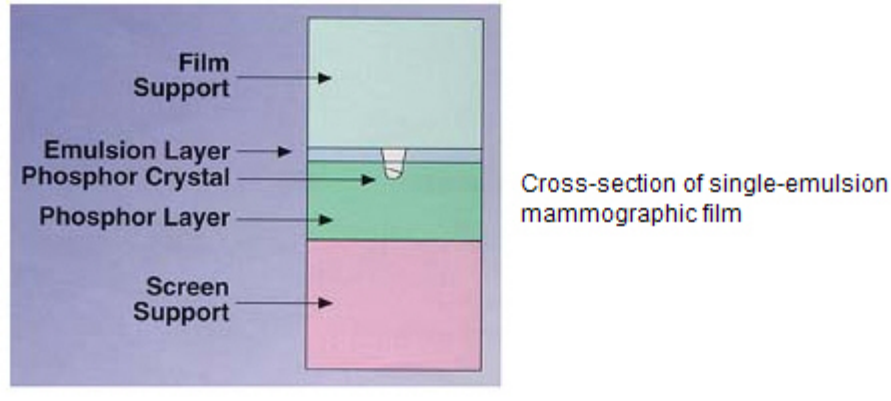


Cleaning Screens and Cassettes

Screens and cassettes used for mammography should be cleaned weekly and any time minus-density artifacts (white spots) caused by dirt and dust are detected on a mammogram. The goal is to minimize the occurrence of this type of artifact which affects the quality of both clinical and phantom images.

Single-emulsion films are inherently more susceptible to artifacts, especially minus-density artifacts.

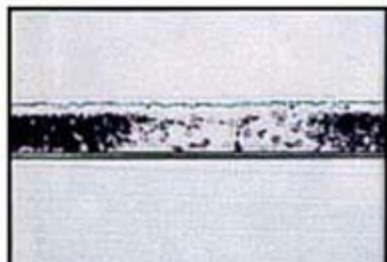
Mammography most often utilizes single-emulsion film which has a light-sensitive emulsion layer on only one side of the film support. This provides maximum resolution (16 to 20 line pairs/mm) and minimum geometric unsharpness. Single-emulsion films, however, are inherently more susceptible to artifacts, especially minus-density artifacts. Minus-density artifacts are one of the most common artifacts seen on mammograms. They appear white or of lighter density and are usually caused by dirt and dust trapped between the film and screen. Minus-density artifacts are more commonly called shadow images because the area of reduced density on the film is due to dirt and/or dust blocking the path of light from the intensifying screen to the film emulsion during the mammographic exposure. The minus-density area on the processed film is thus the reversed shadow of the foreign particle.



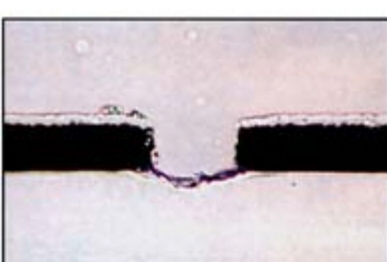
Shadow images are often incorrectly classified as examples of another less-frequently occurring type of minus-density artifact called pick-off. Pick-off also appears on the film as white spots. Pick-off, however, is caused by various processing-related conditions such as rough or dirty rollers, inconsistent film transport speed, or poor-quality chemicals.

Although pick-off may occasionally be caused by a defect in the film, the processing environment and lack of maintenance are more commonly at fault. Magnified cross-sectional views of shadow images and pick-off, respectively, are shown below. The difference between shadow images and pick-off can be distinguished on the radiograph by close examination using both transmitted and reflected light. (Transmitted light is the light which shines through the radiograph when a film is placed and viewed on an illuminated viewbox; reflected light is the light from a nearby light source, such as an illuminated viewbox, which bounces off the surface of the film.)

Place the film on a viewbox and use an eye loupe (measuring magnifier) with at least 7x magnification. Pick-off is characterized by a piling up of the emulsion to one side of the artifact. Under reflected light, a hole may be seen where part of the emulsion layer coated on the film support has been ripped away. For shadow images, the surface where the minus-density area is present will be entirely intact and the small tell-tale pile of emulsion will be absent. Severe pick-off can actually be felt by the finger, as well as seen. It is estimated that up to 95% of all minus-density artifacts seen on mammographic images are shadow images.



A magnified cross-sectional view of a **Shadow Image** shows an intact emulsion layer of the film.



A magnified cross-sectional view of **Pick-Off** shows a defect in the emulsion layer of the film and a piling up of the emulsion to the left side of the artifact.

Shadow images can be reduced by:

1. Keeping the darkroom clean.
2. Thoroughly cleaning mammographic screens and cassettes according to your manufacturer's recommendations. Only constant vigilance in both of these areas will eliminate minus-density artifacts from your mammography films.

"Minus-density artifacts are more commonly called shadow images because the area of reduced density on the film is due to dirt and/or dust blocking the path of light from the intensifying screen to the emulsion during the mammographic exposure."



Use a viewbox and eye loupe with at least 7x magnification to inspect any artifacts on the film.



Use reflected light to check the emulsion side of the film.

