

## AC9100 INTELLIGENT 1.2 GHZ FIBRE OPTIC PLATFORM



The AC9100 is an intelligent 4 output optical node of ACx product family. It is based on fixed platform but flexible modular solution, supporting up to four optical transmitters and dual power supplies. The two fixed optical receivers can act as 2 independent nodes or in 1+1 backup operation.

The 4 independent 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

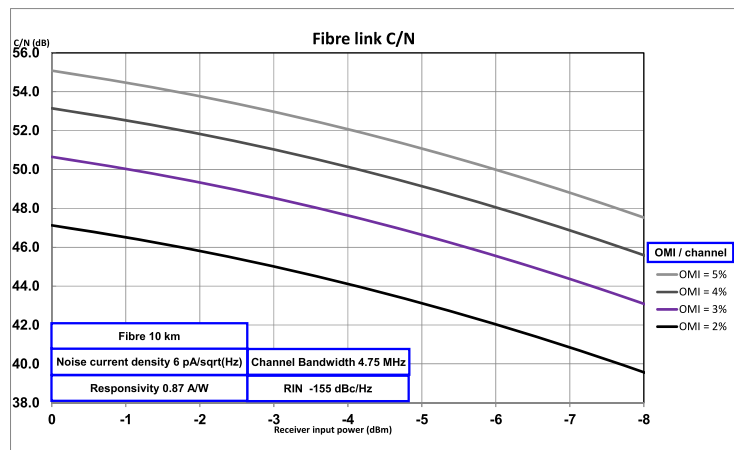
- 1.2 GHz GaN HEMT technology
- Return path supports 204 MHz bandwidth
- Innovative splice organizing
- Redundant power supplies
- Full electrical controls
- Automatic alignment of both forward and return path
- Flexible electrically controlled forward and return path signal routing
- Support for digital return path transmitters
- Fixed downstream receivers
- 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	
<b>Forward path</b>		
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 dBμV / 2 x 119 dBμV	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	±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/√Hz	11)
U <sub>max</sub> (112 QAM channels) @1GHz	114.0 dBμV	12)
U <sub>max</sub> (138 QAM channels) @1.2GHz	111.5 dBμV	
CTB 41 channels	119.0 dBμV	13)
CSO 41 channels	119.0 dBμV	13)
<b>Return path</b>		
Frequency range	5...204 MHz	
Return loss	18 dB	14)
Flatness	±0.5 dB	14)
Ingress switching	0 / -6 / < -45 dB	
Input level	57.0 dBμV	15)
CINR	See curves	16)
OMI adjustment	0...-20 dB	
OMI test point	-5 dB	17)
Transponder connection	-38 dB	18)
Isolation between US paths	> 55 dB	
<b>General</b>		
Power consumption	47 W	19)
Supply voltage	30...65 V <sub>AC</sub>	
Maximum current feed through	12.0 A / port	
Hum modulation	70 dB	20)
Optical connectors	SC/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	21)
Surge	6 kV (EN 60728-3)	

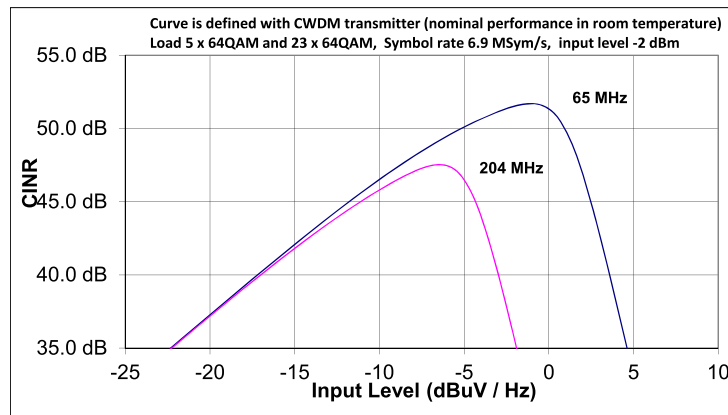
**Notes**

- 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 55 dB.
- 7) Typical value in room temperature. Guaranteed value is  $\pm 0.85$  dB.
- 8)  $F > 125$  MHz, BW 4.43 MHz
- 9) TP has  $\pm 0.75$  dB tolerance between 85...862 MHz and  $\pm 1.0$  dB between 862...1218 MHz.
- 10) Level difference between transponder connection and output 3. Valid for modem signal.
- 11) Typical C/N curves can be seen in the graph below.



- 12) Typical value according to IEC60728-3-1. 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) 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.
- 14) Valid after 8 MHz .
- 15) Nominal input level for 4.0 % OMI. Defined at the output connector of the node.

