Acute TravelBus Series 2 In 1 Protocol and Logic Analyzer User Manual

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Acute TravelBus Series 2 In 1 Protocol and Logic Analyzer

User Manual TravelBus 2-in-1 Analyzer (Protocol & Logic)

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Installation

Hardware
To install the TravelBus, connect it to the PC using the USB 3.0 cable provided in the kit.

Software
To install the software, follow these steps:

1. Download the software from **https://www.acute.com.tw/logic-analyzer-en/support/download/software**
2. Run TBA.exe and choose either Protocol Analyzer or Logic Analyzer from the menu window below.
3. To open an old file (.TBW), click on Open File…

Operations

Protocol Analyzer

Main Window

- The toolbar includes options for Protocol, Waveform, Run, Search, and Save to text with .csv or .txt format.
- The Report Window displays real-time protocol data.
- The Waveform displays the waveforms only when the Waveform option is checked.
- The Status Bar shows if the TravelBus is connected to the PC, the protocol being used, time captured/available time to capture, etc.
- The Detail/Navigator/Filter shows the protocol data detail and is able to filter those data.
- The Cursors display the time/frequency difference between cursors.

To select I2C protocol, follow these steps:

1. Click on Protocol Select.
2. Choose I2C from the options.
3. Choose either I2C ports or LA ports (channel 0~15) to measurethe I2C signal. The I2C ports are only for low-speed I2C signals.
4. The TravelBus auto-detects the signal frequency and displays the real-time waveform.
5. Choose the address mode from the Options menu.
6. The threshold is provided by default for each protocol or can be set manually from the Threshold option.

If the I2C Port is selected, the SDA and SCL channels are I2C ports for slow I2C signals.

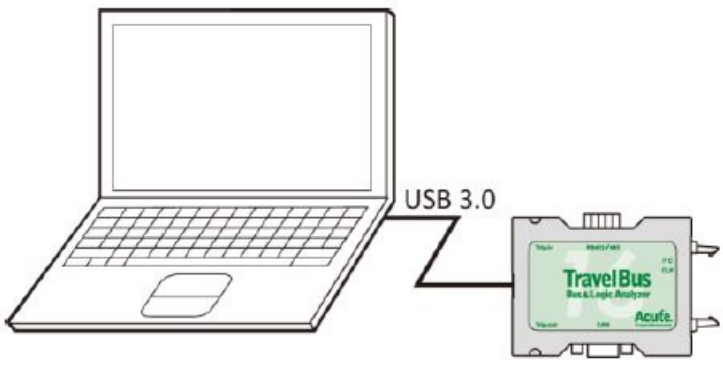
PWM

PWM decode can show at most six PWM curves on the screen. The direction can be determined by Direction Message on Direction channel. It can be chosen as High or Low to represent the positive direction, and the example of practical application is the positive or negative rotation of the motor. You may choose one of the three curves, duty-cycle, frequency and RPM.

Installation

Hardware

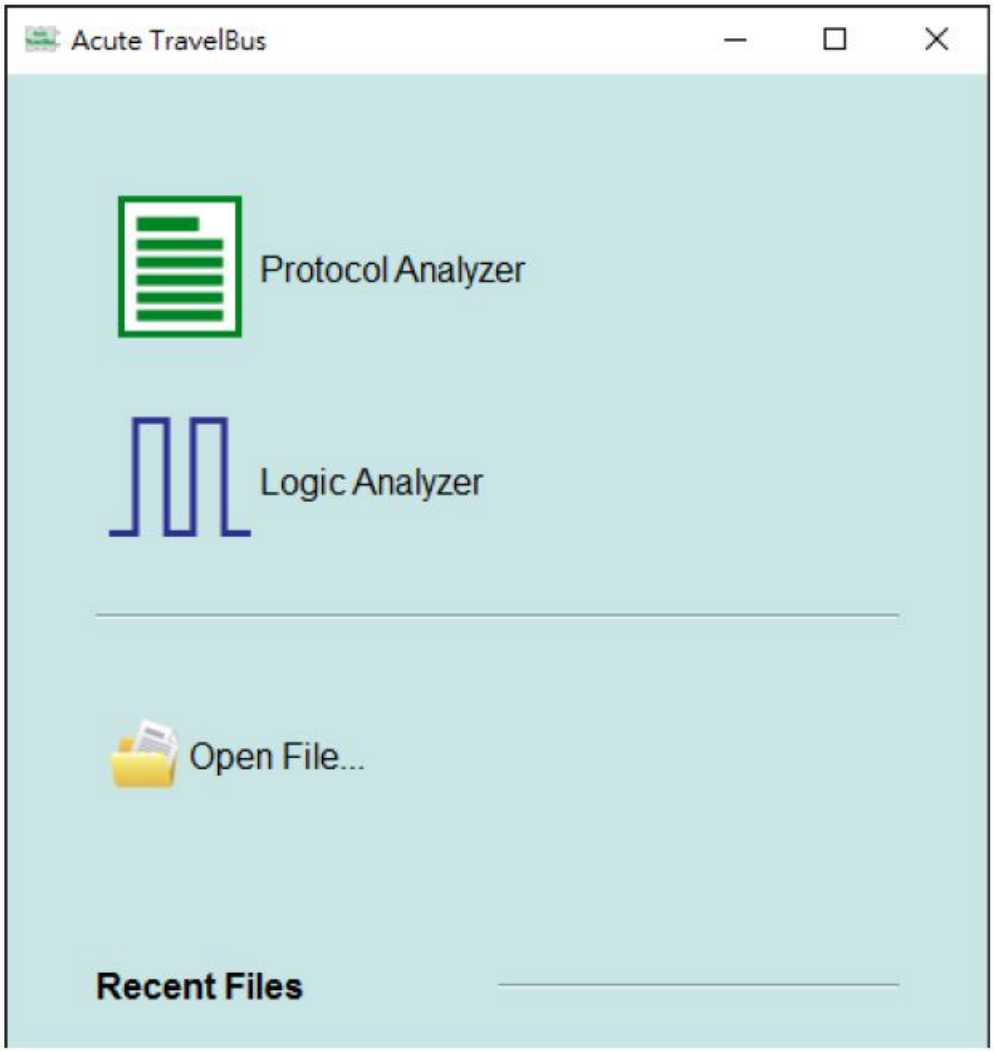
Connect the TravelBus to the PC with the USB 3.0 cable in the TravelBus kit



Software

Install the software from https://www.acute.com.tw/logic-analyzer-en/support/download/software Run

TBA.exe (and choose the Protocol Analyzer or Logic Analyzer in the menu window below.



Open File… will open the old file (.TBW).

Operations

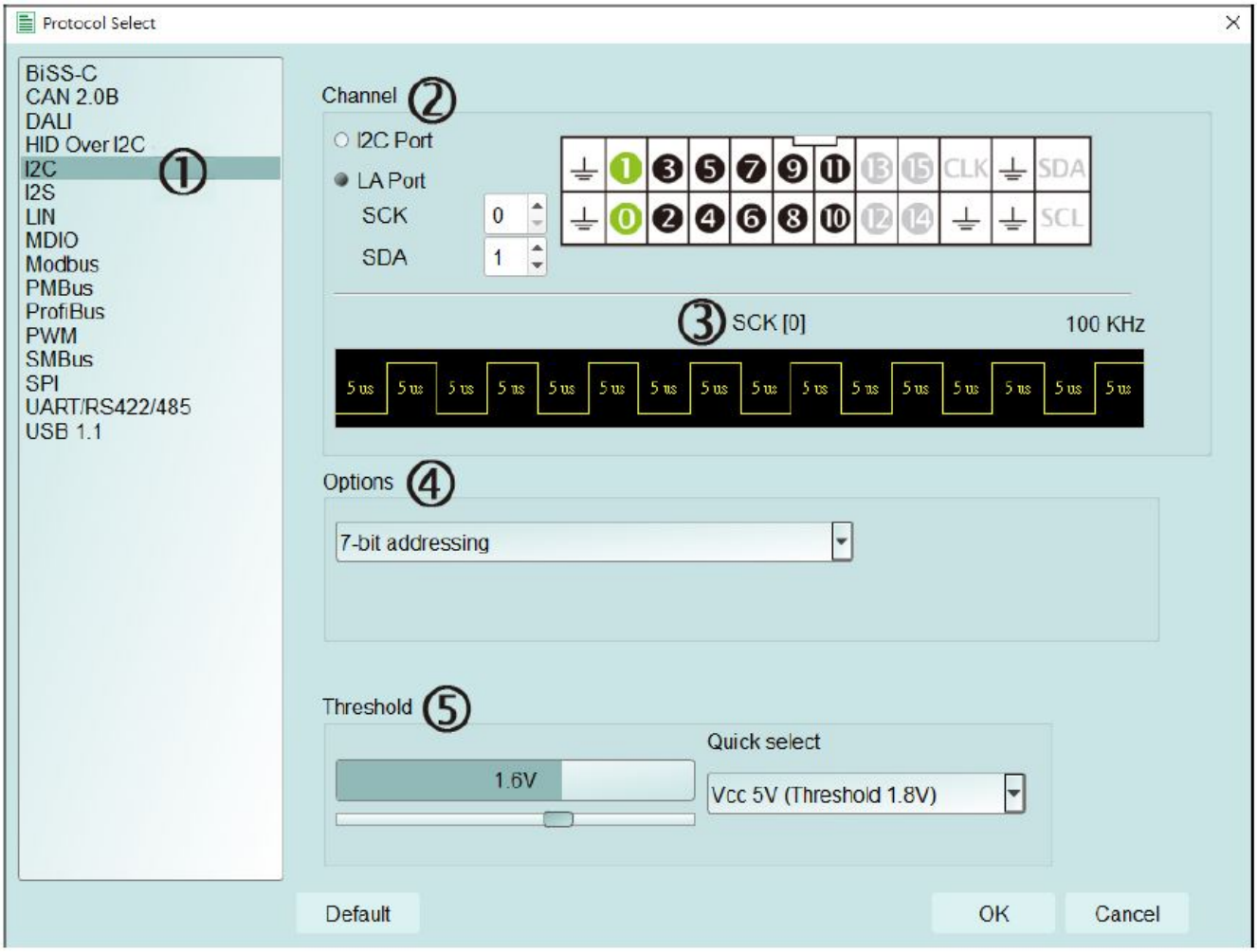
Protocol Analyzer

Main Window

1. Toolbar includes Protocol, Waveform, Run, Search and Save to text which format is .csv or .txt.
2. Report Window displays real-time protocol data.
3. Waveform displays the waveforms only when the Waveform option is checked.
4. Status Bar shows if the TravelBus is connected to the PC, what protocol, time captured/available time to capture, ….
5. Detail/Navigator/Filter shows the protocol data detail and is able to filter those data.
6. Cursors display the time/frequency difference between cursors.

