# Grounding Notes

**Al The Man**

Also I would ensure all grounds are taken back to a common ground point together with the Service ground, also it may pay to look at grounding the encoder supply to this plate.  
If the encoder is supplied from the PC power supply, the grounded common point for it can wend its way back to the PS ground through the MB screws etc, instead if a sound point external, for example, the ground bus, together with all shields.

I normally take all my power supply commons to a single ground plate.

But, some things need to remain isolated, right?

**Mariss Freimanis**

1. Good and accepted practice is if it is enclosed in metal, ground the metal to the negative terminal of the power supply. Look at a PC. If you have ever put PCs together yourself from components, you may have noticed some of the supplied standoffs for the motherboard were brass, not plastic. The brass standoffs were placed where motherboard mounting screws connected to the groundplane holes of the mother board.  
     
   2) Take an Ohmmeter. Touch one probe to the ground pins of the parallel port. Touch the other lead to any unpainted metal on the computer case. You will read a dead short. The computer case is grounded to GND from the PC power supply.  
     
   3) The same thing applies to our drives. Our drives have metal enclosures. Grounding the metal enclosure insures no matter what happens in the drive, the 'hot' side of the power supply will never appear on the case of the drive. The case is firmly connected to the GND terminal of the drive. This is both a shielding issue and a safety issue. You cannot have the case floating because you don't know what may touch it.   
     
   4) This has no effect on how you use the drives. They should be in a metal chassis. You should follow the same good practice and ground the chassis. Have a single wire run from the GND side of your supply to the chassis metal.  
     
   5) Never use the chassis as a GND distribution to the motor drives. Every drive GND input gets a separate wire going back to a single GND terminal on your power supply. Do the same for +VDC distribution to the drives. Every drive gets its own wire going from +VDC back to a single point on your power supply. This is called 'star distribution' because each drive gets two wires (+/-) emanating from the supply like sunrays.  
     
   6) Screw the drives down to your chassis. It makes no difference if the screw grinds through the drive's hard-anodized or not. The drive's case is grounded internally, your chassis grounded and you have a copper wire running from power supply GND to the drive power supply GND. Electricity prefers the path of least resistance and that is the copper wire.  
     
   7) That takes care of the DC side of proper grounding and power GND distribution. If you have the power supply inside the control box chassis and you are using a 3-prong AC receptacle, wire the receptacle GND to the same chassis point as you wired the power supply GND to. This carries your chassis ground to earth ground (that big pipe pounded 10' into the ground near your circuit breaker box) so that even lighting can hit your chassis without harm. If you live in an area where there are no thunderstorms (Southern California), don't bother. Just use a two terminal receptacle.:-)

**Mariss F. on how to fuse a Geckodrive**

1. Fuses are used to prevent fires and to limit damage. Except for a few specialty fuses, a fuse usually will not prevent damage to motor drives. The reason is speed.  
     
   We use IRF540N MOSFETs which are rugged devices. They are rated at 33A continuous current, 110A of pulse current and 100VDC operation, but not both V and I simultaneously. The datasheet "Maximum SOA" graph shows the part can endure a 20A or higher (110A) pulse at 80VDC for a maximum time period of 0.1 millisecond (100 microseconds).  
     
   Fuse "blow-time" is based on its (I^2)t rating. A 5A 3AG 250V fuse has an (I^2)t rating of about 25. This calculates to a blow time 2 milliseconds at 110A. The fuse cannot protect the circuit because the fuse is 20 times (0.1 mS vs 2 mS) to slow!  
     
   See [http://www.littelfuse.com/data/en/Da...\_314P\_324P.pdf](http://www.littelfuse.com/data/en/Data_Sheets/Littelfuse_Fuse_314P_324P.pdf)  
   for graphs of fuse blow time versus overload current.  
     
   2) Fuses should not be used in a way where they can cause damage themselves. Motor drives draw current from the power supply. Motor drives also can put current back into the power supply. If a fuse is used between the power supply and the drive and the fuse blows, the current from the drive has no place to go. This causes the voltage on most drives (but not the G203V) to climb to destructive levels.  
     
   The cure is to use a 1 Amp rectifier diode (1N4004) in parallel with the fuse. The rectifier cathode (the end with the stripe) is towards the power supply. Should the fuse blow, the rectifier diode shunts the motor's kinetic and/or inductive energy back to the supply.

But then Mariss goes on to say: There are "no Geckos in danger" because the MOSFETs we use has the intrinsic diode functions as a 114V zener diode. In a word, they are overvoltage protected in that regards. It may bust other drives but not ours.