



Connect Tech Inc.

Industrial Strength Communications

Titan/cPCI

Multi-port Serial Communications Adapters

User Manual

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Limited Warranty

Connect Tech Inc. warrants to the original purchaser of this Connect Tech hardware product that it is to be in good working order for a period of one year from the date of purchase from Connect Tech Inc. or an authorized Connect Tech dealer. 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 Limited Warranty service by delivering this product to an authorized Connect Tech dealer or to Connect Tech Inc. along with proof of purchase. If this product is shipped, you agree to insure the product or assume risk of loss or damage in transit, and to prepay shipping charges to the warranty repair location.

The above warranty is the only warranty authorized by Connect Tech Inc. **UNDER NO CIRCUMSTANCES WILL CONNECT TECH INC. BE LIABLE IN ANY WAY FOR ANY DAMAGES, INCLUDING ANY LOST PROFITS, LOST SAVINGS OR OTHER INCIDENTAL OR CONSEQUENTIAL DAMAGES ARISING OUT OF THE USE OF, OR INABILITY TO USE, SUCH PRODUCT.**

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Introduction

This section contains an overall description of the Titan/cPCI manual, the Titan/cPCI product, Connect Tech's technical services, Return Merchandise Authorization and warranty repair policies. The organization of the information is as follows:

- Manual Overview - describes the structure of the manual and the conventions the manual uses.
- Product Overview - describes the Titan/cPCI, its features and specifications.
- Customer Services Overview - describes the various customer support services available to users of Connect Tech products.
- RMA Overview - describes the RMA policy and procedures for all Connect Tech products.

Manual Overview

The purpose of the Titan/cPCI User's Manual is to help you install the Titan/cPCI as effortlessly as possible. The manual includes four main sections:

- Introduction - the section you are currently reading covers the Titan/cPCI features; Connect Tech's customer services; and return merchandise authorization (RMA) policies and procedures.
- Hardware Installation - describes installation of the Titan/cPCI adapter.
- Software Installation - discusses the installation of the Titan/cPCI device drivers under various operating systems.

Note:

*We recommend that you read both the **Hardware Installation** and **Software Installation** sections before you attempt to install the Titan/cPCI adapter.*

- Appendices - the appendices contain information on electrical pinouts, product specifications such as power requirements; and other technical information.

Conventions & Symbols

This manual uses the following conventions:

- In most cases the font for file names and command statements is Arial Narrow Bold in 9pt. An example is:

Device=Titan/cPCI.sys P=280 P=288

- *Note: the "Note" convention informs you of important messages, exceptions, or special cases.*

- *Example: the "Example" convention outlines hardware and software installation examples.*

- *Technical Tip: the "Technical Tip" convention offers technical tips to assist you in hardware and software installation or problems*

WARNING

The "Warning" convention advises you to take certain precautions in order to avoid possible damage to your Connect Tech product.



This message warns you that your Connect Tech product is very sensitive to static electricity. Make sure that before handling the product you practice proper ESD procedures.

Product Overview

The Titan/cPCI adapters are high performance multi-port serial adapters that allow you to connect up to 4 serial devices through one expansion slot.

Your Titan/cPCI product consists of the following components:

- Titan/cPCI adapter
- Cable harness (optional with four port models only)
- Titan/cPCI device drivers

