1. JY-8902 Specifications

1.1 Overview

The PXIe-8902 is a high-precision digital multimeter (DMM) with six built-in measurement types: DC voltage, DC current, AC voltage, AC current, 2-wire resistance, and 4-wire resistance, offering the accuracy of 80 ppm. Its modular design allows for customization by adding or swapping modules, which expands its functionalities and reduces the need for multiple specialized instruments. This design also supports upgradeability, keeping the device current with advancing technology.

Compact and lightweight, the PXIe-8902 is easy to transport and store, and its modular nature simplifies maintenance and repair, reducing downtime and costs. Versatile in its applications, it is ideal for diagnosing electrical issues, verifying circuit operation, and ensuring component integrity. Overall, the PXIe-8902 provides a precise, flexible, and cost-effective solution for diverse electrical measurement needs.

Please download JYTEK <JYPEDIA>, you can quickly inquire the product prices, the key features and available accessories.

1.2 Main Features

- DCV accuracy: 80 ppm (6½-digit)
- Minimum aperture time 0.31ms
- 6 standard measurements:DCV, ACV, DCI, ACI, 2- and 4-wire resistance
- External trigger in and DMM out, to synchronize with external multiplexers and instruments
- Floating isolation (CAT II) to 300 V

1.3 Hardware Specifications

1.3.1 DC Functions

Measurement method	Delta-sigma A/D conversion
Input resistance	200 mV, 2.0 V ranges: >10 GΩ with typical leakage of < 100 pA; 20 V, 200 V ranges: 10.0 MΩ
Input isolation	300 V from Earth ground
Input overvoltage protection	300 VDC all ranges
DCV noise rejection	NPLC ⩾ 1, CMRR (1 kΩ lead imbalance) ⩾ 120 dB

Table 1 DC Function

1.3.2 DC System Speed

Range or function changes	First start-up	5.12 s
	Switch DC V, DC I, and resistance to AC V, AC I	0.12 s
	Switch from small range (over-range) to large range for DC V and DC I	5.12 s
	Other conditions	0.12s
Auto Range time, DC V	Switch from small range (over-range) to large range	5.12 s
	Other conditions	0.12s
Auto Range time, DC I	Switch from small range (over-range) to large range	5.12 s
	Other conditions	0.12s
Auto Range time, resistance	Switch from small range (over-range) to large range	5.12 s
	Other conditions	0.12s
Maximum sample rate		3.5 kHz

Table 2 DC System Speed

1.3.3 DC Absolute Accuracy

DC Volotage Accuracy

DC Voltage ± (ppm of Reading + ppm of Range)					
Range	Resolution	Resistance (10MΩ,default) nominal	24 hourT_{cal} ±1 °C	1 year T_{cal} ±5 °C	Tempco (ppm/°C)
0.2 V	200 nV	>10 GΩ	20+25	60+40	5+5
2 V	2 µV	>10 GΩ	12+15	50+30	5+2
20 V	20 µV	10 MΩ	12+25	50+40	10+5
240 V	240 µV	10 MΩ	25+25	50+40	25+5
Accuracy valid to 100% of full range					

Table 3 DC Volotage Accuracy

DC Current Accuracy

DC Current ± (ppm of Reading + ppm of Range)					
Range	Resolution	Burden voltage, typical	24 hourT_{cal} ±1 °C	1 year T_{cal} ±5 °C	Tempco (ppm/°C)
20 mA	20 nA	<200 mV	60+40	250+100	20+5
200 mA	200 nA	<200 mV	90+40	300+100	15+5
1A	1 µA	<100 mV	150+40	600+100	15+5
Accuracy valid to 100% of full range					

Table 4 DC Current Accuracy

Resistance (2-Wire and 4-Wire) Accuracy

Resistance (2-Wire and 4-Wire) ± (ppm of Reading + ppm of Range)					
Range	Resolution	Test current nominal	24 hourT_{cal} ±1 °C	1 year T_{cal} ±5 °C	Tempco (ppm/°C)
100	100 uΩ	2 mA	30+200	150+300	5+5
1 k	1 mΩ	2 mA	20+20	150+200	5+3
10 k	100 mΩ	200 µA	20+10	150+100	5+3
100 k	100 mΩ	20 µA	30+10	150+100	5+3
1 M	1 Ω	2 µA	150+20	500+100	25+3
10 M	10 Ω	200 nA	800+200	1500+400	200+10
100 M	100 Ω	200 nA‖10 MΩ	20000+500	20000+500	1000+100
Accuracy valid to 100% of full range					

Table 5 Resistance (2-Wire and 4-Wire) Accuracy

1.3.4 DC Effective Noise

DC Voltage Effective Noise Value (ppm of Range)

Integration Time (NPLC)	DC Voltage 0.2 V	DC Voltage 2 V	DC Voltage 20 V	DC Voltage 240 V
0.0155	89.9	76.4	103.1	65.9
0.125	23.4	3.2	80.2	8.9
0.5	18.0	1.9	54.0	6.9
5	0.9	0.3	1.0	0.3
9	0.8	0.2	1.3	0.2

Table 6 DC Voltage Effective Noise Value

DC Current Effective Noise Value (ppm of Range)

Integration Time (NPLC)	DC Current 20 mA	DC Current 200 mA	DC Current 1 A
0.0155	91.1	88.2	83.5
0.125	5.2	4.5	3.7
0.5	3.2	2.4	2.1
5	0.7	0.5	0.6
9	0.3	0.4	0.4

Table 7 DC Current Effective Noise Value

Resistance Effective Noise Value (ppm of Range)

