UNI-T®

Instruments.uni-trend.com

Service Manual

UPO1000X Series products

Table of Contents

Safety Information

This manual contains information and warnings that must be followed to keep the instrument operating under safety conditions.

General Safety Summary

Use the product only as specified. In order to use this instrument safely and correctly, please read this manual thoroughly and keep it for future reference.

This product should be used under the local and national regulation.

For correct and safe operation of the product, it is essential that you follow gernerally accepted procedures in addition to the safety precautions specified in this manual.

This product is only for trained personnel to use.

Only qualified personnel who are aware of the operation danger can remove the outer case for repair, maintenance or adjustment.

Before use, always check the product with a known source to be sure it is operating correctly

This product is not suitable for measuring dangerous voltage.

Wearing personal safety equipemnt to prevent electric shock and electric arc blast where dangerous live conductors are exposed.

You may need to read the safety section of other subassembly to learn the warning and note.

When this device is integrated into the system, the safety of this system is the responsibility of the system assembler.

To avoid fire hazard and personal injury

Use the power cord properly	You can only use the special power cord for the instrument approved by the local and state standards. Do not use the attached power cord to other product.
Use the voltage setting properly	Before power on, please ensure that the line selector is in the correct position of the power supply being used.
Instrument grounding	This product is grounded through the grounding conductor of the power cord. To avoid electric shock, the grounding conductor must be connected to earth ground. Before making connections to the input or output terminals of the product, ensure that the product is properly grounded. Do not disable the power cord grounding connection.
Power switch disconnect	The power switch disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to disconnect the power switch; it must remain accessible to the user at all times to allow for quick disconnection if needed.
Power cord disconnect	The power cord disconnects the product from the power source. See instructions for the location. Do not position the equipment so that it is difficult to disconnect the power switch; it must remain accessible to the user at all times to allow for quick disconnection if needed.
Use correct AC adapter	Only use the sepcified AC adapter for this product.
Connect and disconnect properly	Do not connect or disconnect probes or test leads while they are connected to a voltage source. Use only insulated voltage probes, test leads, and adapters supplied with the product, or indicated by UNI-T to be suitable for the product.

Observe all specific ratings	To avoid fire or shock hazard, observe all rating and markings on the product. Consult the product manual for further ratings information before making connections to the product. Do not exceed the Measurement Category (CAT) rating and voltage or current rating of the lowest rated individual component of a product, probe, or accessory. Use caution when using 1:1 test leads because the probe tip voltage is directly transmitted to the product.
Observe all terminal ratings	To avoid fire or shock hazard, observe all rating and markings on the product. Consult the product manual for further ratings information before making connections to the product. Do not apply a potential to any terminal, including the common terminal, that exceeds the maximum rating of that terminal. Do not float the common terminal above the rated voltage for that terminal. The measurement terminal on this porduction is not rated for connecting power supply or CAT II, III or IV circuit.
Do not operate without covers	Do not operate this product with covers or panels removed, or with the case open. Hazardous voltage exposure is possible.
Avoid exposed circuitry	Do not touch exposed connections and components when powered on.
Do not operate with suspected failures	If you suspect that there is damage to this product, have it inspected by qualified service personnel. Disable the product if it is damaged. Do not use the product if it is damaged or operates incorrectly. If in doubt about safety of the product, turn it off and disconnect the power cord. Clearly mark the product to prevent its further operation. Before use, inspect voltage probes, test leads, and accessories for mechanical damage and replace when damaged. Do not use probes or test leads if they are damaged, if there is exposed metal, or if a wear indicator shows. Examine the exterior of the product before you use it. Look for cracks or missing pieces. Use only specified replacement parts.
Use proper fuse	Use only the fuse type and rating specified for this product.
Wear eye protection	Wear eye protection if exposure to high-intensity rays or laser radiation exists.
Do not operate in wet/damp conditions	Be aware that condensation may occur if the instrument is moved from a cold to a warm environment.
Do not operate in an explosive atmosphere	
Keep product surfaces clean and dry	Remove the input signals before you clean the product.
Provide proper ventilation	Refer to the installation instructions in the manual for details on installing the product so it has proper ventilation. Slots and openings are provided for ventilation and should never be covered or otherwise obstructed. Do not push objects into any of the openings. Always place the product in a location convenient for viewing the display and indicators. Avoid improper or long-time use the keyboard, pointer abd key panel.
Provide a safe working environment	Improper or long-time use will cause grievous injury for keyboard or pointer. Make sure that your work area is intended for ergonomics standards. Consult an ergonomist to identify pressure damage. Be careful when lift and move the product. This product is assembled one or

multiple hands for lift and move.

Probe and Test Leads

Before connecting probes or test leads, connect the power cord from the power connector to a properly grounded power outlet.
Keep fingers behind the protective barrier, protective finger guard, or tactile indicator on the probes.
Remove all probes, test leads and accessories that are not in use.
Use only correct Measurement Category (CAT), voltage, temperature, altitude, and amperage rated probes, test leads, and adapters for any measurement.

Beware of high voltages	Understand the voltage ratings for the probe you are using and do not exceed those ratings. Two ratings are important to know and understand: • The maximum measurement voltage from the probe tip to the probe reference lead. • The maximum floating voltage from the probe reference lead to earth ground. These two voltage ratings depend on the probe and your application. Refer to the Specifications section of the manual for more information. Warning: To prevent electrical shock, do not exceed the maximum measurement or maximum floating voltage of the oscilloscope input.
Connect and disconnect properly	Connect the probe output to the measurement product before connecting the probe to the circuit under test. Connect the probe reference lead to the circuit under test before connecting the probe input. Disconnect the probe input and the probe reference lead from the circuit under test before disconnecting the probe from the measurement product.
Connect and disconnect properly	De-energize the circuit under test before connecting or disconnecting the current probe. Connect the probe reference lead to earth ground only. Do not connect a current probe to any wire that carries voltages or frequencies above the current probe voltage rating.
Inspect the probe and accessories	Before each use, inspect probe and accessories for damage (cuts, tears, or defects in the probe body, accessories, or cable jacket). Do not use if damaged.
Grounding reference for Oscilloscope	Do not float the reference lead of this probe when used with an oscilloscope with ground as reference. The reference lead must connect to ground potential (0V).
Use floating measurement	Do not float the reference lead of this probe above to the floating voltage.

Service Safety Summary

The service safety summary section contains additional information required to safely perform service on the product. Only qualified personnel should perform service procedures. Read this Service safety summary and the General Safety Summary before performing any service procedures.

To avoid electric shock	Do not touch exposed connections.
Do not service alone	Do not perform internal service or adjustments of this product unless another person capable of rendering first aid and resuscitation is present.
Disconnect power	To avoid electric shock, switch off the product power and disconnect the power cord from the mains power before removing any covers or panels, or opening the case for servicing.
Use care when servicing with power on	Dangerous voltages or currents may exist in this product. Disconnect power, remove battery (if applicable), and disconnect test leads before removing protective panels, soldering, or replacing components.
Verify safety after repair	Always recheck ground continuity and mains dielectric strength after performing a repair.

Terms in the manual

These terms may appear in this manual:

Warning: Warning statements identify conditions or practices that could result in injury or loss of life.

Caution: Caution statements identify conditions or practices that could result in damage to this product or other property.

Symbols on the product

These terms may appear on the product:

- DANGER indicates an injury hazard immediately accessible as you read the marking.
- WARNING indicates an injury hazard not immediately accessible as you read the marking.
- CAUTION indicates a hazard to property including the product.

When this symbol is marked on the product, be sure to consult the manual to find out the nature of the potential hazards and any actions which have to be taken to avoid them. (This symbol may also be used to refer the user to ratings in the manual.)

Perface

This manual contains the service information of the instrument.

Befor maintaining the product, please read **General Safety Summary and Service Safety Summary**.

Please read the introduction of all procedures. These introductions provide important information to perform the service correctly, safely and efficiently.

Supporting Product

This manual contains the service information for UPO1204X, UPO1104X and UPO1054X.

Check the header on top of page, headline, table or figure or the specified product name in this manual. Materials without any specific product name apply to all products in the manual.

Operation Information

The instrument information of installation, operation and networking see attached Help or User's Manual with the oscilloscope.

Theory of Operation

This chapter describes the electrical operation of the oscilloscope to the module level. The block diagrams shows the oscilloscope module interconnections.

