Chapter 2

Introduction to Radiographic Equipment

Learning Objectives

- Use correct terminology when discussing x-ray equipment and its parts
- Demonstrate the radiation field and define central ray (CR)
- Explain the differences between primary radiation, scatter radiation, and remnant radiation
- List two effects of scatter radiation

Learning Objectives (Cont'd)

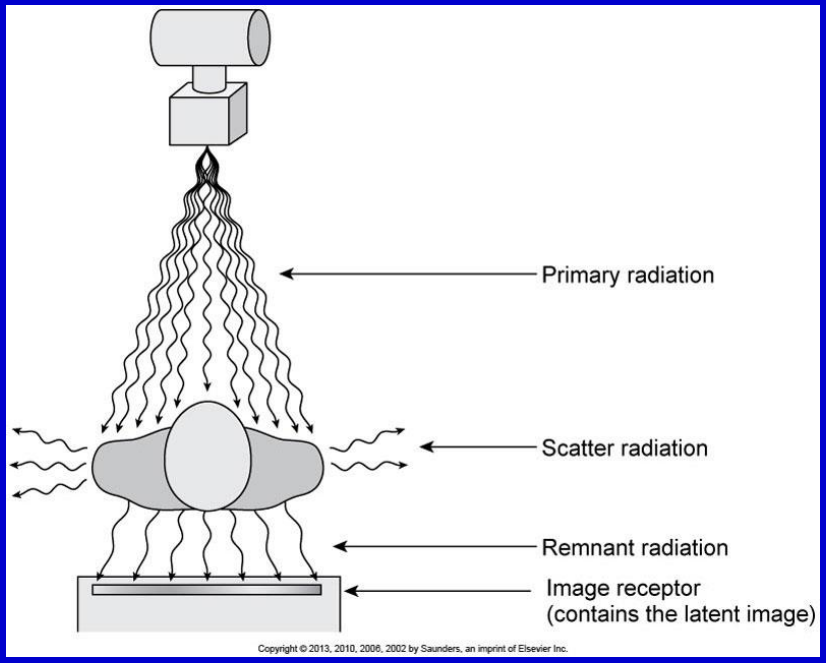
- List the components of an image receptor (IR) system
- List the essential features of a typical x-ray room
- Explain the purposes of the control booth and the transformer cabinet
- Safely change the positions of the radiographic table and the x-ray tube

Learning Objectives (Cont'd)

- Explain the term *adverse incident* as it relates to radiography
- Demonstrate a detent and explain its function
- Explain the purpose of a collimator
- Describe precautions to be taken to ensure personnel safety from radiation exposure

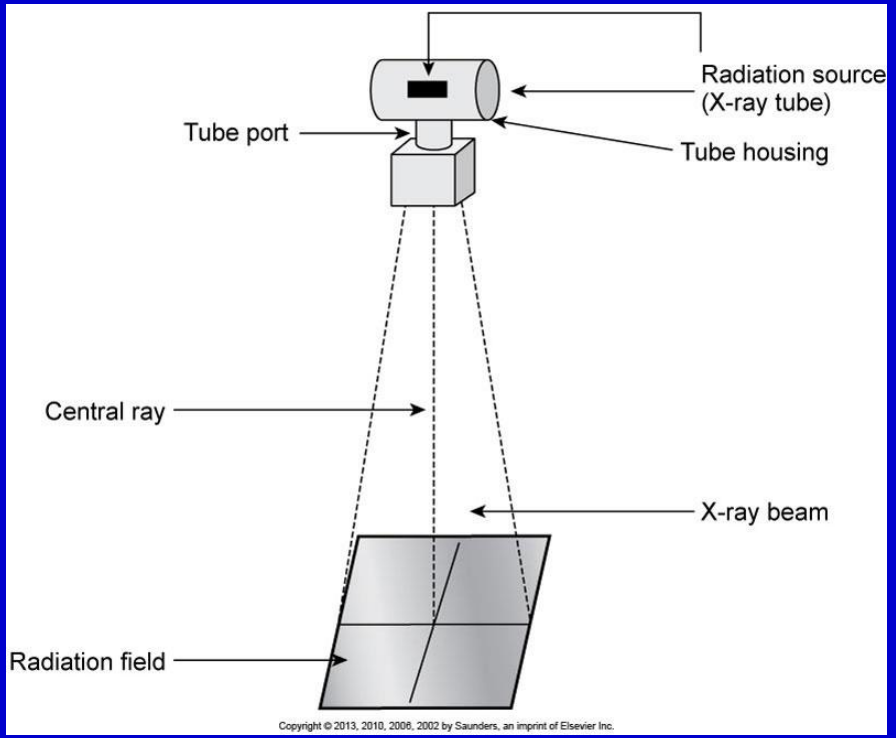
Basic Components of Image Production

- Primary radiation
- Scatter radiation
- Remnant radiation
- Image receptor (IR)



