

# BOR 4160

## Quadruple Optical return-path receiver

### General:

The BOR 4160 is a quadruple optical receiver for upstream (CWDM) applications in modern HFC networks. The receiver is specially designed to meet today's requirements for easy, cost-effective network segmentation using CWDM techniques for optimal fiber employment. The integration of 4 receivers in a single BK-housing is the space-reducing solution for efficient segmentation of the upstream-path in an optical hub.

### Application

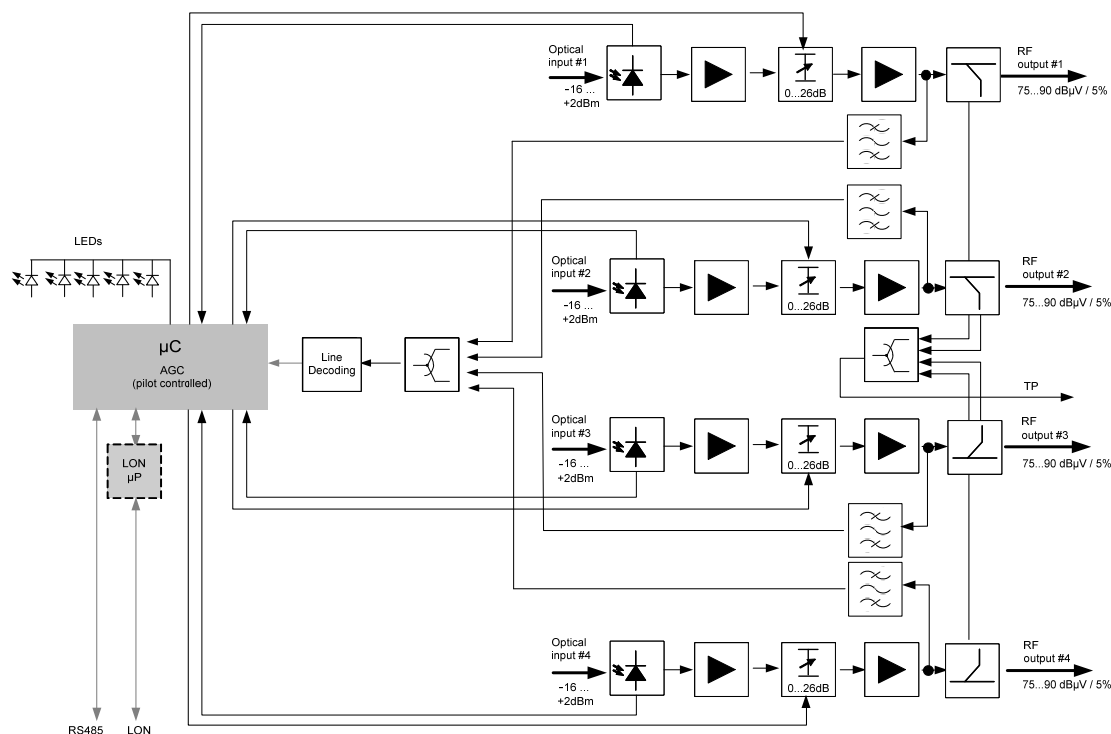
- Optical to electrical conversion of four upstream signals in hybrid fiber coax (HFC) networks
- Redundant path switching
- Usage in head-ends and indoor fiber hubs

### Features

- Four independent receivers
- Each receiver section can be disabled separately
- Sleep mode for redundant receivers
- Optical power detection on all inputs
- Wide optical input power range
- Bandwidth 5...200 MHz enables application of return path frequency stacking technology
- Pilot tone and optical input power controlled AGC
- Various network management capabilities RS 485
- Switchable RF test-point with LED status information
- Optional CWDM de-multiplexer integrated (one optical input)
- BK modular design (1 unit)
- Very low power consumption



### Block diagram:



## Technical specifications

### Electrical and optical specifications

Parameter	Symbol	Min	Typ	Max	Unit
Opt. Input level standard	Pin	-16		+2	dBm
With integrated DEMUX	Pin	-15		+2	dBm
Optical return loss	ORL	45			dB
Photodiode-Sensitivity @1310 nm @1550 nm	$\eta$	0.8 0.89			A/W
Voltage	Vcc	22.8	24	25.2	V
Power consumption	P			10	W
Optical connector			E2000		
HF-connectors			IEC – female		