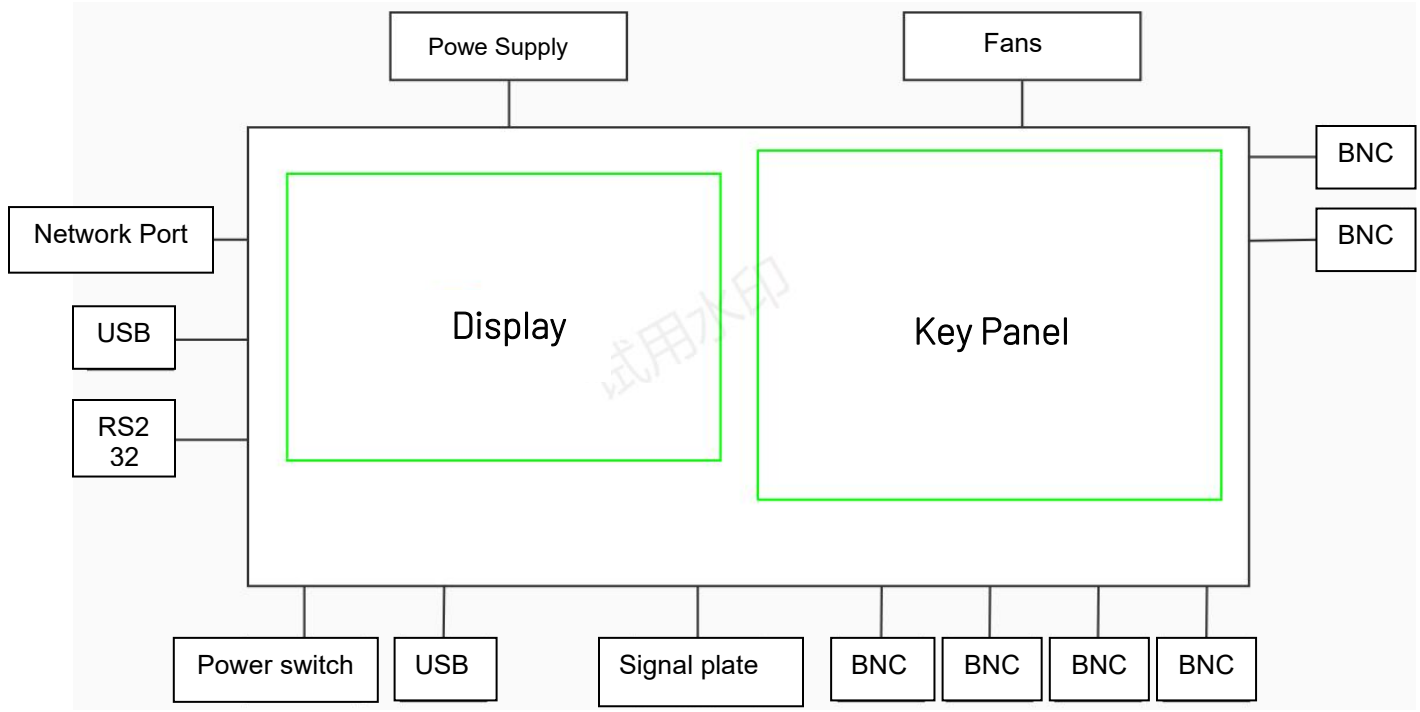


Figure 1 UPO1000X Series Block Diagram

Power Supply

The Power Supply board converts AC line voltage to secondary electric power supply for all internal circuits.

Main Board

The Main boards contain the following functions.

Acquisition System	The Acquisition system begins with the analog signal path and ends with a digitized signal in memory. The signal enters a channel input, and then passes through an attenuator and preamplifier. The analog signal from each preamplifier goes through a digitizer, and then into acquisition memory. The analog signal from each preamplifier is also distributed to a trigger circuit.
Analog Front End	All analog and digital input are routing to the analog front end. Analog channel can be magnified or attenuated via front-end circuit and output to the acquisition ASIC. Digital channel only needs to pass through the front-end circuit to reach the acquisition ASIC.
Processor	Processing the data the analog front end and the data from keyboard and send the data collected by analog front panel to the screen according to the input command by the keyboard.
Power Adaptor	Power supply converts to all voltages used for analog and digital circuits throughout the system. The standby power supply is used to keep power for certain parts of the system at all times when AC power is connected to the instrument.

Keyboard and Display Screen

Keyboard contains read-keyboard knob and digital logic control, which can send information to the processor on the mainboard. The front panel also generates probe compensation output signals, provides USB ports and digital logic signal input interfaces on the front panel, and accommodates the main power switch.

Maintenance

This section contains the information needed to do periodic and corrective maintenance on the oscilloscope.

ESD Prevention

Before servicing this product, read the General Safety Summary and the Service Safety Summary at the front of the manual, as well as the following ESD information.

⚠ **Caution:** Electrostatic discharge (ESD) can damage any semiconductor component in this instrument.

When performing any service that requires internal access to the instrument, adhere to the following precautions to avoid damaging internal modules and their components due to electrostatic discharge:

1. Minimize handling of static-sensitive circuit boards and components.
2. Transport and store static-sensitive modules in their static protected containers or on a metal rail. Label any package that contains static-sensitive boards.
3. Discharge the static voltage from your body by wearing a grounded antistatic wrist strap while handling these modules.
4. Service static-sensitive modules only at a static-free work station.
5. Do not allow any items capable of generating or holding a static charge on the work station surface.
6. Handle circuit boards by the edges when possible.
7. Do not slide the circuit boards over any surface.
8. Avoid handling circuit boards in areas that have a floor or work-surface covering capable of generating a static charge.

Inspection and Cleaning

Inspection and Cleaning describes how to inspect for dirt and damage. It also describes how to clean the exterior and interior of the instrument. Inspection and cleaning are done as preventive maintenance. Preventive maintenance, when done regularly, may prevent instrument malfunction and enhance its reliability.

Preventive maintenance consists of visually inspecting and cleaning the instrument and using general care when operating it.

How often to perform maintenance depends on the severity of the environment in which the instrument is used. A proper time to perform preventive maintenance is just before instrument adjustment.

Exterior Cleaning

Clean the exterior surfaces of the chassis with a dry lint-free cloth or a soft-bristle brush. If any dirt remains, use a cloth or swab dipped in a 75% isopropyl alcohol solution. Use a swab to clean narrow spaces around controls and connectors. Do not use abrasive compounds on any part of the chassis that may damage the chassis.

Clean the On/Standby switch using a cleaning towel dampened with deionized water. Do not spray or wet the switch itself.

Caution: Avoid the use of chemical cleaning agents which might damage the plastics used in this instrument.

Use only deionized water when cleaning the front-panel buttons. Use a 75% isopropyl alcohol solution as a cleaner for cabinet parts. Before using any other type of cleaner, consult UNI-T Service Center or representative.

Inspection - Exterior. Inspect the outside of the instrument for damage, wear, and missing parts. Immediately repair defects that could cause personal injury or lead to further damage to the instrument.

Table 1: External Inspection Checklist

Item	Inspect for	Repair Action
Cabinet, front panel, and cover	Cracks, scratches, deformations, damaged hardware.	Repair or replace defective module.
Front-panel knobs	Missing, damaged, or loose knobs	Repair or replace missing or defective knobs.
Connectors	Broken shells, cracked insulation, and deformed contacts. Dirt in connectors.	Repair or replace defective modules. Clear or brush out dirt.
Carrying handle and cabinet feet	Correct operation.	Repair or replace defective module.
Accessories	Missing items or parts of items, bent pins, broken or frayed cables, and damaged connectors.	Repair or replace damaged or missing items, frayed cables, and defective modules.

Screen Cleaning

Please use wet tissue or a soft cloth to wipe the dust from the screen and surface.

If the display screen is very dirty, please use a cloth to dipped in distilled water, 75% isopropyl alcohol solution or glass cleaner to slightly wipe the sceen surface. Only use enough water to wet the cloth or to wipe. Avoid excessive force, which may damage the display surface.

Caution: Improper cleaner and cleaning way will cause damage to the screen.

- Do not use abrasive cleaner or surface cleaner to clear the LCD.
- Do not spray water on the LCD surface.
- Do not excessive force to wipe the LCD.

Caution: To prevent moisture inside the instrument during external cleaning, do not spray any cleaning solution onto the screen or instrument directly.

Return Instrument to Maintenance

Use the original package to repack the instrument for shipping. If the package is not applicable, please contact the local UNI-T representative for a new packing.

Use industrial stapler or strapping tape to seal the carton.

If the instrument is being shipped to a UNI-T Service Center, enclose the following information:

- The owner's address
- Name and phone number of a contact person
- Model and serial number of the instrument
- Reason for returning
- A complete description of the service request

Mark the address of the UNI-T Service Center and also your own return address on the shipping carton in two prominent locations.

Removal and Replacement Procedure

This section contains removal and replacement procedure, please see the replaceable module table and exploded view. Any module in the chassis that does not have a disassembly and replacement procedure will require the entire instrument to be returned to the UNI-T Service Center for repair .

Warning: Before executing the process or other process, please read the **Safety Summary** ⚠ at the beginning of this manual. In addition, to prevent injury to maintenance personnel or damage to instrument components, please read the **ESD Prevention**.

Befor performing any of the steps in this subsection, disconnect the power cable and line voltage souce. Otherwise, it may cause grievous injury or death.

⚠ **Caution:** Before remove the instrument to clean, please read the cleaning procedure.

Required Device

Most components in this instrument can be removed with a T8 or T10 quincunx ® screwdriver.

Table 2: Device for Removal and Replacement

No.	Tool's Name	Description
2	T8, T10, T15 quincunx screwdriver	Remove the screws of the instrument
4	9/16 inch open-end wrench	Remove the screw studs
5	ESD prevention	To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.

Removal and Replacement

Remove Front Panel

The following process is describes the removal and replacement of knob module on the front panel. Seven knob modules can be remove from the front panel.

Precondition

• Whenever you work on the insturment, you should wear grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.

Steps

1. Pull out the knob module directly from the front shroud by hands. Hands force is enough to remove the knobs module. Do not use pliers.
2. Align the knobs to axle indentation for reinstallation. Rotate the knobs to ensure the knobs is properly reinstalled and can be rotate smoothly.

Remove Rear Panel

The following process is describes the removal and replacement of rear panel.

Precondition

• To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.

Steps

1. Dismantle gum.

2. Use T8 quincunx screwdriver to remove two screws from handle.

3. Remove two screws from the bottom of case and then to take off the rear panel.

4. If you want to reinstall the rear panel, execute the steps in reverse. Use T8 quincunx screwdriver to fix the screw.

Remove Rear Mdule

The following process is describes the removal and replacement of rear module.

