

EX-94064

Isolated

64 channel D/O

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Table of Contents

| | |
|---|-----------|
| Chapter 1 Introduction | 3 |
| 1.1 Introduction..... | 3 |
| 1.2 Features | 3 |
| 1.3 Applications | 3 |
| 1.4 Specifications..... | 4 |
| 1.5 Software Supporting | 5 |
| 1.6 Programming Library | 5 |
| Chapter 2 Installation | 6 |
| 2.1 What You Have | 6 |
| 2.2 Unpacking..... | 6 |
| 2.3 Hardware Installation Outline | 6 |
| 2.4 PCB Layout..... | 7 |
| 2.5 Installation Procedures | 8 |
| 2.6 Device Installation for Windows Systems | 8 |
| 2.7 Connector Pin Assignment of EX-94064 | 9 |
| 2.8 Card number setting | 10 |
| 2.9 Latch output value setting..... | 10 |
| Chapter 3 Registers Format | 11 |
| 3.1 PCI PnP Registers..... | 11 |
| 3.2 Reset control registers..... | 12 |
| 3.3 Digital Output Register..... | 12 |
| Chapter 4 Operation Theorem | 15 |
| 4.1 Isolated Digital Output Channels | 15 |
| Chapter 5 Libraries | 16 |
| 5.1 Libraries Installation | 16 |
| 5.1.1 How to use the DOSDAQH.LIB in DOS | 16 |
| 5.1.2 How to use the PCIDAQ.DLL s in Windows..... | 17 |
| 5.2 Summary of function calls..... | 18 |
| 5.3 Open card..... | 19 |
| 5.4 Get Card's ID:..... | 20 |
| 5.5 Get Driver Version | 21 |
| 5.6 Close card..... | 22 |
| 5.7 Get PCI Bus and Slot number..... | 23 |
| 5.8 Write data to digital output port | 24 |
| Chapter 6 EX-98068 Terminal board | 25 |

Chapter 1

Introduction

1.1 Introduction

The EX-94064 is 64-CH high-density isolated digital output product. This digital output card is isolated up-to 5000 Vdc (excluding cables) for channel-to-computer isolation. It protects your computer against damage caused by accidental contact with high external voltage and eliminates troublesome ground loops.

The EX-94064 fully implements the PCI local bus specification Rev 2.1. All bus relative configurations, such as base memory and interrupt assignment, are automatically controlled by BIOS software.

1.2 Features

The EX-94064 Isolated digital I/O card provide the following advanced features:

- ◆ 64 Isolated digital output channels
- ◆ High output driving capability, 500mA sink current on isolated output
- ◆ 5000 Vrms high voltage isolation
- ◆ External interrupt signal on DI channels
- ◆ 68-pin SCSI-II connector (Pin compatible to EX-98068)(see page 25)

1.3 Applications

- ◆ Laboratory and Industrial automation
- ◆ Relay driving
- ◆ On-Off control
- ◆ Low level pulse generator
- ◆ LED control

1.4 Specifications

◆ Optical Isolated Output Channel

Numbers of Channel: 64 digital outputs

Output type: Darlington transistors with common ground

Output voltage: 5V_{DC} min, 90V_{DC} maximum

Output Device: ULN2803 (common ground)

Sink Current: Max. 500mA/ch for only one of the ULN2803 transistor is ON

Power Dissipation: 1.47W per ULN2803 device (8 channels)

Isolated voltage: 5000 V_{DC}

◆ General Specifications

Connector: **68**-pin SCSI-II

Operating temperature: 0°C ~ 60°C

Storage temperature: -20°C ~ 80°C

Humidity: 5 ~ 95%, non-condensing

Power Consumption: +5V @ 530 mA typical

Dimension: 170mm(W) x102mm (H)

1.5 Software Supporting

Topsccc 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™, InTouch™ and so on. All the software options are included in the provided CD.

1.6 Programming Library

The provided CD includes the function libraries for many different operating systems, including:

- ♦ **DOS Library:** BorlandC/C++ and Microsoft C++, the functions descriptions are included in this user's guide.
- ♦ **Windows 98/2000/NT/Me/XP DLL:** For VB, VC++, BC5, the functions descriptions are included in this user's guide.
- ♦ Windows 98/2000/NT/Me/XP ActiveX: For Windows's applications
- ♦ **LabVIEW ® Driver:** Contains the VIs, which are used to interface with NI's LabVIEW ® software package. Supporting Windows 95/98/NT/2000. The LabVIEW ® drivers are free shipped with the board.
- ♦ **InTouch Driver:** Contains the InTouch driver which support the Windows 98/2000/NT/XP. The The InTouch ® drivers are free shipped with the board.

