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Classification Level: Confidential

Short-Wave Transceiver Series

G90/G90S

Maintenance Manual

Private and Confidential!

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XIEGU

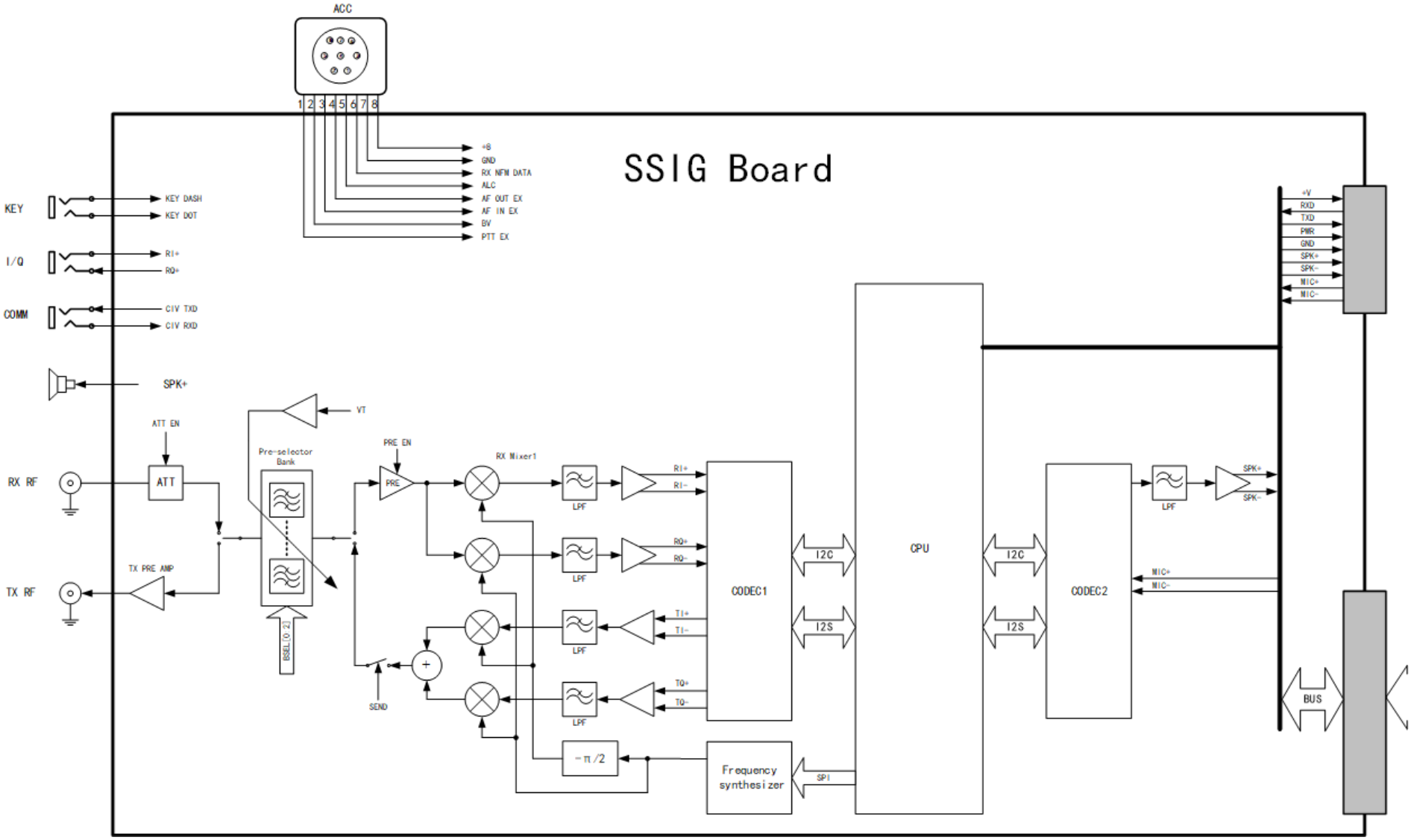
Contents

I. Overview of the Whole Device

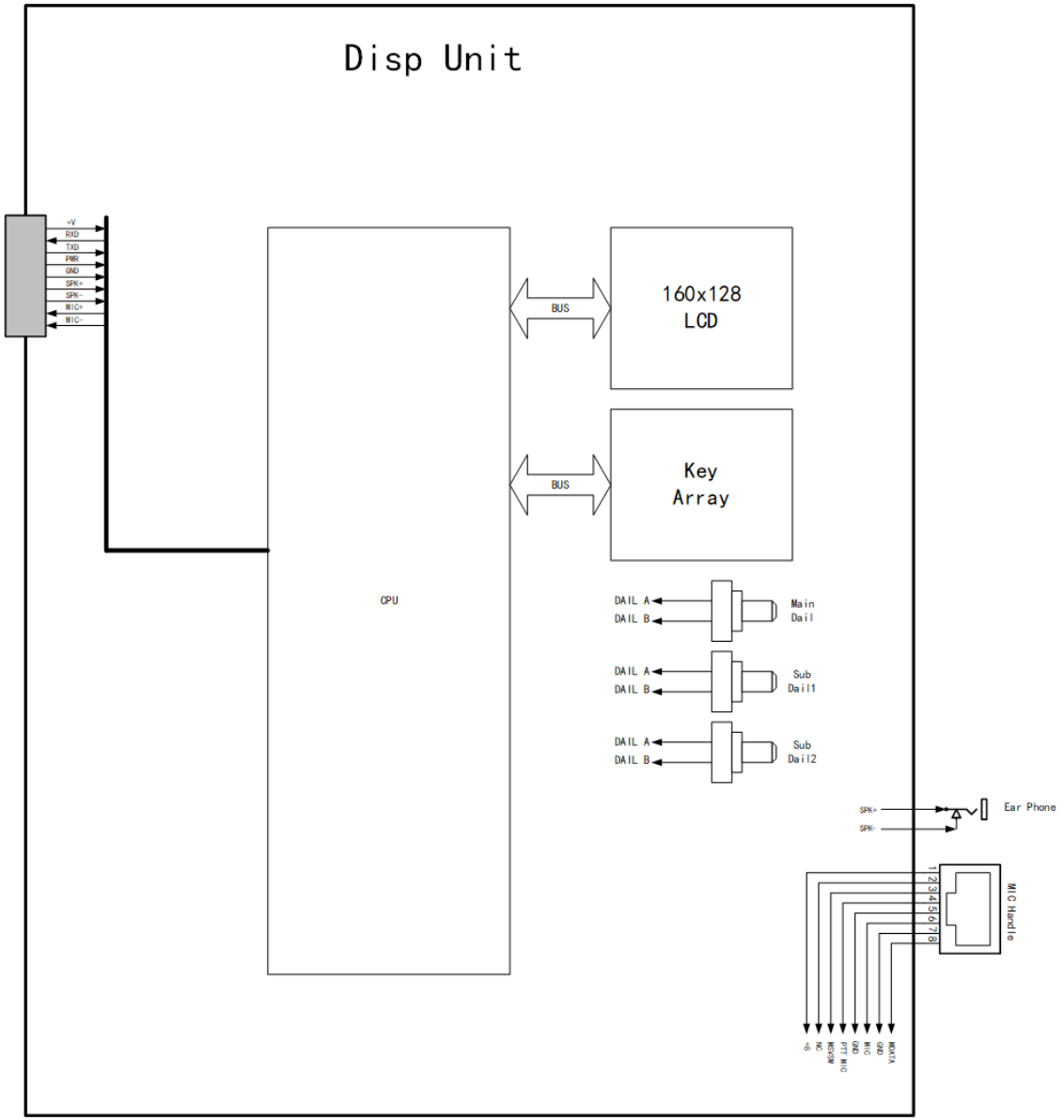
G90/G90S is a short-wave transceiver with ZIF zero-IF structure, built-in automatic antenna tuner, and a transmitting power of 20W.

The block diagram of each part of the whole device is as follows:

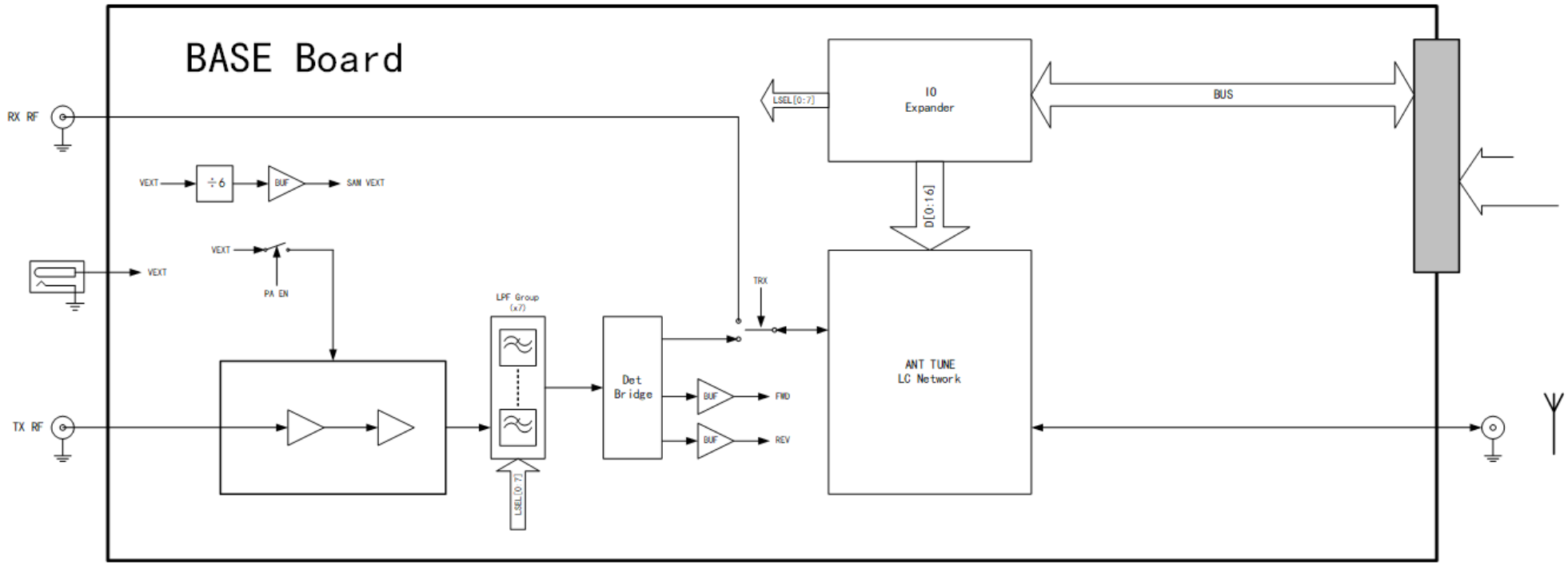
Small signal board unit:



Display unit:



Base board unit:



Basic skills of board-level maintenance:

1. Be familiar with the circuit structure of the whole device and accurately grasp its signal flow.
2. Be familiar with the status of each working voltage and be able to measure it accurately.
3. Be able to operate the radio proficiently and combine various operations to support the maintenance process.
4. Be familiar with the meaning of each physical quantity and use it in combination with the actual situation of the overhauled product.
5. Be able to skillfully use and set commonly used measuring instruments and meters.

- The head of G90 can be separated from its body, with hot swap supported. Therefore, in the maintenance process, this feature can be utilized to quickly locate whether the fault point is in the main unit or the head unit.
- The heads of different versions can be interchanged, and the replacement method can be taken to quickly locate whether it is the fault of the head.

Main troubleshooting methods:

- Check according to the signal flow direction: Check step by step along the signal flow to find abnormalities.
- Judge based on voltage/ current: According to the measured voltage or current, quickly and roughly judge whether the product has a short circuit/ open circuit. Take full advantage of thermal imager to troubleshoot short-circuit points.
- Component-level inspection: Perform fault inspection according to the inherent characteristics of components.

To sum up, the maintenance personnel need to have a comprehensive understanding of the overall structure, signal flow, unit function, and operation method of the product, and at the same time arm themselves with certain basic knowledge of module and circuit.

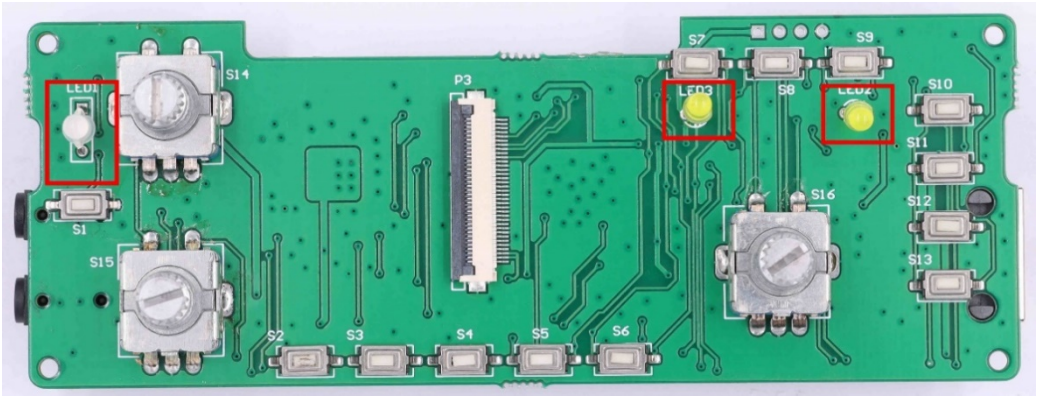
Next, each circuit board will be regarded as a unit to explain the judgment, detection and maintenance of faults by categories in combination with common fault phenomena.

Some fault phenomena have appeared to be the same on the single board and the whole device. Therefore, the maintenance method of the same fault on the single board and the whole device will be explained at the same time.

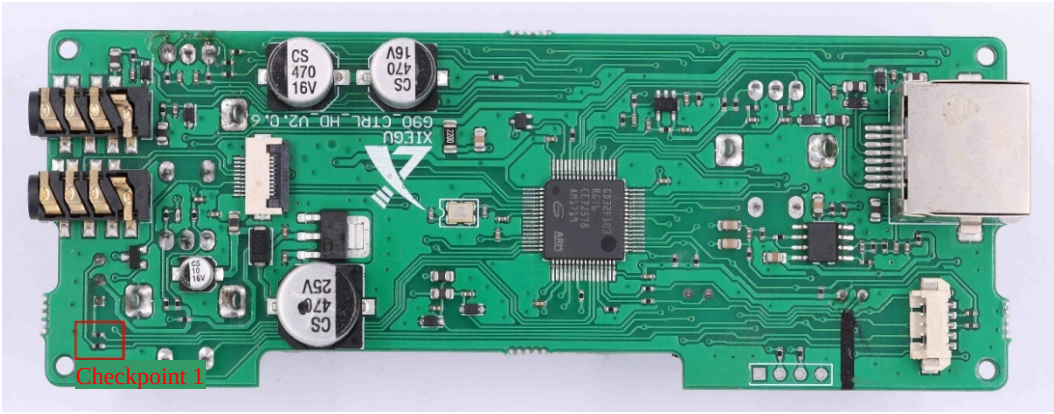
II. Board-Level Maintenance

2.1 Display

- Fault phenomenon: The indicator light does not light up

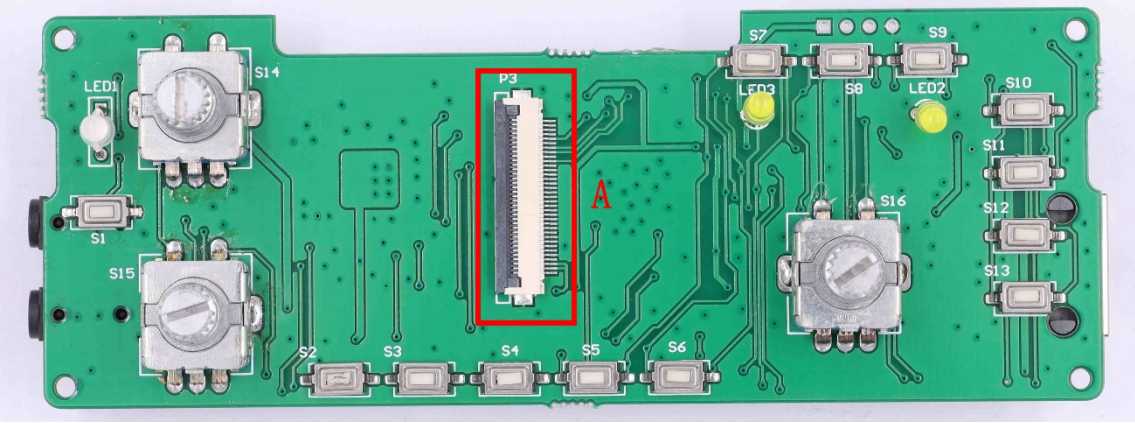


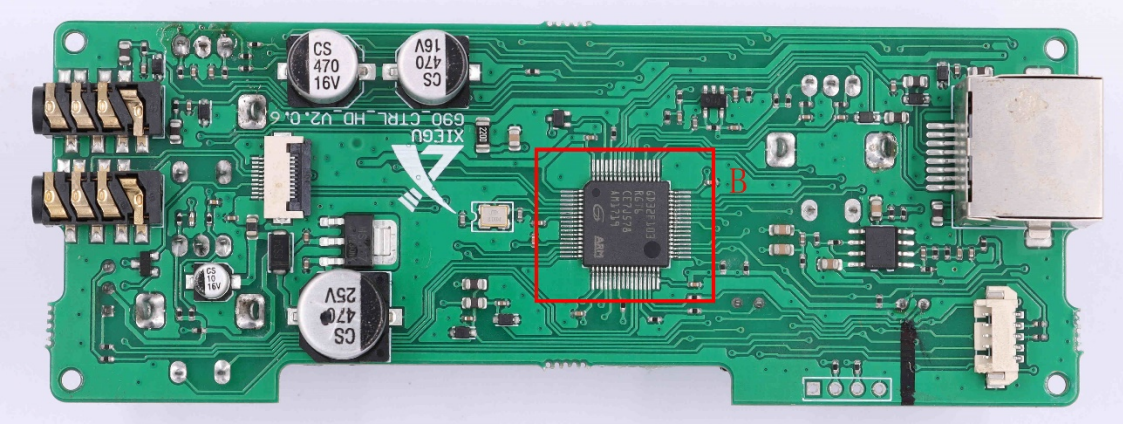
Fault Phenomenon	Maintenance Method	
	Display	Whole device
The LED light does not light up	Check its welding direction	/



Fault Phenomenon	Maintenance Method	
	Display	Location
The bicolor LED light does not light up	Check whether the two resistors on the back are faultily welded	Checkpoint 1

- Fault phenomenon: The display is blank

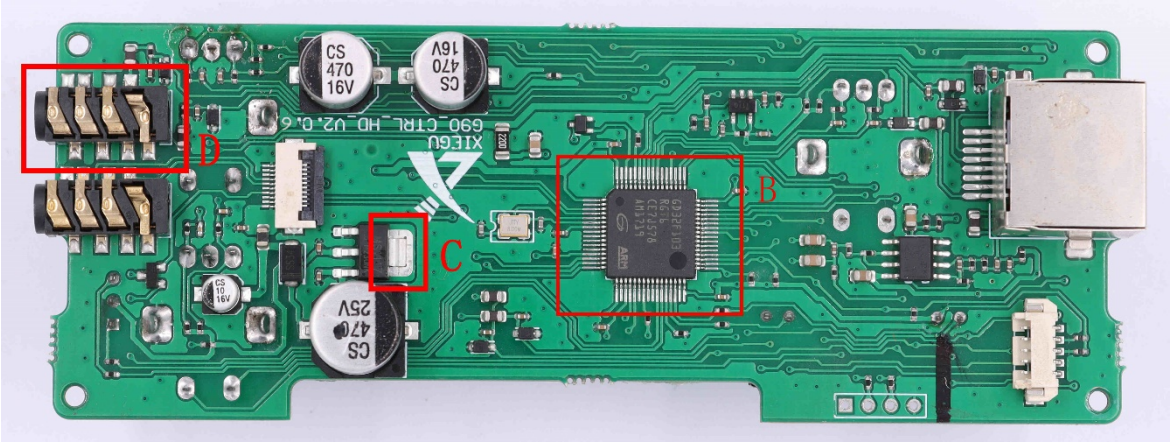




Fault Phenomenon	Maintenance Method	
	Display	Checkpoint
Blank display	Check whether the FPC pedestal is faultily welded	A
	Check whether there is any false welding at the MCU pins	B

