NuDAQ®

PCI-6308 Series

Isolated Analog Output Board

User's Guide

Recycled Paper

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Questions	
Product Model	
Environment to Use	□OS: ______ □Computer Brand: ______ □M/B: □CPU: □Chipset: □BIOS: □Video Card: □Network Interface Card: □Other:
Challenge Description	
Suggestions for ADLINK	

Table of Contents

How to Use This Guide

This manual is designed to help you use the PCI-6308. It describes how to modify and control various functions on the PCI-6308 card to meet your requirements. It is divided into three chapters:

Chapter 1, "Introduction", gives an overview of the product features, applications, and specifications.

Chapter 2, "Installation", describes how to install the PCI-6308. The layout of PCI-6308 is shown, the connectors specifications, and the notes for installation are described.

Chapter 3, "Register Format", describes details on-board register format. It is very useful to understand the lowest level of controlling the boards.

Chapter 4, "Operation Theorem", describes more details about the operation of versatile functions, including DIO and DA systems.

Chapter 5, "C/C++ Library", describes the functions in the DOS C/C++ Library and Windows 95 DLL.

Chapter 6, "Software Utility", describes how to run the utility program included in the software CD.

1

Introduction

The PCI-6308 series products are isolated analog output cards. The PCI-6308 series includes three cards:

- PCI-6308V: Isolated 8-CH voltage output card
- PCI-6308A: Isolated 8-CH voltage and current output card
- PCI-6304V: Isolated 4-CH voltage output card

The PCI-6308V is high-performance, 12-bit analog output boards with PCI interface. The PCI-6308V provide 8-CH identical voltage output channels, each of channel has: (1) bipolar ±10V voltage outputs; (2) unipolar 0~+10V voltage output; and (3) unipolar 0 to user defined voltage output. The DA chip is the DAC-4814AP that is a state-of-the-art, fully monotonic, digital to analog converter. This device employs ultra-stable nichrome (NiCr) thin-film resistors to provide monotonicity, low distortion, and low differential linearity error over long period of time.

The PCI-6304V is for large quantity OEM only. It is fully compatible with PCI-6308V, but with four voltage-output channels only. The functionality, software interface and detail operation of PCI-6304V is exactly the same as PCI-6308V. Therefore, there will have no more description about PCI-6304V in this manual.

The PCI-6308A is the combination of PCI-6308V with an 8-CH current output extended board called EXP-8A. The EXP-8A board includes 8 precision voltage-to-current converters/transmitters, which convert voltage output of PCI-6308V to current source output. The EXP-8A is piggy back on the PCI-6308V. Therefore, the PCI-6308A provides not only voltage output but also current output. The total number of analog output channel is still 8.

1.1 Features

- 32-bit PCI-Bus, Plug and Play, complies with PCI local bus specification Rev 2.1
- 8-CH 12-bit voltage output
- Fully isolation protection from PC power to external device
- 2500Vrms isolation voltage
- Unipolar or bipolar voltage output range
- Current output available on PCI-6308A,
- On board DC-to-DC converter provide voltage and current source
- 4 Isolated digital input channels
- 4 Isolated digital output channels

1.2 Applications

- Industrial Process Control
- Pressure / Temperature Transmitter
- Current Source for Testing Equipment
- Servo Control

1.3 Specifications

◆ Voltage Output

- Numbers of channel:
  8 channel for PCI-6308V and PCI-6308A
- Converter: DAC4814AP or equivalent
- Conversion type: Monolithic multiplying
- Resolution: 12-bit no missing code (11-bit guarantee)
- Voltage output range: (jumper selectable)

  ❑ Bipolar: ±10V
  ❑ Unipolar: 0~10V
  ❑ User defined unipolar: 0~ user defined voltage.

- Voltage output driving capability: ± 5mA min.
- Settling time: 16 μ second (-10V to +10V)
- DA update time: 90 μ second for four channels simultaneously
- Gain error: ± 0.2 % (max, without trimming, with internal 10.0V reference voltage)
- Differential Linearity Error: ± 0.002 % Full Scale Range
- Data Transfer: Programmed I/O
- Isolation voltage: 2500Vrms (photo isolation PC9D10)
- Output initial status: 0V (after RESET or POWER-ON)

◆ Current Output

- Numbers of channel: 8 channel for PCI-6308A
- Current output range: (software programmable)

  ❑ 0~20mA, 4~20mA, 5~25mA.

