PCL-849

4-Port RS-232
Interface Card

Copyright Notice

Acknowledgments

PC-LabCard is a trademark of Advantech Co., Ltd. IBM, PC and PC/XT/AT are trademarks of International Business Machines Corporation. MS-DOS, MASM, QuickBASIC, Microsoft C and MS-PASCAL are trademarks of Microsoft Corporation. Intel is a trademark of Intel Corporation. Turbo C and Turbo PASCAL are trademarks of Borland International.

Part No. 2000084900 3rd Edition
Printed in Taiwan May 2001

Contents

CHAPTER 1

Introduction

Description

The PCL-849 series are four port serial communication interface cards. Each port can be configured individually to RS-232 using on-board jumpers.

PCL-849A/849B serial ports are implemented using 16C554 UARTs which make serial I/O more reliable. For higher performance, 16C654 UARTs can be installed in place of the 16C554 to create the PCL-849+. By buffering data into 64-byte packets before putting it on the bus, UARTs drastically reduce the CPU load. This makes the PCL-849+ especially suitable for high-speed serial I/O applications under multitasking environments and for applications involving high data rates.

PCL-849 series cards support two operating modes: standard mode and enhanced mode. In standard mode each of the four port addresses can be set individually. In enhanced mode, all four port addresses can be set automatically. The PCL-849+ also supports either shared IRQ or independent IRQ functions. When an on-board interrupt occurs the interrupt status register (vector address) indicates which port generated it. The shared interrupt can be set to most common (extended) AT interrupts. This simplifies programming, speeds interrupt processing and frees interrupts for other devices.

Features

- Four independent RS-232 serial ports
- Transmission speeds up to 307.2 kbps
- Independent I/O addresses and independent/shared IRQ settings for each of 4 serial ports
- Wide IRQ selection: 3, 4, 5, 6, 7, 9, 10, 11, 12, 15
- Supports Standard DOS COM1, COM2, COM3, and COM4
- Supports DOS/Windows 3.1, Windows 95/98, Windows NT (ICOM Utility)
- Supports surge protection: 3000 V_{DC} (PCL-849B/849+)
- LED indicators on each port indicate data flow
- On-board interrupt status register for greater throughput
- Complete RS-232 Modem-control signals

Specifications

- Bus interface: ISA
- Number of ports: 4
- I/O address: 0x0200 ~ 0x03F8
- IRQ: 3, 4, 5, 6, 7, 9, 10, 11, 12, 15
- Data bits: 5, 6, 7, 8
- Stop bits: 1, 1.5, 2
- Parity: none, even, odd

- UART:

  1 × 16C554 (PCL-849A/849B)

  1 × 16C654 (PCL-849+)

- Speed: 50 ~ 921.6 kbps (PCL-849A)

  50 ~ 307.2 kbps (PCL-849B/849+)

- Connectors: 30-cm male DB-37 to 4 × DB25 male (DTE)
- Data signals: TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI, GND
- Surge protection: 3000 V_{DC} (PCL-849B/849+)
- Power requirement: 250 mA typical 500 mA max. (+5 V),

  70 mA typical. 120 mA max.(±12 V),

- Dimensions: 185 mm × 98 mm
- Operating Temperature.: 0 ~ 60° C (32 ~ 140° F) (refer to IEC-68-1.2.3 item)
- Storage Temperature: -25 ~ 80° C (-13 ~ 176° F)
- MTBF: over 135,000 hrs at 25° C, ground-fix environment
- For technical support and service please visit our support website at: **http://support.advantech.com**
  and visit the "Industrial Automation Support" and "FAQ" sections.

