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Connect Tech Inc.
Industrial Strength Communications

Xtreme/104

PC/104 Serial Communications

User Manual

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CTIM-00003, Revision 0.05 October 6, 2004

Limited Lifetime Warranty

Connect Tech Inc. provides a Lifetime Warranty for all Connect Tech Inc. products. Should this product, in Connect Tech Inc.'s opinion, fail to be in good working order during the warranty period, Connect Tech Inc. will, at its option, repair or replace this product at no charge, provided that the product has not been subjected to abuse, misuse, accident, disaster or non Connect Tech Inc. authorized modification or repair.

You may obtain warranty service by delivering this product to an authorized Connect Tech Inc. business partner or to Connect Tech Inc. along with proof of purchase. Product returned to Connect Tech Inc. must be pre-authorized by Connect Tech Inc. with an RMA (Return Material Authorization) number marked on the outside of the package and sent prepaid, insured and packaged for safe shipment. Connect Tech Inc. will return this product by prepaid ground shipment service.

The Connect Tech Inc. Lifetime Warranty is defined as the serviceable life of the product. This is defined as the period during which all components are available. Should the product prove to be irreparable, Connect Tech Inc. reserves the right to substitute an equivalent product if available or to retract Life Time Warranty if no replacement is available.

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Certification

Xtreme/104; Xtreme/104 RS-232

The Xtreme/104 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; Xtreme/104 RS-232 with EMI and EMC considerations such as:

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

Table of Contents

Limited Lifetime Warranty 2
Copyright Notice 2
Trademark Acknowledgment 2
Certification 3
Table of Contents 4
    List of Figures 5
    List of Tables 5
Customer Support Overview 6
Contact Information 6
Introduction 7
    Features 7
Xtreme/104 Diagrams 8
Hardware Installation 10
    Port Addresses 10
    Status Port Addresses 10
    Custom Port Addresses 10
    Interrupt Selection 11
        Mode 1 (one IRQ): 11
        Mode 2 (two IRQs): 12
        Mode 3 (two IRQs): 12
    Baud Rate Selection 13
Software Installation 14
Specifications 15
    Operating Environment 15
    Power Requirements 15
    PC Bus Interface 15
    Communications 15
        UARTs 15
        RS-232 (Xtreme/104; Xtreme/104 RS-232) 15
        RS-422/485 (Xtreme/104) 15
    Control Signals 15
    Dimensions 16
    Connectors/Interface 16
    Part Numbers 16
        Xtreme/104 (four port model) 16
        Xtreme/104 (eight port model) 16
        Xtreme/104 RS-232 (four port model) 16
        Xtreme/104 RS-232 (eight port model) 16
    Connectors/Pinouts 17
Factory Default Settings 19
RS-232/RS-422/485 Interfaces 20
    Electrical Interface Selection 20
    Half Duplex RS-422/485 20
    Line Termination 21
    RS-422/485 Cable Wiring 22

List of Figures

Figure 1: Xtreme/104 Adapters 8
Figure 2: Xtreme/104 RS-232 models 9
Figure 3: Examples of port address settings 11
Figure 4: Examples of IRQ settings 12
Figure 5: Example of baud rate selection 13
Figure 6: Example of electrical interface selection 20
Figure 7: Example of half duplex setting 20
Figure 8: Example of line termination setting 21
Figure 9: RS-422/485 wiring diagram (4 wire) 22
Figure 10: RS-422/485 wiring diagram (2 wire) 22

List of Tables

Table 1: Port Address Settings 11
Table 2: Baud rates 13
Table 3: HD1/HD2; P1/P2 - 40 pin port header pinouts 17
Table 4: DB-9 cable connector pinouts 18
Table 5: Factory default settings 19

Customer Support Overview

If you experience difficulties after reading the manual and/or using the product, contact the Connect Tech reseller from which you purchased the product. In most cases the reseller can help you with product installation and difficulties.

In the event that the reseller is unable to resolve your problem, our highly qualified support staff can assist you. Our support section is available 24 hours a day, 7 days a week on our website at: www.connecttech.com/sub/support/support.asp. See the contact information section below for more information on how to contact us directly. Our technical support is always free.

Contact Information

We offer three ways for you to contact us:

Mail/Courier
You may contact us by letter at:
Connect Tech Inc.
Technical Support
42 Arrow Road
Guelph, Ontario
Canada N1K 1S6

Email/Internet
You may contact us through the Internet. Our email and URL addresses on the Internet are:

sales@connecttech.com
support@connecttech.com
www.connecttech.com

Note:
Please go to the **Download Zone** or the **Knowledge Database** in the **Support Center** on the Connect Tech website for product manuals, installation guides, device driver software and technical tips.
Submit your technical support questions to our customer support engineers via the **Support Center** on the Connect Tech website.