Titan/cPCI Adapters

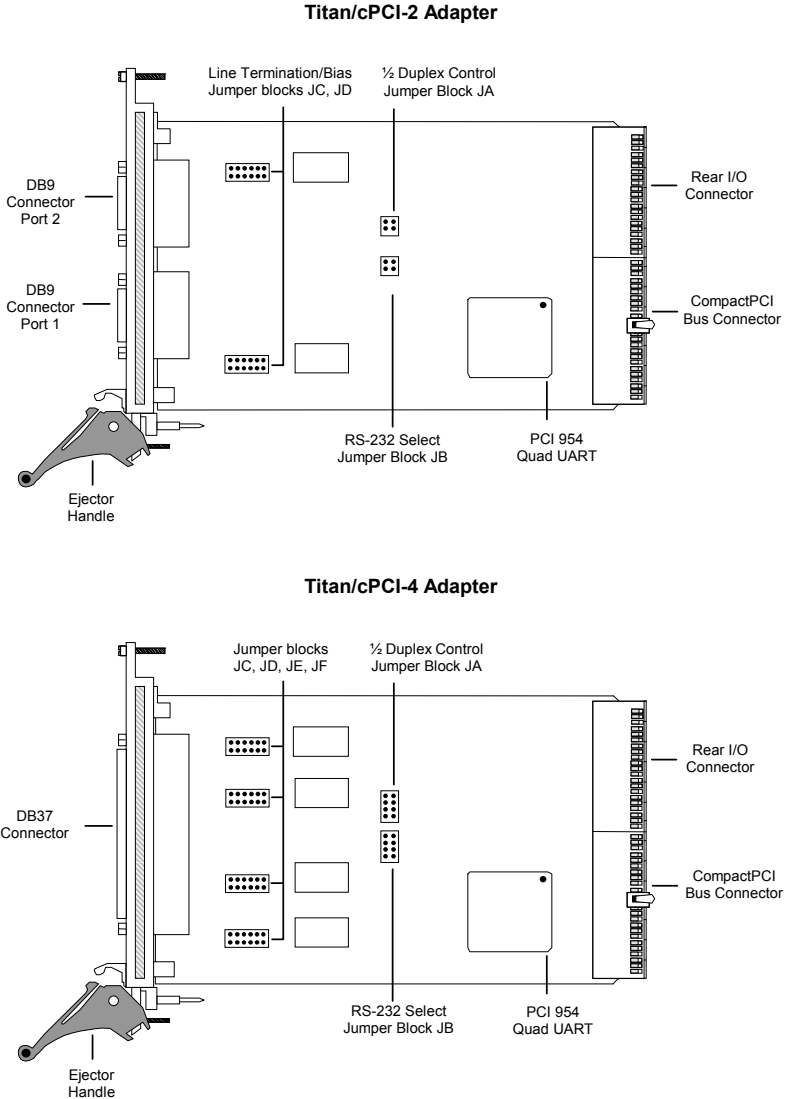
Titan/cPCI adapters provide the high-speed interfaces between a host computer's CompactPCI bus and multiple external serial devices. Titan/cPCI adapters include features such as:

Features

- 2 or 4 asynchronous serial ports from one slot.
- RS-232 and RS-485/422 interfaces.
- Titan/cPCI offers full RS-485/422 support in hardware. The modes are as follows:
 - Full Duplex Mode
 - Half Duplex Mode
 - Multi-drop Slave Mode
- 16C950 UARTs control two or four ports.
- Each port on a Titan/cPCI adapter has independent baud rate selection offering baud rates from 50 bps to 1.8342 Mbps (RS-485/422) or 230.4 Kbps (RS-232), with 5, 6, 7 or 8 data bits and 1, 1.5, 2 stop bits, odd, even, mark and space parity.
- Titan/cPCI adapters come with TransGuard[®] Transient Voltage Suppression (surge suppression – IEC 1000-4 compatible), able to withstand multiple strikes on every signal of every port.
- Titan/cPCI adapters offer CompactPCI rear I/O capability. Please contact your Connect Tech Sales representative for further information concerning the available rear I/O options for your Titan/cPCI adapter.
- System requirements are one 3U CompactPCI compatible slot
- You can install any number of Titan/cPCI adapters that your system can accommodate.

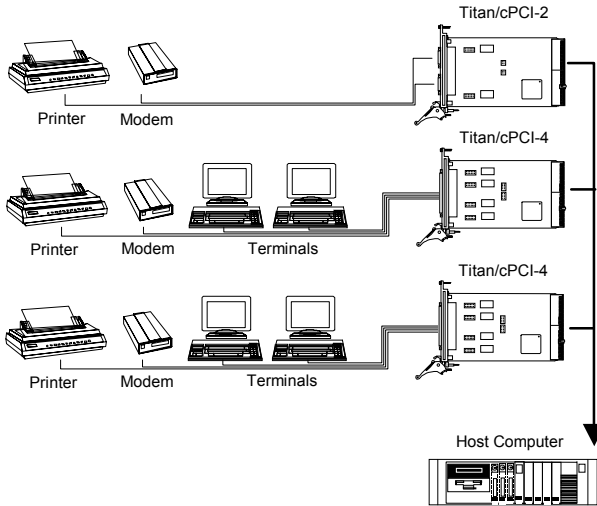
Figure 1 shows the locations of various hardware components found on Titan/cPCI adapters.

