

2146562

2146564

2146565

**PC Based Oscilloscope
Service Manual**

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Chapter 1 Safety Tips

1.1 General Safety Summary

Read the following safety precautions to avoid injury and prevent damage to this product or any products connected to it. To evade potential hazards, use this product only as specified.

Only qualified personnel should perform maintenance.

Avoid fire or personal injury.

Use suitable power cord. Use only the power cord specified for this product and certified for the country of use.

Connect and disconnect properly. Connect a probe with the oscilloscope before it is connected to measured circuits; disconnect the probe from the oscilloscope after it is disconnected from measured circuits.

Ground the product. 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.

Connect the probe in a right way. The probe ground lead is at ground potential. Do not connect the ground lead to an elevated voltage.

Check all terminal ratings. To avoid fire or shock hazard, check all ratings and markings on the product. Refer to the product manual for detailed information about ratings before making connections to the product.

Do not operate without covers. Do not operate this product with covers or panels removed.

Avoid exposed circuitry. Do not touch exposed connections and components when power is present.

Do not operate with suspected failures. If you suspect there is damage to this product, have it inspected by qualified service personnel.

Assure good ventilation.

Do not operate in wet/damp environments.

Do not operate in an explosive atmosphere.

Keep product surfaces clean and dry.

1.2 Safety Terms and Symbols

The following terms may appear in this manual:



WARNING. Warning statements point out 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.

1.3 Terms on Product

The following 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 possible hazard to this product or other property.

1.4 Symbols on Product

The following symbols may appear on the product:



Protective
Ground
(Earth)
Terminal



Measurement
Ground
Terminal



CAUTION
Refer to Manual



Measurement
Input Terminal



Mains
Disconnected
OFF (Power)



Mains
Connected
ON (Power)



High Voltage

1.5 Product Scrapping

Device Recycling

We need extract and utilize natural resources to produce this device. If you do not reclaim the device in a proper way, some substances it contains may become harmful or poisonous to environments or human bodies. To avoid them being released outside and to minimize the waste of natural resources, we suggest you reasonably call back this device to ensure proper recovery and recycling of most materials within it.

Chapter 2 Overview

2.1 Brief Introduction

Farnell Model No.	Tenma Model No.	Channels	Bandwidth	Sample Rate
2146562	72-10155	2	40MHz	100MSa/s
2146564	72-10160	2	60MHz	150MSa/s
2146565	72-10165	2	100MHz	250MSa/s

