RF and Digital Signals over Fiber optic cable

Key Features

- **Frequency range from DC to 4 GHz**
- **Signal loss less than 0.5 dB per 1000 m.**
- **Operates over distances of up to 50 km.**
- **Immune to EMI and RFI due to fiber being a non-conductive medium.**
- **Security against signal interception**
- **Simple Installation**

Typical Applications

- **Antenna remoting such as GPS Antennas**
- **Satcom ground stations**
- **GPS Timing Distribution including 1 pps**
- **Communication links from DC to 4 GHz**
- **Broadcast VHF/UHF links**
- **Military Communications**

General Description

RF over optical fibre is small in size, flexible, very low loss technology using intensity modulation to transmit RF signals. The continued fall in the cost of electro-optical conversion over recent years has led to RF over Fibre being increasingly adopted for applications such as linking satellite teleports to control rooms, live outside broadcast TV, and enhancing coverage of wireless technologies such as GPS, GSM, WiMax, Tetra and P25 for example by linking remote antennas inside buildings, tunnels and mines.

Typical System

A typical system will consist of three main elements:

- Optical Transmitter,
- Fibre Optic Cable
- Optical Receiver (to convert back to RF).

The system is defined in terms of normal RF parameters, i.e. gain, noise figure, linearity etc., and can be treated as an RF black box by a systems designer.

These systems use intensity modulation, which is amplitude modulation in the optical domain. The RF signal applied by the user to the optical transmitter directly modulates the intensity of a light source (e.g. a laser diode).

No frequency conversion or analog-to-digital conversion is involved.

This technique results in the widest possible frequency response and highest possible dynamic range. At the optical receiver, the modulated light is converted back into an RF signal using a high frequency photodiode.

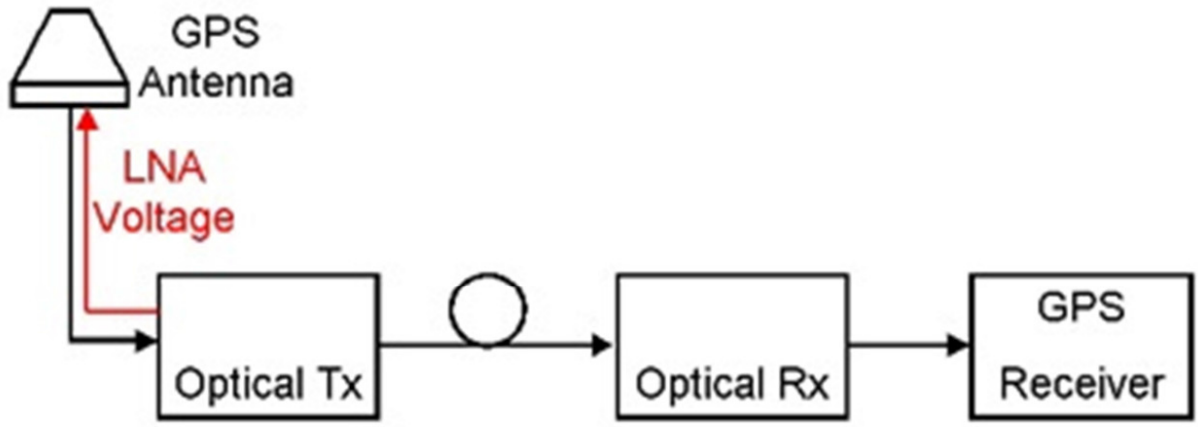
Intensity modulation places very demanding requirements on all components in the optical path - particularly the laser diode. In our products, these components have been designed for optimum efficiency, noise and linearity performance.

GPS Antenna Example

Our range of GPS frequency standards use a small GPS antenna that must be placed on the roof of the building to get a good view of the sky. Normally this connection is made using high quality RF coaxial cable. But because the GPS frequency is 1.57542 GHz, the cable can be expensive and have a large diameter for long runs.

An alternative way is for us to mount an optically receiver inside out unit and an optical transmitter near the antenna. The GPS antenna is connected to the optical transmitter. The optical transmitter converts the RF GPS signal to an optical signal. The optical signal is sent over a thin flexible fiber optic cable to the optical receiver. The optical receiver converts the optical signal back to the RF GPS signal.

A power supply that powers the optical transmitter can also power the GPS antenna via a voltage on the inner connector of the GPS antenna cable. Below is a picture showing this system.



Different Models

We can supply many models operating from DC to over 4 GHz and for various applications. The table below shows brief specifications on systems that can be supplied.

However, its best to contact us directly to discuss your specific applications, so that we can direct you to the correct product.

RF and Optical Performance Characteristics

Parameter	Low Frequency Link	High Frequency Link	GPS Antenna Link	Wideband Link	Digital Data
Frequency / Data Range	10kHz - 50MHz	10-1000 MHz	L1 and L2	2 kHz – 4.2 GHz	Asynchronous NRZ, DC-10Mbps for RS422/485, DC-460kbps for RS232/TTL
RF Link Gain (nominal)	0 dB (-25dB Tx and +25dB Rx)	0 dB	0 dB	0 dB	
Flatness	±0.5dB (max)	±1.0dB (max)	±1.0dB (max)	±1.0dB (max)	
Gain Stability	±0.25dB over operating temp range @24hrs	±0.25dB over operating temp range @24hrs	±0.25dB over operating temp range @24hrs		
Impedance / VSWR	50Ω / 1 : 1.5	50Ω / 2 : 1.5	50Ω /2 : 1.5	50Ω / 2 : 1.5	120 Ω
CNR	60dB				
Nominal Input Signal	0dBm				
Nominal Output Signal	0dBm				
Noise Figure	37dB	22 dB	< 18 dB	21 dB	
Input P1dB	+13dBm	+1 dBm	➢ -10 dBm	➢ 0 dBm	➢
Maximum Input Power (without damage)	+25dBm	+15 dBm			
Output IP3	+15dBm	+13 dBm			
SFDR	108dB Hz				
External LNA Voltage	Capability for +5V or +12V feed from RF input of Tx		Capability for +5V or +12V feed from RF input of Tx		
Laser Type	DFB	DFB			
Optical Wavelength	1310 nm ± 20 nm (1550nm/CWDM options)	1310 nm ± 20 nm (1550nm/CWDM options)	1310 nm ± 20 nm (1550nm/CWDM options)	1310 nm ± 20 nm (1550nm/CWDM options)	1310 nm ± 20 nm (1550nm/CWDM options)
Optical Power Output	4.5 dBm (nominal) (3mW)	4.5 dBm (nominal) (3mW)	4.5 dBm (nominal) (3mW)		
Optical Connector	FC/APC (E2000 and SC options)	FC/APC (E2000 and SC options)	FC/APC (E2000 and SC options)		FC/APC
Fibre Cable	Single mode 9/125, Corning SMF28 or equivalent				

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Full specifications available from www.ptsyst.com. Specifications and features subject to change without notice 091013)