Figure 1: Titan/cPCI adapters



You can combine different Titan/cPCI adapters in a single computer to accommodate both small and large multi-channel applications. **Figure 2** below represents a sample configuration for a system requiring 10 ports.

Figure 2: *Titan/cPCI- 10 port configuration*



Titan/cPCI Software

To install your Titan/cPCI adapter under different operating systems see **Chapter 3: Software Installation**.

Customer Service Overview

If you experience difficulties after reading the manual and 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. Please refer to and complete the problem summary sheet found in **Figure 3** before contacting us. You may also submit your technical problem online using our problem submission form found at:

www.connecttech.com/support/support_question.html

Figure 3: *Problem summary sheet*

Problem Description	
Connect Tech Product Description	
Product:	Revision no.:
Product serial no.:	No. of serial ports:
IRQ selected:	Base address selected:
I/O port address selected:	
Device driver:	Revision no.:
System Description	
Operating system:	Revision no.:
System type & manufacturer:	
Amount of RAM:	CPU type/speed:
Video adapter:	Settings:
Network adapter:	Settings:
Hard disk adapter:	Settings:
Tape adapter:	Settings:
Other serial adapters	Settings:
Other adapters:	Settings:
Devices connected to ports:	

We offer three ways for you to contact us:

Mail/Courier

You may contact us by letter and our mailing address for correspondence is:

Connect Tech Inc.
c/o Customer Service
42 Arrow Road
Guelph, Ontario
Canada N1K 1S6

Email/Internet

You may contact us through the Internet. Our email, FTP and HTTP addresses on the Internet are:

sales@connecttech.com
support@connecttech.com
<ftp://ftp.connecttech.com>
<http://www.connecttech.com>

Note:

1. *You can submit your technical support questions to our customer support engineers via our Internet email address
OR*
2. *You can refer to our knowledge database found in the Customer Support section of our World Wide Web site.
OR*
3. *You can fill out the problem summary form, found in the Customer Support section of our World Wide Web site and submit it to our customer support engineers via the Web.
OR*
4. *You can obtain the latest versions of software drivers and manuals from the Customer Support section of our World Wide Web site or from the /pub section on our FTP site.*

Telephone/Facsimile

Customer Support representatives are ready to answer your call Monday through Friday, from 9:00 a.m. to noon and 1:00 p.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
Facsimile 519-836-4878 (on-line 24 hours)

RMA Overview

Connect Tech products requiring warranty or non-warranty repairs need an RMA number. To obtain a Return Merchandise Authorization (RMA) Number please contact:

Connect Tech Inc.
Technical Support
42 Arrow Road
Guelph, Ontario, Canada N1K 1S6
Phone: 519-836-1291
Toll: 800-426-8979 (North America only)
Facsimile: 519-836-4878
Email: support@connecttech.com
FTP: ftp.connecttech.com
HTTP: //www.connecttech.com

Once you have obtained an RMA number please follow these steps:

1. Include with the product:
 - proof of purchase (including date of purchase)
 - serial number
 - problem description
 - RMA number.
2. Clearly display the RMA number on the external packaging.
3. International customers must state on all shipping documents and packages, “Canadian Goods in Origin being returned for in/out of warranty repair”.
4. Please refer to the Limited Warranty for further restrictions or requirements.

Note:

1. *Please pack the item for repair securely and ship it prepaid and insured. Connect Tech is not liable for damage or loss to the product due to shipping.*
2. *Connect Tech will not accept items for repair without an RMA number.*
3. *Connect Tech will not accept items for repair shipped freight collect.*



Your Titan/cPCI adapter is very sensitive to static electricity. Make sure you wear an anti-static wristband before you remove the adapter from your computer. When you remove the board from your computer, handle it only by the edges and place it on the anti-static bag or an anti-static mat

Hardware Installation

Introduction

Hardware installation involves configuration of the following Titan/cPCI products:

- The Titan/cPCI-2 /cPCI-4 adapters

***Note:** Please refer to **Chapter 3: Software Installation** for installation of your Titan/cPCI board under certain operating systems.*

Configuration

Compact Peripheral Component Interconnect (cPCI) bus architecture offers a feature called Plug and Play (sometimes referred to as PnP). This feature automatically identifies and configures installed devices each time the system boots.

In most CompactPCI compliant computers, the system BIOS will automatically detect and configure the Titan/cPCI adapter. However in some cases a system BIOS cannot resolve all of the requests for resources in the system. This often occurs with the assignment of system interrupts, since this is usually the scarcest resource.

