

## ModBox OBand 28Gb/s Stress Eye

O-Band 28 Gb/s NRZ Stress Eye Modulation Unit

**PHOTLINE ModBox**


The Photline ModBox-OBand-28Gb/s-NRZ-SE provides production and R&D engineers a solution for Stress Receiver Sensitivity test & measurements in the O-Band.

This Reference Transmitter delivers high-quality NRZ clean eye diagram and offers the possibility to add variable Stress to the data.

This O-band optical transmitter operates with data-rate from 155 Mb/s up to 28 Gb/s, and provides an independent solution for tunable stress magnitudes in both horizontal (time) and vertical (optical power) eye axis (Stressed Eye).

It is primarily intended for electrical to optical conversion in an Optical Stressed Eye test set up for 100 GbE IEEE 802.3-2012 standard. This unit is also used to test communication links and other telecommunication stress simulation purposes.

### FEATURES

- Reference transmitter
- Clean and Stress eye capabilities
- 1310 nm laser embedded (ITU-T G694.1)
- Sinusoidal interference input
- Extinction Ratio Variation

### APPLICATIONS

- 100 GbE testing
- Fibre channel dispersion penalty testing
- Manufacturing and R&D receiver testing
- R&D Datacom/Telecom

### OPTIONS

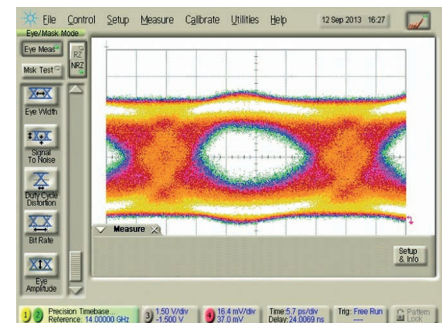
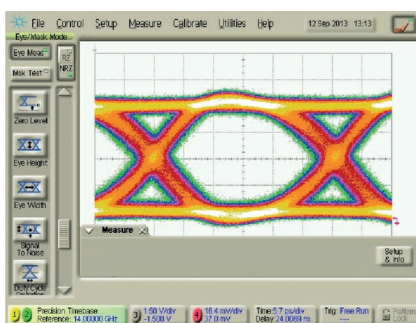
- 4 laser lanes option (ITU-T G694.1)
- Reference photodetector
- 850 nm band version
- 1550 nm band version

### Performance Highlights

Parameter	Min	Typ	Max
Operating wavelength	1270 nm	-	1330 nm
Modulation format	NRZ, clean and stressed eye diagrams		
Rise / fall times	-	12	-
RMS jitter	-	1.4	-
Peak to peak jitter	-	-	2 UI
RIN	-	-	-138 dB/Hz
Variable Extinction Ratio	3 dB	-	12 dB

Compliant with the IEEE 802.3-2012 standard.

### 28 Gb/s Clean and Stressed Eye diagrams



**Input Electrical Specifications** User supplied, not a ModBox specification

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Data Input Specifications						
Input electrical data <sup>(1)</sup>	-	NRZ - Single ended / AC coupled	0.1	-	28	Gb/s
Rise / fall times <sup>(1)</sup>	$t_r / t_f$	20 % - 80 %	-	12	16	ps
Input signal amplitude <sup>(1)</sup>	$V_{IN}$	50 $\Omega$ – Single ended / AC coupled	-	450	-	mVpp
SI Input Specifications						
Frequency <sup>(2)</sup>	F	Single ended / AC coupled	0.1	-	2	GHz
Signal type <sup>(2)</sup>	-	Single ended / AC coupled	Sinusoidal			
Input signal amplitude <sup>(2)</sup>	$V_{IN}$	50 $\Omega$ – Single ended / AC coupled	-	120	-	mVpp

