Smart solutions for smart networks

Version 1.0

SFP-COPPER-SERIAL

SFP Serial to IP Converter RS232/485/422

MULTI PROTOCOL
RS232/485/422

SFP INTERFACE
100BASE-FX and/or 1000BASE-X

INDUSTRIAL GRADE
-40~+85°C

Introduction

The new low power industrial SFP (Small Form-factor Pluggable) module is a Serial Interface (RS-232/485/422) to IP (Ethernet) data converter. The **SFP-COPPER-SERIAL** can be plugged into any Ethernet device with SFP ports that support 100BASE-FX and/or 1000BASE-X. The configuration is possible by Web, Telnet or SSH access. For security reasons, the Web, Telnet and SSH access can be set to write-protected using the switch on the SFP module. Access to the SFP module via Web, Telnet and SSH can be password- protected.

Serial data transmission can be done using UDP or TCP protocols. The SFP module is fully compatible to 3rd-Party COM-Servers. You can use the SFP module for COM Port Extenders and Virtual Serial Ports.

Application

- RS232/485/422 Access and Data transmission over IP Networks
- Industry 4.0 Applications
- Switch & Router Enhancement
- Com-Server Applications, Com Port Extender

CXR Networks

Product Features

- Industrial & Intelligent Serial to IP (Ethernet) Converter
- 100BASE-FX and/or 1000BASE-X SFP Interface
- RS-232 or RS485/422 Selectable with Software
- RS485/422 Termination Resistor Configurable with Software
- Serial Interface Speed 75 to 230400 bps
- Compatible to 3rd-Party COM-Servers
- HTTP Web GUI, Telnet and SSH CLI (Command Line Interface)
- Network Security, Three Position Switch for Normal, Management Blocked and Factory Default Mode
- Low Power (< 500mW)
- Digital Diagnostic Monitoring (DDM) Available
- Single +3.3V DC Power Supply
- Hot-pluggable SFP Converter
- Operating Temperature -40°C to +85°C
- Temperature Sensor Included
- Voltage Measurement Included
- Fully Metallic Enclosure for Low EMI
- Compliant with SFP MSA Specification
- Software Upgradable

Applications

Serial data transmission can be done using UDP or TCP protocols. The UDP protocol allows operating in both Point-To-Point (PTP) and Point-To-MultiPoint (PTMP) modes. Point-To-MultiPoint mode allows to set up several broadcasting nodes and to build a broadcast configuration. The TCP/IP protocol allows only working in Point-To-Point mode.

UDP Point-To-Point

In this mode two serial data endpoints should be configured with each other's IP Address and PORT Number as illustrated on following picture. It means one side with IP_Address1:PORT_Number1 sends data to the other side with IP_Adress2:PORT_Number2 and vice versa.

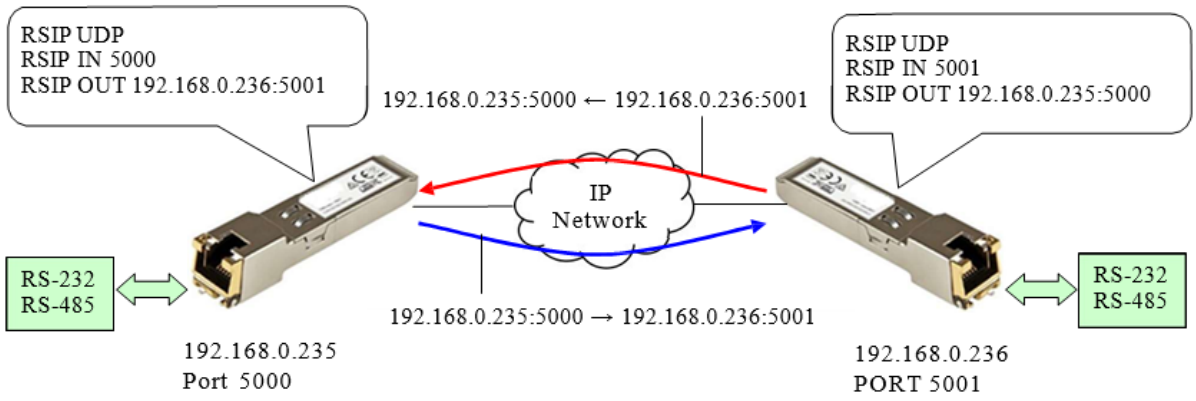


Figure 1: Serial Data Transmission with UDP Point-To-Point

UDP Point-To-MultiPoint

In Point-To-MultiPoint mode the endpoint ("Master") should have configured to send serial data with a multicast IP Address (IPM) and some PORT Number (PORTM) as outgoing address. Outgoing data of such an endpoint will reach all other endpoints. Endpoints with input PORT Number PORTM will accept received data and other endpoints will discard it.

Non broadcasting endpoints should be configured as they work with "Master" endpoint in Point-to-Point mode with incoming PORT Number set to PORTM.

Any multicast address acceptable in the application network can be used. Endpoints distinguish incoming broadcast data by destination PORT Number (PORTM). Multicast addresses are IP Addresses in range from 224.0.0.0 to 239.255.255.255.

