

# Fiber Optical Communication Unit **Star Coupler TELEM-4xFO-3** User Manual

**Martem AS**  
**Tallinn 2011**



Operating under certified quality systems accordance with ISO 9001

# Fiber Optical Star Coupler Telem-4xFO-3

## Contents

1. Application	1
2. Features	1
3. Construction	1
4. Technical data	2
5. Connectors	2
6. Cables	3
7. Block diagram	4
8. DIP switch positions summary	5
9. Connection examples	6
10. Tx and Rx signal modes tracing figures	7
11. Label	11
12. Notes	11

## 1. Application

Telem-4xFO-3 is a fiber optic communication unit that enables various devices to be interconnected over fiber optic lines using serial asynchronous data exchange. Serial RS232, RS422 and optical interfaces can be used for connecting to higher and lower level devices (e.g. a PC, SCADA system, relay protection, monitoring terminal, IED).

## 2. Features

- Protocol free
- Daisy chain connection
- Possibility to invert optical signals
- For increasing the number of slave channels the Telem-4xFO-3 modules can be stacked together via RS232 interface.
- For increasing the number of stacked modules the Tx signal can be transmitted between modules via RS422 and for Rx can be used intermediate amplifier (every 10th FO-module)

## 3. Construction

The mechanical design is based on metal enclosure that can be readily mounted on DIN 35-mm rails. Configuration DIP switch allows to set communication mode without opening the enclosure. (The first model Telem-4xFO had configuration jumpers, residing under the cover of enclosure.)



Fig. 1

#### 4. Technical data

- Interfaces

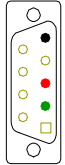
RS-232 or RS-422 (1 channel)	2 connectors RJ12 (2-nd connector for cascading) and 1 DB9 connector
Optical interface (4 channels)	ST connectors for fiber 50/125, 62.5/125, 100/140 and 200 μm (or by request Versatile Link for plastic cables)


- Transmission speed 1200 ... 38400 bit/s
- Power supply 10 -48V DC
- Power consumption 3 W
- Dimensions 35x172x140 mm
- Weight 0,3 kg
- Ambient temperature in operation -15...+50 °C

- Disturbance

Emission	EN-55022A
Static discharge	EN-61000-4-2
Fast transients	EN-61000-4-4
Surge	EN-6100-4-5
Conducted HF field	EN-61000-4-6
Emitted HF field	EN-61000-4-3

#### 5. Connectors

RS-232 interface	DB9 pin	RJ12 pin	Signal	Comment
	5	6	RS422-	Tx transmission between modules
	3	5	GND	Signal ground
	2	4	RS232 Tx	Transmit Data (INPUT)
		3	RS232 Rx	Receive Data (OUTPUT)
		2	GND	Signal ground
		1	RS422+	Tx transmission between modules

RS-422 interface	DB9 pin	Signal	Comment
	6	RS422 Tx-	Transmit Data - (OUTPUT)
	7	RS422 Tx+	Transmit Data + (OUTPUT)
	8	RS422 Rx-	Receive Data - (INPUT)
	9	RS422 Rx+	Receive Data + (INPUT)