- Voltage to current converter: B.B. XTR110 or equivalent
- Settling time: 17 μ second (0~20mA)
- Slew rate: 1.3mA / μs
- Non-linearity: ± 0.01 % of Span
- Span error: 0.3% of initial Span
- Output resistance: 10 Ohms maximum
- Output initial status: 0mA (after RESET or POWER-ON)

◆ Digital Input

- Numbers of digital input channel: 4 isolated input channel
- Photo isolator: PC814 or equivalent
- Isolation voltage: 5000Vrms
- Input voltage: up to 34Vdc

  ∗ Logic "L": 0~3.0V
  ∗ Logic "H": 3.2~34V

- Input resistance: 4.7KΩ @ 0.5W

Digital Output

- Numbers of digital output channel: 4 isolated output channel
- Photo isolator: PC817 or equivalent
- Isolation voltage: 5000Vrms
- Output type: Photo-coupler transistors, open collector up to 35Vdc
- Sink current: 50mA maximum

Power Supply source

- +15V output (Pin #7 on CN1):
  - ∗ 200mA maximum (for PCI-6308V)
  - ∗ 20mA maximum (for PCI-6308A, when all current output channel is 25mA)
- -15V output (Pin #25 on CN1):
  - ∗ 200mA maximum (for PCI-6308V)
  - ∗ 20mA maximum (for PCI-6308A, when all current output channel is 25mA)

General Specifications

- Operating temperature: 0° ~ 55°C
- Storage temperature: -20° ~ 80°C
- Humidity: 5 ~95% non-condensing
- Connector: 37-pin D-sub connector (female)
- Bus interface: 32-bit slave PCI bus
- Power consumption:
  - ∗ PCI-6308V: +5VDC @ 220mA typical
+12VDC @ 175mA typical
  - ∗ PCI-6308A: +5VDC @ 220mA typical
+12VDC @ 250mA typical
or +12VDC @ 530mA (when all current output channels are 25mA)
- PCB Dimension: Half-sized 172 mm x 105 mm

1.4 Software Supporting

ADLINK provides versatile software drivers and packages for users' different approach to built-up a system. We not only provide programming library such as DLL for many Windows systems, but also provide drivers for many software package such as LabVIEW®, HP VEE™, DASYLab™, InTouch™, InControl™, ISaGRAF™, and so on.

All the software options are included in the ADLINK CD. The non-free software drivers are protected with serial licensed code. Without the software serial number, you can still install them and run the demo version for two hours for demonstration purpose. Please contact with your dealer to purchase the formal license serial code.

1.4.1 Programming Library

For customers who are writing their own programs, we provide function libraries for many different operating systems, including:

- **DOS** Library: Borland C/C++ and Microsoft C++, the functions descriptions are included in this user's guide.
- **Windows 95** DLL: For VB, VC++, Delphi, BC5, the functions descriptions are included in this user's guide.
- PCIS-DASK: Include device drivers and DLL for **Windows 98**, **Windows NT** and **Windows 2000**. DLL is binary compatible across Windows 98, Windows NT and Windows 2000. That means all applications developed with PCIS-DASK are compatible across Windows 98, Windows NT and Windows 2000. The developing environment can be VB, VC++, Delphi, BC5, or any Windows programming language that allows calls to a DLL. The user's guide and function reference manual of PCIS-DASK are in the CD. Please refer the PDF manual files under \\Manual_PDF\Software\PCIS-DASK
- PCIS-DASK/X: Include device drivers and shared library for **Linux**. The developing environment can be Gnu C/C++ or any programming language that allows linking to a shared library. The user's guide and function reference manual of PCIS-DASK/X are in the CD. (\Manual_PDF\Software\PCIS-DASK-X.)

The above software drivers are shipped with the board. Please refer to the "Software Installation Guide" to install these drivers.

1.4.2 PCIS-LVIEW: LabVIEW® Driver

PCIS-LVIEW contains the VIs, which are used to interface with NI's LabVIEW® software package. The PCIS-LVIEW supports Windows 95/98/NT/2000. The LabVIEW® drivers are free shipped with the board. You can install and use them without license. For detail information about PCIS-LVIEW, please refer to the user's guide in the CD.

(\\Manual_PDF\Software\PCIS-LVIEW)

1.4.3 PCIS-VEE: HP-VEE Driver

The PCIS-VEE includes the user objects, which are used to interface with HP VEE software package. PCIS-VEE supports Windows 95/98/NT. The HP-VEE drivers are free shipped with the board. You can install and use them without license. For detail information about PCIS-VEE, please refer to the user's guide in the CD.

(\\Manual_PDF\Software\PCIS-VEE)

1.4.4 DAQBench™: ActiveX Controls

We suggest the customers who are familiar with ActiveX controls and VB/VC++ programming use the DAQBench™ ActiveX Control components library for developing applications. The DAQBench™ is designed under Windows NT/98. For more detailed information about DAQBench, please refer to the user's guide in the CD.

(\\Manual_PDF\Software\DAQBench\DAQBench Manual.PDF)

1.4.5 DASYLab™ PRO

DASYLab is an easy-to-use software package, which provides easy-setup instrument functions such as FFT analysis. Please contact us to get DASYLab PRO, which include DASYLab and ADLINK hardware drivers.

1.4.6 PCIS-DDE: DDE Server and InTouch™

DDE stands for Dynamic Data Exchange specifications. The PCIS-DDE includes the PCI cards' DDE server. The PCIS-DDE server is included in the ADLINK CD. It needs license. The DDE server can be used conjunction with any DDE client under Windows NT.

