

Dental Radiography Series



Successful
Intraoral Radiography





Successful Intraoral Radiography

Every dental professional would like to achieve the goal of producing consistent, quality intraoral radiographs. A quality intraoral radiograph will reveal maximum image detail with anatomic accuracy and optimal density and contrast, providing the highest diagnostic yield. This pamphlet will address some of the common errors in capturing and processing intraoral radiographs and explain how to prevent and correct them. For similar information on panoramic radiography, please refer to the publication entitled "Successful Panoramic Radiography".

Quality Radiography

The goal of all radiography should be to produce a high quality radiograph. Such a radiograph will exhibit maximum detail to resolve fine objects. It will show the teeth and anatomic structures accurately without distortion or magnification. It will have the optimal density and contrast (visual characteristics) to maximize its use for the detection of dental disease. To create such a film, the dental staff must pay attention to all three steps in the production of the radiograph including: positioning, exposure and processing.

First, the film must be properly positioned to ensure proper geometry and prevent distortion and overlap. Second, the exposure technique factors must be appropriate for the patient and the film selected. And last, proper processing time, temperature and handling requirements must be followed to produce a quality radiograph.

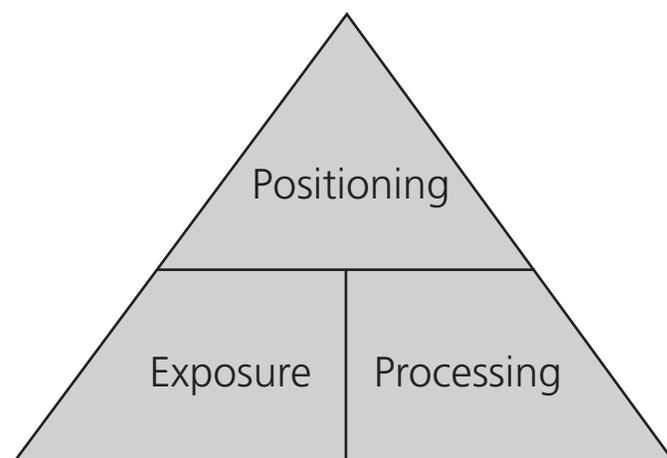


Figure 1 Three steps In producing a quality radiograph

Proper Film Positioning

Step 1: Proper Film Positioning

Film placement for proper anatomic coverage is beyond the scope of this pamphlet and can be reviewed in any quality dental radiography text. This document will discuss improper film placement that can lead to errors such as overlapped contacts and distorted teeth and roots. These problems occur due to the fact that dental radiography is a shadow casting technique. In other words, we cast an image of the tooth onto the film. Shadow casting can cause geometric distortions in the final radiograph such as elongation, magnification and overlapping contacts.

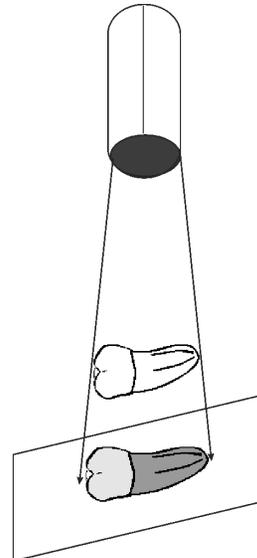


Figure 2 Shadow casting

Figure 3 Excessive vertical angulation, note inferior border of mandible visible, elongation of roots. Correct by moving film further back into the mouth



Geometric distortion can be minimized by using a long x-ray source to object distance. This can be obtained using a long cone (40 cm/16 inch) technique. Geometric distortion can also occur if the film is not at right angles to the beam. For this reason, it is recommended to always use a film-holding and position indicating device (PID). Many practitioners assume these devices can control all angulation problems; however, they merely hold the film perpendicular to the x-ray beam. They do not totally prevent errors in the vertical and horizontal angulation of the film to the tooth itself. This can lead to commonly seen errors of overlapped contacts and vertical distortion of teeth on the radiograph. These issues can be minimized by proper use of the paralleling technique.

Figure 4 Distortion from film bending in corner of arch. Correct by placing film further into center of the mouth

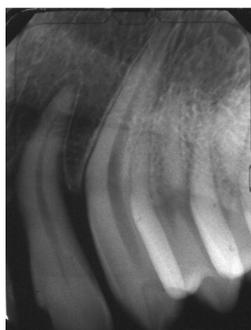


Figure 5 Bent film corners causing black lines on film. Correct with proper film placement, use soft film packets. Handle film packets as carefully as possible



Distortion (vertical angulation)

Although film-holding devices position the film at right angles to the x-ray beam, they do not prevent rotation of the whole device in a vertical axis. This rotation places the film at an angle to the tooth and can result in distortion when the angle is significant. This commonly occurs when the film is not placed far enough in the center of the mouth and the film must be angulated to avoid the slope of the palate or the mandibular vestibule. It can be avoided by simply placing the film deeper into the center of the mouth so that tipping is not necessary. Another type of distortion occurs when the film is bent when the patient bites down. This can also be avoided by placing the film deep enough into the mouth to avoid contact with the palate. Bending of film corners for patient comfort can also cause errors, as the pressure of the bend can cause partial film development. These bends appear as black lines on the film.

