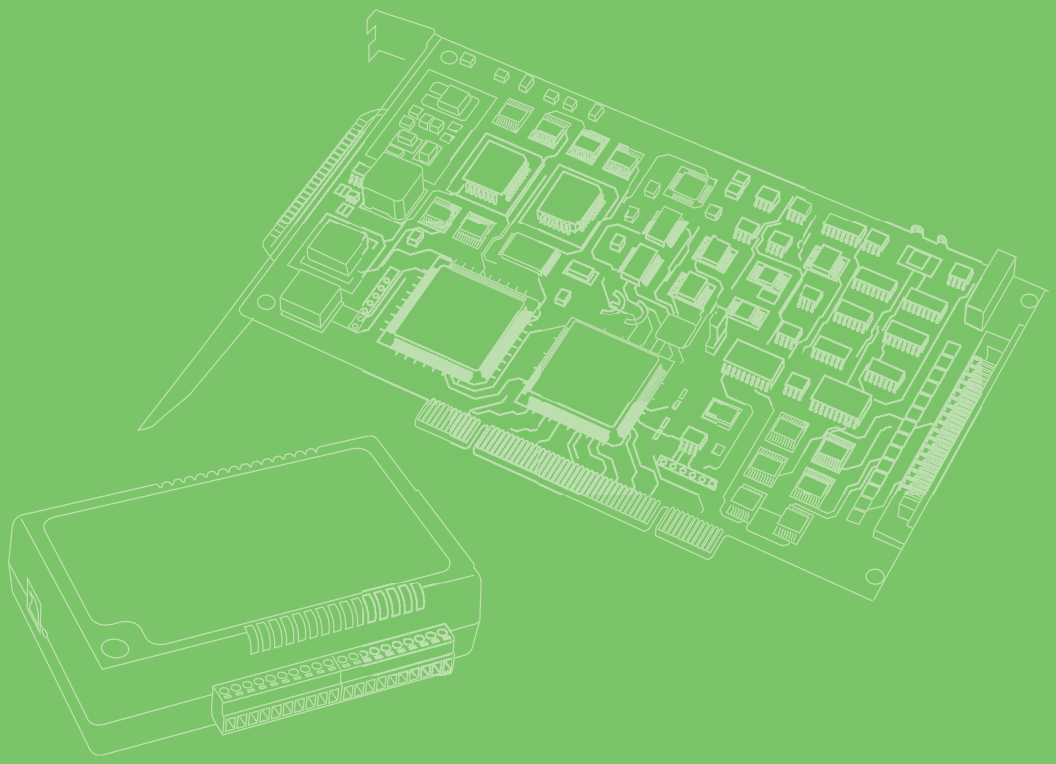

User Manual

iDAQ-868

16-ch, 24-bit Thermocouple Input Industrial DAQ Module

ADVANTECH

Enabling an Intelligent Planet

Copyright

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Product Warranty (2 years)

Advantech warrants the original purchaser that each of its products will be free from defects in materials and workmanship for two years from the date of purchase.

This warranty does not apply to any products that have been repaired or altered by persons other than repair personnel authorized by Advantech, or products that have been subject to misuse, abuse, accident, or improper installation. Advantech assumes no liability under the terms of this warranty as a consequence of such events.

Because of Advantech's high quality-control standards and rigorous testing, most customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced free of charge during the warranty period. For out-of-warranty repairs, customers will be billed according to the cost of replacement materials, service time, and freight. Please consult your dealer for more details.

If you believe your product is defective, follow the steps outlined below.

1. Collect all the information about the problem encountered. (For example, CPU speed, Advantech products used, other hardware and software used, etc.) Note anything abnormal and list any onscreen messages displayed when the problem occurs.
2. Call your dealer and describe the problem. Please have your manual, product, and any helpful information readily available.
3. If your product is diagnosed as defective, obtain a return merchandise authorization (RMA) number from your dealer. This allows us to process your return more quickly.
4. Carefully pack the defective product, a completed Repair and Replacement Order Card, and a proof of purchase date (such as a photocopy of your sales receipt) into a shippable container. Products returned without a proof of purchase date are not eligible for warranty service.
5. Write the RMA number clearly on the outside of the package and ship the package prepaid to your dealer.

Part No. 2003086800 Edition 1

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Declaration of Conformity

CE

This product has passed the CE test for environmental specifications when shielded cables are used for external wiring. We recommend the use of shielded cables. This type of cable is available from Advantech. Please contact your local supplier for ordering information.

Test conditions for passing also include the equipment being operated within an industrial enclosure. In order to protect the product from damage caused by electrostatic discharge (ESD) and EMI leakage, we strongly recommend the use of CE-compliant industrial enclosure products.

FCC Class A

This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference. In this event, users are required to correct the interference at their own expense.

Technical Support and Assistance

1. Visit the Advantech website at www.advantech.com/support to obtain the latest product information.
2. Contact your distributor, sales representative, or Advantech's customer service center for technical support if you need additional assistance. Please have the following information ready before calling:
   - Product name and serial number
   - Description of your peripheral attachments
   - Description of your software (operating system, version, application software, etc.)
   - A complete description of the problem
   - The exact wording of any error messages

Warnings, Cautions, and Notes

Warning! *Warnings indicate conditions that if not observed can cause personal injury!*

Caution! *Cautions are included to help prevent hardware damage and data losses. E.g.*

"Batteries are at risk of exploding if incorrectly installed. Do not attempt to recharge, force open, or heat the battery. Replace the battery only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions."