Telephone/Facsimile
Technical Support representatives are ready to answer your call Monday through Friday, from 8:30 a.m. to 5:00 p.m. Eastern Standard Time. Our numbers for calls are:

Telephone: 800-426-8979 (North America only)
Telephone: 519-836-1291 (Live assistance available 8:30 a.m. to 5:00 p.m. EST, Monday to Friday)
Facsimile: 519-836-4878 (on-line 24 hours)

Introduction

Xtreme/104 adapters are high performance multi-port serial adapters in a PC/104 form factor that enable you to connect up to 8 serial devices to your PC-based system. They provide a high speed interface between your host computer and multiple external serial devices

Features

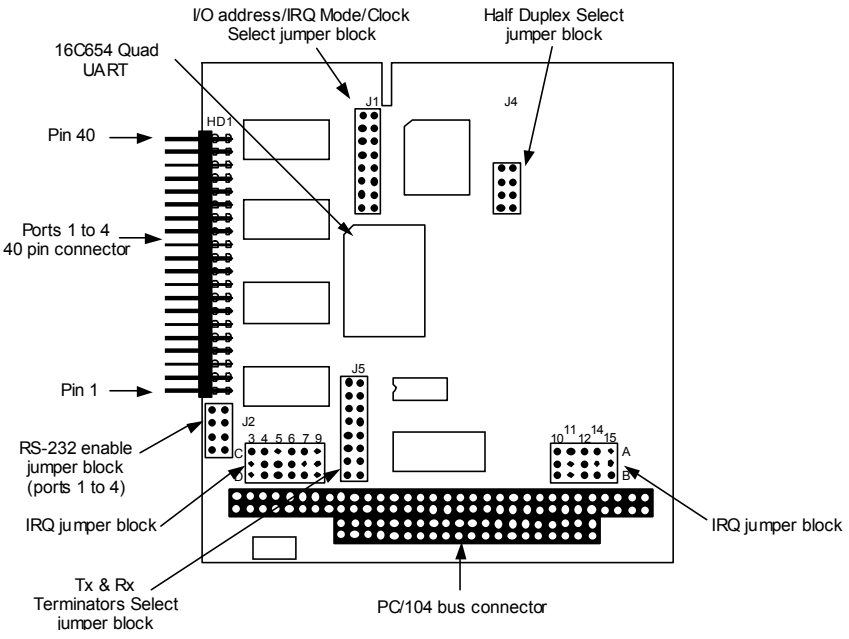
- 4 or 8 asynchronous serial ports.
- Hardware configurable RS-232 and RS-422/485 electrical interfaces. The interfaces are jumper selectable for each port. (Xtreme/104 RS-232 adapters have an RS-232 only electrical interface.)
- Multiple Xtreme/104; Xtreme/104 RS-232 adapters may reside in a system.
- 16C654 quad UARTs control each port. The 16C654 quad UART has 64 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 – 230.4 Kbps (RS-232) and 50 – 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 or 2 IRQ lines. You can choose from interrupts 3, 4, 5, 6, 7, 9, 10, 11, 12, 14 and 15.
- Driver support for Windows 95/98/Me/CE/CE .NET/XP/XPe/NT/2000/. Also compatible with operating systems featuring 16450/16550 serial drivers such as: Linux, BSD/OS, QNX, DOS, Solaris, OS/2 (3^{RD} party driver) and SCO Unix.

Xtreme/104 Diagrams

Figures 1 and 2 show the locations of various hardware components found on the Xtreme/104 and Xtreme/104 RS-232 boards.

Figure 1: Xtreme/104 Adapters

Xtreme/104 (four port model)



Xtreme/104 (eight port model)

