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Contents

CHAPTER 1

Introduction

Description

The PCI Local Bus is a high-performance bus that provides a processor-independent data path between the CPU and high-speed peripherals. PCI is a robust interconnect mechanism designed specifically to accommodate multiple high performance peripherals for series communication, SCSI, LAN, etc.

Advantech serial communication cards leverages the " Plug and Play " capability defined in the PCI 2.1 bus specification. The board requires only one PCI slot within the personal computer and provides independent serial channels. All channels are addressed in a continuous 32 byte I/O block for simplified software access. And, all channels may also share one PCI interrupt. An interrupt status register is available for determining the interrupt source.

The Advantech PCI communication card comes standard with 16PCI954 UARTs containing 128 byte FIFOs which are available as an option. These upgraded FIFOs greatly reduce CPU overhead and are an ideal choice for heavy multitasking environments.

16PCI954

The 16PCI954 is a high performance Quad UART with an on-chip PCI interface. Targeted at PCI-based serial and parallel expansion cards, PCI-architecture computer systems and embedded applications, the 16PCI954 integrates a PCI bus interface together with four of 16C950 high performance UARTs, a bi-directional parallel port and a local bus bridge function. This single-chip solution replaces five or more integrated circuits used in today products, giving performance, cost and size advantages for new designs.

Features

- PCI Specification 2.1 compliant
- Speeds up to 921.6 Kbps
- 16C954/950 UARTs with 128-byte standard
- Standard Industrial Board size
- I/O address automatically assigned by PCI Plug-and-Play

- OS supported: Windows NT, Windows 95, Windows 98
- Optional surge protection
- Optional isolation protection for RS-422/485
- Interrupt status register for increased performance
- Space reserved for termination resistors
- Automatic RS-485 data flow control

Specifications

- **Bus Interface**: PCI bus specification 2.1 compliant
- **IRQ**: all ports use the same IRQ assigned by PCI Plug-and-Play
- **Data bits**: 5, 6, 7, 8
- **Stop bits**: 1, 1.5, 2
- **Parity**: none, even, odd
- **Communication controller**:

  16PCI954 + 16C954 for PCI-1620A/B
  16PCI954 for PCI-1610A/B, PCI-1612A/B
  16PCI954 for PCI-1601A/B, 1602A/B

- **Speed (bps)** : 50 ~ 921.6 K
- **Data signals**:
  TxD, RxD, RTS, CTS, DTR, DSR, DCD, GND (for RS-232)
  RI (for PCI-1610)
  TxD, RxD, RTS, CTS (for RS-422)

- **Power requirement** :

	Typical	Max
PCI-1620	120 mA (+12 V)	150 mA (+12 V)
	180 mA (+5 V)	220 mA (+5 V)
PCI-1610	60 mA (+12 V)	80 mA (+12 V)
	150 mA (+5 V)	180 mA (+5 V)
PCI-1601	220 mA	270 mA
PCI-1602	250 mA	300 mA
PCI-1612	60 mA (+12 V)	80 mA (+12 V)
	270 mA (+5 V)	340 mA (+5 V)

- **Dimensions**: 185 mm x 100 mm (for PCI-1612/1620)
  123 mm x 92 mm (for PCI-1601/1602/1610)
- **Operating temperature**: 0^{o} ~ 65^{o} C (referring to IEC 68-2-1, 2)
- **Operating Humidity**: 5 ~ 95% Relative Humidity, non-condensing (referring to IEC 68-2-1, 2)
- **Operating Humidity**: 5 ~ 95% Relative Humidity, non-condensing (referring to IEC 68-2-3)
- **Storage Temperature**: -25 ~ 85^{o} C

Ordering Information

PCI-1601A: 2-port RS-422/485 PCI Comm Card
PCI-1601B: 2-port RS-422/485 PCI Comm Card, w/surge protection
PCI-1602A: 2-port RS-422/485 PCI Comm Card. w/ isolation protection
PCI-1602B: 2-port RS-422/485 PCI Comm Card, w/isolation and surge protection
PCI-1620A: 8-port RS-232 PCI Comm Card
PCI-1620B: 8-port RS-232 PCI Comm Card, w/surge protection
PCI-1610A: 4-port RS-232 PCI Comm Card
PCI-1610B: 4-port RS-232 PCI Comm Card, w/surge protection
PCI-1612A: 4-port RS-232/422/485 PCI Comm Card
PCI-1612B: 4-port RS-232/422/485 PCI Comm Card, w/surge protection

Series	**PCI-1601**		**PCI-1602**		**PCI-1610**		**PCI-1612**		**PCI-1620**	
	A	B	A	B	A	B	A	B	A	B
No. of Port	2	2	2	2	4	4	4	4	8	8
Interface	RS-422/485		RS-422/485		RS-232		RS-232/422/485		RS-232	
Surge Protection	-	2500 V_{DC}	-	2500 V_{DC}	-	3000 V_{DC}	N/A	2500 V_{DC}	-	3000 V_{DC}
Isolation Protection	-	-	3000 V_{DC}	3000 V_{DC}	-	-	-	-	-	-

CHAPTER 2

Hardware Configuration

Initial Inspection

You should find the following items inside the shipping package (in addition to this manual):

- PCI communication interface card
- Advantech Automation Software
- PCI communication card user's manual

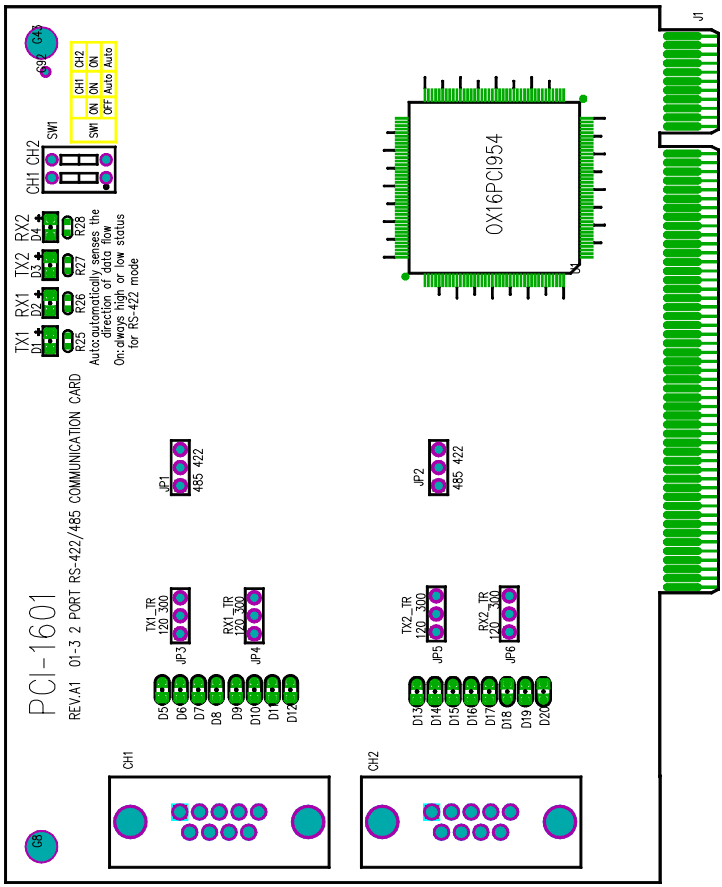
We carefully inspected the PCI communication card series mechanically and electrically before we shipped it. It should be free of marks and scratches and in perfect working order on receipt.

As you unpack the PCI communication card series, check it for signs of shipping damage (damaged box, scratches, dents, etc.). If it is damaged or it fails to meet specifications, notify our service department or your local sales representative immediately. Also notify the carrier. Retain the shipping carton and packing material for inspection by the carrier. After inspection we will make arrangements to repair or replace the unit.

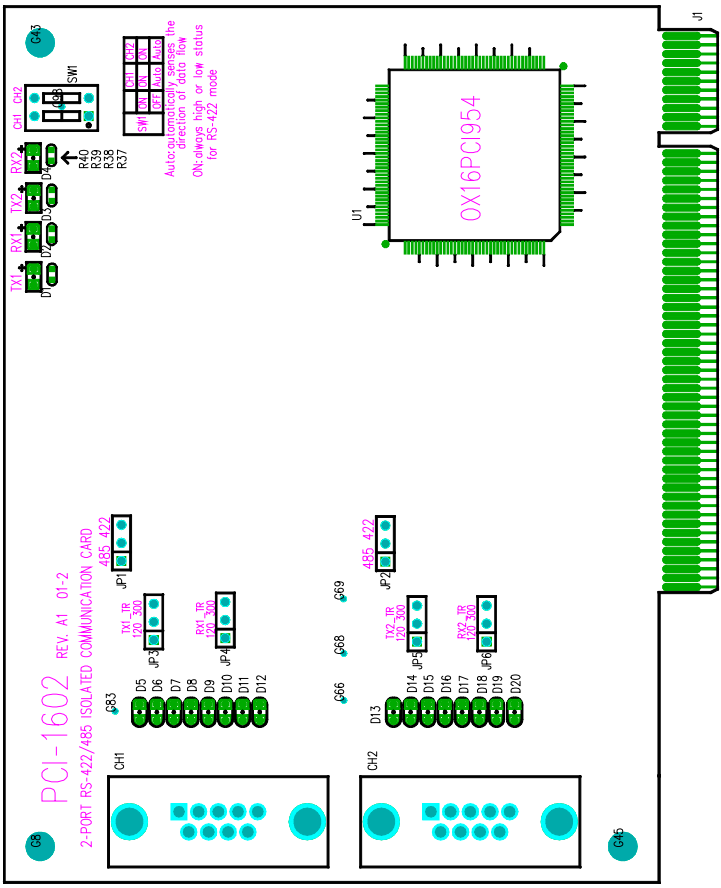
When you handle the PCI communication card series, remove it from its protective packaging by grasping the rear metal panel. Keep the anti-vibration packing. Whenever you remove the card from the PC, store it in this package for protection.