Note! *Notes provide additional optional information.*

Document Feedback

To assist us with improving this manual, we welcome all comments and constructive criticism. Please send all such feedback in writing to support@advantech.com.

Packing List

Before system installation, check that the items listed below are included and in good condition. If any item does not accord with the list, contact your dealer immediately.

iDAQ-868

- iDAQ-868 x 1
- 20-pin terminal block x 2
- Startup Manual x 1

Safety Instructions

1. Read these safety instructions carefully.
2. Retain this user manual for future reference.
3. Disconnect the equipment from all power outlets before cleaning. Use only a damp cloth for cleaning. Do not use liquid or spray detergents.
4. For pluggable equipment, the power outlet socket must be located near the equipment and easily accessible.
5. Protect the equipment from humidity.
6. Place the equipment on a reliable surface during installation. Dropping or letting the equipment fall may cause damage.
7. The openings on the enclosure are for air convection. Protect the equipment from overheating. Do not cover the openings.
8. Ensure that the voltage of the power source is correct before connecting the equipment to a power outlet.
9. Position the power cord away from high-traffic areas. Do not place anything over the power cord.
10. All cautions and warnings on the equipment should be noted.
11. If the equipment is not used for a long time, disconnect it from the power source to avoid damage from transient overvoltage.
12. Never pour liquid into an opening. This may cause fire or electrical shock.
13. Never open the equipment. For safety reasons, the equipment should be opened only by qualified service personnel.
14. If any of the following occurs, have the equipment checked by service personnel:
    - The power cord or plug is damaged.
    - Liquid has penetrated the equipment.
    - The equipment has been exposed to moisture.
    - The equipment is malfunctioning, or does not operate according to the user manual.
    - The equipment has been dropped and damaged.
    - The equipment show obvious signs of breakage.
15. Do not leave the equipment in an environment with a storage temperature of below -20°C (-4°F) or above 60°C (140°F) as this may damage the components. The equipment should be kept in a controlled environment.
16. CAUTION: Batteries are at risk of exploding if incorrectly replaced. Replace only with the same or equivalent type as recommended by the manufacturer. Discard used batteries according to the manufacturer's instructions.
17. In accordance with IEC 704-1:1982 specifications, the sound pressure level at the operator's position does not exceed 70 dB (A).

DISCLAIMER: These instructions are provided according to IEC 704-1 standards. Advantech disclaims all responsibility for the accuracy of any statements contained herein.

Wichtige Sicherheishinweise

1. Bitte lesen sie Sich diese Hinweise sorgfältig durch.
2. Heben Sie diese Anleitung für den späteren Gebrauch auf.
3. Vor jedem Reinigen ist das Gerät vom Stromnetz zu trennen. Verwenden Sie Keine Flüssig-oder Aerosolreiniger. Am besten dient ein angefeuchtetes Tuch zur Reinigung.
4. Die NetzanschluBsteckdose soll nahe dem Gerät angebracht und leicht zugänglich sein.
5. Das Gerät ist vor Feuchtigkeit zu schützen.
6. Bei der Aufstellung des Gerätes ist auf sicheren Stand zu achten. Ein Kippen oder Fallen könnte Verletzungen hervorrufen.
7. Die Belüftungsöffnungen dienen zur Luftzirkulation die das Gerät vor überhitzung schützt. Sorgen Sie dafür, daB diese Öffnungen nicht abgedeckt werden.
8. Beachten Sie beim. AnschluB an das Stromnetz die AnschluBwerte.
9. Verlegen Sie die NetzanschluBleitung so, daB niemand darüber fallen kann. Es sollte auch nichts auf der Leitung abgestellt werden.
10. Alle Hinweise und Warnungen die sich am Geräten befinden sind zu beachten.
11. Wird das Gerät über einen längeren Zeitraum nicht benutzt, sollten Sie es vom Stromnetz trennen. Somit wird im Falle einer Überspannung eine Beschädigung vermieden.
12. Durch die Lüftungsöffnungen dürfen niemals Gegenstände oder Flüssigkeiten in das Gerät gelangen. Dies könnte einen Brand bzw. elektrischen Schlag auslösen.
13. Öffnen Sie niemals das Gerät. Das Gerät darf aus Gründen der elektrischen Sicherheit nur von authorisiertem Servicepersonal geöffnet werden.
14. Wenn folgende Situationen auftreten ist das Gerät vom Stromnetz zu trennen und von einer qualifizierten Servicestelle zu überprüfen:
    - Netzkabel oder Netzstecker sind beschädigt.
    - Flüssigkeit ist in das Gerät eingedrungen.
    - Das Gerät war Feuchtigkeit ausgesetzt.
    - Wenn das Gerät nicht der Bedienungsanleitung entsprechend funktioniert oder Sie mit Hilfe dieser Anleitung keine Verbesserung erzielen.
    - Das Gerät ist gefallen und/oder das Gehäuse ist beschädigt.
    - Wenn das Gerät deutliche Anzeichen eines Defektes aufweist.
15. VOSICHT: Explisionsgefahr bei unsachgemaben Austausch der Batterie.Ersatz nur durch densellben order einem vom Hersteller empfohlene-mahnlichen Typ. Entsorgung gebrauchter Batterien navh Angaben des Herstellers.
16. ACHTUNG: Es besteht die Explosionsgefahr, falls die Batterie auf nicht fachmännische Weise gewechselt wird. Verfangen Sie die Batterie nur gleicher oder entsprechender Type, wie vom Hersteller empfohlen. Entsorgen Sie Batterien nach Anweisung des Herstellers.
17. Der arbeitsplatzbezogene Schalldruckpegel nach DIN 45 635 Teil 1000 beträgt 70dB(A) oder weiger.

