

BF7264B+ MIPI M-PHY UFS2.1 方案說明



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概況

此方案僅於 BF7264B+產品適用,除主機可繼續使用原 BF6264B 及 BF7264B 功能 外,增加 MIPI M-PHY UFS2.1 分析儀功能(可解析 UFS3.1 命令組)。

MIPI M-PHY UFS2.1 方案,規格內容如下:

1. BF7264B+, 32Gb RAM, 搭配 MIPI M-PHY UFS2.1 探棒組



 完整支援 MIPI M-PHY UFS2.1 以及支援 UFS3.1 命令 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. 可同時顯示 Unipro 及 UFS 協定封包資料以表格方式呈現,包含指令解析





- 4. 使用 32Gb RAM 搭配硬碟串流來儲存 Unipro, UFS 通訊資料,可完整節錄待測物從 Low Power Mode 初始化到 High Speed Mode 的流程
- 5. 提供 Data Filter 功能,可將不必要的資料濾除以節省記憶體
- 6. 提供 Search 資料功能
- 7. 提供 CRC Packet 計算及錯誤顯示
- 8. Unipro, UFS 命令統計功能,包含封包總數、各類別指令數量以及錯誤數量統計

avent		0		統計			6) 🗶
描述	Txns	Bytes		描述	Txns	Bytes	
 Unipro 				▼ UFS			
▼ L2	4856976		_	SCSI Command	283		
SUF	43/601			UFS Protocol	27373		
AFC TC0	3901//0			QUERY REQUEST	56		
NAC	0			QUERY RESPONSE	56		
COF TC0	0			DESERVED	U		
EOF EVEN	437597			RESERVED			
EOF ODD	0						
▶ L1.5	2530						
▼ L1	213						
HIBERN8	5						
SIALL	2						
LINE DESET	3						
LINE CONEIG	4						
PREPARE	199						
Error Packets	118						
		1	a				
			, 111				
			_				
統計 Txns	Bytes			統計		Txns	=
統計 Txns ▼ SOF 437601	Bytes			統計 NOP OUT		Txns 3	
統計 Txns ▼ SOF 437601 Host 342	Bytes			統計 NOP OUT NOP IN		Txns 3 3	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE		Txns 3 3 282	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN DECOTORING DECOTOR		Txns 3 282 27049	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI NOU INC DESPONSE OF D	I) PONSE(DATA IN)	Txns 3 282 27049 15	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D, Lebeurg RESPONSE(D,	I) Ponse(data in) Ata in)	Txns 3 282 27049 15 2	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN REAPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D, Unknwon	I) PONSE(DATA IN) ATA IN)	Txns 3 282 27049 15 2 19	
読計 Txns SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D/ Unknwon	I) PONSE(DATA IN) ATA IN)	Txns 3 282 27049 15 2 19	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INOURY RESPONSE(D/ Unknwon	I) Ponse(data in) Ata in)	Txns 3 282 27049 15 2 19	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D, Unknwon	I) Ponse(data in) Ata in)	Txms 3 282 27049 15 2 19	
應計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RES INQUIRY RESPONSE(D/ Unknwon	I) Ponse(data in) Ata in)	Txms 3 3 282 27049 15 2 19 19 19 10 <th1< th=""><th></th></th1<>	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D) Unkniwon	I) Ponse(data in) ata in)	Txns 3 282 27049 15 2 19	
應計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			旅計 NOP OUT NOP IN RESPONSE READ(10) DATA[DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D, Unknwon) Ponse(data in) Ata in)	Txns 3 3 282 27049 15 2 19	
應計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D/ Unknwon	I) PONSE(DATA IN) ATA IN)	Txns 3 3 282 27049 15 2 19	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D) Unkniwon	I) Ponse(data in) Ata in)	Txns 3 282 27049 15 2 19	
應計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA[DATA IN REQUEST SENSE RES INQUIRY RESPONSE(D/ Unknwon)) PONSE(DATA IN) ATA IN)	Txns 3 282 27049 15 2 19	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INOURY RESPONSE(D/ Unknwon	I) PONSE(DATA IN) ATA IN)	Txns 3 282 27049 15 2 19	
統計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			家計 NOP OUT NOP IN RESPONSE READ(10) DATA[DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D, Unknwon)) PONSE(DATA IN) ATA IN)	Txns 3 282 27049 15 2 19	
應計 Txns ▼ SOF 437601 Host 342 Device 437259	Bytes			統計 NOP OUT NOP IN RESPONSE READ(10) DATA(DATA IN REQUEST SENSE RESI INQUIRY RESPONSE(D/ Unknwon	I) Ponse(data in) Ata in)	Txns 3 282 27049 15 2 19	



9. Unipro, UFS 命令觸發功能

- a. 觸發參數包含命令與參數資料可依據不同種類封包填入數值,
- b. 涵蓋所有 Unipro, UFS Packet,
- c. 可觸發 CRC Error, Unknown packet
- d. 可觸發 VCC drop, VCCQ2 drop
- e. 可透過 Trigger-Out 接孔同步觸發外部的示波器

