Chapter 2

Introduction to Radiographic Equipment

Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

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)

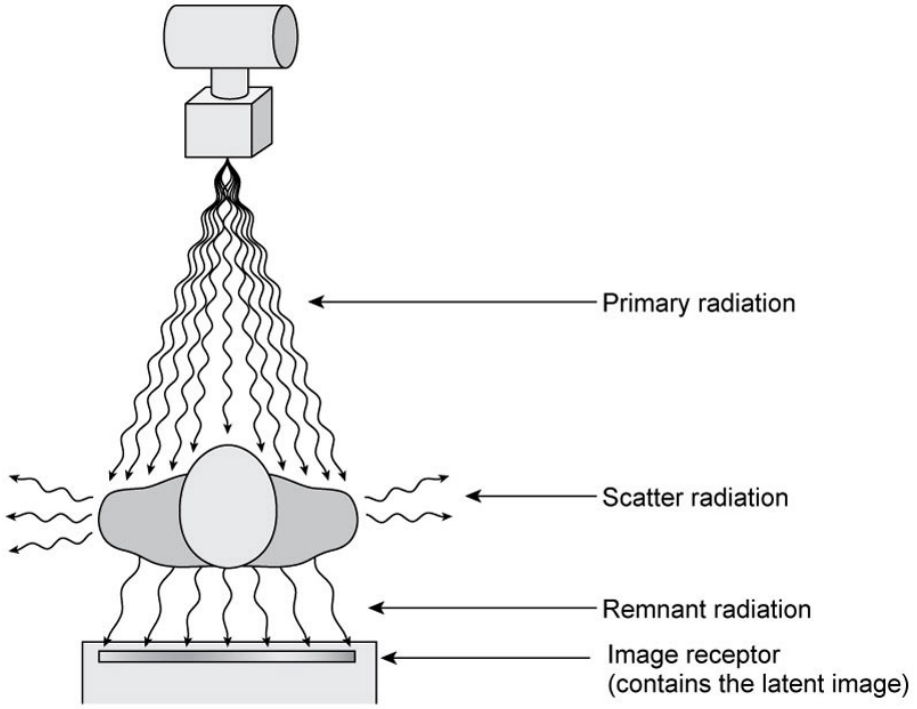
- List the components of an image receptor (IR) system
- List the essential features of a typical x-ray room
- Explain the purposes of the control booth and the transformer cabinet
- Safely change the positions of the radiographic table and the x-ray tube

Learning Objectives (Cont'd)

