

# Optically Isolated RS-232 to RS-485 Converter

## Model 485DOICR

The Model 485DOICR converts unbalanced, full or half-duplex RS-232 signals to optically isolated, balanced, full or half-duplex RS-422 or RS-485 signals at baud rates up to 38400 bps. RS-485 is an enhanced version of the RS-422 Standard. It allows multiple drivers and receivers on a two-wire system.



The RS-232 port has a female DB25 connector with pins 2(TD), 3(RD), and 7(Signal Ground) supported. Pins 4(RTS) and 5(CTS) are tied together, and pins 6(DSR), 8(CD), and 20(DTR) are also tied together. These handshake lines provide power for the RS-232 side of the isolator. If you have a port that cannot supply these pins, or if they cannot provide enough power, a power supply can be connected to the terminal blocks to power the RS-232 side of the converter. Terminal blocks are provided for Transmit Data (A) and (B), Receive Data (A) and (B), RS-485 power and ground, and RS-232 power and ground as shown in Figure 1. Note that the RS-485 Ground terminal block is the connection for RS-485 Signal Ground as well as the RS-485 power ground.

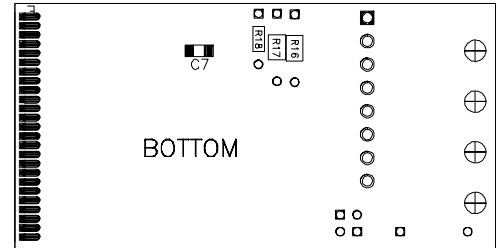
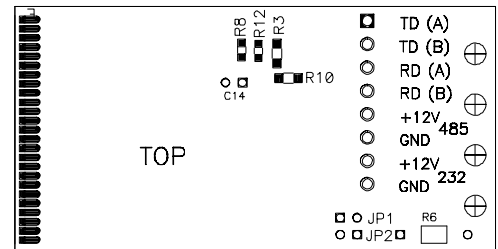


Figure 2 shows how to interconnect two RS-485 converters in a half-duplex system using two wires. The resistors  $R_t$  (labeled R6 on the converter) are termination resistors that should only be used when very long cables runs are used at high baud rates. If installed, the resistors should equal the characteristic impedance of the line used, normally about 120 ohms.



The 485DOICR enables the RS-485 driver by automatic sensing of the data on Transmit Data (pin 2) of the RS-232 side. The 485DOICR has two jumpers located adjacent to the terminal blocks. JP2 enables either RS-422 or RS-485 mode. Placing JP2 in the shorting position enables RS-485 mode, removing the jumper switches to RS-422 mode. JP1 is used in two wire connections, preventing data being sent from the RS-232 port from being echoed back to the RS-232 port. Placing JP1 in the shorting position will prevent the data from echoing. Removing the jumper will hold the receiver enabled.

Figure 1: Timing Component Locations

There are two internal components, resistor R12 and capacitor C7, which control timing of the automatic send data circuit. These components are factory selected to allow the converter to run at 9600 baud or higher, disabling the RS-485 driver 1 ms after the last character has been sent. To change to a baud rate lower than 9600 baud, or to configure the 485DOICR for a specific baud rate, these component values need to be changed. Due to the surface mount construction of the converter, space for through-hole components has been provided adjacent to R12 and C7. These through-hole components are electrically in parallel with R12 and C7. To change to a baud rate other than 9600, remove R12 and C7, select the proper values for the baud rate from Table 1 and install them in the spaces labeled R18 and C14. Up to 32 receivers can be driven by any one RS-485 driver, allowing you to put together large systems with many drop points. If you are using termination resistors, they should be located at only opposite ends of the system.

Table 1. Timing Component Values

Baud Rate	Time (ms)	R18 ( $\Omega$ )	C14 ( $\mu$ F)
300	33.0	330K	0.1
600	16.0	160K	0.1
1200	8.2	820K	0.01
2400	4.3	430K	0.01
4800	2.1	200K	0.01
9600	1.04	100K	0.01
19200	0.6	56K	0.01
38400	0.3	27K	0.01

Proper operation of any RS-485 system requires the presence of a return path. The RS-485 Standard recommends that a third wire be used for this. For safety, a 100 ohm, 1/2 watt resistor should be connected between Signal Ground and the "reference wire" at every drop point. While it may be possible to interconnect Signal Grounds directly, this is not recommended due to the danger of circulating currents possibly being present. No wire type or maximum run length is listed in the RS-485 Standard. However, the RS-422 Standard (which is very similar) recommends number 24AWG twisted pair telephone cable with a shunt capacitance of 16 picofarads per foot, and no more than 4000 feet long.

