

**MODEL L-661-662**  
**COLLIMATOR/BEAM ALIGNMENT**  
**TEST TOOL**  
**June 2020**



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TEST TOOL  
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**Ludlum**  
Medical Physics

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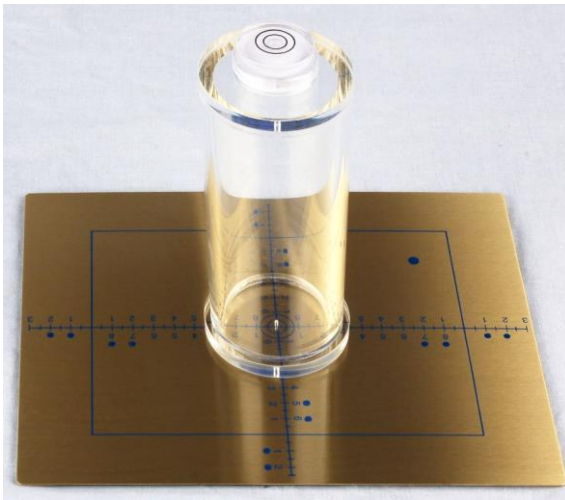
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## Introduction

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A common problem of X-ray units is the misalignment of the collimator light field and the X-ray field. The collimator test tool is designed to evaluate this light field X-ray alignment according to National Center for Devices and Radiological Health (NCDRH) specifications. The beam alignment test tool, when used with the collimator test tool, provides a simple test for beam alignment. The beam alignment test tool is a plastic cylinder, 15.2 cm (6 in.) tall with a 0.16 cm (1/16 inch) diameter steel ball at each end. When the tool sits upright on a level surface, the upper ball is directly above the one in the base. The collimator test tool is a flat plate with a rectangular outline and markings etched on its surface to provide a target for the light field.



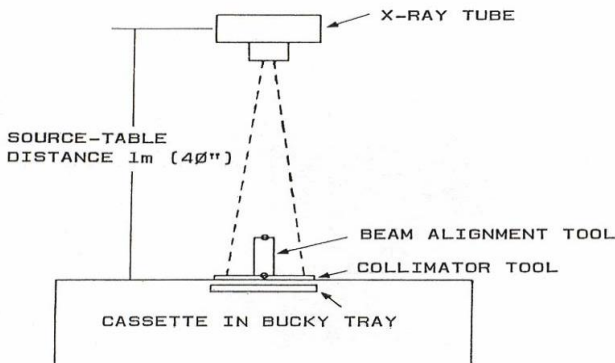
## **General Collimation Procedure**

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Before using these tools, level the table and place the X-ray tube so the beam is perpendicular to the table. A bubble level can be used for this purpose. Center the tube to the table and use a 102 cm (40 in.) distance from the focal spot to the tabletop.

Place the beam alignment tool in the center of the collimator tool and put both in the center of the light field. Adjust the collimator shutters so that the edges of the light field coincide with the rectangular outline on the collimator tool. Orient the collimator tool so that the dot in the lower left corner corresponds to the position of a supine patient's right shoulder. This allows the direction of collimator error to be determined later.

Place a 20.3 x 25.4 cm (8 x 10 in) cassette in the center of the bucky tray. Align the tray to the X-ray tube and expose the cassette at approximately 60 kVp, 10 mAs for RP film using the bucky. (This may also be performed on the tabletop.)



If the X-ray field falls just within the image of the rectangular frame, there is good alignment. If an edge of the X-ray field falls on the first spot,  $\pm 1$  cm on either side of the line, the edges of the X-ray and light fields are misaligned by 1% of the distance between the X-ray source and the tabletop.

Similarly, an edge falling on the second spot,  $\pm 2$  cm indicates an error of 2% at 102 cm (40 in.). The maximum misalignment allowed is 2% of the source-to-image distance (SID).

Alignment at one distance does not guarantee alignment at all other distances. It may be advisable to repeat the test at other commonly used distances. Suggested exposures and allowable errors at different distances are shown in Table 1.

**Table 1**  
**Suggested Exposures and Results**

102 cm (40 in.)	60 kVp	10 mAs
183 cm (72 in.)	60 kVp	38 mAs

**\*Distance between source and light field (tabletop); exposure values noted are for classic RP film. Note: Maximum misalignment allowed by BRH is 2%.**

In addition to the alignment of the light field with the X-ray field, NCDRH also specifies that the center of the X-ray field must be within 2% of the SID of the center of the image receptor in the plane of the image. To determine the center of the image receptor, draw diagonal lines from opposite corners of the X-ray film. The two lines will cross in the center of the image receptor (film). Draw diagonal lines from the corners of the imaged X-ray field. If the centers of the X-ray field and image receptor (film) are the same, the diagonals of both sets of lines should cross at the same point.



At 102 cm (40 in.), the error between the image receptor and the X-ray field center should not be greater than 2% of the SID – approximately 2 cm (0.8 in.), for a 101.6 cm (40 in.) SID.

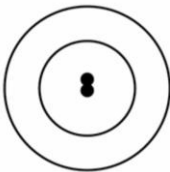
## **General Beam Alignment Procedure**

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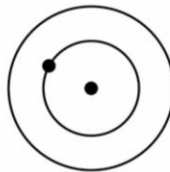
According to NCDRH specifications, the X-ray beam should be perpendicular to the plane of the image receptor. If the image receptor is parallel to the tabletop, the perpendicularity of the X-ray beam can be checked by using the beam alignment tool with the collimator tool.

The following criterion is applied for a source-table distance of 101.6 cm (40 in.):

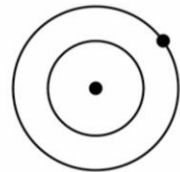
- If the images of the two steel balls overlap (Figure A below), the central ray is perpendicular to within  $0.5^\circ$ .
- If the image of the top ball (larger shadow) intercepts the first circle as shown in Figure B, the beam is about  $1.5^\circ$  away from the perpendicular.
- If the image of the top ball intercepts the second circle Figure C, the misalignment is approximately  $3^\circ$ .



A



B



C

## **Instrument Return**

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To return an instrument for repair or calibration, provide sufficient packing material to prevent damage during shipment.

Every returned instrument must be accompanied by an Instrument Return Form, which can be downloaded from the Ludlum website at [www.ludlums.com](http://www.ludlums.com). Find the form by clicking the “Support” tab and selecting “Repair and Calibration” from the drop-down menu. Then choose the appropriate Repair and Calibration division where you will find a link to the form.