WhatsMiner Hydro-Cooling Miner

Repair Manual

V1.0

Shenzhen MicroBT Electronics Technology Co., Ltd..

Forward

About this Document

This Document introduces repair methods for hydro-cooling miners （M54&64 series）. All pictures and other information are merely for illustrative purposes.

Symbol instruction

Symbol	Instruction
	Provides additional information to supplement the text.

Revision history

Version	Revision Content	Release Time
V1.0	First release	20260109

Legal information

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1. Repair Environment Setup and Tooling Requirements

The following content briefly introduces information related to environmental setup and tool requirements.

1.1 Test Program

You need to use Mobxterm for testing. If you do not have this program, please contact our after-sales personnel.

1.2 Test Command

The following content introduces test commands.

Hashboard test:	ft-readchipid
First 9 groups LDO power on:	echo 1 > /sys/class/gpio/gpio263/value
test cable connect to slot0, 1:	
RST set to 1.2 V:	echo 1 > /sys/class/gpio/gpio201/value
RST set to 0 V:	echo 0 > /sys/class/gpio/gpio201/value
test cable connect to slot2, 3:	
RST set to 1.2 V:	echo 1 > /sys/class/gpio/gpio202/value
RST set to 0 V:	echo 0 > /sys/class/gpio/gpio202/value

1.3 Test Fixture CB

The test fixture CB (Control Board, abbreviated as “CB”) is a hydro-cooling miner CB (CB4/CB5/CB6).

The test fixture CB is identical to the one adopted in M63 series; meanwhile, the test firmware deployed for the test fixture is also consistent with that used in the M63 series.

Note: The self-contained CB associated with M54&64 series cannot be flashed, and thus cannot be repurposed as a repair test fixture.

1.4 Test Cable

The test cable is a hydro-cooling miner original cable.

1.5 Fixture CB Connection

The following figure shows a connection method of a fixture CB.

