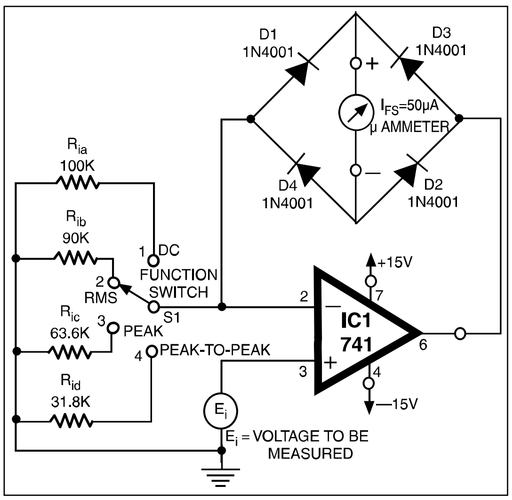
UNIVERSAL HIGH-RESISTANCE VOLTMETER

The full-scale deflection of the universal high-input-resistance voltmeter circuit shown in the figure



depends on the function switch position as follows:

(a) 5V DC on position 1

(b) 5V AC rms in position 2

(c) 5V peak AC in position 3

(d) 5V AC peak-to-peak in position 4

The circuit is basically a voltage-to-current converter. The design procedure is as follows:

Calculate R_I according to the application from one of the following equations:

(a) DC voltmeter: R_{IA} = full-scale E_{DC}/I_{FS}

(b) RMS AC voltmeter (sine wave only): R_{IB} = 0.9 full-scale E_{RMS}/ I_{FS}

(c) Peak reading voltmeter (sine wave only): R_{IC} = 0.636 full-scale E_{PK}/I_{FS}

(d) Peak-to-peak AC voltmeter (sine wave only): R_{ID} = 0.318 full-scale $E_{PK\text{-}TO\text{-}PK}$ / I_{FS}

The term I_{FS} in the above equations refers to meter's full-scale deflection current rating in amperes.

It must be noted that neither meter resistance nor diode voltage drops affects meter current.

Note: The results obtained during practical testing of the circuit in EFY lab are tabulated in Tables I through IV.

A high-input-resistance op-amp, a bridge rectifier, a microammeter, and a few other discrete components are all that are required to realise this versatile circuit. This circuit can be used for measurement of DC, AC RMS, AC peak, or AC peak-to-peak voltage by simply changing the value of the resistor connected between the inverting input terminal of the op-amp and ground. The voltage to be measured is connected to non-inverting input of the op-amp.

E_{dc} input	Meter Current

E_{rms} input	Meter Current

E_{Pk} input	Meter Current

$E_{Pk\text{-}To\text{-}Pk}$	Meter Current