(1) Anritsu MP1800A compliant

(2) Anritsu MG3740A compliant

**Output Modulated Signal**

The ModBox 28 Gb/s Stress Eye has several features that allow the user to build a stressed eye per IEEE Std. 802.3-2012. The transmitter provides the user with the ability to insert interference, insertion of an internal 4<sup>th</sup> order low pass Bessel Thomson filter, or externally customer supplied filter.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Laser specifications						
Wavelength	$\lambda_{L3}$	Embedded - Lane L <sub>3</sub>	-	1310	-	nm
Optical power	$P_{CW}$	-	1	-	10	mW
RIN <sup>(1)</sup>	RIN	-	-	-	-138	dB/Hz
General specifications						
Output data-rate		Single ended / AC coupled	0.1 <sup>(2)</sup>	25	28	Gb/s
Wavelength	$\lambda_{laser}$	-	1270	-	1330	nm
Spectrum linewidth	$\Delta\lambda$	-	-	1	-	MHz
Optical output power	$P_{Out}$	Average NRZ	0	2	3	dBm
Cross point	-	-	45	50	55	%
Chirp	$\alpha$	-	-0.1	0	0.1	-
Optical Return Loss	ORL	-	-40	-45	-	dB
Reference mode						
Rise / fall times	$t_r / t_f$	20 % - 80 %	-	10	12	ps
RMS jitter	$J_{RMS}$	-	1	1.4	-	ps
Peak to peak jitter	$J_{PP}$	-	-	-	0.2	UI
Variable Extinction Ratio <sup>(3)</sup>	VER	Pres-set value 3dB, 6dB, 9dB, 12dB	3	-	12	dB
Pre-set VER values <sup>(3)</sup>	VER	Available from the Smart and GUI	3 dB, 6 dB, 9 dB, 12 dB			-

(1) Compliant with the "Reference Transmitter requirement clause 88.8.5.1 from Std 802.3-2012.

(2) Automatic Bias Control is warranted from 5 Gb/s up to 28 Gb/s.

(3) The VER can be adjusted independently of the Stress applied with SI.

### Optional OBand DFB Laser Specifications

The reference transmitter ModBox is a high-quality instrument-grade device, which can be implemented by a CW laser modulated by a high-performance modulator. The ModBox embeds at least one 1310 nm laser, and can be upgraded up to the 4 lane wavelengths. The wavelength range for each lane is compliant with the IEEE 802.3-2012 standard.

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Wavelength	$\lambda$	5 nm wavelength gap	1295 nm, 1300 nm, 1305 nm, 1310 nm			-
		20 nm wavelength gap	1270 nm, 1290 nm, 1310 nm, 1330 nm			-
Laser type	-	-	DFB			-
Optical output power	-	1310 nm	10	-	-	mW
Spectrum linewidth	$\Delta\lambda$	CW	-	2	-	MHz
Optical return loss	ORL	-	30	35	-	dB
Side mode suppression ratio	SMSR	-	30	-	-	dB
Optical output power adjustment	$P_{CW}$	Adjustable from Smart and GUI	5	-	100	%
Wavelength laser tuning range	-	Adjustable from Smart and GUI	-	0.8	1	nm

### Optional O-Band Reference Photodetector Specifications

Parameter	Symbol	Condition	Min	Typ	Max	Unit
Photodetector type	-	-	PIN			
Operating wavelength range	$\lambda$	-	1270	-	1330	nm
Operating optical input	$P_{opt}$	Average	-20	-	13	dBm
3 dB cut-off frequency	$f_{3dB}$	-	45	50	-	GHz
Photodiode DC responsivity	R	Optimum polarisation	-	0.45	-	A/W
Maximum output voltage	$V_{peak}$	Peak voltage	-	-	1.5	V

### Absolute Maximum Ratings

Stresses in excess of the absolute maximum ratings can cause permanent damage to the device. These are absolute stress ratings only. Functional operation of the device is not implied at these or any other conditions in excess of those given in the operational sections of the data sheet. Exposure to absolute maximum ratings for extended periods can adversely affect device reliability.

