1. JY-6314-T7 Specifications



1.1 Overview

The JY-6314-T7 is an advanced channel-to-channel isolated thermocouple input module that offers exceptional performance and versatility for a wide range of applications. With its 16 channels of measurements, it allows simultaneous measurement of multiple thermocouples, making it ideal for various industrial and testing environments. The module boasts high accuracy of up to 0.05% full-scale, ensuring precise and reliable temperature measurements. Its 24-bit resolution captures even the slightest temperature variations with great detail. Additionally, the JY-6314-T7 incorporates 50 Hz/60 Hz noise rejection capabilities, minimizing interference from power line frequencies commonly found in industrial settings. It also includes open thermocouple detection, alerting users to any broken or disconnected thermocouple circuits. The module supports a wide range of voltage inputs, making it compatible with various thermocouple types. With its 60 VDC channel-to-channel isolation, the JY-6314-T7 provides reliable measurements even in noisy and demanding environments. Whether for white goods testing, in-vehicle data logging, battery stack testing, or other industrial applications, the JY-6314-T7 offers the accuracy, reliability, and flexibility required for precise thermocouple measurements.

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

1.2 Main Features

- 16 channels simultaneous measurement
- Up to 0.05% full-scale accuracy
- 24 bits resolution
- 50 Hz/60 Hz noise rejection
- 4 cold-junction compensation channels provided by 1 TB-6312 terminal blocks
- 60 VDC channel-to-channel isolation
- Open Thermocouple Detection
- Voltage range supported: ±1.25 V / ±600 mV / ±300 mV / ±150 mV / ±78 mV / ±39 mV
- Support R/S/B/J/T/E/K/N/C/A types of thermocouples
- Simultaneous measurement of thermocouples and voltages

1.3 Hardware Specifications

1.3.1 Input Characteristic

Number of channels	16 channels
ADC resolution	24 bits
Type of ADC	Δ-Σ
Sensor support	R/S/B/J/T/E/K/N/C/A thermocouple
Sampling mode	Simultaneous sampling
Sampling rate	Max 3 kS/s per channel
Voltage Range	±1.25V / ±600mV / ±300mV/ ±150mV/ ±78 mV / ±39mV
Temperature Range	Full J, K, T, E, N, B, R, S thermocouple range
Overvoltage protection	±2.0 V
Synchronous acquisition	Yes
Storage depth	64M Samples
Differential input impedance	666 MΩ
Typical DC linearity	±2 ppm
Maximum DC linearity	±15 ppm
ESD	4kV(Human Body Model)

Table 1 Input Characteristic

1.3.2 Basic Voltage Accuracy

Sample Rate: 40 Sample/s

JY6314-T7 AI Basic Accuracy = ±(% Reading+% Range)						
Nominal Range (V)	24 Hour Tcal ±1°C	90 Days Tcal±5°C	Temperature Coefficients (/°C)	24 Hr Full Scale Accuracy	90 Days Full Scale Accuracy	Full Scale Accuracy (%)
0.039	0.010 + 0.013	0.029 + 0.0013	0.0015 + 0.0002	0.01 mV	0.02 mV	0.042
0.078	0.010 + 0.008	0.028 + 0.008	0.0015 + 0.0001	0.02 mV	0.03 mV	0.036
0.15	0.009 + 0.005	0.027 + 0.005	0.0015 + 0.0001	0.03 mV	0.05 mV	0.032
0.3	0.009 + 0.004	0.024 + 0.004	0.0013 + 0.0001	0.05 mV	0.09 mV	0.028
0.6	0.008 + 0.003	0.022 + 0.003	0.0012 + 0.0001	0.07 mV	0.16 mV	0.025
1.25	0.008 + 0.003	0.021 + 0.003	0.0012 + 0.0001	0.14 mV	0.30 mV	0.024

Table 2 Basic Voltage Accuracy (@ 40 Sample/s)

Sample Rate: 3000 Sample/s

JY6314-T7 AI Basic Accuracy = ±(% Reading+% Range)						
Nominal Range (V)	24 Hour Tcal ±1°C	90 Days Tcal±5°C	Temperature Coefficients (/°C)	24 Hr Full Scale Accuracy	90 Days Full Scale Accuracy	Full Scale Accuracy (%)
0.039	0.012 + 0.032	0.032 + 0.032	0.0015 + 0.0002	0.02 mV	0.03 mV	0.064
0.078	0.011 + 0.017	0.031 + 0.017	0.0015 + 0.0001	0.03 mV	0.04 mV	0.048
0.15	0.010 + 0.010	0.029 + 0.010	0.0015 + 0.0001	0.04 mV	0.07 mV	0.039
0.3	0.009 + 0.007	0.026 + 0.007	0.0013 + 0.0001	0.05 mV	0.11 mV	0.033
0.6	0.009 + 0.005	0.024 + 0.005	0.0012 + 0.0001	0.09 mV	0.19 mV	0.029

JY6314-T7 AI Basic Accuracy = ±(% Reading+% Range)						
Nominal Range (V)	24 Hour Tcal ±1°C	90 Days Tcal±5°C	Temperature Coefficients (/°C)	24 Hr Full Scale Accuracy	90 Days Full Scale Accuracy	Full Scale Accuracy (%)
1.25	0.008 + 0.004	0.023 + 0.004	0.0012 + 0.0001	0.15 mV	0.34 mV	0.027

Table 3 Basic Voltage Accuracy (@ 3000 Sample/s)

Temperature Measurement Accuracy

Thermocouple Type	Temperature Range(° C)	Temperature Measurement Accuracy(° C)
J	-210 to 0	0.3
	0 to 760	0.3
	760 to 1200	0.5
K	-200 to 0	0.4
	0 to 500	0.3
	500 to 1300	0.6
N	-200 to 0	0.5
	0 to 600	0.4
	600 to 1300	0.6
T	-200 to 0	0.4
	0 to 400	0.2
E	-200 to 0	0.3
	0 to 1000	0.4
R	-50 to 250	1.4
	250 to 1064	0.8
	1064 to 1664.5	0.9
	1664.5 to 1768.1	1
S	-50 to 250	1.4
	250 to 1064	0.8
	1064 to 1664.5	1
	1664.5 to 1768.1	1.2
B	250 to 700	4.1
	700 to 1820	1.1
C	0 to 2315	1.8
A	100 to 480	0.5
G	0 to 2315	2.9
D	0 to 2315	1.9
1. Test at 78.125 mV range, using data over 90 days (±5°C) 2. Sample Rate (40 S/s).		

Table 4 Temperature Measurement Accuracy

1.3.3 Channel Isolation

JY-6314-T7 has new designs including 60 VDC isolation and noise reduction.

Isolation	Isolation voltage
channel-to-channel	60 VDC
channel-to-ground	60 VDC

Table 5 Isolation voltage

1.3.4 Simultaneous Measurement of Thermocouples and Voltages

JY-6314-T7 not only measures thermocouples but also has the capability to measure ±1.25V voltage (with a total of 6 voltage ranges), allowing simultaneous measurement of thermocouples and voltages.

