PCL-741
Isolated Dual Port
RS-232/Current-Loop
Interface Card

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Contents

Introduction

Description

The PCL-741 card provides two isolated RS-232 or current-loop serial ports for communication applications in difficult environments. You can configure each port individually to RS-232 or 4-20 mA current-loop using on-board jumpers.

The card has two 16C550 UARTs (on-chip 16-byte FIFO buffers) making serial I/O more reliable. By buffering data into 16-byte packets before putting it on the bus the UARTs drastically reduce the CPU load. This makes the PCL-741 especially suitable for high speed serial I/O applications and applications under MS Windows.

On-board optical isolators protect your PC and equipment against damage from ground loops to increase system reliability in harsh environments.

Features

- Two independent RS-232 or Current-loop serial ports

- Each port can be individually configured to RS-232 or current-loop

- 16C550 FIFO UARTs (16-byte FIFO)

- Baud rate up to 56 Kbps

- IRQ selection: 3, 4, 5, 7, 9, 10, 11, 12 or 15

- Complete RS-232 modem-control signals

- Up to four cards per system for a total of eight ports

- Provides 500 VDC isolation protection

- Fully isolated ground and signal lines

- COM1, COM2, COM3 and COM4 software compatibility

Applications

- PLC monitoring and control

- Serial communication in harsh environments

- Data entry terminals

- Remote data acquisition and control

- Instrument controller, distributed control systems

- Interface to modem, bar code reader, scale, plotter

Specifications

Board

- **Number of ports**: 2
- **Protocol selection**: RS-232 or 4~20 mA current-loop
- **UART**: 2 x 16C550 (16-byte FIFO)
- **I/O address selection**: From 200H to 3F8H
- **IRQ selection**: 3, 4, 5, 7, 9, 10, 11, 12 or 15
- **Power isolation**: 500 V_{DC}
- **Signalisolation**: 2500 V_{AC}
- **Power consumption**: +5 V, 300 mA typical, 1.1 A Max.
- **Connectors**: Dual DB-9 male
- **Operating temperature**: 32 to 122°F (0 to 50°C)
- **Dimensions**: 7.25" x 4.13" (18.4-cm x 10.5-cm)
- **Weight**: 0.2 Kg

RS-232 interface

- **Signal driver/receiver**: MAX-213
- **Signals**: TxD, RxD, RTS, CTS, DTR, DSR, DCD, RI, GND
- **Opto-isolators**: H1 lL1 for all signal lines
- **Mode**: Asynchronous, full duplex
- **Baud-rate**: 50 to 57600 bps
- **Stophits**: 1,1.5,2
- **Parity**: Even, odd or none
- **Data bits**: 5, 6, 7, 8

Current-loop interface

- **Signal driver/Receiver**: 6N136
- **Signals**: TxD+, TxD-, RxD+, RxD-
- **Current value**: 20 mA (Standard)
- **Mode**: Asynchronous, full duplex
- **Baud-rate**: 50 to 57600 bps
- **Opto-isolators**: HIIL1
- **Transmission distance**: 1000 m

