



Non contractual picture

1 – 25 Gbps NRZ 850 nm Modulation Unit

The Photline ModBox systems are a family of turnkey optical transmitters and external modulation benchtop units for digital and analog transmission, pulsed and other specific applications.

The Modbox design integrates within a bench-top or 2U 19" enclosure a laser source (optional), a complete modulation stage featuring an external LiNbO₃ modulator with its RF driver and bias control circuit, and a receiver stage (optional).

ModBoxes can be tailored to specific needs in order to provide systems engineers with reliable performance and high speed modulation capabilities together with the peace of mind of a ready-to-plug equipment.

The ModBox 1-25 Gbps NRZ 850 nm Modulation unit

Description

The ModBox-850nm-1-25Gbps–NRZ is a transmitter and receiver unit intended to operate at 850 nm up to 25 Gbps data rate.

The unit is designed to operate with a user supplied NRZ single ended electrical data stream, provided for instance by a PRBS. The unit features a detection stage that converts a 850 nm – 1- 25 Gbps optical data stream into an 1 - 25 Gbps electrical data stream, that can be forwarded to a fast oscilloscope or another analyzer.

The ModBox-850nm-1-25Gbps–NRZ incorporates a CW 850 nm DFB laser source a typical 14 GHz bandwidth 850 nm LiNbO₃ modulator, a 30 GHz RF driver, a bias control board and a detection stage.

The parameters of the modulator bias control board can be adjusted through the USB interface (rear panel). By default, the bias control parameters are optimized for NRZ modulation with the typical specifications appearing in the specification chart below.

The ModBox-850nm-1-25Gbps–NRZ will ensure optimised eye diagram performance by user adjustable modulator bias control and adjustable RF driver's gain and cross point.

The optical power of the 850 nm laser is adjustable through a front panel potentiometer and through the USB interface.

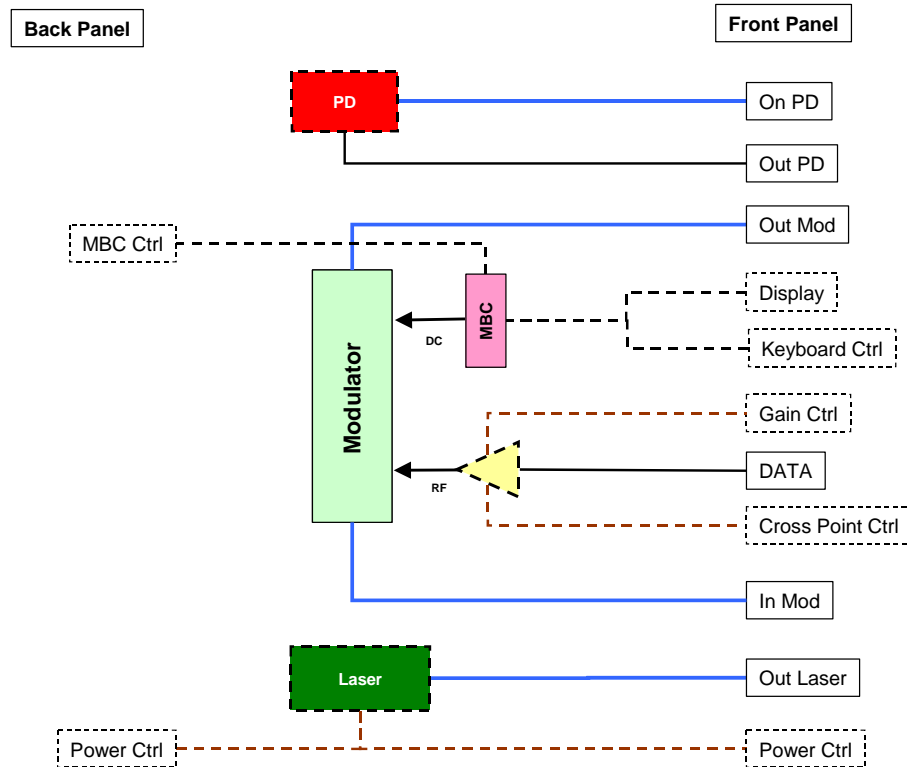
The internal optical detection stage is made up with a commercial photo-detector combined with a high frequency TIA in order to deliver an electrical signal workable with a high speed scope.

