

SECTION X GUN PERFORMANCE

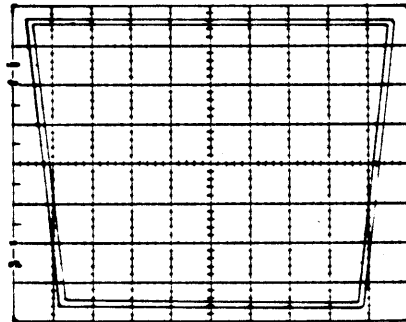
INTRODUCTION

This section is on a variety of parts which effect the appearance of patterns on the screen. Some of the causes are reworkable with magnets. Others can not be fixed. In this section I will try to explain detection, cause, and some rework methods for each performance parameter.

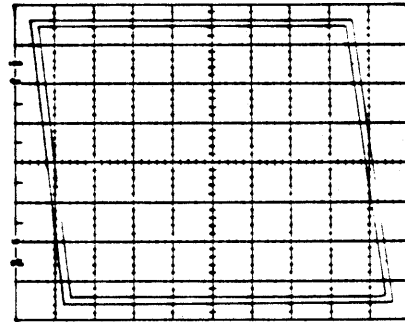
GEOMETRY R 322 VERTICAL , R 323 HORIZONTAL

DESCRIPTION

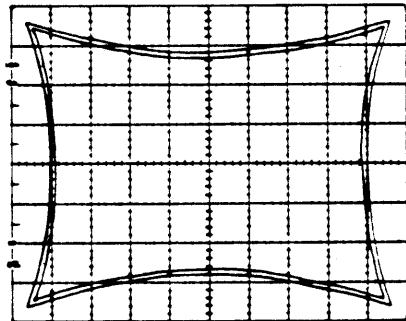
Geometry is defined as the Parallelism and Straightness of all lines within the graticule area. There are many shapes geometry can take. Some of the basic ones are shown below. The amount of deviation is the sum of the measurements made on both sides for Keystone, Pincushion, Bowing, and Distortion. The measure of deviation in the Tilt example is made on the worst side.