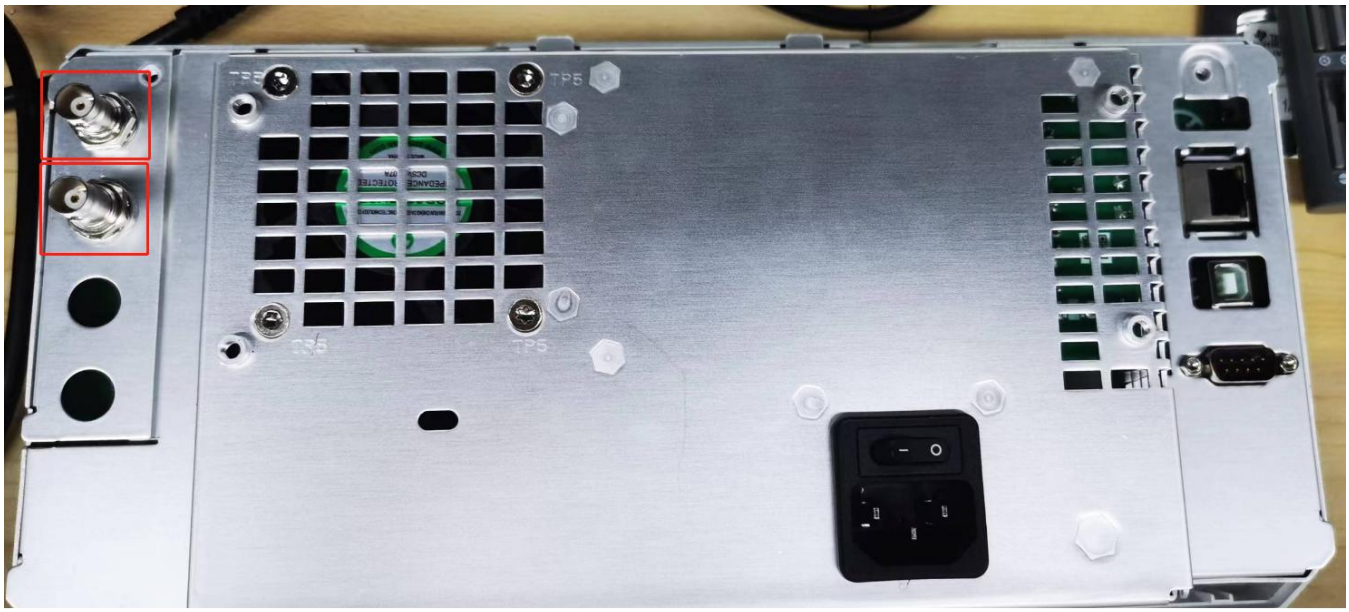
Precondition

- To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.
- Take down the rear panel.

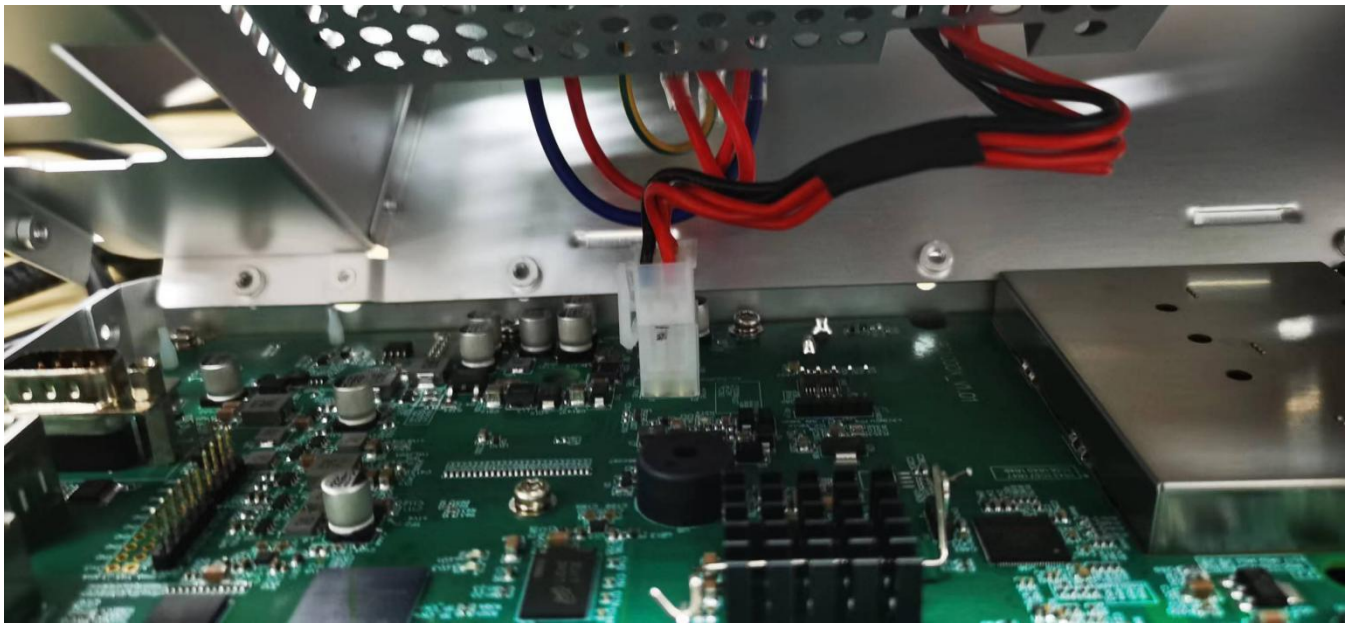
Steps

1. Use T10 quincunx screwdriver to move M3 screws on the top side.

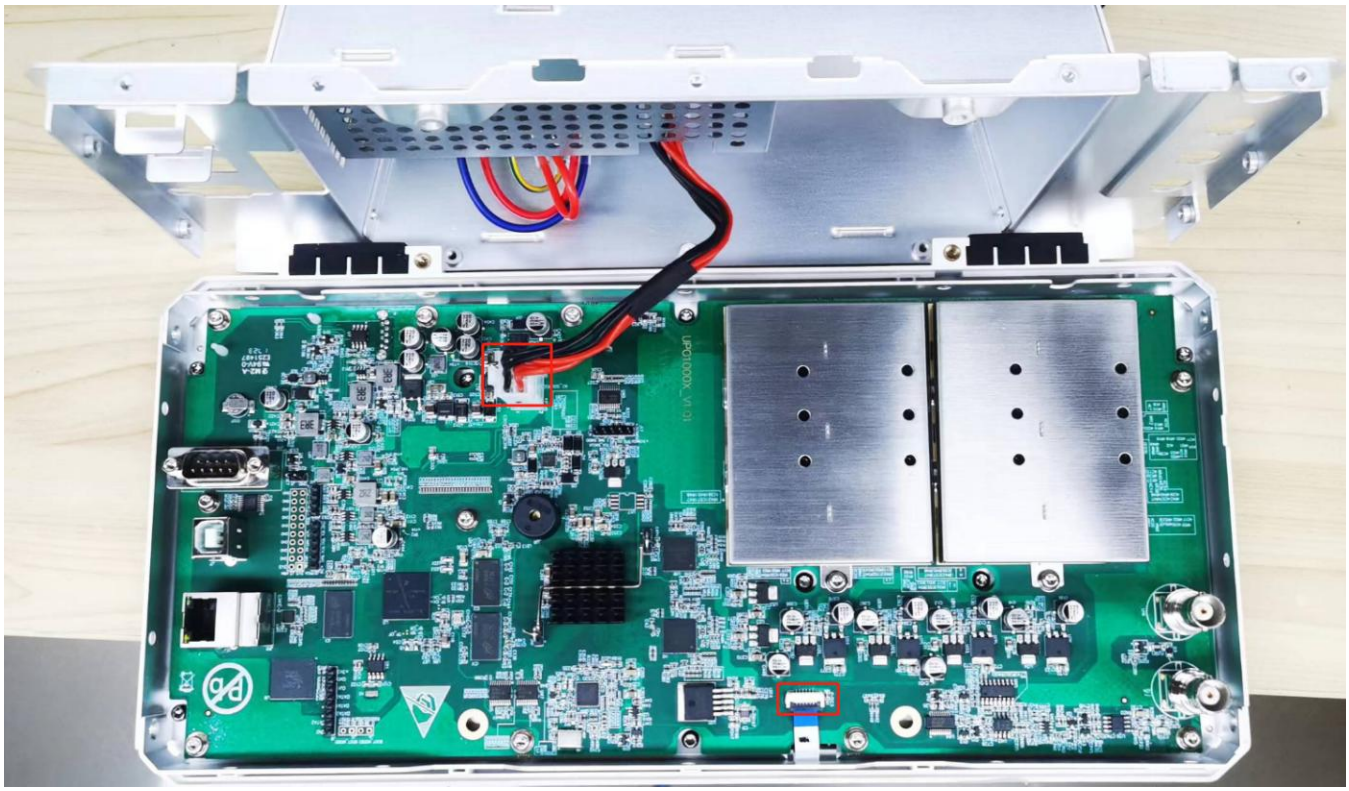
2. Use 9/16 inch open-end wrentch to remove two BNC nuts and washers.

