



AXIOMTEK

AX92350

**High Speed Isolated DIO PCI
Express Communication Card for
Machine Vision Application**

User's Manual



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ESD Precautions

The boards have integrated circuits sensitive to static electricity. To avoid damaging chipsets from electrostatic discharge, observe the following precautions:

- Do not remove boards or integrated circuits from their anti-static packaging until you are ready to install them.
- Before handling a board or integrated circuit, touch an unpainted portion of the system unit chassis for a few seconds. This will help to discharge any static electricity on a human body.
- When handling boards and components, wear a grounding wrist strap available from most electronic component stores.

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Section 1

Introduction

This section contains general information and detailed specifications of the AX92350 Vision I/O Card, including the following sections:

- General Description
- Features
- Specifications
- Dimensions

1.1 General Description

The AX92350 integrates various I/O features for machine vision applications, including trigger input and output with microsecond-scale real-time control, an auto measurement timer, as well as LED lighting control with dimming support. It also provides an encoder input function suited for conveyor applications in factory automation. The AX92350 can fit into the PCI Express slot of any vision control system to simplify deployment and maintenance of your machine vision platform.

1.2 Features

- **Integrated vision I/O**
 - 4 CH trigger input
 - 4 or 8 CH trigger output
 - 4 CH LED lighting control
(LED trigger output channels are defined by software settings)
 - 1 CH quadrature encoder input
 - 8 CH isolated DI, 8 CH isolated DO
 - 1 CH auto measurement function
- **Programmable interrupt functions**
- **1 PCI Express compliant**
- **Flexible design for vision inspection**

