AC500 AMPLIFIER PLATFORM

The AC500 is a single active output amplifier with 39 dB of gain. The amplifier can be used as in distribution purposes in high gain mode but also as a line amplifier with lower gain. By using internal splitting there can be available 2 separate outputs.

The amplifier is very flexible and scaleable. It does the basic amplifier functions but can be modified with passive or active plug-in modules to carry out more sophisticated solutions like two-way optical node. The required modules can be ordered as factory installed together with the amplifier, but it is also possible to update the amplifier later on the field.

All essential return path elements like ingress switches are fixed built on the mother board but for example return amplifier module can be chosen after the needed performance.

Features

- Output amplifier stages use GaAs technology
- 2 outputs by internal splitting
- Improved ESD and surge protection
- Can be updated to optical node
- Plug-in module adjustments
- Return path ingress switch built-in
- Combined mid-stage gain and slope plug
- 2 possibilities to inject upstream test signal
- HMS compatible transponder module available
- Optional spectrum analyser function
- Fixed station memory for electrical identification
- Optional high performance return amplifier
- Automatic return path termination

Technical specifications

Parameter	Specification	Note
Downstream signal path (values with diplex filters)		
Frequency range	47 / 54 / 70 / 85...862 MHz	
Return loss	20 dB	1
Gain	31…39 dB	2
Input attenuator control range	20 dB	3
Input equaliser control range	25 dB	3
Mid-stage slope	8 dB	4
Flatness	± 0.4 dB	5
Group delay	2 ns	6
Test point	- 20 dB	7
Transponder connection	- 19 dB	8
Noise figure	7.7 dB	9
Output level, DIN 45004B	127.5 dBµV	10
CTB 42 channels	113.0 dBµV	11
CSO 42 channels	114.0 dBµV	11
XMOD 42 channels	111.0 dBµV	11
CTB 110 / 77 channels	69.0 / 77.0 dBc	12
CSO 110 / 77 channels	64.0 / 72.0 dBc	12
XMOD 110 / 77 channels	64.0 / 71.0 dBc	12
Upstream signal path (values with diplex filters)		
Frequency range	5...30 / 42 / 50 / 65 MHz	
Return loss	18 dB	13
Gain	21 / - 6.5 dB	14
Ingress switching	0 / - 6 / < - 50 dB	
Gain control range	20 dB	15
Equaliser control range	7 dB	16
Flatness	± 0.5 dB	17
Test signal injection point	- 30 dB	18
Transponder connection	- 26 dB	19
Noise figure	8.5 dB	20
Output level, DIN 45004B	113.0 dBµV	20
General		
Power consumption	15.0 W	21
Supply voltage	27...65 Vac , ±33...90Vdc / 205…255 Vac	
Supply current	see note	22
Maximum current feed through	8.0 A / port	23
Hum modulation	70 dB	23
Resistance for remote current	25 mΩ / port	
Input / Output connectors	PG11	
Test point connectors	F- female	
Dimensions	245 x 255 x 100 mm	h x w x d
Weight	3.0 kg	
Operating temperature	-40...+55 °C	
Class of enclosure	IP67	24
EMC	EN50083-2	
ESD	4 kV	25
Surge	6 kV	26

