



IRC485

RS485 FIELD BUS REPEATER

USER GUIDE

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The IRC485 field bus repeater module is manufactured by

ETIC TELECOMMUNICATIONS

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1. Product overview

The IRC485 module performs field bus extension over a long distance according to the required data rate and the cable type.

The module repeats the data of an L1 line to an L2 line and the other way round. L1 and L2 lines are optically isolated.

The on-line transmission to the half-duplex is RS485 over a pair.

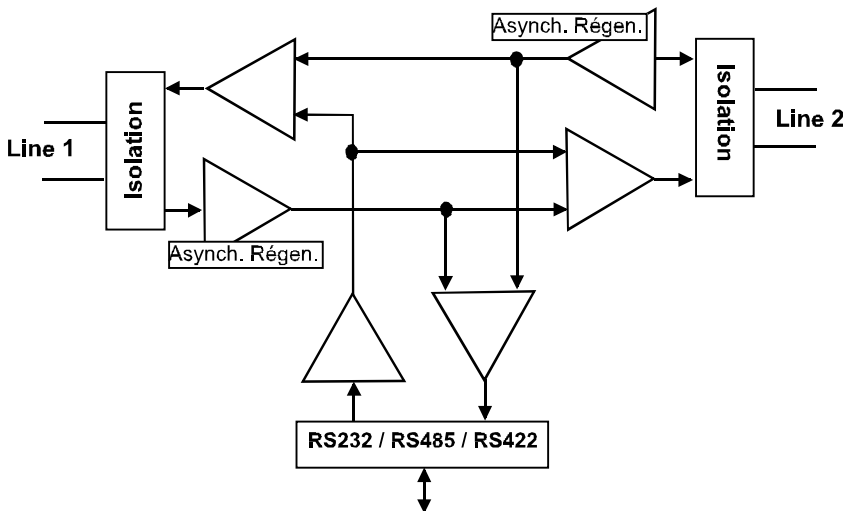
Moreover the module has an RS232, RS422 and RS485 locale interface.

The data to be transmitted can be synchronous or asynchronous.

If the transmission is asynchronous and contains errors, it is possible to launch a byte active repetition process.

This device permits to recalibrate the start bit as well as the data bits and the stop bit without entailing any significant delay to the transmission.

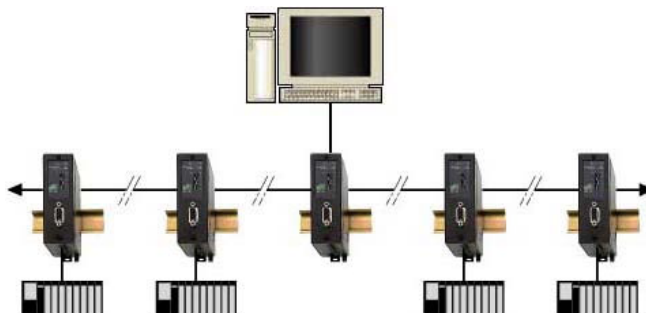
The IRC485 is compatible with the PROFIBUS network transmission.



2. Network topologies

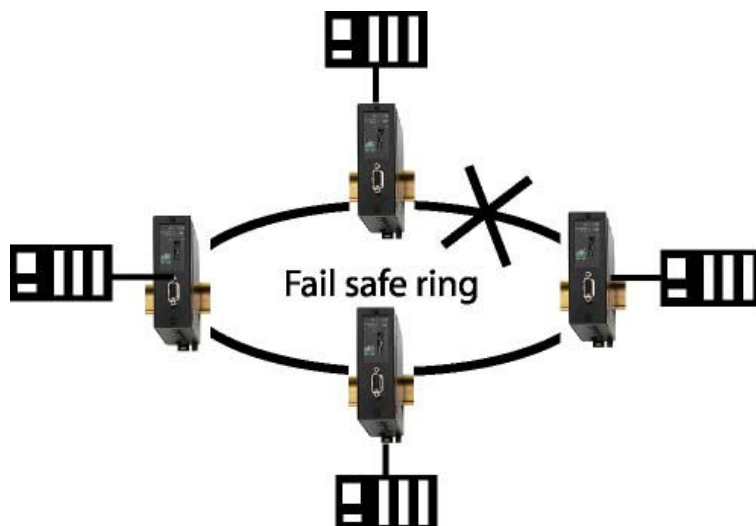
The IRC485 can be used to create either a bus or a failsafe ring network.

