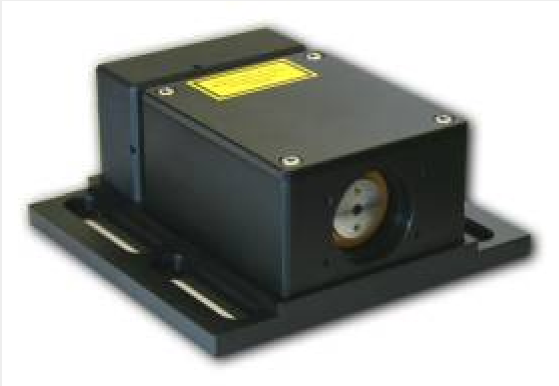
DBR Laser Module



D2-100-DBR DBR Laser

Model No. D2-100-DBR

Document Revision: 2

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Please read Limited Warranty and General Warnings and Cautions prior to operating the D2-100-DBR.

Description

The DBR laser module is comprised of a distributed feedback (DBR) laser diode in a precision temperature-controlled housing with beam conditioning optics and an optical isolator. DBR laser diodes are fabricated with the feedback grating patterned directly over the gain section of the diode. They are highly immune to vibrations and by virtue of a very short cavity (~ 1 mm), they can be current tuned over more than 50 GHz. The result is a robust laser capable of very fast servo control for easy locking to atomic transitions. The module contains no moving parts or piezo-electrics and is therefore inherently robust and rugged.

DBR lasers have 2-3 times larger temperature and current tuning coefficients as compared to external-cavity diode lasers. Vescent carefully controls these parameters with two stages of temperature control and a precision low-noise current controller with fast servo input.

The DBR laser is collimated by a 0.68 NA lens mounted to a movable plate for pointing adjustments. The module also comes with a 35 dB optical isolator and a pair of anamorphic prisms. (Note that prior to fiber coupling we recommend a second stage of isolation.)

The temperature controllers use an 8-pin circular connector on the back of the DBR subassembly (see table 2 for identity of connectors). The injection current connection to the laser diode is through an SMA connector also on the back of the DBR subassembly.

The DBR laser chip is contained in a thermal package allowing temperature control between 15° to 30° C. Vescent can replace the package if it exceeds its lifetime.

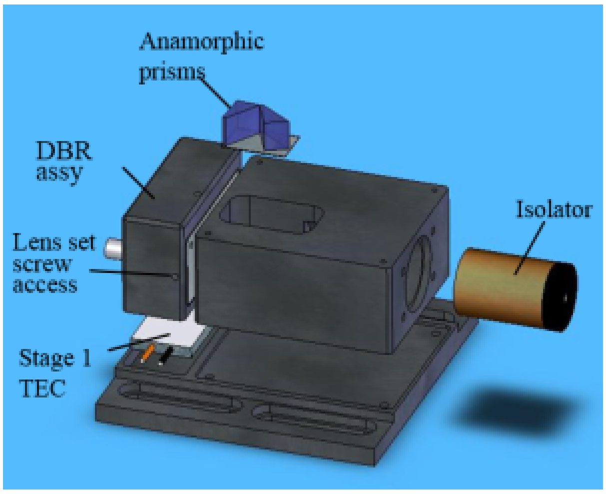

Fig. 1: The DBR Laser Module

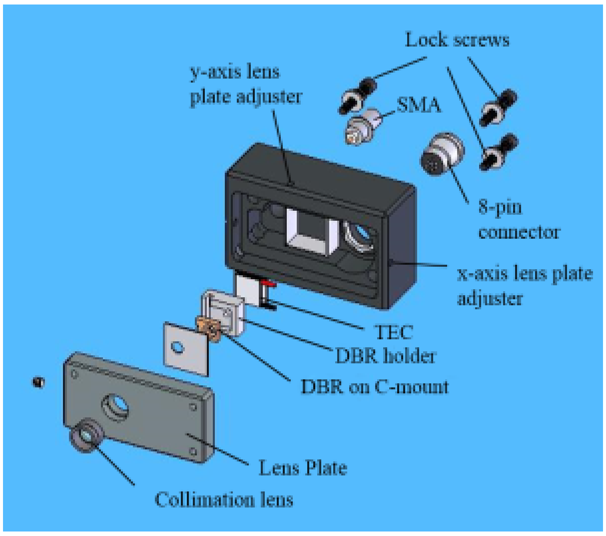

Fig. 2: Exploded view of the DBR subassembly

Purchase Includes

- D2-100 DBR Laser

Absolute Maximum Ratings

Note: All modules designed to be operated in laboratory environment

Parameter	Rating
Environmental Temperature	>15°C and <30°C
Environmental Humidity	<60%
Environmental Dew Points	<15°C
Stage 2 Temperature of DBR Laser Diode	>15°C and <40°C
Laser Diode Current	See datasheet included with your laser.