Chapter 2 Installation

This chapter describes how to install the EX-94064 card. Please follow the follow steps to install the EX-94064 card.

2.1 What You Have

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

- ♦ EX-94064 board
- ♦ Driver/utilities CD
- ♦ This user's manual

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 EX-94064 card contains sensitive electronic components that can be easily damaged by static electricity. 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 handling damages on the module before processing.

After opening the card module carton, extract the system module and place it only on a grounded anti-static surface component side up. Again inspect the module for damage. Press down on all the socketed IC's to make sure that they are properly seated. Do this only with the module place on a firm flat surface.

2.3 Hardware Installation Outline

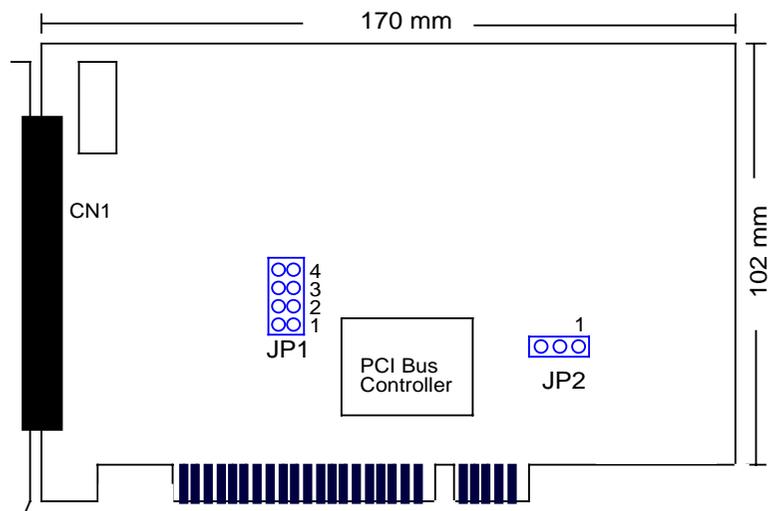
♦ PCI configuration

The PCI cards are equipped with plug and play PCI controller, it can request 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 assignments are done on a board-by-board basis. It is not suggested to assign the system resource by any other methods.

♦ PCI slot selection

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

2.4 PCB Layout



Where

CN1: Digital output connector

JP1: Card number jumper

JP2: Restore output value jumper

2.5 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 card.
5. 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.
6. Position the board into the PCI slot you selected.
7. Secure the card in place at the rear panel of the system.

2.6 Device Installation for Windows Systems

Once Windows 95/98/2000 has started, the Plug and Play function of Windows system will find the new Expert cards. If this is the first time to install Expert cards in your Windows system, you will be informed to input the device information source.

2.7 Connector Pin Assignment of EX-94064

The pin assignment of the 68 pins SCSI-II connector is an isolated signal connector, 94064's pin assignment is as shown in Figure 2.7

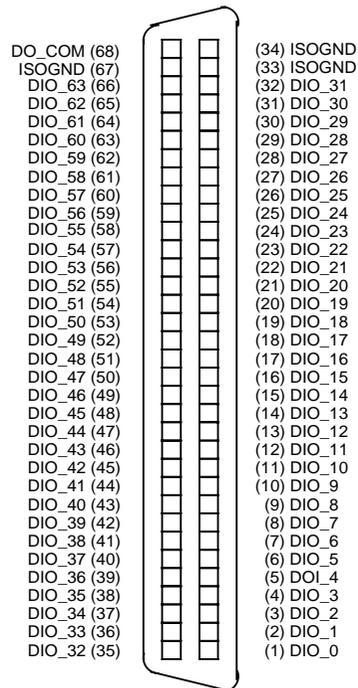


Figure 2.7 Pin Assignment of EX-94064 connector CN1

Legend:

- ◆ **DO_n**: Isolated digital output channel #n
- ◆ **DO_COM**: Power input signal for fly-wheel diode of DO channels
- ◆ **ISOGND**: Ground return path of isolated input and output channels

2.8 Card number setting

Maximum four EX-94064 cards can be installed in system simultaneously with each has a unique card number.

