

MSO Series 3 in 1 Analyzer (Protocol + Logic + Simple DSO) Manual



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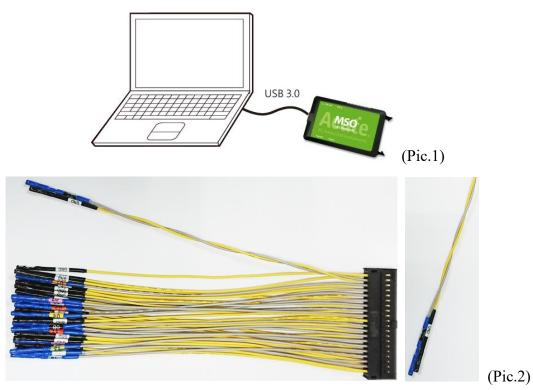
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Chapter 1 Installation and Settings

Hardware Installation

Connect the USB 3.0 cable to the USB slot on the computer (Pic.1). After confirming that the connection is complete, you can turn on the software and connect the signal cable to the object to be tested for observation. Before the measurement, please make sure the GND has been correctly connected. If it is possible, we suggest twisted pair the Data Pin and GND to improve the signal quality (Pic.2). If the signal speed is over 150MHz, please use the short cable for measurement



Software installation

Please visit the official website of Acute Technology Inc., go to the Download page, and then select and download the MSO series. After completion of installation, the "start icon" of MSO series will appear on the desktop and the program set. You can select either one to start MSO (). After starting the software, the main menu screen will show up. You can choose to enter logic Analyzer or protocol Analyzer.



BAcute MSO (Ver:1.4.3)	_	×
Protocol Analyzer		
Open File		_
Recent Files		_

Or after entering the function window, you can select the icon below to add Logic Analyzer

or Protocol Analyzer window



Or click the Add Logic Analyzer or Add Protocol Analyzer window within the file functions.

	Л
Add PA	Add LA

For the first-time use, the following screen will show up. Please set up the working directory that you will surely use. It is recommended that you choose the hard disk with larger remaining space for the storage of the working directory.



📾 Initial Working Directory Setting	?	×
Working Directory		
C:/Users/UserName/Documents/Acute/MSO/		
Disk Free Space		
C:/	4.23	GB
D:/	97.32	2 GB
○ Default	×c	ancel



Specification Table

Model		MSO1008E	MSO1116E	MSO2116B	MSO2216B	MSO2216B+		
	Power Source	USB bus-power (+5V)						
Power	Static Power Consumption	0.9W						
Power Hardware Inter Channels (Data Total Memory Analog Input Digital Input	Max Power	< 3.9W	< 6W					
TT 1 T 4	Consumption			LICD2 0				
		USB3.0 8/1/23 16/1/23						
	/ Clock / Ground)			-		0.01		
Iotal Memory		2Gb	40	Gb C L H (8Gb		
	Channels	Group I (CH0~7) Group I, II (CH0~7, CH8~15)						
	Sample Rate(Group I 或 II)	200MHz / 1CH, 100MHz / 2CH, 25MHz / 8CH						
Analog Input	Sample Rate(Group I 或 II)		The mir	nimum value of Group	I or II settings			
	Bandwidth			40MHz				
	ADC Bits			12				
	Timing Analyzer (Asynchronous)			Conventional / Transitional Timing) - Memory per channel				
	2 GHz	(4 / 3)– 512 Mb	(4 / 3)– 1 Gb	(8 / 7)– 512 Mb		7)– 1 Gb		
D 1	1 GHz	(8 / 6)- 256 Mb	(8 / 6)– 512 Mb	(16 / 14)– 256 Mb		4)– 512 Mb		
-	500 MHz	(8 / 6)- 256 Mb	(16 / 12)- 256 Mb	(16 / 16)- 256 Mb	<u>`</u>	5)– 512 Mb		
ութա	250 MHz and lower	(8 / 6)– 256 Mb	(16 / 16)– 256 Mb	(16 / 16)– 256 Mb	(16/16	6)– 512 Mb		
	State Clock Rate (Synchronous, External Clock)	150 MHz 200 MHz						
	Storage	Conventional Timing, Transitional Timing						
Channel to chan	nnel skew	< 1ns						
	Group	1 (CH0~7 & CKI) 2 (CH0~7 & CKI, CH8~15)						
Threshold	Range	$+20V \sim -20V$						
Threshold	Resolution	50mV						
	Accuracy	$\pm 100 \text{mV} + 5\%$ *Vth						
	Non-Destructive			Over +/-42V DC &	AC			
Input Voltage	Operation (Normal/High Division)	$-20V \sim +20V / -10V \sim +10V$						
input voltage	Sensitivity (0.5/0.75/1 Vpp)	100 MHz / 120	MHz / 150 MHz	18	0 MHz / 200 MHz / 22	0 MHz		
	H/W Schmitt (On/Off)	560 mV / 80 mV						
Impedance		1 mΩ /2 pF						
Temperature	Operating / Storage	5°C~45°C (41°F~113°F) / -10°C~65°C (14°F~149°F)						
	Trig-In	TTL 3.3V (Rising / Falling)						
	Trigger pulse approval	> 8 ns						
I/O port	Trig-Out		TTL 3.3V, Pulse Width					
r o Port	Ref. Clock Input		10MHz, Vpp=3.3 to 5V					
	Ref. Clock Output			10MHz, TTL 3.3V	I			
	Connector type		MCX jack / female					
	Resolution		I	500ps				
	Channels	8			16			
	States			16				
	Events			16				
Trigger	Pre / Post			Yes				
	Pass Counter			Yes (0~1048575 tim				
	Digital		Channel, Pattern, S	Single / Multi Level, W	idth, Time-out, Extern	al		
	Analog			Rising / Falling				
	Bus I		T	I2C, SPI, UART				
	Bus II		BiSS-C, CAN2	.0B/CAN FD, DP_Aux	¹ , HID over I2C, I2S,	LIN2.2, USB PD 3.0		



	Bus III			DALI, I3C, LPC, MDIO, Mini/Mic 2, Modbus, PMBus, Profibu			
	Bus IV				eSPI, MII, RGMII, RMII, SVID ³ IO 2.0), Serial Flash (SPI NAND)		
	I			I2C, SPI, UART			
	II		BiSS-C, CAN2	2.0B/CAN FD, DP_Aux ¹ , HID over I2	2C, I2S, LIN2.2, USB PD 3.0		
Protocol Analyzer	Ш			DALI, I3C, LPC, MDIO, Mini/Micro LED, MIPI RFFE, MIPI SF 2, Modbus, PMBus, Profibus, SMBus, SVI2, USB1.1			
	IV			eSPI, I	MII, RGMII, RMII, SVID ³		
	Power Sequence			Input setup .CSV file for Timing	Sequence and H/W Strap check.		
	Measurement			Digital or Analog waveforms			
	Zoom / Report Window			YES			
	Note editor		Edit notes on Waveform Window				
	Quick Bus Decode Setup	YES					
	Trigger / Auxiliary cursors		1/25				
	Data Logger		Saved to Hard Disk Drive				
Software Features	Bus Decode	2.0B/FD, Close Ca HD Audio, HDL0 (CCIR656), JTAC LPT, Math, M-Bu MIPI RFFE, MIPI S S/PDIF, SD 2. SoundWire, SPI, SF	 1-Wire, 3-Wire, 7-Segment, A/D Mux Flash, AccMeter, ADC, APML, AVSBus, BiSS-C, BSD, BT1120, CAN 2.0B/FD, Close Caption, CODEC_SSI, DALI, DMX512, DP_Aux¹, EDID, eMMC 5.1/MMC, eSPI, FlexRay, HD Audio, HDLC, HDQ, HID over I²C, I²C, I²C EEPROM, I²S (PCM, TDM), I3C, IrDA, ITU-R BT.656 (CCIR656), JTAG, JVC IR, LCD1602, LED_Ctrl, LIN 2.2, Line Decoding, Line Encoding, Lissajous, LPC, LPT, Math, M-Bus, MDDI, MDIO, MHL CBUS, Microwire, Mini/Micro LED, MIPI CSI LP, MIPI DSI LP, MIPI RFFE, MIPI SPMI 2.0, Modbus, NEC IR, PECI 3.0, PMBus, Profibus, PS/2, PWM, QEI, QI, RC-5, RC-6 S/PDIF, SD 2.0 (SDIO 2.0), Serial Flash, Serial IRQ, SGPIO, Smart Card, SMBus (SBS, SPD), SMI, SoundWire, SPI, SPI-NAND, SSI, ST7669, SVI2, SVID², SWD, SWIM, SWP, UART, ULPI, UNI/O, USB 1.2 USB PD 3.0, Wiegand, 				
	Line Decoding	Biphase Mark, Diff	ferential-Manchester,	Manchester (Thomas, IEEE802.3), M	liller, Modified Miller, NRZI, …		
	Line Encoding	AMI(Standard, B8Z		Mark, CMI, Differential-Manchester, Manchester (Thomas, IEEE802.4), er, Modified Miller, NRZI, Pseudoternary, …			
Dimension	L x W x H (mm ³)			123 x 76 x 21(mm ³)			
Lead Cable	Data / CLK / NC / GND	8/1/8/23 16/1/0/23					
	Data / CLK / NC / UND			10/1/0/25			
Grippers	Data / CEK / INC / GIND	10		20			

¹Optional DP AUX adapter needed.

² Upon request ONLY by users who have signed CNDA with Intel, SVID decode supported by all MSO models

³Upon request ONLY by users who have signed CNDA with Intel, SVID trigger & PA supported by MSO2216B / B+ ONLY.



