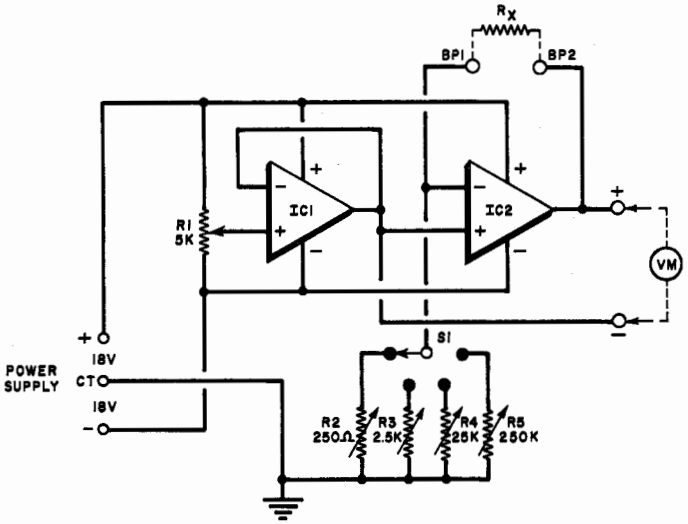
Readers Circuit. If you've used an ohmmeter to any extent, you've probably been frustrated on several occasions when trying to interpolate a value at the "squeezed" end of the nonlinear scale found on most such instruments. A little frustration apparently was too much for reader M. J. Guenther (1169 Prairie Rd., Port Coquitlam, B.C., Canada), for he put on his thinking cap and devised a *linear scale* ohmmeter, which he proceeded to build and has been using for some time. His circuit is illustrated above.

Guenther's design features a pair of op amps, *IC1* and *IC2*, a reference voltage source, established by *R1*, various ranges, selected by *S1*, and a voltmeter readout. Test terminals *BP1* and *BP2* are provided for checking unknown resistance (*Rx*) values.

The reference voltage obtained from *R1*, stabilized by voltage follower *IC1*, is applied to *IC2*'s non-inverting input. At the same time, *IC2*'s output is coupled back to its inverting input through a voltage divider consisting of the unknown resistor, *Rx*, and a preselected range resistor, *R2* thru *R5*. The net result is that *IC2*'s output voltage is equal to the reference voltage plus the reference voltage times the ratio of the unknown and range resistors. When a voltmeter is used to check the potential difference between *IC2*'s noninverting input and its output, the initial reference voltage is cancelled, giving a reading which is *directly proportional* to the unknown resistor's value, the basic requirement for a linear scale.

Guenther used type 741C op amps in his model, but suggests that a single type 747 dual op amp or other 741 types may serve as well. The pin connections will vary, of course, depending on whether a DIP, TO, or minidip type device is used. Range selector *S1* is a single-pole, four-position rotary switch, *R1* a conventional linear potentiometer, and *R2, R3, R4* and *R5* are small trimmer pots, although full-sized controls may be used. A dual 18-volt regulated (or zener stabilized) dc power supply is required for operation, while the readout instrument should be a high-impedance VTVM or FET VM.



Linear scale ohmmeter uses two intergrated circuits. When the circuit is properly balanced (via range switch and potentiometers), the meter reading is proportional to the unknown resistor.

In his letter, Guenther writes that he assembled his model as part of a home-built FET voltmeter, providing a pushbutton switch between *IC2*'s output and the voltmeter's input to prevent an off-scale reading when the test terminals are open.

Except for establishing the readout voltmeter range, the reference voltage adjustment, *R1*, is completely noncritical, according to Guenther. He suggests calibrating the instrument by using mid-scale value precision (1% or better) resistors as test units to adjust each range potentiometer. In his model, Guenther used test resistors (as *Rx*) of 50, 500, 5,000, and 50,000 ohms, adjusting *R2, R3, R4,* and *R5,* respectively, to provide ranges of 0-100, 0-1,000, 0-10,000 and 0-100,000 ohms.