1.3.5 Open Thermocouple Detection (OTD)

OTD selection:	Software
OTD detection:	Per channel
OTD enabled burnout current:	500nA

Table 6 Open Thermocouple Detection (OTD)

1.3.6 Common Mode Voltage Range

Channel-to-channel	±60 VDC
COM-Earth ground	±60 VDC

Table 7 Common Mode Voltage Range

1.3.7 CMRR

Rejection of channel-to-channel common mode voltages	
Sample Rate <= 40 S/s, best 50 Hz rejection, best 60 Hz rejection	> 180 dB
Sample Rate > 40 S/s	132 dB
Rejection of channel-to-earth ground common mode voltages	
Sample Rate <= 40 S/s, best 50 Hz rejection, best 60 Hz rejection	> 180 dB
Sample Rate > 40 S/s	130 dB

Table 8 CMRR

1.3.8 PFI Specifications

Number of channels	2 channels PFI<0..1>
External digital trigger	Trigger voltage: 5VTTL
	Trigger edge: rising/falling
Direction	Input
6314-T7's PFI is only used for external digital triggering	

Table 9 PFI Specifications

1.3.9 System Noise

Noise (uVrms)						
Range(V) Sample rate(S/s)	1.25	0.6	0.3	0.15	0.078	0.039
3000	6.91	5.05	4.24	2.58	1.70	1.36
1000	4.53	3.18	2.63	1.64	1.10	0.89
500	2.96	1.87	1.38	0.87	0.59	0.48
250	1.30	0.85	0.64	0.43	0.31	0.25
125	0.83	0.55	0.41	0.28	0.20	0.17
63	0.57	0.38	0.28	0.19	0.13	0.11
32	0.44	0.29	0.21	0.14	0.10	0.08
16	0.32	0.20	0.15	0.10	0.07	0.06
8	0.19	0.12	0.09	0.06	0.04	0.03
4	0.12	0.07	0.06	0.03	0.02	0.02
2	0.05	0.04	0.02	0.02	0.02	0.01

Table 10 System Noise

1.3.10 Digital Trigger

	PXIe-6314-T7	PCIe-6314-T7	TXI-6314-T7	USB-6314-T7
Trigger source	PXI_TRIG<0..7> PXI_STAR PFI<0..1>	SSI<0..7>* PFI<0..1>	SSI<0..7>* PFI<0..1>	PFI<0..1>
Trigger Mode	Start Reference ReTrigger	Start Reference ReTrigger	Start Reference ReTrigger	Start Reference ReTrigger
Polarity	Software selectable	Software selectable	Software selectable	Software selectable
*SSI<0..7> definition please refer to section 6.7				

Table 11 Digital Trigger

1.3.11 Bus Interface

	PXIe-6314-T7	PCIe-6314-T7
Bus Type	x4 PXI Express peripheral module Specification V1.0 compliant	x4 PCI Express 2.0
Slot supported	x1 and x4 PXI Express or PXI Express hybrid slots	x4/x8/x16 PCIe slot

Table 12 Bus Interface

1.3.12 Physical Characteristics

Product Model	Size(mm)	Weight(g)
PXIe-6314-T7	160 x 100	
PCIe-6314-T7	167.7 x 111.2	
USB-6314-T7	208.1 x 128 x 36.4*	
DDA-6314-T7	208.1 x 128 x 36.4*	
*Length including connectors		

Table 13 Physical Characteristics

1.3.13 Power Requirements

Voltage	Current
12V	0.7 A
3.3V	0.1 A

Table 14 Power Requirements

1.3.14 Environment Specifications

Operating Environment

Ambient temperature range	0 °C to 50 °C
Relative humidity range	20% to 80%, noncondensing

Table 15 Operating Environment

Storage Environment

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

Table 16 Storage Environment

2. Order Information

- PXIe-6314-T7 (PN: TBD)

  16-ch 24-bit PXIe ch-to-ch isolated thermocouple input module
- PCIe-6314-T7 (PN: TBD)

  16-ch 24-bit PCIe ch-to-ch isolated thermocouple input module
- USB-6314-T7 (PN: TBD)

  16-ch 24-bit USB ch-to-ch isolated thermocouple input module
- DDA-6314-T7 (PN: TBD)

  16-ch 24-bit DDA ch-to-ch isolated thermocouple input module
- Accessories

  Terminal Block:

  TB-6312 (PN: JY1227130-01) 68-Pin SCSI Shielded I/O Connector Block with cold junction sensor and shunt resistor

  Cable:

  ACL-2026868-1 (PN: JY2026868-01) 1 M 68pin VHDCI68M-SCSI68M 100 ohm all shielded cable

  ACL-2026868-2 (PN: JY2026868-02) 2 M 68pin VHDCI68M-SCSI68M 100 ohm all shielded cable

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3. Introduction

3.1 Overview

The JY-6314-T7 is an advanced channel-to-channel isolated thermocouple input module that offers exceptional performance and versatility for a wide range of applications. With its 16 channels of measurements, it allows simultaneous measurement of multiple thermocouples, making it ideal for various industrial and testing environments.

3.2 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-6314-T7 in the driver sheet, select **JY6314-T7 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	Support Module
JY6312_V1.3.0_Linux.tar	2024/4/26	Driver	6312
JY6312_V1.3.0_Win.rar	2024/4/12	Driver	6312
JY6312_V1.2.0_Examples.rar	2023/9/1	Example	6312
JY6312_V1.0.0_C++Examples.zip	2023/5/26	Example	6312
JY6312_V1.0.0_Python.zip	2023/5/26	Driver	6312
JY6312_V1.0.0_PythonExamples.zip	2023/5/26	Example	6312

Figure 1 JYPEDIA Information

4. Hardware Specifications

4.1 Front Panel



Figure 2 JY-6314-T7 Front Panel

JY-6314-T7 provides 16 channels of thermocouple measurements and 2 digital input channels (for digital triggering).

4.2 Pin Definition

Connector 0

Channel	Pin	Defination
Ch0	P35	TC+, Voltage measurement high side
	P1	TC-, Voltage measurement low side
Ch1	P37	TC+, Voltage measurement high side
	P3	TC-, Voltage measurement low side
Ch2	P38	TC+, Voltage measurement high side
	P4	TC-, Voltage measurement low side
Ch3	P40	TC+, Voltage measurement high side
	P6	TC-, Voltage measurement low side
Ch4	P41	TC+, Voltage measurement high side
	P7	TC-, Voltage measurement low side
Ch5	P43	TC+, Voltage measurement high side
	P9	TC-, Voltage measurement low side
Ch6	P44	TC+, Voltage measurement high side
	P10	TC-, Voltage measurement low side
Ch7	P46	TC+, Voltage measurement high side
	P12	TC-, Voltage measurement low side
Ch8	P49	TC+, Voltage measurement high side
	P15	TC-, Voltage measurement low side
Ch9	P51	TC+, Voltage measurement high side
	P17	TC-, Voltage measurement low side
Ch10	P52	TC+, Voltage measurement high side
	P18	TC-, Voltage measurement low side
Ch11	P54	TC+, Voltage measurement high side
	P20	TC-, Voltage measurement low side
Ch12	P55	TC+, Voltage measurement high side
	P21	TC-, Voltage measurement low side
Ch13	P58	TC+, Voltage measurement high side
	P24	TC-, Voltage measurement low side
Ch14	P59	TC+, Voltage measurement high side
	P25	TC-, Voltage measurement low side
Ch15	P61	TC+, Voltage measurement high side
	P27	TC-, Voltage measurement low side

