

# Blackrock Digital Hub 128

## Instructions for Use



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## 1 Contraindications, Warnings, Cautions, and Specifications

### 1.1 Contraindications

- The Digital Hub 128 is part of a recording system and should not be used in applications involving stimulation.
- Do not use the Digital Hub 128 with any device that has not been approved by Blackrock Microsystems.

### 1.2 Warnings

- Do not touch any exposed electrical conductors, or use damaged HDMI cables when using the Digital Hub 128.
- Keep cables out of traffic paths. Injury to user or patient can occur.
- The user/patient/subject should not attempt to open the Digital Hub 128.
- Use caution when operating the Digital Hub 128, especially when connecting and disconnecting cables to minimize risk of Digital Hub 128 falling and/or injury.
- Do not rest objects on or against the Digital Hub 128.
- Avoid strong static discharges from sources like television or computer monitors; they may damage the electrical components of the system.
- Keep the Digital Hub 128 away from liquids. Contact with water, shower spray, or wet surfaces can lead to the Digital Hub 128 malfunctioning and/or electrical shock.
- Connection of external instruments to the Digital Hub 128 may compromise electrical safety.
- Always use antistatic or electrostatic discharge (ESD) safe gloves when connecting the Digital Hub 128.
- Use only the supplied Blackrock Microsystems components (Cerebus™ system, Digital Hub 128, Cables, headstages). Substitution of components not supplied by Blackrock Microsystems may affect system performance and patient/ subject safety.
- Do not leave the patient/subject connected to the Digital Hub 128 when the Cerebus™ System is not in use.
- Regularly inspect cables for compromised insulation or bad connections. This can help prevent electrical shock as well as data corruption.

### 1.3 Cautions

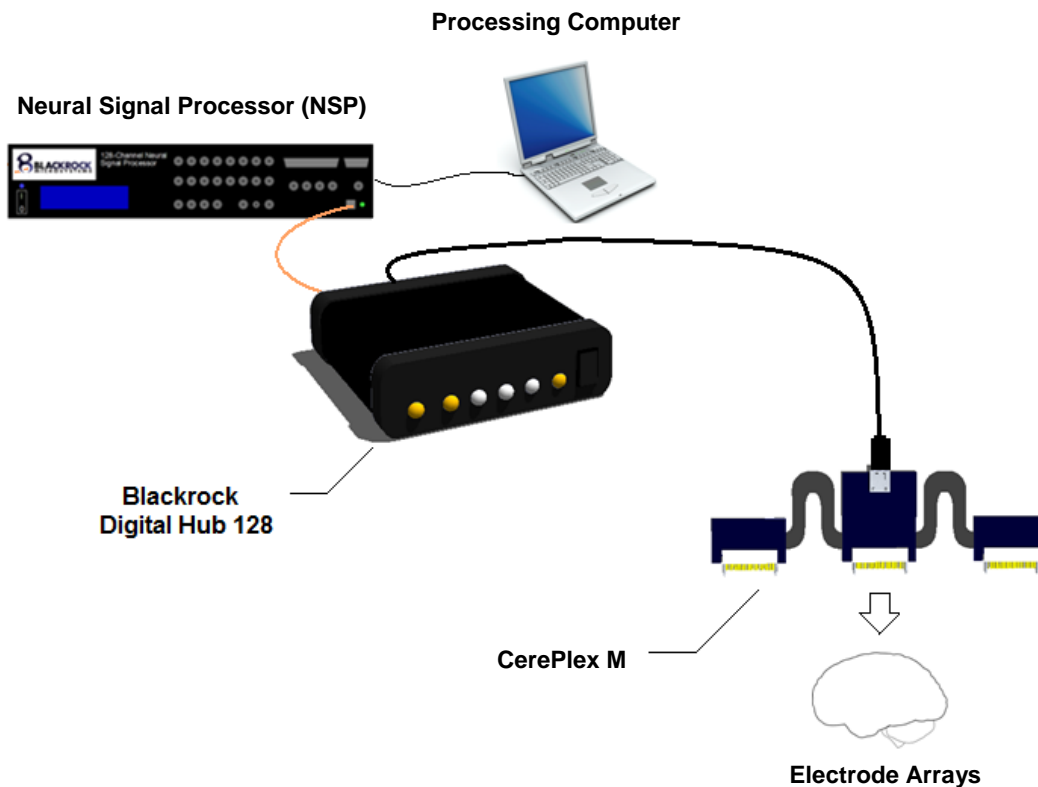
- Read this entire manual prior to using the device.
- This product is for animal use only. This model is not for use with human subjects.

