

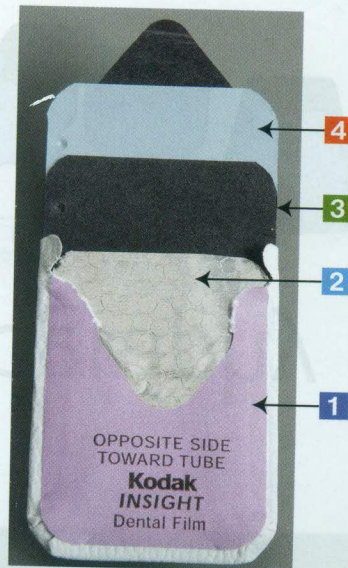
- Practice Note** ▶ Many patients have dental fears that may be best served by using certain materials.
- Characteristics** ▶ Each paper on the bag is coated so moisture will not reach another paper.
- Function** ▶ To mix all types of dental materials.

INSTRUMENT Paper Mixing Bags

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.

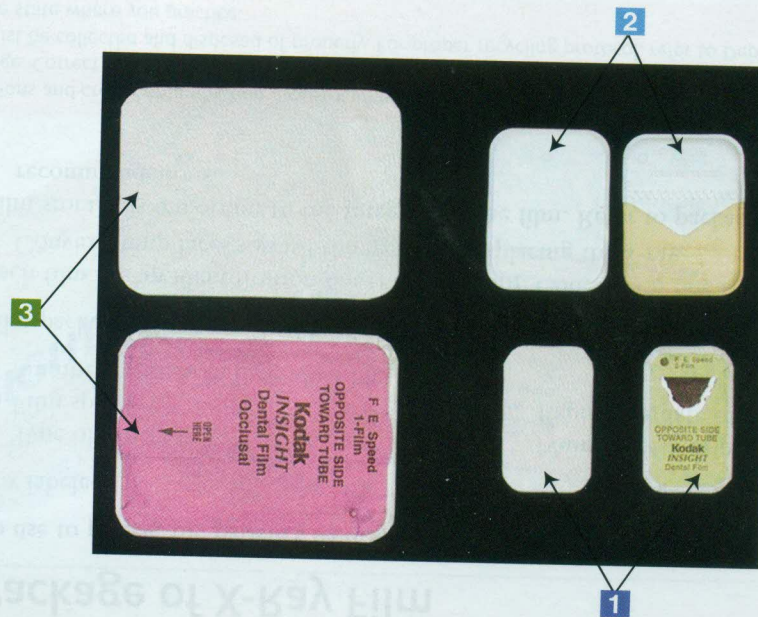


Photo courtesy Carestream Health Inc., Rochester, NY.

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
 - Film speed
 - Number of films in individual film packet
 - Film packets—Single or double film
 - Number of film packets in the box
 - Expiration date of 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

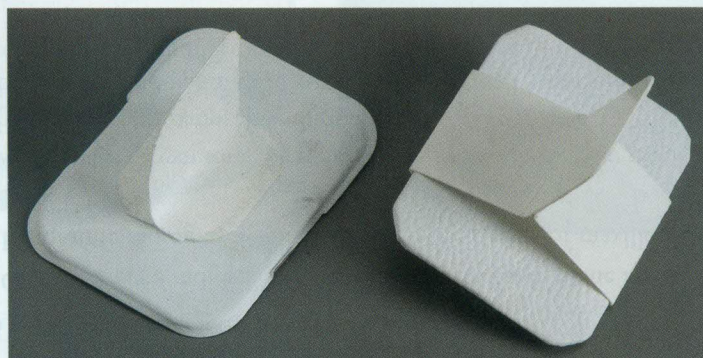
2 Panoramic radiograph—Shows a panoramic view of maxillary and mandibular teeth on one x-ray

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.

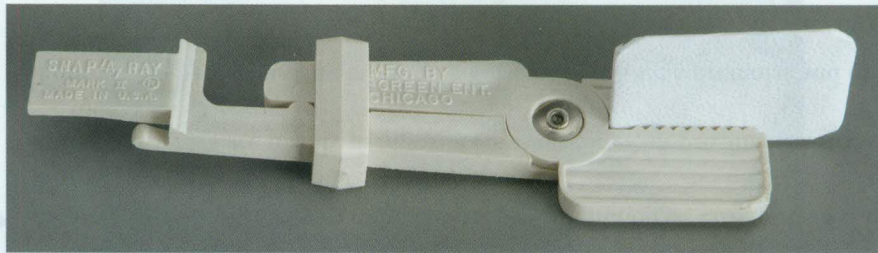
S Follow standard precautions and cross-contamination protocol when exposing and processing film for developing.



