

2. ...

Practice Note > ...

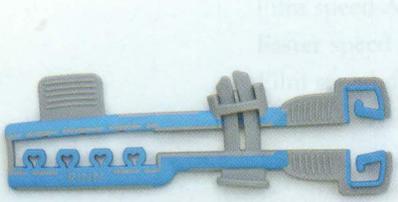
Characteristics > ...

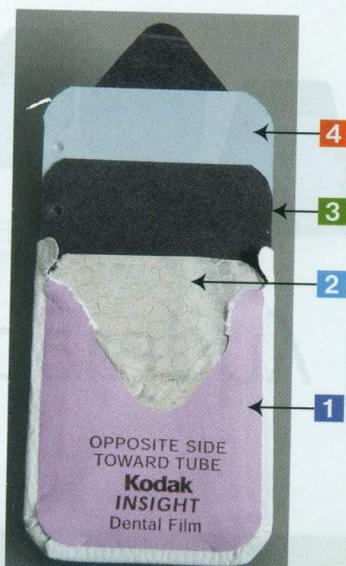
Function > ...

### INSTRUMENTS Paper Mixing Pads

# 20

## Dental Radiography Equipment





## INSTRUMENT Intraoral X-Ray Film

**Function** ▶ To use to project the patient's teeth through x-ray onto the film

- Characteristics** ▶
- 1 Outside covering of film—Soft plastic or paper (both waterproof)
  - 2 Sheet of lead foil to stop the radiation from extending beyond the film
  - 3 Black paper to protect the film from light penetration
  - 4 Film—Single or double film

Film speed indicated on each packet—Set by American National Standards Institute (ANSI)

Film speed A through F—D, E, F used intraorally

Faster speed of the film reduces the amount of radiation exposure; F speed is faster than D speed.

Film speed determines amount of radiation needed to produce a quality radiograph—Settings are on x-ray unit.

**Practice Note** ▶ Intraoral x-ray film is used in all phases of dentistry.

**S** Follow standard precautions and cross-contamination protocol when exposing and processing film for developing. Outer packet and black paper may be disposed of in the garbage. Correct disposal of lead foil must be checked within your state. In some states, lead foil is considered a hazardous waste and must be collected and disposed of properly. For proper recycling protocol, refer to Department of Environmental Health regulations in the state where you practice.

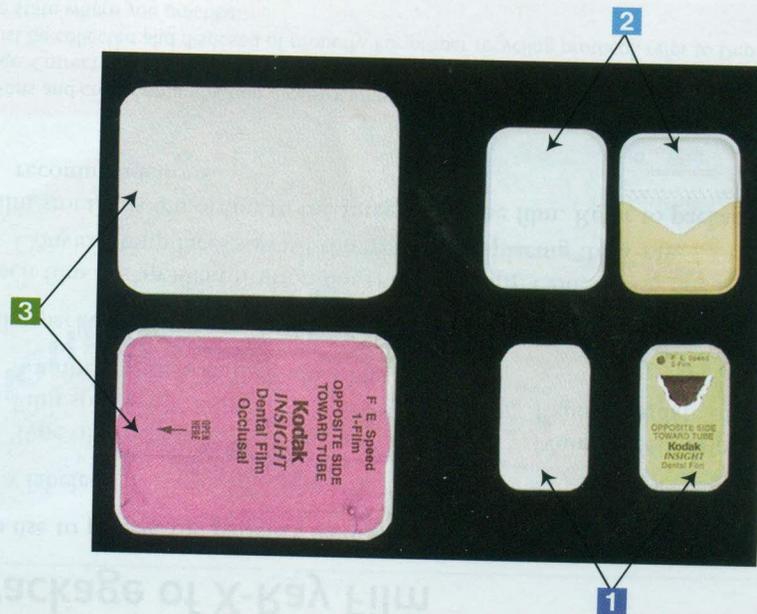


Photo courtesy Carestream Health Inc., Rochester, NY.

## INSTRUMENT Package of X-Ray Film

- Function** ▶ To use to project the patient's teeth through x-ray onto the film
- Characteristics** ▶ Box labeled:
- |   |                                   |
|---|-----------------------------------|
| Type of film                              | Number of film packets in the box |
| Film speed                                | Expiration date of film           |
| Number of films in individual film packet |                                   |
- Film packets—Single or double film
- Practice Notes** ▶ Each film has an identification dot (raised bump). Concave on one side and convex on the other. Convex/bump faces toward the teeth when placing the x-ray.
- Film storage is important to the integrity of the film. Refer to package instructions for storage recommendations.

**S** Follow standard precautions and cross-contamination protocol when processing film for developing. Outer packet and black paper may be disposed of in the garbage. Correct disposal of lead foil must be checked within your state. In some states, lead foil is considered a hazardous waste and must be collected and disposed of properly. For proper recycling protocol, refer to Department of Environmental Health regulations in the state where you practice.



## INSTRUMENT X-Ray Film—Various Sizes

**Functions** ▶ To use to project the patient's teeth through x-ray onto the film  
To use for intraoral and extraoral projections

**Characteristics** ▶ Commonly taken x-rays—Front and back view  
Size #0—Taken on children under 3 (not pictured)

**1** Size #1—Anterior periapical x-ray (narrow view)

**2** Size #2—Periapical and bite-wing x-ray

Size #3—Long x-ray usually taken on children (not pictured)

**3** Size #4—Occlusal projections usually taken on children

**Practice Notes** ▶ Smooth side of the film (the raised-dot side—convex) faces the x-ray tube or position indicating device (PID). Raised dot should be toward the occlusal or incisal.