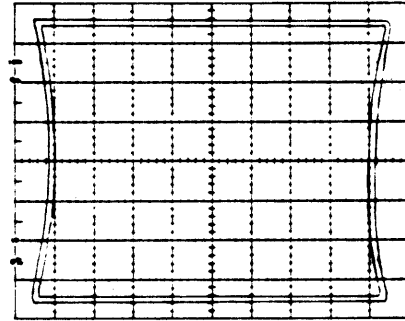
KEYSTONE



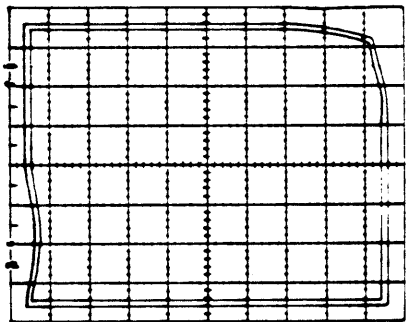
TILT



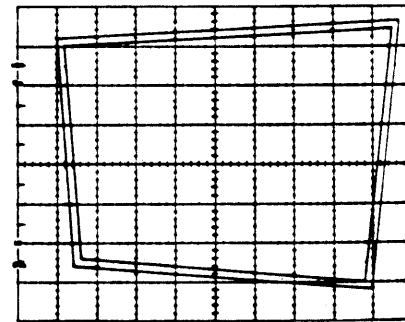
PINCUSHION



BOWING



DISTORTION

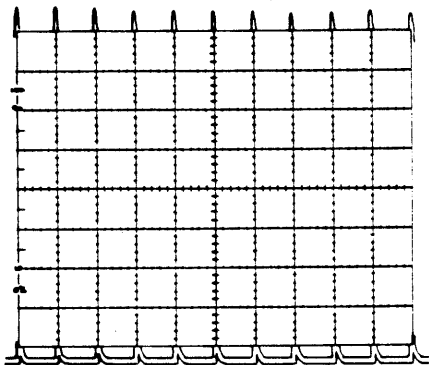


TRAPEZOID

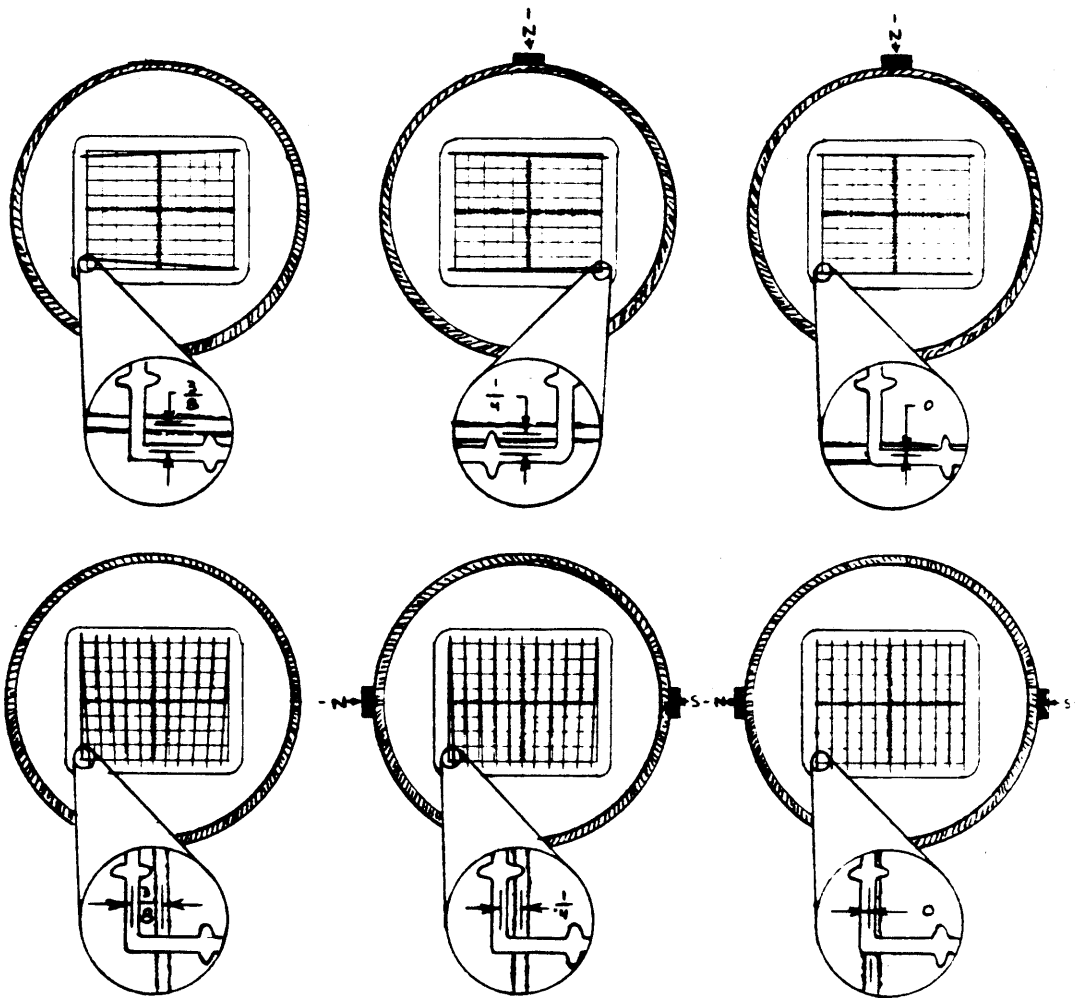
GEOMETRY (CONT)

MEASUREMENT

After optimum set-up conditions have been established, position Time Marks behind each graticule line. Center each time mark under the graticule line. Switch the Time Mark Generator to 10 times more lines. This will fill the screen with Time Marks, each one half minor division apart. These Time Marks can now be used as a gauge to measure the amount of deviation. The examples below are some typical measurements.