- 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

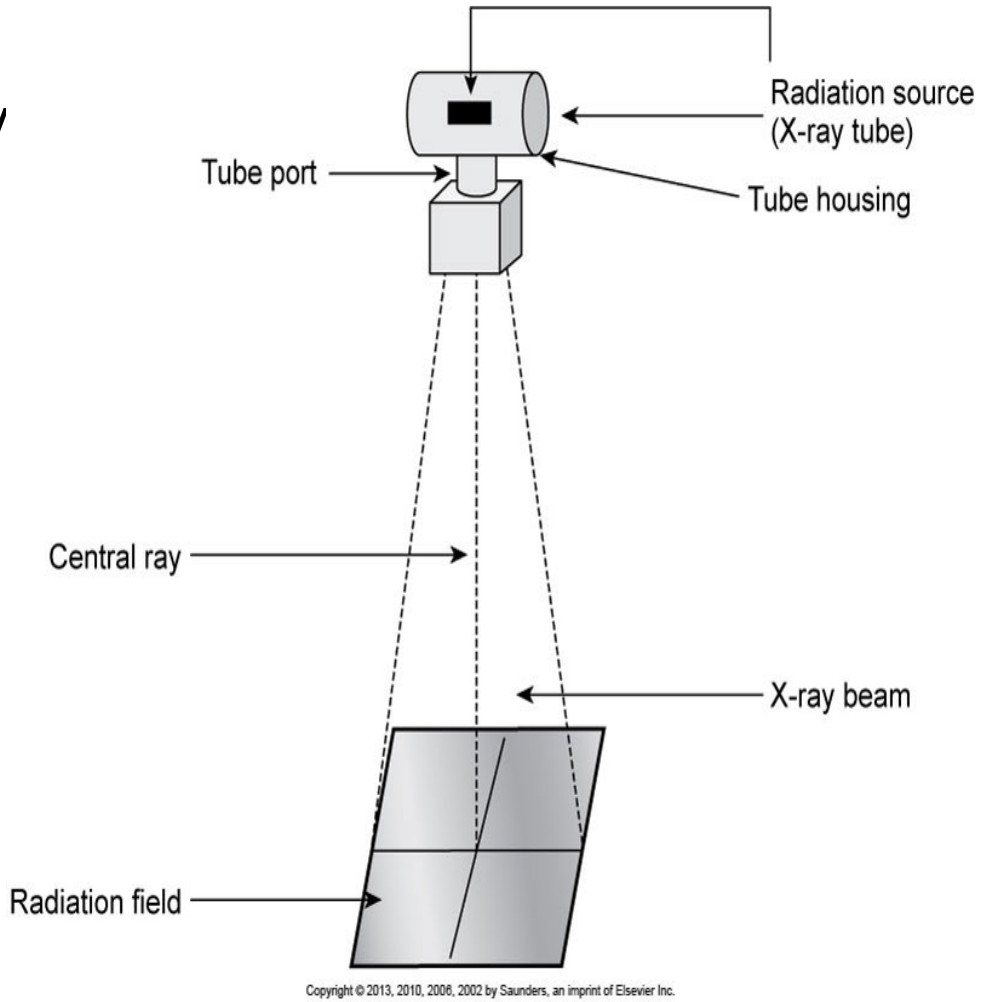
- Primary radiation – radiation that leaves the tube
- Scatter radiation – attenuated x-rays that scatter outside the body
- Remnant radiation – exits the opposite side of patient (exit radiation)
- Image receptor (IR) – cassette, imaging plate



Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

Basic Components of Image Production

- X-ray tube – source of x-rays
- Tube housing – lead lined housing which contains the x-ray tube
- Tube port – opening in tube housing where x-rays exit
- X-ray beam – triangular shaped beam formed by x-rays
- Central ray (CR) – line in center of x-ray beam
- Radiation field – squared area that strikes the patient and x-ray table



Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

Recording the Radiographic Image

- Digital imaging is most often used today
  - CR (computed radiography) cassettes contain a special phosphor that stores the image
  - 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
- Film/screen is also still in use
  - These cassettes contain intensifying screens and radiographic film
  - Film must be developed in a dark room

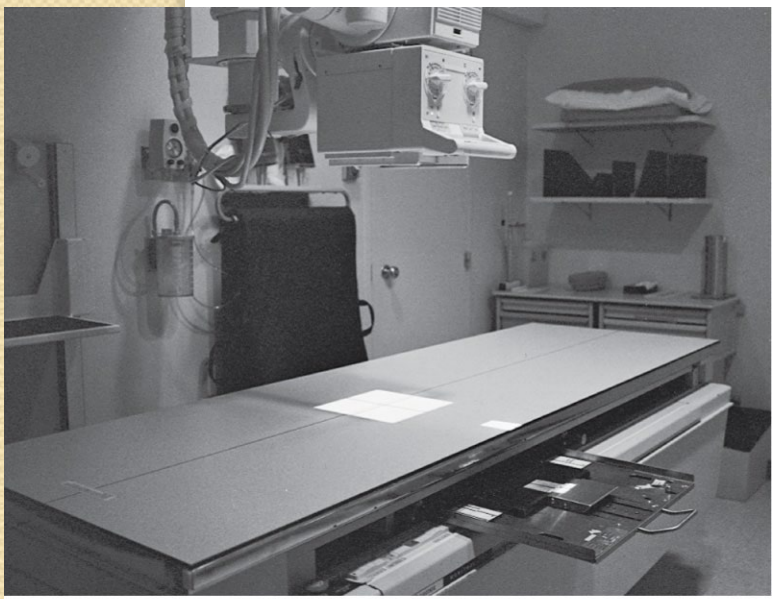
Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

