USB-5200 Series Multifunctional Data Acquisition Devices

User Manual

Rev. C

Smacq

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Smacq.cn

Statement

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http://www.smacq.cn

Safety Requirements

Warning Only the voltage within the specified range can be connected. Voltage exceeding the specified range may cause damage to the device, and even present a negative impact on personal safety. Check the product specification for detailed reference to the range of voltages that can be connected by each port.

Warning Do not attempt to operate the device in other ways that are not mentioned in this document. Incorrect use of the device may be dangerous. In the event of device damage, the internal security protection mechanism will also be affected.

Warning Do not attempt to replace device components or change devices in other ways that are not mentioned in this document. Do not repair the device yourself in the event of a product failure.

Warning Do not use the device in an environment where an explosion may occur or where flammable flue or gas is present. If you must use the device in this kind of environment, please fit it into a proper case.

Warning While the device is running, all chassis covers and fill panels need to be closed.

Warning For equipment with exhaust vents, do not insert foreign objects into the vents or block air circulation in the vents.

Measurement Categories

Warning For use in measurement category I (CAT I) only. Do not use in measurement category II/III/IV. Use this device to connect signals or make measurements.

Measurement categories Note

Measurement categories I (CAT I) means that measurements are made on a circuit that is not directly connected to the main power supply. For example, a circuit that is not exported from the main power supply, especially a circuit that is exported from a protected (internal) primary power supply, is measured. In the latter case, the instantaneous stress will change. Therefore, the user should be aware of the instantaneous affordability of the device.

Measurement categories II (CAT II) means that measurements are made on a circuit that is directly connected to a low-voltage device. For example, a measurement on household appliances, portable tools and similar equipment.

Measurement categories III (CAT III) means that measurements are made in construction equipment. For example, a measurement on the distribution boards, circuit breakers, wiring (including cables, Busbars, junction boxes, switches, sockets) in fixed equipment and equipment for industrial use and certain other equipment (for example, fixed motors that are permanently connected to fixtures).

Measurement categories IV (CAT IV) means that measurements are made on the source of low-voltage equipment. For example, a measurement on a meter, a major overcurrent protection device, and a pulse control unit.

Environment

Temperature	
Operating	0℃ ~ 55℃
Storage	-40℃ ~ 85℃
Humidity	
Operating	5%RH ~ 95%RH, no condensation
Storage	5%RH ~ 95%RH, no condensation
Pollution degree	2
Highest elevation	2000 m

Pollution degree description

Pollution degree 1: No pollution, or only dry non-conductive pollution. This pollution degree has no effect. For example: a clean room or an air-conditioned office environment.

Pollution degree 2: Generally only dry non-conductive pollution occurs. Temporary conduction can sometimes occur due to condensation. For example: General indoor environment.

Pollution degree 3: Conductive pollution occurs, or dry non-conductive pollution becomes conductive due to condensation. For example, an outdoor sheltered environment.

Pollution degree 4: Permanent conductive pollution caused by conductive dust, rain, or snow. For example: Outdoor places.

Recycle precautions

Warning Some of the substances contained in this product may be harmful to the environment or human health. In order to avoid releasing harmful substances into the environment or endangering human health, it is recommended that appropriate methods be used to recover this product to ensure that most materials can be properly reused or recycled. For information about processing or recycling, please contact your local professional organizations.

CONTENT

1. Getting Started

This chapter describes the basic functions of USB-5200 Series Data Acquisition Device, as well as product specifications and precautions in the process of product unpacking.

1.1. Product introduction

USB-5200 Series data acquisition device is the multifunctional data acquisition device based on high-speed USB2.0 interface. When connected to the computer, it can be used for continuous high-speed signal acquisition and high-speed control signal output.

USB-5200 series of data acquisition devices can measure analog and digital signals continuously and save the data to the computer hard drive without interruption. It can also provide digital signal output, periodic repetitive signal output, and high-speed uninterrupted non-repetitive signal output controlled by a computer.

USB-5200 series data acquisition device supports operating in Windows OS, providing standard DLLs and support for mainstream development languages including VC++, VB, C#, LabVIEW, and MATLAB.

USB-5200 series data acquisition device provides multiple models, in terms of function and performance. For detailed reference, please turn to Chapter 1.3 for specification description of each model.

Key Features

- High speed USB interface, Plug and Play, USB powered
- 16-bit analog input resolution, support continuous uninterrupted acquisition
- The analog input supports up to 16 channels of synchronous sampling and up to 500kS/s/Ch sampling rate.
- Up to 10MS/s/Ch sampling rate for digital I/O

1.2. Function Diagram

Figure 1.1 shows the schematic diagram of USB-5200 series data acquisition device.

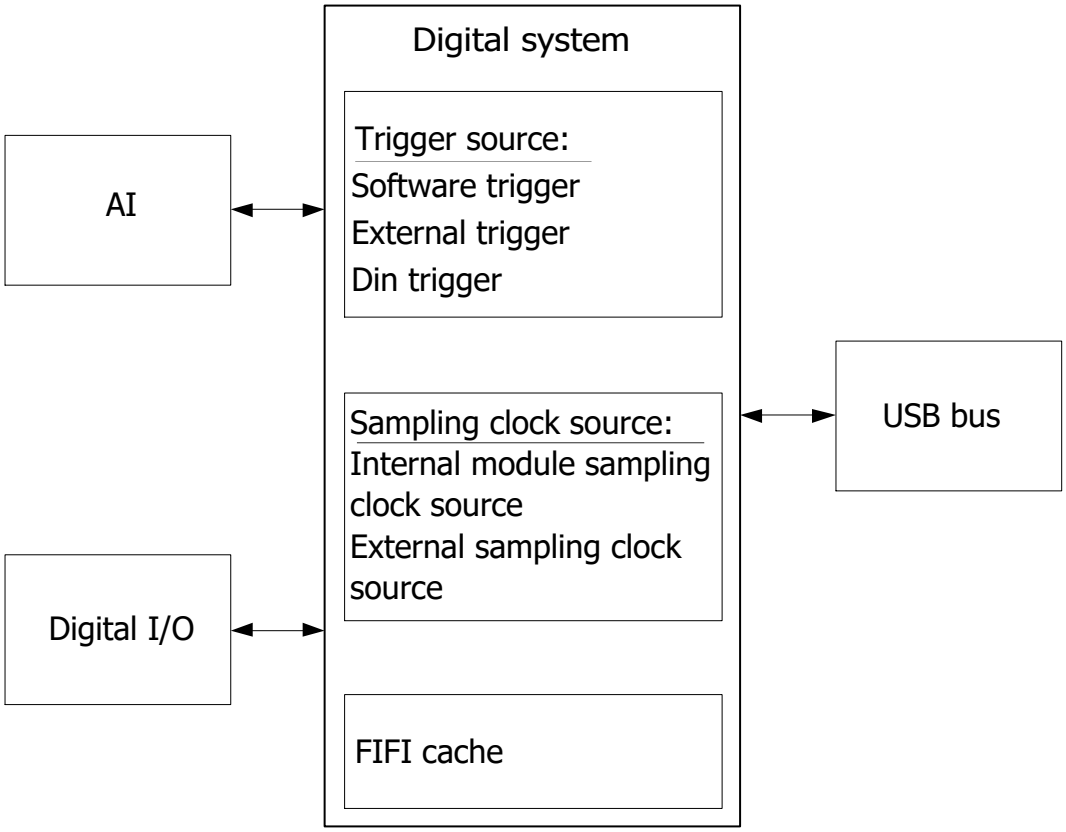


Figure 1.1 USB-5200 series data acquisition device functions

1.3. Product specifications

The following product specification parameters, unless otherwise stated, are acquired at the temperature of 25°C and the humidity of 40%, while the device is turned on for 20 minutes.