1.4.7 PCIS-ISG: ISaGRAF™ driver

The ISaGRAF WorkBench is an IEC1131-3 SoftPLC control program development environment. The PCIS-ISG includes ADLINK products' target drivers for ISaGRAF under Windows NT environment. The PCIS-ISG is included in the ADLINK CD. It needs license.

1.4.8 PCIS-ICL: InControl^{TM} Driver

PCIS-ICL is the InControl driver which support the Windows NT. The PCIS-ICL is included in the ADLINK CD. It needs license.

1.4.9 PCIS-OPC: OPC Server

PCIS-OPC is an OPC Server, which can link with the OPC clients. There are many software packages on the market can provide the OPC clients now. The PCIS-OPC supports the Windows NT. It needs license.

2

Installation

This chapter describes how to install the PCI-6308. Please follow the follow steps to install the PCI-6308 family products.

- Check what you have (section 2.1)
- Unpacking (section 2.2)
- Check the PCB and jumper location (section 2.3)
- Install the hardware and setup and jumpers (section 2.4, 2.7)
- Install the software drivers and run utility to test (section 2.5)
- Cabling with external devices (section 2.6, 2.8)

2.1 What You Have

In addition to this *User's Manual*, the package includes the following items:

- PCI-6308V (or PCI-6308A) Board
- ADLINK CD
- Software Installation Guide

If any of these items is missing or damaged, contact the dealer from whom you purchased the product. Save the shipping materials and carton in case you want to ship or store the product in the future.

2.2 Unpacking

Your PCI-6308 series card contains sensitive electronic components that can be easily damaged by static electricity.

The card should be done on a grounded anti-static mat. The operator should be wearing an anti-static wristband, grounded at the same point as the anti-static mat.

Inspect the card module carton for obvious damage. Shipping and handling may cause damage to your module. Be sure there are no shipping and handing damages on the module before processing.

After opening the card module carton, exact the system module and place it only on a grounded anti-static surface component side up.

Note: DO NOT APPLY POWER TO THE CARD IF IT HAS BEEN DAMAGED.

You are now ready to install your PCI-6308 series card.

2.3PCI-6308V Layout

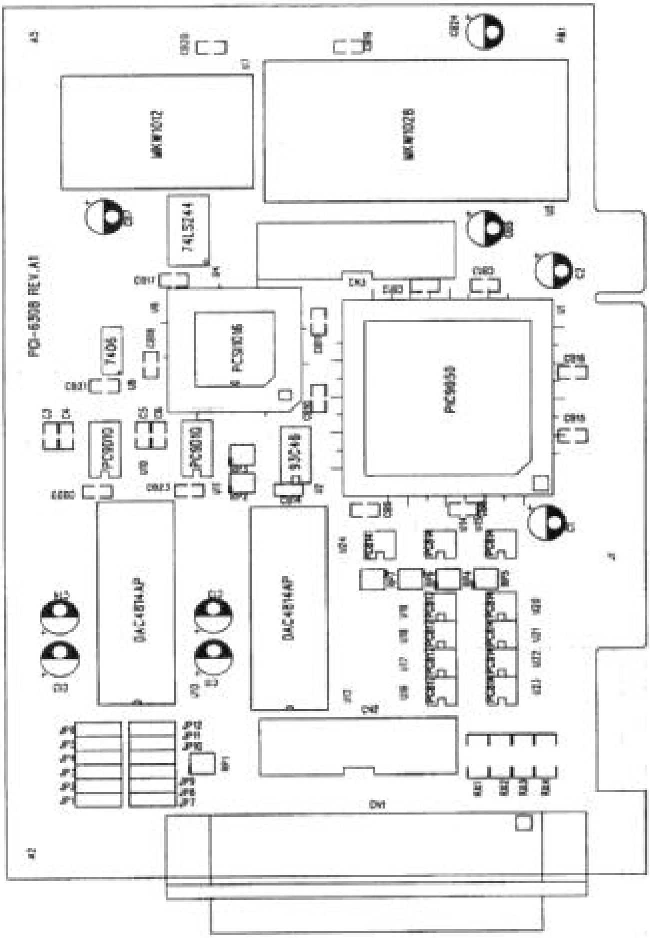


Figure 2.1 PCI-6308V Layout

2.4 Hardware Installation Outline

2.4.1 Hardware configuration

The PCI cards (or CompactPCI cards) are equipped with plug and play PCI controller, it can requests base addresses and interrupt according to PCI standard. The system BIOS will install the system resource based on the PCI cards' configuration registers and system parameters (which are set by system BIOS). Interrupt assignment and memory usage (I/O port locations) of the PCI cards can be assigned by system BIOS only. These system resource assignment is done on a board-by-board basis. It is not suggested to assign the system resource by any other methods.

