

## Compact Reverse Transmitters 9008x with FP, DFB or CWDM Lasers

The Compact nodes can be configured with a variety of optical reverse transmitters to provide flexibility for use in multiple applications. The reverse transmitters are plug-in modules and all deliver a cost-effective, user-friendly solution for upstream transmission. The reverse transmitters type 9008x are available with FP, DFB or CWDM lasers.

All transmitters feature a built-in microprocessor and pilot tone for easy set-up of the reverse path. The pilot tone does not take up any reverse bandwidth as it is placed at 5 MHz. Moreover, placing the pilot tone at 5 MHz also makes the reverse transmitter interoperable with virtually all reverse receivers in the marketplace. In the event of no modulation, the pilot tone serves as a quieting tone, which reduces spurious noise and improves overall noise performance with up to 15 dB. All transmitters within the 9008x series have increased gain, which allows low reverse input levels at the node.

### Reverse Transmitters and CWDM

The reverse transmitters type 90083 and 90086 are an integral part of the CWDM (Coarse Wavelength Division Multiplexing) transport system enabling each fiber in a HFC network to support a sixteen fold increase in the number of wavelengths available.

**Figure 1.** Reverse Transmitter 90080



### General Features

- Designed to operate within the Compact platform of optical nodes
- Variable modulation depth (RF drive level) enables superior link optimization
- RF input test point
- 5 MHz pilot tone for easy set up
- Multiple set-up and control options
  - Local control via front panel or Handheld Programmer Terminal, type 91200
  - Advanced element management (status monitoring and control) interface
- Nonvolatile storage of pre-set operating parameters
- Remote OMI setting (when supported by node)

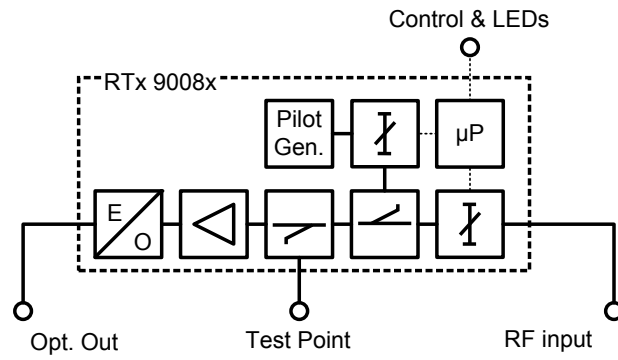
**Additional Features Type 90080**

- Un-cooled high-performance FP lasers

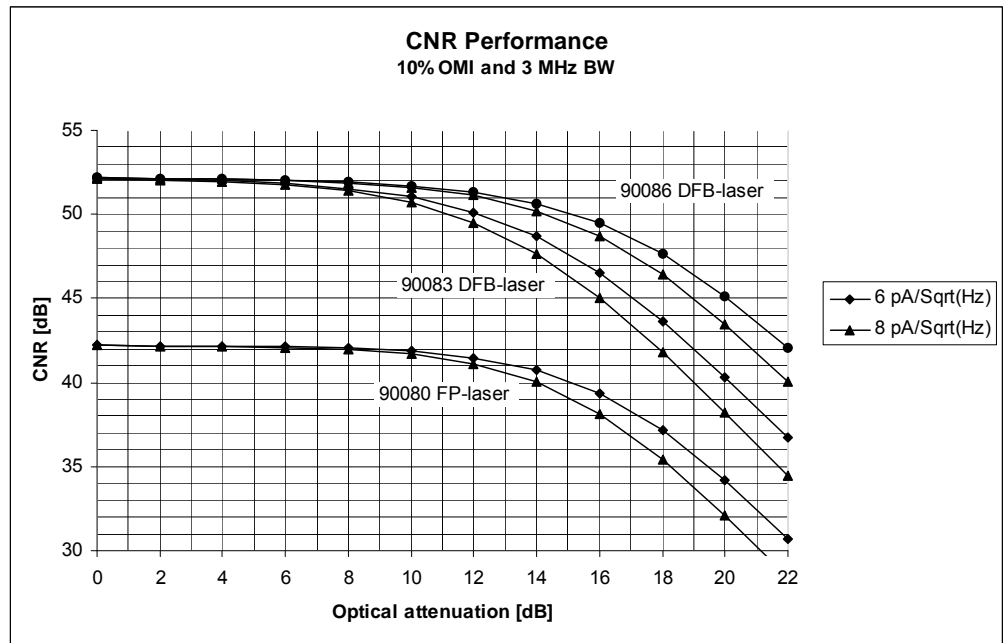
**Additional Features Type 90083 and 90086**

