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Biomedical

Nuclear Associates

57-411, 57-412, 57-413

57-426, 57-431, 57-432

57-433, 57-435, 57-436

CLEAR-Pb Transparent X-Ray Compensation Filters

Users Manual

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**Fluke Biomedical
Radiation Management Services**

6045 Cochran Road
Cleveland, Ohio 44139
440.498.2564

www.flukebiomedical.com/rms

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Section 1 General Information

1.1 Introduction

CLEAR-Pb Compensation Filters are made of a lead- plastic material that is 30% lead by weight. Since lead is an efficient absorber of x-rays, the filters will attenuate the x-ray beam. By varying the shape and thickness of the filters, many combinations of filtering action can be achieved...from almost complete attenuation to full penetration. (See Figure 1-1.)

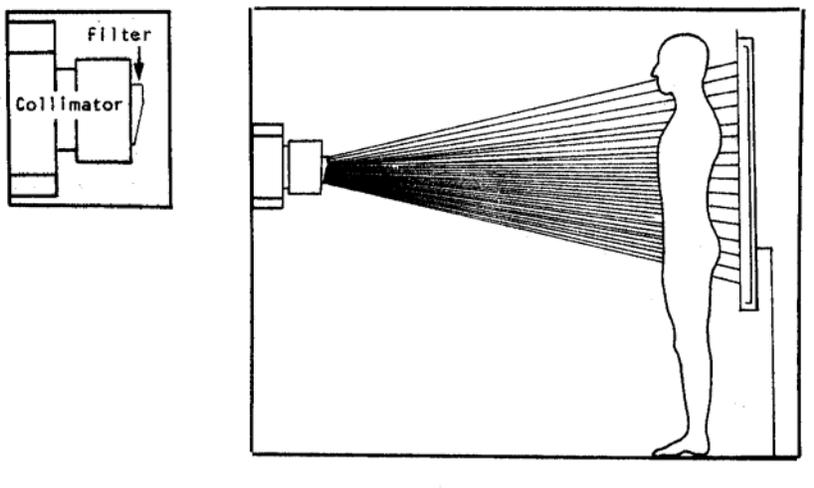


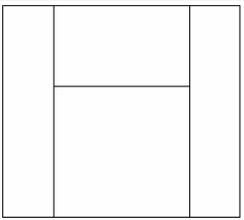
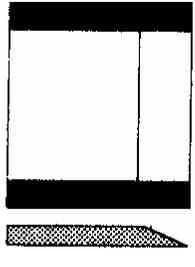
Figure 1-1 Filters attenuate x-ray beam to provide even exposure throughout image area.

CLEAR-Pb Filters improve image quality significantly and decrease patient radiation doses during radiography. They compensate for differences in body thickness or density in full-spine exams, combined mediastinum and lung-chest tomography, aortic arch angiography, full-length leg radiographs, among others.

CLEAR-Pb Filters are transparent and lightweight. By means of our "Quick-Stik" system of magnetic strips, the filters can be held firmly in place or repositioned instantly. You can see and adjust the area and/or degree of filter coverage as necessary. Last-minute positioning checks of the patient, x-ray collimator and filters are possible, thanks to the filter transparency. Selected-beam shaping has never been so simple and effective.

CLEAR-Pb Filters should be used with a rare-earth film/screen combination to improve the image quality. Consult your film manufacturer for the proper combination.

1.2 Applications & Specifications

Filter	1" Wedge	2" Wedge	3" Wedge	Long Leg (Ceiling-mount machines)	Long Leg (Conventional machines)
Model No.	57-431	57-432	57-433	57-435	57-436
Applications	Tangential breast (for therapy seed location) Angiography of limbs (use 2 filters)	Lateral decubitus at 40° FFD Angiography of neck and head (use 2 filters)	Lateral decubitus at 40° FFD (suggested for children) IVP	Orthopedic and angiographic	Full-leg radiography under body-weight load Orthopedic and angiographic
Length x Width Max. Thickness	6.5" L x 1" W	6.5" L x 2" W	6.5" L x 3" W	7" L x 4" w Filter on 7" x 8" mounting plate 0.25"	6.5" L x 4.25" W 0.29"
Configuration Filter Materials				 Mounting plate included. Does not need 57-426 Filter Holder assembly	
	<input type="checkbox"/> Plastic				
	<input type="checkbox"/> Lead-Plastic				
	<input checked="" type="checkbox"/> Magnetic Tape				

Trough (Regular)	Trough (Small)	This list of uses is by no means exhaustive. Applications are limited only by the user's imagination.
57-412	57-413	
Chest tomography	Chest tomography Angiography of neck and head	
6.5" L x 5.5" W 0.187" 1.25"	6.5" L x 5.5" W 0.1" 0.75"	
		All filters on these pages, except the 57-435 Long-Leg Filter, require a 57-426 Filter Holder to make them compatible with collimator accessory trays. One filter holder per machine is sufficient.

