PCI-1680U

2-Port CAN Interface Universal PCI Communication Card w/Isolation

User Manual

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Product Warranty (2 years)

Advantech warrants to you, 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 which have been repaired or altered by persons other than repair personnel authorized by Advantech, or which 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 of our customers never need to use our repair service. If an Advantech product is defective, it will be repaired or replaced at no charge during the warranty period. For out-of-warranty repairs, you will be billed according to the cost of replacement materials, service time and freight. Please consult your dealer for more details.

If you think you have a defective product, follow these steps:

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 you get 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 an RMA (return merchandize authorization) number from your dealer. This allows us to process your return more quickly.

4. Carefully pack the defective product, a fully-completed Repair and Replacement Order Card and a photocopy proof of purchase date (such as your sales receipt) in a shippable container. A product returned without proof of the purchase date is not eligible for warranty service.

5. Write the RMA number visibly on the outside of the package and ship it prepaid to your dealer.

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 kind of cable is available from Advantech. Please contact your local supplier for ordering information.

Technical Support and Assistance

Step 1. Visit the Advantech web site at **www.advantech.com/support** where you can find the latest information about the product.

Step 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 you call:
- 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

Packing List

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

• PCI communication interface card

• Industrial Communication Driver, Utility and PCI communication card user's manual in ICOM CD-ROM

Contents

Introduction

This chapter provides a general description of the PCI-1680U.

Sections include:

- Description
- Features
- Specifications
- Ordering Information

Chapter 1 Introduction

1.1 Description

PCI-1680U is special purpose communication card that offers connectivity to Controller Area Networks (CAN) on your PC. With its built-in CAN controllers, the PCI-1680U provides bus arbitration and error detection with an automatic transmission repetition function. This drastically reduces the chance of data loss and ensures system reliability. You can run both CAN controllers independently at the same time. The PCI-1680U operates at baud rates up to 1 Mbps and can be installed in a PC expansion slot.

1.1.1 Controller Area Network
The CAN (Controller Area Network) is a serial bus system especially suited for networking "intelligent" I/O devices as well as sensors and actuators within a machine or plant. Characterized by its multi-master protocol, real-time capability, error correction, high noise immunity, and the existence of many different silicon components, the CAN serial bus system, originally developed by Bosch for use in automobiles, is increasingly being used in industrial automation.

1.1.2 Universal PCI
PCI-1680U provides truly universal connectivity, enabling a single product to be used to implement systems with dramatically different resource requirements. This makes PCI-1680U the most robust, most flexible, and most economical choice for any application requiring isolation. PCI-1680U uses a universal PCI connector compatible with both new 3.3 V signaling support required for plug-in boards by the PCI 2.2 specification and the 5 V signaling still used by many systems.

1.1.3 Optical Isolation Protection
On-board optical isolators protect your PC and equipment against damage from ground loops, increasing system reliability in harsh environments.

1.2 Features

- PCI bus specification 2.2 compliant
- Operates two separate CAN networks at the same time
- High speed transmission up to 1 Mbps
- 16 MHz CAN controller frequency
- Optical isolation protection of 1000 VDC ensures system reliability
- I/O address automatically assigned by PCI PnP
- LED indicates Transmit/Receive status on each port
- Windows DLL library and examples included
- Supports Windows 98/ME/2000/XP driver and utility
- Universal PCI

1.3 Specifications

- **Bus Interface:** PCI bus spec. 2.2 compliant
- **Ports:** 2
- **Protocol:** CAN 2.0 A/B
- **Communication Controller:** SJA-1000
- **CAN Transceiver:** 82C250
- **Signal Support:** CAN_H, CAN_L
- **CAN Controller Frequency:** 16 MHz
- **Speed (bps):** Up to 1 Mbps programmable transfer rate
- **Isolation Protection:** 1,000 V DC
- **Connector:** Dual DB9 male connectors
- **Power Consumption:** 5 V @ 400 mA(Typical)
- **Dimensions:** 185 x 100 mm
- **Operating Temperature:** 0 ~ 60° C
- **Storage Temperature:** -25 ~ 85° C
- **Operating Humidity:** 5 ~ 95% Relative Humidity, non-condensing

1.4 Ordering Information

PCI-1680U: 2-port CAN interface universal PCI communication card w/isolation.

Installation of Driver and Advantech Device Manager

This chapter shows how to install the driver and Advantech Device Manager.