2.4.2 PCI slot selection

The PCI card can be inserted to any PCI slot without any configuration for system resource.

2.4.3 Installation Procedures

1. Turn off your computer.
2. Turn off all accessories (printer, modem, monitor, etc.) connected to your computer.
3. Remove the cover from your computer.
4. Setup jumpers on the PCI or CompactPCI card.
5. Select a 32-bit PCI slot. PCI slot are short than ISA or EISA slots, and are usually white or ivory.
6. Before handling the PCI cards, discharge any static buildup on your body by touching the metal case of the computer. Hold the edge and do not touch the components.
7. Position the board into the PCI slot you selected.
8. Secure the card in place at the rear panel of the system.

2.5 Device Installation for Windows Systems

Once Windows 95/98/2000 has started, the Plug and Play function of Windows system will find the new NuDAQ/NuIPC cards. If this is the first time to install NuDAQ/NuIPC cards in your Windows system, you will be informed to input the device information source. Please refer to the "***Software Installation Guide***" for the steps of installing the device.

2.6 Connector Pin Assignment

The pin assignment of PCI-6308V/6308A/6304V are shown in Figure 2.2

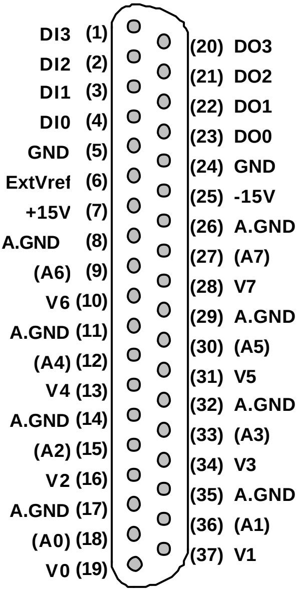


Figure 2.2Pin Assignment of CN1 connector

Legend:

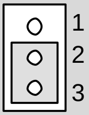
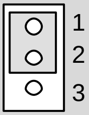
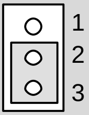
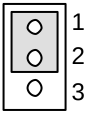
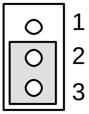
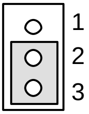
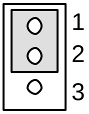
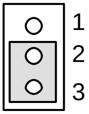
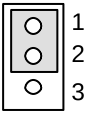
V*n*: the voltage output of channel *n*
for PCI-6308V/6308A, *n*=0~7
for PCI-6304V, *n*=0~4
A*n*: the current output of channel *n*
A*n* is used for PCI-6308A only, *n*=0~7
ExtVref: external reference voltage for voltage output
AGND : Ground of analog output channels and +/-15V
-15V: -15V voltage output
+15V: +15V voltage output
DIx: Digital input channel x
DOx: Digital Output channel x
GND: Isolated ground of digital input and output

2.7 Jumper Setting

The PCI-6308‘s voltage output channels can be configured as different voltage range. Each output channel and its corresponding jumpers are listed as follow.

Channel NO.	Corresponding Jumper For output mode (Unipolar/Bipolar)		Corresponding Jumper For reference voltage sources (external/internal)
CH0	JP1	JP9	JP11
CH1	JP2	JP9	JP11
CH2	JP3	JP9	JP11
CH3	JP4	JP9	JP11
CH4	JP5	JP10	JP12
CH5	JP6	JP10	JP12
CH6	JP7	JP10	JP12
CH7	JP8	JP10	JP12

The output range is dependent on D/A converter's reference voltage source and output mode (Bipolar or Unipolar). The JP11 and JP12 are used to set reference voltage sources comes internally or externally. The external reference voltage input (ExtVref) is on the connector CN1. The JP1~8 and JP9/10 set the output mode to be unipolar or bipolar.

	Unipolar/Bipolar		external/internal
Output Range	JP1~JP8	JP9~JP10	JP11~JP12
-10V to +10V Bipolar **(Default)**			
0V to +10V Unipolar			
0V to ExtRef Voltage Unipolar			

2.8 Termination Board Connection

The PCI-6308 is equipped with the DB-37 connector. The available termination boards include:

- ACLD-9137: A general purposed 37-pin screw terminal. The ACLD-9137 is with male DB-37 connector, which is used to directly attach on the PCI-6308.
- ACLD-9188: A general purposed 37-pin screw terminal, which equipped with heavy-duty screw terminal
- DIN-37D: A general purposed 37-pin screw terminal with DIN-socket, which provide the easily installation socket. DIN-37D is shipped with a 37-pin cable

3

Registers Format

The detailed descriptions of the registers format are specified in this chapter. This information is quite useful for the programmers who wish to handle the card by low-level programming. However, we suggest user have to understand more about the PCI interface then start any low-level programming. In addition, the contents of this chapter can help users understand how to use software driver to manipulate this card.

