

### Activity B-3. Measuring Flash Duration

Goal: To learn how to measure the duration of the flash from an electronic flash unit

Prelab: Prepare your lab book in the usual way.

Equipment:

- Vivitar 283 flash unit
- 4 AA batteries
- 100-k $\Omega$  variable resistor
- High-frequency clock (clip clock)
- Electronic stroboscope

Method: The duration of the flash from a flash unit can't be read directly from a dial on the unit, but there are other methods of measuring it. The method that will be used in this activity is to set up a motor as a high-frequency clock. A black cardboard disc like that used in Activity A-3 is centered on the axle of a fan motor to serve as the clock face. A white, radial line painted on the disc serves as the hand of the clock. If the motor rotates fast enough, the hand produces a perceptible blur under the illumination of the electronic flash.

1. Clip the fan motor onto the edge of the table. Then turn the motor on to top speed. (Don't leave the motor running too long at one time, because it's not designed to rotate this fast indefinitely.) Use the electronic stroboscope to measure the frequency of the motor. Show your work on the calculations below.
  - a. Record your data and then calculate the clock frequency. Give your final result in units of flashes per second.
  - b. Calculate the time in seconds for the clock to make 1 full rotation.
  - c. Calculate how long it would take for the hand of the clock to move through an angle of  $1^\circ$ . This gives an approximate lower limit for the time intervals that the clock can measure.
2. In order to use the clock to make accurate measurements of flash duration, it's necessary to take photographs of the rotating disc. For this activity, however, you can simply view the disc and make relative judgments about the angle through which the hand moves. Set the flash unit on the purple automatic mode and point it at the rotating disc, about a meter away. Discharge the unit, watching the disc as you do so. Back up to greater and greater distances from the disc, noting the amount of blur each time. Then repeat with the flash unit set on the yellow automatic mode. Also try with the auto-thyristor set on M. Finally, make some tests with the 100-k $\Omega$  resistor replacing the auto-thyristor module. Describe the results of the tests.
  - a. effect of increasing distance:
  - b. effect of yellow compared to purple:
  - c. effect of M setting:
  - d. effect of increasing variable resistance:
3. Summarize what you've learned from this activity.