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HDO777 C-BAND DWDM FIBRE TRANSMITTER

HDO777 is an externally modulated C-band DWDM transmitter for forward path fibre optic links in CATV and FTTx networks. The transmitter has an extended frequency range to fulfil DOCSIS 3.1 requirements. HDO777 has been optimised for QAM transmission and it can carry more than 100 QAM channels i.e. a full channel load up to 1.2 GHz. HDO777 can be also loaded with a large amount of analogue TV channels or with the mix of analogue and digital channels. The module is installed into HDX installation frame. The transmitter has two equal input sections with level and slope adjustments to support broadcast and narrowcast signal distribution. The RF isolation between the input branches is high minimising the leakage of narrowcast signals into wrong node segments. The power consumption is low but HDO777 still offers the high performance and the widest variety of features, including the internal spectrum analyser module. An integrated WDM filter is available as an option for applications where the light wavelengths of two transmitters are combined into common output enabling an optical daisy chaining. An integrated filter can be used also when forward path and return paths are transmitted in one fibre.



Features

- DOCSIS 3.1 compatible
- External modulation enables different link spans from one transmitter (more than one receiver)
- External modulation doesn't require dispersion compensation
- Standard and high SBS suppression models available
- Standardised input and test point levels
- Low power consumption and high performance
- Two inputs with level adjustments
- Equaliser in both inputs
- High isolation between inputs
- Unused input can be switched off for power saving and noise reduction
- Integrated input amplifiers and laser driver amplifiers
- Automatic power control providing constant total OMI as standard feature
- Optional spectrum analyser function
- Optional integrated xWDM filter to combine forward and return paths into one fibre or to combine various forward wavelengths into one fibre
- Fibre connectors can be located at the rear or at the front panel
- Small form factor family, 2 RU height
- Local and remote software control of all adjustments
- Forced cooling through the unit

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Management features

- Monitoring of APC (Automatic Power Control) functionality with user configurable offset
- Signal level adjustment in both inputs
- Slope adjustment in both inputs
- SBS setting (RF load start frequency)
- Input 2 switch on/off
- LED indicators for signal and module statuses
- Internal temperature measurement and monitoring
- Intelligent fan speed control with monitoring
- Non-volatile logging of 32 latest events, including alarms, alarming values, settings changes and application starts.
- Uptime and total uptime counters
- All adjustments and alarm limits fully user configurable
- Local PC connection through backplane HDO bus with HDX021 cable
- Remote IP connection through HDC100 controller module
- SNMP monitoring and configuration through HDC100 controller module

Technical specifications

Parameter	Specification	Note
Optical parameters		
Light source and modulator	L-EML, monolithic InP device	
Peak wavelength	1530...1560 nm (ITU ch59...21)	1)
Output power, nominal value	+11 dBm	2)
SBS suppression, option A		3)
RF load starting from 45 MHz	+12 dBm	
RF load starting from 85 MHz	+14 dBm	
RF load starting from 112 MHz	+15 dBm	
RF load starting from 200 MHz	+16 dBm	
SBS suppression, option H	+18 dBm	4)
Relative intensity noise	-153 dBc/Hz	5)
OMI per channel	2.6 %	6)
Pass band of optional xWDM filter		7)
Pass channel	±0.12 nm (DWDM) or ±6.5 nm (CWDM)	
Reflect channel, DWDM	1520...1565 nm except the pass channel	
Reflect channel, CWDM	1260...1620 nm except the pass channel	
Number of optical ports	1 or 2	
RF parameters		
Frequency range	47...1218 MHz	
RF impedance	75 Ω	
Input return loss	18 dB	8)
Flatness	±0.4 dB	9)
Automatic power control (APC)	Yes	10)
Laser test point level for 4.5 % OMI	78 dBμV	11)
Input level	77 dBμV	12)
Level adjustment range	10 dB	
Equaliser adjustment range	0...6 dB	
Isolation between inputs	50 dB	13)