## 6. Communication cables

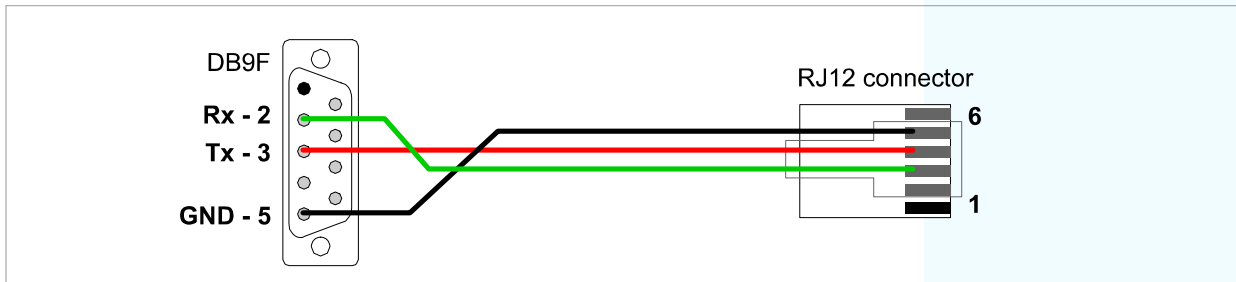


Fig.3 Cable master device com - Telem4xFO-3 RS232 interface in RJ12

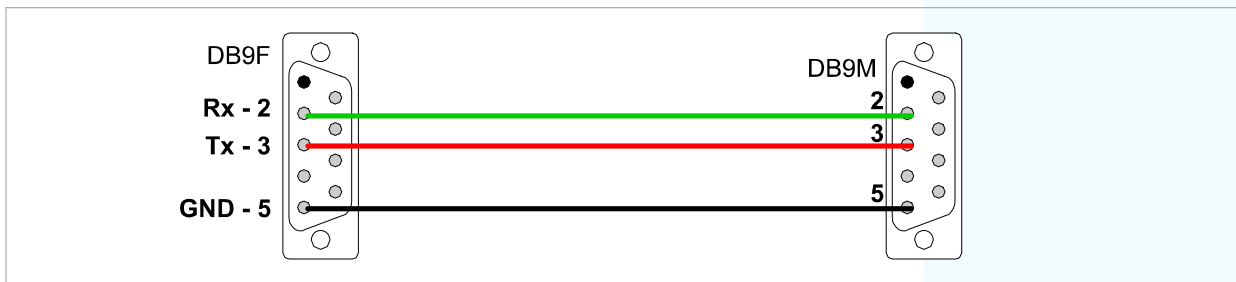


Fig.4 Cable master device com - Telem4xFO-3 RS232 interface in DB9

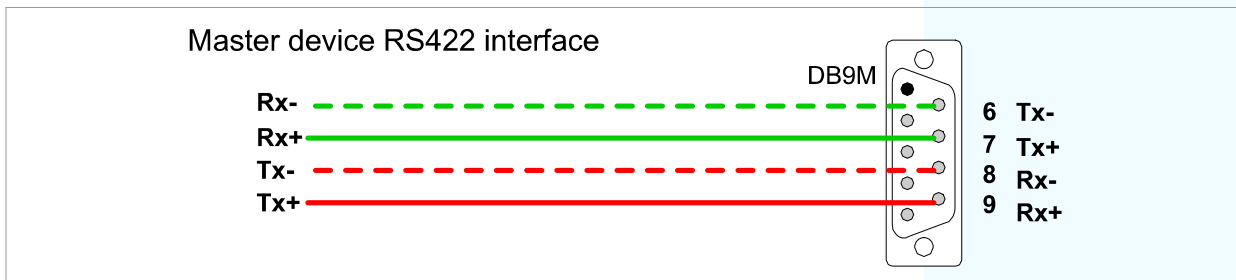


Fig.5 Cable master device RS422 - Telem4xFO-3 RS422 interface in DB9



Fig. 6 Cable between Telem4xFO-3 modules

## 7. Block diagram

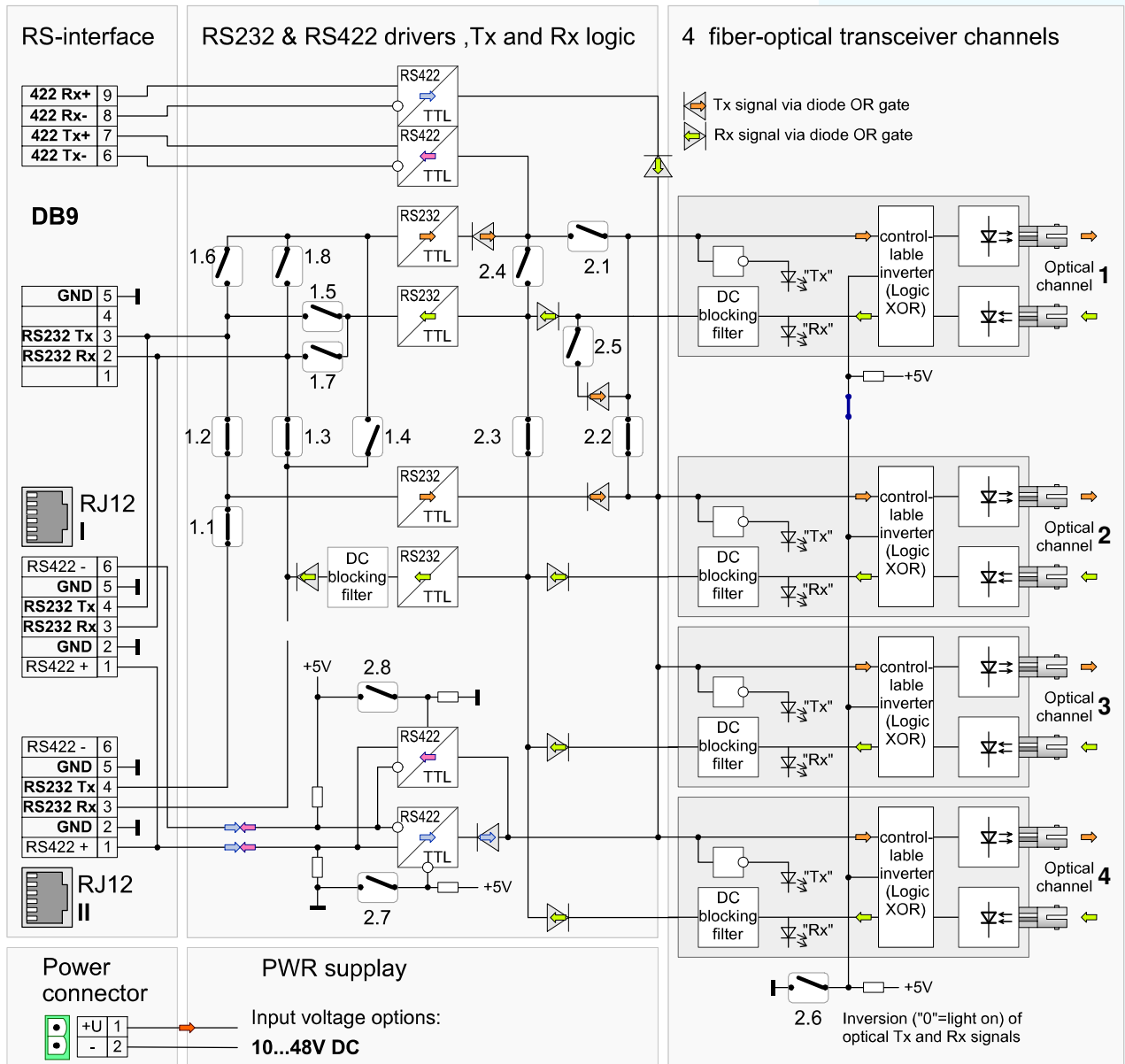


Fig.7

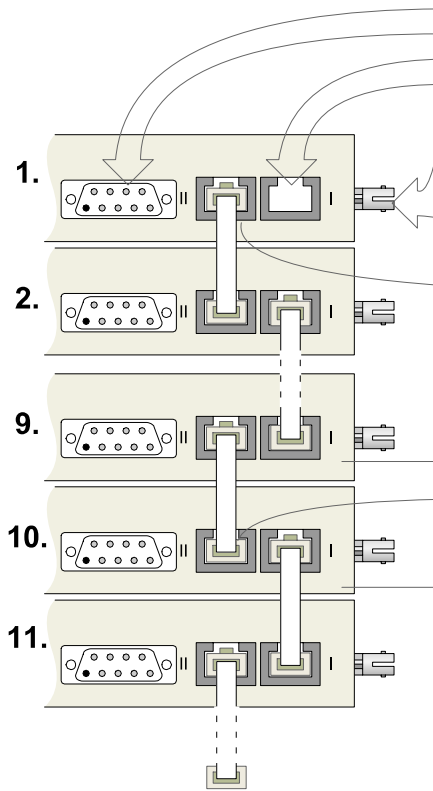
### Remarks:

1. Connect the RS232 master device to the RS232 jack I or DB9 (pins 2,3,5), RS422 master to DB9 (pins 6-9) or "Optical master" (or "Optical loop") to optical channel no.1
2. The RS232 interface RJ12 connectors pins 1 and 6 are used for Tx transmission between Telem-4xFO modules via RS422 . Do not connect these signals to the master device communication port, use for RS232 interface only pins No 2, 3, 4, 5
3. The polarity of optical signals (switch 2.6) is independent on other settings. The Tx and Rx LEDs show always direct signals. Turning on the optical inversion without optical signals in the receiver channels the Rx LEDs are continuously lighting.

## 8. DIP switch positions summary

OFF

ON



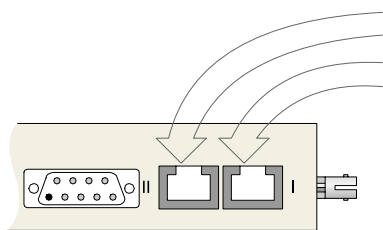
The first 4xFO-2 module connected to the master device		
Master device connection options	S2	S1
	1 2 3 4 5 6 7 8	1 2 3 4 5 6 7 8
RS422 - connected to DB9	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
RS232 - to RJ12 I or DB9	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Optical channel 1	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Optical channel 1 (with loop)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

\*Use RJ12 II for stacking next modules

The next stacked 4xFO-3 modules	
Modules no. 2...9, 11...19, 21... (RJ12 I and II are paralel)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
*The communication cable to the master direction must be connected into RJ12 II (from 10. to 9. module)	
Every 10th module (10, 20, ...) - intermediate Rx amplifier	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Up to 5 modules in series via RS232	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
*RS422 is not used, all modules have the same settings	
*RJ12 I and II are paralel (compatible with previous 4xFO models)	

**Additional mode - splitting 4xFO module into 2 independent RS232 to fiber-optical converters:**



1. RS232 RJ12 I (or DB9 ) to optical channel 1	
2. RS232 jack II to optical channels 2,3 and 4 (in mode "Up to 5 modules in series via RS232")	
Direct connection for RS232 RJ12 I (or DB9 ) Tx=4(3), Rx=3(2)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Crossed connection for RS232 RJ12 I (or DB9 ) Tx=3(2), Rx=4(3)	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>
Optical I/O polarity switch 2.6 "0"=light ON	<input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/> <input type="checkbox"/>