The unit is CE marked and compliant with the EN60825-1 safety standard.

Delivery content

- ✓ ModBox-850nm-1-14Gbps–NRZ
- ✓ Operating manual
- ✓ 1 x 850 nm PM optical cable (1 m long)
- ✓ LabView CD for MBC remote control + laser remote control

Schematic



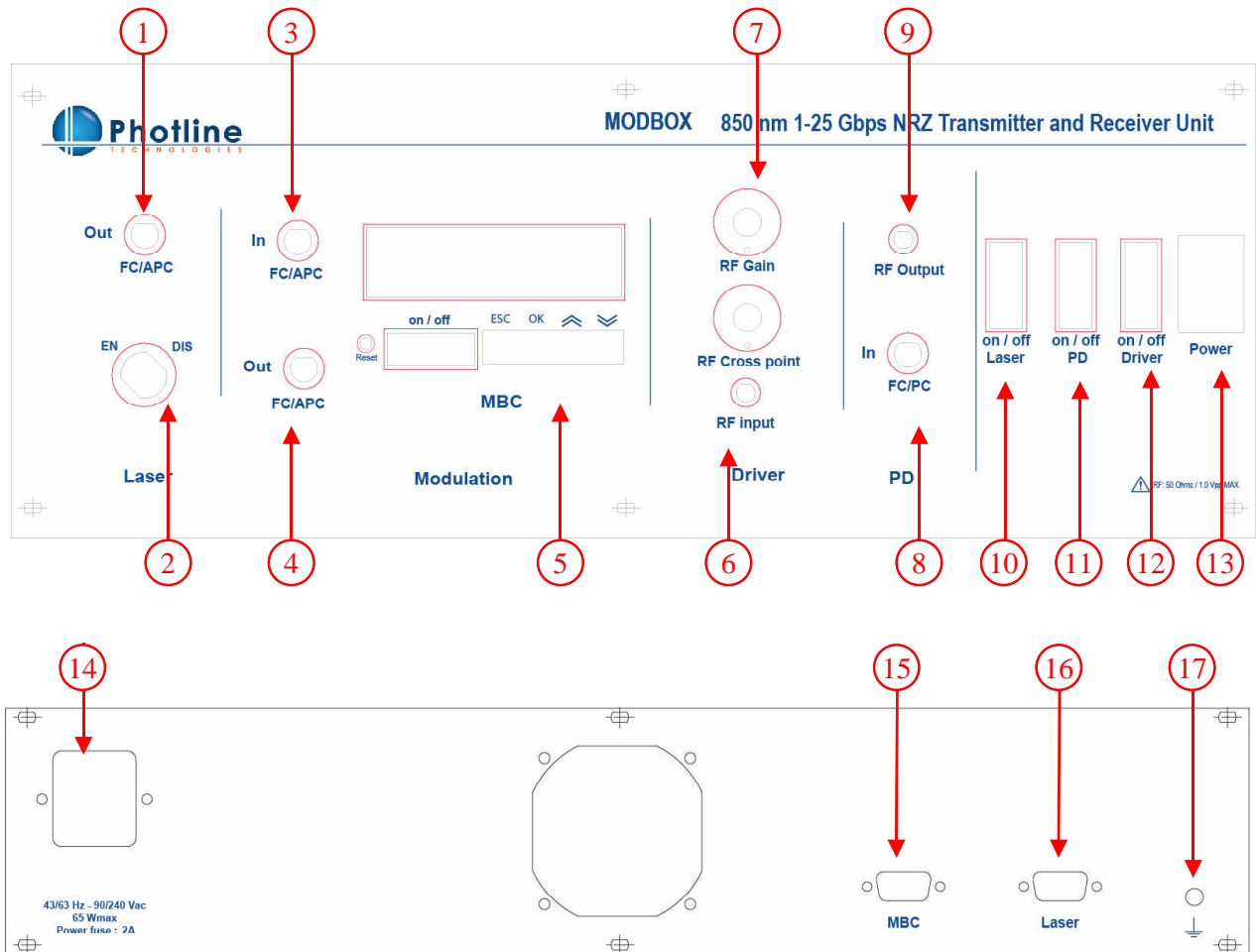
Feature

The ModBox-850nm-1-25Gbps-NRZ will ensure:

