Hobby Scene

By John McVeigh

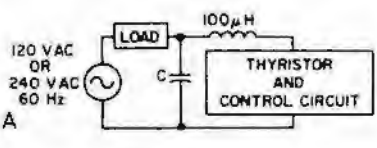
LIGHT DIMMER RFI

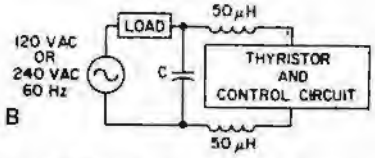
***Q.** I purchased a light dimmer and mounted it in a light switch box in the wall. The dimmer creates a buzz and static in any AM radio in the house that is turned on at the same time as the dimmer. Varying the brightness control has no effect on the interference. Using a transistor radio as a signal sniffer, I found that the noise is loudest near the switch box, and is also loud when I follow the wiring in the wall up to the bulb. The dimmer doesn't cause any interference to my FM radio. What can I do to remedy this situation?—Duane Anderson, Leeds, ND.*

A. I have discussed the problem of light dimmer RFI in previous columns, but recently a batch of letters on this subject has been received. So, it seems appropriate to deal with it again. The information that follows and the schematics are abstracted from the RCA *Transistor, Thyristor, and Diode Manual.*

The fast switching action of triacs connected to resistive loads causes the current through them to rise to a certain level in a very brief time interval. Triacs typically transit from the high to the low impedance state within one or two microseconds. This rapid switching generates a current step function (an almost instantaneous jump from zero) which is largely composed of high-frequency harmonics. The amplitude of these harmonics varies inversely with frequency.

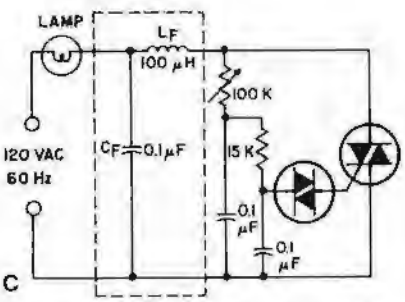
In phase-control applications such as light dimming, this current step is produced each half cycle of the line voltage. Because the triac switches on and off many times each second, a noise pulse is generated which can affect amplitude-sensitive devices such as AM radios. The amplitude of the vhf harmonics is so small that they generally do not interfere with television reception or with FM radios, which have the additional advantage of having a limiter stage. Limiting gives the FM receiver a high degree of immunity to impulse noise signals.





There are two basic types of RFI associated with triac switching. One, radiated RFI, consists of the high-frequency energy radiated by the triac-equipped appliance. In most cases, this radiated RFI is insignificant unless the radio is located very close to the source of radiation.

Of more significance is conducted RFI, which is carried along the power line and affects equipment connected to it. Because the current waveform contains high-frequency energies, a simple choke placed in series with the load will increase the current's rise time and reduce the amplitude of the higher-order harmonics. To be effective, however, the choke must be quite large.



A more effective filter, one that has been found to be adequate in most light dimming applications, is shown at A. An alternative design is shown at B. The inductors attenuate the harmonic signals and reduce the noise interference to a low level. The capacitor bypasses the harmonics so that they are not passed to any external circuits connected to the power line.

At C, a triac control circuit is shown which includes an RFI suppression network for the purpose of minimizing high-frequency interference. The values indicated are typical of those used in lamp dimmer circuits. The two-terminal semiconductor is a bilateral trigger diode, and the triac is usually chosen to handle a given load demand, say, 600 watts or 6 amperes. In all these circuits, bypass capacitors should be rated at 1000 volts minimum and approved for power-line bypass applications.

Have a problem or question on circuitry, components, parts availability, etc? Send it to the Hobby Scene Editor, POPULAR ELECTRONICS, One Park Ave., New York, N.Y. 10016. Though all letters can't be answered individually, those with wide interest will be published.