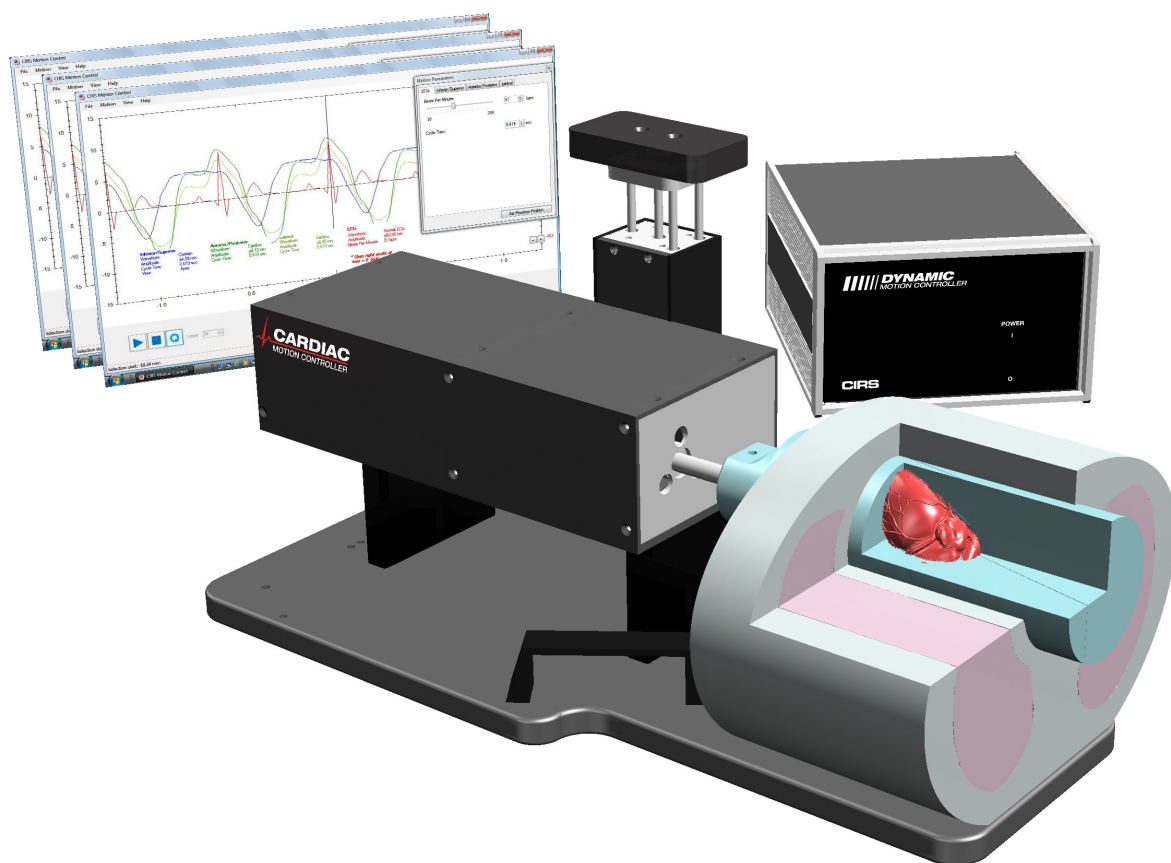


Dynamic Cardiac Phantom

Model 008C



USER GUIDE

CIRS

900 Asbury Ave • Norfolk, Virginia 23513 • USA • Tel: 757-855-2765 • WWW.CIRSINC.COM

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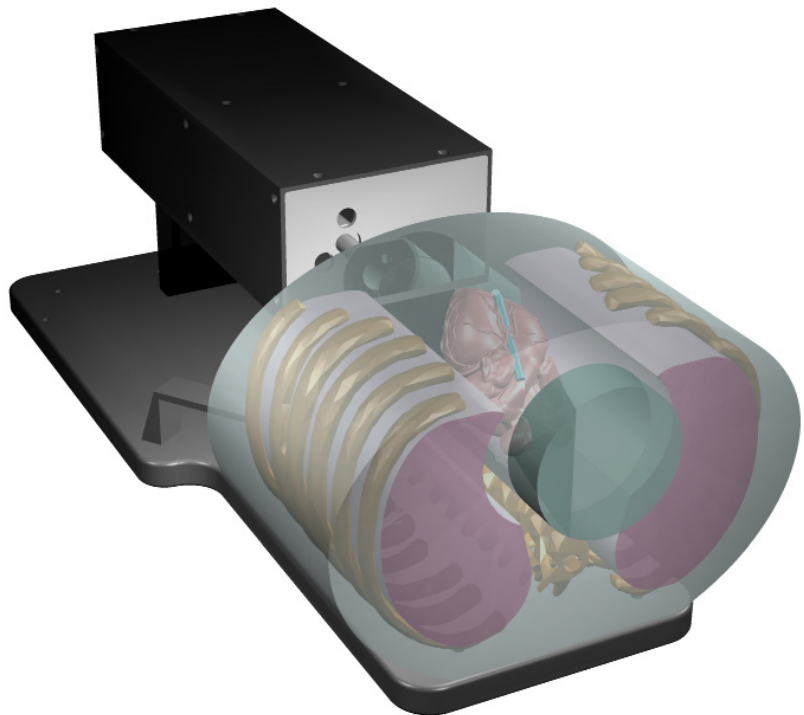
Model 008C Advanced Features

- Anthropomorphic heart inside a thorax body
- Tissue equivalent materials
- Iodine contrast and calcification detection capabilities
- Contrast target interchangeability
- Complex heart motion combined with respiratory motion
- Sub-millimeter accuracy and reproducibility
- Motion software enables different cycles, amplitudes, and wave forms
- Correlated ECG signal with readable output

Overview

The CIRS Dynamic Cardiac Phantom is a precision instrument that simulates the realistic motion of an average human heart. It provides known, accurate and repeatable 3D motion of a solid heart model inside the tissue-equivalent thorax phantom. This phantom is designed as a comprehensive image analysis tool for calcification detection, iodine contrast resolution and ECG signal gating.

The cardiac phantom is constructed from the tissue equivalent thorax body, moving rod with the solid tissue equivalent heart inside, motion actuator, motion controller and CIRS Motion Control software.