- ✓ modulation optical data streams up to 25 Gbps
- ✓ a high stable X-cut with power handling LiNbO₃ Mach-Zehnder modulator, chirp-free, 14 GHz typical electro-optical bandwidth (Photline NIR800-MX-LN-10),
- ✓ 30 GHz bandwidth typical modulator driver with gain and cross point adjustable (Photline DR-DG-40-MO),
- ✓ a bias controller board to lock Mach-Zehnder modulator in Quadrature mode and ensure high stability of output signal, (Photline MBC-1001),
- ✓ selectable bias control in manual or automatic mode (USB and Modbox front panel),
- ✓ a DFB laser with high stability with power control from ModBox front panel,

a high bandwidth photodetector with high sensitivity and low noise detection.

Panels



Features	Notice
1. Laser Interlock On/Off	Laser switch On/Off
2. Laser Optical Output	FC/APC – Panda fiber - slow axis // key
3. Modulator Optical Input	FC/APC – Panda fiber - slow axis // key
4. Modulator Optical Output	FC/APC – Panda fiber - slow axis // key
5. MBC manual mode	Display and key-pad
6. RF In	SMA connector – K compatible – 50 Ohms
7. Driver's gain and cross point controls	Full range potentiometers for RF amplifier gain and cross point tuning
8. Photodetector Input	FC/PC – 9- μ m Single mode fiber
9. Photodetector Output	Wiltron K – 50 Ohms
10. 11. 12. 13 AC Power Switch	Lights up green when unit is turned ON
14. AC Power and fuse socket	Fuse socket accept 5*20mm fuse (2.5A / quick action)
15. 16. Socket	RS232 or USB MBC remote control
17. Ground	

Specifications

INPUT SIGNALS	Unit	Min	Typ	Max
NRZ MODULATION INPUT SIGNAL (user supplied, not a ModBox specification)				
Data rate	Gbit/s	1	14	25
Signal type		Single ended		
Rise / fall time	ps	-	25	-
Signal amplitude	V p-p	0.25	0.5	1

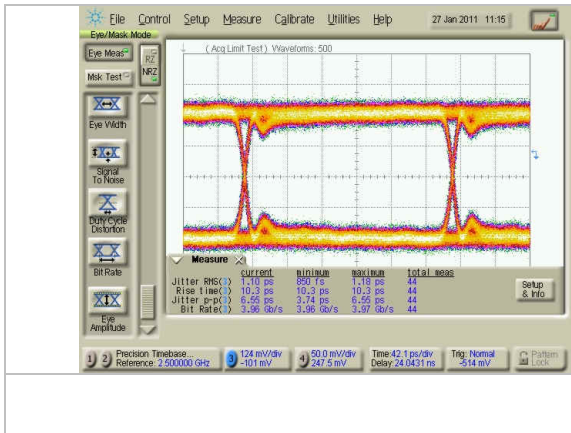
LASER SPECIFICATION	Unit	Min	Typ	Max
LASER SOURCE				
Source type		CW DFB		
Wavelength	nm	850	852	854
Power	dBm	-	-	13
Spectral width	MHz	-	2	-
SMSR	dB	30	45	-
Polarization Extinction Ratio	dB	-	20	-

PHOTODETECTOR SPECIFICATION @850 nm	Unit	Min	Typ	Max
DETECTION STAGE				
Detector type		GaAs/PIN		
CW Saturated Power	mW	2	-	-
Responsivity	A/W	-	0.4	-
Detector bandwidth	GHz	-	22	-
Rise time	ps	-	15	-
Detector gain	V/W	-	10	-
Detector output impedance	Ω	-	50	-

PERFORMANCES	Unit	Min	Typ	Max
MODULATION STAGE				
Modulator type	Mach-Zehnder type NIR-MX800-LN-10			
Optical manufacturing process	Proton exchange			
Crystal	Lithium Niobate x-cut, y-propagating			
Chirp		-0.1	0	+0.1
Modulator electro-optic bandwidth S_{21} @-3 dB	GHz	-	14	-
Static Extinction Ratio	dB	20	25	-
Insertion loss (measured at maximum transmission)	dB	-	4	5
Bias controller type	Photline MBC-DG			
Dithering signal for bias control	kHz	-	1	-
Preset working point	QUAD			
OPTICAL MODULATED SIGNAL				
Data rate	Gbit/s	1	14	25
Rise / Fall time (20% - 80%)	ps	-	15	-
RMS jitter	ps	-	TBD	-
ELECTRICAL OUTPUT SIGNAL				
Data rate	Gbit/s	1	14	25
Rise / Fall time (20% - 80%)	ps	-	15	-
RMS jitter	ps	-	TBD	-

