

Acute MSO2000 series

3-in-1 Analyzer

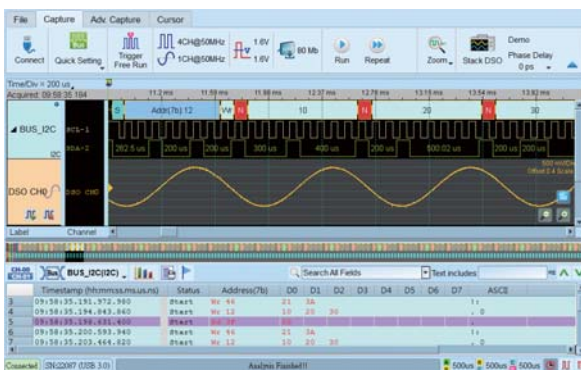
Logic Analyzer, Protocol Analyzer, Simple DSO



- PC-based, USB3.0 interface / power
- 8 / 16 Channels (display digital and analog waveforms of the same channel)
- Digital Inputs : 2 GHz Timing, 200MHz State Analysis (Max.)
- Analog Inputs : 200 MS/s (Max.), Bandwidth 40 MHz
- 8 Gb Memory (Max.)
- PC RAM storage for streaming mode
- Protocol Decode : BiSS-C, CAN 2.0B/CAN FD, DP_Aux¹, eSPI, I²C, I²S, MII, MIPI I3C 1.1, Serial Flash, SPI, SVID², UART (RS232), USB PD 3.1, USB1.1, ... (100+)
- Protocol Trigger I : I2C, MIPI I3C 1.1, SPI, UART (RS232)
- Protocol Trigger II : BiSS-C, CAN2.0B/CAN FD, DP_Aux¹, LIN2.2, SENT, USB PD 3.1,...
- Protocol Trigger III : DALI, MDIO, MIPI RFFE 3, MIPI SPMI 2, Modbus, PMBus, SMBus, USB1.1,...
- Protocol Trigger IV : eMMC 4.5, eSPI, MII, RGMII, RMII, SD 2.0 (SDIO 2.0), SVI3², SVID³
- Protocol Analyzer I : I2C, MIPI I3C 1.1, SPI, UART (RS232)
- Protocol Analyzer II : BiSS-C, CAN2.0B/CAN FD, DP_Aux¹, HID over I2C, I2S, LIN2.2, USB PD 3.1
- Protocol Analyzer III : DALI, MDIO, MIPI RFFE 3, Modbus, PMBus, Profibus, PWM, SMBus, USB1.1
- Protocol Analyzer IV : eSPI, MII, RGMII, RMII, SVI3², SVID³

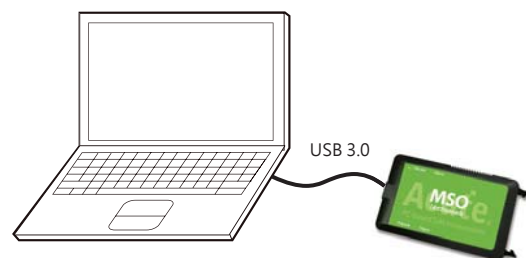
Model	Channels	Sample Rate	Memory	Protocol Trigger/ Protocol Analyzer	Power Sequence Channels
MSO2008E	8	2 GHz	2 Gb	I	8
MSO2116E	16	2 GHz	4 Gb	I, II	16
MSO2116B	16	2 GHz	4 Gb	I, II, III	16
MSO2216B	16	2 GHz	8 Gb	I, II, III, IV	16 (128/ 8 sets cascaded)

Software Window



System Requirements

- USB 3.0 port
- Win 7, Win 8, Win 10, Win11
- PC RAM 16GB (recommended) or 8GB at least



Acute

PC-based T&M Instruments

Acute Technology Inc.

Tel: +886-2-2999-3275 E-mail: service@acute.com.tw <http://www.acute.com.tw>



Protocol Analyzer:

It is hardware decoding, may log protocol data very long time if without waveforms.
Application timing: Preliminary protocol debug.