3.1 PCI PnP Registers

This PCI card functions as a 32-bit PCI target device to any master on the PCI bus. There are three types of registers: PCI Configuration Registers (PCR), Local Configuration Registers (LCR) and PCI-6308 registers.

The PCR, which is compliant to the PCI-bus specifications, is initialized and controlled by the plug & play (PnP) PCI BIOS. User's can study the PCI BIOS specification to understand the operation of the PCR. Please contact with PCISIG to acquire the specifications of the PCI interface.

The PCI bus controller PCI-9050 is provided by PLX technology Inc. (www.plxtech.com). For more detailed information of LCR, please visit PLX technology's web site to download relative information. It is not necessary for users to understand the details of the LCR if you use the software library. The PCI PnP BIOS assigns the base address of the LCR. The assigned address is located at offset 14h of PCR.

The PCI-6308 registers are shown in the next section. The base address, which is also assigned by the PCI PnP BIOS, is located at offset 18h of PCR. Therefore, users can read the 18h of PCR to know the base address by using the BIOS function call.

Please do not try to modify the base address and interrupt which assigned by the PCI PnP BIOS, it may cause resource confliction in your system.

3.2 I/O Address Map

Most of the PCI-6308 registers are 16 bits. The users can access these registers by 16 bits I/O instructions. The following table shows the registers map, including descriptions and their offset addresses relative to the base address.

I/O Address	Write	Read
Base + 00h	DA Channel #3 value	DA Sent Status
Base + 02h	DA Channel #2 value	--
Base + 04h	DA Channel #1 value	--
Base + 06h	DA Channel #0 value	--
Base + 08h	DA Channel #7 value	--
Base + 0Ah	DA Channel #6 value	--
Base + 0Ch	DA Channel #5 value	--
Base + 0Eh	DA Channel #4 value	--
Base + 10h ~3Eh	Reserved	
Base + 40h	Digital Input	Digital Output

Table 3.1 I/O Address Map

3.3 DA Output Register

There are 8 analog output channels on PCI-6308. Every channel is with 12-bit.

Address: BASE + 00(hex) ~ BASE+ 0E(hex)

Attribute: write only

Data Format:

Bit	7	6	5	4	3	2	1	0
BASE+0	DA7	DA6	DA5	DA4	DA3	DA2	DA1	DA0
Bit	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**
BASE+1	--	--	--	--	DA11	DA10	DA9	DA8

3.4 Digital Output Register

D0~D3 is the digital output signal written to output channel. D4~D7 don't care.

Address: BASE + 40(hex)

Attribute: write only

Data Format:

Bit	7	6	5	4	3	2	1	0
BASE+20	X	X	X	X	DO3	DO2	DO1	DO0

3.5 Digital Input Ports

D4~D7 is digital input signal from CN1.

D0~D3 is read back signal from digital output channel.

Address: BASE + 40(hex)

Attribute: read only

Data Format:

Bit	7	6	5	4	3	2	1	0
BASE+20	DI3	DI2	DI1	DI0	DO3	DO2	DO1	DO0

4

Operation Theorem

In this chapter, the detail operation theorem of PCI-6308V and PCI-6308A is described. Before programming or applying the PCI-6308 cards to your applications, please go through this chapter to understand the features of the functions.

4.1 Voltage Output

There are 8 voltage output channels for PCI-6308V and 6308A. For voltage output operation, you have to understand:

1. How to set the voltage output range.
2. The DA data format.

4.1.1 Voltage Output Range Selection

The DA converters used on the PCI-6308 are Burr-Brown DAC4814AP. This DAC is 12 bits resolution with bipolar or unipolar output. The voltage output range is jumper selectable by JP1~JP8. Please refer to section 2.7 for detail of the jumper setting. The selectable range is +/-10V, 0~+10V and 0V ~ user defined voltage. The user-defined voltage is input from the DB-37 connector's pin #6.

4.1.2 DA data format

The DA data format is 12-bits unsigned value for all channels, that is, the value is in binary format. The digital value range from 0(0X000) to +4095(0xFFF) is corresponding to full span of the output range, which is setting by jumper. Table 4.1 shows the relation between the digital value and the analog output voltage.

When the applications use smaller voltage range, the PCI-6308 can still be applied. For example, if the application voltage range is uni-polar 0~5V, the user just need to set jumper to external reference mode, supply 5V from CN1 connector.

For +/-10V mode:

Digital Value	HEX value	Output Voltage
4095	0xFFF	+9.99969V
2048	0x800	0.00000V
0	0x000	-10.00000V

For 0~+10V mode:

Digital Value	HEX value	Output Voltage
4095	0xFFF	+9.99969V
2048	0x800	5.00000V
0	0x000	0.00000V

For 0V ~ Vuser mode:

Digital Value	HEX value	Output Voltage
4095	0xFFF	+Vuser
2048	0x800	+Vuser/2
0	0x000	0.00000V

Table 4.1 DA Voltage Output Format

The following table shows the address of every analog output ports relative to the base address. Note that the base address is assigned by the PCI BIOS. The current output control of the PCI-6308A is described in Section 4.3.

