Tech Note No. 6

by Pete Stark

I've run out of intelligent things to say ... but that hasn't stopped me from opening my mouth (and putting my foot into it) before, so I'm not about to stop now.

Eating Crow etc. etc.

It's actually hard to eat crow while (a) you have egg all over your face, and (b) your foot is in your mouth. But I know it's possible...

In Tech Notes #5 a few months ago, I attempted to help Bill Bruce with two problems he was having in his Recital Organ -- some hum, and a loud thud when he turns his organ off. I thought I had found the brilliant answer to his problem, and so I stuck my foot into my mouth. Well, not only didn't I help him solve his thud problem, but I even wasted a lot of his time (and phone money) without getting anywhere at all. Sorry, Bill...

In the hope that some of you might be able to suggest a solution, let me explain what we did.

The first thing I asked Bill was whether the thud occurred at the *instant* he turned off the switch, or a fraction of a second later, and he said it occurred at the instant of turning off the switch. My reason for asking was this: When you turn off the power to a power supply, the filter capacitors in it retain some charge for a second or two. For instance, an amplifier such as my Schober amp will continue to play for a second or two after the power goes off. In other words, there is a delay from the time the main line power goes off, to the time that the power supply's output starts to drop. So if the thud occurs *immediately*, whatever is causing it must be somehow sending its thud around the power supply, not through it. If, on the other hand, there is a delay, then the thud is being caused by the output of the power supply.

Since Bill said that the thud occurred immediately, I suspected the input to the power supply. Knowing that there is usually some arcing at the switch contacts, that's what I suspected. And so I wrote Tech Notes #5, in which I suggested shielding the switch leads, and changing to a three-wire, grounded configuration. The only problem was this -- Bill made the changes, and they didn't help!

That's where things got a bit embarrassing. Bill telephoned, and we spent quite some time talking about what to do next. The difficulty here was that it's hard to do this sort of thing by phone, but we tried.

So we started to eliminate one cause after another. First -- was the thud in the organ, or was it in the amplifier? Many amplifiers make a thump when you turn them off, so I suggested to Bill to plug his amplifier into a separate, unswitched power outlet. In other words, to keep the amplifier powered on while switching off the organ. The thud was still there, so it wasn't coming from the amp. Just to make sure, I suggested that Bill connect a shorting jumper across the organ output -- the point where the audio signal leaves the organ and goes to the amplifier. This removed the thud, so we were pretty sure that the thud was coming out of the preamplifier-vibrato board in the organ (which feeds the amplifier in his system.)

Our next step was to disconnect (actually, to short to ground) the audio inputs into the preamplifier-vibrato board. Now, even with no inputs into this board, the thud was still there. So the thud was getting into the preamp-vibrato somehow.

Although I was quite sure that the thud wasn't getting there through the power supply, we tried

to eliminate that possibility anyway. I suggested to Bill that he replace the capacitors in his decoupler board. Since I've had a lot of trouble with old Schober capacitors, we thought that these filter capacitors might possibly have dropped in value over time (and I thought this might also account for the hum he had.) But again, this didn't help. Then we added one more capacitor (technically, we added an RC filter, for those of you into electronics) to filter just the preamp-vibrato board power, but still no improvement.

Just to review, we now knew this: With the output of the preamp-vibrato board shorted to ground, the thud was gone. But with its signal inputs shorted. the thud was still there, so it had to be generated somewhere inside the board. And with the extra good power supply filtering, including a separate filter network just for this board, we knew the power was rock solid, and shouldn't go through any rapid changes at the instant of turning off the power. So how -- and where -- was the thud getting in?

We next tried to narrow down the exact path of the thud by pulling out transistors to split the board into sections. I was still pretty sure that it was a switching transient somehow sneaking in from the power switch. There is some external wiring to the preamp-vibrato board, including some switches and the two swell shoes. Maybe the thud was getting in through some of this wiring. To check this out, we had to eliminate one possible cause at a time by disconnecting and/or shorting leads to ground.

Unfortunately, by now Bill and I had spent so much time on the phone, discussing and trying various possibilities, that we both pretty much lost hope. I'm sure that if we could have worked on this side-by-side, instead of being on opposite coasts and having to do it all long-distance, we would have found the problem. As it was, we just gave up!

So if you have any ideas on what we should have done next, how about hearing from you?