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Connect Tech Inc.
Industrial Strength Communications

Titan/cPCI

CompactPCI Serial Communications

User Manual

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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.

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Certification Statements

Class A Computing Device

Titan/cPCI; Titan/cPCI Rear I/O; Titan/cPCI Rear I/O Opto*

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

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

** Note: Models TN004 and TN003 are not FCC or CE certified.*

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Introduction

Connect Tech's Titan/cPCI and Titan/cPCI Rear I/O adapters are high performance multi-port serial adapters that allow you to connect up to 4 serial devices through one expansion slot.

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

You must have the corresponding number of Titan/cPCI serial ports installed in the front I/O in order to use a Titan/cPCI Rear I/O or Titan/cPCI Rear I/O Opto adapter in your system. Titan/cPCI Rear I/O and Rear I/O Opto adapters provide the high-speed interfaces between a host computer's rear I/O CompactPCI bus and multiple external serial devices. **Please note that when you have a Titan/cPCI Rear I/O adapter installed the corresponding number of ports in the front I/O section are not available**.

Features:

- Two or four asynchronous serial ports from one slot
- RS-232 and RS-422/485 interfaces
- Full RS-422/485 support in the following modes:

  Full Duplex Mode
  Half Duplex Mode
  Multi-drop Slave Mode

- 16C950 UARTs
- Independent baud rate selection per port offering baud rates from 50 bps to 1.8342 Mbps (RS-422/485) 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
- TransGuard Transient Voltage Suppression (surge suppression – IEC 1000-4 compatible), able to withstand multiple strikes on every signal of every port (not available on the Rear I/O Opto model)
- 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)
- Jumper selectable +5 V DC or +12 V DC output on pin 6 of the DB-9 connector (available on Titan/cPCI Rear I/O adapters only)
- Each port is independently optically isolated to 3.0kV AC peak to peak (Titan/cPCI Rear I/O Opto models only)
- Ability to install any number of Titan/cPCI adapters that your system can accommodate(For Rear/IO, you can install up to the same number of Titan/cPCI Rear I/O and Rear I/O Opto serial ports as Titan/cPCI serial ports already installed in your system.)

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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)

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Titan/cPCI Installation Overview

There are two main stages in the installation process for your Titan/cPCI product:

1. Hardware Installation
   This involves the physical connection of the Titan/cPCI hardware to your system.
2. Software Installation and Configuration of Titan/cPCI
   This step installs and configures the Titan/cPCI drivers and allows you to set parameters specific to your serial requirements.

Hardware Installation

Connecting the Titan/cPCI to your System

Before you begin, take a minute to ensure that your package includes the required components that should have shipped with your Titan/cPCI:

- Titan/cPCI adapter and/or Titan/cPCI Rear I/O adapter (if applicable)
- Cable harness (optional with four-port models only)
- Titan/cPCI device drivers
- One CD containing software and documentation

If any of these components is missing, contact Connect Tech (See Contact Details) or your reseller.

Please read before you install your Titan/cPCI

Some Titan/cPCI cards are designed with rear I/O capabilities. These are 32-bit cards. The Titan/cPCI cards with rear I/O capabilities are NOT designed for use in 64-bit backplanes. Using these Titan/cPCI cards in a 64-bit backplane may damage the card and/or your equipment.

If you are uncertain whether the cPCI slots in your backplane support 32 or 64-bit cards, please consult your equipment manual or manufacturer.

Non-rear I/O versions of the Titan/cPCI cards are available (TN004 and TN007 for example). Please contact sales@connecttech.com for more details or support@connecttech.com if you have any questions.

