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TRAILER TRIPPING GFCI AC OUTLET ON HOUSE

My wife, Sheila, and I are fairly new RVers, having purchased our first travel trailer in 2007. We've been fortunate to have traveled through most of the states, racking up over 50,000 miles since then. On a recent trip to Texas during the month of March, we started noticing that when we plug into friends homes (using GFCI-protected AC outlets) that they will trip immediately. This was rather disconcerting, as we had never had an issue with this in prior trips and were unable to run some of the more power-hungry appliances, such as the microwave oven.

Once we returned home, and being the retired electronics engineer I am, I started troubleshooting the issue. Fortunately, I also had checked a couple RV forums and sort of had a starting point to look for the trouble.

The first thing I tried was to isolate the AC branch that was causing the trip condition. This is easily done by flipping off all the secondary branch circuit breakers (keeping the master "ON") and then trying them each separately. I soon had isolated the branch to the REC/CON breaker. Not being sure what this meant, I referred back to the Internet forums and discovered it meant Receptacles and Converter. By then, I had already checked the shore power line and connections up to the breaker panel. I then disconnected the AC-DC power converter primary, but the problem was still there. Since I had eliminated the converter, I started checking all the AC outlets. Finding nothing, and after checking the forums once again, I ran into a possible lead in that it might be connected in some way to the water heater. Examining my heater and reading the manual revealed it was a dual-mode heater (propane and AC line) - a fact I'd forgotten. It was also connected to the REC/CON breaker, so I disconnected the two line connections on the heater element and measured each terminal to ground with a digital multimeter. One side measured 4.7 M-ohms (probably OK) and the other side, 0.47 M-ohms, just enough of a leakage path to ground to cause the GFCI to trip! Replacing the heater element fixed the problem.

So why the problem? We normally keep the trailer connected to shore power during periods of storage and I'd drained the water tank during the winterization process. Unfortunately, I had left the heater power switch in the "ON" position after it was drained and the element burned out and partially shorted to ground.