

# RF Over Fiber Analog/Digital Link System

(10MHz ~ 40GHz, SM28 Fiber)

This series of RF over Fiber (RFOF) links is designed to transmit both analog and digital RF signals with exceptional fidelity, supporting frequencies up to 40 GHz over distances of up to 20 km. The system converts electrical RF signals into optical signals via a transmitter which either directly or externally modulating a laser. At the receiver, a high-linearity photodiode coupled with a low-noise amplifier convert the optical signals back into RF signals. For fiber-constrained applications, bidirectional optical option reduces the number of fiber by half. For transmission multiple channels using a single fiber strand, the system offers Wavelength Division Multiplexing (WDM) solutions, combining multiple wavelengths into a single fiber by a WDM module. At the receiving end, a Dense Wavelength Division Multiplexing (DWDM) module separates these wavelengths into multiple channels.

Housed in a ruggedized rack-mount chassis for network-grade reliability, this system supports diverse applications, including telecommunications, satellite communication, radio telescopes, distributed antenna systems, and broadcasting. Examples include connecting point-to-point antennas over kilometers of fiber, linking base stations to remote sector antennas, or transmitting RF signals between satellite antennas and control sites. Optional low-noise RF amplifiers and optical amplifiers can be integrated to optimize noise performance, ensuring high-quality signal transmission.



## Features

- 0.01 ~ 40 GHz
- Up to 100 km
- Dispersion Compensation
- Loss Compensation
- Analog or Digital
- Low Distortion
- Stable

## Applications

- GSM Repeater
- CDMA Repeater
- WCDMA Repeater
- PHS Repeater
- Digital TV Repeater
- Broadcast Repeater

## Specifications

Parameter	Min	Typical	Max	Unit
Optical Wavelength	1310 ± 20	1490 ± 20	1550 ± 20	nm
Optical Output Power	2	5	8	dBm
Optical Input Power	-16		-6	dBm
RF Frequency Range	0.01		40	GHz
	20		800	MHz
Flatness		4	6	dB
RF Output Power (@-10dBm optical input)			-30	dBm
Input RF Return Loss	10	12		dB
RF Input Power	-45	-40	-30	dBm
RF AGC Variation		± 2		dB
IMD 2 <sup>nd</sup> Order (two input tones at -20dBm)	32	50		dB
IMD 3 <sup>rd</sup> Order (two input tones at -20dBm)	55			dB
Noise (0dB RF gain, 0dB optical decrease)*	-90		-130	dBm/Hz
Link Gain		0		dB
Delay	60			ns
Fiber Type	Single Mode	9µm /125µm		
RF Impedance		75		Ω
RF Connector		F-Type		
Power Consumption	3			W
Weight	0.5			kg
Operating Temperature	-20		50	°C
Storage Temperature	-45		85	°C

\* Adding a low noise RF amplifier can reduce the noise figure by about 15dB

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## Dimensions (mm) 1U, 2U, 4U

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## Operation Instruction

- Connect the optical connector on the front
- Connect the RF connector on the front
- Connect AC power (110-240VA) using the accompanied power cord
- Turn on the power rock switch on the back panel
- The system should function smoothly
- Any issues, please email us

## Ordering Information

Prefix	Type	Wavelength *	Direction **	Link Length	Max RF Frequency	Channel #	Fiber Connector	RF Connector
RFOF-	Standard = 2 Special = 0	1550 nm = 1 CWDM = C DWDM = D Special = 0	One Direction = 1 Bidirectional = 2	< 5km = 01 5km = 05 10km = 10 15km = 15 20km = 20	2GHz = L2 6GHz = L6 10GHz = 10 15GHz = 15 20GHz = 20 30GHz = 30 40GHz = 40 100MHz = 01 500MHz = 05 800MHz = 08	1 Transmitter = T1 1 Receiver = R1 1TX and 1RX = X1 2TX and 2RX = X2 3TX and 3RX = X3 NTX and NRX = XN Special = 0	FC/APC = 2 FC/UPC = 3 SC/APC = 4 SC/UPC = 5 LC/APC = A LC/UPC = U Special = 0	SMA = 1 N type = 2 Special = 0

**Note:**

- \* 1550nm is a standard wavelength for transmission for single channel transmission. By using wavelength on the CWDM ITU, 4 channels can transmit through one fiber. By using wavelength on the DWDM ITU, 20 channels can transmit through one fiber.
- \*\* Bidirectional means two-way communications. This option reduce the fiber count in the link by half

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## Titel CWDM Module



- 1U Box houses 4 pluggable modules
- 2U Box house 8 pluggable module
- Each module house up to 6 transmitters or 6 receivers
- Each module house up to 3 transmitter/receiver pairs
- Each module house one 18 channel CWDM with LC connectors
- Each module house one 12 channel CWDM with SC connectors

## Operation Instruction

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- Connect the RF connector on the front
- Connect AC power (110-240VA) using the accompanied power cord
- Turn on the power rock switch on the back panel
- The system should function smoothly
- Any issues, please email us

## Application Notes

### Fiber Core Alignment

Note that the minimum attenuation for these devices depends on excellent core-to-core alignment when the connectors are mated. This is crucial for shorter wavelengths with smaller fiber core diameters that can increase the loss of many decibels above the specification if they are not perfectly aligned. Different vendors' connectors may not mate well with each other, especially for angled APC.

### Fiber Cleanliness

Fibers with smaller core diameters (<5  $\mu\text{m}$ ) must be kept extremely clean, contamination at fiber-fiber interfaces, combined with the high optical power density, can lead to significant optical damage. This type of damage usually requires re-polishing or replacement of the connector.

### Maximum Optical Input Power

Due to their small fiber core diameters for short wavelength and high photon energies, the damage thresholds for device is substantially reduced than the common 1550nm fiber. To avoid damage to the exposed fiber end faces and internal components, the optical input power should never exceed 20 mW for wavelengths shorter 650nm. We produce a special version to increase the how handling by expanding the core side at the fiber ends.

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## DWDM Module

The DWDM module combines multiple Tx channels into one fiber. It is used for links with limited available fiber lines.



- Each 1U module combines up to 18 channel with LC connectors
- Each 1U module combines up to 12 channel with SC or FC connectors

## Ordering Information

Prefix	Type	Channel Number	Configuration	Fiber Connector
DWDM-	RF over Fiber = 111 Special = 0	2 = 02 4 = 04 8 = 08 12 = 12 14 = 14 16 = 16 18 = 18 20 = 20 .....	Standard = 11	FC/APC = 2 FC/UPC = 3 SC/APC = 4 SC/UPC = 5 LC/APC = A LC/UPC = U Special = 0