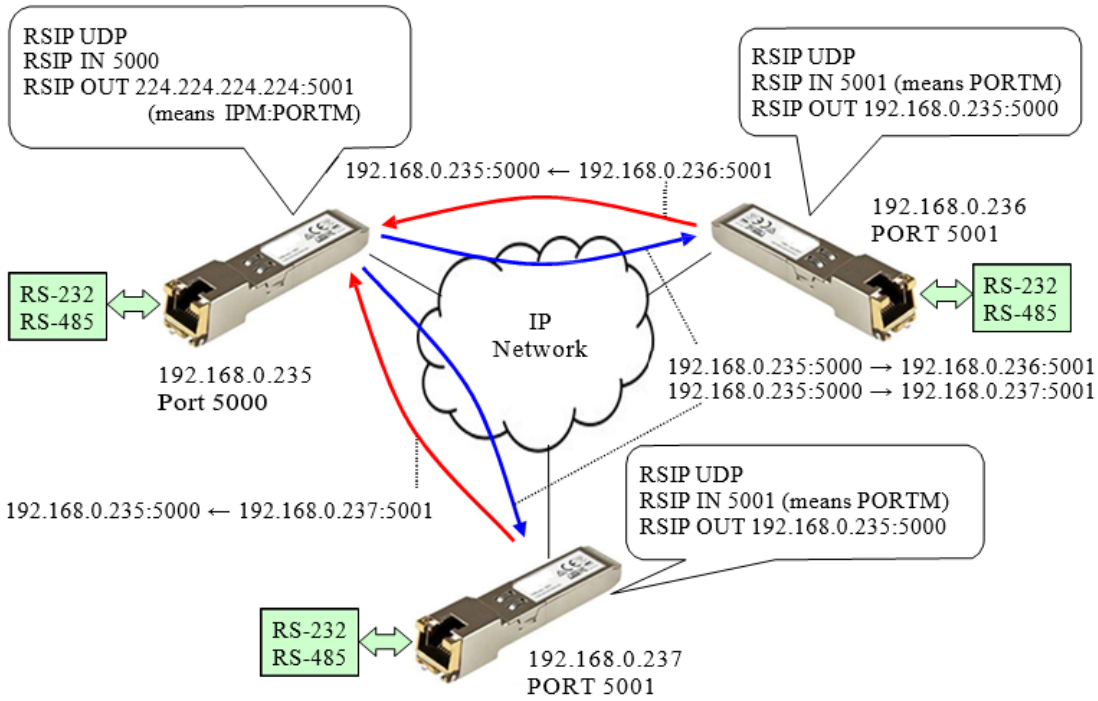


Figure 2: Serial Data Transmission with UDP Point-To-MultiPoint

UDP Broadcast Mode

In this mode the endpoints should be configured to send their serial data to the multicast IP Address (IPM). Incoming and outgoing PORT Number (PORTM) should be the same for all endpoints to receive each other's serial data.

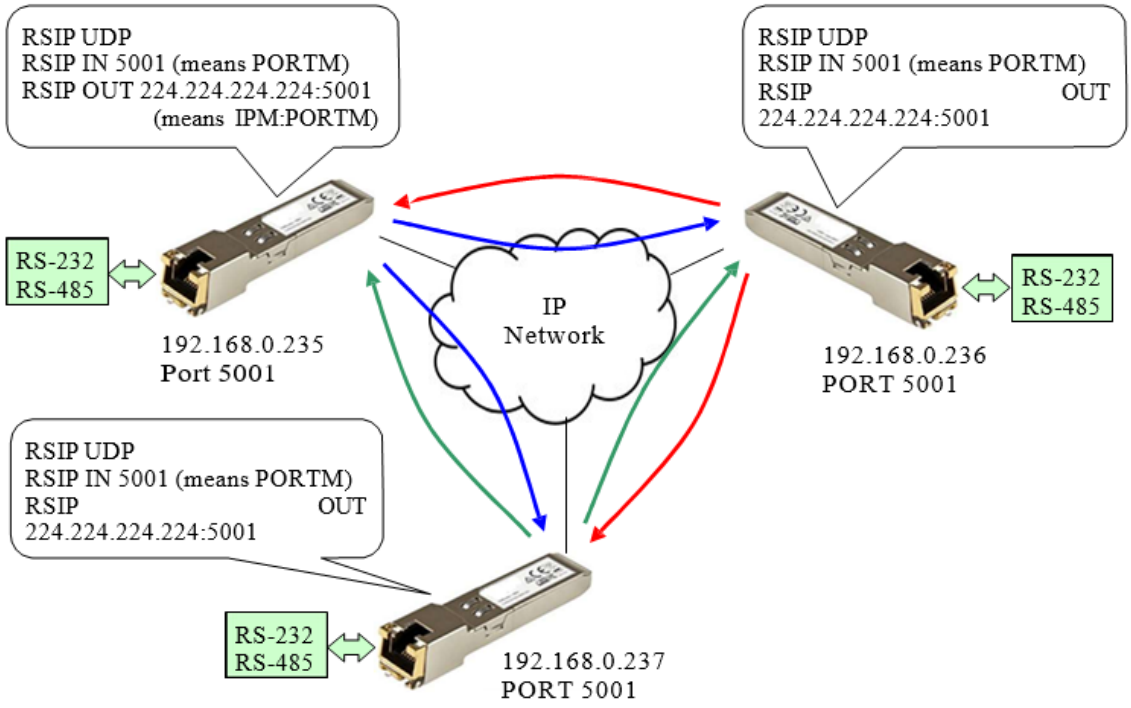


Figure 3: Serial Data Transmission with UDP Broadcast

UDP Point-To-Multipoint Whitelist

In this mode, three serial data endpoints may be configured with each other's IP Address and PORT Number as illustrated on following picture. The maximum possible number of UDP endpoints is 8