If this occurs, the driver will signal that a given resource has not been assigned, which requires the user to assign system resources manually. After reboot, determine with the BIOS setup utility what resources have been assigned to the cPCI devices and then do manual assignments of free resources to your cPCI device. Reboot your system. If the BIOS cannot find a suitable configuration please contact Connect Tech Technical Support.

Baud Rate Selection

Titan/cPCI adapters offer ideal solutions for applications requiring serial communications up to 1.8432 Mbps. Baud rates are software selectable, so therefore please refer to **Chapter 3: Software Installation** for configuring the baud rates under certain operating systems.

RS-485/422 Line Interface

The Titan/cPCI adapters come with a jumper selectable RS-485/422 electrical line interface for each port. The RS-485/422 electrical interface is a reliable high-speed serial link that offers superior noise immunity and multi-drop network connectivity. The RS-485/422 electrical interface is also a superset of the RS-422 electrical interface. Titan/cPCI adapters offer full RS-485/422 support in hardware. The support is:

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. Please refer to **Appendix D: RS-485/422 Line Interface** for the jumper settings associated with this function.

Half Duplex Mode

In this mode the TxD line driver is enabled only when data is transmitted and RxD is disabled when data is being transmitted. This mode is typically used in either point to point "2 wire" connections OR in multi-drop "2 wire" bussed connections. Please refer to **Appendix D: RS-485/422 Line Interface** for the jumper settings associated with this function.

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. Please refer to **Appendix D: RS-485/422 Line Interface** for the jumper settings associated with this function.

Line Termination

You can terminate and bias TxD \pm , RxD \pm , RTS \pm , and CTS \pm on the individual RS-485/422 ports through jumper selectable 150 Ω fixed resistors. Please refer to **Appendix D: RS-485/422 Line Interface** for the jumper settings associated with this function.

Installing the Titan/cPCI Adapter in your System

To install your Titan/cPCI adapter in your computer follow these steps:



Your Titan/cPCI adapter is very sensitive to static electricity. Make sure you wear an anti-static wristband before you remove the card from the anti-static shipping bag. When you remove the board from the anti-static bag, handle it only by the edges and place it on the anti-static bag or an anti-static mat.

1. Turn the power off to your computer.
2. Remove the Titan from its packaging, and remove the protective rubber from the alignment pins on the Titan's front panel.
3. Insert your Titan/cPCI into an available 3U slot. The black handle on the front panel should be on the bottom, in the lowered position.
4. Push the Titan into the cPCI slot until the handle mates with the card cage. Lift the handle to lock the Titan into place.
4. With a screwdriver, fasten the screw on the top of the panel into the card cage for added mechanical security.

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Software Installation

Introduction

Your Titan/cPCI adapter may ship with diskettes that include **README** files. Please examine these files for technical tips or release notes concerning installation and configuration of various device drivers and software utilities. If you require further information please contact Connect Tech Customer Support.

Before installing the Titan/cPCI software device driver, verify and note jumper settings described in **Appendix D: RS-485/422 Line Interface** for:

- Jumper block JA – Full duplex, half duplex and multi-drop slave control
- Jumper block JB – RS-232, RS-485/422 select
- Jumper blocks JC, JD, JE and JF – line bias/termination.

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Appendix A: Specifications

Operating Environment

- Storage temperature: -65° C - 150° C
- Operating temperature: 5° C to 70° C
- Relative humidity: 5 - 95% non-condensing
- Air movement: no requirement
- Altitude: 15,000 feet (5000 metres)

Power Requirements

- **Titan-2/cPCI:** +5 VDC +/-5% @ 350 mA (typical)
- **Titan-4/cPCI:** +5 VDC +/-5% @ 550 mA (typical)

CompactPCI Bus Interface

- One 3U cPCI slot

Communications

- **UARTs**
 - 16C950 UARTs c/w 128 byte TxD/RxD FIFO buffers
- **RS-232**
 - Programmable baud rate generator: up to 230.4 Kbps on all ports
- **RS-485/422**
 - Programmable baud rate generator: up to 1,843.2 Kbps on all ports

Control Signals

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

Surge Suppression

- TransGuard® Transient Voltage Suppression, able to withstand multiple strikes on every signal of every port.
- Transient Energy dissipation 0.1 joules on every signal of every port
- Transient peak current dissipation 40A on every signal of every port
- EN61000-4-2/3/4 compatible

Dimensions

- 3U cPCI compliant

Connectors/Interface

- Titan-2/cPCI:
Male DB-9
- Titan-4/cPCI:
Optional cable harness with DB-37 to four male DB-9 connectors

Other connection options are available upon request. Contact Connect Tech for details.