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.



CAUTION:

PHANTOM ASSEMBLY REQUIRES TWO PEOPLE. ONE PERSON FOR STABILIZING AND A SECOND FOR ASSEMBLING THE PHANTOM. FAILURE TO STABILIZE THE BASE PLATE CAN ALSO RESULT IN DAMAGE TO THE PHANTOM.

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. Lithium grease is used to coat the cardiac rod. You can clean the rod with a soft cloth with dampened water and mild detergent and then reapply the lithium grease with the supplied container of extra grease.

Unpacking Instructions for All Dynamic Phantoms



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 wall partition from the case and set aside.



3. Pull phantom body from case.



4. Remove controller unit from case and set aside.



5. Remove computer and cables. (Optional computer is available).



6. Remove any rods from case.




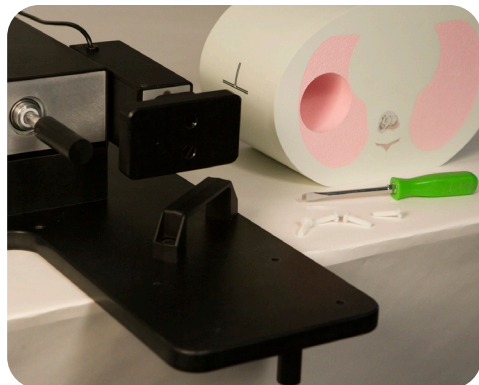
7. Pull base and the actuator assembly from case.



8. Inspect the list of parts before assembly. Refer to pack list in case. Verify all parts received.

Assembly Procedure for All Dynamic Phantoms

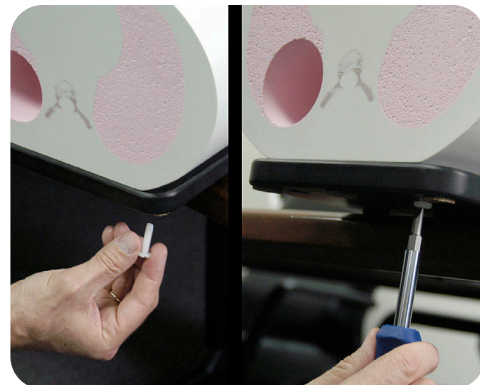
 **CAUTION:**
PHANTOM ASSEMBLY REQUIRES 2 PEOPLE. ONE PERSON FOR STABILIZING AND A SECOND FOR ASSEMBLING THE PHANTOM.
FAILURE TO STABILIZE THE BASE PLATE CAN RESULT IN DAMAGE TO THE PHANTOM.