Hardware Installation

Initial Inspection

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

We carefully inspected the PCL-74 1 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 PCL-74 l, 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.
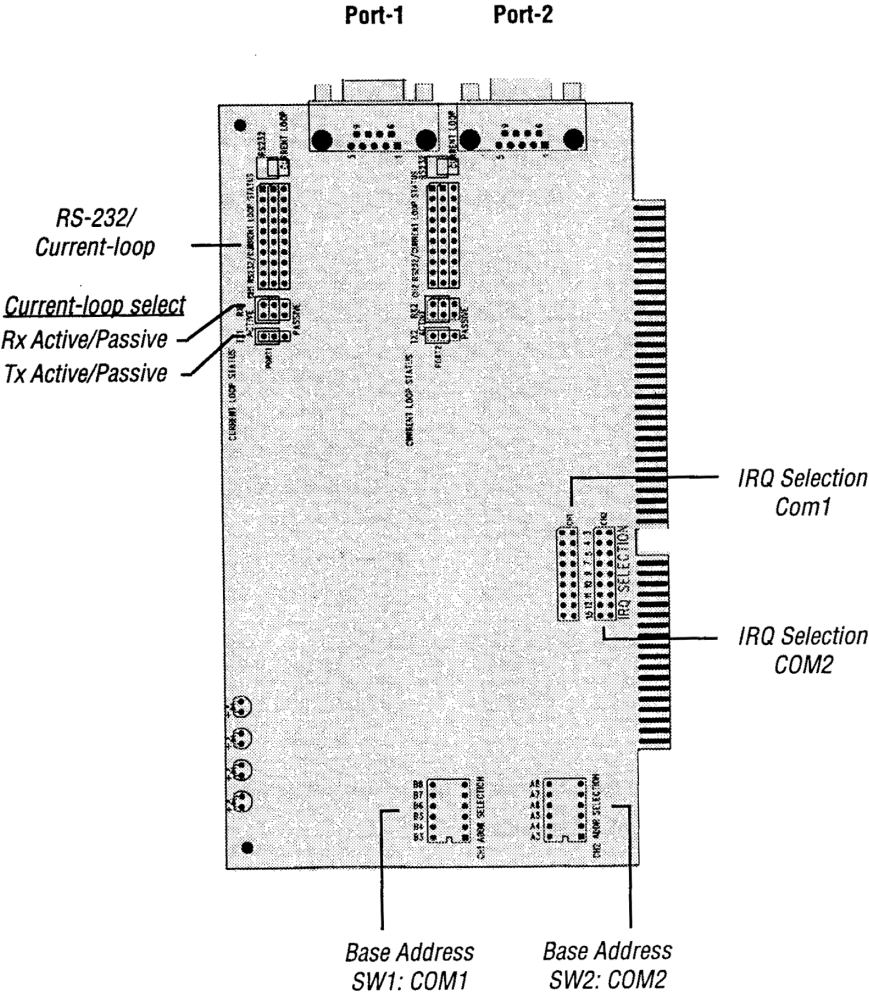
When you handle the PCL-741, remove it from its protective packaging by grasping the rear metal panel. Keep the anti-vibration packing. Whenever you remove the card from the PC, store it in this package for protection.

Warning   Discharge your body's stafic 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.

Jumper and Switch Location

Port-1   Port-2

RS-232/
Current-loop

Current-loop select
Rx Active/Passive
Tx Active/Passive

IRQ Selection
Com1

IRQ Selection
COM2

Base Address
SW1: COM1

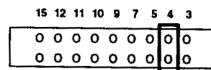Base Address
SW2: COM2

Card Configuration

Each port of the PCL-741 card has four associated status jumper groups and one six position DIP switch. If you do not use the boards default settings then these all require configuring prior to use. I/O port base address, interrupt level, RS-232/current-loop driver mode and current-loop driver and receiver status all require setting up. The functions of these DIP switches and jumpers are shown below.

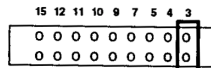| PCL-741 Switch and Jumper options		
Selection	Switches/Jumpers	Function
Protocol Selection		
	CH1	RS-232 or Current-Loop
	CH2	RS-232 or Current-Loop
Current-Loop Status		
	Tx1	Current-Loop TX active/passive
	Rx1	Current-Loop RX active/passive
	Tx2	Current-Loop TX active/passive
	Rx2	Current-Loop RX active/passive
Address Selection		
	SW1	Base address for port 1
	SW2	Base address for port 2
IRQ Selection		
	CH1	Interrupt level for port 1
	CH2	Interrupt level for port 2

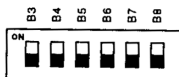Please refer to the diagram on page 9 for jumper and DIP switch locations.

Default Settinos

The board will be shipped in the RS-232 mode, the jumpers on the 10*3 pin jumper will be set to the upper position, this is the cards default setting. If your requirements are the same as the default settings, you may simply install the card without the need for any setting up. The PCL-741 DIP switch and jumper default settings are as j; shown below:
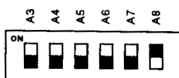

Current-loop only

RS-232/Current-loop mode

CH-1: IRQ-4 (Com1)

CH-2: IRQ-3 (Com2)
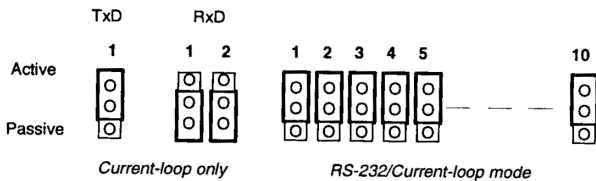
IRQ default settings

CH-1 Base address: 3F8

Base address default settings

Protocol Selection

Firstly you have to decide which mode each port will be operating in, RS-232 or current-loop driver mode. You can configure each port to operate in a different mode if required. Each port has to be individuaIIy set-up by selecting the correct jumper configurations on the three jumper groups identified as CH1 and CH2, these consist of a 10*3 pin jumper, a 2*3 pin jumper and a 1*3 jumper.

