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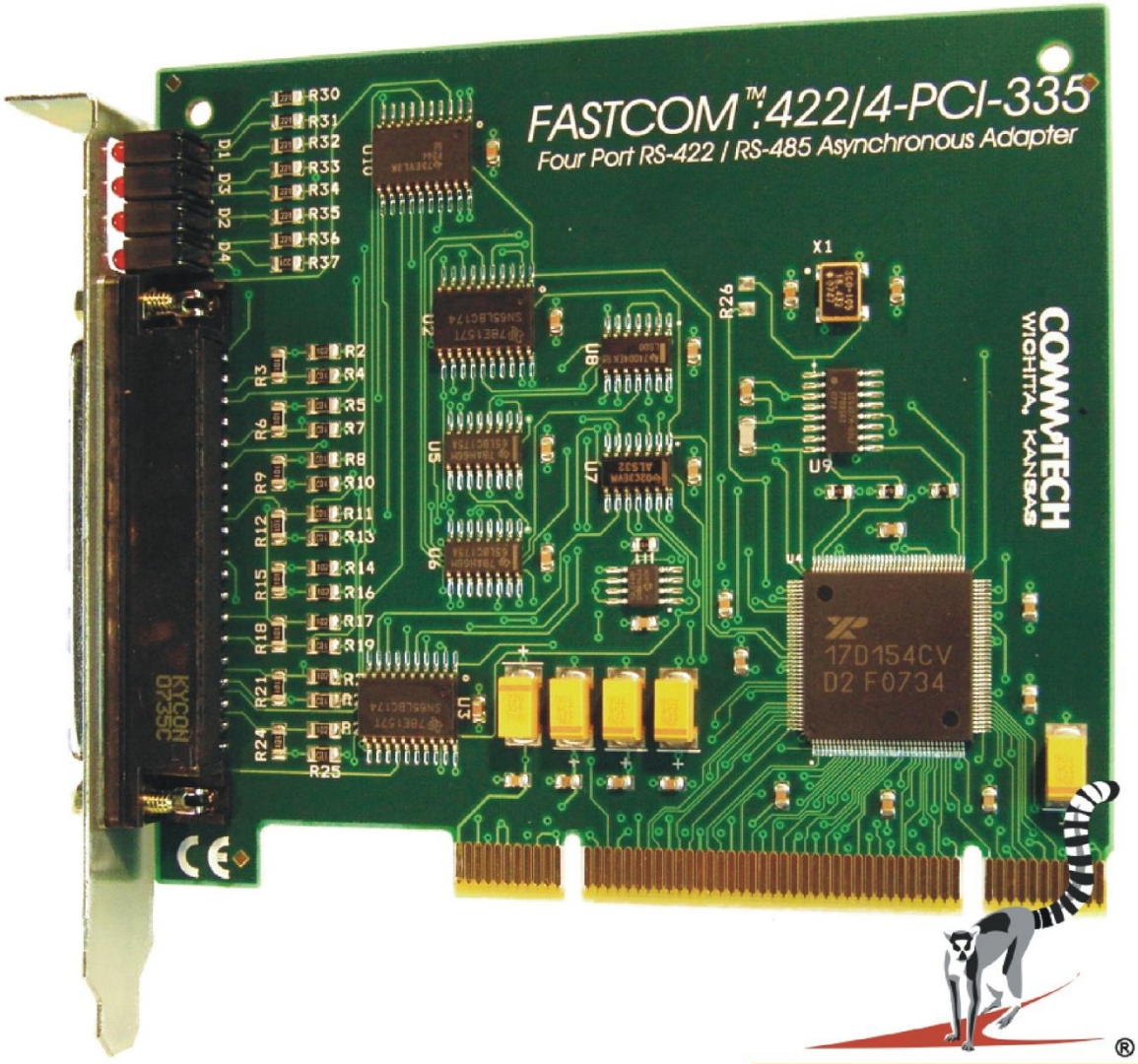
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Find the *Commtech 422/4-PCI* at our website: ***Click HERE***

FASTCOM® ADAPTERS

FASTCOM®: 422/4-PCI-335

Four Channel RS-422/RS-485 Interface for Universal PCI Bus Hardware Reference Manual



CERTIFIED CE

COMMTECH, INC.
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REVISION NOTES

REVISION	PAGE NUMBER	CHANGES MADE
1.0		Document created
1.1	10	CTS+/- pin numbers swapped Fix page numbers in TOC
1.2	9	Added to the serial settings description
1.3	16	Changed warranty to limited lifetime
1.4	1	Updated “CE” certificate
1.5	16	Updated Limitation of Liability

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EUROPEAN UNION DECLARATION OF CONFORMITY
Information Technology Equipment

The Company COMMTECH, INC. declares under its own and full responsibility that the product

" Fastcom 422/4-PCI-335 - Revision 1.3 "

on which is attached this Certificate is compliant to the "89/336/EEC" Directive, amended by 92/31/EEC and 93/88/EEC.