Sections include:

- Driver Installation
- Advantech Device Manager Installation

Chapter 2 Installation of Driver and Advantech Device Manager

2.1 Advantech Device Manager Installation

Advantech Device Manager is a software program that allows you to configure your hardware and store the settings in your Windows registry. You must install the Advantech Device Manager if you want to add and manage Advantech CAN cards.

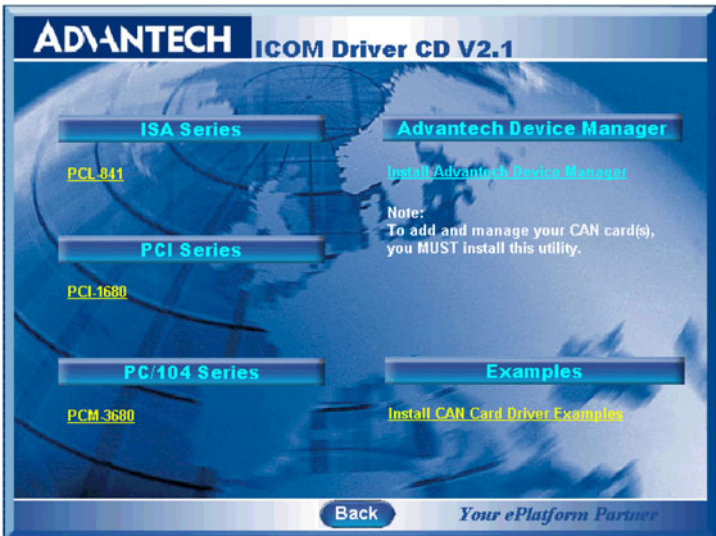Please follow the steps below to install Advantech Device Manager.

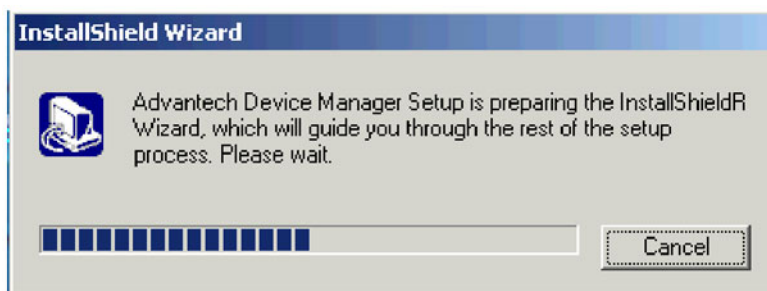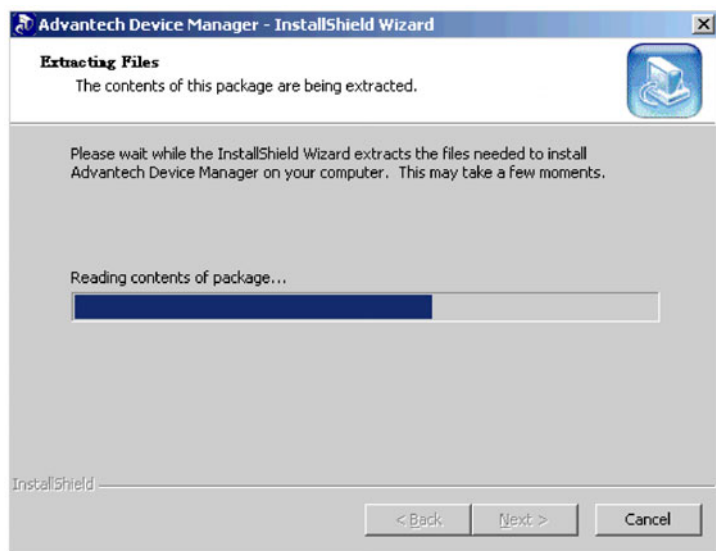1.   Click the **Installation** button for installation.

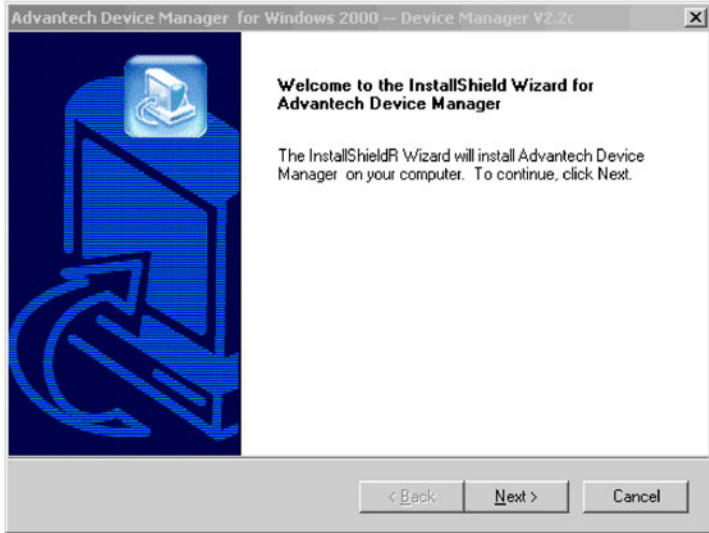2. Click the **CAN Card Drivers** button to enter the CAN cards selection screen.

