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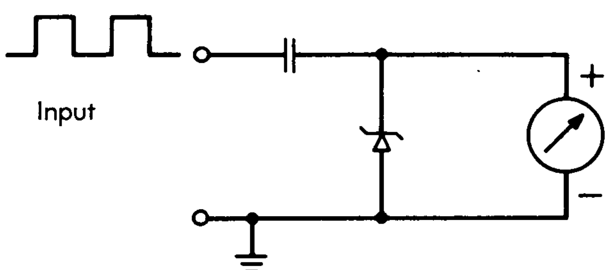
A Simple Tachometer Circuit

The problem:

To measure the frequency of a repetitive sinusoidal or rectangular wave with a simple circuit instead of the highly precise devices ordinarily employed as frequency meters, event counters, etc.



The solution:

A simple tachometer consisting of a capacitor, a Zener diode, and an indicating meter.

How it's done:

The circuit consists only of three components, a capacitor, a Zener diode, and a high-resistance meter. For the circuit indicated in the diagram, the input signal must be a positive-level square wave of the type such as may be obtained when the input terminals of the tachometer are connected to the breaker points of an automotive distributor; alternatively, when used for other purposes, a positive-pulse input signal may be provided by appropriate electronic circuitry. The Zener diode and the meter terminals must be reversed if negative levels are to be indicated.

The circuit operates as follows when used as a tachometer for an automobile engine: The condenser is in a zero-charge state when the points are closed because the input terminals are shorted (grounded). When the points open, the voltage at the input terminal suddenly rises to a positive level of eight to twelve volts. If the diode has been chosen to have a Zener potential of about six volts (or any value less than the input voltage), it will conduct. Charge will be transferred rapidly to the capacitor because the product of the diode's resistance and the capacitor is small (R_ZC); very shortly thereafter, the voltage across the diode builds up to the point where conduction through the diode no longer occurs. Additional charge will be transferred to the capacitor through the larger resistance of the meter until the capacitor is fully charged. The additional charge transferred to the capacitor is E_ZC (where E_Z is the Zener voltage), and it is independent of the input voltage. The meter resistance R_M and the capacitor are chosen so that the time constant R_MC is small in comparison with the time between the opening and closing of the distributor points at the highest engine speed of concern; the charging process will be completed during each successive opening of the points.

The product of a fixed charge flow per closure and the number of closures per unit time represents the flow of current in the meter; thus, the meter indication is directly proportional to the rpm of the engine. Moreover, since the charge transferred depends only on the Zener voltage and the capacitance, the simple circuit provides accurate indication of rpm independent of the voltage appearing at the terminals.

When the distributor points are closed, and the capacitor is at input voltage, closure of the distributor points suddenly decreases the charge on the input plates of the capacitor; the charges on the plates on the meter side of the capacitor are also decreased,

(continued overleaf)

causing a negative voltage to appear across the meter terminals. The high negative voltage causes a current to flow through the meter since its resistance is much higher than the diode resistance.

Note:

No additional documentation is available. Specific questions, however, may be directed to:

Technology Utilization Officer
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Reference: B72-10308

Patent status:

Inquiries about obtaining rights for the commercial use of this invention may be made to:

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