

## USB-5801

# 4-Ch, 24-Bit, 192 kS/s Dynamic Signal Acquisition USB 3.0 I/O Module with Analog Output and Tachometer Startup Manual

### Packing List

Before installation, please ensure that the following items are included with the product:

- 1 x USB-5801 module
- 4 x Terminal blocks
- 1 x USB 3.0 lockable cable (1 m)
- 1 x USB-5801 startup manual

If any of the above items are missing or damaged, contact your distributor or sales representative immediately

### User Manual

For more detailed information regarding this product, please download the USB-5801 user manual from the Advantech website.

### Overview

USB-5801 is a highly accurate dynamic signal acquisition USB 3.0 module specifically designed for vibration and acoustic measurements. The module provides four simultaneously sampled 24-bit IEPE sensor inputs with an up to 192 kS/s sample rate for high-resolution measurements. USB-5801 is also equipped with two 24-bit analog outputs with an up to 192 kS/s update rate and two tachometer inputs whose data can be correlated to the sensor data. The built-in USB hub makes this module daisy chainable with other USB-5000 series products.

For more information about this or other Advantech products, visit our website at

<http://www.advantech.com>



For technical support and customer service, visit our support website at

<http://support.advantech.com>

This manual is for USB-5801.

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### Declaration of Conformity

#### 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 such cases, users are required to correct the interference at their 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.

### Specifications

#### Analog Input

- **Channels:** 4 (simultaneous sampling, 50  $\Omega$  pseudo differential configurable)
- **Resolution:** 24 bits (delta-sigma ADC)
- **Max. Sampling Rate:** 1 ~ 192 kS/s
- **Input Coupling:** AC/DC, selectable per channel
- **Trigger Mode:** Start, delay start, stop, delay stop
- **Input Range:**  $\pm 1$  V,  $\pm 2$  V,  $\pm 5$  V,  $\pm 10$  V
- **Offset Error:**  $< \pm 0.2$  mV
- **Gain Error:**  $< \pm 0.02\%$  of full-scale range
- **Total Harmonic Distortion Plus Noise (THD+N):** -95 dB
- **IEPE Excitation:** 2 mA
- **Automatic Calibration:** Yes

#### Analog Output

- **Channels:** 2 (50  $\Omega$  pseudo differential)
- **Resolution:** 24 bits (delta-sigma DAC)
- **Update Rate:** 1 ~ 192 kS/s
- **Output Coupling:** DC
- **Output Range:**  $\pm 1$  V,  $\pm 10$  V
- **Offset Error:**  $< \pm 0.5$  mV
- **Gain Error:**  $< \pm 0.03\%$  of full-scale range

## Specifications (Cont.)

- **Total Harmonic Distortion Plus Noise (THD+N):** -91 dB
- **Trigger Mode:** Start, delay start, stop, delay stop
- **Automatic Calibration:** Yes

### Tachometer Input

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- **Channels:** 2
- **Input Voltage:** Logic 0: 3 V max.  
Logic 1: 10 V min. (30 V max.)
- **Input Frequency:** 5 kHz max.
- **Digital Filter:** 16  $\mu$ s ~ 131 ms
- **Isolation Protection:** 2,500 V<sub>DC</sub>

### Digital Input

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- **Channels:** 4
- **Input Voltage:** Logic 0: 3 V max.  
Logic 1: 10 V min. (30 V max.)
- **Opto-Isolator Response Time:** 100  $\mu$ s
- **Digital Filter:** 16  $\mu$ s ~ 131 ms
- **Isolation Protection:** 2,500 V<sub>DC</sub>

### Digital Output

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- **Channels:** 4
- **Load Voltage:** 5 ~ 40 V<sub>DC</sub>
- **Load Current:** 350 mA/ch (sink)
- **Opto-Isolator Response Time:** 100  $\mu$ s
- **Isolation Protection:** 2,500 V<sub>DC</sub>

