Circular slide rule provides quick results

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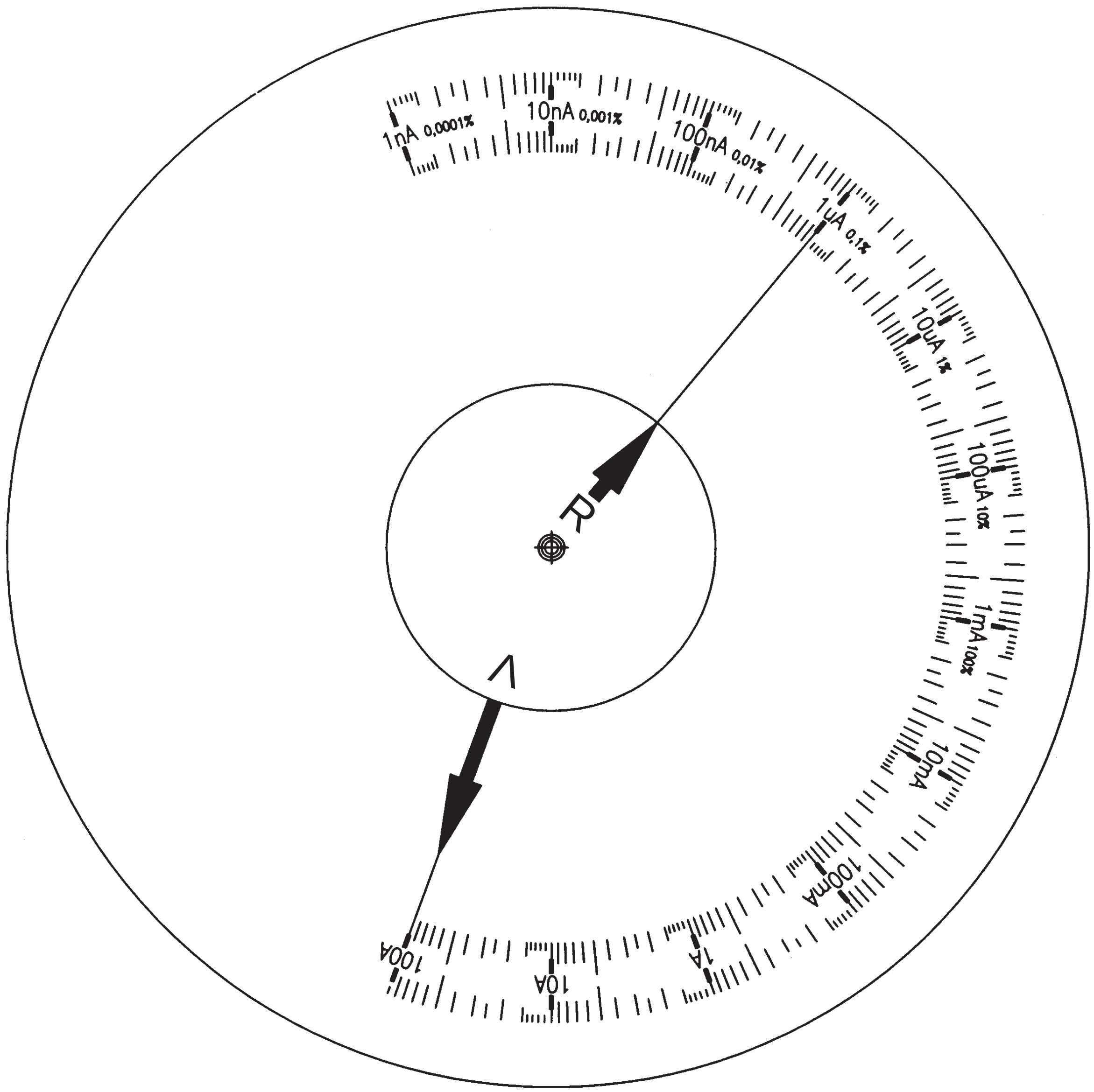
In analog-circuit design, most calculations you make need not be very precise. If you need an LED-current calculation or a coupling-capacitor value, for example, ±5% or even ±10% accuracy is usually adequate. It's sometimes inconvenient to make these calculations with a pocket calculator. For example, finding the cutoff frequency of a 3.3-kΩ/47-pF network requires approximately 20 key presses. The circular slide rule using the patterns in **Figures 1** through **4** simpli-