Fig.8

## 9. Connection examples

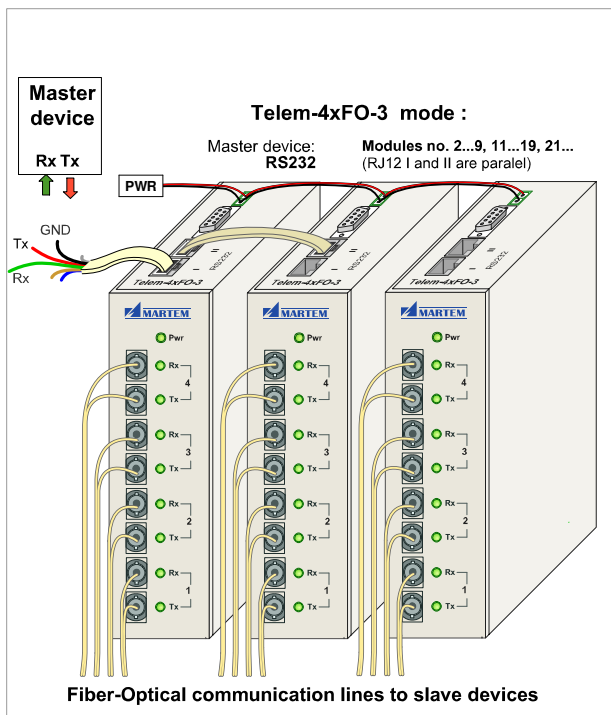


Fig.9 Connection option RS232 master - optical slaves

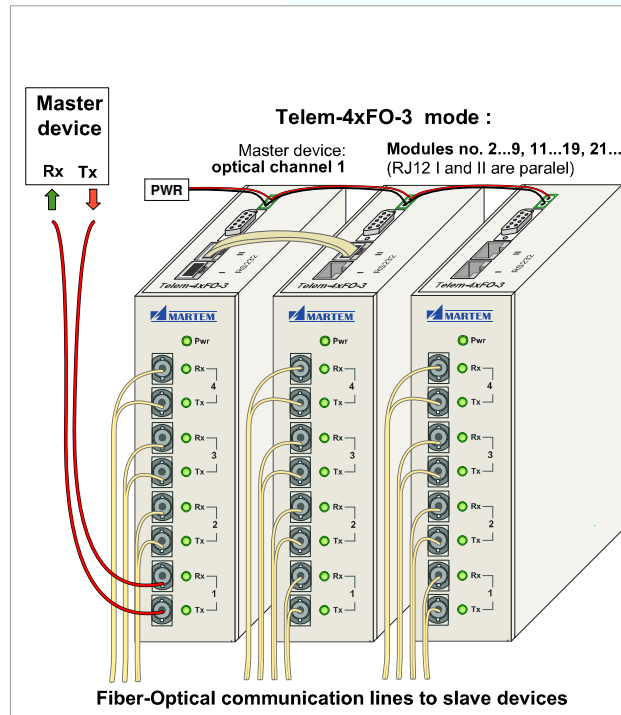


Fig.10 Connection option optical master - optical slaves