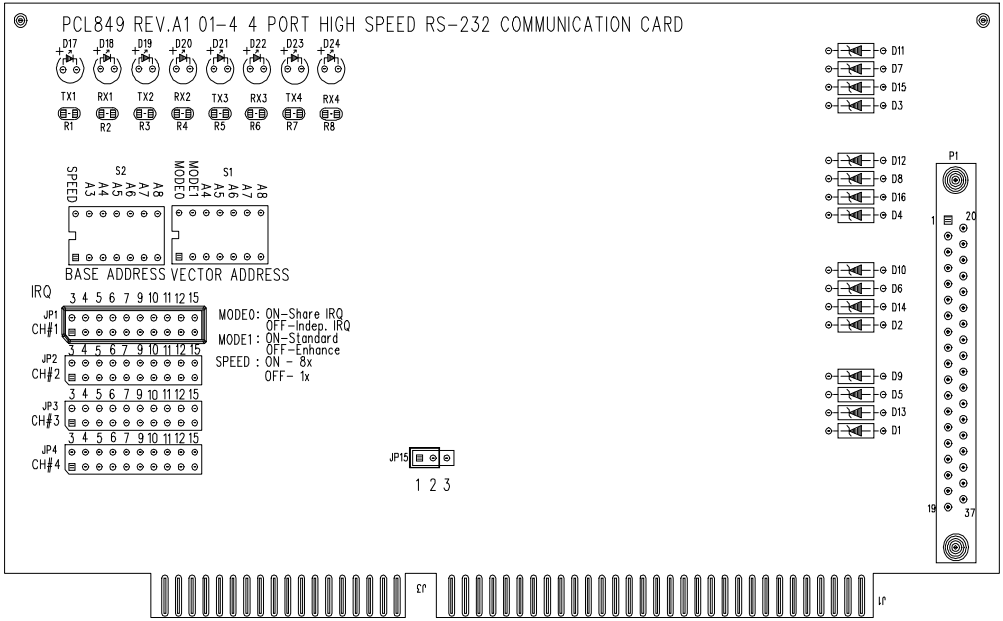


Figure 1-1: Switch and jumper layout

CHAPTER 2

Hardware Installation

Initial Inspection

Depending on the option you ordered, in addition to this manual, you should find the following items inside the shipping container:

- PCL-849(A/B/+) 4-port RS-232 Card
- One 30-cm male DB-37 to four male DB-25 cable
- One diskette with ICOM utility software

We have carefully inspected the PCL-849 mechanically and electrically before shipping. It should be free of marks and scratches and in perfect working order on receipt.

As you unpack the PCL-849, 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.

Remove the PCL-849 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.*

Card Installation

Warning! *Turn off your PC's power supply whenever you install or remove the PCL-849 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. 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). Remove the anti-vibration card clamp if supplied.
6. Carefully grasp the upper edge of the PCL-849 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.
9. Attach the DB-37 cable to the connector on the bracket. Turn the computer power on.

The board is now installed in the computer. See Chapter 3 for information on cabling.

Card Configuration

Each port on the PCL-849 card has a jumper and a DIP switch which require configuring prior to use. The DIP switch sets the port to the appropriate I/O address and speed mode. The jumpers set the port's IRQ.

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. Note that you will need to disable your CPU card's on-board COM ports, if any, or set them to alternate addresses / IRQs.

PCL-849 Default Configuration

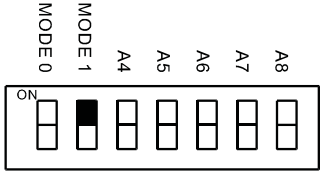
Setting	Default function
JPI	IRQ 12
Speed mode	1x
IRQ mode	Share
Base address	Address 300H
Vector address	Interrupt 280H
Address mode	Enhance

I/O Address and Interrupt Setup

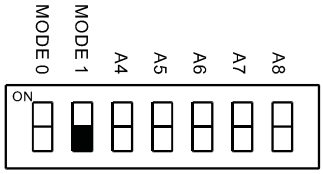
Next, you will need to select an IRQ (interrupt request) number, and an I/O base address for the PCL-849.

Model Setup (base address setting)

The card base address is affected by the setting of the Mode 1 switch. Standard mode or enhanced mode is selected as shown.



Standard Mode (S1)



Enhanced Mode (S1, default)

Standard Mode

In this mode, each of the four ports is assigned an address, as shown below.

Port 1	Ch1	base address	3F8
Port 2	Ch2	base address	2F8
Port 3	Ch3	base address	3E8
Port 4	Ch4	base address	2E8

Enhanced Mode

In this mode, the address for each of the four ports is assigned according to the card base address, which is set using switch S2. Select an address which is not already in use by another card in the system. If you are installing more than one PCL-849 card in your system, set the cards to different base addresses. DIP switches control each card's base address, as shown below.

