



# **BF7264B+ MIPI M-PHY analyzer UFS2.1**

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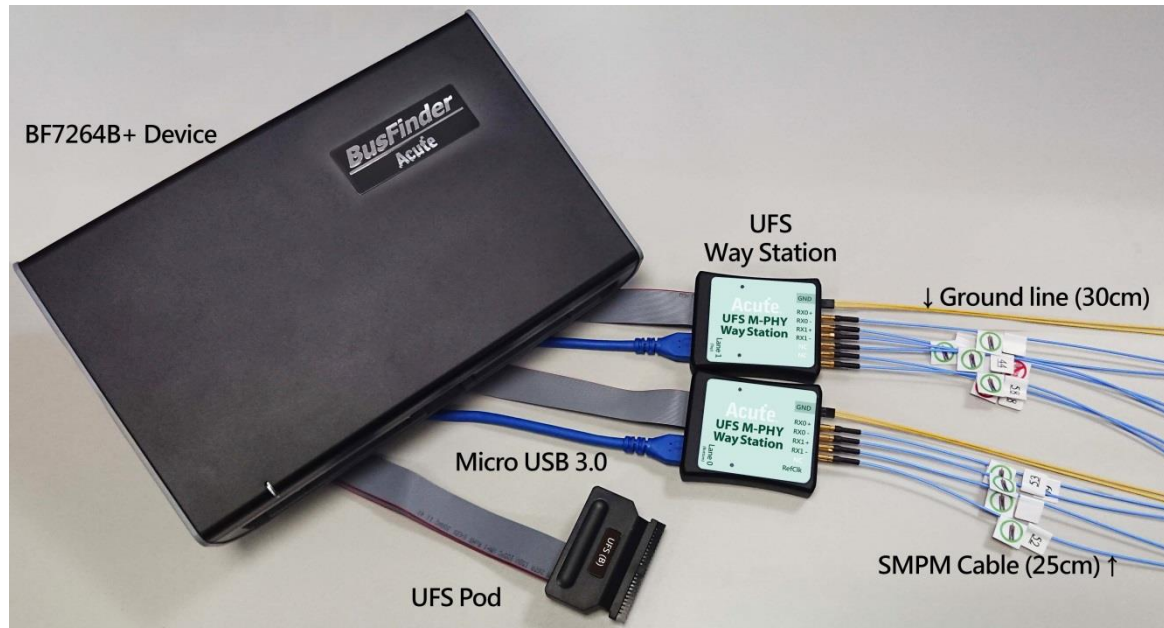
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## Feature:

The BF7264B+ is an MIPI M-PHY UFS2.1 analyzer (Support to UFS3.1 command) and offers other protocol analyzer options like eMMC5, NAND flash, SD3, SD4 or MIPI D-PHY(DSI, CSI) as its predecessor, the BF7264B.

## Specifications:

### 1. BF7264B+, 32Gb RAM, MIPI M-PHY UFS2.1 Probes



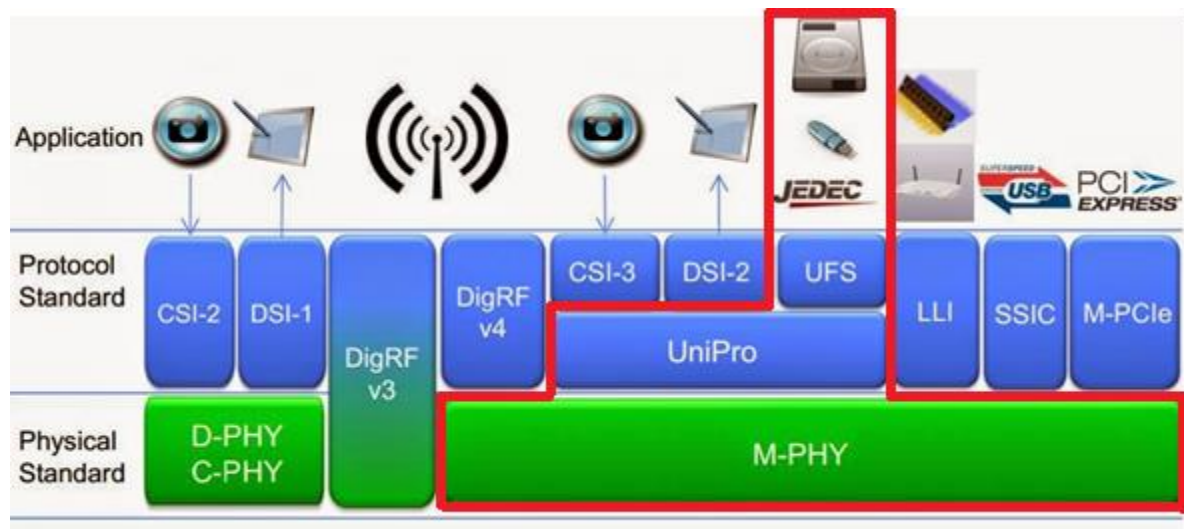
### 2. Fully supports MIPI M-PHY UFS2.1, and support UFS3.1 commands.

MIPI M-PHY 3.0, Up to 5.8Gbps, 2 Lanes

MIPI Unipro 1.8

JEDEC UFS 2.1 Gear 3, Rate A / B

JEDEC UFS 3.1 commands



### 3. Can simultaneously display Unipro or UFS protocol packet data in tabular form, including command parsing

Timestamp (mills.ms.us.ns dur)

Host

Device

Seq. #C

11:29:31.586.787.079 170.1...

Start of Burst

11:29:31.586.787.086 6.66ms

Filler(2x)

11:29:31.586.792.809 5.72us

AFC TCO CReq=0

06

11:29:31.586.798.598 5.78us

Filler(2x)

11:29:31.586.804.347 5.74us

AFC TCO CReq=0

06

11:29:31.586.810.097 5.74us

Filler(2x)

11:29:31.586.815.833 5.73us

AFC TCO CReq=0

06

11:29:31.586.821.609 5.77us

Filler(2x)

11:29:31.586.827.315 5.70us

Data Frame TCO

11:29:31.586.879.120 51.80

EOF EVEN

17

11:29:31.586.884.876 5.75us

End of Burst

11:29:31.586.884.883 6.66ms

Filler(2x)

11:29:31.586.990.931 114.0...

PREPARE

11:29:31.587.027.862 28.93...

Start of Burst

11:29:31.587.027.868 6.66ms

Filler(4x)

11:29:31.587.032.528 4.65us

AFC TCO CReq=0

17

11:29:31.587.041.770 9.23us

Data Frame TCO

11:29:31.587.051.293 9.51us

STALL

11:29:31.587.106.624 55.34...