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.*

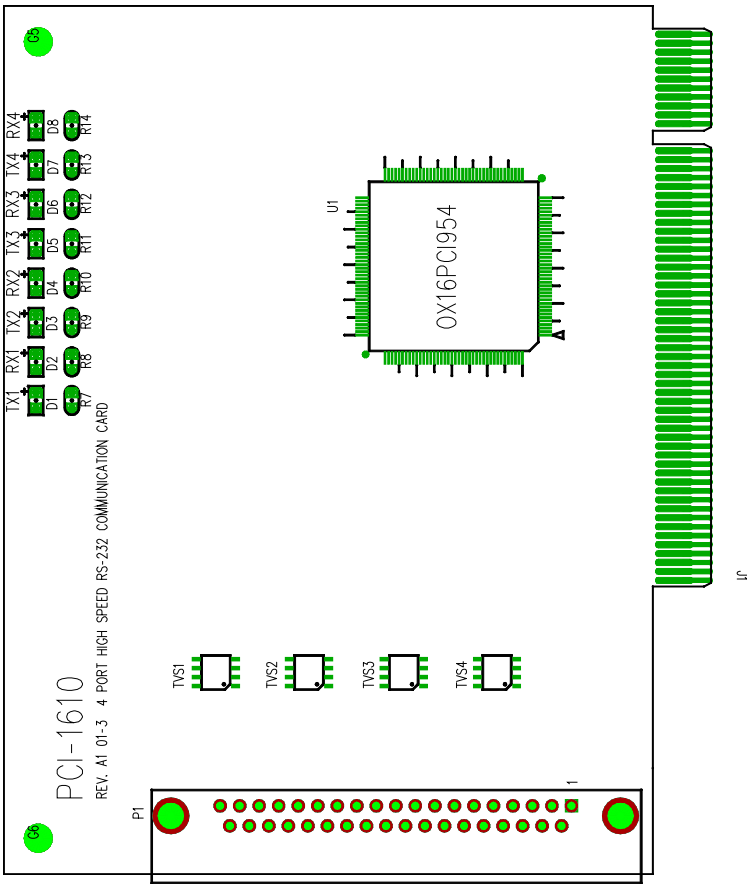
Jumper and Switch Locations



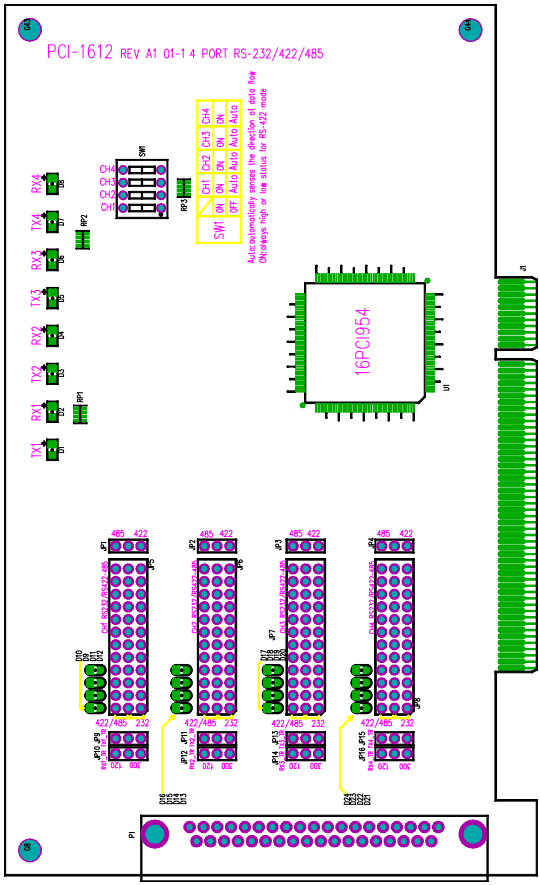
PCI-1601 Silk Screen



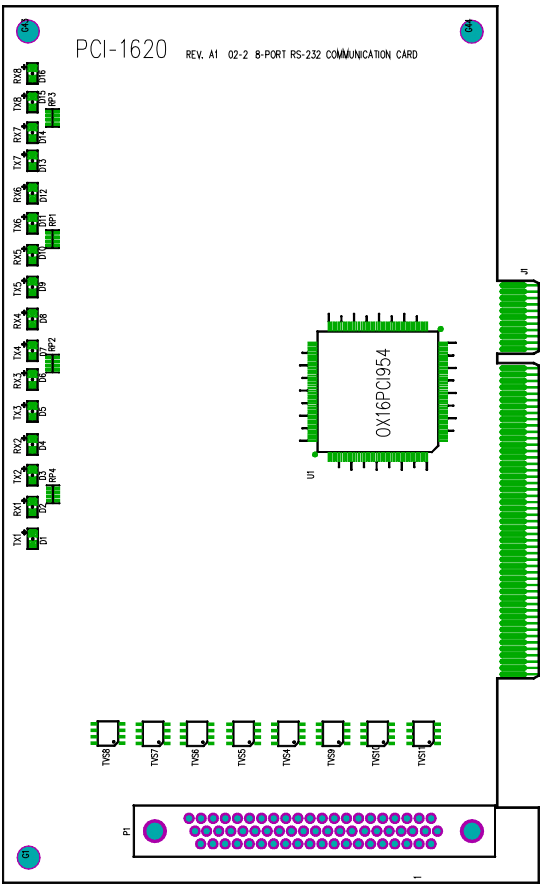
PCI-1602 Silk Screen



PCI-1610 Silk Screen



PCI-1612 Silk Screen



PCI-1620 Silk Screen

Jumper settings

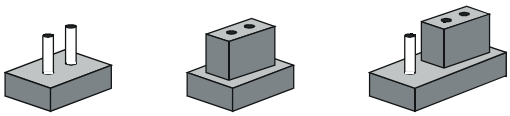
This section tells how to set the jumpers to configure your card. It gives the card default configuration and your options for each jumper.

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. Sometimes a jumper will have three pins, labeled 1, 2 and 3. In this case you would connect either pins 1 and 2 or 2 and 3.

You may find pair of needle-nose pliers useful for setting the jumpers.

If you have any doubts about the best hardware configuration for your application, contact your local distributor or sales representative before you make any changes.



Open **Closed** **Closed 2-3**

Default Settings

The board is shipped with default settings. If you need to change these settings, however, see the following sections. Otherwise, you can simply install the card.

	PCI-1601	PCI-1602	PCI-1612
RS-422/485 Mode	RS-422	RS-422	RS-422
Enable Mode	Auto	Auto	Auto

Card installation

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.*

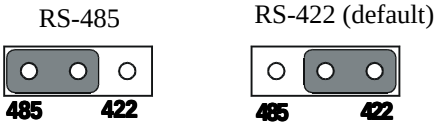
See the static warning on page 6

1. Turn off the computer. Turn the power off to any peripheral devices (such as printers and monitors).
2. Disconnect the power cord and any other cables from the back of the computer. Turn the PC if necessary to gain access to the cables.
3. Remove the PC's cover (refer to your user's guide if necessary).
4. Locate the expansion slots or passive backplane (at the rear of the PC) and choose any unused slot.
5. Remove the screw that secures the expansion slot cover to the PC (save the screw to secure the interface card retaining bracket). Re move the anti-vibration card clamp if supplied.
6. Carefully grasp the upper edge of the PCL-743/745 card. Align the hole in the retaining bracket with the hole on top of the expansion slot. Align the gold striped edge connector with the expansion slot socket. Press the board firmly into the socket.
7. Replace the screw in the expansion slot retaining bracket. Replace anti-vibration card holder.
8. Replace the PC's cover. Connect the cables you removed in step 2. Turn the computer power on.

The board is now installed in the computer. See Chapter 4 for information on cabling.

RS-422/485 selection (for PCI-1601/1602/1612)

You can set each port individually for either RS-422 (the default) or RS-485 operation. The figure below shows the jumper settings. See the "Jumper and Switch Locations" figure from page 7 to 11 for help to locate the jumpers.



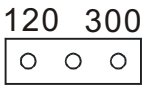
Enable mode selection

You set the Enable mode using two- or four- position DIP switches, one for each port. If the switches are set to "AUTO", the driver automatically senses the direction of the data flow and switches the direction of transmission. No handshaking is necessary.

If DIP switches are set to "On," the driver is always enabled, and always in high or low status. The user must select a mode before beginning RS-422 applications.

Terminator resistor setup (for PCI-1601/1602/1612)

You can install terminator resistors if necessary to match impedance. Each signal line (RTS, CTS) has a separate resistor.