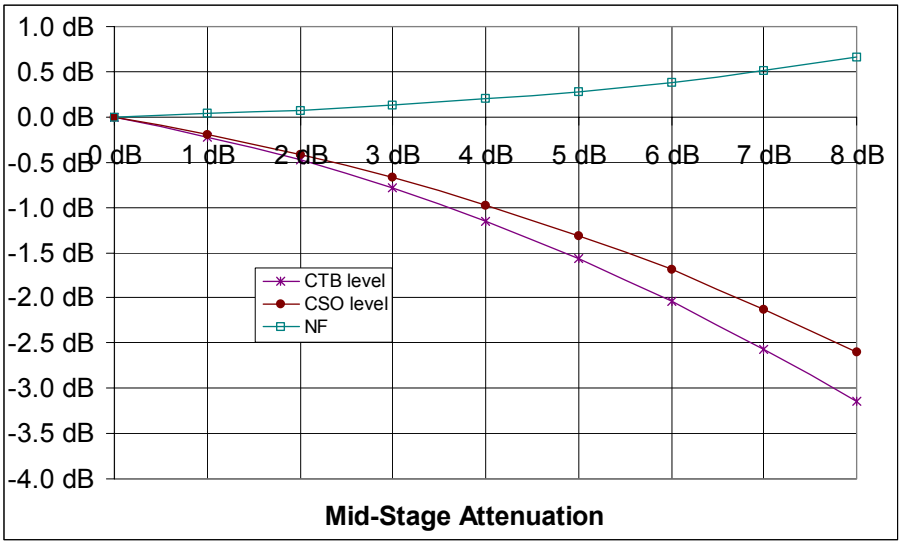
Technical specifications (optical node)

Parameter	Specification	Note
The following specifications are valid for AC500 when used as an optical node. If parameter is not specified in this section, the relevant corresponding parameter from amplifier part above can be used.		
Downstream signal path (values with diplex filter)		
Light wavelength	1290…1600 nm	27
Optical input power range	- 7…+ 2dBm	28
Gain limited output level	109 dBuV	29
Flatness	± 0.6 dB	30
Noise current density	7 pA / √ Hz	31
Upstream signal path (values with diplex filter)		
Input level	62.0 dBµV	32
General		
Power consumption	21.0 W	33
Supply current	see note	34
Class of enclosure	IP54	35

Notes

1) The limiting curve is defined at 40 MHz -1.5 dB / octave.

2) Guaranteed maximum gain is always 38 dB. With combined mid-stage gain and slope control possibility the amplifier can be used in low gain mode. Specified gain is defined with mid-stage equaliser without extra losses and 2 pcs of diplex filters. All other used plug modules are 0 db jumpers.



The picture shows how the NF and distortion performance is changing if mid-stage gain control is used. CTB and CSO curves are valid with CENELEC loading. NF curve is defined at 862 MHz.

3) Fixed value attenuators and equalisers are available.

4) The amplifier is defined with 8 dB tilted output. However, it is possible to use the amplifier with other slopes by changing the mid-stage equaliser plug.

5) Typical value. The guaranteed value is ± 0.80 dB. Flatness is defined with mid-stage equaliser and 2 pcs of diplex filters. All other used plug modules are 0 dB jumpers. Spec is valid 2 MHz after the starting frequency of the selected diplex filter.

6) Typical value for 4.43 MHz band. Measured at channel S2. At higher frequencies the specification is better.

7) Output TP is from a directional coupler and has a ± 0.75 dB tolerance. The TP is defined with 0 dB plug as OUTPUT MODULE 1. This connection can be used also as an injection point for a test signal of return channel.
Input TP is a transformer type and it is having an accuracy of ± 1.5. It can be used as the output test point for the return signal.

8) This is the level difference between output 1and transponder connection pin on the motherboard.

9) Typical value at 862 MHz with the maximum gain. The guaranteed worst case value is 1.0 dB worse. Defined in conditions described in NOTE 2.

10) DIN 45004B, typical value at 862 MHz with maximum gain.

11) EN50083-3. Amplifier output was 8 dB cable equivalent sloped. 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 amplifier is 112.0 dBuV with 42 channels.

12) Measured with 77 and 110 NTSC channels. Amplifier output was 12 dB linearly sloped and the used levels were at 55 / 550 / 750 / 862 MHz 35.0 / 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 55.25 MHz. The high end of the frequency band up to 862 MHz was fulfilled with QAM channels having a level of –6 dB relative to analogue CW carriers.
The highest recommended output level for the amplifier is 50 dBmV with 110 channels and 52 dBmV with 77 channels.

13) Valid over the band 7…65 MHz. At lower frequencies 15 dB is the worst case value.

