

# RD300-OF & RD300-OFR

## RS-232/422/485 to multimode fiber optic Converter



- Serial interfaces 3 in 1 : RS232, RS422 and RS485
- Multimode silicium optical fiber
- Maximum rate of 2 Mbaud in RS422 and RS485, 1 Mbaud in RS232
- Length transmission up to 5,000 m (16,400 ft) on 100/140µm fiber optic
- Built-in automatic turn-around in RS485 mode
- activity LEDs for TxD and RxD 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
- 2 additional optical interfaces for the RD300-OFR (redundancy, repeater, multidrop topologies)

### TECHNICAL SPECIFICATIONS

Conversion RS232 or RS422/RS485, TXD and RXD, towards optical fibers.  
Asynchronous transmission, full duplex, half duplex or simplex.  
Serial interfaces: 9 pins male screw connector.  
Optical interfaces  
RD300-OF : 2 ST connectors.  
RD300-OFR : 4 ST 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 RD300-OF : Power, Serial Tx, Serial Rx, Tx, Rx, Alert.  
RD300-OFR : Power, Serial Tx, Serial Rx, Tx1, Rx1, Alert1, Tx2, Rx2, Alert2.  
Dimensions and Weigth : 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 RD300-OF = 2.1 W max.  
Consumption RD300-OFR = 2.3 W max.

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

#### Optical Interfaces

820 nm GaAlAs LED.  
Kind of fiber to use: Silicium Optical Fiber, multimode 50/125µm, 62.5/125µm or 100/140µm.

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	Connection system loss	Power Budget	
	Min.	Max.	Min.	Typ.	Min.	Max.
50/125 µm	-17.3 dB	-11.4 dB	-24 dB	+ 2* 0.25 dB	7.2 dB	13.1 dB
62.5/125 µm	-13.5 dB	-7.6 dB	-24 dB	+ 2* 0.25 dB	11 dB	16.9 dB
100/140 µm	- 8 dB	- 2.1 dB	-24 dB	+ 2* 0.25 dB	16.5 dB	22.4 dB

Note that the acceptable maximum optical power in reception should never exceed -10 dB.

	Attenuation of various fibers (-40 °C, +85 °C)		
	Min.	Typ.	Max.
50/125 µm	1 dB/km	2.8 dB/km	4 dB/km
62.5/125 µm	1.5 dB/km	2.8 dB/km	4 dB/km
100/140 µm	1 dB/km	3.3 dB/km	5.5 dB/km

#### 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 : 1 Mbaud.

#### 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.

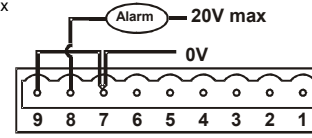
#### Security

RD300-OF and RD300-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 :

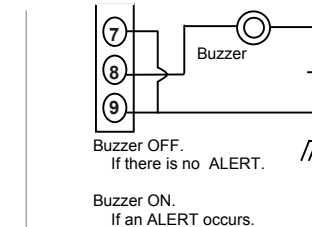
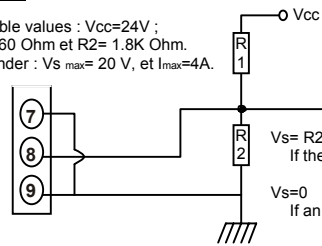
Drain to Src (V8-9) breakdown voltage = 20 V max  
Continuous Src current = 4 A max  
Pulse Src current = 30 A max

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	GND	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 mm<sup>2</sup>) or 24 (0.22 mm<sup>2</sup>), 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 (RD300)	→	RxA (Equipments)
	TxB (RD300)	→	RxB (Equipments)
	RxA (RD300)	→	TxA (Equipments)
	RxB (RD300)	→	TxB (Equipments)
In RS485	TxRxA (RD300)	→	TxRxA (Equipments)
	TxRxB (RD300)	→	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 1 CONFIGURATION

SW2					
1	2	3	4	5	6
Light in Idle state :	Repeater Rx1 → Tx1 :	Alarm	(Unused)	Attenuation on transmission	
OFF → light off ON → light on	ON / OFF	ON / OFF		ON / ON : no attenuation OFF / ON : attenuation of 5dB OFF / OFF : attenuation of 11dB	

#### Idle state

Selects the light state (turned on or off) for the Tx1 transmitter "MARK" state, in order to standardize the use of equipments from different manufacturers.

