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DIGITAL VARIABLE REFLECTOR

Features:

- High speed
- Wide reflectance range
- Low insertion loss
- High resolution
- Rugged and compact design
- Can be calibrated for dual wavelengths
- Wide wavelength range
- Wide range of connectors
- Polarization insensitive
- USB communications interface
- Low cost

Digital Variable Reflector

Applications:

- Bit error rate testing
- Troubleshooting receivers and other active fiber optic components
- Design of fiber optic transmitter/receiver circuitry

Product Description:

OZ Optics' Digital Variable Reflector enables the user to generate a known level of return loss to evaluate system response. The unit allows testing the return loss sensitivity of devices such as laser diodes, transmitters, isolators and so on. By generating a precise reflection level, system performance (bit error rate, noise levels, isolator performance) can be evaluated. Our built-in calibration table accurately defines intermediate degrees of reflection from 3 dB to as high as 55 dB for different wavelengths.

Digital reflectors are offered using either singlemode, multimode, or polarization maintaining (PM) fibers. In general, OZ Optics uses polarization maintaining fibers based on the PANDA fiber structure when building polarization maintaining components and patchcords. However OZ Optics can construct devices using other PM fiber structures. We do carry some alternative fiber types in stock, so please contact our sales department for availability. If necessary, we are willing to use customer supplied fibers to build devices.

For best results, the standard parts are designed to accept angled FC/APC connectors. Other connector types are possible with lower dynamic reflectance range.

The device can be controlled remotely via a USB interface. A universal AC/DC power supply is included with all units.

The Digital Variable Reflector can be provided with a custom built-in fused coupler which directs a fraction of the reflected light to a second optical connector on the unit. The user can use this signal for monitoring the reflected power, or determining the influence of reflected power on his device under test.

Contact OZ Optics for details.

Ordering Information for Standard Parts:

Bar Code	Part Number	Description
8154	DR-100-3A-1300/1550-9/125-S-60	Singlemode digital variable reflector with 55 dB dynamic range calibrated at 1300 nm and 1550 nm with angled FC receptacle.
9454	DR-100-3A-1550-9/125-S-60	Singlemode digital variable reflector with 55 dB dynamic range calibrated at 1550 nm with angled FC receptacle.
9107	DR-100-3A-980-6/125-S-40	Singlemode digital variable reflector with 40 dB dynamic range calibrated at 980 nm with angled FC receptacle.
2118	SMJ-3S3A-1300/1550-9/125-3-2	Patchcord, Super FC/PC to angled FC/APC, 9/125 µm singlemode 1300/1550 nm fiber, 3 mm OD PVC jacketed, 2 meters long.
10283	SMJ-3S3A-980-6/125-3-2	Patchcord, Super FC/PC to angled FC/APC, 6/125 µm singlemode 980 nm fiber, 3 mm OD PVC jacketed, 2 meters long.

Standard Product Specifications[1]:

Part Number	DR-100-3A-1550-9/125-S-60	DR-100-3A-1310/1550-9/125-S-60	DR-100-3A-980-6/125-S-40
Bar Code Number	9454	9454	9107
Calibrated Wavelength	1550 nm ± 20 nm	1310 nm and 1550 nm ± 20 nm	980 nm ± 20 nm
Fiber Type	Singlemode Fiber (9/125 µm)	Fiber (9/125 µm)	Singlemode Fiber (6/125 µm)
Reflectance Range[3]	3 dB to 55 dB		4 dB to 40 dB
Reflectance Accuracy[4]	± 0.3 dB for 3 dB up to 40 dB		± 0.3 dB for 4 dB up to 40 dB
	± 0.5 dB for 40 dB to 50 dB		± 0.5 dB for 25 dB to 35 dB
	± 1 dB for 50 dB to 55 dB		± 1 dB for 35 dB to 40 dB
PDL	0.05 dB		0.08 dB
Repeatability[3]	± 0.03 dB for 3 dB to 10 dB		
	± 0.1 5 dB for 10 dB to 40 dB		
Response Time 3 dB change	0.1 sec (typical). Time depends on reflectance level		
Optical Power Level	500 mW maximum continuous exposure – Singlemode fiber 50 mW maximum continuous exposure – Multimode fiber For power levels above 50 mW for multimode fiber or 500 mW for singlemode fiber, please contact OZ Optics.		
Resolution	0.01 dB for 1 dB to 10 dB		
	0.1 dB for 10 dB to 40 dB		
Insertion Loss[2]	<3.0 dB		< 4.0 dB
Connector Interface	FC/APC		
Communications Port	USB		
Input Voltage	Universal 110/220V AC/DC adapter)		
Dimensions (with boot)	60 x 90 x 190 mm (2.4”x 3.5” x 7.5”)		
Weight	450 gr (1 lb.)		
Operating Temperature	-10 to 40 °C		
Storage Temperature	-30 to 80 °C		
Relative Humidity	< 90% RH non condensing		
Certifications	**Standard**	**Description**	
	CSA-C22.2 NO. 61010-1-12	Safety requirements for electrical equipment for measurement, control, and laboratory use - Part 1: General requirements - Third Edition; Update No. 1: July 2015; Update No. 2: April 2016	
	UL 61010-1	UL Standard for Safety Electrical Equipment For Measurement, Control, and Laboratory Use; Part 1: General Requirements - Third Edition; Including Revisions through July 15, 2015	
	CE	Certifies the product meets all EU health, safety and environment requirements including the latest RoHS & REACH compliance, which ensures consumer safety	

[1] All specifications are tested at 23°C ± 2°C.
[2] Excludes the connector loss.
[3] The minimum reflectance depends on the connector end being used.
[4] Measured with FP laser diode source after 30 minutes warm-up using a singlemode jumper with angled connector.

Ordering Examples for Standard Parts:

A European laser diode manufacturer wants to automate a test system via a USB interface. He wants to test the effect of backreflection on the output spectrum of his 1550 nm laser diodes. He needs to order these following parts:

Bar Code	Part Number	Description
8154	DR-100-3A-1300/1550-9/125-S-60	Singlemode digital variable reflector with 55 dB dynamic range calibrated at 1300 nm and 1550 nm with angled FC receptacle.
11303	FUSED-12-1300/1550-9/125-50/50-3A3A3A-3-0.5	Fused Fiber Coupler, 50/50 split 1x2, 9/125 um singlemode 1300/1550 nm fiber, 0.5 meter long 3 mm OD PVC jacketed leads with angled FC/PC connectors

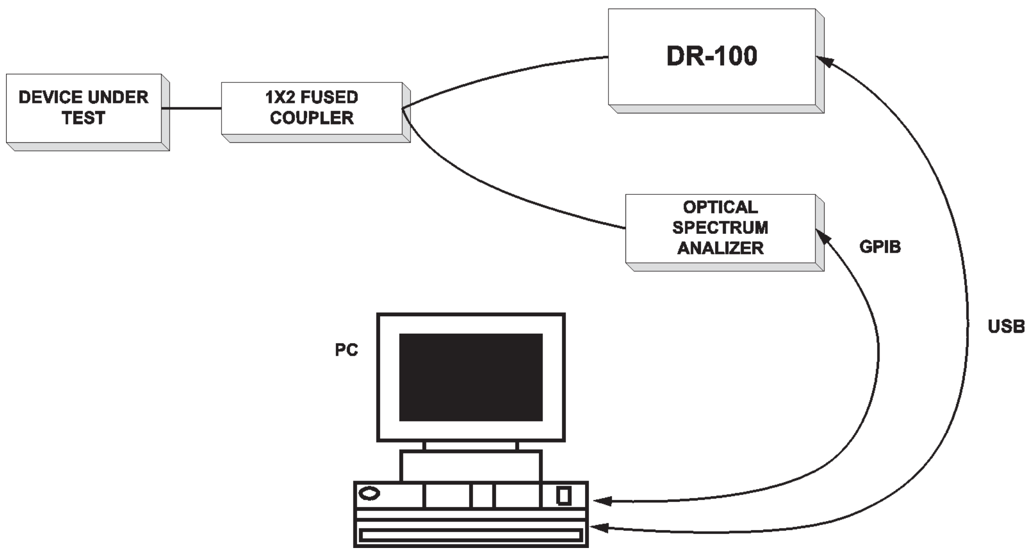

Figure 1: Setup for testing the effect of backreflection on the spectrum of a laser diode.

