# Innosilicon T1 Hash Board Repair Manual

In using the T1 miner, if the user encounters a broken chain, low hash rate, and many hardware errors, please refer to this maintenance manual for maintenance.

I. Maintenance preparation

Tools: serial board, data cable, TF card, jumper cap, oscilloscope, Fluke 17B+ multimeter.

jumper cap
跳线帽

TF卡
TF card

串口板 serial board

数据线
data cable
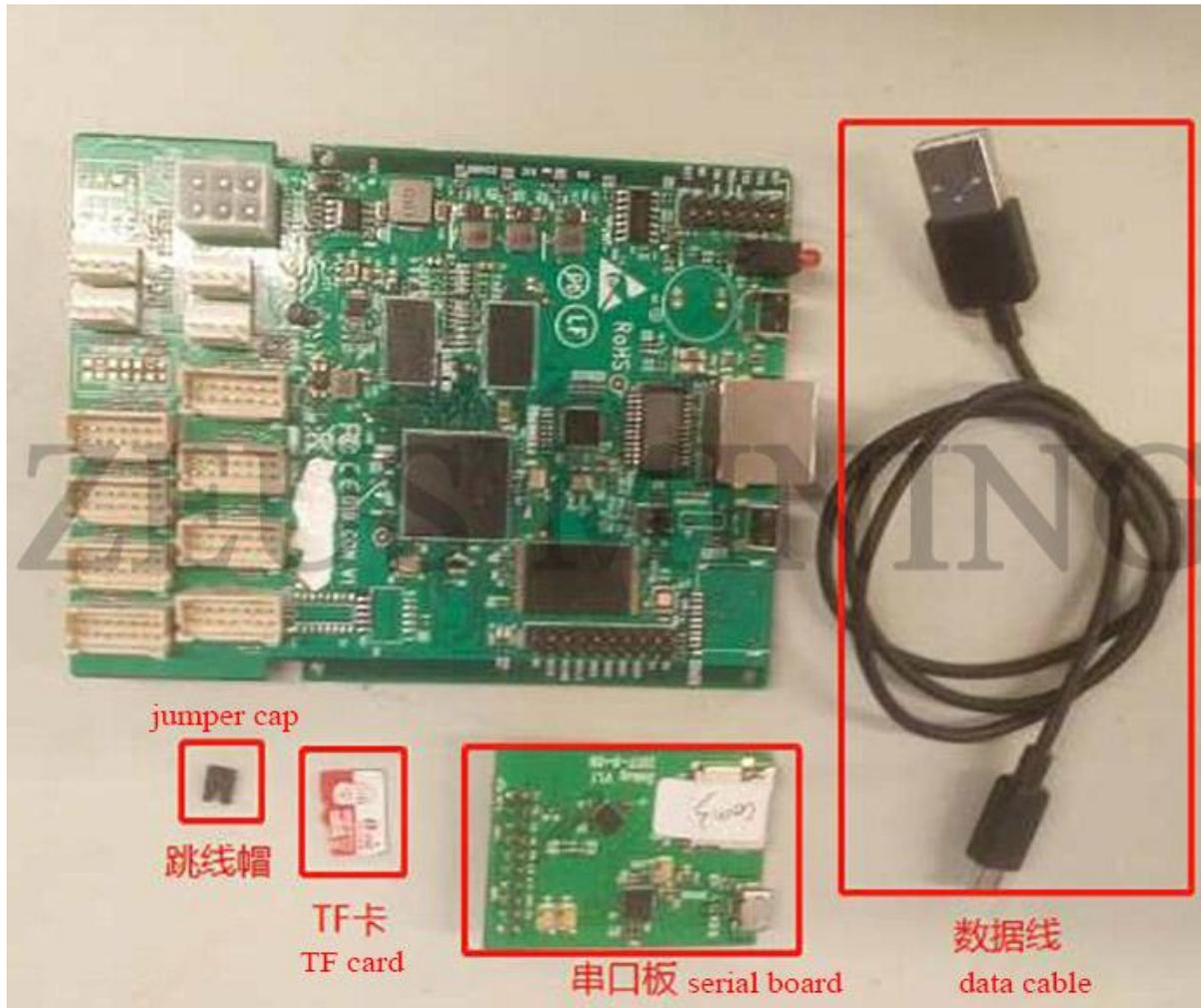
Required software: Normal.bin, repair.bin, SecureCRT.exe.

1. Maintenance software instructions

1) How to use Normal.bin

How to use: After shutting down, copy xxx.bin directly to the TF card, insert the TF card into the slot of the serial board, connect the serial board to the control board, and use the jumper cap to connect to the J2 interface, then power on.