16)



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

- 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 dBμV 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) With single PSU, 1 DS receiver activated, no active plug-in modules, no power save.  
Power save ON: -5 W. It is recommended to use Power Save function always when calculated CTB is better than 67 dB and/or operational level is -3 dBuV lower than Umax.  
Activation of 2<sup>nd</sup> DS receiver: +5 W  
Dual node with 2xUS TX and Docsis transponder, no power save: 61 W
- 20) 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.
- 21) 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.

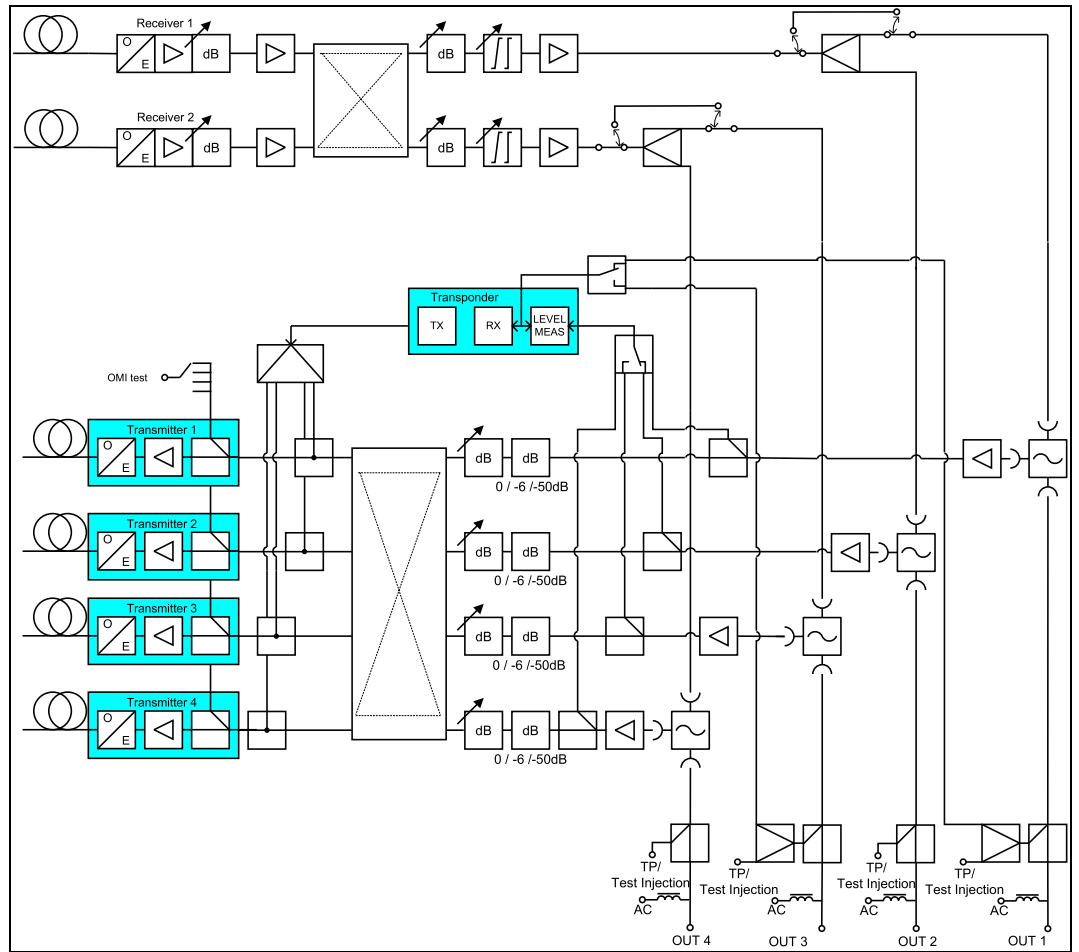
## Monitoring functions

- 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 configuration map

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

<b>1-1 Platform type</b>
A Standard 1.2 GHz
<b>1-2 Power supply</b>
A Single PSU, 65 VAC
B Double PSUs, 65 VAC
Customer specific option
<b>1-3 Fiber organizing</b>
A Standard fibre organiser
Customer specific option

<b>2-1 Fibre feed-through adapter 1 (left)</b>
E 5/8 Adapter (KDC3'6)
G 1-4 fibres (KDO900)
X None
<b>2-2 Fibre feed-through adapter 2 (right)</b>
E 5/8 Adapter (KDC3'6)
G 1-4 fibres (KDO900)
X None

<b>2-3 Output 1 connection (first from right)</b>
A PG11
B 5/8"
C IEC
D 3.5/12
E F
X None (PG11 sealing plug)
<b>2-4 Output 2 connection</b>
A PG11
B 5/8"
C IEC
D 3.5/12
E F
X None (PG11 sealing plug)
<b>2-5 Output 3 connection</b>
A PG11
B 5/8"
C IEC
D 3.5/12
E F
X None (PG11 sealing plug)
<b>2-6 Output 4 connection (first from left)</b>
A PG11
B 5/8"
C IEC
D 3.5/12
E F
X None (PG11 sealing plug)

<b>3-1 Optical connector for receiver RX1</b>
A SC/APC, 9 deg.
C E-2000
D SC/APC, 8 deg.
<b>4-1 Optical connector for receiver RX2</b>
A SC/APC, 9 deg.
C E-2000
D SC/APC, 8 deg.