Click Protocol Select () to open the software window below:

1. Choose I2C.



2. Channel

   Choose either I2C ports or LA ports (channel 0~15) to measure the I2C signal. The I2C ports are only for low speed I2C signal.

3. Waveform

   The TravelBus auto-detects the signal frequency and displays the real-time waveform.

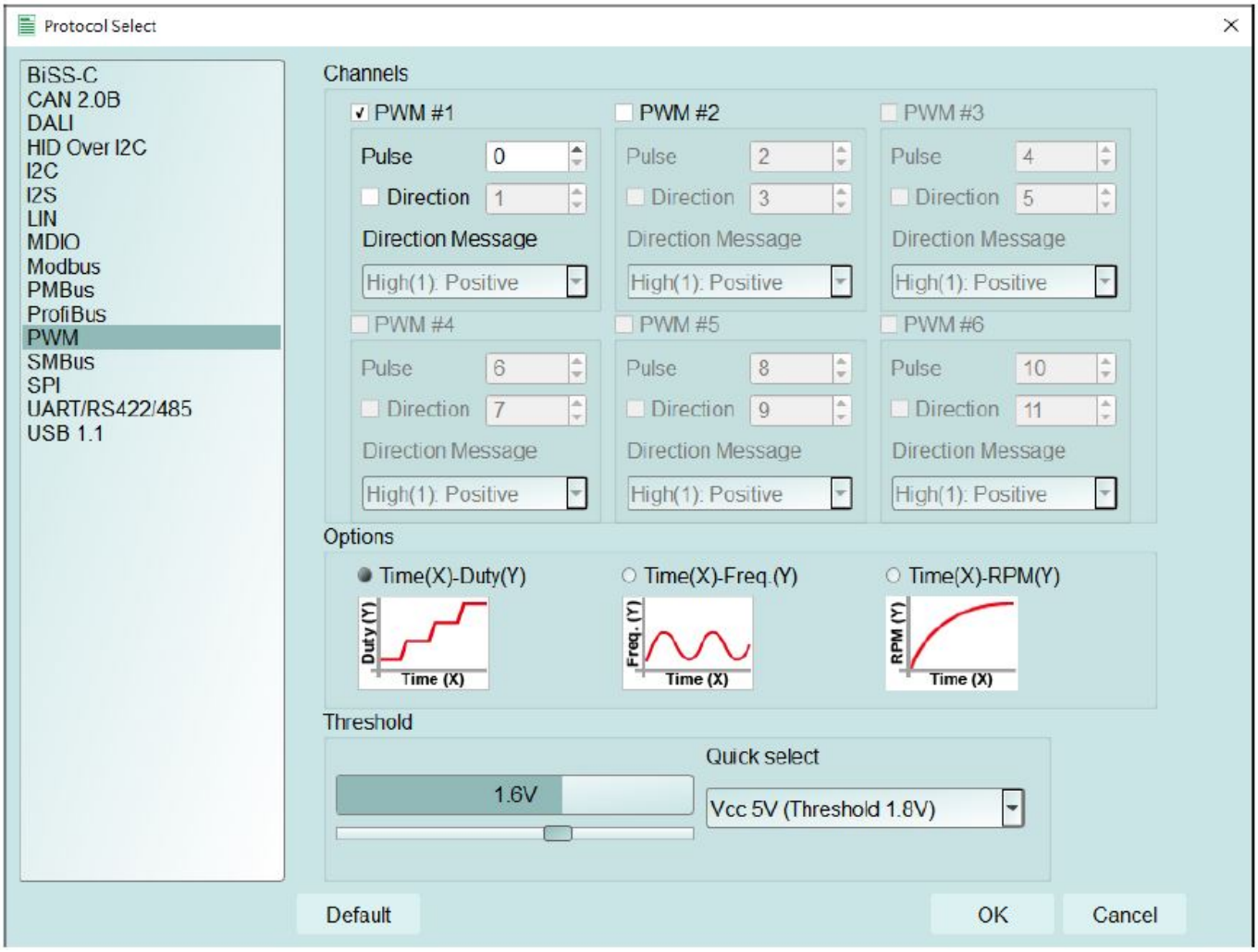
4. Options Choose the address mode.

5. Threshold The threshold is provided by default for each protocol or can be set manually.

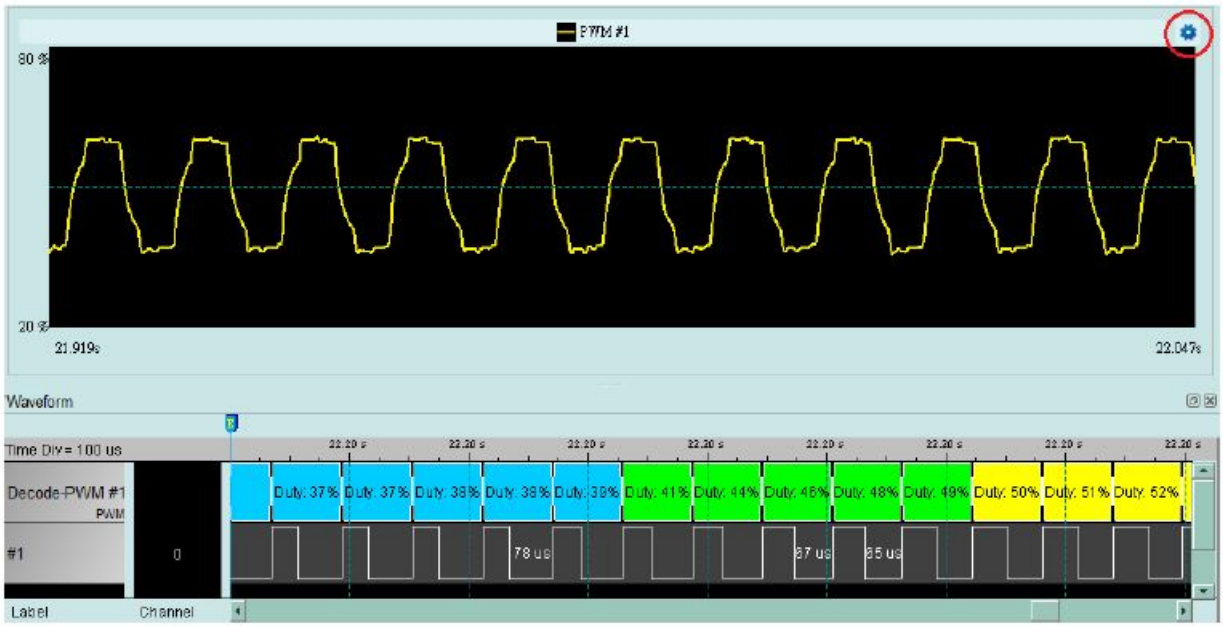
If the I2C Port is selected, the SDA and SCL channels are I2C ports for slow I2C signal

PWM

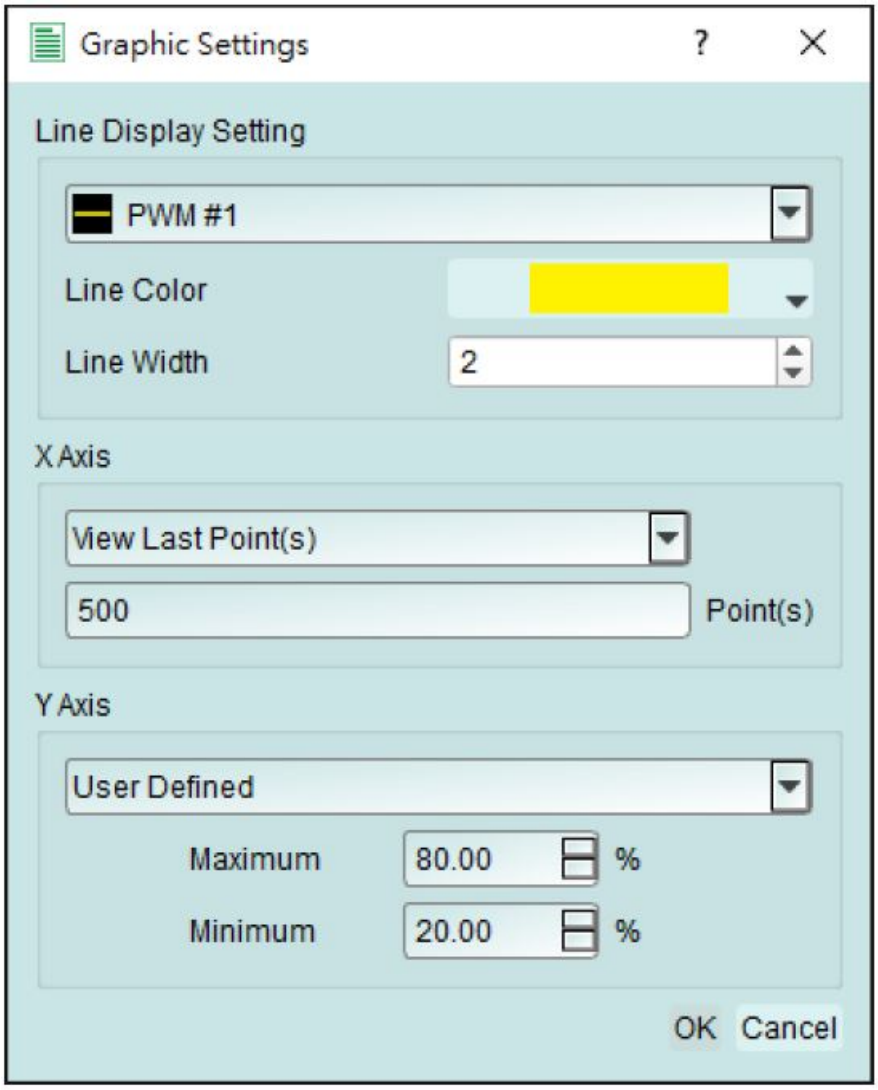
PWM decode can show at most six PWM curves on the screen. The direction can be determined by Direction Message on Direction channel. It can be choose High or Low to represent the positive direction, and the example of practical application is the positive or negative rotation of the motor. You may choose one of the three curves, duty-cycle, frequency and RPM.