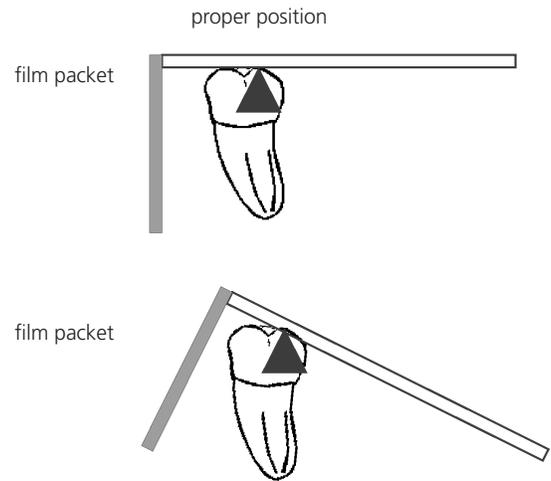


Figure 6 Vertical angulation due to fulcrum rotation on lower molar

Overlapped contacts (horizontal angulation)

In order to maximize the amount of contact opening, the beam should be directed at right angles to the contact area. In the mandible this is fairly straightforward. In the maxilla, however, the molar contacts are often directed mesially due to the triangular shape of the maxillary molars. This means that the beam must also be directed from the mesial to open these contacts. Often times the reverse is done. The beam is directed from the mesial in the bicuspid area and at right angles or distal in the molar region. This will most often result in overlapped contacts. Contact areas should always be visualized prior to taking bitewing radiographs.

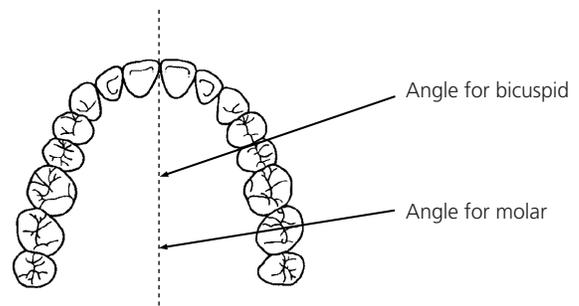


Figure 9

Figure 7 Improper horizontal angulation, contacts overlapped



Figure 8 Proper horizontal angulation, contacts open



Cone cuts

Dental x-ray beams are collimated or restricted to a diameter of 7 cm/2.75 inches at the end of the cone or even less when a rectangular collimator is used. When the exit pattern of the beam is not aligned with the film, part of the film will not be exposed to radiation and will appear clear. This is known as a cone cut. Proper use of position indicating devices (PIDs) will help to prevent these cone cuts, which can occur with either round or rectangular cones.

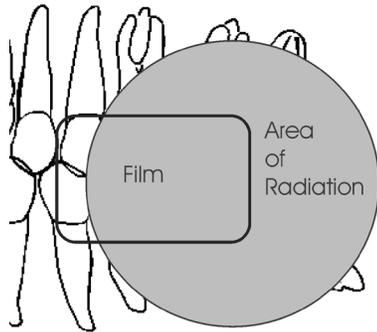


Figure 10

Reversed films

Dental x-ray film is marked with an indicator dot to help indicate the tube side of the film and to help distinguish the patient's right or left side. In addition, the film packet contains a sheet of lead foil which prevents unnecessary radiation from passing through into the patient and reduces scatter radiation. This sheet of lead foil is marked with a special pattern. When a film is exposed from the wrong side, the pattern is visible on the radiograph. Due to the attenuation of the foil, the radiograph also appears overall light in density.

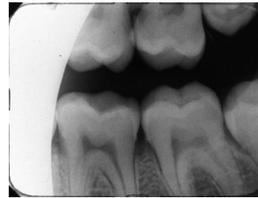


Figure 11 Cone cut using round cone

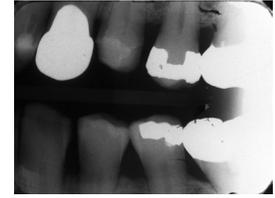


Figure 12 Cone cut using rectangular cone

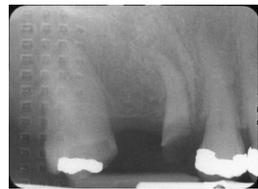


Figure 13 Reversed film, note dot pattern on left edge of radiograph, light overall density



Figure 14 Foil from packet showing pattern of dots

| Radiograph | Error | Fix |
|--|---|--|
| Teeth elongated or shortened, cusps don't overlap, sinus structures or inferior border of mandible visible | Excessive vertical angulation | Correct film placement and reduce vertical angulation |
| Contacts of teeth overlapped | Improper horizontal angulation | Visualize contact area and adjust |
| Dark lines on film | Film bent | Use of Carestream Dental Poly-Soft packets and proper placement to minimize any bending. Open packet without excessive bending |
| Clear area on one edge of film either in arc or straight | Cone cut | Align cone with position indicating device |
| Film light in density, unusual pattern across film ("tire tracks" "herringbone") | Packet was reversed and exposed through the back side, pattern is for orientation from foil inside packet | Follow instructions on packet for proper orientation |

Table 1 Film positioning errors

Film Exposure

Step 2: Film Exposure

Selecting a Film

Film selection is important to both radiographic success and to provide the lowest practical exposure to the patient. To achieve consistent quality radiographs you must use a consistent quality film. Low cost films may vary from batch to batch or may come from different manufacturers. This makes establishing consistent exposure and development technique factors very difficult. Dental films are provided in different speed groups. D-speed films are the slowest speed films and F-speed films are the fastest.