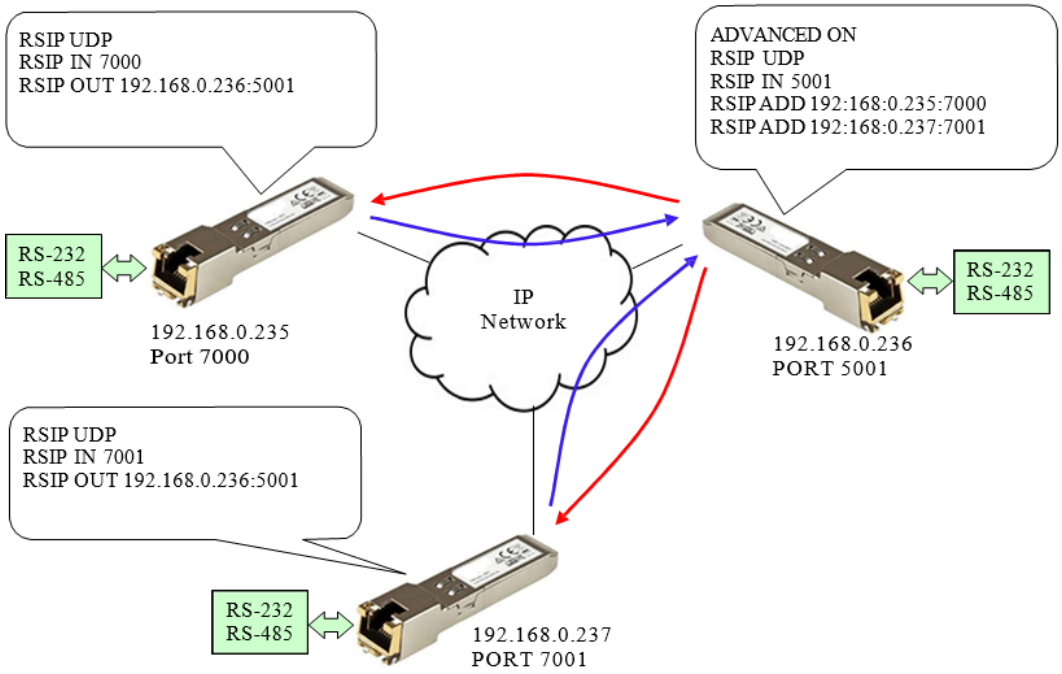


Figure 4: Serial Data Transmission with UDP Point-To-Multipoint

TCP Point-To-Point

In this mode one serial data endpoint should be configured as Server and the other as Client. Client configuration is the same as UDP endpoint. On the Server endpoint the Client IP Address and incoming PORT Number should be specified

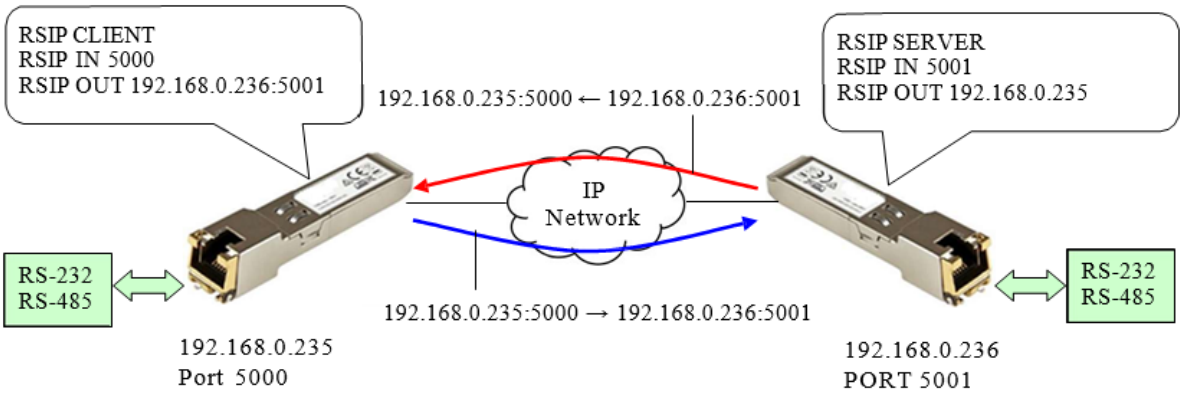


Figure 5: Serial Data Transmission with TCP Point-To-Point

TCP Point-To-Multipoint Whitelist

In this mode one serial data endpoint should be configured as Server and the others as Client. The maximum possible number of Clients is 5. Client configuration is the same as UDP endpoint. On the Server endpoint the Client IP Address and incoming PORT Number should be specified

