Radiography Fluoroscopy QA Phantom

Model 903

USER GUIDE

CIRS

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PHANTOM DESCRIPTION

The CIRS Model 903 Radiography / Fluoroscopy QA Phantom is designed to provide physicians with an opportunity for a comprehensive review of their Radiography / Fluoroscopy facility as well as CR/DR systems.

The phantom can be used for initial QA assessment and routine monthly QA testing to help ensure patients are receiving the best possible X-ray examinations.

The CIRS Model 903 is manufactured from PMMA equivalent epoxy that offers the same X-ray attenuation properties as acrylic to simulate an average patient with significantly greater durability.

The overall phantom measures 25.4 cm wide x 25.4 cm long x 20.7 cm high and consists of three
attenuation plates, one test object plate and a detachable stand for easy, reproducible set-up. Test objects include high-resolution copper mesh targets from 12 – 80 lines per inch, two separate contrast-detail test objects.

The phantom enables evaluation of minimum detectable contrast, low contrast resolution, optical density, high contrast resolution and dose.

SPECIFICATIONS

DIMENSIONS:	25.4 cm x 25.4 cm x 20.3 cm (10" x 10" x 8")
PHANTOM WEIGHT:	16.8 kg (37 lb)
MATERIALS:	PMMA-equivalent epoxy

MODEL 903 INCLUDES

PART NO.	QTY	DESCRIPTION
903-01	1	Test Object Plate
903-02	1	4.1cm Block with Lead Markers
903-03	1	7.6 cm Block with Aluminum Plate & Detachable Support Legs
903-04	1	7.6 cm Block

MODEL 903 OPTIONAL ACCESSORIES

PART NO.	DESCRIPTION
903-05	Optional Artery Slot Block for Model 903
903-06*	Artery Block with Iodine (15 mg/mL)
903-07*	Artery Block with Iodine (150 mg/mL)
903-08	Bone Block
9506	Optional Soft-Sided Case for ACR Radiography Fluoroscopy Accreditation Phantom

*Must purchase Model 903-05 Optional Artery Slot Block to use this accessory with Model 903 Radiography Fluoroscopy Accreditation Phantom.

ESTABLISH A BASELINE

System setup can have a dramatic impact on the results obtained from quality assurance measurements. You should establish and record what system settings are used for each image acquisition. These same settings should be used each time the test is performed. If not, then the conclusions drawn may not be valid.

The first set of measurements taken when all systems are operating properly will be the baseline measurements for that facility. Record the system settings used to acquire each image along with your image results. On subsequent tests, refer to the baseline results to determine if the system has drifted to an unacceptable level. It is each facilities responsibility to establish the magnitude of drift allowed before corrective action is warranted.

The difference between the original baseline measurements and subsequent measurement should be calculated and recorded. At some point the difference may be large enough that action is required (call service, replace system, etc.). Each facility needs to determine the action level for each test. You should refer to the user's manual of your imaging system and note the stated accuracies of the system. These stated accuracies may greatly influence the conclusions made when evaluating the system.

How often each system is evaluated is also up to each facility to determine. At minimum they should be inspected on a quarterly basis.

SET UP

It is recommended that the phantom be imaged using the same technique used in typical clinical situations. Factors such as film/screen speed, Bucky orientation, photo timer cell selection, density setting, SI distance, and kVp should be considered. The phantom simulates average patient size and density, thus various dosimeters can be used with the phantom if desired.

CHEST ASSEMBLY (FIGURE 1)

Attach the leg supports to the 7.6 cm-thick slab so the aluminum plate faces toward the x-ray tube and the legs are in contact with the entrance surface of the wall stand. Place the image quality test tool on the tube side of the phantom, with the rectangular contrast-detail pattern toward the patient's head position for repeatable orientation. The distance from the front surface of the image quality test tool to the entrance surface of the chest stand should be 16.9 cm. (A cart or some other device will be needed to support the phantom in front of the vertical image receptor.) It is suggested that the phantom be placed on top of a low-scattering support, such as a cardboard or styrofoam box (not shown).

