

ZEUS: MRgRT Motion Management QA Phantom

Model 008Z

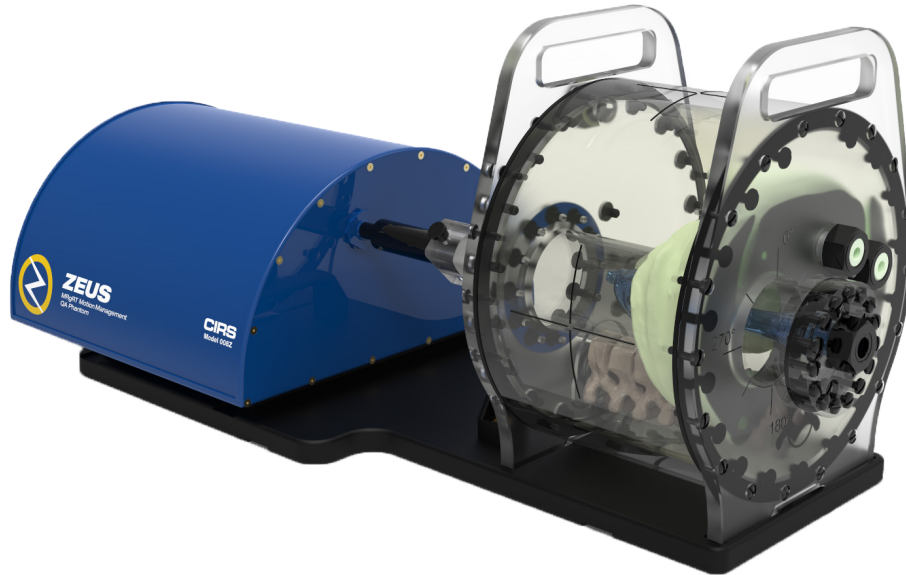


IMAGE ACQUISITION • TREATMENT PLANNING • DOSE DELIVERY

USER GUIDE



CIRS

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Overview

Key Features

- Non-ferromagnetic materials => MR safe
- Allows for positioning within magnet bore due to piezo electric motors
- Organic shaped organs at risk and moving target
- Can be imaged in MRI, CT, and hybrid systems
- Ion chamber dosimetry in liver, kidney, spine and moving target
- Calculate beam latency for each breathing cycle and as an average of all executed cycles without the need of an external oscilloscope.
- 3D tissue equivalent spine for bone landmark

The integration of MR imaging in radiation therapy facilitates real time motion management.

The CIRS Zeus MRgRT Motion Management QA phantom is designed to address such needs. Zeus is MR Safe due to the use of piezoelectric motors and non-ferro-magnetic materials. The two piezoelectric motors move a cylindrical insert, which contain a tracking target, through a gel/liquid fillable body by rotating it independently from the motion in the Inferior-Superior direction.

The moving insert contains an organic shaped target (tumor) filled with gel, which is surrounded by the same background gel used to fill the body. The body represents a heterogenous background due to simulated lungs, liver, kidney and spine. The simulated organs are anatomical in shape and have a life-like spatial relationship. They are filled with gels that provide contrast in CT and MR versus the background gel, which fills the void between the organs. Besides imaging, all organs, except for the lungs, offer ion chamber dosimetry cavities, which allow for completing an entire QA process; from imaging to planning to verification of dose delivered.

Zeus is designed as a single unit with a piezo actuator fixed permanently to a base plate on which the MRI body “snaps”. This allows for quick setup, removal, filling, and storage purposes. The phantom’s base plate has machined slots on the bottom, which allow for the use of indexing bars for precise and repeatable/reproducible phantom-MRI (MRI-Linac) alignment.

Safety

GENERAL SAFETY NOTICE

Warnings and Cautions are identified throughout this user guide to alert users of dangerous conditions that are created when instructions are not followed. Operation and maintenance personnel must observe all safety regulations. For the purposes of this manual, cautions are identified as situations that can cause damage to the phantom and internal electronics. Warnings are defined as conditions that can cause injury to the operator.

SAFETY PRECAUTIONS

Below is a list of specific safety precautions detailed in this user guide. Please review these precautions carefully and use care while handling the phantom.