EOF EVEN

07

11:29:31.587.111.270 4.64us

Data Frame TCO

11:29:31.587.152.959 41.68...

EOF EVEN

08

11:29:31.587.157.592 4.63us

Filler(4x)

11:29:31.587.175.584 17.98...

PREPARE

11:29:31.587.208.560 32.97...

End of Burst

11:29:31.587.208.567 6.66ms

Filler(2x)

11:29:31.587.244.577 96.00...

STALL

11:29:31.587.371.111 126.5...

Start of Burst

11:29:31.587.371.117 6.66ms

Filler(2x)

11:29:31.587.376.897 5.77us

AFC TCO CReq=0

07

11:29:31.587.382.630 5.73us

Filler(2x)

11:29:31.587.388.379 5.74us

AFC TCO CReq=0

07

11:29:31.587.394.142 5.76us

Filler(2x)

11:29:31.587.399.918 5.77us

AFC TCO CReq=0

07

11:29:31.587.405.654 5.73us

Filler(2x)

11:29:31.587.411.403 5.74us

AFC TCO CReq=0

08

11:29:31.587.417.166 5.76us

Filler(2x)

11:29:31.587.422.942 5.77us

AFC TCO CReq=0

08

11:29:31.587.428.705 5.76us

Data Frame TCO

11:29:31.587.480.510 51.80...

EOF EVEN

18

11:29:31.587.486.266 5.75us

Filler(2x)

11:29:31.587.492.002 5.73us

End of Burst

11:29:31.587.492.009 6.66ms

Filler(2x)

11:29:31.587.603.491 111.4...

PREPARE

Timestamp

Host

Device

Seq. #C

2.824.603.474 803.56us

QREQ(READ FLAG)

QRESP(READ FLAG) (Su...

2.824.803.614 200.13us

2.825.610.440 806.82us

QREQ(READ FLAG)

QRESP(READ FLAG) (Su...

2.825.816.500 206.05us

2.826.617.393 800.89us

QREQ(READ FLAG)

QRESP(READ FLAG) (Su...

2.826.817.846 200.45us

2.827.624.342 806.49us

QREQ(READ FLAG)

QRESP(READ FLAG) (Su...

2.827.830.785 206.44us

2.828.631.308 800.52us

QREQ(READ FLAG)

QRESP(READ FLAG) (Su...

2.828.832.105 200.79us

2.829.639.301 806.19us

QREQ(READ FLAG)

QRESP(READ FLAG) (Su...

2.829.845.100 206.79us

2.830.645.253 800.18us

QREQ(READ FLAG)

QRESP(READ FLAG) (Su...

2.830.846.393 201.13us

2.831.652.216 805.82us

QREQ(READ FLAG)

QRESP(READ FLAG) (Su...

2.831.859.332 207.11us

2.832.659.235 799.90us

CMD (TEST UNIT READY)

RESPONSE

D

2.832.860.692 201.45us

2.833.240.377 379.68us

QREQ(READ DESCRIPTOR)

QRESP(READ DESCRIPTO...

2.833.450.076 209.69us

2.833.827.315 377.23us

CMD (REQUEST SENSE)

REQUEST\_SENSE\_RESPON...

D

2.834.041.770 214.45us

2.834.111.270 69.49us

2.834.428.705 317.43us

CMD (START STOP UNIT)

RESPONSE

D

2.834.645.047 216.34us

2.835.441.380 796.33us

CMD (INQUIRY)

INQUIRY\_RESPONSE

D

2.835.647.220 205.83us

2.835.744.483 97.26us

2.836.062.902 318.41us

QREQ(READ DESCRIPTOR)

QRESP(READ DESCRIPTO...

2.836.276.064 213.16us

2.836.810.970 534.90us

QREQ(READ ATTRIBUTE)

QRESP(READ ATTRIBUTE...

2.837.023.105 212.13us

2.837.829.438 806.33us

QREQ(READ ATTRIBUTE)

QRESP(READ ATTRIBUTE...

2.838.034.361 204.92us

2.838.836.431 802.06us

QREQ(READ DESCRIPTOR)

QRESP(READ DESCRIPTO...

2.839.038.024 201.59us

2.839.486.686 448.66us

CMD (TEST UNIT READY)

RESPONSE

D

2.839.694.728 208.04us

2.841.782.943 2.08ms

CMD (REQUEST SENSE)

REQUEST\_SENSE\_RESPON...

D

2.841.788.047 5.10us

2.841.788.767 719.92ns

2.841.823.555 34.70us

QREQ(READ DESCRIPTOR)

QRESP(READ DESCRIPTO...

2.841.829.351 5.79us

Detail

Navigator

Hide Items

CMD (START STOP UNIT)

7 6 5 4 3 2 1 0 7 6 5 4 3 2 1 0 7 6 5 4 3 2 1 0

Transaction Code 0

Unipro

UFS

Deatil

4. Use 32Gb RAM as the buffer to stream all M-PHY data into the SSD HD in order to record all data flow from Low Power Mode to High Speed Mode.
5. “Data Filter” filters unwanted data to save memory.
6. “Search” searches specific data.
7. “CRC Packet” displays and counts CRC
8. D-PHY command statistics include numbers of packets, individual command, different data length, and errors

Navigator		
Discription	Txns	Bytes
▼ Unipro		
▶ L2	75570	
▼ L1.5	1488	
Start of Burst	275	
End of Burst	271	
End GT	0	
TRG_UPR0	24	
TRG_UPR1	784	
TRG_UPR2	120	
PACP_PWR_req	2	
PACP_PWR_cnf	2	
PACP_CAP_ind	4	
PACP_CAP_EXT1_ind	4	
PACP_CAP_EXT2_ind	2	
PACP_EPR_ind	0	
PACP_TEST_MOD...	0	
PACP_GET_req	0	
PACP_GET_cnf	0	
PACP_SET_req	0	
PACP_SET_cnf	0	
▶ L1	554	
▶ Error Packets	0	
Statistics		
▼ TRG_UPR2	120	
Host	114	
Device	6	

Navigator		
Discription	Txns	Bytes
▼ UFS		
SCSI Command	148	
UFS Protocol	610	
QUERY REQUEST	75	
QUERY RESPONSE	75	
TASK MANAGEMENT	0	
LUN	754	
TRANSFER LENGTH	129	
RESERVED		
Statistics		
CMD (TEST UNIT READY)	10	
CMD (READ (10))	129	
CMD (REQUEST SENSE)	7	
CMD (START STOP UNIT)	1	
CMD (INQUIRY)	1	