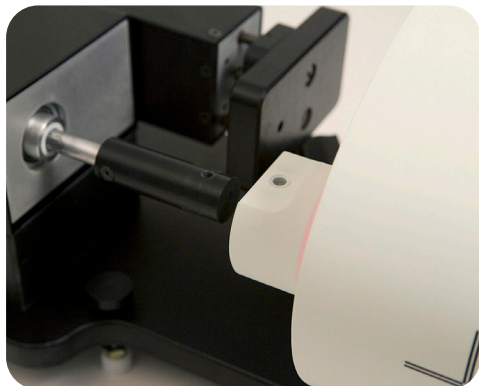
1. Place base plate with actuator assembly on table. Carefully move base plate to overhang table. This allows access to holes for attaching phantom body.



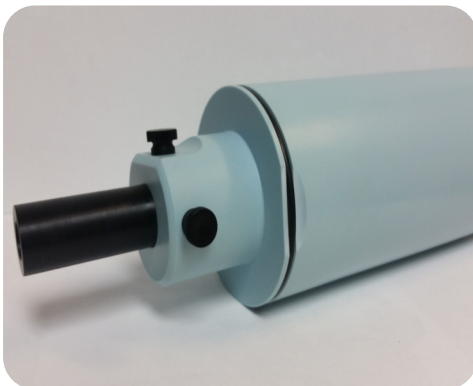
2. Position phantom body on base plate as shown. To ensure proper alignment for model 008C, the phantom face with the CIRS label should be facing away from the actuator.



3. Place one screw through bottom of base plate and screw into phantom. Continue until all screws are in place. Snug but do not tighten screws to allow minor alignment adjustments in steps 6 and 7.



4. Insert rod thru hole in phantom body. Ensure that screw hole on rod is aligned with screw hole on actuator rod.



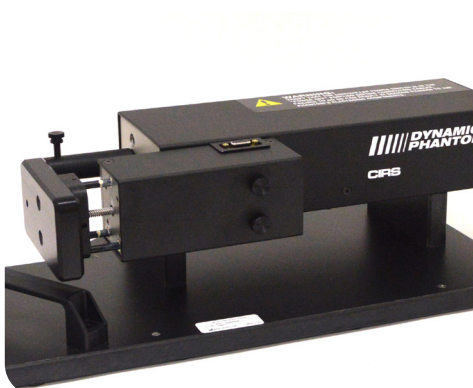
5. Use thumb screw to secure rod to actuator rod. For Model 008C, use two thumb screws to secure rod to the actuator rod. Use the $\frac{3}{4}$ " screw in the flat top hole, and the 1" screw in the perpendicular hole.



6. Push rod towards the motor box. Visually check gap around the rod. It should appear consistent. If not, adjust body left and right until gap is consistent around rod.



7. Repeat step 6 with rod extended out. Check gap on the motor box side of body as well. Adjust phantom body to achieve best fit. Finish tightening the screws on underside of phantom.



8. 3rd axis actuator is shipped in the horizontal position.

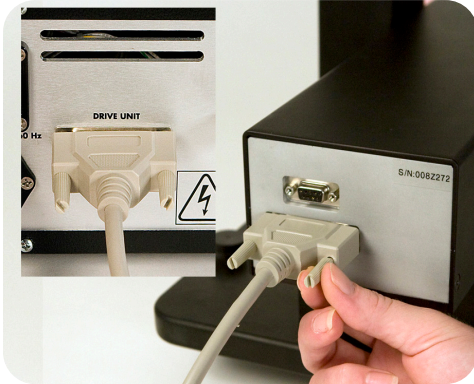


9. Move 3rd axis device to vertical position by loosening screws and repositioning as shown.

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 DB25 m/m to back of controller and to back of actuator.