3. Click the **Install Advantech Device Manager** hyperlink to install Advantech Device Manager.
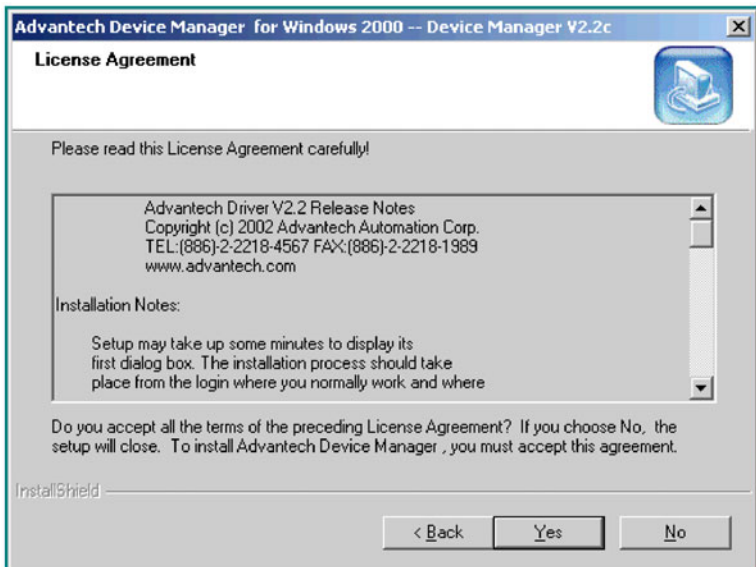
4. The InstallShield Wizard wil initiate the installation process..