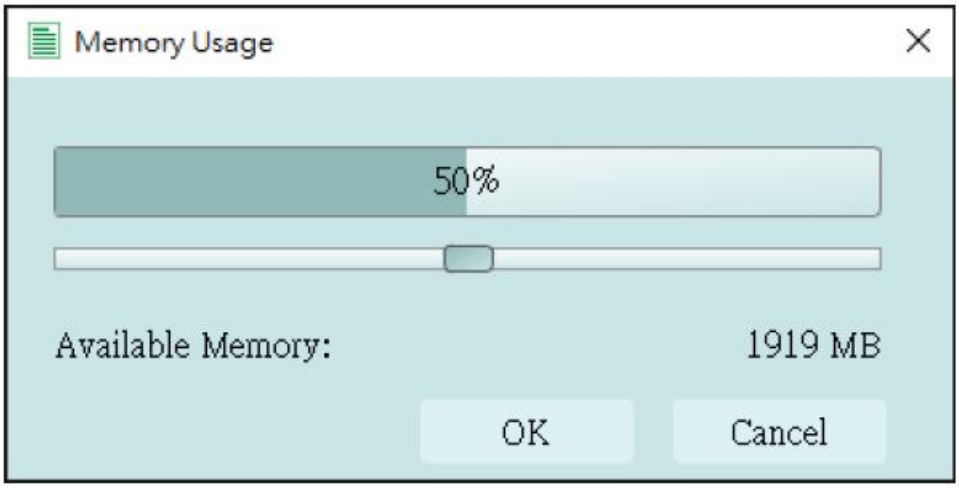
Click on the upper right Graphic Settings to change the plot setting.



You may change the line display setting and the range of axes in Graphic Settings.

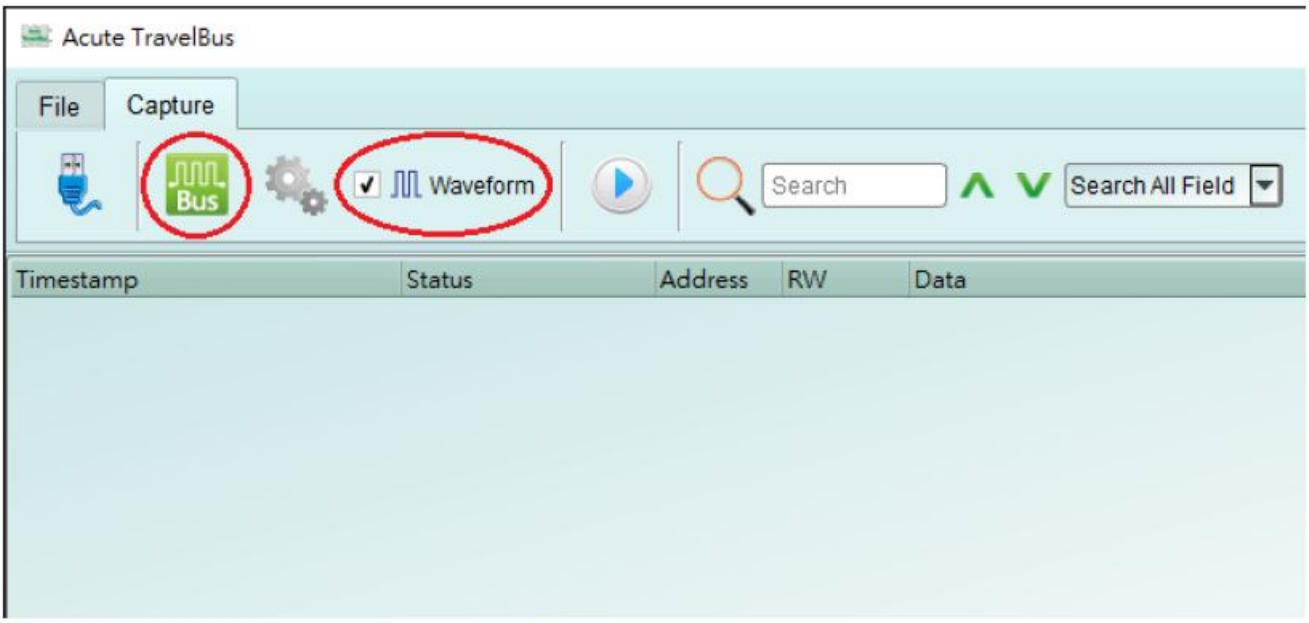


Click Memory Usage  on the Main Window to set the percentage of the PC RAM for use.

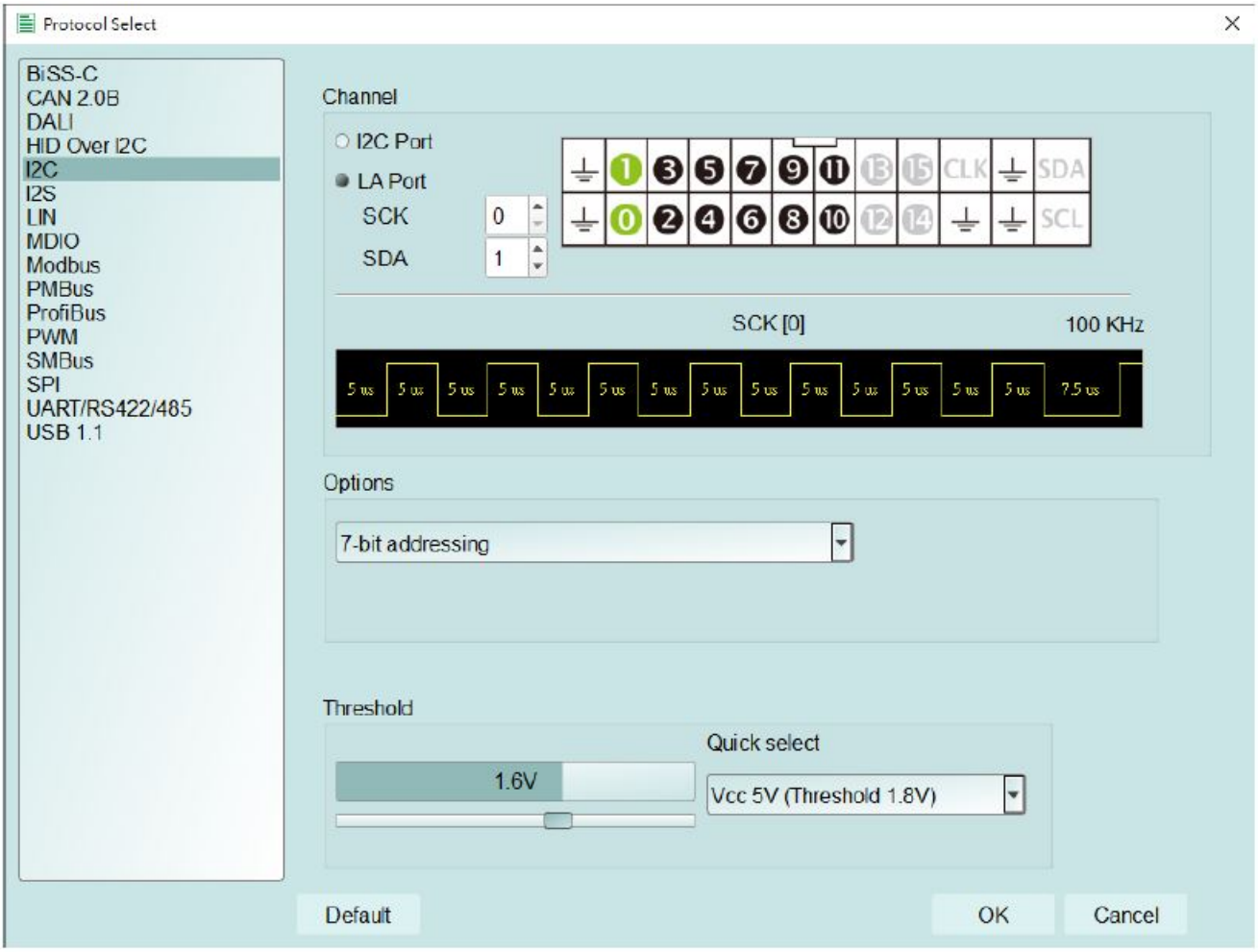


Stack with the DSO
The TravelBus, when used as a logic analyzer, is able to stack with the Acute TravelScope DSO to form an MSO.

