

doric

**Bundle-imaging Fiber Photometry System**  
Gen3

User Manual

Version 1.0.0

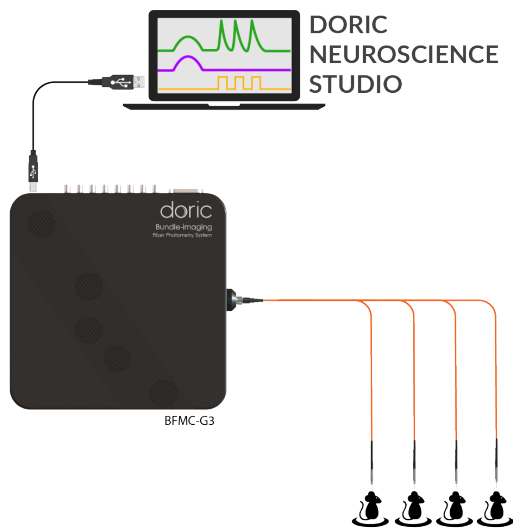
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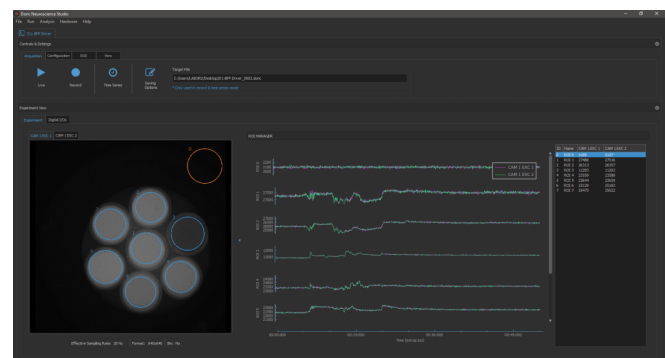
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## Introduction

**Doric's Bundle-imaging Fiber Photometry System Generation 3 (BFMC Gen3)** is a fully integrated, offering a hassle-free, plug-and-play solution, that represents an elegant alternative for multiple site measurements. To record green and red photometry signals, the BFMC uses built-in LEDs to illuminate the entire sample port, and a CMOS sensor to simultaneously image the fluorescent signal from every fiber within the bundle. The fluorescent light collected from each fiber within the bundle creates circular spots on a CMOS sensor. The electrical read-out from pixels within each fiber image correlates with the calcium activity of the corresponding brain site within Doric Neuroscience Studio (Fig.1.1b). The system is available for single and dual color measurements with isosbestic reference excitation (Fig.1.1a).



(a) BFMC system (Fan Out configuration)



(b) Doric Neuroscience Studio BFPS interface

Figure 1.1: Bundle-Imaging Fiber Photometry System (BFPS) overview

## System Overview

- The BFMC system is also equipped with 8 Digital Input/Output (DIO) ports and an DB25 adapter (see pinout description on Fig. 2.2). These ports are useful for synchronization and closed-loop experiments with external devices such as behavior cameras, operant conditioning chambers, video tracking software, and optogenetic light sources (Fig. 2.1).
- Each BFMC Gen3 has a single sample port (Fig. 2.1). This port doesn't have spectral filtering, all wavelengths can pass freely through it. The sample port consists of a microscope lens and a fiber adapter to image fiber bundle onto the cameras. To accommodate larger fiber bundles (up to 2.5 mm of diameter), an SMA receptacle is used on the sample port. Two types of bundle can be connected to the SMA port: A Fan Out bundle where each fiber has an individual connector at its other end, or a High Density fiber that has multiple fiber-optic strands terminated on one side in the same high-density connector pattern as the corresponding High-Density Fiber-optic Cannula Array. Low autofluorescence materials and black epoxy are used to reduce background fluorescence and prevent cross-talk between each fiber.
- The BFMC Gen3 is also equipped with a power switch and 2 status lights turning ON when the device is powered on and connected to Doric Neuroscience Studio software (Fig. 2.1).
- The 12 VDC power input port is used to power the BFMC Gen3 (Fig. 2.1).
- The USB-3 port is used to connect the BFMC Gen3 to the computer via a USB-3 cable.

