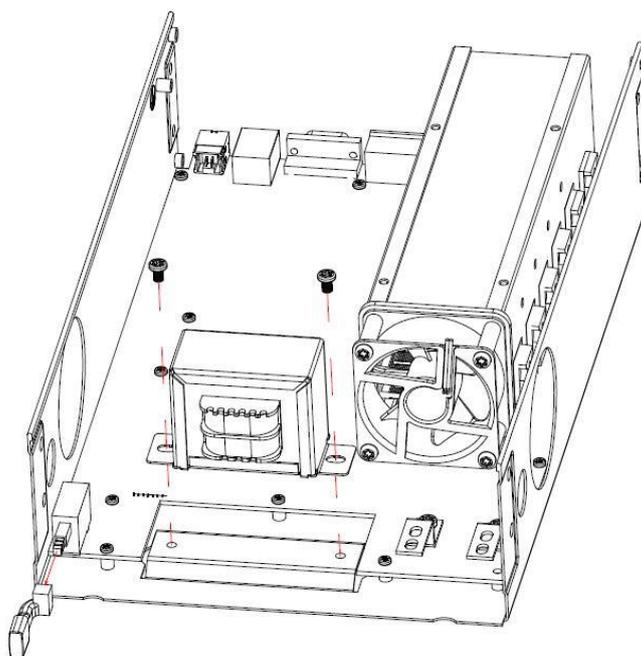


Figure 3-8.

3.6.2 Remove the 4pcs M3 screws at the bottom of the metal rack(Figure 3-9).
Remove the 11pcs M3 screws on the mainboard PCB, and then we can
remove the mainboard PCB assembly. Figure 3-10.

