Connect Tech Inc.

"Industrial Strength Communications"

Xtreme/104 Opto

Multi-port Serial Communications Adapter

User Manual

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Certification

Xtreme/104 Opto

The Xtreme/104 Opto product family is to be included into a device ultimately subject to FCC, DOC/IC, and CE certification. The customer is responsible for bringing the completed device into compliance prior to resale.

Connect Tech has designed the Xtreme/104 Opto with EMI and EMC considerations such as:

- Ground and power planes
- Controlled slew-rate signals
- EMI/EMC reducing PCB layout

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Product Overview

The Xtreme/104 Opto adapters are high performance multi-port serial adapters in a PC/104 form factor that allow you to connect up to 4 serial devices.

Your Xtreme/104 Opto product consists of the following components:

- Xtreme/104 Opto adapter.
- Xtreme/104 Opto DOS, Windows 95/98/Me, Windows CE, Windows XP, Windows 2000 and QNX 4.X device drivers.

Note:

1. *If you did not receive a driver diskette for your operating system or you require additional information, please go to the* **Download Zone** *of the* **Support Center** *on the Connect Tech website for product manuals, installation guides, device driver software, diagnostic utilities and updates.*
2. *You can also order standard cables for the Xtreme/104 Opto*

Xtreme/104 Opto Adapter

Xtreme/104 Opto adapters provide high speed interfaces between a host computer and multiple external serial devices. Xtreme/104 Opto adapters include features such as:

- Two or four asynchronous serial ports.
- Both RS-232 and RS-422/485 electrical interfaces. The interfaces are jumper selectable for each port.
- Multiple Xtreme/104 Opto adapters may reside in a system.
- 16C2850 dual UARTs control each port. The 16C2850 has 128 byte TxD and RxD FIFO buffers for each port and automatic software/hardware flow control.
- Each port has independent baud rate selection offering baud rates from 50 bps – 230.4 Kbps (RS-232) and 50 bps – 460.8 Kbps (RS-422/485), with 5, 6, 7 or 8 data bits and 1, 1.5, 2 stop bits, odd or even parity.
- On board jumpers allow the selection of 8 predefined I/O address sets.
- On board jumpers allow the selection of 1, 2 or 4 IRQ lines. You can choose from interrupts 3, 4, 5, 6, 7, 9, 10, 11, 12, 14 and 15.

- Each port is individually optically isolated up to 3.0 kV AC peak to peak.
- Driver support for Windows 95/98/Me, Windows CE/CE .NET, Windows XP and Windows NT/2000. Also compatible with operating systems featuring 16450/16550 serial drivers such as: Linux, QNX, DOS, Solaris and SCO Unix.

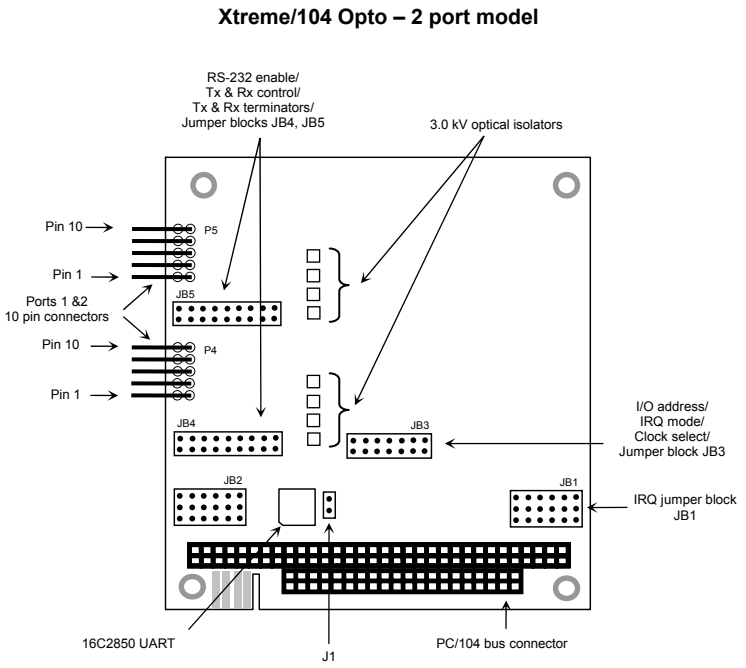
Optical Isolation

The Xtreme/104 Opto uses optocouplers and isolated DC to DC converters to achieve optical isolation. The board provides **3.0 kV AC** peak to peak isolation between each port and also between each port and your system. However there are some considerations to note.