Basic Components of Image Production (Cont'd)

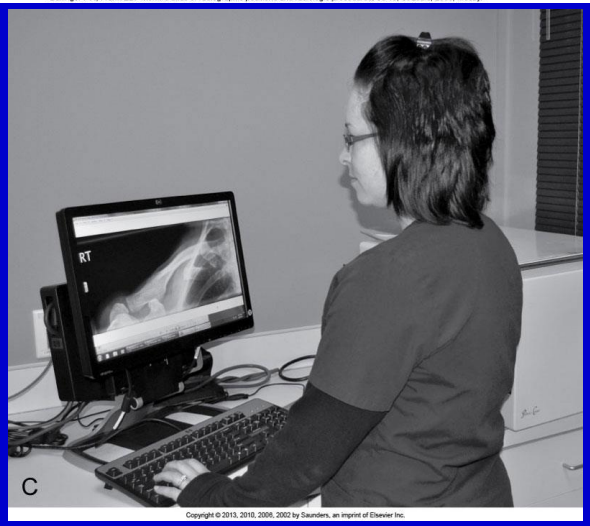
- X-ray tube
- Tube housing
- Tube port
- X-ray beam
- Central ray (CR)
- Radiation field



Recording the Radiographic Image

- Digital imaging is used today
- CR cassettes contain a special phosphor that stores the image
- CR cassettes come in standard sizes
- A CR reader is used to convert/process the latent image to a visible image
- The image is viewed, stored, and retrieved using a computer

Ballinger PW, Frank ED: *Merrill's atlas of radiographic positions and radiologic procedures*, ed 10, St Louis, 2003, Mosby.

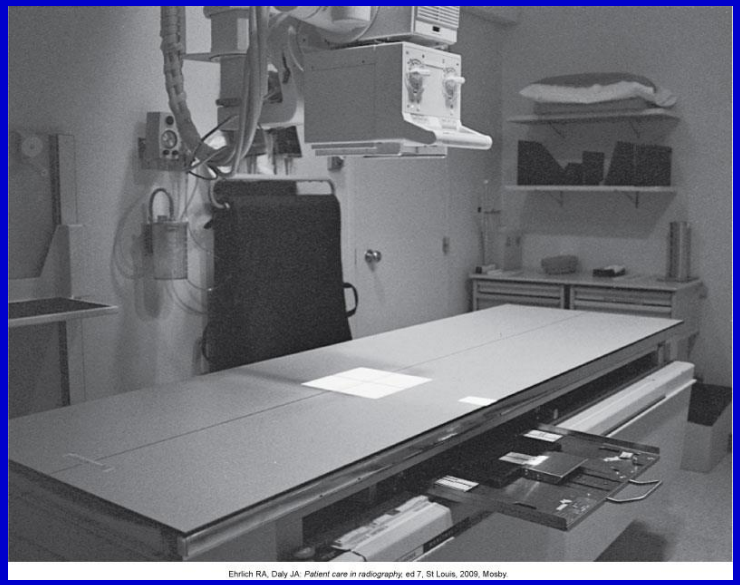


The X-ray Room

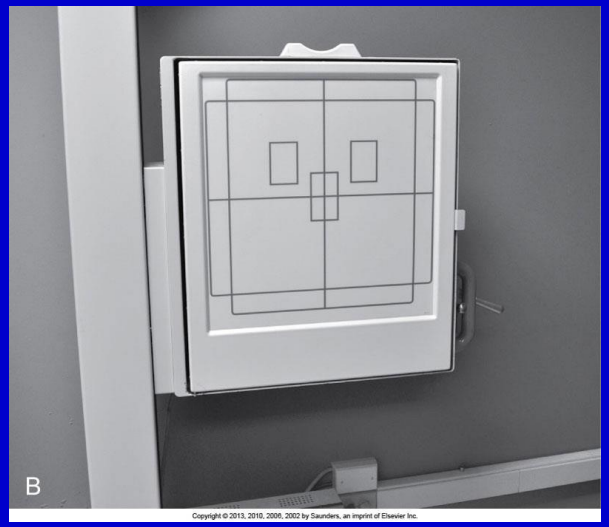
- Control booth
- Control console
- Transformer cabinet
- X-ray tube
- Upright cassette holder
- Radiographic table