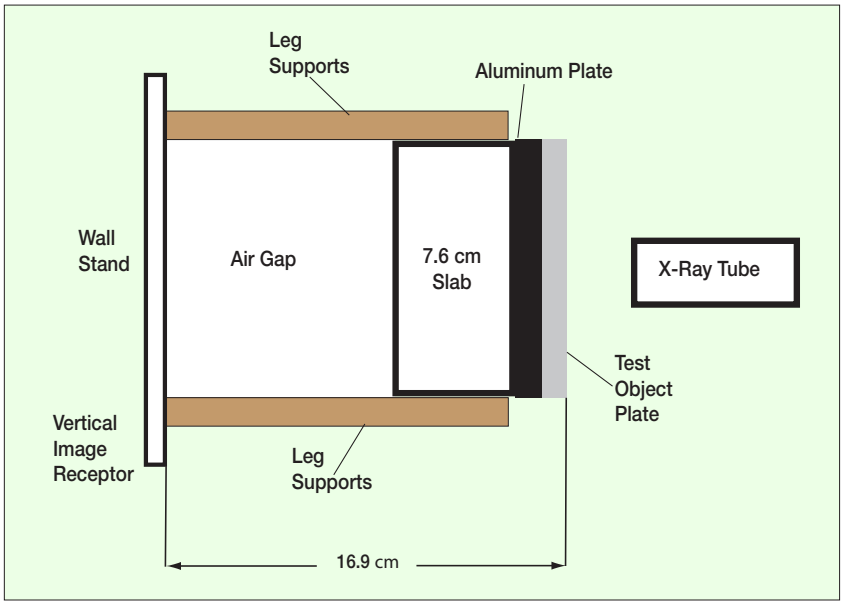


Figure 1: Upright Chest Set Up

CHEST PHANTOM ORIENTATION AND IMAGE ACQUISITION

Center the light field to the center of the vertical image receptor. Collimate the field (if adjustable collimation is available) so the light field is 10" x 10" at the entrance surface of the phantom. Select appropriate settings for kVp, mA, and AEC. For manually selected techniques, use the kVp and mAs normally used for a 20 to 24 cm thick patient. The optical density in the center of the test tool should be between 1.3 and 1.8. If the optical density does not fall in this range, adjust technique appropriately.

ABDOMINAL ASSEMBLY (FIGURES 2 AND 3)

For Radiography and Overtable Fluoroscopy place the 4.1 cm thick slab on the tabletop or cassette holder with lead shot markings toward the image receptor. Stack the 7.6 cm slab, then stack the 7.6 cm slab with 3/16" aluminum plate attached on top. The aluminum plate should be toward the x-ray tube. Place the image quality test tool (this is the test object plate) on top with the rectangular contrast-detail pattern toward the patient's head position for repeatable orientation.

For Undertable Fluoroscopy attach the leg supports to the 7.6 cm thick slab with the 3/16" aluminum plate so that the aluminum plate is toward the x-ray tube when the phantom is placed on the tabletop and supported on the legs. Stack the 7.6 cm slab, then stack the 4.1 cm tool on top with the lead shot markings toward the image receptor. Place the image quality test tool on the tabletop underneath the phantom
with the rectangular contrast-detail pattern toward the patient's head position for repeatable orientation.

