Information and Instruction Manual for the
RS232ToTTL Revision 03
RS232 to TTL-Serial Conversion Board

By
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Table of Contents

Disclaimer and Revision History

All of our products are constantly undergoing upgrades and enhancements. Therefore, while this manual is accurate to the best of our knowledge as of its date of publication, it cannot be construed as a commitment that future releases will operate identically to this description. Errors may appear in the documentation; we will correct any mistakes as soon as they are discovered, and we will post the corrections on the web site in a timely manner. Please refer to the specific manual for the version of the hardware and firmware that you have for the most accurate information for your product.

This manual describes the RS232ToTTL RS232 to TTL-Serial conversion board, artwork version 3.

Product Warnings

Note that the product is not protected against static electricity.   Its components can be damaged simply by touching the board when you have a "static charge" built up on your body. Such damage is not covered under either the satisfaction guarantee or the product warranty. Please be certain to safely "discharge" yourself before handling any of the boards or components.

LIFE SUPPORT POLICY

Due to the components used in the products (such as those from National Semiconductor Corporation and others), Peter Norberg Consulting, Inc.'s products are not authorized for use in life support devices or systems or in devices that can cause any form of personal injury if a failure occurs.

Note that National Semiconductor states "Life support devices or systems are devices which (a) are intended for surgical implant within the body, or (b) support or sustain life, and in whose failure to perform when properly used in accordance with instructions or use provided in the labeling, can be reasonably expected to result in a significant injury to the user".   For a more detailed set of such policies, please contact National Semiconductor Corporation.

Introduction and Product Summary

The Peter Norberg Consulting, Inc. RS232ToTTL serial communications adapter board is a tiny (1" x 1.725") board that allows TTL-Serial devices (such as our BC4E20 stepper motor controller board) to communicate via a standard RS232 port on a computer.

The RS232ToTTL adapter is powered by your power supply.

The board supports communication rates of up to 120K bits/second; however, when used with our stepper motor controllers, you will most commonly operate at 9600 baud (due to the default settings of those products).

From a connections point of view, there are exactly 2 connectors on the board. One is an RS232 DB9 female connector, to be used to connect to your RS232 system. The other is a 4-wire connector (either a screw-terminal or an MTA-100 SIP header), which is to be connected to your target board. The 3 signals transferred are Serial Input (to the RS232ToTTL board), Serial Output (from the RS232ToTTL board), and ground (so that the systems are correctly referenced to each other). In addition, this connector provides power for the board. You must provide regulated 5 volts between the "+5" and GND pins.

No other standard serial signals are provided (such as CTS, RTS, DSR, etc.); this reduces the cost and complexity of the connections. You should refer to the following manual section ("Connecting the RS232ToTTL") for more information about the connections.

Connecting the RS232ToTTL

The RS232ToTTL board (revision 3) appears as shown here.
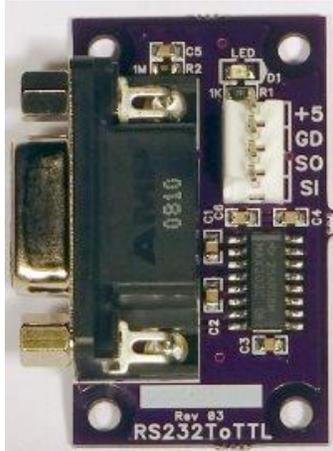
The image shows the board with the MTA-100 connector option.

The board as shown (not including the overhang from the DB9 connector) is 1 inch wide by 1.725 inches tall. The mounting holes are 0.125" in diameter, positioned in 0.125" from each corner. This size hole can accept up to a number 5 screw; this means that the standard #4 mounting posts work quite well. The screw hole positions are therefore:

0.125, 0.125	0.875, 0.125
0.125, 1.600	0.875, 1.600

The signals on the remaining connector are to be attached to your motor controller board (and your power supply, if you are not powering the RS232ToTTL product off of your motor controller board). The TTL signals are defined as:

TTL Signal	Description
+5	+5 volt regulated power input to the board. Use this to provide power from a 5 volt regulated source from your own controller board.
GD	Ground reference. This must be connected to the ground on your controller board; otherwise, the TTL signals may not have a correct reference for operation.
SO	Serial Output FROM the RS232ToTTL board TO your controller (usually, this is attached to the SI line for our boards)
SI	Serial Input TO the RS232ToTTL board FROM your controller (usually, this is attached to the SO line for our boards)

The RS232 signals that are present on the female DB9 connector are selected such that a normal "straight-through" RS232 male-female cable may be used to connect the board to a standard computer male RS232 DB9 connector. The pins that are actually connected are:

RS232 Pin	Description
2	RS232 serial data from the RS232ToTTL board to the computer (serial out from board)
3	RS232 serial data to the RS232ToTTL board from the computer (serial in to board)
5	Serial ground
Shell	Shield, connected to ground

The power requirements for the board are less than 20 milliamps, and a 5 volt regulated supply must be used to provide the power. Connect it to the "+5" and "GD" connectors on the board.