Support multiple protocols with different operating modes

Real-time data search

Stack with a DSO as an MSO in logic analyzer mode

The screenshot displays the software interface with several key components highlighted by red boxes and arrows:

- Protocol Analyzer Mode:** Indicated by an arrow pointing to the 'Protocol Analyzer' button in the top toolbar.
- Real-time Data Search:** Indicated by an arrow pointing to the search bar in the toolbar.
- Stack DSO:** Indicated by an arrow pointing to the 'Stack DSO' button in the toolbar.
- Real-time Data Statistics:** A table in the 'Navigator' pane showing transaction counts and bytes for various I2C bus addresses.
- Hide Items for Easy View:** A button in the 'Navigator' pane used to manage the visibility of data items.
- Protocol Report:** A table listing captured transactions with columns for Timestamp, Status, Address, RW, Data, and ASCII.
- Show Waveforms with Bus Decodes:** A waveform view at the bottom showing signal timing and decoded data points.

Timestamp	Status	Address	RW	Data	ASCII
0.001.848.160	Start	3F	Rd	00*	.
0.002.393.460	Start	3F	Rd	00*	.
0.002.941.080	Start	12	Wr	41* 43* 55* 54* 45*	ACUTE
0.004.493.640	Start	46	Wr	54* 4C* 5F* 33* 30* 30* 30* 5...	TL_3000Series
0.008.039.840	Start	3F	Rd	00*	.
0.008.585.140	Start	3F	Rd	00*	.
0.009.130.460	Start	3F	Rd	00*	.
0.009.678.060	Start	12	Wr	41* 43* 55* 54* 45*	ACUTE
0.011.230.620	Start	46	Wr	54* 4C* 5F* 33* 30* 30* 30* 5...	TL_3000Series
0.014.776.820	Start	3F	Rd	00*	.
0.015.322.120	Start	3F	Rd	00*	.
0.015.867.440	Start	3F	Rd	00*	.
0.016.415.060	Start	12	Wr	41* 43* 55* 54* 45*	ACUTE
0.017.967.600	Start	46	Wr	54* 4C* 5F* 33* 30* 30* 30* 5...	TL_3000Series
0.021.513.800	Start	3F	Rd	00*	.
0.022.059.120	Start	3F	Rd	00*	.

Real-time data statistics

Hide items for easy view

Show waveforms with bus decodes



Protocol Analyzer

Show real-time protocol data
Application timing: view real-time protocol data if many idles in between



Protocol Logger

Like data logger, save massive data into SSD hard drive
Application timing: save massive protocol data if not many idles in between



Protocol Monitor

Like dash cameras, record protocol data by the device's memory only
Application timing: trigger event only happens in very long time

Packing List :



MSO2008/2116E



MSO2000B



8.5cm Lead Cable
MSO2216B only



18.5cm
Lead Cable



USB 3.0 cable



Grippers
Stack cable

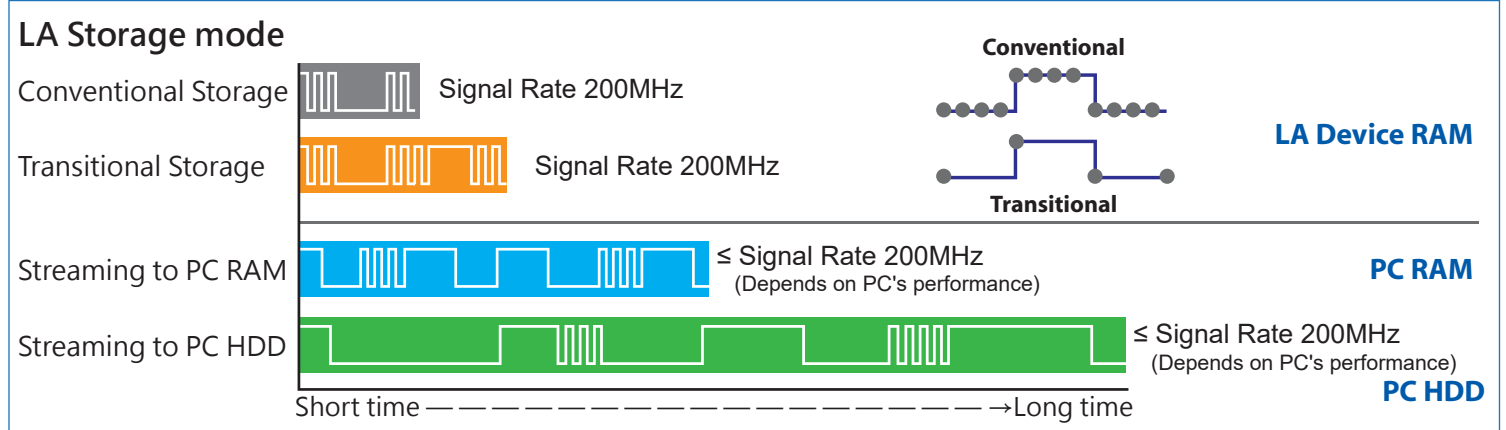


Handbag

Logic Analyzer:

Built-in DSO to capture analog waveforms to compare with the digital waveforms.