**S** Follow standard precautions and cross-contamination protocol when exposing and processing film for developing. Outer packet and black paper may be disposed of in the garbage. Correct disposal of lead foil must be checked within your state. In some states, lead foil is considered a hazardous waste and must be collected and disposed of properly. For proper recycling protocol, refer to Department of Environmental Health regulations in the state where you practice.



Photo courtesy Carestream Health Inc., Rochester, NY.

## INSTRUMENT Extraoral X-Rays—Cephalometric and Panoramic

**Functions** ▶ To use to project the patient's teeth through x-ray onto the film  
To use for extraoral projections

**Characteristics** ▶ Film is placed in a cassette outside the mouth.

**1** Cephalometric radiograph—Shows bony and soft-tissue areas of the facial profile

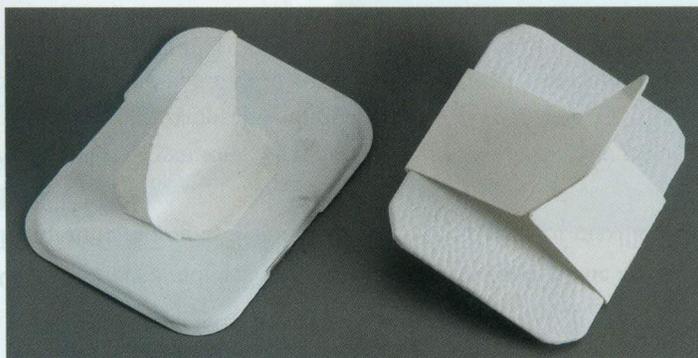
**2** Panoramic radiograph—Shows a panoramic view of maxillary and mandibular teeth on one x-ray

**Practice Notes** ▶ Different styles of extraoral x-ray machines are available (see pages 682-683).

Cephalometric and panoramic digital x-rays

Cephalometric and panoramic x-rays are used in all phases of dentistry. Panoramic x-rays are used frequently in orthodontics.

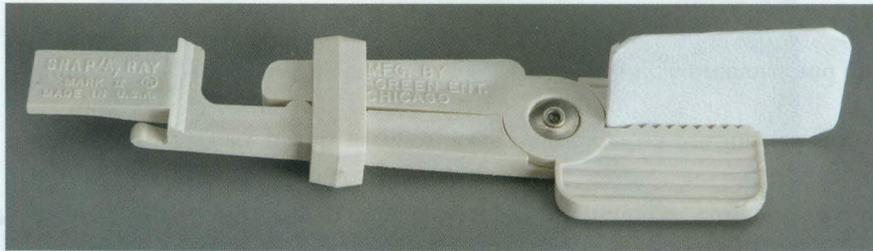
**S** Follow standard precautions and cross-contamination protocol when exposing and processing film for developing.



## INSTRUMENT Bite-Wing X-Ray Tabs

- Function** ▶ To use to take a bite-wing x-ray projection
- Characteristics** ▶ Stick-on or slip-on tab  
Tab or wing is placed on the occlusal, and patient bites on the tab to secure the x-ray.
- Practice Notes** ▶ Slip-on tabs are available in different sizes to accommodate different-sized film.  
Size #2 film is used for adult bite-wing x-ray.  
Bite-wing x-rays are mainly used for diagnosing caries on proximal surfaces (mesial and distal) of the posterior teeth.  
Four bite-wings are usually taken on adult dentition—One premolar and one molar projection on each side of the mouth.

**S** Follow standard precautions and cross-contamination protocol when exposing and processing film. Outer packet, black paper, and Bite-Wing Tabs may be disposed of in the garbage. Correct disposal of lead foil must be checked within your state. In some states, lead foil is considered a hazardous waste and must be collected and disposed of properly. For proper recycling protocol, refer to Department of Environmental Health regulations in the state where you practice.



## ■ INSTRUMENT Film Holder—Periapical X-Ray (EeZee-Grip)

- Function** ▶ To position and hold an x-ray in patient's mouth for periapical x-ray
- Characteristics** ▶ Double ended:  
 One end holds film for posterior teeth projection, as shown.  
 Opposite end holds film for anterior teeth projection.
- Practice Notes** ▶ Size #2 film used for posterior periapical x-ray  
 Size #1 or #2 used for anterior periapical x-ray  
 Periapical x-rays used for viewing the coronal part of the tooth, root, apex, and surrounding bone and tissue  
 EeZee-Grip formerly called *Snap-a-ray*

**S** EeZee-Grip Film Holder must be cleaned, bagged individually, and then sterilized. A chemical/steam indicator device should be included in the wrapping.



Photos courtesy DENTSPLY Rinn, Elgin, IL.

