Kaypro Column

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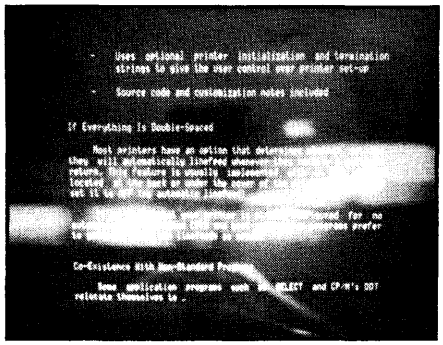
Want a simple Kaypro mod? Something non-technical like a non-glare screen? This is a non-glare screen but it's still pretty technical. Sorry, maybe next time.

Who hasn't complained about unwanted light falling on the computer or monitor screen and washing out contrast, as in Figure 1? Mesh filters, spray-on liquid, and green filters have all been offered as solutions, but often cause reflections of their own.

Figure 1 - Before



An Optical View

My solution uses an optical principle that is not original with me, nor even particularly new. The principle is illustrated in Figure 2.

Picture your eye, at right, looking toward a computer screen (in dashed outline, at left). Next, imagine a curved mirror or reflector (solid line) placed in front of the screen. Finally, suppose that the reflector's curve is such that all light rays coming to your eye must come from a point below and in front of the screen — as shown in the figure. If these conditions are met, then the only thing you can see will be that point. Make that point a black surface (light trap), and black is all you'll see.

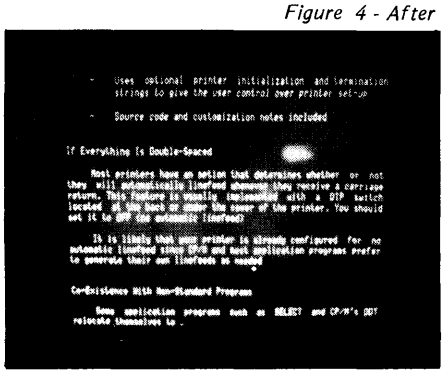
This curve is an ellipse, with your eye at one focus and the black point at the other. The mirror can be expanded to an elliptical trough or cylinder, and the point can be expanded to a surface (parallel to the axis of the cylinder). Same result.

Suppose we replace the mirror with a sheet of transparent color-filter material? We can see the screen through that — and the only thing we can see reflected from it is the light trap, the black surface. There are no distracting reflections off the filter sheet, because reflected light from any other source just doesn't go to your eye. The black surface doesn't give off any light. As a result, the filter sheet (assuming it is smooth and clean) actually seems to disappear.

Figure 3 shows the desired arrangement. The "light shade" is a box-like structure with the front and back open; you look right through it at the screen. The sides contain grooves or tracks into which you slide your sheet of filter material. These tracks, in turn, serve to shape the filter into the desired elliptical form. The inside of the box is painted flat black — and there's your light shade and light trap, all in one.

The result is shown in Figure 4: greatly reduced stray illumination on the screen, and at the same time absolutely no reflections from the filter sheet.

Figure 4 - After



Construction Notes

The structure must be light and stiff. I used mostly corrugated cardboard, with a few pieces of 3/4" wood cove molding in the upper corners and across the front at the bottom for extra stiffening. Cardboard can be remarkably strong, especially if the directions of the corrugations are crossed in alternate layers.

To lay out the tracks for the ellipse, I drew the CRT screen and the measured location of my eye to full scale on an easel pad. Then I got my ellipse by cut-and-try. There are two constraints in drawing the ellipse: (1) its major axis (A——A in Figure 3) must pass through one focus (F1) and through the eye position (F2); and (2) the ellipse must clear the screen by a small but comfortable margin.

The solid part of the ellipse (in Figure 3) is all that is used for the filter. I have drawn the unused part with dashed lines, just to show how it all goes together. The light trap, of course, must be placed at F1; it is formed by the bottom of the box.

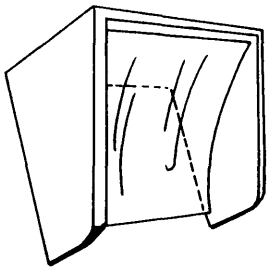
Figure 5 illustrates the classical method of constructing an ellipse, using drawing-pins and a piece of string. The cut-and-try part comes in getting just the right amount of slack in the string so that the ellipse falls in the desired place relative to the screen, as shown in Figure 3.

Having gotten my curve and sketched a suitable shape for the light shield, I pricked the outlines of the shield and curve through the original sheet of paper onto cardboard "raw material" with a scriber. Then I connected the points with pencil lines and cut the material with a smooth, unserrated knife blade in a sabre saw.

The inner sides of the box (containing the elliptical tracks) came in two pieces, fore and aft, for each side. (They were three plies thick, so the tracks were about 3/8" deep.) I established the track width by separating these pieces with 1/32" cardboard shims, and glued them inside the outer sides of the box to form the tracks.

Figure 6 shows the box in an early stage of construction (without the bottom, but with a piece of filter material temporarily in place). Finishing touches included spray-painting the inside of the box flat black, and the outside with aluminum paint. I sanded the aluminum paint lightly to remove raised grain, burnished it with the

Figure 6 - Non-glare box



back of the sandpaper, and gave the outside a couple of coats of clear spray lacquer to keep aluminum flakes from getting loose.

Filter Material

Here again we have two requirements: (1) the color of the filter material must roughly match the color of the CRT phosphor (i.e., green or amber); and (2) the material must be of reasonably good optical quality — that is, clear and smooth. I discovered two unlikely but very effective filter sheets. One was the material in a transparent plastic report binder (Ful-Vu E-Z SLIDE, available in stationery stores), and the other was a material intended for making overhead projector transparencies with a tinted background.