1.3 Accessories

Filter Holder & Mounting Plate Assembly

Model 57-426 consists of a transparent filter holder 6 1/2" wide x 5 1/2" long x 3/8" thick, fastened to 9" x 9" mounting plates. Thin steel rails on both ends of the holder attract the filter's magnetic strips. Weighs 18 oz.

Replacement Mounting Plates (2)

Model 57-411 clear plastic, 9" x 9" x 1/16" thick. attached to filter holder with four (4) screws. Can be cut to fit the collimator's accessory tray.

1.4 Filter Holder Mounting Instructions

If the collimator housing has an accessory tray, the two 9" x 9" X 1/16" acrylic mounting plates (held together by four (4) screws) should be cut to fit the rails of the tray (Figure 1-3). If the tray channel is less than 1/8" wide, only one of the mounting plates is required. The other should be removed and retained as a spare.

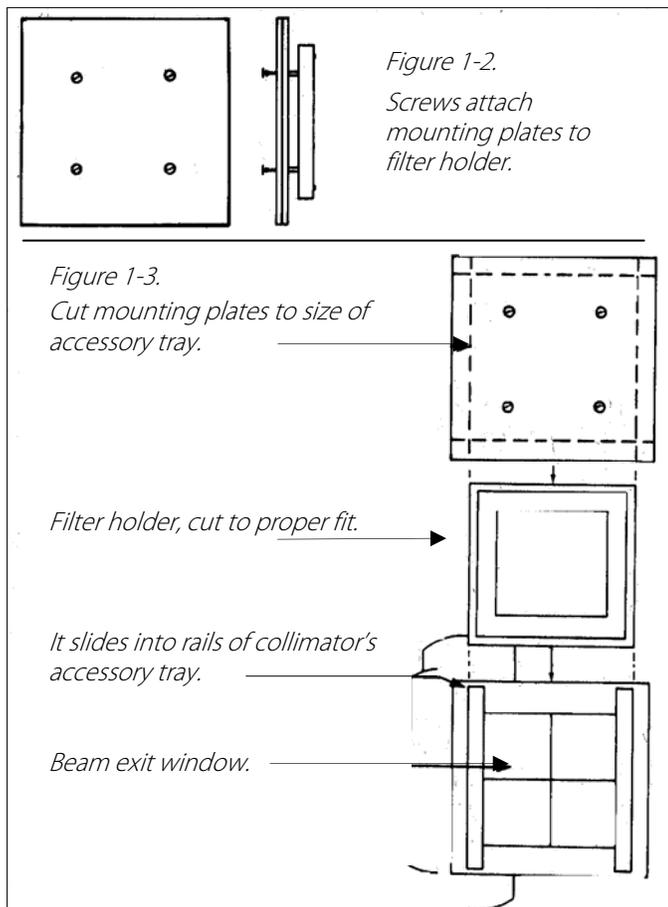
To separate the filter holder from the mounting plate(s), remove the four (4) small screws holding them together (Figure 1-2). Carefully measure the collimator's accessory tray, and mark one or both of the mounting plates for cutting. A cardboard template is recommended as a cutting guide. Make a trial fitting with the template before cutting the plastic to ensure that the filter holder will be in the proper position on the mounting plate. If the final shape of the mounting plate is not square, be sure to check for proper longitudinal orientation of the filter holder (Figure 1-3).

To cut the plastic mounting plate(s), use a Plexiglas-scoring knife. Score the plastic at the desired locations, making sure that each score runs the full length (width) of the plate. Make the scores deep by going over each scratch several times.

To break the plastic, place it over the edge of a table, with the score mark on top and exactly above the edge. Hold the plastic sheet flat to the table top with one hand. With the other hand, bend the overhanging part of the plastic sheet down. If the score mark lines up exactly at the table edge, the overhanging piece will break cleanly at the mark.

Check that the mounting plate slides easily into the accessory tray. To make any fine adjustments needed for a proper fit, use a file or fine sandpaper.

Re-attach the filter holder to the mounting plate(s), and insert the assembly into the collimator's accessory tray (Figure 1-3).



If the steel rails on the filter holder intrude into the x-ray field of view, unscrew the rails and turn them around (Figure 1-4). Since the screw holes in these rails are off center, turning the rails will set them $\frac{3}{4}$ " further apart.

If desired, the magnetic tape on some or all of the filters can be cut to match the new position of the holder rails. Using a sharp knife, cut through the magnetic tape (on each side of the filter) in a line parallel to, and $\frac{3}{8}$ " from, the inner edge. Remove this $\frac{3}{8}$ " strip, leaving a $\frac{5}{8}$ " tape strip along the outer edge of the filter, which matches the new position of the filter holder rails.