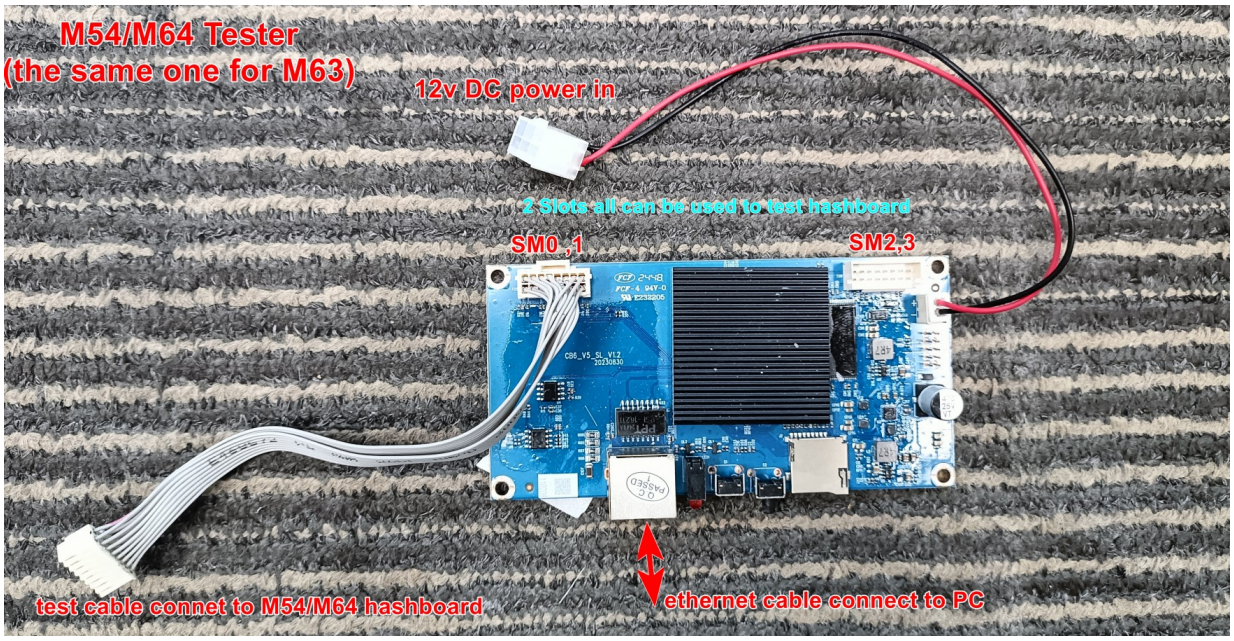


Figure 1-1

1.6 Power Supply Requirements

- Hashboard Power Supply Calculation Rule

Test voltage = 0.31 V × Total number of voltage domains of hashboard

Example: Slot 0 and Slot 1 each contain 96 chips, totaling (96 × 2 = 192) chips. Since 3 chips correspond to one voltage domain, the total number of voltage domains is (192 / 3 = 64). The calculated test voltage is (0.31 × times 64 = 19.84 V), and it can be set to 20 VDC in practice.

- Fixture Control Board Power Supply Parameters

12 VDC, 2 A

1.7 Tools and Accessories

The following tools are required to perform the test and potential rework procedures:

- **Soldering/Rework**: Hot air rework station
- **Measurement Instruments**: Multimeter, and Oscilloscope
- **Hand Tools & Consumables**: Tweezers, Solder Paste, and Solder Flux

2. Introduction to Circuit Principle

2.1 Internal Structure

An external interface of a hydro-cooling miner (M54&M64 series) comprises the following modules: 1. Water Outlet, 2. Water Intake, 3. Ethernet Port (for network connection), 4. Type-C Interface (for firmware upgrade), 5. Power Port (for power input), 6. Control Board Cover.

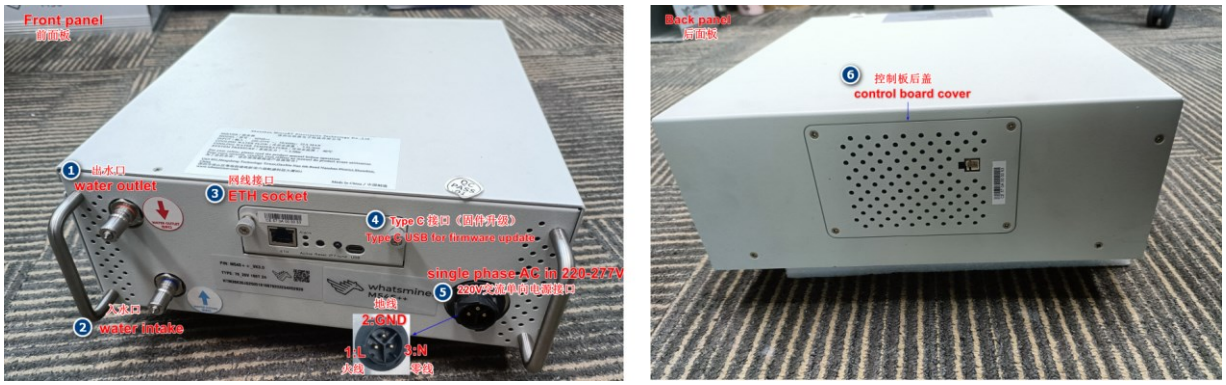


Figure 2-1

2.2 Chip Group Series-Connected Power Supply

The following picture illustrates that the 4 rows of chips on the hashboard are connected in a head-to-tail series configuration (arranged from top to bottom):

- The copper power rail at the upper left acts as the positive pole
- The copper power rail at the lower right acts as the negative pole

Note: The connection between the positive and negative poles forms the power supply circuit for the chip groups.