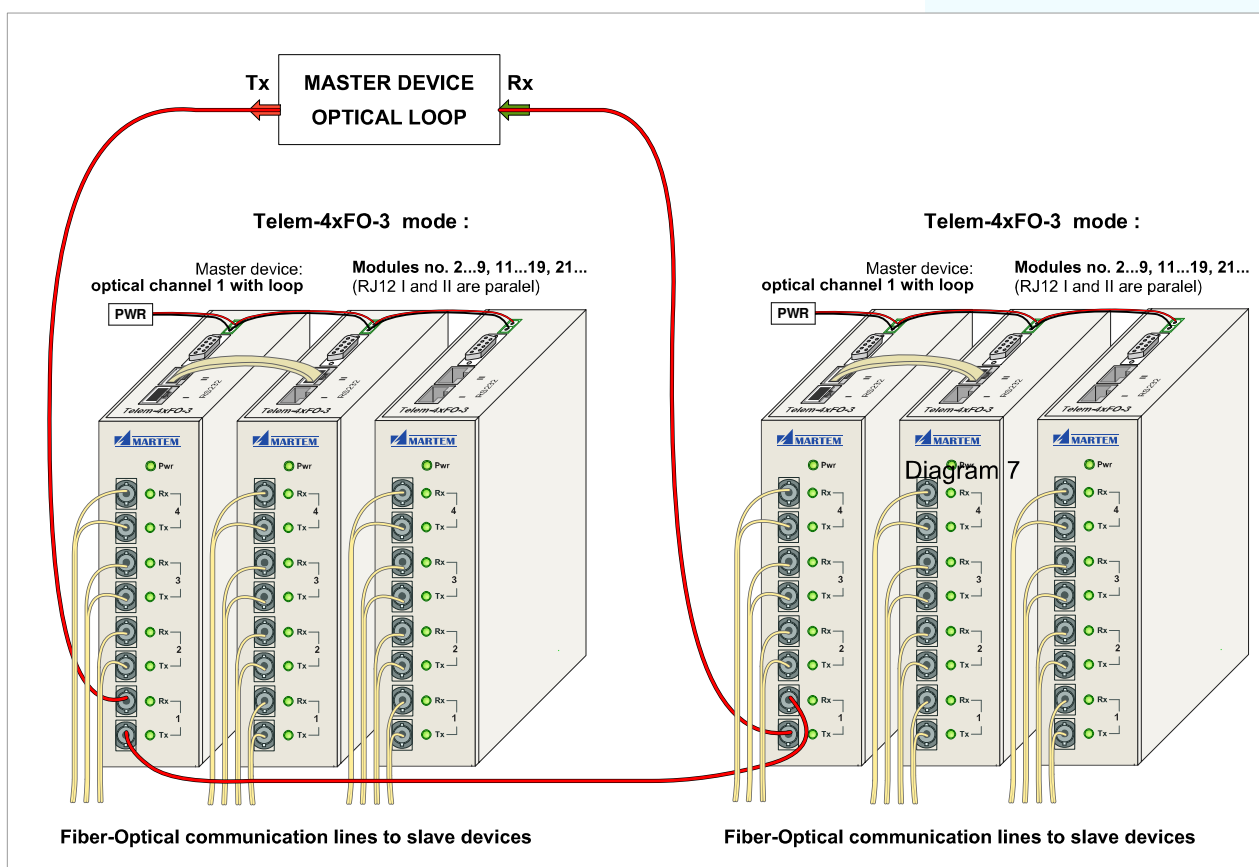


Fig.11 Connection option OPTICAL LOOP master - optical slaves

10. Tx and Rx signal modes tracing figures.

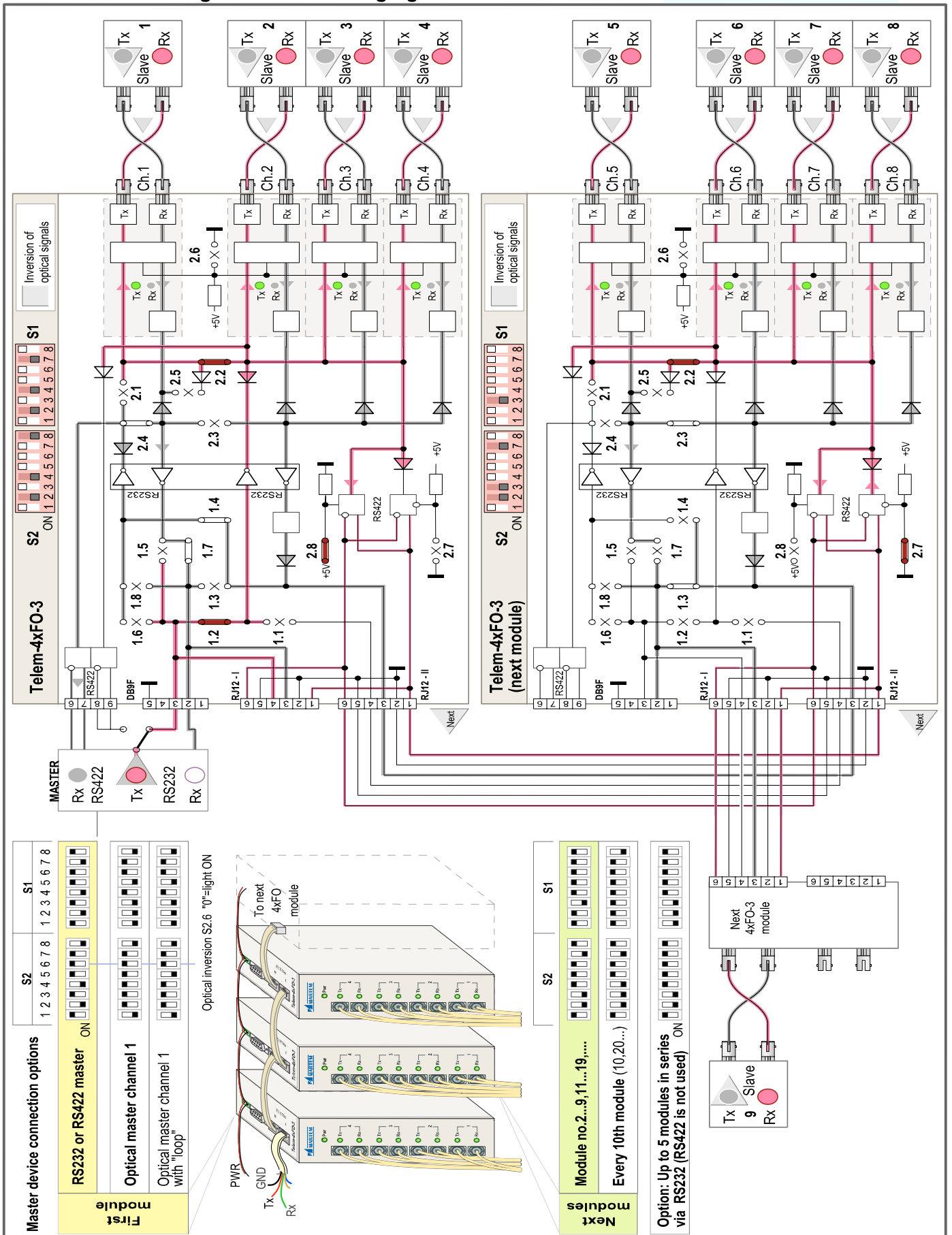


Fig.12 Tx signal tracing, using RS422 transmission.