CHAPTER 3

Driver Setup & Installation

Overview

This chapter describes the driver installation, configuration and removal procedures for Windows 95/98, and Windows NT. ***We strongly recommend that you install the software driver first before you install the hardware into your system, since this will guarantee a smooth and trouble-free installation process.***

For Windows 95/98 Driver Setup

- To install the driver for the first time, please refer to Section **"Steps for Windows 95/98 Driver Setup"** and Section **"Reboot after Win95/98 driver Setup"**
- To verify your installation, refer to Section **"Verify your Win 95/98 Driver Setup"**
- To configure your PCI ICOM devices, refer to Section **"Configure PCI ICOM Series Devices"**
- To remove the Device from your system, refer to Section **"Remove Advantech PCI ICOM Series Devices"**
- To remove the driver, refer to Section **"Steps for Complete Windows 95/98 Driver Uninstall"**

For Windows NT Driver Setup

- To install the driver for the first time, please refer to Section **"Steps for Windows NT Driver Setup"**
- To verify your installation, refer to Section **"Verify your NT Driver Setup"**
- To start the device function, refer to Section **"Start the Device Function"**
- To verify the driver function, refer to Section **"Verify your NT Driver Function"**
- To stop the device function, refer to Section **"Stop the Device Function in Windows NT"**

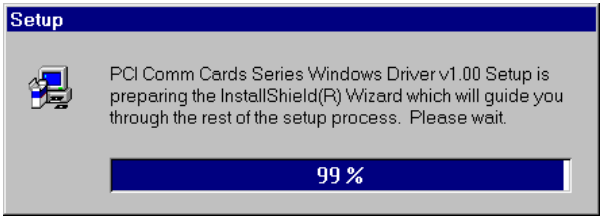
Windows 95/98 Driver Setup

Windows 95/98 supports up to **256** serial ports, from **COM1** to **COM256**. Advantech PCI ICOM driver, however, will start to assign port numbers beginning from **COM 5**. In order to fully utilize Windows 95/98 advanced features such as multi-process and multi-thread , we offer pure 32-bit Windows 95/98 virtual device port drivers, which are compliant with communication drivers, for the PCI-1601/ 1602/ 1610/ 1612/ 1620 multiport boards. All these drivers conform to Win32 COMM API standard to serve you with a smooth performance.

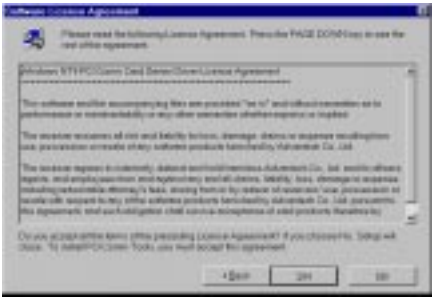
Steps for Windows 95/98 Driver Setup

Before you install the card into your system, we strongly recommend you install the driver first. Please follow the steps below for the PCI-1601/ 1602/ 1610/1612/ 1620 Windows 95/98 driver installation.

1. Insert your driver installation diskette into your floppy drive, or insert companion CD-ROM disc into your CD-ROM drive.
2. Use Windows Explorer or Windows Run command to execute SETUP.EXE on your driver diskette or companion CD-ROM. Or if the autoplay function is enabled on your system, the driver setup program will be launched automatically from the CD-ROM.
3. After the Setup program is launched, you'll see the following Setup Screen.



4. Click the *Next* button and the License Agreement Page appears.



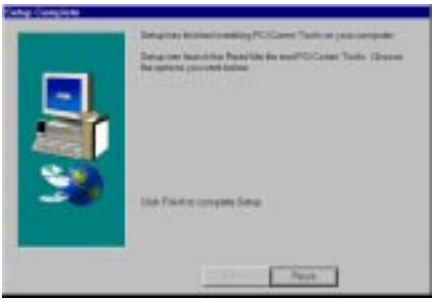
5. Click the *Next* button and the Choose Destination Location page appears.

6. Click *Next* to bring up the Select Program Folder dialog box.

7. The Driver Setup program will begin copying files to your system.

8. The Setup program will create the Advantech ICOM Tools program folder in the Start/Programs Menu.

9. After the installation process is completed, just click ***Finish*** to close the driver setup program.



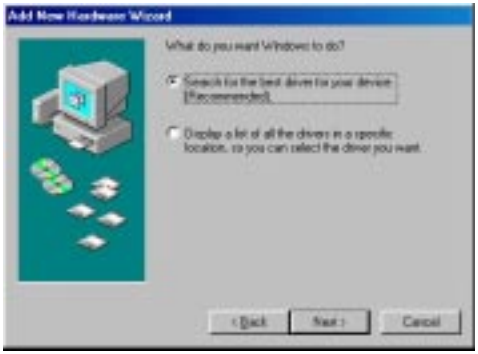
10. After you have finished the driver installation, you need to reboot your system for proper functioning of your card.

Reboot your system after Win95/98 driver Setup

PCI UARTs Device Driver Installation

1. On rebooting your system, Windows 95/98 will recognize your card devices and will search for the device driver for PCI UARTs automatically as shown in the following dialog box.

2. Choose ***"Search for the most Suitable Driver"*** radio button, and click Next.

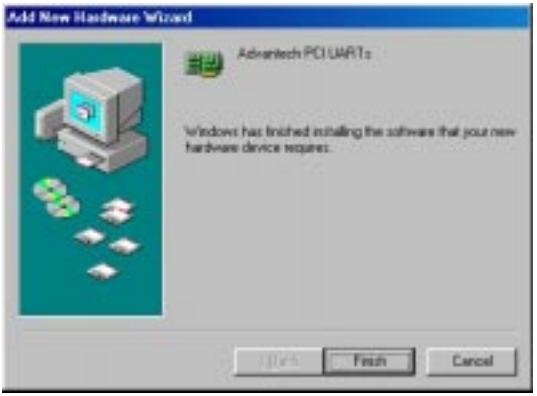


3. You don’t have to choose the location of the device driver program, since it is already installed on your system. Just click ***Next*** to proceed.

4. Windows 95/98 has found the driver location and is ready to install the driver. Click ***Next.***

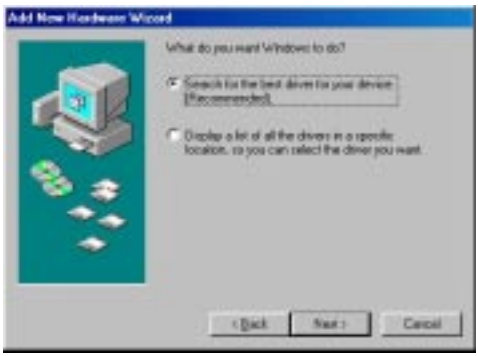
5. You will be prompted to decide whether you want to install the Updated Driver. Accept the Updated Driver option and click ***Next.***

6. The driver installation is complete. Click ***Finish.***

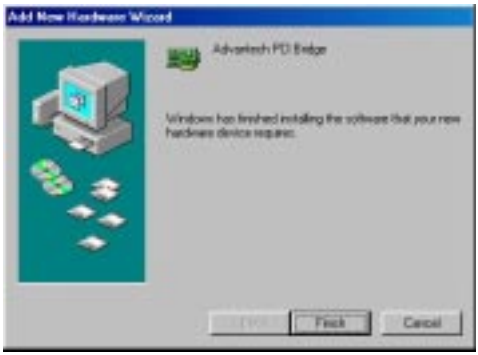


PCI Bridge Device Driver Installation

7. After the PCI UARTs device driver has been installed, Windows 95/98 will proceed to recognize the PCI Bridge device. Just repeat similar steps as above to install the device driver for PCI Bridge.



8. After the ***PCI Bridge*** device driver is installed, a dialog box such as below will appear to indicate that Windows 95/98 has completed the device driver installation of the hardwares.



Verify your Win95/98 Driver Setup

After you have installed your card, go to Control Panel/System/ Device Manager to look for the Device Name that is supposed to appear after you have installed the driver.

Note:

If your device has not been properly installed, there will be an exclamation mark (!) on the device name to indicate a conflicting device. If this is the case, just remove that device and start the driver installation process all over again. Or you can run ***COM Registry Clean Tool*** utility (by accessing *Start/ Programs/Advantech PCI ICOM/COM Registry Clean Tool*) to remove all Advantech PCI ICOM series devices from your system. After driver uninstall is completed, you must restart your system to re-assign the communication port numbers.

You can also check up the Com Port properties by double-clicking the specific com port device configuration you want to see. On the ***Properties*** sheet, just select the specific tabs to see relevant information.

On the ***General*** tab, you can see whether the device is working properly. If your device functions normally, you can see a line of message under the ***Device*** statsus box, stating “This device is working properly”.

On the ***Settings*** tab, you can check up the relevant information of that specific port. As you can see on the figures below, the description for the communication port actually contains four parts:

[DEV_0B] specifies the PCI slot in your system.

PCI-1620 specifies the device model of Advantech PCI ICOM device.

Port 1 specifies the port index for Advantech PCI ICOM device.

RS-232 or **RS-422/485** specifies the operating mode.


Advantech PCI ICOM series
OK
Cancel

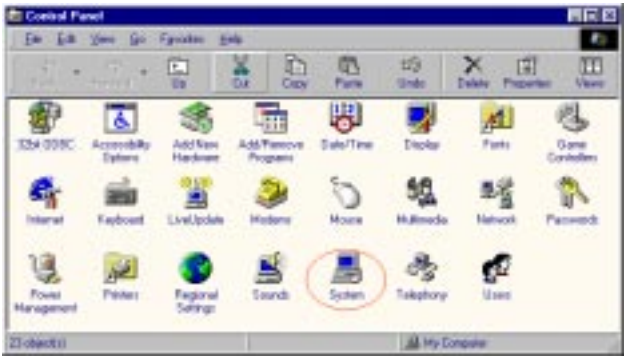

Advantech PCI ICOM series
OK
Cancel

If you want to configure FIFO Properties, select FIFOs tab. On the tab, you can see the relevant FIFO configurations. We recommend you to use the default settings. However, you are allowed to set the configurations manually according to your preferences. If you want to restore the default settings, just click the ***Default Setting*** button.