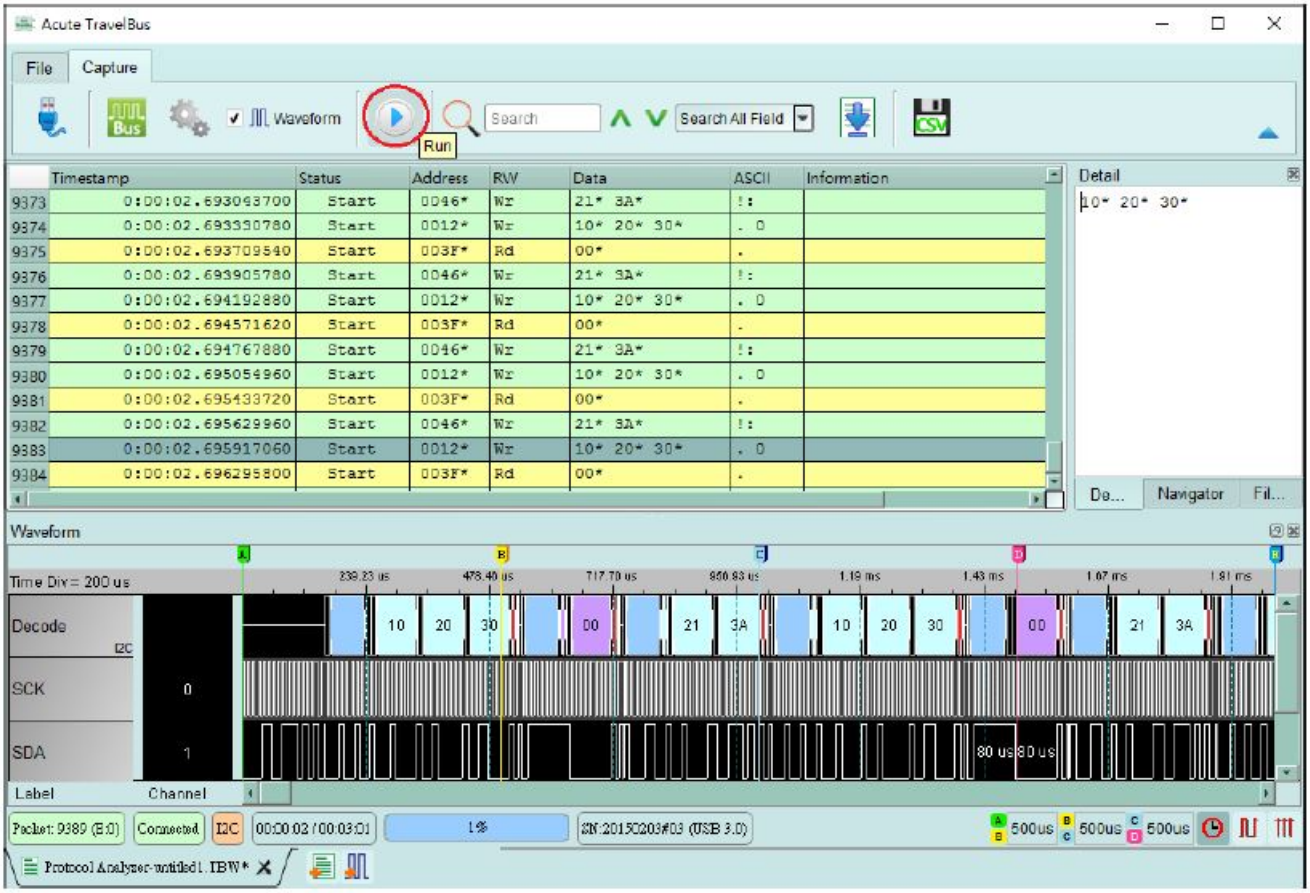
Example
Click Waveform to store the protocol data with waveform.



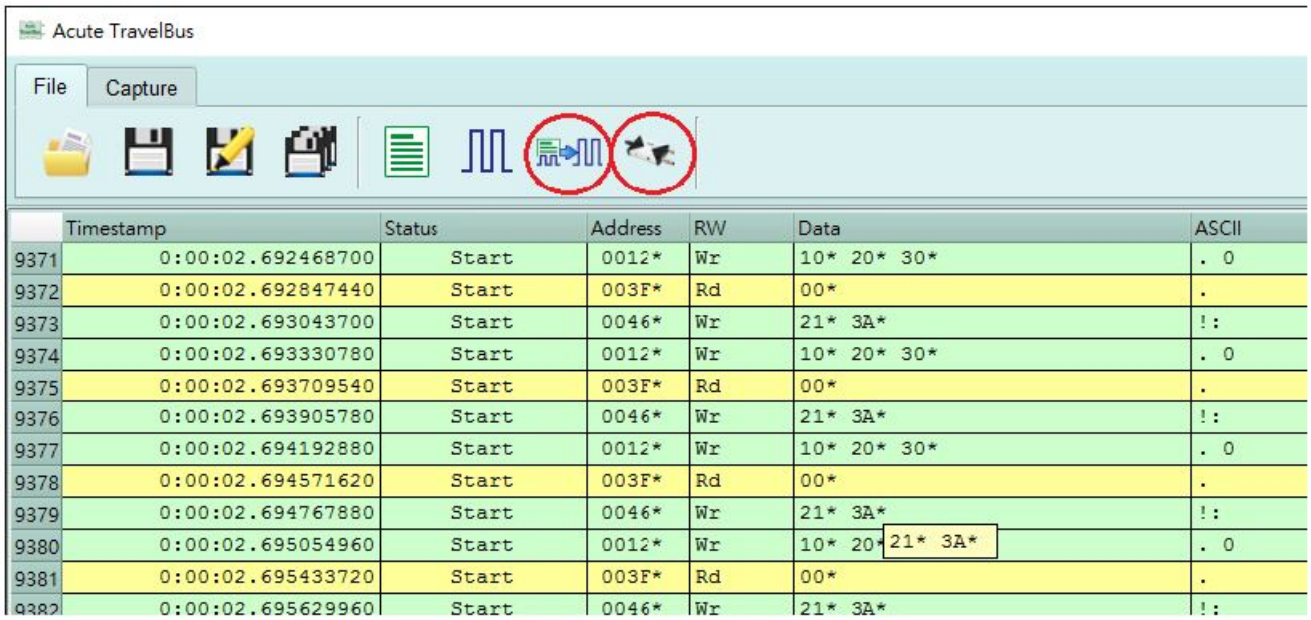
Choose I2C for protocol settings, click OK by default settings or reset manually.



Click Run ( ) to capture the data.

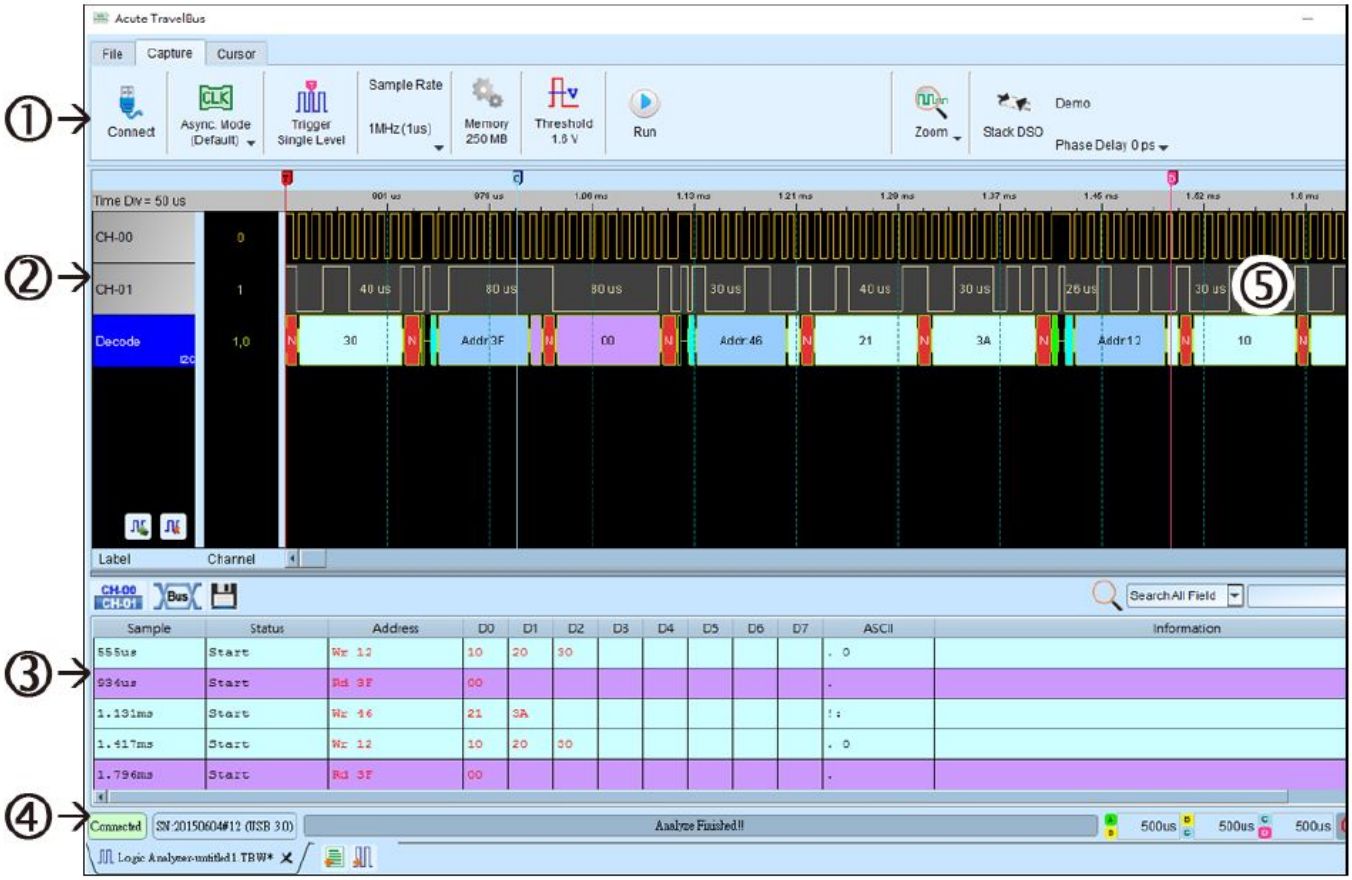


Click Convert to Logic Analyzer to stack with DSO  in File to stack the Acute TravelScope DSO; all data captured and settings in Protocol Analyzer will be moved to the Logic Analyzer. This operation will be elaborated in Logic Analyzer. You can also simply convert Protocol Analyzer to Logic Analyzer with the data and setting by clicking Convert to Logic Analyzer  in File.