Titan/cPCI Part Numbers

TN029000000	Titan-2/cPCI, 2 ports, RS232/485, front I/O, male DB9
TN029100000	Titan-2/cPCI, 2 ports, RS232/485, surge suppression
TN049000000	Titan-4/cPCI, 4 ports, RS232/485, front I/O, no cable
TN049000001	Titan-4/cPCI, 4 ports, RS232/485, front I/O, with male DB9 cable
TN049000003	Titan-4/cPCI, 4 ports, RS232/485, front I/O, with male DB25 cable
TN049100000	Titan-4/cPCI, 4 ports, RS232/485, front I/O, surge suppression, no cable
TN049100001	Titan-4/cPCI, 4 ports, RS232/485, front I/O, surge suppression, with male DB9 cable
TN049100003	Titan-4/cPCI, 4 ports, RS232/485, front I/O, surge suppression, with male DB25 cable

Certification

Titan/cPCI-2; Titan/cPCI-4

FCC

This equipment complies with the requirements in Part 15 of FCC Rules for a Class A computing device. Operation of this equipment in a residential area may cause unacceptable interference to radio and TV reception requiring the operator to take whatever steps are necessary to correct the interference.

DOC/IC

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

CE

Connect Tech Inc. declares that the product(s) covered by the contents of this manual have been tested and found compliant with the below listed standards as required by the Electromagnetic Compatibility (EMC) Directive for General Immunity Compliance, EN 50 0082.1:1997

EN 55022	Conducted and Radiated emissions, Class A
EN 61000-4-2	Electrostatic Discharge
EN 61000-4-3	Radiated Immunity
EN 61000-4-4	Electrical Fast Transients
EN 61000-4-6	Conducted Immunity Test, Level 2



Rod Doré
Manager of Engineering



David Worthen, P.Eng.
President

General

The above agency conformance were met by independent laboratory testing of Connect Tech Inc. product(s) with shielded cables, with metal hoods, attached to either the terminating connectors or cable assemblies supplied with the product(s).

Failure to follow good EMC/EMI compliant cabling practices may produce more emissions or less immunity than was obtained in laboratory measurements.

Operation of this equipment in a residential area may cause unacceptable interference to radio a TV reception, requiring the user to take whatever steps necessary to correct the interference

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Appendix B: Connectors/Pinouts

Appendix B outlines the connector pinouts for the Titan/cPCI-2 and the Titan/cPCI-4.

Connector Pinouts

Tables 1 and 2 outline the pinouts for the Titan/cPCI connectors or cable connectors.

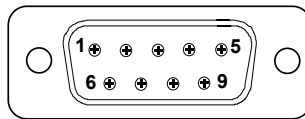
Technical Tip:

Please ensure that you terminate signals if your application does not use them. Failure to do so may result in a loss of a performance on your Titan/cPCI adapter.

Table 1: 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

Male DB-9 Connector



Cable Part Number: CAB04DX

Technical Tip:

1. 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 performance

Table 2: *DB-37 cable connector pinouts*

Pin No.	Port No.	RS-232 Signal	Direction	RS-485/422 Signal	Direction
1	1	SG	signal gnd	SR	signal ref
2	1	DTR	output	TxD-	output
3	1	TxD	output	TxD+	output
4	1	RxD	input	RxD-	input
5	1	DCD	input	RxD+	input
6		unused		unused	
7	3	RI	input	RTS-	output
8	3	CTS	input	CTS+	input
9	3	RTS	output	RTS+	output
10	3	DSR	input	CTS-	input
11	4	RI	input	RTS-	output
12	4	CTS	input	CTS+	input
13	4	RTS	output	RTS+	output
14	4	DSR	input	CTS-	input
15	2	SG	signal gnd	SR	signal ref
16	2	DTR	output	TxD-	output
17	2	TxD	output	TxD+	output
18	2	RxD	input	RxD-	input
19	2	DCD	input	RxD+	input
20	1	RI	input	RTS-	output
21	1	CTS	input	CTS+	input
22	1	RTS	output	RTS+	output
23	1	DSR	input	CTS-	input
24	3	SG	signal gnd	SR	signal ref
25	3	DTR	output	TxD-	output
26	3	TxD	output	TxD+	output
27	3	RxD	input	RxD-	input
28	3	DCD	input	RxD+	input
29	4	SG	signal gnd	SR	signal ref
30	4	DTR	output	TxD-	output
31	4	TxD	output	TxD+	output
32	4	RxD	input	RxD-	input
33	4	DCD	input	RxD+	input
34	2	RI	input	RTS-	output
35	2	CTS	input	CTS+	input
36	2	RTS	output	RTS+	output
37	2	DSR	input	CTS-	input
Cable Part Number: CAB04DX					