BUS topology: Chaining of an unlimited number of IRC485 modules.

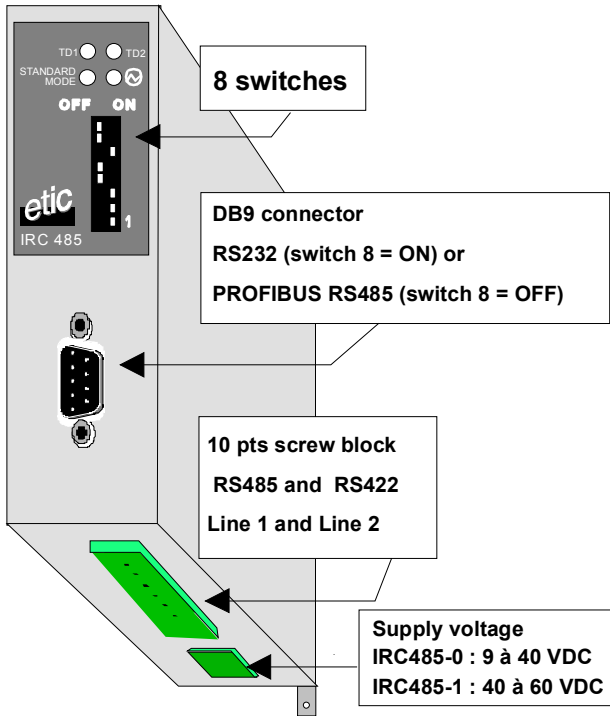



Failsafe ring topology

1 IRC module must be assigned as the ring master module and the other ones as the slaves modules.



3. Description



Leds	
TD1	Data transmitted to line 1
TD2	Data transmitted to line 2
STANDARD MODE	ON : Standard mode (Switch 2 =ON) OFF : "active repetition" mode (Switch 2 =OFF)
	Power-on indicator

4. Switches configuration

The 8 switches on the front panel allow the complete configuration of the module.

TABLE 1 : SWITCHES					
SW.					
1	NETWORK TOPOLOGY				
	Bus or ring slave	OFF			
	Ring master	ON			
2	MODE				
	Bytes active repetition	OFF			
	Standard	ON			
3	FRAME (significant only if SW2=OFF)				
	1 byte = 10 bits	OFF			
	8 b + 1 start + 1 stop				
	7 b + 1 start + 1 parity + 1 stop				
	7 b + 1 start + 2 stops				
1 byte = 11 bits	ON				
8 b + parity + start + stop					
4 to 7	DATA RATE (significant only if SW2=OFF)				
		4	5	6	7
	1200 b/s	OFF	OFF	OFF	OFF
	2400 b/s	ON	OFF	OFF	OFF
	4 800 b/s	OFF	ON	OFF	OFF
	9 600 b/s	ON	ON	OFF	OFF
	19 200 b/s	OFF	OFF	ON	OFF
	38 400 b/s	ON	OFF	ON	OFF
	57 600 b/s	OFF	ON	ON	OFF
	115 200 b/s	ON	ON	ON	OFF
	93 750 b/s	OFF	OFF	OFF	ON
	187 500 b/s	ON	OFF	OFF	ON
	500 000 b/s	OFF	ON	OFF	ON
	8	DB9 : Use of DB9 connector			
PROFIBUS RS485		OFF			
RS232		ON			

4.1. Synchronous transmission

	Switches position
SW 1	OFF
SW 2	ON
SW 3	-
SW 4 à 7	-
SW8	RS232 or PROFIBUS DP (see table1)

4.2. Asynchronous transmission : Bus topology

	Switches position
SW 1	OFF
SW 2	OFF
SW 3	see table1
SW 4 à 7	see table1
SW8	RS232 or PROFIBUS DP (see table1)

4.3. Asynchronous transmission : Ring topology

	Switches position	
	IRC485 master	IRC485 slave
SW 1	ON	OFF
SW 2	OFF	OFF
SW 3	see table1	
SW 4 à 7	see table1	
SW8	RS232 or PROFIBUS DP (see table1)	

4.4. PROFIBUS network

PROFIBUS transmission is RS485 asynchronous.
You need to configure the module by following the indications in the previous paragraphs 4.2. (bus topology) or 4.3. (ring topology).