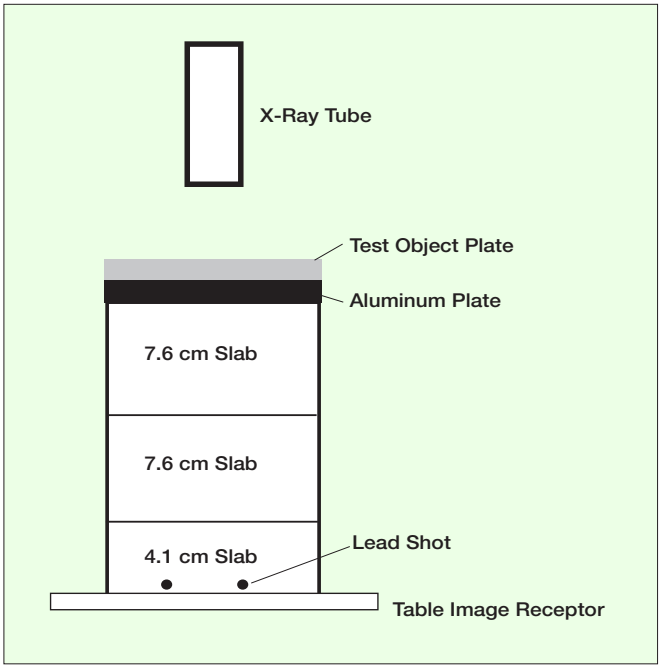


Figure 2: Over Table Set Up

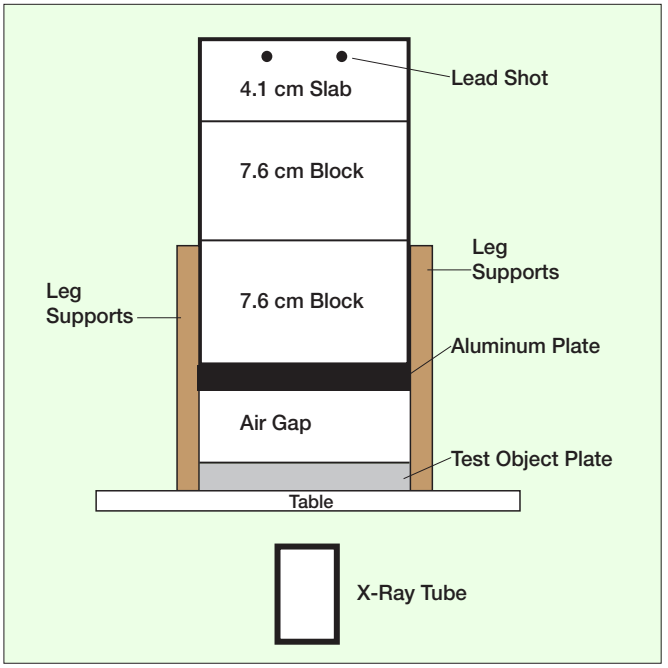


Figure 3: Under Table Set Up

ABDOMINAL PHANTOM IMAGE ACQUISITION FOR RADIOGRAPHIC UNITS

Center the field light to the center of the image receptor and adjust the collimator to a 10”x10” field size on the x-ray tabletop or wall Bucky surface using the light field. Place the phantom either on the tabletop or in contact with the wall Bucky and center the phantom in the field with the aluminum side toward the x-ray tube, test tool section on top. Select kVp, mA, and density control settings normally used clinically. Expose and process the film. Select the center cell on phototimer for the abdominal phantom image. For manually selected techniques choose the kVp and mAs setting normally used clinically for a large patient (24-28 cm thick). The optical density in the center of the test tool should be between 1.3 and 1.8. If it is less than that, increase the mAs either manually or by increasing the phototimer density setting appropriately.

ABDOMINAL PHANTOM IMAGES ACQUISITION FOR SPOT-FILM DEVICES

For undertable x-ray tube systems remove any table padding, if the padding is removable. If there is a compression cone, move it out of the field of view (FOV). With the supports attached, place the phantom and image quality test tool on the tabletop. Center the phantom in the FOV under fluoroscopy. Position the image intensifier tower so that is rests on the phantom. Set the compression and lateral/longitudinal locks on the tower. Set the FOV to the mode closest to 23 cm (9 inch) FOV. Collimate the beam to the four lead shot markings such that all four markings are visible just inside the collimator blades. If the FOV is too small to visualize all the markings, the collimators should be opened to their widest position.