The use of the filters and holder is not changed by the above procedure.

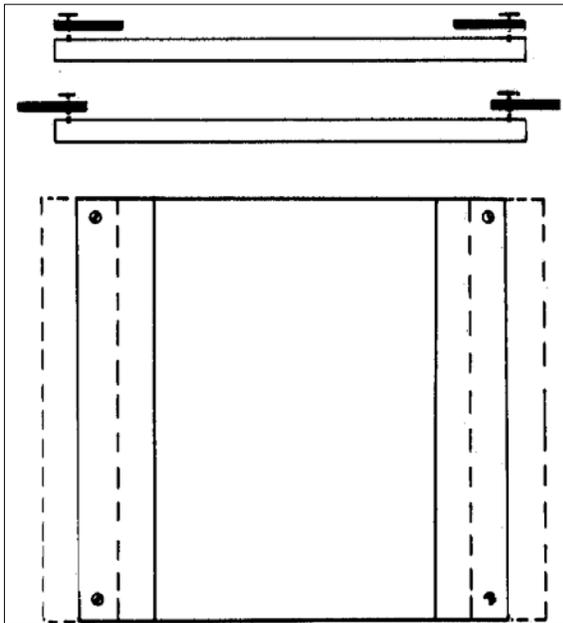


Figure 1-4. Turning the steel rails increases spacing between them.

1.5 Long Leg Filter Mounting Instructions – Ceiling Mount (Model 57-435)

This filter is mounted at the bottom of the beam-defining cone below ceiling mount x-ray tubes. The lower beam opening of the cone is typically a 4" x 10" rectangle, and the location of the x-ray beam limits, at the position of the patient, is known. The filter can be mounted by using double-sided tape, epoxy (or other cement), screws or other convenient methods. The uniformly thick part of the filter attenuates the x-ray beam from the patient's feet to approximately the knees. The tapered part of the filter attenuates the beam approximately $\frac{1}{3}$ to $\frac{1}{2}$ way up the thighs (See Figure 1-5).

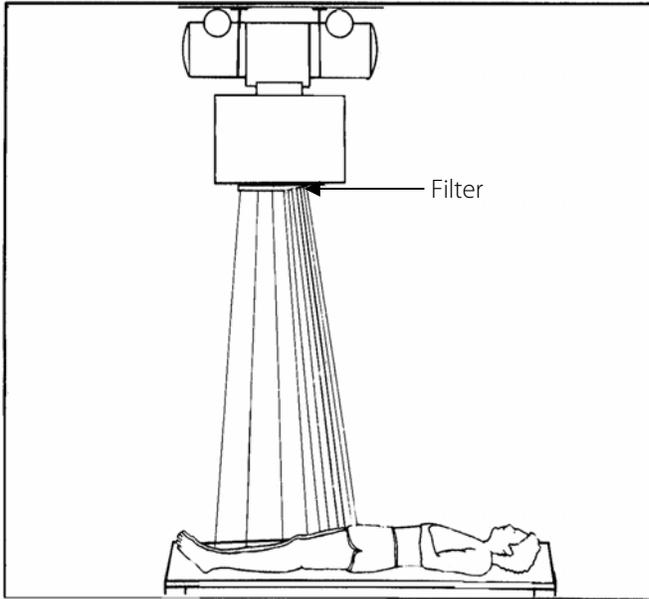


Figure 1-5. Shows placement of ceiling mount Long-Leg Filter

1.6 Tomography Trough Filters (Models 57-412 & 57-413)

The regular trough filter (57-412) is used for adult linear tomography. Use the small filter (57-413) for linear motion tomography of pediatric patients.

Position the filter with the collimator at the midpoint of its motion path so that the collimator, the patient's chest and the film are lined up vertically (See Figure 1-6). Place the gap in the filter's center over the patient's mediastinum. The width of the gap permits alignment during the motion.

Depending on the FFD used, the small filter (57-413) may be appropriate even for adult patients. Then, the 57-412 would be used only for occasional cases of cardiomegaly.