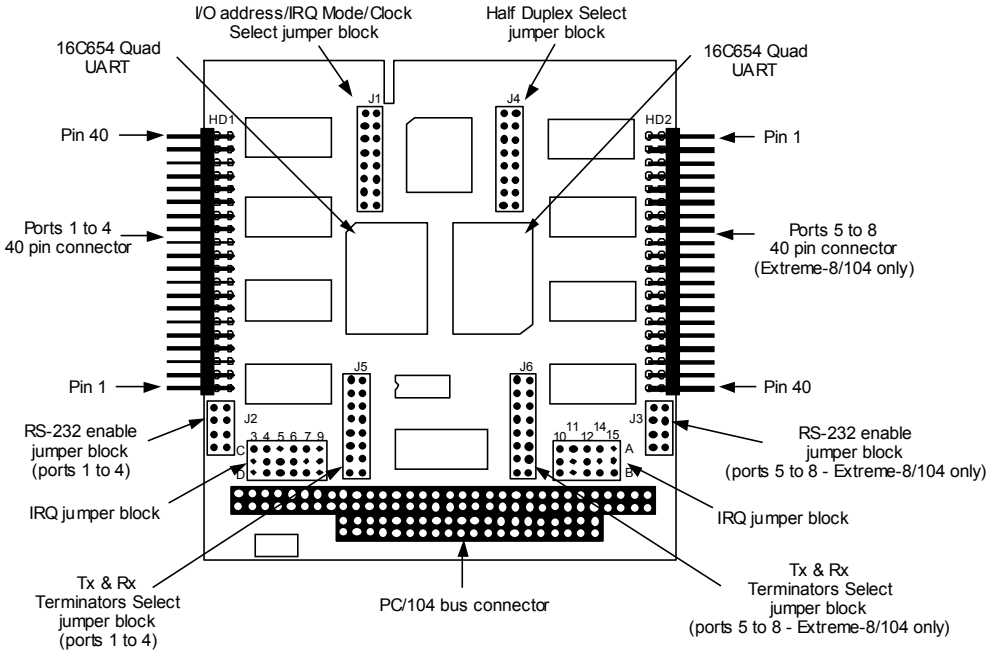
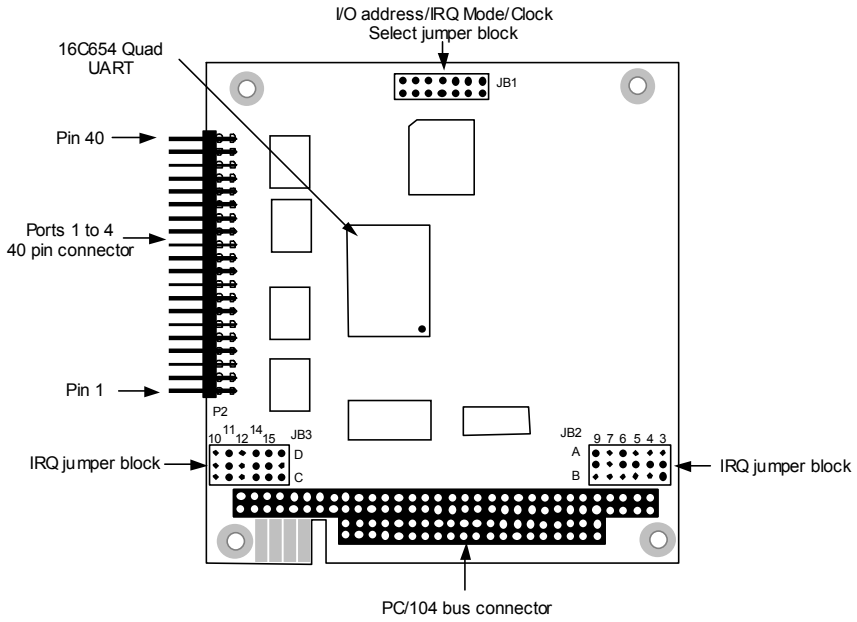
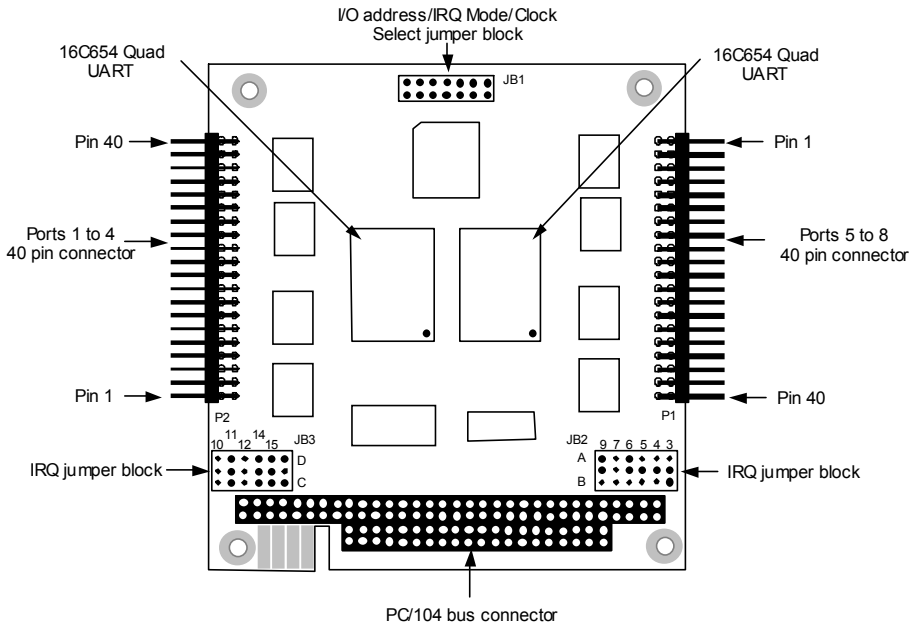


Figure 2: Xtreme/104 RS-232 models

Xtreme/104 RS-232 (four port model)



Xtreme/104 RS-232 (eight port model)



Hardware Installation

Before you begin, take a minute to ensure that your package includes the required components that should have shipped with your Xtreme/104.