Trigger On			
		Trigger It	em 1/8 Clear All
✓ SCSI Com SCSI Com FC IN M PF PF V RE RE RE	ny UFS packets mand Ng Command SRMAT UNIT QUIRY ODE SELECT (10) ODE SENSE (10) (E-FETCH (16) (E-FETCH (16) (AD (10) (AD (16) (AD C)(FETCH (16))		
Unknown Pac	ket	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			Transacti	on Code			Reserved	R Flag Bit	W Flag Bit	Res	erved	CP		ATTR	
0	0	0 0 01h) x	X	X	X	(h	X		Xh		
ļļ				LU	N				Ļ			Tasi	k Tag				
2				XX	h				L			X	Kh				
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4		Xh		l		Xł	1	_	L			X	Kh				4
								Res	erved								
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10								X	XXh								
ÌÌ							Exp	ected Data	Transfer Le	ength							i I
12								Х	XXh								
							Exp	ected Data	Transfer Le	ength							
14								xxxxh									
1		OPERATION CODE															
1 1			OF	PERATIC	ON CODE					Reserved			LOGICAL	BLOCKA	DDRES	S	
16			OF	PERATIC 08	N CODE					Reserved Xh			LOGICAL	BLOCK A XXh	DDRES	S	
16			OF	PERATIC 08	h		L	OGICAL BL		Reserved Xh ESS			LOGICAL	. BLOCK A XXh	DDRES	S	
16 18			PO PO	08	h		L	DGICAL BL	DCK ADDRE XXh	Reserved Xh ESS			LOGICAL	. BLOCK A XXh	DDRES	S	
16 18 20			OF TR.	ANSFER	N CODE h R LENGTH		L	DGICAL BL		Reserved Xh ESS		CON	LOGICAL TROL	. BLOCK A XXh	DDRES	S	
16 18 20			OF TR.	ANSFEF	DN CODE h R LENGTH h		L	DGICAL BL XX	DCK ADDRE XXh	Reserved Xh ESS		CON	LOGICAL TROL Kh	BLOCK A XXh	DDRES	S	
16 18 20 22			TR	ANSFER XX	h R LENGTH h			DGICAL BL XX Re: XX	CCK ADDRI XXh erved XXh	Reserved Xh ESS		CON	LOGICAL TROL Kh	BLOCK A	DDRES	S	
16 18 20 22			OF TR	ANSFER XX	h R LENGTH h			DGICAL BL XX Res XX Res	CCK ADDR XXh erved XXh	Reserved Xh ESS		CON	LOGICAL TROL Kh	BLOCKA XXh	DDRES	<u>S</u>	
16 18 20 22 24			TR	ANSFER XX	h R LENGTH h			DGICAL BL XX Res XX Res XX	CK ADDR XXh erved XXh erved XXh erved XXh	Reserved Xh ESS		CON	LOGICAL TROL Kh	BLOCKA XXh	DDRES	S	
16 18 20 22 24			OF TR.	ANSFER	h R LENGTH h		L	DGICAL BL XX Res XX Res XX Res	DCK ADDRI XXh erved XXh erved XXh erved	Reserved Xh ESS		CON	LOGICAL TROL Kh	BLOCKA XXh	DDRES	S	
16 18 20 22 24 24			TR	ANSFER	h R LENGTH h			DGICAL BL X0 Res X0 Res X0 Res X0 X0 X0 X0 X0 X0 X0 X0 X0 X0 X0 X0 X0	CCK ADDRI XXh L L L L L L L L L L L L L L L L L L	Reserved Xh ESS		СОМ	LOGICAL TROL (h	BLOCKA XXh	DDRES	S	
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16 18 20 22 24 26 28			TR		h RLENGTH h			CGICAL BL XX Res XX Res XX Res XX	CCK ADDRE XXh erved XXh erved XXh erved XXh erved XXh erved XXh	Reserved Xh ESS		CON	LOGICAL TROL (h	BLOCKA XXh	DDRES	8	
16 [18 [20 [22 [24 [26 [28 [28			TR		h R LENGTH h			CGICAL BL XX Res XX Res XX Res XX Res	CCK ADDRI XXh Erved XXh erved XXh erved XXh erved XXh erved XXh	Reserved Xh ESS		CON	LOGICAL TROL Kh	BLOCKA XXh	DDRES	8	
16 [18 [20 [22 24 [26] 30			TR		N CODE h			CGICAL BL XX Res XX Res XX Res XX Res	DOCK ADDRI XXh erved XXh erved XXh erved XXh erved XXh erved XXh erved XXh	Reserved Xh ESS		CON	TROL Kh	BLOCKA XXh	DDRES	8	
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10. 報告區進階使用方法

a. <u>雙報告關聯</u>: Unipro 與 UFS 報告互相關聯, 雙擊可追蹤另一報告區對應資料。 ex: 點擊 Unipro 區報告, 可關聯至 UFS 對應報告。