## 9. M-PHY command trigger

- Trigger parameters include commands and data in order to cover all kinds of packets.
- CRC Error, Unknown packet
- VCC drop, VCCQ2 drop
- The Trigger-Out port is to trigger a DSO to capture waveforms

☒ Trigger On

Trigger Item 1/8 Clear All

☐ Any UFS packets
 

☒ SCSI Command
 

☐ Any Command
 ☐ FORMAT UNIT
 ☐ INQUIRY
 ☐ MODE SELECT (10)
 ☐ MODE SENSE (10)
 ☐ PRE-FETCH (10)
 ☐ PRE-FETCH (16)
 ☒ READ (6)
 ☐ READ (10)
 ☐ READ (16)
 ☐ READ BUFFER

☐ Unknown Packet
 ☐ CRC ERR
 ☐ VCC Drop
 ☐ VCCQ2 Drop

READ (6)

7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0	
HD		DD		Transaction Code				Reserved	R Flag Bit	W Flag Bit	Reserved	CP		ATTR		
0		0		01h				X	X	X	Xh		X		Xh	
LUN								Task Tag								
XXh								XXh								
IID				Command Set Type				Reserved								
Xh				Xh				XXh								
Reserved								Reserved								
XXXXh								XXXXh								
EHS Length				Reserved				Reserved								
XXh				XXh				XXh								
Data Segment Length								Data Segment Length								
XXXXh								XXXXh								
Expected Data Transfer Length								Expected Data Transfer Length								
XXXXh								XXXXh								
Expected Data Transfer Length								Expected Data Transfer Length								
XXXXh								XXXXh								
OPERATION CODE				Reserved				LOGICAL BLOCK ADDRESS				LOGICAL BLOCK ADDRESS				
08h				Xh				XXh				XXh				
LOGICAL BLOCK ADDRESS								LOGICAL BLOCK ADDRESS								
XXXXh								XXXXh								
TRANSFER LENGTH				CONTROL				TRANSFER LENGTH				CONTROL				
XXh				XXh				XXh				XXh				
Reserved								Reserved								
XXXXh								XXXXh								
Reserved								Reserved								
XXXXh								XXXXh								
Reserved								Reserved								
XXXXh								XXXXh								
Reserved								Reserved								
XXXXh								XXXXh								
Reserved								Reserved								
XXXXh								XXXXh								

Default OK Cancel

## 9. Advanced usage of the report area

- a. Dual report correlation: Unipro and UFS reports are related to each other.

Double-click to track the corresponding data in another report area.

ex: Click the Unipro area report to link to the UFS corresponding report.

