

AC9100 NEO INTELLIGENT 1.2 GHZ FIBRE OPTIC PLATFORM WITH REMOTE PHY NODE MIGRATION SUPPORT



The AC9100 NEO is an intelligent 4 output optical node of ACx product family. It is modular HFC node with flexibility to equipped with up to 2x4 operation. Node supports to Remote PHY node upgrade with an separate RPD lid. Both signal directions can have RF overlays together with an RPD module.

The return path inputs are connected to optical transmitters via an electrically configurable routing matrix which allows flexible backup operations.

AC9100 has a USB connector for local configuration with a PC or mobile device. It has a slot for transponder module, which allows full remote monitoring and control of all node parameters. The transponder unit measures the forward and return path signal levels and enables the automatic forward and return path alignment function.

Node's dual power supplies are monitored by the transponder and increase the reliability of the node. Fully user configurable automatic level control (ALC) keeps output levels constant and automatic ingress blocking reacts to unwanted return path signals.

Features

- Optional RPD module with RF overlay support
- 1.2 GHz GaN HEMT technology
- Return path supports 204 MHz bandwidth
- Innovative splice organizing
- Redundant power supplies
- Digital return path option
- Automatic alignment of both forward and return path
- Flexible electrically controlled forward and return path signal routing
- With AC6992/AC6981 transponder plug-in:
 - CATVvisor / HMS (AC6992) or DOCSIS (AC6981) remote connection
 - ALC 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 (AC6992)

Technical specifications

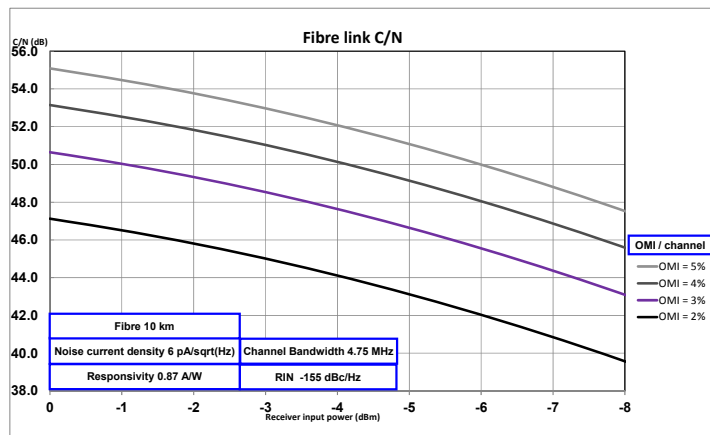
Parameter	Specification	
Forward path		
Light wavelength	1290...1610 nm	
Optical input power range	-8...0 dBm	
Frequency range	85...1218 MHz	
Return loss	18 dB	1)
Gain limited output level	4 x 115 dB μ V / 2 x 119 dB μ V	2)
Input gain control	0...-26 dB	3)
Inter-stage gain control	0...-15 dB	4)
Slope control	0...20 dB	5)
Isolation between DS paths	> 60 dB	6)
Flatness	\pm 0.5 dB	7)
Group delay	2 ns	8)
Test point	-20 dB	9)
Transponder connection	- 24 dB	10)
Noise current density	6.0 pA/ \sqrt Hz	11)
U_{\max} (112 QAM channels) @1GHz	114.0 dB μ V	12)
U_{\max} (138 QAM channels) @1.2GHz	111.5 dB μ V	
MER	See curve	13)
CTB 41 channels	119.0 dB μ V	14)
CSO 41 channels	119.0 dB μ V	14)
Return path		
Frequency range	5...204 MHz	
Return loss	18 dB	15)
Flatness	\pm 0.5 dB	15)
Ingress switching	0 / -6 / < -45 dB	
Nominal input level	57.0 dB μ V	16)
CINR	See curves	17)
OMI adjustment	0...-20 dB	
OMI test point	-5 dB	18)
Transponder connection	-38 dB	19)
Isolation between US paths	> 55 dB	
Remote PHY module , see separate AC6440 specification sheet		20)
Downstream SC-QAM channels	120 channels, 108...1006 MHz	21)
Downstream OFDM channels	6 channels, 108...1218 MHz Modulation up to 16k QAM	
Number of upstream segments	2	
Upstream SC-QAM channels	12 channels per segment, 5...85 MHz	
Upstream OFDMA channels	2 channels per segment, 5...204 MHz Modulation up to 4k QAM	
Number of OOB channels	3 per segment	
Uplink interfaces	2 x 10 GigE interface, SFP+ module slot	
Standard	CableLabs Remote PHY specification	