Specification Table (International & Microchip)

	International	MSO2008W	MSO2116W	MSO2116B	MSO2216B	MSO2216B+		
	Microchip	MSO2008N	MSO2116N	MSO2116M	MSO2216M	MSO2216M+		
	Power Source			USB bus-power (+5V)			
	Static Power	0.9W						
Power	Consumption		I	0.5 W				
	Max Power	< 3.9W		<	6W			
Interface	Consumption	USB3.0						
	a / Clock / Ground)	8 / 1 / 23			/ 1 / 23			
Total Memory	,	2Gb	40		-	8Gb		
Total Wiemory	Channels	Group I (CH0~7)			CH0~7, CH8~15)	000		
	Sample Rate (Group I or II)	Gloup I (CHO-I)	200MHz / 1	1CH, 100MHz / 2CH, 2				
Analog	Sample Rate (Group I or II)			num value of Group I of				
Input	Bandwidth			40MHz	n n settings			
	ADC Bits			12				
	Timing Analysis (Asynchronous)	Av	ailable channels (Conve		ming) - Memorv per c	hannel		
	2 GHz	(4 / 3)– 512 Mb	(4 / 3)– 1 Gb	(8 / 7)– 512 Mb	e , f	7)– 1 Gb		
	1 GHz	(8 / 6)- 256 Mb	(8 / 6)– 512 Mb	(16 / 14) - 256 Mb	,	4)– 512 Mb		
Digital	500 MHz	(8 / 6)- 256 Mb	(16 / 12)- 256 Mb	(16 / 16)– 256 Mb	`	6)– 512 Mb		
Input	250 MHz and lower	(8 / 6)– 256 Mb	(16 / 16)– 256 Mb	(16 / 16)– 256 Mb	· · · · ·	6)– 512 Mb		
	State Clock Rate (Synchronous, External Clock)	150	MHz	200 MHz				
	Data Storage	Conventional Timing, Transitional Timing						
Channel to cha	annel skew	< 1ns						
	Group	1 (CH0~7 & CKI) 2 (CH0~7 & CKI, CH8~15)						
	Range	$+20V \sim -20V$						
Threshold	Resolution	50mV						
	Accuracy	$\pm 100 \text{mV} + 5\% \text{*Vth}$						
	Non-Destructive	Over +/-42V DC & AC						
Input	Operation (Standard / High Resolution)		10V					
Voltage	Sensitivity (0.5/0.75/1 Vpp)	100 MHz / 120	MHz / 150 MHz	18	0 MHz / 200 MHz / 22	0 MHz		
	H/W Schmitt (On/Off)			560 mV / 80 mV				
Impedance		1 MΩ / 2 pF						
Temperature	Operating / Storage	5°C~45°C (41°F~113°F) / -10°C~65°C (14°F~149°F)						
	Trig-In	TTL 3.3V (Rising / Falling)						
	Trigger pulse approval			> 8 ns				
	Trig-Out			TTL 3.3V, Pulse Width				
I/O port	Ref. Clock Input		10MHz, Vpp=3.3 to 5V					
	Ref. Clock Output		10MHz, TTL 3.3V					
	Connector type		MCX jack / female					
	Resolution		500ps					
	Channels	8		16				
	States			16				
Trigger	Events			16				
	Pre / Post			Yes				
	Pass Count			Yes (0~1048575 times	3)			
	Digital		Channel, Pattern, Si	ngle / Multi Level, Wid	th, Time-out, External			



	Analog			Rising / Falling				
	Bus I			I2C				
	Bus II							
			BiSS-C, DALI, DP_Aux ¹ , HID over I2C, I2S, I3C, LPC					
					_			
	Bus III	-		Mini/Micro LED,	, MIPI RFFE, MIPI SP	MI 2, Modbus, PMBus,		
				Profibus,	, SMBus, SVI2, USB1	.1, USB PD 3.0		
	Bus IV					III, RGMII, RMII, SVID ³ ,		
					SD 2.0 (SDIO 2.0),	Serial Flash (SPI NAND)		
	Ι		1	I2C				
	II		CAN 2.0B/CAN FD, I			5232)		
Protocol Analyzer	III	_			P_Aux ¹ , HID over I2C , PMBus, Profibus, PV	C, I2S, I3C, MDIO, MIPI VM, SMBus, USB1.1,		
					USB PD 3.0			
	IV				eSPI, MII, RO	GMII, RMII, SVID ³		
	Power Sequence	-	Input setup .CSV file for Timing Sequence and H/W Stra					
	Measurement		Digital or Analog waveforms					
	Zoom / Report Window		YES					
	Note editor		Edit notes on Waveform Window					
	Quick Bus Decode Setup		YES					
	Trigger / Auxiliary cursors		1/25					
	Data Logger		Saved to Hard Disk Drive					
Software Features	Bus Decode	2.0B/FD, Close Capi Audio, HDLC, HDQ, JTAG, JVC IR, LCD MDDI, MDIO, MHL 0 Modbus, NEC IR, PEC Flash, Serial IRQ, SG	 1-Wire, 3-Wire, 7-Segment, A/D Mux Flash, AccMeter, ADC, APML, AVSBus, BiSS-C, BSD, BT1120, CAN 2.0B/FD, Close Caption, CODEC_SSI, DALI, DMX512, DP_Aux¹, EDID, eMMC 5.1/MMC, eSPI, FlexRay, HD Audio, HDLC, HDQ, HID over 1²C, 1²C, I²C EEPROM, I²S (PCM, TDM), I3C, IrDA, ITU-R BT.656 (CCIR656), JTAG, JVC IR, LCD1602, LED_Ctrl, LIN 2.2, Line Decoding, Line Encoding, Lissajous, LPC, LPT, Math, M-Bus, MDDI, MDIO, MHL CBUS, Microwire, Mini/Micro LED, MIPI CSI LP, MIPI DSI LP, MIPI RFFE, MIPI SPMI 2.0, Modbus, NEC IR, PECI 3.0, PMBus, Profibus, PS/2, PWM, QEI, QI, RC-5, RC-6, S/PDIF, SD 2.0 (SDIO 2.0), Serial Flash, Serial IRQ, SGPIO, Smart Card, SMBus (SBS, SPD), SMI, SoundWire, SPI, SPI-NAND, SSI, ST7669, SVI2, SVID², SWD, SWIM, SWP, UART, ULPI, UNI/O, USB 1.1, USB PD 3.0, Wiegand, 					
	Line Decoding	Biphase Mark, Dif	ferential-Manchester, M	anchester (Thomas, IE	EE802.3), Miller, Mod	lified Miller, NRZI, …		
	Line Encoding	AMI(Standard, B8Z	AMI(Standard, B8ZS, HDB3), Biphase Mark, CMI, Differential-Manchester, Manchester (Thomas, IEEE802.4), MLT-3, Miller, Modified Miller, NRZI, Pseudoternary, …					
Dimension	L x W x H (mm3)			123 x 76 x 21				
Lead Cable	Data / CLK / NC / GND	8 / 1 / 8 / 23		16 /	1 / 0 / 23			
Grippers		10			20			
Stack Cable	MCX to MCX (30cm)		1			2		

¹Optional DP AUX adapter needed.

² Upon request ONLY by users who have signed CNDA with Intel, SVID decode supported by all MSO models

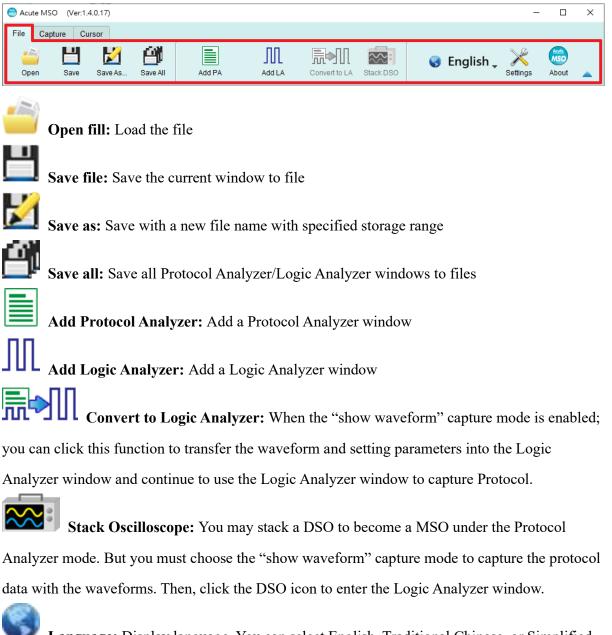
³Upon request ONLY by users who have signed CNDA with Intel, SVID trigger & PA supported by MSO2216B / B+ ONLY.



Chapter 2 Function list and operation

Protocol Analyzer

File



Language: Display language. You can select English, Traditional Chinese, or Simplified

Chinese

System environment settings: Here you can set the working directory, the label height, whether to load the last setting, the waveform display mode and its color



Capture

👼 Acute MSC	D (Ver:1.4.0	0.17)								×
File Capt	ture Curs	or								
Connect	Bus Protocol	Protocol Analyzer	Hide Waveforms-	Run	Search All Field Se	1 / 0 To bottom	Window,	Save to text	Stack DSO	

Protocol Settings



通道 SCK 0 ↓ 2 SDA 1 ↓ 2	
SCK 0 2 SDA 1 2	
SCK 0 2 SDA 1 2	
SDA 1 🗘	
SCK [0]	100 KHz
	5 us 5 us
選項 🔊	
7-bit addressing	
995 ch/h	
1.000V	-
Vcc 5V (Threshold 1.8V)	_
◎ 補設	✓ 確定 × 取消
	選項 4

Style 1 for those protocols with easy setting

- 1. Select the Protocol
- 2. Channel setting
- 3. Waveform Preview: The signal's waveform and frequency are automatically detected.
- 4. Options: 可 You can set the capture and decoding parameters for Protocol
- 5. Threshold: It can be set according to the voltage level of the signal.