[ ] The product identified above complies with the requirements of the above EU Directive by meeting the following standards:

- EN 50081-1 (1992) EMC Generic Emission Standard - Part 1, Residential, Commercial and Light Industry
  - EN 55022 (1995), CISPR 22 (1993) Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment, 30 MHz - 1 GHz, Class B Limits

- EN 50082-1 (1992) EMC Generic Immunity Standard - Part 1, Residential, Commercial and Light Industry
  - IEC 801-2 (1984), Method of Evaluating Susceptibility to Electrostatic Discharge, Level 4
  - IEC 801-3 (1984), Radiated Electromagnetic field Requirements, Level 3
  - IEC 801-4 (1988), Electrical Fast Transient/Burst Requirements, Level 2

Products listed on this declaration are exempt from the requirements of the 73/23/EEC directive due to the input voltage specification as stated in Article 1 of the directive.

The technical documentation required to demonstrate that this product meets the requirements of the EMC Directive has been compiled by the signatory below and is available for inspection by the relevant enforcement authorities.

In WICHITA, KS on April 1st of 2011

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INTRODUCTION

The new Fastcom Universal PCI Bus, Asynchronous RS422/485 adapter utilizes the latest technology to live up to today's requirements for high bandwidth requirements in communication systems. The new Fastcom: 422/4-PCI-335 is capable of operating at virtually any baud rate up to an astounding maximum serial data rate of 6.25 Mbps. There is no fine print or asterisks pointing to notes; this card is capable of running at the maximum data rate, without any jumpers or hardware changes, right out of the box.

Designed to comply with the latest PCI specifications, the Universal PCI adapter will operate in both 5V and 3.3V PCI slots. This means the card will work in the high speed PCI-X slots that commonly found in most new servers as well as the standard PCI slots in desktop PC's. This flexibility allows for a single serial interface board to be used across a wide range of different types of computers including both current and future computing systems.

The Fastcom: 422/4-PCI-335 adapter utilizes an advanced quad Universal Asynchronous Receiver and Transmitter (UART). Each channel of the 17D154 UART is independently controlled and has its own 16C550 compatible register set. Each UART contains its own receive and transmit FIFOs of 64 bytes with programmable trigger levels.

Each of the four UART channels on the board can be independently configured as either RS-422 or RS-485 for full or half-duplex communication. This is implemented using an automatic RS-485 transmitter enable/disable function that permits the hardware itself to regulate data flow by only driving lines while actively transmitting. This provides increased speed and convenience over the older software controlled method, while still allowing the use of the software method of flow control. Optionally, in automatic RS-485 mode, the receiver can be disabled during transmits to avoid a receive echo, common in 2-wire 485 networks.

Additionally, each board utilizes a programmable clock generator to create the UARTs input frequency. The clock generator is capable of generating frequencies between 6 and 50 MHz. Utilizing this feature, it is possible to configure the board to operate at virtually any serial data rate that the user desires (up to 6.25 Mbits/second maximum).

With the supplied software driver, the ports on the Fastcom: 422/4-PCI-335 will be seen as standard COM ports and can utilize all the same functions as a standard serial device. With the addition of a few simple IO commands to control the unique features of the board, the standard software interface to a serial port can be used to simplify program design. Example C programs are provided to demonstrate how to effectively use serial interface as well as control the board specific features.

Overall, the new Fastcom: 422/4-PCI-335 Universal PCI Bus RS-422/485 adapter is the ideal board for commercial and industrial applications demanding high data rates, reliability and ease of use.

Software drivers for Windows 2000/XP and Linux are supplied. Multiple Fastcom: 422/4-PCI-335 adapters can be installed in all operating systems.