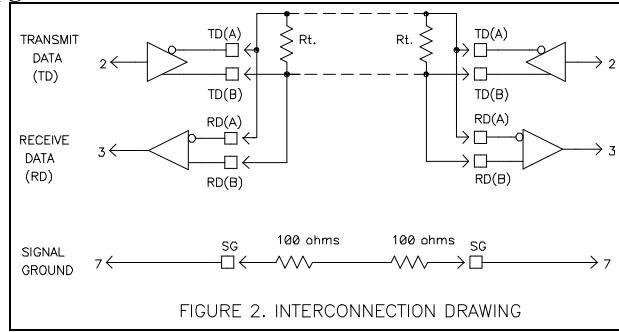
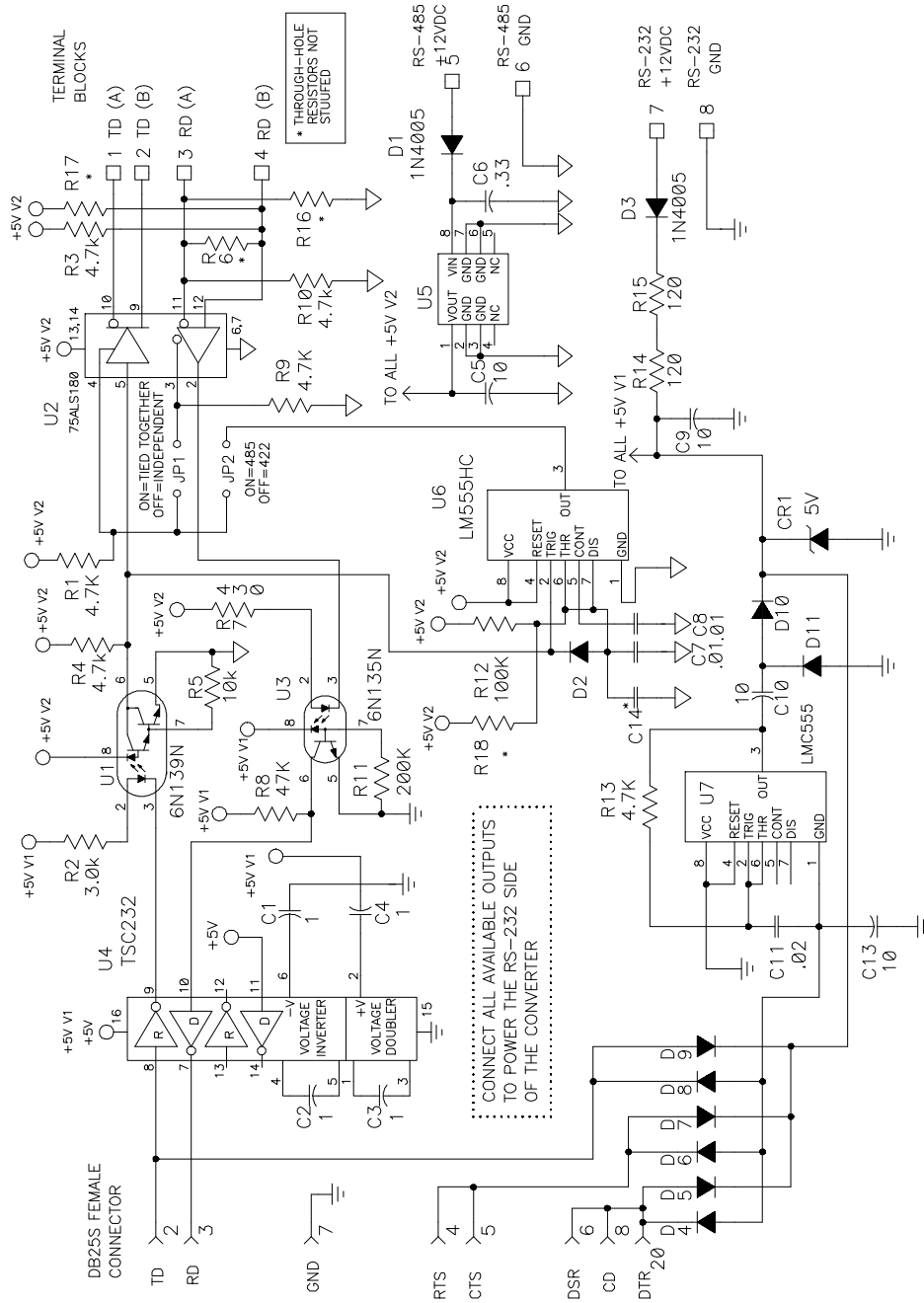


FIGURE 2. INTERCONNECTION DRAWING

MODEL 485DOICR



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