2. Analyzer (SGDK330A/SGDK330B)

Supported Media List

Media type	version	Description
SD	SD version 3.10	4bit UHS-I (up to 208MHz) SDSC/SDHC/SDXC
SDIO	SDIO version 3.10	4bit/8bit UHS-I (Up to 208MHz) 2KByte block size
eMMC	eMMC version 5.10	4bit/8bit HS200 /HS400 (up to 200MHz DDR) 3.3V/1.8V/1.2V

NOTES: At higher frequency, for example 200MHz, this analyzer might not capture signals correctly because of noise or cross talk problem. And some host cannot access media correctly if this analyzer's mini POD is inserted between Host and Media.

Difference between SGDK330A and SGDK330B

	Log Memory Size	eMMC HS400
SGDK330A	256MB	Not fully supported (*1)
SGDK330B	1GB	Supported

(*1) SGDK330B can save all of protocol information of HS400 mode.
SGDK330A can save only 256Byte (half of one sector) information of HS400 mode.

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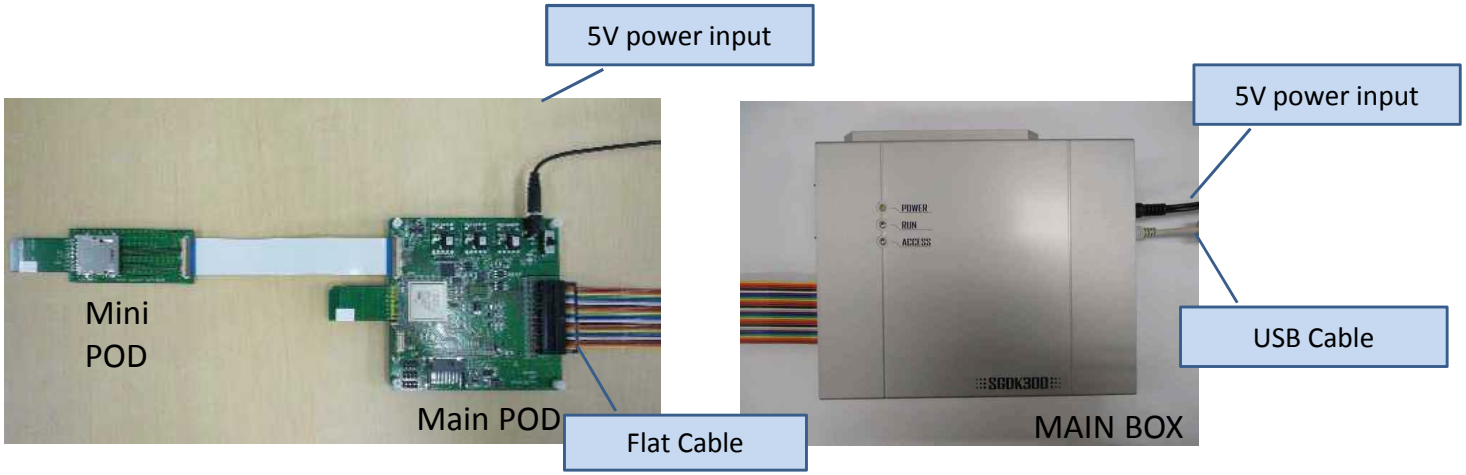
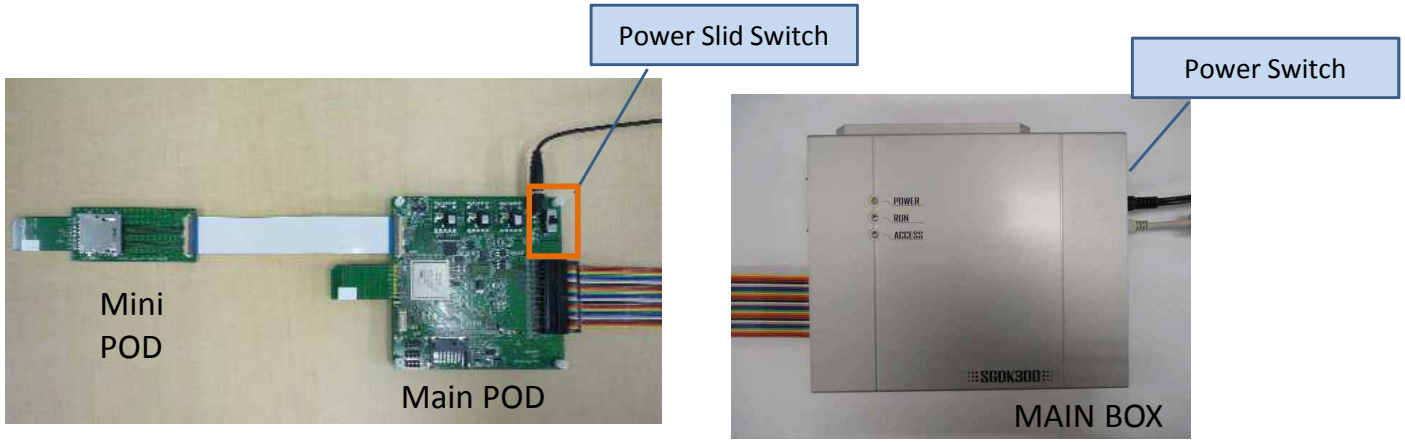
1. Setup (1/4)

[Step1] Connect Cables (5V Power, USB cable, Flat cable, Mini POD)

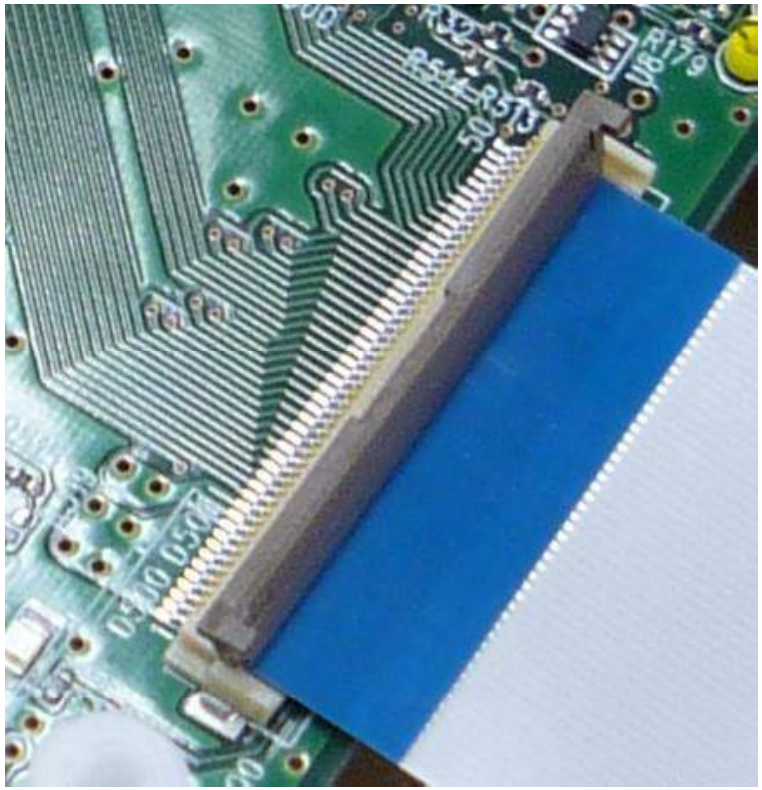


[Step2]] Switch on both POD and MAIN power at the same time. Or switch on POD power, then switch on MAIN power as soon as possible.

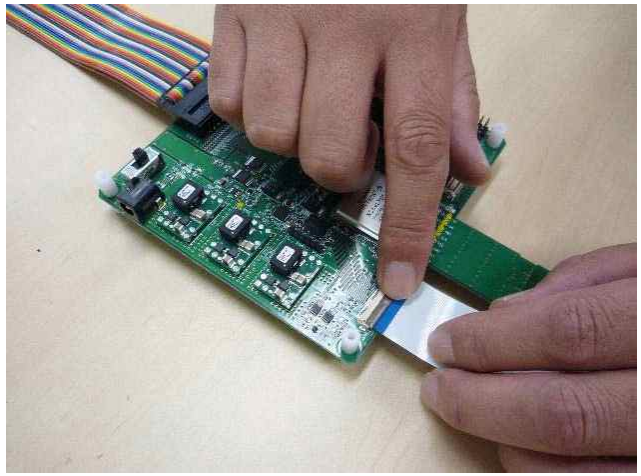


1. Setup (2/4)

FFC cable setting



Pull up lid and put FFC on connector

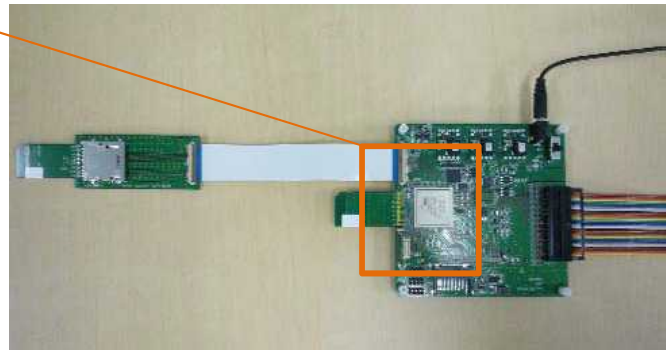


Press lid

1. Setup (3/4)

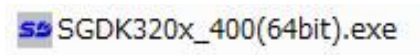
[Step3] About 12 seconds later after POD was powered on, Red LED will light.

12 seconds later
after power on



[Step4] Run Application software.

For 32bit or 64bit OS



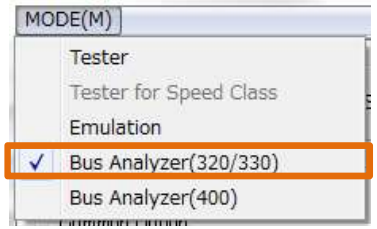
For 64bit OS

If communication between PC and this Emulator is good, number (except all"0") will be shown on menu bar.

If communication is NO good, "Offline Mode" will be shown on menu bar. In this case, please power off both MAIN and POD. And retry power on procedure again or check USB cable.

2. Getting Started (1/4)

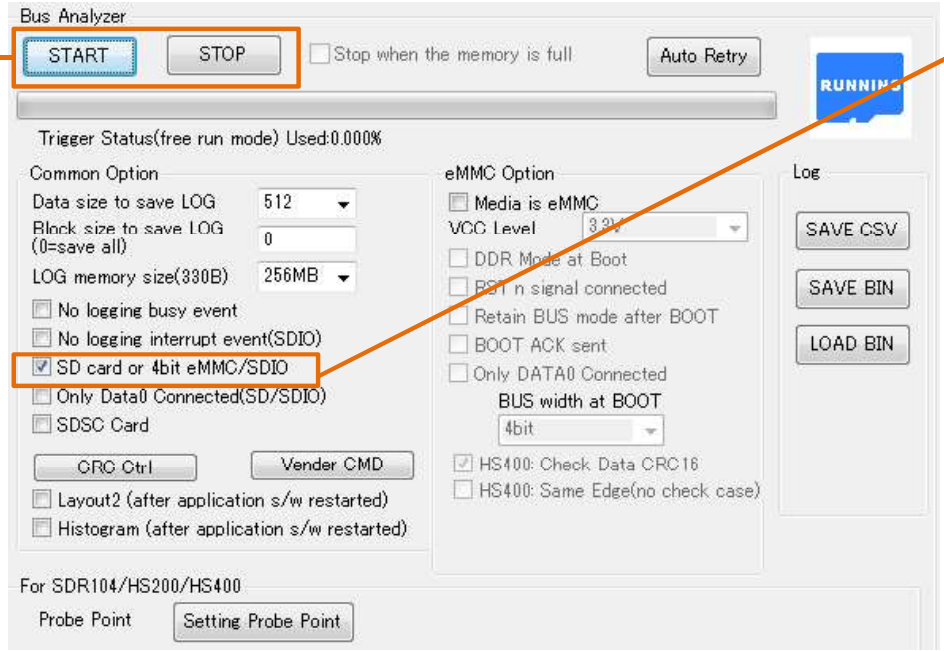
[Step1] Select “Bus Analyzer(320/330)”



[Step2] Set SD Card to Mini POD.

[Step3] Push “START” Button

“START” & “STOP”



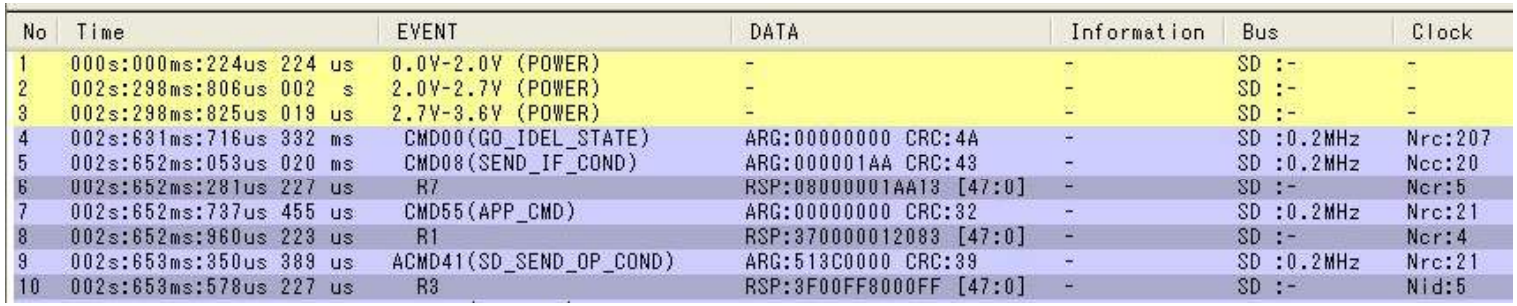
Caution:

If SD card, please check this Box.

If 8bit media, please off this Box.

[Step4] Inset Mini POD to Host Product, and let Host access SD card.

[Step5] Push “STOP” Button. LOG will be shown on the PC screen.



No	Time	EVENT	DATA	Information	Bus	Clock
1	000s:000ms:224us 224 us	0.0V-2.0V (POWER)	-	-	SD :-	-
2	002s:298ms:806us 002 s	2.0V-2.7V (POWER)	-	-	SD :-	-
3	002s:298ms:825us 019 us	2.7V-3.6V (POWER)	-	-	SD :-	-
4	002s:631ms:716us 332 ms	CMD00(GO_IDEL_STATE)	ARG:00000000 CRC:4A	-	SD :0.2MHz	Nrc:207
5	002s:652ms:053us 020 ms	CMD08(SEND_IF_COND)	ARG:000001AA CRC:43	-	SD :0.2MHz	Ncc:20
6	002s:652ms:281us 227 us	R7	RSP:08000001AA13 [47:0]	-	SD :-	Ncr:5
7	002s:652ms:737us 455 us	CMD55(APP_CMD)	ARG:00000000 CRC:32	-	SD :0.2MHz	Nrc:21
8	002s:652ms:960us 223 us	R1	RSP:370000012083 [47:0]	-	SD :-	Ncr:4
9	002s:653ms:350us 389 us	ACMD41(SD_SEND_OP_COND)	ARG:513C0000 CRC:39	-	SD :0.2MHz	Nrc:21
10	002s:653ms:578us 227 us	R3	RSP:3F00FF8000FF [47:0]	-	SD :-	Nid:5

ID	Description
No	Event number
Time	Event time and interval time from previous Event.
EVENT	Event such as CMD, Response, Read, Write.
DATA	Argument, Response, Read Data, Write Data
Information	Wait time, Busy time, IO voltage, CRC Error information
BUS	Bus width, Bus mode, Frequency. Frequency value is calculated by measuring period from Start bit to Stop bit of Command, and divides by 48. So this value is not precise. Please use this value only for reference.
Clock	Ncr, Nrc, Nid, Nac. Nrc after power on is clock count from power on to CMD0 is issued.

[Step6] If “SAVE BIN” button is pushed, LOG information is saved to file in PC.
If “LOAD BIN” button is pushed, saved LOG information is loaded.

To check whether protocol was correctly captured, please push “s_crc.txt” (double click). “s_crc.txt” tries to find CRC7/CRC16 error in captured LOG. (Analyzer calculates CRC value by itself, and if input CRC value is not the same as calculated CRC, it displays CRC7/16 error message at each line.)

s_cmd_arg.txt	E:¥Master_Data¥WorkArea
s_cmd_arg_a...	E:¥Master_Data¥WorkArea
s_crc.txt	E:¥Master_Data¥WorkArea
s_crc_card.txt	E:¥Master_Data¥WorkArea
s_crc_host.txt	E:¥Master_Data¥WorkArea

[OK case] only POWER event are listed up.

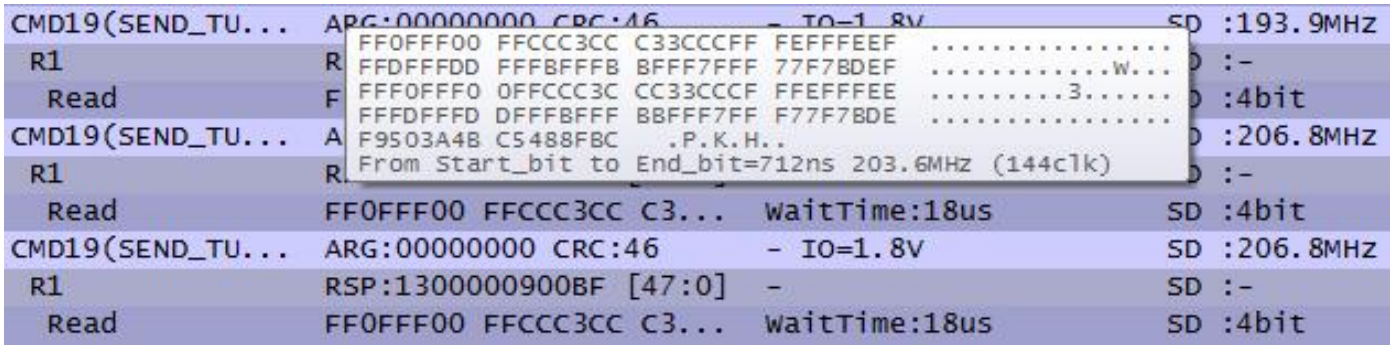
0	000s:0...	POWER
1	000s:0...	POWER
6296	004s:3...	POWER
6297	004s:3...	POWER

[NG case] CRC7/16 error are listed up

000s...	- CRC7 ERROR	
000s...	- CRC7 ERROR	
000s...	- CRC7 ERROR	
000s...	CMD,48	CRC16 ERROR
000s...	CMD,48	CRC16 ERROR
000s...	CMD,48	CRC16 ERROR

If CRC7/16 error are listed up, “Tune Probe point” should be executed to delete such error message.
Please note that some host change output AC timing to find appropriate output AC timing while mounting media operation.
In such case, CRC7/16 error message cannot be deleted.

Data and some CMD/Response information will be shown in POP UP window.



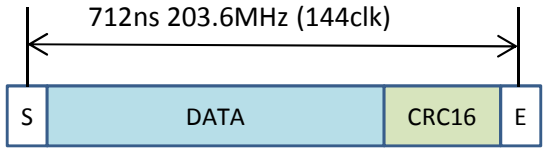
If you need to save these information as TEXT file, please do below steps.

- select target line by clicking left mouse button (right button is assigned as line marker operation)
- press control-C (copy)
- paste to text editor (paste)

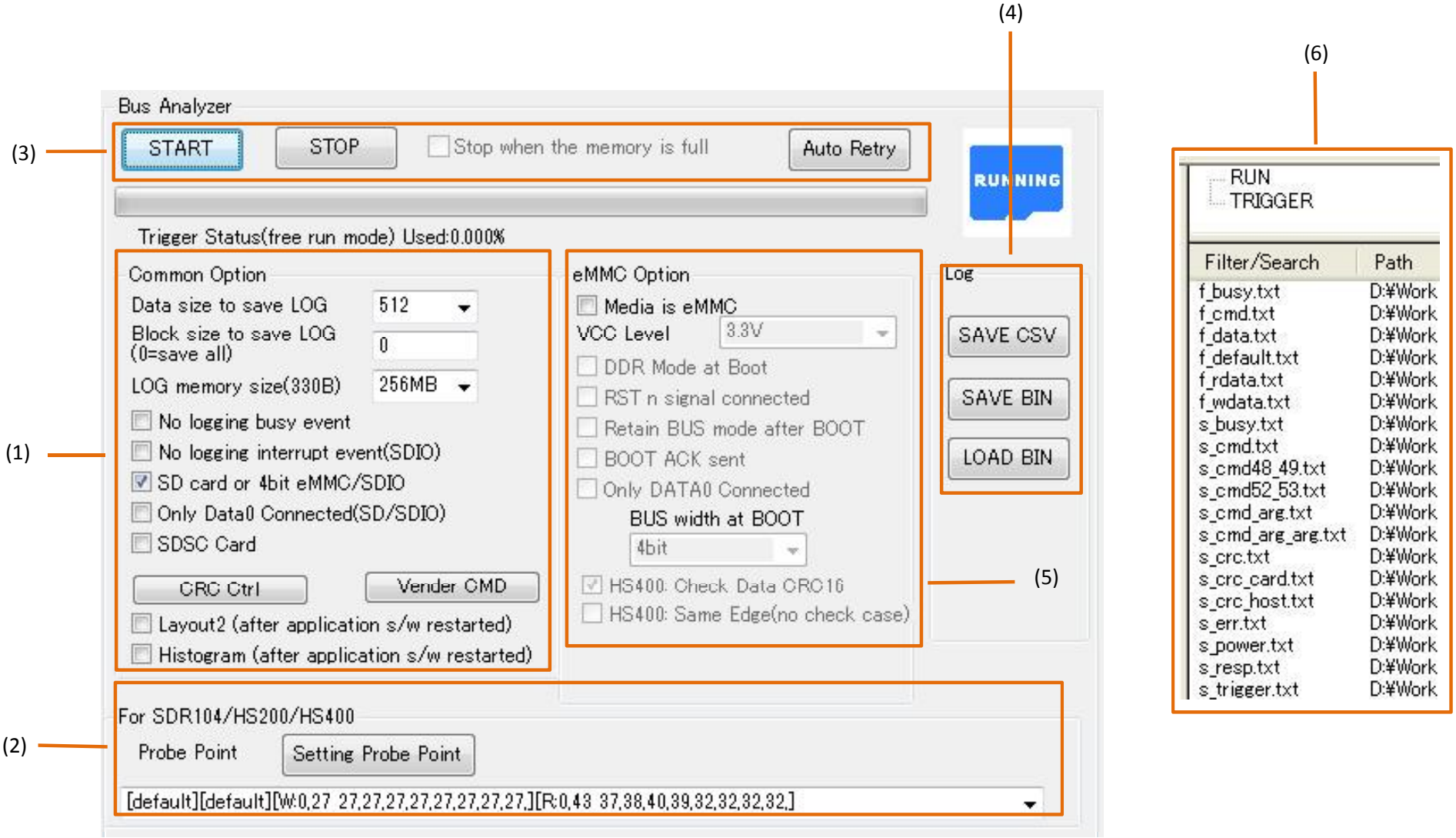
```
FF0FFF00 FFCCC3CC C33CCCFF FEFFFEEF  ................
FFDFFFDD FFFBFFFB BFFF7FFF 77F7BDEF  ............W...
FFF0FFF0 0FFCCC3C CC33CCCF FFEFFFEE  .........3......
FFFDFFFD DFFFBFFF BBFFF7FF F77F7BDE  ................
F9503A4B C5488FBC  .P.K.H..
From Start_bit to End_bit=712ns 203.6MHz (144clk)
```

Bottom line is CRC16 data

1bit mode	: 2 byte
4bit mode	: 8 byte
8bit mode	: 16 byte
4bit DDR mode	: 16 byte
8bit DDR mode	: 32 byte



3. TOP Menu (1/4)


(4)
(6)
(3)
(1)
(2)
(5)
Bus Analyzer
START
STOP
Stop when the memory is full
Auto Retry
RUNNING
Trigger Status(free run mode) Used:0.000%
Common Option
Data size to save LOG
512
Block size to save LOG (0=save all)
0
LOG memory size(330B)
256MB
No logging busy event
No logging interrupt event(SDIO)
SD card or 4bit eMMC/SDIO
Only Data0 Connected(SD/SDIO)
SDSC Card
CRC Ctrl
Vender CMD
Layout2 (after application s/w restarted)
Histogram (after application s/w restarted)
eMMC Option
Media is eMMC
VCC Level
3.3V
DDR Mode at Boot
RST n signal connected
Retain BUS mode after BOOT
BOOT ACK sent
Only DATA0 Connected
BUS width at BOOT
4bit
HS400: Check Data CRC16
HS400: Same Edge(no check case)
Log
SAVE CSV
SAVE BIN
LOAD BIN
For SDR104/HS200/HS400
Probe Point
Setting Probe Point
[default][default][W:0,27 27,27,27,27,27,27,27,27,27,27,][R:0,43 37,38,40,39,32,32,32,32,]
RUN
TRIGGER
Filter/Search
Path
f_busy.txt D:¥Work
f_cmd.txt D:¥Work
f_data.txt D:¥Work
f_default.txt D:¥Work
f_rdata.txt D:¥Work
f_wdata.txt D:¥Work
s_busy.txt D:¥Work
s_cmd.txt D:¥Work
s_cmd48_49.txt D:¥Work
s_cmd52_53.txt D:¥Work
s_cmd_arg.txt D:¥Work
s_cmd_arg_arg.txt D:¥Work
s_crc.txt D:¥Work
s_crc_card.txt D:¥Work
s_crc_host.txt D:¥Work
s_err.txt D:¥Work
s_power.txt D:¥Work
s_resp.txt D:¥Work
s_trigger.txt D:¥Work

3. TOP Menu (2/4)

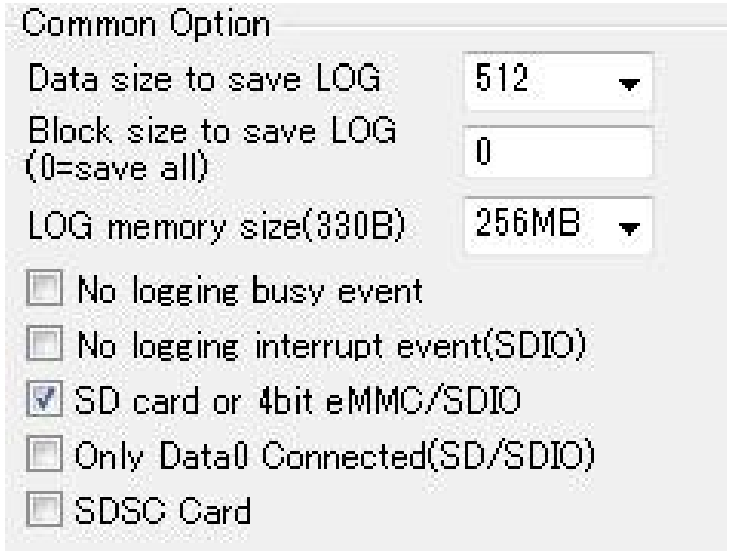
#	ID	Description	Reference
(1)	Data size to save LOG	Choose Data size to be saved to LOG. If 512 bytes is chosen, all of Data information including CRC16 information are saved. If from 4 bytes to 128 bytes is chosen, specified bytes information are saved. If 0 byte is chosen, any Data information is not saved.	3.1.1
	Block size to save LOG	Choose Block size to be saved to LOG. If it is 0, all of blocks are saved to LOG.	3.1.2
	LOG Memory Size (330B)	In case of SGDK330B, LOG memory size can be selected from 256MB/512MB/1GB. In case of SGDK330A, LOG memory size is fixed to 256MB.	3.1.3
	No logging busy event	If checked, busy event is not recorded.	3.1.4
	No logging Interrupt event (SDIO)	If checked, Interrupt event is not recorded.	3.1.5
	SD card or 4bit eMMC/SDIO	If target media is SD card or 4bit eMMC/SDIO, please check.	3.1.6
	Only Data0 Connected (SD/SDIO)	Check this box if only DATA0 signal is connected to wire type mini POD. (CLK and CMD signals should be connected)	3.1.7
	SDSC Card	If SDSD card is used and also Address trigger is used, check this.box. If Address trigger is not used, it is no need to check.	
	CRC Ctrl	Push this button to set CRC Error detected signal output mode. Analyzer outputs Pulse signal from Header pin when CRC Error is detected.	8 CRC Error Detected signal
	Vendor CMD	Push this button to add new CMD definition. Four (4) CMD definitions can be added.	7 Add CMD definition
	Layout2	If checked, window layout is changed to mode 2 after application software is restarted. If not checked, window layout is changed to default mode after application software is restarted.	
	Histogram	If checked, Histogram of SD card access is displayed at the below of log window after application software is restarted. If not checked, Histogram window is deleted after application software is restarted.	3.4 Histogram

3. TOP Menu (3/4)

#	ID	Description	Reference
(2)	Probe Point	Choose probe point values from Pull Down menu.	5 Probe Point
	Setting Probe Point	If new Probe Point is needed to make, use this button.	
(3)	START	If this button is pushed, Protocol Analysis starts. When log area becomes full, old log data is over written by new log data.	9.1 Start and Stop
	STOP	If this button is pushed, Protocol Analysis stops and log data is displayed on PC screen.	
	Auto Retry	If this Button is pushed, Protocol Analysis will start in auto log data saving mode. In this mode, log data is saved when captured log becomes full and Analysis will restart repeatedly till STOP button is pushed. Log data will not be saved while log data is being saved.	9.2 Auto Retry (repeat mode)
(4)	SAVE CSV	Push this button to save LOG information in CSV format.	6 Save and load Log information
	SAVE BIN	Push this button to save LOG information in Binary format.	
	LOAD BIN	Push this button to load Binary format LOG file.	

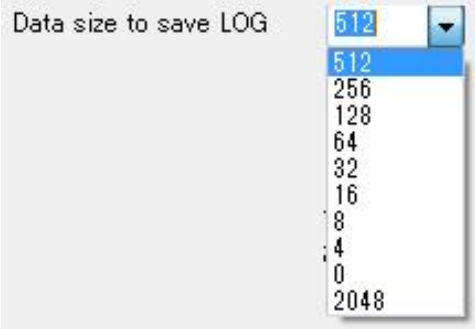
#	ID		Description	Reference
(5)	Media is eMMC		Check this box if eMMC (including MMC Card) is target media.	3.2.1
	VCC Level		Choose VCCQ level (IO voltage level) 3.3V,1.8V or 1.2V can be chosen.	3.2.2
	DDR Mode at BOOT		Check this box if eMMC is DDR mode at Boot phase.	3.2.3
	RST_n signal connected		Check this box if RST_n signal is connected to wire type mini POD. If rising edge is found, RST_n event will be recorded to LOG.	3.2.4
	Retain BUS mode after BOOT		Check this box if “Retain BOOT_BUS_WIDTH and BOOT_MODE values after boot operation” of target eMMC is set.	3.2.5
	BOOT ACK sent		Check this box if eMMC media sends BOOT ACK signal at Boot phase.	3.2.6
	Only DATA0 mode	Only DATA0 connected	Check this box if only DATA0 signal is connected to wire type mini POD. (CLK and CMD signals should be connected)	3.2.7
		BUS width at BOOT	Choose bus width at Boot phase. DDR Mode is specified by ”DDR Mode at BOOT”.	
	HS400: Check Data CRC16		[HS400] If checked, CRC16 of Data is checked while HS400 mode. If not checked, CRC16 of Data is not checked while HS400 mode.	3.2.8
	HS400: Same edge (no check case)		[HS400] This option is valid if Check Data CRC16 is off. If checked, HS400 output timing from eMMC is supposed the same as HS200. If not checked, 180 degree delayed. This timing is used for latching CRC status.	3.2.9
(6)	RUN/TRIGGER		Change to Trigger menu	
	Filter/Search		Search event from LOG information.	3.6 Search

3.1 Common Option

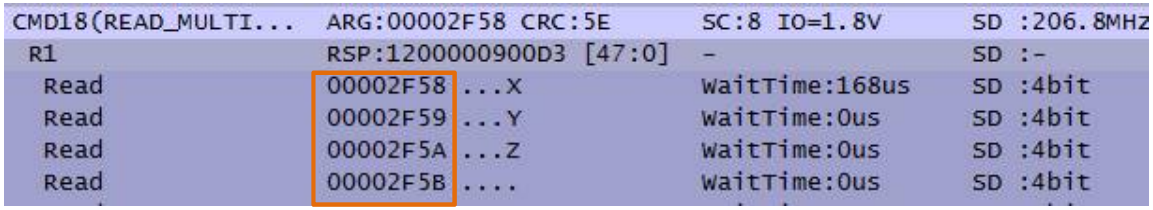


3.1.1 Data size to save LOG

This value defines how many bytes per sector are saved to LOG.
If it is 512, all of data with CRC16 code are saved to LOG.
If it is 4, only 4bytes of head of each sector data are saved to LOG.
If it is 0, no data content is saved to LOG.
“2048” is for SDIO.



For example, if it is 4, only 4bytes data contents are saved to LOG as below figure.