The X-ray Room

- **Control booth** - *protective lead lined area providing the operator with protection from x-ray exposure*
- **Control console** - *control panel located in the control booth; contains equipment necessary to adjust technical factors and initiate the exposure*
- **Transformer cabinet** - *produces the voltage needed to produce x-rays;limited operators will have little or no contact with this*
- **X-ray tube**
- **Upright cassette holder** – *holds IR in upright position*
- **Radiographic table**

The X-ray Room

- Radiographic table

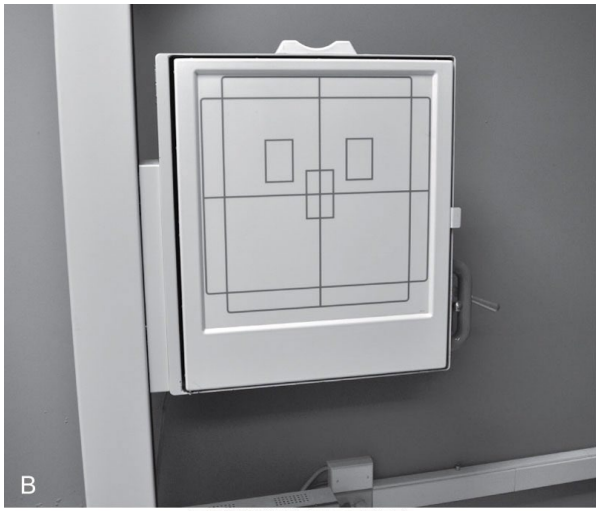


Ehrlich RA, Daly JA: *Patient care in radiography,* ed 7, St Louis, 2009, Mosby.