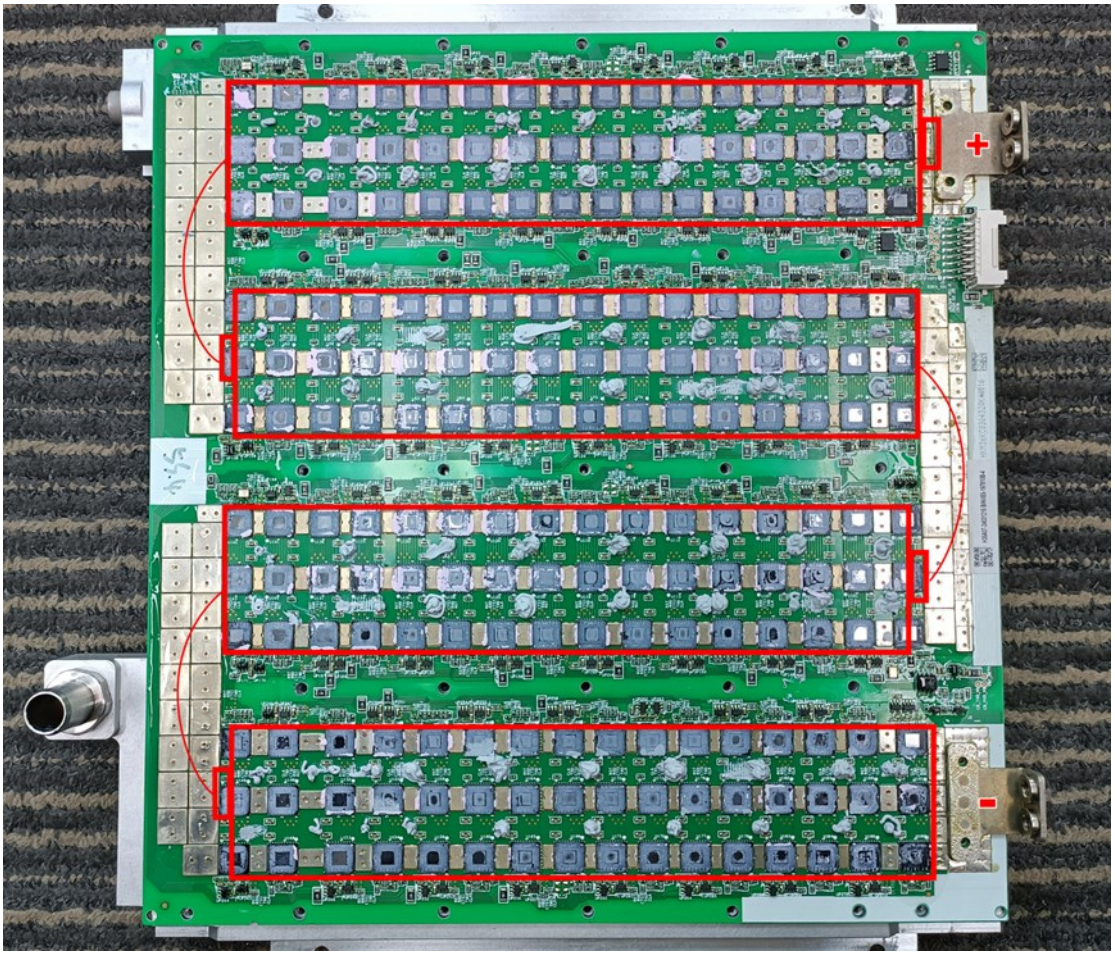


Figure 2-2

2.3 LDO Power Supply

Power Input for First 9 LDOs

The power input of the first 9 LDOs is provided by the control board. These LDOs remain inactive in the initial (pre-power-on) state. After executing the power-on command echo 1 > /sys/class/gpio/gpio263/value, the control board supplies 3.3 V voltage to the first 9 LDOs.

Power Input for Other LDOs

The input voltage of other LDOs comes from the positive pole of the ninth group chip, and is fed into the first pin of the LDO via a 4R7 resistor.