## INSTRUMENT Holder for Digital X-Ray Sensor (EeZee-Grip)

**Function** ▶ To position and hold a digital x-ray sensor in patient's mouth for periapical x-rays

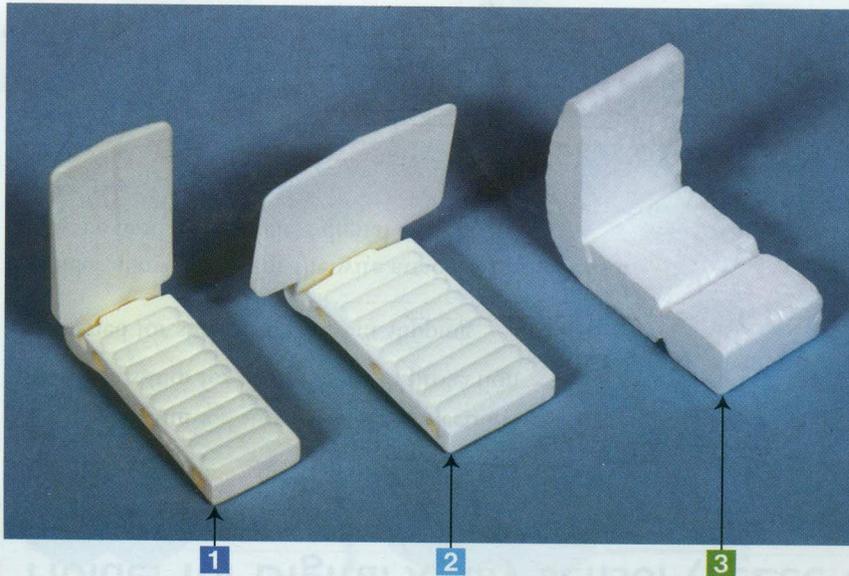
**Characteristics** ▶ Double ended:

- 1 Holds film for anterior teeth projection
- 2 Holds film for posterior teeth projection

Designed for snug fit to prevent slipping

**Practice Notes** ▶ Holder allows room for the wire attached to the sensor  
May be used with wireless digital sensor

**S** Follow standard precautions and cross-contamination protocol when taking digital x-rays. Holder must be cleaned, bagged individually, and then sterilized. A chemical/steam indicator device should be included in the wrapping.



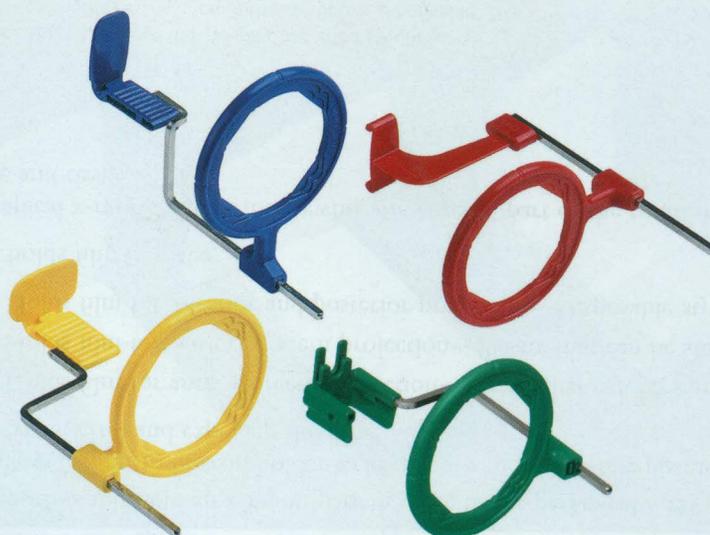
## INSTRUMENT Film Holders—Periapical X-Ray

**Functions** ▶ To position and hold an x-ray in patient's mouth for periapical x-ray  
To allow patient to bite on holder to keep x-ray in place while positioning the position indicating device (PID) and exposing the film

- Characteristics** ▶
- 1** Holds film for anterior teeth projection—Plastic that can be sterilized
  - 2** Holds film for posterior teeth projection—Plastic that can be sterilized
  - 3** Holds film for anterior and posterior projection—Disposable styrofoam
- Slot holds film in place

**Practice Note** ▶ Periapical x-rays are used for viewing the coronal part of the tooth, root, apex, and surrounding bone and tissue.

**S** Plastic Film Holders must be cleaned, bagged individually, and then sterilized. A chemical/steam indicator device should be included in the wrapping. Disposable styrofoam holder may be disposed of in garbage.



Photos courtesy DENTSPLY Rinn, Elgin, IL.

## INSTRUMENT Film Holders—XCP Positioning System

**Functions** ▶ To position and hold an x-ray in patient's mouth for periapical and bite-wing x-rays using parallel technique  
To allow patient to bite on holder to keep x-ray in place while positioning the position indicating device (PID) and exposing the film

**Characteristics** ▶ Red—Bite-wing projection                      Yellow—Posterior teeth projection  
Blue—Anterior teeth projection                      Green—Projections for endodontic procedures  
Slot holds film in place

**Practice Notes** ▶ XCP uses the parallel technique for exposing radiation to the film.  
PID is parallel with the ring on the XCP.

**S** Film Holders must be cleaned, bagged individually, and then sterilized. A chemical/steam indicator device should be included in the wrapping.



Photos courtesy DENTSPLY Kim, Elgin, IL.