General

Power consumption (no RPD / RPD)	50 W / 84 W	22)
Supply voltage	27...65 V _{AC}	
Maximum current feed through	12.0 A / port	
Hum modulation	70 dB	23)
Optical connectors	SC/APC, E-2000	
Output connectors	PG11	
Test point connectors	F female	
Dimensions (no RPD)	33(36) x 31(35) x 14 cm	h x w x d
Dimensions (RPD)	33(36) x 31(35) x 19 cm	h x w x d
Weight (no RPD / RPD)	10 kg /13 kg	
Operating temperature	-40...+60 °C	
Class of enclosure	IP 54	
EMC	EN50083-2	
ESD	4 kV	24)
Surge	6 kV (EN 60728-3)	

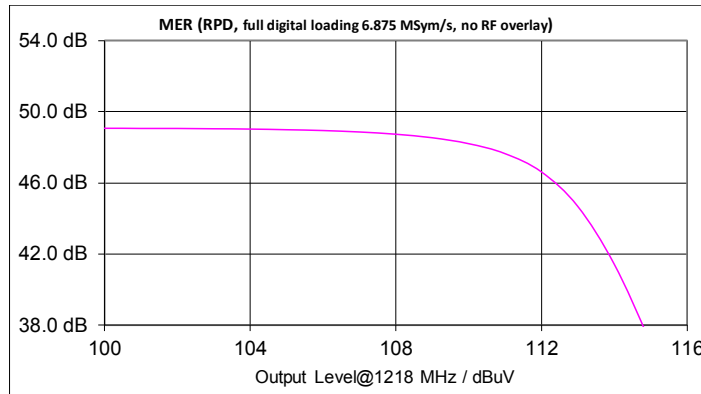
Notes

- 1) The limiting curve is defined at 40 MHz -1.5 dB / octave. Return loss is always > 13 dB.
- 2) This is the gain limited output level when OMI is 4.0 %. The level is available with -8 dBm optical input power. The used wavelength is 1310 nm. Higher output levels are possible if optical input level is higher than -8 dBm.
- 3) Step size is 0.5 dB. This control is used by OLC.
- 4) Step size is 0.2 dB. This control is used by ALC. Flatness spec is guaranteed when attenuation is less than 13 dB.
- 5) Step size is 0.5 dB. Slope is defined between 85...1218 MHz. Flatness spec is guaranteed when slope is less than 15 dB.
- 6) Defined between 85...1006 MHz. In higher frequencies the limit is 54 dB.
- 7) Typical value in room temperature. Guaranteed value is ±0.85 dB.
- 8) F > 125 MHz, BW 4.43 MHz
- 9) TP has ±0.75 dB tolerance between 85...862 MHz and ±1.0 dB between 862...1218 MHz.
- 10) Level difference between transponder connection and output 3. Tolerance ±0.5 dB.
- 11) Typical C/N curves can be seen in the graph below.

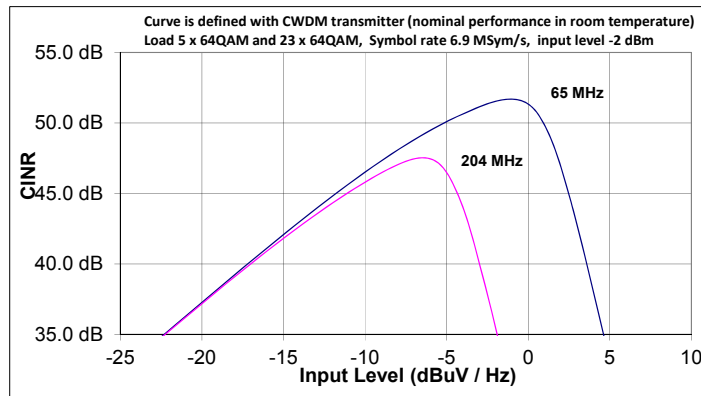


- 12) Typical value according to IEC60728-3. Channels have 10 dB cable equivalent slope between 110...1218 MHz and signal level has been defined at 1002 MHz. BER measurement has been done on the worst channel between 110...1006 MHz.