		1000	Device		1 Inco oump	1000	Device	rush rug	Ducu
1280	16:15:03.796.342.673 13.33	Filler(2x)		2					
1281	16:15:03.796.342.703 29.99	AFC TCO CReq=0		3	16:15:03.783.717.515 0 (Ma	NOP OUT		00	00 00 00 0
1282	16:15:03.796.342.729 26.66	Filler(2x)		4	16:15:03.783.938.943 221.4		NOP IN	00	20 00 00 00
1283	16:15:03.796.342.756 26.66	AFC TC0 CReg=0		5	16:15:03.792.935.487 8.99ms	CMD (TEST UNIT READY)		01	01 00 B0 0:
1284	16:15:03.796.342.783 26.66	Filler(2x)		6	16:15:03.792.940.406 4.91us		RESPONSE	01	21 00 B0 0
1285	16:15:03.796.342.813 29.99	AFC TCO CReg=0		7	16:15:03.793.956.611 1.01ms	CMD (TEST UNIT READY)		02	01 00 B0 0:
1286	16:15:03.796.342.839 26.66	AFC TC0 CReg=0		8	16:15:03.793.960.981 4.36us		RESPONSE	02	21 00 B0 0;
1287	16:15:03.796.342.893 53.32	AFC TC0 CReg=0		9	16:15:03.793.985.555 24.57	CMD (READ (10))		03	01 40 B0 0
1288	16:15:03.796.342.906 13.33		EOF EVEN	10	16:15:03.794.209.246 223.6		DATA IN	03	22 00 B0 0
1289	16:15:03.796.342.919 13.33	AFC TC0 CReg=0		11	16:15:03.794.238.410 29.16		RESPONSE	03	21 00 B0 0
1290	16:15:03.796.342.933 13.33		Filler(6x)	12	16:15:03.794.310.372 71.96	CMD (READ (10))		04	01 40 B0 0
1291	16:15:03.796.342.976 43.32	Filler(4x)		13	16:15:03.794.372.383 62.01		DATA IN	04	22 00 B0 0
1292	16:15:03.796.343.029 53.32	AFC TC0 CReg=0		14	16:15:03.794.401.543 29.16		RESPONSE	04	21 00 B0 0
1293	16:15:03.796.343.056 26.66	Filler(2x)		15	16:15:03.796.251.568 1.85ms	CMD (READ (10))		05	01 40 B0 0
1294	16:15:03.796.343.086.29.99	AFC TCO CRed=0		16	16:15:03.796.313.495.61.92		DATA IN	05	22 00 B0 0
1205	16:15:03.796.343.112.26.66	Filler(6x)		17	16:15:03.796.342.659.29.16		RESPONSE	05	21 00 80 0
1296	16:15:03.796.343.306.193.3	AFC TCO CReg=0		18	16:15:03.796.362.107.19.44	CMD (READ (10))		06	01 40 B0 01
1207	16:15:03.796.343.332.26.66	Filler(2x)		10	16:15:03.796.424.391.62.28		DATA IN	06	22 00 B0 00
1208	16+15+03,796,343,359,26,66	AFC TCO CRegmo		20	16:15:03.796.453.551.29.16		RESPONSE	06	21 00 80 0
1200	16-15-03 796 343 386 26 66	Filler (2x)		21	16:15:03 796 491 171 37 61	CMD (READ (10))		07	01 40 B0 0
1300	16.15.03 796 343 412 26 66	AFC TCO CRegmo		22	16.15.03 796 553 098 61 92		DATA IN	07	22 00 B0 0
1301	16:15:03.796.343.442 29.99	Filler(6x)		23	16:15:03.796.582.262 29.16		RESPONSE	07	21 00 B0 0'
1302	16:15:03.796.362.107 18.66	Data Frame TCO		24	16:15:03.796.592.558 10.29	CMD (READ (10))		08	01 40 B0 01
1302 1303	16:15:03.796.362.107 18.66 16:15:03.796.362.354 246.6	Data Frame TCO EOF EVEN		24	16:15:03.796.592.558 10.29 16:15:03.796.655.115 62.55	CMD (READ (10))	DATA IN	08	01 40 B0 00 22 00 B0 00
1302 1303 1304	16:15:03.796.362.107 18.66 16:15:03.796.362.354 246.6 16:15:03.796.362.381 26.66	Data Frame TCO EOF EVEN Filler(4x)		24 25 26	16:15:03.796.592.558 10.29 16:15:03.796.655.115 62.55 16:15:03.796.684.275 29.16	CMD (READ (10))	DATA IN RESPONSE	08 08 08	01 40 B0 08 22 00 B0 08 21 00 B0 08
1302 1303 1304 1305	16:15:03.796.362.107 18.66 16:15:03.796.362.354 246.6 16:15:03.796.362.381 26.66 16:15:03.796.363.270 889.9	Data Frame TCO EOF EVEN Filler(4x)	AFC TC0 CReg=0	24 25 26 27	16:15:03.796.592.558 10.29 16:15:03.796.655.115 62.55 16:15:03.796.684.275 29.16 16:15:03.797.375.309 691.0	CMD (READ (10))	DATA IN RESPONSE	08 08 08 09	01 40 B0 0 22 00 B0 0 21 00 B0 0 01 40 B0 0
1302 1303 1304 1305 1305	16:15:03.796.362.107 18.66 16:15:03.796.362.354 246.6. 16:15:03.796.362.381 26.66. 16:15:03.796.363.270 889.9. 16:15:03.796.363.324 53.32	Data Frame TCO EOF EVEN Filler(4x)	AFC TCO CReq=0 Filler(6x)	24 25 26 27 28	16:15:03.796.592.558 10.29 16:15:03.796.655.115 62.55 16:15:03.796.684.275 29.16 16:15:03.797.375.309 691.0 16:15:03.797.450.942 75.63	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE	08 08 08 09 09	01 40 80 0 22 00 80 0 21 00 80 0 01 40 80 0 22 00 80 0
1302 1303 1304 1305 1306 1307	16:15:03.796.362.107 18.66 16:15:03.796.362.351 246.66 16:15:03.796.362.351 26.66 16:15:03.796.363.270 889.9 16:15:03.796.363.350 26.66	Data Frame TCO EOF EVEN Filler(4x)	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0	24 25 26 27 28 29	16:15:03.796.592.558 10.29. 16:15:03.796.655.115 62.55. 16:15:03.796.684.275 29.16. 16:15:03.797.375.309 691.0. 16:15:03.797.450.942 75.63. 16:15:03.797.490.105 29.16.	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE DATA IN DATA IN	08 08 08 09 09 09	01 40 80 0 22 00 80 0 21 00 80 0 01 40 80 0 22 00 80 0 22 00 80 0
1302 1303 1304 1305 1305 1306 1307 1308	16:15:03.796.362.107 18.66 16:15:03.796.362.354 246.6 16:15:03.796.362.381 26.66 16:15:03.796.363.270 685.9 16:15:03.796.363.324 53.32 16:15:03.796.363.350 26.66 16:15:03.796.363.407 56.66	Data Frame TCO EOF EVEN Filler(4x)	AFC TCO CReg=0 Filler(6x) AFC TCO CReg=0 Filler(4x)	24 25 26 27 28 29 30	16:15:03.796.592.558 10.29 16:15:03.796.655.115 62.55. 16:15:03.796.684.275 29.16 16:15:03.797.450.942 75.63. 16:15:03.797.450.942 75.63. 16:15:03.797.450.155 29.16	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE DATA IN DATA IN DATA IN	80 80 08 09 09 09 09	01 40 B0 01 22 00 B0 01 21 00 B0 01 01 40 B0 01 22 00 B0 01 22 00 B0 01 22 00 B0 01 22 00 B0 01
1302 1303 1304 1305 1306 1307 1308 1309	16:15:03.766.382.107.18.66. 16:15:03.796.382.351.246.6. 16:15:03.796.382.381.26.66. 16:15:03.796.383.270.889.2. 16:15:03.796.383.270.889.2. 16:15:03.796.383.350.26.66. 16:15:03.796.383.407.56.68. 16:15:03.796.434.91.60.98.	Data Frame TCO EOF EVEN Filler(4x)	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO	24 25 26 27 28 29 30 31	16:15:03.796.552.558 10.29. 16:15:03.796.663.115 62.55. 16:15:03.796.6634.275 29.16. 16:15:03.797.375.309 601.0. 16:15:03.797.450.105 29.16. 16:15:03.797.480.105 29.16. 16:15:03.797.597.599.266 29.16.	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE DATA IN DATA IN DATA IN DATA IN	08 08 09 09 09 09 09 09	01 40 B0 01 22 00 B0 01 21 00 B0 01 01 40 B0 01 22 00 B0 01