## INSTRUMENT One Ring and Arm Positioning System

**Functions ▶** To position and hold digital x-ray sensors or film in patient's mouth for periapical and bite-wing x-rays using parallel technique

To allow patient to bite on holder to keep digital x-ray sensor or film in place while positioning the position indicating device (PID) and exposing the sensor or film

Reduces the number of components needed for positioning—one arm, one ring

- Characteristics ▶**
- 1 Holds film for bite-wing projection
  - 2 Holds film for anterior and posterior teeth projections
  - 3 Holds film for posterior teeth projection

Slots on ring are color coded—blue, anterior; yellow, posterior; red, bite-wing

Allows sufficient amount of space for sensors with wires

- Practice Notes ▶** Uses the parallel technique for exposing radiation to the sensor or film  
PID is parallel with the ring using a round or square PID

**S** Holders must be cleaned, bagged individually, and then sterilized. A chemical/steam indicator device should be included in the wrapping.



Photos courtesy Dux Dental, Oxnard, CA

**INSTRUMENT** Lead Aprons

**Function** ▶ To place on patient for protection against scattered x-rays during exposure of x-ray film

- Characteristics** ▶
- 1 Lead apron
  - 2 Lead apron with collar to protect thyroid area
  - 3 Lead apron poncho for front and back protection

**Practice Note** ▶ Lead apron must be used when exposing patient to dental x-rays.



**S** Disinfect lead apron according to the manufacturer's recommendation.



Photo courtesy: Global Dosimetry Solutions, Irvine, CA.

## INSTRUMENT X-Ray Monitoring Device

- Function** ▶ To place on operator's protective clothing while employee is working in a dental office or radiography lab
- Characteristics** ▶ Each badge includes employee's name, number, and date. X-Ray Monitoring Device should be worn for traditional and digital x-ray projections.
- Practice Note** ▶ At the end of a reporting period, the X-Ray Monitoring Device is sent to monitoring service company. Company will process the device and send a report back to the office.

**S** If contaminated, disinfect X-Ray Monitoring Device according to the manufacturer's recommendation.

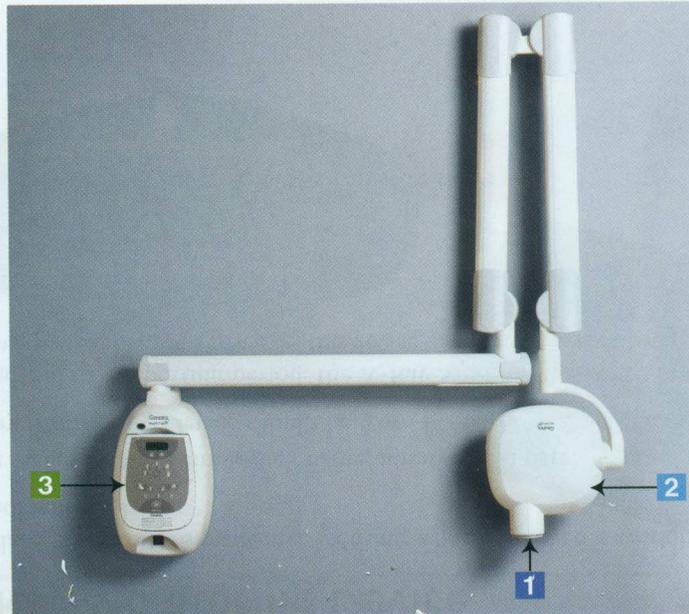


Photo courtesy Gendex Dental Systems, Lake Zurich, IL.

## INSTRUMENT Dental X-Ray Unit

**Function** ▶ To expose film with radiation that is generated in the x-ray unit

**Characteristics** ▶ **1** Position Indicating Device (PID)

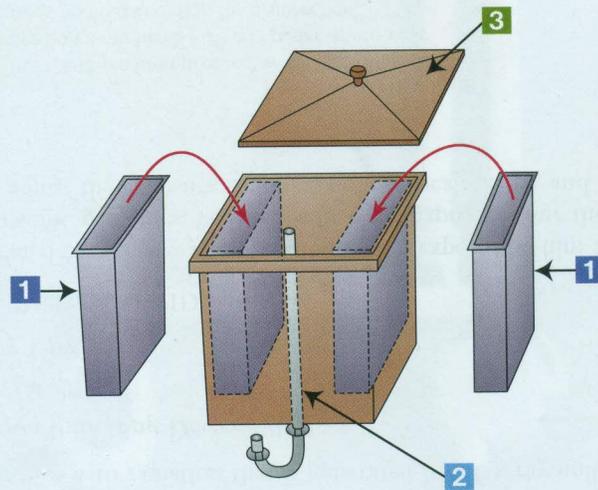
**2** Tube Head

**3** X-Ray Unit

Round or Rectangular PIDs available

**Practice Note** ▶ Control Panel for the x-ray unit and button to expose the film are outside patient's treatment room. On some machines, you may adjust the exposure time the x-ray is exposed. Other machines adjust the exposure time, kilovoltage peak (kVp), and milliamperage (mA).

**S** Follow standard precautions and cross-contamination protocol when exposing and processing film. Barriers should be used on x-ray head, PID, and panel where x-ray button is pushed. Follow manufacturer's recommendation for disinfection.