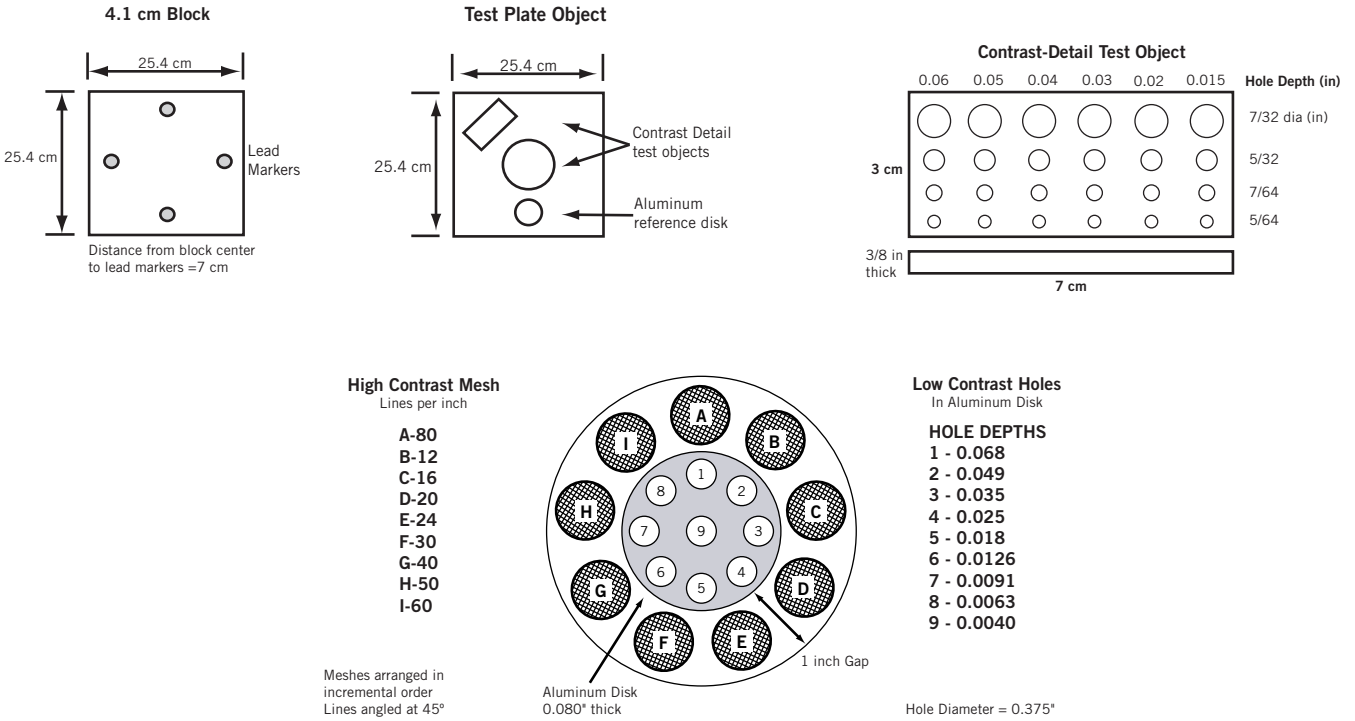
For overtable fluoroscopic tube systems remove any table padding, if the padding is removable. If there is a compression cone, move it out of the field of view (FOV). Place the phantom and image quality test tool on the tabletop with the aluminum side toward the x-ray source and the test tool of the aluminum. Center the phantom in the FOV under fluoroscopy. Set the FOV to the mode closest to 23 cm (9 inch) FOV. Collimate the beam to the four lead shot markings, such that all

four markings are visible just inside the collimator blades. If the FOV is too small to visualize all the markings, the collimators should be opened to their widest position.

Select the kVp, mA, and density control setting most commonly used. Position the grid according to clinical use for spot imaging. Make sure the collimation mode is set to maintain collimation to the lead shot markings for spot imaging.

If the fluoroscopic system is capable of multiple types of spot imaging consider each type of imaging that should be tested.

TEST OBJECT SPECIFICATIONS



OPTIONAL DSA SET-UP

A 20 x 20 x 2.5 cm PMMA equivalent-epoxy Bone block (903-08) is available for use with other blocks in the Model 903 to test the visibility of 0.5, 1.0 & 1.5 cm thick bones in digitally subtracted images.

A 25.4 x 25.4 x 7.6 cm Artery Slot Block (903-05) is available to receive Artery Blocks (903-06 & 903-07) and provide proper surrounding background. When used with the Bone Block (903-08) and 7.6 cm Block (903-04), various patient configurations can be achieved. In order to use the Artery Slot Block (903-05) with the Bone Block (903-08), the Bone Block must be positioned in the 20 x 20 cm cavity in the Artery Slot Block. See figure 4 on page 8.

