PRICE $2.00

HEATH COMPANY • BENTON HARBOR, MICHIGAN

HEATHKIT®
OPERATIONAL MANUAL

HEATHKIT

EDUCATIONAL ELECTRONIC ANALOG COMPUTER

MODEL EC-1

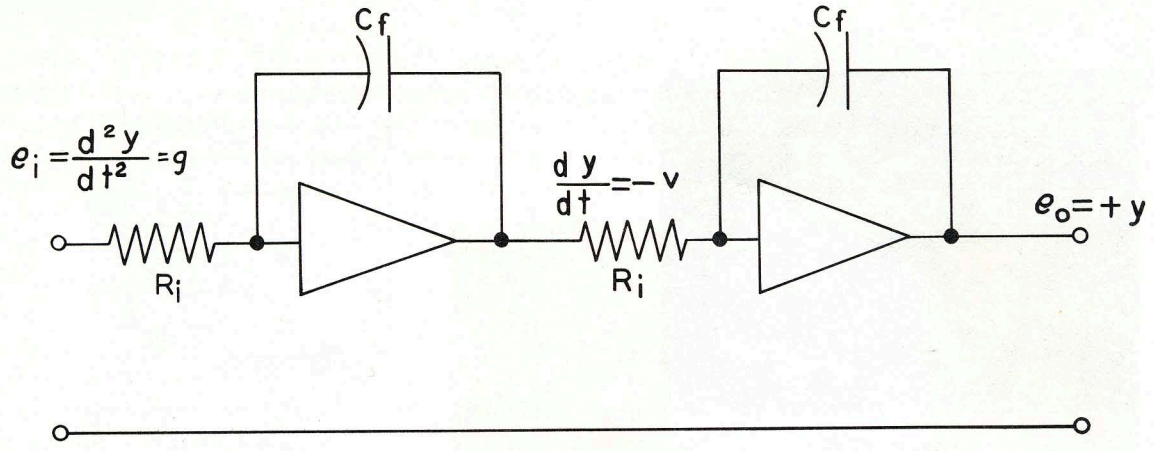

Figure 23

FALLING BODY PROBLEM CIRCUIT

The value of g is supplied by one of the IC power supplies. Some way must be provided for discharging the capacitors at the end of the solution of the problem. This can be accomplished by connecting the capacitor to the relay contacts which are open during solution of the problem and closed during the "reset" time.