Channel	Pin	Defination
GND	P30	GND
	P31	
	P32	
	P33	
	P34	
PFI	P64	PFI0
	P65	PFI1
	P66	Reseved, Do not connect
	P67	Reseved, Do not connect
Other	P2	Reseved, Do not connect
	P36	Reseved, Do not connect
	P5	Reseved, Do not connect
	P39	Reseved, Do not connect
	P8	Reseved, Do not connect
	P42	Reseved, Do not connect
	P11	Reseved, Do not connect
	P45	Reseved, Do not connect
	P13	Reseved, Do not connect
	P47	Reseved, Do not connect
	P14	Reseved, Do not connect
	P48	Reseved, Do not connect
	P16	Reseved, Do not connect
	P50	Reseved, Do not connect
	P19	Reseved, Do not connect
	P53	Reseved, Do not connect
	P22	Reseved, Do not connect
	P56	Reseved, Do not connect
	P23	Reseved, Do not connect
	P57	Reseved, Do not connect
	P26	Reseved, Do not connect
	P60	Reseved, Do not connect
	P28	Reseved, Do not connect
	P62	Reseved, Do not connect
	P29	Reseved, Do not connect
	P63	Reseved, Do not connect
	P68	+ 5V

Table 17 Pin Definition

4.3 Temperature Measurement Accuracy

The accuracy of the temperature measurement depends on the thermocouple, the connectors, the terminal block, and the measuring device. This chapter provides the temperature measurement accuracy specifications by JY-6314-T7 and specified terminal block only. The effect of the thermocouple is not included.

4.3.1 Thermocouple Measurement Basics

A Thermocouple temperature measurement utilizes the "Seebeck effect", and its basic measurement principle is shown in the Figure 1.

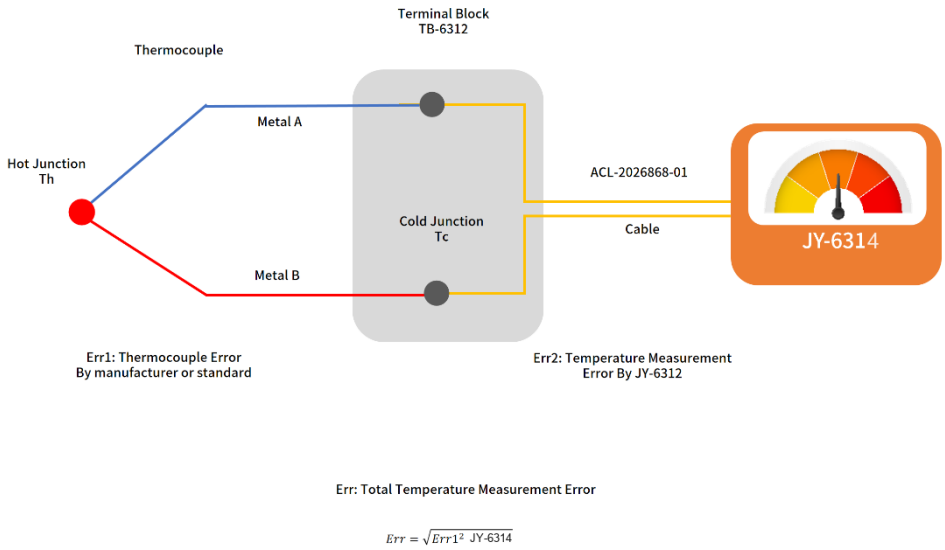


Figure 3 Thermocouple Temperature Measurement Principle

Two different types of metals A and B are connected to each other, and the temperature difference between the temperature measuring contact Th (Metal Junction) and the reference contact Tc (Thermocouple Display Instrument Contact) is used to generate the corresponding voltage, also called the Electromotive Force （EMF）in the standards. This voltage is measured by JY-6314-T7 and is then converted the temperature values using a conversion formula defiend by the standard.

4.3.2 Thermocouple Accuracy

A thermocouple has its own accuracy, also called the error tolerance in many international standards. Table 18 Err1: Thermocouple Tolerance Class Information shows the accuracies of common thermocouple types by two commonly used standards. Using the K-type as an example. Each K-type thermocouple falls into one of the three classes. The maximum accuracy of class 1 of the K-type thermocouple is ±1.5°C or ±(0.004*|T|), whichever is bigger. T is the measured temperature value in °C.

If the measured temperature is -30°C, 0.004*|-30| = 0.12°C, so the accuracy is ±1.5°C. If T=1000°C, 1000*0.004=4°C, so the accuracy is ±4°C.

Thermocouple Type	Standard	Tolerance Class	Temperature Range (°C)	Thermocouple Error (°C) (larger of the two)	
				Fixed Error	Formula Error
J	IEC-EN 60584-1	Class 1	–40 < T < 750	±1.5	±(0.004 · |T|)
		Class 2	–40 < T < 750	±2.5	±(0.0075 · |T|)
		Class 3	–	–	–
	ASTM E230 / ANSI MC96.1	Special	0 < T < 750	±1.1	±(0.004 · |T|)
		Standard	0 < T < 750	±2.2	±(0.0075 · |T|)
K	IEC-EN 60584-1	Class 1	–40 < T < 1000	±1.5	±(0.004 · |T|)
		Class 2	–40 < T < 1200	±2.5	±(0.0075 · |T|)
		Class 3	–200 < T < 40	±2.5	±(0.015 · |T|)
	ASTM E230 / ANSI MC96.1	Special	0 < T < 1250	±1.1	±(0.004 · |T|)
		Standard	–200 < T < 0 0 < T < 1250	±2.2 ±2.2	±(0.02 · |T|) ±(0.0075 · |T|)
N	IEC-EN 60584-1	Class 1	–40 < T < 1000	±1.5	±(0.004 · |T|)
		Class 2	–40 < T < 1200	±2.5	±(0.0075 · |T|)
		Class 3	–200 < T < 40	±2.5	±(0.015 · |T|)
	ASTM E230 / ANSI MC96.1	Special	0 < T < 1300	±1.1	±(0.004 · |T|)
		Standard	–270 < T < 0 0 < T < 1300	±2.2 ±2.2	±(0.02 · |T|) ±(0.0075 · |T|)
T	IEC-EN 60584-1	Class 1	–40 < T < 350	±0.5	±(0.004 · |T|)
		Class 2	–40 < T < 350	±1.0	±(0.0075 · |T|)
		Class 3	–200 < T < 40	±1.0	±(0.015 · |T|)
	ASTM E230 / ANSI MC96.1	Special	–200 < T < 0 0 < T < 350	±0.5 ±0.5	±(0.008 · |T|) ±(0.004 · |T|)
		Standard	–200 < T < 0 0 < T < 350	±1.0 ±1.0	±(0.015 · |T|) ±(0.0075 · |T|)
E	IEC-EN 60584-1	Class 1	–40 < T < 800	±1.5	±(0.004 · |T|)
		Class 2	–40 < T < 900	±2.5	±(0.0075 · |T|)
		Class 3	–200 < T < 40	±2.5	±(0.015 · |T|)
	ASTM E230 / ANSI MC96.1	Special	–200 < T < 0 0 < T < 900	±1.0 ±1.0	±(0.005 · |T|) ±(0.004 · |T|)
		Standard	–200 < T < 0 0 < T < 900	±1.7 ±1.7	±(0.01 · |T|) ±(0.005 · |T|)
R & S	IEC-EN 60584-1	Class 1	0 < T < 1600	±1.0	±[1 + 0.003 · (|T| – 1100)]
		Class 2	–40 < T < 1600	±1.5	±(0.0025 · |T|)
		Class 3	–	±4.0	±(0.005 · |T|)