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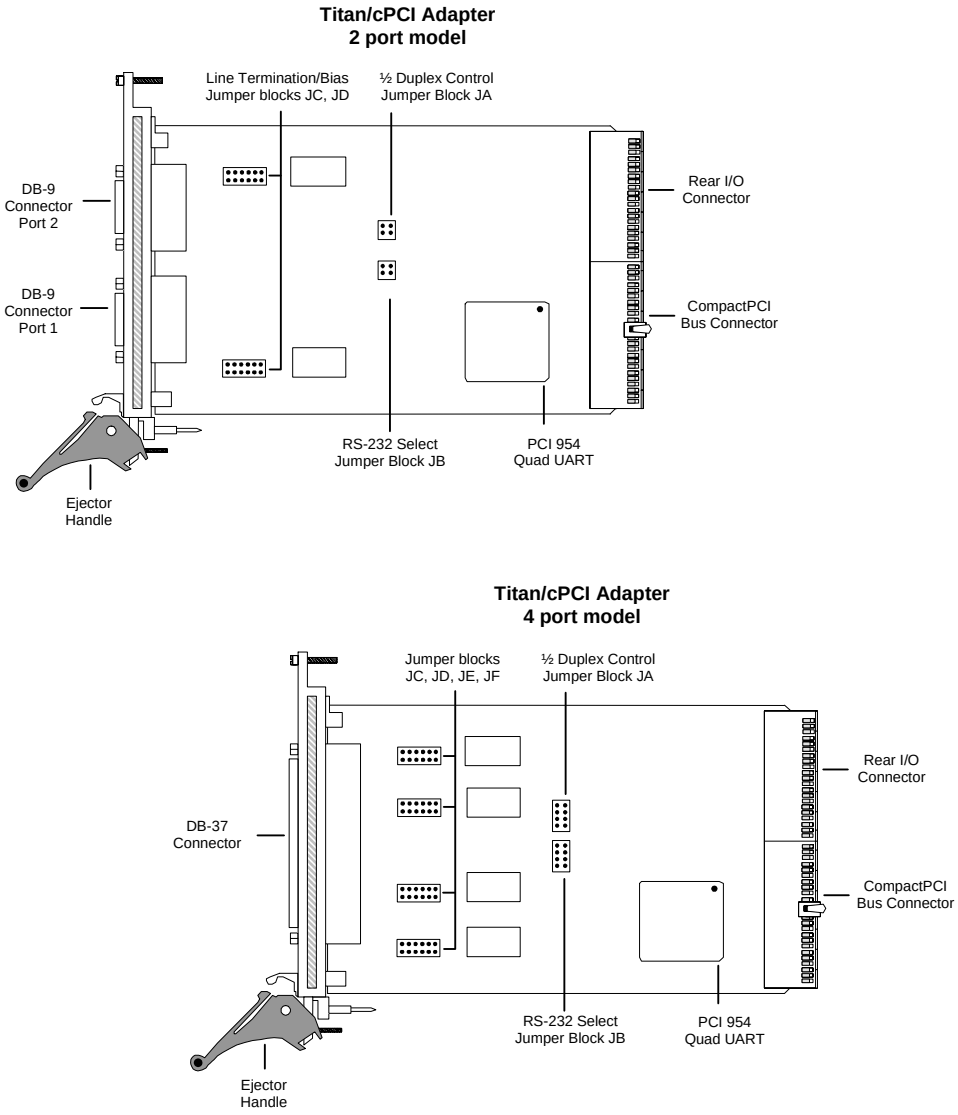


Figure 1: Titan/cPCI two and four port adapters

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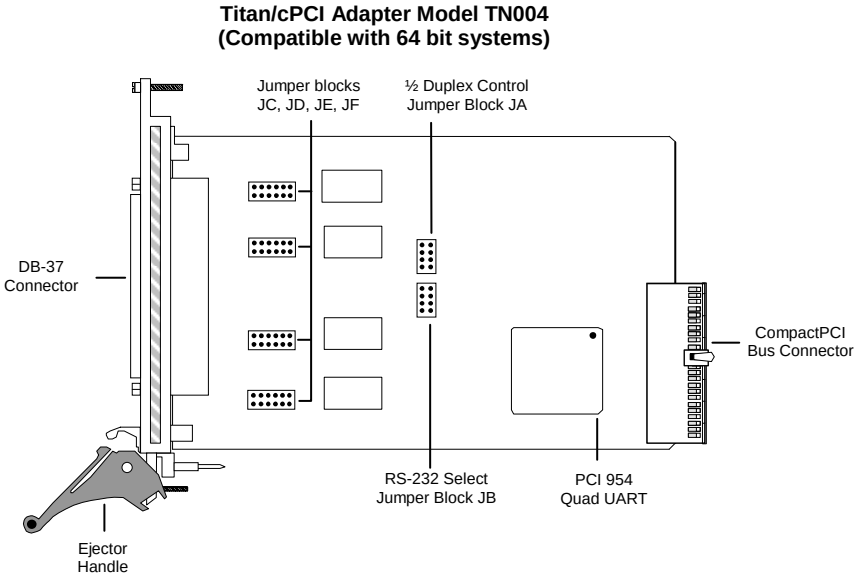