Analog input

Number of channels	USB-5220/5221: 16Single-Ended USB-5210/5211: 8Single-Ended USB-5620/5621: 16Single-Ended USB-5610/5611: 8Single-Ended USB-5420/5421: 8Single-Ended USB-5410/5411: 8Single-Ended
ADC type	SAR
Resolution	USB-5220/5221/5210/5211: 16-bit USB-5620/5621/5610/5611: 14-bit

	USB-5420/5421/5410/5411：12-bit
Highest sampling rate	USB-5211/5221: 500kS/s/Ch,continuous USB-5210/5220: 250kS/s/Ch,continuous USB-5611/5621: 500kS/s/Ch,continuous USB-5610/5620: 250kS/s/Ch,continuous USB-5411/5421: 500kS/s/Ch,continuous USB-5410/5420: 250kS/s/Ch,continuous
Timing resolution	10ns
Channel synchronization	Yes
Range	±10 V / ±5V
Input coupling mode	DC
Input impedance	100 MΩ
Small signal bandwidth（-3 dB）	450 kHz
Input bias current	1uA
Analog input max voltage	±15 V
Software FIFO	2 MPts/Ch
Pre-trigger FIFO	4096 Pts
AI capture mode	Continuous acquisition mode and limited number acquisition mode

Analog input accuracy (with temperature coefficient of 5 ppm/°C)

Range	Gain error (ppm of reading)	Offset error (ppm of range)	Random noise（μVrms）	Full range absolute accuracy（μV）
±10 V	90	4	180	1100
±5 V	80	10	90	500

Digital I/O

Number of channels	USB-5210/5211/5610/5611/5410/5411: 8 input,8 output USB-5220/5221/5620/5621/5420/5421: 2 input,2 output
Ground reference	DGND
Digital input pull-up resistanc	10 kΩ
Digital input voltage	High level:1.95 V~5 V Low level:0 V~1.2 V
Digital output voltage	High level:3.3 V Low level:0 V~0.003 V
Digital output power-on status	Low level
DIN highest sampling rate	10 MS/s/Ch

DOUT highest update rate	10 MS/s/Ch
Timing resolution	10 ns
Channel synchronization	Yes
DIN software FIFO	2 MPts/Ch
DIN pre-trigger FIFO	2048 Pts/Ch
DOUT hardware FIFO	2048 Pts/Ch
DIN capture mode	Continuous acquisition mode and OneShot mode
DOUT output mode	Direct output; onboard FIFO waveform periodic generation; onboard FIFO waveform trigger N loop; Uninterrupted non-repetitive signals for computer caches
DOUT edge time	Ascending edge: 6 ns Descending edge: 8 ns

External trigger

Number of channels	1 input, 1 output
Input voltage	High level: 1.95 V~5 V Low level: 0 V~1.2 V
Output voltage	High level: 3.3 V Low level: 0 V~0.003 V
Output power-on status	Low level
Output edge time	Ascending edge: 6 ns Descending edge: 8 ns

External sampling clock I/O

Number of channels	1 input、1 output
Input voltage	High level:1.95 V~5 V Low level:0 V~1.2 V
Output voltage	High level: 3.3 V Low level:0 V~0.003 V
Output power-on status	Low level
Output frequency range	DC~1 MHz
Output edge time	Ascending edge: 6 ns Descending edge: 8 ns

Calibration

Recommended warm-up time	No less than 20Minutes
Recommended calibration interval	1 year

Bus interface

USB	USB2.0 High Speed interface

Power supply requirements

USB interface power supply	4.5 V~5.5 V
Typical current without load	420 mA
Maximum Load	600mA

Physical properties

Size (mm)	Without connectors: 150*96*28 Connectors included: 150*112*28
Weight (g)	Without connectors: about 185g Connectors included: about 230g
I/O connectors	Bolt terminals
Bolt terminal connection	16 AWG~28 AWG
USB connectors	USB Type B

1.4. Product unpacking

Precautions

To prevent electrostatic discharge (ESD) from damaging the device, please note the following:

- Please wear a grounding wristband or touch a grounded object first to ensure being grounded.
- Before removing the equipment from the packaging, please first connect the anti-static packaging to the grounded object.
- Do not touch the exposed pins of the connector.
- Place your device in anti-static packaging when you are not using the device.

Check the packing list

After unpacking the product, follow the packing list in the box, check the host and each attachment individually to ensure that the items in the box are consistent with the packing list.

If you find that any item is missing, please get in touch with us for help as soon as possible.

If you find that the product comes in damaged after unpacking, please get in touch with us as soon as possible. Do not install damaged equipment on your devices.

2. Installation

This chapter describes signal connection and drive installation of USB-5200 series data acquisition device.

