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CerePlex Direct

Instructions for Use



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Welcome!

Thank you for choosing Blackrock Microsystems!

This manual contains information on the CerePlex Direct, a plug-and-play biosignal data acquisition system. The system is designed for use with many of Blackrock's CerePlex digital headstages and is compatible with the NeuroMotive video tracking system. The CerePlex Direct can record from up to 96 channels over three HDMI input banks. The figure below shows an example of how the CerePlex Direct fits into a complete neural recording system.



Clockwise, from top left: recording computer (example; not included), CerePlex Direct, CerePlex-series digital headstage, HDMI A-D cable, USB A-B cable, power cable

This manual will cover the system requirements, associated software, and an overview of the system's hardware features.

For questions on this product or any other Blackrock products, contact our 24/7 support service at support@blackrockmicro.com

Warnings

- Do not use with devices not approved by Blackrock Microsystems
- Do not touch any exposed electrical conductors, or use damaged HDMI cables when using the CerePlex Direct.
- Keep cables out of traffic paths. Injury to user or patient can occur.
- The user/patient/subject should not attempt to open the CerePlex Direct.
- Use caution when operating the CerePlex Direct, especially when connecting and disconnecting cables to minimize risk of CerePlex Direct falling and/or injury.
- Do not rest objects on or against the CerePlex Direct.
- Avoid strong static discharges from sources like television or computer monitors; they may damage the electrical components of the system.
- Always operate the CerePlex Direct system in a clean environment.
- Keep the CerePlex Direct system away from liquids. Contact with water, shower spray, or wet surfaces can result in a device malfunction and/or electrical shock.
- Connection of external instruments to the CerePlex Direct may compromise electrical safety.
- Always use antistatic or electrostatic discharge (ESD) safe gloves when connecting the CerePlex Direct.
- Use only Blackrock Microsystems supplied components (CerePlex Direct, CerePlex Headstages, Blackrock Microsystems Cables and Adaptors). 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 CerePlex Direct when system is not in use.
- Plug in all connections and wires to the patient / subject and the system prior to powering on the CerePlex Direct.
- Power off the system prior to removing or disconnecting any cables from the patient / subject and the system.
- Regularly inspect cables for compromised insulation or bad connections. This can help prevent electrical shock as well as data corruption.
- Read this entire manual prior to using the device.
- This product is for non-human use only. This model is not for use with human subjects

Safety Specifications



Power Requirements	110 (at 60 Hz) or 220 (at 50 Hz) VAC, 220 ma/118 mA maximum load
Serviceable Fuses	1/4" x 1 ¼", 250 V, 2 Amps, Slow Blow
Mode of Operation	Continuous
Input Protocol	Low-voltage differential signaling
Water Ingress Protection	Ordinary equipment, not fluid resistant, IP20
Operating Environment	10° C to 40° C, 5 to 95% relative humidity (non-condensing)
Storage Environment	-20° C to 50° C, 5 to 100% relative humidity (non-condensing)

Hardware Specifications

Digital Signal Processing	Adaptive line noise cancellation filter, 4 th -order hi/lo pass digital filtering for all channels. Separate filters for simultaneous continuous and spike streams along with online spike classification using time/amplitude and/or template matching
Neural Signal Inputs	Up to 96 channels
Input Protocol	Low-voltage differential signaling
Sampling Frequency	30 kHz maximum data acquisition rate, 50 MHz data transfer
Experimental Analog Inputs	Three ±5 V inputs for experiment or neural signal processing
Analog to Digital Conversion	16-bit digital output, with 0.25 µV per bit resolution
Maximum Input Voltage Range	Up to ±5.0 V between any input and ground
Common Mode Rejection Ratio	>90 dB at 50/60 Hz
Experimental Digital Inputs	Sixteen 0-5V TTL Logic Level inputs for experiment event signaling
Power Supply	Standard 3-pin PC power connector for accepting 110-240 VAC, 50-60 Hz
PC Hardware Interface	Hi-Speed USB 2.0
PC Software OS supported	Windows XP Pro, Windows 7 – 32 and 64 bit

Setting Up the CerePlex Direct

The software CD included with the CerePlex Direct contains two executable installers:




 CerePlex-Direct-Central-Suite-7.0.0	5/24/2017 7:37 PM	Windows Installer ...	34,823 KB
 MCRInstaller-7.16	8/14/2011 4:58 AM	Application	406,320 KB

CerePlex-Direct-Central-Suite-7.X.X.msi installs the CerePlex Direct Software Suite and USB drivers for communicating with the CerePlex Direct. The latest version can be downloaded from the ‘Software Downloads’ section of the Blackrock Microsystems website.