### 1.4 Specifications

<b>Model Name</b>	Blackrock Digital Hub 128
<b>Power Requirements</b>	15 VDC, 750 mAmps maximum load
<b>Sampling Frequency</b>	48MHz or 66MHz
<b>Mode of Operation</b>	Continuous
<b>Input Protocol</b>	Low-voltage differential signaling
<b>Water Ingress Protection</b>	Ordinary Equipment, not fluid resistant, IP20
<b>Operating Environment</b>	10°C to 40°C, 5 to 95% R.H. (non-condensing)
<b>Storage Environment</b>	-20°C to 50°C, 5 to 100% R.H. (non-condensing)

## 2 Introduction

The Blackrock Digital Hub 128 provides an interface between the Cerebus Data Acquisition System and the CerePlex E or CerePlex M series headstages for high fidelity transmission and recording of extracellular spikes and local field potentials from the brain. The Blackrock Digital Hub 128 converts digital signal to an optic-digital format which is sent directly to the Blackrock Neural Signal Processor (NSP). This dramatically reduces the noise introduced to the signal during transmission. Figure 2-1 below shows an application overview of how the Digital Hub 128 fits into a complete neural recording system using a CerePlex M headstage as an example.



**Figure 2-1: Blackrock Digital Hub 128 Set-up**

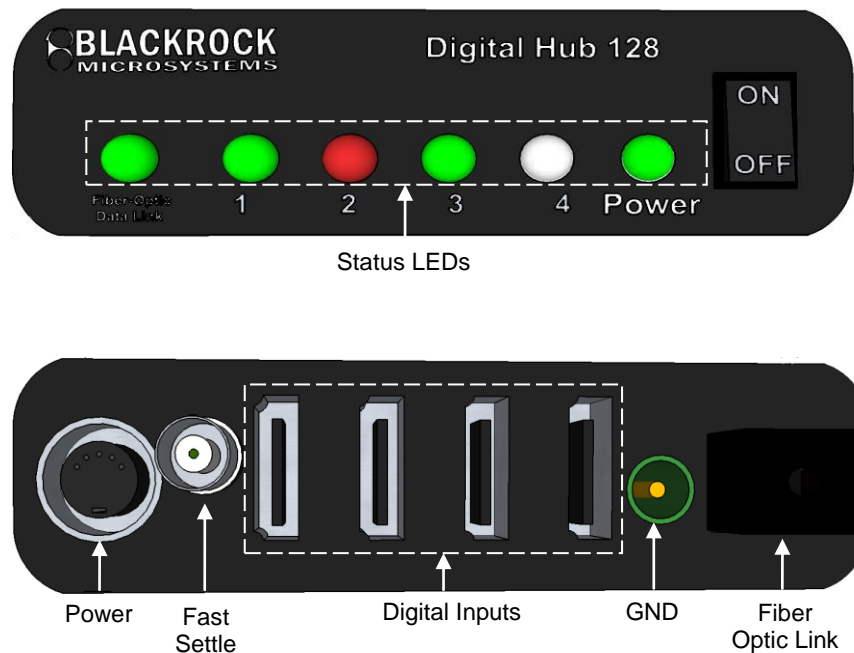
\* The Blackrock Digital Hub 128 and Cerebus Data Acquisition System are purchased separately.

