

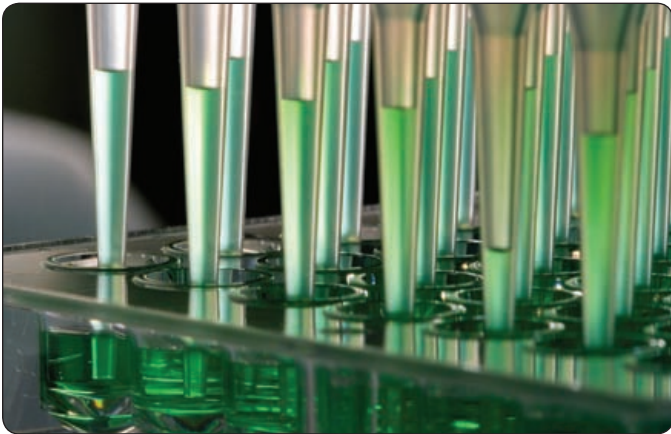
# BioRay FR

## Multimode Fiber-Ready Laser

Bioinstrumentation laser sources currently provide core capabilities for a wide range of applications, for example: DNA research, new drug development, fluid evaluation, biological maintenance activities as well as many others.

The Coherent BioRay FR (Fiber-Ready) products provide unmatched performance, reliability and repeatability, enabling unparalleled expansion of bioinstrumentation lasers into other applications and markets. The Coherent BioRay FR products are a stable, cost-effective line of diode lasers that include the following:

- Pre-aligned SMA 905 mm fiber adapter
- Self-contained power supply and drive electronics
- Closed-loop independent power feedback and on-board modulation
- Communications and self-monitoring electronics



**Superior Reliability & Performance**

### **BioRay FR Features:**

- **405 nm to 640 nm**
- **Power up to 35 mW Ex-fiber**
- **Analog modulation**
- **Microprocessor controlled**
- **Advanced service monitor**
- **RS-232 controllable with GUI interface**
- **Auto scaling input power 5 to 24 VDC**
- **ESD, Over Temp, Reverse Polarity**

### **BioRay FR Applications:**

- **Genetic Sequencing**
- **PCR**
- **High Throughput Drug Screening**
- **Hematology**
- **Medical Diagnostics**
- **Micro Array Scanners**
- **Flow Cytometry**

# BioRay FR

## Multimode Fiber-Ready Laser

### System Specifications

	BioRay FR-405	BioRay FR-450	BioRay FR-488	BioRay FR-520	BioRay FR-640
Wavelength <sup>1</sup> (nm)	405	450	488	520	640
Wavelength Tolerance (±nm)	±3	±5	±2	±5	±3
Wavelength Drift (nm/°C)	0.06	0.06	0.03	0.06	0.20
Spatial Mode	TEM <sub>00</sub>				
Fiber Connector	SMA 905				
RMS Noise (%) (20 Hz to 20 MHz)	<0.5				
Peak-to-Peak Noise (%) (20 Hz to 20 MHz)	<1				
Long-term Power Stability (%) (8 hrs., ±3°C)	<2				
Warm-up Time (minutes) (from Cold Start)	<15				
Laser Drive Modes	Analog				
Analog Modulation					
Maximum Bandwidth (KHz)	500 (Constant Power)				
Rise Time (10% to 90%) (nsec)	<500				
Fall Time (90% to 10%) (nsec)	<500				
Modulation Depth (%)	100				
Linear Range (VDC)	0.5 to 5.0 to 4.5				
Operating Voltage (VDC)	5 to 24				
Operating Current (mA) (Max. at 25°C)	100	160	85	200	160
Laser Connector <sup>2</sup>	Hirose HR-10P-12S				
Slow Start Delay <sup>3</sup> (sec.)	5				
Input Impedance (kOhm)	1.5				
ESD Protection	Level 4				
Heat Dissipation of Laser Head (W) (Max.)	5				
Ambient Temperature					
Operating Condition (°C)	15 to 40				
Non-operating Condition (°C)	-20 to 60				
Shock Tolerance (g) (6 ms)	30				

<sup>1</sup> Center Wavelength at 25°C.

<sup>2</sup> Flying lead for OEM configuration.

<sup>3</sup> If enabled.