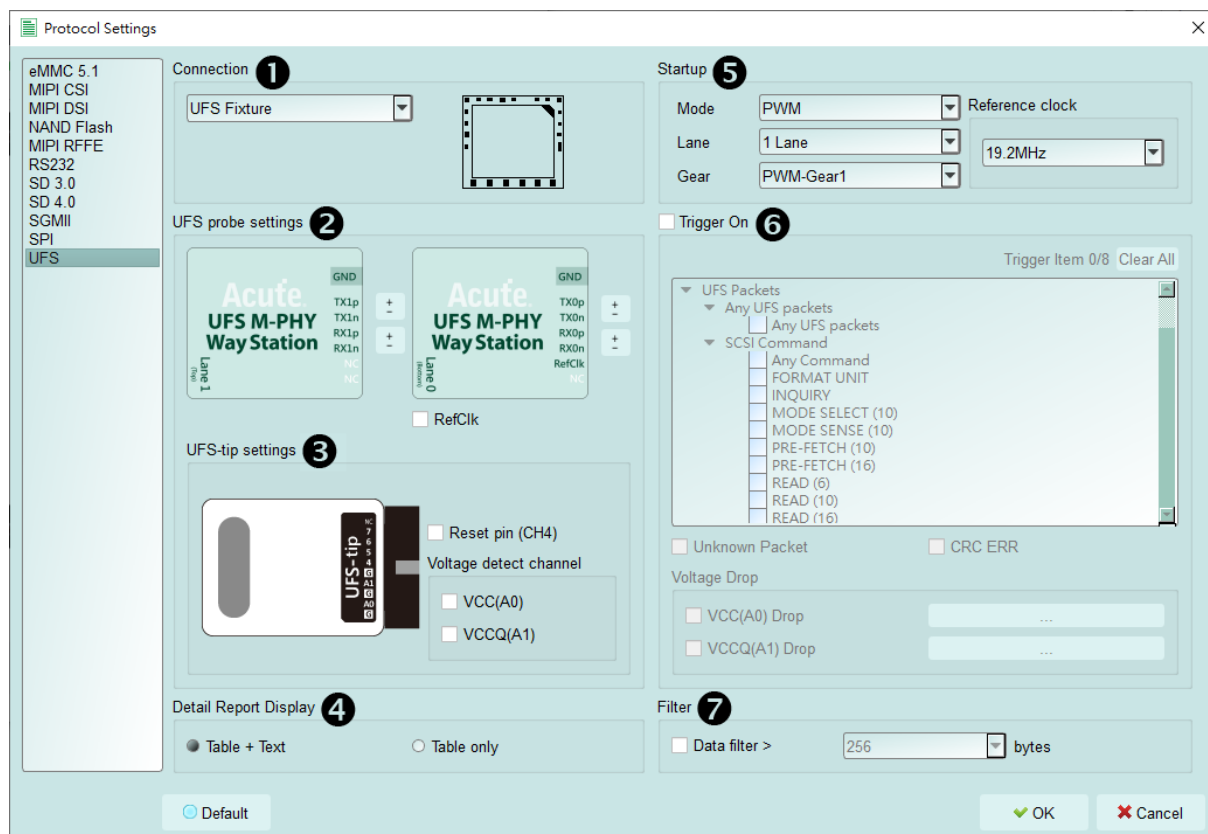
Timestamp (h:m:s.ms.us.ns dur)	Host	Device	Timestamp	Host	Device	Task Tag Data
1280	16:15:03.796.342.673 13.33..	Filler(2x)	2	16:15:03.783.717.515 0 (Ma...	NOP OUT	00 00 00 00 0
1281	16:15:03.796.342.703 29.99..	AFC TCO CReq=0	3	16:15:03.783.938.943 221.4...	NOP IN	00 20 00 00 0
1282	16:15:03.796.342.729 26.66..	Filler(2x)	4	16:15:03.792.935.487 9.99ms	CMD (TEST UNIT READY)	01 01 00 00 0
1283	16:15:03.796.342.756 26.66..	AFC TCO CReq=0	5	16:15:03.792.940.406 4.91us	RESPONSE	01 21 00 00 0
1284	16:15:03.796.342.783 26.66..	Filler(2x)	6	16:15:03.793.956.611 1.01ms	CMD (TEST UNIT READY)	02 01 00 00 0
1285	16:15:03.796.342.813 29.99..	AFC TCO CReq=0	7	16:15:03.793.960.581 4.36us	RESPONSE	02 21 00 00 0
1286	16:15:03.796.342.839 26.66..	AFC TCO CReq=0	8	16:15:03.793.985.555 24.67...	CMD (READ (10))	03 01 40 00 0
1287	16:15:03.796.342.893 53.32..	AFC TCO CReq=0	9	16:15:03.794.209.246 223.6...	DATA IN	03 22 00 00 0
1288	16:15:03.796.342.906 13.33..	EOF EVEN	10	16:15:03.794.238.410 29.16...	DATA IN	03 21 00 00 0
1289	16:15:03.796.342.919 13.33..	AFC TCO CReq=0	11	16:15:03.794.310.372 71.96...	CMD (READ (10))	04 01 40 00 0
1290	16:15:03.796.342.933 13.33..	Filler(6x)	12	16:15:03.794.372.383 62.01...	DATA IN	04 22 00 00 0
1291	16:15:03.796.342.976 43.32..	Filler(4x)	13	16:15:03.794.401.543 29.16...	RESPONSE	04 21 00 00 0
1292	16:15:03.796.343.029 53.32..	AFC TCO CReq=0	14	16:15:03.796.251.568 1.85ms	CMD (READ (10))	05 01 40 00 0
1293	16:15:03.796.343.056 26.66..	Filler(2x)	15	16:15:03.796.313.495 61.92...	DATA IN	05 22 00 00 0
1294	16:15:03.796.343.086 29.99..	AFC TCO CReq=0	16	16:15:03.796.342.659 29.16...	RESPONSE	05 21 00 00 0
1295	16:15:03.796.343.112 26.66..	Filler(6x)	17	16:15:03.796.342.107 19.44...	CMD (READ (10))	06 01 40 00 0
1296	16:15:03.796.343.306 193.3..	AFC TCO CReq=0	18	16:15:03.796.424.391 62.28...	DATA IN	06 22 00 00 0
1297	16:15:03.796.343.332 26.66..	Filler(2x)	19	16:15:03.796.453.551 29.16...	RESPONSE	06 21 00 00 0
1298	16:15:03.796.343.359 26.66..	AFC TCO CReq=0	20	16:15:03.796.491.171 37.61...	CMD (READ (10))	07 01 40 00 0
1299	16:15:03.796.343.386 26.66..	Filler(2x)	21	16:15:03.796.553.098 61.92...	DATA IN	07 22 00 00 0
1300	16:15:03.796.343.412 26.66..	AFC TCO CReq=0	22	16:15:03.796.592.262 29.16...	RESPONSE	07 21 00 00 0
1301	16:15:03.796.343.442 29.99..	Filler(6x)	23	16:15:03.796.592.559 10.29...	CMD (READ (10))	08 01 40 00 0
1302	16:15:03.796.342.107 18.66..	Data Frame TCO	24	16:15:03.796.655.115 62.55...	DATA IN	08 22 00 00 0
1303	16:15:03.796.342.354 246.6..	EOF EVEN	25	16:15:03.796.684.275 29.16...	RESPONSE	08 21 00 00 0
1304	16:15:03.796.362.381 26.66..	Filler(4x)	26	16:15:03.797.375.309 691.0...	CMD (READ (10))	09 01 40 00 0
1305	16:15:03.796.363.270 889.9...	AFC TCO CReq=0	27	16:15:03.797.450.942 75.63...	DATA IN	09 22 00 00 0
1306	16:15:03.796.363.324 53.32..	Filler(6x)	28	16:15:03.797.480.105 29.16...	DATA IN	09 22 00 00 0
1307	16:15:03.796.363.350 26.66..	AFC TCO CReq=0	29	16:15:03.797.509.266 29.16...	DATA IN	09 22 00 00 0
1308	16:15:03.796.363.407 56.66..	Filler(4x)	30	16:15:03.797.538.430 29.16...	DATA IN	09 22 00 00 0
1309	16:15:03.796.424.391 60.98...	Data Frame TCO	31	16:15:03.797.567.593 29.16...	DATA IN	09 22 00 00 0
1310	16:15:03.796.426.281 1.88us	EOF EVEN	32	16:15:03.797.596.754 29.16...	DATA IN	09 22 00 00 0
1311	16:15:03.796.426.307 26.66..	Data Frame TCO	33	16:15:03.797.625.918 29.16...	DATA IN	09 22 00 00 0
1312	16:15:03.796.426.681 373.2...	AFC TCO CReq=0	34	16:15:03.797.655.081 29.16...	DATA IN	09 22 00 00 0
1313	16:15:03.796.426.707 26.66..	Filler(2x)	35	16:15:03.797.684.242 29.16...	DATA IN	09 22 00 00 0
1314	16:15:03.796.426.734 26.66..	AFC TCO CReq=0	36	16:15:03.797.713.405 29.16...	DATA IN	09 22 00 00 0
1315	16:15:03.796.426.764 29.99..	Filler(2x)	37	16:15:03.797.742.566 29.16...	DATA IN	09 22 00 00 0
1316	16:15:03.796.426.791 26.66..	AFC TCO CReq=0	38	16:15:03.797.771.730 29.16...	DATA IN	09 22 00 00 0
1317	16:15:03.796.426.817 26.66..	Filler(2x)	39	16:15:03.797.800.893 29.16...	DATA IN	09 22 00 00 0
1318	16:15:03.796.426.844 26.66..	AFC TCO CReq=0	40	16:15:03.797.830.054 29.16...	DATA IN	09 22 00 00 0
1319	16:15:03.796.426.871 26.66..	AFC TCO CReq=0	41	16:15:03.797.859.218 29.16...	DATA IN	09 22 00 00 0
1320	16:15:03.796.426.827 56.66..	AFC TCO CReq=0	42	16:15:03.797.888.381 29.16...	DATA IN	09 22 00 00 0
1321	16:15:03.796.426.954 26.66..	AFC TCO CReq=0	43	16:15:03.797.917.542 29.16...	DATA IN	09 22 00 00 0
1322	16:15:03.796.427.011 56.66..	Filler(4x)	44	16:15:03.797.946.705 29.16...	DATA IN	09 22 00 00 0
1323	16:15:03.796.428.201 1.18us	EOF EVEN	45			

- b. Statistics list: Quickly categorize and track the location of data with statistical functions.

