



POWER LINE FILTERS

Practice:

Power line filters are designed into power lines (power buses) at the inputs to payloads, instruments, subsystems, and components.

Benefits:

Power line filters minimize the flow of conducted noise currents on power buses emanating from hardware that could interfere with the proper operation of other hardware also operating on the same power buses. Additionally, power line filters minimize the flow of noise currents on power buses into hardware which could interfere with the proper operation of that hardware.

Programs That Certified Usage:

All GSFC flight programs.

Center to Contact for More Information:

GSFC NASA Assurance Requirements Office.

Implementation:

Power line filters are used to meet the Conducted Emission and Conducted Susceptibility Requirements of GSFC's General Environmental Verification Specification for STS and ELV Payloads, Subsystems, and Components (GEVS-SE). This document contains a baseline for demonstrating by test the satisfactory performance of hardware in the expected mission environments.

Technical Rationale:

The problems of Conducted Emission and Conducted Susceptibility have been widely recognized for many years. The EMC community and the Department of Defense have collaborated in preparing and in continually reviewing and updating a widely used set of EMC design and test requirements designated MIL-STD-461, 462, and 463. These requirements have been tailored for specific spaceflight application and incorporated by the GSFC into the GEVS-SE document along with specific requirements defined in the Shuttle Orbiter/Cargo Standard Interfaces Document (JSC 07700 Volume XIV Attachment 1 (ICD 2-19001).

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Impact of Nonpractice:

The absence of power line filters frequently results in cross interference, which disrupts the proper operation of hardware and can obliterate science data. These problems usually can be identified in ground testing; however, correcting them by retrofitting flight hardware is very difficult and expensive. Therefore, it is important that power line filters be included in the early design of hardware.

Significant interference problems can occur on orbit that were not found in ground testing due to unexpected ground loops or to hardware interface situations that could not be duplicated exactly during ground testing. Also, deterioration or partial failure of components and parts can result in increased levels of noise on power and ground buses. Hardware that is susceptible to conducted emissions can exhibit such problems as microprocessor resets, false or inaccurate engineering data readouts, unintentional mode changes, and lost or noisy scientific data. Power line filters minimize these interference problems by isolating hardware from conducted noise on power lines.

References:

1. General Environment Verification Specification For STS and ELV Payloads, Subsystems, and Components (GEVS-SE)
2. Shuttle Orbiter/Cargo Standard Interfaces Document (JSC 07700 Volume XIV Attachment 1 (ICD 2-19001).