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## Overview

The SynLink GT4 PC/104+ Serial Adapter is an add-in card for use in systems with a PC/104+ expansion socket. The card provides four serial ports for use by the system. A variety of serial protocols are supported on a RS-232 compliant serial interface. Refer to the software documentation included with the card for details on using the card for a specific application.

## Features

- Maximum Speed: 230400bps
- SDLC, HDLC, BISYNC, MONOSYNC, ASYNC, raw bit-synchronous protocols
- Selectable hardware CRC: CRC-16, CRC-32, None
- DPLL Clock Recovery (x8 and x16 sampling)
- Clock Generation
- Configurable transmit preamble and idle patterns
- Encoding: NRZ,NRZB,NRZ-L,NRZI,NRZ-M,NRZ-S,FM0,FM1,Manchester,differential biphas level
- RS-232 serial interface
- Optional termination for differential inputs
- Optional fail safe biasing for differential inputs
- Full set of control and status signals (DTR,DSR,RTS,CTS,DCD,RI,LL,RL)
- General Purpose LVTTTL signals for application specific use
- Current Limited power supplied to serial connector to safely power external devices

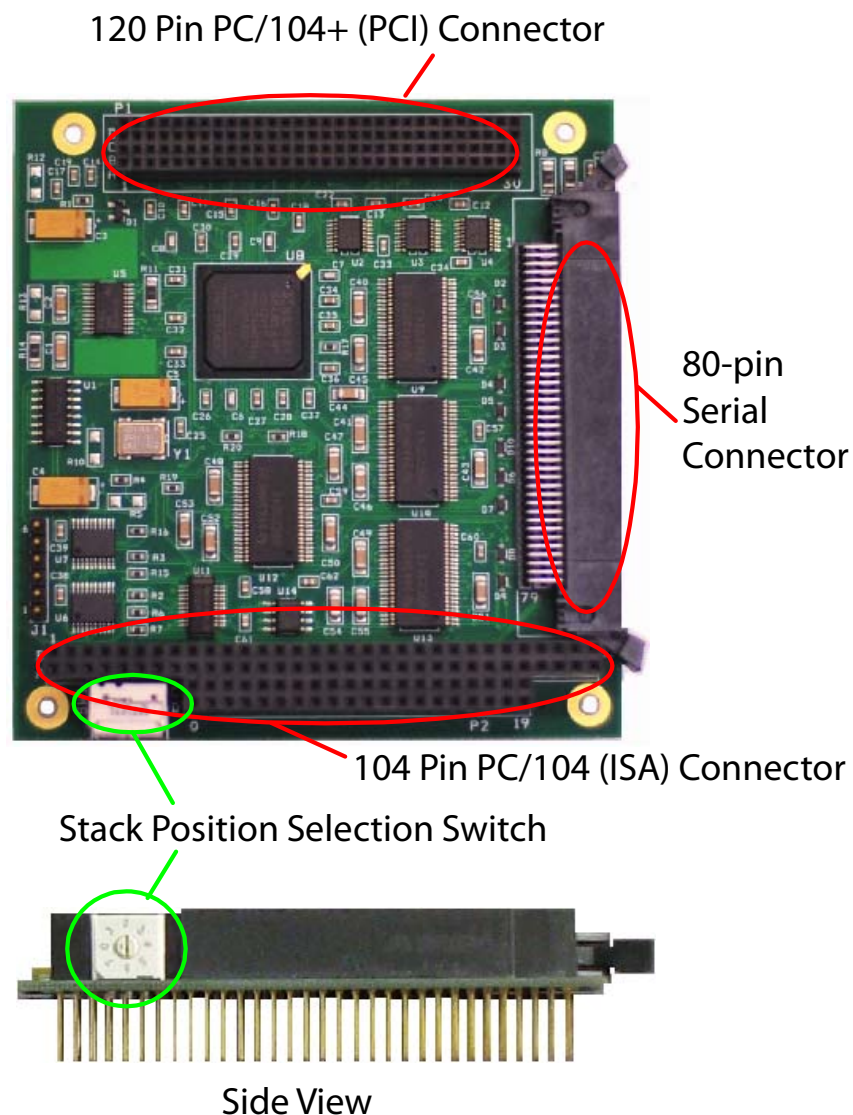
## Specifications

- MicroGate FPGA serial controller (4 ports)
- PC/104+  
automatically compatible with 5V and 3.3V signaling  
uses only 5V power by default, can be configured to use only 3.3V power
- Bus Master DMA data transfer
- Environmental: Temperature -40C to +85C; humidity 0 to 95% non-condensing; alt. - 200 to +10,000 ft
- Mechanical: Standard PC/104+ dimensions, Stack-through connectors, Weight 3.1 Oz
- Power usage: 300mA 5V or 300mA 3.3V depending on selected power source
- Connector: 80 Pin Header with Ejector/Latches

PC/104+ is a standard based on PCI electrical and protocol specifications which uses a stacked mechanical design useful for embedded and industrial applications. PC/104+ is mechanically compatible with PC/104 cards which use the older ISA electrical and protocol standards. PC/104 (ISA) cards have only a 104-pin connector. PC/104+ cards have both 120-pin PC/104+ and 104-pin PC/104 connectors. The 104-pin connector on PC/104+ cards is used to pass through ISA signals to any PC/104 cards above it in the stack. The SyncLink card is a PC/104+ (PCI) card.

