

PCI8103

User's Manual



Beijing ART Technology Development Co., Ltd.

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Chapter 1 Overview

In the fields of Real-time Signal Processing, Digital Image Processing and others, high-speed and high-precision data acquisition modules are demanded. ART PCI8103 data acquisition module, which brings in advantages of similar products that produced in china and other countries, is convenient for use and has low cost and stably high performance.

ART PCI8103 is an Arbitrary-waveform generator board based on PCI bus. It can be directly inserted into IBM-PC/AT or a computer which is compatible with PCI8103. It can be used as signal generating source in a variety of fields such as the laboratory, product quality testing center and so on.

Technical Characteristic

- 32-bit PCI Bus, support PCI2.2 protocol and achieve plug and play
- The design of FPGA Interface CMOS chip has the utmost confidentiality, especially suit OEM cooperation with our partners.

Unpacking Checklist

Check the shipping carton for any damage. If the shipping carton and contents are damaged, notify the local dealer or sales for a replacement. Retain the shipping carton and packing material for inspection by the dealer.

Check for the following items in the package. If there are any missing items, contact your local dealer or sales.

- PCI8103 Data Acquisition Board
- ART Disk
 - a) user's manual (pdf)
 - b) drive
 - c) catalog
- Warranty Card

FEATURES

Analog Output

- Conversion Type: AD7945
- Output Range: $\pm 5V$, ± 2.5 , $0\sim 10V$, $0\sim 5V$ (default)
- 12-bit resolution
- Sampling Rate: $0.01KS/s\sim 1MS/s$ (software-configurable)
Frequency division formula= master frequency / the number of frequency division, the master frequency =40MHz, 32-bit frequency division, and the number of frequency division from 40 to 2^{32} .
- Analog Signals Bandwidth: $0\sim 50KHz$
- Channel No.: 4-channel
- Analog Output Impedance:: jumper-selectable output impedances of $50\ \Omega$ and $75\ \Omega$
- Trigger Source: software trigger, hardware trigger (ATR and DTR)
- Trigger Mode: single time, continuum, single step and emergency trigger
- Trigger Direction: negative, positive, positive and negative trigger
- Trigger Level: $0\sim 10V$ (software setting)
- Clock Source: External Clock, Internal Clock(software-configurable)
- Memory Depth: each channel 256K word (point) RAM memory

- Working Sign: DA conversion flag, trigger flag, the current segment number, the current segment address, the current number of cycles, the current total number of cycles
- Data Transfer Mode: programmed mode
- Operating Temperature Range: 0°C~50°C
- Storage Temperature Range: -20°C~70°C

Digital Input/Output

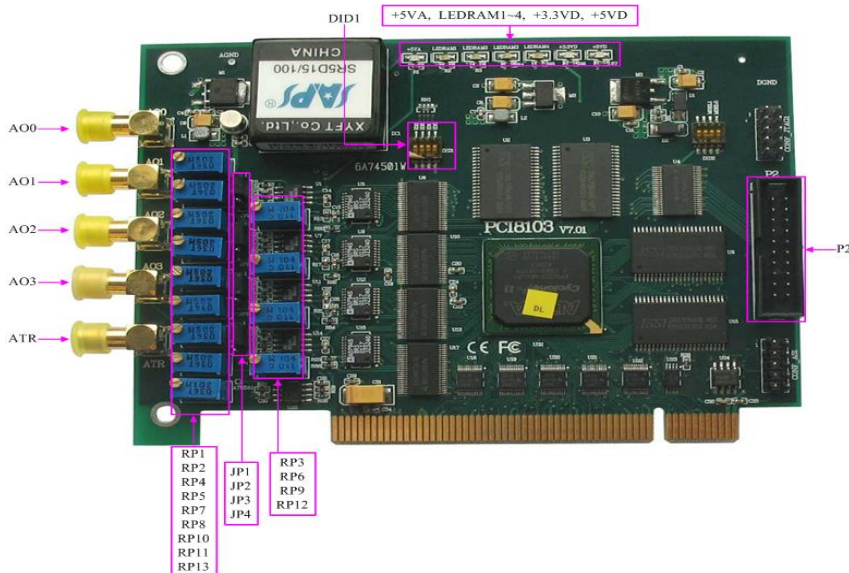
- Input Channel No.: 4-channel
- Output Channel No.: 4-channel
- Electric Standard: TTL compatible
- Input Voltage Range: high voltage $\cong 2V$, low voltage $\cong 0.8V$
- Output Voltage Range: high voltage $\cong 3.7V$, low voltage $\cong 0.55V$

Other Features

- Board Clock Oscillation: 40MHz
- Board Dimensions: 130mm (L) * 91mm (W)

Chapter 2 Components Layout Diagram and a Brief Description

2.1 The Main Component Layout Diagram



2.2 The Function Description for the Main Component

2.2.1 Signal Input and Output Connectors

AO0~AO3: analog signal output port.