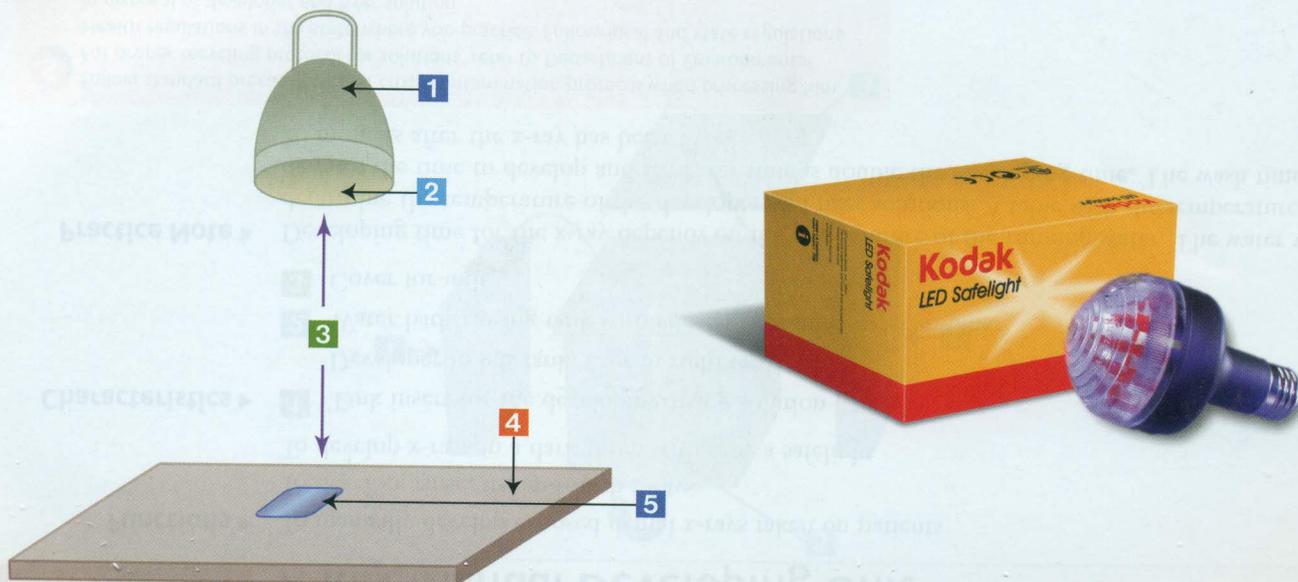
## INSTRUMENT X-Ray Manual Developing Unit

- Functions** ▶ To manually develop exposed dental x-rays taken on patients  
 To develop, rinse, fix, and wash x-rays  
 To develop x-rays in a dark room with only a safelight

- Characteristics** ▶ **1** Tank insert for the developing/fixing solution  
 Developer in left tank; fixer in right tank  
**2** Water bath/rinsing tank with constant running water in tank  
**3** Cover for unit

- Practice Note** ▶ Developing time for the x-ray depends on the temperature of the running water. The water will determine the temperature of the developer and fixer solutions. A table with the temperature denotes the time to develop and fix. Fixer time is double the developing time. The wash time is 20 minutes after the x-ray has been fixed.

**S** Follow standard precautions and cross-contamination protocol when processing film. For proper recycling protocol for solutions, refer to Department of Environmental Health regulations in the state where you practice. Follow local and state regulations in disposal of developer and fixer solution.



## INSTRUMENT X-Ray Safelight

**Function** ▶ To develop x-rays in a dark room with only a Safelight

- Characteristics** ▶
- 1 Safelight
  - 2 Safelight filter
  - 3 Minimum distance (at least 4 feet) from safelight to undeveloped x-ray
  - 4 Working area
  - 5 Undeveloped and unwrapped x-ray film

**Practice Note** ▶ Unwrapped film left too close to the safelight or exposed for more than 2 to 3 minutes will appear fogged.

**S** Follow standard precautions and cross-contamination protocol when processing film. Disinfect area if contaminated.

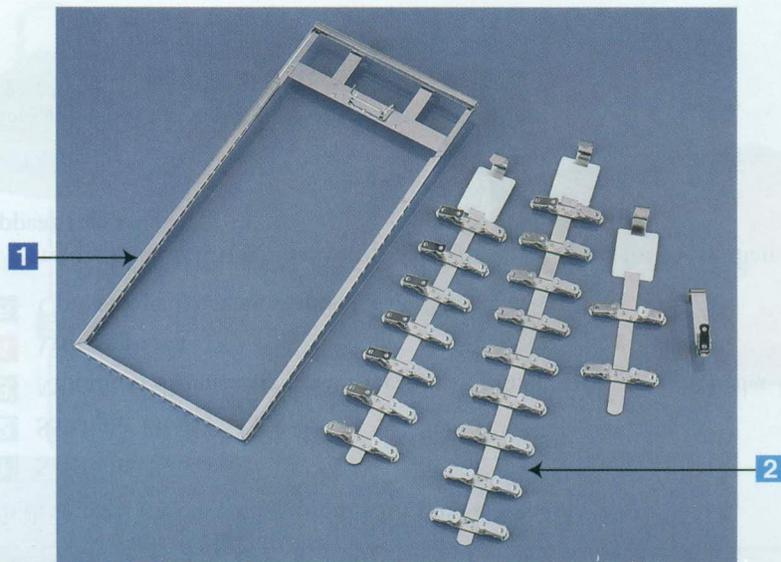


Photo courtesy: DENTSPLY Kinn, Egin, IL.

