

X-Ray Circuit Lesson Plan

Learn it. Build it. Understand it.

Topic X-Ray Circuit and Electrical Sequence	Suggested Time 60-90 minutes	Audience Radiography students
Instructional Tool RadTech Interactive - X-Ray Circuit Builder	Format Guided practice + independent construction	Assessment Builder Assessment Mode + explanation questions

Learning Objectives

- Identify the major components of the x-ray circuit.
- Differentiate between components of the primary, secondary, and filament circuits.
- Arrange circuit components in the correct electrical sequence.
- Explain the function of major components, including the line compensator, autotransformer, transformers, rectifiers, mA selector, and x-ray tube.
- Trace the path of electrical energy through the x-ray circuit.
- Explain why rectification is necessary for x-ray production.
- Construct a complete x-ray circuit independently using the X-Ray Circuit Builder.
- Use feedback from an incorrectly constructed circuit to identify and correct misconceptions.

Materials

Computer or tablet with access to the RadTech Interactive X-Ray Circuit Builder; instructor presentation/display; course notes or textbook as appropriate; optional paper for sketching the completed circuit.

Lesson Sequence

Time	Instructor Activity	Student Activity
5-10 min	Engage / Prior Knowledge - Ask: <i>What has to happen electrically between the wall outlet and the production of an x-ray photon?</i> Collect responses without immediately correcting them.	Recall prior knowledge about voltage, current, transformers, rectification, and x-ray production.
10-15 min	Circuit Overview - Introduce the major sections of the circuit. Emphasize understanding function and sequence rather than memorizing a diagram.	Identify components and connect each to previously learned electrical principles.
15-20 min	Guided Practice - Open Practice Circuits . Work through selected sections as a class. Ask students to predict placement and connections before building.	Build along with the instructor and explain why each component belongs in its location.
15-20 min	Full Circuit Construction - Move to Full X-Ray Circuit . Encourage students to use Check Circuit diagnostically rather than guessing until correct.	Construct, check, troubleshoot, and revise the circuit individually or in pairs.
10 min	Explain the Why - Trace electrical energy through the completed circuit. Discuss what happens at major components and why each transformation is necessary.	Verbally trace the circuit and explain component functions.
5-10 min	Beat the Timer - Use timed mode as retrieval practice after successful circuit construction.	Rebuild the circuit from memory under increasing time pressure.

Time	Instructor Activity	Student Activity
10-15 min	Assessment Mode - Have students enter Assessment Mode and construct the circuit independently from a fresh workspace.	Complete and submit the circuit independently.
5 min	Closure - Debrief common errors and revisit the opening question.	Explain how electrical energy moves from the incoming supply to x-ray production using circuit terminology.

Questions to Ask During Instruction

- Why do we need a line compensator before proceeding through the circuit?
- What does the autotransformer control?
- Why is the autotransformer located on the primary side of the step-up transformer?
- What is happening to voltage and current at the step-up transformer?
- Why must alternating current be rectified before reaching the x-ray tube?
- What would happen if electrons were allowed to travel from anode to cathode during the negative half-cycle?
- How does the filament circuit differ from the high-voltage portion of the circuit?
- Why does the filament transformer need to be a step-down transformer?
- Where is mA controlled? Where is kVp controlled?
- If a component were removed, which components would prevent an exposure entirely and which would change the characteristics of the exposure?

Formative Assessment

During Practice Circuits and Full X-Ray Circuit, treat errors as part of instruction. Students should use Builder feedback to determine:

What is wrong → Why it is wrong → What electrical principle explains the correction

Instead of simply moving an incorrectly wired component after receiving feedback, ask: *"What does this error tell you about where this component belongs in the electrical pathway?"*

Summative / Independent Check

Use Assessment Mode after guided practice. A successful student should be able to select the necessary components, position them appropriately, wire the circuit correctly, distinguish the major circuit sections, and submit the completed circuit.

Pair the simulator result with 2-3 short explanation questions to verify conceptual understanding:

- Why is rectification necessary in the x-ray circuit?
- Explain what happens to voltage and current as electricity passes through the step-up transformer.
- Choose one circuit component and explain what would happen to x-ray production if that component failed.

Exit Ticket

"The part of the x-ray circuit that makes the most sense to me now is _____ because _____. The part I still need to review is _____."