The PROFIBUS interface can be activated on the DB 9 connector on the front panel.

To configure the PROFIBUS transmission:

- Configure the module just like for an asynchronous transmission (§ 4.2 or 4.3).
- Make PROFIBUS available on the DB9 connector on the front panel by turning switch 8 in OFF position.

5. Installation

TABLE 2 : 10-pin screw block		
RS485 isolated lines and local interface and RS422 non-isolated lines		
Pin	Signal	Function
Line 1		
1	B	Line 1 RS485 signal B polarity
2	A	Line 1 RS485 signal A polarity
3	Adp	Line 1 adaptation by bridging 2 and 3
Ligne 2		
4	B	Line 2 RS485 signal B polarity
5	A	Line 2 RS485 signal A polarity
6	Adp	Line 2 adaptation by bridging 5 and 6
RS485 and RS422 local interfaces		
7	RS422 B'	RS422 transmission B polarity (to IRC485)
8	RS422 A'	RS422 transmission A polarity (to IRC485)
9	RS485 B	RS422 reception B polarity (to local data terminal) Or RS485 B polarity
10	RS485 A	RS422 reception A polarity (to local data terminal) or RS485 A polarity

TABLE 3 : DB9 RS232 connector (switch 8=ON)				
Non-isolated local interface				
Pin	Circuits		Designation	Terminal-Modem
1	CD	109	Carrier Detect	←
2	RX	104	Data reception	←
3	TX	103	Data transmission	⇒
4	DTR	108	Data terminal ready	⇒
5	SG	102	Signal ground	
6	DSR	107	Data set ready	←
7	RTS	105	Request to send	⇒
8	CTS	106	Clear to send	←
9	RI	125	Ring indicator	←

TABLE 4 : DB9 PROFIBUS DP CONNECTOR (switch 8=OFF)		
Non isolated local interface		
Broche	Signal	Function
1	SHIELD	Shield
3	B/B'	RS485 B polarity
5	C/C'	Signal ground
6	VP	Voltage plus : +5 VDC/ 50 mA supply voltage delivered by IRC485 Only for bus polarization
8	A/A'	RS485 A polarity

TABLE 5 : 2-pin screw block		
Pin	Signal	Function
1	+	9 to 40 VDC supply voltage
2	-	Signal ground

5.1. Local interface

The module permits the connection of an RS232, RS422 or RS485 local equipment.

Those interfaces are not isolated. The local equipment must then be located near the IRC485 module in accordance with the chosen norm (RS232, RS422, RS485).

- **RS422 or RS485**

The RS422 local interface and the RS485 interface are available on the 10-pin screw block (refer to table 2).

- **RS232**

The RS232 interface is available on the DB9 connector on the front panel. Switch 8 must be switched ON.

The IRC485 is a modem; It can be connected to a PC with a normal DTE to DCE straight cable (pin1 to 1, pin2 to 2, ..., pin9 to 9) (refer to table 3).

- **PROFIBUS**

The standard PROFIBUS interface is available on the DB9 connector by turning switch 8 in OFF position (refer to tables 1 and 4).

5.2. Connecting line 1 and 2

- **Line type**

The module was designed to be connected to a two-wire shielded twisted line.