14) Active (AC6144)/ passive (AC6140) return module.

15) There is plug-in places at the input and output of the upstream channel. Both positions are using the attenuators of JDA9xx series.
The attenuator at the return input is always selected already in factory to be JDA900. When station is working as a node, the equipment is automatically delivered with the plug-in low pass filter of right frequency.
The wanted output attenuator plug has to be defined in ordering code.

16) The pivot point is at 65 MHz. In 30 MHz operation the control range is 2.5 lower. This means that the reached maximum gain in 30 MHz operation is 2.5 dB lower if maximum slope is used

17) Valid with active return module AC6144. With plugs AC6140 and AC6147 the spec is 0.3 dB worse.

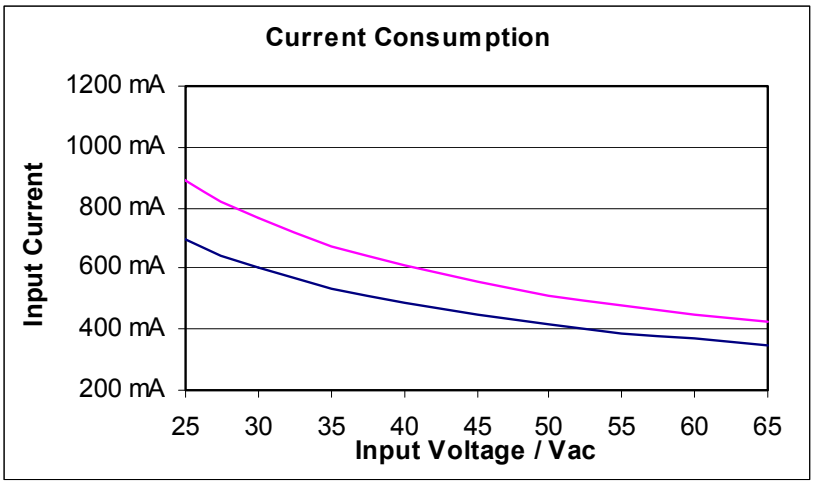
18) The –30 dB level is calculated from the return signal input at output port 1. Output module 1 and return input attenuator were 0 dB plugs. This 2-way connection can be used as an input test point for return signal and test signal injection.

19) This is the theoretical level difference between the input connector of the return signal path and the injection pin of the up-stream signal of the transponder. It can be used when adjusting the transmitter of the modem. The input attenuator of the return path is 0 dB.

20) Typical values , which can be used in network design. Valid with the active module AC6144.

21) With the passive return path. With the active return path and transponder module the value is 5 W higher.

22)



The lower curve is with passive return path. The higher curve is active return path and transponder.

23) At any frequency from 10 to 862 MHz when the remote current is less than 8 A. The hum modulation is defined to be 20 lg(2U/Upp), where 2U is the peak-to-peak value of the carrier and Upp the peak-to-peak value of the modulation signal (50 and 100 Hz). 12 A is the maximum current, which can be locally injected into all ports together.

24) The housing is tested to be class IP67. However, in standard delivery conditions the lowest side wall is equipped with a ventilation hole of 1 mm. Then the enclosure class is IP54.

25) EN61000-4-2, contact discharge to enclosure and RF-ports.

26) EN61000-4-5, 1.2 / 50 µs pulse to RF-ports.