Configure PCI ICOM serial devices on Windows 95/98

After your serial devices have been properly installed in your system, you can now proceed to configure your serial devices according to the following steps:

1. Access ***Control Panel/System***

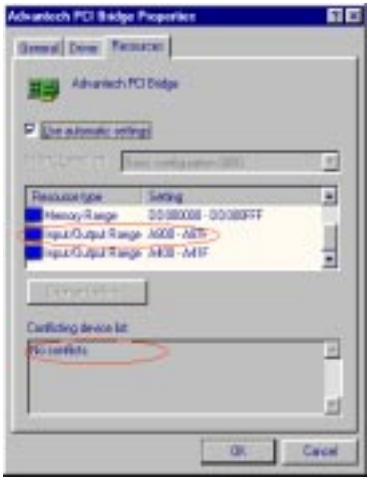


2. Select ***Device Manager*** tab on the ***System Properties*** sheet.

3. Click the plus sign (+) on the right of the ***ADSPCIUART*** device category to expand it. As shown on the figure below, you can see ***Advantech PCI UARTs*** and ***Advantech PCI Bridge*** device names listed under the device category.

Configuring PCI UARTs Device

4. Double-click the ***Advantech PCI UARTs*** device to evoke its ***Properties*** page, and then select the ***Resource*** tab on the ***Properties*** page to look up or configure the current settings of the ***PCI UARTs*** device.

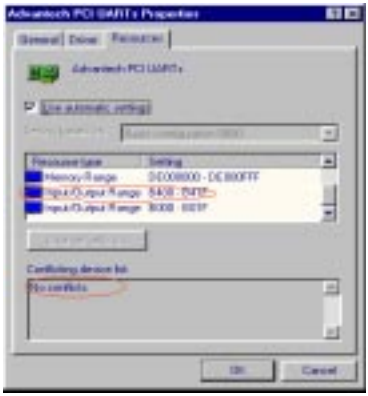


5. After you have made necessary changes or if you are just satisfied

with the default settings, click ***OK*** to accept. If you want to cancel the configuration, just click ***Cancel.***

Configuring PCI Bridge Device

6. Double-click the Advantech PCI Bridge device to evoke its Properties page, and then select the Resources tab on the Properties page to look up or configure the current configuration of the PCI Bridge device to make sure there is no conflicting device. Click other tabs to look up or configure the device.



Note: 1. In Windows 95 there might appear a conflicting device, but it won't do any harm.

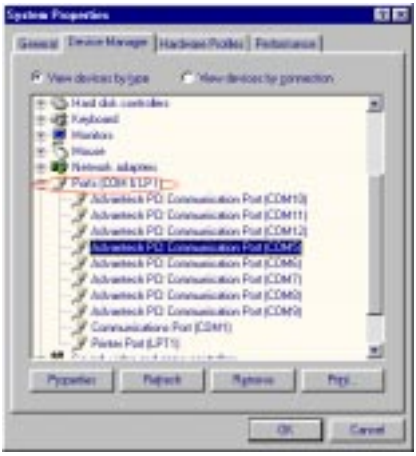
2. The Input/Output Range information is helpful to recognize the communication port attached to the device.

7. After you have made necessary changes or if you are just satisfied with the default settings, click ***OK*** to accept. If you want to cancel the configuration, just click ***Cancel.***

Configuring ports

8. Click the plus sign (+) on the right of the ***Ports (COM & LPT)***

device category to expand it, and then double-click the specific communication port to evoke its ***Properties*** page. Select specific tabs for configuring specific settings.



9. Select the ***Settings*** tab on the ***Properties*** page of the communica tion port to examine the port settings.

Note: As you can see on the figure of the previous page above, the description for the communication port contains four parts:

[DEV_0B] specifies the PCI slot in your system.

PCI-1620 specifies the device model of Advantech PCI ICOM device.

Port 1 specifies the port index for Advantech PCI ICOM device.

RS-232 specifies the operating mode.

10. Select the ***Data Rate*** tab to check up information about clock frequency, baud rate, etc. You can see a slider on the bottom of this tab, and if you want to adjust the baud rate, just drag the slider to where you want it to be.

11. Select ***FIFOs*** tab to have a look at the FIFO properties.

Note:

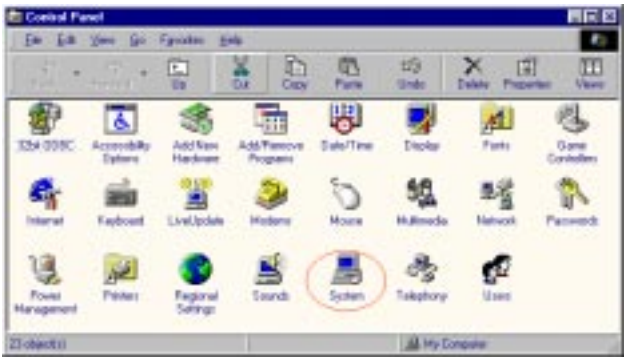
The ***Default Setting*** button can recover all the FIFO settings to their default values.

12. Select the ***Resource*** tab on the ***Properties*** page to look up the resource settings.

Note:1. In Windows 95 there might appear a conflicting device, but it won't do any harm.

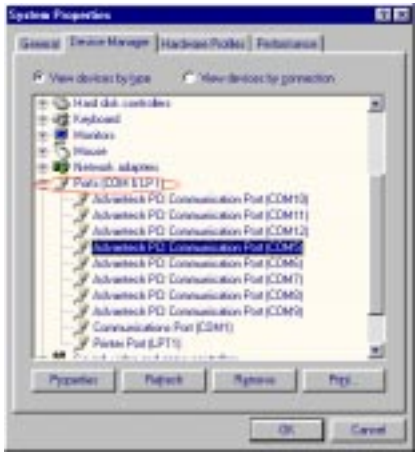
2. The Input/Output Range information is helpful to recognize the communication port attached to the device.

Remove PCI ICOM series device



1. Access ***Control Panel/System*** to bring up the ***System Properties*** sheet.
2. Select the ***Device Manager*** tab on the ***System Properties*** sheet.

3. Click the plus sign (+) on the right of the ***Ports (COM & LPT)*** device category to expand it. Select the specific "Advantech PCI communication port" you want to remove, and click the ***Remove*** button to remove the device you have selected.



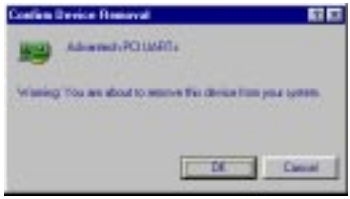
4. The following dialog box will appear to prompt you again to make sure you really want to remove the device from your system.

5. Click the plus sign (+) on the right of the **ADSPCIUART** device category to expand it, and select ***Advantech PCI UARTs*** or ***Advantech PCI Bridge*** you want to remove.

Note:

You must remove all ports attached to the device before you remove the device itself.

6. Click the ***Remove*** button and the following dialog box appears to prompt you whether you really want to remove the device.



Note:

We recommend you to remove the original device before installing another model of Advantech PCI ICOM series device in the same PCI slot.

Steps for Complete Win98/98 Driver Uninstall

If you want to uninstall the driver completely, please use the uninstaller utility, ***AdsCleaner***, for a clean and safe driver uninstall. Please follow the steps below to proceed with the complete driver uninstall:

1. Access ***Start/Program/Advantech PCI ICOM/COM Registry Clearn Tool***.

2. A dialog box will appear to make sure that you want to remove all the Advantech PCI ICOM devices from your system.

3. Click OK to begin removal of all PCI ICOM devices from your system. After the removal is complete, a message box will appear to prompt you for a reboot.

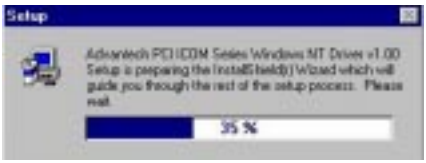
Windows NT Driver Setup

Windows NT supports up to **256** serial ports, from **COM1 to COM256**. Advantech PCI ICOM driver, however, will start to assign port numbers beginning from **COM 5**. In order to fully utilize Windows NT advanced features such as multi-process and multi-thread, we offer pure 32-bit Windows NT device drivers for the PCI-1601/ 1602/ 1610/ 1612/ 1620 multiport cards. All these drivers conform to Win32 COMM API standard.

Steps for Windows NT Driver Setup

Before you install the card into your system, we recommend you install the driver first. Please follow the steps below for the PCI- 1601/ -1602/ -1610/-1612/ -1620 Windows NT 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 autoplay function is not enabled on your system, use Windows Explorer or Windows Run command to execute SETUP.EXE on the companion CD-ROM.



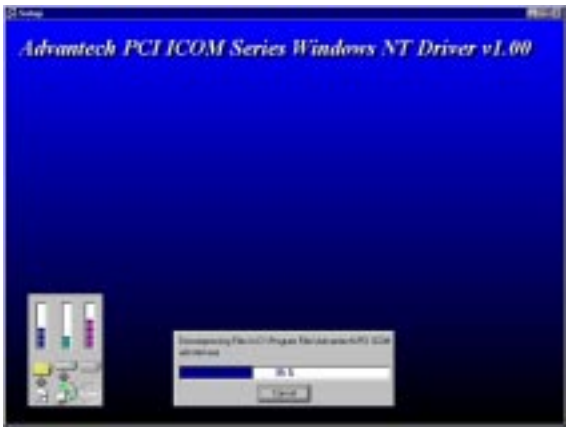
3. After the setup program is launched, you'll see the following ***Setup Screen.***

4. Click the ***Next*** button and the *License Agreement* page appears.

5. Click ***Yes*** to accept the terms as stated in the License Agreement. The *Select Program Folder* dialog box appears.

6. Just click ***Next*** to accept the default installation folder, and the **Start Copying Files** dialog box appears. (Or you can specify the folder name yourself, and then click ***Next***). On the dialog box you can survey your current installation settings. If you are satisfied with these current settings,, just click ***Yes*** to complete your driver installation. If you are not satisfied with the settings, just click ***Back*** to return to the previous steps and go over again.