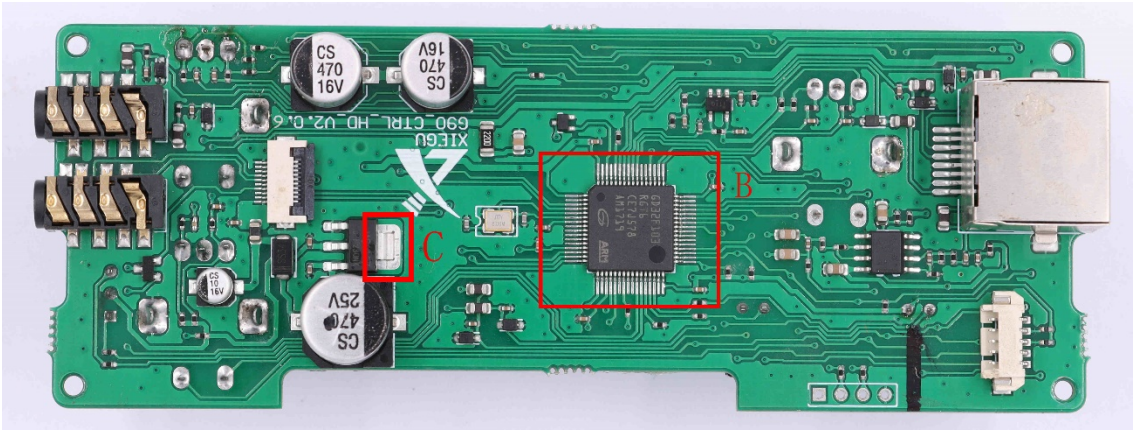
- This fault is mostly caused by the false welding of components.
- During repair welding of the FPC pedestal, it is necessary to shorten the welding time as much as possible to avoid thermal deformation of the pedestal.
-

Fault phenomenon: It cannot be written into Bootloader or the application



Fault Phenomenon	Maintenance Method	
	Display	Checkpoint
Failure to burn program	Check whether the voltage is 3.3V	C
	Check whether the MCU is faultily welded	B
	Check whether the pedestal is faultily welded	D

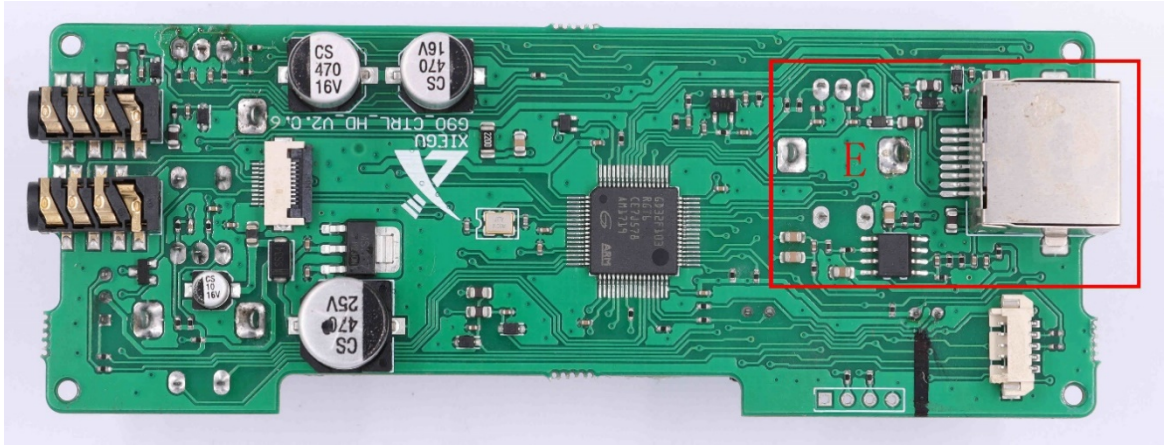
- Fault phenomenon: high current



Fault Phenomenon	Maintenance Method	
	Display	Checkpoint
High current and hot MCU	Check whether the voltage is 3.3V	C

- If the voltage at point C > 3.3V, the LDO regulator has already been damaged. It is necessary to replace the LM1117-3.3 regulator first, confirm that the output voltage is 3.3V, and then replace the damaged MCU. Otherwise, it will cause a secondary fault to burn the MCU.
- During the maintenance, it has ever been found that the short circuit of the display FPC pedestal welding lead to the 3.3V grounding short circuit, where attention to check is thus required.

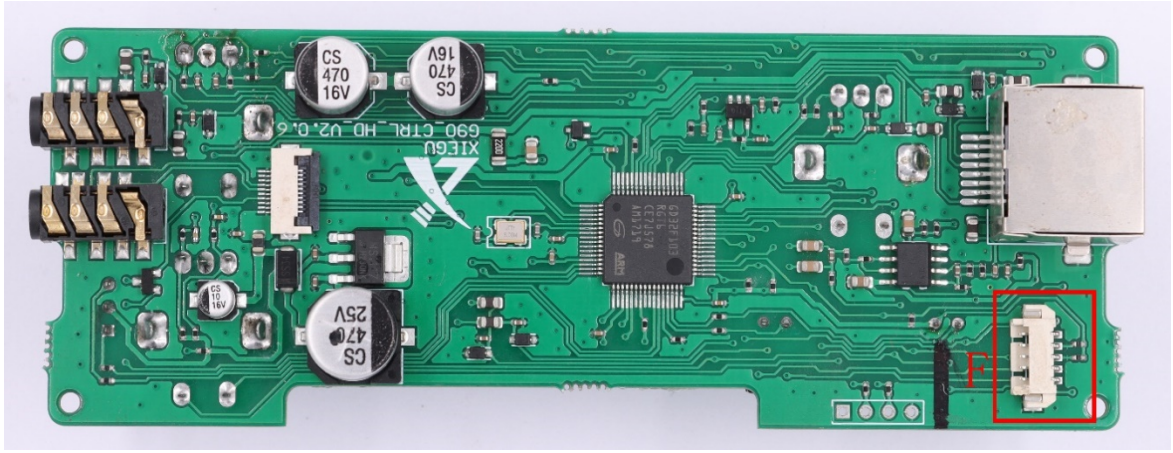
- Fault phenomenon: no power for the hand microphone input, no action after hand microphone buttons are pressed, and no backlight at the hand microphone



Fault Phenomenon	Maintenance Method	
	Display	Checking Area
The hand microphone does not respond	Check whether the components in this area are faultily welded	E

- Check whether the elastic contacts in the RJ45 pedestal are in good condition, and whether there is deformation or dislocation.

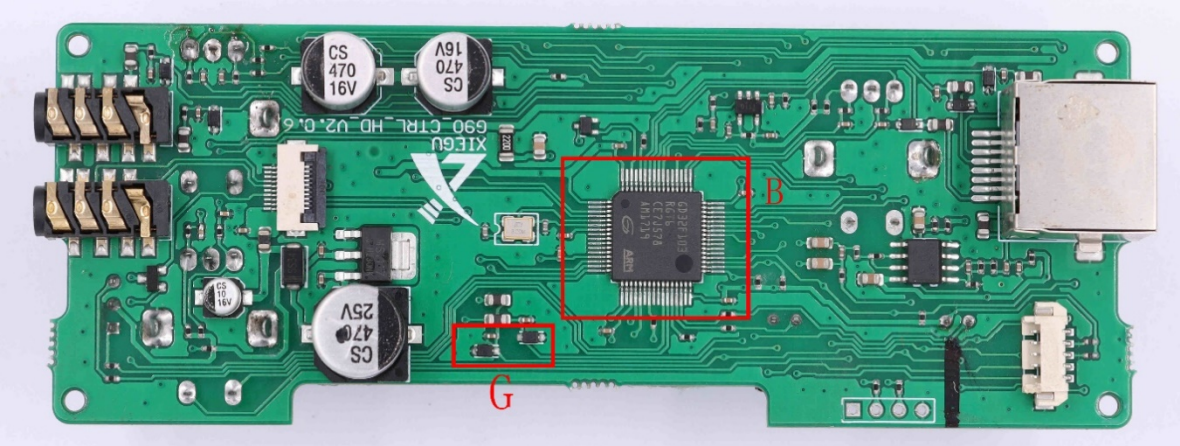
- Fault phenomenon: The top button does not respond when it is pressed



Fault Phenomenon	Maintenance Method	
	Display	Checkpoint
The top button does not respond when it is pressed	Check whether the socket pins are faultily welded	F

- Check whether the components on the top button board are faultily welded.
- Check whether the connecting lines are in good contact and the line sequence correct.

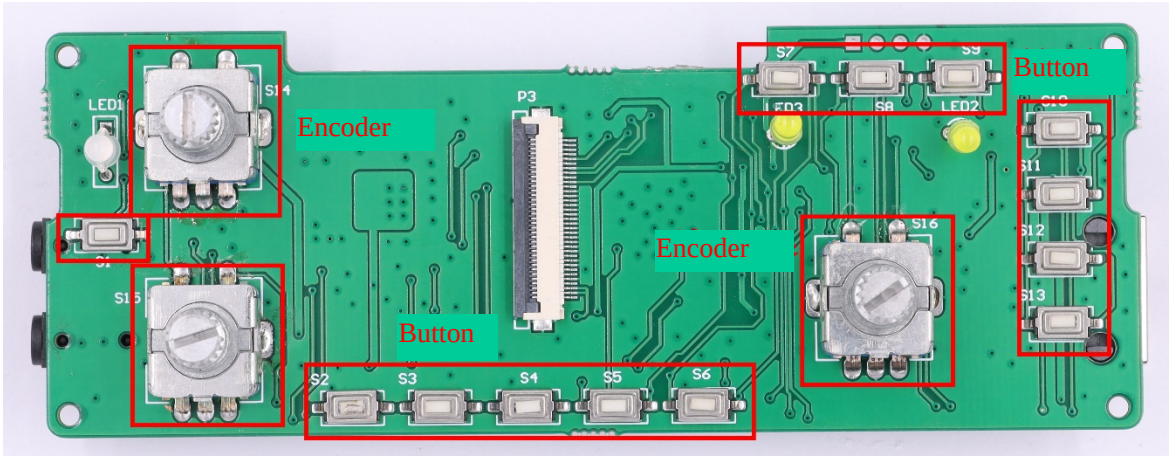
- Fault phenomenon: The device head cannot communicate with the host, and the screen displays COMM LOST



Fault Phenomenon	Maintenance Method	
	Display	Checkpoint
No communication between the device head and the host	Check whether the MCU pins are faultily welded and whether the chip is damaged	B
	Check whether the ESD diode is broken down	G

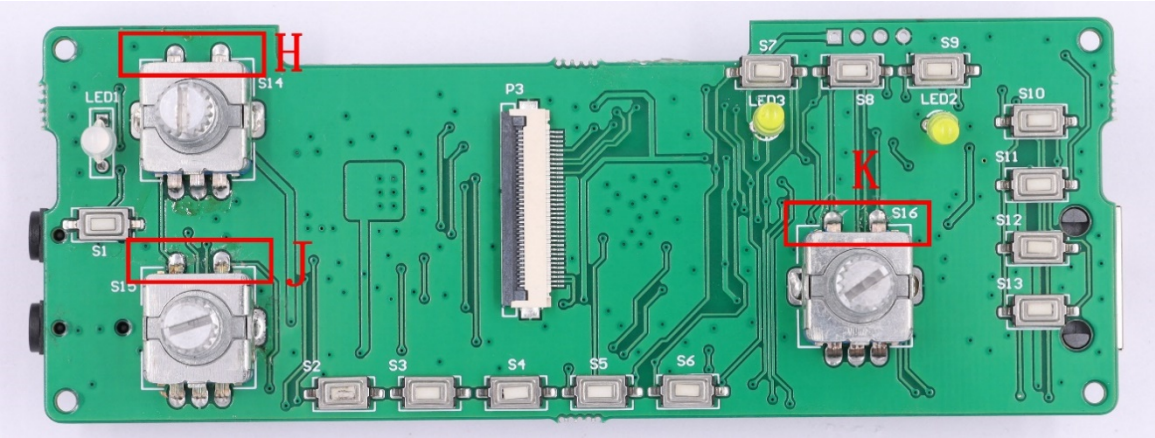
- In addition, note to check whether the DB9 connection board is faultily welded.

- Fault phenomenon: The starting-up speed is too fast, and it enters the main interface as soon as it flashes/ cannot enter the flashing state



Fault Phenomenon	Maintenance Method	
	Display	Checkpoint
Fast starting-up speed/ failure to enter the flashing state	Check whether the two pins of all buttons are short-circuited by themselves	Button
	Check whether there is grounding short circuit of all encoder pins	Encoder

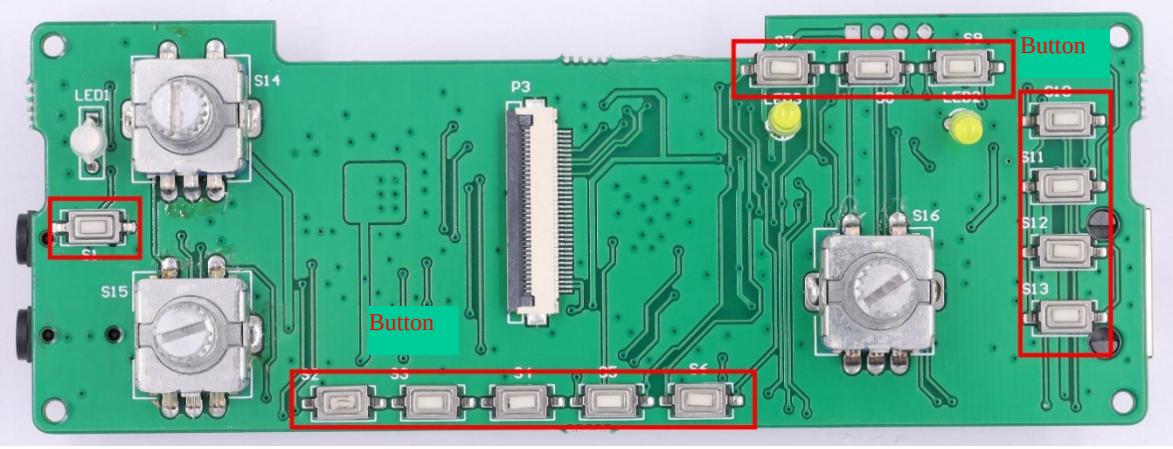
- Fault phenomenon: The encoder does not respond when it is pressed



Fault Phenomenon	Maintenance Method	
	Display	Checkpoint
The encoder does not respond when it is pressed	Check whether the encoder switch pins are faultily welded or there is any grounding short circuit	H.J.K

- Also pay attention to whether the other three pins of the encoder are short-circuited by lap welding of adjacent pins.
- Some of these fault points are very subtle, such as PCB disconnection, or rubbing of the solder mask on the PCB by the metal fixing pins of the encoder, resulting in a grounding short circuit of the pin wiring.

- Fault phenomenon: A certain button does not respond when it is pressed



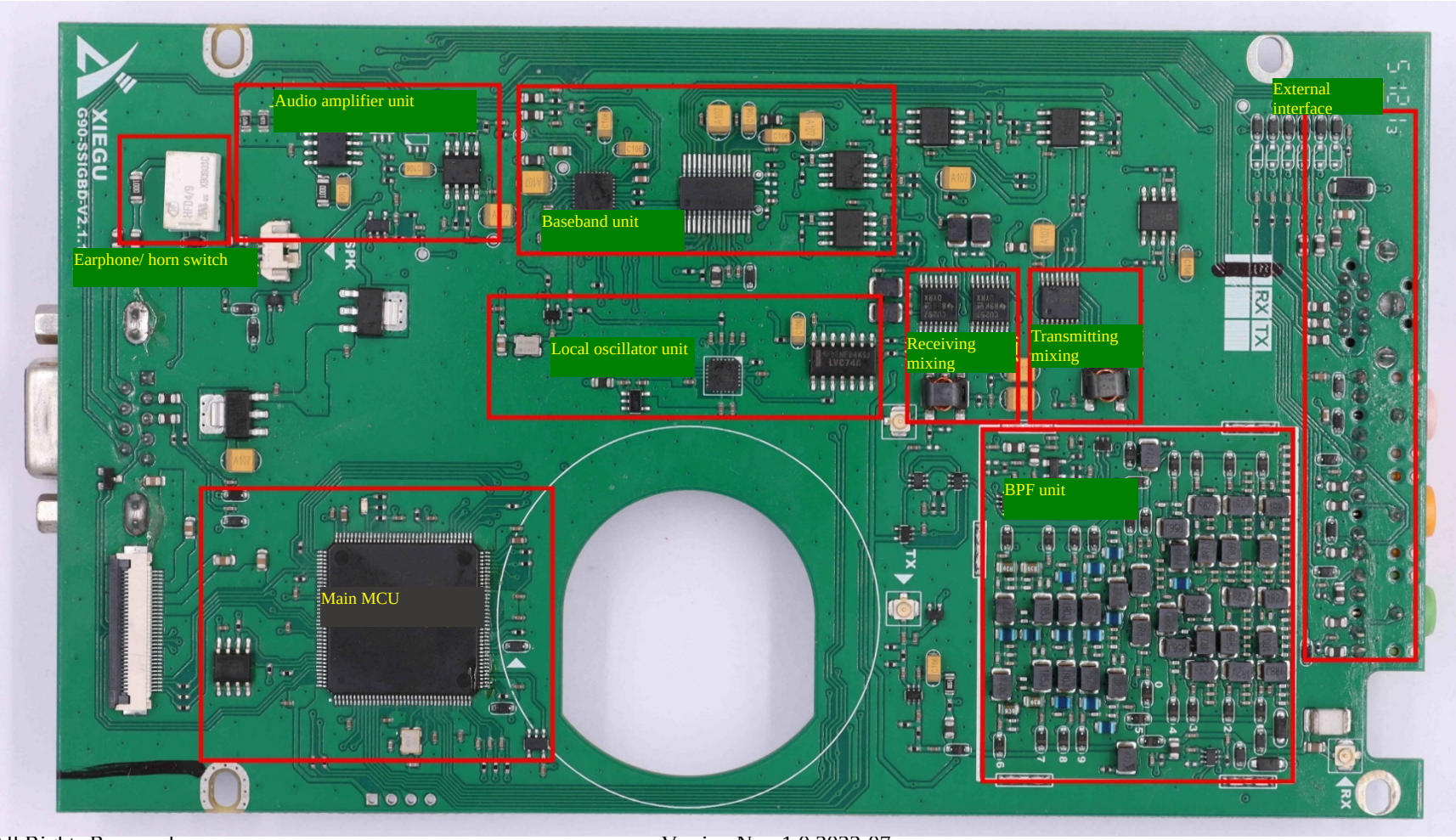
Fault Phenomenon	Maintenance Method	
	Display	Checkpoint
A certain button does not respond when it is pressed	Check whether the two pins are connected after the button is pressed	Fault button

- Check with power off.
- Some of these fault points are very subtle, such as PCB disconnection, or rubbing of the solder mask on the PCB by the metal of the button casing, resulting in a grounding short circuit.