Specifications

	Min.	Typical	Max.	Units
Wavelength	767, 770, 780, 795, 852, 895, 1064, or 1083[1]	nm		
Output power	30	40	50	mW
Beam diameter	0.8	1.1	1.7	mm ($1/e^2$ dia.)
Polarization	Horizontal			
Optical isolation		35		dB
Operating current		150	180	mA
Threshold Current	40	50	70	mA
Temperature range **Stage 1, housing** **Stage 2, laser**	15 0	20 15	40 50 [2]	°C
Temperature stability	See Laser Controller			
Safety Class	3B			
Beam height	0.95	inches		
Total package Size (L x W x H)	3.75 x 4 x 2	inches		

Inputs, Outputs, and Controls

Vertical and horizontal pointing

The vertical and horizontal alignment of the laser system is factory set and should not need adjustment. However, if your specific application requires it or the system is misaligned, the DBR subassembly has adjustments to steer the beam for alignment to the spectroscopy module or other modules. The beam pointing is adjusted by loosening the three lock screws ½ turn past the crack point and adjusting the x and y positioning set screws on the top and left side (facing out along the laser beam) of the module (see figure ##). For more detailed instructions, see the alignment section.

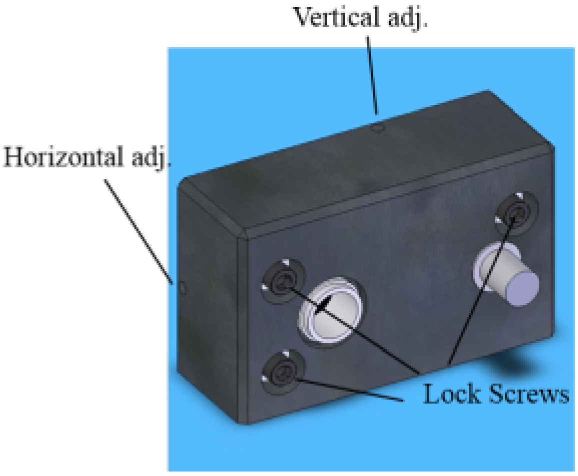

Fig. ##: Lock screws and beam pointing controls

Beam Conditioning

The collimation of the output beam is set at the factory and should not be adjusted unless absolutely necessary. Remove the isolator subassembly from the baseplate with the 4 screws accessible from the bottom. The collimation can be adjusted by turning the lens. A spanner wrench can be inserted into the two holes on the side of the black lens holder to adjust the lens.

Laser diodes all have astigmatism, which means the horizontal and vertical axis have different foci. Vescent uses a powerful asphere with a short focal length and an anamorphic prism pair to create a small diameter circular beam. This reduces the costs of the isolator and other downstream modules by reducing the clear aperture requirements. While the aspheres and anamorphic prisms produce a circular beam, astigmatism dictates that a single lens will not simultaneously collimate both orthogonal axes of the beam with the result that in the far field the beam is again elliptical.

The far-field pattern is the most important for ascertaining the quality of the diode output. The near-field pattern often shows stray light from the diode waveguide and ASE that doesn't propagate as part of the primary beam. However, aberrations and beam clipping due to an insufficient lens NA will show up as fringes-on the far field pattern. Vescent has taken care in the design of the DBR laser module to keep aberrations and clipping to a minimum, resulting in a clean beam in the far field.

Cable Connector

The connections to the TECs and thermisters are made to an 8-pin Hirose connector (see table 2 for identity of connectors). The pin definitions are:

Pin	Signal
1	TEC1+
2	TEC1-
3	Rth-1
4	Rth1-RTN
5	TEC2+
6	TEC2-
7	Rth2
8	Rth2-RTN

Connector Location	Connector (Hirose Part Number)
D2-105 Bulkhead	HR25-7TR-8SA
Cable Connection to D2-105	HR25-7TP-8P
Cable Connection to D2-100	HR25-7TP-8S
D2-100 Bulkhead	HR25-7TR-8PA

Tab. 2: Connectors used in Temperature Control Cabling

NOTE: Earlier models use a push-pull connector for the 8-pin connector to the DBR module. To remove take care to apply opposition forces with the thumb and forefinger knuckles against the housing. Excessive force could displace the output beam and require realignment.

Laser Current (SMA)

Current is provided to the DBR chip through an SMA connector. The central conductor of the SMA connects to the laser anode, and the shield connects to the laser cathode. *This is a direct, unprotected connection to the DBR chip, so care must be taken to avoid ESD damage.*

Aligning the DBR Laser Module

The module should not need adjustments, but if necessary the following procedure can be used to fine tune the beam positioning.

1. Loosen the three locking screws on the back of the DBR module ½ turn past the crack point.
2. With a 0.050" Allen driver, adjust the vertical adjustment setscrew on the top of the DBR housing to level the beam.
3. Adjust the horizontal adjustment 4-40 set screw on the left side of the DBR housing (See figure ##).
4. Alternatively, use the spectroscopy module as a beam target. Place the spectroscopy module as far down the table as possible, bolt it down, and center the beam to the input hole.
5. Gently retighten the three locking screws.

1)
Contact factory for other wavelengths
2)
Operation above 40° C can reduce the lifetime of the laser diode