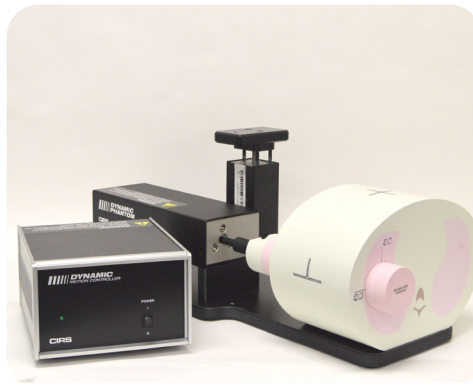
2. Plug the Cable DB9 m/m which leads from gating device to back of actuator.



3. Attach ethernet cable to back of controller.



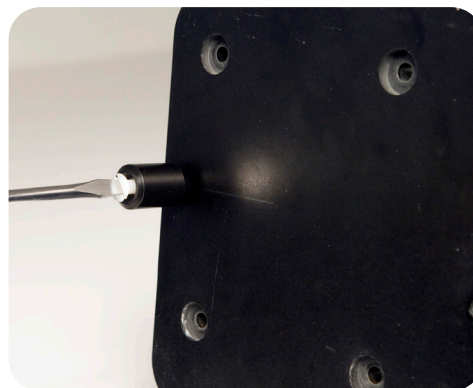
4. Plug power cord into the back of controller. Plug other end of power cord into the wall outlet.



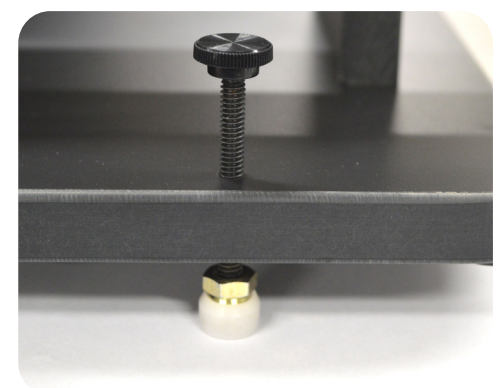
5. The controller and actuator powered and ready for use.



- A. **Adjustable legs kit** (See B and C for mounting)



- B. Prior to attaching phantom body, carefully lay base plate with actuator in its side. Attach solid black post to underside of base plate as shown.



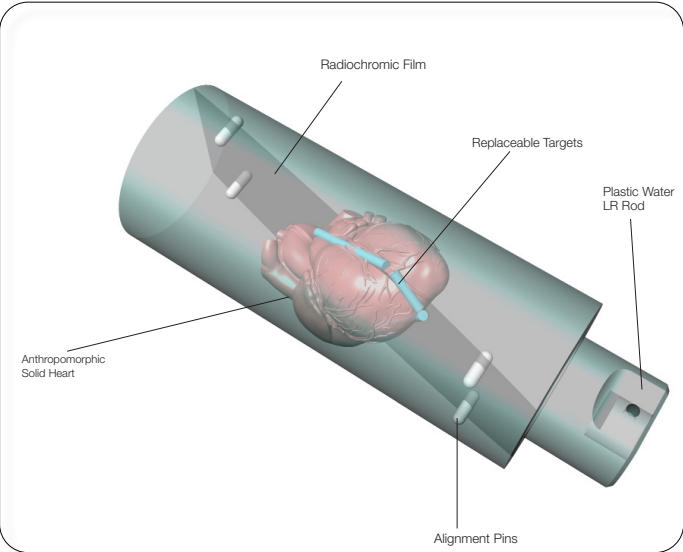
- C. Secure remaining 4 adjustable feet to base plate as shown.

ECG Output

The movement of the phantom is controlled by CIRS motion control software. The movement profiles are correlated with the heart rate of the phantom, which can also be controlled and set through the software interface. The back of the motion controller has a 3 lead ECG output from which the heart rate of the phantom can be read by any basic heart rate monitoring system, just as a physician would for a real patient. Simply connect three snap on leads to the corresponding labels, LL, RA, LA on the back of the controller and connect to your bpm monitoring device in order to read the signal.