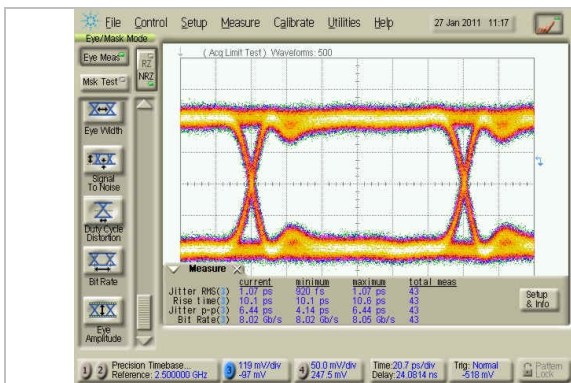
OTHER				
INTERFACES				
Laser Output / Modulator Input and Output fiber	PM fiber - Corning 98-U25A - Panda type			
Modulator Input / Laser Output connector	FC/APC - Polarization in slow axis // key			
Modulator output and Photodetector input connectors	Front Panel - Polarization maintaining Corning 98-U25A - Panda type -			
Modulator Output / Photodetector connector	FC/PC - Polarization in slow axis // key			
Data input RF connector / detector output RF connector	Front Panel - 50 Ω SMA or K			
MBC Interface	Rear Panel - USB type			
ENVIRONMENTAL				
Operating temperature	15 $^{\circ}$ C – 35 $^{\circ}$ C			
Storage temperature	-20 $^{\circ}$ C - +50 $^{\circ}$ C			
POWER SUPPLY				
AC Voltage (Automatic Switch)	V	90	110	240
	Hz	50		60
Electrical plug	Rear panel			
MAXIMUM RATINGS				
Maximum RF input power	+4 dBm			
Maximum optical input power	+13 dBm			
DIMENSIONS				
19" Modulation unit	19" 2U			
COMPLIANCE				
Safety	EN 60825-1			
Marking	CE			

EYE DIAGRAMS – Input Electrical Waveform



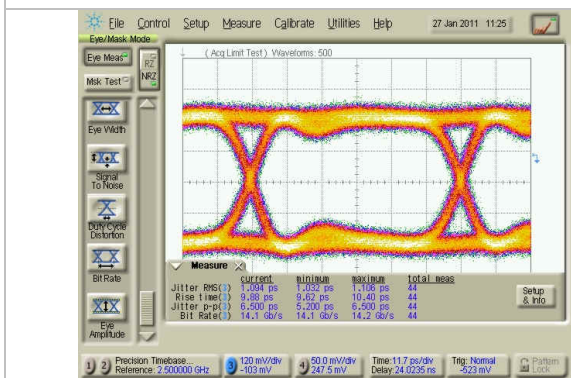
Electrical Input Signal 4 Gbps - NRZ - $2^{31}-1$
 Genrated by Anritsu Generator MP1758A

Eye Amplitude = 0.500 Vpp
Rise/Fall Time = 10 ps
Crossing point = 52.1 %



Electrical Input Signal 8 Gbps - NRZ - $2^{31}-1$
 Genrated by Anritsu Generator MP1758A

