Attention:

Spending 15 minutes reading this section of the manual will greatly assist you when using your Corix-70 dental X-ray machine in conjunction with a digital image system such as the Bio-Ray digital sensor system.

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Modern digital systems provide excellent diagnostic image detail and decreased exposure times compared to traditional dental film. Digital systems have some unique characteristics that must be recognized to produce the best quality films possible. Attention to the following will shorten your learning curve and help you achieve excellent clinical results in a short time.

1. Decreased exposure times mean lower occupational exposure to everyone working around the dental x-ray equipment. Because the exposure times are so short with digital systems, it is recommended that you use an X-ray machine that allows you to manually set your exposure times in 1/100th second increments. A difference in exposure time of 1-2 hundredths of a second can make a visible difference when using some sensors, especially in smaller patients. *Your Corix dental X-ray machine is capable of these fine adjustments.*

2. Another factor that can make a difference is the distance between the X-ray machine and the patient. When using normal x-ray film, you are not likely to notice any difference if the positioning tube is one vs. two inches away from the patient. Since variation in this distance makes a significant difference with digital sensors, you should try to maintain a consistent distance between the end of the positioning tube (PID) and the patient. We suggest that you try to maintain a consistent tube (PID) to patient distance of approximately one inch. Although any consistent distance is acceptable, allowing one inch between the PID and the patient allows you to make small adjustments in tube position without altering the patient's positioning.

3. Image quality and density can change as the incident angle between the beam and a hard-wired (DR) sensor varies. Due to anatomic considerations, most dental x-rays in veterinary patients will require some angulation between the X-ray beam and the sensor. As the incident beam angle becomes less perpendicular to the sensor, some sensors begin to produce more scatter and require increased exposure times. Try to maintain the same angles between the sensor and beam for the same area imaged in all of your patients. For example, when taking radiographs of upper incisors, try to maintain the same angle between the beam and sensor regardless of patient size or species. In some cases, you will produce a better image by aiming the beam more perpendicular to the sensor, even if this means introducing a small degree of elongation or foreshortening to the image. *This effect is not a factor for radiographs of the lower premolar and molars in which the beam is directed directly at (perpendicular to) the sensor, utilizing the parallel technique.*

4. Most digital systems allow a great deal of individual adjustment after the image is obtained. The initial sensor software settings for brightness, contrast, smoothing, gamma, etc. were developed by each company as starting points for using their sensors. After you use the sensor for a while, you may find that you prefer different settings for your images. As an example, you may find that you prefer the appearance of most radiographs if the contrast is slightly increased. If this is a consistent preference for you, you have the option of automatically applying this preference to all of your radiographs as they are taken. Contact your vendor for information about how to make these adjustments for your particular system.

5. In general, you should try for the darkest exposure possible without overexposing the sensor. This will provide the most information for the computer to produce the image. When a view is overexposed on many sensors, parts of the image will begin to take on a characteristic "melted" appearance. When exposed correctly, little or no soft tissue will be visible on the image.

6. A convenient feature of DR digital X-ray systems is that you can leave the sensor in place while you view the image on the screen. If an adjustment in positioning or exposure time is required, you can

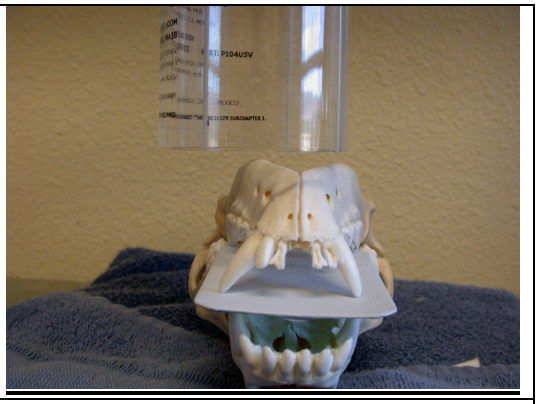
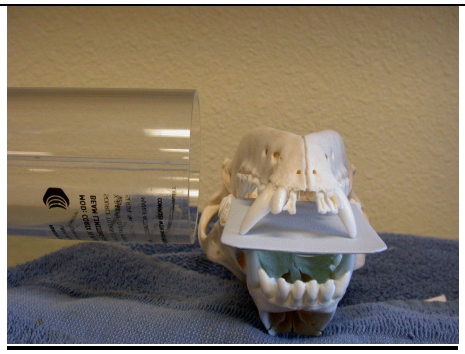
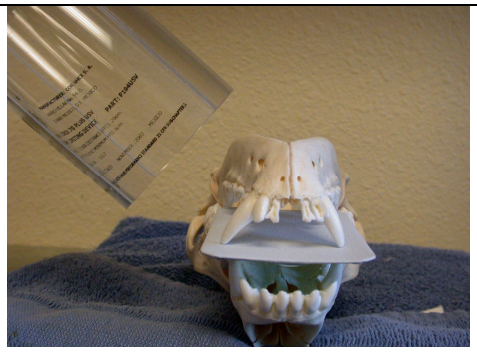
simply make the required adjustment and view the new radiograph in a few seconds.