■ 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.



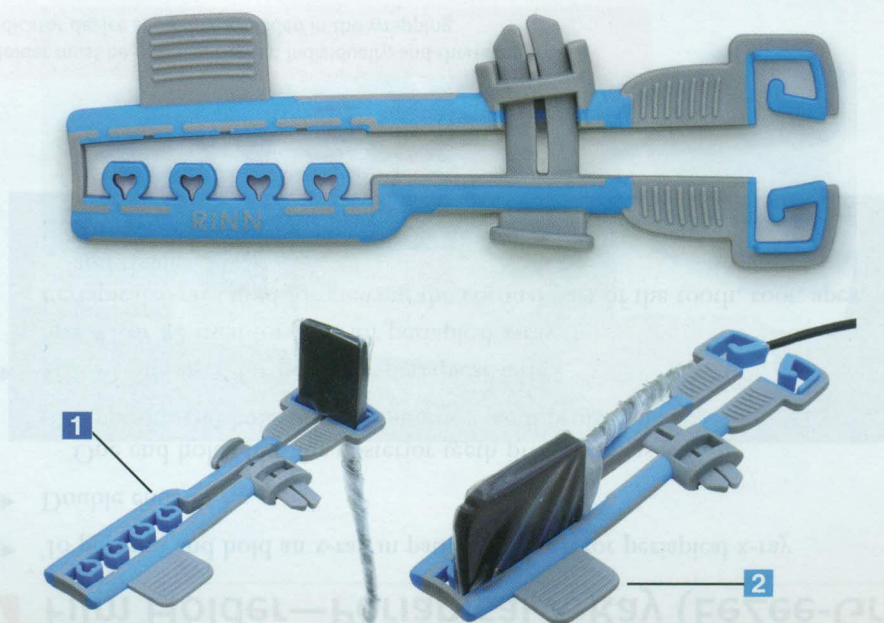
■ INSTRUMENT

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*



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

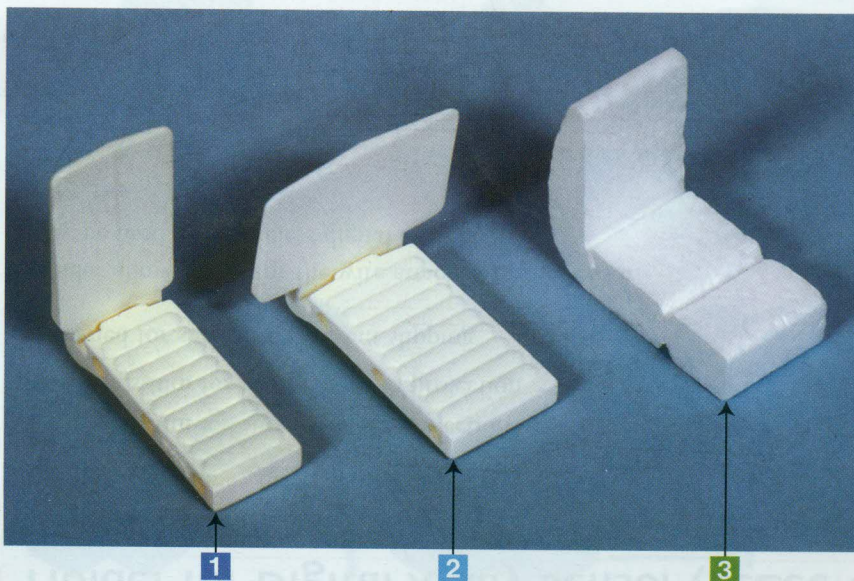
Characteristics ▶ Double ended:

- 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

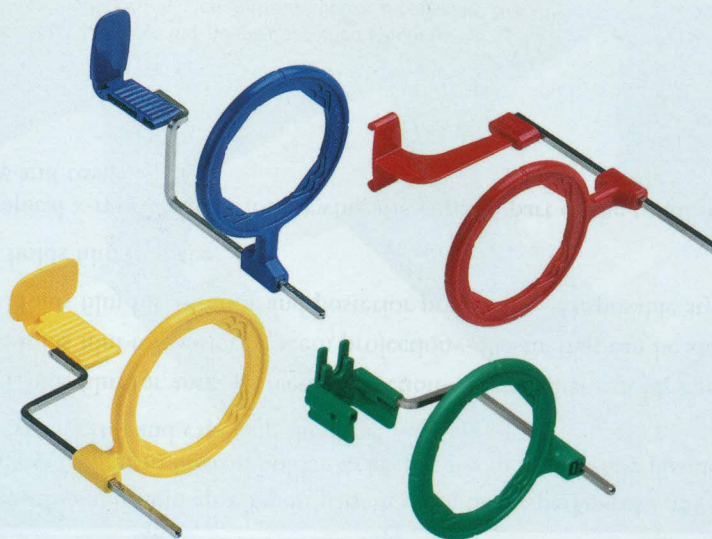
Functions ▶ To position and hold an x-ray in patient's mouth for periapical x-ray
To allow patient to bite on holder to keep x-ray in place while positioning the position indicating device (PID) and exposing the film

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 Kim, Elgin, IL.

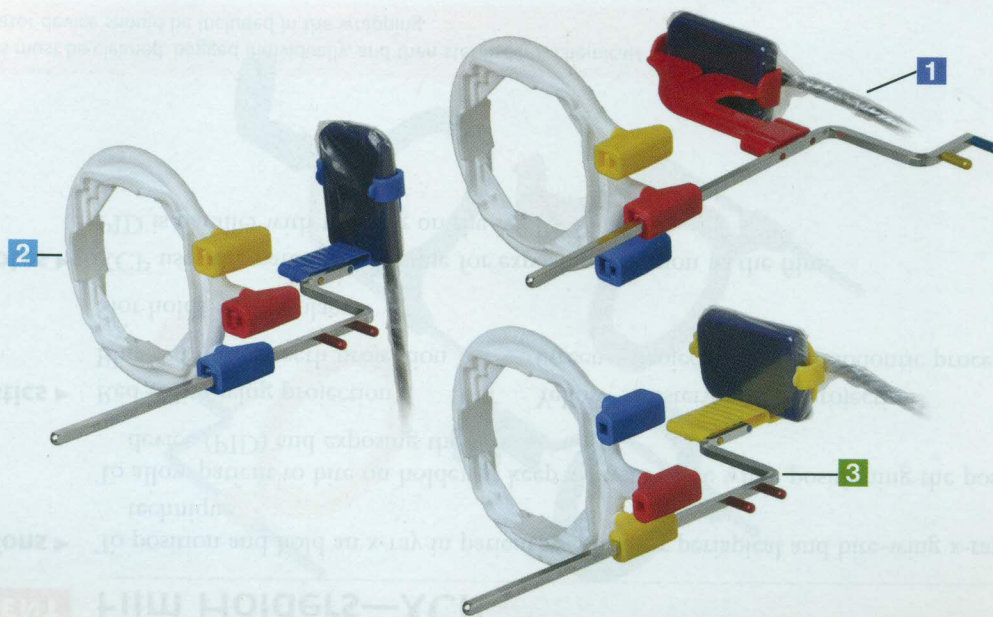
INSTRUMENT Film Holders—XCP

- 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.

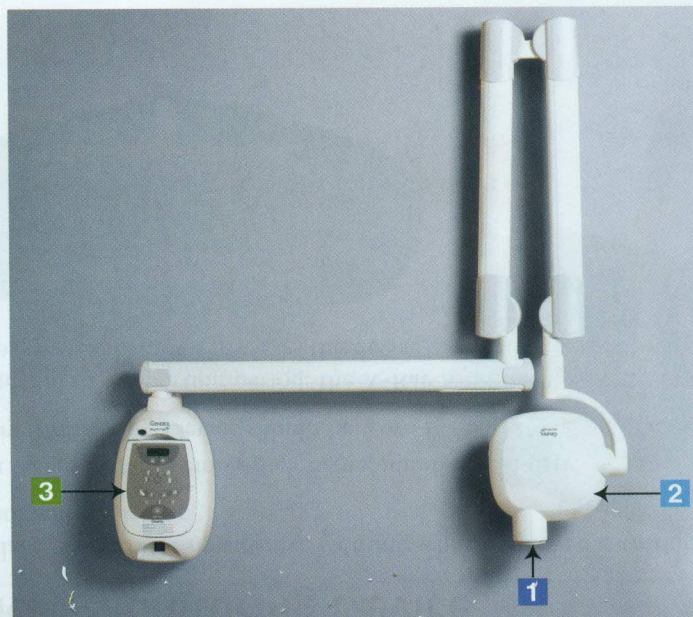


Photo courtesy Gendex Dental Systems, Lake Zurich, IL.