Two 15 x 45 x 2.5 cm Artery Blocks are available (903-06, 903-07). Each block contains 15 and 150 mg/mL iodine concentrations respectively. Each block contains 1, 2 & 4 mm arteries with aneurysms and stenosis that are 0.25, 0.50 and 0.75% of each arterial dimensions. See figure 5 on page 8.

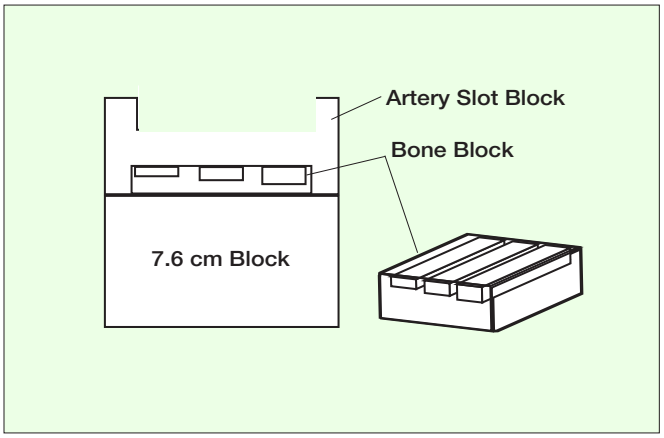


Figure 4: Optional DSA Set - Up

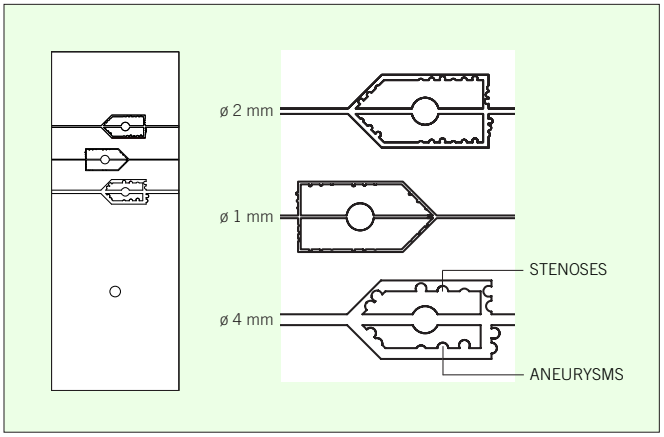


Figure 5: Artery Block with Iodine

DSA ACQUISITION / ARTERY DETECTION

Program a delay of 15 seconds between mask and image exposure. Establish and record optimized technique for testing. Always use the same technique and intensifier mode (if used) for future testing.

Use a consistent phantom set-up for each patient type. Position the bones in the bone block perpendicular or parallel to arterial direction. Position the blank side of the artery block in the slot to produce a mask exposure, then slide the artery pattern into place and produce image exposure. Subtract the mask from the image and evaluate visibility of the bones and subtraction effectiveness. Remove the bone block and repeat the process. Measure and record results against baseline data.

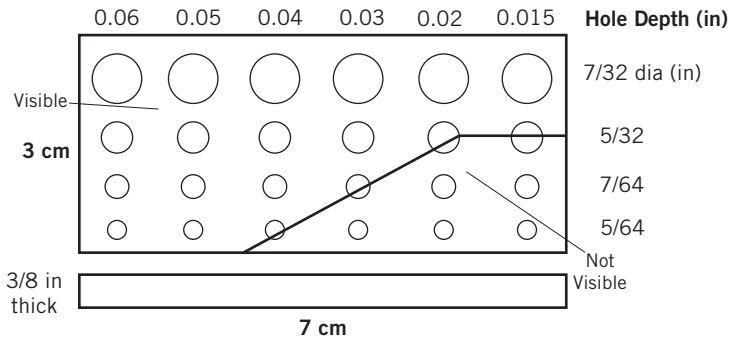
MODEL 903 EVALUATION INSTRUCTIONS

For each set up, record system settings and evaluation notes for each test object.