The screenshot displays the Acute BufFinder software interface. The main window shows a table of data with columns: Timestamp, Host, Device, Task, Tag, Data, and Info. A red box highlights a specific row in the table. To the right, a 'Navigator' panel is open, showing a tree view of the data structure. Below the table, a 'Statistics List' panel is visible, showing a list of statistics with columns: Line No., Timestamp, Host, and Device. A red arrow points from the highlighted row in the table to the 'Statistics List' panel.



## 10. UFS Settings



1. **Connection:** You need to select the connection method between BusFinder and the test object
2. **UFS way station Settings:** Exchange p/n of the same Lane. Ref-Clk Option can observe whether Ref-Clk is operating..
3. **UFS tip Settings:**
  - a. Can turn on the UFS Reset pin judgment, you need to connect the reset pin to the UFS tip CH4 position of the UFS probe,
  - b. Detect Voltage channel on A0 and A1
4. **Detail Report Display:** Add the detail report by using text description.
5. **Startup:** It needs to be set the mode of the DUT at the moment of capturing data and Reference clock(19.2 / 26 / 38.4 / 52 MHz). (It doesn't matter if the Ref-CLK is not connected, but its frequency must be set)
6. **Trigger On:** can set Unipro / UFS packets, a total of 8 groups, and Unknown Packet, CRC error trigger options, another two sets of voltage detection can be used,
7. **Filter:** After opening, it will filter out the data behind the packet greater than the set value



## FAQ

### 1. What UFS version is supported, any limitation for differential ports?

A: MIPI M-PHY 3.0, Up to 5.8Gbps, 2 Lanes

MIPI Unipro 1.8

JEDEC UFS 2.1 Gear 3, Rate A / B

JEDEC UFS 3.1 commands

### 2. Will the signal quality be affected during measurement?

A: The measurement of the external instrument will inevitably have some load effect. We use the SMPM Coaxial Cable connection to reduce the interference of the object to be measured and improve the signal quality.

### 3. Is Tx supported?

A: No

### 4. Precautions during measurement

#### a. Wiring problem:

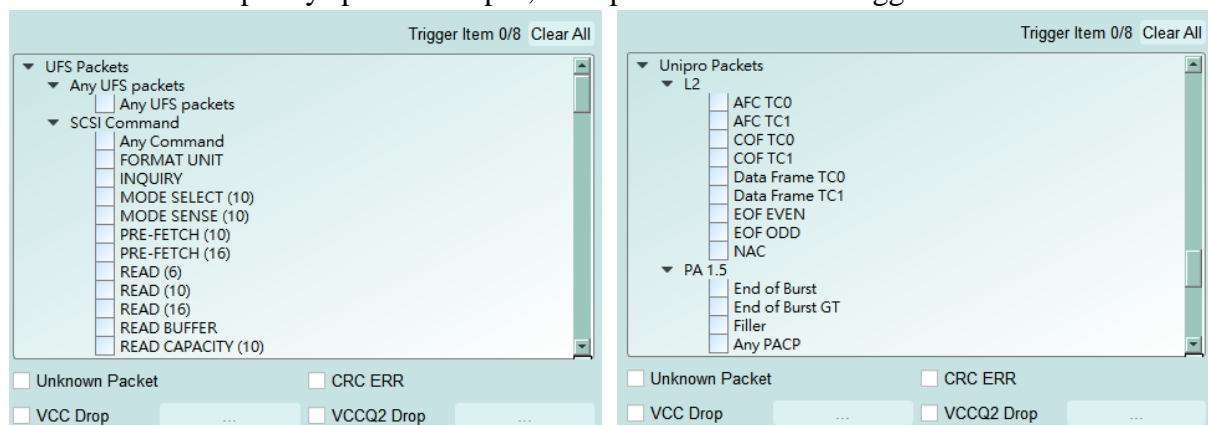
Please make sure to connection according to the “Probe and test object connection” on page 10. If the PWM is normal during measurement, but you cannot see any HS data or you can only go to 1 Lane and not 2 Lane, you should first check whether the wiring is wrong.

#### b. Reference clock setting method:

There are four options for Ref CLK 19.2MHz (default) / 26MHz / 38.4MHz / 52MHz in Settings. If it is not clear what the Ref CLK is used, refer to the following method. If the PWM is normal but the HS Data is wrong, please try to adjust the Ref CLK to others and try again.

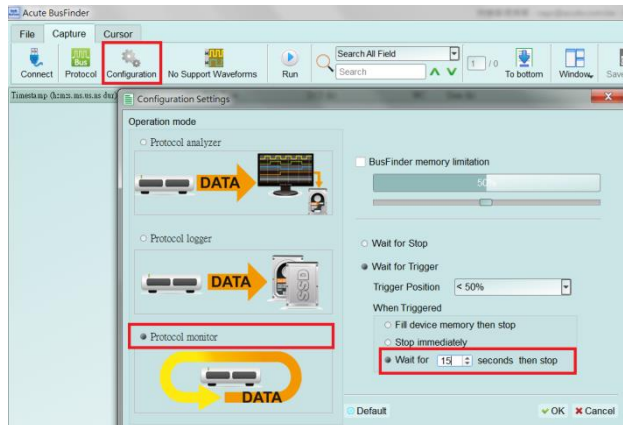
### 5. Can I specify a Unipro, UFS packet as the trigger point function?

A: You can specify specific Unipro, UFS packet or Error to trigger.



**6. Is it possible to set a Unipro, UFS starting point, and specify how much time to capture Data?**

A: You can set the starting condition to the trigger item and adjust to the data monitor mode in the working mode menu. And specify the length of acquisition time.

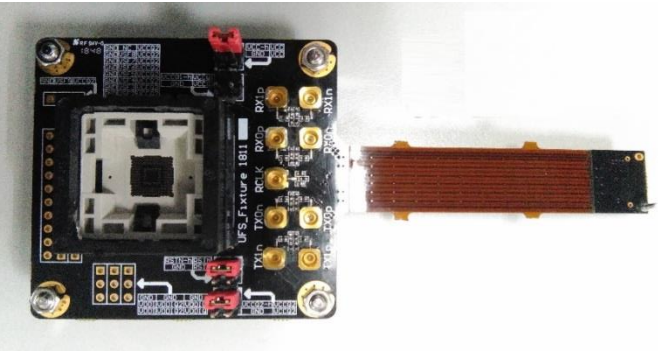
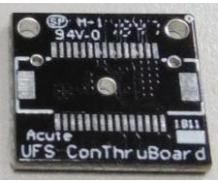
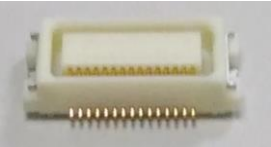