- 13) MER with RPD module.



- 14) IEC60728-3. In 2 output mode (=not splitted). Node output 8 dB cable equivalent sloped between 85...862 MHz and optical input level -2 dBm. All results are typical values in room temperature.
- 15) Valid after 8 MHz .
- 16) Nominal input level for 4.0 % OMI. Defined at the output connector of the node. Maximum applied RF power to the return input port is -24 dBm.
- 17)



Curves are valid, when one US input port is feeding a CWDM transmitter.

- 18) - 5 dB is valid if ingress switch and US input attenuator are set to 0 dB. The nominal value at this TP is 52 dB μ V when OMI is set to 4 %. Tested at 20 MHz.
- 19) 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.
- 20) Connection modules AC6430 and AC6431 are needed when RPD is in use. These modules have an own specification sheet.
- 21) 120 SC-QAM channels when using Annex A. 160 SC-QAM channels when using Annex B. All SC-QAM channels can be used flexibly for video or DOCSIS
- 22) 50 W is valid with single PSU, dual node with 2xTX. No transponder or power saving in use. 84 W is valid with 1x 2 RPD and RF overlay. No SFP, transponder, return TX or power saving in use.
- 23) 70 dB hum value is valid at any frequency from 10 to 1218 MHz, when the remote current is less than 10 A/port. Hum modulation is 60 dB, if 12.0 A is fed. 20.0 A is the maximum current which can be locally injected into all ports together.
- 24) EN61000-4-2, contact discharge to enclosure and RF-ports.

Compatibility

All accessories that will be used with this product should use the newest generation available. By using only up-to-date accessories a proper operation can be ensured.