2) Serial port tool description

Install the serial port test tool on the computer, and set the baud rate: 115200, n, 8, 1.

The setting method is as follows:

a. Double - click the serial port icon to open the serial port tool as shown in the figure below, and click "New Dialog" in the red dialog box.
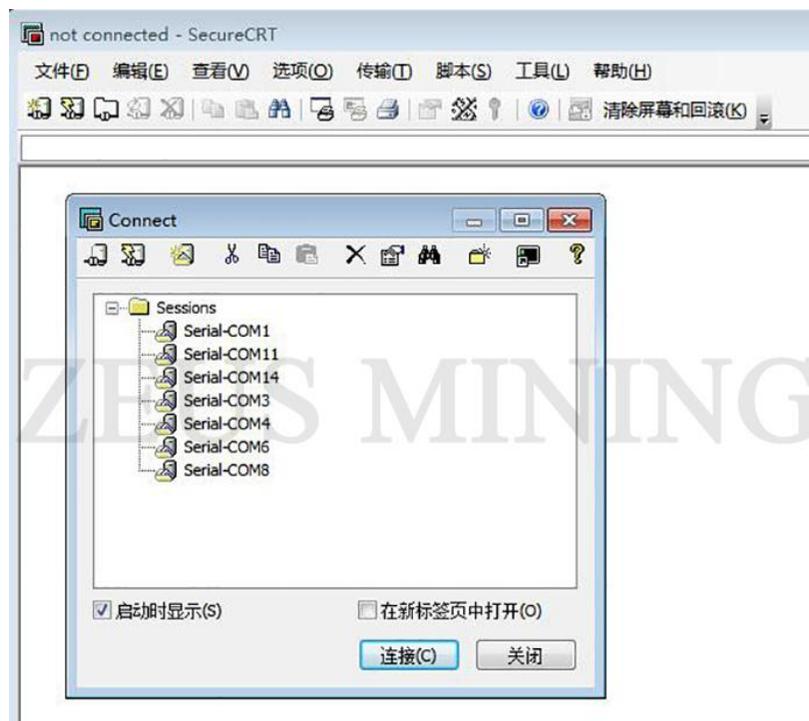
b. Select the serial port protocol in the new session wizard.

c. Set the baud rate: 115200 and other options.
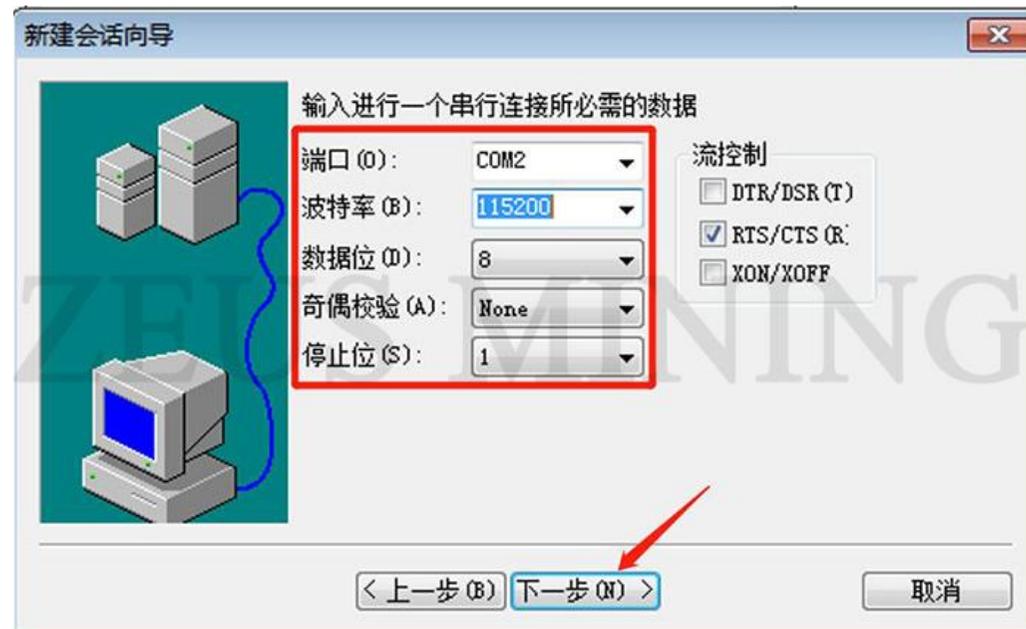
3) Instructions for the use of Normal software

The Normal software usage process is as follows:

a. After inserting the SD card into the slot, check that the device is correct, and then power on.