2.1. Connector signal pins distribution

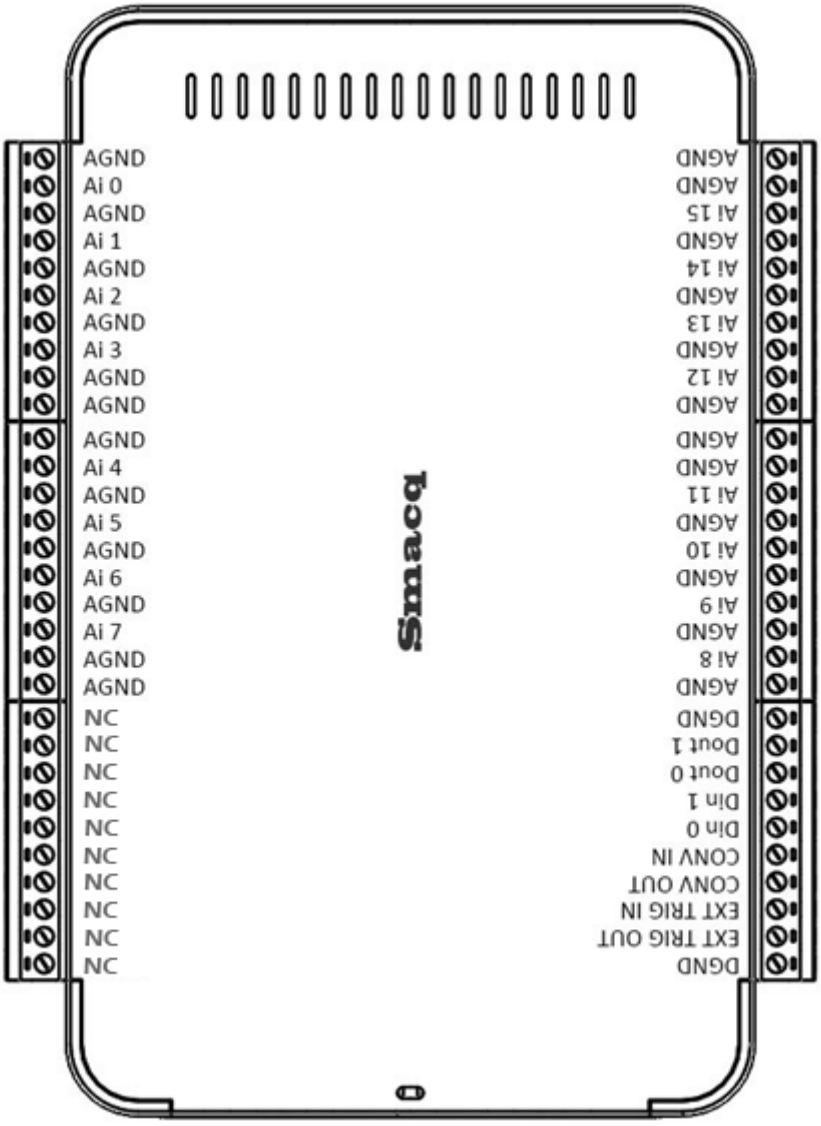


Figure 2.1 USB-5200 signal pins distribution

Table 2.1, Signal pin allocation

Signal name	Notes
AI 0	Analog input 0
AI 1	Analog input 1
AI 2	Analog input 2

Signal name	Notes
AI 3	Analog input 3
AI 4	Analog input 4
AI 5	Analog input 5
AI 6	Analog input 6
AI 7	Analog input 7
AI 8	Analog input 8
AI 9	Analog input 9
AI 10	Analog input 10
AI 11	Analog input 11
AI 12	Analog input 12
AI 13	Analog input 13
AI 14	Analog input 14
AI 15	Analog input 15
AGND	Simulated ground
DI 0	Digital input 0
DI 1	Digital input1
DO 0	Digital output 0
DO 1	Digital output1
DGND	Digital ground
EXT TRIG OUT	Trigger signal output
EXT TRIG IN	External trigger signal input
CONV OUT	Sampling clock output
CONV IN	External sampling clock input

2.2. USB cable reinforcement design

USB cable connectors are prone to be pulled off during operation. USB-5200 series data acquisition devices provide a cable reinforcement design, with which a strap can be used to fix the USB cable to the device to prevent the accidents. Check Figure 2.2 for details.

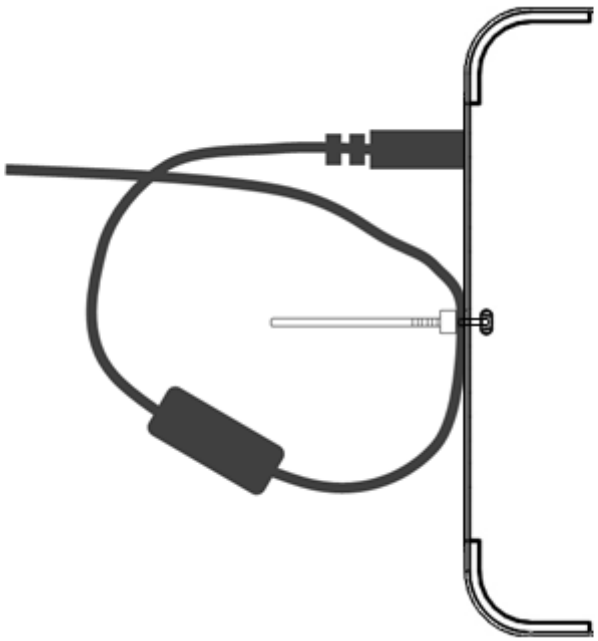
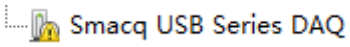


Figure 2.2 USB cable reinforcement design

2.3. Drive installation

Smacq USB-5200 series data acquisition device support Microsoft Windows XP, Windows 7, Windows 8/8.1, and Windows 10, including all the 32-bit and 64-bit versions. To install the driver for USB-5200 devices, you need to turn off driver signature enforcement first. Here is an example step-by-step tutorial on how to install the driver in Windows 7.

1) Connect your USB-5200 card to the computer and launch the Device Manager in Windows.
2) There should be a device with an exclamation point." 

Right-click it, select "Update driver".
3) In the pop-up dialog box, select "Browse my computer for driver software"
4) And then select "Let me pick from a list of device drivers on my computer"
5) Click on "Next" and then select "Have disk"
6) Click Browse in the pop-up dialog box, then enter the \USB-3000SeriesDAQ\driver folder in the CD-ROM, then enter the "win7" folder, then the 32-bit operating system enters the "x86" folder, the 64-bit operating system enters the "x64" folder, select the "susb.inf" file, and then click "Open". (The drivers of Windows8/8.1 and Windows10 are the same as those of Windows7, using the same file.)
7) Then in the dialogue of "Install from disk", click on "Yes".

8) Click "Next", if the Windows security warning pops up, you need to select "Install this driver software anyway" to finish the installation.

After these steps, the operating system will start installing the driver, which usually takes about 30 seconds. After the driver is installed, the exclamation point in Device Manager will disappear, as shown in the following Figure 2.3.