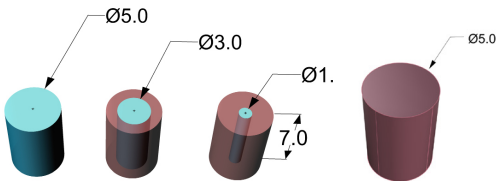


Model 008C-01 Target Detection Rod Assembly Procedure



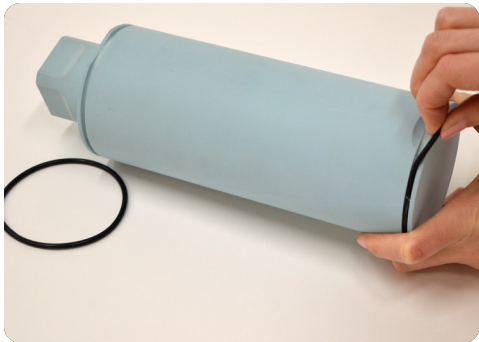
CALCIFICATION DETECTION TARGETS		IODINE CONTRAST TARGETS		SOLID TARGETS	
TARGET DIAMETERS	1.2mm 3mm 5mm	TARGET DIAMETERS	1.2mm 3mm 5mm	TARGET DIAMETERS	5mm
CONCENTRA-TIONS	50 mg/cc 100 mg/cc 250 mg/cc 400 mg/cc Qty: 3 each	CONCENTRA-TIONS	0.5 mg/cc 1.0 mg/cc 5.0 mg/cc 10 mg/cc Qty: 3 each	QTY	20

The replaceable targets listed in the table above are provided with model 008C-01 Target detection rod. They are used to resemble different concentra-tions and sizes of calcifications and iodine contrast in the arteries. The target diameters listed refer to the core of the target, each target will be encapsulat-ed in a blood equivalent tissue to bring the final dimensions of all rods to 5mm diameter by 7mm in length.

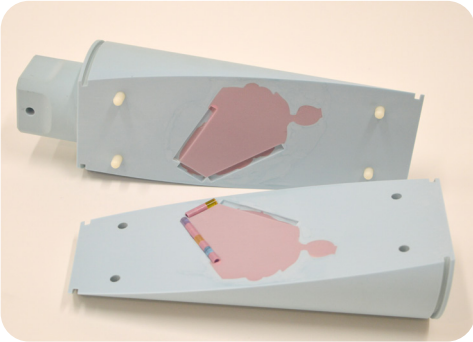


The colors of the iodine core of the targets correspond to the different concen-trations.

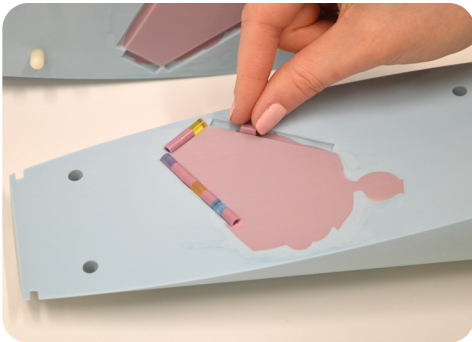
- Purple 10mg/cc iodine
- Yellow 5.0 mg/cc iodine
- Blue 1.0 mg/cc iodine
- Hydroxyapatite all concentrations are pale yellow
- Spacer inserts tissue equivalent blood solid rods



1. The dynamic cardiac phantom target detection rod is split at a 13 degree angle along the left coronary artery of the embedded heart. The rod is held together via two O-rings at either end of the rod and 4 alignment pins between the two halves. Inner pockets are milled along the edge of the heart to mimic the coronary arteries.



2. To access these pockets remove both O-rings and carefully pull the two halves apart



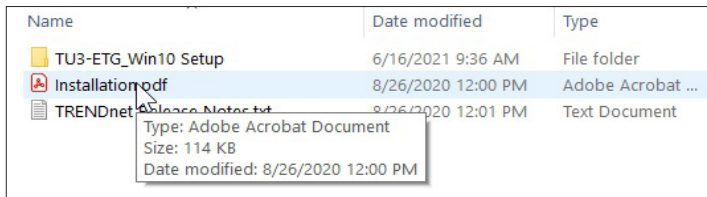
3. The Dynamic Cardiac Phantom Target Detection Rod 008C-01 is supplied with replaceable targets that simulate different iodine and calcification concentrations in the arteries.