### Coupling Efficiencies<sup>1</sup>

Typical coupling efficiencies that can be obtained with a step index core fiber, 0.22 NA, SMA/SMA, 1 meter (Coherent part number 1278782):

$$CE (\%) = \frac{P_{\text{fiber}}}{P_{\text{laser}}} \times 100$$

	BioRay FR-405	BioRay FR-450	BioRay FR-488	BioRay FR-520	BioRay FR-640
Wavelength (nm)	405	450	488	520	640
Output Power (mW)	50	50	20	50	40
Typical Output Power <sup>2</sup> (ex-fiber, mW)	35	35	15	35	30
Coupling Efficiencies (%)	72 to 75	72 to 75	75 to 78	77 to 80	80 to 83
Numerical Aperture <sup>3</sup> (NA) (1/e <sup>2</sup> )	0.22				
Minimum Core Diameter (µm)	50				

<sup>1</sup> These coupling efficiencies are not guaranteed and should only be used as guidelines.

<sup>2</sup> Delivered power.

<sup>3</sup> Typical value.

# BioRay FR

## Multimode Fiber-Ready Laser

### Mechanical Specifications

Weight (g)	<80
Foot Print (L x W x H)	95 x 40 x 26 mm (3.7 x 1.6 x 1.0 in.)
Material	Black anodized AL 6061 T1

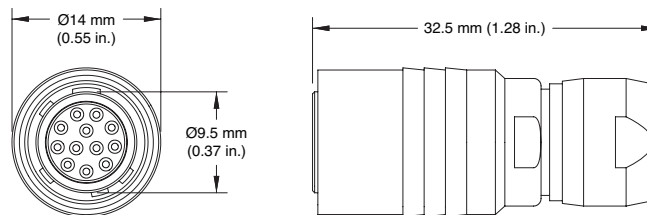
### RS-232 Commands<sup>1</sup>

Commands	Description
CDRH	Enables/Disables CDRH Delay
BAUD	Set Baud Rate
HAND	Enables/Disables SCPI Handshaking
HOUR	Reports System Lasing Hours
MOD	Reports Laser Model
PNUM	Reports Part Number
SNUM	Reports Serial Number
USER	Stores User Defined Identification
POW:LEV	Reports Diode Laser Power
DIOD	Reports Diode Temperature
INT	Reports Internal Temperature
HIGH	Reports Diode High Temperature Set
STAT	Reports System Status

### Pinout

Color	Description	Pin (optional Hirose connector)
Red	V <sub>in</sub>	9
Black	V <sub>in</sub> Gnd	1
Green	Fault	10
White	RS232 Recv	4
White/Black	RS232 Gnd	5
Orange	RS232 Trans	6
Blue	V <sub>mod</sub>	2
Red/Black	V <sub>mod</sub> Gnd	3

<sup>1</sup> See Users manual for full Host command set.



# BioRay FR

## Multimode Fiber-Ready Laser

### Fault Conditions

Built-in microcontroller probes most critical parameters of the circuit with ADCs such as:

- Temperature
- Photodiode output voltage
- Laser diode voltage
- Laser diode current
- Value of inverted and non-inverted modulating signal in case of StingRay-AM product options.

Based on the results of the parameter measurement microcontroller can detect following fault conditions

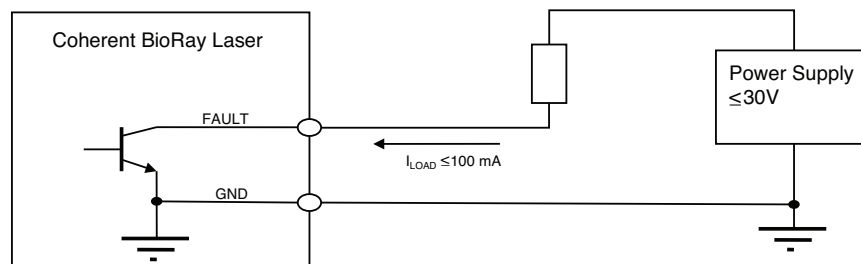
- Over temperature
- Circuit malfunction
- Absence of the input modulating signal
- Critical drop of laser diode output power due to aging

### Fault Output Circuit

Fault output is an open collector of the transistor that allows wire junction OR functionality with fault signals from other devices. The output can tolerate voltage up to 30V and can drain the current up to 100 mA. The circuit is protected from over current by recoverable fuse.

The load should be connected between the voltage source and the open collector output as shown Figure 1.

