

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



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Chapter 1 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).



Chapter 2 Operations

Protocol Analyzer

Main Window

	📇 A	cute TravelBu	s										-		×	
	File	Capture														
1)-	> ₫	, Inn. Bus	40, 6	I Mavet	form	D	Q	Se	arch		Search All F	ield 🔻				
		Timestamp		Status	Address	RW	Data			ASCII	Information	Detail		G		
	2796	0:00:00.	802996820	Start	0046*	Wr	21*	3A*		!:		10* 20	* 30*	-		
	2797	0:00:00.	803283900	Start	0012*	Wr	10*	20*	30*	. 0						
ົງ-	2798	0:00:00.	803662660	Start	003F*	Rd	00*			•						
U	2799	0:00:00.	803858900	Start	0046*	Wr	21*	3A*		1:						
	2800	0:00:00.	804146000	Start	0012*	Wr	10*	20*	30*	. 0	00-					
	2801	0:00:00.	804524740	Start	003F*	Rd	00*			•						
	2802	0:00:00.	804721000	Start	0046*	Wr	21*	3A*		!:						
	2803	0:00:00.	805008080	Start	0012*	Wr	10*	20*	30*	. 0						
	2804	0:00:00.	005300040	Start	0032*	Ka	21*	27.*		•	<u> </u>					
	1	10.00.00.	005505000	Juare	10010	147	21-	JM.		1		Detail	Naviga	tor Fil	ter	
	Wayof	orm													G	
	Vaven	VIIII		B									c		i	
	Time D)iv = 50 us			793.35 us		84	13.35 us	¢	893.35	us 943.35	us	993.35 LS		1.4 ms	
	Decod	de I2C		VVr N		10	0 N 20				20	N 30 N				
3-	СК		O	$\int \int \int$										\prod		
	SDA		1	20 us	30 us		40 u	ıs	2	0 us	50 us	20 us	20 us	40 us		
	Label		Channel	4											•	
4)-	acket:	22923 (E:0)	Connected 12	C 00:00:06	5700:04:53			2%		SN:20	0150604#12 (USB 3.0) <mark>8</mark> 500i	us <mark>c</mark> 500u	s 🧧 500u	us 🖸	+
	P:	rotocol Analyze	r-untitled 1. TBV	* X / .												

- 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 I^2C .

Protocol Select	\times
BiSS-C CAN 2 0B DAU HD Over I2C I2S LN MDIO Modbus PMBus ProfiBus SPI UARTIRS422/485 USB 1.1 Channel O I2C Pot LA Pot SDA 1 USB 1.1 Channel O USCK 0 SDA 1 USB 1.1 Channel O USCK 0 SDA 1 USB 1.1 Coptions O C USB 1.1 C C C C C C C C C C C C C C C C C C	
Default OK Cancel	

2. Channel :

Choose either I²C ports or LA ports (channel $0\sim15$) 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

Protocol Select	×
BiSS-C CAN 2.0B DALI HD Over I2C Channel IZS LIN Motious ProfiBus SPR SPR USB 1.1 I A Port SCK Image: Comparison of the second sec	



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



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**.

Graphic Settings	? ×
Line Display Setting	
PWM #1	-
Line Color	•
Line Width 2	•
XAxis	
View Last Point(s)	-
500	Point(s)
YAxis	
User Defined	-
Maximum 80.00	%
Minimum 20.00	%
	OK Cancel

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

🚢 Acute TravelBus File Capture . . Bus ✓ ∭ Waveform 10% Search Search All Field 💌 A V =, Address Status RW Data Timestamp

Click **Waveform** to store the protocol data with waveform.