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.

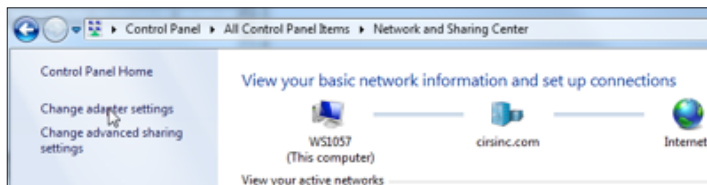
Note: Steps 5-8 should be followed if the “PC Internal Network Adapter” is used instead of the “USB to Network Adapter”.

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.



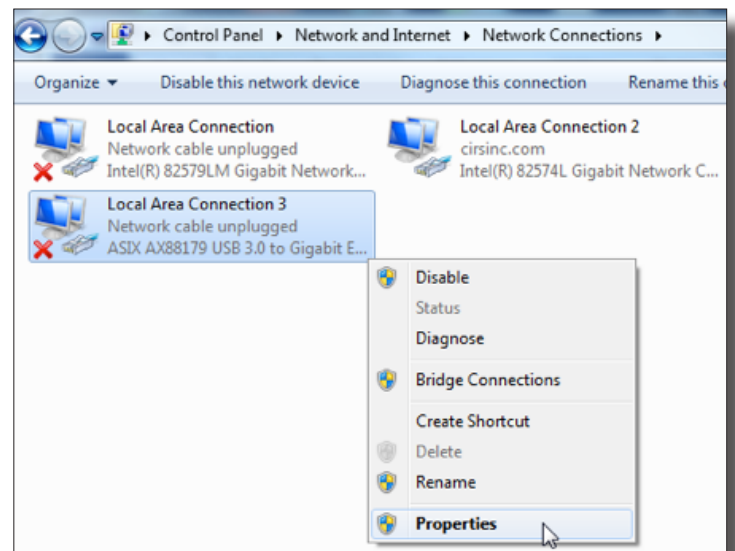
Note: The provided “USB to Network Adapter” can act as Plug and Play device on some PC but CIRS recommends doing the installation of the driver as outlined above.

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

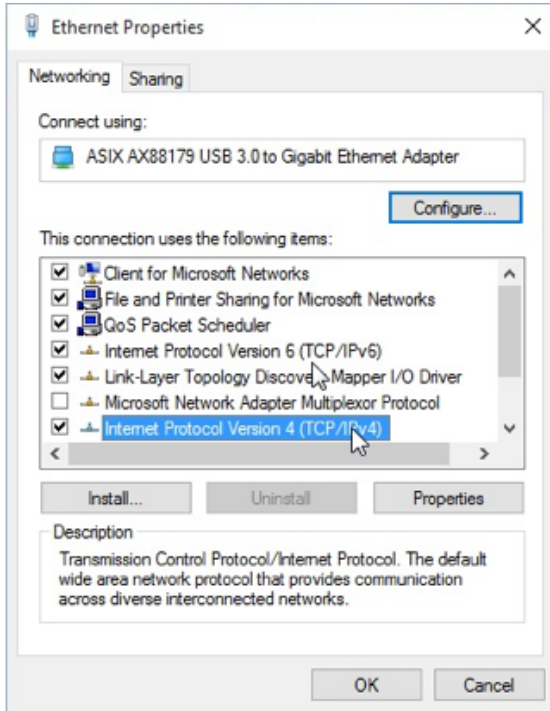


2. Follow the on screen steps and acknowledge all the messages related to driver's installation. Once the driver installation is finished, plug the “USB-to-Network Adapter” into your PC's USB port and acknowledge the Windows installation message. Exit the “USB-to-Network Adapter Software” menu by clicking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