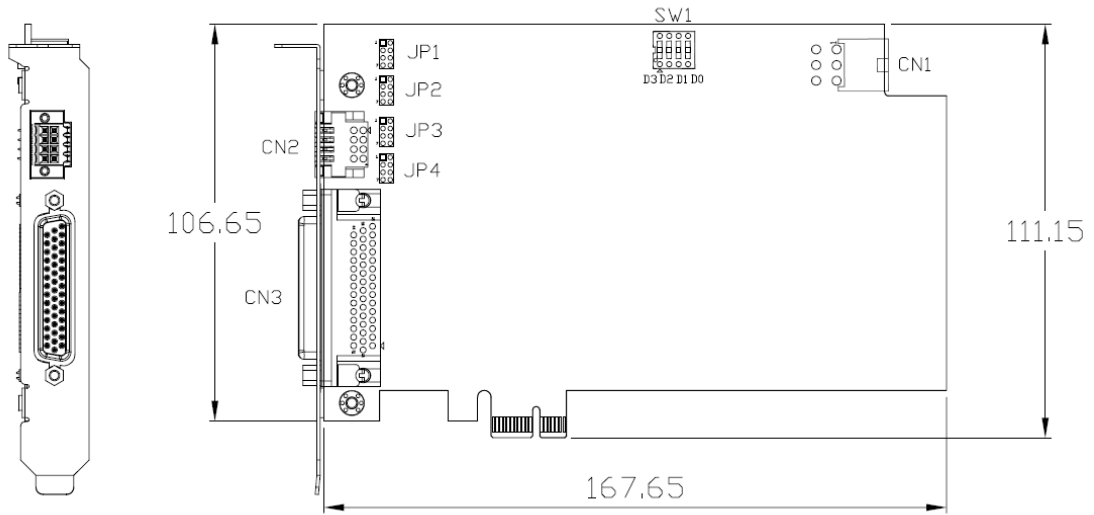
1.3 Specifications

- **Isolated digital input**
 - Number of channels: 8
 - Input type: sink/source
 - Input voltage: on (logic 1): 10~30VDC, off (logic 0): 0~3VDC or dry contact
 - Impedance: 7.5k Ω
- **Isolated digital output**
 - Number of channels: 8
 - Output type: sink, open collector
 - Supply voltage: 5-30VDC
 - Sink current: Max. 200mA per channel
- **Isolated trigger input**
 - Number of channels: 4
 - Type: sink
 - Input voltage: on (logic 1): 10~30VDC, off (logic 0): 0~2VDC or dry contact
 - Response time: <1 μ s (from trigger input to trigger output)
 - Input filter: support programmable de-bounce filter (0~10 ms)
- **Isolated encoder input**
 - Number of channel: 1
 - Support mode: incremental quadrature encoder input (A/B/Z phase, x4 counts)
 - Type of wiring: differential or single-ended
 - Frequency input: Max. 1MHz
 - Data length: 16-bit
- **Isolated trigger output**
 - Number of channels: 4 or 8
 - Output voltage: 12VDC
 - Output impedance: 1k Ω
 - Response time: <1 μ s (from trigger input to trigger output)
 - Configuration: Derived from 4CH trigger input or encoder input. The user can set the pulse delay time and duration time. Trigger output channel 4,5,6,7 can only be selected either for trigger output or for LED lighting control.
 - Auto measurement: Timer that measures response interval between trigger input and trigger output
- **Interrupt**
 - Sources: Provides two interrupt sources from DI 0~5, trigger input 0~1, encoder Z phase and encoder check pointer 0~2

Note: DI 2-5 only support rising trigger

- **LED lighting control**
 - Number of channels: 4
 - Output voltage: 24VDC, Max. 0.5A per channel
 - Output current: Each channel can be set for 100mA/250mA/350mA/500mA output by jumper, supporting dimming control
 - Mode: support trigger mode
 - External power supply connector: 6-pin ATX 2x3 connector for connection to 12V external power supply when LED power consumption exceeds 24V @500mA
 - Connector: 4CH LED lighting control via an 8-pin terminal connector
- **General specifications**
 - Bus type: PCI Express x1
 - I/O connector: D-sub 44-pin female connector
 - Isolation voltage: 1000VDC
 - Power requirement: +3.3V @ 50mA (Max.), +12V @ 220mA (Max.)
Note: Excluding the power consumption of 24V LEDs
 - Dimensions: W 168 mm x D 107 mm
 - Board ID: Yes, 4-bit
 - Operating temperature: 0°C ~ +60°C (0°F ~ +140°F) w/air flow
 - Storage temperature: -20°C ~ +80°C (-4°F ~+176°F)
 - Operating Humidity: 5 ~% RH, non-condensing
- **OS support**
 - Windows® 7, WES7, Windows® 10, Windows® 10 IoT (32/64-bit)
 - Software compatibility: C#, C/C++, Visual Basic

1.4 Dimensions



Component Side

Section 2

Connectors

2.1 Connectors

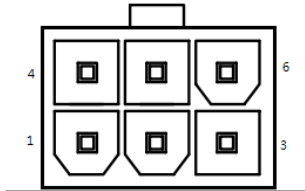
Connectors connect the board with other parts of the system. Loose or improper connection might cause malfunctions. Make sure all connectors are properly and firmly connected. The following table lists the function of each connector on the AX92350.

Connectors	Label
CN1	2.1.1
CN2	2.1.2
CN3	2.1.3
SW1	2.1.4
JP1, JP2, JP3, JP4	2.1.5

2.1.1 12V Power Input (CN1)

The 6-pin ATX connector is used for connecting 12V external power supply when LED power consumption exceeds 24V@500mA.

Pin	Signal
1	+12V
2	+12V
3	+12V
4	Ground (GND)
5	Ground (GND)
6	Ground (GND)



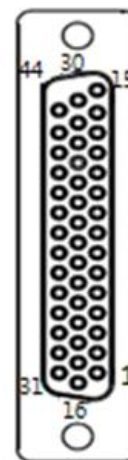
2.1.2 8-Pin Terminal Connector for LED Lighting Control (CN 2)

Pin	Description	Pin	Description
1	LED1 -	2	LED1 +
3	LED2 -	4	LED2 +
5	LED3 -	6	LED3 +
7	LED4 -	8	LED4 +