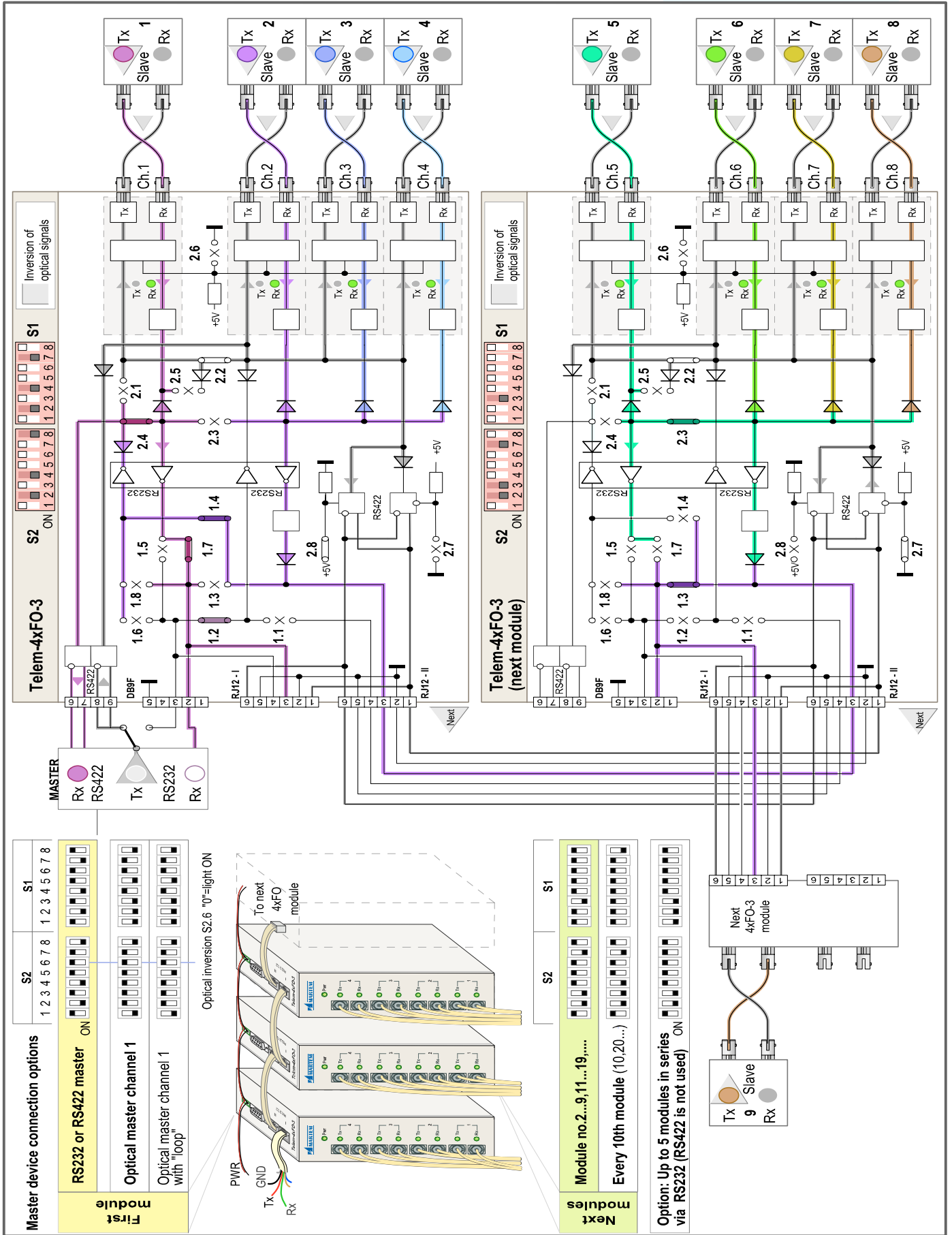


Fig.13 Rx signal tracing.