Haftungsausschluss: Die Bedienungsanleitungen wurden entsprechend der IEC-704-1 erstellt. Advantech lehnt jegliche Verantwortung für die Richtigkeit der in diesem Zusammenhang getätigten Aussagen ab.

Safety Precautions - Static Electricity

Follow these simple precautions to protect yourself from harm and the products from damage.

- To avoid electrical shock, always disconnect the power from the PC chassis before manual handling. Do not touch any components on the CPU card or other cards while the PC is powered on.
- Disconnect the power before making any configuration changes. A sudden rush of power after connecting a jumper or installing a card may damage sensitive electronic components.

Contents

Chapter 1

Start Using iDAQ-868

1.1 Overview

This chapter provides an overview of Advantech industrial data acquisition (iDAQ) modules for iDAQ-868, ranging the product lineups, features and accessories.

iDAQ-868 is an 16-channel thermocouple input module. It features 24-bit resolution, and supports most of popular thermocouple types, making it suitable for thermocouple measurement with high accuracy requirements.

1.2 Product Overview

iDAQ-868

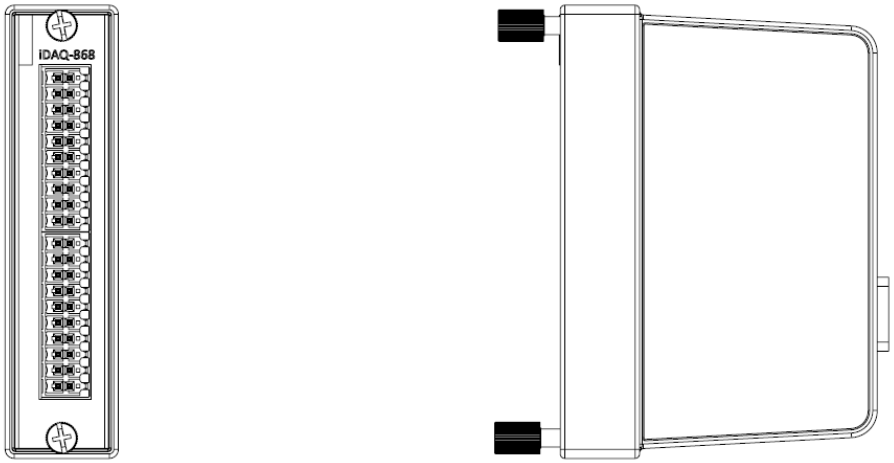


Figure 1.1 Overview of iDAQ-868

1.3 Product Features

1.3.1 Power Input

The power input of all the iDAQ I/O modules come from iDAQ chassis via the DB 15-pin connector. The iDAQ I/O modules are powered on when the power of iDAQ chassis is connected.

1.3.2 BoardID

A Board ID (BID) can be assigned to the iDAQ chassis by the rotary switch and slot number. The board ID will be shown in the software and can be used to distinguish modules. The number shown around the rotary switch is in hexadecimal format. For example, “A” represents 10 in decimal format, and “F” represents 15 in decimal format. The number assigned to each iDAQ module follows a rule combining the ChassisID and slot number. Refer to section 3.4 for detailed information.

1.3.3 Plug and Play Device

The iDAQ modules are hot-swappable in the iDAQ chassis. The modules will be recognized instantly in the software (Installed Devices list) when they are plugged into the iDAQ slots and they can be removed as soon as they are disabled in the software. Therefore, it’s strongly recommended to operate these actions whilst the system is in idle mode not data acquisition mode.

1.4 Driver Installation

The driver package could be found on Advantech Support Portal (https://www.advantech.com/support). Search for iDAQ on the support portal, then the corresponding driver/SDK package can be found. You'll get the XNavi installer after the download session finishes.

Execute the installer, then it will guide you through the session. You can choose the device and software components you'd like to install in the system (Figure 1.3). After the selection, click **Start** to begin the installation.

