



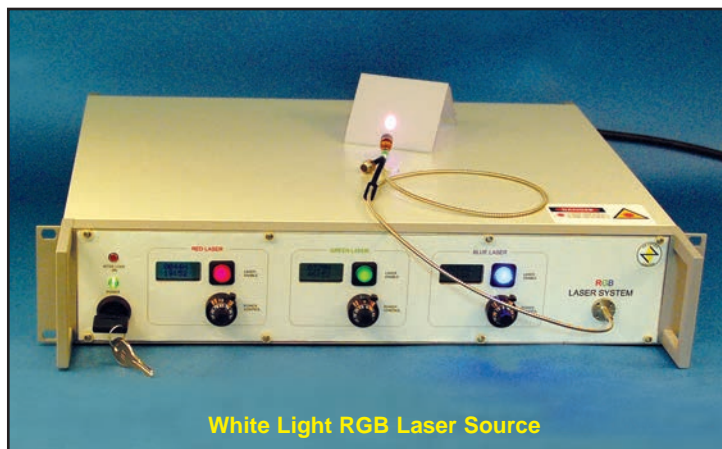
WHITE LIGHT (RGB: RED/GREEN/BLUE) LASER SOURCES

Features:

- A variety of wavelengths and power levels available
- Low noise, stable output.
- Independent analog control of individual laser powers
- Singlemode, multimode and polarization maintaining fiber versions.
- High power versions
- Digital display of elapsed laser working hours
- Interlock-enabled safety shutter
- Color coded LED power ON/OFF indicators

Applications:

- White light displays
- Confocal microscopy
- Laser spectroscopy
- Fluorescence microscopy
- Color Holography
- Flow cytometry



White Light RGB Laser Source

Product Description:

A common application today is the combination of visible laser light of different wavelengths into a single fiber. Such systems are used in a variety of applications where one wants to produce full color images. By combining red, green and blue light and varying the intensities of the signals, one can reproduce practically any color desired. For example, one of the most common emerging requirements is for a white light laser source.

OZ Optics line of RGB (Red/Green/Blue) white light lasers provide a complete method to deliver full color laser light from a singlemode or polarization maintaining fiber. The RGB laser combines light from three different wavelengths - red, green, and blue in nature - to generate output light that is white in appearance from a single fiber. By varying the relative intensities of the individual colors, one can generate a spectrum of colors.

The RGB laser achieves this functionality by combining the strengths of our OZ-2000 turnkey laser sources with our line of wave division multiplexers. The sources are temperature stabilized fiber coupled laser diode sources. The sources are stabilized to within 0.1°C over an environmental temperature range of 15°C to 45°C. This maintains

wavelength variations to better than 0.1nm, and reduces the tendency of the sources to mode hop. As an optional feature, each source can be electrically controlled using separate 0 to 5 volt control voltages, allowing each source to be modulated at low frequencies. The red and blue lasers can be configured to allow modulation up to 100 kHz. Special versions can be modulated at frequencies up to 50MHz, under special request. This is ideal for generating full color displays.

The wave division multiplexer combines the light from the three sources into a singlemode or polarization maintaining fiber. The fiber is protected with a rugged, flexible, stainless steel armored cable. The light from the output fiber can be collimated using an optional achromatic collimator to give near ideal gaussian beams ranging from 0.6mm to 10mm in diameter. Alternatively achromatic focusers can be supplied to focus the light to spots only a few microns in diameter. Refer to our data sheets titled *Collimators and Focusers-Receptacle Style* and *Collimators and Focusers-Pigtail Style*.

In addition to complete RGB laser sources, OZ optics offers separate sources, wave division multiplexers, and collimator and focusers. For detailed information on these items, please refer to our detailed product data sheets *Wavelength Division Multiplexers*, and *Turnkey, Ultra Stable Laser Diode Sources - OZ-1000 & OZ-2000 series*.