Protocol Settin	ngs							×
BiSS CAN DALI eSPI HID_I2C I2C I2S LIN MDIO ModBus PMBus PMBus PMBus PMBus PWM SMBus SPI UART USB_PD USB1.1	取様率 2 通道 3 CS# SCK I/O 0 I/O 1 I/O 2 I/O 3 Alert# Reset#	500MHz 4 5 0 1 2 3 6 7		Trigger on 4 Format Length error OPCode error Response error Status error Status error CRC error CRC error eSPI Packet 初始設定 //O Mode Alert Mode 6 時序設定 5 tSHSL 自動根據訊號速度調 tCLQV 1	Single Mode From I/O[1] 50 ns.	•		
			斑 /cc 5V (Thres	hold 1.8V)	T			
	◎預設						確定	★ 取消

Style 2 for those protocols needs more setting

- 1. Select the Protocol
- 2. Set the Sample Rate
- 3. Channel setting
- 4. Trigger on
- 5. Options: You can set the capture and decoding parameters for Protocol.
- 6. Threshold: It can be set according to the voltage level of the signal.



Operating mode and memory setting

There are three modes for operating mode and memory setting (

■ 工作模式及記憶體設定		? ×
工作模式 ● 協定分析儀模式 1	■ 重複次數 ● 重複次數 ● ① 表示無限) ● ① 表示無限)	
	■ PC RAM 用量限制	
○ 資料收集儀模式	可用記憶體量	2045 MB
	 資料行數 ○ 至多 50,000,000 ○ 至多 10,000 ● 自定義 1000000 	
○ 資料監控儀模式	■ 裝置記憶體用量限制	
	◎預設	✔ 確定 🗙 取消

Mode 1 Protocol Analyzer

Functional description

Captured data will be sent back to the PC for real time display. You can immediately see the protocol data right away.

Rule:

- 1. Data can be seen immediately.
- 2. If the amount of captured data is not big, you do not have to set the amount of memory.

Notice for use:

As data will be captured and displayed at the same time the performance requirement for the USB and the computer will be higher. If the computer cannot handle the data in time, the device may automatically stop due to full memory.

If software is in operation during the capture period the computer will respond more slowly.



• Rules for repetitive times and automatic stop

Repetitive Times

- If it is not enabled, the device will be stop ped after the stop condition matched.
- If it is enabled, the device will be stop ped after the stop condition matched, then save the captured data and repeat the captures again, according to the number of captures that has been set.
- If the number of captures is set at 0, the device will capture data repetitively. Three **Stop Conditions** to stop the device automatically are provided as follows:
- Maximum PC RAM Limit

Stop the capture when the stored data size matched the size of allocated PC RAM, this limitation will avoid excessive use of the PC RAM, which may resulting in insufficient memory and unstable performance of the operating system.

• Number of Data Lines

Stop the capture when the stored data line number matched the setup data line number, you can select this function if you need only sufficiently number of data lines without capturing data for a long time. This function is set to OFF by default.

Maximum Device Memory Limit

Stop the capture when the device memory is filled to the set condition.



■ 工作模式及記憶體設定		?	{	×
工作模式				
○ 協定分析儀模式				
	 2			
● 資料收集儀模式 ①				
○ 資料監控儀模式				
DAIA	◎預設	❤ 確定	×ŧ	艾消

Mode 2 Protocol Logger

Functional description:

Data will be sent back to the PC for saving without being processed and displayed. Only after the user presses to stop the operation will data begin to be processed and displayed.

Rule:

- 1. As long as the hard disk is big enough to respond quickly enough, it can save a great amount of data.
- 2. Logger file (.LOG) can be opened for Analyzer later, no need to analyze them right after their capture

Notice for use:

1. Performance requirements for the USB and the computer (hard disk) are high.

2. Due to the large amount of logger data, the requirements for the hard disk space and the time for follow up Analyzer will be very great.

• Run data process after capture stopped

Check this option to process the data after Logger capture stopped, or the software



will only save the logger data without analyzing process.

✓ Run data process after capture stopped

You can reload the .LOG file from Load file to reanalyze the data.

MSO files (*.MSW | *LOG) \sim

Whether you check the results immediately or load them into the file, the file name will be converted from LOG to BFW.



■ 工作模式及記憶體設定	?	×
工作模式	2	
 協定分析儀模式 DATA 	↓ 装置記憶體用量限制	
 資料收集儀模式 DATA 	 > 持續損取直到按下停止鍵 ● 持續等候直到觸發發生 > 觸發點位置 < 50% 	
DAIA	◎ 預設 🔷 確定 🕽	່≭取消

Mode 3 Protocol Monitor

Functional description

Data will be kept in the device and overwrote the old data without returning to the PC, the capture can be stopped by user manually or by trigger condition matched, then the device will fill the device memory until memory full and return to PC for display.

Rule:

- 1. During the capture period, data are not returned to the PC, reducing the performance requirements on the USB and the computer.
- 2. The total amount of data is the total amount of device memory.
- 3. Trigger conditions can be set and monitored for a long time Device memory will be filled only when the amount of data matches the trigger conditions.

Notice for use:

1. If the trigger is not set or you have set the trigger but want to retrieve the data before the memory is full, you must manually press "Stop" to send data back to the computer.



• Work options

• Maximum Device memory limit

If the checkbox is unchecked, the max memory of the device is used.

If the checkbox is checked, the usage ratio of the device memory can be adjusted; less memory can shorten the subsequent processing time.

- Data capture will continue until "Stop" is pressed (Wait for stop) Data capture will continue. If memory is full the new data will be still captured to replace the old data, until "Stop" is pressed Then the newest data will be sent back to the computer.
- Data capture will continue until the trigger condition is met (Wait for Trigger) If the trigger condition is not set, there will be no Pre/Post Trigger relationship and only the Capturing will be shown until the device memory is full. If the trigger condition is set, data will be filled according to the set Trigger Position. Data capture will continue until the trigger condition is met or "Stop" is pressed Then, data capture will stop and the set memory will be filled.



Show Waveforms



If "Show Waveforms" is selected, the device will capture the waveform data, but show the waveforms only after the capture stops Selection of Show Waveforms will take up more device memory.

When "Show Waveforms" is enabled, the waveform area will provide the following functions:

1. Bus Decode 🌀

Press this button to refresh the bus decode.

2. Stop the bus decode $\overleftarrow{}$

This button can stop the bus decode right away.

- 3. Add User Notes
- 4. Waveform zoom in/out *P*



This button can scale up or down the waveforms, but it is recommended to use the mouse cursor to zoom the waveforms in or out for your convenience.

Search



Search function can search data in the report window.

1. Enter the search text

A mark will appear in front of ther data meeting the search criteria.

- 2. Search the previous piece / the next piece of data.
- 3. Specify all fields or target fields for search.

Specifiy fields for search can reduce the search range, thus speeding up the search.



If no data is found, the search result

In actual search, the searched data will be shown in green background color togther with the

total number of packets found.

'CMD' 5556 Packets found

will be shown in orange background color.

Search text 'CMD99' not found!

To the end



When viewing data, you press this button to move directly to the last end of data If you press this button while the device is capturing data, the most up to date data will be displayed.

Window



Select to enable/disable multiple display lists, such as: Search List, Statistic List ... etc.

Searce	h List					
Trigge	er List					
💾 Statis	tic List					
🔛 Booki	mark List					
Search List	Trigger List Statistic	es List Bookmark List	0			
Statistics List	0	ß				Ø×
₩ ⊼ ∧						
Line No.	Timestamp	Statu	s Address	RW	Data	
2	0.000.155.560 0	Start	12*	Wr 10;	* 20* 30*	
5	0.001.017.660 287.	08us Start	12*	Wr 10;	* 20* 30*	
8	0.001.879.760 287.	08us Start	12*	Wr 10;	* 20* 30*	
11	0.002.741.860 287.		12*		* 20* 30*	
14	0.003.603.980 287.	10us Start	12*	Wr 10;	* 20* 30*	-

- 1. Select to display different display list.
- 2. Use the control buttons to move the current position, or input row number to jump to specified row.
- 3. Use the control buttons to add /remove selected row to Bookmark List.



Saved as text file



Contents of the report may be saved as .TXT or .CSV.

al number of lines: 225	
Save all in one file	U
O Save each file within 3	2000 lines
 Save selected range 	
Select Row Number	
従	1
到	225
Select Column Numt	ber
従	1
쥘]	10
Advance report 2	
ve as	
C:\eSPI PA.TXT	

Save options:

- 1. You can select to save the data as a file or according to the number of rows.
- 2. Advanced reports

If detailed data should be saved in the protocol Analyzer, you should tick this option.

Detail window

Many Protocols are equipped with a large number of numerical data, which cannot be appropriately displayed all together in the report window. Therefore, you can use the mouse to click the Data field on the report window to display the data in the detail window.



Detail	_
CS: 00 (Single I/O)	
OP Code: SET CONFIGURATION(22)	
Address: 0008	
Data: OF 00 40 88	
Response: ACCEPT(08)	
Status: 0107	
(Bit 8) FLASH_C_FREE	
(Bit 2) VWIRE_FREE	
(Bit 1) NP_FREE	
(Bit 0) PC_FREE	
General Capabilities and Configurations	
CRC Checking Enable 0	
Response Modifier Enable 0	
Alert Mode 0	

Statistics window

Data statistics are made a ccording to the different characteristics of Protocols, so as to facilitate the understanding of the entire transmission situation, you may also click on the



statistic trace to summarize all records of the selected trace into the statistic list window.

Vavigator				X
Discription		Txns	Bytes	-
	ponse CRC Error t Count Error	0		
Trigger		0		_
Reset (0		
	eral Channel Channel	0		
	Channel lessage Channel	0		
	ccess Channel	0		
Channe	el Independent	11		
Respor		11		<u> </u>
Statistics	Txns	Bytes		
PUT_VWI. GET_VWI.				

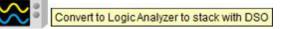
Hide Data window

In this screen, you can select to hide the data items. Software is used in this function to hide data and to restore the data as long as you click the "Clear" button.