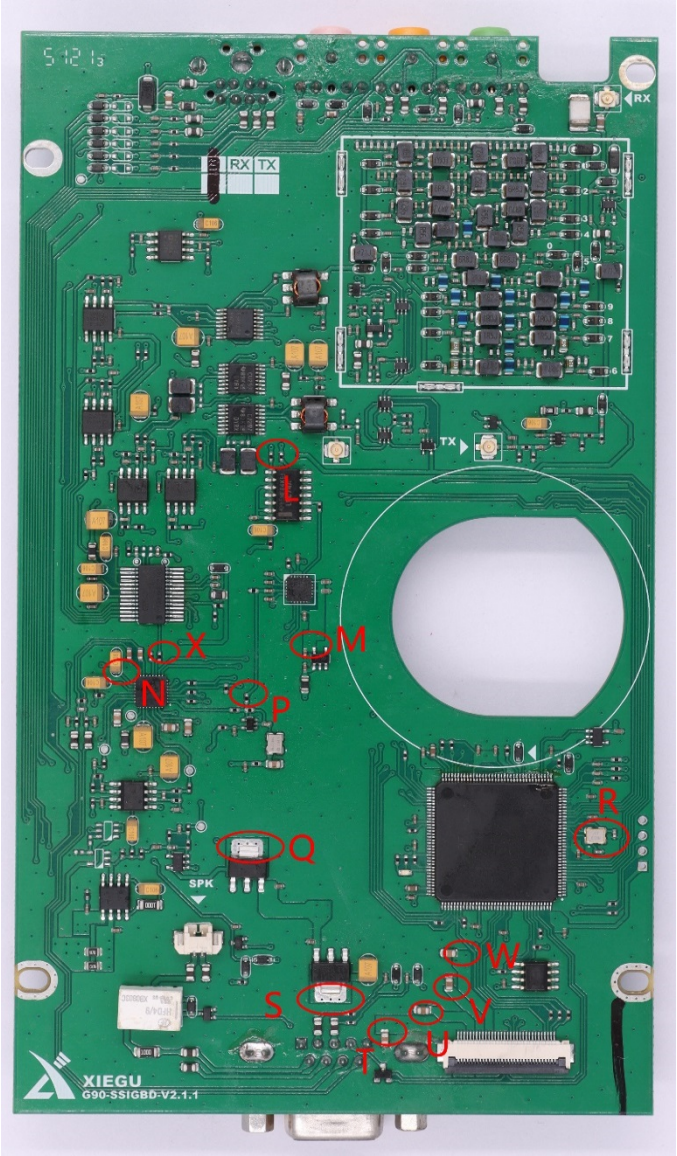
2.2 Small Signal Board

At present, there are mainly two versions of small signal boards with large production volume, i.e. G90-SSIGBD-V2.0.7-GAI03 and the current version G90-SSIGBD-V2.1.1. The old version is the same as the current version in terms of principle, with only part of circuit units having been changed. This manual is to explain in accordance with version V2.1.1.

The distribution of each unit of the small signal board is shown in the following diagram:



The general parameters of each basic measurement point on the small signal board are as follows:



Maintenance methods:

- We are to explain with the default test frequency point of 14.270MHz as an example. The maintenance test frequency point of each subsequent step is considered to be 14.270MHz by default.

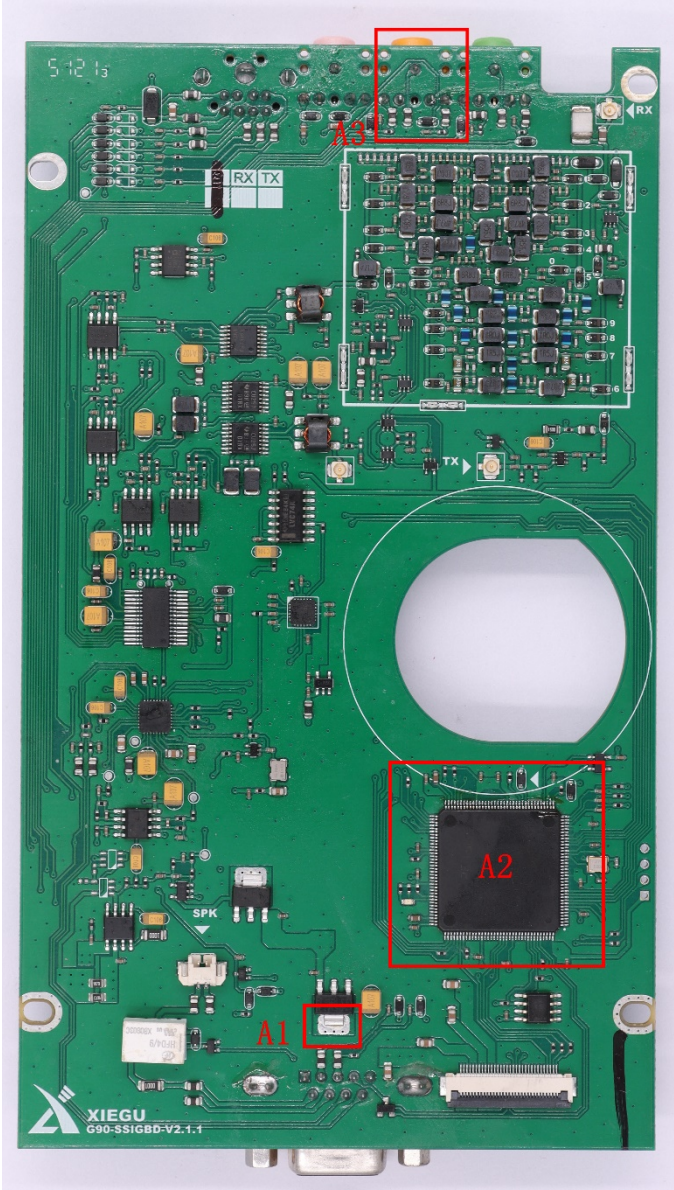
Measurement Point	Voltage V	Name
N	0.94～0.98	Audio unit reference voltage Vref
M	3.3	Local oscillator unit power supply
Q	3.3	Baseband unit power supply
S	3.3	MCU power supply
T	+9	Public 9V power supply
U	+9T	Transmitting 9V power supply
V	+9R	Receiving 9V power supply
W	+5	Public 9V power supply

- +9T is only available in the transmitting state, and it is theoretically 0V when receiving.
- +9R is 0V in the transmitting state.
- +9, +5, and each 3.3V voltage are available in both the receiving state and the transmitting state.

Measurement Point	Frequency MHz	Amplitude Vpp	Name
X	12.288	3.9	CODEC clock
P	26.000	3.6	TXCO reference clock
L	14.270	5.9	Local oscillator output
R	8.000	1.94	MCU clock frequency

- The local oscillator outputs two signals respectively, and their frequencies are the same, both of which are the currently set receiving and transmitting frequencies.

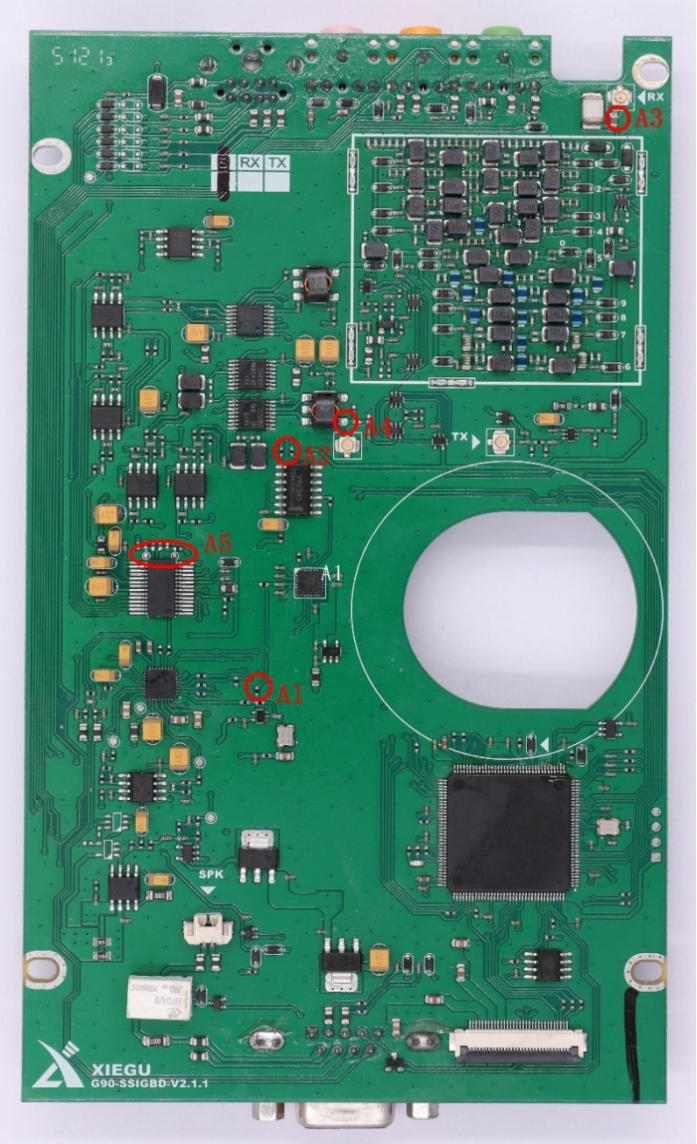
- Fault phenomenon: It cannot be written into Bootloader or the application



Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
Inability to burn or start up the application	1. Check whether the 3.3V power supply is normal	A1
	2. Check whether the main MCU pins are faultily welded	A2
	3. Check whether the COMM socket is connected with the main MCU pin	A3

- Pay attention to the damage of COMM socket, such as short circuit, open circuit, etc. Measure whether the relevant leads from A3 to A2 are connected through the on-off position of the multimeter.

- Fault phenomenon: receive failure (or no signal tone)



Maintenance methods:

1. First, check whether the local oscillator on the small signal board works normally.

Instrument settings:

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Signal Source	Frequency: 14.271MHz	Amplitude: -20dBm	/
Oscilloscope	Time base: 50ns	Y-axis: 100mV	X10 gear

■ Note: The oscilloscope shall be set at X10 gear, and the test probe shall also be set at X10 gear. Coupling mode: AC coupling.

2. First measure the working condition of local oscillator, and the test data shall be roughly as follows:

Checkpoint	Frequency MHz	Amplitude Vpp	Name
A1	26.000	3.6	TXCO reference clock
A2	14.27	5.9	Local oscillator output

■ The upper end of the two resistors at A2 checkpoint is for the quadrature output of the local oscillator signal, with the same frequency and amplitude.

3. Connect the output signal of the signal source to the small signal board, and measure the signal strength of checkpoints A3 and A4 respectively in turn. Normally, it shall be as follows:

Checkpoint	Frequency MHz	Amplitude mVpp
A3	14.271	80
A4	14.271	380

■ During the above test, PRE shall be turned on.

4. Measure the signal strength of checkpoint A5 as follows: (signal source output: -40dBm)

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Oscilloscope	Time base: 1ms	Y-axis: 100mV	X10 gear

Checkpoint	Frequency	Amplitude mVpp	Name
A5	1kHz	350	Baseband signal

The frequency measured at the two test points at checkpoint A5 shall be 1kHz, and amplitude is basically the same (the allowable difference is within 10mV).

5. After measuring according to the sequence of each checkpoint in the above steps, if the value measured at a checkpoint is not consistent with the standard value, it indicates that there may be a fault.

6. If no signal is measured when measuring checkpoint A3, directly measure whether there is an input signal on the terminal of the antenna pedestal:

- If signals can be measured at the antenna pedestal, while cannot be measured at the checkpoint A3, it indicates that there may be an open circuit fault in the IPX signal line for receiving, or there may be a short circuit in the outlet socket for received signal of the base board.
- If signals cannot be measured at the antenna pedestal and the checkpoint A3, it indicates that there may be a short circuit fault in the IPX signal line for receiving, or there may be a short circuit in the outlet socket for received signal of the base board.

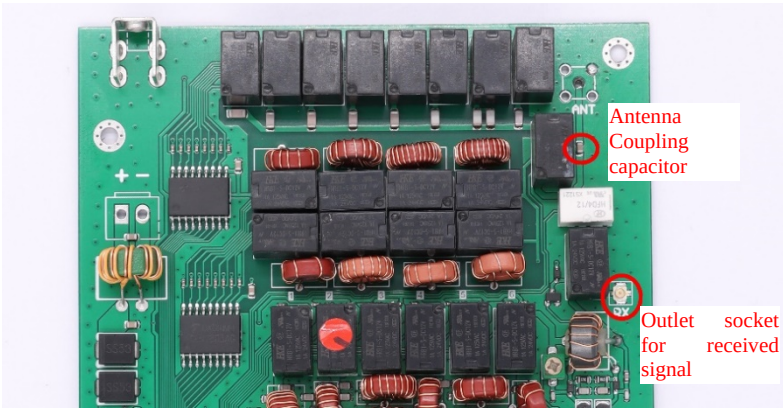
Treatment: Check whether the socket for receiving signal is short-circuited, replace with a new IPX signal line, and test again.

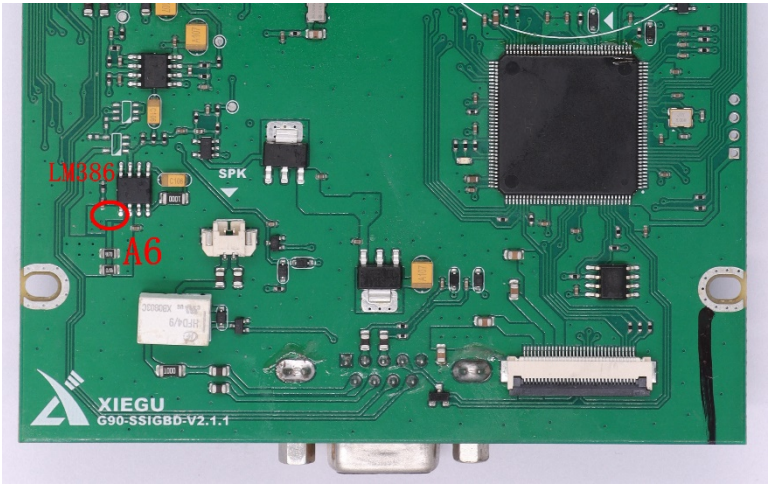
- If signals can be measured at the antenna pedestal while cannot be measured at the lower end of the antenna-coupling capacitor, it is likely that the antenna pedestal lead is poorly welded to the base board, or the pad of the base board falls off, or the antenna-coupling capacitor is faultily welded

7. If there is a signal at the checkpoint A3 while no signal at the checkpoint A4, it is related to the failure of the BPF unit. The troubleshooting of such faults is explained in the following chapter of BPF fault.

8. When setting the volume at about 80%, a sine wave signal shall be measured at the checkpoint A6 at the output terminal (PIN-5) of LM386:

Checkpoint	Receiving Frequency MHz	Amplitude Vpp	Frequency	Signal
A6	14.270	1.95	1kHz	Relatively standard sine wave

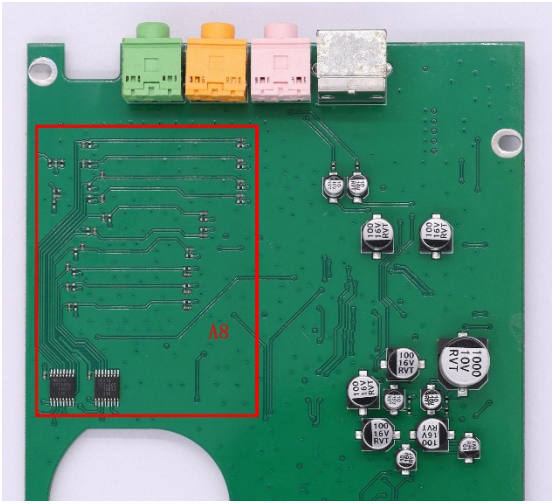


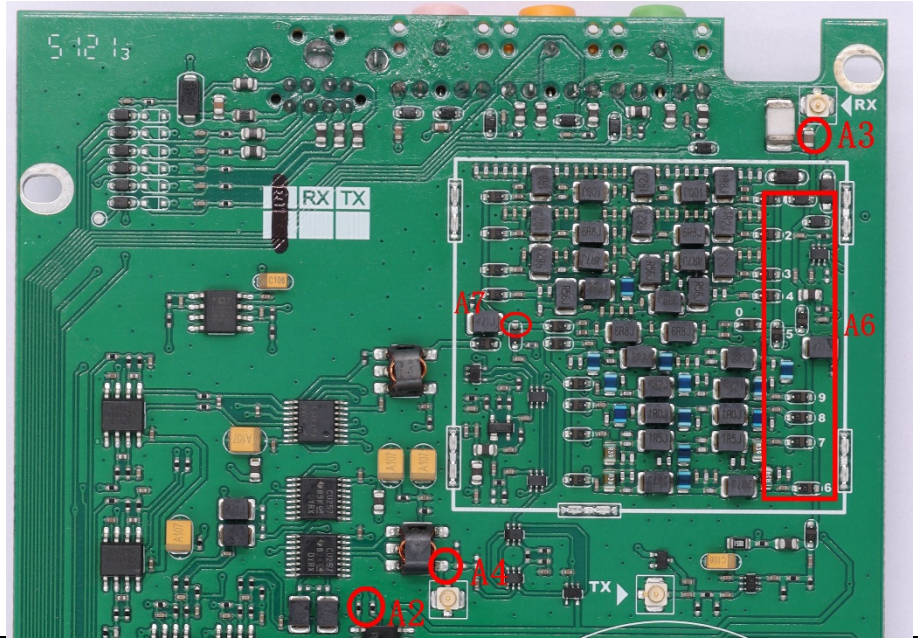


Special reasons for some "Receive Failures":

- The IPX line for receiving is damaged.
- The RX signal base next to checkpoint A3 is welded reversely in direction.
- The gas discharge tube on the left side of checkpoint A3 is broken down.

- Fault phenomenon: BPF unit test fault (there is no amplitude-frequency curve in network analysis test)





Maintenance methods:

1. First check the band switching control area on the back of the small signal board:

Fault Phenomenon	Maintenance Method	
	Small signal board	Checking Area
No BPF	Whether there is false welding in the switching control area	A8

2. Set the instrument:

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Signal Source	Frequency: 14.271MHz	Amplitude: -20dBm	/
Oscilloscope	Time base: 50ns	Y-axis: 100mV	X10 gear

Then check whether the signal amplitude of checkpoints A3, A6, A7, A4 is normal in turn.

- Area A6 collects the input of each segment of BPF;
- Area A7 collects the output of each segment of BPF;

When PRE is turned on, the measured data at each checkpoint shall be as follows:

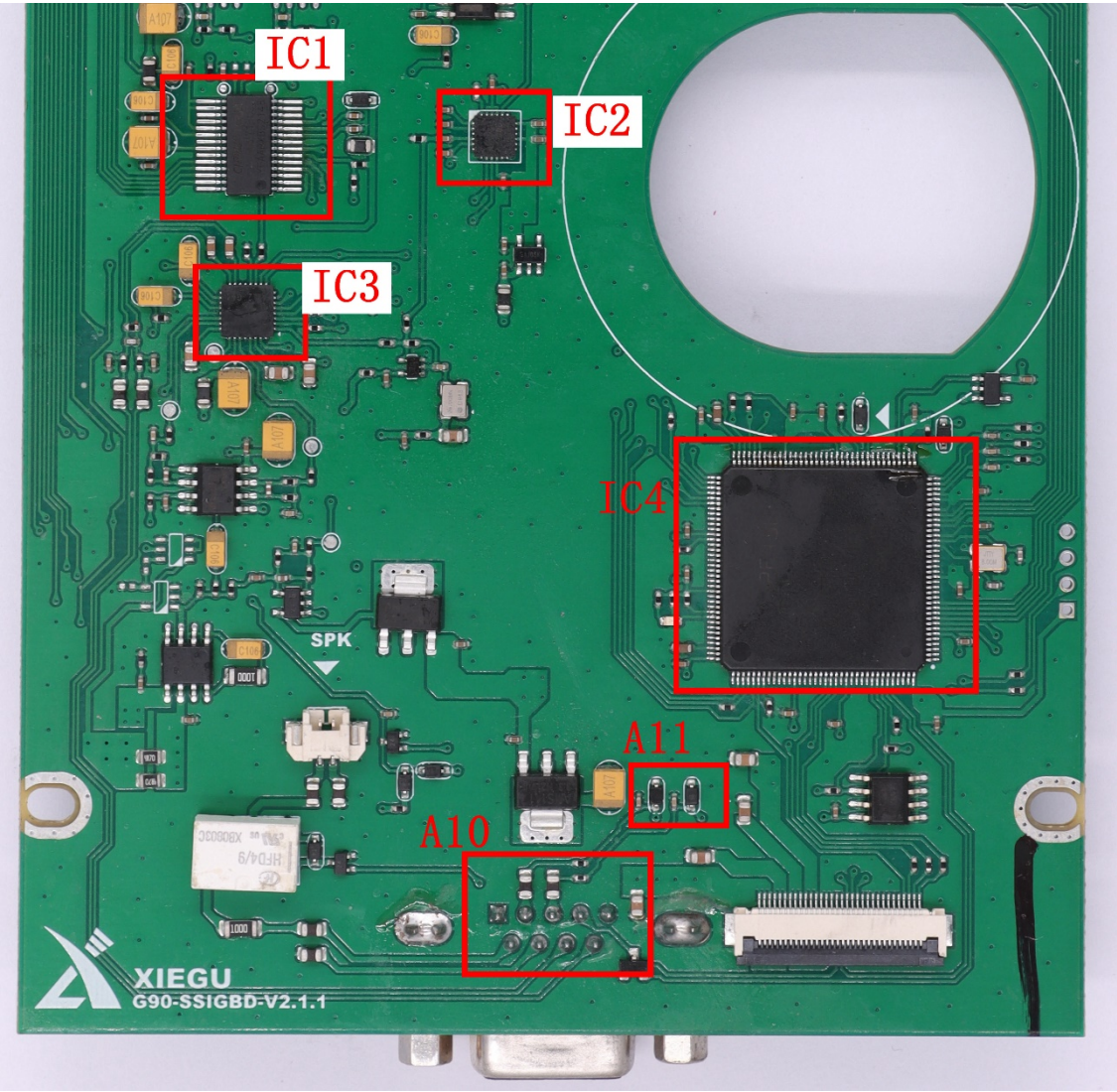
Checkpoint	Frequency MHz	Amplitude mVpp	Name
A3	14.271	80	
A6	14.271	80	Input of each segment of BPF
A7	14.271	50	Output of each segment of BPF
A4	14.271	380	Receive mixer input

3. After selecting a certain segment of BPF, the positive pressure differential between the input and output switching diodes of this segment of BPF shall be about 0.7 ~ 0.9V. If the selected BPF switching diode has a reverse pressure differential, it indicates that the gating of this segment is faulty.