INSIGHT dental film is an F-speed film that can provide an additional 20% reduction in exposure over E-speed films (and a 60% reduction in exposure over D-speed films) with consistent image contrast and quality. In accordance with the ALARA principle (keep doses As Low As Reasonably Achievable), the use of F-speed film is highly encouraged. For helpful exposure guidelines, please see pages 11 and 12. Using these guidelines, the practitioner can verify that their exposure factors are within the suggested normal ranges for good radiographic techniques.

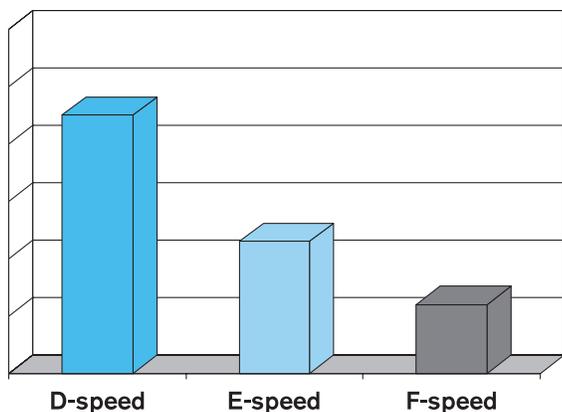


Figure 15 Exposure time, F-speed represents a 60% reduction in exposure over D-speed film

Influence of milliamperes

Most modern dental x-ray machines no longer allow for the adjustment of mA or milliamperage. Since the effect of increasing or decreasing mA is the same as for exposure time, it is common to combine the two and talk of mAs or milliamp-seconds. In dentistry we are mainly concerned with exposure time as discussed below.

Influence of time

Film density (how light or dark the overall film is) is directly related to exposure time. The longer the exposure time the more x-ray photons reach the film and expose it. Therefore, the film is darker. The x-ray timer can be thought of as a faucet. It turns the flow of x-rays on or off. If you open the faucet twice as long, you will get twice as many x-rays out of the machine. If you double the time, the film will be approximately twice as dark.



Figure 16 Exposure time is like a faucet



Figure 17 0.25 second exposure (underexposed)



Figure 18 0.5 second exposure (properly exposed)

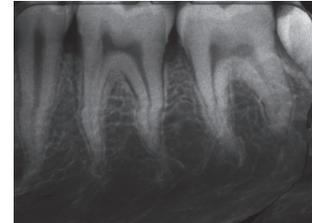


Figure 19 1.0 - second exposure (over exposed)

| Radiograph | Exposure Time | Fix |
|------------|---------------|----------------------------------|
| Too dark | Too long | Use shorter time, fewer impulses |
| Too light | Too short | Use longer time, longer impulses |

Table 2 Exposure time errors

Influence of peak kilovoltage

Many modern dental x-ray machines no longer allow the adjustment of peak kilovoltage (kVp). The kilovoltage affects both the quantity of the x-rays produced and their average energy. The average energy is sometimes referred to as the "beam quality." The effect of peak kilovoltage can be compared to a spray nozzle. It controls the force of the emerging stream of x-rays, while the faucet (timer) controls the volume.

kVp has two effects on the quality of the final radiograph. First, it affects the contrast or gray scale. Low kVp is like opening the nozzle. The lower energy x-rays have less penetrating power. This provides a high contrast image with an obvious black and white appearance. High kVp is like closing the nozzle. The beam is "harder" with higher energy. High kVp gives a low contrast image, but with more shades of gray to show subtle contrast changes. Second, using higher kVp produces more x-rays. This is not a linear relationship, but rather the density of the film varies as the square of the kVp. A good standard to follow is:

An increase of 10 kVp => Divide exposure time by 2

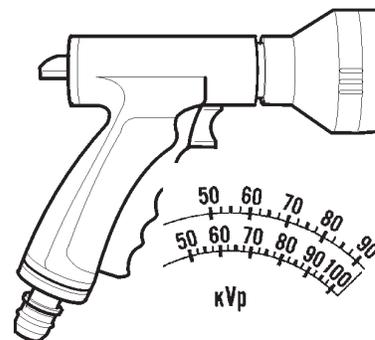


Figure 20 kV is like a spray nozzle

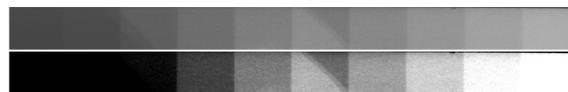


Figure 21 Low contrast long gray scale above, high contrast short gray scale below

An increase of 15 kVp = 2 X an Increase in Density



Figure 22 55 KvP



Figure 23 70 KvP



Figure 24 85 KvP

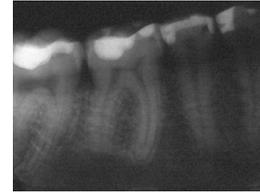


Figure 25 Film mistakenly shot at 90 KvP, all other exposure factors were set as normal

Although many modern x-ray machines do not allow changes in kVp, modern DC (direct current) machines are actually equivalent to older machines operating at higher voltages. For example, a modern 70 kVp DC machine has a beam quality similar to an older 80 kVp machine.

