



Projector Line Dithering

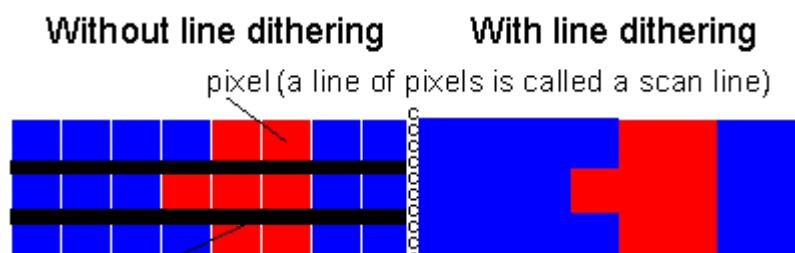
Simply stated, "**projector line dithering**" is a digital process, internal to the projector that dramatically improves the picture quality of still video images and portions of video images.

All Knöll three gun projectors are digital and process signals digitally. To change the image characteristics one needs simply to change the digital computer program. Both the Knöll HT3 and HT300 have proprietary digital programs to significantly improve line dithering. Line dithering works in all modes and formats including NTSC, PAL and line doubled images. Because of the relative slow speed that images are displayed in NTSC and PAL, **line dithering primarily improves images by filling in the blanking lines in portions of the screen that motion has stopped** while retaining sharpness of image. Effectively pixels are made taller from top to bottom without becoming fatter.

Large projection screen sizes magnify any problems that are inherent in the format (NTSC and PAL) is the image source. One of the major problems of NTSC and PAL are that they leave a black or darkened line in between each scan line (a scan line is a horizontal line of lighted dots, called pixels that are usually square or hexagonal). On smaller TV sets these black lines may not be visible. On larger sets (over 30") these lines are easily visible and the larger the image size the more visible they are. **It is important to remove these lines as much as possible so viewers can sit close to the screen to simulate the big screen cinema as closely as possible.** A popular way to remove this effect is to use a line doubler on a projector equipped to handle line doublers and if the doubler and the projector are of sufficient quality the lines will be effectively removed. Line doublers and projectors that can display doubled images are costly and may be out of the price range of many people.

Fig. 1 Effect of line dithering

This enlargement of some video scan lines dramatically shows the effect of line dithering by removing the black lines in between the scan lines.



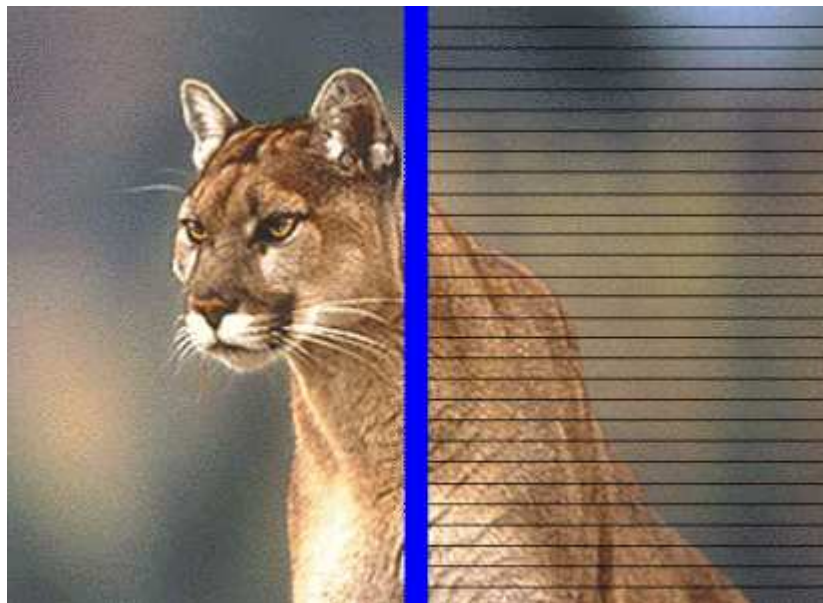
Black line between scan lines
These lines make it difficult to sit near the screen and have a cinema experience.

With line dithering, the black lines on still images are gone. Note how the pixels are taller but not wider.

Line dithering on a lower cost projector is a way to significantly improve image quality at a fraction of the cost of a line doubler and projector that can display line doubled images. Line dithering was added to the HT300 because low resolution, high contrast images (eg. hockey games on cable TV) are frequently viewed with the line doubler disabled because line doubled image sharpness can be seriously reduced by low resolution, high contrast image sources. While viewing a Knöll projector with line dithering, the dithering is present on portions of the image that are still (blanking lines are absent), then as soon as motion starts on that portion of the image, the black lines reappear on the moving portion only, then disappear when the motion stops.

Fig. 2 Image with and without line dithering

The right side of this image shows black lines between scan lines without the use of line dithering. The left side of the image show video scan lines with the use of Knöll series I line dithering. With line dithering the viewer can sit very close to the screen and get a more accurate cinema experience.



Line dithering also has the effect of making a projector last longer with a brighter image. This is possible because the phosphor on the CRT's (cathode ray tube) is more evenly heated as there are much fewer hot (scan line), cold (black line), hot (scan line areas). And because more of the CRT is lit, the image is brighter.

Without line dithering the black lines in between the scan lines is always present. The Knöll **HT3 with Series I line dithering works about 45-55% of the time** removing black

lines depending on the image content and amount of motion. The **HT300 with its faster digital processors uses Series III line dithering and works about 65-80% of the time**. Line dithering never lowers sharpness or contrast on any image type.

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