Thermocouple Type	Standard	Tolerance Class	Temperature Range (°C)	Thermocouple Error (°C) (larger of the two)	
				Fixed Error	Formula Error
	ASTM E230 / ANSI MC96.1	Special	0 < T < 1450	±0.6	±(0.001 · |T|)
		Standard	0 < T < 1450	±1.5	±(0.0025 · |T|)
B	IEC-EN 60584-1	Class 1	–	–	–
		Class 2	600 < T < 1700	±1.5	±(0.0025 · |T|)
		Class 3	600 < T < 1700	±4.0	±(0.005 · |T|)
	ASTM E230 / ANSI MC96.1	Special	870 < T < 1700	–	±(0.0025 · |T|)
		Standard	870 < T < 1700	–	±(0.005 · |T|)
C	IEC-EN 60584-1	Class 1	–	–	–
		Class 2	426 < T < 2315	–	±(0.01 · |T|)
		Class 3	–	–	–
	ASTM E230 / ANSI MC96.1	Special	–	–	–
		Standard	0 < T < 2315	–	±(0.01 · |T|)
Thermocouple error is the larger of the fixed error and the formula error.					

Table 18 Err1: Thermocouple Tolerance Class Information

The accuracies given by Table 18 Err1: Thermocouple Tolerance Class Information are valid for thermocouple material only. It is important that users verify the accuracy of the thermocouple from the thermocouple manufacturer.

4.3.3 Temperature Measurement Accuracy by JY-6314-T7

A thermocouple converts a temperature reading to a voltage which is then measured by JY-6314-T7. The standard provides the conversion formula for different thermocouples and for different temperature ranges. shows the temperature measurement accuracy using JY-6314-T7 for each type and each range of thermocouple. The operating conditions are also listed in the table.

It is important to note that the accuracy data only includes the measurement errors by JY-6314-T7, using the specified ACL-2026868-01 cable and the TB-68CJ termial block. It does not include the errors of the thermocouple itself. To get the total measurement accuracy, users must check with thermocouple error specifications from the thermocouple manufacturer. Section 4.3.4 provides the information how to calculate the total accuracy.

4.3.4 Total Temperature Measurement Accuracy

The total temperature measurement accuracy consists of the errors due to the thermocouple and measurement errors by JY-6314-T7 as shown in Figure 3. It can be calculated by:

$$Total\ Accuracy\ Error = \sqrt{Err_1^2 + Err_2^2}$$

Err1 is the thermocouple error from Table 17 of Section 4.3.2. Err2 is the temperature measurement accuracy from Table 18 of Section 4.3.3.

Table 4 shows two calculations for the total accuracies when using a class 1 K-type thermocouple to measure 100 ºC and 800ºC temperatures with 40 Sample/s sample rate. The two temperatures fall into different range. Hence the temperature measurement errors by JY-6314-T7 are different.

Total Temperature Measurement Error		
Sample Rate (Sample/s)	40	
Thermocouple Type and Class	K-1	K-1
Temperature Being Measured (°C)	100	800
Fixed Error from K-1 Standard (°C)	1.5	1.5
Calculated from K-1 Standard (|T|·0.004) (°C)	0.4	3.2
Err1: Total Thermocouple Error for K-1 Standard, larger of above two lines (°C)	1.5	3.2
Err2: JY-6314-T7 Temperature Measurement Error for K-1 (°C)	0.29	0.61
Total Accuracy, sqrt(Err1^2+Err2^2) (°C)	1.53	3.26

Table 19 Calculating Total Error

4.3.5 Accuracy Not Listed

lists the temperature measurement accuracies for most common applications. There are other factors affecting the measurement accuracy. Most important factors are 1) when the operating temperature is beyond the Tcal±1°C range, and 2) when the cold junction reference temperature are different from the operating temperature as assumed in . It is not possible to list all these accuracies. JYTEK provides a utility in JY-6314-T7 C# example to calculate the accuracy for those conditions. Users can enter required operating parameters to obtain accuracy not listed in .

5. Software

5.1 System Requirements

JY-6314-T7 boards 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 20 Supported Linux Versions

5.2 System Software

When using the JY-6314-T7 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-6314-T7 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-6314-T7 Hardware Driver

After installing the required application development environment as described above, you need to install the JY-6314-T7 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-6314-T7 function. JYTEK has standardized the ways which JYTEK and other vendor's DAQ boards 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

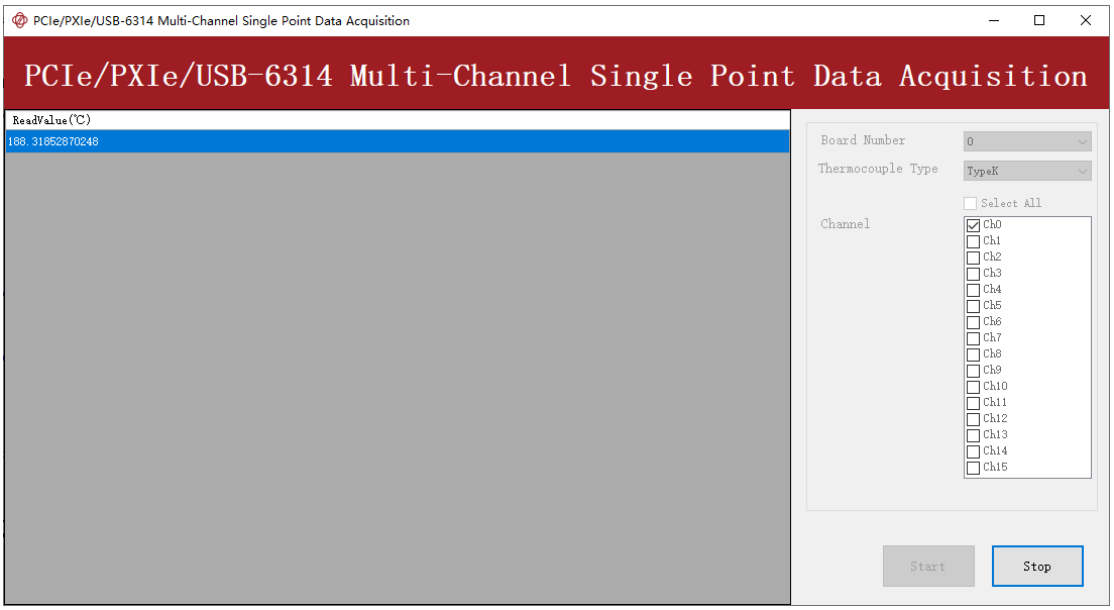
To efficiently and effectively use JY-6314-T7 boards, you need to install a set of free C# utilities, SeeSharpTools from JYTEK. The SeeSharpTools offers rich user interface functions you will find convenient in developing your applications. They are also needed to run the examples come with JY-6314-T7 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.

Learn by Example 6.2.1

■ Connect the K-type thermocouple's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1);
■ Open **Winform AI Single Point MultiChannel**;
■ Set other parameters as shown and click **Start**,the result is shown below.