- One Xtreme/104 adapter or Xtreme/104 RS-232 adapter
- One CD containing software and documentation
- One DB-9 cable (optional)

If any of these components is missing, contact Connect Tech (See Contact Details) or your reseller. Also, visit the Download Zone of the Support Center on the Connect Tech website for the latest product manuals, installation guides, diagnostic utilities and device driver software.

Notes:
1. Please refer to the RS-232/ 422/485 Interfaces section in the back of the manual for more information concerning RS-232 and RS-422/485 settings for the Xtreme/104 adapter.

2. Please refer to the Factory Default Settings section in the back of the manual concerning the factory settings for the Xtreme/104 adapter.

Port Addresses

Port addresses are configured with the jumper block J1 or JB1 on the Xtreme/104 or Xtreme/104 RS-232 adapter respectively. Jumpers 0, 1, and 2 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 and Xtreme/104 RS-232 offer a status port and this port is enabled and disabled using jumper 5 on jumper block J1 or JB1.

Please refer to Table 1 for a list of supported status port addresses and to Figure 1 or Figure 2 for a description and location of jumper block J1 and JB1.

Note:
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.

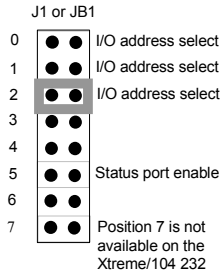
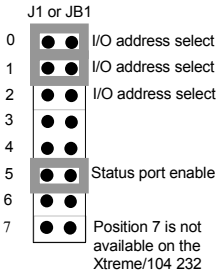
Custom Port Addresses

You can generate other port addresses by making changes to the CPLDs found on the Xtreme/104 and Xtreme/104 RS-232 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								
2	**1**	**0**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**Status**
on	on	on	150	158	160	168	170	178	180	188	190
on	on	off	250	258	260	268	270	278	280	288	290
on	off	on	1A0	1A8	1B0	1B8	1C0	1C8	1D0	1D8	1E0
on	off	off	2A0	2A8	2B0	2B8	2C0	2C8	2D0	2D8	2E0
off	on	on	100	108	110	118	120	128	130	138	140
off	on	off	200	208	210	218	220	228	230	238	240
off	off	on	380	388	390	398	3A0	3A8	3B0	3B8	3C0
off	off	off	300	308	310	318	320	328	330	338	340

Figure 3: Examples of port address settings

Example 1	***Example 2***
The following example shows the port address jumper block set for the factory setting of port addresses 2A0, 2A8, 2B0, 2B8, 2C0, 2C8, 2D0, 2D8 (hex) and status port disabled	*The following example shows the port address jumper block set for port addresses 100, 108, 110, 118, 120, 128, 130, 138 (hex) and status port 140 (hex) enabled.*
	

Interrupt Selection

You can configure an interrupt request line (IRQ) with jumper blocks J1 or JB1, AB and CD on the Xtreme/104 and Xtreme/104 RS-232 adapter. Please refer to Figure 1 and Figure 2 to locate jumper blocks J1, JB1, AB and CD.

You are able to configure the Xtreme/104 and Xtreme/104 RS-232 adapter for three different IRQ modes.

Mode 1 (one IRQ):

1. Ensure there are no jumpers across positions 3 and 4 on the J1 or JB1 jumper block.
2. All ports interrupting on one IRQ by setting jumpers on the A or C rows and the middle rows of IRQ blocks AB and CD.

Mode 2 (two IRQs):

1. Jumper position 3 on the J1 or JB1 jumper block.
2. The odd ports (ports 1, 3, 5, & 7) interrupt on one IRQ by setting jumpers on the A or C rows and the middle rows of IRQ blocks AB and CD.
3. The even ports (ports 2, 4, 6, & 8) interrupt on one IRQ by setting jumpers on the B or D rows and the middle rows of IRQ blocks AB and CD.

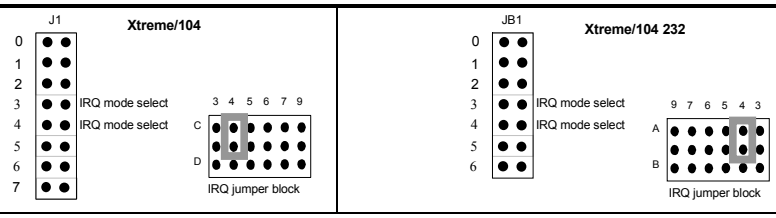
Mode 3 (two IRQs):

1. Jumper position 4 on the J1 or JB1 jumper block
2. The first four ports (ports 1, 2, 3, 4) interrupt on one IRQ by setting jumpers on the A or C rows and the middle rows of IRQ blocks AB and CD.
3. The last four ports (ports 5, 6, 7, 8) interrupt on one IRQ by setting jumpers on the B or D rows and the middle rows of IRQ blocks AB and CD.