Figure 2: Titan/cPCI Model TN004 for compatibility with 64 bit systems

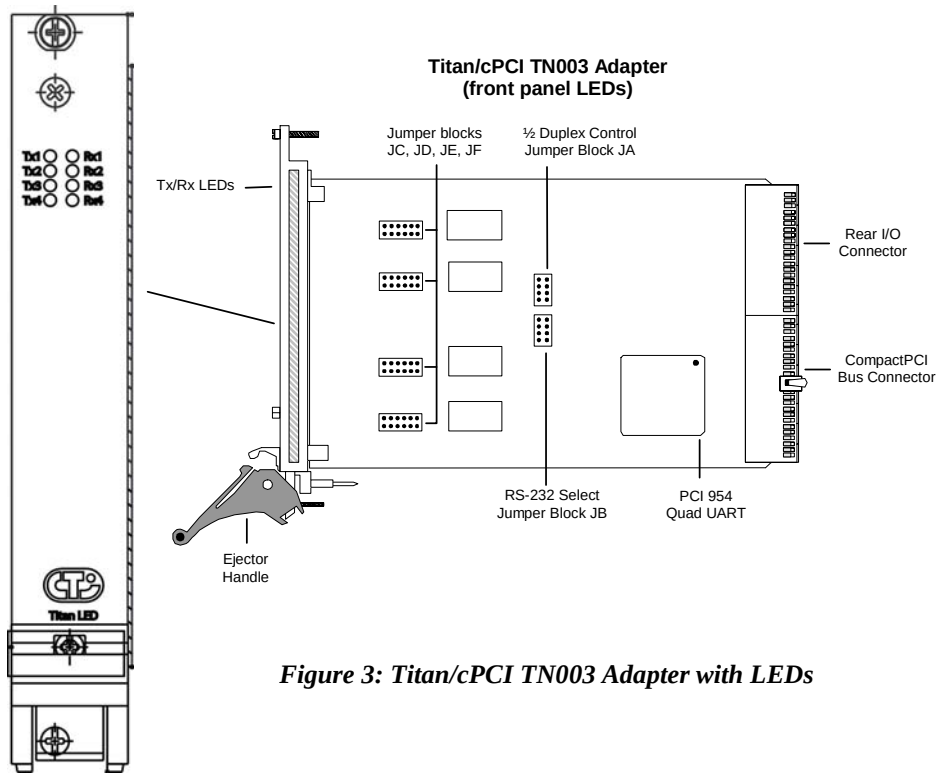


Figure 3: Titan/cPCI TN003 Adapter with LEDs

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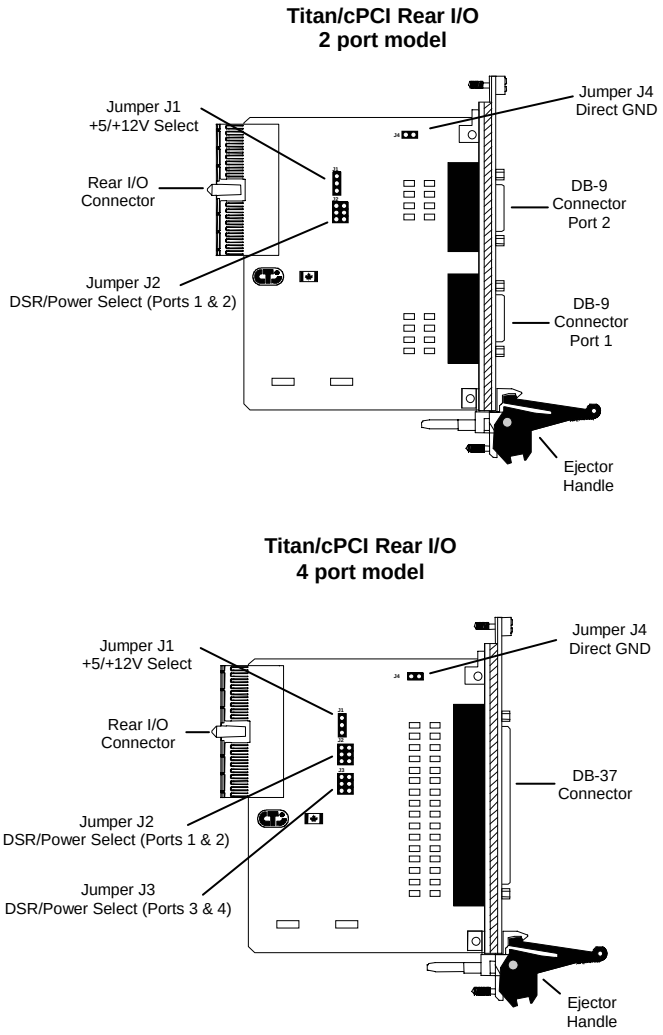