Up to four PC/104+ or PC/104 cards may be placed in a stack where each card plugs into the card below it and the bottom card plugs into the system board. PC/104 (ISA) cards **MUST** be located above any PC/104+ (PCI) cards in the stack. Cards are secured together with stand offs placed in the mounting holes positioned at the four corners of the card. Mounting hardware is not included with the card.

**IMPORTANT NOTE:** The stack position **MUST** be selected on the rotary switch located near the 104 pin connector. The switch is labeled with the numbers 0-7. Every PC/104+ card in the stack has a stack position setting. The stack position setting of every card **MUST** be unique and match the actual physical stack position of the card. 0=Position 1 (closest to system board), 1=Position 2, 2=Position 3, 3=Position 4 (farthest from system board).



## Signal Specifications

The GT4 PC/104+ card provides 4 serial ports that are compatible with the RS-232 and ITU V.28 specifications.

### ***Single Ended Signals (RS-232/V.28)***

Single ended signals supported by the card are compatible with both RS-232 and ITU V.28 standards. Each single ended signal uses one conductor in a cable, and all single ended signals share a common ground conductor.

- Maximum Voltage Range: +15 to -15V (between signal and ground)
- +3V to +15V (+5V typical) = control/status signal on or data value of 0
- -3V to -15V (-5V typical) = control/status signal off or data value of 1
- Voltage between -3V to +3V = invalid (indeterminate) state
- Max cable length 50 feet
- Max data rate 20kbps

The SyncLink card can operate at speeds up to 230400bps depending on the cable length and loading. Longer cables and increased loading reduces the maximum supported data rate. Other equipment may have maximum operating speeds below that of the SyncLink card.

### ***Clock Polarity***

Synchronous serial communications (HDLC/Bisync/Monosync) may use separate clock signals to control the timing of data signals. One clock cycle equals one bit. There are two clock edges (rising and falling) for each clock cycle. On one edge, the transmit data output changes. On the other edge, the receive data input is sampled. The assignment of clock edges to transmit data transition and receive data sampling is referred to as clock polarity.

The SyncLink card uses the clock polarity in the RS-232 standard as described below:

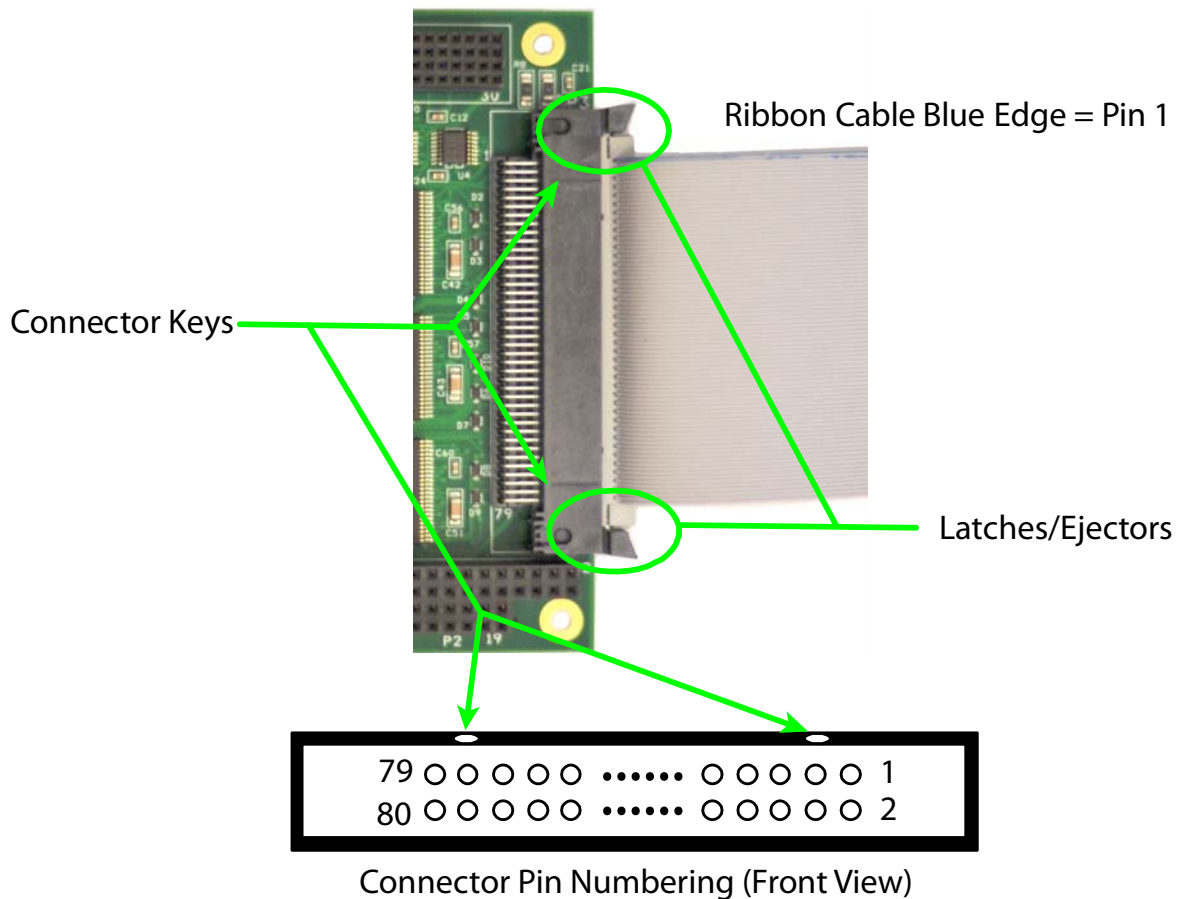
#### **RS-232/V.28 Single Ended Signals**

- +3V to +15V (+5V typical) = clock on
- -3V to -15V (-5V typical) = clock off
- On to Off edge (falling edge) = receive data sample (bit center)
- Off to On edge (rising edge) = transmit data transition (bit edge)

Most serial communications equipment uses the above clock polarity, but some non-standard equipment may use the opposite polarity. For differential signals, the polarity can be altered by inverting the conductors of each clock signal pair.

## Serial Connector Pin Assignments

The serial connector on the card is a single 80 pin shrouded header. This connector carries serial signals for all four ports, GPIO signals, ground, and power. The 80-pin header is from the manufacturer 3M, part #81080-550203RB (810 series). This connector includes latches/ejectors for secure seating and easy extraction of the ribbon cable. The connector is keyed to prevent incorrect insertion.