2.1.3 44-Pin Female I/O Connector (CN 3)

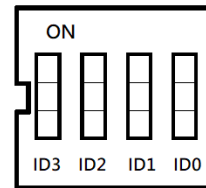
Pin	Description	Pin	Description	Pin	Description
1	DI 0	16	DI 2	31	Trigger input 0
2	DI 1	17	DI 3	32	Trigger input 1
3	DI_COM	18	I_GND	33	Trigger input 2
4	DI 4	19	DI 6	34	Trigger input 3
5	DI 5	20	DI 7	35	Trigger output 0
6	DO_PWR	21	I_GND	36	Trigger output 1
7	DO 0	22	DO 2	37	Trigger output 2
8	DO 1	23	DO 3	38	Trigger output 3
9	I_GND	24	I_GND	39	Trigger output 4
10	DO 4	25	DO 6	40	Trigger output 5
11	DO 5	26	DO 7	41	Trigger output 6
12	I_GND	27	I_GND	42	Trigger output 7
13	Encoder A+	28	Auto Measurement	43	Encoder Z+
14	Encoder A-	29	Encoder B+	44	Encoder Z-
15	I_GND	30	Encoder B-		



2.1.4 Board ID (SW1)

Default board ID setting is 0 (0x000)

ID3	ID2	ID1	ID0	Board ID
0	0	0	0	0
0	0	0	1	1
0	0	1	0	2
0	0	1	1	3
0	1	0	0	4
0	1	0	1	5
0	1	1	0	6
0	1	1	1	7
1	0	0	0	8
1	0	0	1	9
1	0	1	0	10
1	0	1	1	11
1	1	0	0	12
1	1	0	1	13
1	1	1	0	14
1	1	1	1	15



Note: On: 1, Off: 0

2.1.5 LED Lighting Control Output Current Setting Jumper (JP1~4)

Jumpers	Descriptions	Settings
JP1	LED lighting controller 1 output current setting	Short 1-2
JP2	LED lighting controller 2 output current setting	Short 1-2
JP3	LED lighting controller 3 output current setting	Short 1-2
JP4	LED lighting controller 4 output current setting	Short 1-2

Output Current	Settings
100mA (Default)	1-2
250mA	3-4
350mA	5-6
500mA	7-8



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Section 3

I/O Connection

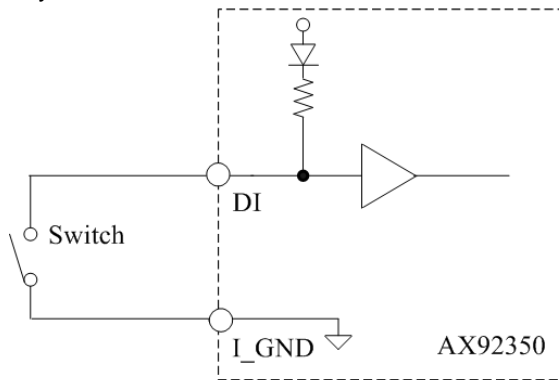
3.1 I/O Connection

Refer to this section to connect any cables between the AX92350 and device.
Each of the following I/O figures illustrates their respective connection on the AX92350.

3.1.1 Isolated Digital Input

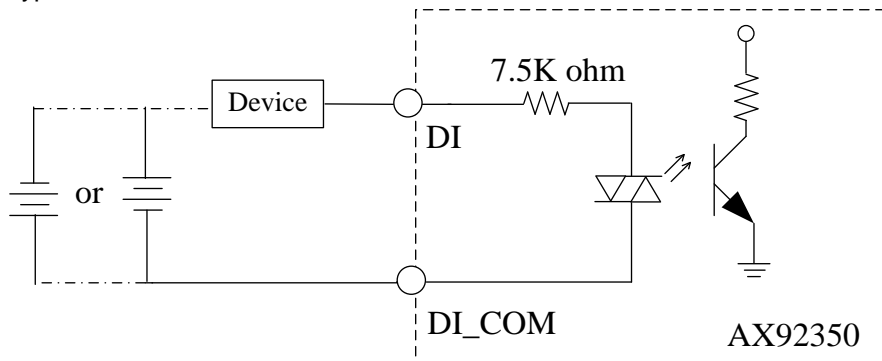
The figure shows how to connect between external input source and the AX92350.