Save to text	~		
	Stack DSO		
Hide Items			0
7-bit Address	s (Hex):		
□ Not (
10-bit Addres	ss (Hex):		
□ Not 〔			
	irst at most 8 byte j., 1A 2B 3C):	s after the	
□ Not			
Address / Address / Read Write			
	Clear		Apply
Detail Navi	igator Hide Items		

Stack Oscilloscope



The stack oscilloscope can only be enabled in the Logic Analyzer mode. If you want to enable the stack oscilloscope in the protocol Analyzer mode, you must first press the "Convert to Logic Analyzer and Stack Oscilloscope" button to switch to the Logic Analyzer mode to enable this function. It should be noted that you must open Show Waveforms in the Protocol Analyzer mode and capture the data/waveform to switch.



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Cursor

Carl Acute MSO (Ver:1.4.0.17)	-	×
File Capture Cursor		
4 4 >		
Add Cursor Delete Cursor Move To		

This function includes the cursor setting and the waveform search function matching the cursor.

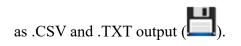


Logic Analyzer

Window

File Capture Adv. Capture Cursor													
File Capture Adv. Capture Cursor	IZ 900mV		Nun Rep	-				Toom	Stack D	Phase Dal	ay •		
Time/Div = 200 ns	7.5ms	→ p J											
cquired: 11:40:41. 53 -707	78ns 353.9ns	Ops	353.9 ns	71	17.8 ns		1.06 us	1.42	IS	1.77 us	2.12 us	2.4	48 us
BUS_eSPI I/0 0-1 I/0 2-3 I/0 3-4 BUS_eSPI DUS_ESPI DUS ESPI DU		nnnn			300 ns		200 ns 11		SP (08)	Data (0F)		nata (00)	Data (08)
espi Reset#-6 L 5	,www		MMA	NN	WM		6 WW	AMA		NANA	MM	ww	500 mV/00 Offset -2 Scale
SO CH0 2 ↓	,		www	M	WM			AAAA	NNN	MMM	MM	WW	Offset -2 Scale
SO CH0 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	• • • • • • • • • • • • • • • • • • •			AW	WW				(Search All	Fields Te	xt includes (WW	Offset -2 Scale
SO CHO Channel Value Channel Value Channel Value Channel Value Channel Value		Tag LEN					WW			Fields Ter Status	xt includes (WWW	Offset -2 Scale
SO CHO 20 Bibel Channel Value Here Description States OpCode/Response 11:40:41.256. BESSEN	Ø		Address				WW	C	Search All			RESET	Offset -2 Scale
COLO 2727 Bog Job DS0 CEO 2727 bel Channel Value too Channel Value too Channel Value too Channel Value too Channel Value too Channel Value	Ø			D0	D1 D2	D3	WW	C	Search All ASCII	Status	CRC	WWW	Offset -2 Scale
SO CH0 DS0 CH0 27±V Bebel Channel Value H:00 DS0_EDS_eSPi(eSP) Image [hh:nm:ss:m] Image [hh:nm:ss:m] DpCode/Response 11:40:41.296 ¹⁷ RESET 11:40:42.296 ¹⁷ rist 11:40:42.296 ¹⁷ rist Coder Gours Transition (21)	Ø		Address 0008		D1 D2		WW	C	Search All			WWW	Offset -2 Scale
SO CHO SO CHO SO CHO Channel Value Channel Value Channel Value isome (hh.mm.ss.ms Intervention (2.1) So CHO So CHO S	Ø		Address	D0	D1 D2	D3	WW	C	Search All ASCII	Status	CRC 10 24	WWW	Offset -2 Scale
COCH0 DS0 GE0 27±V DS0 GE0 Channel Value H00 Stars BUS_eSP(eSP) Iamp (hhtmmss.ms OpCode/Response 11:400:41.296. SET CONFIGURATION (21) 11:400:41.296. SET_CONFIGURATION (21) 11:400:41.296. SET_CONFIGURATION (22) 11:400:41.296. SET_CONFIGURATION (22)	Ø		Address 0008	D0 I	D1 D2 0 08 7 00	D3	WW	C	Search All ASCII	Status 0104 0104	CRC 10 24 C8	WWW	Offset -2 Scale
SO CH0 25.0 CH0 27.0 Lbsl Channel Value Value Lbsl Channel Value Value Ltdo: 1.26.0 BUS_eSP(eSP) Image P Ltdo: 1.26.0 BUS_eSP(eSP) Image P Ltdo: 1.1400-14.296 ACCEPT (08) Image P Ltdo: 1.298 ACCEPT (08) Image P Ltdo: 1.298 ACCEPT (08) Image P Ltdo: 1.298 ACCEPT (08) Image P Ltdo: 2.298 ACCEPT (08) Image P	Ø		Address 0008 0020 0020	D0 1 0F 0 00 0	D1 D2 0 08 7 00	D3 03	WW	C	Search All ASCII	Status 0104	CRC 10 24 C8 90	WWW	Offset -2 Scale
BOCHB DS0_EHD 27.17 abel Channel Value HOO DS0_EHD 27.17 abel Channel Value HOO DS0_EDS BUS_eSPI(eSP) Iamp (hhmmss.mt OpCode/Response 11:40:41.256. "RESET 11:40:41.258. ACCEPT (08) 11:40:41.258. SET_CONFIGURATION (21) 11:40:41.258. SET_CONFIGURATION (22) 11:40:41.258. SET_CONFIGURATION (21) 11:40:41.258. ACCEPT (08) 11:40:42.258. RCEPT (08) 11:40:42.258. RCEPT (08) 11:40:42.258. RCEPT (08) 11:40:42.258. RCEPT (08)	Ø		Address 0008 0020	D0 1 0F 0 00 0 01 0	D1 D2 0 08 7 00 0 07	D3 03 00	WW	C	ASCII	Status 0104 0104 0104	CRC 10 24 C8 90	WWW	Offset -2 Scale
SO CHO DSO CHO 27.77 Abel Channel Value International Control Contr	Ø		Address 0008 0020 0020 0020	D0 1 0F 0 00 0	D1 D2 0 08 7 00 0 07	D3 03	WW	C	Search All ASCII	Status 0104 0104	CRC 10 24 C8 90	WWW	Offset -2 Scale
BOCHB DS0_EHD 27.17 abel Channel Value HOO DS0_EHD 27.17 abel Channel Value HOO DS0_EDS BUS_eSPI(eSP) Iamp (hhmmss.mt OpCode/Response 11:40:41.256. "RESET 11:40:41.258. ACCEPT (08) 11:40:41.258. SET_CONFIGURATION (21) 11:40:41.258. SET_CONFIGURATION (22) 11:40:41.258. SET_CONFIGURATION (21) 11:40:41.258. ACCEPT (08) 11:40:42.258. RCEPT (08) 11:40:42.258. RCEPT (08) 11:40:42.258. RCEPT (08) 11:40:42.258. RCEPT (08)	Ø		Address 0008 0020 0020	D0 0 0F 0 00 0 01 0	D1 D2 0 08 7 00 0 07	D3 03 00 00	WW	C	ASCII	Status 0104 0104 0104	CRC 10 24 C8 90	WWW	Offset -2 Scale

- 1. Toolbar: Including trigger, sampling rate, threshold and other capture parameters.
- 2. Channel Label: You can use the icon (I V V) below to add and delete the channel. Pressing mouse left button on the channel label to change the channel parameter settings; Click the gear button on the top right corner of the Bus channel to change the advanced parameter settings; Select and drag a channel label to another channel label to combine two or more channel labels.
- 3. Report Window Toolbar: In the report window, you can choose to display the channel data (CH-00 data (CH-01)) or decode result (New C), waveform statistics (I), and report the result



- 4. Status Bar: Connection status of the device is displayed.
- Info: Display channel, Value and Trigger information, can be selected to Show/Hide in Environment settings.
- 6. Waveform Area: Mouse wheel can be used to zoom in/out the waveform scale; press



Shift + Key to place cursors to calculate the time interval or frequency. Please refer to the cursor section below for the cursor usage.

File

😔 Acute MSO (Ver	1.4.0.17)				- 0	×
File Capture	Adv. Capture Cursor					
Open Save	Save As Save All	Bave Report Save DG File	Add PA	Add LA	😵 English 🖕 🎇 📾	
🧉 ор	en file: Loa	nd the file				
L Sav	ve file: Save	e the current f	le			
Sav	ve as: Save	with a new fil	e name ar	nd may	set the storage range	
Sav	ve all: Save	all files at one	ce			
	ve report: S	ave the bus de	code repo	ort		
толл	ved as a DO	file:				
C	onvert capt	tured waveform	n to DGV	V forma	t for the Acute Digital Data	
C	enerator(P	KPG、PG200	0、DG3(00 • TI	D3000), which can be used to resend	the
d	igital signa	ls.				
M PGV Export S			? X		Export Setting Wizard	

Idle Convert Method O None O Convert to LOOP when idle time >= 10 ‡ us	Select PG Model PKPG2116+ Max. Operating Clock: 200MHz Memory Depth: 512k
PG Working Frequency Current Sampling Rate 200MHz Operating Clock 100MHz	Enter a file name or browse D:/PGV_Export/PGV_Export.pgv
Waveform Convert Method Real time sampling by Working Frequency Convert waveform to slower speed Signals smaller than 10ns might be lost during the convertion! 	Save range From Buffer Start ♥ To PG Limitation ♥ ✔ Repeat output
< Previous Finish × Cancel	< Previous Next > X Cancel

- 1. Select DG/PG Model: The software will check the maximum working frequency and memory depth according to the selected DG/PG model.
- 2. Enter a file name or browse



Enter a file name and directory to save the converted DGW/PGV file.

3. Save range:

Select the waveform range to convert to DGW/PGV file, you may select either waveform within cursor range, or select maximum available range according to DG/PG's maximum memory. (Exported file size larger than DG/PG's maximum memory may not be opened by the DG/PG's software.)

4. Repeat output:

Check to add "Jump to start" command at the end of DGW/PGV file.

5. Idle Convert Method

Select to replace signal pulse width greater than specified time to a short block of waveform with Loop instructions to save the DG/PG's memory. (The waveform will become more complicated and not easy to read/edit after enable this option)

6. DG/PG Working Frequency:

Specify the DG/PG working frequency.