- 90083: 3 dBm, 1310 nm DFB available in 16 CWDM wavelengths
- 90086: 6 dBm, 1550 nm DFB available in 16 CWDM wavelengths
- Un-cooled DFB lasers with Isolator for exceptional performance and low power consumption

**Figure 2.** Type 9008x Reverse Transmitter Block Diagram



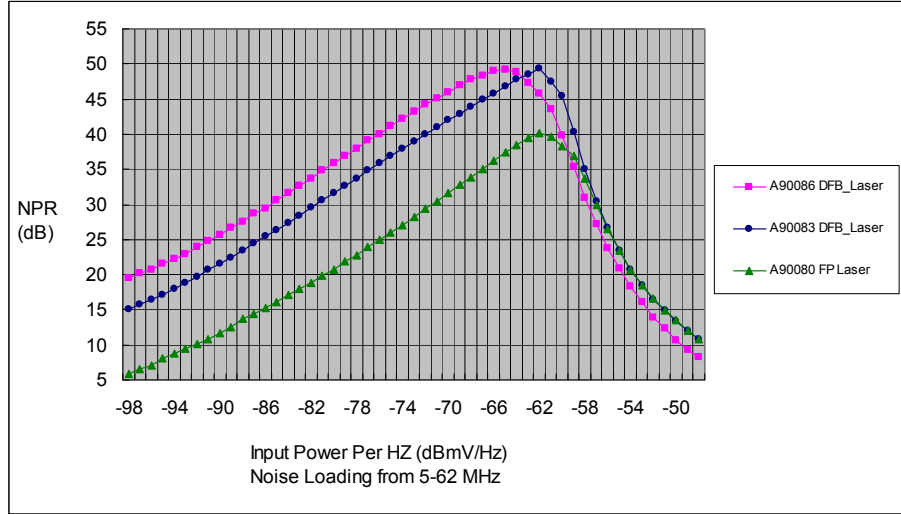
**Table 1.** CNR Performance



### NPR Performance Type 9008x Reverse Transmitter

Test condition: Prisma II Reverse Optical Receiver, 10 dB Optic Link (20 km glass, plus passive loss), Node A90090 in default setting, and room temperature.

**Table 2.** NPR Performance



The following table lists link loss correction factors.

**Table 3.** Link Loss Correction Factors

Optical Link loss (dB)	Fiber Length (km)	Loss Correction Factor (dB)		
		A90080	A90083	A90086
2	0	6	3.25	
3	5	3.5	1.8	1.5
6	12.5	1	1	1
8	12.5	0.5	0.5	0.9
9	20	0	0	0
10	20	0	0	0
12	20	-1	-1	-1
15	20	-3.5	-3	-1.6
18	20	-8	-7	-4.5
20	20	-	-10	-6.5

**Node Correction Factor**

An A90090 Node is used in the above NPR tests. For other nodes as listed below, X axis, which presents input power per Hertz, must move to left by a correction factor. (Node with default configuration and test with a reverse jumper)

**Table 4.** Node Correction Factor

Node	Correction Factor (dB)
A90090/A90093	0
A90100/A90300	1.5
A90200	3.7
A90285/A90286	6.5
A90075/A90275	6.5

**NPR Performance Descriptions**

These NPR performance plots contained in this document depict the NPR performance on a reference 10 dB fiber optic link.

With other link losses, both the:

- NPR dynamic range for a given minimum NPR (C/N) performance
- NPR value for a given transmitter RF input level

will vary from that shown on the reference 10 dB link plots.

**To determine an NPR dynamic range for a different link loss,** add (or subtract) the correction factor associated with the desired link loss to (or from) the dynamic range shown on the reference 10 dB link NPR plot. Note that the associated increase (or decrease) in dynamic range affects only the left side of the NPR curve (minimum RF input side) since that is the portion of the curve affected by changes to the traditional noise sources associated with optical link.