1. Optical isolation can degrade if the board is subjected to high humidity, especially conditions that are right for condensation to occur.
2. Optical isolation can degrade if airborne dust is allowed to accumulate on the surface of the board.
3. **An electrical shock hazard could exist** depending on what equipment is connected to the Xtreme/104 Opto**.** Under these circumstances the wiring and/or cabling leading to the serial port connections may have high voltages on them. You must use appropriately insulated cables in these situations.
4. Please contact your Connect Tech Technical Support Specialist for any questions related to the application of optical isolation.

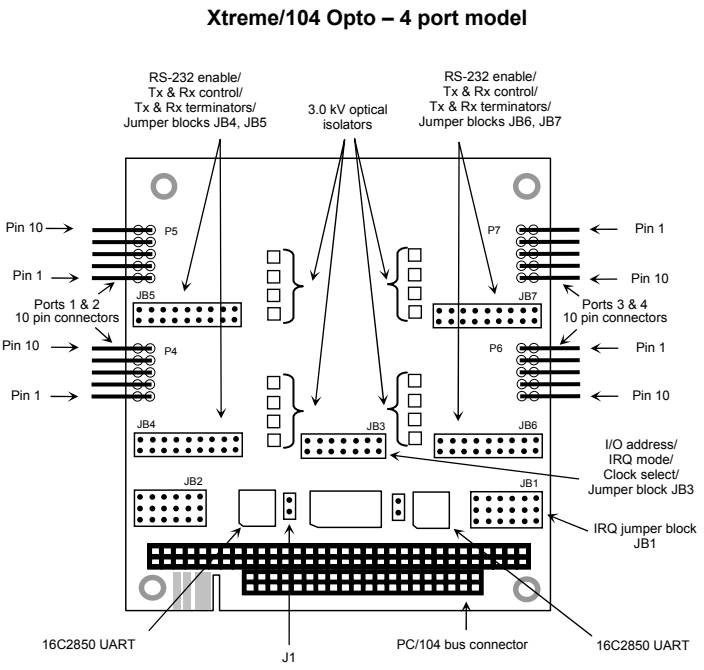
Figures 1 and **2** show the locations of various hardware components of the Xtreme/104 Opto adapter.

Figure 1: *Xtreme/104 Opto – 2 port model*



Note: Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7

Figure 2: *Xtreme/104 Opto – 4 port model*



Note: Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7

Hardware Installation

Port Addresses

Port addresses are configured with the jumper block JB3 on the Xtreme/104 Opto adapter. Jumpers A, B, and C select a set of port addresses for the ports.

Status Port Addresses

Some operating system device drivers can utilize an Interrupt Status Port, for example Windows NT offers it as an option and for SCO Unix it is mandatory. This can improve your system's efficiency. The Xtreme/104 Opto offers a status port and this port is enabled and disabled using jumper F on jumper block JB3.

Please refer to **Table 1** for a list of supported status port addresses and to **Figures 1** and **2** for a description and location of jumper block JB3.

> ***Technical Tip:***
> *Please make certain that the Status Port Enable jumper is disabled if your application is not using the Status Port. This eliminates the possibility of an address conflict with another device in your system.*

Custom Port Addresses

You can generate other port addresses by making changes to the CPLDs found on the Xtreme/104 Opto adapter. If you require specific port addresses not listed in **Table 1** please contact a Connect Tech Customer Service Representative for further information.

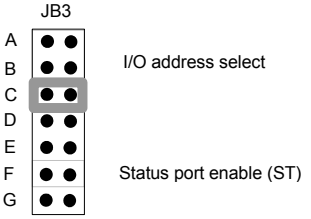
Table 1: *Port address settings*

Jumper			Ports				
C	**B**	**A**	**1**	**2**	**3**	**4**	**Status**
on	on	on	150	158	160	168	190
on	on	off	250	258	260	268	290
on	off	on	1A0	1A8	1B0	1B8	1E0
on	off	off	2A0	2A8	2B0	2B8	2E0
off	on	on	100	108	110	118	140
off	on	off	200	208	210	218	240
off	off	on	380	388	390	398	3C0
off	off	off	300	308	310	318	340

Note:
1. *Addresses for ports 3 & 4 do not apply for the Xtreme/104 Opto, two port model.*
2. *Port addresses are expressed in hex.*

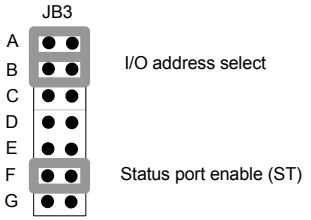
Example 1

The following example shows the port address jumper block set for port addresses 2A0, 2A8, 2B0, 2B8 (hex) and status port disabled.



