# Switching Circuits in Electronic Systems

## (An Effective Approach to Noise Problems from Power Switching Circuits)

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Switching Circuits such as switching power supplies, class D amplifiers, PWM controllers, and similar circuits are ubiquitous in today's electronic circuits and have resulted in lower cost and higher performance systems. However, these circuits can generate enough noise to disrupt system operation and cause EMC problems. Switching circuit noise can masquerade as other problems, especially intermittent ones, and can cause system disruption at significant distances from the switching circuit itself. These operational, EMC, and intermittent problems are addressed in this webinar and techniques to avoid them are presented.

The presentation is practical (as opposed to theoretical) and no head scratching math is needed or presented in the seminar. Results are presented from various types of systems. This short seminar is composed of 55 slides with discussion and real world war stories added and can be presented over GoToMeeting, WebEx, or Skype. Attendees will receive a pdf copy of the slides. Length of the presentation is one to one and a half hours.

### Seminar Outline

1. Introduction
    - Types of switching circuits
    - Tools needed for troubleshooting
2. The Four modes of Switching Circuit Noise Generation
    - Input ripple
    - Output ripple
    - Magnetic field emissions
        - Time domain measurements
        - Frequency domain measurements
        - The best measurement is not with a calibrated magnetic field probe!
    - Conducted noise
        - Different from compliance testing
        - Can cause strange system operation remote from the power supply in other parts of a system
        - Is never included in power supply specifications, but should be
3. Methods for measuring and troubleshooting switching noise
    - Measurement techniques that are very effective, but not well known
    - Finding the source of a noise in a system
    - Finding how a source of noise affects other parts of a system
5. Design Techniques for Avoiding Problems
    - How to handle both single point and multiple point system grounding for low noise
    - Inductor design for low noise
6. Summary