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Spectrum analyser module (optional)

Measurement range	47...1218 MHz, 0.25 MHz steps	
Measurement bandwidth	0.35 MHz	14)
Dynamic range	58...98 dB μ V	15)
Measurement accuracy	± 1 dB	16)

Noise and distortion performance

Link C/N, -2 dBm to optical receiver	51 dB	17)
CTB	62 dB	18)
CSO	62 dB	19)
MER	40 dB	20)
BER	$<10^{-9}$	21)

General

Power consumption	9 W	22)
Supply voltages	25 V / 330 mA	22)
	6.3 V / 150 mA	22)
RF connectors	F female	23)
Optical connector	SC/APC, E-2000	24)
Cooling	Field replaceable fan	25)
Dimensions	2U x 7HP x 380 mm	h x w x d
	Occupies 1/12 of HDX installation frame	
Weight	1.5 kg	
EMC compliance	EN 50083-2	26)
Enclosure classification	IP20	
Operating temperature range	0...+45 °C	
Storage temperature range	-20...+60 °C	
Operating relative humidity	0...85 %	

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Notes

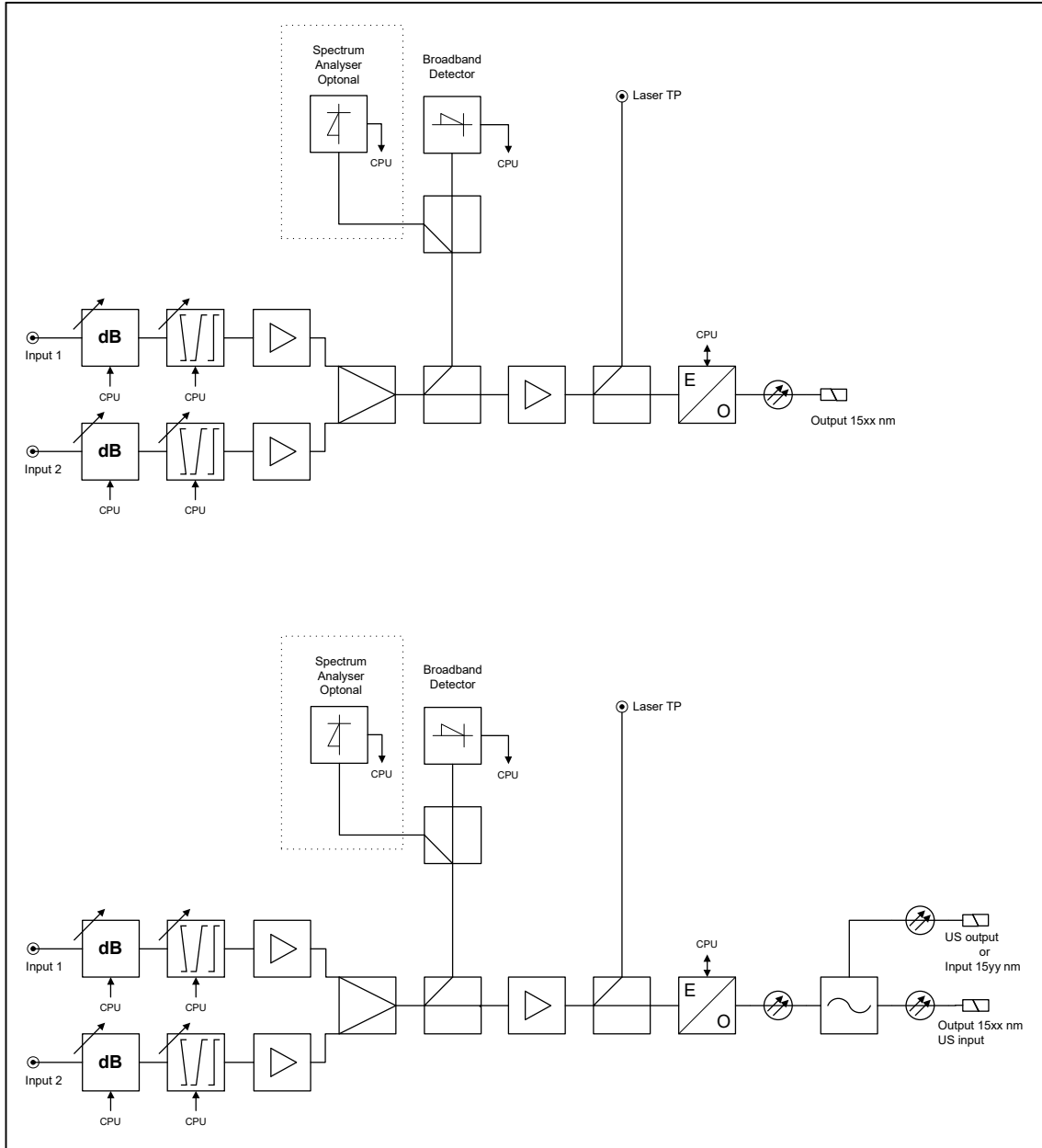
- 1) Standard unit offers ITU channels 21, 22, 24, 26, 28, 33, 36, 39, 48, 52, 54 and 57. Other wavelengths are available on request.
- 2) Nominal output power. The tolerance is ± 1 dB.
- 3) Maximum launch power to fibre. For standard model (option A) user sets the start frequency of RF load.
- 4) Maximum launch power to fibre. RF frequency setting is not used with high SBS suppression model (option H).
- 5) Worst case value.
- 6) Typical OMI of one QAM channel when the loading is 100 x QAM256 channels.
- 7) DWDM filtering is used to combine two transmitters into one common output. The auxiliary optical input enables optical daisy chaining of multiple transmitters (wavelengths). CWDM filter is used if the return path is based on CWDM and forward and return paths are separated in the transmitter. xWDM filter decreases the output power 0.5 dB typically.