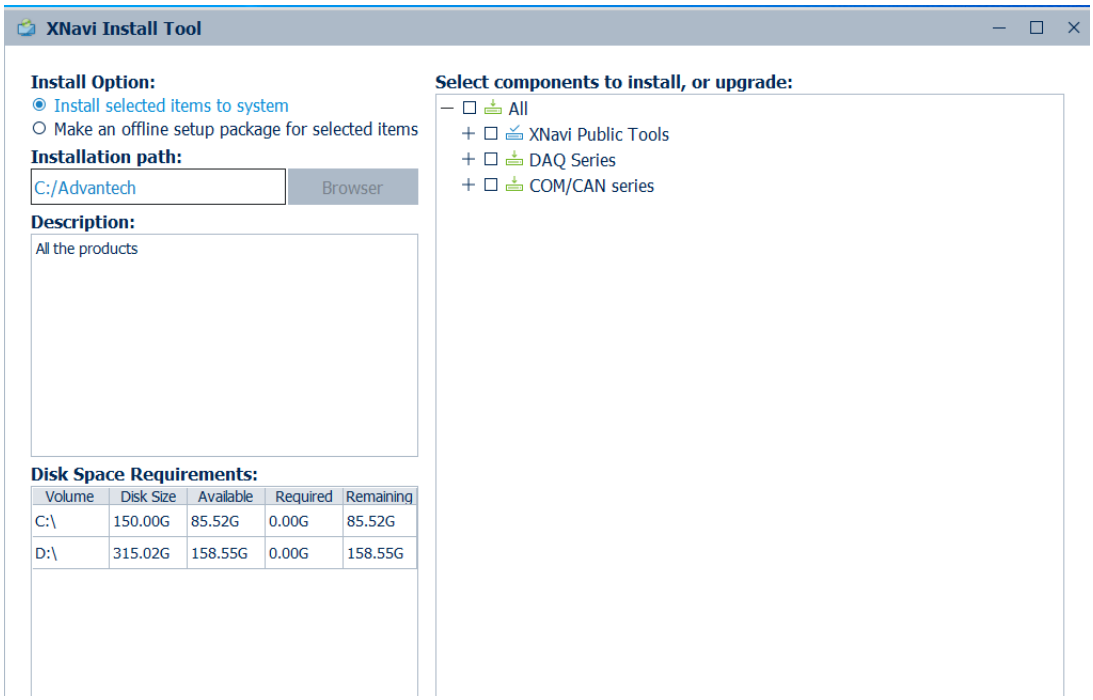


Figure 1.2 XNavi Installation Interface

1.5 Software Utility

Advantech offers device drivers, SDKs, third-party driver support and application software to help fully exploit the functions of your iDAQ system. All these software packages are available on the Advantech website: http://www.advantech.com/.

The Advantech Navigator is a utility that allows you to set up, configure and test your device, and later store your settings in a proprietary database.

1. To set up the I/O device, you could first run the Advantech Navigator program (by accessing Start/Programs/Advantech Automation/DAQNavi/Advantech Navigator). The settings can also be saved.
2. You can then view the device(s) already installed on your system (if any) on the Installed Device tree view. Once the software and hardware installation has completed, you will see the iDAQ modules in the Installed Devices list.

1.6 Software Development Using DAQNavi SDK

DAQNavi SDK is the software development kit for programming applications with Advantech DAQ products. The necessary runtime DLL, header files, software manual and tutorial videos can be installed via XNavi installer, which can be found under C:\Advantech\DAQNavi (default directory) after finishing the installation.

1.7 FPGA Code Update

The FPGA could also be updated via the interface in Navigator. However, it isn't normal to move on to an FPGA update. Advantech strongly suggests you to consult your technical support before starting an FPGA update.

1.8 Ordering Information

IDAQ-868-A16-ch, 24-bit Thermocouple Input iDAQ Module

Chapter 2

Installation Guide

2.1 Initial Unpacking Check

Before you install your iDAQ modules, please make sure you have the following necessary components when unpacking the package:

- DAQ module*1
- Startup manual*1
- Terminal blocks

If anything in the packing list is missing, please contact your local support for further assistance.

2.2 Installation

Below are the steps to insert the iDAQ modules into the iDAQ chassis.

1. Insert the module and follow the guide rail to the end.
2. Screw the two thumb screws tight onto the chassis.

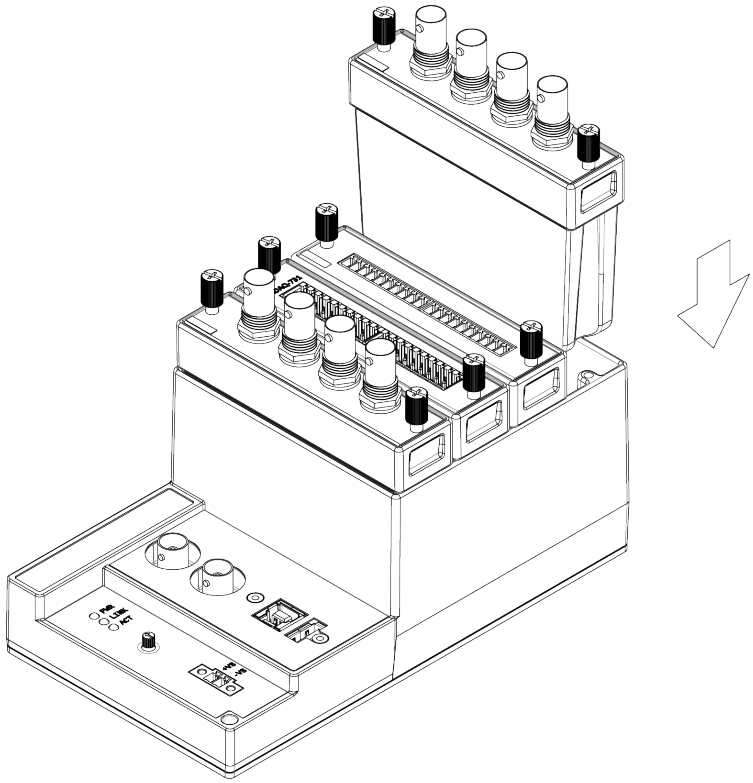


Figure 2.1 iDAQ Module Install into iDAQ Chassis

2.3 Signal Connection and Pin Assignment

2.3.1 Signal Connection

All thermocouples consist of two wires. To complete the connection, attach the wires to the TC+ and TC- terminals of the corresponding channel, as shown in Figure 2.2