Appendix C: Factory Settings

Function	Factory Setting
Electrical Interface	Jumper block JB is set for all ports RS-485/422 - all positions not jumpered
Half Duplex	Jumper block JA is set for all ports running in full duplex or multi-drop slave mode - all positions not jumpered
Termination	Jumper blocks JC, JD, JE and JF are set for all ports not terminated or biased - all positions not jumpered
<i>Note: Please see Figure 1 for the locations of these jumper blocks.</i>	

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Appendix D: RS-485/422 Line Interface

Electrical Interface Selection

The Titan/cPCI adapter provides jumper selectable RS-232 and RS-485/422 electrical interfaces on each port.

Jumper block JB sets the electrical interfaces for the individual ports. Jumpers installed across the pins on jumper block JB enable the RS-232 interface for that port, while jumpers not installed across pins enable the RS-485/422 interface for that port.

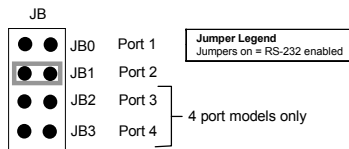
Figure 1 shows the location of jumper block JB.

Technical Tip

Please refer to the **README** files on the driver diskettes for technical tips or release notes concerning installation and configuration of various device drivers and software utilities. If you require further information please contact Connect Tech Technical Support

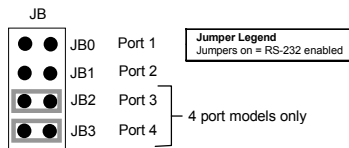
Example 1

This example shows the settings on jumper block JB so that port 2 is set for RS-232 and ports 1, 3, 4 are set for RS-485/422.



Example 2

This example shows the settings on jumper block JB so that ports 1 & 2 are set for RS-485/422 and ports 3 & 4 are set for RS-232.



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

Full Duplex Mode

By **not installing** pins on jumper block JA and by using features in our driver software, you can run the individual RS-485/422 ports in full duplex mode. This mode is typically used in point to point RS-485/422 situations much like RS-232. In this mode, TxD & RxD are active all the time. **Figure 1** shows the location of jumper block JA.

Half Duplex RS-485

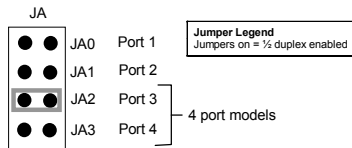
By installing pins on jumper block JA and using features in our driver software, you can run the individual RS-485/422 ports in half duplex mode. In this mode your Titan/cPCI adapter controls the transmitter and receiver circuits. DTR is turned on prior to and during transmission to cause the transmit driver to enable and the receiver to disable. DTR is turned off when not transmitting to cause the transmit driver to disable (tri-stated) and the receiver to enable. The 16C950 UARTs on the Titan/cPCI adapter are responsible for timing the DTR toggle.

Multi-drop Slave Mode

By **not installing** jumpers on jumper block JA and by using features in our driver software, you can run the individual RS-485/422 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.

Example

The example below shows the settings on JA where RS-485 ports 1 and 2 are set for full duplex or multi-drop slave mode, port 3 is set for half duplex and port 4 is not set since port 4 is set for RS-232 on jumper block JB.



