

## XRAY CIRCUIT REVIEW

\*Primary circuit = ?

→ low voltage / filament side

\*Secondary circuit = ?

→ high voltage / tube side

\*Primary circuit controls?

→ quantity (mA)

\*Secondary circuit controls?

→ quality (kVp)

\*Filament heat is controlled by?

→ primary circuit

\*Autotransformer function?

→ selects kVp

\*Which circuit is the step-down transformer located in?

→ primary

\*Which circuit is the step-up transformer located in?

→ secondary

\*Step-down transformer purpose?

→ decreases voltage + increases current to heat filament

\*Step-up transformer purpose?

→ increases voltage to accelerate electrons to x-ray energy

\*Rectifiers convert what to what?

→ AC to DC

\*Why do we need rectifiers?

→ electrons must only flow in one direction thru tube

\*Primary = mA = ?

→ quantity

\*Secondary = kVp = ?

→ quality / penetration

\*Simple rule sentence

→ Primary makes electrons, Secondary speeds electrons.

The X-ray circuit has TWO main sides:

| Side                        | Name              | Function                                     |
|-----------------------------|-------------------|--|
| Low Voltage / Filament side | Primary circuit   | heats filament + controls mA                 |
| High Voltage side           | Secondary circuit | accelerates electrons (kVp) to strike target |

### Primary (Low Voltage) Circuit

controls quantity of electrons

Components:

- Autotransformer → selects kVp
- Line compensator
- Exposure switch
- Filament circuit / mA selector
- Step DOWN transformer → decreases voltage → increases current to heat filament

memory line:

Primary = mA = filament = quantity

### Secondary (High Voltage) Circuit

controls quality / penetration

Components:

- Step UP transformer → increases voltage to kVp
- Rectification system → AC → DC
- X-ray Tube (anode target produces X-rays)

memory line:

Secondary = kVp = penetration = quality

### Key transformer relationships

- Step UP = increases voltage
- Step DOWN = decreases voltage + increases current (mA)

### Why we need rectifiers?

- X-ray tube needs DC current
- prevents electrons from flowing backwards

### **state trick associations:**

| <b>Word</b>   | <b>Circuit</b>   |
|---------------|--|
| filament heat | primary  |
| mA selector   | primary  |
| kVp selector  | primary (autotransformer sets it) but applies on secondary |
| rectifier     | secondary  |
| step UP       | secondary  |
| step DOWN     | primary  |

### **SUPER SIMPLE recall sentence**

**Primary makes electrons, Secondary speeds electrons.**

1. The primary purpose of the primary circuit is to:
  - A. Accelerate electrons across the tube
  - B. Heat the filament to produce electrons
  - C. Convert AC to DC
  - D. Increase tube voltage
2. The secondary circuit controls:
  - A. Quantity
  - B. Filament current
  - C. Quality / kVp
  - D. Filament temperature only
3. Which transformer is located in the primary circuit?
  - A. Step up transformer
  - B. Autotransformer
  - C. Rectifier assembly
  - D. Anode motor
4. Which component is responsible for increasing voltage to thousands of volts for X-ray production?
  - A. Step down transformer
  - B. Step up transformer
  - C. Filament circuit
  - D. Rotor stator
5. Rectifiers convert:
  - A. DC  $\rightarrow$  AC
  - B. AC  $\rightarrow$  DC
  - C. DC  $\rightarrow$  Pulsed AC
  - D. AC  $\rightarrow$  Pulsed DC only
6. The filament circuit is associated with controlling:
  - A. kVp
  - B. mA
  - C. focal spot blur
  - D. contrast only
7. The part of the circuit responsible for quality/penetration is:
  - A. Primary circuit
  - B. Filament circuit
  - C. Secondary circuit
  - D. Timer circuit only

8. The autotransformer is used to:
  - A. Increase voltage to the anode
  - B. Select kVp
  - C. Convert AC to DC
  - D. Rotate the anode
  
9. The step-down transformer:
  - A. Increases voltage
  - B. Decreases current
  - C. Increases current to heat filament
  - D. Increases both voltage and current
  
10. The exposure switch is located in the:
  - A. Secondary circuit
  - B. Primary circuit
  - C. X-ray tube
  - D. Rectifier circuit only