### General

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- **Interface:** USB 3.0
- **Data Transfer Rate:** 5 Gbps
- **Connectors:**
  - 6 x BNC (AI and AO)
  - 2 x 10-pin, 3.81-mm terminal blocks (tachometer, trigger, and DI/O)
  - 2 x 3-pin, 3.81-mm terminal blocks (power)
  - 1 x USB 3.0 type A (downstream port)
  - 1 x USB 3.0 type B (upstream port)
- **Dimensions:**  
168 x 120 x 40 mm (6.6 x 4.7 x 1.6 in)
- **Operating Temperature:** 0 ~ 60 °C (32 ~ 140 °F)
- **Storage Temperature:** -40 ~ 70 °C (-40 ~ 158 °F)
- **Storage Humidity:** 5 ~ 95% RH (non-condensing)
- **Power Supply:** External 10 ~ 30 V<sub>DC</sub> or USB bus power
- **Power Consumption:**  
150 mA typ./200 mA max. @24 V external power  
700 mA typ./860 mA max. @5 V bus power

## Driver Installation

We recommend installing the driver before installing the USB-5801 module to guarantee problem-free installation.

The Advantech DAQNAVI Device Drivers setup program for the USB-5801 module can be downloaded from the Advantech website ([www.advantech.com](http://www.advantech.com)). Follow the steps outlined below to install the driver software.

1. Execute the USB-5801 driver package.
2. The driver installation program should be launched. When the setup program is launched, a setup screen will be displayed.
3. Click the "Next" button and wait for driver installation.
4. Click the "Finish" button to exit the setup program.

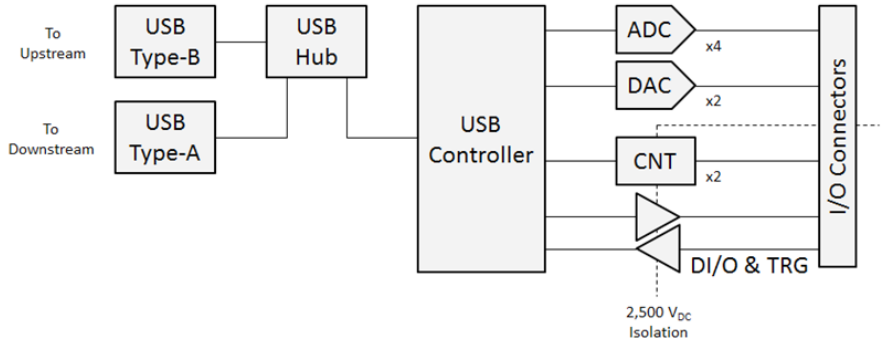
## Hardware Installation

After the device drivers are installed, the USB-5801 module can be installed in the computer. We recommend referring to the user manual or related documentation for detailed instructions. Alternatively, follow the steps outlined below for module installation.

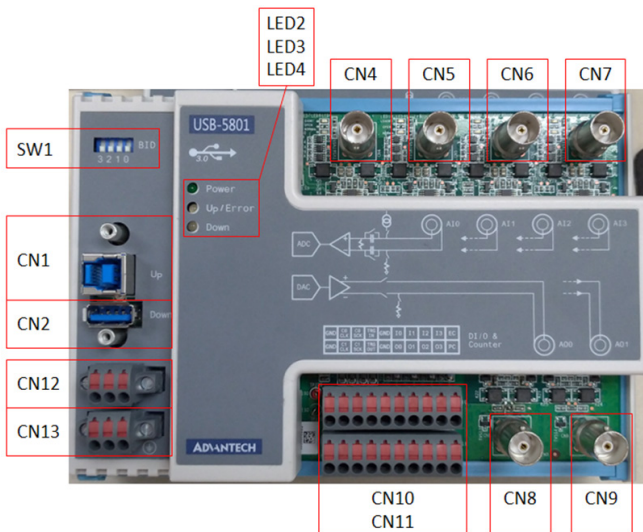
1. Touch any metal surface of the computer to discharge any static electricity that may be in your body.
2. Insert the USB module into the designated USB port. Use caution when inserting the module to avoid damage due to excessive force.

After the module is installed, the device can be configured using the Advantech Navigator Program automatically installed during driver setup. Complete device installation procedures should include device setup, configuration, and testing. Information is provided in the following sections to guide users through the device setup, configuration, and testing.

