

ART2004

User's Manual



Beijing ART Technology Development Co., Ltd.

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Chapter 1 Overview

ART2004 is a card based on PC104+ bus, can be connected to the computer's PC104 interface to constitute the laboratory, product quality inspection center and other areas of data acquisition, waveform analysis and processing system. And also can constitute industrial process monitoring system. Its main applications are:

- Electronic Product Quality Testing
- Signal acquisition
- Process Control
- Servo Control

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.

- ART2004 Data Acquisition Board
- ART Disk
 - a) user's manual (pdf)
 - b) drive
 - c) catalog
- Warranty Card

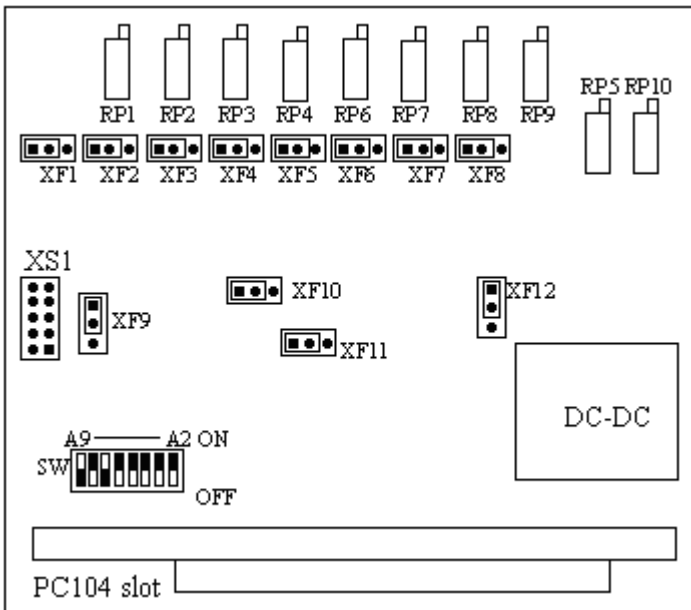
DA Arbitrary Waveform Output Function

- Converter Type: ADC7625
- Output Range: 0~5V, 0~10V, ±5V, ±10V (jumper select)
- Resolution: 12-bit
- Number of Channels: 8
- Set-up Time: 10μs
- Accuracy: 0.1% of FSR
- Non-linear Error: ±1LSB (max)
- Output-error (Full-scale): ±1LSB
- Operating Temperature Range: 0°C~ +50°C
- Storage Temperature Range: -20°C~ +70°C
- Dimension: 96mm (L) * 90mm (W)

Chapter 2 Components Layout Diagram and a Brief Description

2.1 The Main Component Layout Diagram

The following is the ART2004 component location diagram, the switch and jumper settings are the factory standard settings. Set as follows: board base address = 280H, the analog output range is $\pm 5V$.



2.2 The Function Description for the Main Component

2.2.1 Signal Input and Output Connectors

XS1: analog signal output connector

XS1: 10-pin definition

Pin No.	Name	Pin No.	Name
1	VOUT0	6	VOUT5
2	VOUT1	7	VOUT6
3	VOUT2	8	VOUT7
4	VOUT3	9	AGND
5	VOUT4	10	AGND

2.2.2 Potentiometer

RP1: DA0 analog output voltage gain adjustment

RP2: DA1 analog output voltage gain adjustment

RP3: DA2 analog output voltage gain adjustment

- RP4: DA3 analog output voltage gain adjustment
- RP5: DA0, DA1, DA2, DA3 analog output zero-point adjustment
- RP6: DA4 analog output voltage gain adjustment
- RP7: DA5 analog output voltage gain adjustment
- RP8: DA6 analog output voltage gain adjustment
- RP9: DA7 analog output voltage gain adjustment
- RP10: DA4, DA5, DA6, DA7 analog output zero-point adjustment

2.2.3 Board Base Address Selection

SW: board base address DIP switches. Board base address can be set, which occupy the base address of the date of 4consecutive I/O addresses. Switch No. 1, 2, 3, 4, 5, 6, 7, 8 correspond to address bits A2, A3, A4, A5, A6, A7, A8, A9.

Board base address selection switch SW shown as following:



The figure is the default address: 280H. "ON" means the Low effective, "OFF" means the High effective.

Common base address

Adr	SW	Adr	SW
200H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	210H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
220H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	230H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
240H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	250H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
260H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	270H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
280H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	290H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>

2A0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	2B0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
2C0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	2D0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
2E0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	2F0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
300H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	310H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
320H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	330H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
340H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	350H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
360H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	370H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
380H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	390H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
3A0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	3B0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
3C0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	3D0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>
3E0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>	3F0H	<p>A2 A3 A4 A5 A6 A7 A8 A9</p> <p>ON</p> <p>1 2 3 4 5 6 7 8</p>

2.2.4 Jumper

XF1~XF12: analog output range selection

XF1-XF12 can be selected by the jumper. The black box represents the 1-pin, the middle black dot represents 2-pin, the rest is the 3-pin.