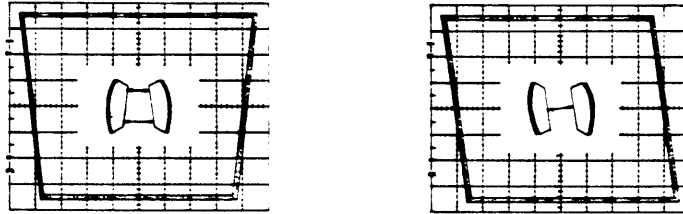
ESTABLISH TIME MARKS



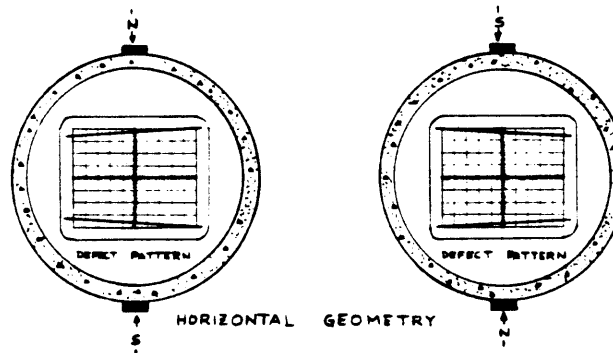
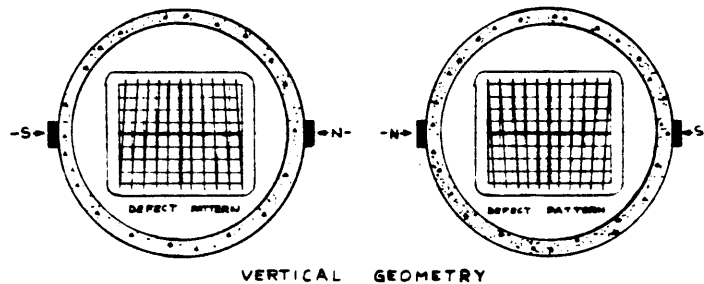
GEOMETRY (CONT)

CAUSES AND CORRECTIONS

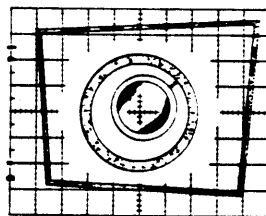
The Keystone and Tilt geometry is the simplest of causes and is typically caused by the position or parallelism of the DIDZ plate position and geometry.

