

CerePlex W

Instructions for Use



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Warnings and Contraindications

	IEC60101-0102	Danger of Electrostatic Discharge (ESD)
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- To reduce the likelihood of ESD, use antistatic or electrostatic discharge (ESD) safe gloves when using the CerePlex W.
- Do not touch any exposed metal plates at the lower part of the device as well as the input pads through the filament film at the bottom of the device of the CerePlex W device when it is on the subject's head as this may result in inducing electric charge to the neural tissue. Irreversible damage may occur.
- The CerePlex W device and its receiver system are only approved for use with Blackrock Microsystems data acquisition systems.
- Do not use the CerePlex W device with non-approved electrodes. The CerePlex W needs to be directly interfaced with approved Blackrock Microsystems pedestal array electrode devices, such as the CerePort pedestal array device. In cases using other electrodes, a pedestal adapter approved by Blackrock Microsystems must be used.
- Do not use the CerePlex W device in an environment surrounded with liquids.
- Do not recharge the device with an uncertified charger, short circuit, crush, disassemble, or heat above 100°C (212°F).

What this Manual Covers

The Blackrock CerePlex W is a fully digital telemetry system for neural recording. The CerePlex is used in conjunction with either the Cerebus recording system or the CerePlex Direct recording system for high fidelity transmission and recording of extracellular spikes and local field potentials from the brain. The Blackrock CerePlex W converts analog signals to digital format right at the recording site which dramatically reduces the noise introduced to the signal during transmission.

Specifications

Model Name	Blackrock CerePlex W
Channel Count	96
Input Frequency Range	0.3 Hz—7.5 kHz
Maximum Input Voltage	± 8.169 mV with respect to reference
Resolution	16-bit ADC, 12-bit transmission to receiver (12 most significant bits)
Input Impedance	>13 MΩ @ 1 kHz, > 1300 MΩ @ DC
Headstage connection to Receiver	Both wired and wireless connection
Battery	Built-in 3.7 V 400 mAh Li-ion rechargeable battery. Life time: 3.5 hours. Charging time: ~1 hour.
Input Connector	Blackrock CerePort pedestal
Wireless Transmission Range	3 m line of sight, 2 m free roaming (maximum)
Weight	26.4g (without battery)/33.5 g (with battery)
Size	32.5 mm x 32.5 mm x 21 mm
Noise	<3 μV rms
Water Ingress Protection	Ordinary Equipment, not fluid resistant, IP20

Overview of Hardware

The CerePlex W system consists of two major subsystems: the headstage, and the receiver along with the receiving antennas. Each component is described in more detail below.

Accessories included with the system are:

- (8) SMA antenna cables
- (8) SMA to N adaptors
- (1) 12 V AC-DC power supply
- (1) micro-USB to USB A cable
- (1) 5-wire micro-USB to micro-USB cable
- (1) magnetic wand

CerePlex W Headstage

The CerePlex W headstage combines a fully digital neural recording amplifier with a radio-frequency transmitter. The amplifier is built on the same platform as other Blackrock CerePlex recording headstages and offers the same low-noise performance. The digital data stream from the amplifier system is encoded and transmitted to the receiving antennas by an on-board radio and antenna. The battery and connection indicator LEDs, as well as the impedance mode switch and micro USB port are shown in *Figure 1*.