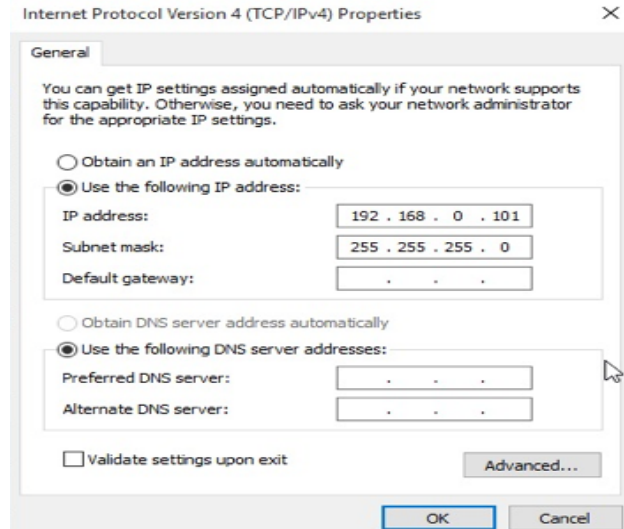
4. Providing that the installation of the “USB-to-Network Card” was successful, the newly installed Network Adapter should show as “ASIX AX88179 USB 3.0 to Gigabit Ethernet Adapter”. Select it's Properties using the right mouse click menu as shown below.



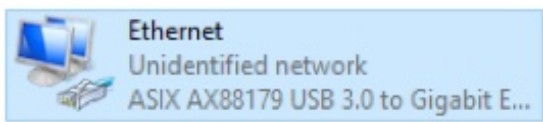
5. Select Internet Protocol Version 4 (TCP/IPv4) and click on properties



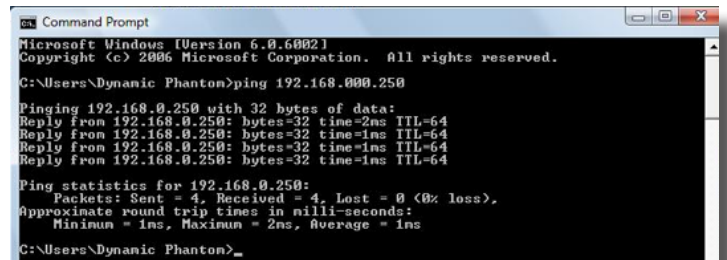
6. In the internet Protocol Version 4 (TCP/IPv4) properties window, change from default "Obtain an IP address automatically" to "Use the following IP address:" Enter "192.168.0.101" as the IP address and "255.255.255.000" as the Subnet mask.
Note: If an IP address conflict occurs because IP address 192.168.0.101 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 008C Dynamic Cardiac Phantom. With CIRS Motion Control, you can quickly set up a movement based on a library of pre-defined motions 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.

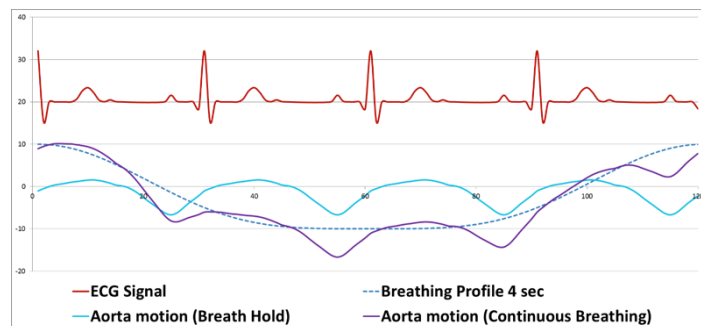
CARDIAC MOTION

The cardiac phantom motion control software comes loaded with three basic motion profiles that are specific to different anatomical parts of the heart (apex, heart center, and aorta) and one correlated ECG profile. Through the intuitive user interface, users can adjust motion amplitudes and heart rate. Other loaded motions include Sin, Cos4, Cos6, Sawtooth and Sharkfin.

The scale on the left side of the display is calibrated in millimeters and is used to evaluate the physical motion of the heart. The scale on the right side of the display is calibrated to match the ECG signal equivalent with a typical ECG printed on graph paper (1mm = 0.1mV). If the mouse is placed on the ECG signal on the main display the user is presented with information about that point of the ECG with respect to time and amplitude (mm/mV).