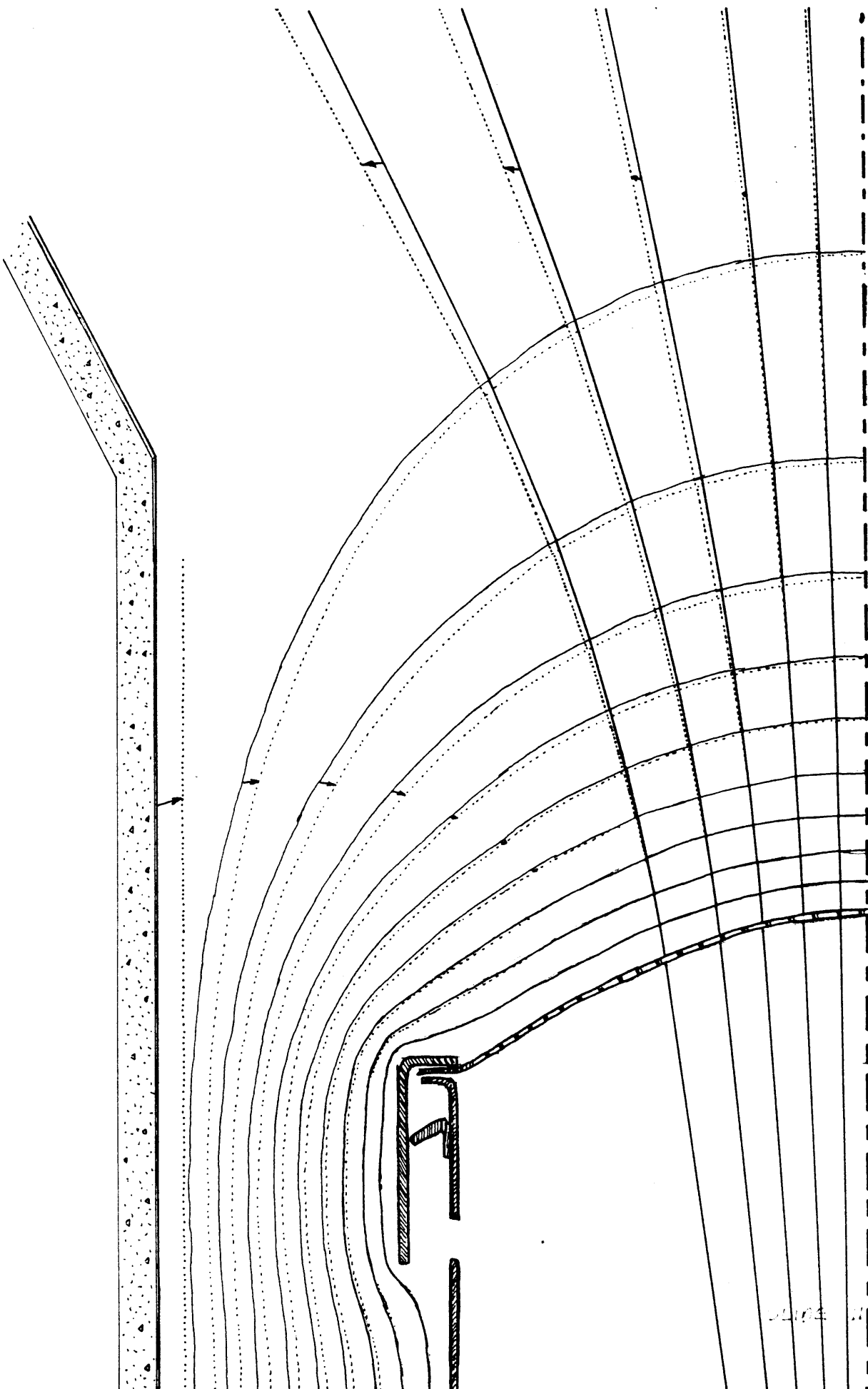


This kind of geometry can be corrected with magnets. The illustration below and the instructions in P/S 7-0496 shows how Keystone and Tilt geometry deviations can be reduced.



The next level of cause is the effect when the mesh is not centered in the ceramic bulb. It produces a Trapezoidal pattern with the pattern pointed in the direction of the off center position. Here the reason for the mesh being