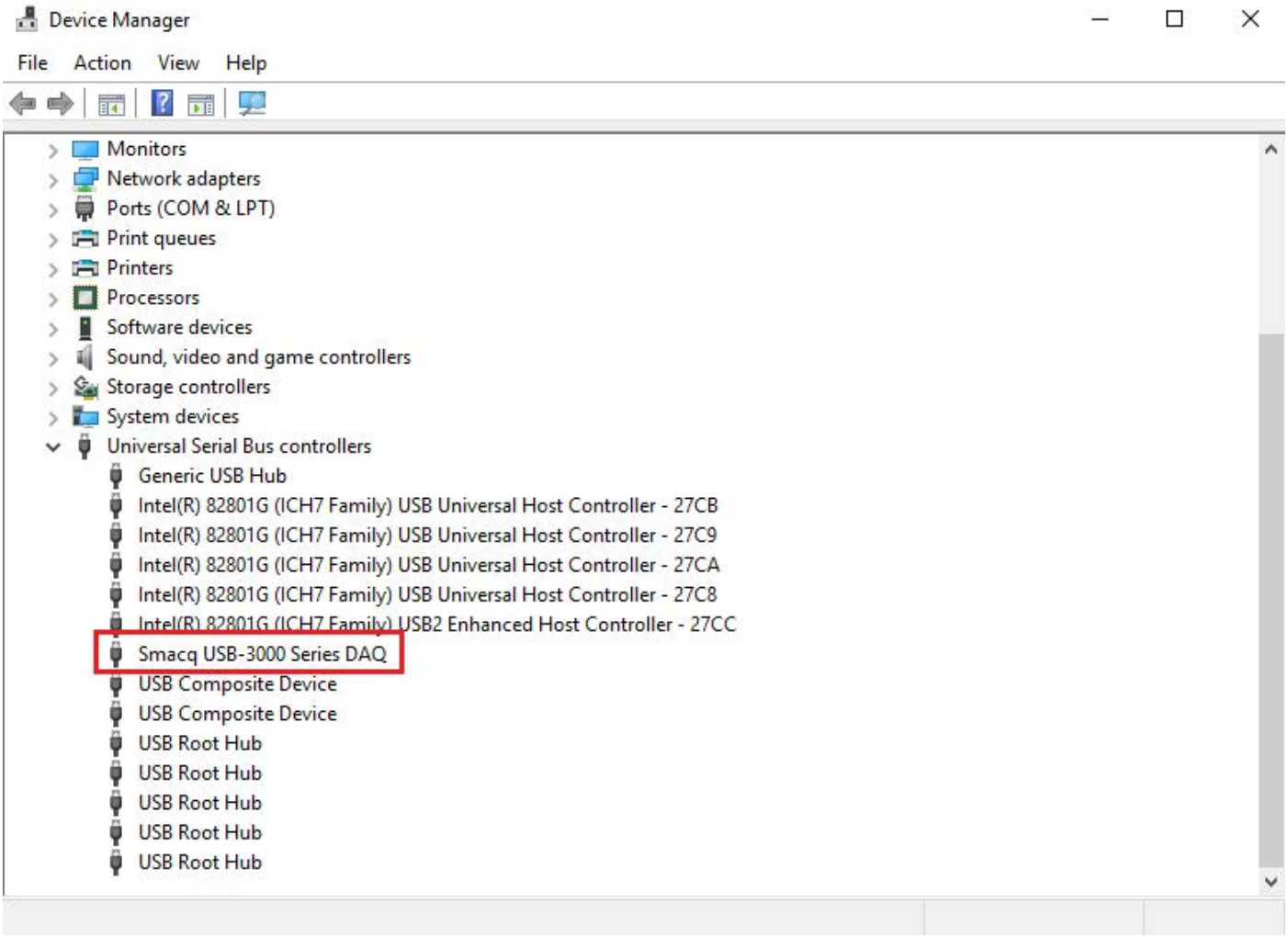


Figure 2.3 the Device Manager after the driver is correctly installed

3. Analog Input（AI）

This chapter describes measuring the relevant content of analog input signals on USB-5200 series data acquisition devices. AI here is short for Analog Input.

3.1. Circuit diagram

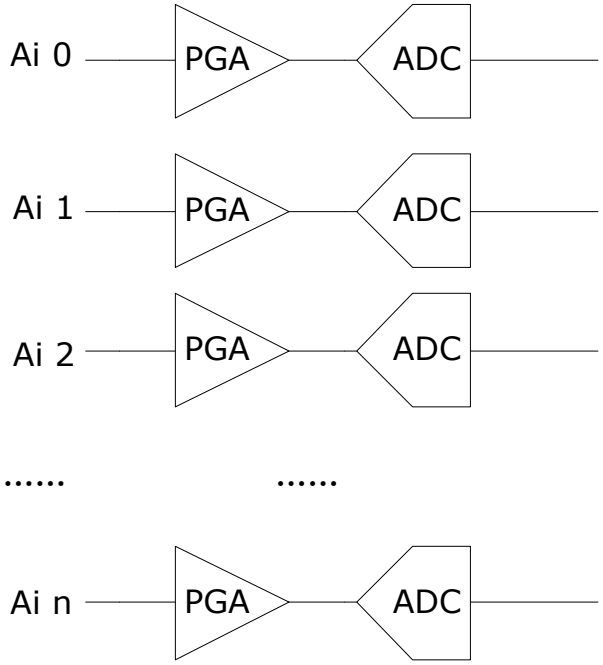


Figure 3.1 analog input circuit

3.2. Signal Connection Mode

The AI acquisition connection mode of the USB-5200 series data acquisition device supports grounding reference single-ended input. The positive end of the analog input signal is connected to the Ain port of the analog input port, and the negative end of the input signal is linked to the AGND port.

3.3. Signal acquisition mode

When the USB-5200 series data acquisition device performs analog input measurement, it supports continuous acquisition mode or limited number acquisition mode. The sampling rates of both modes are hardware-timed. The limited number acquisition mode is called OneShot mode.

Hardware timing mode

Hardware timing means that the sampling rate of AI acquisition is controlled by a hardware digital signal (AI sampling clock), which can be generated internally or externally.

Please refer to the chapter of "Synchronization system" for detailed settings for using externally provided sampling clocks.

Continuous acquisition mode

Continuous acquisition mode refers to continuous and uninterrupted collection of data at defined sampling speed.

In continuous acquisition mode, after the AI acquisition is triggered, the acquisition device collects the signal at a fixed sampling speed, buffers data into FIFO, and continuously uploads the data in the FIFO to the computer memory buffer. The user program only needs to continuously process the data in memory to achieve continuous uninterrupted data acquisition.

If the user program does not process the data fast enough, the data will gradually fill the 2M points of storage space in computer memory buffer. New data cannot be written correctly after the memory is filled up, resulting in discontinuous data.

Limited number acquisition mode

Limited number acquisition mode (OneShot mode) refers to one time acquisition to get the set number of collection points at the set sampling speed.

In OneShot mode, after the AI acquisition triggers, the acquisition device automatically stops the acquisition after the acquisition reaches the set number of times according to the set sampling speed. The user program only needs to read the set data amount from the computer memory buffer.

Attention The set number of collection points cannot exceed 2MPts.

3.4. AI sampling clock

The USB-5200 series data acquisition device has a rich collection timing option.
The schematic diagram of the AI sampling clock is shown in Figure 3.2.

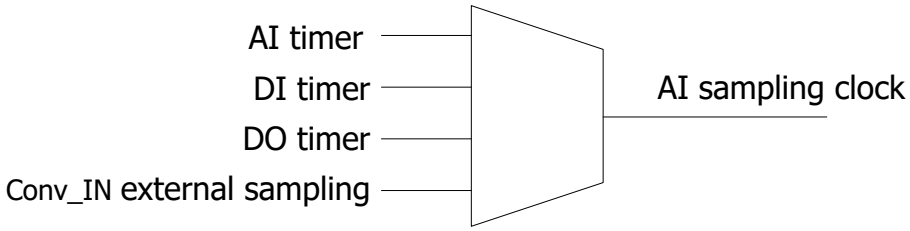


Figure 3.2 AI sampling clock options

The AI acquisition uses the AI timer signal as the AI sampling clock by default. The AI acquisition can be set via software to use other sampling clock sources to achieve the synchronization of each function.