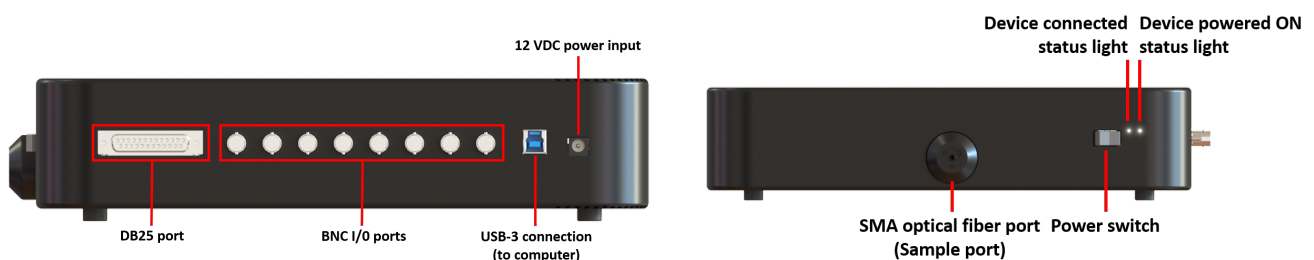


Figure 2.1: BFMC Gen3 overview

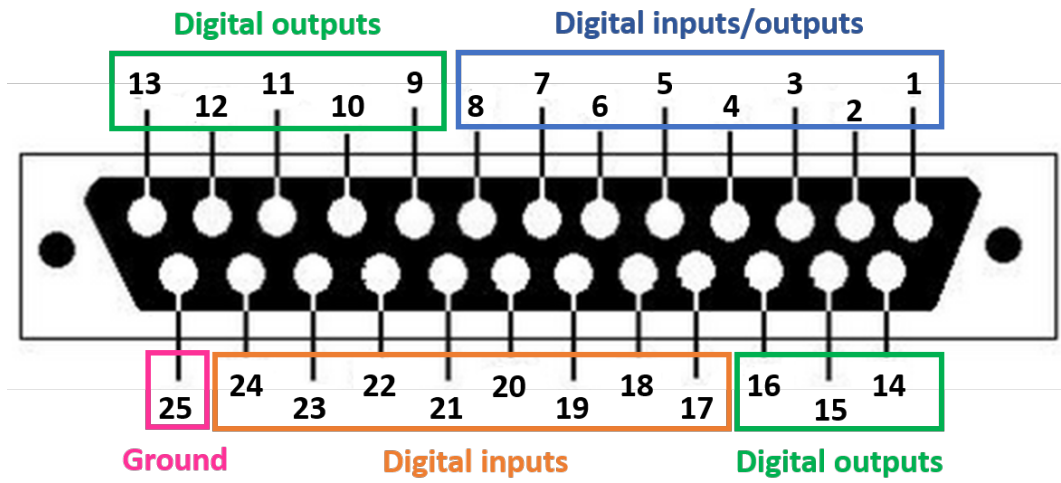


Figure 2.2: DB25 port pinout description

## Getting Started : General Setup Guidelines

A USB-3 cable and power cables are included with the Bundle-imaging Fiber Photometry System. Figure 3.1 illustrates connection of the system to a computer.

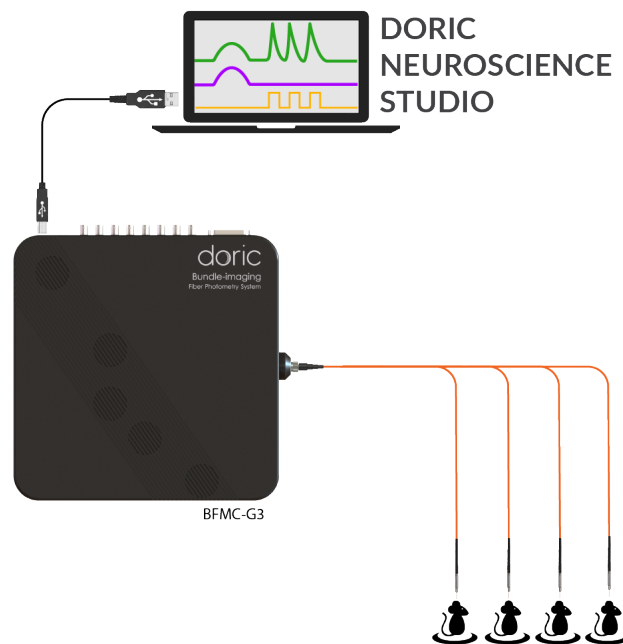


Figure 3.1: Bundle-imaging Fiber Photometry System : Connection to a computer.