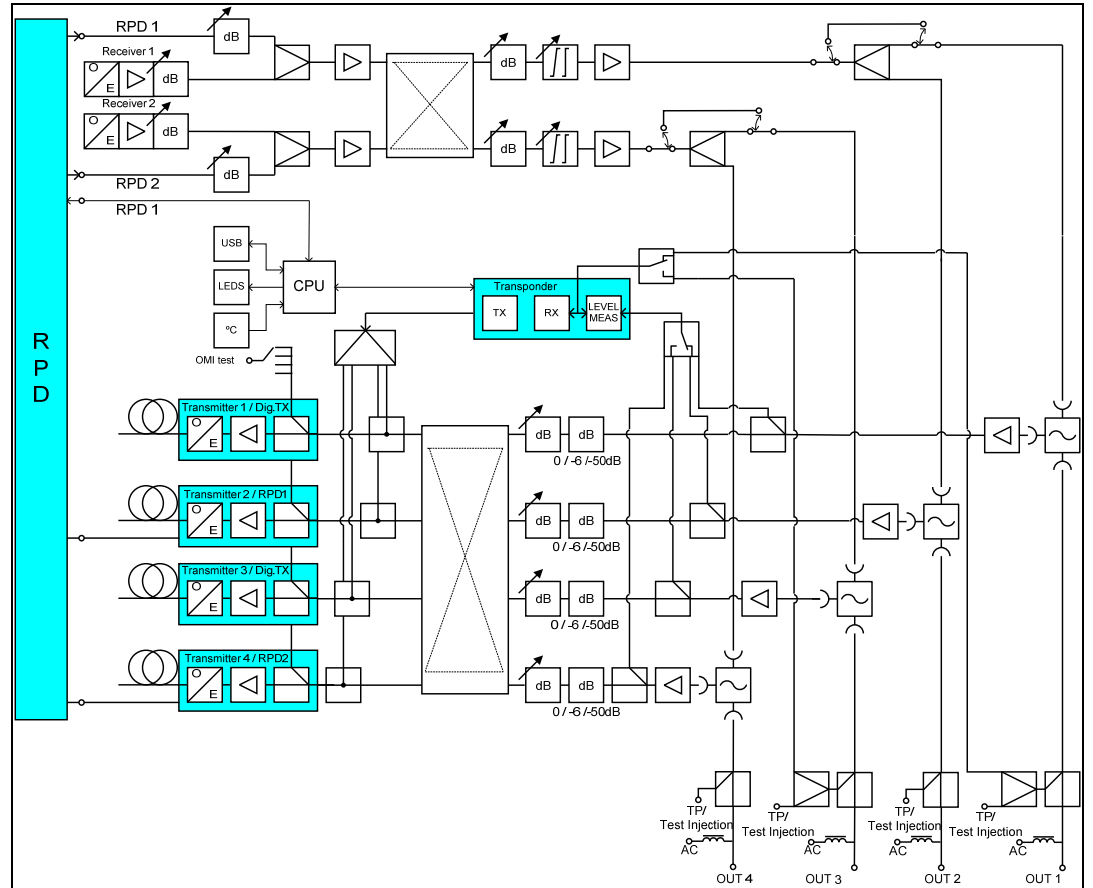
Monitoring functions

- Status LEDs for alarm indication
- Return path ingress switches on / attenuated / off control
- Remote AC 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 non-volatile memory
- Local configuration via USB using PC, Windows tablet or Android smartphone or tablet
- 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 AC6992 / AC6981 transponder:

- Remote access to all AC9100 settings and monitored parameters
- ALSC and modem LEDs for alarm indication
- CATVisor and HMS compatible remote connection (AC6992)
- DOCSIS compatible remote connection (AC6981)
- Interstage gain control by ALC mode with saturation alarm
- ALC pilot frequencies, types and decision levels are user programmable
- Automatic reserve pilot switching
- Pilot based forward path automatic alignment
- Full forward and return path automatic alignment with a single button
- Lid status monitoring with alarm
- Service terminal connection monitoring with alarm
- 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 independently for all inputs based on detected ingress with alarms and user configurable delays
- Modem receive and transmit signal level monitoring with alarms (AC6992)
- Remote software update also to multiple units simultaneously, without affecting operation
- Return path pilot generator with 4 user programmable pilot frequencies and levels (AC6992)