As noted in the above table, you need to have a good ground reference for the system to work correctly. The "GD" signal on the RS232ToTTL board is internally connected to the ground wire of the RS232 cable and also *must* be attached to the ground reference for the board to which it is attached (such as one of our motor controller boards). Failure to connect this line can result in inability to communicate and also can cause failure of the RS232ToTTL board. Note that this means that may be running two wires to the GD pin: the ground for your power supply, and a reference line to the GND for the motor controller board. If the motor controller board is supplying the power (i.e., the +5 voltage input is used), then just the one ground wire to the motor controller board will be needed.

The SO line is the serial output from the RS232ToTTL board to the motor controller (or other board). It is "logically connected" to the serial output line from the computer; thus, it needs to be connected to the Serial Input ("SI") line of the motor controller in order for the controller to see the serial data.

Similarly, the SI line is the serial input to the RS232ToTTL board from the motor controller. It is "logically connected" to the serial input line to the computer; therefore, it needs to be connected to the Serial Output ("SO") line of the motor controller in order for the computer to see the data from said controller.

The signal levels to and from the RS232ToTTL board are standard TTL logic levels. This means that the board's worst-case response is:

> High signal: Minimum 3.2 volts, maximum 4.9 volts

> Low signal: Minimum 0.3 volts, maximum 0.6 volts

> Input switching threshold: 1.3 to 1.9 volts, with about 50 mV of hysteresis

This is fully compatible with all of our board level products and should be compatible with most TTL-serial devices.

When connecting the RS232ToTTL board to any of our retired products which have a "**JS**" jumper (which is most of them), the **JS** jumper MUST be removed in order for the RS232ToTTL board to be able to "talk" to the motor controller board. For our retired boards which have a socketed MAX232 serial chip (such as the BiStepA04 or the SimStepA04), the serial chip must be removed (which has same effect as removing the JS jumper on the later boards).

On our current motor controller offerings, the controllers themselves automatically will switch to use of the SI/SO lines when the RS232ToTTL board is connected, and will ignore their USB connection in terms of communication.

Your communications connection to any of our motor controllers would be:

RS232ToTTL Signal	Motor Controller Signal	Description
+5	+5	Board +5
GD	GND	Common Ground
SO	SI	Serial Data from RS232ToTTL to Motor Controller
SI	SO	Serial Data from Motor Controller to RS232ToTTL

Observe that the "SO" signal from each board is connected to the "SI" of the other board. This is because the signal names are always relative to the given board; therefore, "Serial Input" to one board must be connected to the "Serial Output" of the other board.

Note also that this pinout exactly matches the pinouts of the related connector on most of our 4 and 6 axis controllers (the exception being the SD4DX series). That is to say, a simple 4-wire "straight through" wiring will give you correct operation on those products.

Connecting to our 2 axis controllers or to the SD4DX units will require more careful routing of the +5 and GD signals, since those pins are not positioned beside the SI and SO pins on those products.

Quick test by use of SimpleSerial

The easiest way to test the connection to one of our boards is through use of SimpleSerial. Load Simpleserial, and manually tell it to connect to the RS232 port that you are using to talk to the RS232ToTTL board. Set the baud rate to match that of the motor controller board that you will be using; most commonly, this will be 9600 baud.

Testing without being connected to any other board

You can easily test the RS232ToTTL board by simply jumpering its SO line back to its SI line (using a small clip lead or short wire), and then sending serial data to it. Everything that you send will be echoed back.

Under SimpleSerial, this method will make all of the characters that you type appear twice on the screen: for example, typing "hello" would cause the screen in SimpleSerial to show "hheelloo", assuming that the RS232ToTTL board is operating.

Testing when connected to any of our motor controllers

Having set up the communications parameters, turn on power to our motor controller board (which has already been connected to the RS232ToTTL board as described previously under Connecting the RS232ToTTL). Our copyright message should appear on the HyperTerminal screen if everything is connected correctly.

All of our motor controllers will also respond to the command "-12?" by displaying another copy of the copyright message.