Output Range	XF9	XF10	XF1 (DA0)	XF2 (DA1)	XF3 (DA2)	XF4 (DA3)
0~5V						
0~10V						
±5V						
±10V						

Output Range	XF11	XF12	XF5 (DA4)	XF6 (DA5)	XF7 (DA6)	XF8 (DA7)
0~5V						
0~10V						
±5V						
±10V						

Chapter 3 Address Assignment

3.1 Address Assignment Table of the Board

Address Assignment Table (both read and write are eight bus operation)

Address	Write	读
Base Address+0	DA channel	Start 0-ch, 1-ch, 2-ch and 3-ch DA to convert
Base Address +1	DA data low 8-bit	Invalid
Base Address +2	DA data high 4-bit	Invalid
Base Address +3	Invalid	Start 4-ch, 5-ch, 6-ch and 7-ch DA to convert

3.2 Address Assignment Table Introduction

- ◆ **Write the D/A channels, read and start 0-ch, 1-ch, 2-ch and 3-ch DA to convert (board base address +0)**

Write the DA channels: D0 and D1 select channels, D2~ D7 bits are not valid.

Read Operation: start 0 to 3 channels DA to convert.

D1	D0	DA channel
0	0	0
0	1	1
1	0	2
1	1	3

- ◆ **D/A data register (base address +1, +2)**

Write base address +1, +2, and write the low 8-bit and the high 4-bit of the DA data to the base address.

D/A Converter Data Register								
Data Bit	D7	D6	D5	D4	D3	D2	D1	D0
Low 8-bit	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0
Data Bit	D7	D6	D5	D4	D3	D2	D1	D0
High 4-bit	NC	NC	NC	NC	DA11	DA10	DA9	DA8

DA0~DA11 are DA data. NC: Invalid

- ◆ **Read and start 4-ch, 5-ch, 6-ch and 7-ch DA to convert (base address +3)**

Read Operation: start 4-ch, 5-ch, 6-ch and 7-ch DA to convert.

D0 and D1 select channels, D2~ D7 bits are not valid.

D1	D0	DA channel
0	0	4
0	1	5
1	0	6
1	1	7

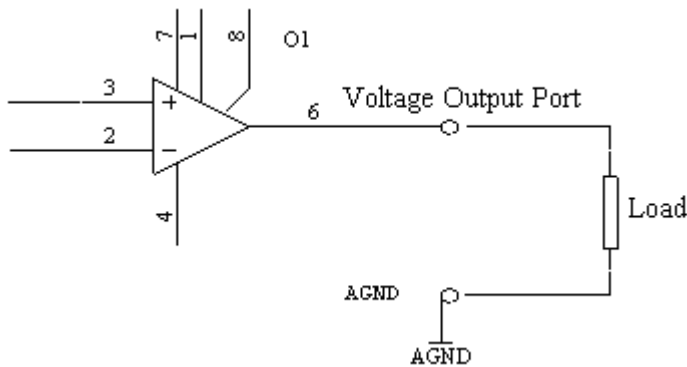
Chapter4 Notes, Calibration and Warranty Policy

4.1 The Connection of the Output Signal

When output voltage, one side of the load connects with the voltage output port (VOUTx), the other side connects with the analog ground (AGND), the max current that provided to the load is 10mA, the voltage output does not require an external power supply.

VOUTx (VOUT0 ~ VOUT7) are the voltage output port of the XS1, 8-channel DA analog output.

Voltage Measurement Schematic:



4.2 Zero-point and Gain Calibration

For calibration, we need a digital multimeter that the precision is more than 4¹/2. First adjust the zero-point, then adjust the gain, each time we change the range, the zero-point and gain should be re-adjusted.

The relations of the potentiometer, the zero-point and the gain

Channel No.	Zero-point	Gain
DA0	RP5	RP1
DA1		RP2
DA2		RP3
DA3		RP4
DA4	RP10	RP6
DA5		RP7
DA6		RP8
DA7		RP9

Calibration Method

- 1) Set the range, connect the load, and power-on to warm up for 5 minutes.
- 2) Adjust the zero-point: make DA output 0V, adjust the zero-point potentiometer, make the output voltage is 0.00mV.
- 3) Adjust the gain, output the data that corresponding to the full-scale, and adjust the potentiometer so that the output voltage reaches the full-scale -1LSB output value.

Note: because the DA0~DA3 and the DA4~DA7 share the one zero-point potentiometer, so adjust the one channel to 0, the other channels are close to 0.

4.3 Note

- Set the jumpers correctly.
- Analog output signal and analog ground connect with the card, and isolate with the bus logic ground.
- Can not hot-plug the card

4.4 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's 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's 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's 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.