# RS232/RS485 CONVERTER
# USER'S GUIDE

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**INTRODUCTION:**

The RS232/RS485 converter allows to interface any device using an RS232 serial link to an RS485 link. The RS485 link was conceived for long haul data acquisition and control applications. The original specifications (which have been surpassed by present hardware), allowed to network up to 32 stations on the same lines, at speeds up to 10 Mbits/s to distances of 4,000 feet (1200 mt). The link is balanced so that any electrical noise getting into one of the lines also gets into the other line thus allowing the receiver to cancel both noise signals.

RS485 links are much used in industrial process control where reliability is important. Also, the ability to communicate over a long distance at a high speed is important when it comes to industrial plants where the stations might be spread over a large area.

It is very common to have a PC in charge of controlling a given process. PC's in general have an RS232 serial port (COM port) and therefore there are two solutions to link the computer to an RS485 network: One is to plug an RS485 interface in a computer slot and the other is to convert the RS232 level signal coming out the computer serial port into an RS485 signal. This is what the RS232/RS485 converter does. The converters are designed to work with the RMV Electronics general purpose I/O-485 line of stations specifically built for process control but they can also be used back to back thus providing an

RS232/RS485/RS232. This way, two computers or devices using a standard RS232 serial port can communicate with each other at a maximum of 115200 Bauds over a distance of 4000 feet, something impossible to achieve using an RS232 link. One interesting application for using two RS232/RS485 converters back to back is when a computer needs to be connected to an I/O-232 board at a distance longer than usual. This provides very good performance while keeping the simplicity of our I/O-232 line of boards.

**POWER REQUIREMENTS:**

The RS232/RS485 converter can be powered from any DC voltage between 7.5 and 15 volts and it consumes 75 mA. From the converter, a 6-wire line carries the data to and for the remote stations. Two wires send data, two wires receive data, one additional line is connected to the computer's ground and one wire is connected to the power supply input (before the converter's voltage regulator). This way, unregulated power can be carried to the remote stations.

The RS232/RS485 converter is NOT optoisolated. Optoisolation must be provided independently in each station along the network as is the case with our I/O-485 process control line.

**LINE CONNECTIONS AND TERMINATION:**

The 6 wire link can be brought to a telephone jack (RJ11) or to a 6 position terminal strip thus allowing the use of any type of wire for the link. Data are **transmitted** via the lines marked YELLOW and BLUE whereas data are **received** via the BLACK and WHITE wires. The line must be terminated by a resistor network which is placed across the 2 pairs of data wires (a non-bussed, 14 or 16 pin resistor network is required. The pinout is not important since the only 2 used resistors are the ones at the centre of the network). Using a resistor network allows to place different resistance values. 120 Ohms is recommended, but in fact, the resistance should match the impedance of the data transmission line.

**IMPORTANT:** For optimal operation, a data network requires to be terminated on both ends of the link. This means that intermediate stations need NOT be terminated with resistors (if you are using our I/O-485 line of stations, you should remove the resistor networks on all the I/O-485 stations but the last one).

The data lines are protected by 4 diodes and 2 Zeners each which prevent voltages over 6 Volts from reaching the drivers.