b. Open the serial port software to check whether the software version information is correct after power-on.

c. During the testing process, test information is displayed and prompts characters at various stages to facilitate hardware testing and status monitoring.

d. After the end of the test, print the test results. If it is a multi - chain test, the test results will be printed together after the end.

e. Re - test, press the Reset button directly on the control board or press the Enter key according to the prompt software character.
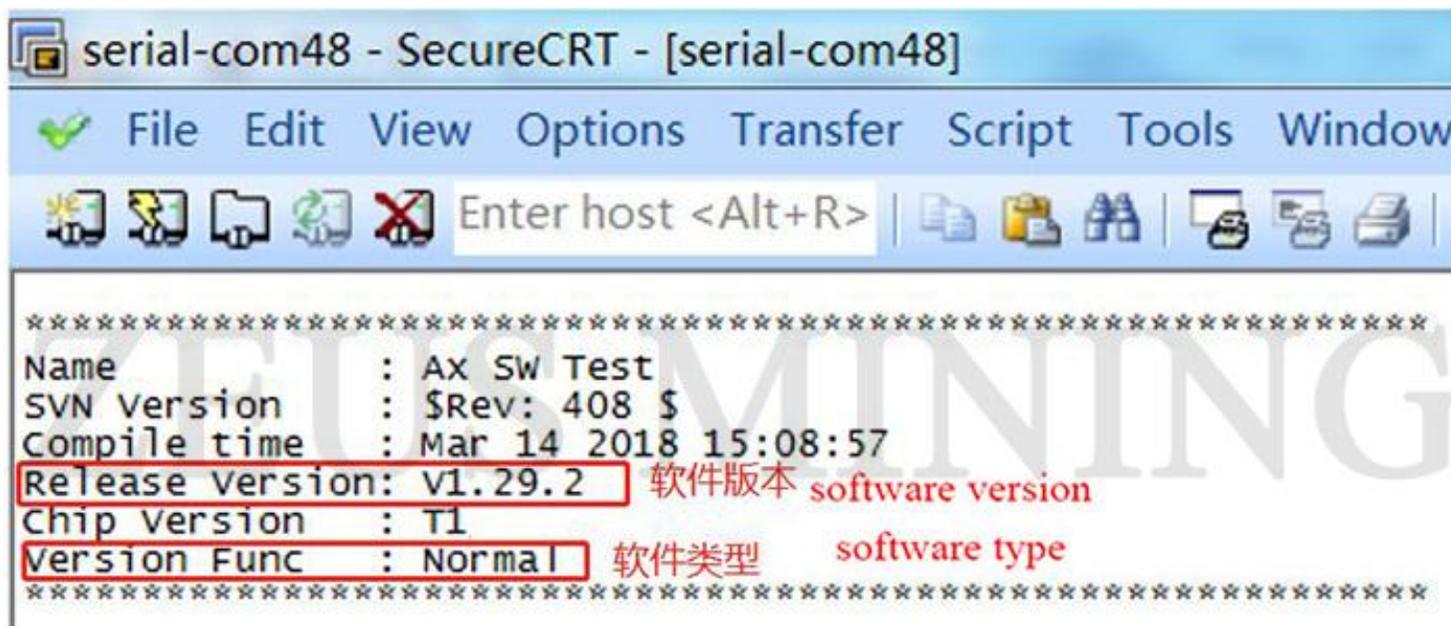
2. Test environment setup
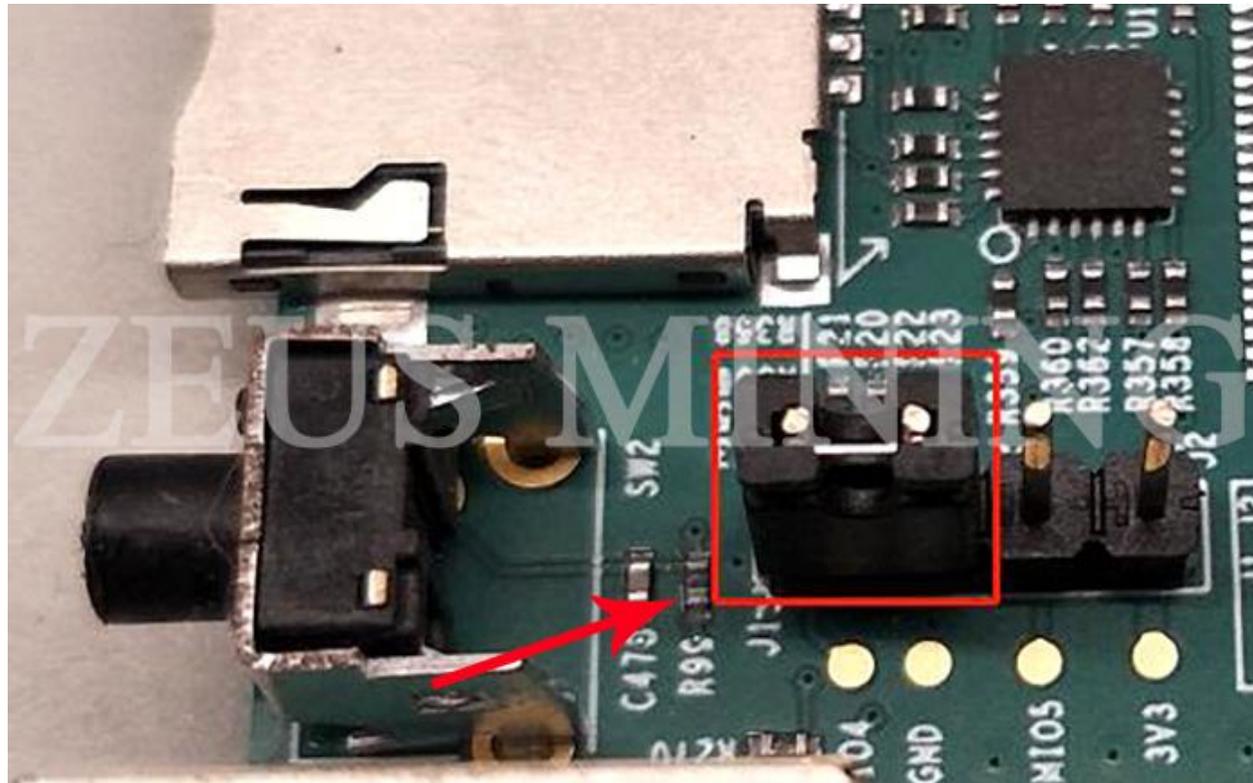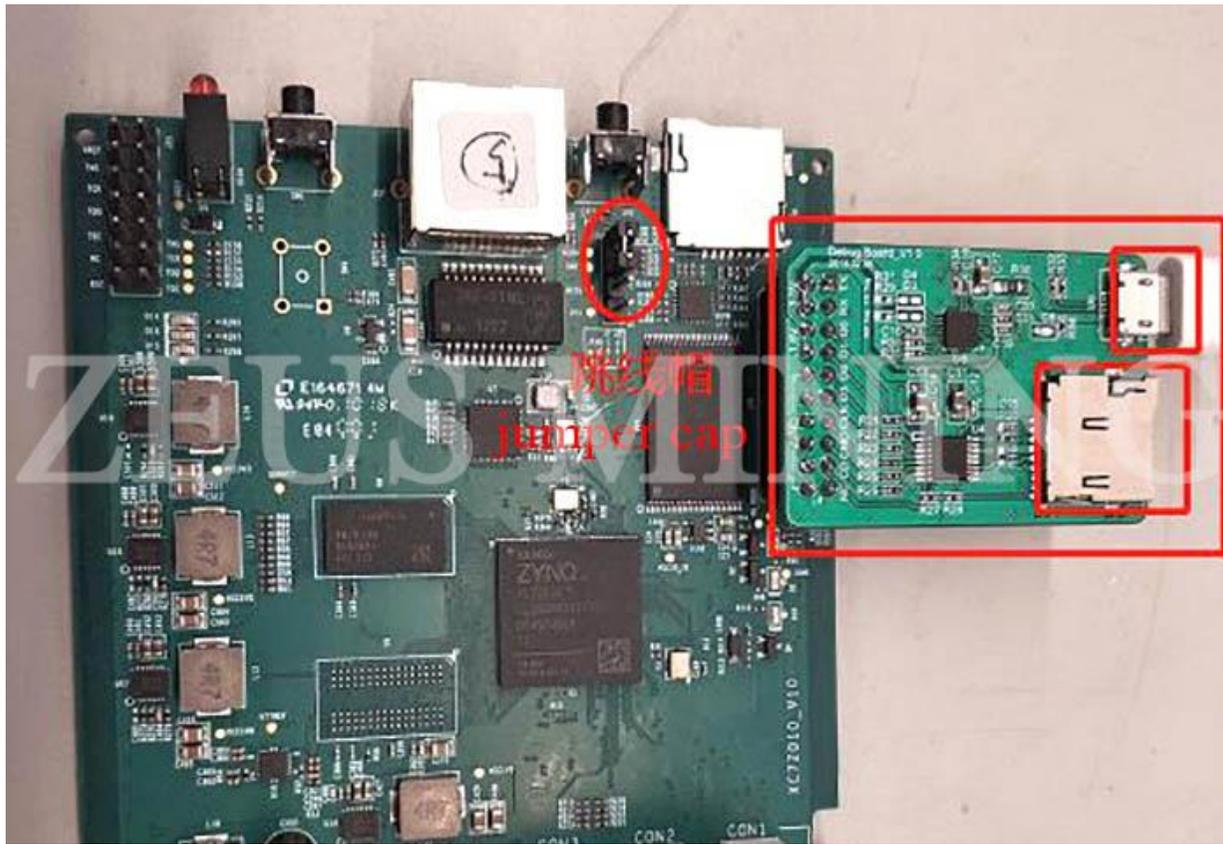
Take out the miner control board to be tested, insert the TF card into the control board and serial port board according to the position shown in the figure, and insert the jumper cap into the interface shown in the figure.