All timers can be set in steps of 10ns, but the set sampling rate cannot exceed the maximum sampling rate supported by the device.

The external sampling clock source input from Conv_IN cannot be set to divide or multiply. It can only be used directly as the sampling clock. The AI timer output signal can be set to the Conv_OUT pin via software for simultaneous synchronization of multiple devices. See the "Synchronization System" chapter for details on the external clock.

3.5. Trigger

The USB-5200 series data acquisition device provides rich trigger options. The schematic diagram of the AI acquisition trigger options are shown in Figure 3.3.

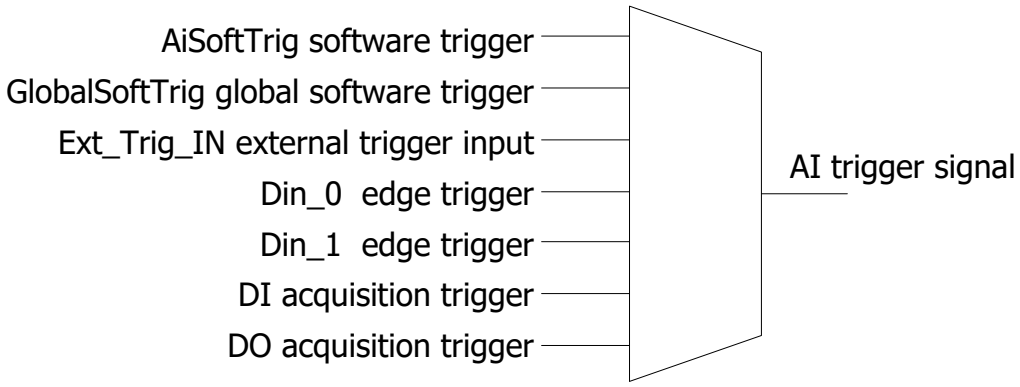


Figure 3.3 AI trigger options

The AI acquisition uses the AiSoftTrig software trigger as the trigger source by default. The AI acquisition can use other trigger sources via software settings to achieve the synchronization of each function.

AiSoftTrig software trigger and GlobalSoftTrig global software trigger are software triggers, which are used to send a command to the acquisition device to initiate device triggering.

Ext_Trig_IN external trigger means that when Ext_Trig_IN receives a rising edge, the device triggers. The AI trigger signal can be set to the Ext_Trig_OUT pin via software for multiple device synchronization. See the "Synchronization System" chapter for details on the external trigger.

The Din_0 ~ Din_1 edge trigger means that when the DIO is configured as an input, the DIO pin receives a rising edge and the device triggers.

DI acquisition trigger and DO acquisition trigger can be used to trigger the AI function alongside their own functions to achieve the synchronization of each function.

Clear trigger

The AI trigger status can be reset to an untriggered state by software settings.

Pre-trigger

The pre-trigger function is used to record the pre-trigger signal. The pre-trigger function relies on the hardware FIFO to store the data of the pre-trigger signal, so the number of pre-triggered points is limited and cannot exceed 4kPts. The pre-trigger function diagram is shown in Figure 3.4.

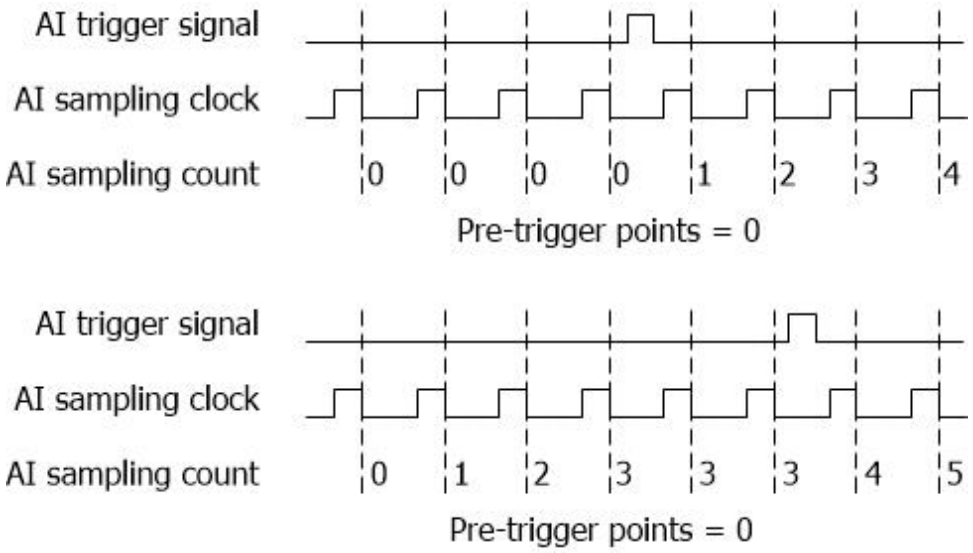


Figure 3.4 AI pre-trigger function

When the pre-trigger point is set to 0, the data before the trigger signal is not stored, and the user will not be able to obtain the signal state before the trigger signal.

When the pre-trigger signal is set to be larger than 0, for example, in Figure 3.4, the number of pre-trigger points is set to 3, then the data before the trigger signal will be stored, and when the stored quantity reaches 3, the newly acquired data will automatically remove the oldest data in the FIFO to ensure that the latest 3 data is saved in the FIFO before the trigger.

4. Digital Input（DI）

This chapter introduces the digital input signal acquisition on USB-5200 series data acquisition devices. DI is the abbreviation of Digital Input here. Figure 4.1 is a schematic diagram of the digital input circuit.

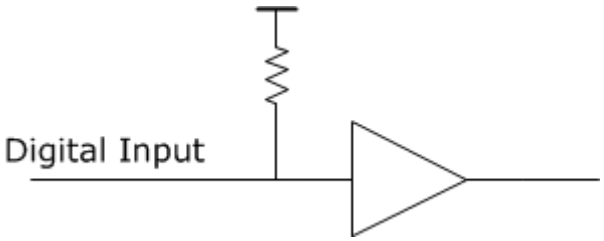


Figure 4.1 digital input circuit Figure

4.1. Signal acquisition mode

When the USB-5200 series data acquisition device performs DI acquisition, it supports continuous acquisition mode or limited number acquisition mode. The sampling rates of both modes are hardware-timed. The limited number acquisition mode is called OneShot mode.

Hardware timing

Hardware timing refers to the sampling rate of the sample acquired by DI. It is controlled by the hardware digital signal (DI sampling clock). This signal can be generated internally or externally.