Block diagram



Ordering information

AC9100 NEO configuration map

AC9100	1-	2-	3-	4-	5-	6-	7-	8-	9-	10-	11-	12-	13-	14-	15-
	1 2 3	1 2 3 4 5 6	1	1	1	1 3	1 3	1 3	1 3	1 3	1 3	1	1	1 2 3	1 2

<p>1-1 Platform type</p> <p>A Standard AC9100 B AC9100 NEO (No RPD) C AC9100 NEO (With RPD)</p> <p>1-2 Power supply</p> <p>A Single PSU, 65 VAC B Double PSU, 65 VAC D Customer specific option</p> <p>1-3 Fiber organizing</p> <p>A Standard fibre organiser B Customer specific option</p>	<p>7- Digital return path transmitter TX1</p> <p>27 +5 dBm CWDM 1270 nm (AC7727) 29 +5 dBm CWDM 1290 nm (AC7729) 31 +5 dBm CWDM 1310 nm (AC7731) 33 +5 dBm CWDM 1330 nm (AC7733) 35 +5 dBm CWDM 1350 nm (AC7735) 37 +5 dBm CWDM 1370 nm (AC7737) 39 +5 dBm CWDM 1390 nm (AC7739) 41 +5 dBm CWDM 1410 nm (AC7741) 43 +5 dBm CWDM 1430 nm (AC7743) 45 +5 dBm CWDM 1450 nm (AC7745) 47 +5 dBm CWDM 1470 nm (AC7747) 49 +5 dBm CWDM 1490 nm (AC7749) 51 +5 dBm CWDM 1510 nm (AC7751) 53 +5 dBm CWDM 1530 nm (AC7753) 55 +5 dBm CWDM 1550 nm (AC7755) 57 +5 dBm CWDM 1570 nm (AC7757) 59 +5 dBm CWDM 1590 nm (AC7759) 61 +5 dBm CWDM 1610 nm (AC7761) XX None</p> <p>7-3 Optical connector for Digital transmitter TX1</p> <p>A SC/APC, 9 deg. C E-2000 D SC/APC, 8 deg. X None</p>	<p>10- Digital return path transmitter TX2</p> <p>27 +5 dBm CWDM 1270 nm (AC7727) 29 +5 dBm CWDM 1290 nm (AC7729) 31 +5 dBm CWDM 1310 nm (AC7731) 33 +5 dBm CWDM 1330 nm (AC7733) 35 +5 dBm CWDM 1350 nm (AC7735) 37 +5 dBm CWDM 1370 nm (AC7737) 39 +5 dBm CWDM 1390 nm (AC7739) 41 +5 dBm CWDM 1410 nm (AC7741) 43 +5 dBm CWDM 1430 nm (AC7743) 45 +5 dBm CWDM 1450 nm (AC7745) 47 +5 dBm CWDM 1470 nm (AC7747) 49 +5 dBm CWDM 1490 nm (AC7749) 51 +5 dBm CWDM 1510 nm (AC7751) 53 +5 dBm CWDM 1530 nm (AC7753) 55 +5 dBm CWDM 1550 nm (AC7755) 57 +5 dBm CWDM 1570 nm (AC7757) 59 +5 dBm CWDM 1590 nm (AC7759) 61 +5 dBm CWDM 1610 nm (AC7761) XX None</p> <p>10-3 Optical connector for Digital transmitter TX2</p> <p>A SC/APC, 9 deg. C E-2000 D SC/APC, 8 deg. X None</p>
<p>2-1 Fibre feed-through adapter 1 (left)</p> <p>E 5/8 Adapter (KDC316) G 1-4 fibres (KDO900) X None</p> <p>2-2 Fibre feed-through adapter 2 (right)</p> <p>E 5/8 Adapter (KDC316) G 1-4 fibres (KDO900) X None</p> <p>2-3 Output 1 connection (first from right)</p> <p>A PG11 B 5/8" C EC D 3.5/12 E F X None (PG11sealing plug)</p> <p>2-4 Output 2 connection</p> <p>A PG11 B 5/8" C EC D 3.5/12 E F X None (PG11sealing plug)</p> <p>2-5 Output 3 connection</p> <p>A PG11 B 5/8" C EC D 3.5/12 E F X None (PG11sealing plug)</p> <p>2-6 Output 4 connection (first from left)</p> <p>A PG11 B 5/8" C EC D 3.5/12 E F X None (PG11sealing plug)</p>	<p>8-1 Return path transmitter TX2</p> <p>40 +1 dBm FP 1310 nm (AC67840) 41 +3 dBm CWDM 1430 nm (AC67841) 42 +6 dBm CWDM 1430 nm (AC67842) 43 +3 dBm CWDM 1450 nm (AC67843) 44 +6 dBm CWDM 1450 nm (AC67844) 45 +3 dBm DFB 1310 nm (AC67845) 46 +6 dBm DFB 1310 nm (AC67846) 47 +3 dBm CWDM 1470 nm (AC67847) 