## Probe and test object connection

### a. Connect using UFS Fixture (connector)

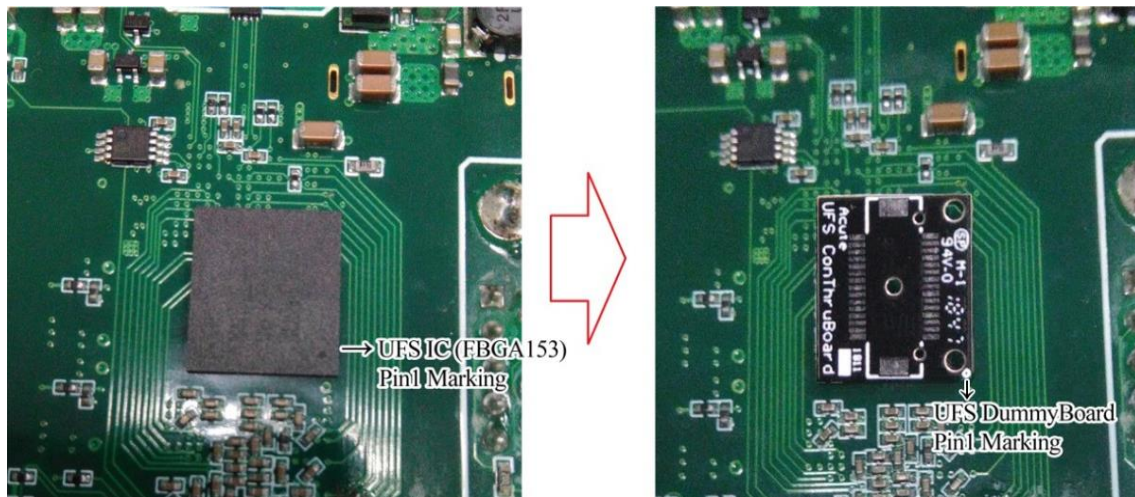
If the Host has multiple sets of connectors, it is convenient to replace the Host and UFS Chip, and directly use the SMPM Cable to connect to the Way Station without jumpers.

Since the connector uses a flexible cable to extend the signal, it is only suitable for applications where the peripheral components of the UFS Chip do not interfere.

Components	
1. Con Fixture	
2. Con Dummy Board	 0.3mm tin balls need to be planted on the back
3. Connector DF17-30DS-0.5V (HiRose Connector)	

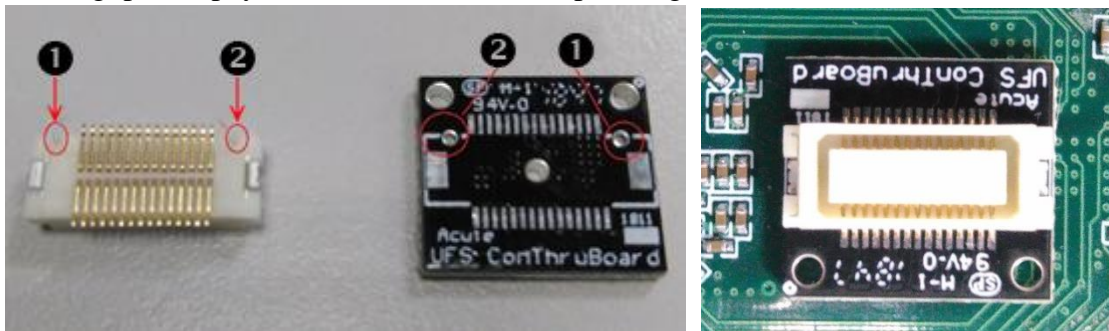
Step1: Remove the UFS chip on your DUT, and then rebuild the solder ball on your UFS chip.

Step2: Welding the connector to the position where the UFS IC has been removed.

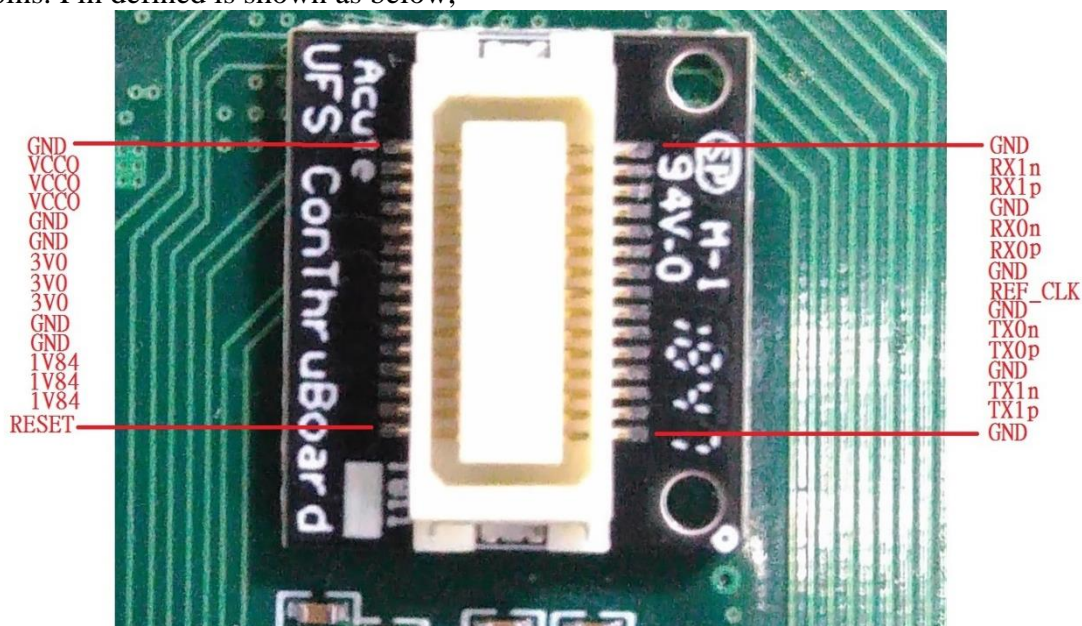


(Pay attention to the direction of Pin1 when welding the connector.)

Step3: Place the connector (DF17-30DS-0.5V) on the small board of the connector. Before welding, please pay attention to the mistake proofing between the connector and the board.