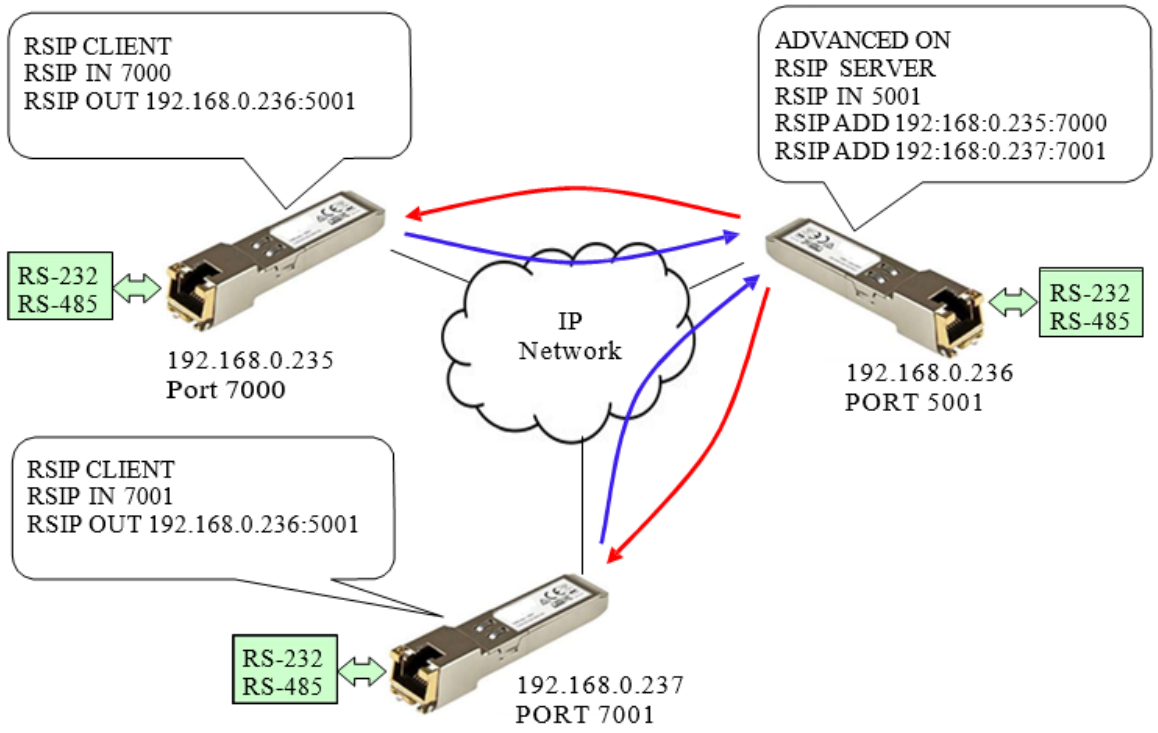


Figure 6: Serial Data Transmission with TCP Point-To-Multipoint

COM-Server (COM Port Extender, Virtual Serial Port) Point-To-Point

In this mode the serial data endpoint should be configured as Server. The Terminal should be setup as Client. On the Server endpoint the Client IP Address and incoming PORT Number should be specified. On the Client IP Ad-

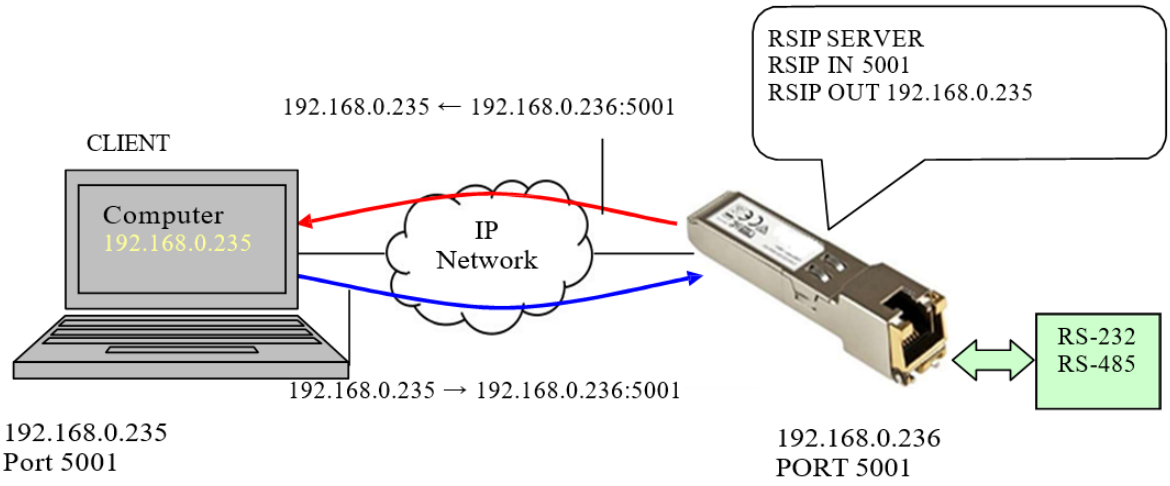


Figure 7: COM-Server application

Special Features

ANY
This feature is supported in SERVER Mode only. This command enables/disables accepting any CLIENT IP destination addresses.

SEPARATOR
This feature is supported in ADVANCED Mode only. This command defines a frame separator for incoming characters on the RS port. Values in the range 0-255 are accepted.

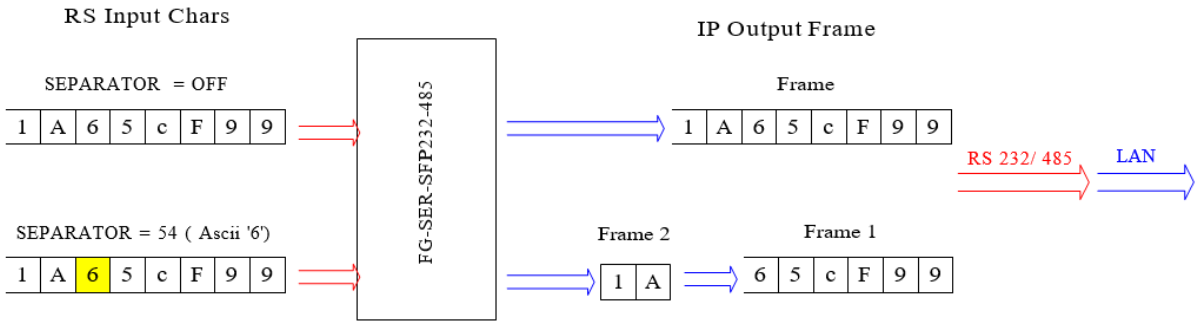


Figure 8: Separator explanation

MAXSIZE

This feature is supported in ADVANCED Mode only. This command defines the maximum Input and Output IP frame size in number of bytes. Input IP frames larger than MAXSIZE will be discarded. Values in the range 1-1460 are accepted.