A jumper called "JP1" (see page 7) on the card is used to set the card number starts from 1 to 4

| JP1 | Card number |
|-----|------------------------|
| | 1 (default setting) |
| | 2 |
| | 3 |
| | 4 |

2.9 Latch output value setting

Jumper JP2 gives the EX-94064 a new and valuable capability. With JP2 enabled, the EX-94064 "memorizes" all output values, and, in the event of a "hot" reset or "push button" reset, the output values present at the port just prior to reset are held to each port following reset.

Complete loss of power to the chip clears chip memory. Thus, even if JP2 is enabled, if the power to the card is disconnected, the card's initial power-on state of all output ports are with "Open state" (output transistor OFF)

| JP2 | |
|--------|---------|
| Enable | Disable |
| | |

Chapter 3

Registers Format

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

There are two types of registers: PCI Configuration Registers (PCR) and Peripheral Interface Bus (PIB). The PCR, which is compliant to the PCI-bus specifications, is initialized and controlled by the plug & play (PnP) PCI BIOS..

The PCI bus controller Tiger 100/320 is provided by Tigerjet Network Inc. (www.tjnet.com). For more detailed information of PIB, please visit Tigerjet technology's web site to download relative information. It is not necessary for users to understand the details of the PIB if you use the software library. The PCI PnP BIOS assigns the base address of the PIB. The assigned address is located at offset 14h of PIB .

The 94064 board registers are in 32-bit width. But only lowest byte (bit0~bit7) is used. The users can access these registers by only 32-bit I/O or 8-bit I/O instructions. The following sections show the address map, including descriptions and their offset addresses relative to the base address.

3.2 Reset control registers

The EX-94064 is in inactive state when the system power on, and should be activated by set bit 0 of this register to "1" state

Address: Base + 0x00

Attribute: Write only

Value:

| Bit | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 | State |
|-----------|---|---|---|---|---|---|---|---|----------------------------------|
| Base+0x00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | Inactive (reset) state (Default) |
| Base+0x00 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 | Active state |

- ♦ Bit 0 of this register should be set to "1" before using EX-94064

3.3 Digital Output Register

There are total 64 digital output channels on the EX-94064. each bit of based address is corresponding to a signal on the digital output channel.

Address: BASE + 0C0H ~ BASE +0DCH (port 0 ~ port 7)

Attribute: write only

Value:

| Bit | Port | 7 | 6 | 5 | 4 | 3 | 2 | 1 | 0 |
|-----------|------|-------|-------|-------|-------|-------|-------|-------|-------|
| Base+0C0H | 0 | DO_7 | DO_6 | DO_5 | DO_5 | DO_3 | DO_2 | DO_1 | DO_0 |
| Base+0C4H | 1 | DO_15 | DO_14 | DO_13 | DO_12 | DO_11 | DO_10 | DO_9 | DO_8 |
| Base+0C8H | 2 | DO_23 | DO_22 | DO_21 | DO_20 | DO_19 | DO_18 | DO_17 | DO_16 |
| Base+0CCH | 3 | DO_31 | DO_30 | DO_29 | DO_28 | DO_27 | DO_26 | DO_25 | DO_24 |
| Base+0D0H | 4 | DO_39 | DO_38 | DO_37 | DO_36 | DO_35 | DO_34 | DO_33 | DO_32 |
| Base+0D4H | 5 | DO_47 | DO_46 | DO_45 | DO_44 | DO_43 | DO_42 | DO_41 | DO_40 |
| Base+0D8H | 6 | DO_55 | DO_54 | DO_53 | DO_52 | DO_51 | DO_50 | DO_49 | DO_48 |
| Base+0DCH | 7 | DO_63 | DO_62 | DO_61 | DO_60 | DO_59 | DO_58 | DO_57 | DO_56 |

Chapter 4 Operation Theorem

4.1 Isolated Digital Output Channels

On EX-94064, the DO_COM pin is used as “fly-wheel” diode, which can protect the driver if the loading is inductance loading such as relay, motor or solenoid. If the loading is resistance loading such as resistor or LED, the connection to fly-wheel diode is not necessary.