1302 1303 1304 1305 1306 1307 1308 1309 1310	1415103.764.362.107 18.66. 1415103.764.362.362 142.6 1415103.764.362.381 26.6 1415103.764.362.381 26.6 1415103.764.363.270 889.9 1415103.764.363.320 26.6 1415103.764.363.30 26.6 1415103.764.363.19 56.6 1415103.764.363.11 809	Data Frame TCO EOF EVEN Filler(4x)	AFC TCO CReq=0 Filler(6%) AFC TCO CReq=0 Filler(4%) Data Frame TCO EOF EVEN	24 25 26 27 28 29 30 31 31 32	16:15:03.796.692.582 10:28. 16:15:03.796.652.156 20:58. 16:15:03.796.652.156 20:58. 16:15:03.796.684.275 29:16. 16:15:03.797.460.105 29:16. 16:15:03.797.460.105 29:16. 16:15:03.797.530.430 29:16. 16:15:03.797.533.430 29:16.	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE DATA IN DATA IN DATA IN DATA IN DATA IN	80 08 08 09 09 09 09 09 09	01 40 B0 01 22 00 B0 01 21 00 B0 01 22 20 B0 01 22 00 B0 01 22 00 B0 01 22 00 B0 01
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311	14:15:03.764.362.107 18:66. 14:15:03.764.362.351 246.6. 14:15:03.764.362.351 246.6. 14:15:03.764.363.270 893.8. 14:15:03.764.363.270 893.8. 14:15:03.764.363.350 26:66. 14:15:03.764.363.350 26:66. 14:15:03.764.424.391 60.90. 14:15:03.764.426.201 1.8089. 14:15:03.764.426.201 28:68.	Data Frame TCO EOF EVEN Filler (4x)	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO EOF EVEN Data Frame TCO	244 25 260 277 289 300 310 311 322 333	16:15:03.796.692.558 10:28. 16:15:03.796.684.275 28:16. 16:15:03.796.684.275 28:18. 16:15:03.797.690.492 78:63. 16:15:03.797.490.102 29:18. 16:15:03.797.490.102 29:18. 16:15:03.797.490.102 29:18. 16:15:03.797.580.262 29:18. 16:15:03.797.587.593 29:18. 16:15:03.797.587.593 29:18. 16:15:03.797.587.558 29:18.	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN	80 80 08 09 09 09 09 09 09 09	01 40 B0 01 22 00 B0 01 21 00 B0 01 22 00 B0 01
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312	1415103.764.362.107 18.66. 1415103.764.362.362.107 18.66. 1415103.764.362.361 246.5. 1415103.764.362.301 26.66. 1415103.764.363.302 453.322. 1415103.764.363.302 455.322. 1415103.764.363.301 55.66. 1415103.764.424.311 60.98. 1415103.764.424.311 1.9809 1415103.764.426.307 26.66. 1415103.764.426.307 26.68. 1415103.764.426.307 26.68. 141510510.764.426.307 26.68. 141510510.764.426.307 26.68. 1415100.764.426.307 26.68. 1415100.764.426.307 26.68. 1415100.764.426.307 26.68. 1415100.764.426.307 26.68. 1415100.764.426.307 26.68. 1415100.764.426.307 26.68. 1415100.764.426.307 26.68. 1415100.764.426.307 26.68. 1415100.764.426.507 26.68. 1415100.764.426.507 26.68. 1415100.764.426.507 26.68. 1415100.764.426.507 26.68. 1415100.764.426.507 26.68. 1415100.764.426.507 26.68. 1415100.764.426.507 26.507 26.507 26.507 56.507 56.507 56.507 57.507 56.507 56.507 57.507 57.507 57.50	Data Frame TCO EOF EVEN Filler(4x) AFC TCO CReq=0	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO EOF EVEN Data Frame TCO	244 25 266 277 288 299 300 311 312 333 344	16:15:03.796.692.582 10:28. 16:15:03.796.653.115 62:55. 16:15:03.796.654.175 23:16. 16:15:03.797.457.237.309 691.0. 16:15:03.797.460.105 29:16. 16:15:03.797.460.105 29:16. 16:15:03.797.533.430 29:16. 16:15:03.797.539.239 29:16. 16:15:03.797.559.239 29:16. 16:15:03.797.559.759 29:16. 16:15:05.759.759.759 29:16. 16:15:05.759.759.759 29:16. 16:15:05.759.759.759.759.759.759.759.759.759.75	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN	80 80 80 90 90 90 90 90 90 90 90 90 90 90	01 40 B0 0 22 00 B0 0 21 00 B0 0 21 00 B0 0 21 00 B0 0 21 00 B0 0 22 00 B0 0
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313	14:15:03.764.362.107 18.66. 14:15:03.764.362.381 26.6. 16:15:03.764.362.381 26.66. 16:15:03.764.362.381 26.66. 16:15:03.764.363.370 88.9. 16:15:03.764.363.380 26.66. 16:15:03.764.363.380 26.66. 16:15:03.764.421.91 60.96. 16:15:03.764.426.421 1.98us 16:15:03.764.426.421 73.2. 16:15:03.764.426.401 73.2. 16:15:03.764.426.401 73.2. 16:15:03.764.426.401 73.2.	Data Frame TCO EOF FUEN Filler(4x) AFC TCO CReq=0 Filler(2x)	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO EOF EVEN Data Frame TCO	244 25 26 27 28 29 30 30 31 31 32 33 34 35	16:13:03.796.592.558 10:28. 16:13:03.796.682.158 10:28. 16:13:03.796.684.275 29:18. 16:13:03.797.690.492 73.63. 16:13:03.797.690.492 73.63. 16:13:03.797.690.492 73.63. 16:13:03.797.531.430 29:16. 16:13:03.797.538.430 29:16. 16:13:03.797.538.508.238.508.238.508.508.258.508.508.508.508.508.508.508.508.508.5	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN	80 80 80 90 90 90 90 90 90 90 90 90 90 90 90	01 40 B0 0 22 00 B0 0 21 00 B0 0 21 00 B0 0 21 00 B0 0 21 00 B0 0 22 00 B0 0