5.   Click **Next** to start the install process.

6.   Click **Yes** if you accept the License Agreement.

7. Type user name and company name, and then click **Next**.

8. Click **Next** to accept the default installation folder, or you can specify a folder by clicking the **Browse** button.
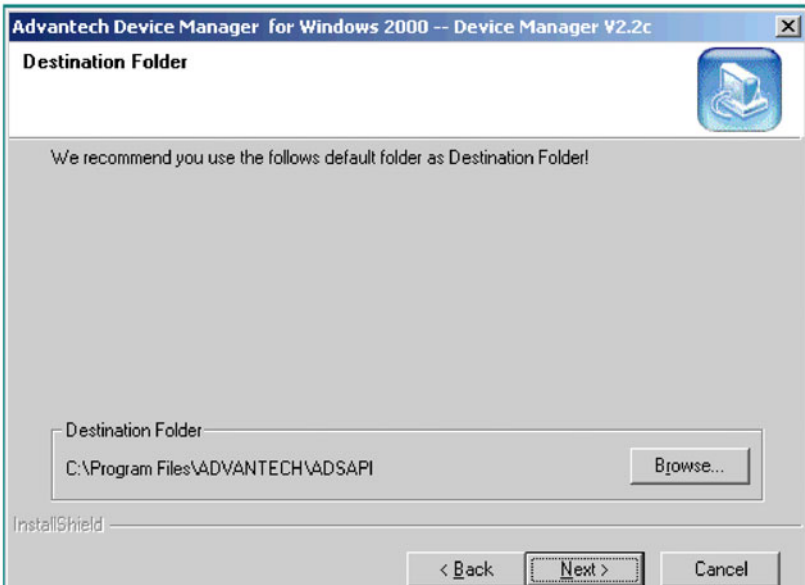
9.   Choose the type of setup you prefer, then click **Next**.
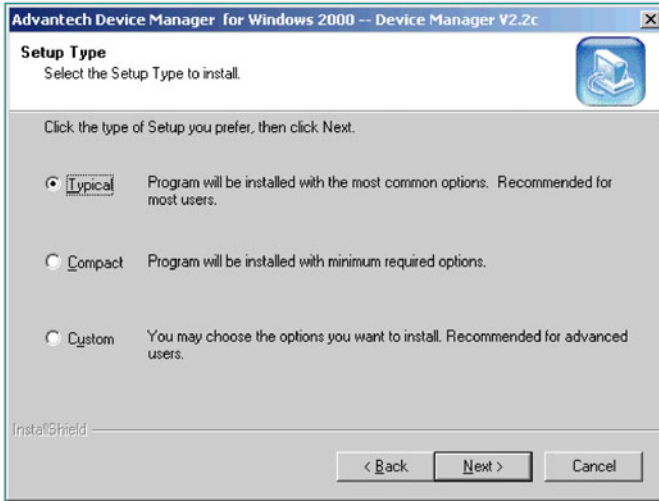
10.   Setup will add program icons to the default program folder. You may type a new folder name, or select one from the existing folder list. Click **Next** to continue.
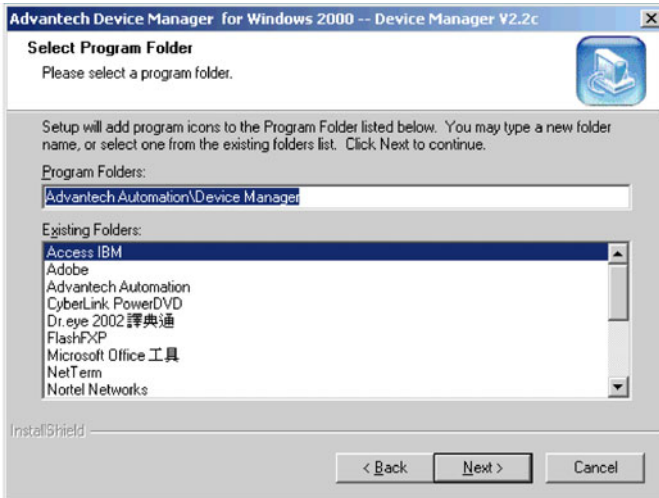