Example 2

The following example shows the port address jumper block set for port addresses 100, 108, 110, 118 (hex) and status port 140 (hex) enabled.



Interrupt Selection

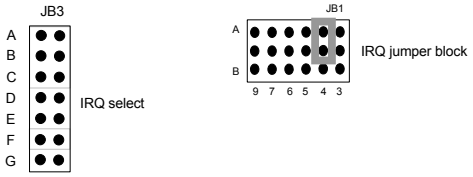
You can configure an interrupt request line (IRQ) with the jumper blocks JB1, JB2 and JB3 on the Xtreme/104 Opto adapter. Please refer to **Figures 1** and **2** for a description and location of the jumper blocks JB1, JB2 and JB3.

You are able to configure the Xtreme/104 Opto adapter for four different IRQ modes.

- **Mode 1 (one IRQ)**:
  1. First ensure there are no jumpers across positions E and D on the JB3 jumper block.
  2. All ports interrupting on one IRQ by setting jumpers on the A or C rows and the middle rows of jumper blocks JB1 or JB2.
- **Mode 2 (two IRQs)**:
  1. First jumper position D on the JB3 jumper block.
  2. The odd ports (ports 1, 3) interrupt on one IRQ by setting jumpers on the B or D rows and the middle rows of jumper blocks JB1 or JB2.
  3. The even ports (ports 2, 4) interrupt on one IRQ by setting jumpers on the A or C rows and the middle rows of jumper blocks JB1 or JB2.
- **Mode 3 (two IRQs – Xtreme/104 Opto, 4 port model only)**:
  1. First jumper position E on the JB3 jumper block.
  2. The first two ports (ports 1, 2) interrupt on one IRQ by setting jumpers on the A or C rows and the middle rows of jumper blocks JB1 and JB2.
  3. The last two ports (ports 3, 4) interrupt on one IRQ by setting jumpers on the B or D rows and the middle rows of jumper blocks JB1 and JB2.
- **Mode 4 (four IRQs – Xtreme/104 Opto, 4 port model only)**:
  1. First jumper positions D and E on the JB3 jumper block.
  2. To set an IRQ for Port 1 install a jumper across a pair of pins on A row and the middle row of IRQ block JB1.
  3. To set an IRQ for Port 2 install a jumper across a pair of pins on B row and the middle row of IRQ block JB1.
  4. To set an IRQ for Port 3 install a jumper across a pair of pins on C row and the middle row of IRQ block JB2.
  5. To set an IRQ for Port 4 install a jumper across a pair of pins on D row and the middle row of IRQ block JB2.

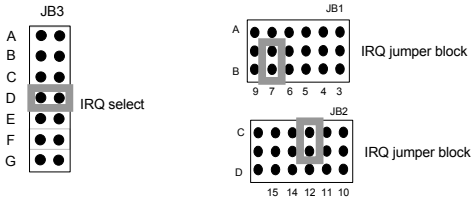
Example: Mode 1 – one IRQ

The following example shows the settings on JB3 and the IRQ jumper block JB1 so that all ports will interrupt on IRQ 4.



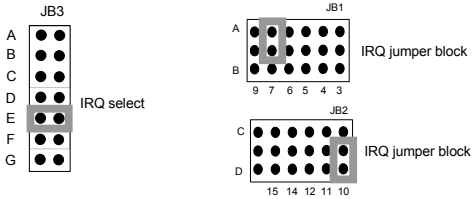
Example: Mode 2 – two IRQs

The following example shows the settings on JB3 and the IRQ jumper blocks JB1 and JB2 so that ports 1, 3 will interrupt on IRQ 7 and ports 2, 4 will interrupt on IRQ 12.



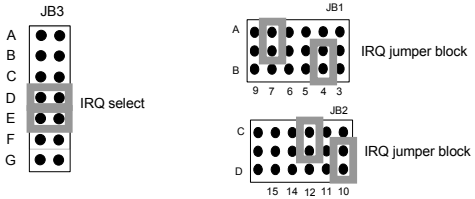
Example: Mode 3 – two IRQs (Xtreme/104 Opto, 4 port model only)

The following example shows the settings on JB3 and the IRQ jumper blocks JB1 and JB2 so that ports 1, 2 interrupt on IRQ 7 and ports 3, 4 interrupt on IRQ 10.