If MAXSIZE is setup to DEFAULT, the MAXSIZE is dependent on the RS RATE.

RS RATE	DEFAULT MAXSIZE
75 - 57600	8
14400 - 19200	16
28800 - 38400	32
56000 - 57600	64
115200 - 256000	128

MAXDELAY
This feature is supported in ADVANCED Mode only. This command defines a maximum frame delay in milliseconds. Values in the range 1-2550 are accepted.

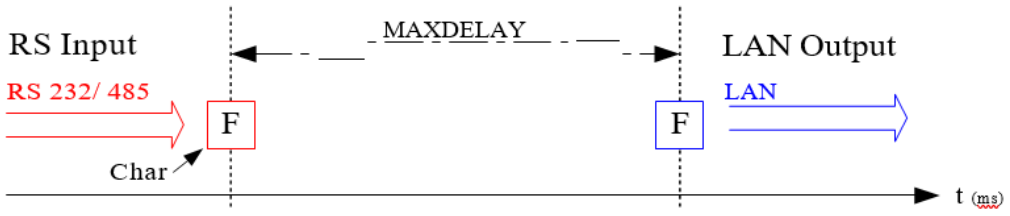
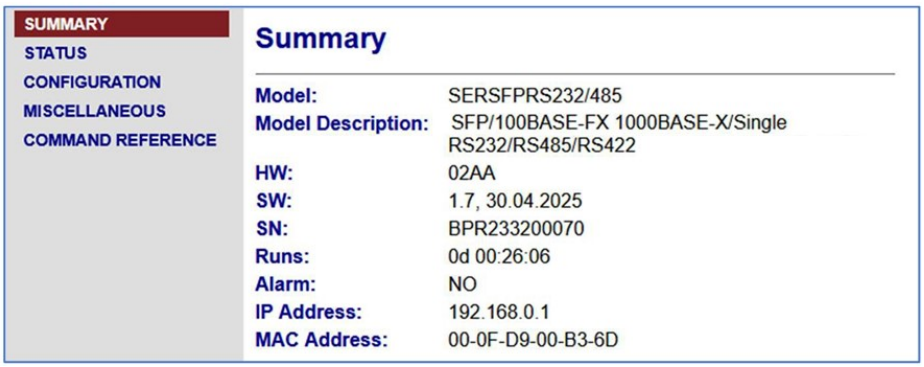