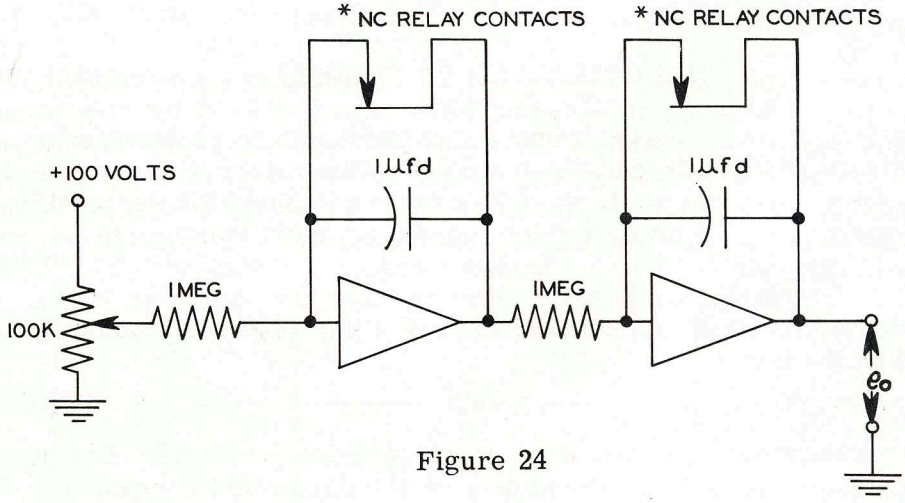

Figure 24

The 100 K potentiometer is the IC potentiometer. Connect a patch cord from the red binding post of IC-1 to the INPUT binding post of amplifier 1, and another patch cord from the black binding post of IC-1 to the black METER INPUT binding post above the meter. Plug a 1 megohm mounted resistor into the input socket of amplifier 1 (the one to which the patch cord is connected) and a 1 megohm resistor into either input socket of amplifier 2. Plug mounted 1 μfd capacitors into the feedback sockets of amplifiers 1 and 2. Connect a patch cord (short) from the output of amplifier 1 to the input of amplifier 2 (the one with the 1 megohm resistor). Connect patch cords from the AMPLIFIER INPUT binding post and AMPLIFIER OUTPUT binding posts to relay contacts 1 for amplifier 1 and relay contacts 2 for amplifier 2. Set IC-1 control to the first or second dot from the extreme counterclockwise direction. Set the METER RANGE switch to 100 V and the METER FUNCTION switch to AMPLIFIER OUTPUT 2. Turn the HIGH VOLTAGE switch to ON (the filament switch should previously have been turned to ON). Turn the OPERATION switch to MANUAL. The meter needle should move to the right, slowly at first, gaining speed as it moves. When the needle reaches 60-65 volts, turn the OPERATION switch to RESET which will discharge the capacitors, making the computer ready to again solve the problem. If the meter needle moves too slowly, turn the IC control clockwise; if the needle

* Normally closed.

moves too rapdily, turn the control counterclockwise. Turn the OPERATION switch to REPETITIVE. The computer will now reset itself and repeat the solution at a rate controlled by the REPETITION RATE control knob. This will continue until the OPERATION switch is returned to the RESET position. If a permanent record of the solution is desired, a pen recorder may be connected to the AMPLIFIER OUTPUT binding posts above the meter.

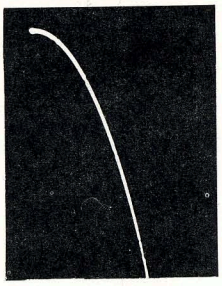

Figure 25 A

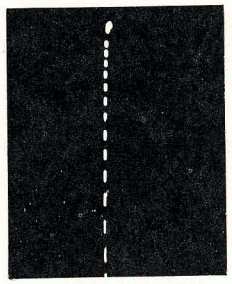

Figure 25 B

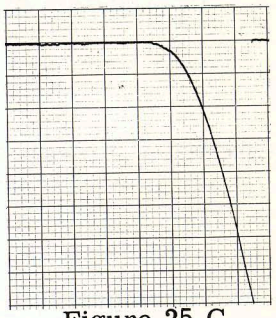

Figure 25 C

SOLUTION OF FALLING-BODY PROBLEM

(a) As observed on oscilloscope. Body was given initial horizontal velocity.
(b) As observed on oscilloscope (no initial horizontal velocity). The dashes represent equal time intervals, showing the increased distance traveled during each succeeding time interval.
(c) As recorded on pen recorder.

The solution may be viewed on a DC oscilloscope, such as the Heath DC Oscilloscope, by connecting the vertical input of the oscilloscope to the red AMPLIFIER OUTPUT binding post and the ground to the black AMPLIFIER OUTPUT binding post. No sweep is needed to show the falling body, but if one wants to show the path when an initial horizontal velocity is given the body, a sweep voltage is necessary. To insure synchronization, one of the computer amplifiers should be used as the sweep generator for the oscilloscope, as shown in Figure 26.

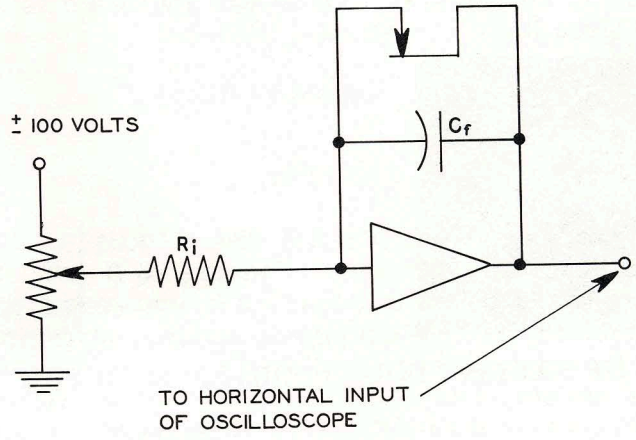

Figure 26

AMPLIFIER USED AS SWEEP GENERATOR

The ±100 volts is obtained from one of the IC power supplies, using + or -, depending on the direction of sweep desired. Set the IC control until the desired rate of sweep is obtained. The values of R_i and of C_f should be the same as those used in the problem.

If a faster rate of solution is desired, the 1 megohm resistors should be replaced by 0.1 megohm resistors and the 1 μfd capacitors by 0.1 μfd capacitors, adjusting the REPETITION RATE control accordingly.