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Rotary Bundle-imaging Fluorescence Photometry

User Manual

Version 1.0.2

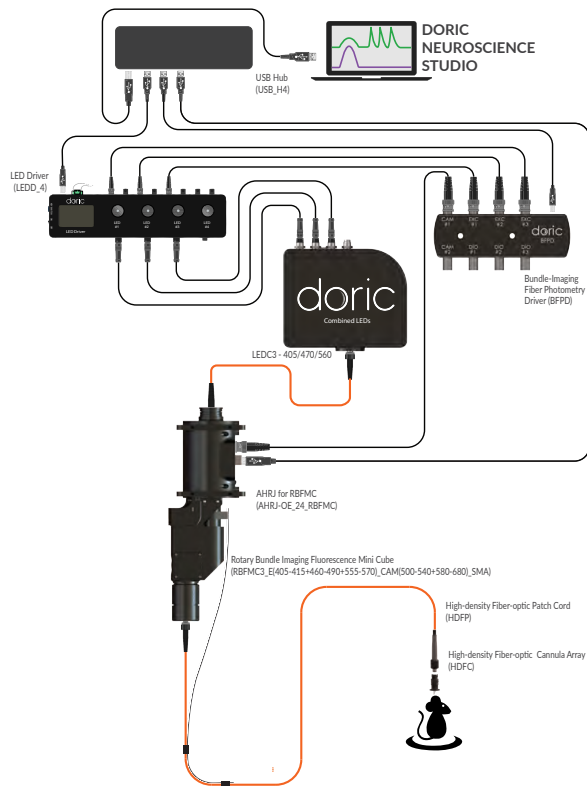
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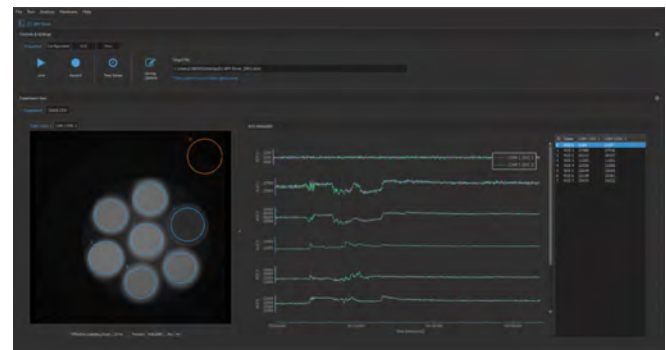
Introduction

The **Rotary Bundle-imaging Fluorescence Photometry System (RBFMC)** is an elegant alternative for multiple site measurements in freely moving animal. By bundling individual fiber together in a SMA connector, separate experiment sites are imaged onto a CMOS detector simultaneously, which greatly simplify parallel fiber photometry measurements. The overall fluorescence signal from each site is recorded from pixel intensity variations within Doric Neuroscience Studio (Fig 1.1b).

The system is available for single and dual color measurements with isosbestic reference excitation as well as optogenetically synchronized experiments (Fig 1.1a).



(a) GCaMP, RFP configuration



(b) Doric Neuroscience Studio BFP interface

Figure 1.1: Rotary Bundle-Imaging Fiber Photometry System overview

System Overview

The **Rotary Bundle-imaging Fluorescence Cube** have two optical ports (the pigtail excitation port connects to the light source, and the fluorescence port connects to the Bundle Fiber-optic Patch Cord), a power entry, an input BNC port (TRIG IN) for synchronization and a USB port for data collection (CAM) (Fig 2.1).