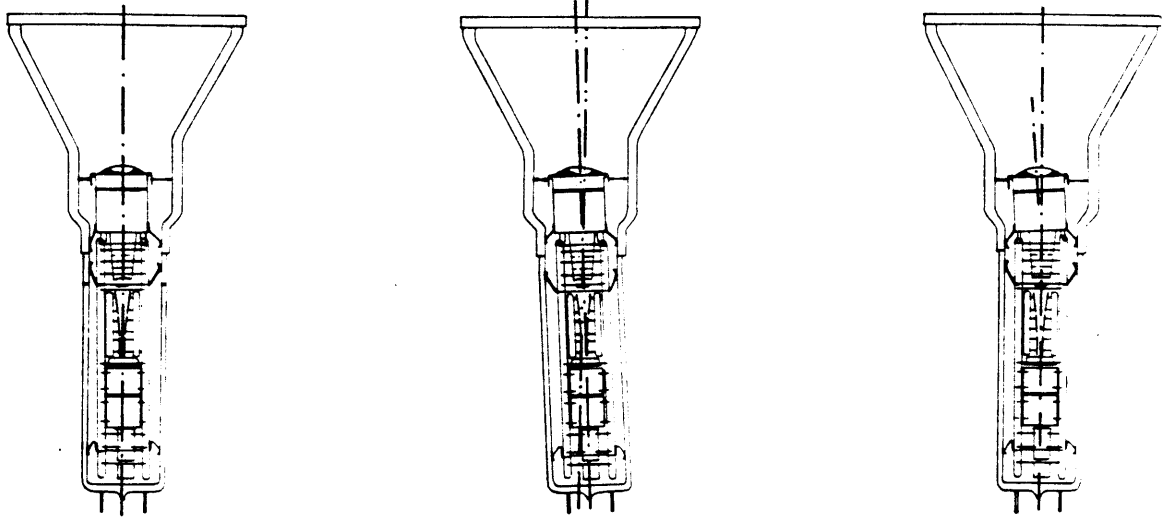
FROM IMAGE PROGRAM ED - 0107 JAN 1977

SLICE 1

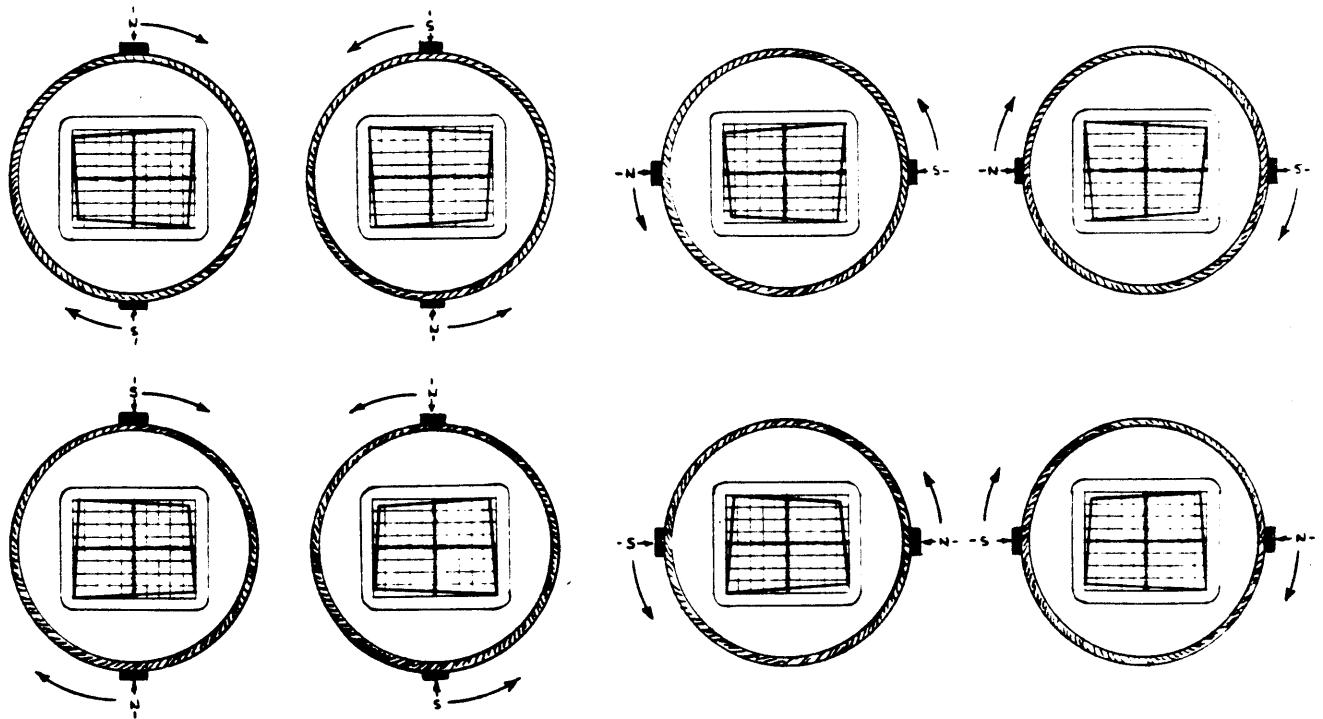
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GEOMETRY (CONT)

off center are many. First the snubber springs are not holding the gun in the center. Second, the scaler may not have the gun and the bulb on the same axis. The final condition is the mesh can is not on center with the axis of the gun and bulb. Again this problem is reworkable with