RESPIRATORY MOTION

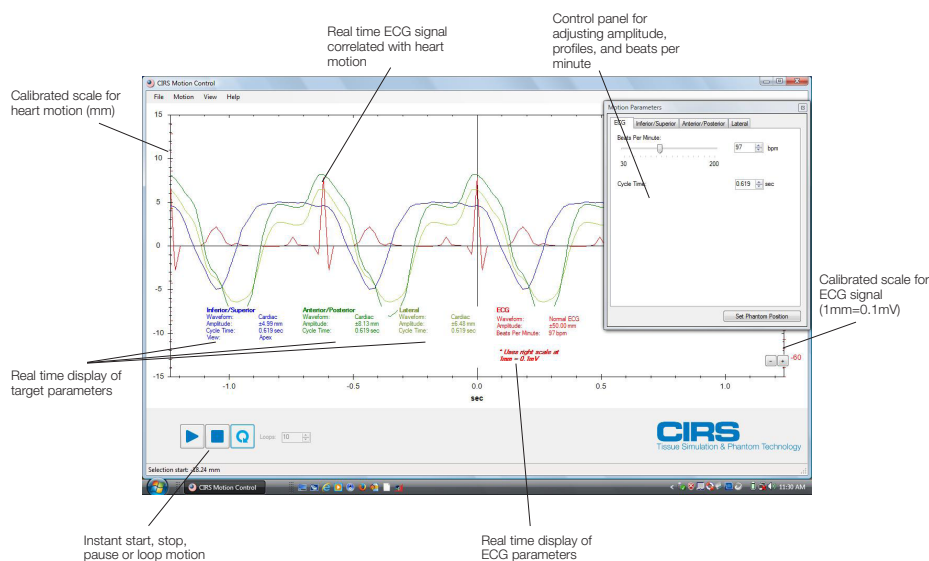
The software can overlay respiratory motion with cardiac motion to account for total displacement of the heart. The respiratory motion can mimic either breath hold or continuous breathing of a patient. The software allows the user to import patient-specific cardiac and breathing profiles or build their own ECG signals in a comma separated value to simulate abnormal heart beats.



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 Install Shield Wizard.

To install CIRS Motion Control, double-click Motion Control 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.



CIRS Motion Control Software

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 CD or 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 wave-form 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 failures 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.



Model 008C Specifications

OVERALL DIMENSIONS:	71 cm x 32 cm x 28 cm (28" x 13" x 11")
OVERALL WEIGHT:	18.6 kg (41 lb)
POWER:	110-250 VAC, 50/60 Hz
AMPLITUDE, IS:	± 5 mm Heart Beating; ± 25 mm Breathing
AMPLITUDE, AP/LR:	± 8 mm AP; ± 6 mm LR
AMPLITUDE, SURROGATE:	± 25 mm
MAX. SURROGATE PLATFORM LOAD	5.4 kg (12 lb)
MOTION ACCURACY:	± 0.2 mm
CYCLE TIME:	1 - ∞ (adjusted based on amplitude)
WAVEFORMS:	sin (t), 1-2cos ⁴ (t), 1-2cos ⁶ (t), sawtooth, sharkfin, heart beat, heart beat + breathing

Ordering Information

INCLUDED WITH MODEL 008C

Part No.	Qty	Component Description
008C	1	Dynamic Cardiac Phantom Body with 3D spine
008C-01	1	Dynamic Cardiac Target Detection Rod
	1	Control unit with firmware installed (110 - 220V, 50 - 60Hz)
	1	Motion actuator box
	1	Gating actuator box
	1	Base plate
	1	CIRS Motion Control Software CD-Rom
	1	Four in one screwdriver
	1	1/8 hex key wrench
	1	Network cable CAT5e, 75'
	1	DB 25 male to male cable
	1	USB cable 1' A/B male
	2	USB extender terminals
	1	Bag of miscellaneous replacement fasteners
	2	2 Amp fast acting fuses
	1	Power cord
	1	User's manual
	1	Carry Case

INTERCHANGEABLE INSERT TARGET OPTIONS

Type	Specification	
	Concentration Options	Internal Rod Diameter Options
Iodine	0.5mg/cc, 1.0mg/cc, 5.0mg/cc, 10mg/cc	1.2mm, 3.0mm, 5.0mm
Calcification	50mg/cc, 100mg/cc, 250mg/cc, 400mg/cc	1.2mm, 3.0mm, 5.0mm

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
Model 008C- Dynamic Cardiac 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 <http://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

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



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