

Initial Setup by the Laboratory Assistant or Instructor

1. Adjust the feet of the apparatus until the guide poles are vertical. Adjustment can be checked by suspending the special plumb line from the screw at the bottom of the carriage. Remove the plumb line from the apparatus after these adjustments are completed.
2. Be sure that the spark timer is turned off. Connect the ground wire from the ground terminal of the spark timer to the ground terminal on the rail of the acceleration apparatus. Connect the high-voltage wire from the high-voltage output terminal of the spark timer to the terminal on the carriage. Be sure that the wire is supported in such a way that it will not be damaged when the carriage falls and in such a way that it will have a minimum effect on the motion of the carriage. Check the carriage fall several times before putting the waxed paper in place. The carriage should fall freely without touching the guide poles.
3. Put the waxed paper in place under enough tension to make it lie flat against the rail. Latch the carriage in position at the top of the frame. Attach a string to the latch for greater safety from high voltage when releasing the carriage.
4. Set the knobs on the spark timer for a frequency of 30 Hz and for operation with the remote pushbutton. Turn the power switch on.

Procedure, Data, and Calculations

1. See that the waxed paper tape is in place under enough tension to make it lie flat against the rail.
2. Latch the carriage in position at the top of the frame.
3. The spark timer has already been set for operation by remote pushbutton and for a pulse repetition frequency of 30 Hz. ("Hz" is the abbreviation for Hertz and means "cycles per second" or "pulses per second.") Thus, the time between successive pulses (Δt) is $1/30$ sec.

Warning: *While the spark timer is operating, you must keep your hand and any other parts of your body at least an inch (and preferably much farther) from any high-voltage points. These include the high-voltage terminal at the spark timer, the high-voltage terminal at the carriage of the free-fall apparatus, and the other metal parts on the plastic plate of the carriage. A string has been attached to the carriage latch to permit you to release the carriage with greater safety.*

4. Press the remote-control pushbutton of the spark timer; a fraction of a second later release the carriage by pulling gently on the string. When you hear the carriage hit the bottom bumpers, release the pushbutton.
5. Raise the carriage to the point where the two bars on the carriage are about to enter the two hollow tubes at the bottom of the frame. Draw a horizontal line on the waxed-paper tape to indicate the level of the needle at this time. The carriage slows down here, and any spark marks beyond this line should be ignored.
6. Remove the waxed-paper strip from the apparatus. Do this by releasing the paper clamp at the top of the rail and by pulling the tape through the slot in the rail. Tear the tape when you reach a clean portion beyond the spark record. Reattach the end of the remaining tape in the paper clamp, so that it will be ready for the next group of students.