Dry contact:



Wet contact:

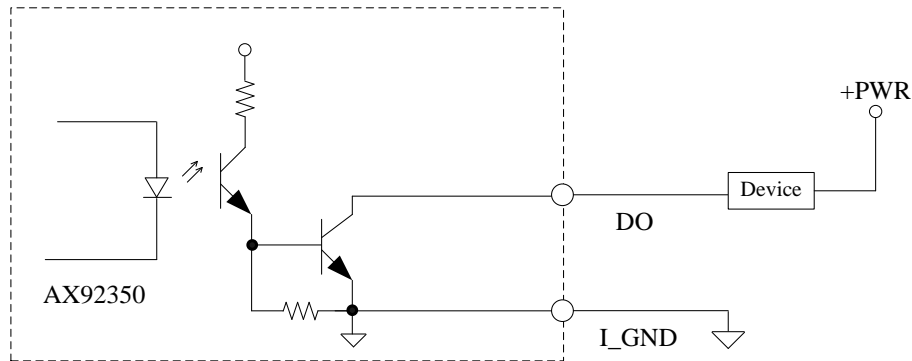
Each of the isolated digital input channels accepts 0~30 VDC with sink type and source type.



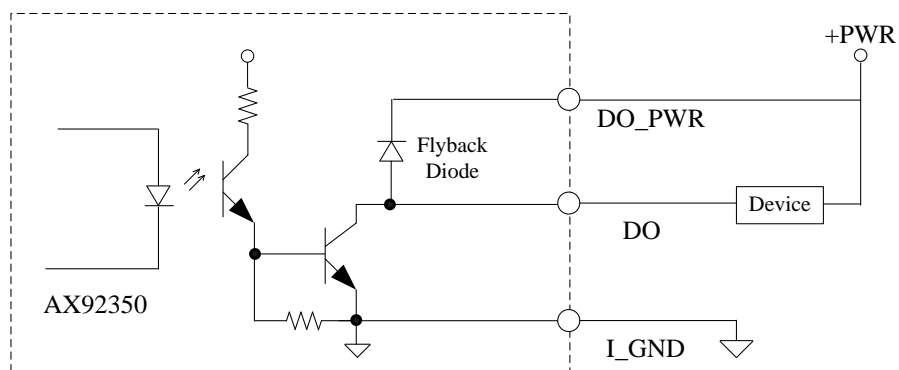
3.1.2 Isolated Digital Output

The figure shows how to connect between an output channel and the AX92350. If an external voltage 5~30 VDC is applied to an isolated output channel, the current will flow from the external voltage source to the card. Please note that the current through each DO channel should not exceed 200 mA.

Resister load:



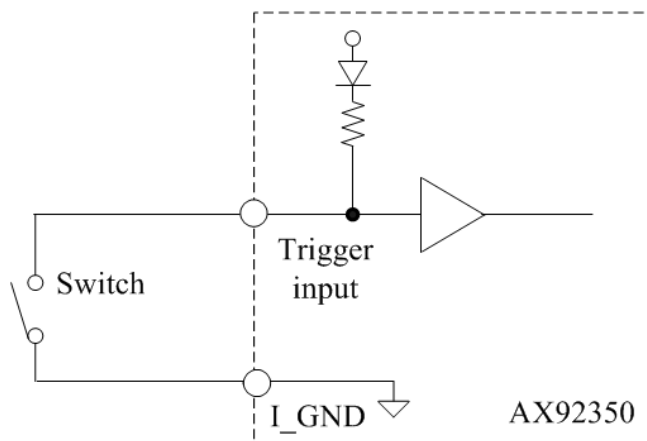
Inductive load:



3.1.3 Isolated Trigger Input & Auto Measurement Input

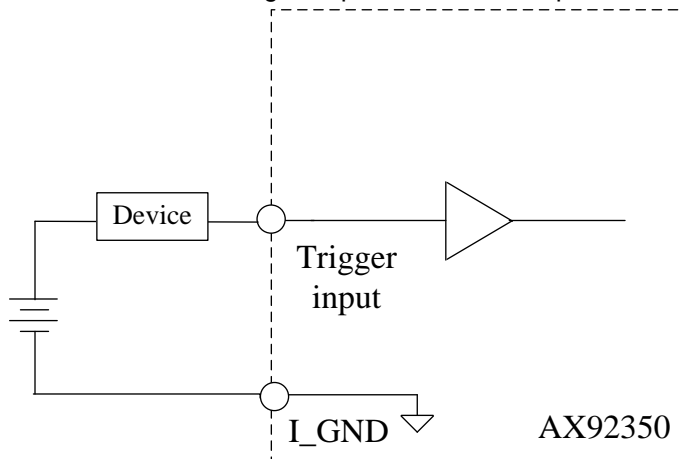
The figure shows how to connect between external input source and the AX92350.

Dry contact:



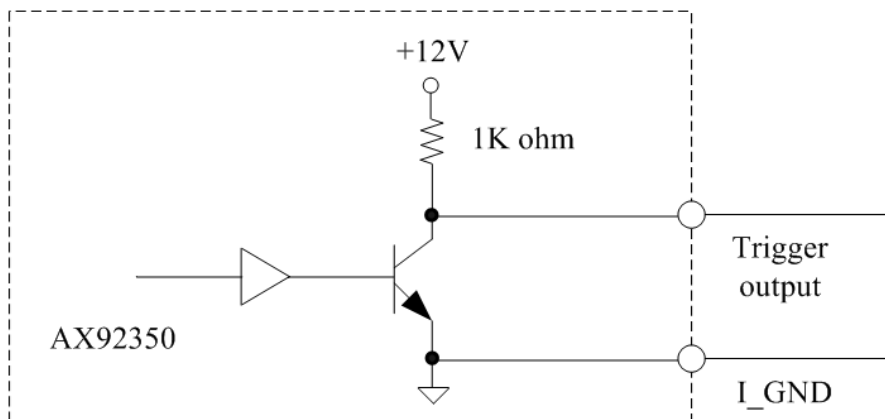
Wet contact:

Each of the isolated digital input channels accepts 0~30 VDC with sink type.



3.1.4 Isolated Trigger Output

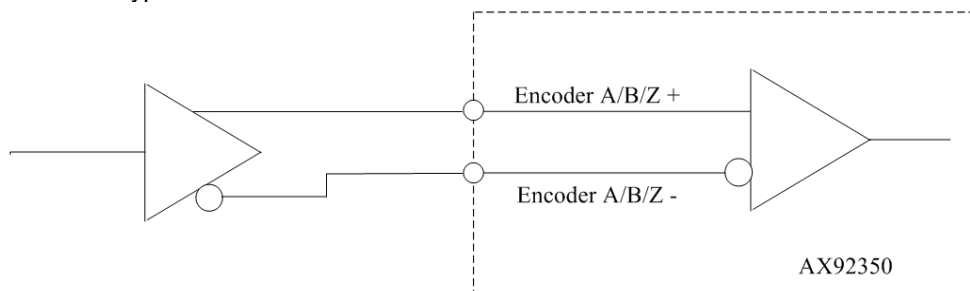
The figure shows how to connect between an output channel and the AX92350. The card provides voltage 12 VDC for an isolated output channel.