Figure 4: Titan/cPCI Rear I/O two and four port adapters

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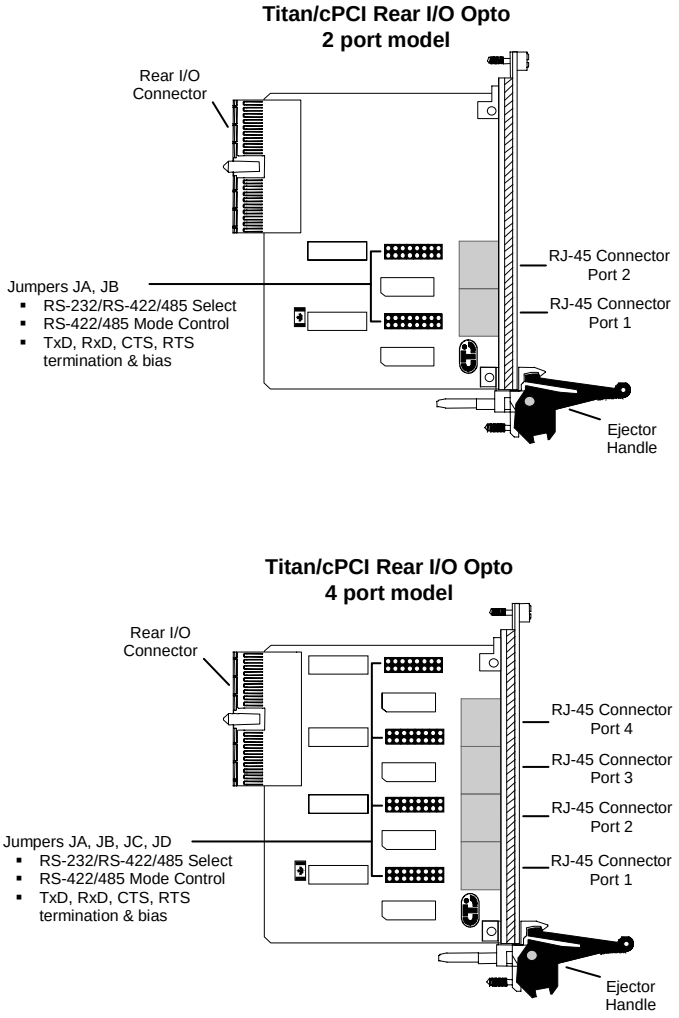


Figure 5: Titan/cPCI Rear I/O Opto two and four port adapters.

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

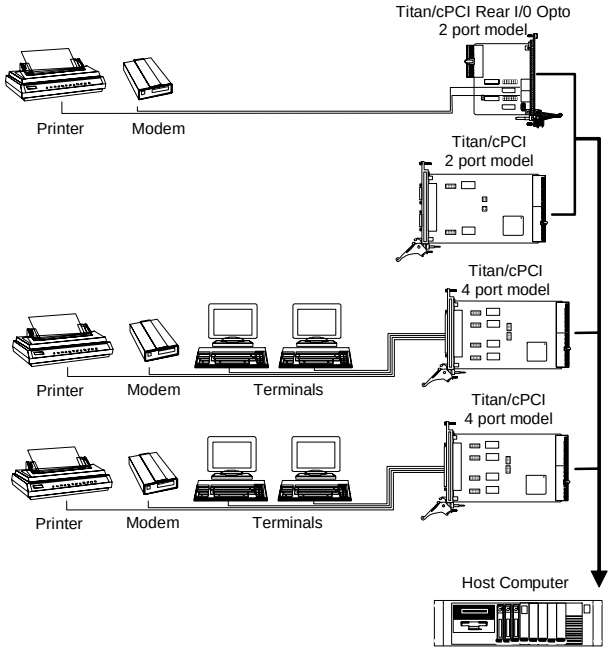


Figure 6: 10-port configuration using Front and Rear I/O

Note:
When you have a Titan/cPCI Rear I/O adapter installed the corresponding number of Titan/cPCI ports in the front I/O section are not available.

Titan/cPCI Software

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

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Installing the Titan/cPCI adapter in your system

Titan/cPCI and Rear I/O adapters

To install your Titan/cPCI or Rear I/O adapter in your computer follow these steps:

1. Turn off the power 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 front 3U slot or insert your Titan/cPCI Rear I/O adapter into an available rear 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.
5. With a screwdriver, fasten the screw on the top of the panel into the card cage for added mechanical security.



Your Titan/cPCI and Rear I/O adapters are 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.

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Configuring the Titan/cPCI

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.

Important Configuration Note:
The Titan/cPCI and the Titan/cPCI with front LEDs must be configured for RS-485 to operate with the **Titan Rear I/O Opto**. This is configured via jumper blocks on the Rear I/O Opto. **You must remove ALL jumpers on the front I/O Titan/cPCI when you are using the Rear I/O Opto.**

Baud Rate Selection

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

RS-422/485 Line Interface

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

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-422/485 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-422/485 Line Interface** for the jumper settings associated with this function.

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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-422/485 Line Interface** for the jumper settings associated with this function.

Line Termination

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

Software Installation

Introduction

Titan/cPCI boards are standard multi-port serial adapters that utilize 16C950 UARTs. In many cases, users have software that will interface directly to the Titan/cPCI boards. Many operating systems come with handlers to control access to multiple 8250 style UARTs. Titan/cPCI adapters currently ship with device drivers for the following operating systems:

- QNX 4
- QNX 6
- Windows NT
- Linux

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.