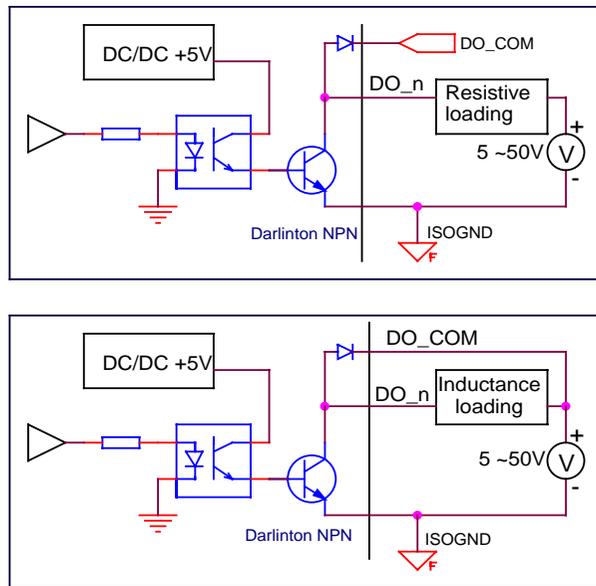


Figure 4-1 isolated digital outputs

Please note that when the loading is as “inductance type loading” such as relay, coil or motor, the DO_COM pin must be connected to the external power source. The extra connection is to utilize the ‘fly-wheel diode’ to form a current-release closed loop, so that the transistor won’t be destroyed by the reverse high voltage which is generated by the inductance load when the output switches from “ON” to “OFF”.

Chapter 5 Libraries

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

5.1 Libraries Installation

This section will show you how to install the software libraries DOSDAQH.LIB for DOS, or Windows 98 DLL, or PCIDAQ for Windows 98/NT/2000.

The device drivers and DLL functions of Windows 98/NT/2000 are included in the PCIDAQ. The Topscdd CD also includes the detail examples and readme files

5.1.1 How to use the DOSDAQH.LIB in DOS

◆ For BC compiler

1. Large mode: Add ..\LIB\BC\DOSDAQ.LIB in your project
2. Huge mode: Add ..\LIB\BC\DOSDAQH.LIB in your project
3. Include DOSDAQ.H in your source file

◆ For MSC compiler

1. Large mode: Add ..\LIB\MSC\DOSDAQ.LIB in your project
2. Huge mode: Add ..\LIB\MSC\DOSDAQH.LIB in your project
3. Include DOSDAQ.H in your source file

◆ For TC compiler

1. Large mode: Add ..\LIB\TC\DOSDAQ.LIB in your project
2. Huge mode: Add ..\LIB\TC\DOSDAQH.LIB in your project
3. Include DOSDAQ.H in your source file

5.1.2 How to use the PCIDAQ.DLL s in Windows

♦ VC++6.0:

1. Add file '../Include/PCIDAQ.H' in your project
2. In link page of menu project| setting, add '../LIB/PCIDAQ.LIB' in the blank of Objects/Library Modules
3. Add this sentence "#include '../Include/PCIDAQ.H' " to the head of your main file.

♦ Visual BASIC:

1. Add file '../Include/Declare.bas' in your project.

♦ Delphi:

1. Add file '../Include/Declare.pas' in your project
2. Add this sentence "uses Declare;" in the head of your unit.pas

♦ C++Builder:

1. Add file '../Include/PCIDAQ.H' and '../Lib/PCIDAQ_CB.lib' to your project
2. Add this sentence "#include '../Include/PCIDAQ.H' " to head of your main file.

Note: For more information, please refer to program in directory '../Example/'

5.2 Summary of function calls

| Function | Description | page |
|-----------------------------------|--|------|
| Open card | Initial EX-94064 card before using | 19 |
| Get Card's ID | Get PCI ID code of EX-94064 | 20 |
| Get Driver Version | Get version number of PCIDAQ.DLL | 21 |
| Close card | Close EX-94064 card before terminating program | 22 |
| Get PCI Bus and Slot number | Get PCI bus and slot number occupied by EX-94064 | 23 |
| Write data to digital output port | Write data (8-bit) to digital output port | 24 |

5.3 Open card

Description:

Because the EX-94064 is PCI bus architecture and meets the plug and play design, the IRQ and base address are assigned by system BIOS directly. EX-94064 cards have to be initialized by this function before calling other functions.

Syntax:**C/C++(DOS)**

```
WORD D_4064_Open (WORD cardNo);
```

C/C++ (Windows)

```
WORD W_4064_Open (WORD *ExistedCards);
```

Visual BASIC (Windows)

```
Function W_4064_Open (ByRef ExistedCards As Long) As Long
```

Delphi

```
Function W_4064_Open (var ExistedCards:Integer):Integer;
```

Argument:

cardNo: Card number set by jumper on card (DOS only)

existCards: This pointer return a value shows how many EX-94064 cards installed in your system. (Windows only)

Return Code:

Error code (Please refer to PCIDAQ.H or DOSDAQ.H)

5.4 Get Card's ID:

Description:

Get the cards number that is set by jumper on cards.