Model List

2.2 Appearance

Front



Rear



Front Side



Channel 1 Input Connector

Channel 2 Input Connector

External Trigger Input Connector

Rear Side



GND Terminal

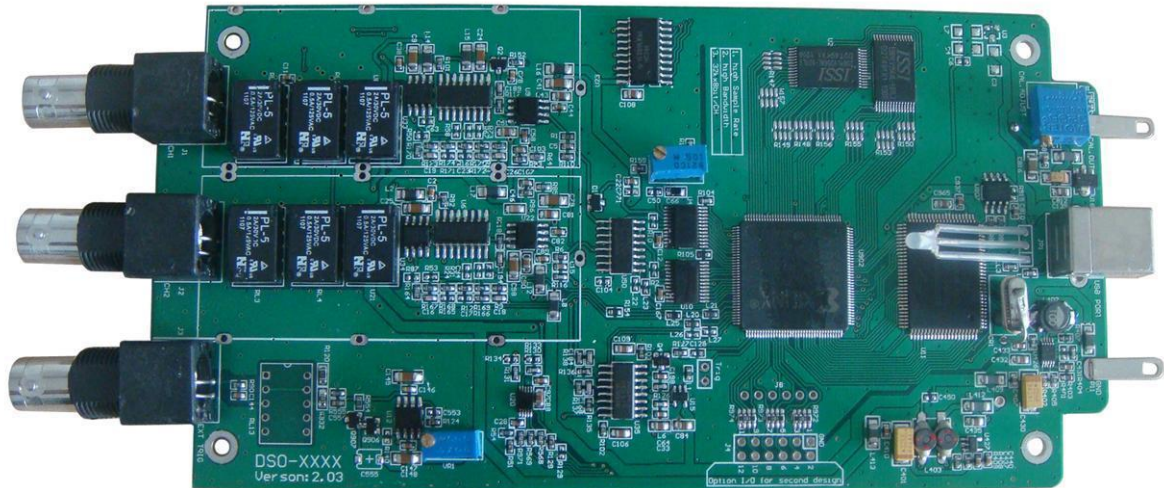
USB Port

Calibration Signal Input Terminal

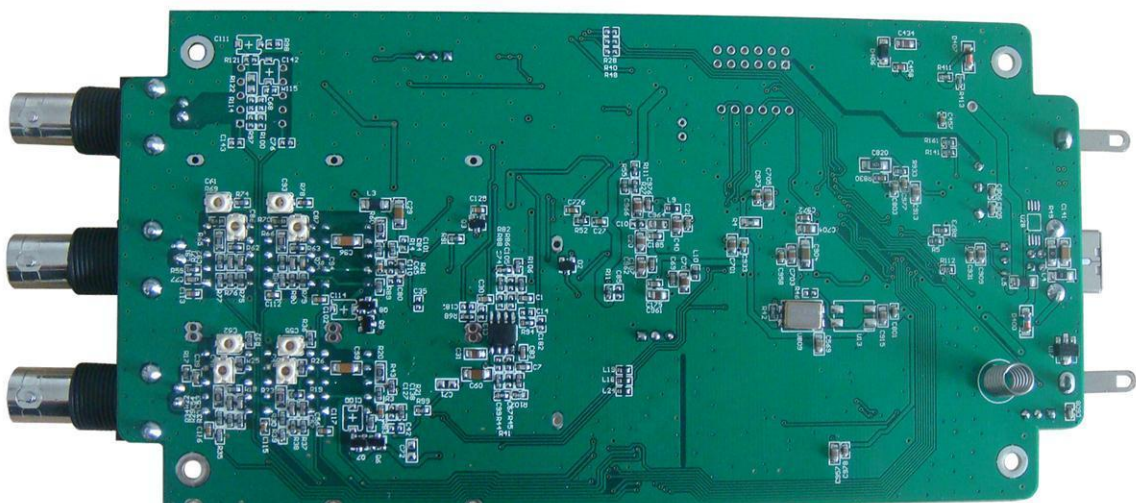
2.3 Mainboard

2.3.1 2146562 Mainboard

Front

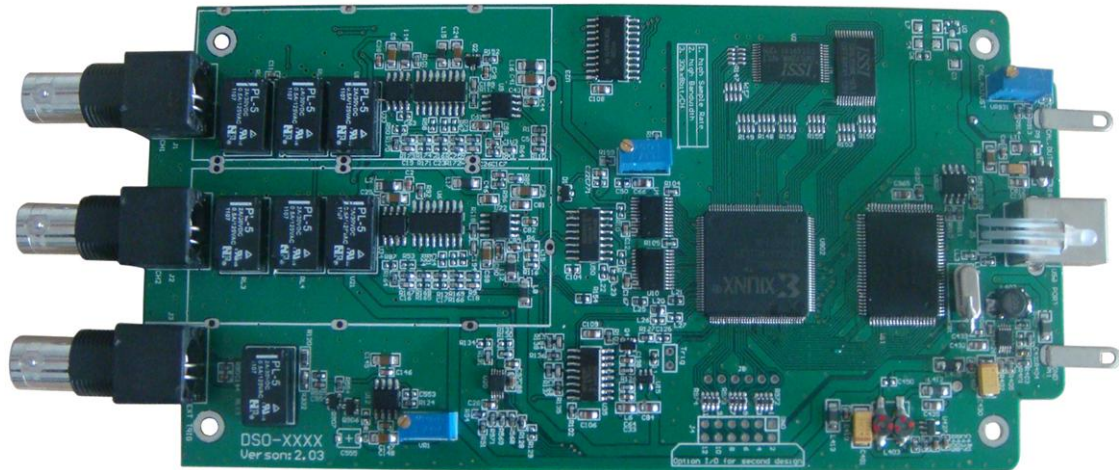


Rear

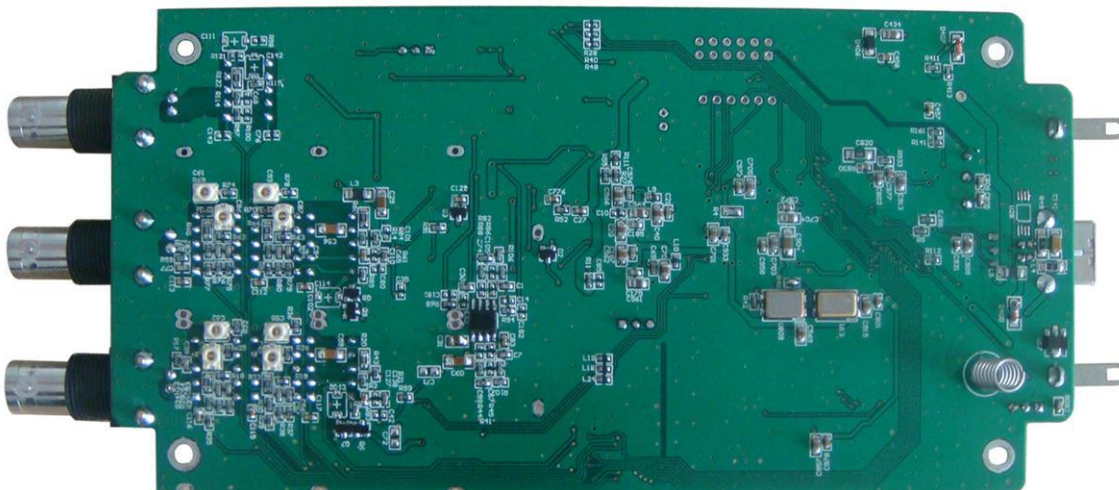


2.3.2 2146564 Mainboard

Front

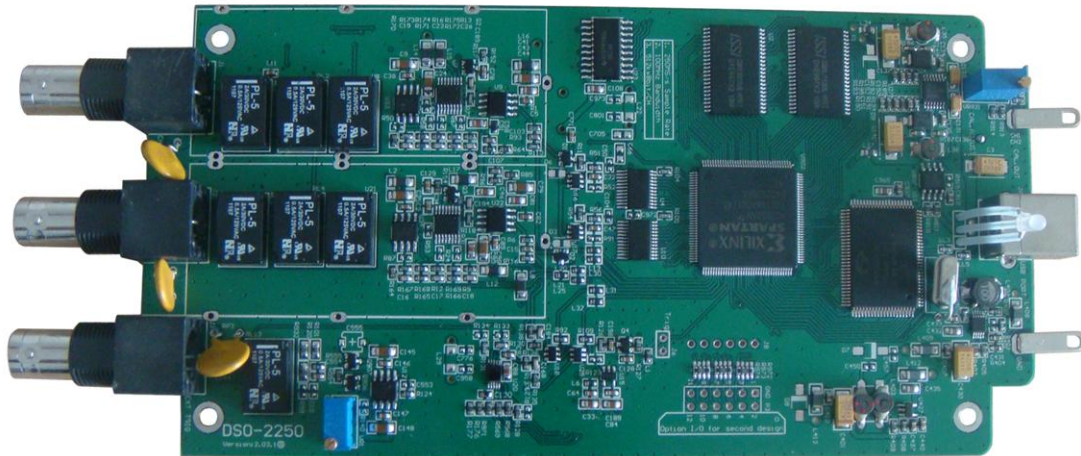


Rear

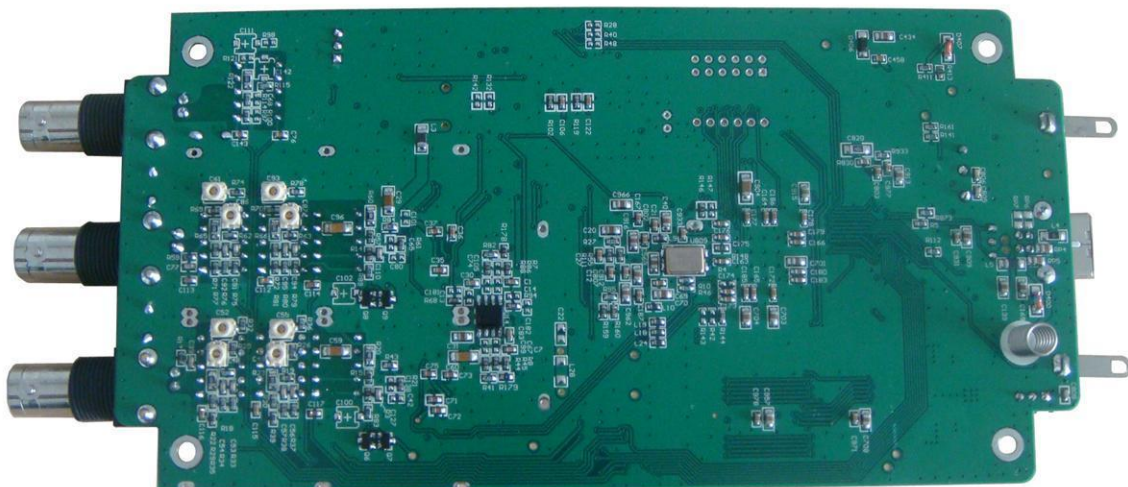


2.3.3 2146565 Mainboard

Front



Rear



2.4 Specification

2.4.1 2146562 Specification

Acquisition	
Sample Mode	Real-Time Sample
Sample Rate	Real-Time Sample:100MSa/s
Average	N acquisitions, all channels simultaneously, N is selectable from 1-128.

Input	
Input Coupling	DC, AC, GND
Input Impedance	Resistance: 1M Ω ; Capacitance: 25pF
PP-80,PP-150 and PP-200 Probe Attenuation	10X
Supported Voltage Probe Attenuation Factors	1X, 10X
Maximum Input Voltage	35Vpk (DC + peak)

Horizontal	
Scanning Speed Range(Sec/Div)	4ns/div ~ 1h/div(1-2-4 sequences)
Sample Rate and Delay Time Accuracy	± 50 ppm(any interval ≥ 1 ms)
Wave form Interpolation	Step, Linear, Sin(x)/x
Memory Depth(Sample Points)	10K : available when timebase is 4ns/div-400ms/div; 32K : 20us/div-400ms/div(Single channel); 40us/div-400ms/div(Dual channel); 64K : 40us/div-400ms/div

Vertical	
Analog Bandwidth	40MHz (-3dB)
A/D converter	8 bit resolution
Vertical Scale(Volt/div) Range	10mV ~ 5V/div @ x1 probe(1,2,5 sequence) 100mV ~ 50V/div @ x10 probe
Position Range	± 4 division
Selectable Analog Bandwidth Limit	20MHz
Lower Frequency Response(-3dB)	≤ 10 Hz(at input BNC)
Rise Time at BNC(typical)	≤ 8.8 ns
DC Gain Accuracy	$\pm 3\%$

Trigger	
Trigger Source	CH1,CH2, EXT
Trigger Mode	Auto, Normal and Single
Trigger Type	Edge trigger: Rising edge, falling edge.
Trigger Sensitivity	0.02 div increments
Trigger Level Range	±4V
Trigger Level Accuracy	±4 division

Measurement		
Cursor	Amplitude difference between cursors (ΔV)	
	Time difference between cursors (Δt)	
Auto Measure	Reciprocal of Δt in Hertz ($1/\Delta t$)	
	(Cross, Trace, Horizontal, Vertical)	
Auto Measure	Voltage Measurement	Vp-p, Vmax, Vmin, Vmean, Vrms, Vamp, Vtop, Vbase, Vmid, Vcrms, Preshoot, Overshoot
	Time Measurement	Frequency, Period, Rise Time(10%~90%), Fall Time(10%~90%), Positive Width, Negative Width, Duty Cycle

Environmental		
Temperature	Operating: 0°C to 40°C	
	Non-operating: -20°C to +60°C)	
Cooling Method	Forced air	
Humidity	Below +35°C, ≤90% relative humidity	
	+35°C to +40°C, ≤60% relative humidity	
Altitude	Operating	3,000m or below
	Non-operating	15,000m or below

Mechanical		
Size	Width	190mm
	Height	100mm
	Depth	35mm
Heavy	Without package	0.29kg
	Packaged	0.9kg

2.4.2 2146564 Specification

Acquisition	
Sample Mode	Real-Time Sample
Sample Rate	Real-Time Sample:150MSa/s
Average	N acquisitions, all channels simultaneously, N is selectable from 1-128.

Input	
Input Coupling	DC, AC, GND
Input Impedance	Resistance: 1M Ω ; Capacitance: 25pF
Probe Attenuation Factors	1X, 10X, 100X, 1000X
Maximum Input Voltage	35Vpk (DC + peak)

Horizontal	
Scanning Speed Range(Sec/Div)	4ns/div ~ 1h/div(1-2-4 sequences)
Sample Rate and Delay Time Accuracy	± 50 ppm(any interval ≥ 1 ms)
Wave form Interpolation	Step, Linear, Sin(x)/x
Memory Depth(Sample Points)	10K : available when timebase is 4ns/div-400ms/div; 32K : 40us/div-400ms/div(Single channel); 20us/div-400ms/div(Dual channel); 64K : 40us/div-400ms/div

Vertical	
Analog Bandwidth	60MHz (-3dB)
A/D converter	8 bit resolution
Vertical Scale(Volt/div) Range	10mV ~ 5V/div @ x1 probe(1,2,5 sequence) 100mV ~ 50V/div @ x10 probe
Position Range	± 4 division
Selectable Analog Bandwidth Limit(typical)	20MHz
Lower Frequency Response(-3dB)	≤ 10 Hz(at input BNC)
Rise Time at BNC(typical)	≤ 5.8 ns
DC Gain Accuracy	$\pm 3\%$

Trigger	
Trigger Source	CH1,CH2, EXT
Trigger Mode	Auto, Normal and Single
Trigger Type	Edge trigger: Rising edge, falling edge.
Trigger Sensitivity	0.02 div increments
Trigger Level Range	±4V
Trigger Level Accuracy	±4 division

Measurement		
Cursor	Amplitude difference between cursors (ΔV)	
	Time difference between cursors (Δt)	
Auto Measure	Reciprocal of Δt in Hertz ($1/\Delta t$)	
	(Cross, Trace, Horizontal, Vertical)	
Auto Measure	Voltage Measurement	Vp-p, Vmax, Vmin, Vmean, Vamp, Vtop, Vbase, Vmid, Vrms, Vcrms, Preshoot, Overshoot
	Time Measurement	Frequency, Period, Rise Time(10%~90%), Fall Time(10%~90%), Positive Width, Negative Width, Duty Cycle

Environmental		
Temperature	Operating: 0°C to 40°C	
	Non-operating: -20°C to +60°C)	
Cooling Method	Forced air	
Humidity	Below +35°C, ≤90% relative humidity	
	+35°C to +40°C, ≤60% relative humidity	
Altitude	Operating	3,000m or below
	Non-operating	15,000m or below

Mechanical		
Size	Width	190mm
	Height	100mm
	Depth	35mm
Heavy	Without package	0.29kg
	Packaged	0.9kg

2.4.3 2146565 Specification

Acquisition	
Sample Mode	Real-Time Sample
Sample Rate	Real-Time Sample:250MSa/s
Average	N acquisitions, all channels simultaneously, N is selectable from 1-128.

Input	
Input Coupling	DC, AC, GND
Input Impedance	Resistance: 1M Ω ; Capacitance: 25pF
Probe Attenuation Factors	1X, 10X, 100X, 1000X
Maximum Input Voltage	35Vpk (DC + peak AC)

Horizontal	
Scanning Speed Range(Sec/Div)	4ns/div ~ 1h/div(1-2-4 sequences)
Sample Rate and Delay Time Accuracy	± 50 ppm(any interval ≥ 1 ms)
Wave form Interpolation	Step, Linear, Sin(x)/x
Memory Depth(Sample Points)	10K : available when timebase is 4ns/div-400ms/div; 32K : 40us/div-400ms/div(Single channel); 20us/div-400ms/div(Dual channel); 64K : 40us/div-400ms/div

Vertical	
Analog Bandwidth	100MHz (-3dB)
A/D converter	8 bit resolution
Vertical Scale(Volt/div) Range	10mV ~ 5V/div @ x1 probe(1,2,5 sequence) 100mV ~ 50V/div @ x10 probe
Position Range	± 4 division
Selectable Analog Bandwidth Limit(typical)	20MHz
Lower Frequency Response(-3dB)	≤ 10 Hz(at input BNC)
Rise Time at BNC(typical)	≤ 3.5 ns
DC Gain Accuracy	$\pm 3\%$

Trigger	
Trigger Source	CH1,CH2, EXT
Trigger Mode	Auto, Normal and Single
Trigger Type	Edge trigger: Rising edge, falling edge.
Trigger Sensitivity	0.02 div increments
Trigger Level Range	±4V
Trigger Level Accuracy	±4 division

Measurement		
Cursor	Amplitude difference between cursors (ΔV)	
	Time difference between cursors (Δt)	
	Reciprocal of Δt in Hertz ($1/\Delta t$)	
	(Cross, Trace, Horizontal, Vertical)	
Auto Measure	Voltage Measurement	Vp-p, Vmax, Vmin, Vmean, Vamp, Vtop, Vbase, Vmid, Vrms, Vcrms, Preshoot, Overshoot
	Time Measurement	Frequency, Period, Rise Time(10%~90%), Fall Time(10%~90%), Positive Width, Negative Width, Duty Cycle

Environmental		
Temperature	Operating: 0°C to 40°C	
	Non-operating: -20°C to +60°C)	
Cooling Method	Forced air	
Humidity	Below +35°C, ≤90% relative humidity	
	+35°C to +40°C, ≤60% relative humidity	
Altitude	Operating	3,000m or below
	Non-operating	15,000m or below