■ 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)

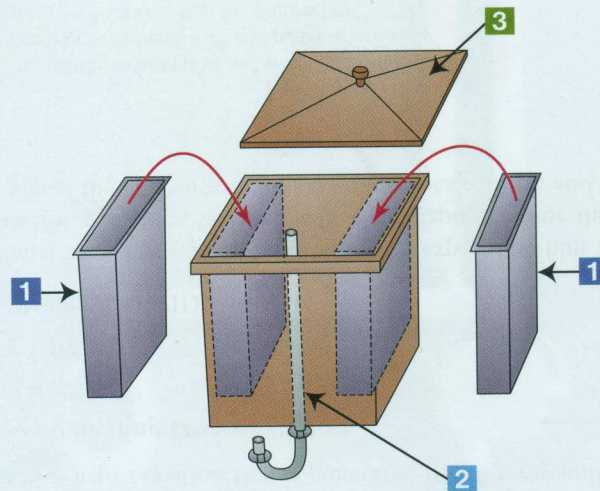
2 Tube Head

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.



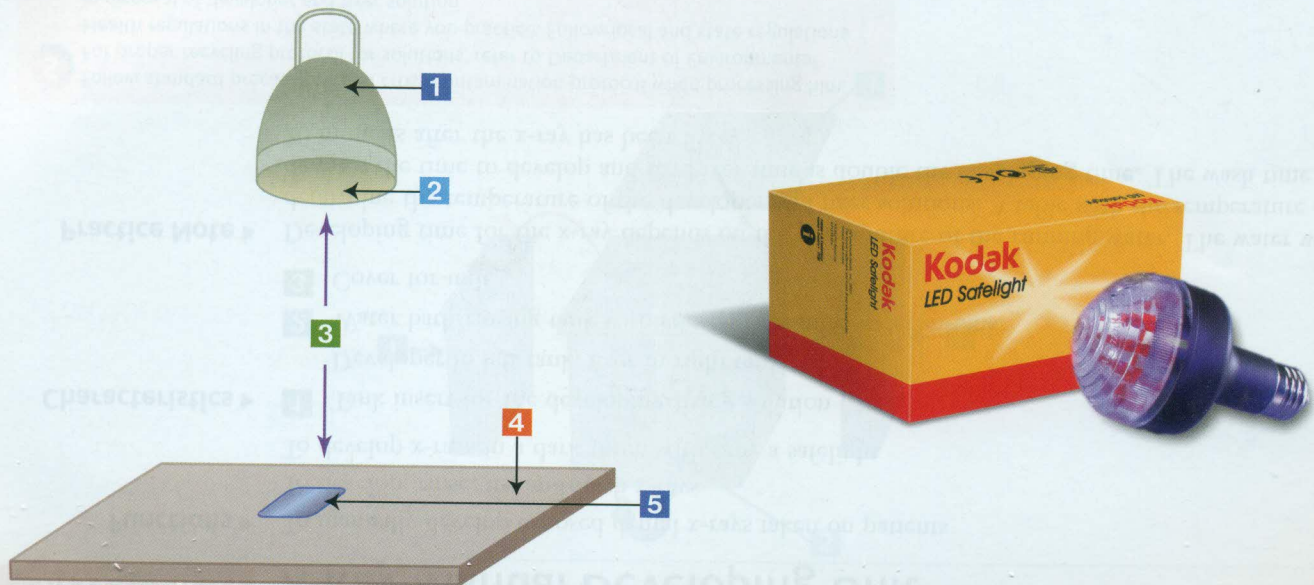
■ INSTRUMENT X-Ray Manual Developing Unit