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

Technical Tips:
Your Titan/cPCI 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.

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.

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Appendix A: Specifications

Operating Environment

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

Power Requirements

- ***Titan/cPCI, Titan/cPCI Rear I/O (2 port models):***
  +5 VDC +/-5% @ 350 mA typical
- ***Titan/cPCI, Titan/cPCI Rear I/O (4 port models):***
  +5 VDC +/-5% @ 550 mA typical
- ***Titan/cPCI Rear I/O Opto (2 port model):***
  +5 VDC +/-5% @ 425 mA typical
- ***Titan/cPCI Rear I/O Opto (4 port model):***
  +5 VDC +/-5% @ 900 mA typical

CompactPCI Bus Interface

- ***Titan/cPCI:*** One 3U cPCI slot
- ***Titan/cPCI Rear I/O:*** One 3U cPCI rear I/O slot

Communications

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

Control Signals

- ***Titan/cPCI***
  RS-232: RTS; DTR; TxD; DCD; CTS; RxD, DSR, RI
  RS-422/485: RTS+/-; TxD+/-; CTS+/-; RxD+/-
- ***Titan/cPCI Rear I/O***
  RS-232: RTS; DTR; TxD; DCD; CTS; RxD, DSR or +5V or +12V, RI
  RS-422/485: RTS+/-; TxD+/-; CTS+/-; RxD+/-

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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

Optical Isolation

- ***Titan/cPCI Rear I/O Opto (2 & 4 port models):***
  3.0kV AC peak to peak on every signal of every port.

Dimensions

- 3U cPCI compliant

Connectors/Interface

- ***Titan/cPCI & Titan/cPCI Rear I/O (2 port model):***
  Male DB-9
- ***Titan/cPCI & Titan/cPCI Rear I/O (4 port model):***
  Optional cable harness with DB-37 to four male DB-9 connectors
- ***Titan/cPCI Rear I/O Opto (2 & 4 port models):***
  RJ-45

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

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Appendix B: Connectors/Pinouts

Connector Pinouts

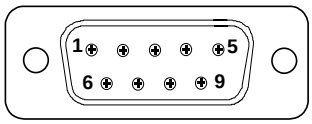
Tables 1 and 2 outline the pinouts for the Titan/cPCI and Titan/cPCI Rear I/O connectors or cable connectors.

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-422/485 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 or +5V ** or +12V **	input	CTS (-)	input
7	RTS	output	RTS (+)	output
8	CTS	input	CTS (+)	input
9	RI	input	RTS (-)	output
** This option is jumper selectable on the Titan/cPCI Rear I/O adapter only.				

Male DB-9 Connector



Cable Part Number: *CAB04DX*

Technical Tip:
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.

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Table 2: DB-37 cable connector pinouts

Pin No.	Port No.	RS-232 Signal	Direction	RS-422/485 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 or +5V or +12V **	input	CTS-	input
11	4	RI	input	RTS-	output
12	4	CTS	input	CTS+	input
13	4	RTS	output	RTS+	output
14	4	DSR or +5V or +12V **	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 or +5V or +12V **	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 or +5V or +12V **	input	CTS-	input
** This option is jumper selectable on the Titan/cPCI Rear I/O adapters only.					
Cable Part Number: *CAB04DX*					

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Table 3: *RJ-45 pinouts – Titan/cPCI Rear I/O Opto*

RJ-45 Pin No.	DB-9 Pin CABRJ4509	RS-232 Signal	Direction	RS-422/485 Signal	Direction
1	9	N/C	no connect	RTS (-)	output
2	1	N/C	input	RxD (+)	input
3	7	RTS	output	RTS (+)	output
4	5	SG	signal ground	SR	signal ref.
5	3	TxD	output	TxD (+)	output
6	2	RxD	input	RxD (-)	input
7	5	Gnd	ground	SR	signal ref.
8	8	CTS	input	CTS (+)	input
9	4	DTR	output	TxD (-)	output
10	6	N/C	no connect	CTS (-)	input
	(This cable is optional)	RJ-45 connector 			

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Appendix C: Factory Settings

Titan/cPCI Adapters

Function	**Factory Setting**
Electrical Interface	Jumper block JB is set for all ports RS-422/485 - all positions not jumpered
Half Duplex (2 wire)	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
*Please see **Figure 1** for the locations of these jumper blocks.*	

Titan/cPCI Rear I/O adapters

Function	**Factory Setting**
Electrical Interface	Jumper blocks JA, JB, JC, JD are set for all ports RS-422/485 – positions 1 not jumpered
Half Duplex (2 wire)	Jumper blocks JA, JB, JC, JD are set for all ports running in full duplex or multi-drop slave mode - positions 2 not jumpered
Termination	Jumper blocks J4 is set for no terminated or biased – positions 3, 4, 5, 6, 7, and 8 not jumpered
*Please see **Figure 4** for the locations of these jumper blocks.*	