7. The Driver Setup Program will begin copying files to your system



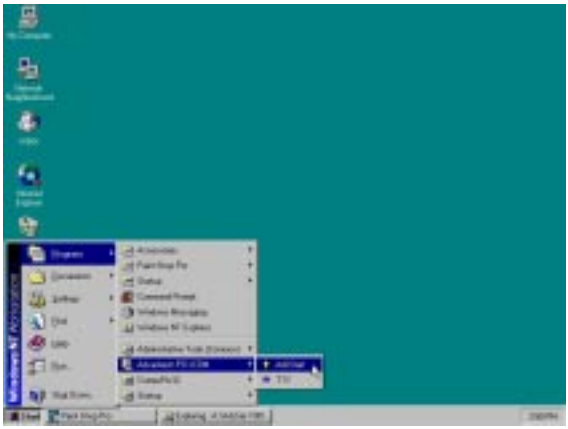
8. The Setup program will create the Advantech ***ICOM Tools*** folder in the Start Menu.

9. After the installation process is completed, just click ***Finish*** to close the driver setup program.

Start the Device Function in Windows NT

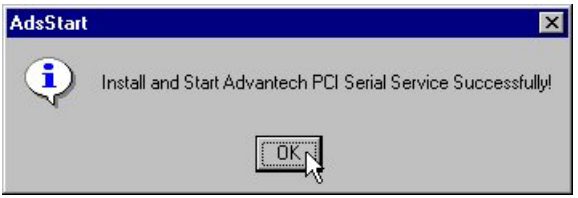
After you have properly installed the driver, please start the function of your hardware device by the following steps:

1. Go to *Start/Programs/Advantech PCI Comm Tools/COM Service Startup Tool*.



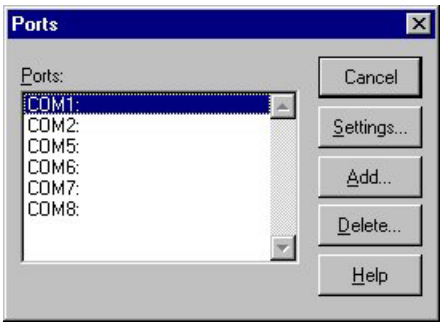
2. The Advantech PCI Serial Service Manager dialog box appears. Choose to start your serial service by selecting the ***Start*** radio button and click **OK**.

3. A message box will appear to inform you that the PCI serial service has started successfully.

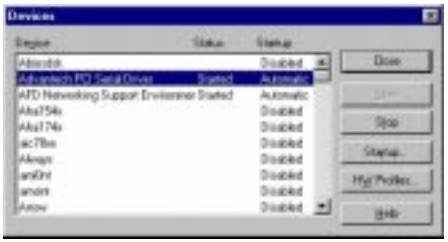


Verify your NT driver Setup

After you have installed your card, go to ***Control Panel/Port*** to look for the Com port name that is supposed to appear after you have installed the driver. (This section should be verified with Andrew!)

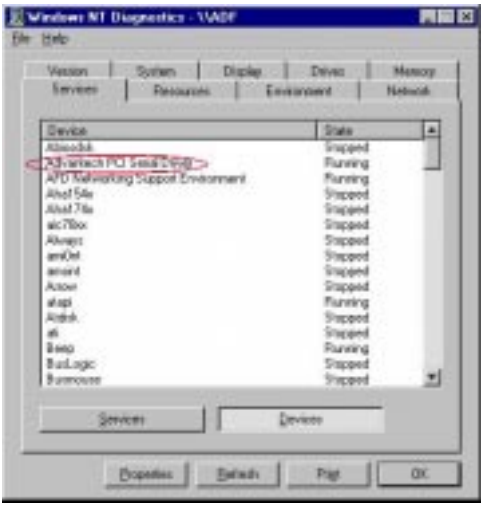


For proper functioning of the card, the Advantech PCI Serial Driver service must be started, too. If your card cannot function properly, please look into ***Control Panel/Devices*** to see if the Advantech PCI Serial Driver service is started.



Verify your NT Driver Function

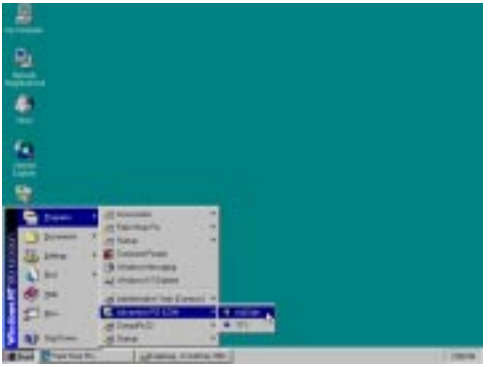
You can verify the driver function by the Windows NT Diagnostics utility. As you can see on the Services tab, the status of the Advantech PCI serial driver is currently running. This indicates that the driver functions properly.



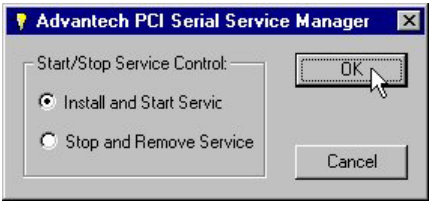
Stop the Device Function in Windows NT

If you want to stop the device function, please follow the steps as seen below:

1. Go to Start/Programs/Advantech Driver for NT/AdsStart.



2. The Advantech PCI Serial Service Manager dialog box appears. Choose to stop your serial service by selecting the ***Stop*** radio button and click ***OK.***



3. A message box will appear to inform you that the PCI serial service has been stopped.

CHAPTER 4

ICOM Tools

Introduction

Advantech ICOM Tools is a very convenient utility to help you test the performance of ICOM card through port status analysing. It features a Graphical User Interface as easy to use as you will soon get familiar with all the menu commands and toolbar buttons. Advantech ICOM Tools is applicable to all series of Advantech ICOM cards, even to other third-party ICOM cards. It is included for free on the diskette or on the companion CD-ROM with all the Advantech ICOM cards.

Installation

To begin its installation, just double-click the SETUP.EXE program to launch the **ICOM Tools** Setup program. The Setup program will copy the program files to the destination folder you choose or to a default installation path (i.e. C:\program files\Advantech\ICOM Tools) if you didn't specify. A program folder will be created in your Start/ Programs menu. (Later you can just access the program through ***Start/Program/Advantech PCI Comm Tools/COM Examine Tool***)

User Interface of ICOM Tools

<Menu Bar >

On the Menu Bar you can select various menu commands to perform port-testing functions. You can also use access key for quicker action.

Port Submenu

Select select the ports you want to configure.

Setup setup the configuration of a specific port

Close close a specific port

Run run the test on a specific port

Stop stop the test on a specific port

All Ports Submenu

Setup setup the configurations of all ports

Run run the test on all ports

Stop stop the test on all ports

Help submenu access the Online Help

<Tool Bar>

(for specific port) **(for all ports)**

Using ***Tool Bar*** buttons is a more intuitive way to implement the functions of the ***ICOM Tools*** utility.

 Port Select — select the port(s) you want to perform test on

 Port Setup — setup configuration of the port you have selected

 Port Close — close the port you have selected

 Port Run — run the port test on the port you have selected

 Port Test — stop the test on the port you have selected

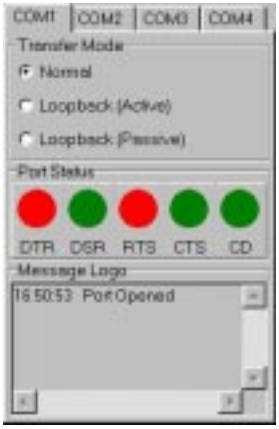
 All Ports Setup — Setup the configuration of all ports not running test

 All Ports Run — run test on all ports

All Ports Stop stop test on all ports

Clear Message clear messages on Message Logo area and the Rx length information on the Performance Listing area

<Com Port Tab>



Each Com Port tab represents a specific port you have selected for test and configuration. On the tab, you can see the Transfer Mode, Port Status, and Message Logo area.

Transfer Mode

You can specify the transfer mode to be Normal, loopback (active) and loopback (passive)

Normal—allows data to be transmitted and received simultaneously. The data receiving rate is helpful in identifying the performance of communication card installed on your system.

Loopback-loopback mode will transmit a series of special data, which are expected to appear on the receive line. Using the loopback mode, we can check the integrity of received data and find whether any error occurred on the transmit line. The active loopback and passive loopback must work in pair to enable the loopback mode. When a port operates as active loopback mode, it will send data first and receive data later. Another port, which operates as passive loopback, will retransmit any received data on Rx line and then send these data onto Tx line. These two modes will form a logical loop and help to verify the integrity of data transmitted over the communication link.

<Port Status>

DTR (data-terminal-ready)

DSR **(data-set-ready)**

RTS **(request-to-send)**

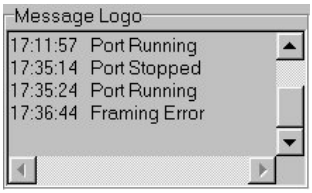
CTS **(clear-to-send)**

CD **(carrier-detect)**

For RS-232 specifications, DTR and RTS are for output signals and can be toggled on and off simply by double-clicking legends (such as DTR, DSR, RTS, CTS, CD) under the red/green marks. But if your are using RTS/CTS for flow control to run the test, you will see the RTS mark appear as black. This indicates that the RTS can no longer be toggled on/off since it is now controlled by driver itself.

A black mark represents the function is controlled by driver itself and therefore not controllable by software utility.