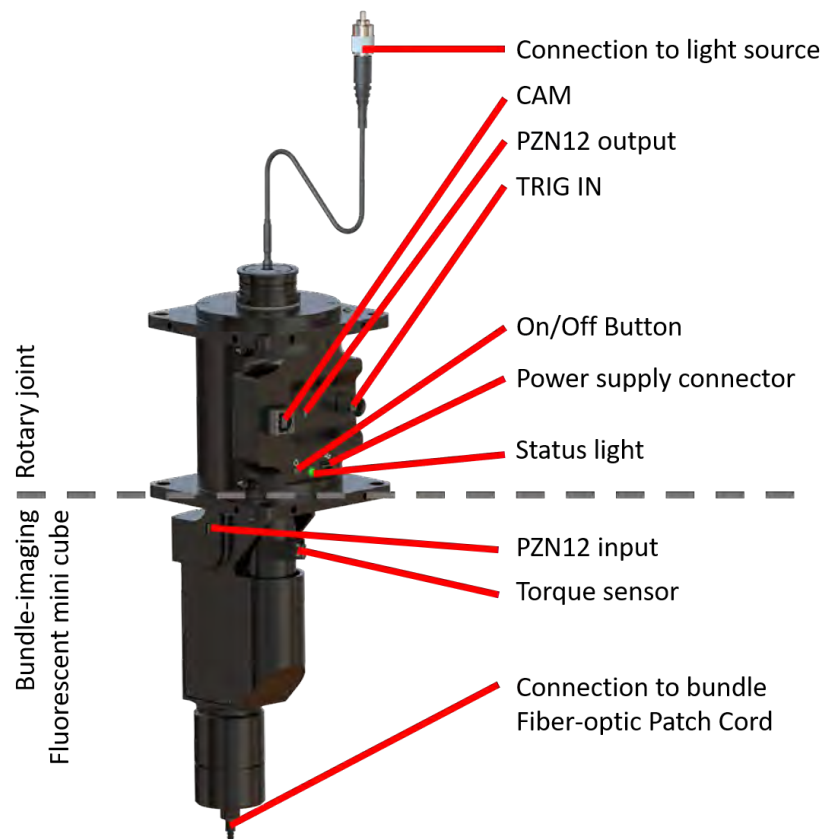


Figure 2.1: RBFMC overview

1. **Connection to light source:** The pigtail fiber-optic cable with an FC connector connects to the light source.
2. **CAM:** The USB port sends data from the CMOS sensor to Doric Neuroscience Studio.
3. **PZN12:** The **PZN12 Input** and **PZN12 Output** are connected to allow the transmission of electrical information through the rotary joint.
4. **TRIG In:** Connects to the BFPD to synchronize the camera acquisition with the system.

5. **ON/OFF button:** Enable or disable the rotation function (does not block the recording even if the rotary joint is OFF).
6. **Power supply connector:** The USB Mini-B 5V Port is used to connect the rotary joint power supply. It must be connected to 2A power supply.
7. **Status light:** The light is red when the assistance is OFF but the power supply connected and the light is green when the assistance is ON.
8. **Torque sensor:** The torque sensor detects when optical fibers are turning to follow the animal movements.
9. **Connection to Bundle Fiber-optic Patch Cord:** The SMA connector connects to the Bundle Fiber-optic Patch Cord.

Operations Guide

3.1 Connecting the Rotary Bundle-Imaging Fiber Photometry System

Figure 3.1, Figure 3.2, and Figure 3.3 illustrate connections between all subsystems in 3 different configurations.

Note:

- The Rotary Bundle-Imaging Fiber Photometry system is sold with a rack, where part of the connections are already done (step 1 to 5).
 - All cables, power supply splitters, as well as the USB hub are included with the rotary Bundle-imaging Fluorescence Photometry System.
 - The connection order on the USB Hub is not important.
1. **Connect** a USB 2.0 cable between the USB hub and the LED driver, the LISER or the LEDFLS, depending on the devices to be connected.
 2. **Connect** a USB 2.0 cable between the BFPD and the USB hub.
 3. **Connect** the integrated LEDs to the corresponding channel number of the LED driver with M8 cables.
 4. **Connect** the LED driver, the LISER and/or the Laser driver digital inputs to the BFPD with BNC cable. To ease experiment configuration in Doric Neuroscience Studio, we recommend connecting LED1 with EXC1, Laser1 with DIO1 and so on.
 5. **Connect** the LED driver, the Laser driver and the USB Hub to the 12 V AC/DC and 60W power supply with the power supply splitters. The LISER need to be connected to its own power supply 12 V AC/DC and 110W.
 6. **Connect** a USB 3.0 cable from the USB Hub to the PC.
 7. **Plug** the power supply.
 8. **Connect** the FC connector of the RBFMC to the LEDC or the DMC depending on your configuration.
 9. **Connect** the TRIG port of the RBFMC to the CAM port of the BFPD with a BNC cable.
 10. **Connect** a USB 2.0 cable between the camera and the USB hub.
 11. **Tape** the white cable to the fiber and pinch the other part in the **Torque sensor**.
 12. **Connect** the HDFP or similar Patch Cord to the SMA port.
 13. **Open** Doric Neuroscience Studio. To set up an experiment, refer to chapter 4.