Example: Mode 4 – four IRQs (Xtreme/104 Opto, 4 port model only)

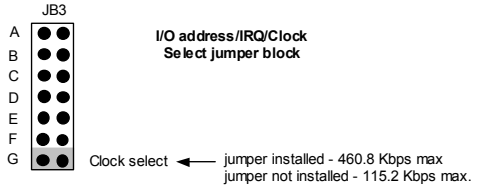
The following example shows the settings on JB3 and the IRQ jumper blocks JB1 and JB2 so that Port 1interrupts on IRQ 7, Port 2 interrupts on IRQ 4, Port 3 interrupts on IRQ 12, and Port 4, interrupts on IRQ 10.



Baud Rate Selection

The Xtreme/104 Opto is capable of baud rates up to 460.8 kbps (4X oscillator) or 115.2 kbps (1X oscillator) depending on whether a shorting block is installed across position G on the JB3 jumper block. Please refer to **Figures 1** and **2** for a description and location of the jumper block JB3. Please refer to **Table 2** for a list of standard and extended baud rates for the Xtreme/104 Opto.

Example



Note: *You must reset your system when you change the clock select setting.*

Table 2: Baud rates

Standard Baud Rate. (1X - set in software)	Max. Baud Rate (4X standard)
50	200
75	300
150	600
300	1200
600	2400
1200	4800
2400	9600
4800	19.2K
7200	28.8K
9600	38.4K
19.2K	76.8K
38.4K	153.6K
57.6K	230.4K
115.2K	460.8K

Software Installation

Xtreme/104 Opto adapters are standard multi-port serial adapters that utilize 16C2850 UARTS. In many cases, users have software that will interface directly to the Xtreme/104 Opto adapters. Many operating systems come with handlers to control access to multiple 8250 style UARTS. Xtreme/104 Opto adapters currently have device drivers for the following operating systems:

- DOS
- Linux
- QNX 4
- QNX 6
- SCO Unix/Openserver
- Solaris
- Windows 2000
- Windows 95/98/Me
- Windows CE
- Windows CE .NET
- Windows NT
- Windows XP

If you require further information please contact Connect Tech Customer Support.

Technical Tips:

3. *Your Xtreme/104 Opto adapter may ship with diskettes that include* **howto.txt** *or* **readme.txt** *files. Please examine these files for technical tips or release notes concerning installation and configuration of various device drivers and software utilities.*
4. *If you did not receive a driver diskette for your operating system or you require additional information, please go to the* **Download Zone** *of the* **Support Center** *on the Connect Tech website for product manuals, installation guides, diagnostic utilities and device driver software.*

Specifications

Operating Environment

- Storage temperature: -65° C to 150° C
- Operating temperature:
  0° C to 70° C (standard version)
  -25° C to 85° C (extended temperature version)
- Humidity: 0 to 90% relative humidity, non-condensing

Power Requirements

Xtreme/104 Opto (2 & 4 port models)

- +5 VDC +/-5% @ 260 mA (typical)

PC Bus Interface

- PC interrupts are jumper selectable, (3, 4, 5, 6, 7, 9, 10, 11, 12, 14, and 15)
- Base address for UARTs is jumper selectable. Each UART requires 8 I/O addresses
- One PC/104 16-bit expansion connector

Communications

UARTs

- 16C2850 dual UARTs communication controllers
- On chip 128 byte TxD and RxD FIFO buffers per port
- Automatic RTS/CTS (Hardware) flow control
- Automatic XON/XOFF (Software) flow control
- Compatible with 16550 style software drivers

RS-232

- Programmable baud rate generator - up to 230.4K baud on all RS-232 ports
- Full duplex, point to point

RS-422/485

- Programmable baud rate generator - up to 460.8K baud on all RS-422/485 ports
- Full duplex, point to point or multi-drop
- Half duplex, point to point or multi-drop
- Jumper selectable RxD, TxD, RTS, and CTS line/bias termination resistors
- Compatible with RS-422

Control Signals

- RS-232 TxD; RxD; RTS; CTS
- RS-422/485 RTS ±; TxD ±; CTS ±; RxD ±

Optical Isolation

Xtreme/104 Opto

- 3.0 kV AC peak to peak on every signal of every port.

