RF Over Fiber

0.01 - 20GHz, (Transceiver, Transmitter + Receiver)

1. One way Transmitter and Receiver Stand Alone in separate packages with dimensions as shown.

2. Transceiver: Transmitter and Receiver together with a power supply in a 2 RU, 19" rack mountable shelf (230mm depth). This unit uses two optical fibers one for transmitting and one for receiving signals. If required, although not recommended, Tx and Rx can be combined into a single optical fiber which connects two transceivers, where signals are streaming in both directions simultaneously.

Shelf can include up to 4 mixed Transmitter and Receivers of any frequency

Rack Unit 2U 19" dimensions – 430x230x88 mm.

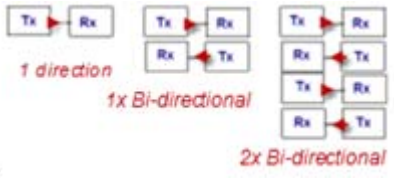
Each transmitter and receiver has green LED that indicates correct optical operation.

(Note -Tx unit for high frequencies is larger, so number of modules may be less than 4)

General Specifications

Frequency range: DC up to 20 GHz
RF Gain: 0dB
Optical Connectors: Angle-polished connectors(APC) – FC, SC, LC & ST
RF Connectors: SMA, N type
Fiber: Single mode fiber (SMF)
Fiber: Single mode fiber (SMF)

Link One Direction – 1x Tx + 1Rx unit,1 Fiber
1 x Link Bi-directional 1x (Tx+Rx), 2 RU shelf, 2 Fiber
2 x Link Bi-directional – 2x (Tx+Rx), 2 RU shelf, 4 Fiber
3 x Link Bi-directional 3x (Tx+Rx), 2 RU shelf, 6 Fiber
4 x Link Bi-directional – 4x (Tx+Rx), 2 RU shelf, 8 Fiber



Order Examples:

1) RRFOF-0.01-2.4-Tx + Rx-1x1 Way-n13
Description: (RF over Fiber, 0.01-2.4GHz, **1x** Tx and Rx, RF to Fiber Optics Converter, Standalone Units)

2) RRFOF-0.01-2.4-TR-1x2 Way-n13
Description: (RF over Fiber, 0.01-2.4GHz, **1x2** Transceiver, RF to Fiber Optics Converters in a 2RU shelf)]

3) RRFOF-0.01-2.4-TR-2x2 Way-n13
Description: (RF over Fiber, 0.01-2.4GHz, **2x2** Transceiver, RF to Fiber Optics Converters in a 2RU shelf)]

Frequencies (GHz)	0.01-2.4	0.05-1.5	0.1 - 2.5	0.1-4.0	0.1-8.0	0.1-13.0	3.4-4.2	3.4-8.0	8.0-12.0	10.0-12.0	10.7-12.75	0.05-20.0	0.01-20.0