Integration Time (NPLC)	Resistance 100 Ω	Resistance 1 kΩ	Resistance 10 kΩ	Resistance 100 kΩ	Resistance 1 MΩ	Resistance 10 MΩ	Resistance 100 MΩ
0.0155	105.3	84.2	87.1	92.0	88.5	859.6	48.9
0.125	74.1	7.0	6.5	5.2	3.0	37.7	45.0
0.5	47.7	4.8	3.7	3.2	1.9	23.3	30.5
5	0.8	0.3	0.3	0.4	0.4	0.4	0.2
9	0.9	0.2	0.3	0.2	0.3	0.3	0.1

Table 8 Resistance Effective Noise Value

1.3.5 AC Functions

AC Functions General Specifications	
Measurement method	AC coupled (15 Hz to 100 kHz) true RMS — measures the AC component only. Analog RMS DC converter.
Crest factor	The crest factor range is 1 to 4, with a maximum additional accuracy error of 0.1%
Input impedance	10 MΩ in parallel with 220 pF
Settling time	< 0.5 sec to within 0.1% of final value
Input overvoltage protection	300 VAC on voltage inputs

Table 9 AC Functions

1.3.6 AC System Speed

Range or function changes	First start-up	0.5 s
	Switch DC V, DC I, and resistance to AC V, AC I	0.5 s
	Other conditions	0.5 s
Auto Range time, AC V	Switch from small range (over-range) to large range	0.5 s
	Other conditions	0.5 s
Auto Range time, AC I	Switch from small range (over-range) to large range	0.5 s
	Other conditions	0.5 s
Maximum sample rate		3.5 kHz

Table 10 AC System Speed

1.3.7 AC Absolute Accuracy

AC Voltage Accuracy

AC Voltage (% of Reading + % of Range)				
Range(rms voltage)	Frequency	24 hourT_{cal} ±1 °C	1 year T_{cal} ±5 °C	Tempco(%/°C)
0.2 V,2 V,20 V,240 V	15 Hz to 30 Hz	2.4+0.15	3.0+0.20	0.01+0.008
	>30 Hz to 300 Hz	0.3+0.15	0.9+0.20	0.01+0.002
	>300 Hz to 1 kHz	0.8+0.15	1.4+0.20	0.01+0.002
	>1 kHz to 20 kHz	2.3+0.15	2.9+0.20	0.01+0.002
	>20 kHz to 100 kHz	2.4+0.15	3.0+0.20	0.01+0.002

Table 11 AC Voltage Accuracy

AC Current Accuracy

AC Current (% of Reading + % of Range)				
Range(rms voltage)	Frequency	24 hourT_{cal} ±1 °C	1 year T_{cal} ±5 °C	Tempco(%/°C)
20 mA,1 A	15 Hz to 30 Hz	2.5+0.15	2.5+0.20	0.015+0.01
	>30 Hz to 1k Hz	0.3+0.15	0.3+0.20	0.015+0.01
	>1 kHz to 5 kHz	2.5+0.15	2.5+0.20	0.015+0.01
200 mA	15 Hz to 30 Hz	2.5+0.15	2.5+0.20	0.015+0.01
	>30 Hz to 1 kHz	2.5+0.15	2.5+0.20	0.015+0.01
	>1 kHz to 5 kHz	15.8+0.15	15.8+0.20	0.015+0.01

Table 12 AC Current Accuracy

1.3.8 Input Protection

DC I and AC I	1.15 Amp, fused F 1.15 A 250 V, fast-acting user-replaceable fuse
Resistance	Up to 300 V DC
DC V, AC V	Up to 300 V DC, 300 V AC rms, 450 V AC peak
Maximum common-mode voltage	300 V AC rms or DC
Measurement Category	II

Table 13 Input Protection

1.3.9 Trigger Characteristics

Input Trigger

Source	PXI_TRIG<0..7> PFI<0,1>
Minimum pulse width	200 ns
Trigger delay	1us to 20 s
Logic level	3.3 V TTL

Table 14 Input Trigger

Output Trigger

Destinations	PXI_TRIG<0..7> PFI<0,1>
Pulse width	2.5 µs
Logic level	3.3 V

Table 15 Output Trigger

1.3.10 Calibration

Warm-up time	1 hour to rated accuracy
Calibration interval	1 year

Table 16 Calibration

1.3.11 Power Consumption

Power consumption	<5.5 W from PXI backplane
+3.3 V	<0.50 W
+12 V	<5 W

Table 17 Power consumption

1.3.12 Physical Characteristics

Size	211.24 mm*130.45 mm*20.29 mm
Weight	293.5 g

Table 18 Physical Characteristics

1.3.13 Environment

Maximum altitude	2,000 m (800 mbar), at 25 °C ambient temperature (Data refer to test results after Final Design)
Pollution Degree	2 Indoor use only (Data refer to test results after Final Design)

Table 19 Environment

Operating Environment

Ambient temperature range	0 °C to 50 °C
Relative humidity range	0% to 80%, noncondensing

Table 20 Operating Environment

Storage Environment

Ambient temperature range	-20 °C to 80 °C
Relative humidity range	10% to 90%, noncondensing

Table 21 torage Environment

1.3.14 Shock and Vibration

Operating shock	30 g peak, half-sine, 11 ms pulse (Tested in accordance with IEC 60068-2-27.)
Operating	5 Hz to 500 Hz, 0.3 grms
Non-operating	5 Hz to 500 Hz, 2.4 grms (Tested in accordance with IEC 60068-2-64.)

Table 22 Shock and Vibration

2. Order Information

- PXIe-8902 (PN: JY9242513-01)

  PXIe-8902, PXIe Digital Multimeter, 6½ digit, High Performance

- Accessories (PN: JY9866644-01)

  ACL-1008902-01, Hirose 4-pin to pigtail cable

Table of Contents

3. Introduction

3.1 Overview

The PXIe-8902 is a high-precision digital multimeter (DMM) with six built-in measurement types: DC voltage, DC current, AC voltage, AC current, 2-wire resistance, and 4-wire resistance, offering the accuracy of 80 ppm.