48 +6 dBm CWDM 1470 nm (AC67848) 49 +3 dBm CWDM 1490 nm (AC67849) 50 +6 dBm CWDM 1490 nm (AC67850) 51 +3 dBm CWDM 1510 nm (AC67851) 52 +6 dBm CWDM 1510 nm (AC67852) 53 +3 dBm CWDM 1530 nm (AC67853) 54 +6 dBm CWDM 1530 nm (AC67854) 55 +3 dBm CWDM 1550 nm (AC67855) 56 +6 dBm CWDM 1550 nm (AC67856) 57 +3 dBm CWDM 1570 nm (AC67857) 58 +6 dBm CWDM 1570 nm (AC67858) 59 +3 dBm CWDM 1590 nm (AC67859) 60 +6 dBm CWDM 1590 nm (AC67860) 61 +3 dBm CWDM 1610 nm (AC67861) 62 +6 dBm CWDM 1610 nm (AC67862) XX None</p> <p>8-3 Optical connector for transmitter TX2</p> <p>A SC/APC, 9 deg. C E-2000 D SC/APC, 8 deg. X None</p>	<p>11-1 Return path transmitter TX4</p> <p>40 +1 dBm FP 1310 nm (AC67840) 41 +3 dBm CWDM 1430 nm (AC67841) 42 +6 dBm CWDM 1430 nm (AC67842) 43 +3 dBm CWDM 1450 nm (AC67843) 44 +6 dBm CWDM 1450 nm (AC67844) 45 +3 dBm DFB 1310 nm (AC67845) 46 +6 dBm DFB 1310 nm (AC67846) 47 +3 dBm CWDM 1470 nm (AC67847) 48 +6 dBm CWDM 1470 nm (AC67848) 49 +3 dBm CWDM 1490 nm (AC67849) 50 +6 dBm CWDM 1490 nm (AC67850) 51 +3 dBm CWDM 1510 nm (AC67851) 52 +6 dBm CWDM 1510 nm (AC67852) 53 +3 dBm CWDM 1530 nm (AC67853) 54 +6 dBm CWDM 1530 nm (AC67854) 55 +3 dBm CWDM 1550 nm (AC67855) 56 +6 dBm CWDM 1550 nm (AC67856) 57 +3 dBm CWDM 1570 nm (AC67857) 58 +6 dBm CWDM 1570 nm (AC67858) 59 +3 dBm CWDM 1590 nm (AC67859) 60 +6 dBm CWDM 1590 nm (AC67860) 61 +3 dBm CWDM 1610 nm (AC67861) 62 +6 dBm CWDM 1610 nm (AC67862) XX None</p> <p>11-3 Optical connector for transmitter TX4</p> <p>A SC/APC, 9 deg. C E-2000 D SC/APC, 8 deg. X None</p>
<p>3-1 Optical connector for receiver RX1</p> <p>A SC/APC, 9 deg. C E-2000 D SC/APC, 8 deg.</p> <p>4-1 Optical connector for receiver RX2</p> <p>A SC/APC, 9 deg. C E-2000 D SC/APC, 8 deg.</p> <p>5-1 Diplexer filter</p> <p>D 65/85 MHz (4 x CXF065) G 65/85 MHz (4 x CXF065 19) H 85/105 MHz (4 x CXF085) J 204/258 MHz (4 x CXF204) U 65/85 MHz (3 x CXF065) V Customer specific W Customer specific X None</p>	<p>9-1 Return path transmitter TX3</p> <p>40 +1 dBm FP 1310 nm (AC67840) 41 +3 dBm CWDM 1430 nm (AC67841) 42 +6 dBm CWDM 1430 nm (AC67842) 43 +3 dBm CWDM 1450 nm (AC67843) 44 +6 dBm CWDM 1450 nm (AC67844) 45 +3 dBm DFB 1310 nm (AC67845) 46 +6 dBm DFB 1310 nm (AC67846) 47 +3 dBm CWDM 1470 nm (AC67847) 48 +6 dBm CWDM 1470 nm (AC67848) 49 +3 dBm CWDM 1490 nm (AC67849) 50 +6 dBm CWDM 1490 nm (AC67850) 51 +3 dBm CWDM 1510 nm (AC67851) 52 +6 dBm CWDM 1510 nm (AC67852) 53 +3 dBm CWDM 1530 nm (AC67853) 54 +6 dBm CWDM 1530 nm (AC67854) 55 +3 dBm CWDM 1550 nm (AC67855) 56 +6 dBm CWDM 1550 nm (AC67856) 57 +3 dBm CWDM 1570 nm (AC67857) 58 +6 dBm CWDM 1570 nm (AC67858) 59 +3 dBm CWDM 1590 nm (AC67859) 60 +6 dBm CWDM 1590 nm (AC67860) 61 +3 dBm CWDM 1610 nm (AC67861) 62 +6 dBm CWDM 1610 nm (AC67862) XX None</p> <p>9-3 Optical connector for transmitter TX3</p> <p>A SC/APC, 9 deg. C E-2000 D SC/APC, 8 deg. X None</p>	<p>12-1 Optical passive</p> <p>XX None</p> <p>F1¹ WDM and 1490 