Advanced Data Capture and Control Systems

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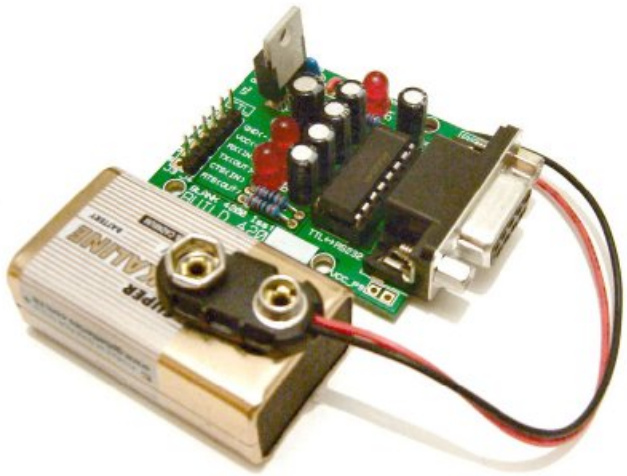

RS232 To TTL User Guide

RS232 to 5V TTL Signal Converter Modules

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1.5 Document Revision

Version	Date	Summary of changes
V1.00	August 2007	First version.
V1.01	February 2008	Added descriptions for new options

2 Introduction

The RS232 to TTL 5V Signal Converter Module is a professional module for projects requiring PC/Laptop RS232 interface to 5V TTL logic. This module converts signals between RS232 voltage levels and TTL voltage levels. It is bi-directional, where TTL signals are converted to RS232 levels and RS232 levels are converted to TTL levels. It is ideal for use in pc interfacing, microcontroller based projects, robotics, or for experimental and educational purposes. This document is applicable to the 4201, 4202 and 4203 versions of the modules. Table 1 highlights the main differences.

Table 1: RS232 to TTL (420X) Model Variations

Model No.	Built-in PSU (5V regulator)	Signal Support	TTL Connector	Status LEDs
4201	Yes	TX,RX,RTS,CTS	6-pin 2.54mm header (component side)	Power and TX/RX logic.
4202	(Optional)	TX,RX,RTS,CTS	6-pin 2.54mm header (PCB underside)	Power. Optional TX/RX logic.
4203	(Optional)	TX,RX. Optional RTS,CTS.	4-mini screw terminals (2.54mm pitch)	Power. Optional TX/RX logic.

2.1 Features List

A brief list of some of the features is given below:

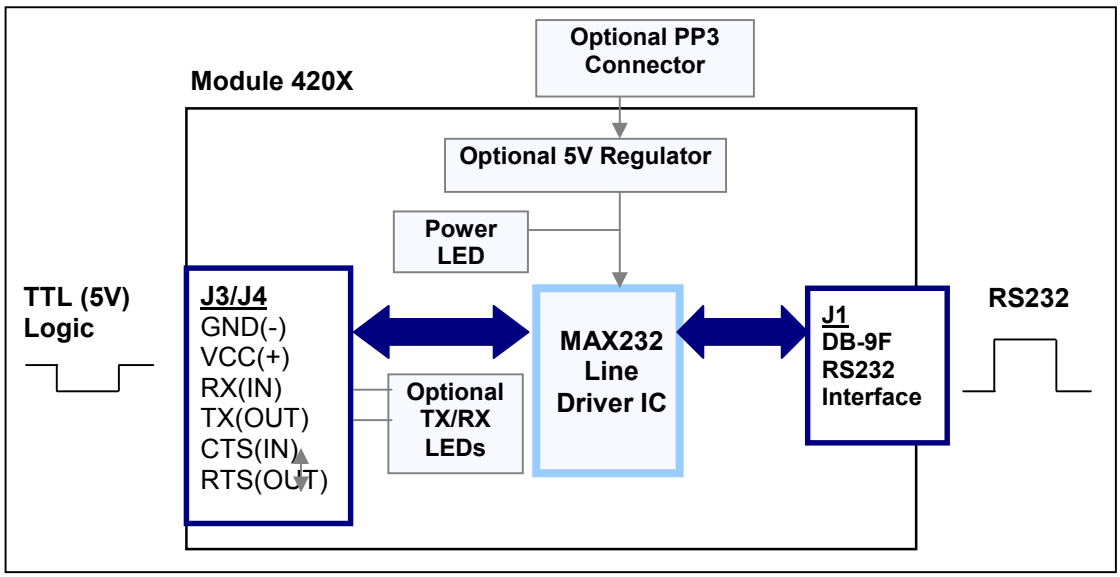
- High speed, replaceable MAX232 based. Device fitted supports upto 120kbps
- Works with PCs or Laptops
- Supports microcontroller UARTs – 5V TTL signal levels.
- Single DC supply: wide input range for 4201 or 5V for 4202 and 4203
- Small PCB footprint of 50×40mm
- Low current status LED(s)
- Very low power consumption
- Optional on board PSU for internal/external use for quick start out of the box.
- Power can be routed to pin 9 (if required) on RS232 connector – useful for specific applications.