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314	14:15:03.764.362.107 18:66. 16:15:03.764.362.351 246.6. 16:15:03.764.362.351 26.66. 16:15:03.764.363.370 883.9. 16:15:03.764.363.300 26:66. 16:15:03.764.363.300 26:66. 16:15:03.764.243.431 60.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 1.80.98. 16:15:03.764.242.431 2.66. 16:15:03.764.242.432 1.66.80. 16:15:03.764.242.701 28:66. 16:15:03.764.242.701 28:66. 16:15:05.764.242.701 28:67. 16:15:05.764.242.701 28:67.	Data Frame TCO EOF EVEN Filler(4x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(fx) Data Frame TCO EOF EVEN Data Frame TCO	24 25 26 27 28 30 30 31 31 32 33 34 34 35 36	16:15:03.796.692.585 10.28. 16:15:03.796.682.155 10.28. 16:15:03.796.684.175 29.16. 16:15:03.796.694.175 29.16. 16:15:03.797.400.105 29.16. 16:15:03.797.400.105 29.16. 16:15:03.797.507.200 29.16. 16:15:03.797.507.507 29.16. 16:15:03.797.547.59 29.16. 16:15:03.797.542.91.62 29.16. 16:15:03.797.642.91.82 29.16. 16:15:03.797.642.91.82 29.16. 16:15:03.797.642.91.82 29.16. 16:15:03.797.642.91.82 29.16. 16:15:03.797.642.91.82 29.16. 16:15:03.797.642.91.82 29.16. 16:15:03.797.642.91.82 29.16. 16:15:03.797.642.91.82 29.16. 16:15:03.797.642.91.28 29.16. 16:15:03.797.65.01.28 10. 16:15:03.797.642.91.28 29.16. 16:15:03.797.642.91.28 29.16. 16:15:05.797.642.91.28 29.16. 16:15:05.797.642.91.28	CMD (READ (10)) CMD (READ (10))	DATA IN DATA IN	80 80 99 09 09 09 09 09 09 09 09 09	01 40 80 0 22 00 80 0 21 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0
1302 1303 1304 1305 1305 1305 1307 1308 1309 1310 1311 1312 1313 1314 1315	14:15:03.764.362.107 18.66. 14:15:03.764.362.381 26.66. 16:15:03.764.363.270 88.76. 16:15:03.764.363.270 88.76. 16:15:03.764.363.270 88.76. 16:15:03.764.363.370 85.66. 16:15:03.764.363.370 26.66. 16:15:03.764.426.301 1.8808 16:15:03.764.426.431 .8808 16:15:03.764.426.431 .878.2 16:15:03.764.426.431 .972.4. 16:15:03.764.426.431 .972.4. 16:15:03.764.426.431 .972.4. 16:15:03.764.426.432 .972.4. 16:15:03.764.426.432 .972.4. 16:15:03.764.426.432 .972.4. 16:15:03.764.426.432 .989.2. 16:15:03.764.426.432 .989.2. 16:15:03.764.426.442 .989.2. 16:15:03.764.426.742 .989.2. 16:15:03.764.426.742 .989.2. 16:15:03.764.426.742 .989.2. 16:15:03.764.426.742 .989.2. 16:15:03.764.426.742 .989.2. 16:15:03.764.426.742 .989.2. 16:15:03.764.426.742 .989.2. 16:15:03.764.426.742 .989.2. 16:15:04.428.752 .989.2. 16:15:05.754.428.752 .989.2. 16:15:05.754.428.752	Data Frame TCO ECOF EVEN Filler(4x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x)	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO EOF EVEN Data Frame TCO	244 255 266 277 288 299 300 311 312 333 344 345 355 366 377	16:13:03.796.592.582 10:28. 16:13:03.796.655.115 62.55. 16:13:03.796.654.275 29:18. 16:13:03.797.400.105 29:18. 16:13:03.797.400.105 29:18. 16:13:03.797.400.105 29:18. 16:13:03.797.400.105 29:18. 16:13:03.797.538.490 29:18. 16:13:03.797.538.490 29:18. 16:13:03.797.538.490 29:18. 16:13:03.797.423.012 29:18. 16:13:03.797.423.012 29:18. 16:13:03.797.423.012 29:18. 16:13:03.797.401.22 29:18. 16:13:03.797.401.22 29:18. 16:13:03.797.401.22 29:18. 16:13:03.797.401.20 29:18. 16:13:001.20 29:18. 16:13:001.	CHD (READ (10))	DATA IN RESPONSE DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN DATA IN	80 80 99 09 09 09 09 09 09 09 09 09 09 09 09	01 40 80 01 22 00 80 01 10 80 01 02 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316	14:15:03.764.362.107 18:66. 14:15:03.764.362.351 246.6. 14:15:03.764.362.351 246.6. 14:15:03.764.363.270 893.8. 14:15:03.764.363.270 893.8. 14:15:03.764.363.350 26:66. 14:15:03.764.424.391 60.90. 14:15:03.764.426.201 1.809. 14:15:03.764.426.201 1.809. 14:15:03.764.426.201 28:60. 14:15:03.764.426.707 26:66. 14:15:03.764.426.707 26:66. 14:15:03.764.426.701 26:60. 14:15:03.764.426.701 26:60. 14:15:05.764.426.701 26:60. 15:15:15:15:15:15:15:15:15:15:15:15:15:1	Data Frame TCO EOF EVEN Filler(\$x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO EOF EVEN Data Frame TCO	244 25 26 27 28 30 30 31 31 32 33 34 35 36 36 37 38	16:15:03.796.492.558 10:28. 16:15:03.796.482.75 28:16. 16:15:03.796.482.75 28:18. 16:15:03.797.400.102 29:18. 16:15:03.797.400.102 29:18. 16:15:03.797.400.102 29:18. 16:15:03.797.400.102 29:18. 16:15:03.797.400.102 29:18. 16:15:03.797.407.402.102 29:18. 16:15:03.797.407.402.102 29:18. 16:15:03.797.407.402 29:18. 16:15:03.797.405.912 29:18. 16:15:03.797.405.912 29:18. 16:15:03.797.13.405 29:18. 16:15:03.797.14.505 29:18. 16:15:05.797.14.505 29:18. 16:15:05.797.14.505 29:18. 16:15:05.797.14.505 29:18. 16:15:05.79	CMD (READ (10)) CMD (READ (10))	DATA IN RESPONSE DATA IN DATA IN	8 08 08 09 09 09 09 09 09 09 09 09 09 09 09 09	01 40 80 01 22 00 80 01 21 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317	14:15:03.764.362.107 18.66. 14:15:03.764.362.374 28.6 14:15:03.764.362.381 28.6 14:15:03.764.362.381 28.6 14:15:03.764.362.381 28.6 14:15:03.764.363.370 28.9 14:15:03.764.363.370 28.6 14:15:03.764.363.370 28.6 14:15:03.764.424.391 60.9 14:15:03.764.424.391 60.9 14:15:03.764.424.391 60.9 14:15:03.764.426.307 28.6 14:15:03.764.426.307 28.6 14:15:03.764.426.707 28.6 14:15:03.764.426.707 28.6 14:15:03.764.426.707 28.6 14:15:03.764.426.707 28.6 14:15:03.764.426.701 28.6 14:15:05.754.426.701 28.6 14:15:05.754.426.701 28.6 14:15:05.754.426.701 28.6 14:15:05.754.426.701 28.6 14:15:05.754.426.701 28.6 14:15:05.754.426.701 28.6 14:15:05.754.426.701 28.6 14:15:05.754.426.701 28.6	Data Frame TCO ECOF EVEN Filler(4x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x)	AFC TCO CReq=0 Filter(6x) AFC TCO CReq=0 Filter(4x) Data Frame TCO ECOF EVEN Data Frame TCO	244 25 26 27 28 30 30 31 31 32 33 34 34 35 36 36 37 38 39	16:13:03.796.492.582 10:28. 16:13:03.796.452.156 21.55. 16:13:03.796.452.156 21.55. 16:13:03.797.450.105 29.16. 16:13:03.797.480.105 29.16. 16:13:03.797.480.105 29.16. 16:13:03.797.480.105 29.16. 16:13:03.797.538.490 29.16. 16:13:03.797.547.592 29.16. 16:13:03.797.547.542 29.16. 16:13:03.797.547.542 29.16. 16:13:03.797.457.502 29.16. 16:13:03.797.457.502 29.16. 16:13:03.797.457.502 29.16. 16:13:03.797.455.502 29.16. 16:13:03.797.742.566 29.16. 16:13:03.797.742.566 29.16. 16:13:03.797.742.566 29.16. 16:13:03.797.742.566 29.16. 16:13:03.797.742.566 29.16. 16:13:03.797.742.560 29.16. 16:13:03.797.742.560 29.16. 16:13:03.797.742.560 29.16. 16:13:03.797.742.560 29.16. 16:13:03.797.742.500 29.16. 16:13:03.797.742	CHD (READ (10))	DATA IN RESPONSE DATA IN DATA IN	08 08 09 09 09 09 09 09 09 09 09 09 09 09 09	01 40 80 01 22 00 80 01 10 40 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80 01 22 00 80<