WARNING:

HIGH VOLTAGES CAPABLE OF CAUSING DEATH ARE USED IN THIS EQUIPMENT. USE EXTREME CAUTION WHEN OPERATING AND SERVICING THE CONTROLLER. DEENERGIZING THE CONTROLLER BY USING THE POWER SWITCH DOES NOT REMOVE THE 110-250 VAC POWER EXCITATION FROM THE CONTROLLER. THESE VOLTAGES REMAIN PRESENT IN THE CONTROLLER POWER SWITCH AND POWER CONNECTOR UNLESS IT IS DISCONNECTED.



WARNING:

TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY WHEN USING THE MOTION CONTROLLER, FOLLOW THESE BASIC PRECAUTIONS:

- There are no user-serviceable parts inside. Refer servicing to qualified service personnel.
- Use only a grounded 3 prong electrical outlet when connecting this product to a power source. If you do not know whether the outlet is grounded, check with a qualified electrician.
- Do not remove ground prong.
- Do not install or use this product near water, or when you are wet.
- Operate the product securely on a stable surface.
- Set up the product in a protected location where no one can step on or trip over the power cord and the power cord can not be damaged.
- It is recommended that the customer install an AC surge arrestor in the AC outlet to which the Controller is connected. This is to avoid damaging the equipment by local lightning strikes and other electrical surges.
- To prevent overheating, do not block the fan on the rear panel or the ventilation holes located on the rear panel and bottom of the Controller.



WARNING:

DUE TO THE NEED TO SHIELD ACTUATOR FOR EMI, HEAT IS GENERATED INSIDE. THEREFORE, CIRS STRONGLY RECOMMENDS THAT THE PHANTOM IS RUN IN SESSIONS OF LESS THAN 1 HOUR WITH HALF HOUR BREAKS BETWEEN SESSIONS.



WARNING:

NEVER MOVE THE PHANTOM FROM ONE PLACE TO ANOTHER WITH THE BODY AND ROD IN PLACE. REMOVE ROD FIRST THEN REMOVE BODY BEFORE MOVING THE ACTUATOR BASE PLATE ASSEMBLY.

CLEANING

You can clean the phantom with a soft cloth dampened with water and mild detergent. Do not use disinfectants or solvent-based cleaners or sprays.

Unpacking Instructions



1. Before you open the case check the three **Drop 'N' Tell** indicators on the right side of the case.

Drop 'N' Tell shipping damage indicator shows when a case has been dropped in transit and contains potential damaged goods. The sensor displays a red arrow when applied before shipping. If the container receives a shock exceeding 25 G force, the sensor display arrows will change to blue. If the sensor has been activated and is blue, a claim may need to be filed with the carrier. If activated, take extra care in inspecting the components as they are unpacked, assembled and tested.

Note: If there is any damage to the packaging case, containers, foam, and components, or operation, immediately contact the carrier and the phantom supplier, and keep all packaging for carrier inspection.