Parameter	Symbol	Min	Max	Unit
Optical input power	$OP_{in}$	-	20	dBm
Data input power	$EP_{in}$	-	4	dBm
SI input power	$OP_{in}$	-	5	dBm

## Front Panel

Parameter	
Power	General main switch
LCD	Displays ModBox current status and allows the user to edit parameter in the ModBox menus
Keypad	Allows browsing and editing through the ModBox menus
System rotary knob	Allows browsing and editing through the ModBox menus
DIS / EN	Switch the laser status between enable and disable positions
1295nm / 1300nm / 1305nm / 1310nm	Laser output optical port
1270nm / 1290nm / 1310nm / 1330nm	
Mod In / Out	Laser modulation input and output ports
Filter In / Filter Out	RF filter input and output ports - 2.92 mm connector, 50 $\Omega$
SI In	Sinusoidal Interference (SI) input port - SMA connector, 50 $\Omega$



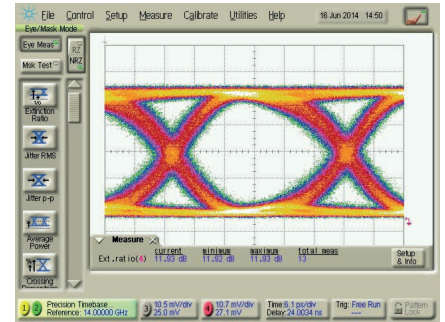
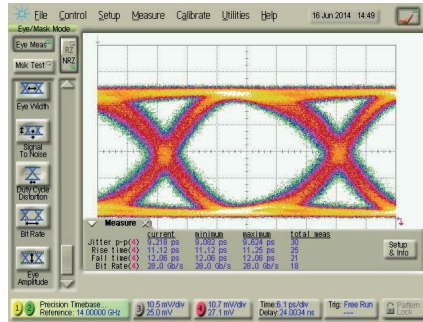
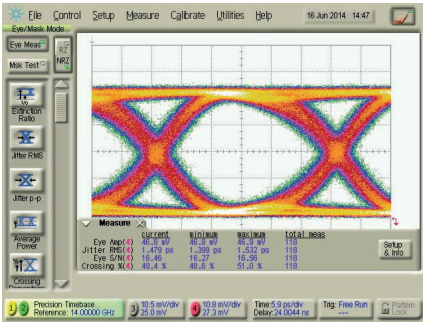
## Rear Panel

Parameter	
USB	This USB port allows system remote control through software
Mains power supply socket	Fuse socket accepts 5*20mm size (2A, quick action)
Ground	This port connects to the internal ground

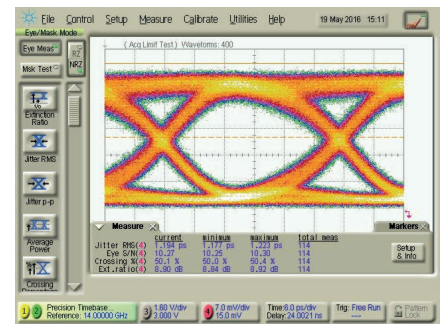
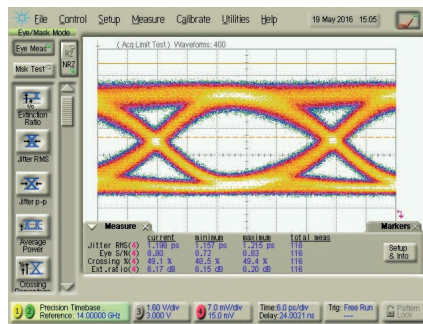
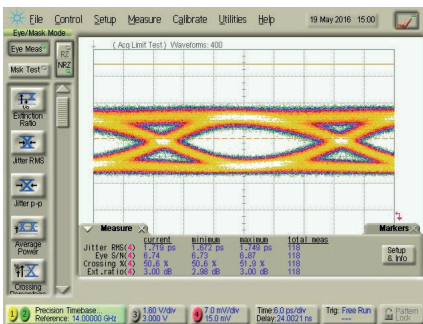
## Dimensions

Parameter	
Size	19 inches 3U
Weight	5 kg
Power supply	100 - 120 V / 220 - 240 V automatic switch, 50 - 60 Hz