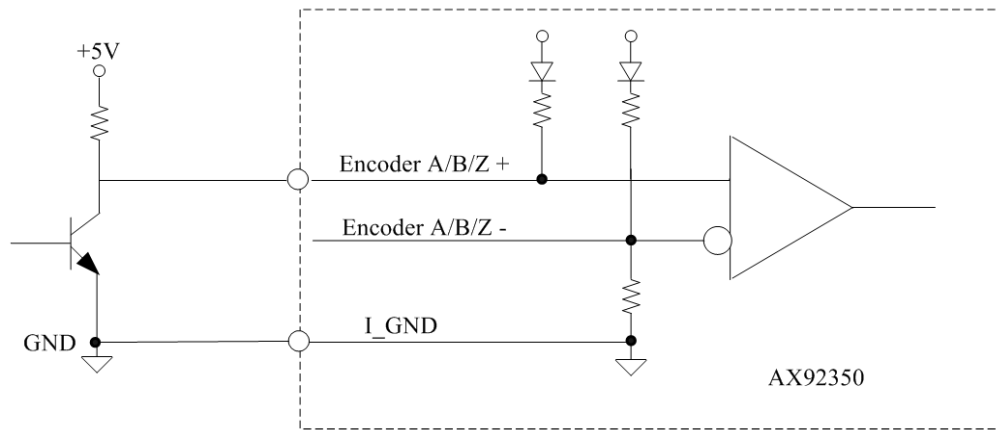
3.1.5 Isolated Encoder Input

The figure shows how to connect between an input channel and the AX92350.

Differential type:



5V Voltage Type:



Section 4

Operating

4.1 Operating

This section describes the detail operation of the AX92350 vision I/O card.

4.1.1 Encoder function

The AX92350 vision I/O card supports 1CH 16-bit incremental quadrature encoder input for the AB signal mode, which is used for applications where direction sensing is required. This mode consists of two square-wave pulse signals known as Phase A and Phase B generated by a rotating encoder. Phase A and Phase B signals are coded 90° out of phase from each other—Phase A is either 90° phase leading or lagging behind Phase B. The AX92350 is able to count square-wave pulses of Phase A and Phase B, and then determine rotating direction of motor movement by comparing the phase relationship between Phase A and B:

- When the quadrature encoder is rotating in a clockwise direction, its signal will show a positive direction of Phase A leading Phase B.
- When the quadrature encoder rotates counterclockwise, its signal will show a negative direction of Phase A lagging behind Phase B.

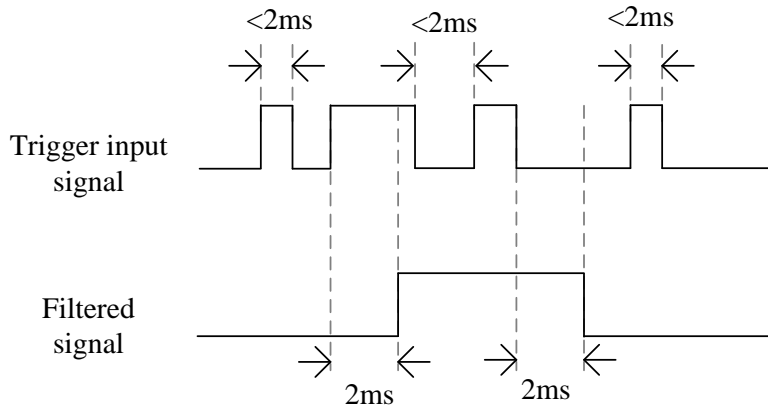
Besides direction, the quadrature encoder can generate another signal named Phase Z, which is produced once per complete rotation of the quadrature encoder. Phase Z is used by the AX92350 card to locate a specific position when the quadrature encoder completes a 360° rotation, so that the card can reset its counter value to zero if necessary.

In most cases, the x4 Phase AB signal mode is applied to incremental encoder devices. For example, an incremental encoder generates 1000 pulses per phase (A or B phase) when a motor completes a 360° rotation, but the count will show 4000 pulses.

