PEARL *Product Information: CryoValve Electron Tubes*

Perkins Electro-Acoustic Research Laboratory. ℗ *Hand-Builders of Fine Music-Reproduction Equipment*

An Overview of the "CryoValve" Treatment and Grading Procedures

The series of operations through which an electron tube must pass before it can be called a **Pearl CryoValve** is lengthy and in some ways, arduous.

As received, a typical electron tube exhibits several problems that deleteriously impact its sonic performance. Most serious are the many internal stresses in the construction materials that accumulate during most of the stages of manufacture and; a very hard, heavy oxide-coating on through-glass pins to which direct connection is made. Seven- & nine-pin miniature tubes are typical of those whose pins are heavily oxidized while power tubes such as KT88 and EL34 are fitted with bases whose pins are tinned. Where required, through-glass pins are cleaned back to base metal and polished, with the result that contact quality is *much improved*. The degree of sonic improvement is *substantial*.

The initial 100hr. burn-in allows the tubes' characteristics to stabilize while providing an opportunity to cull any "infant mortals."

During cryogenic tempering, the tube is *slowly* cooled to the –196°C/–320°F temperature of liquid nitrogen, "soaked" for many hours then *slowly* returned to ambient. By means of this unique and vital process, the stresses interior to the materials of the tube are substantially and permanently relaxed. During a subsequent anneal, the tube is heated to 175°C/350°F then *slowly* cooled to ambient. Although not as extensive, the results are similar to those achieved by the cryogenic treatment.

The "Q" of the (self) resonant (electro)mechanical systems responsible for the output of (electro) microphonic spuriae is thereby drastically reduced. By this important reduction, both the peak amplitude and the "ring down" time of these systems is reduced with the result that the "dynamic noise floor" is lowered and, consequently, the "apparent gain" of the device is increased—even in feedback controlled circuits.

Grading for noise and microphonic performance involves both listening and instrument evaluation. Various instrumentation provides data on the noise, microphonic levels and spectral content while the overall "sound" of the spuriae is critically evaluated. In particular, the evaluation of microphonic output is very much an experienced-judgement call.

Dual triodes are rated for overall noise performance by the noise-output level of the noisier triode or section. Thereby, it's possible for a tube given an overall "Standard" rating to contain an ultra low-noise section. ULN and GG tubes however, always consist of two ULN sections, hence the cost.

The last few steps in our process are the standard yet essential procedures for the evaluation of many important electrical characteristics such as amplification factor, μ, plate current, I_b, and transconductance, g_m. Additional data is generated indicative of the μ and DC balance of the tube's sections.

Quite simply, **Pearl CryoValves** are the electron tube of choice for virtually all high performance audio applications: your satisfaction is *guaranteed!*

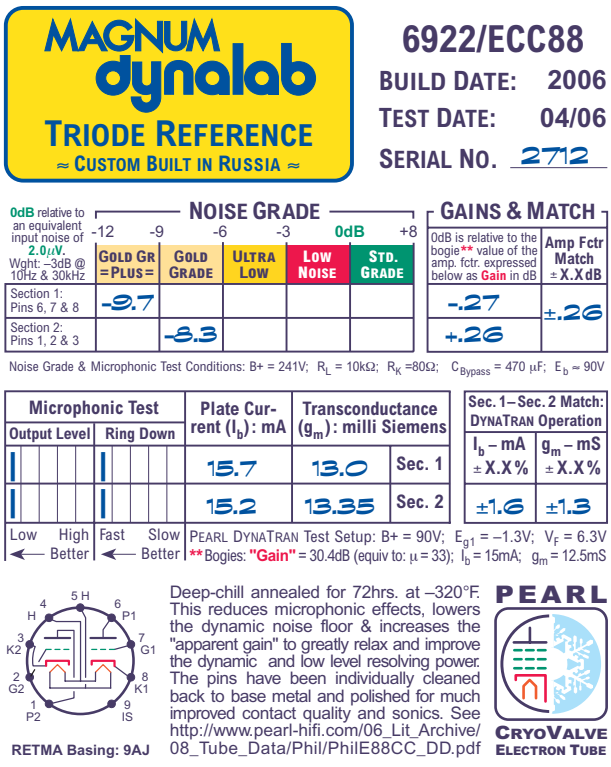
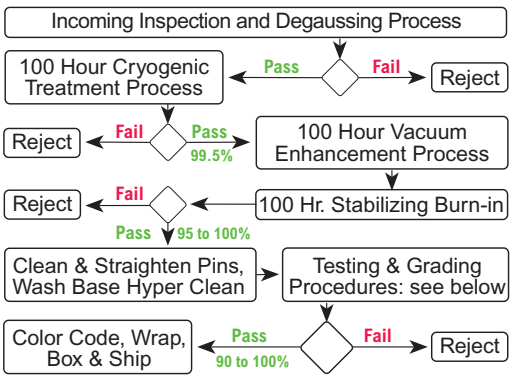


Fig. 1. Shown above is an artwork typical of those applied to the sides of the boxes in which all 7/9-pin CryoValve tubes are packed. All test data is written in by hand as the tube is passed through the various stages of our procedure. Every tube is subjected to assessment by instrumentation and actual listening tests.

Miniature Tube Treatment Procedure



Testing & Grading Procedures

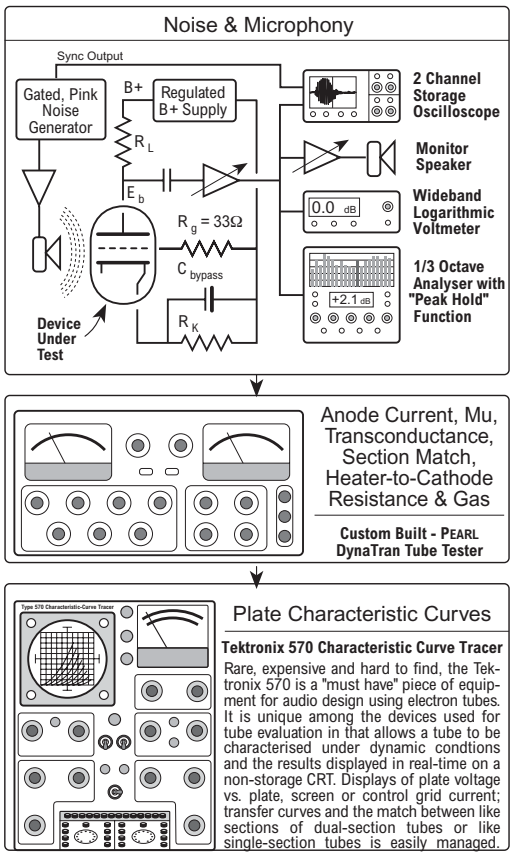


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Fig. 2. The complete production flow for Pearl CryoValve electron tubes is schematically rendered above. Unique in the audio industry, our methodology effectively addresses many issues relevant to the performance of electron tubes in high-quality audio and musical instrument applications. *CryoValves will remarkably improve the sound of* **any** *tube-type audio equipment.*