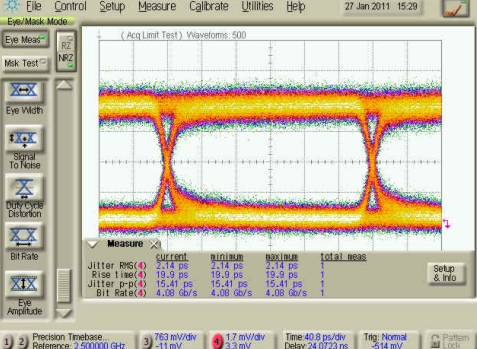
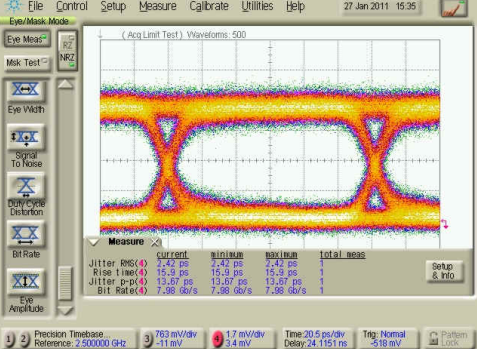
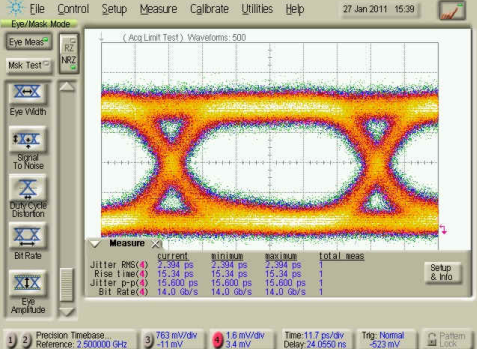
Eye Amplitude = 0.453 Vpp
Rise/Fall Time = 10 ps
Crossing point = 52.5 %

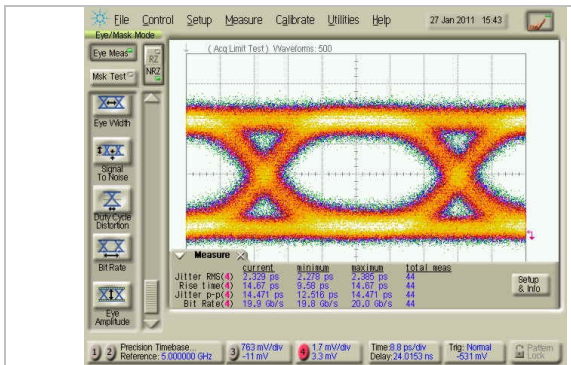


Electrical Input Signal 14 Gbps - NRZ - $2^{31}-1$
 Genrated by Anritsu Generator MP1758A

Eye Amplitude = 0.512 Vpp
Rise/Fall Time = 10 ps
Crossing point = 50.5 %

EYE DIAGRAMS – Output Optical Waveform

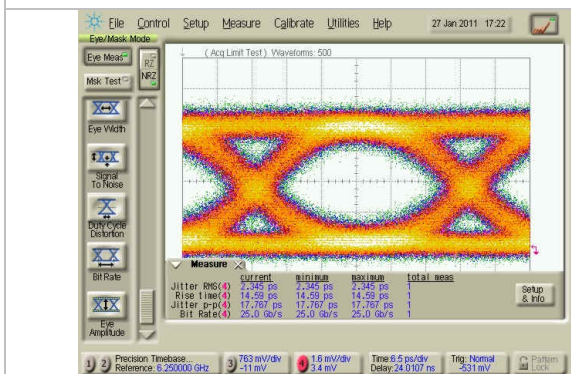
	<p>Output response measured using Agilent oscilloscope model 86100B with its 83484 50GHz plug-in</p> <p>4 Gbps NRZ optical output signal</p> <p><i>Rise/Fall Time = 16 ps</i> <i>Crossing point = 50.7%</i></p>
	<p>Output response measured using Agilent oscilloscope model 86100B with its 83484 50GHz plug-in</p> <p>8 Gbps NRZ optical output signal</p> <p><i>Rise/Fall Time = 16 ps</i> <i>Crossing point = 50.9%</i></p>
	<p>Output response measured using Agilent oscilloscope model 86100B with its 83484 50GHz plug-in</p> <p>14 Gbps NRZ optical output signal</p> <p><i>Rise/Fall Time = 15 ps</i> <i>Crossing point = 50 %</i></p>



Output response measured using Agilent oscilloscope model 86100B with its 83484 50GHz plug-in

20 Gbps NRZ optical output signal

Rise/Fall Time = 15 ps
Crossing point = 50%



Output response measured using Agilent oscilloscope model 86100B with its 83484 50GHz plug-in

25 Gbps NRZ optical output signal

Rise/Fall Time = 15 ps
Crossing point = 50%