Syntax:**C/C++(DOS)**

```
void D_4064_GetCardsID (WORD *CardsIDArray);
```

C/C++(Windows)

```
WORD W_4064_GetCardsID (WORD *CardsIDArray);
```

Visual BASIC (Windows)

```
Function W_4064_GetCardsID (ByRef CardsIDArray As Long)  
    As Integer
```

Delphi

```
Function W_4064_GetCardsID (var CardsIDArray:Word):Word;
```

Argument:

CardsIDArray: This array return card number (1,2,3,4), which is set by jumper on card. You should define a 4 elements array, and then pass the array's pointer to this function.

Return Code:

Error code (Please refer to PCIDAQ.H or DOSDAQ.H)

5.5 Get Driver Version

Description:

The EX-94064 card is driven by PCIDAQ. DLL driver. This function returns the version of PCIDAQ.DLL driver

Syntax:

C/C++(DOS):

```
void D_4064 _Version (char *version);
```

C/C++ (Windows)

```
Int W_4064_Version (void);
```

Visual BASIC (Windows)

```
Function W_4064_Version () As Long
```

Delphi

```
Function W_4064_Version ():Integer;
```

Argument:

version: This string return the version of DOSDAQ.DLL (DOS only)

Return Code:

Return the version number (Windows only)

5.6 Close card

Description:

The IRQ and base address of EX-94064 (pass-through address) are assigned by system BIOS directly. This function should be called to release all system resource before terminate application program

Syntax:

C/C++(DOS)

```
WORD D_4064 _Close (WORD cardNo);
```

C/C++ (Windows)

```
Void W_4064_Close (void);
```

Visual BASIC (Windows)

```
Function W_4064_Close ()
```

Delphi

```
Function W_4064_Close ();
```

Argument:

cardNo: Card number (1,2,3,4),It's set by jumper on card

Return Code:

Error code (Please refer to PCIDAQ.H or DOSDAQ.H)

5.7 Get PCI Bus and Slot number

Description:

Get the PCI bus and slot number occupied by EX-94064 card

Syntax:

C/C++(DOS)

```
WORD D_4064_GetBusSlot (WORD cardNo, WORD *bus,WORD *slot);
```

C/C++ (Windows)

```
WORD W_4064_GetBusSlot (WORD cardNo, WORD *bus,WORD *slot);
```

Visual BASIC (Windows)

```
Function W_4064_GetBusSlot (ByVal cardNo As Long,  
    ByRef bus As Long, ByRef slot As Long) As Long
```

Delphi

```
Function W_4064_GetBusSlot (cardNo:Integer;  
    var bus:Integer;var slot:Integer):Integer;
```

Argument:

cardNo: Card number (1,2,3,4),It's set by jumper on card

bus: Return PCI bus Number

slot: Return PCI slot Number of the bus

Return Code:

Error code (Please refer to PCIDAQ.H or DOSDAQ.H)

5.8 Write data to digital output port

Description:

This function is used to write data (byte) to output port. You can send 8-bit output data to EX-94064 by calling this function.

Syntax:

C/C++(DOS)

```
WORD D_4064_Write_Do (WORD cardNo,WORD portNo,WORD Data);
```

C/C++ (Windows)

```
WORD W_4064_Write_Do (WORD cardNo,WORD portNo,WORD Data);
```

Visual BASIC (Windows)

```
Function W_4064_Write_Do (ByVal cardNo As Long,  
    ByVal portNo As Long, ByVal Data As Long) As Long
```

Delphi

```
Function W_4064_Write_Do (cardNo:Integer;portNo:Integer;  
    Data:Integer):Integer;
```

Argument:

cardNo: Card number (1,2,3,4),It's set by jumper on card

portNo: Digital port number (0 ~ 7)

Port #0: DO_0~DO_7, Port #4: DO_32~DO_39

Port #1: DO_8~DO_15 Port #5: DO_40~DO_47

Port #2: DO_16~DO_23 Port #6: DO_48~DO_55

Port #3: DO_24~DO_31 Port #7: DO_56~DO_63

Data: Data be written to output port

Return Code:

Error code (Please refer to PCIDAQ.H or DOSDAQ.H)

Chapter 6

EX-98068 Terminal board

EX-98068 digital input/output termination board features one DIN socket for easy maintenance, wiring, and installation. It provides 68 channels that are accessed through a SCSI-68 connector.

Each terminal pin is in serial with 0 ohms resistor to relative pin on the DIN connector. These resistors can be changed to the desired value to meet the requirement of your applications