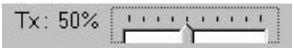
<Message Logo>



On the ***Message Logo*** area, you can see the relevant messages about the port(s) you have selected.

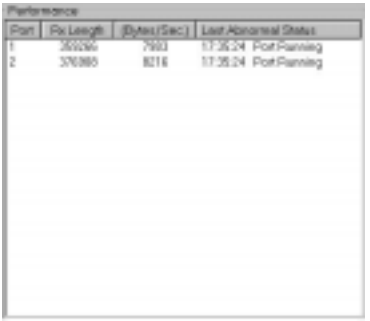
For information about specific messages in this area, please refer to Section 4.4, Messages on the Status Bar and Message Logo area.

<Tx Slide Bar>



The **Tx Slide Bar** allows you to check the overall system loading. You can adjust the transmission rate of your port(s) from 0% to 100%. Just drag the slide button along the groove to adjust the transmission rate.

<Performance Listing Area>



On the performance listing area, you can see the relevant information, such as Rx Length (received packet byte length), Bytes/Sec (transmission rate) and Last Abnormal Status of each port running a test.

<Status Bar>

The Status Bar is where you can glimpse the current information of the port you have selected. The Status Bar indicates whether the port is READY, RUNNING, BUSY or STOPPED, N/A PORT and the configuration information such as baud rate, data bit, stop bit, parity bit and flow control (represented as 1200 N 8 1 None) settings. Also we can see the duration of the test in hh:mm:ss format on the right.

For information about specific messages on this area, please refer to Section 4.4, Messages on the Status Bar and Message Logo area.

Using the ICOM Tools utility

To launch the ICOM Tools testing utility, just access Start/Programs/ Advantech PCI Comm Tools/COM Examine Tools to start the port testing utility.

Port Selection

Please follow the steps below to make your port selection:

Step1: Launch ICOM Tools, you will first see the Program Window

such as Figure 1. Since you haven't selected any port for testing yet, all you can see now is only a blank window area.

Fig. 1 ICOM Tools program window

Step 2:Select the port(s) you want to test by the Port/Select menu command or by clicking the Port Select button on the Toolbar, and a dialog box such as Fig. 2 will appear.

Fig. 2 Select Port dialog box

Step 3: Select the port(s) you want to perform test on from the Port checkbox group. You can either click the checkbox or double-click the name(s) of the port(s) to select/deselect port(s) to perform test. The

port(s) you selected will immediately appear in the Selected Port field.

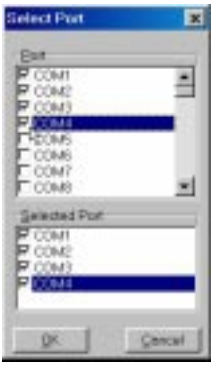


Fig. 3 Ports you selected will appear in the Selected Port checkbox group.

Step 4: Click OK to bring up the ICOM Tools User Interface such as below:

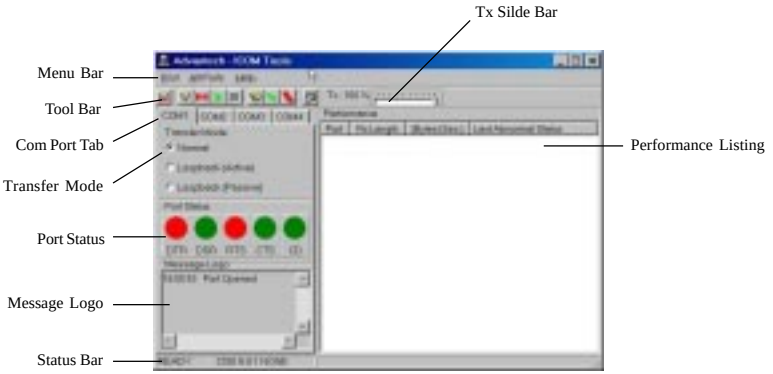
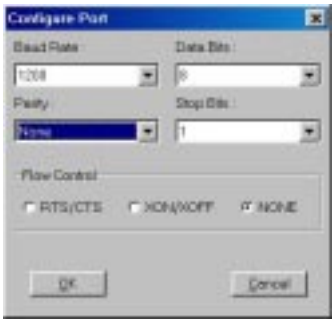


Fig. 4 ICOM Tools User Interface

4.3.2 Configure the Port

You can choose to configure a specific port (or to configure all ports) before running your test. Just click a Com Port Tab to select the port you want to configure, and then click the ***Port Setup*** button or just access the ***Port/Setup*** menu command (or if you want to configure all ports at once, just click the ***All Ports Setup*** button or access the ***All Ports/Setup*** menu command) to bring up the ***Configure Port*** dialog box such as below.



On the **Configure Port** dialog box, you can configure the Baud Rate, Data bits, Parity, Stop Bits and the flow control mode for that specific port (or for all ports). After you have configured all the settings you want to change, just click Ok to make this configuration active.

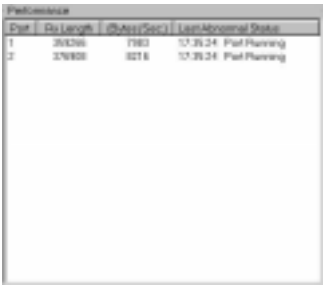
NOTE: When using ***All Ports Setup*** button or ***All Ports/Setup*** menu command to configure settings for all ports, you must take care to stop any ports that are running test in order to configure them. If you do not stop the test running on a specific port, it won't be configured at all. That is, you get to configure only the ports that have been stopped.

Run the test

After you have completed the configuration of the port(s), you can now start the test on the port you have selected by clicking the ***Run*** button or accessing the ***Port/Run*** menu command (or you want to

run all ports at once, just click the ***All Ports Run*** button or access ***All Ports/Run*** menu command).

Once the test is started, you can see relevant test information of port performance on the ***performance listing area.***



Test information on the performance listing Area

The Performance Listing Area

Port	the com port number
Rx length	received packet length in bytes
Bytes/Sec	transmission rate in Bytes/Sec
Last Abnormal Status	last abnormal status

Stop the test

If you want to stop the test on a specific port, just click ***Port Stop*** button or access ***Port/Stop*** menu command (or if you want to stop test on all ports, just click ***All Ports Stop*** button or access All Ports/ Stop menu command).

You can restart the test by clicking the ***Run*** button or accessing the Port/Run menu command (or if you want to run all ports at once, just click the ***All Ports Run*** button or access All Ports/Run menu command).

Close Port

If you want to close a port, just select the ***Com Port*** tab and click ***Port Close***  button or access ***Port/Close*** menu command to close the port.

Exit the ICOM Tools utility

To exit the ICOM Tools utility, simple access Port/Exit menu command or click the Close button on the upper right corner of the program window.

Messages on the Status Bar and Message Logo area

Messages appearing on the Status Bar and Message Logo area are helpful in understanding specific information of your system settings and performance.

Status Bar messages

BUSY: the port is currently used by other application.

FAIL: the configuration parameters are not accepted by the port

N/A PORT: the port is not available in the system

READY: the port is ready to run or configure.

RUNNING: the test is running on the port

STOPPED: the test running on the port has been stopped by user

Message Logo messages

Port Opened: Users has opened the port

Port Setup Fail: Users set up port configuration with parameters that are either incorrect or unsupported.

Port Running: The port is running test

Port Stopped: The test is stopped on the port

Tx Starting/Tx Stopped: transmitting starting/transmitting stop

Rx Starting/Rx Stopped : receiving starting/receiving stop

Break Error: a break event has been detected on the port

Framing Error: A timing error (i.e. from start bit to stop bit) has been detected on the port

Port I/O Error: An incorrect I/O event has been detected on the port

Rx Overrun: The received data has been overwritten before being processed

Rx Buffer Full Error: The buffer on the receiving end is saturated so that newly arrived data are ignored

Tx Buffer Full Error: The buffer on the transmitting end is saturated so that the data transmitted by applications are ignored.

LB Error - %d: data error is detected in loop back

LB Rx Pending: Loop back mode is waiting for incoming data

Data Setup Error: parameter error in port configuration

CHAPTER 5

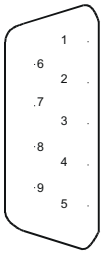
Pin Assignment & Wiring

Pin assignments

PCI-1601/1602

The following figures show the pin assignments for the card's DB-9 connectors in RS-422 and RS-485 modes.

RS-422
RS-485



Pin	Pin description (DB-9 male)
1	TX-(DATA-) or send data - (DTE)
2	TX+(DATA+) or send data + (DTE)
3	RX+ or receive data + (DTE)
4	RX - or receive data - (DTE)
5	GROUND
6	RTS - or ready to send -
7	RTS+ or ready to send +
8	CTS+ or clear to send +
9	CTS- or clear to send -

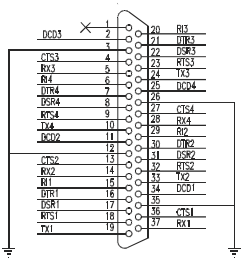
RS-422 signal wiring

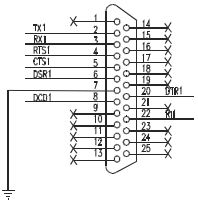
The RS-422 interface wiring is based on one-to-one principles. The transmit lines on one side connect to the receive lines on the other side, and vice versa. With RS-422, you can transmit and receive data simultaneously (full duplex). The connections are as follows:

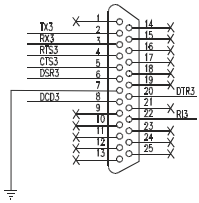
PCI-1601/1602 DTE (Male DB-9)		Terminal DTE
Pin	**Signal**	**Signal**
1	TxD-	RxD-
2	TxD+	RxD+
3	RxD+	TxD+
4	RxD-	TxD-
5	GND	GND
6	RTS-	CTS-
7	RTS+	CTS+
8	CTS+	RTS+
9	CTS-	RTS-

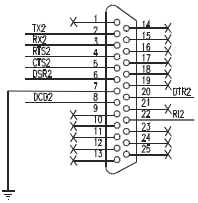
PCI-1610/1612

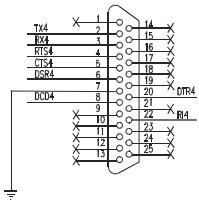
The following diagrams show the pin assignments for the PCI-1610/ 1612 card's DB-37 and DB-25 connectors for RS-232.