Connect the serial board and the computer with a data cable.

3. Hash board layout and test points

1) The two adjacent chips in the figure are a voltage domain [(1,2), (3,4), ... (67,68)], a total of 34 voltage domains, and the voltages of the two chips in each voltage domain are the same, the average voltage domain is 0.40 - 0.43V.

2) There are multiple test point signals between every two chips, and the name of the test signal is printed next to each test point. The test

point between the two chips tests the signal between the two chips.

对应测试点的信号名称

Signal name corresponding to the test point
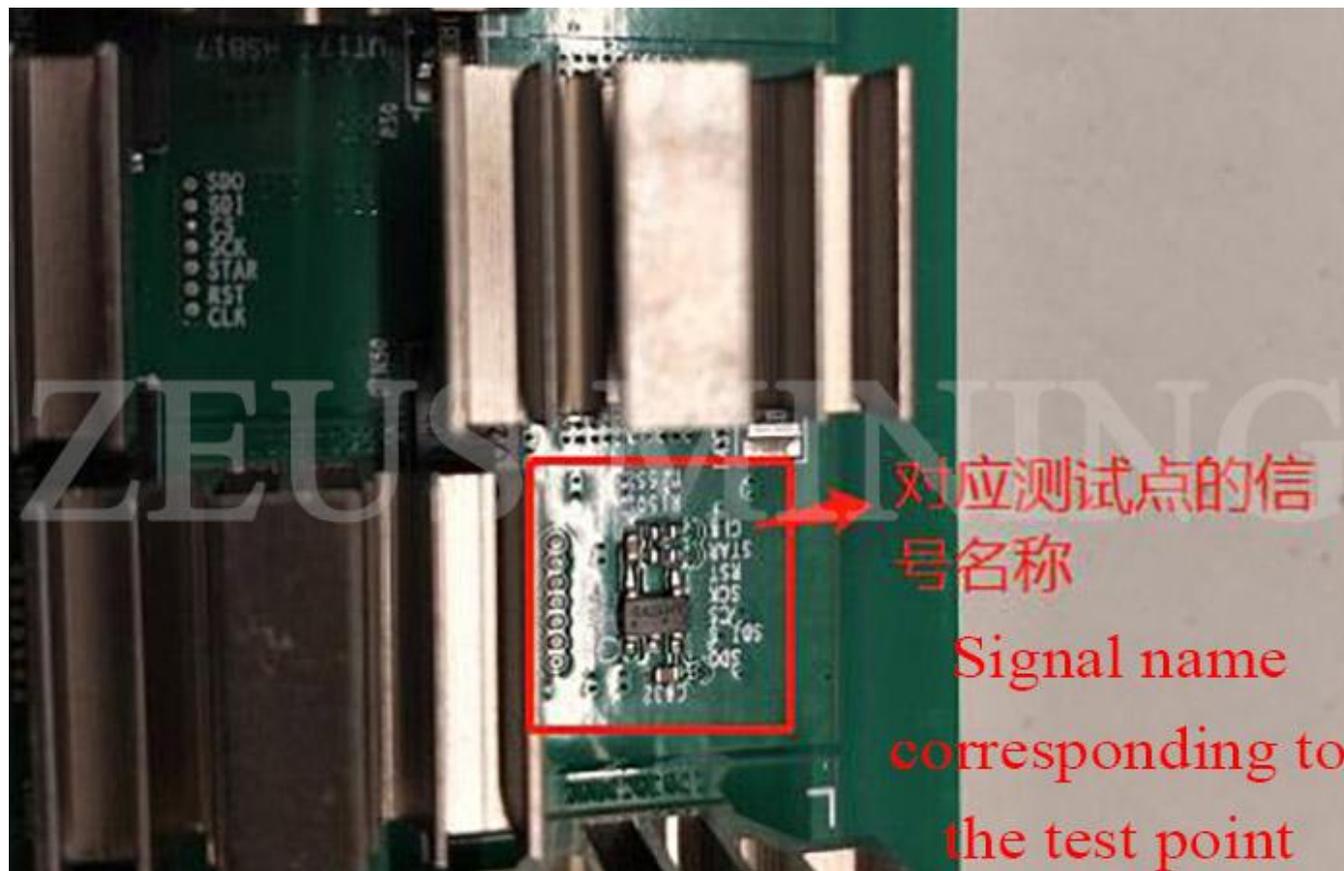
3) Test point and connection relationship between front and rear chips.
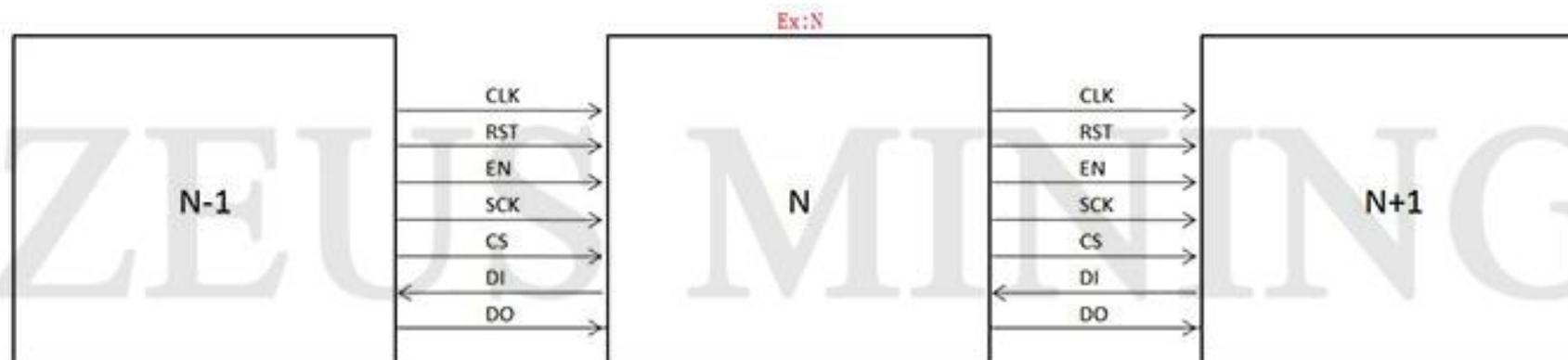
II. Positioning error