2. Remove cables.



3. Remove wall partition from the case and set aside.



4. Remove motion controller from case and set aside.



5. Remove the actuator base plate assembly from case.

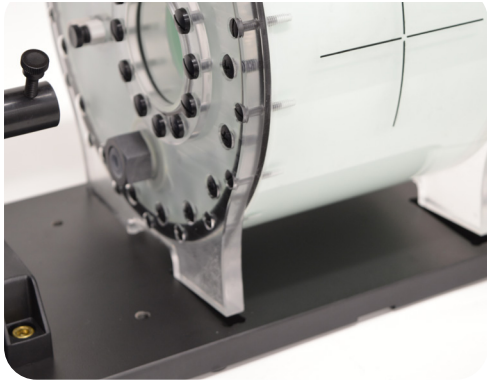


6. Pull phantom body from second case.

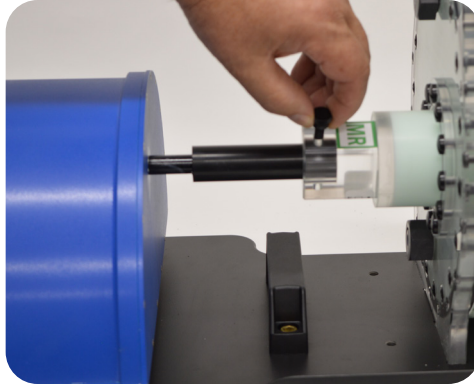


7. Pull phantom rod from second case.

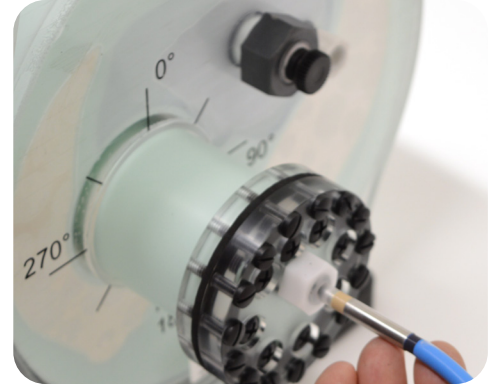
Assembly Procedure



1. Place phantom body on base plate into the 4 slots as shown in image above.



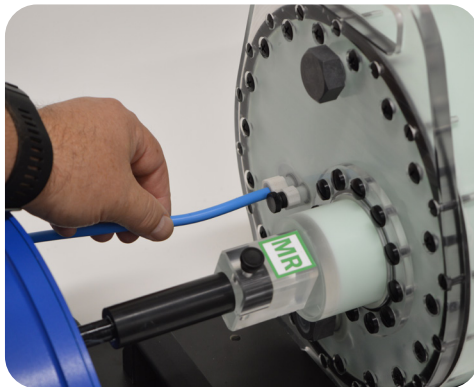
2. Place rod into phantom body and screw the rod and actuator together.



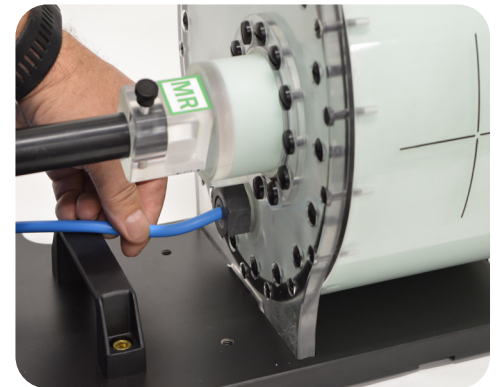
3. Insert ion chamber into each cavity hole. (Moving target)



4. Insert ion chamber into each cavity hole. (Liver)



5. Insert ion chamber into each cavity hole. (Kidney)



6. Insert ion chamber into each cavity hole. (Spine)

Cables and Connections



WARNING:

FOLLOW THE CABLE CONNECTION STEPS AS THEY ARE PRESENTED IN THIS USER GUIDE.

CONNECTING THE CABLES WITH THE CONTROLLER "POWER ON" CAN SERIOUSLY DAMAGE THE PHANTOM'S ELECTRONICS.



1. Plug the Cable DB26 m/m to back of controller and to back of actuator.



2. Plug power cord into the back of controller. Plug other end of power cord into the wall outlet.



3. Attach ethernet cable to back of controller.



4. Plug beam latency (BNC) cable into the back of the controller. To perform beam latency, connect the other end of the BNC cable to the Beam-on Beam-off output signal of the MRI-LINAC



5. The controller and actuator powered and ready for use.

ViewRay MRIdian System Accessories

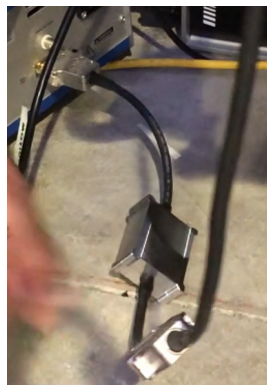


WARNING:

FOLLOW THE CABLE CONNECTION STEPS AS THEY ARE PRESENTED IN THIS USER GUIDE.

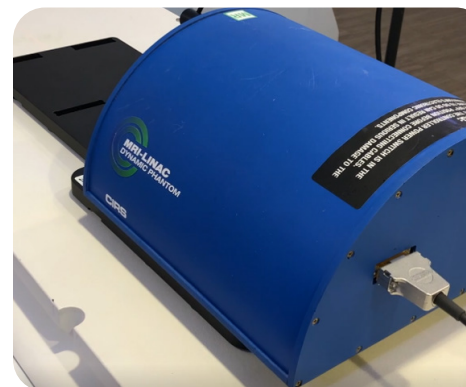
CONNECTING THE CABLES WITH THE CONTROLLER "POWER ON" CAN SERIOUSLY DAMAGE THE PHANTOM'S ELECTRONICS.