#### Repeater

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

#### Alarm

Turns on or off the security function, which allows for optical fiber cut-off detection. This function can only be used between two equipments of the RD300-Ofx serie.

#### Table of attenuation settings

	11dB	5dB	0dB	11dB	5dB	0dB
50/125 µm	0 m	0 to 800m	800 to 2800m	0 ft	0 to 2600 ft	2600 to 9100 ft
62.5/125 µm	0 m	0 to 2100m	2100 to 3900m	0 ft	0 to 6900 ft	6900 to 12800 ft
100/140 µm	0 to 1600m	1600 to 3500m	3500 to 5000m	0 to 5200 ft	5200 to 11500 ft	11500 to 16400 ft

### OPTICAL INTERFACE 2 CONFIGURATION (RD300-OFR)

SW3					
1	2	3	4	5	6
Light in Idle state :	Repeater Rx2 → Tx2 :	Optical Fiber Mode		Attenuation on transmission	
OFF → light off ON → light on	ON / OFF	OFF / OFF → Fiber 2 ignored OFF / ON → Master in Ring ON / OFF → Bus, single master ON / ON → Bus, Multi master or Ring : single master		ON / ON : no attenuation OFF / ON : attenuation of 5dB OFF / OFF : attenuation of 11dB	

#### Idle state

Selects the light state (turned on or off) for the Tx2 transmitter "MARK" state, in order to standardize the use of equipments from different manufacturers.

#### Repeater

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

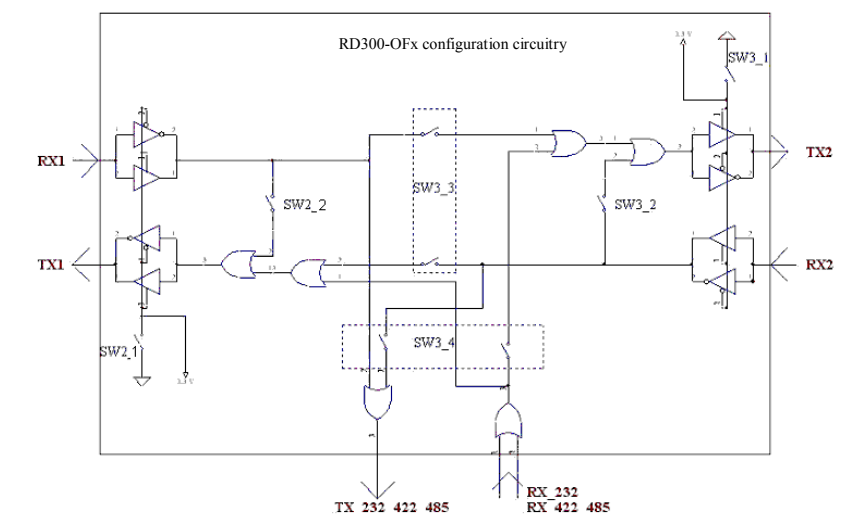
#### Optical Fiber Mode (see feasible topologies):

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.

