FLUKE®
Biomedical

# Nuclear Associates 07-644

## Grid Alignment Test Tool

## Users Manual

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## 1.1 Introduction

The Model 07-644 Grid Alignment Test Tool is designed to test alignment of the radiograph grid with respect to the central ray of the x-ray tube.

An upside-down focused grid or an incorrect tube to grid distance can be easily detected by exposing a cassette in its tray and observing the density fall off toward opposite edges of the processed film (grid cutoff). , However, lateral decentering or tilting of the grid cannot be detected in this manner: the grid cutoff in these cases causes a uniform reduction of density across the film. The result of such a misalignment is increased patient dose and reduced image contrast. It is in detecting this type of "unobvious" grid cutoff that the Grid Alignment Test Tool is very useful.

## 1.2 Description

The test tool is an easily used device consisting of a plastic covered lead blocker 1/16" x 3 ½ x 9-1/8 (0.2 cm x 9 cm x 23 cm) containing several holes. The five larger holes have centers spaced 1" (2.5 cm) apart and allow test exposures to a film cassette while the smaller holes provide marking exposures on the film to show the tool orientation. When an exposure is made through one of the large holes, two small lead blockers are used to block out the other four large holes. For longer exposure times copper strips (0.040" thickness is recommended) can be placed over the holes.

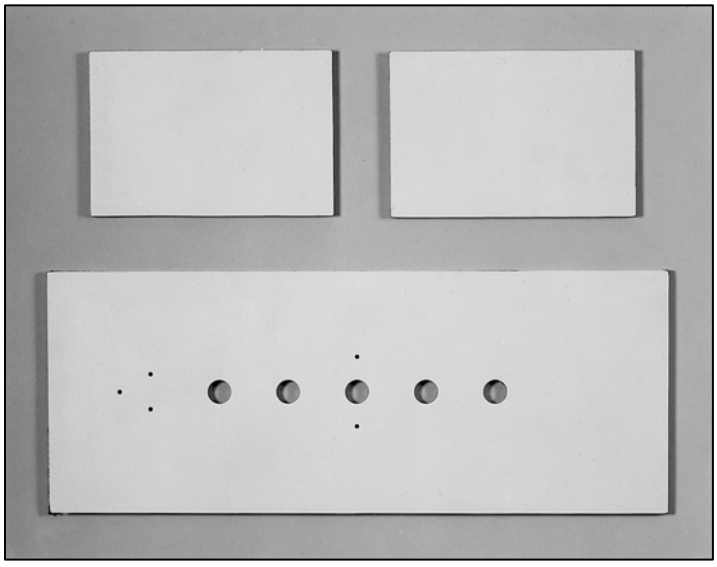

*Figure 1-1. Model 07-644 Grid Alignment Test Tool, with Lead Blockers*

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# *Section 2*
# *Operation*

## 2.1 Operation

Center the x-ray tube with respect to the image receptor both longitudinally and transversely and adjust the height of the tube to the proper source to image (SID) distance for the grid employed on the system. Lock the tube in place. Position an 8" x 10" (20 x 25 cm) or larger cassette in the tray so that the long dimension of the cassette is perpendicular to the long dimension of the table.

Position the Grid Alignment Test Tool on top of the table so that its long dimension is perpendicular to the grid lines (long dimension of the tube). Center the middle hole of the tool in the optical crosshairs of the collimator light field. The three small marking holes should be pointed toward the front of the table (Figure 2-1). Tape the Grid Alignment Tool to the table so it does not move for the duration of the test.

Collimate to approximately a square just smaller than the width of the test tool. Place the small lead blockers on the tools so only the middle (and the two small holes on either side of it) are irradiated and all other large holes are covered. Make an exposure at approximately 60 kVp and 2-4/mAs using the lowest available mA settings to obtain an optical density in the middle hole of between 1. 0 and 2.0 on the developed film. For longer exposures copper strips (0.040" thick are available from Fluke Biomedical, Radiation Management Services) can be placed over the holes. Repeat the exposure so that by moving the tube laterally each of the five large holes is irradiated while centered in the crosshairs. It is not critical to set the middle hole of the test tool under the exact center of the optical crosshairs for the initial positioning. However, it is important that the hole is in a uniform part of the x-ray beam and not in the edge of the field falloff. It is also important that whatever collimator marking is initially aligned over the middle hole, all hole exposures are made with that same collimator marking aligned over the hole irradiated. This insures that the x-ray tube is actually moved laterally one inch between adjacent hole exposures. Be sure to use the same technique settings at each position and do not forget to move the small lead blockers each time to cover the four large holes not being irradiated. Also be sure to irradiate the small marking holes on the test tool to insure the tool orientation is recorded on the film.