The X-ray Room (Cont'd)

- Radiographic table

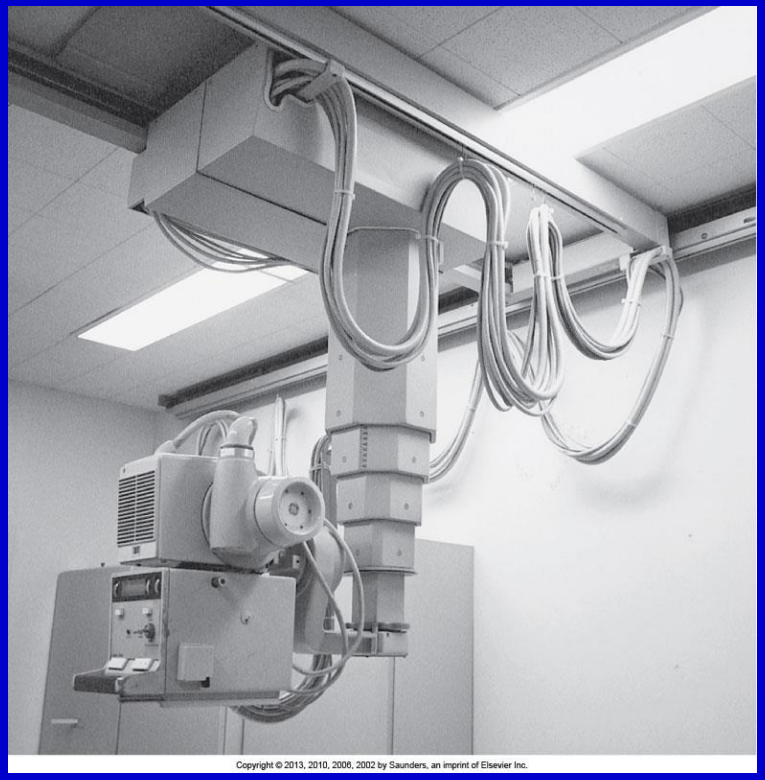


- Upright cassette holder



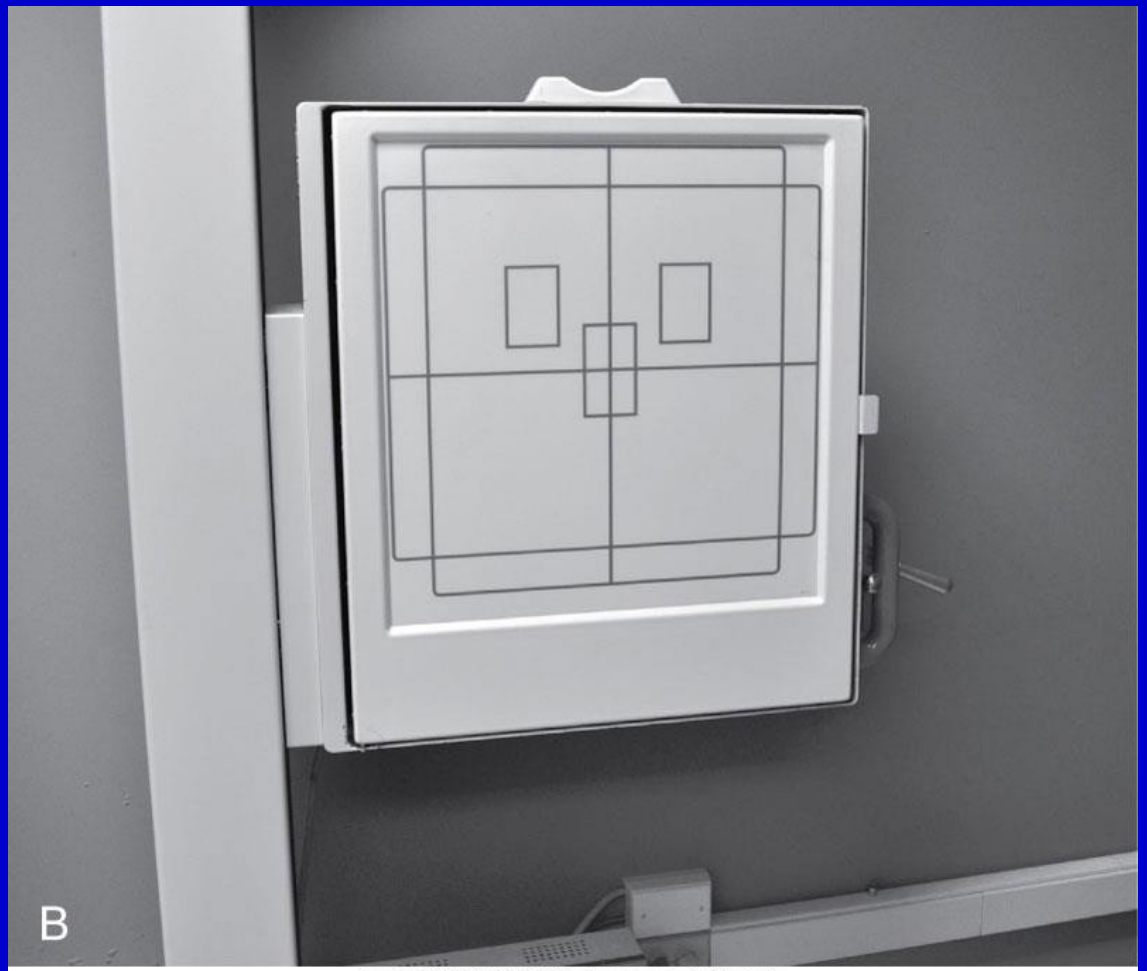
The X-ray Room (Cont'd)

