VOLTAGE-BASED CONTROLLER FOR SWITCHES

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Here's a simple circuit for controlling four switches from a distance through just a pair of wires.

In the circuit, the inverting inputs (pin 2) of operational amplifiers IC1 through IC4 are set to refrence voltages of + 12V, + 9V, + 6V, and + 3V, respectively, through a chain of four 1k resistors (R1 through R4).

The reference voltage (V_{REF}) can be simply calculated by the following relationship:

$$V_{REF} = \frac{\text{Total applied voltage} \times \text{Resistance across reference voltage}}{\text{Total resistance}}$$

For example, reference voltage V_{REF3} is calculated as follows:

$$V_{REF3} = \frac{12V \times (R3 + R4)}{R1 + R2 + R3 + R4} = \frac{12V \times 2k}{4k} = 6V$$

The non-inverting inputs (pin 3) of the four op-amps (IC1 through IC4) are tied together and connected to a pair of wires that provide + 3V to + 12V input voltage for controlling the switches.

Four 12V, 200-ohm, single-changeover relays are connected to four BC548 relay driver transistors (T1 through T4) via resistors R5 through R8, respectively. These relays energise depending on the voltage present at the controlling voltage input terminal; for example, relay RL4 energises when controlling voltage input of + 3V is available at non-inverting pin 3 of IC4. Four electrical equipment can be connected to the terminals of the relays through the 220V AC, 50Hz mains.

This circuit, excluding relays, costs around Rs 60.