4. The fault point of BPF unit can be found out according to the above steps.

- The damaged inductance and capacitance in BPF will also cause faults, so pay attention to that.

- Fault phenomenon: startup failure, unable to connect with the machine head (mainboard MCU indicator light flashes slowly and is always on)



Maintenance methods:

The main manifestations of such faults are as follows:

- After starting up, the blue indicator light beside the main MCU flashes slowly or is always on.
- After starting up, the level on the machine head display is -256dBm, and there is no waterfall plot.

Maintenance methods:

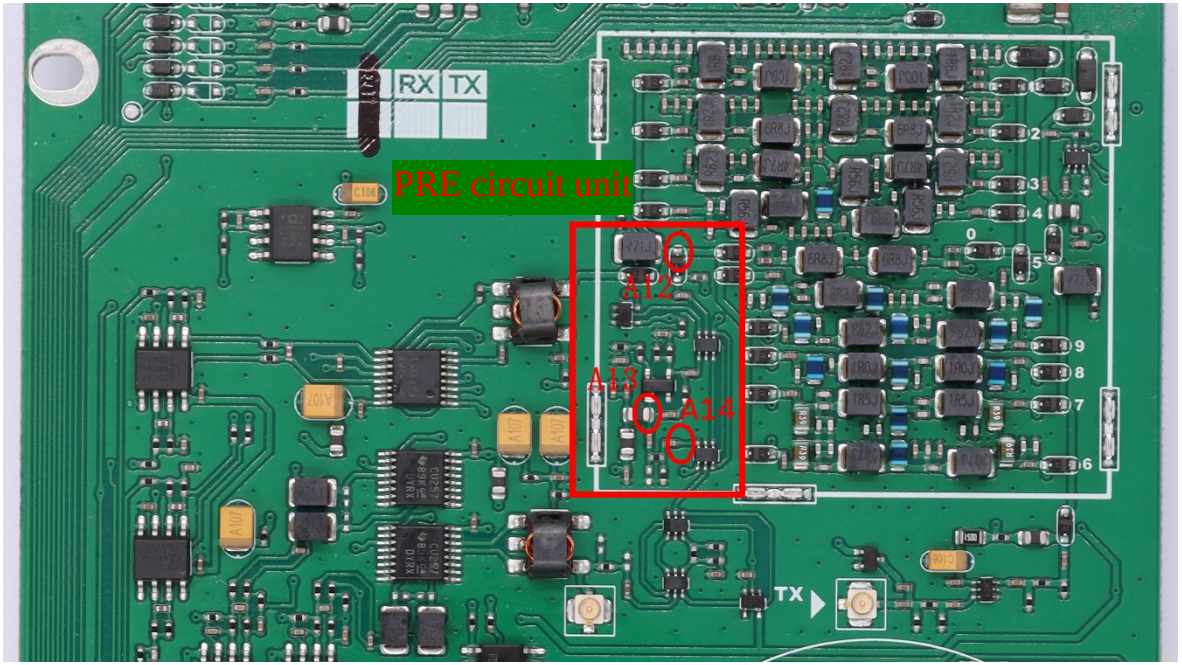
Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
Startup failure	Check whether there is false welding of components	IC1
	Check whether there is false welding of components	IC2
	Check whether there is false welding of components	IC3
	Check whether there is false welding of components	IC4
	Check whether there is false welding of components	A10
	Check whether the two diodes are broken down	A11

- According to previous maintenance experience, there is a higher chance of false welding of IC3, which shall be checked emphatically.
- Principle: IC1, IC2, IC3 and IC4 are for IIC bus communication. When there is a problem in the bus communication of a chip, the communication mechanism will give up the correspondence with it after a certain time and change to communicate with other remaining chips. **The phenomenon** when such actions occur: **After starting up, the indicator light is always on, and then starts flashing after about 10 seconds. At the same time, the sound of relay operation is heard, and background noise of the horn starts.**

Special attention:

- There is a higher defect rate of domestic GD32F450 series chips (about 4%), causing a lot of failures such as startup failure or connection failure with the machine head.

- Fault phenomenon: no PRE function (after turning on PRE, the amplitude-frequency curve of network analysis does not rise)



The fault phenomena are as follows:
During the network analysis test, turn on/ off the PRE function, and the amplitude of the amplitude-frequency curve will not change (or become low)
Maintenance methods:
The instrument settings are as follows:

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Signal Source	Frequency: 14.271MHz	Amplitude: -20dBm	/
Oscilloscope	Time base: 50ns	Y-axis: 100mV	X10 gear

After PRE is turned on, the measured data at each checkpoint shall be as follows:

Checkpoint	Frequency MHz	Amplitude mVpp	Name
A12	14.271	50	Amplifier input
A14	14.271	680	Amplifier output

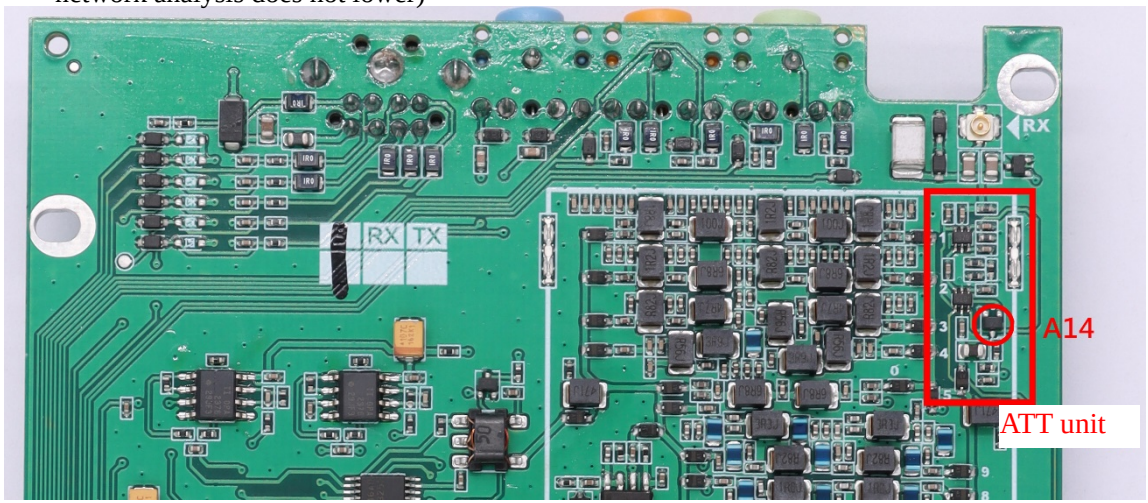
If there is a great difference between the measured signal amplitude and the standard data in the table, the following measurements are required:

Checkpoint	Voltage
Voltage difference between base (B) and emitter (E) of amplifier triode	About 0.55 ~ 0.7V
A13	4.5～5V

- At the same time, check whether the PRE control signal "#PRE_EN" and AS179 controlled voltage turn normally.

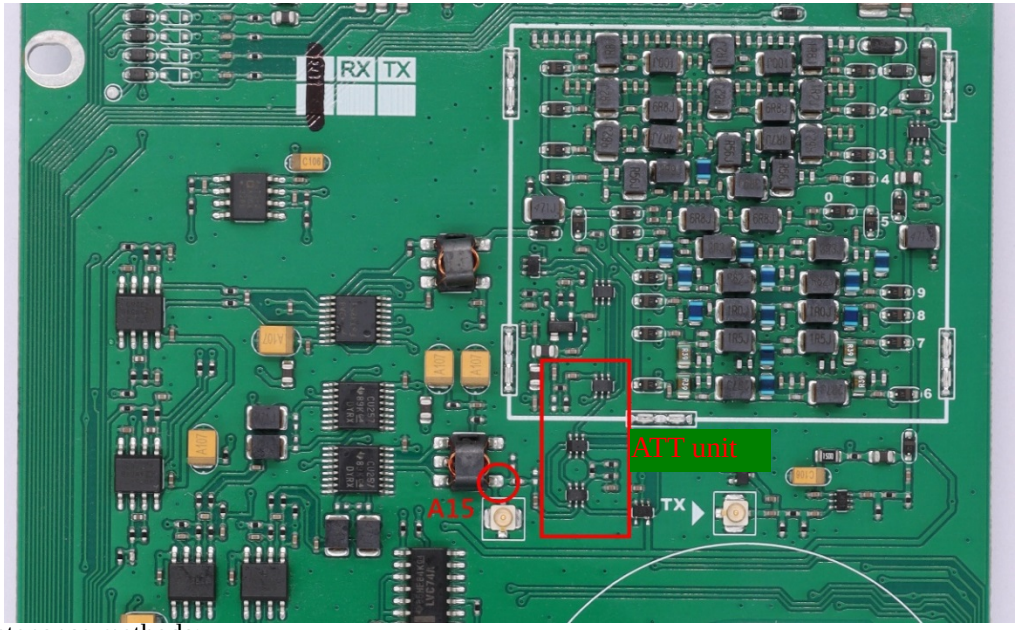
Maintenance methods:

- Fault phenomenon: no ATT function (after turning on ATT, the amplitude-frequency curve of network analysis does not lower)



Mainboard of the old version:
For the mainboard of the old version G90-SSIGBD-V2.0.7-GAI03, the fault is mainly caused by false welding and bumping.

Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
ATT function failure	Check whether the components are damaged or broken	A14
	Check the ATT unit for false welding during other periods	ATT unit



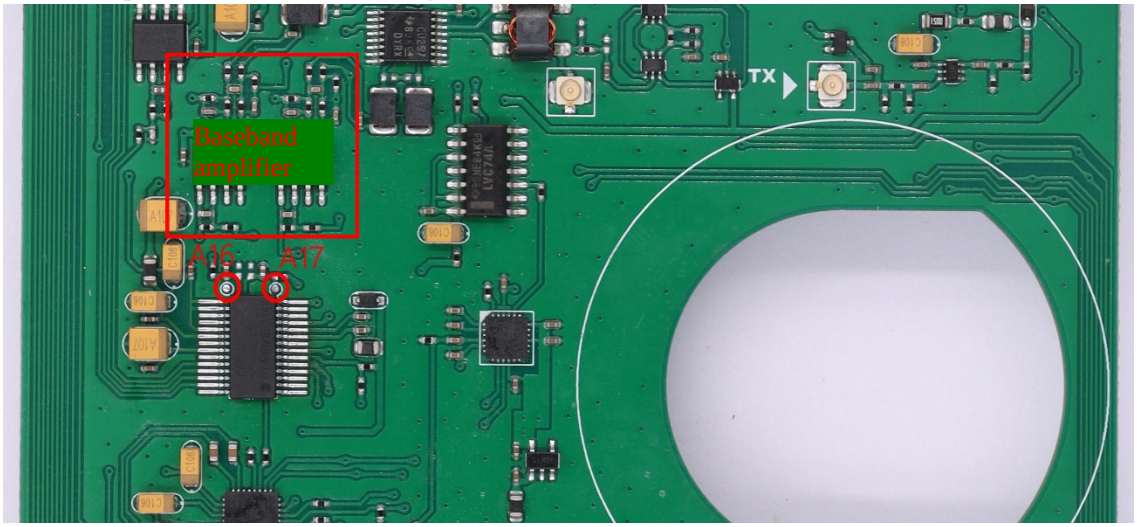
Mainboard of the new version:
For the mainboard of the new version G90-SSIGBD-V2.1.1, the fault is mainly caused by the damage of radio frequency switch AS179 or the abnormal control level of AS179. Check whether the control level can normally turn between high and low when it is in on/ off state of ATT. In the left figure, the circuit composition of the three AS179 in the ATT unit is shown in the SCH document. The signals are measured in sequence, and the signal strength measured at A15 shall be as follows:

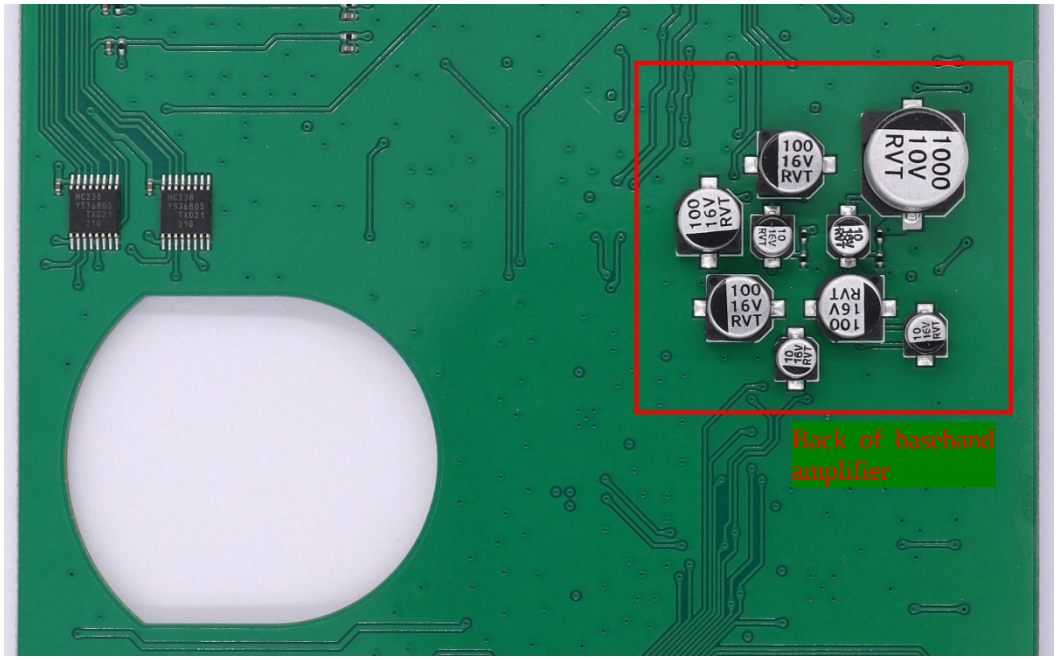
Checkpoint	Frequency MHz	Amplitude mVpp	State
A15	14.271	380	Close ATT. Open PRE
	14.271	45	Open ATT

■ Note: AS179 component is vulnerable to the electrostatic damage and in a state of incomplete damage, showing the phenomenon of increase of interstage insertion loss. Carefully measure the input and output signal amplitude of each AS179 and pay attention to the abnormal changes.

Maintenance methods:

- Fault phenomenon: The receiving IQ balance cannot be adjusted





Maintenance methods:

The instrument settings are as follows:

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Signal Source	Frequency: 14.271MHz	Amplitude: -40dBm	/
Oscilloscope	Time base: 1ms	Y-axis: 100mV	X10 gear

After PRE is turned on, the measured data at each checkpoint shall be as follows:

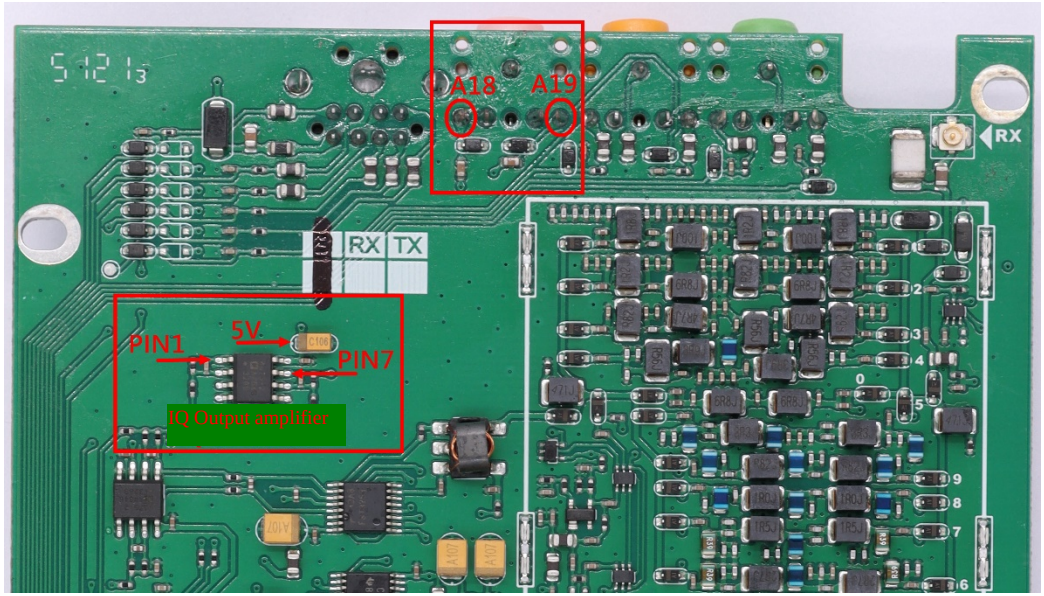
Checkpoint	Frequency	Amplitude mVpp	Name
A16	1kHz	350	Baseband signal of circuit I
A17	1kHz	350	Baseband signal of circuit Q

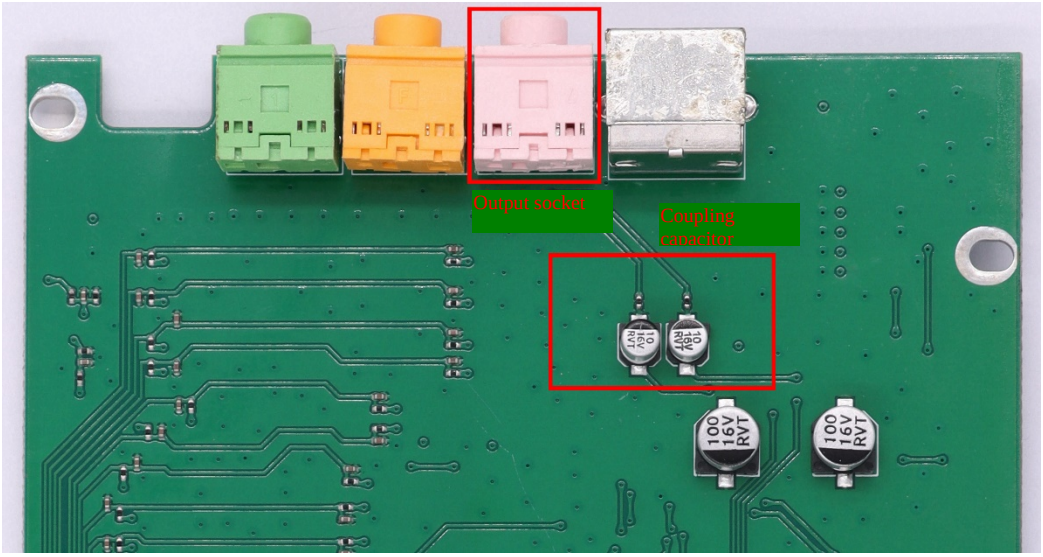
If the amplitude difference between the two checkpoints exceeds 10mV, it means that the baseband signal is unbalanced, and further inspection is required as follows:

Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
IQ is unbalanced	Baseband amplifier unit	Whether there is any false welding
	Back capacitance part	Whether the components are faultily welded or defective

- If the electrolytic capacitor on the back of the baseband amplifier has individual defects, it will also cause IQ signal imbalance fault, so it should be checked emphatically.
- 100 uF/ 16V chip tantalum capacitor is used for the old version of the small signal board, which has a high damage rate, so special attention should be paid during maintenance.