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Titan/cPCI Rear I/O Opto adapters

Function	**Factory Setting**
Electrical Interface	Jumper blocks JA, JB, JC, JD are set for all ports RS-422/485 – positions 1 not jumpered
Half Duplex (2 wire)	Jumper blocks JA, JB, JC, JD are set for all ports running in full duplex or multi-drop slave mode - positions 2 not jumpered
Termination	Jumper blocks JA, JB, JC and JD are set for all ports not terminated or biased – positions 3, 4, 5, 6, 7, and 8 not jumpered
*Please see **Figure 5** for the locations of these jumper blocks.*	

Note to Rear I/O Opto users:
All jumpers must be removed from the Front I/O Titan/cPCI when using the Titan Rear I/O Opto.

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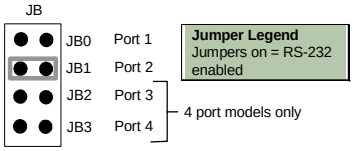
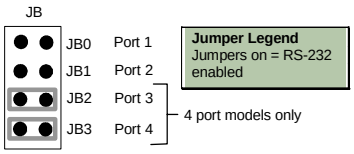
Appendix D: RS-422/485 Line Interface

Titan/cPCI adapters Electrical Interface Selection

The Titan/cPCI adapter provides jumper selectable RS-232 and RS-422/485 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-422/485 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-422/485.* 
Example 2	*This example shows the settings on jumper block JB so that ports 1 & 2 are set for RS-422/485 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 meters.*	

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Full Duplex Mode (4 wire)

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

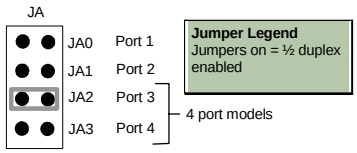
Half Duplex RS-422/485 (2 wire)

By installing pins on jumper block JA and using features in our driver software, you can run the individual RS-422/485 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 (4 wire)

By **not installing** jumpers on jumper block JA and by using features in our driver software, 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.

Example
The example below shows the settings on JA where RS-422/485 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-422/485 ports only. Please ensure that the port is set for RS-422/485 on jumper block JB.

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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-422/485 ports through jumper selectable 150 Ω fixed resistors.

Please refer to Figure 7 for a partial schematic of the RS-422/485 circuit for the Titan/cPCI and to Figure 1 for the locations of JC, JD, JE and JF.

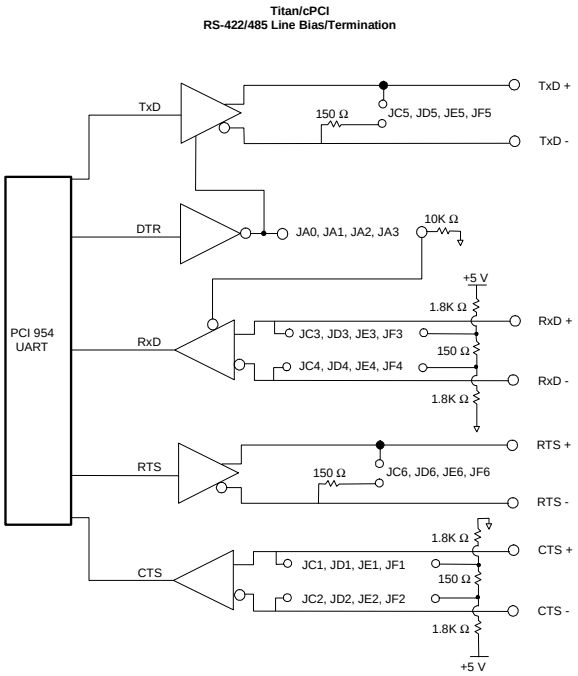


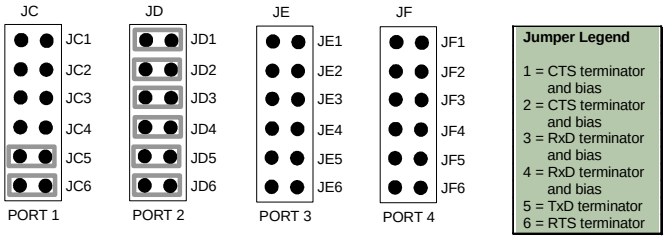
Figure 7: RS-422/485 Partial Schematic

Note: Line bias/termination is jumper selectable

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Example

The following example shows the settings on JC, JD, JE and JF where RS-422/485 port 1 is terminated on RTS ± and TxD ±, the RS-422/485 port 2 is set for bias/termination on RTS ±, TxD ±, CTS ±, and RxD ±, the RS-422/485 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).*

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Titan/cPCI Rear I/O Opto 2 and 4 port adapters

- The four port Rear I/O Opto requires a four port Front I/O Titan to be installed.
- The two port Rear I/O Opto requires a two port Front I/O Titan to be installed.
- In either case, when using the Titan/cPCI Rear I/O Opto, the front I/O Titan/cPCI board must be configured for RS-485, with **no bias or termination jumpers** installed. (Ensure the front Titan/cPCI is **clear of all jumpers** if you are installing a Titan/cPCI Rear I/O Opto.)