### HF specifications

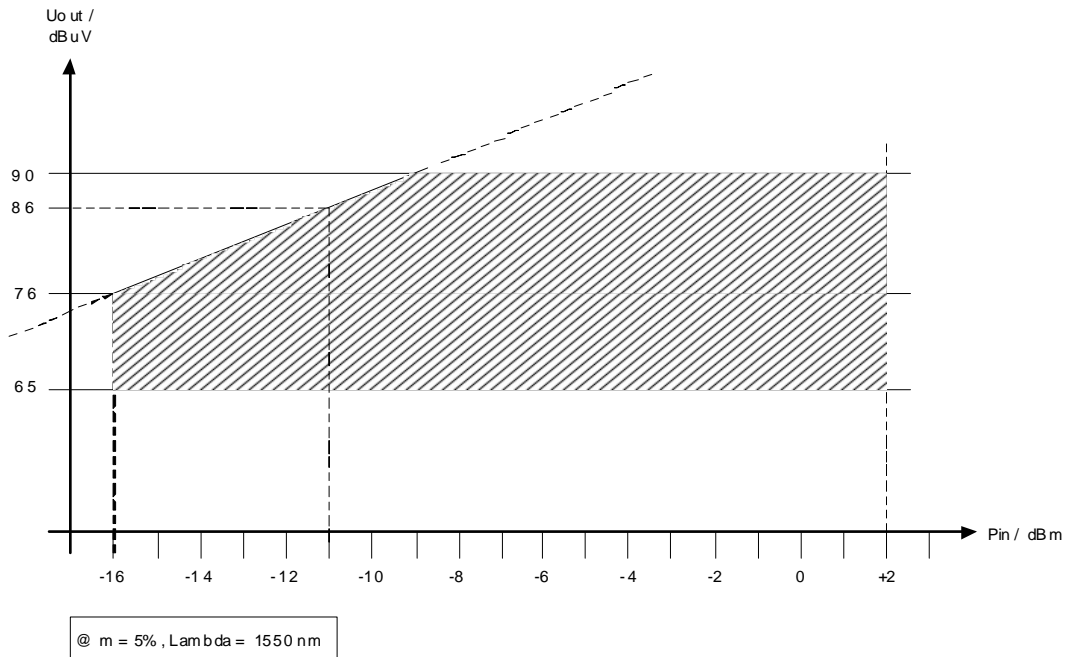
Parameter	Min	Typ	Max	Unit
HF Bandwidth	5	-	200	MHz
Equivalent Noise-current density @ -16 dBm (-15 dBm)		2.5		pA/ $\sqrt{\text{Hz}}$
HF Impedance	-	75	-	$\Omega$
HF Return loss		20@ 47 MHz		dB
HF Flatness @ 5-160 MHz	-0.75		+0.75	dB
HF Flatness @ 160-200 MHz	-1.00		+1.00	dB
HF Output level (@OMI=5%)	65	75	90	dB $\mu$ V
Intermodulation IM3	-55 <sup>1)</sup>			dBc
Crosstalk between outputs	-45 <sup>2)</sup>			dB
Crosstalk between outputs with shut down Receiver	-55			dB
CNR @ -11 dBm (4 QAM carriers with 2 MHz bandwidth, OMI = 10% p/c	50			dB
Pilot-Frequency	590		640	kHz
OMI Pilot		5		%
Suppression Pilot	35			dB
ALC range	> 50 <sup>3)</sup>			dB
BER PSK-Demodulation		<1E-4 <sup>4)</sup>		
Test point attenuation		20 dB $\pm$ 1.5		dB
EMV (EN 50083-2)			20	dBpW
Operational temperature range	-20		60	$^{\circ}\text{C}$
Weight		1		Kilogram
MTBF	15			a
Dimensions (W x H x D)	40 x 250 x 100	= one BK unit		Millimeter

- 1) Optical input power +0dBm, OMI 20% per carrier, 85 dB $\mu$ V Output level
- 2) Total-power 3 neighbor receiving signals to measured carrier with equal optical input level and equal RF output-levels of all 4 receivers
- 3) Total of optical and RF auto leveling range
- 4) 625 kHz, @SNR of 11dB of optical input signal

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## OPTICAL INPUT POWER RANGE:



This diagram shows the BOR 4160's range of optical input power and the corresponding operational RF output level @5% OMI.