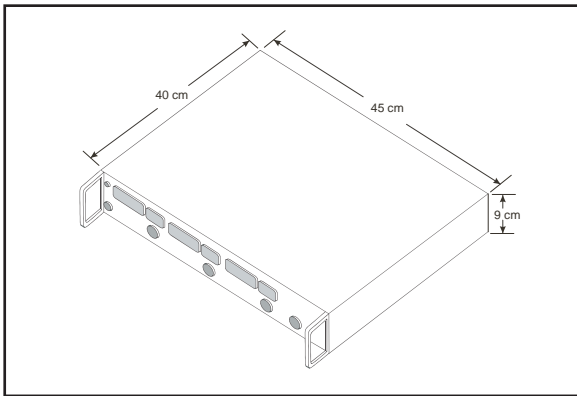


Figure 1: RGB System Dimensions

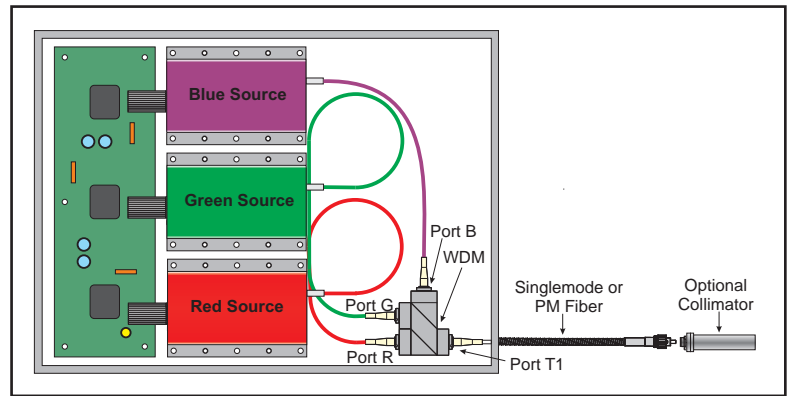


Figure 2: RGB System Layout, With Optional Collimator

Standard RGB Specifications:

| Channel | Blue | | | | Green | Red | |
|---|--|------|-----|-----|-------|------------------------------|---------|
| | 405 | 440 | 473 | 488 | | 635-644 | 650-660 |
| Available Wavelengths ¹ (nm) | 405 | 440 | 473 | 488 | 532 | 635-644 | 650-660 |
| Output power from fiber (mW) ² | 0-15 | 0-15 | 0-5 | 0-5 | 0-20 | 0-20 | 0-20 |
| Long term power Stability ³ | Typically <5% peak-to-peak | | | | | Typically <2% peak-to-peak | |
| Short Term Power Stability ³ | Typically <0.5% peak-to-peak | | | | | Typically <0.5% peak-to-peak | |
| Polarization Extinction Ratio ⁴ (dB) | >18dB | | | | | >20dB | |
| Wavelength Stability ⁵ | Typically ±0.1nm | | | | | | |
| Output Fiber Type | 3.5/125 singlemode or polarization maintaining fiber (for RGB sources with 405nm blue, 3/125 singlemode fiber or 3.5/125 for polarization maintaining fiber) | | | | | | |

- 1 These are standard center wavelengths. Typical tolerances vary from ± 5nm to ±20nm depending on laser diode manufacturer. Contact OZ Optics if a specific wavelength is required.
- 2 Higher and lower maximum power levels available on request.
- 3 Depends on source wavelength, power level and other options. Refers to typical values achieved over a period of 8 hours for the long-term case and 1 minute for the short-term case after 15 minutes warm up time and at median operating output powers
- 4 With polarization maintaining fiber only
- 5 Based on thermal stability achieved with TEC controller and optimum connector termination. Assumes absence of mode-hopping

Example of Standard Part Number:

| Bar Code | Part Number | Description |
|----------|--|--|
| 28569 | RGB-100-405/532/635-3.5/125-P-3A-3AS-1-15 | White light (RGB) laser source with 405nm, 532nm, and 635nm thermally stabilized sources. The maximum output power from the fiber will be at least 15mW for each wavelength. The output fiber is a 3.5/125 polarization maintaining fiber, 1 meter long, cabled in 3mm OD stainless steel cable, and terminated with an FC/APC connector. |
| 28570 | RGB-100-442/532/635-3.5/125-P-3A-3AS-1-15 | White light (RGB) laser source with 442nm, 532nm, and 635nm thermally stabilized sources. The maximum output power from the fiber will be at least 15mW for each wavelength. The output fiber is a 3.5/125 polarization maintaining fiber, 1 meter long, cabled in 3mm OD stainless steel cable, and terminated with an FC/APC connector. |
| 28571 | RGB-100-473/532/635-3.5/125-P-3A-3AS-1-5,15,15 | White light (RGB) laser source with 473nm, 532nm, and 635nm thermally stabilized sources. The maximum output power from the fiber will be at least 5mW at 473nm and 15mW for 532nm and 635nm. The output fiber is a 3.5/125 polarization maintaining fiber, 1 meter long, cabled in 3mm OD stainless steel cable, and terminated with an FC/APC connector. |

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. In particular, we will need additional time to prepare a comprehensive quotation, and lead times will be longer than normal. In some cases non-recurring engineering (NRE) charges 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.