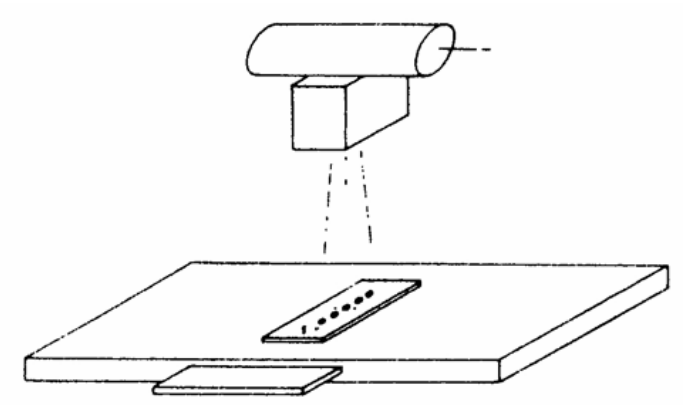
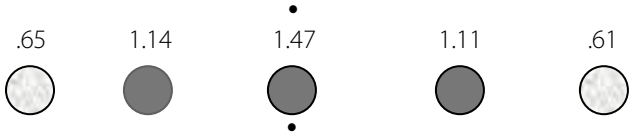
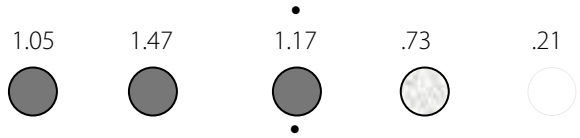


*Figure 2-1. Diagram Showing Arrangement of Grid Alignment Test Tool for Checking Grid Alignment*




Overhead FFD = 100 cm W/Bucky Positioned On Center

*Figure 2-2A. Photograph showing example of x-ray with centered grid. Note that the center hole has maximum optical density and the densities in the other holes taper off in a symmetrical manner.*




Overhead FFD=100 cm W/Bucky Positioned Off Center ~ 0.9”

*Figure 2-2B. Photograph showing example of x-ray with centered grid. This photograph shows a maximum optical density to the left of center.*

Process the test film and measure and record the optical density of each of the hole images (Figure 2-2A and 2-2B). The Models 07-443 or 07-444 Densitometers are very useful for measuring the optical densities. This data may be recorded on the film itself and/or on a data form such as the sample shown at the end of this manual, Grid Alignment QC Form.

Review the recorded data and note whether the middle hole has the maximum density. If the grid is properly aligned, the middle hole should display the maximum density. The density in the other four holes should fall off symmetrically about the middle hole as the tube is laterally decentered to either side of the grid center. Should the density pattern on the test film indicate the maximum density occurs in one of the holes other than the middle, or if the density fall off pattern is not symmetrical a misalignment is suspected.

The requirement that the middle hole display the highest density translates to a maximum tolerance for grid misalignment of + ½ inch.

Grid misalignment may result from any of several causes. There may be misadjustment in the x-ray tube detent mechanism that locks the tube into lateral alignment with the grid. Misalignment may also occur in the reciprocating action of the grid, in the position of the grid or in its construction. If this test indicates a possible misalignment problem exists, a service representative should be contacted.

In radiographic units using moving grids be sure to inspect the test film for any evidence of imaging of the grid lines. Appearance of the grid lines on the film may indicate one of the following problems.

1. The generator was set for tabletop exposure so that the grid motion was not activated. Redo the test after setting the generator for a grid exposure.
2. The reciprocating action of the grid is impaired or inoperative. There may be a malfunction of the delay between initiation of the grid motion and beginning of the x-ray exposure.
3. The exposure time is too short for the grid motion to effectively blur the grid lines. In this case the solution is to use a longer exposure time and reduce the mA and/or kVp setting.

## Sample Grid Alignment QC Form

**Room** 103 **Unit** GE II **Grid Tested** Radiographic Table

**Grid Ratio** 12:1 **Line No.** 103 lines/in. **Focal Distance** 40”

**SID** 40” **kVp** 60 **mA** 5 mAs **Time** N/A

| Date | Measured Optical Density : : Reference Location (3 small marking holes toward the front of the table) | | | | | Comments | Checker’s Initials |
|---|---|---|---|---|---|---|---|
| | 2 | 1 | 0 Center | 1 | 2 | | |
| 1-15-94 | .61 | 1.11 | 1.47 | 1.14 | .65 | Alignment OK | MR |
| 5-18-94 | .31 | .73 | 1.17 | 1.47 | 1.05 | Check Alignment | MR |
| 5-19-94 | .63 | 1.13 | 1.51 | 1.15 | .66 | OK After Service | MR |
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