Instructions:

Draw line through first set of holes that are only partially visible as shown in example.
Compare to baseline to determine if visibility has remained the same

CONTRAST-DETAIL TEST OBJECT

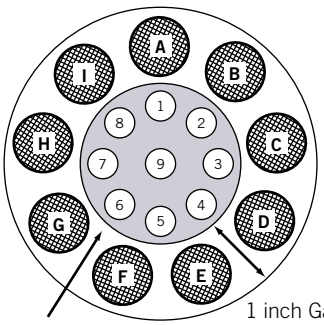


Instructions:

For each target, note if it is fully visible or only partially visible
Record score according to table below
Record total score for High Contrast Mesh Targets
Record total score for Low Contrast Holes
Compare total score of each to baseline to determine if visibility has remained the same

HIGH CONTRAST MESH
LINES PER INCH
A-80
B-12
C-16
D-20
E-24
F-30
G-40
H-50
I-60

Meshes arranged in incremental order
Lines angled at 45º



Aluminum Disk
0.080" thick

LOW CONTRAST HOLES
IN ALUMINUM DISK
HOLE DEPTHS
1 - 0.068
2 - 0.049
3 - 0.035
4 - 0.025
5 - 0.018
6 - 0.0126
7 - 0.0091
8 - 0.0063
9 - 0.0040

Hole Diameter = 0.375"

Group Entirely Visible		Score	Group Partially Visible		Score
1	B	1	1	B	0
2	C	2	2	C	0
3	D	4	3	D	3
4	E	8	4	E	6
5	F	16	5	F	12
6	G	32	6	G	24
7	H	64	7	H	48
8	I	128	8	I	96
9	A	256	9	A	192

MODEL 903 RECORD SHEET

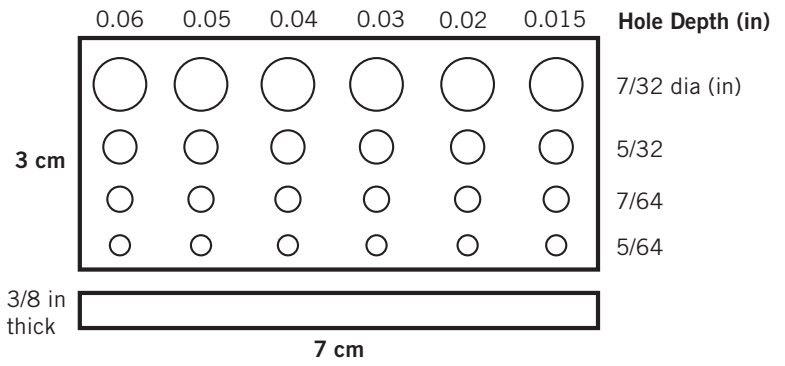
Photocopy this page to record measurements on. For each set up record system settings and evaluation notes for each test object.

Date **Tested By** **System Tested**

Phantom Set Up

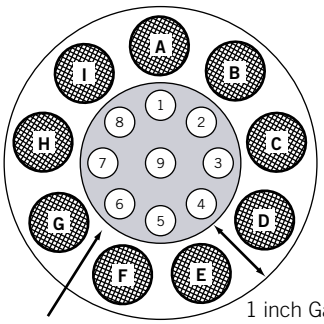
System Settings

CONTRAST-DETAIL TEST OBJECT



HIGH CONTRAST MESH
LINES PER INCH
A-80
B-12
C-16
D-20
E-24
F-30
G-40
H-50
I-60

Meshes arranged in incremental order
Lines angled at 45°



LOW CONTRAST HOLES
IN ALUMINUM DISK
HOLE DEPTHS
1 - 0.068
2 - 0.049
3 - 0.035
4 - 0.025
5 - 0.018
6 - 0.0126
7 - 0.0091
8 - 0.0063
9 - 0.0040

Hole Diameter = 0.375"

Group	Score	Group	Score
1		B	
2		C	
3		D	
4		E	
5		F	
6		G	
7		H	
8		I	
9		A	
Total		Total	

CARE AND HANDLING

The phantom is manufactured from a durable epoxy resin and there are no special handling precautions. Avoid using petroleum distillates or solvents to clean the phantom as they may damage the surface finish.

Technical questions should be referred to CIRS customer service at (800) 617-1177.

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.

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 your local distributor prior to returning the product. Visit https://www.cirsinc.com/distributors/ to find your local distributor. If you purchased your product direct through CIRS, call Customer Service at 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

PRODUCT	WARRANTY PERIOD
Model 903 - Radiography Fluoroscopy QA Phantom	60 Months

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