LOW PASS RF FILTER



1. Connect the female connector of the RF Filter to the controller box and the male connector to the 40ft cable.

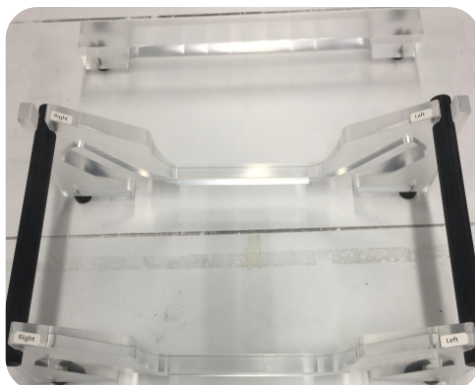
2. Push the 40ft cable into the waveguide.



3. Put the RF filter and cable connectors between two copper meshes and slide them into the waveguide.

4. Pull the 40ft cable from another side of the RF closet and connect it to the back of the actuator.

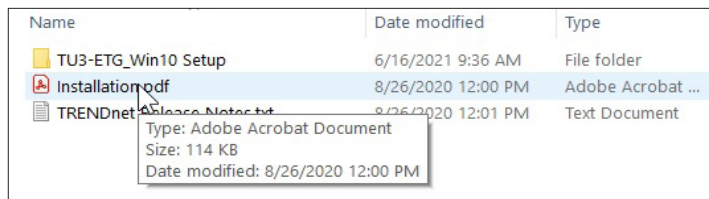
COIL SUPPORT



Setup notes for Dynamic Phantoms with controller connecting to a PC using an Ethernet connection:

The following are the recommended steps to install the “USB to Network Adapter” that was shipped with this phantom. The new Network Connection must be setup as a Static IP address in order for the PC to communicate with the motion controller of the phantom.

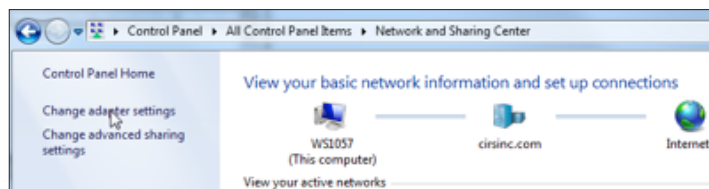
1. To install the necessary driver, unzip the “USB-to-Network Adapter” folder found on the provided USB drive or download the zipped folder from the CIRS website. Unzip to a known location and follow instructions from “Instructions.pdf” document.



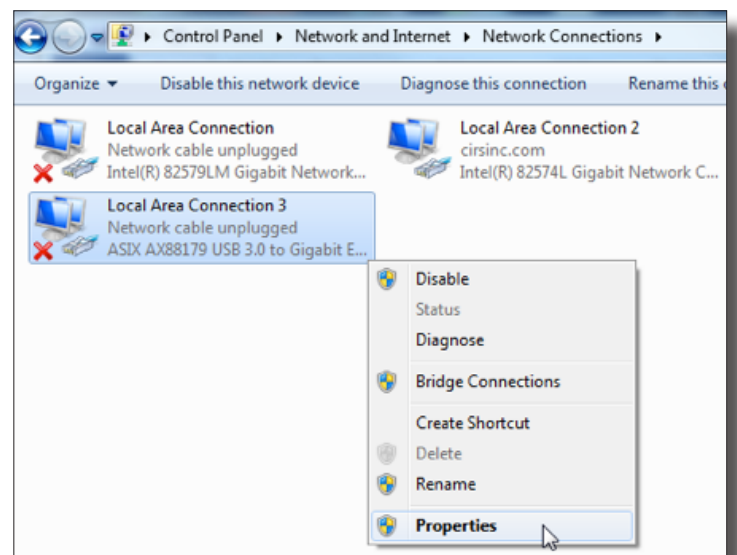
2. Follow the on screen steps and acknowledge all the messages related to driver’s installation. Once the driver installation is finished, plug the “USB-to-Network Adapter” into your PC’s USB port and acknowledge the Windows installation message. Exit the “USB-to-Network Adapter Software” menu by clicking Exit.

Note: The provided “USB to Network Adapter” can act as Plug and Play device on some PC but CIRS recommends doing the installation of the driver as outlined above.