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

1	0 ,	5	U	2
Protocol Select				×
BiSS-C CAN 2.0B DALI HID Over I2C I2C I2S LIN MDIO Modbus PMBus ProfiBus PWM SMBus SPI UART/RS422/485 USB 1.1	Channel I2C Port LA Port SCK 0 SDA 1 5 5 5 5 5 5 5 5 5 5 5 5 5	⊥ 1 3 5 0 ⊥ 0 2 4 0 S Sus 5us 5us 5us	7 9 1	LK ⊥ SDA ↓ SCL 100 KHz 100 KHz
	Threshold		ck select 5V (Threshold 1.8V)	-
	Default			OK Cancel



Click	k Run (🜔) to capt	ture the	data.							
🚟 Acut	e TravelBus										x i
File	Canture										
	Bus 🖏 🗹 M Wa	aveform	Run Sea	arch	∧ ∨ Search	All Field	2 🛓	57			
Tim	nestamp	Status	Address RV	/ Data		ASCII	Information	-	Detail		×
9373	0:00:02.693043700	Start	0046* Wr	21*	3A*	11			µ0* 20*	30*	
9374	0:00:02.693330780	Start	0012* Wr	10*	20* 30*	. 0					
9375	0:00:02.693709540	Start	003F* Rd	. 00*		•					
9376	0:00:02.693905780	Start	0046* Wr	21*	3A*	!:					
9377	0:00:02.694192880	Start	0012* Wr	10*	20* 30*	. 0					
9378	0:00:02.6943/1620	Start	003F* RG	21*	27.*	•					
9379	0:00:02.695054960	Start	0012* Wr	10*	20* 30*						
9380	0:00:02.695433720	Start	003F* Bd	00*	20 00						
9382	0:00:02.695629960	Start	0046* Wr	21*	3A*	11					
9383	0:00:02.695917060	Start	0012* Wr	10*	20* 30*	. 0					
9384	0:00:02.696295800	Start	003F* Rd	. 00*							
			1 1	-				Þ	De	Navigator	r Fil
Waveform	n										6
	A.		в			C)		D			3
Time Div:	= 200 us	239.23 us	478.46 us	717.	70 us 956	.93 us	1.19 ms	1.43 ms	1.67 ms	1.1	91 m s
Decode	120	10	20 30	00	21	AE	10 20	30 00	21	за	
SCK	o										
SDA								80 us			IM -
Lapel											
Packet: 93	89 (E:0) Connected I2C 00:00	:02 / 00:03:01	1%	SN:2	0150203#03 (USB 3	3.0)		<mark>8</mark> 500us	c 500us 0	500us 🕒	U m
Prote	ocol Analyzer-untitled 1. TBW* 🗙 🖊	J.									

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**.

A 184	🚔 Acute TravelBus									
File	Capture									
			\mathbb{V}							
	Timestamp	Status	Address	RW	Data	ASCII				
9371	0:00:02.692468700	Start	0012*	Wr	10* 20* 30*	. 0				
9372	0:00:02.692847440	Start	003F*	Rd	00*	•				
9373	0:00:02.693043700	Start	0046*	Wr	21* 3A*	1:				
9374	0:00:02.693330780	Start	0012*	Wr	10* 20* 30*	. 0				
9375	0:00:02.693709540	Start	003F*	Rd	00*	•				
9376	0:00:02.693905780	Start	0046*	Wr	21* 3A*	1:				
9377	0:00:02.694192880	Start	0012*	Wr	10* 20* 30*	. 0				
9378	0:00:02.694571620	Start	003F*	Rd	00*	•				
9379	0:00:02.694767880	Start	0046*	Wr	21* 3A*	1:				
9380	0:00:02.695054960	Start	0012*	Wr	10* 20* <mark>21* 3A*</mark>	. 0				
9381	0:00:02.695433720	Start	003F*	Rd	00*	•				
0202	0.00.02 695629960	Start	0046*	Wr	21* 33*	1.4				



Logic Analyzer



- 1. Toolbar includes Trigger, Sample Rate, Threshold and Run.
- 3. **Report Window** displays either the data (CH-00) or decode () which can be exported text file in .csv or .txt ().
- 4. **Status Bar** shows 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.





Single Level Trigger Settings

∭ Single Level Trigge	r Settings				? ×
Char					
7 X 6 X	5 X ,	4 X	3 X 2 X	1 X	0 †,
15 X , 14 X ,	13 🗙	12 X	11 X 10 X	9 X	8 X
			Pass Cou	nt 🖉 🖸	-
 Default 			🛩 ОК	3	Cancel

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



Memory Usage (

🚔 Memory Usage			×
Available Memory:			250 MB
	6%		
Trigger Position	< 50%		-
		✓ OK	× Cancel

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.