Use a TF card with Normal test software and run SecureCRT.exe after powering on to locate the error. The Normal test software can test up to 8 hash boards, but it is recommended to measure with the whole miner as a unit. The test results will be displayed after all hash boards have been tested.

The test software is divided into 9 categories according to the known error types, as shown in the following table.

1. Type of error

Mark	Describe	Remark
E0	CHIP_TYPE not found	Chain failure
E1	The number of cores on a single chip < chip core*30%	Statistics under working frequency
E2	The total number of cores on the board<total core*90%	Statistics under working frequency
E3	Single chip softbit error rate ⩾ 99%	
E4	The chip on the board has a PLL and is not locked	
E5	Chip temperature exceeds [-40, 125]	Software report 9999 or -9999
E6	1. The chip's voltage is less than 0.38V at the default frequency, and the PLL is not locked. 2. The chip's voltage is more significant than 0.6V at the default frequency. 3. The chip's voltage is more significant than 0.6V or less than 0.38V at the operating frequency.	

E7	command return failed	"E7::0" means PLL configuration failed
E8	On-board chip softbist total error rate > 50%	

Suppose there is no problem in the detection, print " √ . " Otherwise, print "×." The software will report the error type with the highest priority when a problem is detected. The error priority order is: E0 > E6 > E4 > E7 > E5 > E3 > E1 > E2 > E8. This report can guide maintenance and replacement.

2. The maintenance special program locates the broken chain position

Copy the provided repair.bin into the TF card and insert it into the serial board. Connect the power supply and data cable (no fan is required) and then power on. Cooperate with the Normal software to report the error message, and measure the test points of the relevant chip and its adjacent chips.