### 3 Hardware

#### 3.1 Blackrock Digital Hub 128 Input

The Blackrock Digital Hub has several possible configurations which arise from its ability to transmit 128 channels of data. For instance, the Digital Hub 128 can be used with:

- Four 32-channel CerePlex M headstages
- Two 64-channel CerePlex M headstages
- One 32-channel and one 96-channel CerePlex M headstage
- One CerePlex E



**Figure 3-1: Front (shown top) and Back (shown bottom) of the Digital Hub 128.**

##### 3.1.1 Status LEDs

There are six LED's on the Digital Hub which can give the user information about the device status. If the Digital Hub 128 is powered (plugged in) the "Power" LED will be green as in Fig 3-1. If the fiber-optic connection between the NSP and the Digital Hub 128 is present, the "Fiber Optic Data Link" LED will be green (otherwise red). Finally, LED's 1-4 show the source status of the incoming data streams. If the LED is green for an input (such as inputs 1 & 3 in Fig 3-1) the Digital Hub 128 is receiving data from a CerePlex correctly. If the LED is red (such as show in input 2 in Fig 3-2) data is not being transmitted to the Digital Hub 128 correctly. If the input LED is not lit (such as shown in input 4 Fig 3-1) there is either no data being received or the HDMI cable is not plugged into the input slot.

### 3.1.2 Power

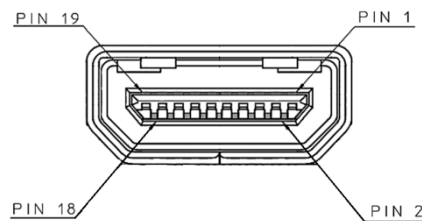
The Digital Hub 128 is powered by a medical grade power supply that is included as part of the Digital Hub packaging. The green LED labeled “Power” will light up when the external power supply is connected to the unit.

### 3.1.3 Fast Settle

The fast settle input connector is located on the back panel of the Digital Hub 128. This connector is tied to each of the four HDMI inputs. The signal fed into the BNC connector is passed through the system to pin 14 on the HDMI connector, providing a fast settle signal to the attached digital headstage(s)

### 3.1.4 Digital Inputs

The Digital Hub 128 is designed so that input one has the highest priority, then input two, and so forth. This means that if two 96 channel CerePlex M’s are connected, in inputs two and three respectively, input two will send the entire 96 channels to the Neural Signal Processor (NSP) but input three will send only the first 32 channels to the NSP. The Digital Hub will always send the first 128 channels to the NSP in this way, unless there are less than 128 channels in which case it will send all channels. The HDMI connector pin-out is shown in Figure 3-2 below.



HDMI/D Pin #	Description
10	Clock+
12	Clock-
14	Fast Settle
17	V-
19	Ground
18	V+
7	Data+
9	Data-

Figure 3-2: Digital Hub 128 Input Connector Pin-Out

### 3.1.5 Patient Ground

This connector is located on the back panel of the Digital Hub 128 and is labeled as “GND.” This is the patient ground connector if needed for a reference ground.