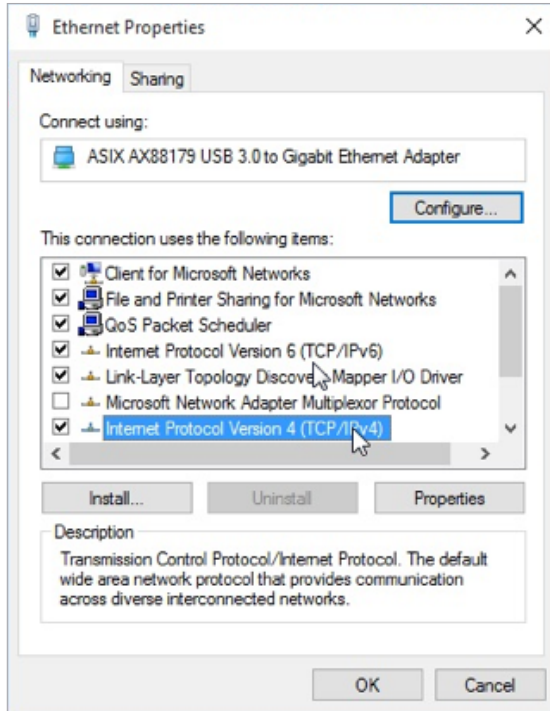
3. From the Control Panel, open the Network and Sharing Center and then select “Change adapter settings”.



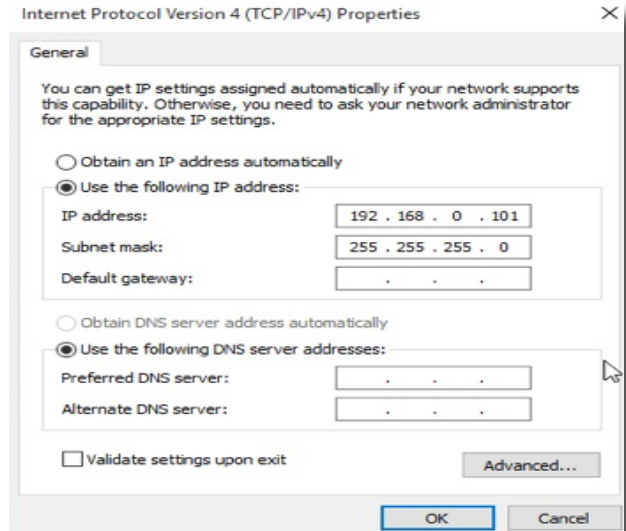
4. Providing that the installation of the “USB-to-Network Card” was successful, the newly installed Network Adapter should show as “ASIX AX88179 USB 3.0 to Gigabit Ethernet Adapter”. Select it’s Properties using the right mouse click menu as shown below.



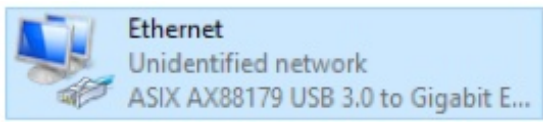
5. Select Internet Protocol Version 4 (TCP/IPv4) and click on properties



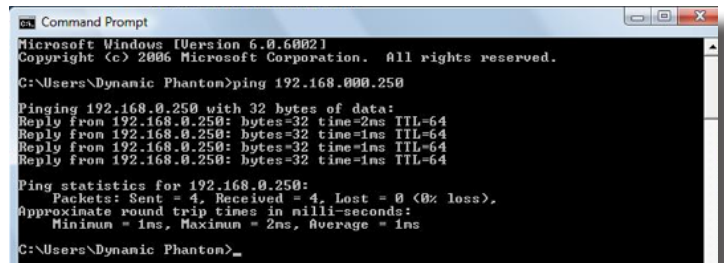
6. In the internet Protocol Version 4 (TCP/IPv4) properties window, change from default “Obtain an IP address automatically” to “Use the following IP address:” Enter “192.168.0.101” as the IP address and “255.255.255.000” as the Subnet mask. *Note: If an IP address conflict occurs because IP address 192.168.0.101 is already assigned to another Network Adapter, the user can try any other IP address between 192.168.0.102 and 192.168.0.249.*



7. Once the IP address is entered, click OK. Connect the PC to the Controller using the provided Ethernet cable by inserting one end of the cable in the controller’s Ethernet port and the other one in the “USB-to-Network Adapter”. Power on the controller. To check that the PC to controller connection was successful, ensure the icon of the “ASIX AX88179 USB 3.0 to Gigabit Ethernet Adapter” in the Control Panel matches the image below. Network Connection can be renamed using the right mouse click menu.