11. Click **Back** to review or change your settings. Click **Next**, and the installation program will copy the files to your computer to finish the installation process.
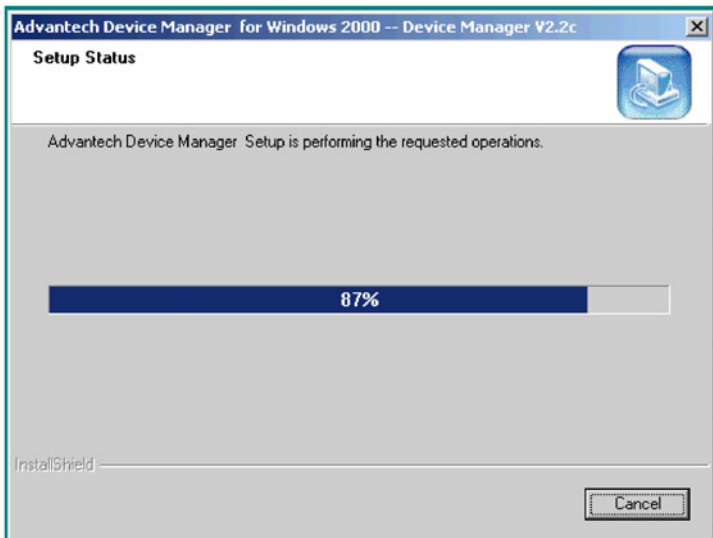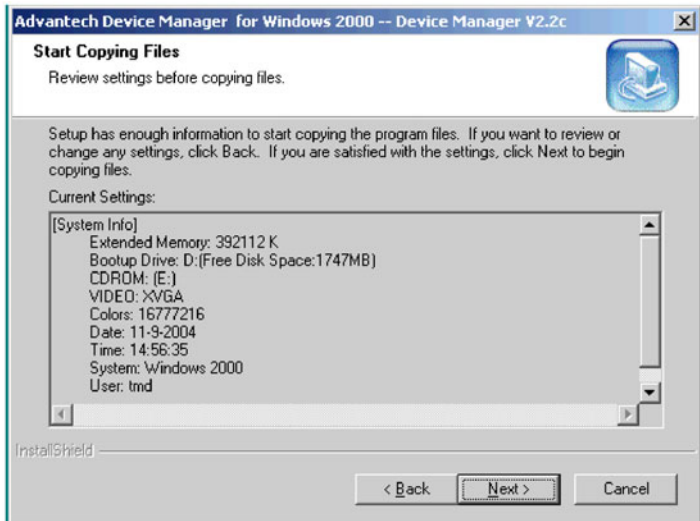
12. You can see that shortcuts that were added to your Windows Start Menu.
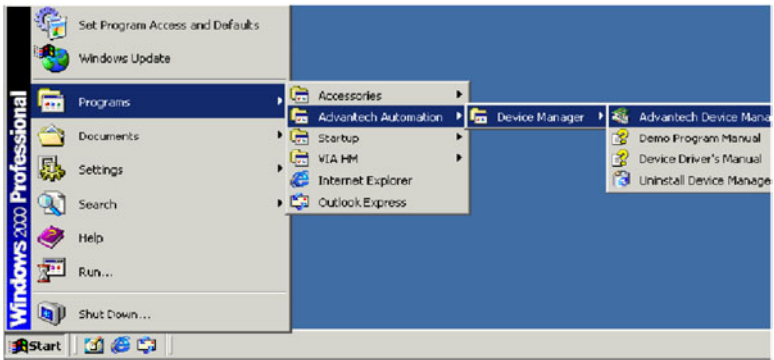
13. After the physical hardware has been installed, execute Advantech Device Manager to see PCI-1680U in both Installed Devices & Support Devices windows. You can get the device number for AdsCAN.dll compiler. Click the **Setup** button for each port setting.
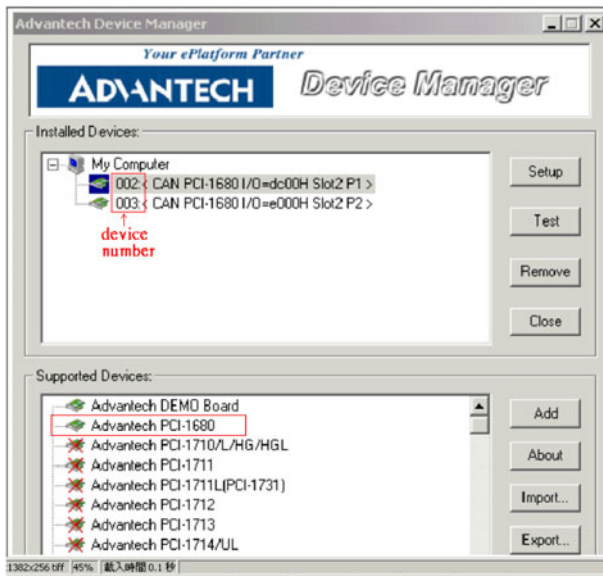
2.2 Driver Installation

