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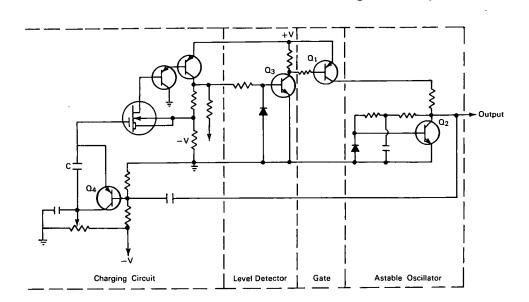
## Brief 65-10206

## NASA TECH BRIEF



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Sensitive Electrometer Features Digital Output



**The problem:** To design an electrometer that will measure very low currents (10-6 to 10-12 amperes) and produce a digital output linearly related to the magnitude of the input.

**The solution:** A four-stage, transistorized electrometer consisting of a charging circuit, a level detector, a gate, and an astable oscillator, plus a feedback loop to reset the charging circuit.

**How it's done:** The gate transistor  $Q_1$  is normally not conducting and prevents the positive supply from being applied to the astable oscillator  $Q_2$ . The astable oscillator, therefore, generates no output. When an input current is applied to the circuit, capacitor C starts to charge. When the charge on C reaches some predetermined level, the level detector  $Q_3$  is triggered. The level detector turns the gate  $Q_1$  on and a positive voltage is applied to  $Q_2$ , which generates an output pulse. The trailing edge of this pulse is fed back to  $Q_4$ , which turns on and discharges C, returning it to zero charge level. The level detector  $Q_3$  is no longer energized and the gate  $Q_1$  turns off. This process is repeated, producing a series of pulses from the oscillator  $Q_2$ . Because the time required for C to charge depends on the magnitude of the input current, the frequency of the output pulses from  $Q_2$  is a direct indication of input current magnitude. **Notes:** 

- 1. This circuit eliminates the need for a logarithmic compression network, a temperamental feature of prior circuits.
- This electrometer will permit advantage to be taken of the capabilities of state-of-the-art sensors in very low current ranges (10<sup>-6</sup> to 10<sup>-12</sup> amperes).

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3. Inquiries concerning this invention may be directed to:

Technology Utilization Officer Goddard Space Flight Center Greenbelt, Maryland, 20771 Reference: B65-10206 **Patent status:** NASA encourages the immediate commercial use of this invention. Inquiries about obtaining rights for its commercial use may be made to NASA, Code AGP, Washington, D.C., 20546.

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