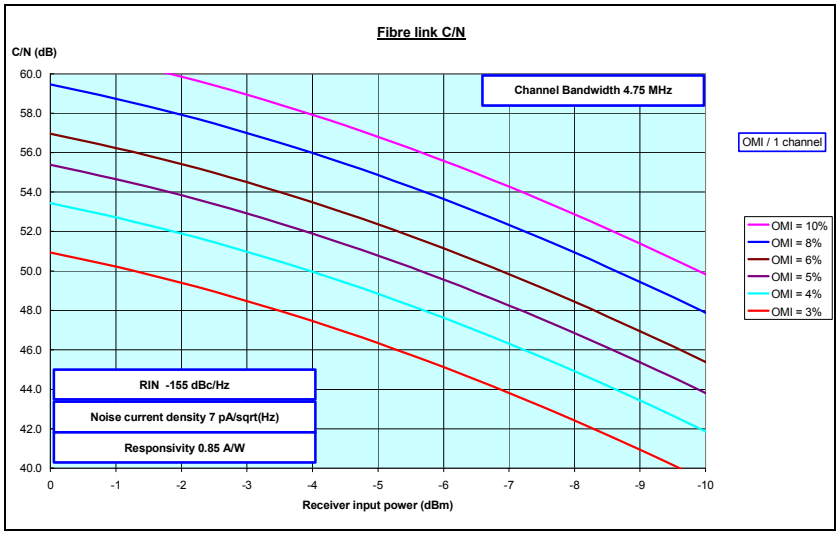
27) The typical responsivity of the photodiode is 0.85 A/W at 1310 nm and 0.95 A/W at 1550 nm.

28) Dependent on selected receiver module. AC6810 is designed for –7...-2 dBm and AC6820 is for the range –3…+2 dBm.

29) This is the maximum output level when OMI is 4.5% . The level is available with the optical input power of – 7 dBm (AC6810) and – 3 dBm (AC6820). The used wavelength is 1310 nm.

30) Typical value. The guaranteed value is ± 0.9 dB. Flatness is defined with mid-stage equaliser and diplex filter. All other used plug modules are 0 dB jumpers. Spec is valid 2 MHz after the starting frequency of the selected diplex filter.

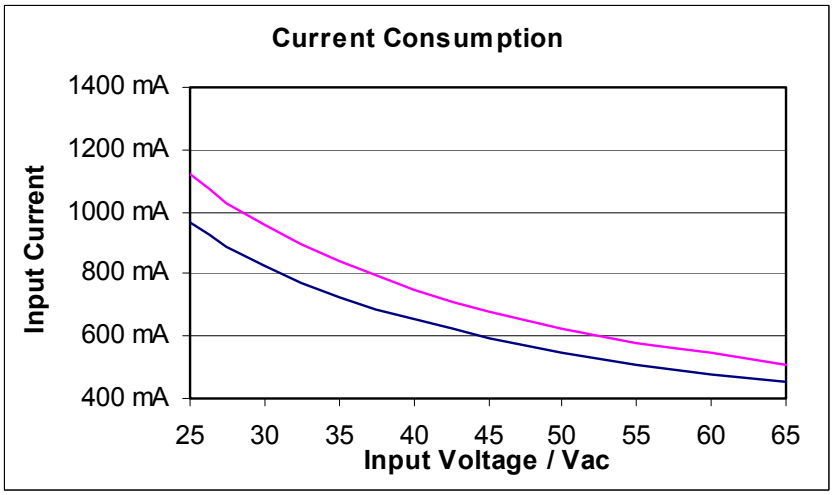
31) This is a typical value at 862 MHz and the value can be used for C/N calculations.



32) Typical input level for 4% OMI. Defined at the output connector of the node. Valid with AC6840 transmitter.

33) An optical receiver (AC6810) and return transmitter (AC6840) are installed.

34)