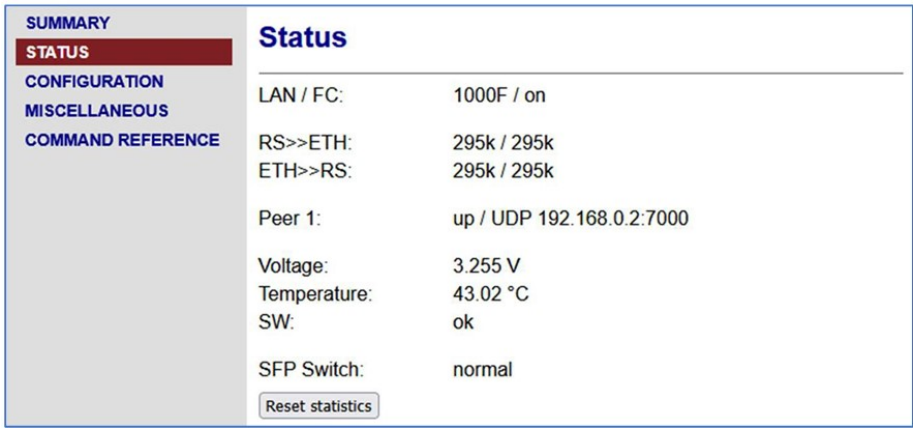
Figure 9: Max Delay explanation

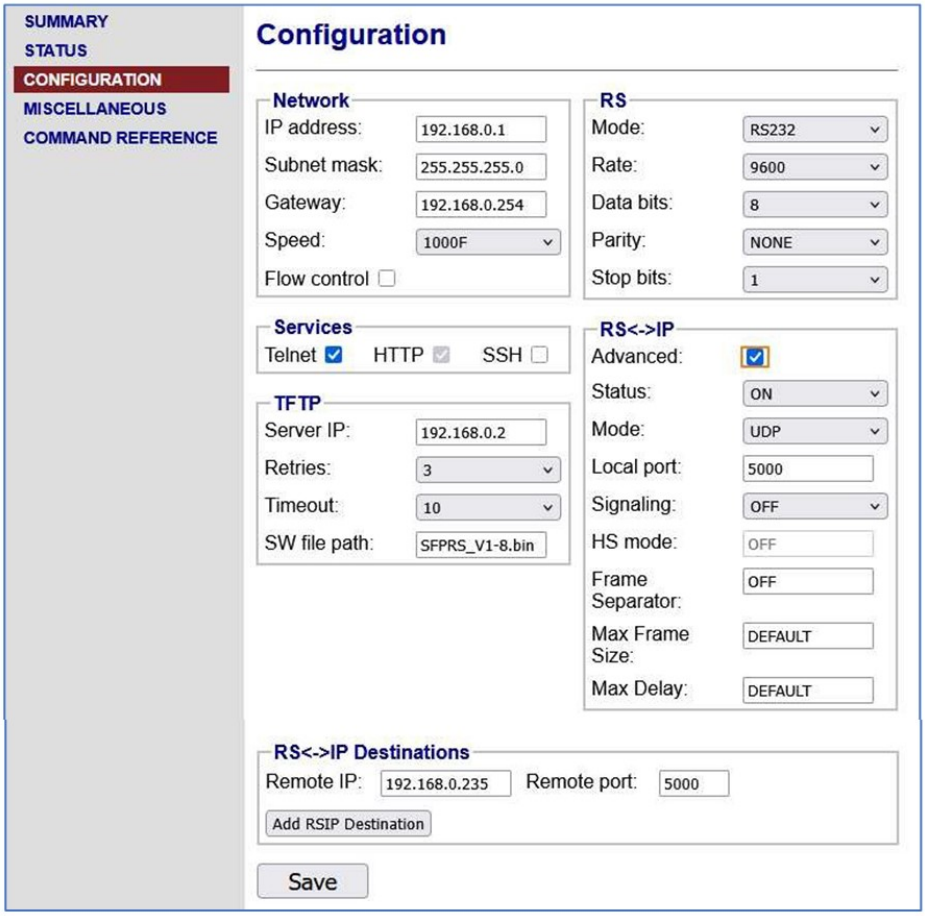
If MAXDELAY is setup to DEFAULT, the MAXDELAY is dependent on the RS RATE

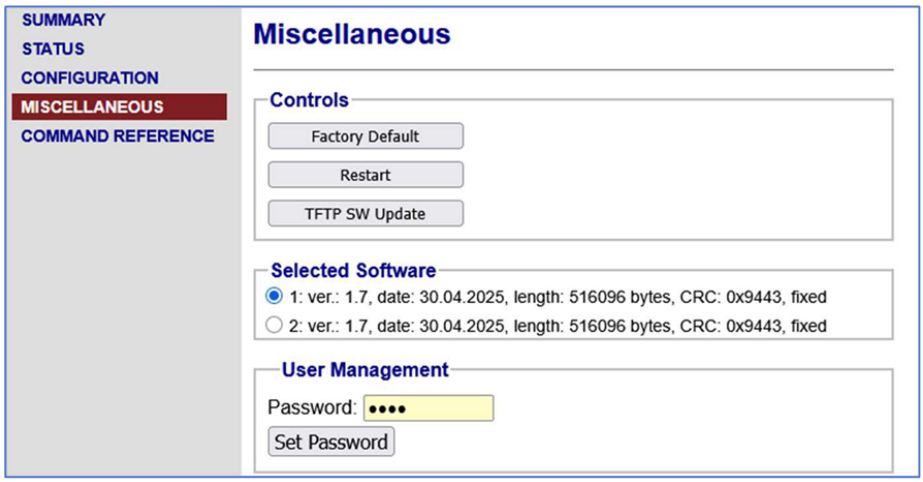
RS RATE	DEFAULT MAXDELAY (ms)
75 -150	300
200 - 256000	100

Web Interface Configuration









Telnet and SSH CLI Command Structure

The command structure is according to ITU-T Rec. M.3400 (Telecommunication Management Networks). Please see the Help for the command descriptions in the CLI or the COMMAND REFERENCE Menu in the WEB interface for further information

Main Menu		
PM Performance management	FMM Fault and maintenance management	CM Configuration management
	SFPVIEW RESET RSIPSTATRESET SERNUM SOFTUPDATE SOFTINFO STATUS TFTP SOFTUPDATE M(AIN) H(ELP)	ADVANCED ETHSD FC GATEWAY NETCONFIG NETMASK SETIP TFTPIP TFTP RETRIES TFTP TIMEOUT TFTP FILEPATH TELNET ON/OFF HTTP ON/OFF SSH ON/OFF SSHKEYSIZE SSHKEYDEL PASSWORD RSIP SEPARATOR MAXSIZE MAXDELAY RS 232/485 RSRATE RSFORMAT RSDUPLEX (only if 485 Mode) RSTERM (only if 485 Mode) SOFTSELECT 1/2 FACTORY DEFAULT APPLY M(AIN) H(ELP)

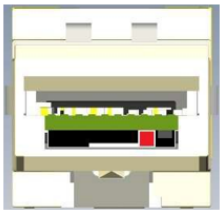
Connector and Pin Description

Table 2. Serial Connector & Pin Description

RJ45		RS232		RS485/RS422		RS485	
	Pin No.	IO	Description (EIA TIA 56)	IO	Description Full Duplex	IO	Description Half Duplex
	1						
	2						
	3						
	4		GND		GND		GND
	5	Output	RxD	Output	Rx- (neg)	In/Out	Dx- (neg)
	6	Input	TxD	Input	Tx+ (pos)		
	7	Output	CTS	Output	Rx+ (pos)	In/Out	Dx+ (pos)
	8	Input	RTS	Input	Tx- (neg)		

Switch Position Description

Table 3. Possible Switch Positions

Switch Positions	Left	Center	Right
	Factory Default	Management Blocking	Normal Mode (default setup)

Normal Mode	The unit works in standard mode.
Management Blocking	It's only possible to read out values in the CLI and/or WEB interface. (write protected)
Factory Default	During start-up the unit will be setup to its default values ANYTIME. Setup the switch to Normal or Management Blocking position after Factory-Default start-up.