# Pin Assignments

Serial Connector Pin Assignments				
Signal Name	Electrical Description	Header Pin #	DB-25 Pin #	Direction
Port 1 AuxClk, DTE Clock Output	RS-232/V.28	1	24	Output
Port 1 RI, Ring Indicator	RS-232/V.28	2	22	Input
Port 1 LL, Local Loopback Control	RS-232/V.28	3	18	Output
Port 1 DTR, Data Terminal Ready	RS-232/V.28	4	20	Output
Port 1 RL, Remote Loopback Control	RS-232/V.28	5	21	Output
Port 1 RxC, Receive Clock	RS-232/V.28	6	17	Input
Signal Ground	Ground	7	7	
Port 1 TxC, Transmit Clock	RS-232/V.28	8	15	Input
VCC (5V default, 3.3V optional)	Power	9		
Port 1 DCD, Data Carrier Detect	RS-232/V.28	10	8	Input
Port 1 INA, general purpose RS232 input	RS-232/V.28	11	12	Input
Port 1 DSR, Data Set Ready	RS-232/V.28	12	6	Input
Port 1 INB, general purpose RS232 input	RS-232/V.28	13	13	Input
Port 1 CTS, Clear to Send	RS-232/V.28	14	5	Input
Port 1 IOA, general purpose I/O	LVTTTL	15		Bidir
Port 1 RTS, Request to Send	RS-232/V.28	16	4	Output
Port 1 IOB, general purpose I/O	LVTTTL	17		Bidir
Port 1 RxD, Receive Data	RS-232/V.28	18	3	Input
Signal Ground	Ground	19	7	
Port 1 TxD, Transmit Data	RS-232/V.28	20	2	Output
Port 2 AuxClk, DTE Clock Output	RS-232/V.28	21	24	Output
Port 2 RI, Ring Indicator	RS-232/V.28	22	22	Input
Port 2 LL, Local Loopback Control	RS-232/V.28	23	18	Output
Port 2 DTR, Data Terminal Ready	RS-232/V.28	24	20	Output
Port 2 RL, Remote Loopback Control	RS-232/V.28	25	21	Output
Port 2 RxC, Receive Clock	RS-232/V.28	26	17	Input
Signal Ground	Ground	27	7	
Port 2 TxC, Transmit Clock	RS-232/V.28	28	15	Input
VCC (5V default, 3.3V optional)	Power	29		
Port 2 DCD, Data Carrier Detect	RS-232/V.28	30	8	Input
Port 2 INA, general purpose RS232 input	RS-232/V.28	31	12	Input
Port 2 DSR, Data Set Ready	RS-232/V.28	32	6	Input
Port 2 INB, general purpose RS232 input	RS-232/V.28	33	13	Input
Port 2 CTS, Clear to Send	RS-232/V.28	34	5	Input
Port 2 IOA, general purpose I/O	LVTTTL	35		Bidir
Port 2 RTS, Request to Send	RS-232/V.28	36	4	Output
Port 2 IOB, general purpose I/O	LVTTTL	37		Bidir
Port 2 RxD, Receive Data	RS-232/V.28	38	3	Input
Signal Ground	Ground	39	7	
Port 2 TxD, Transmit Data	RS-232/V.28	40	2	Output