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Specifications

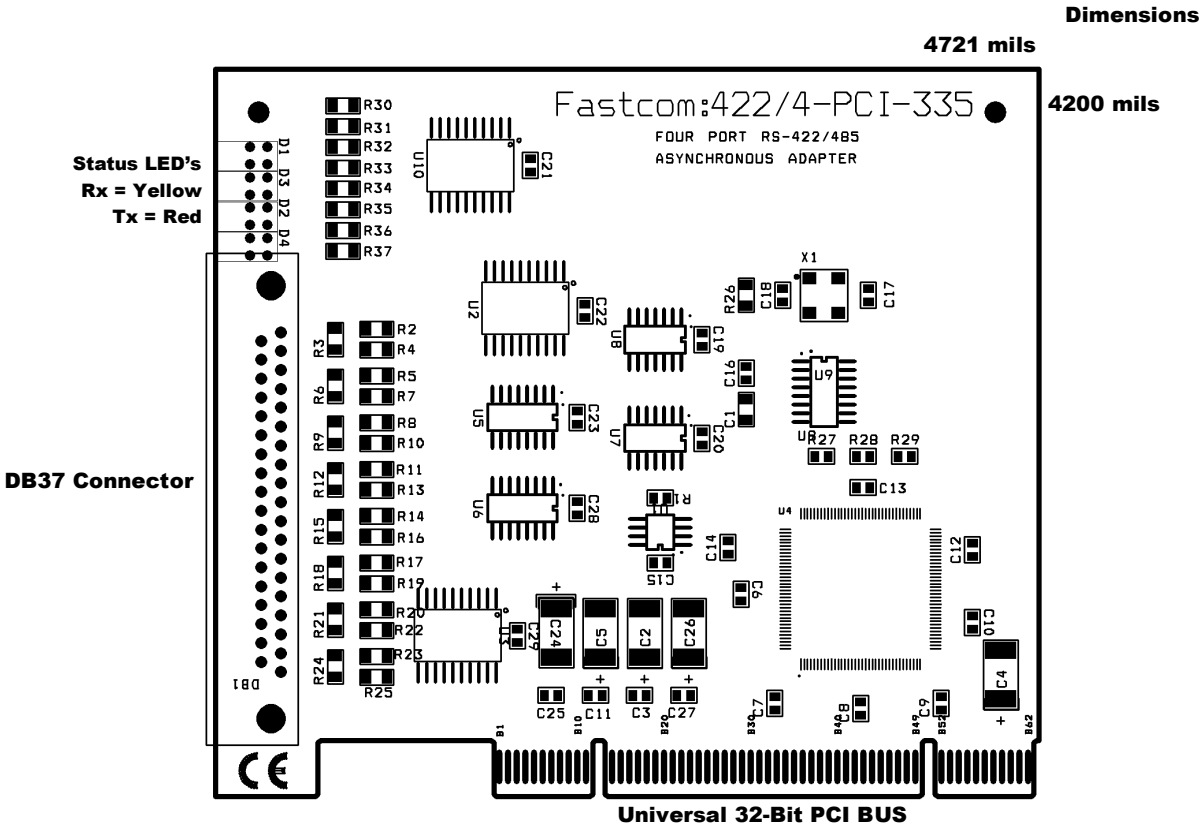
UART:	Exar 17D154
OS Support:	Windows XP, 2000, Linux
Data Rates:	All baud rates up to 6.25Mbit/s
Buffering:	64 byte Tx FIFO each channel 64 byte Rx FIFO each channel
Drivers/Receivers:	High Speed RS-422
Interface:	RS-422 / RS-485
Signals:	Tx±, Rx±, RTS±, CTS±
Connector Configuration:	DB37 male to 4 DB9 female
Bus Interface:	32-bit PCI Version 2.3
Power Requirements:	600mA @ +5V (typical)
Certification:	FCC compliant, CE marked
Operating Temperature Range:	0°C to 70°C
Humidity:	0 to 90% (non-condensing)

Features

- ✓ **New high performance UART**
  - ➢ Standard or the Fastcom: 422/4-PCI-335
  - ➢ All baud rates up to 6.25 Mbits/sec
  - ➢ 64 byte FIFO for improved throughput
  - ➢ Four independent channels
  - ➢ Hardware control for 485 drivers
- ✓ **Software programmable baud rates**
- ✓ **Switchless design for durability and reliability**
- ✓ **Status LED's for system development / debugging**
- ✓ **Hardware Rx echo cancel available in RS485 mode**
- ✓ **Durable cables with RFI shielding**
- ✓ **Hardware documentation, software, and example programs provided on the Fastcom CD**
- ✓ **Made in Wichita, Kansas USA**

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BOARD LAYOUT



PACKING LIST

Fastcom: 422/4-PCI-335 Card
422/4 Cable Assembly
Fastcom CD

If an omission has been made, please call customer service at 316-636-1131 for a replacement.

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INSTALLATION

Hardware Installation

Important: Static electricity can harm system boards. Perform service at an ESD workstation and follow proper ESD procedure to reduce the risk of damage to components. Commtech, Inc. strongly encourages you to follow proper ESD procedure, which can include wrist straps and smocks, when handling Fastcom: 422/4-PCI-335 boards.