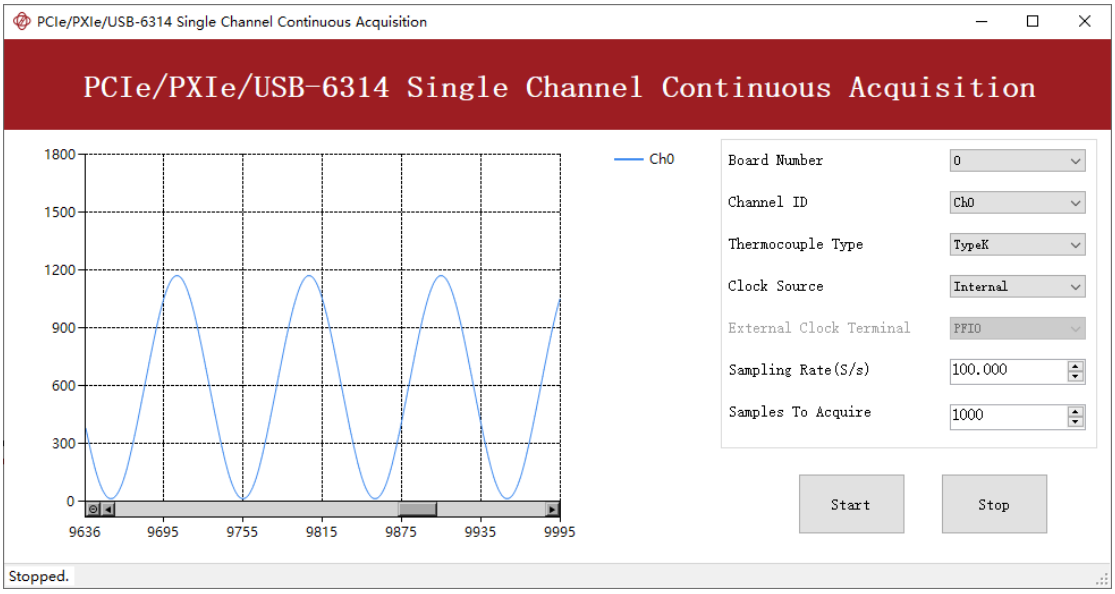


Continuous Acquisition

The JY-6314-T7 can sample up to 3 kS/s per channel. In continuous mode, the task acquires and reads data continuously until it is stopped.

Learn by Example 6.2.2

■ Connect the K-type thermocouple's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1);
■ Open **Winform AI Continuous**;
■ Set other parameters as shown and click **Start**,the result is shown below.



Finite Acquisition

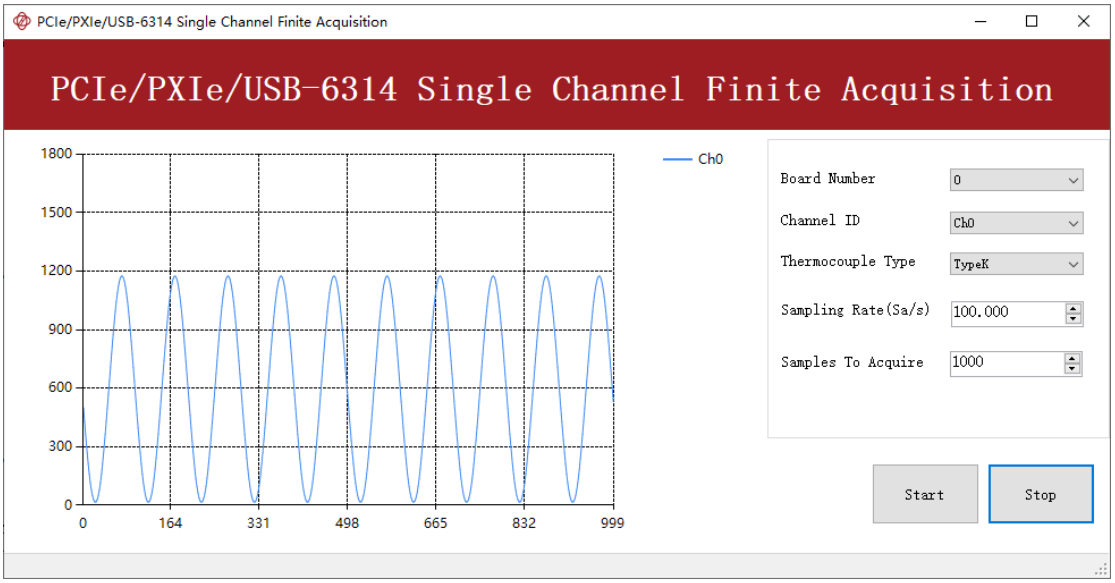
In finite mode, the task acquires the number of samples per channel set by SamplesToAcquire, which is only valid in this mode.

Learn by Example 6.2.3

■ Connect the K-type thermocouple's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1);

■ Open **Winform AI Finite**;

■ Set other parameters as shown and click **Start**,the result is shown below.



Terminal Block Detection

The TB-6312 terminal block provides the cold junction sensor and the shunt resistor. When the build-in cold-junction compensation is enabled, the connection status of the terminal block is checked when the task starts.

Learn by Example 6.2.4

■ Connect the K-type Thermocouple's positive pole and negative pole to Terminal Block's TC1+(Pin#35)and TC1-(Pin#1);

■ Open **Winform Terminal Block State;**

■ Set other parameters as shown and click Open,the result is shown below.

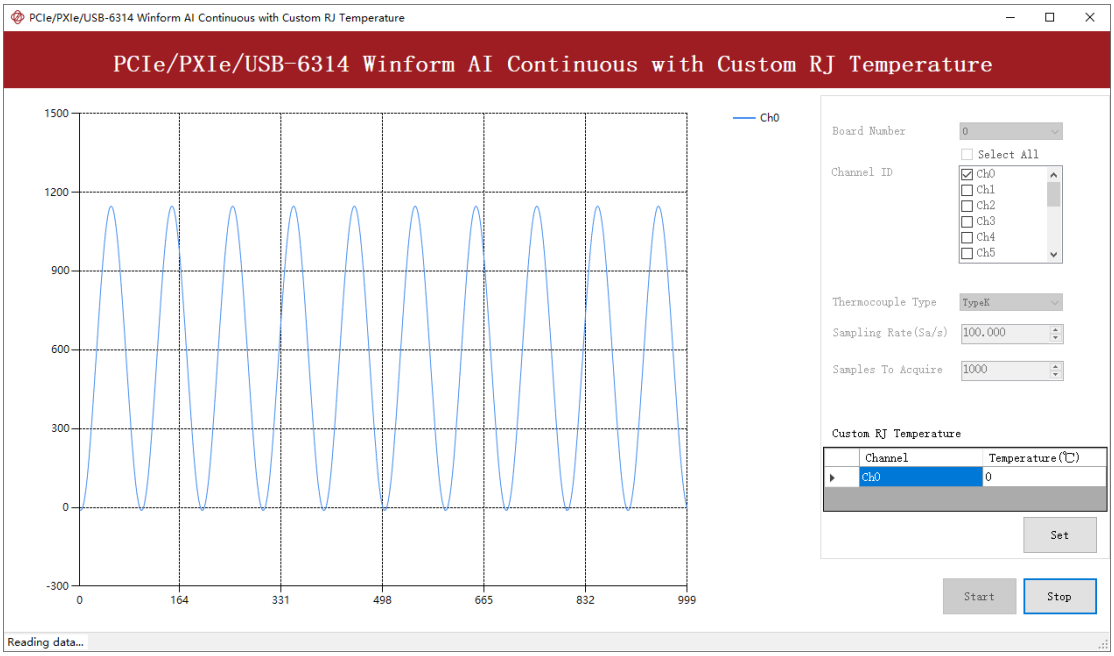


Customized Cold-Junction Temperature

The build-in cold-junction compensation is enabled by default. If it is disabled, you must set the cold junction temperature on each channel manually with SetCJTemperature.

