

# Acute MSO2000 series



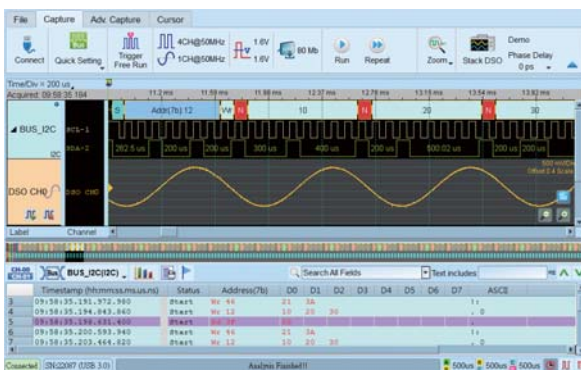
## 3-in-1 Analyzer

## 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
- Bus Decode : BiSS-C, CAN 2.0B/CAN FD, DP\_Aux<sup>1</sup>, eSPI, I<sup>2</sup>C, I<sup>2</sup>S, MII, MIPI I3C 1.1, Serial Flash, SPI, SVID<sup>2</sup>, UART (RS232), USB PD 3.1, USB1.1, ... (100+)
- Bus Trigger I : I2C, MIPI I3C 1.1, SPI, UART (RS232)
- Bus Trigger II : BiSS-C, CAN2.0B/CAN FD, DP\_Aux<sup>1</sup>, LIN2.2, SENT, USB PD 3.1,...
- Bus Trigger III : DALI, MDIO, MIPI RFFE 3, MIPI SPMI 2, Modbus, PMBus, SMBus, USB1.1,...
- Bus Trigger IV : eMMC 4.5, eSPI, MII, RGMII, RMII, SD 2.0 (SDIO 2.0), Serial Flash (SPI NAND), SVID<sup>3</sup>
- Protocol Analyzer I : I2C, MIPI I3C 1.1, SPI, UART (RS232)
- Protocol Analyzer II : BiSS-C, CAN2.0B/CAN FD, DP\_Aux<sup>1</sup>, 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, SVID<sup>3</sup>

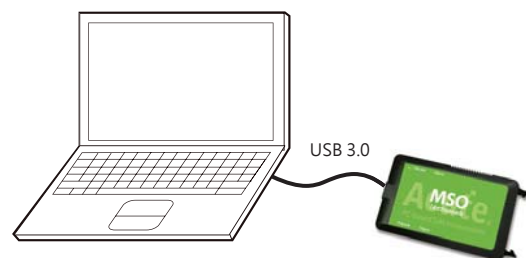
Model	Channels	Sample Rate	Memory	Bus Trigger/ Protocol Analyzer	Power Sequence Channels
MSO2008E	8	2 GHz	2 Gb	I	8
MSO2116E	16	2 GHz	4 Gb	I, II	16
MSO2116B	16	2 GHz	4 Gb	I, II, III	16 (128/ 8 sets cascaded)
MSO2216B	16	2 GHz	8 Gb	I, II, III, IV	16 (128/ 8 sets cascaded)

## Software Window



## System Requirements

- USB 3.0 port
- Windows 7/8/10/11 (64-bit)
- 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](mailto: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

Real-time data statistics

Hide items for easy view

Protocol report

Show waveforms with bus decodes



### Protocol Analyzer

Show real-time protocol data  
Application timing: massive protocol data with some idles in between



### Protocol Logger

Like data logger, save massive data into SSD hard drive  
Application timing: massive protocol data