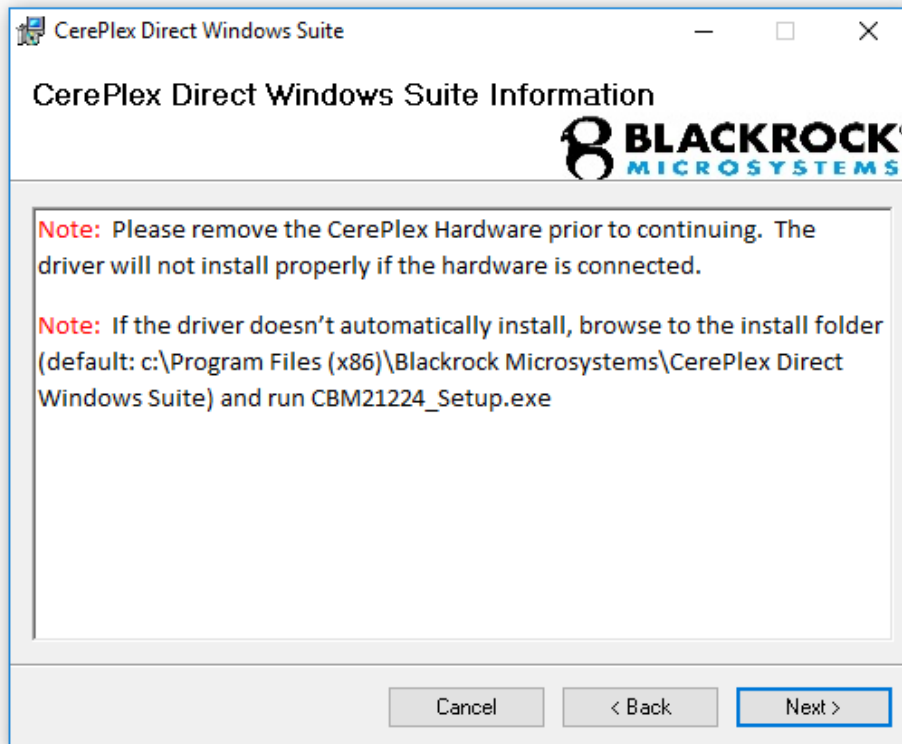
MCRInstaller-7.16.exe is the Matlab Compiler Runtime installer—this is required to use Central’s custom digital filter editor.

NOTE: Before installing: make sure the CerePlex Direct is **not** plugged into the PC with the USB A-B cable. Installing the CerePlex Direct Software Suite with the CerePlex Direct connected to the host PC may result in driver installation issues and cause the host PC to fail to recognize the CerePlex Direct. If this happens, please refer to the ‘Troubleshooting’ section of this manual or contact Blackrock Support.

CerePlex Directs with serial numbers below 17421 will have three executable installers in the CD:

Name	Date modified	Type	Size
 CDM21224_Setup.exe	12/29/2016 11:27 ...	Application	2,089 KB
 CerePlex-Direct-Central-Suite-6.5.5.msi	12/28/2016 12:11 ...	Windows Installer ...	32,438 KB
 MCRInstaller-7.16.exe	8/14/2011 4:58 AM	Application	406,320 KB

CDM21224_Setup.exe is a driver installer that can be used to manually install the USB driver. For convenience, all USB drivers are installed by the CerePlex Direct itself and the CerePlex Direct Software Suite installer. This installer is included for troubleshooting compatibility issues with a previous USB-SPI interface.



To start the installation process, run **CerePlex-Direct-Central-Suite-X.X.X.msi** and follow the onscreen instructions from the installation wizard (as shown in the figure above). After installing the software, the CerePlex Direct can be connected to the host PC via the USB A-B cable. When plugged into a USB port for the first time, the CerePlex Direct will install the device drivers. Windows will re-install these drivers when the USB port is changed.

