Let's communicate

Miniature RS-232/485 Converter with Automatic Transmission Control and Galvanic Isolation of the Interface

ELO E06D

Operation manual

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1.0 Introduction

RS-232 interface with asymmetric signals is designed for two terminal equipments connection (DTE). Maximum load capacity can be 2500 pF (about 50 m twisted pair). The load impedance is to be 3-7 kiloohm that allows induce disturbing pulses into the cables even from relatively soft supplies. Terminal equipments have to have the same potentials of the neutral, for this reason, RS-232 interface range is limited to 15m distance. RS-485 interface signals transmission enables to increase communication range, communication partners´ number and transmission interference immunity.

1.1 Use of the converter

The converter increases transmission immunity against electrical disturbance and isolates both interfaces RS-232/RS-485. Insulation strength is 1 kV. As for permissible over-voltage, the converter can be used in the environments where lightning over-voltage is not necessary to be considered. To lead the cable outside buildings, it is necessary to provide additional over-voltage protection on the input points.

The converter allows transmission rate up to 115200 bps. This maximum attainable rate decreases due to the line length and/or its impedance growth. Recommended maximum line length is 1200m at the rate of 9600 bps.

2.0 Operation principles

RS-485 interface is used to communication in one pair of the cable. For this reason, the transmission has to be half-duplex that means switching off RS-485 transmitter when receiving to allow transmitting to other communication partners and switching on during its own transmitting only.

The converter ignores RTS signal from the terminal equipment (DTE) and interprets TxD signal state. At the TxD changing moment from the idle state (from negative to positive polarity), the converter activates the link transmitter **automatically**.

The transmitter is switched off after the certain time τ of TxD return to the neutral polarity. Time interval length **τ** has to be matched to applied transmission rate because in the automatic mode there it is necessary to keep the transmitter active for the period equal to one byte transmission time. One important communication protocol request is necessary to observe: a device that is to transmit has to wait at least for the time τ from the last byte recorded on RS-485 clamps. If it is to the contrary, the first transmitted byte would be damaged.

3.0 Installation

The converter has to be installed with the respect for specifications of both interfaces

3.1 Converter connection to RS-232 Interface

Signals assignment to the contacts and DTE - DCE interconnection is in the following table

Signal name	abbrev	DTE connector (DB9M)	connector E06D (DB9F)	trans.direction DTE	trans.direction E06D
Signal Ground	SG	5	5	--	--
Transmitted Data	TxD	3	3	output	input
Received Data	RxD	2	2	input	output
Request To Send	RTS	7	7	output	input
Clear To Send	CTS	8	8	input	output
Data Set Ready	DSR	6	6	input	output
Data Terminal Ready	DTR	4	4	output	input

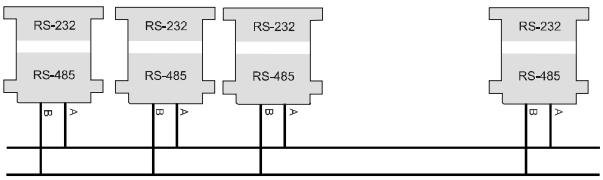
AUT485/1kV transmits RxD and TxD signals. Control signals are not transmitted. The converter contains local interconnects RTS-CTS and DTR-DST. Maximum data rate is 115 200 bps.

!!! CAUTION !!!
To connect DTE to the converter, the cable has to transmit at least TxD, RxD, GND, and DTR or RTS signals! DTR or RTS polarity is optional.

3.2 RS-485 link connection

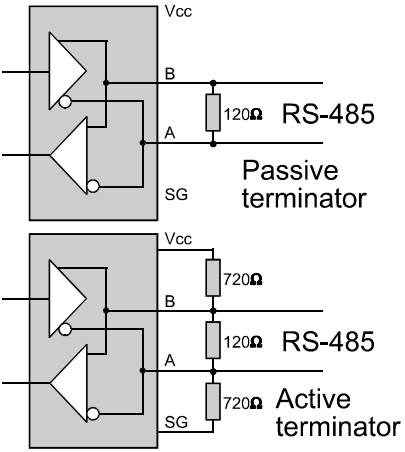
The connector DB9M (Male) is used to the link connection. Single DTE can be interconnected via bus (see Fig.) up to 32 partners.