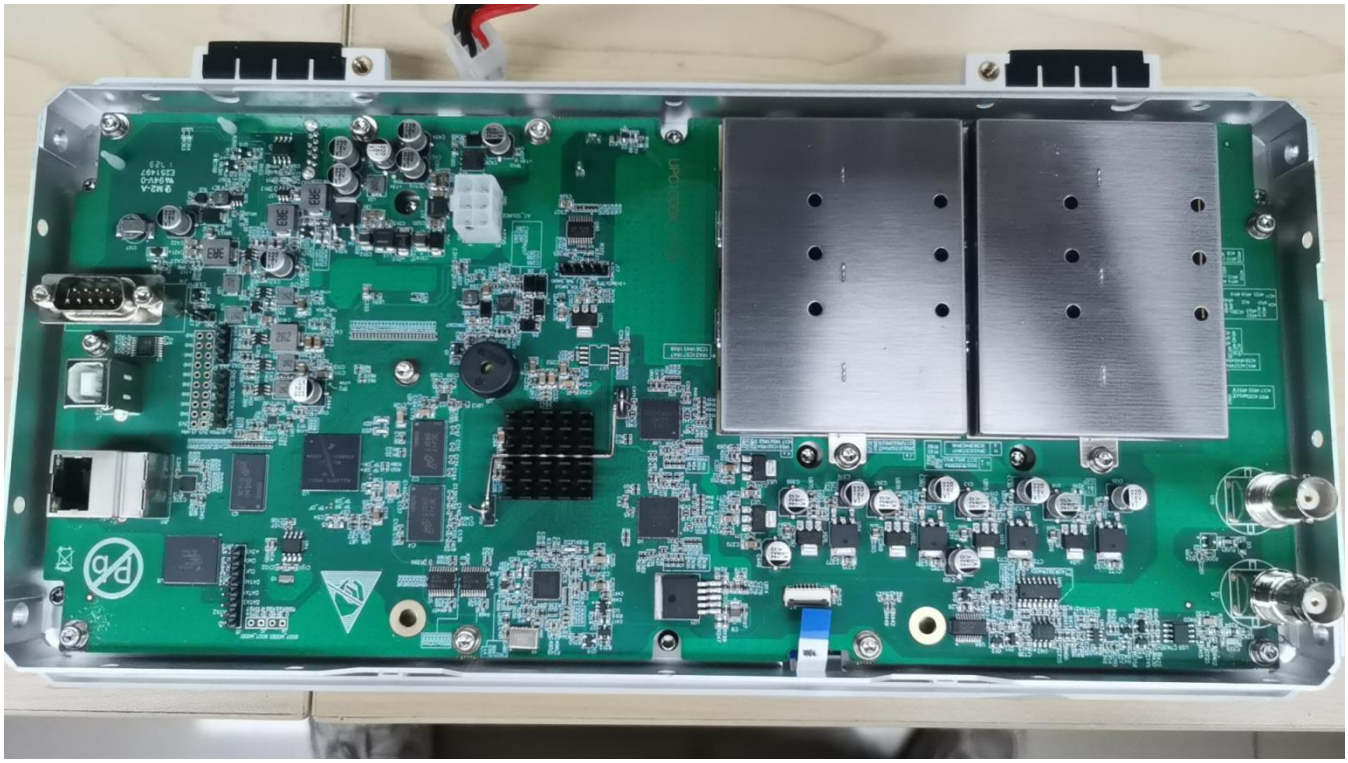


3. Open the rear moduel and plug out the power cable from the mainboard.



4. Put down the front module and rear module, and plug out FPC cable from the mainboard.





5. If you want to reinstall the rear panel, execute the steps in reverse.

Remoce Power Module

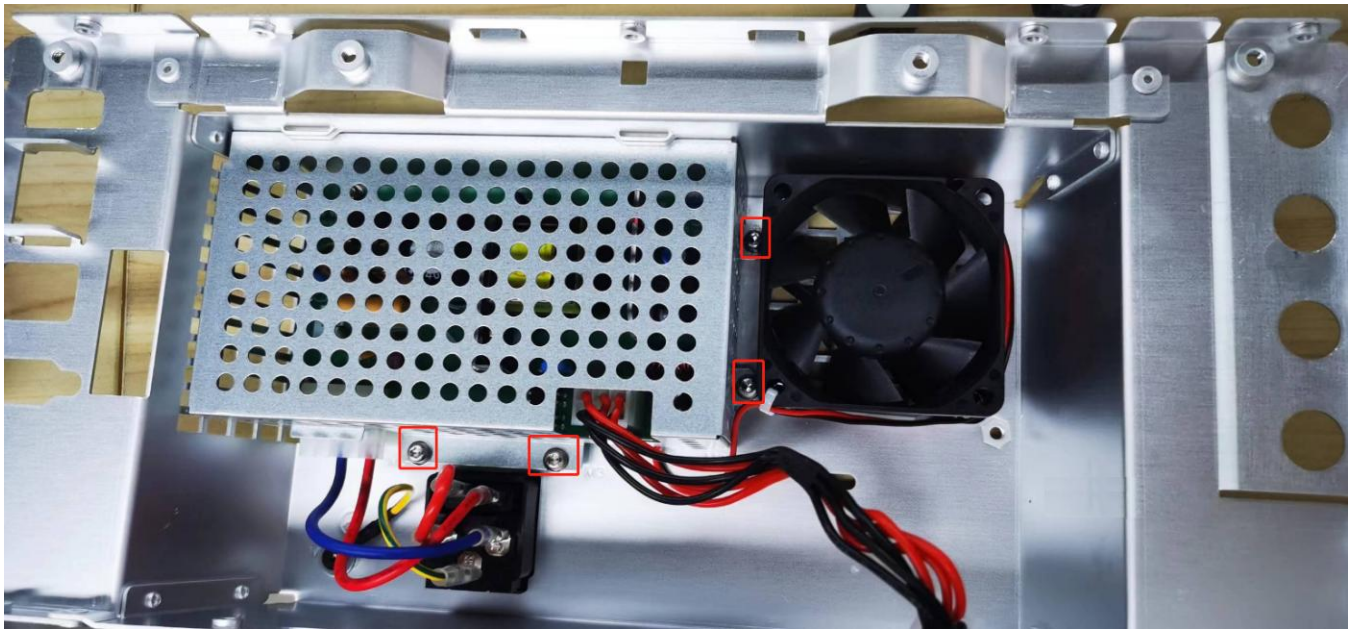
The following process is describes the removal and replacement of power module.

Precondition

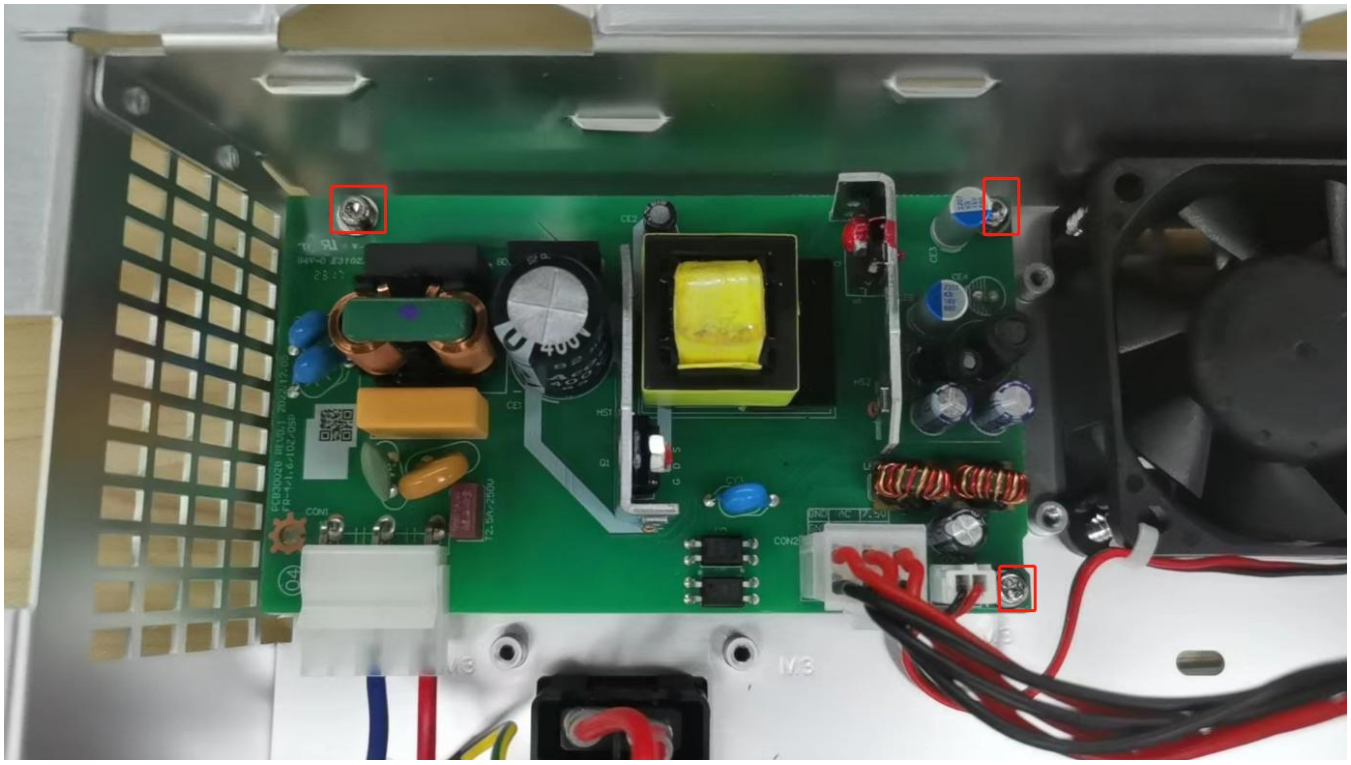
- To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.
- Take down the rear panel.
- Remove the rear module.

Steps

1. Use T10 quincunx screwdriver to move four screws from the rear panel and take down the power cover.



2. Plug out the power cable and fan's power cable, use T10 quincunx screwdriver to move three screws on power module and take down the power module.