Figure 4: Examples of IRQ settings

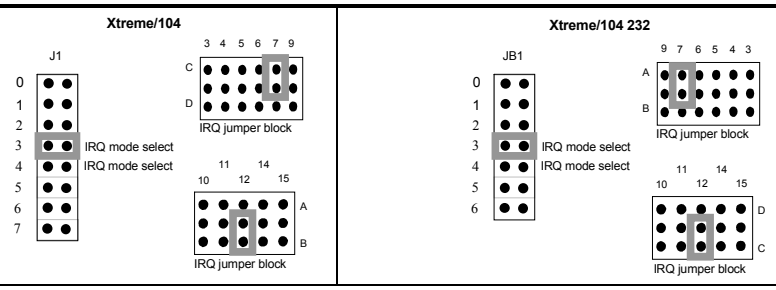
Example: Mode 1 – one IRQ

The following example shows the settings on J1 or JB1 and the IRQ jumper blocks so that all ports will interrupt on IRQ 4.



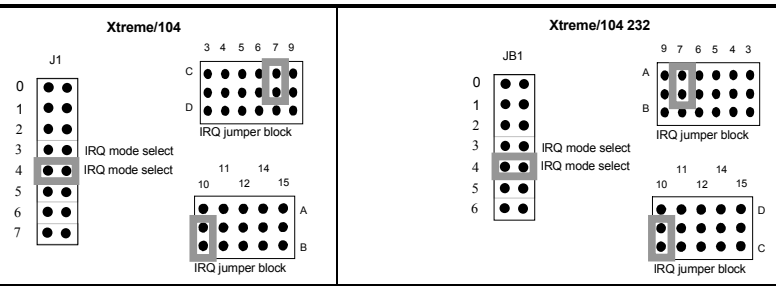
Example: Mode 2 – two IRQs

The following example shows the settings on J1 or JB1 and the IRQ jumper blocks so that ports 1, 3, 5, 7 will interrupt on IRQ 7 and ports 2, 4, 6, 8 will interrupt on IRQ 12.



Example: Mode 3 – two IRQs

The following example shows the settings on J1 or JB1 and the IRQ jumper blocks so that ports 1, 2, 3, 4 interrupt on IRQ 7 and ports 5, 6, 7, 8 interrupt on IRQ 10.



Baud Rate Selection

The Xtreme/104 is capable of baud rates up to 460.8 Kbps (4X oscillator) or 115.2 Kbps (1X oscillator). The Xtreme/104 RS-232 is capable of baud rates up to 230.4 Kbps (4X oscillator) or 115.2 Kbps (1X oscillator). These baud rate limits depend on whether you install a shorting block across position 6 on the J1 or JB1 jumper block. Please refer to Figure 1 and Figure 2 for the location of jumper block J1 or JB1. Please refer to Table 2 for a list of standard and extended baud rates for the Xtreme/104 and Xtreme/104 RS-232.

Figure 5: Example of baud rate selection

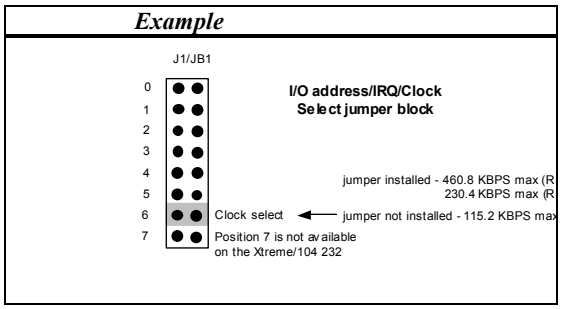


Table 2: Baud rates

Standard Baud Rate **(J1/JB1 not jumpered)**	**Max. Baud Rate (J1/JB1 jumpered)**
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 *
* This baud rate is only possible with RS-422/485 on the Xtreme/104 adapter.	

Software Installation

Xtreme/104 adapters are standard multi-port serial adapters that utilize 16C654 quad UARTS. In many cases, users have software that will interface directly to the Xtreme/104 adapters. Many operating systems come with handlers to control access to multiple 16550 style UARTS. If you require further information please contact Connect Tech Customer Support.

Technical Tips:
Your Xtreme/104 adapter may ship with a CD that includes **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.