RS-232 Mode Selection

For RS-232 mode operation the jumpers will be set as in the default mode. The jumpers on the 10*3 pin jumper must be set to the upper position.
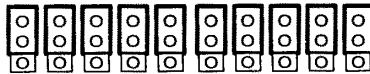
RS-232 mode

Note: When either channel is configured in the RS-232 mode the two associated TxlRx active/passive jumpers are inoperable.

Current-Loop Mode

Should you want to configure the PCL-741 to operate in the current loop mode then configure the main jumper so the jumpers are in the lower position. Then decide which mode the Tx and Rx will operate in. The options are active or passive. In the active mode the Tx or Rx will generate the current required for data transfer over the link. In the passive mode the current is generated by the card at the other end of the link.

Current-loop mode
(one jumper for each port)
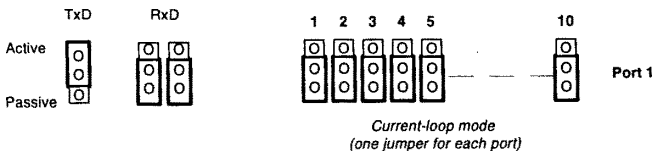
You may configure both the Tx and Rx on one port to operate in the same mode, or you can configure each Tx and Rx on one port to operate in different modes.

Note: Whatever mode you select you must ensure that this is not the :~ same mode as the device that your PCL-741 is connected to. The .i diagram below shows a typical configuration.
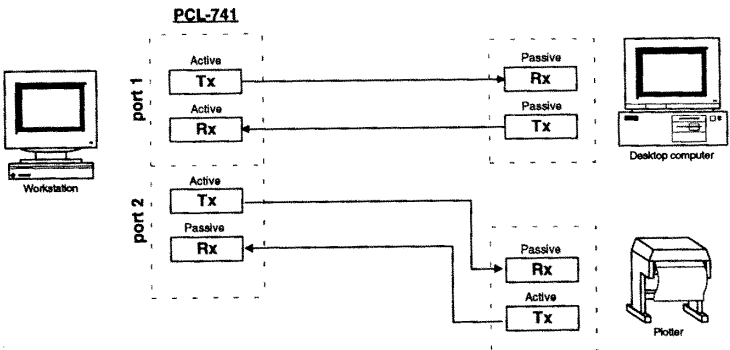
I/O Address and Interrupt Setup

1/O Address setup

The base address of each port is selectable by a 6 position DIP switch, SW1 for CH1 and SW2 for CH2. Refer to page 9 for the locations of the DIP switches SW1 and SW2. The base address can be set anywhere in the I/O address area from hex 200 to hex 3F8. If you have more than one card installed you must select different base addresses for your card. Factory default settings for base addresses are Hex 3F8 (COMl,SW1) and Hex 2F8 (COM2,SW2).
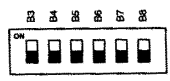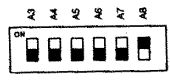
CH-1 Base address: 3F8   CH-2 Base address: 2F8

The required switch settings for various base addresses are as shown below:

Port base address (SW1 or SW2)

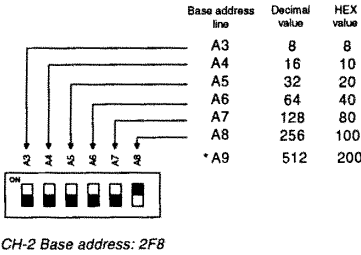| Base address	A3	A4	A5	A6	A7	A8
200-207	●	●	●	●	●	●
208-20F	○	●	●	●	●	●
- -						
2E8-2EF	○	●	○	○	○	●
- -						
COM2:* 2F8-2EF	○	○	○	○	○	●
3E8-3EF	○	●	○	○	○	○
- -						
COM1:* 3F8-3FF	○	○	○	○	○	○

  ●:ON   ○:OFF   *:Default

The following example shows how to set the base address to 2F8, the [t default setting for COM2: the switch sum is set to 2F8 = 200 + 80 +40 + 20 + 10 + 8, (HEX).

Base address line	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

CH-2 Base address: 2F8

NOTE: On the PCL-741 the address line A9 is does not appear on the DIP switch as it is permanently hard-wired to EIEX 200 on the card.