- X-ray tube and collimator



- Control console

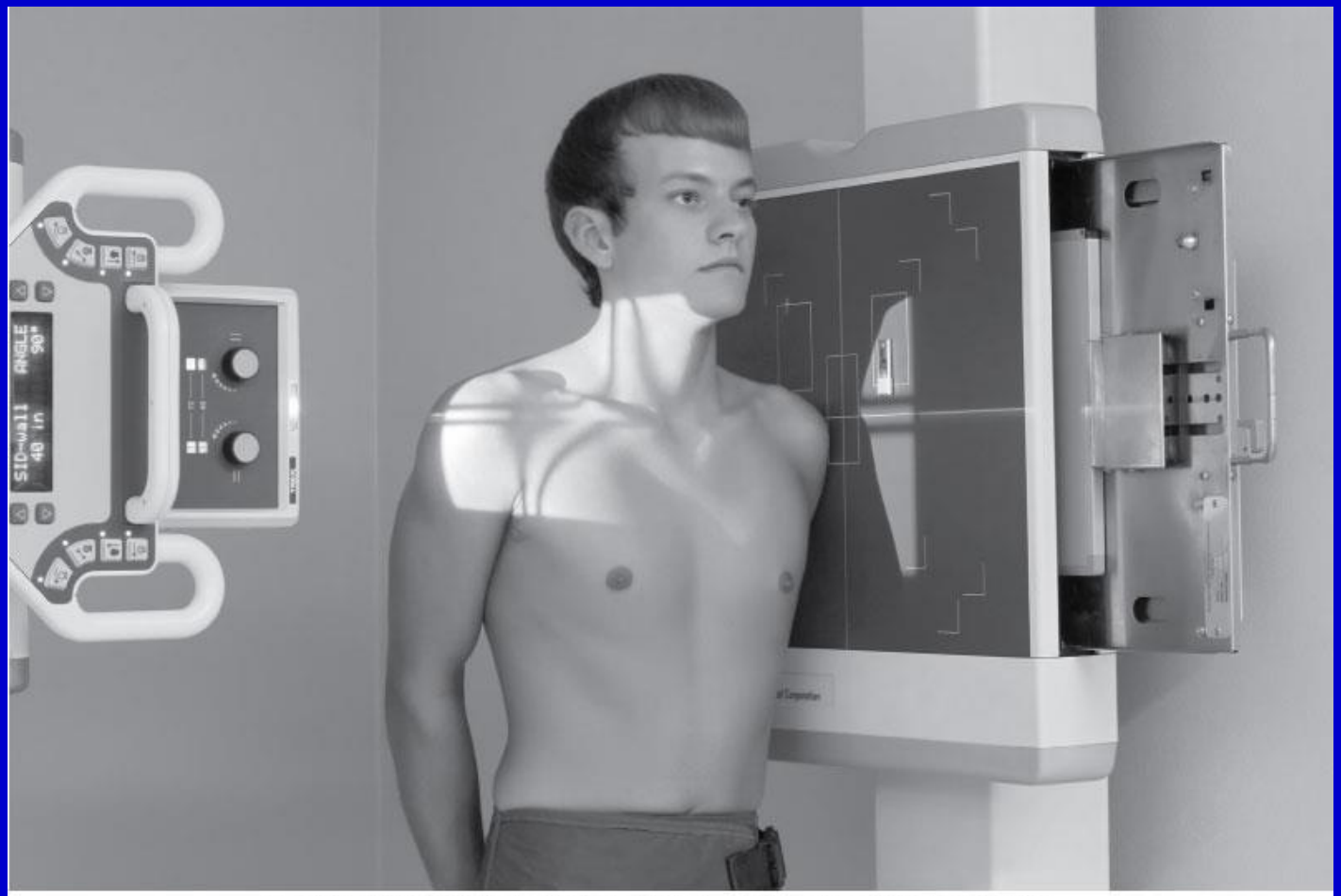
Modern Upright Cassette Holder



Modern Digital Control Console

X-ray Transformer