7. Waveform Convert Method

When the LA's sampling frequency is faster than the DG/PG's working frequency, the software provides two different ways to convert the DGW/PGV wave form, one is the real time sampling mode with DG/PG's maximum working frequency (Small signal might be lost during the conversion), the other is convert the original high speed waveform to slower DGW/PGV waveform (Slower signal speed might introduce some signal timing issue since the setup/hold time will also be changed)



Add Protocol Analyzer: Add a protocol Analyzer window



Add Logic Analyzer: Add a logic Analyzer window

Language: Display language. You can select English, Traditional Chinese, or Simplified Chinese



Nystem environment settings: Here you can set the working directory, the label height,

whether to load the last setting, the waveform display mode and its color.

Property	Value	
Default Label Height	45	
Working Directory	C:/Users/User/Documents/Acute/MSO/	
Waveform Display Type	Timing Value	
Expanded Waveform Color	Change by channel	
Load Last Environment on Software Start		
Save Waveform After Each Acquisition		
Repeat Acquisition Behavior	No Decode and Waveform Display	
Display Row Number in LA Decode Report	V	
Trigger Out Pulse Width (us)	Default	
Show Waveform Value Tooltip on Cursor Position	v	
Auto-reconnect device	v	
Show Channel Information In Waveform Display	v	
Show Value Information In Waveform Display		
Show Trigger Information In Waveform Display		
Show Channel Activity In Waveform Display		
Use Multicore Processing	v	
Display Report Timestamp Information	Show Timing With Date Time Info.	
Show Cursor Position In Decode/Transition Report	t 🖌	
Show Cursor Separate Time on Cursor bar	v	
Cursor Font Size in Report Area	6	
Report Data Display Byte Number	8	
Display Waveform Time Scale Dash Line	v	

- 1. Default Label Height: The channel height of the waveform area can be modified.
- 2. Working Directory: Where the staging content/repeatedly fetched waveforms are stored when the software is in operation.
- 3. Waveform Display Type: What is displayed between waveform edge changes, optional time between grid/logical values/not displayed.
- 4. Expanded waveform color: You can choose whether the colors are different between converged channels.
- Load Last Environment on Software Start: When the software starts, it will automatically load the setting values that were previously closed, and the archive waveforms will not load.
- 6. Save Waveform After Each Acquisition: this archive is stored in the working directory.
- 7. Repeat Acquisition Behavior: Whether to display waveform decoding, to display,



optional must show seconds (1/2/5, unit: s).

- 8. Display Row Number in LA Decode Report: The number of rows will be added to the left of the reporting area timeline.
- 9. Trigger Out Pulse Width (us): The default length is triggered until the end of fetching. The following 2 items will be controlled by the cursor, which will display the contents of the "Select Cursor", which can be set in the waveform area shift and A-Z, and moved to the cursor position by pressing A-Z (T is the trigger point mark, not available).
- 10. Show Channel Information In Waveform Display: Show using channel numbers, and flow row analysis will display additional names.
- 11. Show Value Information In Waveform Display: the digital channel displays 0/1, and the analog channel displays the voltage value.
- 12. Show Trigger Information In Waveform Display: Set trigger point value.
- 13. Show Channel Activity In Waveform Display: Count the kinds of changes that the channel takes in this time.
- 14. Use Multicore Processing: Use multi-core to speed up data processing.
- 15. Display Report Timestamp Information: Includes the time format of the date / general time format (trigger point is 0 seconds) / number of sampling points.
- 16. Show Cursor Position In Decode/Transition Report: Show cursor position in the report area time field.
- 17. Show Cursor Separate Time on Cursor bar: Add additional time between cursors on the horizontal timeline of the waveform area.
- 18. Cursor Font Size in Report Area: Cursor font size for item 13.
- 19. Report Data Display Byte Number: This is an item set for protocol analyzer mode, and you can modify the report field to show the number of Bytes.
- 20. Display Waveform Time Scale Dash Line: Add dashed lines to the waveforms in the reporting area for easy comparation with the timeline.



Capture

🗟 Acute N	MSO (Ver:1.4.0.17)						-	×
File C						Demo		
Connect	Bus Quick Setting Free Run	1.6V 1.6V 2000 Mb	Run	Repeat	Zoom 🗸	Stack DSO Phase Delay 0 ps -		

Quick Settings



Required channels and related settings can be established quickly. If you specify to establish the bus decodes, the sampling rate and threshold will be set according to the default conditions.

Trigger Parameter Setting

• Manual Trigger

After setting up, Click "Stop" button for positioning trigger point

• Single Level Trigger

∭ Single Lev	el Trigger S	ettings						×
Channel	Label							
7 X	6 X ,	5 X ,	4 X,	3	x 2 x	1	X,	0 X
15 🗙	14 X	13 X	12 X	11	K _ 10 X _	9	x	8 X
					Pass Cou	nt	0	•
					1 435 000	in		•
Default	:				🗸 ОК		×c	ancel

1. **Channel/Label:** You can select Don't care(X) $\operatorname{Rising} \operatorname{Edge}(\uparrow) \operatorname{Falling} \operatorname{Edge}(\downarrow)$



Low(0) \cdot High(1) \cdot Either(\updownarrow) or specified Value as trigger conditions.

2. **Pass Count:** The number of triggering signals that match the trigger parameters is ignored. It is preset as 0 by default to indicate that it is not ignored.

• Multi Level Trigger

Multi Level triggering is composed of multiple single-stage trigger conditions. This function can have up to 16 states, each of which must be set separately and set in the same way as the single level trigger. When adding a new state, you can press the button on the top to select the relationship between each state. The relationship between each state can be a continuous trigger (Next IF) or a non-continuous trigger (Then IF).



1. Schematic diagram of the current set of trigger conditions

2. Trigger conditions setting

As shown in the following diagram, the first and the second classes are continuous trigger, the relationship between the second and third classes are non-continuous trigger, and the third, fourth, fifth and sixth classes are continuous trigger.

Multi-Level Trigge	r Settings			
IF Pattern (P Sample Clock Trigger	1)(P2)(P3)(P	4)(P5)(P6))	
IF P1	• *	0		P5 Channel Label 3
Next IF	P2	×		
Then IF	P3	×		POD A 7 X 6 X 5 X 4 X 3 X 2 X 1 X 0 X
Next IF	P4	×		15 X, 14 X, 13 X, 12 X, 11 X, 10 X, 9 X, 8 X,
Next IF	P5	×		
Next IF	P6	*		
 ④ ◆ OR IF Sequence by ⑤ 				
Sample Clock	-	on	AO	
Default				Pass Count 0 🗘 🗸 Car



Difference between the continuous trigger and the non-continuous trigger lies in: Continuous trigger: The signal captured by two adjacent sample clocks must meet the conditions to trigger.

Non-continuous trigger: It is triggered only when both the first condition and the second condition is met, no matter how many signals appear in between the first condition and the second condition. Therefore, such a trigger condition is not continuous at all.

A continuous trigger mode is usually set when Synchronous or State is used for measurement, because the use of synchronous clock is usually in a measurement state, and the signal is in a continuous state. Under the Asynchronous or Timing situation, it is common for the signal at the changing edge to meet the continuous triggering condition, while it is difficult for most of the signals to meet the conditions of continuous triggering, and therefore it is suitable to set non-continuous trigger as a condition for them.

3. The area to set the trigger condition for each class.

4. OR IF is the condition for e stablishing a parallel trigger. At this point, each set of trigger conditions are judging the conditions at the same time It is triggered when any set of conditions is met.

5. Sequence by

The user can also set incidental conditions for triggering. In general, the data taken at the sampling point are used for trigger settings. If you want the specified channel at the changing edge to be triggered only, you should use the "Sequence by" setting. With such a function, the user does not have to set trigger conditions for each change at the edge, but just focus on the data to be set. For example, the signal data to be measured is valid only when the clock is at the rising edge. There are four data lines. In this case, you can set the Sequence by as Custom Rising, and then select the Clock pin as the valid condition for the data. Then, you can set the conditions for other data lines in accordance with Multi Level triggering conditions.

This function is not supported when the sampling frequency is above 2 GHz (inclusive).



• Width Trigger

The width trigger can set the trigger signal when the channel meets the trigger conditions and the length of the full pulse width.

Channel Label	CH-00	-
Match	0	-
Match Time	Time =	-
	10.000	us
	0	
k	— Time = 10us —	\rightarrow
	Pass Count	0



• Timeout Trigger

Timeout trigger can set the time width for trigger conditions When the signal duration

exceeds the set value, it will produce a trigger signal without waiting until a complete pulse is

formed.

∭ Timeout Trigge	r Settings			×
Channel Label	CH-00		-	
✓ Match	0		-	
Match Time >	10.000			us
		0		
<u>k</u>		Time > 10us		→į
			Range	1us to 10s
			Pass Count 0	-
Default			✓ OK	🗙 Cancel

• External Trigger

The Trigger In input pulse signal of the device is taken as the trigger condition

• Analog Trigger

Use the Rise/Fall of MSO's built-in oscilloscope for trigger event.