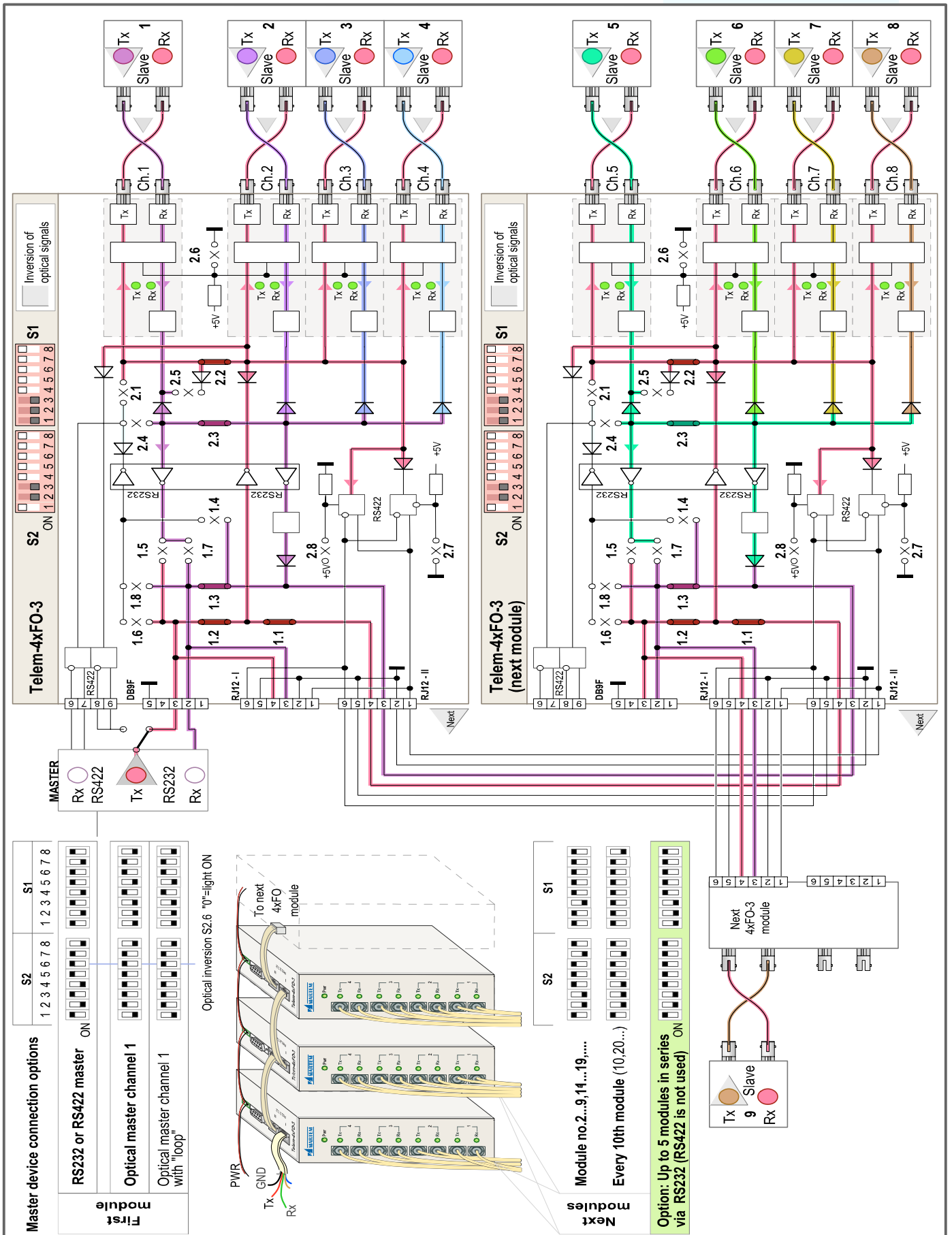


Fig.14 TR232 Tx and Rx signals tracing (compatible with Telem-4xFO previous models)