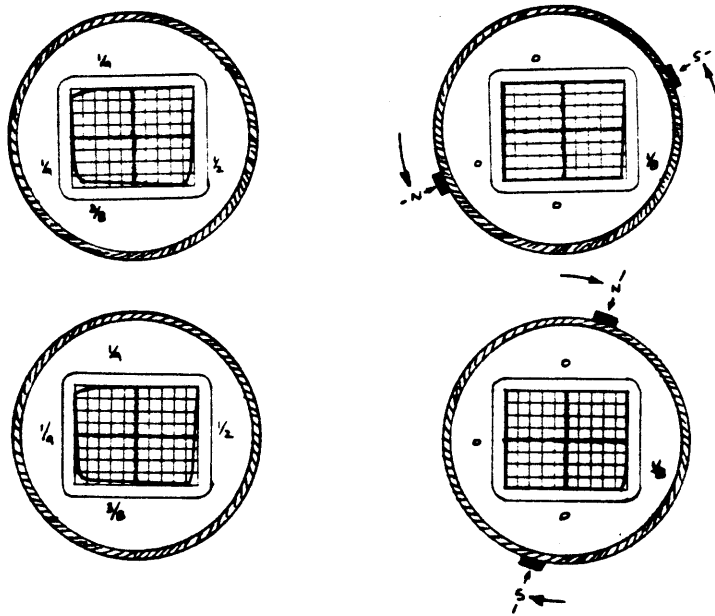


magnets. The illustrations show some of the starting points for correction. In these examples it is necessary to move the magnets around to get the best correction.



GEOMETRY (CONT)

Distortion geometry is caused by irregularities in the mesh profile and can be corrected by magnet rework. Again it is necessary to move the magnets for best correction. This is shown in the illustration below.



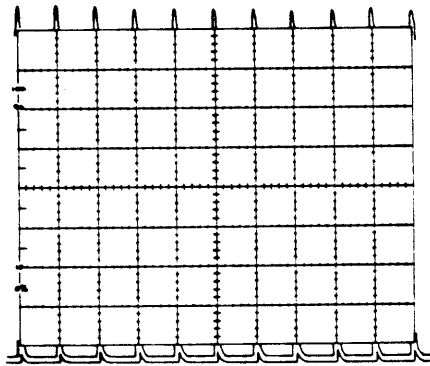
Pincushion and bowing geometry are caused by either the basic profile of the mesh or the gun is not scaled at the proper index. Before starting magnet rework the tube should be checked for sensitivity and scan. If OK, then attempt magnet rework.

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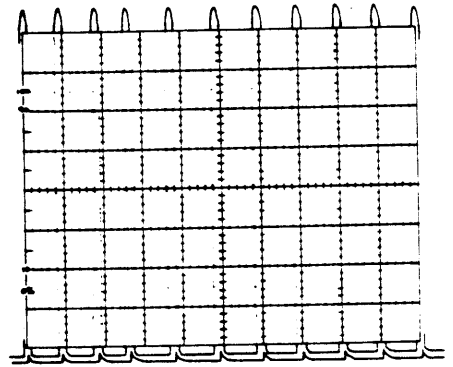
LINEARITY R 531

DESCRIPTION

Linearity is the ability of the CRT to position equally spaced reference markers equally across the screen. It would look like (a) if equally spaced. If not, it would look like (b).