If you intend on using Central's custom digital filter editor to create your own filters, you will need to run **MCRInstaller-7.16.exe**.

Overview of Hardware

CerePlex Direct

The CerePlex Direct is a non-real-time data acquisition system that collects data from up to 96 digital data channels, 3 analog inputs, and a 16-bit digital input. Data is sampled at 30,000 samples/second and transmitted over hi-speed USB to a host PC with a bandwidth of 50 Mbps.

The CerePlex Direct is designed to have several isolated ground planes. The CerePlex Direct chassis is tied to earth ground through the ground pin of the power plug. Patient ground is found on the digital headstage connections and the touchproof ground connector on the front panel. It

is not recommended to bridge these isolated ground planes; it can introduce noise into the signal and compromise the safety isolation of the patient circuitry.



CerePlex Direct front panel. From left to right: Power switch, USB LED, 16-bit digital input, analog input BNC connectors, digital headstage HDMI inputs (with LEDs), touchproof patient ground connector

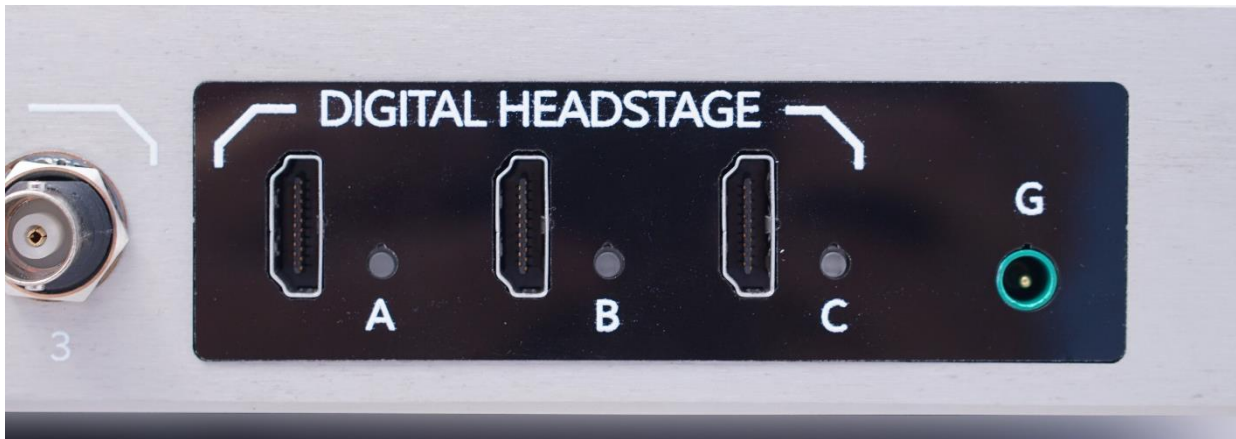


CerePlex Direct rear panel. From left to right: power cable plug, BNC connectors (1 fast settle, two no-connection), USB port to host PC, NeuroMotive sync signal BNC connector

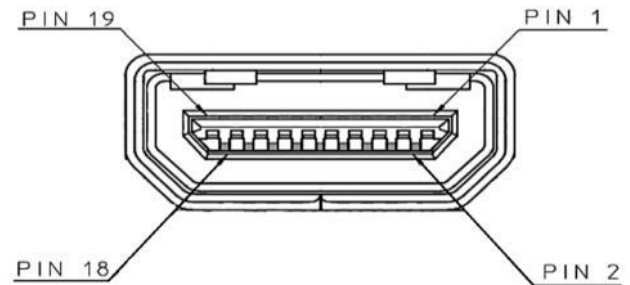
CerePlex Direct Inputs

Digital Headstage HDMI Banks

The CerePlex Direct has 3 HDMI-A connectors located on the front panel labeled A, B, and C for digital headstage inputs.



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



Digital headstage HDMI connector pinout

There is an LED on each of the digital headstage input banks that will be lit blue when the Direct is receiving valid data packets from the digital headstage. For more information on the LED light conditions, please see the troubleshooting section.