Please follow the steps below for PCI-1680U driver installation.

1. Insert your companion CD-ROM disc into your CD-ROM drive

2. The driver setup program will be launched automatically. If the auto-play function is not enabled on your system, use Windows Explorer or the Windows Run command to execute **autorun.exe** on the companion CD-ROM.

3. Click the **Installation** button to start installation.

4.   Click the **CAN Card Drivers** button to enter the CAN cards selection screen.

5.   Choose the card you want to install (PCI-1680U), and then click the hyperlink.
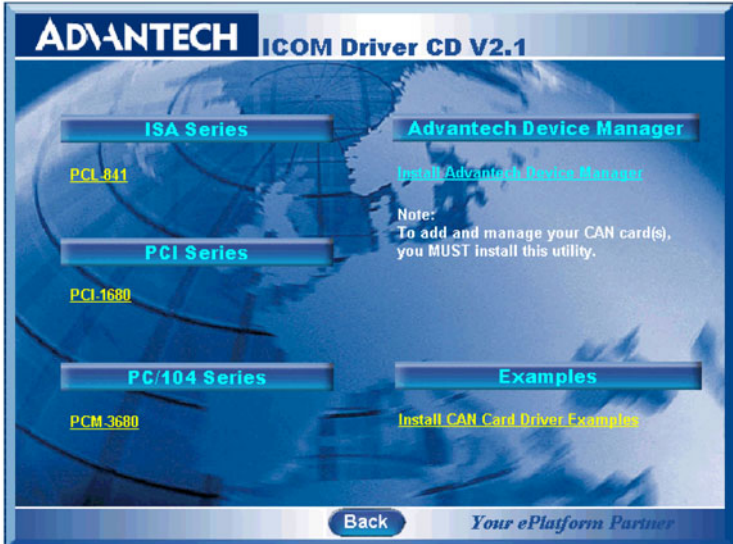
6. Click **Next**, and the Advantech Device Driver will be automatically installed on your computer.
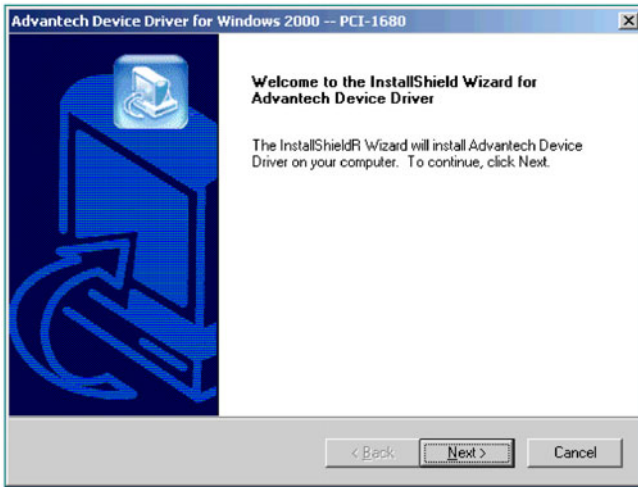
7. After the physical hardware has been installed, the card will be automatically detected.
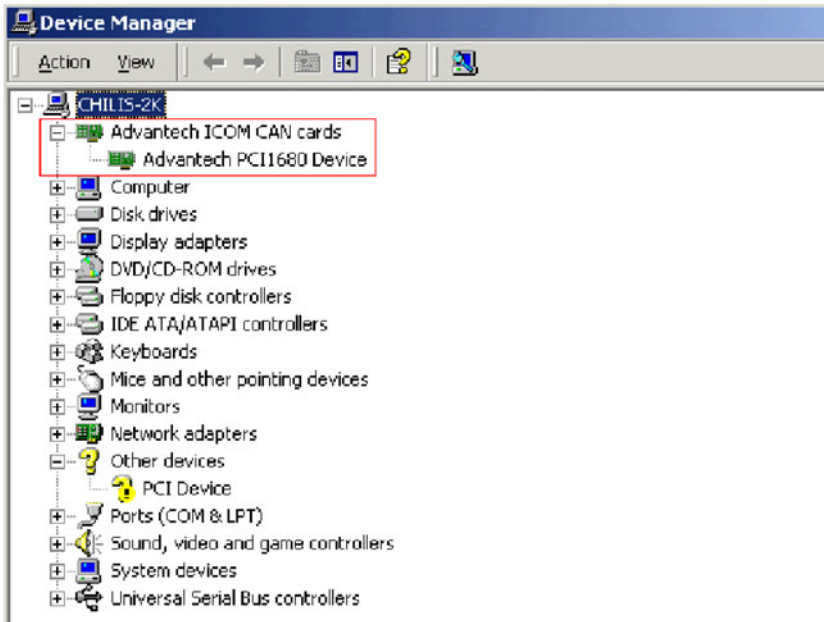
Hardware Installation

This chapter covers inspection and installation of hardware and drivers.

Sections include:

- Initial inspection
- Jumper locations & setting
- Card installation

Chapter 3 Hardware Installation

3.1 Initial Inspection

You should find the following items inside the shipping package:

• PCI communication interface card

• Industrial Communication Driver, Utility and PCI communication card
 user's manual in ICOM CD-ROM

PCI-1680U was carefully inspected mechanically and electrically before
it was shipped. It should be free of marks and scratches and in perfect
working order when received.

As you unpack the PCI-1680U, check for signs of shipping damage (dam-
aged box, scratches, dents, etc.). If it is damaged or it fails to meet speci-
fications, notify our service department or your local sales representative
immediately. Also notify the carrier. Retain the shipping carton and pack-
ing material for inspection by the carrier. After inspection we will make
arrangements to repair or replace the unit.

When you handle the PCI-1680U, remove it from its protective packag-
ing by grasping the rear metal panel. Keep the anti-vibration packing.
Whenever you remove the card from the PC, store it in this package for
protection.

Warning!   *Discharge your body's static electric charge by
             touching the back of the grounded chassis of the
             system unit (metal) before handling the board. You
             should avoid contact with materials that hold a static
             charge such as plastic, vinyl and Styrofoam. Handle
             the board only by its edges to avoid static damage to
             its integrated circuits. Avoid touching the exposed
             circuit connectors. We also recommend that you use
             a grounded wrist strap and place the card on a static
             dissipative mat whenever you work with it.*

3.2 Jumper Locations & Setting

Figure 3.1: PCI-1680U Silk Screen

3.2.1 How to Set Jumpers

You configure your card to match the needs of your application by setting jumpers. A jumper is the simplest kind of electric switch. It consists of two metal pins and a small metal clip (often protected by a plastic cover) that slides over the pins to connect them. To "close" a jumper you connect the pins with the clip. To "open" a jumper you remove the clip.
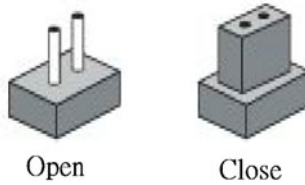

Figure 3.2: How to Set Jumpers

3.2.2 Terminator Resistor Setup

You can set the terminator resistor if necessary to match impedance. Each port has a separate resistor.