2.2 Block Diagram – RS232 To TTL Module

The 4201 module has an optional 5V regulator circuitry fitted as default to provide regulated 5V power to the module from a wide voltage range and is suitable for battery powered applications. Model 4202 and 4203 require 5V to be applied via the TTL connection end.

See Figure 1 below. These modules have multiple connector options for the TTL logic level side. Model 4201 features a 6-pin 2.54mm header interfaces. Model 4202 has the 6-pin header at the underside of the board so that it may be used conveniently on “breadboard” or other such prototype boards. Model 4203 has screw terminals for simple wiring interface for a very common 4-pin interface (power, ground, TX and RX).

Figure 1: RS232 To TLL - Module Block Diagram

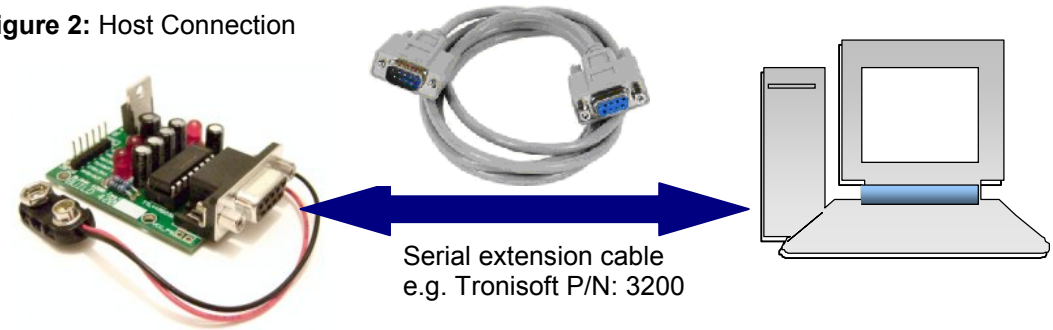


All models feature a low current power status LED to indicate that the module is powered. There are also additional status LEDs fitted as default on model 4201 that monitor at the TTL / logic level state of the TX and RX lines (which will flash on communication).

3 Hardware Description

The RS232 to TTL modules have two main ports - the TTL and RS232 connection as described below. Model 4201 however has an additional PP3 connector and on-board 5V regulator circuitry for battery powered use. A typical connection is via a simple straight through serial cable to a PC/laptop’s serial port:

Figure 2: Host Connection



3.1 Power Supply

Models 4202 or 4203 do not have the regulator IC fitted and requires a 5V supply via J3/J4.

The 4201 module may be powered using an external power supply or battery connected via the attached “PP3” connector. For simple power supply requirements the 4201 module features a built in voltage regulator for operation with a wide voltage range. The input voltage +V is regulated using a standard 7805 IC based voltage regulator to the voltage used internally by the module called VCC(+) and is typically 5V DC. This is also connected to the TTL connection end at J3/J4 and is not normally connected but if used to power external circuitry do not exceed the capabilities of 7805 IC regulator. You can normally draw up to 150mA from VCC(+) without any problems but may need a heat-sink to draw say 400mA depending on input voltage applied at the PP3 connector.

3.2 Digital 5V TTL Connection

This is a 6-pin 2.54mm header on models 4201 and 4202. The TTL connection end has connectors marked J3 and J4 which are electrically connected together for multiple connection builds. Model 4203 is fitted with 4 screw terminal for a simple 4-wire interface suitable for quick wiring. The other 2 signal pins are still available on the board.