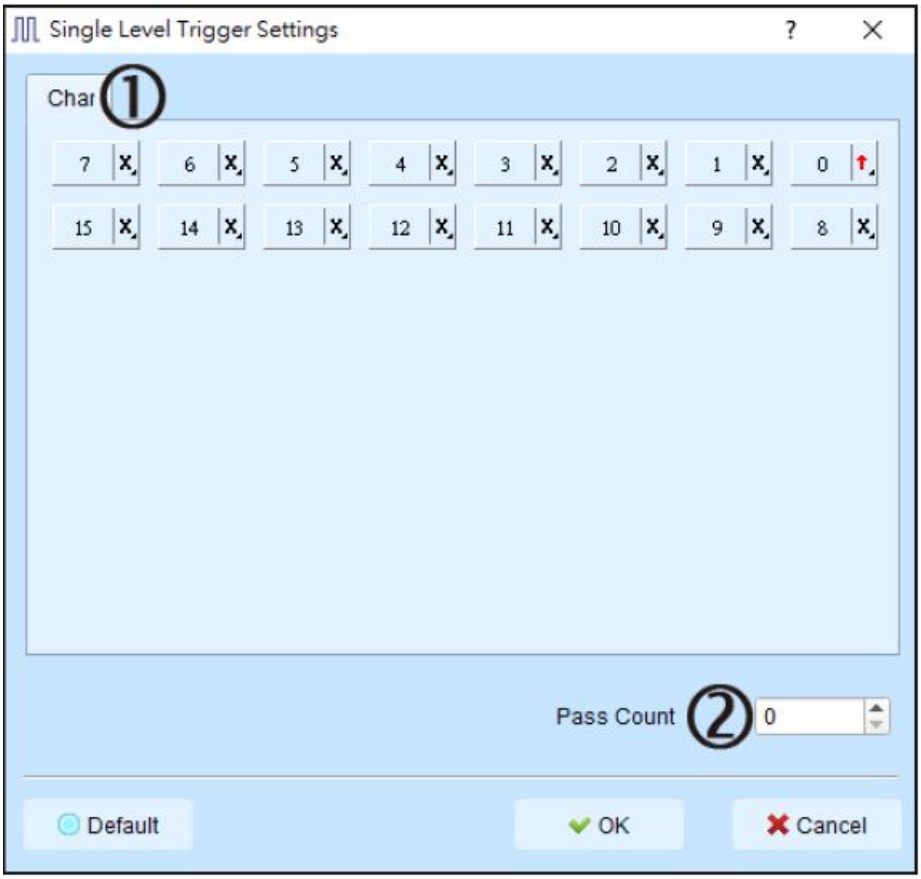
Logic Analyzer

Main Window



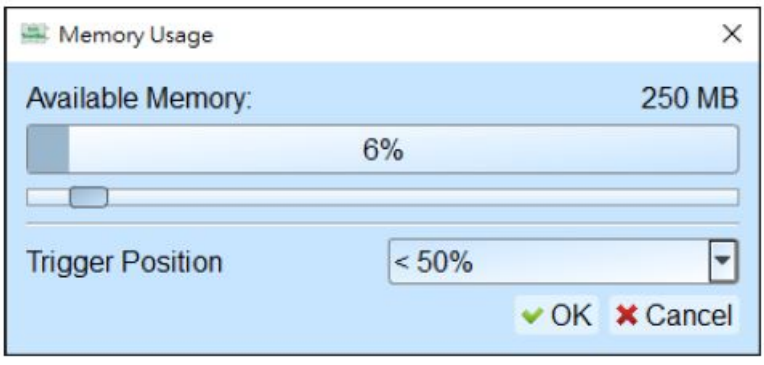
1. Toolbar includes Trigger, Sample Rate, Threshold and Run.
2. Label Field is to add or to delete the channel(s) by pressing the icons (,). You may modify the channel settings by clicking its label.
3. Report Window displays either the data CH-00 CH-01 or decode Bus which can be exported text file in .csv or .txt
4. Status Bar show s if the TravelBus is connected to the PC.
5. Waveform Window
   You may roll the mouse wheel to zoom in out the waveforms and see the time difference between cursors.

Trigger
Single Level Trigger Settings



1. Channel is to choose the trigger event as any (x), rising ↑
2. Pass Count is to pass the trigger event (for the number of times you input.

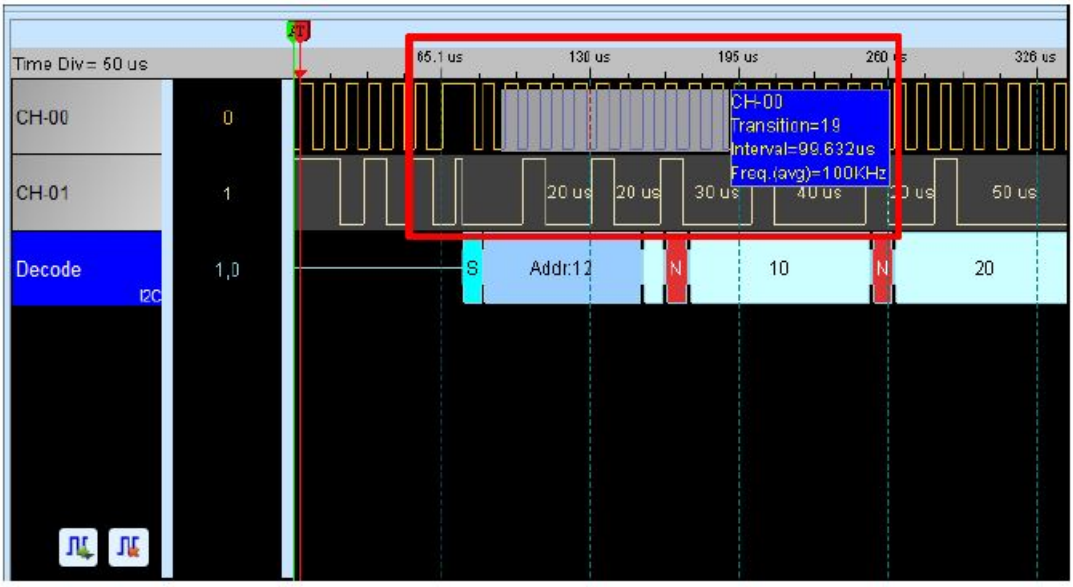
Memory Usage



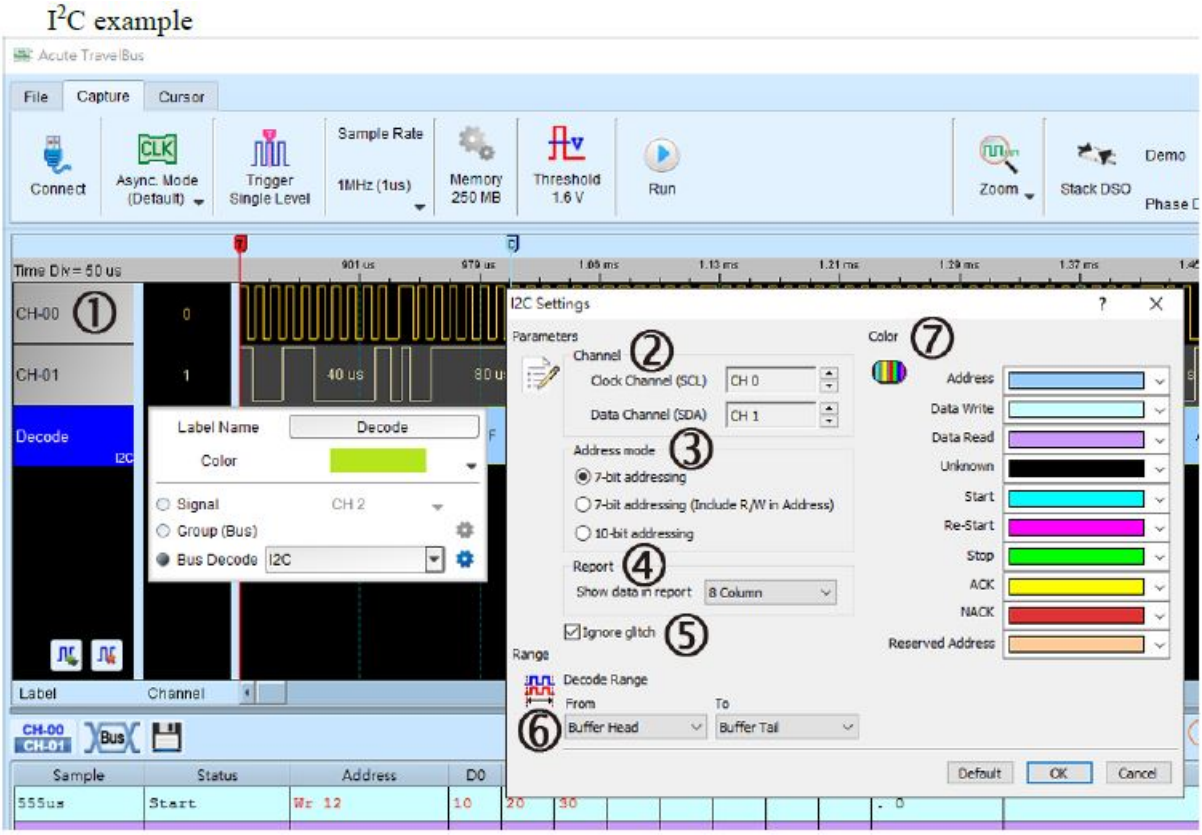
Available Memory is to set the percentage of the available PC RAM for use
Trigger Position is to set the trigger position at the percentage of the memory used.