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318	14:15:03.764.362.107 18.66. 14:15:03.764.362.301 23.66. 14:15:03.764.362.301 23.66. 14:15:03.764.362.301 23.66. 14:15:03.764.363.270 88.9. 14:15:03.764.363.300 23.66. 14:15:03.764.363.300 23.66. 14:15:03.764.424.381 63.61. 14:15:03.764.424.381 63.61. 14:15:03.764.426.307 23.66. 14:15:03.764.426.307 23.66. 14:15:03.764.426.427 23.66. 14:15:03.764.426.747 26.66. 14:15:03.764.426.771 26.66. 14:15:03.764.426.771 26.66. 14:15:03.764.426.771 26.66. 14:15:03.764.426.771 26.66. 14:15:03.764.426.717 26.66. 14:15:03.764.426.717 26.66.	Data Frame TCO EOF EVEN Filler(%x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO EOF EVEN Data Frame TCO	244 25 26 27 28 30 30 31 32 33 34 35 36 36 37 38 39 40	14:13:03.796.492.558 10:28. 14:13:03.796.492.558 10:28. 14:13:03.796.494.275 29:18. 14:13:03.797.400.492 73.63. 14:13:03.797.400.102 29:16. 14:13:03.797.400.102 29:16. 14:13:03.797.400.102 29:16. 14:13:03.797.407.539.29:16. 14:13:03.797.467.539.29:16. 14:13:03.797.467.539.29:16. 14:13:03.797.457.539.29:16. 14:13:03.797.457.530.29:16. 14:13:03.797.452.510 29:16. 14:13:03.797.442.29:18. 14:13:03.797.442.29:14. 14:13:03.797.442.29:14. 14:13:03.797.442.49:29:16. 14:13:03.797.442.49:29:16. 14:13:03.797.71.730 29:16. 14:13:03.797.71.730 29:16. 15:13:03.797.71.730 29:16. 15:13:15:15:15:15:15:15:15:15:15:15:15:15:15:	CMD (READ (10)) CMD (READ (10))	DATA IN RESFORSE DATA IN DATA IN	08 08 09 09 09 09 09 09 09 09 09 09 09 09 09	0 1 0 B0 0 22 00 B0 0 1 0 B0 0 22 00 B0 0
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319	1415103.764.362.107 18.66. 1415103.764.362.361 24.6. 1415103.764.362.381 26.6. 1415103.764.363.270 889.9. 1415103.764.363.270 889.9. 1415103.764.363.320 889.9. 1415103.764.363.30 26.66. 1415103.764.363.107 56.66. 1415103.764.424.91 60.98. 1415103.764.424.91 60.98. 1415103.764.426.97 26.66. 1415103.764.426.97 26.66. 1415103.764.426.771 26.66. 14151050.764.426.771 26.66. 14151050.764.426.771 26.66. 1415100	Data Frame TCO EVE FUEN Filler(4x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 AFC TCO CReq=0	AFC TCO CReq=0 Filer(6x) AFC TCO CReq=0 Filer(4x) Data Frame TCO ECO FUEN Data Frame TCO	244 25 26 27 28 30 30 31 32 33 34 35 36 37 38 39 40 40 41	14:13:03.796.492.582 10.28. 14:13:03.796.453.115 42.55. 14:13:03.796.453.115 42.55. 14:13:03.797.460.105 29.14. 14:13:03.797.460.105 29.14. 14:13:03.797.460.105 29.14. 14:13:03.797.460.105 29.14. 14:13:03.797.531.430 29.14. 14:13:03.797.551.430 29.14. 14:13:03.797.551.430 29.14. 14:13:03.797.455.081 29.14. 14:13:03.797.455.081 29.14. 14:13:03.797.455.081 29.14. 14:13:03.797.455.081 29.14. 14:13:03.797.455.081 29.14. 14:13:03.797.43.562 29.14. 14:13:03.797.43.562 29.14. 14:13:03.797.43.562 29.14. 14:13:03.797.43.562 29.14. 14:13:03.797.400.893 29.14. 14:13:15.207.797.400.893 29.14. 15:15.207.707.40	CHD (READ (10))	DATA IN RESPONSE DATA IN DATA IN	08 08 09 09 09 09 09 09 09 09 09 09 09 09 09	0 1 0 80 0 22 0 80 0 21 0 80 0 01 40 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320	14:15:03.796.382.107 18.66. 14:15:03.796.382.301 26.66. 14:15:03.796.382.381 26.67. 14:15:03.796.383.270 883.20 14:15:03.796.383.270 883.20 14:15:03.796.383.300 26.66. 14:15:03.796.436.381 26.68. 14:15:03.796.426.281 1.8988 16:15:03.796.426.281 1.8988 16:15:03.796.426.437 26.66. 14:15:03.796.426.437 26.66. 14:15:03.796.426.437 26.66. 14:15:03.796.426.437 26.66. 14:15:03.796.426.437 26.66. 14:15:03.796.426.437 26.66. 14:15:03.796.426.81 27.26. 14:15:03.796.426.81 27.26. 14:15:03.796.426.81 27.26. 14:15:03.796.426.81 27.26.66. 14:15:03.796.426.81 28.68. 14:15:03.796.426.81 28.68. 14:15:03.796.426.79 28.68. 15:15:03.796.426.79 28.68. 15:15:03.796.426.79 28.68. 15:15:03.796.426.79 28.68. 15:15:03.796.426.79 28.68. 15:15:03.796.426.79 28.68.	Data Frame TCO EVEN FUEN Filler(4x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 AFC TCO CReq=0 AFC TCO CReq=0 AFC TCO CReq=0	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO EOF FVEN Data Frame TCO	244 25 26 27 28 30 30 31 31 32 33 34 35 36 35 36 37 37 37 37 37 39 9 39 9 40 40 41	14:13:03.796.492.581 0.28. 14:13:03.796.492.581 0.28. 14:13:03.796.494.275 29.14. 14:13:03.797.400.492 73.63. 14:13:03.797.400.102 29.14. 14:13:03.797.400.102 29.14. 14:13:03.797.400.102 29.14. 14:13:03.797.400.492 73.63. 14:13:03.797.459.492 73.63. 14:13:03.797.459.492 29.14. 14:13:03.797.453.492 29.14. 14:13:03.797.453.492 29.14. 14:13:03.797.453.492 29.14. 14:13:03.797.453.492 29.14. 14:13:03.797.453.492 29.14. 14:13:03.797.453.492 29.14. 14:13:03.797.453.492 29.14. 14:13:03.797.432.492 29.14. 14:13:14.202.292.14. 14:14:14.202.292.14. 14:	CHD (READ (10)) CHD (READ (10))	DATA IN RESPONSE DATA IN DATA IN	08 08 09 09 09 09 09 09 09 09 09 09 09 09 09	0 1 0 80 0 22 00 80 0 1 0 80 0 21 0 80 0 21 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0 22 0 80 0