Port base address (S2)						
Base Address	**A_3**	**A_4**	**A_5**	**A_6**	**A_7**	**A_8**
200-21F	●	●	●	●	●	●
208-227	○	●	●	●	●	●
. . . . .						
2E8-307	○	●	○	○	○	●
. . . . .						
***300-31F**	●	●	●	●	●	○
. . . . .						
3E0-3FF	●	●	○	○	○	○

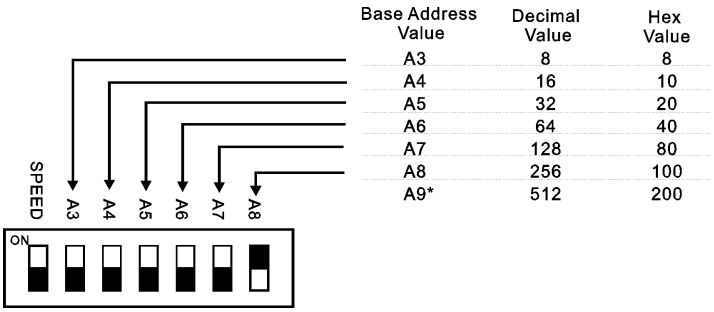
●: on ○ : off *= default

Default Settings

Mode	Enhanced	Mode
Port 1	IRQ12	Address 300H
Port 2	IRQ12	Address 308H
Port 3	IRQ12	Address 310H
Port 4	IRQ12	Address 318H

The following example shows how to set the base address to 2F8.

The switch sum is set to 2F8: 200 + 80 + 40 + 20 + 10 + 8 (HEX).

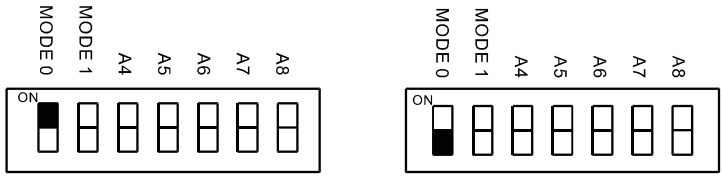


Base Address Value	Decimal Value	Hex Value
A3	8	8
A4	16	10
A5	32	20
A6	64	40
A7	128	80
A8	256	100
A9*	512	200

Note: On the PCL-849 address line A9 does not appear on the DIP switch, as it is permanently hardwired to hex 200.

Interrupt Level (IRQ) Setting (S1, JP1, JP2, JP3, JP4)

The card's IRQ mode can be set using S1. Shared IRQ mode or independent IRQ mode is set as shown below.



Shared IRQ Mode (default)

Independent IRQ Mode

Independent IRQ Mode (JP1-JP4)

In this mode, the IRQ level for each of the four ports is set individually. For each port, select an IRQ which is not already in use by another card in the system. The correspondence of jumpers to ports is shown below.

Port 1 → JP1

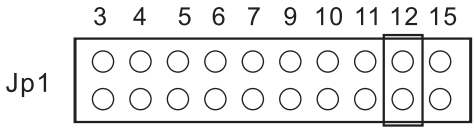
Port 2 → JP2

Port 3 → JP3

Port 4 → JP4

Shared IRQ Mode (JP1)

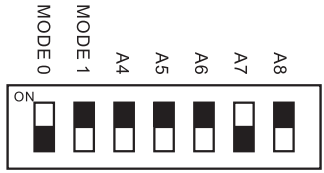
Select an IRQ which is not already in use by another card in the system. If you are installing more than one PCL-849, set them to different IRQ numbers. Jumper Bank JP1 controls the shared card IRQ. Simply place the jumper on the required interrupt level as shown in the following figure.



Interrupt Status Register Setup (S1, Vector address)

This feature on the PCL-849 is utilized in the enhanced mode only. When data arrives at one of the four ports, it will generate an interrupt in the interrupt register. The PC software can read this, and identify immediately which port generated the interrupt. This saves time, and makes programming easier. In DOS or Windows 3.1, when a data bit of the interrupt status register is set to 0, the corresponding channel is selected to generate an interrupt. If the bit is 1, then no interrupt is generated. In Windows 95/98/NT, when a data bit of the interrupt status register is set to 1, the corresponding channel is selected to generate an interrupt. If the bit is 0, then no interrupt is generated. DIP

switch S1 designates the card's interrupt status register address, as shown in the following figure and table.