Waveform Window

In the Waveform Window, right-click and drag the mouse on the waveform to show the number of transitions, the interval and average frequency of the waveform.
The Protocol Analyzer supports this function too



Bus Decode Setting



1. Left click on any channel and choose Bus Decode
2. Channel is to s et the clock and data channels.
3. Address mode

   7 bit addressing.

   7 bit addressing i nclud ing R/W in Address) will show 8 bit addressing including 7 bit address and 1 bit R d/Wr

   10 bit addressing
4. Report is to s how either 8 or 16 columns data in the R eport W indow.
5. Ignore glitch will ignore th os e glitches occurred when high sample rates on the slow slew rate tran sitions.
6. Range is to set the start and the end in the memory buffer to decode the bus.
7. Color Set the channel color.

Stack with DSO
Using TravelBus 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	Models	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
Rohde & Schwarz	RTO1000/RTE1000		V

There are two methods for hardware wiring:

TravelBus is the Master, while the oscilloscope is the Slave.
Wiring direction is from TravelBusTravelBus's Trig-Out the oscilloscope's Trig-In (see Figure 1)

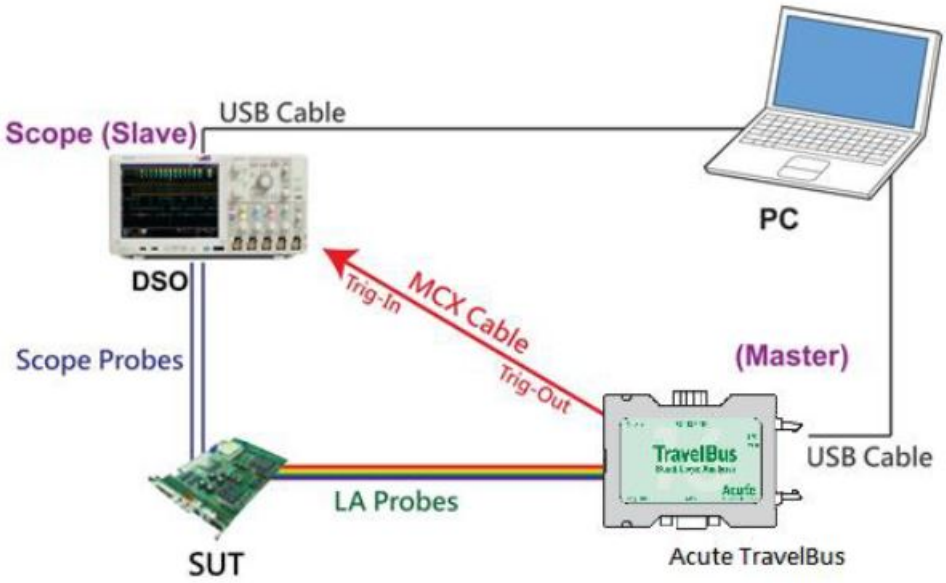


Figure 1

In Figure 1, the USB or Ethernet (TCP / IP) interface is connected to the computer, and then connect the BNC MCX cable to the TravelBus 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 TravelBus is the Slave.
Wiring direction is from the oscilloscope's Trig-Out TravelBusTravelBus's Trig-In (see Figure 2).

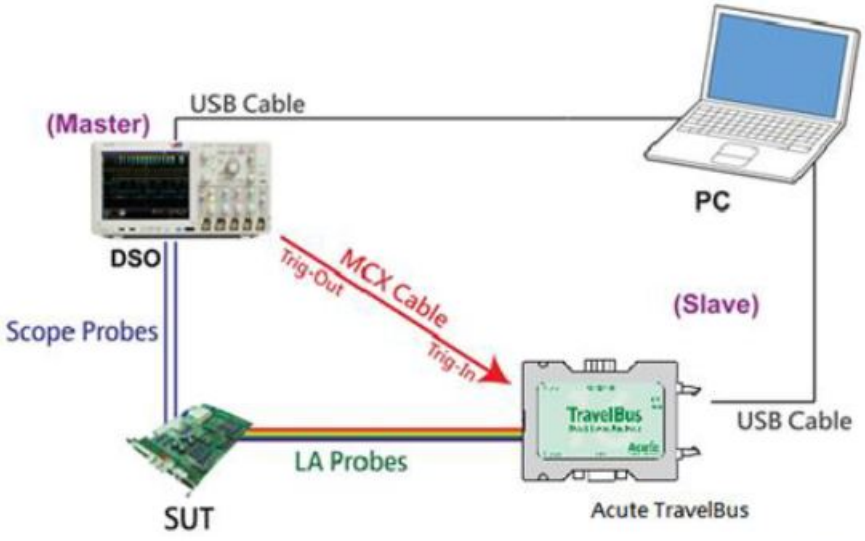
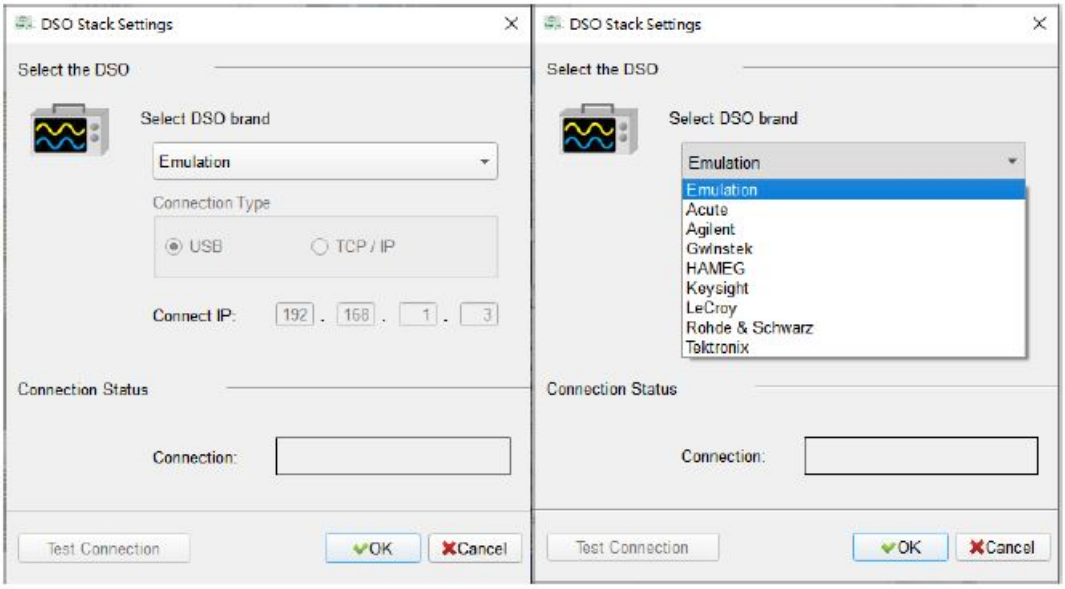


Figure2

In Figure 2, the BNC MCX cable is connected to the TravelBus 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:

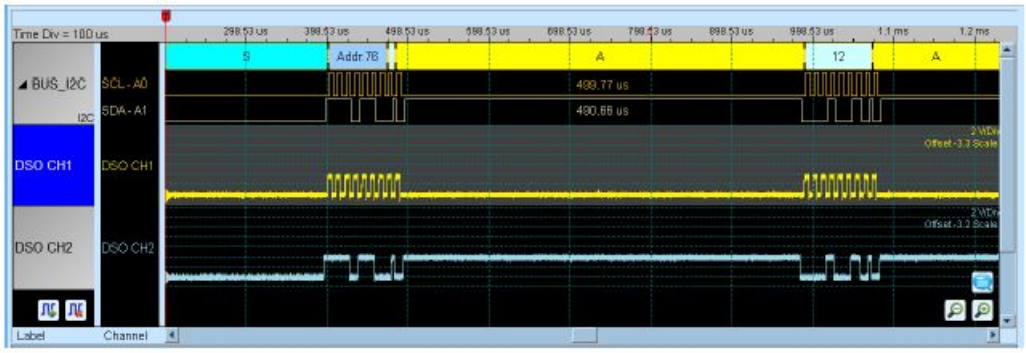


Select the DSO
Select the brand that needs to be stacked on the oscilloscope. When there is no DSO hardware available for stacking, emulation is the mode used to read back the storage files of DSO stack.

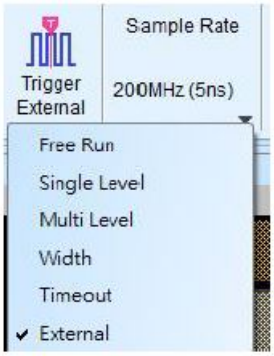
Connection Type
It can be used to select USB, TCP / IP, according to the connection interface provided by the oscilloscope brands.

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.