Mechanical		
Size	Width	190mm
	Height	100mm
	Depth	35mm
Heavy	Without package	0.29kg
	Packaged	0.9kg

Chapter 3 Disassemble Oscilloscope

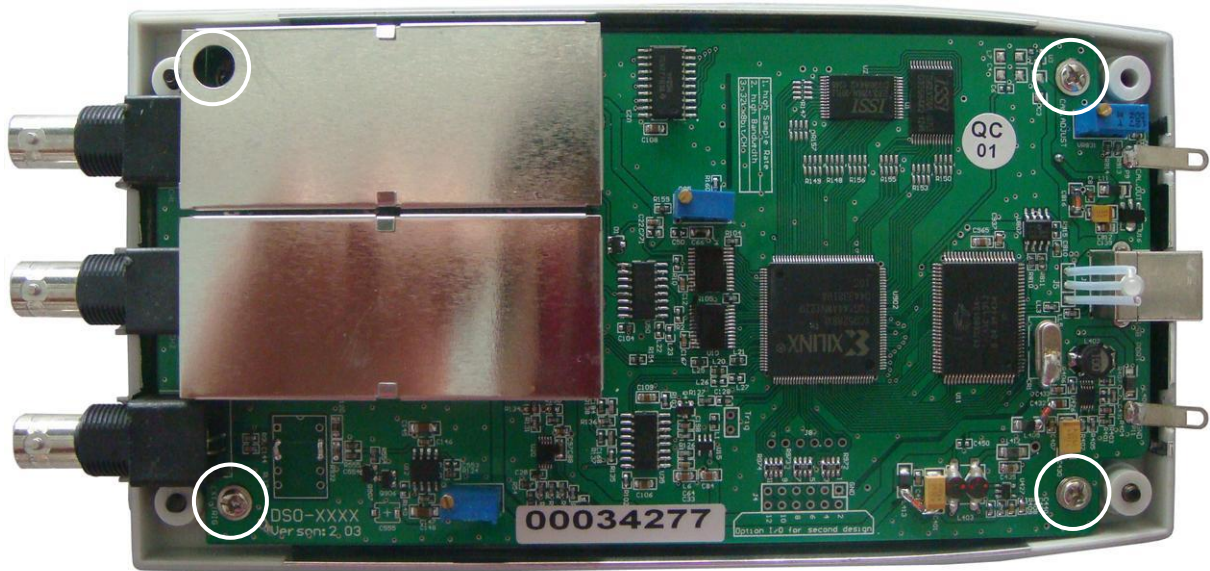
3.1 Remove the Upper-Casing

Detach the upper casing of the oscilloscope by undoing these four screws via a hexagonal screwdriver.



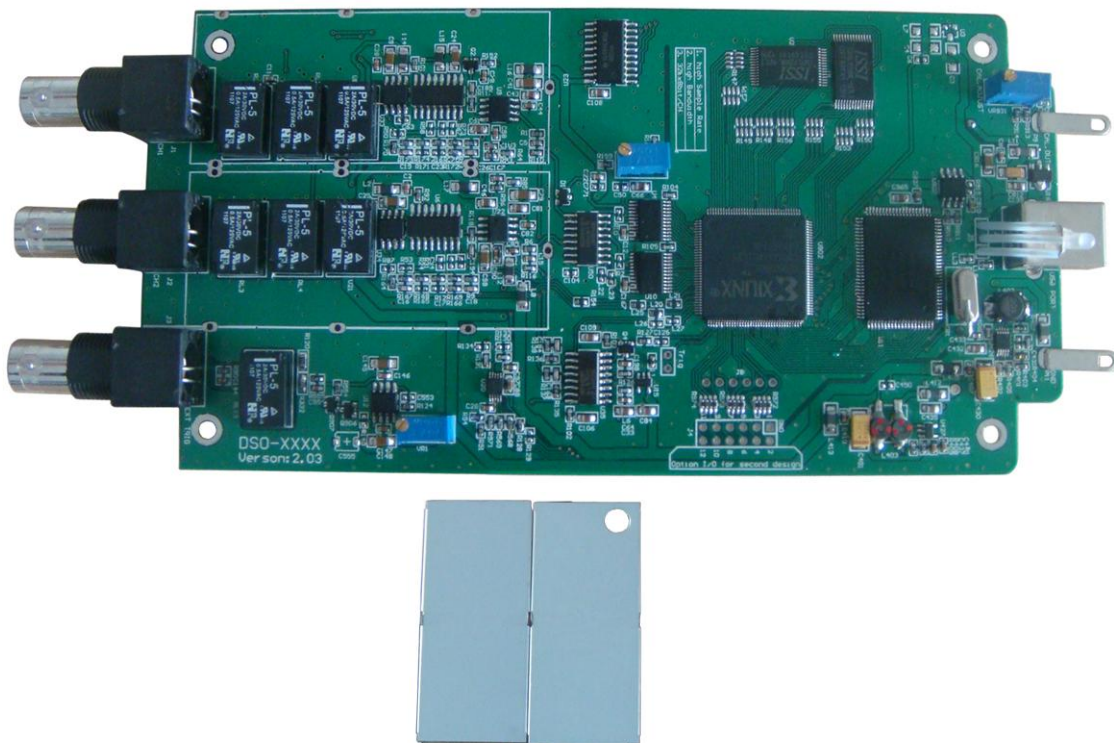
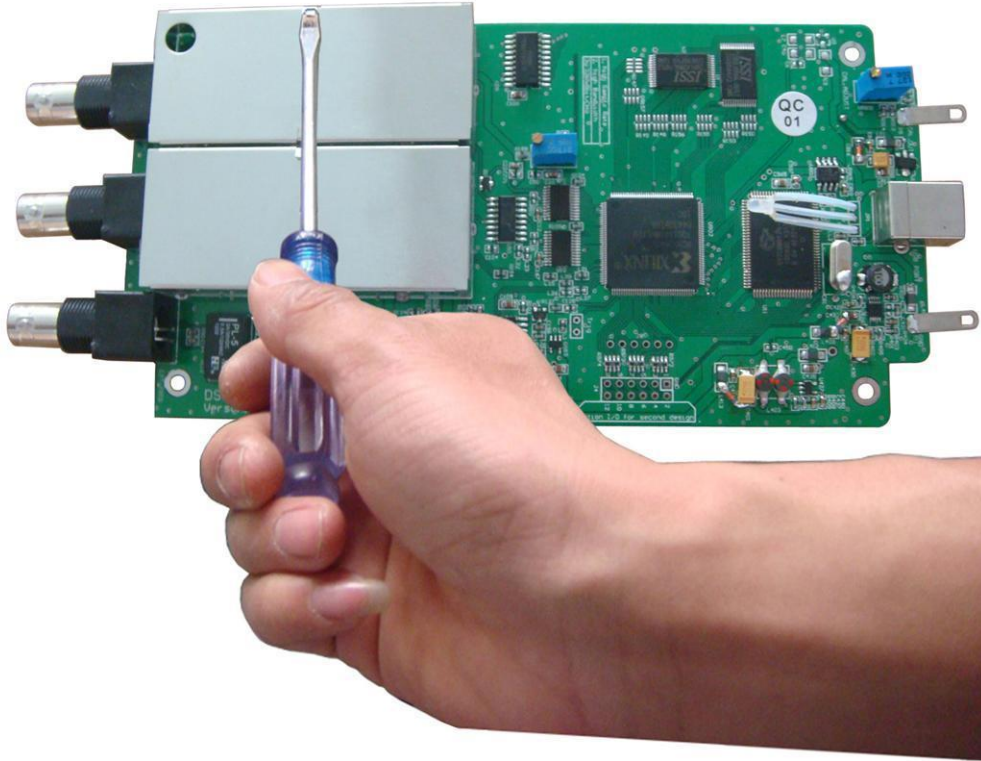
3.2 Remove the Lower-Casing

Detach the lower casing of the oscilloscope by undoing these four screws via a cross screwdriver.



3.3 Remove the shielding case from the PCB front

Insert the flat blade of screwdriver to the riveting joint of the shielding case cover, and pry the riveting fastener slightly one by one.



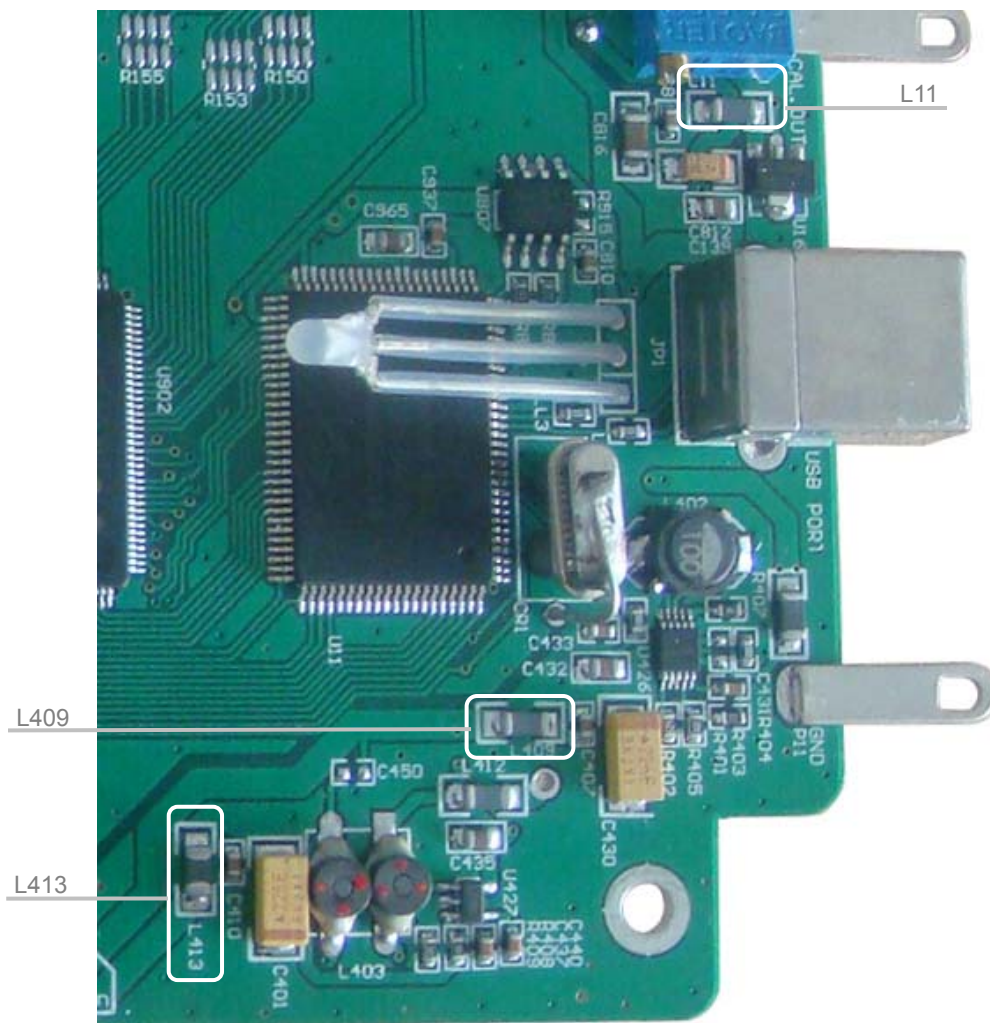
Chapter 4 Oscilloscope Working Power Supply Maintenance