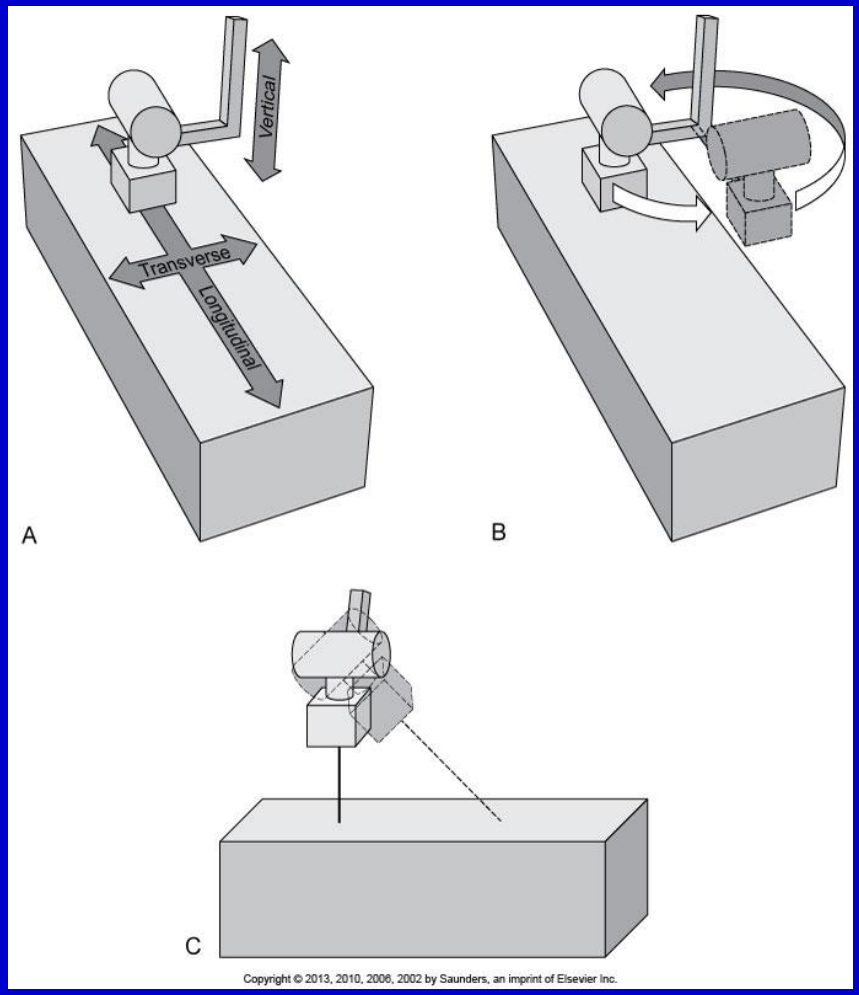
Patient Having X-ray on Upright Bucky



Frank ED, Long BW, Smith BJ: *Merrill's atlas of radiographic positioning and procedures*, ed 12, St Louis, 2012, Mosby.