For details on using an externally supplied sampling clock, refer to the "Synchronization System" chapter.

Continuous acquisition mode

The continuous acquisition mode refers to continuous and uninterrupted data acquisition at a set sampling speed.

In the continuous acquisition mode, after the DI acquisition triggers, the acquisition device collects the signal at a fixed sampling speed, buffers it in the FIFO, and continuously uploads the data in the FIFO to the computer memory buffer. The user program only needs to continuously process the data in memory to achieve continuous uninterrupted data collection.

If the user program could not process the data fast enough, the data will gradually fill up the 2M points of storage space in the computer's memory buffer. After filling it up, the new data cannot be written into memory buffer correctly, resulting in data discontinuity.

Limited number acquisition mode

Limited number of acquisition modes (OneShotmode) refers to one-time acquisition of the set number of collection points at the set sampling speed.

In OneShot mode, after the DI acquisition triggers, the acquisition device will start acquiring set number of data at the set sampling speed and stop the acquisition automatically after. The user program only needs to read the set data amount from the computer memory buffer.

Attention The number of set collection points cannot exceed 2MPts.

4.2. Sampling rate

For USB-5200 series of data acquisition devices, the DI sampling rate is up to10 Msa/s/ch. This is parallel simultaneous sampling of all channels, with each channel able to achieve this highest sampling rate.

4.3. DI sampling clock

The USB-5200 series data acquisition device has a rich DI acquisition timing option. The DI sampling clock is shown in Figure 4.2.

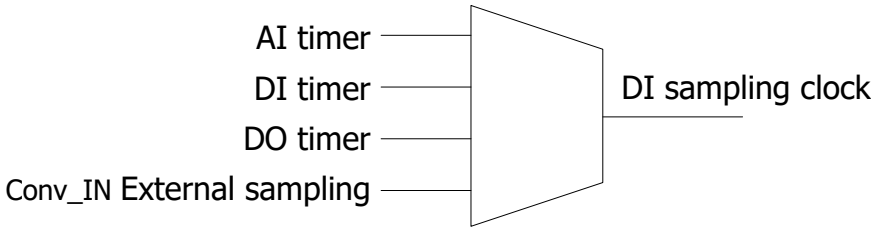


Figure 4.2 DI sampling clock option

The DI acquisition uses the DI timer signal as the DI sampling clock by default. The DI acquisition can be set via software to use other sampling clock sources to achieve the synchronization of each function.

All timers can be set in steps of 10ns, but the set sampling rate cannot exceed the maximum sampling rate supported by the device.

The external sampling clock source input from Conv_IN cannot be set to divide or multiply. It can only be used directly as the sampling clock. The DI timer output signal can be set to the Conv_OUT pin via software for simultaneous synchronization of multiple devices. See the "Synchronization System" chapter for details on the external clock.

4.4. Trigger

The USB-5200 series data acquisition device provides rich trigger options. The DI acquisition trigger options are shown in Figure 4.3.

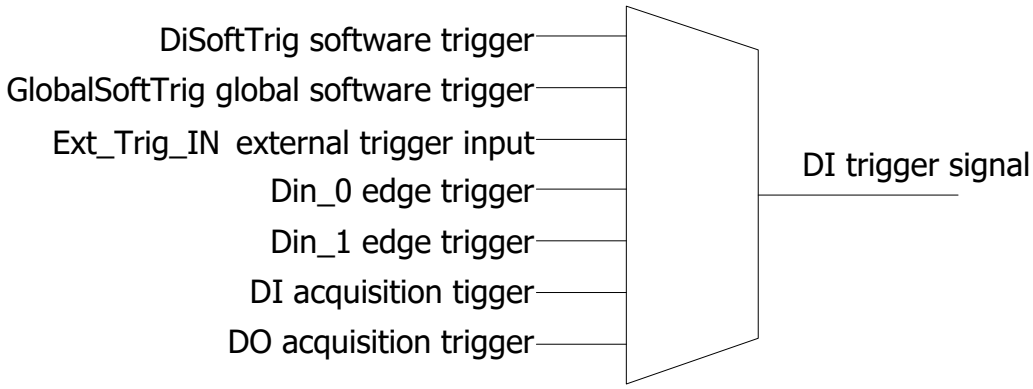


Figure 4.3 DI trigger options

The DI acquisition uses the DiSoftTrig software trigger as the trigger source by default. The DI acquisition can use other trigger sources via software settings to achieve the synchronization of each function.

DiSoftTrig software trigger and GlobalSoftTrig global software trigger are software triggers, which are used to send a command to the acquisition device to initiate device triggering.

Ext_Trig_IN external trigger means that when Ext_Trig_IN receives a rising edge, the device triggers. The AI trigger signal can be set to the Ext_Trig_OUT pin via software for multiple device synchronization. See the "Synchronization System" chapter for details on the external trigger.

The Din_0 ~ Din_1 edge trigger means that when the DIO is configured as an input, the DIO pin receives a rising edge and the device triggers.

DI acquisition trigger and DO acquisition trigger can be used to trigger the DI function alongside their own functions to achieve the synchronization of each function.

Clear Trigger

The DI trigger status can be reset to an untriggered state via software settings.

Pre-Trigger

The pre-trigger function is used to record the pre-trigger signal. The pre-trigger function relies on the hardware FIFO to store the data of the pre-trigger signal, so the number of pre-triggered points is limited and cannot exceed 4kPts. The pre-trigger function diagram is shown in Figure 4.4.

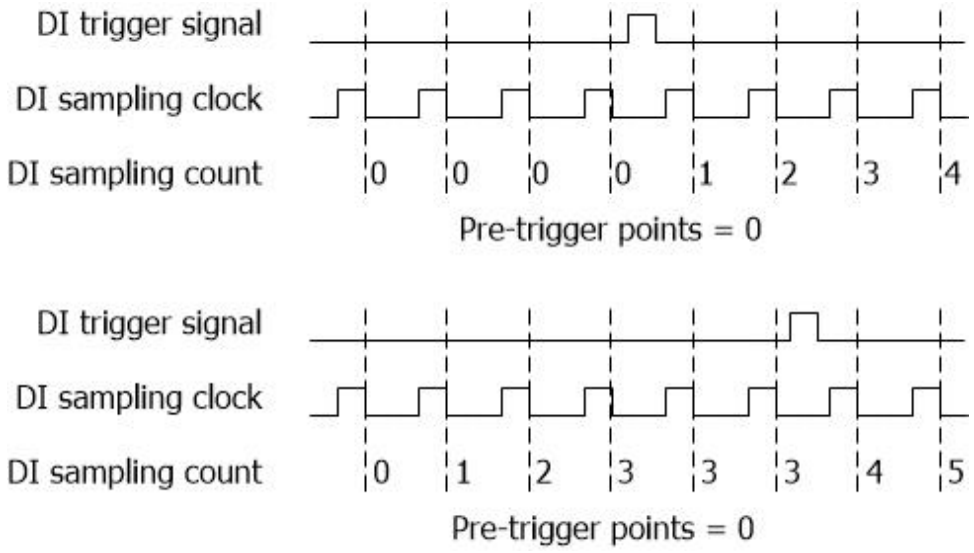


Figure 4.4 DI pre-trigger function

When the pre-trigger point is set to 0, the data before the trigger signal is not stored, and the user will not be able to obtain the signal state before the trigger signal.