∭ Anal	logTrigger Settings	×
Chann	nel	
	DSO CH0	-
Trigger	r on	
	Rising Edge	
	Falling Edge	
Value		
	1.60 V	
	✓ ОК 🗙 С	Deneal
	VK XC	Jancel



- 19 P		
∭ Capture Parameter Settings		×
Digital Channel Quick Setup	Uperating Mode	
CH-00 CH-01 CH-02 CH-03 CH-04 CH-05 CH-06 CH-07 CH-08 CH-09 CH-10 CH-11 CH-12 CH-13 CH-14 CH-15		. Mode (Default)
🕂 👽 Threshold 🔸 🗲 Auto 🔹 Quick Setup 💌	III Sample Rate	
CH 00 - 07	Digital Analog	50MHz
CH 08 - 15 1.60 V	, and og	
Enable Extra Hysteresis		
CH 08 - 15		
	•	
	Memory 5	
	Store to Device RAM	
	O RAM Stream to PC RAM	
Analog Channel 2 Quick Setup	O Stream to PC HDD	
CH-00 CH-01 CH-02 CH-03 CH-04 CH-05 CH-06 CH-07	Enable Transitional Storage (L	ong Time Recording)
CH-08 CH-09 CH-10 CH-11 CH-12 CH-13 CH-14 CH-15		Mb (24%)
Input Sensitivity		
CH 00 - 07	Recordable Time	1.498s
CH 08 - 15	Trigger Position	50%
✓ Automatic Update Channel Labels in Waveform Area		V OK X Cancel

Channels, Threshold, Sample Rate, Device Memory Usage

Chapter 1 Digital Channel Settings:

100

- a. You can customize the channel you want to measure, and provide automatic threshold setting, or manual adjustment. 8 channels are a set of adjustable units, and there are two sets of thresholds that can be adjusted.
- b. Provide Extra Hysteresis function, turn on to reduce noise, turn off to increase sensitivity, replacing the past Schmitt function.
- c. The number of usable channels will vary depending on the trigger function setting or sampling rate.

Chapter 2 Analog Channel Settings:

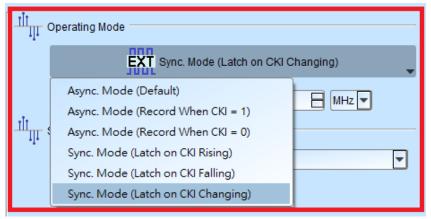
- a. You can customize the channel you want to measure.
- b. Input Sensitivity provides two different revolutions
 - (1). Voltage Range: +-10V, Minimum Scale: 5mV/Div.



(2). Voltage Range: +-20V, Minimum Scale: 10mV/Div.



Chapter 3 Operating Mode Settings:



Asynchronous Mode:

Asynchronous mode, also known as timing analyzer, is based on the internal clock as a sampling frequency. It is recommended that the sampling frequency be set at about 10 times the signal to be measured, with the minimum not less than 5 times Any rates lower than 5 times will cause distortion. Asynchronous sampling will cause sampling error from the actual capture to the signal, with the error time being the reciprocal of the sampling frequency.

The default mode is to capture the signal at the sampling frequency. If you want to increase the signal capture frequency, you can add a qualifier by selecting CK0 and setting a channel to be 0 or 1 For example, when Chip Select is 0 to allow to capture the signal, you can select the asynchronous mode (recorded when CK0 = 0) to add the qualifier. After the qualifier condition is selected, the device will automatically turn on the transpose mode to capture the signal

Synchronous Mode:

Synchronous mode, also known as the state Analyzer, uses the external input clock as the sampling frequency. The channel marked with CK0 on the signal line is the external clock input channel. When the external clock stops, the signal capture will also stop, forming a synchronous operation between the two.

Chapter 4 Sample Rate:



MSO 2000series

Digital Available Channel						
Sample Rate	(Conventional/Transitional)					
2 GHz (Max)	8 / 7					
1 GHz	16 / 14					
500 MHz	16 / 16					
250 MHz	16 / 16					
200 MHz below	16 / 16					

Analog Available Channel						
Sample Rate						
200 MHz (Max)	2 (Ch0, Ch8)					
100 MHz	4 (Ch0-1, Ch8-9)					
50 MHz	8 (Ch0-3, Ch8-11)					
25 MHz below	16					

MSO 1000 series

Digital Available Channel								
	(Conventional/Transitional)							
Sample Rate	1008E	1116E						
2 GHz (Max)	4 / 3	4 / 3						
1 GHz	8 / 6	8 / 6						
500 MHz	8 / 6	16 / 12						
250 MHz	8 / 6	16 / 16						
200 MHz below	8 / 6	16 / 16						

Analog Available Channel						
Sample Rate						
200 MHz (Max)	2 (Ch0, Ch8)					
100 MHz	4 (Ch0-1, Ch8-9)					
50 MHz	8 (Ch0-3, Ch8-11)					
25 MHz below	16					

Chapter 5 Memory Settings:

Memory	
Store to De	evice RAM
🔿 具 Stream to I	PC RAM
🔿 💽 Stream to I	PC HDD
Enable Transiti	onal Storage (Long Time Recording)
	2000 Mb (24%)
Recordable Time	1.498s
Trigger Position	50%

a. Storage Mode: Store to Device RAM, Stream to PC RAM, Stream to PC HDD



LA Storage mode Conventional Storage		Rate 200MHz	Conven	
Transitional Storage		Signal Rate 200MHz	Transit	LA Device RAM
Streaming to PC RAM			I Rate 200MHz ds on PC's performance)	PC RAM
Streaming to PC HDD	Short time — — —			I Rate 200MHz ds on PC's performance) PC HDD

- **b.** Transition Storage: Record the time intervals between edges. If the signal does not change frequently, the recording time can be greatly increased. When MSO analog channels are enabled, it doesn't support transition storage mode.
- **c.** Record time: According to the current settings, the actual acquisition waveform time length is estimated, but when the transition storage is enabled, this function will be disabled without estimation.
- d. Trigger Position : Set the position of the trigger point in the used memory in percentage. For example, set to 50%. Means that the device memory will retain up to 50% to store pre-trigger data.

Stack DSO(Oscilloscope)



Using MSO and the Oscilloscope Stack functions, you need to install the special software

provided by each oscilloscope brand. The software names are shown in the following table:

DSO brand	Software
Acute	Acute DSO software
Tektronix	Please download the TEKVISA CONNECTIVITY SOFTWARE from the Tektronix website.
Agilent Keysight	Please download the KEYSIGHT IO LIBRARIES SUITE from the Keysight website.
LeCroy	Please download the NI VISA and Drivers from the NI website.
HAMEG	Please download the NI VISA and Drivers from the NI website.
Rohde & Schwarz	Please download the NI VISA and Drivers from the NI website.



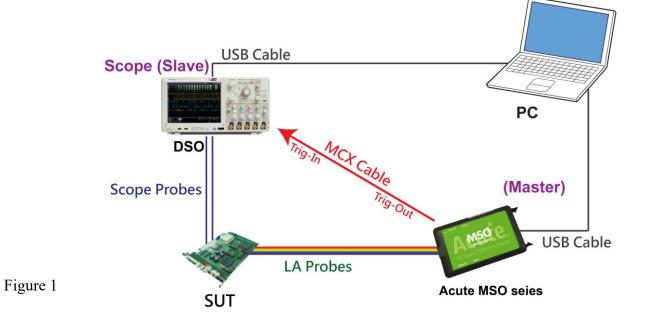
Oscilloscope supportive models:

DSO brand	Model	USB	TCP/IP
Acute	DS-1000 TravelScope	v	
Tektronix	TDS1000B/1000C/2000B/3000/3000B/ 3000C/5000B/7000 DPO2000/3000/4000/4000B/5000/7000 7000C/70000/70000B DSA70000/70000B MSO2000/3000/4000/4000B/5000 MDO3000/4000 TPS2000/2000B	v	V
Agilent	DSO1000A/5000A/DSO6000A/6000L 7000A/7000B/9000A MSO6000A/7000A/7000B/9000A DSO-X 4000A /MSO-X 4000A DSO-X 3000A /MSO-X 3000A DSO-X 2000A/MSO-X 2000A	v	V
Keysight	DSO-X 3000T MSO-X 3000T	v	v
LeCroy	WaveRunner / WaveSurfer / HDO4000 / HDO6000 / SDA 8 Zi-A / DDA 8 Zi-A		V
HAMEG	HMO3000/2000/1000	v	v
R & S	RTO1000/RTE1000		v

There are two methods for hardware wiring:

MSO is the Master, while the oscilloscope is the Slave.

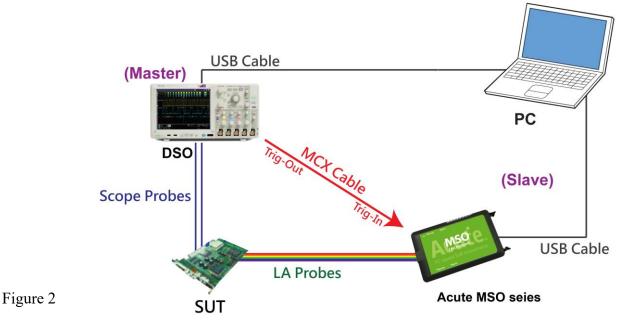
Wiring direction is from MSO's Trig-Out the oscilloscope's Trig-In (see Figure 1)





In Figure 1, the USB or Ethernet (TCP / IP) interface is connected to the computer, and then connect the BNC MCX cable to the MSO Trig Out and the trigger input interface (Ext Trig, Aux In or Trig In) of the oscilloscope. MDO4000 series is fixed in the analog channel CH4. **The oscilloscope is the Master, while the MSO is the Slave.**

Wiring direction is from the oscilloscope's Trig-Out MSO's Trig-In (see Figure 2).



In Figure 2, the BNC-MCX cable is connected to the MSO Trig In and the trigger output interface (Trig Out) of the oscilloscope. After completing the above actions, press the "Stack Oscilloscope" button, as shown below:





i DSO Stack Settings	X 💿 DSO Stack Settings X
Select the DSO	Select the DSO
Select DSO brand	Select DSO brand
Emulation	- Emulation -
Connection Type	Emulation Acute
● USB ○ TCP / IP	Agilent Gwinstek HAMEG
Connect IP: 192. 168. 1.	. 3 Keysight LeCroy Rohde & Schwarz Tektronix
Connection Status	Connection Status
Connection:	Connection:
Test Connection	Cancel Test Connection CK Cancel

Select the DSO

Select the brand that needs to be stacked on the oscilloscope. When there is no DSO hardware available for stacking, emulation is the mode used to read back the storage files of DSO stack.

Connection Type

It can be used to select USB, TCP / IP, according to the connection interface provided by the oscilloscope brands.