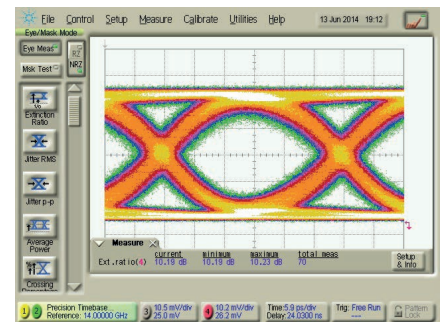
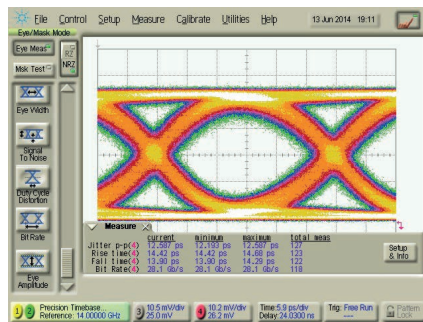
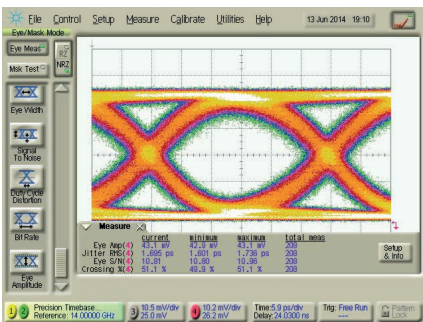
ModBox Output Signal - Unstressed Eye Diagram @ 28 Gb/s PRBS31



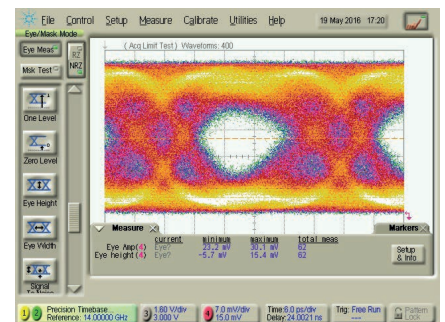
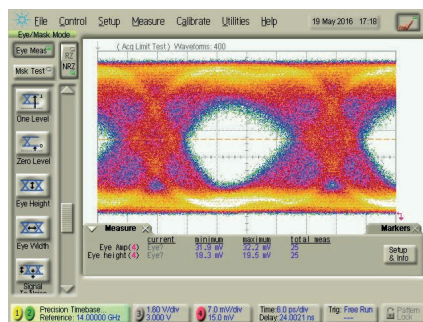
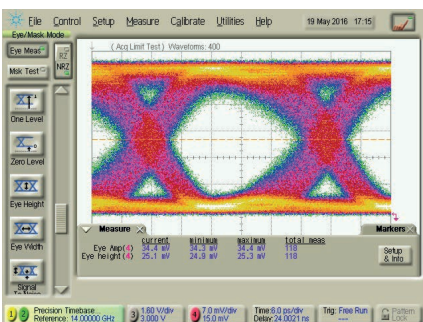
ModBox Output Signal - Unstressed Eye Diagram @ 28 Gb/s PRBS31



ModBox Output Signal - Eye Diagram with Bessel Thomson Filter - @ 28 Gb/s PRBS31



ModBox Output Signal - Eye Diagram with SI - @ 28 Gb/s PRBS31



## Related equipments

This section gives a very brief equipment setup. In order to create an optical stressed eye, the following set of instrumentation is used. When combined together, these instruments fulfill specific functions in the construction of a stressed eye as required for 100GBASE-ER4/LR4 IEEE P802.3ba receiver testing.

The ModBox adds impairments to the incoming data-stream coming from the Anritsu PRBS MP1800A generator for instance.

The impairments applied are:

- induced ISI (inter-symbol interference) by the external 4<sup>th</sup> order Bessel Thomson filter (@25.78125 Gb/s and provided with the ModBox),
- Sinusoidal amplitude interference (SI). The level of the SI is manually controlled. Sinusoidal signal (with fixed amplitude) is provided by the Anritsu MG3740A generator for instance.

The optical signal is either coming from ModBox internal DFB lasers set (5 nm or 20 nm 4 lanes laser gap).



## Ordering information

### ModBox-OBand-28Gb/s-NRZ-SE-ZZ

ModBox definition:

ZZ = Input / Output connectors, FA : FC/APC - FC : FC/UPC - SC : SC/UPC

### Opt-XX-YY-ZZ

DFB laser option:

XX = Wavelength in nm

ZZ = Input / Output connectors - FA : FC/APC - FC : FC/UPC - SC : SC/UPC

## About us

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