

AC9000 INTELLIGENT FIBRE OPTIC PLATFORM



The AC9000 is an intelligent 4 output optical node of ACx product family. It is based on fixed platform but flexible modular solution, supporting up to two optical receivers, four optical transmitters and dual power supplies. The optical receivers can act as 2 independent nodes or in 1+1 backup operation.

The 4 independent upstream inputs are connected to optical transmitters via a configurable signal routing matrix which allows flexible backup operations.

The AC9000 has a slot for transponder module, allowing remote configuration and management of the node. The transponder unit also measures the DS and US signal levels used by the automatic alignment function. Forward and return path automatic alignment function increases the reliability of the node to a even higher level. Fully configurable automatic level control (ALC) keeps output level constant and automatic ingress blocking reacts to unwanted return path signals.

Features

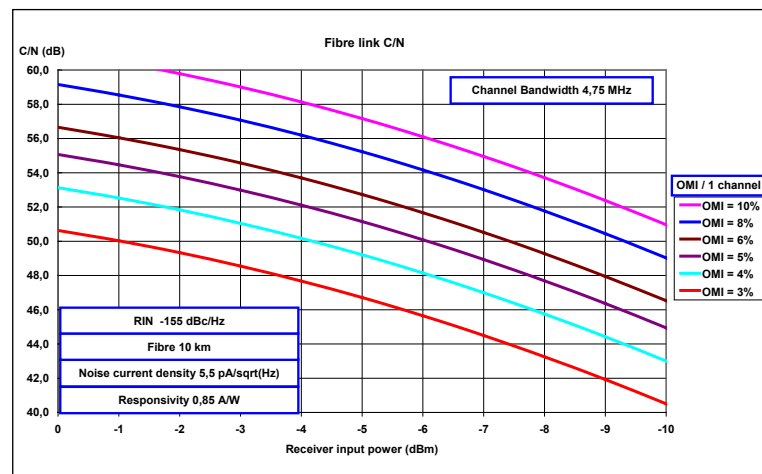
- 1 GHz
- Amplifiers stages use GaN HEMT and GaAs pHEMT technology
- Innovative splice organizing
- Redundant power supplies
- Full electrical controls
- Automatic alignment for both forward and return path
- Automatic power saving operation mode
- Downstream and upstream spectrum analyser function as an option
- Flexible electrically controlled downstream and upstream signal routing
- Support for digital return path transmitters
- Wide range of upstream laser technologies available
- Efficient surge and ESD protection
- With AC6991/AC6980 transponder plug-in:
 - CATVisor / HMS (AC6991) or DOCSIS (AC6980) remote connection
 - ALSC with fully user programmable pilots
 - Downstream spectrum analyser
 - Upstream signal quality monitoring with automatic ingress control
 - True plug-and-play with single pushbutton alignment
 - Return path pilot generator (AC6991)

Technical specifications

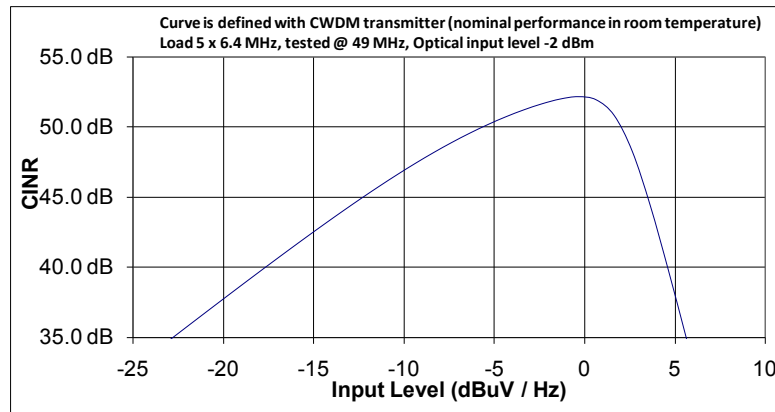
Parameter	Specification	
Downstream signal path		
Light wavelength	1290...1610 nm	
Optical input power range	- 7...0 dBm	
Frequency range	70...1006 MHz	
Return loss	20 dB	1)
Gain limited output level	4 x 112 dBμV / 2 x 116 dBμV	2)
1 st interstage gain control	0...-16 dB	3)
2 nd interstage gain control	0...-13 dB	4)
Level offset, outputs 2 and 4	0...-15 dB	5)
Slope control	0...20 dB	6)
Isolation between DS paths	> 60 dB	7)
Flatness	±0.5 dB	8)
Group delay	2 ns	9)
Test point	-20 dB	10)
Transponder connection	-19 dB	11)
Noise current density	5.5 pA/√Hz	12)
CTB 41 channels	116.0 dBμV	13)
CSO 41 channels	116.0 dBμV	13)
XMOD 41 channels	112.5 dBμV	13)
CTB 105 / 72 channels	78.0 / 85.0 dB	14)
CSO 105 / 72 channels	74.0 / 81.0 dB	14)
XMOD 105 / 72 channels	68.0 / 76.0 dB	14)
Upstream signal path		
Frequency range	5...85 MHz	
Return loss	18 dB	
Ingress switching	0 / -6 / < -45 dB	
Input level	57.0 dBμV	15)
CINR	> 52 dBc	16)
OMI adjustment	0...-20 dB	
OMI test point	-5 dB	17)
Transponder connection	-37 dB	18)
Isolation between US paths	> 55 dB	19)
General		
Power consumption	39...61 W	20)
Supply voltage	30...65 V _{AC}	
Maximum current feed through	12.0 A / port	
Hum modulation	70 dB	21)
Optical connectors	SC/APC, FC/APC, E-2000	
Output connectors	PG11	
Test point connectors	F female	
Dimensions	33(36) x 31(35) x 14 cm	h x w x d
Weight	10 kg	
Operating temperature	-40...+55 °C	
Class of enclosure	IP 54	
EMC	EN50083-2	
ESD	4 kV(22)	
Surge	6 kV (EN 60728-3)	

