

Rarely Asked Questions

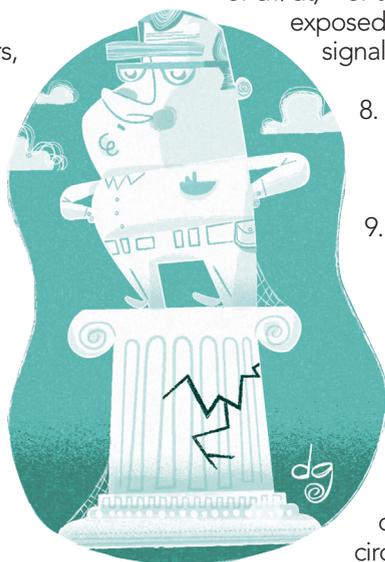
Strange stories from the call logs of Analog Devices

Nobody is Perfect – Not Even an Engineer!

Q. What is the most common problem with precision analog circuits?

A. Probably grounding errors, but there are a number of frequently seen mistakes. They are mostly sins of omission; engineers are not perfect and can forget things.

1. Don't forget to read the data sheet. (Application engineers routinely shout "RTFDS"¹ as they hang up after an enquiry.) Extracting implicit information from a data sheet, not just the explicit details, is important.
2. Don't forget Ohm's Law. The resistance of a wire or PC track is not zero, and leakage in "insulators" matters when measuring low currents.
3. Don't forget the bias current. Sometimes greasy fingerprints provide a current path in the prototype, leading to surprises in the clean(er) final version.
4. Don't forget the stray resistances, inductances, and capacitances of the final (crowded) PCB; don't assume that all is well because the breadboard (or the SPICE model) worked.
5. Don't forget that EMI and RFI occur everywhere; filter your supplies and input/output leads.
6. Don't forget to consider the effects of temperature variation on components (including the effects of differing temperature coefficients in nominally identical components).
7. Don't forget to verify that the circuit can tolerate having its supplies (and signals) applied in any order (and with any value of dv/dt)—or to ensure that it cannot be exposed to unacceptable power/signal sequences and rates.
8. Don't forget that switching power supplies are not as noise free as a battery.
9. Don't forget that analog circuits, unlike microprocessors, often do not reset on power up and that you may need to ensure correct start-up.
10. Don't forget that circuits don't start instantly: capacitors must charge and precision circuits must stabilize.
11. Don't forget that some circuits are unstable when driving a reactive load. An output stage that will drive a wide range of resistive loads may oscillate with capacitance, such as that of a cable.
12. Don't forget that noise, like death and taxes, is universal. Every ADC has quantization noise, every resistor has Johnson noise—you can't avoid them.
13. Don't forget that IC designers may not be user friendly. Devices may not work as you expect. Again I say, "RTFDS!"



Contributing Writer
James Bryant has been a European Applications Manager with Analog Devices since 1982. He holds a degree in Physics and Philosophy from the University of Leeds. He is also C.Eng., Eur. Eng., MIEE, and an FBIS. In addition to his passion for engineering, James is a radio ham and holds the call sign G4CLF.

Have a question involving a perplexing or unusual analog problem? Submit your question to:
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¹RTFDS = "Read The Friendly Data Sheet"