4.1 Short Circuit Detection

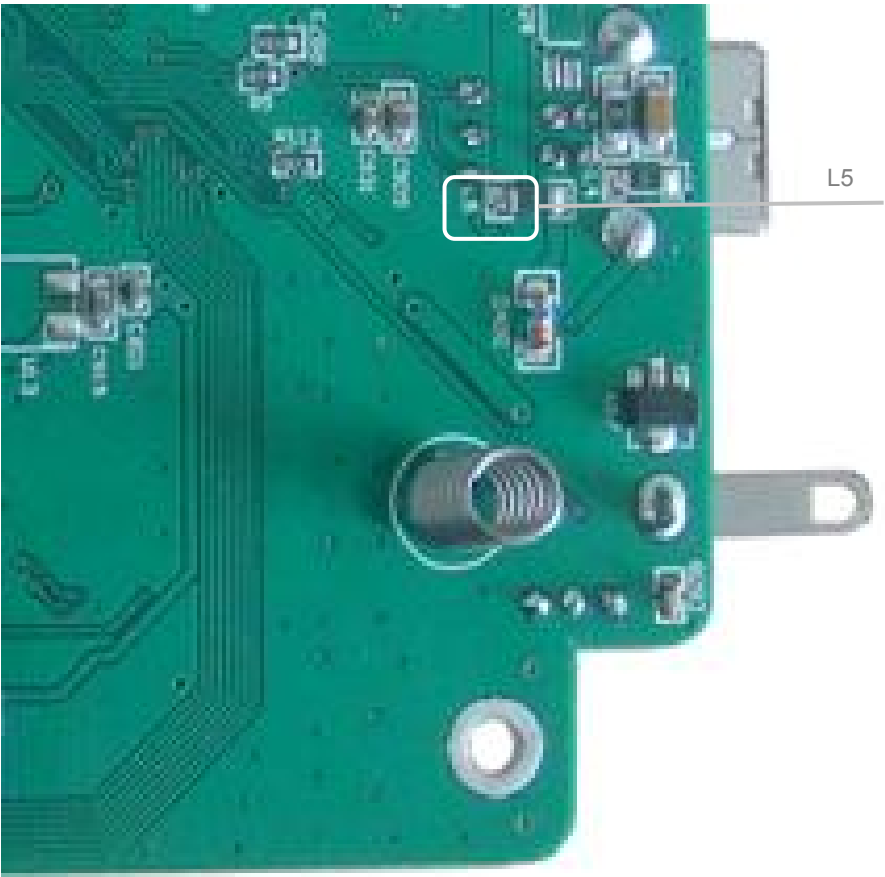
1. Set the resistance of digital multimeter to “ $\times 0\Omega$ ”.
2. Place the black multimeter probe at GDN.
3. Put the red multimeter probe on these parts one by one, like L5, L11, L409, and L413, if the multimeter doesn't show any short circuit warning message, it is normal and well. If there's short circuit, please refer to step 4.3 to repair.

See following highlight testing points.

Front



Rear



4.2 Voltage Detection

- 1) Set the digital multimeter DC voltage to “x6V”;
- 2) Put the red multimeter probe on these test points, like L5, L11, L409, and L413, if the measuring voltage within the following “normal voltage value” range, it is normal and well. If abnormal, please refer to step 4.3 to repair.

Testing Point Identity	“L5”	“L11”	“L409”	“L413”
Normal Voltage Value Range (V)	+4.75 ~ +5.15	+3.25 ~ +3.35	+4.90 ~ +5.05	-4.90 ~ -5.05

4.3 Voltage Repair

4.3.1 Repair digital section power DC+3.3V

When the measured voltage of magnetic bead L11 is out of the range “+3.25 ~ +3.35”, please replace following parts.

No.	Type	Description	Descriptor	Qt'y
1	CAP	TANTALUM, 4.7UF, 16V, 20%, M8R (Type A)	C812	1
2	IC	ME6206A33PG, SOT-89	U16, U17	2

Note: When replace the parts, please make sure the PCB board power off and the repair staff has fullest ESD(Electro Static Discharge).

4.3.2 Repair model section power DC+5V

When the measured voltage of magnetic bead L409 is out of the range “+4.90 ~ +5.05”, please replace following parts.

No.	Type	Description	Descriptor	Qt'y
1	CAP	CERAMIC,100NF, 50V, 20%,Y5V, C0603	C407,C431, C433	3
2	CAP	CERAMIC,10UF, 25V, 20%,Y5V, C0805	C432	1
3	CAP	TANTALUM, 22UF,16V,10%,C1210(B)	C430	1
4	RES	RES, 0R,1/16W, 5%, R0603	R403,R406	2
5	IC	DC/DC, LTC3440EMS#PBF(+5V),SOP-10	U426	1

Note: When replace the parts, please make sure the PCB board power off and the repair staff has fullest ESD(Electro Static Discharge).

4.3.3 Repair model section power DC-5V

When the measured voltage of magnetic bead L413 is out of the range “-4.95 ~ -5.05”, please replace following parts.

No.	Type	Description	Descriptor	Qt'y
1	CAP	CERAMIC,100NF, 50V, 20%,Y5V, C0603	C437,C440	2
2	CAP	TANTALUM, 22UF, 16V, 10%, C1210(B)	C401	1
3	RES	RES, 29.4KR, 1/16W, 1%, R0603	R408	1
4	RES	RES,10KR,1/16W, 1%, R0603	R409	1
5	IC	DC/DC, LT1931ES5, SOT23	U427	1

Note: When replace the parts, please make sure the PCB board power off and the repair staff has fullest ESD(Electro Static Discharge).

Chapter 5 LEDS Working Status Indication

5.1 LED Flashes Red

When power on, if it lits with red and twinkling, indicates voltage is within correct parameters and the driver has been loaded successfully.

5.2 LED Flashed Green

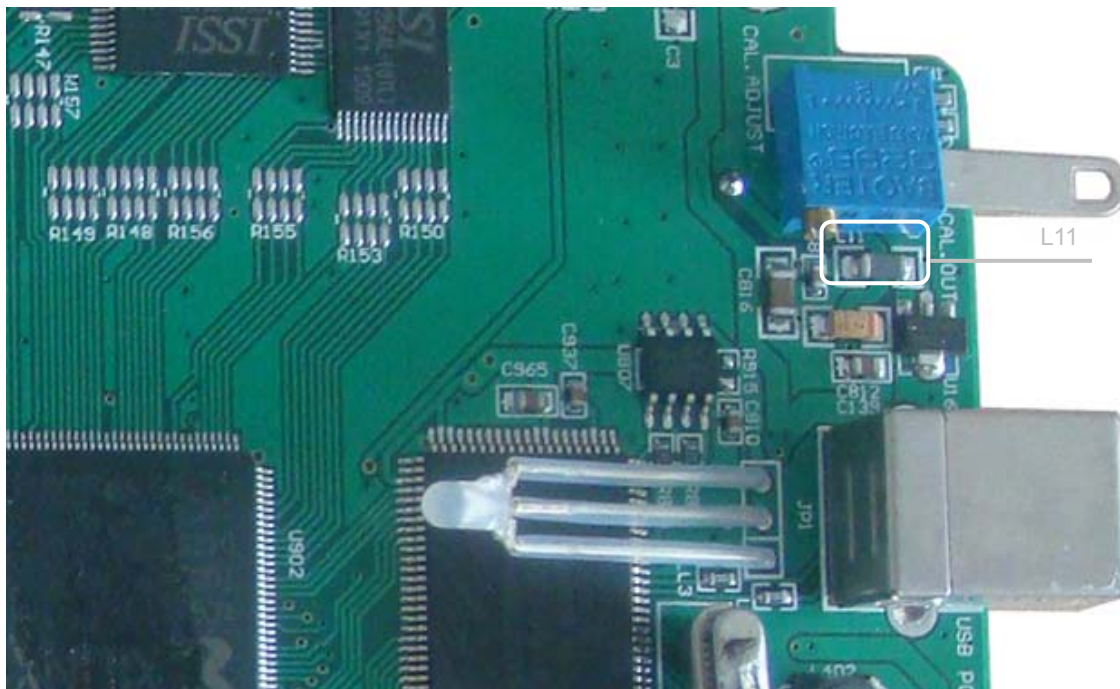
When connect to computer, and run its software on computer, if it is twinkling green, indicates the device work normally.

Chapter 6 Oscilloscope Maintenance

6.1 Example 1: LED Indicator Doesn't Lit

6.1.1

When the LED indicator is unlit, please test the chip L11 (DC+3.3V). If L11 displays within “+3.25 ~ +3.35”, which indicates the working voltage is good. If it didn't show this value, please replace the chips as step 4.3.1 shown. See the testing point as below.

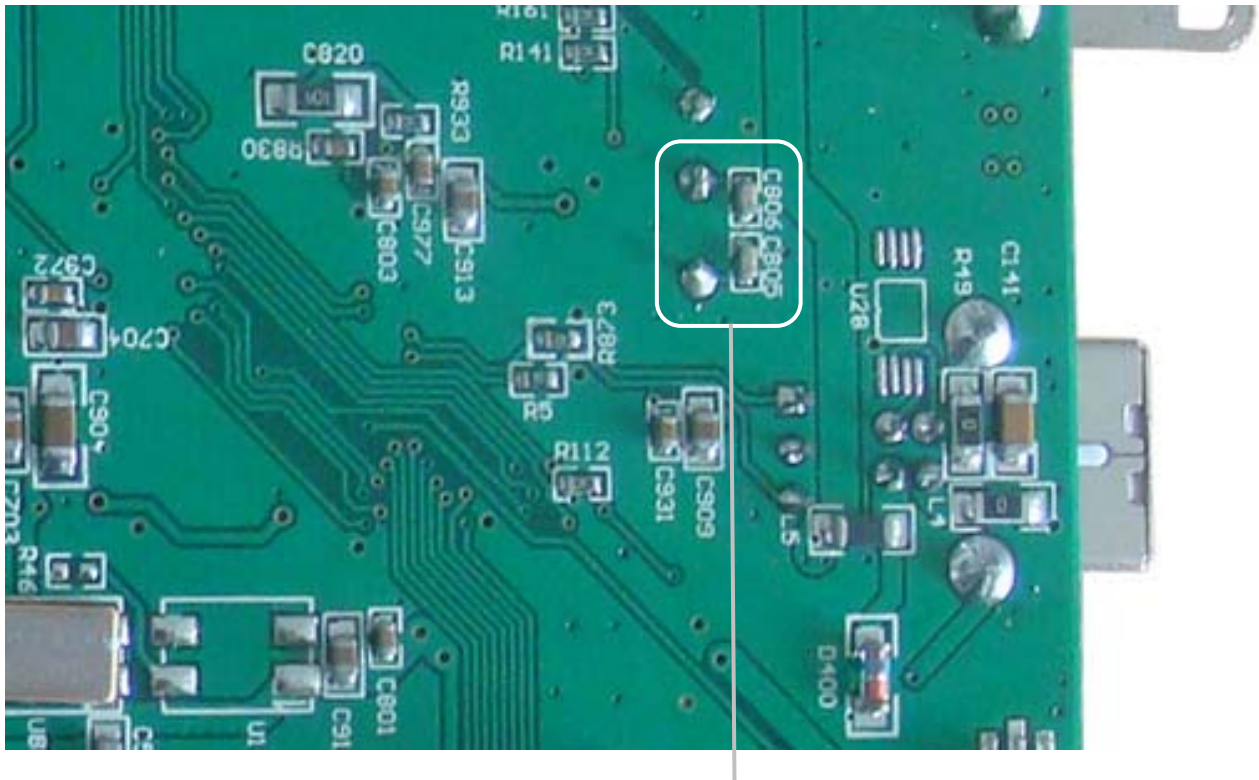


6.1.2

If above step test the voltage of DC +3.3V is normal, please open the device manager on computer and check whether the driver installed successfully.