### 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

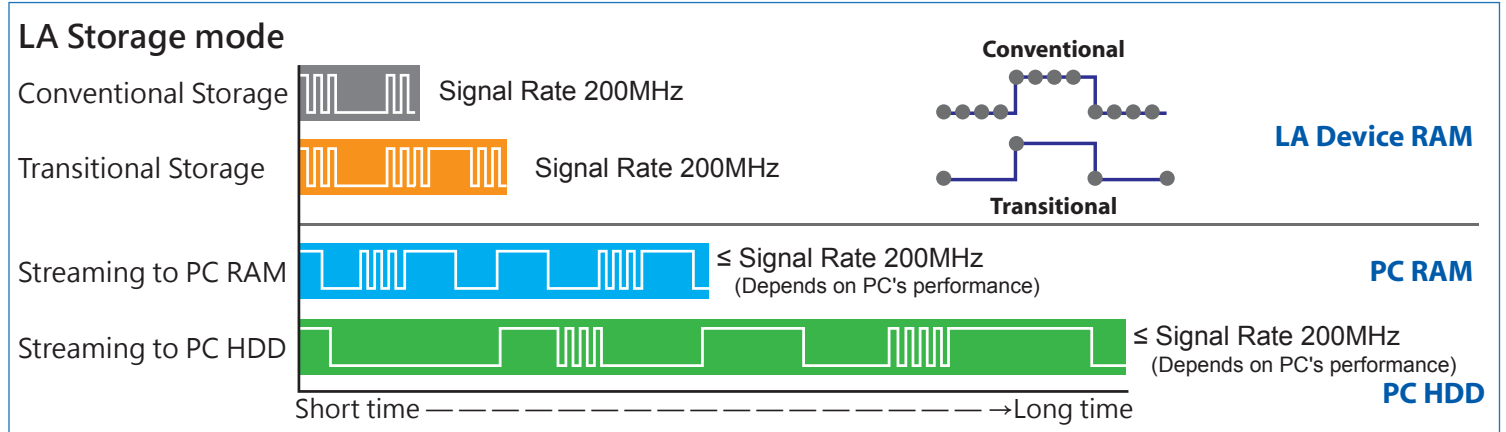


Handbag

# 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

#### Analog waveform

- 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.

Bus Decode

Digital waveforms

Analog waveforms

Report window

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

# MSO 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		
Connector type		MCX jack / female		
Trigger	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		
	Bus I	I2C, MIPI I3C 1.1, SPI, UART (RS232)		
	Bus II	---	BiSS-C, CAN2.0B/CAN FD, DP_Aux <sup>1</sup> , HID over I2C, I2S, LIN2.2, SENT, USB PD 3.1	
Bus III	---	DALI, LPC, MDIO, Mini/Micro LED, MIPI RFFE 3, MIPI SPMI 2, Modbus, PMBus, Profibus, SMBus, SVI2, USB1.1		
Bus IV	---	eMMC 4.5, eSPI, MII, RGMII, RMII, SVID <sup>3</sup> , SD 2.0 (SDIO 2.0), Serial Flash (SPINAND)		
Protocol Analyzer	I	I2C, MIPI I3C 1.1, SPI, UART (RS232)		
	II	---	BiSS-C, CAN2.0B/CAN FD, DP_Aux <sup>1</sup> , HID over I2C, I2S, LIN2.2, USB PD 3.1	
	III	---	DALI, MDIO, MIPI RFFE 3, Modbus, PMBus, Profibus, PWM, SMBus, USB1.1	
	IV	---	eSPI, MII, RGMII, RMII, SVID <sup>3</sup>	
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		
Software Features		Saved to Hard Disk Drive		
Bus Decode		1-Wire, 3-Wire, 7-Segment, A/D Mux Flash, AccMeter, ADC, APML, AVBus, BiSS-C, BSD, BT1120, CAN 2.0B/FD, CEC, Close Caption, CODEC_SSI, DALI, DMX512, DP_Aux <sup>1</sup> , EDID, eMMC 4.5/MMC, eSPI, FlexRay, HD Audio, HDLC, HDQ, HID over I2C, I2C EEPROM, I2C, I2S (PCM, TDM), 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 I3C 1.1, MIPI RFFE 3, MIPI SoundWire 1.2, MIPI SPMI 2, Modbus, NEC IR, PECL 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, SVID <sup>2</sup> , SWD, SWIM, SWP, UART (RS232), ULPI, UNI/O, USB 1.1, USB PD 3.1, Wiegand, ...		
Line Decoding		Biphase Mark, Differential-Manchester, Manchester (Thomas, IEEE802.3), Miller, Modified Miller, NRZI, ...		
Line Encoding		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 <sup>3</sup> )	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	

<sup>1</sup> Optional DP AUX adapter needed. <sup>2</sup> Upon request ONLY by users who have signed CNDA with Intel, SVID decode supported by all MSO models

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