8. A more in depth check of the PC-to-controller communication connection can be done by running a “ping command” in Command Prompt as seen in the image below. To ping the controller, type “ping 192.168.0.250” and press enter. Ping certifies IP-level connectivity to another TCP/IP device. If you receive Ping statistics for IP address 192.168.0.250 (controller IP address) the communication connection between the PC and controller was successful.



CIRS Motion Control Software

CIRS MOTION CONTROL SOFTWARE SYSTEM REQUIREMENTS

Windows XP® / Vista / Windows 7 / Windows 8 / Windows 10 (32 and 64 Bit)

Pentium 3® or equivalent

512 MB RAM, 2 MB of available disk space

INTRODUCTION

CIRS Motion Control is an application which allows you to control the movement of the CIRS Model 008Z MrgRT Motion Management Phantom and model 008PL Dynamic Platform. With CIRS Motion Control, you can quickly set up a movement based on a library of pre-defined motions, including Sin, Cos4, Cos6, Sawtooth, Shark-fin, Hysteresis (Model 008A only) and Continuous Drift, Transient Excursion, Persistent Excursion, High-Frequency Excursion, or you can import custom motion data from any tab-delimited or comma-separated text file. CIRS Motion Control also allows you to save any motion to easily access the same parameters for repeated calibration and testing.

INSTALLATION

The CIRS Motion Control application requires the Trio PC Motion library, which allows the computer to recognize the Trio controller board in the Dynamic Phantom or Platform. To install the Trio PC Motion library, double-click Trio_PC_Motion_ActiveX_2_12_0_Setup and follow the steps in the InstallShield Wizard.

To install CIRS Motion Control, double-click MotionControl-Setup or Setup and follow the steps in the Setup Wizard. The Microsoft.NET Framework Version 3.5 is required for the application to run.

GENERAL USE

The CIRS Motion Control Software is preinstalled on the optional computer. Help can be launched from **Help Menu**. A copy of the software is included on a USB drive.

CIRS does not support 3rd party equipment. Please refer to the included documents for warranty and service information for the ACER brand computer (computer optional).

The software automatically creates a log file where data about waveform parameters are saved. The log file is usually located under the current user in the Application Data folder. A Windows OS search function can be used to find the log file. Searching hidden files and folders should be enabled.

The log file provides a record of the motion history of the device and can be used as objective evidence that proper QA was performed.

SOFTWARE USER MANUAL & SOFTWARE UPGRADES

CIRS Motion Control software has an online user manual. After software installation, a copy may be viewed and downloaded using either the “Check for Updates” button from Help Menu and selecting “Motion Control User Manual.pdf” or by pointing a web browser to the CIRS Software Updates webpage: http://www.cirsinc.com/MotionControlUpdates/Motion_Control_User_Manual.pdf

If the end-user is offline during use of the phantom, it is recommended that a copy of the CIRS Motion Control User Manual is downloaded and saved. Once a copy of the manual is saved in a known location, the PDF document can be opened and viewed in a window separate from the CIRS Motion Control software window to aid in phantom set up and use.

The user manual is regularly updated to incorporate new information based on the addition and/or modification of features as well as end-user feedback.

CIRS recommends that the end-user routinely check the CIRS Software Update webpage using the “Check for Updates” button from Help Menu. This page indicates the current software version. The latest free software upgrade is posted as soon as it becomes available. Instructions for updating the software are also posted. Please note, controllers with serial numbers containing P136 may experience PC communication failuers upon updating Windows OS. If this occurs, CIRS strongly recommends a motion controller update. For details on how to upgrade, refer to the model 008A product brochure.

BEAM LATENCY TESTING

For recommended procedures on how to perform beam latency testing, refer to the CIRS Motion Control User Manual which can be launched from the help menu.