Provides multiple storage modes, users could select to have long time recording or precision acquisition.



Each channel supports both digital and/or analog waveforms measurements, voltage resolution can be changed between 2 levels for all channels at the same time.

Digital waveform

Threshold: CH 00 - 07: 1.60 V, CH 08 - 15: 1.60 V

Enable Extra Hysteresis: CH 00 - 07, CH 08 - 15

Analog waveform

Input Sensitivity: CH 00 - 07: 10 mV/Div, 5 mV/Div; CH 08 - 15: 10 mV/Div, 5 mV/Div

— Extra Hysteresis OFF (More sensitive)

— Extra Hysteresis ON (Lesser noise)

Vertical Range: $\pm 20V \rightarrow \pm 10V$

Resolution: 10mV \rightarrow 5mV

Compare digital and analog waveforms at the same channel for statistics.

Time/Div = 2 us

Acquired: 15:20

192.8us

416.34 ms, 416.34 ms, 416.34 ms, 416.34 ms, 416.34 ms, 416.35 ms, 416.35 ms, 416.35 ms

BUS_I2C 1:0

CH-00 0

CH-01 1

DSO CH0 DSO CH0

DSO CH1 DSO CH1

DSO CH8 DSO CH8

Protocol Decode

Digital waveforms

Analog waveforms

Measurement Type	Label Name A	Label Name B	From	To	Minimum	Maximum	Average
Frequency	CH-00		Begin	End	961.391Hz	77.519KHz	49.852KHz
Edge Count	BUS_I2C (C...		Cursor A	Cursor B	---	---	19
V Max.	DSO CH8		Begin	End	---	---	2.543V
V Mean	DSO CH8		Begin	End	---	---	1.246V
V Amplitude	DSO CH0		Begin	End	---	---	4.373V