The RS-485 interface connector description and the way of passive and active terminator connection (resistors values of the active terminator have to be calculated with reference to the applied values of passive terminators so that the passive terminator voltage drop was 200mV)



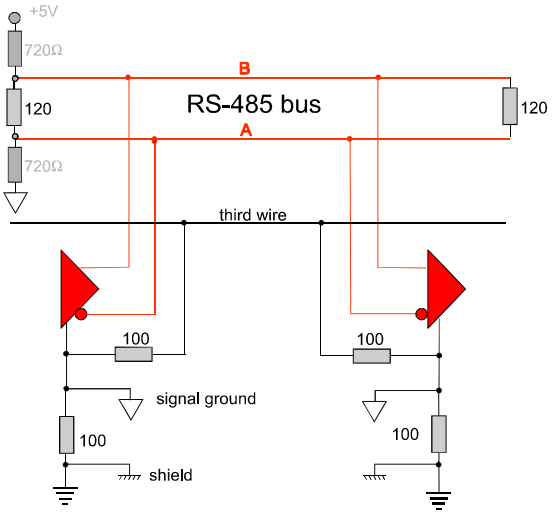
Contact	signal	meaning
1	+5V	contact for possible active terminator connection(Vcc)
2	tau2	contact for transmitter switching off time out range
3	TxRxP	RS-485 link conductor
4,8	TxRxN	RS-485 link conductor
5	Supply -	contact for negative pole supply connection, signal ground
6	tau1	contact for transmitter switching off time out range
7	tau3	contact for transmitter switching off time out range
9	Supply +	power supply +6V DC

The RS-485 line should be terminated with the 100-120Ω resistors on both ends placed between A - B conductors (so-called passive terminators). These terminators are used for the converter impedance matching, undesirable echo suppression and they influence transfer immunity against interference. There are also the active terminators beside the passive ones. Only one active terminator can be installed to one metallic section of the link and its role is as follows:



The RS-485 signal is symmetric. The differential receiver interprets the difference U_A-U_B. It does not depend on the signal ground potential. The receiver interprets the obtained signal $|U_A - U_B| > 200$ mV as log. 1 or log.0. In addition to these levels the third state can occur, it is so-called IDLE state. No transmitter is activated, each communicating partner is just listening so $|U_A - U_B| < 200$ mV. The problem is how to interpret the third state in the two-state logic. The active terminator gives the signal into the IDLE state line and it is interpreted as IDLE in the two-state logic.

To eliminate the influence of the ground potentials differences, each device is earthed on the neutral or the third conductor is used (see Fig.). C. 100 Ω resistors are needed in this case to eliminate currents resulting from the ground potentials differences.



3.3 Converter setting

To work properly, the converter needs time out setting **τ** which is performed by 2, 6, 7 contacts jumpers of the RS-485 connector.

rate	contacts
4800	2, 6, 7 uncoupled
9600	6 and 7 coupled, 2 uncoupled
19200	2 and 7 interconnected via 39 kOhm resistor, 6 uncoupled
38400	2 and 7 interconnected via 20 kOhm resistor, 6 uncoupled
115200	2 and 7 coupled, 6 uncoupled

3.4 Power Supply Connection

In most applications the converter needs external 6V/200 mA power supply connected via 9 (positive terminal) and 5 (negative terminal) contacts of RS-485 connector. The converter can work without external power supply, it uses signals energy of RS-232 interface (TxD, RTS and DTR). But be aware, this interface energy is sufficient just for the applications without terminators, it means: short distances, minimum interference and point-to-point connection.

4.0 Specifications

4.1 Electrical parameters

Interface	RS-232/RS-485
Transmitted signals	TxD and RxD
Control signals	local interconnects RTS-CTS DTR-DSR
RS-232 connector	DB9F, DCE
Trasmission mode	half-duplex
Power supply	external DC supply 6V/200mA
Isolation voltage between interfaces	1 kV
Permissible overvoltage on the line	the line must not be exposed to the atmospheric discharge influences
Required link impedance	100Ω

4.2 Other

Range without repeaters	1200m, double-wire link
Maximum data rate	115 200 bps
Minimum data rate	1 200 bps
Dimension: width x length x height	34 x 63 x 17 mm
Weight	25 g
Stocking temperature	- 10 ^{o} to +55 ^{o} C
Working temperature	+ 0^{o} to +50^{o} C
Humidity	0 – 85% (non-condensing)

5.0 Troubleshooting

Symptom	Action
Converter does not work after installation	Check if the link is connected properly, if 3-4 contacts are not changed. Check if the time constant selection is right. Check the power supply. Check RS-232 connection.
Connection in normal operation quit working	Check the power supply. Check the cable connection.

6.0 Ordering information

Supply code is ELO E06D.

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