<b>5-1 Diplexer filter</b>
D 65/85 MHz (4 x CXF065)
G 65/85 MHz (4 x CXF065 B)
H 85/105 MHz (4 x CXF085)
I 85/105 MHz (4 x CXF085 B) NA
J 204/258 MHz (4 x CXF204)
Customer specific
Customer specific
X None

<b>6-1 Return path transmitter TX1</b>
40 +1dBm FP 13'10 nm (AC67B40)
41 +3 dBm CWDM 1430 nm (AC67B41)
42 +6 dBm CWDM 1430 nm (AC67B42)
43 +3 dBm CWDM 1450 nm (AC67B43)
44 +6 dBm CWDM 1450 nm (AC67B44)
45 +3 dBm DFB 13'10 nm (AC67B45)
46 +6 dBm DFB 13'10 nm (AC67B46)
47 +3 dBm CWDM 1470 nm (AC67B47)
48 +6 dBm CWDM 1470 nm (AC67B48)
49 +3 dBm CWDM 1490 nm (AC67B49)
50 +6 dBm CWDM 1490 nm (AC67B50)
51 +3 dBm CWDM 1510 nm (AC67B51)
52 +6 dBm CWDM 1510 nm (AC67B52)
53 +3 dBm CWDM 1530 nm (AC67B53)
54 +6 dBm CWDM 1530 nm (AC67B54)
55 +3 dBm CWDM 1550 nm (AC67B55)
56 +6 dBm CWDM 1550 nm (AC67B56)
57 +3 dBm CWDM 1570 nm (AC67B57)
58 +6 dBm CWDM 1570 nm (AC67B58)
59 +3 dBm CWDM 1590 nm (AC67B59)
60 +6 dBm CWDM 1590 nm (AC67B60)
61 +3 dBm CWDM 1610 nm (AC67B61)
62 +6 dBm CWDM 1610 nm (AC67B62)
XX None
<b>6-3 Optical connector for transmitter TX1</b>
A SC/APC, 9 deg.
C E-2000
D SC/APC, 8 deg.
X None

<b>7-1 Digital return path transmitter TX1</b>
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
<b>7-3 Optical connector for Digital transmitter TX1</b>
A SC/APC, 9 deg.
C E-2000
D SC/APC, 8 deg.
X None

<b>8-1 Return path transmitter TX2</b>
40 +1dBm FP 13'10 nm (AC67B40)
41 +3 dBm CWDM 1430 nm (AC67B41)
42 +6 dBm CWDM 1430 nm (AC67B42)
43 +3 dBm CWDM 1450 nm (AC67B43)
44 +6 dBm CWDM 1450 nm (AC67B44)
45 +3 dBm DFB 13'10 nm (AC67B45)
46 +6 dBm DFB 13'10 nm (AC67B46)
47 +3 dBm CWDM 1470 nm (AC67B47)
48 +6 dBm CWDM 1470 nm (AC67B48)
49 +3 dBm CWDM 1490 nm (AC67B49)
50 +6 dBm CWDM 1490 nm (AC67B50)
51 +3 dBm CWDM 1510 nm (AC67B51)
52 +6 dBm CWDM 1510 nm (AC67B52)
53 +3 dBm CWDM 1530 nm (AC67B53)
54 +6 dBm CWDM 1530 nm (AC67B54)
55 +3 dBm CWDM 1550 nm (AC67B55)
56 +6 dBm CWDM 1550 nm (AC67B56)
57 +3 dBm CWDM 1570 nm (AC67B57)
58 +6 dBm CWDM 1570 nm (AC67B58)
59 +3 dBm CWDM 1590 nm (AC67B59)
60 +6 dBm CWDM 1590 nm (AC67B60)
61 +3 dBm CWDM 1610 nm (AC67B61)
62 +6 dBm CWDM 1610 nm (AC67B62)
XX None
<b>8-3 Optical connector for transmitter TX2</b>
A SC/APC, 9 deg.
C E-2000
D SC/APC, 8 deg.
X None