- Fault phenomenon: IQ output amplitude is unbalanced (ellipse or a line is displayed)





Maintenance methods:

The instrument settings are as follows:

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Signal Source	Frequency: 14.271MHz	Amplitude: -40dBm	/
Oscilloscope	Time base: 1ms	Y-axis: 100mV	X10 gear

After PRE is turned on, the measured data at each checkpoint shall be as follows:

The working voltage of IQ amplifier should be: 5V

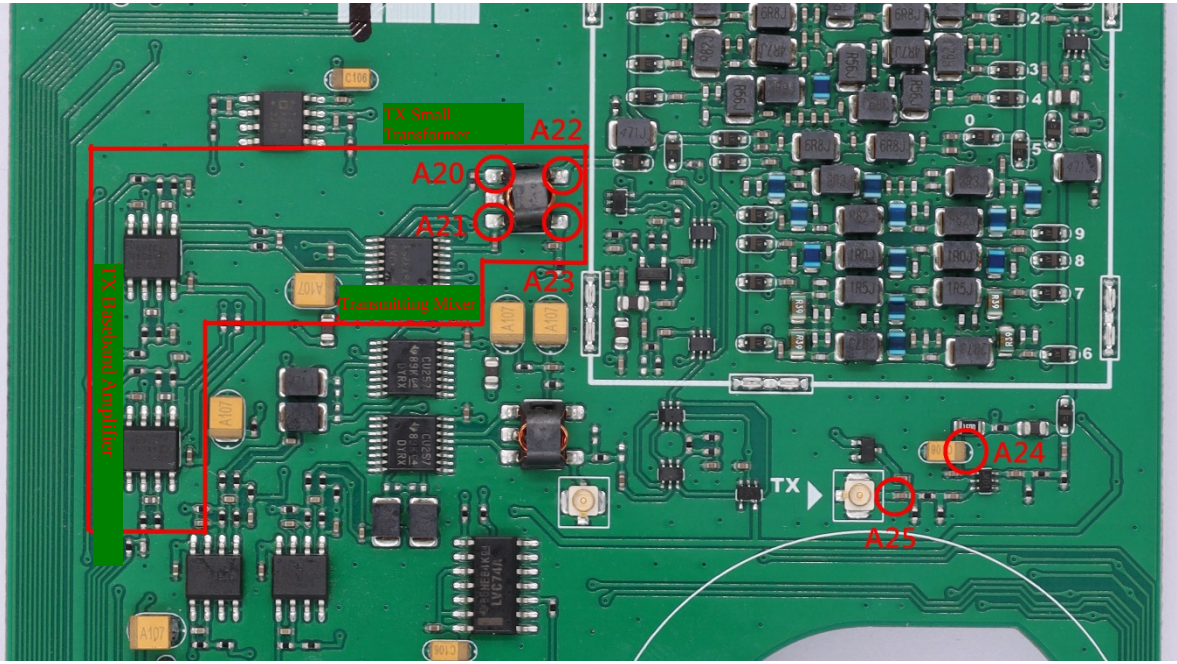
Checkpoint	Frequency	Amplitude mVpp	Name
PIN1	1kHz	350	Baseband signal of circuit I
PIN7	1kHz	350	Baseband signal of circuit Q
A18	1kHz	350	Q signal
A19	1kHz	350	I signal

- If the signal amplitude of a certain circuit is obviously small, it indicates that there is a fault in the circuit, which should be checked emphatically.

- The coupling capacitor on the back of the small signal board should also be checked to see whether the components are faultily welded or defective
- The 3.5mm stereo socket of IQ signal output should be checked to see whether there is a short circuit or open circuit.

- Fault phenomenon: The suppression degree of transmission carrier cannot be adjusted/ no transmission occurs

The two faults have highly coincident inspection parts, so they are explained together.



Maintenance methods:

- Fault cause 1: Carrier suppression caused by transmission channel fault cannot be adjusted.

Check whether the transmitting baseband amplifier, transmitting mixer and small transmitting transformer have welding problems such as false welding and short circuit.

- Fault cause 2: The transmission channel fault causes no transmitting small signal , and the suppression degree of the transmission carrier cannot be adjusted.

The cause of this fault is the same as the maintenance process without transmitting power, and the maintenance method is as follows:

Instrument settings:

Switch the test switch to "transmission state", set the radio station to USB mode, set the power to: 20W, and unplug the TX small signal cable.

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Oscilloscope	Time base: 50ns	Y-axis: 100mV	X10 gear

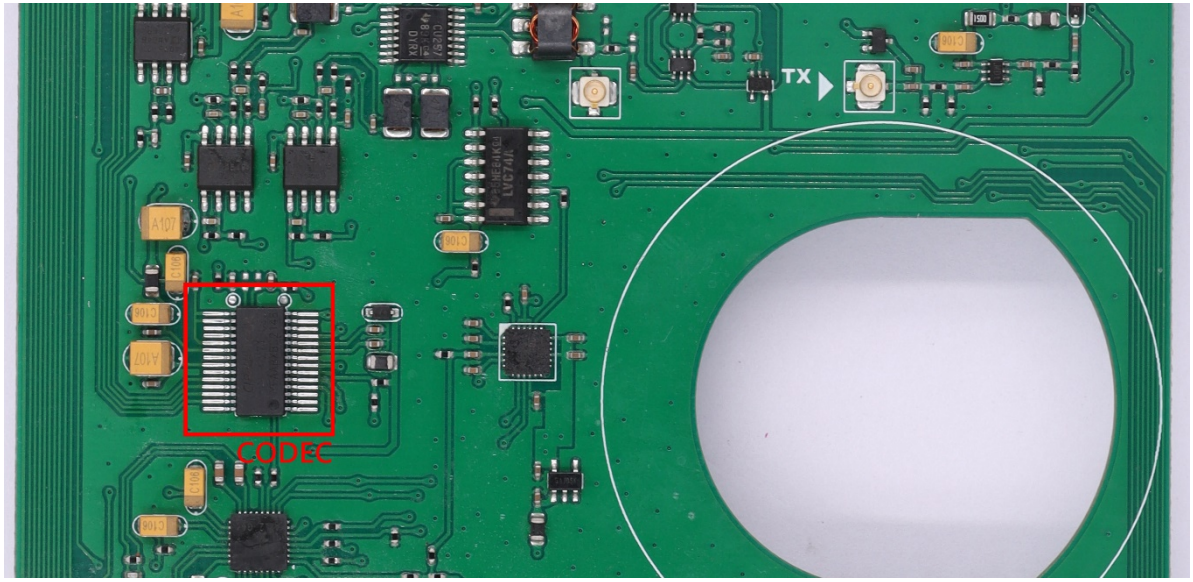
Press the hand microphone PTT button, and the inspection sequence and operation level of each checkpoint shall be as follows:

Checkpoint	Frequency MHz	Amplitude mVpp	Name
A20	14.27	140	Transmitting +
A21	14.27	140	Transmitting -
A22	14.27	70	Transmitting small signal
A25	14.27	500	Amplified transmitting small signal

Checkpoint	Voltage V	Name
A23	2.4	Switching voltage of transmitting small signal into BRF
A24	5.2	Operating voltage of transmitting small signal amplifier

➢ Before performing the above inspection, it is necessary to confirm that the local oscillator unit should work normally, or that the receiving function is normal and the TX/RX voltage switching is normal.

- Fault phenomenon: There is a bulge in the center of the spectrum display area

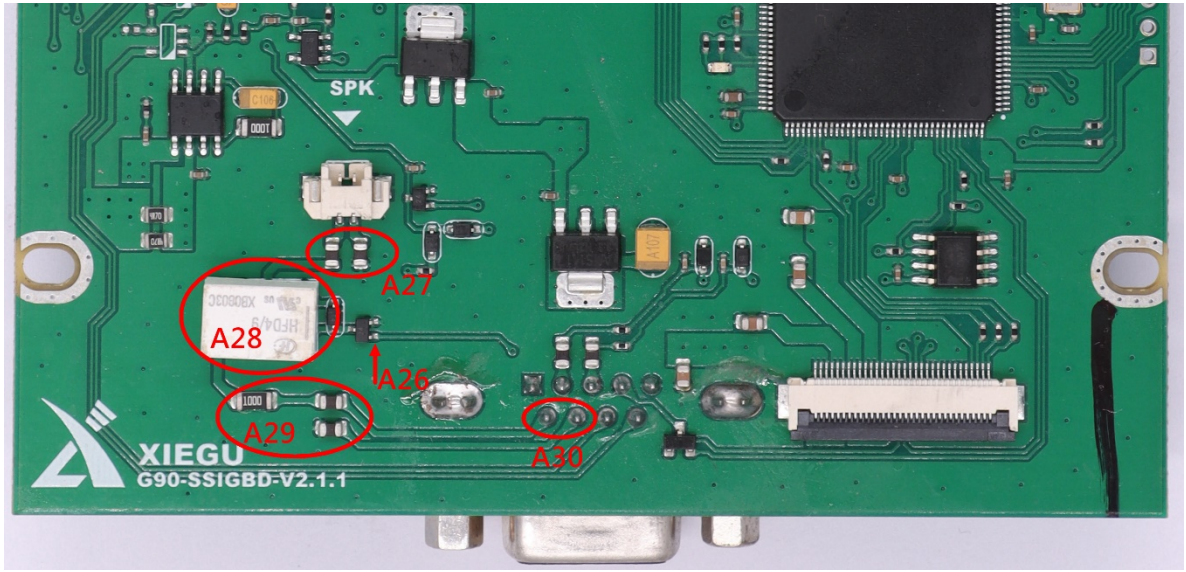


- Fault cause 1: IQ signal is unbalanced. The maintenance method is the same as that of the previous "Receiving IQ balance cannot be adjusted"

- Fault cause 2: CODEC chip is faultily welded or damaged.

Maintenance methods:

- Fault phenomenon: Earphones switch silently



1. Press the sound volume button on the machine head and measure the voltage at the checkpoint:

Fault Phenomenon	Maintenance Method	
	Small signal board	Voltage V
Earphones switch silently	Checkpoint A26: horn state	0
	Checkpoint A26: earphone state	3.3

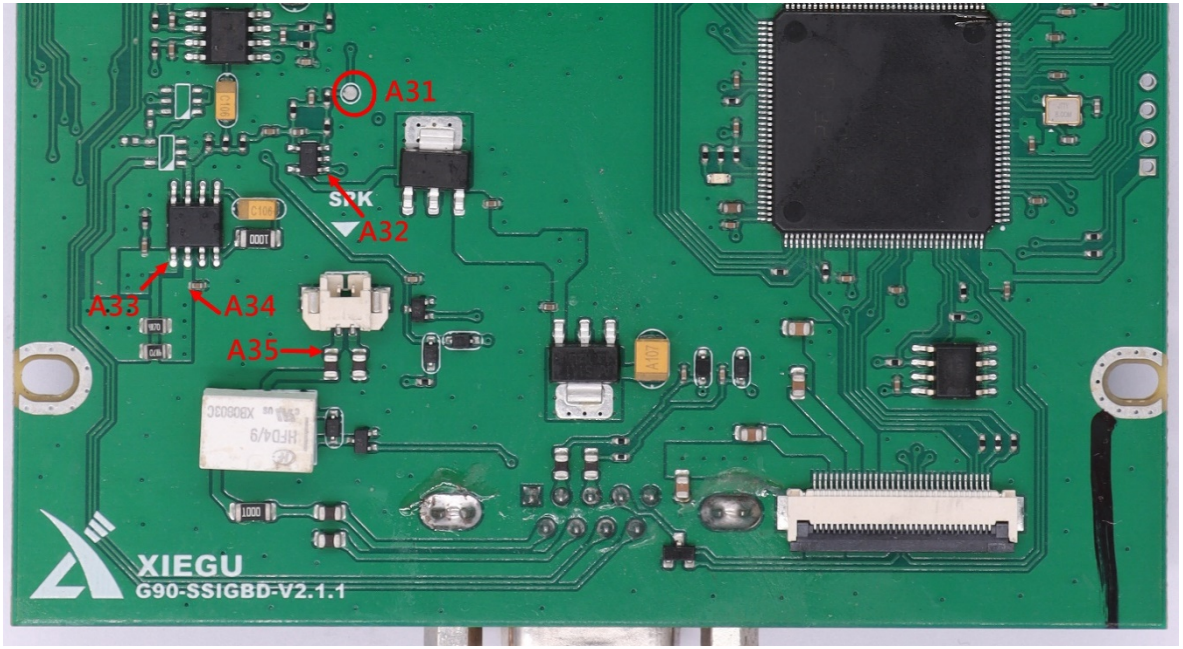
2. Check the welding of the following points:

Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
Earphones switch silently	Check whether there is any false welding	A27
		A28
		A29
		A30

■ Note: when pressing the volume knob to switch the horn/ earphone state, the relay at A28 should have an action sound. In the previous maintenance process, the relay was found to be damaged.

Maintenance methods:

- Fault phenomenon: There is no prompt tone for turning on or off the machine



Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Oscilloscope	Time base: 1ms	Y-axis: 100mV	X10 gear

Under the receiving state, the condition of checkpoint A32 measured is as follows:

Checkpoint	Voltage V	Name
A32	0.94	Operational amplifier reference voltage

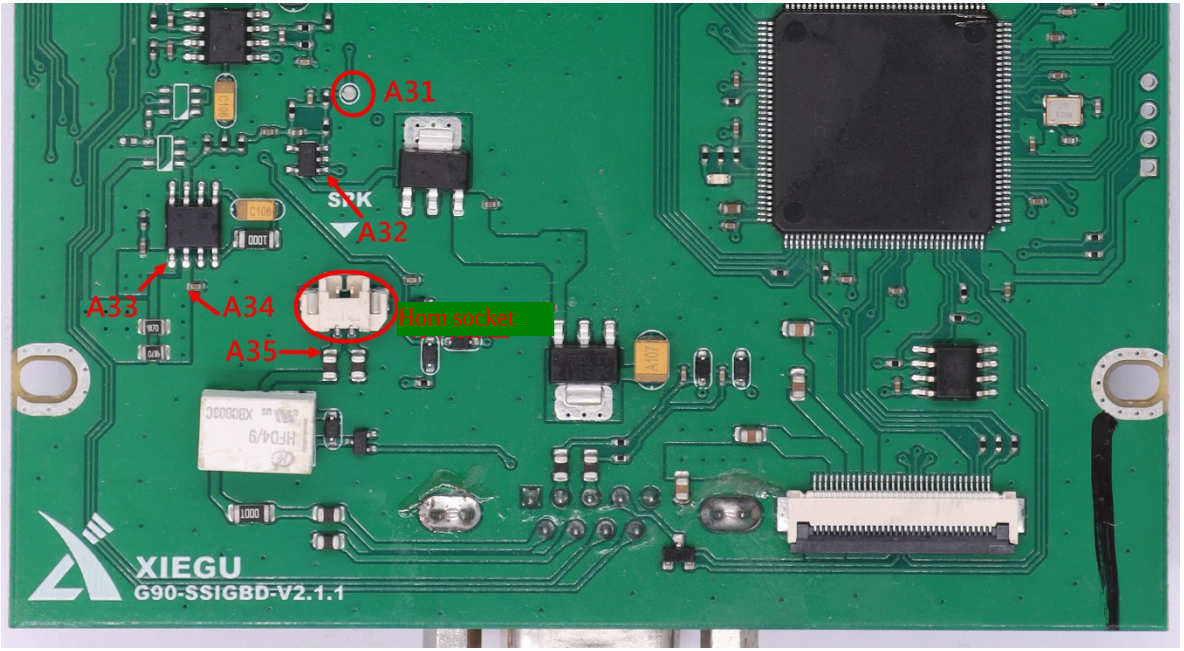
At startup/shutdown, A31 conditions should be measured as follows:

Checkpoint	Amplitude mVpp	Name
A31	About 100	Prompt tone signal for turning on or off the machine

At the same time, a sine wave signal should be seen on the oscilloscope, which is an on/off prompt signal.

Maintenance methods:

- Fault phenomenon: The horn is silent



The instrument settings are as follows:

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Signal Source	Frequency: 14.271MHz	Amplitude: -40dBm	/
Oscilloscope	Time base: 1ms	Y-axis: 200mV	X10 gear

After PRE is turned on, the measured data at each checkpoint shall be as follows:

Checkpoint	Voltage V	Name
A34	8.9	Audio power amplifier working voltage

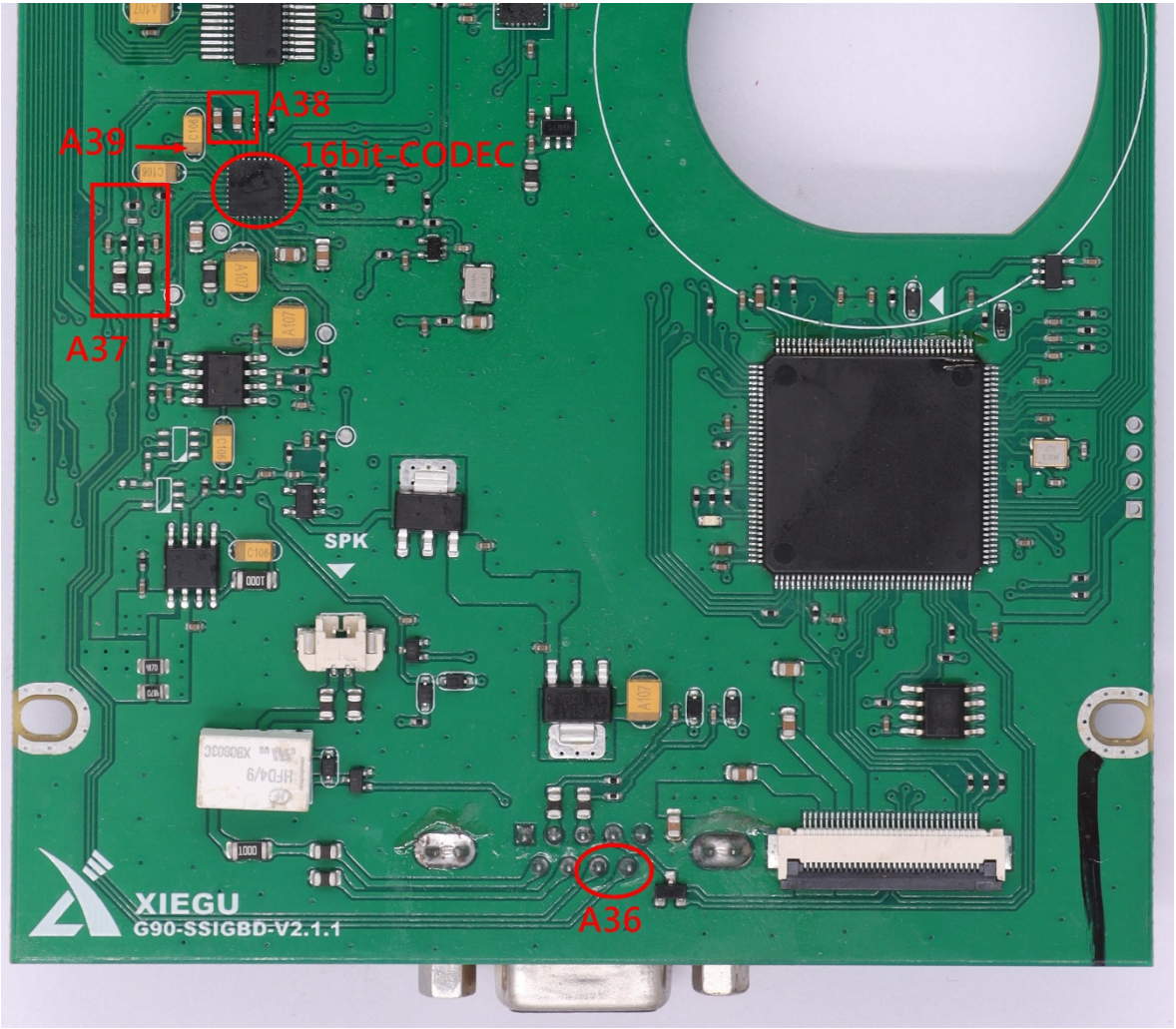
Checkpoint	Frequency	Amplitude mVpp	Name
A33	1kHz	50	Audio signal voltage
A35	1kHz	680	Audio signal voltage

Check the welding of the following points:

Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
The horn is silent	Check whether there is any false welding	Horn socket

Maintenance methods:

- Fault phenomenon: The hand microphone has no transmitting power



1. Instrument setting:

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Function signal source	Frequency: 1 kHz	Amplitude: 250mVpp	/
Oscilloscope	Time base: 1ms	Y-axis: 200mV	X10 gear

2. Connect the test hand microphone to the machine head and measure the status of the following checkpoints:

Checkpoint	Frequency	Amplitude mVpp	Name
A36-1	1kHz	200	Audio signal voltage
A36-2	1kHz	200	Audio signal voltage

3. Measure whether the two welding points of A36 are connected to the lower ends of the two inductors of A37 with the on-off gear of multimeter.