- **Bridging distance**

Bridging distance in Km of the IRC485 repeater (indicative values)					
BUS TOPOLOGY					
According to the cable diametre and the data rate					
Mutual capacity of the cable : 50 nF / km					
	Cable diametre				
	0.4 mm	0.5 mm	0.6 mm	0.8 mm	1 mm
Data rate					
300 b/s	13	17	20	27	34
600 b/s	9	12	14	19	24
1 200 b/s	7	8	10	13	17
2 400 b/s	5	6	7	10	12
4 800 b/s	3	4	5	6	8
9 600 b/s	2.5	3	4	5	6
19 200 b/s	1.5	2	2.5	3	3.5
38 400 b/s	1	1.5	1.7	2	2.5
57 600 b/s	0.7	0.9	1	1.4	1.7
115 200 b/s	0.5	0.6	0.7	0.8	1
93 750 b/s	0.6	0.7	0.8	0.9	1.1
187 500 b/s	0.4	0.5	0.6	0.6	0.8
500 000 b/s	0.2	0.3	0.4	0.4	0.5

Bridging distance in Km of the IRC485 repeater (indicative values)

RING TOPOLOGY

According to the cable diametre and the data rate

Mutual capacity of the cable : 50 nF / km

Data rate	B	C	D				
			Cable diametre				
			0,4 mm	0,5 mm	0,6 mm	0,8 mm	1 mm
1 200	12	10	8	10	10	10	10
2 400	12	10	6	7,5	9	10	10
4 800	12	10	4	5	6	8	9
9 600	12	10	3	3,7	4,5	6	7,5
19 200	12	10	2	2,5	3	4	5
38 400	10	10	1,5	1,8	2,2	2,6	2,6
57 600	9	7	1,2	1,5	1,7	1,7	1,7
115 200	7	6	0,65	0,8	0,8	0,8	0,8
93 750	7	6	0,7	0,9	1	1	1
187 500	7	6	0,5	0,5	0,5	0,5	0,5

B= Maximum number of modules on a ring

C= Maximum length of the ring

D= maximum length of one segment of the ring

- **Connecting the lines**

Line 1 must be connected to pin 1 and 2 of the 10-pin screw deck (refer to table 2).

Line 2 must be connected to pin 4 and 5 of the 10-pin screw deck (refer to table 2).

Line 1 and 2 can be inverted.

The A et B polarities of the lines must compulsorily be respected.

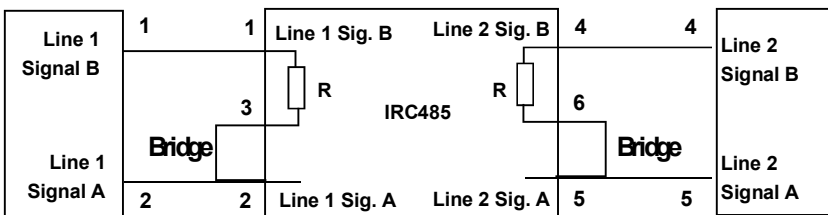
- **Adapting the lines**

The IRC485 contains a 100 Ohm termination impedance for each of the two lines.

Each termination impedance must be bridged between the A and B signals of each line.

Bridging the termination impedance between the line terminals :

- Line 1 : Bridge between 2 and 3 on the 10-pin screw block
- Line 2 : Bridge between 5 and 6 on the 10-pin screw block



CHARACTERISTICS	
Local interface	RS485 - RS422 - RS232
Field bus	All buses RS485, RS422, RS232 (PROFIBUS, MODBUS, UNITELWAY...)
Type of data transmitted	Synchronous or asynchronous Asynchronous : 7 or 8 bits Parity : without / even / odd 1 start, 1 or 2 stops 1200 - 2400 - 4800 - 9600 b/s 19.2 – 38.4 – 57.6 – 115.2 kb/s 93.75 – 187.5 - 500 kb/s (PROFIBUS data rates)
Distance btwn 2 segments / rate	Twisted pair 0.6 mm diam. no noise : 10 km for 1200 b/s 4 km for 9 600 b/s
Nber of segments	Unlimited in theory (data repetition) Only limited by error rate Typically, 10 segments
Configuration	8 micro-switches
Size	115 x 38 x 96 mm (h, l, d)
Isolation / line	Each line is isolated Isolation voltage : 2500 Vrms
EMI	EN50082-2
Electrical safety	EN 60950
Lightning	EN61000-4 and -5 (2kW common and differential modes)
Supply voltage	9 to 40 VDC
Consumption	50 mA at 24 VDC
Operating T°	0°/ + 60°C
On-line transmission	RS485 / Regeneration of signal amplitude and duration (asynchronous)



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