		<u>,T</u>			
Time Div = 50 us		65.1 us	130 us	195 us	260 s 326 us
СН-00	0			CH-00 Transition= Interval=99	19 .632us
CH-01	1		20 us 20 u	IS 30 US 4U	100KHz us 20 us 50 us
Decode I2C	1,0	s	Addr:12	N 10	N 20
ıπ" ιπ					



Bus Decode Setting

I²C example

I C Untur	npre													
🚟 Acute TravelBus	5													
File Capture	Cursor													
Connect (D	nc. Mode refault)	r 1MHz (1us)	Memory 250 MB	Three 1	eshold 1.6 V	Run)					Zoom	Stack DSC	Demo) Phase [
		001 не	070	व	1.08 mc		1.12	me		21 mc	1.20 m	-	1.27 mc	1.4
Time Div = 50 us		aurus	ara us		1.00 ms		1.15	, III.S	· · · ·	.211115	1.281	IS	1.37 ms	1.4
сн-00	o			I2C Set	tings	_							?	×
			יטטטו	Paramet	Channel	\mathcal{O}				0				
CH-01	1	40 us	80 u		Clock	Channel	(SCL)	CH 0		•	Addr	ess 📃		_ ~ s
					Data	Channel ((SDA)	CH 1		•	Data W	/rite		
Decode	Label Name	Decode	F				3	1		•	Data R	ead 🔽		
120	Color		-		Address	mode addressir	খ				Unkno	own		
		CH2 -			O 7-bit	addressir	∙∍ na (Incli	ude R /W i	n Addres	s)	S	tart 📃		
	Group (Bus)		-		0.10.6	it addrose	ina			-/	Re-S	tart 📕		
	Bus Decode 120				0100		any.				s	top		
	• Dus Decode 120	, Ľ	*		Report									
					Show da	ata in rep	ort 8	Column	`	~	N			
					☑ Ignore	glitch	5							<u> </u>
N, N				Range			J				Reserved Add	ress		<u> </u>
Labol	Chapped 4			inn:	Decode Ra	ange								
Lanel					From		1	То						
CH-00 Bus	H			6	Buffer He	ead	~	Buffer Ta	iil	\sim				(
Sample	Status	Address	D0								De	fault	ОК	ancel
555us	Start	Wr 12	10	20	30						. 0			

- 1. Left-click on any channel and choose Bus Decode.
- 2. **Channel** is to set the clock and data channels.
- 3. Address mode :
 - 7-bit addressing.

7-bit addressing (including R/W in Address) will show 8-bit addressing including 7-bit

address and 1-bit Rd/Wr.

10-bit addressing.

- 4. **Report** is to show either 8- or 16-columns data in the Report Window.
- 5. **Ignore glitch** will ignore those glitches occurred when high sample rates on the slow slew-rate transitions.
- 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
	DS-1000		
Acute	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
DSO-X 3000T Keysight 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 TravelBus'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 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 → TravelBus's Trig-In (see Figure 2).



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:

Demo Stack DSO 0 ps	
🖏 DSO Stack Settings 🛛 🗙	DSO Stack Settings X
Select the DSO	Select the DSO
Select DSO brand Emulation Connection Type USB OTCP / IP Connect IP: 192.168.1.3	Select DSO brand Emulation Emulation Acute Agilent GwInstek HAMEG Keysight LeCroy Rohde & Schwarz Tektronix
Connection Status	Connection Status
Connection:	Connection:
Test Connection VOK XCancel	Test Connection VOK XCancel

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 = 100 ι	us	298.53 us	398.53 us	498.53 us	598.53 us	698.53 us	798.53 us	898.53 us	998.53 us	1.1 ms	1.2 ms
		\$	Addr:76			A			12		A A
▲ BUS_I2C	SCL-A0					499.7	7 us				
I2C	SDA-A1					490.6	6 us				
											2 V/Div Offset-3.3 Scale
DSO CH1	DSO CH1								表示的目的目标。		
									┉┉┉┙┊┊╞╘╞╞┝┝		
											Offset-3.2 Scale
DSO CH2	DSO CH2		titinited by the								
W W											
Label	Channel	4	i					i	i i	i	• •

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" \rightarrow "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.







