

RD320-OF & RD320-OFR

RS-232/422/485 to single-mode fiber optic Converter



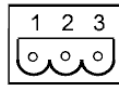
- Serial interfaces 3 in 1 : RS232, RS422 and RS485
- Single-mode silicium optical fiber
- Maximum rate of 500 Kbaud in RS232, RS422 and RS485
- 9/125µm fiber optic, Length transmission up to 20.000 m (65.600 ft)
- Built-in automatic turn-around in RS485 mode
- Activity LEDs for Tx and Rx on serial and optical lines
- Optical fiber break signalization with LED and MOSFET switch closure
- External power supply +9Vdc to +36Vdc
- Metal housing, DIN Rail 35 mm assembly
- 1 additional full duplex optical interface for the RD320-OFR (redundancy, repeater, multidrop topologies)

TECHNICAL SPECIFICATIONS

Conversion RS232 or RS422/RS485, TXD and RXD, towards single-mode optical fibers.
Asynchronous transmission, full duplex, half duplex or simplex.
Serial interfaces: 9 pins male screw connector.
Optical interfaces
RD320-OF : 2 SC connectors.
RD320-OFR : 4 SC connectors.
DIN Rail 35 mm (1.38 in) assembly.
Operating temperature range: -5°C to +65°C (23°F to 149 °F).
Humidity : 0 to 95% RH, without condensation.
Signals RD320-OF : Power, Serial Tx, Serial Rx, Tx, Rx, Alert.
RD320-OFR : Power, Serial Tx, Serial Rx, Tx1, Rx1, Alert1, Tx2, Rx2, Alert2.
Dimensions and Weight : 107 x 88 x 25 mm (4.21 x 3.46 x 0.98 in) - 260g (0.56 lbs).

Power Supply

External power supply 9 to 36 Vdc, filtered in high frequency and surge protection.
Protection of supplies by limitation of current.
Protection against polarity inversions.
Consumption RD320-OF = 2.5 W max.
Consumption RD320-OFR = 3.9 W max.



PIN#	Signal	Description
1	EARTH	Protective ground
2	GND	Ground power supply
3	+VDC	Positive power supply

Optical Interfaces

1310 nm Laser INGaAsP LED.
Kind of fiber to use: Silicium Optical Fiber, single mode 9/125µm.

Fiber	Caractéristiques optiques				
	Output power measured out of 1meter of cable, Ta=25°C, If=100mA		Optical input power logic level low Ta=25°C Io=8mA	Attenuation of fibers.	Power Budget
	Min.	Max.	Min.	Typ.	Typ.
9/125 µm	-15 dBm	-8 dBm	-31 dBm	0.45 dB/Km	16 dBm

Note that the acceptable maximum optical power in reception should never exceed -7dB.

The 16dBm of power budget enable transmission of 20Kms in the worst cases:

- High temperature (80°C): -2dB max
- Connectors coupling : -2dB max
- Fibers ageing : -3dB max

Transmission length = Power budget - (2+2+3) / Attenuation of fiber = (16 - 7) / 0.45 = 20 Kms

RS232 serial interface

EIA/TIA-232 and ITU-T V.28/V.24.
Maximum length of RS232 : 15 meters (50 ft).
ESD Protection of 15kV on RS232.
Maximum data rate on RS232 : 500 Kbaud.

RS422/RS485 serial interface

EIA RS422/RS485/CCITT V11.
Maximum data rate on RS422: 2 Mbaud.
Built-in automatic turn-around in RS485 mode.
Maximum data rate on RS485: 2 Mbaud.
Maximum length on RS422 : 1200 meters (4,000 ft).
Maximum load on RS422 and RS485: 32 transmitters / receivers in the bus.
ESD protection of 15kV on RS422/485.
Protection against temporary line voltage surges (RS485/422) : by peaks, breakdown voltage +/-6.5V in common and differential mode, capacitance 300W over 8/20µs.

Security

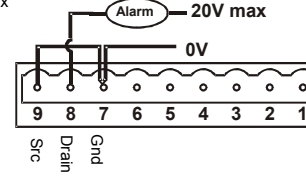
RD320-OF and RD320-OFR offer a high level of safety of communication. A broken fiber is immediately located by the receiving converter:

- A warning light (ALERT) indicates the failing fiber.
- A Mosfet switch, on which the user can connect an alarm, is closed.

