

Protecting Diode Lasers from Electro-Static Discharge (ESD)

A Guide to Safe Handling to
Avoid Inadvertent Damage

Diode lasers are very reliable under normal operating conditions. However, like most semiconductor devices, they can be damaged or destroyed by inadvertent electrical or static discharges (ESD). Several precautionary guidelines to handling lasers are required to prevent latent damage to the laser. ESD can easily damage diode lasers, decreasing performance immediately or over time. These steps can prevent ESD damage:

- Create a static-free work environment
- Store the laser when not in use

Create a Static-free Work Environment

Use the laser only in a static-free work environment.

- Work on a grounded workbench or surface with anti-static floors and a case ground.
- Use grounded tweezers and a wrist strap.

For greater protection, use a dedicated grounding device, an air ionizer designed for static charge control, and identify the area as “ESD Controlled.”

Store the Laser when Not in Use

When the laser is not in use, follow these procedures:

- Short the pins by inserting them into conductive foam or by wrapping wire from pin to pin.
- Store the laser in a Lumentum-approved conductive bag in a static-free environment such as the shipping container or a Faraday cage.
- Label containers as “Static Sensitive” to ensure proper un-packaging.

Antistatic, foamed plastic provides cushioning protection but does not protect un-shortened lasers from ESD. Use only approved conductive foam for packaging.

Definitions

Air ionizer — a source of charged air molecules (ions) that are attracted to and neutralize static charges of the opposite polarity. Ionizers for static-charge control produce large, approximately equal numbers of air ions of both polarities. Ionizers for airborne particle precipitation are not necessarily suitable for ESD control

Dissipative — a material's physical property that allows charged movement. Dissipative materials conduct charges less freely than conductive materials.

ESD — a sudden redistribution of a static charge that can damage sensitive components.

ESD sensitive — a device, assembly, or product that can be degraded or damaged by ESD. Lumentum considers ESD-sensitive parts degraded or damaged by a human body model (HBM) of less than 1.5 kV.

Faraday cage — a closed, conductive container used for ESD protection that can terminate all external electrical fields on its outer surface forming a static shield so that no externally caused field can be detected from within. A Faraday cage provides optimal protection for ESD-sensitive items that must be transported through or stored in unsafe, static areas.

Ground — a conductor connected to the earth and, hence, the natural reference for all voltage measurements, or "hard" ground. "Soft" ground refers to isolated grounding by a series resistor to limit current to a non-hazardous level in case of accidental contact with a power source. Power system safety ground conductors are acceptable for ESD control. The terms "ground" and "earth ground" are interchangeable.

HBM — a mathematical representation of the consequences for a charged person accidentally touching a part. The representation is usually an equivalent circuit with a charged 100 pF capacitor in series with a 1500-ohm resistor.

Insulator — a material with a surface resistivity greater than 1×10^{-12} ohms/square, and volume resistivity greater than 1×10^{-12} ohm-cm.

Portable workstation — a static-safe work surface with a means to connect it to ground, which can also be easily carried or moved (such as a cart) from one location to another.

Static charge — a positive or negative electrical charge resting on the surface of a material that generates an electric field and can cause damaging ESD.

Static safe — complying with all appropriate ESD control measures.

Workbench — a table or similar structure that is the physical support for one or more workstations. A fixed (permanent) workbench is one that cannot be moved without using tools to disconnect attached plumbing, wiring, or other physical restraints. A movable workbench is one that does not require tools to disconnect it.

Work surface — a flexible or rigid top of a workstation where parts and equipment can be placed or used during normal operations, such as counting assembly, testing, and so forth.

Wrist-strap device — an ESD control assembly that grounds the human body that is strapped to the wrist and consists of a wristband and a detachable cord.



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