Other errors that can occur during exposure include patient movement and double exposures. The best way to avoid patient movement is to use an F-speed film to achieve a short exposure time. Another way to decrease patient movement errors is to be sure a headrest stabilizes the patient's head during film placement and exposure. Double exposures are usually caused by operator inattention. Keep unexposed films separated from exposed films to help alleviate this problem. It is important to note that when a double exposure occurs there is usually a corresponding blank film in the series.

| Radiograph | kV Setting |
|-------------------|------------|
| Too dark | Too high |
| Too light | Too low |
| Too much contrast | Too low |
| Too washed out | Too high |

Table 3 kVp errors



Figure 26 Patient movement, note blurring of image, soft focus



Figure 27 Double exposure, not multiple images of teeth

| Radiograph | Error | Fix |
|-------------------------|------------------|---|
| Blurring of structures | Patient movement | Use F-speed film for shorter exposure times. Remind patient to hold still and use a head rest. Tube movement is not as adverse as patient movement. |
| Multiple images on film | Double exposure | Exposed films should always be separated from unexposed film while taking radiographs. |

Table 4 Errors during exposure

Recommended exposure settings for Carestream Dental intraoral films

Ultra-speed*

| | | Settings | kV | 60 | 65 | 65 | 65 | 70 | 70 | 70 | 80 |
|----------------|-----------------|----------------------|---------|------|------|------|------|------|------|------|------|
| | | | mA | 7 | 7.5 | 8 | 10 | 7 | 8 | 10 | 10 |
| 20 cm/8 inches | Maxillary | Incisor | | 0.55 | 0.32 | 0.30 | 0.24 | 0.27 | 0.24 | 0.19 | 0.10 |
| | | Cuspid | | 0.55 | 0.32 | 0.30 | 0.24 | 0.27 | 0.24 | 0.19 | 0.10 |
| | | Bicuspid | | 0.73 | 0.43 | 0.40 | 0.32 | 0.37 | 0.32 | 0.26 | 0.13 |
| | | Molar | | 0.82 | 0.48 | 0.45 | 0.36 | 0.41 | 0.36 | 0.29 | 0.14 |
| | Mandibular | Incisor | | 0.46 | 0.27 | 0.25 | 0.20 | 0.23 | 0.20 | 0.16 | 0.08 |
| | | Cuspid | | 0.46 | 0.27 | 0.25 | 0.20 | 0.23 | 0.20 | 0.16 | 0.08 |
| | | Bicuspid | | 0.50 | 0.29 | 0.28 | 0.22 | 0.25 | 0.22 | 0.18 | 0.09 |
| | | Molar | | 0.55 | 0.32 | 0.30 | 0.24 | 0.27 | 0.24 | 0.19 | 0.10 |
| | Bite-Wing | Anterior (Incisor) | | 0.46 | 0.27 | 0.25 | 0.20 | 0.23 | 0.20 | 0.16 | 0.08 |
| | | Posterior (Bicuspid) | | 0.55 | 0.32 | 0.30 | 0.24 | 0.27 | 0.24 | 0.19 | 0.10 |
| | Occlusal | | | 0.91 | 0.53 | 0.50 | 0.40 | 0.46 | 0.40 | 0.32 | 0.16 |
| | 40 cm/16 inches | Maxillary | Incisor | | 2.19 | 1.28 | 1.20 | 0.96 | 1.10 | 0.96 | 0.77 |
| Cuspid | | | | 2.19 | 1.28 | 1.20 | 0.96 | 1.10 | 0.96 | 0.77 | 0.38 |
| Bicuspid | | | | 2.93 | 1.71 | 1.60 | 1.28 | 1.46 | 1.28 | 1.02 | 0.51 |
| Molar | | | | 3.29 | 1.92 | 1.80 | 1.44 | 1.65 | 1.44 | 1.15 | 0.58 |
| Mandibular | | Incisor | | 1.83 | 1.07 | 1.00 | 0.80 | 0.91 | 0.80 | 0.64 | 0.32 |
| | | Cuspid | | 1.83 | 1.07 | 1.00 | 0.80 | 0.91 | 0.80 | 0.64 | 0.32 |
| | | Bicuspid | | 2.01 | 1.17 | 1.10 | 0.88 | 1.01 | 0.88 | 0.70 | 0.35 |
| | | Molar | | 2.19 | 1.28 | 1.20 | 0.96 | 1.10 | 0.96 | 0.77 | 0.38 |
| Bite-Wing | | Anterior (Incisor) | | 1.83 | 1.07 | 1.00 | 0.80 | 0.91 | 0.80 | 0.64 | 0.32 |
| | | Posterior (Bicuspid) | | 2.19 | 1.28 | 1.20 | 0.96 | 1.10 | 0.96 | 0.77 | 0.38 |
| Occlusal | | | | 3.64 | 2.12 | 2.00 | 1.60 | 1.84 | 1.60 | 1.28 | 0.64 |

*Class: D-speed

Note: for large patients increase time by approximately 25%; for children and / or small patients decrease time by approximately 30%; to convert to impulses, multiply by 60.