- 8) Typical value is 18 dB on the whole frequency band. The minimum value is 18 dB and above 40 MHz -1 dB/ octave.
- 9) Typical value. Maximum value is ± 0.75 dB.
- 10) APC is based on broadband detection in which the total laser driving power is measured and adjusted so that if the RF power is evenly divided into all channels 4 % OMI/ channel is achieved. The offset can be set by a user.
- 11) Typical accuracy is ± 0.4 dB. Maximum value is ± 0.75 dB.
- 12) Input level required to reach 4.5 % OMI with adjustments in 0 dB positions. 4.0 % OMI equals to 1 dB lower level.
- 13) The attenuation from one input to the other input. Above 860 MHz the isolation is more than 40 dB.
- 14) Typical -3 dB bandwidth. Typical -45 dB bandwidth is 0.5 MHz.
- 15) Level at laser (OMI) test point for modulated CW/ PAL signal. For QAM detection the dynamic range is approx. 6 dB higher. QAM detection measures a ~0.35 MHz band and the level calculation assumes the carrier to be 6.875 Msymbols/s signal. Nominal level denotes 4.5 % OMI. (0.45...45 % OMI range)
- 16) This is the typical performance over band 50...740 MHz for CW/ PAL signals. For PAL signals above 740 MHz and all QAM signals the accuracy is ± 1.7 dB.
- 17) This is a minimum value with 60 km fibre. BW = 4.75 MHz and OMI = 4.5 %. The minimum value is 50 dB.
- 18) This is a typical value with 60 km fibre and with CENELEC 42 chs up to 862 MHz. CTB performance is tested up to 1218 MHz. CTB minimum value is 58 dB. With modulated channels the distortion distances are better. The modulation improvement is typically 8 dB for CTB.
- 19) This is a typical value with 60 km fibre and with CENELEC 42 chs up to 862 MHz. CSO performance is tested up to 1218 MHz. CSO minimum value is 58 dB. With modulated channels the distortion distances are better. The modulation improvement is typically 6 dB for CSO.