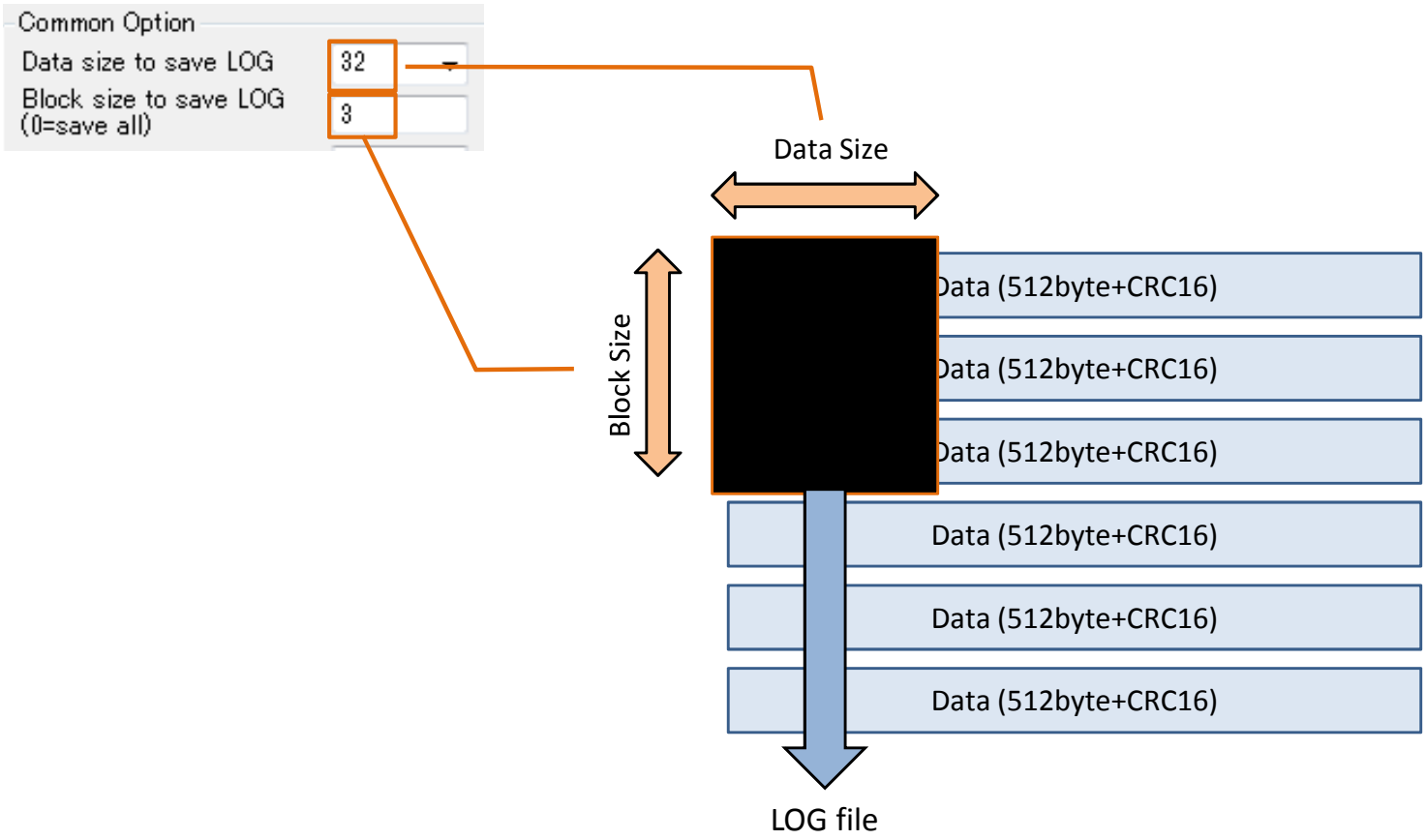
Only 4bytes of each sector are saved to LOG.

Exception is eMMC CMD8 (SEND_EXT_CSD) and packed command. In these case, all of 512Byte are stored LOG even if smaller byte is specified.

3.1.2 Block size to save LOG (1/2)

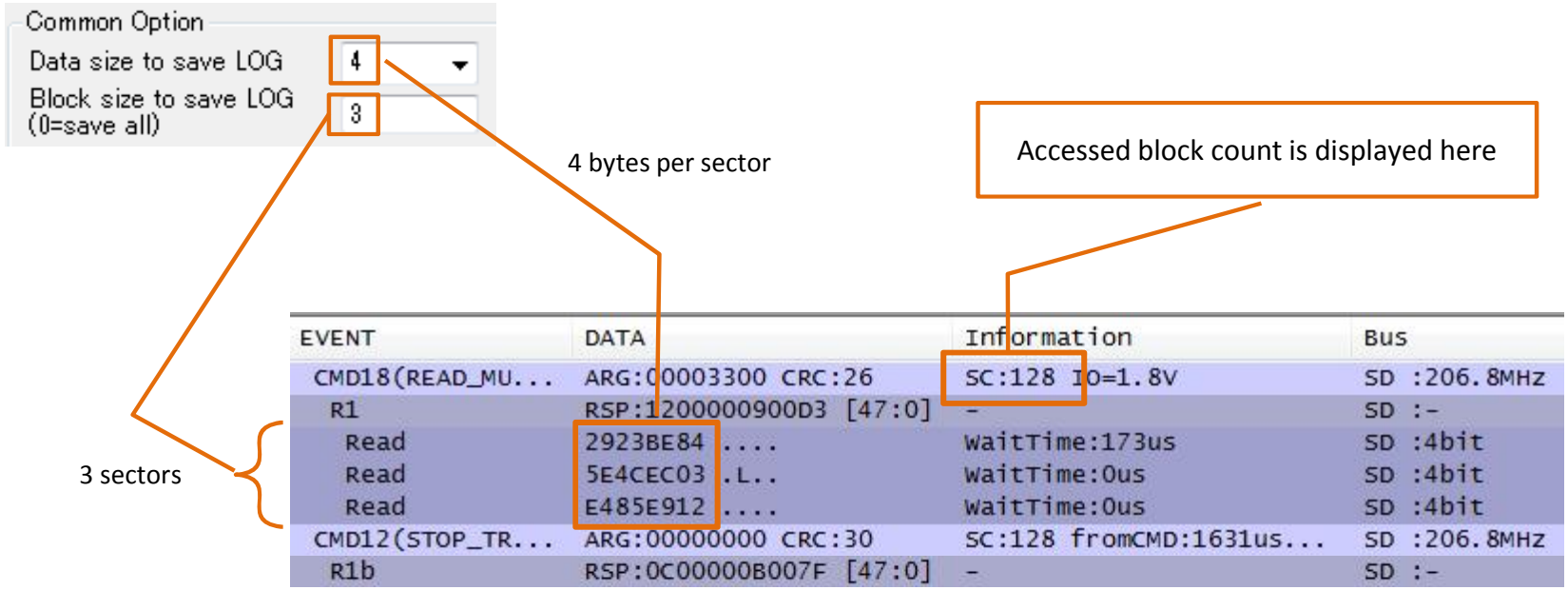
This value defines how many blocks (sectors) in one multiple read/write operation are saved to LOG.
If this value is 0, all of blocks are saved to LOG.
If this value is 1, only one block in one multiple read/write operation are saved to LOG.

“Data size to save LOG” defines byte size, and “Block size to save LOG” defines sector size as below figure.
This is useful to let LOG size minimize, and save more information to LOG if user does not care Data contents itself.



3.1.2 Block size to save LOG (2/2)

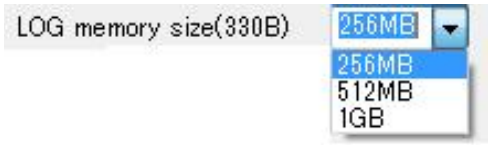
Below figure is sample of “Data size = 4” and “Block size = 3” in multiple read operation (CMD18).
In this case, 128 sectors are read by one CMD18 from media, but only 4 byte of 3 sectors are saved to LOG.
These data information occupy small area in LOG, so many events can be saved to LOG.

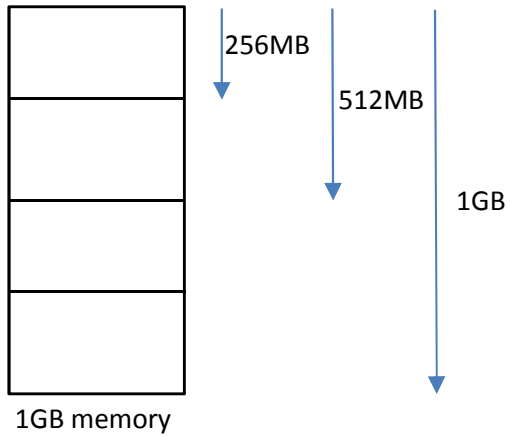


3.1.3 LOG memory size (330B)

SGDK330B has 1GB LOG memory.
If 256MB is selected, only quarter area of 1GB is used to save LOG.
If 1GB is selected, all of 1GB area is used to save LOG.
This value can be selected if hardware is SGDK330B. In case of SGDK330A, this value is fixed to 256MB.

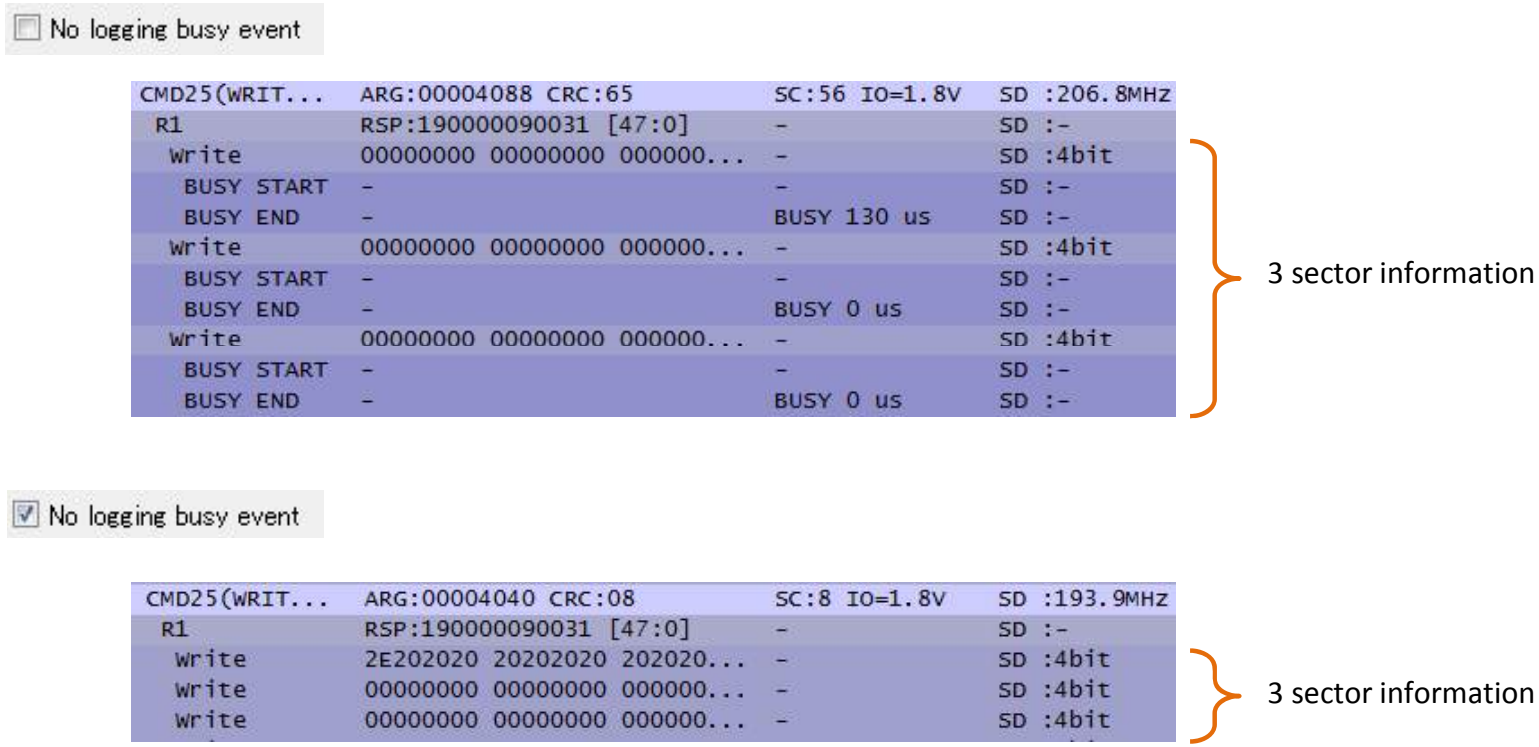
It will take time to upload 1GB data from analyzer to PC. If this value is smaller, time from STOP button pushed till showing LOG to display can be shorter.





3.1.4 No logging busy event

If this is checked, Busy event is not saved to LOG.
If user does not care Busy event (busy time), this is useful to let LOG information be simpler.



3.1.5 No logging interrupt event (SDIO)

In case of SDIO, “DATA1 = LOW” is defined as Interrupt event.
If this is checked, interrupt event is not saved to LOG.

In some situation, interrupt event is saved to LOG as below figure, even though media is SD card.

021 us	Read	00000000 00000000 00...	WaitTime:0us	SD :4bit
021 us	Read	00000000 00000000 00...	WaitTime:0us	SD :4bit
076 us	CMD12(STOP_TR...	ARG:00000000 CRC:30	SC:8 fromCMD:6...	SD :49.2MHz
000 us	int assert	-	-	SD :-
000 us	Read	00000000 00000000 00...	WaitTime:0us	SD :4bit
000 us	R1b	RSP:0C00000B007F [47:0]	-	SD :-
975 us	int negate	-	-	SD :-
000 us	CMD18(READ_MU...	ARG:00002F70 CRC:24	SC:8	SD :49.2MHz
001 us	R1	RSP:1200000900D3 [47:0]	-	SD :-

This reason is some SD card does not set DATA1 signal to High level before Hi-Z, and also Host does not pull up DATA1 signal.
In such case, please use this option to remove Interrupt message from LOG.

3.1.6 SD card or 4bit eMMC/SDIO

If target media is SD card or 4bit eMMC/SDIO, please check this box.
If target media is 8bit, please off this check box.

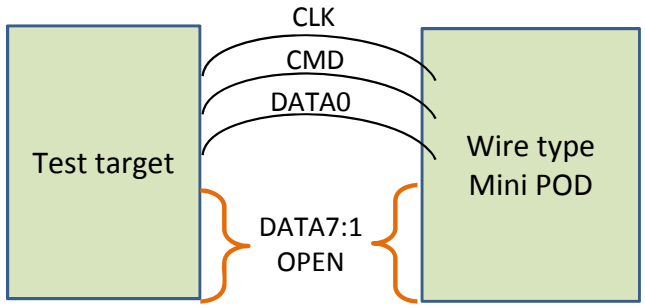
SD card or 4bit eMMC/SDIO case

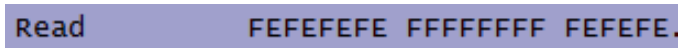
8bit eMMC/SDIO case

3.1.7 Only Data0 Connected (SD/SDIO)

“Only Data0 Connected” mode is used when wire type mini POD is used to analyze SDIO protocol.
In case of wire type mini POD, CLK, CMD and DATA signals must be connected between test target and wire type mini POD.
This analyzer supports only DATA0 signal connected mode. In this mode, it is no need to connect DATA7:1 to wire type mini POD.

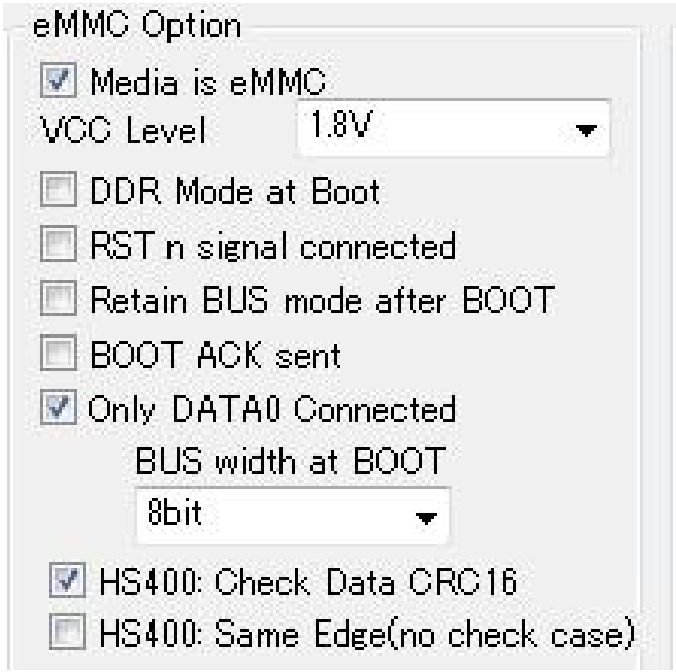
This mode is useful to minimize effort to wire connection between Host and mini POD.





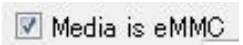
In this case, displayed data is “E” or “F”.
If 4bit mode, and if DATA0=LOW, then Data is “E”, and if DATA0=HIGH, then Data is “F”.
If 8bit mode, and if DATA0=LOW, then Data is “FE”, and if DATA0=HIGH, then Data is “FF”.

3.2 eMMC Option



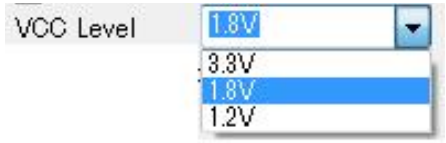
3.2.1 Media is eMMC

If this is off, analyzer treats captured CMD as for SD or SDIO.
If this is on, analyzer treats captured CMD as for eMMC.
So this check box must be correctly set. Otherwise, analyzer will not be able to capture protocol correctly.



3.2.2 VCC Level (VCCQ Level)

In case of eMMC, this setting is used to show Power event of VCCQ.



This analyzer has 4 zone VCC level. If VCCQ is changed to other zone, Power event is saved to LOG.

```
2.0V-2.7V (POWER)
2.7V-3.6V (POWER)
```

```
1.4V-1.7V (POWER)
1.7V-1.95V (POWER)
```

Below table is Voltage definition of each zone.

	1.2V	1.8V	3.3V
Zone1	0V-0.8V	0V-1.4V	0V-2.0V
Zone2	0.8V-1.1V	1.4V-1.7V	2.0V-2.7V
Zone3	1.1V-1.3V	1.7V-1.95V	2.7V-3.6V
Zone4	Over 1.3V	Over 1.95V	Over 3.3V

This analyzer judges whether Host is power off by fixed voltage level. It is less than 1.0V.
This 1.0V does not have any relation with this VCC level setting.
If VCCQ (eMMC) or VCC(SD) is less than 1.0V, this analyzer initializes bus mode setting to 1bit and SDR.

3.2.3 DDR Mode at Boot

This analyzer judges Bus mode (such as SDR/DDR, 1bit/4bit/8bit) by CMD6 and ACMD6 (SD card case).
If analyzer could not capture CMD6 correctly, analyzer will not be able to capture protocol correctly, because analyzer will use wrong Bus mode.
So this analyzer should be started before Host is power on. Otherwise, analyzer might issue wrong LOG, because analyzer cannot capture CMD6.

In case of Boot phase of eMMC, analyzer cannot judge whether SDR mode or DDR mode, because there is no CMD6 before Boot phase.
So before start analyze, bus mode (SDR or DDR) at Boot should be correctly specified.

If Host does not use Boot mode, it is no need to set this mode.

SDR mode at Boot phase

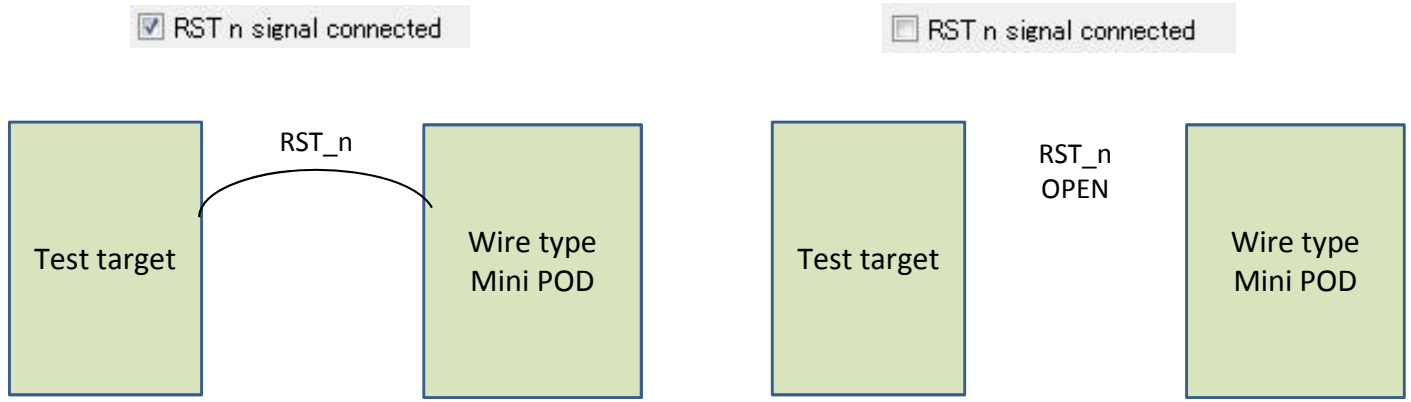
DDR mode at Boot phase

Bus width (1bit/4bit/8bit) is not needed to be set at Boot phase except only DATA0 connected mode.
This analyzer judges Bus width at Boot phase by start bits condition.
If only DATA0 is low, it is 1bit mode.
If DATA3-0 are low and DATA7-4 are high, it is 4bit mode.
If all of DATA7-0 are low, it is 8bit mode.

3.2.4 RST_n signal connected

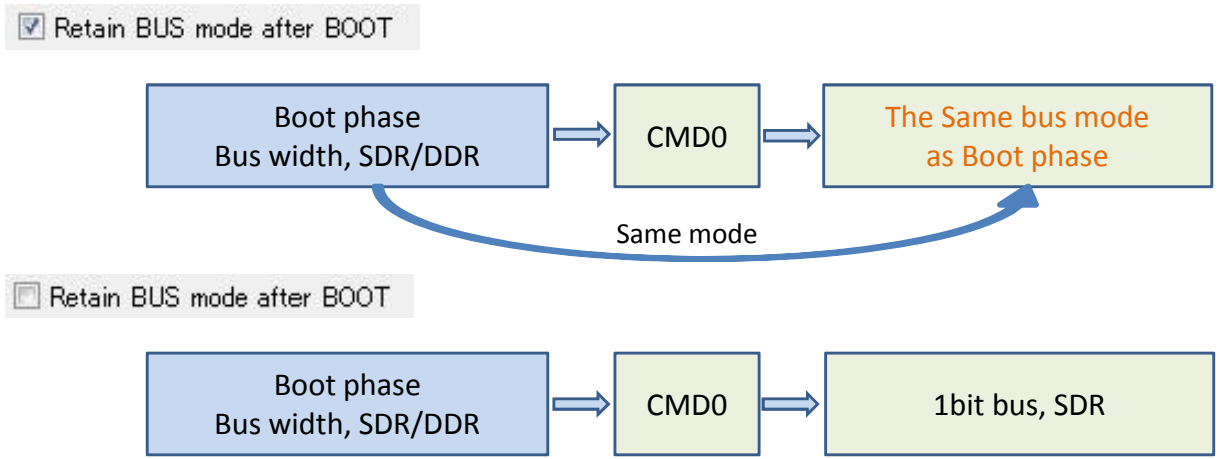
If RST_n signal of wire type mini POD is connected to Target Host, please check this box.

If this box is checked, and analyzer finds RST_n == LOW, analyzer initializes Bus mode, for example, 1bit, SDR, etc.



3.2.5 Retain Bus mode after BOOT

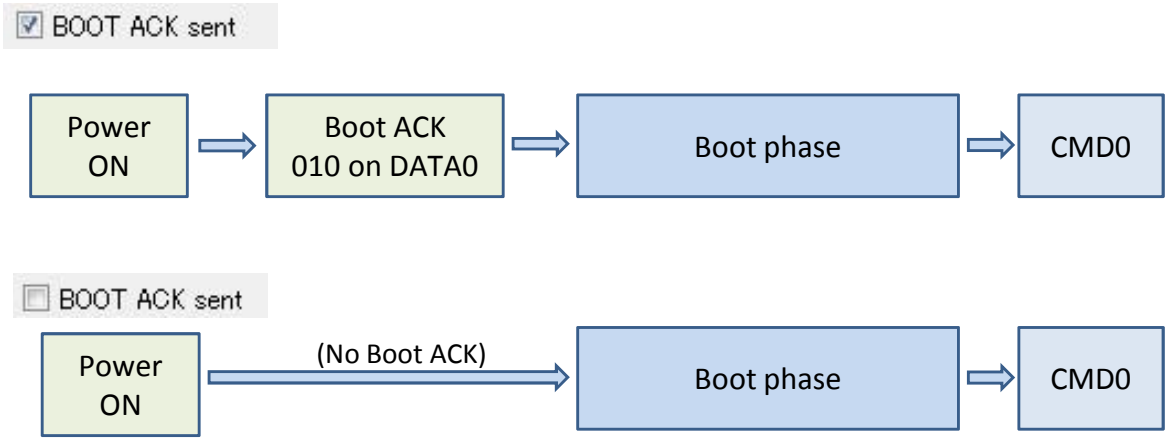
eMMC can retain Bus mode (bus width, SDR/DDR) after Boot operation if eMMC is set this mode.
In this case, Host does not issue CMD6 to change Bus mode after CMD0.
Analyzer cannot judge whether eMMC is this mode or not, so if eMMC is set this mode, please check this check box.



3.2.6 BOOT ACK sent

eMMC issues Boot Acknowledge pattern before issues Boot Data if eMMC is set this mode.
Analyzer cannot judge whether eMMC is this mode or not, so analyzer might issue wrong LOG information when it captured Boot Ack.

Boot Acknowledge pattern is “010” on DATA0 signal.
If this box is checked, analyzer will be able to judge this Boot ACK pattern correctly when it captured Boot Ack.

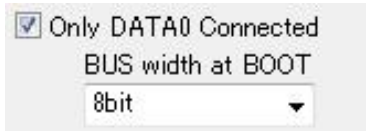


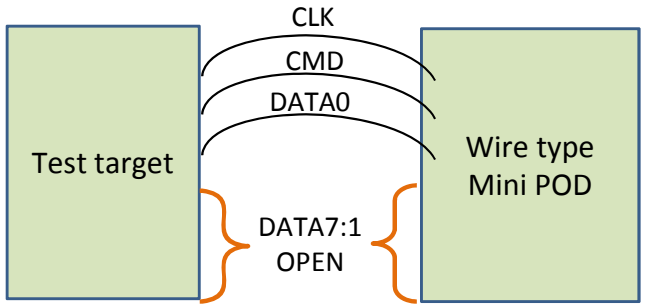
3.2.7 Only DATA0 Connected

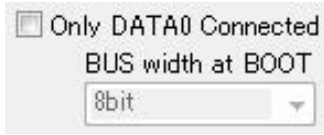
In case of wire type mini POD, CLK, CMD and DATA signals must be connected between test target and wire type mini POD.
This analyzer supports only DATA0 signal connected mode. In this mode, it is no need to connect DATA7:1 to wire type mini POD.

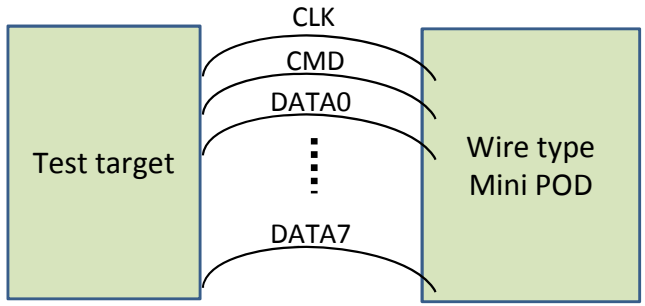
This mode is useful to minimize effort to wire connection between Host and mini POD.

In this mode, analyzer cannot judge bus width at Boot phase. So please specify Bus width at Boot phase.










```
Read            FEFEFEFE FFFFFFFF FEFEFE
```

In Only DATA0 Connected mode case, displayed data is “E” or “F”.
If 4bit mode, and if DATA0=LOW, then Data is “E”, and if DATA0=HIGH, then Data is “F”.
If 8bit mode, and if DATA0=LOW, then Data is “FE”, and if DATA0=HIGH, then Data is “FF”.

3.2.8 HS400: Check Data CRC16

This analyzer always checks whether CRC16 value is correct or not except HS400 mode.
Except HS400 mode, this analyzer makes expected CRC16 value by calculating captured Data, and if captured CRC16 value is not the same as expected CRC16 value, it shows CRC16 error message. Usually if CRC16 error message appear, it means analyzer could not capture Data/CRC16 correctly. (or Host or Media issued wrong Data or CRC16 value when hardware trouble occurred)

In case of HS400 mode, this check box defines whether to check CRC16 or not.
Please take case that in HS400 mode, Default mode is No check Data CRC16.

If this check box is OFF, CRC16 is not checked in HS400 mode.
In this case, CRC16 error message does not appear at HS400 mode access.
To identify this LOG was captured by no check mode, at every Data line, [unreliable data] message is added at tail as like below figure.

➔ CRC16 value is not checked. Captured data is not reliable.

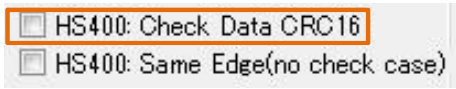
```
Read      A55AA55A A55AA55A A55AA55A A55AA55A .Z.Z .Z.Z .Z.Z .Z.Z [Unreliable data]
Read      A55AA55A A55AA55A A55AA55A A55AA55A .Z.Z .Z.Z .Z.Z .Z.Z [Unreliable data]
Read      A55AA55A A55AA55A A55AA55A A55AA55A .Z.Z .Z.Z .Z.Z .Z.Z [Unreliable data]
```

If this check box is ON, CRC16 is checked in HS400 mode as like other mode.
In this case, CRC16 error message appear if analyzer found captured CRC16 value is the same as expected CRC16 value, which was generated by calculating captured Data.

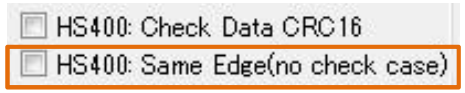
➔ CRC16 value is checked. Captured data is reliable.

3.2.9 HS400: Same Edge (no check case)

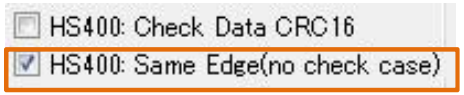
This check box is valid only when “HS400: Check DATA CRC16” is Off.



Usually please “OFF” this check box.

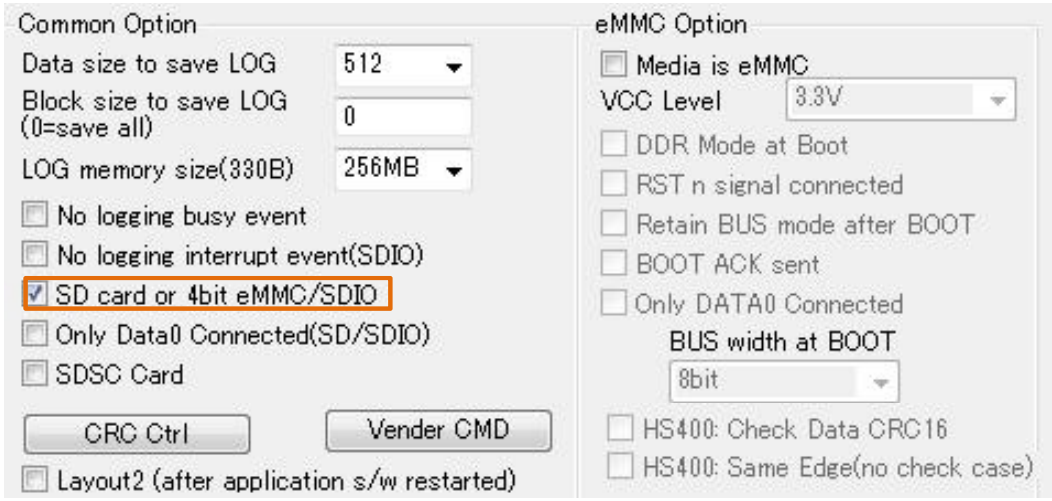


If you think analyzer cannot capture “CRC Status” correctly, which is issued from eMMC when write operation, please try this check box “ON” case.

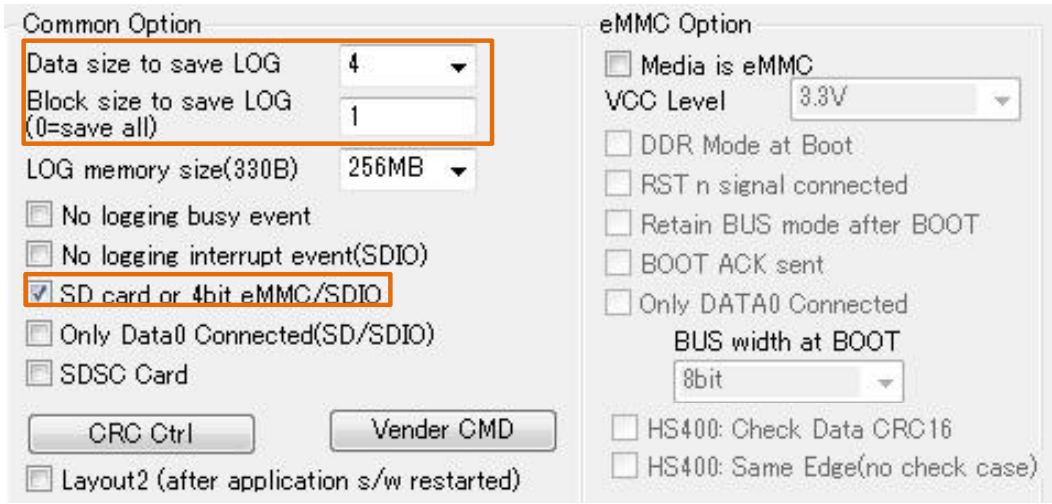


3.3 Typical setting (1/2)

SD card case:
Below setting is to capture and save all of event and data contents in case of SD/SDIO card.