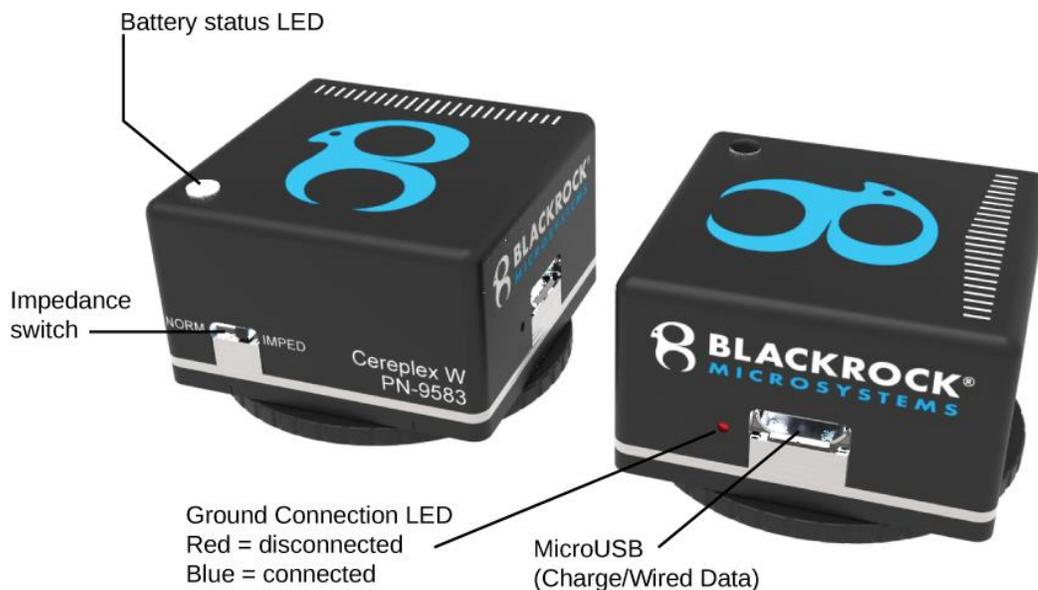


Figure 1—CerePlex W headstage

Power to the CerePlex W headstage is provided by a rechargeable lithium-ion battery housed within the headstage. Power delivered by the battery is controlled via magnetic reed switch inside the headstage. To turn the power on or off to the headstage, swipe the magnetic wand provided with the system across the area shown in Figure 2.

When the battery is low, the battery status LED will turn RED. The battery can be recharged by connecting the CerePlex W headstage to the CerePlex W receiver using the included 5-wire micro-USB cable. The battery status LED will turn YELLOW while the headstage is actively charging and will turn GREEN when charging is complete (Figure 3). Use caution when removing the micro-USB cable as excessive force or twisting can damage the connector on the headstage.

The same 5-wire USB cable can be used to operate the CerePlex W headstage in “wired” mode. In wired mode, the headstage transmits data via the cable rather than wirelessly. The headstage battery will continue to charge while transmitting in wired mode.

The transmission frequency is set at the time of manufacture to 3.5 GHz. The CerePlex W receiver must be tuned to the same frequency as the transmitter. This process is described in Setting Up the CerePlex W section below. It is possible to use two complete CerePlex W systems together for a total of 192 channels if they are tuned to different frequencies. Contact a Blackrock Microsystems representative if you are interested in using two CerePlex W systems simultaneously.



Figure 2—Turning on the power of the CerePlex W headstage using the magnetic wand.



Figure 3 - The battery status indicator turns RED when the battery is low, YELLOW when it is charging, and GREEN when it is fully charged. The battery status LED is not illuminated while the headstage is in use and the battery is not low.

CerePlex W Receiver and Antennas

The CerePlex W receiver can use up to 8 antennas to acquire data transmitted from the CerePlex W headstage. The receiver only needs a robust signal from one antenna to reliably receive the transmission. If the signal strength declines from one antenna, the receiver will cycle through the remaining antennas to find a suitable signal. In this way, the 8 antennas can be used to cover a larger operational area than would be possible with a single antenna. If at least one antenna is close enough to the headstage transmitter, the data link will remain intact. If an antenna input channel is receiving data, the blue reception indicator LED for that channel on the front of the receiver will illuminate.

The antennas provided with the CerePlex W system are rugged outdoor antennas designed for harsh conditions (Figure 4). They have a wide beam width (receiving angle) of over 50° to better cover an experimental area. The antenna cables are low-loss coax cables specifically designed for high performance at the frequency range used by the CerePlex W system.



Figure 4—Receiving antenna used with the CerePlex W system.

After amplifying and decoding the wirelessly transmitted signal, the receiver relays the data to either the digital hub—as part of a Cerebus system—or the CerePlex Direct for further signal processing, display, and storage. Figure 5 shows the CerePlex W receiver with important features labeled.