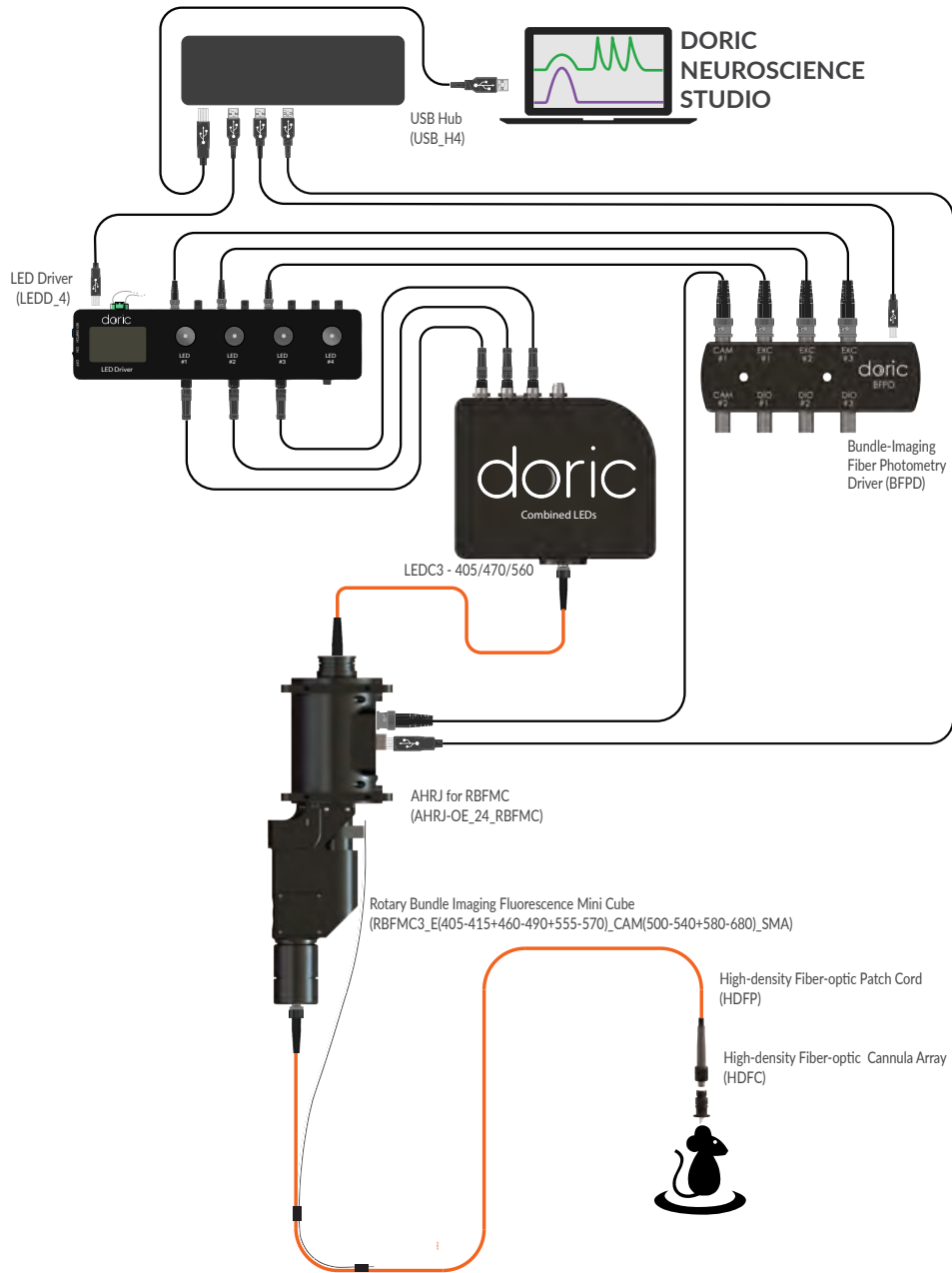


Figure 3.1: GCaMP with Red Fluorophore Rotary Bundle-imaging Fiber Photometry System