Special note: the 4-wire resistance measurement supports a range of 0 to 100kΩ.

3.2 Abbreviations

- DMM: Digital Multi-Meter

3.3 JYPEDIA

We provide many sample programs for this device. Please download the sample programs for this device. You can download a JYPEDIA excel file from our web www.jytek.com. Open JYPEDIA and search for JY-8902 in the driver sheet, select **JY8902 Examples.zip**. In addition to the download information, JYPEDIA also has a lot of other valuable information, JYTEK highly recommend you use this file to obtain information from JYTEK.

简仪科技 JYTEK

Drivers	Update Date	Category
JY8902_V1.0.0_Win.tar	2024/6/21	Driver
JY8902_V1.0.0_C++Examples.rar	2024/6/21	Example
JY8902_V1.0.0_Examples.rar	2024/6/21	Example
JY8902_V1.0.0_Linux.tar	2024/6/21	Driver
JY8902_V1.0.0_Python.rar	2024/6/21	Driver
JY8902_V1.0.0_PythonExamples.rar	2024/6/21	Example

Figure 1 JYPEDIA Information

4. Hardware Specifications

4.1 Front Panel

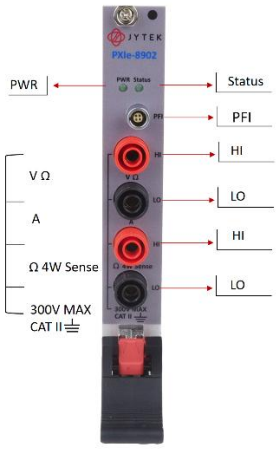

Figure 2 JY-8902 Front Panel

4.2 Accuracy

DC voltage measurement refers to the measurement of a slowly changing voltage. The accuracy of the DC measurement is affected by gain error and offset error. An instrument's DC accuracy is defined by the gain and offset errors as follows:

$$Accuracy = Gain\ Error(\%\ of\ reading)\ + Offset\ Error(\%\ of\ range)$$

Equation 1 Gain and Offset Errors

It should be noted when the reading is close to zero, the gain error is very small and negligible, the offset error is dominant; when the reading is getting close to the full range, the gain error becomes more significant.

The DC Accuracy of JY-8902 is shown in Table 3, Table 4, Table 5.

5. Software

5.1 System Requirements

JY-8902 module can be used in a Windows or a Linux operating system.
Microsoft Windows: Windows 7 32/64 bit, Windows 10 32/64 bit.
Linux Kernel Versions: There are many Linux versions. It is not possible JYTEK can support and test our devices under all different Linux versions. JYTEK will at the best support the following Linux versions.

Linux Version
Ubuntu LTS
16.04： 4.4.0-21-generic(desktop/server)
16.04.6：4.15.0-45-generic(desktop) 4.4.0-142-generic(server)
18.04： 4.15.0-20-generic(desktop) 4.15.0-91-generic(server)
18.04.4：5.3.0-28-generic (desktop) 4.15.0-91-generic(server)
Localized Chinese Version
中标麒麟桌面操作系统软件（兆芯版）V7.0（Build61）: 3.10.0-862.9.1.nd7.zx.18.x86_64
中标麒麟高级服务器操作系统软件V7.0U6: 3.10.0-957.el7.x86_64

Table 23 Supported Linux Versions

5.2 System Software

When using the JY-8902 in the Window environment, you need to install the following software from Microsoft website:
Microsoft Visual Studio Version 2015 or above,
.NET Framework version is 4.0 or above.
.NET Framework is coming with Windows 10. For Windows 7, please check .NET Framework version and upgrade to 4.0 or later version.
Given the resources limitation, JYTEK only tested JY-8902 be with .NET Framework 4.0 with Microsoft Visual Studio 2015. JYTEK relies on Microsoft to maintain the compatibility for the newer versions.

5.3 C# Programming Language

All JYTEK default programming language is Microsoft C#. This is Microsoft recommended programming language in Microsoft Visual Studio and is particularly suitable for the test and measurement applications. C# is also a cross platform programming language.

5.4 JY-8902 Series Hardware Driver

After installing the required application development environment as described above, you need to install the JY-8902 hardware driver.
JYTEK hardware driver has two parts: the shared common driver kernel software (FirmDrive) and the specific hardware driver.
Common Driver Kernel Software (FirmDrive): FirmDrive is the JYTEK's kernel software for all hardware products of JYTEK instruments. You need to install the FirmDrive software before using any other JYTEK hardware products. FirmDrive only needs to be installed once. After that, you can install the specific hardware driver.
Specific Hardware Driver: Each JYTEK hardware has a C# specific hardware driver. This driver provides rich and easy-to-use C# interfaces for users to operate various JY-8902 function. JYTEK has standardized the ways which JYTEK and other vendor's DAQ module are used by providing a consistent user interface, using the methods, properties and enumerations in the object-oriented programming environment. Once you get yourself familiar with how one JYTEK DAQ card works, you should be able to know how to use all other DAQ hardware by using the same methods.
Note that this driver does not support cross-process, and if you are using more than one function, it is best to operate in one process.

5.5 Install the SeeSharpTools from JYTEK

To efficiently and effectively use JY-8902 module, you need to install a set of free C# utilities, SeeSharpTools from JYTEK. The SeeSharpTools offers rich user interface functions you will find convenient in developing your applications. They are also needed to run the examples come with JY-8902 hardware. Please register and down load the latest SeeSharpTools from our website, **www.jytek.com**.

5.6 Running C# Programs in Linux

Most C# written programs in Windows can be run by MonoDevelop development system in a Linux environment. You would develop your C# applications in Windows using Microsoft Visual Studio. Once it is done, run this application in the MonoDevelop environment. This is JYTEK recommended way to run your C# programs in a Linux environment.
If you want to use your own Linux development system other than MonoDevelop, you can do it by using our Linux driver. However, JYTEK does not have the capability to support the Linux applications. JYTEK completely relies upon Microsoft to maintain the cross-platform compatibility between Windows and Linux using MonoDevelop.