**To determine an NPR value for a different link loss,** add (or subtract) the correction factor associated with the desired link loss to (or from) the NPR value shown on the 10 dB link NPR plot for a given RF input level. Again, only the NPR values on the left side of the NPR curve (pre-peak values) are to be adjusted. The NPR values and slope associated with the right side of the NPR curve (post peak values) are to be adjusted. The NPR values and slope associated with the right side of the NPR curve (post peak values) are primarily due to laser clipping the high RF input levels, and therefore do not vary appreciably with link loss.

## Product Specifications

This section lists the product specifications.

**Table 5.** Specifications

Optical Performance	Unit	90080	90083	90086	Note
Wavelength	nm	±30	1270, 1290, 1310, 1330, 1350, 1370, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 Tolerance: ±3	1270, 1290, 1310, 1330, 1350, 1370, 1430, 1450, 1470, 1490, 1510, 1530, 1550, 1570, 1590, 1610 Tolerance: ±3	1
Connector Options	–	See Ordering Information			
Output Power	dBm/dB	0 ±0.5	3 ±0.5	6 ±0.5	
<b>Electrical Performance</b>					
Frequency Range	MHz	5–200			
Input Level	dBµV	60–70			2
<b>Input Level Return Loss</b>					
@ 5–200 MHz	dB		≤ –20		3
<b>Spurious Noise Level</b>					
Carrier Off/Pilot On	dBc	–	–50	–55	
Carrier Off/Pilot On	dBc	–	–55	–60	
Carrier Off/Pilot Off	dBc	–	–33	–33	
Flatness @ 5–200 MHz	dB	≤ ±0.5			4
Power Consumption	W	≤ 1.75	≤ 2.25	≤ 2.50	5
<b>Environmental</b>					
Node Operating Temperature Range	°C	–15 to +55			
<b>Mechanical</b>					
Dimensions (H x W x D)	mm	22 x 69 x 77			
Weight	g	65			
Notes:					
<ol style="list-style-type: none"> <li>At 25°C ambient temperature</li> <li>At module input @ 10% OMI</li> <li>At 40 MHz decreasing with 1.5 dB/octave and module On</li> <li>For 90086 ±1 dB @ 100–200 MHz</li> <li>Measured in node</li> </ol>					
<b>Element Management Monitorable Parameters</b>					
<ul style="list-style-type: none"> <li>Alarms from reverse transmitter <ul style="list-style-type: none"> <li>Module OK</li> <li>Laser ageing</li> <li>Laser failure</li> </ul> </li> </ul>					
<b>Element Management Monitorable Parameters (depending on node)</b>					
<ul style="list-style-type: none"> <li>Factory data <ul style="list-style-type: none"> <li>Wavelength</li> <li>Output power</li> <li>Frequency range</li> </ul> </li> <li>Laser bias</li> </ul>					
<b>Element Management Controllable Parameters (depending on node)</b>					
<ul style="list-style-type: none"> <li>OMI setting</li> <li>Pilot tone level</li> <li>Transmitter on/off</li> <li>Pilot tone on/off</li> </ul>					

## Ordering Information

This section lists the product ordering information.

**Table 6.** Ordering Information

Reverse Transmitters with Pilot Tone	Part Number
1310 nm, FP, without adapter	A90080.10
Reverse CWDM Transmitters with Pilot Tone	Part Number
3 dBm, xxxx nm, DFB without adapter Where xxxx is the wavelength in nm	A90083.10xxxx
6 dBm, xxxx nm, DFB without adapter Where xxxx is the wavelength in nm	A90086.10xxxx

The following **Required Accessories** must be ordered separately.

**Table 7.** Required Accessories

Required Accessories	Part Number
One adapter is required for each optical connection forward and reverse. Internal optical connector is SC/APC.	
<ul style="list-style-type: none"> <li>• Adapter SC/APC to E2108</li> <li>• Adapter SC/APC to FC/APC</li> <li>• Adapter SC/APC to SC/APC</li> </ul>	A90540.1048 A90540.1058 A90540.1088
Related Equipment	Part Number
Stand-alone Housing for Reverse Transmitter	
<ul style="list-style-type: none"> <li>• 90049 Compact Housing, 230 VAC Power Supply</li> <li>• 90049 Compact Housing, Remote Powered 24–65 or 35–75 VDC</li> </ul>	A90049.102 A90049.103
For more information about housings, see Compact Housing data sheet (P/N: A541442).	



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