III. Maintenance methods

1. E0: xx

If the xx chip is 1, first measure the total input voltage: use a multimeter to measure the upper and lower columns with the energy interface, which is the total input voltage. The reasonable range of the total voltage is 13.8-16V.
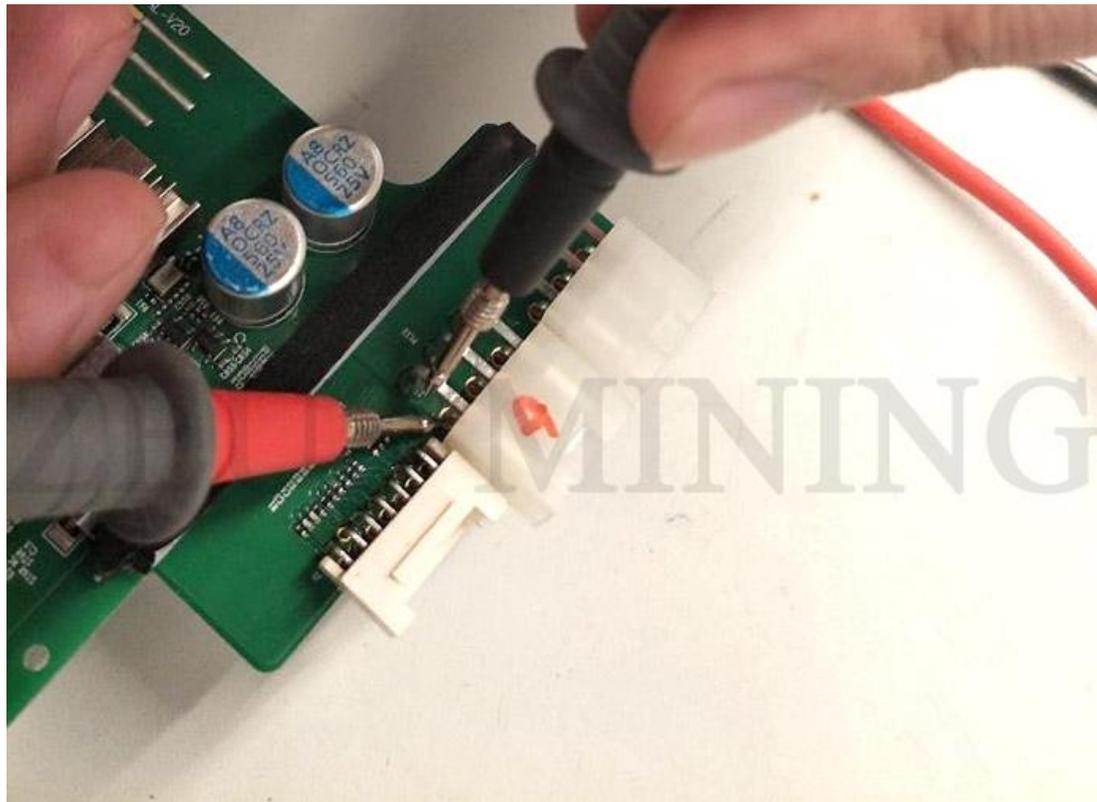
If the xx chip is equal to 63, then check whether the 63rd chip is soldered or abnormal.

