

Optoisolator initializes signal-averaging circuit

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Long-term averaging circuits require an initializing voltage on their capacitive storage element in order to become almost immediately operational on power up. Here, an optoisolator is used to quickly charge the capacitor with a voltage derived either from the input signal itself or from any dc voltage, the two sources most widely used. The optoisolator circuit is superior to an initializer that uses a relay, which, besides having the disadvantage of being electromechanical, also draws power continuously.

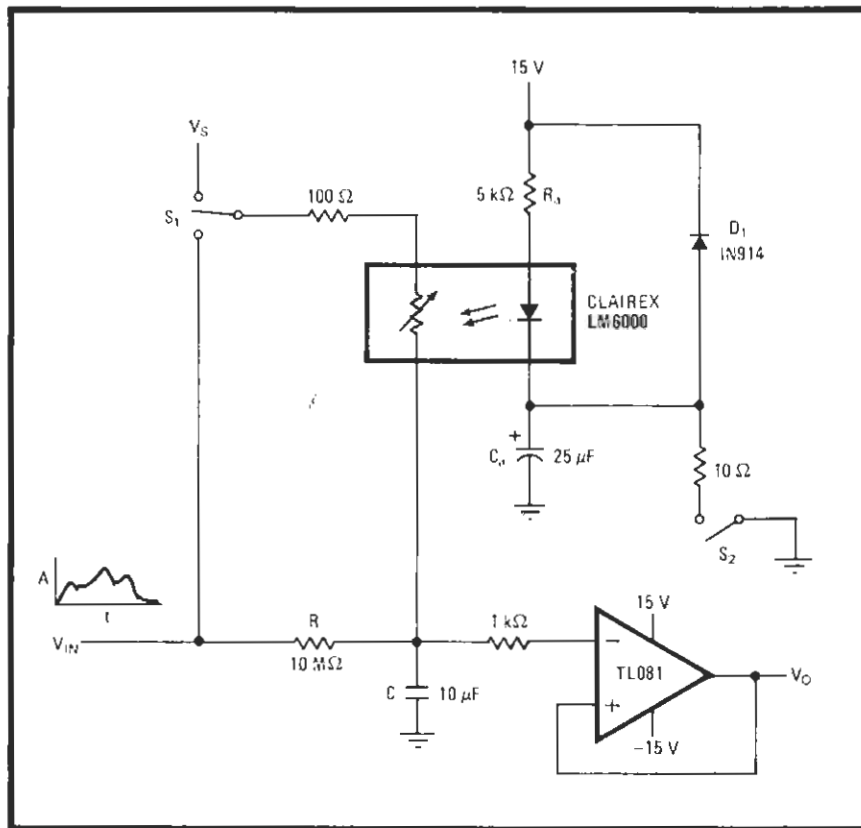
In a circuit that averages a signal over a long period (see figure), the resistor-capacitor (RC) time constant may be on the order of a minute or more. Thus, the output of the averager (V_o) during the time $t = 0-1$ minute is considered to be the circuit's transient response to the input signal, where t is measured from the time that power is applied to the circuit. In most cases, especially when the circuit is part of a more complex system, it is not feasible to wait that long before the RC

network starts generating a true average value.

The difficulty may be circumvented by using an optoisolator and a switch, S_1 , to charge C on power up. Assume it is desired to charge C from a dc voltage, V_s . When power is applied, C_s , which may be 25 microfarads or more, is charged through R_s . Consequently, as current flows through the photodiode, the value of the photoresistance element in the LM 6000 optoisolator is reduced from more than 10^9 ohms to about 1 kilohm. Thus, in a few tens of milliseconds, C charges to V_i through the element, if S_1 is placed in the V_s position. As C_s becomes fully charged, the resistance of the element quickly increases to at least 10^9 ohms, and the circuit is ready to operate in its intended averaging mode.

When power is removed, C_s discharges through D_1 , so that the on-off power cycle can be repeated fairly rapidly. C also discharges slowly through R . This action is of little consequence in circuit operation on a subsequent power up. Note that S_2 , a momentary-contact switch, allows the resetting process to be repeated at any time, even while the circuit is active.

To initialize C from the input signal, it is only necessary to connect S_1 to V_{in} prior to power up (or at any time if S_2 is utilized). Otherwise the initializing operation is the same as before. □



Speedy average. Optoisolator enables long-term averager to operate almost immediately after power up by presenting an initializing voltage to circuit's sampling capacitor, C . Charge is introduced through isolator's low-resistance photoelement. Either a dc voltage or the input signal can be used as the initializing source.