6. Operating JY-8902

This chapter provides the operation guides for JY-8902 measurement, including DC volt, DC current, AC volt, AC current, 2-wire resistance,4-wire resistance etc.

JYTEK provides extensive examples, on-line help and documentation to assist you to operate the JY-8902 board. JYTEK strongly recommends you go through these examples before writing your own application. In many cases, an example can also be a good starting point for a user application.

6.1 Quick Start

After you have installed the driver software and the SeeSharpTools, you are ready to use Microsoft Visual Studio C# to operate the JY-8902 products.

If you are already familiar with Microsoft Visual Studio C#, the quickest way to use JY-8902 boards is to go through our extensive examples. We provide source code of our examples. In many cases, you can modify the source code and start to write your applications.

We also provide **Learn by Example** in the following sections. These examples will help you navigate and learn how to use this JY-8902.

6.2 Data Acquisition Methods

To ensure the accuracy of measurements using the JY-8902, the user needs to understand the relevant parameters associated with the measurements. These parameters include *Acquisition mode, Aperture Time*, *NPLC*, and *Offset Compensation.*

Acquisition mode: JY-8902 provides 3 acquisition modes, **Continuous**, **Multi Point** and **Single Point**, which will be described in details in Section 6.2.1-6.2.3.

Aperture Time: Aperture Time is defined as the duration of time during which the input signal is sampled for a measurement. Aperture Time refers to the time window over which a JY-8902 integrates or averages the input signal to produce a single measurement reading. It determines how long the JY-8902 collects data from the signal before finalizing a measurement.

NPLC: NPLC is the measurement integration time expressed as a multiple of the power line frequency cycles. It represents the period during which the JY-8902 integrates the input signal to obtain a single measurement reading.

Offset Compensation: Offset Compensation is a feature in DMMs that adjusts the measurement to account for any inherent offset errors in the system. It involves measuring and compensating for any fixed offset that might affect the accuracy of the readings.

Range: Choosing an appropriate range is crucial for accurate measurements. A range that is too small may cause overflow, while one that is too large may affect measurement precision. JY-8902 offers multiple range settings for selection, including an automatic range option. When set to automatic, JY-8902 will automatically select the appropriate range based on the signal being measured, ensuring accurate measurements.

Learn by Example 6.2

- Connect the JY-8902 to a 510k ohm resistor using electrical wires. The connection method between the resistor and the JY-8902 is illustrated in the Figure below.

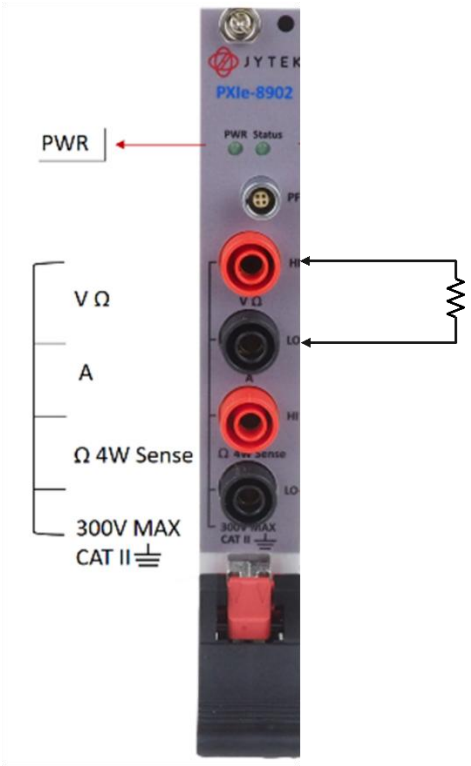

Figure 3 Resistance Connection Method

- Open **Resistance-->Resistance 2-wires continuous measurement**, set the following paraments as shown. This sample program will continuously measure the resistance value of the test resistor.

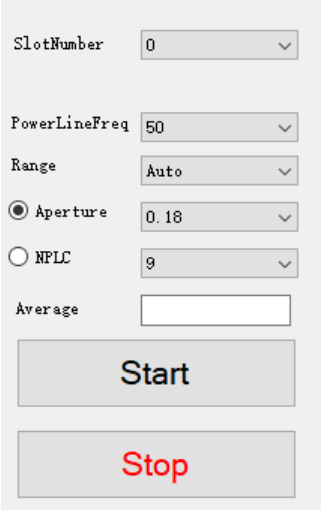

Figure 4 2-wire Resistance Measurement Paraments

- **SlotNumber**: The SlotNumber refers to the sequential number assigned to the JY-8902 within the PXIe chassis. If there is only one JY-8902 card present, it defaults to 0; If there are multiple JY-8902 cards installed, you should select the specific JY-8902 based on its actual slot position within the PXIe chassis.
- **PowerLineFreq:** PowerLineFreq is frequency of the alternating current (AC) power supply used in electrical grids. It commonly refers to frequencies of 50Hz or 60Hz, depending on the region or country.

■ When **start** button is clicked, the acquisition will start. The result is shown below.

