USB-4716
200kS/s, 16-bit Multifunction USB Module
Startup Manual

Packing List

Before installation, please make sure that you have received the following:

1. USB-4716 USB Module x 1
2. Shielded USB 3.0 Cable (1m) x 1
3. DIN-rail mounting kit x 1
4. Startup Manual

If any of these items are missing or damaged, please contact your distributor or sales representative immediately.

User Manual

Please refer to Advantech support portal for the manual.

https://www.advantech.com/support

User Manual

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause interference in which case the user is required to correct interference at his own expense.

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This kind of cable is available from Advantech. Please contact your local supplier for ordering information.

For more information on this and other Advantech products, please visit our website at:

http://www.advantech.com

For technical support and service, please visit our support website at:

http://support.advantech.com

This manual is for the USB-4716.

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Overview

USB-4716 is a 16-bit multifunction module with 200kS/s maximum sampling rate. It provides 16 single-ended/8 differential AI channels along with 2 AO channels. It also offers 8 TTL DI/O channels for on-off control applications. Besides, one 16-bit counter channel is available onboard.

Specifications

Analog Input

Channels	16-ch single-ended/ 8-ch differential						
Resolution	16 bits	FIFO Size	1024 Samples				
Sampling Rate	200 kS/s						
Input Range and Gain List	**Gain**		0.5	1	2	4	8
	Gain Code		4	0	1	2	3
	Bipolar (V)		±10	±5	±2.5	±1.25	±0.625
	Unipolar (V)		N/A	0~10	0~5	0~2.5	0~1.25
Drift	**Gain**		0.5	1	2	4	8
	Zero (μV/° C)		±30				
	Gain (ppm/° C)		30	30	30	30	30
Small Signal Bandwidth for PGA	**Gain**		0.5	1	2	4	8
	Bandwidth (MHz)		1.1	1.1	1.1	1.1	1.1
Input Protection	30 V max.						
Input Impedance	1GW						
Input Comm. Mode Voltage	11V						
Accuracy	**DC**	INLE	1LSB				
		DNLE	3LSB				
		Gain	0.5	1	2	4	8
		Gain Error (% of FSR)	0.015	0.03	0.03	0.05	0.1
	AC	SINAD	83 dB				
		THD	-88 dB				
		ENOB	13.5 bit				

Specifications (Cont.)

Analog Output

Channels	2		
Resolution	16 bits	FIFO Size	N/A
Throughput	2 kHz		
Operating Mode	Single output		
Output Range	0~5, 0~10, ±5, ±10 V		
Accuracy	DC	INLE	±2LSB
		DNLE	±1LSB
Dynamic Performance	Slew Rate	0.125 V/μs	
	Settling Time	150 μs (to ±1/2 LSB of FSB)	
Driving Capability	5 mA		
Output Impedance	0.1W max.		

Non-Isolated Digital Input/Output

Input Channels	8 Non-Isolation TTL	
Input Voltage	Low	0.0 Vdc (Min) / 1.0Vdc (Max)
	High	2.0 Vdc (Min) / 5.0Vdc (Max)
Output Channels	8 Non-Isolation TTL	
Output Voltage	Low	0.4 Vdc / -6mA (Sink)
	High	2.4 Vdc / 6mA (Source)

Counter

Channels	1		
Resolution	32-bit base	Capability	TTL level
Input Frequency	1 kHz max.		
Clock Input	Low	0.0 Vdc (Min) / 1.0 Vdc (Max)	
	High	2.0 Vdc (Min) / 5.0 Vdc (Max)	
Gate Input	Low	0.0 Vdc (Min) / 1.0 Vdc (Max)	
	High	2.0 Vdc (Min) / 5.0 Vdc (Max)	

General

I/O Connector Type	Removable 10-pin screw terminal x 5	
Dimensions	132 X 80 X 32 mm (5.2” X 3.2” X 1.3”)	
Power Consumption	360 mA @ +5.0V Typical 450 mA @ +5.0 V max.	
Temperature	Operation	0~60° C (32~140° F) (refer to IEC 68-2-1, 2)
	Storage	-20~70° C (-4~158° F)
Relative Humidity	5~ 95 % RH non-condensing (refer to IEC 68-2-1, 2)	

Installation

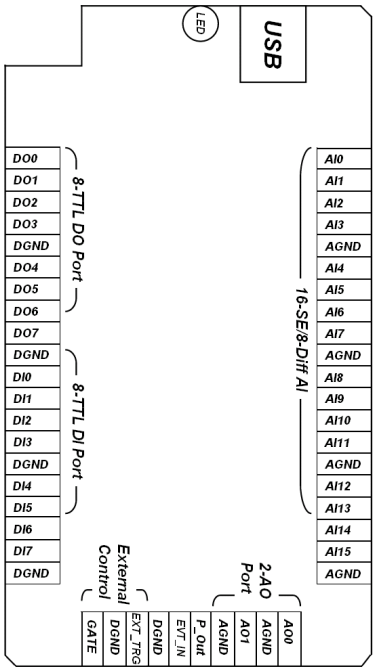
Hardware Installation

After the device driver installation is completed, you can now go on to install the USB-4716 module in any USB port that supports the USB 3.0 super speed on your computer.