Mosfet switch specifications :

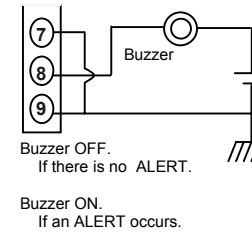
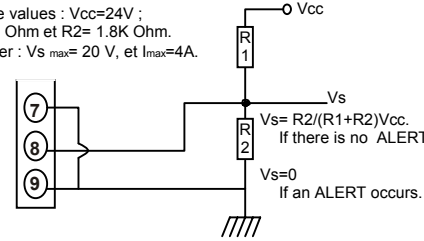
Drain to Src (V8-9) breakdown voltage = 20 V max
Continuous Src current = 4 A max
Pulse Src current = 30 A max

Caution : You must connect pin 9 (src) to pin 7 (GND) to be able to use ALERT signal.



Examples :

Possible values : Vcc=24V ;
R1=560 Ohm et R2= 1.8K Ohm.
Reminder : Vs max= 20 V, et Imax=4A.



Inputs / outputs connector

MODE	RS422A				RS485		RS232		ALERTE	
	TxB	TxA	RxB	RxA	TxRxB	TxRxA	Tx	Rx	Drain	Source
SIGNAL	B	A	B'	A'	BB'	AA'				
PIN#	1	2	3	4	3	4	5	6	7	8 9

CABLING

Required cable on the serial line

Min diameter 3 mm, max 6.5 mm.
1, 2 or 3 twisted pairs shielded or not shielded, preferred gauge 22 (0.34 mm²) or 24 (0.22 mm²), 50 pF/m, 120 Ohms rated impedance.

How to identify TxA/TxB, RxA/RxB or TxRxA/TxRxB signals on equipments

If the signals on the connectors of your equipment are not identified by standardized names (A, B...) but by some names with + and - (Tx+, Tx-, Rx+, Rx-, TxRx+, TxRx-), the wiring may be false because the definition of the polarities + and - can differ from one manufacturer to another.

To determine if the "+" of your equipment corresponds to the "A" or the "B", it is enough to know that the potential of TxB (or TxRxB) is higher than the potential of TxA (or TxRxA) in the idle state (called MARK state).

Wiring

In RS422A	TxA (RD320)	→	RxA (Equipments)
	TxB (RD320)	→	RxB (Equipments)
	RxA (RD320)	→	TxA (Equipments)
	RxB (RD320)	→	TxB (Equipments)
In RS485	TxRxA (RD320)	→	TxRxA (Equipments)
	TxRxB (RD320)	→	TxRxB (Equipments)

SERIAL INTERFACE CONFIGURATION

SW1			
1	2	3	4
Terminating resistor RS422/485 ON / OFF	Line Polarizations RS422/485 ON / OFF	Serial Mode : OFF / OFF → RS232 et RS422 OFF / ON → RS422 SLAVE ON / OFF → RS485 ON / ON → RS485 ECHO	

Serial Mode

RS232 and RS422 : set this on each equipment in a RS232 or point-to-point RS422 link, or on the Master in multidrop RS422 mode.
RS422 SLAVE: set this on RS422 slaves in multidrop mode.
RS485: set this mode to connect RS485 equipments.
RS485 ECHO: In this mode, transmitted characters on Rs485 line are echoed on the receiver of the same port. This mode is used for the specific applications which check the emitted characters to manage the possible collisions.

Line polarizations

Line polarizations are needed for stability:
- in RS485 mode when changing from transmit to receive,
- in RS422 SLAVE mode if several transmitters are on the bus.
No more than one pair of polarizations per line should be set.

Terminating resistor

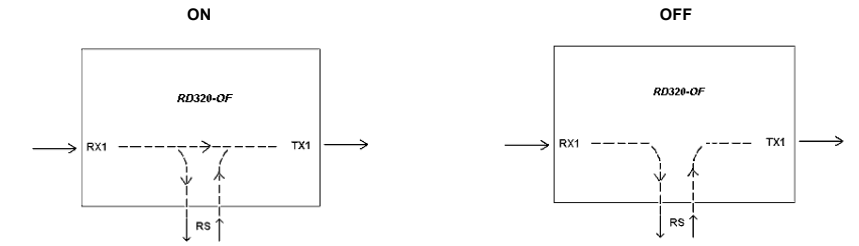
The line terminating resistor for RS422A/RS485 line, reduces reflections created by long lines at high speed. It is not required in noise free environment and if the length and the rate are within 1000 m at 9600 baud or 100 m at 112 Kbaud.