INSIGHT*

| | | Settings | kV | 60 | 65 | 65 | 65 | 70 | 70 | 70 | 80 |
|----------------|-----------------|----------------------|---------|------|------|------|------|------|------|------|------|
| | | | mA | 7 | 7.5 | 8 | 10 | 7 | 8 | 10 | 10 |
| 20 cm/8 inches | Maxillary | Incisor | | 0.25 | 0.14 | 0.14 | 0.11 | 0.12 | 0.11 | 0.09 | 0.04 |
| | | Cuspid | | 0.25 | 0.14 | 0.14 | 0.11 | 0.12 | 0.11 | 0.09 | 0.04 |
| | | Bicuspid | | 0.33 | 0.19 | 0.18 | 0.14 | 0.16 | 0.14 | 0.12 | 0.06 |
| | | Molar | | 0.37 | 0.22 | 0.20 | 0.16 | 0.19 | 0.16 | 0.13 | 0.06 |
| | Mandibular | Incisor | | 0.21 | 0.12 | 0.11 | 0.09 | 0.10 | 0.09 | 0.07 | 0.04 |
| | | Cuspid | | 0.21 | 0.12 | 0.11 | 0.09 | 0.10 | 0.09 | 0.07 | 0.04 |
| | | Bicuspid | | 0.23 | 0.13 | 0.12 | 0.10 | 0.11 | 0.10 | 0.08 | 0.04 |
| | | Molar | | 0.25 | 0.14 | 0.14 | 0.11 | 0.12 | 0.11 | 0.09 | 0.04 |
| | Bite-Wing | Anterior (Incisor) | | 0.21 | 0.12 | 0.11 | 0.09 | 0.10 | 0.09 | 0.07 | 0.04 |
| | | Posterior (Bicuspid) | | 0.25 | 0.14 | 0.14 | 0.11 | 0.12 | 0.11 | 0.09 | 0.04 |
| | Occlusal | | | 0.41 | 0.24 | 0.23 | 0.18 | 0.21 | 0.18 | 0.14 | 0.07 |
| | 40 cm/16 inches | Maxillary | Incisor | | 0.99 | 0.58 | 0.54 | 0.43 | 0.49 | 0.43 | 0.35 |
| Cuspid | | | | 0.99 | 0.58 | 0.54 | 0.43 | 0.49 | 0.43 | 0.35 | 0.17 |
| Bicuspid | | | | 1.32 | 0.77 | 0.72 | 0.58 | 0.66 | 0.58 | 0.46 | 0.23 |
| Molar | | | | 1.48 | 0.86 | 0.81 | 0.65 | 0.74 | 0.65 | 0.52 | 0.26 |
| Mandibular | | Incisor | | 0.82 | 0.48 | 0.45 | 0.36 | 0.41 | 0.36 | 0.29 | 0.14 |
| | | Cuspid | | 0.82 | 0.48 | 0.45 | 0.36 | 0.41 | 0.36 | 0.29 | 0.14 |
| | | Bicuspid | | 0.91 | 0.53 | 0.50 | 0.40 | 0.45 | 0.40 | 0.32 | 0.16 |
| | | Molar | | 0.99 | 0.58 | 0.54 | 0.43 | 0.49 | 0.43 | 0.35 | 0.17 |
| Bite-Wing | | Anterior (Incisor) | | 0.82 | 0.48 | 0.45 | 0.36 | 0.41 | 0.36 | 0.29 | 0.14 |
| | | Posterior (Bicuspid) | | 0.99 | 0.58 | 0.54 | 0.43 | 0.49 | 0.43 | 0.35 | 0.17 |
| Occlusal | | | | 1.65 | 0.96 | 0.90 | 0.72 | 0.82 | 0.72 | 0.58 | 0.29 |

*Class: F-speed

Note: For large patients increase time by approximately 25%; for children and / or small patients decrease time by approximately 30%; to convert to impulses, multiply by 60.

In manual processing environment, the film is E-speed. Increase exposure time by approximately 20%.

Processing

Step 3: Processing Development

Even with the excellent automatic processors available today, many errors can occur during film processing. Many of these errors are due to improper film handling, but some can be caused by the processor itself. Processing is a chemical reaction therefore:

INCREASED TEMPERATURE = INCREASED DEVELOPMENT = DARKER FILM

INCREASED TIME = INCREASED DEVELOPMENT = DARKER FILM

For these reasons, the manufacturer's recommendations for development time and temperature should be closely followed. Automatic processors should still be checked for developer temperature as heating elements can fail or overheat. Proper attention to chemical dilution, mixing and loading must also be followed. Fixer should always be poured first into the processor as a small spill of fixer into the developer can drastically weaken the developer:

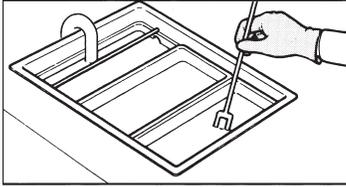
CONTAMINATED OR DEPLETED CHEMISTRY = INCOMPLETE DEVELOPMENT = LIGHT FILM

Developer must be replenished following manufacturer's recommendations or it will become exhausted. These recommendations are usually based on the amount of radiographs processed. However, developer exhaustion is determined by the surface area of the films processed not the number of films. For example, if large numbers of panoramic or cephalometric films are processed, more frequent replenishment will be needed.

| Radiograph | Problem | Fix |
|--------------------|---------------------------------------|--|
| Too light | Temperature too low or time too short | Check temperature and adjust development time as needed |
| Too dark | Temperature too high or time too long | Check temperature and adjust development time as needed |
| Too light | Contaminated or weak developer | Replace or replenish developer. Follow dilution instructions |
| Too dark (fogging) | Over concentrated developer | Follow dilution instructions |

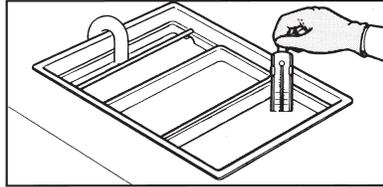
Table 5 Processing errors

Manual Processing of Intraoral Carestream Dental Films



1 STIR SOLUTIONS

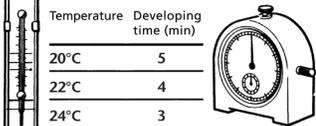
Dilute developer and fixer solutions as directed on the containers. Use separate paddles for each solution to avoid possible contamination. Stir the solutions gently. This ensures uniformity of solutions and temperatures.