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Specifications	Units	0.01-2.4	0.05-1.5	0.1 - 2.5	0.1 - 2.5	0.1-4.0	0.1-8.0	0.1-13.0
RF				1way	2way			
Frequency Range	GHz	0.01-2.4	0.05-1.5	0.1 - 2.5	0.1 - 2.5	0.1-4.0	0.1-8.0	0.1-13.0
RF Gain	dB	>0	10	5	>0	5	0	-10
Gain Flatness	dB	±2	±2	±2	±2	±2	±2	±2
RF input signal range	dBm	-70~0	-70~0	-70~0	-70~0	-70~0	-70~0	-70~0
1 dB compression point	dBm	-5	-5	0	0	-3	-5	12
Maximum input level	dBm	13	13	10	10	10	13	13
VSWR	:1	1:2	1:2	1:2	1:2	1:2	1:2	1:2
Noise Figure	dB	20	20	25	<25*	25	<25	39
Spurious signals	dB	< -80	< -80	< -100	< -100	< -80	< -80	< -80
Added Phase Noise	(dBc/Hz)	<-120	<-120	<-120	<-120	<-120	<-120	<-120
Group Delay	nsec	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Input and output impedance	Ohm	50	50	50	50	50	50	50
Optical and Electrical								
Laser diode operating wavelength	nm	1310	1310	1310	1310	1550	1550	1550
Receiver Photodiode operating wavelength	nm	1200-1650	1200-1650	1200-1650	1200-1650	1200-1650	1200-1650	1200-1650
DC/(VAC) Power Supply voltage	V	12V	5V	5V	90-240(V_{AC})	5+	+5	-12V &+12V
Current consumption	A	<0.2	<0.2	< 0.2	< 0.1	(max) 1	(max) 1	0.2(-12V) 1A(+12V)
Mechanical and Environmental								
Dimensions of Transmitter (L x W x H)	mm	80x55 x22	80x55 x22	80x55 x22	80x55 x22	100x80 x22	100x80 x30	220x180 x30
Dimensions of Receiver L x W x H	mm	80x55 x22	80x55 x22	80x55 x22	80x55 x22	100x80 x22	100x80 x30	100x80 x30
Dimensions Rack Unit					430x230x44			
Depth of Rack Unit shelf	mm		250	250	230	250	250	250
RF Input and Output Connectors		SMA	SMA	SMA	SMA	SMA	SMA	SMA
Optical Connectors		FC/APC	FC/APC	FC/APC	FC/APC	FC/APC	FC/APC	FC/APC
Power Connector		DB9	DB9	DB9	DB9	DB9	DB9	DB9
Optical link status		LED	LED	LED	LED	LED	LED	LED
Fiber					Single Mode 9/124			
Operating temperature range	ºC	-40 to +85	-40 to +85	-20 to +70	-40 to +85	-20 to +70	-40 to +85	-40 to +85
Storage Temperature range	ºC	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85

* Noise figure can be reduced to 12dB by adding an LNA in front of the Laser Diode. Penalty is reducing 1dB compression point to -15dBm

* Fiber Single Mode 9/125

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Specifications	Units	3.4-4.2	3.4-8.0	8.0-12.0	10.0-12.0	10.70-12.75	0.05-20	0.01-20
RF							Wide Band	Full Band
Frequency Range	GHz	3.4-4.2	3.4-8.0	8.0-12.0	10.0-12.0	10.70-12.75	0.05-20.0	0.01-20.0
RF Gain	dB	15	15	0±3	0±3	0±3	-30	-32 ~ -18
Gain Flatness	dB	±2	±2	±2	±2	±2	±3.5	±4
RF input signal range	dBm	-70~0	-70~0	-70~0	-70~0	-70~0	-70~0	-85~+15
1 dB compression point	dBm	-15	-15	>0	>0	>0	15	15
Maximum input level	dBm	13	13	13	13	13	23	23
VSWR	:1	2.0:1	1:2	1:2	1:2	1:2	1:2	2:1
Figure Noise	dB	25	<25	25	25	25	39	50
Spurious signals	dB	< -80	< -80	< -80	< -80	< -80	< -80	< -100
Added Phase Noise	(dBc/Hz)	<-100	<-100	<-120	<-120	<-120	<-120	<-120
Group Delay	nsec	0.1	0.1	0.1	0.1	0.1	0.1	50
Input and output impedance	Ohm	50	50	50	50	50	50	50
Optical and Electrical								
Laser diode operating wavelength	nm	1550	1550	1550	1550	1550	1550	1550
Receiver Photodiode operating wavelength	nm	1200-1650	1200-1650	1200-1650	1200-1650	1200-1650	1200-1650	1200-1650
DC Power Supply voltage	V	+5V & -5V	±5V -12v7 +12v	110/220V_{AC}	110/220V_{AC}	110/220V_{AC}	-12V &+12V	+5V
Current consumption	A	<0.5	<0.5(5v) & 0.2(12V)	0.5	0.5	0.5	0.2(-12V) & 1A(+12V)	1.0
Mechanical and Environmental								
Dimensions of 1RU Transmitter		100x80 x30	100x80 x30	19" x 250mm	19" x 250mm	19" x 250mm	250x170 x30	220x180 x30
Dimensions of Receiver L x W x H	mm	100x80 x30	100x80 x30	1U	1U	1U	100x80 x30	220x180 x30
Depth of Rack Unit shelf	mm	250	250	250	250	250	250	250
RF Input & Output Connectors		SMA/F	SMA/F	SMA	SMA	SMA	SMA	SMA
Optical Connectors		FC/APC	FC/APC	FC/APC	FC/APC	FC/APC	FC/APC	FC/APC
Power Connector		DB9	DB9	N/A	N/A	N/A	DB9	DB9 Male
Optical link status		LED	LED	LED	LED	LED	LED	LEDs or RS232
Operating temperature	ºC	-20 to +70	-20 to +70	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85
Storage Temperature range	ºC	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85	-40 to +85