S1 280H (default)

Interrupt Status Register S1

Bit	Function
0	Port 1
1	Port 2
2	Port 3
3	Port 4
4	Not Used
5	Not Used
6	Not Used
7	Not Used

The user may change the interrupt status register address via S1. Please note that the address decoder will occupy a continuous, 16-byte area related to the switch setting. For example, if you set the switch to 210H, then the address 210H to 21FH will all be decoded. The various DIP switch settings (S1) for the interrupt status register are as shown in the table opposite.

Table 2-1: DIP switch settings for S1

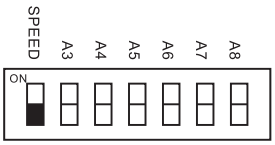
A4	A5	A6	A7	A8	Interrupt Register
ON	ON	ON	ON	ON	200H
OFF	ON	ON	ON	ON	210H
ON	OFF	ON	ON	ON	220H
OFF	OFF	ON	ON	ON	230H
ON	ON	OFF	ON	ON	240H
OFF	ON	OFF	ON	ON	250H
ON	OFF	OFF	ON	ON	260H
OFF	OFF	OFF	ON	ON	270H
ON	ON	ON	OFF	ON	280H
OFF	ON	ON	OFF	ON	290H
ON	OFF	ON	OFF	ON	2A0H
OFF	OFF	ON	OFF	ON	2B0H
ON	ON	OFF	OFF	ON	2C0H
OFF	ON	OFF	OFF	ON	2D0H
ON	OFF	OFF	OFF	ON	2E0H
OFF	OFF	OFF	OFF	ON	2F0H
ON	ON	ON	ON	OFF	300H
OFF	ON	ON	ON	OFF	310H
ON	OFF	ON	ON	OFF	320H
OFF	OFF	ON	ON	OFF	330H
ON	ON	OFF	ON	OFF	340H
OFF	ON	OFF	ON	OFF	350H
ON	OFF	OFF	ON	OFF	360H
OFF	OFF	OFF	ON	OFF	370H
ON	ON	ON	OFF	OFF	380H
OFF	ON	ON	OFF	OFF	390H
ON	OFF	ON	OFF	OFF	3A0H
OFF	OFF	ON	OFF	OFF	3B0H
ON	ON	OFF	OFF	OFF	3C0H
OFF	ON	OFF	OFF	OFF	3D0H
ON	OFF	OFF	OFF	OFF	3E0H
OFF	OFF	OFF	OFF	OFF	3F0H

Speed Mode selection

The PCL-849 employs a unique speed option that allows the user to choose either normal speed mode (1x) or high speed mode (8x). This high speed mode is selected at S2.

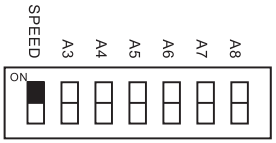
Normal Speed Mode

To select the baud rate commonly associated with COM ports , such as 2400, 4800, 9600. . .115.2 kbps, place the switch as follows.



High Speed Mode

To increase normal mode rates by eight times, (e.g. if 115.2 kbps is selected, the rate is increased to 921.6 kbps), place the switch as follows.

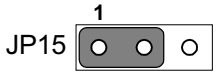


CHAPTER 3

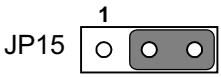
Software Installation

Operating Environment Selection

Set jumper 15 (JP15) to correspond with your desired software operating environment. Connect the left two pins of JP15 to operate in DOS or Windows 3.1 mode, as shown below. Connect the right two pins to operate in Windows 95/98 or Windows NT mode .



DOS, Windows 3.1



Windows 95/98, Windows NT

ICOM Utility Setup for Windows 95/98/NT Environments

This section discusses the ICOM utility software package installation, configuration and upgrade/ removal procedure for the Windows 95/98 and NT environments.

.

Utility Installation

Follow the installation procedure below to install the PCL-849 under Windows 95/98/NT:

1. Run **Setup.exe** on the driver diskette.
2. Select "**Advantech Icom Utility**" to install and configure the board, following the on-line instructions.
3. After the Advantech Icom Utility configuration panel pops up, please refer to the software help file for more details.
4. Following completion of the installation, restart Windows 95.