Table 2: TTL connection

J3/J4 Pin Number	Signal Name	Description
1	GND	This is the ground pin and should be connected to the 0V rail of the application hardware.
2	VCC(+)	For model 4202 and 4203: this pin requires 5V to be supplied to the board for power. For model 4201: leave unconnected (see section 3.1).
3	RX (input - from UART into PC)	This pin is usually connected to the TX output pin of the UART in the microcontroller. This is an input pin.
4	TX (output - from PC to UART)	This pin is usually connected to the RX pin of the UART in the microcontroller. This is an output pin and will be data from the RS232/PC side of the converter.
5	CTS (input - from UART into PC)	This pin is part of the RS232 "Hardware Flow Control" system. Normally this signal is used by the UART to flag to the PC when the UART is ready to receive data. However, because of the various interpretations of the RS232 "standard", the exact way this signal may be used will change from system to system.
6	RTS (output - from the PC to the UART)	This pin is part of the RS232 "Hardware Flow Control" system. Normally this signal is used by the PC to flag when the microcontroller can send data. However, because of the various interpretations of the RS232 "standard", the exact way this signal may be used will change from system to system.

IMPORTANT NOTE (Model 4201 only)
Do not apply power to the VCC(+) pin for model 4201. This pin actually supplies regulated 5V from the on-board PSU and connects to the VCC(+) pin at J3/J4. On this model power may however be drawn from the VCC(+) to provide some low power to related circuits such as a microcontroller.

Table 3 Physical TTL Connector Variations

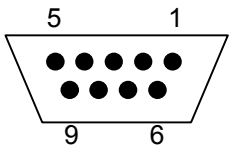
Model	TTL connection	Image
4201	6-pin (2.54mm pitch) on component side.	
4202	6-pin (2.54mm pitch) on underside ideal for “breadboarding” applications.	
4203	4 screw terminals (2.54mm pitch) for simple 4-wire wiring interface.	

3.3 RS232 Port (9 pin D female)

The module connection to a host computer is via J1. J1 is a 9 way D-SUB female connector. A standard serial extension cable (pin 1 to pin1, pin 2 to pin 2 etc.) may be required to connect to a host computer. The module supports baud rates up to 120kpbs.

Table 4: Module RS232 Interface

DB9 (Female)	Signal Name and Notes	Direction (Module → PC)
1	CD (Carrier Detect)	- See note (c) below
2	TXD (Transmit Data)	Output
3	RXD (Receive Data)	Input
4	DSR (Data Set Ready)	- See note (c) below
5	GND (System Ground)	-
6	DTR (Data Terminal Ready)	- See note (c) below
7	CTS (Clear to Send)	Input
8	RTS (Request to Send)	Output
9	N/C (Not connected). Optionally VCC(+) may be routed here if VCC_P9 is linked on the module – use carefully!	(Optional output)



DB9 pin D-SUB female

Note:
a) Signal names here are with respect to the “RS232 To TTL” module.
b) Direction is from module (DCE) to the computer (DTE) e.g. pin 2 (TXD) is the module’s output pin and will normally connect to pin 2 of the serial port on a computer using a standard serial extension cable.
c) Pins 6,4 and 1 are connected together to provide DTR/DSR “loopback” connection for the computer’s serial port.

3.4 Status LEDs

All modules feature a power status LED to indicate that the module is powered.

Model 4201 also has two further communication status LEDs indicating the logic levels of the TX and RX lines at the TTL connection on J3/J4.

All LEDs used are low current and are driven through a 1K0 resistor.

Table 5: Status LED Descriptions

Status	Description
POWER (D1)	Stays on red when power applied.
RX LED (D3)	This flashes red albeit very fast depending on the communication baud rate.
TX LED (D2)	This flashes red albeit very fast depending on the communication baud rate.

3.5 Module Specification

3.5.1 Power Supply

Model 4201
Input Supply Voltage: 6 to 9V +/- 5%. Higher voltages may require an adequate heatsink to be fitted to the on-board voltage regulator depending on the load at VCC(+). Refer to the 7805 IC regulator datasheet for more information.

Internal Regulated Voltage VCC(+): Linear 5V, 4% typical accuracy.

VCC(+) current source capability: Typically 150mA at stated input voltage range. Up to 475mA if heatsink is used on the 7805 IC regulator.

Input Current: 15-22mA typically.

Model 4202/4203

Input Supply Voltage: 5V +/- 5%.

Input Current: 15-22mA typically.

3.5.2 Host Connection / RS232 Line Drivers

Connection: RS232 / serial port, 9 Way D-type socket connector.
Line Drivers: Industry standard RS232 line driver - meets full EIA/TIA-232D specifications.

3.5.3 MAX232 Line Driver Electrical Characteristics

Refer to datasheet for the MAX232 device used on the board.