Connect IP

It can be used to select TCP / IP for the connection mode and enter IP address. When the Ethernet crossover cable is used, it is recommended that the IP settings of the two machines be 192.168.1.2 and 192.168.1.3 respectively. Gateway is the same, set to 192.168.1.1, and DHCP is set to OFF. If the IP setting does not take effect, please disable and then enable the network, or reboot to make the network settings effective.

Test Connection / Connection Status

It can be used to connect the oscilloscope / display the current stack oscilloscope model and automatically add the oscilloscope channel to the waveform window.

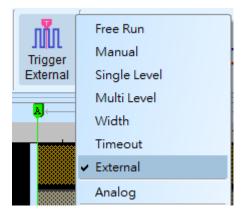


Screen of oscilloscope stack

Time/Div= 50 us			.		1.31			-> () (500us								
Acquired: 15:42:00.940			-207.71 us	-155.78 us	-100).88 us	-51.93 us	0.05	51.93 us	103.08 us	155.78 us	207.71 us	259.64 us	311.57 us	363.5 us	415.42 us	467.35 us
•		06	Addr(7b):	50 VVr	A	0	6	A S		Addr(7b):50	Rð A		41	A	47	A	49
▲ BUS_I2C		L															
120	SDA-1	0				79.04 us	30.38 us 27.	04 us		63.04 us	33.12	us	64.54 us	33.64 us	38.72 us 4	1.88 us 33.64 u	25.84 us
Ext DSO CH1 🕜	EXT DSO CH1	4.3497	חרו		נר, ר	$\gamma\gamma\gamma$	יינייני	╠╹╎╹╹	Лŗ	[]] [] []] [] [] []] [] []] [] []] [] []] [] []] [] []] [] []] [] []] [] []] [] []] [] []] [] []] [] [] []] [] [] []] [] []] [] [] []] [] [] [] []] [] [] [] []] [ηημ		ŢŢŢŢ	רורנר			┉┉
Ext DSO CH2 🕜	EXT DS0 CH2	121.299 n V	,					•					ſ	····		,	<u> </u>
15 IS																	
Label	Channel	Value	4														

Oscilloscope is set as the master, while the MSO is set as the slave

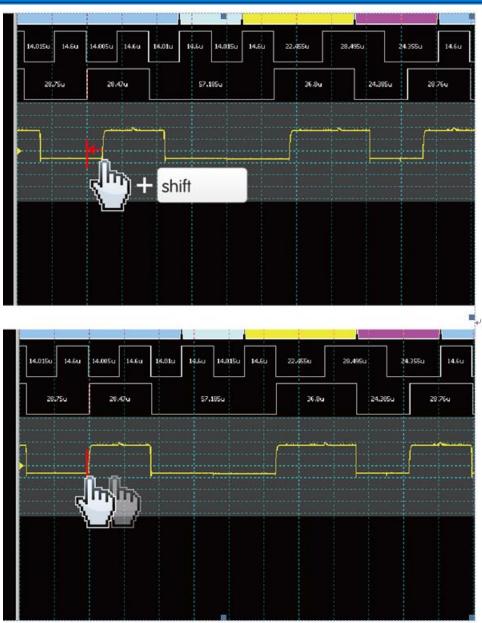
If the stack is composed of the oscilloscope as the master and MSO as the slave, you must not only complete the above-mentioned basic settings but also set the external trigger signal For the hardware wiring, please refer to Figure 2. Press "Trigger Condition" \rightarrow "External Trigger", as shown below



Stack Delay

When MSO is triggered successfully, the Trig-Out signal is transmitted through Cable to the DSO with a time delay, resulting in a deviation between the logic and the analog signal time displayed by the waveforms. Therefore, the stack delay time must be set to compensate the delay. In the waveform display screen, you can put the mouse on the top of the DSO waveforms, hold down the Shift key, and then use the mouse's left button to drag the DSO waveforms to the appropriate location to complete the stack delay correction.





Stack Cable:

Standard MCX-MCX line for Acute DSO





Optional BNC-MCX line (50cm or 100cm) for standalone DSOs





Advanced Capture Settings

• Glitch filter settings



The hardware glitch filter function is used to filter out unwanted glitches and logical misjudgment caused by slow transitions. It can be regarded as a low pass filter to remind the user that the glitches may sometimes lead to poor quality of data transmission. You can use the Logic Analyzer and Oscilloscope Stack to determine the signal integrity and whether there are unexpected glitches.

∭ Glitch Filter Settings	Х
Ch 0 Ch 1 Ch 2 Ch 3 Ch 4 Ch 5 Ch 6 Ch 7	
Ch 8 Ch 9 Ch 10 Ch 11 Ch 12 Ch 13 Ch 14 Ch 1	5
Filter signal width < 4 ns	
Reset All On VOK X Cance	əl

This filter function can be set to filter the signals of less than 5ns-35ns wide. After this filter function is enabled, it will filter before the hardware is triggered. Channels that use the glitch filter function are marked with a red dot on the channel label for dentification



• Software Glitch filter settings

∭ SWFilter		×
Ch 0 Ch 1 Ch 2 Ch 3 Ch 4 Ch 5 Ch 8 Ch 9 Ch 10 Ch 11 Ch 12 Ch 13 Filter signal width < 1 sample ▼		Ch 7
Reset All On	🗸 ОК	X Cancel

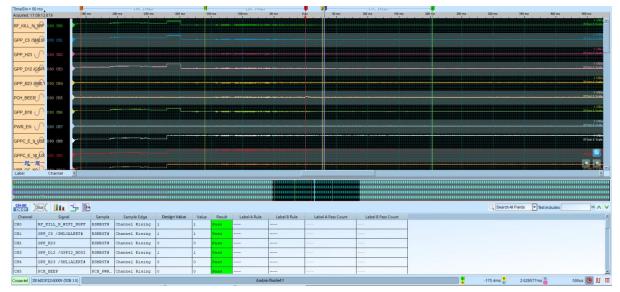
This filter function can be set to filter the signals with pulse width range from 1ps to 1ms. Applying this filter function will only change the display and decode contents, the trigger and recordable time will remain not effected Disabling this filter function will restore all waveform contents back to the original un filtered waveform.



• Timing Check

This function will import the .csv file of the timing check items; this file must be pre-input the parameters and measurement items. The main measurement types are the following two projects, and it can be judged whether it meets the design value. (For sample files, Please contact us.)

1. HW Strap: Measuring the actual voltage at the sample points



2. Timing sequence: Measuring power-on(off) sequence.

	/er:1.4.0.17) Adv. Capture Curso													- 0
€.			∄⊻ ^{1.7\(1.6\)}		() Repeat					Zoom Stack DS	Demo D Phase Delay 0 ps 👻			
ne/Div = 5 s quired: 14:17:57		8.723s B	6 5	10 s 15 s	20 s	26 s	30 s	35 z	40 =	46 s	60 s 66 s	60 s	65 s 70 s	76 s
	DSO CHO	أوتنسنسن												0 ffset 0 Sea
	DS0 CH2													1 VI Offset 8 Sos
C10_GATE	DS0 CH1	Í IIIIIII IIIIIIIIII												0rtcer 0 Se
PWROK	DS0 CH4													1 VI Offset 0 Sa
VR_QN	DS0 CH5													t G Offset 0 Se
PWROK	DS0 CH6													1 V Offset 0 S
st# 🕜	DS0 CH7													Offset 0 S
sus#	DS0 CH8													1 Offset 0 1
														Office D S
	Channel													•
Bus	(🌆 🗄 🗟											Q Search All Fields	Text includes	RE
ming Spec.	Description	Label Name A	Label Name B	Туре	Min. Limit	Max. Limit	Value	Pass/Fail	Label A Rule	Label B Rule	Label A Pass Count	Label B Pass Count		
ec00	Only for testing	VCCSTG	VccST_PWRGD	CH A Rise to CH B Rise	lms		-8.724s	Fail	90.0% (1.607	90.0% (5mV)			-	
ec01	Only for testing	VDDQ	VccST_PWRGD	CH & Rise to CH B Rise	lms		-8.028#	Fail	80.0% (2.634	80.0% (3mV)		AT 10. 10	-	
ec03	Only for testing	VDDQ	VCCSTG	CH & Rise to CH B Rise		25ms	786.289ms	Fail	1.2V	1.25V			-	
201	Only for testing	VCCST	VCCSTG	CH & Rise to CH B Rise	0ps		8.724s	Pass	90.0% (16mV)	90.0% (1.607	l time(s)		-	
ec05	Only for testing	VDDQ	VCCSA	CH A Rise to CH B Rise	100ns		-8.027s	Fail	90.0% (2.963	90.0% (13mV)	l time(s)	l time(s)	-	
	Only for testing	VCCSTG	VCCSA	CH & Rise to CH B Rise	100ns		-8.724s	Fail					-	
				CH A Rise to CH B Rise	lms		7.880s	Pass						
ec06 ec00	Only for testing	VCCSA	PROCPWRGD										-	
ec00	Only for testing Only for testing P22160009 (USB 30)		PROCPWRGD	CH & RISE TO CH B RISE	lma	alytis Finished!!	-843.650mg	Fail					577ms	500us 🕒]



Cursor

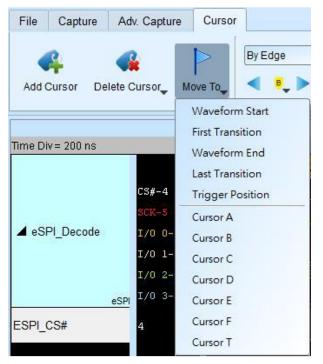
This function includes the cursor setting and the waveform search function matching the

cursor.

Carte MSO (Ver:1.4.6)	
File Capture Adv. Capture Cursor	
Add Cursor Delete Cursor Move To	By Edge BUS_eSPI(CH 5) x 8 Rising By Edge Move x 3 Cursor(s)

Move To: Move the focused timestamp position in the waveform area according to the

selection.