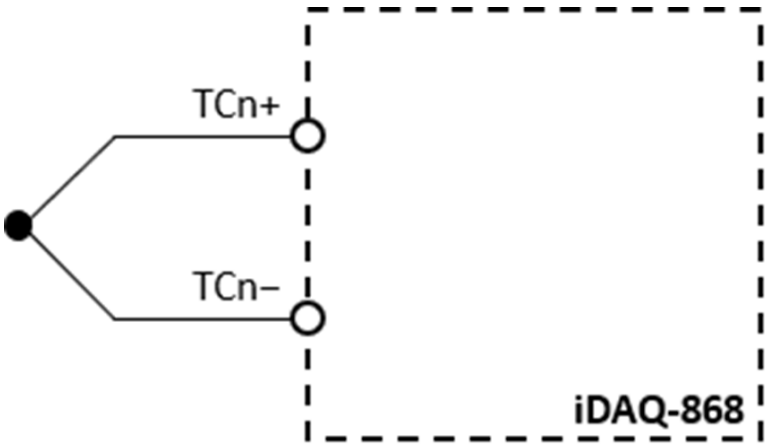


Figure 2.2 Signal Connection of iDAQ-868

2.3.2 Pin Assignment

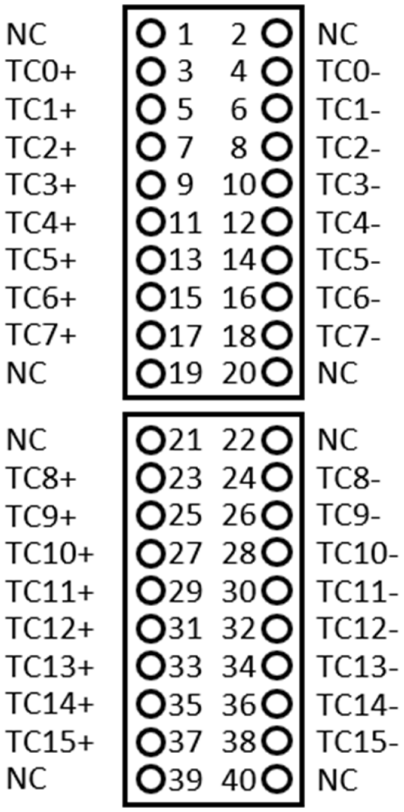


Figure 2.3 Pin Assignment for iDAQ-868

Table 2.1: Pin Assignment		
Pin Name	**Description**	**Pin Number**
TC<0..15>+	Thermocouple input positive terminals	3, 5, 7, 9, 11, 13, 15, 17, 23, 25, 27, 29, 31, 33, 35, 37
TC<0..15>-	Thermocouple input negative terminals	4, 6, 8, 10, 12, 14, 16, 18, 24, 26, 28, 30, 32, 34, 36, 38
NC	Not connect	1, 2, 19, 20, 21, 22, 39, 40

Chapter 3

Function Details

The iDAQ system relys on the chassis module as a platform to bring all the signals together in order to achieve functions including synchronization, data streaming, and timing control. This chapter describes all the functions that the iDAQ system provides and how they work.

3.1 Analog Input

Insert an iDAQ module supporting analog input to perform analog input measurement. The following sections describe the analog input acquisition mechanisms. For detailed specifications of the analog input functions, please refer to the document for the individual iDAQ module.

3.1.1 Instant Analog Input Acquisition

With instant analog input acquisition, the software controls the sample timing. The analog-to-digital converter (ADC) is continuously converting analog input signals by its maximum allowable conversion rate. Each time the software sends a “read instant analog input sample” command, the most recent conversion result is sampled as shown in Figure 3.1.

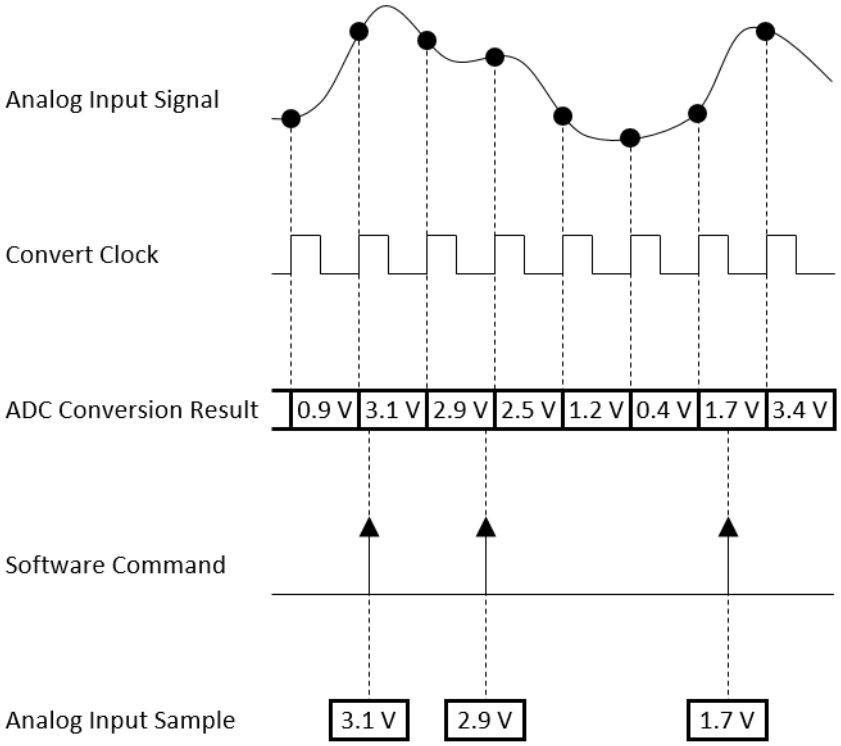


Figure 3.1 Instant analog input acquisition.