Note-

- Gain matching between pairs is optional.
- Packaging in 1U (Standard 19")x 250mm (9.8") Rack Mount with 1,2,3,4 units is optional.
- Weatherproof enclosure - available at additional charge.

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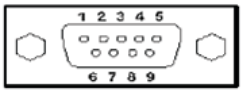
Fiber Optic transmission is the most efficient means to transmit RF signals over long distance.

- Fibers show a lower signal loss, are lighter and are less expensive than coaxial cables. Light from a laser diode is modulated by the RF signal either by direct modulation of the injection current into the laser diode or by an external modulator, thus converting the electronic RF signal into an optical signal.
- On the far end of the fiber, the receiver uses a high-speed, high linearity In GaAs PIN photodiode to convert the optical signal back to an electrical RF signal.
- Using advanced fiber optic multiplexers, up to 8 signals can be transmitted over a single fiber with high isolation (>60dB) among the channels.
- Alternatively, signals can be transmitted over a fiber in both directions simultaneously, by using different optical wavelengths as carriers.

DB9 Connector RX	
PIN	**Assignment**
1	+5V
2	+5V
3	NC
4	GND
5	GND
6	NC
7	Received average optical power
8	Low- no link High- active link
9	NC

DB9 Connector TX	
PIN	**Assignment**
1	+5V
2	+5V
3	NC
4	GND
5	GND
6	NC
7	Average optical power out from the LD (laser diode)
8	Output Low- LD off High- active LD (laser diode)
9	Input high – shut down LD (laser diode)