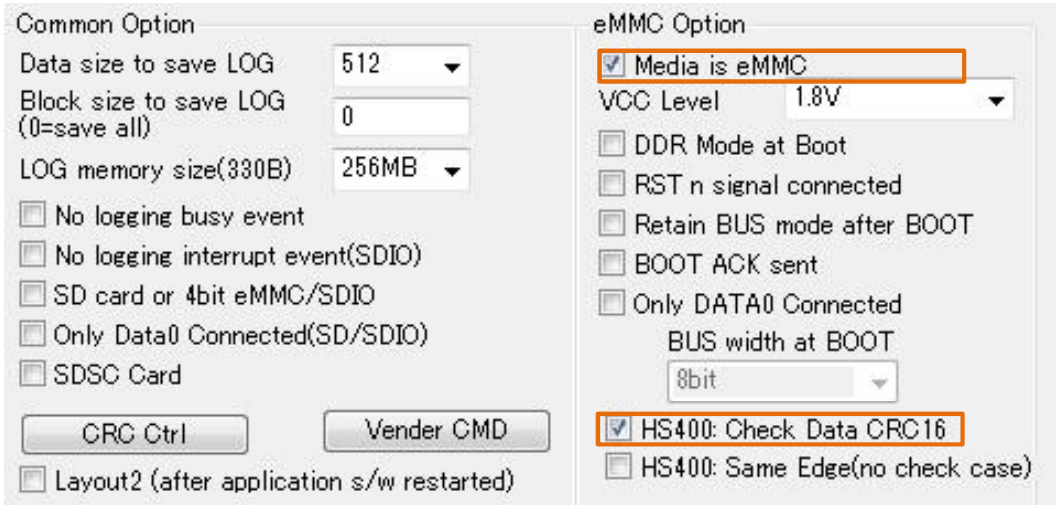


If user wants to capture a lot of event, and does not care data contents itself, please use below setting.

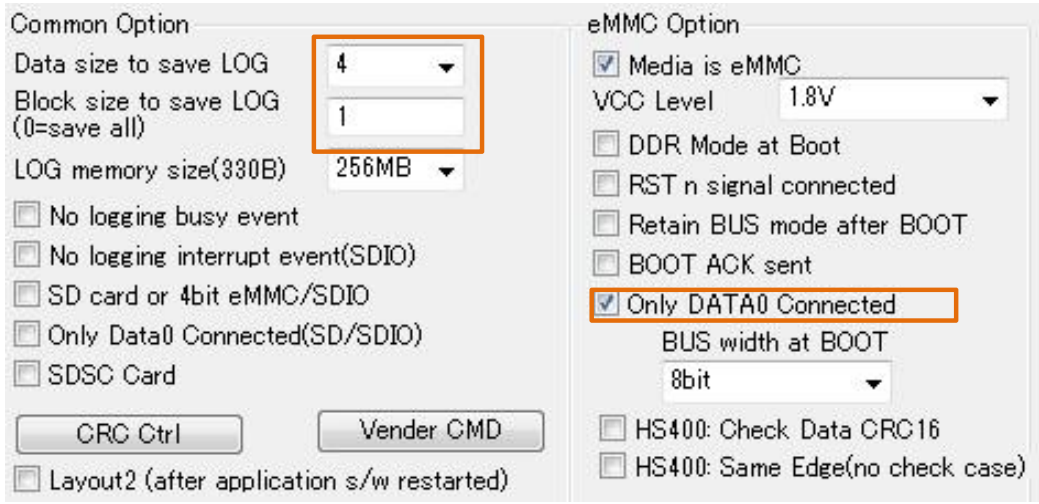


3.3 Typical setting (2/2)

eMMC case:
Below setting is “all of Data7:0 are connected to wire type mini POD” case.

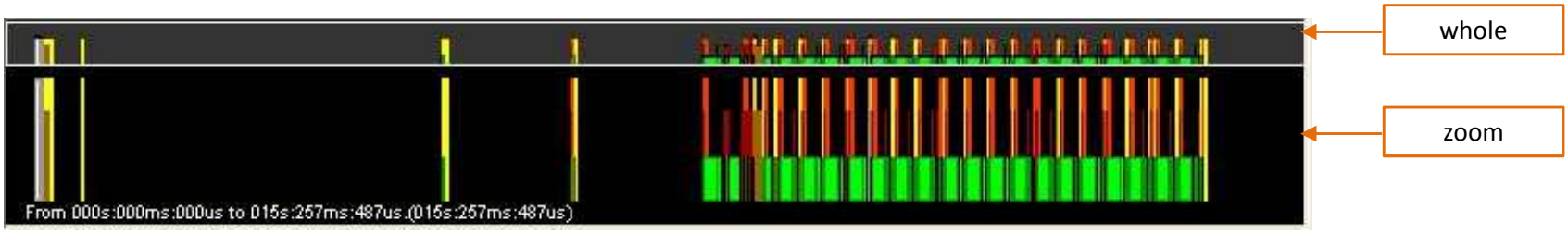


If only DATA0 is connected to wire type mini POD, and if user does not care Busy time/Read wait time, please use below setting.

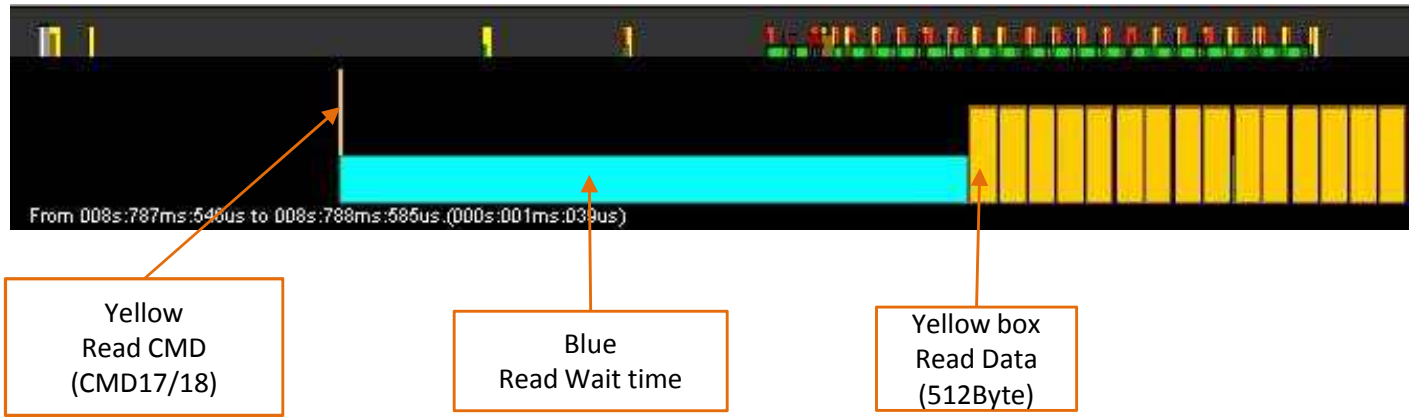


3.4 Histogram (1/3)

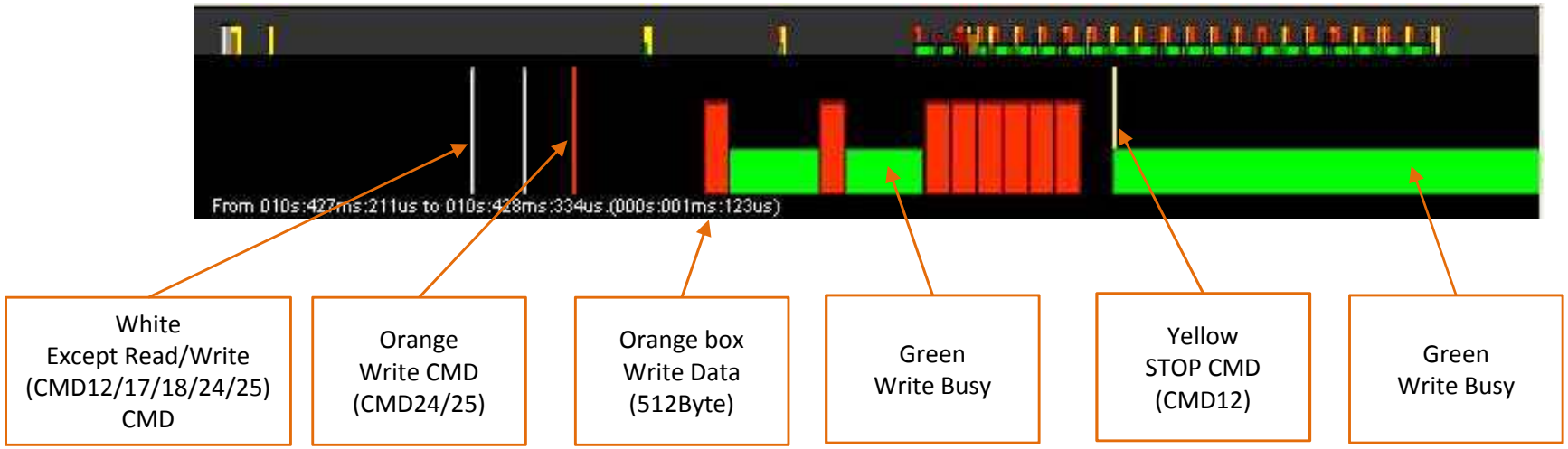
If “Histogram on” is on, access histogram is displayed at the below of log window.
Upper side is whole time histogram, and lower side is zoomed in histogram.



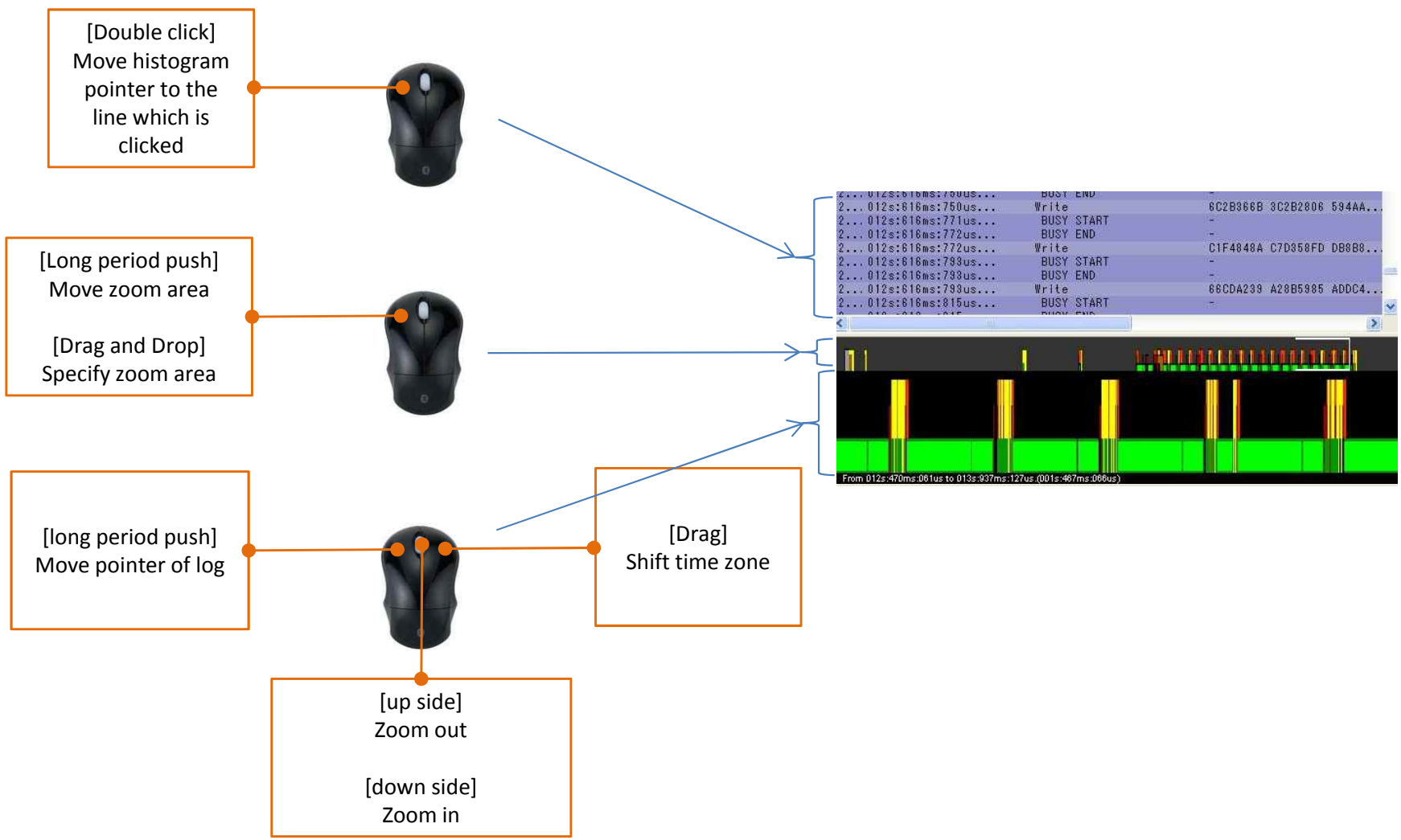
Example of Read access
CMD17/18 is longer height yellow bar, Read wait time is smaller height blue bar, and 512 byte Read data is middle height yellow box.



Example of Write
CMD24/25 is longer height orange bar, 512 byte write data is middle height orange bar, and write busy time is green bar.
CMD except Read/Write(CMD12/17/18/24/25) is longer height white bar.

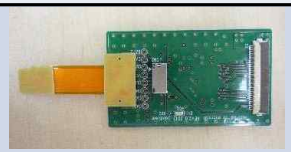
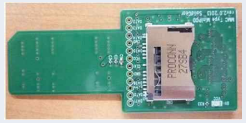


Mouse operation



4 Mini POD

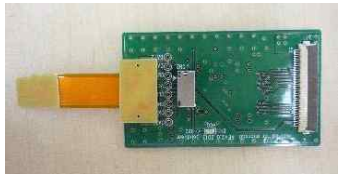
Active Mini POD list : (at July 2016)

Mini POD name	Feature	Parts no	SD card		SDIO		eMMC	
			Not UHS-I	UHS-I	Not UHS-I	UHS-I	HS200	HS400
Mini POD for SD		SGDK330A-01	Yes		Yes (4bit SD form factor only)		No	
Mini POD for microSD		SGDK330A-02	Yes (microSD only)		Yes (4bit microSD form factor only)		No	
Mini POD for 8bit MMC		SGDK330A-05	Yes		Yes (MMC form factor only)		No	
Wire type mini POD for eMMC/SDIO Rev2		SGDK330A-04	Yes		Yes		Yes	No
Wire type mini POD for eMMC/SDIO Rev5		SGDK330A-06	Yes		Yes		Yes	No
Wire type mini POD for eMMC Rev6.1		SGDK330A-08	Yes	No	Yes	No	Yes	
Socket type mini POD for eMMC Rev2		SGDK330A-30	No		No		Yes	No

4.1 Mini POD for SD card

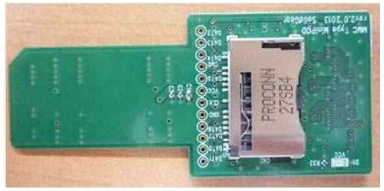
If form factor of Host is SD, please use this mini POD.

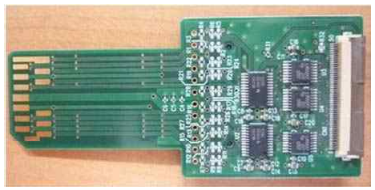
4.2 Mini POD for microSD card



If form factor of Host is microSD, please use this mini POD.

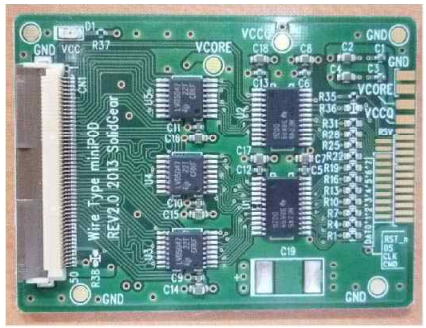
4.3 Mini POD for 8bit MMC





If form factor of Host is 8bit MMC type, please use this mini POD. This can be used for 4bit SD card too.
50pin connector for FFC cable is mounted on bottom side, so developing board, whose form factor is SD card, can be inserted to Socket on upper side.

4.4 Wire type Mini POD for eMMC/SDIO Rev2

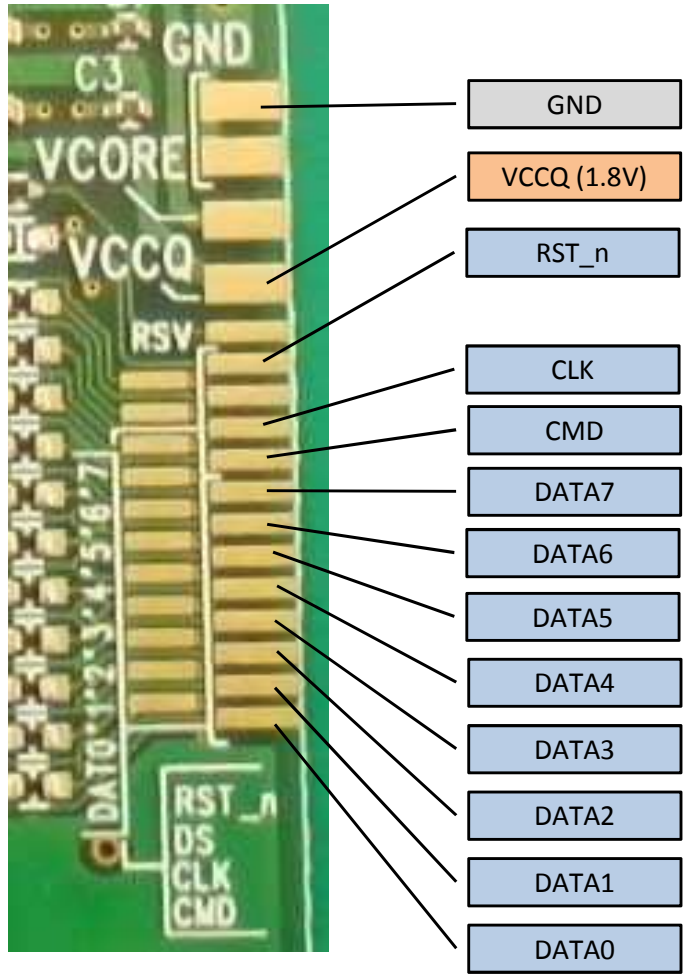


This is wire type mini POD for eMMC or SDIO.
Please connect wire between target system and this mini POD.

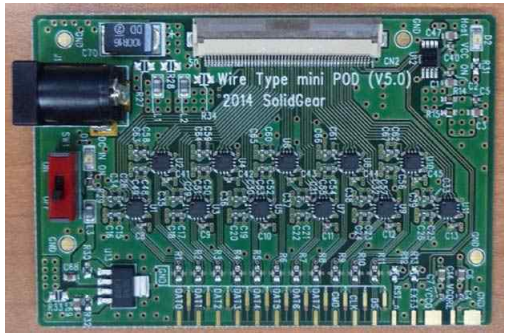
If Only DATA0 connected mode, it is no need to connect DATA7-1.

In case of SDIO, please connect VCC of SDIO (3.3V or 1.8V) to VCCQ PAD of this mini POD.

If result of this mini POD is not good, please use Rev5 or Rev6.1.



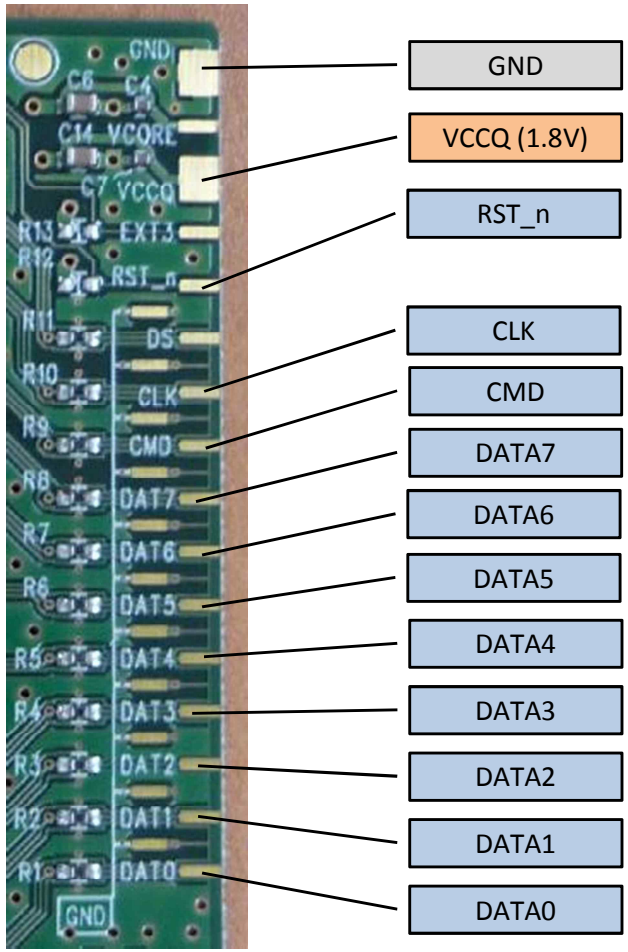
4.5 Wire type Mini POD for eMMC/SDIO Rev5



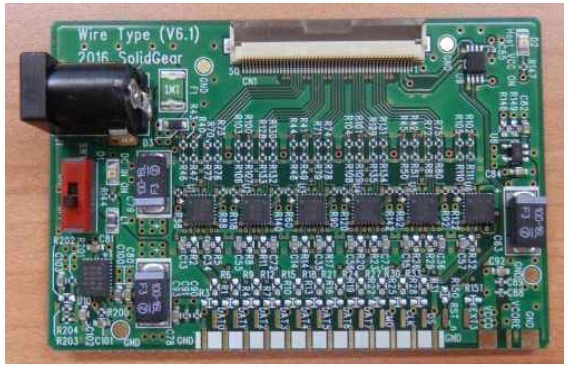
This is wire type mini POD for eMMC or SDIO.
This mini POD needs 5V input.
Please connect wire between target system and this mini POD.

In case of SDIO, please connect VCC of SDIO (3.3V or 1.8V) to VCCQ PAD of this mini POD.

This mini POD is better than Rev2, but not better than Rev6.1.
If test result of this mini POD is not good, please use Rev6.1. (please note Rev6.1 does not support SD/SDIO)

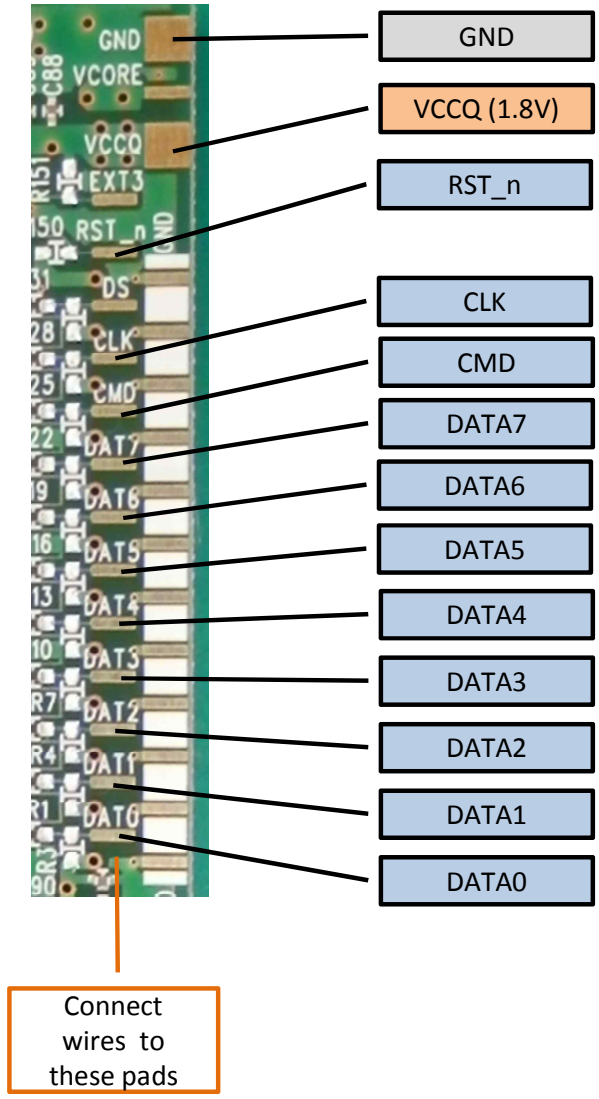


4.6 Wire type Mini POD for eMMC Rev6.1



This is wire type mini POD for eMMC.
This mini POD needs 5V input.
Please connect wire between target system and this mini POD.

This mini POD does not support SD/SDIO CMD11 sequence, so this cannot be used for SD/SDIO in UHS-I mode. But if VCC of SDIO is fixed voltage (1.8V) after power on, this can be used for SDIO UHS-I mode. In this case, please connect VCC of SDIO (1.8V) to VCCQ PAD of this mini POD.

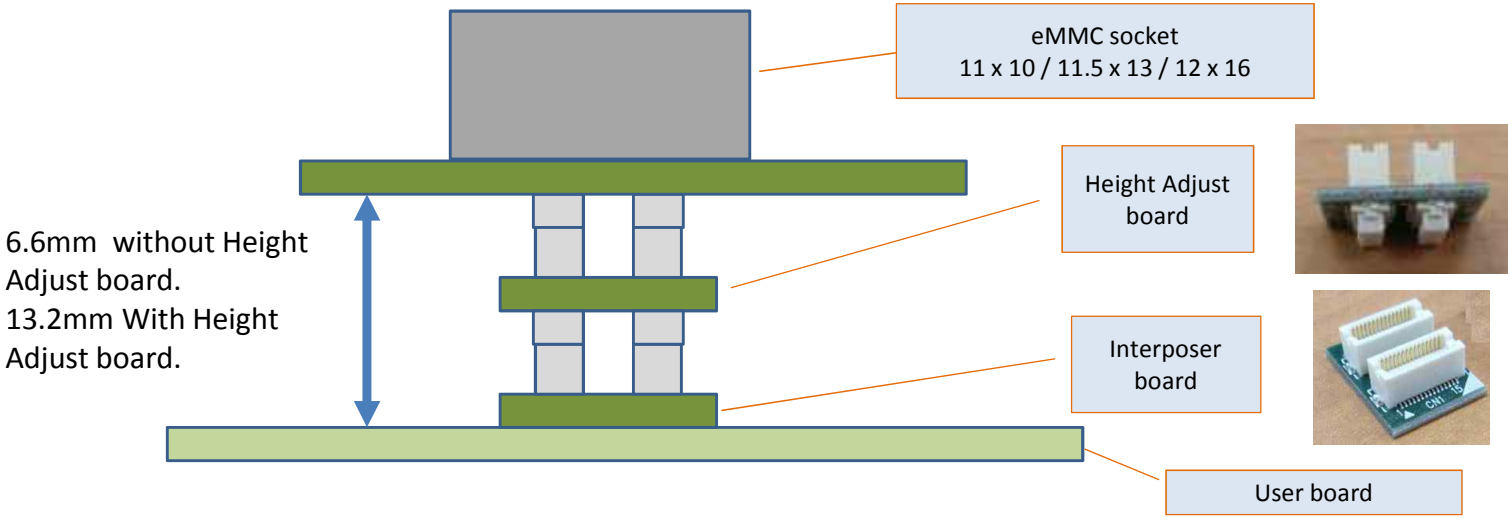


4.7 Socket type Mini POD for eMMC Rev2

This is socket type mini POD for eMMC.
To use this mini POD, interposer board (eMMC footprint) must be mounted on user board instead of eMMC media.

eMMC media in eMMC socket can be changed easily, so this mini POD is useful to check media performance.

3 kinds adaptors (11x10 / 11.5x13 / 12x16) is bundled. This adaptor can be changed by pushing Socket from top by finger and picking up adaptor.



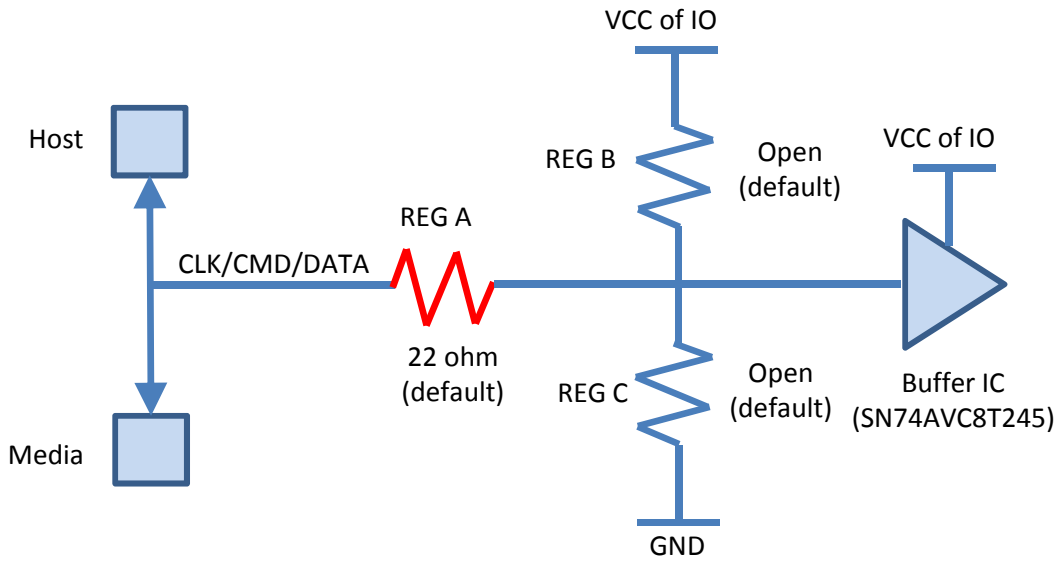
4.8 Dumped resister (1/4)

Buffer IC input port damages Host system. In worst case, Host cannot access Media correctly if mini POD is attached.

Every Mini POD has dumped resistors between Host system and buffer IC on mini POD.

If this resister value is changed to large, damage for Host system will become smaller.
Bad influence of larger dumped resister is Analyzer cannot capture signals correctly. This phenomenon depends on IO drive strength of Host system.

If Host cannot access media correctly, please change dumped resister value to larger value (for example 220 ohm, or 330 ohm in case of Buffer IC is SN74AVC8T245).