<b>9-1 Return path transmitter TX3</b>
40 +1dBm FP 13'10 nm (AC67B40)
41 +3 dBm CWDM 1430 nm (AC67B41)
42 +6 dBm CWDM 1430 nm (AC67B42)
43 +3 dBm CWDM 1450 nm (AC67B43)
44 +6 dBm CWDM 1450 nm (AC67B44)
45 +3 dBm DFB 13'10 nm (AC67B45)
46 +6 dBm DFB 13'10 nm (AC67B46)
47 +3 dBm CWDM 1470 nm (AC67B47)
48 +6 dBm CWDM 1470 nm (AC67B48)
49 +3 dBm CWDM 1490 nm (AC67B49)
50 +6 dBm CWDM 1490 nm (AC67B50)
51 +3 dBm CWDM 1510 nm (AC67B51)
52 +6 dBm CWDM 1510 nm (AC67B52)
53 +3 dBm CWDM 1530 nm (AC67B53)
54 +6 dBm CWDM 1530 nm (AC67B54)
55 +3 dBm CWDM 1550 nm (AC67B55)
56 +6 dBm CWDM 1550 nm (AC67B56)
57 +3 dBm CWDM 1570 nm (AC67B57)
58 +6 dBm CWDM 1570 nm (AC67B58)
59 +3 dBm CWDM 1590 nm (AC67B59)
60 +6 dBm CWDM 1590 nm (AC67B60)
61 +3 dBm CWDM 1610 nm (AC67B61)
62 +6 dBm CWDM 1610 nm (AC67B62)
XX None
<b>9-3 Optical connector for transmitter TX3</b>
A SC/APC, 9 deg.
C E-2000
D SC/APC, 8 deg.
X None

<b>10-1 Digital return path transmitter TX2</b>
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
<b>10-3 Optical connector for Digital transmitter TX2</b>
A SC/APC, 9 deg.
C E-2000
D SC/APC, 8 deg.
X None

<b>11-1 Return path transmitter TX4</b>
40 +1dBm FP 13'10 nm (AC67B40)
41 +3 dBm CWDM 1430 nm (AC67B41)
42 +6 dBm CWDM 1430 nm (AC67B42)
43 +3 dBm CWDM 1450 nm (AC67B43)
44 +6 dBm CWDM 1450 nm (AC67B44)
45 +3 dBm DFB 13'10 nm (AC67B45)
46 +6 dBm DFB 13'10 nm (AC67B46)
47 +3 dBm CWDM 1470 nm (AC67B47)
48 +6 dBm CWDM 1470 nm (AC67B48)
49 +3 dBm CWDM 1490 nm (AC67B49)
50 +6 dBm CWDM 1490 nm (AC67B50)
51 +3 dBm CWDM 1510 nm (AC67B51)
52 +6 dBm CWDM 1510 nm (AC67B52)
53 +3 dBm CWDM 1530 nm (AC67B53)
54 +6 dBm CWDM 1530 nm (AC67B54)
55 +3 dBm CWDM 1550 nm (AC67B55)
56 +6 dBm CWDM 1550 nm (AC67B56)
57 +3 dBm CWDM 1570 nm (AC67B57)
58 +6 dBm CWDM 1570 nm (AC67B58)
59 +3 dBm CWDM 1590 nm (AC67B59)
60 +6 dBm CWDM 1590 nm (AC67B60)
61 +3 dBm CWDM 1610 nm (AC67B61)
62 +6 dBm CWDM 1610 nm (AC67B62)
XX None
<b>11-3 Optical connector for transmitter TX4</b>
A SC/APC, 9 deg.
C E-2000
D SC/APC, 8 deg.
X None

<b>12-1 Optical passive</b>
XX None
F1 <sup>W</sup> WDM and 1490 nm Add Drop with 9 deg. SC/APC connectors
F2 <sup>W</sup> WDM with 8 deg. SC/APC connectors
F3 <sup>W</sup> WDM with 9 deg. SC/APC connectors
F6 <sup>W</sup> WDM and 1490 nm Add Drop with 8 deg. SC/APC connectors
F7 <sup>W</sup> WDM and 1490 nm Add Drop with 8 deg. SC/APC connectors
G1 <sup>W</sup> WDM with 8 deg. SC/APC connectors
M1 MUX with SC/APC connectors
M2 MUX with SC/APC connectors
M3 MUX with SC/APC connectors
M4 MUX with SC/APC connectors
M5 MUX with SC/APC connectors
M8 MUX with SC/APC connectors
<b>13-1 Transponder module</b>
E Transponder and ALS module (AC6992)
G DOCSIS transponder (AC6981)
X None
<b>14-1 Transponder communication protocol</b>
A CATV/isor compatible
B HMS/SNMP compatible
<b>14-2 Settings</b>
X Factory default
A Customer specified (ECML file)
<b>14-3 Product keys (software features)</b>
X None
A Auto alignment, spectrum and ingress analyzer, pilot generator
B Optical receiver 2 activation
C A + B
<b>15-1 Customer specific selections</b>
B Customer specific option
X None
<b>15-2 External control port</b>
A USB extension cable
X None