OPTICAL INTERFACE CONFIGURATION

SW2			
1	2	3	4
RD320-OF & OFR	RD320-OFR only / reserved 'OFF' for RD320-OF		
Repeater Rx1 → Tx1 ON / OFF	Repeater Rx2 → Tx2 ON / OFF	Optical Fiber Mode OFF / OFF → Fiber 2 ignored OFF / ON → Master in Ring ON / OFF → Bus, single master ON / ON → Bus, Multi master or Ring : single master	

Repeater Rx1 → Tx1

Retransmits the characters received by Rx1 optical fiber on Tx1 optical fiber.



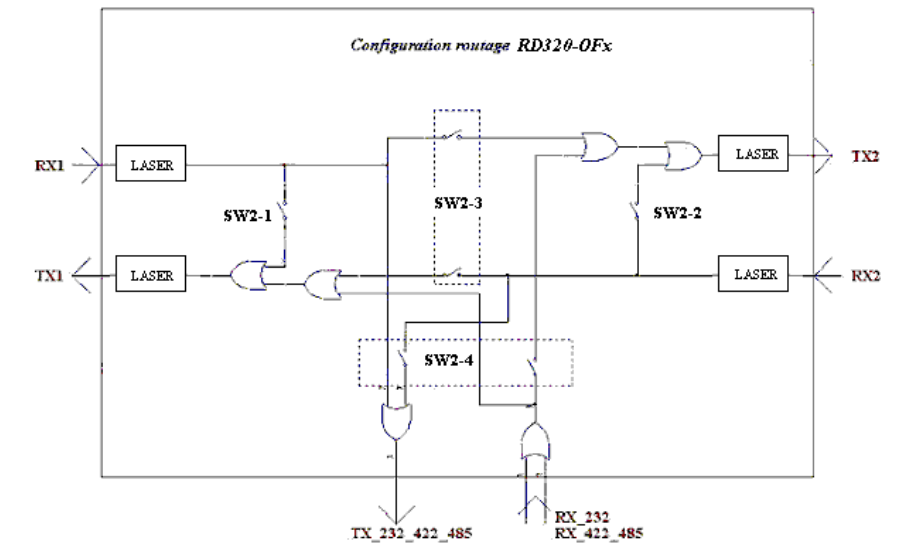
Repeater

Retransmits the characters received by Rx2 optical fiber on Tx2 optical fiber.

Optical Fiber Mode (see feasible topologies):

- OFF / OFF → The second fiber (transmitter and receiver) is ignored.
- OFF / ON → Set this for :
- A ring configuration, for the Master equipment.
- ON / OFF → Set this for :
- All equipments in a single-master bus configuration.
- ON / ON → Set this for :
- All equipments in a multi-master bus configuration.
- Slave equipments in a ring configuration.

SYNOPTIC



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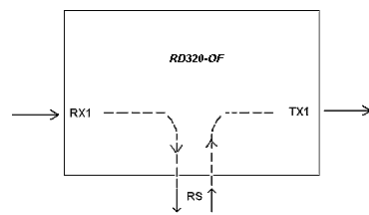
FEASIBLE TOPOLOGIES WITH RD320-OF AND OFR

- Point to Point topology:

This configuration of RD320-OF allows control of a single equipment located in a disturbed or distant zone.

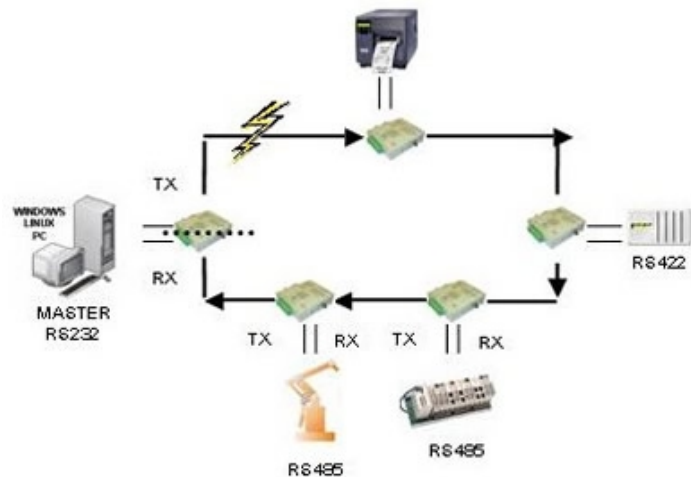


Example :