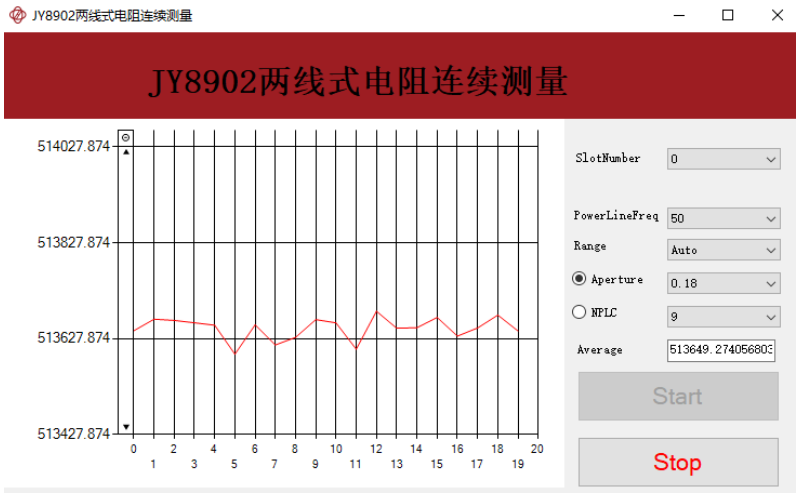

Figure 5 2-wire Resistance Acquisition Result

6.2.1 Continuous Acquisition

A Continuous task will acquire the data continuously until the task is stopped. The speed of acquisition is based on *Aperture Time* and *NPLC*.

6.2.2 Single Point Acquisition

In the Single Acquisition mode, it is to capture a single sample for each acquisition.

You can use sample program: **Resistance-->Resistance 2-wires Single point measurement** to learn more about the single point acquisition.

6.2.3 MultiPoint Acquisition

In the MultiPoint Acquisition mode, it is to capture Multi sample for each acquisition.

6.3 Measurement Type

The JY-8902 provide 3 measurement types:

- Voltage
- Current
- Resistance

Voltage: voltage is the difference in electric potential energy per unit charge between two points. In simpler terms, it is the pressure or force that pushes electric charges through a conductor. In most cases, we measure voltage using a parallel connection.

Current: current is the flow of electric charge carriers, usually electrons or ions, through a conductor in a circuit. It is the rate of flow of electric charge past a specific point in a circuit. In most cases, we measure the current in a circuit using a series connection.

Resistance: resistance is the opposition to the flow of electric current through a conductor. It is a property of the material that impedes the movement of electrons. The measurement of resistance is divided into two-wire method and four-wire method, with specific connection methods to be detailed in section 6.3.3

6.3.1 Voltage

The JY-8902 can accurately measure voltage values. When operating in voltage mode, the connection method between the voltage to be measured and the JY-8902 is illustrated in Figure 6 Connection Method of Voltage Measurement.

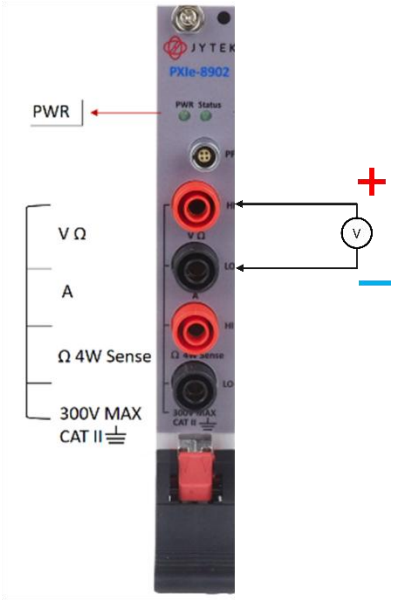

Figure 6 Connection Method of Voltage Measurement

When measuring a voltage signal in voltage mode, there are two coupling methods available: DC coupling and AC coupling. User can select the measurement method through the software.

DC coupling:

When use DC coupling, JY-8902 will measure voltage signal directly.

Learn by Example

- Open the program **Volt-->DC Voltage Single point measurement**
- Connect the voltage signal (V = 5V) source to JY-8902 as shown in Figure 6 Connection Method of Voltage Measurement.
- Set parameters as shown in figure below.

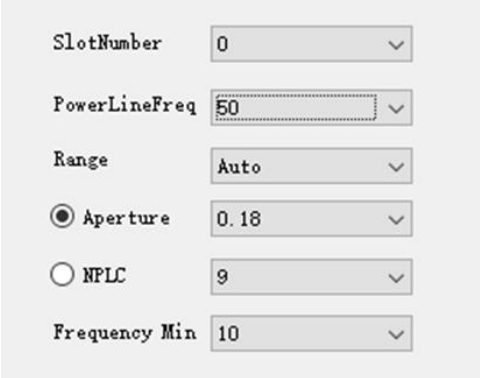

Figure 7 DC Voltage Single Point Paraments

- Click **Measure** button, the measurement result is shown below.

Figure 8 Measurement Result of DC single point

AC coupling:

When use AC coupling, JY-8902 will measure the RMS value of the AC voltage signal and include filters to eliminate DC components.

Learn by Example

- Open the program **Volt-->AC Voltage Single point measurement**
- Connect the signal source (Wave type: Sine; Vpp = 5V; f = 1k) to JY-8902 as shown in Figure 6 Connection Method of Voltage Measurement.
- Set parameters as shown in figure below.

Figure 9 AC Voltage Measurement Paraments

- Click **Measure** button, the measurement result is shown in figure below.

Figure 10 Measurement result of AC Voltage single point

The measurement result is the RMS value of sine wave voltage signal with a Vpp of 5V.

6.3.2 Current

The JY-8902 can accurately measure current values in circuit. When current mode is selected, the connection method between the circuit and the JY-8902 is shown in figure below.

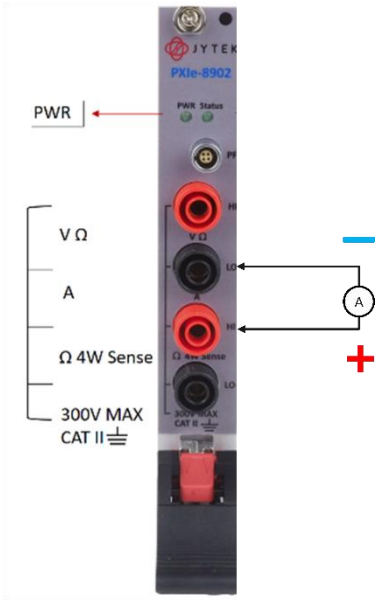

Figure 11 Connection Method of current measurement

When measuring a current signal in voltage mode, there are two coupling methods available: DC coupling and AC coupling. Users can select the measurement method through the software.