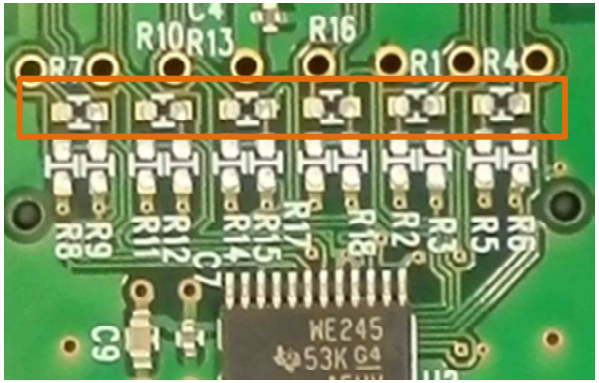


4.8 Dumped resister (2/4)

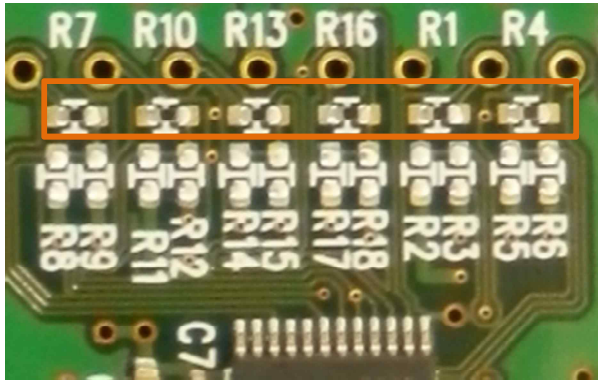
Signal	SD	microSD	8bit MMC	Wire type Rev2	Wire type Rev5	Wire type Rev6.1	Socket type Rev2
SGDK330A-xx	-01	-02	-05	-04	-06	-08	-30
DATA0	R1	R1	R1	R1	R1	R1	R1
DATA1	R4	R4	R4	R4	R2	R4	R4
DATA2	R7	R7	R7	R7	R3	R7	R7
DATA3	R10	R10	R10	R10	R4	R10	R10
DATA4			R13	R13	R5	R13	R13
DATA5			R16	R16	R6	R16	R16
DATA6			R19	R19	R7	R19	R19
DATA7			R22	R22	R8	R22	R22
CMD	R13	R13	R25	R25	R9	R25	R25
CLK	R16	R16	R28	R28	R10	R28	R28

Resister number of Dumped resister

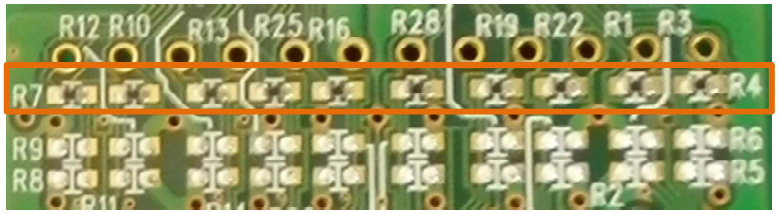
4.8 Dumped resister (3/4)



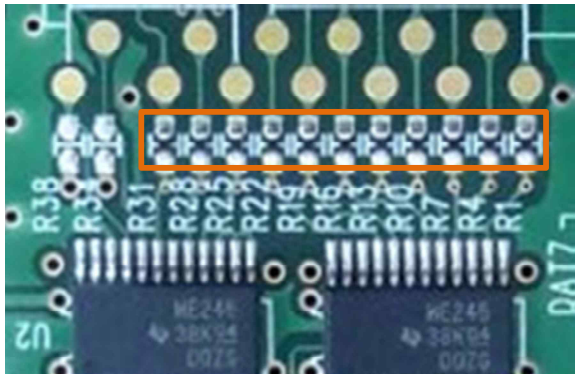
Mini POD for SD (SGDK330A-01)
Default value = 22 ohm
Buffer IC SN74AVC8T245



Mini POD for microSD (SGDK330A-02)
Default value = 22 ohm
Buffer IC SN74AVC8T245

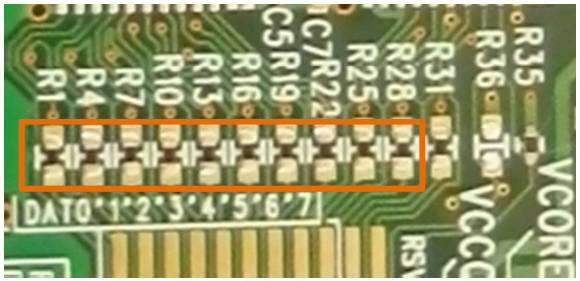


Mini POD for 8bit MMC (SGDK330A-05)
Default value = 22 ohm
Buffer IC SN74AVC8T245

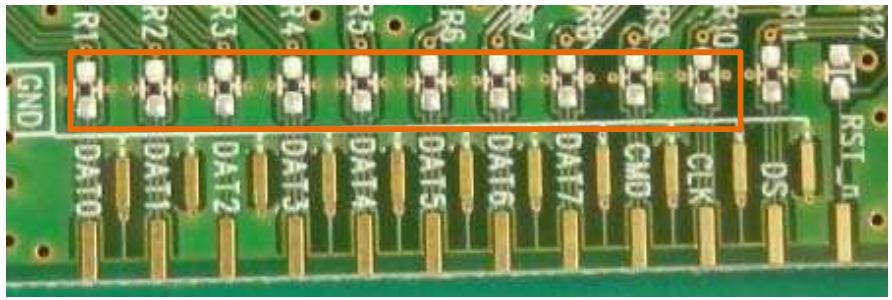


Socket type mini POD (SGDK330A-30)
Default value = 22 ohm
Buffer IC SN74AVC8T245

4.8 Dumped resister (4/4)

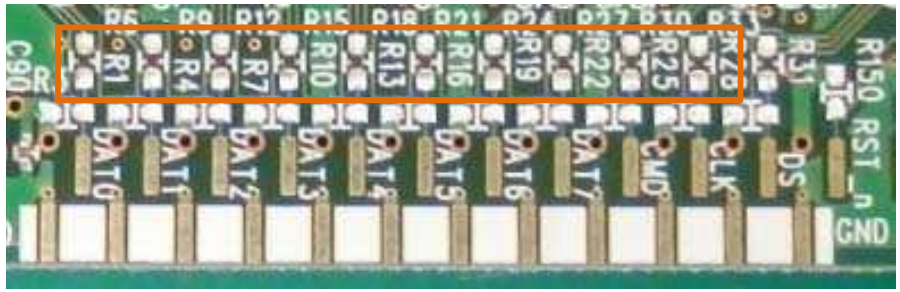


Wire type mini POD Rev2 (SGDK330A-04)
Default value = 22 ohm
Buffer IC SN74AVC8T245



Wire type mini POD Rev5 (SGDK330A-06)
Default value = 10 ohm

Comparator IC
ADCMP604



Wire type mini POD Rev6.1 (SGDK330A-08)
Default value = 47 ohm

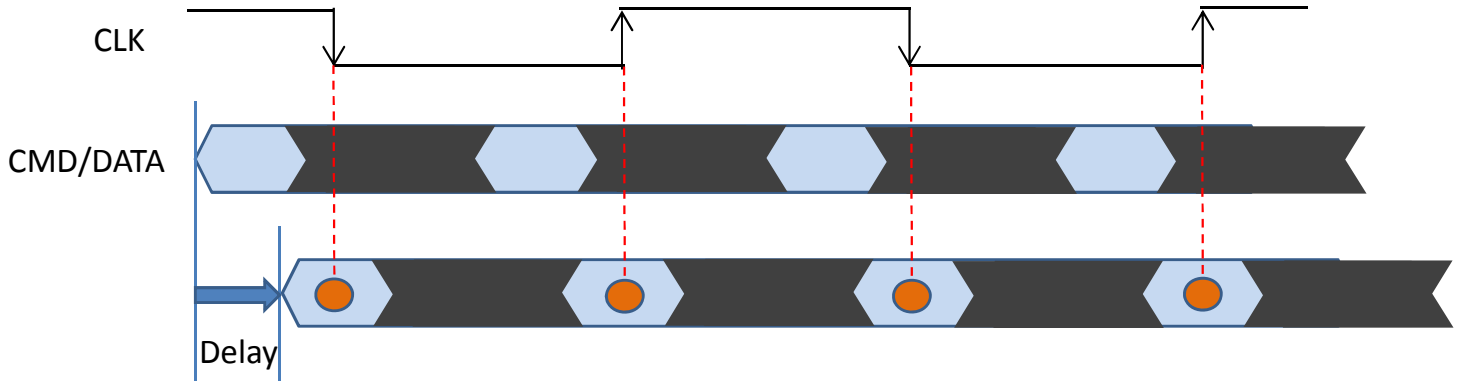
Comparator IC
LMH7322

5.1 Probe Point Overview (1/3)

Proper probe point is key point for this analyzer.

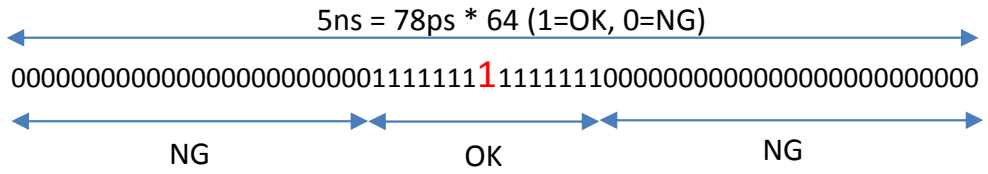
This analyzer captures CMD/DATA signals at rising edge of CLK in case of SDR, or at both edges of CLK in case of DDR.
If frequency is slow, for example 50MHz SDR, usually it is no need to do Tune Probe Point.
But if frequency is high, for example 100MHz or over, or DDR mode, usually it is need to do Tune probe Point.
CRC7/16 error message notify customer that current probe point is not correct.

This analyzer can change probe point 0ns - 5ns. (CMD/DATA are delayed from 0ns to 5ns, and are latched by CLK edge)



This analyzer has 2 sets of probe point. One is Read Operation (Response and Read data issued from Media). The other is Write Operation (CMD and Write data issued from Host)

Resolution of Probe Point is 78ps. So totally 64 step per 5ns. (78ps * 64 = 5ns)
Analyzer sets center of OK area as Probe Point.



5.1 Probe Point Overview (2/3)

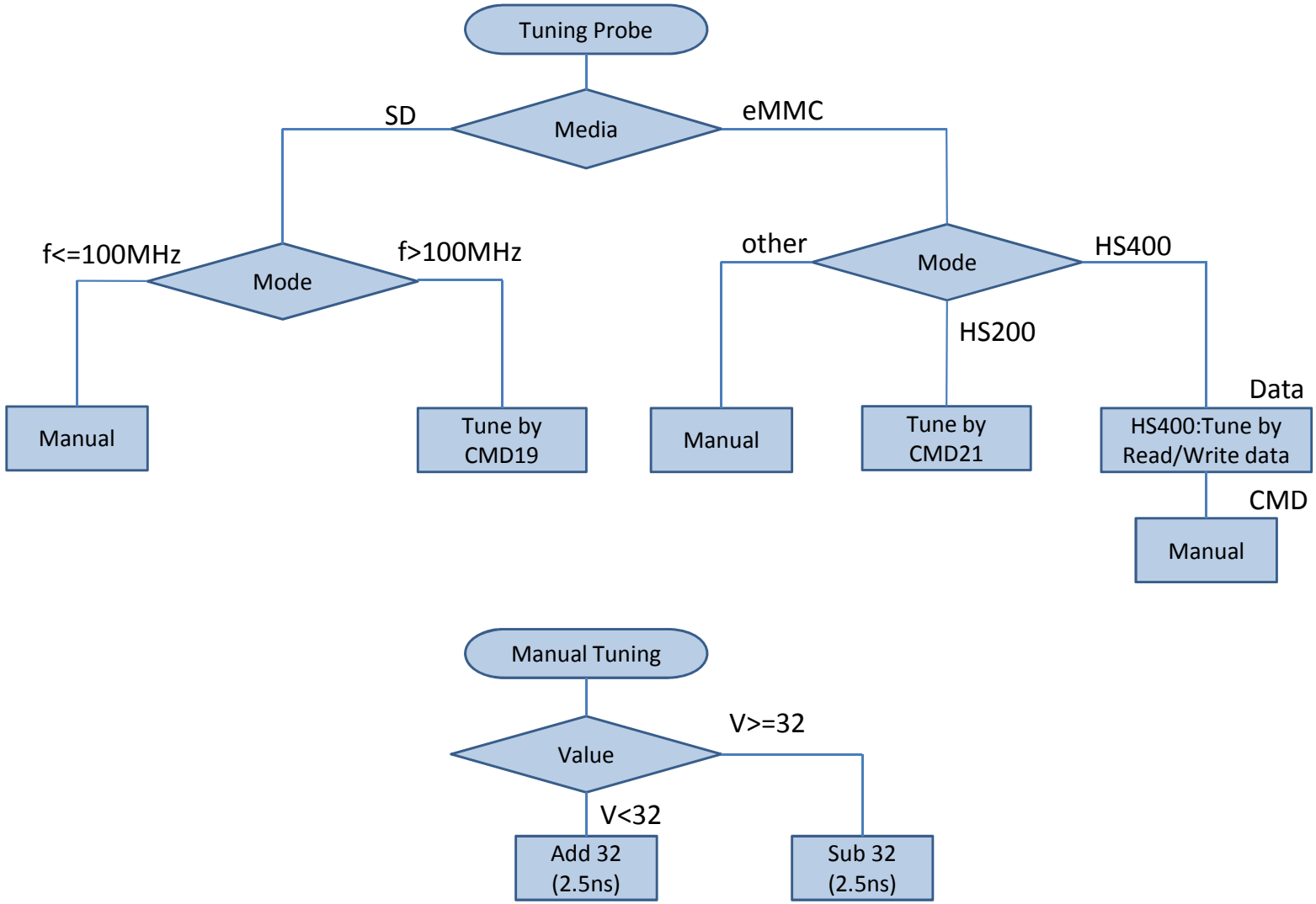
If Host system issues CMD19/21, proper Probe point can be found by “Tune by CMD19 (Read/Write)”.

In case of HS400, probe point for Data can be found by “HS400:Tune by Read/Write data”.

Media	Mode	CMD	Command/Response	Read/Write Data	Comments
SD/SDIO	Over 100MHz	CMD19	Tune by CMD19/21	Tune by CMD19/21	
	Less than 100MHz	-	Manual	Manual	
eMMC	HS200	CMD21	Tune by CMD19/21	Tune by CMD19/21	
	HS400	-	Manual	HS400:Tune by Read/Write Data	
	Others	-	Manual	Manual	

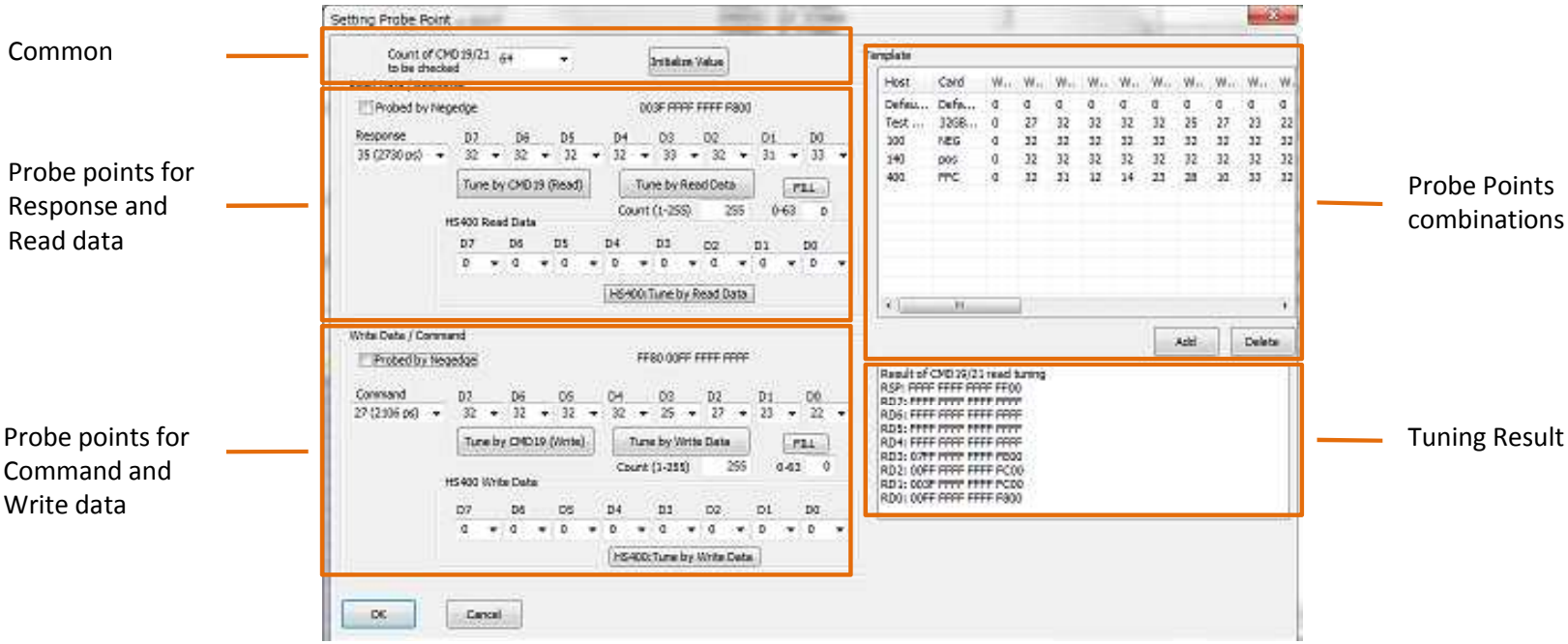
To get proper probe point of “Manual” in this table, it is need to adjust value manually. But it is not difficult.
Usually Valid area (OK area) except Data of HS400 mode is wide enough. Typically 75% area is Valid.
So the point, which is 2.5ns different from NG probe point, is usually OK. if NG probe point is smaller than 32, add 32 to it, if NG probe point is lager than 32, subtract 32 from it.
Please refer 5.5 Manual tuning.

5.1 Probe Point Overview (3/3)

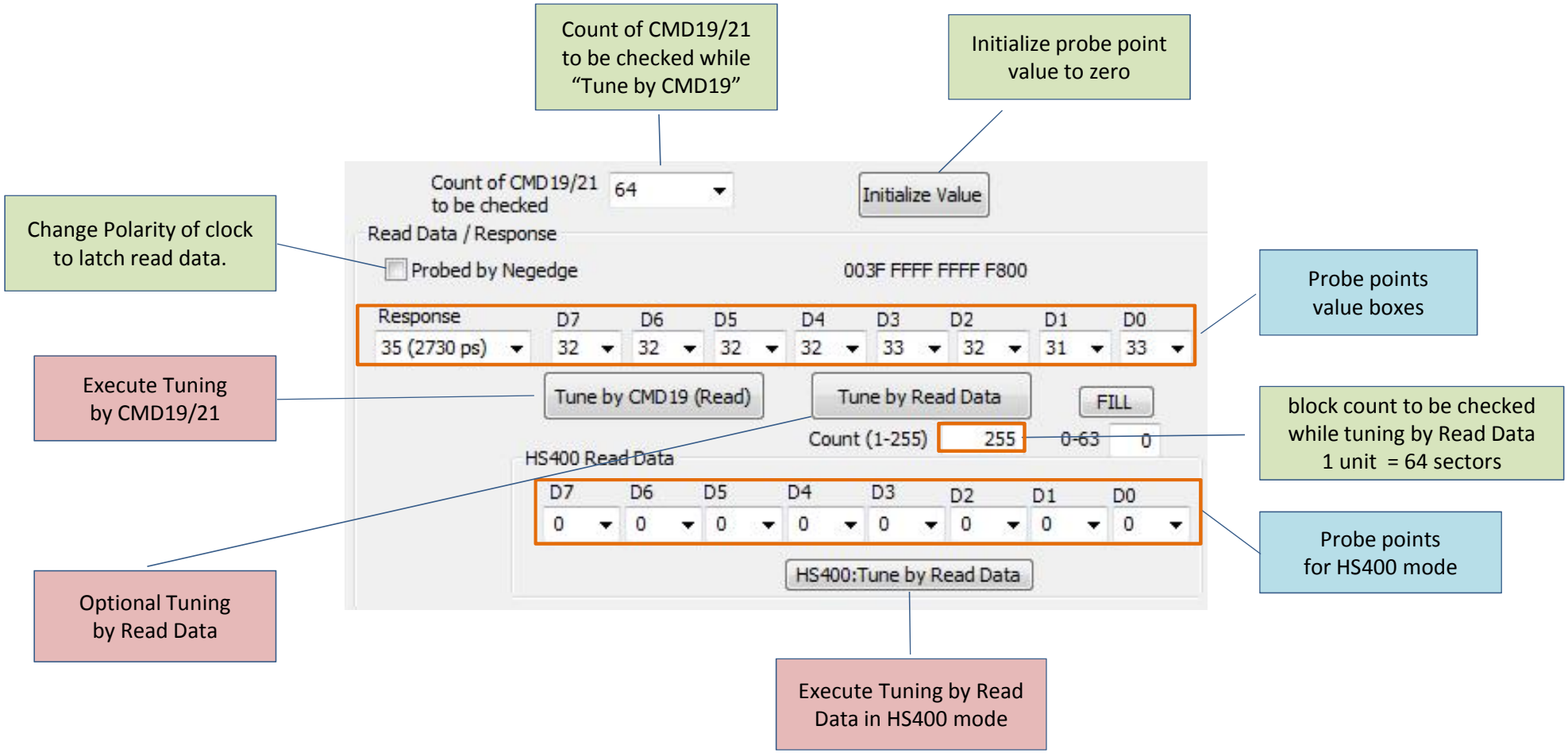


5.2 Tuning Menu (1/5)

If “Setting Probe Point” button pushed, Tuning menu window displayed.

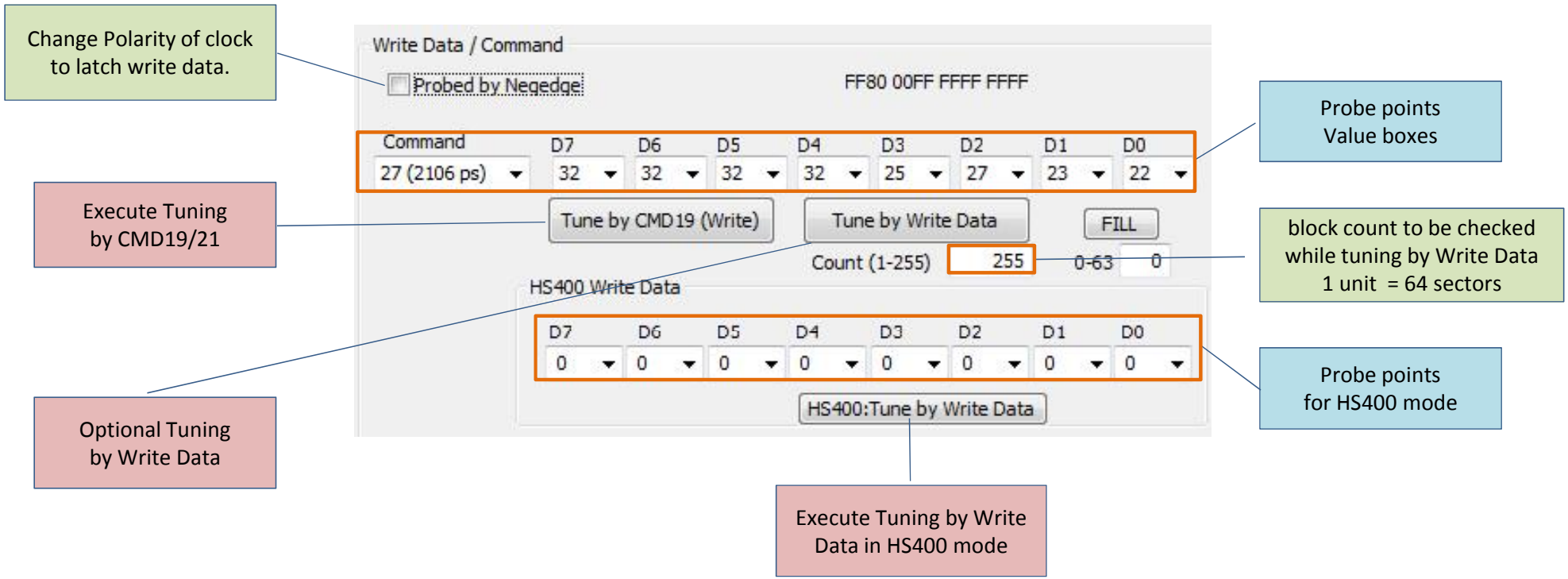


Common & Probe points for Response and Read data



5.2 Tuning Menu (3/5)

Probe points for Command and Write data



5.2 Tuning Menu (4/5)

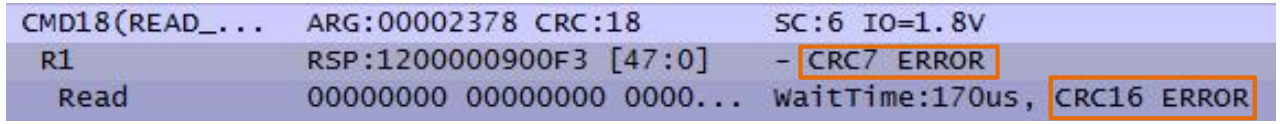
	ID	Description	Reference
Common	Count of CMD19/21 to be checked	Specify count of CMD19/21 to be checked while Tune by CMD19/21. From 4 to 64 can be set. Larger value is better to find proper probe point.	5.7
	Initialize value	If pushed, all of probe point value are initialized to zero (0). This initializing is not always need before executing Tune by CMD19/21.	
Response and Read data	Tune by CMD19 (Read)	This is used to find proper probe point of the system whose Host issues CMD19/21. By this, proper probe point for response and read data will be gotten.	5.3
	HS400: Tune by Read Data	This is used to find proper probe point for Read Data in case of HS400 mode. By this, proper probe point for Read Data will be gotten.	5.4
	Tune by Read Data	This is optional function to find proper probe point for Read Data except HS400 mode. If it seems probe point for Read data is not good, please try to use this function. This is effective if signal integrity of Data is not good, because of reflection or cross talk.	5.6
	Probe point value boxes	Probe point value is set to each box which were found by auto tuning. Or user can set probe point manually.	
	Probed by Negedge	If checked, polarity of CLK edge is changed. If proper probe point cannot be found, try again with checking this box.	
	Count (1-255)	While “HS400: Tune by Read Data” or “Tune by Read Data” is executing, multiple read block are checked. Its block count is 64 * (this count). For example, if this is 255, 64 * 255 = 16320 read block will be checked to find probe point.	5.4,5.6

5.2 Tuning Menu (5/5)

	ID	Description	Reference
Command and Write data	Tune by CMD19 (Write)	This is used to find proper probe point of the system whose Host issues CMD19/21. By this, proper probe point for Command will be gotten. In CMD19/21 operation, there is no write data, so the same value of Command is used for Write data.	5.3
	HS400: Tune by Write Data	This is used to find proper probe point for Write Data in case of HS400 mode. By this, proper probe point for Write Data will be gotten.	5.4
	Tune by Write Data	This is optional function to find proper probe point for Write Data except HS400 mode. If it seems probe point for Write data is not good, please try to use this function. This is effective if signal integrity of Data is not good, because of reflection or cross talk.	5.6
	Probe point value boxes	Probe point value is set to each box which were found by auto tuning. Or user can set probe point manually.	
	Probed by Negedge	If checked, polarity of CLK edge is changed. If proper probe point cannot be found, try again with checking this box.	
	Count (1-255)	While “HS400: Tune by Write Data” or “Tune by Write Data” is executing, multiple write block are checked. Its block count is 64 * (this count). For example, if this is 255, 64 * 255 = 16320 write block will be checked to find probe point.	5.4,5.6

5.3 Tune by CMD19/21 (1/7)

If CRC7 or CRC16 Error message appeared on LOG, usually it means Probe point is not good.
If such message appeared, probe point must be adjusted.



If Host issues CMD19 (SD) or CMD21 (eMMC), proper probe point can be found by “Tune by CMD19/21”.

At first, by pushing “Tune by CMD19 (Read)” button, find probe point for Response and Read data.

- Analyzer checks CRC7 of response, and sets center of OK area as probe point for response.
- At the same time, analyzer checks CRC16 of Read Data, and sets center of OK area as probe point for Read Data.

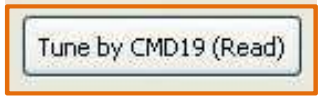
And then, by pushing “Tune by CMD19(Write)” button, find probe point for COMD and write data.

- Analyzer checks CRC7 of CMD, and sets center of OK area as probe point for CMD
- In CMD19/21 operation, there is no write data, so the same value of CMD is used for Write data.

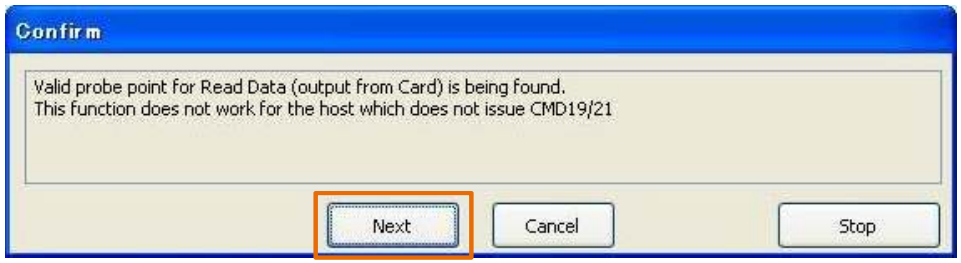
5.3 Tune by CMD19/21 (2/7)

Step1: Push “Setting Probe Point” button.

Step2: Push “Tune by CMD19 (Read)” button.



Push “Next” button.



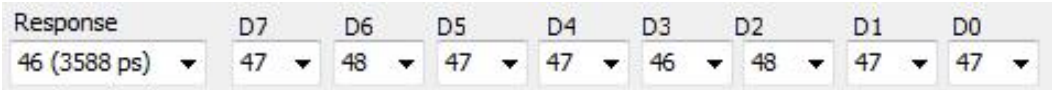
Then, below message box will be displayed.

5.3 Tune by CMD19/21 (3/7)

Step3: Let Host product do mount procedure (CMD19/21). After finished, push “Next” button. If this analyzer found specified times CMD19/21, below message box is shown. Then push “Next” button.
If this analyzer did not find specified times CMD19/21, do mount procedure again.

Push “OK” button.

Searched probe point value (response and data[7:0]) are set to “Read Probe Point Value Box”.

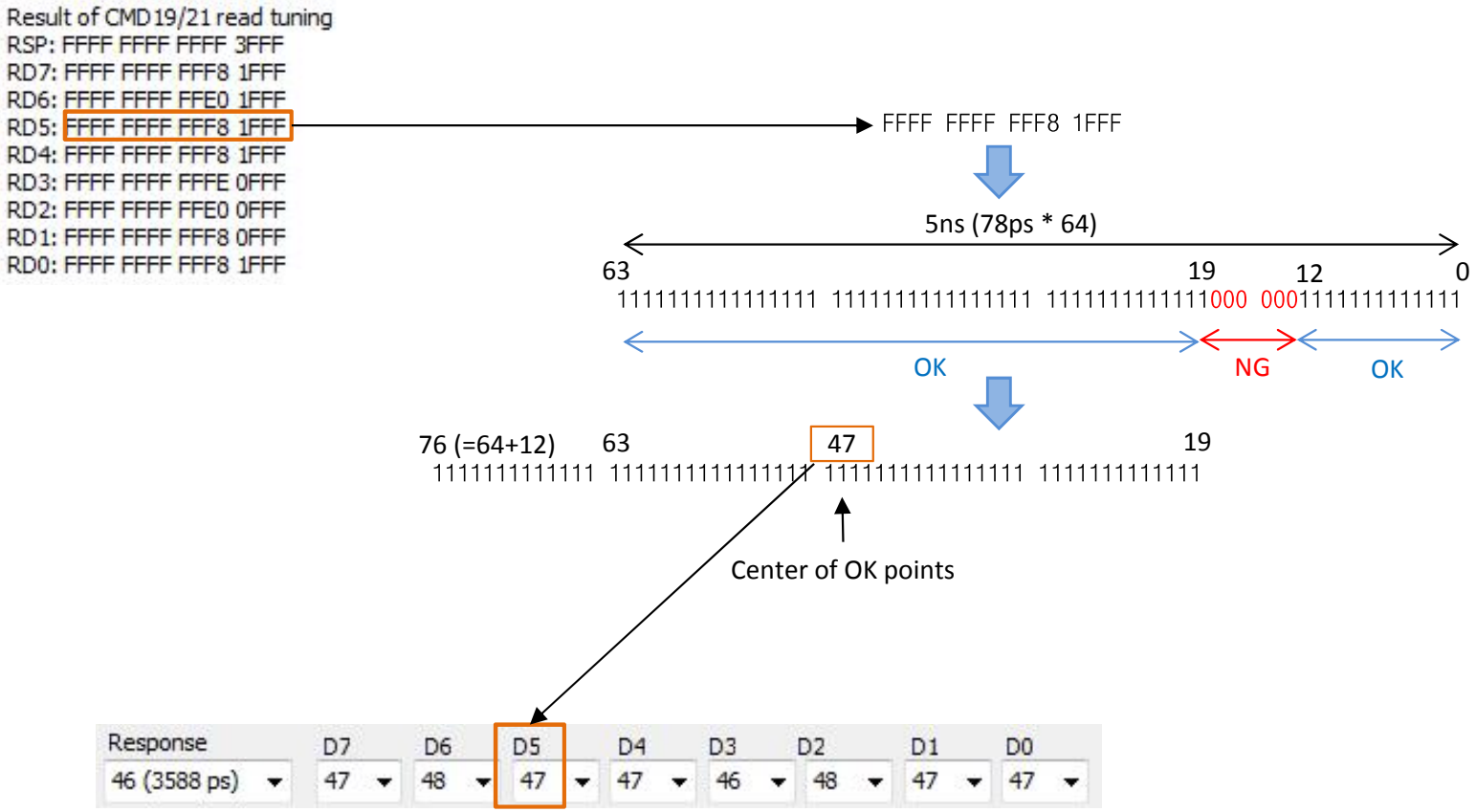


5.3 Tune by CMD19/21 (4/7)

At result window, Tuning Result is shown. “1” is OK, “0” is NG.

This analyze checks 64 times with changing probe point. If CRC7/16 error occurred, it is NG point (“0”). If CRC7/16 error did not occurred, it s OK point (“1”).

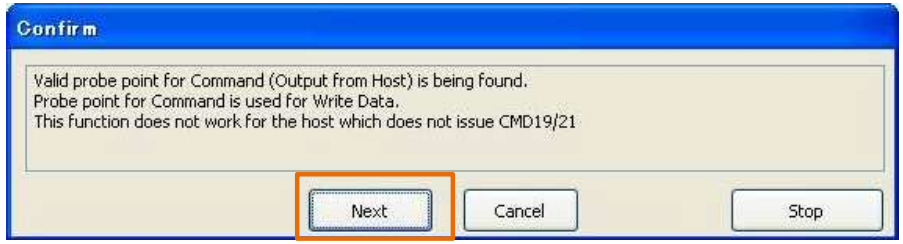
This analyzer sets center of OK points as Probe point.



5.3 Tune by CMD19/21 (5/7)

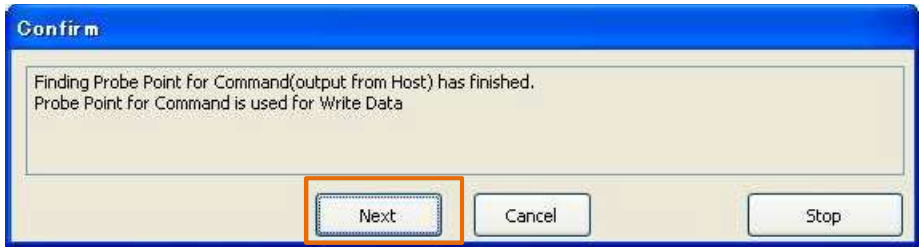
Step4: Push “Tune by CMD19 (Write)” button.

Push “Next” button.



Then, below message box is shown.