### 3.1.6 Fiber Optic Link

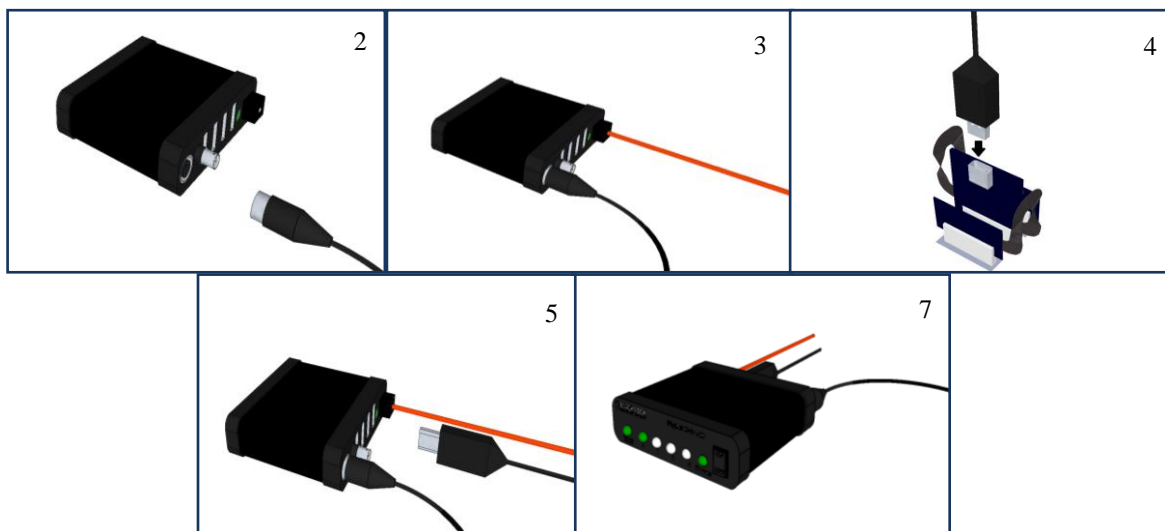
This connector is located on the back panel of the Digital Hub 128 and provides a connection to the Blackrock Neural Signal Processor via a fiber optic cable.

## 4 Instruction for Assembly

1. The following instructions are for the Digital Hub 128 which is capable of supporting up to 128 channels of data. Assembly illustrations are shown in Figure 4-1.

**NOTE:** This set of instructions uses the CerePlex M as an example for the digital headstage. For instructions regarding assembly with the CerePlex E, refer to the CerePlex E Instructions for Use (LB-0545).

2. Make sure the Digital Hub is plugged in, and the power switch is in the “Off” position before making any connections.
3. Connect the fiber optic cable from the back of the Digital Hub 128 to the Neural Signal Processor.
  - a. The “Power” switch can be switched to the “On” position now to verify the Digital Hub 128 is powered and to verify a fiber-optic connection is present if the Neural Signal processor is also turned on.
  - b. Switch the Digital Hub 128 to the “Off” position.
4. Plug the HDMI cable to the output connector on the CerePlex M main board after the CerePlex M is fully connected to the electrode termination.
5. Plug the other end of the HDMI cable to the connector on the back of the Digital Hub 128.
6. Make sure the connections are secured.
7. Turn on the power of the Digital Hub 128 for recording. The specific input LED where the HDMI cable was plugged in from the headstage to the Digital Hub 128 should be green.



**Figure 4-1: Instruction for Assembly**

\*\*After recording, turn off power before disconnecting any cables.

## 5 Warranty

Blackrock Microsystems, LLC warrants that its products are free from defects in materials and manufacturing for a period of one year from the date of shipment. Blackrock will, at its option, repair or replace any product that does not comply with this warranty. This warranty is voided by:

Electrophysiology,  
Simplified.

1. Any modification or attempted modification to the product done by anyone other than an authorized Blackrock employee
2. Any abuse, negligent handling or misapplication of the product.

This constitutes the sole warranty made by Blackrock, LLC. There are no other warranties, expressed or implied, which extend beyond those described herein or to anyone other than the original purchaser, including the implied warranties of merchantability and fitness for a particular purpose. In no event shall Blackrock Microsystems, Inc. be liable for any incidental or consequential damages, or for the infringement of any patent rights or third party rights due to the use of its products.

## 5.1 Return Merchandise Authorization (RMA)

In the unlikely event that your device needs to be returned to Blackrock for service or maintenance, do not send any equipment back without a Return Merchandise Authorization Number. An RMA number will be issued to you by a Blackrock representative. If you need to obtain an RMA number, you may contact a product support representative at (801) 582-5533 or toll free at (866) 806-3692.

Once an RMA number has been issued, it is important to safely pack the returned item for shipping back to Blackrock. It is preferred that you save the original boxes and packing materials that your system arrived in for return shipment. Please address the package as follows:

**Blackrock Microsystems, LLC**  
**ATTN: RMA#**  
**630 Komas Dr, Suite 200**  
**Salt Lake City, UT 84108 USA**  
**Tel: (801) 582-5533**