## Block Diagram



## Connector, Switch, and LED Locations



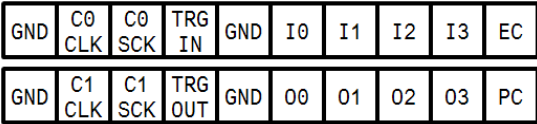
## Board ID Switch and Connectors

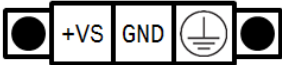

Switch	Description				
SW1	Board ID switch. Refer to the table below for board ID configuration.				
	Board ID	1	2	3	4
	0	↑	↑	↑	↑
	1	↑	↑	↑	↓
	2	↑	↑	↓	↑
	3	↑	↑	↓	↓
	4	↑	↓	↑	↑
	5	↑	↓	↑	↓
	6	↑	↓	↓	↑
	7	↑	↓	↓	↓
	8	↓	↑	↑	↑
	9	↓	↑	↑	↓
	10	↓	↑	↓	↑
	11	↓	↑	↓	↓
	12	↓	↓	↑	↑
	13	↓	↓	↑	↓
14	↓	↓	↓	↑	
15	↓	↓	↓	↓	

Connector	Description
CN1	USB upstream port (USB 3.0 type-B connector with screw). Connect this port to the host or the downstream port of the previous USB module.
CN2	USB downstream port (USB 3.0 type-A connector with screw). Connect this port to the upstream port of the next USB module, if any.

## Pin Assignments

Connector	Pin	Description
CN4	Center pin	Positive terminal of analog input channel 0
	Outer shield	Negative terminal of analog input channel 0
CN5	Center pin	Positive terminal of analog input channel 1
	Outer shield	Negative terminal of analog input channel 1
CN6	Center pin	Positive terminal of analog input channel 2
	Outer shield	Negative terminal of analog input channel 2
CN7	Center pin	Positive terminal of analog input channel 3
	Outer shield	Negative terminal of analog input channel 3
CN8	Center pin	Positive terminal of analog output channel 0
	Outer shield	Negative terminal of analog output channel 0
CN9	Center pin	Positive terminal of analog output channel 1
	Outer shield	Negative terminal of analog output channel 1

Connector	Pin	Description
CN10 & CN11		
	C<0...1>CLK	Clock input for counter channel 0 and 1
	C<0...1>SCK	Sample clock input for counter channel 0 and 1
	TRGIN	Digital trigger input
	TRGOUT	Digital trigger output
	I<0...3>	Digital input channel 0 through 3
	O<0...3>	Digital output channel 0 through 3
	EC	Common point for digital input signals
	PC	Common point for digital output signals
	GND	Ground for digital signals

Connector	Pin Name	Description
CN12 & CN13		
	+VS	External 10 ~ 30 V <sub>DC</sub> power supply
	GND	Power ground
		Chassis ground

Note: CN12 and CN13 are used for power redundancy. External power can be supplied by either connector.

## LED Status Descriptions

LED	State	Description
LED2	Off	Module is not powered on
	Green	Module is powered on using either USB bus power or external power
LED3	Off	Initial state. Module has not been connected
	Green	Upstream port is connected. Module is functioning normally
	Red	Upstream port is not connected or is disconnected. Module function is halted
LED4	Off	Downstream port is not connected
	Blue	Downstream port is connected

LED	State	Description
Near CN4	Off	No sensor is connected to analog input channel 0 or the sensor wire is broken
	Green	Sensor is connected to analog input channel 0 and works normally
	Red	Sensor connected to analog input channel 0 is short circuited
Near CN5	Off	No sensor is connected to analog input channel 1 or the sensor wire is broken
	Green	Sensor is connected to analog input channel 1 and works normally
	Red	Sensor connected to analog input channel 1 is short circuited
Near CN6	Off	No sensor is connected to analog input channel 2 or the sensor wire is broken
	Green	Sensor is connected to analog input channel 2 and works normally
	Red	Sensor connected to analog input channel 2 is short circuited
Near CN7	Off	No sensor is connected to analog input channel 3 or the sensor wire is broken
	Green	Sensor is connected to analog input channel 3 and works normally
	Red	Sensor connected to analog input channel 3 is short circuited

Note: LEDs near CN4 ~ CN7 function only when IEPE is enabled for the corresponding analog input channel.