Dimensions

Xtreme/104 Opto PCB

- Length: 10.40 cm (4.09 inches) – includes connectors
- Height: 1.10 cm (0.43 inches)
- Width: 9.60 cm (3.78 inches)
- Compliant to PC/104 Specification 2.3

Connectors/Interface

Xtreme/104 Opto (2 port model)

- Two 10 pin header connectors

Xtreme/104 Opto (4 port model)

- Four 10 pin header connectors

Part Numbers

Xtreme/104 Opto (2 port model)

1040290101	Xtreme/104 Opto, 2 ports, c/w 16C2850 UARTs, with cable

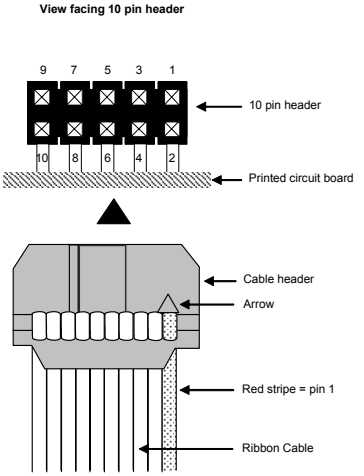
Xtreme/104 Opto (4 port model)

1040490101	Xtreme/104 Opto, 4 ports, c/w 16C2850 UARTs, with cable

Connectors/Pinouts

Table 3: *P4/P5/P6/P7 - 10 pin port header pinouts*

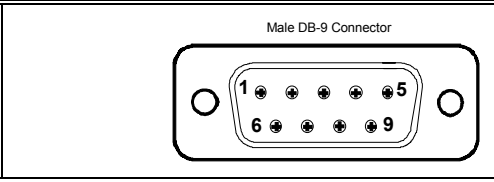
Pin No.	RS-232	Direction	RS-422/485	Direction
1	NC	NC	RxD (+)	input
2	NC	NC	CTS (-)	input
3	RxD	input	RxD (-)	input
4	RTS	output	RTS (+)	output
5	TxD	output	TxD (+)	output
6	CTS	input	CTS (+)	input
7	NC	NC	TxD (-)	output
8	NC	NC	RTS (-)	output
9	isolated gnd.	signal gnd.	isolated gnd.	signal reference
10	N/A	N/A	N/A	N/A



Technical Tip:
The red stripe on the CAB104 cable indicates pin 1 on the 10 pin cable header connector.

Table 4: *DB-9 cable connector pinouts*

Pin No.	RS-232 Signal	Direction	RS-422/485 Signal	Direction
1	NC	NC	RxD (+)	input
2	RxD	input	RxD (-)	input
3	TxD	output	TxD (+)	output
4	NC	NC	TxD (-)	output
5	Isolated Gnd	signal gnd	Isolated Gnd	signal reference
6	NC	NC	CTS (-)	input
7	RTS	output	RTS (+)	output
8	CTS	input	CTS (+)	input
9	NC	NC	RTS (-)	output



Part Number: *CAB104*

Technical Tip:

1. ***You must connect pin 5 (the isolated ground) to the ground of the external device you are connecting to.***
2. *The red stripe on the CAB104 cable indicates pin 1 on the 10 pin header connector.*
3. *Please ensure that you terminate the CTS signal if your application does not use them. The common way to do this is to connect CTS to RTS. Failure to do so may result in a loss of a performance on your Xtreme/104 Opto adapter.*

Factory Default Settings

Function	Factory Setting
I/O Port Address	JB3 is set for I/O port addresses 300, 308, 310, 318 hex and the status port disabled (positions A, B, C, not jumpered).
Status Port Address	JB3 is set for the status port disabled (position F not jumpered).
Baud Rate	JB3 is set for the maximum baud rate of 115.2 Kbps (position G not jumpered).
IRQs	1. JB3 set for all ports interrupting on a single interrupt (positions D & E not jumpered). 2. JB1 and JB2 jumper blocks set for no interrupts (all positions not jumpered).
Electrical Interface	JB4, JB5, JB6 and JB7 set for all ports RS-422/485 (position B not jumpered).
RS-422/485 Mode	1. JB4, JB5, JB6 and JB7 set for all ports running in full duplex mode (positions A and C not jumpered). 2. J1 and J2 are not jumpered.
Termination	JB4, JB5, JB6 and JB7 set for all ports being not terminated (positions D, E, F, G, H, and I, not jumpered).