#### Table of attenuation settings

	11dB	5dB	0dB	11dB	5dB	0dB
50/125 µm	0 m	0 to 800m	800 to 2800m	0 ft	0 to 2600 ft	2600 to 9100 ft
62.5/125 µm	0 m	0 to 2100m	2100 to 3900m	0 ft	0 to 6900 ft	6900 to 12800 ft
100/140 µm	0 to 1600m	1600 to 3500m	3500 to 5000m	0 to 5200 ft	5200 to 11500 ft	11500 to 16400 ft

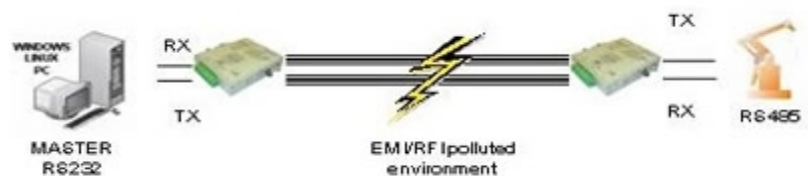
### SYNOPTIC



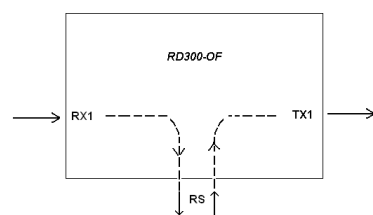
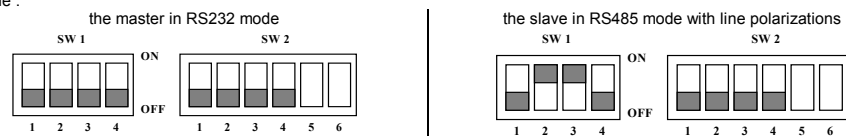
## FEASIBLE TOPOLOGIES WITH RD300-OF AND OFR

### - Point to Point topology:

This configuration of RD300-OF allows control of a single equipment located in a disturbed or distant zone.

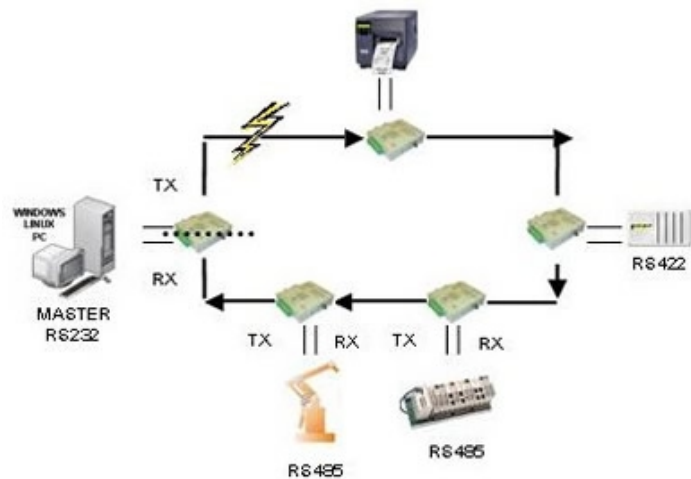


Example :

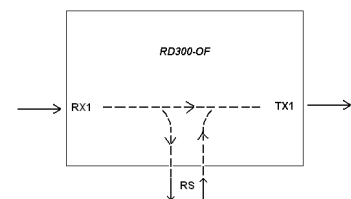
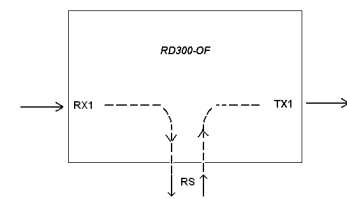
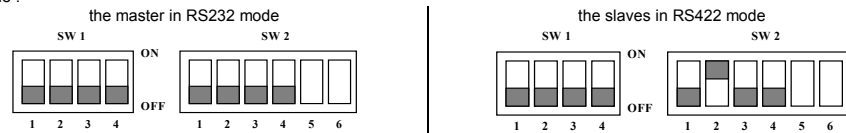


### - Simple ring topology

The RD300-OF can be chained to create a simple ring (one master, many slaves).