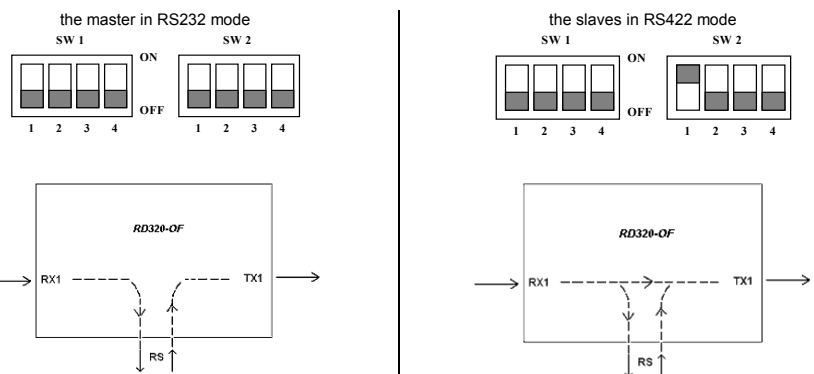


- Simple ring topology

The RD320-OF can be chained to create a simple ring (one master, many slaves).



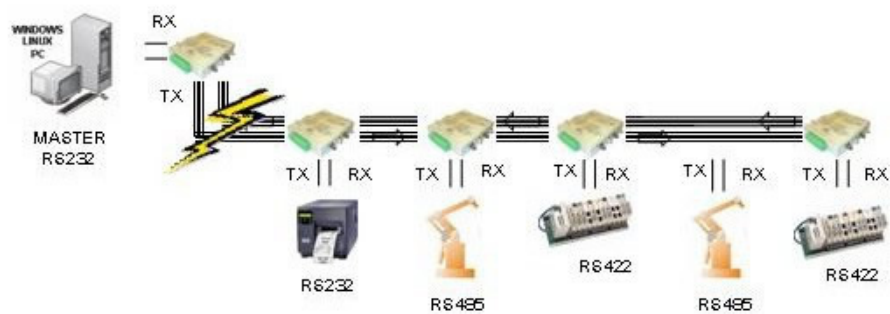
Example :



FEASIBLE TOPOLOGIES WITH RD320-OFR

- Single-master bus topology

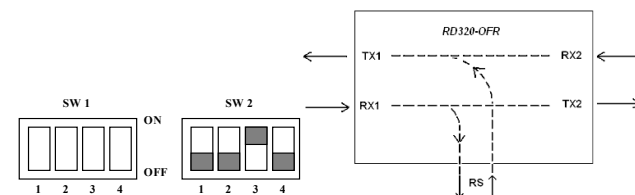
Each RD320-OFR allows to connect one or more "Slave" peripheral equipments controlled by a "Master" station, which uses addressing sequences to manages data exchanges. All the "Slave" stations receive the data transmitted by the "Master" station, but answers are received only by the "Master".



In this case "Master" could use a simple RD320-OF.

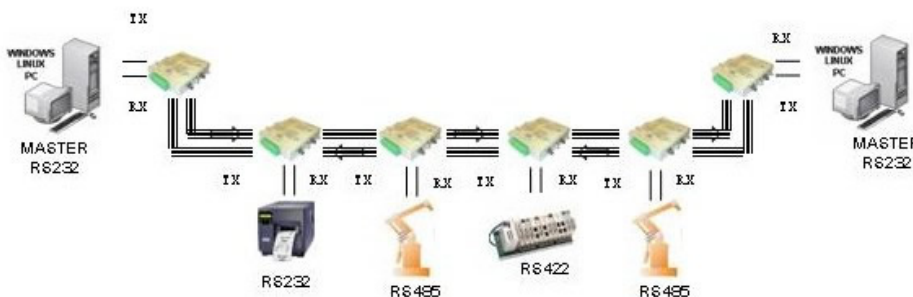
Example :

Below, the switch SW1 must be set depending on the kind of electrical interface on each device. SW2 is common to the master and the slaves.



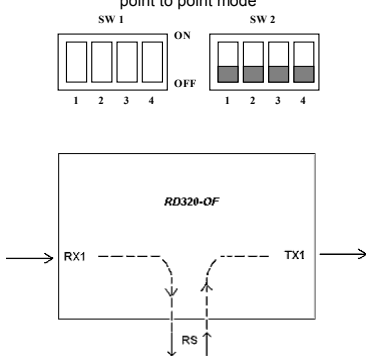
- Multi-master bus topology

In this configuration, the data transmitted by the Master 1 are received by all the slave stations as well as by the Master 2, known as a rescue station. The answers of one slave station are received by all the slave stations, and by Masters 1 and 2. This kind of configuration brings a safety for the application, because the Master 2 station guarantees the continuation of the activity, in the event of breakdown of the Master 1 station or of cut of the optical fiber. The master 1 and 2 stations can be a single station with two independent serial ports.