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320 1321	1415103.764.362.107 18.66. 1415103.765.362.301 28.4 24.6. 1415103.765.362.301 26.66. 1415103.766.363.301 26.66. 1415103.766.363.301 35.32. 1415103.766.363.301 35.32. 1415103.766.363.301 35.6.66. 1415103.766.424.301 60.98. 1415103.766.424.301 60.98. 1415103.766.426.307 26.66. 1415103.766.426.307 26.66. 1415103.766.426.427 426.847 26.66. 1415103.766.426.427 426.847 426.847 456.847	Data Frame TCO EVEN Filler(4x) Filler(4x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 AFC TCO CReq=0 AFC TCO CReq=0 AFC TCO CReq=0 AFC TCO CReq=0	AFC TCO CReq=0 Filier(6x) AFC TCO CReq=0 Filier(4x) Data Frame TCO ECO FUEN Data Frame TCO	244 25 26 27 27 28 29 29 30 31 32 33 34 35 36 35 36 37 37 38 39 40 40 41 41 42 43	14:13:03.79:452.552 10:28 16:13:03.79:453.152 23:14 14:13:03.79:453.152 23:14 14:13:03.79:453.152 23:14 14:13:03.797.480.105 23:14 14:13:03.797.480.105 23:14 14:13:03.797.480.105 23:14 14:13:03.797.480.105 23:14 14:13:03.797.533.430 23:14 14:13:03.797.535.03 23:14 14:13:03.797.550.23 23:14 14:13:03.797.455.02 23:14 14:13:03.797.455.02 23:14 14:13:03.797.43.402 23:14 14:13:03.797.43.402 23:14 14:13:03.797.43.402 23:14 14:13:03.797.43.502 23:14 14:13:03.797.453.201 23:14	CHD (READ (10))	DATA IN RESPONSE DATA IN DATA IN	08 08 09 09 09 09 09 09 09 09 09 09 09 09 09	0 1 0 0 0 22 00 80 0 21 00 80 0 21 00 80 0 21 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0 22 00 80 0
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 1320 1321 1322	14:15:03.796.382.107 18.66. 14:15:03.796.382.107 18.66. 16:15:03.796.382.381 26.66. 16:15:03.796.382.381 26.66. 16:15:03.796.383.270 88.8. 16:15:03.796.383.50 26.66. 16:15:03.796.383.50 26.66. 16:15:03.796.423.91 60.98. 16:15:03.796.426.423.91 60.98. 16:15:03.796.426.423.91 1.8988 16:15:03.796.426.423.91 1.8988 16:15:03.796.426.423.91 2.638. 16:15:03.796.426.423.91 2.638. 16:15:03.796.426.423.92 2.66. 16:15:03.796.426.423.92 2.66. 16:15:03.796.426.427 2.6.66. 16:15:03.796.426.427 2.6.66. 16:15:03.796.426.427 56.66. 16:15:03.796.426.427 56.66. 16:15:03.796.426.427 56.66. 16:15:03.796.426.427 56.66.	Data Frame TCO EVEN FOR VI Filler(4x) Filler(4x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(3x) AFC TCO CReq=0 AFC TCO CReq=0 AFC TCO CReq=0 AFC TCO CReq=0 Filler(4x)	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO EOF EVEN Data Frame TCO	244 25 265 277 288 29 29 30 30 31 31 33 34 4 55 56 36 36 37 37 39 99 99 99 90 40 40 41 41 44 43	14:13:03.796.492.581 0.28. 14:13:03.796.492.581 0.28. 14:13:03.796.494.275 29.18. 14:13:03.796.494.275 29.18. 14:13:03.797.490.105 29.16. 14:13:03.797.490.105 29.16. 14:13:03.797.490.105 29.16. 14:13:03.797.490.298 29.16. 14:13:03.797.490.298 29.16. 14:13:03.797.425.89 29.16. 14:13:03.797.425.80 29.16. 14:13:03.797.425.402 29.16. 14:13:03.797.425.402 29.16. 14:13:03.797.425.402 29.16. 14:13:03.797.425.402 29.16. 14:13:03.797.402.802 29.16. 14:13:03.797.402.802 29.16. 14:13:03.797.402.802 29.16. 14:13:03.797.402.802 29.16. 14:13:03.797.402.802 29.16. 14:13:03.797.402.812 29.16. 14:13:03.797.402.812 29.16. 14:13:03.797.402.812 29.16. 14:13:03.797.402.812 29.16. 14:13:03.797.402.821 29.16. 14:13:03.797.402.822 29.16. 15:13:03.797.402.822 29.16. 15:13:03.797.402.822 29.16. 15:13:03.797.402.822 29.16. 15:13:03.797.422.822 29.16. 15:13:03.797.422.822 29.16. 15:13:13:122.822 29.16. 15:13:13:122.822 29.16. 15:13:13:122.822 29.16. 15:13:13:122.822 29.16. 15:13:13:122.822 29.16. 15:13:13:122.822 29.16. 15:13:13:122.822 29.16. 15:13:122.822 29.16. 15:13:1222 29.16. 15:13:1222 29.16. 15:13:1222 29.16. 15:13:1222 29.16. 15:13:1222 29.16.	CHD (READ (10))	DATA IN RESPONSE DATA IN DATA	08 08 09 09 09 09 09 09 09 09 09 09 09 09 09	0. 4.0 9.0 9.0 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1 22 0.0 8.0 0.1
1302 1303 1304 1305 1306 1307 1308 1309 1310 1311 1312 1313 1314 1315 1316 1317 1318 1319 13201 13202 1321 1322	1415103.764.362.107 18.66. 1415103.765.362.301 28.6 1415103.765.362.301 26.65. 1415103.766.362.301 26.65. 1415103.766.363.302 36.302 1415103.766.363.302 45.322. 1415103.766.363.302 45.322. 1415103.766.363.302 45.66. 1415103.766.424.391 60.96. 1415103.766.426.307 26.66. 1415103.766.426.307 26.66. 1415103.766.426.427 302 46.65. 1415103.766.426.427 26.66. 1415103.766.426.427 26.66. 1415103.766.426.427 26.66. 1415103.766.426.427 26.66. 1415103.766.426.427 26.66. 1415103.766.426.427 26.66. 1415103.766.426.427 26.66. 1415103.766.426.427 56.66. 1415103.766.426.427 56.66. 14151050.766.427.427 56.66. 1415100.766.427.427 56.66	Data Frame TCO Data Frame TCO For FUEN Filler(4x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 Filler(2x) AFC TCO CReq=0 AFC TCO CReq=0 Filler(4x) Filler(4x)	AFC TCO CReq=0 Filler(6x) AFC TCO CReq=0 Filler(4x) Data Frame TCO ECOF EVEN EOF EVEN EOF EVEN	244 25 26 27 27 28 30 30 31 31 32 33 34 45 35 35 35 35 35 35 35 35 35 35 35 35 35	14:11:03.79:45.92.581 10.28. 16:11:03.79:45.95.11:62.55. 14:11:03.79:45.95.11:62.55. 14:11:03.79:45.95.15.29.14. 14:11:03.79.460.105.29.14. 14:11:03.79.460.105.29.14. 14:11:03.79.460.105.29.14. 14:11:03.79.460.105.29.14. 14:11:03.79.581.430.29.14. 14:11:03.79.581.430.29.14. 14:11:03.79.561.29.29.14. 14:11:03.79.455.001.29.14. 14:11:03.79.71.31.492.29.14. 14:11:03.79.71.31.492.29.14. 14:11:03.797.71.31.492.29.14. 14:11:03.797.71.31.492.29.14. 14:11:03.797.71.31.492.29.14. 14:11:03.797.71.31.492.29.14. 14:11:03.797.71.31.492.29.14. 14:11:03.797.71.31.492.29.14. 14:11:03.797.71.71.30.29.14. 14:11:03.797.455.012.29.14. 14:11:03.797.457.30.29.14. 14:11:03.797.457.30.29.14. 14:11:03.797.457.30.29.14. 14:11:03.797.457.30.29.14. 14:11:03.797.477.47.20.29.14. 14:11:03.797.477.4	CHD (READ (10))	DATA IN RESPONSE DATA IN DATA	08 08 09 09 09 09 09 09 09 09 09 09 09 09 09	0. 4.0 0.0 0.0 2.0 0.0 0.0 0.0 2.1 0.0 0.0 0.0 2.1 0.0 0.0 0.0 2.1 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0 2.0 0.0 0.0 0.0<