2 CHECK TEMPERATURES OF SOLUTIONS

Check temperatures of solutions with an accurate thermometer. Rinse the thermometer thoroughly in running water before checking the other solution. Developer temperature should be within 20-24 °C. Fixer temperature should be within 15-30 °C.

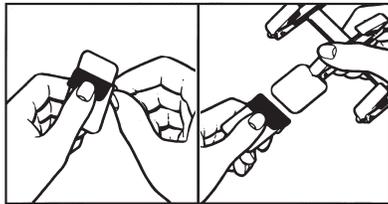
| Temperature | Developing time (min) |
|-------------|-----------------------|
| 20°C | 5 |
| 22°C | 4 |
| 24°C | 3 |



3 CHECK DEVELOPMENT TIME

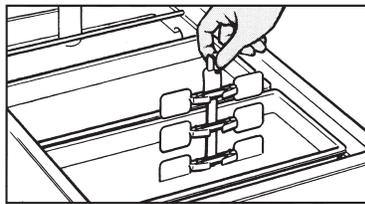
Refer to the table above and check the development time based on the temperature of the developer in preparation for step 5.

The times in the table are recommended for use with GBX Dental Developer.



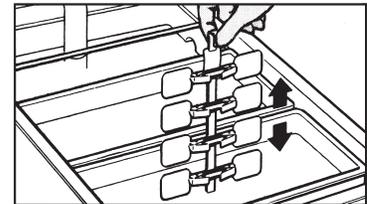
4 LOAD FILM ON HANGER

Remove films from packets and attach carefully to a multiple-clip hanger, avoid finger-marks, scratching or bending.



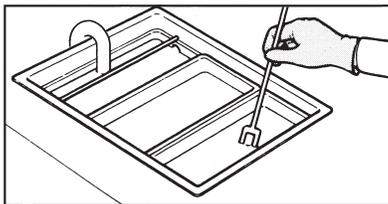
5 IMMERSE FILMS IN DEVELOPER AND START TIMING

Immerse the films smoothly and without pause; this minimizes streaking. Start timing.



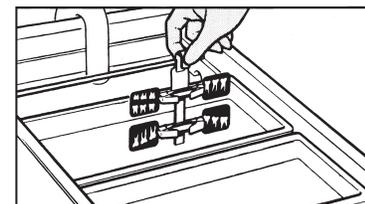
6 AGITATE FILMS

Dislodge air bubbles by vigorously moving film hanger in solution for 5 seconds. Do not raise out of the developer solution.



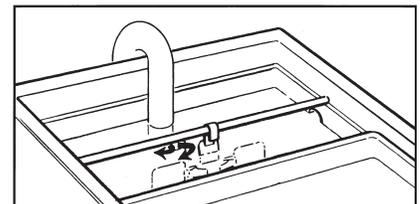
7 RINSE THOROUGHLY

At the end of development time, quickly remove hanger from the developer and place in wash section for 30 seconds with clean running water at a temperature of 15-30 °C. Lift from water and allow to drain over the wash section.



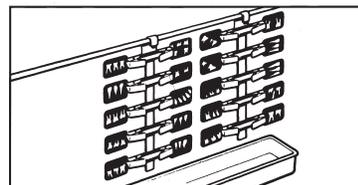
8 FIX ADEQUATELY

Place films in the fixer solution and agitate the hanger continuously for 2-4 minutes. See specific instructions for fixing times and temperatures.



9 WASH THOROUGHLY

Remove hanger from fixer and place in wash section. Wash for 10 minutes in running water. Eight volume changes per hour are recommended. Extraoral film should be washed for 5 minutes.



10 DRY

Suspend hanger from a drying rack in dust-free area. Use a fan to accelerate drying. When dry, remove films from hanger, mount and identify.

Note: The times indicated are appropriate with correct exposure time of the intraoral films.

Handling

Film must be handled carefully under proper safelight conditions during processing. Most dental films recommend red safety filters such as GBX-2 safelight filter. If a daylight loader is used in a brightly lit room, the use of another type of filter can result in film fogging. Care must also be taken when feeding film into a processor. Opening the lid too soon on a daylight loader can result in room light fogging the trailing edge of the film.

It can take up to 15-20 seconds for film to completely enter an automatic processor. Film fed too quickly or too close together can overlap or stick together. Other errors can occur from emulsion tears, fingerprints, static electricity and chemical spills onto the film. Only clean, dry,

powder-free gloves should contact the bare film prior to processing. Unprocessed film should not come in contact with wet or contaminated surfaces as this may lead to film spotting.

Carestream Dental Films with a ClinAsept barrier not only aids in infection control but also allows film to be handled with clean hands after removal from the barrier envelope, preventing discoloration and cross-contamination.

After processing, films must not come into contact until completely dry as the wet emulsions can stick together and peel off the films when they are separated.



