Eye-BERT Gen2
Users Manual

Overview:

The Eye-BERT Gen2 is a low cost, easy to use, stand-alone bit error rate tester offering high performance testing from 125Mbps to 4.25Gbps and from 9.9Gbps to 11.4Gbps in a single package. The Eye-BERT combines the capabilities of the Eye-BERT Micro and the Eye-BERT Micro 10G while adding electrical SMA interfaces and a color touch screen. The Eye-BERT accepts any MSA compatible SFP or SFP+ transceiver for optical bit error rate testing. Using the differential SMA inputs and outputs, electrical or mixed mode optical / electrical testing can be performed.

Warnings and Precautions:

- ❒ Do not exceed manufacturers recommended electrical or optical input power on any port
- ❒ Use only compatible fiber optical connectors and modules
- ❒ Use only the supplied 5VDC power supply
- ❒ Observe ESD precautions when handling
- ❒ Proper ventilation may be required depending on the environment and transceiver

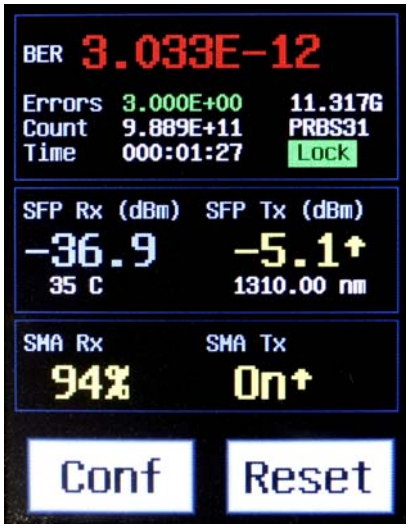
Connections

All data connections are located on the front of the unit and power, USB, Ethernet, and the reference clock are located on the rear of the unit. The table below describes each of these interfaces in detail.

Connection	Description
SFP+ Slot	An MSA compliant SFP or SFP+ transceiver can be inserted into this slot to produce the selected optical test pattern. The SFP receiver can be selected as the input source for bit error rate testing. If only electrical interfaces are required, the SFP is not required.
Electrical Outputs	A pair of 100Ω differential SMA connectors serve as the electrical data output port. The nominal differential amplitude is 900mVpp. This interface transmits the selected test pattern unless disabled. Note if this interface is used, both outputs should be terminated with 50Ω.

Connection	Description
Electrical Inputs	A pair of 100Ω differential SMA connectors serve as the electrical data input port. This interface can accept differential signals ranging from 50 to 1200mVpp. Note if this interface is used, both inputs should be terminated with 50Ω.
Power input	Connect to the supplied 5VDC adapter.
USB	Optional computer interface allowing remote control and monitoring using a terminal program or custom user supplied software.
Ethernet	Optional computer interface allowing remote control and monitoring using a terminal program or custom user supplied software.
Clock Output	A pair of 100Ω differential SMA connectors serve as the reference clock output port. The nominal differential amplitude is 750mVpp. This clock is synchronous with the transmitted data and is intended to be used for synchronization purposes only. Rise time and jitter characteristics of this output limit its use as an oscilloscope trigger at high bit rates. The table below shows the different clock rates for the various bit rate settings: Rate — Clock Frequency 125 to 155Mbps — Rate/1 200Mbps — Rate/1.6 622Mbps — Rate/4 1.062 to 1.250Gbps — Rate/10 2.125 to 2.667Gbps — Rate/16 4.25Gbps — Rate/32 9.9 to 11.4Gbps — Rate/64 Note if this interface is used, both outputs should be terminated with 50Ω.