Analog Input

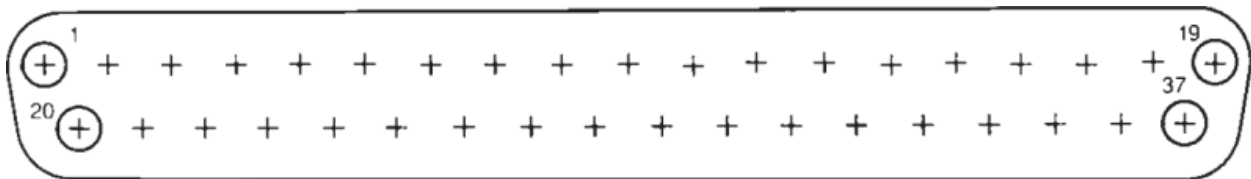
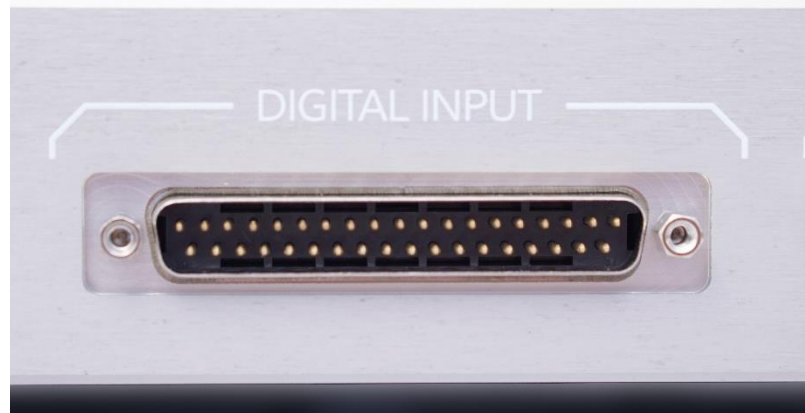
Auxiliary analog signals can be recorded through three analog input BNC ports located to the left of the HDMI connectors on the front panel. The analog input range is ± 5.0 V and should come from a source of less than 100 Ω .



Digital Input

Digital events can be recorded through the 16-bit DB37 input port.

Digital Input Pin #	Description
1, 18, 19	NC
2	Dig In 0
3	Dig In 1
...	...
16	Dig In 14
17	Dig In 15
20-37	GND



Digital input pinout

Fast Settle Input

The CerePlex Direct has a BNC connector located on the back panel labeled 'FS' that serves as a fast settle input. The fast settle connector is tied to each of the digital headstage banks in the front. The signal fed into the BNC connector is passed straight through the system to Pin 14 on the HDMI connector, so that downstream digital headstages can receive a fast settle signal.



CerePlex Direct Outputs

Host PC

The CerePlex Direct has a Hi-Speed USB 2.0 B connector on the back panel that can connect the CerePlex Direct to the host PC via a USB A-B cable.

The USB LED on the front panel indicates the status of the CerePlex Direct: upon powering on the CerePlex Direct, the USB will be a brightly lit yellow. When CerePlex Direct Suite is initialized, the LED will flash blue briefly, then turn yellow while Central loads the configuration file. Once the configurations have been loaded by Central, the LED will turn continuously blue.

Patient Ground

The CerePlex Direct has a touch-proof connector to patient ground located on the front panel to the right of the digital headstage HDMI banks labeled 'G.' The HDMI cable and headstage also communicate patient ground through the pin 19 of the digital headstage input. The touchproof connector provides an additional low-impedance connection to patient ground.