FIGURE 1

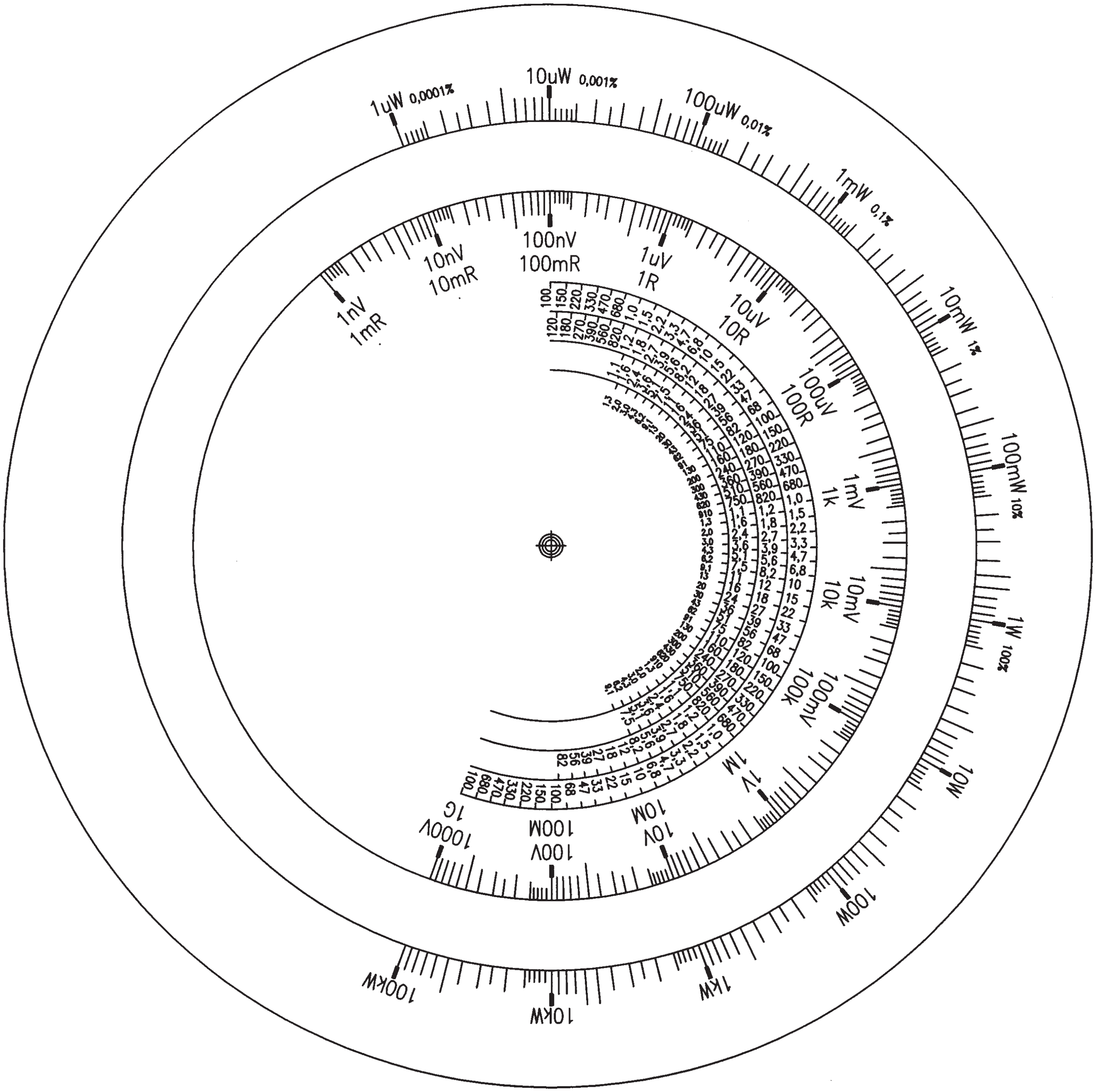


This wheel, using transparent material, gives current values of 1 nA to 100A.

fies such calculations. The slide rule uses one large, opaque, double-sided wheel and two smaller, transparent wheels.