Please follow the steps below to install the module on your system:

1. Touch the metal part on the surface of your computer to neutralize the static electricity that might be in your body.
2. Plug your USB module into the selected USB port. Use of excessive force must be avoided; otherwise the module might get damaged.

Pin Assignments



Signal Name	Reference	Direction	Description
AI<0…15>	AGND	Input	Analog Input Channels 0 through 15.
AIGND	-	-	Analog Input Ground.
AO0 AO1	AGND	Output	Analog Output Channels 0/1.
AOGND	-	-	Analog Output Ground. The analog output voltages are referenced to these nodes.
DI<0..7>	DGND	Input	Digital Input channels.
DO<0..7>	DGND	Output	Digital Output channels.
DGND	-	-	Digital Ground. This pin supplies the reference for the digital channels at the I/O connector.
GATE	DGND	Input	A/D External Trigger Gate. When GATE is connected to +5V, it will disable the external trigger signal to input.
EXT _TRG	DGND	Input	A/D External Trigger. This pin is external trigger signal input for the A/D conversion. A low-to-high edge triggers A/D conversion to start.
EVT_IN	DGND	Input	External events input ch.
P_OUT	DGND	Output	Pulse output channel

LED Definitions

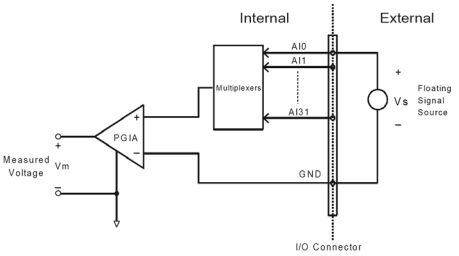
The USB Module is equipped with a LED indicator to show the current status of the device. When you plug the USB device into the USB port, the LED indicator will blink five times and then stay lit to indicate that it is on. Please refer to the following table for detailed LED indicator status information

LED Status	Description
On	Device ready for work
Off	Device not ready to work
Slow Blinking (5 times)	Device initialization
Fast Blinking (Based on data transfer speed).	Device working

Input Connections

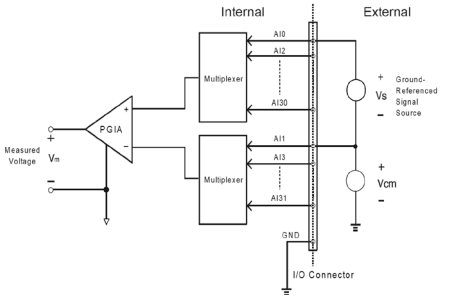
Analog Input - Single-ended Channel Connections

The single-ended input configuration has only one signal wire for each channel, and the measured voltage (Vm) is the voltage of the wire referred to the common ground.



Analog Input - Differential Channel Connections

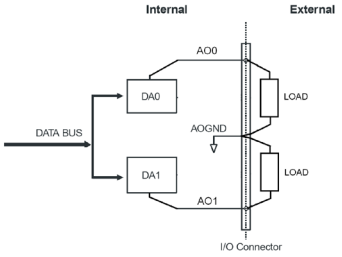
The differential input channels operate with two signal wires for each channel, and the voltage difference between both signal wires is measured. On USB-4716, when all channels are configured to differential input, up to 8 analog channels are available.



Input Connections (Cont.)

Analog Output Connections (Voltage)

USB-4716 provides two analog output channels, AO0 and AO1. The figure below shows how to make analog output connections on USB-4716.



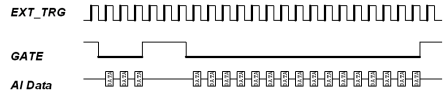
Internal Pacer Trigger Connection

USB-4716 provides two 16-bit counters connected to a 10 MHz clock. Counter 0 is a counter that counts events from an input channel. Counter 1 is a 16-bit timer for pacer triggering. A low-to-high edge from the Counter 1 output will trigger an A/D conversion on USB-4716.

External Trigger Source Connection

In addition to pacer triggering, USB-4716 also allows external triggering for A/D conversions. When GATE is connected to a +5V DC source, the external trigger function is thereby disabled. And the external trigger function will be enabled once the +5V DC source is removed.

External Trigger Mode :



External Trigger Source Connections

In addition to pacer triggering, the USB-4716 card also allows external triggering for A/D conversions. A low-to-high edge coming from EXT_TRG will trigger an A/D conversion on the USB-4716 board.

Note! Don't connect any signal to the EXT_TRG pin when the external trigger function is not being used.

Note! If you use external triggering for A/D conversions, we recommend you choose differential mode for all analog input signals, so as to reduce the cross-talk noise caused by the external trigger source.