6.1.2.1 If driver's installation doesn't succeed, please test the USB chip crystal oscillator CR1 is 24MHz or not. Testing steps as follows:

Use an oscilloscope with 200MHz bandwidth, 1G sampling rate to detect the state of USB's crystal oscillator-CR1. Set oscilloscope probe to "X10", set trigger to "AUTO" and trigger level to "50%", time base to "100 ns", coupling mode to "AC", vertical position to "100mV", vertical offset to "0div". Then put the oscilloscope probe to output and input terminals of crystal oscillator CR1, if the measured frequency is 24 MHz, the USB's crystal oscillator works fine. See the testing points as below.

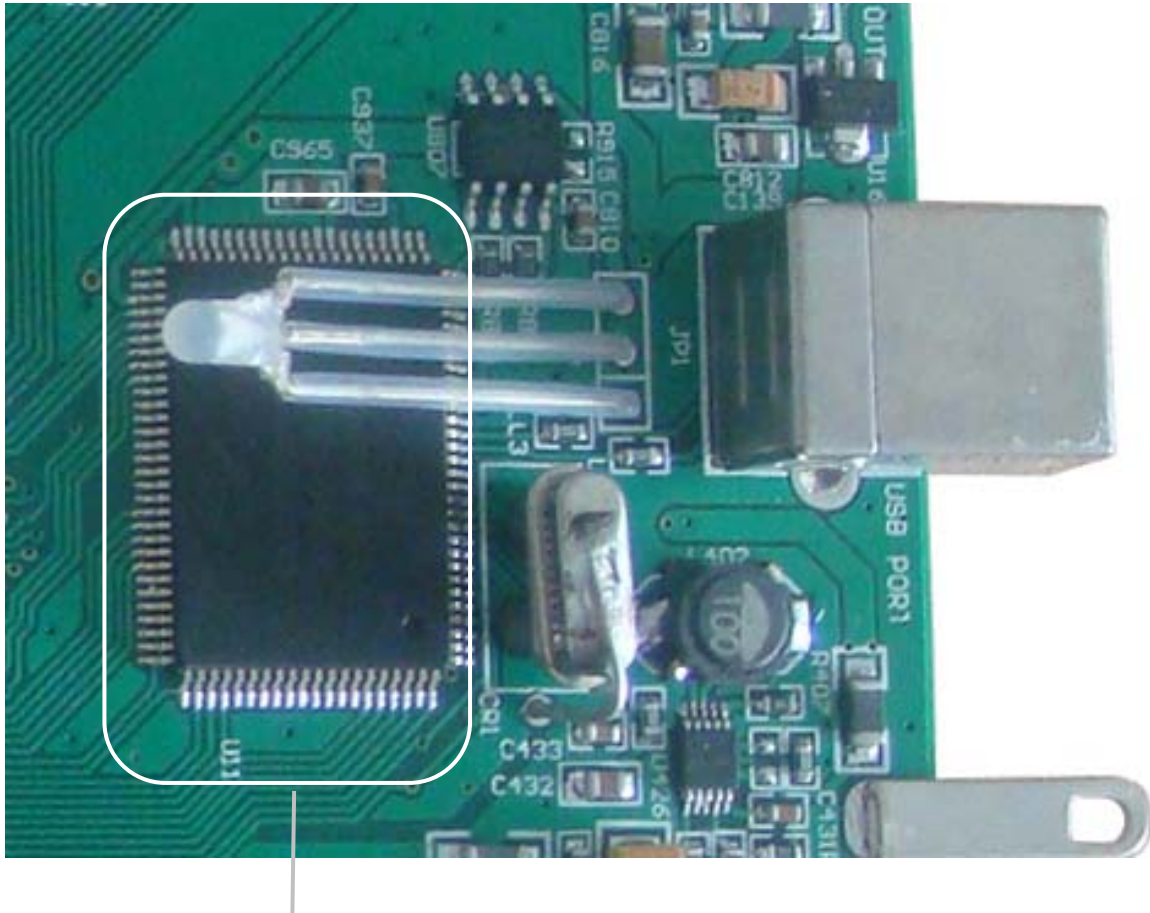


These two welds within the frame is the testing points for output and input terminals of crystal oscillator CR1.

6.1.2.2 If not, please replace this USB chip, whose specification and position as follows:

No.	Type	Description	Descriptor	Qt'y
1	IC	CY7C68013A-100AXC,QFP-100	U11	1

Note: When replace the parts, please make sure the PCB board power off and the repair staff has fullest ESD(Electro Static Discharge).



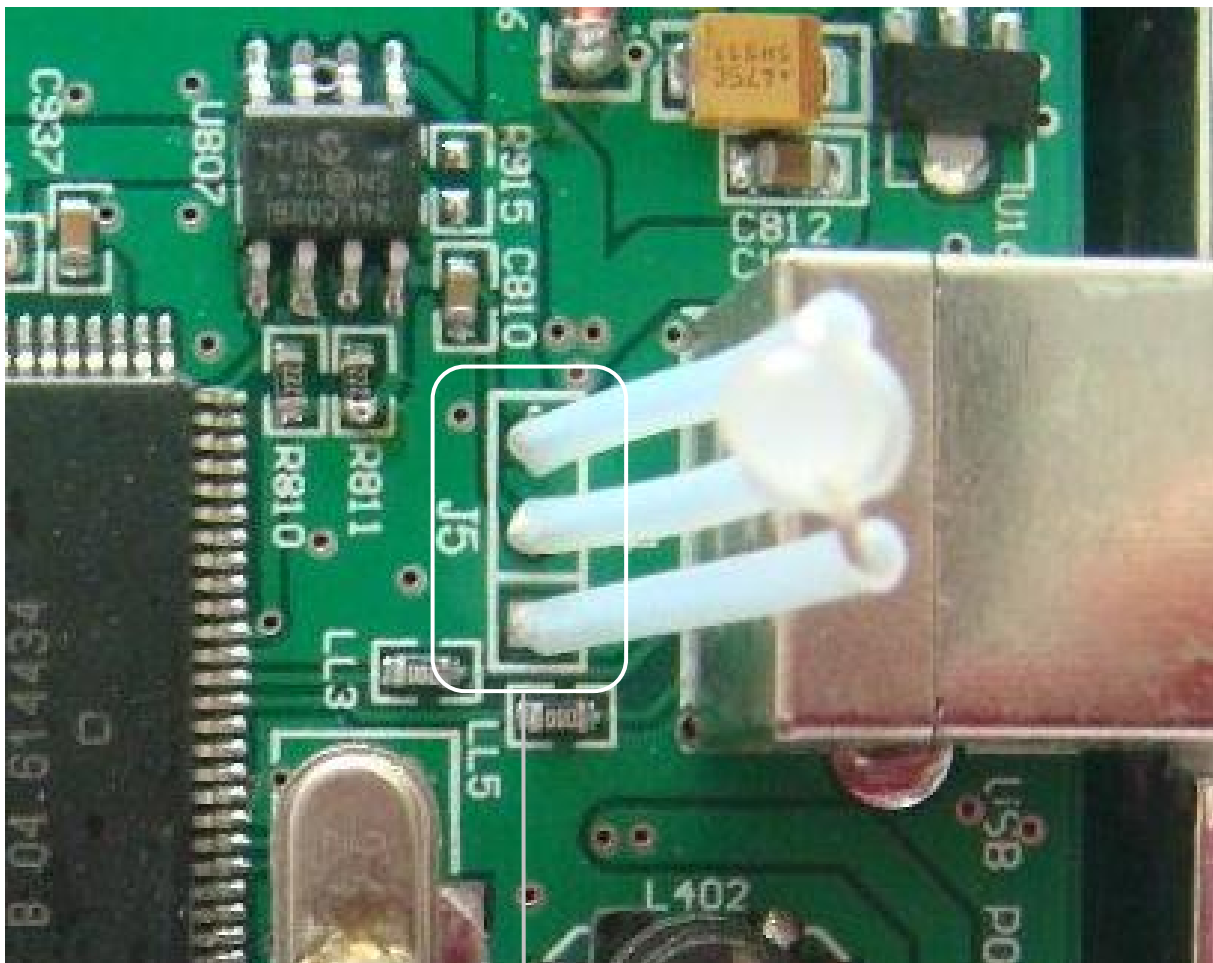
USB chip at U11

6.1.2.3 If the LED indicator still not light when finish above two steps 6.1.2.1 and 6.1.2.2, please replace the LED light.

6.1.2.4 If the driver installed successfully, indicates the LED damaged, please replace LED light, its specification and position as below:

No.	Type	Description	Descriptor	Qt'y
1	LED	LED,RED&YELLOW,CLEAR,DIP-3	J5	1

Note: When replace the parts, please make sure the PCB board power off and the repair staff has fullest ESD(Electro Static Discharge).