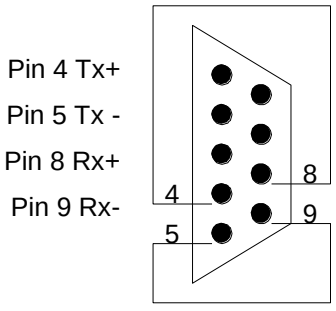
1. Turn off PC power. Disconnect the power cord.
2. Remove the PC case cover (if applicable).
3. Unpack the Fastcom: 422/4-PCI-335. Keep the box and static bag for warranty repair returns.
4. Select an open PCI slot in your PC.
5. After removing the blank bracket from your PC, install the Fastcom: 422/4-PCI-335 in the PC by pressing it firmly into the slot. Install the bracket screw to hold it firmly in place.
6. Re-install the cover on your PC.
7. Refer to Software Installation in the next section for information on installing the software for the board.

Software Installation

1. Click here to open the Installation Manual located on your Fastcom CD. If you do not have the Fastcom CD, you can click here to download the installation manual from our web site.
2. Find Fastcom-Async-PCI-335 series cards select your operating system and follow the instructions to install the software for your board.
3. When you are finished, select Fastcom: 422/4-PCI-335 from the list at the end of the Fastcom-Async-PCI series section to return to this manual.

TESTING THE INSTALLATION

To fully test the installation of your Fastcom: 422/4-PCI-335, you will need to build a "loop back plug". Materials needed are a DB9 male plug, solder cup style, and two short pieces of 20 or 24 AWG stranded wire. This loop back plug can be used to test any RS-422 port. Jumper the pins together on the DB9 as illustrated below:



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Testing the Fastcom Async PCI Port in Windows

These instructions assume that you have already installed the card and have followed the installation instructions. The Device Manager should show the boards/ports that are installed, and the COM numbers assigned to those ports.

1. Attach the supplied 422/4 Cable Assembly to the DB37 connector. Install the loopback plug on the port to test.
2. Open an MS-DOS or Command prompt windows and change to the directory `(C:\> cd directoryname )` where you saved the Fastcom software files that were either copied from the CD or downloaded from our website. Change to the examples directory, then change to the loop_back directory.
3. Type: `loop_back X` Where X is the COM port you wish to test.
4. This test will transmit data out of the specified COM port and receive the data on the same port, checking to see that the data is still the same.

If you get error messages during the loop_back test, some possible reasons are:

1. You have an incorrect or faulty loop back plug construction or a bad connection. Verify that the wiring is correct in your plug and correct any problems you may find.
2. The Fastcom board did not install correctly. Open the Device Manager (Start -> Run -> devmgmt.msc -> OK). Expand the “Multiport Serial Adapter” tab and double click on the Fastcom device listed in that class. Verify that the Device Status box on the General class lists “The device is working properly.”
3. The Fastcom ports did not install correctly. Open the Device Manager (Start -> Run -> devmgmt.msc -> OK). Expand the “Ports (COM & LPT)” class and double click on the Fastcom ports listed in that class. Verify that the Device Status box on the General tab lists “The device is working properly.”
4. The loop back plug is not connected to the correct port/cable.

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FASTCOM ASYNCPCI-335 SERIAL SETTINGS

The Serial Settings property page can be found by opening the Device Manager (Start -> Run -> devmgmt.msc -> OK), expanding the “Ports (COM & LPT)” class and double clicking on one of the installed “Fastcom Async335 Communications Port” devices, and then clicking on the “Fastcom AsyncPCI-335 Serial Settings” tab.

Each port on the Fastcom board has all of the settings available to it. However there are two options that will affect all other ports on that particular Fastcom board: Clock Generator Frequency and Rx Echo Cancel. All other settings are will affect only the selected port.

Clicking on each individual setting will bring up a description of the setting in box at the top of the page. This is a slightly more detailed version of those same descriptions.

- **Clock Generator Frequency**
  The clock generator frequency divided by the sampling rate will directly determine the maximum available bit rate that you may use with the Fastcom board. It works like this: Windows must be able to divide the clock frequency by the sampling rate and then by any whole number and get to your bit rate as the answer. By default, the clock is set to 14.7456 MHz (14745600 Hz). This frequency can be divided by whole numbers to get all of the standard bit rates (i.e. 9600, 19200, 115200, etc). Minimum = 6 MHz, Maximum = 50 MHz.

  For Example:

  Frequency / Sampling rate (8 or 16) / n = bit rate

  14,745,600 / 16 / 96 = 9600

  This setting is global. Changing the clock generator frequency will affect all Fastcom ports on the board. Setting the clock for one port will set it for all port of the same board.

- **Rx Echo Cancel**
  When configured to operate on a 485 network, the card’s receive and transmit lines are tied together to make a single data line. Because of this, every time data is transmitted out of the port, it will simultaneously be received on the same port. Enabling Rx Echo Cancel will turn off the receiver during all transmits, eliminating this simultaneous echo. 485 transmit control must be enabled to use this feature. This is accomplished in hardware not software; it will not affect performance.