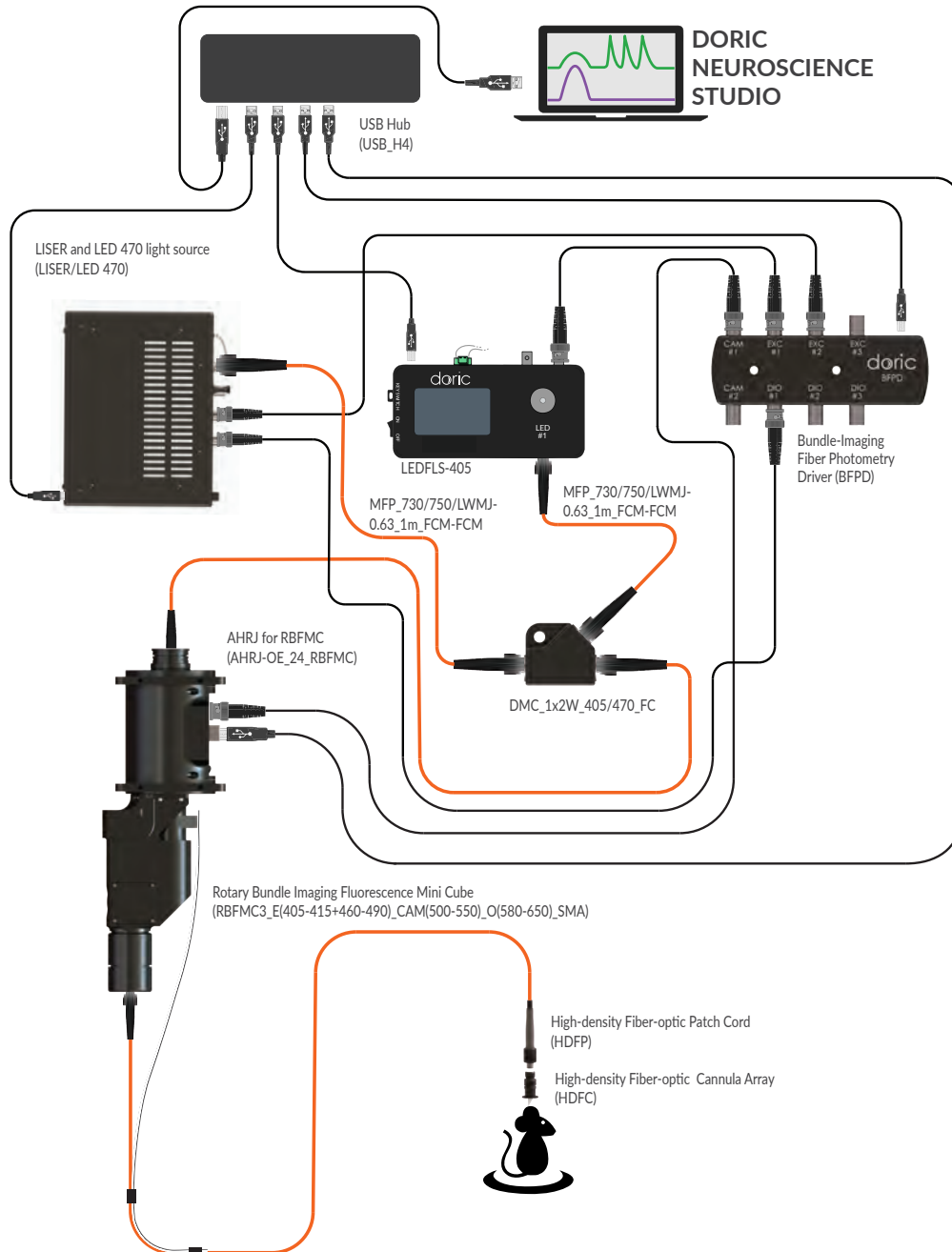


Figure 3.2: GCaMP with 590 nm Amber Opsin Rotary Bundle-imaging Fiber Photometry System