Interrupt Level (IRQ) Setting

The PCL-741 card is designed to access interrupt levels 3 up to level 15 with the exception of 6, 8, 13, and 14. If the card is to be designated as COM1: and COM2:, the card must be set to interrupt levels and 3 respectively. Ensure this does not conflict with any other cards IRQ. Simply place the jumper links on the required interrupt level asshown below:

15 12 11 10 9 8 7 5 4 3	15 12 11 10 9 8 7 5 4 3
o o o o o o o o [o o] o	o o o o o o o o o [o]
o o o o o o o o [o o] o	o o o o o o o o o [o]

| *IRQ-4 (CH-1,COM1)* | *IRQ-3 (CH-2,COM2)* |
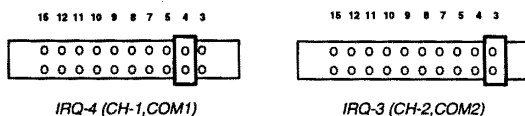
Card installation

Warnaing! *Tum off your PC's power supply whenever you installorremove the PCL-741 oritscables. Static electricity can easily damage computer equipment.Ground yourseH by touching the chassis of the computer (metalJ before you touch any boards. See t the static warning on page 8.*

1. Turn off the computer. Turn the power offto 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-741 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. Attach the DB-9 cable to the connector on the bracket.

9. 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.

Wiring

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 to 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

PCL-741 (DTE): DB-9 MALE		Terminal (DTE):DB-25	
Pin	Signal	Pin	Signal
3	TxD	3	RxD
2	RxD	2	TxD
7	RTS	5	CTS
8	CTS	4	RTS
6	DSR	20	DTR
5	GND	7	GND
4	DTR	6	DSR
1	DCD	8	DCD

Modem connections

PCL-741: DB-9 Male Modem (DCE)			
Pin	Signal	Pin	Signal
3	TxD	2	RxD
2	RxD	3	TxD
7	RTS	4	CTS
8	CTS	5	RTS
6	DSR	6	DTR
5	GND	7	GND
4	DTR	20	DSR
1	DCD	8	DCD

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

Terminal without handshake

PCL-741: DB-9 MALE		Terminal (DTE)	
Pin	Signal	Pin	Signal
3	TxD	3	RxD
2	RxD	2	TxD
7	RTS		
8	CTS		
6	DSR		
5	GND	7	GND
4	DTR		
1	DCD		

The maximum length of a RS-232 cable is 100 ft. If you need to connect over longer distances7 (longer than 100 h), please use current-loop mode to match this requirement.

current Loop Signal Wiring

For Current loop interfacing, the wiring is based on one-to-one principle and the connections are as follows:
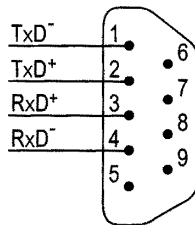
PCL-741: De-9 malePC or Terminal			
Pin	Signal	Pin	Signal
1	TxD-	4	RxD
2	TxD+	3	RxD+
3	RxD+	2	TxD+
4	RxD-	1	TxD

RS-232/Current loop Pin Assignments

The two diagrams below show the pin assignments for the DB-9 connectors in both RS-232 and current-loop modes:
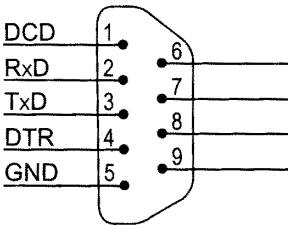
RS-232   Current-loop

PC I/O Address Reference

APPENDIX B PC 1/0 Address usage

The following table indicates the PC I/O address usage assignrnent. To prevent conflicting settings of the PCL-74 1 with other devices or I/O cards, you are recomrnended to refer this table.

1/0 Address	Device
000 - OOF	DMA (8237A)
020 - 021	8259A 1 RQ Controller
040 - 043	8253/8254 Timer/Counter
060 - 063	PPI 8255A
070 - 071	Real-Time Clock
080 - 08F	DMA Page Register
OAO - OBF	8259A Interrupt Chip
OCO - ODF	Second DMA Controller 8237A
OFO - OFF	Math Coprocessor
1 FO - 1 F8	AT Fixed Disk
200 - 20F	Game 1/0
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
3AO - 3AF	Master Binary Communication Adaptor
3BO - 3BF	Monochrome/Parallel Adaptor
3DO - 3DF	Color Graphics Adaptor
3FO - 3F7	Diskette Controller
3F8 - 3FF	Serial Adaptor (COM 1)