Zeus Specifications

MOTION CONTROLLER

OVERALL DIMENSIONS:	67 cm x 32 cm x 20 cm
OVERALL WEIGHT:	12 kg (26.5 lbs)
AMPLITUDE, IS:	± 25 mm
AMPLITUDE, AP/LR:	± 3.5 mm
MOTION ACCURACY:	± 0.2 mm (linear motion)
MOTION ACCURACY:	± 0.25° (rotation motion)
CYCLE TIME:	1 - ∞ (adjusted based on amplitude)
WAVEFORMS:	sin (t), 1-2cos ⁴ (t), 1-2cos ⁶ (t), sawtooth, sharkfin (built in), custom (through import)

PHANTOM BODY*

OVERALL DIMENSIONS:	25.6 cm x 32 cm x 18 cm
OVERALL WEIGHT:	10 kg (22 lbs)

MOVING ROD*

OVERALL DIMENSIONS:	22 cm x Ø 6.3 cm
OVERALL WEIGHT:	1.1 kg (2.4 lbs)

Note: Customers must complete their order with the purchase of the moving rod. *Refer to separate CIRS cavity code list for available chamber cavities. It is recommended to choose the same cavities for both the body and rod.

INCLUDED WITH ZEUS

Part No.	Qty	Component Description
008Z	1	Zeus: MRgRT Motion Management QA phantom Body (moving rod not included)
	1	Dynamic Motion Controller with firmware installed (110 - 220V, 50 - 60Hz)
	1	Actuator base plate assembly
	1	CIRS Motion Control Software
	1	Communication cables kit: Ethernet cable + adapter
	1	User's guide
	2	Carry Case

ADDITIONAL ITEMS FOR VIEWRAY SYSTEMS

	Component Description
Optional	Coil Support for ViewRay System (MRIdian)
Required	Low Pass RF Filter to Use with 008Z ViewRay System

Warranty

All standard CIRS products and accessories are warranted by CIRS against defects in material and workmanship for a period as specified below. During the warranty period, the manufacturer will repair or, at its option, replace, at no charge, a product containing such defect provided it is returned, transportation prepaid, to the manufacturer. Products repaired in warranty will be returned transportation prepaid.

PRODUCT	WARRANTY PERIOD
Zeus: MRgRT Motion Management QA Phantom	24 Months

There are no warranties, expressed or implied, including without limitation any implied warranty of merchantability or fitness, which extend beyond the description on the face hereof. This expressed warranty excludes coverage of, and does not provide relief for, incidental or consequential damages of any kind or nature, including but not limited to loss of use, loss of sales or inconvenience. The exclusive remedy of the purchaser is limited to repair, recalibration, or replacement of the product at manufacturer's option.

This warranty does not apply if the product, as determined by the manufacturer, is defective because of normal wear, accident, misuse, or modification.

NON-WARRANTY SERVICE

If repairs or replacement not covered by this warranty are required, a repair estimate will be submitted for approval before proceeding with said repair or replacement.

RETURNS

If you are not satisfied with your purchase for any reason, please contact Customer Service or your local distributor prior to returning the product. Visit <https://www.cirsinc.com/distributors/> to find your local distributor. Call 800-617-1177, email rma@cirsinc.com, or fax an RMA request form to 757-857-0523. CIRS staff will attempt to remedy the issue via phone or email as soon as possible. If unable to correct the problem, a return material authorization (RMA) number will be issued. Non-standard or "customized" products may not be returned for refund or exchange unless such product is deemed by CIRS not to comply with documented order specifications. You must return the product to CIRS within 30 calendar days of the issuance of the RMA. All returns should be packed in the original cases and or packaging and must include any accessories, manuals and documentation that shipped with the product. The RMA number must be clearly indicated on the outside of each returned package. CIRS recommends that you use a carrier that offers shipment tracking for all returns and insure the full value of your package so that you are completely protected if the shipment is lost or damaged in transit. If you choose not to use a carrier that offers tracking or insure the product, you will be responsible for any loss or damage to the product during shipping. CIRS will not be responsible for lost or damaged return shipments. Return freight and insurance is to be pre-paid.

With RMA number, items may be returned to:

**CIRS
Receiving
900 Asbury Ave,
Norfolk, Virginia, 23513 USA**



NOTES:



NOTES:

CIRS

**COMPUTERIZED IMAGING
REFERENCE SYSTEMS, INC.**

900 Asbury Ave
Norfolk, Virginia 23513 USA

Toll Free: 800.617.1177

Tel: 757.855.2765

Fax: 757.857.0523

Email admin@cirsinc.com

www.cirsinc.com

Technical Assistance

1.800.617.1177



Computerized Imaging Reference Systems, Inc. has been certified by UL DQS Inc. to **(ISO) 13485:2016**. Certificate Registration No.10000905-MP2016.

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Specifications subject to change without notice.
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