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Brief 70-10534

AEC-NASA TECH BRIEF

Circuit Minimizes Current Drain Caused by Neon Indicator Lamps

The problem:

Neon indicator lamps place high loads on the circuitry being monitored, requiring the loading effect of the indicator to be considered in the circuit design. In addition, loading usually occurs in the worst possible situation, i.e., when the driving transistor is in the OFF state. Thus, any current fed back from the device lowers the voltage necessary for the indication.

The solution:

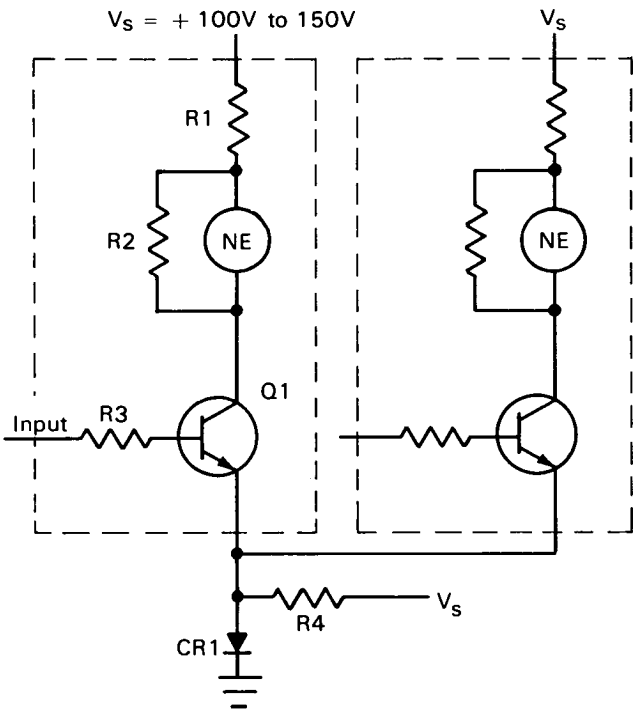
A circuit is provided which will light the neon lamp by the back leakage current of the driving transistor, rather than by the transistor's saturation or "on-state" current.

How it's done:

In the circuit shown, a high voltage switching transistor Q1 is used as a buffer switch to control the operation of the neon lamp. The resistor R1 limits the lamp current while resistor R2 equalizes the potential between the electrodes of the lamp when the switch is in the OFF state so that the lamp will be completely extinguished. The input levels are: zero volts for a lighted indication, and a negative potential in excess of five volts for the extinguished condition. These voltage levels may be varied as a function of the resistance R3.

Resistor R3 establishes the on-off bias for Q1. The OFF current is derived from the collector load resistor of the driving circuit, when this driving circuit is in the cutoff state (negative voltage input to R3). The OFF current for transistor Q1 is limited by this base resistor R3 and by the back leakage current of the transistor itself (2 to 7 nanoamperes).

The ON current of the device (lighted condition) is derived from the back leakage current of Q1 which



develops a biased current across R3, causing Q1 to conduct. In order to develop this biased voltage, the emitter of Q1 must be at the same voltage reference point as the input side of R3, when the driving circuit is in the ON or saturated state (output close to zero volts potential). For this reason, two components, CR1 and R4, are used to establish a slight positive potential at the emitter of the indicator transistors. Only one R4-CR1 combination is required for a significant number of indicator devices. In actual practice, R4 and CR1 are not necessary in most transistor logic; however, if the driving transistor is a silicon device, this combination probably will be required.

(continued overleaf)

Notes:

1. This circuit provides an operating speed beyond that possible with any indication circuit using a saturation principle.
2. The technique is of major significance to ground, underwater and airborne computer design (status of flip-flops, gates and delay devices), or in any situation where power must be rationed.
3. Inquiries concerning this innovation may be directed to:

   Technology Utilization Officer
   AEC-NASA Space Nuclear Propulsion Office
   U.S. Atomic Energy Commission
   Washington, D.C. 20545
   Reference: B70-10534

Patent status:

No patent action is contemplated by the AEC or NASA.

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