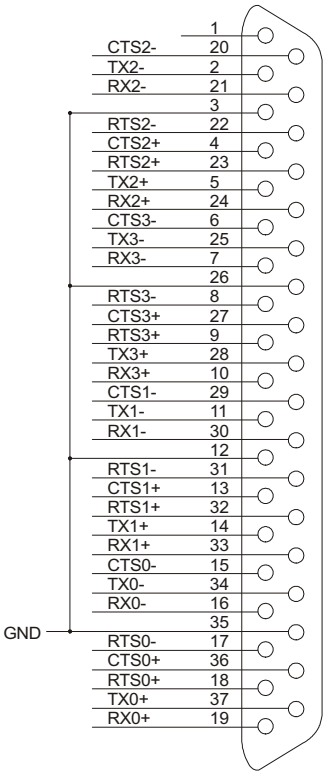




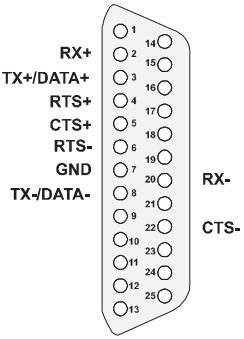


PCI-1612

The following diagrams show the pin assignments for the PCI-1612 card's DB-37 and DB-25 connectors for RS-422/485.



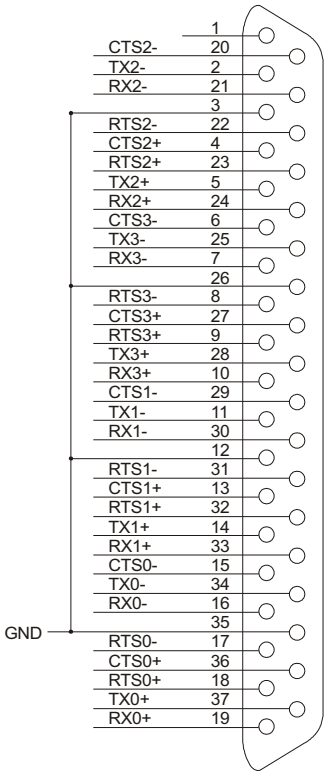
CONNECTOR DB37



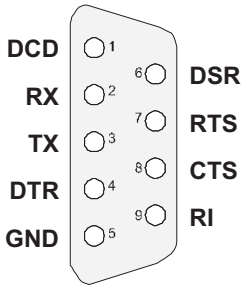
RS-422/485

PCI-1610/1612

The following diagrams show the pin assignments for the PCI-1610/ 1612 card's DB-37 and DB-9 (opt 4A) connectors for RS-232.



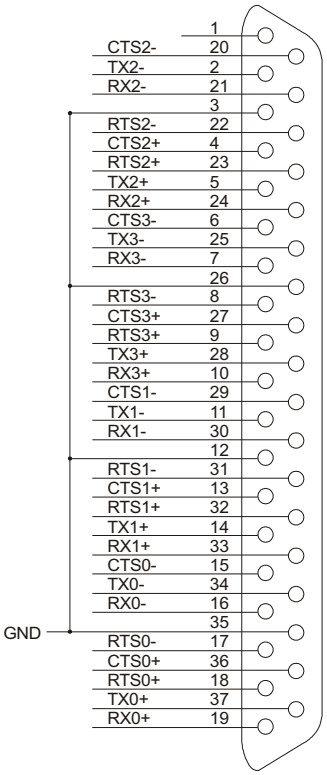
CONNECTOR DB37



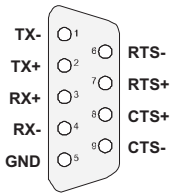
RS-232

PCI-1612

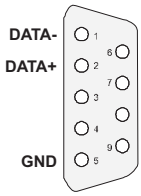
The following diagrams show the pin assignments for the PCI-1610/ 1612 card's DB-9 and DB-25 (opt 4A)connectors for RS-422/485.



CONNECTOR DB37



RS-422



RS-485

PCI-1620

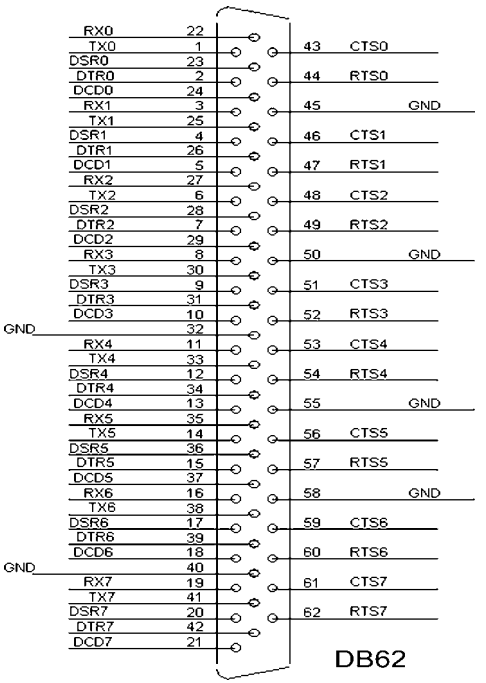
RS-232 8-port connection boxes/octopus cable designed for PCI-1620 are:

Opt8A: 8-port DB25 female connection box
Opt8B: 8-port DB25 male connection box
Opt8C: Octopus cable with 8 male RS-232 DB25 ports

The following lists the pin assignments of the DB62 connector on the bracket. You may fabricate octopus cable for DB25 to 8 x DB25 with these pinouts.

Pin no.	Signal	Pin no.	Signal	Pin no.	Signal
1	TxD1	22	RxD1	43	CTS1
2	DTR1	23	DSR1	44	RTS1
		24	DCD1	45	GND
3	RxD2	25	TxD2	46	CTS2
4	DSR2	26	DTR2	47	RTS2
5	DCD2				
6	TxD3	27	RxD3	48	CTS3
7	DTR3	28	DSR3	49	RTS3
		29	DCD3	50	GND
8	RxD4	30	TxD4	51	CTS4
9	DSR4	31	DTR4	52	RTS4
10	DCD4	32	GND		
11	RxD5	33	TxD5	53	CTS5
12	DSR5	34	DTR5	54	RTS5
13	DCD5	55	GND		
14	TxD6	35	RxD6	56	CTS6
15	DTR6	36	DSR6	57	RTS6
		37	DCD6	58	GND
16	RxD7	38	TxD7	59	CTS7
17	DSR7	39	DTR7	60	RTS7
18	DCD7	40	GND		
19	RxD8	41	TxD8	61	CTS8
20	DSR8	42	DTR8	62	RTS8
21	DCD8				

Signal	Name	DB25 Pinout	DB9 Pinout	Mode
GND	Ground	7	5	
TD	Transmit Data	2	3	Output
RTS	Request To Send	4	7	Output
DTR	Data Terminal Ready	20	4	Output
RD	Receive Data	3	2	Input
CTS	Clear To Send	5	8	Input
DSR	Data Set Ready	6	6	Input
DCD	Data Carrier Detect	8	1	Input
RI	Ring Indicator	22	9	Input



Wiring

RS-232 signal wiring

Since the RS-232 interface is not strictly defined, many devices have their own connection methods which may ignore some signal lines or define reserved lines for other functions. It is best to refer to the user's manual for your device for installation instructions. You may find the following helpful.

In general, DTE (Data Terminal Equipment) refers to the device that is leading the communication. Examples include PC's, terminals and some printers. DCE refers to the device being communicated with or controlled. Examples include modems, DSU's (digital service units), printers and lab/factory equipment.

In some situations you may be able to get by with just three lines: data on TXD, a signal ground and a handshaking line. Examples are printer or plotter connections, troubleshooting and situations where you require only one-wire communication.

Terminal or PC (DTE) connections

DB-25 Male		DB-25 Male or Female: Terminal	
Pin	**Signal**	**Pin**	**Signal**
2	TxD	3	RxD
3	RxD	2	TxD
4	RTS	5	CTS
5	CTS	4	RTS
6	DSR	20	DTR
7	GND	7	GND
20	DTR	6	DSR
8	DCD	8	DCD

Modem connections

DB-25 Male		Modem (DCE)	
Pin	**Signal**	**Pin**	**Signal**
2	TxD	2	RxD
3	RxD	3	TxD
4	RTS	4	CTS
5	CTS	5	RTS
6	DSR	6	DTR
7	GND	7	GND
20	DTR	20	DSR
8	DCD	8	DCD

For DTE to DCE connections, use straight through cable (i.e., you don't have to reverse lines 2 and 3, lines 4 and 5, and lines 6 and 20 since, in general, the DCE RS-232 interfaces are reversed themselves).

Terminal without handshake

DB-25 Male		Terminal, PC (DTE)	
Pin	**Signal**	**Pin**	**Signal**
2	TxD	3	RxD
3	RxD	2	TxD
4	RTS ——		
5	CTS ——		
7	GND	7	GND
6	DSR ——		
20	DTR ——		
8	DCD ——		

Therefore, if you are not using CTS, RTS, DSR ,DTR and DCD signals, please short pins 4 and 5 together, and please short pins 6, 8, and 20 together.