Technical Note:

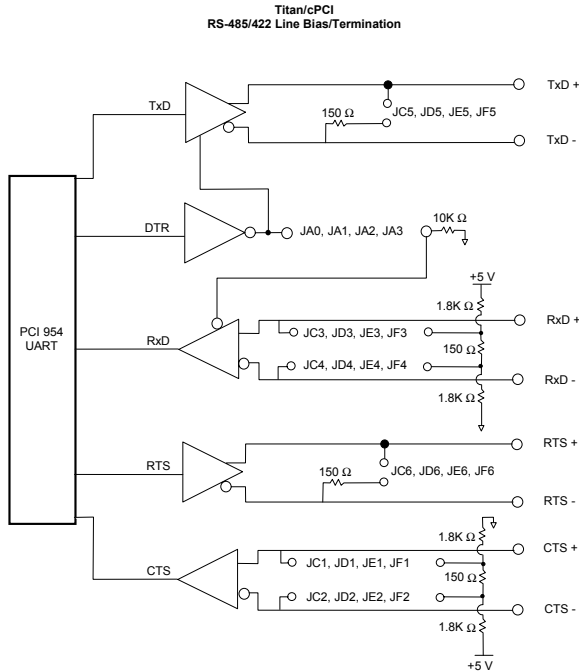
Full duplex, multi-drop slave and half duplex modes apply to RS-485/422 ports only. Please ensure that the port is set for RS-485/422 on jumper block JB.

Line Termination

You can use jumper blocks JC, JD, JE and JF to terminate and bias TxD ±, RxD ±, RTS ±, and CTS ± on the individual RS-485/422 ports through jumper selectable 150 Ω fixed resistors.

Please refer to **Figure 4** for a partial schematic of the RS-485/422 circuit for the Titan/cPCI and to **Figure 1** for the locations of JC, JD, JE and JF.

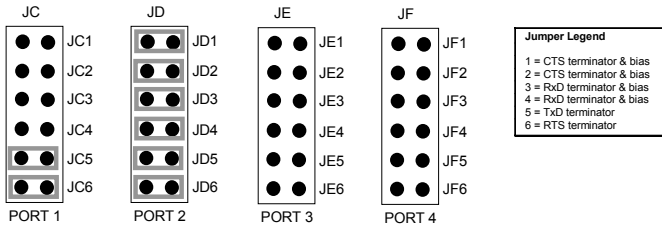
Figure 4: RS-485/422 partial schematic



Note: Line bias/termination is jumper selectable

Example

The following example shows the settings on JC, JD, JE and JF where RS-485 port 1 is terminated on RTS \pm and Tx/D \pm , the RS-485 port 2 is set for bias/termination on RTS \pm , Tx/D \pm , CTS \pm , and Rx/D \pm , the RS-485 port 3 is not terminated, and port 4 is set for RS-232 on jumper block JB and therefore should not be terminated

**Technical Notes:**

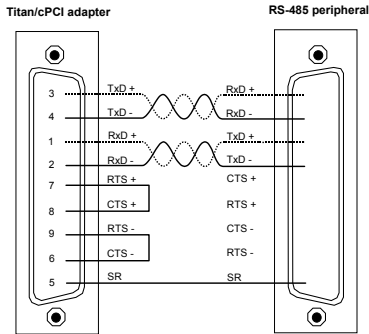
1. For full duplex and multi-drop slave you can jumper positions 1, 2, 3, 4, 5, and 6, on the appropriate jumper block (JC, JD, JE or JF) if you want them terminated.
2. For RS-232 ports do not jumper positions 1, 2, 3, 4, 5, and 6, on the appropriate jumper block (JC, JD, JE or JF).

RS-485/422 Cable Wiring

You can wire Titan/cPCI adapters in various ways to communicate with RS-485/422 peripherals. This section describes a few examples of RS-485/422 cabling schemes.

Figure 5 describes a 4 wire cabling scheme between a port on the Titan/cPCI adapter to a port on the RS-485/422 peripheral.

Figure 5: RS-485/422 wiring diagram (4 wire)

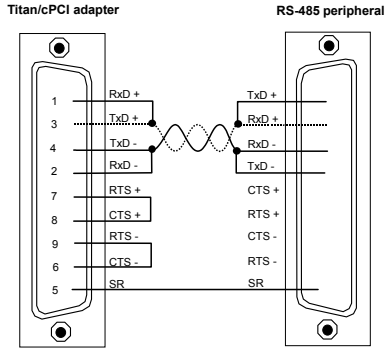


Technical Tip

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

Figure 6 describes a 2 wire cabling scheme between a port on the Titan/cPCI adapter to a port on the RS-485/422 peripheral.

Figure 6: RS-485/422 wiring diagram (2 wire)



Technical Tip

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