Note:

1. *Please see **Figures 1** and **2** for the locations of these jumper blocks.*
2. *Revisions A and B of the Xtreme/104 Opto adapter do not have bias resistors*
3. *Revisions A & B of the Xtreme/104 Opto adapter do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7*

RS-232/RS-422/485 Interfaces

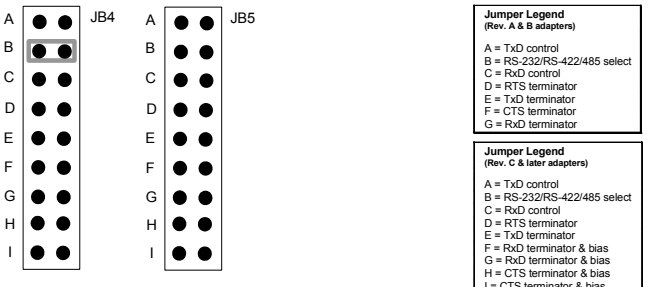
Electrical Interface Selection

The Xtreme/104 Opto adapter provides jumper selectable RS-232 and RS-422/485 electrical interfaces on each port**.**

Jumper blocks JB4, JB5, JB6 and JB7 set the electrical interfaces for the individual ports, with JB4 for Port 1; JB5 for Port 2; JB6 for Port 3; and JB7 for Port 4. Jumpers installed across position B on JB4, JB5, JB6 and JB7 enable the RS-232 interface for that port, while jumpers not installed across position B enable the RS-422/485 interface for that port**.** **Figures 1** and **2** show the locations of jumper blocks JB4, JB5, JB6 and JB7.

Example 1

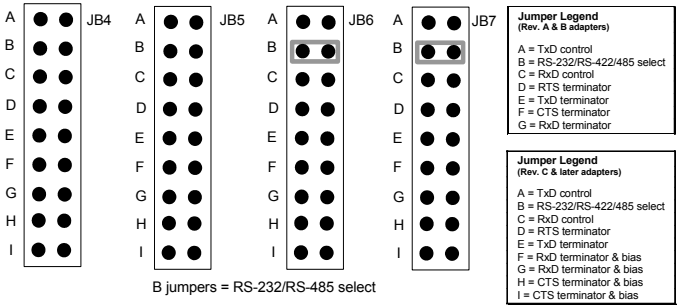
This example shows the settings on JB4 and JB5 jumper blocks so that port 1 is set for RS-232 and port 2 is set for RS-422/485.



Note: Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7

Example 2

This example shows the settings on JB4, JB5, JB6 and JB7 jumper blocks so that ports 1, 2 are set for RS-422/485 and ports 3, 4 are set for RS-232.



Note: Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7

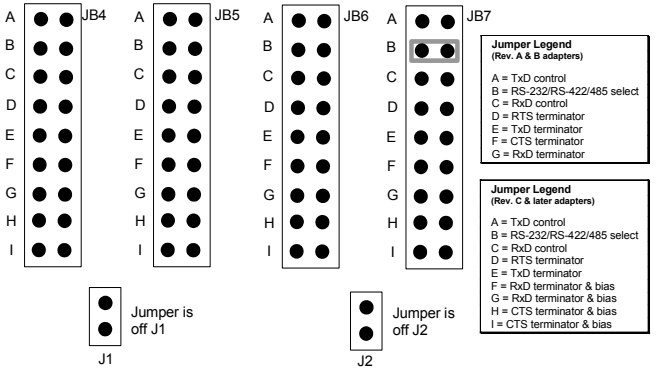
Technical Tip:
You can set up the RS-232 serial ports to run at up to 230.4 Kbps, but you must use good quality serial cables with lengths that do not exceed 2 metres.

Full Duplex Mode

By making sure that there are no jumpers on positions A and C of jumper blocks JB4, JB5, JB6 and JB7 you can run the individual RS-422/485 ports in full duplex mode. In this mode, TxD & RxD are active all the time. This mode is typically used in point to point situations much like RS-232.

Figures 1 and **2** show the locations of jumper block JB4, JB5, JB6, JB7 and J1, J2.

Example
The example below shows the settings on JB4, JB5, JB6, and J1, J2 where RS-422/485 ports 1, 2 and 3 are set for full duplex mode. Port 4 is RS-232 and therefore is not set for full duplex.



Note: Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7

Technical Tip:
J1 controls ports 1 and 2 and J2 controls ports 3 and 4. If both ports 1 and 2 are set for full duplex then J1 should not be jumpered. If both ports 3 and 4 are set for full duplex then J2 should not be jumpered.