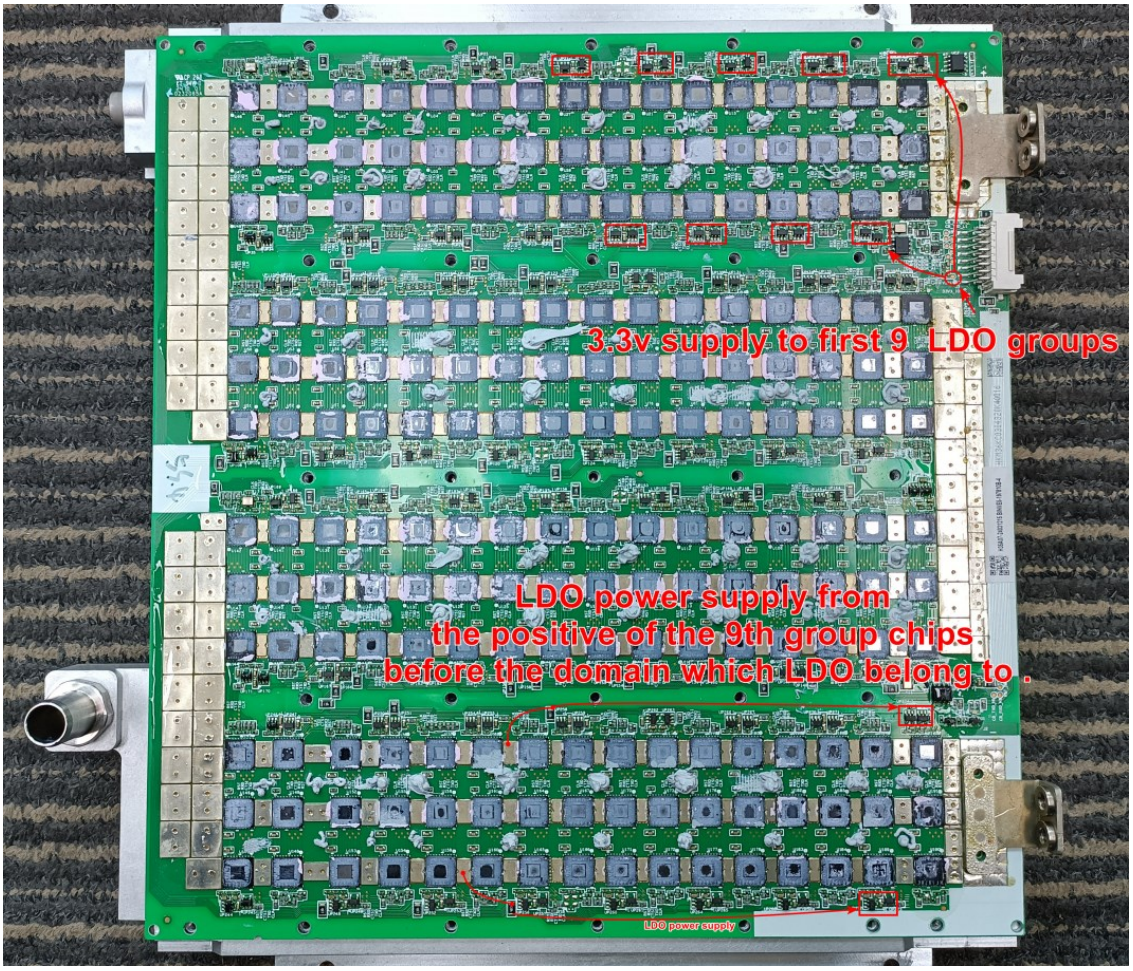


Figure 2-3

2.4 Signal Flow

A hashboard consists of SM0 and SM1 modules. Four core signals (RST, CLK, RXD, TXD) are transmitted on the hashboard, with the following flow logic.

- RST Signal

RST is a public signal. It enters through the first chip of SM0, passes through all chips in SM0, then exits SM0 and enters the first chip of SM1. After exiting the last chip of SM1, it drives an LED to indicate a high/low level state of the RST signal.

- CLK Signal

The CLK signal is generated by a crystal oscillator (each oscillator is responsible for signal transmission over a specific distance). As shown in the diagram, CLK signal needs to be inspected in segments.