Jumpers JA through JD	**Description**	**Position/Function**
1	RS-232/RS-485 select	In = RS-232 Out = RS-485
2	RS-485 RX tri-state control	In = ½ Duplex mode (2-wire) Out = Full or Multi-drop (4-wire) mode
3	RS-485 RTS +/- Termination resistor	RS-485 RTS+/- Terminator resistor, 150 ohms
4	RS-485 TxD +/- Termination resistor	RS-485 TXD+/- Terminator resistor, 150 ohms
5	RX485 CTS +/- Bias and Termination network	RS-485 CTS+/- Bias and termination. Both jumpers must be installed at the same time.
6	RX485 CTS +/- Bias and Termination network	RS-485 CTS+/- Bias and termination. Both jumpers must be installed at the same time.
7	RX485 RXD +/- Bias and Termination network	RS-485 RXD+/- Bias and termination. Both jumpers must be installed at the same time.
8	RX485 RXD +/- Bias and Termination network	RS-485 RXD+/- Bias and termination. Both jumpers must be installed at the same time.

Table 4: Titan/cPCI Rear I/O Opto jumper descriptions

Note for Rear I/O Opto users:
All jumpers must be removed from the Front I/O Titan/cPCI when using the Titan Rear I/O Opto.

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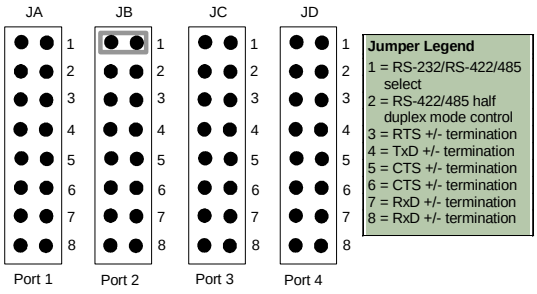
Titan/cPCI Rear I/O Opto Electrical Interface Selection

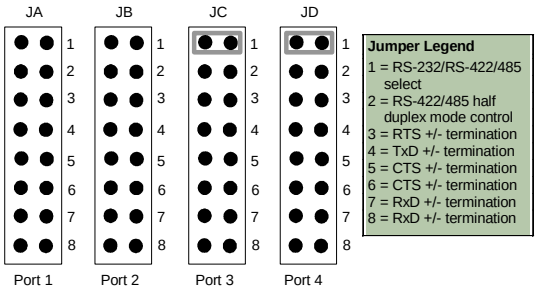
The Titan/cPCI Rear I/O Opto adapter provides jumper selectable RS-232 and RS-422/485 electrical interfaces on each port**.**

Jumper blocks JA, JB, JC, JD set the electrical interfaces for the individual ports. Jumpers installed across the pins at position 1 on jumper blocks JA, JB, JC, JD enable the RS-232 interface for that port, while jumpers not installed across these pins enable the RS-422/485 interface for that port**.** **Figure 5** shows the location of jumper blocks JA, JB, JC, JD.

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's Technical Support.

Example 1	*This example shows the settings on jumper blocks JA, JB, JC, JD of the Rear I/O Opto so that port 2 is set for RS-232 and ports 1, 3, 4 are set for RS-422/485.*
Example 2	*This example shows the settings on jumper block JA, JB, JC, JD so that ports 1 & 2 are set for RS-422/485 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 meters.

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Full Duplex Mode (4 wire)

Ensure J1 and J2 for the specific port is removed. You must also ensure that the configuration software does NOT have the ½ duplex or multi-drop slave mode enabled.

Half Duplex RS-422/485 (2 wire)

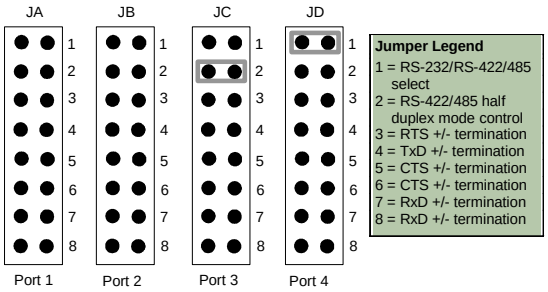
Ensure J1 for the specific port is removed, and that J2 for the specific port is installed. Use the configuration software to enable the ½ duplex mode.