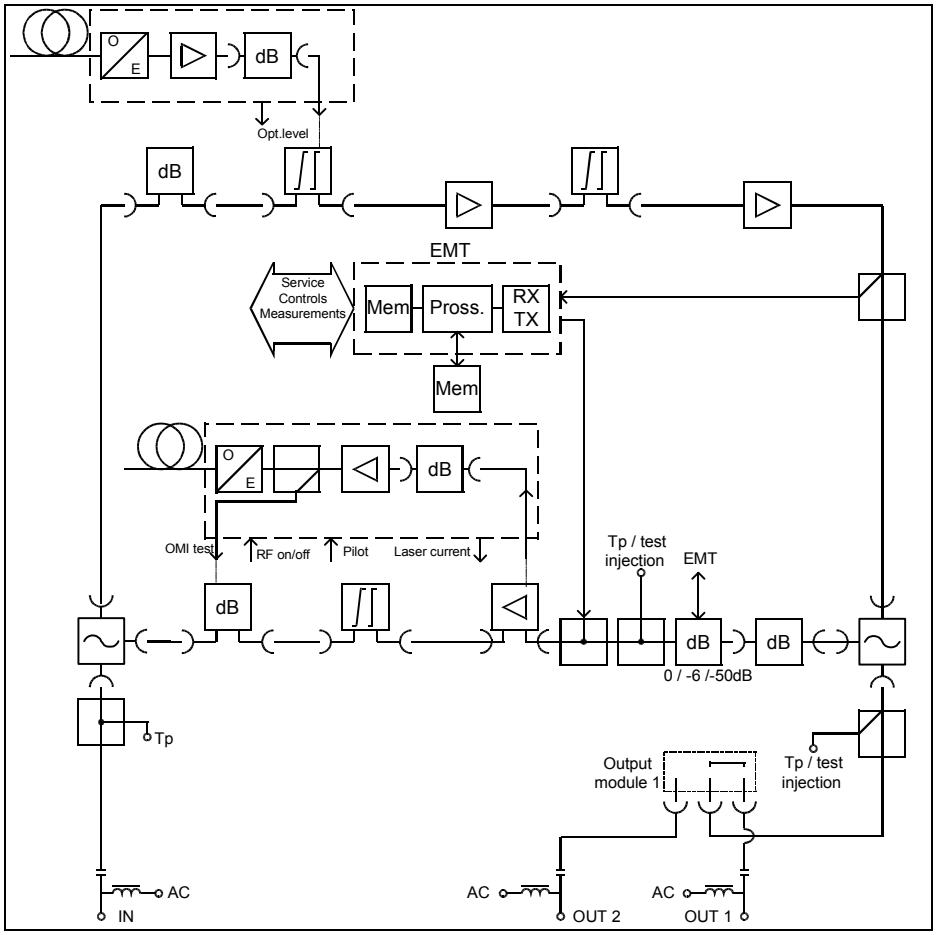
The current need depends on module configuration. The lower curve indicates the current need of the platform with optics. The higher one includes also the transponder AC6950.

35) IP classification depends on selected fiber feed through solution

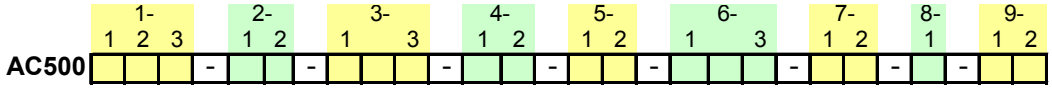
Monitored Functions and Controlled Parameters

- Return path ingress switch ON/ -6 dB / OFF control
- 65 VAC voltage measurement
- Local DC voltages, 12 V and 24 V
- Temperature measurement
- Optical level of the RX module
- Laser current measurement
- Pilot generator control in optical TX
- Individual channel level measurement (AC6950)
- Lid status monitoring
- Local connection indication at server
- Configuration data stored in main board eeprom (station memory)

Block Diagram



Ordering Information



1-1 Input connection (first from left)	
A	PG11
B	5/8" (KDC314)
C	IEC (KDC312)
D	3.5/12 (KDC310)
E	F (KDC313)
F	1 fibre (KDO831)
G	2 fibres (KDO832)

1-2 Output 2 connection	
A	PG11
B	5/8" (KDC314)
C	IEC (KDC312)
D	3.5/12 (KDC310)
E	F (KDC313)
X	None (PG11 sealing plug)

1-3 Output 1 connection (first from right)	
A	PG11
B	5/8" (KDC314)
C	IEC (KDC312)
D	3.5/12 (KDC310)
E	F (KDC313)