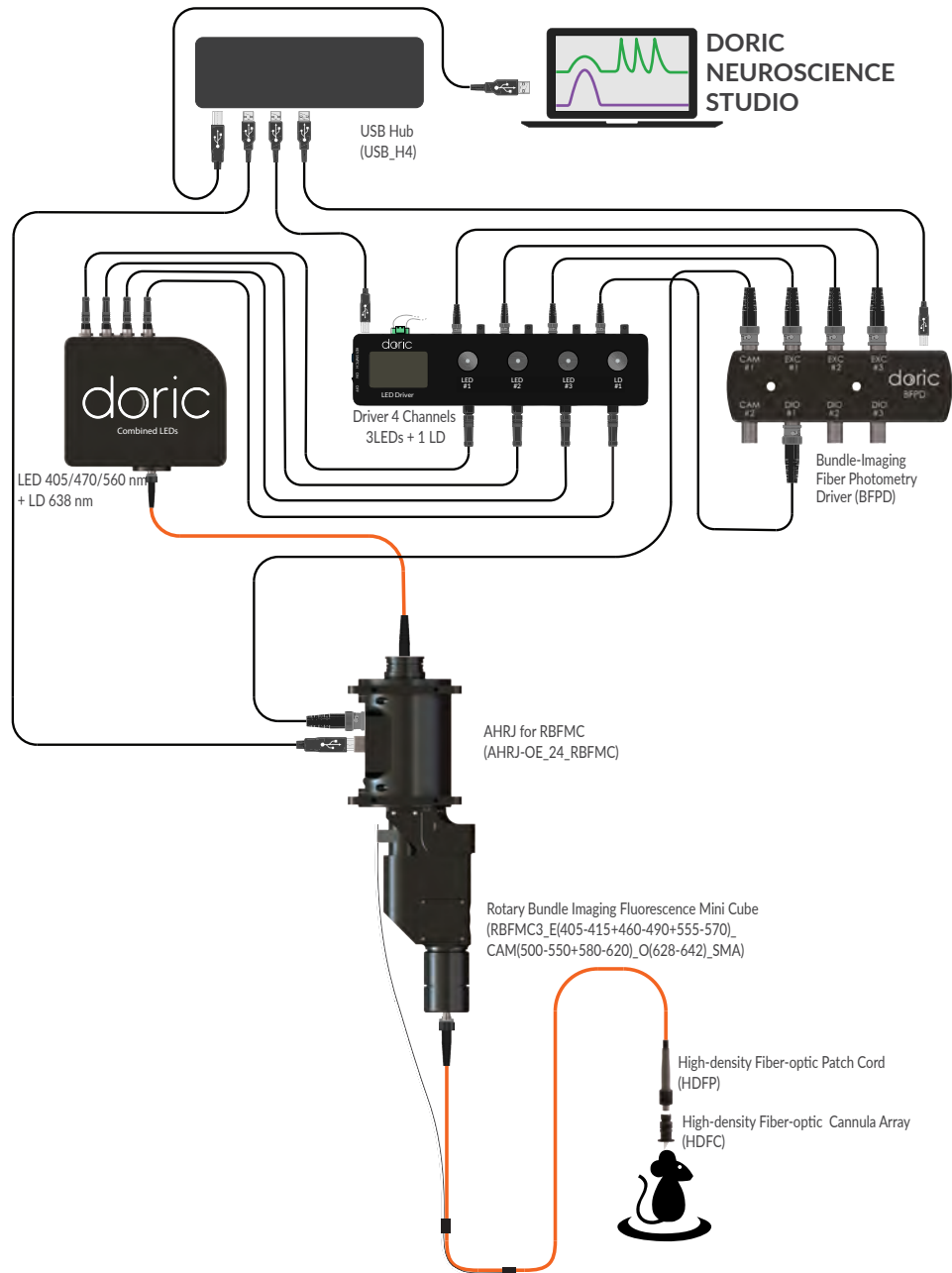


Figure 3.3: GCaMP with Red Fluorophore and 638 nm Red Opsin Rotary Bundle-imaging Fiber Photometry System