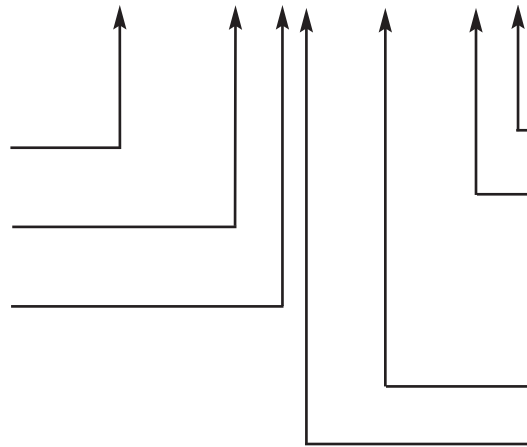
Questionnaire For Custom Parts:

- 1) What wavelengths are you interested in?
- 2) What power levels are required?
- 3) What type of fiber is needed? Singlemode, Multimode or PM?
- 4) How long should the fiber be?
- 5) What type of fiber jacket/cabling do you need?
- 6) What connector type are you using?
- 7) Do you need a collimated or focused output beam?
- 8) If a collimated beam is required, what is the desired beam diameter?
- 9) If a focused spot is required, what is the desired spot size and working distance?

Description

RGB System:

Part Number
RGB-100- W_1, W_2, W_3 -(a/b)- f - X - P_1, P_2, P_3 - JD - L



W_1, W_2, W_3 = Wavelengths to be combined, in nanometers (shortest to longest)

(a/b) = Fiber core/cladding size, in microns (3.5/125 Standard)

f = Output fiber types
 M = Multimode
 S = Singlemode
 P = Polarization Maintaining

L = Fiber length, in meters (1 m standard)

JD = Fiber jacket type:
 1 = 900 μ m OD Hytrel jacket
 3 = 3 mm OD Kevlar reinforced PVC cable
 3AS = 3 mm OD Stainless Steel Cable.
 5AS = 5 mm OD Stainless Steel Cable.

P_1, P_2, P_3 = Output power levels in mW

X = Connector type on output
 3S=Super NTT-FC/PC
 3U=Ultra NTT-FC/PC
 3A=Angled NTT-FC/PC
 3AF=Angled Flat FC
 A3A=Adjustable Focus Angled NTT-FC/PC
 NTT-FC/PC
 SC=SC

Frequently Asked Questions (FAQs):

Q: What wavelength ranges are available?

A: OZ Optics offers a variety of sources working from 375 nm to 1550 nm.

Q: What output powers are available?

A: Depending on the wavelength, up to 20 mW is possible. Custom configurations with higher power levels can be manufactured. See the standard source specifications table for more details.

Q: Can the WDMs used in the RGB system handle higher powers?

A: Yes, OZ Optics' standard WDMs design can handle up to 250mW. For higher power applications a custom design can be done to handle up to 2W.

Q: What is the standard system size? Can I get a smaller system?

A: The standard RGB system is 45 cm (W) x 40 cm (L) x 9 cm (H). These units are ideal for low cost rack mounted applications. For OEM applications OZ Optics will work with you to design a package that meets your size requirements.

Q: Do you offer RGB sources that can combine more than 3 wavelengths?

A: Yes, systems that combine 4 - 6 different wavelengths can also be made, as a custom solution. In such solutions the output fiber may be multimode at some wavelengths.

Source Questions

Q: Since the interlock feature is TTL compatible, can I use it as a TTL input for modulation?

A: No, although the interlock is TTL compatible, it should only be used for turning the unit on or off through a computer interface or via a safety switch.

Q: Do the sources have a modulation function?

A: A standard RGB source can be modulated at low frequencies by feeding the modulation signal to the power control input. The power control signal varies the output power from 100% to 0% as the voltage changes from 0 volts to 5 volts. Most applications using modulation will require a modulation signal with a DC offset. The standard units use filters to minimize noise in the drive circuitry so as to give the cleanest possible optical signal. However, these filters also limit the bandwidth of the output. For applications that require a higher modulation capability, the bandwidth limitation can be reduced at the factory, to allow modulation of over 100 kHz, although this presently applies to only the red and blue sources. Special versions can be built using dedicated circuitry to allow up to 50MHz. Contact OZ Optics if modulation above a few kHz is required.

Q: Can OZ Optics manufacture sources using a customer supplied laser diode and/or fiber?

A: Yes, please provide OZ Optics with detailed information.

Q: Does OZ Optics offer higher power sources than what is standard on the data sheet?

A: Yes, please provide OZ Optics with the requested fiber output power and fiber type and we'll work with you to find a solution.

Q: Why do you recommend integrated systems rather than individual sources and combiners for visible wavelengths?

A: For visible wavelengths the fiber core size is 4 microns or smaller. For such small sizes, mechanical tolerances may result in over 1dB (20%) losses at the receptacle interface. Using an integrated system avoids this issue.

Q: Can I control the output power of each RGB wavelength source?

A: Yes, output power for each source is adjustable via individual potentiometers, allowing the customer a wide range of colors.

Q: Can a RGB source be made to deliver a collimated or focused beam?

A: Yes, we can add a collimator or a focuser to the output end of the pigtailed fiber delivery system.