RS-422 signal wiring

The RS-422 interface wiring is based on one-to-one principles. The transmit lines on one side connect to the receive lines on the other side, and vice versa. With RS-422, you can transmit and receive data simultaneously (full duplex). The connections are as follows:

DTE (Male DB-9)	Terminal DTE	
Pin	**Signal**	**Signal**
1	TxD-	RxD-
2	TxD+	RxD+
3	RxD+	TxD+
4	RxD-	TxD-
5	GND	GND
6	RTS-	CTS-
7	RTS+	CTS+
8	CTS+	RTS+
9	CTS-	RTS-

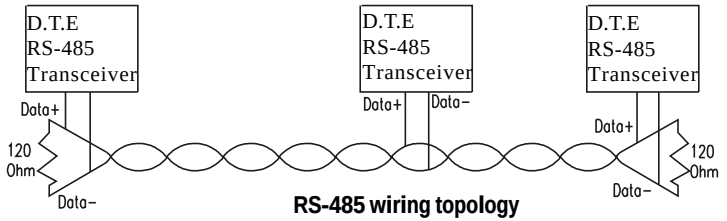
Terminator Resistors setup

The signals DSR, DTR and DCD are shorted internally on the PCI-1601/1602/1612 cards when operating in RS-422 mode.

A user can solder in termination resistors if necessary for impedance matching. The card has two mounting spaces for termination resistors, but no resistors are installed at the factory. Each pair of signal lines has a separate resistor (RxD+/-, TxD+/-).

RS-485 signal wiring

The RS-485 standard supports half-duplex communication. This means that just two wires are needed to both transmit and receive data. Handshaking signals (such as RTS, Request To Send) are normally used to control the direction of the data flow and to switch the transmission accordingly. In RS-485 mode, the PCI-1601/1602/1612 automatically senses the direction of the data flow and switches the transmission direction — no handshaking is necessary. This means a user can build an RS-485 network with just two wires. This RS-485 control is completely transparent to the user. The Software written for half duplex RS-232 works without the need for any modification.



RS-485 wiring topology

Termination resistor setup

You can install termination resistors if necessary for impedance matching. The card has mounting spaces for termination resistors, but no resistors are installed at the factory. Depending on your application you may need to solder in a single resistor to handle the DATA+/ DATA- pair (and a corresponding resistor on the other end of the connection). The value of the resistor should equal the characteristic impedance of the signal wires (approximately 120 Ohms or 300 Ohms).

APPENDIX A

Register structure and format

Register Structure

This appendix gives short descriptions of each of the module's registers. For more information please refer to the data book for the STARTECH 16C550 UART chip.

All registers are one byte. Bit 0 is the least significant bit, and bit 7 is the most significant bit. The address of each register is specified as an offset from the port base address (BASE), selected with DIP switch SW1 or SW2.

DLAB is the "Divisor Latch Access Bit:, bit 7 of BASE+3.

BASE+0 Receiver buffer register when DLAB=0 and the operation is a read.

BASE+0 Transmitter holding register when DLAB=0 and the operation is a write.

BASE+0 Divisor latch bits 0 - 7 when DLAB=1.

BASE+1 Divisor latch bits 8 - 15 when DLAB=1

The two bytes BASE+0 and BASE+1 together form a 16-bit number, the divisor, which determines the baud rate. Set the divisor as follows:

Baud rate	Divisor	Baud rate	Divisor
50	2304	3600	32
75	1536	4800	24
150	768	7200	16
300	384	9600	12
600	192	19200	6
1200	96	38400	3
1800	64	57600	2
2400	48	115200	1

BASE+1 Interrupt Status Register (ISR) when DLAB=0

Bit 0 Enable received-data-available interrupt

bit 1 Enable transmitter-holding-register-empty interrupt

bit 2 Enable receiver-line-status interrupt

bit 3 Enable modem-status interrupt

BASE+2 FIFO Control Register (FCR)

bit 0 Enable transmit and receive FIFOs

bit 1 Clear contents of receive FIFO

bit 2 Clear contents of transmit FIFO

bits 6-7 Set trigger level fro receiver FIFO interrupt.

Bit 7	Bit 6	FIFO trigger level
0	0	01
0	1	04
1	0	08
1	1	14

BASE+3 Line Control Register (LCR)

bit 0 Word length select bit 0

bit 1 Word length select bit 1

Bit 1	Bit 0	Word length (bits)
0	0	5
0	1	6
1	0	7
1	1	8

bit 2 Number of stop bits

bit 3 Parity enable

bit 4 even parity select

bit 5 Stick parity

bit 6 Set break

	bit 7	Divisor Latch Access Bit (DLAB)
BASE+4	Modem Control Register (MCR)	
	bit 0	DTR
	bit 1	RTS
BASE+5	Line Status Register (LSR)	
	bit 0	Receiver data ready
	bit 1	Overrun error
	bit 2	Parity error
	bit 3	Framing error
	bit 4	Break interrupt
	bit 5	Transmitter holding register empty
	bit 6	Transmitter shift register empty
	bit 7	At least one parity error, framing error or break indication in the FIFO
BASE+6	Modem Status Register MSR)	
	bit 0	Delta CTS
	bit 1	Delta DSR
	bit 2	Trailing edge ring indicator
	bit 3	Delta received line signal detect
	bit 4	CTS
	bit 5	DSR
	bit 6	RI
	bit 7	Received line signal detect
BASE+7	Temporary data register	

Programming example

The following C example shows how to program the PCL-743/745 registers directly. It uses I/O ports hex 3F8 and 2F8 to test the PCL-743/745 send, receive and FIFO functions.

```
/
************************************************/
/*  Program: DEM001.C
*/
/*  Description:
*/
/*    Sends a string from COM1 to COM2 then reads
*/
/*    it back from COM2 and displays it on the
*/
/*    screen. It uses direct register control.
*/
/
************************************************/

# include <dos.h>
# include <io.h>
# include <stdio.h>
# include <conic.h>

/* Timeout value in seconds */
#define TIME_OUT        10000
static int base0=0x3f8; /* Port 1 base address
(COM1)*/
static int base1=0x2f8;/*Port 2 base address
(COM2)*/

static char     rec[16]; /* Receive buffer */
static char     CMD[16]; /* Command buffer */

Void main()
{
    int i;
    timeout; /*       counter for timeout  */
    char flag;
```

```
    /* Set up Port 1 (COM1)  */
    outport((base0+2),0xc9);       /*     Enable FIFO
*/
    outp(base1+3,0x80);     /*     Set DLAB=1    */

    /*Set bps = 115200      */
    outp(base0 ,0x01); outp(base0+1,0x00);

    outp(base0+3,0x03); /* set data=8; stop=1; no
parity*/
    outp(base0+1,0x00);  /* disable interrupt */

    /* (Set up) Port 2 (COM2)      */
    outport((base1+2),0xc9);       /*     Enable FIFO
*/
    outp(base1+3,0x80);     /*     Set DLAB=1    */

/* Set bps = 115,200  */
    outp(base1 ,0x01);  outp(base1+1,0);

outp(base1+3,0x03); /* Set data=8; stop=1; no pari-
ty*/
    oupt(base1+1,0x00); /* Disable interrupt */

    printf(:\nEnter string (max 15 char) or Q to
quit:");
    gets(cmd);

while (cmd{0} != 'q' && cmd[0] != 'Q')
{
      /* Send string on Port 1 (COM1)    */
      i=0;
      cmd[strlen(cmd)] = 0x0d;
      flag=1;
      while (flag)
      {
        outportb(base0,cmd[i]); /* send data */
        if (cmd[i] == 0x0d;
```

```
        */
               if (cmd[i] == 0x0d)
                      flag=0
               i++;
        }

    /*  Receive data on Port 2 (COM2)  */
    i=0;
    flag=1;
    timeout=TIME_OUT;
    whole (flag)
    {
        rec[i]=inportb(base1); /* Receive data*/
        if (rec[i] == 0x0d)
      {
               rec[i=1]='\0';
               flag=0;
               printf("\nReceived data: %s\n", rec);
      }
      i++;

    }
    else
{   /I Check timeout */
      timeout-;
        if(timeout == 0)
        {
               flag=0;
               print("\nTimeout error\n");
        }
      }
    } /*      End of receive data while()      */

      printf("\nEnter string (max 15 char) or Q to
quit:");
      gets(cmd);
    } /*End of "Enter string"while() */

}   /*End of main()  */
```

APPENDIX B

PC I/O address reference

The following table shows the I/O addresses commonly used by standard PC devices. Avoid these addresses when you select your port I/O base addresses.

I/O Address	Device
000 - 00F	DMA (8237A)
020 - 021	8259A IRQ Controller
040 - 043	8253/8254 Timer/Counter
060 - 063	PPI 8255A
070 - 071	Real-Time Clock
080 - 08F	DMA Page Register
0A0 - 0BF	8259A Interrupt Chip
0C0 - 0DF	Second DMA Controller 8237A
0F0 - 0FF	Math Coprocessor
1F0 - 1F8	AT Fixed Disk
200 - 20F	Game I/O
278 - 27F	Serial I/O Port #2
2F8 - 2FF	Serial Adaptor (COM 2)
320 - 32F	XT Fixed Disk
378 - 37F	Parallel Printer Adaptor
380 - 38F	SDLC Binary Communication Adaptor
3A0 - 3AF	Master Binary Communication Adaptor
3B0 - 3BF	Monochrome/Parallel Adaptor
3D0 - 3DF	Color Graphics Adaptor
3F0 - 3F7	Diskette Controller
3F8 - 3FF	Serial Adaptor (COM 1)