  This setting is global. Enabling or disabling this option will affect all other ports on the board.

- **Sampling Rate**
  Determines the number of times a data bit is sampled. It can be set to either 8 or 16 on a per port basis. It is used in conjunction with clock generator frequency to determine attainable bit rates. As a general rule, if your bit rate will be less than or equal to 3.125 Mbits/sec you should use 16 times sampling. 8 times sampling should only be used if you wish to run at bit rates over 3.125 Mbits/sec.

- **Max Baud**
  This field reads the values that you have entered in the clock generator box and the sampling box and calculates the maximum bit rate possible using those settings. The formula used to calculate the maximum bit rate looks like this:

  Frequency / Sampling = Maximum bit rate

  Or

  Frequency / Sampling rate (8 or 16) / 1 = Max bit rate

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- **Hardware Auto 485**
  Turns on or off hardware auto 485 direction control. It will automatically de-assert RTS following the last stop bit of the last character that has been transmitted. This setting affects only the selected port. This is accomplished in hardware not software; it will not affect performance.

- **485 Transmit Control**
  Turns on or off auto 485 transmitter enable control. The line driver will be enabled at the beginning of a transmit, and when finished transmitting the line driver will be disabled. Must enable Hardware Auto 485 to use this feature. This setting affects only the selected port. This is accomplished in hardware not software; it will not affect performance.

- **Rx FIFO Trigger Level[1]**
  The Rx FIFO level generates an interrupt whenever the receive FIFO level rises above this preset trigger level (high water mark). Raising or lowering this value can help to reduce the number of interrupts generated by the Fastcom port during receives. This setting affects only the selected port. Modify this value only if necessary in your application or if the receiver is generating too many interrupts for your CPU to handle.

- **Tx FIFO Trigger Level[1]**
  The Tx FIFO level generates an interrupt whenever the transmit FIFO level falls below this preset trigger level (low water mark). Raising or lowering this value can help to reduce the number of interrupts generated by the Fastcom port during transmits. This setting affects only the selected port. Modify this value only if necessary in your application or if the transmitter is generating too many interrupts for your CPU to handle. Tx FIFO Trigger + Tx Write Size must not exceed 64.

- **Tx Write Size[1]**
  Tx Write Size is the number of bytes that get written to the Tx FIFO when the low water mark is reached. Raising or lowering this value can help to reduce the number of interrupts generated by the Fastcom port during transmits. This setting affects only the selected port. Modify this value only if necessary in your application or if the transmitter is generating too many interrupts for your CPU to handle. Tx FIFO Trigger + Tx Write Size must not exceed 64.

- **Software 9-Bit Mode**
  Turns on or off software 9-bit mode emulation. A feature of some UARTS and microcontrollers "MCS-51 9-bit format." If you don't know what this is, you probably do not want to use it.

- **Return 9-Bit data**
  Turns on or off the returning of the 9th data bit as its own character. A feature of some UARTS and microcontrollers "MCS-51 9-bit format." If you don't know what this is, you probably do not want to use it.

- **Custom Speed**
  When enabled, this allows you to use a non-standard, custom baud rate inside of an application that does not support custom rates. When this is enabled, the 9600 baud rate will be overridden with the Max Baud rate. Just select a baud rate of 9600 in your application and you will get whatever rate you have in the Max Baud field.

[1] The results of changing the Rx FIFO Trigger, Tx FIFO Trigger, and Tx Write Size will depend entirely upon the host PC. What lowers the number of interrupt requests on one PC will raise the number of interrupt requests on another PC. You will have to experiment with these values to find the settings that yield the best performance with the lowest number of interrupt requests that must be serviced by your CPU. If you do not experience problems using the card in you PC, you should leave these at their default settings.

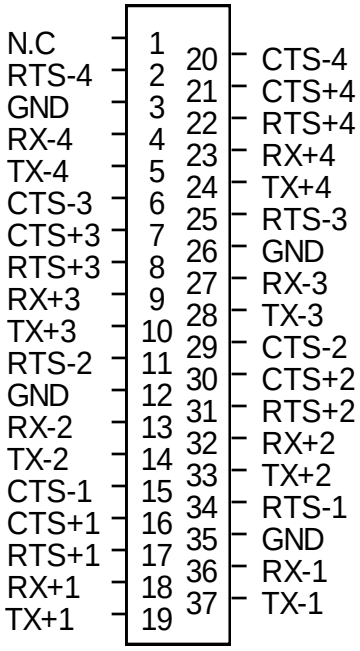
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FASTCOM: 422/4-PCI-335 ADAPTER CABLE

We provide access to the four channels of the FASTCOM: 422/4-PCI-335 through a shielded DB37 connector and an adapter cable (supplied with the board). The adapter cable consists of a DB37 male plug fanning out to four standard DB9 female receptacles.

