

# RML485

## RS-485/422 Channel Card

### Description

The RML485 RS-485/422 card provides two channels connecting RS-232 to RS-485 devices over distances up to 8 miles for DC-to-2400 baud signals. It operates with LDM422 and LDM485 modules. RML485 also features Request-To-Send/Clear-To-Send handshaking and tri-state outputs for multidrop applications.

The RML485 is designed for full duplex operation over two twisted-wire pairs (4 wires). Outputs are tri-state, allowing multidropping of up to 64 units. Hardware handshaking is available over two separate wire pairs. Data rates are DC to 57.6K baud. Six diagnostic LED indicators are provided for installation guidance and system troubleshooting. The RS-232 interface supports Request To Send, Clear To Send, Data Set Ready, Received Line Signal Detect, and

Data Terminal Ready. A convenient null modem switch is provided for the data lines. Also, line termination jumpers connect a line termination resistor and line bias resistors to the RS-485 transmission lines. The RS-485 interface supports Request To Send and Clear To Send on separate wire pairs. The RML485 may be used to convert two sets of send and receive channels by using RTS and CTS circuits as the second data channels. Data rates are the same.

RS-485 and RS-422 interfaces are compatible with each other and may be interconnected provided a few basic limitations are observed. By the same argument, the RML485, the LDM485, and the LDM422 may all be interconnected provided a few basic limitations are observed. The LDM422, however, offers two very distinct advantages over the RS-422 specification; the LDM422