If you did not receive a driver diskette or CD 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)
  -40° C to 85° C (industrial version)
- Humidity: 0 to 90% relative humidity, non-condensing

Power Requirements

Xtreme/104; Xtreme/104 RS-232

+5 VDC +/-5% @ 155 mA (max.)
+5 VDC +/-5% @ 131 mA (max.)

PC Bus Interface

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

Communications

UARTs

- 16C654 quad UARTs communication controllers
- On chip 64 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 (Xtreme/104; Xtreme/104 RS-232)

- Programmable baud rate generator - up to 230.4.8 Kbps on all RS-232 ports
- Full duplex, point to point

RS-422/485 (Xtreme/104)

- Programmable baud rate generator - up to 460.8 Kbps 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 and TxD line termination resistors
- Compatible with RS-422

Control Signals

- RS-232 TxD; RxD; RTS; CTS; DTR; DCD; DSR; RI
- RS-422/485 RTS ±; TxD ±; CTS ±; RxD ±

Dimensions

Xtreme/104; Xtreme/104 RS-232 PCB

Length: 9.58 cm (3.775 inches)
Height: 9.00 cm (3.55 inches)
Compliant to PC/104 Specification 2.3

Connectors/Interface

Xtreme/104; Xtreme/104 RS-232 (four port models)

One 40 pin header connectors

Xtreme/104; Xtreme/104 RS-232 (eight port models)

Two 40 pin header connectors

Part Numbers

Xtreme/104 (four port model)
1040490001 Xtreme/104, 4 ports, 16C654 UARTs, with cable

Xtreme/104 (eight port model)
1040890001 Xtreme/104, 8 ports, 16C654 UARTs, with cable

Xtreme/104 RS-232 (four port model)
1040400001 Xtreme/104, 4 port, RS-232, 16C654 UARTs, with cable

Xtreme/104 RS-232 (eight port model)
1040800001 Xtreme/104, 8 port, RS-232, 16C654 UARTs, with cables

Connectors/Pinouts

Table 3: HD1/HD2; P1/P2 - 40 pin port header pinouts

Port No.	Pin No.	RS-232	Direction	RS-422/485	Direction
1 or 5	1	DCD	input	RxD (+)	input
1 or 5	2	DSR	input	CTS (-)	input
1 or 5	3	RxD	input	RxD (-)	input
1 or 5	4	RTS	output	RTS (+)	output
1 or 5	5	TxD	output	TxD (+)	output
1 or 5	6	CTS	input	CTS (+)	input
1 or 5	7	DTR	output	TxD (-)	output
1 or 5	8	RI	input	RTS (-)	output
1 or 5	9	SG	signal gnd.	SR	signal reference
1 or 5	10	N/C	N/C	N/C	N/C
2 or 6	11	DCD	input	RxD (+)	input
2 or 6	12	DSR	input	CTS (-)	input
2 or 6	13	RxD	input	RxD (-)	input
2 or 6	14	RTS	output	RTS (+)	output
2 or 6	15	TxD	output	TxD (+)	output
2 or 6	16	CTS	input	CTS (+)	input
2 or 6	17	DTR	output	TxD (-)	output
2 or 6	18	RI	input	RTS (-)	output
2 or 6	19	SG	signal gnd.	SR	signal reference
2 or 6	20	N/C	N/C	N/C	N/C
3 or 7	21	DCD	input	RxD (+)	input
3 or 7	22	DSR	input	CTS (-)	input
3 or 7	23	RxD	input	RxD (-)	input
3 or 7	24	RTS	output	RTS (+)	output
3 or 7	25	TxD	output	TxD (+)	output
3 or 7	26	CTS	input	CTS (+)	input
3 or 7	27	DTR	output	TxD (-)	output
3 or 7	28	RI	input	RTS (-)	output
3 or 7	29	SG	signal gnd.	SR	signal reference
3 or 7	30	N/C	N/C	N/C	N/C
4 or 8	31	DCD	input	RxD (+)	input
4 or 8	32	DSR	input	CTS (-)	input
4 or 8	33	RxD	input	RxD (-)	input
4 or 8	34	RTS	output	RTS (+)	output
4 or 8	35	TxD	output	TxD (+)	output
4 or 8	36	CTS	input	CTS (+)	input
4 or 8	37	DTR	output	TxD (-)	output
4 or 8	38	RI	input	RTS (-)	output
4 or 8	39	SG	signal gnd.	SR	signal reference
4 or 8	40	N/C	N/C	N/C	N/C