DB37 Pin Description

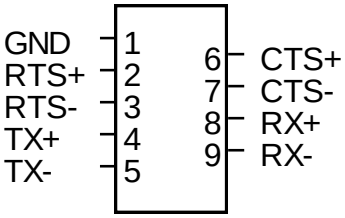


DB9 Pin Description

The FASTCOM: 422/4-PCI-335 features four RS-422/RS-485 channels, which are accessed through four DB9 connectors on the cable assembly.

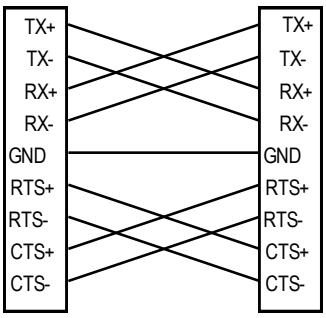
The following is a pin description of the DB9 connectors:

PIN NO.	SIGNAL NAME	DIRECTION
1	SIGNAL GROUND (GND)	GROUND
2	READY TO SEND (RTS) +	OUTPUT
3	READY TO SEND (RTS) –	OUTPUT
4	TRANSMIT DATA (TX) +	OUTPUT
5	TRANSMIT DATA (TX) –	OUTPUT
6	CLEAR TO SEND (CTS) +	INPUT
7	CLEAR TO SEND (CTS) -	INPUT
8	RECEIVE DATA (RX) +	INPUT
9	RECEIVE DATA (RX) –	INPUT



Cable

We recommend using vinyl jacketed, shielded, multiple twisted pair cable (24 AWG wire) for use with the FASTCOM: 422/4-PCI-335. The following cable illustration shows how to connect two RS-422 devices. Note that disabling handshaking can eliminate CTS/RTS lines.



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PROGRAMMING

To interface with the serial ports on the Fastcom: 422/4-PCI-335 in a Windows application, your code will use the standard Win32 COM API. Documentation pertaining to how to use the Win32 API is beyond the scope of this document. For more information on using the API, refer to the “Using Communications Resources” in the MSDN.

In addition to the Win32 API, you can also use several special Fastcom specific commands that allow you to accomplish all of the options from the Fastcom AsyncPCI-335 Serial Settings property page. These commands as well as the custom structures used in them are defined in the fcapi.h header file.

Fastcom AsyncPCI-335 Serial Setting	**DeviceIOControl *dwIoControlCode***
Clock Generator Frequency	IOCTL_FASTCOM_SET_CLOCK
Rx Echo Cancel	IOCTL_FASTCOM_SET_RXECHO
Sampling Rate	IOCTL_FCPORT_SET_SAMPLING
Hardware Auto 485	IOCTL_FCPORT_SET_RS485
485 Transmit Control	IOCTL_FCPORT_SET_485_TXEN
Tx FIFO Trigger Level	IOCTL_FCPORT_SET_RXTX_TRIG
Tx FIFO Trigger Level	IOCTL_FCPORT_SET_RXTX_TRIG
Tx Write Size	IOCTL_FCPORT_SET_RXTX_TRIG

Refer to the AsyncPCI335\examples directory on the Fastcom CD or in the downloaded zip file for some example C programs that demonstrate how to use the Fastcom specific serial settings as well as give a general sense of how to use the Win32 API.

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RS422 / RS485

Most engineers have worked with RS-232 devices at least once in their career. If you have never worked with RS-422 or RS-485 devices, you will be pleased to know that working with the FASTCOM: 422/4-PCI-335 is not much different from working with a standard RS-232 device.

The RS-422 standard was developed to correct some of the deficiencies of RS-232. In commercial and industrial applications, RS-232 has some significant problems. First, the cable length between RS-232 devices must be short (usually less than 50 feet at 9600 baud). Second, many RS-232 errors are the result of cables picking up normal industrial electrical noises such as fluorescent lights, motors, transformers, and other EMF sources. Third, RS-232 data rates are functionally limited to 19.2K Baud. On the other hand, the newer RS-422 standard makes cable lengths up to 5000 feet possible and is highly immune to most industrial noises. Data rates are also improved -- the FASTCOM: 422/4-PCI-335 features data rates up to 6.25 Mbit/sec. These improvements were made possible by differentially driving and receiving the data as opposed to the single ended method employed by the RS-232 standard. With the RS-422 standard, the transmit signal (TX in RS-232) is a differential signal consisting of TX+ and TX-; the receive signal (RX in RS-232) consists of RX+ and RX-.