Bicolor LED with a common anode

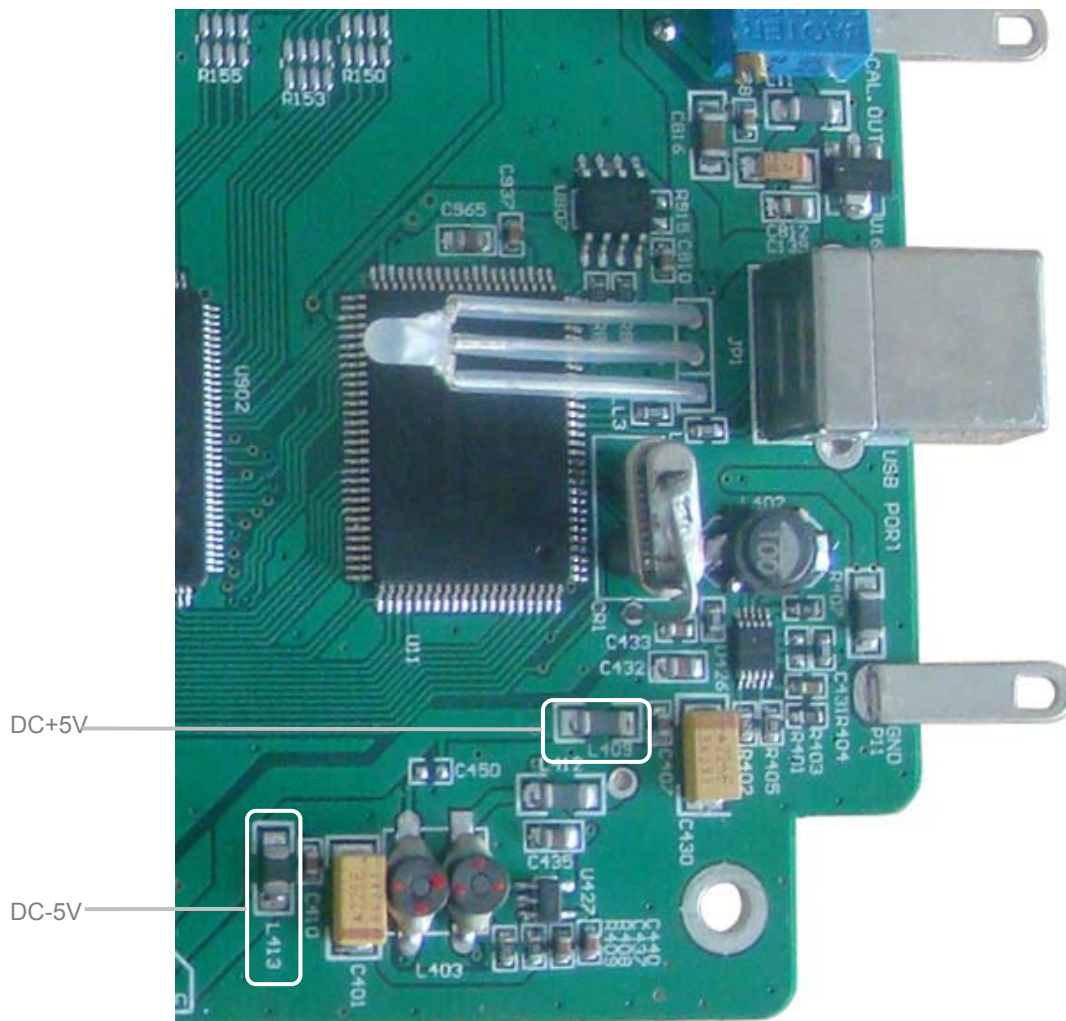
6.2 Example 2: Vertical Offset

When channels occur vertical deviation from zero datum on the oscilloscope working interface, please repair it as the following two steps.

6.2.1 Step one: test the working voltage of AFE (analog front end).

1. Set the digital multimeter DC voltage to “x6V”;
2. Put the red multimeter probe on these test points, like L409, L413. The working voltage of AFE of L409 is DC+5V, and L413 is DC-5V, and their voltage range should within the following “normal voltage value” . If abnormal, please send the testing report to manufacturer.

Testing Point	“L409”	“L413”
Normal Voltage	+4.90 ~ +5.05	-4.90 ~ -5.05



6.2.2 Step two: Do self calibration.

6.2.2.1 Start self calibration: Connect oscilloscope to computer, and open its software, click "UTILITY"->"SELF CAL"->select "Channel"->"OK" in turn.

6.2.2.2 When oscilloscope enter into self calibration process, it takes several minutes to finish. If the vertical offset has been corrected after calibration means this offset has been solved.

If the vertical offset hasn't been corrected after calibration, please replace the vertical offset adjusting resistance: CH1 is R21 (at the BOTTOM layer of the circuit board), CH2 is R61 (at the BOTTOM layer of the circuit board), please select encapsulation 0603 (1608) accuracy 1% resister between 4R and 9R. And then calibrate it as Step 6.2.2.1.

Please select the right resistance value according to the self calibration result. Different circuit board may need different resistance value resister. The resister value should be adjusted and changed according to the testing and adjusting result until the offset disappeared.

See the resister R21 and R61 positions as below:



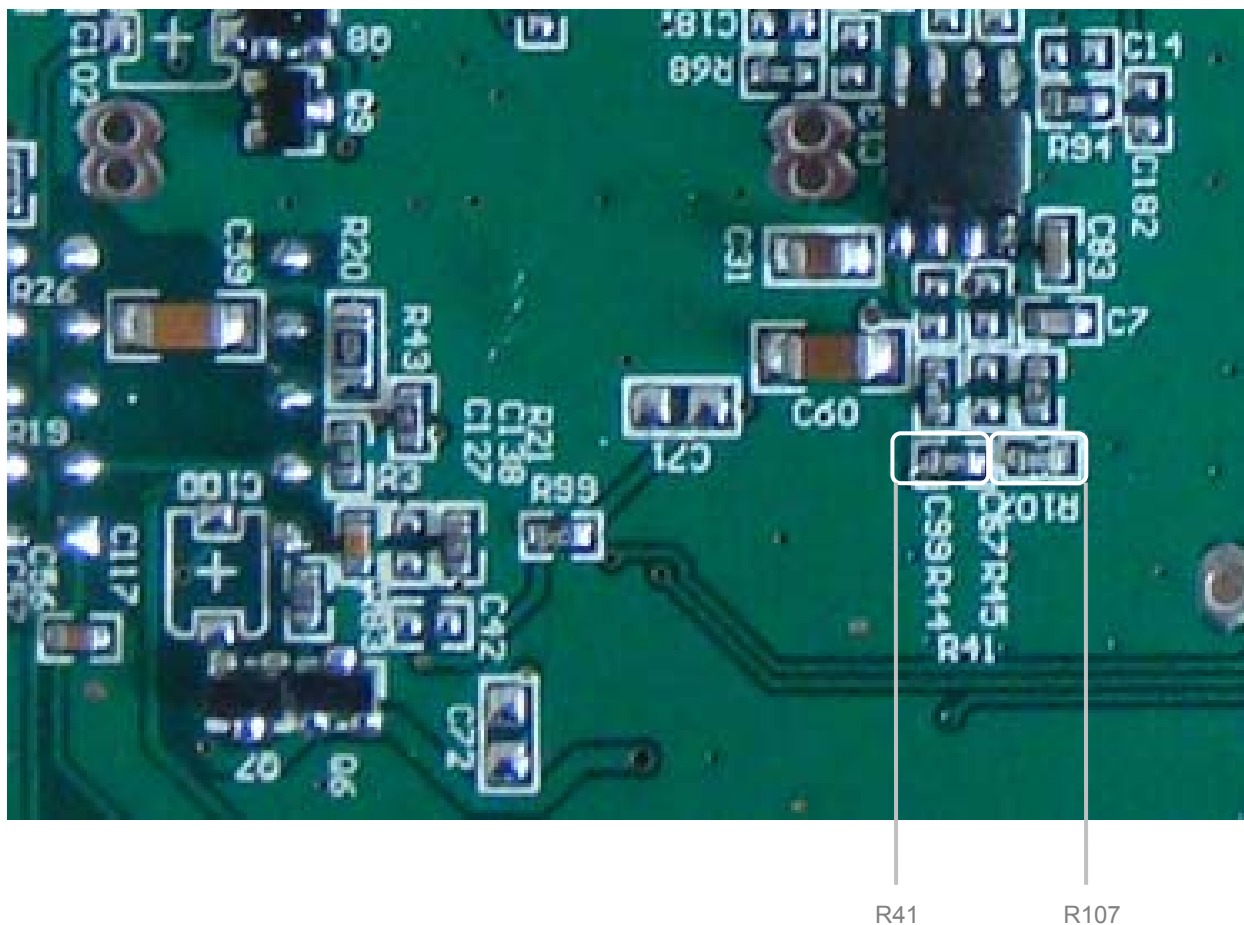
6.3 Example 3: Channel 1 (CH1) Signal Amplitude Calibration

When channel 1 (CH1) measuring amplitude is small, please modify components as follows.

6.3.1

1. Set oscilloscope vertical position to "10mV", horizontal position to "200uS", trigger type to "edge", trigger source to "CH1", edge type to "+", trigger mode to "Auto".
2. Input frequency 1KHz, amplitude 60mV square wave to channel 1 (CH1), if the measured oscilloscope signal amplitude less than 6 div, please increase the value of resistor R107 until the signal amplitude reach 6 div.
3. Input frequency 1KHz, amplitude 60mV square wave to channel 1 (CH1), if the measured oscilloscope signal amplitude more than 6 div, please decrease the value of resistor R107 or R41 until the signal amplitude reach 6 div.

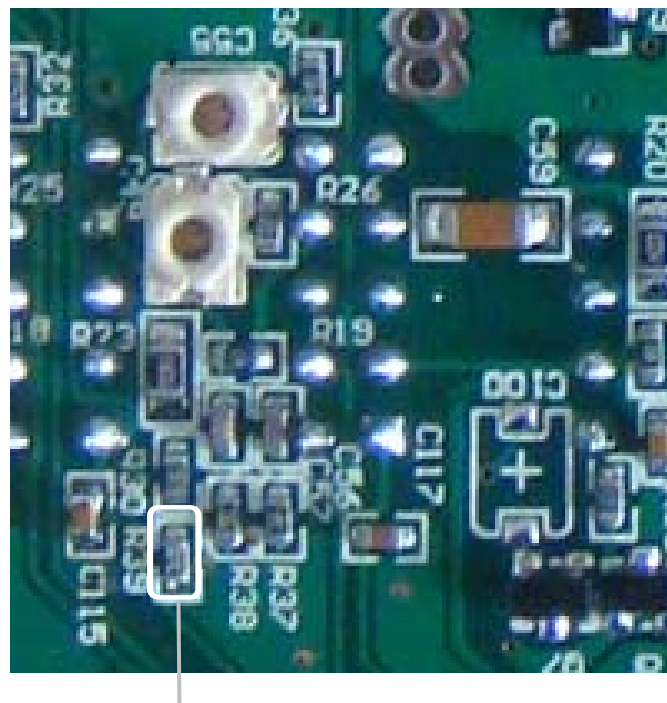
Note: Please select encapsulation 0603, accuracy 1% resistor R107 or R41.



6.3.2

1. Set oscilloscope vertical position to "100mV", horizontal position to "200uS", trigger type to "edge", trigger source to "CH1", edge type to "+", trigger mode to "Auto".
2. Input frequency 1KHz, amplitude 600mV square wave to channel 1 (CH1), if the measured oscilloscope signal amplitude less than 6 div, please increase the value of resistor R39 until the signal amplitude reach 6 div.
3. Input frequency 1KHz, amplitude 600mV square wave to channel 1 (CH1), if the measured oscilloscope signal amplitude more than 6 div, please decrease the value of resistor R39 until the signal amplitude reach 6 div.

Note: Please select encapsulation 0603, accuracy 1% resistor R39.