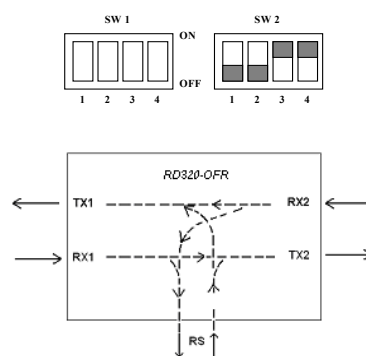


Example :

The masters could be simply connected with RD320-OF set to point to point mode

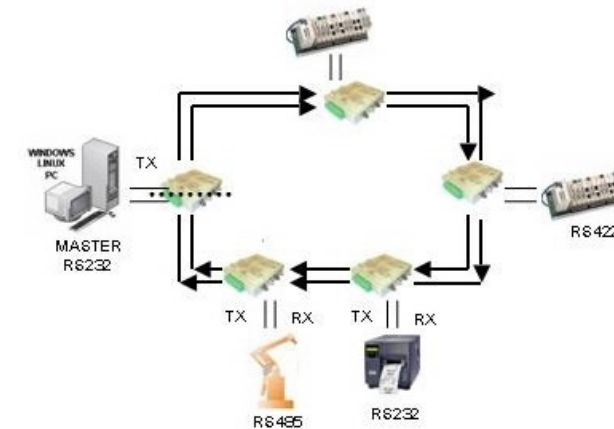


The slaves have the same configuration on switches SW2

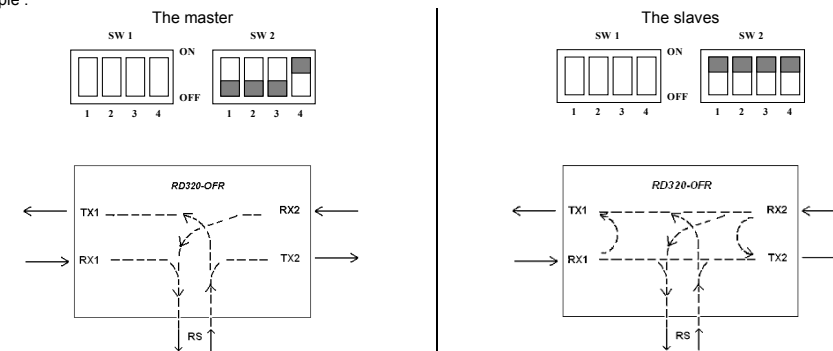


- Redundant ring topology

In this configuration, the same data flow is transmitted on the 2 rings simultaneously. It's a single master topology. In the event of cut of one fiber, the equipment will receive information on the other line.

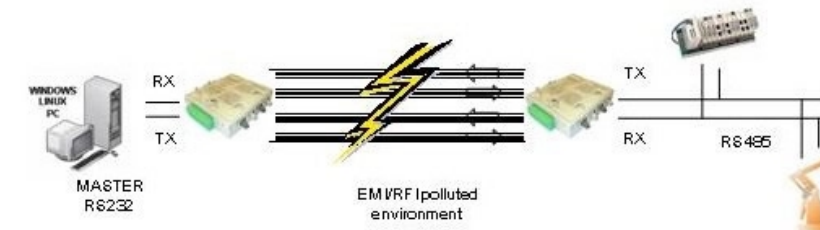


Example :

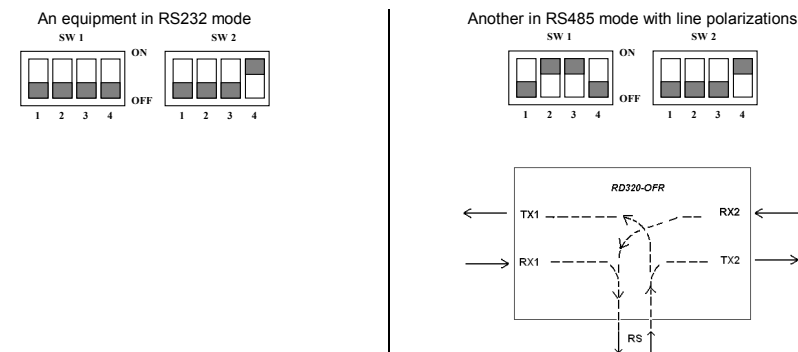


- Point to Point topology with redundancy

The redundancy ensures a double safety for a critical connection.



Example :



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