Report window

MSO2000 series

Model	MSO2008E	MSO2116E	MSO2116B	MSO2216B
Power	Power Source	USB bus-power (+5V)		
	Static Power Consumption	0.9W		
	Max Power Consumption	<3.9W	<6W	
Hardware Interface		USB 3.0		
Channels (Data / Clock / Ground)		8/1/23	16/1/23	
Total Memory		2 Gb	4 Gb	8 Gb
Analog Inputs	Group	I (CH0~7)	I, II (CH0~7, CH8~15)	
	Sampling Rate (by group)	200MHz/1CH, 100MHz/2CH, 50MHz/4CH, 25MHz/8CH	200MHz/2CH, 100MHz/4CH, 50MHz/8CH, 25MHz/16CH	
	Bandwidth	40MHz		
ADC Bits		12		
Timing Analysis (Asynchronous)		Available channels (Conventional / Transitional Timing) - Memory per channel		
Digital Inputs	2 GHz	(8/7) - 256Mb	(8/7) - 512Mb	(8/7) - 1Gb
	1 GHz	(8/8) - 256Mb	(16/14) - 256Mb	(16/14) - 512Mb
	500 MHz	(8/8) - 256Mb	(16/16) - 256Mb	(16/16) - 512Mb
	250 MHz and lower	(8/8) - 256Mb	(16/16) - 256Mb	(16/16) - 512Mb
State Clock Rate <small>(Synchronous, External Clock)</small>		200MHz		
Data Storage		Conventional Timing, Transitional Timing		
Channel to channel skew		< 1ns		
Threshold	Group	I (CH0~7 & CKI)	I, II (CH0~7 & CKI, CH8~15)	
	Range	+20V ~ -20V		
	Resolution	50mV		
Input Voltage	Accuracy	±100mV + 5%*Vth		
	Non-Destructive Operation (Standard / High Resolution)	over +/-42V DC & AC		
	Sensitivity (1Vpp)	-20V ~ +20V / -10V ~ +10V		
	Extra Hysteresis (On/Off)	200MHz		
Impedance	560mV / 80mV			
Temperature	1MΩ/2pF			
I/O port	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		
	Ref. Clock Input	10MHz, Vpp=3.3 to 5V		
	Ref. Clock Output	10MHz, TTL 3.3V		
Trigger	Connector type	MCX jack / female		
	Resolution	500ps		
	Channels	8	16	
	States	16		
	Events	16		
	Pre / Post	Yes		
	Pass Counter	Yes (0~1048575 times)		
	Digital	Channel, Pattern, Single / Multi Level, Width, Time-out, Setup/Hold Timing Violation, External, Manual		
	Analog	Rising / Falling, Activity		
	Protocol I	I2C, MIPI I3C 1.1, SPI, UART (RS232)		
Protocol II	---	10BASE-T1S ¹ , BiSS-C, CAN2.0B/CAN FD, DP_Aux ¹ , HID over I2C, I2S, LIN2.2, SENT, USB PD 3		
Protocol III	---	DALI, LPC, MDIO, Mini/Micro LED, MIPI RFFE 3, MIPI SPMI 2, Modbus, PMBus, Profibus, SMBus, SVI2, USB1.1		
Protocol IV	---	eMMC 4.5, eSPI, MII, RGMII, RMII, SVI3 ² , SVID ³ , SD 2.0 (SDIO 2.0), Serial Flash (SPI NAND)		
Protocol Analyzer	I	I2C, MIPI I3C 1.1, SPI, UART (RS232)		
	II	---	10BASE-T1S ¹ , BiSS-C, CAN2.0B/CAN FD, DP_Aux ¹ , HID over I2C, I2S, LIN2.2, USB PD 3	
	III	---	DALI, MDIO, MIPI RFFE 3, Modbus, PMBus, Profibus, PWM, SMBus, USB1.1	
	IV	---	eSPI, MII, RGMII, RMII, SVI3 ² , SVID ³	
Software Features	Power Sequence Measurement	Input setup .CSV file for Timing Sequence and H/W Strap check.		
	Zoom / Report Window	Digital or Analog waveforms		
	Note editor	YES		
	Quick Bus Decode Setup	Edit notes on Waveform Window		
	Trigger / Auxiliary cursors	YES		
	Data Logger	1/25		
	Line Decoding	Saved to Hard Disk Drive		
Line Encoding	1-Wire, 3-Wire, 7-Segment, 10BASE-T1S ¹ , A/D Mux Flash, AccMeter, ADC, APML, AVSBus, BiSS-C, BSD, BT1120, CAN 2.0B/FD, Close Caption, CODEC_SSI, DALI, DMX512, DP_Aux ¹ , EDID, eMMC 4.5, eSPI, FlexRay, HD Audio, HDLC, HDQ, HID over I2C, I2C EEPROM, I2C, I2S (PCM, TDM), IrDA, ISELED, 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, Microchip SWI, Microwire, Mini/Micro LED, MIPI CSI LP, MIPI DSI LP, MIPI I3C 1.1, MIPI RFFE 3, MIPI SoundWire 1.2, MIPI SPMI 2, Modbus, NEC IR, PECE 3.0, PMBus, Profibus, PS/2, PWM, QEI, QI, QSPI, RC-5, RC-6, S/PDIF, SD 2.0 (SDIO 2.0), SENT, Serial Flash, Serial IRQ, SGPIO, Smart Card, SMBus (SBS, SPD), SMI, SPI, SPI-NAND, SSI, ST7669, SVI2, SVI3 ² , SVID ³ , SWD, SWIM, SWP, UART (RS232), ULPI, UNI/O, USB 1.1, USB4/TBT3 SB Channel, USB PD 3, Wiegand, ...			
	Biphase Mark, Differential-Manchester, Manchester (Thomas, IEEE802.3), Miller, Modified Miller, NRZI, ...			
	AMI(Standard, B8ZS, HDB3), Biphase Mark, CMI, Differential-Manchester, Manchester (Thomas, IEEE802.3), MLT-3, Miller, Modified Miller, NRZI, Pseudoternary, ...			
Dimension	L x W x H (mm ³)	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	

¹ Optional 10BASE-T1S / DP_Aux adapter needed.

² Upon request by user who is approved by AMD. SVI3 decode, trigger and protocol analyzer are supported ONLY by MSO2216B.

³ Upon request by user who has signed CNDA with Intel. SVID decode, trigger and protocol analyzer are supported ONLY by MSO2216B.