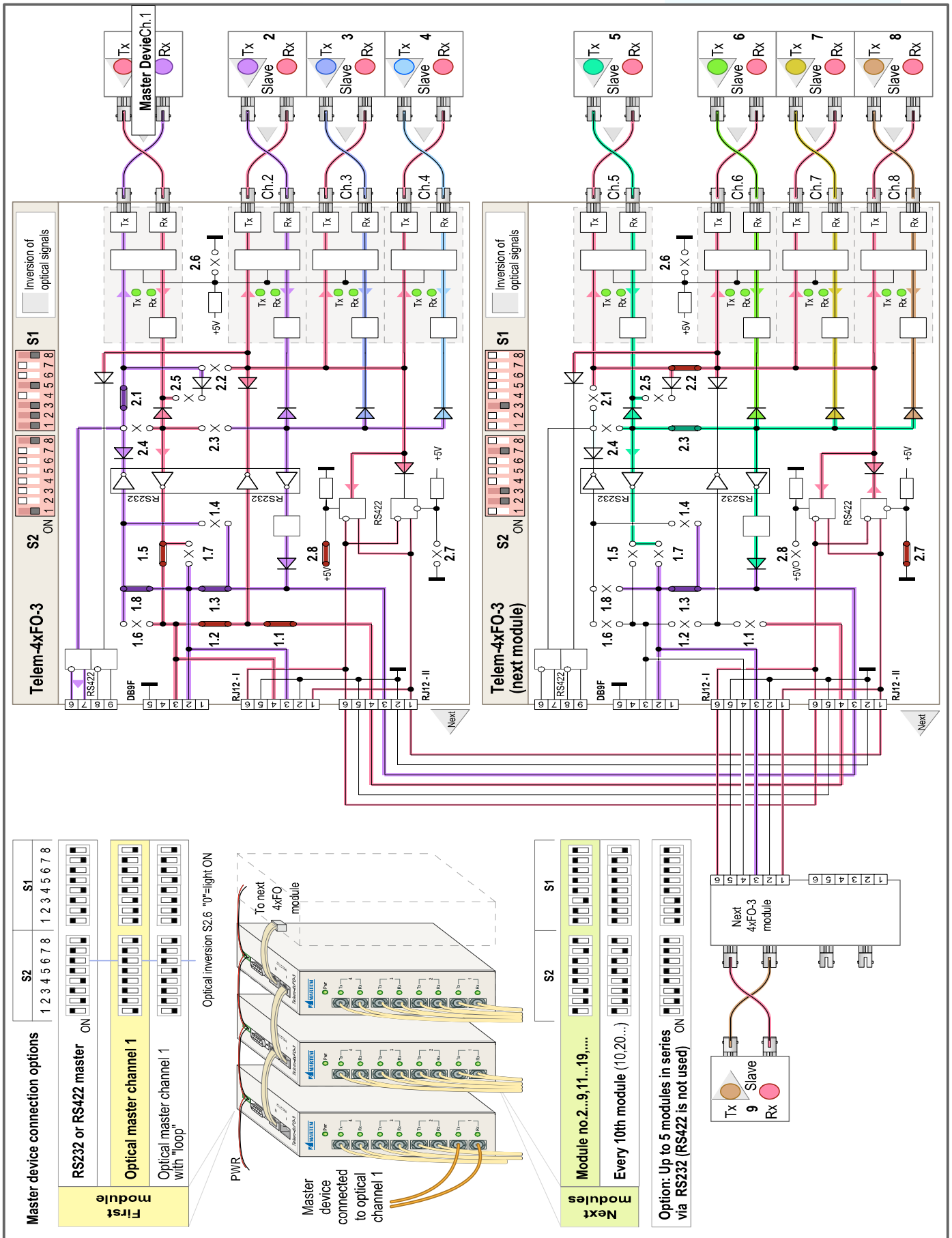
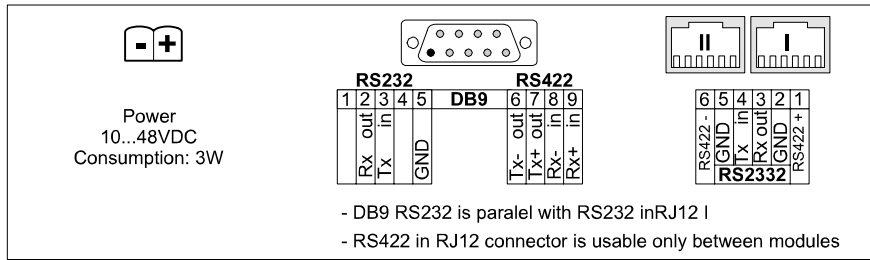





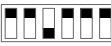








Fig.15 Tx and Rx signals tracing for "Optical Master". Tx transmission via RS422 .

## 11. Telem-4xFO-3 label



DIP-switch settings		S2	S1	Comment
* First module	RS232 or RS-422 master			RJ12 II - to next module (not usable for master)
	Optical master ch.1			
Next modules	No.2...9,11...			RJ12 I and II are paralel
	Every 10th (No.10,20...)			RJ12 II - master direction (from previous module)
Up to 5 modules (first and next) RS232 master **				RJ12 I and II are paralel
Optical inversion, light on S2.6				

\* Usable also for only one module

\*\* Compatible with 4xFO previous models

! RJ12 - RS422 usable only between modules

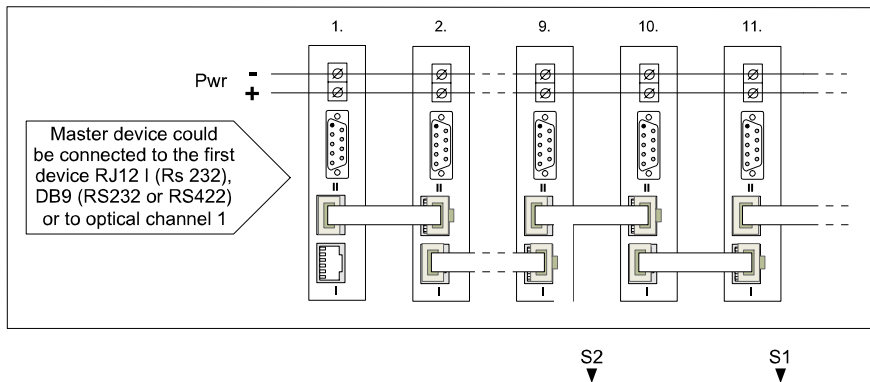


Fig.16

## 12. Notes

- If not stated otherwise on the individual pages of this document, AS Martem reserves the right to include modifications.
- Although the content of this publication has been checked for conformity with the hardware and software described, we cannot guarantee complete conformity since errors can not be excluded.
- The information provided in this manual is checked at regular intervals and any corrections which might become necessary are included in the next releases.
- Any suggestions for improvement are welcome.
- The contents of this manual is subject to change with out prior notice.