Step5: Let Host product do mount procedure (CMD19/21). After finished, push “Next” button. If this analyzer found specified times CMD19/21, below message box is shown. Then push “Next” button.
If this analyzer did not find specified times CMD19/21, do mount procedure again.



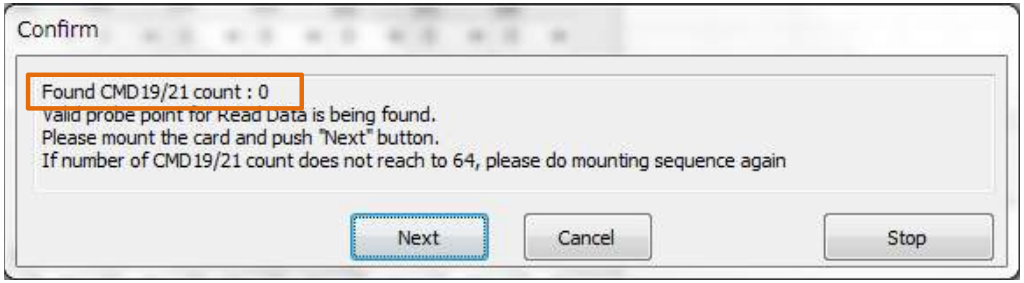
Push “OK” button.

Searched probe point value (command) is set to “Write Probe Point Value Box”.
Probe point for data[7:0] are filled with the same value of command.

Step6: Push “OK” button. Searched probe point are used for analyze operation.

5.3 Tune by CMD19/21 (7/7)

While “Tune by CMD19(Read)”, there is possibility that number of “CMD19/21 count” does not increase even though Host issues CMD19/21.



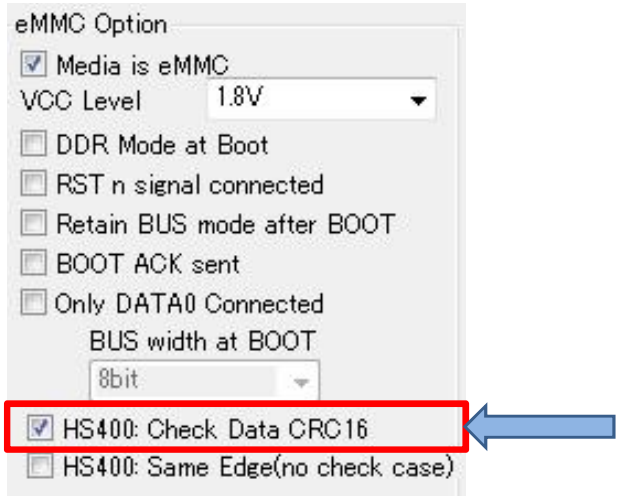
One of possibility of this phenomenon is, Probe point for Command is NG. In such case, Analyzer cannot find Command (CMD19/21) from Host correctly.
If this phenomenon occurred, please change Probe point for Command manually. (Please Refer to 5.5 Manual tuning)

5.4 HS400: Tune by Read/Write Data (1/5)

HS400 timing (200MHz DDR) is most critical timing which this analyzer supports.
It might be impossible to find proper probe point for DATA without using “HS400:Tune by Read/Write Data” function.

Default mode of HS400 is “Analyzer does not check Data contents by CRC16 while HS400 mode”.
In default mode, captured data in LOG is not reliable, because captured data is not checked with CRC16 calculation by this analyzer.

So please check “HS400: Check Data CRC16” box before execute HS400:Tune by Read/Write Data.
Otherwise, probe point cannot be found correctly.



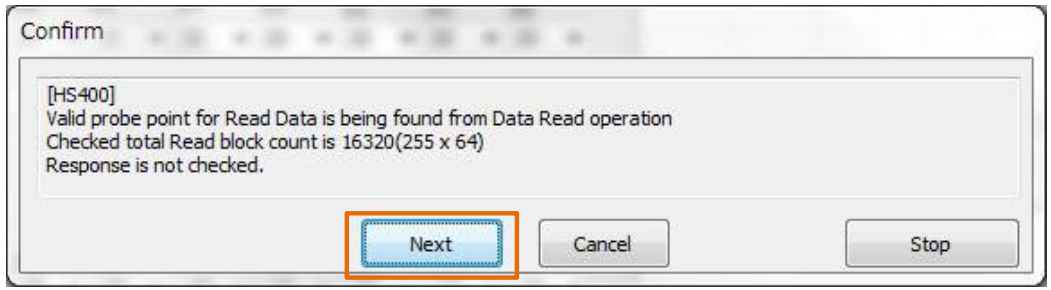
Please check this box before execute HS400:Tune by Read/Write Data.

Before execute HS400: Tune by Read/Write data, please adjust probe point value for Command/Response.
Otherwise, this analyzer cannot find correct Read/Write operation.

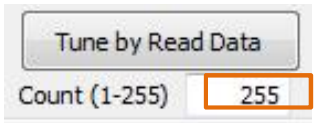
5.4 HS400: Tune by Read/Write Data (2/5)

Step1: Push “HS400: Tune by Read Data” button.

Push Next button.



This analyzer checks multiple Read block to find probe point. Its block count can be specified by below box.
If it is 255, total block count to be checked is 255 * 64 = 16320.



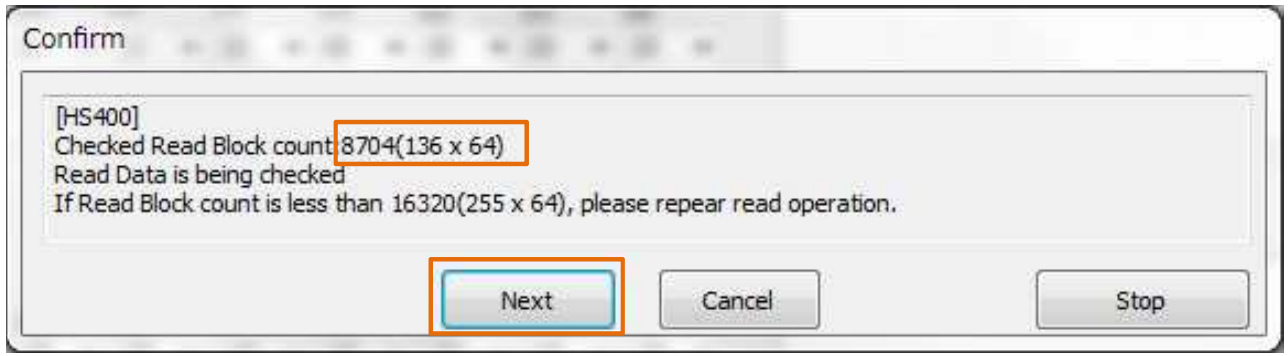
Step2: Power on Host, and let Host do read operation at HS400 mode.

This analyzer checks eMMC bus mode by decoding CMD6. In this tuning procedure, this analyzer checks Read operation in HS400 mode. To let this analyzer be able to judge bus mode correctly, it is need that at first push HS400:Tune by Read Data button, and then let Host do mount procedure (It is supposed that Host issues CMD6 while mount procedure).

5.4 HS400: Tune by Read/Write Data (3/5)

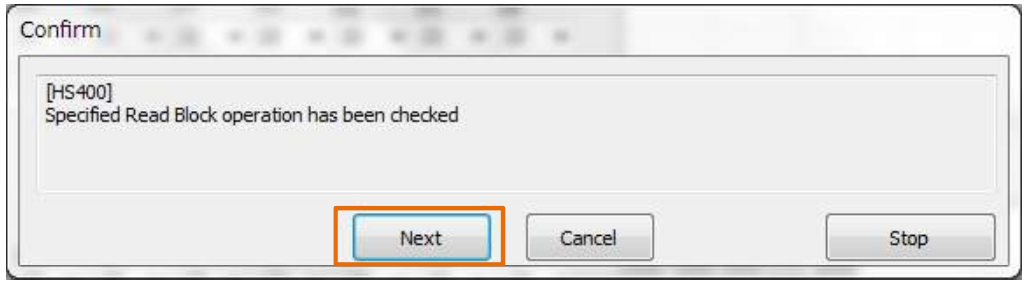
Step3: Push “Next” button.

If this analyzer has not yet been captured specified block count, below window appear.
In this case, captured block count is 8704.
If you want to stop this tuning, please push Stop button. In this case, information, which has been gotten till Stop button pushed, is used.



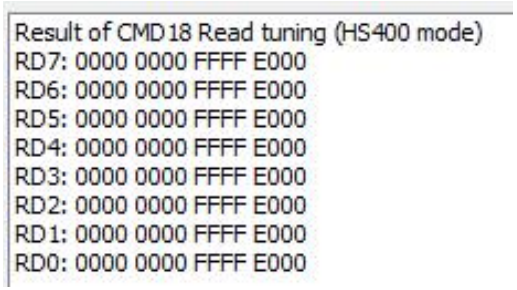
Step4: If specified block has been captured, below window appear.

Push Next Button.

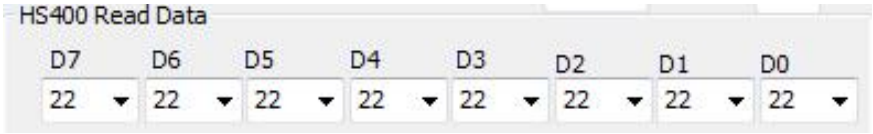


5.4 HS400: Tune by Read/Write Data (4/5)

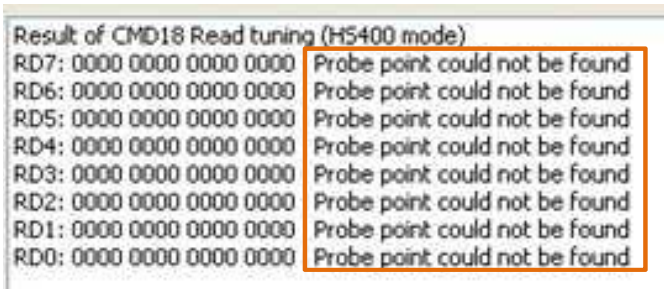
Result of tuning is displayed at right-bottom corner window. “1” is OK, “0” is NG.



Application software sets center of valid area as probe point for HS400 mode.



If analyzer could not find valid probe point, below message is shown.
In this case, please improve signal integrity, for example, shorten wire length or use coaxial cable (shield cable), etc.



5.4 HS400: Tune by Read/Write Data (5/5)

Step5: Push “HS400: Tune by Write Data” button.

Other operation is the same as “HS400:Tune by Read Data”. This analyze checks Write Operation in HS400 mode.

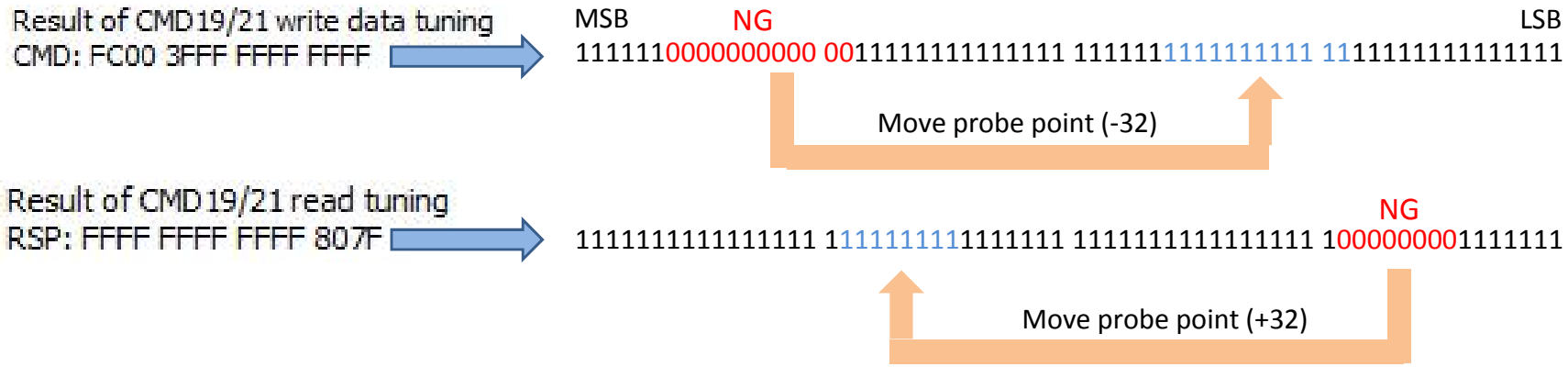
5.5 Manual tuning (1/2)

If CRC7/16 Error message appeared, and also Host does not issue CMD19/21, probe point must be adjusted manually.

Usually Manual tuning is needed for Command and Response. In case of Data, Tune by Read/Write data can be used to find proper probe point.

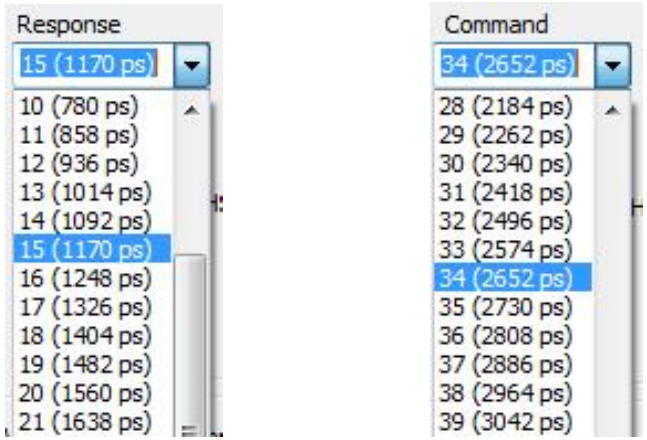
Usually valid (OK) probe point area for Command and Response is wide, and invalid (NG) probe point area is narrow.
If CRC7 error message appear, it means probe point is set to this narrow NG area.

Please see below sample of 208MHz case. (“1”=OK “0”=NG. There are 64 points. One point is 78ps. Totally 78ps * 64 = 5ns)
If probe point are shifted 32 (right or left), it is expected that new probe point might be OK.



5.5 Manual tuning (2/2)

Probe point can be chosen from pull down menu by manually.



5.6 Tune by Read/Write Data

Usually valid probe point for Data is wide except HS400 mode.

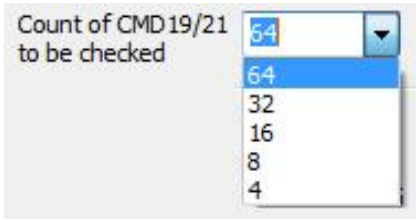
But if signal integrity is not good, valid probe point becomes narrow.
Signal integrity is damaged by long wire, signal reflection, cross talk among Data lines, etc.

If it seems probe point for Data is not good, please do Tune by Read/Write data except HS400 mode.

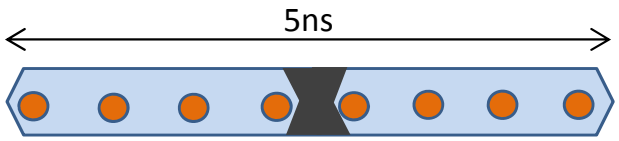
Usage of these buttons are the same as HS400: Tune by Read/Write Data.
Please refer to 5.4 HS400: Tune by Read/Write Data.

5.7 Count of CMD19/21 to be checked

This specifies how many CMD19/21 are checked while Tune by CMD19/21.



If Host issues only 8 times while mount procedure, please select 8 from pull down menu.
But in this case, there is possibility that this analyzer cannot find NG point.
NG point is very important for tuning, because usually opposite side of NG point is Center of OK point. (in case of 200MHz, 5ns)



All probe point are OK ➔ In this case, it cannot find proper probe point

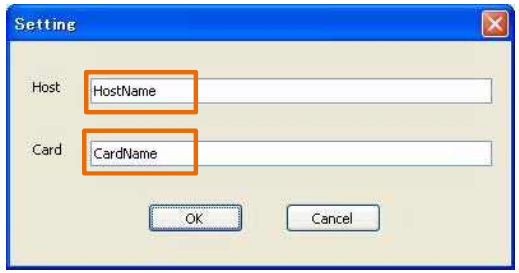
So larger count is better for tuning.
If Host does not issue many CMD19/21 while mount procedure, please repeat mount procedure while doing Tune by CMD19/21.
If Host issues 8 times CMD19/21, and 32 is selected, please repeat mount procedure 4 times (8*4=32).

5.8 Save & Load Probe Point (1/2)

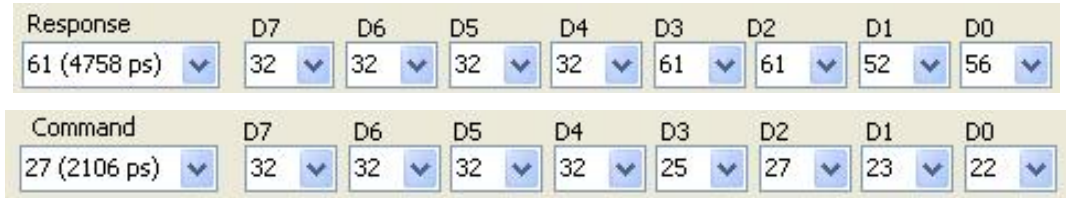
Probe points, which are gotten by tuning procedure, can be saved with adding name.

Push “Add” button if you want to save current probe point value conbination.

Key in Host name and Card name.



Value of probe point boxes are saved to template with name.



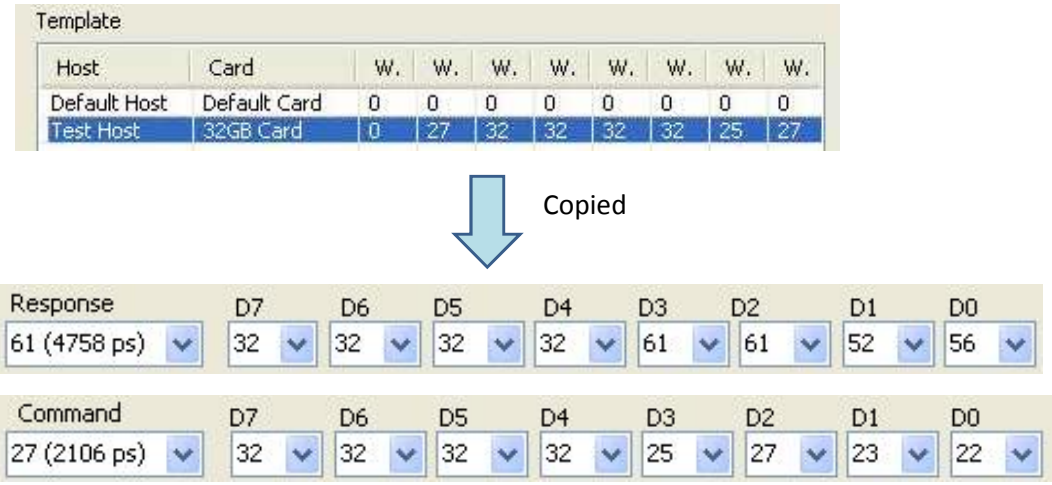
Saved

Template

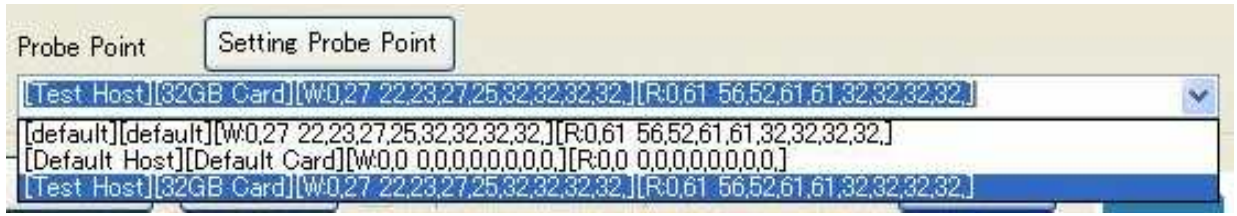
Host	Card	W.	W.	W.	W.	W.	W.	W.	W.
Default Host	Default Card	0	0	0	0	0	0	0	0
Test Host	32GB Card	0	27	32	32	32	32	25	27

5.8 Save & Load Probe Point (2/2)

If column of template is clicked, saved value are copied to value of probe point boxes.



Saved probe point value are listed in pull down menu.
Probe point value can be selected from this pull down menu too.

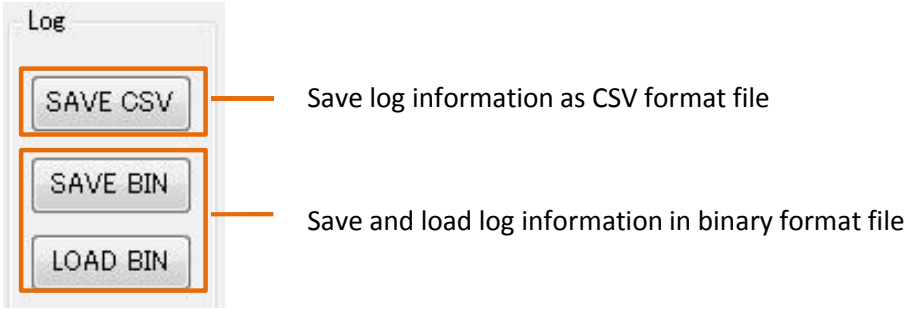


6 Save and Load Log information

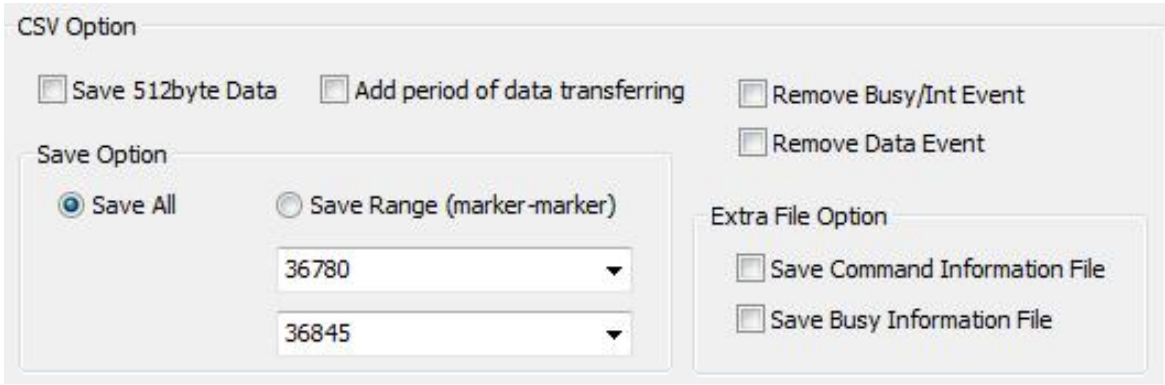
If STOP button is pushed after this analyzer captured protocol, LOG information is transferred from this analyzer to PC, and saved to “tmp” directory. Its name is “montmp.mon” and it is binary format file.

If SAVE BIN button pushed, this montmp.mon file is copied to file whose name is specified by user.
If LOAD BIN button pushed, binary format LOG file is loaded to application software.
This binary format LOG file has all of information which this analyzer captured.

SAVE CSV button saves log information as CSV format file.
This CSV format file does not have all of information which log has.



6.1 CSV Option



ID	Description	Refer
Save 512byte Data	If checked, all of Data information is saved to CSV file	6.2
Add period of data transferring	If checked, duration time from start bit to end bit is saved to CSV file	6.3
Remove Busy/Int Event	If checked, Busy/Int Event is not saved to CSV file	6.4
Remove Data Event	If checked, Data Event is not saved to CSV file	6.5
Save All Save Range (Marker-marker)	If Save All is selected, information of all of area is saved to CSV file. If Save Range is selected, only specified area (marker – marker) is saved to CSV file.	6.6
Save Command Information File	If checked, command information, which is displayed on TOP window, is saved.	
Save Busy Information File	If checked, busy time information is saved.	

6.1.1 Save 512byte Data

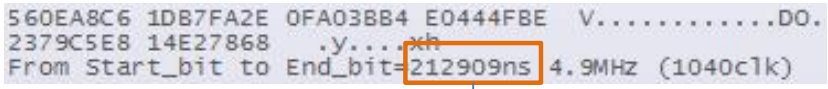
If this box is checked, all of captured 512byte data + CRC16 data are saved to CSV file.
If this box is not checked, these data information is not saved to CSV file.

```
8E958ABF 4FC3EE04 70D696A9 E878D3CE  ....O...p....x..
29E14992 A74E9929 94AE3D2F EE9EB33B  ..I..N.........
BC97DDB8 9566A8F0 61DDEC6A 64C99376  .....f..a..jd..v
7824FE06 998BA4BF A7F2FC50 68969E03  x..........Ph...
CD33A591 7677573B 77B70816 5DE23BA7  .3..vwW.w.......
6CB30BAF 2B2AC948 233CE731 E3CA1467  l......H...1...g
47D0A9F5 FADF440C 3ACDB256 DBAB1388  G.....D....V....
8FF73837 641350EC 8EF6C47A 67225F8F  ..87d.P....zg...
B4D5B28A 2A84B78C 3185B4D2 E70C6242  ........1.....bB
68584F43 4D2E81D2 72875CD3 FD86C6A4  hXOCM...r.......
9BAC88F8 0D4FF7E3 E448D531 88ED72FC  .....O...H.1..r.
7F3F167E EC64A323 565777E2 ABDE90CE  .....d..VWw.....
85BCF3E8 AB284E38 DB7FDC1C C73689DF  ......N8.....6..
5D12578D 4B9B0006 C3CEDD52 7B120634  ..W.K......R...4
F96DBB02 0DF802B3 9F90923A AACFF013  .m.............
893AD81B 72BCDEA4 405455C9 750A70FF  ....r....TU.u.p.
7F27A7ED 3AA55C7E B7E5BF34 3CA0EFBF  ...........4....
8B2062CE 67B08625 5551A8EF A0AE1656  ..b.g...UQ.....V
9F528052 3A19A4BE ABE42BB1 8291CD0B  .R.R............
EC2BBC4E 345D40B0 8A2D9E6E 04E73F62  ...N4......n...b
E2560ED8 163A229E 04F79D5A 868BD420  .V.........Z....
33C2B044 E1AD546D 6850FFEB A99B344B  3..D..TmhP....4K
CF9C1928 D5F21E44 4985DED7 4F744A26  .......DI...OtJ.
E84F0458 74870985 76229311 98B33E38  .O.Xt...v......8
EF8A69E9 7F28DFD8 02F6B7CF E5367844  ..i..........6xD
94398131 F7D2A820 3C0C2285 D818A351  .9.1...........Q
C889C5C4 1DC4AE83 B7B1EDEA 51B7A6A3  ............Q...
BEE8EF78 71787965 437473F2 71B0ABC0  ...xqxyeCts.q...
E402F761 B6ADD36C F1204BD1 9AE11C6B  ...a...l..K....k
EEC416D4 EB60C47D 12C34FFE 6C65A0AA  ..........O.le..
CB5BC567 52CD96BD 37AA982C C89A21C3  ...gR...7.......
AC35BDEE 6C72D190 32627E51 D01EC83A  .5..lr..2b.Q....
6AAB3984 459DBAC2    j.9.E...
```

6.1.2 Add period of data transferring

On pop up window of Data information, at bottom line, duration time from start bit to end bit is displayed.
If this box is checked, this duration time is inserted after 2nd column.
If this box is not checked, this duration time is not saved to CSV file.

This information is useful to judge CLK signal stopped while data transferring.
In blow case, 2nd line duration is much larger than others. It means CLK signal stopped while 2nd line data transferring.



Pop up window

22274	003s:388ms:107us 010 us	9924 ns	Read	B3377396 1D6ACA00 CBD56AC0 F463E133 .7s. .j.. ..j. .c.3
22275	003s:388ms:117us 010 us	212909 ns	Read	C8C08075 67D2BAB8 0DD60ED9 90D7AD58 ...u g... X
22276	003s:388ms:330us 212 us	9924 ns	Read	2D595EE4 024A7BFF 9FE78382 7C5C480E .Y.. .J.. .... ..H.

6.1.3 Remove Busy/Int Event

If this box is checked, Busy or Int Event is not saved to CSV file.
If this box is not checked, all of Busy and Int Event is saved to CSV file.

This is useful to minimize CSV file size if Busy time is not important for user.

Check Box ON case

85902	004s:491ms:683us 004 us	Write	B9EBFEFC D1957097 6EB27C90 694B5268	-	SD :4bit	Nwr:1003
85905	004s:491ms:693us 004 us	Write	1E84DC6B 6B0D30DE 01C3F13A 55CFEE1D	-	SD :4bit	Nwr:987

Check Box OFF case

85902	004s:491ms:683us 004 us	Write	B9EBFEFC D1957097 6EB27C90 694B5268	-	SD :4bit	Nwr:1003
85903	004s:491ms:688us 005 us	BUSY START	-	-	SD :-	-
85904	004s:491ms:689us 000 us	BUSY END	-	BUSY 0 us	SD :-	-
85905	004s:491ms:693us 004 us	Write	1E84DC6B 6B0D30DE 01C3F13A 55CFEE1D	-	SD :4bit	Nwr:987
85906	004s:491ms:699us 005 us	BUSY START	-	-	SD :-	-
85907	004s:491ms:699us 000 us	BUSY END	-	BUSY 0 us	SD :-	-

6.1.4 Remove Data Event

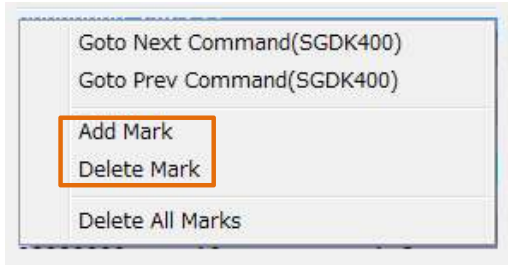
If this box is checked, Data Event is not saved to CSV file.
If this box is not checked, all of Data Event is saved to CSV file.

This is useful to minimize CSV file size.
Accessed sector count is displayed following “SC:”.

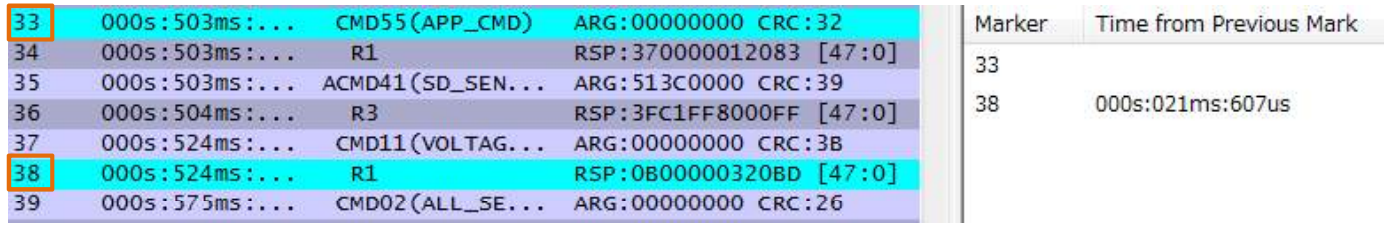
74153	004s:307ms:674us 878 us	CMD18(READ_MULTIPLE_BLOCK)	ARG:00004680 CRC:66	SC:136 IO=1.8V	SD :193.9MHz	Nrc:24
74154	004s:307ms:674us 000 us	R1	RSP:1200000900D3 [47:0]	-	SD :-	Ncr:33
74291	004s:310ms:175us 831 us	CMD12(STOP_TRANSMISSION)	ARG:00000000 CRC:30	SC:136 fromCMD:2501us	SD :206.8MHz	Nrc:Over 64K Cycles
74293	004s:310ms:176us 000 us	R1b	RSP:0C00000B007F [47:0]	-	SD :-	Ncr:33
74294	004s:311ms:061us 884 us	CMD18(READ_MULTIPLE_BLOCK)	ARG:00004280 CRC:4A	SC:136 IO=1.8V	SD :206.8MHz	Nrc:24
74295	004s:311ms:061us 000 us	R1	RSP:1200000900D3 [47:0]	-	SD :-	Ncr:33
74432	004s:313ms:368us 659 us	CMD12(STOP_TRANSMISSION)	ARG:00000000 CRC:30	SC:136 fromCMD:2306us	SD :206.8MHz	Nrc:Over 64K Cycles
74434	004s:313ms:368us 000 us	R1b	RSP:0C00000B007F [47:0]	-	SD :-	Ncr:33

6.1.5 Save area to CSV file

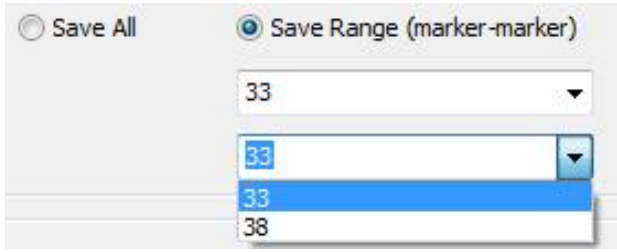
It is possible to add Marker or delete Marker to LOG line by double clicking right mouse button.



Only this area is saved to CSV file

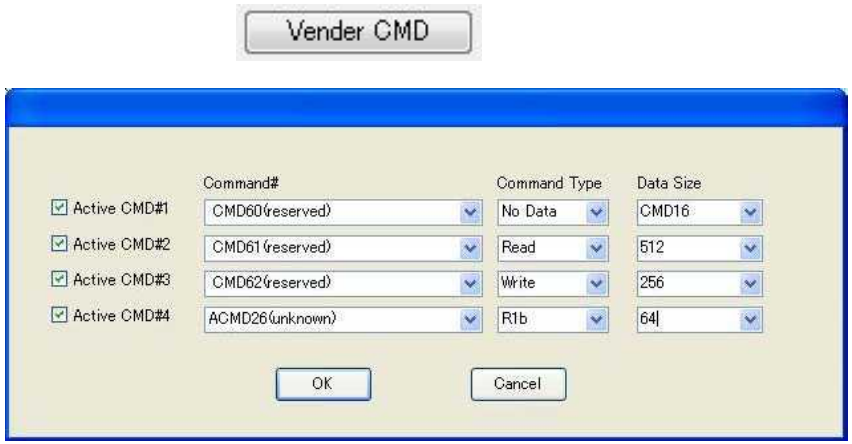


It Save All is selected, information of all of area is saved to CSV file.
If Markers are defined, and if Save Range is selected, only specified area is saved to CSV file.