nm Add Drop with 9 deg. SC/APC connectors F2² WDM with 8 deg. SC/APC connectors F3³ WDM with 9 deg. SC/APC connectors F4⁴ WDM and 1490 nm Add Drop with 8 deg. SC/APC connectors F7⁷ WDM and 1490 nm Add Drop with 8 deg. SC/APC connectors G1¹ WDM with 8 deg. SC/APC connectors M1¹ MUX with SC/APC connectors M2² MUX with SC/APC connectors M3³ MUX with SC/APC connectors M4⁴ MUX with SC/APC connectors M5⁵ MUX with SC/APC connectors M6⁶ MUX with SC/APC connectors</p>
<p>6-1 Return path transmitter TX1</p> <p>40 +1 dBm FP 1310 nm (AC67840) 41 +3 dBm CWDM 1430 nm (AC67841) 42 +6 dBm CWDM 1430 nm (AC67842) 43 +3 dBm CWDM 1450 nm (AC67843) 44 +6 dBm CWDM 1450 nm (AC67844) 45 +3 dBm DFB 1310 nm (AC67845) 46 +6 dBm DFB 1310 nm (AC67846) 47 +3 dBm CWDM 1470 nm (AC67847) 48 +6 dBm CWDM 1470 nm (AC67848) 49 +3 dBm CWDM 1490 nm (AC67849) 50 +6 dBm CWDM 1490 nm (AC67850) 51 +3 dBm CWDM 1510 nm (AC67851) 52 +6 dBm CWDM 1510 nm (AC67852) 53 +3 dBm CWDM 1530 nm (AC67853) 54 +6 dBm CWDM 1530 nm (AC67854) 55 +3 dBm CWDM 1550 nm (AC67855) 56 +6 dBm CWDM 1550 nm (AC67856) 57 +3 dBm CWDM 1570 nm (AC67857) 58 +6 dBm CWDM 1570 nm (AC67858) 59 +3 dBm CWDM 1590 nm (AC67859) 60 +6 dBm CWDM 1590 nm (AC67860) 61 +3 dBm CWDM 1610 nm (AC67861) 62 +6 dBm CWDM 1610 nm (AC67862) XX None</p> <p>6-3 Optical connector for transmitter TX1</p> <p>A SC/APC, 9 deg. C E-2000 D SC/APC, 8 deg. X None</p>	<p>13-1 Transponder module</p> <p>E Transponder and ALS module (AC6892) G DOCSIS transponder (AC6881) X None</p> <p>14-1 Transponder communication protocol</p> <p>A CATV/compatible B HMSN/SNMP compatible</p> <p>14-2 Settings</p> <p>X Factory default A Customer specified (ECML file)</p> <p>14-3 Product keys (software feature)</p> <p>X None A Auto alignment, spectrum and ingress analyzer, pilot generator B Optical receiver 2 activation C A + B</p>	<p>15-1 Customer specific selections</p> <p>B Customer specific option X None</p> <p>15-2 External control port</p> <p>A USB extension cable X None</p>

AC9100 NEO configuration map, RPD features

	16-		17-				18-	19-					20-				21-	
	1	2	1				1	1	2	3	4	5	1	2	3	4		1
AC9100			-				-						-				-	

16- 1 RPD type	
A	1Downstream, 1Upstream
B	1Downstream, 2 Upstreams
X	None
16- 2 RPD Power supply	
A	Single PSU, 65 VAC
B	Double PSUs, 65 VAC
X	None

17- 1 SFP1	
L31	LR, 13 10 nm, 10 km, dual LC
XXX	None
17- 4 SFP2	
L31	LR, 13 10 nm, 10 km, dual LC
XXX	None

18- 1 Optical passive / Fibre routing	
X	None

19- 1 Reserved for future	
X	None
19- 2 Reserved for future	
X	None
19- 3 Reserved for future	
X	None
19- 4 Reserved for future	
X	None
19- 5 Reserved for future	
X	None

20- 1 Reserved for future	
X	None
20- 2 Reserved future	
X	None
20- 3 Reserved for future	
X	None
20- 4 Settings	
A	Default
X	None

21- 1 Reserved for future	
X	None

DOC0022835, Rev020

AC9100 specification sheet versions lower than v3.0 are valid with platform type selection 1-1:A that doesn't support RPD.