- RXD Signal

The upper segment: Enters from the first chip and terminates at the last chip

The lower segment: Enters from the first chip and terminates at the last chip

The upper and lower segments operate independently.

- TXD Signal

The upper segment: Enters from the last chip and returns to the first chip

The lower segment: Enters from the last chip and returns to the first chip

The upper and lower segments operate independently.

Figure 2-4

Figure 2-5

2.5 Signal Routing Schematic Diagram for SM0 Slot

In the following two figures, the left figure shows a physical wiring layout of signals at the SM0 I/O port, which is a detailed wiring diagram of signals at SM0 I/O port. The right figure shows signal connections for each pin of the SM0 I/O port, which is a pin-level signal connection diagram for SM0 I/O Port.

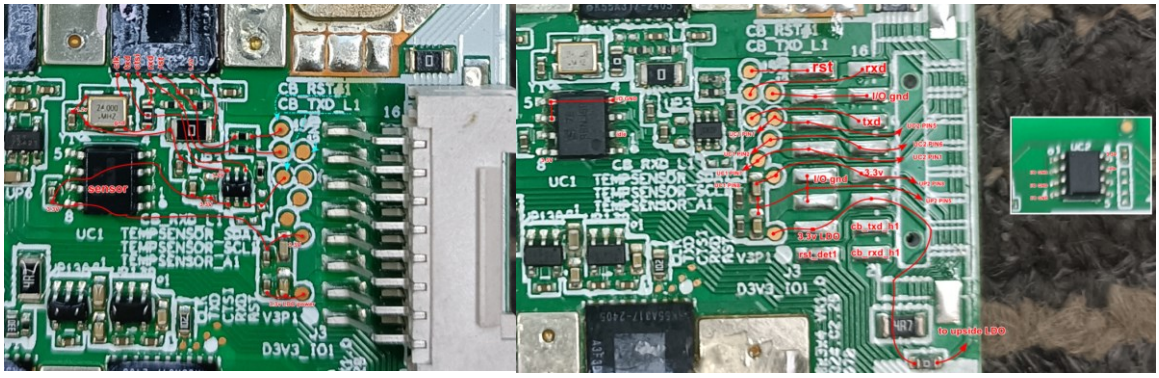


Figure 2-6

2.6 Signal Routing Diagram for SM1 Port

In the following figure, UP1 outputs 2.5 V voltage, which supplies power to a bidirectional level conversion chip (UP2). Simultaneously, UP2 converts RXD and TXD signals of slot1.