Chapter 3 Dedicated Channel Description

I2C $\$ DP AUX port are supported on the TB2000/TB3000 series $\frac{\pm 0}{\pm 0} \underbrace{3}_{5} \underbrace{7}_{9} \underbrace{0}_{6} \underbrace{3}_{5} \underbrace{CLK} \pm \underbrace{SDA}_{4} \\
\pm \underbrace{0}_{2} \underbrace{4}_{6} \underbrace{6}_{3} \underbrace{0}_{2} \underbrace{2}_{6} \pm \underbrace{+}_{5} \underbrace{SCL}_{4} \\
\underbrace{\pm 0}_{2} \underbrace{3}_{6} \underbrace{5}_{9} \underbrace{0}_{6} \underbrace{6}_{5} \underbrace{CLK} \pm \underbrace{SDA}_{4} \\
\underbrace{\pm 0}_{2} \underbrace{4}_{6} \underbrace{6}_{3} \underbrace{0}_{2} \underbrace{2}_{6} \pm \underbrace{+}_{5} \underbrace{SCL}_{4} \\
DP AUX$

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

Protocol Select	×
BISS-C CAN FD DALI 20 DP-AUX HID Over I2C I2S I3C LIN 2.2 MDIO Modbus PMBus SPH BUS SPH RS223/422/485 USB P1.1 Cptions Treshold Threshold	
○ Default	

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.)



Chapter 4 Specifications

Model		TB3016F	TB3016E	TB3016B		
	Power Source	USB bus-power (+5V)				
Power	Static Power Dissipation	0.75W				
	Max Power Dissipation	< 2.5W				
Hardware Inter	face			USB 3.0		
Timing Analys	is			800MHz*		
(Asynchronous	s, Max. Sample Rate)					
State Clock Ra	te			200MHz*		
(Synchronous,	External Clock)					
Channels		16 / 1 /	2/-/-	16 / 1 / 2 / 2 / 4		
(Data / CLK / 1 RS485)	I ² C / DP_Aux / CAN /					
 .	Timing Analysis		Ava	ilable channels		
Timing	800 MHz			8		
VS	400 MHz			16		
Chamlers	200 MHz	16				
	Group	2 (ch0~7, ch8~15 & clk0)				
Threshold	Range	±6V				
Inresnoid	Resolution	50mV				
	Accuracy	$\pm 100 mV + 5\% *V th$				
	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, Extern				
	Module I	I^2	C, MIPI I3C	1.1, SPI, UART (RS232)		
Trigger	Module II	HID over I ² C , I ² S , LIN2.2, MDIO, H SMBus, USB1.1		² C , I ² S , 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		$200 \mathrm{K}\Omega$ // $< 5 \mathrm{pF}$					
Maximum target signal speed		Data Port: 14 MHz, CAN Port: 10 Mbps, I ² C 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°F ~ 149°F)			
	Module I	I ²	C, MIPI I3C	1.1, SPI, UART (RS232)			
Protocol	Module II		HID over I ² C, I ² S, LIN2.2, MDIO, PMB SMBus, USB1.1				
Analyzer	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, APM BiSS-C, BSD, CAN2.0, CAN FD, Close Caption CODEC_SSI, DALI2.0, Digital LED, DMX512, DP_Aux, EDID, FlexRay, HDLC, HDQ, HID over PC, PC EEPROM, PS, ITU656, IrDA, JTAG, JVC LCD1602, LIN2.2, Line Decoding, Line Encoding, I M-Bus, Math, MDIO, MHL Cbus, Microwire, Mini/Micro LED, MIPI CSI LP, MIPI DSI LP, MIPI 1.1, MIPI SoundWire, Modbus, NEC IR, PECI, PMI Profibus, PS/2, PWM, QEI, QI, RC-5, RC-6, RT_S' SDQ, SENT, SGPIO, Smart Card (ISO7816), SMB SMI, SPI, SSI, ST7669, SWD, SWIM, SWP, UAR UNI/O, USB1 1, USB PD 3, Wiegand 					

* Measure signal under 14 MHz ONLY due to data transmission limitation.