4.2 Analog Output Status Register

The DAC is with series bus hence it takes times to send digital value out. The data transfer time for every DA data write takes 16µs, therefore the software driver must wait for 16µs before send another data to any analog output port. While the DA value is sending, the Data_Send bit is ‘H’. The software driver should check this bit before write any data to output port. This register is read only.

Base	D16~D1	D0
0x00	X	Data_Send

4.3 Current Output and Range Control

The current output is implemented by a precision voltage-to-current converter XTR110. The current output channel n (An) is control by the voltage of channel n (Vn). The block diagram of the current output channels is shown in Fig 4.1.

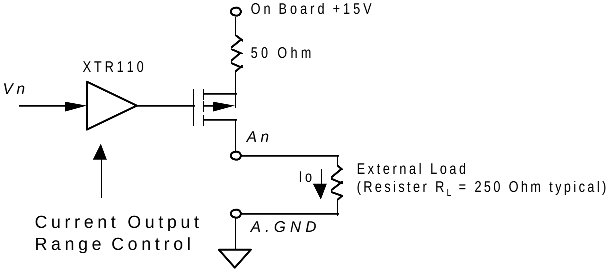


Figure 4.1 Current output circuit

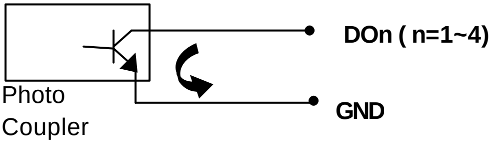
The PCI-6308A provides an on board +15V power supply. Each current output channel is a current source, which is controlled by the voltage of the corresponding voltage output channel. For example, voltage output channel 3 control the current source channel 3.

The output current range is programmable. All the 8 current channels on PCI-6308A are controlled by current range control register. There are three kinds of output current range. Refer to the following table and Section 5.2.9 for programming the current range by _6308_I2V_Control function.

Mode	Input Voltage Range	Output Current Range
0	0~10V	0~20 mA
1	0~10V	5~25 mA
2	--	--
3	0~10V	4~20 mA

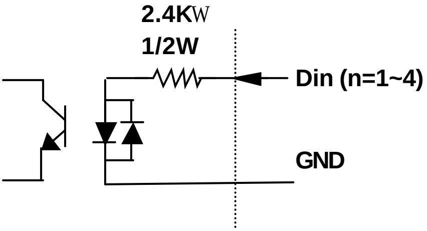
4.4 Isolated Digital Output

The isolated digital output circuits are as following. The output is open collector type. The isolation voltage between the isolated output and the host power signals is 5000 Vrms.



4.5 Isolated Digital Input

The isolated digital input circuits are as following. The input is equipped with current-limit resistor. The input voltage could up to 34V. The isolation voltage between the isolated input and the host power signals is 5000 Vrms.



5

C/C++ Library

This chapter describes the software library for operating this card. Only the functions in DOS library and Windows 95 DLL are described. Please refer to the PCIS-DASK function reference manual, which included in ADLINK CD, for the descriptions of the Windows 98/NT/2000 DLL functions.

The function prototypes and some useful constants are defined in the header files LIB directory (DOS) and INCLUDE directory (Windows 95). For Windows 95 DLL, the developing environment can be Visual Basic 4.0 or above, Visual C/C++ 4.0 or above, Borland C++ 5.0 or above, Borland Delphi 2.x (32-bit) or above, or any Windows programming language that allows calls to a DLL. It provides the C/C++, VB, and Delphi include files.

5.1 Libraries Installation

Please refer to the "***Software Installation Guide***" for the detail information about how to install the software libraries for DOS, or Windows 95 DLL, or PCIS-DASK for Windows 98/NT/2000.

The device drivers and DLL functions of Windows 98/NT/2000 are included in the PCIS-DASK. Please refer the PCIS-DASK user's guide and function reference, which included in the ADLINK CD, for detailed programming information.

5.2 Programming Guide

5.2.1 Naming Convention

There are 7 function calls provided by the C Language Library. All the functions of PCI-6308 are covered in this library. Its capabilities include D/A conversion, Digital Input and Output, etc.

The functions of PCI-6308 software driver are using full-names to represent the functions' real meaning. The naming convention rules are:

In DOS Environment:

_{hardware_model}_{action_name}. **e.g. _`6308_Initial()`.**

All functions in PCI-6308 driver are with 6308 as {hardware_model}. But they can be used by PCI-6308V, PCI-6308A.

In order to recognize the difference between DOS library and Windows 95 library, a capital "**W**" is put on the head of each function name of the Windows 95 DLL driver. e.g. **`W_6308_Initial()`.**

5.2.2 Data Types

We defined some data type in Pci_6308.h (DOS) and Acl_pci.h (Windows 95). These data types are used by PCI-6308/6216 library. We suggest you to use these data types in your application programs. The following table shows the data type names and their range.

