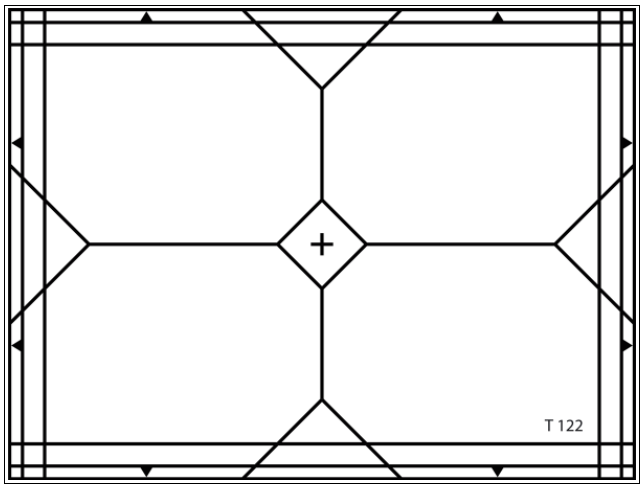
CCD REGISTRATION TEST CHART

TRANSPARENCY



CCD sensors are built-up of pixels in vertical rows. These vertical rows will interfere with the vertical lines of the usual registration test charts. To avoid this interference the TE122 is designed with lines under 45°.

Measuring registration errors in a CCD camera requires:

- registration test unit which consists of two delay sections, one for R/B and one for Green
- test chart TE122
- B/W-monitor

Horizontal and vertical registration errors can also be measured if the registration test unit can only generate a delay or an advance of R/B to Green in horizontal direction. Notice, that not only the camera is tested in this way but the combination lens-camera (lens effects).

Measurements
The switches of both delay sections are place in the zero position before each measurement. Shift R resp. B over Green to minimize the distance a and b (s. fig.1). The horizontal and vertical errors can be found with:

Horizontal error = (a + b) / 2 Vertical error = (b - a) / 2

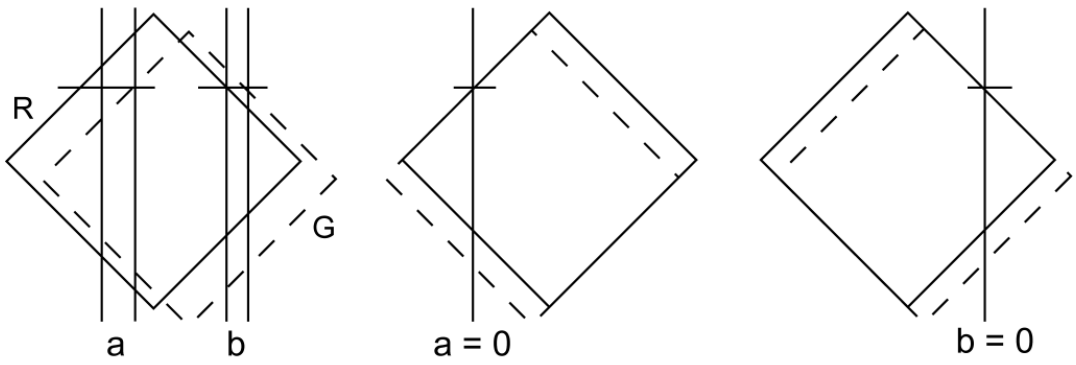


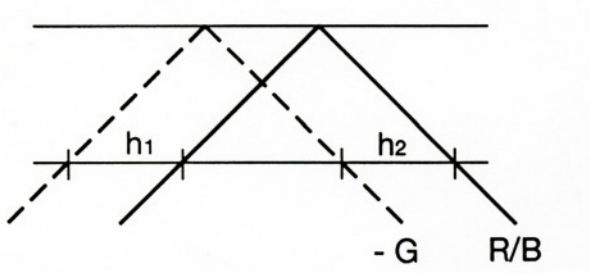
Fig. 1: Registration error in horizontal and vertical direction in the picture centre and the determination of a and b. Overlay R-G.

Errors are positive, if a green delay correction is required and errors are negative, if a R/B delay correction is required. Measure the horizontal registration error at the locations Up and Down (s.fig. 2) and ignore a possible vertical error overthere. R resp. B. are now located symetrically around Green.

Survey of possible errors

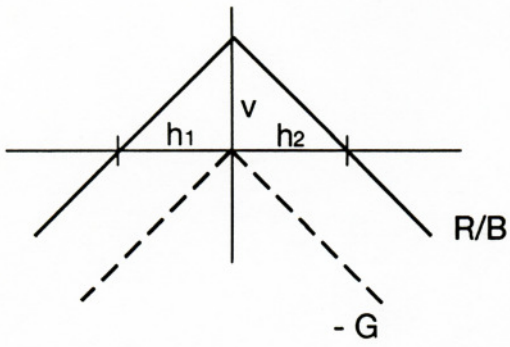
1. Horizontal error only, h1 = h2

To measure horiz. error h1 shift(advance) Red over Green.
Horiz. error = h1.
R/B delayed to Green: +
R/B advanced to Green: -



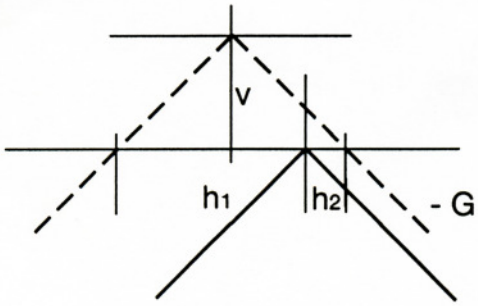
2. Vertical error only, v = h1 = h2

To measure the vertical error v shift (advanvce) Red over Green. Vertical error v = horiz. shift h1.
R/B up to Green: +
R/B down to Green: -



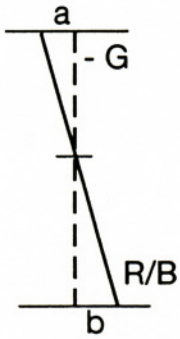
3. Horizontal and vertical error

Start to measure the horiz. error: shift (advance) Red so that h1 = h2. Second measure the vertical error v conform to 2.: Shift (advance) Red over Green; the amount of shift is the vertical error v.



4. Rotation R/B to Green

Rotation = (a + b)/2.
R/B turned counter-clockwise to Green: +
R/B turned clockwise to Green: -



5. Lateral chromatic abberation = h1 + h2
(due to the lens)