Maintaining clean mammography intensifying screens and cassette interiors will reduce the occurrence of minus-density artifacts caused by dust or dirt. Intensifying screens and cassettes should always be cleaned following the recommendations of the manufacturer. Generally, for effective cleaning and prolonged screen life, only the screen cleaning solution (e.g. KODAK MIN-R Screen Cleaner) and any other products specified by the manufacturer of the screens and cassettes should be used.

Mammography screens should be cleaned at least once a week, or more frequently as necessitated by environmental conditions to reduce shadow images caused by dust and dirt.

For best results, the recommendations below should be followed when cleaning KODAK MIN-R and MIN-R 2 cassettes in which KODAK MIN-R, MIN-R 2000 or MIN-R 2190 screens are mounted. **New screens and cassettes must be cleaned prior to first use and prior to screen/film contact test.**

1. Choose a clean location to clean screens and cassettes.
 - o If working on a countertop in the darkroom used for processing mammography film, wipe the outside of the cassettes and clean the countertop with a damp cloth prior to cleaning the screens.
 - o Manage cassettes so they are empty at the time of cleaning (end of the day is usually best).
 - o Avoid replacing film previously loaded into cassettes back into the film box or film bin, since this could introduce dust into the film supply.
2. Clean the inside plastic cover of the cassette (tube side panel) using a lint-free wipe that has been dampened with a small amount of the KODAK MIN-R Screen Cleaner. If dust is noted at screen chest wall edge, very carefully clean under the foam using a cotton swap or compressed air.
3. Dry the cover - It may be advisable to use a camel's-hair brush or other soft lint-free brush to remove any dust accumulated in the corners of the cassette cover and along the hinge. Such dust may not be easily reached with the dampened cloth.
4. Moisten a lint-free wipe with a small amount of Kodak MIN-R Screen Cleaner and gently rub the wipe across the screen.
 - o Avoid the use of abrasive wipes such as surgical gauze pads.
 - o Avoid excessive pressure or rubbing on the screen.
 - o Avoid pouring the screen cleaner directly onto the screens or cassettes
 - o Use the minimum amount of screen cleaner needed to moisten the wipe.
 - o Excess screen cleaner will not improve screen cleanliness, will prolong the drying period, and may stain the screen.
 - o Clean around any labels on the screen (e.g. those used to individually number the cassettes).
 - o DO NOT WIPE THE SCREEN DRY - Allow the screen surface to air dry so that the full effects of the screen cleaner may be realized.
 - o A solution of 70% isopropyl alcohol may be used occasionally to remove stubborn dirt or dust.
 - o After using 70% isopropyl alcohol, KODAK MIN-R Screen Cleaner must be used following the procedure outlined above.

The use of 70% isopropyl alcohol should be limited to occasional use only.

5. Stand the cassettes on edge to dry.
 - o Allow the screens and cassettes to completely air dry before returning them to service.
 - o Loading film into a cassette with wet screens may damage the film and lead to staining of the screens.
6. Inspect the screen and cassette cover for any stray particles of dust.
 - o An ultraviolet, or black light is helpful in determining if screens and cassettes are clean.

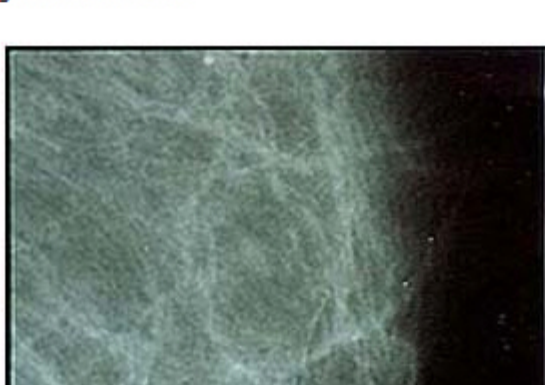
Limit exposure to the ultraviolet light and observe appropriate safety precautions for eyes, face, and exposed skin: do not look directly at the light.

7. Reload the cassette with film.
 - o If using improved KODAK MIN-R 2 Cassettes, wait at least 5 minutes after loading before using.
 - o If using KODAK MIN-R Cassettes or an older version of MIN-R 2 Cassettes, wait at least 15 minutes before using.

Note: Improved MIN-R 2 Cassettes have a rounded latch lever. The older version of the cassette has an angular latch lever.

8. Reclean the countertop, if the cleaning procedure was done in the darkroom.
9. Between regular cleanings, a camel's-hair brush may be used to remove dust particles from the cassette and screen surface. Care should be taken when using any brush to protect the screen surface from scratches, which will degrade image quality.
10. Each intensifying screen and cassette should be marked with a unique number to facilitate locating a specific cassette suspected of requiring cleaning or inspection.

KODAK recommends the use of a soft lint-free untreated cloth. The use of other manufacturers' screen cleaning devices or cleaner with KODAK MIN-R, MIN-R 2000 or MIN-R 2190 screens is not recommended as their formulas, raw materials and photoactive properties may change without notice.



This mammogram shows several shadow images. Shadow images account for an estimated 95% of all minus-density artifacts seen on mammographic images.

For touch-up cleaning anytime, the antistatic brush may be used alone, or use screen cleaner followed by the antistatic brush.

Be sure to follow only the manufacturer's recommendations for the proper cleaning and care of screens and cassettes.

Clean screens and cassettes will help to prolong their life. More importantly, clean screens and cassettes will help promote optimum image quality.