4.1.2 Trigger Input/ Output

The AX92350 card's trigger input supports de-bounce filter function to help filter out environmental noise that can mix with normal encoder signals and affect the accuracy of the pulse count. The de-bounce filter defines the interval width for high/low signals. Signals with interval width less than the defined value will be filtered out.

Below is a diagram illustrating the case of filter timer set with a duration time of 2 millisecond:



Trigger Output CH 0~7 provides the following parameters to configure:

■ **Trigger source**

The user can select any of the following items as a triggering condition that prompts the AX92350 to generate a trigger output: Trigger Input CH 0~3, Encoder Phase Z, Encoder Check Pointer CH0~2.

Note: One trigger source can be set to activate multiple trigger outputs.

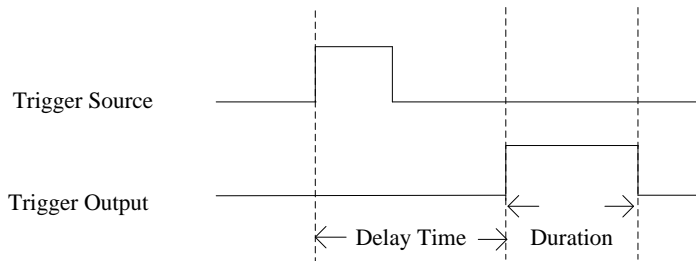
■ **Delay time function**

The user can set the delay time that the AX92350 waits before it sends a trigger output.

■ **Duration time**

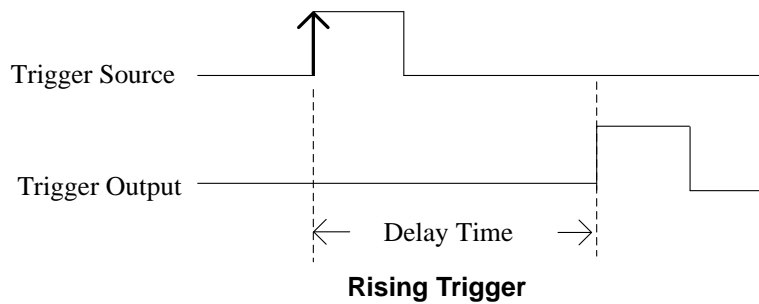
The user can adjust pulse width for the output signal.

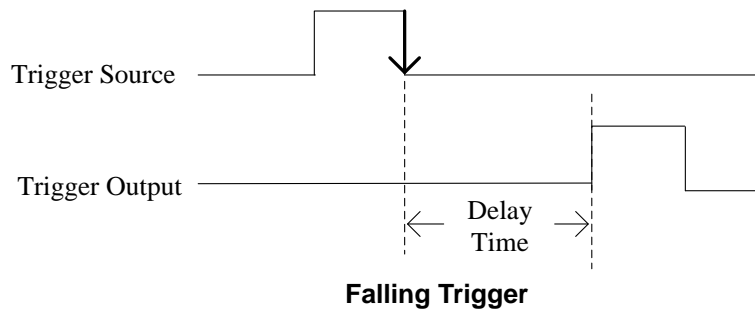
(Definitions of delay time and duration time are illustrated below):



■ **Inverter**

Trigger source mode can be set as rising trigger or falling trigger.





4.1.3 LED Lighting Control

Select Trigger Output CH 4~7 to perform LED light control including LED brightness settings for various machine vision applications.

Note: The AX92350 card provides the power sources as below:

- Output voltage: 24VDC. Max. 0.5A per channel.
- Each channel can be set to provide 100mA/250mA/350mA/500mA output by jumper.

4.1.4 Auto Measurement Function

The AX92350 card features a timer that measures response interval between trigger input and trigger output, allowing the user to define the length of response interval that trigger output waits after the card receives trigger input.

4.1.5 Interrupt

This function can send an interrupt signal to the host PC.

The user can select two conditions from the list below for the AX92350 to generate an interrupt signal:

1. Digital input
2. Trigger input
3. Encoder phase z
4. Encoder check pointer