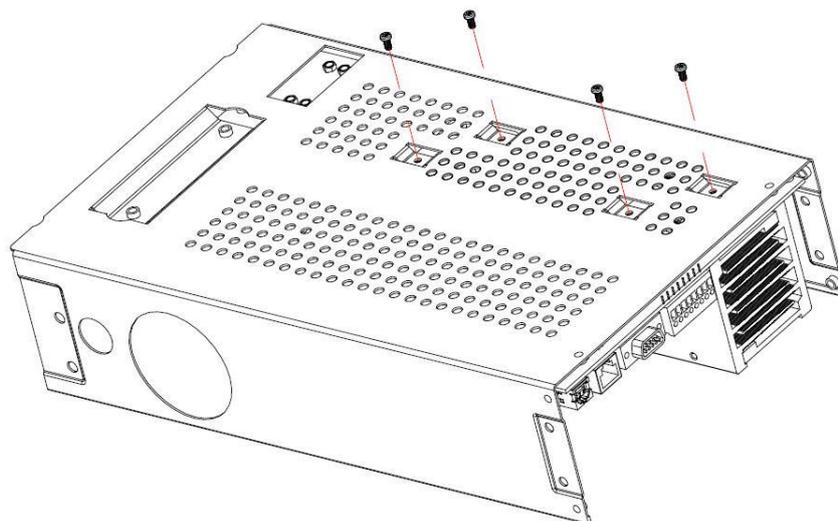


Figure 3-9

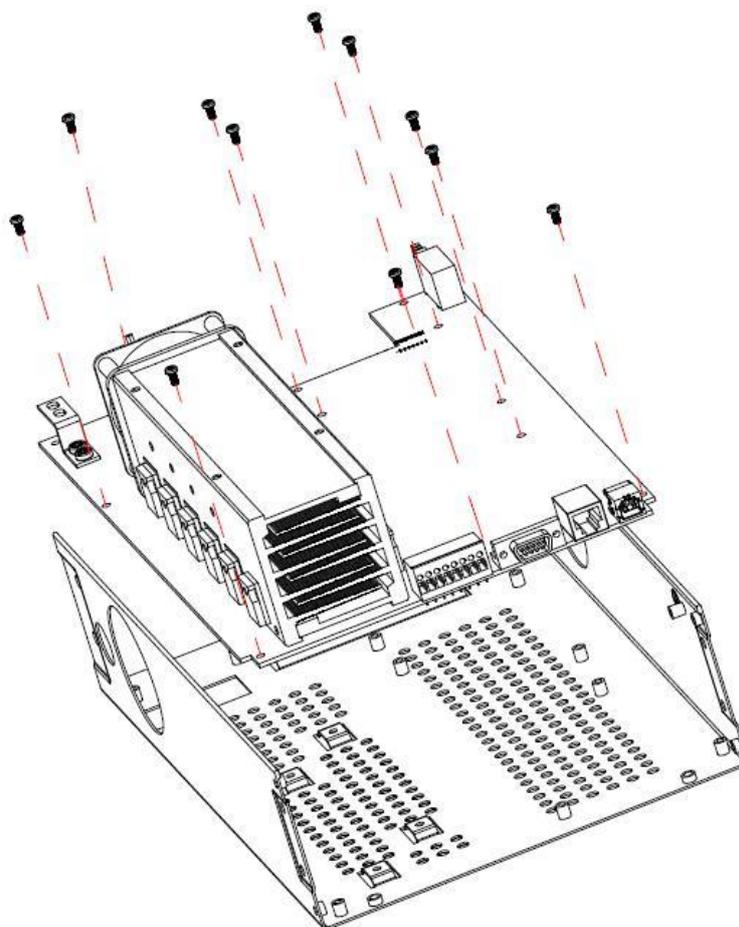


Figure 3-10

3.7 Remove the mainboard's heat sink

Remove the 4pcs M3 screw at the bottom of the mainboard(Figure 3-11) and remove the 12pcs M3 screw from the heat sink(Figure 3-12)

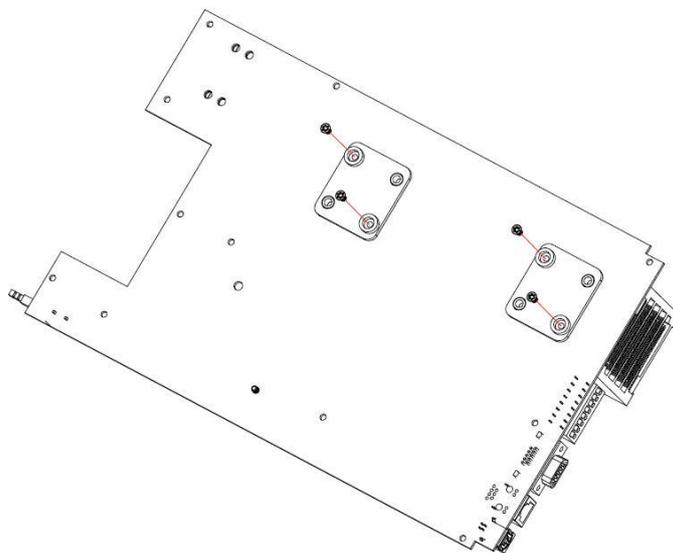


Figure 3-11

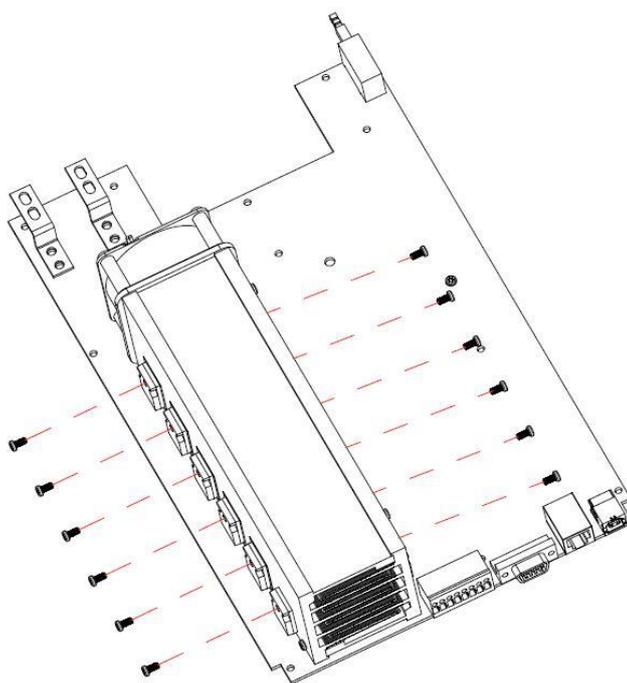


Figure 3-12

Chapter 4 Hardware troubleshooting

This chapter describes how to handle common hardware failures encountered during power operation. Before handling such fault, ensure that the power supply meets the following prerequisites.

1. If one voltage value is found to be different from the nominal value when measuring voltage, turn off the power immediately.
2. Turn off the power before unpacking the connecting wire of the mainboard and the screen backlight.
3. During the process of taking apart the instrument for measurement, take measures to prevent static electricity from damaging the internal components.

The internal structure of the electronic load consists of main board and key board, and they are linked through cables or connectors. This chapter explains the main checking procedures for the mainboard by measuring the rated test points on them, thus to help you decide the reason for the failure you encounter while operating SDL1020X.