ATR: external analog trigger signal input port.

P2: external digital trigger signal, clock input/output and on/off port.

2.2.2 Potentiometer

RP3, RP6, RP9, RP12: AO0~AO3 analog signal output zero point adjustment potentiometer

RP1, RP4, RP7, RP11: AO0~AO3 analog signal output magnification adjustment 1

RP2, RP5, RP8, RP10: AO0~AO3 analog signal output magnification adjustment 2

RP13: Trigger level adjustment potentiometer

2.2.3 Jumper

JP1~JP4: AO0~AO3 output impedance setting, connect the first and the second pin of the jumper, the output impedance is 75Ω, and connect the second and the third pin, the output impedance is 50Ω.

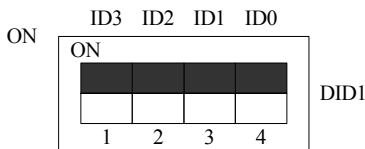
2.2.4 Status indicator

LEDRAM1~LEDRAM4: AO0~AO3 RAM indicator.

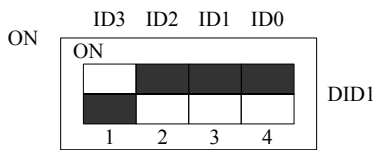
- +5VA: 5V analog power supply indicator light, ON for normal condition.
- +3.3VD: 3.3V digital power supply indicator light, ON for normal condition.
- +5VD: 5V digital power supply indicator light, ON for normal condition.

2.2.5 Physical ID of DIP Switch

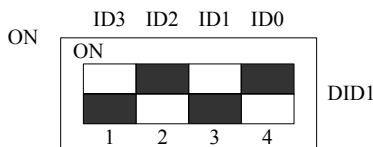
DID1: Set physical ID number. When the PC is installed more than one PCI8103 , you can use the DIP switch to set a physical ID number for each board, which makes it very convenient for users to distinguish and visit each board in the progress of the hardware configuration and software programming. The following four-place numbers are expressed by the binary system: When DIP switch points to "ON", that means "1", and when it points to the other side, that means "0." As they are shown in the following diagrams: place "ID3" is the high bit."ID0" is the low bit, and the black part in the diagram represents the location of the switch. (Test softwares of the company often use the logic ID management equipments and at this moment the physical ID DIP switch is invalid. If you want to use more than one kind of the equipments in one and the same system at the same time, please use the physical ID as much as possible. As for the differences between logic ID and physical ID, please refer to the function explanations of "CreateDevice" and "CreateDeviceEx" of *The Prototype Explanation of Device Object Management Function in PCI8103S* software specification



The above chart shows"1111", so it means that the physical ID is 15.



The above chart shows"0111", so it means that the physical ID is 7.



The above chart shows"0101", so it means that the physical ID is 5.

ID3	ID2	ID1	ID0	Physical ID (Hex)	Physical ID (Dec)
OFF (0)	OFF (0)	OFF (0)	OFF (0)	0	0
OFF (0)	OFF (0)	OFF (0)	ON (1)	1	1
OFF (0)	OFF (0)	ON (1)	OFF (0)	2	2
OFF (0)	OFF (0)	ON (1)	ON (1)	3	3
OFF (0)	ON (1)	OFF (0)	OFF (0)	4	4
OFF (0)	ON (1)	OFF (0)	ON (1)	5	5
OFF (0)	ON (1)	ON (1)	OFF (0)	6	6
OFF (0)	ON (1)	ON (1)	ON (1)	7	7
ON (1)	OFF (0)	OFF (0)	OFF (0)	8	8
ON (1)	OFF (0)	OFF (0)	ON (1)	9	9
ON (1)	OFF (0)	ON (1)	OFF (0)	A	10

ON (1)	OFF (0)	ON (1)	ON (1)	B	11
ON (1)	ON (1)	OFF (0)	OFF (0)	C	12
ON (1)	ON (1)	OFF (0)	ON (1)	D	13
ON (1)	ON (1)	ON (1)	OFF (0)	E	14
ON (1)	ON (1)	ON (1)	ON (1)	F	15

