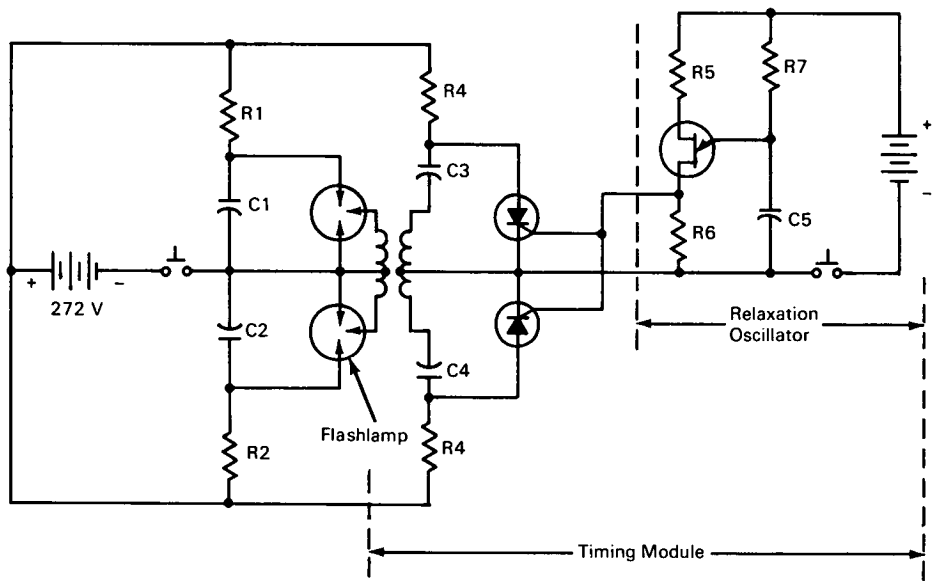
NASA TECH BRIEF

High-Intensity Flashing Beacon Powered by Mercury Cells



The problem: To design a lightweight, rugged, self-contained flashing beacon with an effective intensity of a second-magnitude star to a dark-adapted eye at a distance of 10 statute miles. The beacon must flash once each second for a minimum of five hours and must withstand shock and vibration.

The solution: A pair of xenon flashlamps powered by mercury batteries in a transistorized circuit. The entire set of components, with the exception of the flashlamps, is potted in silicone rubber and enclosed in a spherical aluminum shell. The weight of the assembly is approximately 10 pounds.

How it's done: The flash lamp circuit incorporates two power supplies and a timing module which includes a relaxation oscillator.

The lamp power supply consists of a battery of mercury cells connected in series to provide an open-circuit voltage of approximately 272 volts. This supply will deliver 185 milliamps of peak current each second for a minimum of 5 hours. The supply charges storage capacitors C1 and C2 (through resistors R1 and R2), and also capacitors C3 and C4 in the timing module.

One second after the switches are closed, the unijunction transistor in the relaxation oscillator turns on the silicon controlled rectifiers in the timing module. The capacitors C3 and C4 then discharge through the ignition transformers, causing an ionizing potential to be applied to the flashlamps. Each lamp emits approximately 100 lumen-seconds of light.

(continued overleaf)

The relaxation oscillator power supply also consists of a battery of mercury cells. The frequency of the relaxation oscillator is controlled by R7, C5, and the intrinsic standoff ratio of the unijunction transistor. R5 is a temperature compensation resistor for C5.

Notes:

1. The flashing beacon was designed for use in the NASA Flashing Satellite Program. The packaging configuration, weight, number of flashlamps, and flash frequency can be easily modified for application of the beacon as a maritime rescue marker or other luminous signal device.
2. Further information concerning this innovation is given in NASA TN D-2377, "Flashing-Beacon Experiment for Mercury-Atlas 9 (MA-9) Mission" by Charles C. Laney, Jr., available from Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia, 22151. Inquiries may also be directed to:

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   Reference: B65-10361

Patent status: NASA encourages commercial use of this innovation. No patent action is comtemplated by NASA.

Source: (Langley-80)