7. Vendor CMD (Add CMD definition) (1/2)

This analyzer can define operation of Vendor unique Command or new Command which will be defined in future.
Four (4) new CMD can be defined.
It is need to specify CMD type (R1b, Read data, Write Data) and Data size.
Please note that if CMD which is already supported by this analyzer is specified again, this new definition is adopted.

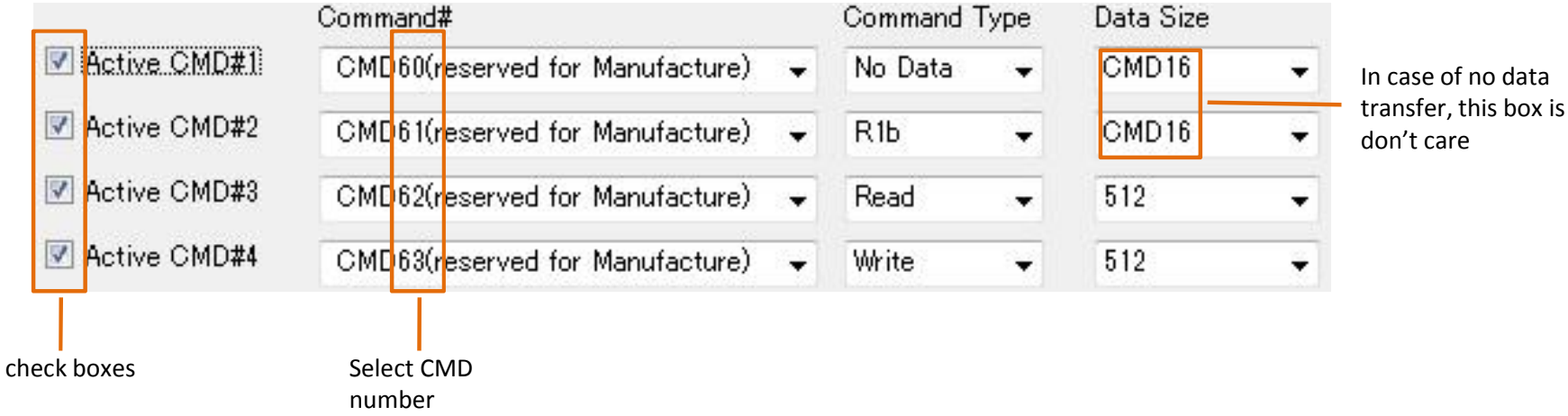


ID		Description
Active CMD#n (n=0..3)		Check the box to activate new CMD.
CMD		Choose new CMD number. If CMD which is already supported by this Analyzer is specified, this new definition is adopted. Response type is fixed to R1/R1b, and it cannot be changed.
Type	No Data	Choose if CMD is not R1b and not Data Transfer.
	R1b	Choose if CMD is R1b case.
	READ	Choose if CMD is Read Data case.
	WRITE	Choose if CMD is Write Data case.
Data Size	CMD16	Choose if Data Length is defined by CMD16 setting.
	4..512	Choose Data Length if it is fixed size.

7. Vendor CMD (Add CMD definition) (2/2)

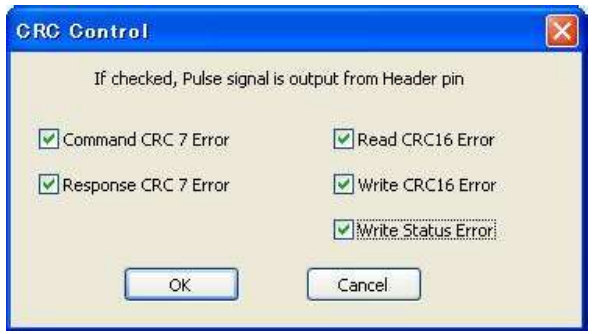
This is sample.
If operation of CMD60-63 are following case, please specify values as below picture.

CMD60	Response = R1, No Data Transfer CMD. In this case, value of “Data Size” is not used.
CMD61	Response =R1b, No Data Transfer CMD. In this case, value of “Data Size” is not used.
CMD62	Response = R1, Read Data Operation. Data Length is 512Byte.
CMD63	Response = R1, Write Data Operation. Data Length is 512Byte.

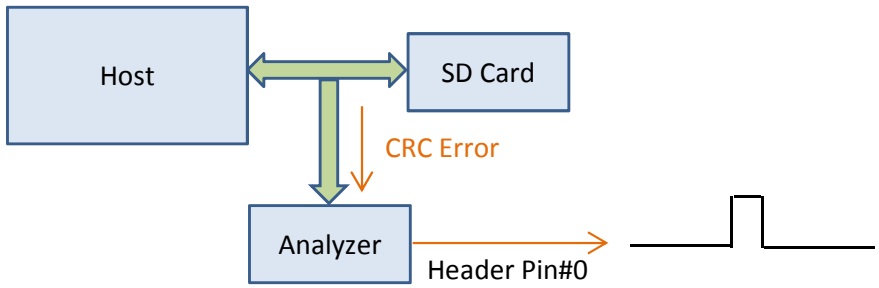


8. CRC Error Detected Signal

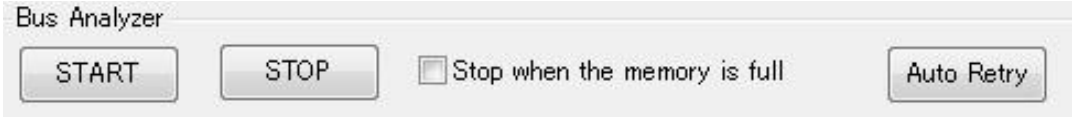
When Analyzer finds CRC Error, Analyzer outputs high pulse signal from Header Pin#0.
It is possible to activate 5 kinds CRC Errors individually.
If all of CRC Errors are activated, high pulse signal is output when any CRC Error is found.



It is possible to set Trigger event for CRC Error, but Trigger function has restriction. It is only one time.
So if CRC Error occur many times, please use this function to find CRC Error position.



9.1 Start and Stop



[START button]

If it is pushed, this analyzer begins to capture protocol.

If it is pushed again after it was pushed, this analyzer clears captured log and then begins to capture protocol again. This is useful to skip uploading time for transferring LOG which user does not want to upload by pushing STOP button.

[STOP button]

If it is pushed, this analyzer stops to capture protocol and uploads LOG from this analyzer to PC.

[Stop when the memory is full]

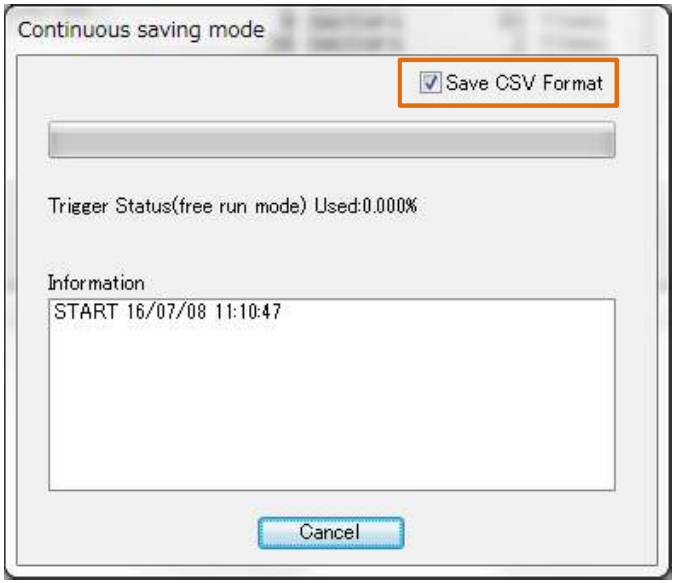
If this box is checked, analyzer stops capturing protocol when Log memory size becomes full.
LOG memory of this analyzer is Ring Buffer memory. Oldest protocol is overwritten by newest protocol.
But in this mode, all of captured protocol are not overwritten, so captured protocol at START button pushed is always remained in LOG.

9.2 Auto Retry (Repeat mode) (1/3)

Auto Retry is repeat mode.
In this mode, when LOG memory becomes full, this analyzer stops capturing protocol, uploads LOG to PC, and then starts again capturing protocol.
Please note that this analyzer cannot capture protocol while LOG information is uploading to PC (usually it is 1 minute.

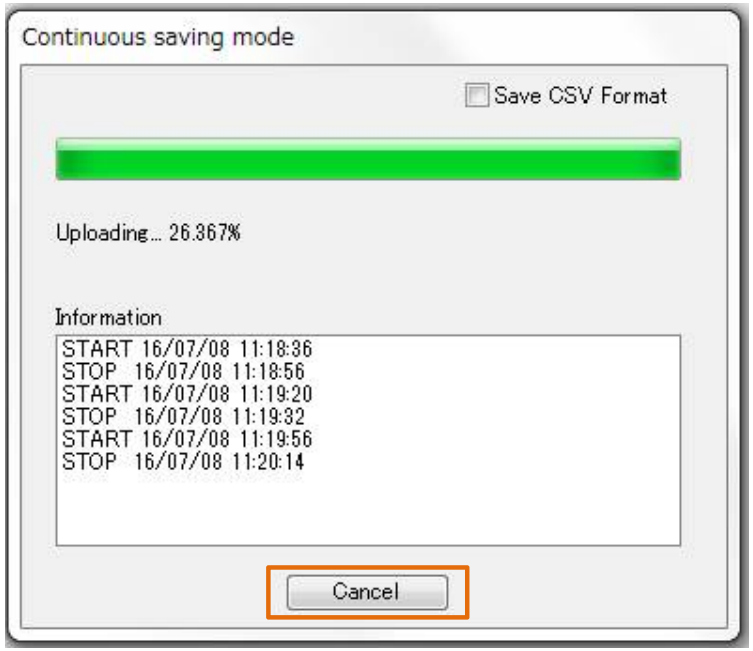
If “Auto Retry” button is pushed, below window appear.

If you don’t want to make CSV file, please off “Save CSV Format” check box.
It shorten dead time which this analyzer cannot capture log.



9.2 Auto Retry (Repeat mode) (2/3)

In this mode, captured LOG is uploaded to PC when LOG size becomes 256MB.
This is repeated till “Cancel” button is pushed.



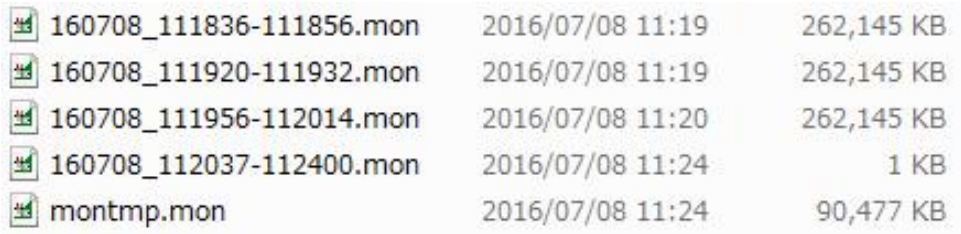
Duration from STOP time to next START time is dead time, which this analyzer did not capture protocol. In this case, it is about 30 sec.

After push “Cancel” button, please push “STOP” button to upload LOG of final period.

9.2 Auto Retry (Repeat mode) (3/3)

Uploaded LOG are stored to “tmp” directory, which is the same directory of application software exists.

Uploaded LOG size is 256MB.
File name is made from Date.
“montmp.mon” is final period LOG.

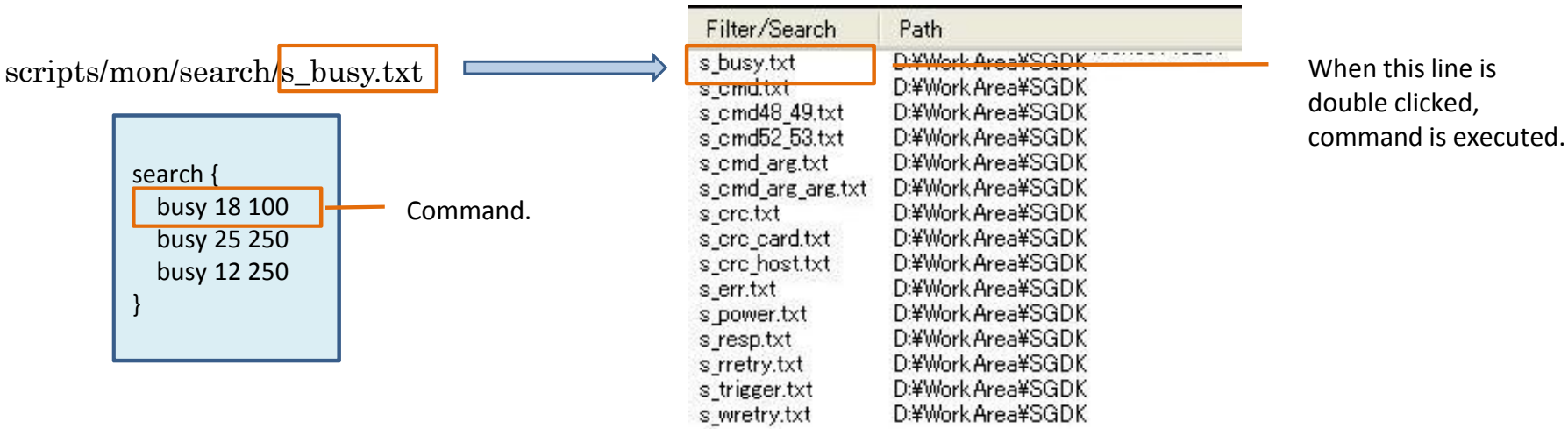


10. Search (1/9)

Search function is used to search specified event from LOG.

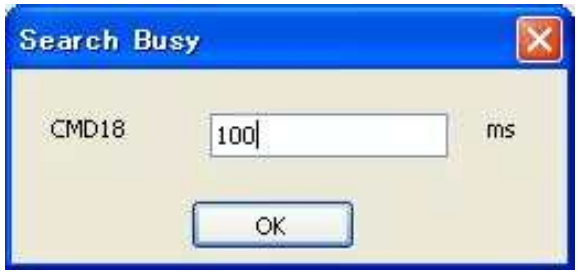
	File name	Description
Search	s_busy.txt	Search long busy period or long read latency
	s_cmd.txt	Search CMD
	s_cmd_arg.txt	Search CMD and Argument
	s_cmd_arg_arg.txt	Search CMD and range from Argument1 to Argument2. This is used to specify address range.
	s_cmd48_49.txt	Search CMD48 and CMD49 with specifying parameter
	s_cmd52_53.txt	Search CMD52 and CMD53 with specifying parameter
	s_crc.txt	Search CRC Error Event
	s_crc_card.txt	Search CRC Error Event (Response CRC7, Read Data CRC16, Write CRC Status) which is issued from SD Card.
	s_crc_host.txt	Search CRC Error Event (CMD CRC7, Write Data CRC16) which is issued from Host product.
	s_err.txt	Search any Error Event
	s_power.txt	Search power event
	s_resp.txt	Search Response Error Event such as R1 Error
	s_trigger.txt	Search Trigger Event

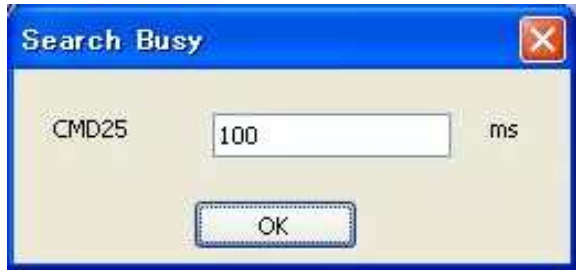
When Application software is started, it lists up files which exist in “search” directory.
When one of file is clicked, command, which are described in this TXT file, are executed.
Customer can add or modify this TXT file.

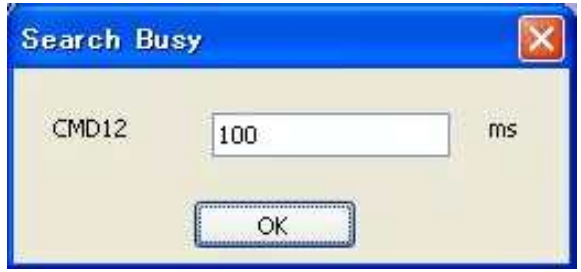


10. Search (3/9)

category	File name	Command format	Description
Busy	s_busy.txt	busy 17 100	"busy" searches longer busy event or longer read latency event. Application software will ask time when these command is executed, so please specify value in ms order. First parameter is CMD number. (CMD17, CMD18, CMD24, CMD25 and CMD12) Second parameter (for example 100 or 250) is not used by current application software, but please specify second parameter for compatibility reason.
		busy 18 100	
		busy 24 250	
		busy 25 250	
		busy 12 250	



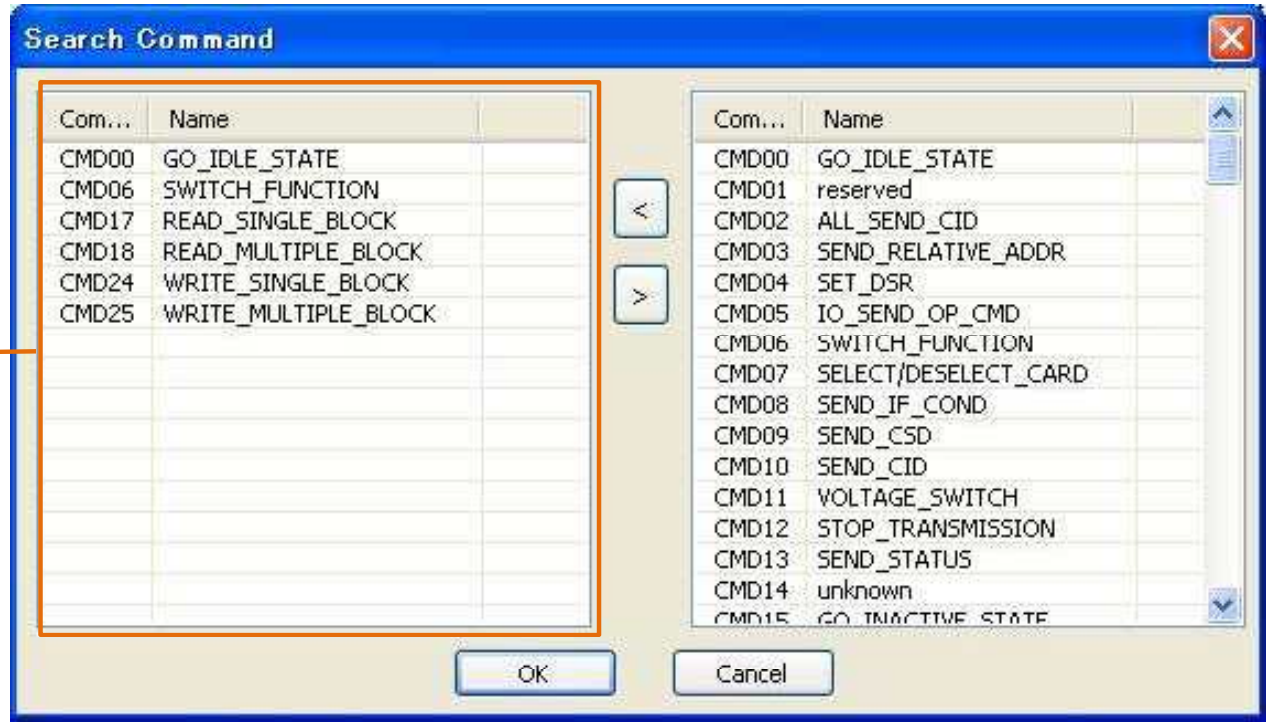




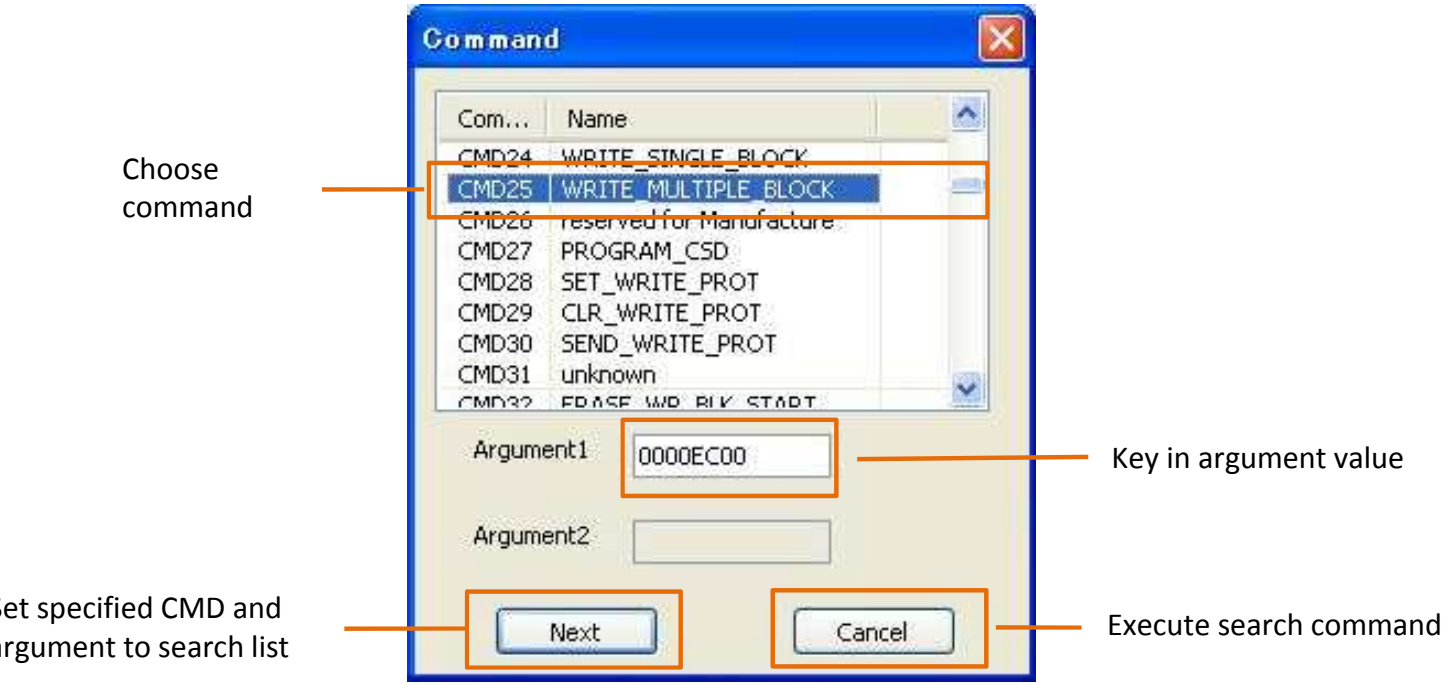
10. Search (4/9)

category	File name	Format	Description
Command	s_cmd.txt	command	“command” searches CMDs which are specified by Search Command Dialog. To add new command to search list, double click CMD of right side window. To delete command from search list, double click CMD of search list.

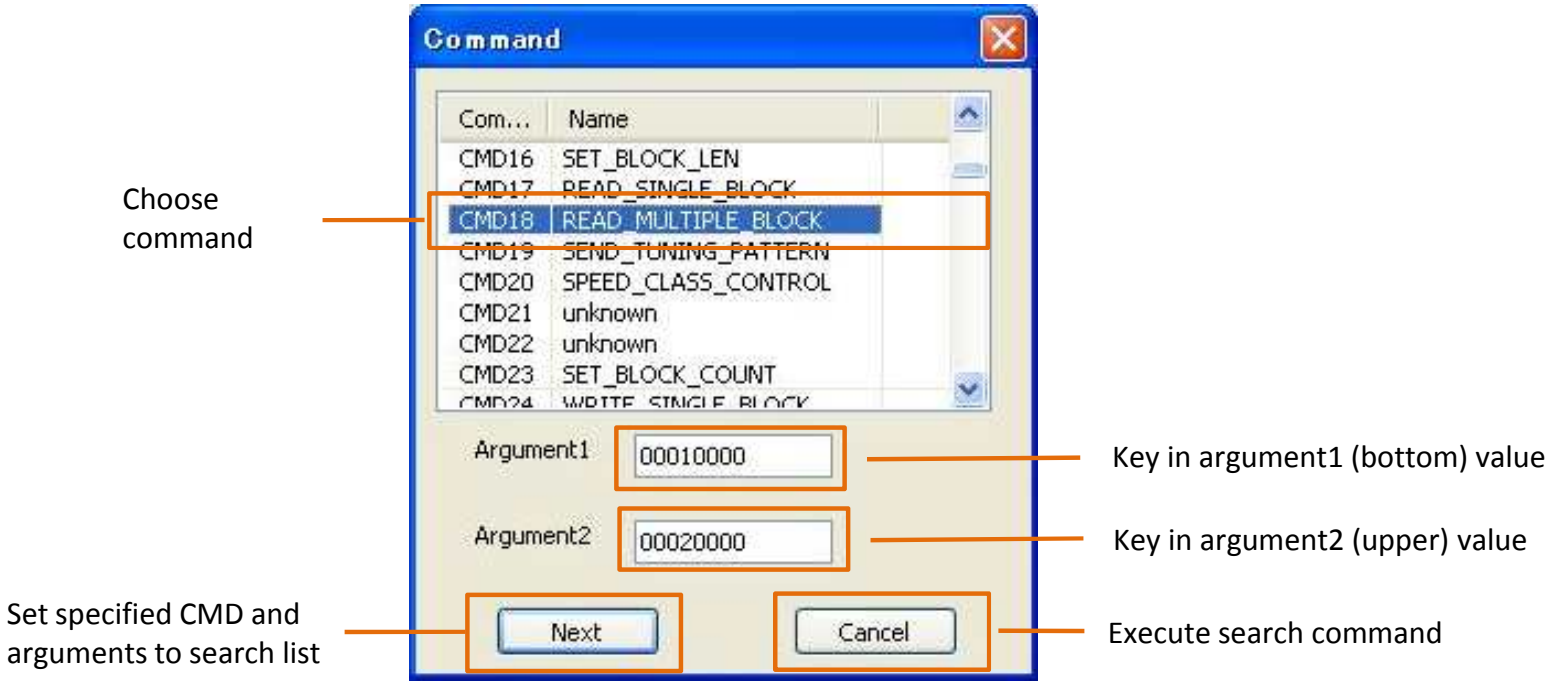
Search list



category	File name	Format	Description
Command	s_cmd_arg.txt	command arg	“command arg” searches CMD which are both CMD and Argument are matched Choose CMD number in command list and key in argument value, then push “Next” button. Multiple search condition can be set. After final CMD was set by pushing Next button, push “Cancel” button, then specified CMD will be searched.



category	File name	Format	Description
Command	s_cmd_arg_arg.txt	command arg arg	“command arg arg” searches CMD whose argument is between Argument1 and Argument2. Choose CMD number in command list and key in Argument 1 and Argument2 value, then push “Next” button. Multiple search condition can be set. After final CMD was set by pushing Next button, push “Cancel” button, then specified CMD will be searched.



10. Search (7/9)

category	File name	Format	Description
Command	s_cmd48_49.txt	command_48_49	“command_48_49” searches CMD48 or CMD49 whose argument matches specified values. Specify CMD number, Memory or IO, FN and Address range.
	s_cmd52_53.txt	command_52_53	“command_52_53” searches CMD52 or CMD53 whose argument matches specified values. Specify CMD number, Read or Write, FN and Address range.

10. Search (8/9)

category	File name	Format	Description
CRC	s_crctxt	crc	“crc” searches CRC Error event. This command searches all of CRC Error event.
	s_crc_host.txt	crc_host	“crc_host” searches CRC Error event which Host issued. They are CMD CRC7 Error and Write Data CRC16 Error.
	s_crc_card.txt	crc_card	“crc_card” searches CRC Error event which Card issued. They are Response CRC7 Error, Read Data CRC16 Error and Write CRC Status Error.
Power	s_power.txt	power	“power” searches Power event (power on or power off)
R1 Response	s_resp.txt	resp OUT_OF_RANGE resp ADDRESS_ERROR resp BLOCK_LEN_ERROR resp ERASE_SEQ_ERROR resp ERASE_PARAM resp WP_VIOLATION resp CARD_IS_LOCKED resp LOCK_UNLOCK_FAILED resp COM_CRC_ERROR resp ILLEGAL_COMMAND resp CARD_ECC_FAILED resp CC_ERROR resp ERROR resp CSD_OVERWRITE resp WP_ERASE_SKIP resp CARD_ECC_DISABLED resp ERASE_RESET	“resp” searches ERROR bit = 1 of R1 response.

10. Search (9/9)

Searched result can be saved as CSV file by double clicking Right mouse button.
(Left mouse button jumps to target line of LOG window)

No	Time	CMD	Argumen...	TransferS...	LBA(Argu...	...
2	000s:...	CMD,25	00002000	00000001	00000010	AbsTime,112,us,M
11	000s:...	CMD,18	00004040	00000008	00000020	AbsTime,2907,us,I
23	000s:...	CMD,18	000		00000020	AbsTime,4117,us,I
36	000s:...	CMD,18	000		0000020	AbsTime,5338,us,I
49	000s:...	CMD,18	00004058	00000008	00000020	AbsTime,6552,us,I
62	000s:...	CMD,18	00004060	00000008	00000020	AbsTime,7776,us,I
75	000s:...	CMD,18	00004068	00000008	00000020	AbsTime,9159,us,I
88	000s:...	CMD,18	00004070	00000008	00000020	AbsTime,10491,us
101	000s:...	CMD,18	00004078	00000008	00000020	AbsTime,11824,us

Save List

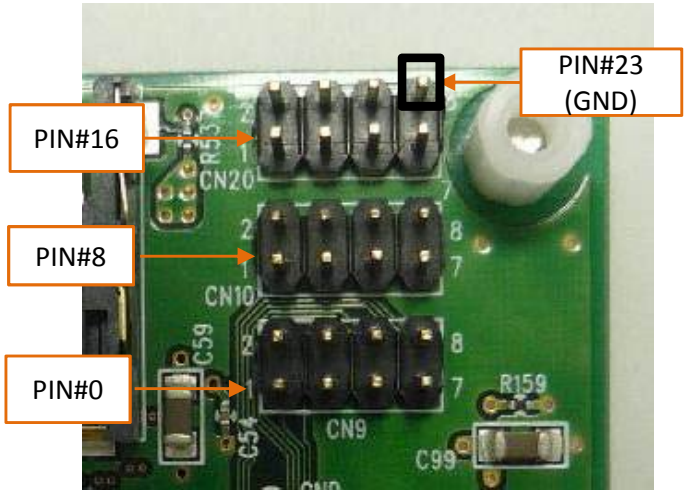
2	000s:000ms:112us 112 us	CMD	25	2000	1	10
11	000s:002ms:907us 001 ms	CMD	18	4040	8	20
23	000s:004ms:117us 948 us	CMD	18	4048	8	20
36	000s:005ms:338us 942 us	CMD	18	4050	8	20
49	000s:006ms:552us 942 us	CMD	18	4058	8	20
62	000s:007ms:776us 953 us	CMD	18	4060	8	20
75	000s:009ms:159us 001 ms	CMD	18	4068	8	20
88	000s:010ms:491us 001 ms	CMD	18	4070	8	20
101	000s:011ms:824us 001 ms	CMD	18	4078	8	20

11. Header pin (1/8)

On main POD, there are some Header pins.
From these header pins, encoded signals are output while this analyzer is capturing protocol.
With connecting these header pins and SD signals to Logic Analyzer (external equipment), it is possible to analyze host products operation precisely.

In case of SGDK330A, these signals are 3.3V CMOS level. In case of SGDK330B, these signals are 1.8V or 3.3V CMOS level.