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

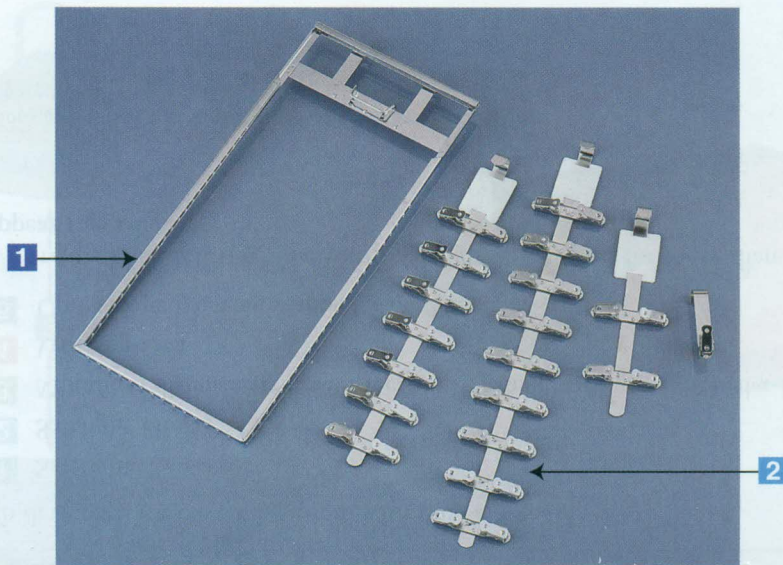
Function ▶ To develop x-rays in a dark room with only a Safelight

- 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.



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



■ INSTRUMENT X-Ray Rack

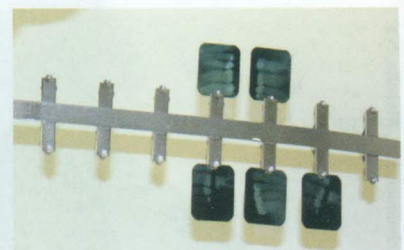
Functions ▶ To place undeveloped x-rays on the rack in the darkroom with only the safelight prior to putting rack in the developer

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

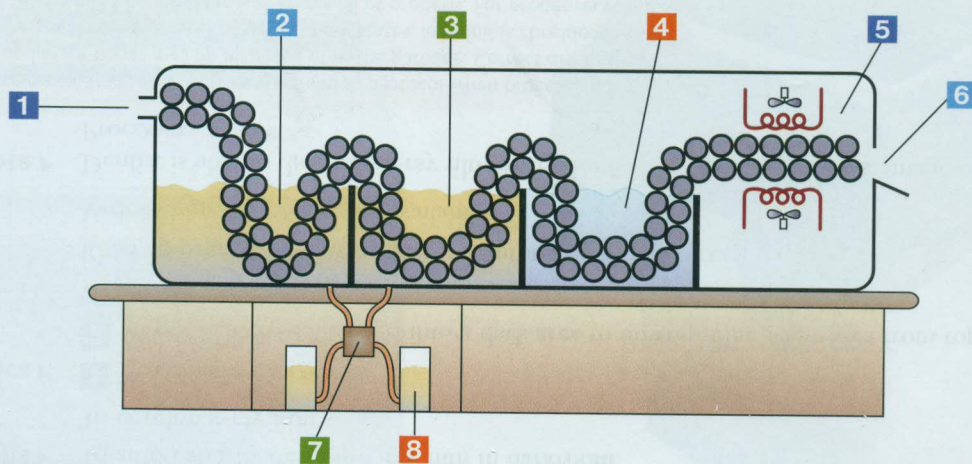
2 Front loader—Hands go into a dark area to unwrap film. View area from top. Darkroom not needed.

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 ▶

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

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

- 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 Shiron Dental Systems LLC, Charlotte, NC.