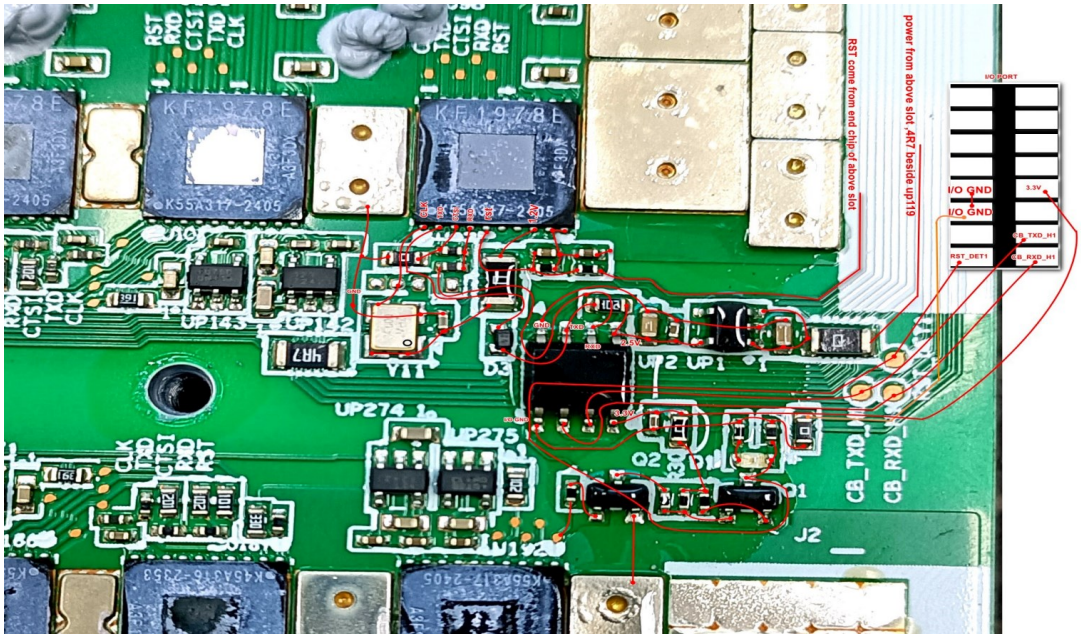


Figure 2-7

3. Disassembling and Assembling Steps

The following figures show disassembly and assembly steps of a hydro-cooling miner (M54&M64 series).

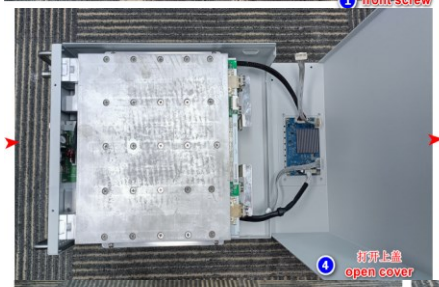
- **Disassembly**: Follow Steps 1 to 16 in sequence.
- **Assembly**: Follow the reverse order of Steps 1 to 16 (perform operations from Step 16 down to Step 1).