D9 Male Layout



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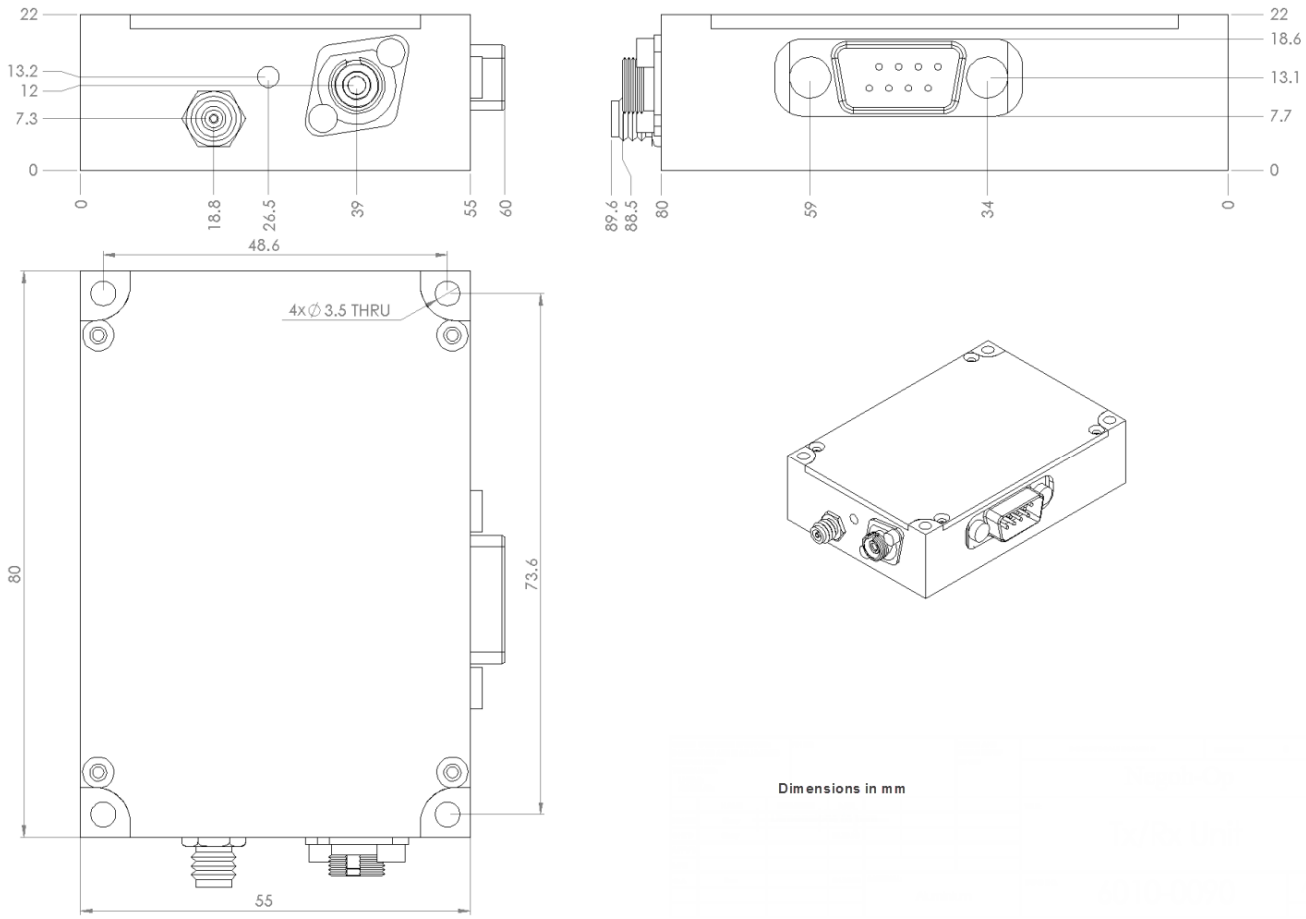
Line Drawing of Tx / Rx Unit