[SGDK330A]



CN20

#20	#21	#22	#23
#16	#17	#18	#19

CN10

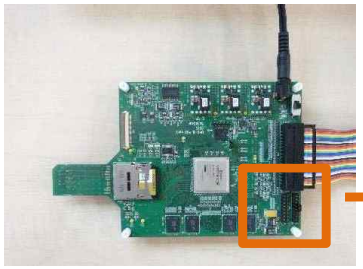
#12	#13	#14	#15
#8	#9	#10	#11

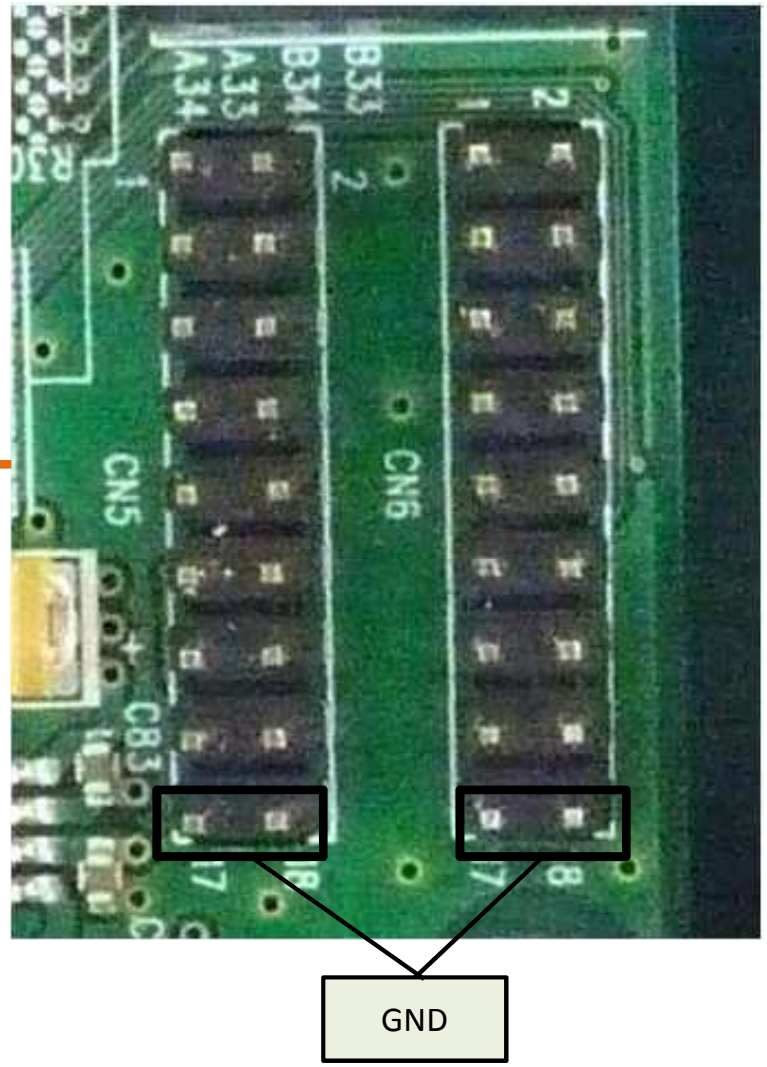
CN9

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

11. Header pin (2/8)

[SGDK330B]





CN5	
#0	#8
#1	#9
#2	#10
#3	#11
#4	#12
#5	#13
#6	#14
#7	#15
GND	GND

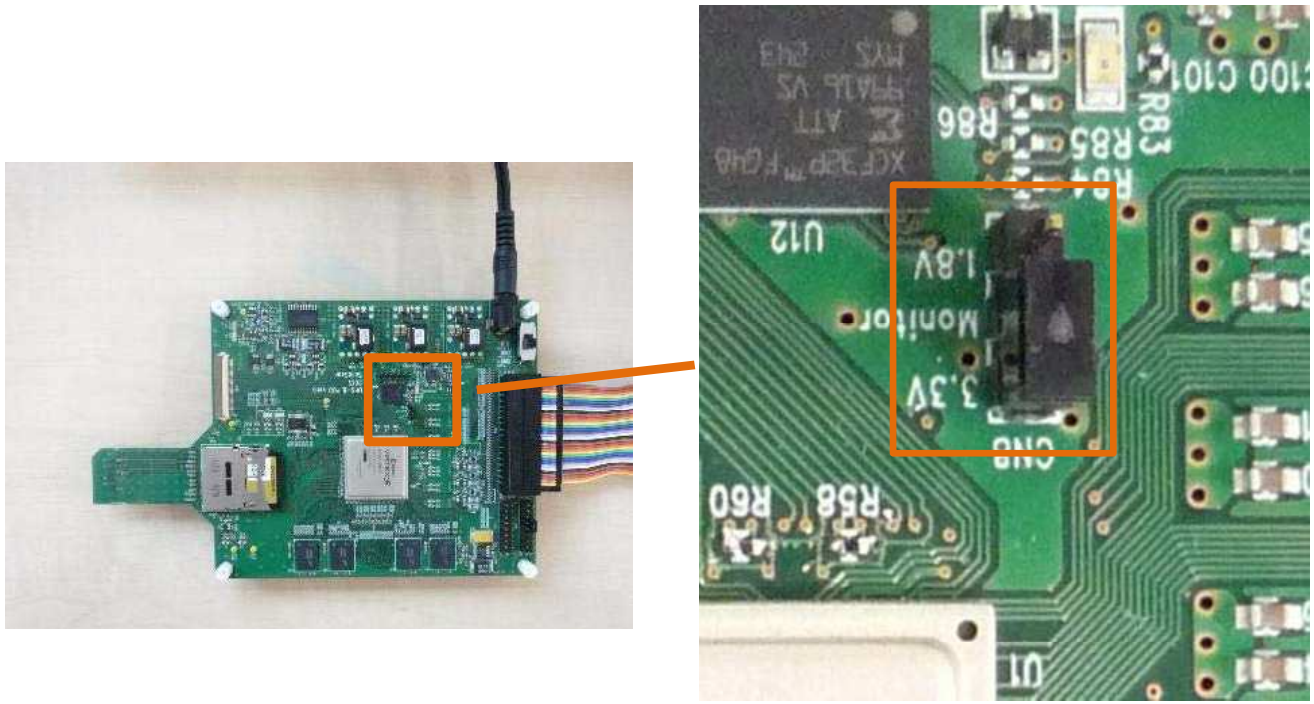
CN6	
#16	#24
#17	#”25
#18	#26
#19	#27
#20	#28
#21	#29
#22	#30
#23	#31
GND	GND

11. Header pin (3/8)

[SGDK330B]

Voltage level of Header pin can be selected by Jumper pin setting.

Jumper setting	Voltage level of Header pin
1.8V – Center pin	1.8V
3.3V – Center pin	3.3V



11. Header pin (4/8)

Header pin definition during Analyzer Mode				
SGDK330A	SGDK330B	Signal Name	In/Out	Description
#23		GND		Grand Level (0V)
#22	#31	External Trigger IN	Input	If positive edge or negative edge signal is input to this pin, external trigger in event occurs. No connection if trigger in mode is not used.
#21	#30	External Event	Input	If positive edge or negative edge signal is input to this pin, external event occurs, and it is recoded to LOG file. No connection if external event is not used.
#20-#16	#29-#16	reserved		Reserved
#15	#15	CMD Pulse	Output	High level pulse signal is output when new CMD from Host product is found. While this signal is high level, signal of #14-#8 are stable.
#14	#14	ACMD ID	Output	If new CMD is ACMD, this signal becomes high level. This signal level is kept till next CMD is input.
#13-#8	#13-#8	CMD	Output	Host CMD are output in parallel. Pin#13 is MSB and Pin#8 is LSB. These signal level are kept till next CMD is input.

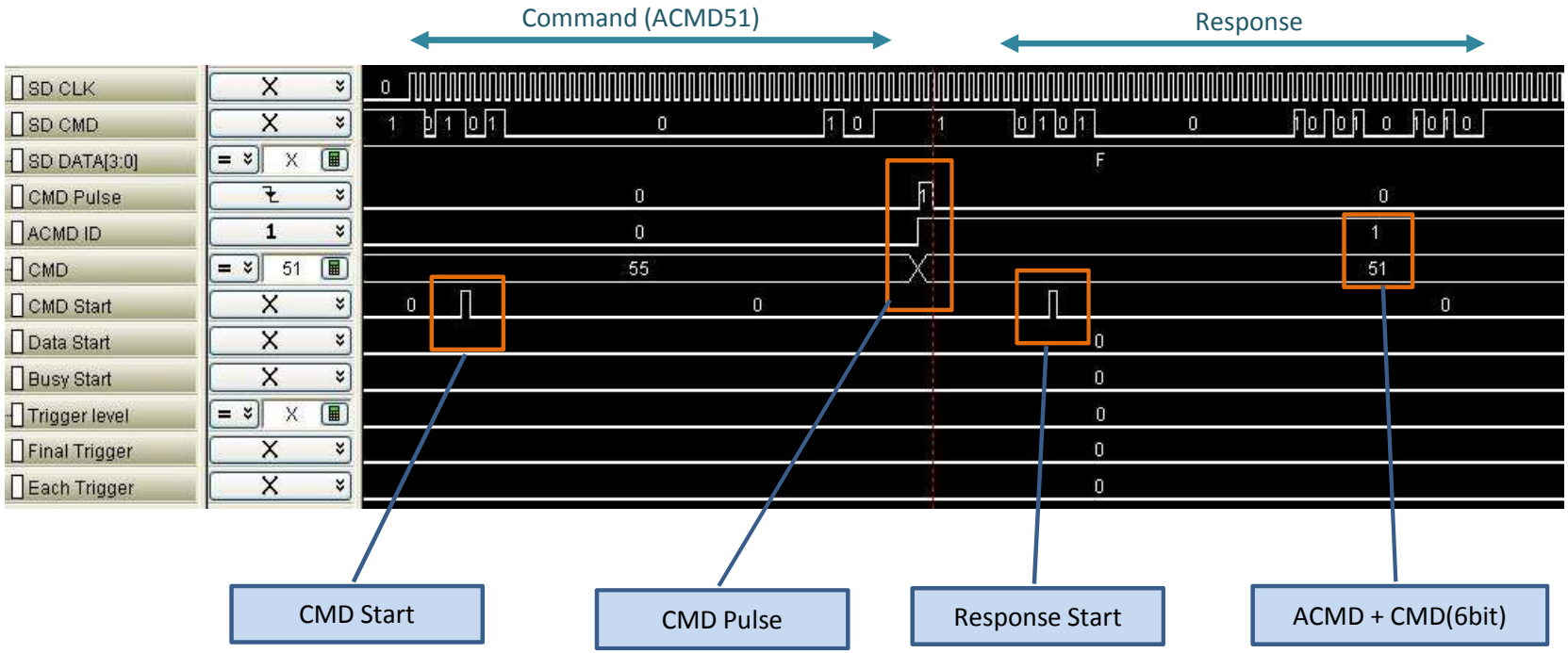
11. Header pin (5/8)

Header pin definition during Analyzer Mode				
SGDK330A	SGDK330B	Signal Name	In/Out	Description
#7	#7	CMD/Response Start Pulse	Output	High pulse signal is output when start bit of command or response is found.
#6	#6	Data Start Pulse	Output	High pulse signal is output when start bit of Read Data or Write Data is found.
#5	#5	BUSY Start Pulse	Output	High pulse signal is output when Busy signal is found.
#4-#3	#4-#3	Trigger Level	Output	Trigger level from 0 to 3 are output.
#2	#2	Final Trigger Pulse	Output	High pulse signal is output when final trigger hit.
#1	#1	Each Trigger Pulse	Output	High pulse signal is output when each trigger hit.
#0	#0	CRC Error Pulse	Output	High pulse signal is output when Analyzer finds CRC Error.

11. Header pin (6/8)

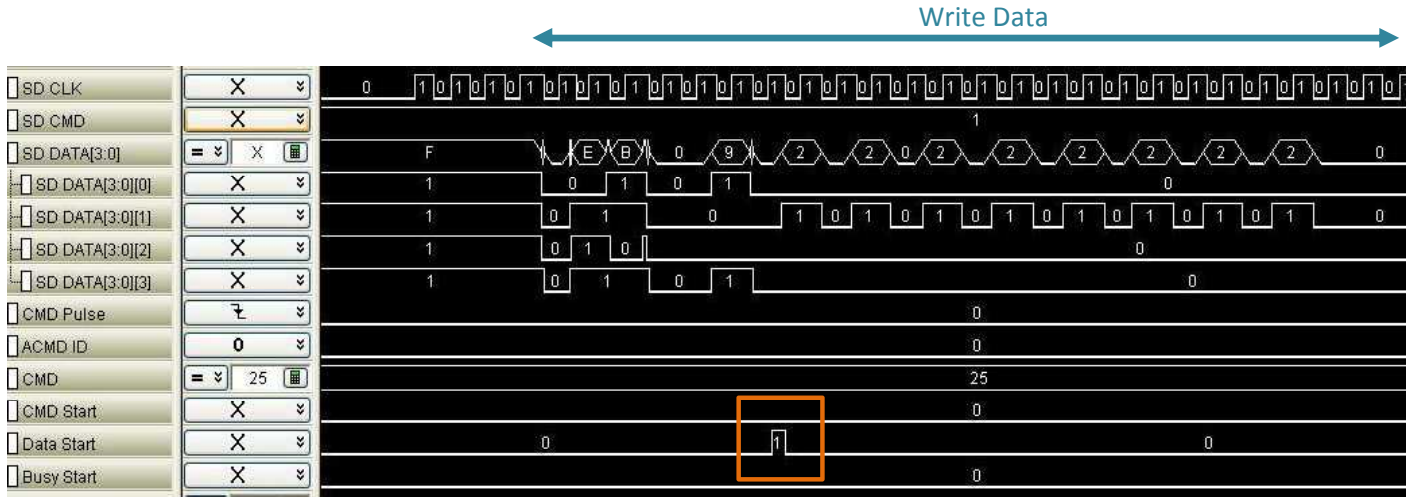
Below fig is sample wave form of signals from header pins and SD signals.
In this case, trigger condition of logic analyzer is ACMD51.

CMD Pulse:	High pulse signal is output when 48bit command is input.
ACMD ID:	High level signal is output if command is ACMD.
CMD:	6 bit command is output.
CMD Start:	High pulse signal is output when start bit of command or response is found.

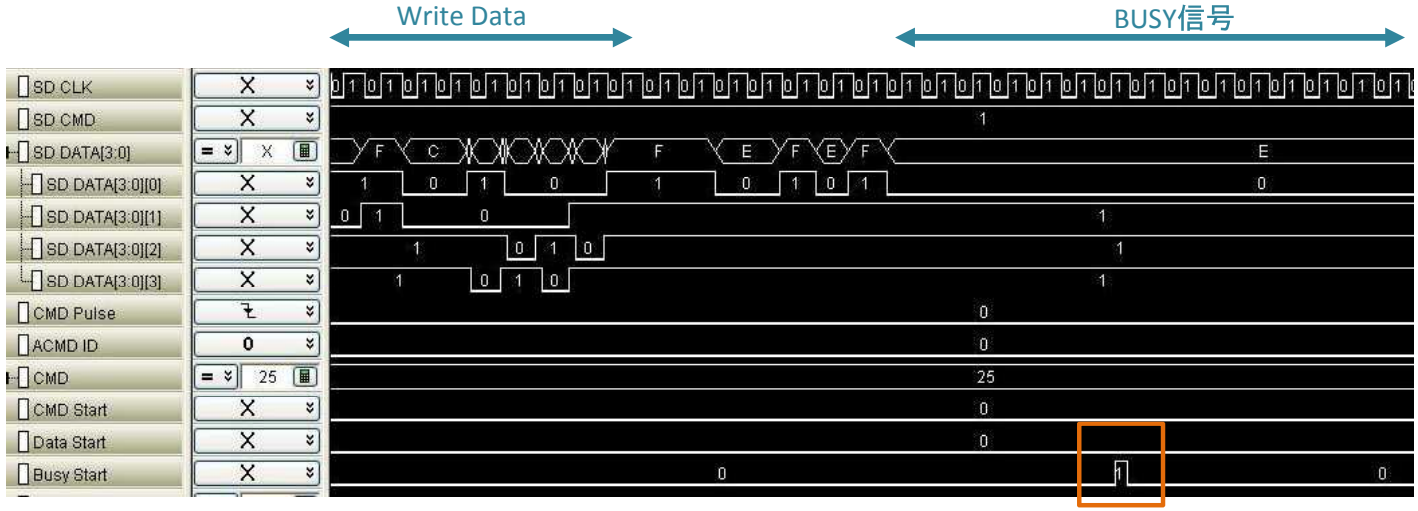


11. Header pin (7/8)

Below fig is wave form of write data by CMD25.
Data Start: High pulse signal is output when start bit of write data is found.



Below fig is wave form of write data by CMD25.
Busy Start: High pulse signal is output when Busy signal is found.

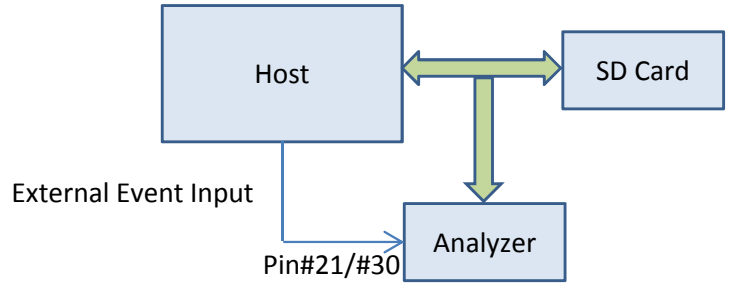


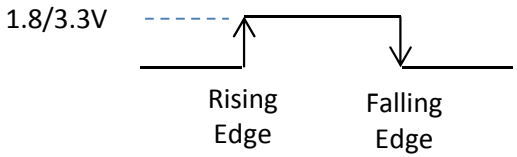
11. Header pin (8/8)

[External Event from Header pin]

If signal level of Header Pin#21(330A)/#30(330B) is changed, this Event is recorded to LOG file.
Please set minimum width of high level and low level to greater than 100ns.

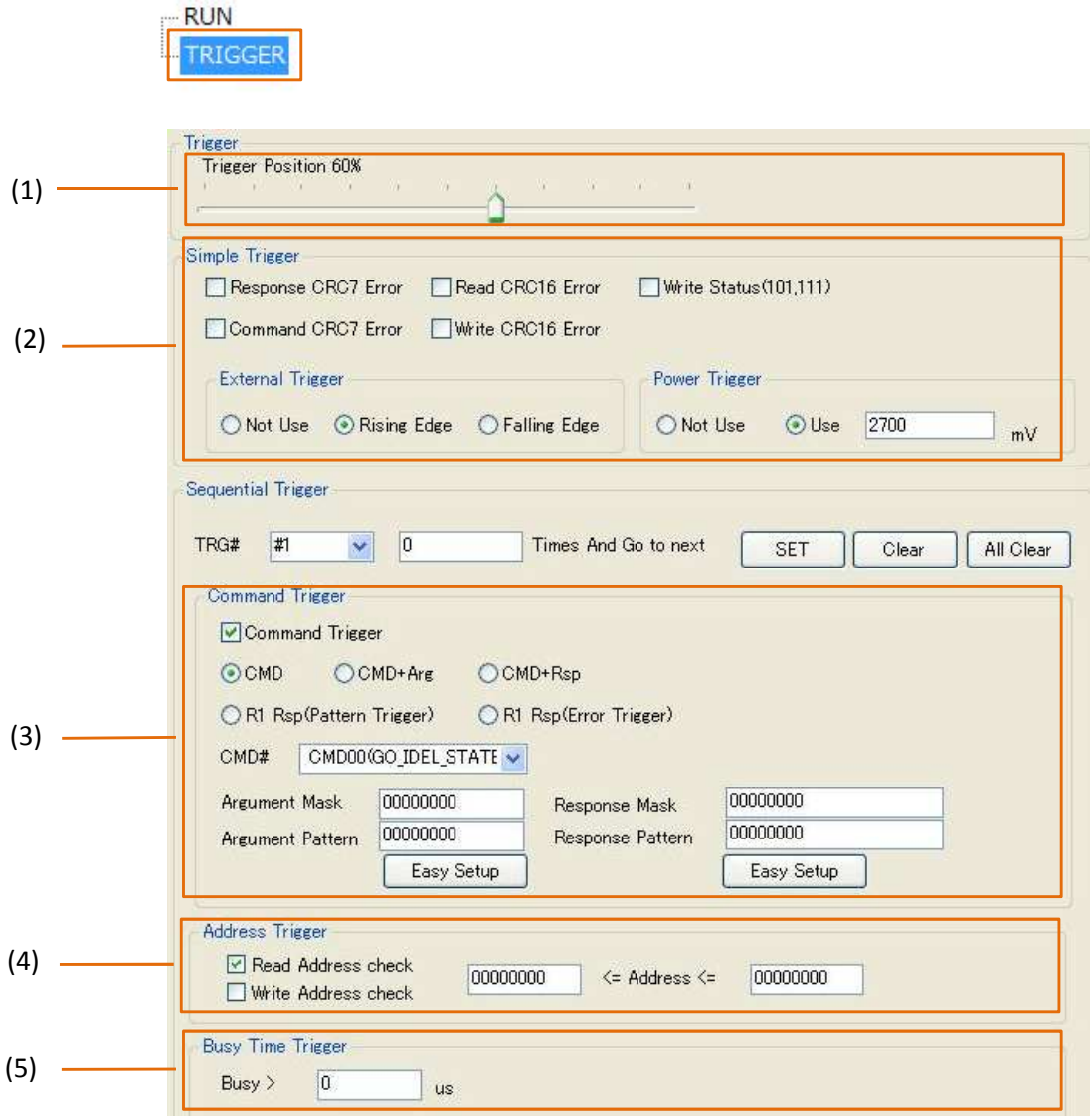
This function is used to check timing relationship between media access and certain event of Host product.





CMD18(READ_MULTIPLE_BLOCK)	ARG:00000000 CRC:70	SC:1 IO=1.8V
External Event(Risigne Edge)	-	-
R1	RSP:1200000900D3 [47:0]	-
Read	EB58904D .X.M	WaitTime:378us
CMD12(STOP_TRANSMISSION)	ARG:00000000 CRC:30	SC:1 fromCMD:455us...
Read	52526141 RRaA	WaitTime:0us
External Event(Falling Edge)	-	-
R1b	RSP:0C00000B007F [47:0]	-

12. Trigger Menu (1/2)



12. Trigger Menu (2/2)

#	ID		内容	参照
(1)	Trigger Point		Set Trigger point. If 100%, Analyzer sops its operation when Trigger Event is found. If 0%, Analyzer continues its operation till LOG data size reached to Log memory size (256MB/512MB/1G).	12.1 Trigger Position
(2)	Simple Trigger	CRC Error	Check these boxes to activate CRC Error as Trigger Event. This Trigger occurs only one time.	12.2 CRC Error Trigger
		External Trigger	Choose appropriate button to activate External Trigger In as Trigger Event. This Trigger occurs only one time.	12.3 External Trigger
		Power Trigger	Choose “Use” button to activate Low Voltage as Trigger Event.	12.4 Low Voltage Trigger
(3)	Sequential Trigger	Command Trigger	Check and Set appropriate condition to activate Command, Argument value or Response (R1) value as Trigger Event.	12.5 Command Trigger 12.6 Sequential Trigger
(4)		Address Trigger	Check and set these boxes to activate Address value as Trigger Event.	12.7 Address Trigger
(5)		Busy Time Trigger	Set timer value to activate “Long Busy Time” as Trigger Event.	12.8 Busy Trigger

12.1 Trigger Position

Trigger Position can be set by Slide Bar.
If 100%, Analyzer stops its operation when Trigger Event occurred.
If 0%, Analyzer stops operation when captured LOG data size from Trigger Event occurred, becomes LOG memory size.

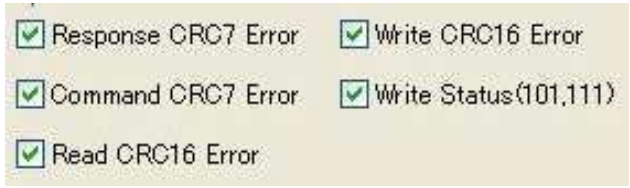
LOG memory size is 256MB(330A) or 256MB/512MB/1GB(330B).
Size of each event are listed below table.
For example, size of CMD event is 36byte, so if all of event is CMD, totally 7.4M event can be saved to LOG memory in case of 256MB.

Event		Size of Event in LOG	Number of Event (256MB case)
CMD		36 Bytes	7.4M
Response	48 bit	36 Bytes	7.4M
	136 bit	48 Bytes	5.6M
DATA	512 Byte case	572 Byte	470K
	4 Byte case	32 Byte	8.4 M
BUSY		16 Bytes	16.8 M

12.2 CRC Error trigger (1/3)

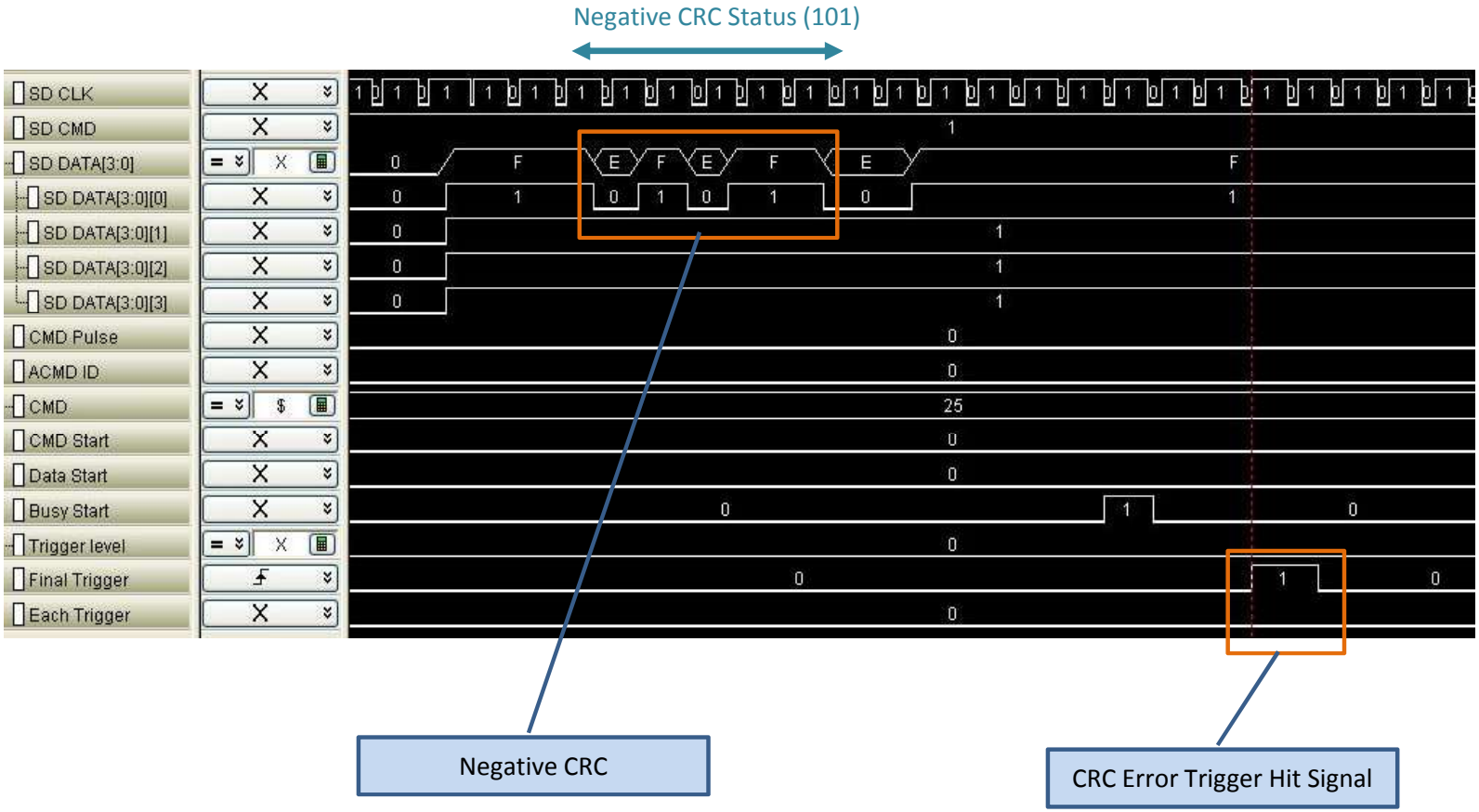
CRC Error is one of the highest priority Trigger Event.
If this Analyzer found CRC Error, it enters the state of Final Trigger.

[How to set]
Choose CRC Error from 5 kinds CRC Error. It is possible to choose multi kinds CRC Error.



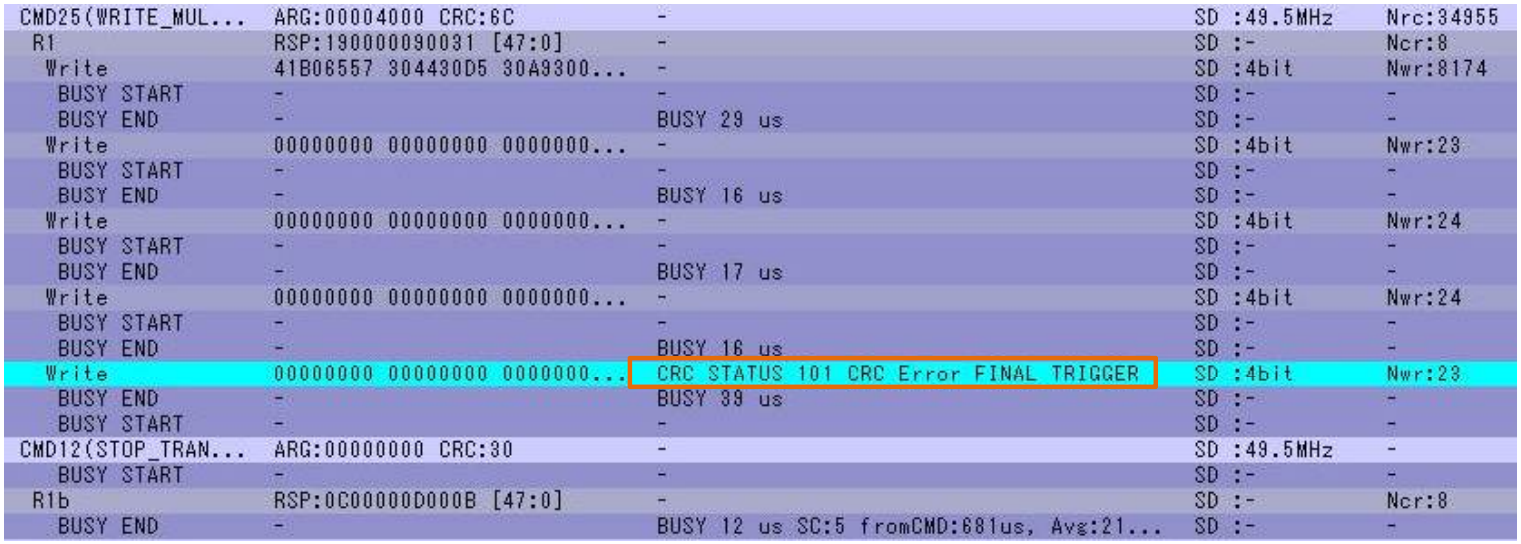
12.2 CRC Error trigger (2/3)

Below fig is wave form when SD card returns negative CRC status (101).
High pulse signal is output from “Final Trigger” pin.



12.2 CRC Error trigger (3/3)

Below fig is log when SD card returned negative CRC status (101).
“CRC STATUS 101 CRC Error” and “FINAL TRIGGER” message are displayed at the point which negative CRC status was found.

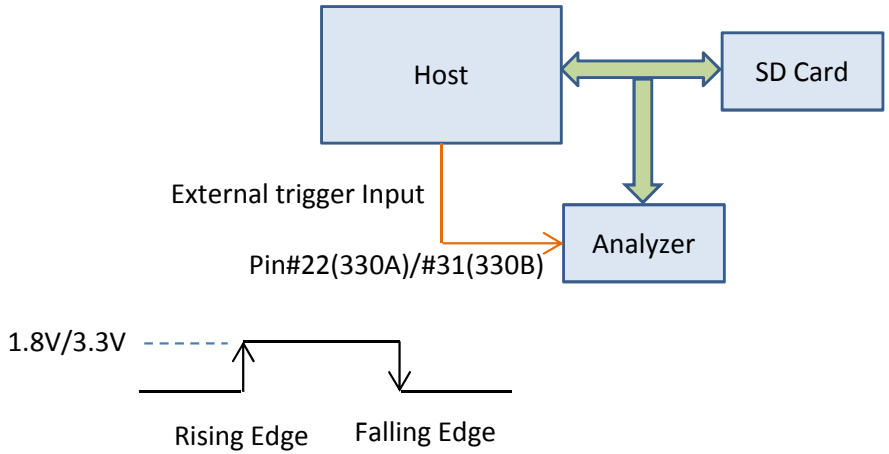


CMD25(WRITE_MUL...	ARG:00004000 CRC:6C	-	SD :49.5MHz	Nrc:34955
R1	RSP:190000090031 [47:0]	-	SD :-	Ncr:8
Write	41B06557 304430D5 30A9300...	-	SD :4bit	Nwr:8174
BUSY START	-	-	SD :-	-
BUSY END	-	BUSY 29 us	SD :-	-
Write	00000000 00000000 0000000...	-	SD :4bit	Nwr:23
BUSY START	-	-	SD :-	-
BUSY END	-	BUSY 16 us	SD :-	-
Write	00000000 00000000 0000000...	-	SD :4bit	Nwr:24
BUSY START	-	-	SD :-	-
BUSY END	-	BUSY 17 us	SD :-	-
Write	00000000 00000000 0000000...	-	SD :4bit	Nwr:24
BUSY START	-	-	SD :-	-
BUSY END	-	BUSY 16 us	SD :-	-
Write	00000000 00000000 0000000...	CRC STATUS 101 CRC Error FINAL TRIGGER	SD :4bit	Nwr:23
BUSY END	-	BUSY 39 us	SD :-	-
BUSY START	-	-	SD :-	-
CMD12(STOP_TRAN...	ARG:00000000 CRC:30	-	SD :49.5MHz	-
BUSY START	-	-	SD :-	-
R1b	RSP:0C00000D000B [47:0]	-	SD :-	Ncr:8
BUSY END	-	BUSY 12 us SC:5 fromCMD:681us, Avg:21...	SD :-	-

12.3 External trigger in (1/2)

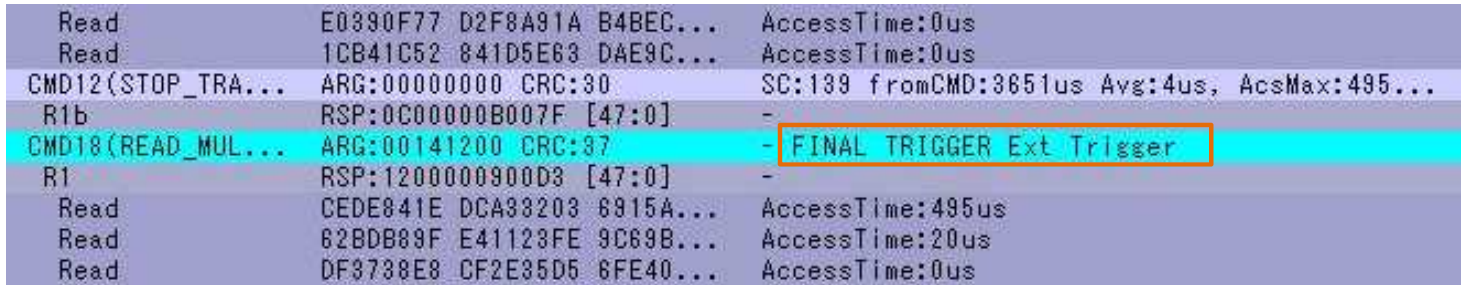
This analyzer has external trigger in function.
External trigger is one of the highest priority Trigger Event.
If Analyzer found External Trigger Event, it enters the state of final trigger.