3. If you want to reinstall the rear panel, execute the steps in reverse.

Remove Fan

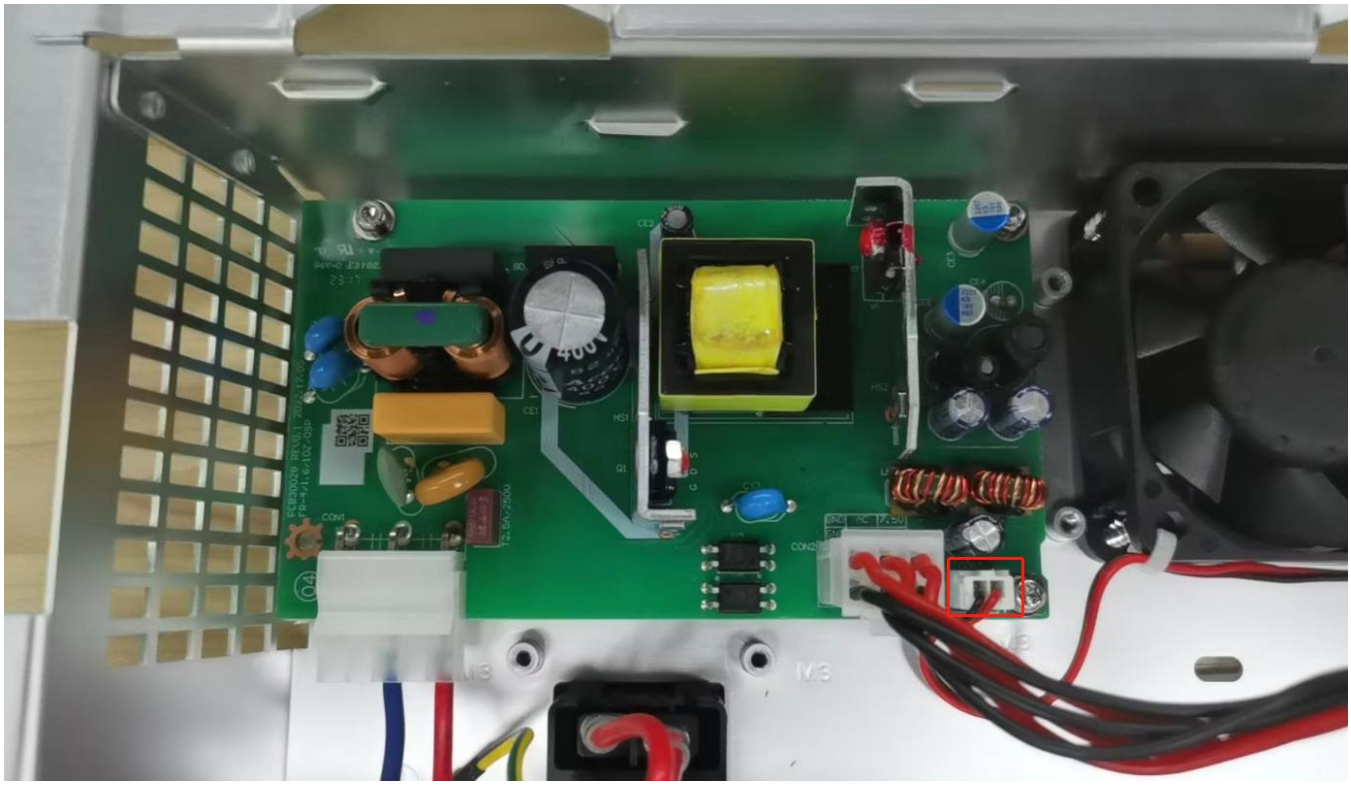
The following process is describes the removal and replacement of power module.

Precondition

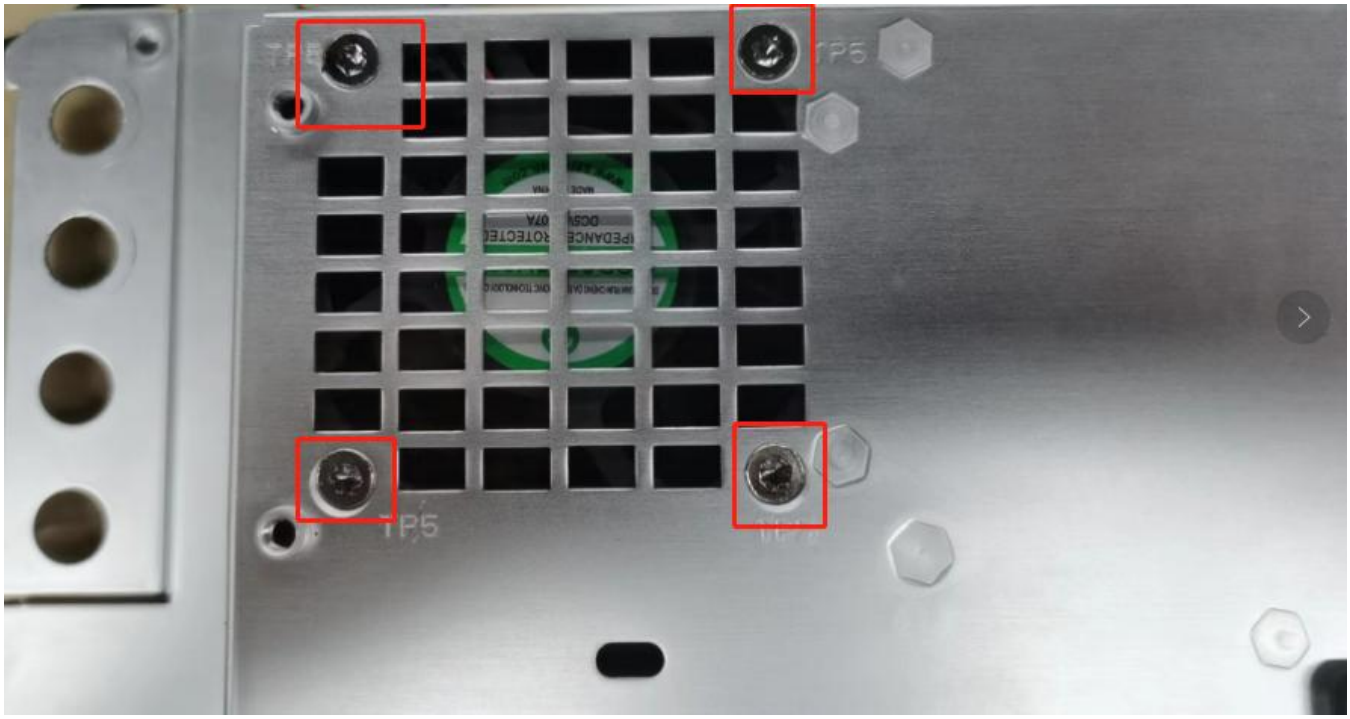
- To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.
- Take down the rear panel.
- Remove the rear module.
- Remove the power cover.

Steps

1. Disconnect the fan's cable from power supply.



2. Use T15 quincunx screwdriver to move four screws on four sides and take down the fan.



3. If you want to reinstall the rear panel, execute the steps in reverse.

Remove Front Panel

The following process is describes the removal and replacement of front panel.

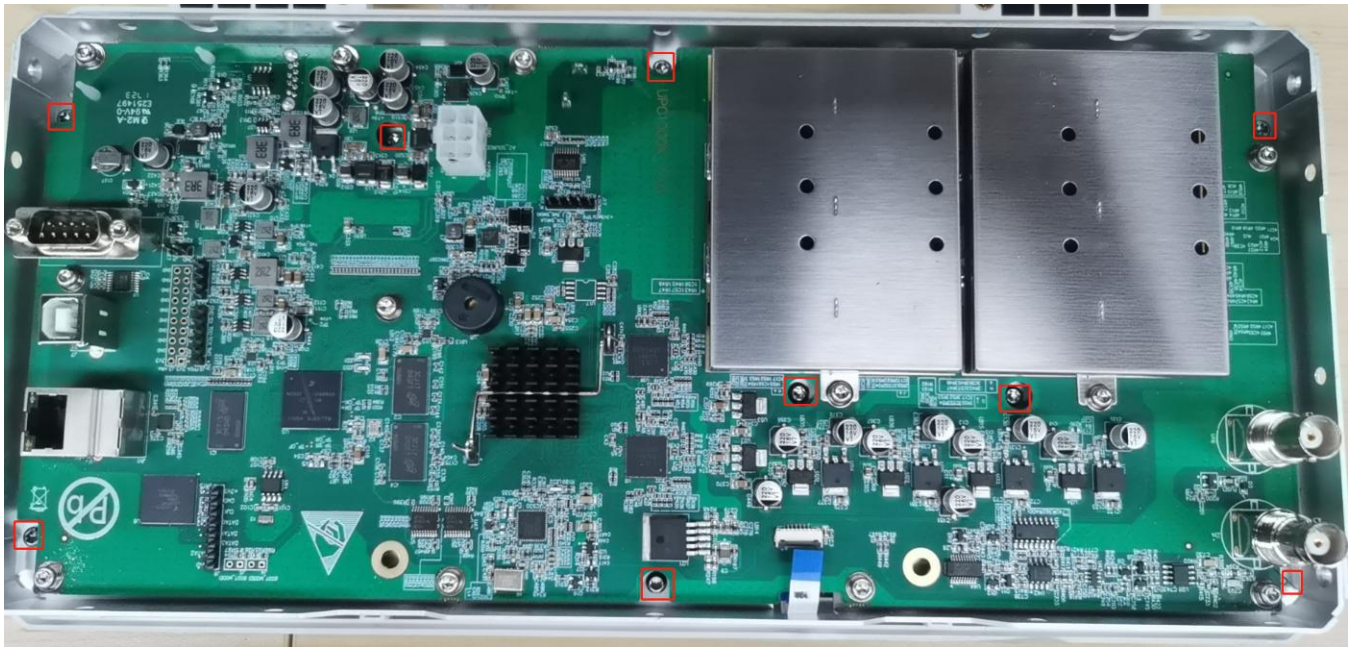
Precondition

- To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.
- Take down the knobs on the front panel.
- Remove the rear cover.
- Remove the rear module.

Steps

1. Take down the knobs on the front panel.

2. Use T10 quincunx screwdriver to move nine screws and take down the front cover.



3. If you want to reinstall the rear panel, execute the steps in reverse.

Remove Screen

The following process is describes the removal and replacement of screen.

Precondition

- To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.
- Take down the front panel.