Other cases require the use of maintenance-specific procedures to assist with positioning. Insert the TF card with repair.bin into the serial board, power on, connect the hash board SPI cable and power cable and tap the Reset button on the control board once. At this time, you need to use a multimeter to measure the abnormal chip voltage, and The oscilloscope measures the signal of the Nth and N-1th chips. If the N-1th chip outputs SDO / CS / SCK abnormally (it can be compared with the normal waveforms of the chips before the N - 1th; if the waveforms are inconsistent, it is abnormal), Then replace the N - 1th chip; if the output of the Nth chip is abnormal, then replace the Nth chip. If the output of the Nth chip is normal, but the input SDI is abnormal, then replace the N+1th chip.
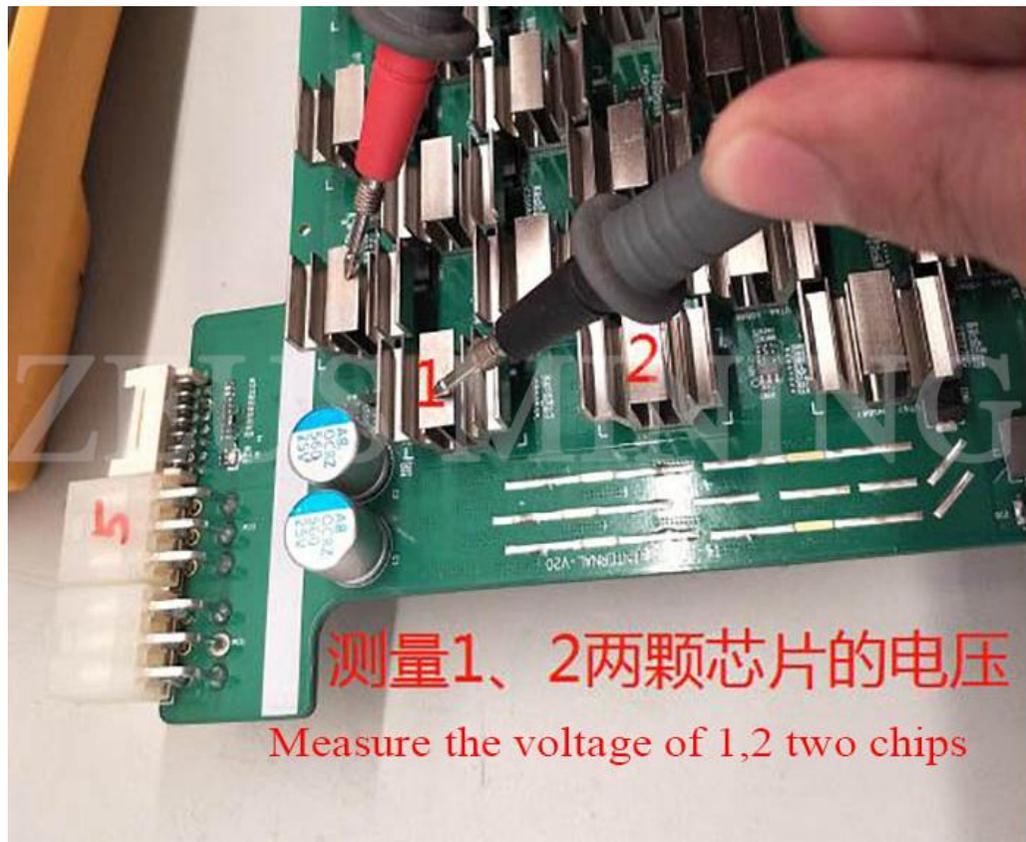
测量1、2两颗芯片的电压

Measure the voltage of 1,2 two chips

测量3,4两颗芯片的电压

Measure the voltage of 3,4 two chips

测量67,68两颗芯片的电压

Measure the voltage of 67,68 two chips

示波器测量信号

Oscilloscope measurement signal

夹子夹住电源接口的柱子

The clip clamps the post of the power

探针接触对应信号测试点

The probe touches the test point corresponding to the signal

2. E1: xx

The xx chip has fewer cores; replace the chip.

3. E2

There are few total cores on the board. Check whether the total voltage of the hash board is abnormal (refer to the method in E0 error). If there is no abnormality, you need to send the board to the nearest repair center for repair.

4. E3: xx

The xx chip has a high softbist error rate, so replace the chip.

5. E4: xx

The xx chip PLL is not locked; replace the xx chip.

6. E5: xx

The temperature of the xx chip exceeds the standard, and the chip should be replaced.

7. E6: xx

The voltage of the xx chip is abnormal. After measuring the voltage of the same - level chip where the chip is located, confirm to replace the chip or the same - level chip (the measurement method is the same as E0, measure the SCK signal of the three chip test points of this level, and replace the chip whose SCK frequency jitters).

8) E7: xx

Indicates that the PLL cannot be configured, and the chip should be replaced. When the PLL cannot be configured, the startup voltage can be appropriately increased to test whether the hash board can adequately configure the PLL.

9) E8

The whole board has a high softbist error rate. Detect whether the hash board voltage and the clock of each chip are abnormal, and replace the abnormal chip. If there is no abnormality, the board needs to be sent to the nearest repair center.

This maintenance plan is only used for the initial location of the abnormality of the hash board, and it must be changed after the hardware measurement is confirmed after the abnormality occurs.

A5 DEVICE INFORMATION
(32 Pins in total, xxW xxA max rating, Top View)

Left pin	#		#	Right pin
Sck_L	1		32	Clock_L
Sck_S_L	2		31	Clock_S_L
Cs_L	3	VDD_CORE	30	Resetn_L
Cs_S_L	4		29	Resetn_S_L
Sdo_L	5		28	Start_En_L
Sdi_L	6		27	Start_En_S_L
Sdi_S_L	7		26	VSS_IO
Clk_Mux_L	8		25	VDD_IO
VSS_IO	9		24	VDD_LDIN
VDD_IO	10		23	EQ_CTL0
Test_En	11	GND	22	EQ_CTL1
Sdo_R	12		21	IO_Mux_L
Sdi_S_R	13		20	IO_Mux_R
Sdi_R	14		19	Start_En_R
Cs_R	15		18	Resetn_R
Sck_R	16		17	Clock_R

Figure 3-1 Chip package