1. **Connect** a USB 3.0 cable between the BFMC Gen3 system and a USB-3 port of the computer that will be used for experimentation.
2. **Connect** a Bundle Branching Fiber Optic Patchcord to the Sample Port.
3. **Connect** the BFMC Gen3 to the 12 V AC/DC and 36W power supply.
4. **Open** Doric Neuroscience Studio. To set up an experiment, refer to [Doric Neuroscience Studio user manual](#).

## Specifications

### 4.1 General specifications

Table 4.1: General specifications for BFMC Gen3

SPECIFICATION	VALUE	UNIT
<b>Bundle-imaging Fluorescence Mini Cube</b>		
Wavelength range	350 to 1100	nm
Field of view	2.5	mm
Objective NA	0.4	-
Optical Fiber connector	SMA	-
Max. number of sites	- 20x core 400 $\mu\text{m}$ NA0.37 - 60x core 200 $\mu\text{m}$ NA0.37 - 100x core 100 $\mu\text{m}$ NA0.37	-
Excitation Uniformity	10% over FOV	-
Optical fiber compatibility	Core diameter 100, 200, or 400 $\mu\text{m}$ NA 0.37	-
Optical fiber attenuation	OD 5 outside band	-
<b>Built-in LEDs</b>		
Max Current	500	mA
Maximum Output Power	See Table 4.3	-
<b>Sensor</b>		
CMOS image sensor	Sony IMX174LLJ	-
Pixel Size	5.86 x 5.86	$\mu\text{m}$
Resolution	1024 x 1024	pixels
Quantum Efficiency	82% at 520nm	-
Frame Rate	up to 60	Hz
Power consumption (supplied by USB)	200	mA
<b>DI/O</b>		
Number of ports	32	-
Maximum sampling rate	10	kSps
Ports description	8 BNC I/O + 1 DB25 (8 Input/Output, 8 Input, 8 Output)	-

<b>Physical properties</b>		
Size	310x310x66	mm
Mass	3700	g
<b>Power supply</b>		
Voltage	110 - 240	VAC
DC power supply	12	VDC
Power	36	W
Output current	3	A

Table 4.2: Computer requirements for BFMC Gen3 installation

<b>Operating system</b>	Microsoft 10, 64 bit
<b>Memory</b>	8 GB RAM minimum (16 GB recommended)
<b>Processor speed</b>	3 GHz and 8 cores
<b>Hard drive</b>	500 MB of free hard disk space (SSD recommended)
<b>Data link</b>	USB3.0 (cable included)

## 4.2 Optical specifications

Table 4.3: Typical Built-in LED Output Power vs Optical Fiber Core Diameter





	LED		TYPICAL OUTPUT POWER @200 mA,CW (mW)	
	Central Wavelength (nm)	Bandwidth FWHM (nm)	Core 200 $\mu$ m 0.37 NA	Core 400 $\mu$ m 0.57 NA
	405	10	~0.100	~0.700
	415	10	~0.130	~0.500
	474	23	~0.180	~0.700
	563	9	~0.020	~0.130

Table 4.4: Typical filter configuration of BFMC Gen3

Fluorescence Mini Cubes	Excitation (nm)	Fluorescence (nm)
<b>GCaMP</b>		
Excitation 1 (isosbestic)	400-410 or 410-420	
Emission 2 (functional)	460-490	500-550
<b>GCaMP + red fluorophore</b>		
Excitation 1 (isosbestic)	400-410 or 410-420	
Excitation 2 (functional)	460-490	500-550
Excitation 3 (red fluorophore)	555-570	580-680



## Support

### 5.1 Maintenance

The product does not require any specific maintenance. Contact Doric Lenses for return instructions if the unit does not work properly and needs to be repaired.

### 5.2 Warranty

This product is under warranty for a period of 12 months. Contact Doric Lenses for return instructions. This warranty will not be applicable if the unit is damaged or needs to be repaired as a result of improper use or operation outside the conditions stated in this manual. For more information, see our [Website](#).

### 5.3 Contact us

For any questions or comments, do not hesitate to contact us by:

**Phone** 1-418-877-5600

**Email** [sales@doriclenses.com](mailto:sales@doriclenses.com)

The logo for Doric Lenses, featuring the word "doric" in a lowercase, sans-serif font. The letter 'o' is stylized with a white highlight on its upper-left curve, giving it a three-dimensional appearance.

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