



## A.H. Systems, Inc.

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Electrostatic Discharge (ESD) has become one of the most critical issues with our preamplifiers. As the circuit performance has been improved and the bandwidth of the preamplifiers has been increased, problems of ESD have emerged as a major challenge.

### PROBABLE CAUSES OF FAILURE

**Excessive input power** is the number one failure analysis with the preamplifiers. This type of damage is without fault of A.H. Systems and will void the warranty. Caution should always be maintained when operating the preamplifier and conveyed to all personnel handling the preamplifier.

**Storage near strong EMI or RF fields** is typically not an issue with common labs, however in the EMC community it is common practice to produce high fields for some standards. These preamplifiers are not intended to withstand a high field environment.

**Handling the antenna** is another possible cause of failure and one that most engineers don't realize is an issue. Most antennas (such as log periodic and drg horn antennas) are an electrical DC short at the RF connection. When performing a test where switching antennas or changing polarities is a requirement, please realize that touching the antenna is like touching the input center conductor of the preamplifier.

### CONSIDERATIONS AND SOLUTIONS

**Adding a one-watt limiter** shunts the ESD narrow pulse to ground before it can reach the preamplifier input. We have introduced a preamplifier with a built-in one-watt input limiter (PAM-0118P). So far, we have not had any of these units fail or returned for repair.

**Understanding the maximum field** that the preamplifier can handle is extremely important. Preamplifiers are very delicate amplifiers used to amplify very low signals and not to be used in a high field environment. Customers who do general lab testing (NOT EMI testing), know that exceeding the input CW power of approximately +10 dBm will burn out the first stage of the preamplifier. They also know that an input signal above (+10 dBm minus gain) will saturate the output.

**Repair cost and time** is another factor in realizing the importance of proper care and handling of the preamplifiers. Repairing the first stage cost \$850.00 and takes 6-8 weeks.

**Proper grounding techniques** will prevent ESD and is recommended at all times.

**Antenna handling** is very important and caution should be exercised at all times. The use of a RF switch at the input of the preamplifier will reduce the threading and unthreading of the connector and ensure that the preamplifier is not connected when changing antennas.

An over voltage at the preamplifier RF input will damage the preamplifier. This type of damage is without fault of A.H. Systems and will void the warranty. **Adding the one-watt limiter reduces the gain by about 1dB and increases the noise figure by about 0.5dB.**

*A minor price in performance to pay for added security.*

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