Model		TB2016F	B2016F TB2016E TB2016B					
Power Source			USB bus-power (+5V)					
Power	Static Power Dissipation		0.75W					
Max Power Dissipation			< 2.5W					
Hardware	Interface		U	ISB 3.0				
Timing A	nalysis		20	0MHz*				
(Asynchro	onous, Max. Sample Rate)							
State Cloc	ek Rate		20	0MHz*				
(Synchron	nous, External Clock)							
Channels (Data / CI	LK / I ² C / CAN / RS485)	16 / 1 /	/2/-/-	16 / 1 / 2 / 2 / 4				
	Time resolution		·	5 ns				
	Channels		1	6 (Max.)				
	Conditions			Yes (4)				
	Pre/Post Trigger Setting			Yes				
	Pass Counter		0~6	55536 times				
	Event Types	Channe	l, Pattern, Sing	gle, Width, Time-out, External				
	Module I		I ² C, RS232, SPI					
	Module II		HID over I ² C , I ² S , LIN2.2, MDIC PMbus, SMBus, USB1.1					
Trigger	Module III			BiSS-C, CAN2.0B, CAN-FD, DALI2.0, DP_AUX, SENT, Modbus, ProfiBus, RS422, RS485, USB PD3.0				
	Input port (for Stack)			TTL 3.3V				
	Output port (for Stack)			TTL 3.3V				
	Range		-6V ~ +6V					
	Voltage resolution		50mV					
Threshold	Accuracy		$\pm 100 \text{mV} + 5\% \text{*Vth}$					
Input	Maximum		±40V D	C, 15Vpp AC				
Voltage	Sensitivity		0.5Vpp @150MHz					
Impedance		Impedance						
Temperatu	Operating Temperature		5°C ~ 45°C (41°F ~ 113°F)					
	Storage Temperature		-10°C ~ 65°	C (14°F ~ 149°F)				
	Module I	DALI, H	$\frac{10 \text{ over } I^2C, I^2}{RS232, SM}$	C, I ² S, LIN, MDIO, PMBus, Bus, SPI, USB1.1				
Bus Deco	de Module II		CAN, Mod	ous, ProfiBus, RS422, RS485				
	Module III			BiSS-C, PWM				

*Measure signal under 14MHz ONLY due to data transmission limitation



Model		TB1016E	TB1016B	TB1016B+			
Power Source		USB bus-power (+5V)					
Power	Static Power Dissipation	0.75W					
	Max Power Dissipation	< 2.5W					
Hardware Inter	rface	USB 3.	.0 (USB 2.0 Co	ompatible)			
Timing Analys	is		200MHz*				
(Asynchronous	s, Max. Sample Rate)						
State Clock Ra	ite		200MHz*				
(Synchronous,	External Clock)						
Channels	2	16 / 1 / 2 / - / -	16 /	1/2/2/4			
(Data / CLK / 1	I ² C / CAN / RS485)						
	Time resolution		5 ns				
	Channels		16 (Max.)				
	Conditions		Yes (4)				
	Pre/Post Trigger Setting		Yes				
	Pass Counter	0~65536 times					
	Event Types	Pattern, Channel, Transition, Width					
Trigger	Module I	DALI, HID over I ² C, I ² C, I ² S, 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			
La mart Malta a s	Maximum	±40V DC, 15Vpp AC					
Input voltage	Sensitivity	0.5Vpp @150MHz					
Impedance	·	$200 \text{K}\Omega // < 5 \text{pF}$					
Operating Temperature		5°C ~ 45°C (41°F ~ 113°F)					
Temperature	Storage Temperature	-10°C ~ 65°C (14°F ~ 149°F)					
	Module I	DALI, HID o PMBus, R	over I ² C, I ² C, I S232, SMBus,	² S, LIN, MDIO, SPI, USB1.1			
Bus Decode	Module II	CAN, Modbus, ProfiBus, RS422, RS485					
	Module III			BiSS-C, PWM			

*Measure signal under 14MHz ONLY due to data transmission limitation



Chapter 5 Service

Contact information: Website: <u>http://www.acute.com.tw</u> E-Mail: <u>service@acute.com.tw</u> Phone: +886-2-2999 3275 Fax: +886-2-2999 3276

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.