## Serial Connector Pin Assignments

Signal Name	Electrical Description	Header Pin #	DB-25 Pin #	Direction
<b>Port 3 AuxClk, DTE Clock Output</b>	RS-232/V.28	41	24	Output
<b>Port 3 RI, Ring Indicator</b>	RS-232/V.28	42	22	Input
<b>Port 3 LL, Local Loopback Control</b>	RS-232/V.28	43	18	Output
<b>Port 3 DTR, Data Terminal Ready</b>	RS-232/V.28	44	20	Output
<b>Port 3 RL, Remote Loopback Control</b>	RS-232/V.28	45	21	Output
<b>Port 3 RxC, Receive Clock</b>	RS-232/V.28	46	17	Input
<b>Signal Ground</b>	Ground	47	7	
<b>Port 3 TxC, Transmit Clock</b>	RS-232/V.28	48	15	Input
<b>VCC (5V default, 3.3V optional)</b>	Power	49		
<b>Port 3 DCD, Data Carrier Detect</b>	RS-232/V.28	50	8	Input
<b>Port 3 INA, general purpose RS232 input</b>	RS-232/V.28	51	12	Input
<b>Port 3 DSR, Data Set Ready</b>	RS-232/V.28	52	6	Input
<b>Port 3 INB, general purpose RS232 input</b>	RS-232/V.28	53	13	Input
<b>Port 3 CTS, Clear to Send</b>	RS-232/V.28	54	5	Input
<b>Port 3 IOA, general purpose I/O</b>	LVTTTL	55		Bidir
<b>Port 3 RTS, Request to Send</b>	RS-232/V.28	56	4	Output
<b>Port 3 IOB, general purpose I/O</b>	LVTTTL	57		Bidir
<b>Port 3 RxD, Receive Data</b>	RS-232/V.28	58	3	Input
<b>Signal Ground</b>	Ground	59	7	
<b>Port 3 TxD, Transmit Data</b>	RS-232/V.28	60	2	Output
<b>Port 4 AuxClk, DTE Clock Output</b>	RS-232/V.28	61	24	Output
<b>Port 4 RI, Ring Indicator</b>	RS-232/V.28	62	22	Input
<b>Port 4 LL, Local Loopback Control</b>	RS-232/V.28	63	18	Output
<b>Port 4 DTR, Data Terminal Ready</b>	RS-232/V.28	64	20	Output
<b>Port 4 RL, Remote Loopback Control</b>	RS-232/V.28	65	21	Output
<b>Port 4 RxC, Receive Clock</b>	RS-232/V.28	66	17	Input
<b>Signal Ground</b>	Ground	67	7	
<b>Port 4 TxC, Transmit Clock</b>	RS-232/V.28	68	15	Input
<b>VCC (5V default, 3.3V optional)</b>	Power	69		
<b>Port 4 DCD, Data Carrier Detect</b>	RS-232/V.28	70	8	Input
<b>Port 4 INA, general purpose RS232 input</b>	RS-232/V.28	71	12	Input
<b>Port 4 DSR, Data Set Ready</b>	RS-232/V.28	72	6	Input
<b>Port 4 INB, general purpose RS232 input</b>	RS-232/V.28	73	13	Input
<b>Port 4 CTS, Clear to Send</b>	RS-232/V.28	74	5	Input
<b>Port 4 IOA, general purpose I/O</b>	LVTTTL	75		Bidir
<b>Port 4 RTS, Request to Send</b>	RS-232/V.28	76	4	Output
<b>Port 4 IOB, general purpose I/O</b>	LVTTTL	77		Bidir
<b>Port 4 RxD, Receive Data</b>	RS-232/V.28	78	3	Input
<b>Signal Ground</b>	Ground	79	7	
<b>Port 4 TxD, Transmit Data</b>	RS-232/V.28	80	2	Output

## General Purpose I/O Signals

The serial card has general purpose input/output (GPIO) signals and extra RS-232 inputs for application specific uses. These signals are controlled by an application using the serial API (Windows and Linux). Each GPIO signal can be configured to be either an input or an output. The RS-232 inputs are dedicated inputs. Inputs can be monitored and outputs can be controlled. In addition, ground and power signals are available on the 80 pin serial connector.

### *DC GPIO Specifications*

Vil (input low) = -0.5V min, 0.8V max

Vih (input high) = 2.0V min, 5.5V max

Vol (output low) = 0.4V max

Voh (output high) = 2.4V min

Iol (output low) = 24mA max

Iil (output high) = -24mA max

Input Current = +/- 10uA max

GPIO signals are 3.3V TTL compatible and inputs are 5V tolerant.