Screen of oscilloscope stack

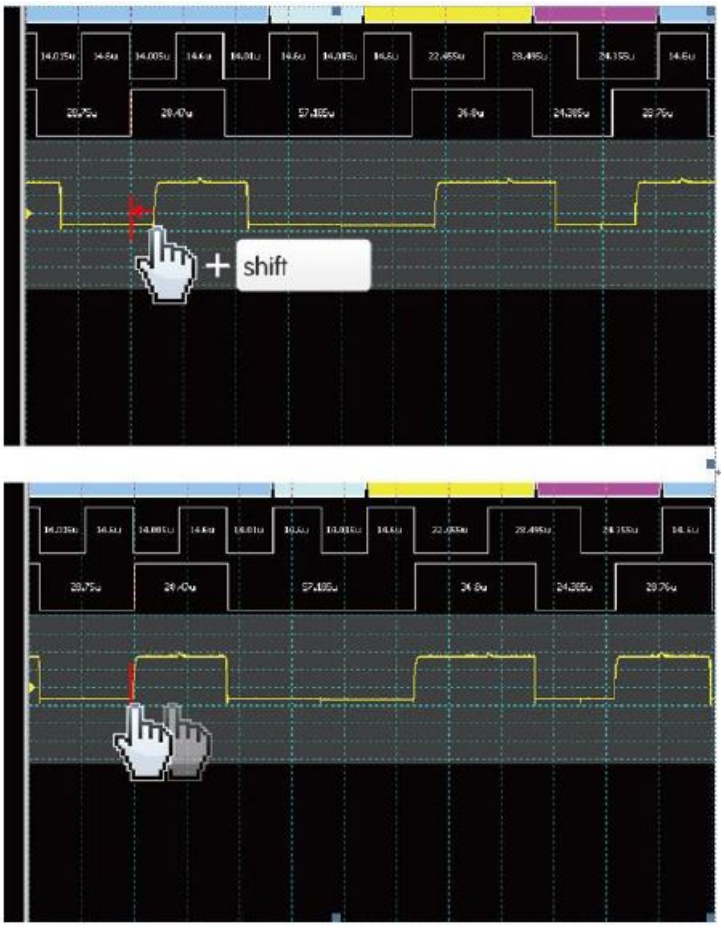


Oscilloscope is set as the master, while the TravelBus is set as the slave
If the stack is composed of the oscilloscope as the master and TravelBus as the slave, you must not only complete the above-mentioned basic settings but also set the external trigger signal. For the hardware wiring, please refer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



Stack Delay

When TravelBus 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.

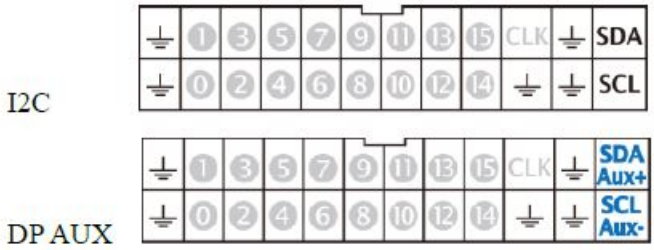


Test Connection / Connection Status

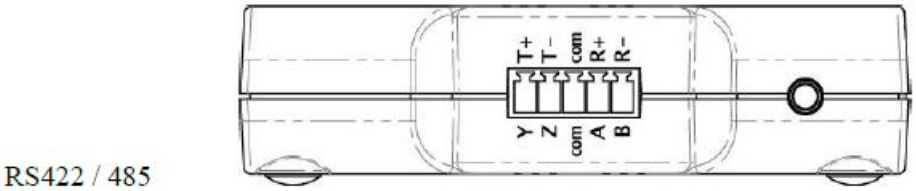
It can be used to connect the oscilloscope / display the current stack oscilloscope model and automatically add the oscilloscope channel to the waveform window.

Dedicated Channel Description

I2C DP AUX port are supported on the TB2000/TB3000 series



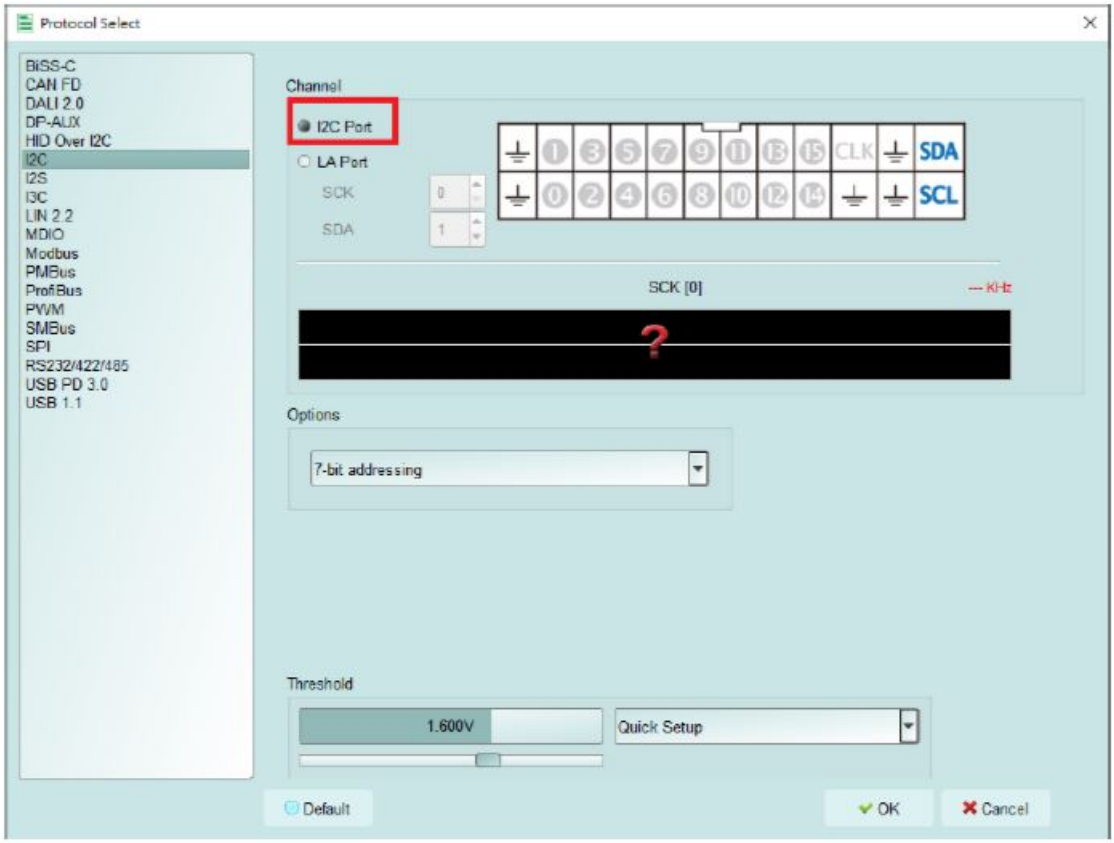
There are additional RS422 / 485 CAN / CAN-FD port supported on the TB2016B/TB3016B,



(DP AUX, RS485, CAN / CAN-FD are differential signal. Since TB2000/TB3000 series have the converter inside, there is no need to set the threshold before measure)

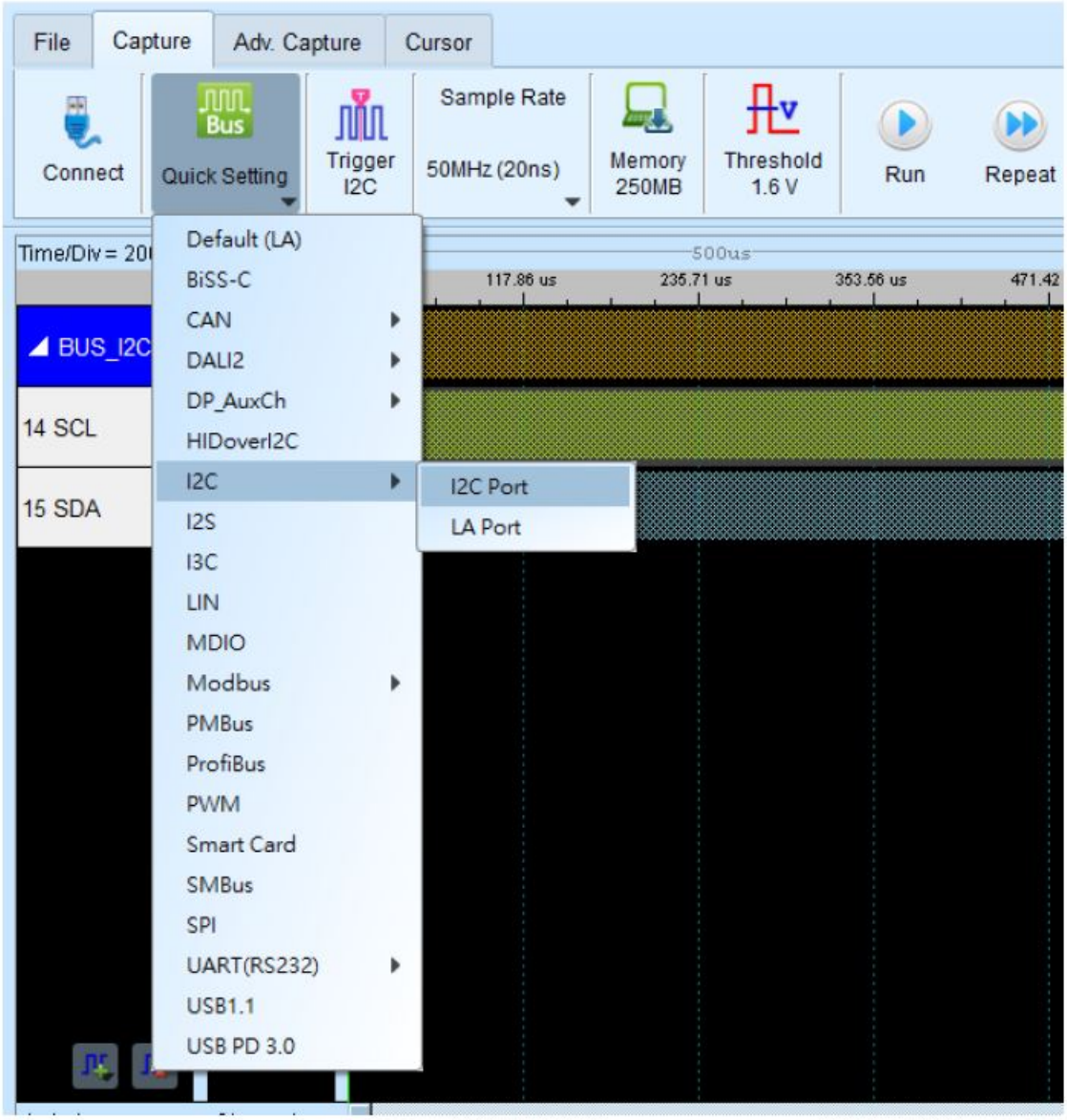
Protocol Analyzer mode

Please modify the channel settings in the Protocol Setting.