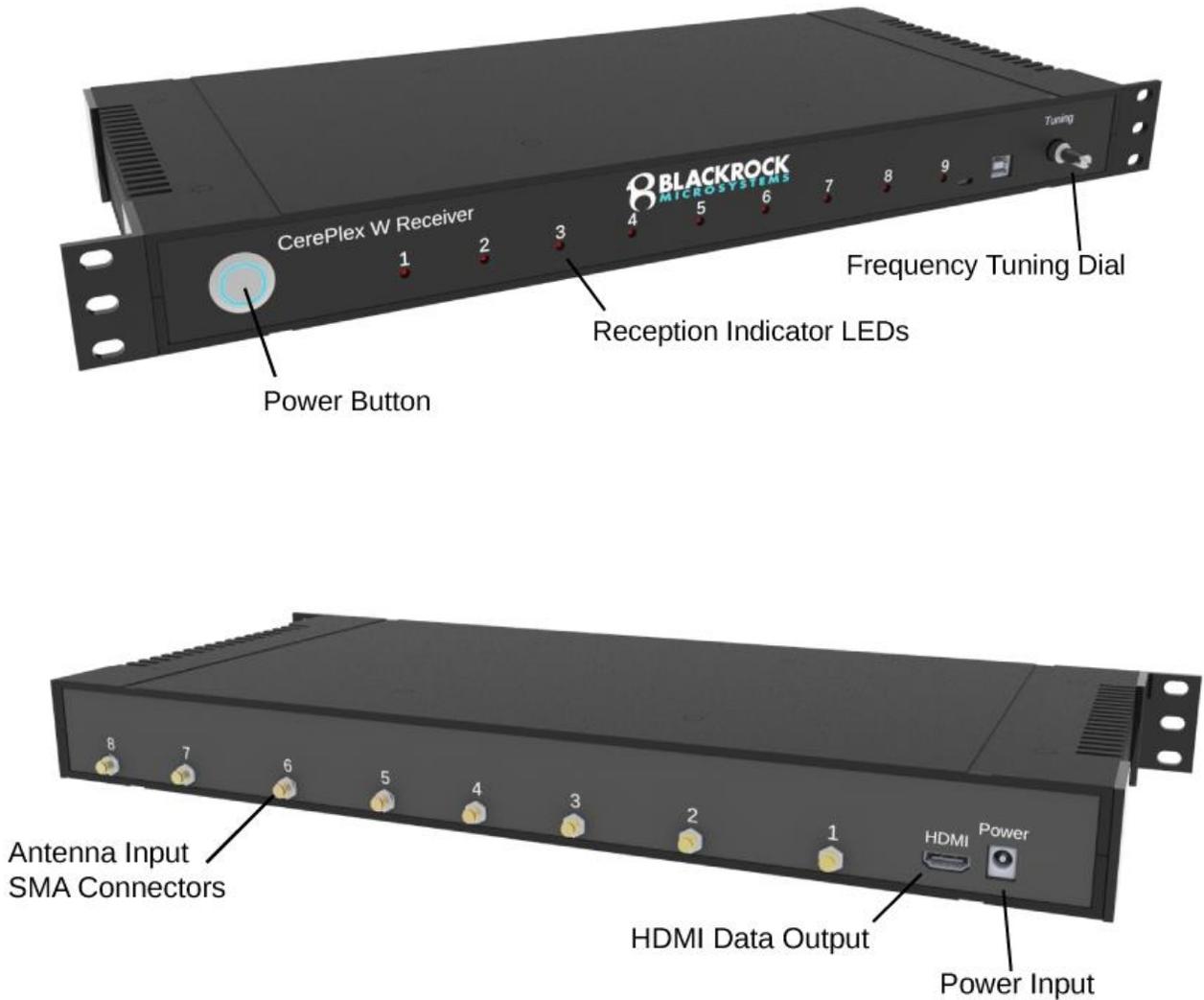


Figure 5—CerePlex W receiver. Data enters the receiver via the antenna SMA input connectors and leaves the receiver via the HDMI data output port. The reception indicator LEDs for an antenna input channel when illuminate when that antenna is receiving a strong signal from the CerePlex W headstage.

Setting Up the CerePlex W

This section describes how to connect the components of the CerePlex W system to conduct a recording session. The Blackrock digital neural signal simulator (DNSS) is used for a signal source in this section, but the same procedure would be used when recording from a subject.

1. Connect the antennas to the receiver.
 - a. Connect the SMA-N adapters to the antennas as shown in Figure 6.
 - b. Connect the SMA cables to the antennas and receiver.



Figure 6—Connecting the SMA adapter to the antenna.

2. Position the antennas around the experimental area, pointing the front face of the antenna towards the expected location of the CerePlex W headstage.
3. Connect the 12 V power supply to the receiver.
4. Connect the HDMI-A cable to the receiver as well as the digital hub or CerePlex Direct.
5. Launch the Central Software Suite on the host PC.
6. Power on the components of the Blackrock data acquisition system—the digital hub and NSP when using the Cerebus system, or the CerePlex Direct if using the CerePlex Direct system. Refer to the associated data acquisition system product manuals as needed.

7. Connect the CerePlex W headstage to the pedestal connector on the Blackrock DNSS as shown in Figure 7. Caution: do not overtighten the wheel connector as this can cause damage to the device.