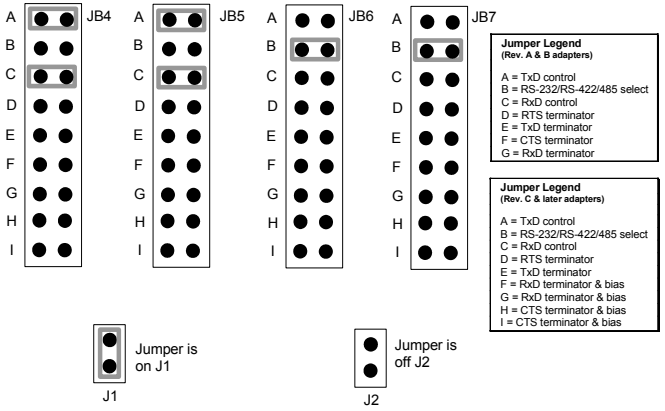
Half Duplex RS-422/485

By jumpering positions A and C of jumper blocks JB4, JB5, JB6 and JB7 you can run the individual RS-422/485 ports in half duplex mode. In this mode your Xtreme/104 Opto adapter controls the transmitter and receiver circuits. RTS is turned on prior to and during transmission to cause the transmit driver to enable and the receiver to disable. RTS is turned off when not transmitting to cause the transmit driver to disable (tri-stated) and the receiver to enable. The Xtreme/104 Opto adapter is responsible for timing the RTS toggle.

Figures 1 and **2** show the locations of jumper block JB4, JB5, JB6, JB7 and J1, J2.

Example

The example below shows the settings on JB4, JB5, JB6, JB7 and J1, J2 where RS-422/485 ports 1, 2 are set for half duplex mode. Ports 3, 4 are RS-232 and therefore should not be set for half duplex.



Note: Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7

Technical Tip:

J1 controls ports 1 and 2 and J2 controls ports 3 and 4. If both ports 1 and 2 are set for full duplex then J1 should not be jumpered. If both ports 3 and 4 are set for full duplex then J2 should not be jumpered.

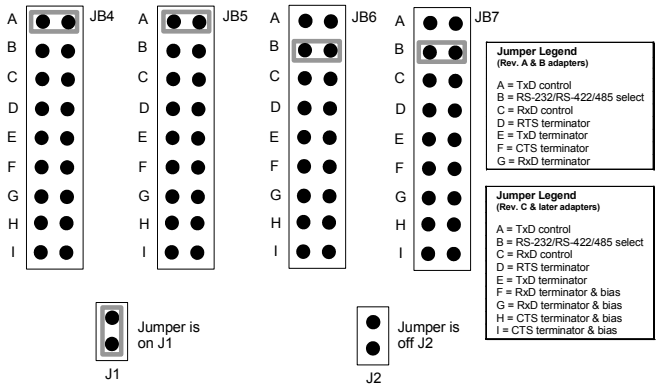
Multi-drop Slave Mode

By placing a jumper on position A of jumper blocks JB4, JB5, JB6, JB7 and on J1 (ports 1 & 2) or J2 (ports3 & 4) you can run the individual RS-422/485 ports in multi-drop slave mode. In this mode the TxD line driver is enabled only when data is transmitted and RxD is enabled all the time. This mode is typically used in multi-drop "4 wire" connections.

Figures 1 and **2** show the locations of jumper block JB4, JB5, JB6, JB7 and J1, J2.

Example

The example below shows the settings on JB4, JB5, JB6, JB7 and J1, J2 where RS-422/485 ports 1, 2 are set for multi-drop slave mode. Ports 3, 4 are RS-232 and therefore should not be set for multi-drop slave mode.



Note: Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7

Technical Tip:

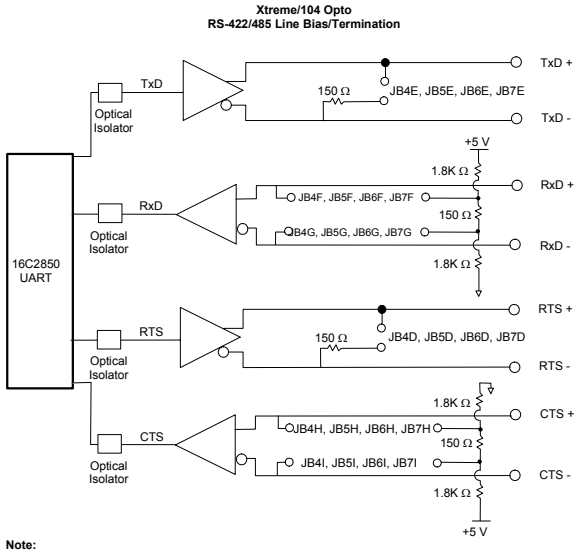
J1 controls ports 1 and 2 and J2 controls ports 3 and 4. If both ports 1 and 2 are set for full duplex then you ***should not*** *jumper J1. If both ports 3 and 4 are set for full duplex then you* ***should not*** *jumper J2.*

Line Termination

You can use jumper blocks JB4, JB5, JB6 and JB7 to terminate and bias TxD ±, RxD ±, RTS ±, and CTS ± on the individual RS-422/485 ports through jumper selectable 150 Ω fixed resistors. Please note that revisions A and B of the Xtreme/104 Opto adapter do not have bias resistors **(please refer to KDB-284 in the Connect Tech Knowledge Database found in the Support section of our website www.connecttech.com)**.