b. 統計列表: 以統計功能快速分類並可追蹤資料位置









11. UFS Settings

Protocol Settings						×
eMMC 5.1	Connection		Startup 5			
MIPI CSI MIPI DSI	UFS Fixture		Mode	PWM	Reference clock	
MIPI RFFE			Lane	1 Lane	▼ 19.2MHz	_
SD 3.0			Gear	PWM-Gear1		
SGMII	UFS probe settings 2		Trigger O	6		
UFS	GND	GND		-	Trigger Item 0	/8 Clear All
	Acute UFS M-PHY Way Station		▼ UFS P4 ▼ An ▼ SC	ackets y UFS packets Any UFS packets SI Command FORMAT UNIT INQUIRY MODE SELECT (10) PRE-FETCH (16) READ (6) READ (16)		
	∎ ST ST ST ST ST ST ST ST ST ST ST ST ST	Reset pin (CH4) Voltage detect channel	Unknov Voltage Dr	vn Packet	CRC ERR	
		VCC(A0)		A0) Drop		
		VCCQ(A1)		Q(A1) Drop		
	Detail Report Display		Filter			
	Table + Text	O Table only	Data fil	er > 256	bytes	
			Data	200	bytes	
	O Default				✓ OK	× Cancel

- 1. Connection: 需選擇 BF7264B+與待測物的連接方式
- 2. UFS way station Settings: 可交換同一 Lane 之 p/n, 並可選擇是否要量測 Ref-Clk.
- 3. UFS tip Settings:
 - a. 可開啟 UFS Reset pin 之判斷,需接上 reset pin 於 UFS probe 之 LA tip CH4 位置
 - b. 電壓偵測通道 A0, A1
- 4. Detail Report Display: 可選擇是否需要文字描述的解析方式
- Startup: 需設定於擷取當下,待測物所運行之模式; 必須設定 Reference clock, 可選 擇 19.2/26/38.4/52 MHz 選項 (無論 Ref-CLK 是否有接上, 正確數值必須給定)
- 7. Filter: 開啟後將會濾除大於設定值之封包後方資料



FAQ

1. 支援 UFS 第幾版的規格,是否有 Differential 對數或 port 數限制呢?

- 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. 量測時是否會影響訊號品質?

A:外接的儀器量測必然會有部分的負載效應影響,我們採用 SMPM Coaxial Cable 的連接方式來降低對待測物干擾並提升訊號品質。

3. 是否有支援訊號發送 (Tx) 功能?

A:不支援訊號發送功能

4. 量测時須注意的事項

a. 接線問題判斷與排除方法:

請確實按手冊探棒與待測物連接方式進行連接。若量測起來 PWM 正常,但無法看到任何 HS data 或只能上 1 Lane 而無法上 2 Lane 時,就應先檢查接線是否有錯誤。

b. Reference clock 設定方式:

在 Settings 有提供 Ref Clk 19.2MHz(default) / 26MHz / 38.4MHz / 52MHz 四個選項。 若不清楚所使用的 Ref clk 為何時,可按下列方式做判斷。若 PWM 正常,但 HS Data 都是錯誤的,請嘗試調整 Ref Clk 為其他頻率再抓一次。

5. 有指定某個 Unipro, UFS packet 做為 trigger 點的功能嗎?

A:可以指定特定的 Unipro, UFS packet 或是 Error 進行觸發。





6. 是否可以自行設定一個 Unipro, UFS 起始點,指定抓取多少時間內的 Data?

A:可以將起始條件設定在觸發項目後,到工作模式選單內調整為資料監控儀模式, 並指定擷取時間長度。





探棒與待測物連接方式

a. 使用 UFS Fixture (連接器)方式連接

使用時機:

若 Host 有多套時可用連接器的方式,方便更換 Host 與 UFS Chip,以及不需要 跳線直接使用 SMPM Cable 連接 Way Station。

由於連接器使用軟排線延伸訊號,只適合應用於 UFS Chip 周邊元件不干涉的情況。

零件列表	
1. 連接器主板(Con Fixture)	
2. 連接器小板(Con Dummy Board)	Sation Station Statio
3. 連接器 DF17-30DS-0.5V (HiRose Connector)	

Step1: 將待測物上的 UFS IC 拔起,拔起來的 UFS IC 需重新植鍚球。 Step2: 將連接器小板,焊在已拆下 UFS IC 位置。





焊接連接器小板時請注意 Pin1 方向

Step3: 將連接器(DF17-30DS-0.5V)放在連接器小板上,在焊接之前請先注意連接器 背後定位柱方向與小板定位孔位置



<u>Step4</u>: 連接器放置小板確認完成開始焊接,焊接完成後確認 pin 腳之間有無短路。 Pin 腳名稱如下圖



Step5: 連接主板,連接前請先注意主板連接器上定位針與小板定位孔位置





<u>Step6:</u> 將拔起來的 UFS IC 放進連接器主板 UFS Socket (FBGA153 Socket),完成。 b. 使用增高板搭配 End-Tip 方式連接

使用時機:

若原 UFS Chip 周邊元件干涉,無法使用 UFS Fixture 時以及 UFS Chip 周邊沒有 測試點(Test point)可進行跳線時,就需拔除原 UFS Chip,以增高板墊高之後再從測 試點接上 End-Tip 後再使用 SMPM Cable 連接 Way Station。







增高板腳位圖

c. 使用 End-Tip 方式連接

若待測板已留有測試點(Test point)可進行跳線時,可直接使用 End-Tip 接上測試,就不需使用增高板。

UFS 標配的 End-tip 軟板上面的電阻為 250ohm,一般的情況下可直接使用。 若希望縮短跳線距離以提升訊號品質,可按照下列方式以電阻橋接方式(如下圖), End-tip 要做修改。

修改流程:

Step1: 電阻拿掉,頭剪掉,保留2個焊點。





Step2: 改完後 End-tip 上面的 P/N 焊點與增高板的 P/N 焊點對齊,對齊後再將電阻 2500hm 焊上去,4 組 data +1 條 clk 焊完後再焊接地線。



完成示意圖。此種方式因距離最短使得訊號品質會比 End-tip 跳線連接的方式來的好。









Way Station 連接方式

- 1. UFS Probe 請安裝於 BusFinder 7264B+ 的 Slot B 插槽
- Way Station 轉接盒各有一個 USB Type B 插孔,請使用對應之 USB Cable 安裝於 主機正面插孔。安裝時,請按照 Way Station 銘板標示之 Top/Botom 安裝即可。