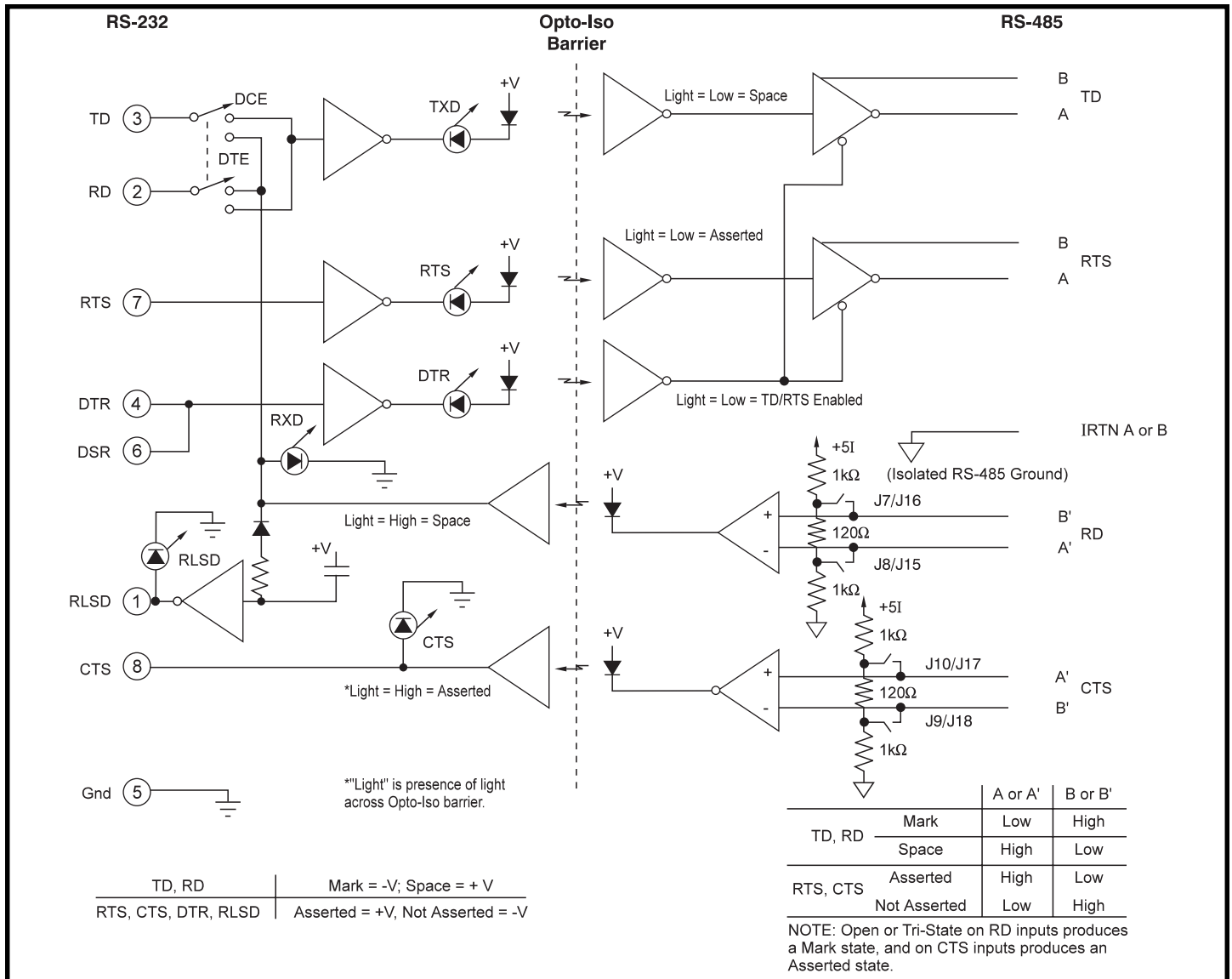


Figure 1: RML485 Logic Diagram (only 1 channel shown)

may be multi-dropped, and the distance is greatly improved because of 100% production testing of each unit over long cables.

Among the RML485, LDM485, and LDM422, the LDM422 has the greatest limitations and its limitations must be respected when interconnecting to the others. The LDM422 may only drive up to 32 multi-dropped units on the line, and it has reduced speed-distance limits as shown in the LDM422 data sheet. Its total driver load is 100 ohms minimum and its maximum common mode voltage range is +6V to -0.25V. Total driver load includes all driver high-impedance state and receiver input impedances and termination resistors.

The RS-232 connector is a female 9-pin connector. Field connection is made through a modern, solderless, screw-termination assembly.

#### Pin Descriptions

Pin 1	RLSD	[8]	Receive Line Signal Detect
Pin 2	RD	[3]	Receive Data
Pin 3	TD	[2]	Transmit Data
Pin 4	DTR	[20]	Data Terminal Ready (jumpered to Data Set Ready)
Pin 5	SG	[7]	Signal Ground
Pin 6	DSR	[6]	Data Set Ready (jumpered to Data Terminal Ready)
Pin 7	RTS	[4]	Request To Send
Pin 8	CTS	[5]	Clear To Send

Pin numbers given are for the 9-pin connector with the 25-pin equivalent in [ ].

## Interface

The RML485 conforms to EIA RS-232 and RS-485 specifications. Pin 6, DSR, is jumpered to pin 4, DTR. DTR must be asserted by the host RS-232 port before the RML485 can transmit data. When Data Terminal Ready is not asserted, all outputs of the RML485 are high impedance, allowing up to 64 RML485 units to be multidropped on a common communications cable. See Figure 5 for details.

Request To Send and Clear To Send are carried through the RS-485 port as two separate wire pairs. These may be used for full duplex flow control.

## Data Rate and Operating Distance

(With wire capacitance equal to 25pF/ft (82pF/m) and up to 32 multidrop units).

Reduced distances may be required when as many as 64 units are multidropped. Use the following percentage reductions of distance:

Percent Reduction of Distance	Number of Multidrop Units
0%	1-32
30%	33-48
50%	49-64

Specified distances are for the wire sizes 18-24AWG (0.82-0.20mm<sup>2</sup>) with a maximum capacitance of 25pF/ft (82pF/m). For higher capacitance cables, decrease the distance specifications for 2400 baud and above by an amount proportionate to the increase in cable capacitance. For example, the use of shielded cable with 50pF/ft (164pF/m) would reduce the distances by 50%.

For baud rates of 2400 and below, distances are limited by the DC voltage drop. For 4800 baud and above, distances are limited by pulse distortion. The use of low-capacitance cable can extend the distances shown. Belden 9182 and 9184 are, respectively, single and dual twisted-pair cables that are especially designed for high-speed data communications applications. With these cables, the distances can be extended by 50%. However, the DC voltage drop limited distance specified for 2400 baud may not be exceeded.

Cable capacitance for individually shielded wire pairs is usually given by manufacturers as the capacitance between the wires and the capacitance from each wire to the shield. The effective transmission line capacitance is approximately the interwire capacitance plus one-half of the wire-to-shield capacitance.

## Configuration

The four other LEDs indicate the status of various control conditions and will be on when these functions are asserted. An open circuit to Request To Send will be interpreted as assertion, allowing convenient operation with equipment not supporting this function. An open circuit on the Receive Data line of the RS-485 circuits will be interpreted as a MARK.