(a) EQUALLY SPACED TIME MARKS



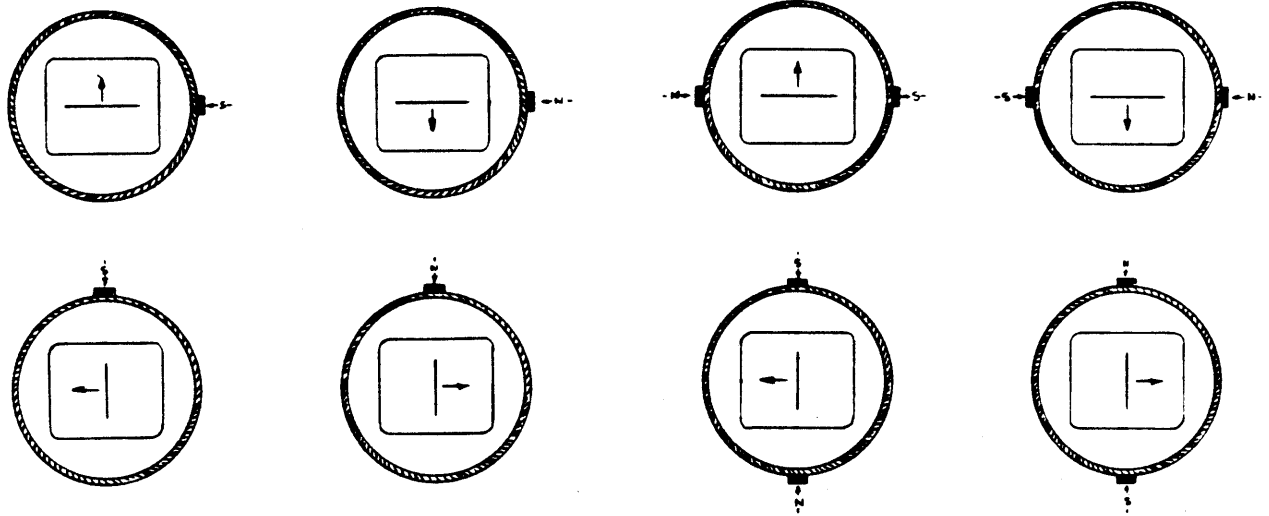
(b) NON-LINEAR DISPLAY

There are several methods of measurement. For those tubes tested in production, it is a simple match of time marks to graticule lines and measuring the maximum deviation.

The second method of measurement is conducted by Special Measurements. Here they measure the voltage required to move a vertical line from one graticule line to another. These voltage measurements are made with a precision voltmeter and the results are entered into a formula to calculate performance.

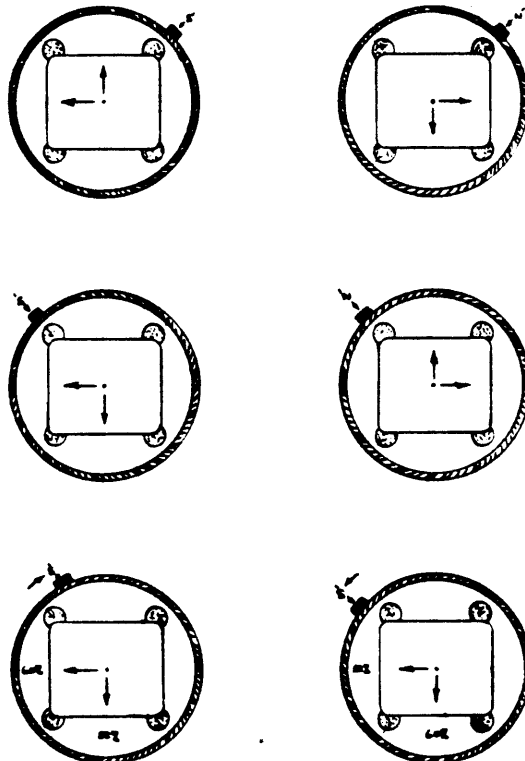
ELECTRICAL CENTER R 502

Electrical centering is a check to see if the gun is pointed in the right direction. It is accomplished by applying zero difference voltage to the plates being tested. It is measured by how far it is from graticule center. It is caused by several things. It is most often off because the gun is off center. But it can be off because some elements within the gun are not aligned, typically the focus rings. Electrical center can be corrected by magnets as shown below.