4. Check the welding of the following points:

Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
No power at the hand microphone	Check whether all components are faultily welded or damaged	A37

5. The measured data at each checkpoint are as follows:

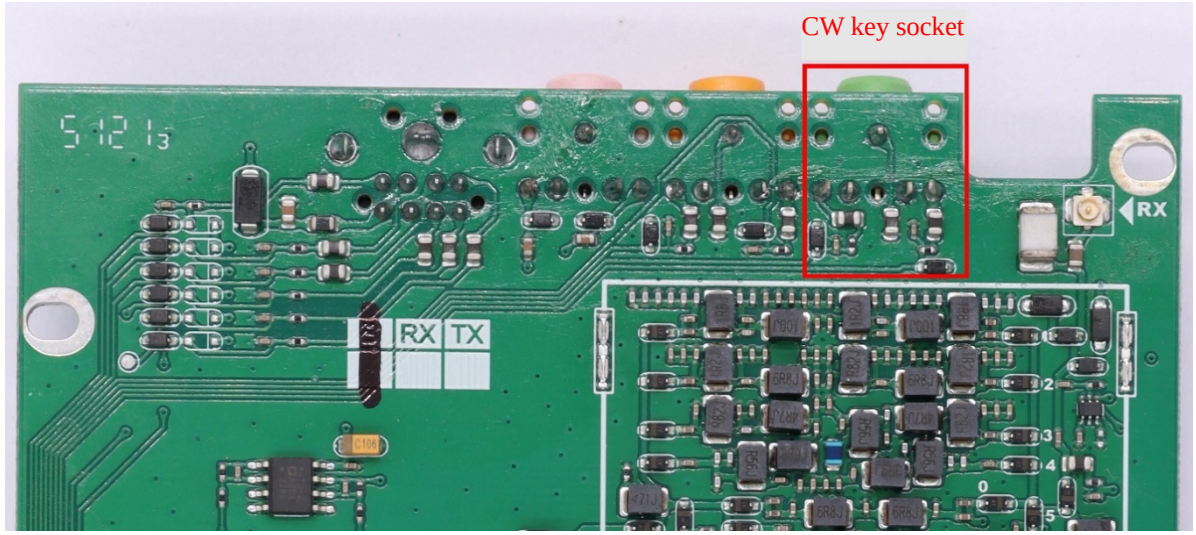
Checkpoint	Voltage V	Name
A39	0.94	Audio reference voltage

Checkpoint	Frequency	Amplitude mVpp	Name
A38-1	1kHz	200	Audio differential signal amplitude
A38-2	1kHz	200	Audio differential signal amplitude

6. Check whether the 16bit-CODEC chip is faultily welded or damaged.

Maintenance methods:

- Fault phenomenon: Transmit when the machine is turned on (accompanied by a long prompt tone)

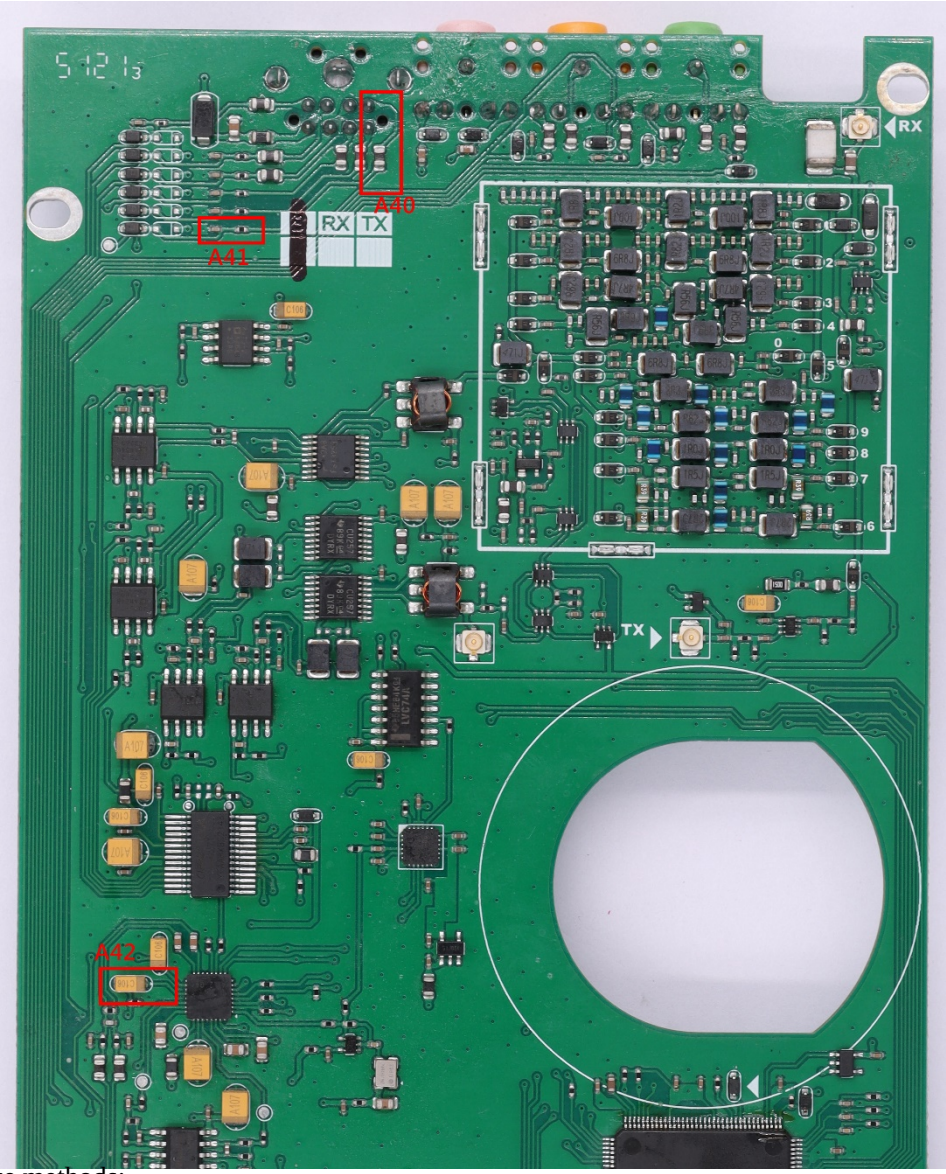


Maintenance methods:

Fault cause: CW pedestal is partially short-circuited

- Check whether the pins of CW pedestal are short-circuited to the ground and whether the two ESD protection diodes are broken down.

- Fault phenomenon: There is no transmission power in the line input



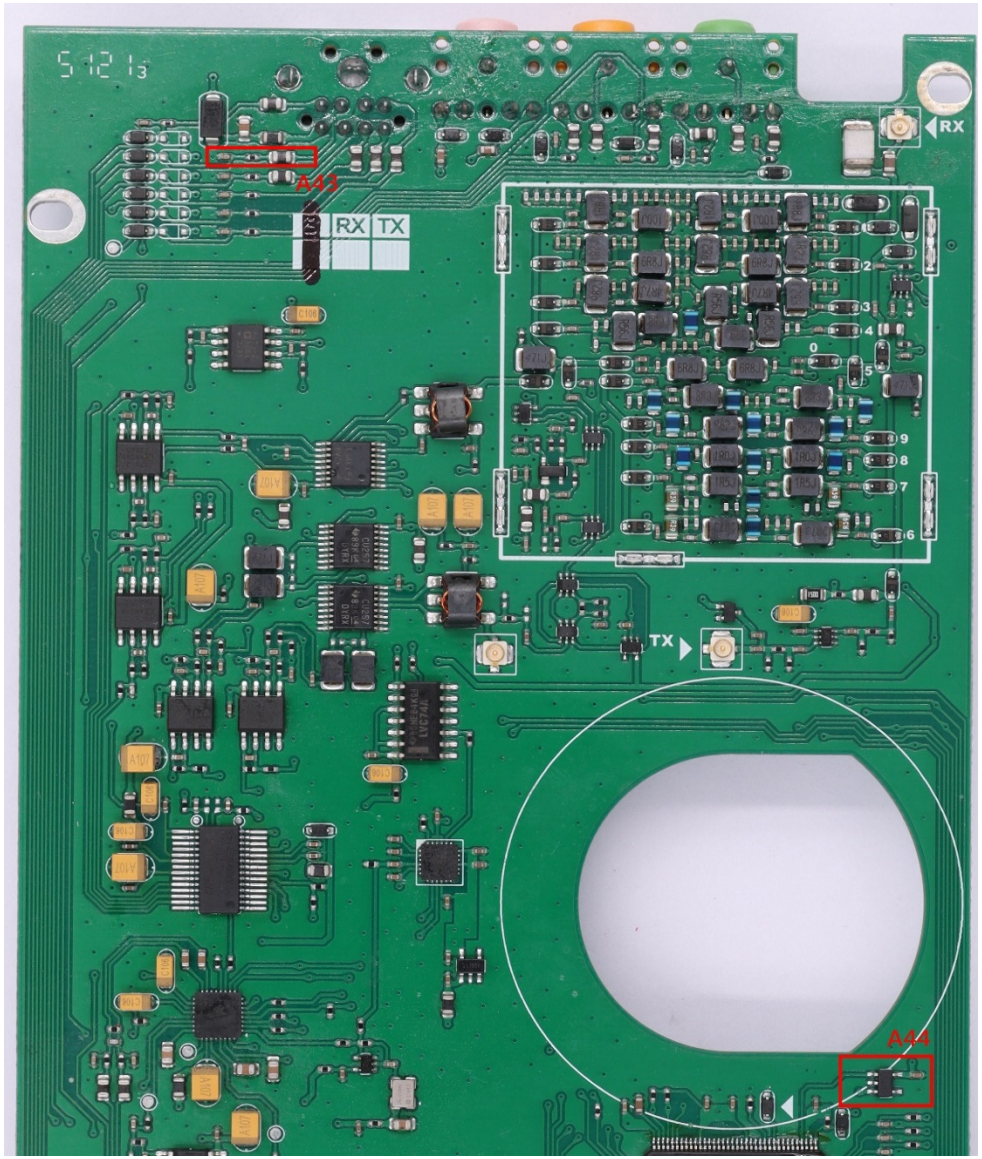
Maintenance methods:

Check the welding of the following points:

Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
The line input has no power	Check whether there is any false welding	A40
		A41
		A42

- Check whether the Mini-Din8 pedestal is damaged or poorly contacted.
- Check whether the wire from A41 to A42 is connected.
- Check whether the machine head setting is in LINE.

- Fault phenomenon: There is no wave band voltage output



Maintenance methods:

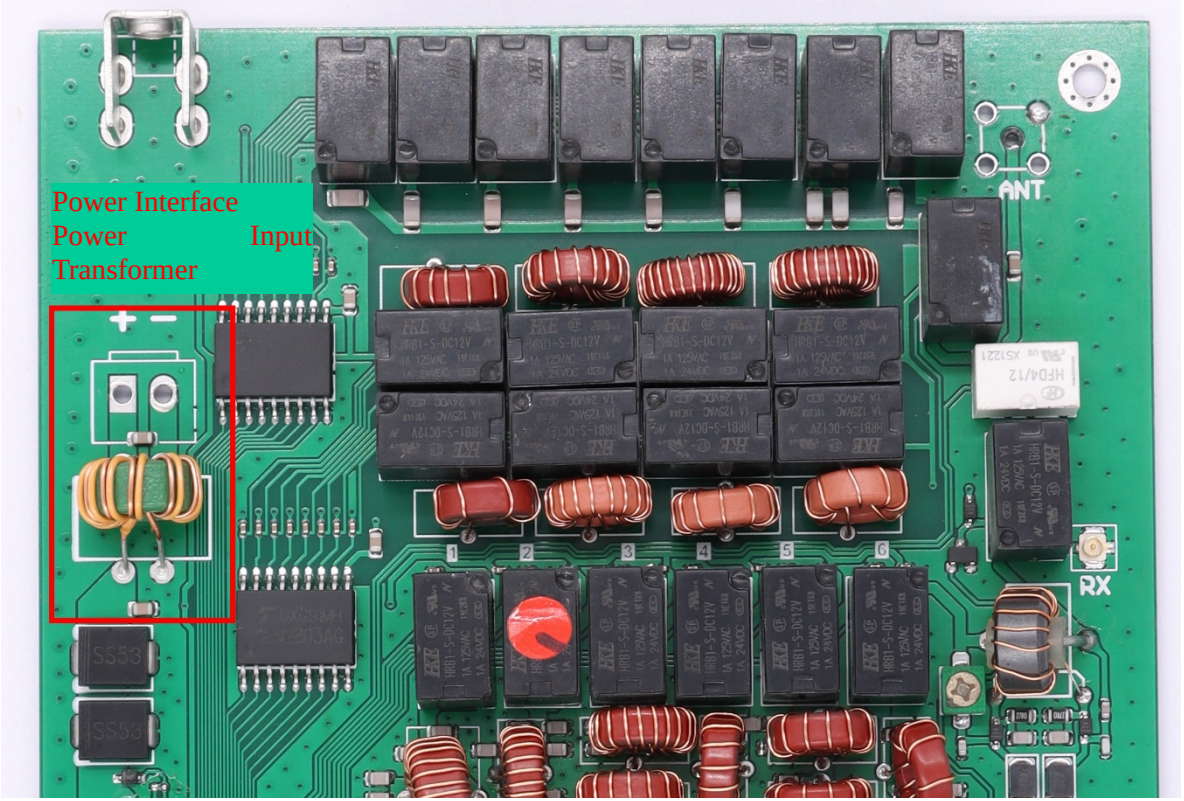
Check the welding of the following checkpoints:

Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
There is no wave band voltage output	Check whether there is any false welding	A43
		A44

- Check whether the Mini-Din8 pedestal is damaged or poorly contacted.
- Check whether the wire from A43 to A44 is connected.

Base board G90-BASEBD-V2.0.6

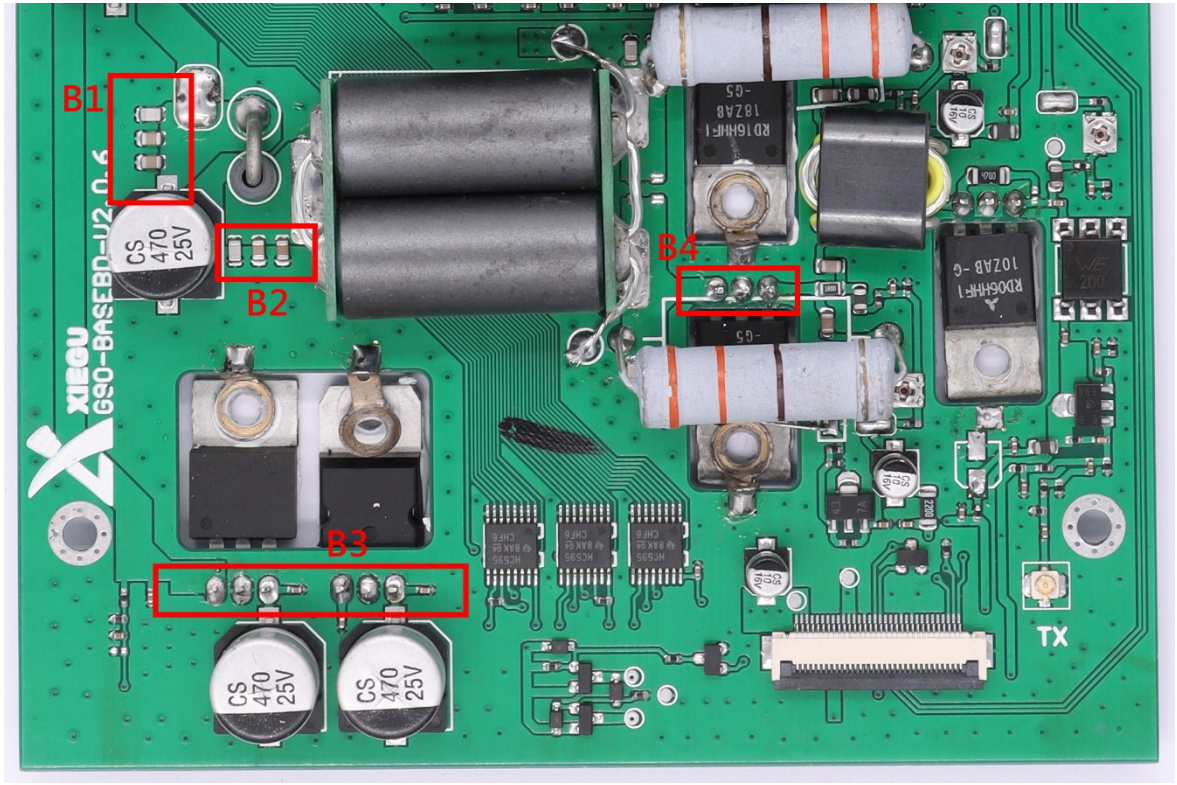
- Fault phenomenon: The plug-in power line is short-circuited to the ground



1. Observe whether the pins of the power input transformer are welded reversely. The output of the transformer should be the same winding corresponding to the welding input, and cannot be connected in reverse. After reverse connection, it is short-circuited directly after plugging in.
2. Observe whether the winding of the transformer is burnt.
3. Measure whether the chip capacitor at the output of the transformer is short-circuited.

Maintenance methods:

- Fault phenomenon: Short circuit at startup



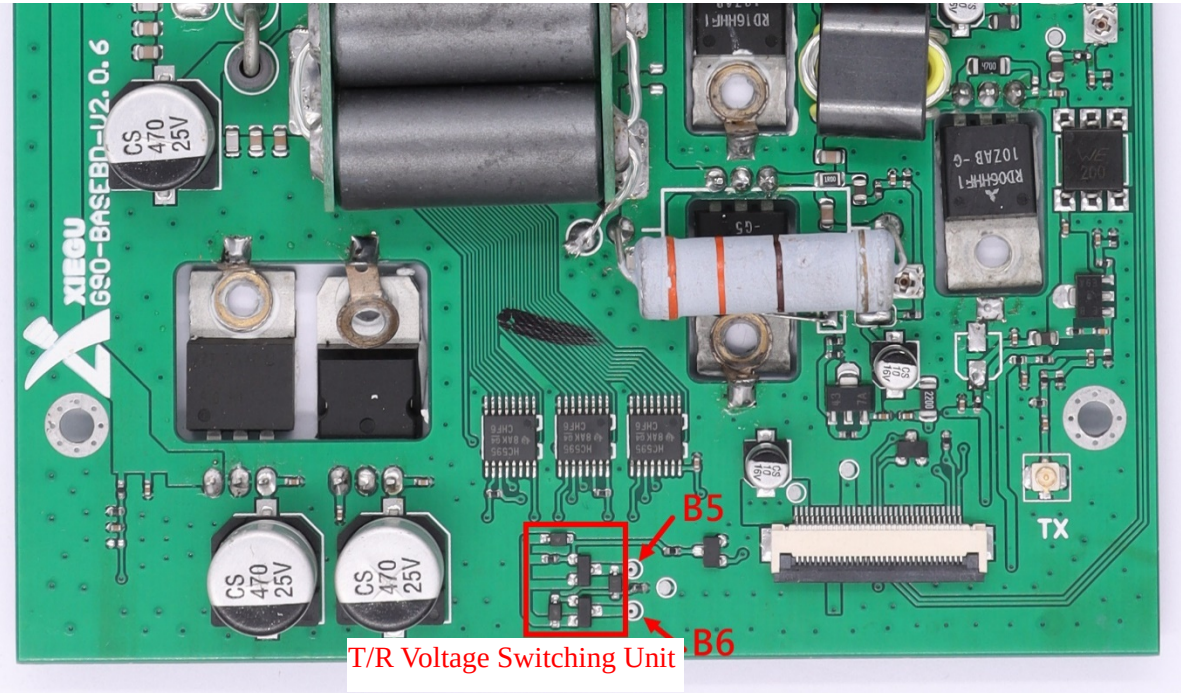
1. Check whether there is continuous tin electrodeposit caused by the manual welding of components in each point:

Fault Phenomenon	Maintenance Method	
	Small signal board	Checkpoint
There is no wave band voltage output	Check whether there is any false welding	B1
		B2
		B3
		B4

2. Check whether components of the 9V and 5V voltage regulators are installed incorrectly, and check whether the two RD16 are installed incorrectly.
3. Check whether the pins of the output transformer are short-circuited with the nearby components; or whether there is continuous tin electrodeposit in nearby components.