- Upright cassette holder

Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

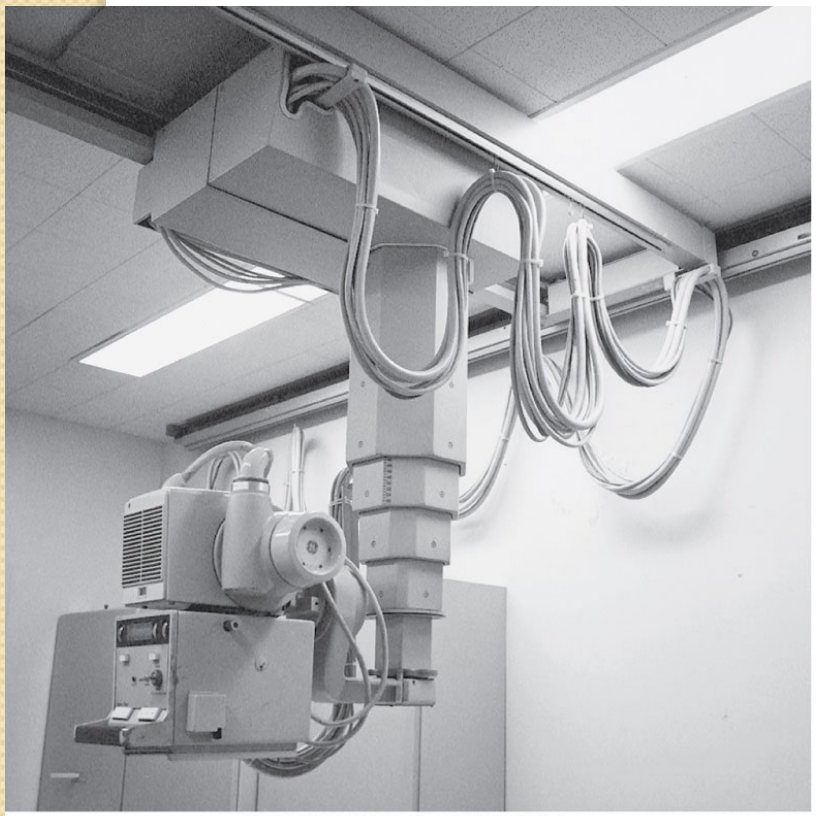
- Upright Bucky



Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

The X-ray Room

- X-ray tube and collimator



Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

- Control console

Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

The X-ray Room

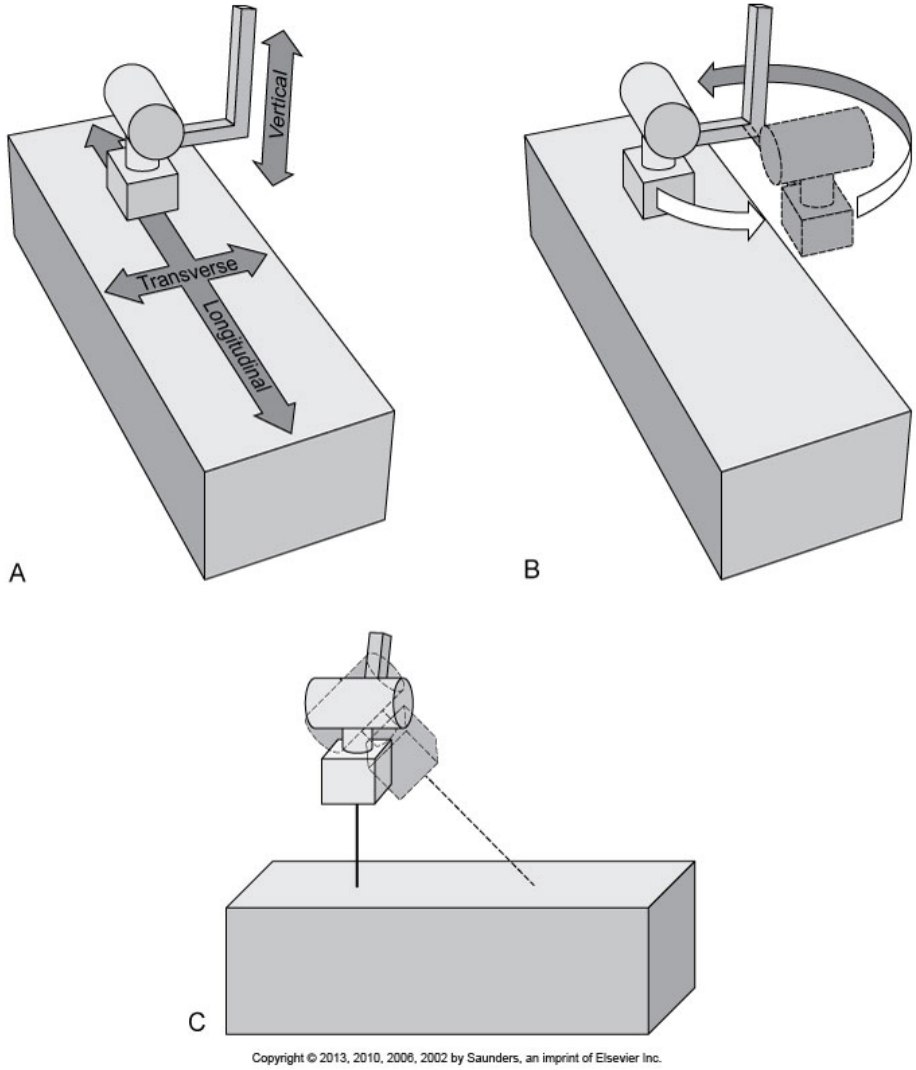
Control Booth

The X-ray Room

- Installing an X-ray Room

X-ray Tube Movement

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



Copyright © 2013, 2010, 2006, 2002 by Saunders, an imprint of Elsevier Inc.

X-ray Tube Features

- Locks
- Detent – stops a moving part in a specific location
- Collimator – boxlike device under housing; varies size of radiation field
- Collimator controls – allows for adjustments
- 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

Ehrlich RA, Daly JA: *Patient care in radiography,* ed 7, St Louis, 2009, Mosby.

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

- 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