Learn by Example 6.2.5

- Connect the K-type thermocouple's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1).
- Open **Winform AI Continuous Custom RJ.**
- Set other parameters as shown and click Start,the result is shown below.



Voltage Measurement

The JY-6314-T7 also measures voltage, allowing simultaneous measurement of thermocouples and voltages. 6 ranges are supported: ±1.25 V / ±600 mV / ±300 mV / ±150 mV / ±78 mV / ±39 mV, with an accuracy of up to 360 ppm; the input impedance is 666 MΩ and the overvoltage protection is ±2.0 V.

Single Point

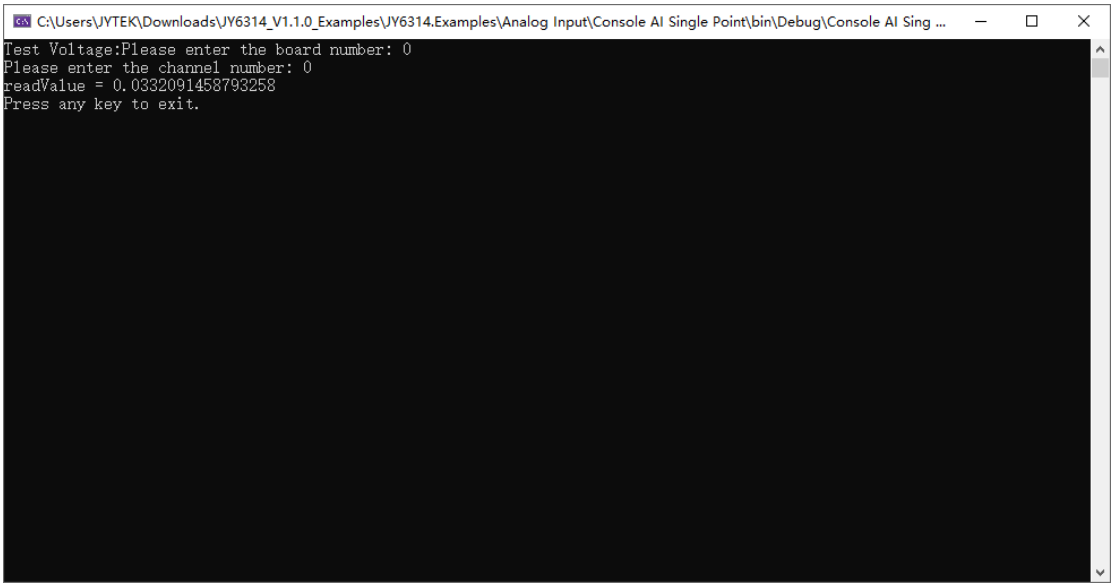
The AddChannel method adds a general voltage input channel with a selected voltage range. In single point mode, one point is read on demand from each enabled channel, and ReadSinglePoint returns the voltage value in V.

Learn by Example 6.3.1

■ Connect the voltage source's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1).

■ Run the console example **Console AI Single Point.**

■ The example adds all channels with the ±1.25 V range and reads one sample from each;the voltage of Ch0 is printed on the console.



Continuous Acquisition

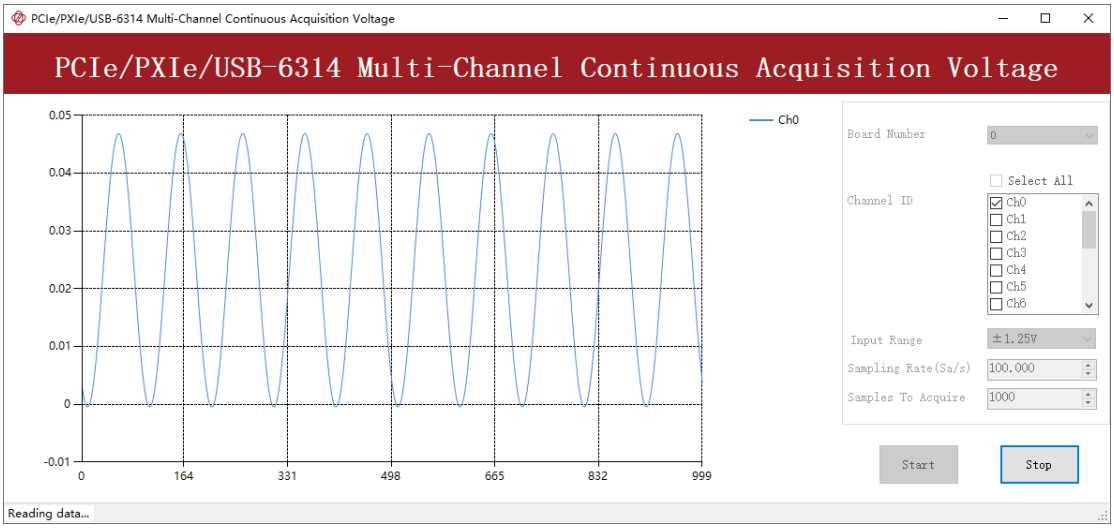
In continuous mode, the task acquires and reads voltage data continuously.

Learn by Example 6.3.2

■ Connect the signal source's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1).Keep the voltage within the ±1.25 V range;

■ Open **Winform AI Continuous MutiChannel Voltage**;

■ Set other parameters as shown and click Start,the result is shown below.

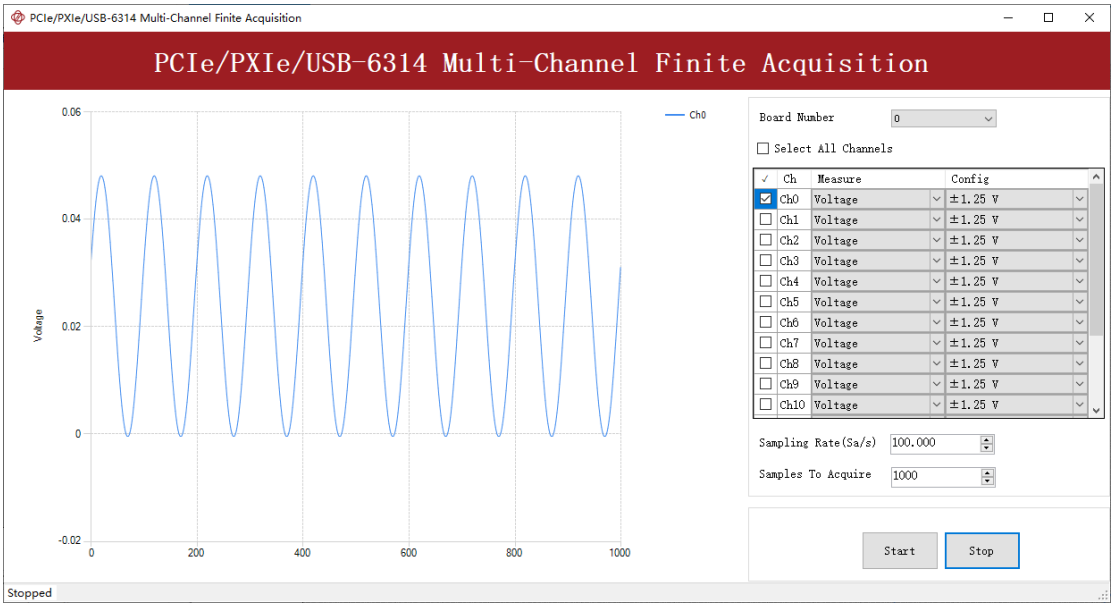


Finite Acquisition

This example performs a finite acquisition on multiple channels; each channel can be a voltage channel or a thermocouple channel, and the results are shown in the same chart.