Maintenance methods:

- Fault phenomenon: High startup current and abnormal operation of the whole device



The fault is mainly caused by the abnormal switching of the transmitting and receiving voltages, which leads to the incomplete switching of the voltages of the two circuits.

1. Disconnect the transmitting small signal line.

2. Press/ release the hand microphone PTT button, and the measurement data of each checkpoint shall be as follows:

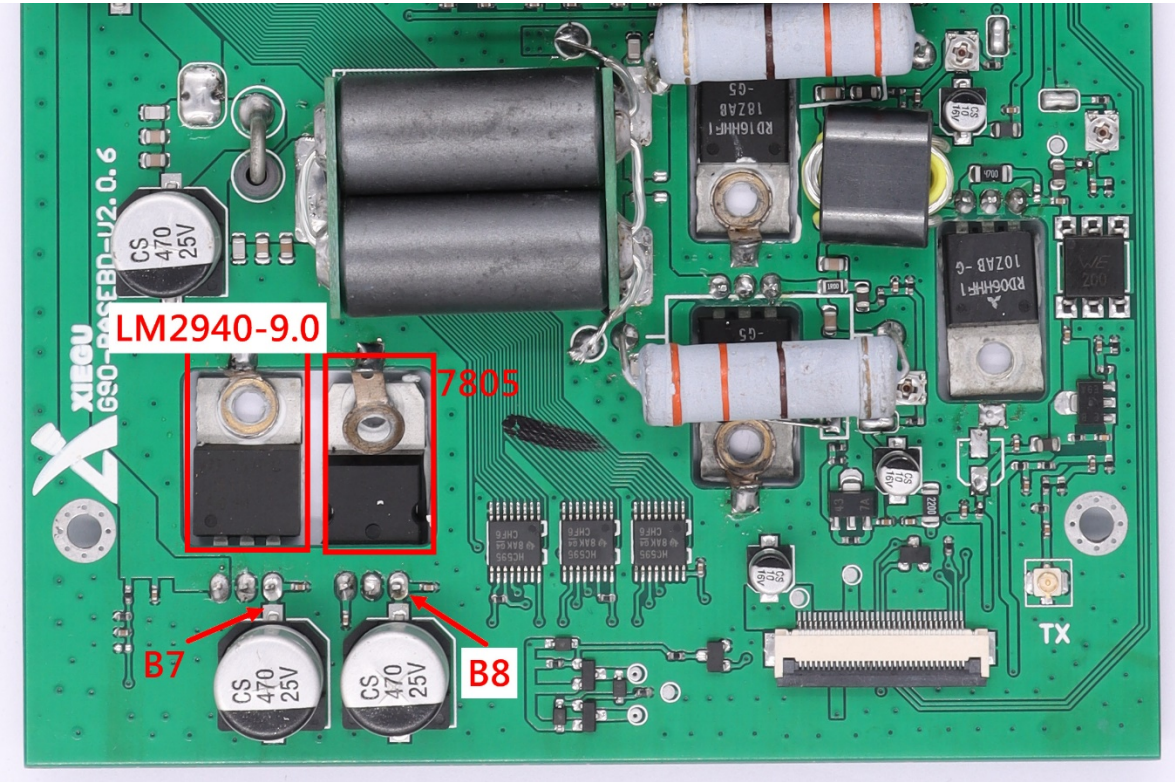
Checkpoint	Voltage V	Name
B5	+9T	Transmitting 9V voltage
B6	+9R	Receiving 9V voltage

- In the receiving state, +9T voltage should be about 0V;
- In the transmitting state, +9T should be about 9V, and +9R should be about 0~0.15V.

3. If the above voltage is abnormal, focus on checking whether the components in the T/R voltage switching unit are faultily welded or defective. MOS tube and diode in this unit are damaged a lot.

Maintenance methods:

- Fault phenomenon: low startup current



1. Check the model of the two regulators to prevent wrong loading of materials.

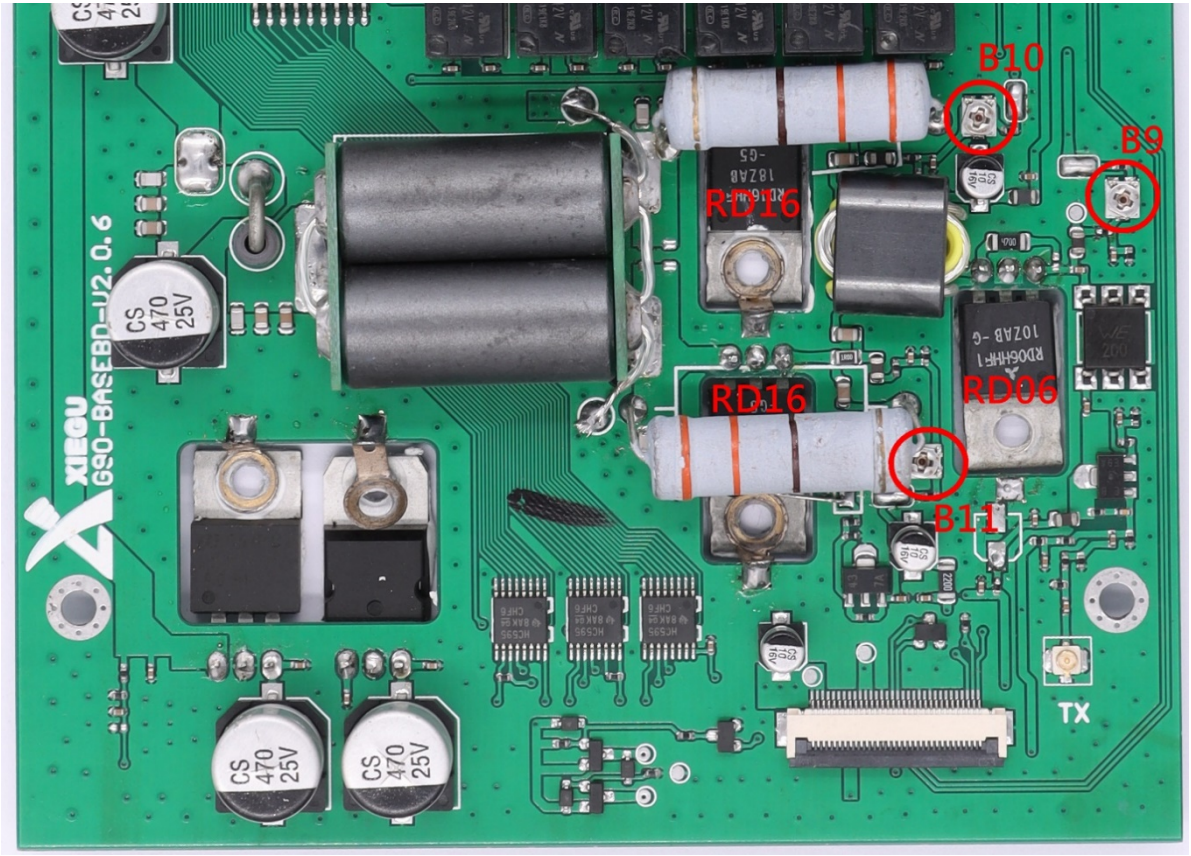
2. Check the voltage at each point:

Checkpoint	Voltage V	Name
B7	+9	Internal 9V voltage
B8	+5	Internal 5V voltage

■ In some cases, the low startup current is probably due to the wrong material loading of the two regulators.

Maintenance methods:

- Fault phenomenon: there is sudden change of current when the power amplifier is adjusted to static state

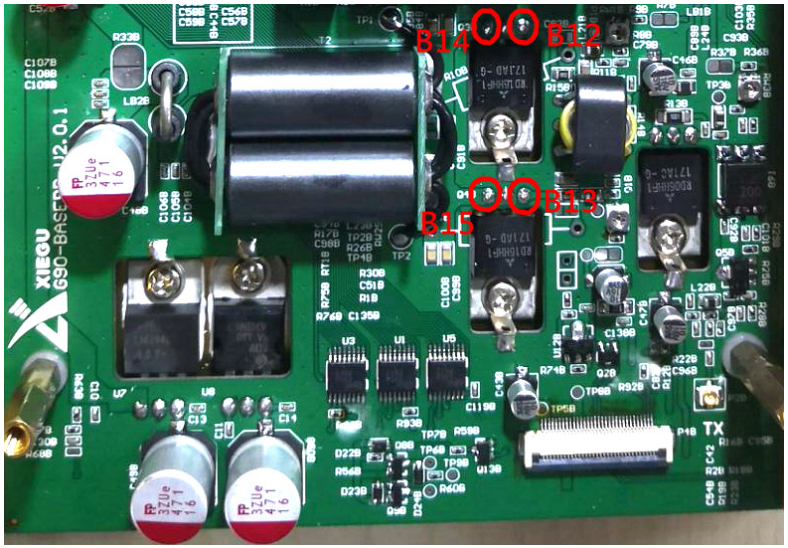


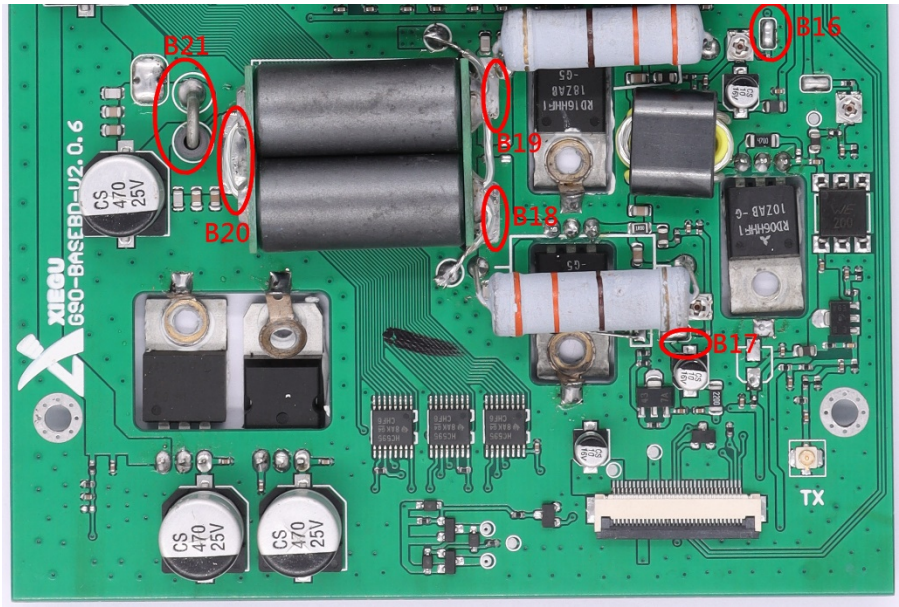
Maintenance methods:

1. First confirm that the static current does have nonlinear changes (sudden changes) during regulation.
2. Adjust all three adjustable potentiometers to zero.
3. First turn up potentiometers B10 and B11 by 650mA respectively, and observe whether the change of current is linear during adjustment.
4. Then adjust potentiometer B9 to increase the current by 350mA, and observe the change of current at any time during the adjustment. Once there is a sudden increase in current, return the potentiometer B9 to zero and adjust it again to observe whether the current changes suddenly. If it still changes suddenly, it can be determined that the power tube RD06 is damaged.

- According to previous maintenance experience, most sudden changes of current are caused by the damage of RD06.

- Fault phenomenon: during static current adjustment, the current does not change





Maintenance methods:

1. Disconnect the transmitting small signal line and press the hand microphone so that the whole device enters the transmitting state.
2. Check the voltage status at each point:

Checkpoint	Voltage V	Name
B12	2.5～4.55	Power tube grid voltage (cut-off - amplification)
B13	2.5～4.55	Power tube grid voltage (cut-off - amplification)
B14	13.8	Power tube VCC voltage
B15	13.8	Power tube VCC voltage

3. If the voltage of check points B12 and B13 is 0 or lower than the above standard voltage, it indicates that there is a problem with the power tube grid power supply or there is a short circuit in the power tube grid.

3.1 Power off the whole device and unplug the power cord. Measure whether the grid of two RD16HHF1 power tubes is short-circuited to the ground.

3.2 Start up to enter the transmitting state, and measure whether the voltage at the following check points is normal:

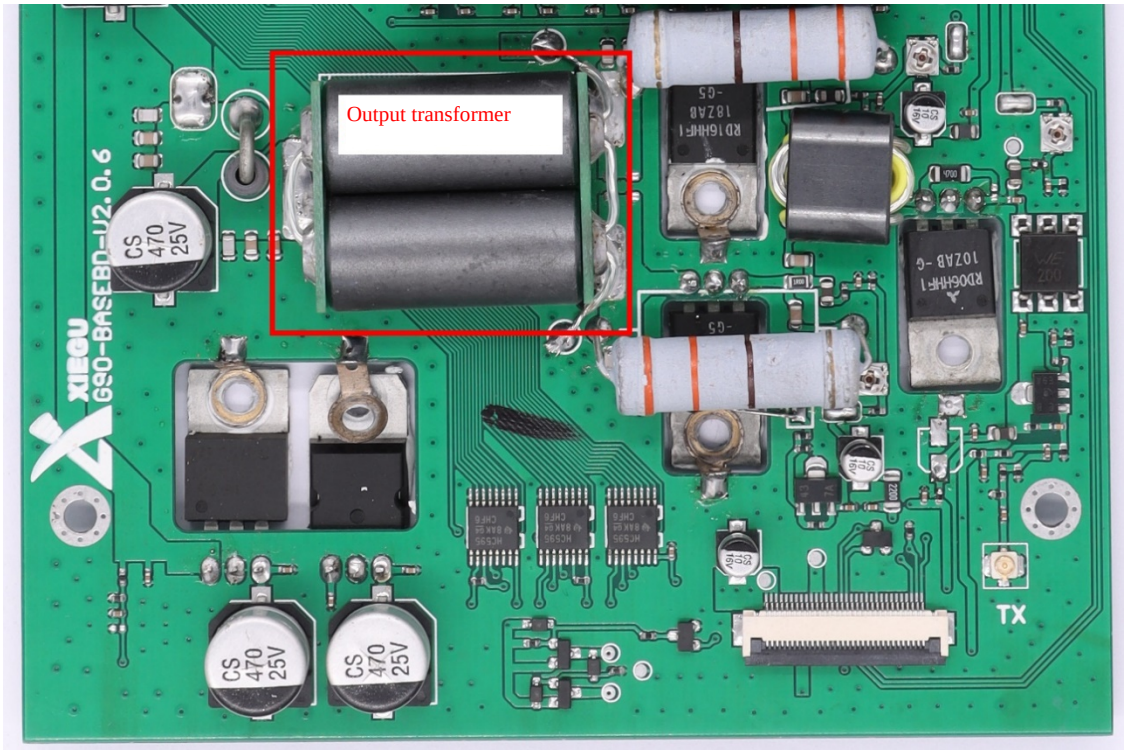
Checkpoint	Voltage V	Name
B16	6	Transmitting reference voltage
B17	6	Transmitting reference voltage

4. If the above steps are normal, check the following points:

Checkpoint	Voltage V	Name
B18	13.8V	Transformer secondary voltage
B19	13.8V	Transformer secondary voltage
B20	13.8V	Transformer primary voltage
B21	13.8V	Voltage at the choke

- If there is a point with voltage of 0 among the above check points, check whether there is false welding at the four points.

- Fault phenomenon: the power supply is short-circuited as soon as the transmitting starts (the power supply exceeds 10A)

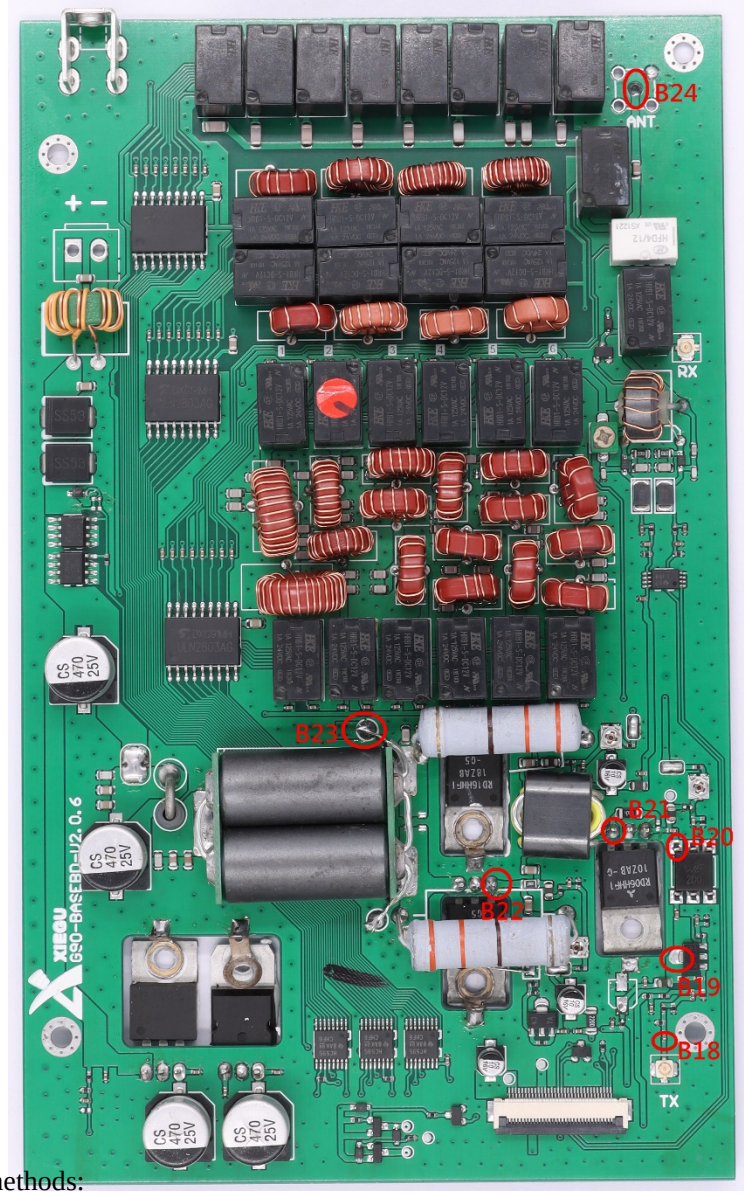


Maintenance methods:

- Power off the whole device, and check whether the winding of the output transformer is short-circuited with the copper tube of the transformer.

This fault is generally a short circuit caused by the cutting of the winding sheath by the copper tube in the transformer during the manufacturing process of the transformer.