When the pre-trigger signal is set to be larger than 0, for example, in Figure 4.4, the number of pre-trigger points is set to 3, then the data before the trigger signal will be stored, and when the stored quantity reaches 3, the newly acquired data will automatically remove the oldest data in the FIFO to ensure that the latest 3 data is saved in the FIFO before the trigger.

5. Digital Output（DO）

This chapter introduces the digital signal output for the USB-5200 series data acquisition device. The digital input is referred to as DO here, the abbreviation of Digital Output. Figure 5.1 is a schematic diagram of the digital output circuit.

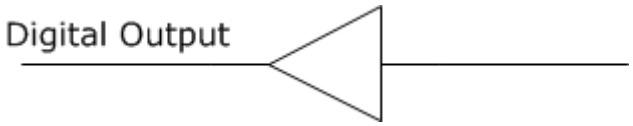


Figure 5.1 Digital output circuit

5.1. Signal output mode

When the USB-5200 series data acquisition device is utilized for digital output, the following four output modes are supported:

- Immediate output
- Finite number output
- Unlimited number of loop output
- Infinite non-loop output

Immediate output

Immediate output refers to the output state without buffer and no waveform. The computer sends a command to the acquisition device, and it immediately outputs the specified level state.

Hardware timing

The three output modes mentioned below refer to the mode of outputting digital waveforms, so the sampling rate of the output waveform is an important parameter. When the acquisition q is in DO mode, the DO sampling clock is generated by hardware timing. The sampling clock signal can be generated internally or externally.

For details on using an externally supplied sampling clock, refer to the "Synchronization System" chapter.

Finite number output mode

The limited number of output modes means that the digital waveform data to be output is first stored in the hardware FIFO, then the output sampling rate is set, the number of times the waveform needs to be output is set, and the channel for outputting the digital waveform is set. After the DO output is triggered, the capture card begins to output a digital waveform in accordance with the set parameters. After the set number of outputs is reached, the capture card stops outputting the digital waveform.

Attention When the specified number of outputs is completed, the DO output level state stays at the level defined by the last point of the waveform data.

Infinite loop output mode

Infinite loop output mode means that the digital waveform data to be output is first stored in the hardware FIFO, and then the output sampling rate is set. After the DO is triggered, the acquisition device starts to output the digital waveform according to the set parameters, and continuously loops the output until the DO triggers cleared to an untriggered state.

Attention After clearing the DO trigger to the untriggered state, the DO output level state stays at the level state at which the DO trigger is cleared.

Infinite non-loop output mode

The infinite loop output mode refers to a waveform in which the DO output exceeds the length of the hardware FIFO space, and the computer transfers the data in batches to the DO hardware FIFO.

For example, a waveform with a length of 1M point needs to be output at a sampling rate of 10kSa/s, and the DO hardware FIFO space is only 2k points, so the waveform of 1M point length needs to be transferred to the DO hardware FIFO in 500 times. The 2k point data in the hardware FIFO, with an output sampling rate of 10kSa/s, can be transmitted in 0.2 seconds. Therefore, the computer must start a new data transmission in less than 0.2 seconds to ensure the continuity of DO output waveform.

When the waveform output in the hardware FIFO is complete and no new data arrives, the DO output level state will remain at the level defined by the last point.

5.2. Output update rate

USB-5200 series data acquisition device DO output update rate can reach up to 10MSa/s/Ch. This means parallel simultaneous sampling of all channels, while each channel can achieve this highest sampling rate.

5.3. DO sampling clock

The USB-5200 series data acquisition device has rich DO acquisition timing options. The DO sampling clock is shown in Figure 5.2.

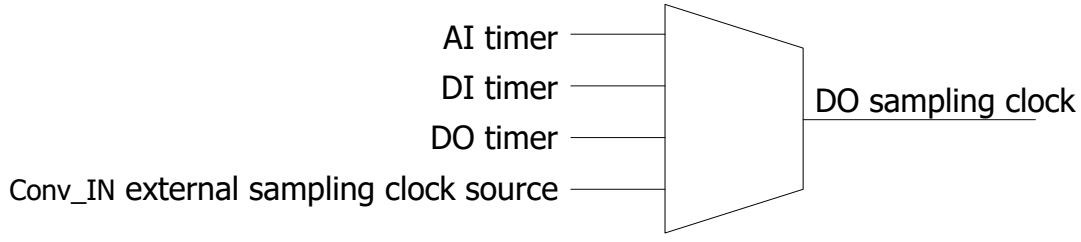


Figure 5.2 DO sampling clock option

The DO acquisition uses the DO timer signal as the DO sampling clock by default. You can set DO acquisition to use other sampling clock sources to achieve the synchronization of each function via software settings.

All timers can be set in steps of 10ns, but the set sampling rate cannot exceed the maximum sample rate supported by the device.

The external sampling clock source input from Conv_IN cannot be set to divide or multiply. It can only be used directly as the sampling clock. The DO timer output signal can be set to the Conv_OUT pin via software for simultaneous synchronization of multiple devices. See the "Synchronization System" chapter for details on the external clock.

5.4. Trigger

The USB-5200 series of data acquisition devices provide a rich set of trigger options, as shown in Figure 5.3, which describes trigger options for the DO output.

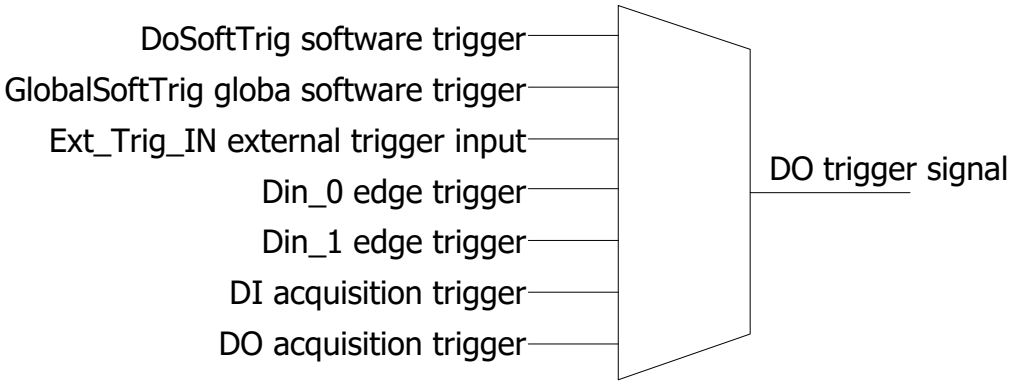


Figure 5.3 DO trigger options

The DO output uses the channel exclusive software trigger signal DoSoftTrig as the trigger source by default. You can set DO output to use other trigger sources to achieve the synchronization of each function via software settings.