IP Default settings

IP address 192.168.0.1

Subnet mask 255.255.255.0

Gateway 192.168.0.254

Technical Specification

Table 4. SFP Host Interface

SFP Host Connector Power (MSA Compliant)						
Parameter	Symbol	Min	Typical	Max	Unit	Note
Input Voltage	Vcc	3.135	3.3	3.465	V DC	
Input Current	Icc		120	140	mA	

SFP Host Connector Data (MSA Compliant)						
Parameter	Symbol	Min	Typical	Max	Unit	Note
Data Rate	TD/RD		100		Mbps	100Base-FX
Data Rate	TD/RD		1000		Mbps	1000Base-X

Table 5. SFP Converter Interface

Serial RS-232/485/422 Interface	
Standard	ITU-T Rec RS-232/V28 or RS485/422
Bit Rate RS-232/485/422 (bps)	75, 150, 200, 300, 600, 1200, 2400, 4800, 9600, 14400, 19200, 28800, 38400, 56000, 57600,115200, 128000, 230400, 256000
Format RS-232/485/422	Bits: 5…8 Stop bits: 1 or 2 Parity: none / even / odd

Table 6. Environment

Operating Conditions						
Parameter	Symbol	Min	Typical	Max	Unit	Note
Storage Temperature	Ts	-40		+85	°C	
Operating Temperature	To	-40		+85	°C	
Relative Humidity	RH	5		95	%	non-condensing

ID & Diagnostic and Control/Status Fields Memory Map

The SFP MSA defines an enhanced memory map with a digital diagnostic monitoring interface for SFP transceivers that allows pseudo real time access to device operating parameters. It defines a 256 bytes memory map which is accessible over a 2-wire serial interface at the 8-bit address 1010000X (A0h), the ID fields. The digital diagnostic monitoring interface makes use of the 8-bit address 1010001X (A2h).

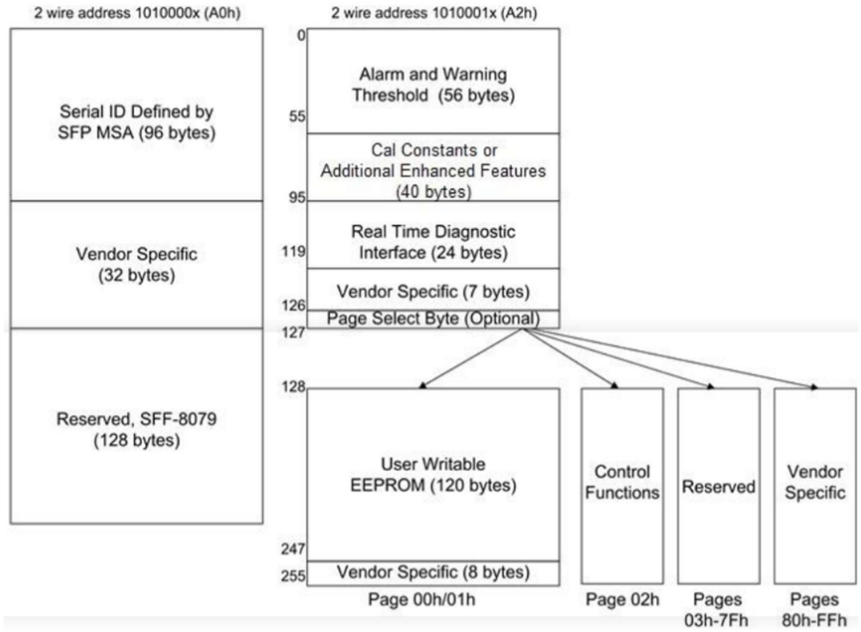


Figure 6. Digital Diagnostic Memory Map Specific Data Field Descriptions

Table 7. Base/Extended ID Fields, Address A0h

Address	Name	Content (Hex)	Description
0	Identifier	03	SFP
1	Ext. Identifier	00	Unspecified
2	Connector	22	RJ45
3-10	Transceiver	00 00 00 00 00 00 00 00	Unspecified
11	Encoding	00	Unspecified
12	Signaling Rate, Nominal	00	Unspecified
13	Rate Identifier	00	Unspecified
14-17	Link length fiber	00 00 00 00	Unspecified
18	Length copper cable	0F	Minimum 15 meter
19	Reserved	00	
20-35	Vendor name	46 6C 65 78 44 53 4C 20 20 20 20 20 20 20 20 20	FlexDSL
36	Transceiver compliance	00	Unspecified
37-39	Vendor OUI	00 0F D9	00 0F D9
40-55	Vendor PN	53 45 52 53 46 50 52 53 32 33 32 2F 34 38 35 20	SERSFPRS232/485

56-59	Vendor rev	31 2E 30 20	1.0
60-61	Wavelength	00 00	
62	Fibre Channel Speed 2	00	
63	CC_BASE	xx	Check code for Base ID Fields (addresses 0-62)
64-65	Options	00 12	TX_DISABLE and Loss of Signal implemented
66	Signaling Rate, max	00	Unspecified
67	Signaling Rate, min	00	Unspecified
68-83	Vendor Serial Number	xx	
84-91	Date code	yy yy mm mm dd dd 20 20	Year yy yy, Month: mm mm, Day: dd dd, Lot:
92	Diagnostic Monitoring Type	20	Internally calibrated
93	Enhanced Options	00	
94	SFF-8472 Compliance	09	Includes functionality described in Rev 12.4 of SFF-8472
95	CC_EXT	xx	Check code for the Extended ID Fields (addresses 64-94)
96-106	Vendor Specific, Flex PN	xx	SFPSER xxxx
107-127	Vendor Specific, Flex SN	xx	Manufacturer/Year/Week/SerialNumber
119-124	Vendor Specific, MAC	xx	MAC Number
125-127	Vendor Specific		Unspecified
128-255	Reserved		