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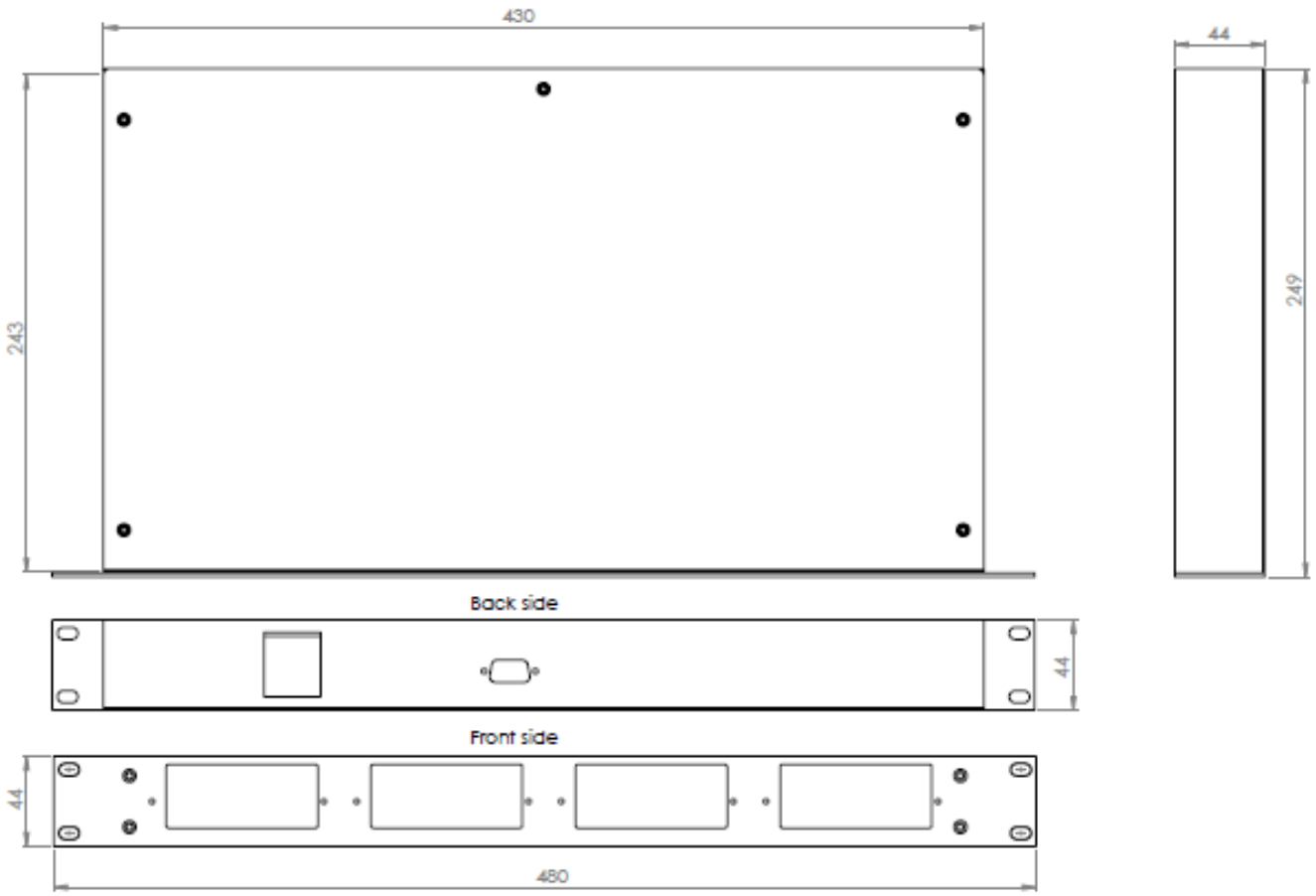
Line Drawing of 19” 1U Box



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RFQ 30237 - Additional Specs for 0.01-2.4

Specifications
2 X Bi-directional RF FIBER CONVERTERS
Two units each with 4Tx and 4Rx Links (total of 8 links per unit)
RF Tx-Rx Links Spec
Frequency Range (MHz) 10-2400MHz or up to 3GHz
Link Gain front adjustable -/+10
Amplitude Response @ Unity Gain 10-2400MHz any 36 MHz dB typical ±0.4dB min ±0.3dB max ±0.5dB
Gain Stability dB/24hr typical ±0.25 max ±0.3
Input Signal Range – Total Power dBm -30 minimum and 0 Maximum
RF Output Signal Range – Total Power dBm -25 minimum and 0 Maximum
Maximum Input without Damage dBm +15
Input/Output Impedance 50 and 75 Ohms
VSWR 2:1
Noise Figure (NF)2 dB 18 typical and 21 max
SFDR1 dB/Hz 2/3 100
CNR [any 36 MHz] 1 dB Typical 60 and 57 min
RF connector type SMA, F
Optical Specifications
Optical Power Output dBm typical 3, min 1, 4max
Optical Connector Types FC/APC
Optical Wavelength nm 1310/1550/CWDM
LED status indicators (Tx/Rx) green
Electrical Specification
Supply voltage VAC 85-230
Dual power supplies per unit for redundancy purposes
Mechanical specifications
2UX340
Warranty 2 years

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