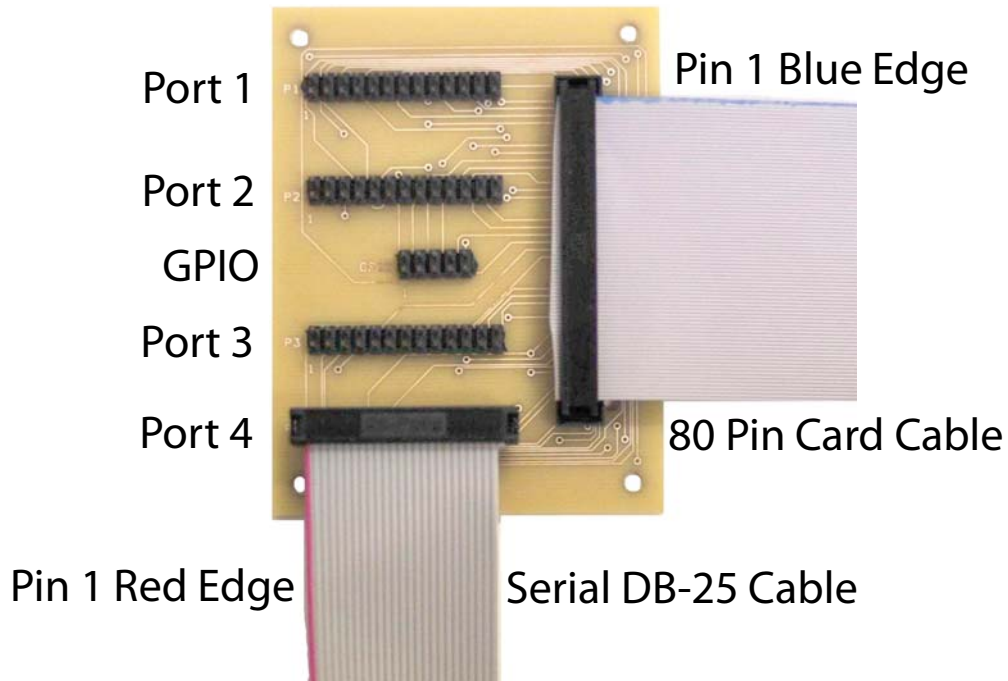
Refer to the API documentation for details on using GPIO signals.

GPIO API Assignments	
API GPIO	Function
GPIO[0]	Port 1 IOA (TTL I/O)
GPIO[1]	Port 1 IOB (TTL I/O)
GPIO[2]	Port 1 INA (RS-232 input)
GPIO[3]	Port 1 INB (RS-232 input)
GPIO[4]	Port 2 IOA (TTL I/O)
GPIO[5]	Port 2 IOB (TTL I/O)
GPIO[6]	Port 2 INA (RS-232 input)
GPIO[7]	Port 2 INB (RS-232 input)
GPIO[8]	Port 3 IOA (TTL I/O)
GPIO[9]	Port 3 IOB (TTL I/O)
GPIO[10]	Port 3 INA (RS-232 input)
GPIO[11]	Port 3 INB (RS-232 input)
GPIO[12]	Port 4 IOA (TTL I/O)
GPIO[13]	Port 4 IOB (TTL I/O)
GPIO[14]	Port 4 INA (RS-232 input)
GPIO[15]	Port 4 INB (RS-232 input)

## Development Breakout Kit

A development breakout kit is available to convert the 80-pin serial connector to a small PCB with headers for each port and a general purpose I/O header. Additional ribbon cables convert the port headers to standard DB-25 connectors. The breakout kit is intended for development use and is not included as standard equipment with each serial adapter. The headers on the breakout PCB allow easy access to all of the signals on the 80-pin connector.

### Development Breakout PCB



GND (1) ●● (2) Port 3 IOA  
 Port 1 IOA (3) ●● (4) Port 3 IOB  
 Port 1 IOB (5) ●● (6) Port 4 IOA  
 Port 2 IOA (7) ●● (8) Port 4 IOB  
 Port 2 IOB (9) ●● (10) VCC

### GPIO Header

NC (1) ●● (2) NC  
 TXD (3) ●● (4) TXC  
 RXD (5) ●● (6) NC  
 RTS (7) ●● (8) RXC  
 CTS (9) ●● (10) LL  
 DSR (11) ●● (12) NC  
 GND (13) ●● (14) DTR  
 DCD (15) ●● (16) RL  
 NC (17) ●● (18) RI  
 NC (19) ●● (20) NC  
 NC (21) ●● (22) AUXCLK  
 INA (23) ●● (24) NC  
 INB (25) ●● (26) NC

### Serial Port Header