[How to set]
Choose “Rising Edge” or “Falling Edge” to enable the use of External Trigger in.



12.3 External trigger in (2/2)

Below fig is sample log of External Trigger is input.
“FINAL TRIGGER” and “Ext Trigger” message is displayed.

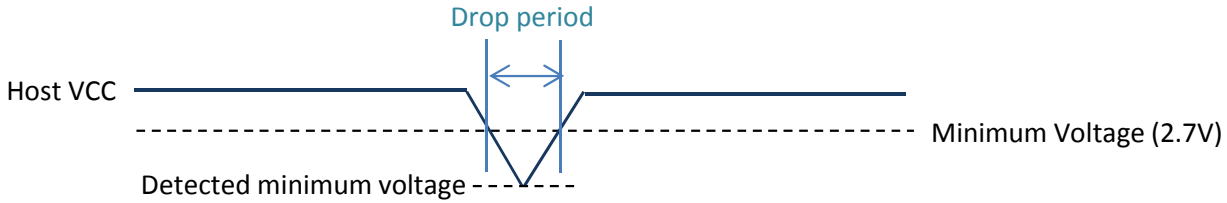


12.4 Low Voltage Trigger (1/2)

This Analyzer records “Low Voltage Event” to log if VCC of host becomes lower than “Minimum Voltage”.
This event is recorded always.

		Minimum Voltage
SD		2.70V
eMMC	3.3V	2.70V
	1.8V	1.70V
	1.2V	1.1V

Detected minimum voltage is recorded to log.




```
CMD18(READ_MULTIPLE_BLOCK)    ARG:00006000 CRC:6F              SC:8
 R1                           RSP:1200000900D3 [47:0]          -
  Read                        01070000 02070000 03070000...    WaitTime:209us
  Read                        81070000 82070000 83070000...    WaitTime:0us
  Read                        01080000 02080000 03080000...    WaitTime:0us
POWER (Low Voltage 2.590 V)   -                                -
  Read                        81080000 82080000 83080000...    WaitTime:0us
  Read                        01090000 02090000 03090000...    WaitTime:22us
  Read                        81090000 82090000 83090000...    WaitTime:0us
```

12.4 Low Voltage Trigger (2/2)

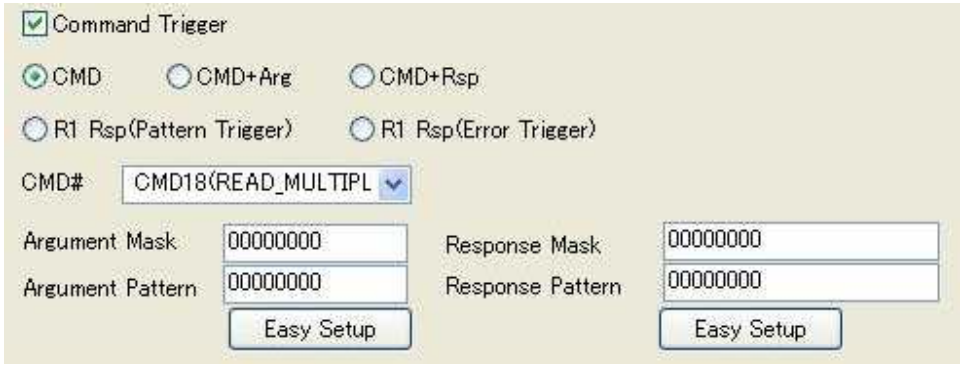
It is possible to set this “Detected Low Voltage” as Trigger Event.
In this case, any voltage value can be set.

If lower voltage than specified voltage is detected and also it kept longer than specified duration, Low voltage trigger occurs. This trigger hit occurs only one time.
After trigger hit, if lower voltage is detected again, it is saved as Low Voltage Event.

12.5 Command Trigger (1/6)

It is possible to set CMD, Argument value or Response value (R1) as Trigger Event.

Bit position, which is set to “1” by “Mask”, are compared with “Pattern”.



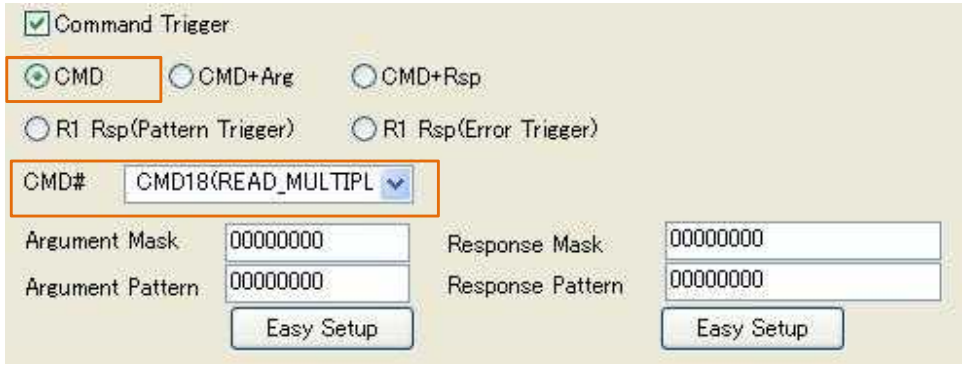
ID		CMD#	Argument	Response	description	reference
Command Trigger	CMD	√			If specified CMD# is found, then Trigger Hit.	12.5.1
	CMD + Arg	√	√		If specified CMD# and Argument value are found, then Trigger Hit.	12.5.2
	CMD + Rsp	√		√	If specified CMD# and Response value are found, then Trigger Hit.	12.5.3
	R1 Rsp (Pattern Trigger)			√	If specified R1 Response value is found, then Trigger Hit.	12.5.4
	R1 Rsp (Error Trigger)			√	If any Error bit in R1 Response is found, then Trigger Hit. Error bit is specified by Response Mask.	12.5.5

12.5 Command Trigger (2/6)

12.5.1 CMD Trigger

In this mode, Trigger Hit occurs when specified CMD is found.

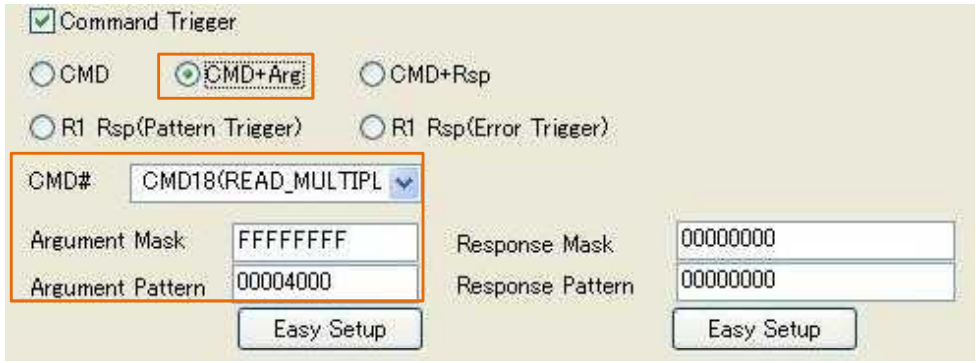
In below case, CMD18 makes Trigger Hit.



12.5.2 CMD+Arg Trigger

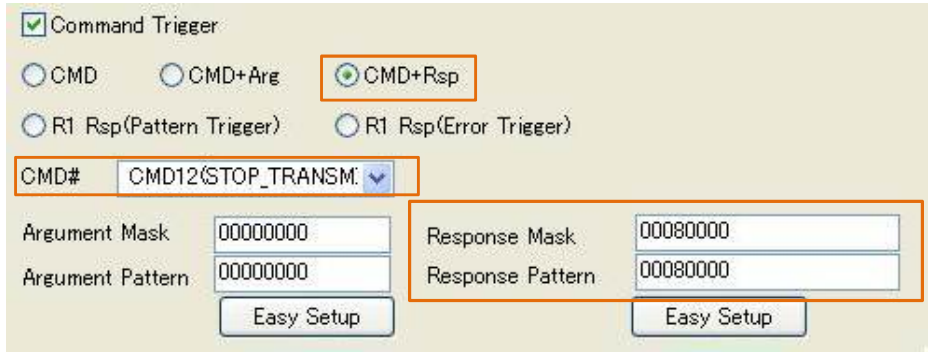
In this mode, Trigger Hit occurs when specified CMD and Argument are found.

In below case, CMD18 and Argument = 0x00004000 makes Trigger Hit.



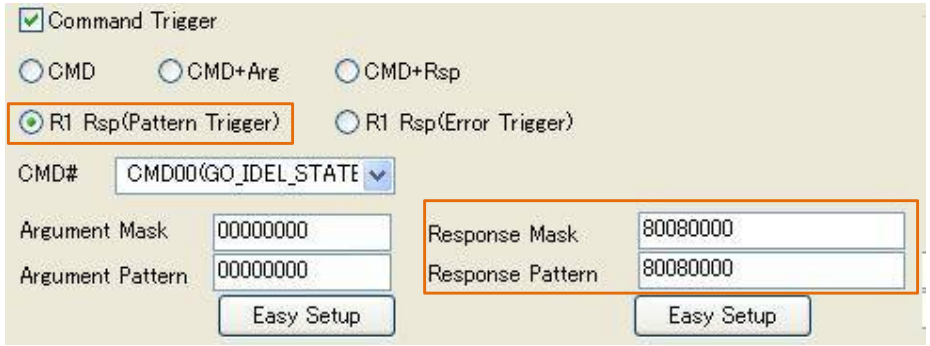
12.5.3 CMD+Rsp Trigger

In this mode, Trigger Hit occurs when specified CMD and Response value are matched.
In below case, CMD12 and ERROR BIT of Response makes Trigger HIT.



12.5.4 R1 Rsp (Patten Trigger)

In this mode, Trigger Hit occurs when Specified Response value is matched.
In below case, “both OUT_OF_RANG and ERROR are on” makes Trigger Hit.

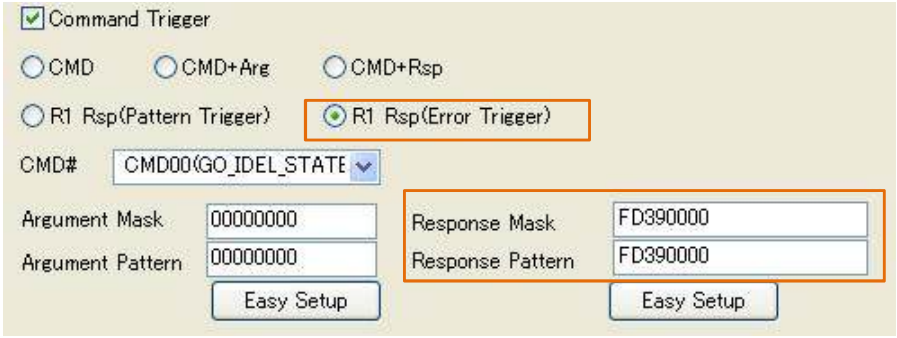


12.5.5 R1 Rsp (Error Trigger)

In this mode, Trigger Hit occurs when any Error bit in Response is ON.

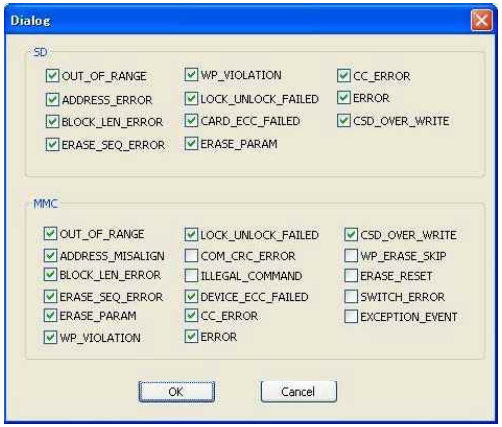
Check target bits are specified by Response Mask.

In below case, any Error bit in Response makes Trigger Hit.



12.5.6 Easy Setup

By pushing “Easy Setup”, R1 Response value can be set.

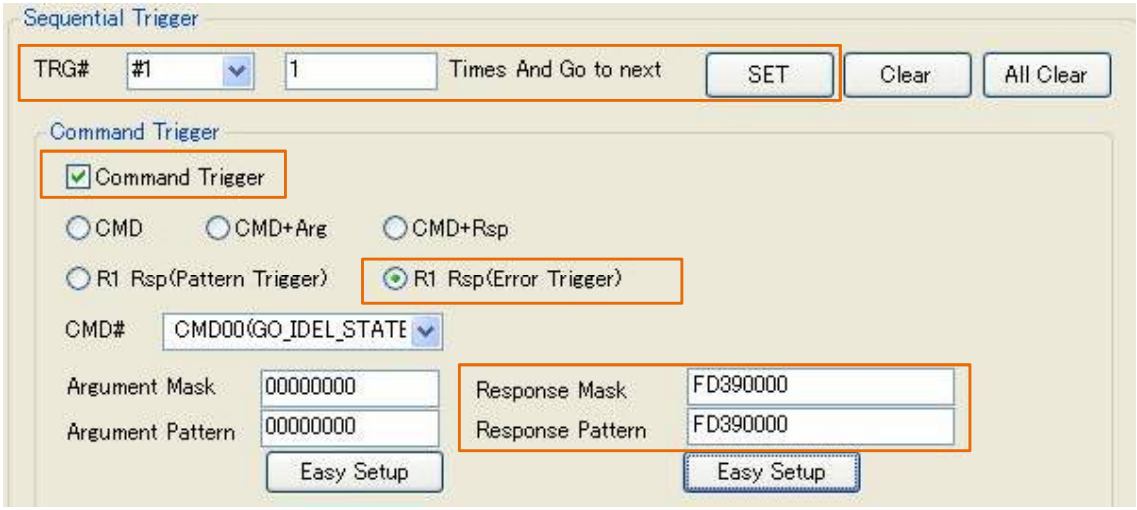


12.5 Command Trigger (5/6)

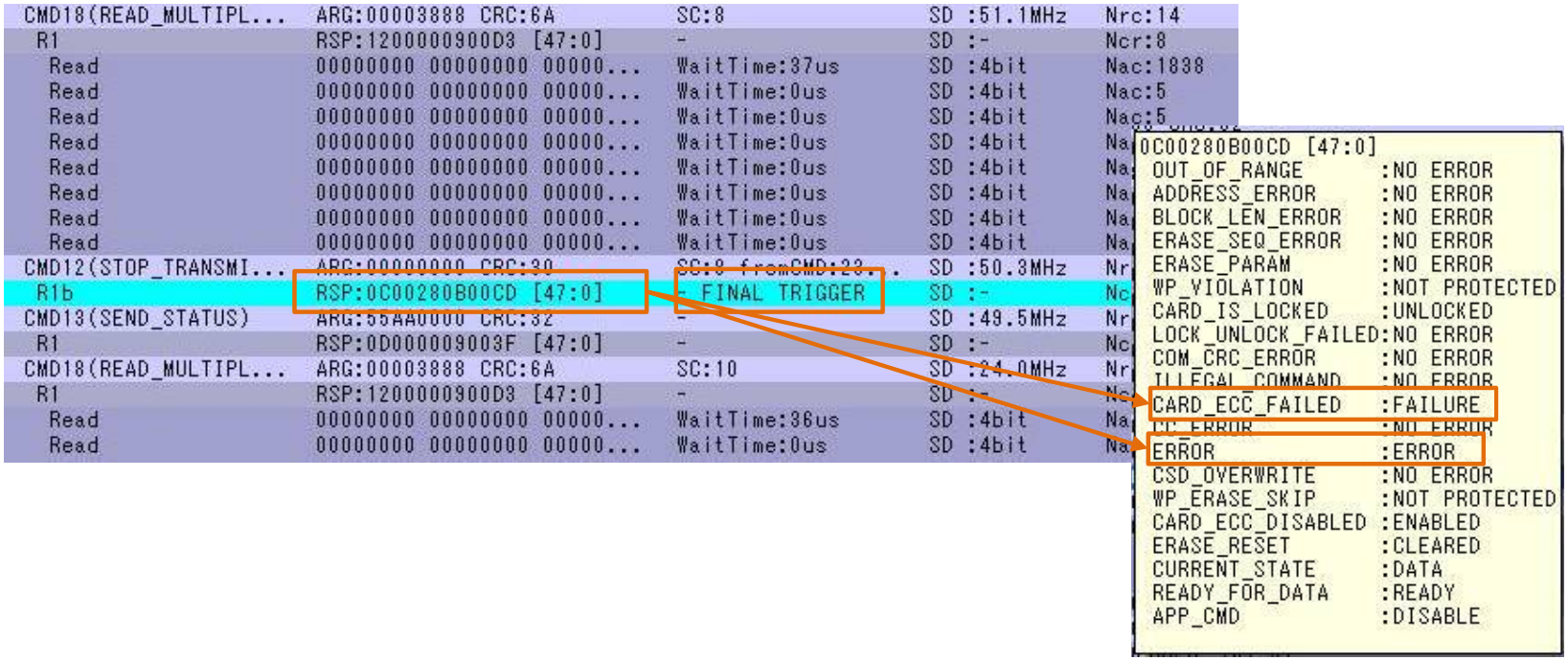
It is possible to set Error condition of R1 response as Trigger Event with using “R1 Rsp (Error Trigger)”.

[How to set]
(Setp1) Check “Command Trigger”.
(Step2) Choose “R1 Rsp (Error Trigger)”
(Step3) Set the value to “Response Mask”. Set “1” to Error bit field which you want to set as trigger event.
(Step4) Specify number to “Times And Go to next” field and push SET button.

In below case, all of error bits are checked.
In this case, if any error bit of R1 response is on, Trigger will hit.



Below fig is log if Error bit of R1 response is on.
Two Error bits of R1 response are on, so Trigger hit.



12.6 Sequential Trigger (1/3)

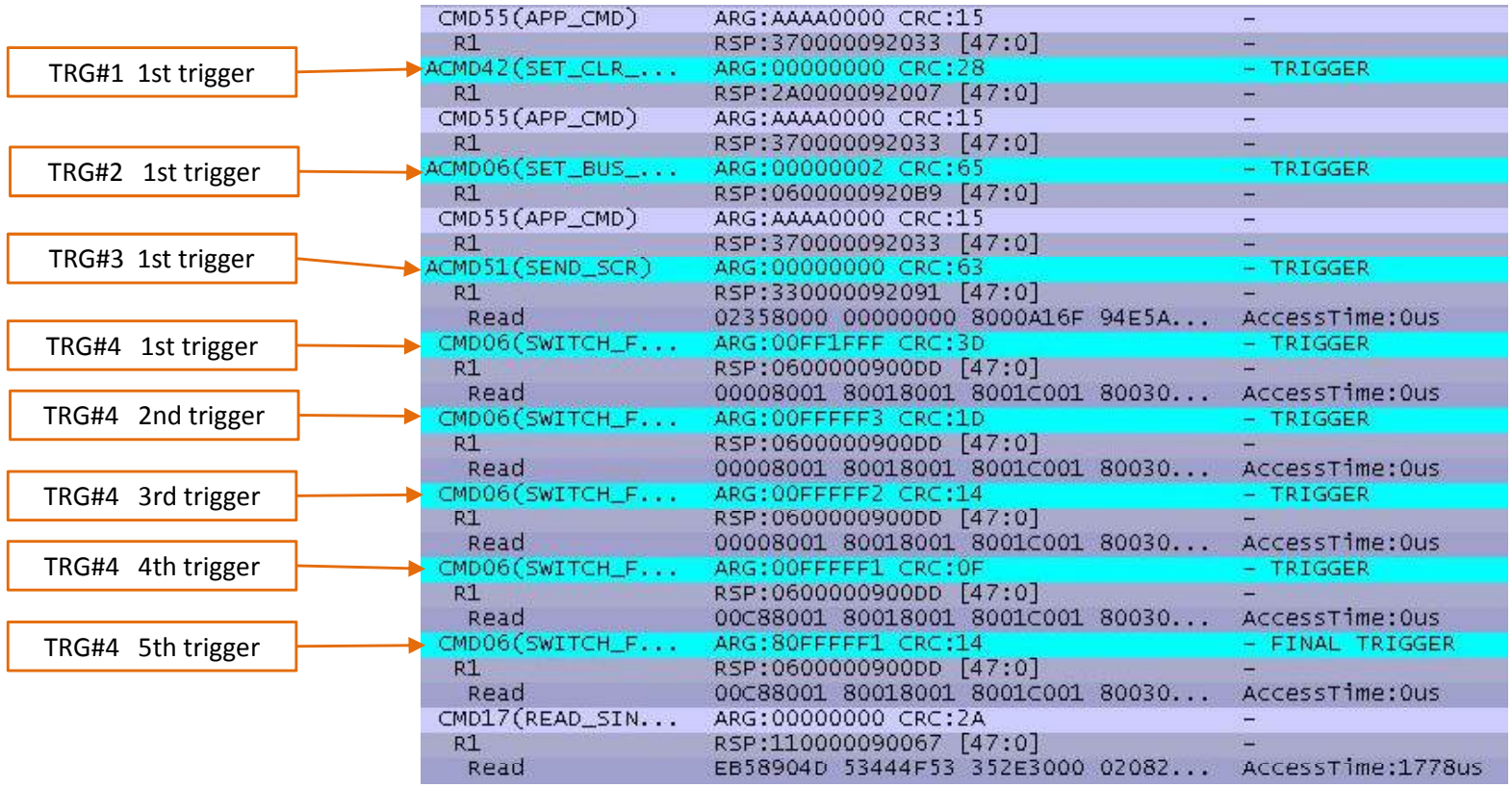
Analyzer supports 4 level sequence trigger from TRG#1 to TRG#4.
Trigger count value can be set from 1 to 65535 for each TRG#. “0” means NO trigger setting.
When trigger count is reached to “0”, next TRG# is adopted.

Start
TRG#1 when trigger count is reached to ”0”, move to TRG#2
TRG#2 when trigger count is reached to ”0”, move to TRG#3
TRG#3 when trigger count is reached to ”0”, move to TRG#4
TRG#4 when trigger count is reached to ”0”, finish
Finish

[How to set]
Following figs are sample of 4 level sequence trigger.

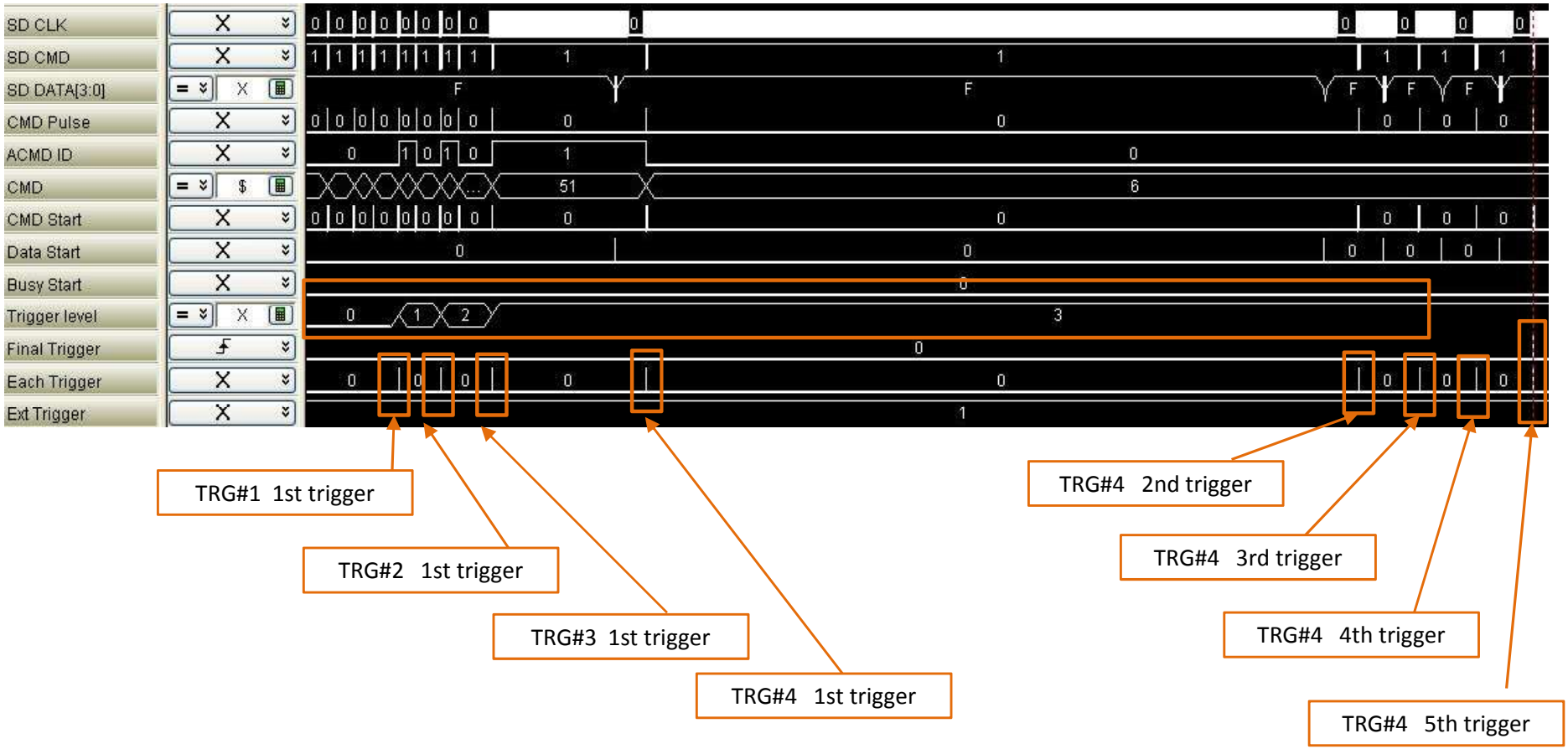
TRG#1 ACMD42 Trigger count = 1 time
TRG#2 ACMD6 Trigger count = 1 time
TRG#3 ACMD51 Trigger count = 1 time
TRG#4 CMD6 Trigger count = 5 times

Below fig is sample log when 4 level sequence trigger is set.
“TRIGGER” message is displayed at each trigger event except “FINAL TRIGGER” which is final trigger event.



12.6 Sequential Trigger (3/3)

Below fig is wave form when 4 level sequence trigger is set.
When trigger event is occurred, high pulse signal is output from “Each Trigger” pin.
When final trigger event is occurred, high pulse signal is output from “Final Trigger” pin.
TRG# value is output from “Trigger level” pins. At first it is “0”. And when TRG# is changed, it is incremented by 1.



12.7 Address trigger

It is possible to set address as trigger event.
Address value is BYTE in case of standard capacity media, or BLOCK in case of high capacity media (SDHC or SDXC).

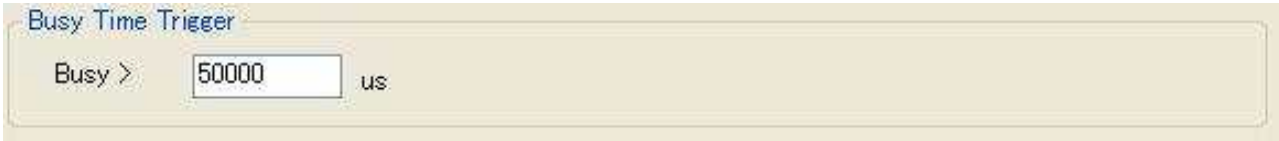
[How to set]

Read Address check:	Check when address trigger is adopted at read operation.
Write Address check:	Check when address trigger is adopted at write operation.
Address range:	key in hexadecimal number.

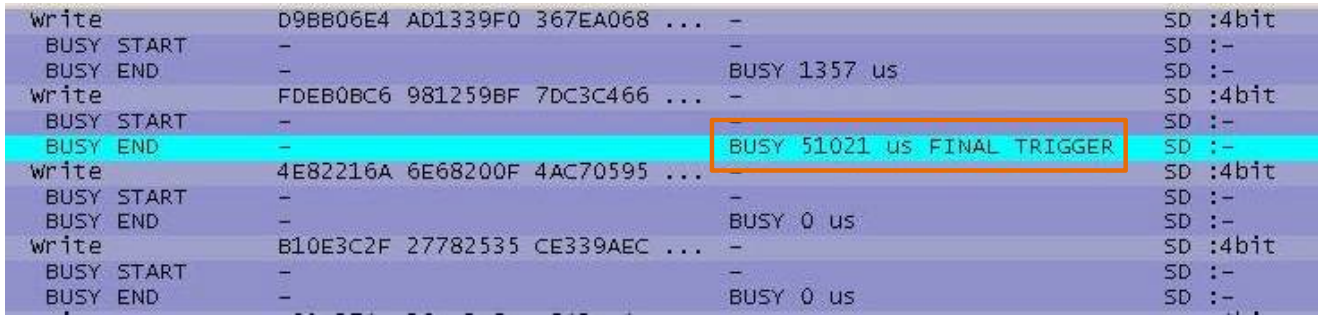
12.8 Busy trigger

It is possible to set longer busy period of write operation as trigger event.

[How to set]
Key in busy period in us unit.
In below case, when busy period is over 50000us(50ms), it becomes trigger event.

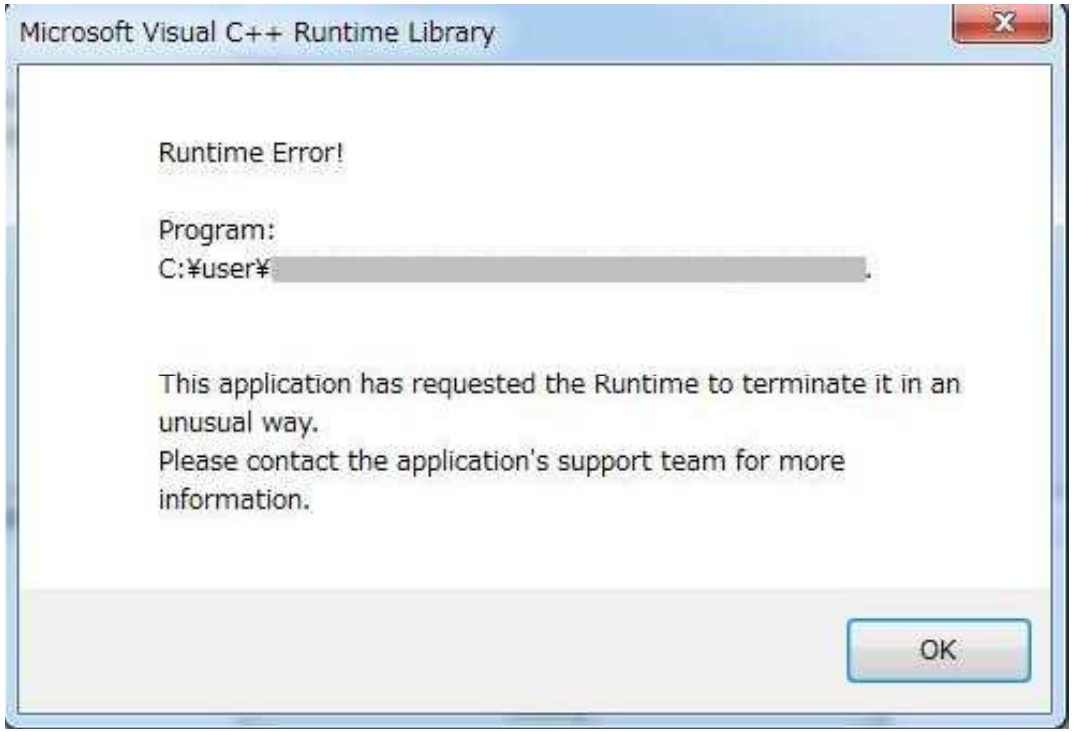


Below fig is sample log when busy trigger (50000 us) is set.
“FINAL TRIGGER” is displayed at when BUSY period is over 50000us.



13. Runtime Error (1/2)

Windows OS shows “Runtime Error!” message if this application software consumed limitation of memory area in PC.
If this message appeared, it is need to minimize Log memory size for example 256MB, increase PC memory for example 16GB, use 64bit OS, etc.



Runtime Error message

13. Runtime Error (2/2)

OS	Application s/w	icon	measure
32bit OS	32bit application s/w		● Use 64bit application s/w on 64bit OS ● let “LOG memory size” be smaller, for example 256MB
64bit OS	32bit application s/w		● Use 64bit application s/w ● let “LOG memory size” be smaller, for example 256MB
	64bit application s/w		● Increase PC memory ● let “LOG memory size” be smaller, for example 256MB