Please refer to **Figure 3** for a partial schematic of the RS-422/485 circuit for the Xtreme/104 Opto and **Figures 1** and **2** for the locations of JB4, JB5, JB6, JB7 and J1, J2.

Figure 3: *RS-422/485 partial schematic: Xtreme/104 Opto*

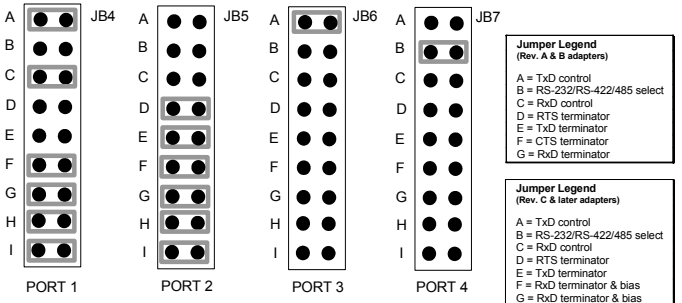


Note:

1. Line bias/termination is jumper selectable.
2. Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7
3. Rev A & B Xtreme/104 Opto adapters do not have bias resistors (please refer to KDB-284 in the Connect Tech Knowledge Database found in the Support section of our website www.connecttech.com).

Example

The following example shows the settings on JB4, JB5, JB6 and JB7 where half duplex RS-422/485 port 1 is terminated and biased on CTS ± and RxD ±, the full duplex RS-422/485 port 2 is set for bias/termination on RTS ±, TxD ±, CTS ±, and RxD ±, the multi-drop slave RS-422/485 port 3 is not terminated, and the RS-232 port 4 is not and should not be terminated.



Note: Rev A & B Xtreme/104 Opto adapters do not have positions H & I on jumper blocks, JB4, JB5, JB6, and JB7

Technical Tips:

1. *For half duplex RS-422/485 ports you typically only jumper position G(Rev. A & B adapters) or positions F and G(Rev. C adapters and later) on the appropriate jumper block (JB4, JB5, JB6 or JB7) if you want them terminated.*
2. *For full duplex and multi-drop slave you can jumper positions D, E, F, G(Rev. A & B adapters) or D, E, F, G, H, and I (Rev. C adapters and later), on the appropriate jumper block (JB4, JB5, JB6 or JB7) if you want them terminated.*
3. *For RS-232 ports do not jumper positions D, E, F, G, H, and I, on the appropriate jumper block (JB4, JB5, JB6 or JB7).*

RS-422/485 Cable Wiring

Figure 4 describes a 4 wire cabling scheme between a port on the Xtreme/104 Opto adapter to a port on the RS-422/485 peripheral.

Figure 4*: RS-422/485 wiring diagram (4 wire*)

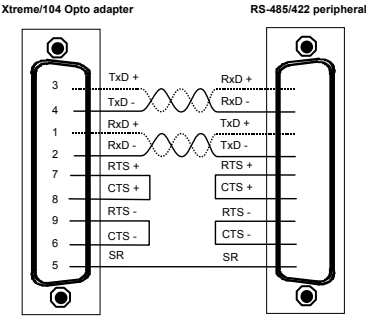
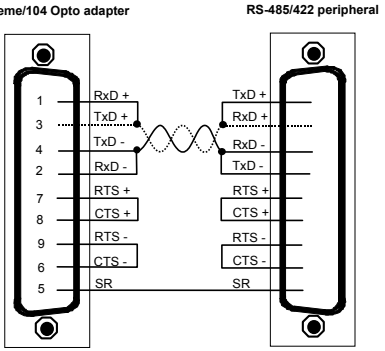


Figure 5 describes a 2 wire cabling scheme between a port on the Xtreme/104 Opto adapter to a port on the RS-422/485 peripheral.

Figure 5: *RS-422/485 wiring diagram (2 wire*)



Technical Tips:

1. *The RS-422/485 electrical interface consists of a differential signaling scheme.* ***You should always connect the signals with twisted pairs.***
2. *Signal reference* ***must be connected.***