3.1.2 Buffered Analog Input Acquisition

With buffered analog input acquisition, the ADC conversion rate and the duration of the acquisition is controlled by hardware timing signals. All conversion results are sampled and stored in the buffer memory before sending back to the host computer as shown in Figure 3.2.

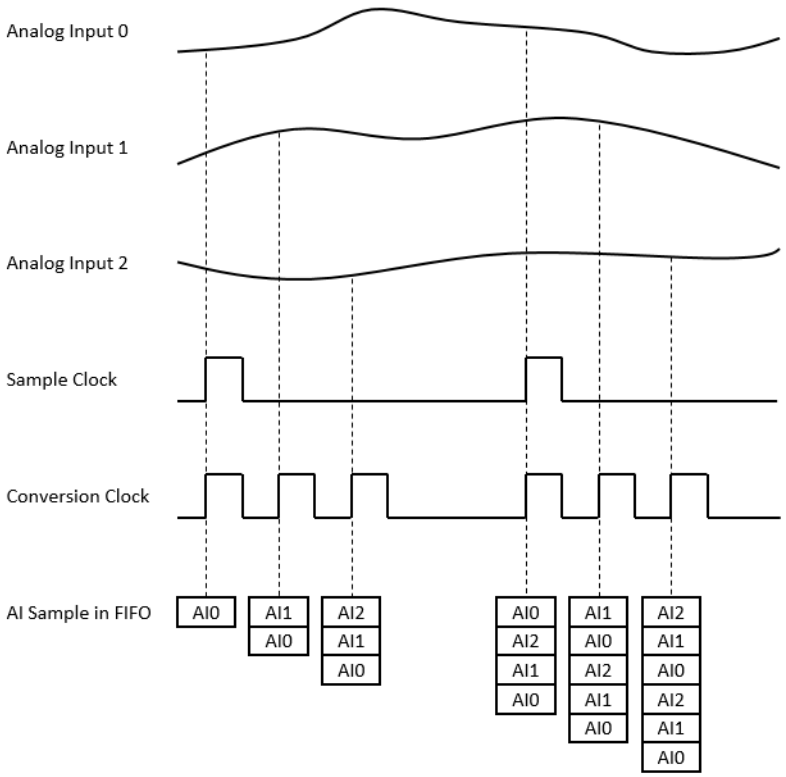


Figure 3.2 Buffered analog input acquisition.

The start and stop mechanism of the data acquisition are controlled by the start trigger and stop trigger respectively. When configuration is completed, the acquisition engine of the iDAQ chassis is at standby state. After receiving a start trigger, acquisition becomes active and each rising edge of the sample clock acquires one analog input sample. The acquisition active period lasts until a stop trigger is received, which ends the acquisition. This is shown in Figure 3.3.

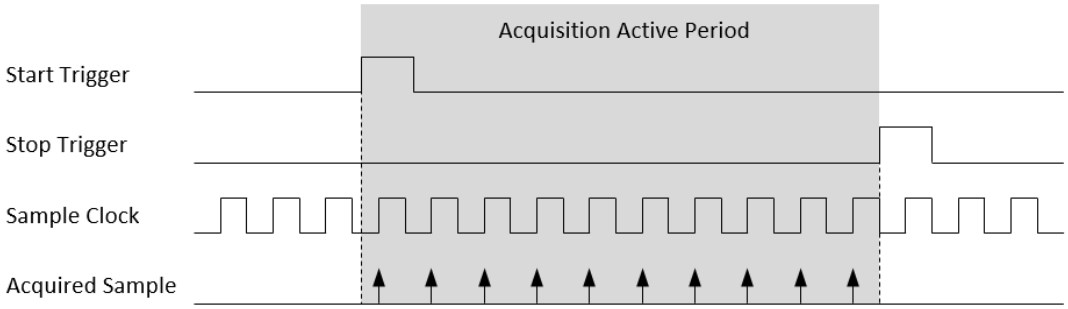


Figure 3.3 Start and stop triggers of the analog input acquisition.

The start and stop times of data acquisition can also be delayed in the number of samples after receiving the corresponding trigger signal. As shown in Figure 3.4, the start of acquisition is delayed by 3 samples after receiving a start trigger, and the stop of acquisition is delayed by 2 samples after receiving a stop trigger.