MicroBT

1 前面板螺丝
front screw

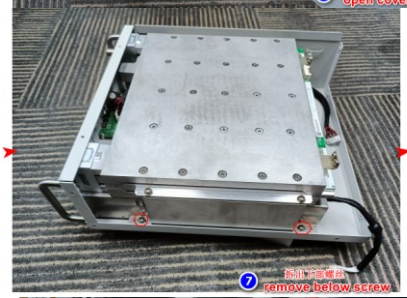
2 侧边螺丝
side screw

3 后边螺丝
back screw


4 打开上盖
open cover

5 拆卸工业电源铜柱
remove power rail

6

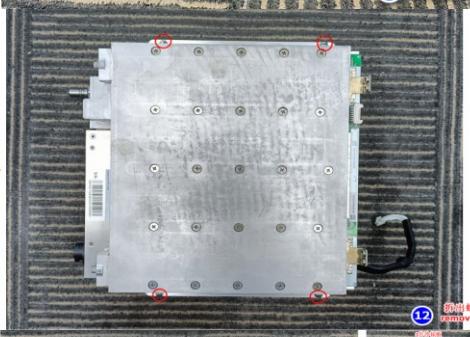

7 拆出下部螺丝
remove below screw

screw
screw
8 拆出上部螺丝
remove above screw

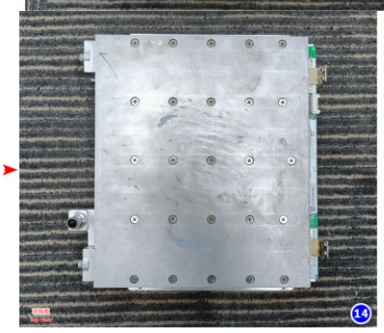
pull out toward right
整体向右移出
9

4颗螺丝
4 screws
6颗螺丝
6 screws
10 拆卸水路接口
remove joint

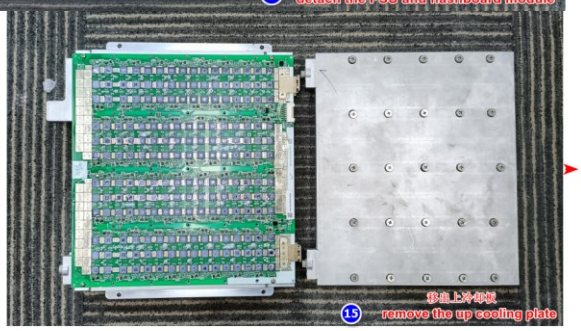
注意 密封圈不可丢失
Not missing the seal ring
11


12 拆掉螺丝
remove screw

13 分离PSU与算力板组件
detach the PSU and hashboard module


14

screw
cooling plate
hashboard


15 拆出上冷却板
remove the up cooling plate

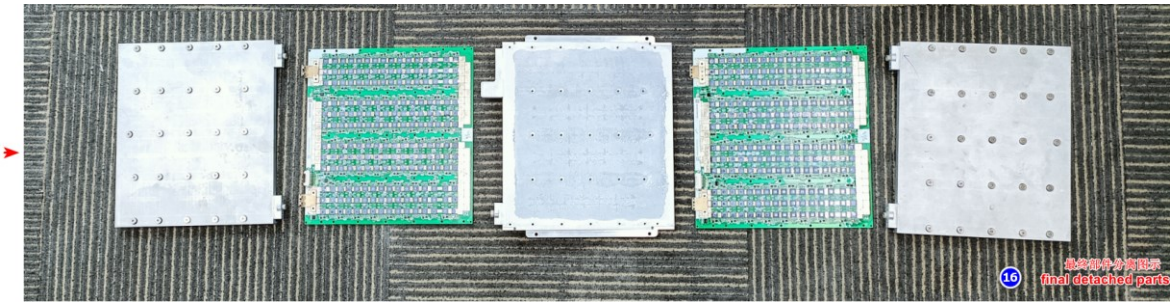


Figure 3-1

4. Installation Position of Hashboard

After opening a cover of a hydro-cooling miner (M54&M64 series), slots on the upper area correspond to SLOT 0 and SLOT 1, and slots on the lower area correspond to SLOT 2 and SLOT 3. Refer to the following figure for details.

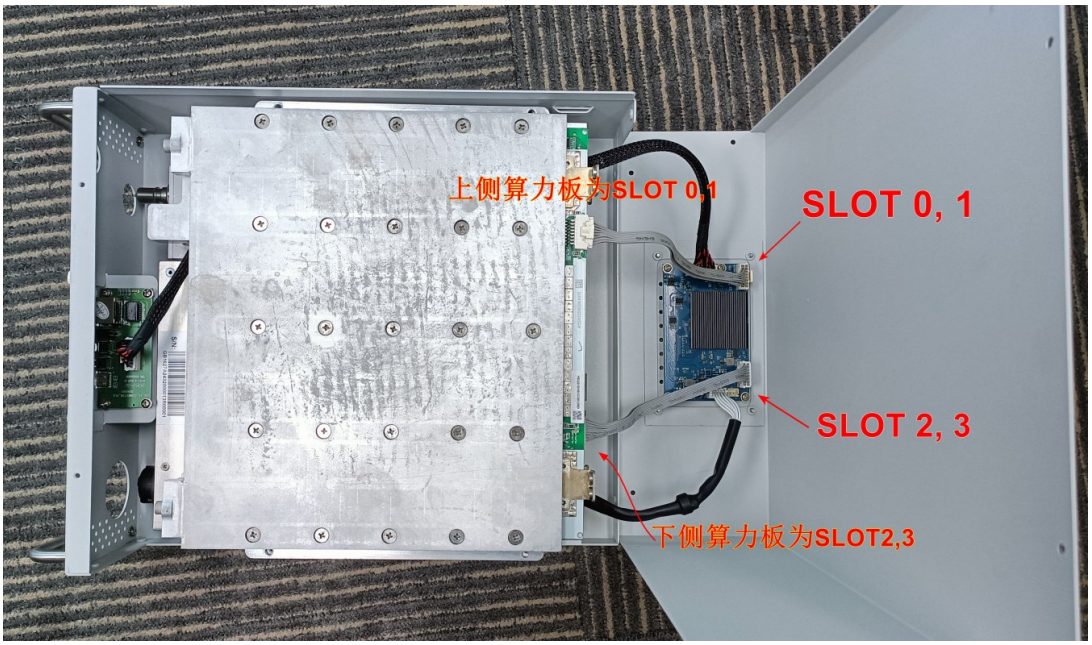


Figure 4-1

5. Maintenance Procedure

Step 1 Check whether the voltage output of each LDO is normal.