Main Measurement Screen

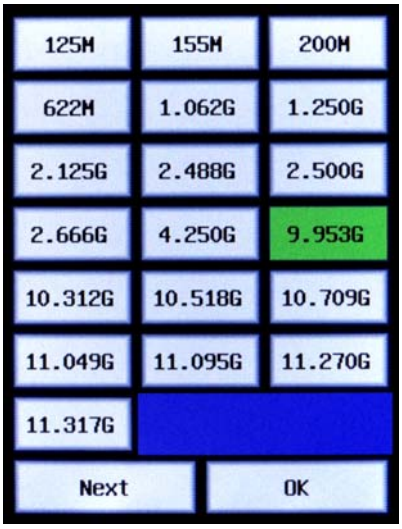


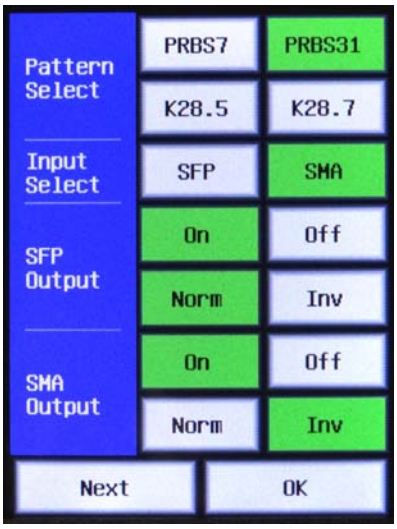
The Eye-BERT user interface consists of the main measurement screen and two configuration screens. The measurement screen is divided into three sections: the BERT area, the SFP/+ area, and the SMA/electrical area. All status and measurements are displayed on the main measurement screen; these are described in detail in the table below. Additionally there are two buttons near the bottom of the screen which are used to enter the configuration screens and reset all BERT counters.

BERT Area	Description
BER	Displays the current bit error rate. ❑ Green: No errors detected since the last reset ❑ Red: At least one error has been detected
Errors	The number of bits errors. ❑ Green: No errors detected within the last 100mS ❑ Red: At least one error has been detected within the last 100mS
Time	The total test time since the last reset (hours:minutes:seconds)
Bit Rate	Current data rate setting
Pattern	Current pattern setting
Lock / LOL	Displays the pattern detector/CDR status: ❑ "Lock" Green: CDR and pattern detector are locked ❑ "LOL" Red: CDR or pattern detector are not locked
SFP Area	**Description**
Rx Power	Displays the received optical power level as reported by the SFP / SFP+. The color indicates if the receiver has been selected as the BERT measurement interface. This field is displayed only when a transceiver is inserted. ❑ Yellow: Indicates the SFP receiver is the active interface ❑ Grey: Indicates the SFP receiver is not the active interface
Tx Power	Displays the transmitted optical power level as reported by the SFP / SFP+. The up/down arrow following the measurement indicates the output polarity. The color indicates if the transmitter has been enabled. This field is displayed only when a transceiver is inserted. ❑ Yellow: Indicates the SFP transmitter is active ❑ Grey: Indicates the SFP transmitter is not active
Temperature	Displays the SFP/SFP+ temperature
Wavelength	Displays the SFP/SFP+ transmitter wavelength
SMA Area	**Description**
SMA Rx	Displays the received electrical level as a percentage of full scale. The color indicates if this input has been selected as the BERT measurement interface. ❑ Yellow: Indicates the SMA input is the active interface ❑ Grey: Indicates the SMA input is not the active interface
SMA Tx	Displays the state of the electrical SMA output. The up/down arrow following the measurement indicates the output polarity. The color indicates if the output has been enabled. ❑ Yellow: Indicates the output is active ❑ Grey: Indicates the output is not active
Conf Button	Pressing this button displays the configuration screens as described in the following section
Reset Button	Pressing this button resets all BERT counters

Configuration Screens

Pressing the “Conf” button from the main screen displays one of the configuration screens shown below. To display a different configuration screen press the “Next” button.





Field	Description
Rate Selection	Use the buttons on this screen to select the desired bit rate.
Pattern Select	Select one of four test patterns.
Input Select	Selects the BERT input (optical SFP or electrical SMA)
SFP Output	Turns the SFP laser output on/off and selects whether or not to invert the output transmit data.
SMA Output	Turns the SMA output on/off and selects whether or not to invert the output transmit data.
Next	Displays the next configuration screen
OK	Used to return to the main measurement screen

USB and Ethernet ports

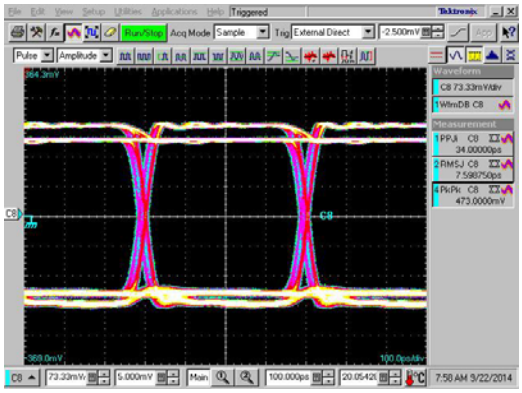
Remote / computer control of the Eye-BERT is possible via either USB or Ethernet ports. For more information on using these interfaces consult the “Eye-BERT Gen2 Software Programming Guide”.