Table 3.1: PCI-1680U Terminator Resistor Reference	
Status	Value of Terminator Resistor()
Open mode	0
Close mode	120

3.3 Card Installation

Note: *Make sure you have installed the driver before installing the card. We strongly recommend that you install the software driver before installing the hardware into your system, since this will guarantee a smooth and trouble-free installation process.*

Warning!   *Turn off your PC's power supply whenever you install or remove the PCI communication card or its cables. Static electricity can easily damage computer equipment. Ground yourself by touching the chassis of the computer (metal) before you touch any boards.*

1. Turn off the computer.
2. Turn the power off to any peripheral devices (such as printers and monitors).
3. Disconnect the power cord and any other cables from the back of the computer.
4. Turn the PC if necessary to gain access to the cables.
5. Remove the PC's cover (refer to your user's guide if necessary).
6. Locate the expansion slots or passive back-plane (at the rear of the PC) and choose any unused slot.
7. Remove the screw that secures the expansion slot cover to the PC (save the screw to secure the interface card retaining bracket).
8. Remove the anti-vibration card clamp if supplied.
9. Carefully grasp the upper edge of the PCI communication card.
10. Align the hole in the retaining bracket with the hole on top of the expansion slot.
11. Align the gold striped edge connector with the expansion slot socket.
12. Press the board firmly into the socket.
13. Replace the screw in the expansion slot's retaining bracket.

14. Replace anti-vibration cardholder.

15. Replace the PC's cover. Connect the cables you removed in step 3.

16. Turn the computer power on.

17. The board is now installed in the computer. See Chapter 5 for information on cabling.

Software Requirements

This chapter has information on the software of PCI-1680U.

Sections include:

- Introduction
- Overall Description
- Specific Requirements

Chapter 4 Software Requirements

4.1 Introduction

PCI-1680 and PCL-841 are Isolated Dual-port CAN communication cards. Each provides two isolated CAN ports for communication applications in difficult environments. The chip on the CAN cards is SJA1000. The SJA1000 is a single chip solution for PC-based CAN port and parallel expansion add-in cards.

This chapter outlines the CAN card's windows DLL driver software requirement specifications. Including functionality, performance, and user interface requirements. It applies to programming the CAN cards Windows unified DLL driver, including the driver for PCL841 and PCI1680.

4.1.1 Definitions, Acronyms, and Abbreviations

SRS = Software Requirements Specification

PPI = Programmable Peripheral Interface

GUI = Graphics User Interface

4.1.2 Reference

Please see "SJA1000.pdf" on your CD-ROM for further information on the SJA1000 chip.

4.2 Overall Description

In order to unify the driver interface of Advantech's CAN series of products, a new DLL file named AdsCAN.dll has been defined. This makes it possible to change the CAN card from PCI-1680 to PCL-841 without recompiling applications.

AdsCAN.dll should decide which driver to call depending on the different CAN cards.

4.3 Specific Requirements

4.3.1 Device Driver Functionality

The AdsCAN.dll driver needs to decide which driver should be called depending on different hardware.

The AdsCAN.dll driver should properly translate the function parameters to a lower layer driver.

4.3.2 The CAN Driver Framework

All user-mode functionality is implemented through Win32 communication API Functions.

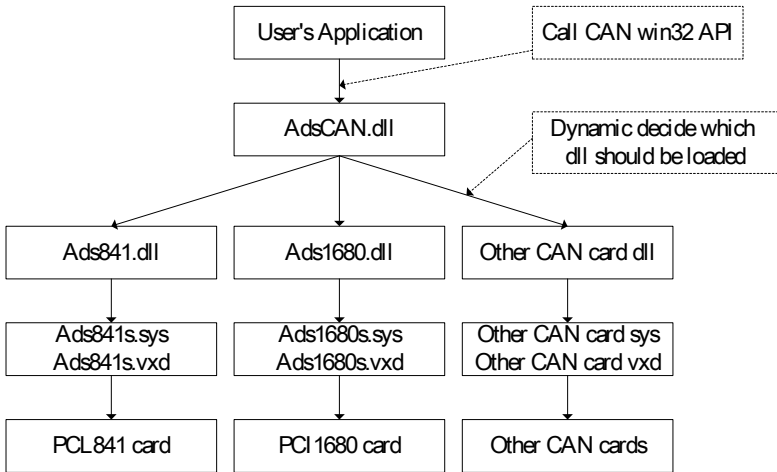The AdsCan.dll unified driver interface for all CAN cards is shown in figure 4.1.

