Name: _____ Date: _____ Team: _____

Lab Experiment # 2

Operating the X-ray Control Console

Purpose

This lab exercise is designed to demonstrate how to convert the time of exposure to and from milliseconds and how to set a technique on an x-ray console.

Learning Objectives

After completing this lab, you should be able to:

1. Use the laboratory equipment properly.
2. Set up the control console correctly.
3. Function effectively in group work.
4. Perform the experiment independently.
5. Evaluate the effect of seconds and milliseconds on the exposure
6. Convert the exposure time from seconds to milliseconds.
7. Calculate the appropriate milliseconds to maintain image density.
8. Predict the effect of the change in seconds or milliseconds on image quality

Materials Needed

- High-frequency, digital control console

Pre-Lab Discussion

Units of Exposure Time

The exposure timers in use today vary with each x-ray machine. Most machines use seconds or milliseconds. Therefore, radiographers must be able to calculate and set the exposure time on the control console using seconds and milliseconds.

Relationship of Seconds to Milliseconds

Seconds (s)	Milliseconds (ms)
1.0	1000
0.8	800
0.75	750
0.667	667
0.6	600
0.5	500
0.4	400
0.333	333
0.25	250
0.2	200
0.167	167
0.1	100
0.05	50
0.017	17
0.008	* 8
0.004	4
0.002	2
0.001	** 1

* Shortest exposure time possible when using a ***single-phase*** imaging system

** Shortest exposure time possible when using a ***triple-phase*** or ***high-frequency*** imaging system

Millisecond Conversion

milli = m = 0.001

To change seconds to milliseconds – **multiply by 1,000**

$$\text{sec} \times 1{,}000 = \text{ms}$$

Example:

To convert 3 seconds to milliseconds:

$$3 \text{ sec} \times 1{,}000 = 3{,}000 \text{ ms}$$

Convert 0.04 seconds to milliseconds:

To change milliseconds to seconds – **divide by 1,000**

$$\frac{\text{ms}}{1{,}000} = \text{sec}$$

Example:

To convert 250 milliseconds to seconds:

$$\frac{250 \text{ ms}}{1{,}000} = 0.250 \text{ sec}$$

Convert 800 milliseconds to seconds:

Illustrated Thought Process

Here is a simple method for remembering the direction the decimal point must move.

To convert ***seconds*** to ***milliseconds***, move the decimal point three places to the **RIGHT**.

Ex. 0.500 seconds = 500 milliseconds

A. Write the following visual aid.

s ⟵ 3 ⟶ ms

B. Place the old time above the appropriate unit of measurement.

0.5
s ⟵ 3 ⟶ ms

D. Move the decimal point three (**3**) places in the direction of the arrow and place the converted time above the new unit.

0.5 **500**
s ⟵ 3 ⟶ ms

To convert ***milliseconds*** to ***seconds***, move the decimal point three places to the **LEFT**.

Ex. 660 milliseconds = 0.660 seconds

A. Write the visual aid.

s ⟵ 3 ⟶ ms

B. Place the old time above the appropriate unit of measurement.

660
s ⟵ 3 ⟶ ms

C. Move the decimal point three (**3**) places in the direction of the arrow and place the converted time above the new unit.

0.660 660
s ⟵ 3 ⟶ ms

Practice Drill – Illustrated Thought Process

1. A radiographic exposure requires 0.12 seconds.
   What <u>millisecond-equivalent</u> timer setting should you use?

   [_____]

s ⟵ 3 ⟶ ms

2. A radiographic exposure requires 300 milliseconds.
   What <u>decimal-equivalent</u> timer setting should you use?

   [_____]

s ⟵ 3 ⟶ ms

3. A radiographic exposure requires 0.044 seconds.
   What <u>millisecond-equivalent</u> timer setting should you use?

   [_____]

s ⟵ 3 ⟶ ms

4. A radiographic exposure requires 9 milliseconds.
   What <u>decimal-equivalent</u> timer setting should you use?

   [_____]

s ⟵ 3 ⟶ ms

Setting the Control Console

Lab Worksheet

1. What is the HIGHEST kVp value that can be set on your console?

2. What is the LOWEST kVp value that can be set on your console?

3. What is the HIGHEST mA station that can be set on your console?

4. What is the LOWEST mA station that can be set on your console?

5. What is the HIGHEST mA station that can be set on your console when using the small focal spot (small filament)?

6. What is the LOWEST mA station that can be set on your console when using the small focal spot (small filament)?

7. What is the HIGHEST mA station that can be set on your console when using the large focal spot (large filament)?

8. What is the HIGHEST mA station that can be set on your console when using the large focal spot (large filament)?

9. What is the LOWEST mA station that can be set on your console when using the large focal spot (large filament)?

10. What mA and time combinations on your console would generate **2** mAs when using small focal spot?

mA	Time (s)

11. What mA and time combinations on your console would generate **16** mAs when using small focal spot?

mA	Time (s)

12. What mA and time combinations on your console would generate **2** mAs when using small focal spot?

mA	Time (s)

2. ***List*** four ***exposure factors*** the radiographer sets on the operating console.

A. _____

B. _____

C. _____

D. _____

3A. ***Explain*** the effect of changing the mode of operation from **2-button mode** to **3-button mode**.

3B. Give an example of when the **2-button** mode of operation should be used.

3C. Give an example of when the **3-button** mode of operation should be used.

4A. ***Explain*** the effect of changing the focal spot size from **small** to **large** focal spot.

4B. Give an example of when the **small** focal spot should be used.

4C. Give an example of when the **large** focal spot should be used.