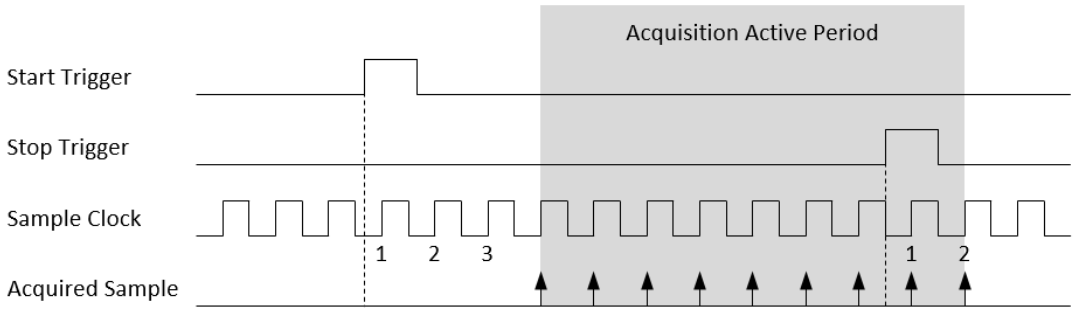


Figure 3.4 Start and stop of the analog input acquisition with delay.

Buffered analog input acquisition has several advantages over instant analog input acquisition:

- The start and stop time of acquisition (or duration of the acquisition) can be precisely controlled by hardware trigger signals.
- The ADC conversion rate is configurable and the sample rate can be much higher by using hardware sample clock signals.
- Time between samples is deterministic.

3.1.3 Analog Input Isolation

The analog input circuitry includes a galvanic isolator capable of withstanding high continuous voltages between the external and internal sides. This protects internal components and host devices (e.g., PC) from damage in the event of a fault condition.

3.2 Device Description and Configuration

The Device Description identifies individual modules within the iDAQ system. It follows a naming convention that combines the chassis ID, model name, and slot number. You can customize the description in Navigator or use the default. This description is used in your program to control the device or obtain its handler.

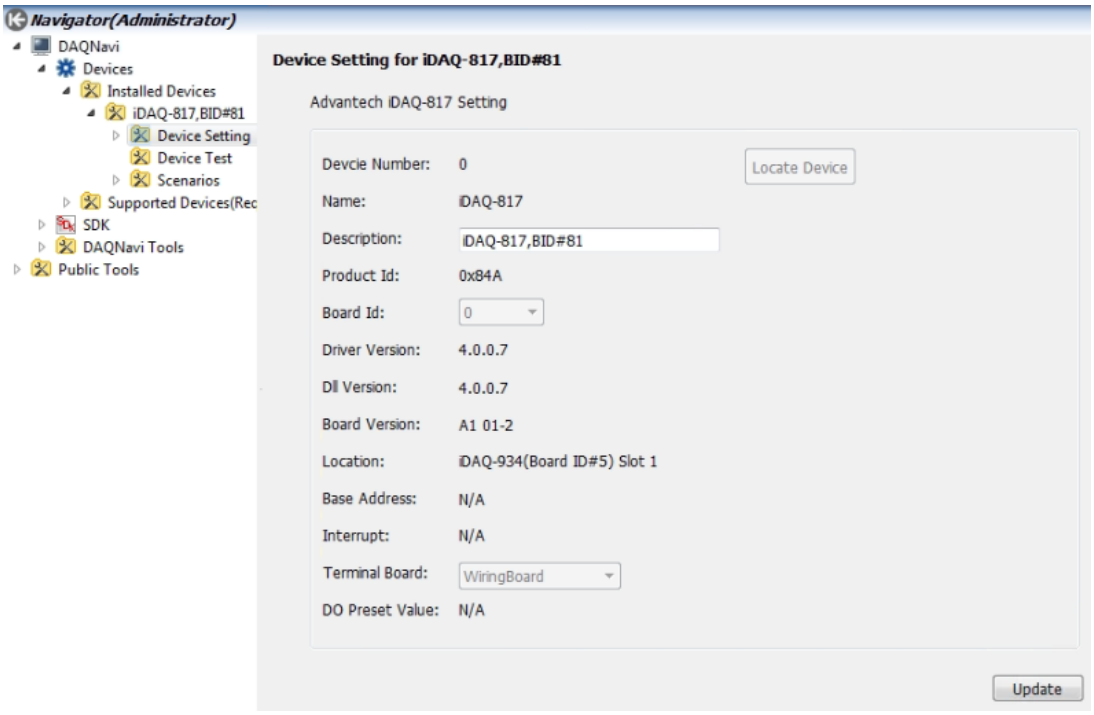


Figure 3.5 Device description shown in Navigator

Appendix A

Specifications

A.1 Thermocouple Input

- **Channels:** 16
- **ADC Resolution:** 24 bits
- **Acquisition Method:** Scanning
- **Supported thermocouple type, measurement range and accuracy**

Table A.1: Supported thermocouple type, measurement range and accuracy

Thermocouple Type	Measurement Range	Accuracy
Type J	0°C to 760°C	±0.1% of full-scale range max.
Type K	0°C to 1,370°C	
Type E	0°C to 1,000°C	
Type R	500°C to 1,750°C	
Type S	500°C to 1,750°C	
Type N	-200°C to 1,300°C	±0.15% of full-scale range max.
Type B	500°C to 1,800°C	
Type T	-100°C to 400°C	±0.2% of full-scale range max