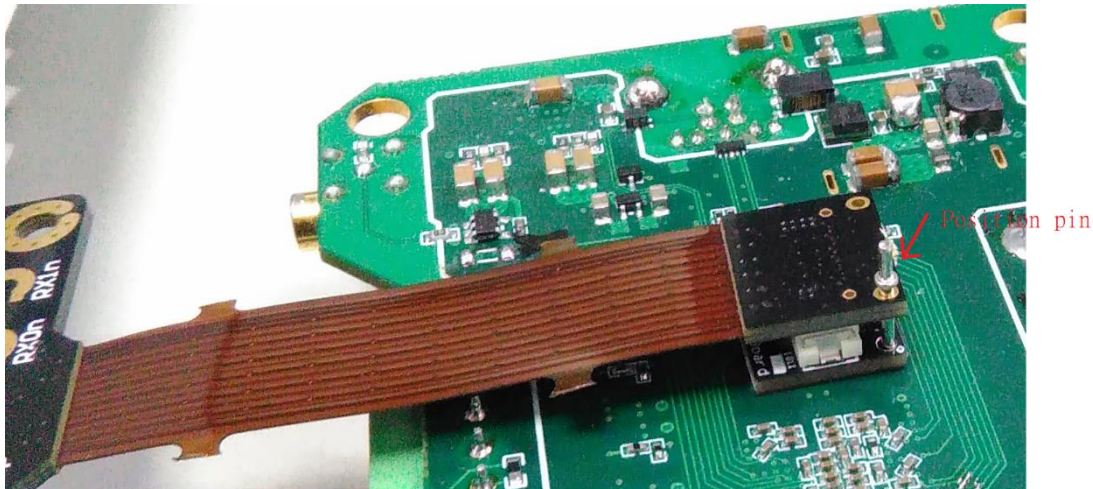


Step4: After the welding is completed, confirm whether there is a short circuit between the pins. Pin defined is shown as below,





Step5: Connect the Con Fixture, please pay attention to the mistake proofing between the board and the Fixture.



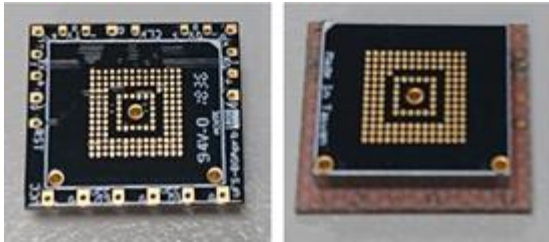
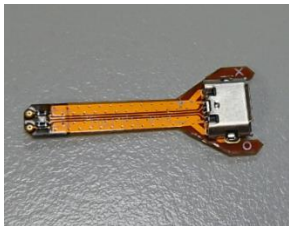
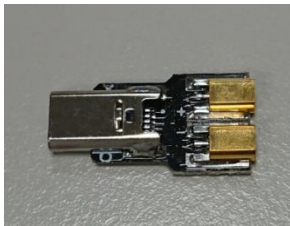
Step6: Put the unplugged UFS IC into the Con Fixture UFS Socket (FBGA153 Socket), and finish.

#### **b. Use Interposer with End-Tip connection**

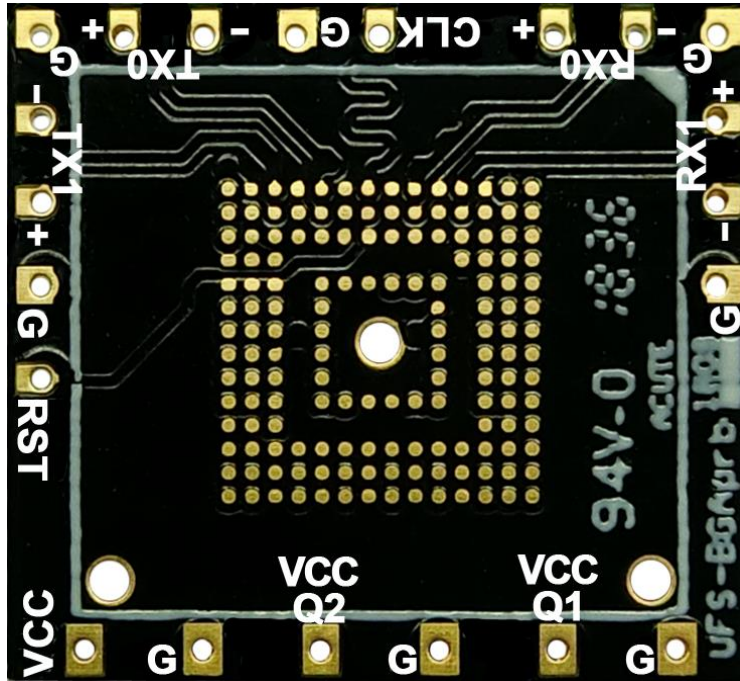
If the components around the original UFS Chip interfere, UFS Fixture cannot be used and there is no test point around the UFS Chip can jumper on, you need to remove the UFS Chip and reball the interposer on the board, and then reball the UFS chip again.

Connect End- from the test point. use the SMPM cable to connect to the Way Station.

If there are test points left on the board to be tested, they can be used directly

Components			
Interposer			
End-tip (FPC)		End-Tip Connector (FPC)	

Combined



(Interposer Pin Define)

### **C. Connect using End-Tip**

If the board has a test point that can be jumpered, it can be used directly. After the End-Tip is connected to the test, there is no need to use a booster board.

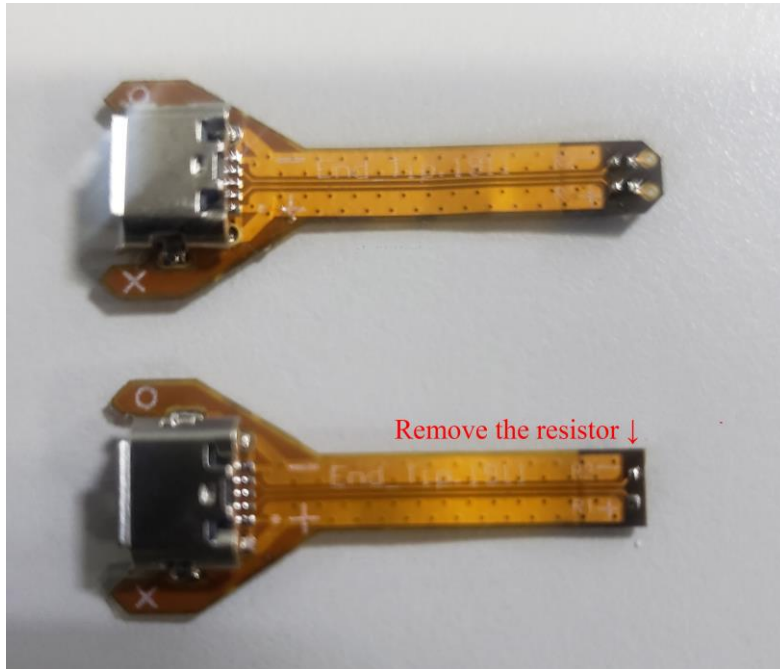
The UFS standard terminal soft board resistance is 250ohm, which can be used directly under normal circumstances.