The DoSoftTrig software trigger and the GlobalSoftTrig global software trigger are both software triggers, which means the computer sends a command to the data acquisition device to achieve device triggering.

Ext_Trig_IN external trigger means that when Ext_Trig_IN receives a rising edge, the device triggers. The DO trigger signal can be set to the Ext_Trig_OUT pin via software for multiple device synchronization. See the "Synchronization System" chapter for details on external triggering.

The Din_0 ~ Din_1 edge trigger means that when the DIO pin is configured as an input, and the DIO pin receives a rising edge, the device triggers.

DI acquisition trigger and DO acquisition trigger can be used to trigger the DO function alongside their own functions to achieve the synchronization of each function.

Clear trigger

The DO trigger status can be reset to an untriggered state via software settings.

6. Synchronization System

This chapter introduces the multi-card synchronization system of the USB-5200 series data acquisition device. The synchronous system has 4 ports, sampling clock input, sampling clock output, external trigger input, and external trigger output.

6.1. Sampling clock

The sampling clock is used to eliminate the error of the clock between multiple acquisition devices and achieve the synchronization of the sampling rate between multiple acquisition devices. At this time, the sampling clock output of one of the acquisition devices should be connected to the sampling clock input of other acquisition devices and use the appropriate software settings. Figure 6.1 shows the sampling clock input circuit.

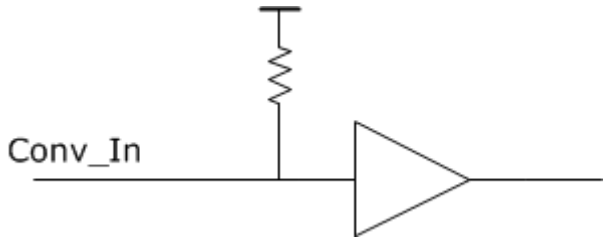


Figure 6.1 sampling clock input circuit

The sampling clock output circuit diagram is shown in Figure 6.2. The following sources can be selected as output options:

- AI sampling clock
- DI sampling clock
- DO sampling clock

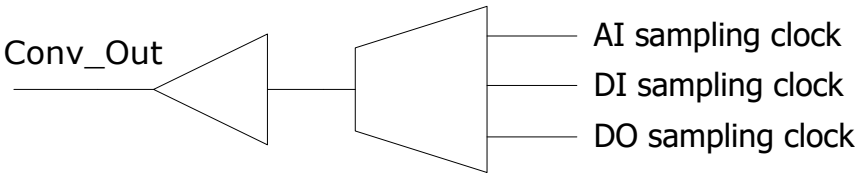


Figure 6.2 Sampling clock output circuit

6.2. External trigger

The pins of external trigger input and output are used to trigger the USB-5200 series acquisition device in synchronization with an external device.
Each function trigger source of the acquisition device can select the external trigger input pin Ext_Trig_In as the trigger source.

The external trigger input circuit diagram is shown in Figure 6.3.

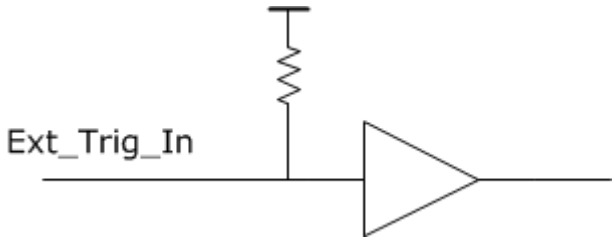


Figure 6.3 External trigger input circuit

When the trigger signal of the specified function is set as the output source, the Ext_Trig_Out pin will output a high level pulse for 1us while the function is triggered.

The circuit diagram of the external trigger output Ext_Trig_Out is shown in Figure 6.4. The following sources can be selected as output options:

- AI acquisition trigger
- DI acquisition trigger
- DO acquisition trigger

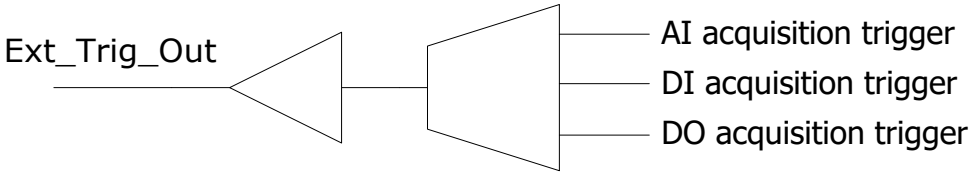


Figure 6.4 External trigger output circuit

7. Service and Warranty

Beijing Smacq Technology Co., Ltd. is committed to its products during the warranty period, if the product fails under normal use in warranty, we will repair or replace defected parts for free. Please refer to the warranty explanation in the box for detailed instructions.

In addition to the warranties mentioned in this manual and the warranty note, we do not provide any other warranties, express or implied, including, but not limited to, any implied warranties as to the tradable nature of the product and the suitability of the special purpose.

To get more technical support and service details, or if you have any questions about using this product and this document, you are welcome to contact us:

Phone:(+86)10-52482802
E-mail: service@smacq.com
Website: http://www.smacq.com
http://www.smacq.cn

8. Ordering Information

Host

Model	Notes
USB-5221	16-bit, 16-AI(500 kSa/s) 2-DI 2-DO
USB-5220	16-bit, 16-AI(250 kSa/s) 2-DI 2-DO
USB-5211	16-bit, 8-AI(500 kSa/s) 8-DI 8-DO
USB-5210	16-bit, 8-AI(250 kSa/s) 8-DI 8-DO
USB-5621	14-bit, 16-AI(500 kSa/s) 2-DI 2-DO
USB-5620	14-bit, 16-AI(250 kSa/s) 2-DI 2-DO
USB-5611	14-bit, 8-AI(500 kSa/s) 8-DI 8-DO
USB-5610	14-bit, 8-AI(250 kSa/s) 8-DI 8-DO
USB-5421	12-bit, 16-AI(500 kSa/s) 2-DI 2-DO
USB-5420	12-bit, 16-AI(250 kSa/s) 2-DI 2-DO
USB-5411	12-bit, 8-AI(500 kSa/s) 8-DI 8-DO
USB-5410	12-bit, 8-AI(250 kSa/s) 8-DI 8-DO

Standard accessories

Model	Notes
USB-A-B	USB connection cable, 1.5 meters, USB-A type to USB-B type
TB10-3.81	10-bit, 3.81mm pitch terminal block

Optional accessories

Model	Notes
SDIN	35mm DIN rail mounting bracket
CHF-100B	Current sensor, 100A, DC~20kHz, output ±4v
CHV-600VD	Voltage sensor,600V, DC~20kHz,isolated differential input, output±5v