Ordering Information for Custom Parts:

OZ Optics welcomes the opportunity to provide custom designed products to meet your application needs. As with most manufacturers, customized products do take additional effort so please expect some differences in the pricing compared to our standard parts list. In particular, we will need additional time to prepare a comprehensive quotation, and lead times will be longer than normal. In most cases non-recurring engineering (NRE) charges, lot charges, and a 5 piece minimum order will be necessary. These points will be carefully explained in your quotation, so your decision will be as well-informed as possible. We strongly recommend buying our standard products.

Questionnaire for Custom Parts:

1. What is the application?
2. What wavelengths do you plan on using?
3. What are the return loss requirements?
4. What fiber type are you using?
5. What connector receptacle type do you need?
6. What power level do you need to handle?
7. Do you need to control the unit by a computer? If so, what type of interface?

Digital Variable Reflector: ***DR-100-X-W-a/b-F-LB***

XY = Connector Code:
- 3S= Super NTT-FC/PC
- 3U= Ultra NTT-FC/PC receptacle
- 3A= Angled NTT-FC/PC
- SC= SC
- SCA= Angled SC
- 8= AT&T-ST

W = Wavelength in nm:
980, 1310, 1480,1550 and 1625

a/b = Fiber core/cladding size, in microns.

F = Fiber type:
- M= Multimode
- S= Singlemode
- P= Polarization maintaining (PM) fiber

LB = Backreflection range:
40 or 60 dB for singlemode or PM fibers
60 dB backreflection is available for 1310 nm up to 1625 nm singlemode only with FC/APC connectors
35 dB for multimode fibers

Ordering Examples for Custom Parts:

A customer would like to emulate the anticipated backreflection from different types of devices by using a variable reflector. If his system is operating at a wavelength of 980 nm and he is using an SCA connector, then he could order the following part to perform the required testing:

Bar Code	Part Number	Description
N/A	DR-100-SCA-980-6/125-S-40	Singlemode Digital Variable Reflector with 40 dB dynamic range calibrated at 980 nm with angled SC connector.

Frequently Asked Questions (FAQs):

Q: What is a variable reflector used for?
A: A variable reflector is useful for emulating the reflectance that normally occurs from all optical interfaces within fiber optic systems. This allows a designer to test a prototype quickly and easily to determine if its operation will be adversely affected by unexpected backreflection.

Q: Can it be used at wavelengths for which it is not calibrated?
A: Sometimes. Since the wavelength response of the Digital Variable Reflector is fairly flat, it can be used at other wavelengths without noticeable degradation, if the wavelength is within a few tens of nanometers of the calibrated values. If the wavelength is significantly different than the calibrated value, then the insertion losses will increase and the overall backreflection will deviate somewhat from the displayed value.

Q: How do I get the unit calibrated?
A: OZ Optics recommends that the unit be returned to the factory annually for calibration.

Q: Why is the power rating for a multimode unit different than that of a singlemode unit?
A: Singlemode units use a beam blocking technique that can handle significant power levels. Multimode units use a variable neutral density filter. The power handling of the multimode unit is limited by the power handling capabilities of the filter.

Q: Why do singlemode devices use a different technique than multimode units?
A: With singlemode units, the beam blocking technique is simple, repeatable, and cost effective. With multimode units, the fiber can support many different modes. These mode patterns tend to be susceptible to any changes in the fiber due to applied stresses or temperature variations. The beam blocking technique does not work well in such situations because it will not block all possible modes equally. Hence, a variable filter is used instead.

Application Notes:

If a coherent light source is used in an application where a variable reflector will also be used, then the user may observe the effects of constructive or destructive interference as the reflected light returns to the source. This may cause instabilities in the source or measurements that might or might not be a problem in a "real" application. There are a couple of ways of getting around this problem:

1. If possible, replace the source with a non-coherent source. LED sources are relatively non-coherent and may be used successfully in some situations, although their power output is generally less than that of a laser.
2. By inserting a spool of fiber between the system under test and the variable reflector, the coherence of the light will be greatly diminished.
3. Use a source with a built-in isolator to block any reflections before they reach the source.