If you want to shorten the jumper distance to improve signal quality, you can use the following resistance bridge method.

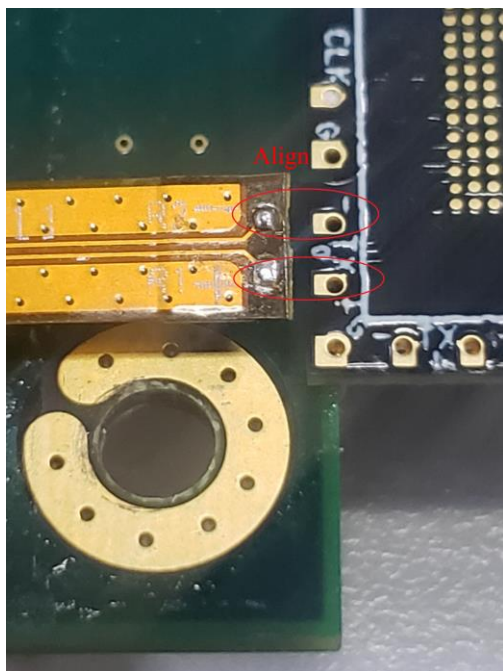
To use the resistance bridging method without jumpers (as shown in the figure below), the end-tip needs to be modified.

Modification process:

Step1: Remove the resistor, cut off the head, and reserve 2 welding point.

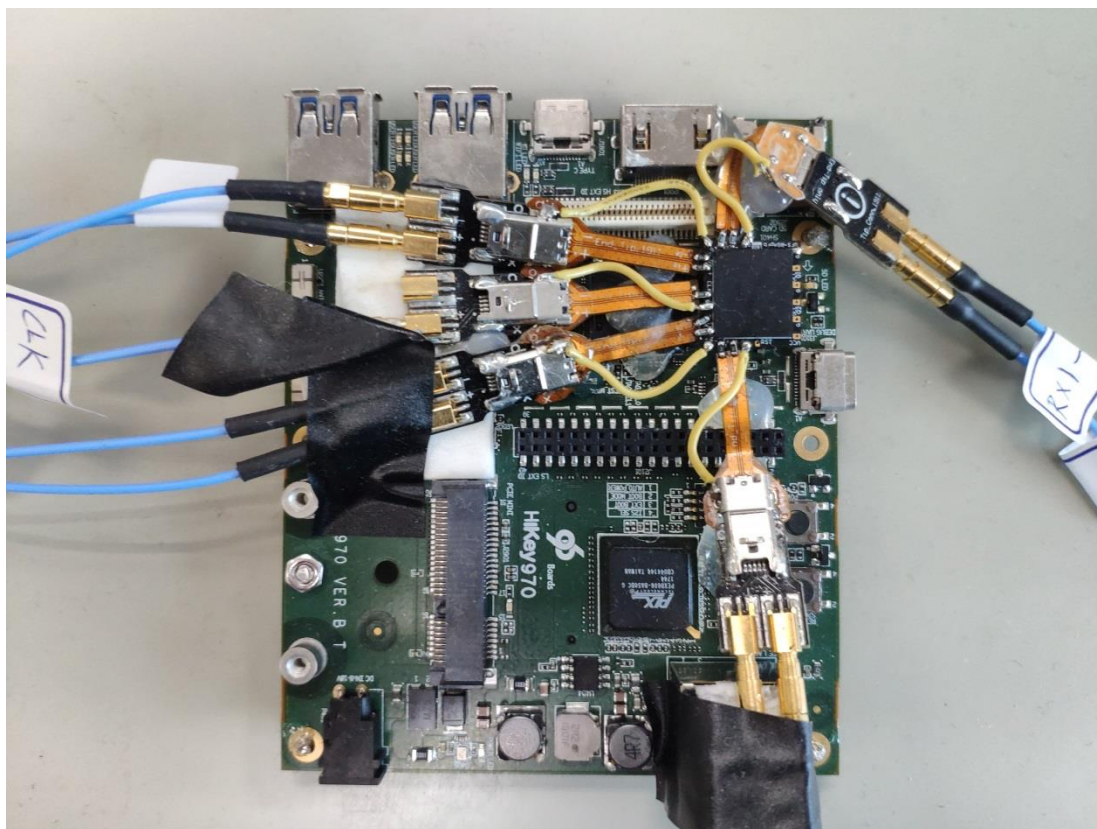
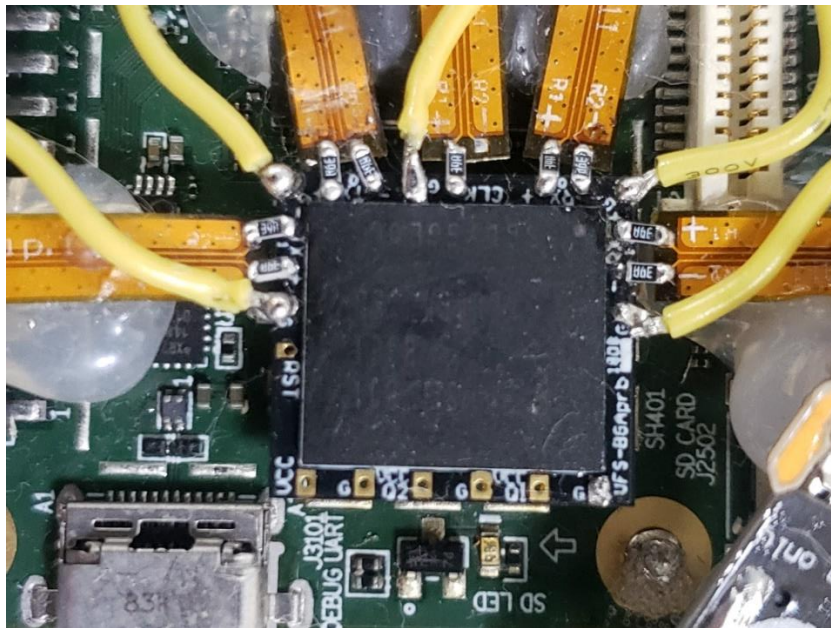


Step2: After the modification, aligning the P / N welding point between the end-tip and the interposer. Welding the resistor 250ohm (4 groups of data + 1 CLK), and the Gnds.



In this way, the shortest distance makes the signal quality better than the end-tip jumper connection.





## Way Station connection

1. Please install UFS Probe in Slot B of BusFinder 7264B+
2. Each Way Station has a USB type B interface, please use the corresponding USB cable to install it to the BusFinder front panel. When installing, please check the installation according to the top/bottom of the Way Station nameplate mark.

