

BERTScope™ DCR_J

BERTScope DCR_J 11000A
Digital Communications Receiver
700-1650 nm Reference Receiver



- 10 Gb/s Reference Receiver for 10 GbE, OC-192/STM-64, and 10 G Fibre Channel
- SONET, SDH, OTN and 11.1Gb/s 802.3ae over G.709 Jitter Generation Analysis
- Optical and Electrical Standards'
 - SONET and SDH
 - 1 & 10 G Ethernet
 - Fibre Channel
- Optical and Electrical Spectral Jitter Analysis and Display
- BERTScope CR clock recovery functionality:
 - Continuous 150 Mb/s to 12.5 Gb/s data rate coverage
 - Independently adjustable, selfmeasuring loop BW and peaking.
 - Display of clock recovery's observed jitter transfer function.
- In combination with BERTScope S:
 - 10 Gb/s Transmitter Compliance Testing
 - Jitter Tolerance Test and Margin Analysis
 - Jitter Transfer Measurement

The Vision of a Scope, the Confidence of a BERT
And Clock Recovery you can Count on.

SYNTHESYS
RESEARCH, INC.

A Versatile Tool for Optical Component Test and Analysis

The BERTScope Digital Communications Receiver (DCRj) is a flexible multi-function instrument which complements the powerful signal integrity analysis capabilities of the BERTScope S. It is also designed to use stand alone or with other measurement instruments.

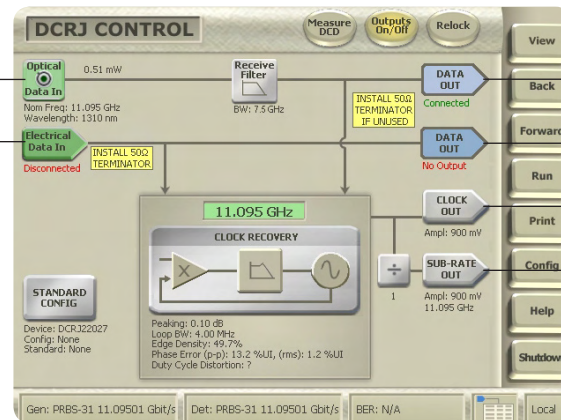
- The BERTScope DCRj's optical input is an integrated, calibrated, 10 Gb/s optical reference receiver for SONET OC-192, SDH STM-64, 10 G Ethernet, and 10 G Fibre Channel transmitter compliance testing.
- The DCRj performs telecom jitter generation (output jitter, intrinsic jitter) measurements for SONET, SDH, OTN, and 11.1 Gb/s 10 GBASE-R over G.709 on either optical or electrical data. Jitter tolerance and jitter transfer tests may be performed by combining the DCRj with the BERTScope S.
- It also measures duty cycle distortion (DCD) on either electrical or optical data. When connected to a BERTScope S, the DCD measurement augments the BERTScope's jitter peak analysis which gives fast, accurate, repeatable TJ measurement and MJSQ dual Dirac RJ-DJ jitter separation.

- The DCRj's final key function is 150 Mb/s to 12.5 Gb/s clock recovery from the optical or electrical data inputs. As with the BERTScope CR and CRj, the clock recovery has independently controlled PLL loop bandwidth and peaking enabling it to provide the "Golden PLL" response required for many test compliance transmitter and receiver test applications including Fibre Channel, XFP/XFI, SFP+/SFI, and OIF-CEI.



User selects either optical data input or single-ended electrical data input.

850, 1310, 1550nm Multimode 62.5 μm input
Single-ended electrical input for clock recovery



Electrical output with compliant reference response to connect to analyzer input

Electrical output

Clock output

Sub-rate clock output

The DCRj includes an amplified 10 Gb/s optical reference receiver, flexible standards' compliant clock recovery, and jitter generation measurements to 12.5 Gb/s, including new 11.1 Gb/s 10GbE LAN PHY.



The BERTScope DCRj provides both optical and single-ended electrical data interfaces. The BERTScope CRj, which offers the same versatile clock recovery and spectral jitter test and analysis, provides differential electrical data interfaces for exclusively electrical applications.