DC coupling:

Learn by Example 6.3.2-1

- Open the program **Current-->DC Current Single point measurement**
- Connect the current signal generator (I = 20mA, DC) to JY-8902 as shown in Figure 11 Connection Method of current measurement .
- Set range to **_200mA**, set other parameters as shown in figure below. Here we use JY-8902 in Slot 7.

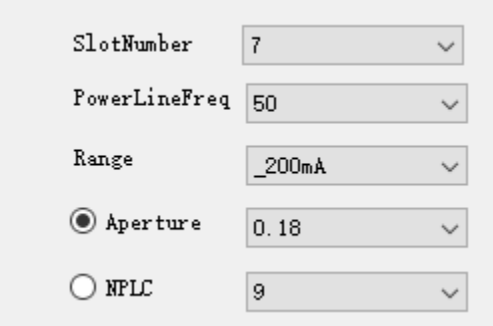

Figure 12 DC Current Measurement Paraments

- Click **Measure** button, the measurement result is shown below.

Figure 13 Measurement Result of DC Current Single Point

AC coupling:

When measure AC current, use same connection method as shown in Figure 11. The JY-8902 will measure the AC component of the current in the circuit.

Learn by Example 6.3.2-2

- Open the program **Current-->AC Current Single point measurement**

- Connect the current signal generator (I = 20mA, AC) to JY-8902 as shown in Figure 11 Connection Method of current measurement.
- Set range to **_200mA**, set other parameters as shown. Here we use JY-8902 card in Slot 7.

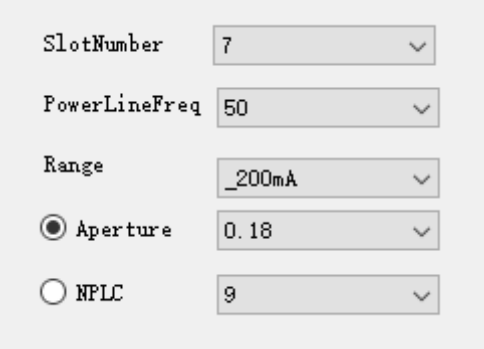

Figure 14 AC Current Single Point Paraments

- Click **Measure** button, the measurement result is shown below.

Figure 15 Measurement Result of AC Current Single Point

6.3.3 Resistance

The JY-8902 can accurately measure the resistance value of the test object. When using resistance mode, measurements can be performed using either the two-wire method or the four-wire method.

The two-wire method for measuring resistance is simple and is suitable for general applications. However, it includes lead and contact resistance, reducing accuracy, especially for low-resistance measurements. In contrast, the four-wire method provides higher accuracy by eliminating lead and contact resistance effects, making it ideal for low-resistance and precision measurements.

2-wire Method

The connection of 2-wire Method is shown in Figure 3. You can get more information from Section 6.2.

4-wire Method

4-wire method is suitable for low-resistance resistor. The connection of 4-wire method is shown in figure below.

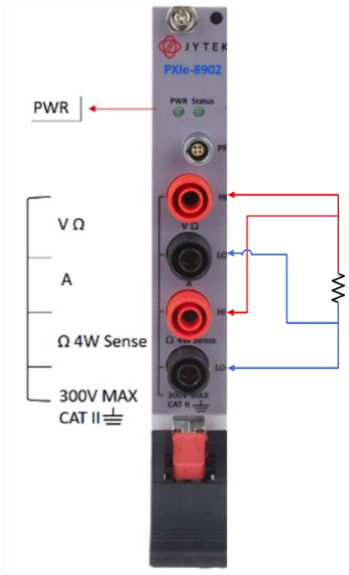

Figure 16 Connection Method of 4-wire Resistance Measurement

Learn by Example 0

- Open **Resistance-->Resistance 4-wires Single point measurement**, set the following numbers as shown in figure below

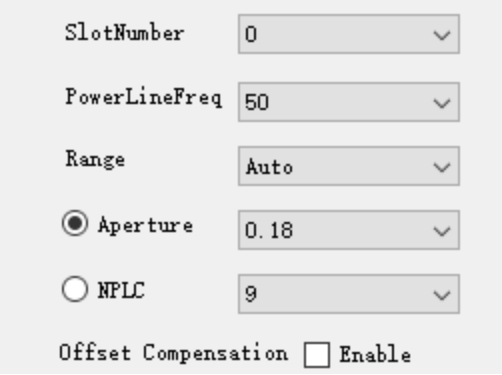

Figure 17 4-wire Resistance Measurement Paraments

- Offset compensation: It is a method used to improve the accuracy of low

resistance measurements by accounting for and eliminating small voltage offsets in the measurement circuitry. This technique ensures more precise and reliable readings by mitigating the impact of these offsets.

- Click **Measure** button, the result is shown below.

Figure 18 Measurement Result of 4-wire Resistance

6.4 Trigger Source

JY-8902 provides 3 trigger types: Immediate trigger, Software trigger and Digital trigger. The trigger type is a property and set by driver software.

6.4.1 Immediate trigger

This trigger mode does not require configuration and is triggered immediately when an operation starts.

Learn by Example 6.4.1

- Connect JY-8902 with DC Voltage source(V=5V). The connection method is illustrated in Figure 6 Connection Method of Voltage Measurement.
- Open **Volt--> DC Voltage continuous measurement**. Set the following parameters as shown in figure below.