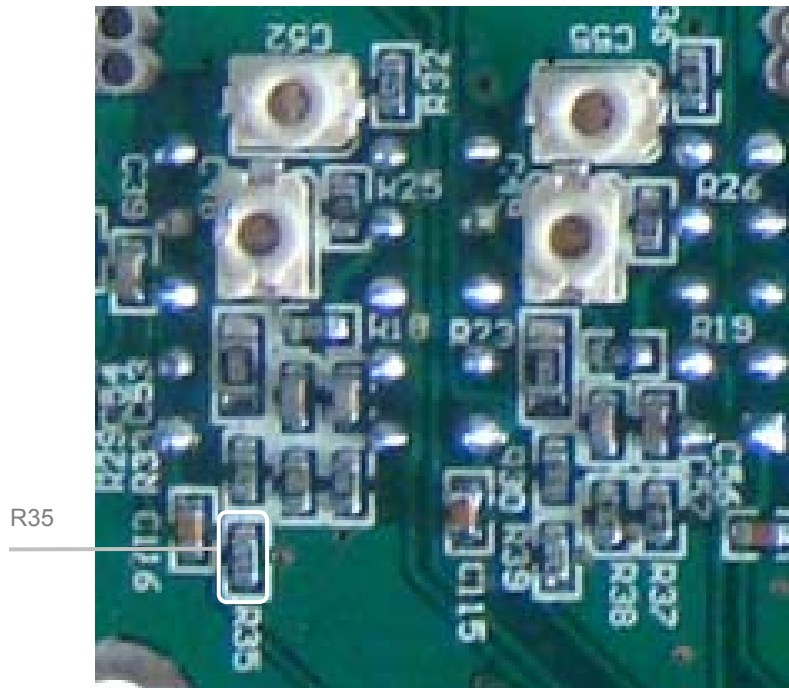
R39

6.3.3

1. Set oscilloscope vertical position to "1V", horizontal position to "200uS", trigger type to "edge", trigger source to "CH1", edge type to "+", trigger mode to "Auto".
2. Input frequency 1KHz, amplitude 6V square wave to channel 1 (CH1), if the measured oscilloscope signal amplitude less than 6 div, please increase the value of resistor R35 until the signal amplitude reach 6 div.

3. Input frequency 1KHz, amplitude 6V square wave to channel 1 (CH1), if the measured oscilloscope signal amplitude more than 6 div, please decrease the value of resistor R35 until the signal amplitude reach 6 div.

Note: Please select encapsulation 0603, accuracy 1% resistor R35.



6.4 Example 4: Channel 2 (CH2) Signal Amplitude Calibration

When channel 2 (CH2) measuring amplitude is small, please modify components as follows.

6.4.1

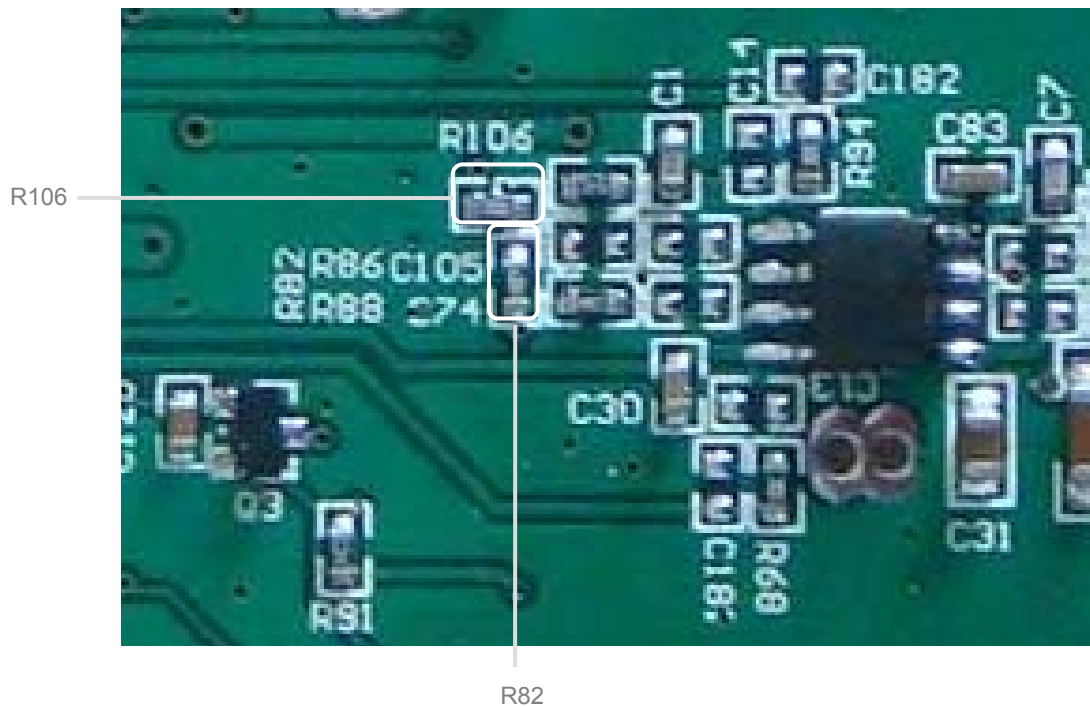
1. Set oscilloscope vertical position to "10mV", horizontal position to "200uS", trigger type to "edge", trigger source to "CH2", edge type to "+", trigger mode to "Auto".

2. Input frequency 1KHz, amplitude 60mV square wave to channel 2 (CH2), if the measured oscilloscope signal amplitude less than 6 div, please increase the value of resistor R106 until the

signal amplitude reach 6 div.

3. Input frequency 1KHz, amplitude 60mV square wave to channel 2 (CH2), if the measured oscilloscope signal amplitude more than 6 div, please decrease the value of resistor R106 or R82 until the signal amplitude reach 6 div.

Note: Please select encapsulation 0603, accuracy 1% resistor R106 or R82.



6.4.2

1. Set oscilloscope vertical position to "100mV", horizontal position to "200uS", trigger type to "edge", trigger source to "CH2", edge type to "+", trigger mode to "Auto".

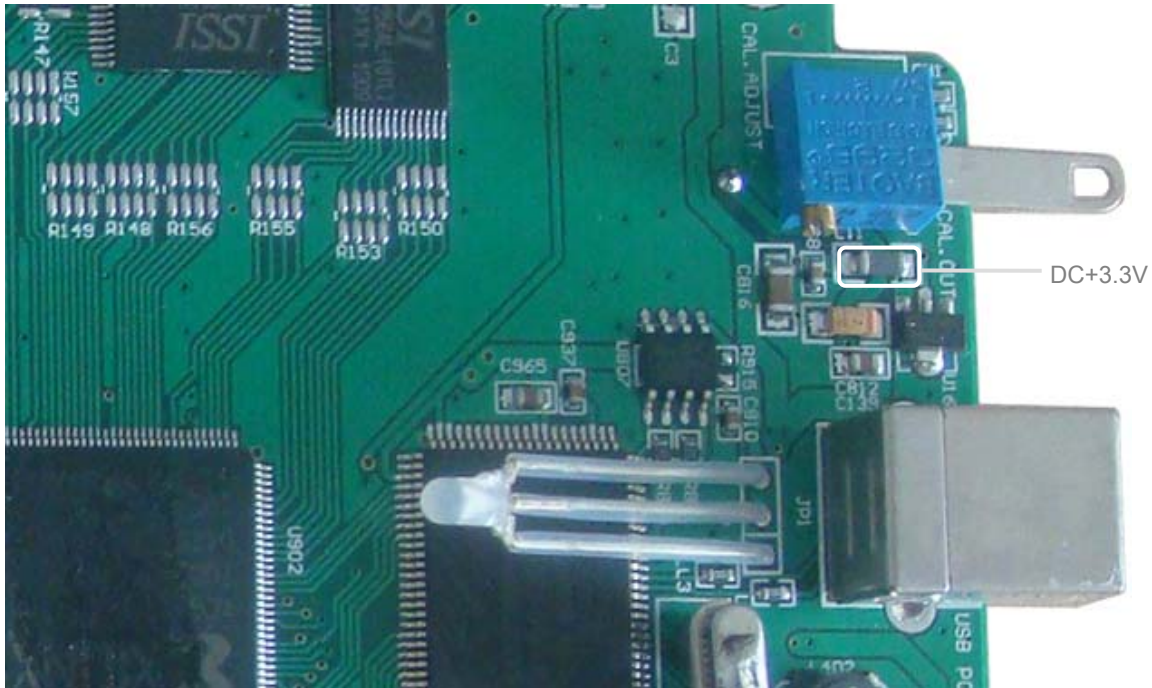
2. Input frequency 1KHz, amplitude 600mV square wave to channel 2 (CH2), if the measured oscilloscope signal amplitude less than 6 div, please increase the value of resistor R81 until the signal amplitude reach 6 div.

3. Input frequency 1KHz, amplitude 600mV square wave to channel 2 (CH2), if the measured oscilloscope signal amplitude more than 6 div, please decrease the value of resistor R81 until the signal amplitude reach 6 div.

6.5 Example 5: Cannot Connect to Computer

When oscilloscope cannot connect to computer, please test power DC+3.3V on PCB board, and check whether the driver has been installed successfully.

