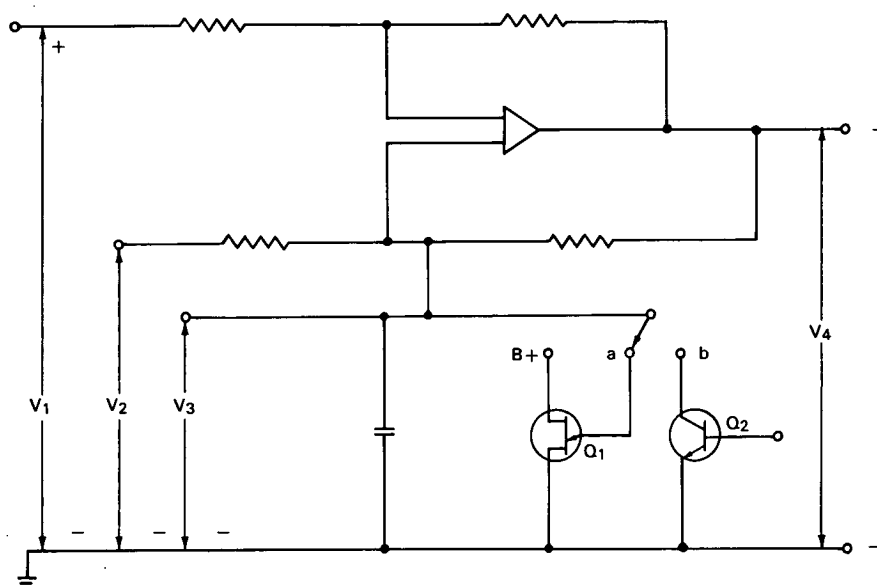


# NASA TECH BRIEF



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## Integrator Can Easily Be Set and Reset with an Electronic Switch



### The problem:

To design an integrator circuit that can easily be set and reset to some initial condition using an electronic switch. A conventional integrator uses an operational amplifier with negative feedback applied from the output terminal to the inverting input via a capacitor. It is frequently desirable to use an electronic switch to set and reset the capacitor to some initial condition, and this is made difficult because the capacitor is floating.

### The solution:

An integrating circuit that uses a single grounded capacitor, four equal resistors, and an operational amplifier.

### How it's done:

With high quality operational amplifiers the integrator circuit shown will work well with resistor values from a few kilohms to many megohms, and with capacitors from a few hundred picofarads to hundreds of microfarads. Component tolerance depends on the accuracy desired. In general, the design philosophy and component selection has been to minimize error introduced by deviation from the idealized circuit. The capacitor leakage should be low, the amplifier should have high open-loop gain, high input impedance and low output impedance. The input voltage and current offsets should be low, and thermally stable. The resistor value selected should not be too low because of reduction of the circuit's input

(continued overleaf)

impedance. Neither should it be too high because of offsets due to leakage current.

**Notes:**

1. An integrator was constructed at Ames Research Center and used as a linear ramp generator in a ratemeter circuit. It utilized the following component values:

- R = 10,000 ohms
- C = 1 microfarad
- power =  $\pm 15$  volts
- Q<sub>1</sub> = 2N2 646
- Q<sub>2</sub> = 2N3 565

2. Inquiries concerning this invention may be directed to:

Technology Utilization Officer  
Ames Research Center  
Moffett Field, California 94035  
Reference: B67-10135

**Patent status:**

Inquiries about obtaining rights for the commercial use of this invention may be made to NASA, Code GP, Washington, D.C. 20546.

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