Learn by Example 6.3.3

■ Connect the signal source's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1);
■ Open **Winform AI Finite MultiChannel VoltageAndThermocouple**;
■ Set the Measure type of the enabled channels to Voltage;
■ Set other parameters as shown and click Start,the result is shown below.



Current Measurement

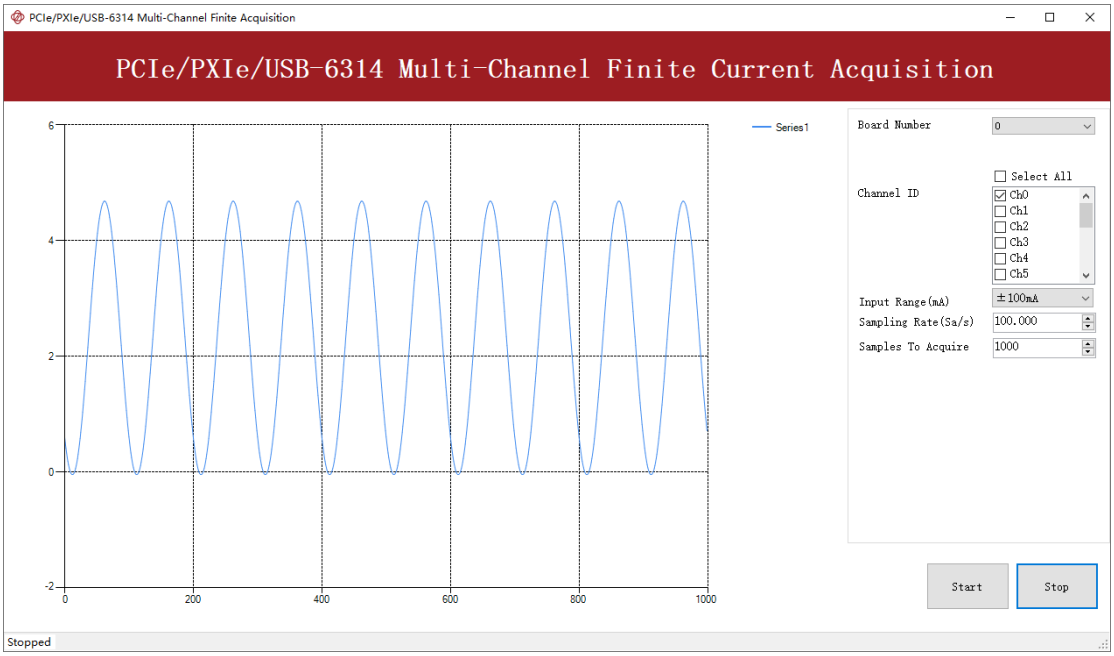
The JY-6314-T7 achieves ±100 mA current measurement via the TB-6312 terminal block, which provides the shunt resistor. Current channels are added in the same way as voltage channels but with a current range: ±100 / ±50 / ±25 / ±12.5 / ±6.25 / ±3.125 mA (T7 only).

Finite Acquisition

In finite mode, the sample count per channel is set by SamplesToAcquire. Select the current range of the channels before the acquisition.

Learn by Example 6.4.2

■ Connect the current source's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1).Keep the current within the selected range;
■ Open **Winform AI Finite Current**;
■ Set other parameters as shown and click Start,the result is shown below.



Trigger Mode

The JY-6314-T7 supports the Start, Reference and ReTrigger trigger modes, and the polarity of the digital trigger is software selectable. The trigger is configured with the trigger configuration (AITrigger) of the task.

Start Trigger

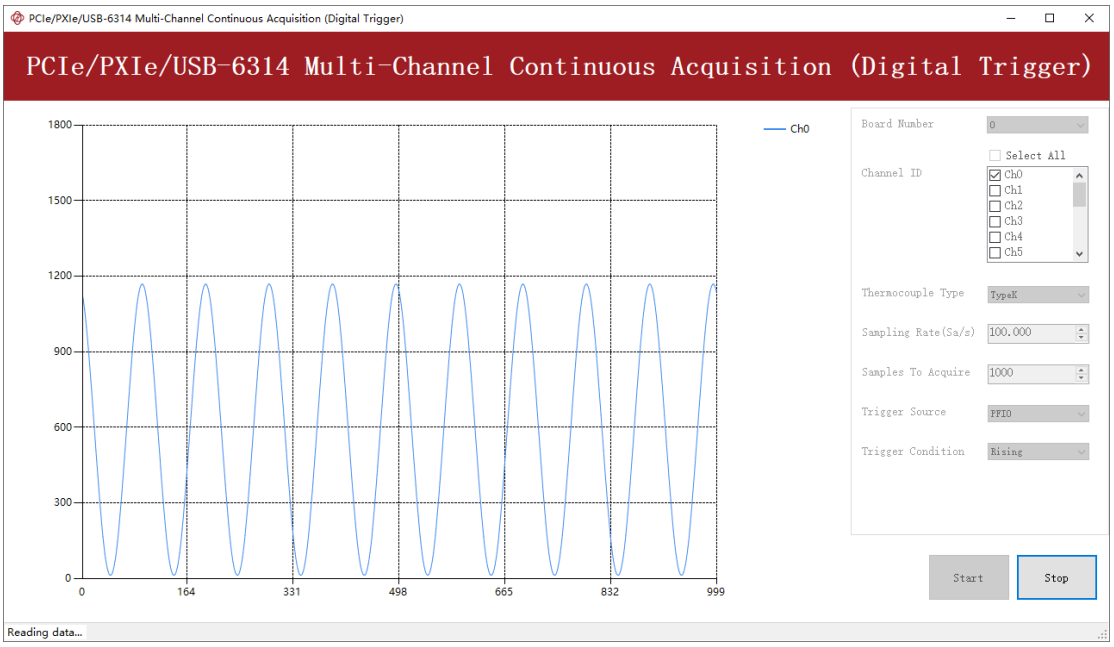
Start is the default trigger mode. When a digital trigger is used, the trigger source can be PFI0 or PFI1, and the trigger edge can be Rising or Falling.

Learn by Example 6.6.1

■ Connect the K-type thermocouple's positive pole and negative pole to TB-6312's Ch0+ (Pin#35) and Ch0- (Pin#1),then connect the trigger signal to PFI0 (Pin#64);

■ Open **Winform AI Continuous Digital Trigger**;

■Set other parameters as shown and click Start; the result is shown below after a trigger signal is received.