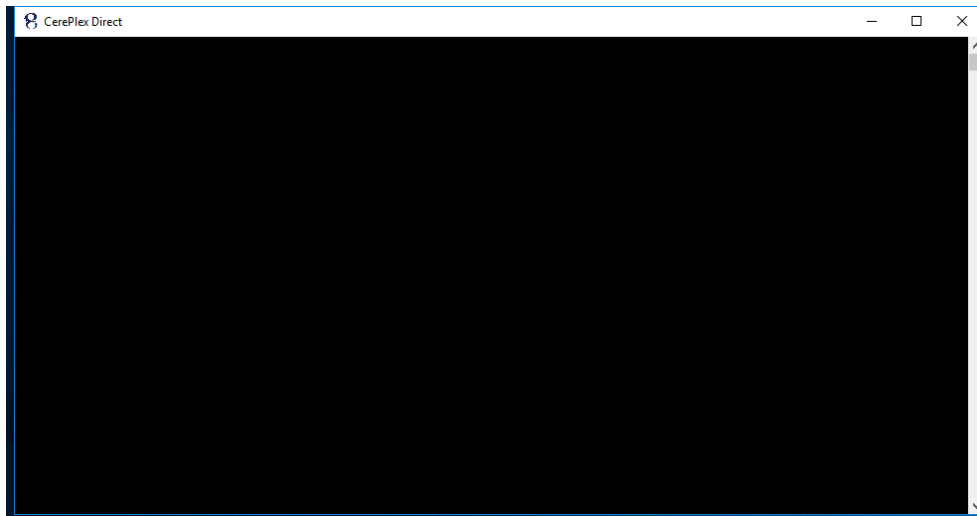
NeuroMotive Camera Sync

If using the NeuroMotive video tracking system, the CerePlex Direct can be hardware synchronized with the tracking and recording system. The BNC connector outputs a TTL digital signal to trigger the NeuroMotive camera.

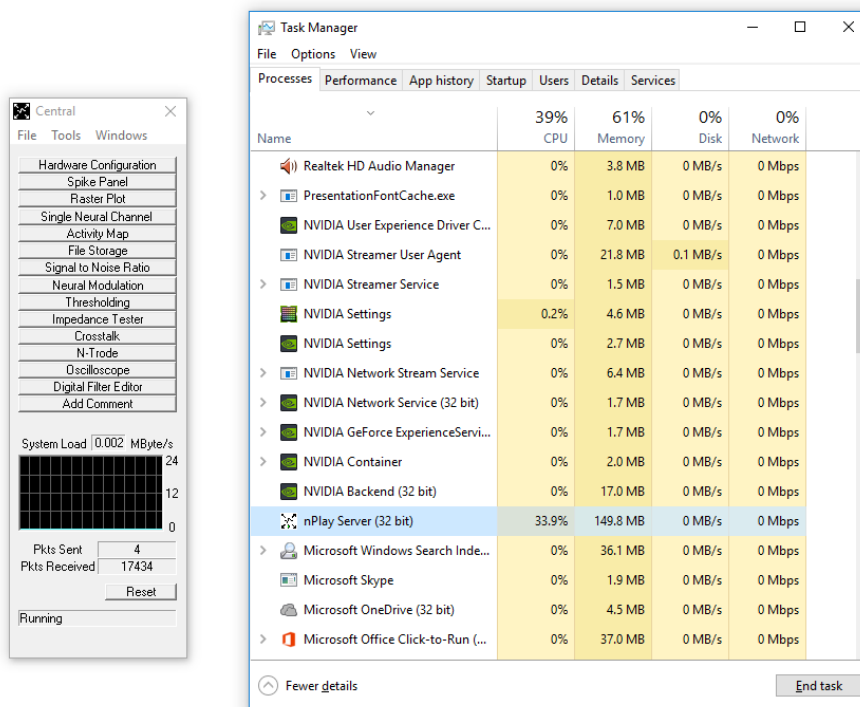
CerePlex Direct Software Suite

The CerePlex Direct Software Suite consists of two applications that run simultaneously: nPlayServer and Central Software Suite via nPlay File Control.

Upon running CerePlex Direct Software Suite, a window titled, 'CerePlex Direct' will briefly open:



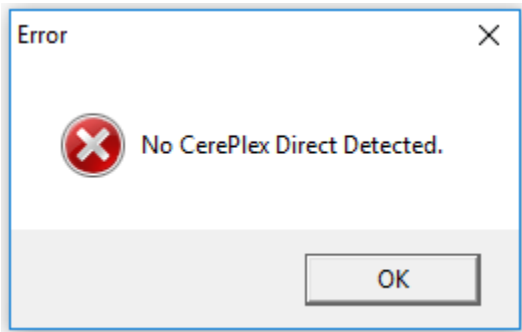
The 'CerePlex Direct' window will close, and Central will launch and run simultaneously with nPlayServer in the background:



nPlayServer receives data from the CerePlex Direct then broadcasts this data to Central for visualization and analysis. The end user interface is identical to Central; during recording, nPlay File Control is locked down. For more detailed instructions and use on Central Software Suite, please see LB-0574 Central Software Suite IFU