Notes

- 1) The limiting curve is defined at 40 MHz -1.5 dB / octave. Return loss is always better than 13 dB.
- 2) This is the gain limited output level when OMI is 4.0 %. The level is available with -7 dBm optical input power (AC66B10). The used wavelength is 1310 nm. Higher output levels are possible if optical input level is higher than -7 dBm.
- 3) Step size is 1 dB.
- 4) Step size is 0.2 dB. This control is used by ALC.
- 5) Step size is 1.0 dB. Adjusted with JDA series attenuators. There is an automatic 0 dB bypass built on motherboard in the case of missing JDA plug.
- 6) Step size is 0.5 dB. Slope is defined between 47...1006 MHz. Flatness spec is guaranteed when slope is less than 16 dB.
- 7) Defined 70...900 MHz. In higher frequencies the limit is 50 dB.
- 8) Typical value in room temperature. Guaranteed value is ± 0.75 dB.
- 9) $F > 125$ MHz, BW 4.43 MHz
- 10) TP has ± 0.75 dB tolerance between 70...862 MHz and ± 1.0 dB between 862...1006 MHz.
- 11) Level difference between transponder connection and output 1. Tolerance ± 0.5 dB.
- 12) This is a typical value at 862 MHz and the value can be used for C/N calculations. Typical C/N curves can be seen in the graph below.



- 13) EN50083-3. In 2 output mode (=not splitted). Node output 8 dB cable equivalent sloped and optical input level -7 dBm. All results are typical values in room temperature. XMOD is measured at the lowest channel.
The highest recommended output level for the node is 116 dBμV with 41 channels.
- 14) In 2 output mode (=not splitted). Measured with 72 and 105 NTSC channels. The output 11 dB linearly sloped and the used levels at 120 / 550 / 750 / 862 MHz 36.0 / 42.5 / 45.5 / 47.0 dBmV. All results are typical values in room temperature, which can be used in system calculations. XMOD is measured at the lowest channel.
The highest recommended output level for the node is 54 dBmV with 105 channels and 56 dBmV with 72 channels.
- 15) Nominal input level for 4.0 % OMI. Defined at the output connector of the node.