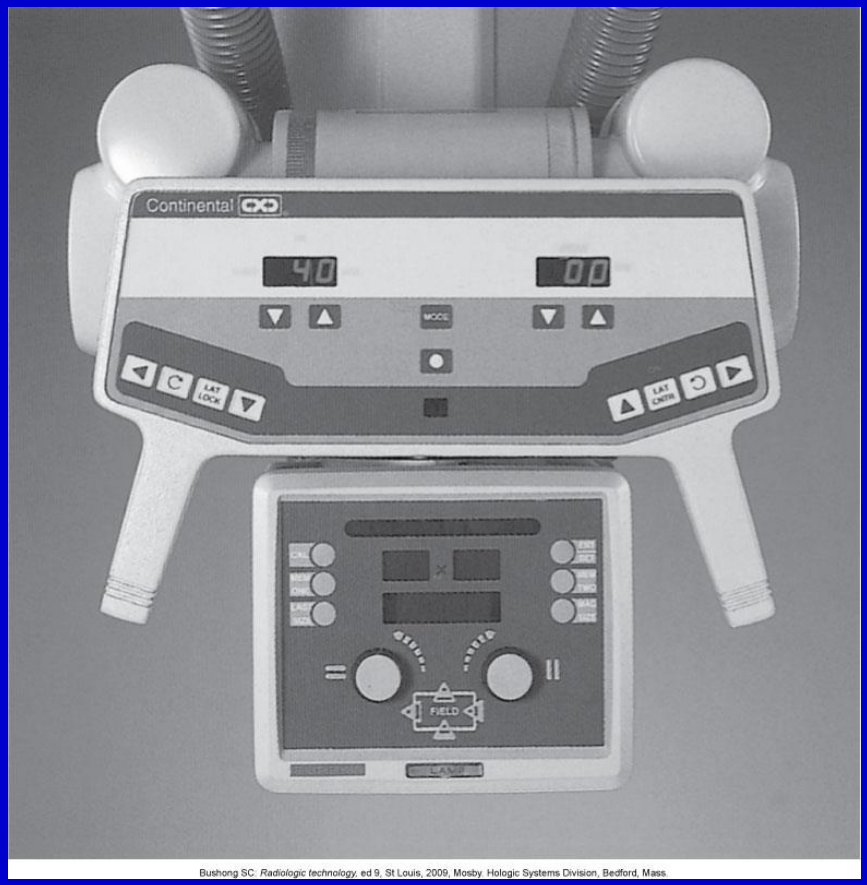
X-ray Tube Movement

- The X-ray tube may be:
  - Raised and lowered
  - Moved longitudinally or transversely
  - Swiveled or rotated
  - Angled



X-ray Tube Features

- Locks
- Detent
- Collimator
- Collimator controls
- Collimator light



Bushong SC. *Radiologic technology*, ed 9, St Louis, 2009, Mosby. Hologic Systems Division, Bedford, Mass.

Table Movement

- The table may be:
  - Titled
  - Moved horizontally or longitudinally

Podiatric X-ray Self-Contained X-ray Unit

Equipment Safety Considerations

- Table and x-ray tube locks are released before attempting to move them
- Footboard and shoulder guard are secure before tilting the table
- Table and x-ray tube locks are secure after positioning them for a procedure
- Equipment obstacles are removed before assisting the patient on or off the table

Radiation Protection Principles

- Never hold a patient during a radiographic exposure unless absolutely necessary
- Remain within the control booth during all exposures
- Ensure all nonessential personnel are behind the control booth or outside the x-ray room
- Ensure the door to the x-ray room is closed before taking an exposure
- Keep image receptors not in use inside the control booth

Summary

- X-rays produced in the x-ray tube pass through the patient to produce a latent image in the phosphor of the IR
- The latent image becomes visible after processing
- Major equipment in the x-ray room includes the x-ray tube and collimator, table, upright cassette holder, control console, and transformer cabinet

Summary (Cont'd)

- The x-ray tube and table may be positioned in a variety of ways
- Always use x-ray tube, table, and ancillary equipment locks appropriately
- Be mindful of equipment obstacles that may cause harm to the patient
- Protect yourself and others by remaining within the control booth during exposures