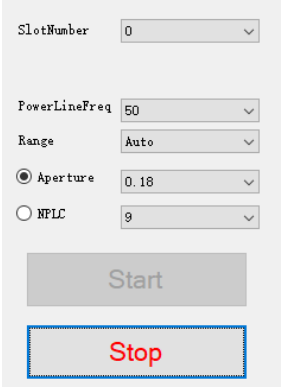

Figure 19 DC Voltage Continuous Measurement Paraments

- Click **Start** button, JY-8902 will start acquisition immediately. The measurement result is shown below:

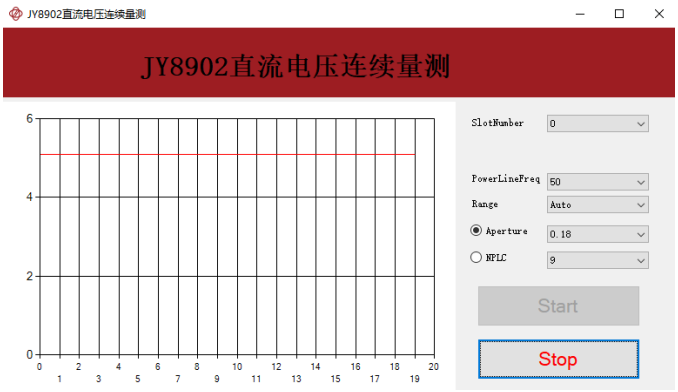

Figure 20 Acquisition Result of DC Voltage Continuous Measurement

6.4.2 Software Trigger

A software trigger must be configured by the driver software. The trigger starts when a trigger software routine is called.

Learn by Example

- Connect JY-8902 with DC Voltage source(V=5V). The connection method is illustrated in Figure 6.
- Open **Volt--> DC Voltage continuous measurement Soft Trigger**. Set the following parameters as shown in figure below。

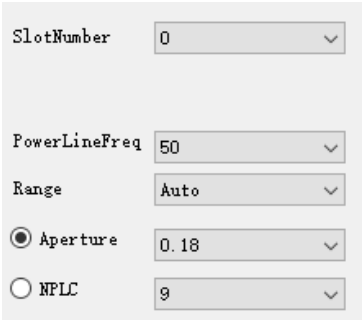

Figure 21 Soft Trigger Paraments

- Click **Start** button, JY-8902 will not start acquisition immediately.
- Click **Send Soft** button, JY8900 will start acquisition. The measurement result is shown below.

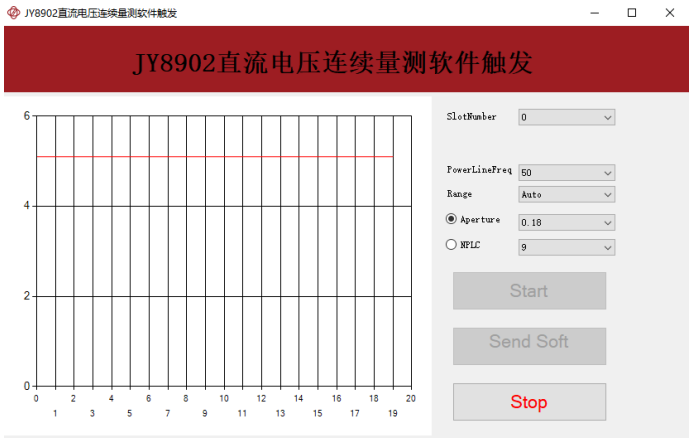

Figure 22 Measurement Result of DC Voltage Soft Trigger

6.4.3 Digital Trigger

JY-8902 supports different external digital trigger sources from PXI Trigger bus (PXI_TRIG<0..7>) and connectors of front panel (PFI). The high pulse width of digital trigger signal must be longer than 20 ns for effective trigger. The module will monitor the signal on digital trigger source and wait for the rising edge or falling edge of digital signal which depending on the set trigger condition, then cause the module to acquire the data as shown in Figure 23.

Figure 23 External Digital Trigger

Learn by Example 6.4.3

- Connect JY-8902 with DC Voltage source (V=5V). The connection method is illustrated in Figure 6.
- Open **Volt--> DC Voltage continuous measurement Digital Trigger**. Set the following parameters as shown in figure below。

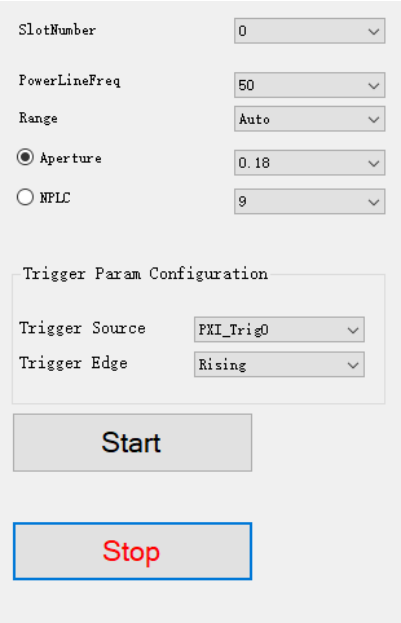

Figure 24 Digital Trigger Paraments

- **Trigger Source** must match the pin on JY-8902.Here we use **PXI_Trig0** as Trigger Source.
- There are two **Trigger Edge**: **Rising** and **Falling**.

- Click **Start** button, the acquisition will not start immediately.

- After send Signal to PXI_Trig0, JY-8902 will start acquisition. The measurement result is shown below.

