

**Use lossy chokes  
to cut vhf noise  
on TTL boards**

Here's a solution to the noise problem on TTL power supply lines. Iklil Kayihan of the Technical University of Istanbul notes that if you are not using an extremely wide-band (200–500-MHZ) oscilloscope to monitor the noise on TTL or Schottky TTL supply lines, you may be in trouble. Good decoupling capacitors, even if placed at every IC package, cause a buildup of oscillations in the upper vhf range on those lines. In fact, the power supply traces on the printed-circuit boards form shorted pieces of transmission lines—actually resonators at vhf frequencies, which are shock-excited at every transition of the TTL output stage. Contrary to the general assumption, these lines are not lossy enough to damp such oscillations. Adding more decoupling merely shifts the frequency of oscillation.

The only cure is **adding more loss in series with the line in the form of series resistance or, better yet, lossy chokes**. Such chokes can be constructed by winding several turns of enameled wire through a lossy ferrite bead. Special six-hole cylindrical ferrite cores made from lossy material like the Siemens N22 material are particularly effective. These chokes should be placed in series with the supply lines of each TTL package and the package decoupled very close to its supply pins. Two packages can be fed over a choke. Lower-frequency decoupling is necessary at the voltage input to the circuit board.