ESD Precautions

While performing any internal test of the electronic load, please refer to the following precautions to avoid damages to its 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 Equipment

The equipment listed in the table are required to troubleshoot the electronic load.

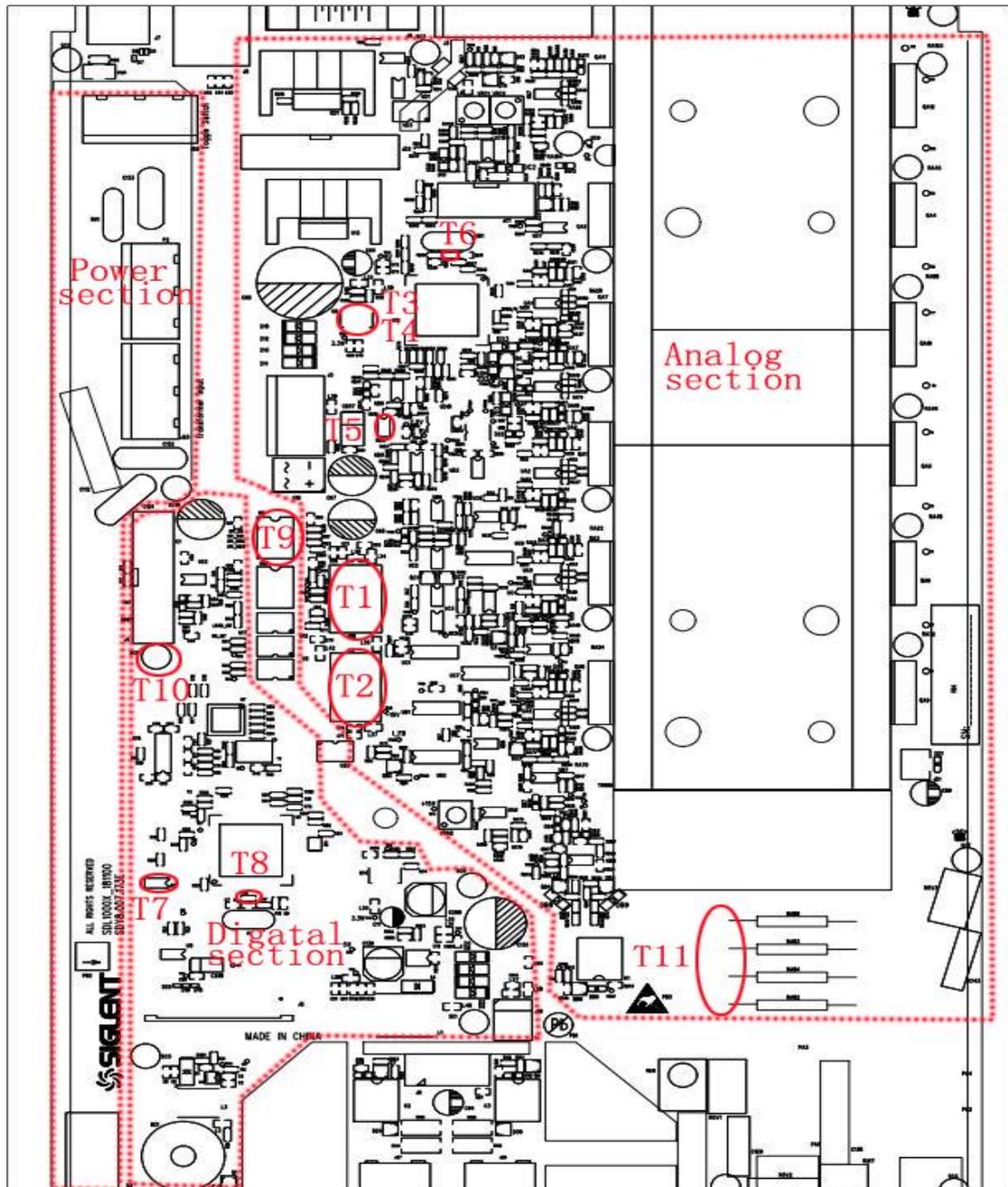
Table 4-1 required equipment

Equipment	Critical Specifications	Example
Digital Multimeter	Accuracy $\pm 0.05\%$ 1 mV resolution	SDM3055
Oscilloscope	200MHz Bandwidth	SDS1202X-E

MainBoard Drawing

The main board consists of power、 analog and digital three sections:

- 1) 、 Power section: 110/220 V is converted to a low voltage to supply the analog and digital sections.
- 2) 、 Analog section: It mainly realizes the functions of CC、 CV、 CR、 CP and so on.
- 3) 、 Digital section: Responsible for data processing and function control、 LCD display control.