Steps

1. Use T10 quincunx screwdriver to move four screws.

2. Flip the screen and fixed support, plug out FPC cable between screen adapter board.

3. If you want to reinstall the rear panel, execute the steps in reverse.

Remove Keyboard

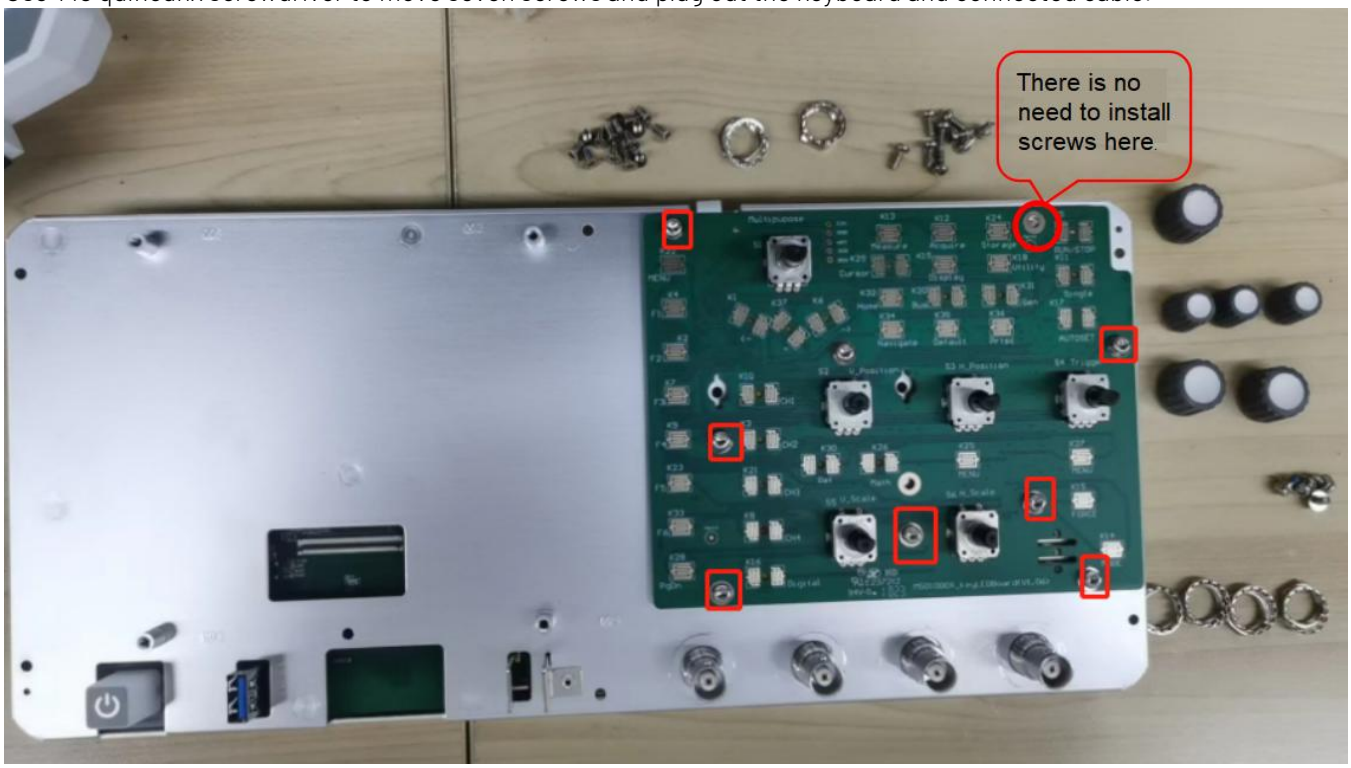
The following process is describes the removal and replacement of keyboard.

Precondition

- To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.
- Take down the front panel.

Steps

1. Use T10 quincunx screwdriver to move seven screws and plug out the keyboard and connected cable.



2. If you want to reinstall the rear panel, execute the steps in reverse.

Remove Mainboard

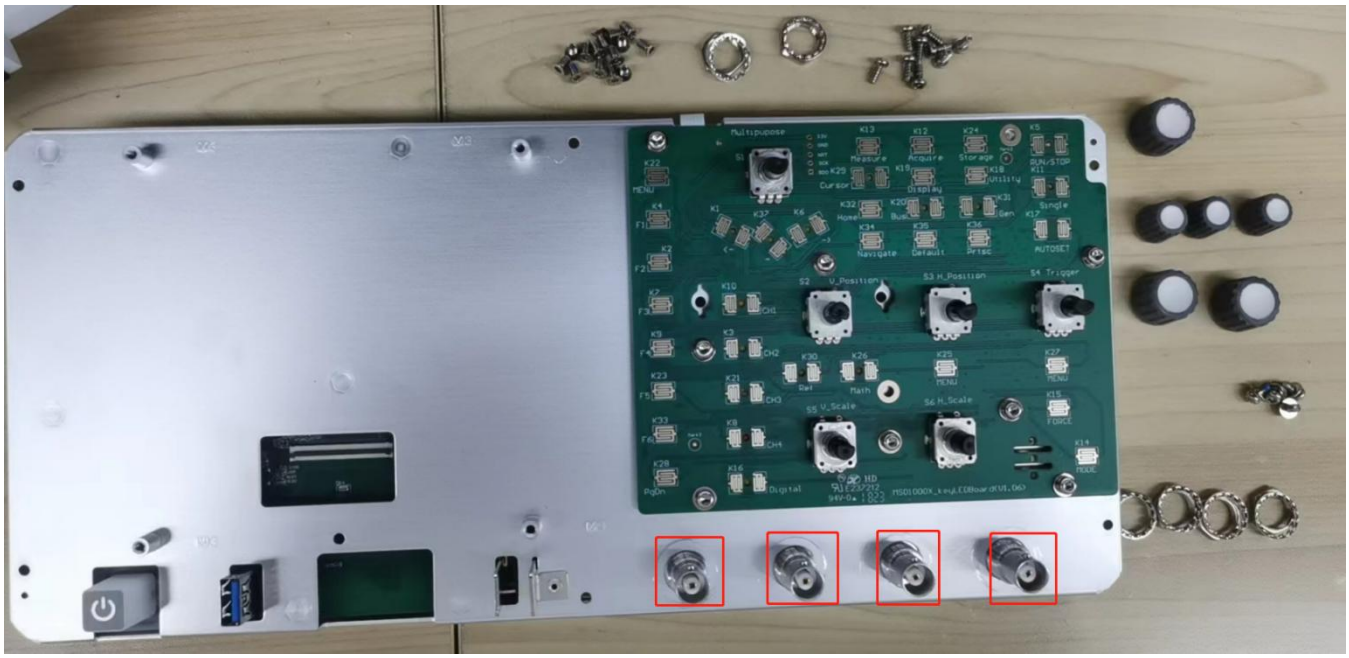
The following process is describes the removal and replacement of mainboard.

Precondition

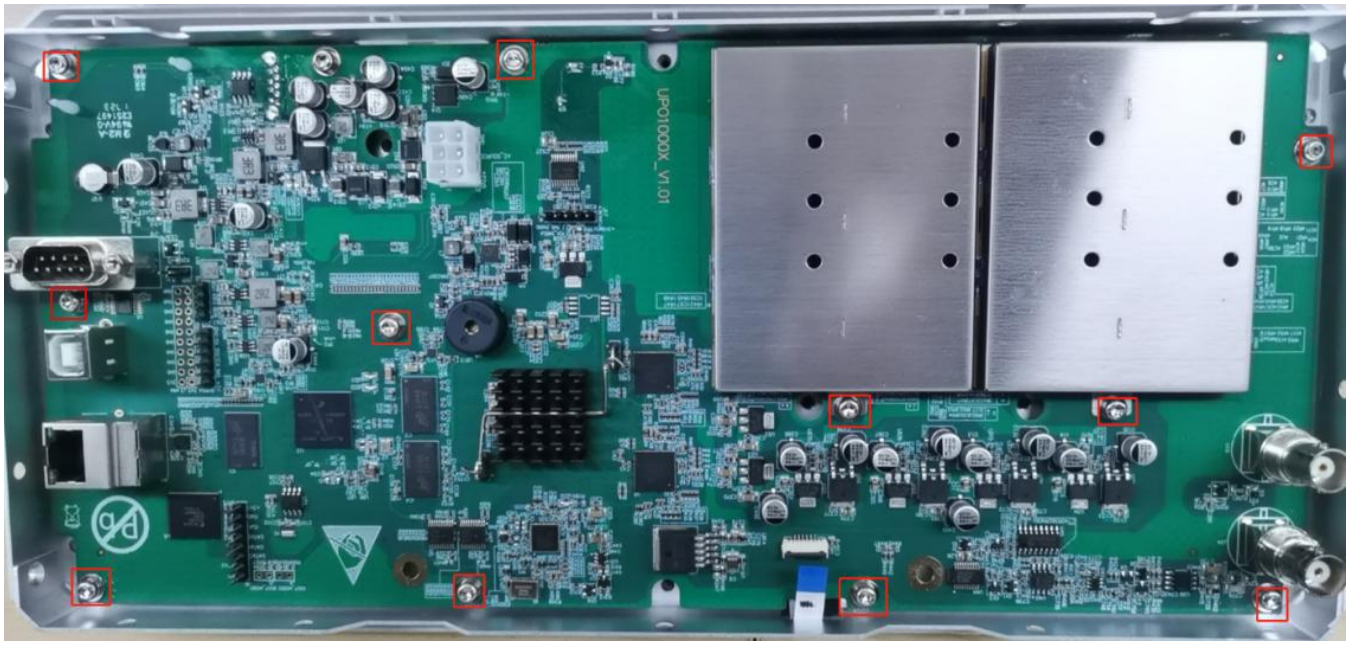
- To prevent static damage to the components while working on the instrument, wear properly grounded anti-static wristbands and foot bands, and use anti-static pads in a tested anti-static environment.
- Take down the rear cover.
- Remove the rear module.
- Remove the front panel.

Steps

1. Use 9/16 inch open-end wrentch to remove four BNC nuts and washers, as shown in the following figure.



2. Use T10 quincunx screwdriver to move eleven screws.



3. If you want to reinstall the rear panel, execute the steps in reverse.

Troubleshooting

Caution: Before performing this or any other procedure in this manual, read the **General Safety Summary** and **Service Safety Summary** at the beginning of this manual.

To prevent possible injury to service personnel or damage to electrical components, please read information on **ESD prevention**.

This section contains information and procedures designed to help you isolate faults to a module.

For assistance, contact your local UNI-T Service Center.

Service Class

The information and procedure contains in this section can help you determine whether the instrument has problem.

If is power failure, please send the instrument back to UNI-T Service Center for repair. Because the user cannot replace the internal electronic components or modules.