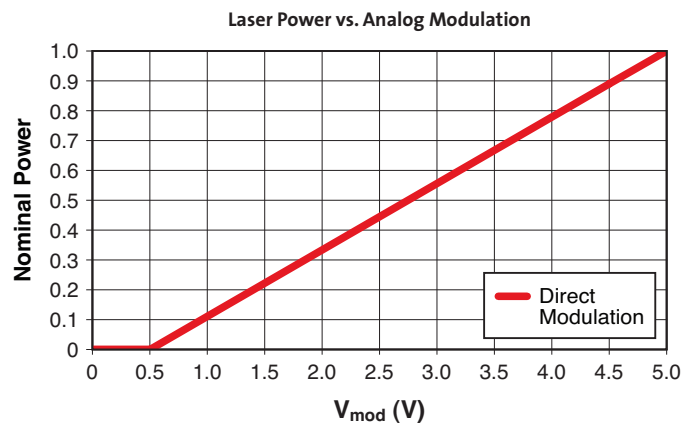
Figure 1



### Modulation<sup>1</sup> Timing

Modulation	Fmax	Direct (VDC)
Analog	500 KHz	0 to 0.5
		OFF
		0.5 to 5
		Linear Region

<sup>1</sup> Lasers must have load applied to the modulation for proper operation.

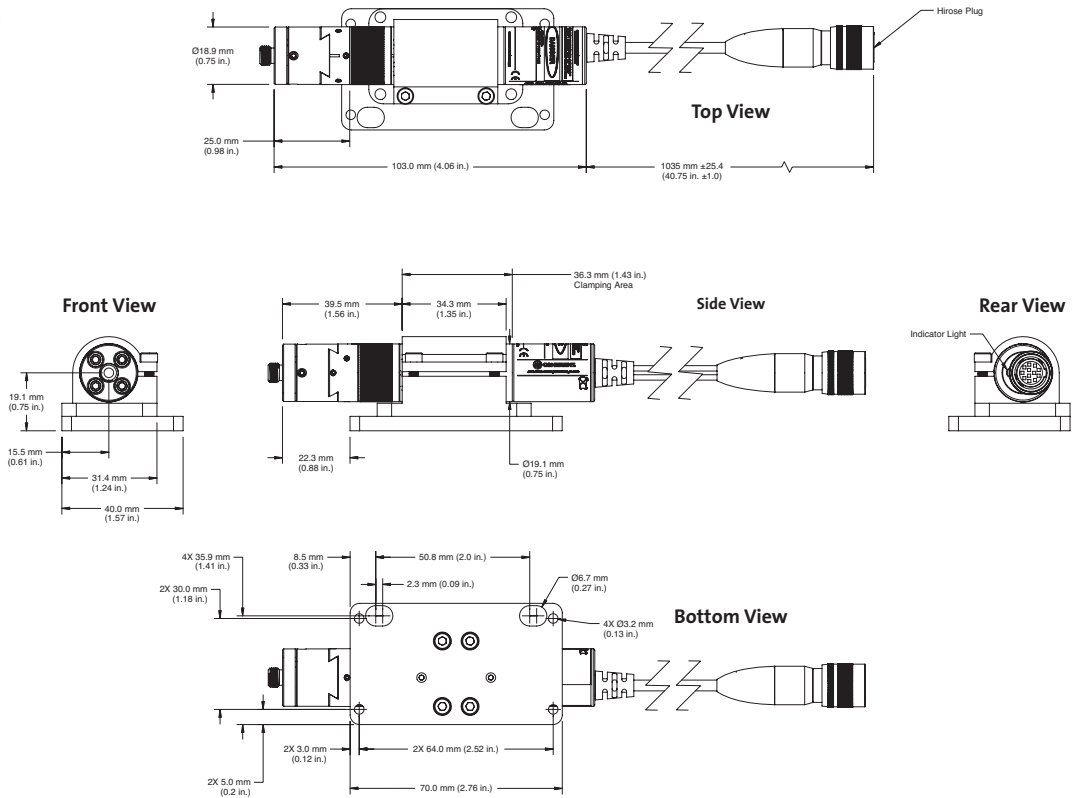


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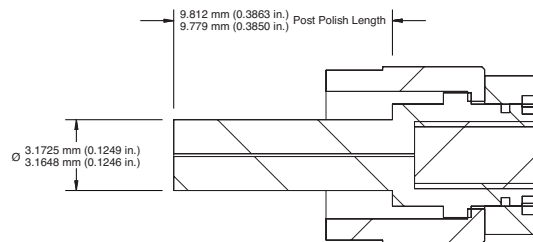
Multimode Fiber-Ready Laser

## Mechanical Specifications

### BioRay FR



### BioRay FR SMA 905 Connector



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Coherent follows a policy of continuous product improvement. Specifications are subject to change without notice.

Coherent's scientific and industrial lasers are certified to comply with the Federal Regulations (21 CFR Subchapter J) as administered by the Center for Devices and Radiological Health on all systems ordered for shipment after August 2, 1976.

Coherent offers a limited warranty for all BioRay FR lasers. For full details of this warranty coverage, please refer to the Service section at [www.Coherent.com](http://www.Coherent.com) or contact your local Sales or Service Representative.