Logic Analyzer mode

Use Quick Setting to change channel settings. Warning: Don’t change the trigger type after quick setting, or the dedicated channel can’t not use.



(If the I2C port is on, only the I2C Clause Trigger can use. If change to the other trigger mode, the I2C port can’t use. Unless re-Quick Setting.)

Specifications

Model		TB3016F	TB3016E	TB3016B
Power	Power Source	USB bus-power (+5V)		
	Static Power Dissipation	0.75W		
	Max Power Dissipation	< 2.5W		
Hardware Interface		USB 3.0		
Timing Analysis (Asynchronous, Max. Sample Rate)		800MHz*		

State Clock Rate (Synchronous, External Clock)		200MHz*	
Channels (Data / CLK / I2C / DP_Aux / CAN / RS485)		16 / 1 / 2 / – / –	16 / 1 / 2 / 2 / 4
Timing Vs Channels	Timing Analysis	Available channels	
	800 MHz	8	
	400 MHz	16	
	200 MHz	16	
Threshold	Group	2 (ch0~7, ch8~15 & clk0)	
	Range	±6V	
	Resolution	50mV	
	Accuracy	±100mV + 5%*Vth	
Trigger	Time resolution	5 ns	
	Channels	16 (Max.)	
	Pre/Post Trigger Setting	Yes	
	Pass Counter	Yes (0~65536 times)	
	Event Types	Channel, Pattern, Single, Width, Time-out, External	
	Module I	I2C, MIPI I3C 1.1, SPI, UART (RS232)	
	Module II	—	HID over I2C , I2S , LIN2.2, MDIO, PMBus, SMBus, USB1.1
	Module III	—	BiSS-C, CAN2.0B, CAN-FD, DALI2.0, DP_AUX, SENT, Modbus, ProfiBus, RS422, RS485, USB PD 3
	Input port (for Stack)	—	TTL 3.3V
	Output port (for Stack)	—	TTL 3.3V
Input Voltage	Maximum	±40V DC, 15Vpp AC	

	Sensitivity	0.5Vpp @150MHz		
Impedance		200KΩ // < 5pF		
Maximum target signal speed		Data Port: 14 MHz, CAN Port: 10 Mbps, I²C Port: 400 KHz 3.3V, RS485 Port: Baud rate 20 Mbps		
Temperature	Operating / Storage	5°C ~ 45°C (41°F ~ 113°F)) / -10°C ~ 65°C (-14℉ ~ 149℉)		
Protocol Analyzer	Module I	I2C, MIPI I3C 1.1, SPI, UART (RS232)		
	Module II	—	HID over I²C, I²S, LIN2.2, MDIO, PMBus, SMBus, USB1.1	
	Module III	—	—	BiSS-C, CAN2.0B, CAN-FD, DALI2.0, DP_Aux, Modbus, Profibus, PWM, RS422, RS485, USB PD 3
Software features	Bus decode	1-Wire, 3-Wire, 7-Segment, AccMeter, ADC, APML, BiSS-C, BSD, CAN2.0, CAN FD, Close Caption, CODEC_SSI, DALI2.0, Digital LED, DMX512, DP_Aux, EDID, FlexRay, HDLC, HDQ, HID over I²C, I²C, I²C EEPROM, I²S, ITU656, IrDA, JTAG, JVC IR, LCD1602, LIN2.2, Line Decoding, Line Encoding, LPT, M-Bus, Math, MDIO, MHL Cbus, Microwire, Mini/Micro LED, MIPI CSI LP, MIPI DSI LP, MIPI I3C 1.1, MIPI SoundWire, Modbus, NEC IR, PECI, PMBus, Profibus, PS/2, PWM, QEI, QI, RC-5, RC-6, RT_SWI, SDQ, SENT, SGPIO, Smart Card (ISO7816), SMBus, SMI, SPI, SSI, ST7669, SWD, SWIM, SWP, UART, UNI/O, USB1.1, USB PD 3, Wiegand		

	Sensitivity	0.5Vpp @150MHz		
Impedance		200KΩ // < 5pF		
Maximum target signal speed		Data Port: 14 MHz, CAN Port: 10 Mbps, I²C Port: 400 KHz 3.3V, RS485 Port: Baud rate 20 Mbps		
Temperature	Operating / Storage	5°C ~ 45°C (41°F ~ 113°F)) / -10°C ~ 65°C (-14℉ ~ 149℉)		
Protocol Analyzer	Module I	I2C, MIPI I3C 1.1, SPI, UART (RS232)		
	Module II	—	HID over I²C, I²S, LIN2.2, MDIO, PMBus, SMBus, USB1.1	
	Module III	—	—	BiSS-C, CAN2.0B, CAN-FD, DALI2.0, DP_Aux, Modbus, Profibus, PWM, RS422, RS485, USB PD 3
Software features	Bus decode	1-Wire, 3-Wire, 7-Segment, AccMeter, ADC, APML, BiSS-C, BSD, CAN2.0, CAN FD, Close Caption, CODEC_SSI, DALI2.0, Digital LED, DMX512, DP_Aux, EDID, FlexRay, HDLC, HDQ, HID over I²C, I²C, I²C EEPROM, I²S, ITU656, IrDA, JTAG, JVC IR, LCD1602, LIN2.2, Line Decoding, Line Encoding, LPT, M-Bus, Math, MDIO, MHL Cbus, Microwire, Mini/Micro LED, MIPI CSI LP, MIPI DSI LP, MIPI I3C 1.1, MIPI SoundWire, Modbus, NEC IR, PECI, PMBus, Profibus, PS/2, PWM, QEI, QI, RC-5, RC-6, RT_SWI, SDQ, SENT, SGPIO, Smart Card (ISO7816), SMBus, SMI, SPI, SSI, ST7669, SWD, SWIM, SWP, UART, UNI/O, USB1.1, USB PD 3, Wiegand		

Model		TB1016E	TB1016B	TB1016B+
Power	Power Source	USB bus-power (+5V)		
	Static Power Dissipation	0.75W		
	Max Power Dissipation	< 2.5W		
Hardware Interface		USB 3.0 (USB 2.0 Compatible)		
Timing Analysis (Asynchronous, Max. Sample Rate)		200MHz*		
State Clock Rate (Synchronous, External Clock)		200MHz*		
Channels (Data / CLK / I2C / CAN / RS485)		16 / 1 / 2 / – / –	16 / 1 / 2 / 2 / 4	
	Time resolution	5 ns		

Trigger	Channels	16 (Max.)		
	Conditions	Yes (4)		
	Pre/Post Trigger Setting	Yes		
	Pass Counter	0~65536 times		
	Event Types	Pattern, Channel, Transition, Width		
	Module I	DALI, HID over I2C, I2C, I2S, LIN, MDIO, PMBus, RS232, SMBus, SPI, USB1.1		
	Module II	—	CAN, Modbus, ProfiBus, RS422, RS485	
	Module III	—	—	BiSS-C
	Input port (for Stack)	—	TTL 3.3V	
	Output port (for Stack)	—	TTL 3.3V	
	Range	-6V ~ +6V		
	Voltage resolution	50mV		
Threshold	Accuracy	±100mV + 5%*Vth		
Input Voltage	Maximum	±40V DC, 15Vpp AC		
	Sensitivity	0.5Vpp @150MHz		
Impedance		200KΩ // < 5pF		
Temperature	Operating Temperature	5°C ~ 45°C (41°F ~ 113°F)		
	Storage Temperature	-10°C ~ 65°C (14°F ~ 149°F)		
Bus Decode	Module I	DALI, HID over I2C, I2C, I2S, LIN, MDIO, PMBus, RS232, SMBus, SPI, USB1.1		
	Module II	—	CAN, Modbus, ProfiBus, RS422, RS485	
	Module III	—	—	BiSS-C, PWM

Measure signal under 14MHz ONLY due to data transmission limitation

Service
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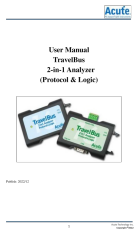
Troubleshooting:
If the TravelBus is in “Demo mode”, please follow the steps below:

1. Use the USB3.0 cable (only) in the product package.
2. Check if the USB driver is in the Device Manager.

3. Install the latest version software from https://www.acute.com.tw/logic-analyzer-en/support/download/software
4. Re-plug the USB3.0 cable or reboot the OS to check if the USB driver exists.
5. Contact us for further help if above procedures do not work.

Documents / Resources

	Acute TravelBus Series 2 In 1 Protocol and Logic Analyzer [pdf] User Manual TravelBus Series, 2 In 1 Protocol and Logic Analyzer, TravelBus Series 2 In 1 Protocol and Logic Analyzer, Protocol and Logic Analyzer, Logic Analyzer, Protocol Analyzer, Analyzer, TB3016F, TB3016E, TB3016B

References

- Logic Analyzer - Acute
- Logic Analyzer - Acute
- Software - Acute
- User Manual