Reference Trigger

Reference Trigger mode is valid when the sample mode is Finite. PreTriggerSamples sets the number of AI pretrigger samples; it must be less than or equal to SamplesToAcquire.

Retrigger

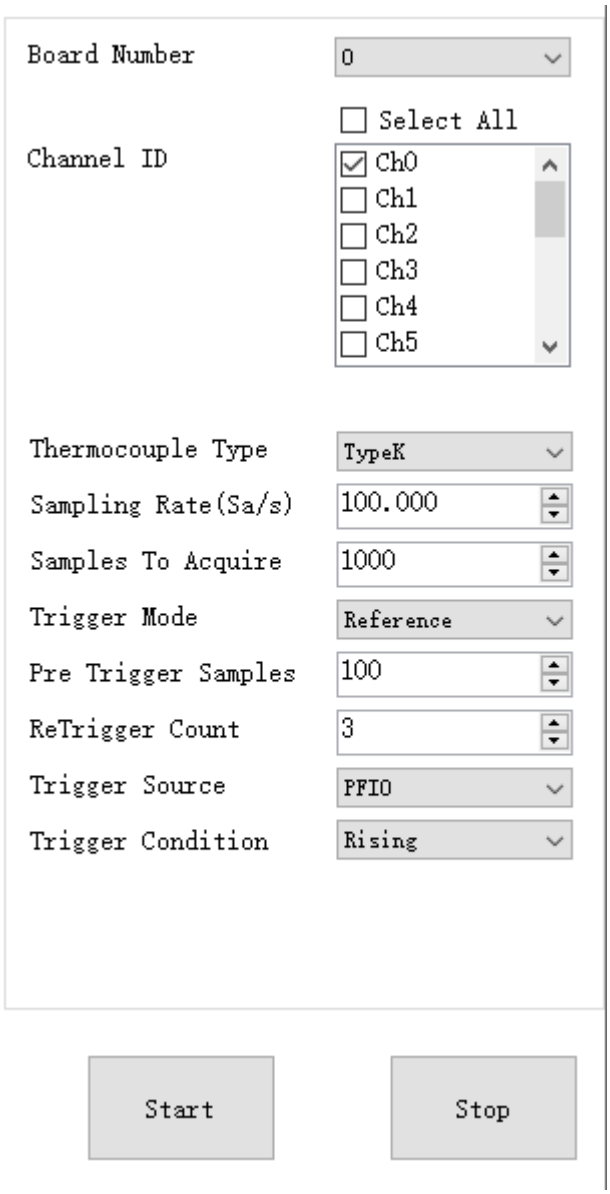
ReTriggerCount sets the number of repeat triggers: when it is 0 or 1, the trigger only occurs once; when it is -1, the task continuously retriggers until it is stopped.

Learn by Example 6.6.2 and 6.6.3

■ Connect the K-type Thermocouple's positive pole and negative pole to Terminal Block's TC1+ (Pin#35) and TC1 - (Pin#1),then connect the signal source's positive pole and negative pole to JY-6314 PFI 0 (Pin#64)and GND(Pin#30);

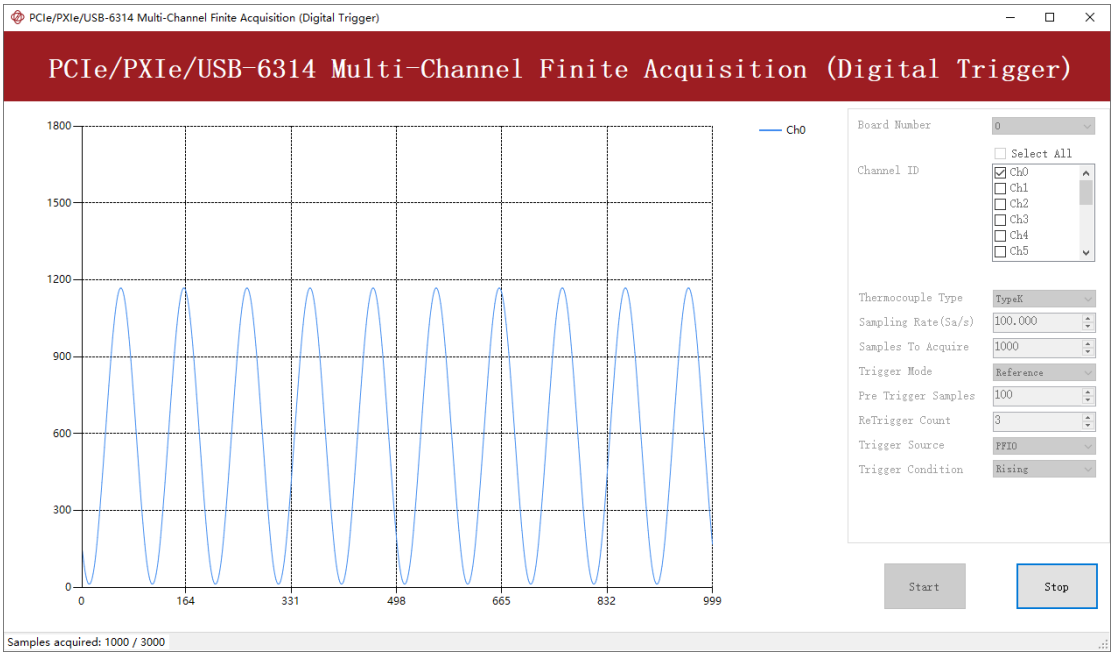
■ Set the signal source Ch0's output to squarewave signal.

■ Open **Winform AI Finite Digital Trigger**,set the following numbers as shown.



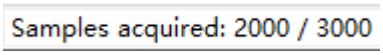
➢ You can use three different kinds of triggers in this program as mentioned in this chapter.Start Trigger and Reference Trigger can be set by **Trigger Mode**.For ReTrigger it can be used by changing the numbers in **Retrigger Count**.

■ Now the **Trigger Mode** is“**Reference**”, and the **PreTrigger Samples** are 100. Click Start to begin the data acquisition,the result is shown below:



➢ Because the measured waveform is an irregular continuous line,the effect of **Trigger mode** change can not be seen clearly.

■ Now change the mode of trigger to Retrigger through giving **Retrigger Count** the number 3 and click Start.A message will appear in the lower left corner:“Samples acquired: 2000/3000”.



➢ It shows the acquisition process through every trigger signal.

6. Calibration

JY-6314-T7 Series boards are precalibrated before the shipment. We recommend you recalibrate JY-6314-T7 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.

7. Using JY-6314-T7 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-6314-T7 DAQ card using one of this software.

7.1 Python

JYTEK provides and supports a native Python driver for JY-6314-T7 boards. 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.

7.2 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.

7.3 LabVIEW

LabVIEW is a software product from National Instruments. JYTEK does not support LabVIEW and will no longer provide LabVIEW interface to JY-6314-T7 boards. Our third-party partners may have LabVIEW support to JY-6314-T7 boards. We can recommend you if you want to convert your LabVIEW applications to C# based applications.

8. Appendix

8.1 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).

8.2 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.

8.3 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.

9. About JYTEK

9.1 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.

9.2 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.

9.3 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.

10.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-6314-T7 Series family of multi-function data acquisition boards. The manual is copyrighted by JYTEK.

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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