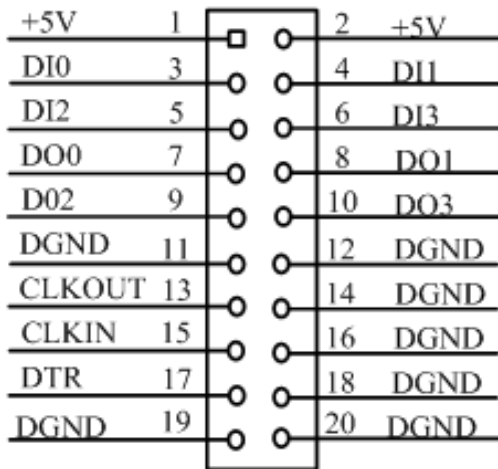
Chapter 3 Signal Connectors

3.1 The Definition of Signal Output Connectors

There are five signal ports in the side of the PCI8103, AO0, AO1, AO2, AO3, ATR signal ports, AO0, AO1, AO2, AO3 are analog signal output ports, and ART is external analog trigger signal input port.

3.2 Trigger Signal, Clock Input/Output and Digital Input/Output Connector

20 core plug P2 pin definition



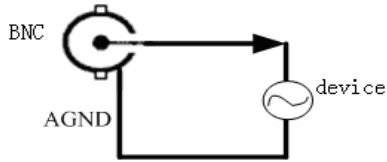
Pin definition

Pin name	Type	Pin function definition
DI0~DI3	Input	Digital signal input pin, the reference ground is DGND
DO0~DO3	Output	Digital signal output pin, the reference ground is DGND
DGND	GND	Digital ground
CLKOUT	Output	Internal clock output pin
CLKIN	Input	External clock input pin
+5V	Power	+5V power output
DTR	Input	External digital trigger signal input pin, the reference ground is DGND.

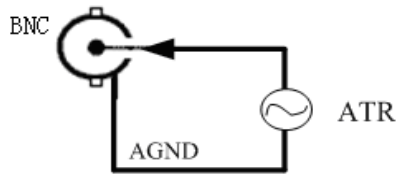
Chapter 4 Connection Ways for Each Signal

4.1 BNC Interface Connection

The method to connect DA analog output signals AO0~AO3



The method to connect external analog trigger signal (ATR)



If use ART BNC down-lead to connect with output or input signals, please keep in mind that the red port is output/ input signals, the black port is ground.

4.2 Signal Connection

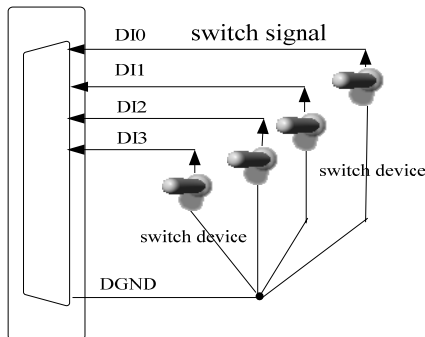


Figure 4.2.1 digital signal input connection

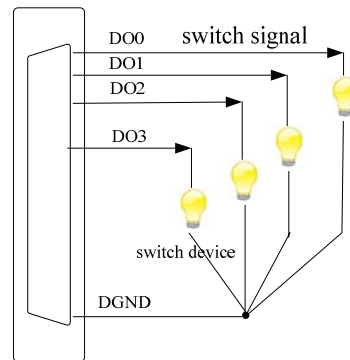


Figure 4.2.2 digital signal output connection

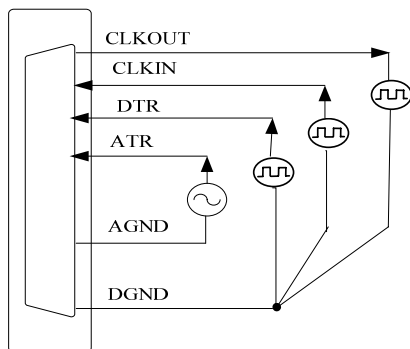


Figure 4.2.3 Clock Input/Output and Trigger Signal Connect

Chapter 5 The Instruction of Trigger and Clock Functions

5.1 The Instruction of the DA Trigger Function

Refer to the trigger part of the PCI 8103 Software Instruction

5.2 Methods of using DA Internal and External Clock Function

5.2.1 Internal Clock Function of DA

Internal Clock Function refers to the use of on-board clock oscillator and the clock signals which are produced by the user-specified frequency to trigger the DA conversion regularly. Its maximum value up to the frequency of the DA chip, and its minimum value is one thirty-second of the on-board clock. So it can playback the waveform stored in SRAM slowly. To use the clock function, the hardware parameters `ADPara.ClockSource = PCI8103_CLOCKSRC_IN` should be installed in the software. The frequency of the clock in the software depends on the hardware parameters `ADPara.Frequency`. For example, if `Frequency = 100000`, that means the rate of output points is 100 KHz.