Type Name	Description	Range
U8	8-bit ASCII character	0 to 255
I16	16-bit signed integer	-32768 to 32767
U16	16-bit unsigned integer	0 to 65535
I32	32-bit signed integer	-2147483648 to 2147483647
U32	32-bit single-precision floating-point	0 to 4294967295
F32	32-bit single-precision floating-point	-3.402823E38 to 3.402823E38
F64	64-bit double-precision floating-point	-1.797683134862315E308 to 1.797683134862315E309
Boolean	Boolean logic value	TRUE, FALSE

5.3 _6308_Initial

@ Description

This function is used to initialize PCI 6308. Every PCI_6308 has to be initialized by this function before calling other functions.

@ Syntax

C/C++ (DOS)

```
U16 _6308_Initial (U16 *existCards, PCI_INFO *pciInfo)
```

C/C++ (Windows 95)

```
U16 W_6308_Initial (U16 *existCards, PCI_INFO *pciInfo)
```

Visual Basic (Windows 95)

```
W_6308_Initial  (existCards  As  Integer,  pciInfo  As
PCI_INFO) As Integer
```

@ Argument

```
existCards:number of existing PCI-6308 cards
info:      relative information of the PCI-6308 cards
```

@ Return Code

```
ERR_NoError
ERR_BoardNoInit
ERR_PCIBiosNotExist
```

5.4 _6308_Software_Reset

@ Description

This function is used to reset the I/O port configuration. Note that this function can not re-start the PCI bus and all the hardware setting won’t be change either.

@ Syntax

C/C++ (DOS)

```
void  _6308_Software_Reset (U16 cardNo)
```

C/C++ (Windows 95)

```
void  W_6308_Software_Reset (U16 cardNo)
```

Visual Basic (Windows 95)

```
W_6308_Software_Reset (ByVal cardNo As Integer)
```

@ Argument

```
cardNo:  the card number of PCI-6308 card
```

@ Return Code

```
ERR_NoError
```

5.5 _6308_DA

@ *Description*

This function is used to write data to D/A converters. There are 8 Digital-to-Analog conversion channels on the PCI-6308. respectively. The resolution of each channel is 12 bits without sign; i.e. the digital value range from 0 (0x000) to +4095 (0xFFF). Please refer to section 4.1.2 for details of DA data format.

@ *Syntax*

C/C++ (DOS)

```
U16  _6308_DA (U16 cardNo, U16 chn, I16  DAData)
```

C/C++ (Windows 95)

```
U16  W_6308_DA (U16 cardNo, U16 chn, I16  DAData)
```

Visual Basic (Windows 95)

```
W_6308_DA  (ByVal  cardNo  As  Integer,  ByVal  chn  As
Integer, ByVal DAData As Integer) As Integer
```

@ *Argument*

```
cardNo:   The card number of PCI-6308 card
Chn:      D/A channel number
DAData:   D/A data value
```

@ *Return Code*

ERR_NoError

5.6 _6308_DA_0_3

@Description

This function is used to simultaneously write data to D/A converters of channel 0 to channel 3. The resolution of each channel is 12 bits without sign; i.e. the digital value range from 0 to 4095. Please refer to section 4.1.2 for details of DA data format.

@Syntax

c/c++ (DOS)

```
U16 _6308_DA_0_3(U16 cardNo, I16 DA0_Data, I16
DA1_Data, I16 DA2_Data, I16 DA3_Data)
```

c/c++ (Windows 95)

```
U16 W_6308_DA_0_3(U16 cardNo, I16 DA0_Data, I16
DA1_Data, I16 DA2_Data, I16 DA3_Data)
```

Visual Basic (Windows 95)

```
W_6308_DA_0_3(ByVal cardNo As Integer, ByVal DA0_Data
As Integer, ByVal DA0_Data As Integer, ByVal
DA2_Data As Integer, ByVal DA3_Data As
Integer)
```

@Argument

cardNo:	The card number of PCI-6308 card
DA0_Data:	Channel 0 D/A data value
DA1_Data:	Channel 1 D/A data value
DA2_Data:	Channel 2 D/A data value
DA3_Data:	Channel 3 D/A data value

@Return Code

ERR_NoError

5.7 _6308_DA_4_7

@Description

This function is used to simultaneously write data to D/A converters of channel 4 to channel 7. The resolution of each channel is 12 bits without sign; i.e. the digital value range from 0 to 4095. Please refer to section 4.1.2 for details of DA data format.