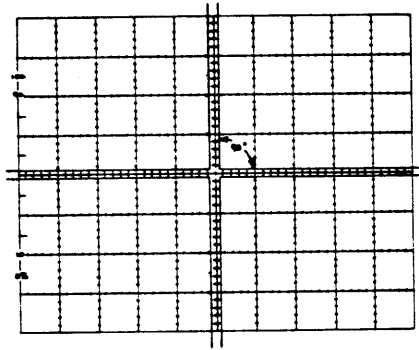
SINGLE MAGNET REWORK

DOUBLE MAGNET REWORK

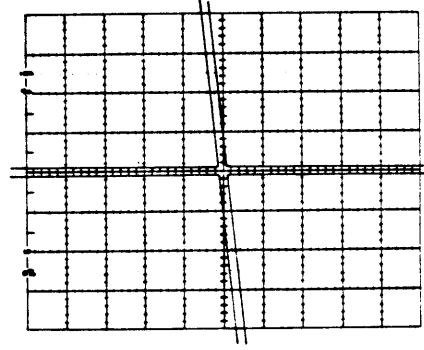


X-Y ALIGNMENT R 302

X-Y alignment or Orthogonality is the perpendicularity of the x and y deflection traces. It should look like the pattern in (a), but if out, it looks like (b). It is caused by the horizontal and

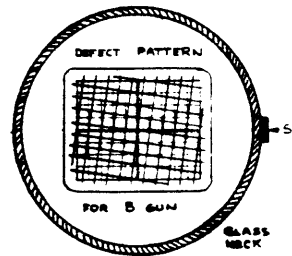
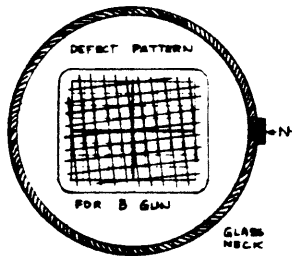
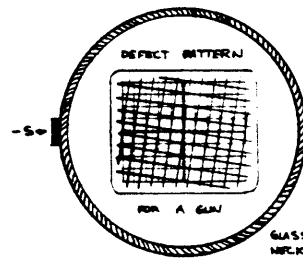
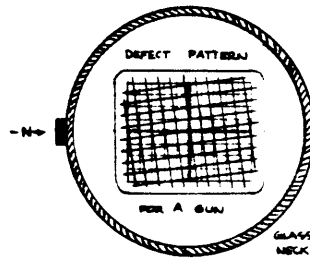


(a) GOOD ORTHOGONALITY



(b) POOR ORTHOGONALITY

vertical deflection plates. Many instruments have correction coils and magnets can be used. Below are illustrations for magnet correction on a dual gun CRT.



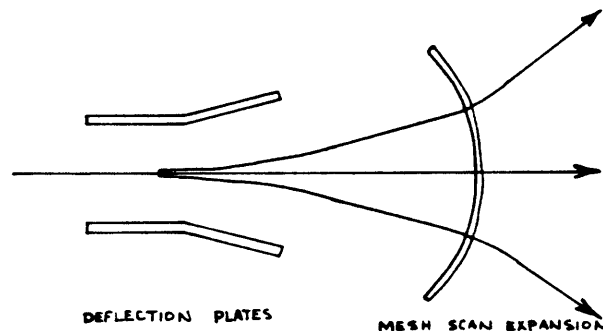
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SCAN R 326 VERTICAL R 327 HORIZONTAL

Scan is the ability to get all of the electron beam to the screen. When the beam is deflected toward the deflection plates, some of the electron at the edge of the beam are intercepted by the plate. Scan problem can occur when the plates are too close together, if this is the case the sensitivity will also be high. The tube can not be reworked. Another cause of scan problems is if the plates are not centered either in the rodded gun or the gun centered in the tube. Both of these do not effect the sensitivity and it can be reworked with magnets the same as electrical center.

SENSITIVITY R 527 VERTICAL R 530 HORIZONTAL

Sensitivity or Deflection Factor is the voltage required to deflect the beam a given amount. The amount of voltage required is dependent on the spacing of the plates and the profile of the mesh.



The greater the plate spacing, the more voltage required to deflect the beam. The greater the curvature of the mesh, the less voltage required to deflect the beam. If either of these elements are out, the tube is a reject.

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BEAM REGISTRATION R 311

Beam registration is the alignment of the two guns in the 7B40 CRT. It is best shown by the illustration below. Magnets are used to correct registration.