**CONNECTION TO THE COMPUTER:**

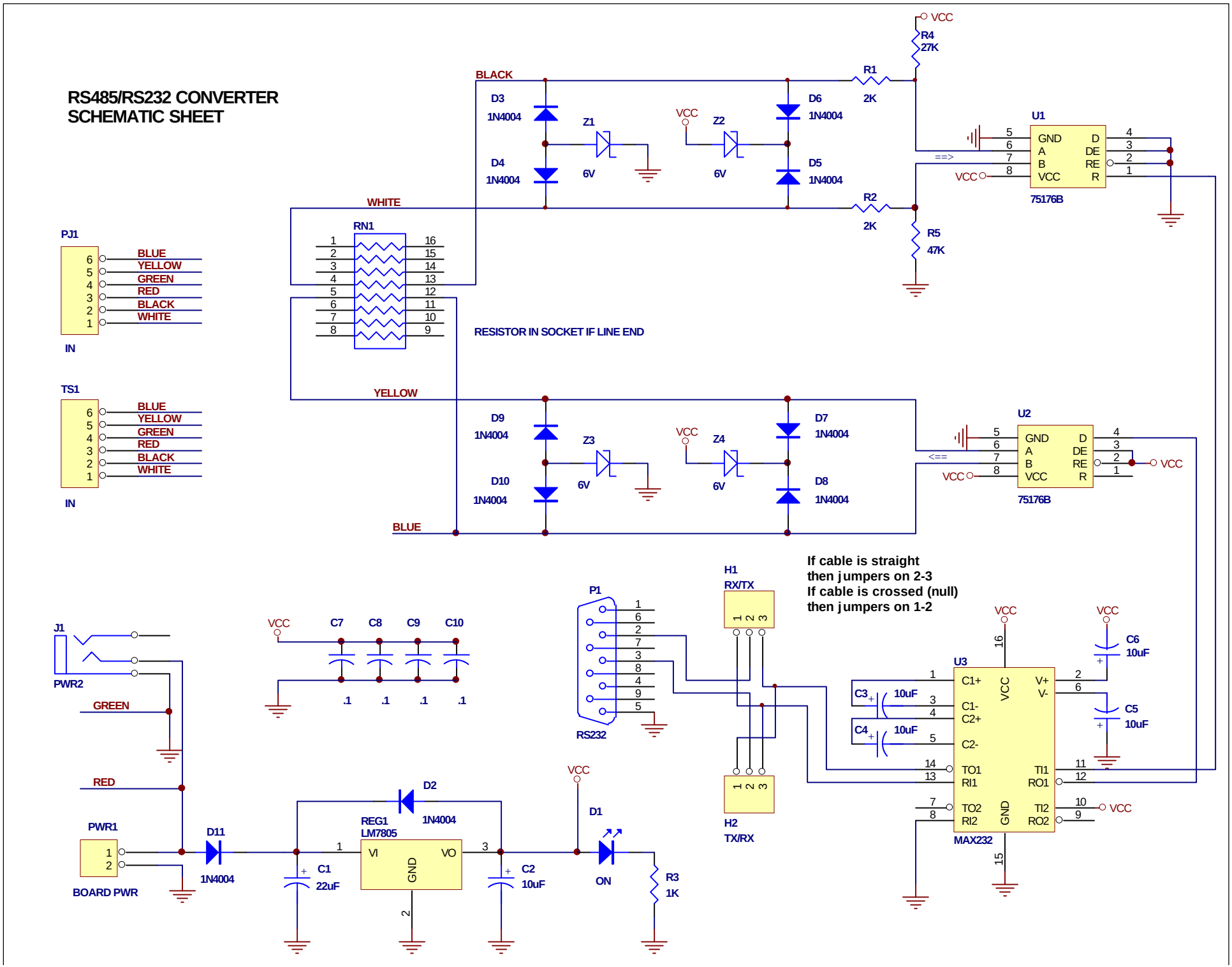
The converter has a 9 pin DB9 connector of which only 3 lines are used: TX, RX and Ground. Some commercial cables have "straight" data lines whereas others are "crossed" (null modern).

In order to accommodate both types, H1 and H2 allow to get a straight or a cross connection to the TX and RX lines. No RTS or other control lines are used since the link is fully duplex.

**TROUBLE SHOOTING:**

A very easy way to troubleshoot these boards is to join together the BLUE and WHITE lines and the BLACK and YELLOW lines on the 6 position terminal strip. (Make sure you have no other devices connected on the RS485 lines.) This results in a closed loop and therefore whatever you type on a computer communications program should be echoed back to the screen. (If the echo-on feature in the program is selected, then you should get each character twice.)

The Baud rate as well as the number of bits or the stop bit, are all irrelevant. Should it not work properly, the first thing to check is that the board is powered and secondly, to move the jumpers to the appropriate positions on both H1 and H2. (Note: The jumpers should **always** be both on the same relative positions. That is closing either 1-2 in both H1 **and** H2 or 2-3 in both headers.)


RS485/RS232 CONVERTER
SCHEMATIC SHEET
PJ1
BLUE
YELLOW
GREEN
RED
BLACK
WHITE
IN
TS1
IN
BLACK
WHITE
YELLOW
BLUE
RN1
RESISTOR IN SOCKET IF LINE END
D3 1N4004
D4 1N4004
D6 1N4004
D5 1N4004
D9 1N4004
D10 1N4004
D7 1N4004
D8 1N4004
Z1 6V
Z2 6V
Z3 6V
Z4 6V
VCC
R1 2K
R2 2K
R4 27K
R5 47K
U1
U2
GND
A
B
VCC
D
DE
RE
R
75176B
==>
<==
J1
PWR2
GREEN
RED
PWR1
BOARD PWR
D11 1N4004
D2 1N4004
D1 ON
REG1 LM7805
VI
VO
GND
C1 22uF
C2 10uF
R3 1K
C7 .1
C8 .1
C9 .1
C10 .1
P1
RS232
H1 RX/TX
H2 TX/RX
If cable is straight
then jumpers on 2-3
If cable is crossed (null)
then jumpers on 1-2
U3
C1+
C1-
C2+
C2-
V+
V-
TO1
RI1
TO2
RI2
TI1
RO1
TI2
RO2
MAX232
C3 10uF
C4 10uF
C5 10uF
C6 10uF