Multi-drop Slave Mode (4 wire)

Ensure J1 and J2 for the specific port is removed. Use the configuration software to enable the ½ duplex or Multi-drop slave mode.

Example

The example below shows the settings where RS-422/485 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 set for RS-232.



Technical Note:
Full duplex, multi-drop slave and half duplex modes apply to RS-422/485 ports only. Please ensure that the port is set for RS-422/485.

Line Termination

You can use jumper blocks JA, JB, JC and JD to terminate and bias RxD ± and CTS ± on the individual RS-422/485 ports through a jumper selectable resistor network.

You can terminate TxD ± and RTS ± with a jumper selectable 150 Ω resistor.

Please refer to Figure 8 for a partial schematic of the RS-422/485 circuit for the Titan/cPCI Rear I/O Opto adapter and to **Figure 5** for the locations of JA, JB, JC and JD.

Note:
Line termination and bias must be removed for RS-232 operation.

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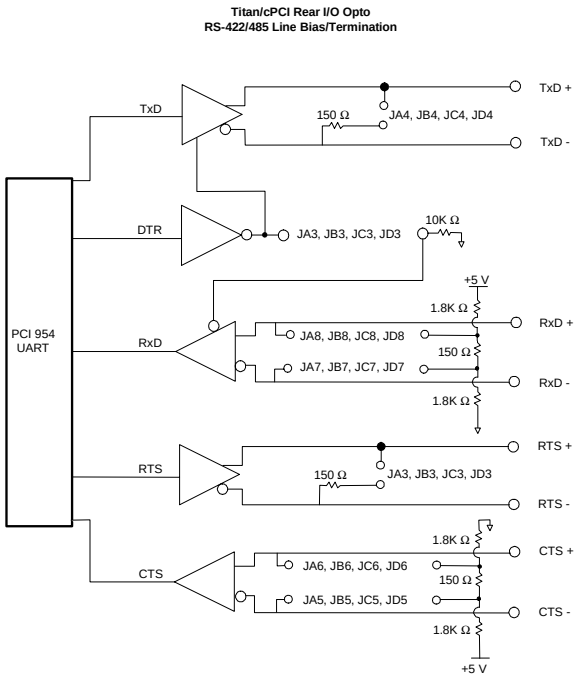


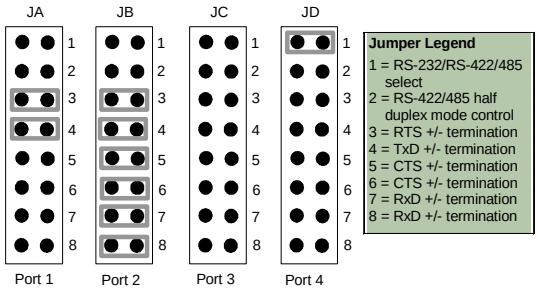
Figure 8: ***RS-422/485 partial schematic for Rear I/O Opto***

Note
Line bias/termination is jumper selectable

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Example

The following example shows the settings on JA, JB, JC and JD where port 1 is terminated on RTS ± and TxD ±, the RS-422/485 port 2 is set for bias/termination on RTS ±, TxD ±, CTS ±, and RxD ±, the RS-422/485 port 3 is not terminated, and port 4 is set for RS-232 and therefore should not be terminated



Technical Notes:

1. *For full duplex, half duplex and multi-drop slave you can jumper position 2 on the jumper block.*
2. *For RS-232 port jumper position 1 on the jumper block.*

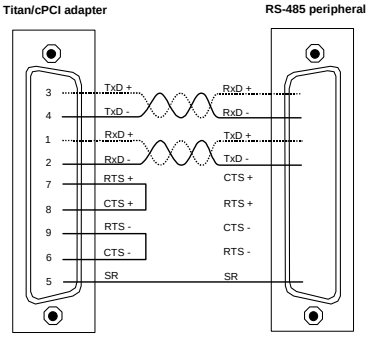
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RS-422/485 Cable Wiring

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

Figure 8 depicts a 4 wire cabling scheme between a port on the Titan/cPCI adapter to a port on the RS-422/485 peripheral.

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

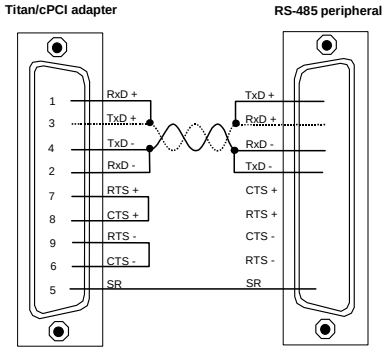


Technical Tip
The RS-422/485 electrical interface consists of a differential signaling scheme. **You should always connect the signals with twisted pairs**

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Figure 9 depicts a 2 wire cabling scheme between a port on the Titan/cPCI 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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