Step 2 Detect the RST signal of the entire board to ensure its proper function.

Step 3 Detect the CLK signal in sections to ensure its frequency is stable at 24 MHz.

Step 4 Check the RXD signal in two separate sections (top and bottom).

Step 5 Check the TXD signal in two separate sections (top and bottom).

6. Maintenance Case

During operation of a hydro-cooling, if an error code 560 (Fault Description: Loss Balance) occurs, troubleshoot as follows.

```
C52 freq:354 vol:236 temp:47 nonce:35 err:0 crc:8 x:0 / 7 repeat:0 pct: 0.0%/ 0.0%
C53 freq:354 vol:234 temp:46 nonce:34 err:0 crc:5 x:0 / 9 repeat:0 pct: 0.0%/ 0.0%
C54 freq:358 vol:231 temp:47 nonce:42 err:0 crc:5 x:0 / 9 repeat:0 pct: 0.0%/ 0.0%
C55 freq:354 vol:234 temp:48 nonce:37 err:0 crc:9 x:0 / 8 repeat:0 pct: 0.0%/ 0.0%
C56 freq:354 vol:234 temp:46 nonce:49 err:0 crc:13 x:0 / 8 repeat:0 pct: 0.0%/ 0.0%
C57 freq:354 vol:235 temp:48 nonce:50 err:0 crc:9 x:0 / 9 repeat:0 pct: 0.0%/ 0.0%
C58 freq:354 vol:236 temp:48 nonce:43 err:0 crc:11 x:0 / 9 repeat:0 pct: 0.0%/ 0.0%
C59 freq:354 vol:235 temp:48 nonce:42 err:0 crc:6 x:0 / 9 repeat:1 pct: 0.0%/ 0.0%
C60 freq:354 vol:364 temp:79 nonce:42 err:0 crc:1 x:0 /64 repeat:0 pct: 0.0%/ 0.0%
C61 freq:354 vol:326 temp:80 nonce:35 err:0 crc:0 x:0 /64 repeat:0 pct: 0.0%/ 0.0%
C62 freq:354 vol:326 temp:79 nonce:47 err:0 crc:0 x:0 /64 repeat:0 pct: 0.0%/ 0.0%
C63 freq:354 vol:326 temp:78 nonce:55 err:0 crc:1 x:0 /64 repeat:0 pct: 0.0%/ 0.0%
C64 freq:354 vol:328 temp:79 nonce:45 err:0 crc:1 x:0 /64 repeat:0 pct: 0.0%/ 0.0%
C65 freq:354 vol:328 temp:79 nonce:44 err:0 crc:1 x:0 /64 repeat:0 pct: 0.0%/ 0.0%
C66 freq:354 vol:329 temp:79 nonce:42 err:0 crc:2 x:0 /64 repeat:0 pct: 0.0%/ 0.0%
```

Figure 6-1

In the above figure, VOL represents operating voltage of a chip, and a VOL value changes abruptly starting from C60. For the hydro-cooling miner that has been taken out from a cabinet, you can measure a LDO output pin PIN5 of a chip group where a hashboard U61 is located with a multimeter. Then you may find that the voltage is too low, and usually, it is because a certain chip within this chip group is faulty and pulling down the LDO output voltage. At this time, you can identify this faulty chip and replace it.

7. Precautions

- Before disassembling a hydro-cooling miner (M54&M64 series), you need to use an air pump to drain liquid inside cooling plates completely.
- After repair the hydro-cooling miner and passing the performance test, you need to use an air pump to drain the liquid inside the cooling plates completely again.