10 Gb/s Transmitter Compliance Testing for SONET, SDH, Fibre Channel, and 10 GbE

Transmitter Compliance Testing

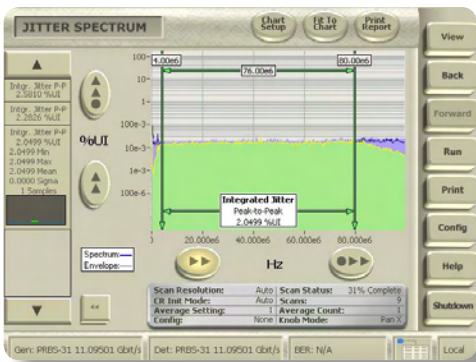
Combining the DCRj with a BERTScope S 12500B provides fast, repeatable 10 Gb/s transmitter compliance testing. Optional filters may be added to provide lower data rate reference receiver responses for transmitter compliance testing 1,2,4,8x FC, 1 GbE, SONET OC-48 and SDH STM-16.

Full Eye Diagram Measurements

Eye diagram analysis using BERTScope's fast and deep data acquisition is completed in six seconds and includes a full menu of key measurements such as rise and fall times, jitter, and extinction ratio.

Deep Mask Testing

Mask testing may be limited to shallow depths like conventional sampling scopes and completed in a second or masks may be tested to BER levels beyond 10^{-6} in a few seconds. Mask tests can also be swiftly evaluated vs BER contours to 10^{-12} levels to meet the requirements of some of the latest standards (e.g. XFP/XFI, SFP+).



Jitter insight

Comprehensive and Flexible

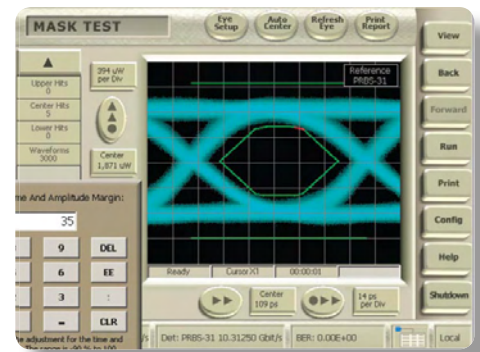
The DCRj's 62.5 μm multimode optical input enables measurements on single mode and multimode transmitters; the receiver has broad wavelength sensitivity with calibrated conversion gains for 850, 1310, and 1550 nm signals. The DCRj also provides average optical power measurements calibrated at 850, 1310, and 1550 nm wavelengths.

Complete Clock Recovery

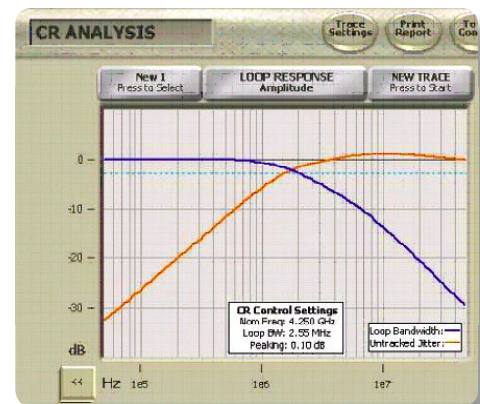
The DCRj provides standard's compliant clock recovery from either optical or electrical data and has the full capabilities of the BERTScope CR including standard and user settable PLL loop bandwidths and peaking as well as self measured and displayed PLL frequency response and observed jitter transfer function.

Jitter Insight

Jitter generation measurements are available at the push of a button for SONET OC-192 and OC-48; for SDH STM-64 and STM-16, and for OTN OTU 2 and OTU 1. The DCRj doesn't just report the jitter generation value; it also provides a display of the data's spectral jitter content allowing identification of the frequency and magnitude of any jitter peaks present.