## INSTRUMENT X-Ray Rack

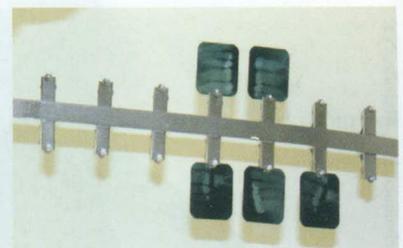
**Functions ▶** To place undeveloped x-rays on the rack in the darkroom with only the safelight prior to putting rack in the developer

To place film on rack without touching each other

**Characteristic ▶** **1** Panoramic rack  
**2** Individual single X-Ray Racks

Various sizes of racks available

**Practice Note ▶** Keep x-rays on rack through the entire process: develop, rinse, fix, wash, and dry.



**S** Follow standard precautions and cross-contamination protocol when processing film. Outer packet and black paper may be disposed of in the garbage. Correct disposal of lead foil must be checked within your state. In some states, lead foil is considered a hazardous waste and must be collected and disposed of properly. For proper recycling protocol, refer to Department of Environmental Health regulations in the state where you practice. Disinfect racks according to manufacturer's recommendation.

**INSTRUMENT****Automatic Film Processor**

**Functions** ▶ To automatically develop x-ray film in darkroom  
To develop x-ray film

**Characteristics** ▶ **1** Automatic processor

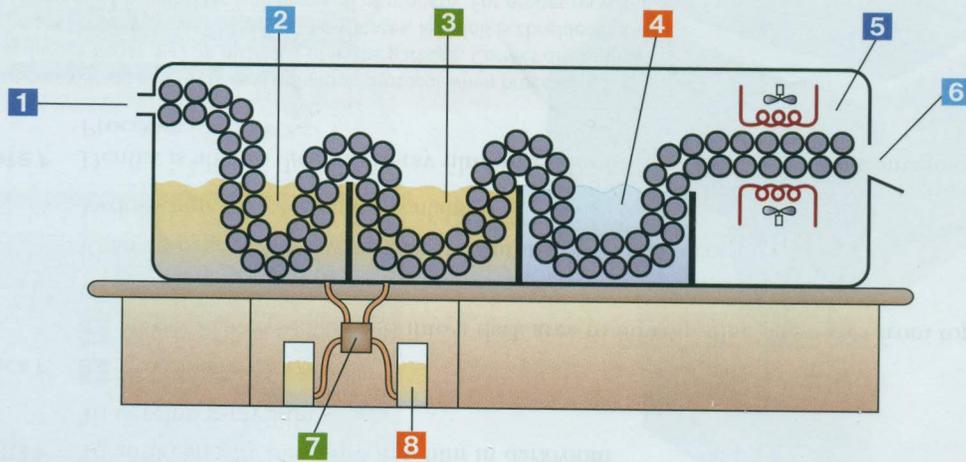
**2** Front loader—Hands go into a dark area to unwrap film. View area from top. Darkroom not needed.

Refer to pages 670-671 for parts of Automatic Film Processor.

Various types of processors available

**Practice Note** ▶ Dentist is able to diagnose x-ray film once film is dry, which is great advantage of Automatic Processor.

**S** Follow standard precautions and cross-contamination protocol when processing film. Outer packet and black paper may be disposed of in the garbage. Correct disposal of lead foil must be checked within your state. In some states, lead foil is considered a hazardous waste and must be collected and disposed of properly. For proper recycling protocol, refer to Department of Environmental Health regulations in the state where you practice. Follow local and state regulations in disposal of developer and fixer solution.



## INSTRUMENT Parts of Automatic Film Processor

**Functions** ▶ To automatically develop x-ray film  
To place film in processor to develop, fix, wash, dry; film then ready to mount

- Characteristics** ▶
- |  |  |
|--|--|
| <p><b>1</b> Slot to feed film</p> <p><b>2</b> Roller transporter in developer tank</p> <p><b>3</b> Roller transporter in fixer tank</p> <p><b>4</b> Roller transporter in water tank</p> | <p><b>5</b> Roller transporter in drying compartment</p> <p><b>6</b> Film releases from rollers onto recovery slot</p> <p><b>7</b> Pump to replenish developer and fixer</p> <p><b>8</b> Replenishing solution for developer and fixer</p> |
|--|--|

**Practice Note** ▶ Developer and fixer solutions for the automatic processor are different from those for manual processing.

**S** Follow standard precautions and cross-contamination protocol when processing film. Outer packet and black paper may be disposed of in the garbage. Correct disposal of lead foil must be checked within your state. In some states, lead foil is considered a hazardous waste and must be collected and disposed of properly. For proper recycling protocol for solutions, refer to Department of Environmental Health regulations in the state where you practice. Follow local and state regulations in disposal of developer and fixer solution.

