



Fig. 6.10. The complete circuit diagram of the integrator switch

adjust VR1-VR4 on the resistor panel for optimum accuracy on each range.

INTEGRATOR MODE SWITCHING

The simplest type of integrator switch employs a mechanical relay with several sets of contacts, driven by an astable multivibrator, and this system is used for small demonstration and educational analogue computers. The relay is arranged to "gate" the inputs of several amplifiers simultaneously.

The PEAC integrator switch goes a stage further, with reed relays for a "clean" switching action at high speeds, full initial condition facilities, and a circuit based on two independently timed monostable multivibrators.

Referring back to the basic integrator switch shown in Fig 1.2c, two changeover switches S1 and S2 are opened and closed in a pre-determined sequence, governed by an external timing circuit. It is important to ensure that integrating amplifier input resistors are not left floating when they are disconnected from the virtual earth summing junction, as this could seriously disturb input and other computer voltages, hence the presence of S1 and S2 earthed contacts.

DIODE CLAMPS

To eliminate the need for expensive reed switches with changeover contacts, diode clamps can be used instead of an earthed contact, see the alternative

amplifier circuit of Fig 6.9. The diodes do not interfere with the normal working of the integrator, but will nevertheless hold resistor junctions close enough to earth to prevent load variations when S1 and S2 are open, and this modification more than halves the cost of switching components.

In the block diagram of Fig 6.9, the 1st monostable—controlled by VR18—determines the period of closure of S1. When S1 opens after a timed interval, a pulse is delivered to the input of the 2nd monostable, thus closing S2. S2 will remain closed for an interval controlled solely by VR19.

For "single shot" operation, a trigger pulse applied to the 1st monostable input, when S8 is switched to "hold", will initiate the closure of S1 (reset) and bring the integrating amplifier to its initial condition.

As soon as S1 opens, S2 closes (compute) and connects input resistors to the summing junction. At the end of the compute period, S1 and S2 are both open (hold), the monostables are quiescent, and the amplifier output voltage is held steady by the action of capacitor C_i . The next computer run is started by another trigger pulse applied to the 1st monostable input.

Repetitive operation is achieved by passing the output pulse from the 2nd monostable back to the input of the 1st monostable, when S8 is switched to "repeat". S1 and S2 are then made to open and close alternately, and the "hold" facility is deleted.