



## Shipping and Handling of Power Grid Tubes

Power grid tubes are relatively fragile, and care must be exercised during handling and shipping. Tubes manufactured by CPI – Eimac are shipped in specially designed cartons or wooden crates, depending on their size. All tubes are suitably packed for transportation by air, sea or ground, and are marked as fragile. Due to the severe shock and vibration of transport by truck, the use of trucks having an “air ride” suspension system is highly recommended. Tubes should always be stored or shipped in their original containers. Tubes which have been installed in equipment should not be shipped still mounted in that equipment, as no adequate shock or vibration protection will be present.

Power grid tubes must be stored or shipped in an upright position, never lying on their sides (the exceptions to this are small oxide cathode tubes such as the 4CX250B, the planar triodes, and the Inductive Output Tube, or IOT). In general, they should be kept within about 20 degrees of vertical, as angles beyond that could cause the tube container to fall on its side if the support is removed. Storage should always be in a clean, dry indoors area. Tubes which employ liquid cooling should have a protective cap on the cooling inlet and outlet during storage if those inlet and outlet connectors open upward, so that foreign materials will not enter the cooling system. Also during storage of liquid cooled tubes, the cooling systems should be drained and dry to prevent corrosion or possible freezing at low temperatures. Whenever handling power grid tubes, the built-in handle bands should be used if present, or the tube should be lifted by the anode. Large power tubes may be hoisted using the lifting point welded to the top of the cooler, or by using the threaded screw points if those are present. **Tubes should never be handled by their ceramics.**

When a new tube is received, the container should be visually inspected for damage. If any is present, a photo should be taken in the event a claim will need to be filed with the shipper. Large tubes are often shipped in crates which may include tilt-watch and shock-watch indicators. These will give an indication if the tube has been tipped more than 90 degrees from vertical or subjected to a shock of more than 100 G's. If either of these indicators has been tripped, a photo of the indicators should also be taken. A damaged shipping container, or tripped tilt or shock indicators do not necessarily mean the tube is damaged, but they are an indication of improper handling.

Once tubes are removed from their packing container, they should be placed onto an appropriate stand. Special care must be taken with several of the large tetrodes which have the vac-ion pump assembly protruding from the bottom of the tube. These large tubes are shipped in wooden crates and may include special instructions on removing the tube from the crate. Most other tubes may be carefully placed onto a soft pad, such as a felt or rubber mat. Tubes should never be put down hard or knocked against hard objects, including other tubes. With the tube removed from the shipping container, it should be visually inspected, and checked electrically. As a minimum, Eimac recommends using an Ohmmeter to check for filament continuity and whether there are any grid-cathode, grid-grid or grid-anode shorts. A failure of either of these tests indicates shipping damage.

An inspection and evaluation of a tube soon after it has been received, and documentation of any indications of poor handling during shipping will make filing of damage claims with the shipper much easier.