Another draw back of RS-232 is that more than two devices cannot share a single cable. This is also true of RS-422, and that's why the RS-485 standard was developed. RS-485 offers all of the benefits of RS-422 and also allows multiple units (up to 32) to share the same “twisted pair” of wires (see diagram on next page). RS-485 is often referred to as a "multi-drop" or "two-wire, half duplex" network. In order for an RS-485 system to work, only one driver (transmitter) can occupy the network at a time. This means that each station on the network must control the enabling/disabling of their drivers in order to avoid network conflicts. If two drivers engage the network at the same time, data from both will be corrupted. In RS-485 mode, the receivers are always enabled.

For a more detailed description of RS-422 and RS-485, we recommend the following references:

> LINEAR AND INTERFACE CIRCUITS APPLICATIONS, Volume 2: Line Circuits, Display Drivers. By D.E. Pippenger and E. J. Tobaben. Published 1985 by Texas Instruments. ISBN-0-89512-185-9
>
> Note: This book may be difficult to find in a bookstore. The best place to get it is directly from Texas Instruments or from one their component dealers. Publication # SLYA002.
>
> "Driver/Receiver Family Extends Data-Link Performance", ELECTRONIC PRODUCTS, January 15, 1985. By Dale Pippenger and Joe Miller

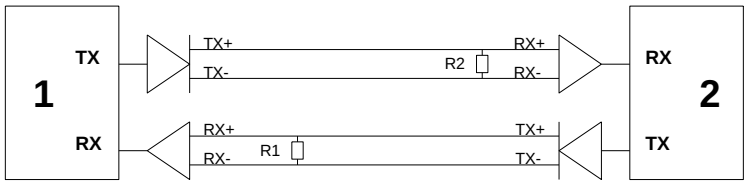
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Termination Resistance

In both the RS-422 and the RS-485 mode, the receiver end of the cable between two stations must be terminated with a resistor equal to the characteristic impedance of the wire. This is to prevent signal reflections in the wire and to improve noise rejection. However, **you do not need to add a terminator resistor to your cables when you use the Fastcom: 422/4-PCI-335. The termination resistance is built in.** We have installed a terminator resistor for each receiver: between RX+ and RX- and between CTS+ and CTS- for each channel.

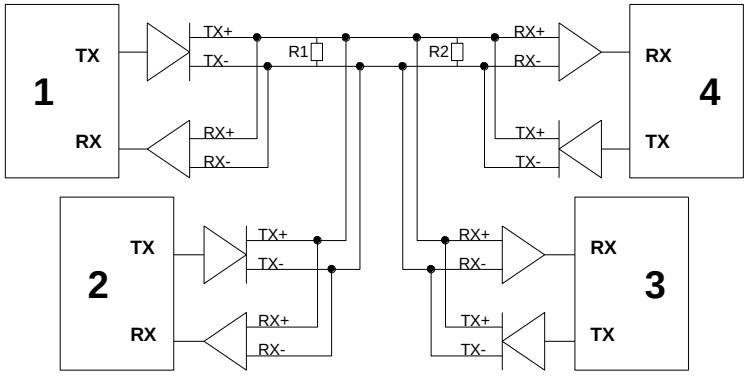
If you are using the Fastcom: 422/4-PCI-335 in a multi-drop network, the termination resistor should be removed from all units except the first and last (see the RS-485 illustration below). Call for technical support if you need to modify the resistor. You may also order the Fastcom: 422/4-PCI-335 without the termination resistor installed (it is easier to add the resistor than to remove it). Observe the resistors in the following drawings and remember that they are built into the Fastcom: 422/4-PCI-335 (shown below):

Typical RS-422 Installation



R1 & R2 - Line Termination (100 ohms)

Typical RS-485 Installation



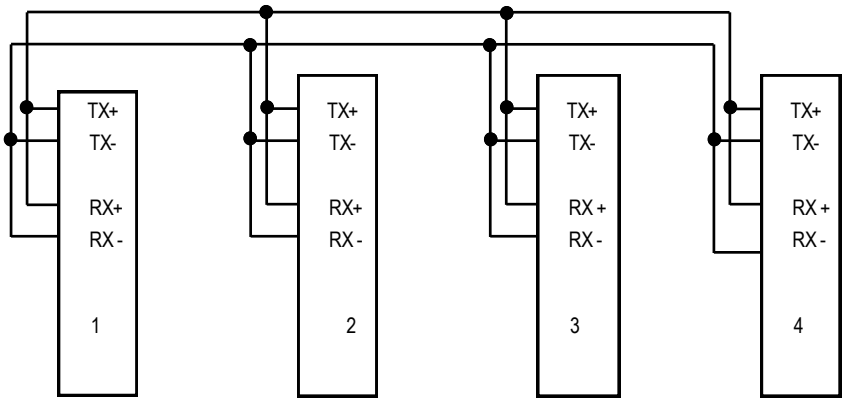
R1 & R2 - Line Termination (100 ohms)

