The Sony Trinitron Tube

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The Trinitron colour tube, designed by and used exclusively by Sony in all its colour receivers, was the first to have an in-line gun arrangement. It has a single gun assembly with three cathodes mounted in line horizontally, a striped-phosphor screen, an aperture grill with vertical slots instead of the traditional type of shadowmask, and a faceplate with cylindrical rather than parabolic curvature. The Trinitron tube produces a very good display – some people, including the author, would say the best. There are sound technical reasons for making this claim, for example the design of the large electron lens which provides excellent resolution. An advantage of the cylindrical in comparison with the traditional parabolic faceplate is the fact that most of the external light that falls on it is reflected away from instead of towards the viewer, thus improving the contrast and reducing eye strain. The Black Trinitron introduced a couple of years ago gives a further improvement in this respect (the faceplate has been darkened to a black colour).

Since the first Trinitron tubes appeared in the UK in the late sixties there has not been a great deal of change in the design, though a number of improvements have been introduced. More recently we have had the Black Trinitron mentioned above and the Pan-focus gun which gives uniform focusing over the entire screen area, eliminating any need for dynamic focusing.

The Trinitron Gun

Fig. 1 shows the basic Trinitron gun arrangement. Note that the beams cross over during their passage through the electron lens system. We have used the traditional UK A1, 2, 3 etc. system of electrode identification though Sony prefers G1, G2 (A1) etc. which is really more logical. Conventional tubes generally employ what is referred to as bipotential focusing, i.e. the first anode (A1, G2) is at about 800V while the focus electrode is at around 20 per cent of the final anode voltage (e.h.t.). With the Trinitron the A1 (G2) voltage is about 200-800V, the focus electrode (A3, G4) is at around 350-800V while A2 and A4 are internally connected to the e.h.t. voltage. The convergence electrodes act as an electron prism, deflecting the beams after their cross-over in the electron lens to ensure convergence at the aperture grill. This is where the horizontal static convergence voltage is applied. Most of you will have seen the large H stat controls in Sony TV sets. By adjusting this control well away from its correct setting you can see the effects of incorrect RGB beam convergence.

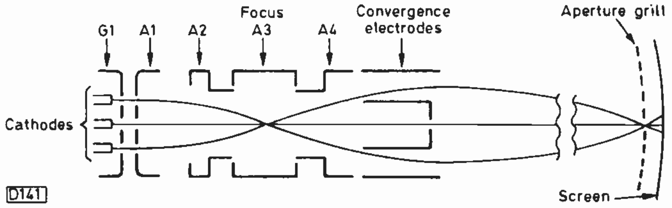

Fig. 1: The Trinitron's internal arrangements.

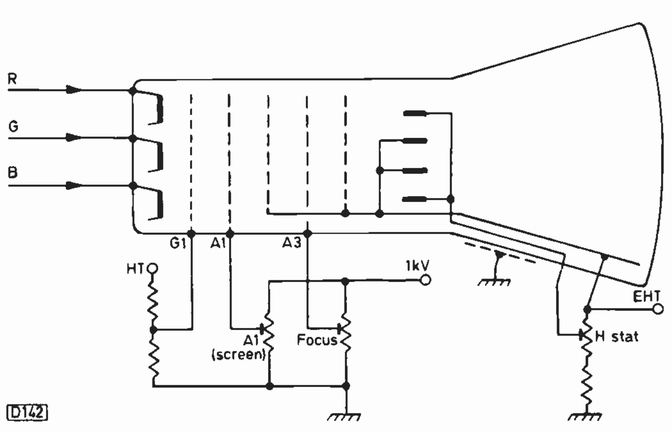

Fig. 2: Inputs to the various electrodes.

In the earliest Trinitron tubes the convergence voltage was applied via a connection on the tube's neck – you may recall the rubber boots on the neck of the tube in the KV1300! Subsequently connection was made by means of a two connection e.h.t. cap. In the latest tubes an external connection is not required at this end. Instead the arrangement is as follows. A high resistance (IBR) is incorporated in the neck of the tube, between the final anode and the convergence electrode. The potentiometer to control the horizontal static convergence voltage is connected to the earthy end of the IBR, enabling the connection to be made through a pin at the tube's base.

To improve corner focusing a "double astigmatic" lens is now used. What this means is that the holes in the G1 plate, which provides prefocusing, are now oval instead of circular. To improve the focus from the centre to the edge with large-screen tubes the Pan-focus system has been introduced. This involves a change in the position and angles of the cathodes and makes it unnecessary to apply a parabolic dynamic focus waveform to the focus electrode.

Tube flashovers can destroy costly devices in the associated circuitry, though they don't usually damage the tube itself. They tend to occur during only the first 100 hours or so of tube use. A flashover consists of a discharge from one of the high-voltage electrodes to one at a lower potential. To protect the external circuits the latest tubes employ Peak Current Elements (PCEs), which are basically high-impedance resistors, within the tube. There are two of these, one from A4 to A2 and the other in series with A3. In the event of a flashover a very high voltage will be developed across these PCEs, as a result of which the charge cannot reach the c.r.t. connections and external circuitry.

As with other types of tube the degaussing shield is now incorporated within the tube. It's made of low-carbon steel which has low permeability and a thickness of only 0·15mm. This reduces the size and weight of the receiver and also greatly simplifies tube replacement.

Setting up a Trinitron

Many readers will probably be more interested in the alignment of Trinitron tubes. In common with the conventional shadowmask tube in its modern form, i.e. with FS screen etc., the corner convergence and focusing are not