

FLUKE®

Biomedical

Nuclear Associates 07-607

Digital X-Ray Field-Size Test Tool

Users Manual

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Section 1 General Information

1.1 Description

The Digital X-Ray Field-Size Test Tool (Model 07-607)* is designed to allow quick and accurate collimation assessment of digital stereotactic x-ray machines. The tool consists of a copper pattern etched onto fiberglass-printed circuit board material. It provides a ± 5 cm by ± 5 cm alignment pattern with 1 mm resolution in the x and y directions. This test tool allows users to evaluate the size and position of the x-ray beam and digital images, light-field-to x-ray alignment and compression paddle positioning.

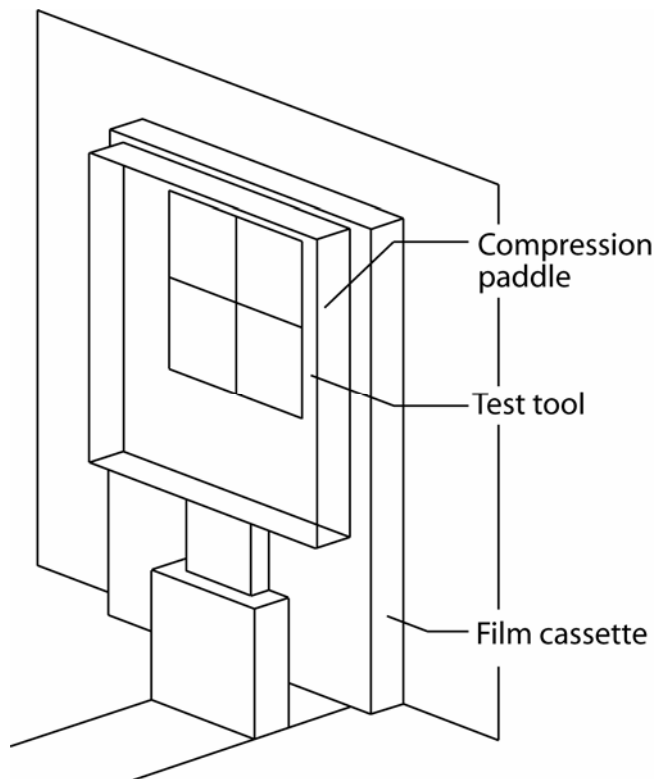


Figure 1-1. The Digital X-Ray Field Size Test Tool Shown Mounted Between the Compression Paddle and Film Cassette

* Digital X-Ray Field Size Test Tool developed by Don Jacobson, Ph.D.

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Section 2 Operation

2.1 Procedure for Use (with all units except LoRad Stereoguide)

1. Position a loaded film cassette on the breast support (digital detector input). Place the cassette such that it extends beyond the chest wall side of the digital detector.
2. Place the Digital X-Ray Field-Size Test Tool on the film cassette such that it is approximately centered in the light field or inside the compression paddle window. Use tape or compression to hold it in place.
3. Record the position of the edges of the light field (if present) or the compression paddle window (optional) on the recording form. Choose the most convenient orientation for the form by checking the appropriate "Chest Wall" box.
4. Make an exposure using a technique of 26 kVp and 25 mAs.
5. Process the film to find the size and position of the x-ray field. Note also the chest-wall position of the compression paddle. Record positions of the x-ray field and compression paddle edges on the recording form.
6. Record the position of the four edges of the digital image as demonstrated on the monitor. Be sure to record chest wall and anterior positions correctly.
7. From the recorded measurements, perform the relevant evaluations:
 - X-ray-to-image at each edge.
 - X-ray-to-light-field (if present) at chest wall.
 - Compression paddle-to-image at chest wall.
 - Compression paddle window-to-image (optional).

If the test tool-cassette combination is in contact with the detector input, the magnification factor is 1.0.

2.2 Procedure for Use with LoRad Stereoguide

1. Place a loaded film cassette in the cassette holder. Use a spacer under the lower edge (hinge side) of the cassette to support it, such that the chest wall edge is about 2 cm above the top of the digital detector. (A marker pen is convenient for this purpose.)
2. Move the breast support to the "6 cm" position.
3. Using the compression/collimator plate as a guide, tape the Digital X-Ray Field-Size Test Tool on the breast support, such that it is approximately centered in the collimating window. Bring the collimator plate close to, but not touching, the Test Tool.
4. Make an exposure using 28 kVp, and 16 mAs.

Steps 5 and 6 are an optional test to assure that the entire digital detector is irradiated when the x-ray beam is collimated by the compression paddle window.
5. Remove the compression/collimator plate without moving the Test Tool or film.
6. Make another exposure using the same technique.

7. Process both films.
8. Find the magnification factor for the film by measuring the distance between any two marks in the image, and dividing by the actual distance; for example, if the distance from 2 cm to 2 cm measures 4.64 cm, the magnification factor is $4.64/4 \text{ cm} = 1.16$.
9. Record all appropriate measurements and differences on the recording form. Choose the most convenient orientation for the form by checking the appropriate "Chest Wall" box.
10. To obtain the true differences at the detector, the differences measured in Step 9 must be multiplied by the magnification factor.
11. Perform the appropriate evaluations as shown on the recording form.
12. The optional x-ray field size vs. detector size test is evaluated by simply comparing the two digital images, with and without collimator. Any increase in digital image size that results from removing the collimator plate indicates that the digital detector is not optimally used (i.e. overcollimation).

2.3 Specifications

Dimensions	Width: 10.0 cm (3.94 in) Length: 10.0 cm (3.94 in)
Alignment Marks (X & Y)	1.0 mm increments
Material:	FR4 with 1 oz copper, tinned

Digital Stereotactic Collimation Assessment

Magnification _____
(1.0 for all but LoRad)

SID _____
x 0.02 _____

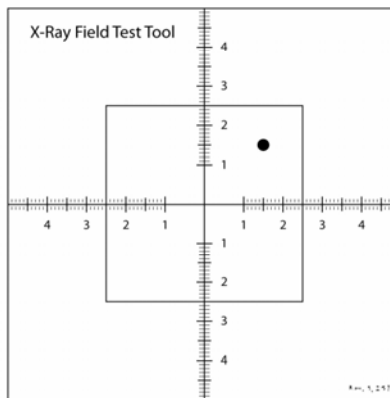
Chest Wall

_____ paddle edge paddle - image = _____ x mag. = _____
 _____ light* light - x-ray = _____ x mag. = _____
 _____ paddle window*
 _____ x-ray x-ray - image = _____ x mag. = _____
 _____ image

_____ light* _____ paddle* _____ x-ray _____ image

x-ray - image = _____ x mag. = _____

light - image = _____ x mag. = _____



_____ light* _____ paddle* _____ x-ray _____ image

x-ray - image = _____ x mag. = _____

light - image = _____ x mag. = _____

_____ image
 _____ x-ray x-ray - image = _____ x mag. = _____
 _____ paddle*
 _____ light* light - x-ray = _____ x mag. = _____
 _____ paddle edge paddle - image _____ x mag. _____

Chest Wall

	acceptable?		
	yes	no	N/A
X-ray should not extend more than 2% SID beyond image at chest wall?	_____	_____	_____
X-ray field should be within 5 mm of the image receptor on all sides?	_____	_____	_____
Chest wall edge of compression paddle should be within 1% SID of the image?	_____	_____	_____
Entire digital detector should be irradiated? (optional)	_____	_____	_____
Compression paddle window should be centered? (optional)	_____	_____	_____
Light field should agree with x-ray field to within 2% SID	_____	_____	_____

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