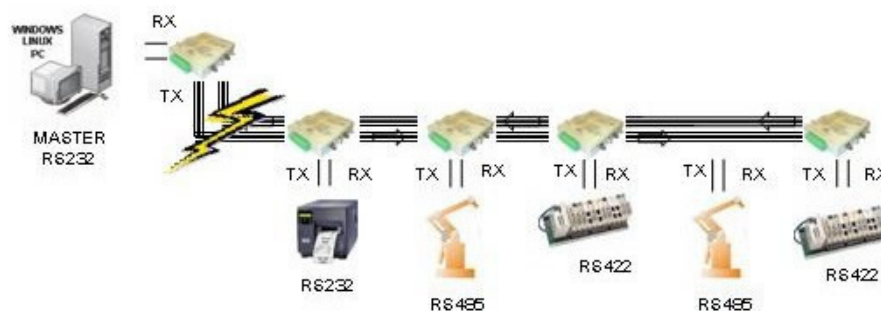
Example :



## FEASIBLE TOPOLOGIES WITH RD300-OFR

### - Single-master bus topology

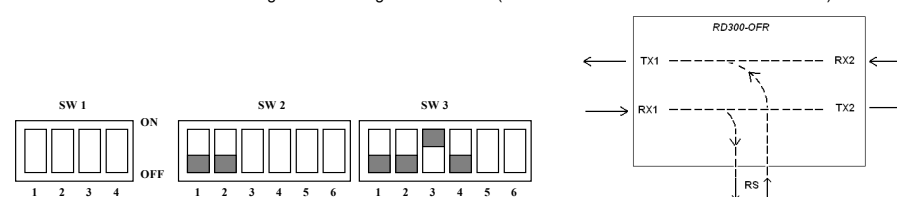
Each RD300-OFR allows to connect one or more "Slave" peripheral equipments controlled by a "Master" station, which uses addressing sequences to manages data exchanges. All the "Slave" stations receive the data transmitted by the "Master" station, but answers are received only by the "Master".



In this case "Master" uses a simple RD300-OF.

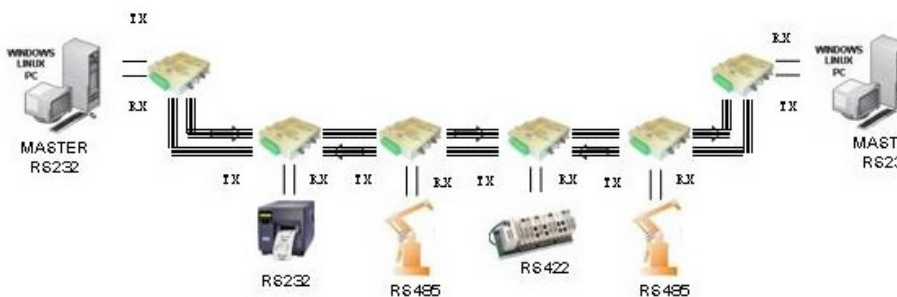
Example :

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. SW3 gives the settings for the slaves (SW3 does not exist on the master RD300-OF).



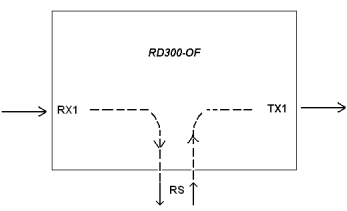
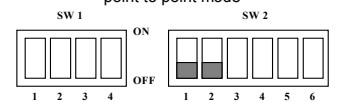
### - Multi-master bus topology

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.

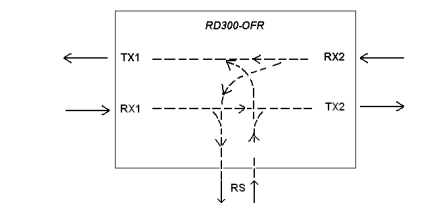
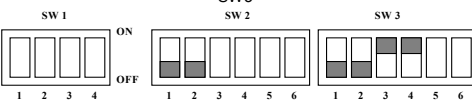


Example :