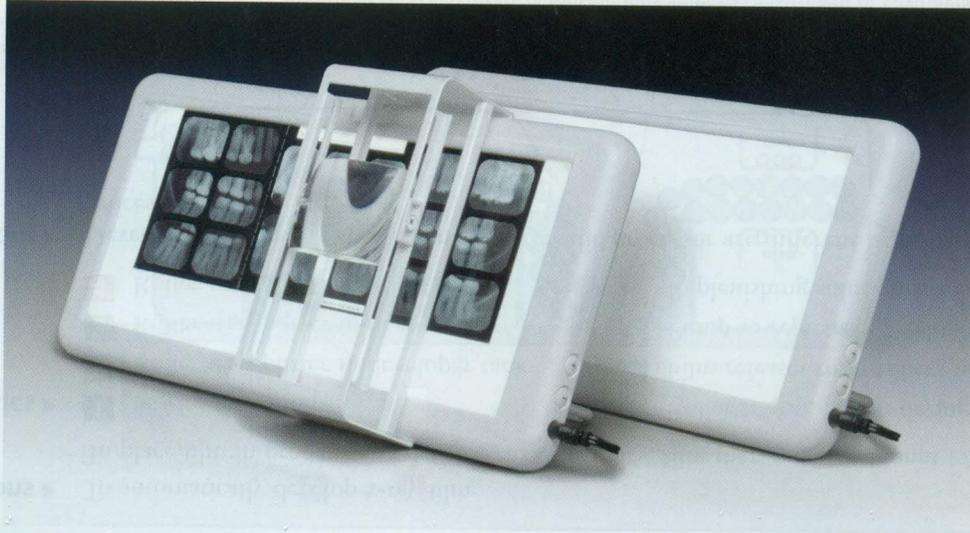


Photo courtesy DENTSPLY Rinn, Elgin, IL.

## ■ INSTRUMENT X-Ray View Luminator

- Function** ▶ To view x-ray for diagnosis
- Characteristics** ▶ Various sizes and styles of view luminators. Also referred to as *view box*.
- Practice Note** ▶ View boxes are located in each patient treatment room.

**S** If contaminated, disinfect X-Ray View Luminator according to the manufacturer's recommendation.





Photo courtesy DENTSPLY Rinn, Elgin, IL.

## INSTRUMENT X-Ray Duplicator X-Ray Unit

- Function** ▶ To duplicate x-ray film
- Characteristics** ▶ Produces white light to expose film  
Various sizes and styles available
- Practice Notes** ▶ All phases of dentistry use film duplicators. Some dental offices use double-pack x-ray film instead of duplicating the film.  
Electronic devices are available for duplicating x-rays.  
Duplicated films are sent to insurance companies and/or referring specialists. If using double-pack x-ray film or digital radiography, duplication is not necessary.

**S** If contaminated, disinfect X-Ray Duplicator according to the manufacturer's recommendation.



Photos courtesy Shroma Dental Systems LLC, Charlotte, NC.

**INSTRUMENT** Digital Intraoral X-Ray Unit X-Rays

**Functions** ▶ To take digital intraoral x-rays without film or without processing the film  
 To project the image of the teeth by digitally projecting radiation onto an electronic sensor and then to computerized imaging system

- Characteristics** ▶ **1** Position Indicating Device (PID) (Round)      **2** Tube Head  
**3** X-Ray Unit with Digital Panel      **4** Rectangular PID

Digital radiographs use less radiation than conventional x-rays.  
 Networks to computers in all areas of the dental office  
 Immediate imaging available

**Practice Notes** ▶ Paperless dental offices store digital x-rays on the computer, along with patient records.  
 Used in all phases of dentistry, especially endodontics, orthodontics, oral surgery, and implantology.

**S** Follow standard precautions and cross-contamination protocol when exposing digital film. Barriers must be placed on the sensors. Barriers should be used and the manufacturer's recommendation for disinfection followed.



Left photo courtesy: Sirona Dental Systems LLC, Charlotte, NC; right photo courtesy: Schick Technologies, Long Island City, NY.

## INSTRUMENT Intraoral Sensors for Digital X-Rays

**Functions** ▶ To take digital intraoral x-rays without film or without processing the film  
To project the image of the teeth by digitally projecting radiation onto an electronic sensor and to computerized imaging system before going to computer storage

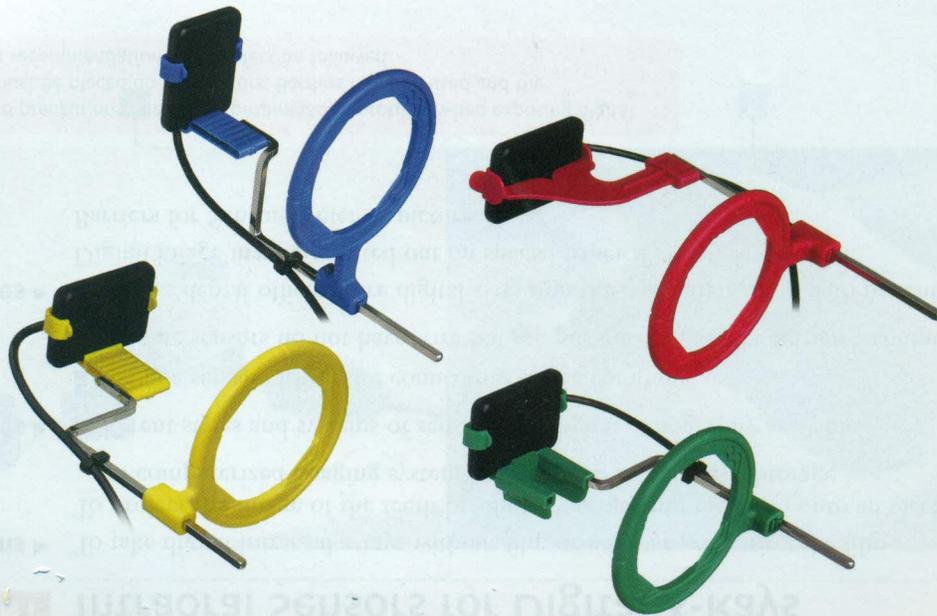
**Characteristics** ▶ Different styles and systems of sensors and digital radiography available

**1** Some sensors have wire connecting to the computer.

**2** Some sensors do not have wire but are put into a specially designed computer after exposure.

**Practice Notes** ▶ Paperless dental offices store digital x-rays on the computer, along with patient records. Digital image may be printed out on special paper if a copy is required.  
Barriers for Sensors (refer to picture 2)

**S** Follow standard precautions and cross-contamination protocol when exposing digital film. Barriers must be placed on the sensors. Barriers must be used and the manufacturer's recommendation for disinfection followed.