5.2.2 External Clock Function of DA

External Clock Function refers to the use of the outside clock signals to trigger the DA conversion regularly. The clock signals are provide by the CLKIN pin of the CN1 connector. To use the external clock function, the hardware parameters `ADPara.ClockSource = PCI8103_CLOCKSRC_OUT` should be installed in the software. In the external clock mode, the clocks of DA refreshing and waveform data reading are the same as the external clock.

Chapter 6 Notes, Calibration and Warranty Policy

6.1 Notes

In our products' packing, user can find a user manual, a PCI8103 module and a quality guarantee card. Users must keep quality guarantee card carefully, if the products have some problems and need repairing, please send products together with quality guarantee card to ART, we will provide good after-sale service and solve the problem as quickly as we can.

When using PCI8103, in order to prevent the IC (chip) from electrostatic harm, please do not touch IC (chip) in the front panel of PCI8103 module.

6.2 DA Analog Signal Output Calibration

Every device has to be calibrated before sending from the factory. It is necessary to calibrate the module again if users want to after using for a period of time or changing the input range. PCI8103 default output range: $\pm 5V$, in the manual, we introduce how to calibrate PCI8103 in $\pm 5V$, calibrations of other output ranges are similar.

- 1) Zero point adjustment: run ART Data Acquisition Measurement Suite in the WINDOWS. Select channel 0, set to output constant value 0V, adjustment potentiometer RP3 to make the actual output value of channel 0 to 0V. The other channels are the same.
- 2) Full-scale adjustment: Select channel 0, set to output constant value 5V, adjustment potentiometer RP2 to make the actual output of channels 0 to 5V. The other channels are the same.

6.3 Warranty Policy

Thank you for choosing ART. To understand your rights and enjoy all the after-sales services we offer, please read the following carefully.

1. Before using ART products please read the user manual and follow the instructions exactly. When sending in damaged products for repair, please attach an RMA application form which can be downloaded from: www.art-control.com.
2. All ART products come with a limited two-year warranty:
 - The warranty period starts on the day the product is shipped from ART factory
 - For products containing storage devices (hard drives, flash cards, etc.), please back up your data before sending them for repair. ART is not responsible for any loss of data.
 - Please ensure the use of properly licensed software with our systems. ART does not condone the use of pirated software and will not service systems using such software. ART will not be held legally responsible for products shipped with unlicensed software installed by the user.
3. Our repair service is not covered by ART guarantee in the following situations:
 - Damage caused by not following instructions in the User's Manual.
 - Damage caused by carelessness on the user's part during product transportation.
 - Damage caused by unsuitable storage environments (i.e. high temperatures, high humidity, or volatile chemicals).
 - Damage from improper repair by unauthorized ART technicians.
 - Products with altered and/or damaged serial numbers are not entitled to our service.
4. Customers are responsible for shipping costs to transport damaged products to our company or sales office.

5. To ensure the speed and quality of product repair, please download an RMA application form from our company website.

Products Rapid Installation and Self-check

Rapid Installation

Product-driven procedure is the operating system adaptive installation mode. After inserting the disc, you can select the appropriate board type on the pop-up interface, click the button **【driver installation】**; or select CD-ROM drive in Resource Explorer, locate the product catalog and enter into the APP folder, and implement Setup.exe file. After the installation, pop-up CD-ROM, shut off your computer, insert the PCI card. If it is a USB product, it can be directly inserted into the device. When the system prompts that it finds a new hardware, you do not specify a drive path, the operating system can automatically look up it from the system directory, and then you can complete the installation.

Self-check

At this moment, there should be installation information of the installed device in the Device Manager (when the device does not work, you can check this item.). Open "Start -> Programs -> ART Demonstration Monitoring and Control System -> Corresponding Board -> Advanced Testing Presentation System", the program is a standard testing procedure. Based on the specification of Pin definition, connect the signal acquisition data and test whether AD is normal or not. Connect the input pins to the corresponding output pins and use the testing procedure to test whether the switch is normal or not.

Delete Wrong Installation

When you select the wrong drive, or viruses lead to driver error, you can carry out the following operations: In Resource Explorer, open CD-ROM drive, run Others-> SUPPORT-> PCI.bat procedures, and delete the hardware information that relevant to our boards, and then carry out the process of section I all over again, we can complete the new installation.