True North, use it to calibrate your compass. Take your compass and sight along the line. Record the angle of variation between the line and magnetic north, as indicated on the compass.

Remember that if variation is west, add the deviation to the compass reading, and subtract deviation when it is east. If you want to point the dish toward the west (270°) and variation is 12° west, simply aim the dish on a compass heading of 282 degrees (270 + 12). If variation is 8 degrees east then aim for 262 degrees.

BALUN FOR TV RHOMBIC WHERE'S THE FIGURE?

You answered a question in your August issue regarding a balun for a rhombic antenna. You referenced a figure, but I couldn't find any. Am I missing anything?—G.S.W., New York, NY.

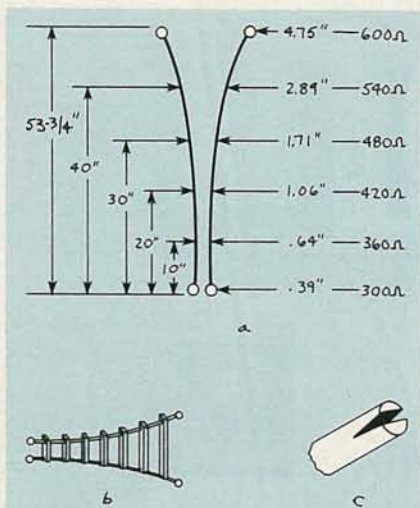No. Your weren't missing anything, but we certainly were missing something! The figures that we

FIG. 2

referred to are shown here in Fig. 2. Please accept our apologies for that embarrassing omission.

ELECTRONIC TIME DELAY

Please show me how to build a time-delay circuit that can be adjusted for up to five minutes. Either an electromechanical or a solid-state relay will be OK.—C. C. S., Holiday, FL.

Figure 3 shows the circuit of an inexpensive general-purpose timer based on a 555 IC. The time delay T in seconds is:

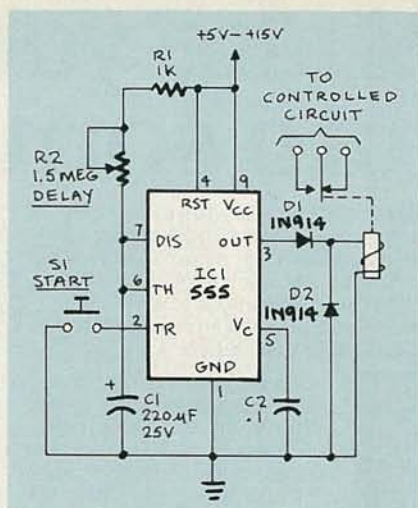$$T = 1.1 \cdot C1 \cdot (R1 + R2)$$

Resistances should be specified in

FIG. 3

megohms and capacitance in microfarads. The sum of R1 and R2 should not be less that 1000 ohms nor higher than 20 megohms. Pressing S1 starts the timing cycle. You could use a low-going pulse, instead of S1, to initiate the timing cycle.

Suppose that you have a good 5-megohm linear pot that you want to use as the adjustable control. Then C1 = 300 / (1.1·5) = 55 µF. Since that's not a standard value, use the next highest standard value, 75 µF. The actual value of a device with 20% tolerance can range from 60 to 90 µF. So the maximum time delay (with R2 at 5 megohms) will be 5 minutes and 30 seconds if the value of C1 is 60 µF, or 8 minutes and 15 seconds if C1 is 90 µF.

With the values shown in the diagram, and allowing for the tolerances of the 200-µF capacitor, the delay will range from 4 minutes and 50 seconds to 7 minutes and 26 seconds.

The output terminal, pin 3, of a 555 is normally low and switches high during the timing cycle. The output can either sink or source currents up to 200 mA. Therefore a load such as a relay coil can be connected between pin 3 and V_{CC} or between pin 3 and ground, depending on circuit requirements. When the relay is connected between pin 3 and ground, as in Fig. 3, it is normally de-energized, so it is energized only during the timing cycle. Connecting the relay to ground will save power and allow the IC to run cool. **R-E**