The masters could be simply connected with RD300-OF set to point to point mode

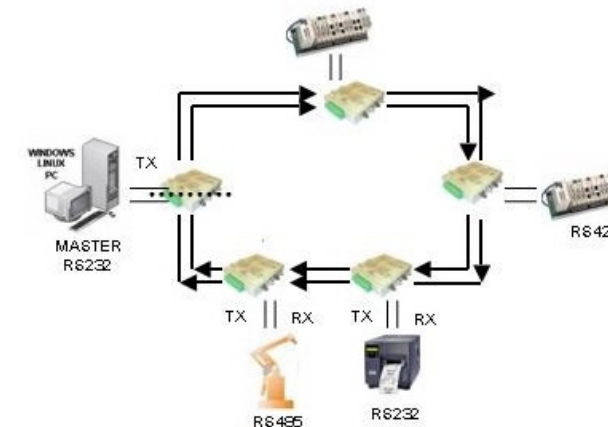


The slaves have the same configuration on switches SW2 and SW3

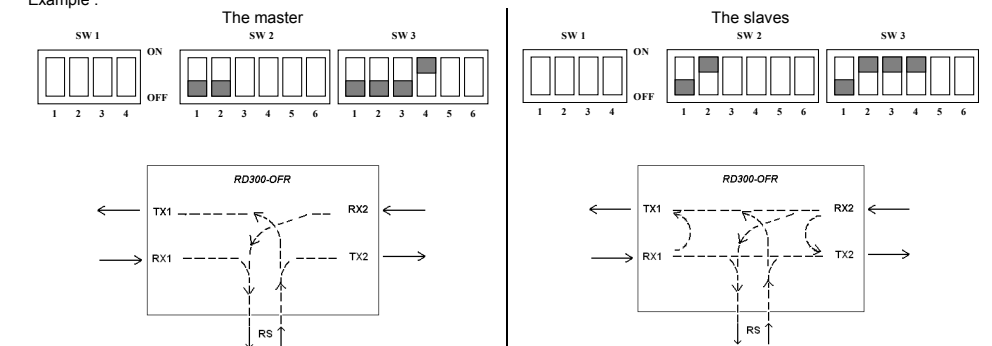


### - Redundant ring topology

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.

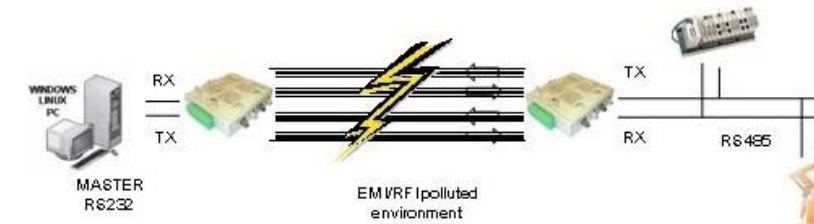


Example :

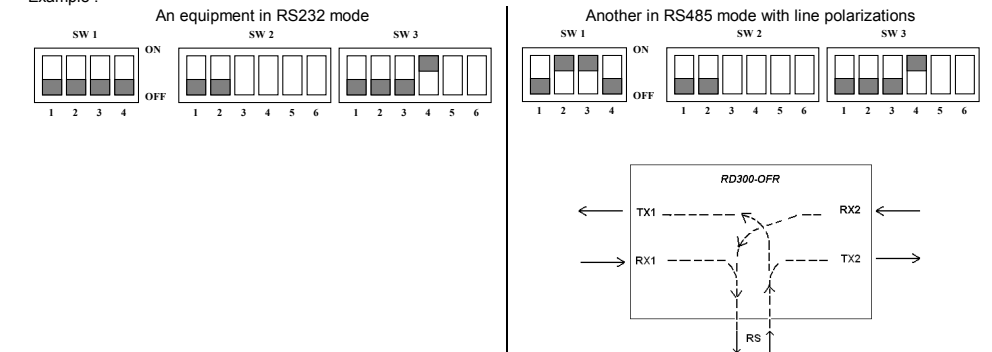


### - Point to Point topology with redundancy

The redundancy ensures a double safety for a critical connection.



Example :



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