A technique for grounding a PCB to a conductive enclosure

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Very often when a PCB is encased in a metal enclosure it is a good idea to ground the PCB at selected locations to the enclosure. This can play a number of roles. For example when common mode (C/M) voltage exists between the PCB ground plane and the enclosure and unshielded cables exit the enclosure, the C/M voltage leads to C/M current flow on the cable. This can be likened to a monopole antenna where the cable is the rod of the antenna and the outside of the enclosure is the ground plane. This combination of C/M voltage driving an unshielded cable can result in very high levels of radiation, especially when the cable is a resonant length. Very often when an enclosure is placed around a PCB the electromagnetic fields which would normally be launched from the PCB couple to the inside of the enclosure and back to the PCB itself. The net result may be higher C/M currents on the PCB and on any attached unshielded cable. This is one case where adding a shield to an enclosure may be counter-productive when the attached cables are unshielded or do not use a filtered connector.
By adding a signal ground to chassis connection as signals exit the enclosure the C/M voltage is reduced as is the C/M cable current and level of radiated emissions.

Another typical location for a chassis to a PCB ground connection is at the interface between digital ground and analog/video/RF. This connection will avoid digital noise currents from flowing into the potentially susceptible signal grounds of the PCB.

The exact location and number of these chassis ground to signal ground connections is not always clear. Flexibility is one of the golden rules of grounding and the technique described here will allow a high level of flexibility in grounding.

The technique is applicable when the PCB is mounted on one surface of the enclosure and supported by stand offs. It is not applicable to PCBs which are inserted into a card cage in an overall enclosure.

In figure 1 we see a small circular island of copper on the upper surface of the PCB, furthest away from the enclosure surface. This island is through hole plated to the underside of the board which contains a second isolated island and which contacts a metal stand off.

The diameter of the upper circular island is the same as the screw used to hold the PCB down to the stand off. The signal ground is then taken close to the isolated island as shown in figure 1. When the signal ground must be connected to chassis a washer is used with a large enough diameter to cover the island and contact signal ground. When the signal ground must be isolated the washer is left out or a nylon washer is used.

Using this technique the PCB may be isolated , or single point or multiple point grounded with no change to the PCB layout required.

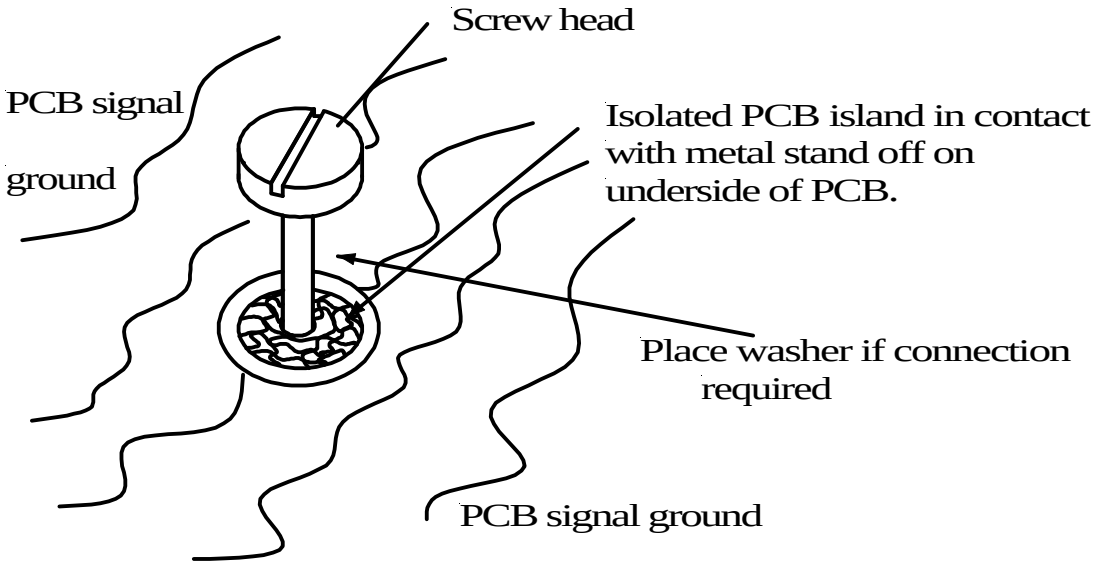

Figure 1 Ground configuration without washer, i.e. no connection between signal ground and chassis.