Common Problem

Use the following table to isloate the possible faults. The table is not exhaustive, but it can help you to eliminate quick-fix issues, such as the power cable is loose. For more details, please see **Troubleshooting Flowchart.**

Table 3 Fault Symptom and Possible Reason

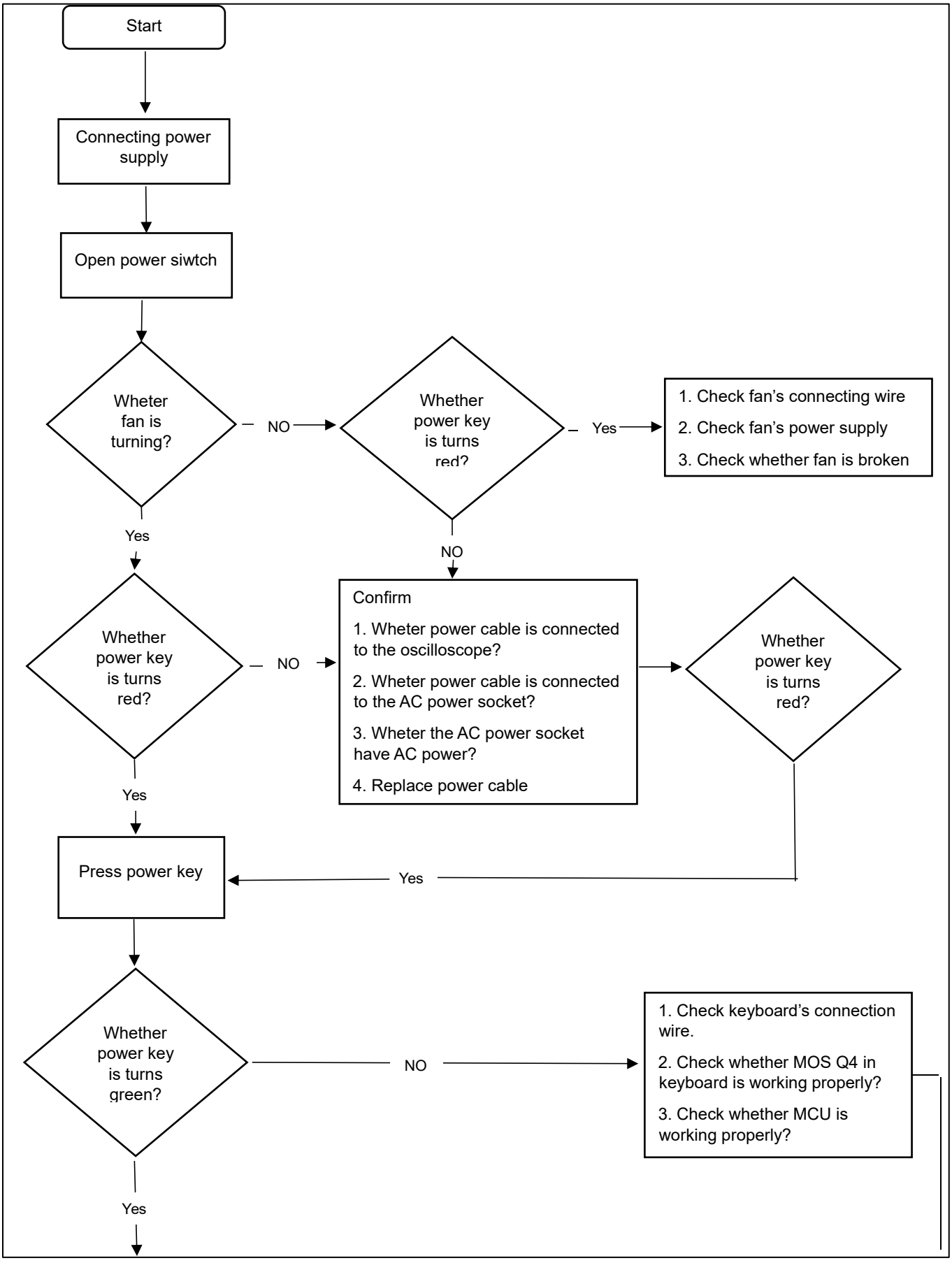
Fault Symptoms	Possible Reasons
The instrument cannot power on	• Power cable is not inserted. • Power faults • Microcontroller components has defective
The instrument is power on but the fan is failure	• Fan's power cable faults • Fan's power cable is not connect to the circuit board • Fan faults • Power faults • Load regulator have one or multiple defective points
Screen is blank or displays stripe	• LCD or video circuit faults

Required Device

- Check the digital voltage meter of power voltage
- Anti-static work environment

Troubleshooting Flowchart

Follow the troubleshooting flowchart to ensure the operation for the fault.


Start
Connecting power supply
Open power siwtch
Wheter fan is turning?
NO
Whether power key is turns red?
Yes
1. Check fan's connecting wire
2. Check fan's power supply
3. Check whether fan is broken
Yes
NO
Whether power key is turns red?
NO
Confirm
1. Wheter power cable is connected to the oscilloscope?
2. Wheter power cable is connected to the AC power socket?
3. Wheter the AC power socket have AC power?
4. Replace power cable
Whether power key is turns red?
Yes
Press power key
Yes
Whether power key is turns green?
NO
1. Check keyboard's connection wire.
2. Check whether MOS Q4 in keyboard is working properly?
3. Check whether MCU is working properly?
Yes

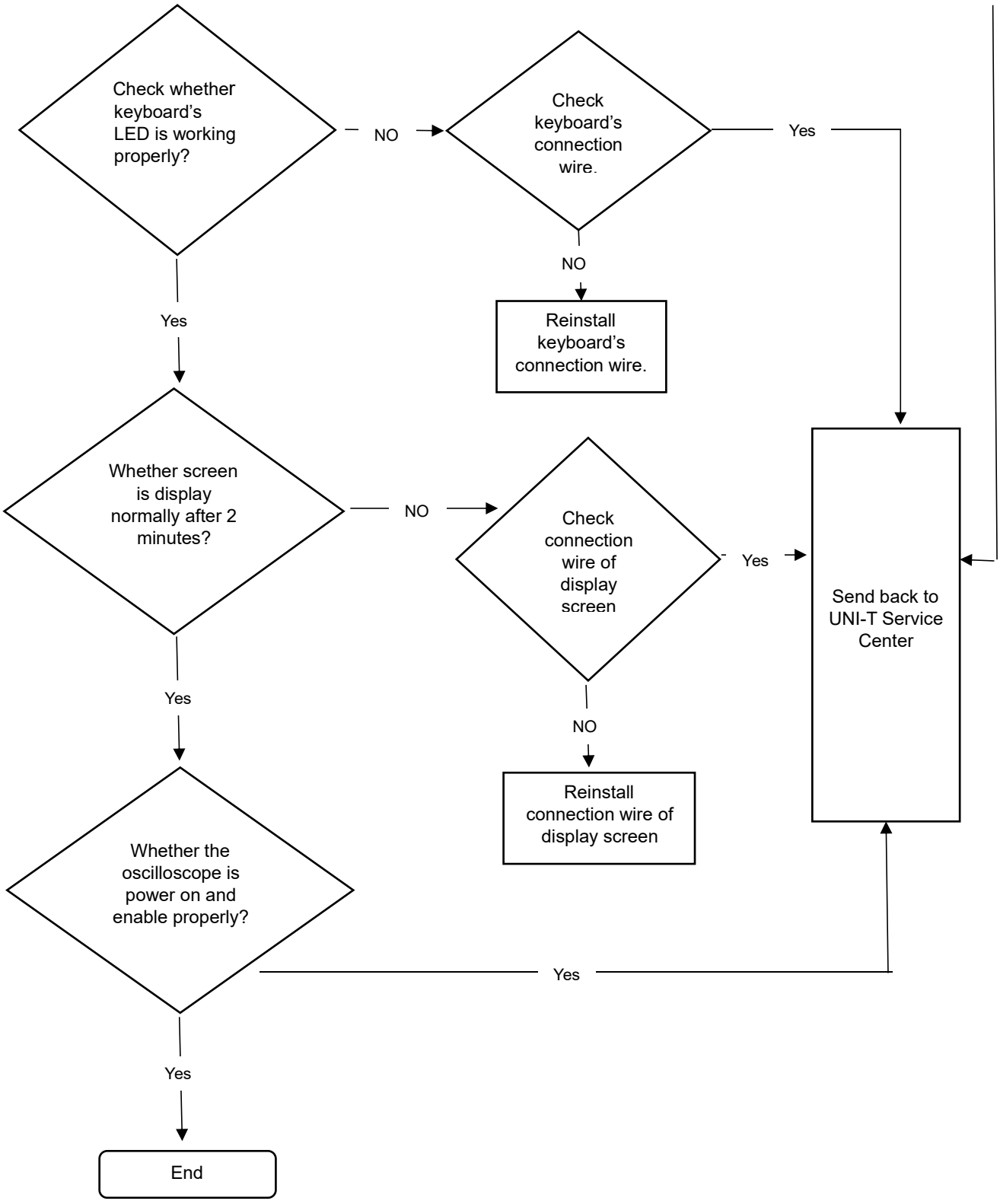

Check whether keyboard's LED is working properly?
NO
Check keyboard's connection wire.
Yes
NO
Reinstall keyboard's connection wire.
Yes
Whether screen is display normally after 2 minutes?
NO
Check connection wire of display screen
Yes
NO
Reinstall connection wire of display screen
Send back to UNI-T Service Center
Yes
Whether the oscilloscope is power on and enable properly?
Yes
Yes
End

Figure 2 Common Problem Troubleshooting Flowchart

After Maintenance

If the instrument cannot pass the performance verification test after remove and replace the power module, please send the instrument back to UNI-T Service Center for adjustement.