7. Try to avoid sensor "cone-cut" as this adds another layer of variability to the radiographs. Cone cut is easily recognized as a blank white area on the image, with a curved border. The curved border represents the circular edge of the X-ray beam, which is well collimated and readily visible. When producing an image, the computer program needs to produce a gradual greyscale from the lightest part of the image to the darkest part of the image. When part of the sensor is not exposed to the X-ray beam, the software has difficulty producing the correct grayscale image.
8. Because DR digital sensors are limited to a maximum size corresponding to #2 dental film, larger patients often require two views to completely image larger teeth such as the lower first molars and canine teeth. Typically, you will need to obtain one view of the crown and another of the root. The views showing the roots are taken through a much thicker anatomic area than the views of the crowns of the teeth. Therefore, you should utilize different exposure times for your "crown" and "root" views on these teeth. Views of the crowns of these larger teeth commonly require an exposure time only half as long as the views of the roots.
9. At times, the sensor cannot be placed into the normal position for imaging rostral mandibular teeth. This most commonly occurs with small canine patients and feline patients. Normally, mandibular premolars and molars are imaged utilizing the *parallel technique*. In smaller patients there is simply not enough room to slide the sensor down between the tongue and rostral premolars. To successfully image these areas, the operator should employ a *bisecting angle* technique, placing the sensor across the floor of the mouth and using a 45 degree beam angle. This is the same technique used to image the maxillary premolars and molars; you are just imaging the mandibular teeth instead of the maxillary teeth. To visualize this, place a skull or model right side up and position the beam as if you were going to image a maxillary premolar. Now, without moving the X-ray tube, rotate the skull 180 degrees so that the lower jaw is now up. You should have the correct positioning to now image the rostral mandibular premolars.
10. See the following photos for the positioning modifications described above.

Positioning modifications when using a #2 size digital sensor

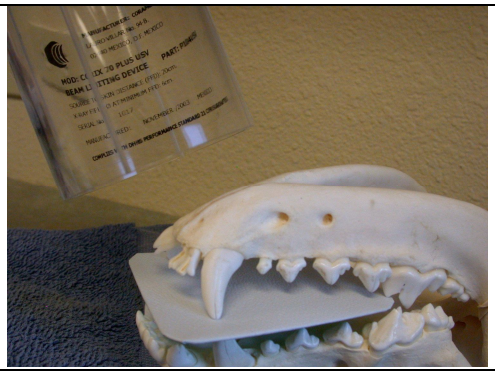
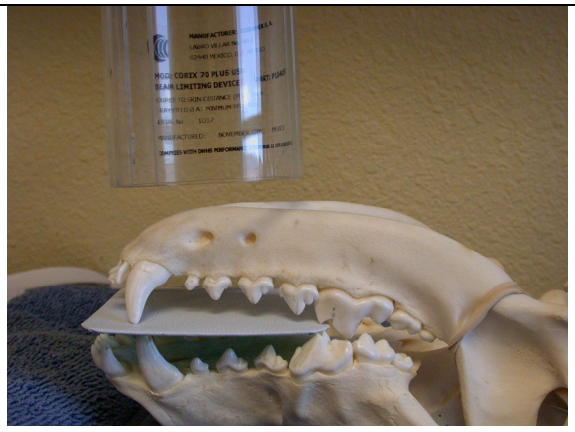
Some limitations are encountered when using a #2 hard-wired (DR) sensor. These problems arise from either the size of the teeth being imaged or the difficulty in placing the relatively thick sensor into certain areas of the oral cavity. Teeth that require modified positioning include the canine and carnassial teeth of medium to larger dogs, and the rostral (cranial) premolars in both dogs and cats. At first it may seem difficult to evaluate a tooth using one view to image the roots and another view to image the crown. This limitation is quickly overcome and does not present any appreciable difficulty. In fact, this may be actually thought of as an advantage because the very low exposure times of most hard-wired (DR) sensors require different exposure times to image the different thicknesses of crowns vs. roots. The modified positioning required for DR sensors, illustrated below, will provide excellent image quality for these teeth.