Figure 28 Emulsion tear, note white area under pontic where no emulsion is left



Figure 29 Fingerprint, dirty finger had fixer on it leaving white mark on film



Figure 30 Overlap of films during processing



Figure 31 Stain from incomplete film fixing/washing or exhausted fixer



Figure 32 Light fog on left edge of film from opening lid on daylight loader too soon

Handling Errors

| Radiograph | Handling Problem | Fix |
|---|---|---|
| Too dark (similar to fogging) | Improper safelight | Use GBX-2 Safelight Filters or filter with wavelength >520 nm |
| Random sized dark spots: v shaped, mottle "noise" | Stored in humid or hot conditions | Store film between 10 to 24 °C (50-75 °F) and between 30-50% rH. |
| Dark rectangle on film | Overlap during processing | Feed films slowly or side by side |
| Dark edge on film | Exposed to light before safely in processor | Allow 15-30 seconds from last film to enter processor. Listen for click or watch for ready light on processor to indicate when safe to feed next film |
| Fingerprints | Improper handling | Clean, dry hands and hold the film on the edges |
| Dark spots | Developer stains | Keep darkroom clean, wipe up any spilled chemistry to avoid spotting films |
| White spots | Fixer stains | Keep darkroom clean, wipe up any spilled chemistry to avoid spotting films |
| Streaks or scratches | Emulsion tears | Never allow wet films to contact one another or fingernails, emulsion is delicate when wet. Keep films away from extreme sides of processor |
| Dark spots or lines in a pattern | Roller marks | Use Roller Transport Clean-up Film daily and/or clean rollers with mild detergent and rinse thoroughly |
| Dark spots-branched or dots | Static (most common in winter months) | Add humidifier and or open packets slowly to minimize static discharge. Do not refrigerate film |
| Yellowish color | Poor fixing/washing or exhausted fixer | Change chemistry |

Summary of Intraoral Errors

| Problem | Error and Fix |
|---|---|
| Teeth elongated, cusps don't overlap, sinus structures or inferior border of mandible visible | Excessive vertical angulation, correct film placement |
| Contacts of teeth overlapped | Improper horizontal angulation, visualize contact area and adjust |
| Dark lines on corner of film | Film bent, use of Carestream Dental Poly-Soft packets and proper placement to reduce bending |
| Clear area on one edge of the film either in arc or straight | Cone cut, use position indicating device |
| Film light in density, unusual pattern across film ("tire tracks" or "herringbone") | Film was reversed and exposed through the back side, pattern is from lead foil, assure correct side toward tube |
| Too dark | Exposure too long, shorten time kV too high, reduce kV Processor temperature too high, reduce temperature Development time too long, shorten time Over concentrated developer, follow dilution directions Improper safelight, follow recommendations |
| Too light | Exposure too short, lengthen time kV too low, raise kV Processor temperature too low, raise temperature Development time too short, increase time Contaminated or weak developer (replace or replenish solutions) |
| Too much contrast | kV low, adjust kv |
| Too washed out or gray | kV high, adjust kV |
| Blurring of structures | Patient movement, use F-speed film for shorter exposure time. Use head rest. |
| Multiple images on film | Double exposure, separate exposed packets from unexposed packets |
| Mottle "noise" | Stored in humid or hot conditions, store as directed on package |
| Dark rectangular area on film | Overlap during processing, feed as directed |
| Dark edge on film | Exposed to light before safely in processor, do not open or turn on light too soon |
| Fingerprints | Clean, dry hands and hold the film on the edges |
| Dark spots | Developer stains, practice darkroom cleanliness |
| White spots | Fixer stains, practice darkroom cleanliness |
| Clear streaks, splotches or scratches | Emulsion tears, keep separated while wet |
| Dark spots in pattern | Dirty processor rollers, clean processor daily |
| Dark spots branched or dots | Static due to over-dry conditions, adjust humidity, open packets slowly |

Carestream Dental Chemistry*

Chemistry for manual processing

| Product | Processing | Ready to Use or Concentrate |
|---|---|---|
| Rapid Access Developer Rapid Access Fixer Rapid Access Twin Pack | Developing: 15 sec. 20°C/68°F Fixing: 15 sec.** 20°C/68°F Wash: 1 - 2 min. 20°C/68°F (for archiving refix and wash as directed) | Ready to use |
| GBX Developer and Replenisher GBX Fixer and Replenisher GBX Twin Pack | Developing: 5 min. 20°C/68°F 4 1/2 min. 21°C/70°F 4 min. 22°C/72°F 3 min. 24.5°C/76°F 2 1/2 min. 26.5°C/80°F Rinse: 30 sec. agitating continuously Fixing: 2-4 min. or 2X clearing time with intermittent agitation 15.5-29.5°C/60-68°F Wash: 10 min. in running water | Concentrate – requires dilution follow instructions on product |
| GBX Developer and Replenisher | see above | Concentrate – requires dilution follow instructions on product |
| GBX Fixer and Replenisher | see above | Concentrate – requires dilution follow instructions on product |

Carestream Dental chemistry for automatic processing

| Product | Processing | Ready to Use |
|--------------------------------------|------------------------|---|
| READYMATIC Chem Pack | See processor's manual | Ready to use. Roller type processor |
| READYMATIC Developer and Replenisher | See processor's manual | Ready to use. Roller type processor |
| READYMATIC Fixer and Replenisher | See processor's manual | Ready to use. Roller type processor |
| READYPRO Twin Pack | See processor's manual | Ready to use. Rollerless type processor |