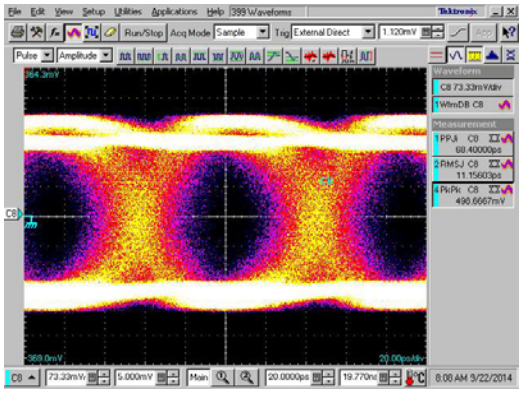
Using the Eye-BERT

With the unit plugged into the supplied power adapter, press the power button above the display to turn the unit on. After a short initialization period the splash screen displays the firmware revision. Touch the display anywhere to continue. When the measurement screen is displayed, configure the parameters as desired (described above).

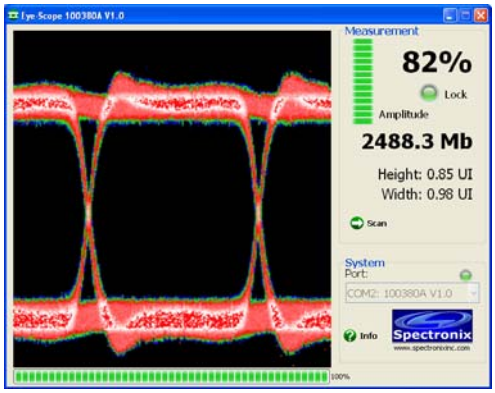
The PRBS BERT patterns are compatible with the Eye-BERT Micro and Eye-BERT Micro 10G which means that these devices can measure the BER of a signal generated by the Eye-BERT Gen2 and vise-versa. When using the Eye-BERT Micro 10G with the Eye-BERT Gen2, simply set both devices for the same rate and pattern. When using the Eye-BERT Micro with the Eye-BERT Gen2, first set both devices for the same rate and pattern, then switch the Eye-BERT Micro to "Repeat" mode.

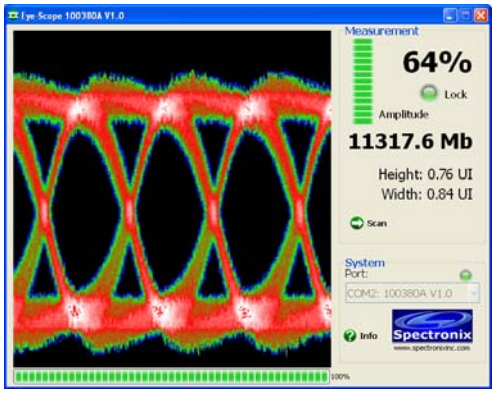
The reference clock output is synchronous with the transmitted data and is intended to be used for synchronization purposes only. Rise time and jitter characteristics of this output limit its usefulness as an oscilloscope trigger at high bit rates. The plots below show typical electrical eye diagrams at 2.488Gbps and 11.3Gbps using the reference clock as the oscilloscope trigger.





For eye measurements it is recommended using an eye scanning device with a built in CDR such as the Eye-Scope (Spectronix PN 100380A). The plots below show the same eye diagrams using the Eye-Scope with its internal CDR.





LETTER OF VOLOTILITY

The Eye-BERT Gen2 contains both volatile and non volatile memory. The Eye-BERT firmware application, settings, and network configuration are stored in non volatile memory and program variables and settings are stored in volatile RAM which is cleared upon power down. The user has no means of directly altering the non volatile memory without opening up the unit and reprogramming the device using a special programming adapter. Therefore there is no clearing procedure.