6.5.1 Test voltage DC+3.3V.



6.5.2 Test USB cable, make sure its communication is good.

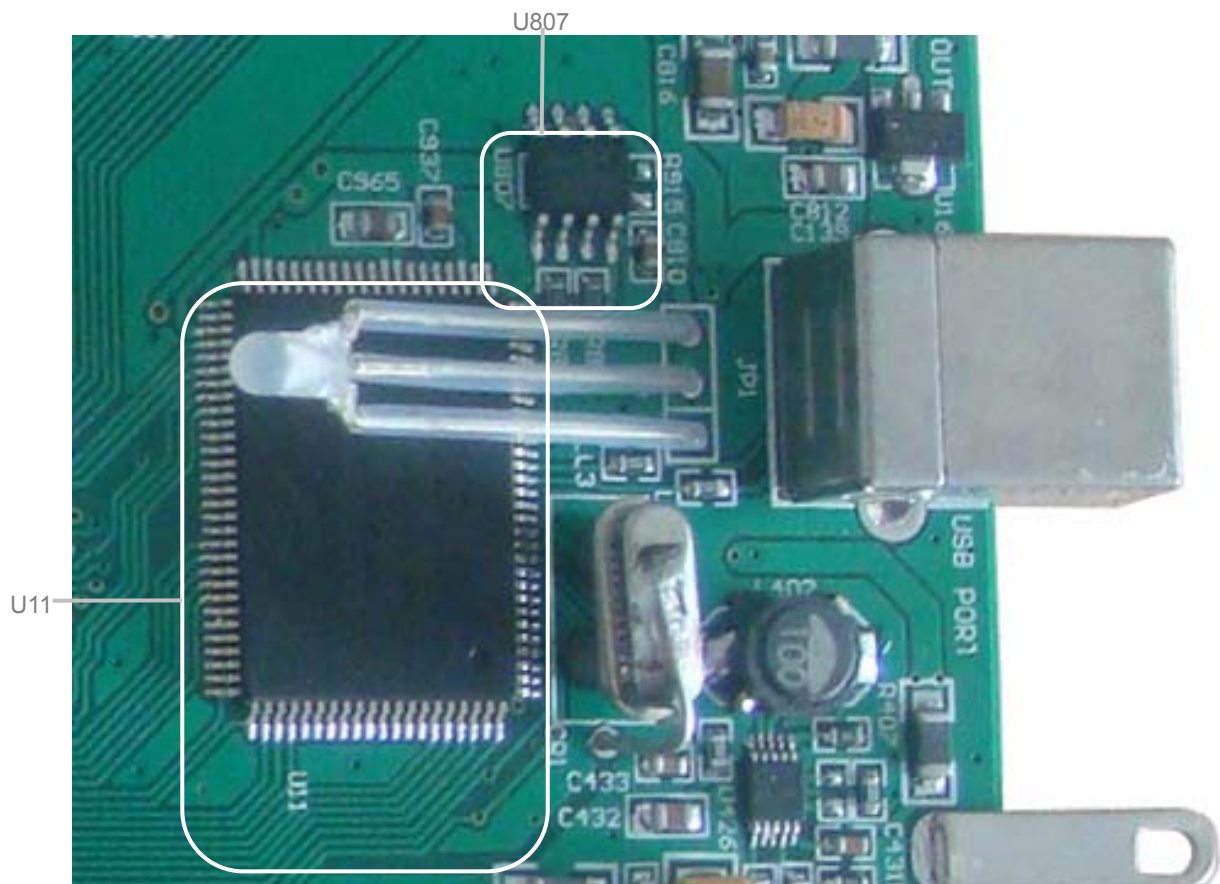
6.5.3 Open the device manager on computer, and check whether oscilloscope driver has been installed successfully.

If there's oscilloscope driver icon in computer device manager, skip to the next step 6.5.4.

If there's a yellow exclamation mark on the oscilloscope driver icon, please uninstall and delete all the driver files from computer, and install it again.

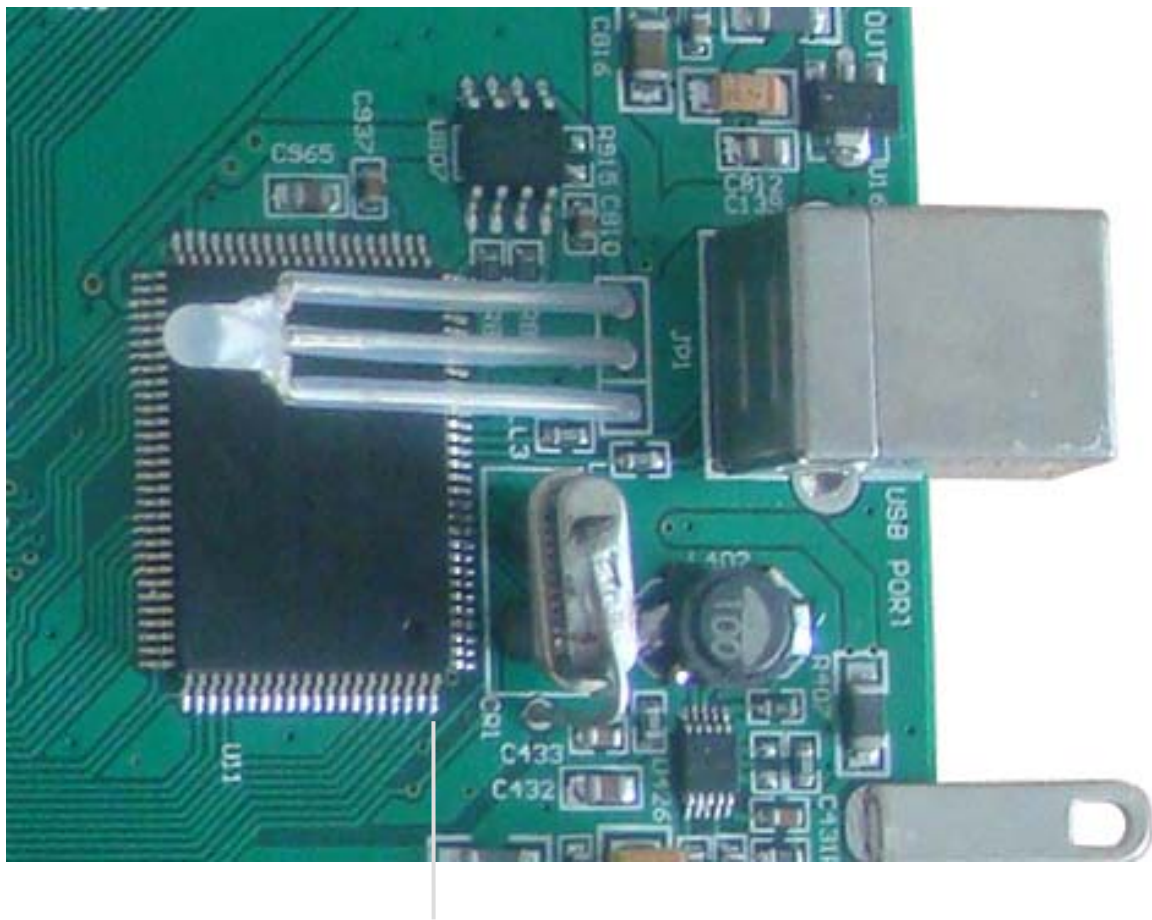


If there's no oscilloscope driver icon in computer device manager, please install again, if still no driver icon, please replace chip CY7C68013A-100AXC (U11) or EEPROM (U807) on PCB board.



6.5.4 Detect the crystal oscillator of USB communication control chip CY7C68013A-100AXC work well or not.

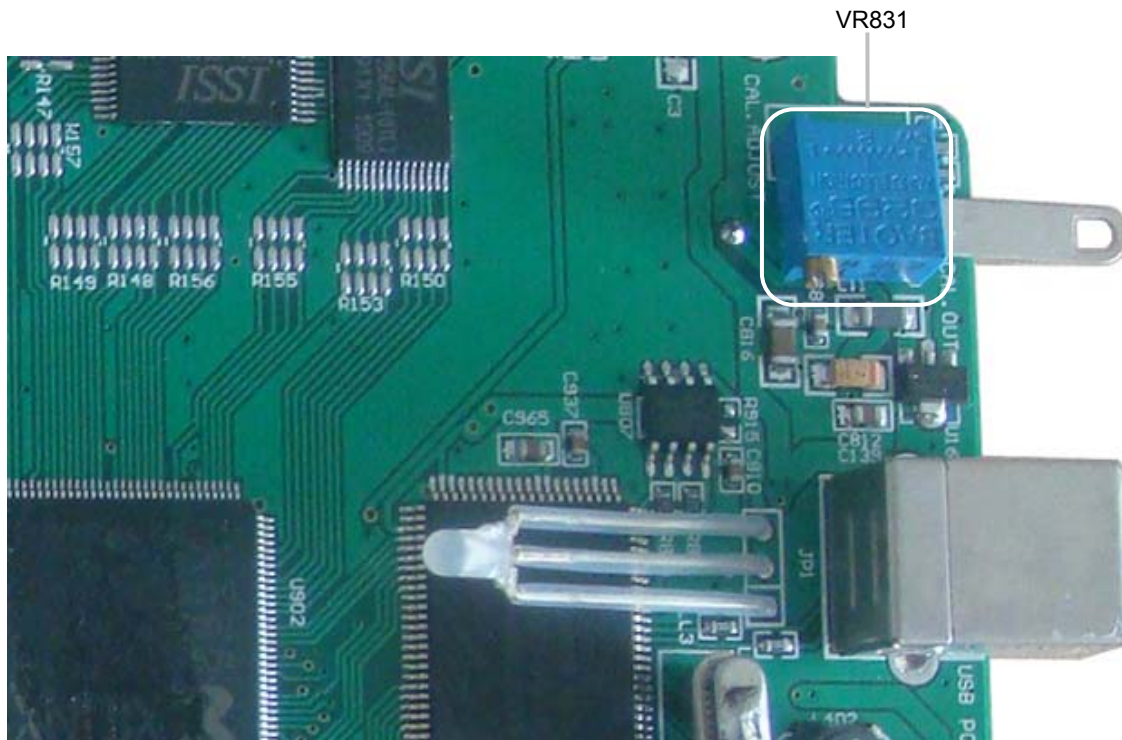
Measure with Tektronix Oscilloscope. Put probe on the two weld leg of crystal oscillator CR1 (Note: these two weld leg are on the back of the PCB board), click "AutoSet" button, then click "Set to 50%" button in the trigger section, if there displays a frequency 24MHz signal on the oscilloscope screen, it's normal; if not, please replace this 24MHz crystal oscillator CY7C68013A-100AXC.



The 100th weld leg, its output frequency of CLKOUT is 24MHz.

6.6 Example 6: Calibration Signal Adjustment (1KHz, 2Vpp)

When the amplitude of calibration signal deviates from 2Vpp, please adjust the adjustable resistor VR831 (screw the yellow point until the calibration signal become 2Vpp) on the PCB board. See the resistor position as follows:



Chapter 7 General Care and Cleaning

7.1 General Care

Do not put or leave the device in a place where the device will be exposed to direct sunlight for long periods of time.

Note: To avoid damage to the oscilloscope or probes, do not expose them to sprays, liquids, or solvents.

7.2 Cleaning

Examine the oscilloscope and probes as often as operating conditions require. To clean the exterior surface, perform the following steps:

- 1) Use a lint-free cloth to remove floating dust on the outside of the oscilloscope and probes. Take care to avoid scratching the glabrous display filter.
- 2) Use a soft cloth dampened with water to clean the oscilloscope. For more efficient cleaning, you may use an aqueous solution of 75% isopropyl alcohol.

Note: To avoid damage to the surface of the oscilloscope or probes, do not use any corrosive or chemical cleaning agents.

Appendix A Harmful and Poisonous Substances or Elements

Component ²	Harmful and poisonous substances or elements ¹					
	Pb	Hg	Cd	Cr(Vi)	PBB	PBDE
Shell and Chassis	X	0	0	X	0	0
Display Module	X	X	0	0	0	0
Circuit Board	X	0	0	X	0	0
Power Supply	X	0	0	X	0	0
Electric Wire and Cable Assembly	X	0	0	0	0	0
Connector	X	0	0	X	0	0
Fastener and Installed Hardware	X	0	X	X	0	0
Other Accessories (including probes)	X	0	0	X	0	0
Others	0	0	0	0	0	0

'X' means that at least the content of this poisonous and harmful substance in a homogeneous material of this component exceeds the limit specified in the SJ/T 11363-2006 standard.

'0' indicates that the content of this poisonous and harmful substance in all homogeneous materials of this component is refrained under the limit stated in the SJ/T 11363-2006 standard.

This component list contains components approved in the file '*Management Measures*'.