Exploded View of Product

The product is divided into three parts: front cover, product module and rear panel

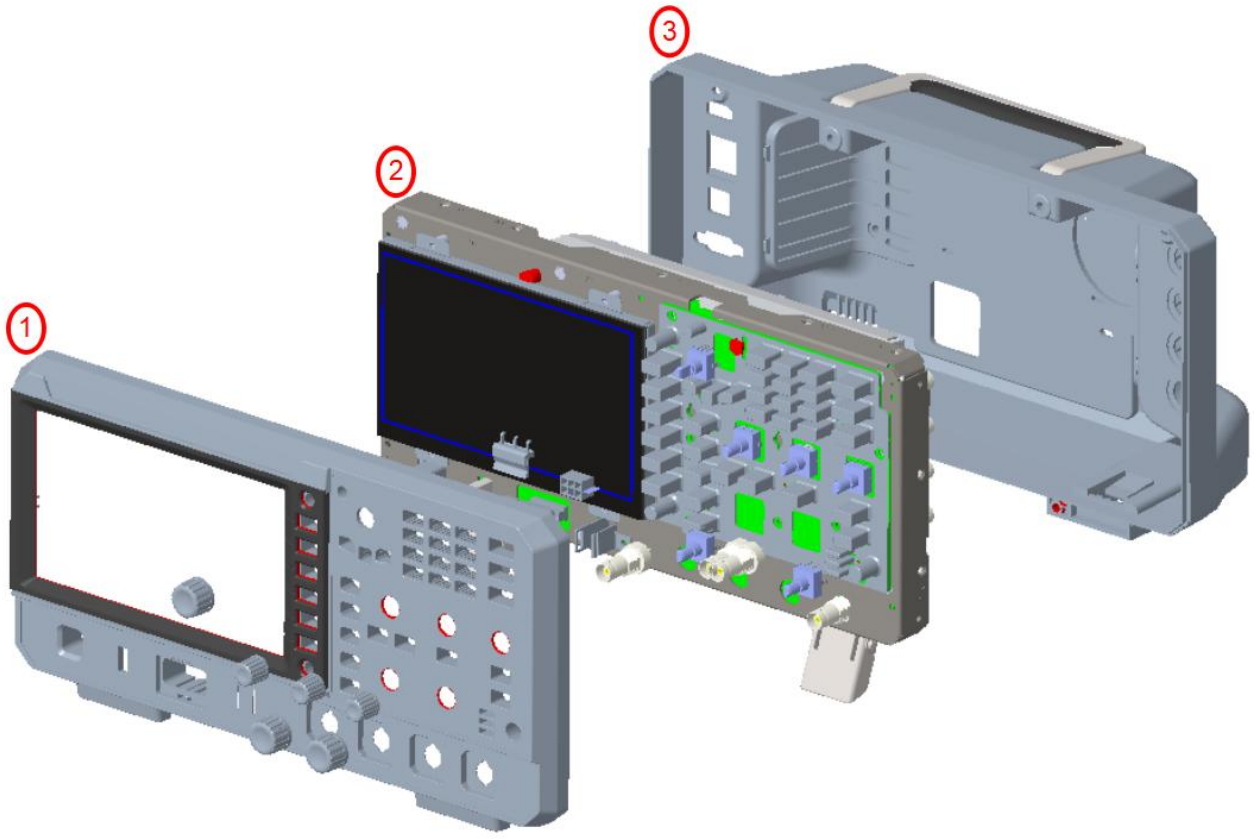


Figure 3 Exploded View of Rear Module with Handle and Stand

Table 4 Product's Components

No.	Parts' Name	Description
1	Front Panel	Front panel contains the knobs
2	Produt's Module	Product's module contains the front module and the rear module
3	Rear Panel	

Front Module

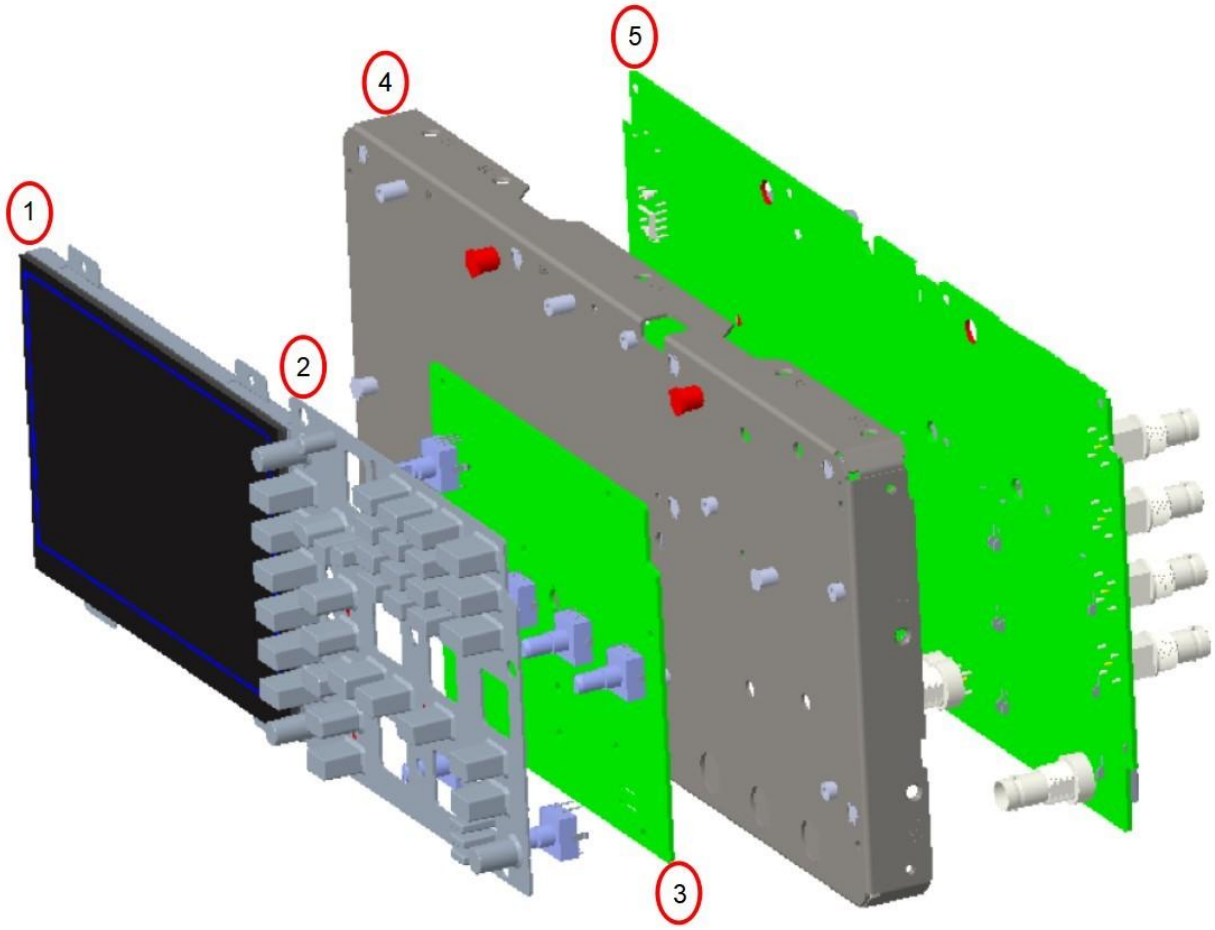


Figure 4 Exploded View of Front Panel

Table 5 Components of Front Panel

No.	Parts' Name	Description

1	Display Screen	HD screen
2	Silicone Key	Key and keyboard to realize man-machine interaction
3	Keyboard Module	Include keyboard and FPC cable
4	Front Module	Fixed mainboard, display screen, keyboard module
5	Mainboard	Core board

Rear Module

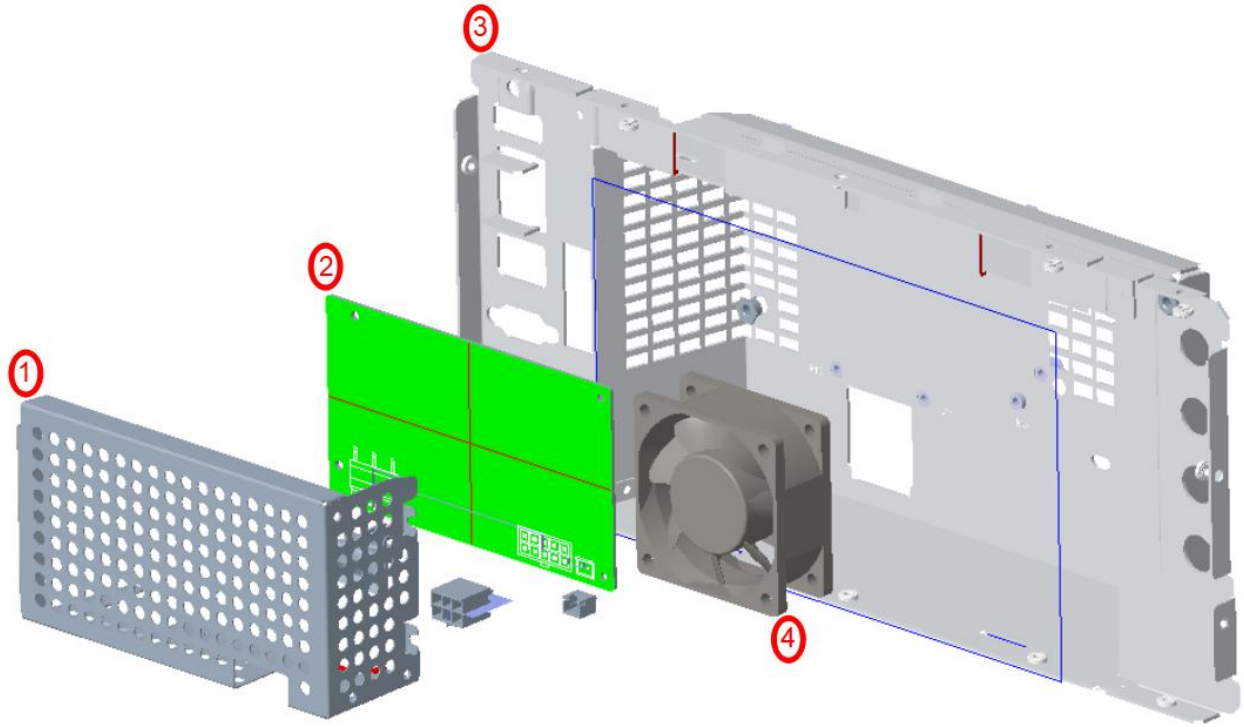


Figure 5 Exploded View of Rear Panel with Power and Fan

Table 6 Components of Rear Panel

No.	Parts' Name	Description
1	Power Protective Cover	Prevent personnel from electric shock

2	Power Module	Power supply system for AC power input
3	Rear Module	Fixed interface
4	Fan	Heat dissipation