Figure 4.1: AdsCan.dll architecture

With the new driver architecture, you don't need to recompile your CAN applications when you switch one CAN card with another.

4.3.3 Software Interfaces

AdsCAN.dll should follow the CAN software-programming interface, so that users can use Advantech's driver software in the same way.

You can access the CAN functionality via the AdsCAN.dll Library as shown in the following table. For detailed function library definitions and descriptions please see the file 'can.chm' on the CD-ROM.
Path in CD-ROM: Documents\Software Manuals\CAN

Table 4.1: Function Table of AdsCAN.dll		
Function	**Syntax (in C)**	**Description**
1	CANCheckEvent()	Check event status from kernel-mode and clear event.
2	CANEnableEvent()	Enables or disables the event mechanism
3	CANEnableMessaging()	Select the data transmit interrupt
4	CANEnableRxInt()	Enable the receive interrupt
5	CANGetArbitrationLost-CatchMsgEx()	Get arbitrate lost catch information
6	CANGetBaudRate()	Get the card current baud rate
7	CANGetControllerError-CodeEx()	Get Controller error code
8	CANGetErrorMessage()	Get error message
9	CANGetEventName()	Queries and gets CAN port's event name
10	CANGetProtocolType()	Get the card current protocol type
11	CANHwReset()	Reset the hardware
12	CANInit()	Controls CAN port settings
13	CANInpb()	Inputs a byte data from the specified address on CAN card
14	CANOutpb()	Outputs a byte data to the specified address on CAN card
15	CANPortClose()	Releases settings, close port
16	CANPortOpen()	Open the CAN port
17	CANQueryID()	Query the message ID
18	CANQueryMsg ()	Reads data from the card

Table 4.1: Function Table of AdsCAN.dll		
19	CANReadFile()	Reads data
20	CANReset()	Resets CAN port
21	CANSendMsg()	Sends message
22	CANSetAcp()	Set the card 2.0 A protocol acceptance code
23	CANSetAcpEx()	Set 2.0B protocol accept code
24	CANSetBaud()	Set card baud rate
25	CANSetBufferPtr()	Set the data receive buffer
26	CANSetCountPtr()	Set the counter of receive buffer
27	CANSetIntrMaskEx()	Set 2.0B protocol interrupt mask
28	CANSetNormal()	Sets CAN card to normal mode
29	CANSetOutCtrl()	Set the card out control register
30	CANSetProtocolType()	Set the card current protocol type
31	CANWaitForFIFOEvent()	Wait for the FIFO buffer event.
32	CANWaitForID()	Wait For the message ID
33	CANWaitForMsg()	Queries and gets message from CAN bus.
34	CANWakeUpEx()	Set Can controller into sleep mode
35	CANWriteFile()	Send message

Pin Assignments and Wiring

This chapter covers the pin assignment for the CAN connector, and the wiring of the two transmission wires.

Sections include:

- Pin Assignments
- Wiring

Chapter 5 Pin Assignments and Wiring

5.1 Pin Assignments

Figure 5.1 shows the pin assignment for the card's DB-9 connectors
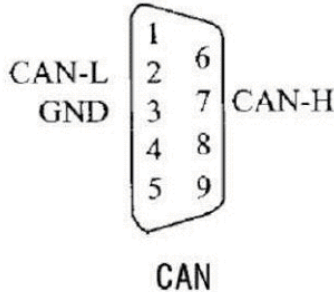

Figure 5.1: PCI-1680U DB-9 pin assignment

5.2 Wiring

The CAN standard supports half–duplex communication. This means that just two wires are used to transmit and receive data.

Table 5.1: PCI-1680U Pin Wiring and Description		
	PCI-1680U DTE (male DB-9)	**Terminal DTE**
Pin	**Signal**	**Signal**
2	CAN_L	CAN_L
3	GND	GND
7	CAN_H	CAN_H