Deep mask testing with margin adjustment



Complete clock recovery

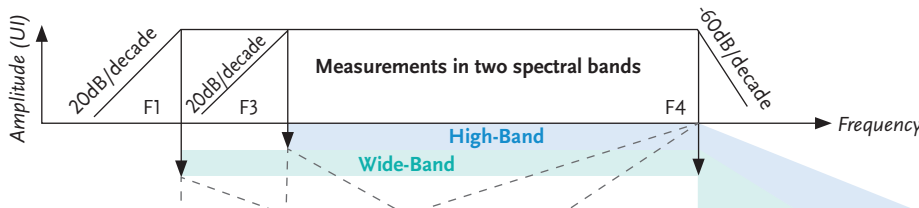
The detailed jitter display in this example is the high bandwidth (4 MHz to 80 MHz) jitter generation of an 11.095 Gb/s 802.3ae 10GbE LAN PHY rate. Note the sloped measurement bandwidth limits at 4 MHz and 80 MHz.

Related Literature <http://www.bertscope.com/Literature/>

- BERTScope CR Product Brief
- BERTScope CRj Product Brief
- BERTScope S Product Family Brochure
- BERTScope S Technical Specifications
- Optical Stressed Eye Technical Brief

- 10 Gb/s Optical Transmitter Testing
- Testing the High Speed Electrical Specifications of an XFP Transceiver
- Constructing a 10 GbE Optical Stressed Eye
- Constructing a 4xFC Optical Stressed Eye
- Stressed Eye: "Know what you're really testing with"

	Minimum	Typical	Maximum	Units
Optical Parameters				
Wavelength range	700		1650	nm
Conversion Gain (Calibrated Conversion Gains at 850 nm, 1310 nm, 1550 nm—1550nm provided with each unit)				
850nm		250		V/W
1310nm		450		V/W
Maximum Average Input Power			5.5	mW
Maximum Input Fiber Diameter			62.5	μm
Optical Return Loss	Better than -14			dB
Electrical Bandwidth (Meets 10 GbE and 10G SONET Reference Receiver frequency response tolerance limits.)		7.5		GHz
Jitter Spectrum Display Parameters				
Jitter Spectrum Frequency Range	0.0002		90	MHz
Minimum Frequency Resolution	200			Hz
Vertical (Amplitude) Scale				Log or Linear
Horizontal (Frequency) Scale				Log or Linear
Standard Jitter Measurements				
Duty Cycle Distortion (DCD) Measurement				
DCD measurement units				ps or %UI
DCD maximum			50	%UI
Telecom Standard Integrated Jitter Measurements See diagram and table below.				
Clock Recovery Function For Complete Specifications, see Clock Recovery Product Brief, SR-DS014.				
Clock Recovery Data Rate Input Range	0.15		12.5	Gb/s
Loop Bandwidth	0.1		12	MHz
Peaking Adjustment				
0.5 – 12 MHz Loop Bandwidths	0		6	dB
0.1 – 0.5 MHz Loop Bandwidths			0	dB
Electrical Data Insertion Loss	2	2.6	3	dB
Electrical Input Sensitivity	100			mV
Standard Settings: Required data rate for clock recovery, required loop bandwidth and peaking, jitter generation (integrated jitter) bandwidths and roll offs are automatically set by selecting from the standards list.	Included Standards: 1 & 10 G Ethernet, Xaui, 1, 2, 4, & 8 x Fibre Channel, OC-192, OC-48 SONET, STM-64, STM-16 SDH, 6 & 11 G OIF-CEI, 2.5 & 5 G PCI-E, 3 & 6 G SATA/SAS			



Standard	High-Pass 1 F1	High-Pass 2 F3 HBJ	Low-Pass F4	Standard	Wide Band Jitter F1 – F4	High Band Jitter F3 - F4
SONET – OC-192, 9.9532 Gb/s SDH – STM-64, 9.9532 Gb/s OTN – OTU-2, 10.709 Gb/s, and 10GbE LAN PHY, 11.095 Gb/s	20 kHz	4 MHz	80 MHz	OC-192 STM-64 OTU-2	0.3 UI 0.5 UI 0.3 UI	0.1 UI 0.1 UI 0.1 UI
SONET – OC-48, 2.48832 Gb/s SDH – STM-16, 2.48832 Gb/s OTN – OTU-1, 2.666 Gb/s	5 kHz	1 MHz	20 MHz	OC-48 STM-16 OTU-1	0.1 UI 0.5 UI 0.3 UI	– 0.1 UI 0.1 UI



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