

Peter Norberg Consulting, Inc.

*Professional Solutions to Professional Problems*

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Information and Instruction Manual for the  
**RS422ToTTL**  
RS422 to TTL-Serial Conversion Board

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## **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 RS422ToTTL RS422 to TTL-Serial conversion board, artwork version 02.

## **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. RS422ToTTL serial communications adapter board is a tiny (1.25" x 1.5") board that allows TTL-Serial devices (such as our BC4D15 stepper motor controller board) to communicate with each other using RS422 communications. Each board supports two completely independent channels, thus simplifying 'daisy chain' communications using our BC2D15 and BC4D15 motor controller boards.

The RS422ToTTL adapter is powered by your power supply.

The board supports communication rates of up to 10 megabaud; however, when used with our stepper motor controllers, you normally operate at 9600 baud (due to the design specifications of those products). If the board is connected to some other TTL-Serial compatible device, its full communication rate may be available, depending on the limitations of the device to which it is being connected and upon termination resistors and your cabling.

From a connections point of view, there are exactly 2 connectors on the board. One is an 8 pin connector which is used for the two independent channels of RS422 communications. The other is a 7 pin connector used to attach TTL-Serial compatible devices to your RS422 system, and to provide power to the board. The 7 signals transferred are SI1 and SI2 (serial input to the RS422ToTTL board), SO1 and SO2 (serial output from the RS422ToTTL board), and ground (so that the systems are correctly referenced to each other). In addition, this connector provides power for the board. You either provide regulated 5 volts to the "+5" and GND pins, or 6.5 to 9 volts to the "Vc" and GND pin.

Please refer to the following manual section ("Connecting the RS422ToTTL") for more information about the connections.



The signals on the left connector are to be attached to your twisted pair (#24) wire, and then connected to the matching RS422ToTTL board at the other side of the line. The signals support two separate channels of communication (#1 and #2), thus allowing for two separate boards to be having a ‘dialogue’. The signals are defined as:

| Signal | Description   |
|--------|---|
| I1+    | Differential ‘+’ side of input signal for channel one. This, combined with ‘I1-’, is passed through to the ‘SO1’ TTL output signal. It is to be attached to the ‘O1+’ signal on the other RS422ToTTL board. |
| I1-    | Differential ‘-’ side of input signal for channel one. This, combined with ‘I1+’, is passed through to the ‘SO1’ TTL output signal. It is to be attached to the ‘O1-’ signal on the other RS422ToTTL board  |
| O1+    | Differential ‘+’ side of output signal for channel one. This, combined with ‘O1-’, is generated from the ‘SI1’ TTL input signal. It is to be attached to the ‘I1+’ signal on the other RS422ToTTL board     |
| O1-    | Differential ‘-’ side of output signal for channel one. This, combined with ‘O1+’, is generated from the ‘SI1’ TTL input signal. It is to be attached to the ‘I1-’ signal on the other RS422ToTTL board     |
| I2+    | Differential ‘+’ side of input signal for channel two. This, combined with ‘I1-’, is passed through to the ‘SO2’ TTL output signal. It is to be attached to the ‘O2+’ signal on the other RS422ToTTL board  |
| I2-    | Differential ‘-’ side of input signal for channel two. This, combined with ‘I1+’, is passed through to the ‘SO2’ TTL output signal. It is to be attached to the ‘O2+’ signal on the other RS422ToTTL board  |
| O2+    | Differential ‘+’ side of output signal for channel two. This, combined with ‘O1-’, is generated from the ‘SI2’ TTL input signal. It is to be attached to the ‘I2+’ signal on the other RS422ToTTL board     |
| O2-    | Differential ‘-’ side of output signal for channel two. This, combined with ‘O1+’, is generated from the ‘SI2’ TTL input signal. It is to be attached to the ‘I2-’ signal on the other RS422ToTTL board     |

The power requirements for the board are less than 20 milliamps, and either a 5 volt or a 6.5 to 9 volt regulated supply must be used to provide the power. If you use 5 volts, connect it to the “+5” and “GD” connectors on the board. If you use +6.5 to +9 volts, connect it to the “Vc” and “GD” connectors on the board. **Do not connect power supplies to both the Vc and the +5 power input pins!** You will blow out the board, and you may damage your power supplies!

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 RS422ToTTL board *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 RS422ToTTL board. Note that this means that you will probably 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 SO1 and SO2 lines are the serial output from the RS422ToTTL board to the motor controller(s) (or other board(s)). They need 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 SI1 and SI2 lines are the serial inputs to the RS422ToTTL board from the motor controller(s). They need to be connected to the Serial Output (“SO”) line of the motor controller in order for the data to be transmitted from the controller.

When connecting the RS422ToTTL board to any of our products which have a “**JS**” jumper (which is most of them), the **JS** jumper **MUST** be removed in order for the RS422ToTTL board to be able to “talk” to the motor controller board. For our older boards which have a socketed MAX232 serial chip (such as the BiStepA04 or the SimStepA04), the serial chip must be removed (same effect as removing the JS jumper on the later boards). Otherwise, your connection to the motor controller is:

| RS422ToTTL Signal | Motor Controller Signal | Description                                     |
|-------------------|-------------------------|---|
| GD                | GND                     | Common Ground                                   |
| SO1/2             | SI                      | Serial Data from RS422ToTTL to Motor Controller |
| SI1/2             | SO                      | Serial Data from Motor Controller to RS422ToTTL |

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.