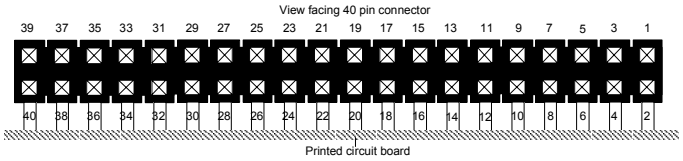
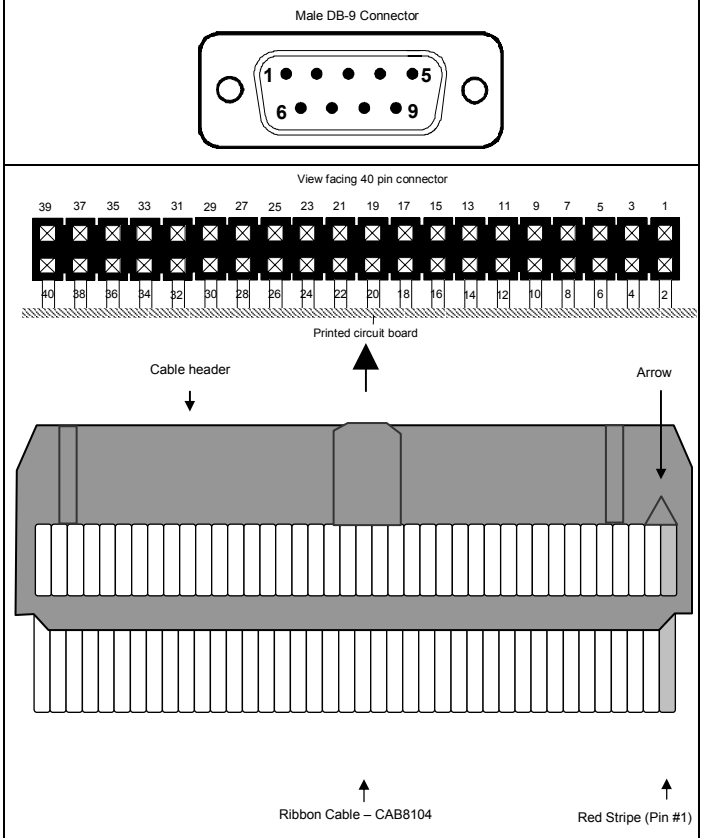


Table 4: DB-9 cable connector pinouts

Pin No.	RS-232 Signal	Direction	RS-485/422 Signal	Direction
1	DCD	input	RxD (+)	input
2	RxD	input	RxD (-)	input
3	TxD	output	TxD (+)	output
4	DTR	output	TxD (-)	output
5	SG	signal ground	SR	signal reference
6	DSR	input	CTS (-)	input
7	RTS	output	RTS (+)	output
8	CTS	input	CTS (+)	input
9	RI	input	RTS (-)	output



Part Number: *CAB8104*

Technical Tip:
The red stripe on the CAB8104 cable indicates pin 1 on the 40 pin header connector.
Please ensure that you terminate the DCD or CTS signals if your application does not use them. The common way to do this is to connect DCD to DTR and/or to connect CTS to RTS. Failure to do so may result in a loss of a performance on your Xtreme/104;

Xtreme/104 RS-232 adapter.

Factory Default Settings

Table 5: Factory default settings

Function	**Factory Setting**
I/O Port Address	J1 or JB1 is set for I/O port addresses 300, 308, 310, 318, 320, 328, 330, 338 hex and the status port disabled (positions 0, 1, 2, not jumpered)
Status Port Address	J1 or JB1 is set for the status port disabled (position 5 not jumpered)
Baud Rate	J1 or JB1 is set for the maximum baud rate of 115.2 Kbps (position 6 not jumpered)
IRQs	1. J1 or JB1 set for all ports interrupting on a single interrupt (positions 3 & 4 not jumpered) 2. AB and CD blocks set for no interrupts (all positions not jumpered)
Electrical Interface	J2 and J3 set for all ports RS-422/485 - all positions not jumpered (Xtreme/104 adapters only)
Half Duplex	J4 set for all ports running in full duplex mode - all positions not jumpered (Xtreme/104 adapters only)
Termination	J5 and J6 set for all ports being not terminated. - all positions not jumpered (Xtreme/104 adapters only)
Note: *Pleases see Figure 1 and Figure 2 for the locations of these jumper blocks.*	

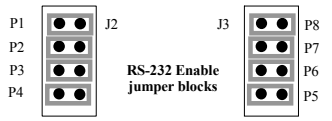
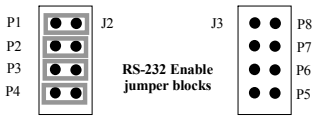
RS-232/422/485 Interfaces

Electrical Interface Selection

The Xtreme/104 adapter provides jumper selectable RS-232/422/485 electrical interfaces on each port. The Xtreme/104 RS-232 adapter provides only a RS-232 electrical interface so the information contained in this section does not apply to Xtreme/104 RS-232 adapters.