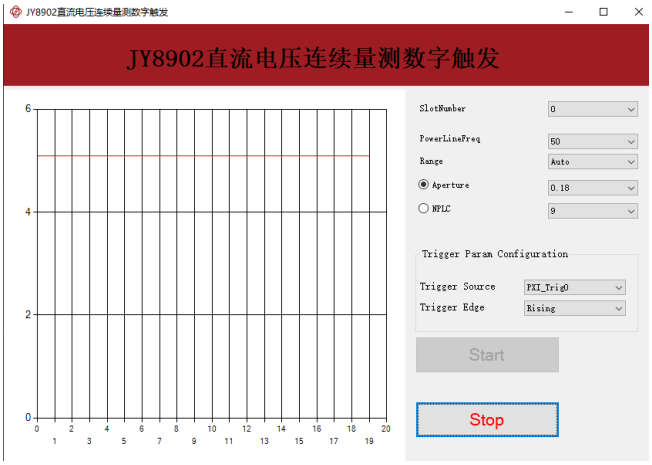

Figure 25 Digital Trigger Acquisition

7. Calibration

JY-8902 Series module are precalibrated before the shipment. We recommend you recalibrate JY-8902 board periodically to ensure the measurement accuracy. A commonly accepted practice is one year. If for any reason, you need to recalibrate your board, please contact JYTEK.

8. Using JY-8902 in Other Software

While JYTEK's default application platform is Visual Studio, the programming language is C#, we recognize there are other platforms that are either becoming very popular or have been widely used in the data acquisition applications. Among them are Python, C++ and LabVIEW. This chapter explains how you can use JY-8902 DAQ card using one of this software.

8.1 Python

JYTEK provides and supports a native Python driver for JY-8902 module. There are many different versions of Python. JYTEK has only tested in CPython version 3.5.4. There is no guarantee that JYTEK python drivers will work correctly with other versions of Python.
If you want to be our partner to support different Python platforms, please contact us.

8.2 C++

We recommend our customers to use C# drivers because C# platform deliver much better efficiency and performance in most situations. We also provide C++ drivers and examples in the Qt IDE, which can be downloaded from web. However, due to the limit of our resources, we do not actively support C++ drivers. If you want to be our partner to support C++ drivers, please contact us.

8.3 LabVIEW

LabVIEW is a software product from National Instruments. JYTEK does not support LabVIEW and will no longer provide LabVIEW interface to JY-8902 module. Our third-party partners may have LabVIEW support to JY-8902 module. We can recommend you if you want to convert your LabVIEW applications to C# based applications.

9. Appendix

9.1 Typical Measurement Error

Typical measurement error is a term used to describe the variation or uncertainty in a measurement that is repeated under the same conditions. It can be caused by random errors (chance differences between observed and true values) or systematic errors (consistent biases in measurement).
Typical measurement error can be expressed as a standard deviation (the typical error of measurement) or as a percentage of the mean (the coefficient of variation).

9.2 System Noise

System noise refers to any unwanted and random fluctuations or disturbances in a physical or electronic system that can interfere with its normal operation. System noise can arise from various sources such as electrical interference, thermal noise, environmental factors, and inherent limitations of the system's components.
In electronic systems, system noise can affect the accuracy and reliability of signal processing and communication. For example, in audio systems, system noise can lead to hissing or humming sounds, and in wireless communication systems, it can cause interference and reduce the quality of the signal.
Reducing system noise is an important consideration in the design and operation of many types of systems, and engineers use various techniques to mitigate its effects, including shielding, filtering, and signal processing algorithms.

9.3 Temperature Drift

Temperature drift refers to the phenomenon where the performance or behavior of a physical or electronic system changes as the temperature changes. Temperature drift can affect various parameters such as frequency, voltage, resistance, and sensitivity, and it can cause errors or inaccuracies in the system's operation.
In electronic systems, temperature drift can arise due to the temperature dependence of the properties of the system's components, such as resistors, capacitors, and transistors. For example, the resistance of a resistor increases with temperature, and this can affect the accuracy of voltage measurements in a circuit. Similarly, the frequency of an oscillator can drift due to the temperature dependence of its resonant circuit components.
Temperature drift is an important consideration in the design and operation of many types of systems, particularly those that require high accuracy and stability over a wide

range of temperatures. Engineers use various techniques to compensate for temperature drift, including using temperature sensors to monitor and control the temperature, selecting components with low temperature coefficients, and implementing temperature compensation algorithms in software or firmware.

10. About JYTEK

10.1 JYTEK China

Founded in June, 2016, JYTEK China is a leading Chinese test & measurement company, providing complete software and hardware products for the test and measurement industry. The company has evolved from re-branding and reselling PXI(e) and DAQ products to a fully-fledged product company. The company offers complete lines of PXI, DAQ, USB products. More importantly, JYTEK has been promoting open-sourced based ecosystem and offers complete software products. Presently, JYTEK is focused on the Chinese market. Our Shanghai headquarters and production service center have regular stocks to ensure timely supply; we also have R&D centers in Xi'an and Chongqing. We also have highly trained direct technical sales representatives in Shanghai, Beijing, Tianjin, Xi'an, Chengdu, Nanjing, Wuhan, Guangdong, Haerbin, and Changchun. We also have many patners who provide system level support in various cities.

10.2 JYTEK Software Platform

JYTEK has developed a complete software platform, SeeSharp Platform, for the test and measurement applications. We leverage the open sources communities to provide the software tools. Our platform software is also open sourced and is free, thus lowering the cost of tests for our customers. We are the only domestic vendor to offer complete commercial software and hardware tools.

10.3 JYTEK Warranty and Support Services

With our complete software and hardware products, JYTEK is able to provide technical and sales services to wide range of applications and customers. In most cases, our products are backed by a 1-year warranty. For technical consultation, pre-sale and after-sales support, please contact JYTEK of your country.

11.Statement

The hardware and software products described in this manual are provided by JYTEK China, or JYTEK in short.

This manual provides the product review, quick start, some driver interface explanation for JYTEK JY-8902 Series family of multi-function data acquisition module.

No warranty is given as to any implied warranties, express or implied, including any purpose or non-infringement of intellectual property rights, unless such disclaimer is legally invalid. JYTEK is not responsible for any incidental or consequential damages related to performance or use of this manual. The information contained in this manual is subject to change without notice.

While we try to keep this manual up to date, there are factors beyond our control that may affect the accuracy of the manual. Please check the latest manual and product information from our website.

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