Waveform Start: Move to the beginning of waveform

First Transition: Move to first waveform transition

First Transition on Selected Label: Move to first waveform transition of selected label

Waveform End: Move to the end of waveform

Last Transition: Move to last waveform transition

Last Transition on Selected Label: Move to the last waveform transition of selected label

Trigger Position: Move to the trigger position

Cursor A-Z: Move to the Cursor position



Waveform search is divided into four modes:

File Captur	e Adv. Capture	Cursor		
Add Cursor	Delete Cursor, M	Nove To	By Edge eSPI_D By Edge By Time By Value Match Search Pulse Width	ecode(CH 4) 💌 x 8 💌 Rising Move x 3 Cursor(s) 🗘 📢

1. By Edge: Move the specified cursor position according to the number of

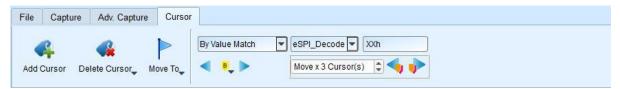
Rising/Falling/Either edges ($x_1 \sim x_{4096}$) of the specified channel.

File Capt	ure Adv. Capture	e Cursor		
4			By Edge 🔹 eS	PI_Decode(CH 4) 💌 🗴 8 💌 Rising 💌
Add Cursor	Delete Cursor	Move To	< ق ک	Move x 3 Cursor(s) 🗘 ┥ 帅

2. By Time: Move the specified cursor position forward or backward to specify the amount of time.

File	Capture	Adv. Capture	Cursor				
	R			ByTime	▼ 10	us 🔻	
Add (Cursor D	elete Cursor	Move To	◀ 씨.	Move x 3 Cursor(s)	🗈 🕠 🧼	

3. By Value Match: In search of displayed value content of the specified channel, if the specified channel is the bus Protocol, the text comparison will be used for the search; if the specified channel is the bus or channel, the numerical comparison will be used for the search.



4. Search Pulse Width: The waveform pulse widths meeting the conditions can be searched on the specified channels. The single-cursor movement function on the left side or the multiple-cursor movement function on the right side can be used on any operation meeting or exceeding the conditions.

All of the above operations can be used to move a single cursor on the left or multiple cursors on the right.

File Captur	e Adv. Captur	e Cursor			
4			Search Pulse Width 🗨 ESPI_CS# 💌 High Pulse 💌	Time >	10 us 🔽
Add Cursor	Delete Cursor	Move To_	<	Move x 3 Cursor(s)	🗆 🗢 🧼

The starting point of the search is set to the current position of the selected cursor.



Cursor usage:

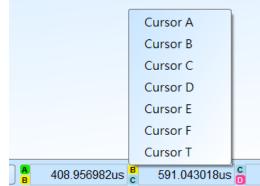
The cursor system has two special purpose cursors: the triggering cursor T and the search specific cursor B, respectively. To add a new cursor, you can use the left mouse button to click the "Add Cursor Button" () on the top or press the Shift+ letter key. To delete a cursor, you can click the "Delete Cursor Button" () on the top.

Cursor movement method:

- 1. Using the left mouse button to drag the cursor sign or cursor line on the top of the waveform window, you can achieve the purpose of moving the cursor.
- 2. Use the keyboard A-Z to quickly navigate to the mouse cursor location.
- Use the keyboard Shift + A-Z to move the cursor to the place where the mouse cursor is. If the cursor does not exist, you can add the cursor to the mouse cursor without dragging the cursor.

The value on the frequency / time display bar at the bottom right of the screen will change as the cursor moves.

O N m From left to right are the interval time, frequency calculation, the number of sampling statistics, respectively.



Clicking the cursor name, you can switch the cursor.



Waveform And Report

Waveform

- 1. Use the left mouse button to drag the waveform in the wave form display area.
- 2. You can use the mouse wheel or click the zoom in button on the screen to zoom the

waveforms in or out \mathcal{P} .

- 3. To add text/graphic annotation, you can add text or graphic annotation data in the waveform area.
- 4. Quick calculation function

If you press the right button to drag in the waveform display area, you can circle the range to be observed, and show the number of signal transitions in the observation interval, the length of time and the average frequency information. This function can also be used in the waveform display area under the protocol Analyzer mode.

īme Div= 1 us	0 ps	1 us	2 us	3 us	4 us	δus	6 us
			GET_CO	NFIGURATION(21)			ADDR (00)
CS#-4							
SCK-5						Decode(SCK) tion=16	
▲ eSPI_Decode I/0 0-0	395 ns 40(D ns 800 ns	400 ns	1.6 us		I=3.280us avg)=2.50MHz	
I/O 1-1							
I/O 2-2							
I/O 3-3 eSPI							



Report Area



- 1. Display the channel status.
- 2. Display the results of the bus decode, or create customize report from multiple decodes.
- 3. Waveform data statistics

When setting, select the channel and determine the type of statistics. If you only need to count the specific range, you can use the cursor to select the specified range. By default, the range is the entire waveform area. To apply the same measurement values to other channels, you need only click and drag the items to be copied, and multiple sets of the same measurements will be added to the other channels. To add a variety of measurement values on the same channel, you need only to click and drag on the channel name, and a number of different types of measurements will be added.

Digital Measurement:

Туре	Channels
Period	1
Frequency	1
Edge Count	1
Cycle Count	1
Positive Cycle Count	1
Negative Cycle Count	1
Positive Pulse count	1
Negative Pulse count	1
Positive Pulse Width	1
Negative Pulse Count	1
Channel-to-Channel Rising Delay	2
Channel-to-Channel Falling Delay	2
Channel Rising to Channel Falling Delay	2
Channel Falling to Channel Rising Delay	2
Phase Delay	2



Туре	Channels
Frequency	1
Period	1
V Max.	1
V Min.	1
V High	1
V Low	1
V Peak to Peak	1
V Amplitude	1
V RMS.	1
V Mean	1
V Mid	1
High Duty	1
Low Duty	1
High Period	1
Low Period	1
Rise Time	1
Fall Time	1
V Pos. Overshoot	1
V Neg. Overshoot	1
V Rising Pre-shoot	1
V Falling Pre-shoot	1
Ch to Ch Rising Delay	2
Ch to Ch Falling Delay	2
Ch Rising to Ch Falling Delay	2
Ch Falling to Ch Rising Delay	2
Phase Delay	2
Rising Edge Count	1
Falling Edge Count	1
Edge Count	1

Analog Measurement:

4. Report area storage

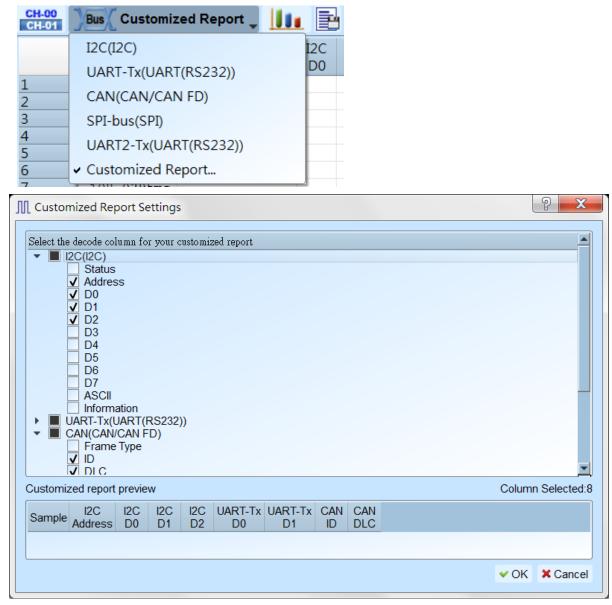
Report contents can be saved as text files.



Bus Decode Settings

Please see the bus trigger and Analyzer manual.

Customized Report Settings



All Bus Decoders enabled in waveform area will be listed in the setting window, you may select interested columns from each Reports, the preview window will show how many columns you have selected and combine them to create your customized report.

Note: The Bus Decoders must be setup correctly in order to fetch the correct column names for the customized report.



Chapter 3 Technical Support

Contact information

Acute website: <u>https://www.acute.com.tw</u> E-Mail: <u>service@acute.com.tw</u> Tel: +886-2-29993275 傳真: +886-2-29993276

If Device not found Demo mode-

shows up in the Demo mode during the execution of MSO

software, please try the following steps to solve the issue:

- Install the latest version of the MSO software, please go to the official website of Acute Technology Inc. – Download - Software, and then select the MSO to download and install.
- (2) Please use the original USB3.0 Cable in the kit.
- (3) Go to the device manager and check the driver status

Please connect the device USB cable to the computer and then go to the system device manager to check whether the Acute USB Bootloader or Acute USB3.0 Product shows up. Please go to the Acute Website-Download -Software, download the USB3.0 driver and follow the troubleshoot manual in the package to reinstall the driver.



Device Manager	1	2
e Action View Help		
🔿 🖬 😰 🖬 💯		
> Disk drives		
> 🔙 Display adapters		
> 🎽 Firmware		
> 🙀 Human Interface Devices		
> 📹 IDE ATA/ATAPI controllers		
> 👔 Imaging devices		
> 🏣 Intel(R) Dynamic Platform and Thermal Framework		
> 🥅 Keyboards		
> 🧾 Memory technology devices		
> II Mice and other pointing devices		
> 🛄 Monitors		
> 🚅 Network adapters		
> 🚍 Print queues		
> Processors		
Security devices		
> Software devices		
> 4 Sound, video and game controllers		
> 🍇 Storage controllers		
> 🖵 SV drivers		
> 🏣 System devices		
V 🖗 Universal Serial Bus controllers		
Acute USB BootLoader		
Intel(R) USB 3.0 eXtensible Host Controller - 1.0 (Microsoft)		
USB Composite Device		
USB Root Hub (xHCI)		

- (4) Remove all probes and re-plug the USB3.0 Cable or restart the computer to check whether the driver appears.
- (5) After the above steps are taken but the problem is still there, please contact us.