Figure 7—The CerePlex W headstage connected to the pedestal connector of the DNSS

8. Place the CerePlex W headstage and DNSS in the experimental area.
9. Turn on the CerePlex W headstage using the magnetic wand as shown in Figure 2 above.
10. Turn on the CerePlex W receiver by pressing the round power switch shown in Figure 5 above.
 - a. The indicator LED on the digital hub or CerePlex Direct change from RED to either BLUE or GREEN, depending on the model, to indicate successful communication between the CerePlex W receiver and the data acquisition system.
11. If the receiver is properly tuned, the reception indicator LEDs on the CerePlex W receiver should illuminate. Adjust the frequency tuning dial to maximize the number of antenna input channels with illuminated reception indicator LEDs.
 - a. If tuning the receiver frequency does not cause the reception indicator LEDs to illuminate, it could be because the antenna is too far away from the headstage, or the antenna is facing the wrong direction causing the antenna to not pick up enough RF signal. In such scenarios, bring the

antenna closer or reposition the antenna to make the antenna (planar antenna) face the top of the headstage. Please note that it is possible that some reception indicator LEDs will not illuminate depending on your experiment setup. If the antennas are dispersed to cover a large experimental area, move the headstage and DNSS to different locations within the experimental area to test reception in those areas.

Cleaning and Maintenance

The rechargeable battery used to power the CerePlex W headstage is rated for 500 recharge cycles. Eventually, the battery will lose its ability to maintain its original capacity. At such time, contact a Blackrock representative to coordinate a replacement.

The CerePlex W headstage should be kept dry and free of debris. A gentle cleaning with small amounts of isopropyl alcohol can be used to clean the outside of the headstage if necessary.

There is a conductive filament film membrane that permits contact between pads on the pedestal connector and pads on the CerePlex W headstage (Figure 8). Eventually, this filament film will compact or become soiled and fail to permit reliable connection between the pedestal and headstage. If this appears to be the case, contact a Blackrock representative to coordinate a replacement.

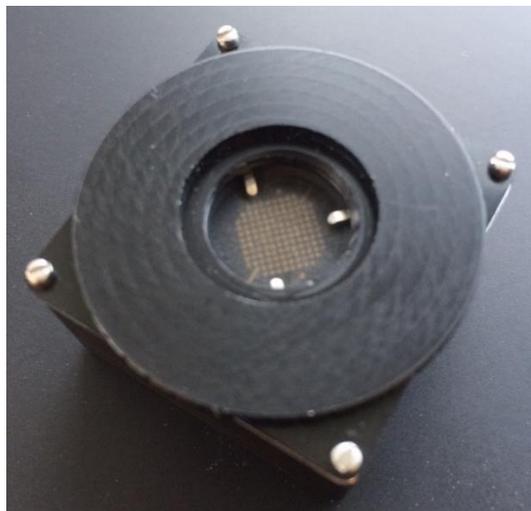


Figure 8—View of the CerePlex W headstage input connector. The wheel connector, pedestal alignment pins, and filament film membrane are shown. The headstage input pads are visible beneath the filament film membrane.

Warranty

Blackrock Microsystems ("Blackrock") warrants its products are free from defects in materials and manufacturing for a period of one year from the date of shipment. At its option, Blackrock will repair or replace any product that does not comply with this warranty. This warranty is voided by: (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; or (3) any sale or other transfer of the product by the original purchaser.

Except for the warranty set forth in the preceding paragraph, Blackrock provides no warranties of any kind, either express or implied, by fact or law, and hereby disclaims all other warranties, including without limitation the implied warranties of merchantability, fitness for a particular purpose, and non-infringement of third-party patent or other intellectual property rights.

Blackrock shall not be liable for special, indirect, incidental, punitive, exemplary or consequential damages (including without limitation, damages resulting from loss of use, loss of profits, interruption or loss of business or other economic loss) arising out of non-compliance with any warranty. Blackrock's entire liability shall be limited to providing the remedy set forth in the previous paragraph.

Return Merchandise Authorization (RMA)

In the unlikely event that your CerePlex W needs to be returned to Blackrock for repair 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 +1 (801) 582 5533 or by emailing support@blackrockmicro.com. 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 S. Komas Dr., Suite 200

Salt Lake City, UT 84108 USA

Tel: +1 (801) 582 5533

Support

Blackrock prides itself in its customer support. For additional information on this product or any of our products, you can contact our Support team through the contact information below:

Manuals, Software Downloads, and Application Notes

www.blackrockmicro.com/technical-support

Issues or Questions

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