Photos courtesy DENTSPLY Rinn, Elgin, IL.

## INSTRUMENT Rinn XCP Holders for Digital X-Ray Sensors

**Functions** ▶ To position and hold digital sensor in patient's mouth for periapical and bite-wing x-rays, using parallel technique

To allow patient to bite on holder to keep x-ray in place while positioning the PID and exposing the electronic sensor

**Characteristics** ▶ Red—Holds film for bite-wing projection  
 Blue—Holds film for anterior teeth projection  
 Yellow—Holds film for posterior teeth projection  
 Green—Holds film when taking projections for endodontic procedures

Slots hold electronic sensor in place.

**Practice Note** ▶ Several different styles of electronic sensor holders are available.



**S** Follow standard precautions and cross-contamination protocol when exposing digital film. Barriers must be placed on the sensors. Barriers should be used on the x-ray unit, and the manufacturer's recommendation for disinfection should be followed. Digital Radiography XCP Holders must be cleaned, bagged individually, and then sterilized. A chemical/steam indicator device should be included in the wrapping.



Photos courtesy Sirona Dental Systems LLC, Charlotte, NC.

## INSTRUMENT Digital Panoramic Imaging Unit and Digital Cephalometric Imaging Unit

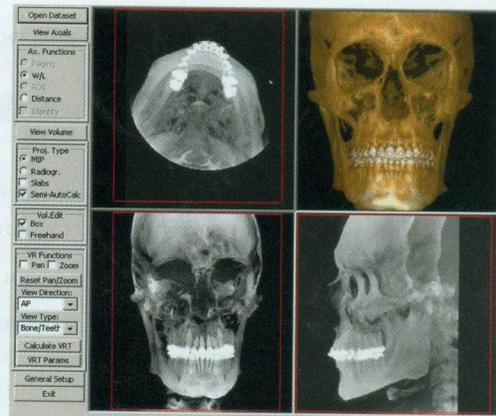
**Functions** ▶ To take digital panograph x-rays without film or without processing the film  
To project the image of maxillary and mandibular teeth by digitally projecting radiation onto an electronic sensor and then to computerized imaging system

**Characteristics** ▶ **1** Digital Panoramic Imaging Unit      **2** Digital Cephalometric Imaging Unit

**Practice Note** Digital radiographs use less radiation than conventional x-rays.  
Networks to computers in all areas of the dental office  
Immediate imaging available

**Practice Notes** ▶ Paperless dental offices store digital panoramic imaging on the computer, along with patient records.  
Used in all phases of dentistry, especially orthodontics, oral surgery, and implantology.

**S** Follow standard precautions and cross-contamination protocol. Barriers should be used and the manufacturer's recommendation for disinfection followed.



Photos courtesy Imaging Sciences International, Hatfield, PA.

## INSTRUMENT Cone Beam 3-D Imaging System

**Function** ▶ To produce diagnostic 3D images of the head and neck as related to dentistry

**Characteristics** ▶ High resolution scans produce images at .2mm voxel size to provide diagnosis for difficult areas to view with traditional x-rays.

Typical scan time of 8.9 seconds

Less radiation and more comfortable for the patient

**Practice Note** ▶ Assists in diagnosis for enhanced orthodontic treatment planning, supernumerary teeth, abnormal anomalies, 3rd molars, small root fractures, periodontal conditions, relationship of dentition and other anatomy requiring detailed visualization

**S** Follow standard precautions and cross-contamination protocol. Barriers should be used when exposing x-rays and the manufacturer's recommendation for disinfection followed. Plastic barriers are recommended.



Photos courtesy Air Techniques, Inc., Melville, NY.

## INSTRUMENT

### SCANX Digital Imaging System

**Function** ▶ To produce diagnostic intraoral digital images

**Characteristics** ▶ Utilizes phosphor storage plates (PSP)—plastic plates coated with an x-ray sensitive phosphor material  
 Plates reused multiple times using one time only plastic barriers for each patient that covers the plates  
 Plates placed in machine to erase current image taken  
 Different size plates available for images  
 Compatible computer software needed for the ScanX digital images  
 Computer software compatibility of enhancing digital images to aid in diagnosis

**Practice Note** ▶ Use regular intraoral x-ray machines for images  
 Use requirements—ScanX, computer and practice management software  
 Can be used in normal room lighting

**S** Follow standard precautions and cross-contamination protocol. Barriers must be used when exposing x-rays and the manufacturer's recommendation for disinfection followed. Each plastic plate is covered and closed with a plastic barrier. Plastic barrier is removed before placing in ScanX. New plastic barrier is used for each ScanX image. Plastic covers are one time use only and disposed of in garbage after each use.

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