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- 20) Typical performance for the standard model (option A). 8 wavelengths in 50 km fibre. The load is 100 x 256-QAM channels.
- 21) Typical value at nominal loading i.e. total OMI is max. 26 %. The maximum value is 10^{-8} .
- 22) Typical power consumption at 25°C, no spectrum analyser. The spectrum analyser module adds 1.5 W.
- 23) Fixed connections are located at the rear panel. Test points are located at the front panel.
- 24) Fibre connectors can be located at the rear or at the front panel.
- 25) The fan can be replaced by the user without signal interruption.
- 26) Radiation limit is 20 dBpW.

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Block diagrams, with and without WDM filter (optional)



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Ordering information

HDO777 configuration map

	1-	2-	3-	4-	5-	6-
	1	1	1	1	1	1
HDO777	-	-	-	-	-	-

1-1 Transmitter type	
A	Standard model, ITU ch 21...59
H	High SBS suppression model, ITU ch 21...59
X	N/A

2-1 ITU ch and wavelength	
A21	ITU Ch 21 1560.61 nm
A22	ITU Ch 22 1559.79 nm
A23	ITU Ch 23 1558.98 nm
A24	ITU Ch 24 1558.17 nm
A25	ITU Ch 25 1557.36 nm
A26	ITU Ch 26 1556.55 nm
A27	ITU Ch 27 1555.75 nm
A28	ITU Ch 28 1554.94 nm
A29	ITU Ch 29 1554.13 nm
A30	ITU Ch 30 1553.33 nm
A31	ITU Ch 31 1552.52 nm
A32	ITU Ch 32 1551.72 nm
A33	ITU Ch 33 1550.92 nm
A34	ITU Ch 34 1550.12 nm
A35	ITU Ch 35 1549.32 nm
A36	ITU Ch 36 1548.51 nm
A37	ITU Ch 37 1547.72 nm
A38	ITU Ch 38 1546.92 nm
A39	ITU Ch 39 1546.12 nm
A40	ITU Ch 40 1545.32 nm
A41	ITU Ch 41 1544.53 nm
A42	ITU Ch 42 1543.73 nm
A43	ITU Ch 43 1542.94 nm
A44	ITU Ch 44 1542.14 nm
A45	ITU Ch 45 1541.35 nm
A46	ITU Ch 46 1540.56 nm
A47	ITU Ch 47 1539.77 nm
A48	ITU Ch 48 1538.98 nm
A49	ITU Ch 49 1538.19 nm
A50	ITU Ch 50 1537.40 nm
A51	ITU Ch 51 1536.61 nm
A52	ITU Ch 52 1535.82 nm
A53	ITU Ch 53 1535.04 nm
A54	ITU Ch 54 1534.25 nm
A55	ITU Ch 55 1533.47 nm
A56	ITU Ch 56 1532.68 nm
A57	ITU Ch 57 1531.90 nm
A58	ITU Ch 58 1531.12 nm
A59	ITU Ch 59 1530.33 nm

3-1 Fibre location	
F	Front panel
R	Rear panel

4-1 Optopassive	
F21	ITU21 filter, front
R21	ITU21 filter, rear
F22	ITU22 filter, front
R22	ITU22 filter, rear
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F59	ITU59 filter, front
R59	ITU59 filter, rear
FC3	1531 nm filter, front
RC3	1531 nm filter, rear
FC5	1551 nm filter, front
RC5	1551 nm filter, rear
FXX	None
RXX	None

5-1 Fibre connector type	
A1	SC/APC, 9 deg.
B1	FC/APC
C1	E2000/APC
D1	SC/APC 8 deg.
H1	SC/APC 8 deg. with shutter
A2	2xSC/APC 9 deg.
B2	2xFC/APC
C2	2xE2000/APC
D2	2xSC/APC 8 deg.
H2	2xSC/APC 8 deg. with shutter

6-1 Signal monitoring	
B	Spectrum analyser
X	None

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