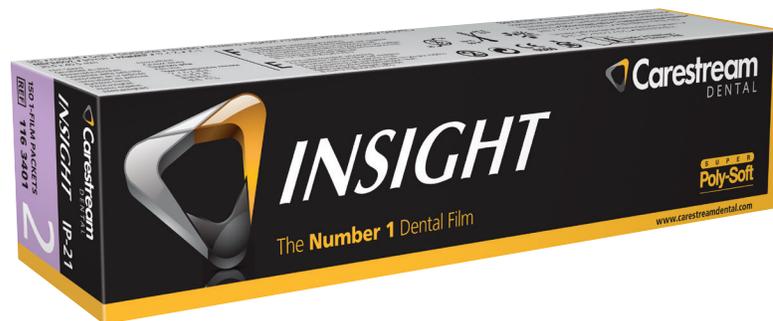
*Check with distributor for availability in your area. All chemistries are not available in all countries.

**May need extra if near end of solution potency.



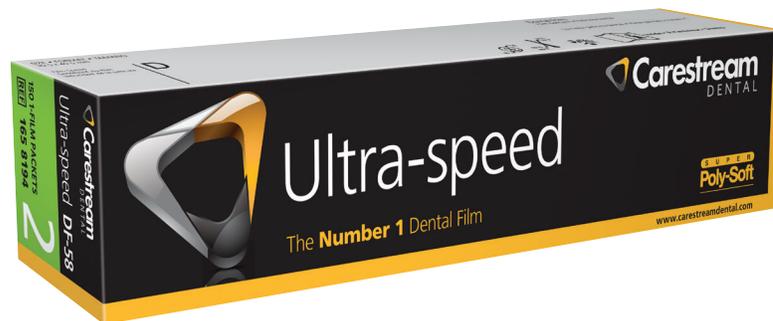
Ordering Information for INSIGHT Film

| Size | Description | Code | Films/Pkgs | REF No |
|--------|--|--------|------------|----------|
| Size 0 | Super Poly-Soft packets | IP-01 | 100 | 867 5332 |
| Size 0 | Super Poly-Soft packets (double film) | IP-02 | 100 | 128 0619 |
| Size 0 | Super Poly-Soft packets with ClinAsept barrier | IP-01C | 75 | 120 0328 |
| Size 0 | Bite-wing paper packets | IB-01 | 50 | 811 0785 |
| Size 1 | Paper packets | IP-11 | 100 | 112 4981 |
| Size 1 | Paper packets (double film) | IP-12 | 100 | 805 5402 |
| Size 2 | Super Poly-Soft packets | IP-21 | 150 | 116 3401 |
| Size 2 | Super Poly-Soft packets (double film) | IP-22 | 130 | 179 8628 |
| Size 2 | Super Poly-Soft packets with ClinAsept barrier | IP-21C | 100 | 153 9931 |
| Size 2 | Super Poly-Soft packets with ClinAsept barrier (double film) | IP-22C | 100 | 156 0390 |
| Size 2 | Paper packets | IP-21 | 150 | 176 3960 |
| Size 2 | Paper packets (double film) | IP-22 | 150 | 107 9086 |
| Size 2 | Bite-wing paper packets | IB-21 | 50 | 180 7650 |
| Size 3 | Bite-wing paper packets | IB-31 | 100 | 829 8929 |
| Size 4 | Occlusal paper packets | IO-41 | 25 | 116 9143 |



Ordering Information for Ultra-speed

| Size | Description | Code | Packets/Package | REF No |
|--------|--|--------|-----------------|----------|
| Size 0 | Super Poly-Soft packets | DF-54 | 100 | 122 8840 |
| Size 0 | Super Poly-Soft packets (double film) | DF-53 | 100 | 122 8931 |
| Size 0 | Super Poly-Soft packets with ClinAsept barrier | DF-54C | 75 | 144 5360 |
| Size 0 | Bite-wing paper packets | DF-48 | 50 | 834 8658 |
| Size 1 | Paper packets | DF-56 | 100 | 127 3747 |
| Size 1 | Paper packets (double film) | DF-55 | 100 | 127 3721 |
| Size 2 | Super Poly-Soft packets | DF-58 | 150 | 165 8194 |
| Size 2 | Super Poly-Soft packets (double film) | DF-57 | 130 | 175 3664 |
| Size 2 | Paper packets | DF-58 | 150 | 149 1737 |
| Size 2 | Paper packets (double film) | DF-57 | 150 | 149 1752 |
| Size 2 | Bite-wing paper packets | DF-40 | 50 | 839 3043 |
| Size 2 | Super Poly-Soft packets with ClinAsept barrier | DF-58C | 100 | 171 7131 |
| Size 2 | Super Poly-Soft packets with ClinAsept barrier (double film) | DF-57C | 100 | 898 7877 |
| Size 3 | Bite-wing paper packets | DF-42 | 100 | 129 6771 |
| Size 4 | Occlusal paper packets | DF-50 | 25 | 166 6163 |



Other Publications in the Dental Radiography Series

- Exposure and Processing in Dental Film Radiography
- Guidelines for Prescribing Dental Radiographs
- Radiation Safety in Dental Radiography
- Successful Panoramic Radiography
- Quality Assurance in Dental Film Radiography

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