You can make the opaque wheel by gluing back-to-back the patterns in **Figures 2** and **4**. For the transparent wheels, you simply photocopy the patterns in **Figures 1** and **3** onto overhead-transparency foils. To attach the wheels, you can use a rivet or a screw and nut. Using side A (**Figures 1** and **2**), you can calculate resistance (V/I), power (VI), and percentage products (Δ=δ·X, where δ is a percentage). X can be voltage, current, power, or resistance. Side A also gives stan-

FIGURE 2



This wheel, an opaque background, gives voltage, current, power, and dissipation-factor percentages. The inner rows give standard EIA resistance values.

dard EIA values for resistance.

$$\tau = RC,$$

$$F_C = \frac{1}{2\pi RC},$$

$$X_C = \frac{1}{2\pi fC},$$

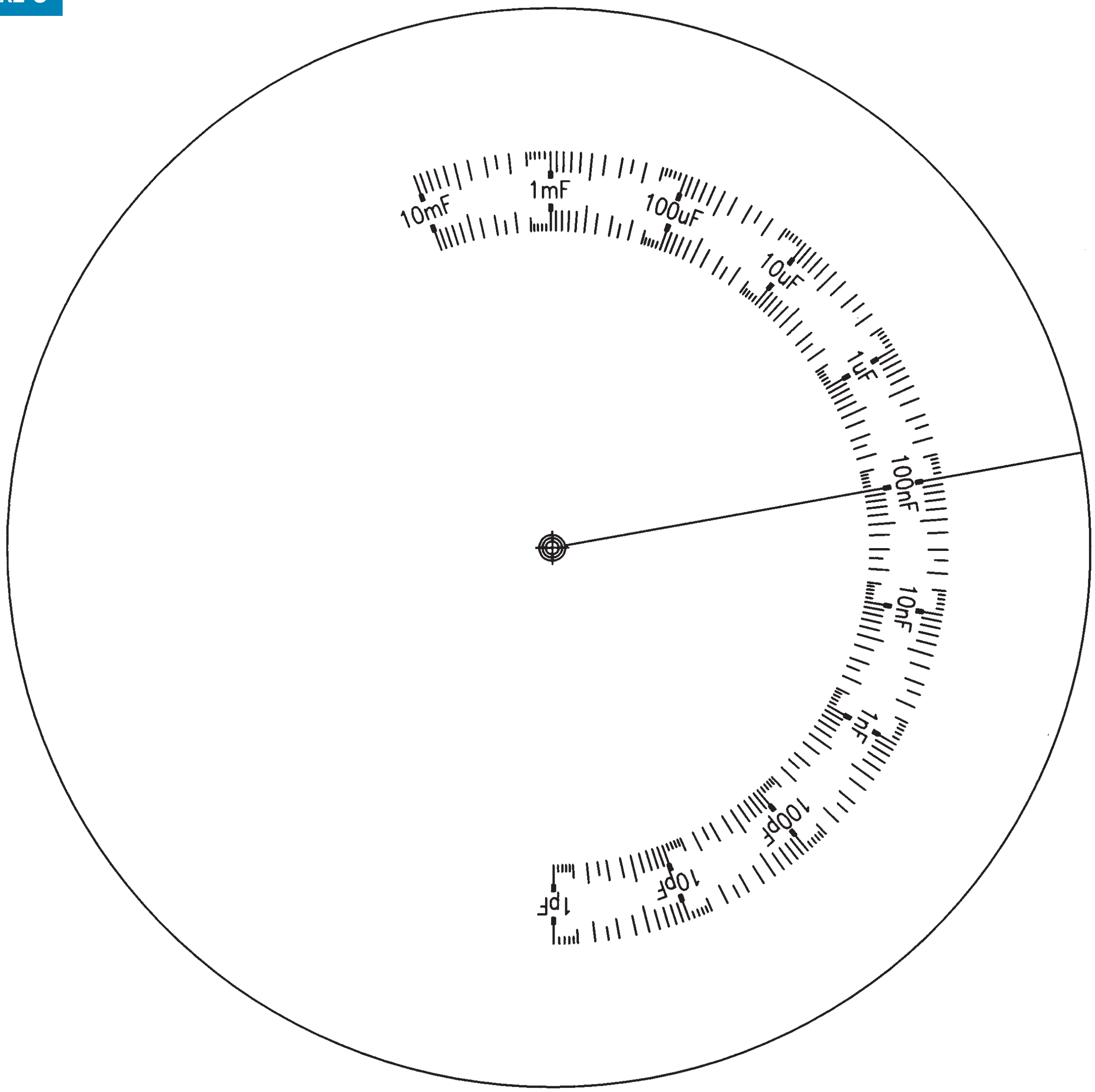
$$F_{RES} = \frac{1}{2\pi\sqrt{LC}},$$

$$T = \frac{1}{f}.$$

On side B (**Figures 3** and **4)**, you can calculate the following formulas:

$$F_{RES} = \frac{1}{2\pi\sqrt{LC}},$$

FIGURE 3



This wheel, copied onto transparency material, gives capacitance values from 1 pF to 10 mF (10,000 µF).