Table 8. Diagnostic and Control/Status Fields, Address A2h

Address	Name	Content (Hex)	Description
0-119	Standard DDM values	00	Unspecified
96	Temperature MSB	xx	Internally measured temperature, according SFF-8472
97	Temperature LSB	xx	Internally measured temperature, according SFF-8472
98	Supply Voltage MSB	xx	Internally measured supply voltage, according SFF-8472
99	Supply Voltage LSB	xx	Internally measured supply voltage, according SFF-8472
120	SW Version MSB	zz	Value zz.yy
121	SW Version LSB	yy	Value zz.yy
122-126	Vendor Specific	00	Unspecified
127	Optional Page Select	00	

Safety / EMC / ROHS / WEEE / MTBF

The SFP MSA defines an enhanced memory map with a digital diagnostic monitoring interface for SFP transceivers that allows pseudo real time access to device operating parameters. It defines a 256 bytes memory map which is accessible over a 2-wire serial interface at the 8-bit address 1010000X (A0h), the ID fields. The digital diagnostic monitoring interface makes use of the 8-bit address 1010001X (A2h).

Table 9. Standards

Safety	EN 62368-1:2020/A11:2020 IEC 62368-1:2020/A11:2020	
EMC	EN 300 386 V1.6.1:2012 EN 55032:2015/A11:2020 EN 55035:2017/A11:2020 EN61000-4-2:2009 EN 61000-4-3:2020 EN 61000-4-6:2014	 class B criterion A ± 8 kV contact discharge, ± 15 kV air discharge 10 V/m (80-1000 MHz) 10 V (150 kHz-80 MHz)
RoHS	RoHS2 Directive 2011/65/EU and 2015/863/EU	
WEEE	WEEE Directive 2012/19/EU	
MTBF	Lifetime: 1'392'757 H, λ (10^{-9} h^{-1}) = 718, Siemens Norm SN 29500, Temperature 40°C	

Mechanical Specification

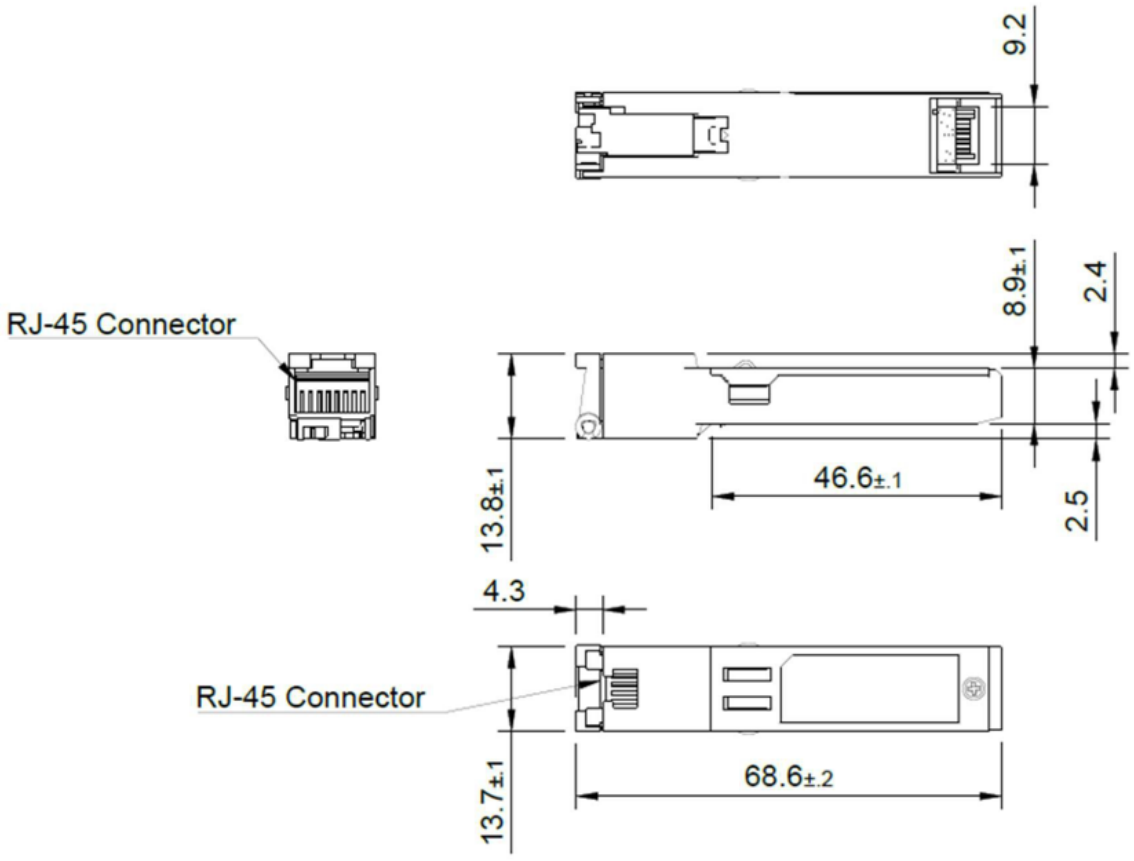


Figure 7. Outline Drawing SFP Module

Ordering Information

Référence	Description
SFP-COPPER-SERIAL	SFP Module Serial RJ-45, RS232/485/422 100BASE-FX / 1000BASE-X, -40°C to +85°C

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