- **Over-voltage protection:** ±30 V
- **Isolation protection:** 600 VRMS
- **Conversion time**
  - High resolution mode: 57 ms x n, where n is the number of enabled channels
  - High Speed mode: 830 us x n, where n is the number of enabled channels
- **50/60 Hz filter:** Yes (High resolution mode only)
- **Bandwidth (-3 dB):**
  - High-resolution Mode 13.2 Hz
  - High-speed mode 718 Hz
- **Acquisition type:** Instant or buffered, software configurable

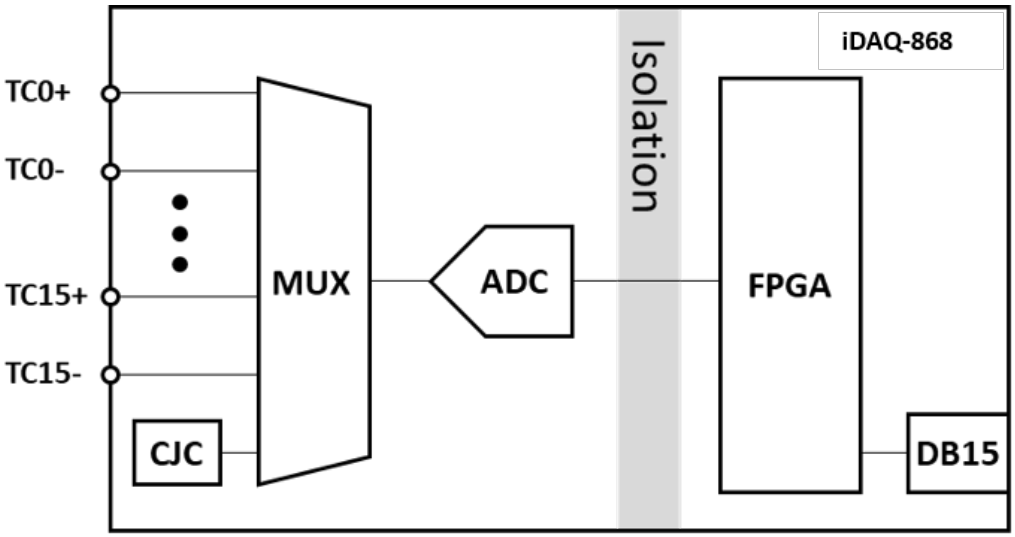
Buffered Acquisition

- **Enabled channel combination:** Each channel can be enabled/disabled independently by software
- **Sample rate:** 20 kHz max., for all channels(1), software configurable
- **Internal data buffer (FIFO) size:** 512 samples

A.2 General

- **Power consumption from chassis:** 850 mW typ./1000 mW max.
- **Module dimensions:** 100 x 80 x 25 mm (3.94 x 3.15 x 0.98 in.)
- **Weight:** 175 g
- **Connector Type:** 2x 20-pin plug-in terminals
- **Operating temperature:** -20 °C to 60 °C (-4 °F to 140 °F)
- **Storage temperature:** -40 °C to 70 °C (-40 °F to 158 °F)
- **Operating humidity:** 10% to 90% RH, non-condensing
- **Storage humidity:** Up to 95% RH, non-condensing
- **Random Vibration:** 5Grms, random, 5~500Hz, 1hr/axis
- **Shock:** 30G, half sine, 11ms

A.3 Function Block



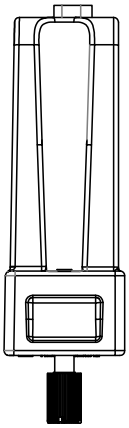
(1) When using higher sampling rate (e.g. synchronous sampling with other iDAQ modules under higher sampling rate), duplicated data would be returned.

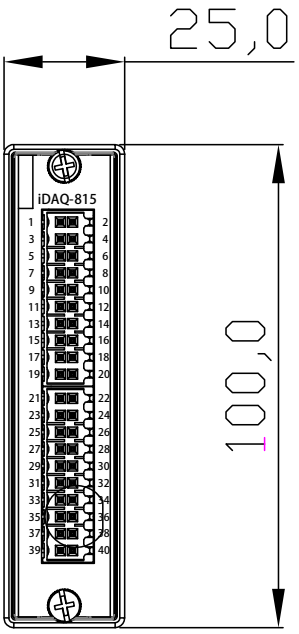
(2) The iDAQ modules should be used along with the base units. For detail of each base unit, please refer to individual datasheet.

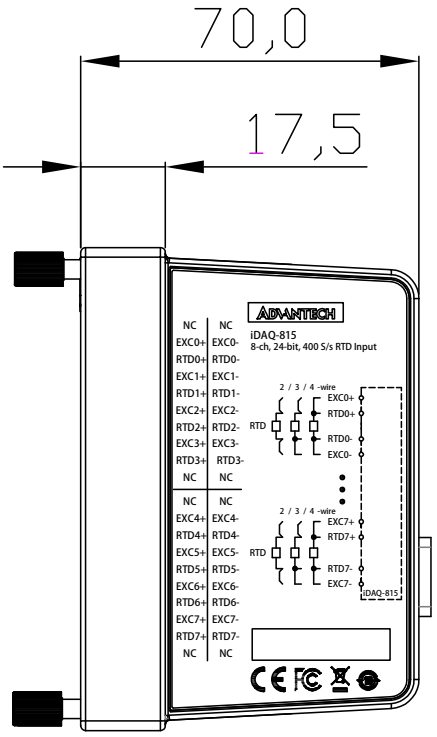
Appendix B

System Dimensions

B.1 System Dimensions







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