4 Quick Start – Demonstration

The module may be quickly tested via a “loopback” test using most serial port terminal emulators. For a basic test use the following steps:

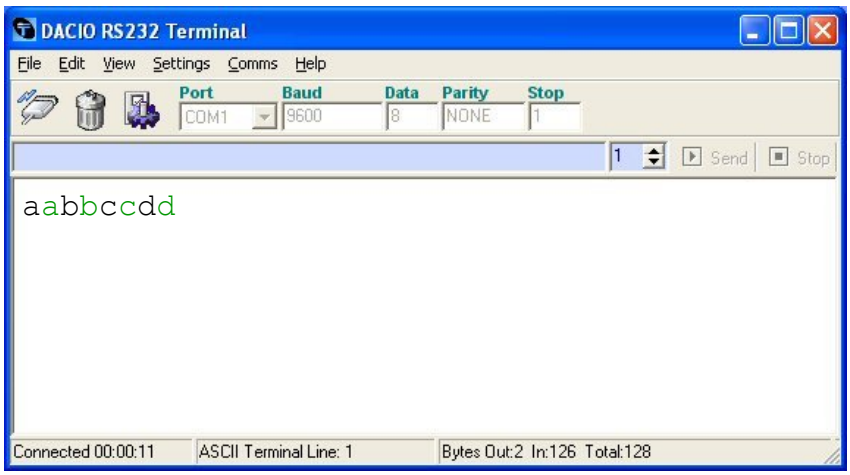
1) Connect the module using a standard serial extension cable (e.g. Tronisoft P/N: 3200) to a computer’s serial port - say COM1. If your computer or Laptop does not have a serial port then you can use a USB to serial port adapter (e.g. Tronisoft P/N: 2441 or 2446) assuming it does at least have a USB port!

2) Run the DACIO RS232 Terminal (or a terminal emulator such as HyperTerminal configured to use e.g. COM1 and with line settings of 9600 baud, 8 data bits, no parity and no handshaking).

3) Connect the TX/RX lines together at connector J3 (or J4) e.g. you can jumper pins 3&4 on model 4201. Now apply power. If the module is up and running then note that power status LED D1 (and D2, D3 on model 4201) should be lit red.

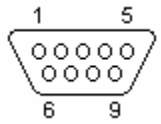
4) Type e.g. ‘abcd’ on the DACIO RS232 Terminal (or HyperTerminal) screen. Anything typed on screen is sent to the module and routed back (looped back) to the host computer’s input. Therefore the terminal screen will echo any characters on screen resulting in the display as shown below.

Figure 3: DACIO RS232 Terminal / Serial Port Monitoring Application



Appendix A – Pinout and Signals for the PC RS232 Connector

DB9 RS232 Port (IBM PC XT/AT)

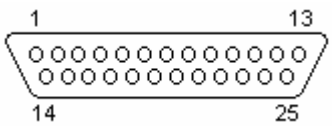


DB9 pin D-SUB male

Pin	Signal Name	Direction (DTE ← DCE)
1	CD (Carrier Detect)	←
2	RXD (Receive Data)	←
3	TXD (Transmit Data)	→
4	DTR (Data Terminal Ready)	→
5	GND (System Ground)	-
6	DSR (Data Set Ready)	←
7	RTS (Request to Send)	→
8	CTS (Clear to Send)	←
9	RI (Ring Indicator)	←

Note: a) Signal names are with respect to the computer/PC. b) Direction is from peripheral/modem (DCE) to the computer (DTE) e.g. RXD is the computer's input pin.

DB25 RS232 Port



DB25 pin D-SUB male

Pin	Signal Name	Direction (DTE ← DCE)
1	SHIELD (Shield/Protective Ground)	-
2	TXD (Transmit Data)	→
3	RXD (Receive Data)	←
4	RTS (Request to Send)	→
5	CTS (Clear to Send)	←
6	DSR (Data Set Ready)	←
7	GND (System Ground)	-
8	CD (Carrier Detect)	←
9	n/c	-
10	n/c	-
11	n/c	-
12	n/c	-
13	n/c	-
14	n/c	-
15	n/c	-
16	n/c	-
17	n/c	-
18	n/c	-
19	n/c	-
20	DTR (Data Terminal Ready)	→
21	n/c	-
22	RI (Ring Indicator)	←
23	n/c	-
24	n/c	-
25	n/c	-

Note:
a) Signal names here are with respect to the computer/PC.
b) Direction is from peripheral/modem (DCE) to the computer (DTE) e.g. RXD is the computer's input pin.
c) Do not connect SHIELD(1) to GND(7)