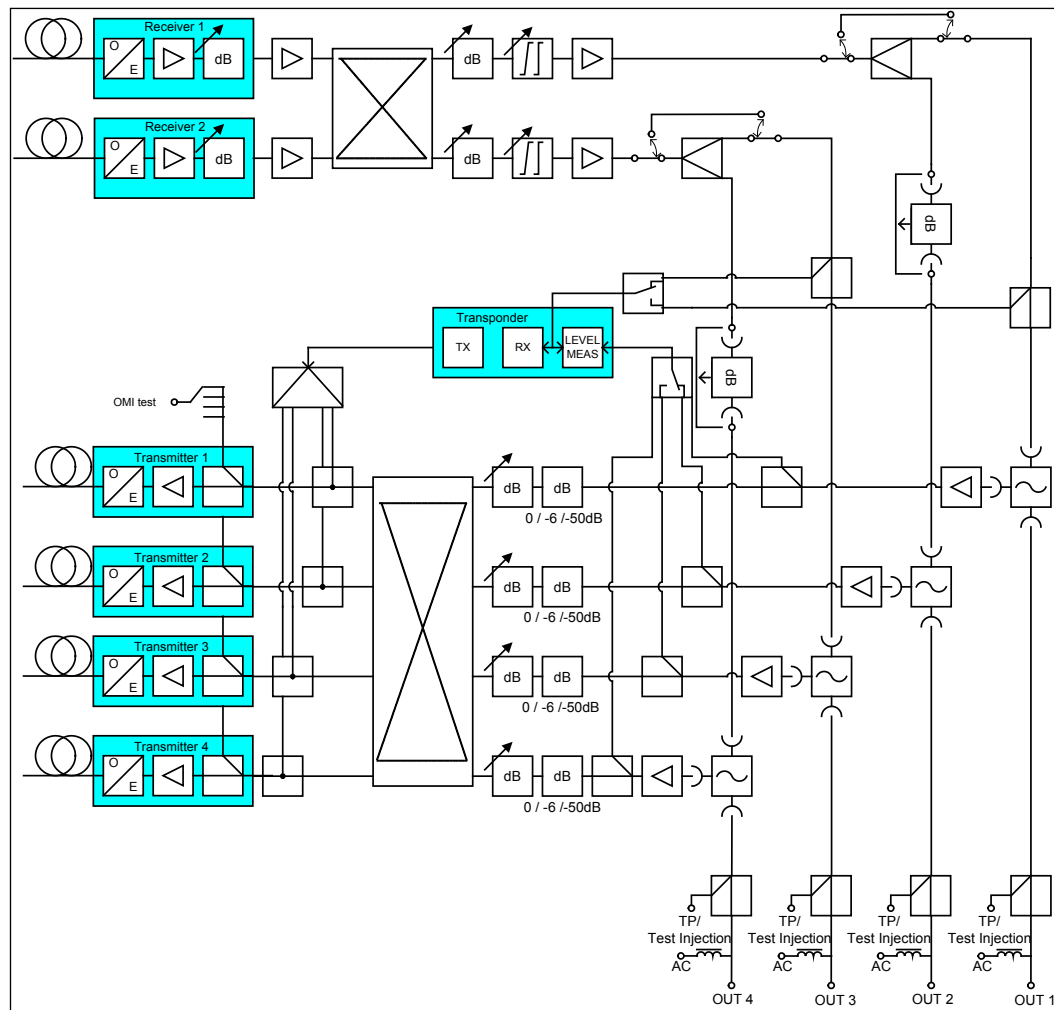
- 16) Nominal performance when 65 MHz US channel is in use
- 17) - 5 dB is valid if ingress switch and US input attenuator are set to 0 dB.
The nominal value at this TP is 52 dBuV when OMI is set to 4 %. Tested at 20 MHz.
- 18) This is the level difference between return path input and transponder transmit pin when return path attenuation is 0 dB. This value increases linearly with increasing return path attenuation.
- 19) Defined 5...65 MHz.
- 20) 61 W: single PSU, transponder, 4 * optical CWDM TX, 2 * optical RX, full RF performance.
39 W: single PSU, 1 * optical CWDM TX, 1 * optical RX, power save mode.
- 21) 70 dB hum value is valid at any frequency from 10 to 1006 MHz, when the remote current is less than 8.0 A/port. Hum modulation is 65 dB, if 12.0 A is fed.
20.0 A is the maximum current which can be locally injected into all ports together.
- 22) EN61000-4-2, contact discharge to enclosure and RF-ports.

Monitoring functions

- Status LED for alarm indication
- Return path ingress switches on / attenuated / off control
- 65 VAC voltage measurement with alarms
- Local +12 V and +24 V voltage measurements with alarms
- Internal temperature measurement with alarms
- Full electrical control of all forward and return path alignments
- OMI based forward path automatic alignment
- OMI based return path automatic alignment
- Uptime, total uptime and reset counters for power outage statistics
- User notes can be stored into amplifier memory
- Fully user configurable alarm limits, severities, enabling and delays
- Alarm log stored into non-volatile memory for easy troubleshooting
- Node configuration and accessory information stored in amplifier memory
- Fast local software update via USB also without power supply
- Optical receiver input power measurement with alarms
- Optical transmitter laser bias current monitoring with alarms
- Automatic or manual optical receiver selection
- Optical transmitter pilot generator enabling and frequency control
- Return path signal combining / separation control with automatic backup

Additional features available with AC6991 / AC6980 transponder:

- Remote access to all AC9000 settings and monitored parameters
- ALSC and modem LEDs for alarm indication
- CATVisor and HMS compatible remote connection (AC6991)
- DOCSIS compatible remote connection (AC6980)
- Interstage gain control by ALC mode with saturation alarm
- ALC pilot frequencies, types, back-offs and decision levels are user programmable
- Automatic reserve pilot switching
- User configurable all pilots lost behaviour
- Pilot based forward path automatic alignment
- Full forward and return path automatic alignment with single button
- Lid status monitoring with alarm
- Service terminal connection monitoring with alarm
- Node configuration change monitoring with alarm
- Spectrum analyser for forward path level measurement with alarm
- Ingress analyser for return path level measurement with alarms
- Automatic ingress switch activation and deactivation based on detected ingress with alarms and user configurable delays
- Modem receive and transmit signal level monitoring with alarms (AC6991)
- Remote software update to multiple units simultaneously
- Return path pilot generator with 4 user programmable pilot frequencies and levels (AC6991)

Block diagram

AC9000 configuration map

DOC0018989, Rev016