Check the Power Supply

Both the analog and digital sections have a power connector, and we can check whether the input voltage is within the specification. Before performing the power supply testing procedure, please make sure that the electronic load 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, 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 electronic load and then check whether the fuse has been burnt out.
2. Remove metal shell of the electronic load using a driver, and then disconnect the power connector.
3. Focus on the Power Connector for analog section, which contains five pins from Pin1 to Pin5. You can test the adjacent pins that are marked with blue, brown, yellow and white to check whether the AC voltage value is within the corresponding specified range using a digital Multimeter. The voltage parameters to be tested are listed in table below:

Table 4-2 Test AC voltages for the analog section power connector

Pins	Voltage (V)	Error (V)
blue to blue	8	±1
Yellow to brown	16	±2
White to yellow	16	±2

Table 4-3 Test AC voltage for the digital section power connector

Pins	Voltage (V)	Error (V)
Black to black	12	±2

If each tested voltage value is within the corresponding spec range referring to the table above, then the power supply works normally. Otherwise, it proves to be faulted, please return it to the factory to have it repaired or contact SIGLENT.

Note: *The main power supply provides an input fuse to 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 that a significant overload occurs. Replace the entire main power supply assembly if the input fuse fails.*

Check the Analog Section

To avoid some chips or components on the main board being damaged for overheating, it is essential to 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, Power Connector and Keypad Connector are located on the main board. Check if all these connectors are connected properly.
2. Make sure that the connectors on the channel board are properly connected, then connect the electronic load to AC power and turn it on. Check if the voltage values at all test points are within the spec range using a digital Multimeter. The voltage parameters to be tested are listed in table below:

Voltage Checking

Test the voltage points on the analog section in the table below. If each tested voltage value is within the corresponding spec range referring to the table above, then the analog section works normally. Otherwise, it proves to be faulted, please return it to the factory to have it repaired or contact SIGLENT.

Table 4-3 Test DC voltages of the analog board

Test point	Name	Test pin	Voltage (V)	Error (V)
T1	U18	3	+15	±1
T2	U19	3	-15	±1
T3	U9	3	+5	±0.25
T4	U9	2 or 4	+3.3	±0.065
T5	UB11	6	+2.5	±0.0025
T11	AGND	1	0	/

Analog section Clock Checking

Analog section clock is the internal system clock of the electronic load. To verify if the clock on the analog section works normally, please test the clock frequency listed below using an oscilloscope.

Test point	Name	Pin	Frequency	Stability
T6	RD60	1 or 2	25MHz	±50ppm

MCU Checking

Look at the LED light on the analog section, which indicates the working state of MCU. If the light flashes at a certain frequency, then the corresponding codes have been loaded successfully and the chip is in good working state. Otherwise, there may be failure within it.

Check the Digital Section

Voltage Checking

Test the voltage points on the digital section in the table below. If each tested voltage value is within the corresponding spec range referring to the table above, then the digital section works normally. Otherwise, it proves to be faulted, please return it to the factory to have it repaired or contact SIGLENT.

Test point	Name	Test pin	Voltage (V)	Error (V)
T7	U5	8	3.3	±0.065

Digital section Clock Checking

To verify if the clock on the digital section works normally, please test the clock frequency listed below using an oscilloscope.

Test point	Name	Pin	Frequency	Stability
T8	R18	1 or 2	25MHz	±50ppm

CPU Checking

There is no light in the digital section to indicate the working status of the CPU, We can check if the CPU and MCU are communicating, if so, the CPU works normally. Please view the communication signals listed below using an oscilloscope.

Test point	Name	Pin	Signal
T9	U6	3	SPI_CS
		4	SPI_SCK
		5	SPI_MOSI
		6	SPI_MISO
T10	SC8	1	DGND

Quick Guide for General Failures

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

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

- (1) Check if the power cord is correctly connected.
- (2) Check if the power button is usable.
- (3) Check whether the fuse has been burnt out. If the fuse needs to be changed, please contact SIGLENT as soon as possible and return the instrument to the factory to have it repaired by qualified personnel.
- (4) Check if the power connector is properly connected to the main board.
- (5) If the instrument still does not work normally, please contact SIGLENT.

2. The instrument starts up with a dark screen:

- (1) Check if the power connector is properly connected to the main board.
- (2) 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 if the two end of the connector between the keypad circuit board and the main board is properly connected.
- (2) If the instrument still does not work normally, please contact SIGLENT.

Chapter 5 Service and Support

Warranty

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.

Repackaging for Shipment

If the unit needs to be shipped 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.

Contact SIGLENT

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