The binder material's color was rather on the blue side, but it worked well in severe cases; it was used in Figure 4. The transparency material was a perfect color match for my green screen.

For computers with color displays, of course, a color filter is out, but a neutral-density (gray) material will be helpful. Whatever material you use, one thickness must be enough. Using two layers will add back-and-forth reflections between them. It is a good idea to wipe the filter sheet with anti-static treatment before final installation.

Figure 2

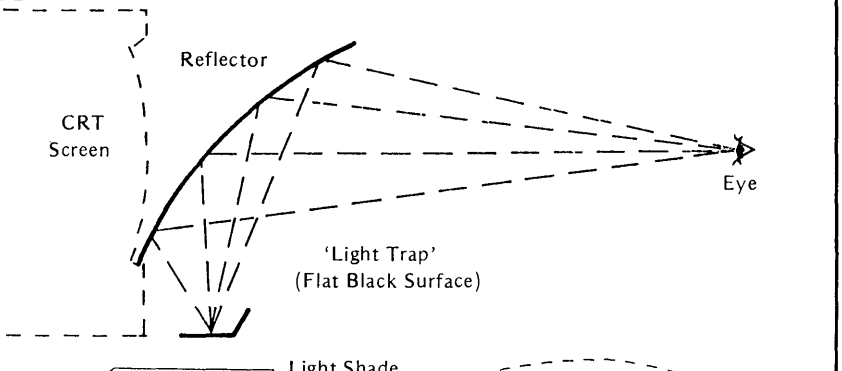


Figure 3

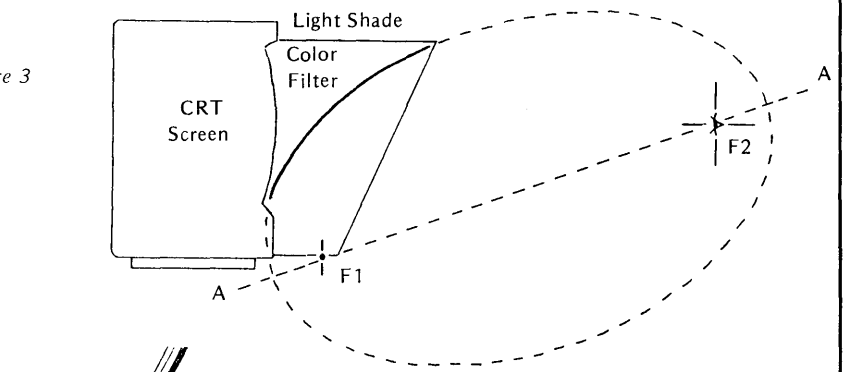
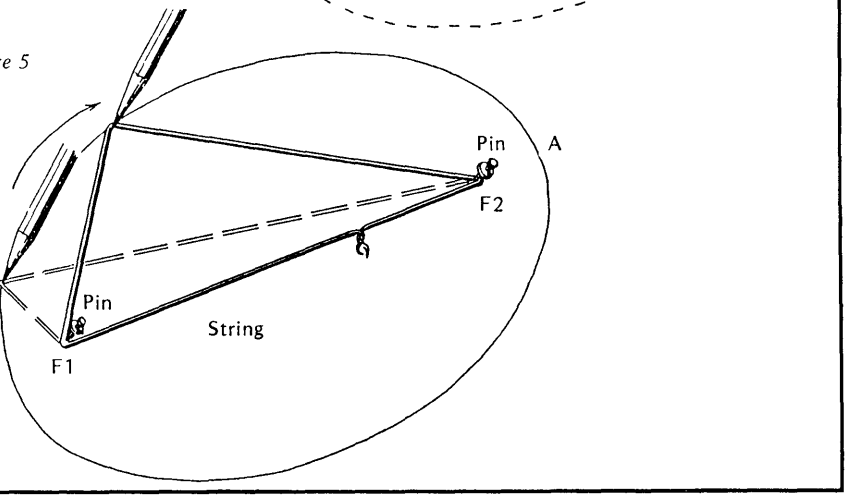


Figure 5



Concluding Notes

A word is in order about attaching the light shield and filter holder. My computer is a Kaypro II with a 9'' screen. If the front of your monitor is smooth and featureless, you may have to use something like double-sided sticky foam tape for attachment — in which case ultra-lightweight construction is essential. Some support from the bottom will help in situations like this.

With larger monitors, the box might get a bit bulky and cumbersome. However, if you can arrange the setup so your eye is slightly above the center of the screen, the resulting ellipse will be tilted upward and back, and will not extend as far in front of the screen. You may have to try several layouts (on paper!) in order to achieve the best compromise. It may be helpful to duplicate your ellipse on a separate piece of tracing paper, place it over your layout, and experiment.

Finally, the surprise. Before you do anything else, cut a light-shield out of black paper, cardboard, whatever is handy. Hold it or tape it in front of your screen. You may find that it shades the screen so well you don't need the filter material at all! In that case, just build the box and bless your luck.

EDITOR'S UPDATE:
No Garbage On 84 Video

Michael Stocker called recently to say that he had finally rid his screen of occasional garbage characters (even when using the Pro-884 Max in fast video mode). He simply replaced the 6116 static RAM chips in the video section with faster (150ns) parts.

He said he had gotten his new 6116s from Microprocessors Unlimited for $1.00 each (the video section holds two). The chips are located at U15 and U23 on the 84 Kaypro 1, 2, and 4. See the back cover of this issue for the address of Microprocessors Unlimited.

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