$$L = \frac{1}{4\pi^2 (F_{RES})^2 C},$$

Any quantity can be the unknown. For example, you can calculate

$$C = \frac{1}{4\pi^2 (F_{RES})^2 L}.$$

You can modify the slide rule to incorporate the formulas you use most often. The design of the slide rule uses AutoCAD LT. (DI #2137)

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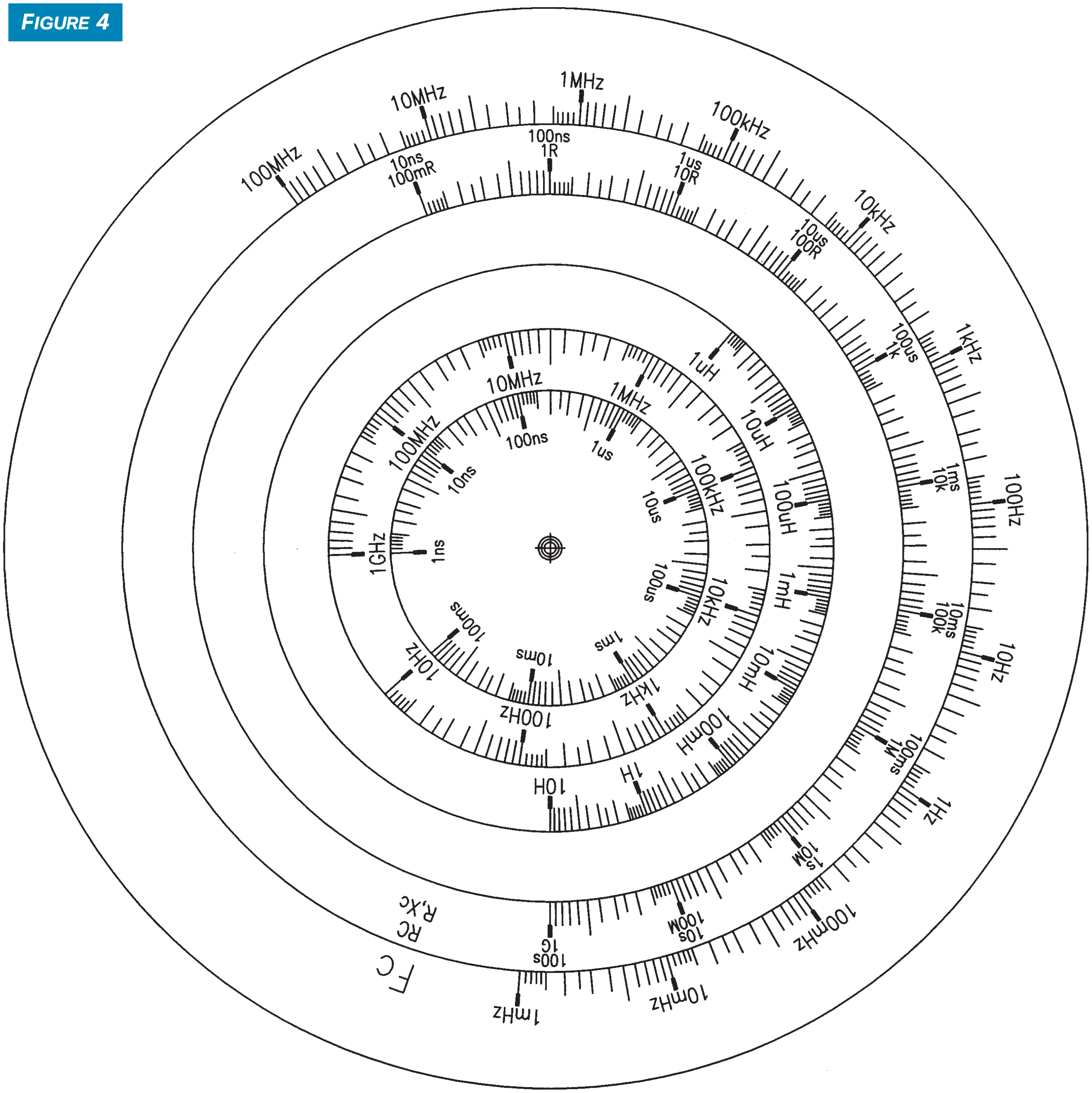
FIGURE 4



This wheel, the opaque backing for the wheel in Figure 2, relates resistance, frequencies, and time constants to the capacitance values on the wheel in Figure 3.