@Syntax

c/c++ (DOS)

```
U16   _6308_DA_4_7(U16  cardNo,  I16  DA4_Data,  I16
DA5_Data, I16 DA6_Data, I16 DA7_Data)
```

c/c++ (Windows 95)

```
U16  W_6308_DA_4_7(U16  cardNo,  I16  DA4_Data,  I16
DA5_Data, I16 DA6_Data, I16 DA7_Data)
```

Visual Basic (Windows 95)

```
W_6308_DA_4_7(ByVal cardNo As Integer, ByVal DA4_Data
As Integer, ByVal DA5_Data As Integer, ByVal DA6_Data
As Integer, ByVal DA7_Data As Integer)
```

@Argument

cardNo:	The card number of PCI-6308 card
DA4_Data:	Channel 4 D/A data value
DA5_Data:	Channel 5 D/A data value
DA6_Data:	Channel 6 D/A data value
DA7_Data:	Channel 7 D/A data value

@Return Code

ERR_NoError

5.8 _6308_Get_DA_Status

@ *Description*

This function is used to check the DA data sending status. Because the data transfer time for every DA data takes 16.0 µs, the software driver must wait for 16.0µs before sending another data to any analog output port. This function should be called before writing any data to output port. While the DA value is sending, the returned value is “1”, otherwise the returned value is “0”.

@ *Syntax*

C/C++ (DOS)

```
U16 W_6308_Get_DA_Status (U16 cardNo)
```

C/C++ (Windows 95)

```
U16 W_6308_Get_DA_Status (U16 cardNo)
```

Visual Basic (Windows 95)

```
W_6308_Get_DA_Status  (ByVal  cardNo  As  Integer)  As
Integer
```

@ *Argument*

cardNo: The card number of PCI-6308 cards

@ *Return Code*

0 (low): no DA value is sending
1 (high): the DA value is sending

5.9 _6308_DI

@ *Description*

This function is used to read data from digital input ports. There are 4 digital input channels on PCI-6308. The retrieved value is stored in DIData. Note that

@ *Syntax*

C/C++ (DOS)

```
U16  _6308_DI (U16 cardNo, U16 *DIData)
```

C/C++ (Windows 95)

```
U16 W_6308_DI (U16 cardNo, U16 *DIData)
```

Visual Basic (Windows 95)

```
W_6308_DI (ByVal cardNo As Integer, DIData As Integer)
As Integer
```

@ *Argument*

cardNo: the card number of PCI-6308 cards

DIData: the value read from digital input port

@ *Return Code*

ERR_NoError

5.10 _6308_DO

@ Description

This function is used to write data to digital output ports. There are 4 digital output channels on PCI-6308, i.e. the output value ranges from 0 to 15.

@ Syntax

C/C++ (DOS)

```
U16  _6308_DO (U16 cardNo, U16 DOData)
```

C/C++ (Windows 95)

```
U16 W_6308_DO (U16 cardNo, U16 DOData)
```

Visual Basic (Windows 95)

```
W_6308_DO (ByVal cardNo As Integer, ByVal DOData As
Integer) As Integer
```

@ Argument

cardNo:	the card number of PCI-6308 cards
DOData:	the value written to digital output port

@ Return Code

ERR_NoError

5.11 _6308_I2V_Control

@ *Description*

This function is used to set PCI-6308A voltage-to-current mode control. There are three modes of range for PCI-6308A. Please refer to section 3.3 for the detailed description of voltage to current conversion. The three voltage-to-current modes are:

Mode	Input Voltage Range	Output Current Range
I_0to20mA	0~10V	0~20 mA
I_4to20mA	0~10V	4~20 mA
I_5to25mA	0~10V	5~25 mA

@ *Syntax*

C/C++ (DOS)

```
U16  _6308_I2V_Control (U16 cardNo, U16 ctrl)
```

C/C++ (Windows 95)

```
U16 W_6308_I2V_Control (U16 cardNo, U16 ctrl)
```

Visual Basic (Windows 95)

```
W_6308_I2V_Control  (ByVal  cardNo  As  Integer,  ByVal
ctrl As Integer) As Integer
```

@ *Argument*

cardNo: the card number of PCI-6308A cards

ctrl: the voltage-to-current mode, the valid modes are shown in the above table. The constants are defined in Pci_6308.h (DOS) and Acl_pci.h (Windows 95).

@ *Return Code*

ERR_NoError

Product Warranty/Service

ADLINK warrants that equipment furnished will be free from defects in material and workmanship for a period of one year from the date of shipment. During the warranty period, we shall, at our option, either repair or replace any product that proves to be defective under normal operation.

This warranty shall not apply to equipment that has been previously repaired or altered outside our plant in any way as to, in the judgment of the manufacturer, affect its reliability. Nor will it apply if the equipment has been used in a manner exceeding its specifications or if the serial number has been removed.

ADLINK does not assume any liability for consequential damages as a result from our product uses, and in any event our liability shall not exceed the original selling price of the equipment. The remedies provided herein are the customer’s sole and exclusive remedies. In no event shall ADLINK be liable for direct, indirect, special or consequential damages whether based on contract of any other legal theory.

The equipment must be returned postage-prepaid. Package it securely and insure it. You will be charged for parts and labor if the warranty period is expired or the product is proves to be misuse, abuse or unauthorized repair or modification.