Following completion of installation, please restart your system as prompted.

Once the board and driver have been installed and the system restarts successfully, users can execute any ready-made applications, such as HyperTerminal to transmit/receive data, or Remote Access Service to provide dial-up networking capability.

Configuration:

Enter the configuration program to install the device driver, or click the Taskbar [**Start**] button, then select the [**Programs**] menu, then the [**Advantech Icom Utility**] menu and then [**Icom**].

When the configuration panel pops up,

click the [**Add Board**] button to add a board.

Click the [**Delete**] button to remove a board.

Board Type: PCL-849

Base COM: Specifies the COM number of the first port. Subsequent ports are mapped to subsequent COM numbers. For instance, if the first port is mapped to COM10, then the second port is mapped to COM11 sequentially.

Base Address (200H~3F8H): Specifies the base address of the first port. Subsequent base addresses are mapped to subsequent COM numbers. For instance, if the first port is mapped to 300H, then the second port is mapped to 308H sequentially.

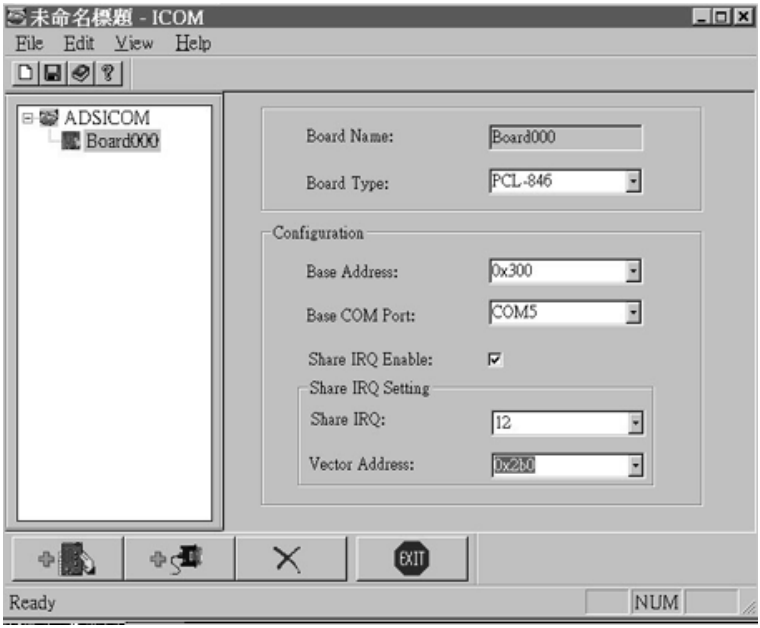
PCL-849 series cards can be installed together in a single system as long as the system memory resources are sufficient and available in a system. Different boards should be assigned different IRQs.

Click the [**Share IRQ Enable**] button to set the share IRQ function.

Share IRQ: 3, 4, 5, 6, 7, 9, 10, 11, 12, 15

Vector Address: 200H ~ 3F0H

After you finish the installation, you can click [**Exit**] and restart your system. Unless the system is restarted, the latest configuration will not take effect.