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RS-485 Mode

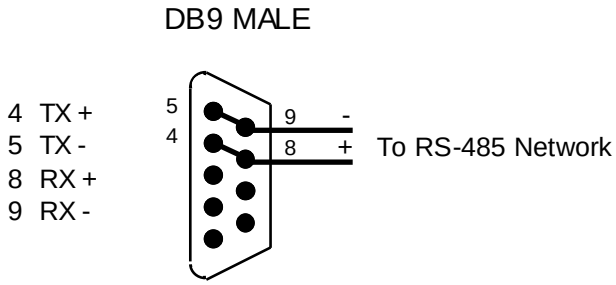
RS-485 is often referred to as a multi-drop or two-wire, half duplex network because the drivers (transmitters) and receivers share the same two lines. In fact, up to 32 stations can share the same twisted pair. In order for an RS-485 system to work, only one driver (transmitter) can occupy the network at a time. This means that each station on the network must control the enabling/disabling of its drivers in order to avoid network conflicts. If two drivers engage the network at the same time, data from both will be corrupted. In RS-485 mode, the receivers are always enabled.

The following cable illustration shows four RS-485 Devices sharing the same twisted pair:



Note: The termination resistors from Station #2 and Station #3 have been removed.

Not all RS-422 devices feature RS-485 compatibility; only RS-485 devices can be connected to the RS-485 network.



Note that when in the RS-485 mode, you will need to externally connect TX+ to RX+ and TX- to RX-.

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TECHNICAL SUPPORT

Commtech provides extensive technical support and application suggestions. Most of the problems that occur with the FASTCOM: 422/4-PCI-335 can be corrected by double-checking the switch positions, your cables and your program. We recommend that you build the loop back plug that is described in the Programming section of this manual. With that plug, you can quickly isolate the problem to the board, cables, or software.

If you still have unresolved questions, use the following procedure to get technical support:

1. Call our Technical Support Staff at (316) 636-1131. They are on duty from 9:00 AM to 5:00 PM Central Time.
2. Ask for technical support for the FASTCOM: 422/4-PCI-335. Be ready to describe the problem, your computer system, your application, and your software.
3. If necessary, our staff will give you an RMA number (Return Material Authorization). Use this number on the mailing label and in all references to your board. Put the board back in its static bag and in its box. Ship the board back to us as directed.
4. If you prefer, you may FAX a description of the problem to us at (316) 636-1163, or we can be reached on the Internet at http://www.commtech-fastcom.com/TechSupport.html or by email at techsupport@commtech-fastcom.com.

FASTCOM LIMITED LIFETIME WARRANTY

Commtech's entire FASTCOM product line is covered by a limited lifetime warranty against defects in workmanship. This warranty is available only to the original purchaser and only covers defects in our workmanship. Any FASTCOM board that is returned to Commtech will, at the option of Commtech, be repaired or replaced at no charge -- except for circumstances excluded by this warranty.

A Return Materials Authorization (RMA) number must be obtained from Commtech before a return will be accepted. Please contact us via telephone or email to obtain an RMA number.

You are responsible for shipping charges when you return a FASTCOM board to Commtech. We will pay the shipping charges to send the board back to you if a defect in workmanship is found. However, if no defect in workmanship is found, or the board is not found to be defective, or the any of the following warranty exclusions occur, you will be responsible for shipping charges both ways.

Warranty Exclusions

This warranty does not cover problems or damage resulting from, but not limited to, the following:

1. Any modification, misuse, abuse, disassembly, misapplication, or unauthorized repair by anyone other than Commtech.
2. Any improper operation, including any use not in accordance with any verbal product instructions or documentation.
3. Connection to an improper voltage supply or ESD damage.
4. Any other cause not related to workmanship.

Non-Warranty Repairs

We can provide a quote for non-warranty repairs upon request.

If any Commtech product is damaged such that it cannot be repaired, you can return it to Commtech for replacement under our *Non-Repairable Replacement* policy, regardless of the cause of damage. Commtech will replace the unit at 60% of the then-current list price.

Limitation of Liability

Commtech shall not be liable for any special, incidental, indirect, or consequential damages whatsoever, including but not limited to loss of profits, revenue, or data (whether direct or indirect), or commercial loss for breach of any express or implied warranty on your product even if Commtech has been advised previously of the possibility of such damages. Commtech does not warrant that its products will work in every system or every system configuration. We do not warrant that our products will be suitable for your application. If you are dissatisfied with our product, contact customer service to arrange for a return of our product and refund of your money. Commtech's liability, in any case, is limited to the original product purchase price and is available to the original customer only.

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APPENDIX A

17D154 UART Data Sheet

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