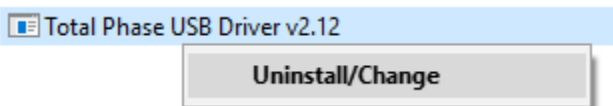
Troubleshooting

No CerePlex Direct Detected




This error indicates an error has occurred in communication between nPlayServer and Central Software Suite. If the CerePlex Direct and the PC are connected through the USB cable and the CerePlex Direct is powered on, this may be caused by an error with the USB driver.

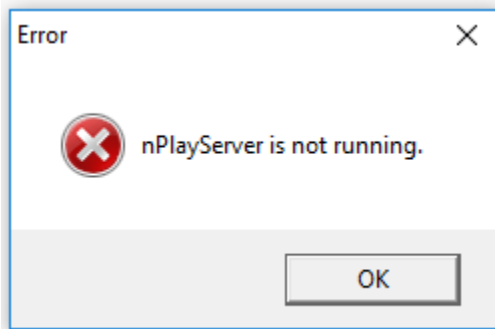
To correct this, uninstall the Total Phase USB driver in the Control Panel's Programs and Features menu:



After the uninstall is complete, run CDM21224_Setup.exe from the software CD included with the CerePlex Direct.

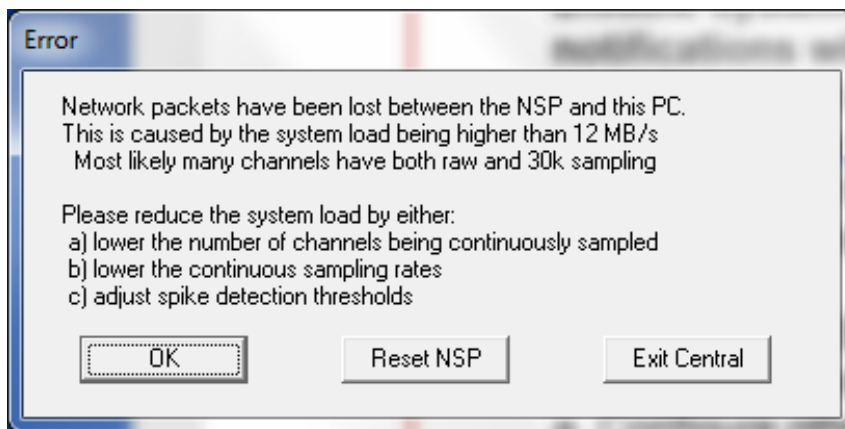
Name	Date modified	Type	Size
 CDM21224_Setup.exe	12/29/2016 11:27 ...	Application	2,089 KB

nPlayServer is Not Running



This error occurs when a previous instance of nPlayServer has not closed properly and is still running in the background. In the Windows Task Manager (accessible with CTRL+SHIFT+ESC), close any instances of nplay.exe and nplayserver.exe before starting CerePlex Direct Suite again.

Packet Loss



In rare cases, USB hardware can have compatibility conflicts with the CerePlex Direct, causing periodic packet loss between the Direct and host PC. If this happens, try switching to a different USB port on the PC (e.g., moving from a front cap to a rear port or vice versa; moving between USB 3.0 to USB 2.0, et cetera).

Digital Headstage Connectivity

The LED on the HDMI connector will briefly flash yellow upon initially plugging in the HDMI port, then turn blue. A continuously blue LED means that the bank is plugged in and receiving valid signals from the headstage.

If the LED turns yellow again, it indicates a data transmission error and packets may have been invalidated. If this happens, check that the HDMI is plugged into the bank securely. If the LED stays unlit, this indicates that the Direct is not recognizing and powering the headstage. Contact

Blackrock Support at support@blackrockmicro.com for assistance with headstage compatibility issues if this occurs.

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.

Returns

In the event that your device 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 via email at 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 device arrived in for return shipment. Please address the package as follows:

Blackrock Microsystems
ATTN: RMA # XXXX
630 S. Komas Drive | Suite 200
Salt Lake City | UT 84108 USA
T +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

www.blackrockmicro.com/technical-support

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