Modified positioning for rostral mandibular premolars in cats and small dogs
For illustration purposes, placement of regular film is shown and the patient is shown in dorsal recumbency. The beam angles are always in relation to the patient, so obtaining the view in lateral recumbency involves identical positioning.

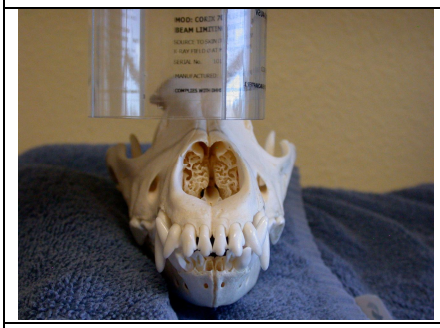
<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>1. Sensor placement across the floor of the mouth. The active side of the sensor is placed facing the teeth to be imaged.</td><td>2. Here the tube is positioned directly over the roots of the mandibular premolars.</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>3. Here the tube is positioned directly to the side of the teeth</td><td>4. Splitting the tube angles in figures #2 and #3 above provides the correct beam angle, which is directed approximately 45 degrees to the long axis of the teeth.</td></tr>
</table>

Modified positioning for mandibular canines in larger dogs

For this view, separate radiographs must be taken of each crown and one view is taken to image the roots of both mandibular canine teeth.

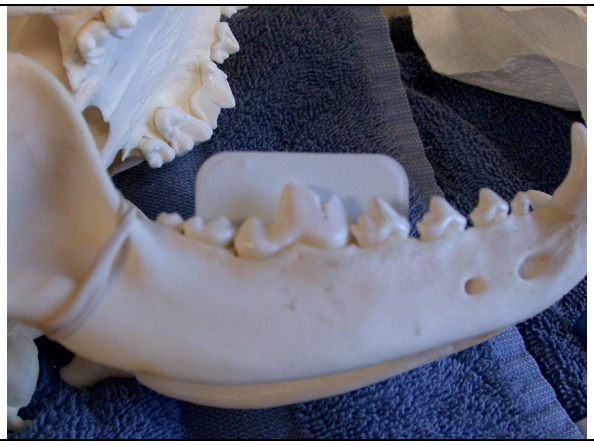
<table>
<tr><td>  </td><td>  </td></tr>
<tr><td>1. Film placement for imaging the crown of the mandibular molar. The angle of the beam is the same as the angle of the camera lens used to take this picture.</td><td>2. Same as #1, showing the approximate position of the X-ray tube and film.</td></tr>
<tr><td>  </td><td>  </td></tr>
<tr><td>3. Sensor position for imaging the roots of both mandibular canine teeth. The active side of the sensor is placed toward the teeth to be imaged and the sensor is positioned over the center of the mandible.</td><td>4. The beam is directed perpendicular to the sensor, with no tipping of the beam required. Note that the sensor is centered over the second premolars, which is the approximate level of the apices (ends) of both roots.</td></tr>
</table>

Modified positioning for maxillary canines in larger dogs
For this view, separate radiographs must be taken of the crown and roots.

		
1. Sensor position for imaging the crown of the maxillary canine tooth. . The angle of the beam is the same as the angle of the camera lens used to take this picture.	2. The beam is initially positioned above the nose.	3. The beam is then tipped 20-30 degrees forward.
		
4. Viewed from the front, the beam is initially straight over the nose.	5. The beam is then also tipped 20-30 degrees to the side.	6. Sensor placement for imaging the root of the maxillary canine tooth. The active side of the sensor faces the tooth and the sensor is centered at the level of the second premolar.
		
7. Initially the beam is directed over the top of the nose, perpendicular to the sensor.	8. The beam is then tipped 20-30 degrees to the side.	

Modified positioning for mandibular first molars in larger dogs

In larger dogs, one radiograph must be taken of the crown and a second view is taken to image the roots. Both views are taken with the beam perpendicular to the tooth and the sensor. The sensor is placed between the tongue and the tooth, with the active side of the sensor facing the tooth.

	
1. Sensor placement for imaging the roots of the mandibular molar. Due to increased bone density, this view requires a greater exposure than the view of the crown of the tooth. This camera angle is the same as the angle of the X-ray beam, perpendicular to the tooth and sensor.	2. Sensor positioning for imaging the crown of the mandibular first molar. This view requires a shorter exposure time than the view of the roots.