



ELECTRONIC DEVICES – HEALTH AND SAFETY HAZARDS

EEV electronic devices are safe to handle and operate, provided that the relevant precautions stated herein are observed. English Electric Valve Company does not accept responsibility for damage or injury resulting from the use of electronic devices it produces. Equipment manufacturers and users must ensure that adequate precautions are taken. Appropriate warning labels and notices must be provided on equipments incorporating EEV devices and in operating manuals.

High Voltage

Equipment must be designed so that personnel cannot come into contact with high voltage circuits. All high voltage circuits and terminals must be enclosed and fail-safe interlock switches must be fitted to disconnect the primary power supply and discharge all high voltage capacitors and stored charges in the electronic devices before allowing access. Interlock switches must not be bypassed to allow operation with access doors open.

R.F. Radiation

Exposure to r.f. fields can be a hazard even at relatively low frequencies. Absorption of r.f. energy by the human body is dependent on frequency and although at frequencies below 30MHz most energy passes straight through the body with little heating effect it still presents a hazard.

All r.f. connectors and cavities must be correctly fitted before operation so that no leakage of r.f. energy can occur and the r.f. output must be coupled efficiently to the load. It is particularly dangerous to look into open waveguide or coaxial feeders, or transmitter antennae while the device is energized. Power klystrons must not be operated without a suitable load at the intermediate and output cavities. Screening of the cathode side arm of high power magnetrons may be necessary.

X-Ray Radiation

All high voltage devices operating at voltages above 10kV produce progressively more dangerous X-rays as the voltage is increased. The device envelope usually provides only limited protection and further shielding may be required. It should be noted that the X-rays emitted by magnetrons and power klystrons correspond to a voltage approximately twice the applied beam voltage.

Radioactive Materials

Very small quantities of radioactive material are incorporated in some electronic devices such as primerless TR tubes, spark gaps and voltage stabilizers. The devices are graded as Class 1 in Defence Standard 59-60 (Part 1) Annex A and for almost all purposes the presence of radioactive material may be disregarded.

There are no handling or operating restrictions for Class 1 devices. They should not be stored near photographic film. No more than 100 may be disposed of as waste at any one time and in the event of fire involving large numbers of Class 1 devices, the area should be monitored to determine the degree of contamination.

Beryllium Oxide Ceramics

The third and output cavities of most EEV high power klystrons are made of beryllium oxide (coloured blue, or marked with a black line). This material is also used in some high power travelling wave tubes but the metal envelope of the latter normally eliminates any hazard to users. **Beryllium oxide dust or fumes are highly toxic if inhaled, or if particles enter a cut or abrasion. Avoid handling the beryllium oxide ceramics;** if they are touched the hands must be washed before smoking or eating. **Do nothing** to the beryllium oxide ceramics which may produce dust or fumes. Cleaning information is available from EEV.

Information on the procedure to follow if a beryllium oxide ceramic is broken is provided with the device.

Mercury

All ignitrons and some rectifiers and thyratrons have a mercury content. This is a hazardous substance, especially in the vapour phase. Should breakage occur, **ALL** droplets must be brushed up as soon as possible and placed in an airtight container for disposal. Direct contact with the skin must be avoided. Afterwards, the hands must be thoroughly washed.

Implosion

All high vacuum tubes store potential energy by virtue of their vacuum. The energy level is low in small tubes but represents a significant hazard in larger tubes such as cathode ray, storage, image isocon and image orthicon tubes particularly if the tube is dropped or subjected to violent impact.

Such tubes must be stored and transported in their approved packs. During installation or replacement the tube must not be scratched or damaged in any way likely to reduce the strength of the glass envelope. No stresses must be imposed on the glass envelope, particularly the neck, and the tube must be adequately supported. Free standing cathode ray tubes should be placed faceplate down on a soft surface free from abrasive particles. The user must be protected against implosion of the tube in the equipment.

Explosion

Some devices such as spark gaps are pressurized and the precautions specified in the clause on Implosion must be observed.

Disposal

Instructions are available from EEV on disposal at the end of useful working life of any device where hazards of beryllium oxide ceramic, mercury or implosion exist. To avoid potential hazards any device should be returned to the original supplier in the approved pack for safe disposal.