Echo suppression is available by jumpering J1 and/or J2 (figure 7). Then asserting RTS enables echo suppression and forces RD (pin 2) to a MARK.

Data Terminal Ready, DTR, must be asserted before the RML485 can transmit data. This is normally done by the host computer. For situations where the host equipment does not have the capability of supplying a DTR signal, RLSD may be used to automatically assert DTR. On the RS-232 connector of each RML485, simply connect RLSD pin 1 to DTR pin 4. Alternately, DTR may be asserted continuously by closing J4 and/or J12 (figure 3). To terminate 4-wire transmission lines, use the appropriate jumpers from among J5-J10 (Channel A), J13-J18 (Channel B) (figures 1 and 3). This connection is not appropriate for multi-drop installations.

For multi-drop installations, the following points should be considered (see Figure 2 for multi-drop wiring connections):

1. DTR at +V, energizes the RS-485 transmitter and DTR at -V, sets the transmitter to high impedance releasing the RS-485 line so other devices may transmit. As a result, for any 2-wire RS-485 connection, the RS-232 equipment must automatically control DTR for transmit and receive on the RS-485 line. If the equipment automatically controls RTS, CTS, or DSR instead, simply wire that line to DTR on the RML485.
2. Local equipment connected to the RS-232 connector must not leave DTR in the asserted state.
3. An open circuit or zero volts on the RS-232 connector pin 4 (DTR) is equivalent to disassertion.
4. If the RML485 is not powered, it releases the transmit bus so other RS-485 devices may use the bus.
5. The RS-485 line should be terminated at both ends using line termination jumpers J5-J10, Channel A and/or J13-J18 Channel B (figure 3). Stub length off the main line should be as short as possible.

To move the DTR switch point from the +1 to +2V range to the -1 to 0V range, jumper J3 and/or J11 (figure 3).

For DSR continuous assertion independent of DTR, remove J4 and/or J12 (figure 3) and place over one pin.

#### NOTES:

- (1) For data channels, MARK is A negative relative to B.
- (2) For control lines, assertion is A positive relative to B.
- (3) RTS = Request To Send, CTS = Clear To Send, TD = Transmitted Data, RD = Received Data.
- (4) Recommended wire sizes are 14AWG to 22AWG (1.63 to 0.64mm). Belden 8442 or Signal 1172 are typical low cost, nonshielded, twisted pair cables for use with RML485.
- (5) Signal return is not required. Cable shield, if used, should be connected to IRTN A and/or IRTN B.
- (6) RML485 units are suitable for use in RS-422/485 applications.