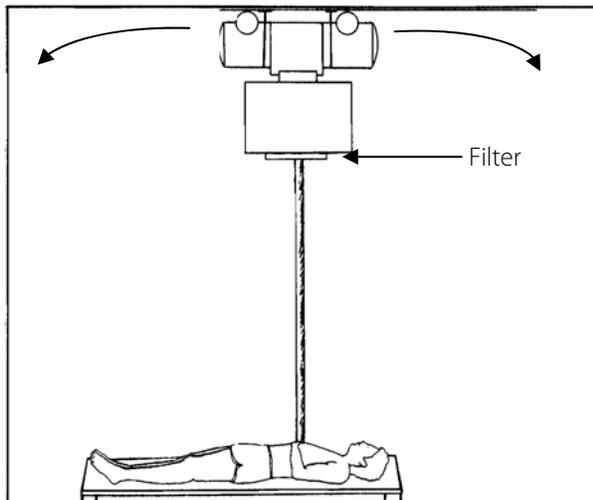


Figure 1-6. Shows correct positioning of Tomography filters

1.7 1" Wedge Filter (Model 57-431)

The 1" wedge filter is used to prevent "burn out" or overexposure where parts of the body vary in thickness over a short distance. It is appropriate when radiographing the breast in a tangential direction (for example, when locating radioactive therapy "seeds").

Two such filters, with their thin edges placed together or at a slight separation, form a trough whose spacing is adjustable. This positioning is particularly useful for angiography of the limbs, where overexposure would make details near peripheral edges of the limb difficult to see.

1.8 2" Wedge (Decubitus) Filter (Model 57-432)

This filter is ideal for preventing over-exposure to the upper portion of the colon during double contrast (Barium and Air) studies when the patient is in the Lateral Decubitus Position. With the patient lying on one side, the viscera tend to drop, so that the upper side of the body has less attenuation to x-rays. The decubitus filter is placed on the holder rails horizontally, with its thicker (more attenuating) side up, so that it attenuates approximately the upper half of the field of view. Placement is facilitated by using the collimator light.

A pair of these filters, with their thin edges (low attenuating edges) together or nearly together, forms a trough filter that may be used for angiography of the head and neck. This makes the peripheral regions of the subject more easily visible. In an emergency, 2" wedge filters can also be used for angiography of the limbs when 1" wedges are not available.

1.9 3" Wedge Filter (Model 57-433)

The first two-thirds of this filter may be considered as a thinner or less attenuating decubitus filter. Therefore it is useful for the decubitus view on children or adults who are particularly thin or small.

When used in pairs (as a trough) the 3" wedges are particularly suited for most films of the abdominal region. This makes the peripheral parts more visible than in a non-filtered view. An I.V.P. film will benefit in the same way.

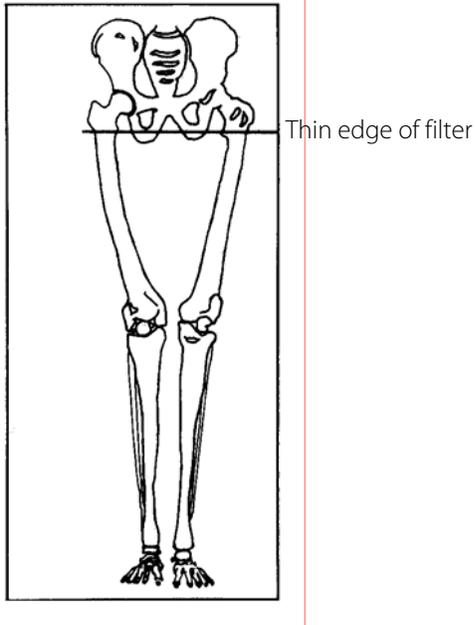
1.10 Long-Leg Filter (Model 57-435)

This filter is intended for use with ceiling-mount x-ray generators. It is used in radiographing the whole leg, from the ankle up to and including the lower abdomen. Such films, used in orthopedics as well as in angiography, would otherwise require dividing the view into several sections. Each section would be exposed with a technique appropriate to the thickness of that section of the leg.

The filter is mounted at the bottom of the beam-defining cone so that the thickest part of the filter covers the lowest part of the foot and leg. The thinnest part reaches approximately 3/5 of the way up, approximately half way up the thigh. Ceiling-mounted generators do not have a collimator light, and the size of the x-ray beam can be located with a fluorescent target (e.g., Nuclear Associates' Beam-Size Ruler, Model 07-606). Since these x-ray generators are usually used only for long-leg radiography, permanent mounting of the filter on the cone is practical, and either a long (36") cassette or two 14" x 17" cassettes may be used.

1.11 Long-Leg Filter (Model 57-436)

Where a conventional x-ray generator is used, such as in long-leg radiography taken with the patient standing, the 57-436 filter can be used. It is mounted on a standard 57-426 Filter Holder. The thick part of the filter is placed so as to attenuate the lowest portion of the x-ray beam, and the tapered edge of the filter is cephalad, reaching to the level of the patient's lesser trochanter. The filter is placed correctly with the aid of the collimator light. Because the taper refracts light, the filter produces a dark band on the patient where the tapered portion affects the x-ray beam. This facilitates filter placement.



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