- Fault phenomenon: no power



Maintenance methods:

1. Adopt the stage-by-stage signal inspection method to troubleshoot such faults. The signal measurement at each check point shall be as follows:

Name	Setting Parameters		
	Parameter 1	Parameter 2	Parameter 3
Oscilloscope	Time base: 50ns	Y-axis: 0.2～20V	X10 gear

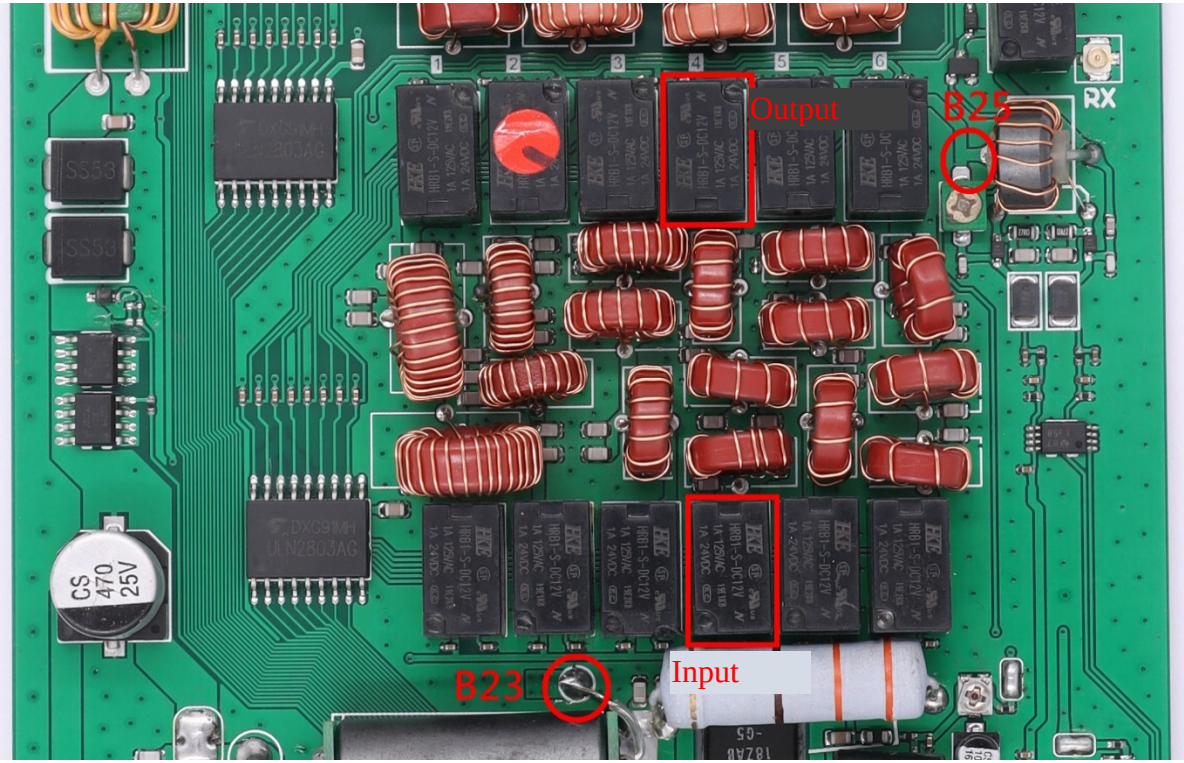
Connect the transmitting small signal line, connect the test hand microphone, and switch the test tooling to the transmitting state

Checkpoint	Frequency MHz	Amplitude Vpp	Name
B18	14.27	0.62	Power amplifier input signal
B19	14.27	2.4	Preamp output
B20	14.27	1.84	Three-wire transformer output
B21	14.27	10.2	RD06 output
B22	14.27	17～18.5	RD16 input
B23	14.27	118	Power amplifier transformer output
B24	14.27	98～100	Antenna port output

2. When the amplitude of a certain stage is significantly different from the above standard amplitude, it should be re-detected and positioned.

3. When no signal is detected at B18 checkpoint, it is necessary to consider whether the IPX signal line is damaged.

- Fault phenomenon: no power in some frequency range (low power)



General cause: the relay and coil of a certain filter are faulty.

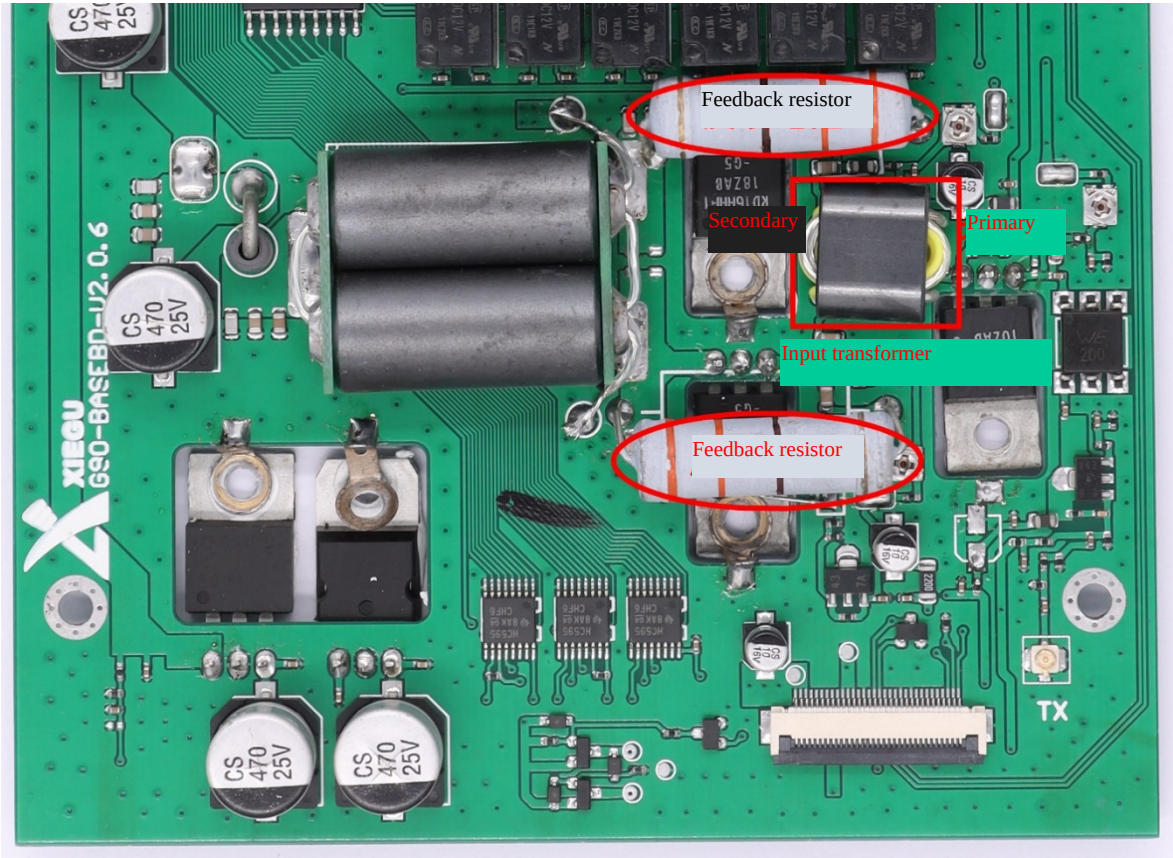
1. Take the filter shown in the figure as an example, and pay attention to the input and output terminals in the figure.
2. First make sure that check point B23 has output, with high amplitude (generally above 50V).
3. Judgment in the following situations:

	Comprehensive Situation			Fault Point
B23 has signal	No signal behind input terminal	B25 has no signal	Low or high current	Input terminal relay is broken
B23 has signal	There is voltage on the coil in the filter	B25 has no signal	High current	Output terminal relay is broken
B23 has signal	There is signal behind input terminal	No voltage on the coil in the filter	Low current	The filter coil is broken or faultily welded

- This fault is generally caused by relay damage (internal contact is damaged after wave welding), and part of it is caused by LPF coil breaking or false welding. The fault phenomenon is obvious, which can be determined one by one according to the above method.

Maintenance methods:

- Fault phenomenon: the power of the whole section is small (only ≤ 10W)



- Fault cause 1: this fault is generally caused by the reverse welding of the primary and secondary coils of the input transformer.

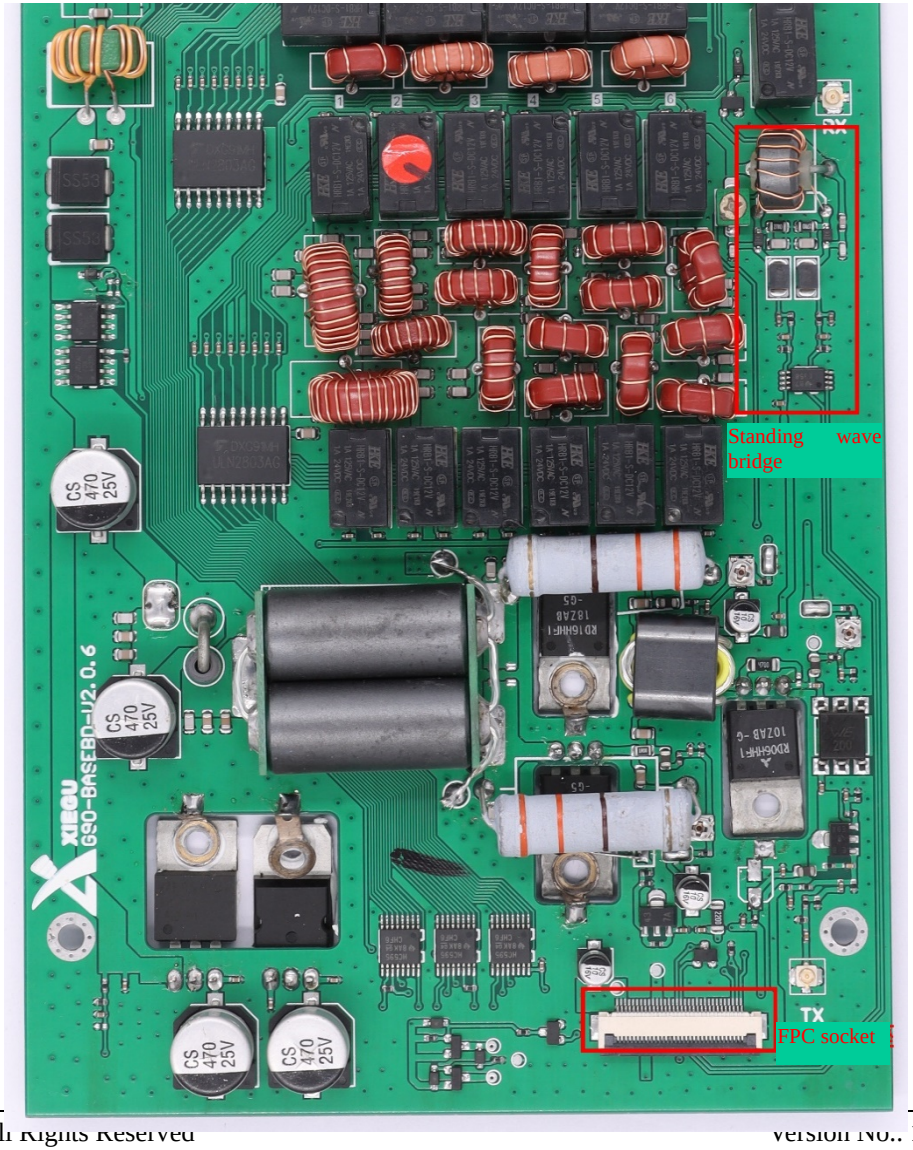
Transformer primary (near RD06 end): 2T

Transformer secondary (near RD16 end): 6T

- Fault cause 2: two feedback resistors are faultily welded or desoldered.

Maintenance methods:

- Fault phenomenon: power out of control (output exceeds 22W, and regulation is invalid)
- Fault phenomenon: The standing wave of the variable capacitor cannot be adjusted to the minimum



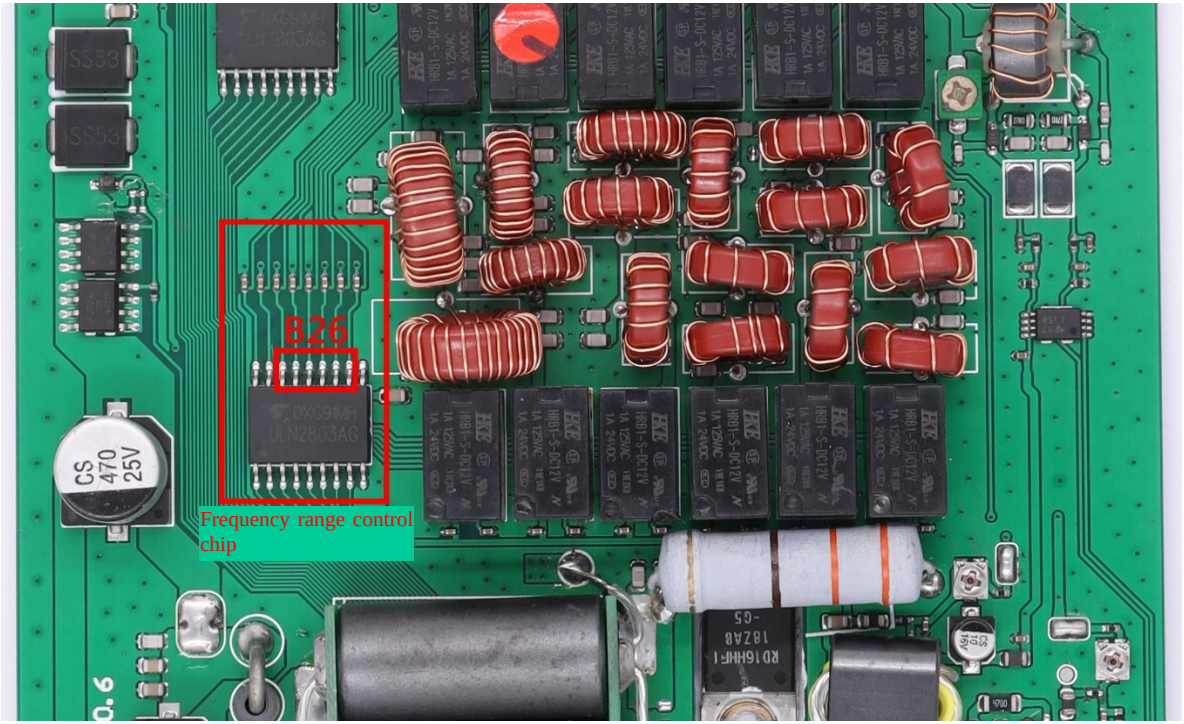
Maintenance methods:

■ Power out of control: this fault is generally caused by the false welding of standing wave bridge unit or FPC socket unit. Check the welding condition.

■ The standing wave cannot be adjusted to 0: check whether the variable capacitor of the standing wave bridge unit is welded well; check whether the coil winding of the standing wave coupler is broken.

✧ During the maintenance, LM358 damage is found, so pay attention to screening.

- Fault phenomenon: when switching frequency range, LPF relay does not act



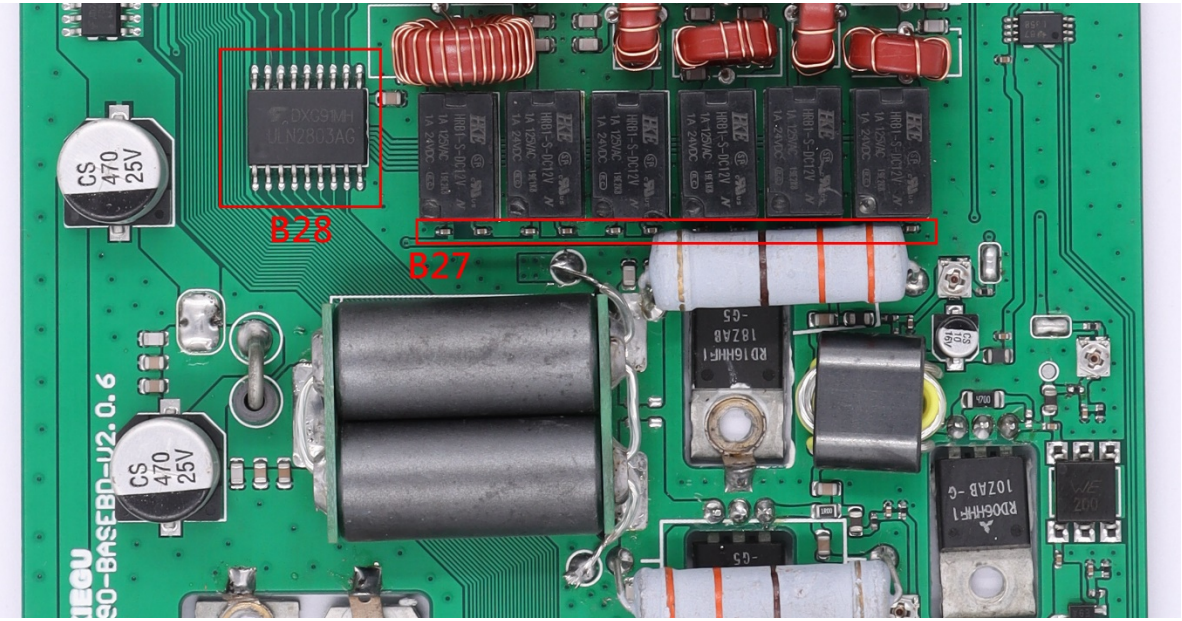
1. The relay of each LPF frequency range is controlled by the control chip ULN2803 output .
2. Voltage of output control pin corresponding to ULN2803:

Pin voltage corresponding to each band output of ULN2803	Selected Voltage	Unselected Voltage
	0.7V	13.8V

3. According to the circuit schematic diagram, measure the band voltage of the output pin respectively, to judge whether ULN2803 works normally.
4. Check whether the previous stage control chip 74HC595 of ULN2803 has poor welding.

Maintenance methods:

- Fault phenomenon: some sections of the transmitting spectrum are abnormal, with large stray

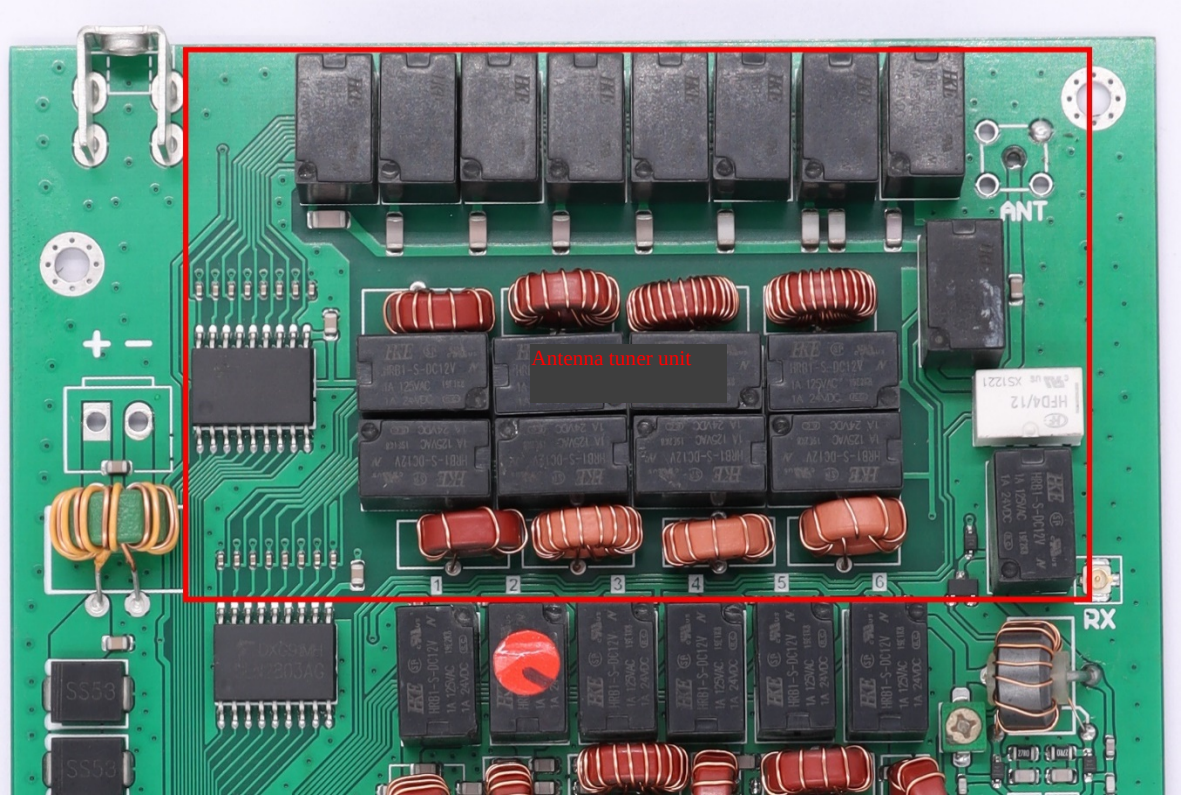


Fault Phenomenon	Maintenance Method	
	Base board	Checkpoint
Multi frequency range adhesion	Check whether there is any pin connected to tin	B27
	Check whether there is any pin connected to tin	B28

■ All 0402 packaged chip capacitors on the B27 check point should be carefully checked. Due to the welding of the transformer and feedback resistor below, it is easy for this capacitor to connect tin, resulting in band control disorder. This fault occurs frequently.

Maintenance methods:

- Fault phenomenon: antenna tuner failure (unable to adjust)



1. Check whether all chips, relays and coils in the antenna tuner unit are faultily welded.
2. Confirm whether the magnetic ring and number of turns of the antenna tuner coil are correct.
3. Check whether the transmitting static current of the power amplifier unit is correctly adjusted.
4. Check whether the standing wave bridge is well adjusted.

Maintenance methods:

Revision Record:

Prepared/ Revised by	Revision Content	Version No.	Date
Yan Huan	Preparation for the first time	V1.0/A0	2022.07.27

Temporarily ended.