Jumper blocks J2 and J3 set the electrical interfaces for the individual ports. Jumpers installed across positions on J2 and J3 enable the RS-232 interface for that port, while jumpers not installed across positions enable the RS-422/485 interface for that port**.** Figure 1 shows the locations of jumper blocks J2 and J3.

Figure 6: Example of electrical interface selection

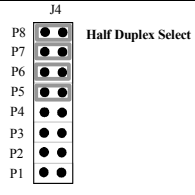
Example 1	***Example 2***
The following example shows the settings on J2 and J3 jumper blocks so that ports 1, 2, 3, 4, 5, 6, 7, 8 are set for RS-232.	*The following example shows the settings on J2 and J3 jumper blocks so that ports 1, 2, 3, 4 are set for RS-232 and ports 5, 6, 7, 8 are set for RS-422/485.*
	

Technical Note:
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.

Half Duplex RS-422/485

You can set jumper block J4 to run individual RS-422/485 ports in half duplex mode. In this mode the transmitter and receiver circuits are controlled by RTS and DTR. **Your software application must control these signals as follows:**
DTR **must be turned off** to enable half duplex
RTS **must be turned on prior to and during** transmission to cause the transmit driver to enable and the receiver to disable.
RTS must be turned off when not transmitting to cause the transmit driver to disable (tri-stated) and the receiver to enable. The application is responsible for timing the RTS toggle.

Figure 7: Example of half duplex setting

Example	
The following example shows the settings on J4 where RS-422/485 ports 5, 6, 7, 8 are set for half duplex mode. Ports 1, 2, 3, 4 are RS-232 and therefore should not be set for half duplex.	

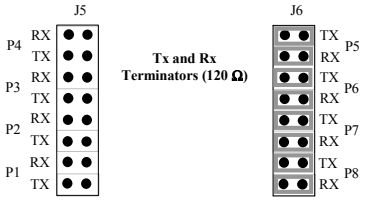
Line Termination

Jumper blocks J5 and J6 can terminate the transmitters and receivers on the individual RS-422/485 ports through jumper selectable 120 Ω fixed resistors. Please refer to Figure 1 for the location of J5 and J6.

Figure 8: Example of line termination setting

Example

The following example shows the settings on J5 and J6 where RS-422/485 ports 5, 6, 7, 8 are terminated. Ports 1, 2, 3, 4 are RS-232 and therefore should no be terminated with resistors



RS-422/485 Cable Wiring

Figure 9 depicts a 4 wire cabling scheme between a port on the Xtreme/104 adapter to a port on the RS-422/485 peripheral.

Figure 9: RS-422/485 wiring diagram (4 wire)

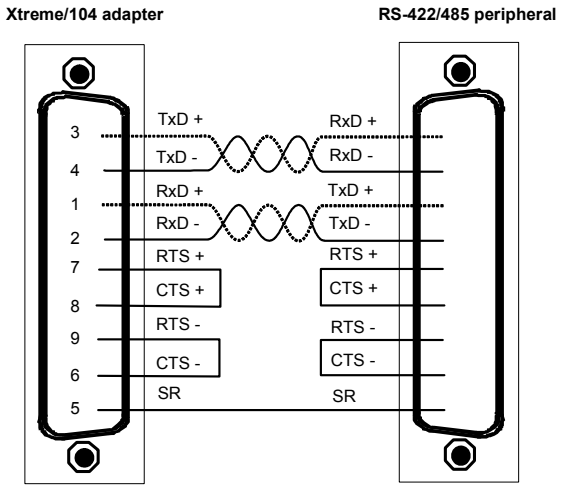
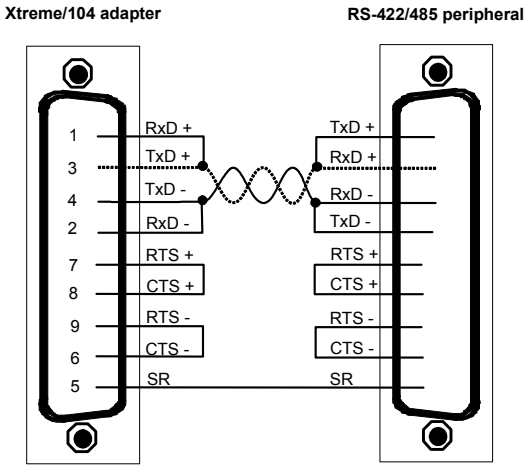


Figure 10 depicts a 2 wire cabling scheme between a port on the Xtreme/104 adapter to a port on the RS-422/485 peripheral.

Figure 10: RS-422/485 wiring diagram (2 wire)



Technical Tip: The RS-422/485 electrical interface consists of a differential signaling scheme. You should always connect the signals with twisted pairs

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