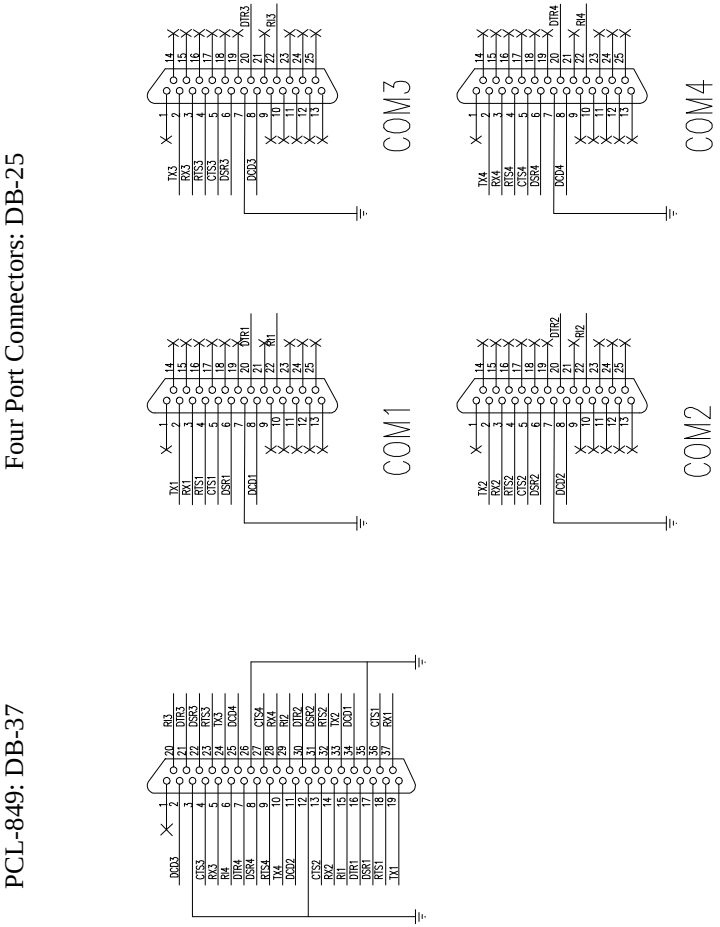


CHAPTER 4

Wiring

Connector Pin Assignments

The following diagrams show the pin assignments for DB-37 and DB-25 connectors for RS-232.



PCL-849 Pin assignments for RS-232

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: PCL-849		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: PCL-849		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: PCL-849		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		

APPENDIX A

PC I/O Address Reference

PC I/O Address Usage

The following table indicates the PC I/O address usage assignments. To prevent the PCL-849 card settings from conflicting with other device or I/O card settings, we recommend you refer to this table.

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	Parallel Printer Adaptor #2
2F8 - 2FF	Serial Adaptor (COM 2)
320 - 32F	XT Fixed Disk
378 - 37F	Parallel Printer Adaptor #1
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)

APPENDIX B

Quick Reference

➢ **Jumper Setting**

· **IRQ** Mode

DIP 1 (**MODE 0**) of **S1** is used to set the IRQ mode of this card.

DIP1 : **ON** (Upper) position ➔ **Shared IRQ** mode

DIP1 : **OFF** (Lower) position ➔ **Independent IRQ** mode

· **STANDARD/ ENHANCED** Mode

DIP 2 (**MODE 1**) of **S1** is used to set the standard/enhanced mode of this card.

DIP1 : **ON** (Upper) position ➔ **STANDARD** mode

DIP1 : **OFF** (Lower) position ➔ **ENHANCED** mode

· **SPEED** Mode

DIP 1 (**SPEED**) of **S2** is used to determine the speed mode of this card.

➢ **Operating System Mode**

Connect the left two pins of **JP15** to use DOS, Windows 3.1

Connect the right two pins of **JP15** to use Windows 95/98/ NT

DIP1 : **ON** (Upper) position ➔ **High Speed Mode** or ´ **8 Mode**
(Frequency of Oscillator Crystal = 14.7456 MHz)

DIP1 : **OFF** (Lower) position ➔ **Normal Speed Mode**
(Frequency of Oscillator Crystal = 1.8432 MHz)

STANDARD MODE: In this mode, the I/O addresses and the IRQ levels for each port are set to default as shown below, (Disable BIOS setting of on-board COM1 ~ COM4)

Port No.	I/O Address	COM Port No.	IRQ Level (*)	
			Independent IRQ	Shared IRQ
Port 1	3F8h	COM1	JP1	JP1
Port 2	2F8h	COM2	JP2	JP1
Port 3	3E8h	COM3	JP3	JP1
Port 4	2E8h	COM4	JP4	JP1

ENHANCED MODE: In this mode, the I/O addresses and the IRQ levels for each port are set as shown below, (Make sure that the I/O address on the BIOS setting of on-board COM1 ~ COM4 will never conflict with **[Base Address] ~ [Base Address + 1Fh])**

Port No.	I/O Address	COM Port No.	IRQ Level (*)	
			Independent IRQ	Shared IRQ
Port 1	Base Address + 00h	COM1	JP1	JP1
Port 2	Base Address + 08h	COM2	JP2	JP1
Port 3	Base Address + 10h	COM3	JP3	JP1
Port 4	Base Address + 18h	COM4	JP4	JP1