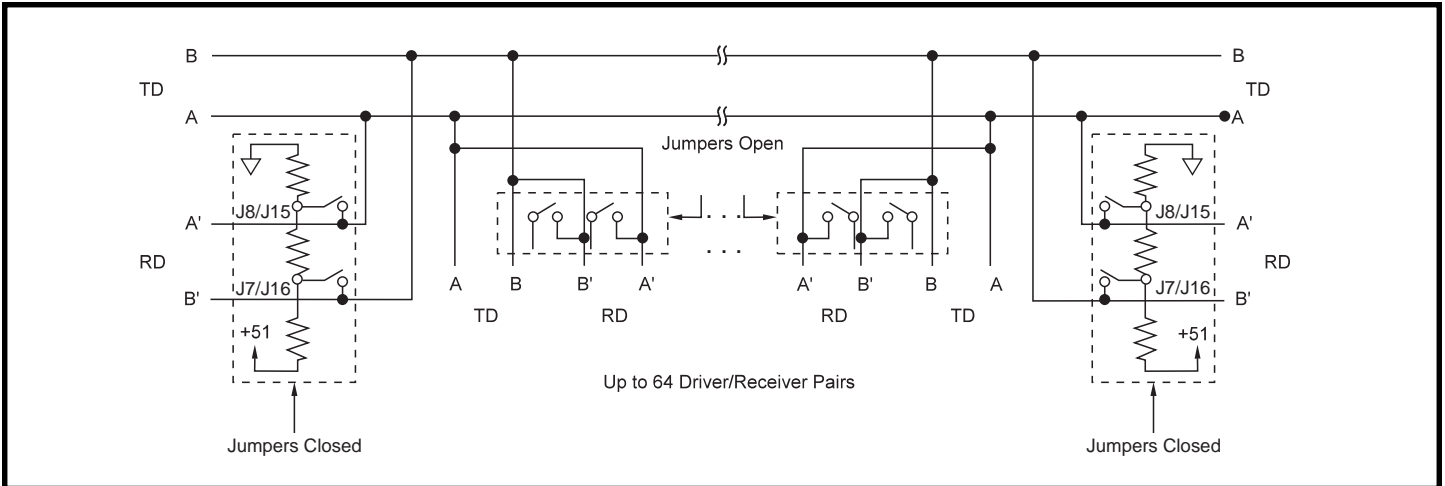


Figure 2: RML485 Multidrop Wiring Connection

Dataforth does not authorize or warrant its products for use in life support/critical applications.

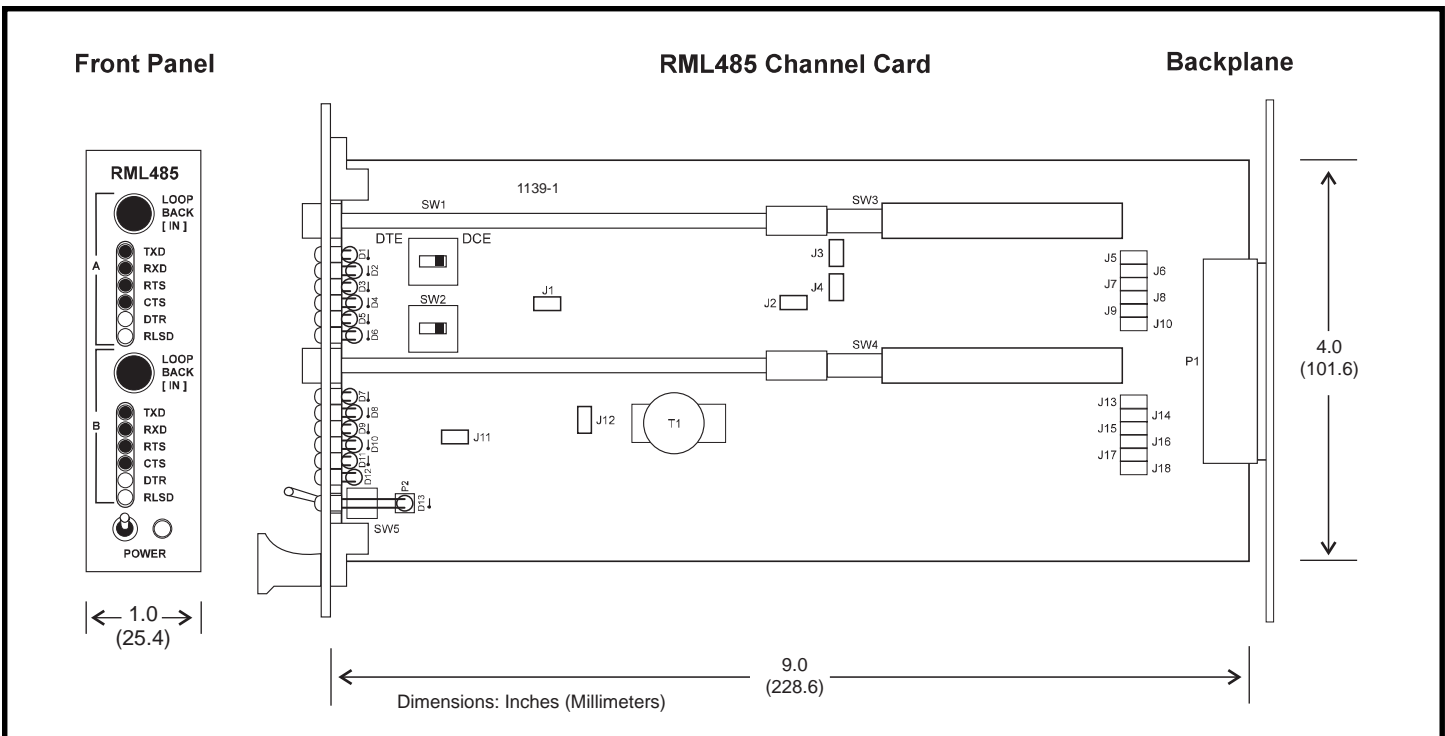


Figure 3: RML485 Mechanical Drawing