3.2 Optical fiber patch cord

- **Clean** the optical fiber connector before insertion. Use isopropanol and a lint-free wipe.
- With an FC connector, the **connector key must be oriented to enter within the receptacle slot** to ensure proper connection (Fig. 3.4).

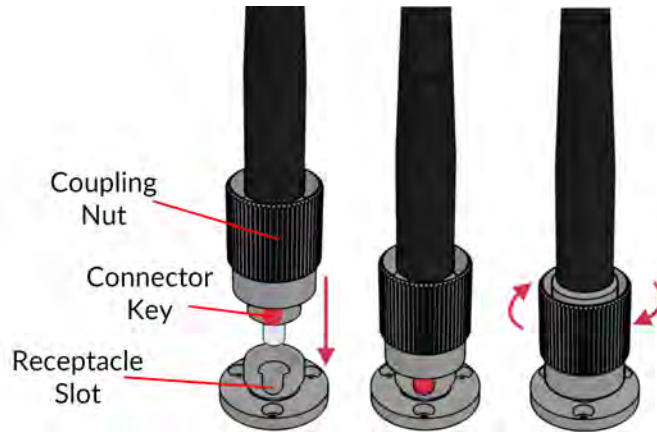


Figure 3.4: FC connector, Fiber Installation



To reduce the risk of eye injury, it is sound practice to
NOT CONNECT/DISCONNECT OPTICAL FIBERS
when the light source is turned on



Specifications

Table 4.1: *Rotary Bundle-imaging Fluorescence Photometry*

SPECIFICATION	VALUE
Mass	2.1 Kg
Dimensions RBFMC without cables	92 x 83 x 267 mm (W x L x H)
Objective lens NA	0.50
Maximum number of sites (could be limited by patch cord manufacturing)	7x core 400 μm NA 0.57 20x core 200 μm NA 0.57 90x core 100 μm NA 0.37
Excitation Uniformity	10% over FOV
Optical fiber compatibility	Core diameter 100, 200, or 400 μm NA 0.37 to 0.57
Optical filter attenuation	> OD 5 outside band
Optical fiber connector	SMA
Sensor	
Type	CMOS Image sensor
Resolution	540 x 540 px
Pixel Size	6.9 μm x 6.9 μm
Frame rate	up to 100 Hz
Computer interface	USB 2.0

Table 4.2: Typical filter configuration of RBFMC

Florescent Mini Cube	Excitation (nm)	Fluorescences (nm)	Opsin (nm)
GCaMP + RFP			
Isosbestic	400 - 410	500 - 540	
GCaMP	460 - 490		
RFP	555 - 570	580 - 680	
GCaMP + Yellow Optogenetics			
Isosbestic	400 - 410	500 - 540	
GCaMP	460 - 490		
Yellow Optogenetics			580 - 650
GCaMP + RFP + Red Optogenetics			
Isosbestic	400 - 410	500 - 540	
GCaMP	460 - 490		
RFP	555 - 570	580 - 600	
Red Optogenetics			628 - 642

Support

5.1 Maintenance

The product does not require any maintenance. Do not open the enclosure. 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 Disposition



Figure 6.1: WEEE directive logo

According with the directive 2012/19/EU of the European Parliament and the Council of the European Union regarding Waste Electrical and Electronic Equipment (WEEE), when the product will reach its end-of-life phase, it must not be disposed with regular waste. Make sure to dispose of it with regards of your local regulations. For more information about how and where to dispose of the product, please contact Doric Lenses.

5.4 Contact us

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

Phone 1-418-877-5600

Email sales@doriclenses.com

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