2-1 Diplexer filters	
A	30/47 MHz (2 x CXF030)
B	42/54 MHz (2 x CXF042)
C	50/70 MHz (2 x CXF050)
D	65/85 MHz (2 x CXF065)
K	Forward path jumper (2 x CXF000)
X	None

2-2 Input attenuator and equaliser	
A	2 x 0 dB plugs (JDA900 and TXA000)
X	None

3-1 Optical receiver RX1	
10	RX1 input level -7...-2 dBm (AC6810)
20	RX1 input level -3...+2 dBm (AC6820)
XX	None

3-3 Optical connector for receiver RX1	
A	SC/APC, 9 deg.
B	FC/APC, 8 deg.
C	E-2000
D	SC/APC, 8 deg.
E	SC/APC, 8 deg. AMP
X	None

4-1 Interstage slope and gain adjustment	
A	8 dB slope @ 862 MHz (TDE810)
B	8 dB slope @ 862 MHz, temp. comp. (TTE810)
D	8 dB slope @ 862 MHz, -4 dB att. (TDE810 04)
F	8 dB slope @ 862 MHz, -8 dB att. (TDE810 08)
G	Flat response (TXA000)
X	None

4-2 Output module	
A	0 dB, 1 output in use (AC6120)
B	Splitter -3.7, 2 outputs in use (AC6124)
C	Tap -8 dB, 2 outputs in use (AC6128)
D	Tap -12 dB, 2 outputs in use (AC6112)
X	**None**

5-1 Return path input module	
A	0 dB plug (JDA900)
B	HPF 15 MHz, ingress blocker (AC6223)
F	LPF 30 MHz, used with optical TX (AC6210)
G	LPF 42 MHz, used with optical TX (AC6212)
H	LPF 50 MHz, used with optical TX (AC6215)
I	LPF 65 MHz, used with optical TX (AC6217)
X	None

5-2 Return path unit	
A	Active return 21 dB (AC6144) without att. and equal.
B	Active return 21 dB (AC6144) with 0 dB att. and equal. (2 x JDA900)
C	Hybrid amplifier 18 dB (AC6147) without att. and equal.
D	Hybrid amplifier 18 dB (AC6147) with 0 dB att. and equal. (2 x JDA900)
E	Passive return (AC6140) without att. and equal.
F	Passive return (AC6140) with 0 dB att. and equal. (2 x JDA900)
X	None

6-1 Return path transmitter TX1	
40	FP 1310 nm (AC6840)
45	DFB 1310 nm (AC6845)
47	CWDM 1470 nm (AC6847)
49	CWDM 1490 nm (AC6849)
51	CWDM 1510 nm (AC6851)
53	CWDM 1530 nm (AC6853)
55	CWDM 1550 nm (AC6855)
57	CWDM 1570 nm (AC6857)
59	CWDM 1590 nm (AC6859)
61	CWDM 1610 nm (AC6861)
XX	None

6-3 Optical connector for transmitter TX1	
A	SC/APC, 9 deg.
B	FC/APC, 8 deg.
C	E-2000
D	SC/APC, 8 deg.
E	SC/APC, 8 deg. AMP
X	None

7-1 Optical filter 1	
0	FWDM filter, 1310/1550 nm (AC6570)
X	None

7-2 Optical connectors (3 pcs) for filter 1	
A	SC/APC, 9 deg.
B	FC/APC, 8 deg.
C	E-2000
D	SC/APC, 8 deg.
E	SC/APC, 8 deg. AMP
X	None

8-1 Element management transponder	
A	Standard, CATVisor (AC6910)
B	With tuner level measurement, CATVisor (AC6950)
C	Standard, HMS (AC6910 HMS), N/A
D	With tuner level measurement, HMS (AC6950 HMS), N/A
X	None

9-1 Power supply	
A	Local powering, euro plug (230 VAC)
B	Remote powering with cable clamp (65 VAC)
C	Local powering, UK plug (230 VAC)

9-2 Gain and housing	
A	39 dB platform, painted housing
B	39 dB platform, not painted housing

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