■ INSTRUMENT Digital Intraoral X-Ray Unit

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

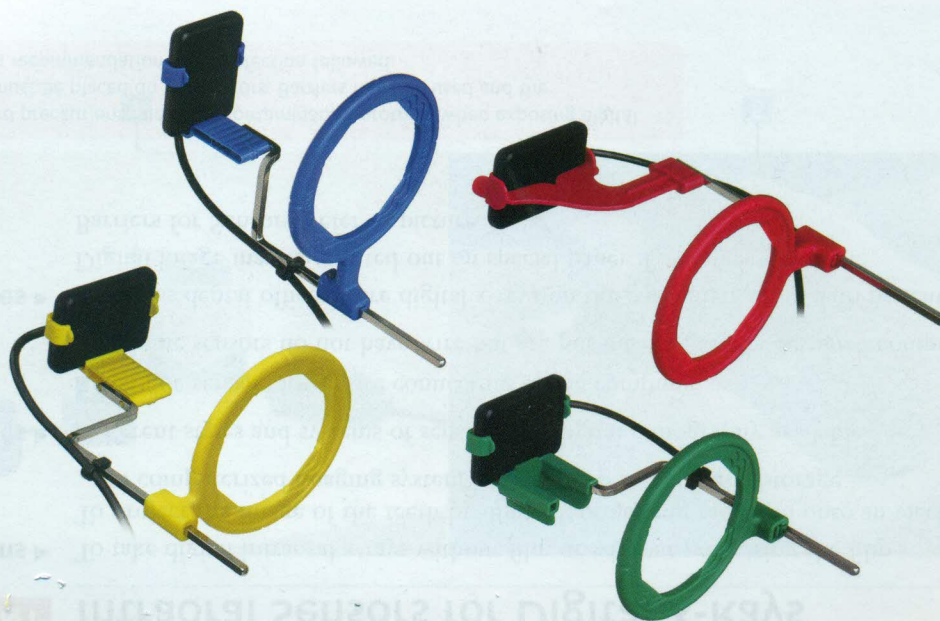
Functions ▶ To take digital intraoral x-rays without film or without processing the film
To project the image of the teeth by digitally projecting radiation onto an electronic sensor and to computerized imaging system before going to computer storage

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.



■ 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

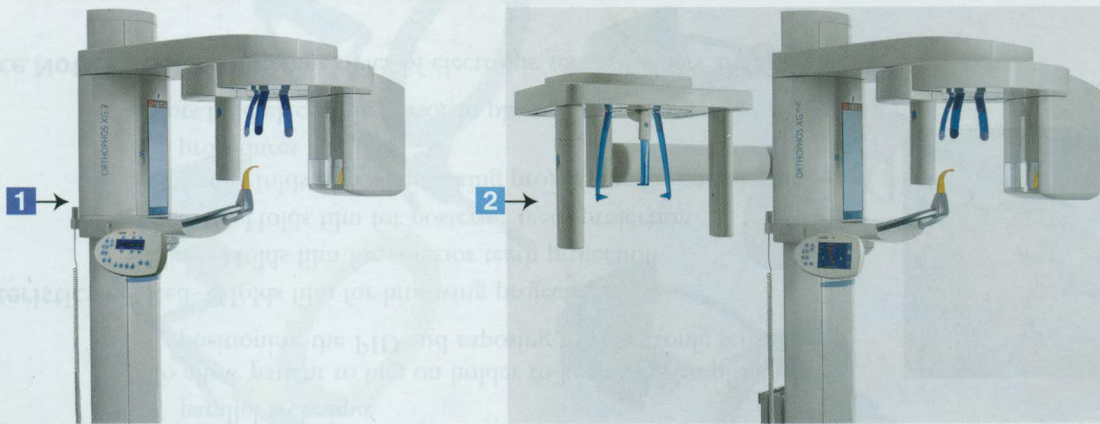
Characteristics ▶ Red—Holds film for bite-wing projection
 Blue—Holds film for anterior teeth projection
 Yellow—Holds film for posterior teeth projection
 Green—Holds film when taking projections for endodontic procedures

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

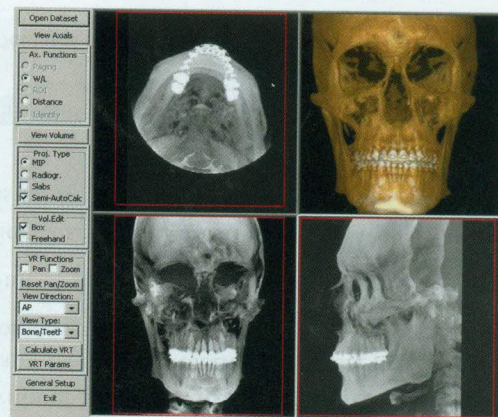
Digital radiographs use less radiation than conventional x-rays.
 Networks to computers in all areas of the dental office
 Immediate imaging available

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.



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, adnormal 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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